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Investigation of a New Simulation Procedure for Speech Intelligibility in Open-Plan Offices

Master's Thesis in Sound and Vibrations

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Abstract

Open-plan offices are a popular office layout, due to the efficient use of floor space. However, to employees open-plan offices normally appear to be less beneficial. Complains about noise from phone calls or discussions from colleagues are very common. But not only annoyance is a negative consequence of bad acoustical conditions, also work performance and productivity decrease steadily with increasing number of office users. Therefore it is essential for the acoustic planners to consider all major sources of noise in the planning stage to gain the best possible user experience.

The current measurement standard for evaluating office rooms ISO 3382-3 is difficult to apply due to given limitations and conditions. In addition, it generalizes results using a limited number of measurement points and linear regression for the calculation of single number values, which are used for rating the examined office. There is no systematic model available for comprehensive acoustical analysis or advanced optimization in the planning stage. Therefore, this thesis investigates a new evaluation method. The main focus lies on speech intelligibility, represented by the Speech Transmission Index (STI), since speech sounds possess the highest potential to disturb office users.

In the new method investigated, each office user is considered to be a source as well as a receiver. Therefore, the idea of a Source-Receiver-Matrix is pursued. Thereby it is possible to gain information on every single source and receiver relation, as well as a comprehensive overview on the overall acoustics in the room. A color scheme, which categorizes the STI results regarding the expected working conditions, enables a direct evaluation. Three hypothesis were tested with data gained from three generic simulation models. Firstly, it showed that the shape of the ground plot has significant influence on the overall acoustic quality achieved. Secondly, there are workplace groups, which have significantly different noise exposures. Thirdly, with the new model, the effectiveness of modifications of interior design with regards to acoustical performance can be judged and ranked on statistical basis, which is exemplified. The new method supplies concise analytics based on comprehensive modelling, which leads to better understanding of acoustics in the open-plan office.

Keywords: open-plan office, acoustics, ISO 3382-3, simulation, speech transmission index, source-receiver-matrix, comprehensive model, statistics

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Rebecca Valeria Bertazzoni, Stuttgart, September 2018

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Acronyms

ANOVA Analysis of Variances. 29, 59

DP Decrease of Performance. 27

IBP Fraunhofer Institute for Building Physics. iii, iv, vii
ISE Irrelevant Sound Effect. 26

PESQ Perceptual Evaluation of Speech Quality. 27

RASTI Room Acoustic Speech Transmission Index. 27

SII Speech Intelligibility Index. 27
SIL Speech Interference Level. 27
SNR Signal to Noise Ratio. xvi, XXVIII, 35, 36, 56
SPL Sound Pressure Level. xiii, xv, XXX, 6–12, 23–26, 28, 33, 35, 40, 57, 58
STI Speech Transmission Index. v, xiv–xvi, XXVIII–XL, XLIV, 3, 6, 9, 10, 14, 15, 24–29, 33–36, 41, 43–52, 54–56, 58–63, 65, 67, 68
STIPA Speech Transmission Index for Public Address Systems. 27

Nomenclature

χ^2	Chi-Square test statistics
A	Area of office model
A/WP	Area per workplace
A_i	A-weighting values per octave i
D_n or $D_{n,i}$	Level attenuation per octave i
$D_{2,S}$	Spatial decay rate of the A-weighted SPL of speech
f_c	Mid frequencies of octaves i
H	Height of office model
L	Length of office model
L_p	Sound Pressure Level (SPL)
$L_{NA,Bau}$	SPL of construction noises
$L_{p,A,B}$	Average A-weighted background noise level
$L_{p,A,S,4m}$	A-weighted sound pressure level of speech in a distance of 4 m
$L_{p,A,S,n}$	A-weighted Sound Pressure Level (SPL) of speech at the measurement position n, summed up over all octaves i
$L_{p,A}$	A-weighted SPL
$L_{p,B,n,i}$	Measured background noise level at the measurement position n, per octave i
$L_{p,B}$	Background noise level
$L_{p,Ls,1m,i}$	SPL of the loudspeaker in a distance of 1 m to the middle of the loudspeaker in freefield and per octave i
$L_{p,Ls,n,i}$	Measured SPL of the test signal at the measurement positions n, per octave i
$L_{p,S,1m,i}$	SPL of speech in a distance of 1 m to the middle of the source in freefield per octave i
$L_{p,S,n,i}$	SPL of normal speech at the measurement position n, per octave i
$L_{W,Ls,i}$	Sound power level of the loudspeaker per octave i
$L_{W,S,i}$	Sound power level of normal speech per octave i
N	Amount of workplaces in office model
P	Amount of required measurement paths
p	Probability
r	Effect size
r or r_n	Distance to the source from measurement position n
R^2	Coefficient of determination
r_0	Reference distance of 1 m
r_D	Distraction distance
r_P	Confidential distance

STI	Speech Transmission Index (STI)
T	Reverberation time
T_n	Gaussian triangular number
V	Volume of office model
W	Width of office model
z	A data point expressed in standard deviation units

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1
Introduction

The Open-plan office is an increasingly popular office layout, which is said to provide better communication for the increasing demand of exchange by employees. This chapter describes how office work originated and evolved over time, how different studies of the last four decades discussed advantages and disadvantages of the concept of open-plan offices and how the current market situation of office real estate influences supply and demand. It gives a brief introduction to the opinion of open-plan office users and why the currently used standards on acoustics in offices do not automatically lead to pleasant acoustic working conditions.

1.1 A Closer Look at Open-Plan Offices

The importance of office work increased steadily. Since the end of the middle ages, it became necessary to be in contact with trading partners, to write down transactions and to book payments, as well as to calculate and plan future labor. At that time the desk became one of the most important furniture pieces for the merchants, and office work started to develop. With industrialization not only manufacturing increased but also administrative work. Governments and companies of the competitive economy system formed bureaucratic systems in order to take care of planning and monitoring tasks, the social insurance system and tax matters. Around the turn of the millennium (1900), when corporations experienced a strong growth and typewriters started to be used in offices, the administrations of companies became more and more structured. This led to the formation of various departments such as the accounting, the order acceptance or the shipping. Each of these divisions was independent and pursued its special function. The extreme amount of newly created paperwork led to an increase of employment, among them more and more women, who started to work as stenographers, typists, accountants and cashiers. Especially the monotonous work in these positions was carried out by women, at the same time in the same room - the first open-plan offices. For an optimization of working procedures and for rational employment this kind of office concept has been continued to be used also after World War II [1]. In the 1950s more elaborated concepts for open-plan offices started to be created and in the 1970s they reached a peak in popularity [2].

The progressive digitization in today's information era made offices to one of the most common work spaces of employees. According to [3], the demand for office workers is increasing, as a consequence of the technological development and the thereby arising *Industry 4.0* in the last few years. The *Institute of German Economy Cologne* (German: Institut der deutschen Wirtschaft Köln), referred to as *IW*

Köln, points out that in almost every industry some employees work in the office. The IW Köln determines the number of office workers in Germany not by curatorial statistics about clerical occupation, but using an own method for several years[1] [4]. According to this study, in the fourth quarter of 2015, 7.6 million people were employed as office workers. This corresponds to around 24 % of all employees, subject to social insurance contribution [3]. In the first quarter of 2017 the number of employed office workers increased to 7.84 million and 24.5 % of all employees [4]. This development indicates an increasing demand for corresponding working areas. In addition, according to [5], vacancies of office buildings in the seven biggest cities in Germany decreased from 8.5 % in 2013 to 4.5 % in March 2018 with a continuing decreasing trend. Moreover, the highest rents for offices in the first quarter of the year 2018 were 4.3 % higher than in the preceding year.

A solution to higher demand seems to be the concept of open-plan offices. Several papers and studies have been published within the last five decades, discussing advantages and disadvantages of open-plan offices. So, proponents claim that open-plan offices give the possibility for an efficient and economic use of space. Furthermore, it allows an adjustable layout, being able to change the space in matters of structure and organizational size. If changes are necessary, workstations can be re-arranged easily, causing minimal costs. When the concept started to be developed, it was believed that the omission of building walls between individual work stations would enhance the communication between colleagues and groups, lead to higher productivity and improve the attitude towards work [2], [6]. On the other hand, opponents argue that employees working in open-plan offices often complain about aural and visual distractions, a loss of privacy, problems with ambient conditions and frequent interruptions by other employees [6]. [7] and [8] show that especially sound privacy and indoor environmental quality, including the noise level, are parameters that cause dissatisfaction at working places. In particular noise inside buildings like phone calls, conversations between colleagues or sound emissions from printers and photocopiers (noise other than from building systems) were perceived as disturbing. The *SBiB-Study*, conducted in Switzerland in 2010 [9], initiated a statistical data overview of ratings of working conditions in offices. In total 1230 persons employed by 58 different companies participated in the survey. Most results of the study are structured according to the number of occupants in the offices (1, 2, 3-6, 7-15, 16-50 and more than 50 persons). The results show that with increasing number of persons the self-rated productivity decreases steadily. Also people considered noise inside the room from phone calls and chatting of colleagues to be the most impairing environmental conditions. The higher the number of colleagues in one office, the higher is the percentage of people who feel disturbed at least once or several times a day by *conversations of others*. This number increases from 9 % in single offices to 68.5 % in open-plan offices with more than 50 persons. The general

[1] The IW Köln does not explain explicitly how the calculations are carried out. It has been published that the calculations are based on the classification of economic activities. Therefore, only economic sectors with mostly employed people as office workers are considered. This corresponds to 23 out of 90 economic sectors. Using this method approximately 60-70 % of all office workers in Germany can be documented [3].

satisfaction decreases with increasing number of people working in the same office from 79.8 % (single office) to 24.5 % (open-pan office with more than 50 persons). The study also revealed that disease symptoms occur at higher frequency in bigger offices than in smaller offices. As a result, it can also be observed that absences due to sickness increases with increasing office size. Herbig et al. carried out a cross-sectional examination with 247 employees, in order to analyze how office space occupancy, satisfaction with environmental conditions in offices and psycho-social working conditions affect (single and joint factors) mental and physical well-being of employees working in different office sizes [10]. The study shows that stressors like interruptions of work, loss of quality and additional effort increase linearly with an increasing number of persons per office space, while social support from colleagues, information exchange, quality of collaboration or confidence in a team do not show any correlation with the number of seats in open office spaces.

Reading studies and articles from news papers leaves the impression that the general opinion on open-plan offices is rather negative among employees. Especially complaints on the acoustics in these rooms occur frequently. Nevertheless, open-plan offices are continued to be build due to their space efficiency and massive cost savings caused by desk sharing. However, acoustic problems, ergonomic aspects and change management are underestimated. In addition, the existing acoustical tools are not yet suitable to represent the entire problem. For this reason it is important to gain more knowledge about the acoustical conditions inside these rooms, how people are exposed to sound and disturbed by it. Only then, it is possible to plan and design open-plan offices in a way that more employees feel comfortable, their working performance is not negatively influenced and the positive aspects of open-plan offices, like easy and fast communication, can be maintained.

1.2 What Is This Thesis About?

From all acoustical signals present in an office, speech sounds possess the highest potential to disturb office workers. The central role of speech in open-plan offices has been discussed by Schlittmeier [11]. It results that speech intelligibility, represented by the parameter Speech Transmission Index (STI), is of major interest. So far, ISO 3382-3:2012-05 [12] and E VDI 2569:2016-02 [13] present a measurement procedure, parameters and target values to examine the acoustical quality in open-plan offices, which are reviewed in detail. Three generic layouts of offices are designed, in order to show how the existing methods work and which limitations they display. Further, these models are used for room acoustic simulations, to calculate the STI between all possible sources and receivers. The results are systematically assessed and ideas to describe the full system of speakers and listeners are developed. In combination with statistical methods, exemplary investigations of the three rooms are evaluated.

The goal of this thesis is to show the difficulties, the existing methods entail and to present more precise methods to evaluate open-plan offices.

2
Underlying Standards

The standard ISO 3382-3:2012-05 [12] and the guideline E VDI 2569:2016-02 [13] present a method to measure and evaluate the acoustical quality of open-plan offices. In order to understand this specific method for rating the acoustical quality of open plan offices, the standard and the guideline are described and their limitations are explained.

2.1 ISO 3382-3:2012-05

The standard gives a measurement method, parameters and target values for room acoustics for open-plan offices. It is an internationally recognized standard, which is well established and frequently used for measuring open-plan offices. The described measurement and evaluation methods lead to three single number values, which are used for the final rating of the examined room. The main goal is to create good and private conversation areas for the different working places. The standard states that the measurement method and the resulting single values are largely consistent with the perceived acoustic conditions of office users.

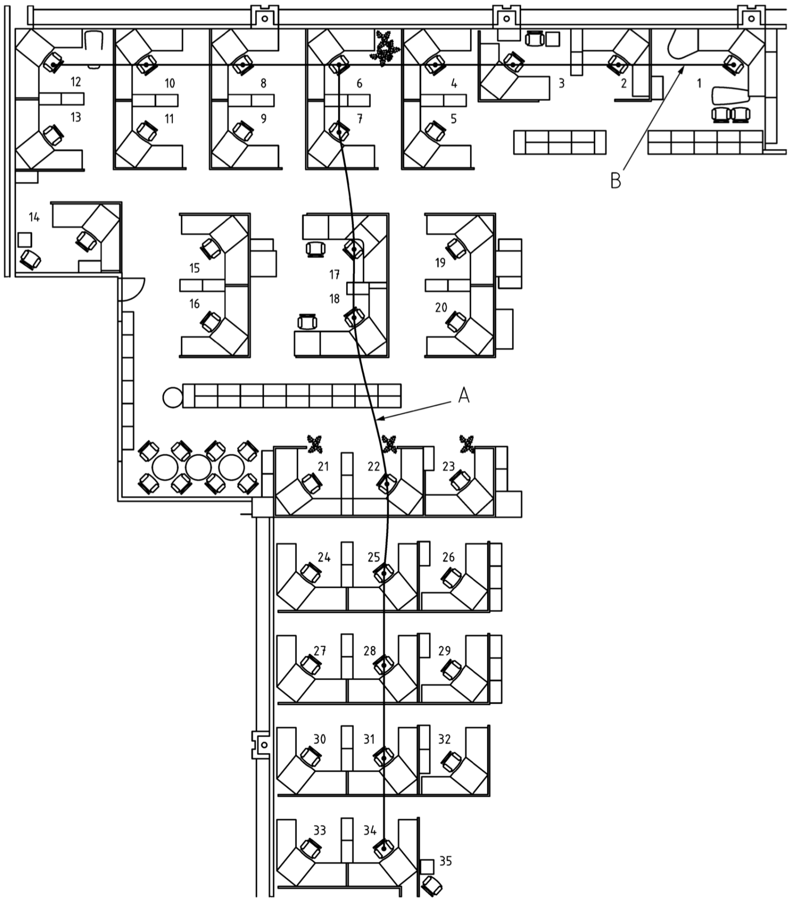
Measurement Conditions

For the measurements, the office has to be fully furnished, since the furniture does influence the acoustical behaviour inside the room. Also, it can only be measured when no employees are present and background noises like air condition, traffic noise or sound masking are similar to working hours.

Measurement Procedure

The standard recommends to measure along a path across the open-plan office. The measurement path should pass along the working places, where each place represents one microphone position. The working place at one end of the selected path is the loudspeaker position. Figure 2.1 shows an example of two measurement paths in an open-plan office.

The number of measurement positions are recommended to be between six and ten in one path, but at least four. The distances from the measurement positions to the source position depend on the size of the rooms, however only positions within a range of 2 to 16 m are considered for the evaluation. At least two different source positions have to be considered. If the room offers only one path, this path has to be measured twice, with the source at its opposite ends. When open-plan offices have different types of material at the ceiling or very different furniture in different areas of the room, the room has to be split up into different zones. The measurements and the calculation of the single values have to be carried out for each zone individually.



* A: Curved path, B: Straight path

Figure 2.1: Examples for a measurement path selection in an open-plan office. [12]

At each selected microphone position the following parameters have to be measured:

- SPL of the test signal in octaves, $L_{p,Ls,n,i}$
- STI
- Background noise level in octaves, $L_{p,B,n,i}$
- Distance to the source, r_n

The SPL and STI are measured for the octave bands from 125 Hz to 8000 Hz. The STI is measured for each source and receiver combination on the measurement path, according to the indirect procedure of DIN EN 60268-16 [14]. Here, gender specific voice differences, masking or the auditory threshold are not taken into consideration.

Measurement Equipment

The source used has to be omnidirectional and it needs to create pink noise, MLS or sweeps. The reason for an omnidirectional source is to cover the head movements of office users, since they do not talk in the same direction all the time. It is located in a height of 1.2 m, which should represent the height of the head of a sitting person, and it has to fulfill the requirements for an omnidirectional source according to DIN EN ISO 3382-1 [15]. The sound power level of the source $L_{W,Ls,i}$ should be high enough in order to generate a SPL at least 6 dB higher then the background noise at the measurement position furthest away from the source. The standard depicts the situation in which one person is speaking and all the others are quiet and listening. Therefore, only one loudspeaker is used per measurement. This situation is described as the worst case scenario with a maximum of possible distraction. If several persons would be talking, the masking effect would increase and distraction would decrease.

The sound pressure level is measured with a sound level meter, which fulfills the requirements according to DIN EN 61672-1 class 1 [16], at each microphone position for each octave band. The microphone has to be omnidirectional and be located at a height of 1.2 m. The microphones are not supposed to be located within a range of 0.5 m to tables or within 2 m to walls or other reflecting surfaces. If a measurement point does not fulfill these requirements it can not be part of the measurement procedure.

Data Analysis

From the data obtained, three single values are estimated: The distraction distance r_D, the spatial decay rate of the A-weighted SPL of speech $D_{2,S}$ and the A-weighted SPL of speech in a distance of 4 m to the source $L_{p,A,S,4m}$. Optional, the average A-weighted background noise level $L_{p,A,B}$ and the confidential distance r_P can be determined, if desired.

For the estimation of the single values, the standard provides data (Table 1) about the sound power spectrum of normal speech per octave $L_{W,S,i}$, the SPL of speech in a distance of 1 m to the middle of the source for directional and omnidirectional sources in freefield per octave $L_{p,S,1m,i}$ and the A-weighting values per octave A_i. As a first step, when the sound power level of the loudspeaker $L_{W,Ls,i}$ used is known, these values are used in order to calculate the SPL of the loudspeaker at a distance of 1 m to the middle of the loudspeaker in freefield and per octave $L_{p,Ls,1m,i}$ using

$$\begin{aligned} L_{p,Ls,1m,i} &= L_{W,Ls,i} + 10 \cdot lg\left(\frac{1}{4\pi \cdot 1.0^2}\right) \\ &\approx L_{W,Ls,i} - 11\,\text{dB}, \end{aligned} \tag{2.1}$$

where i stands for the individual octave bands.

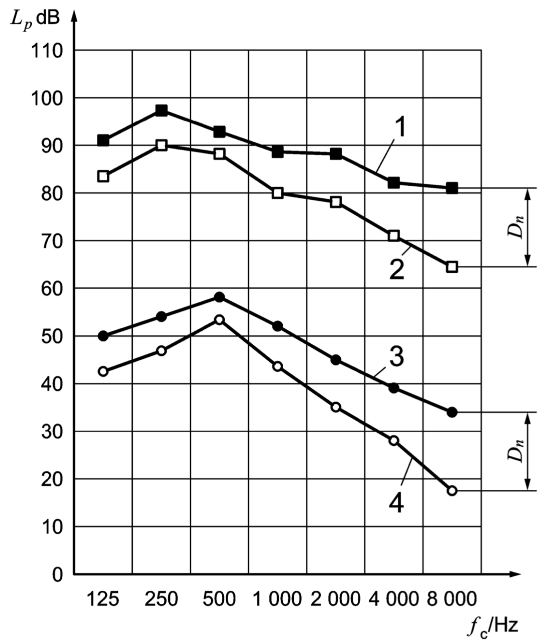
The measured SPL $L_{p,Ls,n,i}$ at the microphone positions of one path n have to be corrected by the measured background noises $L_{p,B,n,i}$ at the same microphone positions of the same path n, according to ISO 3744 [17]. The corrected $L_{p,Ls,n,i}$ can then be used in order to calculate the level attenuation $D_{n,i}$ between the SPL of the loudspeaker 1 m in front of the source and the SPL of the loudspeaker at the measurement position n by

$$D_{n,i} = L_{p,Ls,1m,i} - L_{p,Ls,n,i}. \tag{2.2}$$

This level attenuation is valid for any sound power level of the loudspeaker, and therefore it is possible to apply it to the sound power level of speech $L_{W,S,i}$. Thereby, the SPL of normal speech at the different measurement positions $L_{p,S,n,i}$ can be calculated using

$$L_{p,S,n,i} = L_{p,S,1m,i} - D_{n,i}. \tag{2.3}$$

The standard also shows a graphical way to estimate $L_{p,S,n,i}$. It can be seen in Figure 2.2.



Label

1 SPL of the loudspeaker in freefield with a distance of 1 m to the source, $L_{p,Ls,1m,i}$
2 Measured SPL of the loudspeaker at position n, $L_{p,Ls,n,i}$
3 SPL of normal speech in freefield with a distance of 1 m to the source, $L_{p,S,1m,i}$
4 Calculated SPL of speech at position n, $L_{p,S,n,i}$
L_p SPL per octave
f_c Midfrequency of the octaves in Hz
D_n Level attenuation per octave at position n

* The level attenuation per octave D_n between 1 and 2 is the same between 3 and 4.

Figure 2.2: Estimation of the SPL of speech at measurement position n. [12]

Finally, the calculated $L_{p,S,n,i}$ has to be A-weighted and summed up logarithmically in order to obtain a total, A-weighted SPL of speech at a specific measurement position $L_{p,A,S,n}$ by using

$$L_{p,A,S,n} = 10 \cdot lg \left(\sum_{i=1}^{7} 10^{\frac{L_{p,S,n,i}+A_i}{10}} \right). \tag{2.4}$$

This calculation procedure is carried out for each measurement position of a path. The resulting $L_{p,A,S,n}$ of one path are used to calculate a linear regression line (least square method), which depends on a logarithmic distance scale. This line is then be used to find $L_{p,A,S,4m}$. The same linear regression is used to get the spatial decay rate of the A-weighted SPL of speech $D_{2,S}$ by using

$$D_{2,S} = -lg(2) \cdot \frac{N \cdot \sum_{n=1}^{N} \left[L_{p,A,S,n} \cdot lg\left(\frac{r_n}{r_0}\right)\right] - \sum_{n=1}^{N} L_{p,A,S,n} \cdot \sum_{n=1}^{N} lg\left(\frac{r_n}{r_0}\right)}{N \cdot \sum_{n=1}^{N} \left[lg\left(\frac{r_n}{r_0}\right)\right]^2 - \left[\sum_{n=1}^{N} lg\left(\frac{r_n}{r_0}\right)\right]^2}, \quad (2.5)$$

where r_0 is the reference distance of 1 m. $D_{2,S}$ can also be estimated graphically, see Figure 2.3a.

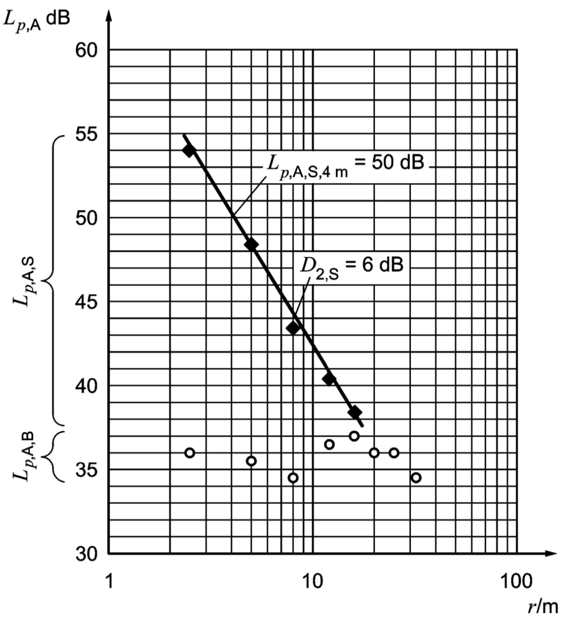
The distraction distance r_D and the confidential distance r_P are determined using the STI. Its results are used to create a linear regression line over distance. The distance values on the line at $STI = 0.5$ and $STI = 0.2$ represent r_D and r_P respectively. This can also be seen in Figure 2.3b.

As already mentioned, the background noise $L_{p,B,n,i}$ is used in order to correct the SPL of the loudspeaker at the different positions $L_{p,Ls,n,i}$. Later it is A-weighted and averaged over octave bands and the different positions of the measurement path $L_{p,A,B}$. The resulting single value of the background noise level is then used to calculate the STI. This avoids fluctuations of the STI due to spatial differences in background noise, and thereby difficulties in estimating r_D and r_P.

Evaluation of the Results

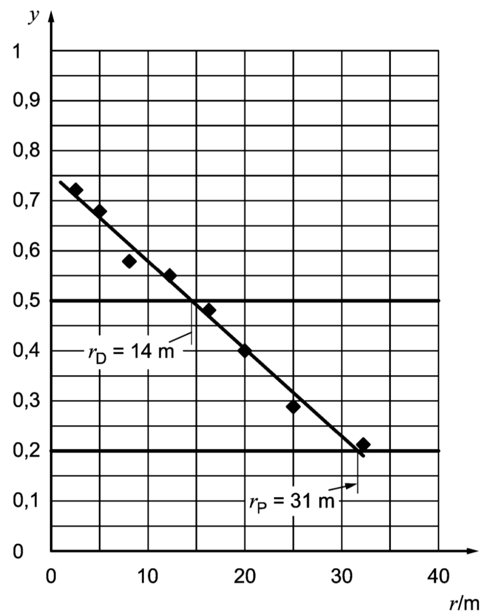
The standard ISO 3382-3 provides rough target values for the rating of open-plan offices. These values have been determined by comparing measurement data and subjective impressions about the acoustics of 21 offices.

The offices with bad or insufficient acoustics had single values of $D_{2,S} < 5$ dB, $L_{p,A,S,4m} > 50$ dB(A) and $r_D > 10$ m. Offices with good acoustics had single values like $D_{2,S} \geq 7$ dB, $L_{p,A,S,4m} \leq 48$ dB and $r_D \leq 5$ m.



(a) Estimation of $D_{2,S}$ and $L_{p,A,S,4m}$.

Label	
$L_{p,A}$	A-weighted SPL
r	Distance to the source
$D_{2,S}$	Spatial decay rate of the A-weighted SPL of speech
$L_{p,A,B}$	A-weighted SPL of the background noise
$L_{p,A,S}$	A-weighted SPL of speech
$L_{p,A,S,4m}$	A-weighted SPL of speech in a distance of 4 m to the source



(b) Estimation of r_D.

Label	
y	Speech Transmission Index
r	Distance to the source
r_D	Distraction distance
r_P	Confidential distance

Figure 2.3: Examples for the estimation of the single values using the measurement data of the spatial distribution. [12]

2.2 E VDI 2569:2016-02

The *VDI e. V.* (German: Verein Deutscher Ingenieure) is a German union of engineers and scientists, which represents its interests in national politics. Their members carry out technical and scientific work on standardization.

This guideline, which is still in draft status, is used in addition to [12]. It treats recommendations for classifications in room acoustics and sound insulation of offices and gives further advise on how the measurements, described in [12], should be carried out, depending on the number of workplaces inside the room. For an evaluation it uses the room acoustic classes A, B and C, and the sound insulation classes A, B and C, which are independent from each other. The sound insulation of offices is not included in this master thesis and is not considered in this section. Further, only the recommendations for open-plan offices are described.

Open-plan offices are classified using parameters, which describe the room acoustics, depending on the room itself (for example the reverberation time T, the spatial decay rate of speech $D_{2,S}$, etc.) and the SPL of construction noises $L_{NA,Bau}$. As for [12], the classification is valid for furnished but unoccupied offices.

The guideline states that one of the most essential parts of a successful room acoustic planning for an open-plan office is a concept for different zones according to work content and working method. The spatial dissociation between groups, the partition between areas with high communication, highly frequented corridors and quiet areas has to be taken into account. It is also stated that masking sound is not part of the classification in this guideline.

The Room Acoustic Classes

Table 2.1 gives an overview on how open-plan offices can be classified, which planning and construction effort is necessary and it gives recommendations for the use of the classified rooms.

Room Acoustic Class	Effort	Description	Recommendations for the use
A	high	To reach room acoustic class A very extensive and highly effective room acoustic measures for room attenuation and the reduction of sound propagation inside the room have to be taken. A further improvement of the acoustical conditions keeping an open structure for the office is not possible.	Well suited for Call Center or rooms with high communication
B	medium	To reach room acoustic class B extensive and effective room acoustic measures for room attenuation and the reduction of sound propagation inside the room have to be taken.	Well suited for rooms for Sales, Constructions or Administration. Appropriate for Call Center
C	low	To reach room acoustic class C effective room acoustic measures for room attenuation and the reduction of sound propagation inside the room have to be taken.	Appropriate for rooms for Sales, Construction or Administration

Table 2.1: Description of the effort in planning and construction for room acoustic classification of open-plan offices dependent of its use. [13]

Parameters for Acoustical Comfort

The essential parameters to describe acoustical comfort in open-plan offices are the A-weighted SPL of construction noises $L_{NA,Bau}$ and the reverberation time T. In general a low $L_{NA,Bau}$ and short T are perceived as comfortable, but it has to be noted that reverberation times lower than 0.2 to 0.3 s can decrease the subjective comfort if they do not meet hearing expectations. The mentioned requirements of low noise levels and short (but not too short) reverberation times for a high acoustical comfort do not work together with the requirements, which have to be accomplished to be able to work concentrated. Short reverberation times and low background noise levels lead to high speech intelligibility, with the consequence that cognitive performance can be influenced negatively. Therefore, the guideline advises against noise levels lower than $L_{NA,Bau} \leq 30\,\mathrm{dB(A)}$ and reverberation times T shorter than 0.3 to 0.4 s. In general it can also be said, the smaller the room volume, the shorter reverberation times are acceptable. In big open-plan offices[1] it is not useful to evaluate the room acoustic conditions using only the reverberation time, since it does not describe the effect of specifically placed sound absorption or the reduction of sound propagation. In addition, these offices might have a special form, which could lead to some kind of sound shielding, which then would prevent a diffuse sound field inside the room, which is necessary for calculating the reverberation time by *Sabine*.

Parameters for Cognitive Performance

To describe cognitive performance using room acoustics, parameters are chosen, which describe a reduction of understandable speech at a working place. The A-weighted SPL of speech in a distance of 4 m $L_{p,A,S,4m}$ rates the sound shielding from directly adjacent workplaces and the spatial decay rate of the A-weighted SPL of speech $D_{2,S}$ describes the obstruction of sound propagation for workplaces lying further away.

Parameters for the Classification

The four parameters mentioned above (T, $L_{NA,Bau}, L_{p,A,S,4m}$ and $D_{2,S}$) are used to assign big open-plan offices to a single room acoustic class. In this connection it should be ensured that for an evaluation of the room acoustic conditions in an open-plan office using objective parameters, it has to be differentiated between the effect on subjective acoustical comfort and on the ability to concentrate. To reach one specific room acoustic class, all four used parameters have to fulfill the recommended target values. For new building projects classification is verified out by calculations. For already accomplished projects, the verification of classification is verified by measurements according to [12].

[1] In this guideline, big open-plan offices are rooms where at least one measurement path with the length of ≥ 8 m can fit.

Table 2.2 shows recommendations of E VDI 2569 for the number of measurement paths in open-plan offices depending on the amount of workplaces.

Amount of work-places N	Amount of measurement paths
$N \leq 5$	Maximum 2; A ranking according to measurement paths is usually not useful. If it is not possible to set at least one measurement path with a length of $\geq 8\,\text{m}$, a ranking of the sound propagation according to Table 2.3 is not useful
$5 < N \leq 15$	3
$15 < N \leq 24$	$N/4$, if possible 3 or 6
$25 < N \leq 50$	$N/5 + 1$, if possible 6 or 9
$50 < N$	12

Table 2.2: Reference values for the amount of measurement paths. [13]

Depending on the ground plan of the office and the arrangement of the workplaces it might happen that the selected measurement paths have different lengths. The amount of the longer measurement paths should be twice the number of the shorter measurement paths. If the arrangement of the workplaces is scattered, the measurement paths should be selected in such a way that they distinguish between their mutual orientation. For open-plan offices with a very long and thin ground plan the recommended amount of measurement paths in Table 2.2 could be too high. In rooms that contain noise barriers, measurement paths including and excluding the screening have to be selected. For measurement paths including the screening, at least one microphone position should be located between source and the first screen. For the evaluation of $D_{2,S}$ for a bent measurement path, care must be taken that the distances from the microphone positions to the source are direct and not cumulated. A change in direction of more than 30° within one measurement path should be avoided. Single workplaces, which are located separately and which would change the direction of a measurement path strongly, should not be included. Big structural obstacles like walls or staircases should not be included in a measurement path.

After selecting the measurement paths and calculating $D_{2,S}$ and $L_{p,A,S,4m}$, these two parameters can be used to rank the measurement paths according to Table 2.3. After ranking the paths, a room acoustic class can be determined for the examined room, see Table 2.4.

Ranking of sound propagation	$D_{2,S}$	$L_{p,A,S,4m}$
1	$\geq 8\,\text{dB}$	$\leq 47\,\text{dB(A)}$
2	$\geq 6\,\text{dB}$	$\leq 49\,\text{dB(A)}$
3	$\geq 4\,\text{dB}$	$\leq 51\,\text{dB(A)}$

Table 2.3: Recommendation values of room acoustic parameters for ranking the measurement paths in large open-plan offices. [13]

Table 2.4 gives recommendations for the room acoustic parameters T and $L_{NA,Bau}$ using the ranking of the measurement paths, in order to classify the treated office room.

Room Acoustic Class	Recommendation for room acoustical parameters	T		$L_{NA,Bau}$
		125 Hz	250 Hz bis 4000 Hz	
A	2/3 of measurement paths with ranking 1, remaining paths at least ranking 2	≤ 0.8 s	≤ 0.6 s	≤ 35 dB
B	2/3 of measurement paths with ranking 2, remaining paths at least ranking 3	≤ 0.9 s	≤ 0.7 s	≤ 40 dB
C	1/3 of measurement paths with ranking 2, remaining paths at least ranking 3	≤ 1.1 s	≤ 0.9 s	≤ 40 dB

Table 2.4: Recommendation values of room acoustic parameters in open-plan offices. [13]

Optionally, it is also possible to estimate the STI, which has to be measured according to [12].

The guideline does also give advise for the planning of open-plan offices regarding the floor plan, the shielding and structural sound insulation. In addition, the Appendix treats audibility and intelligibility of speech, the creation of different zones in open office landscapes, acoustic functions of acoustically effective components and furniture, planning examples for open-plan offices, masking noise and an employee survey about participation in room acoustic planning.

2.3 Conditions and Limitations

Limitations for Microphone Positions and Measurement Paths

The two guidelines present several limitations considering the microphone positions used for the measurement paths. These limitations describe which microphone positions can be used, which have to be excluded and how the measurement paths have to be selected.

- Microphone positions, which are located within a range of 2 m to a reflective surface should not be considered
- A measurement path should consist of microphone positions, which are located at a distance between 2 to 16 m from the source
- One measurement path should have at least four microphone positions
- A change in direction in a measurement path should not exceed 30°

- The first microphone position next to the source must not be blocked by a noise barrier from the source. There must not be a noise barrier between sound source and the first receiver in a measurement path.
- Zones have to be created, if furniture or surface materials inside the room change drastically

Due to German workplace regulations in ASR A3.4 [18], workplaces have to have direct connection to daylight, which means that many desks are located next to windows. Usually this distance is within 2 m, which means that these positions can not be part of a measurement path because they are too close to a sound reflecting surface. Daylight is also the reason why office rooms usually have a thin but long shape, with windows on the long sides. This often results in two rows of desks, which makes it difficult to create a bent measurement path without a change in direction bigger than 30° and nevertheless having a maximum length of 16 m and at least 4 microphone positions, or to create a measurement path along the short side of the room, because there are too little feasible microphone positions. If the room has to be split into different zones, due to its material conditions, even more potential microphone positions have to be omitted.

Within those limitations the measurement paths can be freely selected. This may lead to a selection of paths that has a positive effect on the resulting single values, which are used for the evaluation of the office room. In addition, using only this limited amount of paths, which include only specific microphone and source positions, leads to a poor data basis for the generalization of the results. It does not represent the entire room or the potential for improvement at the different workplaces. At the end, after all necessary calculations, there are single values for several measurement paths. These single values might vary between paths, but ISO 3382-3 does not give advice how to deal with different results.

It makes sense that microphones should be located at a height of 1.2 m, in order to represent the height of the head of a sitting person. Apparently, the floor is not considered as a reflecting surface. So the question arises, why is it important to exclude microphone positions, which are closer than 2 m to a hard surface even though, the reflections detected by a microphone would also be experienced by a person sitting at that position. It is also interesting to see that not even the examples of measurement paths in ISO 3382-3 (see Figure 2.1) do fulfill these limitations. The microphone positions of measurement path B seem to be closer than 2 m to a, most likely, reflecting surface.

E VDI 2569:2016-02

The guideline E VDI 2569 was created based on ISO 3382-3. It can not be applied without the other standard. It describes how offices can be organized into different room acoustic classes using the parameters T, $L_{NA,Bau}$, $L_{p,A,S,4m}$ and $D_{2,S}$. The STI is only mentioned in a very small section at the very end, although it can be used for a direct conclusion to assess the influence on cognitive performance, which is an important parameter to know in open-plan offices.

For the classification of a room, a specific number of measurement paths should be used to calculate the single values. This number depends on the amount of persons sitting inside the room. Unfortunately, it can be difficult to find this number of required measurement paths, especially if the limitations mentioned above are fulfilled. Although, there might be a lot of potential microphone positions in a room, it depends very much on the shape of the room, the arrangement of the workplaces and the given limitations, if it is possible to create the required amount of measurement paths.

In [19] measurements and listening tests have been carried out to analyze how the three room acoustic classes described in VDI 2569:2014 do actually influence cognitive performance and subjective impressions of persons. Results in [19] show that there are no significant differences between the three room acoustic classes regarding cognitive performance, perceived strain and perceived cumbersomeness, although class A, B and C should guarantee better working conditions, respectively. So all in all, the standard often cannot be fully applied and even if it is applied, the technical quality reached does not necessarily lead to less noise and annoyance for the users, which is the actual goal.

Masking Effect

The standard ISO 3382-3 describes that the measurements using only one source at a time depict the worst case scenario with a maximum possible distraction. It represents the situation when one person is talking and all the others are listening. If several persons would be talking, the masking effect would increase and distraction would decrease.

Zaglauer et al. [20] investigated this phenomenon using listening tests. Therefore, they used six background speakers and one nearby speaker. These sounds were played to participants while working on verbal short-term memory tasks. It results that the statement from ISO 3382-3 can be confirmed. When increasing the amount of babble voices, the short-term memory performance improves with a significant trend. Nevertheless, the performance levels under silent conditions are clearly better. But, these results were gained under certain circumstances. For example, the babble speaker were not distributed over the room, but all located at one spot, which does not represent a realistic situation in an open-plan office. In addition, there are studies showing that the positive masking effect of babble can be reduced when the sources are separated [21]. Further, to gain the babble effect, several people need to be talking at the same time. In real scenarios, the density of background speech might vary with time. The study has been conducted using a male voice for all speakers. However, the differences in spectra of real voices can also reduce the masking effect of babble, since the differentiation of speech with different frequency content is easier for the human hearing.

Conclusion

The above shows that it is important to think about a new additional method or to try to improve ISO 3382-3 and E VDI 2569, because the described conditions and limitations are often difficult to meet in reality. This leads to measurements, which are often carried out ignoring some of the limitations, which gives the method an arbitrary character. If the method is applicable according to the standards, it is neither precise nor underlined by physiological studies. As long as the method is based on levels, the necessary parameters are not directly included. To represent the acoustical conditions of the entire room, not only selected paths should be used. Specific microphone positions should not be excluded because every kind of acoustical effect that could occur at these positions would also appear when persons are actually sitting and working there. Nevertheless, the conditions and limitations might exist for a reason, but then it is important to show that they actually help to represent the entire room. Because this is what the two standards aim at, representing a measurement and classification method, which represents the room acoustic conditions of the entire room. The new method should be based on results, which cover every possible source and receiver relation in an office room. Therefore, every workplace is considered to be a source as well as a receiver. Mathematically, this could be displayed using a matrix. Depending on the size of the examined offices, this provides much more data than the original path method and could therefore lead to a more precise overview of the acoustical conditions of the entire room. Additionally it will provide detailed information about single effect between specific workplaces.

3

Description of the Examined Open-Plan Office Models

Three different office layouts are examined, in order to display the limitations of the already existing evaluation method from [12] and [13] and to investigate on a new simulation method. A narrow space with one line of desks - the *One-Line-Model*, a wider space with two lines of desks and a corridor in between - the *Two-Line-Model* and a space, which has the desks arranged like the letter *U* - the *U-Shape-Model*. They have been chosen to represent the most commonly used office geometries in practice. All geometries are modelled with the program *SketchUp 2017* from *Trimble Navigation Ltd.*

3.1 Furniture and Construction Material

The models are furnished according to [22], [23] and [24], which describe technical rules for working spaces in Germany. They treat room dimensions and movement areas regarding labour protection in offices, give requirements for setting up and operating traffic spaces and for operating escape paths, respectively. The relevant target values used are described in Appendix A.1, A.2 and A.3. For comparability, the different models contain the same amount of desks and the same total area. This leads to an identical area per workplace. The total area of one office is often chosen to be smaller then $400\,\mathrm{m}^2$, due to fire regulations in Germany [25].

As shown in the following figures, for all models the desks are arranged in a group of four, two desks directly next to each other and two desks facing each other. One line of desks, as described above, consists of these groups next to each other. The desks facing each other are divided by an absorbing partition wall, which reaches down to the floor. Three different heights for the partitions are simulated: 140 cm, 160 cm and 180 cm. Each workplace has one upholstered chair with cloth cover and cupboards, which are located either in the corridors or at one side of the desk group. The floor is covered with a thin carpet and the ceiling is made of an suspended absorbing material. The Two-Line-Model has additional phone booths made out of glass and sofas located in the corridor. Since the glass cabins do not reach the ceiling, they still count as furniture and do not reduce the total area of the office room.

A description of the materials used and their absorption properties are displayed in Table A.2 and A.3 in Appendix A.4. The dimensions of the furniture are described in Table A.4 in Appendix A.4.

3.2 One-Line-Model

The One-Line-Model contains one line of desk groups, which leads to a long and narrow room. Figure 3.1 shows the model from two different angles.

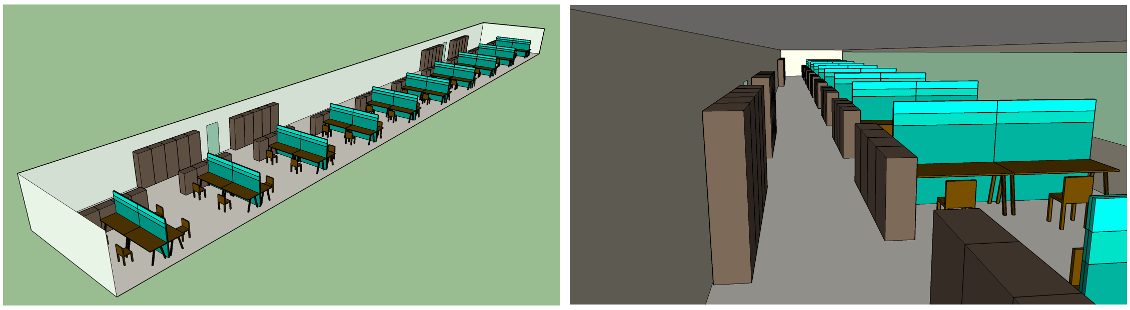


Figure 3.1: 3D view of the One-Line-Model, from the outside (left) and the inside (right).

The office room has the dimensions L x W x $H = 54\,\mathrm{m}$ x $6.75\,\mathrm{m}$ x $2.8\,\mathrm{m}$. The height is measured from the floor to the suspended ceiling. The resulting total area and volume are $A = 364.5\,\mathrm{m}^2$ and $V = 1020.6\,\mathrm{m}^3$, respectively. The office seats 40 employees (10 desk groups, always 4 desks in one group), which leads to an area per workplace of $A/WP = 9.11\,\mathrm{m}^2$. In Germany, the ASR A1.2 [22] gives a reference value for the area requirements per workplace in an open-plan office: 12 to $15\,\mathrm{m}^2$. The area per workplace in the model is clearly smaller but still close to values, which are usually implemented in real open-plan offices.

Each workplace is assigned with a number, which is necessary for the following simulations. It can be found in Figure 3.2.

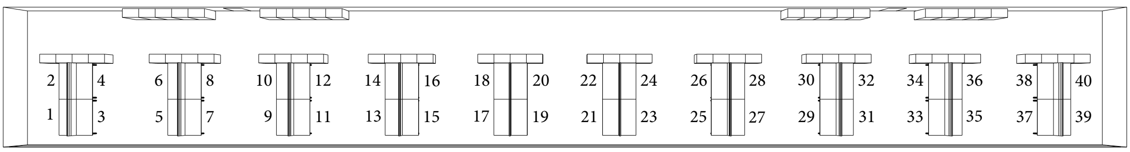


Figure 3.2: One-Line-Model with assigned numbers of the workplaces.

3.3 Two-Line-Model

The Two-Line-Model contains two lines of desk groups. Each line is close to windows on both long sides of the room (the shape of the room is a rectangle). The corridor between those lines is filled with cupboards, telephone booths and an almost closed area with sofas. The idea behind filling the corridor is to create some amount of sound shielding, in order to reduce sound transmission from one desk line to the other desk line. In the Two-Line-Model the cupboards on one side of the desk groups are replaced by additional absorbing partition walls. For achieving the same total area as the One-Line-Model, having enough space in the corridor and to fulfill the requirements for escape paths, the cupboards had to be moved into the corridor. Figure 3.3 shows the model from two different angles.

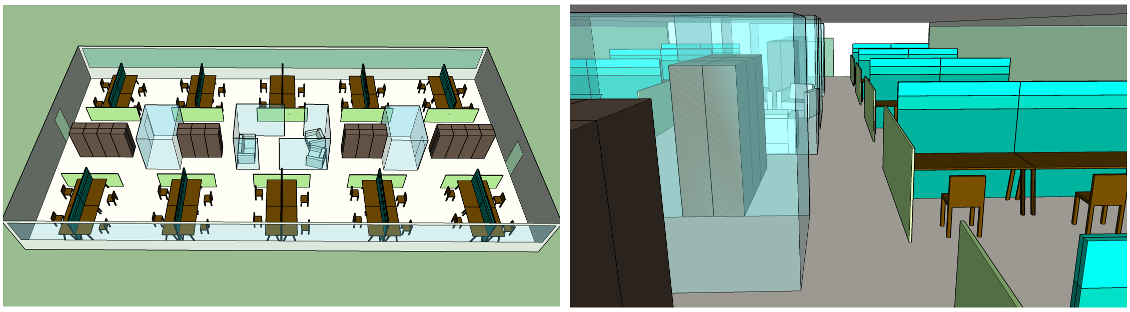


Figure 3.3: 3D view of the Two-Line-Model, from the outside (left) and from the inside (right).

The office room has the dimensions L x W x $H = 27\,\mathrm{m}$ x $13.5\,\mathrm{m}$ x $2.8\,\mathrm{m}$. The height is measured from the floor to the suspended ceiling. Similar to the One-Line-Model, the resulting total area and volume are $A = 364.5\,\mathrm{m}^2$ and $V = 1020.6\,\mathrm{m}^3$, respectively. The office has space for 40 employees (10 desk groups, always 4 desks in one group), which leads to an area per workplace of $A/WP = 9.11\,\mathrm{m}^2$.

Each workplace is assigned with a number, as shown in Figure 3.4.

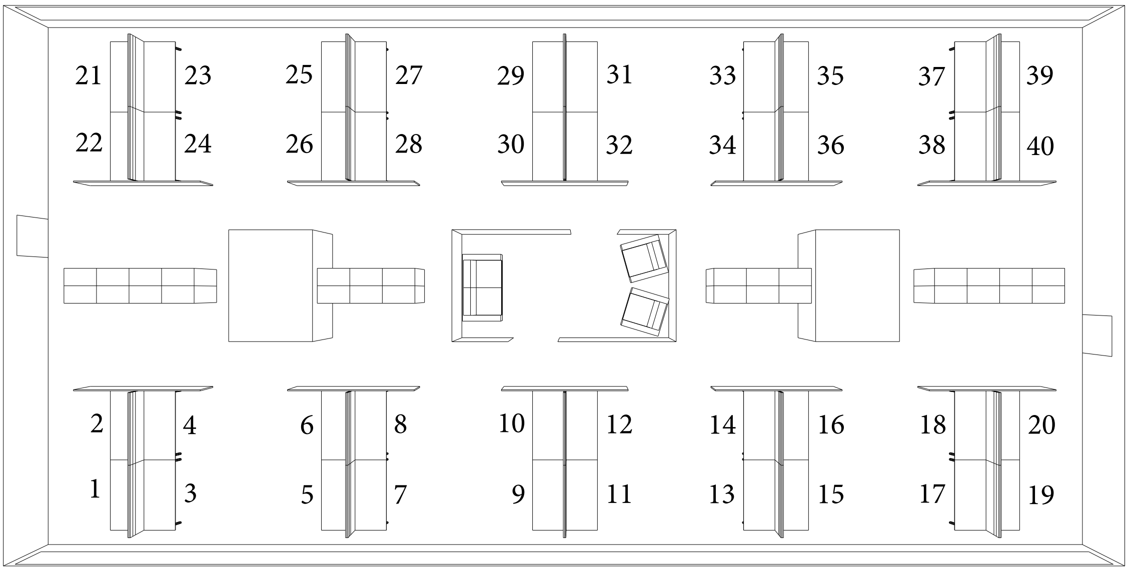


Figure 3.4: Two-Line-Model with assigned numbers of the workplaces.

3.4 U-Shape-Model

In the U-Shape-Model the desk groups are arranged like the letter U. It displays a mix of the One-Line-Model (U-shaped tube) and the Two-Line-Model (obstruction in the middle). The constructions in the middle of the room are not only furniture, but individual, additional, closed rooms like a stair case, meeting rooms, toilets and a kitchenette. This area does not contribute to the total area of the office. Again, the idea is to avoid sounds being transported to the other sides of the room. This room layout is quite common in reality, since the space in the middle of big rooms can be used for rooms that do not require connection to direct daylight. Figure 3.5 shows the model from two different angles.

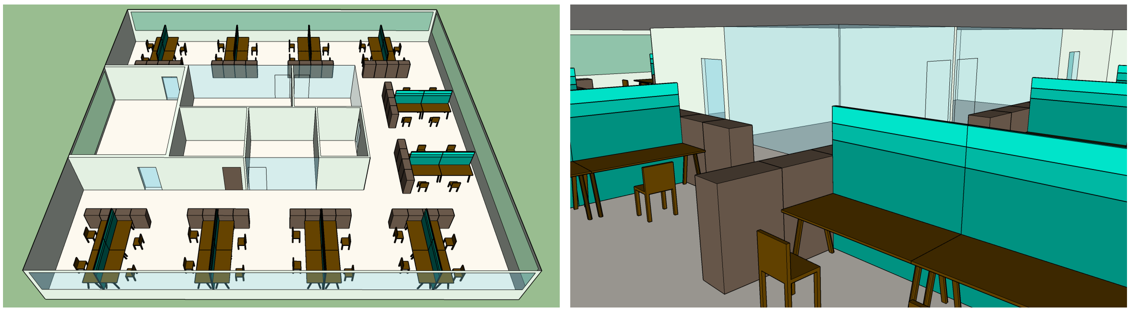


Figure 3.5: 3D view of the U-Shaped-Model, from the outside (left) and from the inside (right).

The office room has the outer dimensions L x W x H = 22.95 m x 21.6 m x 2.8 m and the inner dimensions L x W x H = 16.2 m x 8.1 m x 2.8 m. The height is measured from the floor to the suspended ceiling. When subtracting the inner separate rooms from the outer dimensions, the resulting total area and volume are $A = 364.5\,\mathrm{m}^2$ and $V = 1020.6\,\mathrm{m}^3$, respectively. The office has space for 40 employees (10 desk groups, always 4 desks in one group), which leads to an area per workplace of $A/WP = 9.11\,\mathrm{m}^2$. The structuring of the workplaces can be seen in Figure 3.6.

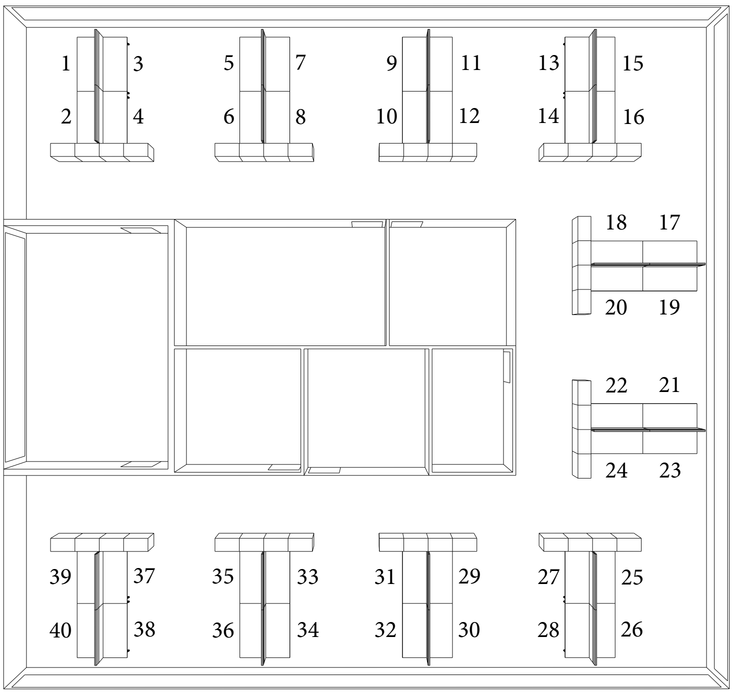


Figure 3.6: U-Shape-Model with assigned numbers of the workplaces.

4
Simulation Methods

The described generic Sketch-up models of the three open-plan offices are used to carry out room acoustic simulations using the program *Odeon 14.03 Auditorium*. The *SU2Odeon* function exports the SketchUp-Model directly into a format that can be used from Odeon. After simulation, the calculated values for the room acoustic parameters are exported and further processed in *Microsoft Excel*. The most important room acoustic parameters for this work are the Speech Transmission Index (STI) and the A-weighted Sound Pressure Level of speech ($L_{p,A,S}$).

4.1 Settings in Odeon

Microphone and Source Settings

Once a model is uploaded to Odeon, microphone and source positions can be set. Figure B.1 in Appendix B.1 shows a screenshot of the Odeon layout for setting microphone and source positions. The coordinates of microphone and source positions for each model are shown in Tables B.1, B.2 and B.3, in Appendix B.1. For the simulations each workplace is assigned with one microphone and one source position in Odeon. The Microphones are omnidirectional. The sources (omnidirectional point sources) have the characteristics described in [12] for the sound power levels of speech. For this, Odeon offers a suitable preset, which can be selected. The details can be seen in Figure B.2 in Appendix B.1. Due to this source settings, the resulting A-weighted SPL at a receiver is the A-weighted SPL of speech ($L_{p,A,S}$). Apart from the coordinates, which are different for all source positions, the settings of the sources are the same for each workplace. An orientation of sources and receivers is not necessary, due to their omnidirectionality.

Materials

The material properties of the different building component surfaces and the furniture surfaces are additionally set, according to Tables A.3 and A.4 in Appendix A.4. Material settings are already available in Odeon and can be selected as desired. Figure B.3 in Appendix B.2 shows a screenshot of the Odeon layout for assigning material properties to different components of a model.

Calculation Parameters

In Odeon, additional calculation parameters can be adjusted. These parameters specify how calculations are carried out and influence the quality of the results. The three presets *Survey*, *Engineering* or *Precision* are available. By selecting one of these, Odeon automatically adjusts the calculation parameters accordingly. All simulations in this master thesis are carried out using the preset Engineering. Apart from the adjusted calculation parameters, there are *General Settings* and *Specialist Settings*. The specialist settings normally do not need to be changed, due to the preset. In the general settings there are two parameters, which need some attention, the impulse response length and the number of late rays.

According to the Odeon User Manual [26], the impulse response length should be at least 2/3 of the reverberation time in the room. It determines how many milliseconds of the decay curve are to be calculated. If it is too short, then T_{30} can not be calculated properly, because the dynamic range of the decay curve is less then 35 dB. In order to determine how long the impulse response should be, the *Quick Estimate* function can be used. This function calculates a reverberation time inside the room, based on the absorbing properties and the area of the surfaces according to Sabine's and Eyring's equations. The impulse response used for the simulations in this master thesis is 2000 ms for each model. The number of late rays determines the density of reflections in the late part of the decay. For good results, the reflection density should be bigger then 50-100 rays per ms at each receiver position. If simulated rooms are very large, contain an uneven distribution of absorption or contain decoupling effects, the number of late rays should be increased. For the One-Line-Model, the Two-Line-Model and the U-Shape-Model the number of late rays is set to 40000, 20000 and 20000 rays per ms, respectively. These values were chosen after several calculations of the reflection density for the largest source-receiver distances in each model, using the surface settings with the highest absorption (extreme case with partition wall height of 180 cm). The number of late rays was set to these values, when the reflection density reached a value of at least 50 rays per ms, in order to verify that the results are reliable. At the same time, it was taken care of keeping the number of late reflections as small as possible, in order to keep the calculation time as short as possible. A screenshot of an example for the calculation parameters can be seen in Figure B.4a in Appendix B.3.

Background Noise

In order to calculate the STI properly, Odeon needs information about the background noise inside the room. It is assumed that the applied background noise is the same on each microphone position. Table 4.1 shows the SPL used, according to [14]. The resulting total SPL are $L_{p,B} = 48.9\,\text{dB}$ and $L_{p,A,B} = 38\,\text{dB(A)}$. A screenshot of the background noise settings can be seen in Figure B.4b in Appendix B.3. The Software uses the background noise for the calculation of the STI and not for the calculation of the sound pressure levels. Odeon calculates the STI according to [14].

Frequency	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
SPL	48 dB	40 dB	34 dB	30 dB	27 dB	25 dB	23 dB

Table 4.1: Background noise according to [14].

Joblist

The Joblist defines all calculations that have to be carried out. For each job, the number of active sources and receiving microphone positions can be defined. For the simulations carried out, at each job there is one source active and all microphones at all other positions receive. This is called a *Multi Point Response Calculation* and results in 40 jobs. For each job the required room acoustic parameters are calculated at each receiving microphone. This calculation procedure leads to obtain the room acoustic parameters for any required source and receiver relation.

4.2 Existing Evaluation Method from ISO 3382-3 and E VDI 2569

As already discussed in Section 2.3, the standards [12] and [13] give limitations for selecting measurement paths in open-plan offices. The resulting data from the measurements are then used to create a linear regression line. This is a simple model, which should represent the entire room and give the possibility to calculate the corresponding single values ($L_{p,A,S,4m}$, $D_{2,S}$ and r_D) for rating the room. In order to get a feeling for what it means to apply the limitations, which difficulties arise and if this kind of model is suitable for representing the simulated values, the following steps are carried out for each model.

1. All positions, which do not fulfill the limitations of [12] are excluded, in order to elucidate how many microphone positions are actually affected. Here, in this first consideration of the application of the limitations, only the limit, which does not consider a relation between source and receiver can be checked. In this case: Microphone positions closer than 2 m to a reflecting surface have to be excluded.

2. Measurement paths are created according to [12] and [13] (fulfilling all limitations) and the required single values are calculated.

In addition, to review the underlying linear regression, residual errors and R^2 are examined. Therefore, the resulting values of STI and the A-weighted SPL of speech, calculated in 2., are used. This small, additional study is carried out as a further investigation about the evaluation method of [12], but is not part of main research of this thesis. The results can be seen in Appendix C.1.3.

4.3 The Source-Receiver-Matrix

The Idea

The idea behind the Source-Receiver-Matrix is to gain information about room acoustic parameters between each possible source and receiver relation in an office. Therefore, each workplace has to be designated with a number or a letter. In this case numbers are used, as it is shown in Chapter 3. Table 4.2 gives an example on how the matrix looks like. Using the office models described in Chapter 3, the matrix has 40 rows and 40 columns.

		Sources							
		1	2	3	4	5	6	7	...
Receiver	1	-							
	2		-						
	3			-					
	4				-				
	5					-			
	6						-		
	7							-	
	...								-

Table 4.2: Example for a Source-Receiver-Matrix.

When one source is active, with the help of the corresponding transfer functions, the desired room acoustic parameter can be calculated for all other workplaces. The active source is never a receiving microphone at the same time. In this way, all calculated parameters can be displayed in a clear, easily readable and systematic way. If then in addition, reciprocity is assumed, with the help of the *Gaussian Triangular Number* the amount of values, which can describe the entire room, can be calculated. In the case of the described models in Chapter 3 it turns out to be 780 values, as sown in Equation 4.1.

$$T_n = \frac{N^2 - N}{2} = \frac{40^2 - 40}{2} = 780. \tag{4.1}$$

In this master thesis, the room acoustic parameter with the main focus for the matrix is the STI. Of course, such a matrix can also be used for the SPL of speech or any other room acoustic parameter, but as already discussed, intelligible speech is claimed to be the most annoying and disturbing noise in an office. In general, the speech intelligibility and not the sound level of speech is of importance regarding the distracting effect. Only when speech is intelligible it is distracting [27]. The human brain processes and records the heard sounds even though being focused on other tasks. [28] shows that background speech has a harmful impact on verbal short-term memory. This effect is called the Irrelevant Sound Effect (ISE). According to [29], this effect can only arise if the disturbing sounds have a sufficiently high variation in time like speech sounds, as speech has a temporal fluctuation of the intensity envelope curve. These fluctuations occur at the acoustical separation of sentences, words and phonemes, the most basic elements of speech, and carry the most relevant information regarding speech intelligibility [14].

The STI describes the intelligibility of speech and can directly be related with the Decrease of Performance (DP) for complex tasks due to distraction by speech, which has been described by Hongisto [27]. The STI can describe the impact of intelligible speech, but also the effect of background noise. It can take on values between 0 and 1, where a $STI = 0$ means that speech is not intelligible and a $STI = 1$ means that speech is perfectly intelligible. Other parameters, which are able to describe speech intelligibility have been reviewed, with the result that the STI seems to be the most suitable parameter. The Room Acoustic Speech Transmission Index (RASTI) is considered as obsolete, the Speech Transmission Index for Public Address Systems (STIPA) is a quick and simplified measurement method based on the STI method, but mainly used for public address systems. The Perceptual Evaluation of Speech Quality (PESQ) model is used for the prediction of speech quality and intelligibility of telecommunication channels. In addition, there are three simplified models: the Speech Interference Level (SIL), Clarity and Definition. When applied under certain conditions for intended applications, these models might reach an accuracy close to the accuracy of the STI model. For more complex situations, the accuracy of the STI is always better. Further, the Speech Intelligibility Index (SII) compares mainly the effects of different linguistic materials rather than the effect of different transmission channels, which is desired for the Source-Receiver-Matrix. [14]

After creating a STI-Matrix, for a first overview of the results it can be helpful to assess the STI values and gain knowledge about the expected working conditions. This can be done using a simple color scheme. The created color scheme is based on Hongisto's model for the Decrease of Performance (DP) vs. STI curve [27]. This model is also used in [12]. Figures 4.1 and 4.2 show Hongisto's model and the resulting STI evaluation color scheme.

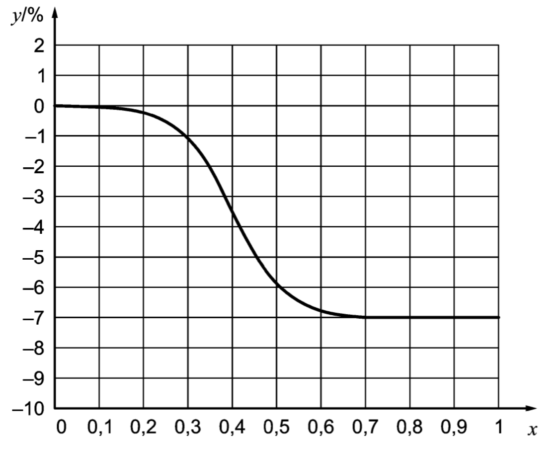


Figure 4.1: Hongisto's model for the DP (y) vs. STI (x) curve. [12]

The x-Axis shows the increasing STI from zero to one and the y-Axis shows the decrease of performance in %. With increasing speech intelligibility the work performance decreases. It can be seen that the negative effect of speech on work performance, decreases quickly below a STI of 0.5. Above 0.5 the curve stagnates, so the influence on work performance is independent of an higher speech intelligibility. Furthermore, the negative effects of speech on work performance disappear below a STI of 0.2. These two values are used as a starting point for the color scheme. $STI = 0.5$ marks the highest border, everything above characterizes *poor* (red) working conditions, because a very high speech intelligibility is not desired in an open-plan office. On the opposite side, $STI = 0.2$ marks the lowest border. Everything below is absolutely irrelevant and will always represent *excellent* (green) working conditions for an open-plan office.

An additional border at $STI = 0.35$ is introduced, which divides the two categories *good* (yellow) and *fair* (orange). After that point, the working conditions worsen drastically until $STI = 0.5$. Nevertheless, it has to be kept in mind that tasks where intense concentration is needed, speech might have a stronger effect than shown in the model. In addition, stress or other work-related factors will decrease the work performance even more [12].

Figure 4.2: STI evaluation color scheme.

While working on this Thesis, the STI-Matrix and the color scheme have been presented at *EuroNoise 2018* by Dickschen et al., who is one of the supervisors for this work. More detailed information can be seen in [30]. In addition, Probst published a paper about the idea of a STI-Matrix for the evaluation of restaurants, offices and other common rooms in March 2018. More detailed information can be seen in [31].

Grouping of Workplaces

Especially after coloring the STI-Matrix it will be possible to see how the speech intelligibility is distributed for each receiver in relation to all other sources. There will be receiver positions where more sources cause a high speech intelligibility and there will be receiver positions where more sources cause a low speech intelligibility. So, the distribution of the speech intelligibility for each receiver could be used in order to group the workplaces and asses them as more or less pleasant workplaces. With such information, the more problematic workplaces can be found directly to be improved. If there are advantageous and/or unfavorable workplaces is investigated for each model.

Assessment of the Open-Plan Office Models

The matrix and the grouping of the workplaces are tools to obtain an overview over the distribution of the STI values, to investigate potential of improvement and evaluate single source and receiver relations, but it does not give an overall assessment of the entire office model, as it is done in [12]. Therefore, the already existing evaluation methods according to [12] are considered. The single values r_D, $D_{2,S}$ and $L_{p,A,S,4m}$ are calculated using the data obtained from the matrices (accordingly a matrix with the A-weighted SPL of speech is created). Concurrently, the regression line method is reviewed again.

4.4 Statistical Evaluation

Statistics is a tool, which is used in order to classify, analyze and evaluate data. Especially the *STI*-Matrix causes a lot of data, which can be used as an additional evaluation method for scientifically sound statements about the acoustical behaviour in the three office models, and the verification or negation of theories. Therefore, different hypotheses are established. The statistical investigations are carried out using the software *IBM SPSS Statistics 24*.

Hypothesis 1: The three office geometries show significant differences in speech intelligibility distribution.

An easy way for a direct comparison of the three examined office geometries is a one-way independent Analysis of Variances (ANOVA) of the *STI* values. Here, the three office models with the same partition wall height are investigated. Due to the same amount of workplaces, the same area per workplace, approximately the same furniture and material properties the results should display differences only caused by the room geometry.

Hypothesis 2: The choice of workplace in a room has an influence on the working conditions regarding speech intelligibility.

There are workplaces, which show similar *STI* value distributions. This leads to a grouping of workplaces and afterwards to an assessment of these groups between each other (better workplaces or worse workplaces). An one-way independent ANOVA should show that the differences between these groups are significant and that it is important to include an investigation of speech intelligibility improvement for workplaces into the room acoustic planning of an open-plan office.

Hypothesis 3: The working conditions regarding speech intelligibility change when using specific sound attenuating measures like absorbing partition walls.

Partition walls are a popular way for a supposed improvement of acoustic conditions in offices. For this investigation three different partition wall heights are examined (140 cm, 160 cm and 180 cm). An one-way repeated measures ANOVA should confirm that a change in partition wall height can cause significant differences in speech intelligibility independent the office geometry.

Hypothesis 4: Two-Line-Model - Speech intelligibility worsens when the corridor between the two lines of desks is furnished.

The Two-Line-Model is a very common workplace arrangement in open-plan offices. With an one-way repeated measures ANOVA it should be shown that it is important to furnish the corridor between the two lines of desks, in order to reduce the speech intelligibility and that this furnishing can cause significant differences in speech intelligibility.

5
Results

5.1 Existing Evaluation Method from ISO 3382-3 and E VDI 2569

5.1.1 Exclusion of Microphone Positions

The Figures 5.1, 5.2 and 5.3 show, which microphone positions have to be excluded, when considering the limitation described in Section 4.2, point 1. The positions marked with the red color represent the excluded positions.

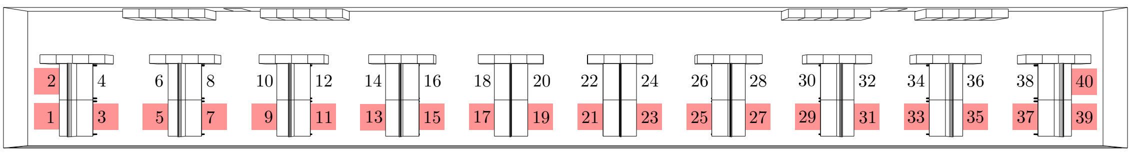


Figure 5.1: One-Line-Model with marked microphone positions, which have to be excluded from measurement paths, according to [12].

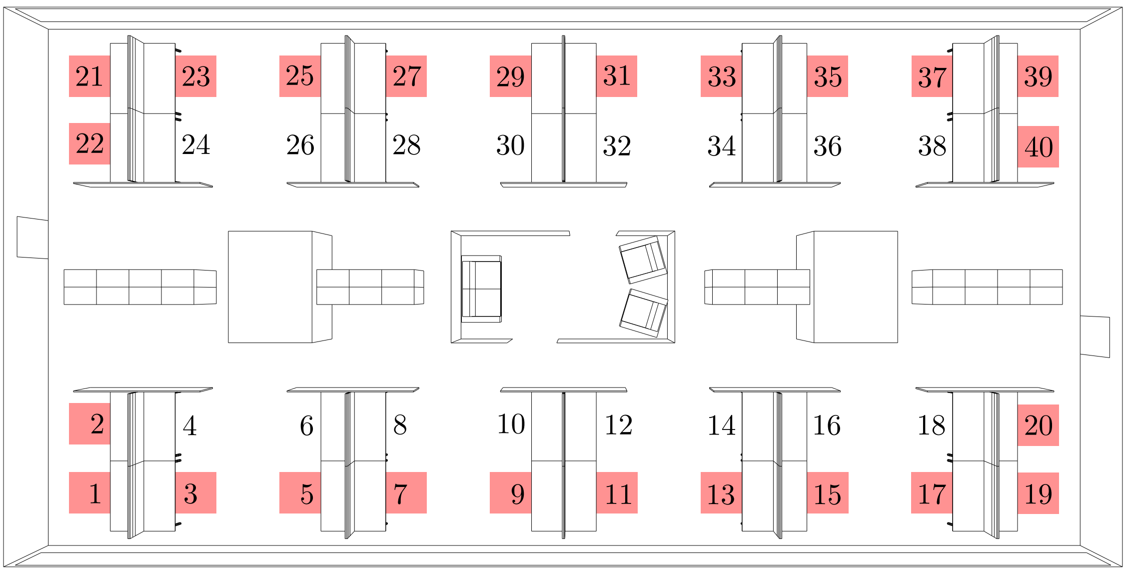


Figure 5.2: Two-Line-Model with marked microphone positions, which have to be excluded from measurement paths, according to [12].

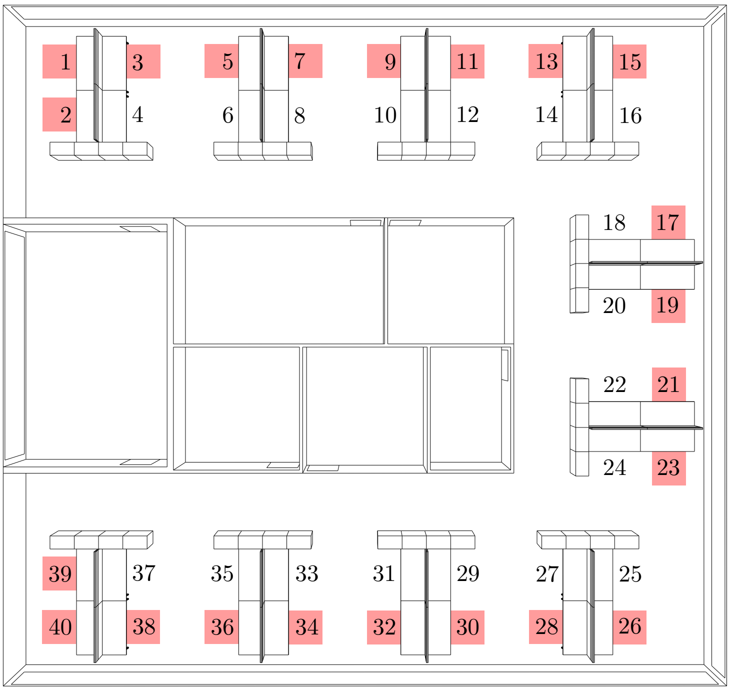


Figure 5.3: U-Shape-Model with marked microphone positions, which have to be excluded from measurement paths, according to [12].

Just by looking at the three figures above, it can be seen directly that a lot of microphone positions can not be considered for the measurements according to [12], only by applying one limitation. For the One-Line-Model 22 out of 40 positions (55 %), for the Two-Line-Model 24 out of 40 positions (60 %) and for the U-Shape-Model 22 out of 40 positions (55 %) have to be excluded. This significantly reduces the possibilities to create different measurement paths and it results in less data, which should represent the entire rooms.

5.1.2 Measurement Path Method

For each open-plan office model, measurement paths according to [12] and [13] are created. The number of required measurement paths is calculated according to Table 2.2. The amount of workplaces is $N = 40$ for each office geometry. The resulting number of required measurement paths P is

$$P = \frac{N}{5} + 1 = 9. \tag{5.1}$$

One-Line-Model:

All possible measurement paths for the One-Line-Model, without having too many overlaps, are shown in Figure 5.4 and Table 5.1. The arrows indicate the sound waves' direction of travel from the source. The first workplace position along the path (arrow) is the source position. All other workplace positions are microphone positions.

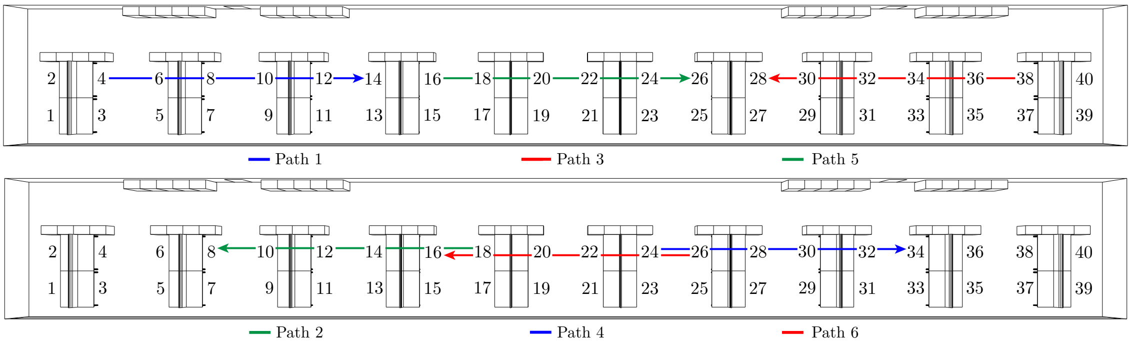


Figure 5.4: Measurement paths for the One-Line-Model

In order to gain as many measurement paths as possible, both directions through the room (from the left to the right and from the right to the left) are considered.

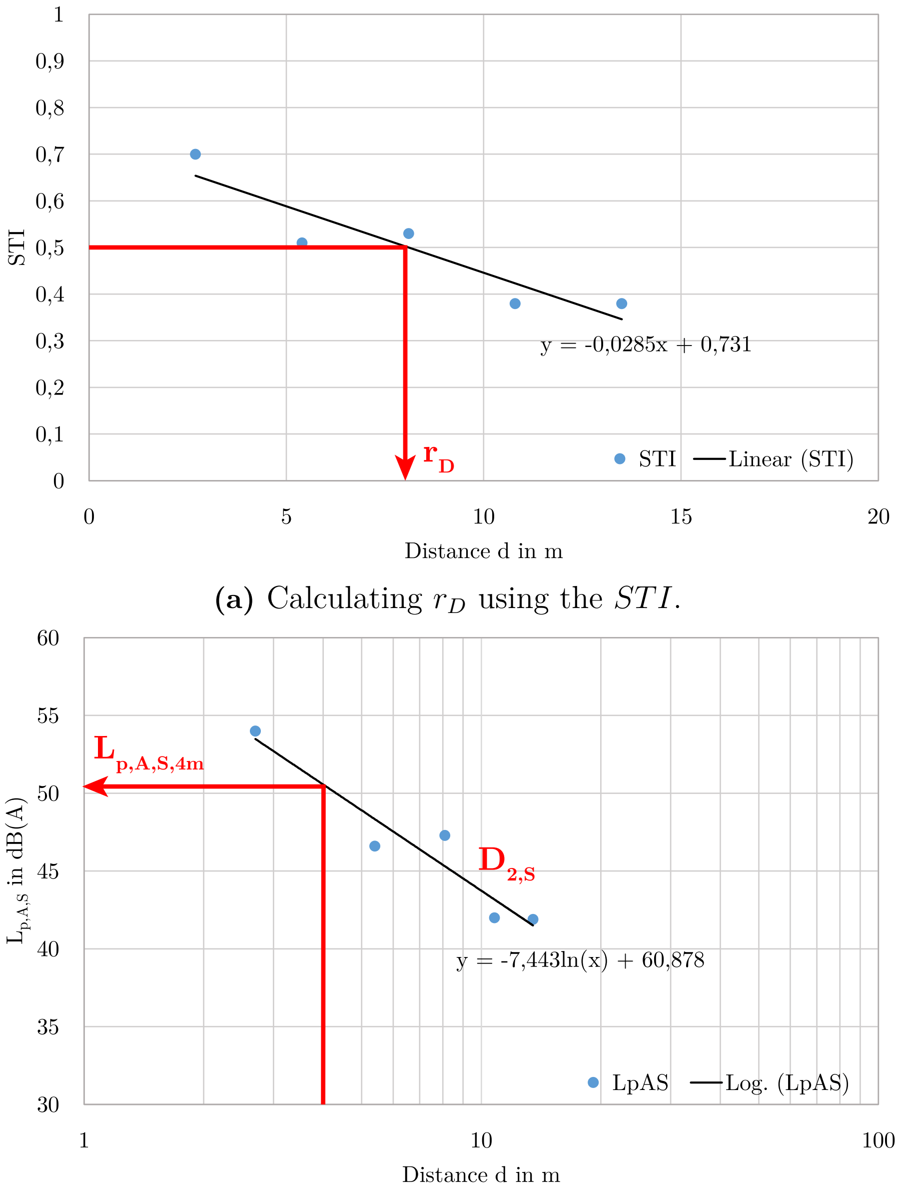
Path No.	Source Position	Receiver Positions				
1.	4	6	8	10	12	14
2.	18	16	14	12	10	8
3.	38	36	34	32	30	28
4.	24	26	28	30	32	34
5.	12	14	16	18	20	22
6.	26	24	22	20	18	16

Table 5.1: Measurement paths for the One-Line-Model

It can be seen that it is not possible to create nine measurement paths in the One-Line-Model without having too many overlaps. [13] indicated that the calculated number of required measurement paths can be too high for long and thin office rooms, which can be confirmed here.

Figure 5.5 shows the resulting STI and A-weighted SPL of speech for the One-Line-Model with 1.40 m partition wall of the 1^{st} path. These graphs are shown as an example, but the procedure is the same for all other results, which are shown in Appendix C.1.1. From the figures the single values can be read off. The results of the single values of the One-Line-Model are shown in Table 5.2.

The blue dots are the simulation results and the blue lines represent the calculated linear regression lines. In Figure 5.5a the STI is displayed over distance. Each dot represents one measurement position. The distances are the direct distances between each source and receiver relation. The speech intelligibility shows a declining trend with increasing distance, which is as expected. The red arrow shows how to find the distraction distance r_D on the regression line at $STI = 0.5$. In Figure 5.5b the A-weighted SPL of speech is displayed over distance. Again each dot represents one measurement position of the path, the distances are the direct distances between each source and receiver relation and the sound pressure levels show a decreasing trend with increasing distance. The red arrow indicates how to find $L_{p,A,S,4m}$ using the corresponding regression line. The gradient per distance doubling (slope of the curve) of the regression line is then the spatial decay rate $D_{2,S}$.



(a) Calculating r_D using the STI.

(b) Calculating $L_{p,A,S,4m}$ and $D_{2,S}$ using the $L_{p,A,S}$.

Figure 5.5: Example of the estimation of the single number values r_D, $L_{p,A,S,4m}$ and $D_{2,S}$ according to [12].

140 cm						
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
r_D	8.11 m	8.11 m	8.02 m	8.16 m	8.25 m	8.18 m
$D_{2,S}$	5.2 dB	5.1 dB	5.2 dB	5.1 dB	4.9 dB	4.9 dB
$L_{p,A,S,4m}$	50.6 dB(A)	50.4 dB(A)	50.5 dB(A)	50.4 dB(A)	50.3 dB(A)	50.3 dB(A)
160 cm						
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
r_D	7.7 m	7.9 m	7.7 m	7.98 m	8.03 m	8.03 m
$D_{2,S}$	5.6 dB	5.4 dB	5.5 dB	5.5 dB	5.2 dB	5.3 dB
$L_{p,A,S,4m}$	50.3 dB(A)	50.2 dB(A)	50.2 dB(A)	50.2 dB(A)	50 dB(A)	50.2 dB(A)
180 cm						
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
r_D	7.52 m	7.73 m	7.52 m	7.84 m	7.92 m	7.85 m
$D_{2,S}$	5.8 dB	5.8 dB	5.9 dB	5.8 dB	5.4 dB	5.4 dB
$L_{p,A,S,4m}$	50.2 dB(A)	50.2 dB(A)	50.2 dB(A)	50.2 dB(A)	50 dB(A)	50.1 dB(A)

Table 5.2: Results for single values of six measurement paths in the One-Line-Model with three different partition wall heights.

Table 5.2 shows that the single values for each path show very similar results, regarding the same partition wall. For the partition wall of 1.40 m, 1.60 m and 1.80 m height the distraction distances r_D vary by only 23 cm, 33 cm and 40 cm, respectively between the corresponding paths. The $D_{2,S}$ and $L_{p,A,S,4m}$ vary by less then 0.5 dB for all three partition wall heights, which is not audible for the human hearing. In addition, it can also be seen that with increasing height of partition walls the distraction distances decrease, the spatial decay rates increase slightly and the A-weighted SPL of speech decrease marginally. When assuming that the speech intelligibility decreases with increasing distance from the source, a smaller r_D can be interpreted that a lower speech intelligibility can be reached with a smaller distance from the source. This is a desired effect in an open-plan office. More absorption and shielding inside the room does also lead to a slight increase of $D_{2,S}$. This is as expected, since more sound energy can be attenuated per distance doubling, which does consequently lead to a smaller SPL at the distance of 4 m. The changes of $D_{2,S}$ and $L_{p,A,S,4m}$ with increasing partition are almost not audible for the human hearing and not as explicit as the change of r_D. This can also be due to their logarithmic characteristics.

The STI can be roughly estimated using the reverberation time T and the Signal to Noise Ratio (SNR). Hongisto [27] published a graph describing the relation between these three parameters (see Appendix C.1.2). The higher partition walls have the effect that the informative sound, coming from the source is highly attenuated while the background noise remains similar at the receiving workplaces, which decreases the $SignaltoNoiseRatio(SNR)$. A smaller SNR results in a smaller STI value. Especially, in simulation software like Odeon, the background noise for the calculation of the STI is fixed and does not change due to higher absorption in the room. Higher absorption has a small decreasing effect on the reverberation time inside a highly absorbing room with target $T \approx 0.4 \ldots 0.6\,\mathrm{s}$ broadband. A smaller T results in a higher STI. However, the change of T has a smaller effect on the STI than the change of SNR, which results in a decreasing STI with higher partition walls.

Using the assessment according to [12], the One-Line-Model, independent the three different partition heights is rated as a room with rather poor acoustical properties. As a small repetition, the evaluation values of [12] are displayed in Table 5.3.

Evaluation	Good	Bad
r_D	$\leq 5\,\mathrm{m}$	$> 10\,\mathrm{m}$
$D_{2,S}$	$\geq 7\,\mathrm{dB}$	$< 5\,\mathrm{dB}$
$L_{p,A,S,4m}$	$\leq 48\,\mathrm{dB(A)}$	$> 50\,\mathrm{dB(A)}$

Table 5.3: Evaluation values for open-plan offices, according to [12].

Two-Line-Model:

Figure 5.6 and Table 5.4 show the measurement paths for the Two-Line-Model. For this model it is possible to create only four measurement paths, although the shape of the room is not long and thin, but the limitations presented in Section 2.3 prevent the creation of paths across the corridor.

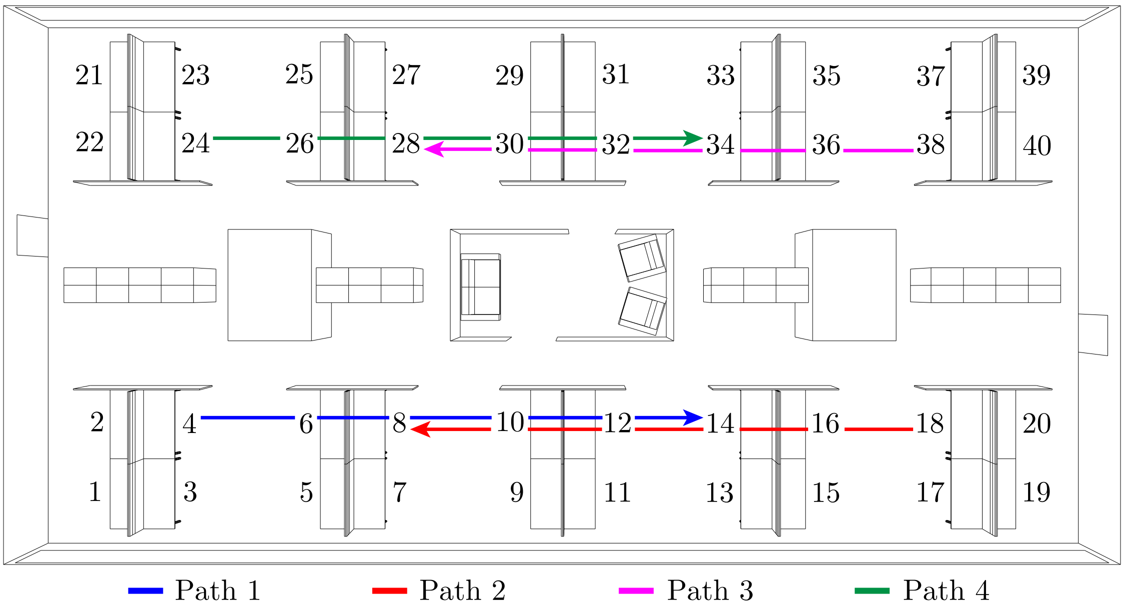


Figure 5.6: Measurement paths for the Two-Line-Model.

The first microphone position from the source in a path must not be shielded, for which reason the first two workplaces for the source and the first microphone have to be at the same side of the room. The second microphone position could then be across the corridor. Since the change in direction of a path is limited to maximum 30 ° the next possible workplace on the other side of the room can be quite far away (tests showed that it would still be within the range of 2-16 m distance to the source). Unfortunately, the possible third microphone position would already be further away then 16 m from the source. So, the created path would consist of one source and two microphone positions, which is too little, because minimum four microphone positions are required for a valid measurement path. A measurement path along the short side of the room is also not possible, due to the too few feasible microphone positions. In order to have at least four measurement paths, both directions through the room (from the left to the right and from the right to the left) are considered. The resulting single values with the three partition walls are shown in Table 5.5.

Path No.	Source Position	Receiver Positions				
1.	4	6	8	10	12	14
2.	18	16	14	12	10	8
3.	38	36	34	32	30	28
4.	24	26	28	30	32	34

Table 5.4: Measurement paths for the Two-Line-Model.

140 cm				
	Path 1	Path 2	Path 3	Path 4
r_D	8.17 m	8.1 m	8.1 m	8.1 m
$D_{2,S}$	5.6 dB	5.5 dB	5.5 dB	5.4 dB
$L_{p,A,S,4m}$	50.1 dB(A)	50 dB(A)	50 dB(A)	50 dB(A)
160 cm				
	Path 1	Path 2	Path 3	Path 4
r_D	7.76 m	7.69 m	7.73 m	7.79 m
$D_{2,S}$	6.1 dB	5.9 dB	5.9 dB	5.9 dB
$L_{p,A,S,4m}$	49.8 dB(A)	49.7 dB(A)	49.7 dB(A)	49.7 dB(A)
180 cm				
	Path 1	Path 2	Path 3	Path 4
r_D	7.6 m	7.53 m	7.47 m	7.53 m
$D_{2,S}$	6.4 dB	6.2 dB	6.2 dB	6.2 dB
$L_{p,A,S,4m}$	49.7 dB(A)	49.5 dB(A)	49.5 dB(A)	49.6 dB(A)

Table 5.5: Results for single values of four measurement paths in the Two-Line-Model with three different partition walls.

As for the One-Line-Model, the results of the paths are very similar regarding the corresponding partition wall height. The r_D vary by only 7 cm, 10 cm and 13 cm for the 1.40 m, 1.60 m and 1.80 m partition respectively. The $D_{2,S}$ and the $L_{p,A,S,4m}$ vary by around 0.2 dB between the different paths, for all partition wall heights. The effect of decreasing r_D and $L_{p,A,S,4m}$ and increasing $D_{2,S}$ with increasing partition can also be observed. However, the changes of the levels are not audible for the human hearing. Using the rating system of [12], the Two-Line-Model can be assessed as a room with medium acoustical properties, no matter which of the three partition wall heights is used.

The uniform results from the Two-Line and One-Line-Model can be caused by the geometric comparability of all paths. This is enforced by the limitations of the standard but does not necessarily mean that all other paths show the same behaviour.

U-Shape-Model:

Figure 5.7 and Table 5.6 show the measurement paths for the U-Shape-Model. Here it is possible to create eight different measurement paths. In order to have as many paths as possible, all directions through the room (from the left to the right and from the right to the left as well as from the bottom to the top and the other way around) are considered.

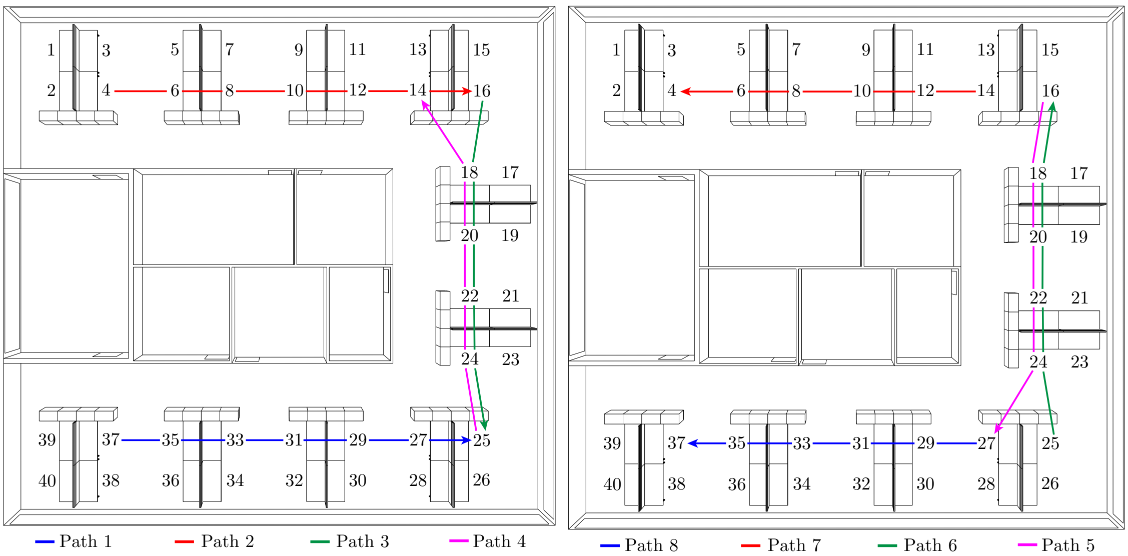


Figure 5.7: Measurement paths for the U-Shape-Model.

Path no.	Source Position	Receiver Positions					
1.	37	35	33	31	29	27	25
2.	4	6	8	10	12	14	16
3.	16	18	20	22	24	25	-
4.	25	24	22	20	18	14	-
5.	16	18	20	22	24	27	-
6.	25	24	22	20	18	16	-
7.	14	12	10	8	6	4	-
8.	27	29	31	33	35	37	-

Table 5.6: Measurement paths for the U-Shape-Model.

The resulting single values with the three partition walls are shown in Table 5.7. At first view, some differences can be seen in this model. The results of the paths 3, 4, 5 and 6 (vertical paths) differ from the results of the paths 1, 2, 7 and 8 (horizontal paths).

140 cm				
	Path 1	Path 2	Path 3	Path 4
r_D	8.11 m	8.1 m	6.87 m	6.85 m
$D_{2,S}$	5 dB	4.9 dB	4 dB	4 dB
$L_{p,A,S,4m}$	50.8 dB(A)	50.9 dB(A)	48.4 dB(A)	48.3 dB(A)
	Path 5	Path 6	Path 7	Path 8
r_D	6.81 m	6.87 m	8.33 m	8.24 m
$D_{2,S}$	4.4 dB	3.8 dB	4.6 dB	4.6 dB
$L_{p,A,S,4m}$	48.6 dB(A)	48.2 dB(A)	50.4 dB(A)	50.3 dB(A)
160 cm				
	Path 1	Path 2	Path 3	Path 4
r_D	7.82 m	7.88 m	6.59 m	6.51 m
$D_{2,S}$	5.3 dB	5.2 dB	4.6 dB	4.6 dB
$L_{p,A,S,4m}$	50.5 dB(A)	50.5 dB(A)	48.4 dB(A)	48.3 dB(A)
	Path 5	Path 6	Path 7	Path 8
r_D	6.57 m	6.54 m	8.18 m	8.1 m
$D_{2,S}$	4.9 dB	4.6 dB	4.8 dB	4.9 dB
$L_{p,A,S,4m}$	48.6 dB(A)	48.2 dB(A)	50.1 dB(A)	50.2 dB(A)
180 cm				
	Path 1	Path 2	Path 3	Path 4
r_D	7.43 m	7.61 m	6.34 m	6.34 m
$D_{2,S}$	5.6 dB	5.5 dB	5 dB	4.8 dB
$L_{p,A,S,4m}$	50.3 dB(A)	50.4 dB(A)	48.4 dB(A)	48.3 dB(A)
	Path 5	Path 6	Path 7	Path 8
r_D	6.33 m	6.34 m	8.04 m	7.97 m
$D_{2,S}$	5.2 dB	4.8 dB	5.1 dB	5.1 dB
$L_{p,A,S,4m}$	48.6 dB(A)	48.3 dB(A)	50 dB(A)	50 dB(A)

Table 5.7: Results for single values of four measurement paths in the U-Shape-Model with three different partition walls.

The results between the vertical and the horizontal paths differ most for r_D. These differences decrease with increasing partition wall height. This is because the results of path 7 and 8 do not change that much compared to the results of the other six paths with increasing partition wall. The reason for this behaviour is not clear, usually the change of the results between the different partitions are approximately uniform within the paths. Also, the reason for the differences between the vertical and horizontal paths are not clear. The furniture and the building components do all have the same material properties, along all paths are windows on one side and on the opposite side is a wall either made of gypsum or glass. The only difference is that the vertical paths are not as straight as the horizontal paths. They have slight changes in direction. [12] or [13] do not explain how results should be handled if they differ clearly, as it happens here with r_D. The values for the $D_{2,S}$ and $L_{p,A,S,4m}$ do not vary that clearly between the vertical and horizontal paths as the values for the distraction distance, which might be due to their logarithmic properties. The variations between the paths is maximum 1.2 dB for the $D_{2,S}$ (barely audible) and maximum 2.7 dB for the $L_{p,A,S,4m}$ (audible). Nevertheless, as for the One-Line and the Two-Line-Model, the distraction distances and the A-weighted SPL of speech decrease and the spatial decay rates increase with increasing partition wall. Using the rating method of [12] the U-Shape-Model can be assessed as a room with rather bad acoustical properties for the partition walls with 1.40 m and 1.60 m height, and as a room with medium to bad acoustical properties for the partition wall with 1.80 m height.

Conclusion:

For a conclusion and a better overview of the results, the median values of the three single values of each simulated office model with each partition height are displayed in Table 5.8. Of course, the median values reduce detail of differences in the results, but they give a good impression on the different effects regarding the changes in partition wall and office geometry.

Model & Partition Wall		r_D	$D_{2,S}$	$L_{p,A,S,4m}$
One-Line-Model	140 cm	8.135 m	5.1 dB	50.4 dB(A)
	160 cm	7.94 m	5.45 dB	50.2 dB(A)
	180 cm	7.785 m	5.8 dB	50.2 dB(A)
Two-Line-Model	140 cm	8.1 m	5.5 dB	50 dB(A)
	160 cm	7.745 m	5.9 dB	49.7 dB(A)
	180 cm	7.53 m	6.2 dB	49.55 dB(A)
U-Shape-Model	140 cm	7.485 m	4.5 dB	49.45 dB(A)
	160 cm	7.205 m	4.7 dB	49.35 dB(A)
	180 cm	6.885 m	5.1 dB	49.3 dB(A)

Table 5.8: Median values of the calculated single values for all simulated office models, according to [12].

The medians are displayed as exact as they were calculated. The meaningfulness about the amount of decimals is not considered here. For each office geometry it can be said that an increase of partition wall height results in a slight improvement of the acoustical properties of the offices (although most of the changes are smaller than a human hearing could perceive them). The distraction distances decrease, the spatial decay rates increase and the A-weighted SPL of speech in distance of 4 m decrease. This trend is desirable. Despite the improvements, all models have to be assessed as offices with medium to bad acoustical properties. Keeping in mind that most open-plan offices have lower levels of absorption, partition heights and background noise the target values of ISO 3382-3 are extremely ambitious. At the same time, it remains unclear, if reaching them guarantees employee satisfaction regarding acoustics in the office. This emphasises the need for a more comprehensive model and alternative approaches.

The One-Line and the Two-Line-Model showed very similar results regarding the different paths, which makes it easy to evaluate the office. The-U-Shape model shows partially different results for different path directions. These kind of results can make it difficult to evaluate an office, especially since the standards do not give any advice on how to handle such results. Also, the question arises, what kind of results would appear in other geometries, if different path directions would be possible? For example for the Two-Line-Model?

The results of the three geometries do not really help in judging, which of them is the best geometry. The U-Shape-Model shows the best results for r_D and $L_{p,A,S,4m}$, but the Two-Line-Model for $D_{2,S}$ (considering the calculated median values). When looking at the results in total, the Two-Line-Model has most of its values categorized as medium, regardless which single value or partition wall, which would make it to the best model. However, acoustical experience tells the opposite [1]. Two-Line-Models are usually experienced as office layouts in which employees complain most and feel most disturbed by speech sounds in comparison to layouts with one desk line.

It could be, that the current method is not suitable for the three layouts assessed. This would mean, that a large number of offices in Germany cannot be classified by it. Alternatively, the method is valid, however it does not give sufficient resolution in the cases modelled. Either way, there is a need for more comprehensive modelling approaches, which help to classify the three office models given.

5.2 The Source-Receiver-Matrix

5.2.1 The STI-Matrix

One-Line-Model:

The colored STI-Matrices of the One-Line-Model are displayed in Figure 5.8. They are displayed very small, so the values are not really readable, but the color scheme does indicate how the speech intelligibility is distributed and how the distribution changes with increasing partition wall height. For detailed information about each single value, the matrices are displayed bigger in Appendix C.2.1.

The speech intelligibility is very high along the diagonal of the matrix. These are all source and receiver relations, which have small distances to each other, for example workplaces at the same desk group or at the desk group right next to them. The further away the receiver is from the source, the lower is the STI. This goes hand in hand with expectations, since a closer source is more intelligible than a source

[1] Oral information from A. Dickschen, May 2018

located further away.

	Sources																																							
Receiver	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,77	0,62	0,58	0,6	0,59	0,47	0,48	0,46	0,47	0,37	0,37	0,36	0,38	0,24	0,24	0,28	0,29	0,12	0,12	0,22	0,23	0,05	0,07	0,16	0,17	0,03	0,04	0,11	0,14	0,01	0,02	0,08	0,09	0,01	0,01	0,06	0,07	0	0,01
2	0,77	-	0,61	0,59	0,59	0,6	0,49	0,47	0,47	0,46	0,38	0,37	0,37	0,38	0,25	0,24	0,28	0,29	0,12	0,13	0,22	0,23	0,05	0,07	0,16	0,17	0,03	0,04	0,11	0,13	0,02	0,03	0,08	0,09	0,02	0,01	0,05	0,07	0	0,01
3	0,61	0,6	-	0,74	0,71	0,7	0,5	0,51	0,51	0,51	0,4	0,39	0,38	0,39	0,29	0,29	0,29	0,31	0,19	0,18	0,23	0,24	0,1	0,11	0,18	0,19	0,05	0,06	0,13	0,14	0,03	0,03	0,07	0,08	0,01	0,01	0,04	0,05	0	0,01
4	0,59	0,59	0,74	-	0,7	0,7	0,55	0,5	0,51	0,53	0,4	0,38	0,39	0,38	0,3	0,28	0,3	0,3	0,18	0,18	0,23	0,23	0,09	0,12	0,18	0,18	0,05	0,06	0,13	0,14	0,03	0,03	0,08	0,08	0,01	0,01	0,04	0,05	0	0
5	0,57	0,57	0,71	0,7	-	0,74	0,59	0,53	0,5	0,54	0,39	0,41	0,38	0,4	0,3	0,3	0,29	0,3	0,2	0,2	0,22	0,23	0,09	0,1	0,16	0,17	0,05	0,05	0,12	0,13	0,02	0,03	0,07	0,08	0,01	0,01	0,05	0,05	0,01	0
6	0,58	0,58	0,7	0,7	0,73	-	0,53	0,54	0,51	0,5	0,41	0,38	0,39	0,37	0,31	0,27	0,29	0,29	0,21	0,18	0,21	0,22	0,08	0,1	0,16	0,16	0,04	0,05	0,12	0,12	0,02	0,03	0,06	0,07	0,01	0,01	0,04	0,04	0	0
7	0,46	0,47	0,51	0,55	0,58	0,52	-	0,75	0,72	0,71	0,5	0,5	0,51	0,51	0,39	0,39	0,37	0,39	0,3	0,3	0,29	0,31	0,19	0,18	0,22	0,24	0,11	0,11	0,17	0,18	0,05	0,06	0,12	0,12	0,02	0,03	0,07	0,06	0,02	0,01
8	0,46	0,46	0,51	0,51	0,53	0,54	0,75	-	0,7	0,71	0,56	0,49	0,51	0,53	0,4	0,37	0,38	0,38	0,31	0,28	0,3	0,3	0,18	0,18	0,23	0,23	0,11	0,11	0,17	0,17	0,05	0,06	0,11	0,12	0,02	0,03	0,07	0,06	0,01	0,01
9	0,46	0,46	0,51	0,51	0,49	0,49	0,72	0,71	-	0,75	0,6	0,54	0,51	0,54	0,39	0,41	0,38	0,4	0,31	0,3	0,29	0,3	0,21	0,2	0,2	0,22	0,1	0,1	0,14	0,16	0,04	0,05	0,11	0,1	0,02	0,03	0,06	0,06	0,01	0,01
10	0,46	0,46	0,51	0,53	0,53	0,48	0,71	0,71	0,75	-	0,54	0,55	0,51	0,51	0,41	0,38	0,39	0,37	0,31	0,28	0,29	0,28	0,22	0,18	0,19	0,21	0,09	0,1	0,14	0,15	0,04	0,05	0,1	0,1	0,02	0,02	0,05	0,05	0,01	0,01
11	0,35	0,36	0,38	0,4	0,39	0,4	0,51	0,56	0,59	0,53	-	0,76	0,72	0,71	0,5	0,5	0,52	0,51	0,39	0,39	0,38	0,4	0,31	0,3	0,3	0,31	0,2	0,2	0,23	0,25	0,11	0,11	0,17	0,18	0,06	0,07	0,12	0,12	0,05	0,05
12	0,35	0,34	0,39	0,38	0,41	0,38	0,51	0,51	0,53	0,55	0,76	-	0,71	0,71	0,56	0,49	0,51	0,53	0,4	0,38	0,39	0,39	0,32	0,29	0,31	0,31	0,19	0,2	0,23	0,24	0,11	0,12	0,17	0,17	0,06	0,07	0,12	0,12	0,05	0,05
13	0,36	0,36	0,38	0,39	0,38	0,38	0,51	0,51	0,49	0,5	0,72	0,72	-	0,75	0,59	0,53	0,51	0,54	0,39	0,41	0,38	0,4	0,3	0,3	0,29	0,31	0,2	0,21	0,21	0,22	0,1	0,1	0,15	0,15	0,05	0,07	0,09	0,1	0,04	0,04
14	0,36	0,35	0,38	0,38	0,4	0,37	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,54	0,55	0,51	0,51	0,41	0,39	0,39	0,38	0,31	0,28	0,29	0,29	0,22	0,2	0,2	0,21	0,09	0,1	0,14	0,15	0,05	0,06	0,09	0,09	0,04	0,03
15	0,24	0,25	0,27	0,29	0,29	0,29	0,38	0,39	0,39	0,41	0,51	0,56	0,59	0,53	-	0,76	0,72	0,71	0,5	0,5	0,52	0,51	0,39	0,39	0,38	0,39	0,3	0,3	0,3	0,31	0,2	0,19	0,23	0,24	0,12	0,14	0,17	0,18	0,11	0,11
16	0,25	0,23	0,28	0,28	0,3	0,27	0,39	0,37	0,41	0,38	0,51	0,51	0,53	0,55	0,75	-	0,71	0,71	0,56	0,49	0,51	0,53	0,41	0,38	0,39	0,39	0,31	0,29	0,31	0,31	0,19	0,19	0,23	0,23	0,11	0,13	0,17	0,17	0,1	0,11
17	0,26	0,26	0,3	0,3	0,29	0,29	0,38	0,38	0,39	0,39	0,52	0,51	0,49	0,5	0,72	0,71	-	0,75	0,6	0,53	0,5	0,54	0,39	0,41	0,38	0,4	0,3	0,3	0,28	0,3	0,2	0,2	0,2	0,2	0,1	0,12	0,14	0,15	0,08	0,08
18	0,25	0,26	0,3	0,3	0,3	0,28	0,39	0,37	0,4	0,37	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,54	0,54	0,51	0,51	0,41	0,38	0,39	0,38	0,31	0,28	0,29	0,29	0,22	0,19	0,19	0,2	0,09	0,11	0,13	0,14	0,07	0,08
19	0,15	0,16	0,19	0,2	0,19	0,2	0,28	0,29	0,3	0,29	0,38	0,4	0,39	0,41	0,51	0,55	0,59	0,53	-	0,76	0,72	0,71	0,49	0,5	0,52	0,51	0,39	0,39	0,38	0,39	0,3	0,3	0,3	0,3	0,2	0,2	0,22	0,24	0,16	0,17
20	0,14	0,15	0,19	0,19	0,21	0,18	0,29	0,28	0,31	0,28	0,39	0,38	0,41	0,38	0,51	0,51	0,54	0,55	0,76	-	0,71	0,71	0,55	0,48	0,51	0,52	0,4	0,38	0,39	0,38	0,31	0,29	0,31	0,3	0,2	0,2	0,23	0,24	0,17	0,17
21	0,17	0,17	0,23	0,23	0,19	0,19	0,29	0,3	0,3	0,29	0,38	0,4	0,39	0,39	0,52	0,51	0,49	0,5	0,72	0,71	-	0,76	0,59	0,53	0,51	0,54	0,39	0,41	0,38	0,39	0,3	0,3	0,28	0,3	0,19	0,2	0,2	0,2	0,14	0,15
22	0,17	0,17	0,23	0,22	0,19	0,19	0,3	0,3	0,31	0,29	0,39	0,39	0,4	0,38	0,51	0,53	0,54	0,48	0,71	0,71	0,76	-	0,53	0,55	0,51	0,51	0,41	0,38	0,39	0,38	0,31	0,28	0,29	0,28	0,22	0,18	0,19	0,2	0,13	0,15
23	0,07	0,09	0,13	0,14	0,1	0,12	0,2	0,2	0,2	0,2	0,28	0,3	0,3	0,3	0,38	0,39	0,39	0,41	0,5	0,56	0,6	0,53	-	0,76	0,72	0,71	0,49	0,5	0,52	0,51	0,38	0,38	0,37	0,38	0,3	0,29	0,29	0,3	0,25	0,26
24	0,07	0,07	0,14	0,13	0,09	0,12	0,19	0,19	0,22	0,19	0,29	0,29	0,31	0,28	0,39	0,38	0,41	0,38	0,51	0,51	0,54	0,54	0,75	-	0,71	0,71	0,55	0,49	0,51	0,53	0,4	0,38	0,38	0,37	0,31	0,28	0,3	0,3	0,25	0,26
25	0,09	0,11	0,16	0,17	0,12	0,13	0,23	0,23	0,19	0,19	0,3	0,31	0,3	0,3	0,38	0,39	0,39	0,39	0,52	0,51	0,49	0,5	0,72	0,71	-	0,75	0,59	0,53	0,51	0,54	0,39	0,41	0,37	0,39	0,29	0,29	0,27	0,3	0,24	0,24
26	0,09	0,1	0,17	0,16	0,11	0,13	0,23	0,22	0,19	0,19	0,31	0,31	0,31	0,29	0,39	0,39	0,41	0,38	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,53	0,55	0,51	0,51	0,41	0,38	0,38	0,37	0,3	0,27	0,28	0,28	0,24	0,23
27	0,04	0,04	0,1	0,1	0,05	0,06	0,14	0,15	0,1	0,11	0,2	0,22	0,2	0,2	0,29	0,31	0,31	0,3	0,38	0,4	0,39	0,41	0,51	0,55	0,6	0,53	-	0,75	0,72	0,72	0,49	0,5	0,51	0,51	0,38	0,38	0,38	0,39	0,36	0,36
28	0,03	0,03	0,09	0,1	0,05	0,06	0,14	0,14	0,09	0,1	0,2	0,21	0,21	0,19	0,3	0,29	0,31	0,28	0,39	0,38	0,41	0,38	0,51	0,51	0,54	0,55	0,75	-	0,71	0,71	0,55	0,49	0,51	0,53	0,39	0,37	0,38	0,38	0,36	0,35
29	0,04	0,05	0,12	0,13	0,06	0,07	0,16	0,18	0,11	0,12	0,23	0,25	0,2	0,2	0,3	0,32	0,3	0,3	0,38	0,39	0,39	0,39	0,52	0,51	0,5	0,5	0,72	0,71	-	0,76	0,59	0,54	0,51	0,54	0,39	0,41	0,38	0,4	0,35	0,36
30	0,04	0,05	0,12	0,12	0,06	0,07	0,17	0,17	0,11	0,12	0,24	0,24	0,19	0,2	0,31	0,31	0,31	0,29	0,39	0,39	0,4	0,38	0,51	0,53	0,55	0,49	0,71	0,71	0,76	-	0,53	0,55	0,51	0,51	0,41	0,38	0,39	0,38	0,35	0,34
31	0,02	0,01	0,06	0,06	0,02	0,03	0,11	0,1	0,04	0,05	0,14	0,15	0,1	0,12	0,2	0,21	0,2	0,2	0,29	0,3	0,31	0,3	0,38	0,4	0,39	0,41	0,5	0,56	0,6	0,53	-	0,76	0,72	0,71	0,49	0,49	0,51	0,51	0,45	0,46
32	0,01	0,01	0,06	0,05	0,02	0,03	0,1	0,09	0,04	0,05	0,14	0,15	0,09	0,1	0,2	0,2	0,22	0,18	0,29	0,29	0,31	0,28	0,39	0,38	0,41	0,38	0,51	0,5	0,54	0,55	0,75	-	0,71	0,71	0,54	0,48	0,51	0,53	0,46	0,46
33	0,01	0,02	0,07	0,06	0,03	0,04	0,13	0,12	0,06	0,06	0,17	0,17	0,1	0,11	0,22	0,24	0,18	0,18	0,29	0,3	0,3	0,3	0,37	0,39	0,39	0,39	0,5	0,51	0,5	0,5	0,72	0,71	-	0,75	0,58	0,52	0,51	0,54	0,46	0,47
34	0,02	0,02	0,07	0,07	0,03	0,03	0,12	0,12	0,05	0,06	0,17	0,17	0,1	0,11	0,23	0,23	0,18	0,18	0,3	0,3	0,3	0,28	0,38	0,38	0,4	0,38	0,5	0,53	0,54	0,49	0,7	0,71	0,74	-	0,53	0,54	0,51	0,51	0,46	0,46
35	0	0	0,05	0,05	0,02	0,01	0,09	0,08	0,02	0,03	0,11	0,12	0,05	0,06	0,16	0,16	0,08	0,1	0,21	0,23	0,2	0,2	0,29	0,3	0,3	0,3	0,38	0,4	0,39	0,41	0,5	0,55	0,59	0,53	-	0,74	0,71	0,7	0,57	0,57
36	0	0	0,05	0,05	0,01	0,01	0,08	0,08	0,01	0,03	0,1	0,11	0,04	0,05	0,15	0,16	0,08	0,1	0,21	0,22	0,21	0,18	0,29	0,29	0,31	0,27	0,39	0,38	0,41	0,38	0,51	0,5	0,53	0,54	0,74	-	0,7	0,69	0,59	0,58
37	0	0	0,06	0,06	0,02	0,02	0,08	0,08	0,02	0,03	0,13	0,14	0,05	0,06	0,17	0,18	0,09	0,12	0,23	0,25	0,18	0,18	0,3	0,31	0,29	0,29	0,38	0,39	0,4	0,39	0,51	0,51	0,5	0,51	0,71	0,7	-	0,74	0,61	0,6
38	0	0	0,05	0,05	0,01	0,02	0,08	0,08	0,02	0,03	0,12	0,13	0,05	0,06	0,17	0,18	0,09	0,12	0,24	0,24	0,18	0,18	0,3	0,3	0,3	0,28	0,39	0,39	0,41	0,38	0,51	0,53	0,54	0,49	0,7	0,69	0,73	-	0,59	0,59
39	0	0,01	0,05	0,06	0,01	0,01	0,08	0,1	0,02	0,03	0,11	0,13	0,03	0,04	0,17	0,18	0,06	0,09	0,22	0,22	0,11	0,14	0,28	0,29	0,25	0,24	0,37	0,38	0,38	0,37	0,46	0,47	0,48	0,48	0,6	0,6	0,62	0,58	-	0,77
40	0,01	0,02	0,05	0,07	0,01	0,01	0,08	0,1	0,02	0,03	0,11	0,13	0,03	0,05	0,16	0,18	0,05	0,09	0,22	0,22	0,11	0,14	0,28	0,29	0,26	0,24	0,37	0,38	0,38	0,37	0,47	0,47	0,49	0,47	0,59	0,6	0,61	0,59	0,77	-

(a) 1.40 m partition wall

	Sources																																							
Receiver	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,77	0,61	0,58	0,6	0,59	0,44	0,44	0,45	0,45	0,3	0,27	0,34	0,35	0,17	0,15	0,24	0,25	0,07	0,1	0,17	0,18	0,03	0,05	0,09	0,12	0,01	0,02	0,03	0,07	0	0,01	0,01	0,03	0	0,01	0	0,02	0	0
2	0,77	-	0,6	0,58	0,59	0,6	0,46	0,43	0,46	0,46	0,29	0,28	0,35	0,35	0,16	0,15	0,24	0,25	0,07	0,11	0,17	0,18	0,03	0,05	0,08	0,1	0,01	0,02	0,03	0,06	0	0,01	0,01	0,03	0	0,01	0	0,01	0	0
3	0,6	0,59	-	0,74	0,71	0,7	0,49	0,5	0,51	0,51	0,36	0,35	0,37	0,39	0,23	0,21	0,27	0,29	0,12	0,14	0,18	0,2	0,04	0,06	0,12	0,14	0,02	0,03	0,05	0,08	0	0,01	0,01	0,03	0	0	0	0,02	0	0
4	0,58	0,58	0,74	-	0,7	0,7	0,55	0,48	0,5	0,53	0,35	0,34	0,38	0,37	0,22	0,21	0,28	0,29	0,12	0,13	0,19	0,19	0,05	0,06	0,12	0,13	0,02	0,04	0,05	0,07	0	0,01	0,01	0,03	0	0	0	0,01	0	0
5	0,58	0,57	0,71	0,7	-	0,74	0,58	0,52	0,5	0,53	0,37	0,39	0,36	0,36	0,23	0,2	0,26	0,27	0,12	0,12	0,17	0,17	0,05	0,06	0,1	0,12	0,02	0,02	0,05	0,07	0	0,01	0,01	0,03	0	0	0	0,01	0	0
6	0,58	0,58	0,7	0,7	0,73	-	0,52	0,53	0,5	0,5	0,39	0,36	0,36	0,36	0,2	0,19	0,25	0,26	0,11	0,12	0,16	0,17	0,04	0,06	0,1	0,12	0,02	0,02	0,04	0,07	0	0,01	0,01	0,03	0	0	0	0,01	0	0
7	0,43	0,44	0,5	0,55	0,58	0,51	-	0,75	0,72	0,71	0,49	0,5	0,51	0,51	0,36	0,35	0,37	0,38	0,24	0,22	0,27	0,28	0,13	0,13	0,18	0,2	0,06	0,06	0,12	0,13	0,02	0,02	0,07	0,06	0	0,01	0,01	0,02	0	0
8	0,43	0,43	0,51	0,5	0,51	0,52	0,75	-	0,71	0,71	0,56	0,48	0,51	0,53	0,35	0,34	0,38	0,38	0,23	0,22	0,28	0,28	0,13	0,13	0,19	0,19	0,06	0,07	0,12	0,12	0,02	0,02	0,06	0,06	0	0,01	0,01	0,02	0	0
9	0,44	0,45	0,51	0,51	0,49	0,49	0,72	0,71	-	0,75	0,59	0,53	0,5	0,54	0,37	0,39	0,36	0,36	0,25	0,22	0,26	0,26	0,13	0,13	0,16	0,19	0,07	0,06	0,1	0,11	0,02	0,02	0,06	0,06	0	0,01	0,02	0,02	0	0
10	0,44	0,45	0,5	0,53	0,53	0,47	0,71	0,72	0,75	-	0,52	0,53	0,51	0,5	0,39	0,36	0,35	0,35	0,22	0,22	0,24	0,25	0,12	0,13	0,16	0,18	0,06	0,06	0,1	0,1	0,02	0,02	0,06	0,05	0	0,01	0,02	0,02	0	0
11	0,3	0,3	0,36	0,35	0,36	0,39	0,5	0,55	0,59	0,52	-	0,76	0,72	0,72	0,5	0,5	0,52	0,51	0,37	0,36	0,38	0,4	0,25	0,23	0,28	0,3	0,13	0,14	0,19	0,21	0,06	0,06	0,12	0,13	0,02	0,02	0,03	0,04	0,01	0,01
12	0,29	0,29	0,35	0,34	0,39	0,36	0,51	0,5	0,52	0,53	0,76	-	0,72	0,71	0,56	0,48	0,51	0,53	0,37	0,36	0,39	0,39	0,24	0,24	0,29	0,3	0,14	0,14	0,21	0,2	0,05	0,07	0,13	0,13	0,02	0,03	0,06	0,06	0,01	0,01
13	0,31	0,31	0,37	0,38	0,36	0,34	0,51	0,51	0,49	0,5	0,72	0,72	-	0,75	0,59	0,53	0,51	0,54	0,37	0,39	0,36	0,36	0,25	0,22	0,26	0,26	0,13	0,13	0,17	0,2	0,06	0,06	0,11	0,11	0,02	0,03	0,07	0,06	0,01	0,01
14	0,31	0,31	0,38	0,37	0,35	0,34	0,5	0,53	0,54	0,48	0,72	0,71	0,75	-	0,52	0,53	0,51	0,5	0,4	0,36	0,35	0,36	0,22	0,22	0,25	0,26	0,12	0,13	0,17	0,19	0,05	0,07	0,1	0,11	0,02	0,02	0,06	0,05	0,01	0,01
15	0,17	0,18	0,23	0,24	0,22	0,21	0,34	0,34	0,36	0,39	0,5	0,55	0,59	0,52	-	0,76	0,72	0,71	0,49	0,49	0,52	0,51	0,37	0,36	0,37	0,39	0,24	0,23	0,28	0,29	0,13	0,13	0,19	0,21	0,06	0,07	0,12	0,13	0,04	0,03
16	0,17	0,18	0,23	0,24	0,21	0,2	0,34	0,34	0,39	0,36	0,51	0,5	0,52	0,53	0,75	-	0,71	0,71	0,56	0,48	0,51	0,53	0,36	0,36	0,39	0,39	0,24	0,24	0,29	0,29	0,13	0,14	0,2	0,2	0,06	0,07	0,13	0,12	0,04	0,04
17	0,18	0,19	0,27	0,29	0,24	0,22	0,37	0,38	0,36	0,35	0,52	0,51	0,49	0,49	0,72	0,71	-	0,75	0,59	0,52	0,5	0,54	0,36	0,39	0,35	0,36	0,24	0,22	0,25	0,26	0,13	0,13	0,17	0,18	0,05	0,07	0,1	0,11	0,04	0,04
18	0,18	0,19	0,28	0,28	0,23	0,22	0,38	0,38	0,36	0,35	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,52	0,53	0,51	0,5	0,39	0,36	0,35	0,36	0,22	0,22	0,24	0,26	0,12	0,12	0,16	0,17	0,05	0,06	0,1	0,1	0,03	0,03
19	0,08	0,1	0,15	0,17	0,12	0,12	0,25	0,25	0,24	0,21	0,35	0,36	0,36	0,39	0,5	0,55	0,59	0,51	-	0,76	0,72	0,72	0,49	0,49	0,52	0,51	0,36	0,36	0,38	0,39	0,24	0,22	0,27	0,29	0,13	0,13	0,18	0,2	0,09	0,09
20	0,08	0,09	0,16	0,17	0,11	0,12	0,24	0,25	0,22	0,21	0,35	0,36	0,39	0,36	0,51	0,5	0,52	0,53	0,76	-	0,71	0,71	0,55	0,48	0,51	0,53	0,36	0,36	0,39	0,39	0,24	0,23	0,29	0,29	0,13	0,14	0,2	0,2	0,08	0,1
21	0,08	0,11	0,18	0,2	0,13	0,14	0,28	0,29	0,25	0,22	0,38	0,39	0,37	0,35	0,52	0,51	0,49	0,49	0,72	0,71	-	0,76	0,59	0,52	0,5	0,54	0,36	0,39	0,35	0,36	0,24	0,21	0,24	0,25	0,12	0,12	0,16	0,16	0,08	0,1
22	0,08	0,11	0,19	0,19	0,13	0,14	0,29	0,29	0,24	0,22	0,39	0,39	0,36	0,36	0,51	0,53	0,54	0,48	0,71	0,72	0,75	-	0,52	0,53	0,51	0,5	0,39	0,36	0,35	0,35	0,22	0,21	0,24	0,25	0,11	0,12	0,15	0,16	0,07	0,09
23	0,03	0,05	0,09	0,1	0,06	0,07	0,16	0,18	0,13	0,12	0,25	0,27	0,25	0,22	0,36	0,36	0,36	0,39	0,5	0,55	0,59	0,52	-	0,76	0,72	0,71	0,49	0,49	0,52	0,51	0,36	0,35	0,37	0,38	0,23	0,21	0,27	0,28	0,18	0,19
24	0,02	0,04	0,09	0,09	0,05	0,06	0,16	0,18	0,12	0,11	0,25	0,26	0,22	0,22	0,36	0,36	0,39	0,36	0,51	0,5	0,52	0,53	0,75	-	0,71	0,71	0,55	0,48	0,51	0,53	0,36	0,35	0,39	0,37	0,23	0,22	0,28	0,28	0,18	0,19
25	0,02	0,04	0,11	0,12	0,05	0,08	0,19	0,21	0,13	0,13	0,28	0,3	0,25	0,23	0,37	0,39	0,37	0,35	0,52	0,51	0,49	0,49	0,72	0,71	-	0,75	0,58	0,52	0,5	0,54	0,36	0,39	0,34	0,34	0,23	0,2	0,24	0,24	0,18	0,17
26	0,02	0,04	0,13	0,12	0,06	0,08	0,2	0,2	0,13	0,13	0,29	0,3	0,24	0,24	0,39	0,39	0,36	0,36	0,51	0,53	0,54	0,48	0,71	0,72	0,75	-	0,52	0,53	0,51	0,5	0,39	0,36	0,34	0,34	0,21	0,2	0,23	0,24	0,16	0,17
27	0,01	0,01	0,06	0,06	0,03	0,04	0,1	0,11	0,06	0,07	0,18	0,19	0,14	0,13	0,25	0,27	0,25	0,23	0,36	0,36	0,37	0,39	0,5	0,55	0,59	0,51	-	0,76	0,72	0,72	0,49	0,5	0,51	0,51	0,37	0,35	0,37	0,38	0,31	0,31
28	0,01	0,01	0,05	0,06	0,02	0,02	0,09	0,11	0,05	0,06	0,17	0,19	0,12	0,13	0,25	0,26	0,23	0,23	0,36	0,36	0,39	0,36	0,51	0,5	0,52	0,53	0,75	-	0,72	0,71	0,55	0,48	0,5	0,53	0,36	0,34	0,38	0,37	0,31	0,31
29	0,02	0,01	0,07	0,07	0,02	0,03	0,12	0,14	0,07	0,07	0,19	0,21	0,13	0,14	0,28	0,3	0,25	0,23	0,36	0,36	0,35	0,36	0,52	0,51	0,49	0,5	0,72	0,72	-	0,76	0,59	0,52	0,5	0,54	0,37	0,39	0,35	0,35	0,31	0,31
30	0,01	0,01	0,07	0,07	0,02	0,03	0,12	0,13	0,06	0,07	0,2	0,2	0,13	0,14	0,29	0,3	0,24	0,23	0,39	0,39	0,36	0,36	0,51	0,53	0,54	0,48	0,72	0,71	0,76	-	0,52	0,53	0,51	0,5	0,39	0,35	0,34	0,34	0,29	0,29
31	0	0	0,02	0,03	0	0	0,04	0,05	0,02	0,03	0,09	0,12	0,05	0,06	0,16	0,19	0,13	0,13	0,25	0,27	0,25	0,22	0,36	0,36	0,37	0,39	0,5	0,55	0,59	0,52	-	0,76	0,72	0,72	0,49	0,49	0,51	0,51	0,44	0,45
32	0	0	0,01	0,02	0	0	0,05	0,05	0,01	0,03	0,09	0,11	0,04	0,06	0,15	0,18	0,12	0,12	0,24	0,26	0,22	0,21	0,35	0,35	0,39	0,36	0,51	0,5	0,52	0,53	0,75	-	0,71	0,71	0,54	0,48	0,5	0,53	0,44	0,45
33	0	0	0,02	0,03	0	0	0,05	0,06	0,01	0,04	0,11	0,13	0,05	0,06	0,18	0,2	0,13	0,12	0,27	0,29	0,24	0,21	0,37	0,38	0,37	0,36	0,52	0,48	0,51	0,5	0,72	0,71	-	0,75	0,58	0,51	0,5	0,53	0,44	0,45
34	0	0	0,01	0,03	0	0,01	0,05	0,06	0,01	0,03	0,12	0,12	0,04	0,07	0,19	0,2	0,13	0,13	0,28	0,29	0,23	0,22	0,38	0,38	0,35	0,34	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,51	0,52	0,5	0,5	0,43	0,43
35	0	0	0	0,01	0	0	0,01	0,04	0	0,01	0,05	0,07	0,01	0,03	0,1	0,11	0,05	0,05	0,16	0,18	0,12	0,13	0,26	0,26	0,23	0,21	0,36	0,37	0,36	0,39	0,5	0,55	0,58	0,51	-	0,74	0,71	0,7	0,57	0,57
36	0	0	0	0,01	0	0	0,01	0,04	0	0,01	0,05	0,06	0,01	0,03	0,09	0,11	0,04	0,06	0,16	0,17	0,11	0,12	0,25	0,26	0,2	0,2	0,36	0,38	0,39	0,36	0,5	0,5	0,52	0,53	0,74	-	0,7	0,7	0,59	0,58
37	0	0	0	0,01	0	0	0,02	0,04	0,01	0,01	0,06	0,07	0,01	0,03	0,11	0,13	0,05	0,06	0,18	0,2	0,12	0,13	0,27	0,29	0,23	0,21	0,37	0,39	0,36	0,35	0,51	0,51	0,49	0,5	0,71	0,7	-	0,74	0,6	0,6
38	0	0	0	0,01	0	0	0,01	0,03	0,01	0,01	0,06	0,06	0,01	0,03	0,12	0,13	0,05	0,06	0,19	0,2	0,11	0,13	0,28	0,28	0,22	0,21	0,38	0,38	0,35	0,34	0,5	0,53	0,54	0,48	0,7	0,7	0,74	-	0,58	0,58
39	0	0	0	0,01	0	0	0,01	0,03	0	0,01	0,04	0,07	0,01	0,03	0,08	0,11	0,03	0,07	0,17	0,18	0,06	0,1	0,24	0,26	0,17	0,15	0,34	0,35	0,3	0,27	0,45	0,45	0,44	0,44	0,6	0,6	0,61	0,58	-	0,78
40	0	0	0	0	0	0	0,01	0,04	0	0,01	0,03	0,07	0,01	0,03	0,08	0,11	0,03	0,06	0,17	0,17	0,07	0,12	0,24	0,26	0,16	0,16	0,34	0,36	0,29	0,28	0,46	0,46	0,46	0,43	0,59	0,6	0,6	0,58	0,77	-

(b) 1.60 m partition wall

	Sources																																							
Receiver	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,8	0,61	0,57	0,6	0,59	0,4	0,39	0,43	0,44	0,27	0,23	0,3	0,32	0,14	0,12	0,17	0,2	0,06	0,07	0,09	0,12	0,01	0,03	0,04	0,08	0	0,01	0,01	0,03	0	0	0	0,01	0	0	0	0	0	0
2	0,79	-	0,6	0,58	0,59	0,6	0,41	0,39	0,44	0,44	0,26	0,25	0,31	0,33	0,13	0,13	0,17	0,21	0,05	0,07	0,1	0,12	0,01	0,02	0,04	0,07	0	0,01	0,01	0,02	0	0	0	0,01	0	0	0	0	0	0
3	0,6	0,58	-	0,77	0,71	0,71	0,49	0,5	0,51	0,51	0,33	0,32	0,36	0,37	0,2	0,17	0,23	0,26	0,09	0,09	0,13	0,15	0,02	0,04	0,06	0,08	0,01	0,01	0,03	0,04	0	0	0	0,01	0	0	0	0	0	0
4	0,58	0,58	0,77	-	0,71	0,7	0,55	0,48	0,5	0,53	0,32	0,31	0,37	0,36	0,19	0,18	0,25	0,25	0,09	0,1	0,13	0,15	0,02	0,04	0,06	0,08	0	0,01	0,02	0,04	0	0	0	0,01	0	0	0	0	0	0
5	0,58	0,57	0,72	0,71	-	0,76	0,58	0,52	0,49	0,53	0,31	0,32	0,33	0,34	0,2	0,17	0,21	0,22	0,09	0,09	0,12	0,15	0,03	0,03	0,06	0,08	0,01	0,01	0,02	0,04	0	0	0	0,01	0	0	0	0	0	0
6	0,59	0,58	0,71	0,7	0,76	-	0,51	0,53	0,5	0,49	0,31	0,31	0,33	0,33	0,18	0,17	0,21	0,22	0,08	0,09	0,11	0,14	0,02	0,04	0,05	0,08	0	0,01	0,02	0,04	0	0	0	0,01	0	0	0	0	0	0
7	0,41	0,41	0,49	0,55	0,58	0,51	-	0,79	0,72	0,72	0,49	0,5	0,52	0,51	0,33	0,32	0,36	0,37	0,21	0,19	0,23	0,26	0,09	0,09	0,13	0,15	0,03	0,04	0,06	0,08	0,01	0,01	0,03	0,04	0	0	0,01	0,01	0	0
8	0,4	0,4	0,5	0,49	0,51	0,52	0,78	-	0,72	0,72	0,55	0,48	0,51	0,54	0,32	0,31	0,37	0,36	0,21	0,2	0,25	0,26	0,09	0,1	0,13	0,16	0,03	0,04	0,07	0,08	0	0,01	0,03	0,03	0	0	0	0,01	0	0
9	0,42	0,43	0,51	0,51	0,49	0,49	0,72	0,72	-	0,77	0,59	0,52	0,5	0,53	0,31	0,32	0,34	0,34	0,22	0,18	0,22	0,23	0,11	0,09	0,12	0,16	0,03	0,04	0,06	0,07	0,01	0,01	0,02	0,03	0	0	0	0	0	0
10	0,42	0,43	0,5	0,53	0,53	0,47	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,32	0,31	0,33	0,34	0,19	0,18	0,22	0,23	0,08	0,08	0,12	0,15	0,03	0,04	0,06	0,06	0	0,01	0,02	0,02	0	0	0	0	0	0
11	0,26	0,26	0,33	0,34	0,31	0,32	0,5	0,55	0,59	0,52	-	0,79	0,73	0,72	0,49	0,5	0,53	0,52	0,35	0,33	0,37	0,38	0,22	0,21	0,25	0,27	0,1	0,1	0,15	0,17	0,04	0,04	0,08	0,07	0	0,01	0,03	0,03	0	0
12	0,25	0,26	0,33	0,33	0,31	0,31	0,5	0,49	0,52	0,53	0,79	-	0,72	0,71	0,56	0,48	0,51	0,53	0,34	0,33	0,38	0,38	0,22	0,21	0,27	0,28	0,11	0,11	0,15	0,18	0,03	0,04	0,07	0,08	0	0,01	0,03	0,03	0	0
13	0,27	0,27	0,36	0,37	0,33	0,32	0,52	0,51	0,49	0,5	0,73	0,73	-	0,78	0,59	0,51	0,49	0,53	0,32	0,32	0,34	0,35	0,21	0,19	0,23	0,23	0,1	0,09	0,13	0,16	0,04	0,03	0,07	0,07	0,01	0,01	0,04	0,03	0	0
14	0,27	0,28	0,37	0,36	0,32	0,31	0,51	0,53	0,54	0,48	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,32	0,32	0,34	0,35	0,19	0,19	0,22	0,23	0,09	0,1	0,13	0,16	0,04	0,03	0,06	0,07	0	0,01	0,03	0,02	0	0
15	0,14	0,14	0,2	0,21	0,19	0,18	0,33	0,33	0,31	0,32	0,49	0,55	0,59	0,51	-	0,79	0,73	0,72	0,49	0,5	0,53	0,51	0,34	0,33	0,36	0,38	0,22	0,21	0,24	0,27	0,1	0,1	0,14	0,15	0,03	0,05	0,08	0,07	0,01	0,02
16	0,12	0,13	0,2	0,21	0,17	0,18	0,32	0,32	0,32	0,31	0,5	0,49	0,52	0,53	0,79	-	0,72	0,72	0,55	0,48	0,51	0,53	0,34	0,33	0,38	0,38	0,22	0,21	0,27	0,28	0,1	0,1	0,14	0,16	0,03	0,05	0,08	0,07	0,01	0,02
17	0,13	0,14	0,23	0,26	0,2	0,19	0,35	0,37	0,34	0,32	0,53	0,52	0,49	0,49	0,73	0,72	-	0,78	0,59	0,51	0,49	0,53	0,31	0,32	0,34	0,34	0,22	0,19	0,22	0,24	0,09	0,09	0,13	0,15	0,03	0,06	0,05	0,07	0,01	0,02
18	0,13	0,14	0,25	0,26	0,2	0,19	0,37	0,37	0,33	0,32	0,51	0,54	0,54	0,48	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,32	0,32	0,34	0,34	0,19	0,18	0,22	0,24	0,08	0,08	0,12	0,14	0,02	0,04	0,06	0,06	0,01	0,02
19	0,04	0,06	0,12	0,14	0,08	0,09	0,22	0,22	0,21	0,17	0,34	0,34	0,31	0,33	0,49	0,55	0,59	0,51	-	0,79	0,73	0,72	0,49	0,49	0,53	0,51	0,34	0,33	0,36	0,38	0,23	0,19	0,24	0,26	0,08	0,1	0,14	0,15	0,05	0,06
20	0,04	0,05	0,12	0,13	0,08	0,09	0,21	0,23	0,19	0,18	0,34	0,34	0,32	0,32	0,5	0,49	0,52	0,53	0,79	-	0,72	0,72	0,55	0,48	0,51	0,53	0,34	0,33	0,38	0,38	0,22	0,2	0,26	0,26	0,08	0,1	0,14	0,15	0,05	0,06
21	0,05	0,06	0,13	0,14	0,08	0,1	0,25	0,27	0,22	0,19	0,37	0,38	0,34	0,33	0,53	0,51	0,49	0,5	0,72	0,72	-	0,78	0,59	0,51	0,49	0,53	0,31	0,32	0,34	0,34	0,21	0,17	0,22	0,22	0,08	0,09	0,12	0,14	0,05	0,06
22	0,05	0,07	0,13	0,15	0,09	0,11	0,26	0,27	0,21	0,2	0,38	0,38	0,34	0,34	0,51	0,53	0,54	0,48	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,32	0,32	0,34	0,34	0,19	0,17	0,21	0,21	0,08	0,08	0,11	0,13	0,05	0,05
23	0,02	0,02	0,06	0,06	0,03	0,05	0,13	0,14	0,1	0,09	0,22	0,24	0,21	0,19	0,34	0,34	0,31	0,33	0,49	0,54	0,59	0,51	-	0,79	0,72	0,72	0,49	0,5	0,53	0,51	0,34	0,32	0,36	0,37	0,2	0,18	0,23	0,25	0,13	0,14
24	0,01	0,02	0,07	0,06	0,02	0,05	0,13	0,14	0,09	0,09	0,22	0,24	0,2	0,19	0,34	0,34	0,32	0,32	0,5	0,49	0,52	0,53	0,79	-	0,72	0,72	0,55	0,48	0,51	0,53	0,33	0,32	0,38	0,36	0,2	0,19	0,25	0,25	0,13	0,14
25	0,02	0,02	0,07	0,08	0,03	0,05	0,14	0,14	0,1	0,09	0,25	0,28	0,22	0,21	0,36	0,38	0,34	0,33	0,53	0,51	0,49	0,49	0,72	0,72	-	0,78	0,59	0,52	0,5	0,53	0,3	0,32	0,33	0,33	0,2	0,17	0,21	0,21	0,13	0,13
26	0,01	0,02	0,07	0,07	0,03	0,05	0,14	0,15	0,1	0,1	0,27	0,28	0,22	0,21	0,38	0,38	0,34	0,33	0,51	0,53	0,54	0,48	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,31	0,31	0,32	0,32	0,18	0,17	0,2	0,21	0,12	0,12
27	0	0	0,03	0,03	0	0,02	0,06	0,08	0,03	0,03	0,13	0,17	0,1	0,09	0,23	0,23	0,22	0,18	0,34	0,35	0,31	0,33	0,5	0,55	0,59	0,51	-	0,79	0,73	0,73	0,49	0,5	0,52	0,51	0,33	0,32	0,35	0,37	0,26	0,26
28	0	0	0,02	0,03	0	0,01	0,06	0,07	0,03	0,03	0,13	0,16	0,09	0,09	0,22	0,24	0,2	0,19	0,34	0,35	0,33	0,32	0,5	0,5	0,52	0,53	0,79	-	0,72	0,72	0,56	0,48	0,51	0,53	0,32	0,32	0,37	0,36	0,27	0,27
29	0	0	0,03	0,04	0	0,02	0,07	0,08	0,05	0,03	0,14	0,16	0,1	0,11	0,25	0,27	0,23	0,21	0,37	0,39	0,35	0,33	0,53	0,52	0,49	0,5	0,73	0,72	-	0,78	0,59	0,52	0,5	0,53	0,31	0,32	0,33	0,33	0,26	0,26
30	0	0	0,03	0,04	0	0,02	0,07	0,09	0,04	0,05	0,15	0,17	0,11	0,11	0,27	0,27	0,22	0,21	0,38	0,38	0,34	0,33	0,51	0,53	0,54	0,48	0,72	0,72	0,78	-	0,52	0,53	0,5	0,49	0,31	0,31	0,33	0,33	0,24	0,25
31	0	0	0	0	0	0	0,02	0,03	0,01	0	0,06	0,06	0,03	0,04	0,12	0,16	0,1	0,09	0,22	0,24	0,21	0,18	0,34	0,34	0,32	0,32	0,5	0,55	0,59	0,51	-	0,79	0,72	0,72	0,49	0,49	0,51	0,51	0,42	0,43
32	0	0	0	0	0	0	0,01	0,02	0,01	0	0,06	0,06	0,03	0,05	0,11	0,15	0,09	0,09	0,21	0,23	0,19	0,18	0,33	0,34	0,32	0,31	0,5	0,49	0,52	0,53	0,78	-	0,72	0,72	0,55	0,48	0,51	0,53	0,42	0,43
33	0	0	0	0	0	0	0,02	0,03	0	0	0,06	0,07	0,03	0,05	0,12	0,15	0,08	0,09	0,24	0,26	0,21	0,18	0,36	0,37	0,33	0,32	0,52	0,51	0,49	0,5	0,72	0,72	-	0,78	0,58	0,51	0,49	0,53	0,41	0,41
34	0	0	0	0	0	0	0,02	0,03	0	0,01	0,06	0,07	0,03	0,05	0,13	0,15	0,09	0,1	0,25	0,26	0,21	0,19	0,37	0,37	0,32	0,32	0,51	0,54	0,54	0,48	0,72	0,72	0,77	-	0,51	0,52	0,5	0,49	0,4	0,41
35	0	0	0	0	0	0	0	0,01	0	0	0,02	0,04	0,01	0,01	0,06	0,07	0,02	0,04	0,12	0,15	0,09	0,09	0,22	0,22	0,2	0,17	0,34	0,34	0,31	0,32	0,49	0,54	0,58	0,51	-	0,78	0,71	0,71	0,58	0,57
36	0	0	0	0	0	0	0	0,01	0	0	0,03	0,04	0	0,01	0,06	0,07	0,02	0,04	0,11	0,14	0,08	0,09	0,21	0,23	0,17	0,16	0,33	0,33	0,31	0,31	0,5	0,49	0,51	0,53	0,77	-	0,71	0,7	0,59	0,58
37	0	0	0	0	0	0	0	0,01	0	0	0,02	0,04	0,01	0,01	0,06	0,08	0,03	0,04	0,12	0,15	0,08	0,1	0,23	0,26	0,2	0,17	0,36	0,37	0,33	0,31	0,51	0,51	0,49	0,5	0,71	0,71	-	0,77	0,6	0,58
38	0	0	0	0	0	0	0	0,01	0	0	0,02	0,03	0,01	0,01	0,06	0,09	0,03	0,05	0,13	0,14	0,08	0,09	0,25	0,25	0,2	0,18	0,37	0,36	0,32	0,31	0,5	0,53	0,54	0,48	0,71	0,7	0,76	-	0,58	0,58
39	0	0	0	0	0	0	0	0,01	0	0	0,01	0,03	0	0,01	0,05	0,07	0,02	0,03	0,09	0,11	0,04	0,07	0,18	0,19	0,14	0,11	0,3	0,32	0,27	0,24	0,43	0,44	0,41	0,39	0,6	0,6	0,61	0,57	-	0,8
40	0	0	0	0	0	0	0	0,01	0	0,01	0,01	0,03	0	0,01	0,05	0,06	0,02	0,03	0,1	0,12	0,04	0,08	0,18	0,2	0,13	0,12	0,31	0,33	0,26	0,25	0,44	0,44	0,41	0,39	0,59	0,6	0,6	0,58	0,79	-

(c) 1.80 m partition wall

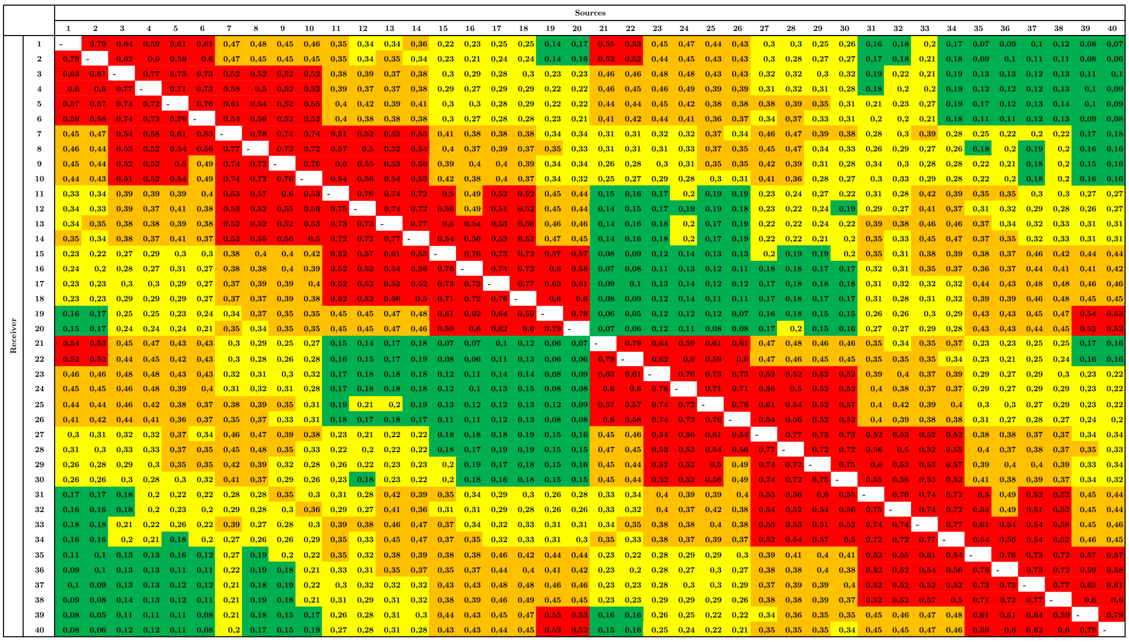
Figure 5.8: Colored *STI*-Matrix of the One-Line-Model.

It can also be seen that the workplaces in the middle of the room (around workplace no. 20 in Figure 3.2) show a higher amount of sources, which cause a speech intelligibility in the yellow and orange category than the workplaces at the two ends of the room. Sitting in the middle of he room, i.e. seat 20, the workplaces located furthest away (seat 20 to 1 or to 40) are half the distance compared to the distance between 1 to 40 or the other way around. In addition, the workplaces in the middle experience the same amount of sources from both directions while workplaces, located further on one side experience a higher amount of sources from one direction with higher distances and a smaller amount of sources from the other direction with smaller distances. The distance between source and receiver seem to be one decisive criterion for a good or poor speech intelligibility. With increasing partition wall height, the green areas increase, red areas decrease slightly and a big amount of areas, which have been orange before become yellow. In total, the speech intelligibility becomes lower, which is desirable in open-plan offices. This development was also shown in Section 5.1.2. Therewith, the amount of absorption also is one of the decisive criteria on the level of speech intelligibility inside a room.

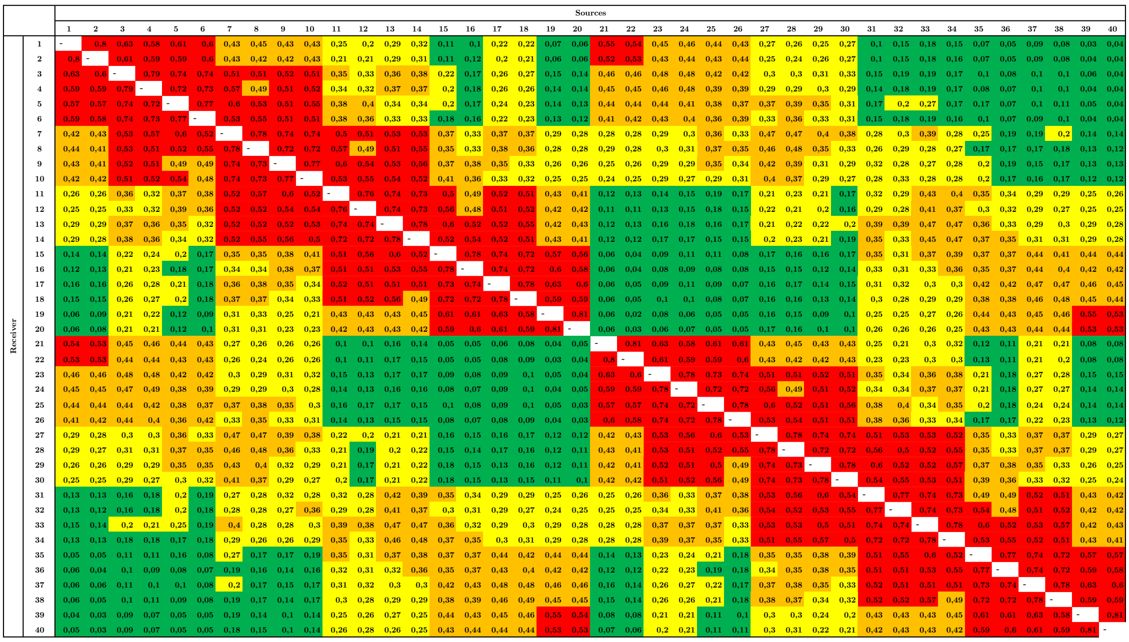
When looking closer at the values it is also possible to detect potential of improvement. For example, if a specific orange area is observed and it is the goal to improve this area to the yellow category, it is possible to find the responsible sources and receivers for these specific *STI* values and to take targeted measures in order to improve the acoustical properties. If then, measures for improvement have been implemented into the model and simulated, the *STI*-Matrix can be used in comparison to the original *STI*-Matrix, to show in a simple way, if the measures actually improved the acoustical properties of the room or not.

Two-Line-Model:

The *STI*-Matrices for the Two-Line-Model are displayed in Figure 5.9. The color pattern is clearly different for this office geometry with two desk lines instead of one desk line.



(a) 1.40 m partition wall



(b) 1.60 m partition wall

Sources (1–20)

Receiver	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-	0,8	0,63	0,58	0,61	0,6	0,37	0,36	0,41	0,41	0,2	0,16	0,26	0,27	0,08	0,07	0,12	0,13	0,03	0,04
2	0,8	-	0,61	0,59	0,58	0,59	0,35	0,36	0,4	0,42	0,19	0,18	0,26	0,27	0,07	0,07	0,12	0,13	0,03	0,04
3	0,62	0,59	-	0,79	0,74	0,74	0,51	0,51	0,52	0,51	0,31	0,3	0,34	0,36	0,18	0,14	0,21	0,23	0,06	0,07
4	0,58	0,58	0,79	-	0,72	0,73	0,57	0,49	0,51	0,52	0,3	0,29	0,35	0,35	0,16	0,14	0,22	0,22	0,07	0,07
5	0,57	0,57	0,74	0,73	-	0,77	0,6	0,52	0,5	0,54	0,31	0,31	0,31	0,32	0,17	0,14	0,17	0,19	0,09	0,08
6	0,59	0,58	0,74	0,74	0,77	-	0,52	0,54	0,5	0,5	0,29	0,3	0,3	0,31	0,15	0,14	0,16	0,18	0,06	0,07
7	0,38	0,38	0,52	0,57	0,6	0,52	-	0,78	0,74	0,74	0,5	0,51	0,53	0,53	0,34	0,28	0,35	0,35	0,23	0,23
8	0,37	0,37	0,52	0,5	0,52	0,54	0,78	-	0,72	0,72	0,57	0,5	0,51	0,55	0,32	0,29	0,37	0,35	0,23	0,23
9	0,4	0,38	0,53	0,52	0,49	0,49	0,75	0,73	-	0,77	0,6	0,54	0,52	0,55	0,31	0,29	0,34	0,31	0,21	0,23
10	0,4	0,39	0,51	0,52	0,54	0,48	0,75	0,73	0,78	-	0,53	0,55	0,53	0,51	0,31	0,3	0,31	0,31	0,2	0,22
11	0,2	0,2	0,34	0,3	0,3	0,29	0,51	0,57	0,6	0,52	-	0,76	0,74	0,73	0,49	0,49	0,52	0,51	0,4	0,39
12	0,19	0,2	0,3	0,3	0,29	0,29	0,52	0,51	0,54	0,54	0,76	-	0,74	0,73	0,56	0,48	0,51	0,52	0,39	0,4
13	0,24	0,22	0,35	0,36	0,31	0,28	0,53	0,52	0,51	0,53	0,74	0,74	-	0,78	0,6	0,52	0,51	0,55	0,37	0,38
14	0,23	0,22	0,36	0,35	0,31	0,29	0,52	0,55	0,56	0,5	0,72	0,72	0,78	-	0,52	0,54	0,52	0,5	0,37	0,37
15	0,09	0,08	0,17	0,19	0,17	0,13	0,32	0,32	0,3	0,32	0,5	0,56	0,6	0,52	-	0,78	0,74	0,73	0,57	0,57
16	0,06	0,06	0,17	0,18	0,16	0,12	0,31	0,32	0,29	0,31	0,5	0,5	0,52	0,54	0,78	-	0,74	0,72	0,6	0,58
17	0,07	0,07	0,21	0,23	0,17	0,14	0,35	0,36	0,32	0,31	0,52	0,51	0,51	0,51	0,73	0,74	-	0,78	0,62	0,59
18	0,08	0,07	0,22	0,23	0,16	0,14	0,35	0,35	0,3	0,31	0,51	0,52	0,56	0,49	0,72	0,72	0,78	-	0,58	0,59
19	0,03	0,02	0,11	0,14	0,08	0,07	0,27	0,29	0,21	0,18	0,41	0,41	0,36	0,36	0,61	0,61	0,63	0,58	-	0,81
20	0,04	0,02	0,11	0,14	0,08	0,07	0,26	0,27	0,19	0,2	0,4	0,41	0,36	0,36	0,58	0,6	0,61	0,59	0,81	-
21	0,55	0,54	0,45	0,46	0,44	0,43	0,23	0,21	0,23	0,23	0,08	0,08	0,11	0,1	0,02	0,02	0,04	0,05	0,01	0
22	0,53	0,53	0,44	0,44	0,43	0,43	0,23	0,22	0,23	0,25	0,08	0,09	0,12	0,13	0,02	0,02	0,05	0,05	0,01	0,01
23	0,45	0,45	0,47	0,48	0,41	0,42	0,3	0,28	0,31	0,32	0,12	0,11	0,14	0,15	0,05	0,05	0,06	0,08	0,03	0,02
24	0,44	0,45	0,46	0,49	0,38	0,38	0,28	0,29	0,3	0,27	0,11	0,11	0,14	0,15	0,05	0,05	0,06	0,08	0,03	0,02
25	0,44	0,44	0,44	0,41	0,37	0,36	0,36	0,38	0,34	0,3	0,13	0,13	0,16	0,14	0,05	0,04	0,06	0,09	0,04	0,02
26	0,42	0,42	0,43	0,4	0,35	0,42	0,32	0,35	0,32	0,31	0,12	0,11	0,14	0,13	0,05	0,04	0,06	0,07	0,03	0,02
27	0,25	0,26	0,28	0,29	0,36	0,32	0,47	0,48	0,4	0,38	0,21	0,17	0,2	0,2	0,11	0,12	0,15	0,16	0,11	0,08
28	0,25	0,25	0,3	0,31	0,37	0,35	0,46	0,48	0,36	0,34	0,2	0,17	0,21	0,21	0,11	0,12	0,15	0,15	0,1	0,07
29	0,25	0,24	0,29	0,29	0,35	0,34	0,43	0,4	0,32	0,29	0,19	0,15	0,2	0,21	0,11	0,13	0,12	0,14	0,11	0,08
30	0,23	0,24	0,29	0,27	0,3	0,31	0,41	0,37	0,29	0,27	0,17	0,15	0,19	0,19	0,1	0,12	0,11	0,14	0,09	0,07
31	0,1	0,1	0,14	0,16	0,15	0,16	0,27	0,26	0,32	0,28	0,33	0,28	0,43	0,4	0,35	0,34	0,28	0,29	0,23	0,24
32	0,1	0,1	0,14	0,16	0,16	0,15	0,28	0,27	0,28	0,35	0,3	0,28	0,41	0,37	0,29	0,32	0,29	0,26	0,22	0,23
33	0,11	0,12	0,17	0,19	0,25	0,17	0,4	0,28	0,28	0,29	0,4	0,38	0,47	0,48	0,36	0,32	0,28	0,29	0,24	0,26
34	0,1	0,1	0,16	0,17	0,15	0,16	0,29	0,27	0,26	0,28	0,36	0,34	0,46	0,48	0,37	0,35	0,29	0,3	0,24	0,25
35	0,05	0,04	0,07	0,08	0,15	0,05	0,26	0,14	0,15	0,15	0,34	0,3	0,36	0,38	0,36	0,36	0,44	0,41	0,44	0,44
36	0,03	0,04	0,06	0,06	0,07	0,05	0,17	0,14	0,14	0,14	0,32	0,31	0,32	0,36	0,35	0,37	0,43	0,4	0,41	0,42
37	0,02	0,05	0,06	0,08	0,07	0,06	0,17	0,15	0,15	0,15	0,31	0,32	0,3	0,3	0,41	0,43	0,47	0,48	0,45	0,45
38	0,02	0,04	0,06	0,07	0,07	0,05	0,16	0,14	0,14	0,15	0,3	0,28	0,28	0,29	0,37	0,38	0,46	0,49	0,44	0,44
39	0,01	0,02	0,05	0,05	0,04	0,02	0,14	0,12	0,06	0,12	0,23	0,24	0,24	0,22	0,44	0,43	0,45	0,46	0,55	0,54
40	0,02	0,02	0,05	0,05	0,05	0,02	0,14	0,13	0,07	0,12	0,24	0,25	0,23	0,21	0,43	0,43	0,43	0,44	0,53	0,53

Sources (21–40)

Receiver	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	0,55	0,54	0,45	0,46	0,44	0,43	0,23	0,23	0,23	0,24	0,07	0,12	0,14	0,12	0,05	0,05	0,04	0,05	0,03	0,01
2	0,53	0,53	0,43	0,44	0,43	0,43	0,23	0,22	0,24	0,25	0,06	0,12	0,15	0,13	0,05	0,04	0,04	0,05	0,02	0,01
3	0,45	0,45	0,47	0,48	0,41	0,43	0,3	0,3	0,3	0,33	0,14	0,15	0,17	0,15	0,06	0,07	0,07	0,07	0,04	0,03
4	0,44	0,45	0,46	0,49	0,38	0,38	0,28	0,29	0,29	0,28	0,13	0,14	0,17	0,15	0,06	0,07	0,06	0,07	0,04	0,04
5	0,44	0,44	0,44	0,41	0,37	0,36	0,36	0,38	0,34	0,3	0,14	0,15	0,26	0,14	0,15	0,07	0,06	0,07	0,04	0,03
6	0,41	0,42	0,43	0,4	0,34	0,39	0,32	0,36	0,32	0,31	0,13	0,14	0,16	0,14	0,06	0,06	0,06	0,06	0,03	0,03
7	0,25	0,26	0,28	0,29	0,36	0,31	0,47	0,48	0,4	0,38	0,28	0,29	0,4	0,28	0,25	0,17	0,17	0,18	0,11	0,11
8	0,25	0,26	0,29	0,31	0,37	0,35	0,46	0,48	0,35	0,34	0,26	0,28	0,28	0,26	0,14	0,15	0,16	0,16	0,11	0,1
9	0,24	0,25	0,28	0,28	0,35	0,34	0,43	0,4	0,32	0,29	0,31	0,28	0,26	0,27	0,15	0,16	0,14	0,16	0,11	0,11
10	0,23	0,24	0,29	0,26	0,29	0,31	0,41	0,37	0,29	0,28	0,28	0,33	0,28	0,28	0,15	0,15	0,14	0,15	0,11	0,1
11	0,08	0,09	0,12	0,13	0,11	0,12	0,19	0,22	0,18	0,16	0,32	0,28	0,43	0,4	0,34	0,34	0,28	0,29	0,24	0,24
12	0,07	0,08	0,12	0,14	0,1	0,11	0,18	0,2	0,17	0,15	0,3	0,28	0,41	0,38	0,29	0,32	0,29	0,27	0,23	0,23
13	0,07	0,09	0,15	0,15	0,12	0,13	0,21	0,22	0,21	0,18	0,39	0,39	0,47	0,47	0,36	0,32	0,28	0,29	0,25	0,25
14	0,07	0,09	0,16	0,15	0,11	0,13	0,2	0,22	0,2	0,17	0,36	0,34	0,46	0,47	0,37	0,35	0,3	0,31	0,25	0,26
15	0,03	0,04	0,07	0,1	0,07	0,05	0,17	0,14	0,13	0,14	0,34	0,3	0,36	0,38	0,36	0,37	0,44	0,41	0,44	0,44
16	0,03	0,04	0,06	0,07	0,06	0,05	0,15	0,14	0,11	0,11	0,33	0,31	0,32	0,35	0,35	0,37	0,43	0,4	0,41	0,42
17	0,04	0,02	0,08	0,08	0,06	0,06	0,14	0,15	0,11	0,12	0,3	0,33	0,3	0,29	0,41	0,42	0,47	0,48	0,45	0,45
18	0,03	0,02	0,07	0,08	0,06	0,05	0,14	0,15	0,11	0,11	0,29	0,28	0,28	0,29	0,38	0,39	0,46	0,48	0,44	0,44
19	0,01	0,02	0,05	0,04	0,04	0,02	0,11	0,12	0,07	0,09	0,22	0,24	0,23	0,22	0,44	0,42	0,45	0,46	0,55	0,54
20	0,01	0,01	0,05	0,05	0,04	0,04	0,12	0,14	0,08	0,1	0,24	0,25	0,23	0,23	0,43	0,43	0,44	0,44	0,53	0,53
21	-	0,81	0,63	0,58	0,61	0,61	0,37	0,36	0,41	0,41	0,21	0,19	0,27	0,28	0,08	0,08	0,12	0,13	0,03	0,03
22	0,8	-	0,61	0,59	0,58	0,6	0,36	0,36	0,4	0,41	0,19	0,21	0,26	0,27	0,09	0,08	0,12	0,14	0,03	0,03
23	0,62	0,6	-	0,78	0,73	0,74	0,51	0,51	0,52	0,51	0,32	0,3	0,34	0,37	0,16	0,14	0,21	0,24	0,07	0,08
24	0,58	0,59	0,78	-	0,72	0,72	0,56	0,49	0,51	0,52	0,3	0,3	0,35	0,35	0,15	0,14	0,23	0,23	0,07	0,08
25	0,57	0,57	0,74	0,72	-	0,78	0,6	0,52	0,5	0,56	0,31	0,32	0,31	0,33	0,17	0,14	0,18	0,19	0,1	0,07
26	0,6	0,58	0,74	0,72	0,78	-	0,52	0,54	0,5	0,5	0,3	0,3	0,29	0,32	0,14	0,13	0,17	0,18	0,07	0,06
27	0,38	0,38	0,52	0,55	0,6	0,52	-	0,78	0,74	0,74	0,52	0,53	0,53	0,52	0,31	0,28	0,35	0,35	0,24	0,23
28	0,37	0,37	0,52	0,5	0,52	0,54	0,78	-	0,72	0,72	0,56	0,5	0,52	0,55	0,31	0,28	0,36	0,35	0,23	0,23
29	0,39	0,38	0,52	0,51	0,5	0,49	0,75	0,73	-	0,78	0,6	0,52	0,51	0,57	0,3	0,29	0,34	0,31	0,2	0,2
30	0,39	0,4	0,51	0,52	0,56	0,48	0,75	0,73	0,78	-	0,54	0,54	0,52	0,51	0,31	0,28	0,3	0,3	0,2	0,2
31	0,19	0,2	0,33	0,31	0,31	0,29	0,52	0,55	0,6	0,54	-	0,77	0,75	0,73	0,49	0,49	0,53	0,52	0,4	0,39
32	0,19	0,2	0,31	0,31	0,32	0,29	0,53	0,51	0,52	0,55	0,77	-	0,75	0,73	0,54	0,48	0,51	0,52	0,4	0,39
33	0,22	0,23	0,35	0,36	0,34	0,28	0,53	0,53	0,5	0,51	0,74	0,75	-	0,78	0,6	0,52	0,52	0,57	0,38	0,38
34	0,22	0,22	0,37	0,35	0,32	0,29	0,52	0,55	0,57	0,49	0,72	0,73	0,78	-	0,52	0,54	0,52	0,5	0,37	0,37
35	0,09	0,08	0,18	0,19	0,16	0,14	0,32	0,32	0,31	0,3	0,5	0,54	0,6	0,52	-	0,77	0,74	0,73	0,57	0,57
36	0,06	0,07	0,17	0,17	0,14	0,13	0,3	0,31	0,3	0,29	0,5	0,5	0,52	0,54	0,77	-	0,74	0,72	0,59	0,58
37	0,08	0,09	0,21	0,23	0,18	0,14	0,35	0,36	0,31	0,29	0,52	0,51	0,51	0,51	0,73	0,74	-	0,78	0,62	0,59
38	0,07	0,07	0,22	0,21	0,16	0,14	0,35	0,35	0,3	0,29	0,52	0,52	0,57	0,49	0,72	0,72	0,78	-	0,58	0,59
39	0,04	0,03	0,12	0,14	0,09	0,09	0,26	0,27	0,2	0,16	0,41	0,41	0,37	0,36	0,61	0,6	0,63	0,58	-	0,81
40	0,04	0,03	0,11	0,11	0,08	0,08	0,26	0,27	0,19	0,18	0,4	0,41	0,36	0,35	0,58	0,59	0,61	0,59	0,81	-

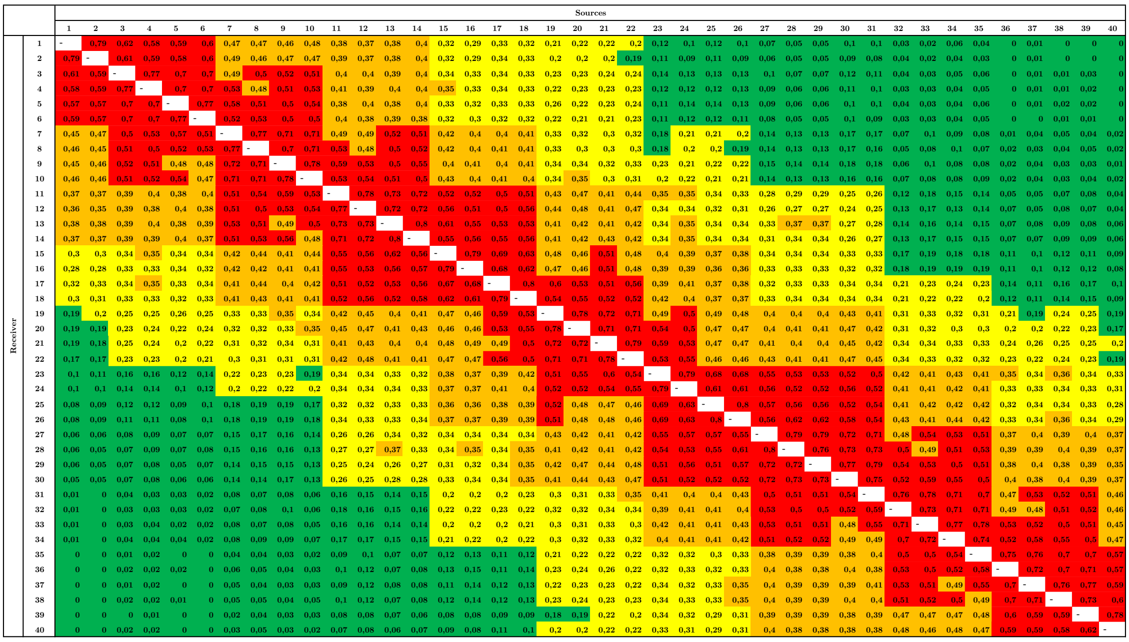
(c) 1.80 m partition wall

Figure 5.9: Colored *STI*-Matrix of the Two-Line-Model.

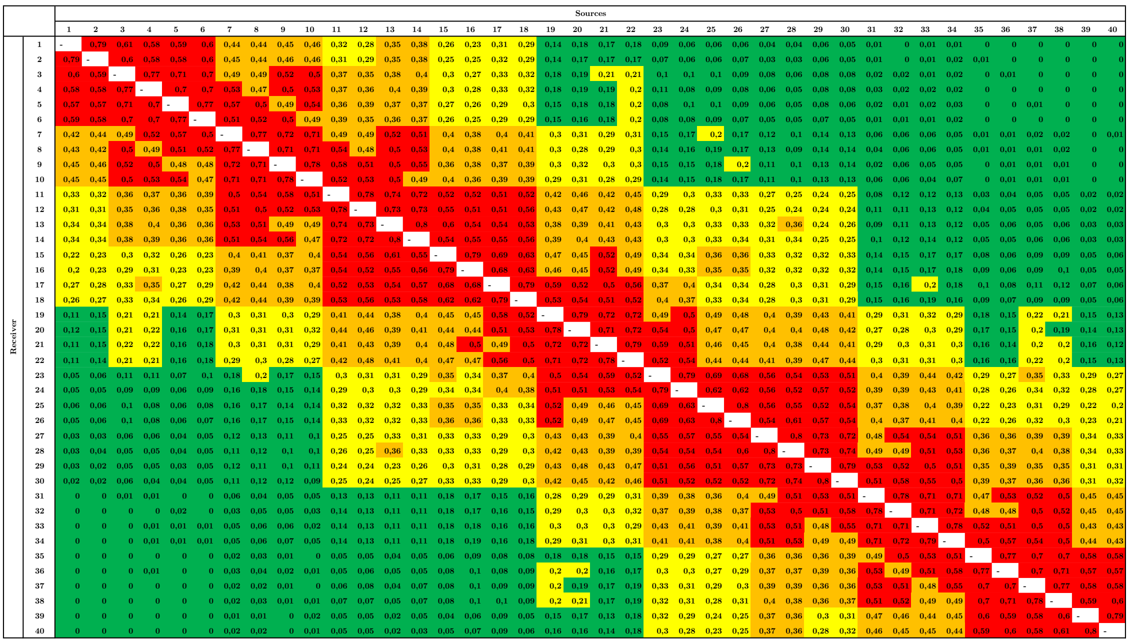
Again, the diagonal shows mostly a very high speech intelligibility, apart from green spots in the middle of it. This is where the *STI* of the source and receiver relation from the workplaces at the end of the first desk line to the workplaces at the beginning of the second desk line (or the other way around) are displayed. They have the maximum possible distance for this office geometry. The same relation can be observed in the upper right and the lower left corners of the matrices, which are also green. With increasing partition walls, the green areas grow and new green dots at the sides, the top and the bottom appear. These dots belong to the source and receiver relations between the workplaces on the same desk line but the opposite ends. In general, the amount of yellow and orange areas is clearly bigger and the amount of green areas is clearly smaller than in the One-Line-Model, which indicates a higher speech intelligibility for all receivers in this model. This model is a good example to see how the furniture in the corridor can influence speech intelligibility. Therefore, it can be looked at the *STI* values of the vertical paths between workplaces on the different sides of the corridor, for example the source/receiver relation between workplaces no. 7, 8/27, 28. The corresponding results of the matrix show that the height of the furniture decides about how well or bad speech is understood on the other side of the corridor. When a cupboard is standing in the way (height 2.10 m), the resulting *STI* are in the orange category, very close to the border of the red category. If a telephone booth is standing in the way (height 2.70 m, 10 cm below ceiling) the resulting *STI* are also in the orange category, but very close to the border of the yellow category. Whereas the glass division in the middle of the room, which goes up to the ceiling, causes a speech intelligibility in the yellow category. So, there is potential for improvement by using different types of furniture. Nevertheless, it is important to keep in mind that the furniture can only cause changes on very specific places and that it would be more beneficial to look at holistic improvements.

U-Shape-Model:

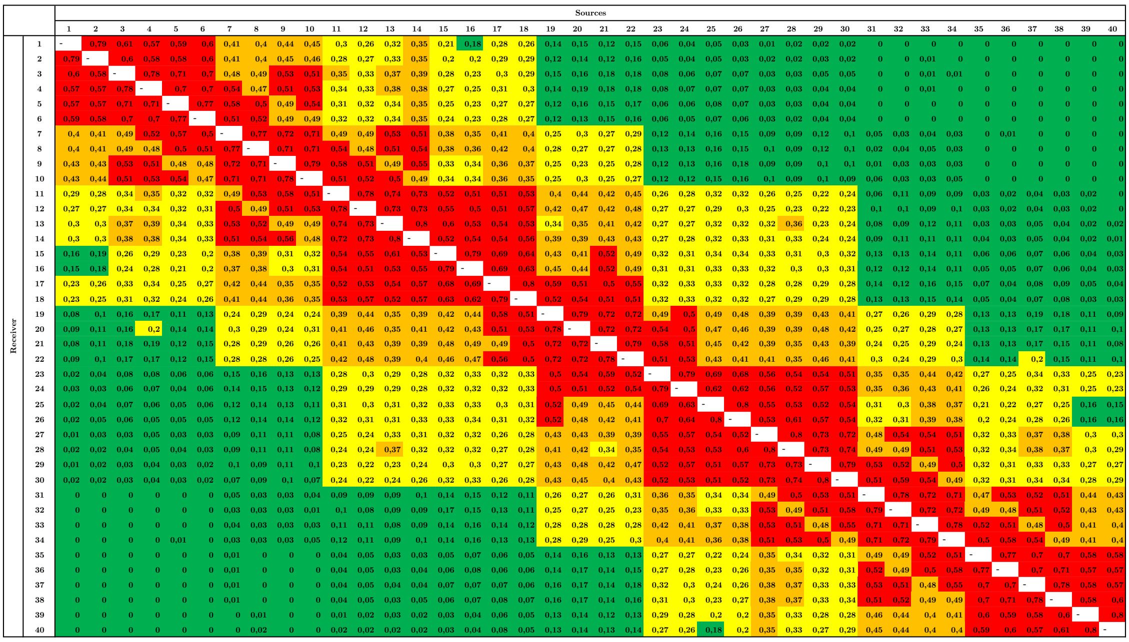
The colored *STI*-Matrices are displayed in Figure 5.10. The color pattern is similar to the color pattern of the One-Line-Model, which is understandable, since the U-Shape-Model can be considered as a bent One-Line-Model.



(a) 1.40 m partition wall



(b) 1.60 m partition wall



Receiver \ Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,79	0,61	0,57	0,59	0,6	0,41	0,4	0,44	0,45	0,3	0,26	0,32	0,35	0,21	0,18	0,28	0,26	0,14	0,15	0,12	0,15	0,06	0,04	0,05	0,03	0,01	0,02	0,02	0,02	0	0	0	0	0	0	0	0	0	0
2	0,79	-	0,6	0,58	0,58	0,6	0,41	0,4	0,45	0,46	0,28	0,27	0,33	0,35	0,2	0,2	0,29	0,29	0,12	0,14	0,12	0,16	0,05	0,04	0,05	0,03	0,02	0,02	0,03	0,02	0	0	0,01	0	0	0	0	0	0	0
3	0,6	0,58	-	0,78	0,71	0,7	0,48	0,49	0,53	0,51	0,35	0,33	0,37	0,39	0,28	0,23	0,3	0,29	0,15	0,16	0,18	0,18	0,08	0,06	0,07	0,07	0,03	0,03	0,05	0,05	0	0	0,01	0,01	0	0	0	0	0	0
4	0,57	0,57	0,78	-	0,7	0,7	0,54	0,47	0,51	0,53	0,34	0,33	0,38	0,38	0,27	0,25	0,31	0,3	0,14	0,19	0,18	0,18	0,08	0,07	0,07	0,07	0,03	0,03	0,04	0,04	0	0	0,01	0	0	0	0	0	0	0
5	0,57	0,57	0,71	0,71	-	0,77	0,58	0,5	0,49	0,54	0,31	0,32	0,34	0,35	0,25	0,23	0,27	0,27	0,12	0,16	0,15	0,17	0,06	0,06	0,08	0,07	0,03	0,03	0,04	0,04	0	0	0	0	0	0	0	0	0	0
6	0,59	0,58	0,7	0,7	0,77	-	0,51	0,52	0,49	0,49	0,32	0,32	0,34	0,35	0,24	0,23	0,28	0,27	0,12	0,13	0,15	0,16	0,06	0,05	0,07	0,06	0,03	0,02	0,04	0,04	0	0	0	0	0	0	0	0	0	0
7	0,4	0,41	0,49	0,52	0,57	0,5	-	0,77	0,72	0,71	0,49	0,49	0,53	0,51	0,38	0,35	0,41	0,4	0,25	0,3	0,27	0,29	0,12	0,14	0,16	0,15	0,09	0,09	0,12	0,1	0,05	0,03	0,04	0,03	0	0,01	0	0	0	0
8	0,4	0,41	0,49	0,48	0,5	0,51	0,77	-	0,71	0,71	0,54	0,48	0,51	0,54	0,38	0,36	0,42	0,4	0,28	0,27	0,27	0,28	0,13	0,13	0,16	0,15	0,1	0,09	0,12	0,1	0,02	0,04	0,05	0,03	0	0	0	0	0	0
9	0,43	0,43	0,53	0,51	0,48	0,48	0,72	0,71	-	0,79	0,58	0,51	0,49	0,55	0,33	0,34	0,36	0,37	0,25	0,23	0,25	0,28	0,12	0,13	0,16	0,18	0,09	0,09	0,1	0,1	0,01	0,03	0,03	0,03	0	0	0	0	0	0
10	0,43	0,44	0,51	0,53	0,54	0,47	0,71	0,71	0,78	-	0,51	0,52	0,5	0,49	0,34	0,34	0,36	0,35	0,25	0,3	0,25	0,27	0,12	0,12	0,15	0,16	0,1	0,09	0,1	0,09	0,06	0,03	0,03	0,05	0	0	0	0	0	0
11	0,29	0,28	0,34	0,35	0,32	0,32	0,49	0,53	0,58	0,51	-	0,78	0,74	0,73	0,52	0,51	0,51	0,53	0,4	0,44	0,42	0,45	0,26	0,28	0,32	0,32	0,26	0,25	0,22	0,24	0,06	0,11	0,09	0,09	0,03	0,02	0,04	0,03	0,02	0
12	0,27	0,27	0,34	0,34	0,32	0,31	0,5	0,49	0,51	0,53	0,78	-	0,73	0,73	0,55	0,5	0,51	0,57	0,42	0,47	0,42	0,48	0,27	0,27	0,29	0,3	0,25	0,23	0,22	0,23	0,1	0,1	0,09	0,1	0,03	0,02	0,04	0,03	0,02	0
13	0,3	0,3	0,37	0,39	0,34	0,33	0,53	0,52	0,49	0,49	0,74	0,73	-	0,8	0,6	0,53	0,54	0,53	0,34	0,35	0,41	0,42	0,27	0,27	0,32	0,32	0,32	0,36	0,23	0,24	0,08	0,09	0,12	0,11	0,03	0,03	0,05	0,04	0,02	0,02
14	0,3	0,3	0,38	0,38	0,34	0,33	0,51	0,54	0,56	0,48	0,72	0,73	0,8	-	0,52	0,54	0,54	0,56	0,39	0,39	0,43	0,43	0,27	0,28	0,32	0,33	0,31	0,33	0,24	0,24	0,09	0,11	0,11	0,11	0,04	0,03	0,05	0,04	0,02	0,01
15	0,16	0,19	0,26	0,29	0,23	0,2	0,38	0,39	0,31	0,32	0,54	0,55	0,61	0,53	-	0,79	0,69	0,64	0,43	0,41	0,52	0,49	0,32	0,31	0,34	0,34	0,33	0,31	0,3	0,32	0,13	0,13	0,14	0,11	0,06	0,06	0,07	0,06	0,04	0,03
16	0,15	0,18	0,24	0,28	0,21	0,2	0,37	0,38	0,3	0,31	0,54	0,51	0,53	0,55	0,79	-	0,69	0,63	0,45	0,44	0,52	0,49	0,31	0,31	0,33	0,33	0,32	0,3	0,3	0,31	0,12	0,12	0,14	0,11	0,05	0,05	0,07	0,06	0,04	0,03
17	0,23	0,26	0,33	0,34	0,25	0,27	0,42	0,44	0,35	0,35	0,52	0,53	0,54	0,57	0,68	0,69	-	0,8	0,59	0,51	0,5	0,55	0,32	0,33	0,33	0,32	0,28	0,28	0,29	0,28	0,14	0,12	0,16	0,15	0,07	0,04	0,08	0,09	0,05	0,04
18	0,23	0,25	0,31	0,32	0,24	0,26	0,41	0,44	0,36	0,35	0,53	0,57	0,52	0,57	0,63	0,62	0,79	-	0,52	0,54	0,51	0,51	0,32	0,33	0,32	0,32	0,27	0,29	0,29	0,28	0,13	0,13	0,15	0,14	0,05	0,04	0,07	0,08	0,03	0,03
19	0,08	0,1	0,16	0,17	0,11	0,13	0,24	0,29	0,24	0,24	0,39	0,44	0,35	0,39	0,42	0,44	0,58	0,51	-	0,79	0,72	0,72	0,49	0,5	0,49	0,48	0,39	0,39	0,43	0,41	0,27	0,26	0,29	0,28	0,13	0,13	0,19	0,18	0,11	0,09
20	0,09	0,11	0,16	0,2	0,14	0,14	0,3	0,29	0,24	0,31	0,41	0,46	0,35	0,41	0,42	0,43	0,51	0,53	0,78	-	0,72	0,72	0,54	0,5	0,47	0,46	0,39	0,39	0,48	0,42	0,25	0,27	0,28	0,27	0,13	0,13	0,17	0,17	0,11	0,1
21	0,08	0,11	0,18	0,19	0,12	0,15	0,28	0,29	0,26	0,26	0,41	0,43	0,39	0,39	0,48	0,49	0,49	0,5	0,72	0,72	-	0,79	0,58	0,51	0,45	0,42	0,39	0,35	0,43	0,39	0,24	0,25	0,29	0,24	0,13	0,13	0,17	0,15	0,11	0,08
22	0,09	0,1	0,17	0,17	0,12	0,15	0,28	0,28	0,26	0,25	0,42	0,48	0,39	0,4	0,46	0,47	0,56	0,5	0,72	0,72	0,78	-	0,51	0,53	0,43	0,41	0,41	0,35	0,46	0,41	0,3	0,24	0,29	0,3	0,14	0,14	0,2	0,15	0,11	0,1
23	0,02	0,04	0,08	0,08	0,06	0,06	0,15	0,16	0,13	0,13	0,28	0,3	0,29	0,28	0,32	0,33	0,32	0,33	0,5	0,54	0,59	0,52	-	0,79	0,69	0,68	0,56	0,54	0,54	0,51	0,35	0,35	0,44	0,42	0,27	0,25	0,34	0,33	0,25	0,23
24	0,03	0,03	0,06	0,07	0,04	0,06	0,14	0,15	0,13	0,12	0,29	0,29	0,29	0,28	0,32	0,32	0,32	0,33	0,5	0,51	0,52	0,54	0,79	-	0,62	0,62	0,56	0,52	0,57	0,53	0,35	0,36	0,43	0,41	0,26	0,24	0,32	0,31	0,25	0,23
25	0,02	0,04	0,07	0,06	0,05	0,06	0,12	0,14	0,13	0,11	0,31	0,3	0,31	0,32	0,33	0,33	0,3	0,31	0,52	0,49	0,45	0,44	0,69	0,63	-	0,8	0,55	0,53	0,52	0,54	0,31	0,3	0,38	0,37	0,21	0,22	0,27	0,25	0,16	0,15
26	0,02	0,05	0,06	0,05	0,05	0,05	0,12	0,14	0,14	0,12	0,32	0,31	0,31	0,33	0,33	0,34	0,31	0,32	0,52	0,48	0,42	0,41	0,7	0,64	0,8	-	0,53	0,61	0,57	0,54	0,32	0,31	0,39	0,38	0,2	0,24	0,28	0,26	0,16	0,16
27	0,01	0,03	0,03	0,05	0,03	0,03	0,09	0,11	0,11	0,08	0,25	0,24	0,33	0,31	0,32	0,32	0,26	0,28	0,43	0,43	0,39	0,39	0,55	0,57	0,54	0,52	-	0,8	0,73	0,72	0,48	0,54	0,54	0,51	0,32	0,33	0,37	0,38	0,3	0,3
28	0,02	0,02	0,04	0,05	0,04	0,03	0,09	0,11	0,11	0,08	0,24	0,24	0,37	0,32	0,32	0,32	0,27	0,28	0,41	0,42	0,34	0,35	0,54	0,53	0,53	0,6	0,8	-	0,73	0,74	0,49	0,49	0,51	0,53	0,32	0,34	0,38	0,37	0,3	0,29
29	0,01	0,02	0,03	0,04	0,03	0,02	0,1	0,09	0,11	0,1	0,23	0,22	0,23	0,24	0,3	0,3	0,27	0,27	0,43	0,48	0,42	0,47	0,52	0,57	0,51	0,57	0,73	0,73	-	0,79	0,53	0,52	0,49	0,5	0,32	0,31	0,33	0,33	0,27	0,27
30	0,02	0,02	0,03	0,04	0,03	0,02	0,07	0,09	0,1	0,07	0,24	0,22	0,24	0,26	0,32	0,33	0,26	0,28	0,43	0,45	0,4	0,43	0,52	0,53	0,51	0,52	0,73	0,74	0,8	-	0,51	0,59	0,54	0,49	0,32	0,31	0,34	0,34	0,28	0,29
31	0	0	0	0	0	0	0,05	0,03	0,03	0,04	0,09	0,09	0,09	0,1	0,14	0,15	0,12	0,11	0,26	0,27	0,26	0,31	0,36	0,35	0,34	0,34	0,49	0,5	0,53	0,51	-	0,78	0,72	0,71	0,47	0,53	0,52	0,51	0,44	0,43
32	0	0	0	0	0	0	0,03	0,03	0,03	0,01	0,1	0,08	0,09	0,09	0,17	0,15	0,13	0,11	0,25	0,27	0,25	0,23	0,35	0,36	0,33	0,33	0,53	0,49	0,51	0,58	0,79	-	0,72	0,72	0,49	0,48	0,51	0,52	0,43	0,43
33	0	0	0	0	0	0	0,04	0,03	0,03	0,03	0,11	0,11	0,08	0,09	0,14	0,16	0,14	0,12	0,28	0,28	0,28	0,28	0,42	0,41	0,37	0,38	0,53	0,51	0,48	0,55	0,71	0,71	-	0,78	0,52	0,51	0,48	0,5	0,41	0,4
34	0	0	0	0	0,01	0	0,03	0,03	0,03	0,05	0,12	0,11	0,09	0,1	0,14	0,16	0,13	0,13	0,28	0,29	0,25	0,3	0,4	0,41	0,36	0,38	0,51	0,53	0,5	0,49	0,71	0,72	0,79	-	0,5	0,58	0,54	0,49	0,41	0,4
35	0	0	0	0	0	0	0,01	0	0	0	0,04	0,05	0,03	0,03	0,05	0,07	0,06	0,05	0,14	0,16	0,13	0,13	0,27	0,27	0,22	0,24	0,35	0,34	0,32	0,31	0,49	0,49	0,52	0,51	-	0,77	0,7	0,7	0,58	0,58
36	0	0	0	0	0	0	0,01	0	0	0	0,04	0,05	0,03	0,04	0,06	0,08	0,06	0,06	0,14	0,17	0,14	0,15	0,27	0,28	0,23	0,26	0,35	0,35	0,32	0,31	0,52	0,49	0,5	0,58	0,77	-	0,7	0,71	0,57	0,57
37	0	0	0	0	0	0	0,01	0	0	0	0,04	0,05	0,04	0,04	0,07	0,07	0,07	0,06	0,16	0,17	0,14	0,18	0,32	0,3	0,24	0,26	0,38	0,37	0,33	0,33	0,53	0,51	0,48	0,55	0,7	0,7	-	0,78	0,58	0,57
38	0	0	0	0	0	0	0,01	0	0	0	0,04	0,05	0,03	0,05	0,06	0,07	0,08	0,07	0,16	0,17	0,14	0,16	0,31	0,3	0,23	0,27	0,38	0,37	0,33	0,34	0,51	0,52	0,49	0,49	0,7	0,71	0,78	-	0,58	0,6
39	0	0	0	0	0	0	0	0,01	0	0	0,01	0,02	0,03	0,02	0,03	0,04	0,06	0,05	0,13	0,14	0,12	0,13	0,29	0,28	0,2	0,2	0,35	0,33	0,28	0,28	0,46	0,44	0,4	0,41	0,6	0,59	0,58	0,6	-	0,8
40	0	0	0	0	0	0	0	0,02	0	0	0,02	0,02	0,02	0,02	0,03	0,04	0,08	0,05	0,13	0,14	0,13	0,14	0,27	0,26	0,18	0,2	0,35	0,33	0,27	0,29	0,45	0,44	0,4	0,4	0,59	0,6	0,57	0,61	0,8	-

(c) 1.80 m partition wall

Figure 5.10: Colored STI-Matrix of the U-Shape-Model.

Here, the same effects as for the One-Line-Model can be observed. The only difference is that the distances between sources and receivers are not as uniform, which cause a not as perfect straight line in the results as for the One-Line-Model.

Conclusion:

When comparing the matrices of the three models to each other, it can be seen that the One-Line and the U-Shape-Model must be better layouts than the Two-Line-Model, only by comparing the color distribution. The Two-Line-Model shows less STI values in the green category then the other two. This is in line with experience.

All in all, the matrices give exact, easy understandable and quick information about the overall situation inside the room and what is happening regarding room acoustics when changing small details in furniture or absorption properties. In addition, different layouts can easily be compared and it can be decided which of the layouts is the best. Of course, simulations always entail uncertainties, due to the calculation algorithms, but the matrices embody a good reference point for the evaluation of open-plan offices. It is a tool, which can be used for the planning phase of offices as well as an evaluation method for already existing offices.

5.2.2 Grouping of Workplaces

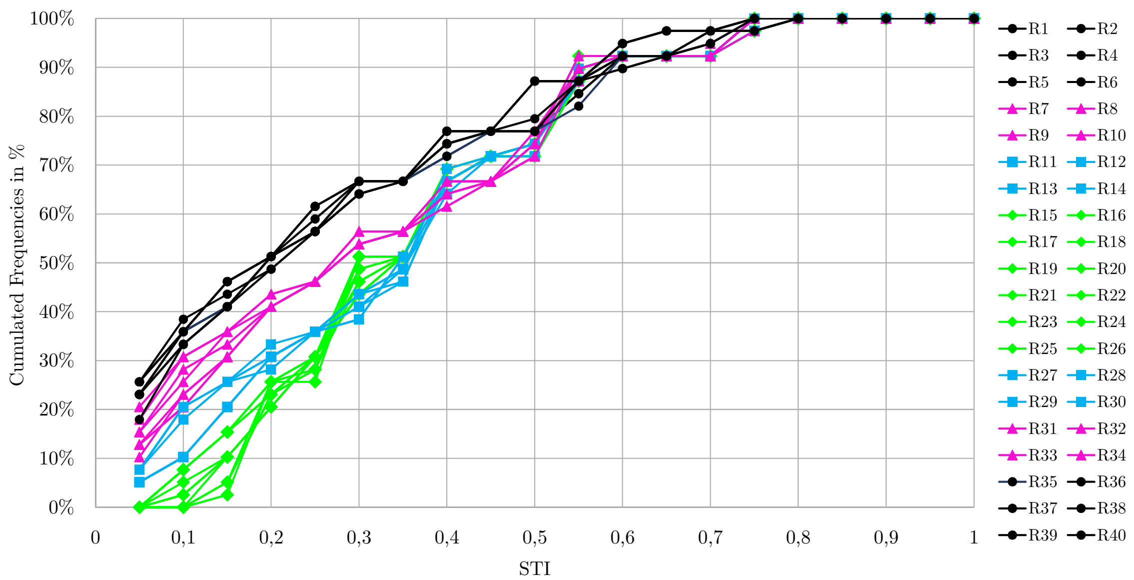
In order to display the distribution of speech intelligibility for each receiver, histograms or cumulated frequencies can be calculated. If histograms are to be created for every possible receiver, this would lead to 40 different plots, which would be difficult to compare properly to each other. Cumulated frequencies have the advantage that the results can be displayed as curves and be compared easily, displaying the same statement as histograms. Therefore, the entire range of STI has to be divided into groups. Their upper limits are shown in Table 5.9. The frequencies are calculated for each receiver, so 39 values can be assigned to the different groups. In total, there will be 40 curves for each office model.

Upper Limits of the STI-Groups									
0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5
0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1

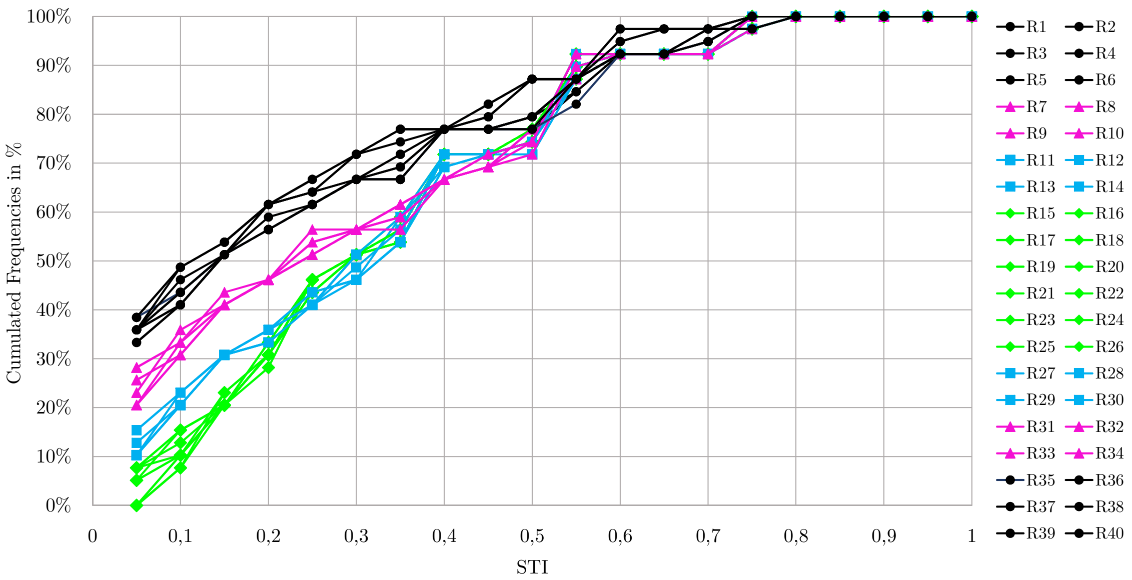
Table 5.9: Upper limits of the STI groups for the calculation of cumulated frequencies.

One-Line-Model:

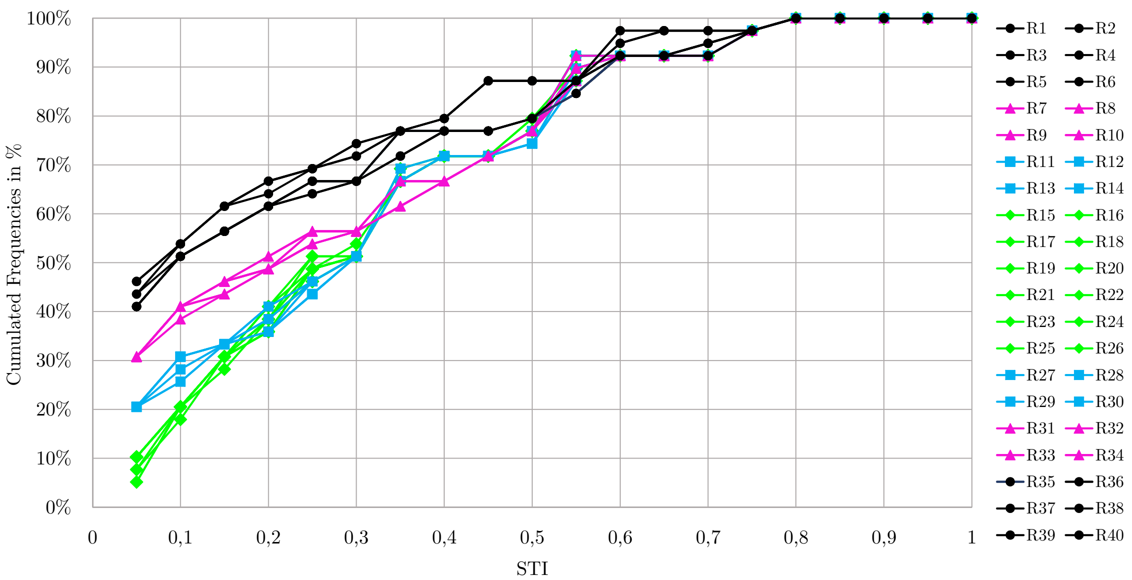
The results for the One-Line-Model are shown in Figure 5.11. The graphs show the STI on the x-Axis and the frequency of STI values in % on the y-Axis. Each curve represents one receiver out of 40. The data points are located at the upper limits but represent the entire STI group. So, for example if a data point is located at $STI = 0.2$, it stands for the group from 0.15 to 0.2. The frequencies are represented in %, so if a data point is located at around 25 %, approximately 10 out of 39 STI values were counted until that certain STI group. The higher a curve starts with the first data point and the steeper it continues, the more low STI values were counted for that specific receiver. The optimum distribution would be this described trend.



(a) 1.40 m partition



(b) 1.60 m partition



(c) 1.80 m partition

Figure 5.11: Cumulated frequencies for the One-Line-Model with three different partition walls.

The graphs show that there are several curves that have similar trends, so the STI value distribution is similar for these receivers. Curves with similar trends are colored in the same color. For the One-Line-Model four groups can be distinguished, which become even more separated with increasing partition wall. The black curves, which start at the highest cumulated percentage and show the highest values for a STI below 0.5, consist of receivers located at the two ends of the room. They represent the receivers with the highest amount of low STI values and can therefore be considered as the most advantageous workplaces. The closer receivers are located in the middle of the room, the lower is their starting point and the lower are the curves until a STI of 0.5. These are the less beneficial workplaces. With increasing partition wall height, the curves of all four groups experience a shift upwards in their starting point, which means that a higher amount of STI values was counted within the first group. Despite this positive development, all four groups meet at a STI value of around 0.5 with a cumulated percentage between 70 to 90 % and continue very similar, independent the partition wall height. This means that the amount of lower STI values might increase, but this seems to be only a small shift, which happens within the values below 0.5 and the total amount of STI values remains at 70 to 90 % up to 0.5. Of course, the curves above 0.5 are not exactly the same, but they do not change much. This could also be seen in the matrix. Not many red areas became orange. This also shows that a simple change in partition wall is not enough in order to tackle speech intelligibility problems of closely located workplaces. In addition, it can also be seen that the STI values do not exceed a value of 0.8. This is where the curves reach a value of 100 %.

Nevertheless, the cumulated frequencies provide another easy tool to judge, which workplaces can be considered as the best or the worst in this specific geometry, with this specific furniture, this specific material properties and dependent of the resulting STI values. This approach does not give an absolute rating for the room but it gives information on where in the office the biggest speech intelligibility problems might occur. By transferring the results to the floor plan it is easier to see which workplaces belong to which group. This can be seen in Figure 5.12. The same procedure is also carried out for the other two office geometries.

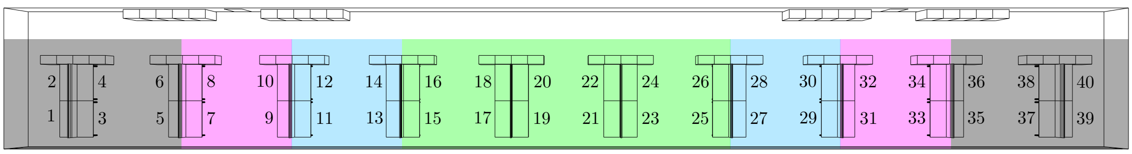
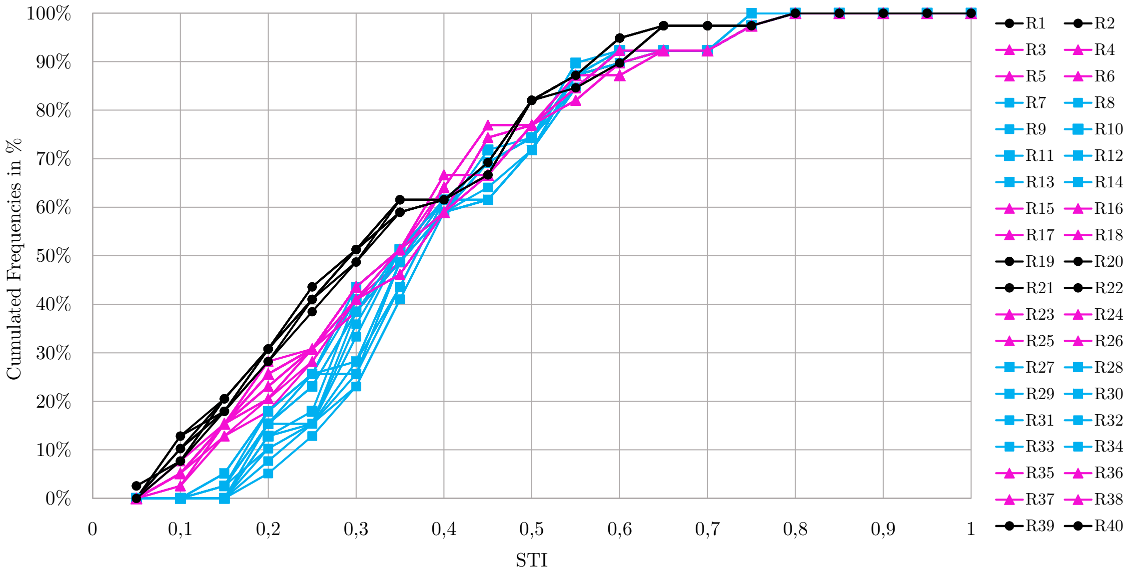


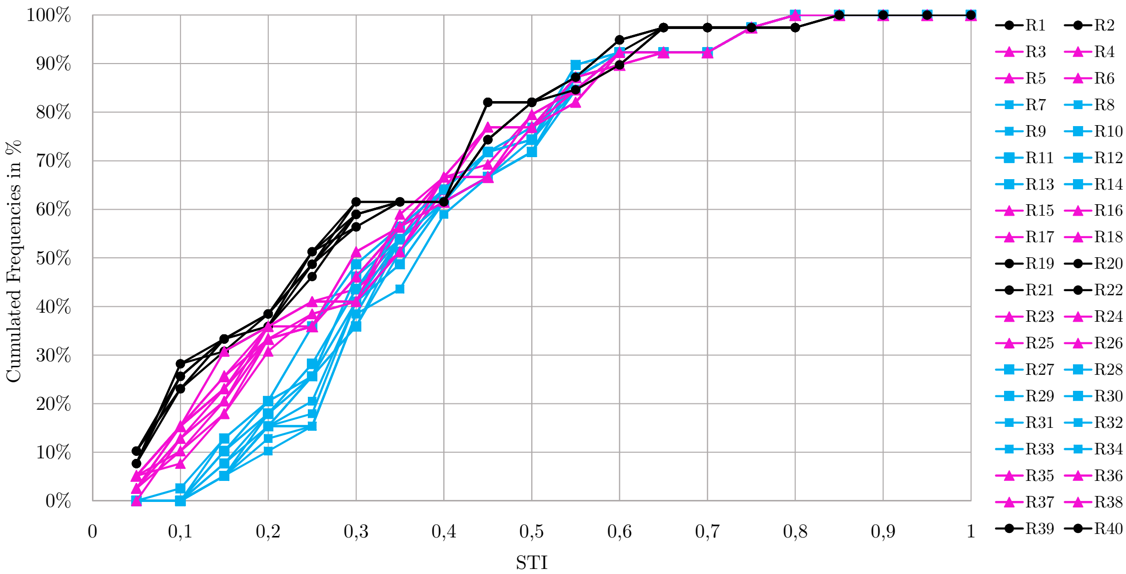
Figure 5.12: Workplace groups of the One-Line-Model.

Two-Line-Model:

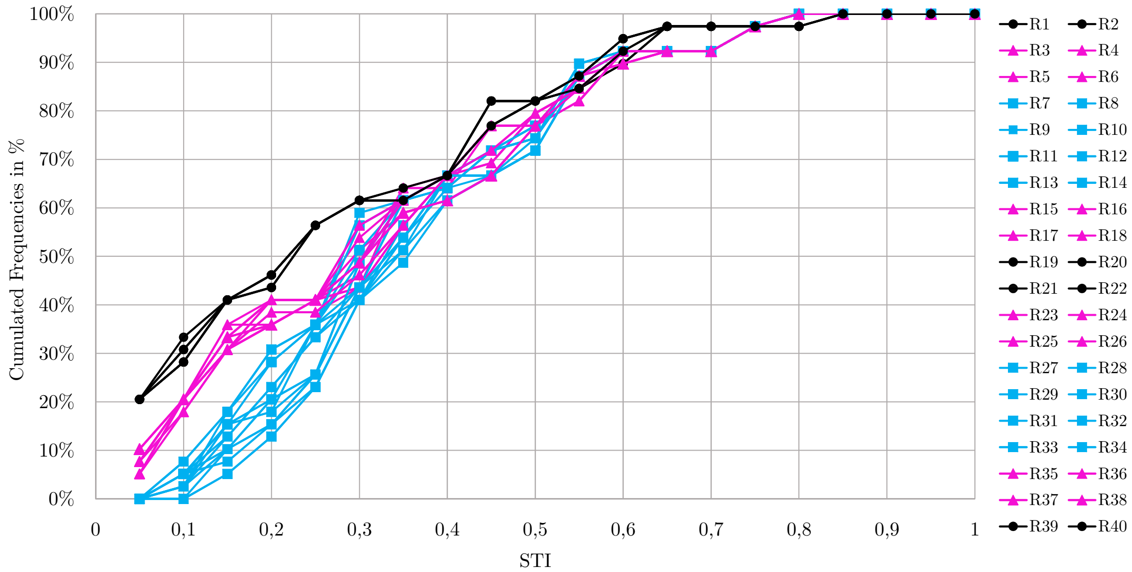
The cumulated frequencies of the Two-Line-Model are displayed in Figure 5.13. For the Two-Line-Model three different groups can be distinguished and the same effect as for the One-Line-Model can be observed. With increasing partition walls, the starting points of the curves shift towards higher percentages. Nevertheless, the maximum starting points (1.80 m partition) look similar to the minimum starting points (1.40 m partition) of the One-Line-Model. This indicates that the Two-Line-Model shows clearly less low STI values than the One-Line-Model, which can also be seen in the matrices. The curves converge at around $STI = 0.4$. From there on all receivers have approximately the same amount of STI values in the following groups. As for the One-Line-Model, the curves reach a cumulated frequency of 70 to 90 % for the STI of 0.5, independent of the partition wall, so both models have approximately the same amount of STI values in the red category. Just like that, the workplaces at the corners of the room show the best and the workplaces in the middle of the room show the least advantageous STI distribution. This is displayed in Figure 5.14. It can also be seen that the highest STI values are maximum 0.85, which is a bit higher than for the One-Line-Model.



(a) 1.40 m partition



(b) 1.60 m partition



(c) 1.80 m partition

Figure 5.13: Cumulated Frequencies for the Two-Line-Model with three different partition walls.

Earlier in this section, where the matrices were described, it was written about the influence of the furniture in the corridor on the *STI* values for the vertical paths. The paths in the middle of the room, where the ceiling-high glass division was in the way, showed the best *STI* values. Here, the workplaces in the middle of the room show the lowest *STI* distribution. These two opposing results confirm how important it is to consider also a holistic approach and not only single paths.

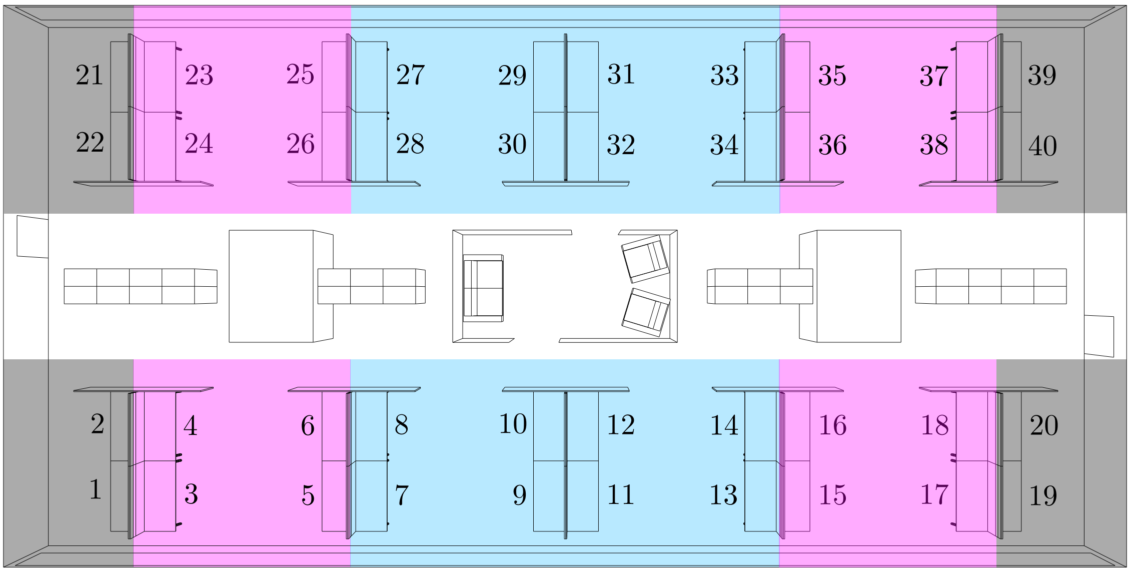
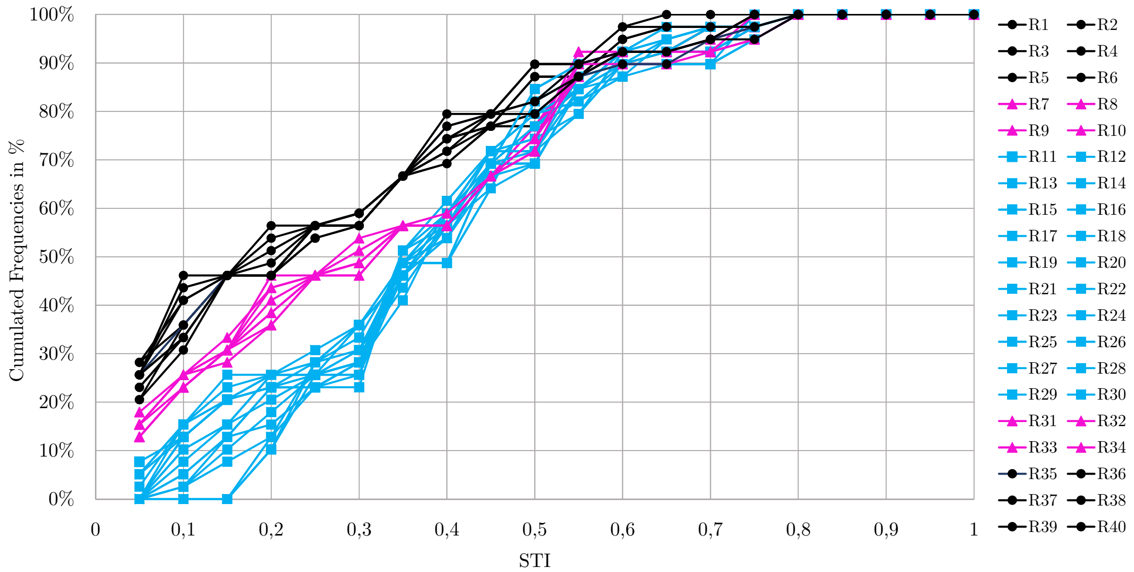


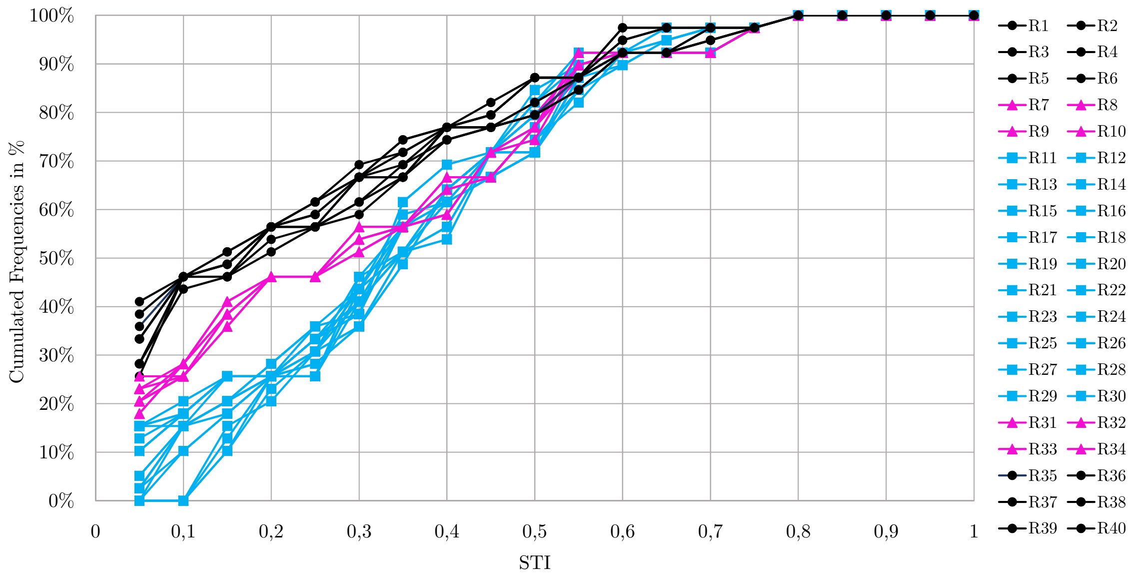
Figure 5.14: Workplace groups of the Two-Line-Model.

U-Shape-Model:

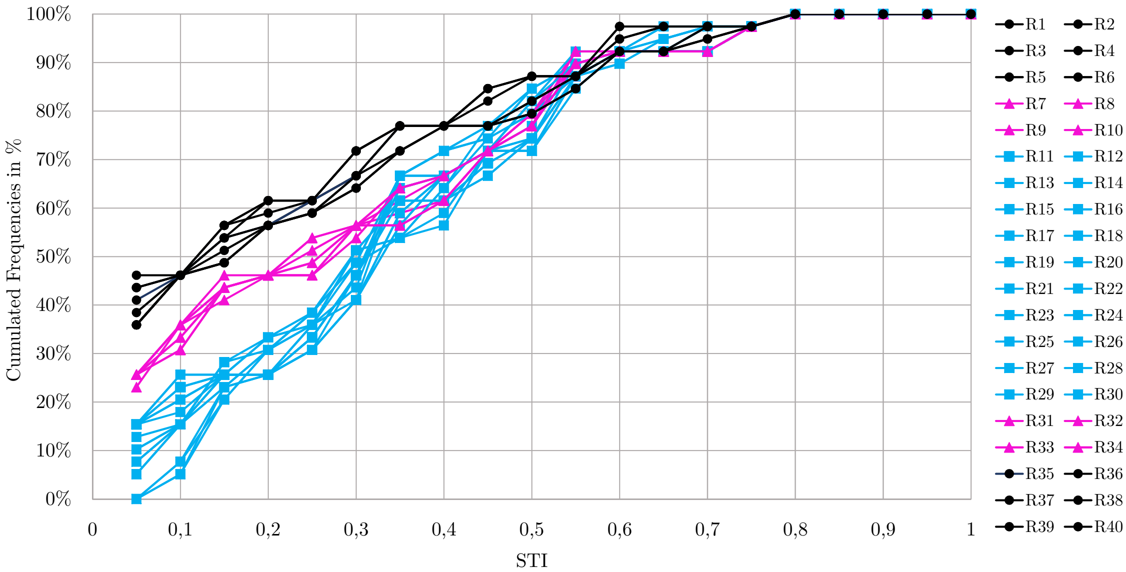
The cumulated frequencies for the U-Shape-Model are shown in Figure 5.15. As the model geometry indicates that the U-Shape-Model is a mix between the One-Line-Model and the Two-Line-Model, the same can be seen in the curves of the cumulated frequencies.



(a) 1.40 m partition



(b) 1.60 m partition



(c) 1.80 m partition

Figure 5.15: Cumulated Frequencies for the U-Shape-Model with three different partition walls.

Three groups crystallize out, as for the Two-Line-Model, but the starting points are similar to the One-Line-Model. Hence, this model has similar many low STI values as the One-Line-Model, which can also be seen in the matrices. As for the both other models, the starting points shift upwards with increasing partition wall. The curves converge at a STI of around 0.5. Above, all receivers have approximately the same amount of STI values in the following groups. As for the One-Line and the Two-Line-Model, the curves reach a cumulated frequency of 70 to 90 % for the STI of 0.5, independent of the partition wall, so all models have approximately the same number of STI values in the red category. This confirms that no matter which of the three examined geometries is chosen, an increase in partition walls is not enough in order to reduce the STI values between closely located workplaces. Here again, the two ends of the room can be assigned as the best workplaces and the workplaces in the middle as the least advantageous. The only difference is that the blue group contains more receivers than the two other models. The colored floor plan of the U-Shape-Model is displayed in Figure 5.16.

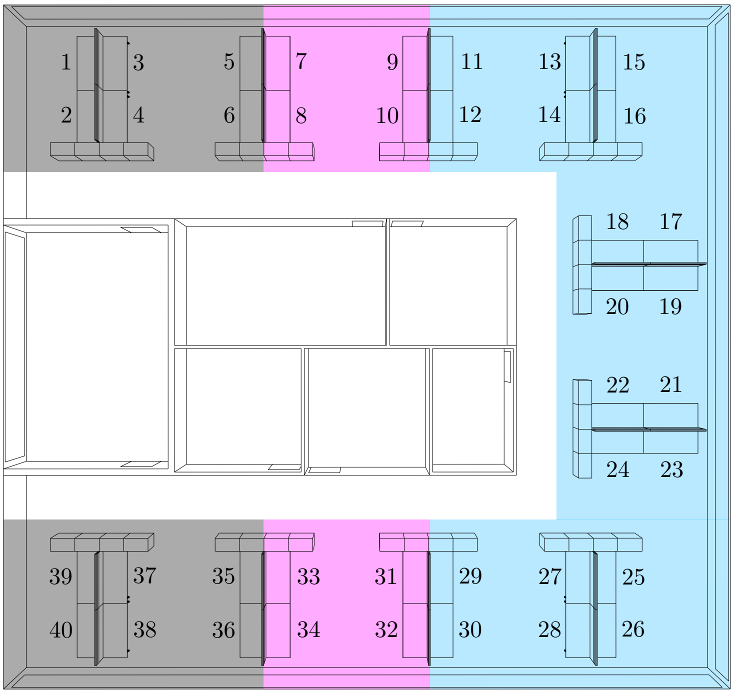


Figure 5.16: Workplace groups of the U-Shape-Model.

Conclusion:

For each examined model, groups of workplaces can be determined, which distinguish in their STI value distribution. It is possible to assign a valuation regarding the distribution, telling, which workplace groups are more favorable or adversely. This assessment is relative considering the specific model. It does not tell if the models are rooms with good acoustical properties as the evaluation method from [12] does, but it gives information about where in the room the biggest problems regarding speech intelligibility might occur. In addition, when comparing different layouts the cumulated frequencies can be used to find out, which layouts are more advantageous.

The examined models are quite large, having a lot of workplaces. If such a method should be used in future, it is important to investigate if it is applicable for small rooms and it should be examined if it works for rooms having a layout with zones.

The results of this method are very descriptive and easy to understand, for which reason the method represents a good measure to be shown to clients.

5.2.3 Assessment of the Open-Plan Office Models

When displaying all STI and $L_{p,A,S}$ results over distance, it was noted that it would not be meaningful to use all data of the matrices for the calculation of the single values according to [12]. The office models contain long distances between some workplaces. This results in low STI and $L_{p,A,S}$ values, which do not have any relevance for the receivers. This generates a data cloud, which is located at the bottom of the graphs (bottom effect) or a data cloud, which has a different slope then the rest of the data. It also happens that values are below the background noise. For the STI values this happens because a range of SNR from -15 to +15 dB is used in the algorithm. The $L_{p,A,S}$ can be smaller that the background noise, since the fixed background noise in Odeon is only used for the calculation of the STI and not for the calculation of sound pressure levels. Using a regression line, these data clouds would influence the single value results, although these values would not have a negative influence on the receivers. In order to determine which part of the data would be meaningful to use, a small study is carried out. The exact procedure of this small study is not treated here, but it turns out that it is most meaningful to reduce the data applying the limitation of [12], which says that the evaluation should be carried out only for microphone positions within the distance between 2 to 16 m from the source. In order to find this out, the residuals and R^2 of four different data sets are examined: all data, all data but excluding data clouds with different slope, all data but excluding everything below the background noise and using all data within 2-16 m distance to the source. R^2 tells how much of the fluctuations of the data can be explained by the model. The residuals can tell if the model chosen is valid. Especially, the residuals showed a not random distribution for all kind of data limitation, apart from the 2-16 m limitation. Figure 5.17 shows the limited STI and $L_{p,A,S}$ data for the One-Line-Model with 1.40 m partition wall over distance.

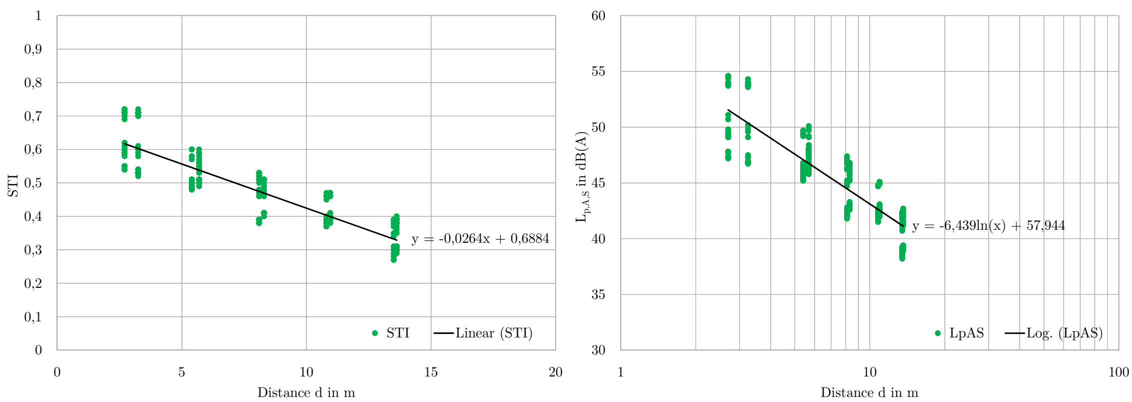


Figure 5.17: Simulated and limited data of STI and $L_{p,A,S}$ with corresponding linear regression lines, for the One-Line-Model with 1.40 m partition.

The data points are evenly distributed over distance, which is due to the symmetric arrangement of the workplaces. The STI and $L_{p,A,S}$ decrease with increasing distance. This has already been discussed in previous sections. Using the regression line, the three single values can be calculated. These graphs are shown as an example. The graphs of the other models are shown in Appendix C.2.2. The resulting single values, for all models, are shown in Table 5.10.

Model & Partition Wall		r_D	$D_{2,S}$	$L_{p,A,S,4m}$
One-Line-Model	140 cm	7.14 m	4.5 dB	49 dB(A)
	160 cm	6.65 m	5.2 dB	48.7 dB(A)
	180 cm	6.34 m	5.7 dB	48.4 dB(A)
Two-Line-Model	140 cm	6.69 m	5.9 dB	48.9 dB(A)
	160 cm	6.45 m	6.5 dB	48.6 dB(A)
	180 cm	6.24 m	6.9 dB	48.4 dB(A)
U-Shape-Model	140 cm	7.39 m	4.5 dB	49.2 dB(A)
	160 cm	6.84 m	5.1 dB	48.8 dB(A)
	180 cm	6.51 m	5.5 dB	48.5 dB(A)

Table 5.10: Calculated single values using all data between 2 to 16 m for all three office models.

This kind of single value calculation shows also that the distraction distances decrease, the spatial decay rates increase and the SPL of speech decrease with increasing partition wall. The changes of partition walls height cause slightly more spread using this calculation method in comparison to the path method. Using the target values of [12] (see Table 5.3), all office models are rated as medium. Only the One-Line-Model with 1.40 m partition and the U-Shape-Model with 1.40 m partition have the $D_{2,S}$ rated as bad. The results are compared to the median single values of the path method shown in Section 5.1.2, Table 5.8. A positive difference means that the values crated by the original path method are higher and a negative difference the opposite. Here, also the exact values are calculated. The meaningfulness about the amount of decimals is not considered.

Model & Partition Wall		r_D	$D_{2,S}$	$L_{p,A,S,4m}$
One-Line-Model	140 cm	+0.995 m	+0.6 dB	+1.4 dB
	160 cm	+1.29 m	+0.25 dB	+1.5 dB
	180 cm	+1.394 m	+0.1 dB	+1.8 dB
Two-Line-Model	140 cm	+1.41 m	-0.4 dB	+1.1 dB
	160 cm	+1.295 m	-0.6 dB	+1.1 dB
	180 cm	+1.29 m	-0.7 dB	+1.15 dB
U-Shape-Model	140 cm	+0.095 m	0 dB	+0.25 dB
	160 cm	+0.365 m	-0.4 dB	+0.55 dB
	180 cm	+0.375 m	-0.4 dB	+0.8 dB

Table 5.11: Differences between median single values of the path method and the single values using the STI-Matrix.

The differences between the two calculation methods are quite small. Especially the level differences are not really noteworthy. The maximum difference is 1.8 dB for the $L_{p,A,S,4m}$. The distraction distance differences are higher but still less then 1.5 m. According to experience, differences smaller than 1.5 m do not make a big difference. In total, it can be said, that the path method (if it is possible to create paths according to [12] and [13]) is actually capable to display the entire rooms in a quite good way. Nevertheless, when looking at the exact values, the path method slightly underrates the office models. However, due to the daylight regulations for office rooms in Germany, it is often not possible to create the required paths because of the room geometry and the workplace arrangements.

The Two-Line-Model shows the best distraction distances, spatial decay rates and SPL values. Although, it has to be said that the differences between the models are very small. The results from the single values do not confirm what can be seen in the matrices and in the workplace grouping. The Two-Line-Model seemed to be the worst geometry due to the highest amount of STI values in the mid range (yellow and orange) and it had the lowest curves for small STI values in the workplace grouping. These unequal impressions could be caused by the distance restriction. The One-Line-Model and the U-Shape-Model have very low STI values for workplaces outside the distance restriction. However, these values are not part of the calculations and hence can not have an positive influence on the single value results. Since it has not been considered as meaningful to include more data for the calculation, the question arises, if this method is a good way to evaluate an office room. In addition, it is not really clear if the 16 m are a good distance restriction. In literature there is no evidence on how the 16 m have been determined. The results of the single values can lead to wrong conclusions. Not only the STI-Matrix and the grouping of the workplaces tell that the Two-Line-Model seems to be the worst geometry, but also experience tells that this kind of room arrangement leads to a subjective discomfort in comparison to the other geometries.

Conclusion:

After applying the evaluation method from ISO 3382-3 for an assessment of the office models, using the data from the Source-Receiver-Matrices, it turns out that the results of the single values are similar to the results of the single values using the original path method. This indicates, that the path method is quite good in order to represent the models tested. Nevertheless, the data has been limited, which has an influence on the results and the results do not match with the information that give the STI-Matrices. So, if this evaluation method should be used in combination with the evaluation of the matrices, further investigations about the data limitation should be carried out. The method is easy and quickly applicable, though it should be thought about whether it has an added value to invest more time in an investigation with more data, since the single value parameters have a limited informative value. In addition, further research could be conducted on finding an assessment method using the data of the STI-Matrix as it is, without calculating new parameters.

5.3 Statistical Evaluation

Both statistical methods described in Section 4.4 (one-way independent ANOVA and one-way repeated measures ANOVA) require specific assumptions the data has to fulfill, whereupon they were tested for:

One-Way Independent ANOVA:
- Normal distribution of the data sets
- The variances need to be similar for each experimental condition
- Independence of the observations
- The dependent variable should have at least an interval scale

The data fulfills all assumptions apart from normality. Knowing this, non-parametric tests are used instead the one-way independent ANOVA.

One-Way Repeated Measures ANOVA:
- Normal distribution of the data sets
- Assumption of sphericity
- The dependent variable should have at least an interval scale

Only the interval scale can be fulfilled for all data, sphericity is given for half of the data but non of the data can fulfill normality. Therefore, non-parametric tests have to be used instead of the one-way repeated measures ANOVA.

All tests carried out are verified using a level of significance of $p = .05$. This means that if the probability of something occurring by chance is lower than 5 %, the result is a statistically significant finding.

Hypothesis 1: The three office geometries show significant differences in speech intelligibility distribution.

In order to compare the three office geometries, three groups are created (1: One-Line-Model, 2: Two-Line-Model and 3: U-Shape-Model). Each group contains all data of the corresponding STI-Matrix. This is done for each partition wall height independently. Since, two variables are examined (STI and room geometry), more than two groups are compared to each other and the assumptions for a parametric test are not fulfilled, the *Kruskal Wallis Test* is used.

1.40 m Partition Wall:

The test shows that there is a significant difference in resulting STI values between the three different geometries ($\chi^2(2) = 66.713$, $p = .000$). The subsequently conducted Post-Hoc-Test (*Dunn-Bonferroni-Test*) shows that only the One-Line-Model compared to the Two-Line-Model ($z = -7.938$, $p = .000$) and the Two-Line-Model compared to the U-Shape-Model ($z = 5.634$, $p = .000$) differ significantly. The effect sizes according to *Cohen* (1992) display small effects for both significant comparisons ($r = .14$ and $r = .1$, respectively).

1.60 m Partition Wall:

The significant differences between the three geometries remain with increasing partition wall ($\chi^2(2) = 86.718$, $p = .000$). But it seems that this increase in partition wall changes the STI values in such a way that also significant differences between the One-Line-Model and the U-Shape-Model appear ($z = -2.883$, $p = .012$). The significant differences between the One-Line-Model compared to the Two-Line-Model ($z = -9.110$, $p = .000$) and the U-Shape-Model compared to the Two-Line-Model ($z = 6.227$, $p = .000$) remain as well. The corresponding effect sizes are still small but increased slightly ($r = .052$, $r = .163$ and $r = .111$, respectively).

1.80 m Partition Wall:

A further increase of the partition wall shows the same effects. There are still significant differences between the three geometries ($\chi^2(2) = 95.067$, $p = .000$) as well as significant differences in the individual comparisons, One-Line-Model compared to U-Shape-Model ($z = -3.479$, $p = .002$), One-Line-Model compared to Two-Line-Model ($z = -9.628$, $p = .000$) and U-Shape-Model compared to Two-Line-Model ($z = 6.148$, $p = .000$). The corresponding effect sizes remain small ($r = .0622$, $r = .172$ and $r = .11$, respectively).

Concluding, it can be said that the statistical evaluations recognize significant differences between the three office geometries, which also could be seen in the previous investigations. The highest effects, independent the partition wall heights, show the comparisons between the One-Line and the Two-Line-Model, which makes sense, since these two geometries differ the most. These differences cause small effect sizes, which indicates that there might be better measures in order to influence the working conditions regarding speech intelligibility. Nevertheless, the statistical methods can tell whether different layouts have an influence on the working conditions regarding speech intelligibility or not. In combination with the information of the matrices it can be decided, which layout should be chosen in order to make sure, that the best possible working conditions are implemented from the very beginning.

Hypothesis 2: The choice of workplace in a room has an influence on the working conditions regarding speech intelligibility.

In order to compare the different workplaces, four groups are created for the One-Line-Model (1: Black, 2: Pink, 3: Blue and 4: Green) and three groups for the Two-Line and U-Shape-Model (1: Black, 2: Pink and 3: Blue). Each group contains the STI data of the corresponding receivers that has been calculated in Section 5.2.2. This is done for each partition wall height and each office geometry independently. Since, two variables are examined (STI and workplace group), more than two groups are compared to each other and the assumptions for a parametric test are not fulfilled, the Kruskal Wallis Test is used again.

One-Line-Model:

The STI values for each partition wall show significant differences between the workplace groups, $\chi^2(3) = 84.856$, $p = .000$ for the 1.40 m partition, $\chi^2(3) = 89.468$, $p = .000$ for the 1.60 m partition and $\chi^2(3) = 90.595$, $p = .000$ for the 1.80 m partition. The Post-Hoc-Test (Dunn-Bonferroni-Test) shows, which workplace groups differ significantly in comparison to each other. For this model the results depending on the different partition wall heights are very similar. For the three partition walls each comparison shows significant differences apart from the comparisons between the pink and blue group and between the blue and green group (the results will not be displayed). Also the corresponding effect sizes are similar between the partition walls. For a better overview the results are presented in Table 5.12.

Partition Wall	Comparison	z	p	r
140 cm	Black - Pink	-3.624	.002	.129
	Black - Blue	-6.37	.000	.228
	Black - Green	-8.728	.000	.285
	Pink - Green	-4.183	.000	.149
160 cm	Black - Pink	-3.87	.001	.138
	Black - Blue	-6.734	.000	.241
	Black - Green	-8.896	.000	.29
	Pink - Green	-4.086	.000	.146
180 cm	Black - Pink	-3.85	.001	.137
	Black - Blue	-6.61	.000	.238
	Black - Green	-9.022	.000	.294
	Pink - Green	-4.220	.000	.151

* Level of significance .05

Table 5.12: Results from Dunn-Bonferroni Post-Hoc Test and effect sizes r for Hypothesis 2 of the One-Line-Model.

When comparing the results with the graphs in Figure 5.11 it is understandable between which groups significant differences in STI can be determined. The green and blue group differ mostly only in starting point but have a quite similar course. It might be possible to unite these two groups. The pink and blue group are not as similar as blue and green but they meet clearly earlier than the black group in comparison to the other three. The corresponding effect sizes are between small and medium. Logically, the effect between the best workplaces (black) and the worst workplaces (green) is the biggest.

Two-Line-Model:

For the Two-Line-Model, the statistical results can also easily be compared with the graphs in Figure 5.13. They state the same as the results from the One-Line-Model.

The room with the three partition walls shows significant differences in STI values for the defined workplace groups, $\chi^2(2) = 25.844$, $p = .000$ for the 1.40 m partition, $\chi^2(2) = 40.399$, $p = .000$ for the 1.60 m partition and $\chi^2(2) = 50.078$, $p = .000$ for the 1.80 m partition. The results of the subsequent Post-Hoc Test and the effect sizes are shown in Table 5.13.

Partition Wall	Comparison	z	p	r
140 cm	Black - Blue	-4.922	.000	.16
	Pink - Blue	-3.169	.005	.089
160 cm	Black - Pink	-2.967	.009	.096
	Black - Blue	-6.168	.000	.201
	Pink - Blue	-3.92	.000	.11
180 cm	Black - Pink	-3.545	.001	.115
	Black - Blue	-6.928	.000	.226
	Pink - Blue	-4.144	.000	.117

* Level of significance .05

Table 5.13: Results from Dunn-Bonferroni Post-Hoc Test and effect sizes r for Hypothesis 2 of the Two-Line-Model.

For the lowest partition wall there seem to be no significant differences between the black and the pink group, which is understandable since the curves in the graphs show a similar course. For all other comparisons there can be seen significant differences regarding the workplaces. The effect sizes are similar to the One-Line-Model between small and medium.

U-Shape-Model:

Also the U-Shape-Model shows significant differences between the defined workplace groups, $\chi^2(2) = 110.377$, $p = .000$ for the 1.40 m partition, $\chi^2(2) = 98.191$, $p = .000$ for the 1.60 m partition and $\chi^2(2) = 99.561$, $p = .000$ for the 1.80 m partition. All single comparisons also show significant differences, which can be seen in Table 5.14. The corresponding effect sizes are again between small and medium.

Partition Wall	Comparison	z	p	r
140 cm	Black - Pink	-4.154	.000	.148
	Black - Blue	-10.434	.000	.295
	Pink - Blue	-4.575	.000	.138
160 cm	Black - Pink	-3.982	.000	.142
	Black - Blue	-9.849	.000	.278
	Pink - Blue	-4.253	.000	.128
180 cm	Black - Pink	-4.003	.000	.143
	Black - Blue	-9.917	.000	.28
	Pink - Blue	-4.289	.000	.129

* Level of significance .05

Table 5.14: Results from Dunn-Bonferroni Post-Hoc Test and effect sizes r for Hypothesis 2 of the U-Shape-Model.

Concluding, it can be said that significant differences in speech intelligibility can be recognized for almost all direct comparisons between the different workplace groups, independent of office geometry and partition wall height. Nevertheless, only the differences between the corresponding best and worst workplaces show an effect size, which can be considered as important. This still confirms that there can be advantageous and unfavorable workplaces in office rooms. Therefore, it is important to include a method like the grouping of the workplaces as shown in Section 5.2.2, in order to make sure that no employee is disadvantaged and the acoustical conditions can be improved. In addition, the effect sizes are higher than in Hypothesis 1, which indicates that a focus on workplace selection can make a bigger difference than the layout selection.

Hypothesis 3: The working conditions regarding speech intelligibility change when using specific sound attenuating measures like absorbing partition walls.

The three partition wall heights are compared for each office geometry, in order to find out if the changes in STI they cause are significant. Therefore, three groups of data are created for each model (1: 1.40 m, 2: 1.60 m and 3: 1.80 m). Each group contains all data of the corresponding STI-Matrix. Since, two variables are examined (STI and partition wall height), more than two groups for the same model are compared to each other and the assumptions for a parametric test are not fulfilled, the *Friedman Test* is carried out.

One-Line-Model:

This model shows significant differences between the three partition walls ($\chi^2(2) = 1955.956$, $p = .000$, $n = 1560$). Which comparisons differ significantly shows the Post-Hoc Test (Dunn-Bonferroni-Test). All partition walls differ significantly between each other: $z = 17,643$, $p = .000$ for the comparison between 1.80 m and 1.60 m, $z = 40.819$, $p = .000$ between 1.80 m and 1.40 m and $z = 23.175$, $p = .000$

between 1.60 m and 1.40 m. The corresponding effect sizes are $r = 0.446$, $r = 1.033$ and $r = 0.586$, respectively. The effect sizes show that the changes in partition wall height actually have a medium to strong effect and therefore have to be considered as substantial. Logically, the change from lowest to highest has the strongest effect. The first increase, from 1.40 m to 1.60 m has a slightly stronger effect than the second increase. This confirms that even small changes of partition walls are important in order to improve acoustical conditions in offices.

Two-Line-Model:

Here, also significant differences between the three partition walls can be seen ($\chi^2(2) = 1534.339$, $p = .000$, $n = 1560$). The Post-Hoc Test reveals that again all comparisons between each partition height show significant differences. For the comparison between 1.80 m and 1.60 m the result is $z = 17.411$, $p = .000$, for 1.80 m and 1.40 m it is $z = 34.902$, $p = .000$ and for 1.60 m and 1.40 m the result is $z = 17.491$, $p = .000$. The corresponding effect sizes are $r = .44$, $r = .883$ and $r = .44$, respectively. They are a bit smaller than the effect sizes for the One-Line-Model but still medium to strong. Interesting is that in this model, the effect sizes increase linearly. An increase of 40 cm has double the effect than an increase of 20 cm (independent of the first or the second increase).

U-Shape-Model:

The significance between the three partition walls does not change for the U-Shape-Model ($\chi^2(2) = 1680.079$, $p = .000$, $n = 1560$). Also the Post-Hoc Test reveals similar results as for the other two models, $z = 18.35$, $p = .000$ for the comparison between 1.80 m and 1.60 m, $z = 37.372$, $p = .000$ for the comparison between 1.80 m and 1.40 m and $z = 19.022$, $p = .000$ for 1.60 m and 1.40 m. The corresponding effect sizes are $r = 0.464$, $r = 0.946$ and $r = 0.48$, respectively. As for the other two models they are between medium and strong. For this model, the effect sizes are not as linear as for the Two-Line-Model, but they are close to it.

In general it can be said that small increases of partition walls of 20 cm have a medium effect and increases of up to 40 cm have a strong effect in speech intelligibility. This is valid for all examined office geometries. Especially if there are no other options than a change in partition wall height, in order to improve the acoustical conditions in a room, it is good to know that an increase could have positive effects. Nevertheless, the three rooms have rather poor acoustics (according to the measurement path method from [12]). The effect might be different for rooms with already good acoustical conditions. The effect sizes are much higher than in Hypothesis 1, which also indicates that in these models, a change in partition wall influences the working conditions more than changing the room geometry. This statistical comparison is carried out using all data of the matrices, showing the overall effect. Of course, such a comparison could also be carried out for a small part of the rooms in order to find out, if sound attenuating measures have a local effect. In addition, this kind of evaluation can be carried out for any kind of component. In this case, partition walls with different height were chosen.

Hypothesis 4: Two-Line-Model - Speech intelligibility worsens when the corridor between the two lines of desks is furnished

Two versions of the Two-Line-Model are compared. Therefore two groups are created (1: furnished corridor and 2: unfurnished corridor). Each group contains all data of the corresponding STI-Matrix (an additional simulation for exactly the same Two-Line-Model, but with unfurnished corridor has been carried out). This is done for the three partition wall heights independently. Since, two variables are examined (STI and furniture), only two groups for one model are compared to each other and the assumptions for a parametric test are not fulfilled, the *Wilcoxon Test* is used. The results are shown in Table 5.15

Partition Wall	Median	z	p	r
140 cm	Unfurnished: .42 Furnished: .35	-16.809	.000	.425
160 cm	Unfurnished: .41 Furnished: .33	-18.706	.000	.473
180 cm	Unfurnished: .4 Furnished: .3	-20.027	.000	.507

* Level of significance .05

Table 5.15: Results from Dunn-Bonferroni Post-Hoc Test and effect sizes r for Hypothesis 4.

As an first overview, comparing the medians of the furnished and unfurnished corridors, it can already be seen that the STI values are different for the two versions. The results of the Wilcoxon Tests confirm that there are significant differences between the two model versions, independent of the partition wall height. The effect sizes according to Cohen (1992) tell that there is a medium to strong effect, due to the furniture and that the differences have to be considered as substantial. It can be said that, if a Two-Line-Model is chosen for an open-plan office, it is very important to consider to furnish the corridor between the two lines because it could contribute to a better acoustical environment.

6
Conclusion and Outlook

This master thesis is about the investigation on a new simulation method for the evaluation of open-plan offices. Therefore, as a first step, the currently valid measurement standard ISO 3382-3 and regulation E VDI 2569 were applied on three different office models, in order to show the difficulties of application in real measurement situations. Already the measurement path selection was complicated due to the standards' limitations, although the office models contain a lot of potential measurement positions. For smaller office layouts this could lead to the problem that no measurement paths, according to the standards, can be found. The required amount of paths was not possible to achieve for any of the examined models. The results showed that the rooms can be declared as offices with medium to bad acoustical properties. Here, especially the single value results from the U-Shape-Model showed different values between the different paths. Unfortunately, the standards do not explain how to handle differing results. When comparing the results between the three models, it showed that the U-Shape-Model leads to the best results for r_D and $L_{p,A,S,4m}$, but the Two-Line-Model for $D_{2,S}$ (considering the calculated median values). When looking at the results in total, the Two-Line-Model had most of its values categorized as medium, regardless which single value or partition wall height. This would make it to the best model. However, experience tells the opposite. Two-Line-Models are usually experienced as office layouts where employees complain most and feel most disturbed by speech sounds in comparison to layouts with one desk line.

The same office models were assessed with a new simulation method, the STI-Matrix. The generated matrices display the speech intelligibility for each possible source and receiver relation in an office. A color scheme for the rating of the calculated STI values enabled a direct evaluation of the considered office room. When comparing the matrices of the three models, it was possible to see that the One-Line and the U-Shape-Model are better layouts than the Two-Line-Model, solely by comparing the color distribution. The matrices represent a more detailed and valid method in order to represent entire offices, compared to the state of the art. Of course, simulations always entail uncertainties, due to the calculation algorithms, but the matrices embody a good reference point for the evaluation of open-plan offices. It is a tool, which can be used for the planning phase of offices as well as an evaluation method for already existing offices. Due to the detailed information, the matrix would rather be a tool for the acoustic planner than to show to clients.

The data from the matrices has further been used to find out if the selection of workplace makes a difference in expected working conditions, using the STI value distribution of each single receiver. By comparing these cumulated frequencies, different groups of workplaces with a similar STI value distribution crystallized out. These groups were categorized as more advantageous or adversely workplaces. When transferring this to a floor plan it is very easy to understand the information. This assessment is relative considering the specific model. It does not tell if the models are rooms with good acoustical properties as the evaluation method from [12] does, but it gives information about where in the room the biggest problems regarding speech intelligibility might occur and if employees could be disadvantaged. However, the trend of the curves give rough information about if a room is rather good or bad. In addition, when comparing different layouts, the cumulated frequencies can also be used in an even more precise way than the color distribution of the matrices, to find out, which is more advantageous. The results of this method are very descriptive and easy to understand, for which reason the method represents a good measure to be shown to clients.

Further, statistics have been used as an additional evaluation method. The matrices provide a lot of data, which are able to show differences between different models, differences in STI values when including different furniture components into a room or differences between single workplace groups. Nevertheless, it is not possible to say, if these differences are significant. Using statistics, it can be found out how big differences are and which changes in layout, furniture or component properties are most efficient. This information helps to relate acoustical advantages to economy. The investigated hypotheses showed that both, the geometry of the office models (Hypothesis 1), the selection of workplaces (Hypothesis 2) as well as the partition wall height in all three models (Hypothesis 3) and the furniture in the corridor of the Two-Line-Model (Hypothesis 4) have a significant influence on the expected working conditions. In particular, the comparisons of furniture (Hypotheses 3 and 4) showed the strongest effect sizes, which indicates that the furniture has the strongest influence on the acoustical conditions and that a right selection of furniture is substantial.

Nevertheless, if the STI-Matrix, should be established as an officially valid evaluation method, further investigations and validations have to be carried out. Maybe it is possible to change the arrangement of the values of the matrix in such a way that more information can be read from it, for example the corresponding distances between each source and receiver. It could be investigated on the amount of sources and receivers. Is it really necessary to simulate each source and receiver relation or is it possible to combine some workplaces? And if yes, under which circumstances is that possible? Less data would make it easier and the simulations would need less computation. Further, this method has been created testing it with only three different models. In future much more office models and sizes should be included to the investigation, in order to find out where possible technical limits might occur. The accuracy of the resulting conclusions, using this method, should be verified with real objects. A pilot office area could be measured, simulated and the corresponding employees be questioned using a survey. In order to be able to rate a room as in [12] and since its single value parameters have a limited informative value it would be good to conduct further research to find an assessment method using the data of the STI-Matrix as it is, without calculating new parameters. In addition, it could be investigated, if it is possible to create such a matrix using the results from the original path method from [12] and [13]. This would enable that already measured offices could be evaluated in more detail.

All in all, the presented new methods display detailed and valuable information for the evaluation of open-plan offices, which is an important field of investigation now a days. Progress in this area of acoustics can improve the working live of a lot of employees.

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A

Description of the Examined Open-Plan Office Models

A.1 ASR A1.2 Guideline for Room Dimensions and Movement Areas in Offices

The guide line describes an total area of 12 to 15 m^2 as target values for the area per working space. This area includes space for furniture, movement area and traffic space.

Movement Area per Working Place

The minimum size of the movement area at one working space has to be 1.5 m^2 for sitting or standing activities. There, the with and the depth of the movement area has to be at least 1 m. If several working places are located directly next to each other the with of the movement area has to be at least 1.20 m. The movement areas are not supposed to overlap with the movement areas of other working places, areas for traffic ways (including escape paths, corridors to other workplaces and ways to occasionally used operating equipment), floor space for work equipment, areas, which are required for the function of work equipment and areas for safety distances. In return, the movement area of one workplace can overlap with utility space for self used work equipment, areas, which are required for the function of self used work equipment and areas for safety distances of self used equipment at the workplace.

Traffic Spaces

Dimensions of heights and widths of traffic spaces, including corridors to workplaces and ways to occasionally used work equipment are treated in [23]. Dimensions of heights and widths of escape paths are treated in [24].

Floor Space for Work Equipment

Floor spaces have to considered according to the outermost dimensions of work equipment, installations and furnishing.

Required Area for Functionality of Work Equipment

For the determination of the necessary area for the function of work equipment, all operating conditions and space for possibly upcoming maintenance have to be taken into account.

A.2 ASR A1.8 Guideline for Traffic Spaces

The minimum width of traffic spaces for pedestrians are set in Table 2 of the guideline. The values arise from the minimum width of escape paths according to [24] and depend of the number of persons in the considered catchment area (in this case the office room). The width of corridors to personally assigned workplaces are also set in Table 2 of the guideline. The relevant values are summarized in Table A.1.

Traffic Space	Width
Traffic space according to escape paths and depending on the number of persons	
up to 5 persons	0.875 m
up to 20 persons	1.00 m
up to 200 persons	1.20 m
up to 300 persons	1.80 m
up to 400 persons	2.40 m
Corridors to personally assigned workplaces	0.60 m

Table A.1: Minimum width for traffic spaces for pedestrians in working spaces.

The height of traffic spaces has to be at least 2.0 m. For new built working spaces the traffic spaces have to have a height of minimum 2.10 m.

A.3 ASR A2.3 Guideline for Escape Paths

The length of an escape path has to be as short as possible. For rooms with normal fire hazard the length of the escape path can be maximum 35 m. The minimum width of escape paths has been described in Section A.2.

A.4 Material Properties and Furniture Dimensions

Component	Material Description
Wall	Plaster with wallpaper on backing paper
Ceiling	Perforated wood fiber plate, 50 mm mineral wool mat with 135 mm cavity behind
Floor	10 mm soft carpet on concrete
Glass	Double glazing, 2-3 mm glass, > 30 mm gap
Cupboard	Plywood paneling, 1 cm thick
Desk	Plywood paneling, 1 cm thick
Chair	Empty chair, upholstered with cloth cover
Partition Walls	50 mm wood wool set in mortar
Sofa[1]	Medium upholstered concert hall chair

Table A.2: Material description of examined open-plan office models.

Component	Frequency in Hz							
	63	125	250	500	1000	2000	4000	8000
Wall	0.02	0.02	0.03	0.04	0.05	0.07	0.08	0.08
Ceiling	0.7	0.7	0.863	0.77	0.54	0.21	0.2	0.2
Floor	0.09	0.09	0.08	0.21	0.26	0.27	0.37	0.37
Glass	0.15	0.15	0.05	0.03	0.03	0.02	0.02	0.02
Cupboard	0.28	0.28	0.22	0.17	0.09	0.1	0.11	0.11
Desk	0.28	0.28	0.22	0.17	0.09	0.1	0.11	0.11
Chair	0.44	0.44	0.6	0.77	0.89	0.82	0.7	0.7
Partition Walls	0.08	0.08	0.17	0.35	0.45	0.65	0.65	0.65
Sofa[1]	0.56	0.56	0.64	0.7	0.72	0.68	0.62	0.62

Table A.3: Material absorption coefficients of examined open-plan office models.

Furniture	Length	Width	Height
Desk	1.80 m	0.80 m	0.72 m
Chair	0.44 m	0.4 m	0.81 m
Cupboard (small)	0.80 m	0.43 m	1.20 m
Cupboard (big)	0.80 m	0.43 m	2.10 m
Partition Wall (between desks)	1.80 m	0.03 m	1.40/1.60/1.80 m
Telephone Booth[1]	2.70 m	2.00 m	2.70 m
Sofa[1]	1.00/1.70 m	0.98 m	0.90 m
Additional Partition Wall[1]	3.20 m	0.03 m	1.20 m

Table A.4: Furniture dimensions of examined open-plan office models.

[1]Only in Two-Line-Model

B

Simulation Methods

B.1 Microphone and Source Settings

WP No.	X	Y	Z	WP No.	X	Y	Z
1	1,35 m	1,4 m	1,2 m	21	28,35 m	1,4 m	1,2 m
2	1,35 m	3,2 m	1,2 m	22	28,35 m	3,2 m	1,2 m
3	4,05 m	1,4 m	1,2 m	23	31,05 m	1,4 m	1,2 m
4	4,05 m	3,2 m	1,2 m	24	31,05 m	3,2 m	1,2 m
5	6,75 m	1,4 m	1,2 m	25	33,75 m	1,4 m	1,2 m
6	6,75 m	3,2 m	1,2 m	26	33,75 m	3,2 m	1,2 m
7	9,45 m	1,4 m	1,2 m	27	36,45 m	1,4 m	1,2 m
8	9,45 m	3,2 m	1,2 m	28	36,45 m	3,2 m	1,2 m
9	12,15 m	1,4 m	1,2 m	29	39,15 m	1,4 m	1,2 m
10	12,15 m	3,2 m	1,2 m	30	39,15 m	3,2 m	1,2 m
11	14,85 m	1,4 m	1,2 m	31	41,85 m	1,4 m	1,2 m
12	14,85 m	3,2 m	1,2 m	32	41,85 m	3,2 m	1,2 m
13	17,55 m	1,4 m	1,2 m	33	44,55 m	1,4 m	1,2 m
14	17,55 m	3,2 m	1,2 m	34	44,55 m	3,2 m	1,2 m
15	20,25 m	1,4 m	1,2 m	35	47,25 m	1,4 m	1,2 m
16	20,25 m	3,2 m	1,2 m	36	47,25 m	3,2 m	1,2 m
17	22,95 m	1,4 m	1,2 m	37	49,95 m	1,4 m	1,2 m
18	22,95 m	3,2 m	1,2 m	38	49,95 m	3,2 m	1,2 m
19	25,65 m	1,4 m	1,2 m	39	52,65 m	1,4 m	1,2 m
20	25,65 m	3,2 m	1,2 m	40	52,65 m	3,2 m	1,2 m

Table B.1: Microphone and source positions for the One-Line-Model.

WP No.	X	Y	Z	WP No.	X	Y	Z
1	1,35 m	1,4 m	1,2 m	21	1,35 m	12,1 m	1,2 m
2	1,35 m	3,2 m	1,2 m	22	1,35 m	10,3 m	1,2 m
3	4,05 m	1,4 m	1,2 m	23	4,05 m	12,1 m	1,2 m
4	4,05 m	3,2 m	1,2 m	24	4,05 m	10,3 m	1,2 m
5	6,75 m	1,4 m	1,2 m	25	6,75 m	12,1 m	1,2 m
6	6,75 m	3,2 m	1,2 m	26	6,75 m	10,3 m	1,2 m
7	9,45 m	1,4 m	1,2 m	27	9,45 m	12,1 m	1,2 m
8	9,45 m	3,2 m	1,2 m	28	9,45 m	10,3 m	1,2 m
9	12,15 m	1,4 m	1,2 m	29	12,15 m	12,1 m	1,2 m
10	12,15 m	3,2 m	1,2 m	30	12,15 m	10,3 m	1,2 m
11	14,85 m	1,4 m	1,2 m	31	14,85 m	12,1 m	1,2 m
12	14,85 m	3,2 m	1,2 m	32	14,85 m	10,3 m	1,2 m
13	17,55 m	1,4 m	1,2 m	33	17,55 m	12,1 m	1,2 m
14	17,55 m	3,2 m	1,2 m	34	17,55 m	10,3 m	1,2 m
15	20,25 m	1,4 m	1,2 m	35	20,25 m	12,1 m	1,2 m
16	20,25 m	3,2 m	1,2 m	36	20,25 m	10,3 m	1,2 m
17	22,95 m	1,4 m	1,2 m	37	22,95 m	12,1 m	1,2 m
18	22,95 m	3,2 m	1,2 m	38	22,95 m	10,3 m	1,2 m
19	25,65 m	1,4 m	1,2 m	39	25,65 m	12,1 m	1,2 m
20	25,65 m	3,2 m	1,2 m	40	25,65 m	10,3 m	1,2 m

Table B.2: Microphone and source positions for the Two-Line-Model.

WP No.	X	Y	Z	WP No.	X	Y	Z
1	1,4 m	1,35 m	1,2 m	21	12,15 m	21,55 m	1,2 m
2	3,2 m	1,35 m	1,2 m	22	12,15 m	19,75 m	1,2 m
3	1,4 m	4,05 m	1,2 m	23	14,85 m	21,55 m	1,2 m
4	3,2 m	4,05 m	1,2 m	24	14,85 m	19,75 m	1,2 m
5	1,4 m	6,75 m	1,2 m	25	18,4 m	20,25 m	1,2 m
6	3,2 m	6,75 m	1,2 m	26	20,2 m	20,25 m	1,2 m
7	1,4 m	9,45 m	1,2 m	27	18,4 m	17,55 m	1,2 m
8	3,2 m	9,45 m	1,2 m	28	20,2 m	17,55 m	1,2 m
9	1,4 m	12,15 m	1,2 m	29	18,4 m	14,85 m	1,2 m
10	3,2 m	12,15 m	1,2 m	30	20,2 m	14,85 m	1,2 m
11	1,4 m	14,85 m	1,2 m	31	18,4 m	12,15 m	1,2 m
12	3,2 m	14,85 m	1,2 m	32	20,2 m	12,15 m	1,2 m
13	1,4 m	17,55 m	1,2 m	33	18,4 m	9,45 m	1,2 m
14	3,2 m	17,55 m	1,2 m	34	20,2 m	9,45 m	1,2 m
15	1,4 m	20,25 m	1,2 m	35	18,4 m	6,75 m	1,2 m
16	3,2 m	20,25 m	1,2 m	36	20,2 m	6,75 m	1,2 m
17	6,75 m	21,55 m	1,2 m	37	18,4 m	4,05 m	1,2 m
18	6,75 m	19,75 m	1,2 m	38	20,2 m	4,05 m	1,2 m
19	9,45 m	21,55 m	1,2 m	39	18,4 m	1,35 m	1,2 m
20	9,45 m	19,75 m	1,2 m	40	20,2 m	1,35 m	1,2 m

Table B.3: Microphone and source positions for the U-Shape-Model.

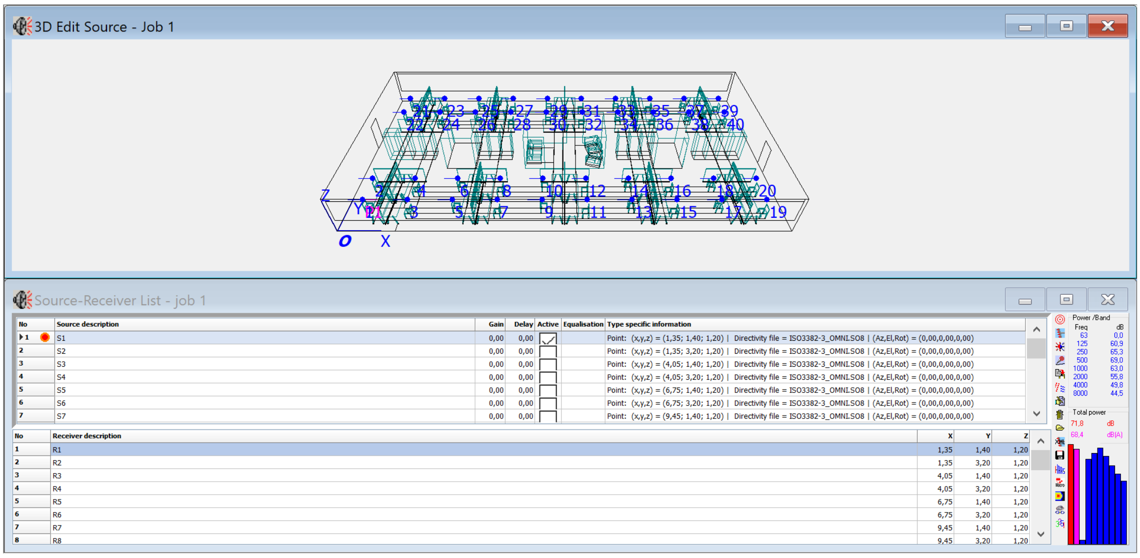


Figure B.1: Sceenshot of the Odeon layout for setting microphone and source positions.

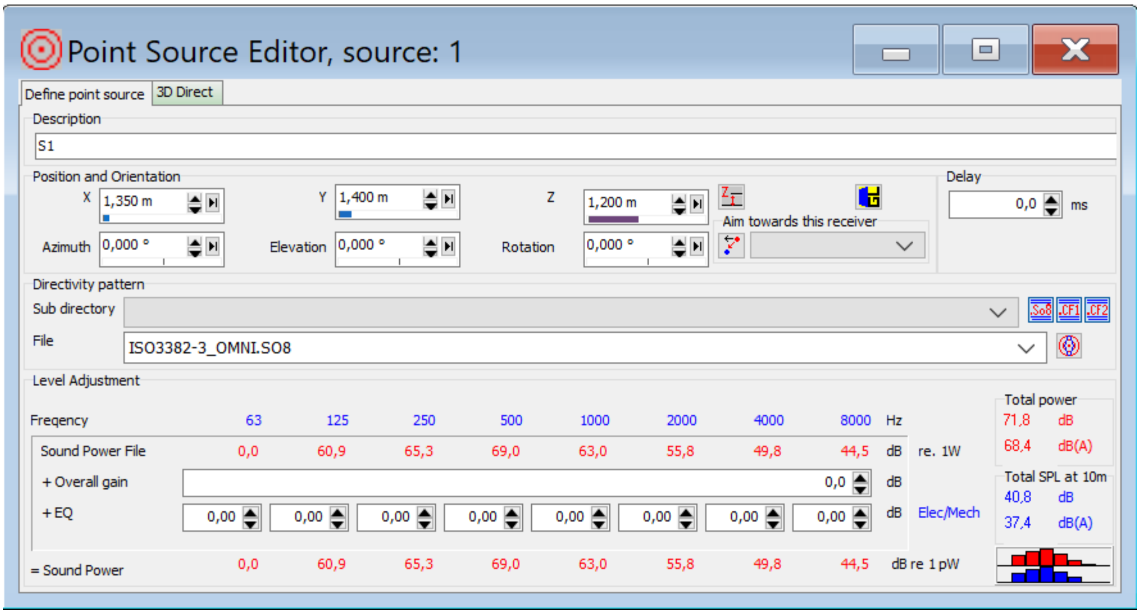


Figure B.2: Screenshot of the source editor in Odeon.

B.2 Material Settings

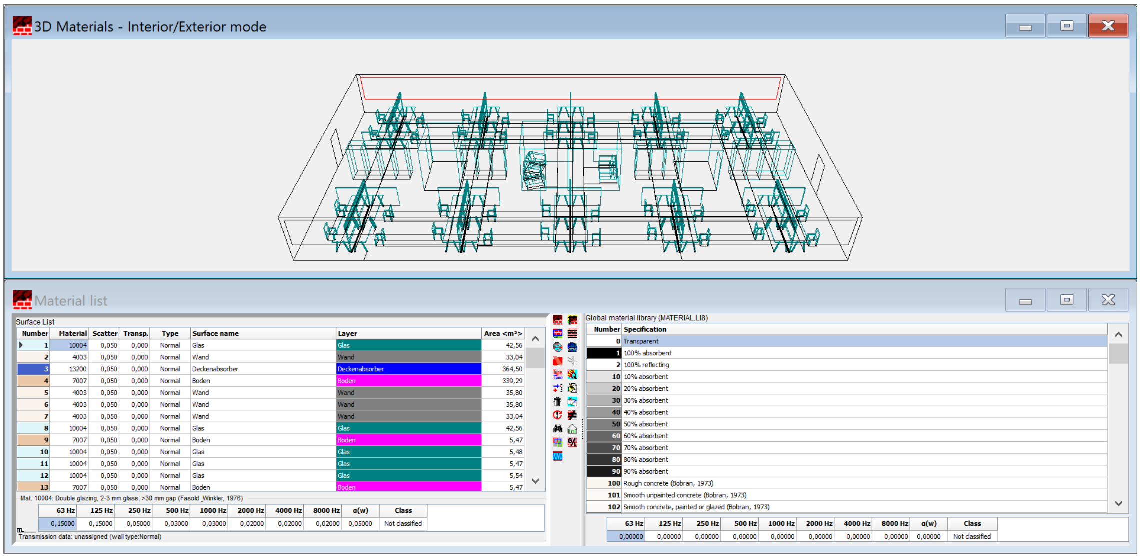
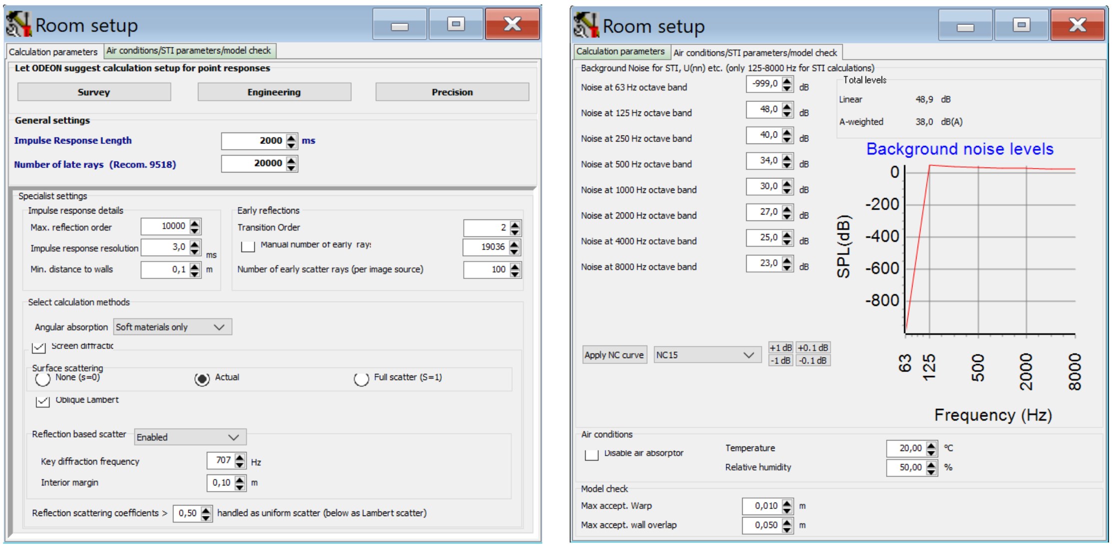


Figure B.3: Screenshot of the Odeon Layout for assigning materials to room components.

B.3 Room Setup



(a) Calculation Parameters

(b) Background Noise

Figure B.4: Screenshots of the Odeon Layout for assigning the calculation parameters and the background noise.

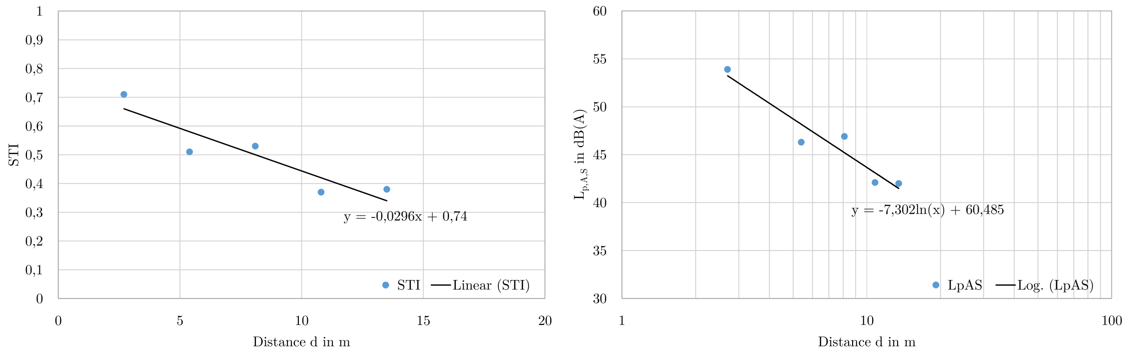
C

Results

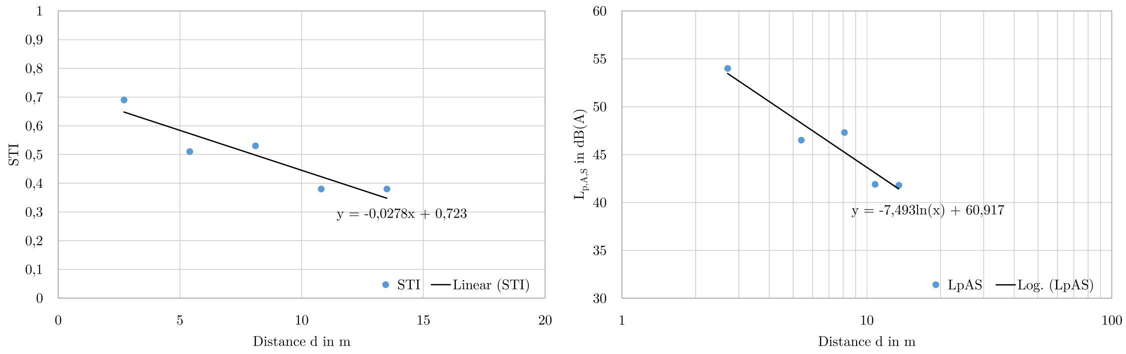
C.1 Existing Evaluation Method from ISO 3382-3 and E VDI 2569

C.1.1 Results Measurement Path Method

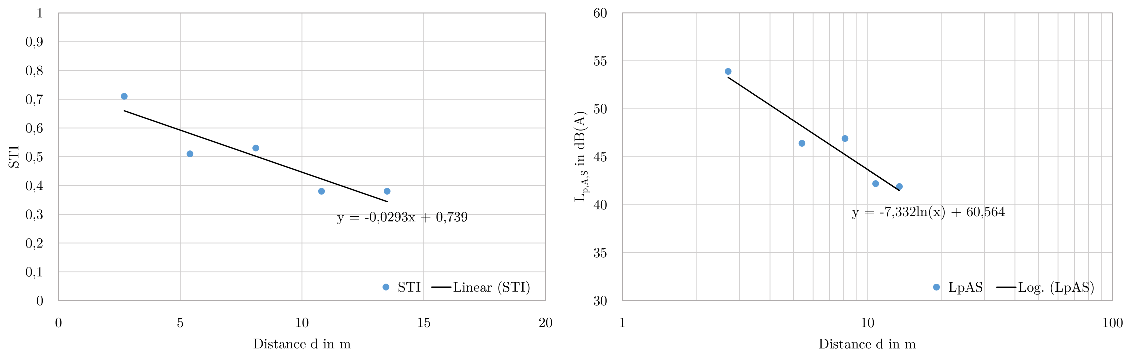
One-Line-Model:



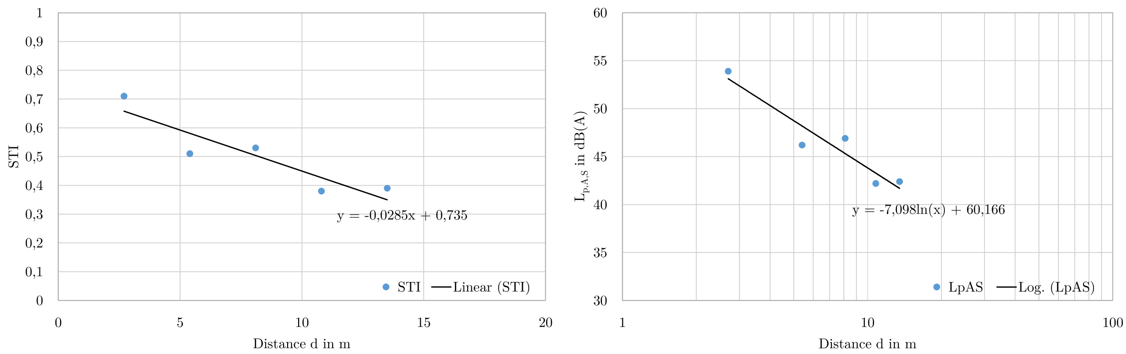
(a) Path 2



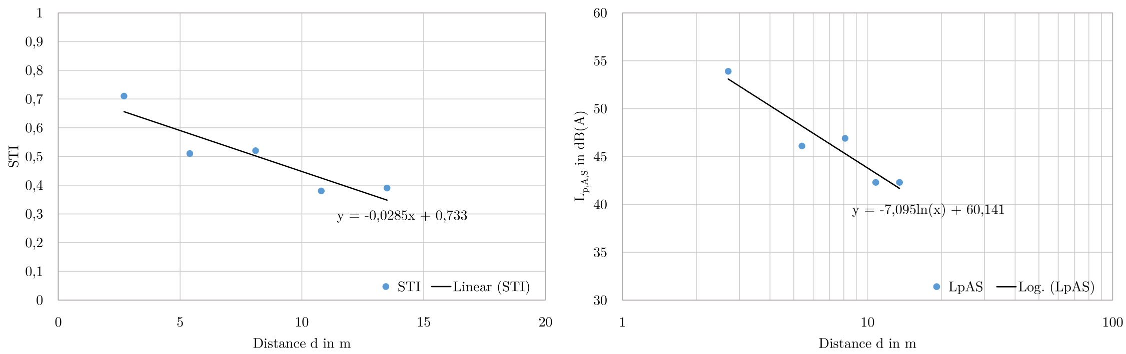
(b) Path 3



(c) Path 4

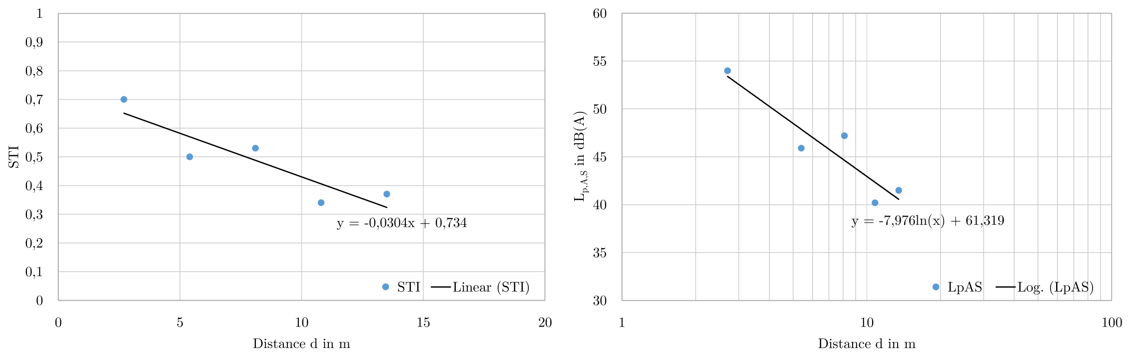


(d) Path 5

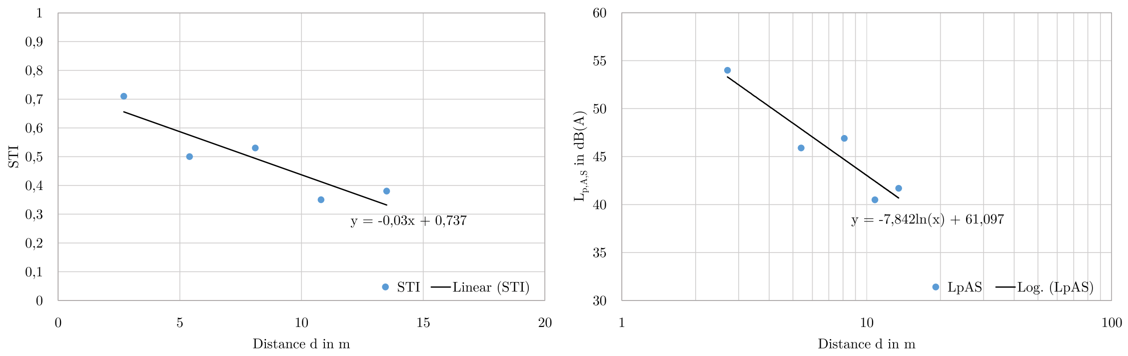


(e) Path 6

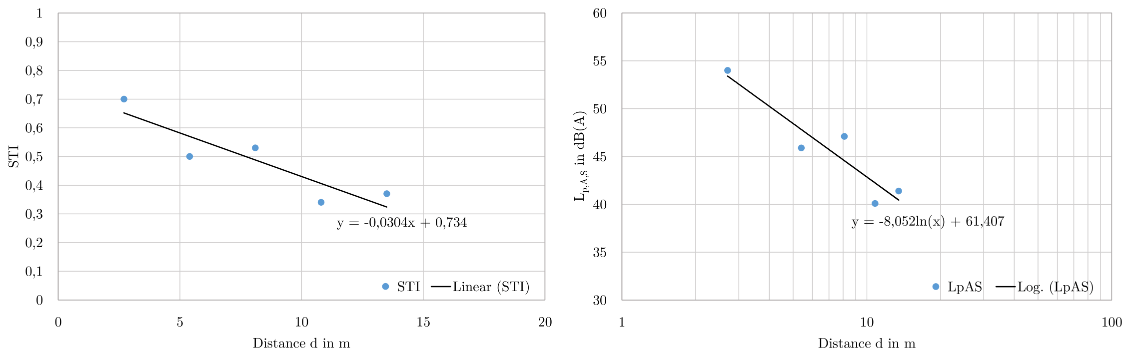
Figure C.1: Simulation results of One-Line-Model with 1.40 m partition wall.



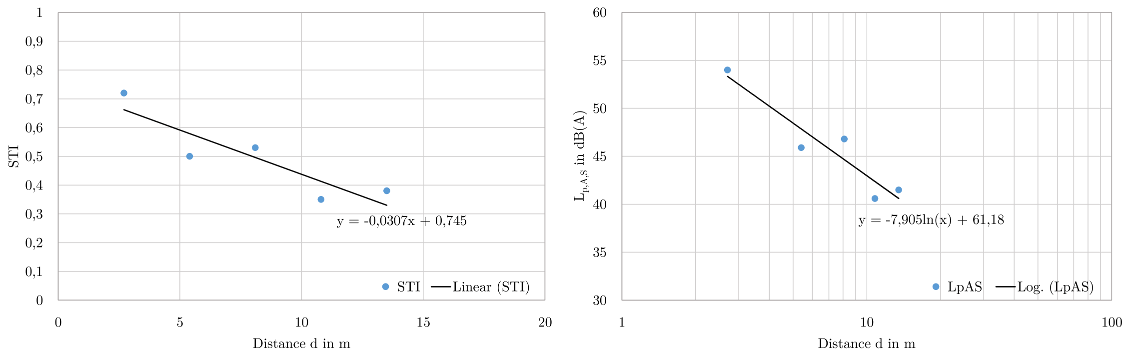
(a) Path 1



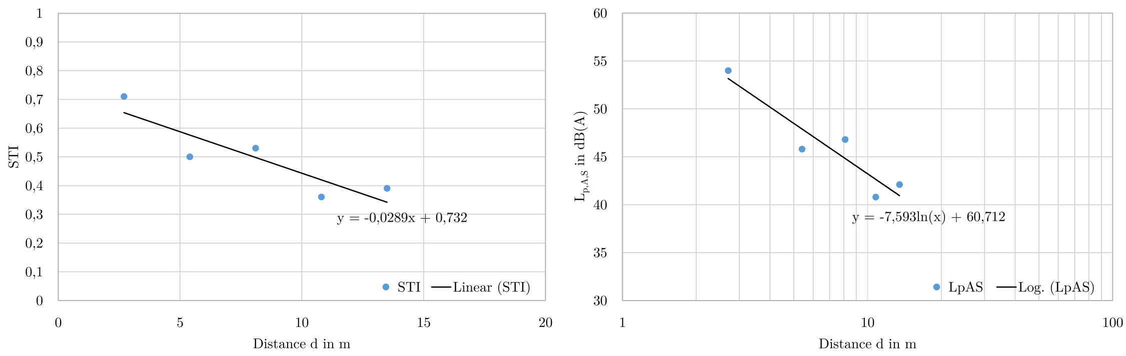
(b) Path 2



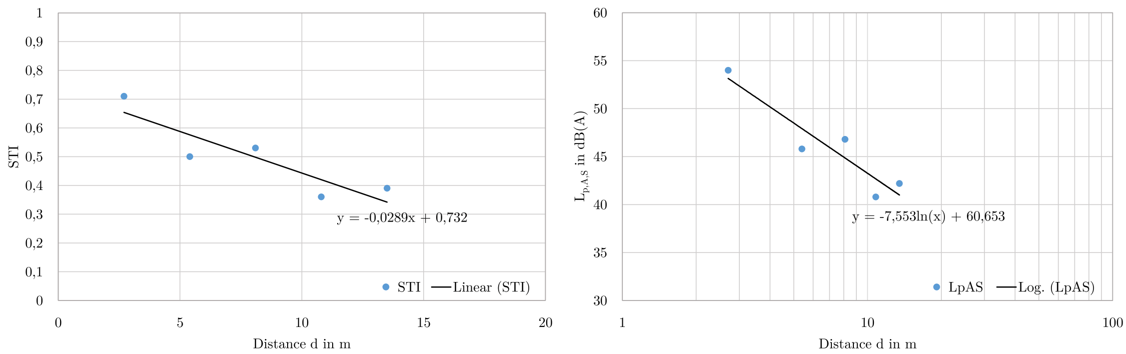
(c) Path 3



(d) Path 4

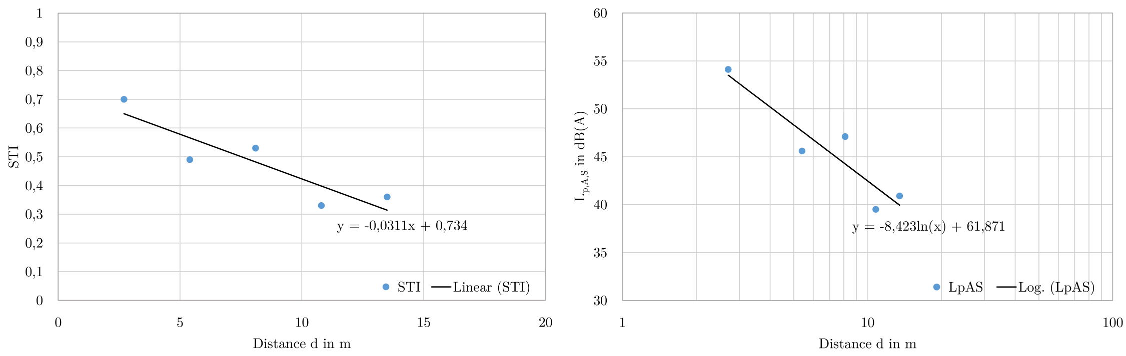


(e) Path 5

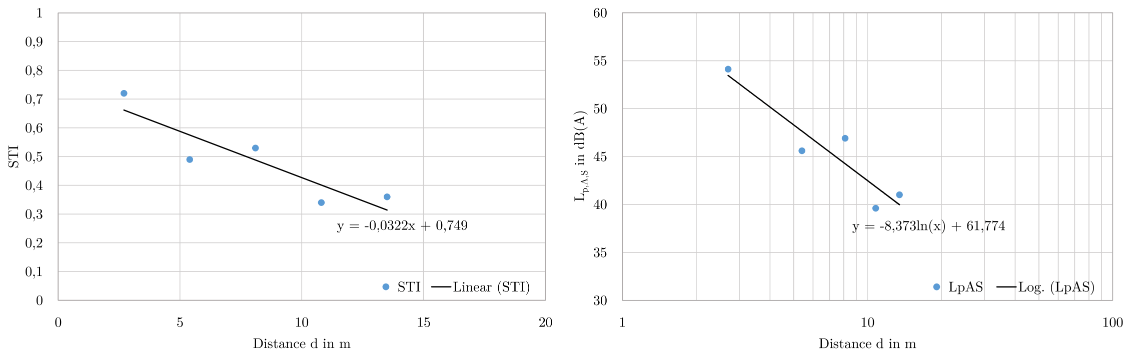


(f) Path 6

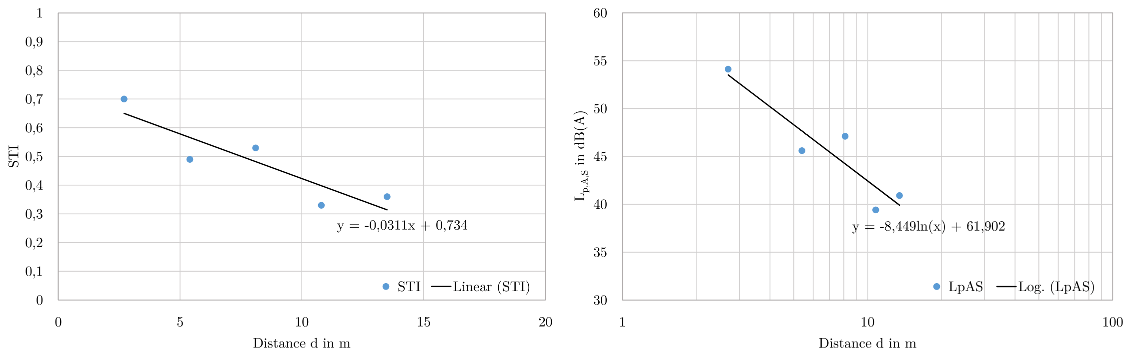
Figure C.2: Simulation results of One-Line-Model with 1.60 m partition wall.



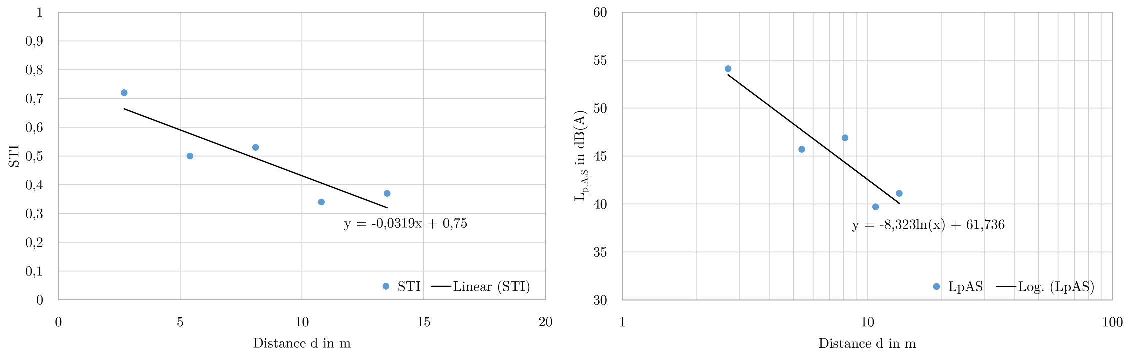
(a) Path 1



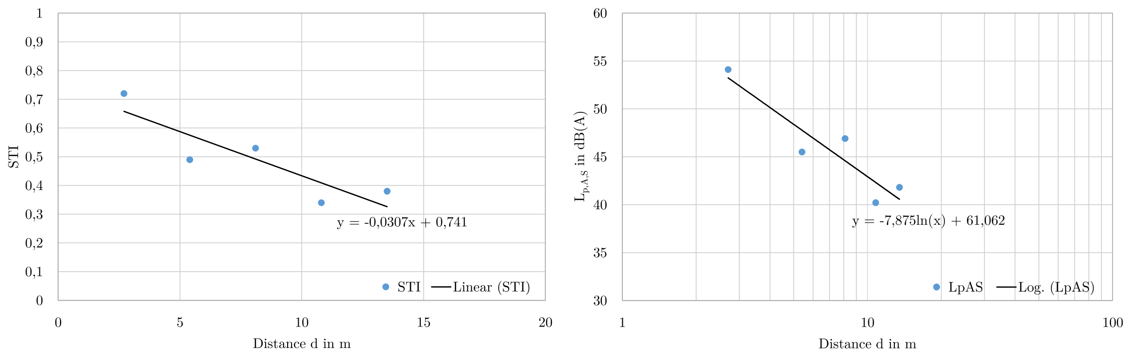
(b) Path 2



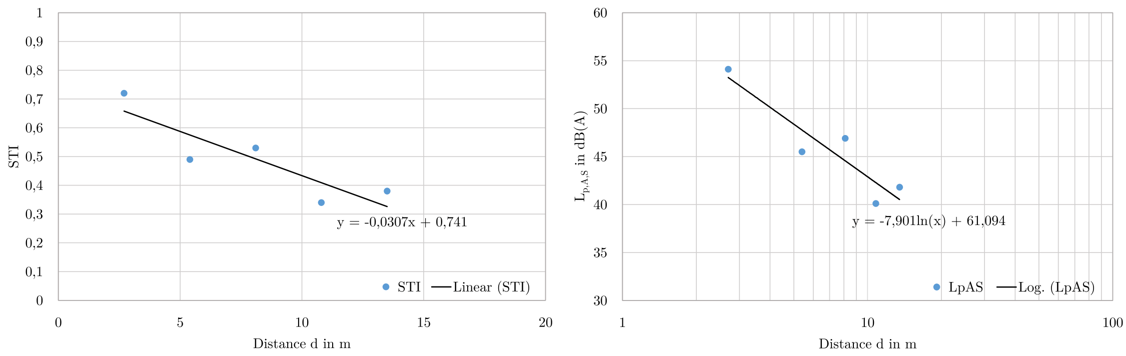
(c) Path 3



(d) Path 4



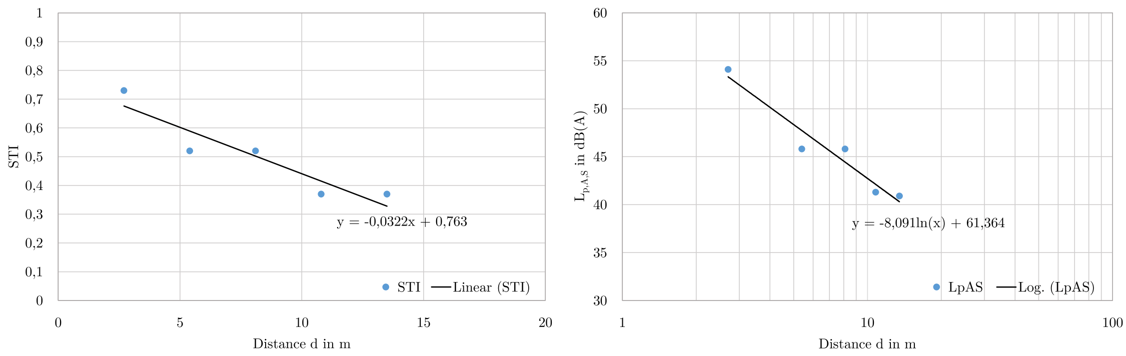
(e) Path 5



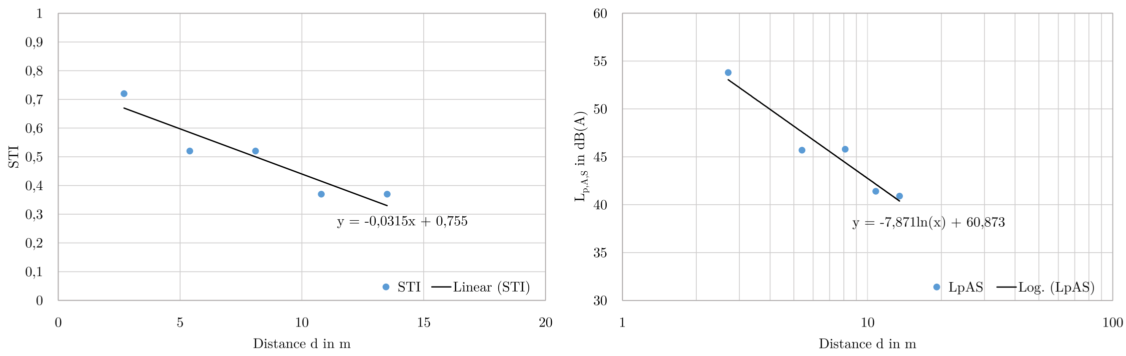
(f) Path 6

Figure C.3: Simulation results of One-Line-Model with 1.80 m partition wall.

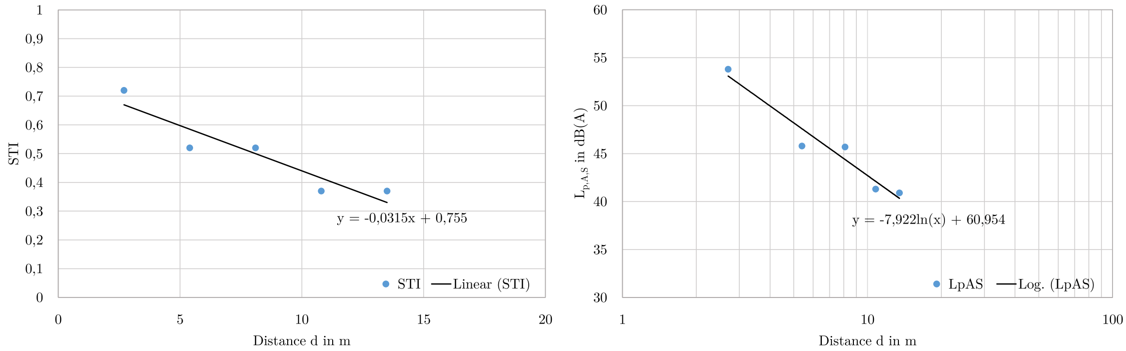
Two-Line-Model:



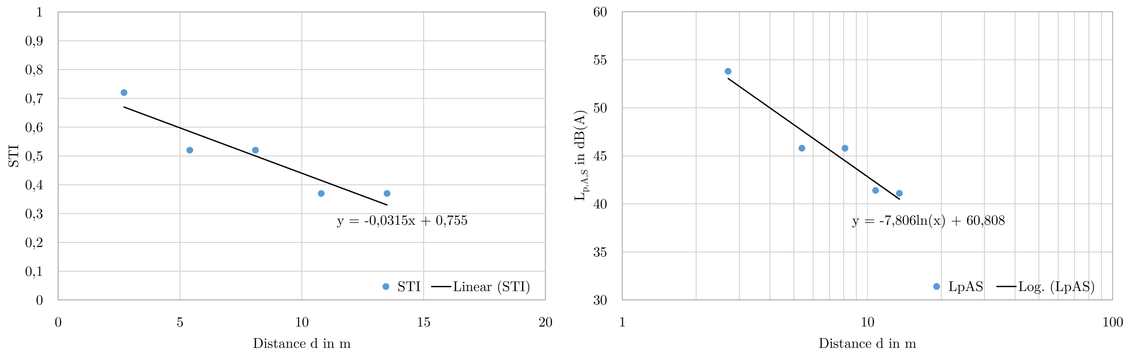
(a) Path 1



(b) Path 2

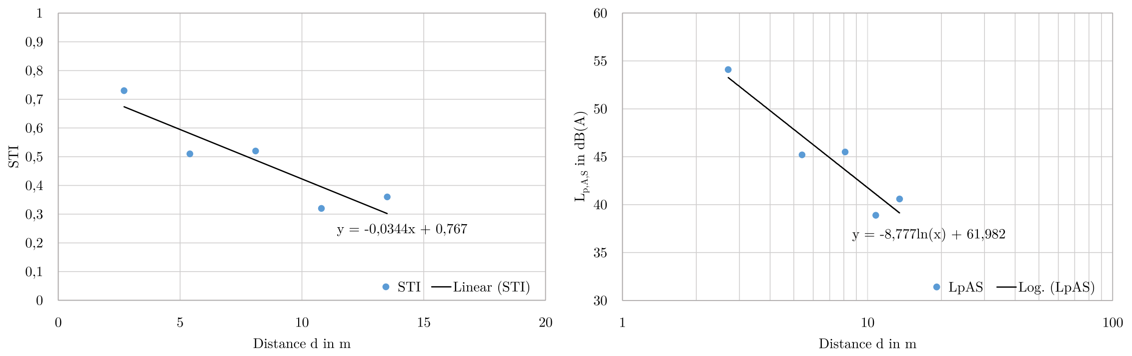


(c) Path 3

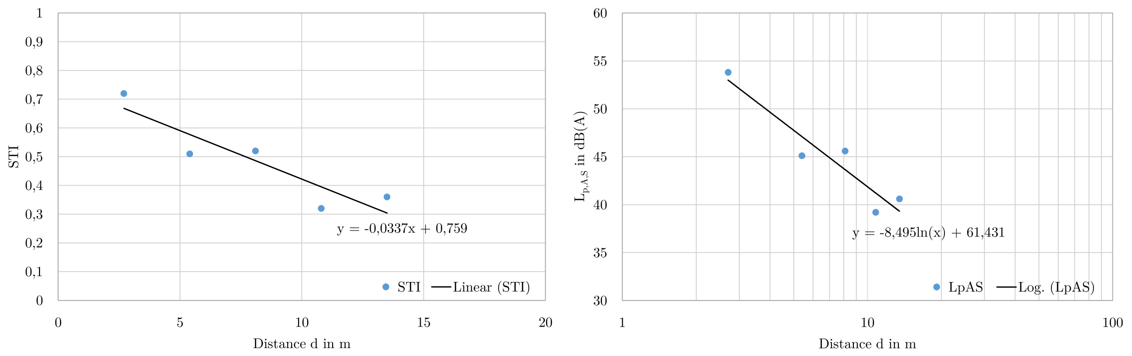


(d) Path 4

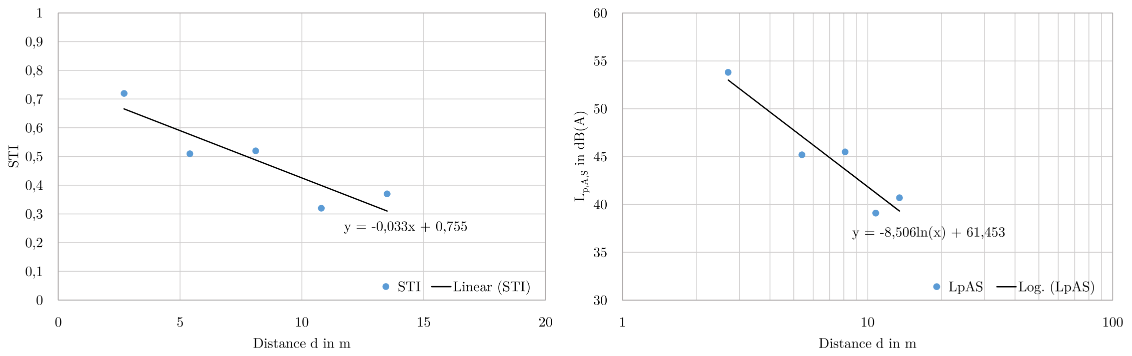
Figure C.4: Simulation results of Two-Line-Model with 1.40 m partition wall.



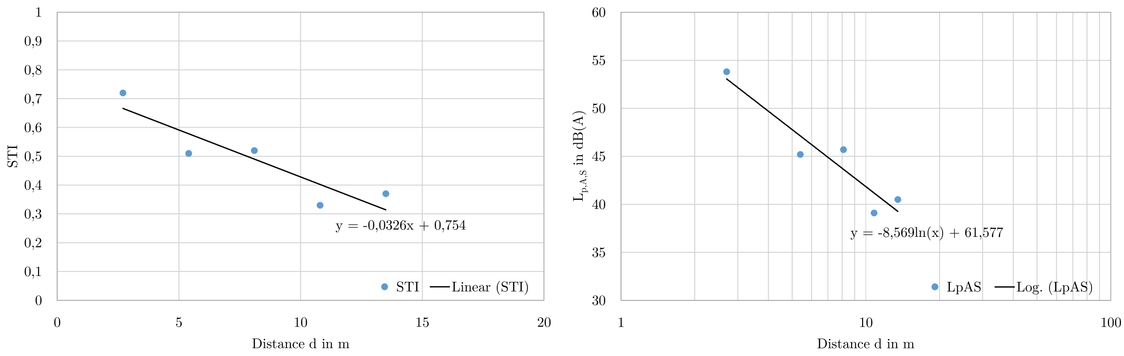
(a) Path 1



(b) Path 2

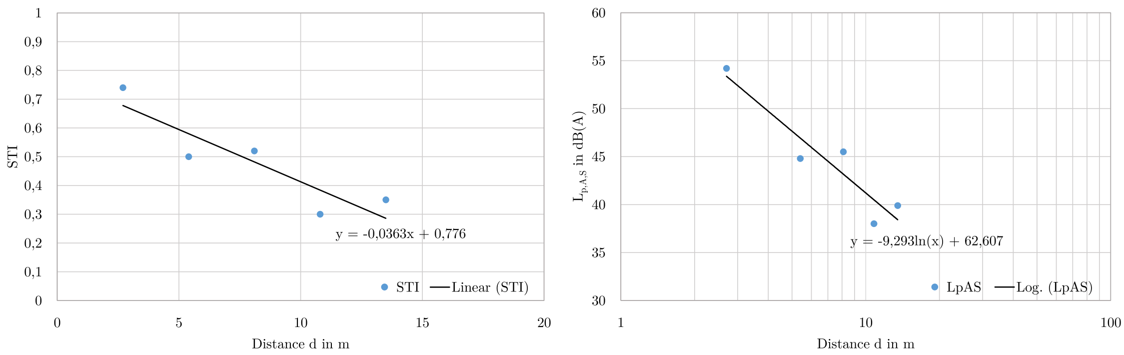


(c) Path 3

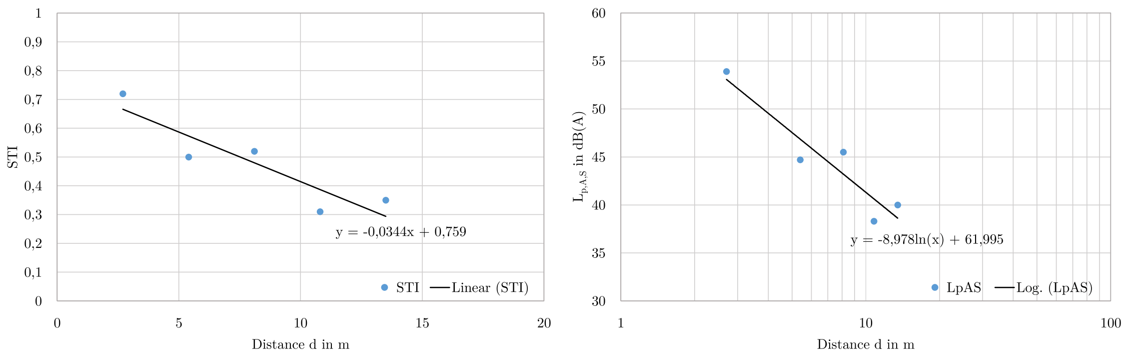


(d) Path 4

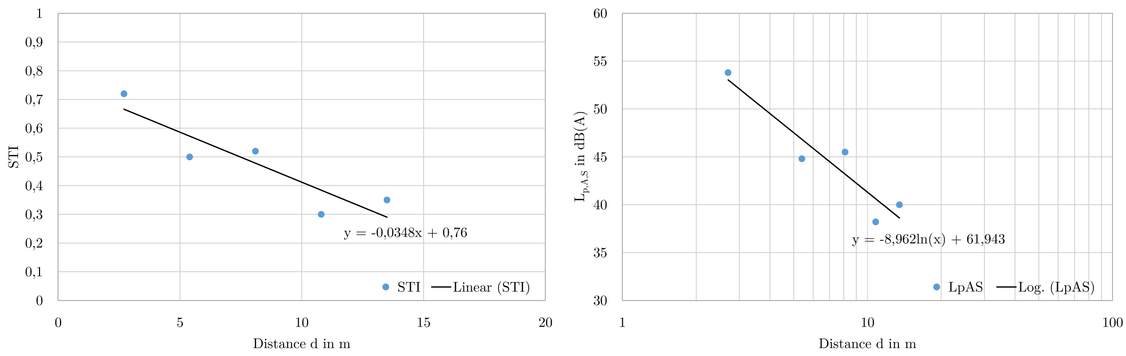
Figure C.5: Simulation results of Two-Line-Model with 1.60 m partition wall.



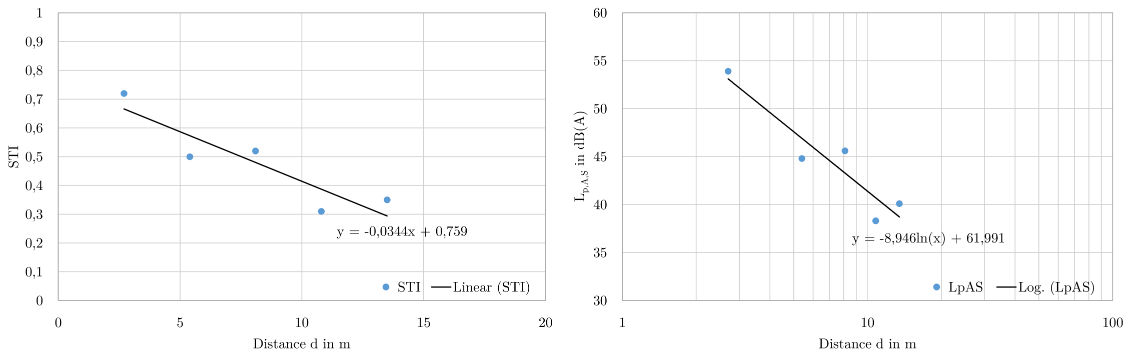
(a) Path 1



(b) Path 2



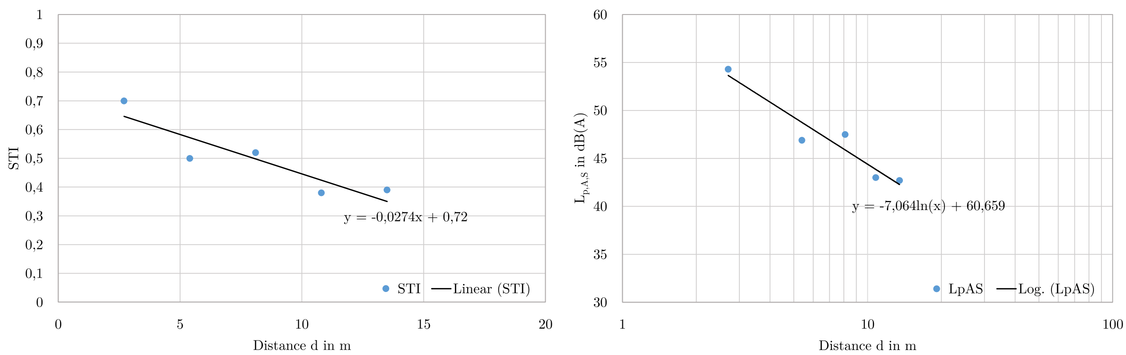
(c) Path 3



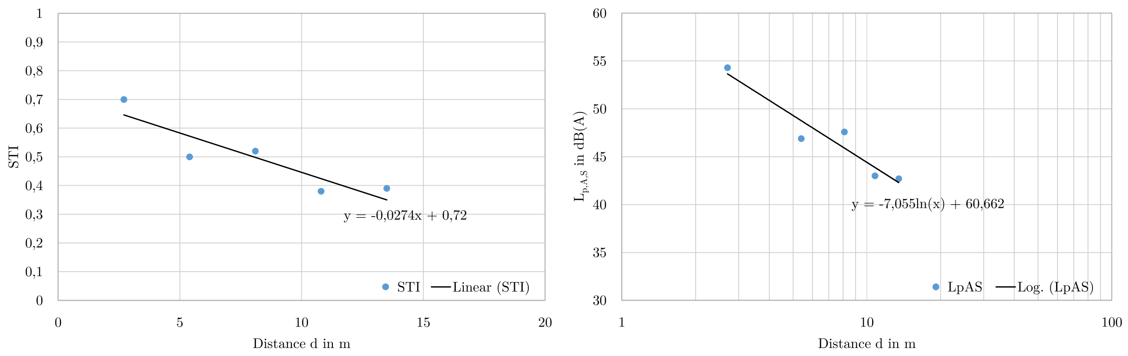
(d) Path 4

Figure C.6: Simulation results of Two-Line-Model with 1.80 m partition wall.

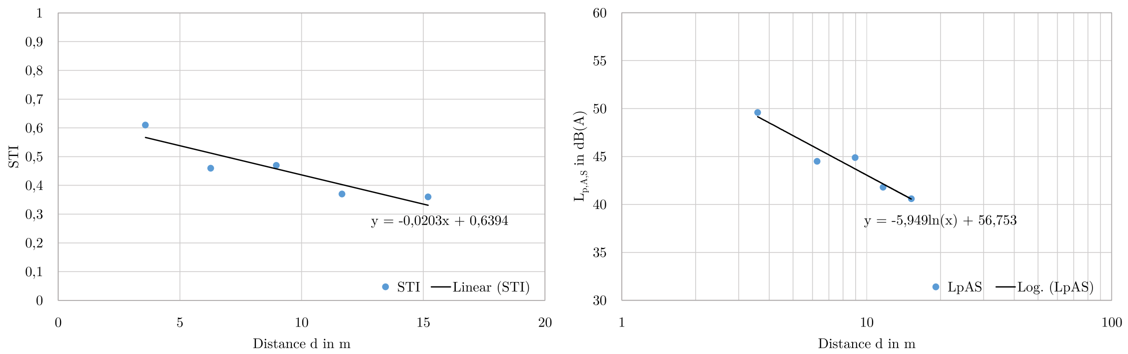
U-Shape-Model:



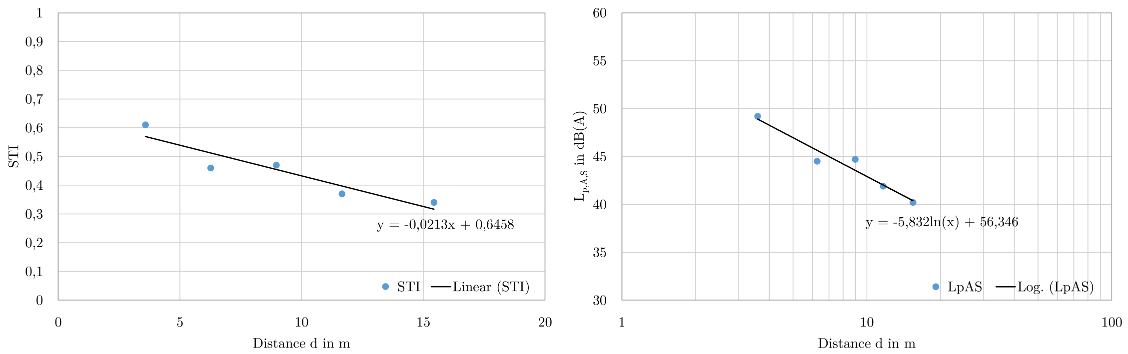
(a) Path 1



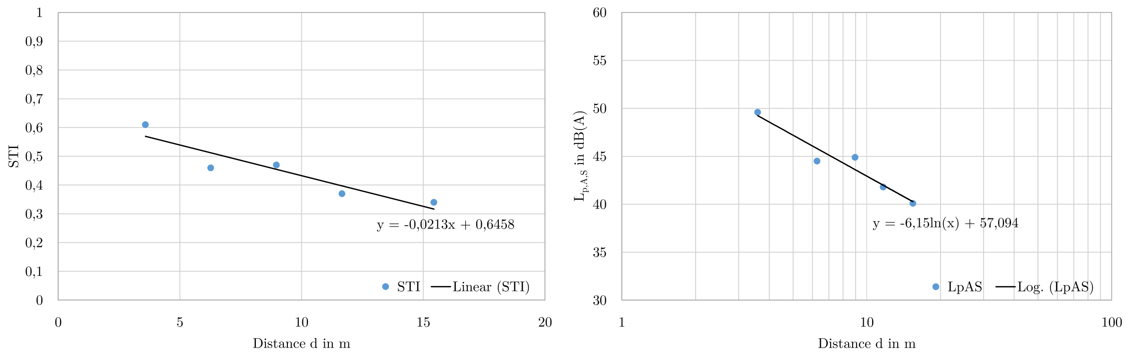
(b) Path 2



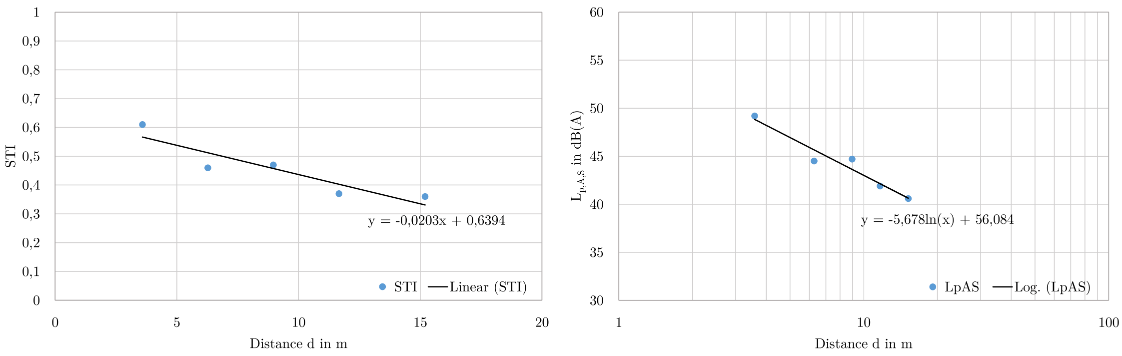
(c) Path 3



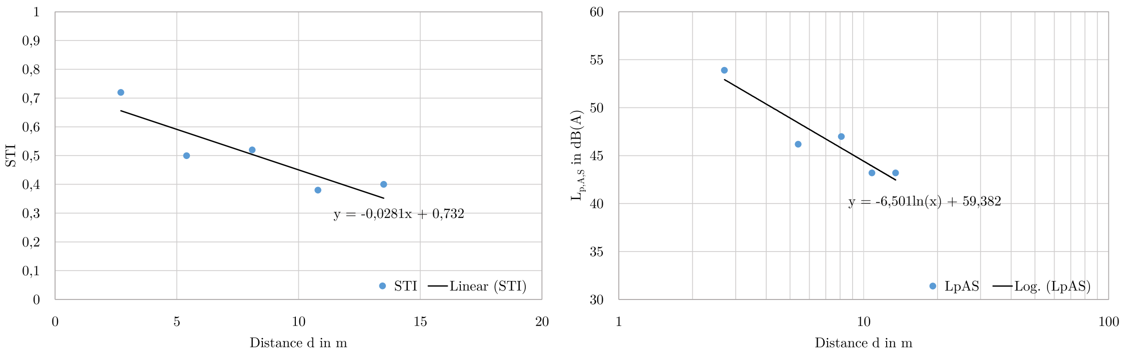
(d) Path 4



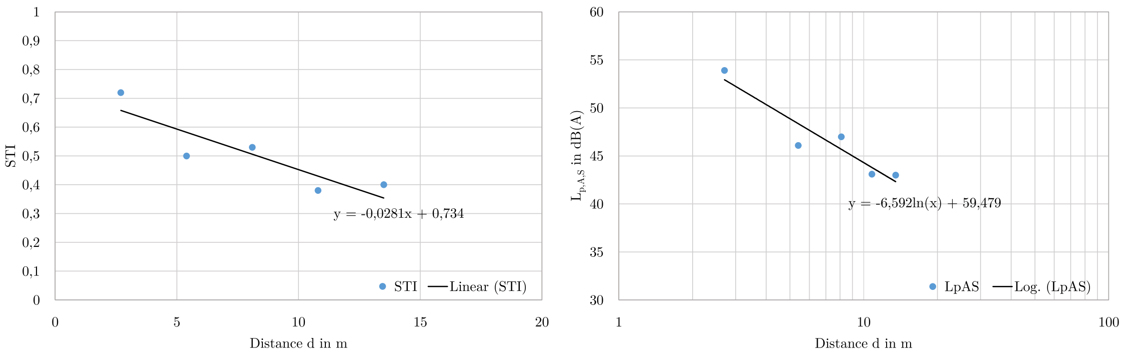
(e) Path 5



(f) Path 6

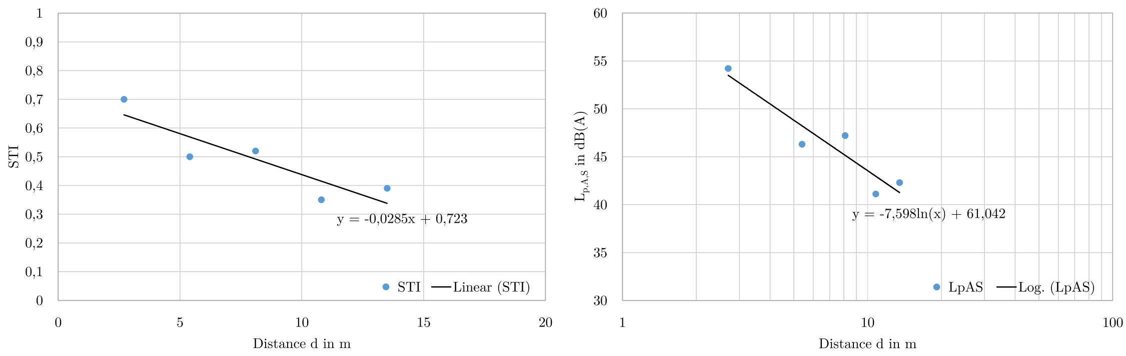


(g) Path 7

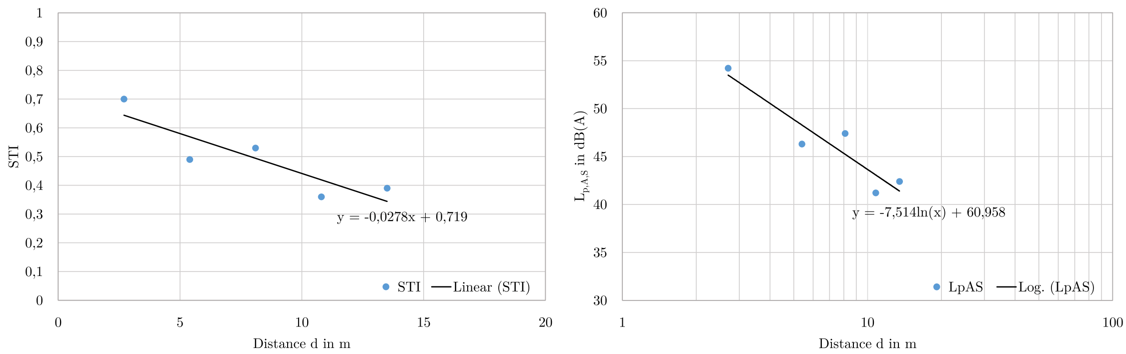


(h) Path 8

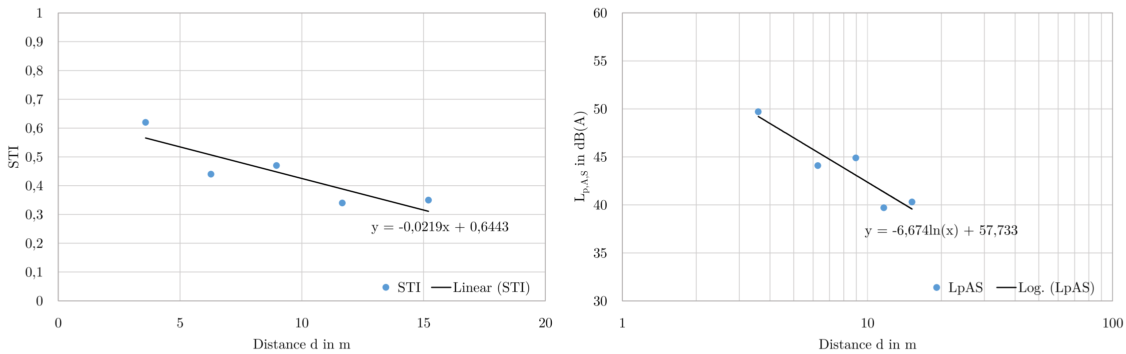
Figure C.7: Simulation results of U-Shape-Model with 1.40 m partition wall.



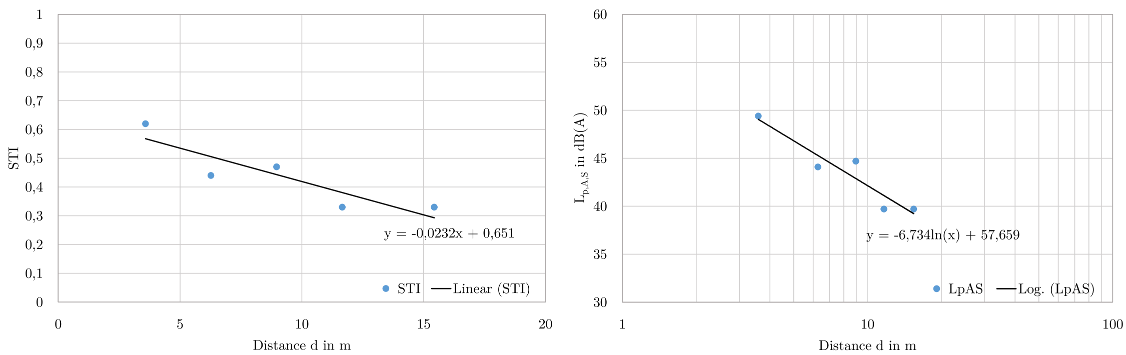
(a) Path 1



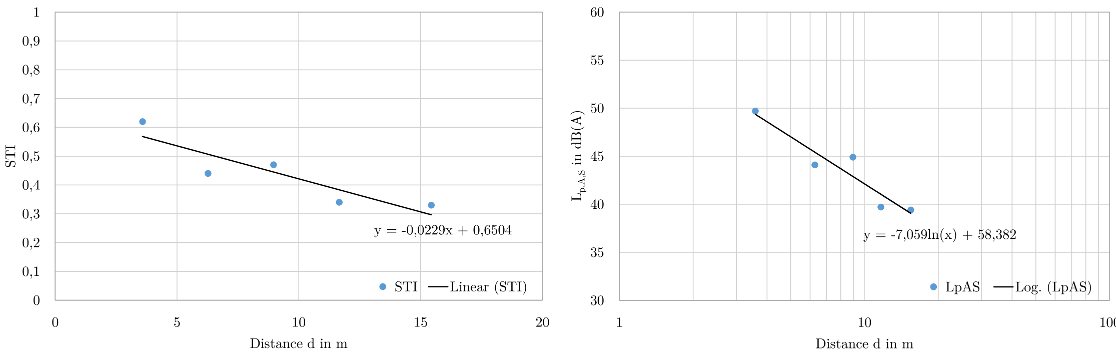
(b) Path 2



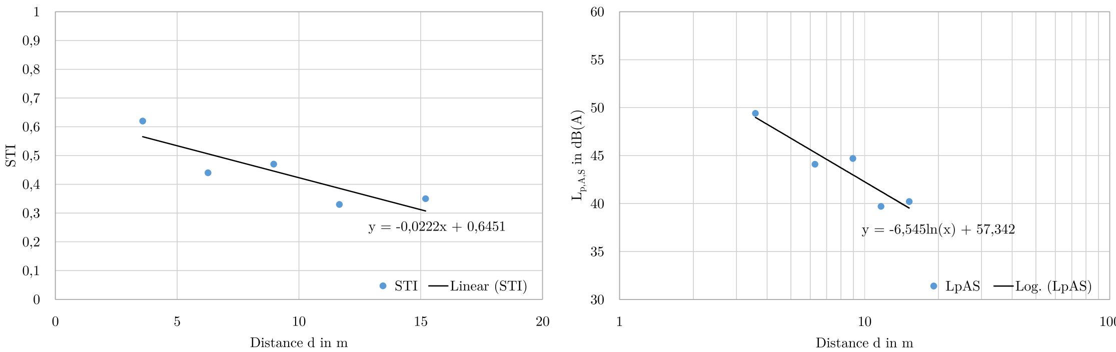
(c) Path 3



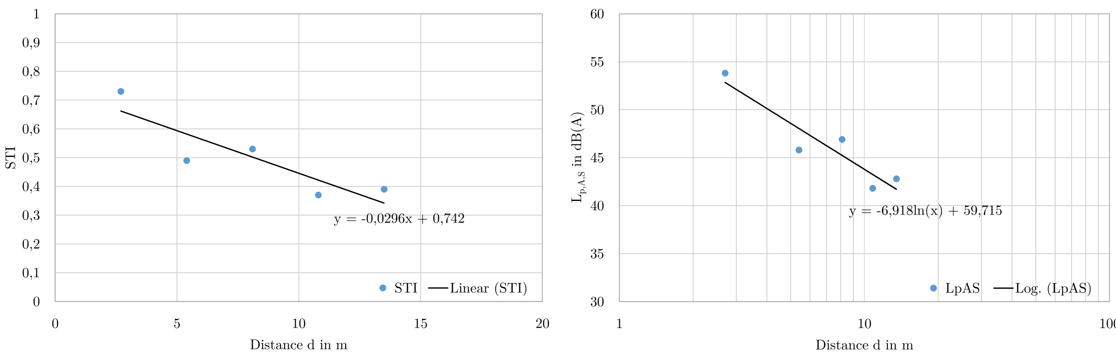
(d) Path 4



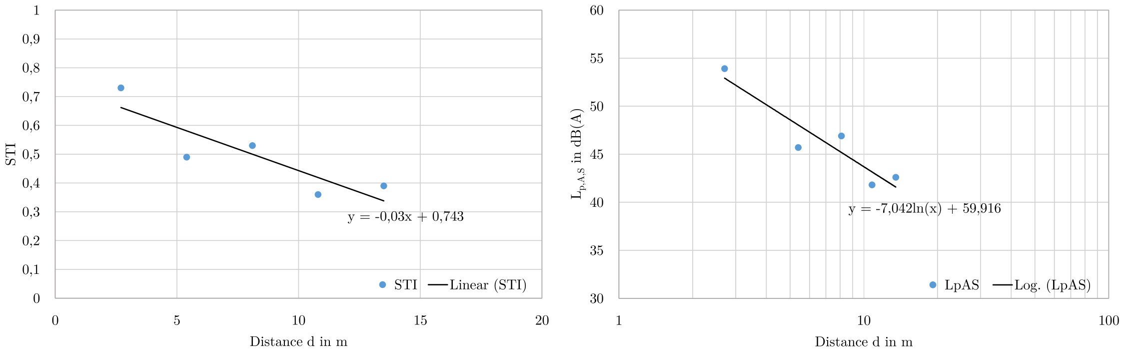
(e) Path 5



(f) Path 6

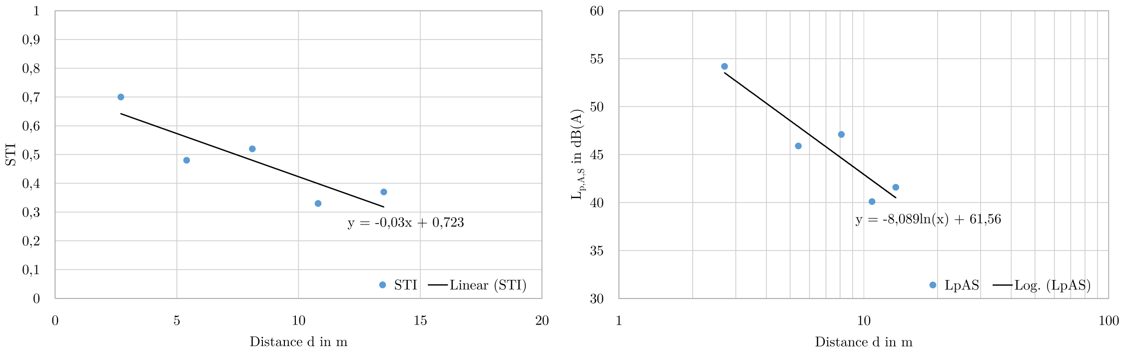


(g) Path 7

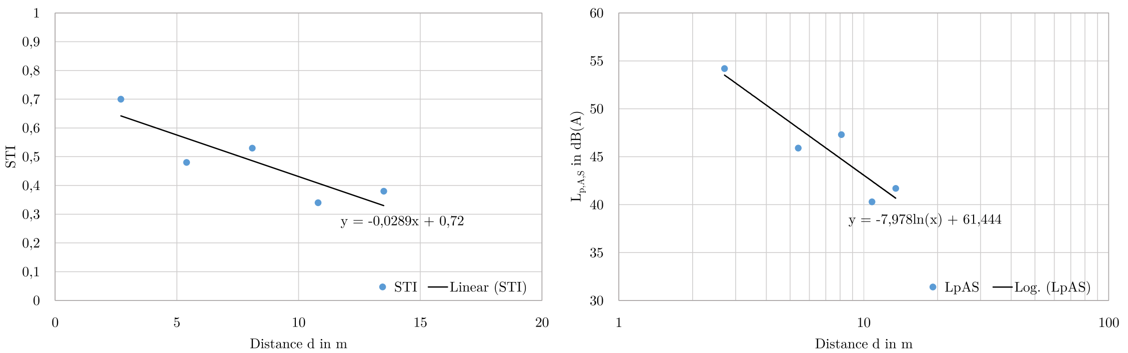


(h) Path 8

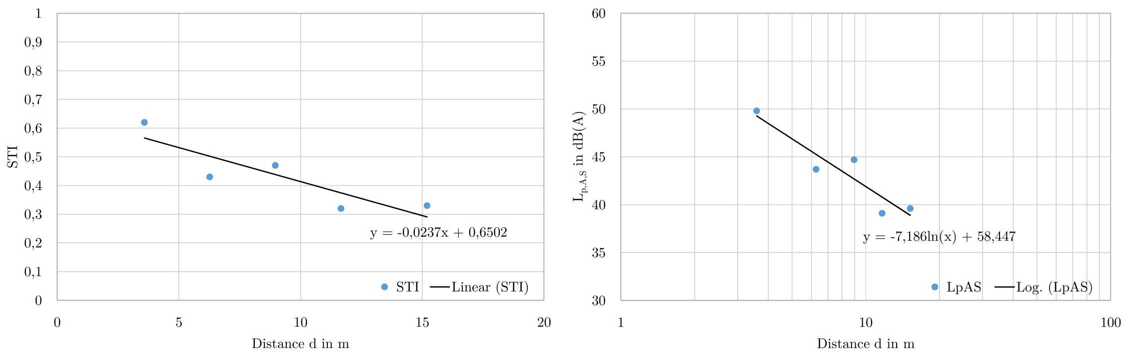
Figure C.8: Simulation results of U-Shape-Model with 1.60 m partition wall.



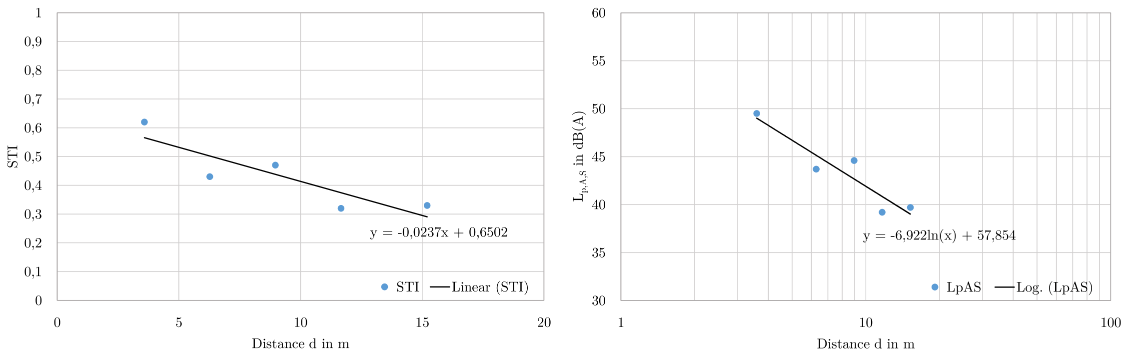
(a) Path 1



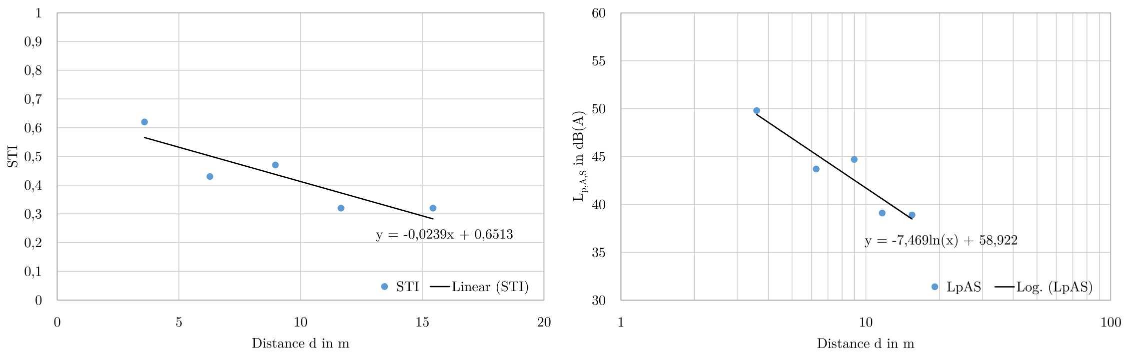
(b) Path 2



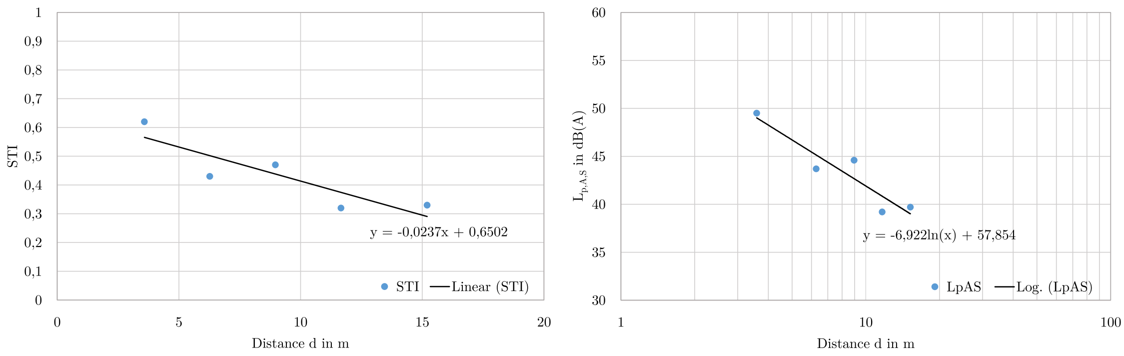
(c) Path 3



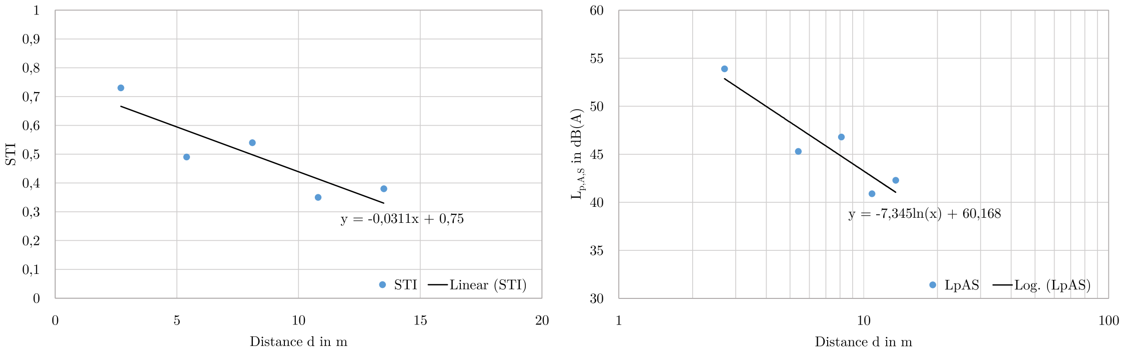
(d) Path 4



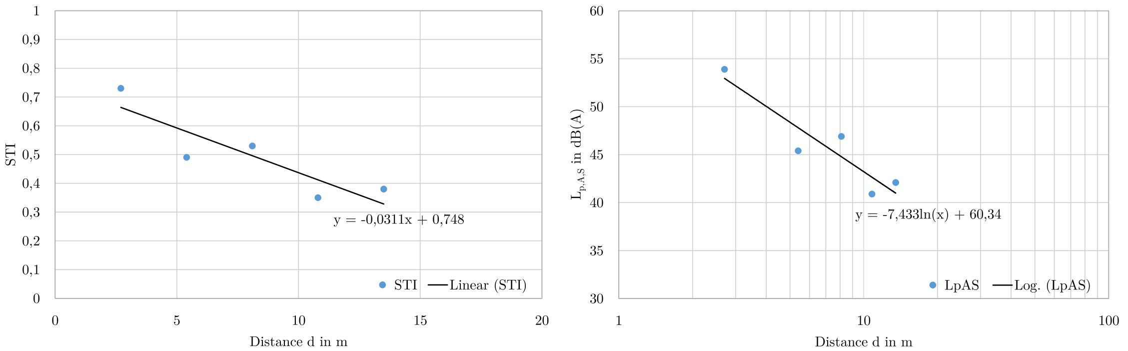
(e) Path 5



(f) Path 6



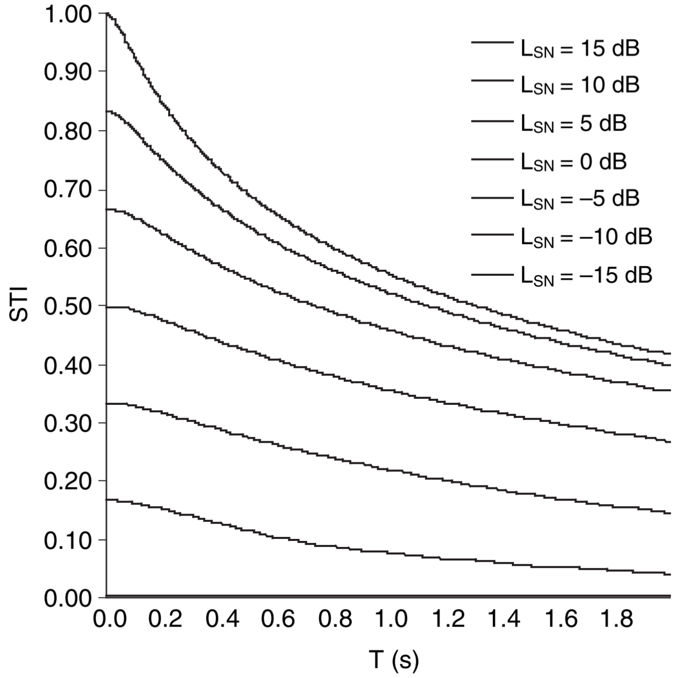
(g) Path 7



(h) Path 8

Figure C.9: Simulation results of U-Shape-Model with 1.80 m partition wall.

C.1.2 Relation Between STI, T and SNR



* For $L_{SN} = -15$ dB, $STI = 0.00$

Figure C.10: Relation between STI, T and SNR (L_{SN}). [27]

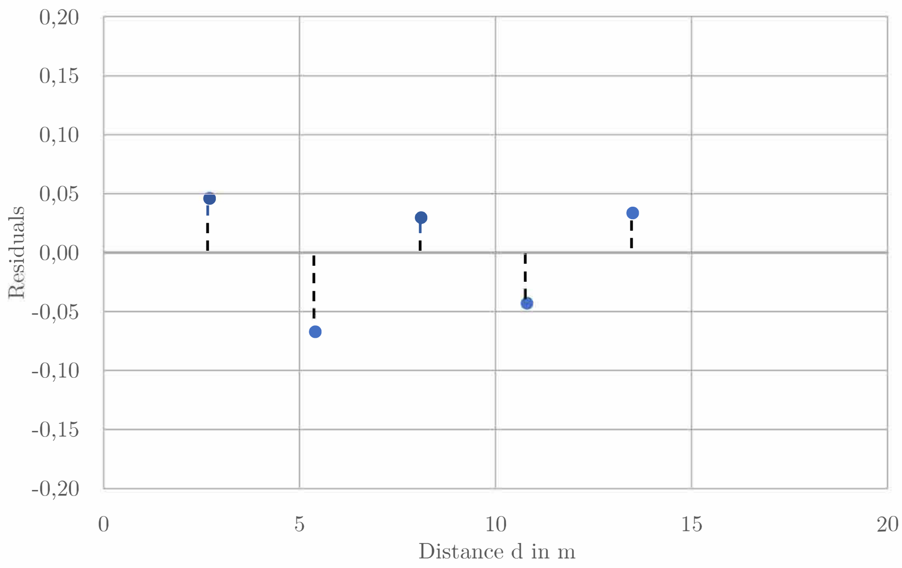
C.1.3 Review of the Linear Regression Model

In statistics, when using a regression analysis to create a model, as it is done in [12], it is important to validate the model. This can be done by calculating R^2, which tells how much of the fluctuations in the data can be explained by the model and by analyzing the residuals, which tell if the model chosen is valid. The residuals are the vertical differences between the obtained data and the regression line model, while R^2 is calculated by dividing the model sum of squares by the total sum of squares.

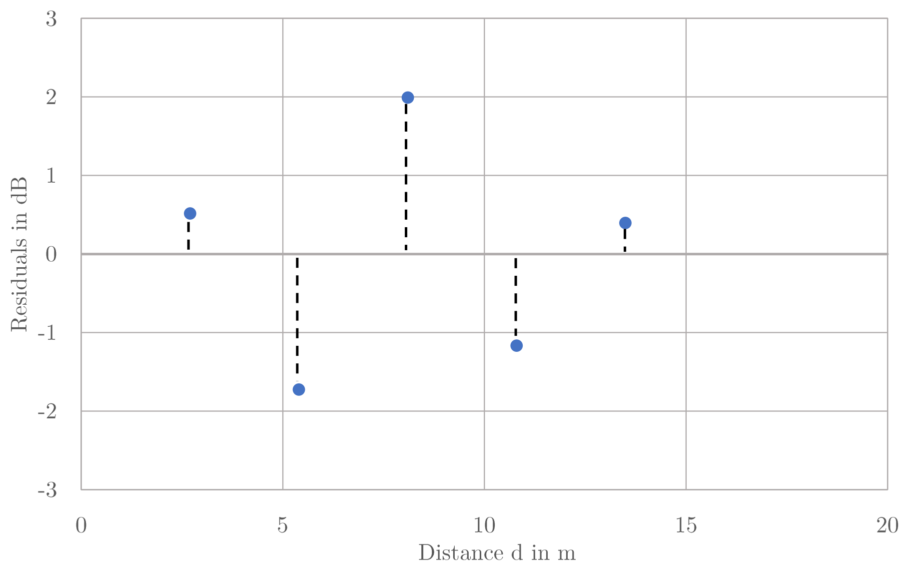
From the simulated results, as shown in Figure 5.5, the residuals for the STI and the $L_{p,A,S}$ can be derived. Table C.1 and Figure C.11 show the residuals for the One-Line-Model with 1.40 m partition and the 1^{st} path. Tables C.3 to C.11, show the residuals of the other models.

Mic. Position in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
1	2.7 m	0.05	0.5 dB
2	5.4 m	-0.07	-1.7 dB
3	8.1 m	0.03	2 dB
4	10.8 m	-0.04	-1.2 dB
5	13.5 m	0.03	0.4 dB

Table C.1: Residuals for STI and $L_{p,A,S}$ of the One-Line-Model with 1.40 m partition and 1st path.



(a) Residuals STI



(b) Residuals $L_{p,A,S}$

Figure C.11: Residuals for STI and $L_{p,A,S}$ of the One-Line-Model with 1.40 m partition and 1st path.

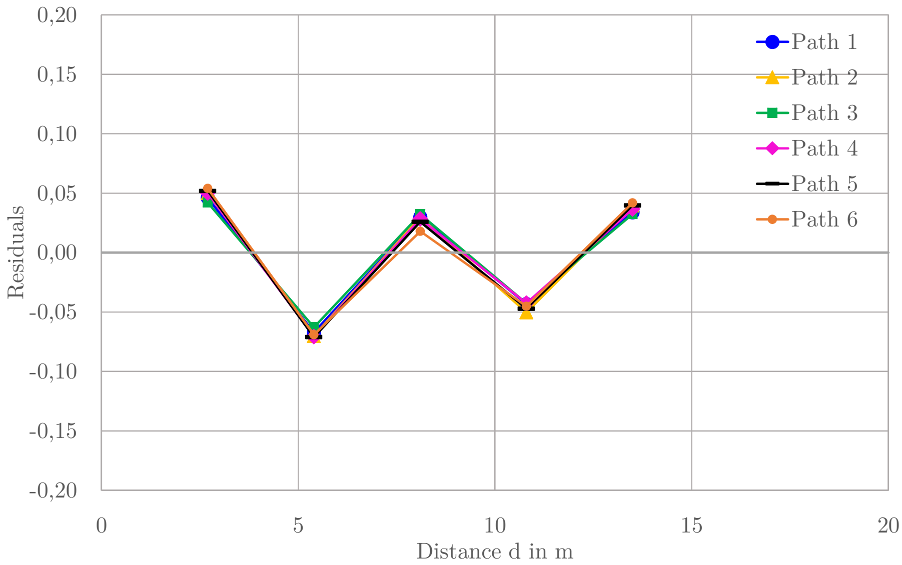
Using the values of the residuals, the R^2 can be calculated, which are displayed in Table C.2 for the One-Line-Model. For the Two-Line and the U-Shape-Model the results of R^2 are displayed in Tables C.12 and C.13.

140 cm						
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
R^2 (STI)	84.9 %	83.8 %	85.4 %	84.5 %	82.9 %	83.4 %
R^2 ($L_{p,A,S}$)	91.1 %	91.7 %	90.8 %	92.1 %	90.3 %	90.2 %
160 cm						
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
R^2 (STI)	81.3 %	80.3 %	81.3 %	80 %	79.3 %	79.3 %
R^2 ($L_{p,A,S}$)	86.3 %	87.6 %	86.7 %	88.7 %	87.2 %	86.8 %
180 cm						
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
R^2 (STI)	80.3 %	80.6 %	80.3 %	80.9 %	77.3 %	77.3 %
R^2 ($L_{p,A,S}$)	85.7 %	86.5 %	85.5 %	86.8 %	85.3 %	85 %

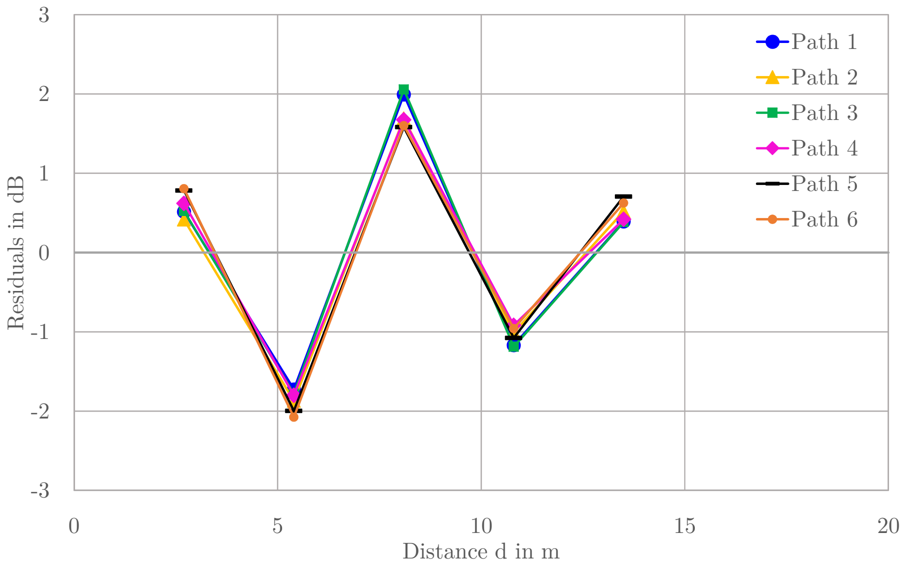
Table C.2: R^2 values of the STI and the $L_{p,A,S}$ for the One-Line-Model.

For all models, the values of R^2 are very high, which means that most of the fluctuations of the data can actually be explained from the model. This does not surprise, since the results in Figure 5.5 and Figures C.1-C.9 show that the data is quite close to the regression lines. R^2 is always higher for the A-weighted SPL of speech than for the STI and with increasing partition wall, the values decrease slightly for all models and paths. This behaviour can also be seen for the Two-Line and the U-Shape-Model. As a first conclusion it can be said, that the model seem to be quite good for the simulated data, since it is able to represent the fluctuations of the data.

As a second step, the distribution of the residuals has to be evaluated. In order the model (regression line) to be valid it should not be possible to predict the error of an observation and the residuals should occur randomly. Residual plots, like in Figure C.11, help to asses these two properties. Figure C.12 shows the residuals of all paths of the One-Line-Model with 1.40 m partition. The graphs for the other models are shown in Figures C.13 to C.15 at the end of this section.



(a) Residuals STI



(b) Residuals $L_{p,A,S}$

Figure C.12: Residuals for STI and $L_{p,A,S}$ of the One-Line-Model with 1.40 m partition and all paths.

The residuals distributions are almost exactly the same for all paths, for the STI and the $L_{p,A,S}$. The 1st, 3rd and 5th microphone position always show a positive error and the 2nd and 4th microphone position always show a negative error. When looking at the results for the other models the same behaviour can be observed in all graphs apart from one. The residuals of the $L_{p,A,S}$ in the U-Shape-Model with the 1.40 m partition wall for the vertical paths (path 3, 4, 5 and 6) have negative values or values around zero for the 5^{th} microphone position. There is no obvious explanation for this behaviour. But, it can also be observed that independent of the distances between source and receiver, the vertical paths in the U-Shape-Model have slightly different distances, the positions with an odd number have a positive error and the positions with an even number have a negative error.

The W shape of the residuals is favored due to the partition walls. As one of the limitations says, the first microphone position must be placed in direct view to the source (before any possible shielding). This leads to a measurement point with influence of the direct sound field of the source and results in data which is always underestimated from the linear regression. The second measurement point in these models is always behind a partition wall, which leads to an overestimation of the data from the linear regression line. The following measurement points continue like this. In order to see, if only the partition walls cause this W distribution of the residuals, simulations of the three geometries without any partition walls are carried out.

Figure C.16 at the end of this section, shows that the W shape of the residuals for the models without partition walls can not be confirmed for all graphs. Only the STI residuals for the One-Line-Model shows that specific shape. Otherwise, the distribution looks very different and there is no systematic between the three layouts recognizable. The R^2 are even higher for the models without partition walls, see Table C.14, for which reason it can be assumed that the model of the linear regression can display the data properly.

The systematic distribution of the three office geometries with the partition walls is not random as it should be, so it could be said that the model is not able to display the simulated data for these specific models. But without partition walls, the errors are not predictable anymore, which speaks for the model. For a proper review of the model a higher number and more different models should be examined, in order to be able to come to a meaningful statement.

Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$	Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
Path 2				Path 3			
1	2.7 m	0.05	0.4 dB	1	2.7 m	0.04	0.5 dB
2	5.4 m	-0.07	-1.9 dB	2	5.4 m	-0.06	-1.8 dB
3	8.1 m	0.03	1.7 dB	3	8.1 m	0.03	2.1 dB
4	10.8 m	-0.05	-1 dB	4	10.8 m	-0.04	-1.2 dB
5	13.5 m	0.04	0.5 dB	5	13.5 m	0.03	0.4 dB
Path 4				Path 5			
1	2.7 m	0.05	0.6 dB	1	2.7 m	0.05	0.8 dB
2	5.4 m	-0.07	-1.8 dB	2	5.4 m	-0.07	-2 dB
3	8.1 m	0.03	1.7 dB	3	8.1 m	0.03	1.6 dB
4	10.8 m	-0.04	-0.9 dB	4	10.8 m	-0.05	-1.1 dB
5	13.5 m	0.04	0.4 dB	5	13.5 m	0.04	0.7 dB
Path 6							
1	2.7 m	0.05	0.8 dB				
2	5.4 m	-0.07	-2.1 dB				
3	8.1 m	0.02	1.6 dB				
4	10.8 m	-0.05	-1 dB				
5	13.5 m	0.04	0.6 dB				

Table C.3: Residuals for STI and $L_{p,A,S}$ of the One-Line-Model with 1.40 m partition.

Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$	Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
Path 1				Path 2			
1	2.7 m	0.05	0.6 dB	1	2.7 m	0.05	0.7 dB
2	5.4 m	-0.07	-2 dB	2	5.4 m	-0.08	-2 dB
3	8.1 m	0.04	2.6 dB	3	8.1 m	0.04	2.2 dB
4	10.8 m	-0.07	-2.1 dB	4	10.8 m	-0.06	-1.9 dB
5	13.5 m	0.05	0.9 dB	5	13.5 m	0.05	1 dB
Path 3				Path 4			
1	2.7 m	0.05	0.6 dB	1	2.7 m	0.06	0.7 dB
2	5.4 m	-0.07	-1.9 dB	2	5.4 m	-0.08	-1.9 dB
3	8.1 m	0.04	2.5 dB	3	8.1 m	0.03	2.2 dB
4	10.8 m	-0.07	-2.1 dB	4	10.8 m	-0.06	-1.8 dB
5	13.5 m	0.05	0.9 dB	5	13.5 m	0.05	0.9 dB
Path 5				Path 6			
1	2.7 m	0.06	0.8 dB	1	2.7 m	0.06	0.8 dB
2	5.4 m	-0.08	-2.1 dB	2	5.4 m	-0.08	-2.1 dB
3	8.1 m	0.03	2 dB	3	8.1 m	0.03	1.9 dB
4	10.8 m	-0.06	-1.8 dB	4	10.8 m	-0.06	-1.9 dB
5	13.5 m	0.05	1.2 dB	5	13.5 m	0.05	1.2 dB

Table C.4: Residuals for STI and $L_{p,A,S}$ of the One-Line-Model with 1.60 m partition.

Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$	Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
Path 1				Path 2			
1	2.7 m	0.05	0.6 dB	1	2.7 m	0.06	0.6 dB
2	5.4 m	-0.08	-2.1 dB	2	5.4 m	-0.09	-2.1 dB
3	8.1 m	0.05	2.8 dB	3	8.1 m	0.04	2.6 dB
4	10.8 m	-0.07	-2.3 dB	4	10.8 m	-0.06	-2.3 dB
5	13.5 m	0.05	1 dB	5	13.5 m	0.05	1 dB
Path 3				Path 4			
1	2.7 m	0.05	0.6 dB	1	2.7 m	0.06	0.6 dB
2	5.4 m	-0.08	-2.1 dB	2	5.4 m	-0.08	-2 dB
3	8.1 m	0.05	2.9 dB	3	8.1 m	0.04	2.6 dB
4	10.8 m	-0.07	-2.4 dB	4	10.8 m	-0.07	-2.2 dB
5	13.5 m	0.05	1 dB	5	13.5 m	0.05	1 dB
Path 5				Path 6			
1	2.7 m	0.06	0.9 dB	1	2.7 m	0.06	0.9 dB
2	5.4 m	-0.09	-2.3 dB	2	5.4 m	-0.09	-2.3 dB
3	8.1 m	0.04	2.3 dB	3	8.1 m	0.04	2.3 dB
4	10.8 m	-0.07	-2.1 dB	4	10.8 m	-0.07	-2.2 dB
5	13.5 m	0.05	1.2 dB	5	13.5 m	0.05	1.3 dB

Table C.5: Residuals for STI and $L_{p,A,S}$ of the One-Line-Model with 1.80 m partition.

Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$	Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
Path 1				Path 2			
1	2.7 m	0.05	0.8 dB	1	2.7 m	0.05	0.7 dB
2	5.4 m	-0.07	-1.9 dB	2	5.4 m	-0.06	-1.9 dB
3	8.1 m	0.02	1.4 dB	3	8.1 m	0.02	1.4 dB
4	10.8 m	-0.05	-0.8 dB	4	10.8 m	-0.04	-0.7 dB
5	13.5 m	0.04	0.6 dB	5	13.5 m	0.04	0.5 dB
Path 3				Path 4			
1	2.7 m	0.05	0.7 dB	1	2.7 m	0.05	0.7 dB
2	5.4 m	-0.06	-1.8 dB	2	5.4 m	-0.06	-1.8 dB
3	8.1 m	0.02	1.3 dB	3	8.1 m	0.02	1.3 dB
4	10.8 m	-0.04	-0.8 dB	4	10.8 m	-0.04	-0.8 dB
5	13.5 m	0.04	0.6 dB	5	13.5 m	0.04	0.6 dB

Table C.6: Residuals for STI and $L_{p,A,S}$ of the Two-Line-Model with 1.40 m partition.

Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$	Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
Path 1				Path 2			
1	2.7 m	0.06	0.8 dB	1	2.7 m	0.05	0.8 dB
2	5.4 m	-0.07	-2 dB	2	5.4 m	-0.07	-2 dB
3	8.1 m	0.03	1.9 dB	3	8.1 m	0.03	1.9 dB
4	10.8 m	-0.08	-2.2 dB	4	10.8 m	-0.08	-2 dB
5	13.5 m	0.06	1.5 dB	5	13.5 m	0.06	1.3 dB
Path 3				Path 4			
1	2.7 m	0.05	0.8 dB	1	2.7 m	0.05	0.7 dB
2	5.4 m	-0.07	-1.9 dB	2	5.4 m	-0.07	-1.9 dB
3	8.1 m	0.03	1.8 dB	3	8.1 m	0.03	2 dB
4	10.8 m	-0.08	-2.1 dB	4	10.8 m	-0.07	-2.1 dB
5	13.5 m	0.06	1.4 dB	5	13.5 m	0.06	1.2 dB

Table C.7: Residuals for STI and $L_{p,A,S}$ of the Two-Line-Model with 1.60 m partition.

Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$	Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
Path 1				Path 2			
1	2.7 m	0.06	0.8 dB	1	2.7 m	0.05	0.8 dB
2	5.4 m	-0.08	-2.1 dB	2	5.4 m	-0.07	-2.2 dB
3	8.1 m	0.04	2.3 dB	3	8.1 m	0.04	2.3 dB
4	10.8 m	-0.08	-2.5 dB	4	10.8 m	-0.08	-2.3 dB
5	13.5 m	0.06	1.5 dB	5	13.5 m	0.06	1.4 dB
Path 3				Path 4			
1	2.7 m	0.05	0.8 dB	1	2.7 m	0.05	0.8 dB
2	5.4 m	-0.07	-2 dB	2	5.4 m	-0.07	-2.1 dB
3	8.1 m	0.04	2.3 dB	3	8.1 m	0.04	2.3 dB
4	10.8 m	-0.08	-2.4 dB	4	10.8 m	-0.08	-2.4 dB
5	13.5 m	0.06	1.4 dB	5	13.5 m	0.06	1.4 dB

Table C.8: Residuals for STI and $L_{p,A,S}$ of the Two-Line-Model with 1.80 m partition.

Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$	Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
Path 1				Path 2			
1	2.7 m	0.05	0.7 dB	1	2.7 m	0.05	0.6 dB
2	5.4 m	-0.07	-1.8 dB	2	5.4 m	-0.07	-1.9 dB
3	8.1 m	0.02	1.6 dB	3	8.1 m	0.02	1.7 dB
4	10.8 m	-0.04	-0.8 dB	4	10.8 m	-0.04	-0.9 dB
5	13.5 m	0.04	0.4 dB	5	13.5 m	0.04	0.4 dB
Path 3				Path 4			
1	3.6 m	0.04	0.4 dB	1	3.6 m	0.04	0.3 dB
2	6.3 m	-0.05	-1.3 dB	2	6.3 m	-0.05	-1.1 dB
3	9 m	0.01	1.2 dB	3	9 m	0.02	1.1 dB
4	11.7 m	-0.03	-0.3 dB	4	11.7 m	-0.03	-0.1 dB
5	15.2 m	0.03	0 dB	5	15.4 m	0.02	-0.2 dB
Path 5				Path 6			
1	3.6 m	0.04	0.4 dB	1	3.6 m	0.04	0.4 dB
2	6.3 m	-0.05	-1.3 dB	2	6.3 m	-0.05	-1.2 dB
3	9 m	0.02	1.3 dB	3	9 m	0.01	1.1 dB
4	11.7 m	-0.03	-0.2 dB	4	11.7 m	-0.03	-0.2 dB
5	15.2 m	0.02	-0.2 dB	5	15.2 m	0.03	0 dB
Path 7				Path 8			
1	2.7 m	0.06	1 dB	1	2.7 m	0.06	1 dB
2	5.4 m	-0.08	-2.2 dB	2	5.4 m	-0.08	-2.3 dB
3	8.1 m	0.02	1.2 dB	3	8.1 m	0.02	1.3 dB
4	10.8 m	-0.05	-0.7 dB	4	10.8 m	-0.05	-0.7 dB
5	13.5 m	0.05	0.7 dB	5	13.5 m	0.05	0.7 dB

Table C.9: Residuals for STI and $L_{p,A,S}$ of the U-Shape-Model with 1.40 m partition.

Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$	Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
Path 1				Path 2			
1	2.7 m	0.05	0.7 dB	1	2.7 m	0.06	0.7 dB
2	5.4 m	-0.07	-1.9 dB	2	5.4 m	-0.08	-2 dB
3	8.1 m	0.03	2.1 dB	3	8.1 m	0.04	2.2 dB
4	10.8 m	-0.07	-1.9 dB	4	10.8 m	-0.06	-1.9 dB
5	13.5 m	0.05	1 dB	5	13.5 m	0.05	1 dB
Path 3				Path 4			
1	3.6 m	0.05	0.5 dB	1	3.6 m	0.05	0.3 dB
2	6.3 m	-0.07	-1.4 dB	2	6.3 m	-0.07	-1.2 dB
3	9 m	0.02	1.8 dB	3	9 m	0.03	1.8 dB
4	11.7 m	-0.05	-1.6 dB	4	11.7 m	-0.05	-1.4 dB
5	15.2 m	0.04	0.7 dB	5	15.4 m	0.04	0.5 dB
Path 5				Path 6			
1	3.6 m	0.05	0.3 dB	1	3.6 m	0.05	0.4 dB
2	6.3 m	-0.07	-1.3 dB	2	6.3 m	-0.07	-1.2 dB
3	9 m	0.02	2 dB	3	9 m	0.02	1.7 dB
4	11.7 m	-0.04	-1.3 dB	4	11.7 m	-0.06	-1.6 dB
5	15.4 m	0.03	0.3 dB	5	15.2 m	0.04	0.7 dB
Path 7				Path 8			
1	2.7 m	0.07	1 dB	1	2.7 m	0.07	1 dB
2	5.4 m	-0.09	-2.2 dB	2	5.4 m	-0.09	-2.3 dB
3	8.1 m	0.03	1.7 dB	3	8.1 m	0.03	1.7 dB
4	10.8 m	-0.05	-1.5 dB	4	10.8 m	-0.06	-1.4 dB
5	13.5 m	0.05	1.1 dB	5	13.5 m	0.05	1 dB

Table C.10: Residuals for STI and $L_{p,A,S}$ of the U-Shape-Model with 1.60 m partition.

Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$	Mic. Pos. in Path	Distance to Source	Residuals STI	Residuals $L_{p,A,S}$
Path 1				Path 2			
1	2.7 m	0.06	0.7 dB	1	2.7 m	0.06	0.7 dB
2	5.4 m	-0.08	-2 dB	2	5.4 m	-0.08	-2.1 dB
3	8.1 m	0.04	2.5 dB	3	8.1 m	0.04	2.5 dB
4	10.8 m	-0.07	-2.2 dB	4	10.8 m	-0.07	-2.2 dB
5	13.5 m	0.05	1.1 dB	5	13.5 m	0.05	1 dB
Path 3				Path 4			
1	3.6 m	0.05	0.5 dB	1	3.6 m	0.05	0.5 dB
2	6.3 m	-0.07	-1.6 dB	2	6.3 m	-0.07	-1.4 dB
3	9 m	0.03	2 dB	3	9 m	0.03	1.9 dB
4	11.7 m	-0.05	-1.7 dB	4	11.7 m	-0.05	-1.7 dB
5	15.2 m	0.04	0.7 dB	5	15.4 m	0.04	0.7 dB
Path 5				Path 6			
1	3.6 m	0.05	0.4 dB	1	3.6 m	0.05	0.5 dB
2	6.3 m	-0.07	-1.5 dB	2	6.3 m	-0.07	-1.4 dB
3	9 m	0.03	2.2 dB	3	9 m	0.03	1.9 dB
4	11.7 m	-0.05	-1.5 dB	4	11.7 m	-0.05	-1.7 dB
5	15.4 m	0.04	0.4 dB	5	15.2 m	0.04	0.7 dB
Path 7				Path 8			
1	2.7 m	0.06	1 dB	1	2.7 m	0.07	0.9 dB
2	5.4 m	-0.09	-2.5 dB	2	5.4 m	-0.09	-2.4 dB
3	8.1 m	0.04	2 dB	3	8.1 m	0.03	2.1 dB
4	10.8 m	-0.06	-1.8 dB	4	10.8 m	-0.06	-1.8 dB
5	13.5 m	0.05	1.2 dB	5	13.5 m	0.05	1.1 dB

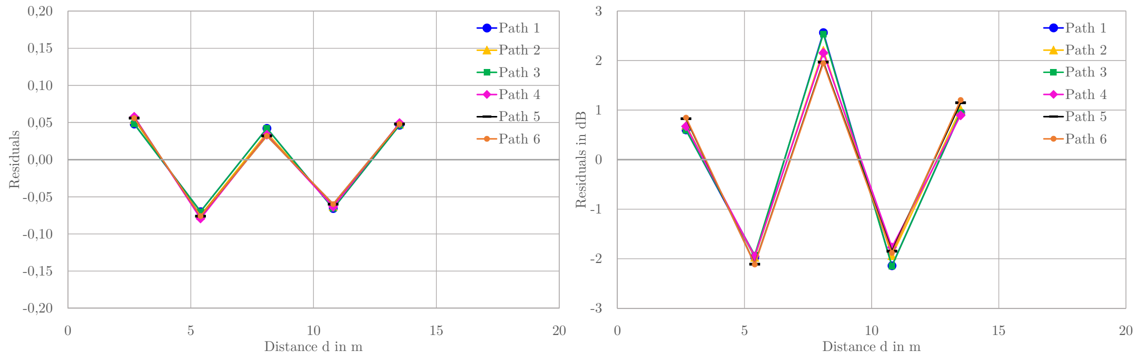
Table C.11: Residuals for STI and $L_{p,A,S}$ of the U-Shape-Model with 1.80 m partition.

140 cm				
	Path 1	Path 2	Path 3	Path 4
R^2 (STI)	86.5 %	87.1 %	87.1 %	87.1 %
R^2 $(L_{p,A,S})$	93.7 %	93.5 %	94 %	93.6 %
160 cm				
	Path 1	Path 2	Path 3	Path 4
R^2 (STI)	82.6 %	82.9 %	81.3 %	82.2 %
R^2 $(L_{p,A,S})$	89.2 %	89.2 %	89.3 %	89.2 %
180 cm				
	Path 1	Path 2	Path 3	Path 4
R^2 (STI)	80.8 %	82.1 %	81.2 %	82.1 %
R^2 $(L_{p,A,S})$	88 %	87.9 %	88 %	87.7 %

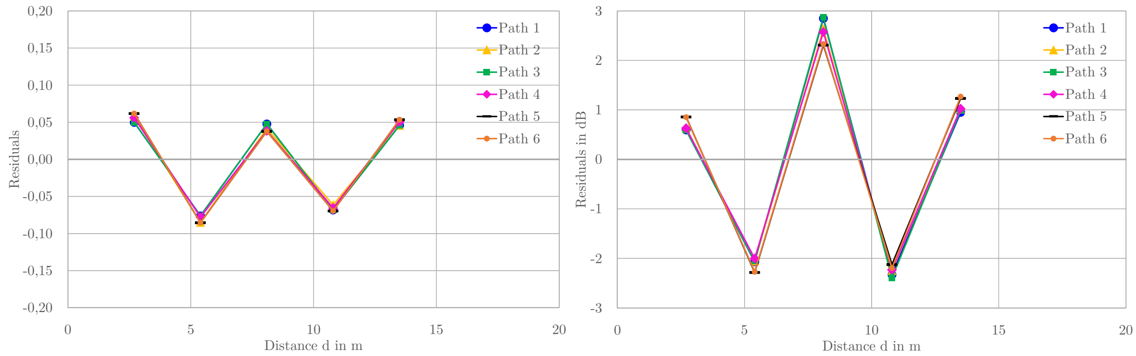
Table C.12: Results for R^2 of four measurement paths in the Two-Line-Model with three different partition walls.

140 cm								
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6	Path 7	Path 8
R^2 (STI)	81.9 %	81.9 %	83.5 %	87.3 %	86.8 %	83.5 %	79 %	78.6 %
R^2 $(L_{p,A,S})$	91.6 %	91.3 %	92.7 %	94 %	93.2 %	93.9 %	89 %	89 %
160 cm								
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6	Path 7	Path 8
R^2 (STI)	79.4 %	77.6 %	77 %	79.7 %	80.6 %	76 %	77.2 %	76.7 %
R^2 $(L_{p,A,S})$	87.8 %	87 %	86.8 %	89.2 %	89.2 %	87.9 %	86.6 %	86.7 %
180 cm								
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6	Path 7	Path 8
R^2 (STI)	77.6 %	75.8 %	77.1 %	77.1 %	78.5 %	77.1 %	77.1 %	77.8 %
R^2 $(L_{p,A,S})$	86.4 %	85.8 %	86.6 %	86.8 %	88.4 %	86.8 %	84.5 %	85.3 %

Table C.13: Results for R^2 of four measurement paths in the U-Shape-Model with three different partition walls.

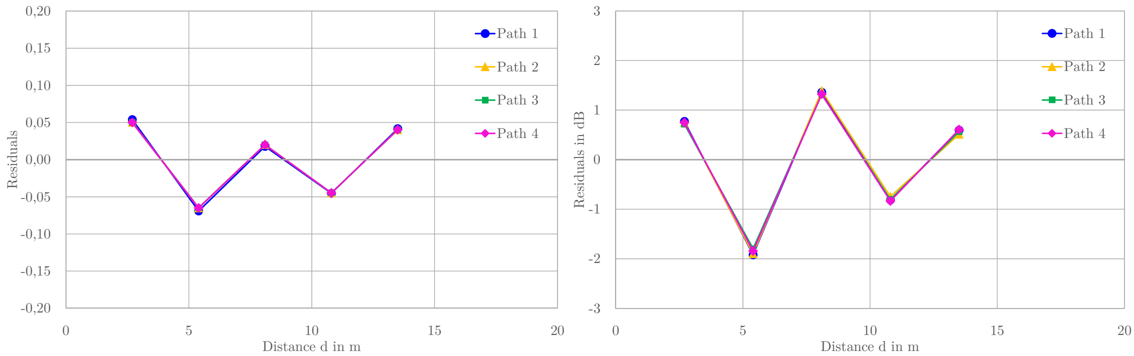


(a) 1.60 m partition wall

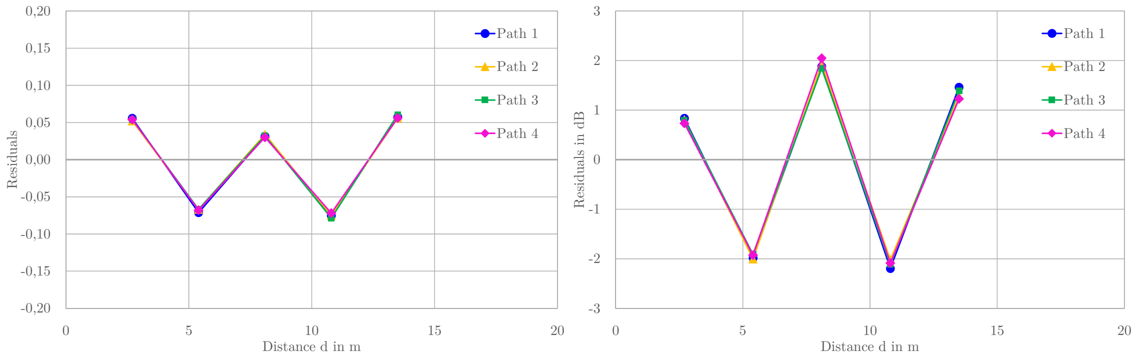


(b) 1.80 m partition wall

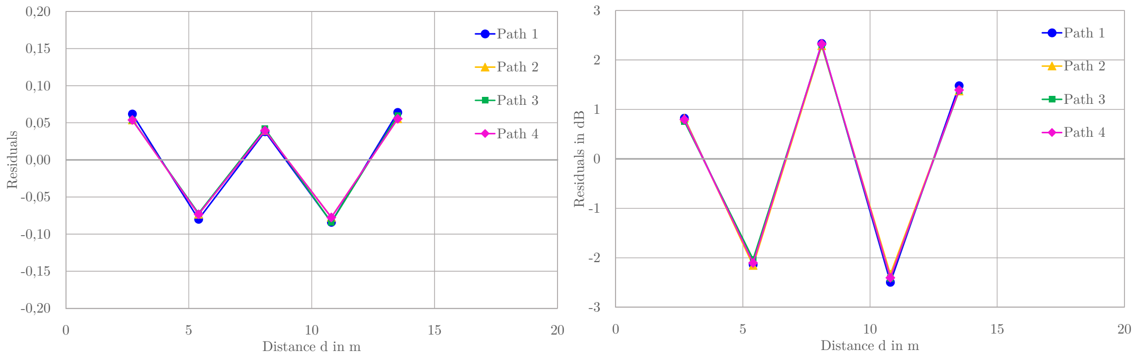
Figure C.13: Residuals of the One-Line-Model.



(a) 1.40 m partition wall

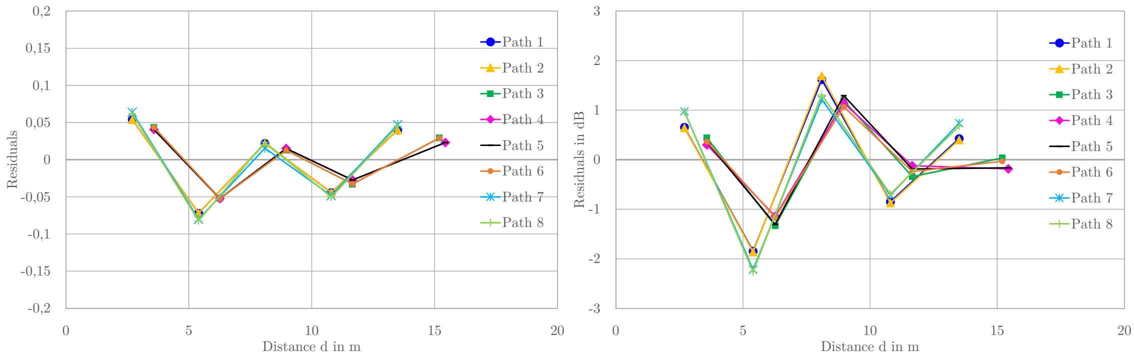


(b) 1.60 m partition wall

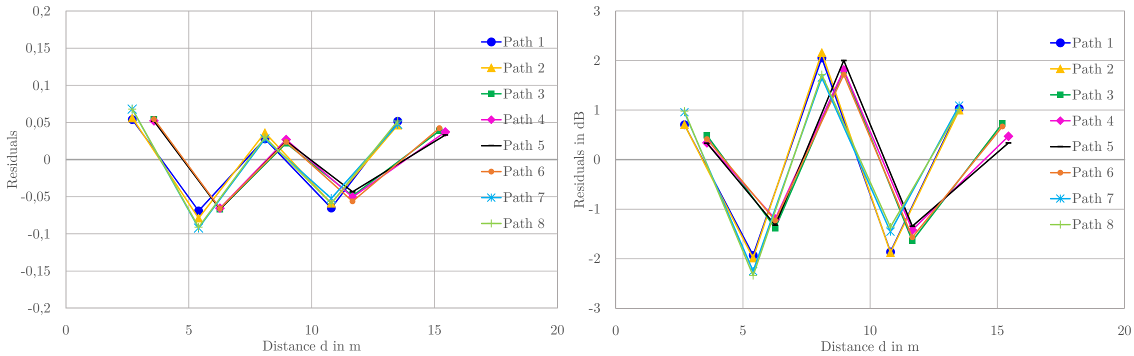


(c) 1.80 m partition wall

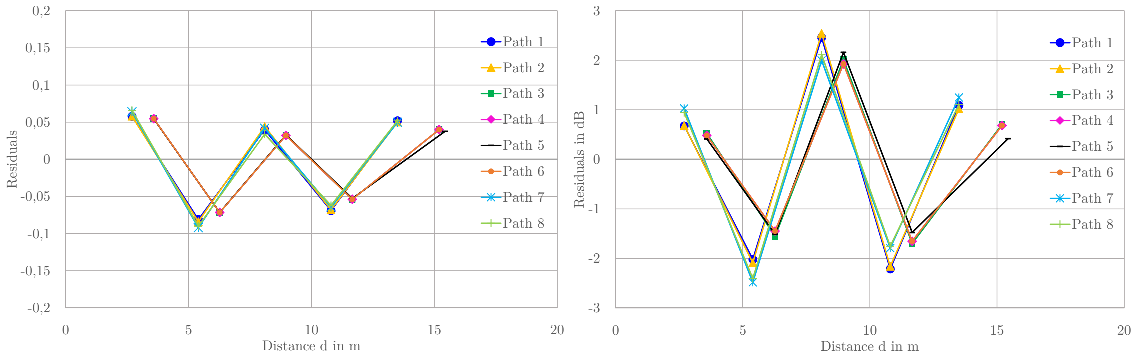
Figure C.14: Residuals of the Two-Line-Model.



(a) 1.40 m partition wall



(b) 1.60 m partition wall



(c) 1.80 m partition wall

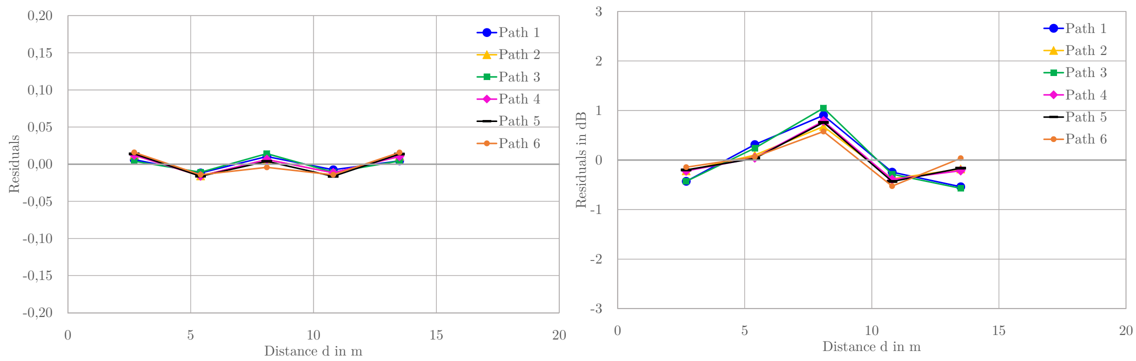
Figure C.15: Residuals of the U-Shape-Model.

One-Line-Model						
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
R^2 (STI)	98.7 %	98.3 %	98.5 %	98.3 %	97.5 %	97.5 %
R^2 $(L_{p,A,S})$	97.0 %	98.5 %	96.5 %	98.1 %	98.2 %	98.6 %

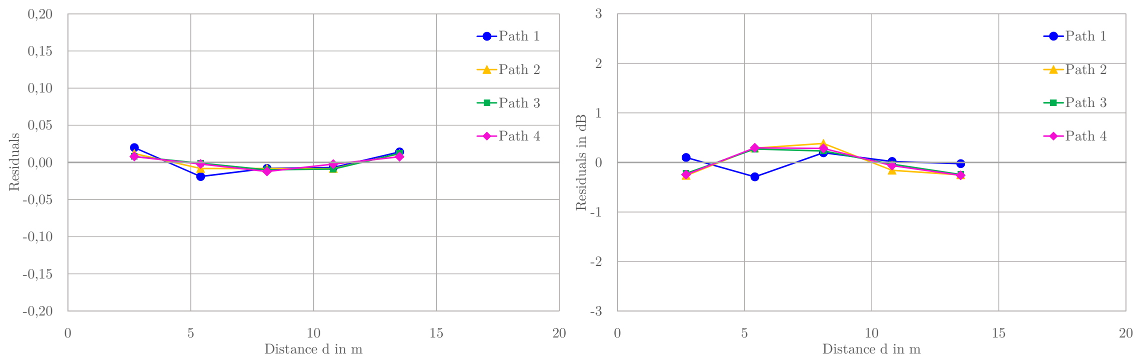
Two-Line-Model				
	Path 1	Path 2	Path 3	Path 4
R^2 (STI)	97.2 %	98.7 %	98.9 %	99.2 %
R^2 $(L_{p,A,S})$	99.7 %	99.2 %	99.5 %	99.4 %

U-Shape-Model								
	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6	Path 7	Path 8
R^2 (STI)	96.8 %	95 %	98.7 %	98.3 %	96.8 %	99.1 %	92.5 %	94 %
R^2 $(L_{p,A,S})$	99 %	99.4 %	93.5 %	91.7 %	88.4 %	95.3 %	99.8 %	99.1 %

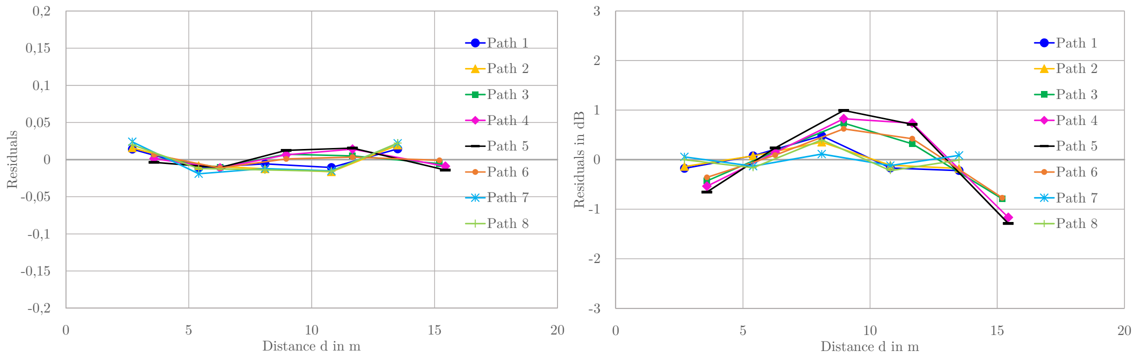
Table C.14: Results for R^2 of the measurement paths of the three office models without partition walls.



(a) One-Line-Model



(b) Two-Line-Model



(c) U-Shape-Model

Figure C.16: Residuals of the three office models without partition walls.

C.2 Source-Receiver-Matrix

C.2.1 *STI*-Matrix

Receiver \ Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,77	0,62	0,58	0,6	0,59	0,47	0,48	0,46	0,47	0,37	0,37	0,36	0,38	0,24	0,24	0,28	0,29	0,12	0,12	0,22	0,23	0,05	0,07	0,16	0,17	0,03	0,04	0,11	0,14	0,01	0,02	0,08	0,09	0,01	0,01	0,06	0,07	0	0,01
2	0,77	-	0,61	0,59	0,59	0,6	0,49	0,47	0,47	0,46	0,38	0,37	0,37	0,38	0,25	0,24	0,28	0,29	0,12	0,13	0,22	0,23	0,05	0,07	0,16	0,17	0,03	0,04	0,11	0,13	0,02	0,03	0,08	0,09	0,02	0,01	0,05	0,07	0	0,01
3	0,61	0,6	-	0,74	0,71	0,7	0,5	0,51	0,51	0,51	0,4	0,39	0,38	0,39	0,29	0,29	0,29	0,31	0,19	0,18	0,23	0,24	0,1	0,11	0,18	0,19	0,05	0,06	0,13	0,14	0,03	0,03	0,07	0,08	0,01	0,01	0,04	0,05	0	0,01
4	0,59	0,59	0,74	-	0,7	0,7	0,55	0,5	0,51	0,53	0,4	0,38	0,39	0,38	0,3	0,28	0,3	0,3	0,18	0,18	0,23	0,23	0,09	0,12	0,18	0,18	0,05	0,06	0,13	0,14	0,03	0,03	0,08	0,08	0,01	0,01	0,04	0,05	0	0
5	0,57	0,57	0,71	0,7	-	0,74	0,59	0,53	0,5	0,54	0,39	0,41	0,38	0,4	0,3	0,3	0,29	0,3	0,2	0,2	0,22	0,23	0,09	0,1	0,16	0,17	0,05	0,05	0,12	0,13	0,02	0,03	0,07	0,08	0,01	0,01	0,05	0,05	0,01	0
6	0,58	0,58	0,7	0,7	0,73	-	0,53	0,54	0,51	0,5	0,41	0,38	0,39	0,37	0,31	0,27	0,29	0,29	0,21	0,18	0,21	0,22	0,08	0,1	0,16	0,16	0,04	0,05	0,12	0,12	0,02	0,03	0,06	0,07	0,01	0,01	0,04	0,04	0	0
7	0,46	0,47	0,51	0,55	0,58	0,52	-	0,75	0,72	0,71	0,5	0,5	0,51	0,51	0,39	0,39	0,37	0,39	0,3	0,3	0,29	0,31	0,19	0,18	0,22	0,24	0,11	0,11	0,17	0,18	0,05	0,06	0,12	0,12	0,02	0,03	0,07	0,06	0,02	0,01
8	0,46	0,46	0,51	0,51	0,53	0,54	0,75	-	0,7	0,71	0,56	0,49	0,51	0,53	0,4	0,37	0,38	0,38	0,31	0,28	0,3	0,3	0,18	0,18	0,23	0,23	0,11	0,11	0,17	0,17	0,05	0,06	0,11	0,12	0,02	0,03	0,07	0,06	0,01	0,01
9	0,46	0,46	0,51	0,51	0,49	0,49	0,72	0,71	-	0,75	0,6	0,54	0,51	0,54	0,39	0,41	0,38	0,4	0,31	0,3	0,29	0,3	0,21	0,2	0,2	0,22	0,1	0,1	0,14	0,16	0,04	0,05	0,11	0,1	0,02	0,03	0,06	0,06	0,01	0,01
10	0,46	0,46	0,51	0,53	0,53	0,48	0,71	0,71	0,75	-	0,54	0,55	0,51	0,51	0,41	0,38	0,39	0,37	0,31	0,28	0,29	0,28	0,22	0,18	0,19	0,21	0,09	0,1	0,14	0,15	0,04	0,05	0,1	0,1	0,02	0,02	0,05	0,05	0,01	0,01
11	0,35	0,36	0,38	0,4	0,39	0,4	0,51	0,56	0,59	0,53	-	0,76	0,72	0,71	0,5	0,5	0,52	0,51	0,39	0,39	0,38	0,4	0,31	0,3	0,3	0,31	0,2	0,2	0,23	0,25	0,11	0,11	0,17	0,18	0,06	0,07	0,12	0,12	0,05	0,05
12	0,35	0,34	0,39	0,38	0,41	0,38	0,51	0,51	0,53	0,55	0,76	-	0,71	0,71	0,56	0,49	0,51	0,53	0,4	0,38	0,39	0,39	0,32	0,29	0,31	0,31	0,19	0,2	0,23	0,24	0,11	0,12	0,17	0,17	0,06	0,07	0,12	0,12	0,05	0,05
13	0,36	0,36	0,38	0,39	0,38	0,38	0,51	0,51	0,49	0,5	0,72	0,72	-	0,75	0,59	0,53	0,51	0,54	0,39	0,41	0,38	0,4	0,3	0,3	0,29	0,31	0,2	0,21	0,21	0,22	0,1	0,1	0,15	0,15	0,05	0,07	0,09	0,1	0,04	0,04
14	0,36	0,35	0,38	0,38	0,4	0,37	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,54	0,55	0,51	0,51	0,41	0,39	0,39	0,38	0,31	0,28	0,29	0,29	0,22	0,2	0,2	0,21	0,09	0,1	0,14	0,15	0,05	0,06	0,09	0,09	0,04	0,03
15	0,24	0,25	0,27	0,29	0,29	0,29	0,38	0,39	0,39	0,41	0,51	0,56	0,59	0,53	-	0,76	0,72	0,71	0,5	0,5	0,52	0,51	0,39	0,39	0,38	0,39	0,3	0,3	0,3	0,31	0,2	0,19	0,23	0,24	0,12	0,14	0,17	0,18	0,11	0,11
16	0,25	0,23	0,28	0,28	0,3	0,27	0,39	0,37	0,41	0,38	0,51	0,51	0,53	0,55	0,75	-	0,71	0,71	0,56	0,49	0,51	0,53	0,41	0,38	0,39	0,39	0,31	0,29	0,31	0,31	0,19	0,19	0,23	0,23	0,11	0,13	0,17	0,17	0,1	0,11
17	0,26	0,26	0,3	0,3	0,29	0,29	0,38	0,38	0,39	0,39	0,52	0,51	0,49	0,5	0,72	0,71	-	0,75	0,6	0,53	0,5	0,54	0,39	0,41	0,38	0,4	0,3	0,3	0,28	0,3	0,2	0,2	0,2	0,2	0,1	0,12	0,14	0,15	0,08	0,08
18	0,25	0,26	0,3	0,3	0,3	0,28	0,39	0,37	0,4	0,37	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,54	0,54	0,51	0,51	0,41	0,38	0,39	0,38	0,31	0,28	0,29	0,29	0,22	0,19	0,19	0,2	0,09	0,11	0,13	0,14	0,07	0,08
19	0,15	0,16	0,19	0,2	0,19	0,2	0,28	0,29	0,3	0,29	0,38	0,4	0,39	0,41	0,51	0,55	0,59	0,53	-	0,76	0,72	0,71	0,49	0,5	0,52	0,51	0,39	0,39	0,38	0,39	0,3	0,3	0,3	0,3	0,2	0,2	0,22	0,24	0,16	0,17
20	0,14	0,15	0,19	0,19	0,21	0,18	0,29	0,28	0,31	0,28	0,39	0,38	0,41	0,38	0,51	0,51	0,54	0,55	0,76	-	0,71	0,71	0,55	0,48	0,51	0,52	0,4	0,38	0,39	0,38	0,31	0,29	0,31	0,3	0,2	0,2	0,23	0,24	0,17	0,17
21	0,17	0,17	0,23	0,23	0,19	0,19	0,29	0,3	0,3	0,29	0,38	0,4	0,39	0,39	0,52	0,51	0,49	0,5	0,72	0,71	-	0,76	0,59	0,53	0,51	0,54	0,39	0,41	0,38	0,39	0,3	0,3	0,28	0,3	0,19	0,2	0,2	0,2	0,14	0,15
22	0,17	0,17	0,23	0,22	0,19	0,19	0,3	0,3	0,31	0,29	0,39	0,39	0,4	0,38	0,51	0,53	0,54	0,48	0,71	0,71	0,76	-	0,53	0,55	0,51	0,51	0,41	0,38	0,39	0,38	0,31	0,28	0,29	0,28	0,22	0,18	0,19	0,2	0,13	0,15
23	0,07	0,09	0,13	0,14	0,1	0,12	0,2	0,2	0,2	0,2	0,28	0,3	0,3	0,3	0,38	0,39	0,39	0,41	0,5	0,56	0,6	0,53	-	0,76	0,72	0,71	0,49	0,5	0,52	0,51	0,38	0,38	0,37	0,38	0,3	0,29	0,29	0,3	0,25	0,26
24	0,07	0,07	0,14	0,13	0,09	0,12	0,19	0,19	0,22	0,19	0,29	0,29	0,31	0,28	0,39	0,38	0,41	0,38	0,51	0,51	0,54	0,54	0,75	-	0,71	0,71	0,55	0,49	0,51	0,53	0,4	0,38	0,38	0,37	0,31	0,28	0,3	0,3	0,25	0,26
25	0,09	0,11	0,16	0,17	0,12	0,13	0,23	0,23	0,19	0,19	0,3	0,31	0,3	0,3	0,38	0,39	0,39	0,39	0,52	0,51	0,49	0,5	0,72	0,71	-	0,75	0,59	0,53	0,51	0,54	0,39	0,41	0,37	0,39	0,29	0,29	0,27	0,3	0,24	0,24
26	0,09	0,1	0,17	0,16	0,11	0,13	0,23	0,22	0,19	0,19	0,31	0,31	0,31	0,29	0,39	0,39	0,41	0,38	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,53	0,55	0,51	0,51	0,41	0,38	0,38	0,37	0,3	0,27	0,28	0,28	0,24	0,23
27	0,04	0,04	0,1	0,1	0,05	0,06	0,14	0,15	0,1	0,11	0,2	0,22	0,2	0,2	0,29	0,31	0,31	0,3	0,38	0,4	0,39	0,41	0,51	0,55	0,6	0,53	-	0,75	0,72	0,72	0,49	0,5	0,51	0,51	0,38	0,38	0,38	0,39	0,36	0,36
28	0,03	0,03	0,09	0,1	0,05	0,06	0,14	0,14	0,09	0,1	0,2	0,21	0,21	0,19	0,3	0,29	0,31	0,28	0,39	0,38	0,41	0,38	0,51	0,51	0,54	0,55	0,75	-	0,71	0,71	0,55	0,49	0,51	0,53	0,39	0,37	0,38	0,38	0,36	0,35
29	0,04	0,05	0,12	0,13	0,06	0,07	0,16	0,18	0,11	0,12	0,23	0,25	0,2	0,2	0,3	0,32	0,3	0,3	0,38	0,39	0,39	0,39	0,52	0,51	0,5	0,5	0,72	0,71	-	0,76	0,59	0,54	0,51	0,54	0,39	0,41	0,38	0,4	0,35	0,36
30	0,04	0,05	0,12	0,12	0,06	0,07	0,17	0,17	0,11	0,12	0,24	0,24	0,19	0,2	0,31	0,31	0,31	0,29	0,39	0,39	0,4	0,38	0,51	0,53	0,55	0,49	0,71	0,71	0,76	-	0,53	0,55	0,51	0,51	0,41	0,38	0,39	0,38	0,35	0,34
31	0,02	0,01	0,06	0,06	0,02	0,03	0,11	0,1	0,04	0,05	0,14	0,15	0,1	0,12	0,2	0,21	0,2	0,2	0,29	0,3	0,31	0,3	0,38	0,4	0,39	0,41	0,5	0,56	0,6	0,53	-	0,76	0,72	0,71	0,49	0,49	0,51	0,51	0,45	0,46
32	0,01	0,01	0,06	0,05	0,02	0,03	0,1	0,09	0,04	0,05	0,14	0,15	0,09	0,1	0,2	0,2	0,22	0,18	0,29	0,29	0,31	0,28	0,39	0,38	0,41	0,38	0,51	0,5	0,54	0,55	0,75	-	0,71	0,71	0,54	0,48	0,51	0,53	0,46	0,46
33	0,01	0,02	0,07	0,06	0,03	0,04	0,13	0,12	0,06	0,06	0,17	0,17	0,1	0,11	0,22	0,24	0,18	0,18	0,29	0,3	0,3	0,3	0,37	0,39	0,39	0,39	0,5	0,51	0,5	0,5	0,72	0,71	-	0,75	0,58	0,52	0,51	0,54	0,46	0,47
34	0,02	0,02	0,07	0,07	0,03	0,03	0,12	0,12	0,05	0,06	0,17	0,17	0,1	0,11	0,23	0,23	0,18	0,18	0,3	0,3	0,3	0,28	0,38	0,38	0,4	0,38	0,5	0,53	0,54	0,49	0,7	0,71	0,74	-	0,53	0,54	0,51	0,51	0,46	0,46
35	0	0	0,05	0,05	0,02	0,01	0,09	0,08	0,02	0,03	0,11	0,12	0,05	0,06	0,16	0,16	0,08	0,1	0,21	0,23	0,2	0,2	0,29	0,3	0,3	0,3	0,38	0,4	0,39	0,41	0,5	0,55	0,59	0,53	-	0,74	0,71	0,7	0,57	0,57
36	0	0	0,05	0,05	0,01	0,01	0,08	0,08	0,01	0,03	0,1	0,11	0,04	0,05	0,15	0,16	0,08	0,1	0,21	0,22	0,21	0,18	0,29	0,29	0,31	0,27	0,39	0,38	0,41	0,38	0,51	0,5	0,53	0,54	0,74	-	0,7	0,69	0,59	0,58
37	0	0	0,06	0,06	0,02	0,02	0,08	0,08	0,02	0,03	0,13	0,14	0,05	0,06	0,17	0,18	0,09	0,12	0,23	0,25	0,18	0,18	0,3	0,31	0,29	0,29	0,38	0,39	0,4	0,39	0,51	0,51	0,5	0,51	0,71	0,7	-	0,74	0,61	0,6
38	0	0	0,05	0,05	0,01	0,02	0,08	0,08	0,02	0,03	0,12	0,13	0,05	0,06	0,17	0,18	0,09	0,12	0,24	0,24	0,18	0,18	0,3	0,3	0,3	0,28	0,39	0,39	0,41	0,38	0,51	0,53	0,54	0,49	0,7	0,69	0,73	-	0,59	0,59
39	0	0,01	0,05	0,06	0,01	0,01	0,08	0,1	0,02	0,03	0,11	0,13	0,03	0,04	0,17	0,18	0,06	0,09	0,22	0,22	0,11	0,14	0,28	0,29	0,25	0,24	0,37	0,38	0,38	0,37	0,46	0,47	0,48	0,48	0,6	0,6	0,62	0,58	-	0,77
40	0,01	0,02	0,05	0,07	0,01	0,01	0,08	0,1	0,02	0,03	0,11	0,13	0,03	0,05	0,16	0,18	0,05	0,09	0,22	0,22	0,11	0,14	0,28	0,29	0,26	0,24	0,37	0,38	0,38	0,37	0,47	0,47	0,49	0,47	0,59	0,6	0,61	0,59	0,77	-

Figure C.17: Colored *STI*-Matrix of the One-Line-Model with 1.40 m partition.

	Sources																																							
Receiver	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,77	0,61	0,58	0,6	0,59	0,44	0,44	0,45	0,45	0,3	0,27	0,34	0,35	0,17	0,15	0,24	0,25	0,07	0,1	0,17	0,18	0,03	0,05	0,09	0,12	0,01	0,02	0,03	0,07	0	0,01	0,01	0,03	0	0,01	0	0,02	0	0
2	0,77	-	0,6	0,58	0,59	0,6	0,46	0,43	0,46	0,46	0,29	0,28	0,35	0,35	0,16	0,15	0,24	0,25	0,07	0,11	0,17	0,18	0,03	0,05	0,08	0,1	0,01	0,02	0,03	0,06	0	0,01	0,01	0,03	0	0,01	0	0,01	0	0
3	0,6	0,59	-	0,74	0,71	0,7	0,49	0,5	0,51	0,51	0,36	0,35	0,37	0,39	0,23	0,21	0,27	0,29	0,12	0,14	0,18	0,2	0,04	0,06	0,12	0,14	0,02	0,03	0,05	0,08	0	0,01	0,01	0,03	0	0	0	0,02	0	0
4	0,58	0,58	0,74	-	0,7	0,7	0,55	0,48	0,5	0,53	0,35	0,34	0,38	0,37	0,22	0,21	0,28	0,29	0,12	0,13	0,19	0,19	0,05	0,06	0,12	0,13	0,02	0,04	0,05	0,07	0	0,01	0,01	0,03	0	0	0	0,01	0	0
5	0,58	0,57	0,71	0,7	-	0,74	0,58	0,52	0,5	0,53	0,37	0,39	0,36	0,36	0,23	0,2	0,26	0,27	0,12	0,12	0,17	0,17	0,05	0,06	0,1	0,12	0,02	0,02	0,05	0,07	0	0,01	0,01	0,03	0	0	0	0,01	0	0
6	0,58	0,58	0,7	0,7	0,73	-	0,52	0,53	0,5	0,5	0,39	0,36	0,36	0,36	0,2	0,19	0,25	0,26	0,11	0,12	0,16	0,17	0,04	0,06	0,1	0,12	0,02	0,02	0,04	0,07	0	0,01	0,01	0,03	0	0	0	0,01	0	0
7	0,43	0,44	0,5	0,55	0,58	0,51	-	0,75	0,72	0,71	0,49	0,5	0,51	0,51	0,36	0,35	0,37	0,38	0,24	0,22	0,27	0,28	0,13	0,13	0,18	0,2	0,06	0,06	0,12	0,13	0,02	0,02	0,07	0,06	0	0,01	0,01	0,02	0	0
8	0,43	0,43	0,51	0,5	0,51	0,52	0,75	-	0,71	0,71	0,56	0,48	0,51	0,53	0,35	0,34	0,38	0,38	0,23	0,22	0,28	0,28	0,13	0,13	0,19	0,19	0,06	0,07	0,12	0,12	0,02	0,02	0,06	0,06	0	0,01	0,01	0,02	0	0
9	0,44	0,45	0,51	0,51	0,49	0,49	0,72	0,71	-	0,75	0,59	0,52	0,5	0,54	0,37	0,39	0,36	0,36	0,25	0,22	0,26	0,26	0,13	0,13	0,16	0,19	0,07	0,06	0,1	0,11	0,02	0,02	0,06	0,06	0	0,01	0,02	0,02	0	0
10	0,44	0,45	0,5	0,53	0,53	0,47	0,71	0,72	0,75	-	0,52	0,53	0,51	0,5	0,39	0,36	0,35	0,35	0,22	0,22	0,24	0,25	0,12	0,13	0,16	0,18	0,06	0,06	0,1	0,1	0,02	0,02	0,06	0,05	0	0,01	0,02	0,02	0	0
11	0,3	0,3	0,36	0,35	0,36	0,39	0,5	0,55	0,59	0,52	-	0,76	0,72	0,72	0,5	0,5	0,52	0,51	0,37	0,36	0,38	0,4	0,25	0,23	0,28	0,3	0,13	0,14	0,19	0,21	0,06	0,06	0,12	0,13	0,02	0,03	0,06	0,07	0,01	0,01
12	0,29	0,29	0,35	0,34	0,39	0,36	0,51	0,5	0,52	0,53	0,76	-	0,72	0,71	0,56	0,48	0,51	0,53	0,37	0,36	0,39	0,39	0,24	0,24	0,29	0,3	0,14	0,14	0,21	0,2	0,05	0,07	0,13	0,13	0,02	0,03	0,06	0,06	0,01	0,01
13	0,31	0,31	0,37	0,38	0,36	0,34	0,51	0,51	0,49	0,5	0,72	0,72	-	0,75	0,59	0,52	0,5	0,54	0,37	0,39	0,36	0,36	0,25	0,22	0,26	0,26	0,13	0,13	0,17	0,2	0,06	0,06	0,11	0,11	0,03	0,03	0,07	0,06	0,01	0,01
14	0,31	0,31	0,38	0,37	0,35	0,34	0,5	0,53	0,54	0,48	0,72	0,71	0,75	-	0,52	0,53	0,51	0,5	0,4	0,36	0,35	0,36	0,22	0,22	0,25	0,26	0,12	0,13	0,17	0,19	0,05	0,07	0,1	0,11	0,02	0,02	0,06	0,05	0,01	0,01
15	0,17	0,18	0,23	0,24	0,22	0,21	0,34	0,34	0,36	0,39	0,5	0,55	0,59	0,52	-	0,76	0,72	0,71	0,49	0,49	0,52	0,51	0,37	0,36	0,37	0,39	0,24	0,23	0,28	0,29	0,13	0,13	0,19	0,21	0,06	0,07	0,12	0,13	0,04	0,03
16	0,17	0,18	0,23	0,24	0,21	0,2	0,34	0,34	0,39	0,36	0,51	0,5	0,52	0,53	0,75	-	0,71	0,71	0,56	0,48	0,51	0,53	0,36	0,36	0,39	0,39	0,24	0,24	0,29	0,29	0,13	0,14	0,2	0,2	0,06	0,07	0,13	0,12	0,04	0,04
17	0,18	0,19	0,27	0,29	0,24	0,22	0,37	0,38	0,36	0,35	0,52	0,51	0,49	0,49	0,72	0,71	-	0,75	0,59	0,52	0,5	0,54	0,36	0,39	0,35	0,36	0,24	0,22	0,25	0,26	0,13	0,12	0,17	0,18	0,05	0,07	0,1	0,11	0,04	0,03
18	0,18	0,19	0,28	0,28	0,23	0,22	0,38	0,38	0,36	0,35	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,52	0,53	0,51	0,5	0,39	0,36	0,35	0,36	0,22	0,22	0,24	0,26	0,12	0,12	0,16	0,17	0,05	0,06	0,1	0,1	0,03	0,03
19	0,08	0,1	0,15	0,17	0,12	0,12	0,25	0,25	0,24	0,21	0,35	0,36	0,36	0,39	0,5	0,55	0,59	0,51	-	0,76	0,72	0,72	0,49	0,49	0,52	0,51	0,36	0,36	0,38	0,39	0,24	0,22	0,27	0,29	0,13	0,13	0,18	0,2	0,09	0,09
20	0,08	0,09	0,16	0,17	0,11	0,12	0,24	0,25	0,22	0,21	0,35	0,36	0,39	0,36	0,51	0,5	0,52	0,53	0,76	-	0,71	0,71	0,55	0,48	0,51	0,53	0,36	0,36	0,39	0,39	0,24	0,23	0,29	0,29	0,13	0,14	0,2	0,2	0,08	0,1
21	0,08	0,11	0,18	0,2	0,13	0,14	0,28	0,29	0,25	0,22	0,38	0,39	0,37	0,35	0,52	0,51	0,49	0,49	0,72	0,71	-	0,76	0,59	0,52	0,5	0,54	0,36	0,39	0,35	0,36	0,24	0,21	0,24	0,25	0,12	0,12	0,16	0,16	0,08	0,1
22	0,08	0,11	0,19	0,19	0,13	0,14	0,29	0,29	0,24	0,22	0,39	0,39	0,36	0,36	0,51	0,53	0,54	0,48	0,71	0,72	0,76	-	0,52	0,53	0,51	0,5	0,39	0,36	0,35	0,35	0,22	0,21	0,24	0,25	0,11	0,12	0,15	0,16	0,07	0,09
23	0,03	0,05	0,09	0,1	0,06	0,07	0,16	0,18	0,13	0,12	0,25	0,27	0,25	0,22	0,36	0,36	0,36	0,39	0,5	0,55	0,59	0,52	-	0,76	0,72	0,71	0,49	0,49	0,52	0,51	0,36	0,35	0,37	0,38	0,23	0,21	0,27	0,28	0,18	0,19
24	0,02	0,04	0,09	0,09	0,05	0,06	0,16	0,18	0,12	0,11	0,25	0,26	0,22	0,22	0,35	0,36	0,39	0,36	0,51	0,5	0,52	0,53	0,75	-	0,71	0,71	0,55	0,48	0,51	0,53	0,36	0,35	0,39	0,37	0,23	0,22	0,28	0,28	0,18	0,19
25	0,02	0,04	0,11	0,12	0,05	0,08	0,19	0,21	0,13	0,13	0,28	0,3	0,25	0,23	0,37	0,39	0,37	0,35	0,52	0,51	0,49	0,49	0,72	0,71	-	0,75	0,58	0,52	0,5	0,54	0,36	0,39	0,34	0,34	0,23	0,2	0,24	0,24	0,18	0,17
26	0,02	0,04	0,13	0,12	0,06	0,08	0,2	0,2	0,13	0,13	0,29	0,3	0,24	0,24	0,39	0,39	0,36	0,36	0,51	0,53	0,54	0,48	0,71	0,72	0,75	-	0,52	0,53	0,51	0,5	0,39	0,36	0,34	0,34	0,21	0,2	0,23	0,24	0,16	0,17
27	0,01	0,01	0,06	0,06	0,03	0,04	0,1	0,11	0,06	0,07	0,18	0,19	0,14	0,13	0,25	0,27	0,25	0,23	0,36	0,36	0,37	0,39	0,5	0,55	0,59	0,51	-	0,76	0,72	0,72	0,49	0,5	0,51	0,51	0,37	0,35	0,37	0,38	0,31	0,31
28	0,01	0,01	0,05	0,06	0,02	0,02	0,09	0,11	0,05	0,06	0,17	0,19	0,12	0,13	0,25	0,26	0,23	0,23	0,36	0,36	0,39	0,36	0,51	0,5	0,52	0,53	0,75	-	0,72	0,71	0,55	0,48	0,5	0,53	0,36	0,34	0,38	0,37	0,31	0,31
29	0,02	0,01	0,07	0,07	0,02	0,03	0,12	0,14	0,07	0,07	0,19	0,21	0,13	0,14	0,28	0,3	0,25	0,23	0,38	0,39	0,37	0,36	0,52	0,51	0,49	0,5	0,72	0,72	-	0,76	0,59	0,52	0,5	0,54	0,37	0,39	0,35	0,35	0,31	0,3
30	0,01	0,01	0,07	0,07	0,02	0,03	0,12	0,13	0,06	0,07	0,2	0,2	0,13	0,14	0,29	0,3	0,24	0,23	0,39	0,39	0,36	0,36	0,51	0,53	0,54	0,48	0,72	0,71	0,76	-	0,52	0,53	0,51	0,5	0,39	0,35	0,34	0,34	0,29	0,29
31	0	0	0,02	0,03	0	0	0,04	0,05	0,02	0,03	0,09	0,12	0,05	0,06	0,16	0,19	0,13	0,13	0,25	0,27	0,25	0,22	0,36	0,36	0,37	0,39	0,5	0,55	0,59	0,52	-	0,76	0,72	0,71	0,49	0,49	0,51	0,51	0,44	0,45
32	0	0	0,01	0,02	0	0	0,05	0,05	0,01	0,03	0,09	0,11	0,04	0,06	0,15	0,18	0,12	0,12	0,24	0,26	0,22	0,21	0,35	0,35	0,39	0,36	0,51	0,5	0,52	0,53	0,75	-	0,71	0,71	0,54	0,48	0,5	0,53	0,44	0,45
33	0	0	0,02	0,03	0	0	0,05	0,06	0,01	0,04	0,11	0,13	0,05	0,06	0,18	0,2	0,13	0,12	0,27	0,29	0,24	0,21	0,37	0,39	0,36	0,34	0,51	0,51	0,5	0,5	0,72	0,71	-	0,75	0,58	0,51	0,5	0,53	0,43	0,45
34	0	0	0,01	0,03	0	0,01	0,05	0,06	0,01	0,03	0,12	0,12	0,04	0,07	0,19	0,2	0,13	0,13	0,28	0,29	0,23	0,22	0,38	0,38	0,35	0,34	0,51	0,53	0,54	0,48	0,71	0,71	0,75	-	0,51	0,52	0,5	0,5	0,43	0,43
35	0	0	0	0,01	0	0	0,01	0,04	0	0,01	0,05	0,07	0,01	0,03	0,1	0,11	0,05	0,05	0,16	0,18	0,12	0,13	0,26	0,26	0,23	0,21	0,36	0,37	0,36	0,39	0,5	0,55	0,58	0,51	-	0,74	0,71	0,7	0,58	0,57
36	0	0	0	0,01	0	0	0,01	0,04	0	0,01	0,05	0,06	0,01	0,03	0,09	0,11	0,04	0,06	0,16	0,17	0,11	0,12	0,25	0,26	0,2	0,2	0,36	0,36	0,39	0,36	0,5	0,5	0,52	0,53	0,74	-	0,7	0,7	0,59	0,58
37	0	0	0	0,01	0	0	0,02	0,04	0,01	0,01	0,06	0,07	0,01	0,03	0,11	0,13	0,05	0,06	0,18	0,2	0,12	0,13	0,27	0,29	0,23	0,21	0,37	0,39	0,36	0,35	0,51	0,51	0,49	0,5	0,71	0,7	-	0,74	0,6	0,59
38	0	0	0	0,01	0	0	0,01	0,03	0,01	0,01	0,06	0,06	0,01	0,03	0,12	0,13	0,05	0,06	0,19	0,2	0,11	0,13	0,28	0,28	0,22	0,21	0,38	0,38	0,35	0,34	0,5	0,53	0,54	0,48	0,7	0,7	0,74	-	0,58	0,58
39	0	0	0	0,01	0	0	0,01	0,03	0	0,01	0,04	0,07	0,01	0,03	0,08	0,11	0,03	0,07	0,17	0,18	0,06	0,1	0,24	0,26	0,17	0,15	0,34	0,35	0,3	0,27	0,45	0,45	0,44	0,44	0,6	0,6	0,61	0,58	-	0,78
40	0	0	0	0	0	0	0,01	0,04	0	0,01	0,03	0,07	0,01	0,03	0,08	0,11	0,03	0,06	0,17	0,17	0,07	0,12	0,24	0,26	0,16	0,16	0,34	0,36	0,29	0,28	0,46	0,46	0,46	0,43	0,59	0,6	0,6	0,58	0,77	-

Figure C.18: Colored *STI*-Matrix of the One-Line-Model with 1.60 m partition.

Sources

Receiver	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,8	0,61	0,57	0,6	0,59	0,4	0,39	0,43	0,44	0,27	0,23	0,3	0,32	0,14	0,12	0,17	0,2	0,06	0,07	0,09	0,12	0,01	0,03	0,04	0,08	0	0,01	0,01	0,03	0	0	0	0,01	0	0	0	0	0	0
2	0,79	-	0,6	0,58	0,59	0,6	0,41	0,39	0,44	0,44	0,26	0,25	0,31	0,33	0,13	0,13	0,17	0,21	0,05	0,07	0,1	0,12	0,01	0,02	0,04	0,07	0	0,01	0,01	0,02	0	0	0	0,01	0	0	0	0	0	0
3	0,6	0,58	-	0,77	0,71	0,71	0,49	0,5	0,51	0,51	0,33	0,32	0,36	0,37	0,2	0,17	0,23	0,26	0,09	0,09	0,13	0,15	0,02	0,04	0,06	0,08	0,01	0,01	0,03	0,04	0	0	0	0,01	0	0	0	0	0	0
4	0,58	0,58	0,77	-	0,71	0,7	0,55	0,48	0,5	0,53	0,32	0,31	0,37	0,36	0,19	0,18	0,25	0,25	0,09	0,1	0,13	0,15	0,02	0,04	0,06	0,08	0	0,01	0,02	0,04	0	0	0	0,01	0	0	0	0	0	0
5	0,58	0,57	0,72	0,71	-	0,76	0,58	0,52	0,49	0,53	0,31	0,32	0,33	0,34	0,2	0,17	0,21	0,22	0,09	0,09	0,12	0,15	0,03	0,03	0,06	0,08	0,01	0,01	0,02	0,04	0	0	0	0,01	0	0	0	0	0	0
6	0,59	0,58	0,71	0,7	0,76	-	0,51	0,53	0,5	0,49	0,31	0,31	0,33	0,33	0,18	0,17	0,21	0,22	0,08	0,09	0,11	0,14	0,02	0,04	0,05	0,08	0	0,01	0,02	0,04	0	0	0	0,01	0	0	0	0	0	0
7	0,41	0,41	0,49	0,55	0,58	0,51	-	0,79	0,72	0,72	0,49	0,5	0,52	0,51	0,33	0,32	0,36	0,37	0,21	0,19	0,23	0,26	0,09	0,09	0,13	0,15	0,03	0,04	0,06	0,08	0,01	0,01	0,03	0,04	0	0	0,01	0,01	0	0
8	0,4	0,4	0,5	0,49	0,51	0,52	0,78	-	0,72	0,72	0,55	0,48	0,51	0,54	0,32	0,31	0,37	0,36	0,21	0,2	0,25	0,26	0,09	0,1	0,13	0,16	0,03	0,04	0,07	0,08	0	0,01	0,03	0,03	0	0	0	0,01	0	0
9	0,42	0,43	0,51	0,51	0,49	0,49	0,72	0,72	-	0,77	0,59	0,52	0,5	0,53	0,31	0,32	0,34	0,34	0,22	0,18	0,22	0,23	0,11	0,09	0,12	0,16	0,03	0,04	0,06	0,07	0,01	0,01	0,02	0,03	0	0	0	0	0	0
10	0,42	0,43	0,5	0,53	0,53	0,47	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,32	0,31	0,33	0,34	0,19	0,18	0,22	0,23	0,08	0,08	0,12	0,15	0,03	0,04	0,06	0,06	0	0,01	0,02	0,02	0	0	0	0	0	0
11	0,26	0,26	0,33	0,34	0,31	0,32	0,5	0,55	0,59	0,52	-	0,79	0,73	0,72	0,49	0,5	0,53	0,52	0,35	0,33	0,37	0,38	0,22	0,21	0,25	0,27	0,1	0,1	0,15	0,17	0,04	0,04	0,08	0,07	0	0,01	0,03	0,03	0	0
12	0,25	0,26	0,33	0,33	0,31	0,31	0,5	0,49	0,52	0,53	0,79	-	0,72	0,71	0,56	0,48	0,51	0,53	0,34	0,33	0,38	0,38	0,22	0,21	0,27	0,28	0,11	0,11	0,15	0,18	0,03	0,04	0,07	0,08	0	0,01	0,03	0,03	0	0
13	0,27	0,27	0,36	0,37	0,33	0,32	0,52	0,51	0,49	0,5	0,73	0,73	-	0,78	0,59	0,51	0,49	0,53	0,32	0,32	0,34	0,35	0,21	0,19	0,23	0,23	0,1	0,09	0,13	0,16	0,04	0,03	0,07	0,07	0,01	0,01	0,04	0,03	0	0
14	0,27	0,28	0,37	0,36	0,32	0,31	0,51	0,53	0,54	0,48	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,32	0,32	0,34	0,35	0,19	0,19	0,22	0,23	0,09	0,1	0,13	0,16	0,04	0,03	0,06	0,07	0	0,01	0,03	0,02	0	0
15	0,14	0,14	0,2	0,21	0,19	0,18	0,33	0,33	0,31	0,32	0,49	0,55	0,59	0,51	-	0,79	0,73	0,72	0,49	0,5	0,53	0,51	0,34	0,33	0,36	0,38	0,22	0,21	0,24	0,27	0,1	0,1	0,14	0,15	0,03	0,05	0,08	0,07	0,01	0,02
16	0,12	0,13	0,2	0,21	0,17	0,18	0,32	0,32	0,32	0,31	0,5	0,49	0,52	0,53	0,79	-	0,72	0,72	0,55	0,48	0,51	0,53	0,34	0,33	0,38	0,38	0,22	0,21	0,27	0,28	0,1	0,1	0,14	0,16	0,03	0,05	0,08	0,07	0,01	0,02
17	0,13	0,14	0,23	0,26	0,2	0,19	0,35	0,37	0,34	0,32	0,53	0,52	0,49	0,49	0,73	0,72	-	0,78	0,59	0,51	0,49	0,53	0,31	0,32	0,34	0,34	0,22	0,19	0,22	0,24	0,09	0,09	0,13	0,15	0,03	0,06	0,05	0,07	0,01	0,02
18	0,13	0,14	0,25	0,26	0,2	0,19	0,37	0,37	0,33	0,32	0,51	0,54	0,54	0,48	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,32	0,32	0,34	0,34	0,19	0,18	0,22	0,24	0,08	0,08	0,12	0,14	0,02	0,04	0,06	0,06	0,01	0,02
19	0,04	0,06	0,12	0,14	0,08	0,09	0,22	0,22	0,21	0,17	0,34	0,34	0,31	0,33	0,49	0,55	0,59	0,51	-	0,79	0,73	0,72	0,49	0,49	0,53	0,51	0,34	0,33	0,36	0,38	0,23	0,19	0,24	0,26	0,08	0,1	0,14	0,15	0,05	0,06
20	0,04	0,05	0,12	0,13	0,08	0,09	0,21	0,23	0,19	0,18	0,34	0,34	0,32	0,32	0,5	0,49	0,52	0,53	0,79	-	0,72	0,72	0,55	0,48	0,51	0,53	0,34	0,33	0,38	0,38	0,22	0,2	0,26	0,26	0,08	0,1	0,14	0,15	0,05	0,06
21	0,05	0,06	0,13	0,14	0,08	0,1	0,25	0,27	0,22	0,19	0,37	0,38	0,34	0,33	0,53	0,51	0,49	0,5	0,72	0,72	-	0,78	0,59	0,51	0,49	0,53	0,31	0,32	0,34	0,34	0,21	0,17	0,22	0,22	0,08	0,09	0,12	0,14	0,05	0,06
22	0,05	0,07	0,13	0,15	0,09	0,11	0,26	0,27	0,21	0,2	0,38	0,38	0,34	0,34	0,51	0,53	0,54	0,48	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,32	0,32	0,34	0,34	0,19	0,17	0,21	0,21	0,08	0,08	0,11	0,13	0,05	0,05
23	0,02	0,02	0,06	0,06	0,03	0,05	0,13	0,14	0,1	0,09	0,22	0,24	0,21	0,19	0,34	0,34	0,31	0,33	0,49	0,54	0,59	0,51	-	0,79	0,72	0,72	0,49	0,5	0,53	0,51	0,34	0,32	0,36	0,37	0,2	0,18	0,23	0,25	0,13	0,14
24	0,01	0,02	0,07	0,06	0,02	0,05	0,13	0,14	0,09	0,09	0,22	0,24	0,2	0,19	0,34	0,34	0,32	0,32	0,5	0,49	0,52	0,53	0,79	-	0,72	0,72	0,55	0,48	0,51	0,53	0,33	0,32	0,38	0,36	0,2	0,19	0,25	0,25	0,13	0,14
25	0,02	0,02	0,07	0,08	0,03	0,05	0,14	0,14	0,1	0,09	0,25	0,28	0,22	0,21	0,36	0,38	0,34	0,33	0,53	0,51	0,49	0,49	0,72	0,72	-	0,78	0,59	0,52	0,5	0,53	0,3	0,32	0,33	0,33	0,2	0,17	0,21	0,21	0,13	0,13
26	0,01	0,02	0,07	0,07	0,03	0,05	0,14	0,15	0,1	0,1	0,27	0,28	0,22	0,21	0,38	0,38	0,34	0,33	0,51	0,53	0,54	0,48	0,72	0,72	0,77	-	0,52	0,53	0,5	0,49	0,31	0,31	0,32	0,32	0,18	0,17	0,2	0,21	0,12	0,12
27	0	0	0,03	0,03	0	0,02	0,06	0,08	0,03	0,03	0,13	0,17	0,1	0,09	0,23	0,23	0,22	0,18	0,34	0,35	0,31	0,33	0,5	0,55	0,59	0,51	-	0,79	0,73	0,73	0,49	0,5	0,52	0,51	0,33	0,32	0,35	0,37	0,26	0,26
28	0	0	0,02	0,03	0	0,01	0,06	0,07	0,03	0,03	0,13	0,16	0,09	0,09	0,22	0,24	0,2	0,19	0,34	0,35	0,33	0,32	0,5	0,5	0,52	0,53	0,79	-	0,72	0,72	0,56	0,48	0,51	0,53	0,32	0,32	0,37	0,36	0,27	0,27
29	0	0	0,03	0,04	0	0,02	0,07	0,08	0,05	0,03	0,14	0,16	0,1	0,11	0,25	0,27	0,23	0,21	0,37	0,39	0,35	0,33	0,53	0,52	0,49	0,5	0,73	0,72	-	0,78	0,59	0,52	0,5	0,53	0,31	0,32	0,33	0,33	0,26	0,26
30	0	0	0,03	0,04	0	0,02	0,07	0,09	0,04	0,05	0,15	0,17	0,11	0,11	0,27	0,27	0,22	0,21	0,38	0,38	0,34	0,33	0,51	0,53	0,54	0,48	0,72	0,72	0,78	-	0,52	0,53	0,5	0,49	0,31	0,31	0,33	0,33	0,24	0,25
31	0	0	0	0	0	0	0,02	0,03	0,01	0	0,06	0,06	0,03	0,04	0,12	0,16	0,1	0,09	0,22	0,24	0,21	0,18	0,34	0,34	0,32	0,32	0,5	0,55	0,59	0,51	-	0,79	0,72	0,72	0,49	0,49	0,51	0,51	0,42	0,43
32	0	0	0	0	0	0	0,01	0,02	0,01	0	0,06	0,06	0,03	0,05	0,11	0,15	0,09	0,09	0,21	0,23	0,19	0,18	0,33	0,34	0,32	0,31	0,5	0,49	0,52	0,53	0,78	-	0,72	0,72	0,55	0,48	0,51	0,53	0,42	0,43
33	0	0	0	0	0	0	0,02	0,03	0	0	0,06	0,07	0,03	0,05	0,12	0,15	0,08	0,09	0,24	0,26	0,21	0,18	0,36	0,37	0,33	0,32	0,52	0,51	0,49	0,5	0,72	0,72	-	0,78	0,58	0,51	0,49	0,53	0,41	0,41
34	0	0	0	0	0	0	0,02	0,03	0	0,01	0,06	0,07	0,03	0,05	0,13	0,15	0,09	0,1	0,25	0,26	0,21	0,19	0,37	0,37	0,32	0,32	0,51	0,54	0,54	0,48	0,72	0,72	0,77	-	0,51	0,52	0,5	0,49	0,4	0,41
35	0	0	0	0	0	0	0	0,01	0	0	0,02	0,04	0,01	0,01	0,06	0,07	0,02	0,04	0,12	0,15	0,09	0,09	0,22	0,22	0,2	0,17	0,34	0,34	0,31	0,32	0,49	0,54	0,58	0,51	-	0,78	0,71	0,71	0,58	0,57
36	0	0	0	0	0	0	0	0,01	0	0	0,03	0,04	0	0,01	0,06	0,07	0,02	0,04	0,11	0,14	0,08	0,09	0,21	0,23	0,17	0,16	0,33	0,33	0,31	0,31	0,5	0,49	0,51	0,53	0,77	-	0,71	0,7	0,59	0,58
37	0	0	0	0	0	0	0	0,01	0	0	0,02	0,04	0,01	0,01	0,06	0,08	0,03	0,04	0,12	0,15	0,08	0,1	0,23	0,26	0,2	0,17	0,36	0,37	0,33	0,31	0,51	0,51	0,49	0,5	0,71	0,71	-	0,77	0,6	0,58
38	0	0	0	0	0	0	0	0,01	0	0	0,02	0,03	0,01	0,01	0,06	0,09	0,03	0,05	0,13	0,14	0,08	0,09	0,25	0,25	0,2	0,18	0,37	0,36	0,32	0,31	0,5	0,53	0,54	0,48	0,71	0,7	0,76	-	0,58	0,58
39	0	0	0	0	0	0	0	0,01	0	0	0,01	0,03	0	0,01	0,05	0,07	0,02	0,03	0,09	0,11	0,04	0,07	0,18	0,19	0,14	0,11	0,3	0,32	0,27	0,24	0,43	0,44	0,41	0,39	0,6	0,6	0,61	0,57	-	0,8
40	0	0	0	0	0	0	0	0,01	0	0,01	0,01	0,03	0	0,01	0,05	0,06	0,02	0,03	0,1	0,12	0,04	0,08	0,18	0,2	0,13	0,12	0,31	0,33	0,26	0,25	0,44	0,44	0,41	0,39	0,59	0,6	0,6	0,58	0,79	-

Figure C.19: Colored *STI*-Matrix of the One-Line-Model with 1.80 m partition.

	Sources																																							
Receiver	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,79	0,64	0,59	0,61	0,61	0,47	0,48	0,45	0,46	0,35	0,34	0,34	0,36	0,22	0,23	0,25	0,25	0,14	0,17	0,55	0,53	0,45	0,47	0,44	0,43	0,3	0,3	0,25	0,26	0,16	0,18	0,2	0,17	0,07	0,09	0,1	0,12	0,08	0,07
2	0,79	-	0,62	0,6	0,59	0,6	0,47	0,45	0,45	0,45	0,35	0,34	0,35	0,34	0,23	0,21	0,24	0,24	0,14	0,16	0,52	0,52	0,44	0,45	0,43	0,43	0,3	0,28	0,27	0,27	0,17	0,18	0,21	0,18	0,09	0,1	0,11	0,11	0,08	0,06
3	0,63	0,61	-	0,77	0,73	0,73	0,52	0,52	0,52	0,52	0,38	0,39	0,37	0,38	0,3	0,29	0,28	0,3	0,23	0,23	0,46	0,46	0,48	0,48	0,43	0,43	0,32	0,32	0,3	0,32	0,19	0,22	0,21	0,19	0,13	0,13	0,12	0,13	0,11	0,1
4	0,6	0,6	0,77	-	0,71	0,73	0,58	0,5	0,52	0,52	0,39	0,37	0,37	0,38	0,29	0,27	0,29	0,29	0,22	0,22	0,46	0,45	0,46	0,49	0,39	0,39	0,31	0,32	0,31	0,28	0,18	0,2	0,2	0,19	0,12	0,12	0,12	0,13	0,1	0,09
5	0,57	0,57	0,74	0,72	-	0,76	0,61	0,54	0,52	0,55	0,4	0,42	0,39	0,41	0,3	0,3	0,28	0,29	0,22	0,22	0,44	0,44	0,45	0,42	0,38	0,38	0,38	0,39	0,35	0,31	0,21	0,23	0,27	0,19	0,17	0,12	0,13	0,14	0,1	0,09
6	0,59	0,58	0,74	0,73	0,76	-	0,54	0,56	0,52	0,52	0,4	0,38	0,38	0,38	0,3	0,27	0,28	0,28	0,23	0,21	0,41	0,42	0,44	0,41	0,36	0,37	0,34	0,37	0,33	0,31	0,2	0,2	0,21	0,18	0,11	0,11	0,12	0,13	0,09	0,08
7	0,45	0,47	0,54	0,58	0,61	0,53	-	0,78	0,74	0,74	0,51	0,52	0,53	0,53	0,41	0,38	0,38	0,38	0,34	0,34	0,31	0,31	0,32	0,32	0,37	0,34	0,46	0,47	0,39	0,38	0,28	0,3	0,39	0,28	0,25	0,22	0,2	0,22	0,17	0,18
8	0,46	0,44	0,53	0,52	0,54	0,56	0,77	-	0,72	0,72	0,57	0,5	0,52	0,54	0,4	0,37	0,39	0,37	0,35	0,33	0,31	0,31	0,31	0,33	0,37	0,35	0,45	0,47	0,34	0,33	0,26	0,29	0,27	0,26	0,18	0,2	0,19	0,2	0,16	0,16
9	0,45	0,44	0,52	0,52	0,5	0,49	0,74	0,72	-	0,76	0,6	0,55	0,53	0,56	0,39	0,4	0,4	0,39	0,34	0,34	0,26	0,28	0,3	0,31	0,35	0,35	0,42	0,39	0,31	0,28	0,34	0,3	0,28	0,28	0,22	0,21	0,18	0,2	0,15	0,16
10	0,44	0,43	0,51	0,52	0,54	0,49	0,74	0,72	0,76	-	0,54	0,56	0,54	0,53	0,42	0,38	0,4	0,37	0,34	0,32	0,25	0,27	0,29	0,28	0,3	0,31	0,41	0,36	0,28	0,27	0,3	0,33	0,29	0,28	0,22	0,2	0,18	0,2	0,16	0,16
11	0,33	0,34	0,39	0,39	0,39	0,4	0,53	0,57	0,6	0,53	-	0,76	0,74	0,72	0,5	0,49	0,52	0,52	0,45	0,44	0,15	0,16	0,17	0,2	0,19	0,19	0,23	0,24	0,27	0,22	0,31	0,28	0,42	0,39	0,35	0,35	0,3	0,3	0,27	0,27
12	0,34	0,33	0,39	0,37	0,41	0,38	0,53	0,52	0,55	0,56	0,75	-	0,74	0,72	0,56	0,49	0,51	0,52	0,45	0,44	0,14	0,15	0,17	0,19	0,19	0,18	0,23	0,22	0,24	0,19	0,29	0,27	0,41	0,37	0,31	0,32	0,29	0,28	0,26	0,27
13	0,34	0,35	0,38	0,38	0,39	0,38	0,52	0,52	0,52	0,53	0,73	0,73	-	0,77	0,6	0,54	0,53	0,56	0,46	0,46	0,14	0,16	0,18	0,2	0,17	0,19	0,22	0,22	0,24	0,22	0,39	0,38	0,46	0,46	0,37	0,34	0,32	0,33	0,31	0,31
14	0,35	0,34	0,38	0,37	0,41	0,37	0,52	0,55	0,56	0,5	0,72	0,72	0,77	-	0,54	0,56	0,53	0,52	0,47	0,45	0,14	0,16	0,18	0,2	0,17	0,19	0,22	0,22	0,21	0,2	0,35	0,33	0,45	0,47	0,37	0,35	0,32	0,33	0,31	0,31
15	0,23	0,22	0,27	0,29	0,3	0,3	0,38	0,4	0,4	0,42	0,52	0,57	0,61	0,53	-	0,76	0,73	0,72	0,57	0,57	0,08	0,09	0,12	0,14	0,13	0,13	0,2	0,19	0,19	0,2	0,35	0,31	0,38	0,39	0,38	0,37	0,46	0,42	0,44	0,44
16	0,24	0,2	0,28	0,27	0,31	0,27	0,38	0,38	0,4	0,39	0,52	0,52	0,54	0,56	0,76	-	0,74	0,72	0,6	0,58	0,07	0,08	0,11	0,13	0,12	0,11	0,18	0,18	0,17	0,17	0,32	0,31	0,35	0,37	0,36	0,37	0,44	0,41	0,41	0,42
17	0,23	0,23	0,3	0,3	0,29	0,27	0,37	0,39	0,39	0,4	0,52	0,52	0,52	0,52	0,73	0,73	-	0,77	0,63	0,61	0,09	0,1	0,13	0,14	0,12	0,12	0,17	0,18	0,18	0,18	0,31	0,32	0,32	0,32	0,44	0,43	0,48	0,48	0,46	0,46
18	0,23	0,23	0,29	0,29	0,29	0,27	0,37	0,37	0,39	0,38	0,52	0,52	0,56	0,5	0,71	0,72	0,76	-	0,6	0,6	0,08	0,09	0,12	0,14	0,11	0,11	0,17	0,18	0,17	0,17	0,31	0,28	0,31	0,32	0,39	0,39	0,46	0,48	0,45	0,45
19	0,16	0,17	0,25	0,25	0,23	0,24	0,34	0,37	0,35	0,35	0,45	0,45	0,47	0,48	0,61	0,62	0,64	0,59	-	0,79	0,06	0,05	0,12	0,12	0,12	0,07	0,16	0,18	0,15	0,15	0,26	0,26	0,3	0,29	0,43	0,43	0,45	0,47	0,54	0,53
20	0,15	0,17	0,24	0,24	0,24	0,21	0,35	0,34	0,35	0,35	0,45	0,45	0,47	0,46	0,59	0,6	0,62	0,6	0,79	-	0,07	0,06	0,12	0,11	0,08	0,08	0,17	0,2	0,15	0,16	0,27	0,27	0,29	0,28	0,43	0,43	0,44	0,45	0,52	0,52
21	0,54	0,53	0,45	0,47	0,43	0,43	0,3	0,29	0,25	0,27	0,15	0,14	0,17	0,18	0,07	0,07	0,1	0,12	0,06	0,07	-	0,79	0,64	0,59	0,61	0,61	0,47	0,48	0,46	0,46	0,35	0,34	0,35	0,37	0,23	0,23	0,25	0,25	0,17	0,16
22	0,52	0,52	0,44	0,45	0,42	0,43	0,3	0,28	0,26	0,28	0,16	0,15	0,17	0,19	0,08	0,06	0,11	0,13	0,06	0,06	0,79	-	0,62	0,6	0,59	0,6	0,47	0,46	0,45	0,45	0,35	0,35	0,35	0,34	0,23	0,21	0,25	0,24	0,16	0,16
23	0,46	0,46	0,48	0,48	0,43	0,43	0,32	0,31	0,3	0,32	0,17	0,18	0,18	0,18	0,12	0,11	0,14	0,14	0,08	0,09	0,63	0,61	-	0,76	0,73	0,73	0,52	0,52	0,52	0,52	0,39	0,4	0,37	0,39	0,29	0,27	0,29	0,3	0,23	0,22
24	0,45	0,45	0,46	0,48	0,39	0,4	0,31	0,32	0,31	0,28	0,17	0,18	0,18	0,18	0,12	0,1	0,13	0,15	0,08	0,08	0,6	0,6	0,76	-	0,71	0,71	0,56	0,5	0,52	0,52	0,4	0,38	0,37	0,37	0,29	0,27	0,29	0,29	0,23	0,22
25	0,44	0,44	0,46	0,42	0,38	0,37	0,38	0,39	0,35	0,31	0,19	0,21	0,2	0,19	0,13	0,12	0,12	0,13	0,12	0,09	0,57	0,57	0,74	0,72	-	0,76	0,61	0,54	0,52	0,57	0,4	0,42	0,39	0,4	0,3	0,3	0,27	0,29	0,23	0,22
26	0,41	0,42	0,44	0,41	0,36	0,37	0,35	0,37	0,33	0,31	0,18	0,17	0,18	0,17	0,11	0,11	0,12	0,13	0,08	0,08	0,6	0,58	0,74	0,72	0,76	-	0,54	0,56	0,52	0,52	0,4	0,39	0,38	0,38	0,31	0,27	0,28	0,27	0,24	0,2
27	0,3	0,31	0,32	0,32	0,37	0,34	0,46	0,47	0,39	0,38	0,23	0,21	0,22	0,22	0,18	0,18	0,18	0,19	0,15	0,16	0,45	0,46	0,54	0,56	0,61	0,54	-	0,77	0,73	0,73	0,52	0,53	0,52	0,52	0,38	0,38	0,37	0,37	0,34	0,34
28	0,31	0,3	0,33	0,33	0,37	0,35	0,45	0,48	0,35	0,33	0,22	0,2	0,22	0,22	0,18	0,17	0,19	0,19	0,15	0,15	0,47	0,45	0,53	0,52	0,54	0,56	0,77	-	0,72	0,72	0,56	0,5	0,52	0,55	0,4	0,37	0,38	0,37	0,35	0,33
29	0,26	0,28	0,29	0,3	0,35	0,35	0,42	0,39	0,32	0,28	0,26	0,22	0,23	0,23	0,2	0,19	0,17	0,18	0,15	0,16	0,45	0,44	0,52	0,52	0,5	0,49	0,74	0,72	-	0,75	0,6	0,53	0,53	0,57	0,39	0,4	0,4	0,39	0,33	0,34
30	0,26	0,26	0,3	0,28	0,3	0,32	0,41	0,37	0,29	0,26	0,23	0,18	0,23	0,22	0,2	0,18	0,16	0,18	0,15	0,15	0,45	0,44	0,52	0,52	0,56	0,49	0,74	0,72	0,75	-	0,55	0,56	0,53	0,52	0,41	0,38	0,39	0,37	0,34	0,32
31	0,17	0,17	0,18	0,2	0,22	0,22	0,28	0,28	0,35	0,3	0,31	0,28	0,42	0,39	0,35	0,34	0,29	0,3	0,26	0,28	0,33	0,34	0,4	0,39	0,39	0,4	0,53	0,56	0,6	0,55	-	0,76	0,74	0,72	0,5	0,49	0,52	0,52	0,45	0,44
32	0,16	0,16	0,18	0,2	0,23	0,2	0,29	0,28	0,3	0,36	0,29	0,27	0,41	0,36	0,31	0,31	0,29	0,28	0,26	0,26	0,33	0,32	0,4	0,37	0,42	0,38	0,54	0,52	0,54	0,56	0,75	-	0,74	0,72	0,54	0,49	0,51	0,52	0,45	0,44
33	0,18	0,18	0,21	0,22	0,26	0,22	0,39	0,27	0,28	0,3	0,39	0,38	0,46	0,47	0,37	0,34	0,32	0,33	0,31	0,31	0,34	0,35	0,38	0,38	0,4	0,38	0,53	0,53	0,51	0,52	0,74	0,74	-	0,77	0,61	0,54	0,54	0,58	0,45	0,46
34	0,16	0,16	0,2	0,21	0,18	0,2	0,27	0,26	0,26	0,29	0,35	0,33	0,45	0,47	0,37	0,35	0,32	0,33	0,31	0,3	0,35	0,33	0,38	0,37	0,39	0,37	0,52	0,54	0,57	0,5	0,72	0,72	0,77	-	0,54	0,56	0,54	0,52	0,46	0,45
35	0,11	0,1	0,13	0,13	0,16	0,12	0,27	0,19	0,2	0,22	0,35	0,32	0,38	0,39	0,38	0,38	0,46	0,42	0,44	0,44	0,23	0,22	0,28	0,29	0,29	0,3	0,39	0,41	0,4	0,41	0,52	0,55	0,61	0,54	-	0,76	0,73	0,72	0,57	0,57
36	0,09	0,1	0,13	0,13	0,11	0,11	0,22	0,19	0,18	0,21	0,33	0,31	0,35	0,37	0,35	0,37	0,44	0,4	0,41	0,42	0,23	0,2	0,28	0,27	0,3	0,27	0,38	0,38	0,4	0,38	0,52	0,52	0,54	0,56	0,76	-	0,73	0,72	0,59	0,58
37	0,1	0,09	0,13	0,13	0,12	0,12	0,21	0,18	0,19	0,22	0,3	0,32	0,32	0,32	0,43	0,43	0,48	0,48	0,46	0,46	0,23	0,23	0,28	0,3	0,3	0,29	0,37	0,39	0,39	0,4	0,52	0,52	0,52	0,52	0,73	0,73	-	0,77	0,63	0,61
38	0,09	0,08	0,14	0,13	0,12	0,11	0,21	0,19	0,18	0,21	0,31	0,29	0,31	0,32	0,38	0,39	0,46	0,49	0,45	0,45	0,23	0,23	0,29	0,29	0,29	0,26	0,38	0,38	0,39	0,37	0,52	0,52	0,57	0,5	0,71	0,72	0,77	-	0,6	0,6
39	0,08	0,05	0,11	0,11	0,11	0,08	0,21	0,18	0,15	0,17	0,26	0,28	0,31	0,3	0,44	0,43	0,45	0,47	0,55	0,53	0,16	0,16	0,26	0,25	0,22	0,22	0,34	0,36	0,35	0,35	0,45	0,46	0,47	0,48	0,61	0,61	0,64	0,59	-	0,79
40	0,08	0,06	0,12	0,12	0,11	0,08	0,2	0,17	0,15	0,19	0,27	0,28	0,31	0,28	0,43	0,43	0,44	0,45	0,52	0,52	0,15	0,16	0,25	0,24	0,22	0,21	0,35	0,35	0,35	0,34	0,45	0,45	0,47	0,46	0,59	0,6	0,62	0,6	0,79	-

Figure C.20: Colored STI-Matrix of the Two-Line-Model with 1.40 m partition.

Receiver \ Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,8	0,63	0,58	0,61	0,6	0,43	0,45	0,43	0,43	0,25	0,2	0,29	0,32	0,11	0,1	0,22	0,22	0,07	0,06	0,55	0,54	0,45	0,46	0,44	0,43	0,27	0,26	0,25	0,27	0,1	0,15	0,18	0,15	0,07	0,05	0,09	0,08	0,03	0,04
2	0,8	-	0,61	0,59	0,59	0,6	0,43	0,42	0,42	0,43	0,21	0,21	0,29	0,31	0,11	0,12	0,2	0,21	0,06	0,06	0,52	0,53	0,43	0,44	0,43	0,44	0,25	0,24	0,26	0,27	0,1	0,15	0,18	0,16	0,07	0,05	0,09	0,08	0,04	0,04
3	0,63	0,6	-	0,79	0,74	0,74	0,51	0,51	0,52	0,51	0,35	0,33	0,36	0,38	0,22	0,17	0,26	0,27	0,15	0,14	0,46	0,46	0,48	0,48	0,42	0,42	0,3	0,3	0,31	0,33	0,15	0,19	0,19	0,17	0,1	0,08	0,1	0,1	0,06	0,04
4	0,59	0,59	0,79	-	0,72	0,73	0,57	0,49	0,51	0,52	0,34	0,32	0,37	0,37	0,2	0,18	0,26	0,26	0,14	0,14	0,45	0,45	0,46	0,48	0,39	0,39	0,29	0,29	0,3	0,29	0,14	0,18	0,19	0,17	0,08	0,07	0,1	0,1	0,04	0,04
5	0,57	0,57	0,74	0,72	-	0,77	0,6	0,53	0,51	0,55	0,38	0,4	0,34	0,34	0,2	0,17	0,24	0,23	0,14	0,13	0,44	0,44	0,44	0,41	0,38	0,37	0,37	0,39	0,35	0,31	0,17	0,2	0,27	0,17	0,17	0,07	0,1	0,11	0,05	0,04
6	0,59	0,58	0,74	0,73	0,77	-	0,53	0,55	0,51	0,51	0,38	0,36	0,33	0,33	0,18	0,16	0,22	0,23	0,13	0,12	0,41	0,42	0,43	0,4	0,36	0,39	0,33	0,36	0,33	0,31	0,15	0,18	0,19	0,16	0,1	0,07	0,09	0,1	0,04	0,04
7	0,42	0,43	0,53	0,57	0,6	0,52	-	0,78	0,74	0,74	0,5	0,51	0,53	0,53	0,37	0,33	0,37	0,37	0,29	0,28	0,28	0,28	0,29	0,3	0,36	0,33	0,47	0,47	0,4	0,38	0,28	0,3	0,39	0,28	0,25	0,19	0,19	0,2	0,14	0,14
8	0,44	0,41	0,53	0,51	0,52	0,55	0,78	-	0,72	0,72	0,57	0,49	0,51	0,55	0,35	0,33	0,38	0,36	0,28	0,28	0,29	0,28	0,3	0,31	0,37	0,35	0,46	0,48	0,35	0,33	0,26	0,29	0,28	0,27	0,17	0,17	0,17	0,18	0,13	0,12
9	0,43	0,41	0,52	0,51	0,49	0,49	0,74	0,73	-	0,77	0,6	0,54	0,53	0,56	0,37	0,38	0,35	0,33	0,26	0,26	0,25	0,26	0,29	0,29	0,35	0,34	0,42	0,39	0,31	0,29	0,32	0,28	0,27	0,28	0,2	0,19	0,15	0,17	0,13	0,13
10	0,42	0,42	0,51	0,52	0,54	0,48	0,74	0,73	0,77	-	0,53	0,55	0,54	0,52	0,41	0,36	0,33	0,32	0,25	0,25	0,24	0,25	0,29	0,27	0,29	0,31	0,4	0,37	0,29	0,27	0,28	0,33	0,28	0,28	0,2	0,17	0,16	0,17	0,12	0,12
11	0,26	0,26	0,36	0,32	0,37	0,38	0,52	0,57	0,6	0,52	-	0,76	0,74	0,73	0,5	0,49	0,52	0,51	0,43	0,41	0,12	0,13	0,14	0,15	0,19	0,17	0,21	0,23	0,21	0,17	0,32	0,29	0,43	0,4	0,35	0,34	0,29	0,29	0,25	0,26
12	0,25	0,25	0,33	0,32	0,39	0,36	0,52	0,52	0,54	0,54	0,76	-	0,74	0,73	0,56	0,48	0,51	0,52	0,42	0,42	0,11	0,11	0,13	0,15	0,18	0,15	0,22	0,21	0,2	0,16	0,29	0,28	0,41	0,37	0,3	0,32	0,29	0,27	0,25	0,25
13	0,29	0,29	0,37	0,36	0,35	0,32	0,52	0,52	0,52	0,53	0,74	0,74	-	0,78	0,6	0,52	0,52	0,55	0,42	0,43	0,12	0,13	0,16	0,18	0,16	0,17	0,21	0,22	0,22	0,2	0,39	0,39	0,47	0,47	0,36	0,33	0,29	0,3	0,29	0,28
14	0,29	0,28	0,38	0,36	0,34	0,32	0,52	0,55	0,56	0,5	0,72	0,72	0,78	-	0,52	0,54	0,52	0,51	0,43	0,41	0,12	0,12	0,17	0,17	0,15	0,15	0,2	0,23	0,21	0,19	0,35	0,33	0,45	0,47	0,37	0,35	0,31	0,31	0,29	0,28
15	0,14	0,14	0,22	0,24	0,2	0,17	0,35	0,35	0,38	0,41	0,51	0,56	0,6	0,52	-	0,78	0,74	0,72	0,57	0,56	0,06	0,04	0,09	0,11	0,11	0,08	0,17	0,16	0,16	0,17	0,35	0,31	0,37	0,39	0,37	0,37	0,44	0,41	0,44	0,44
16	0,12	0,13	0,21	0,23	0,18	0,17	0,34	0,34	0,38	0,37	0,51	0,51	0,53	0,55	0,78	-	0,74	0,72	0,6	0,58	0,06	0,04	0,08	0,09	0,08	0,08	0,15	0,15	0,12	0,14	0,33	0,31	0,33	0,36	0,35	0,37	0,44	0,4	0,42	0,42
17	0,16	0,16	0,26	0,28	0,21	0,18	0,36	0,38	0,35	0,34	0,52	0,51	0,51	0,51	0,73	0,74	-	0,78	0,63	0,6	0,06	0,05	0,09	0,11	0,09	0,07	0,16	0,17	0,14	0,15	0,31	0,32	0,3	0,3	0,42	0,42	0,47	0,47	0,46	0,45
18	0,15	0,15	0,26	0,27	0,2	0,18	0,37	0,37	0,34	0,33	0,51	0,52	0,56	0,49	0,72	0,72	0,78	-	0,59	0,59	0,06	0,05	0,1	0,1	0,08	0,07	0,16	0,16	0,13	0,14	0,3	0,28	0,29	0,29	0,38	0,38	0,46	0,48	0,45	0,44
19	0,06	0,09	0,21	0,22	0,12	0,09	0,31	0,33	0,25	0,21	0,43	0,43	0,43	0,45	0,61	0,61	0,63	0,58	-	0,81	0,06	0,02	0,08	0,06	0,05	0,05	0,16	0,15	0,09	0,1	0,25	0,25	0,27	0,26	0,44	0,43	0,45	0,46	0,55	0,53
20	0,06	0,08	0,21	0,21	0,12	0,1	0,31	0,31	0,23	0,23	0,42	0,43	0,43	0,42	0,59	0,6	0,61	0,59	0,81	-	0,06	0,03	0,06	0,07	0,05	0,05	0,17	0,16	0,1	0,1	0,26	0,26	0,26	0,25	0,43	0,43	0,44	0,44	0,53	0,53
21	0,54	0,53	0,45	0,46	0,44	0,43	0,27	0,26	0,26	0,26	0,1	0,1	0,16	0,14	0,05	0,05	0,06	0,08	0,04	0,05	-	0,81	0,63	0,58	0,61	0,61	0,43	0,45	0,43	0,43	0,25	0,21	0,3	0,32	0,12	0,11	0,21	0,21	0,08	0,08
22	0,53	0,53	0,44	0,44	0,43	0,43	0,26	0,24	0,26	0,26	0,1	0,11	0,17	0,15	0,05	0,05	0,08	0,09	0,03	0,04	0,8	-	0,61	0,59	0,59	0,6	0,43	0,42	0,42	0,43	0,23	0,23	0,3	0,3	0,13	0,11	0,21	0,2	0,08	0,08
23	0,46	0,46	0,48	0,48	0,42	0,42	0,3	0,29	0,31	0,32	0,15	0,13	0,17	0,17	0,09	0,08	0,09	0,1	0,05	0,04	0,63	0,6	-	0,78	0,73	0,74	0,51	0,51	0,52	0,51	0,35	0,34	0,36	0,38	0,21	0,18	0,27	0,28	0,15	0,15
24	0,45	0,45	0,47	0,49	0,38	0,39	0,29	0,29	0,3	0,28	0,14	0,13	0,16	0,16	0,08	0,07	0,09	0,1	0,04	0,05	0,59	0,59	0,78	-	0,72	0,72	0,56	0,49	0,51	0,52	0,34	0,34	0,37	0,37	0,21	0,18	0,27	0,27	0,14	0,14
25	0,44	0,44	0,44	0,42	0,38	0,37	0,37	0,38	0,35	0,3	0,16	0,17	0,17	0,15	0,1	0,08	0,09	0,1	0,05	0,03	0,57	0,57	0,74	0,72	-	0,78	0,6	0,52	0,51	0,56	0,38	0,4	0,34	0,35	0,2	0,18	0,24	0,24	0,14	0,14
26	0,41	0,42	0,44	0,4	0,36	0,42	0,33	0,35	0,33	0,31	0,14	0,13	0,15	0,15	0,08	0,07	0,08	0,09	0,04	0,03	0,6	0,58	0,74	0,72	0,78	-	0,53	0,54	0,51	0,51	0,38	0,36	0,33	0,34	0,17	0,17	0,22	0,23	0,13	0,12
27	0,29	0,28	0,3	0,3	0,36	0,33	0,47	0,47	0,39	0,38	0,22	0,2	0,21	0,21	0,16	0,15	0,16	0,17	0,12	0,12	0,42	0,43	0,53	0,56	0,6	0,53	-	0,78	0,74	0,74	0,51	0,53	0,53	0,52	0,35	0,33	0,37	0,37	0,29	0,27
28	0,29	0,27	0,31	0,31	0,37	0,35	0,46	0,48	0,36	0,33	0,21	0,19	0,2	0,22	0,15	0,14	0,17	0,16	0,12	0,11	0,43	0,41	0,53	0,51	0,52	0,55	0,78	-	0,72	0,72	0,56	0,5	0,52	0,55	0,35	0,33	0,37	0,37	0,29	0,27
29	0,26	0,26	0,29	0,29	0,35	0,35	0,43	0,4	0,32	0,29	0,21	0,17	0,21	0,22	0,18	0,15	0,13	0,16	0,12	0,11	0,42	0,41	0,52	0,51	0,5	0,49	0,74	0,73	-	0,78	0,6	0,52	0,52	0,57	0,37	0,38	0,35	0,33	0,26	0,25
30	0,25	0,25	0,29	0,27	0,3	0,32	0,41	0,37	0,29	0,27	0,2	0,17	0,21	0,22	0,18	0,15	0,13	0,15	0,11	0,1	0,42	0,42	0,51	0,52	0,56	0,49	0,74	0,73	0,78	-	0,54	0,55	0,53	0,51	0,39	0,36	0,33	0,32	0,25	0,24
31	0,13	0,13	0,16	0,18	0,2	0,19	0,27	0,28	0,32	0,28	0,32	0,28	0,42	0,39	0,35	0,34	0,29	0,29	0,25	0,26	0,25	0,26	0,36	0,33	0,37	0,38	0,53	0,56	0,6	0,54	-	0,77	0,74	0,73	0,49	0,49	0,52	0,51	0,43	0,42
32	0,13	0,12	0,16	0,18	0,2	0,18	0,28	0,28	0,27	0,36	0,29	0,28	0,41	0,37	0,3	0,31	0,29	0,27	0,24	0,25	0,25	0,25	0,34	0,33	0,41	0,36	0,54	0,52	0,53	0,55	0,77	-	0,74	0,73	0,54	0,48	0,51	0,52	0,42	0,42
33	0,15	0,14	0,2	0,21	0,25	0,19	0,4	0,28	0,28	0,3	0,39	0,38	0,47	0,47	0,36	0,32	0,29	0,3	0,29	0,28	0,28	0,28	0,37	0,37	0,37	0,33	0,53	0,53	0,5	0,51	0,74	0,74	-	0,78	0,6	0,52	0,53	0,57	0,42	0,43
34	0,13	0,13	0,18	0,18	0,17	0,18	0,29	0,26	0,26	0,29	0,35	0,33	0,46	0,48	0,37	0,35	0,3	0,31	0,29	0,28	0,28	0,28	0,39	0,37	0,35	0,33	0,51	0,55	0,57	0,5	0,72	0,72	0,78	-	0,53	0,55	0,52	0,51	0,43	0,41
35	0,05	0,05	0,11	0,11	0,16	0,08	0,27	0,17	0,17	0,19	0,35	0,31	0,37	0,38	0,37	0,37	0,44	0,42	0,44	0,44	0,14	0,13	0,23	0,24	0,21	0,18	0,35	0,35	0,38	0,39	0,51	0,55	0,6	0,52	-	0,77	0,74	0,72	0,57	0,57
36	0,06	0,04	0,1	0,09	0,08	0,07	0,19	0,16	0,14	0,16	0,32	0,31	0,32	0,36	0,35	0,37	0,43	0,4	0,42	0,42	0,12	0,12	0,22	0,23	0,19	0,18	0,34	0,35	0,38	0,35	0,51	0,51	0,53	0,55	0,77	-	0,74	0,72	0,59	0,58
37	0,06	0,06	0,11	0,1	0,1	0,08	0,2	0,17	0,15	0,17	0,31	0,32	0,3	0,3	0,42	0,43	0,48	0,48	0,46	0,46	0,16	0,14	0,26	0,27	0,22	0,17	0,37	0,38	0,35	0,33	0,52	0,51	0,51	0,51	0,73	0,74	-	0,78	0,63	0,6
38	0,06	0,05	0,1	0,11	0,09	0,08	0,19	0,17	0,14	0,17	0,3	0,28	0,29	0,29	0,38	0,39	0,46	0,49	0,45	0,45	0,15	0,14	0,26	0,26	0,21	0,18	0,38	0,37	0,34	0,32	0,52	0,52	0,57	0,49	0,72	0,72	0,78	-	0,59	0,59
39	0,04	0,03	0,09	0,07	0,05	0,05	0,19	0,14	0,1	0,14	0,25	0,26	0,27	0,25	0,44	0,43	0,45	0,46	0,55	0,54	0,08	0,08	0,21	0,21	0,11	0,1	0,3	0,3	0,24	0,2	0,43	0,43	0,43	0,45	0,61	0,61	0,63	0,58	-	0,81
40	0,05	0,03	0,09	0,07	0,05	0,05	0,18	0,15	0,1	0,14	0,26	0,28	0,26	0,25	0,43	0,44	0,44	0,44	0,53	0,53	0,07	0,06	0,2	0,21	0,11	0,11	0,3	0,31	0,22	0,21	0,42	0,43	0,43	0,42	0,59	0,6	0,61	0,59	0,81	-

Figure C.21: Colored STI-Matrix of the Two-Line-Model with 1.60 m partition.

Receiver \ Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,8	0,63	0,58	0,61	0,6	0,37	0,36	0,41	0,41	0,2	0,16	0,26	0,27	0,08	0,07	0,12	0,13	0,03	0,04	0,55	0,54	0,45	0,46	0,44	0,43	0,23	0,23	0,23	0,24	0,07	0,12	0,14	0,12	0,05	0,05	0,04	0,05	0,03	0,01
2	0,8	-	0,61	0,59	0,58	0,59	0,35	0,36	0,4	0,42	0,19	0,18	0,26	0,27	0,07	0,07	0,12	0,13	0,03	0,04	0,53	0,53	0,43	0,44	0,43	0,43	0,23	0,22	0,24	0,25	0,06	0,12	0,15	0,13	0,05	0,04	0,04	0,05	0,02	0,01
3	0,62	0,59	-	0,79	0,74	0,74	0,51	0,51	0,52	0,51	0,31	0,3	0,34	0,36	0,18	0,14	0,21	0,23	0,06	0,07	0,45	0,45	0,47	0,48	0,41	0,43	0,3	0,3	0,3	0,33	0,14	0,15	0,17	0,15	0,06	0,07	0,07	0,07	0,04	0,03
4	0,58	0,58	0,79	-	0,72	0,73	0,57	0,49	0,51	0,52	0,3	0,29	0,35	0,35	0,16	0,14	0,22	0,22	0,07	0,07	0,44	0,45	0,46	0,49	0,38	0,38	0,28	0,29	0,29	0,28	0,13	0,14	0,17	0,15	0,06	0,07	0,06	0,07	0,04	0,04
5	0,57	0,57	0,74	0,73	-	0,77	0,6	0,52	0,5	0,54	0,31	0,31	0,31	0,32	0,17	0,14	0,17	0,19	0,09	0,08	0,44	0,44	0,44	0,41	0,37	0,36	0,36	0,38	0,34	0,3	0,14	0,15	0,26	0,14	0,15	0,07	0,06	0,07	0,04	0,03
6	0,59	0,58	0,74	0,74	0,77	-	0,52	0,54	0,5	0,5	0,29	0,3	0,3	0,31	0,15	0,14	0,16	0,18	0,06	0,07	0,41	0,42	0,43	0,4	0,34	0,39	0,32	0,36	0,32	0,31	0,13	0,14	0,16	0,14	0,06	0,06	0,06	0,06	0,03	0,03
7	0,38	0,38	0,52	0,57	0,6	0,52	-	0,78	0,74	0,74	0,5	0,51	0,53	0,53	0,34	0,28	0,35	0,35	0,23	0,23	0,25	0,26	0,28	0,29	0,36	0,31	0,47	0,48	0,4	0,38	0,28	0,29	0,4	0,28	0,25	0,17	0,17	0,18	0,11	0,11
8	0,37	0,37	0,52	0,5	0,52	0,54	0,78	-	0,72	0,72	0,57	0,5	0,51	0,55	0,32	0,29	0,37	0,35	0,23	0,23	0,25	0,26	0,29	0,31	0,37	0,35	0,46	0,48	0,35	0,34	0,26	0,28	0,28	0,26	0,14	0,15	0,16	0,16	0,11	0,1
9	0,4	0,38	0,53	0,52	0,49	0,49	0,75	0,73	-	0,77	0,6	0,54	0,52	0,55	0,31	0,29	0,34	0,31	0,21	0,23	0,24	0,25	0,28	0,28	0,35	0,34	0,43	0,4	0,32	0,29	0,31	0,28	0,26	0,27	0,15	0,16	0,14	0,16	0,11	0,11
10	0,4	0,39	0,51	0,52	0,54	0,48	0,75	0,73	0,78	-	0,53	0,55	0,53	0,51	0,31	0,3	0,31	0,31	0,2	0,22	0,23	0,24	0,29	0,26	0,29	0,31	0,41	0,37	0,29	0,28	0,28	0,33	0,28	0,28	0,15	0,15	0,14	0,15	0,11	0,1
11	0,2	0,2	0,34	0,3	0,3	0,29	0,51	0,57	0,6	0,52	-	0,76	0,74	0,73	0,49	0,49	0,52	0,51	0,4	0,39	0,08	0,09	0,12	0,13	0,11	0,12	0,19	0,22	0,18	0,16	0,32	0,28	0,43	0,4	0,34	0,34	0,28	0,29	0,24	0,24
12	0,19	0,2	0,3	0,3	0,29	0,29	0,52	0,51	0,54	0,54	0,76	-	0,74	0,73	0,56	0,48	0,51	0,52	0,39	0,4	0,07	0,08	0,12	0,14	0,1	0,11	0,18	0,2	0,17	0,15	0,3	0,28	0,41	0,38	0,29	0,32	0,29	0,27	0,23	0,23
13	0,24	0,22	0,35	0,36	0,31	0,28	0,53	0,52	0,51	0,53	0,74	0,74	-	0,78	0,6	0,52	0,51	0,55	0,37	0,38	0,07	0,09	0,15	0,15	0,12	0,13	0,21	0,22	0,21	0,18	0,39	0,39	0,47	0,47	0,36	0,32	0,28	0,29	0,25	0,25
14	0,23	0,22	0,36	0,35	0,31	0,29	0,52	0,55	0,56	0,5	0,72	0,72	0,78	-	0,52	0,54	0,52	0,5	0,37	0,37	0,07	0,09	0,16	0,15	0,11	0,13	0,2	0,22	0,2	0,17	0,36	0,34	0,46	0,47	0,37	0,35	0,3	0,31	0,25	0,26
15	0,09	0,08	0,17	0,19	0,17	0,13	0,32	0,32	0,3	0,32	0,5	0,56	0,6	0,52	-	0,78	0,74	0,73	0,57	0,57	0,03	0,04	0,07	0,1	0,07	0,05	0,17	0,14	0,13	0,14	0,34	0,3	0,36	0,38	0,36	0,37	0,44	0,41	0,44	0,44
16	0,06	0,06	0,17	0,18	0,16	0,12	0,31	0,32	0,29	0,31	0,5	0,5	0,52	0,54	0,78	-	0,74	0,72	0,6	0,58	0,03	0,04	0,06	0,07	0,06	0,05	0,15	0,14	0,11	0,11	0,33	0,31	0,32	0,35	0,35	0,37	0,43	0,4	0,41	0,42
17	0,07	0,07	0,21	0,23	0,17	0,14	0,35	0,36	0,32	0,31	0,52	0,51	0,51	0,51	0,73	0,74	-	0,78	0,62	0,59	0,04	0,02	0,08	0,08	0,06	0,06	0,14	0,15	0,11	0,12	0,3	0,33	0,3	0,29	0,41	0,42	0,47	0,48	0,45	0,45
18	0,08	0,07	0,22	0,23	0,16	0,14	0,35	0,35	0,3	0,31	0,51	0,52	0,56	0,49	0,72	0,72	0,78	-	0,58	0,59	0,03	0,02	0,07	0,08	0,06	0,05	0,14	0,15	0,11	0,11	0,29	0,28	0,28	0,29	0,38	0,39	0,46	0,48	0,44	0,44
19	0,03	0,02	0,11	0,14	0,08	0,07	0,27	0,29	0,21	0,18	0,41	0,41	0,36	0,36	0,61	0,61	0,63	0,58	-	0,81	0,01	0,02	0,05	0,04	0,04	0,02	0,11	0,12	0,07	0,09	0,22	0,24	0,23	0,22	0,44	0,42	0,45	0,46	0,55	0,54
20	0,04	0,02	0,11	0,14	0,08	0,07	0,26	0,27	0,19	0,2	0,4	0,41	0,36	0,36	0,58	0,6	0,61	0,59	0,81	-	0,01	0,01	0,05	0,05	0,04	0,04	0,12	0,14	0,08	0,1	0,24	0,25	0,23	0,23	0,43	0,43	0,44	0,44	0,53	0,53
21	0,55	0,54	0,45	0,46	0,44	0,43	0,23	0,21	0,23	0,23	0,08	0,08	0,11	0,1	0,02	0,02	0,04	0,05	0,01	0	-	0,81	0,63	0,58	0,61	0,61	0,37	0,36	0,41	0,41	0,21	0,19	0,27	0,28	0,08	0,08	0,12	0,13	0,03	0,03
22	0,53	0,53	0,44	0,44	0,43	0,43	0,23	0,22	0,23	0,25	0,08	0,09	0,12	0,13	0,02	0,02	0,05	0,05	0,01	0,01	0,8	-	0,61	0,59	0,58	0,6	0,36	0,36	0,4	0,41	0,19	0,21	0,26	0,27	0,09	0,08	0,12	0,14	0,03	0,03
23	0,45	0,45	0,47	0,48	0,41	0,42	0,3	0,28	0,31	0,32	0,12	0,11	0,14	0,15	0,05	0,05	0,06	0,08	0,03	0,02	0,62	0,6	-	0,78	0,73	0,74	0,51	0,51	0,52	0,51	0,32	0,3	0,34	0,37	0,16	0,14	0,21	0,24	0,07	0,08
24	0,44	0,45	0,46	0,49	0,38	0,38	0,28	0,29	0,3	0,27	0,11	0,11	0,14	0,15	0,05	0,05	0,06	0,08	0,03	0,02	0,58	0,59	0,78	-	0,72	0,72	0,56	0,49	0,51	0,52	0,3	0,3	0,35	0,35	0,15	0,14	0,23	0,23	0,07	0,08
25	0,44	0,44	0,44	0,41	0,37	0,36	0,36	0,38	0,34	0,3	0,13	0,13	0,16	0,14	0,05	0,04	0,06	0,09	0,04	0,02	0,57	0,57	0,74	0,72	-	0,78	0,6	0,52	0,5	0,56	0,31	0,32	0,31	0,33	0,17	0,14	0,18	0,19	0,1	0,07
26	0,42	0,42	0,43	0,4	0,35	0,42	0,32	0,35	0,32	0,31	0,12	0,11	0,14	0,13	0,05	0,04	0,06	0,07	0,03	0,02	0,6	0,58	0,74	0,72	0,78	-	0,52	0,54	0,5	0,5	0,3	0,3	0,29	0,32	0,14	0,13	0,17	0,18	0,07	0,06
27	0,25	0,26	0,28	0,29	0,36	0,32	0,47	0,48	0,4	0,38	0,21	0,17	0,2	0,2	0,11	0,12	0,15	0,16	0,11	0,08	0,38	0,38	0,52	0,55	0,6	0,52	-	0,78	0,74	0,74	0,52	0,53	0,53	0,52	0,31	0,28	0,35	0,35	0,24	0,23
28	0,25	0,25	0,3	0,31	0,37	0,35	0,46	0,48	0,36	0,34	0,2	0,17	0,21	0,21	0,11	0,12	0,15	0,15	0,1	0,07	0,37	0,37	0,52	0,5	0,52	0,54	0,78	-	0,72	0,72	0,56	0,5	0,52	0,55	0,31	0,28	0,36	0,35	0,23	0,23
29	0,25	0,24	0,29	0,29	0,35	0,34	0,43	0,4	0,32	0,29	0,19	0,15	0,2	0,21	0,11	0,13	0,12	0,14	0,11	0,08	0,39	0,38	0,52	0,51	0,5	0,49	0,75	0,73	-	0,78	0,6	0,52	0,51	0,57	0,3	0,29	0,34	0,31	0,2	0,2
30	0,23	0,24	0,29	0,27	0,3	0,31	0,41	0,37	0,29	0,27	0,17	0,15	0,19	0,19	0,1	0,12	0,11	0,14	0,09	0,07	0,39	0,4	0,51	0,52	0,56	0,48	0,75	0,73	0,78	-	0,54	0,54	0,52	0,51	0,31	0,28	0,3	0,3	0,2	0,2
31	0,1	0,1	0,14	0,16	0,15	0,16	0,27	0,26	0,32	0,28	0,33	0,28	0,43	0,4	0,35	0,34	0,28	0,29	0,23	0,24	0,19	0,2	0,33	0,31	0,31	0,29	0,52	0,55	0,6	0,54	-	0,77	0,75	0,73	0,49	0,49	0,53	0,52	0,4	0,39
32	0,1	0,1	0,14	0,16	0,16	0,15	0,28	0,27	0,28	0,35	0,3	0,28	0,41	0,37	0,29	0,32	0,29	0,26	0,22	0,23	0,19	0,2	0,31	0,31	0,32	0,29	0,53	0,51	0,52	0,55	0,77	-	0,75	0,73	0,54	0,48	0,51	0,52	0,4	0,39
33	0,11	0,12	0,17	0,19	0,25	0,17	0,4	0,28	0,28	0,29	0,4	0,38	0,47	0,48	0,36	0,32	0,28	0,29	0,24	0,26	0,22	0,23	0,35	0,36	0,34	0,28	0,53	0,53	0,5	0,51	0,74	0,75	-	0,78	0,6	0,52	0,52	0,57	0,38	0,38
34	0,1	0,1	0,16	0,17	0,15	0,16	0,29	0,27	0,26	0,28	0,36	0,34	0,46	0,48	0,37	0,35	0,29	0,3	0,24	0,25	0,22	0,22	0,37	0,35	0,32	0,29	0,52	0,55	0,57	0,49	0,72	0,73	0,78	-	0,52	0,54	0,52	0,5	0,37	0,37
35	0,05	0,04	0,07	0,08	0,15	0,05	0,26	0,14	0,15	0,15	0,34	0,3	0,36	0,38	0,36	0,36	0,44	0,41	0,44	0,44	0,09	0,08	0,18	0,19	0,16	0,14	0,32	0,32	0,31	0,3	0,5	0,54	0,6	0,52	-	0,77	0,74	0,73	0,57	0,57
36	0,03	0,04	0,06	0,06	0,07	0,05	0,17	0,14	0,14	0,14	0,32	0,31	0,32	0,36	0,35	0,37	0,43	0,4	0,41	0,42	0,06	0,07	0,17	0,17	0,14	0,13	0,3	0,31	0,3	0,29	0,5	0,5	0,52	0,54	0,77	-	0,74	0,72	0,59	0,58
37	0,02	0,05	0,06	0,08	0,07	0,06	0,17	0,15	0,15	0,15	0,31	0,32	0,3	0,3	0,41	0,43	0,47	0,48	0,45	0,45	0,08	0,09	0,21	0,23	0,18	0,14	0,35	0,36	0,31	0,29	0,52	0,51	0,51	0,51	0,73	0,74	-	0,78	0,62	0,59
38	0,02	0,04	0,06	0,07	0,07	0,05	0,16	0,14	0,14	0,15	0,3	0,28	0,28	0,29	0,37	0,38	0,46	0,49	0,44	0,44	0,07	0,07	0,22	0,21	0,16	0,14	0,35	0,35	0,3	0,29	0,52	0,52	0,57	0,49	0,72	0,72	0,78	-	0,58	0,59
39	0,01	0,02	0,05	0,05	0,04	0,02	0,14	0,12	0,06	0,12	0,23	0,24	0,24	0,22	0,44	0,43	0,45	0,46	0,55	0,54	0,04	0,03	0,12	0,14	0,09	0,09	0,26	0,27	0,2	0,16	0,41	0,41	0,37	0,36	0,61	0,6	0,63	0,58	-	0,81
40	0,02	0,02	0,05	0,05	0,05	0,02	0,14	0,13	0,07	0,12	0,24	0,25	0,23	0,21	0,43	0,43	0,43	0,44	0,53	0,53	0,04	0,03	0,11	0,11	0,08	0,08	0,26	0,27	0,19	0,18	0,4	0,41	0,36	0,35	0,58	0,59	0,61	0,59	0,81	-

Figure C.22: Colored *STI*-Matrix of the Two-Line-Model with 1.80 m partition.

Receiver \ Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-	0,79	0,62	0,58	0,59	0,6	0,47	0,47	0,46	0,48	0,38	0,37	0,38	0,4	0,32	0,29	0,33	0,32	0,21	0,22	0,22	0,2	0,12	0,1	0,12	0,1	0,07	0,05	0,05	0,1	0,1	0,03	0,02	0,06	0,04	0	0,01	0	0	0
2	0,79	-	0,61	0,59	0,58	0,6	0,49	0,46	0,47	0,47	0,39	0,37	0,38	0,4	0,32	0,29	0,34	0,33	0,2	0,2	0,2	0,19	0,11	0,09	0,11	0,09	0,06	0,05	0,05	0,09	0,08	0,04	0,02	0,04	0,03	0	0,01	0	0	0
3	0,61	0,59	-	0,77	0,7	0,7	0,49	0,5	0,52	0,51	0,4	0,4	0,39	0,4	0,34	0,33	0,34	0,33	0,23	0,23	0,24	0,24	0,14	0,13	0,13	0,13	0,1	0,07	0,07	0,12	0,11	0,04	0,03	0,05	0,06	0	0,01	0,01	0,03	0
4	0,58	0,59	0,77	-	0,7	0,7	0,53	0,48	0,51	0,53	0,41	0,39	0,4	0,4	0,35	0,33	0,34	0,33	0,22	0,23	0,23	0,23	0,12	0,12	0,12	0,13	0,09	0,06	0,06	0,11	0,1	0,03	0,03	0,04	0,05	0	0,01	0,01	0,02	0
5	0,57	0,57	0,7	0,7	-	0,77	0,58	0,51	0,5	0,54	0,38	0,4	0,38	0,4	0,33	0,32	0,33	0,33	0,26	0,22	0,23	0,24	0,11	0,14	0,14	0,13	0,09	0,06	0,06	0,1	0,1	0,04	0,03	0,04	0,06	0	0,01	0,02	0,02	0
6	0,59	0,57	0,7	0,7	0,77	-	0,52	0,53	0,5	0,5	0,4	0,38	0,39	0,38	0,32	0,3	0,32	0,32	0,22	0,21	0,21	0,23	0,11	0,12	0,12	0,11	0,08	0,05	0,05	0,1	0,09	0,03	0,03	0,04	0,05	0	0	0,01	0,01	0
7	0,45	0,47	0,5	0,53	0,57	0,51	-	0,77	0,71	0,71	0,49	0,49	0,52	0,51	0,42	0,4	0,4	0,41	0,33	0,32	0,3	0,32	0,18	0,21	0,21	0,2	0,14	0,13	0,13	0,17	0,17	0,07	0,1	0,09	0,08	0,01	0,04	0,05	0,04	0,02
8	0,46	0,45	0,51	0,5	0,52	0,53	0,77	-	0,7	0,71	0,53	0,48	0,5	0,52	0,42	0,4	0,41	0,41	0,33	0,3	0,3	0,3	0,18	0,2	0,2	0,19	0,14	0,13	0,13	0,17	0,16	0,05	0,08	0,1	0,07	0,02	0,03	0,04	0,05	0,02
9	0,45	0,46	0,52	0,51	0,48	0,48	0,72	0,71	-	0,78	0,59	0,53	0,5	0,55	0,4	0,41	0,4	0,41	0,34	0,34	0,32	0,33	0,23	0,21	0,22	0,22	0,15	0,14	0,14	0,18	0,18	0,06	0,1	0,08	0,08	0,02	0,04	0,03	0,03	0,01
10	0,46	0,46	0,51	0,52	0,54	0,47	0,71	0,71	0,78	-	0,53	0,54	0,51	0,5	0,43	0,4	0,41	0,4	0,34	0,35	0,3	0,31	0,2	0,22	0,21	0,21	0,14	0,13	0,13	0,16	0,16	0,07	0,08	0,08	0,09	0,02	0,04	0,03	0,04	0,02
11	0,37	0,37	0,39	0,4	0,38	0,4	0,51	0,54	0,59	0,53	-	0,78	0,73	0,72	0,52	0,52	0,5	0,51	0,43	0,47	0,41	0,44	0,35	0,35	0,34	0,33	0,28	0,29	0,29	0,25	0,26	0,12	0,18	0,15	0,14	0,05	0,05	0,07	0,08	0,04
12	0,36	0,35	0,39	0,38	0,4	0,38	0,51	0,5	0,53	0,54	0,77	-	0,72	0,72	0,56	0,51	0,5	0,56	0,44	0,48	0,41	0,47	0,34	0,34	0,32	0,31	0,26	0,27	0,27	0,24	0,25	0,13	0,17	0,13	0,14	0,07	0,05	0,08	0,07	0,04
13	0,38	0,38	0,39	0,4	0,38	0,39	0,53	0,51	0,49	0,5	0,73	0,73	-	0,8	0,61	0,55	0,53	0,53	0,41	0,42	0,41	0,42	0,34	0,35	0,34	0,34	0,33	0,37	0,37	0,27	0,28	0,14	0,16	0,14	0,15	0,07	0,08	0,09	0,08	0,06
14	0,37	0,37	0,39	0,39	0,4	0,37	0,51	0,53	0,56	0,48	0,71	0,72	0,8	-	0,55	0,56	0,55	0,56	0,41	0,42	0,43	0,42	0,34	0,35	0,34	0,34	0,31	0,34	0,34	0,26	0,27	0,13	0,17	0,15	0,15	0,07	0,07	0,09	0,09	0,06
15	0,3	0,3	0,34	0,35	0,34	0,34	0,42	0,44	0,41	0,44	0,55	0,56	0,62	0,56	-	0,79	0,69	0,63	0,48	0,46	0,51	0,48	0,4	0,39	0,37	0,38	0,34	0,34	0,34	0,33	0,33	0,17	0,19	0,18	0,18	0,11	0,1	0,12	0,11	0,09
16	0,28	0,28	0,33	0,33	0,34	0,32	0,42	0,42	0,41	0,41	0,55	0,53	0,56	0,57	0,79	-	0,68	0,62	0,47	0,46	0,51	0,48	0,39	0,39	0,36	0,36	0,33	0,33	0,33	0,32	0,32	0,18	0,19	0,19	0,19	0,11	0,1	0,12	0,12	0,08
17	0,32	0,33	0,34	0,35	0,33	0,34	0,41	0,44	0,4	0,42	0,51	0,52	0,53	0,56	0,67	0,68	-	0,8	0,6	0,53	0,51	0,56	0,39	0,41	0,37	0,38	0,32	0,33	0,33	0,34	0,34	0,21	0,23	0,24	0,23	0,14	0,11	0,16	0,17	0,1
18	0,3	0,31	0,33	0,33	0,32	0,33	0,41	0,43	0,41	0,41	0,52	0,56	0,52	0,58	0,62	0,61	0,79	-	0,54	0,55	0,52	0,52	0,42	0,4	0,37	0,37	0,33	0,34	0,34	0,34	0,34	0,21	0,22	0,22	0,2	0,12	0,11	0,14	0,15	0,09
19	0,19	0,2	0,25	0,25	0,26	0,25	0,33	0,33	0,35	0,34	0,42	0,45	0,4	0,41	0,47	0,46	0,59	0,53	-	0,78	0,72	0,71	0,49	0,5	0,49	0,48	0,4	0,4	0,4	0,43	0,41	0,31	0,33	0,32	0,31	0,21	0,19	0,24	0,25	0,19
20	0,19	0,19	0,23	0,24	0,22	0,24	0,32	0,32	0,33	0,35	0,45	0,47	0,41	0,43	0,46	0,46	0,53	0,55	0,78	-	0,71	0,71	0,54	0,5	0,47	0,47	0,4	0,41	0,41	0,47	0,42	0,31	0,32	0,3	0,3	0,2	0,2	0,22	0,23	0,17
21	0,19	0,18	0,25	0,24	0,2	0,22	0,31	0,32	0,34	0,31	0,41	0,43	0,4	0,4	0,48	0,49	0,49	0,5	0,72	0,72	-	0,79	0,59	0,53	0,47	0,47	0,41	0,4	0,4	0,45	0,42	0,34	0,34	0,33	0,33	0,24	0,26	0,25	0,25	0,2
22	0,17	0,17	0,23	0,23	0,2	0,21	0,3	0,31	0,31	0,31	0,42	0,48	0,41	0,41	0,47	0,47	0,56	0,5	0,71	0,71	0,78	-	0,53	0,55	0,46	0,46	0,43	0,41	0,41	0,47	0,45	0,34	0,33	0,32	0,32	0,23	0,22	0,24	0,23	0,19
23	0,1	0,11	0,16	0,16	0,12	0,14	0,22	0,23	0,23	0,19	0,34	0,34	0,33	0,32	0,38	0,37	0,39	0,42	0,51	0,55	0,6	0,54	-	0,79	0,68	0,68	0,55	0,53	0,53	0,52	0,5	0,42	0,41	0,43	0,41	0,35	0,34	0,36	0,34	0,33
24	0,1	0,1	0,14	0,14	0,1	0,12	0,2	0,22	0,22	0,2	0,34	0,34	0,34	0,33	0,37	0,37	0,41	0,4	0,52	0,52	0,54	0,55	0,79	-	0,61	0,61	0,56	0,52	0,52	0,56	0,52	0,41	0,41	0,42	0,41	0,33	0,33	0,34	0,33	0,31
25	0,08	0,09	0,12	0,12	0,09	0,1	0,18	0,19	0,19	0,17	0,32	0,32	0,33	0,33	0,36	0,36	0,38	0,39	0,52	0,48	0,47	0,46	0,69	0,63	-	0,8	0,57	0,56	0,56	0,52	0,54	0,41	0,42	0,42	0,42	0,32	0,34	0,34	0,33	0,28
26	0,08	0,09	0,11	0,11	0,08	0,1	0,18	0,19	0,19	0,18	0,34	0,33	0,33	0,34	0,37	0,37	0,39	0,39	0,51	0,48	0,48	0,46	0,69	0,63	0,8	-	0,56	0,62	0,62	0,58	0,54	0,43	0,41	0,44	0,42	0,33	0,34	0,36	0,34	0,29
27	0,06	0,06	0,08	0,09	0,07	0,07	0,15	0,17	0,16	0,14	0,26	0,26	0,34	0,32	0,34	0,34	0,34	0,34	0,43	0,42	0,41	0,42	0,55	0,57	0,57	0,55	-	0,79	0,79	0,72	0,71	0,48	0,54	0,53	0,51	0,37	0,4	0,39	0,4	0,37
28	0,06	0,05	0,07	0,09	0,07	0,08	0,15	0,16	0,16	0,13	0,27	0,27	0,37	0,33	0,34	0,35	0,34	0,35	0,41	0,42	0,41	0,42	0,54	0,53	0,55	0,61	0,8	-	0,76	0,73	0,73	0,5	0,49	0,51	0,53	0,39	0,39	0,4	0,39	0,37
29	0,06	0,05	0,07	0,08	0,05	0,07	0,14	0,15	0,15	0,13	0,25	0,24	0,26	0,27	0,31	0,32	0,34	0,35	0,42	0,47	0,44	0,48	0,51	0,56	0,51	0,57	0,72	0,72	-	0,77	0,79	0,54	0,53	0,5	0,51	0,38	0,4	0,38	0,39	0,35
30	0,05	0,05	0,07	0,08	0,06	0,06	0,14	0,14	0,17	0,13	0,26	0,25	0,28	0,28	0,33	0,34	0,34	0,35	0,41	0,44	0,43	0,47	0,51	0,52	0,52	0,52	0,72	0,73	0,73	-	0,75	0,52	0,59	0,55	0,5	0,4	0,38	0,4	0,39	0,37
31	0,01	0	0,04	0,03	0,03	0,02	0,08	0,07	0,08	0,06	0,16	0,15	0,14	0,15	0,2	0,2	0,2	0,23	0,3	0,31	0,33	0,35	0,41	0,4	0,4	0,43	0,5	0,51	0,51	0,54	-	0,76	0,78	0,71	0,7	0,47	0,53	0,52	0,51	0,46
32	0,01	0	0,03	0,03	0,03	0,02	0,07	0,08	0,1	0,06	0,18	0,16	0,15	0,16	0,22	0,22	0,23	0,22	0,32	0,32	0,34	0,34	0,39	0,41	0,41	0,4	0,53	0,5	0,5	0,52	0,59	-	0,73	0,71	0,71	0,49	0,48	0,51	0,52	0,46
33	0,01	0	0,03	0,04	0,02	0,02	0,08	0,07	0,08	0,05	0,16	0,16	0,14	0,14	0,2	0,2	0,2	0,21	0,3	0,31	0,33	0,3	0,42	0,41	0,41	0,43	0,53	0,51	0,51	0,48	0,55	0,71	-	0,77	0,78	0,53	0,52	0,5	0,51	0,45
34	0,01	0	0,04	0,04	0,04	0,02	0,08	0,09	0,09	0,07	0,17	0,17	0,15	0,15	0,21	0,22	0,2	0,22	0,3	0,32	0,33	0,32	0,4	0,41	0,41	0,42	0,51	0,52	0,52	0,49	0,49	0,7	0,72	-	0,74	0,52	0,58	0,55	0,5	0,47
35	0	0	0,01	0,02	0	0	0,04	0,04	0,03	0,02	0,09	0,1	0,07	0,07	0,12	0,13	0,11	0,12	0,21	0,22	0,22	0,22	0,32	0,32	0,3	0,33	0,38	0,39	0,39	0,38	0,4	0,5	0,5	0,54	-	0,75	0,76	0,7	0,7	0,57
36	0	0	0,02	0,02	0,02	0	0,06	0,05	0,04	0,03	0,1	0,12	0,07	0,08	0,13	0,15	0,11	0,14	0,23	0,24	0,26	0,22	0,32	0,33	0,32	0,33	0,4	0,38	0,38	0,4	0,38	0,53	0,5	0,52	0,58	-	0,72	0,7	0,71	0,57
37	0	0	0,01	0,02	0	0	0,05	0,04	0,03	0,03	0,09	0,12	0,08	0,08	0,11	0,14	0,12	0,13	0,22	0,23	0,23	0,22	0,34	0,32	0,33	0,35	0,4	0,39	0,39	0,39	0,41	0,53	0,51	0,49	0,55	0,7	-	0,76	0,77	0,59
38	0	0	0,02	0,02	0,01	0	0,05	0,05	0,04	0,05	0,1	0,12	0,07	0,08	0,12	0,14	0,12	0,13	0,23	0,24	0,23	0,23	0,34	0,33	0,33	0,35	0,4	0,39	0,39	0,4	0,4	0,51	0,52	0,5	0,49	0,7	0,71	-	0,73	0,6
39	0	0	0	0,01	0	0	0,02	0,04	0,03	0,03	0,08	0,08	0,07	0,06	0,08	0,08	0,09	0,09	0,18	0,19	0,22	0,2	0,34	0,32	0,29	0,31	0,39	0,39	0,39	0,38	0,39	0,47	0,47	0,47	0,48	0,6	0,59	0,59	-	0,78
40	0	0	0,02	0,02	0	0	0,03	0,05	0,03	0,02	0,07	0,08	0,06	0,07	0,09	0,08	0,11	0,1	0,2	0,2	0,22	0,22	0,33	0,31	0,29	0,31	0,4	0,38	0,38	0,38	0,38	0,48	0,46	0,48	0,47	0,59	0,59	0,58	0,62	-

Figure C.23: Colored *STI*-Matrix of the U-Shape-Model with 1.40 m partition.

Receiver \ Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-	0,79	0,61	0,58	0,59	0,6	0,44	0,44	0,45	0,46	0,32	0,28	0,35	0,38	0,26	0,23	0,31	0,29	0,14	0,18
2	0,79	-	0,6	0,58	0,58	0,6	0,45	0,44	0,46	0,46	0,31	0,29	0,35	0,38	0,25	0,25	0,32	0,29	0,14	0,17
3	0,6	0,59	-	0,77	0,71	0,7	0,49	0,49	0,52	0,5	0,37	0,35	0,38	0,4	0,3	0,27	0,33	0,32	0,18	0,19
4	0,58	0,58	0,77	-	0,7	0,7	0,53	0,47	0,5	0,53	0,37	0,36	0,4	0,39	0,3	0,28	0,33	0,32	0,18	0,19
5	0,57	0,57	0,71	0,7	-	0,77	0,57	0,5	0,49	0,54	0,36	0,39	0,37	0,37	0,27	0,26	0,29	0,3	0,15	0,18
6	0,59	0,58	0,7	0,7	0,77	-	0,51	0,52	0,5	0,49	0,39	0,35	0,36	0,37	0,26	0,25	0,29	0,29	0,15	0,16
7	0,42	0,44	0,49	0,52	0,57	0,5	-	0,77	0,72	0,71	0,49	0,49	0,52	0,51	0,4	0,38	0,4	0,41	0,3	0,31
8	0,43	0,42	0,5	0,49	0,51	0,52	0,77	-	0,71	0,71	0,54	0,48	0,5	0,53	0,4	0,38	0,41	0,41	0,3	0,28
9	0,45	0,46	0,52	0,5	0,48	0,48	0,72	0,71	-	0,78	0,58	0,51	0,5	0,55	0,36	0,38	0,37	0,39	0,3	0,32
10	0,45	0,45	0,5	0,53	0,54	0,47	0,71	0,71	0,78	-	0,52	0,53	0,5	0,49	0,4	0,36	0,39	0,39	0,29	0,31
11	0,33	0,32	0,36	0,37	0,36	0,39	0,5	0,54	0,58	0,51	-	0,78	0,74	0,72	0,52	0,52	0,51	0,52	0,42	0,46
12	0,31	0,31	0,35	0,36	0,38	0,35	0,51	0,5	0,52	0,53	0,78	-	0,73	0,73	0,55	0,51	0,51	0,56	0,43	0,47
13	0,34	0,34	0,38	0,4	0,36	0,36	0,53	0,51	0,49	0,49	0,74	0,73	-	0,8	0,6	0,54	0,54	0,53	0,38	0,39
14	0,34	0,34	0,38	0,39	0,36	0,36	0,51	0,54	0,56	0,47	0,72	0,72	0,8	-	0,54	0,55	0,55	0,56	0,39	0,4
15	0,22	0,23	0,3	0,32	0,26	0,23	0,4	0,41	0,37	0,4	0,54	0,56	0,61	0,55	-	0,79	0,69	0,63	0,47	0,45
16	0,2	0,23	0,29	0,31	0,23	0,23	0,39	0,4	0,37	0,37	0,54	0,52	0,55	0,56	0,79	-	0,68	0,63	0,46	0,45
17	0,27	0,28	0,33	0,35	0,27	0,29	0,42	0,44	0,38	0,4	0,52	0,53	0,54	0,57	0,68	0,68	-	0,79	0,59	0,52
18	0,26	0,27	0,33	0,34	0,26	0,29	0,42	0,44	0,39	0,39	0,53	0,56	0,53	0,58	0,62	0,62	0,79	-	0,53	0,54
19	0,11	0,15	0,21	0,21	0,14	0,17	0,3	0,31	0,3	0,29	0,41	0,44	0,38	0,4	0,45	0,45	0,58	0,52	-	0,79
20	0,12	0,15	0,21	0,22	0,16	0,17	0,31	0,31	0,31	0,32	0,44	0,46	0,39	0,41	0,44	0,44	0,51	0,53	0,78	-
21	0,11	0,15	0,22	0,22	0,16	0,18	0,3	0,31	0,31	0,29	0,41	0,43	0,39	0,4	0,48	0,5	0,49	0,5	0,72	0,72
22	0,11	0,14	0,21	0,21	0,16	0,18	0,29	0,3	0,28	0,27	0,42	0,48	0,41	0,4	0,47	0,47	0,56	0,5	0,71	0,72
23	0,05	0,06	0,11	0,11	0,07	0,1	0,18	0,2	0,17	0,15	0,3	0,31	0,31	0,29	0,35	0,34	0,37	0,4	0,5	0,54
24	0,05	0,05	0,09	0,09	0,06	0,09	0,16	0,18	0,15	0,14	0,29	0,3	0,3	0,29	0,34	0,34	0,4	0,38	0,51	0,51
25	0,06	0,06	0,1	0,08	0,06	0,08	0,16	0,17	0,14	0,14	0,32	0,32	0,32	0,33	0,35	0,35	0,33	0,34	0,52	0,49
26	0,05	0,06	0,1	0,08	0,06	0,07	0,16	0,17	0,15	0,14	0,33	0,32	0,32	0,33	0,36	0,36	0,33	0,33	0,52	0,49
27	0,03	0,03	0,06	0,06	0,04	0,05	0,12	0,13	0,11	0,1	0,25	0,25	0,33	0,31	0,33	0,33	0,29	0,3	0,43	0,43
28	0,03	0,04	0,05	0,05	0,04	0,05	0,11	0,12	0,1	0,1	0,26	0,25	0,36	0,33	0,33	0,33	0,29	0,3	0,42	0,43
29	0,03	0,02	0,05	0,05	0,03	0,05	0,12	0,11	0,1	0,11	0,24	0,24	0,23	0,26	0,3	0,31	0,28	0,29	0,43	0,48
30	0,02	0,02	0,06	0,04	0,04	0,05	0,11	0,12	0,12	0,09	0,25	0,24	0,25	0,27	0,33	0,33	0,29	0,3	0,42	0,45
31	0	0	0,01	0,01	0	0	0,06	0,04	0,05	0,05	0,13	0,13	0,11	0,11	0,18	0,17	0,15	0,16	0,28	0,29
32	0	0	0	0	0,02	0	0,03	0,05	0,05	0,03	0,14	0,13	0,11	0,11	0,18	0,17	0,16	0,15	0,29	0,3
33	0	0	0	0,01	0,01	0,01	0,05	0,06	0,06	0,02	0,14	0,13	0,11	0,11	0,18	0,18	0,16	0,16	0,3	0,3
34	0	0	0	0,01	0,01	0,01	0,05	0,06	0,07	0,05	0,14	0,13	0,11	0,11	0,18	0,19	0,16	0,18	0,29	0,31
35	0	0	0	0	0	0	0,02	0,03	0,01	0	0,05	0,05	0,04	0,05	0,06	0,09	0,08	0,08	0,18	0,18
36	0	0	0	0,01	0	0	0,03	0,04	0,02	0,01	0,05	0,06	0,05	0,05	0,08	0,1	0,08	0,09	0,2	0,2
37	0	0	0	0	0	0	0,02	0,02	0,01	0	0,06	0,08	0,04	0,07	0,08	0,1	0,09	0,09	0,2	0,19
38	0	0	0	0	0	0	0,02	0,03	0,01	0,01	0,07	0,07	0,05	0,07	0,08	0,1	0,1	0,09	0,2	0,21
39	0	0	0	0	0	0	0,01	0,01	0	0,02	0,05	0,05	0,02	0,05	0,04	0,06	0,09	0,05	0,15	0,17
40	0	0	0	0	0	0	0,02	0,02	0	0,01	0,05	0,05	0,02	0,03	0,05	0,07	0,09	0,06	0,16	0,16

Receiver \ Sources	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	0,17	0,18	0,09	0,06	0,06	0,06	0,04	0,04	0,06	0,05	0,01	0	0,01	0,01	0	0	0	0	0	0
2	0,17	0,17	0,07	0,06	0,06	0,07	0,03	0,03	0,06	0,05	0,01	0	0,01	0,02	0,01	0	0	0	0	0
3	0,21	0,21	0,1	0,1	0,1	0,09	0,08	0,06	0,08	0,08	0,02	0,02	0,01	0,02	0	0,01	0	0	0	0
4	0,19	0,2	0,11	0,08	0,09	0,08	0,06	0,05	0,08	0,08	0,03	0,02	0,02	0,02	0	0	0	0	0	0
5	0,18	0,2	0,08	0,1	0,1	0,09	0,06	0,05	0,08	0,06	0,02	0,01	0,02	0,03	0	0	0,01	0	0	0
6	0,18	0,2	0,08	0,08	0,09	0,07	0,05	0,05	0,07	0,05	0,01	0,01	0,01	0,02	0	0	0	0	0	0
7	0,29	0,31	0,15	0,17	0,2	0,17	0,12	0,1	0,14	0,13	0,06	0,06	0,06	0,05	0,01	0,01	0,02	0,02	0	0,01
8	0,29	0,3	0,14	0,16	0,19	0,17	0,13	0,09	0,14	0,14	0,04	0,06	0,06	0,05	0,01	0,01	0,01	0,02	0	0
9	0,3	0,3	0,15	0,15	0,18	0,2	0,11	0,1	0,13	0,14	0,02	0,06	0,05	0,05	0	0,01	0,01	0,01	0	0
10	0,28	0,29	0,14	0,15	0,18	0,17	0,11	0,1	0,13	0,13	0,06	0,06	0,04	0,07	0	0,01	0,01	0,01	0	0
11	0,42	0,45	0,29	0,3	0,33	0,33	0,27	0,25	0,24	0,25	0,08	0,12	0,12	0,13	0,03	0,04	0,05	0,05	0,02	0,02
12	0,42	0,48	0,28	0,28	0,3	0,31	0,25	0,24	0,24	0,24	0,11	0,11	0,13	0,12	0,04	0,05	0,05	0,05	0,02	0,02
13	0,41	0,43	0,3	0,3	0,33	0,33	0,32	0,36	0,24	0,26	0,09	0,11	0,13	0,12	0,05	0,06	0,05	0,06	0,03	0,03
14	0,43	0,43	0,3	0,3	0,33	0,34	0,31	0,34	0,25	0,25	0,1	0,12	0,14	0,12	0,05	0,05	0,06	0,06	0,03	0,03
15	0,52	0,49	0,34	0,34	0,36	0,36	0,33	0,32	0,32	0,33	0,14	0,15	0,17	0,17	0,08	0,06	0,09	0,09	0,05	0,06
16	0,52	0,49	0,34	0,33	0,35	0,35	0,32	0,32	0,32	0,32	0,14	0,15	0,17	0,18	0,09	0,06	0,09	0,1	0,05	0,05
17	0,5	0,56	0,37	0,4	0,34	0,34	0,28	0,3	0,31	0,29	0,15	0,16	0,2	0,18	0,1	0,08	0,11	0,12	0,07	0,06
18	0,51	0,52	0,4	0,37	0,33	0,34	0,28	0,3	0,31	0,29	0,15	0,16	0,19	0,16	0,09	0,07	0,09	0,09	0,05	0,06
19	0,72	0,72	0,49	0,5	0,49	0,48	0,4	0,39	0,43	0,41	0,29	0,31	0,32	0,29	0,18	0,15	0,22	0,21	0,15	0,13
20	0,71	0,72	0,54	0,5	0,47	0,47	0,4	0,4	0,48	0,42	0,27	0,28	0,3	0,29	0,17	0,15	0,2	0,19	0,14	0,13
21	-	0,79	0,59	0,51	0,46	0,45	0,4	0,38	0,44	0,41	0,29	0,3	0,31	0,3	0,16	0,14	0,2	0,2	0,16	0,12
22	0,78	-	0,52	0,54	0,44	0,44	0,41	0,39	0,47	0,44	0,3	0,31	0,31	0,3	0,16	0,16	0,22	0,2	0,15	0,13
23	0,59	0,52	-	0,79	0,69	0,68	0,56	0,54	0,53	0,51	0,4	0,39	0,44	0,42	0,29	0,27	0,35	0,33	0,29	0,27
24	0,53	0,54	0,79	-	0,62	0,62	0,56	0,52	0,57	0,52	0,39	0,39	0,43	0,41	0,28	0,26	0,34	0,32	0,28	0,27
25	0,46	0,45	0,69	0,63	-	0,8	0,56	0,55	0,52	0,54	0,37	0,38	0,4	0,39	0,22	0,23	0,31	0,29	0,22	0,2
26	0,47	0,45	0,69	0,63	0,8	-	0,54	0,61	0,57	0,54	0,4	0,37	0,41	0,4	0,22	0,26	0,32	0,3	0,23	0,21
27	0,39	0,4	0,55	0,57	0,55	0,54	-	0,8	0,73	0,72	0,48	0,54	0,54	0,51	0,36	0,36	0,39	0,39	0,34	0,33
28	0,39	0,39	0,54	0,54	0,54	0,6	0,8	-	0,73	0,74	0,49	0,49	0,51	0,53	0,36	0,37	0,4	0,38	0,34	0,33
29	0,43	0,47	0,51	0,56	0,51	0,57	0,73	0,73	-	0,79	0,53	0,52	0,5	0,51	0,35	0,39	0,35	0,35	0,31	0,31
30	0,42	0,46	0,51	0,52	0,52	0,52	0,72	0,74	0,8	-	0,51	0,58	0,55	0,5	0,39	0,37	0,36	0,36	0,31	0,32
31	0,29	0,31	0,39	0,38	0,36	0,4	0,49	0,51	0,53	0,51	-	0,78	0,71	0,71	0,47	0,53	0,52	0,5	0,45	0,45
32	0,3	0,32	0,37	0,39	0,38	0,37	0,53	0,5	0,51	0,58	0,78	-	0,71	0,72	0,48	0,48	0,5	0,52	0,45	0,45
33	0,3	0,29	0,43	0,41	0,39	0,41	0,53	0,51	0,48	0,55	0,71	0,71	-	0,78	0,52	0,51	0,5	0,5	0,43	0,43
34	0,3	0,31	0,41	0,41	0,38	0,4	0,51	0,53	0,49	0,49	0,71	0,72	0,79	-	0,5	0,57	0,54	0,5	0,44	0,43
35	0,15	0,15	0,29	0,29	0,27	0,27	0,36	0,36	0,36	0,39	0,49	0,5	0,53	0,51	-	0,77	0,7	0,7	0,58	0,58
36	0,16	0,17	0,3	0,3	0,27	0,29	0,37	0,37	0,39	0,36	0,53	0,49	0,51	0,58	0,77	-	0,7	0,71	0,57	0,57
37	0,17	0,19	0,33	0,31	0,29	0,3	0,39	0,39	0,36	0,36	0,53	0,51	0,48	0,55	0,7	0,7	-	0,77	0,58	0,58
38	0,17	0,19	0,32	0,31	0,28	0,31	0,4	0,38	0,36	0,37	0,51	0,52	0,49	0,49	0,7	0,71	0,78	-	0,59	0,6
39	0,13	0,18	0,32	0,29	0,24	0,25	0,37	0,36	0,3	0,31	0,47	0,46	0,44	0,45	0,6	0,59	0,58	0,6	-	0,79
40	0,14	0,18	0,3	0,28	0,23	0,25	0,37	0,36	0,28	0,32	0,46	0,45	0,45	0,44	0,59	0,6	0,58	0,61	0,8	-

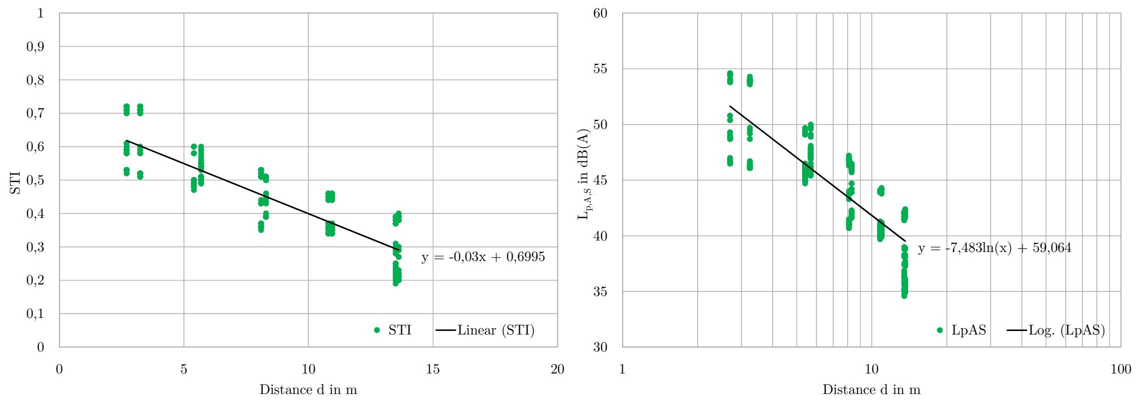
Figure C.24: Colored STI-Matrix of the U-Shape-Model with 1.60 m partition.

Receiver \ Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-	0,79	0,61	0,57	0,59	0,6	0,41	0,4	0,44	0,45	0,3	0,26	0,32	0,35	0,21	0,18	0,28	0,26	0,14	0,15
2	0,79	-	0,6	0,58	0,58	0,6	0,41	0,4	0,45	0,46	0,28	0,27	0,33	0,35	0,2	0,2	0,29	0,29	0,12	0,14
3	0,6	0,58	-	0,78	0,71	0,7	0,48	0,49	0,53	0,51	0,35	0,33	0,37	0,39	0,28	0,23	0,3	0,29	0,15	0,16
4	0,57	0,57	0,78	-	0,7	0,7	0,54	0,47	0,51	0,53	0,34	0,33	0,38	0,38	0,27	0,25	0,31	0,3	0,14	0,19
5	0,57	0,57	0,71	0,71	-	0,77	0,58	0,5	0,49	0,54	0,31	0,32	0,34	0,35	0,25	0,23	0,27	0,27	0,12	0,16
6	0,59	0,58	0,7	0,7	0,77	-	0,51	0,52	0,49	0,49	0,32	0,32	0,34	0,35	0,24	0,23	0,28	0,27	0,12	0,13
7	0,4	0,41	0,49	0,52	0,57	0,5	-	0,77	0,72	0,71	0,49	0,49	0,53	0,51	0,38	0,35	0,41	0,4	0,25	0,3
8	0,4	0,41	0,49	0,48	0,5	0,51	0,77	-	0,71	0,71	0,54	0,48	0,51	0,54	0,38	0,36	0,42	0,4	0,28	0,27
9	0,43	0,43	0,53	0,51	0,48	0,48	0,72	0,71	-	0,79	0,58	0,51	0,49	0,55	0,33	0,34	0,36	0,37	0,25	0,23
10	0,43	0,44	0,51	0,53	0,54	0,47	0,71	0,71	0,78	-	0,51	0,52	0,5	0,49	0,34	0,34	0,36	0,35	0,25	0,3
11	0,29	0,28	0,34	0,35	0,32	0,32	0,49	0,53	0,58	0,51	-	0,78	0,74	0,73	0,52	0,51	0,51	0,53	0,4	0,44
12	0,27	0,27	0,34	0,34	0,32	0,31	0,5	0,49	0,51	0,53	0,78	-	0,73	0,73	0,55	0,5	0,51	0,57	0,42	0,47
13	0,3	0,3	0,37	0,39	0,34	0,33	0,53	0,52	0,49	0,49	0,74	0,73	-	0,8	0,6	0,53	0,54	0,53	0,34	0,35
14	0,3	0,3	0,38	0,38	0,34	0,33	0,51	0,54	0,56	0,48	0,72	0,73	0,8	-	0,52	0,54	0,54	0,56	0,39	0,39
15	0,16	0,19	0,26	0,29	0,23	0,2	0,38	0,39	0,31	0,32	0,54	0,55	0,61	0,53	-	0,79	0,69	0,64	0,43	0,41
16	0,15	0,18	0,24	0,28	0,21	0,2	0,37	0,38	0,3	0,31	0,54	0,51	0,53	0,55	0,79	-	0,69	0,63	0,45	0,44
17	0,23	0,26	0,33	0,34	0,25	0,27	0,42	0,44	0,35	0,35	0,52	0,53	0,54	0,57	0,68	0,69	-	0,8	0,59	0,51
18	0,23	0,25	0,31	0,32	0,24	0,26	0,41	0,44	0,36	0,35	0,53	0,57	0,52	0,57	0,63	0,62	0,79	-	0,52	0,54
19	0,08	0,1	0,16	0,17	0,11	0,13	0,24	0,29	0,24	0,24	0,39	0,44	0,35	0,39	0,42	0,44	0,58	0,51	-	0,79
20	0,09	0,11	0,16	0,2	0,14	0,14	0,3	0,29	0,24	0,31	0,41	0,46	0,35	0,41	0,42	0,43	0,51	0,53	0,78	-
21	0,08	0,11	0,18	0,19	0,12	0,15	0,28	0,29	0,26	0,26	0,41	0,43	0,39	0,39	0,48	0,49	0,49	0,5	0,72	0,72
22	0,09	0,1	0,17	0,17	0,12	0,15	0,28	0,28	0,26	0,25	0,42	0,48	0,39	0,4	0,46	0,47	0,56	0,5	0,72	0,72
23	0,02	0,04	0,08	0,08	0,06	0,06	0,15	0,16	0,13	0,13	0,28	0,3	0,29	0,28	0,32	0,33	0,32	0,33	0,5	0,54
24	0,03	0,03	0,06	0,07	0,04	0,06	0,14	0,15	0,13	0,12	0,29	0,29	0,29	0,28	0,32	0,32	0,32	0,33	0,5	0,51
25	0,02	0,04	0,07	0,06	0,05	0,06	0,12	0,14	0,13	0,11	0,31	0,3	0,31	0,32	0,33	0,33	0,3	0,31	0,52	0,49
26	0,02	0,05	0,06	0,05	0,05	0,05	0,12	0,14	0,14	0,12	0,32	0,31	0,31	0,33	0,33	0,34	0,31	0,32	0,52	0,48
27	0,01	0,03	0,03	0,05	0,03	0,03	0,09	0,11	0,11	0,08	0,25	0,24	0,33	0,31	0,32	0,32	0,26	0,28	0,43	0,43
28	0,02	0,02	0,04	0,05	0,04	0,03	0,09	0,11	0,11	0,08	0,24	0,24	0,37	0,32	0,32	0,32	0,27	0,28	0,41	0,42
29	0,01	0,02	0,03	0,04	0,03	0,02	0,1	0,09	0,11	0,1	0,23	0,22	0,23	0,24	0,3	0,3	0,27	0,27	0,43	0,48
30	0,02	0,02	0,03	0,04	0,03	0,02	0,07	0,09	0,1	0,07	0,24	0,22	0,24	0,26	0,32	0,33	0,26	0,28	0,43	0,45
31	0	0	0	0	0	0	0,05	0,03	0,03	0,04	0,09	0,09	0,09	0,1	0,14	0,15	0,12	0,11	0,26	0,27
32	0	0	0	0	0	0	0,03	0,03	0,03	0,01	0,1	0,08	0,09	0,09	0,17	0,15	0,13	0,11	0,25	0,27
33	0	0	0	0	0	0	0,04	0,03	0,03	0,03	0,11	0,11	0,08	0,09	0,14	0,16	0,14	0,12	0,28	0,28
34	0	0	0	0	0,01	0	0,03	0,03	0,03	0,05	0,12	0,11	0,09	0,1	0,14	0,16	0,13	0,13	0,28	0,29
35	0	0	0	0	0	0	0,01	0	0	0	0,04	0,05	0,03	0,03	0,05	0,07	0,06	0,05	0,14	0,16
36	0	0	0	0	0	0	0,01	0	0	0	0,04	0,05	0,03	0,04	0,06	0,08	0,06	0,06	0,14	0,17
37	0	0	0	0	0	0	0,01	0	0	0	0,04	0,05	0,04	0,04	0,07	0,07	0,07	0,06	0,16	0,17
38	0	0	0	0	0	0	0,01	0	0	0	0,04	0,05	0,03	0,05	0,06	0,07	0,08	0,07	0,16	0,17
39	0	0	0	0	0	0	0	0,01	0	0	0,01	0,02	0,03	0,02	0,03	0,04	0,06	0,05	0,13	0,14
40	0	0	0	0	0	0	0	0,02	0	0	0,02	0,02	0,02	0,02	0,03	0,04	0,08	0,05	0,13	0,14

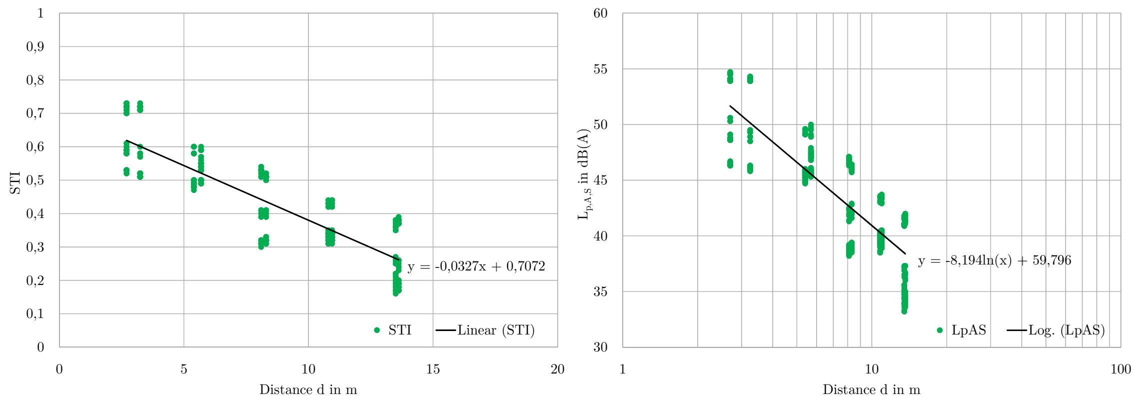
Receiver \ Sources	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	0,12	0,15	0,06	0,04	0,05	0,03	0,01	0,02	0,02	0,02	0	0	0	0	0	0	0	0	0	0
2	0,12	0,16	0,05	0,04	0,05	0,03	0,02	0,02	0,03	0,02	0	0	0,01	0	0	0	0	0	0	0
3	0,18	0,18	0,08	0,06	0,07	0,07	0,03	0,03	0,05	0,05	0	0	0,01	0,01	0	0	0	0	0	0
4	0,18	0,18	0,08	0,07	0,07	0,07	0,03	0,03	0,04	0,04	0	0	0,01	0	0	0	0	0	0	0
5	0,15	0,17	0,06	0,06	0,08	0,07	0,03	0,03	0,04	0,04	0	0	0	0	0	0	0	0	0	0
6	0,15	0,16	0,06	0,05	0,07	0,06	0,03	0,02	0,04	0,04	0	0	0	0	0	0	0	0	0	0
7	0,27	0,29	0,12	0,14	0,16	0,15	0,09	0,09	0,12	0,1	0,05	0,03	0,04	0,03	0	0,01	0	0	0	0
8	0,27	0,28	0,13	0,13	0,16	0,15	0,1	0,09	0,12	0,1	0,02	0,04	0,05	0,03	0	0	0	0	0	0
9	0,25	0,28	0,12	0,13	0,16	0,18	0,09	0,09	0,1	0,1	0,01	0,03	0,03	0,03	0	0	0	0	0	0
10	0,25	0,27	0,12	0,12	0,15	0,16	0,1	0,09	0,1	0,09	0,06	0,03	0,03	0,05	0	0	0	0	0	0
11	0,42	0,45	0,26	0,28	0,32	0,32	0,26	0,25	0,22	0,24	0,06	0,11	0,09	0,09	0,03	0,02	0,04	0,03	0,02	0
12	0,42	0,48	0,27	0,27	0,29	0,3	0,25	0,23	0,22	0,23	0,1	0,1	0,09	0,1	0,03	0,02	0,04	0,03	0,02	0
13	0,41	0,42	0,27	0,27	0,32	0,32	0,32	0,36	0,23	0,24	0,08	0,09	0,12	0,11	0,03	0,03	0,05	0,04	0,02	0,02
14	0,43	0,43	0,27	0,28	0,32	0,33	0,31	0,33	0,24	0,24	0,09	0,11	0,11	0,11	0,04	0,03	0,05	0,04	0,02	0,01
15	0,52	0,49	0,32	0,31	0,34	0,34	0,33	0,31	0,3	0,32	0,13	0,13	0,14	0,11	0,06	0,06	0,07	0,06	0,04	0,03
16	0,52	0,49	0,31	0,31	0,33	0,33	0,32	0,3	0,3	0,31	0,12	0,12	0,14	0,11	0,05	0,05	0,07	0,06	0,04	0,03
17	0,5	0,55	0,32	0,33	0,33	0,32	0,28	0,28	0,29	0,28	0,14	0,12	0,16	0,15	0,07	0,04	0,08	0,09	0,05	0,04
18	0,51	0,51	0,32	0,33	0,32	0,32	0,27	0,29	0,29	0,28	0,13	0,13	0,15	0,14	0,05	0,04	0,07	0,08	0,03	0,03
19	0,72	0,72	0,49	0,5	0,49	0,48	0,39	0,39	0,43	0,41	0,27	0,26	0,29	0,28	0,13	0,13	0,19	0,18	0,11	0,09
20	0,72	0,72	0,54	0,5	0,47	0,46	0,39	0,39	0,48	0,42	0,25	0,27	0,28	0,27	0,13	0,13	0,17	0,17	0,11	0,1
21	-	0,79	0,58	0,51	0,45	0,42	0,39	0,35	0,43	0,39	0,24	0,25	0,29	0,24	0,13	0,13	0,17	0,15	0,11	0,08
22	0,78	-	0,51	0,53	0,43	0,41	0,41	0,35	0,46	0,41	0,3	0,24	0,29	0,3	0,14	0,14	0,2	0,15	0,11	0,1
23	0,59	0,52	-	0,79	0,69	0,68	0,56	0,54	0,54	0,51	0,35	0,35	0,44	0,42	0,27	0,25	0,34	0,33	0,25	0,23
24	0,52	0,54	0,79	-	0,62	0,62	0,56	0,52	0,57	0,53	0,35	0,36	0,43	0,41	0,26	0,24	0,32	0,31	0,25	0,23
25	0,45	0,44	0,69	0,63	-	0,8	0,55	0,53	0,52	0,54	0,31	0,3	0,38	0,37	0,21	0,22	0,27	0,25	0,16	0,15
26	0,42	0,41	0,7	0,64	0,8	-	0,53	0,61	0,57	0,54	0,32	0,31	0,39	0,38	0,2	0,24	0,28	0,26	0,16	0,16
27	0,39	0,39	0,55	0,57	0,54	0,52	-	0,8	0,73	0,72	0,48	0,54	0,54	0,51	0,32	0,33	0,37	0,38	0,3	0,3
28	0,34	0,35	0,54	0,53	0,53	0,6	0,8	-	0,73	0,74	0,49	0,49	0,51	0,53	0,32	0,34	0,38	0,37	0,3	0,29
29	0,42	0,47	0,52	0,57	0,51	0,57	0,73	0,73	-	0,79	0,53	0,52	0,49	0,5	0,32	0,31	0,33	0,33	0,27	0,27
30	0,4	0,43	0,52	0,53	0,51	0,52	0,73	0,74	0,8	-	0,51	0,59	0,54	0,49	0,32	0,31	0,34	0,34	0,28	0,29
31	0,26	0,31	0,36	0,35	0,34	0,34	0,49	0,5	0,53	0,51	-	0,78	0,72	0,71	0,47	0,53	0,52	0,51	0,44	0,43
32	0,25	0,23	0,35	0,36	0,33	0,33	0,53	0,49	0,51	0,58	0,79	-	0,72	0,72	0,49	0,48	0,51	0,52	0,43	0,43
33	0,28	0,28	0,42	0,41	0,37	0,38	0,53	0,51	0,48	0,55	0,71	0,71	-	0,78	0,52	0,51	0,48	0,5	0,41	0,4
34	0,25	0,3	0,4	0,41	0,36	0,38	0,51	0,53	0,5	0,49	0,71	0,72	0,79	-	0,5	0,58	0,54	0,49	0,41	0,4
35	0,13	0,13	0,27	0,27	0,22	0,24	0,35	0,34	0,32	0,31	0,49	0,49	0,52	0,51	-	0,77	0,7	0,7	0,58	0,58
36	0,14	0,15	0,27	0,28	0,23	0,26	0,35	0,35	0,32	0,31	0,52	0,49	0,5	0,58	0,77	-	0,7	0,71	0,57	0,57
37	0,14	0,18	0,32	0,3	0,24	0,26	0,38	0,37	0,33	0,33	0,53	0,51	0,48	0,55	0,7	0,7	-	0,78	0,58	0,57
38	0,14	0,16	0,31	0,3	0,23	0,27	0,38	0,37	0,33	0,34	0,51	0,52	0,49	0,49	0,7	0,71	0,78	-	0,58	0,6
39	0,12	0,13	0,29	0,28	0,2	0,2	0,35	0,33	0,28	0,28	0,46	0,44	0,4	0,41	0,6	0,59	0,58	0,6	-	0,8
40	0,13	0,14	0,27	0,26	0,18	0,2	0,35	0,33	0,27	0,29	0,45	0,44	0,4	0,4	0,59	0,6	0,57	0,61	0,8	-

Figure C.25: Colored *STI*-Matrix of the U-Shape-Model with 1.80 m partition.

C.2.2 Assessment of the Open-Plan Office Models

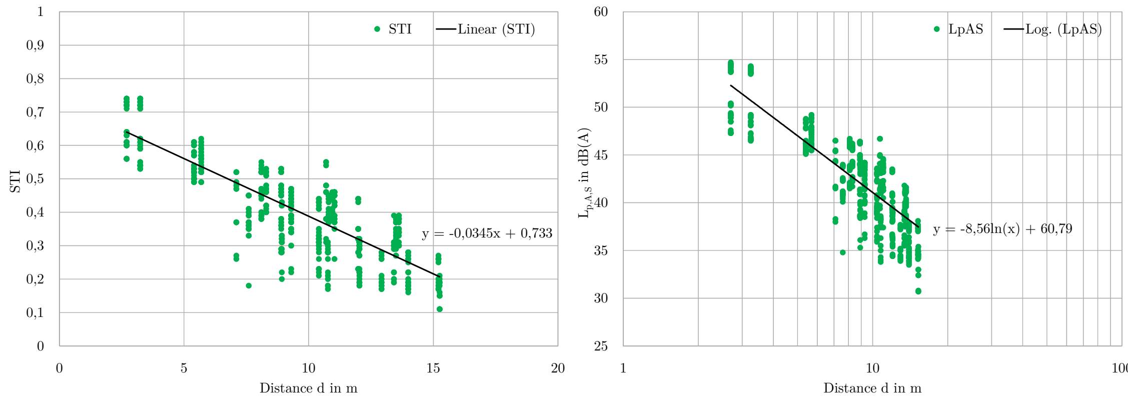


(a) 1.60 m partition wall

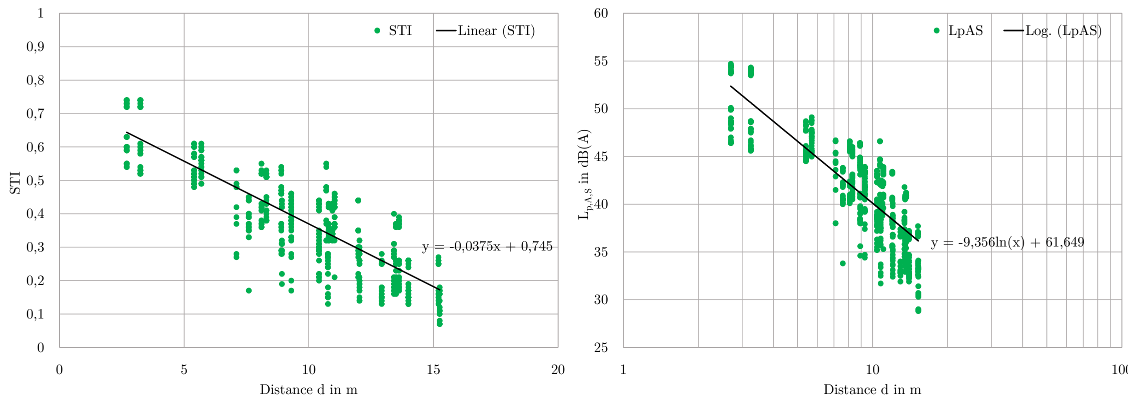


(b) 1.80 m partition wall

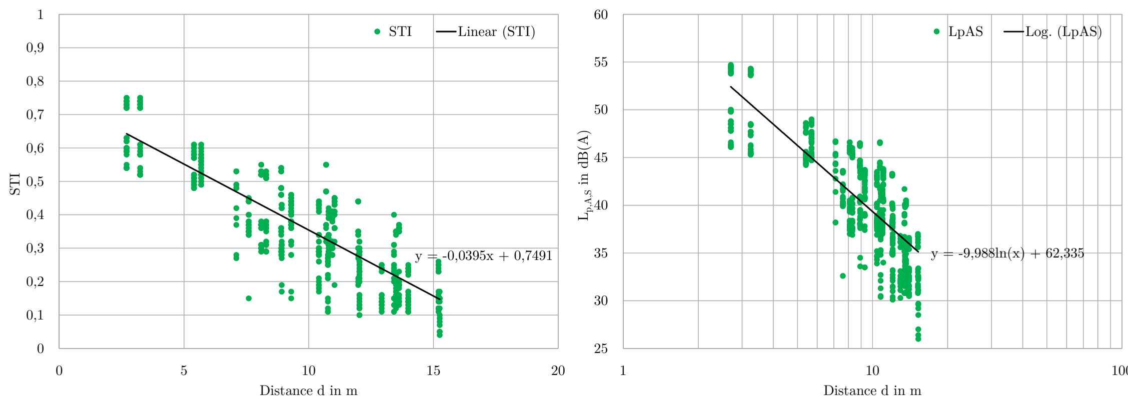
Figure C.26: Simulation results of One-Line-Model.



(a) 1.40 m partition wall

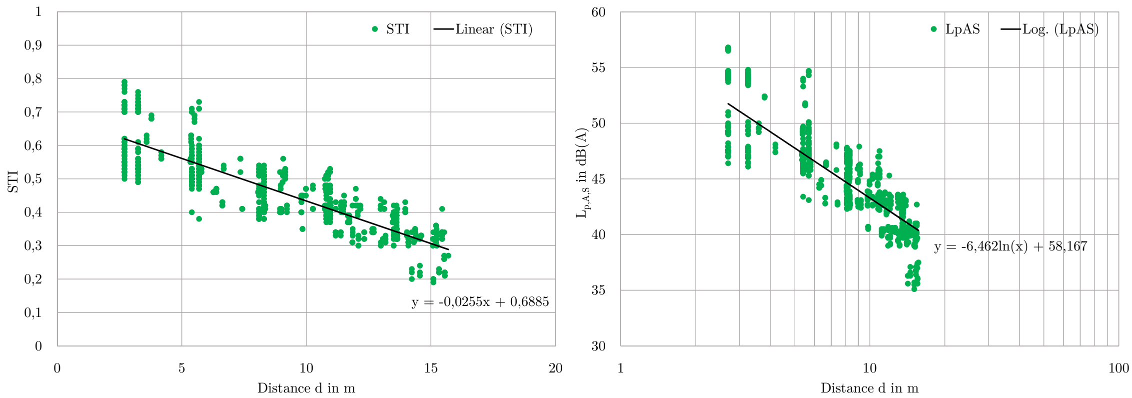


(b) 1.60 m partition wall

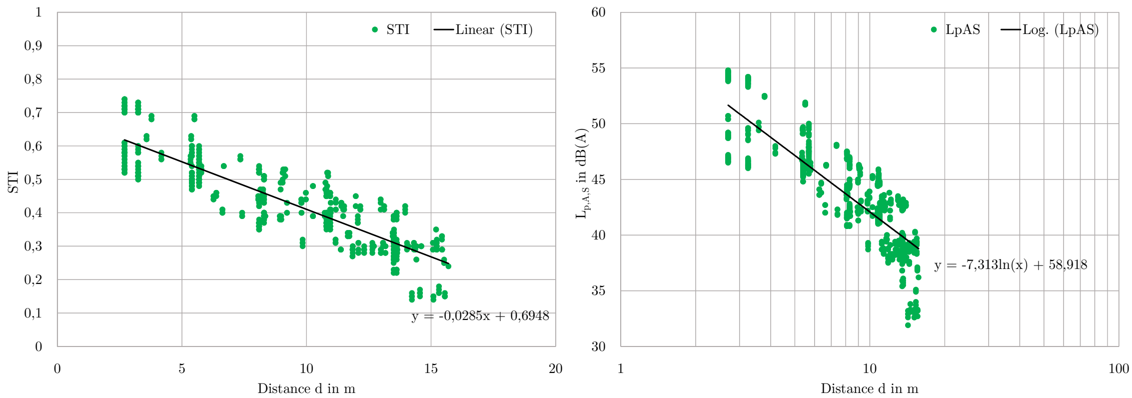


(c) 1.80 m partition wall

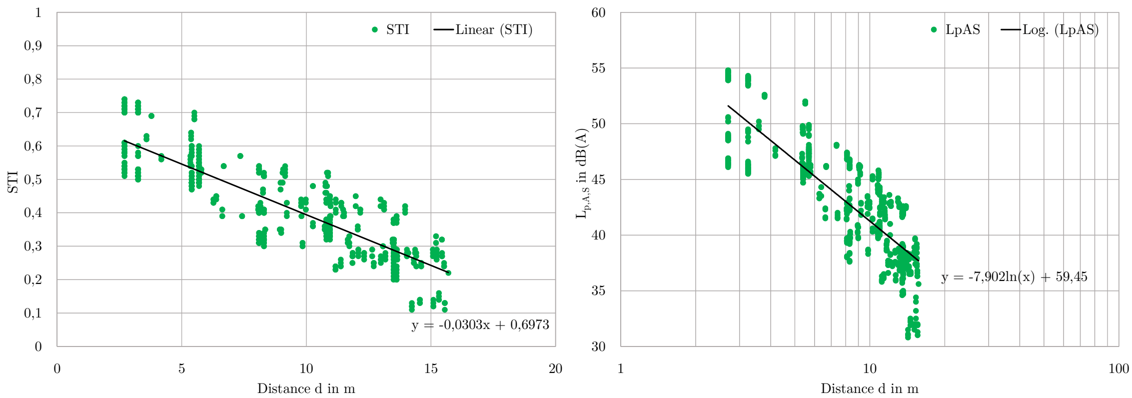
Figure C.27: Simulation results of Two-Line-Model.



(a) 1.40 m partition wall



(b) 1.60 m partition wall



(c) 1.80 m partition wall

Figure C.28: Simulation results of U-Shape-Model.