



**ACOUSTIC WAVEGUIDE FOR COUPLING
ORGAN CHAMBER AND AUDITORIUM**

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SUMMARY

A great part of this project - background research is theoretical.

In this part a research was carried out on different aspects which concerned acoustic wave propagation.

The other part of the project was practical and concerned measurement of acoustic impedance and system simulation.

In this part three methods of measurement of acoustic impedance have been described.

One of them - transmission method with movable microphone was used for determination of impedance.

Table and measured values of impedance have been compared. By this comparison some faults of the proposed method for acoustic impedance measurement have been discovered then described and improvements for future research have been proposed.

Finally introduction to analysis and simulation of the system comprising organ chamber, waveguide and auditorium was proposed.

OBJECTIVES OF THE PROJECT

- (i) carry out a research on organ chambers, organs and auditoria placement
- (ii) investigate the most practical method of conveying the sound from the organ chamber to the auditorium
- (iii) perform calculations of the system for sound transmission by modelling the acoustic waveguide to ascertain the efficiency of the system for ensuring the correct frequency response and group delay
- (iv) gain acoustic matching between the organ chamber and the auditorium by maximising acoustic power transfer into the auditorium
- (v) carry out a practical research associated with the project in determination of the best type of materials for construction of the waveguide to minimise acoustic attenuation

Conclusions

A study of acoustic plane wave, its propagation in different media (lossless, lossy and dispersive) then in bounded area, in the waveguide was carried out.

Later acoustic plane wave on boundary of different media was considered. Some information on rooms acoustics and their properties was also studied i.e. reverberation time and resonant frequencies of the room.

Finally general knowledge on organs and organ chambers was provided. With this introductory part of background work was concluded.

Later methods of acoustic impedance measurement have been described and acoustic impedance of few samples have been measured.

Method of acoustic impedance measurement appeared to have some faults since table and measured values of acoustic impedance were different. However calculated and measured values of impedance of radiation were similar. This fact proves that general idea of impedance measurement is correct.

Later possibility of simulation of the system consisting of organ chamber, waveguide and auditorium have been considered. Only introduction to theoretical part was provided in this project.

FURTHER WORK

A method of impedance measurement appeared to have some faults so it requires some further improvements. Efforts should be made to fit sample of material in the waveguide so that no cavities occur at the sample end of the waveguide.

A less drastic way should be found of placing sound receiver (mike) in the waveguide so that it does not interfere with acoustic field in the waveguide. With these improvements impedance measurements should be repeated.

No experiments with simulation of the system: organ chamber, waveguide and auditorium have been performed, so further research should consider this simulation.

Some problems have been faced in determination of acoustic impedance of organ chamber (theoretical limitations of room dimensions). Hence further work should include more general theory which would enable an increase in frequency range and the diameter of the waveguide.

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