

Modeling of a Jecklin Disk for Stereophonic Recordings

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Introduction: The Jecklin Disk is a sound absorbing disk placed between two omnidirectional microphones. It is used to recreate some of the frequency-response, time and amplitude variations human listeners' experience, but in such a way that the recordings also produce a useful stereo image through loudspeakers.



Figure 1. Jecklin Disk

Computational Methods: To simulate sound wave propagation about a Jecklin disk a two-dimensional model was constructed. An omnidirectional sound source, 10cm in length was placed 3m from a Rockwool disk (22cm × 40cm). The pressure field up to 5m from the source was studied.

For time-harmonic propagation, the subdomain was described with the Helmholtz equation:

$$\nabla \cdot \left(\frac{1}{\rho} \nabla \cdot p \right) + \frac{\omega^2 p}{\rho c^2} = 0 \quad (1)$$

Results: Figure 2 shows the pressure field distribution obtained from a sound source operating at a frequency of 3kHz. Figure 3 shows FEA and experimental results depicting absolute pressure versus distance.

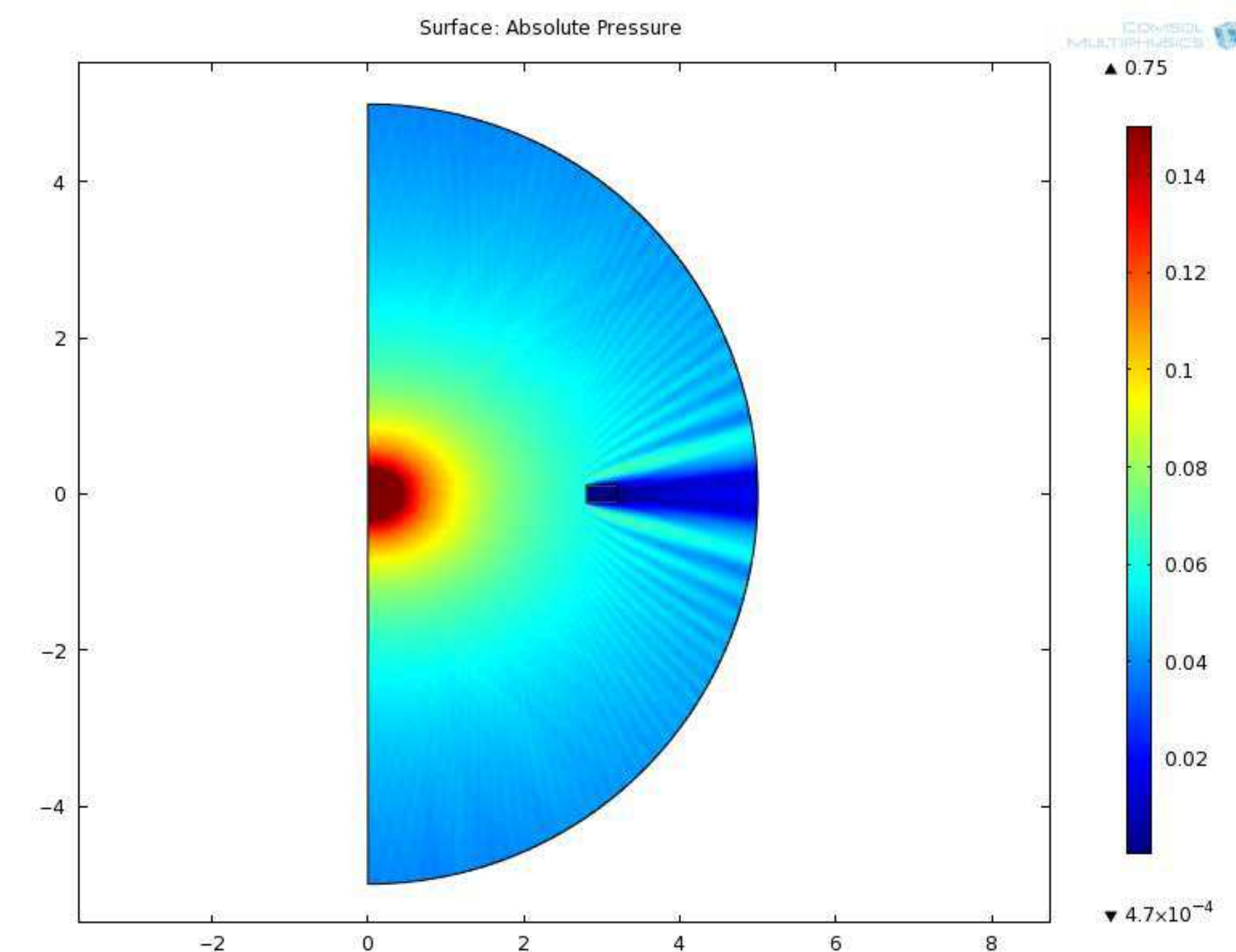


Figure 2. Pressure Field Distribution

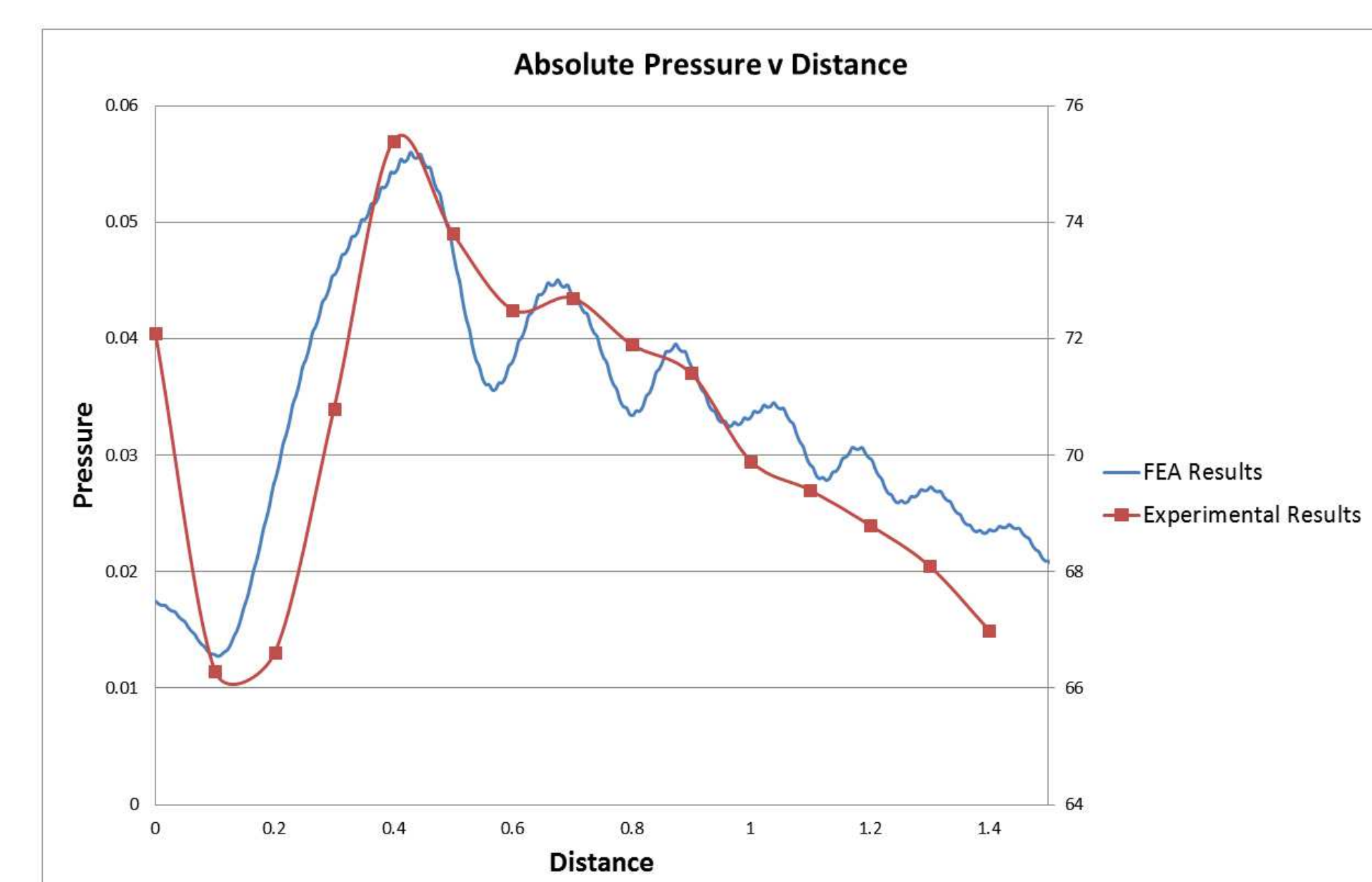


Figure 3. Absolute Pressure versus Distance

Conclusions: The finite element results matched those obtained experimentally within an anechoic chamber. The model may be used to optimize the size and construction of the Jecklin Disk, and the positions of the microphones.

References:

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