MODELING THE ACOUSTIC TRANSMISSION LINE WITH APPLIED DAMPING

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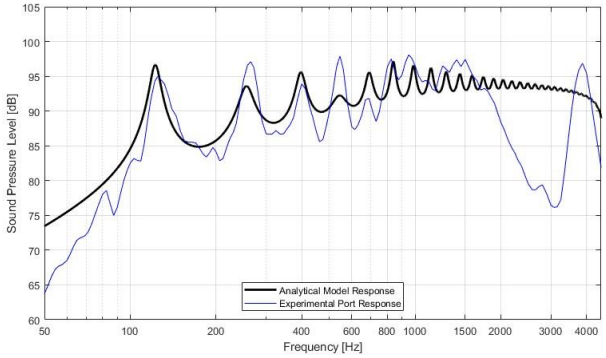

The transmission line is an underappreciated style of loudspeaker enclosure characterized by an acoustic labyrinth stemming from the rear of the speaker driver. In practice the transmission line enclosure produces airy sound uncharacteristic of other styles, at the cost of more pronounced resonant peaks. The most important practical drawback of this loudspeaker enclosure design is the difficulty of properly applying damping to these enclosures. Ideally, this difficulty can be mitigated through the use of an analytical model that accurately predicts the SPL frequency response of a transmission line loudspeaker system for a given geometry and mass of damping material.

This research takes the first step towards establishing such a model by developing a limited model for a simple enclosure geometry. Through the application of a modal analysis, this research predicts the frequency response of the enclosure for the first five modes, discusses the effect damping has on this response, and experimentally verifies the produced outputs. For the simplified transmission line enclosure, the developed model successfully predicts the target portion of the frequency response. The model produces accurate results for a range of damping levels using experimentally derived damping ratios for the first five modes. The resulting curves for each modal damping ratio allow for a set of novel damping ratios to be produced from an input mass of damping material. Through this process, an input mass of damping material produces the predicted frequency response for a straight, non-tapered transmission line enclosure. This prediction can make damping a transmission line enclosure much more efficient, allowing for transmission line loudspeakers to be more widely available.

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