

If Δa_j is taken as 1/2 the width of the j th slot (Figure 8) then it can be shown^j that:

$$w_j = 2\Delta a_j = s_j/2\pi a_j \quad (6)$$

giving $w_1 = 0.0196a$

$$w_2 = 0.0183a$$

$$w_3 = 0.0189a$$

$$w_4 = 0.0197a$$

$$w_5 = 0.0187a$$

This completes the review of Smith's article. The transitions between these annular rings and the throat of the horn are left to the designer. The main requirement is for a smooth transition. An exponential area function in this transition is exotic, but will frequently be found to be too short to justify its economic impact.

EXPERIMENTAL DESIGN

JBL has designed and constructed a new phasing plug for the model 2440 and 375 compression drivers. These have a 0.1 metre voice coil diameter. Figure 9 is a photograph of this four ring plug. Since the velocity of sound is sensitive to the spacing between the plug and the diaphragm, the suppression of a given mode is also sensitive to this spacing.

Figure 10 shows the frequency response curve of a typical 2440 compression driver on a 0.0254 metre diameter terminated tube using the previous phasing plug design as a solid curve. Predicted chamber resonances are at 3,520, 6,740, 10,360 and 14,460 Hz for this transducer. The existing phasing plug does a good job of suppressing the first resonance, but the 6,740 Hz resonance shows through at about 7,600 Hz. The third resonance, predicted for 10,360 Hz appears to occur at 9,600 Hz and is almost coincident with the voice coil decoupling frequency just above 10 kHz. The 14.5 kHz resonance is not obvious. The null appearing at 17 kHz is a cross mode of the loading tube and could fill an entire paper by itself.

Figure 10 also shows the response of the same diaphragm mounted on the new Smith plug as a dashed curve. The normal spacing between the diaphragm and the plug has been slightly increased to illustrate, for this report, the existence of the predicted resonances. Chamber resonances are subtly seen at 4,100, 7,300 and 9,500 Hz.