Subject: Acoustical Klein-Gordon Equation
Posted by Wayne Parham on Thu, 08 Mar 2007 20:55:42 GMT
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There has been some talk here and on various audio discussion boards about the use of secondary resonators and other modifiers to smooth the nodes and antinodes in quarter-wave pipes and small basshorns. Methods for doing this include reactance annulling of the rear chamber, Helmholtz resonators along the horn path and driver offset from the apex to modify standing wave node position. Each of these methods have been done to reduce the strength of reflected wave nodes that cause wave cancellations that result in dips in response.The paper written below may be of interest to those of you doing analysis of basshorns or transmission lines. It proposes a way of determining resonances in a flared pipe, when cross-section expansion isn't constant. Substitutions are made in the Webster equation to the functions that quantify the pressure within the cross-section. It allows a way to see the effects of expansion and/or constriction in the cross-section, and how they will shift quarter-wavelength eigenvalues.The implication of this paper is that flare curvature can be modified along the horn/line path in order to shift the frequency of a standing wave node that falls in that position. This can be used to smooth response. That gives another method of modifying reactance in a horn or transmission line, in addition to the other methods mentioned above.
Acoustical Klein-Gordon Equation