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Discussion

Comments on "Theory of acoustic eigenmodes in parabolic cylindrical enclosures" by M. Willatzen and L.C. Lew Yan Voon

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In the article [1] the authors derive a formula for the eigenmodes of a cavity whose walls are isosurfaces of the parabolic cylindrical coordinate system, having previously treated the equivalent problem for the parabolic rotational coordinate system in a series of articles [2–5]. It is unfortunate, however, that two additional citations were not made in Ref. [1]. The first is to Willatzen and Lew Yan Voon's own article of 2003 [6] in which they presented an identical analysis of the same problem, albeit with Dirichlet rather than Neumann boundary conditions, in order to study quantum dots of this shape. It is perhaps worth pointing out that in this author's view it is entirely legitimate to report results that apply to different fields in separate journals pertaining to each field, as long as they are of use in the relevant field. It would, however, have been a service to readers of *Journal of Sound and Vibration* (and, possibly, the reviewers of Ref. [1]) to have pointed out this earlier publication.

The second citation that would have been desirable is to the analysis on pp. 1400–1402 of Morse and Feshbach [7] of the eigenmodes of a two-dimensional region bounded by parabolic coordinate curves, which they solve in terms of Bessel functions, from which an expression for the eigenmodes of the parabolic cylindrical enclosure could easily be obtained if desired. This book is cited in Ref. [1], but only for the separability of the Helmholtz equation in these coordinates. An even earlier, though admittedly less accessible, solution can be found in Ref. [8]. Incidentally,

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Moon and Spencer [9] (cited in Ref. [1] in connection with the Frobenius method) detail the separation of the Helmholtz equation in every three-dimensional coordinate system for which it is separable, along with general solutions for the resulting equations in terms of special functions, although complex arguments are often required.

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