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Letters to the Editor

Doppler Effect in Fissioning Plasma Reactors

This letter suggests a specific application of Pettus' recent formulation for a Doppler-broadened resonance cross section.[1] Recent studies of plasma (gaseous) core reactors[2,3] have treated Doppler broadening by using the standard formulation given by Weinberg and Wigner.[4] Use of the standard formulation implies that only the component of nuclear momentum in the direction of the incident neutron is significant in determining the effective interaction energy. For a plasma core reactor operating at the anticipated temperatures of 20 000 to 100 000°K, it has been shown[5] that the interaction energy should include the effects of all components of nuclear momentum. Since this correction is included exactly in Pettus' formulation, it is recommended that the resulting cross section expression [Pettus[1] Eq. (9)] be used to correctly treat the Doppler effect in plasma core reactor calculations.

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[2] T. F. PLUNKETT, *Nucl. Appl.*, **3**, 178 (1967).
[3] L. O. HERWIG and T. S. LATHAM, *AIAA Journal*, **5**, 930, (1967).
[4] A. M. WEINBERG and E. P. WIGNER, *The Physical Theory of Neutron Chain Reactors*, p. 68, University of Chicago Press, Chicago (1958).
[5] H. F. ATWATER, Ph.D. Dissertation, University of Florida, Gainesville (1968).

Comments on Massel and Feix's Technical Note on Neutron Diffusion Using a Modulated Source

In reference to the Technical Note by Massel and Feix,[1] we would like to comment that the authors were apparently not aware of the numerous papers that have appeared in the literature since 1956 in the field of neutron wave propagation. In particular, three recent articles[2-4] have reference to most of the current theoretical and experimental work in the field ranging from simple hydrodynamic models to sophisticated polyenergetic kinetic models. Furthermore, the existence of a continuum of eigenvalues in the neutron wave problem was predicted[5] in 1965 and has been studied in detail by a number of authors since that time (for example, see Ref. 6). It should also be noted that at the San Diego and Chicago meetings of the American Nuclear Society sessions were devoted to neutron wave propagation studies.[6,7]

We should like to point out that the authors have done a commendable job from the technical viewpoint. We do not understand, however, why the reviewer or reviewers failed to point out to the authors the previous work that has been done in the field.

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[2] R. B. PEREZ and R. E. UHRIG, "Development of Techniques of Neutron-Wave and Neutron-Pulse Propagation," in *Proc. Symp. Neutron Noise, Waves and Pulse Propagation*, AEC Symposium Series 9, p. 1 (1967).
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[4] R. S. BOOTH, R. H. HARTLEY, and R. B. PEREZ, *Nucl. Sci. Eng.*, **28**, 404 (1967).
[5] R. B. PEREZ and R. S. BOOTH, "Excitation of Neutron Waves by Modulated and Pulsed Sources," in *Pulsed Neutron Research*, II, 701, International Atomic Energy Agency, Vienna (1965).
[6] *Trans. Am. Nucl. Soc.*, **10**, 277 (1967).
[7] *Trans. Am. Nucl. Soc.*, **10**, 588 (1967).