Fundamental Flaw in Kinetic Alfven Wave Dispersion[1] PAUL BEL-LAN, Caltech — The well-known kinetic Alfven wave (KAW) dispersion is shown to be fundamentally incorrect because its derivation involves a mathematical error. The error results from the standard practice of setting to zero the dielectric tensor elements K_{xy}, K_{yx} because these elements are of order ω/ω_{ci} and $\omega/\omega_{ci} \ll 1$. It is shown that in a warm electron, cold ion plasma the dielectric tensor elements K_{yz}, K_{zy} are of order ω_{ci}/ω so, when taking the full 3×3 wave equation determinant, order of unity products of the sort $K_{xy}K_{yz}$ exist, are important, and are missing in the KAW derivation. This error was identified from the substantive discrepancy between the determinant of the matrix of a 3×3 wave equation matrix reported by Hirose et al. [1] and the standard 2×2 determinant used for deriving the KAW. The validity of the 3×3 matrix elements and in particular the elements K_{yz}, K_{zy} was established by showing that 2- fluid theory gives the same matrix elements as the kinetic theory used in Ref. [1].

[1] A. Hirose et al. Phys. Letters A 330, 474 (2004).

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