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Influence of transmitter motion on received signal parameters—analysis of the Doppler effect. (English summary)

Wave Motion **45** (2008), *no. 3,* 178–190.

This paper sets out to compute the effect of uniform motion of a transmitter on the signal received by a stationary receiver when the transmitter broadcasts a monochromatic EM field from a half wavelength dipole antenna.

The authors apply a Galilean transformation to the inhomogeneous wave equation in the electric field, driven by the time derivative of the dipole current, with $t' = t,\ x' = x - vt,\ y' = y,\ z' = z$, where v is the source-receiver relative speed. The Galilean transformation cross-couples the space and time coordinates (which would not have happened had the coordinates been transformed instead according to a Lorentz boost). The authors make a valiant attempt to solve the now non-separable differential equation with various transforms.

By leaving the time untransformed, the primed coordinates do not belong exclusively to either the source or the receiver's frame of reference. And by leaving the electric and magnetic fields untransformed (i.e., ignoring the fact that the electric field components are components of a second rank Lorentz tensor), the final result can at best be no more than a mathematical exercise, unrelated in any useful way to the field seen at the receiver.

The electric field actually observed at the receiver could of course have been determined by direct transformation—a Lorentz boost—of the Faraday tensor populated by electric and magnetic fields for the static case, these expressions being readily available.

{For additional information pertaining to this item see [A. T. de Hoop, Wave Motion **46** (2009), no. 1, 89–91; MR2474940].}

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Current version of review. Go to earlier version.

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