A SUGGESTED IMPROVEMENT TO THE C.W. TECHNIQUE FOR MEASUREMENT OF METEOR VELOCITIES*

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Radio methods of measuring meteor velocities, whether by pulse (Davies and Ellyett 1949) or C.W. techniques (McKinley 1951), ultimately depend on a knowledge of the separation, along Cornu's spiral, between points representing any two maxima or any two minima of the echo waveform. The relation $s=\frac{1}{2}\nabla\sqrt{(R_0\lambda)}$, where R_0 is the minimum range of the echo and λ is the wavelength, enables these " zone values " ∇ to be correlated with line segments s of the meteor trail. The time taken for the meteor to traverse the distance s is obtained from the echo, and hence the velocity of the meteor can be found.

Most sources of error in velocity determination can be attributed to distortion of Cornu's spiral in some way or another, and are common to both pulse and C.W. systems of measurement. The effects of wind shear (Kaiser 1955) and non-uniformity of ionization cannot be eliminated, in general, but are not serious. The effect of transverse polarization (Billam and Browne 1956) is less serious in the C.W. technique where the zones normally used are those prior to the t_0 point. Under conditions of severe diffusion (Dr. C. D. Ellyett, personal communication) large errors (up to 20 per cent.) can be introduced into the pulse measurements, but again the error is not serious in the C.W. method if zones of high order prior to the t_0 point are used.

The C.W. method is therefore inherently more accurate but suffers from the grave defect that the phase of the direct wave, to which Cornu's spiral for the reflected wave is referred, must be known. This cannot be inferred from the " whistle " waveform with any certainty. A detailed analysis of the C.W. method suggests that large errors can be introduced by this—up to 10 per cent. in the case of the zone defined by the 4th and 9th maxima used by McKinley—although in general the error is likely to be much less than the maximum possible 10 per cent.

By using the complete C.W. echo waveform, comprising both whistle and body Doppler beat pattern due to the wind drift of the trail, in conjunction with knowledge of the sense of the wind drift, which in our case is conveniently obtained from the phase spikes (Robertson, Liddy, and Elford 1953), it appears possible to determine unambiguously the phase of the direct (reference) wave at the times represented by any maxima of the whistle which are used in the measurement of the meteor velocity. This modification of the C.W. method

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should prove to be of great advantage for the accurate measurement of the velocities of faint meteors where the application of pulse techniques becomes difficult because of the rapid decay of the echo.

Equipment to test the practical application of this refinement of the C.W. technique is at present under construction.

A full account of these investigations will be published elsewhere.

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