ABSTRACT

Radio observations of the Sun have been made, during 1970-1974, at fixed frequencies of 18, 22, 26 and 36 MHz and, with a swept-frequency receiver, over the range 18 - 28 MHz.

The average form of the exciter profile has been calculated directly from some 100 type III bursts and further inferred from the first three statistical moments. The results are compared with those obtained by other workers at adjacent frequencies, notably Aubier and Boischot (1972) (29 - 60 MHz), and Bradford and Hughes (1974) (2 - 8 MHz). The general results can be interpreted in terms of the two travelling modes of the exciting stream in the corona — field-dominated motion and flow-dominated motion — and indicate the following:

(a) In general, exciting streams travel undecelerated outwards from the 36 MHz coronal level to the 2 MHz level.

(b) The burst profile and the exciter profile retain their characteristic shapes over the range 18 - 36 MHz. Similarity in the profiles can also be inferred for type III bursts at frequencies below 6 MHz. There is no overall similarity.

(c) The electron streams responsible for type III bursts may be decoupled from the magnetic fields of active regions beyond 4 $R_{\odot}$ (above the photosphere on a 2 × Newkirk QS model).

Quasi-periodic solar type IV bursts (type IVP) have been detected at decametre wavelengths. These are only occasionally present and display a mean periodicity of 4 s with a 12 s subharmonic — in support of the fundamental to second harmonic ratio of approximately 1:3 required by the Rosenberg model on shock wave excited oscillating flux tubes. A sharp low-frequency cut-off was observed at 24 MHz.

All published radio measurements available to the writer (at the time of writing) for solar pulsations on a time scale of a few seconds to fractions of a second were compared with the decametric pulsations. An interpretation of the pulsations, based on a Razin suppressed source in an oscillating magnetic flux tube, indicates that:

(a) The period of pulsation is longer for sources higher in the solar corona.

(b) On a 2 × Newkirk QS radial density model, the source of the 4 s pulsation would be situated some 2 - 3 $R_{\odot}$ above the photosphere.

(c) For electron energies in the range 0.5 - 1.25 MeV the magnetic field strength in the source of the 4 s pulsation would be between 3.5 and 0.6 gauss.