A THEORY OF TYPE III SOLAR RADIO BURSTS

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Abstract. This paper is an extension of an earlier paper by Zaitsev *et al.* (1972).

In the earlier paper a theory with the following properties was constructed for the propagation of type III streams:

(i) The injection of electrons accelerated in the flare region is 'explosive', i.e. of negligible duration.

(ii) Plasma waves are generated at the front of the stream where quasi-linear relaxation occurs.

(iii) The plasma waves are either (a) damped due to collisions, or (b) reabsorbed by the following electrons in the stream.

(iv) The stream is maintained by the faster electrons (i.e. those which gain energy as a result of the quasi-linear relaxation) escaping from the front of the stream.

In the present paper assumption (i) is relaxed to allow either *explosive* or *continuous* injection of electrons. The results include the following:

(1) At high frequencies ($\gtrsim$20 to 30 MHz) collisions dominate in the damping (assumption (iiia)) while at low frequencies ($\lesssim$5 MHz) collisions are negligible (assumption (iiib)).

(2) The model with explosive injection and collisional damping implies an unacceptably rapid deceleration of the stream.

(3) The model with continuous injection and collisional damping involves an increase in the energy density in plasma waves (and so of the observed radiation) followed by a decay as t^{-6}.

(4) The appropriate model at low frequencies involves continuous injection from the region (e.g. at 5 to 10 $R_\odot$) which separates the two limiting cases in (1).

(5) This model involves a smooth increase in the energy density in plasma waves followed by a decay as t^{-3}.

The theoretical time profiles for low frequency bursts (at the second harmonic) are compared with those observed by Fainberg and Stone (1970), and reasonable agreement is found.

In addition, type III bursts with quasi-oscillatory decay are attributed to stabilized (in the sense of Zaitsev *et al.*, 1972) proton streams with the oscillation associated with the combined effects of collisional damping and induced scattering of the plasma waves.

Gordon Newkirk, Jr. (ed.), Coronal Disturbances, 283.