OBSERVATION OF A CORONAL IMPULSIVE X-RAY BURST AND ITS IMPLICATIONS REGARDING THE ASSOCIATED MICROWAVE SOURCE

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SUMMARY

Radial structure of impulsive hard X-ray and microwave sources in solar flares is not well known at the present time. Measurements of near-the-limb flares with a high spatial and temporal resolution is, of course, the best way to determine the radial structure of these sources. In absence of such measurements, particularly for the hard X-ray emission, behind-the-limb flares provide (through occultation) a means of observing the coronal part of the impulsive source. Here we summarize the characteristics of the impulsive coronal X-ray source deduced from multi-spacecraft observations of a behind-the-limb flare and their implications with respect to impulsive microwave source.

On 5 October 1978 an impulsive hard X-ray burst associated with a behind-the-limb flare was observed with two spacecraft, International Sun Earth Explorer-3 (ISEE-3) and Pioneer Venus Orbiter (PVO), separated by $\sim 12.5°$ in heliographic longitude. The details have been given elsewhere (Kane et al., 1979). While the flare was essentially in full view of the PVO detectors, the portion of the flare below a height of $\sim$ 2500 km above the photosphere was occulted from the ISEE-3 detector field of view. A comparison of the response of the PVO and ISEE-3 detectors to this behind-the-limb flare and to on-the-disk flare observed on 16 October 1978 indicates that the impulsive hard X-ray source extends from altitudes well below 25000 km (upper chromosphere/transition region) to altitudes well above 25000 km (corona), the "coronal" source for X-rays $\gtrsim$ 50 keV being $\sim$ 600 times less intense than the "transition region" source.

An examination of the published ground-based observations of the impulsive microwave bursts associated with the 5 October and 16 October flares and the known relationship between impulsive hard X-ray and microwave bursts (Kane, 1973, 1974) indicate that the impulsive microwave source also extends to altitudes $\gtrsim$ 25000 km, the coronal source being less intense than the lower altitude source by a factor of $\sim$ 12 for $\sim$ 3 GHz emission and $\sim$ 4 for 1.5 GHz emission. These observations are, in general, consistent with the 3-dimensional model proposed by

M.R. Kundu and T.E. Gergely (eds.), Radio Physics of the Sun, 443-444.

Takakura and Scalise (1970) and Takakura (1972). However, the present observations suggest that the effective emission source at 3 and 1.5 GHz is probably more diffuse than the relatively thin layers predicted by that model.

ACKNOWLEDGEMENTS

The author wishes to acknowledge discussions with Dr. T. Takakura. This research was supported by NASA under contract NAS 5-22307.

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