THE PLASMA PROCESS OF SOME SOLAR RADIO BURSTS AND THEIR FINRE STRUCTURES ON THE TIME

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ABSTRACT

We present some special solar radio bursts and some fine structures on the band of 1.00-7.60 GHz. Firstly, we study the type III burst pair, which was recorded by spectrometer 1.00-2.00 GHz at National Astronomical Observatories of Chinese on May 1 1994. A plausible model might be thought that this event could be the observational evidence of two electron beams traveling bi-directions simultaneously due to the acceleration of magnetic reconnection in the corona. Secondly, a fine structure of microwave type IV bursts is microwave type M-burst. Partial N-burst, which is a fine structure of solar III-V bursts recorded on August 25 1999 by both separated spectrometers 4.50-7.50 GHz at Purple Mountain Observatory and 5.20-7.60 GHz at National Astronomical Observatories respectively, is the third phenomenon studied here. As the N-burst documented before, the last two fine structures are thought to the new observational evidences of electron beam reflected by magnetic mirror in the corona.

INTRODUCTION

Observational properties and theoretical aspects of solar radio bursts and their fine structures play an important role of the solar coronal physics. The solar corona is thought to be the plasma due to the high temperature as millions Kelven. And their radiations just are solar radio bursts. The phenomena in the longer wavelength have been studied and documented well before. In order to study the solar radio bursts and their fine structures in the high frequency range, a radio spectrometer with high resolution in both time and

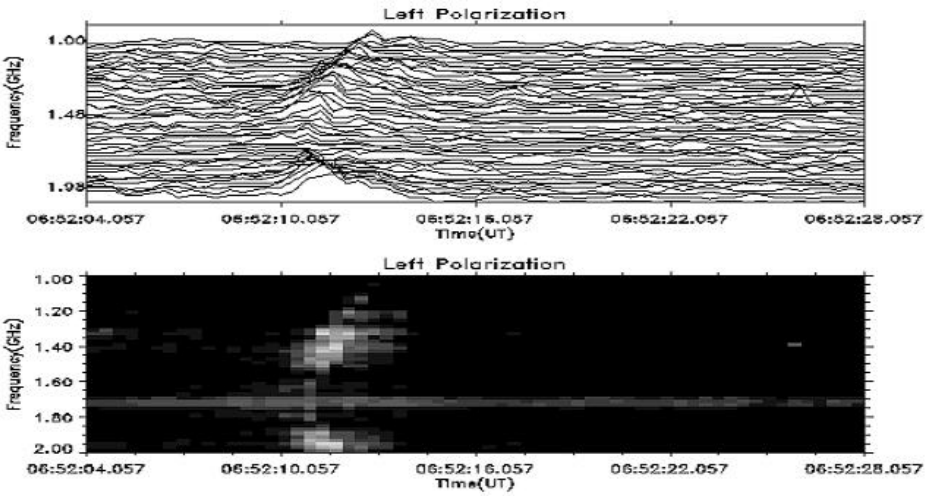

Fig.1 Dynamic spectra of type III burst pair over the range 1.00-2.00 GHz on January 5 1994.

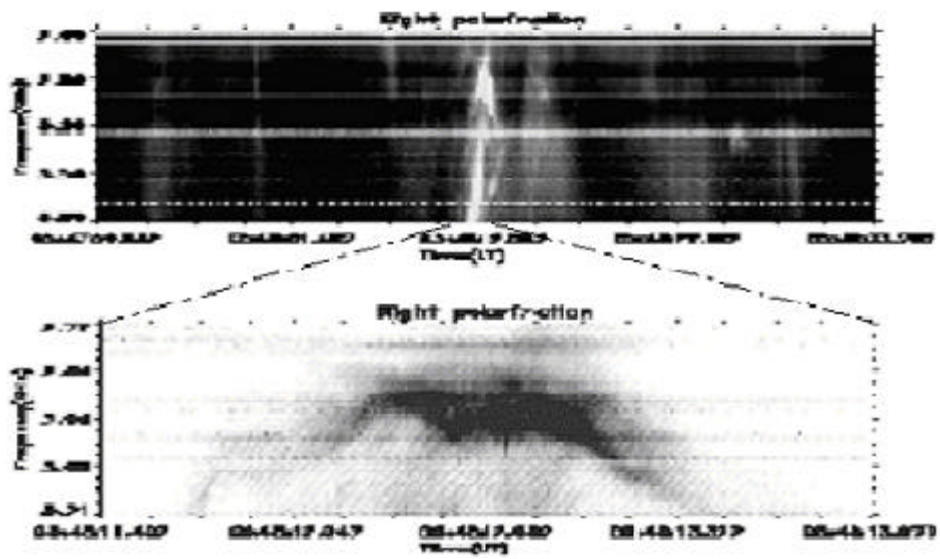

Fig.2 A microwave M-bursts on the right-hand component, which is a fine structure of type IV bursts on May 3 1999.

frequency over a broad band 1.00-7.60 GHz has been developed by the solar radio astronomical group of China (e.g. Fu et al.1995, Ji et al.1997). Some new and special kinds of solar radio events such as M-burst, Zebra pattern, fibre structures have been detected by this instrument. We will present some samples in this papers.

OBSERVATIONS OF SAMPLE EVENTS

The first sample event was detected by the component spectrometer 1.00-2.00 GHz on the January 5 1995. We call it type III burst pair (Ning et al.2000a). Because it contains two kinds of type III bursts drifting bi-directions simultaneously. An overview of the dynamic spectra is given in Fig.1. The properties are reminiscent of the magnetic reconnection process in the solar corona. Because the solar type III bursts are generally thought to be the traveling trajectories of the electron beams in the corona.

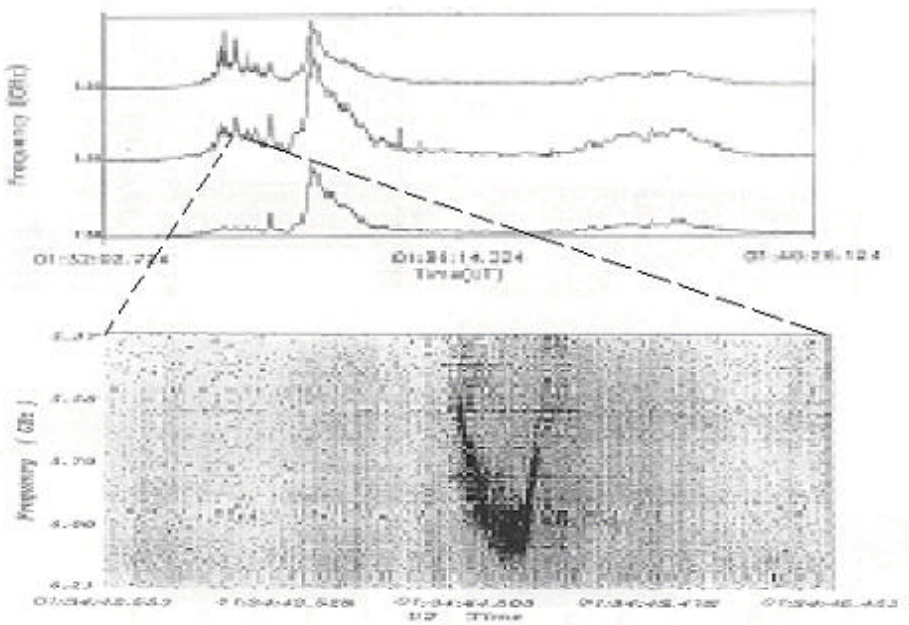

Fig.3 Dynamic spectra of type III-V bursts and their fine structure, partial N-burst on August 25 1999

Secondly, Fig.2 shows a fine structure of solar type IV bursts detected by another component spectrometer 2.60-3.80 GHz on May 3 1999. It is called microwave M-burst because of the dynamic spectra suggesting the capital letter M (Ning et al, 2000b). And M-burst is thought the reflected effect of electron beams on the coronal magnetic mirror after N-burst reported before (Caroubalos et al.1987, Hillari et al.1988).

The last sample, another observational evidence of electron beams effect on coronal magnetic mirror is partial N-burst, which is a fine structure of type III-V bursts on August 25 1999. Because this event is thought to be a N-burst without the first branch. The dynamic spectra are shown on Fig.3.

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