

Spectral fine structure of solar radio bursts observed with IPRT/AMATERAS: Characteristics of Zebra Pattern

KANEDA, Kazutaka^{1*} ; MISAWA, Hiroaki¹ ; TSUCHIYA, Fuminori¹ ; OBARA, Takahiro¹ ; IWAI, Kazumasa²

¹PPARC, Tohoku University, ²NSRO/NAOJ

It is known that there are a variety of complex fine structures in solar radio bursts in the meter to decimeter wave bands such as broadband pulsations, narrowband spikes, fiber bursts and zebra patterns (hereafter ZP). Since they are thought to be caused by some inhomogeneities or modulations of wave generation and/or radio propagation processes, they have significant information about plasma parameters and dynamical plasma processes in the solar corona. Among the various fine structures, ZP has a particularly characteristic spectral pattern with parallel drifting narrow stripes of enhanced emission. Although several models for generating ZP have been proposed so far, the generation mechanisms have not been revealed well yet.

AMATERAS (the Assembly of Metric-band Aperture Telescope and Real-time Analysis System) is a radio spectro-polarimeter installed in a large radio telescope named IPRT in Fukushima, which was developed for solar radio observations in 2010 by Tohoku University (Iwai et al., 2012). The specifications of this system are time resolution of 10 ms, frequency resolution of 61 kHz and the minimum detectable flux of 0.7 s.f.u. in the frequency range of 150 MHz to 500 MHz, which are enough to observe fine structures of solar radio bursts and analyze their spectral characteristics. In this study we focus on an event on June 21, 2011 associated with C7.7 class flare. In this event enhanced ZP appeared around 200MHz with about 30 stripes in fast drifting envelopes like type III bursts or broadband pulsations. The emission was strongly polarized in right-handed and shows a distinctive time delay of the left-handed component relative to the right-handed component by several tens msec increasing with emission frequency. In the presentation, we will show the characteristics of ZP precisely and also discuss the expected generation processes.

Keywords: solar radio, AMATERAS, zebra pattern