Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

PEM07-23 Room:302 Time:May 25 15:15-15:30

Characteristics in solar white-light flares based on radio observations

MASUDA, Satoshi[1*] ; KITAGAWA, Jun[1] ; WATANABE, Kyoko[2]

[1]Solar-Terrestrial Environment Laboratory, Nagoya University, [2]Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency

White-light flare is a solar flare in which an enhancement in white-light continuum is detected. Although most of white-light flares are large flares in energy like GOES X-class flare, it is not correct that only the amount of released energy determine if a solar flare becomes a white-light flare. To understand what generates a white-light flare, we analyzed 42 M- and X-class flares observed with Hinode/SOT during the period from January 2011 to August 2013. Among these 42 events, the number of white-light flares was 19. Comparing the white-light and no white-light events, we concluded that the key factor to generate white-light enhancement is the precipitation of large amount of nonthermal electrons within a short time duration into a compact region (Kitagawa et al., submitted to ApJ).

In this paper, we analyzed the 10 events (white-light: 4 events, no white-light: 6 events) among the 42 events, which were observed with Nobeyama Radio Heliograph (NoRH) and Nobeyama Radio Polarimeters (NoRP). GHz microwave are emitted by gyrosynchrotron from very-high energy (˜MeV) accelerated electrons. The peak intensity in 17 and 35 GHz does not show any significant difference between the white-light and no white-light events. This indicates that such high-energy electrons does not contribute white-light enhancement. The spectrum of gyrosynchrotron emission usually has a peak frequency which corresponds to the turning point (turn-over frequency) between the optical thick part in the lower frequency range and the optically thin part in higher frequency range. The white-light flares show systematically high turn-over frequency than that of the no white-light events. The higher turn-over frequency might correspond to stronger magnetic field. This is consistent that white-light flares tend to be compact. As for the time evolution of the spectrum, the no white-light flares tend to show the spectral hardening. This indicates that the magnetic mirror effectively works in no white-light flares because of the weak magnetic field in the flare loop.

Keywords: solar flare, particle acceleration