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The initial results of high speed flare imaging system at Hida Observatory

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FISCH (Flare Imaging System in Continuum and H-alpha; Ishii et al. PASJ, in press) was installed in August 2011on SMART (Solar Magnetic Activity Research Telescope) at Hida Observatory of Kyoto University and started regular observation in November 2011. FISCH aims to observe solar flares in high time and high spatial resolutions. We continuously observe an active region which likely produces flares in Continuum (642.7nm) and H-alpha with a frame rate between 10 and 25 frames per second. Regularly we select good seeing frames with a cadence of 5 sec, and when an event occurs, we store all the data. Its field of view is 344 x 256 arcsec^2 and FISCH is highly complementary with Hinode/SOT and SDO/HMI.

The main aim of observation with FISCH is to study the emission mechanism of white light flares and to investigate connectivity of magnetic field in the flare loop system by resolving drastic evolution of flare kernels in H-alpha in the impulsive phase. White light flares are thought to be the continuum enhancement caused by high energy electrons precipitating into the chromosphere or photosphere, but "how high the formation height is" and "what the mechanism of the continuum enhancement is" are not solved. Time coincidence among brightenings of flare kernels in H-alpha at different points inform the pair of flare kernels that are footpoints of a flare loop created by "magnetic reconnection". Timing of the brightening of multiple flare kernel pairs in flare ribbons tell us configuration of coronal magnetic fields

We observed 30 events with FISCH until 2012 December 31. 22 events are C class flares, 4 events are M class flares, and 4 events are X class flares. It is unexpected result that the flare capture rate of the FISCH against the all GOES flares is quite low for C class flares (1.2%) and for M class flares (2.2%). This seems to be caused by a broad passband (3A) of the H-alpha filter so that we missed relatively weak flare kernels. After we got this result, we changed the filter of the 3A passband to a filter of the 1.5A passband on January 2013.

Among the 30 events, however, we find two white light flares and data showing clear flare kernels with a good seeing condition. We also reconstruct images with rather poor seeing condition to reduce the fluctuation of the images. We analyzed a white light event with RHESSI data and found white light flare kernel is coincidence with the HXR source spatially. We also analyzed a C class flare in which we can trace the motion of H-alpha flare kernels with HXR images and EUV spectrographs. Moreover we have an M class event data in which we can resolve the fine structure of flare ribbons. In this poster, we present the results of analysis using data taken by 2012, and show the flare capture rate after we changed the H-alpha filter.

Keywords: solar flare, visible wavelength, ground based observation