Progress Seminar

Seminar Title	: Investigation of solar radio emission processes using high resolution observations
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Venue	: MC-126, Department of Physics and Astronomy
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Abstract : Radio emissions from the Sun are observed as compact solar radio bursts, usually produced by explosive activities like solar flares and coronal mass ejections (CMEs) or continuum, usually produced from the quiet Sun. Non-thermal electrons accelerated by CME driven shocks produce slow drifting Type II bursts, the detailed study of which are crucial for radio diagnostics of space weather conditions and effects. So we have investigated the correlation between frequency bandwidth of coronal Type II bursts and the angular width of the associated CMEs for nineteen Type II burst events. We found an anti-correlation of ~65% between the two quantities suggesting that the CMEs with large angular widths produce narrow-band Type II emissions, in stark contrast to a recent study that reported that they produce broad-band Type II emissions. We further deduced the height of the Type II bursts (rType II) and CME height (rCME) at the onset time of the burst and found that for all of the Type II burst events, rType II was < rCME, which shows that these Type II emissions are produced in the flank region of the CME-driven shock rather than at the shock front. On the other hand, the energy release during the solar flare accelerates non-thermal electrons in solar corona which propagate along coronal magnetic field lines as electron beams and produce short-lived fast drifting Type III bursts. We carried out a spectral and imaging study of decimetric Type-III radio bursts observed during the pre-flare phase of a GOES C2.3-class on 20 June 2015, using high spatio-temporal resolution (10.3" to 51.6" and 25 ms) observations of MingantU Spectral Radioheliograph (MUSER) located in China The decimetric Type-III radio emissions show various fine burst structures and radio imaging of these fine burst structures reveals that they are located ~100" away from the main flaring site. A multi-wavelength analysis and magnetic field extrapolation reveal the presence of a magnetic flux rope situated beneath the closed loops near the flaring site along with open field lines lying next to the closed loops. Further, a time-distance (d-t) analysis of EUV images shows the upward motion of the overlying closed loops suggesting a possible interaction between the flux rope and the overlying loops. This resulted in the acceleration of non-thermal electrons that escaped along the open field lines as well as trapped in the closed field lines, producing the various fine burst structures at the remote location far from the flaring site. We also investigated another single decimetric Type III radio burst event at 04:23:30 UT on 11 November 2014, which was co-temporal with a C-class flare occurred at 04:24:26 UT. EUV and X-ray imaging observations indicated that the flare activity occurred on the solar disk, while the MUSER imaging observations revealed a potential radio source at a frequency of 762.5 MHz, that was located on the eastern solar limb, ~1300" away from the flaring site. A magnetic field extrapolations showed no such connectivity between the flaring site and the radio source location, indicating that the Type III burst event is an independent event with no connection to the solar flare activity. Based on a multi-wavelength analyses, we showed the radio burst activity was caused rather by a prominence eruption. Further, we aim to produce high-resolution images of solar noise storm and quiet-Sun radio emission, produced by super-thermal electrons. High-resolution imaging of small sources and structures in the quiet Sun can constrain parameters of turbulence spectrum in the corona and can contribute towards the overall heating of the corona.