Long Baseline Interferometry of the Solar Corona below 100 MHz

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Low-frequency radio emission from the Sun originates in the corona, which is the outermost layer of the solar atmosphere. It is composed of two primary components, a stationary ”quiescent” continuum emission and a non-stationary impulsive emission that is referred as “radio bursts” at meterwavelengths. The solar corona is a tenuous medium of magnetized plasma with an inhomogeneous distribution of electrons and ions. The inherent density turbulence and solar wind cause refractive scattering of radio waves that induce angular broadening of radio sources embedded in the corona and of the cosmic sources in the background observed through it. Some of the observed properties of radio bursts like angular size, brightness temperature, polarization and temporal evolution, are thought to be affected by scattering (Subramanian & Cairns : 2011, *JGR,* 16, A03104). With indirect methods like the lunar occultation technique, the presence of arc-minute scale structures in the solar corona were established through radio observations of partial solar eclipses at low frequencies (Kathiravan et al. : 2011, *ApJ*, **730**, 91). While direct radio imaging observations at 327 MHz presented further evidence to the presence of arc-second scale structures in the solar corona.(Mercier et al. : 2006, *A&A,* **576**, A136) With these recent observations, it is now theoretically predicted that small-scale structures at even lower angular scales (on the order of 10s of arc-seconds) could be present in the corona under weak scattering conditions and emphasize possibilities of their detection with sensitive instruments.

In view of the above, an observational experiment using the Long Wavelength Array (LWA : Ellingson et al. :2013) interferometer is planned. We will make use of the two LWA stations in New Mexico, the LWA1 (Taylor et al. :2012, *JAI,* 1250004) co-located with the Very Large Array and the LWA-SV at the Seviletta National Refuge, with a single-baseline of ≈ 75 Km at an angular resolution of ≈ 14 arc-seconds @ 60 MHz. Both the LWA and LWA-SV are compact arrays consisting of 256 dual-polarization active dipole antennas arranged in a pseudo-random pattern with an effective aperture of ≈ 100 m diameter operating in the frequency range of 10 - 88 MHz. The current deep solar minimum conditions are conducive for long baseline radio observations to probe the smallest angular structures in the solar corona when coronal scattering is expected to be weak. The primary motivation for the present work is to impose constraints on the smallest source sizes detectable in the solar corona and the longest baselines needed for such observations, below 100 MHz. In this talk, I will briefly describe the recent similar studies and discuss the current observations with some initial results.