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New Evidence for a Coronal Mass Ejection-driven High Frequency Type II Burst near the Sun

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Corona, the outermost region of the Sun, is believed to be present from a heliocentric distance of ~1.01 $R_{\odot}$ (where $R_{\odot}$ is the radius of the solar photosphere)to more than 1 AU. Being highly tenuous plasma medium, it harbours large scale structures, as multi-frequency observations reveal. One such powerful solar phenomenon is Coronal Mass Ejections (CMEs), which has radio signatures as Type II bursts. Type II solar radio bursts are considered to originate from plasma waves excited by magnetohydrodynamic(MHD) shocks and converted into radio waves at the local plasma frequency and/or its harmonics. They are the direct diagnostic of MHD shocks in the solar atmosphere.

In this work, we present the observations of a high frequency type II radio burst (440 –30 MHz) that occurred in the solar corona on 2015 November 4. The drift rate of the burst was unusually high (≈ 2 MHz/s). Our analysis shows that the estimated speed of the magneto- hydrodynamic shock driving the burst is not constant. The peak speed and acceleration are very large, 2450 km/s and 17 km/s, respectively. There is good spatio-temporal correlation between the type II burst and the associated coronal mass ejection (CME) in the white-light and extreme-ultraviolet images. The time profile of the shock speed from radio observations and the light curve of the associated soft X-ray profile obtained with ATSROSAT/SSM are well matched with a correlation coefficient of ≈ 86 %. These results indicate that in the present case, (i) the magnetohydrodynamic shock responsible for the high frequency coronal type II burst is driven by the CME and(ii) the time profile of the type II burst shock speed represents the near-Sun kinematics of the CME.These results provide clinching evidence that the CMEs are responsible for radio transients (type II) originating close to the Sun.