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Evidence for wind-like regions, acceleration of shocks in the deep corona and relevance of $1/f$ dynamic spectra for coronal type II bursts

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Type II radio bursts are produced near the local electron plasma frequency f_{pe} and near $2f_{pe}$ by shocks moving through the corona and solar wind. In the present paper 8 well-defined type II coronal radio bursts (30–300 MHz) are analyzed. Three important new results are presented. First, it is found that the dependence of the central frequency on time can be fitted to a power-law model, $f \propto (t - t_0)^{-n}$, with n lying in the range 0.6 to 1.2. Assuming a constant shock velocity, these results provide evidence that the density profile $n_e(r)$ in the type II source regions closely resembles the solar wind, with $n_e(r) \propto r^{-2}$. One possible interpretation is that the solar wind starts within a few solar radii of the photosphere, most probably within 1 solar radius. Discussed also is an alternative interpretation that presumes the shock speed is not constant. Second, for the events considered it is found that radio burst emission in $1/f - t$ dynamic spectra resembles closely straight lines. In future this will allow much more objective identification of type IIs in solar radio data and plausibly real-time correlation with coronagraph and other solar radar. Third, it is demonstrated that $1/f - t$ dynamic spectra sometimes provide direct evidence for acceleration of the shock deep in the corona, thereby complementing coronagraph studies.