



## Investigation into solar type II radio bursts recorded by CALLISTO-BR

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This work brings out the outcomes of investigation of two solar type II radio bursts observed on October 16, 2010 (19:12:54 UT) and on February 14, 2011 (15:27:05 UT) by CALLISTO-BR (Compound Astronomical Low frequency Low Cost Instrument for Spectroscopy and Transportable Observatory) spectrometer operating in the frequency range of 45-870 MHz. The first event comprises a burst with typical type II starting frequency and clues of partial reabsorption of the fundamental frequency band. The second one consists of a solar split-band type II radio burst with whole reabsorption of the fundamental frequency band. Both events were preceded by solar type III radio bursts. Among the physical parameters determined for the propagation of the associated shock and its region are: source speed of the order of  $1127 \pm 76 \text{ km s}^{-1}$  and  $889 \pm 31 \text{ km s}^{-1}$ ; electron number density of  $(5.17 \pm 0.33) \times 10^7 \text{ cm}^{-3}$  and  $(2.46 \pm 0.07) \times 10^8 \text{ cm}^{-3}$ ; Alfvén speed of the order of  $287 \pm 11 \text{ km s}^{-1}$  and  $398 \pm 911 \text{ km s}^{-1}$ ; Mach number of  $1.05 \pm 0.01$  and  $1.12 \pm 0.01$ ; magnetic field strength of  $0.95 \pm 0.03 \text{ G}$  and  $2.85 \pm 0.07 \text{ G}$ ; and temperature of  $(3.79 \pm 1.02) \times 10^7 \text{ K}$  and  $(1.69 \pm 0.39) \times 10^7 \text{ K}$ . The results, compared to those reported in the literature, are consistent. The source speed indeed outdoes the Alfvén speed with a density jump at the shock front which is suitable ( $< 4$ ) for MHD (magnetohydrodynamic) shocks for both events.