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Type II radio bursts with triple harmonic structure at frequencies 10-30 MHz.

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In this presentation we report about the first observations of Type II bursts with three harmonics in frequency range 10 — 30 MHz. The most representative of them was registered on June 4, 2004 with the UTR-2 radio telescope and consisted of three lanes. Wide frequency band of the analysis allowed to observe all three harmonics of the burst at one moment of time ($7^h53^m50^s$ UT). The observational properties, which confirm the harmonic structure of the burst, are discussed. The frequency ratios of the harmonics at fixed moment of time were f_2/f_1=2 and f_3/f_1=2.8, where f_1, f_2 and f_3 are the harmonic frequencies. All three harmonics of the observed Type II burst had fine structure in the form of fast drifting sub-bursts. The durations of sub-bursts of different harmonics were also different (in average 7 s for fundamental, 3 s for second and 1-2 s for third harmonic). The frequency drift rates at fixed moment of time appeared to be -10 kHz/s for fundamental (f=10 MHz), -30 kHz/s for second harmonic (f=20 MHz) and -50 kHz/s for third harmonic (f=30 MHz). The consistency of the three harmonics hypothesis was tested in the frames of four different corona models. For each model corresponding source velocities were calculated. The connection between the observed Type-II burst and CMEs was analyzed. The extension of this Type II burst at lower frequencies (WIND data at frequencies 1–11 MHz) was also found. Some other examples of Type II bursts possibly having the triple harmonic structure are shown.