



Experimental investigations of the fine temporal structures in the Jovian decameter radio emission obtained for the different Io-dependent sources

G.V. Litvinenko (1), V.V. Zakharenko (1), H.O. Rucker (2), A.A. Konovalenko (1), and V.V. Vinogradov (1)

(1) Institute of Radio Astronomy, Kharkov, Ukraine (gallitv@rian.kharkov.ua), (2) Space Research Institute, Graz, Austria (helmut.rucker@oeaw.ac.at)

In October 2009 with the UTR-2 radio telescope (Kharkov, Ukraine) several observational campaigns have been performed with the aim to investigate the fine temporal structures in the Jovian decameter radio emission. As recording equipment the broad band digital receiver with 8192 frequency channels (33 MHz frequency band in common) and 0.25 ms time resolution was put into operation. Experiments have been arranged in accordance to the known diagram occurrence of Io-dependent sources. Periods of the different sources have been chosen, which enable to obtain possible new results for the sporadic S-emission of Io-A, Io-B, Io-C and Io-D sources and their combinations. Continuous measurements lasted approximately 3.5 hours. Long duration of observations provided the possibility to watch the continuous time evolution of the Jovian radiation with complete coverage of the planet's culmination and consideration of the different stages of radiation variation in detail.

A special period of time of appearance of the weak Io-D source was more precisely defined during the observations. This result was feasible due to the high sensitivity of the used receiving equipment (antenna effective area is close to 100 000 m², frequency resolution 12 kHz, time resolution 0.25 ms, dynamic range 70 dB). For the future investigations there refinements are of high relevance. The obtained Jovian S-burst radio emission data have been processed with the Fourier transform method. New effective computer program with unique performances for dynamic spectra visualization and investigation was created. High spectra quality enabled to get the following results without any additional correction procedures: 1) the temporal evolution of the modulation features of S-radiation for the different Io-dependent sources; 2) the time dependence of the density lines of Faraday rotation polarization plane, and, as a result, their connection with the Earth's ionosphere properties in the considered time of period; 3) the temporal variation of the narrow-band emission in the Jovian decameter emission; 4) the microsecond characteristics of the simple S-bursts; 5) the structures of S-bursts with clear positive frequency drift (25 – 30 MHz/s); 6) several quasi-periodic and quasi-harmonic structures of the different time scales and in the different frequency bands.