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A mechanism for the formation of the Jovian S-burst trains and narrow band emission

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A mechanism for the formation of S-bursts fine structure and narrow band (NB) emission of Jovian DAM is suggested. As is well known, the S-bursts usually appear in the dynamic spectra of Jovian decameter radiation, as narrow band emission of short duration (from several milliseconds to tens of milliseconds) with a very strong negative frequency drift. S-bursts often form quasi-periodic trains of pulses with the repetition frequency from 2 Hz to 400 Hz. In contrast to S-bursts another kind of narrow band emission appears as a quasi-continuous line in the dynamic spectra. The frequency band of the NB emission very often varies around a selected frequency. The mechanism proposed in this work is based on the well known physical effect representing a modulation of the amplitude-and-frequency characteristics of a wave with a strong frequency dispersion which travels through a medium with time-varying parameters. Numerical experiments show that, depending on a variety of conditions, temporal variations of the planetary magnetic field along the wave trajectory may lead to formation of quasi-periodic trains of bursts, as well as to the narrow band signals that appear from an initially continuous, constant-frequency narrow band emission. The characteristic time scales of the quasi-periodic S-burst sequences and NB emission are determined by the characteristics of the low-frequency magnetic field variations. The latter are initiated, for example, by the motion of Io through the planetary magnetic field or by large-amplitude Alfven waves excited in the Jovian ionospheric resonator.