Detection of solar coronal magnetic loop oscillations in microwaves

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Analysis of the Low-Frequency fluctuations of solar microwave radiation (37 GHz and 11.7 GHz) appears as a relatively new direction of investigations in the traditional branch of the microwave radio astronomy. For this purpose a "sliding window" Fourier transform combined with the Wigner-Ville technique is applied. It has been shown that slow variations of the electric current and associated magnetic field in a source of solar microwave emission, as well as a large-scale motion of the source, can modulate the intensity of the received signal. Special attention in the present study is paid to the analysis of modulations of microwave emission recorded at the same time when TRACE EUV telescope observed large scale oscillations of coronal loops. For some events the spatial resolution of the radio telescope at 37 GHz allows also to localize an active region containing the oscillating loops. The applied data analysis technique, besides of the modulations probably connected with loop oscillations detected by TRACE, makes possible to detect additional modulations, which may be associated with oscillations of smaller (invisible for TRACE) loops. These modulations can be connected as well with specific wave modes (sausage mode) excited in solar coronal structures. Comparative analysis of phases of oscillations of TRACE loops and the microwave emission modulation allows deeper insight into the global dynamics and structure of solar active regions. This makes the analysis of LF modulations of microwave radiation intensity to be an important and useful tool for diagnostics of the solar corona.