

Artificial aurora triggering by high-power radio emission from the SURA facility as observed on board of the International Space Station

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We present the results of the experiment on modification of the ionosphere by high-power radio emission from the SURA heating facility carried out on October 2, 2007 at 18:40 – 19:00 UT. The effects of modification were observed on board the Russian Segment of the International Space Station (RS ISS).

The mid-latitude (56.13N, 46.1E) heating facility SURA makes it possible to carry out plasma investigations in the ionosphere outside the highly dynamic auroral zone. In the experiment under discussion, the facility was working during 20 min in the mode of periodic heating (meander with a period of 2 min) at the frequency of 4.30 MHz. The effective emission power was 10 MW. The modulation frequency was close to the frequency of natural Alfvén oscillations of plasma in the magnetic flux tube resting on the heated spot in the ionosphere.

The RS ISS observations with an optical TV camera have provided more than 1500 images of a bright local glow, which appeared within the field of view of the camera as the Space Station was passing over the location of the Sura facility. The brightness of the glow reached tens of kilorayleighs. The compact bright glow appeared Northeast of the heating facility (150-200 km) and was moving East in the image plane. This picture was observed against the quiet background luminosity of the planetary emission layer and auroral oval both before and after the passage over the Sura region. The analysis of helio-geophysical conditions did not reveal any significant anomalies during the experiment. According to the INTERMAGNET network data, the planetary index of magnetic activity did not exceed 3, the auroral

oval was quiet, noticeable variations in the solar wind and interplanetary magnetic field were absent (data from GOES, SOHO, etc.)

A low power of the heating emission and high intensity of the glow observed suggest that the glow wasn't due directly to HF heating of ionosphere, but rather might be caused by the particle precipitation (or aurora) artificially stimulated by the heating effects, such as modification of the ionospheric plasma over the SURA heating facility, which forms the base of the magnetic flux tube (and the standing wave node) and whose natural Alfvén oscillations have a period close to the modulation period of the heating emission. The Alfvén oscillations in the magnetic tube could be intensified during the experiment by a short (less than 1 min) and weak (amplitude of about 2 nT) pulse in the planetary geomagnetic field that occurred at 18:47:30 UT.