

Radio wave observation by the Lunar Radar Sounder (LRS) onboard the Kaguya spacecraft

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On October 29, 2007, Lunar Radar Sounder (LRS) onboard the Kaguya spacecraft successfully started radio wave observation on the lunar orbit in order to check the background noise level for the preparation of starting the lunar subsurface radar sounding. In the initial observations, natural radio waves, such as auroral kilometric radiation (AKR) and Type-III solar radio bursts, and broadcasting/communication waves from the Earth were observed. We also detected signals of Moon Bounce Experiment by High Frequency Active Auroral Research Program (HAARP) on Jan. 19 and 20, 2008.

The spectrogram of AKR obtained by the Kaguya spacecraft was compared in detail with that obtained by the Akebono satellite near the Earth. They were basically similar but some components are observed only by Kaguya probably because Kaguya detected AKR from the sources located above the Akebono satellite. The terrestrial manmade noises are detected even in a frequency range around 5 MHz, which is used by LRS radar sounding observation. The intensity of interferences seems to depend on solar zenith angle at regions where high power stations are concentrated on the ground. In a frequency range around 5 MHz, the interferences are most intense when the region at longitude around 80 E is in the night sector. Based on the results, radar sounding operation is now scheduled to avoid the interferences. The HAARP signals at 6.7925 MHz and 7.4075 MHz, whose transmitted power was 3.6 MW, were clearly detected by LRS. The intensity of HAARP signal was stable when the Kaguya was near the boundary of the nearside and the farside of the Moon. In the nearside, however, the intensity of HAARP signal became fluctuated. The results suggest that the lunar surface echo of HAARP signal was superposed on the HAARP signal itself in the nearside of the Moon.