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Jovian Radio Wave Observation system using LLFAST: Lunar Low Frequency Astronomy Telescope

Takahiro Iwata[1*], Kazumasa Imai[2], Hiroaki Misawa[3], Tetsuro Kondo[4], Tomoyuki Nakajo[5], Hirotomo Noda[6], Hiroshi Takeuchi[1], Fuminori Tsuchiya[3], Atsushi Kumamoto[3]

[1]ISAS/JAXA, [2]Kochi National College of Technology, [3]Tohoku Univ., [4]NICT, [5]Fukui Univ. of Technology, [6]NAOJ

Jupiter's decametric radio emissions (DAM) have been regarded as the starting point to elucidate planetary magnetospheres. The De (Jovicentric Declination of the Earth) effect suggests a part of the model of a Jupiter radio search-light beam [1]. Such micro structures in the Jupiter radio sources region also support a highly coherent source region [1]. This model predicts the size of the coherent source region along the line of the magnetic field to be less than 20 km for each individual source frequency component. The highest spatial resolution obtained by the ground based VLBI observations can not, however, resolve the radio sources with the resolution of 1000 km at Jupiter, so that it has been impossible to inspect proposed models.
Lunar Low Frequency Astronomy Telescope (LLFAST) is one of the candidate mission instruments which will be equipped on the Japan's post SELENE/KAGUYA lunar explorer (tentative name: SELENE-2). It is an on-orbit station of a space VLBI composed with decametric radio telescope on SELENE-2 Orbiter and ground stations. The highest spatial resolution of 20km provided by the Moon-Earth baseline interferometry is expected to shed light on the new science for the micro structures and beaming of Jovian radio sources. LLFAST is also regarded as the first step of on-orbit display for the interferometer for the very low frequency, less than 10 MHz, radio wave observations on the lunar far side.
The interferometric system of the LLFAST observations consists of lunar and ground stations for short-wave. An orbiter of SELENE-2 equips the on-board systems of LLFAST which are composed with a cross-dipole antenna and inner instruments. The main beam of the cross-dipole antenna will be pointed toward Jupiter by three-axis thruster control of the orbiter. The observation frequencies are 20-25 MHz and 15-25 MHz for interferometric and single-dish observation, respectively. The acquired signals are transmitted to the down-link stations by the communication and data handling sub-system of the orbiter. All the acquired data including ground observations are executed correlation processes.
Reference - [1] Imai, K. et al. (2008) AGU Fall Meeting SM41B-1673.

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