A Project on the Lunar Low Frequency Astronomy Studying Telescope: LLFAST for Jovian Radio Wave Observation

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The highly accurate observation in the very low frequency band below about 10 MHz is yet to be realized, so that this range is remarkable as one of the last frontiers for astronomy. This is mainly because that the terrestrial ionosphere prevents us from observing the radio waves below the ionospheric cutoff frequency on the ground. It is, moreover, difficult to observe the faint radio waves from planets and celestial objects even on the earth's orbit because of the interference caused by the solar burst, artificial noises and terrestrial aurora emissions. The lunar far-side is a suitable site for the low frequency astronomical observations, because noises from the Earth can always avoided and radio waves from the Sun can be shielded during the lunar night.

Assuming that Japanese lunar exploration after KAGUYA will be conducted as continuous series, we discussed the feasibility to realize a low frequency array on the lunar far-side step by step. We have studied the capability of the Lunar Low Frequency Astronomy Studying Telescope: LLFAST which is a lunar-terrestrial baseline interferometer at 20-25 MHz with Earth-Moon baseline for the first stage. One element antenna would be placed on the lunar polar region where is appropriate as a landing site in the near-future lunar surface exploration. The main objective of this stage is to observe the low frequency radio emissions from Io-Jupiter system with high resolution, of about 20 km on the Jupiter, as well as demonstration of landing and deploying. It will shed light on to elucidate the mechanism of Io-Jupiter's Decametric Radio Source.

We examine the design of a vertical antenna on the lunar surface and the mechanism for its expansion. The design of data acquisition and handling system, and the argument for the comparison with the formation flight system are also presented.