Paper ID: 15285
oral

SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

Author: Dr. Amin Aminaei
Radboud University Nijmegen, The Netherlands, a.aminaei@astro.ru.nl

Dr. Marc Klein Wolt
Radboud University Nijmegen, The Netherlands, M.KleinWolt@astro.ru.nl
Prof. Heino Falcke
Radboud University Nijmegen, The Netherlands, H.Falcke@astro.ru.nl
Dr. Philippe Zarka
France, philippe.zarka@obspm.fr
Mr. Linjie Chen
Radboud University Nijmegen, The Netherlands, chen@jive.nl
Mr. Thomas Bronzwaer
Radboud University Nijmegen, The Netherlands, t.bronzwaer@gmail.com
Mr. Harish Vedantham
The Netherlands, harish@astro.rug.nl
Prof. Leon Koopmans
The Netherlands, koopmans@astro.rug.nl

ULTRA-LONG-WAVELENGTH RADIO OBSERVATIONS ON THE MOON; A SCIENTIFIC AND TECHNICAL REVIEW

Abstract

We present the scientific and technical aspects of lunar radio observations using a tripole antenna and a sensitive digital receiver in a broad spectral range (10 kHz-100MHz). This experiment, referred to as the Lunar Radio eXplorer (LRX), is now envisaged for the ESA Lunar Lander mission (expected launch in 2018) as part of the Lunar Dust Environment and Plasma Package(L-DEPP) [the study is funded by ESA]. The Lunar Lander will essentially be a path-finder mission and address key questions to prepare for future lunar human and science missions. In addition, the LRX will open up the virtually last unexplored frequency regime below 10 MHz which is inaccessible from the earth due to a cut-off in the earth's atmosphere. The key science cases the LRX will address are the study of Lunar environment, Solar and Planetary science and radio astronomy and cosmology. For the lunar science case, the LRX experiment will monitor the lunar exosphere and its interaction with the Earths magnetosphere and solar wind plasma. One of its major goals, and essential for future scientific exploration of the moon, will be to measure the lunar radio background noise and to determine the limit of lunar radio observations. Acting as a ground penetrating radar, the LRX would also provide significant information about the moon surface and sub-surfaces. For the Solar and planetary science the LRX aims to study solar flares and CMEs as well as observations of radio emission from planets such as Jupiter and Saturn. This will provide present-day information on the current rotation periods of these planets. For radio astronomy, radio bursts from ultra-high energy cosmic rays hitting the moon surface will be studied. Placing the antenna at the Lunar south (north) pole would not only allow to observe the dark and sun-lit side of the moon simultaneously, but also provide shielding from man-made RFI while the earth is below the horizon. This will provide the stable observing conditions that are required to look for the global radio signal from atomic hydrogen produced in the early phase of the universe, before the first stars and galaxies formed; i.e. to measure the signal from the so-called “dark ages”. Finally, based on our experience with the LOFAR (Low Frequency Array) and AERA (Auger Engineering Radio Array) experiments, we review the technical details of the LRX experiment towards the future plan for a large lunar radio interferometer.