26th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Space Science Missions (2)

Author: Mr. Mark Ruiter
ASTRON Netherlands Institute for Radio Astronomy, The Netherlands, ruiter@astron.nl

Prof. Mark Bentum
Eindhoven University of Technology, The Netherlands, m.j.bentum@tue.nl
Dr. Albert-Jan Boonstra
Netherlands Institute for Radio Astronomy (ASTRON), The Netherlands, boonstra@astron.nl
Mr. Hans van der Marel
ASTRON Netherlands Institute for Radio Astronomy, Unknown, marel@astron.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
Mr. Jeroen Rotteveel
ISIS - Innovative Solutions In Space B.V., The Netherlands, J.Rotteveel@isispace.nl
Mr. Eric Bertels
Innovative Solutions in Space BV, Unknown, e.bertels@isisspace.nl
Dr. Mo Zhang
CAS-NAOC, China, mzhang@nao.cas.cn
Dr. Mingyuan Wang
CAS-NAOC, China, mwang@nao.cas.cn
Dr. Linjie Chen
CAS-NAOC, China, ljchen@nao.cas.cn
Prof. Jinsong Ping
CAS-NAOC, China, jsping@bao.ac.cn
Dr. David Prinsloo
ASTRON Netherlands Institute for Radio Astronomy, Netherlands Antilles, prinsloo@astron.nl
Mr. Michel Arts
ASTRON Netherlands Institute for Radio Astronomy, The Netherlands, Arts@astron.nl

THE NETHERLANDS CHINA LONG WAVELENGTH EXPLORER MISSION; THE ANALOG RECEIVER SYSTEM

Abstract

The NCLE (Netherlands China Long Wavelength Explorer) is a scientific payload on the Chang'e4 relay satellite, launched on 21th May 2018, currently orbiting the Earth - Moon L2 point. The mission opens up the last virtually unexplored frequency domain below 10 MHz. This part of the spectrum is not observable from Earth due to the opaque ionosphere. This first international payload on a Chinese mission will attempt to detect the highly redshifted 21 cm line emission from hydrogen, origin of the very early universe. Due to the low signature of this emission, a location with low radio frequency interference (RFI) is essential. The RFI-quiet Earth-Moon-L2 orbit at the lunar far side seems an ideal location for this science to be performed. The mission also pursues very long baseline interferometry (VLBI) with the

lunar based Chang'e4 rover and Earth based low frequency telescope LOFAR. This would enable very high angular resolution.

NCLE consists of three 5 meter nearly orthogonal placed antennas. These feed into a wide bandwidth receiver, covering a frequency window from 80 kHz to 80 MHz. The large bandwidth will enable scientific opportunities, as well as RFI characterisation at the lunar far side. This is very important for future radio astronomy missions as the RFI from Earth at the lunar far side is unknown yet.

The NCLE is a serious first pathfinder mission for future low frequency radio astronomy missions in space. The scientific output and technical advancements will be used for future low frequency satellite missions to come. Future missions will consist of a swarm of nano-sats acting a 3-D radio telescope.

In this paper we will describe the analog receiver system of the NCLE instrument in more detail.