UNDERSTANDING NENUFAR AND NENUFAR-1

POSTED BY LAUREN BARRY ON FEBRUARY 4, 2014

With the recent commissioning, construction, and operation of several major radio telescopes, such as the Murchison Widefield Array (MWA), Long Wavelength Array (LWA), and the Low-Frequency Array (LOFAR), all of which are pathfinders to the Square Kilometer Array (SKA), it is undeniable that radioastronomy has seen rapid advancements over the last decade.

In order to increase sensitivity and resolution, the LOFAR telescope is receiving a "facelift," thanks to the development of project NenuFAR. NenuFAR is the LOFAR superstation located in Nancay that will dramatically improve the quality of the radio telescope, allowing us to investigate things such as:

1) The nature of the processes that couple the stellar winds to the planetary systems

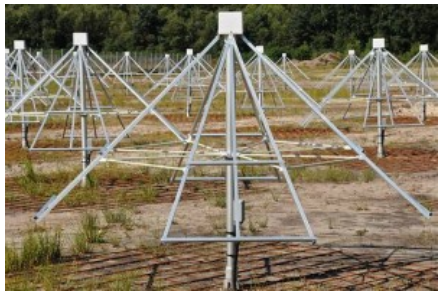
2) The spatial structure and dynamics of the interstellar warm plasma in the Milky Way

3) The populations and physical processes underlying the unveiled Impulsional Universe

4) The physical processes controlling the evolution of the baryonic matter at very high redshift

5) The way that the universe took its local shape over cosmic time scales

The concept of NenuFAR consists of adding 96 tiles to the existingNancay LOFAR station. The tiles will be connected to the 96 dual-polarization RCUs of the LOFAR backend. Each tile is a regular hexagonal cluster of 19 crossed-dipole antennas, analogically phased. The frequency range of operation will include the existing LOFAR-LBA frequencies of 30-80 MHz, but will extend to encompass lower frequencies in the range of 10-85 MHz.



An even smaller project is underway with NenuFAR Phase 1, more commonly referred to as NenuFAR-1, which will precede NenuFAR. Though many of the objectives remain the same, the NenuFAR standalone will have 1824 dipoles, making up 96 mini-arrays, while the NenuFAR-1 will have between 285 and 380 dipoles, forming 15 to 20 mini-arrays. NenuFAR Phase 1 (NenuFAR-1) will consist of the deployment of 15 to 20 mini arrays of 19 dual-polarization LWA-like custom antennas, with their specifically designed preamplifiers, phasing systems, control/command systems and dedicated receiver. Although it will have a lower resolution, the NenuFAR-1 will explore exoplanets and binary eruptive stars, investigate the structure of the galactic interstellar medium (ISM), collect information about the pre-EoR dark ages and the cosmic dawn, and study solar system physics.

In summary, NenuFAR will be used either as a part of the LOFAR network as a super-sensitive LBA station improving LOFAR's global sensitivity and imaging capabilities, or as a standalone instrument that is roughly twice as sensitive as LOFAR's core, rather oriented toward low-frequency, coherent phased-array observations. Thanks to a dedicated receiver, NenuFAR can be used simultaneously in both modes. Burns Industries is excited to be a part of the manufacturing and deployment of the dipole antennas for the NenuFAR and NenuFAR-1. Check back for new developments and updates on this cutting-edge project!