

LOFAR, the Low Frequency Array

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The Low Frequency Array (LOFAR) is being designed by a three-partner consortium (ASTRON in the Netherlands, MIT, and the Naval Research Lab) to open up the 10-240 MHz spectral window to high resolution and high sensitivity study. The array is scheduled for initial operations in 2006, with full capability by 2008. Consisting of roughly 100 phased array stations spanning 400km, and targeting an imaging dynamic range of up to 10^6 , LOFAR is in many important ways a precursor of and prototype for SKA technologies and techniques. Of particular note are requirements for methods of solving for time-variable station beam shapes, atmospheric and ionospheric phase delays that are a function of position within the field of view, and signals from strong sources and RFI entering through station sidelobes. Other important considerations include high bandwidth connectivity of a geographically distributed array, criteria for siting of such an array, and approaches for cost-effective maintenance and operation in a situation where much of the equipment is located in a large number of remote sites.

During the design phase of LOFAR, these issues, along with many others specific to the galactic background limited, RFI-contaminated low frequency regime, have been carefully considered, and design choices have been made. In this presentation, the overall design of LOFAR is described, paying particular attention to problems shared by SKA, whose solutions for the LOFAR project may be relevant for SKA. It will be shown how the development of comparatively modest next-generation radio astronomical arrays like ATA and LOFAR can reduce the cost and risk associated with the designing and building of major instruments like SKA.