

THE DESIGN OF THE LONG WAVELENGTH ARRAY, A
LONG-BASELINE RADIOTELESCOPE FOR 10-90 MHZ

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We will describe the scientific motivations for a long wavelength radio telescope operating between 10 and 90 MHz with baselines up to 450 km. The need for such an instrument was recognized in the NAS decadal report, Astronomy and Astrophysics in the New Millennium. A consortium of universities and national laboratories has been formed to promote the design, implementation and operation of this instrument, the Long Wavelength Array (LWA). The principal members of this consortium are the University of New Mexico, the University of Texas, the Naval Research Laboratory and Los Alamos National Laboratory. The LWA will operate in the last poorly explored part of the electromagnetic spectrum. The instrument will address scientific questions in astronomy and astrophysics, cosmology, solar and planetary science, and ionospheric physics. An important part of the LWA's mission is to educate students in hardware and software design and in signal and image processing.

The consortium plans to site the radio telescope in New Mexico, in order to exploit synergies with the EVLA and other regional facilities and initiatives. The implications of the science drivers for the design of the Long Wavelength Array will be presented. The talk will examine the trade space for scientific goals and instrumental complexity and cost. Particular emphasis will be placed on our ability to perform ionospheric calibration over the whole array. We will also address possible approaches to the excision of radio frequency interference in the instrument's operating range. In addition, we will discuss the software requirements for what is essentially a "software telescope".

We will also present results from prototyping activities funded by the Naval Research Laboratory. These activities are part of our 4 stage plan to develop, construct and operate the LWA, while performing useful and interesting science at each stage.

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