Highlights of Astronomy, Volume 14
XXVIth IAU General Assembly, August 2006
J. Lazio & N. Kassim, ed.

DOI: 00.0000/X000000000000000X

The Long Wavelength Array

G. B. Taylor[1] †

[1]Department of Physics and Astronomy, University of New Mexico, Albuquerque, NM 87131, USA; email: gbtaylor@unm.edu

Abstract. The Long Wavelength Array (LWA) will be a new, open, user-oriented astronomical instrument operating in the relatively unexplored window from 20-80 MHz at arcsecond level resolution. Operated by the University of New Mexico on behalf of the Southwest Consortium (SWC) the LWA will provide a unique training ground for the next generation of radio astronomers. Students may also put skills learned on the LWA to work in computer science, electrical engineering, and the communications industry, among others. The development of the LWA will follow a phased build which benefits from lessons learned at each phase. Four university-based Scientific Testing and Evaluation (ST&E) teams with different areas of concentration (1. High resolution imaging and particle acceleration; 2. Wide field imaging and large scale structures; 3. Ionosphere, and 4. RFI suppression and transient detection) will provide the feedback needed to assure that science objectives are met as the build develops. Currently in its first year of construction funding, the LWA team is working on the design for the first station (see also Ray et al. 2006).

Keywords. instrumentation: interferometers, radio continuum: general, radio lines: general

1. Introduction

We are entering into a new era of exploration of the universe at long wavelengths by a variety of new instruments including the Long Wavelength Array (LWA), LOFAR (Falcke et al, these proceeings), MWA (Webster et al., these proceedings), FASR (Gary et al., these proceedings), and others. Key science drivers that are motivating these advances include (1) acceleration, propagation, and turbulence in the ISM, including the space-distribution and spectrum of Galactic cosmic rays, supernova remnants, and pulsars; (2) the high redshift universe, including the most distant radio galaxies and clusters - tools for understanding the earliest black holes and the cosmological evolution of Dark Matter and Dark Energy; (3) planetary, solar, and space science, including space weather prediction and extra-solar planet searches; and (4) the radio transient universe: including the known (e.g., SNe, GRBs) and the unknown. Because the LWA will explore one of the last and least investigated regions of the spectrum, the potential for new discoveries, including new classes of physical phenomena, is high, and there is a strong synergy with exciting new X-ray and Gamma-ray measurements, e.g. for cosmic ray acceleration, transients, and galaxy clusters. Further discussion of the scientific goals of the LWA can be found in Kassim et al. (2006) or at the LWA web pages `http://lwa.unm.edu`.

2. Current Status

Construction and testing of the Long Wavelength Demonstrator Array (LWDA) is currently underway. The LWDA consists of 16 pairs of dipoles and is located a few

† On behalf of the Southwest Consortium consisting of the University of New Mexico, the Naval Research Laboratory, the Applied Research Laboratory at the University of Texas, and the Los Alamos National Laboratory.

kilometers from the center of the VLA. Lessons learned from the LWDA will feed into the design work on the first two LWA stations. The very first LWA station will eventually supplant the LWDA, and will consist of 256 dipole pairs. The site for the second LWA station is still under study, and is likely to be located near one of the arms of the VLA. Early science should be possible with the first two stations in combination with the 74 MHz system on the VLA. The full LWA is expected to consist of 52 stations on baselines ranging from 400 m to 400 km. This will provide arcsecond level resolution and mJy level sensitivity.

An RFI survey has begun at the LWDA site. Preliminary results are encouraging, both for the environmental conditions, and for the level of self-generated RFI. While FM stations are clearly present at all times, the spectrum from 20-85 MHz is generally clean, with only narrowband signals present the majority of the time.

Acknowledgements

We acknowledge support for the LWA project from the Office of Naval Research.

References

Kassim, N. et al.2006a, in "From Clark Lake to the Long Wavelength Array: Bill Erickson's Radio Science" ASP Conference Series, Vol. 345, (eds. N. Kassim, M. Perez, M. Junor, and P. Henning), p. 392.

Ray, P.S., Ellingson, S., Fisher, R., Kassim, N.E., Rickard, L.J., & Clarke, T.2006, LWA Memo Series No. 35. `http://www.ece.vt.edu/swe/lwa/`