THE 21cm BACKGROUND: A LOW-FREQUENCY PROBE OF THE HIGH-REDSHIFT UNIVERSE J. N. Hewitt[1] [1]MIT Kavli Institute for Astrophysics and Space Research, Room 37-241, Cambridge, MA 02139; jhewitt@mit.edu

Introduction: Observations of the redshifted 21cm line of neutral hydrogen have the potential to probe the processes of structure formation and reionization in a unique way, complementing other techniques in cosmology. The high redshift means that observations have to be done at frequencies of 200 MHz and below, a part of the spectrum plagued by radio frequency interference (RFI). I will review the status of the first-generation experiments that currently are under construction. Even modest collecting areas should be capable of detecting the power spectrum of fluctuations and the largest "bubbles" around quasars. Future experiments could in principle map structures on a wide range of spatial scales and, through sensitive power spectrum measurements, serve as a new probe of cosmological models, structure formation, and dark matter.

The moon offers a unique environment for low-frequency radio measurements. The Earth's ionospheric cutoff of about 10 MHz corresponds to a redshift of 140. Only measurements in space can probe this regime. Even above 10 MHz the Earth's ionosphere severely distorts low-frequency images, so going to space is an advantage for measurements in the 10-100 MHz range to an extent that has not yet been quantified. A major limitation for 21cm background science is RFI. The far side of the moon is uniquely radio quiet, and may be the only site where the most sensitive measurements can be made. Very large collecting areas will be required to carry out investigations at the highest redshifts and of the smallest spatial scales on the sky. The moon would provide a stable platform for such large collecting areas.