

In “New Worlds, New Horizons”, Cosmic Dawn was singled out as one of the top astrophysics priorities for this decade. Specifically, the Astro2010 report asked “when and how did the first galaxies form out of cold clumps of hydrogen gas and start to shine—when was our cosmic dawn?” It proposed “astronomers must now search the sky for these infant galaxies and find out how they behaved and interacted with their surroundings.” This is the science objective of DARE – to search for the first stars, galaxies, and black holes via their impact on the intergalactic medium (IGM) as measured by the highly redshifted 21-cm hyperfine transition of neutral hydrogen. DARE will probe redshifts of 11-35 (Dark Ages to Cosmic Dawn) with observed HI frequencies of 40-120 MHz. DARE will observe expected spectral features in the global signal of HI that correspond to stellar ignition (Lyman-alpha from the first stars coupling with the HI hyperfine transition), X-ray heating/ionization of the IGM from the first accreting black holes, and the beginning of reionization (signal dominated by IGM ionization fraction). We propose to observe these spectral features with a broad-beam bi-conical dipole antenna along with a receiver and digital spectrometer that has high heritage from the ground-based EDGES experiment. We will place DARE in lunar orbit and take data only above the farside, a location known to be free of human-generated RFI and with a negligible ionosphere. In this talk, I will present the mission concept including initial results from engineering prototypes deployed in Green Bank and in Western Australian which are designed to perform end-to-end validation of the instrument and our calibration techniques, and to constrain systematic chromatic corruption produced by the ionosphere. I will also describe our signal extraction tool, using a Markov Chain Monte Carlo technique, which measures the parameterized spectral features in the presence of substantial Galactic and solar system foregrounds.