The Canadian Hydrogen Intensity Mapping Experiment (CHIME): Update and Status

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The Canadian Hydrogen Intensity Mapping Experiment (CHIME) is a new radio transit interferometer now taking data at the Dominion Radio Astrophysical Observatory (DRAO) in Penticton, BC, Canada. We will use the 21cm emission line of neutral hydrogen to map baryon acoustic oscillations (BAO) between 400-800 MHz across 3/4 of the sky. These measurements will yield sensitive constraints on the dark energy equation of state between redshifts 0.8 - 2.5, a fascinating but poorly probed era corresponding to when dark energy began to impact the expansion history of the Universe.

The CHIME instrument consists of four 20 m x 100 m parabolic cylinders, operating with 1024 dual polarization feeds. The analog signals are channelized into 1024 frequency channels across the 400 MHz bandwidth using a set of fast FPGA boards and spatially correlated with a GPU-based correlator. The combination of collecting area and interferometric baseline spacing has been optimized for sensitive measurements of the first three BAO peaks out to the highest redshift ($z\sim 2.5$). CHIME is also exploring a variety of techniques and requirements for removing bright foreground emission emanating from synchrotron emission from the Galaxy.

CHIME saw first light in September 2017, and data collection is ongoing. Current work involves methods of data reduction to help make storage and analysis tractable, in particular co-adding across redundant interferometric baseline spacing; implementing map-making algorithms for efficient mapmaking and noise estimation; testing various methods of foreground emission; and RFI excision techniques. I will describe the CHIME instrument, the analysis challenges, the calibration requirements, and current status.