

Abstract Submitted  
for the SES16 Meeting of  
The American Physical Society

**Probing the distant Universe with ALMA and gravitational lensing** CATHERINE VLAHAKIS, National Radio Astronomy Observatory — The advent of the Atacama Large Millimeter/submillimeter Array (ALMA), located in the Atacama desert in northern Chile, has opened up unprecedented opportunities for studying galaxies in both the local and high redshift Universe at high resolution and with high sensitivity. In 2014-2015, ALMA achieved one of its major goals - the development and verification of the Long Baseline capability, providing imaging at resolutions of tens of milliarcseconds (requiring baselines of up to 15 km). I will present results from the ALMA Long Baseline Campaign Science Verification observations of SDP. 81 (HATLAS J090311.6+003906) - a  $z \approx 3$  gravitationally lensed submillimeter galaxy - in which we detected the Einstein-ring structure in thermal dust emission and CO line emission at unprecedented tens-of-parsec resolution, as well as the highest resolution detection to date of thermal water emission in an extragalactic source. I will also discuss subsequent results presented by several groups that have used lensing models to reconstruct the source emission and investigate the properties of the dust and gas in this distant SDP.81 system, and the future possibilities for using ALMA and gravitational lensing as a powerful tool for probing the distant Universe.

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Date submitted: 14 Oct 2016

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