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Measurements of B-mode Polarization at degree angular scales with the BICEP2, Keck, and Planck

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The theory of cosmic inflation postulates that the initial conditions of our observable universe arose from quantum fluctuations during a very early burst of exponential expansion. The BICEP / Keck Array experiments are a series of cosmic microwave background (CMB) polarimeters specifically designed to search for gravitational waves predicted by inflation by looking for the faint B-mode patterns they would imprint on degree-scale CMB polarization. Observing from the South Pole between 2010 and 2012, the BICEP2 telescope made maps of unprecedented sensitivity at degree angular scales over 2% of the sky, In March 2014 the BICEP2 team reported a high signal-to-noise detection of B-mode polarization at 150 GHz, at a level well above typical predictions of galactic foreground models for that region of sky, and consistent with a large contribution from inflationary gravitational waves. However, later last year high-frequency results reported by the Planck satellite indicated levels of polarized emission from galactic dust potentially high enough to account for the entire BICEP2 signal. In a recently published joint analysis that combines data from BICEP2, the Keck Array, and the Planck satellite, we find that there is not currently significant evidence for a gravitational wave signal, and we set the tightest constraints yet on its possible level. The outlook for continued progress using ultra-deep maps at multiple frequencies is strong. I will describe our current results and the continuing hunt for inflationary gravitational waves both with the BICEP / Keck Array experimental program and with future efforts.