Results from ACBAR

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The Arcminute Cosmology Bolometer Array Receiver (ACBAR) is a 16-element spiderweb bolometer array operating at 150 GHz. Mounted on the 2.1m Viper telescope, ACBAR has dedicated four years to cosmic microwave background (CMB) observations at the South Pole. We present a new CMB temperature anisotropy power spectrum for the complete ACBAR data set. We include data from the 2005 observing season, expanding the data volume by 210% and the sky coverage by 490% over the last ACBAR release. The expanded data set allows us to derive a new set of band-power measurements with finer ℓ-resolution and dramatically smaller uncertainties. In particular, the band-power uncertainties have been reduced by more than a factor of two on angular scales encompassing the third and fourth acoustic peaks and the damping tail of the CMB power spectrum. Despite the exponential damping on small angular scales, the primary CMB fluctuations are detected with a signal-to-noise ratio of greater than 5 up to multipoles of $\ell = 2300$. The calibration has been significantly improved from 6% to 2.3% in temperature. This has been accomplished by replacing the former RCW38-based calibration with a direct cross-calibration to WMAP. Maps of CMB anisotropies measured by WMAP3 and ACBAR are compared to transfer the WMAP dipole-based calibration to ACBAR. The resulting power spectrum is consistent with the theoretical predictions for a spatially flat, dark energy dominated ΛCDM cosmology. The new power spectrum allows us to tighten constraints on the frequency spectrum of the "high-ℓ" excess power reported by CBI.