

Planck 2015 results: V. LFI calibration

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Abstract

© 2016 ESO. We present a description of the pipeline used to calibrate the Planck Low Frequency Instrument (LFI) timelines into thermodynamic temperatures for the Planck 2015 data release, covering four years of uninterrupted operations. As in the 2013 data release, our calibrator is provided by the spin-synchronous modulation of the cosmic microwave background dipole, but we now use the orbital component, rather than adopting the Wilkinson Microwave Anisotropy Probe (WMAP) solar dipole. This allows our 2015 LFI analysis to provide an independent Solar dipole estimate, which is in excellent agreement with that of HFI and within 1σ (0.3% in amplitude) of the WMAP value. This 0.3% shift in the peak-to-peak dipole temperature from WMAP and a general overhaul of the iterative calibration code increases the overall level of the LFI maps by 0.45% (30 GHz), 0.64% (44 GHz), and 0.82% (70 GHz) in temperature with respect to the 2013 Planck data release, thus reducing the discrepancy with the power spectrum measured by WMAP. We estimate that the LFI calibration uncertainty is now at the level of 0.20% for the 70 GHz map, 0.26% for the 44 GHz map, and 0.35% for the 30 GHz map. We provide a detailed description of the impact of all the changes implemented in the calibration since the previous data release.

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Keywords

Cosmic background radiation, Instrumentation: polarimeters, Methods: data analysis