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Large-area measurements of CIB power spectra with *Planck* HFI maps

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We present new measurements of the power spectra of the cosmic infrared background (CIB) anisotropies using the *Planck* 2015 full-mission HFI data at 353, 545, and 857 GHz over 20 000 square degrees. Unlike previous *Planck* measurements of the CIB power spectra, we do not rely on external H_I data to remove Galactic dust emission from the *Planck* maps. Instead, we model the Galactic emission at the level of the power spectra, using templates constructed directly from the *Planck* data by exploiting the statistical isotropy of all extragalactic emission components. This allows us to work at the full resolution of *Planck* over large sky areas. We construct a likelihood based on the measured spectra (for multipoles $50 \leqslant \ell \leqslant 2500$) using analytic covariance matrices that account for masking and the realistic instrumental noise properties. The results of an MCMC exploration of this likelihood are presented, based on simple parameterised models of the CIB power that arises from clustering of infrared galaxies. We explore simultaneously the parameters describing the clustered power, the Poisson power levels, and the amplitudes of the Galactic power spectrum templates across the six frequency (cross-)spectra. The best-fit model provides a good fit to all spectra. As an example, Fig. 1 compares the measured auto spectra at 353, 545, and 857 GHz over 40 % of the sky to the power in the best-fit model. We find that the power in the CIB anisotropies from galaxy clustering is roughly equal to the Poisson power at multipoles $\ell = 2000$ (the clustered power dominates on larger scales), and that our dust-cleaned CIB spectra are in good agreement with previous *Planck* and *Herschel* measurements. A key feature of our analysis is that it allows one to make many internal consistency tests. We show that our results are stable to data selection and choice of survey area, demonstrating both our ability to remove Galactic dust power to high accuracy and the statistical isotropy of the CIB signal.

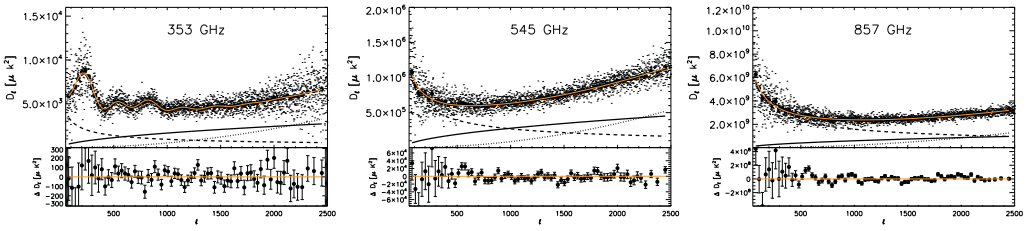

Figure 1. Measured spectra over 40 % of the sky at 353 (left), 545 (middle), and 857 GHz (right), after correcting for the beam and survey mask. The spectra are shown unbinned (thin points) and also after binning with $\Delta\ell = 31$ (thick points). The lines show the best-fit parametric models of the total power (orange solid), clustered CIB (black solid), diffuse Galactic dust (black dashed), and the Poisson power of infrared galaxies (black dotted). Error bars on the binned spectra are $1\,\sigma$ and are taken from the diagonals of the binned covariance matrices. The bottom panels show the residuals of the measured spectra from the best-fit model.