Excess B-modes extracted from the Planck polarization maps - DTU Orbit (09/11/2017)

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One of the main obstacles for extracting the Cosmic Microwave Background (CMB) from mm/submm observations is the pollution from the main Galactic components: synchrotron, free-free and thermal dust emission. The feasibility of using simple neural networks to extract CMB has been demonstrated on both temperature and polarization data obtained by the WMAP satellite. The main goal of this paper is to demonstrate the feasibility of neural networks for extracting the CMB signal from the Planck polarization data with high precision. Both auto-correlation and cross-correlation power spectra within a mask covering about 63 % of the sky have been used together with a “high pass filter” in order to minimize the influence of the remaining systematic errors in the Planck Q and U maps. Using the Planck 2015 released polarization maps, a BB power spectrum have been extracted by Multilayer Perceptron neural networks. This spectrum contains a bright feature with signal to noise ratios 4.5 within $200 \ll l \ll 250$. The spectrum is significantly brighter than the BICEP2 2015 spectrum, with a spectral behaviour quite different from the “canonical” models (weak lensing plus B-modes spectra with different tensor to scalar ratios). The feasibility of the neural network to remove the residual systematics from the available Planck polarization data to a high level has been demonstrated.

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