B98 Data README

1 Band Powers

We have included three data sets from the two separate analysis pipelines described in the Ruhl *et al.* paper[1]. All data are for the 2.9% cut.

- *FASTER* analysis at 3.5 arcminute pixelization using shaped bandpower templates

$$B98\_Ruhl\_faster\_shaped.dat$$

$$B98\_Ruhl\_faster\_shaped.win$$

- *FASTER* analysis at 3.5 arcminute pixelization using flat bandpower templates

$$B98\_Ruhl\_faster\_flat.dat$$

$$B98\_Ruhl\_faster\_flat.win$$

- *MADCAP* analysis at 7.0 arcminute pixelization using flat bandpower templates

$$B98\_Ruhl\_MADCAP.dat$$

The '*.dat' files contain the bandpower estimates together with the errors obtained from the Fisher matrix $F_{bb'}$ and estimates of the x_b parameters to be used in the offset lognormal approximation of the likelihoods for the band powers [2]. They also include columns describing the band boundaries used in calculating the signal correlation matrices when estimating the power spectra. The first line in the files is the total number of band powers. This is followed by the data organized in columns ordered as.

$n_b \quad \mathcal{C}_b \quad \Delta\mathcal{C}_b \quad x_b \quad \ell_- \quad \ell_+.$

These are followed by the normalized correlation matrix G for the band powers. With

$$G_{bb'} = \frac{F^{-1}_{bb'}}{\Delta\mathcal{C}_b \Delta\mathcal{C}_{b'}} \quad \text{and} \quad \Delta\mathcal{C}_b = \sqrt{F^{-1}_{bb}} \tag{1}$$

[1] Ruhl *et al.*, submitted ApJ, astro-ph/0212229

[2] Bond, J. R.. Jaffe, A. H., & Knox, L. 1998, Phys. Rev. D, 57, 2117

2 Non-Gaussian Approximation

To calculate χ^2 values using the offset lognormal approximation to the non-Gaussian likelihood simply transform to variables Z_b as

$$Z_b = \ln(\mathcal{C}_b + x_b), \tag{2}$$

and

$$(F^Z)^{-1}_{b_1 b_2} = \frac{\partial Z_{b_1}}{\partial \mathcal{C}_b} F^{-1}_{bb'} \frac{\partial Z_{b_2}}{\partial \mathcal{C}_{b'}} \equiv \frac{F^{-1}_{b_1 b_2}}{(\mathcal{C}_{b_1} + x_{b_1})(\mathcal{C}_{b_2} + x_{b_2})}. \tag{3}$$

3 Model Filtering

The '*.win' files contain the window functions for each band. These can be used to filter theoretical models to obtain model band powers for accurate comparison to the data. The files are organized in columns as

$\ell \quad W_\ell^1 \quad W_\ell^2 \quad ... \quad W_\ell^{20}$.

To obtain a model bandpower from a target spectrum $\mathcal{C}_\ell^T = \ell(\ell+1)C_\ell^T/2\pi$ use;

$$\mathcal{C}_b^T = \frac{\mathcal{I}[W_\ell^b \mathcal{C}_\ell^T]}{\mathcal{I}[W_\ell^b]}, \tag{4}$$

with

$$\mathcal{I}[f_\ell] = \sum_\ell \frac{(\ell + \frac{1}{2})}{\ell(\ell+1)} f_\ell \tag{5}$$

A file for the *MADCAP* windows is not included as these are not available. Tophat functions bounded by the band limits ℓ_- and ℓ_+ can be used instead.

4 Beam and Calibration Uncertainties

When using the data for parameter estimation the appropriate calibration and beam uncertainties should be included in the likelihoods. For the BOOMERANG98 experiment a calibration uncertainty of 10% (in temperature) should be used together with a beam uncertainty of 1.4 arcminutes rms.

5 Viewing the Data

An *SM* script is also included for viewing the data and window functions.