**Files included in directory:**

There are 2D power spectra and 1D power spectra. Each has nine output files in ASCII text.

**2D:**

|  |  |  |  |
| --- | --- | --- | --- |
| **FILENAME** | **Obs Hours** | **INPUT FILE** | **File ordering** |
| 2d\_eorfg\_10h\_sv.txt | 10h | eor\_p\_fg\_t\_obsv\_10.0\_hr.ms | kperp,kpa, P\_FG, P\_21, P\_sample |
| 2d\_eorfgnoise\_10h\_sv.txt | 10h | eor\_p\_noise\_p\_fg\_t\_obsv\_10.0\_hr.ms | kperp,kpa,P\_FG, P\_21,P\_noise,deltaP\_therm, P\_sample |
| 2d\_eornoise\_10h\_sv.txt | 10h | eor\_p\_noise\_t\_obsv\_10.0\_hr.ms | kperp,kpa,P\_21,P\_noise,deltaP\_therm, P\_sample |
| 2d\_eorfg\_100h\_sv.txt | 100h | eor\_p\_fg\_t\_obsv\_100.0\_hr.ms | kperp,kpa, P\_FG, P\_21, P\_sample |
| 2d\_eorfgnoise\_100h\_sv.txt | 100h | eor\_p\_noise\_p\_fg\_t\_obsv\_100.0\_hr.ms | kperp,kpa,P\_FG, P\_21,P\_noise,deltaP\_therm, P\_sample |
| 2d\_eornoise\_100h\_sv.txt | 100h | eor\_p\_noise\_t\_obsv\_100.0\_hr.ms | kperp,kpa,P\_21,P\_noise,deltaP\_therm, P\_sample |
| 2d\_eorfg\_1000h\_sv.txt | 1000h | eor\_p\_fg\_t\_obsv\_1000.0\_hr.ms | kperp,kpa, P\_FG, P\_21, P\_sample |
| 2d\_eorfgnoise\_1000h\_sv.txt | 1000h | eor\_p\_noise\_p\_fg\_t\_obsv\_1000.0\_hr.ms | kperp,kpa,P\_FG, P\_21,P\_noise,deltaP\_therm, P\_sample |
| 2d\_eornoise\_1000h\_sv.txt | 1000h | eor\_p\_noise\_t\_obsv\_1000.0\_hr.ms | kperp,kpa,P\_21,P\_noise,deltaP\_therm, P\_sample |

**1D:**

|  |  |  |  |
| --- | --- | --- | --- |
| **FILENAME** | **Obs Hours** | **INPUT FILE** | **File ordering** |
| 10h\_eor\_p\_fg\_1d.txt | 10h | eor\_p\_fg\_t\_obsv\_10.0\_hr.ms | k, P\_FG, P\_21, P\_sample |
| 10h\_eor\_p\_fg\_p\_noise\_1d.txt | 10h | eor\_p\_noise\_p\_fg\_t\_obsv\_10.0\_hr.ms | k,P\_FG, P\_21,P\_noise,deltaP\_therm, P\_sample |
| 10h\_eor\_p\_noise\_1d.txt | 10h | eor\_p\_noise\_t\_obsv\_10.0\_hr.ms | k, P\_21, P\_noise, deltaP\_therm , P\_sample |
| 100h\_eor\_p\_fg\_1d.txt | 100h | eor\_p\_fg\_t\_obsv\_100.0\_hr.ms | k, P\_FG, P\_21, P\_sample |
| 100h\_eor\_p\_fg\_p\_noise\_1d.txt | 100h | eor\_p\_noise\_p\_fg\_t\_obsv\_100.0\_hr.ms | k,P\_FG, P\_21,P\_noise,deltaP\_therm, P\_sample |
| 100h\_eor\_p\_noise\_1d.txt | 100h | eor\_p\_noise\_t\_obsv\_100.0\_hr.ms | k,P\_21,P\_noise,deltaP\_therm, P\_sample |
| 1000h\_eor\_p\_fg\_1d.txt | 1000h | eor\_p\_fg\_t\_obsv\_1000.0\_hr.ms | k, P\_FG, P\_21, P\_sample |
| 1000h\_eor\_p\_fg\_p\_noise\_1d.txt | 1000h | eor\_p\_noise\_p\_fg\_t\_obsv\_1000.0\_hr.ms | k, P\_FG, P\_21,P\_noise,deltaP\_therm, P\_sample |
| 1000h\_eor\_p\_noise\_1d.txt | 1000h | eor\_p\_noise\_t\_obsv\_1000.0\_hr.ms | k, P\_21,P\_noise,deltaP\_therm, P\_sample |

**My own details about processing**

All filenames and processing details are found in:

<https://drive.google.com/open?id=1RGKPbuV-yp8xFmNaloCPrreLxfnKvUEOz-EDH90E7cY>

**CHIPSKA Overview**

Frequency-independent phase centre-pointed Gaussian-shaped primary beams are formed with sigma=0.1 radians, appropriate for a station of diameter 38m at 120 MHz. No w-terms are included in the beams. Beams are computed in Fourier space on a grid of Δu =0.5 wavelengths (intrinsic resolution). Visibilities are gridded onto a uv-plane with Δu = 5 wavelengths and umax = 800 wavelengths. The beams are gridded via interpolation for the measured u,v,w baselines, and the beam gridding kernel is 15x15 cells.

For each single frequency channel, the eight timesteps of the complex visibilities, their weights, and a noise set are gridded onto the uv-plane (summed). The noise set is generated via a randomly-distributed complex variable being gridded onto the same uv-plane. This noise set (the “flagpower”) is multiplied by the expected noise level assuming Tsys=871.5 K, and provides the estimate for the noise *power* in the final PS extraction.

The frequency channelised information is combined into a single u,v,nu cube using prepare\_ska.c, and the visibilities and noise are divided by the gridded weights to provide the estimates in Jansky.

Cubes are either (1) fed directly into lssa\_fg.ska.c for LOS transform and variance-weighted power estimation; (2) fed through a polynomial fitting routine (IDL) to separate FG and EoR/noise components; (3) fed through an Ordinary Kriging/GPR fitting routine to extract smoothly-varying (long correlation length) modes. For these data, a polynomial of second order is sufficient to separate the signals for the polynomial fitting. The two datasets (FG and residuals) are then fed through lssa\_fg.ska.c for transform and power estimation.

The signal power components are then identified as:

* FG: power from FG-extracted component after polynomial fitting
* Noise power: power estimated from noise dataset (flagpower)
* EoR: total power minus the FG and noise power components

The results produce more realistic EoR signals for a GPR-based FG estimation and subtraction, and these are used in the outputs. For 1D, each set is computed as a 2D power spectrum with delta kperp = 14.67 wavelengths, and then averaged to 1D with the requested output k values (10, spaced equally in log-space). For 2D, the outputs are directly gridded into the requested linearly-spaced bins with delta kperp = 50 wavelengths.

./lssa\_ska ska\_eorfg\_1000\_fgcomp\_krig 21 60 'all' 800. ska\_eorfg\_1000\_fgcomp\_krig\_1D 0 0 14.67

./lssa\_ska ska\_eorfg\_1000\_fgcomp\_krig 21 100 'all' 800. ska\_eorfg\_1000\_fgcomp\_krig\_2D 0 0 8.23

Individual plot\_powercath\_skaXXX.pro files are created to handle the different 1D and 2D cases, including noise-free, noise-only (EoR+noise) and everything.

Outputs are set as text files in the ska\_data\_challenge/ subdirectory.