ISOTROPIC UPDATE & REVIEW

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FINAL TIME-SHIFTED RUN

DATA / DQ

- Analyzed full O2 run (cleaned frames)
- 1s time shift
- 192s segments, 1/32 Hz bins
- Removed CAT1 veto from CBC veto definer file
- Notch list, Job File, Supercut
- Links to standard plots: a0, a2thirds, a3

RESULTS

*Results include 1.06 bias factor

Spectral Index α	Y/10e-8	σ /10e-8	SNR
0	1.40	1.00	1.40
2/3	1.03	0.76	1.36
3	-0.03	0.13	-0.23

SENSITIVITY OF O1 + O2

- Hubble scaling: $\sigma_{O2} \rightarrow \sigma_{O2}/h_0^2 = 2.16 \times 10^{-8}$

- Since $\sigma_{O1} = 5.9 \times 10^{-8}$ then,

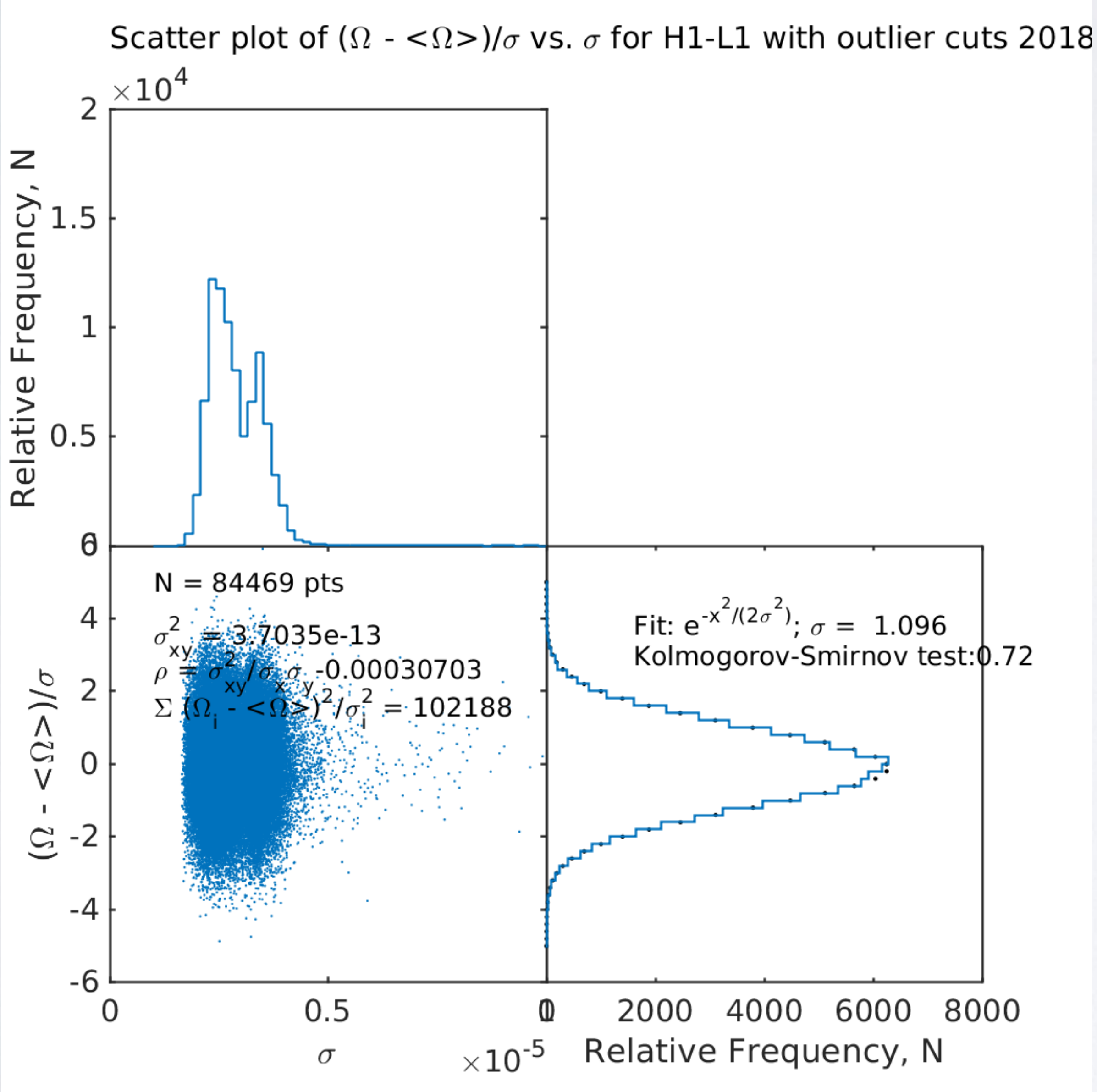
  $$\sigma_{O1+O2} = \left(\sigma_{O1}^{-2} + \sigma_{O2}^{-2}\right)^{-1/2} = 2.03 \times 10^{-8}$$

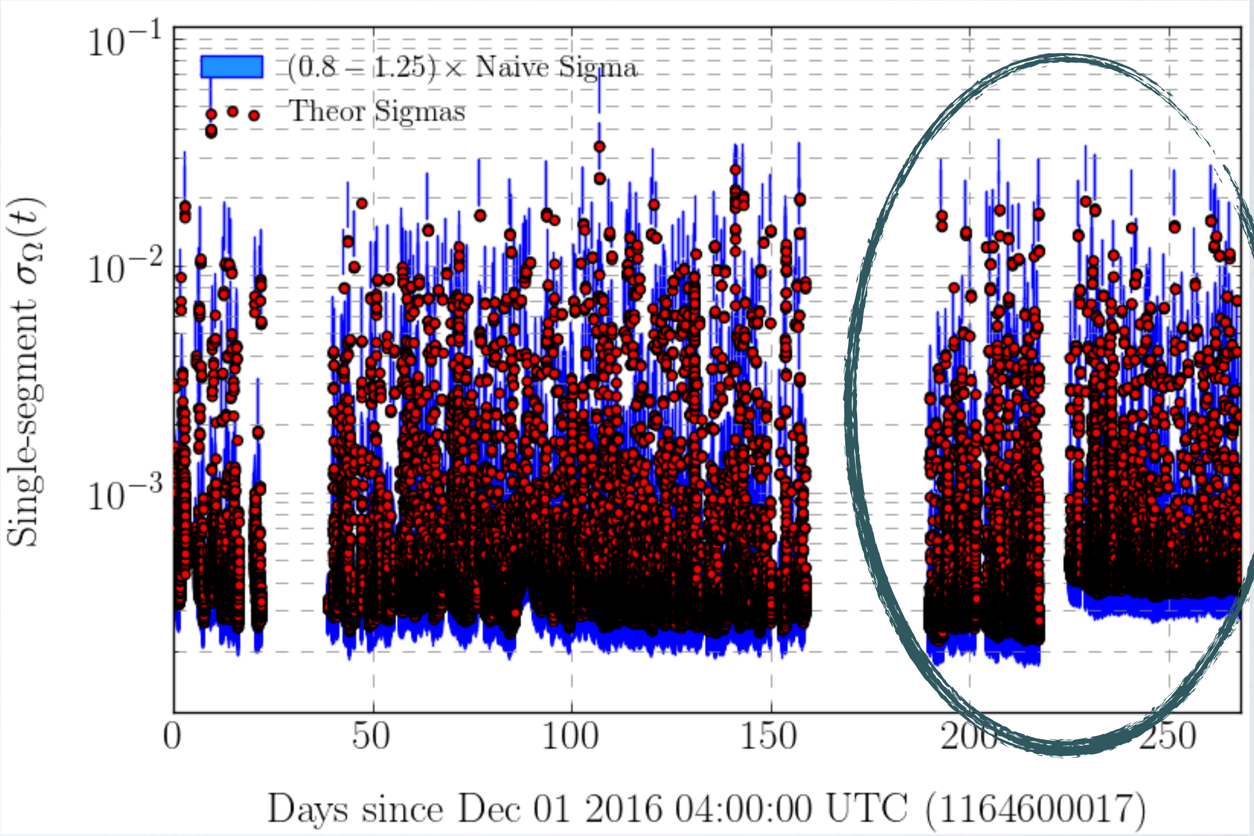
- Improvement $= \sigma_{O1}/\sigma_{O1+O2} = 2.91$

- Compare to C00 data which saw an improvement of ~2.40 [aLOG 339644]

FOLLOWING UP ON ODDITIES

BIMODAL SIGMA DISTRIBUTION

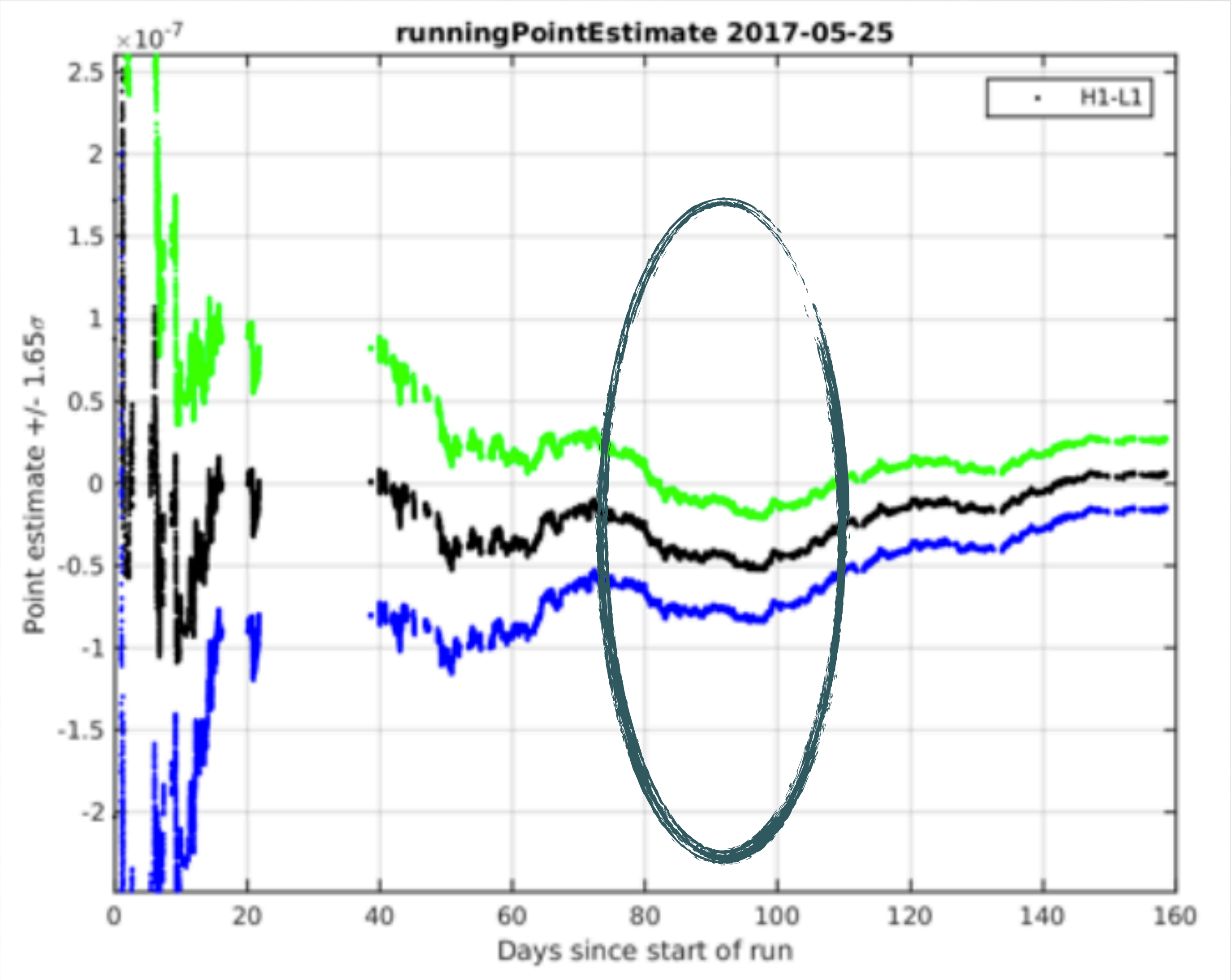




Systematic jump in sigma around July caused by earthquakes near Hanford, WA

DIP IN POINT ESTIMATE

- Ran post-processing on days 70-90. Found SNR of -2.7
- Removing lines with |SNR| > 2 results in an SNR of about -2
- Dip could just be a statistical fluctuation



O2 ZERO-LAG RUN

DATA / DQ

- Analyzed full O2 run (cleaned frames)
- NO TIME SHIFT!
- 192s segments, 1/32 Hz bins
- Removed CAT1 veto from CBC veto definer file
- Notch list, Job File, Supercut
- Links to standard plots: a0, a2thirds, a3

ZERO-LAG RESULTS

*Results include 1.06 bias factor

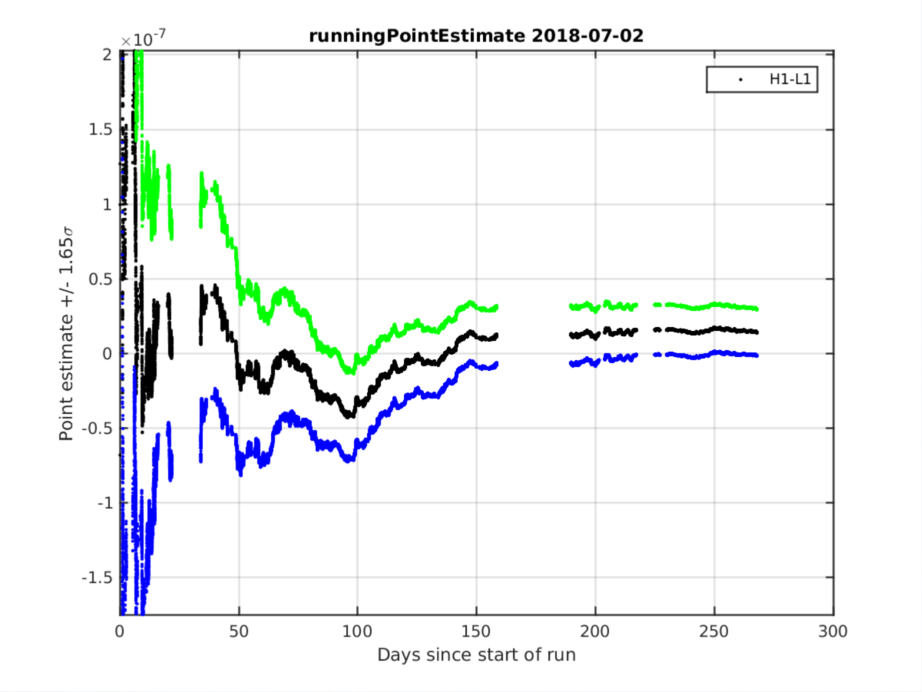
Spectral Index α	Y/10e-8	σ /10e-8	SNR
0	1.03	1.00	1.03
2/3	0.93	0.76	1.22
3	0.16	0.13	1.25

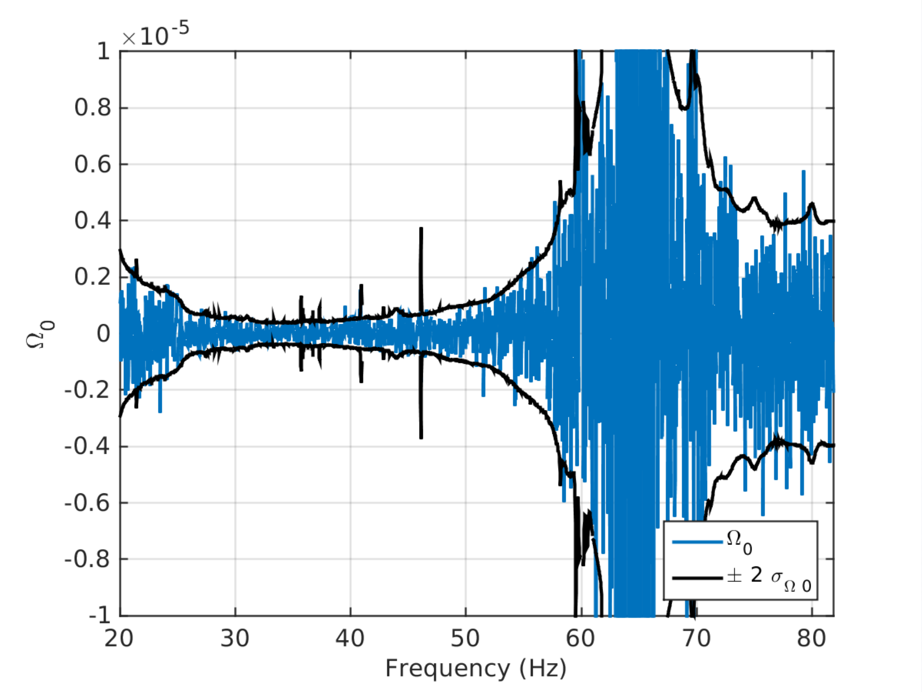
ZERO-LAG QUICK POINTS

- Consistent with expectations from time-shifted run
- K.S. test of 0.92
- Bimodal sigma distribution
- Point estimate looks good - dip in time-shifted run is probably inconsequential

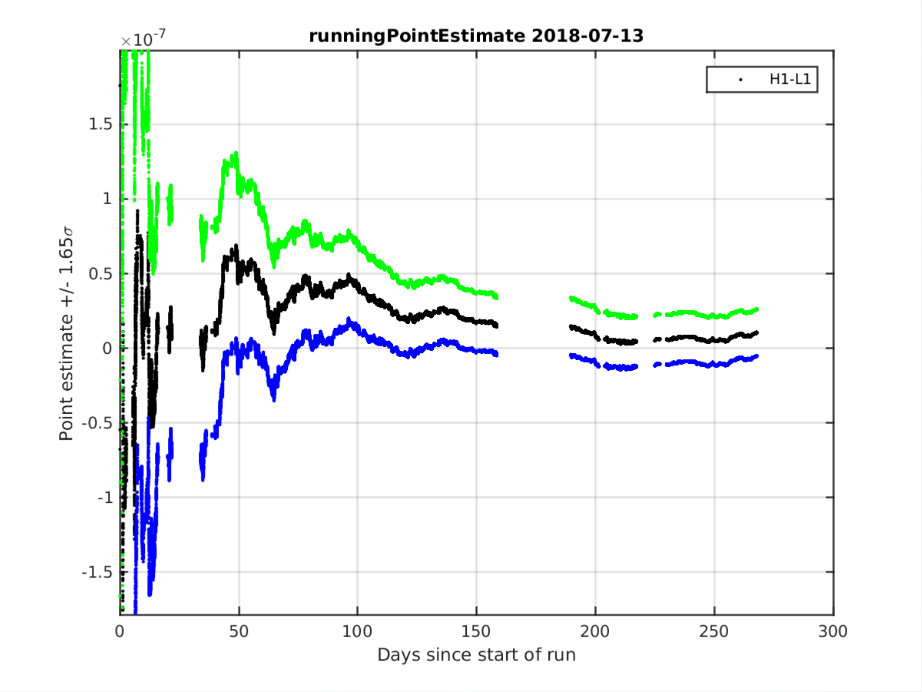
TIME-SHIFT VS. ZERO-LAG I

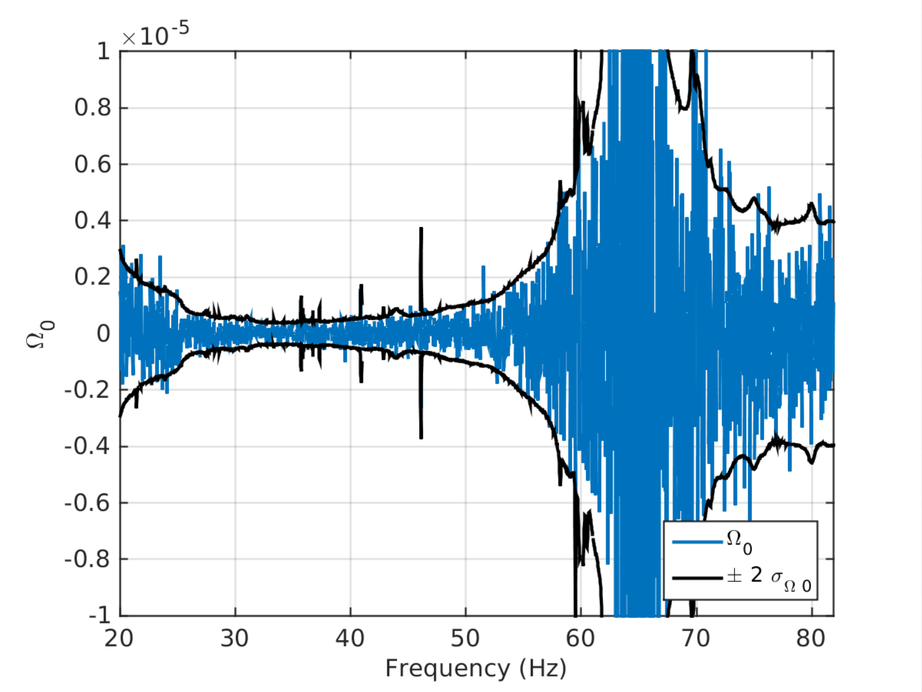
Time Shifted





Zero Lag





TIME-SHIFT VS. ZERO-LAG 2

* Results include 1.06 bias factor
* ZL="Zero Lag, "TS="Time Shifted"

Spectral Index α	Y/10e-8 (ZL / TS)	σ /10e-8 (ZL / TS)	SNR (ZL / TS)
0	1.03 / 1.40	1.00 / 1.00	1.03 / 1.40
2/3	0.93 / 1.03	0.76 / 0.76	1.22 / 1.36
3	0.16 / -0.03	0.13 / 0.13	1.25 / -0.23

COMPUTE_STATS2 CODE REVIEW

ROUGH BREAKDOWN

- Initialize narrow-band point estimate and sigma matrices (sigma and Y for each detector pair)
- Compute the narrowband statistics, handle notched bins, and add the statistics of each detector pair to the point estimate and sigma matrices
- Combine the narrowband results over detectors
- Apply notching, Hubble factor and bias
- Compute broadband statistics

EQUATIONS USED

Narrowband sigma and Y for each detector pair

$$\sigma_{\hat{Y}_\alpha, I}(f) = \frac{1}{\sqrt{S_{\alpha, I}(f)\Delta f}}$$

$$\sigma_{\hat{Y}_\alpha, I} = \left(\sum_f \sigma^{-2}_{\hat{Y}_\alpha, I}(f) \right)^{-1/2}$$

$$\hat{Y}_{\alpha, I}(f) = \frac{2}{\sigma^2_{\hat{Y}_\alpha, I}} Re\left[\frac{p_I(f)}{S_{\alpha, I}(f)} \right]$$

Sum over detectors

$$\hat{Y}_\alpha(f) = \frac{\sum_I \hat{Y}_{\alpha, I}(f) \sigma^{-2}_{\hat{Y}_\alpha, I}(f)}{\sum_I \sigma^{-2}_{\hat{Y}_\alpha, I}(f)}$$

$$\sigma_{\hat{Y}_\alpha}(f) = \left(\sum_I \sigma^{-2}_{\hat{Y}_\alpha, I}(f) \right)^{-1/2}$$

Sum over frequencies

Final broadband statistics

$$\hat{Y}_\alpha = \frac{\sum_f \hat{Y}_\alpha(f) \sigma^{-2}_{\hat{Y}_\alpha}(f)}{\sum_{f'} \sigma^{-2}_{\hat{Y}_\alpha}(f')}$$

$$\sigma_{\hat{Y}_\alpha} = \left(\sum_f \sigma^{-2}_{\hat{Y}_\alpha}(f) \right)^{-1/2}$$

THANKS!