CLASSIC Data Reduction

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CLASSIC Data Reduction

- Tutorial for reducing CLASSIC data:
  - http://www.chara.gsu.edu/tutorials/classic-data-reduction
- redfluor
  - GSU pipeline for reducing CLASSIC and JouFlu data written by Theo ten Brummelaar
- redclimb
  - GSU pipeline for reducing CLIMB data.
  - John Monnier's IDL pipeline is currently recommended
    - See Katie Lester's talk

Starting redfluor

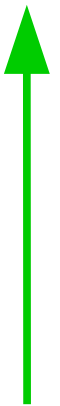
```
redfluor -dev xwin -D/home/schaefer/chara/classic/2018/2018_05_11 -d2 -o3.0 2018_05_11_HD_139087_ird_001.fit
```

Plotting device

Directory to save results

Specifies type of plots to show

Outlier Rejection



Data File to Process

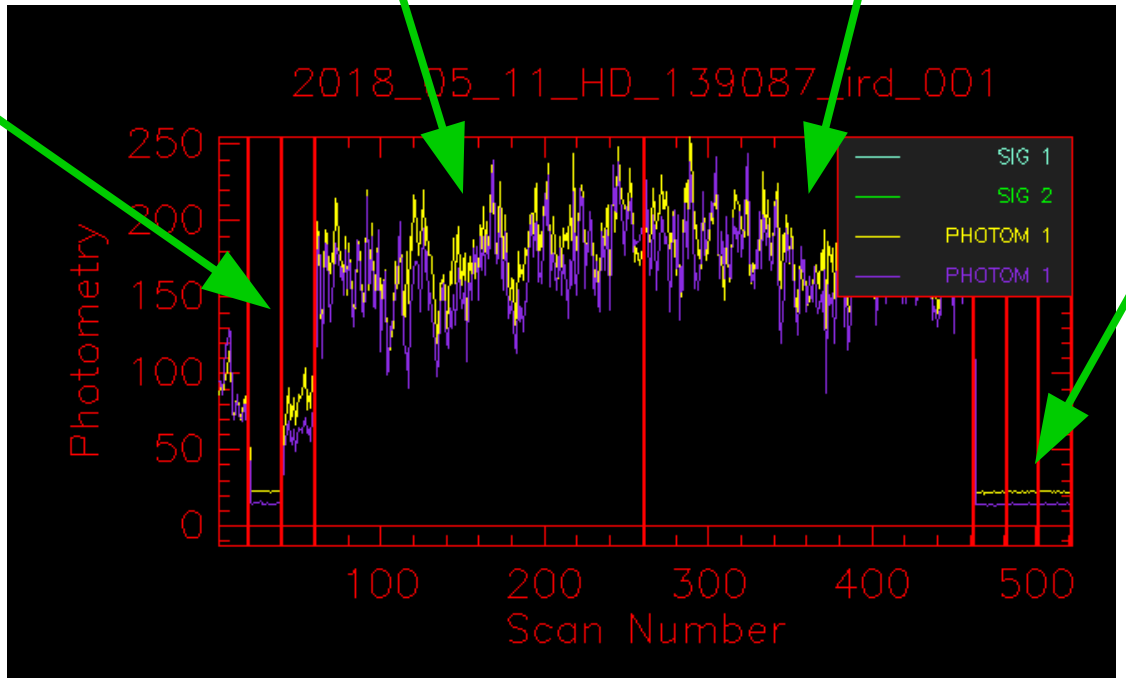
CLASSIC Data

Fringe Data

Off-Fringe Data

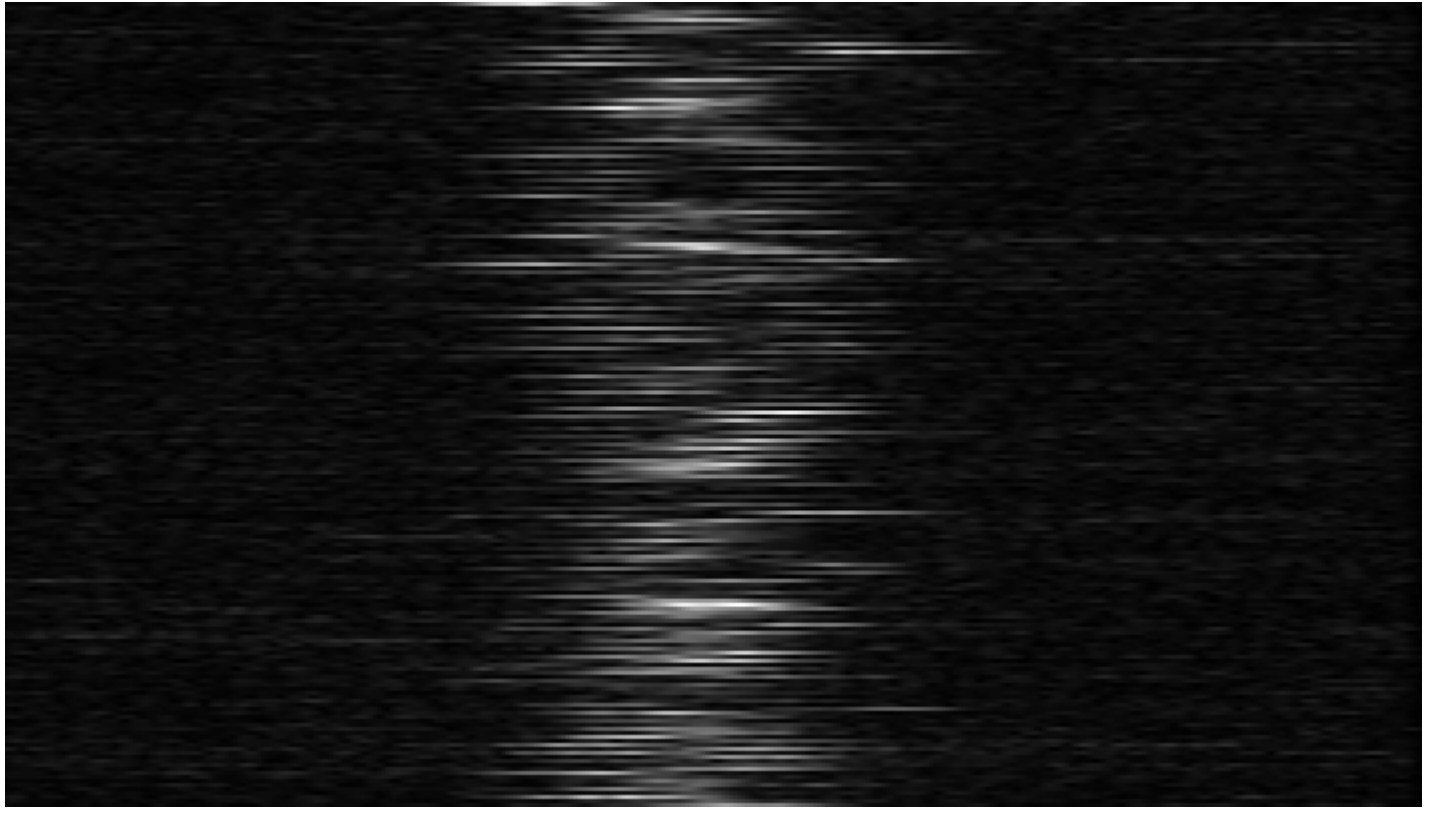
Shutter Sequence:

- Only beam 5 open
- Both beams closed
- Only beam 6 open



Off-Star Background

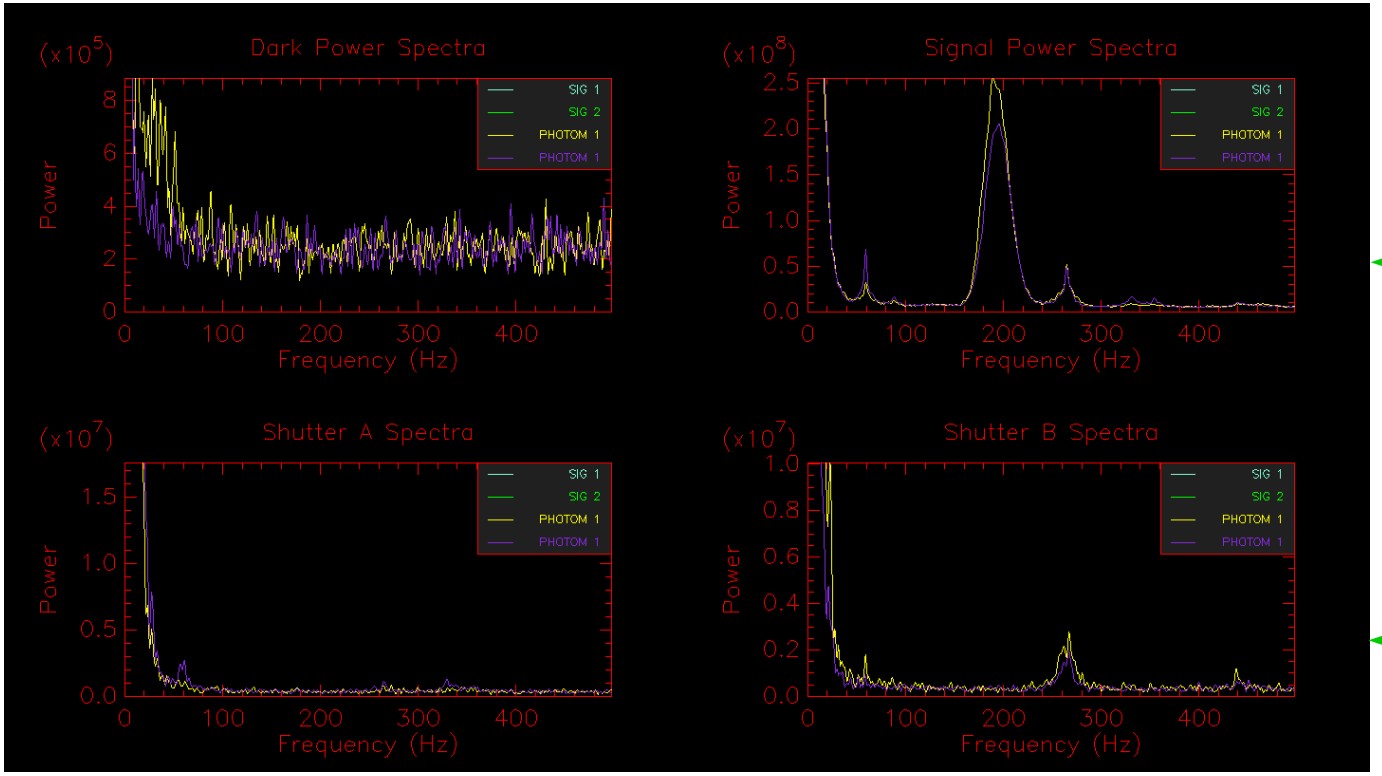
Fringe Waterfall - Data Editing



Power Spectra

Dark

Shutter A



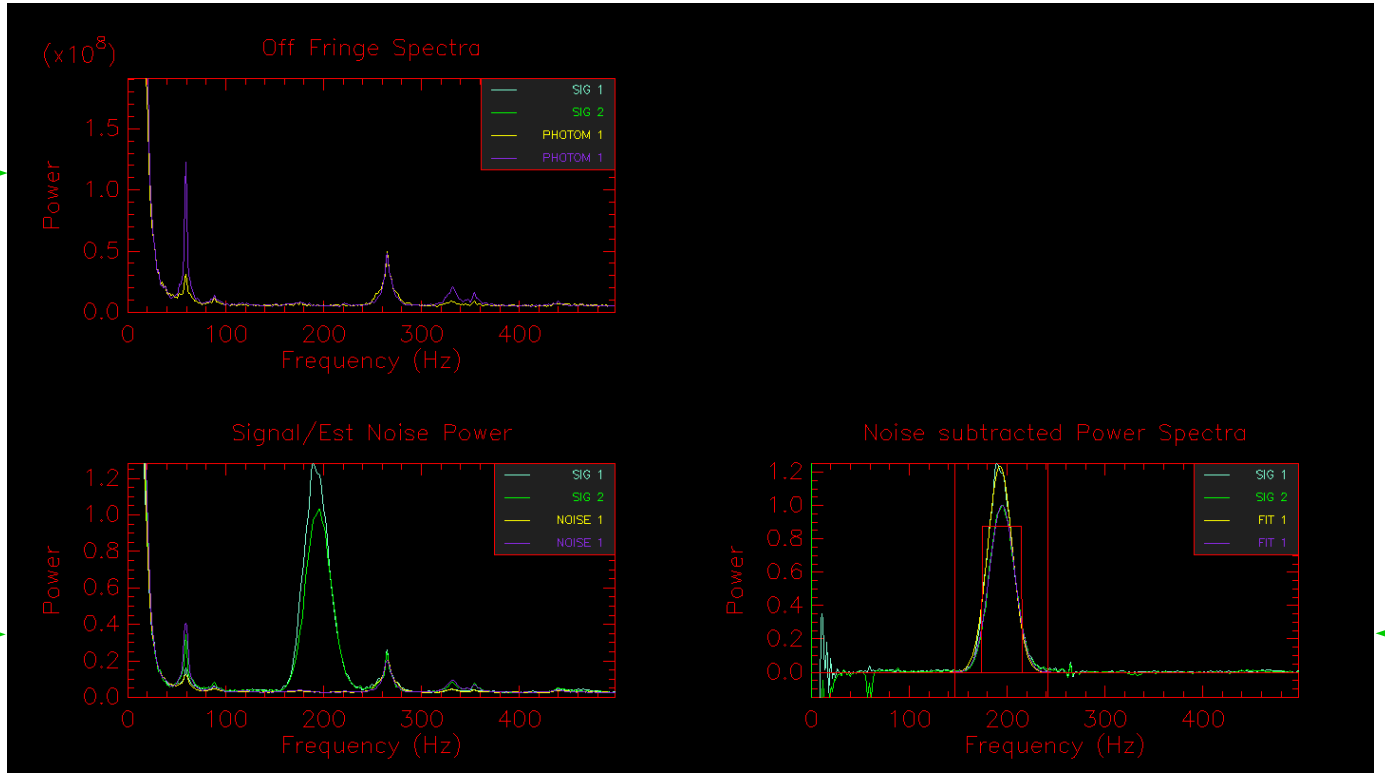
Fringe Signal

Shutter B

Power Spectra

Off Fringe

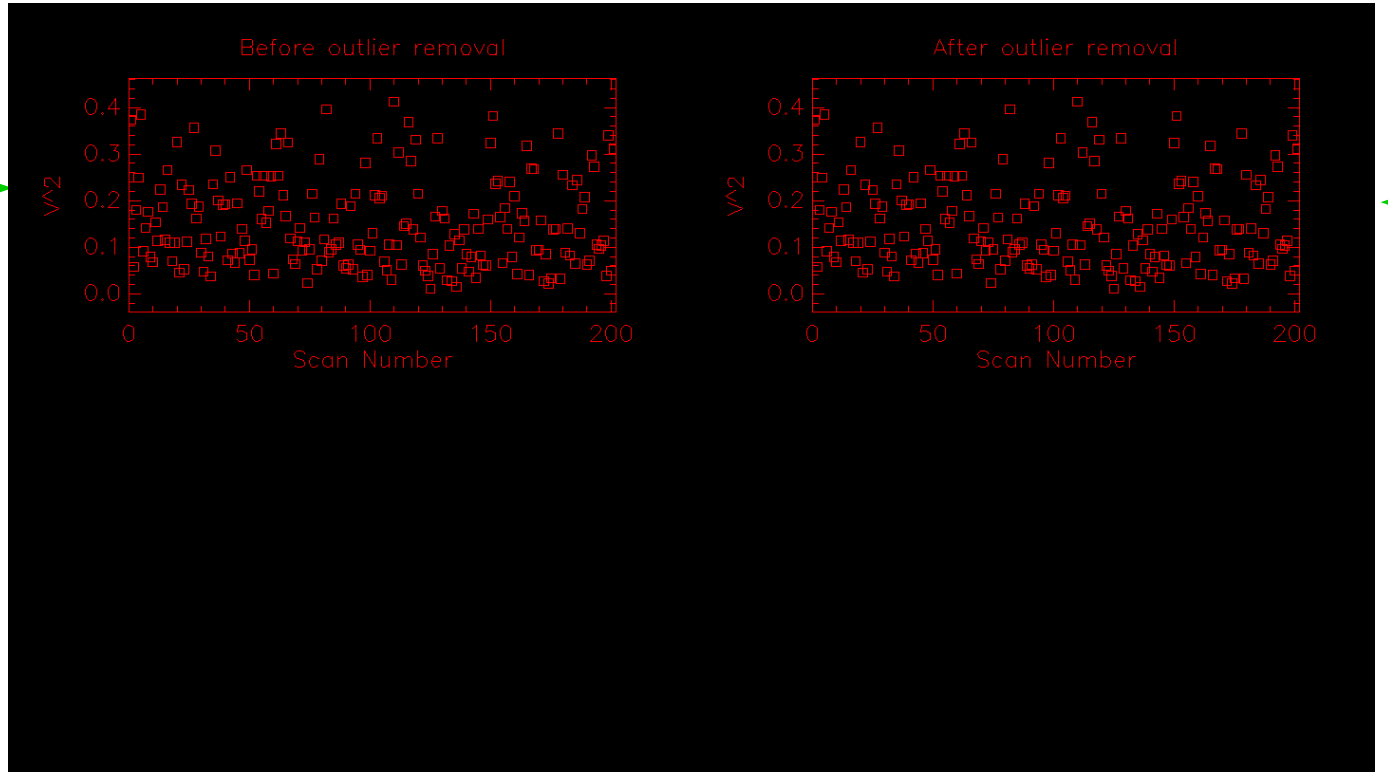
Fringe Signal



Noise Subtracted

Outlier Rejection

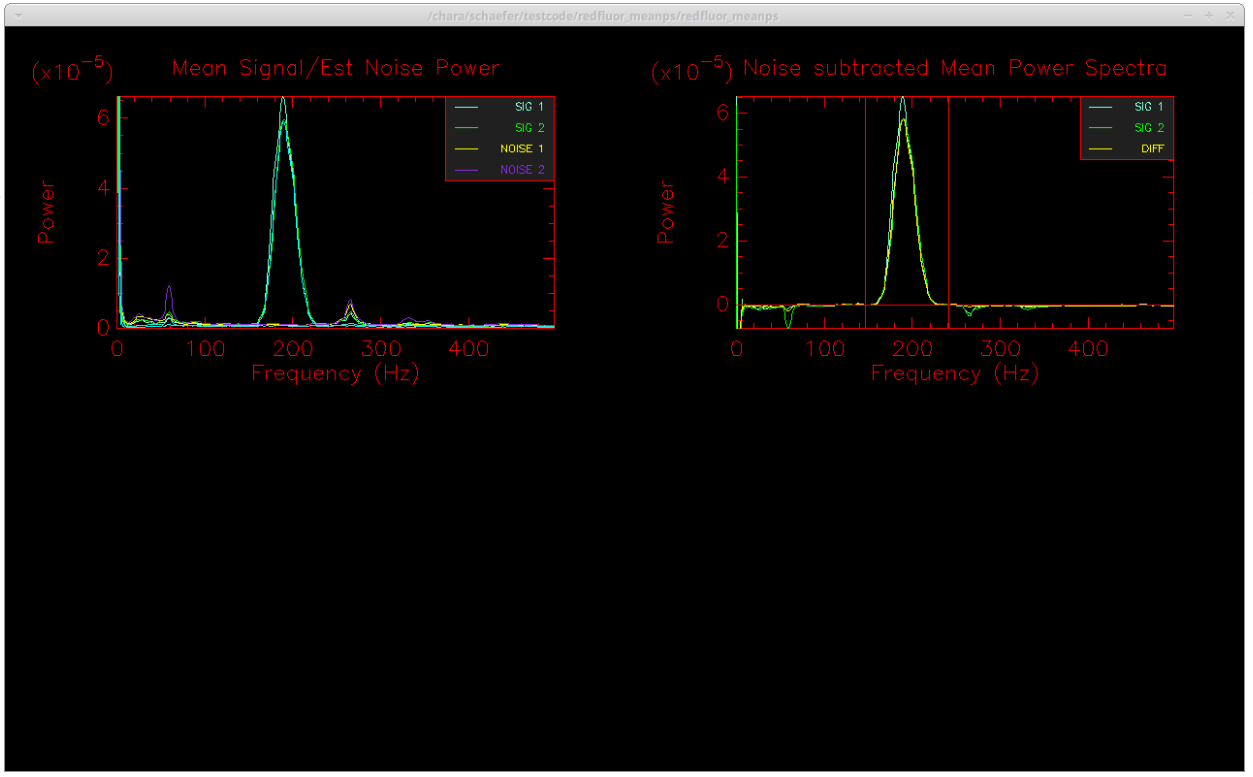
Before



After

Mean Power Spectrum

Mean Signal and Noise



Noise Subtracted Mean Power Spectrum

Visibility Estimators

- Final reduced visibilities recorded in .info files
- V2_MEAN_PS [RECOMMENDED]
  - Visibility computed from mean power spectrum
  - Improves noise subtraction, particularly for low S/N data
- V2_SCANS
  - Weighted mean of the visibilities computed from each scan individually.
- V2_LOGNORM
  - Visibilities computed assuming log-normal statistics which can better represent changes in correlation caused by atmospheric turbulence.
  - Computed based on individual scans

Typical Reduction Sequence

- Run redfluor for each file using -m flag
  - Quick reduction (no mean PS calculation)
- Determine integration range
  - extractir INT_RANGE

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```
$ extractir INT_RANGE
# Name      Type Mod Julian Date  INT_RANGE
HD_139087   CAL  58249.260737257  146.815628 241.301437
HD_141477   OBJ  58249.264472025  150.858429 233.311005
HD_142244   CAL2 58249.268164861  138.343872 223.445312
HD_139087   CAL1 58249.272461308  150.385101 237.790924
HD_141477   OBJ   58249.275727546  150.070251 234.378418
HD_142244   CAL2 58249.278530081  149.113419 237.926346
HD_139087   CAL1 58249.285597569  145.933975 243.147964
HD_141477   OBJ  58249.289307894  152.161224 231.685333
HD_142244   CAL2 58249.292829329  129.979950 229.332367
HD_139087   CAL1 58249.297871725  145.802460 238.510742
HD_141477   OBJ  58249.301426736  144.483536 240.033524
HD_142244   CAL2 58249.306873565  143.567459 243.402542
```

Typical Reduction Sequence

- Run redfluor for each file using -m flag
  - Quick reduction (no mean PS calculation)
- Determine integration range
  - extractir INT_RANGE
- Run redfluor again using fixed integration range for all targets and to compute mean PS (no -m flag)
  - -I130-250

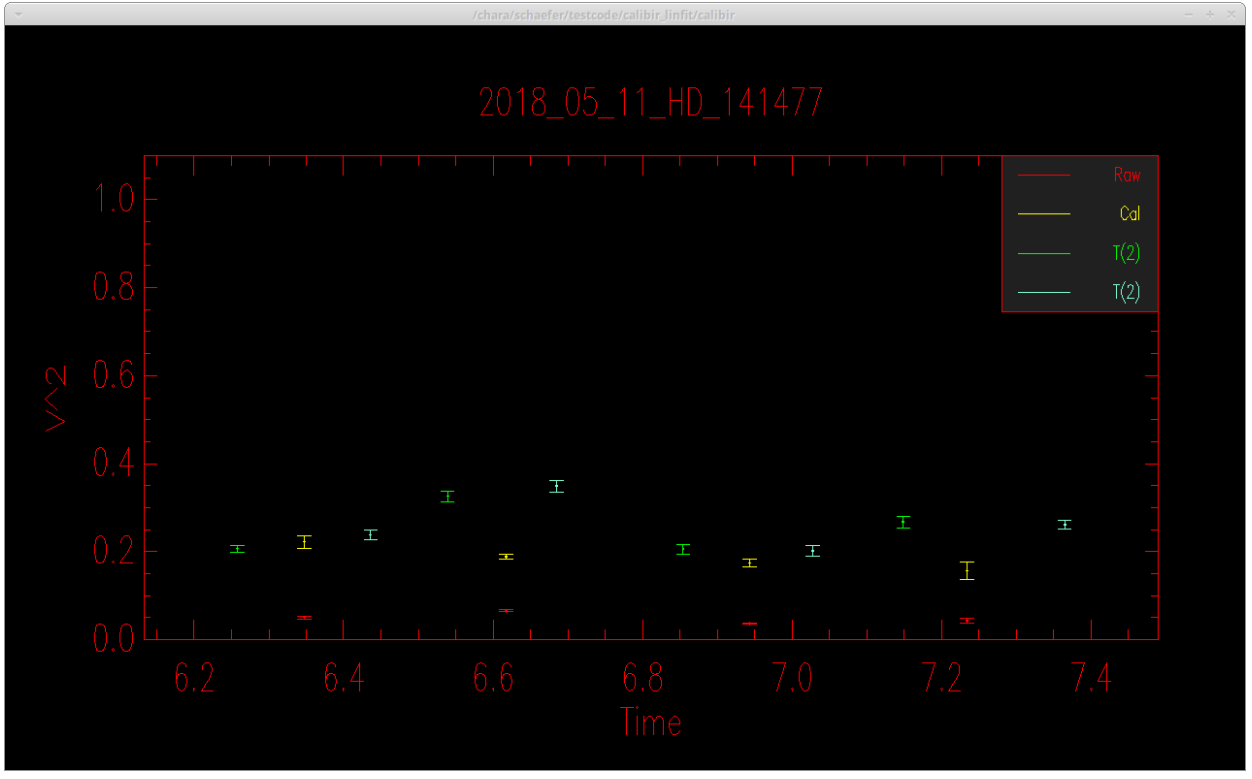
Calibration

- Typical calibration sequence:
  - Cal1 – Obj – Cal2 – Cal1 – Obj – Cal2 ...
- calibir
  - Uses nearest neighbor calibrators
- calibir_linfit
  - Linear fit to calibrators across a calibration sequence
  - Define time of alignment breaks
- Classic produces one visibility measurement for each object observation.

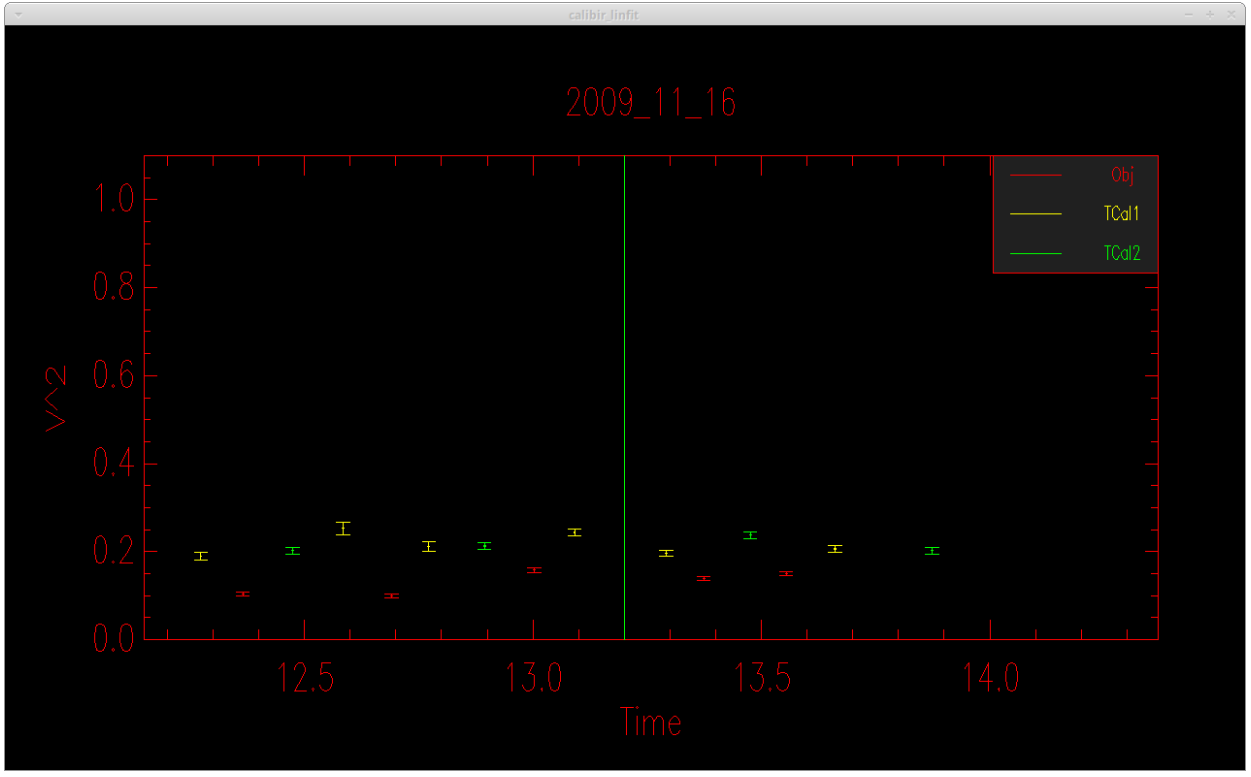
Running calibir

- calibir -F -i -s1.1368-0.1069,1.0644-0.1001 -BV2_MEAN_PS HD_141477 HD_139087 HD_142244
  - F: save results as oifits file
  - i: selects objects based on the "ID" name listed in the INFO file
  - s: set the calibrator diameters
  - B: select visibility estimator (e.g. V2_MEAN_PS)
  - Following the flags, specify the target and the calibrators
- calibir_gtk
  - GUI interface for calibir
- calibir_linfit
  - Same command line options as calibir
  - Queries user for time breaks between alignment sequences

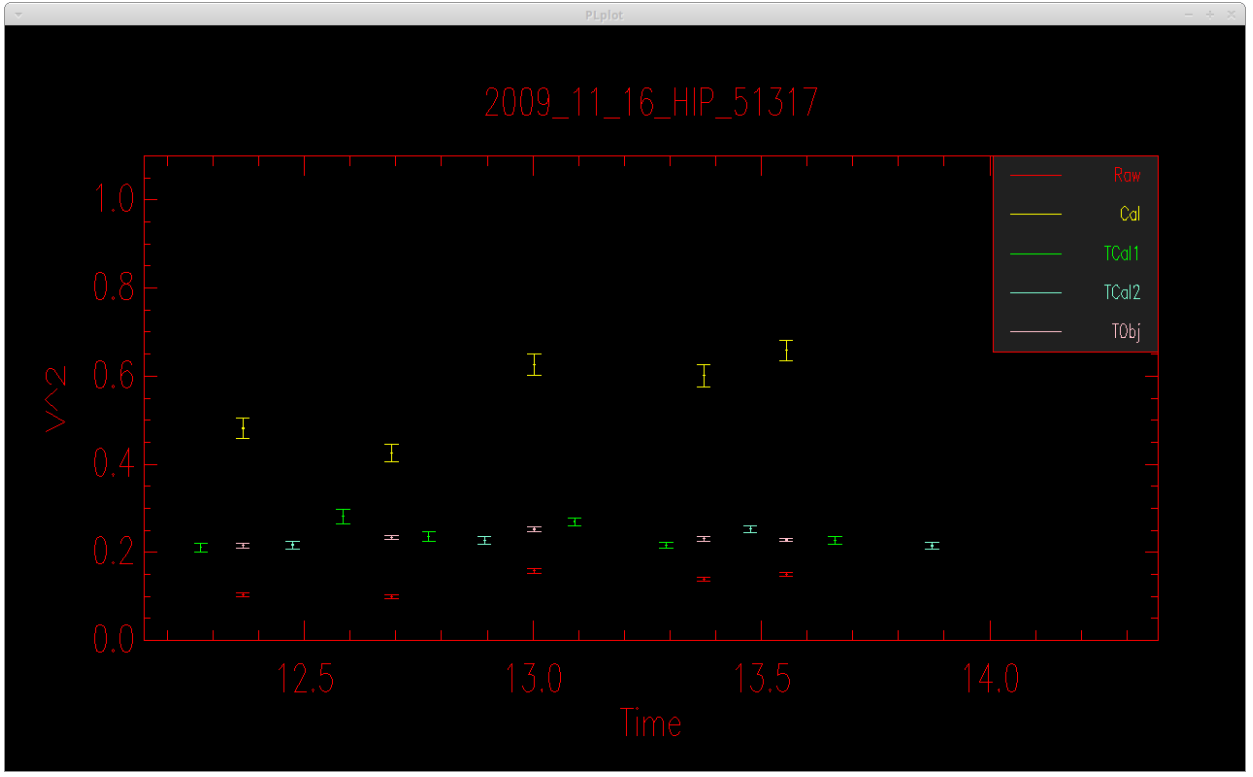
calibir


/chara/schaefer/testcode/calibir_linfit/calibir
2018_05_11_HD_141477
Raw
Cal
T(2)
T(2)
V^2
1.0
0.8
0.6
0.4
0.2
0.0
6.2
6.4
6.6
6.8
7.0
7.2
7.4
Time

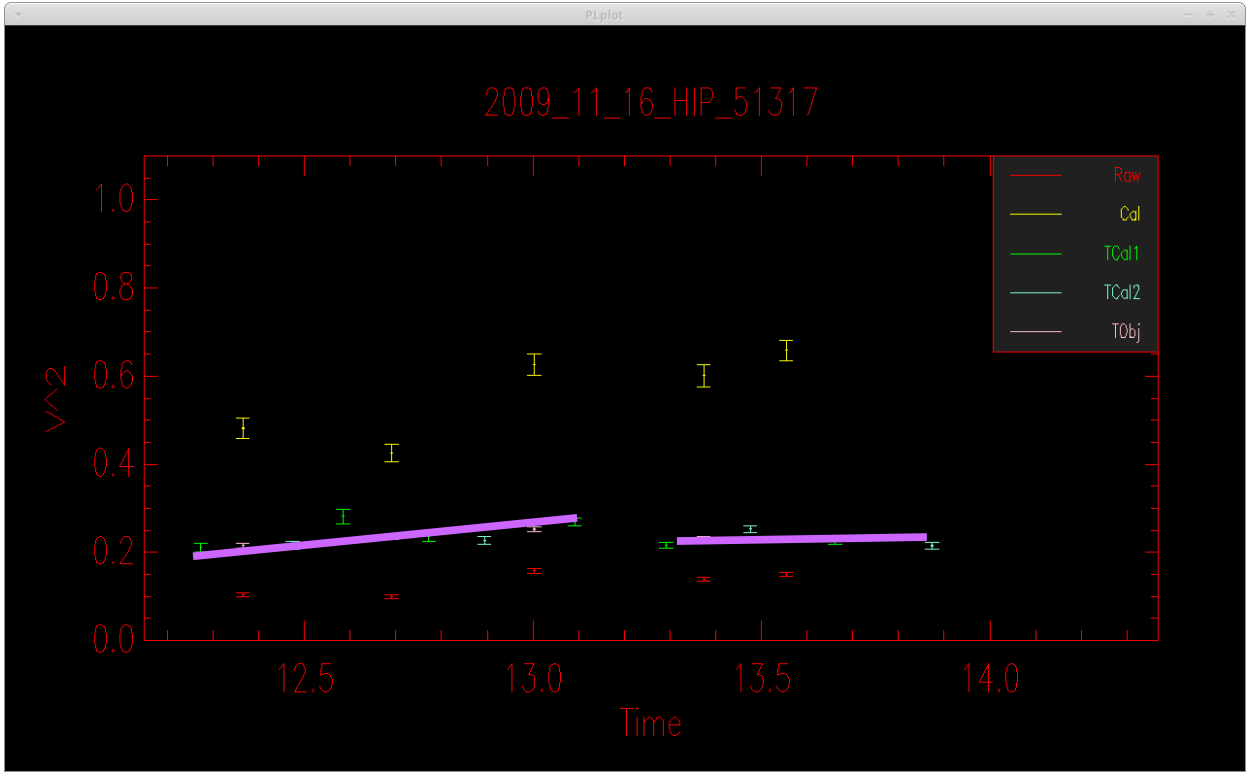
calibir_linfit



calibir_linfit



calibir_linfit



Additional Resources

- The CLASSIC/CLIMB Data Reduction: The Math
  - http://www.chara.gsu.edu/files/chara_technical_reports/tr96.pdf
- The CLASSIC/CLIMB Data Reduction: The Software
  - http://www.chara.gsu.edu/files/chara_technical_reports/tr97.pdf
- Using the Mean Power Spectrum to Compute the Visibility with REDFLUOR
  - http://www.chara.gsu.edu/files/chara_technical_reports/tr98.pdf
- CLASSIC J-Band Calibration
  - http://www.chara.gsu.edu/files/chara_technical_reports/tr99.pdf