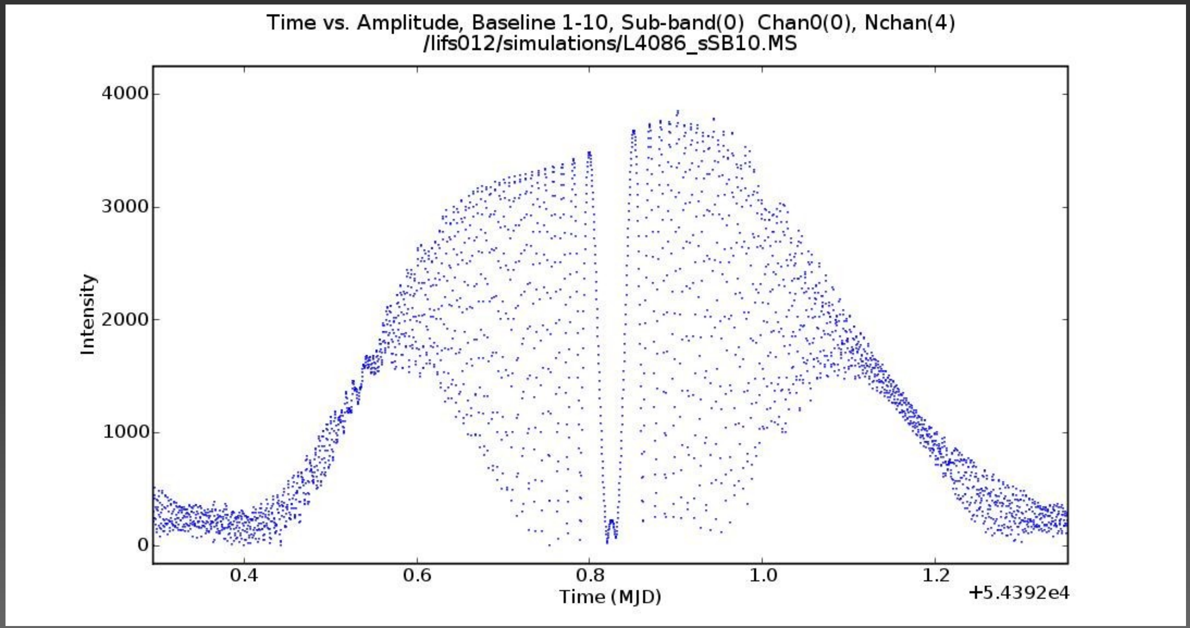
Cas A/Cyg A Flux Ratio

Casey Law

Goals:
1) Absolute flux scale for LOFAR
2) Predict fringe for data quality check

Method:
Fitting fringe amplitude of single baseline in Python



Amplitude of model of two source sky observed with LBA.

Python script "fringe_fit.py"

Process:

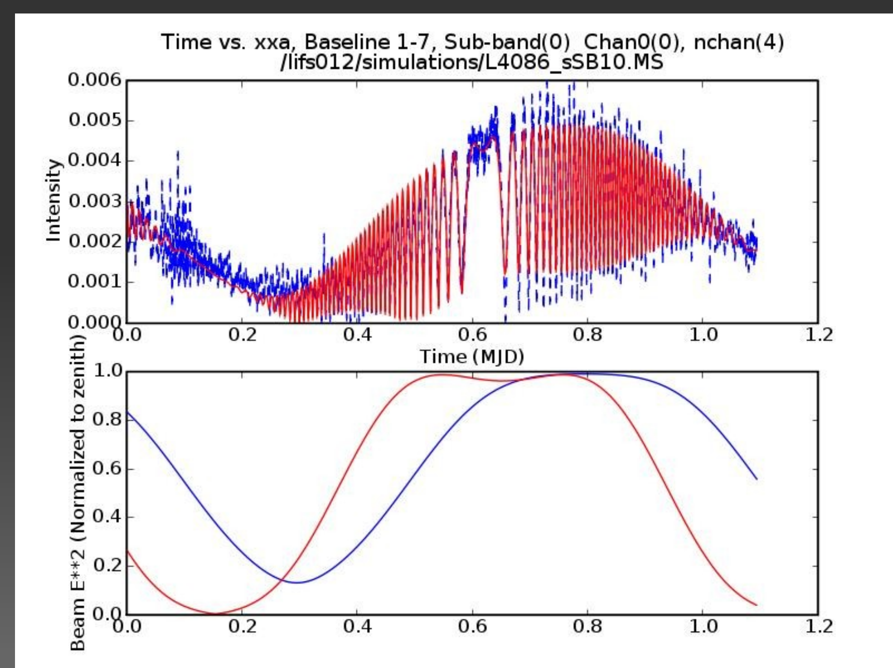
1) Read data with PyDAL

2) Predict fringe

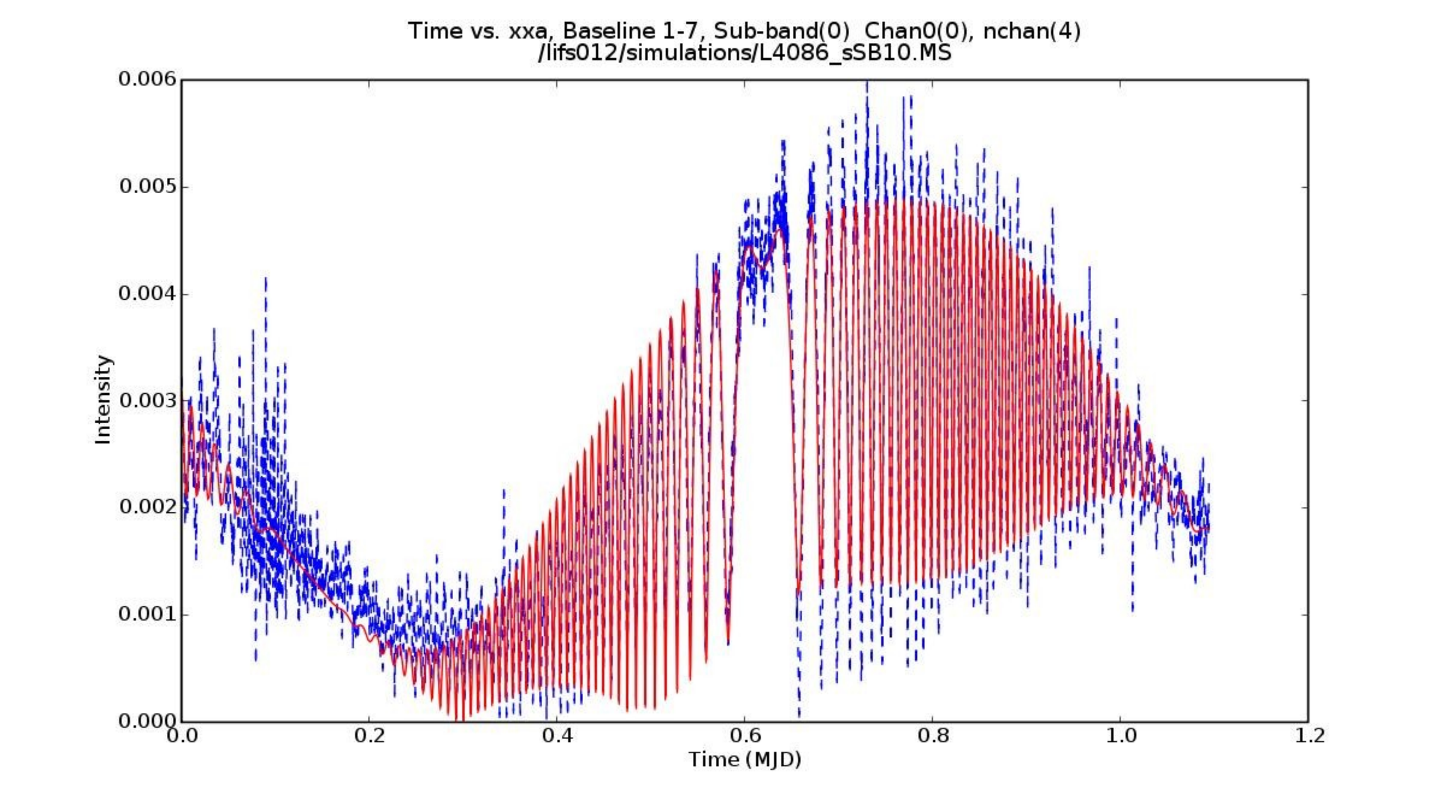
$$Ampl^2 = (I_{CasA} * b_{CasA})^2 + (I_{CygA} * b_{CygA})^2 + 2 * I_{CasA} * b_{CasA} * I_{CygA} * b_{CygA} * \cos(theta_{CasA} - theta_{CygA} + phase)$$

3) Get beam correction

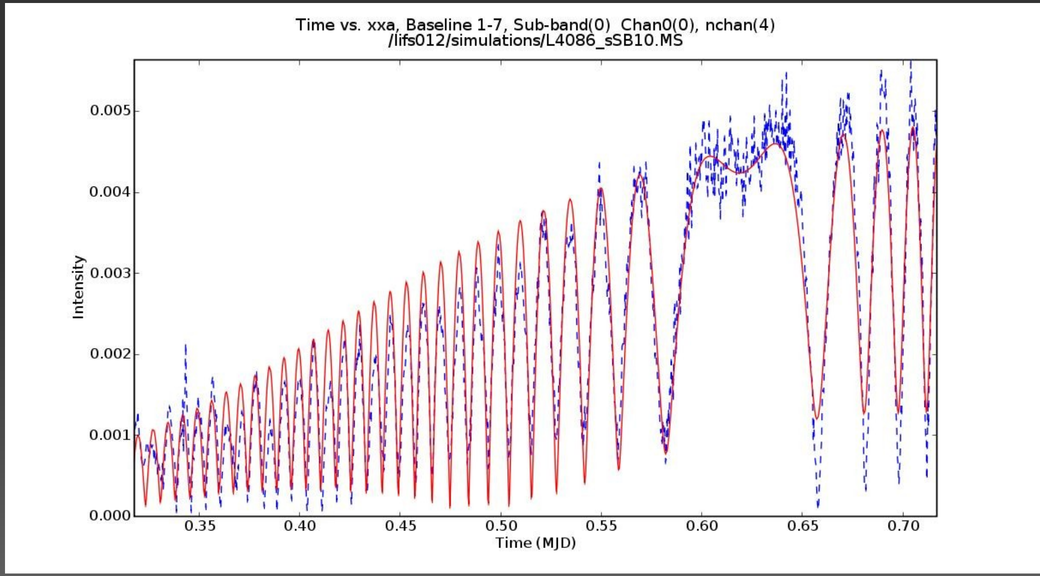
4) Fit model

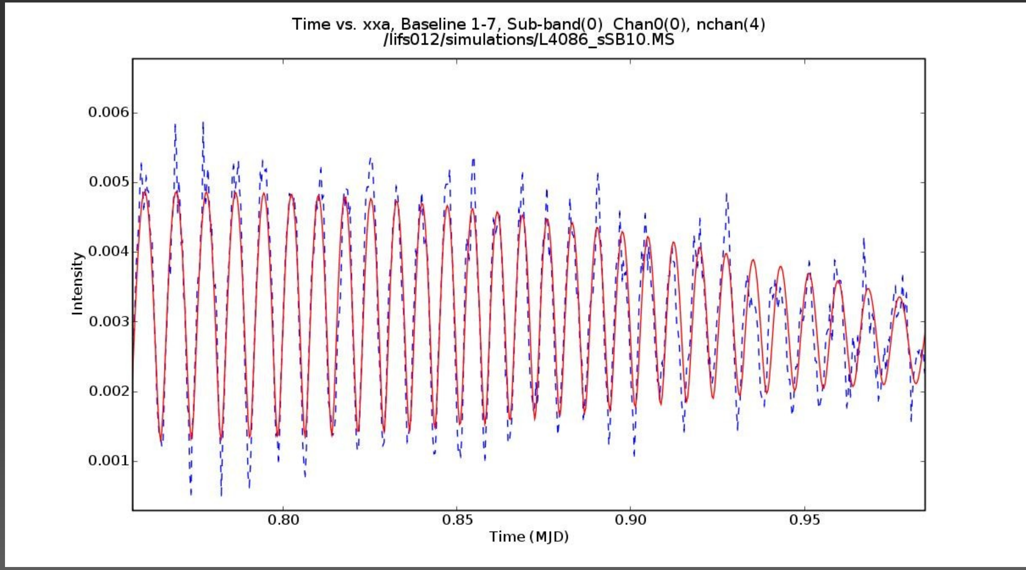


Example plot from fringe_fit.py showing fit fringe and beam corrections.



Fringe fit to 1 day of LBA data.





Close view of the fringe fit as sources rise and set.

Few kinks to work out...
- beam corrections a bit off,
- need to fit less degenerate parameter.

Cas A/Cyg A Expectation:

Cas A/Cyg A = 1.10 at 38 MHz (Baars et al. 1972)
(i.e., F_CasA = 28.0 kJy in 2008, F_CygA = 25.5 kJy).

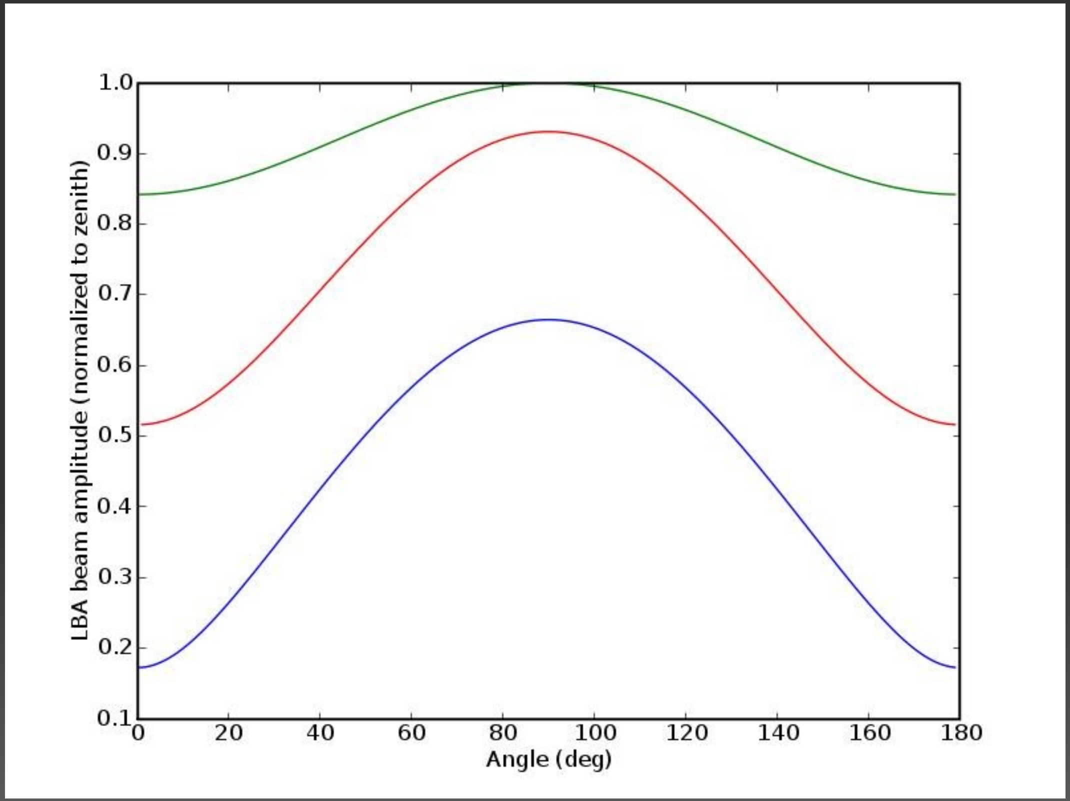
Observed:

Cas A/Cyg A ~ 1.6 at 38 MHz.
Possible evolution? Cas A/Cyg A = 1.5 from 40-45 MHz.

New Python Tools:

1) Coordinate transformations
- (RA, Dec) to (l,m,n)
- (time, RA, Dec) to (alt, az)
- wcstools

2) Beam model



Beam amplitude vs. azimuth for altitude = 25, 45, and 65 deg.