The VLA Pipeline

Claire Chandler

Pipeline Overview

- With the start of (Jansky) VLA Full Operations (January 2013), pipeline automatically run on all Scheduling Blocks as soon as the data are ingested into the archive:
  - Deliver flagged and calibrated visibility data
  - You will self-calibrate and image visibility data to meet science goals, using resources at home institution or NRAO computing resources

- Automated pipeline should run correctly on all "standard" Stokes I science SBs; "standard" means:
  - 128 MHz spws, but may work on other set-ups as well
    - Some constraints on strength of calibrators needed
  - Contains correctly labeled and complete scan intents

Pipeline Overview

- Current versions available:
  - CASA integrated pipeline: compatible with ALMA pipeline infrastructure, and used as real-time pipeline since Sep 2015
  - “scripted” pipeline: collection of python scripts that use CASA tasks wherever possible, but also uses toolkit calls; readable and easy to modify. It was the original VLA pipeline and in use in real-time pipeline operations from early 2013 and until Sep 2015.

Pipeline Overview

- Real-time pipeline:
  - Minimal human intervention: Pipeline is run automatically on *every* science SB as it completes (not just "continuum")
  - Pipeline output undergoes basic quality assurance checks by NRAO staff, and detailed checks are made for X-band and higher for priority A+B projects; reports generated are archived as pipeline products

- At your home institution:
  - Instructions for installation and operation of the VLA CASA Calibration Pipeline are available at http://go.nrao.edu/vla-pipe
    - Uses CASA 5.4.1, similar to current real-time pipeline
    - See the VLA CASA pipeline guide at http://go.nrao.edu/vla-casa-tut

Pipeline Overview

- Scripted pipelines for CASA versions through 5.3.0 also available
  - Provides more flexibility in how to use the pipeline, options suitable for spectral line datasets, mixed correlator set-ups, multi-band observations, etc.
  - Working to incorporate these into the CASA integrated pipeline

Will the Pipeline work for you?

- The pipeline successfully completes on ~92% of all science SBs observed on the VLA; whether the output can be used for science depends on the science goal, and whether the observations were correctly set up
  - Pipeline includes Hanning smoothing, RFI flagging, and weight calculations that may not be appropriate for (some) spectral line projects.
  - No polarization calibration (yet) but can use pipeline output as a starting point.*
  - Will probably work for data taken since May 2012, may work for earlier EVLA data, likely that extra flagging and editing may be needed in these cases

*CASA 5.4.1 and later, requires that you have used the correct polarization intents when setting up the observations

Pipeline Requirements

- "Standard" Stokes I science SB means:
  - 128 MHz spws (64 MHz for L-band; default setup), but may work on other set-ups as well
    - Can work for narrower BWs, depends on the strength of the calibrators
    - Heuristics currently make some assumptions about the strength of the calibrators, in particular, the delay calibrator
      - currently requires the SNR=3 limit on initial gain calibration *per integration*
  - Contains correctly labeled and complete scan intents
    - And also that the observations have been set up correctly!

Pipeline Requirements

- Correct observation set-up
  - Independent of whether you want to run the pipeline!
  - Remember: simple observing set-ups are always easier to calibrate
  - Do not skimp on calibration to spend more time on your target – you may end up not being able to calibrate the target data at all
    - Spending 3 minutes pointing could buy you more sensitivity than doubling the time on your target.

Pipeline Requirements

- Scan intents
  - The pipeline relies entirely on correct *scan intents* to be defined in each SB
  - In order for the pipeline to run successfully on an SB it must contain, *at minimum*, scans with the following intents:
    - A flux density scale calibrator scan that observes one of the primary calibrators (3C48, 3C138, 3C147, or 3C286)* – this will also be used as the delay and bandpass calibrator if no bandpass or delay calibrator is defined
    - Complex gain calibrator scans

*Some of these calibrators are variable (especially 3C48, 3C138), use 3C286 if possible

(Real-Time) Heuristics (I)

- Assuming requirements are met, the pipeline:
  - Loads the data (SDM-BDF → MS)
  - Hanning smooths*
  - Retrieves information about the observing set-up from the data
  - Applies deterministic flags (online flags, shadowed data, end channels of spectral windows, etc.)
  - Identifies primary calibrators and loads models

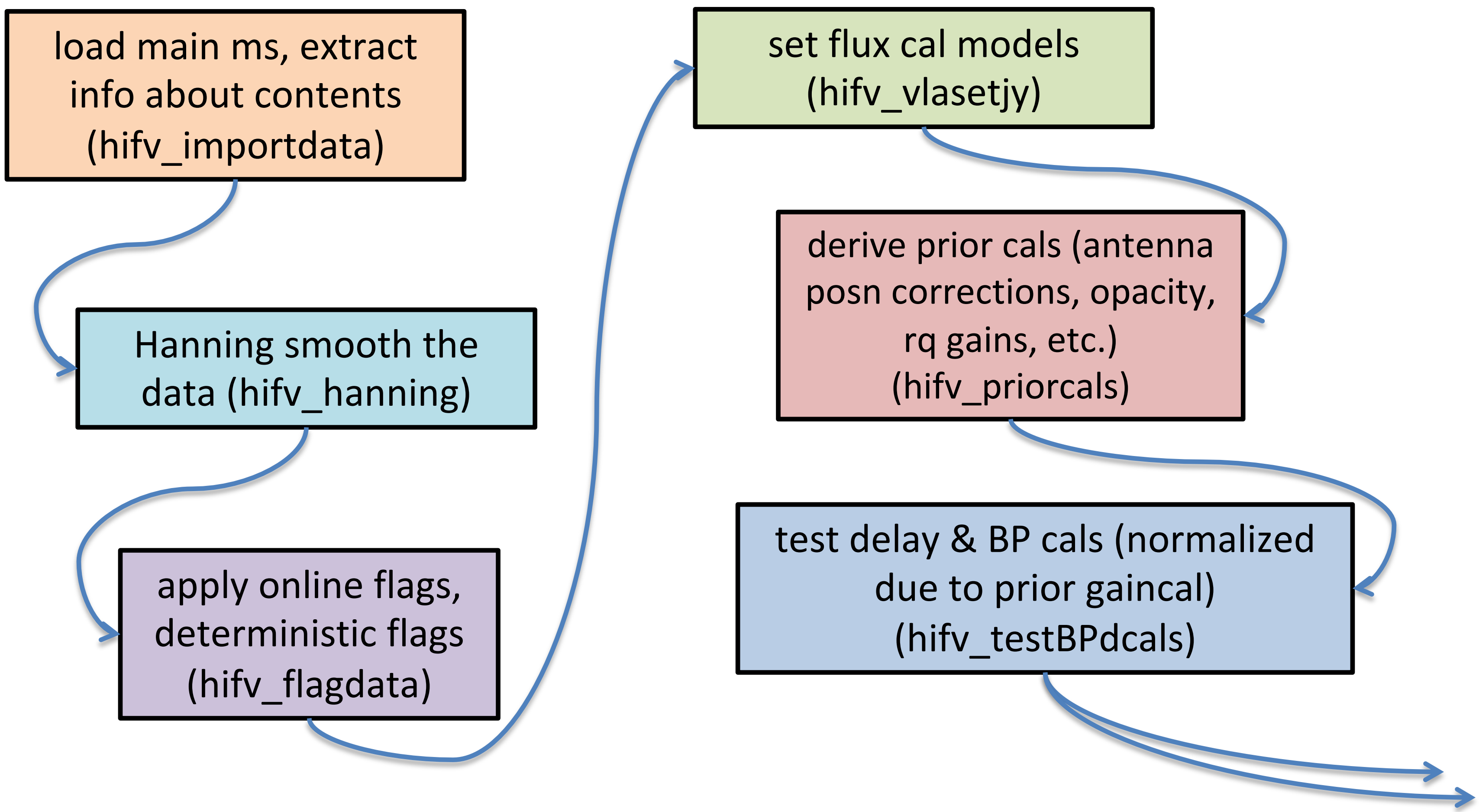
*May want to modify inputs and/or omit entirely for spectral line reductions, unless heavily impacted by RFI or dealing with a very strong spectral line feature.

(Real-Time) Heuristics (II)

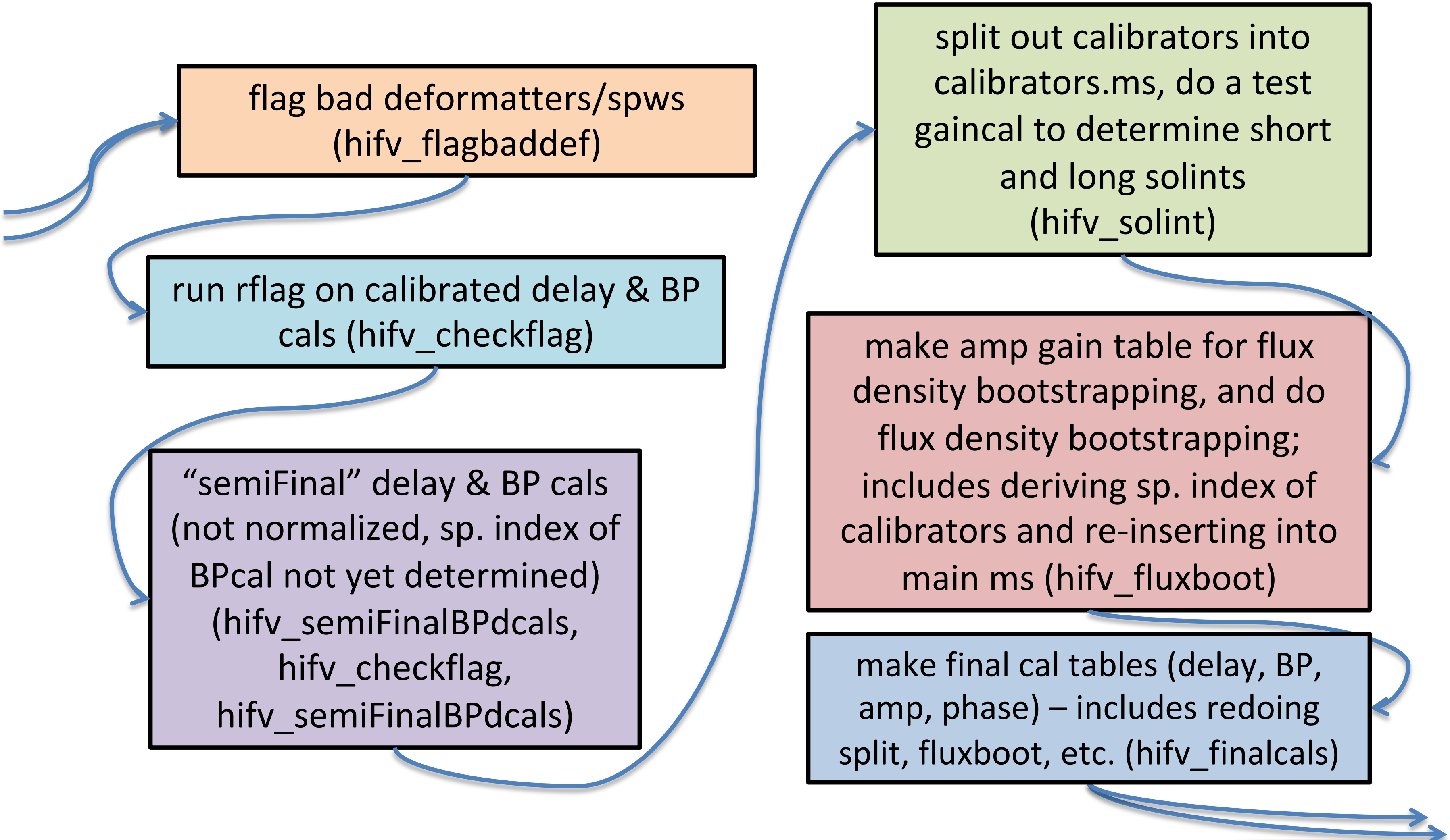
- Derives all prior calibrations (antenna position corrections, gain curves, atmospheric opacity, requantizer gains)
- Iteratively determines initial delay and bandpass solutions, including running RFLAG, and identifying system problems
- Derives initial gain solutions, does flux density bootstrapping and derives spectral index of all calibrators.
- Derives final delay, bandpass, and complex gain calibrations
- Applies all calibrations to the MS
- Runs RFLAG algorithm on all fields, including target*
- Runs statwt to derive proper relative weights per antenna/spw*

*May want to modify inputs and/or omit entirely for spectral line.

Flow chart (CASA pipeline)

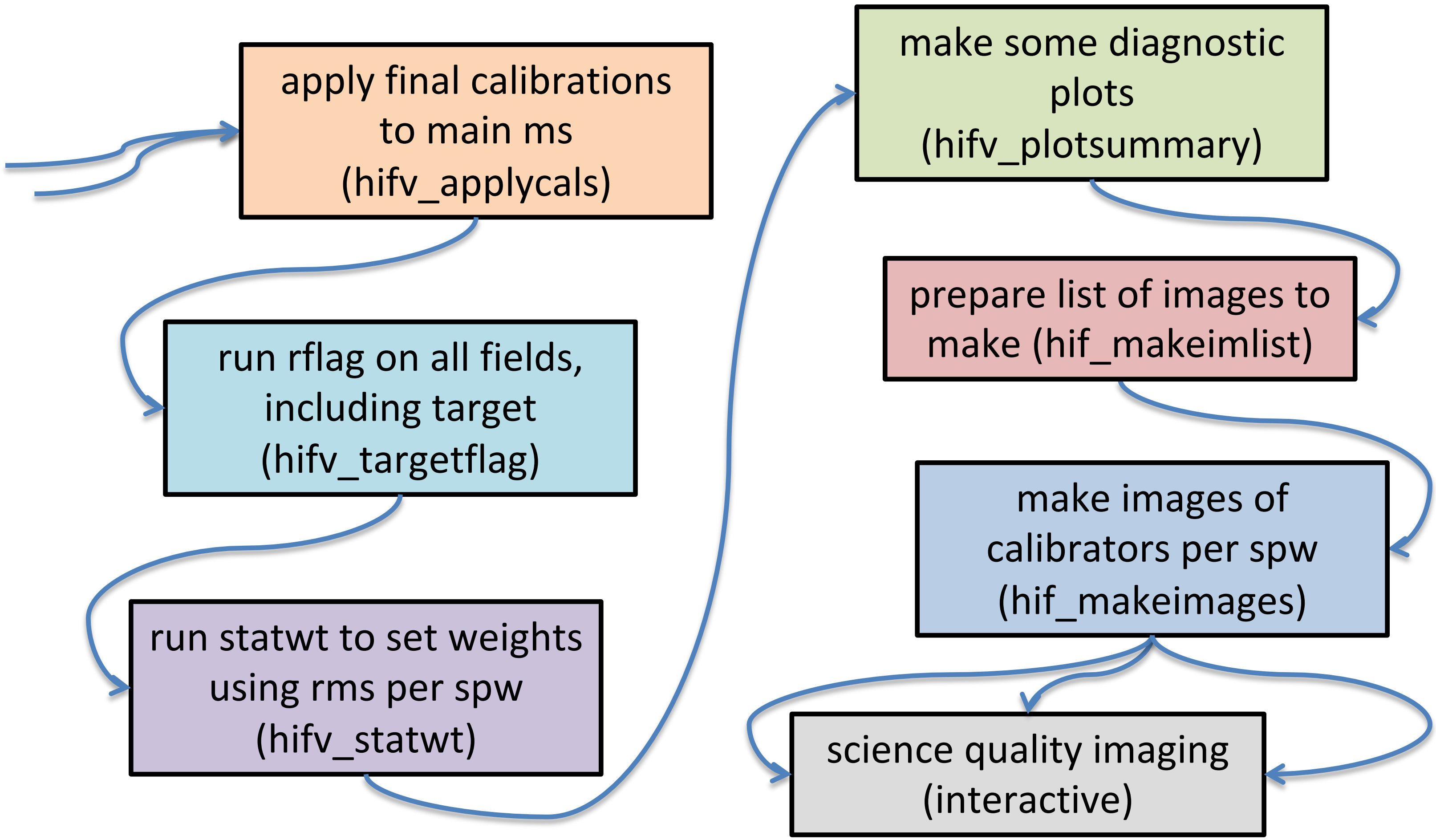


Flow chart



flag bad deformatters/spws (hifv_flagbaddef)
run rflag on calibrated delay & BP cals (hifv_checkflag)
“semiFinal” delay & BP cals (not normalized, sp. index of BPcal not yet determined) (hifv_semiFinalBPdcals, hifv_checkflag, hifv_semiFinalBPdcals)
split out calibrators into calibrators.ms, do a test gaincal to determine short and long solints (hifv_solint)
make amp gain table for flux density bootstrapping, and do flux density bootstrapping; includes deriving sp. index of calibrators and re-inserting into main ms (hifv_fluxboot)
make final cal tables (delay, BP, amp, phase) – includes redoing split, fluxboot, etc. (hifv_finalcals)

Flow chart


apply final calibrations to main ms (hifv_applycals)
run rflag on all fields, including target (hifv_targetflag)
run statwt to set weights using rms per spw (hifv_statwt)
make some diagnostic plots (hifv_plotsummary)
prepare list of images to make (hif_makeimlist)
make images of calibrators per spw (hif_makeimages)
science quality imaging (interactive)

Pipeline Weblog

- Pipeline weblog is created real-time (check while running)
- Diagnostic plots and tables for most stages.
- CASA log file by task or as a whole
- Calibrator images per spw.

- Example used here, and in our Pipeline CASA Guide:

casa.nrao.edu/Data/EVLA/Pipeline/CASA5.4.1/html/

Pipeline Weblog

casa.nrao.edu/Data/EVLA/Pipeline/CASA5.4.1/html/

Home | By Topic | By Task | Project Code N/A

Observation Overview

Project	uid://evla/pdb/14411854
Principal Investigator	Prof. Dominik A. Riechers
Observation Start	2013-03-23 05:09:03 UTC
Observation End	2013-03-23 08:05:36 UTC

Pipeline Summary

Pipeline Version	42192 (Pipeline-CASA54-P2-B)
CASA Version	5.4.1-31 (environment)
Pipeline Start	2018-12-09 05:19:55 UTC
Execution Duration	1 day, 6:43:00

Observation Summary

			Time (UTC)			Baseline Length			
Measurement Set	**Receivers**	**Num Antennas**	**Start**	**End**	**On Source**	**Min**	**Max**	**RMS**	**Size**
Scheduling Block ID: uid://evla/pdbsb/17165245									
Session: session_1									
13A-398.sb17165245.eb19476558.56374.213876608796.ms	1cm (Ka) and 3cm (X)	27	2013-03-23 05:09:03	2013-03-23 08:05:36	2:17:48	40.0 m	1.0 km	441.9 m	146.0 GB

Pipeline Weblog

Home By Topic By Task Project Code N/A

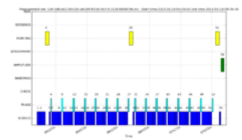
Session: Session_default

13A-398.sb17165245.eb19476558.56374.213876608

Observation Execution Time

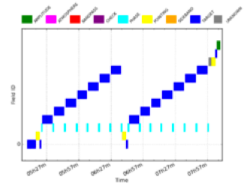
Start Time	2013-03-23 05:09:03
End Time	2013-03-23 08:05:36
Total Time on Source	2:55:04
Total Time on Science Target	2:17:48

LISTOBS OUTPUT



Intent vs Time

Track scan intent vs time



Field vs Time

Track observed field vs time

Spatial Setup

Science Targets	'CP1', 'CP2', 'CP3', 'CP4', 'CP5', 'CP6', 'CP7', 'J1041+0610' and 'J1331+3030'
Calibrators	'J1041+0610' and 'J1331+3030'

Spectral Setup

All Bands	'1cm (Ka)' and '3cm (X)'
Science Bands	'1cm (Ka)' and '3cm (X)'
VLA Bands: Basebands: Freq range: [spws]	X: A0C0: 8.331 GHz to 8.459 GHz: [0] X: B0D0: 8.459 GHz to 8.587 GHz: [1] KA: A1C1: 34.975 GHz to 37.023 GHz: [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17] KA: B1D1: 30.975 GHz to 33.023 GHz: [34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49] KA: A2C2: 36.975 GHz to 39.023 GHz: [18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33] KA: B2D2: 32.975 GHz to 35.023 GHz: [50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]

Antenna Setup

Min Baseline	40.0 m
Max Baseline	1.0 km
Number of Baselines	351
Number of Antennas	27

Sky Setup

Min Elevation	39.56 degrees
Max Elevation	82.72 degrees

Pipeline Weblog

Home   By Topic   By Task   Project Code N/A

Session: Session_default

13A-398.sb17165245.eb19476558.56374.21

listobs.txt

BACK

```
================================================================================
           MeasurementSet Name:  /lustre/aoc/sciops/emomjian/pipe-demo/13A-398.sb17165245.eb19476558.56374.213876608796.ms      MS Version 2
================================================================================
   Observer: Prof. Dominik A. Riechers     Project: uid://evla/pdb/14411854
Observation: EVLA
Data records: 72213336       Total elapsed time = 10767 seconds
   Observed from   23-Mar-2013/05:09:03.0   to   23-Mar-2013/08:08:30.0 (UTC)

   ObservationID = 0         ArrayID = 0
  Date        Timerange (UTC)          Scan  FldId FieldName             nRows     SpwIds   Average Interval(s)    ScanIntent
  23-Mar-2013/05:09:03.0 - 05:12:00.0     1      0 J1041+0610             124254  [0,1]  [1, 1] [OBSERVE_TARGET#UNSPECIFIED]
              05:12:03.0 - 05:16:57.0     2      0 J1041+0610            2201472  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
              05:17:02.0 - 05:17:05.0     3      1 J1041+0610               2106  [0,1]  [1, 1] [UNSPECIFIED#UNSPECIFIED]
              05:17:06.0 - 05:20:30.0     4      1 J1041+0610             136188  [0,1]  [1, 1] [CALIBRATE_POINTING#ON_SOURCE]
              05:20:33.0 - 05:21:57.0     5      0 J1041+0610             628992  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
              05:22:03.0 - 05:23:00.0     6      2 J1041+0610             426816  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [CALIBRATE_AMPLI#UNSPECIFIED,CALIBRATE_PHASE#UNSPECIFIED]
              05:23:03.0 - 05:29:27.0     7      3 CP1                   2875392  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
              05:29:30.0 - 05:32:24.0     8      3 CP1                   1302912  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
              05:32:30.0 - 05:33:54.0     9      2 J1041+0610             628992  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [CALIBRATE_AMPLI#UNSPECIFIED,CALIBRATE_PHASE#UNSPECIFIED]
              05:34:00.0 - 05:40:24.0    10      4 CP2                   2875392  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
```

Pipeline Weblog

Home | By Topic | By Task | Project Code N/A

Session: Session_default

13A-398.sb17165245.eb19476558.56374.21

listobs.txt

BACK

```
================================================================================
           MeasurementSet Name:  /lustre/aoc/sciops/emomjian/pipe-demo/13A-398.sb17165245.eb19476558.56374.213876608796.ms      MS Version 2
================================================================================
   Observer: Prof. Dominik A. Riechers     Project: uid://evla/pdb/14411854
Observation: EVLA
Data records: 72213336       Total elapsed time = 10767 seconds
   Observed from   23-Mar-2013/05:09:03.0   to   23-Mar-2013/08:08:30.0 (UTC)

   ObservationID = 0         ArrayID = 0
  Date        Timerange (UTC)          Scan  FldId FieldName             nRows     SpwIds   Average Interval(s)    ScanIntent
  23-Mar-2013/05:09:03.0 - 05:12:00.0     1      0 J1041+0610             124254  [0,1]  [1, 1] [OBSERVE_TARGET#UNSPECIFIED]
              05:12:03.0 - 05:16:57.0     2      0 J1041+0610            2201472  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
              05:17:02.0 - 05:17:05.0     3      1 J1041+0610               2106  [0,1]  [1, 1] [UNSPECIFIED#UNSPECIFIED]
              05:17:06.0 - 05:20:30.0     4      1 J1041+0610             136188  [0,1]  [1, 1] [CALIBRATE_POINTING#ON_SOURCE]
              05:20:33.0 - 05:21:57.0     5      0 J1041+0610             628992  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
              05:22:03.0 - 05:23:00.0     6      2 J1041+0610             426816  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [CALIBRATE_AMPLI#UNSPECIFIED,CALIBRATE_PHASE#UNSPECIFIED]
              05:23:03.0 - 05:29:27.0     7      3 CP1                   2875392  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
              05:29:30.0 - 05:32:24.0     8      3 CP1                   1302912  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
              05:32:30.0 - 05:33:54.0     9      2 J1041+0610             628992  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [CALIBRATE_AMPLI#UNSPECIFIED,CALIBRATE_PHASE#UNSPECIFIED]
              05:34:00.0 - 05:40:24.0    10      4 CP2                   2875392  [2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,4
0,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65]  [3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3] [OBSERVE_TARGET#UNSPECIFIED]
```

Pipeline Weblog

Home | By Topic | By Task | Project Code N/A

Task Summaries

Task		QA Score	Duration
1. **hifv_importdata**: Register VLA measurement sets with the pipeline		1.00	1:16:06
2. **hifv_hanning**: VLA Hanning Smoothing	No QA	N/A	1:08:14
3. **hifv_flagdata**: VLA Deterministic flagging		0.93	2:11:50
4. **hifv_vlasetjy**: Set calibrator model visibilities		1.00	0:35:26
5. **hifv_priorcals**: Priorcals (gaincurves, opacities, antenna positions corrections, rq gains, and switched power)	No QA	N/A	5:54:42
6. **hifv_testBPdcals**: Initial test calibrations		1.00	2:11:22
7. **hifv_flagbaddef**: Flag bad deformatters	11.11% antennas affected	0.63	0:04:12
8. **hifv_checkflag**: Checkflag summary		1.00	2:08:44
9. **hifv_semiFinalBPdcals**: Semi-final delay and bandpass calibrations		1.00	0:48:21
10. **hifv_checkflag**: Checkflag summary		1.00	0:36:42
11. **hifv_semiFinalBPdcals**: Semi-final delay and bandpass calibrations		1.00	0:47:25
12. **hifv_solint**: Determine solint and Test gain calibrations	No QA	N/A	0:28:41
13. **hifv_fluxboot**: Gain table for flux density bootstrapping	No QA	N/A	0:51:07
14. **hifv_finalcals**: Final Calibration Tables		1.00	1:29:51
15. **hifv_applycals**: Apply calibrations from context		1.00	1:36:41
16. **hifv_targetflag**: Targetflag		1.00	1:57:12
17. **hifv_statwt**: Reweight visibilities		1.00	3:08:54
18. **hifv_plotsummary**: VLA Plot Summary		1.00	2:08:05
19. **hif_makeimlist**: Set-up parameters for cont imaging		1.00	0:09:10
20. **hif_makeimages**: Calculate clean products		1.00	1:10:15

CASA logs and scripts

- View, view in new tab or download casa-20181209-051926.log (35.2 MB)

Pipeline Weblog

- The following pipeline steps provide key checks for calibration quality:
  - hifv_flagdata *deterministic flagged data fraction*
  - hifv_testBPdcals *hardware problems and other obs. issues*
  - hifv_solint *solution intervals for phase cals, input gain tables*
  - hifv_fluxboot *fitted calibrator flux densities and spectral indices*
  - hifv_finalcals *final calibration tables applied to the data*
  - hifv_plotsummary *useful diagnostic plots of calibrated data*

Deterministic Flags (hifv_flagdata)

Home By Topic By Task Project Code N/A

Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

3. VLA Deterministic Flagging

BACK

Flagging agents

Measurement Set	ANOS	Shadowed Antennas	Unwanted Intents	Other Online Flags	Flagging Template	Autocorr	Edge Channels	Clipping	Quack	Baseband	Agent Commands
13A-398.sb17165245.eb19476558.56374.213876608796.ms	✔	✔	✔	✔	✖	✔	✔	✔	✔	✔	View

Flagging agent status per measurement set.

Template Files

Measurement Set	Other Online Flags		Flagging Template	
	File	Number of Statements	File	Number of Statements
13A-398.sb17165245.eb19476558.56374.213876608796.ms	13A-398.sb17165245.eb19476558.56374.213876608796.flagonline.txt	2665		

Files used for template flagging steps.

Flagged data summary

Data Selection (by intent)	Before Task	Flagging Agent (Total Vis)			Flagging Agent (Science Vis)							Total Science	Measurement Set
		ANOS	Shadowed Antennas	Unwanted Intents	Other Online Flags	Flagging Template	Autocorr	Edge Channels	Clipping	Quack	Baseband		13A-398.sb17165245.eb19476558.56
All Data	3.12%	10.20%	0.00%	0.28%	0.75%	0.00%	0.00%	6.40%	0.11%	0.19%	1.40%	8.84%	8.84%

Deterministic Flags (hifv_flagdata)

Home By Topic By Task Project Code N/A

Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

Flagged data summary

Data Selection (by intent)	Before Task	Flagging Agent (Total Vis)			Flagging Agent (Science Vis)							Total Science	Measurement Set
		ANOS	Shadowed Antennas	Unwanted Intents	Other Online Flags	Flagging Template	Autocorr	Edge Channels	Clipping	Quack	Baseband		13A-398.sb17165245.eb19476558.56
All Data	3.12%	10.20%	0.00%	0.28%	0.75%	0.00%	0.00%	6.40%	0.11%	0.19%	1.40%	8.84%	8.84%
Science Spectral Windows	3.12%	10.20%	0.00%	0.28%	0.75%	0.00%	0.00%	6.40%	0.11%	0.19%	1.40%	8.84%	8.84%
Bandpass	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flux	3.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.45%	0.08%	3.22%	1.36%	11.12%	11.12%
Phase	3.12%	35.09%	0.00%	0.00%	0.24%	0.00%	0.00%	6.44%	0.23%	1.26%	1.39%	9.56%	9.56%
Target	3.12%	6.05%	0.00%	0.00%	0.82%	0.00%	0.00%	6.40%	0.09%	0.00%	1.40%	8.71%	8.71%
13A-398.sb17165245.eb19476558.56374.213876608796.ms	3.12%	10.20%	0.00%	0.28%	0.75%	0.00%	0.00%	6.40%	0.11%	0.19%	1.40%	8.84%	

Summary of flagged data. Each cell states the amount of data flagged as a fraction of the specified data selection, with the *Flagging Agent* columns giving this information per flagging agent.

Flagging reason vs time

Plots of flagging reason vs time. The reasons for flagging the data are defined in the plot legend.

13A-398.sb17165245.eb19476558.56374.213876608796.ms

Deterministic Flags (hifv_flagdata)

Home | By Topic | By Task | Project Code N/A

Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

Flagged data summary

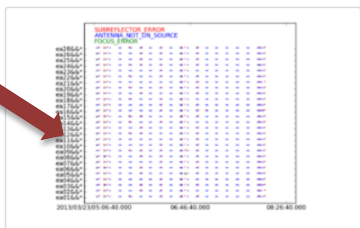
Data Selection (by intent)	Before Task	Flagging Agent (Total Vis) ANOS	Shadowed Antennas	Unwanted Intents	Flagging Agent (Science Vis) Other Online Flags	Flagging Template	Autocorr	Edge Channels	Clipping	Quack	Baseband	Total Science	Measurement Set 13A-398.sb17165245.eb19476558.56
All Data	3.12%	10.20%	0.00%	0.28%	0.75%	0.00%	0.00%	6.40%	0.11%	0.19%	1.40%	8.84%	8.84%
Science Spectral Windows	3.12%	10.20%	0.00%	0.28%	0.75%	0.00%	0.00%	6.40%	0.11%	0.19%	1.40%	8.84%	8.84%
Bandpass	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flux	3.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.45%	0.08%	3.22%	1.36%	11.12%	11.12%
Phase	3.12%	35.09%	0.00%	0.00%	0.24%	0.00%	0.00%	6.44%	0.23%	1.26%	1.39%	9.56%	9.56%
Target	3.12%	6.05%	0.00%	0.00%	0.82%	0.00%	0.00%	6.40%	0.09%	0.00%	1.40%	8.71%	8.71%
13A-398.sb17165245.eb19476558.56374.213876608796.ms	3.12%	10.20%	0.00%	0.28%	0.75%	0.00%	0.00%	6.40%	0.11%	0.19%	1.40%	8.84%	

Summary of flagged data. Each cell states the amount of data flagged as a fraction of the specified data selection, with the *Flagging Agent* columns giving this information per flagging agent.

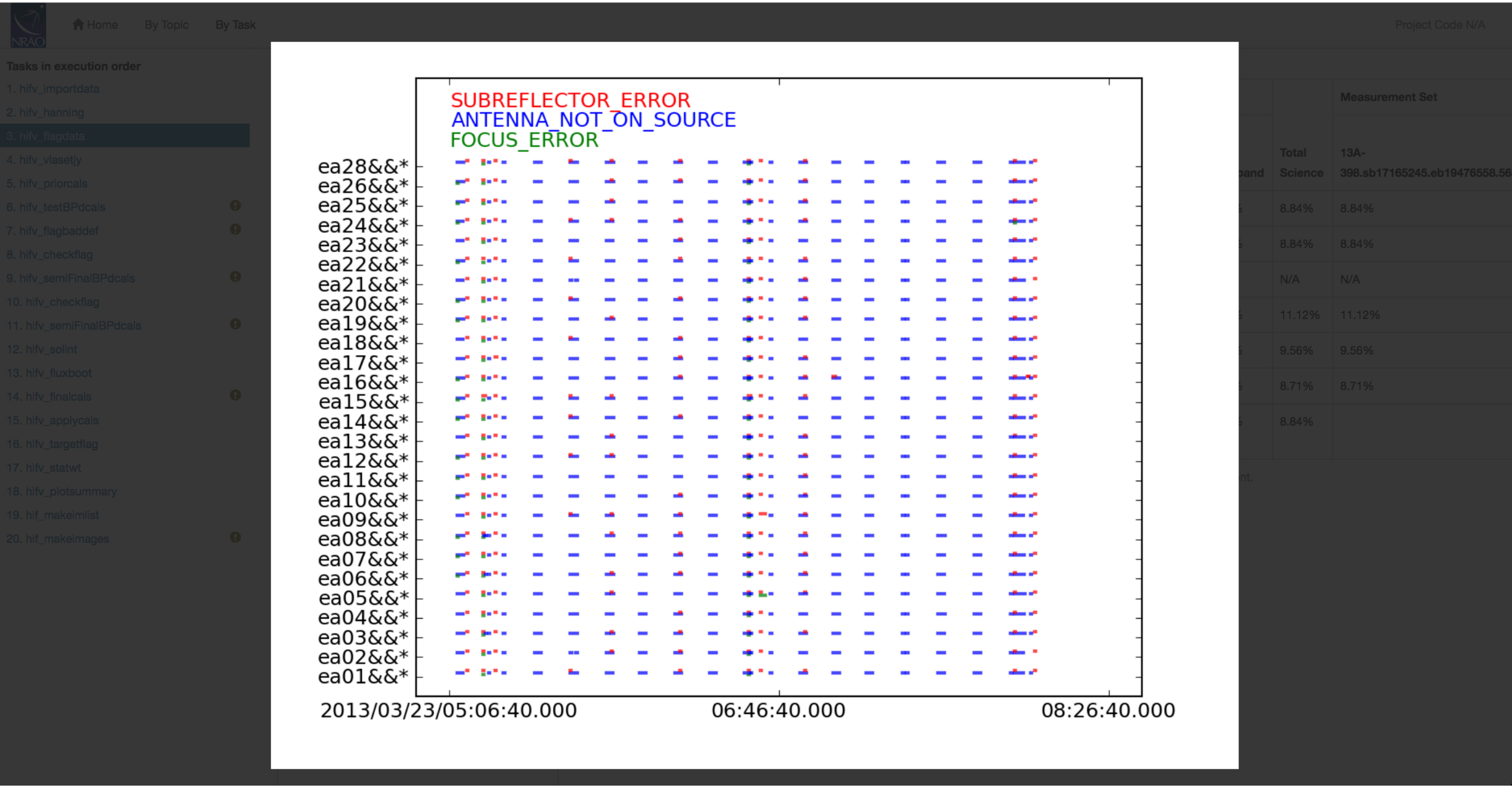
Flagging reason vs time

Plots of flagging reason vs time. The reasons for flagging the data are defined in the plot legend.

13A-398.sb17165245.eb19476558.56374.213876608796.ms



Deterministic Flags (hifv_flagdata)



Hardware Issues (hifv_testBPdcals)

Home | By Topic | By Task

Project Code N/A

Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

6. Initial test calibrations

BACK

Task notifications

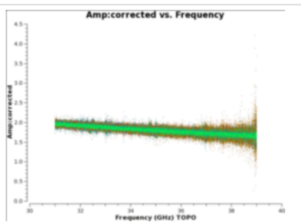
Warning! Antenna 20, spws: 50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65 have a flagging fraction of 1.0.

Initial test calibrations using bandpass and delay calibrators

Plots: Test delay plots | Gain Amplitude | Gain Phase | BP Amp solution | BP Phase solution

testBPdcals summary plot

13A-398.sb17165245.eb19476558.56374.213876608796.ms



Initial calibrated bandpass

Pipeline QA

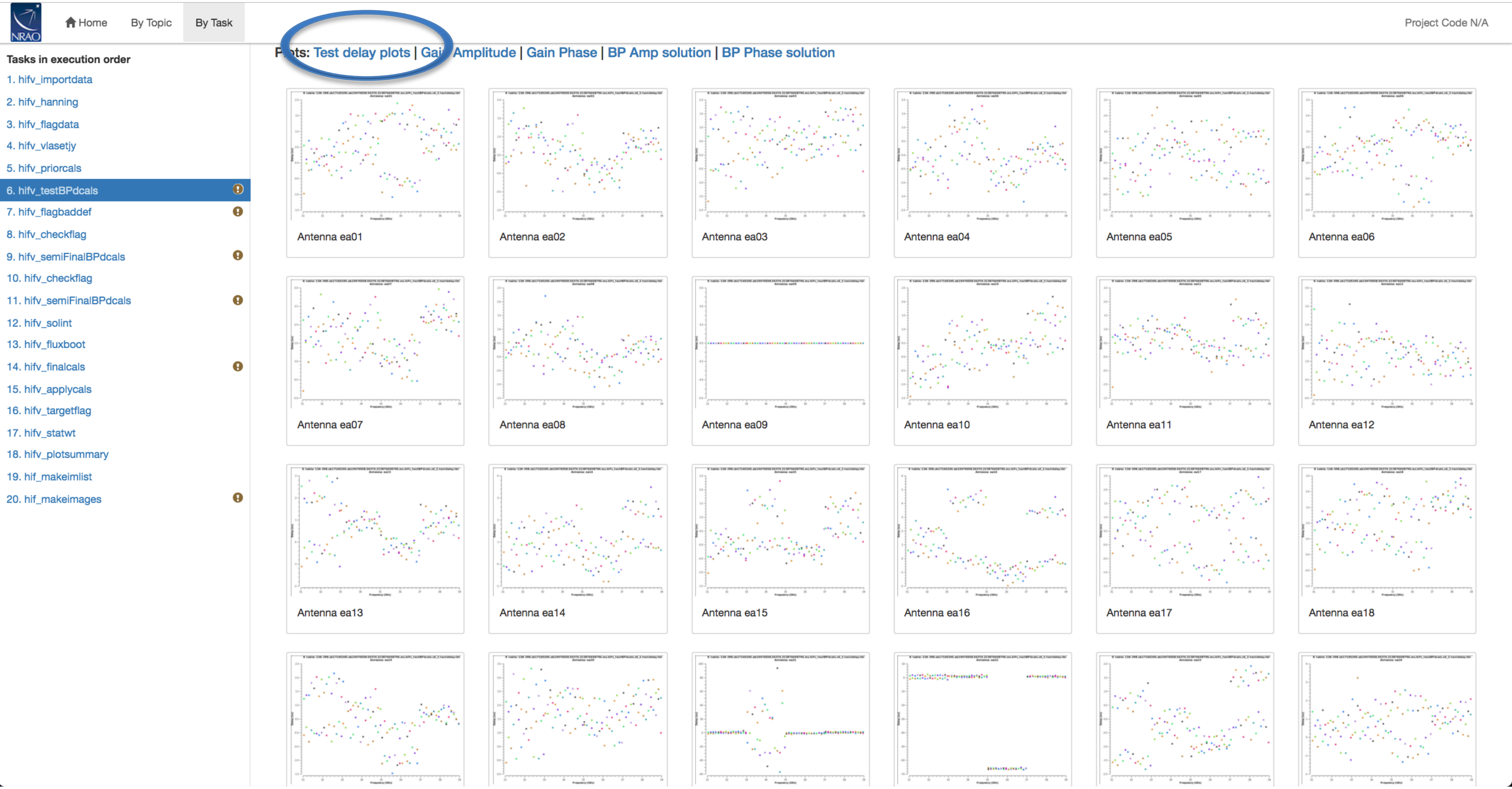
Input Parameters

Tasks Execution Statistics

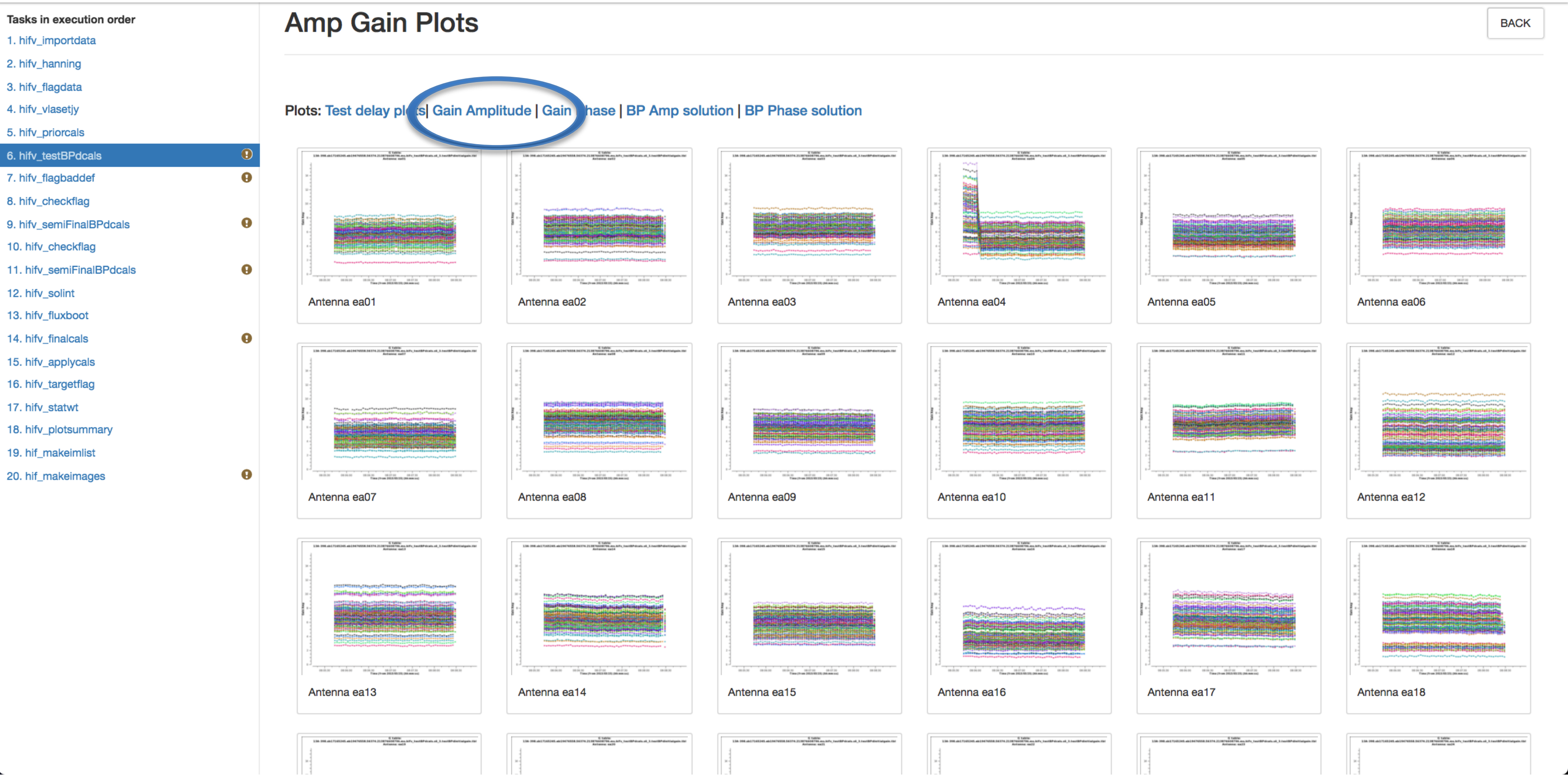
CASA logs for stage 6

- View or download stage6/casapy.log (479.7 KB)

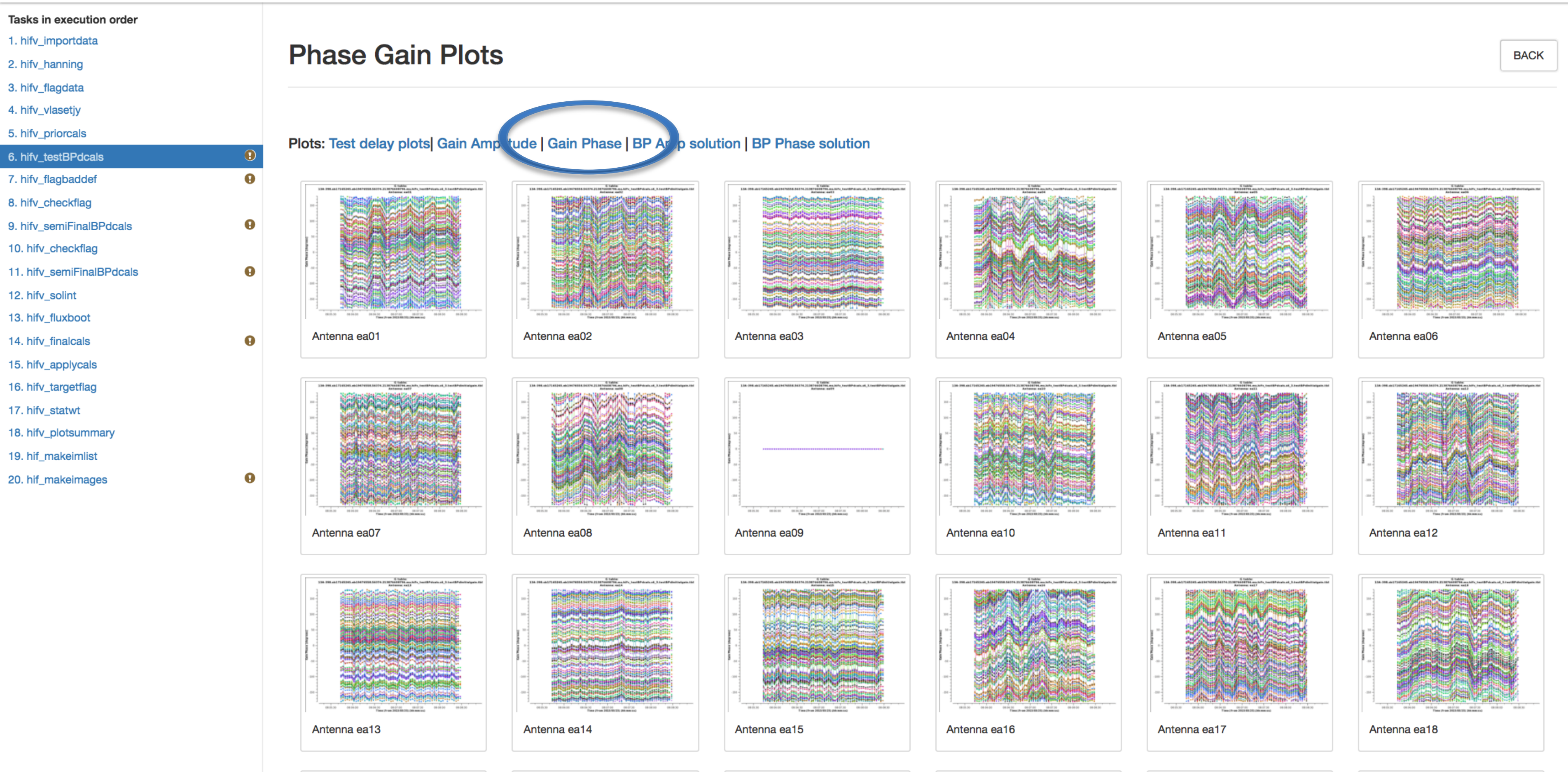
Hardware Issues (hifv_testBPdcals)



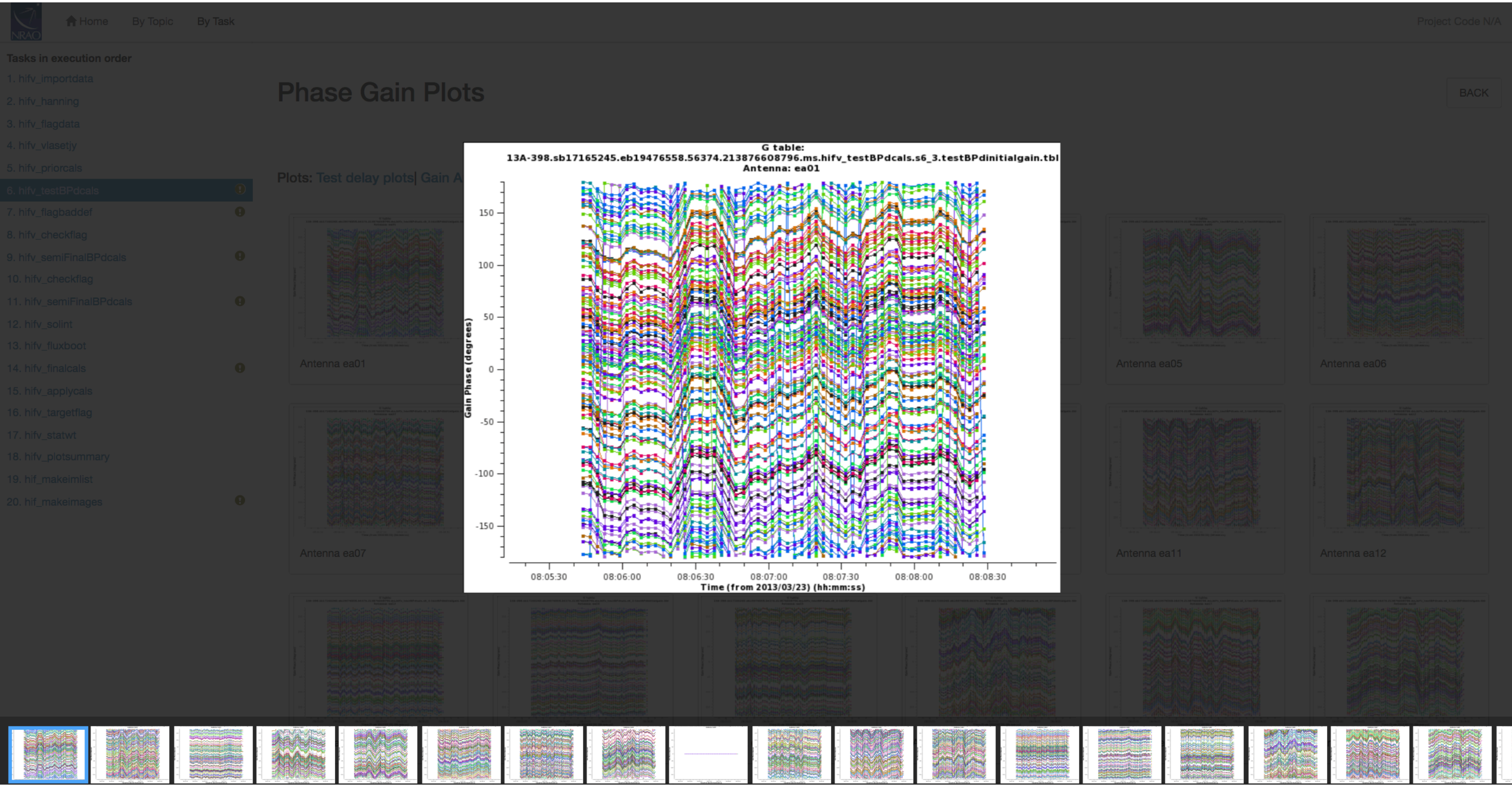
Hardware Issues (hifv_testBPdcals)



Hardware Issues (hifv_testBPdcals)



Hardware Issues (hifv_testBPdcals)



Hardware Issues (hifv_testBPdcals)

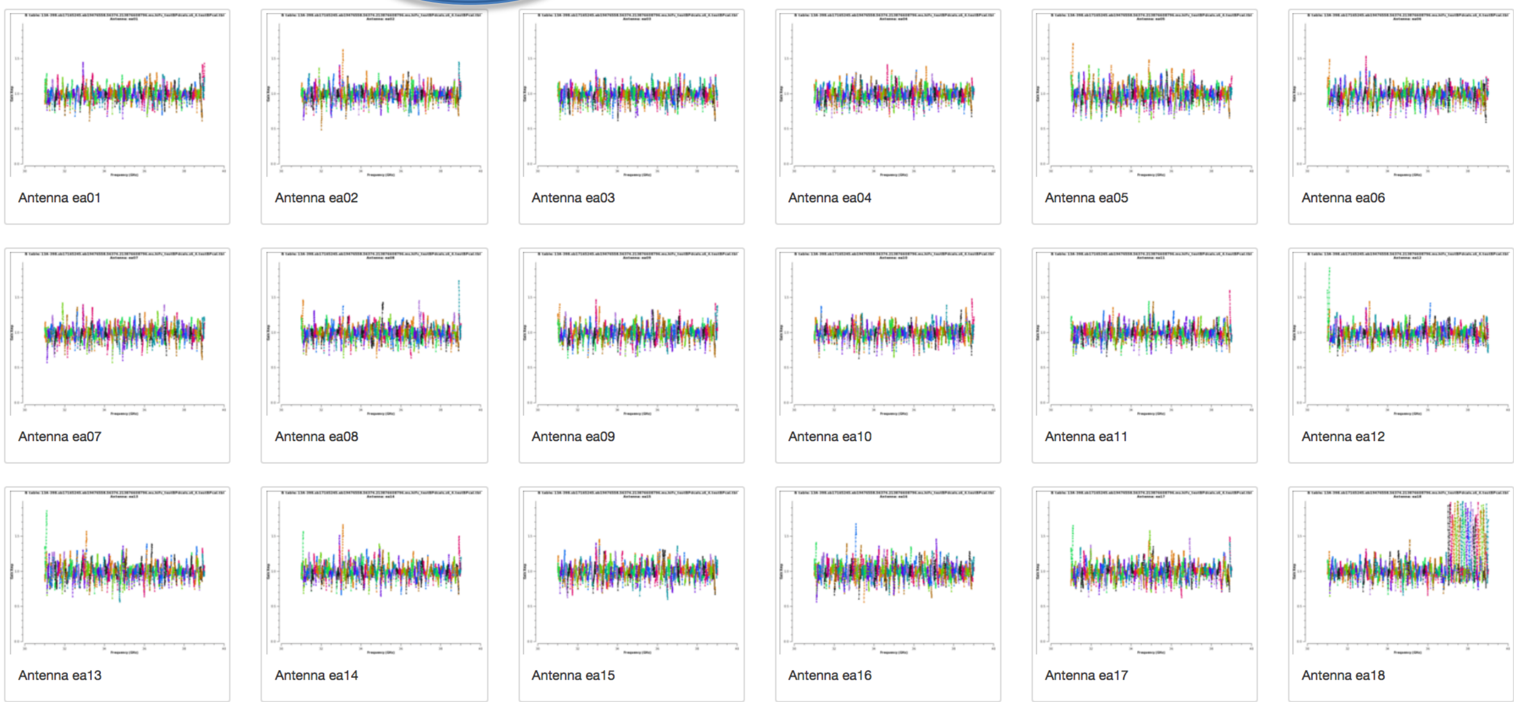
Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

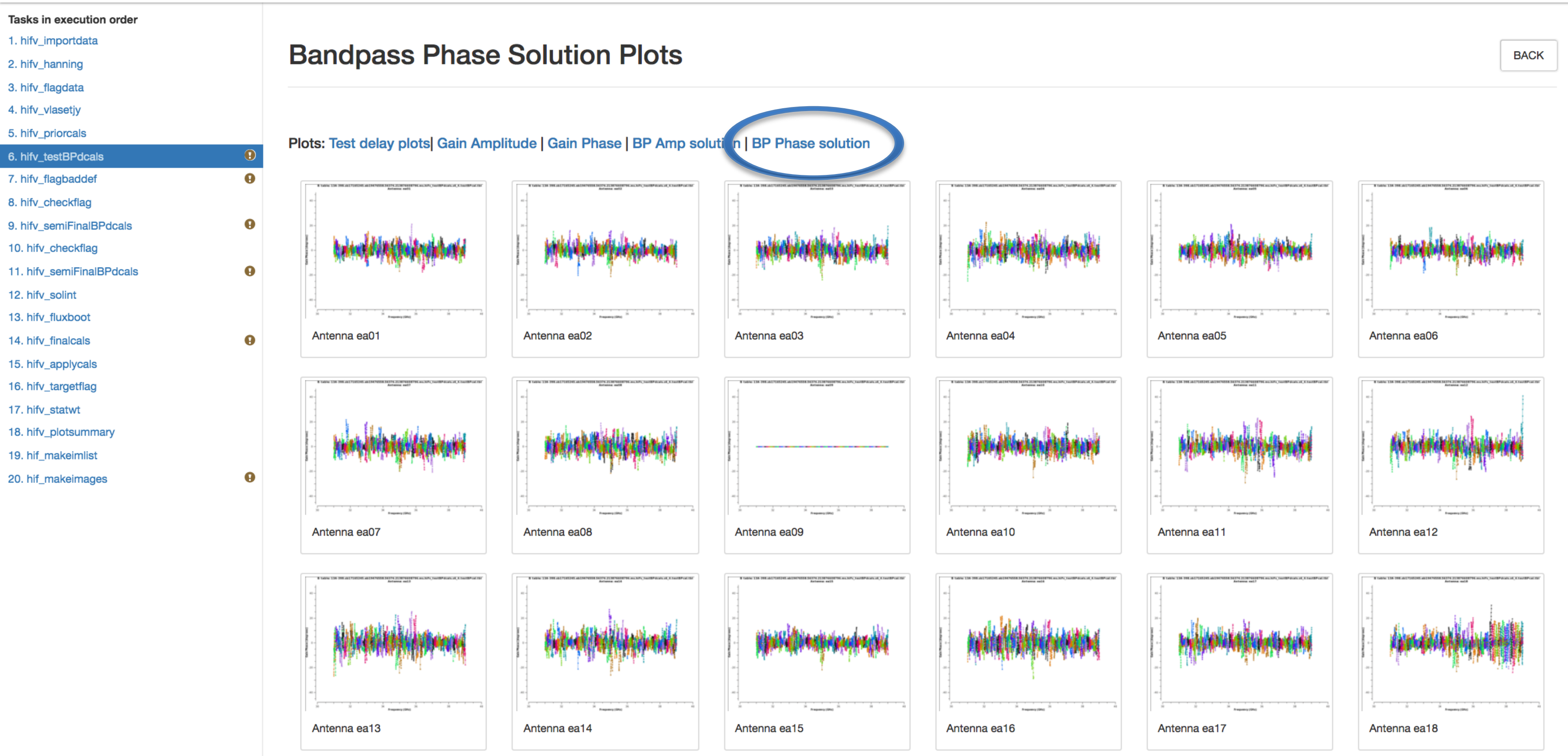
Bandpass Amp Solution Plots

BACK

Plots: Test delay plots| Gain Amplitude | Gain Phase | BP Amp solution | BP Phase solution



Hardware Issues (hifv_testBPdcals)



Gain Solution Intervals (hifv_solint)

Home | By Topic | By Task — Project Code N/A

Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

12. Solution Interval and test gain calibrations

BACK

Determine the solution interval for a scan-average equivalent and do test gain calibrations to establish a short solution interval.

- The long solution interval is: **75.7500005644s**.
- The short solution interval used is: **3.0s**.

Plots: Testgains amp plots | Testgains phase plots

Pipeline QA

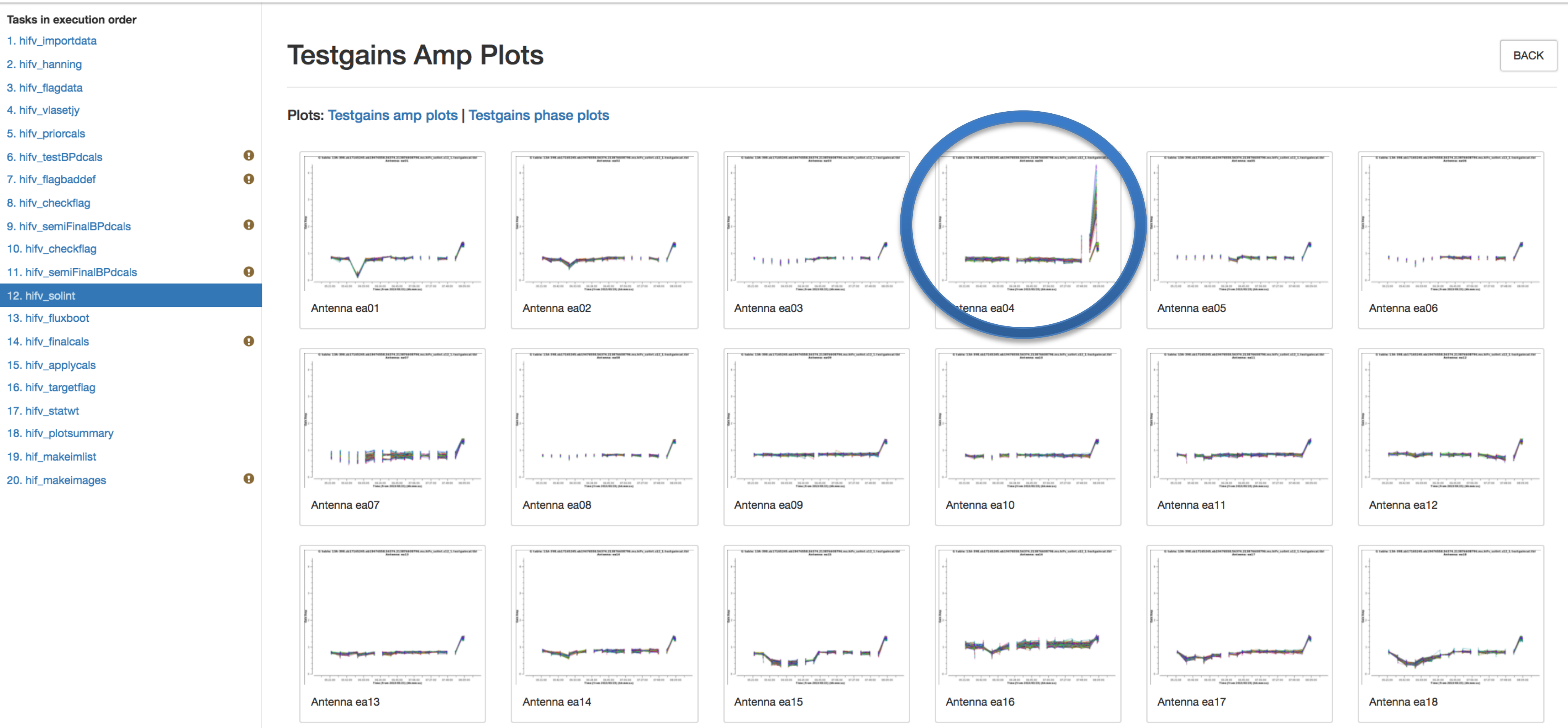
Input Parameters

Tasks Execution Statistics

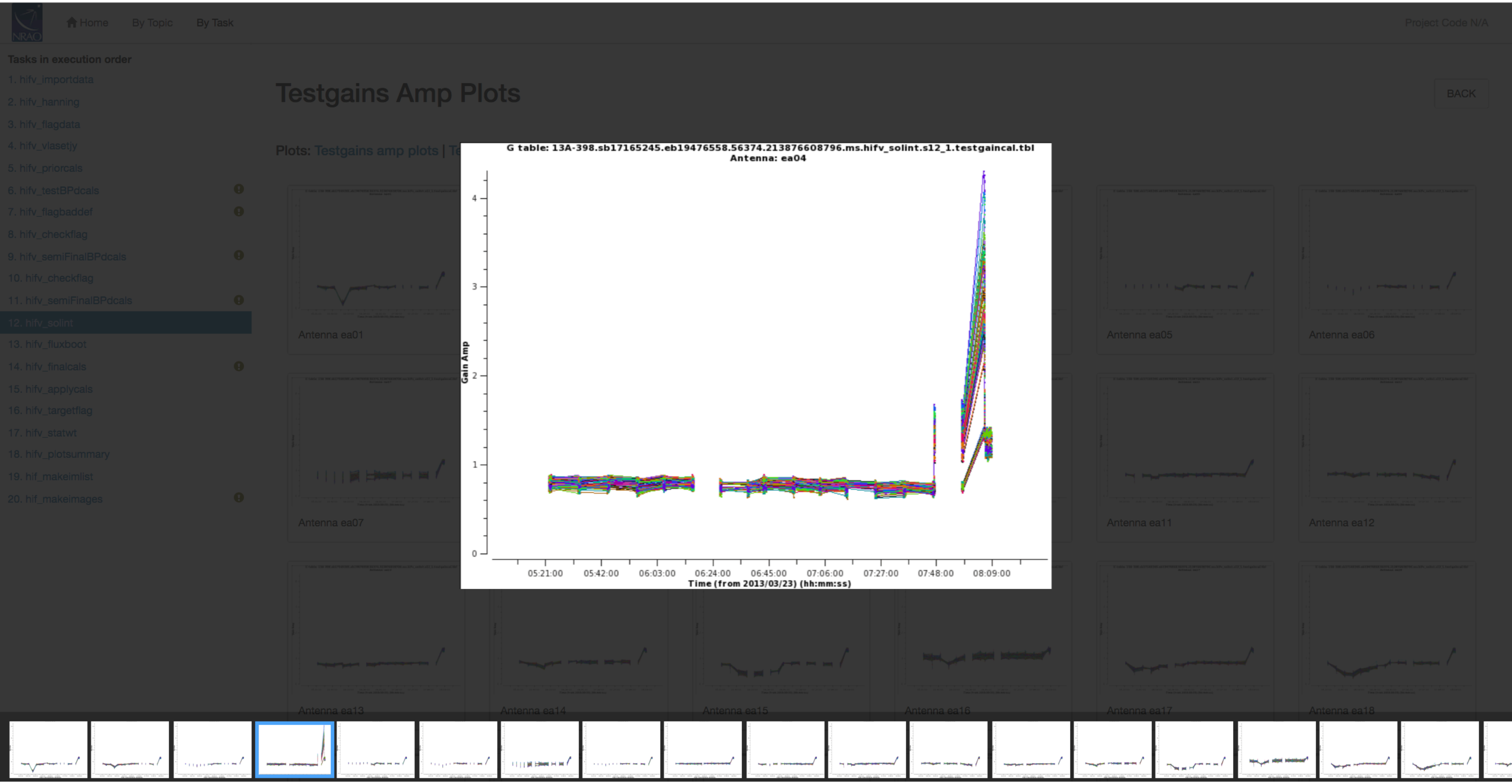
CASA logs for stage 12

- View or download stage12/casapy.log (466.3 KB)

Gain Solution Intervals (hifv_solint)



Gain Solution Intervals (hifv_solint)



Flux Density Bootstrapping (hifv_fluxboot)

Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

13. Flux density bootstrapping and spectral index fitting

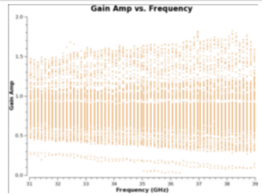
BACK

Make a gain table that includes gain and opacity corrections for final amp cal and for flux density bootstrapping.

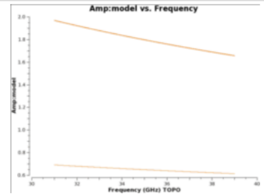
Fit the spectral index of calibrators with a power-law and put the fit in the model column.

Fluxboot summary plots

13A-398.sb17165245.eb19476558.56374.213876608796.ms



Caltable: fluxgaincal.g



Model calibrator

Source	Band	Fitted Spectral Index	Fitted Curvature	Fit Order
J1041+0610	A	-0.5162 +/- 0.0000	0.0000 +/- 0.0000	1

Spectral Indices

Source	Frequency [GHz]	Data	Error	Fitted Data	Residual: Data-Fitted Data
J1041+0610	31.04	0.6821	0.031232	0.6911	-0.009075
	31.168	[illegible]	0.029245	[illegible]	0.000631
	31.296	0.6891	0.028225	0.6882	0.000882
	31.424	0.6824	0.030953	0.6868	-0.004370
	31.552	0.6829	0.031664	0.6853	-0.002452
	31.68	0.6790	0.030396	0.6839	-0.004872
	31.808	0.6793	0.032311	0.6825	-0.003126
	31.936	0.6834	0.031943	0.6811	0.002309

Final Calibration Tables (hifv_finalcals)

Home | By Topic | By Task — Project Code N/A

Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

14. Final calibration tables

BACK

Task notifications

Warning! Antenna 11, spws: 33 have a flagging fraction of 1.0.

Warning! Antenna 18, spws: 34 have a flagging fraction of 1.0.

Warning! Antenna 20, spws: 50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65 have a flagging fraction of 1.0.

Warning! Antenna 21, spws: 33 have a flagging fraction of 1.0.

Make the final calibration tables.

Plots:
Final delay plots | BP initial gain phase | BP Amp solution | BP Phase solution | Phase (short) gain solution | Final amp time cal | Final amp freq cal | Final phase gain cal

Pipeline QA

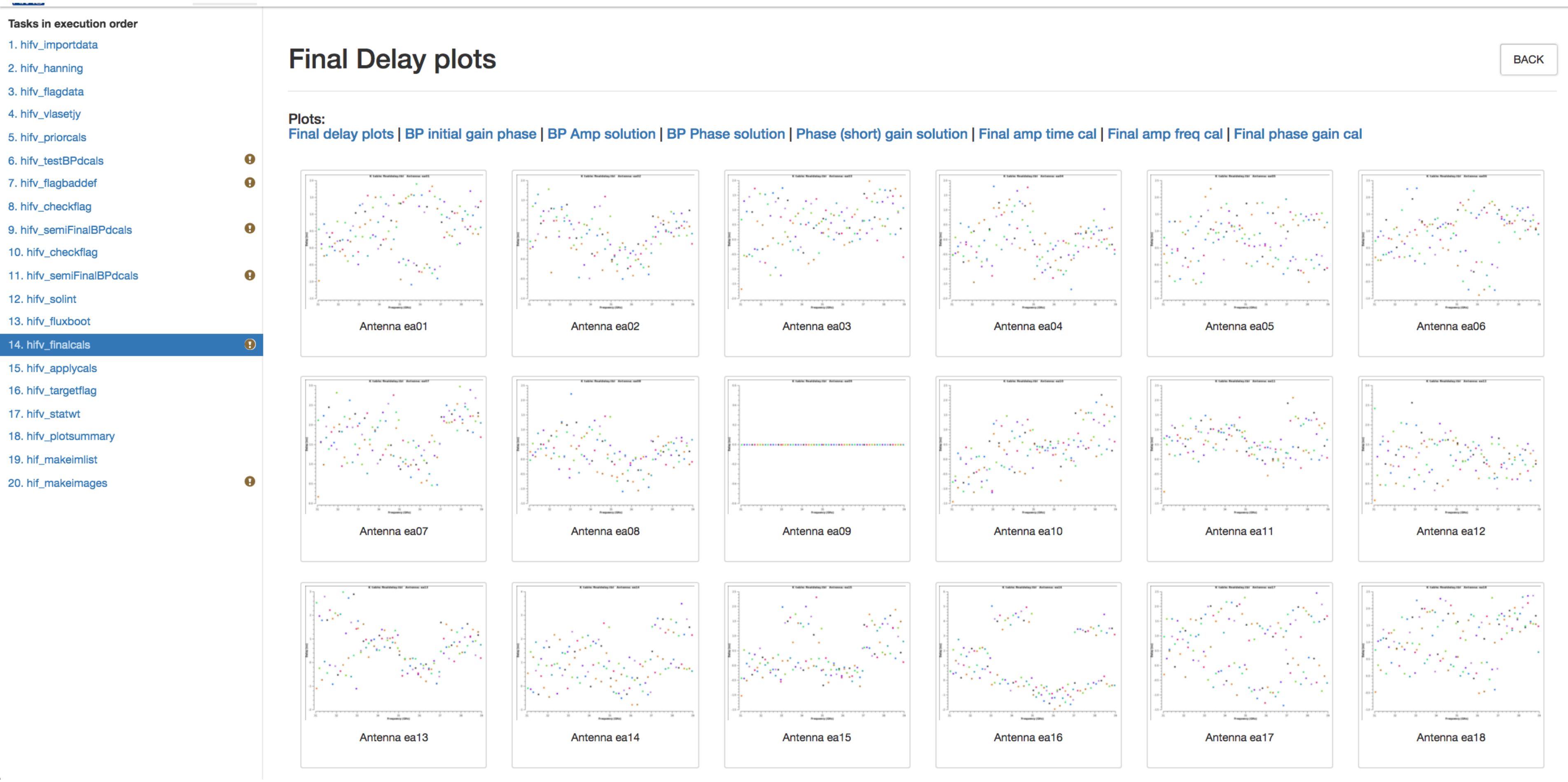
Input Parameters

Tasks Execution Statistics

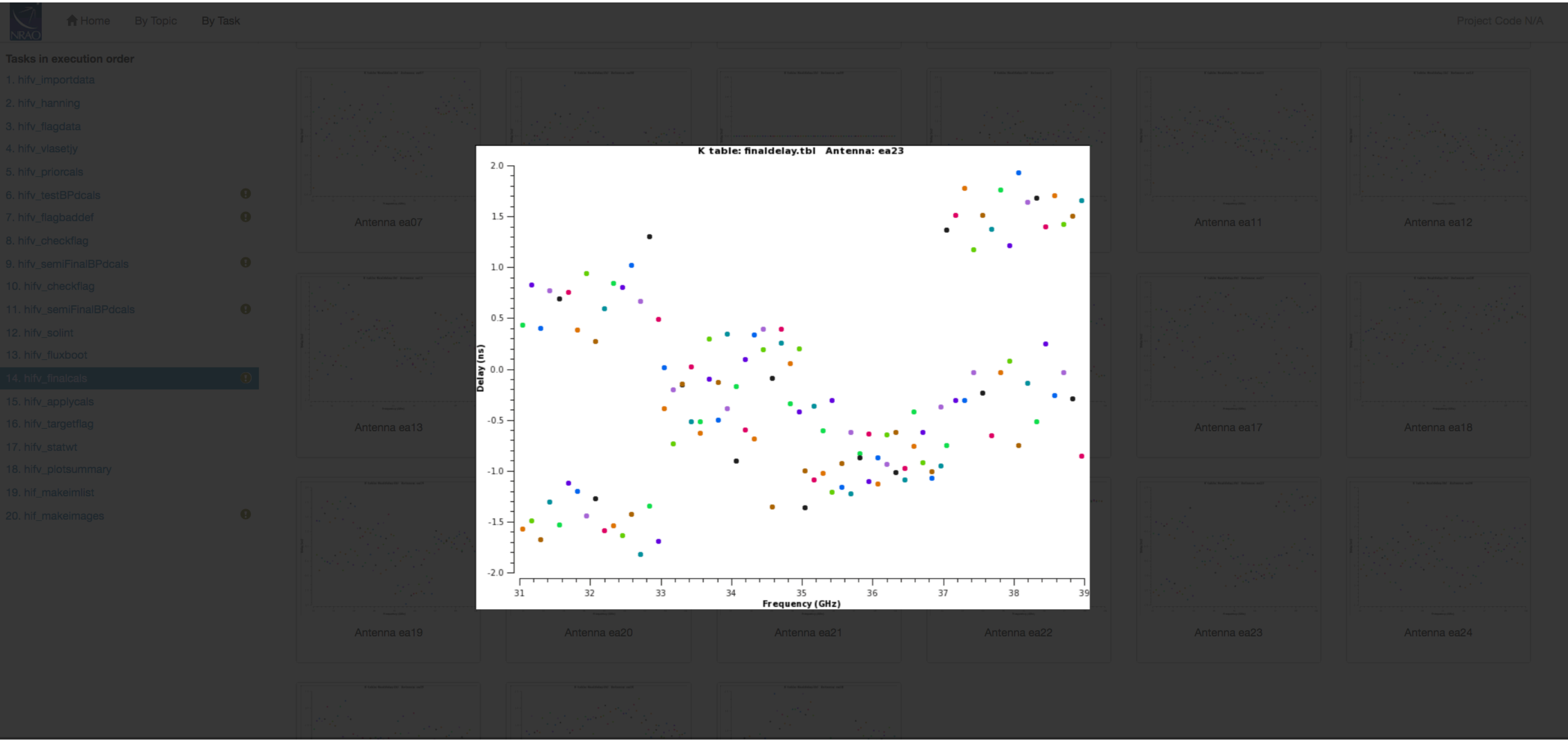
CASA logs for stage 14

- View or download stage14/casapy.log (706.7 KB)

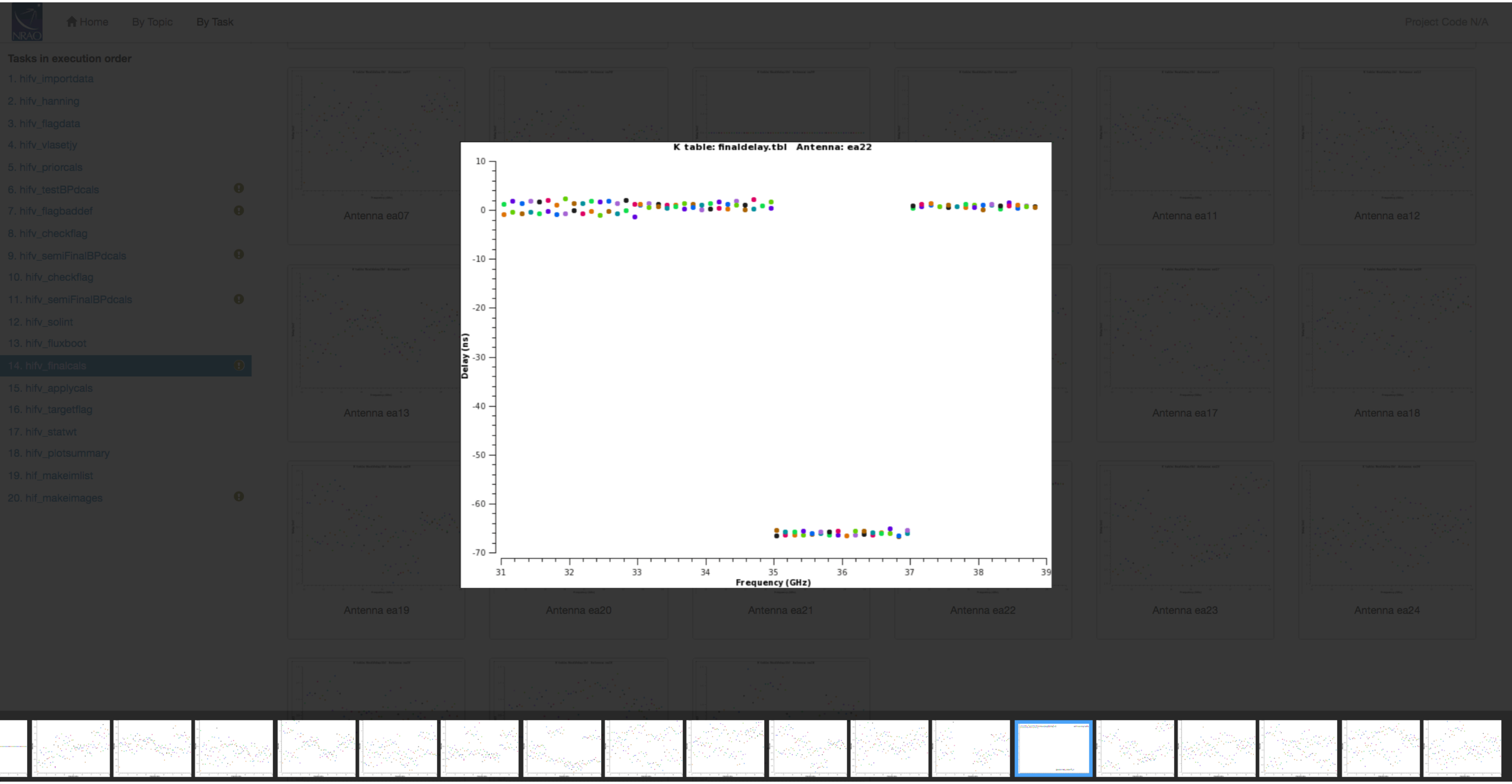
Final Calibration Tables (hifv_finalcals)



Final Calibration Tables (hifv_finalcals)



Final Calibration Tables (hifv_finalcals)



Final Cal Tables: bandpass

Tasks in execution order

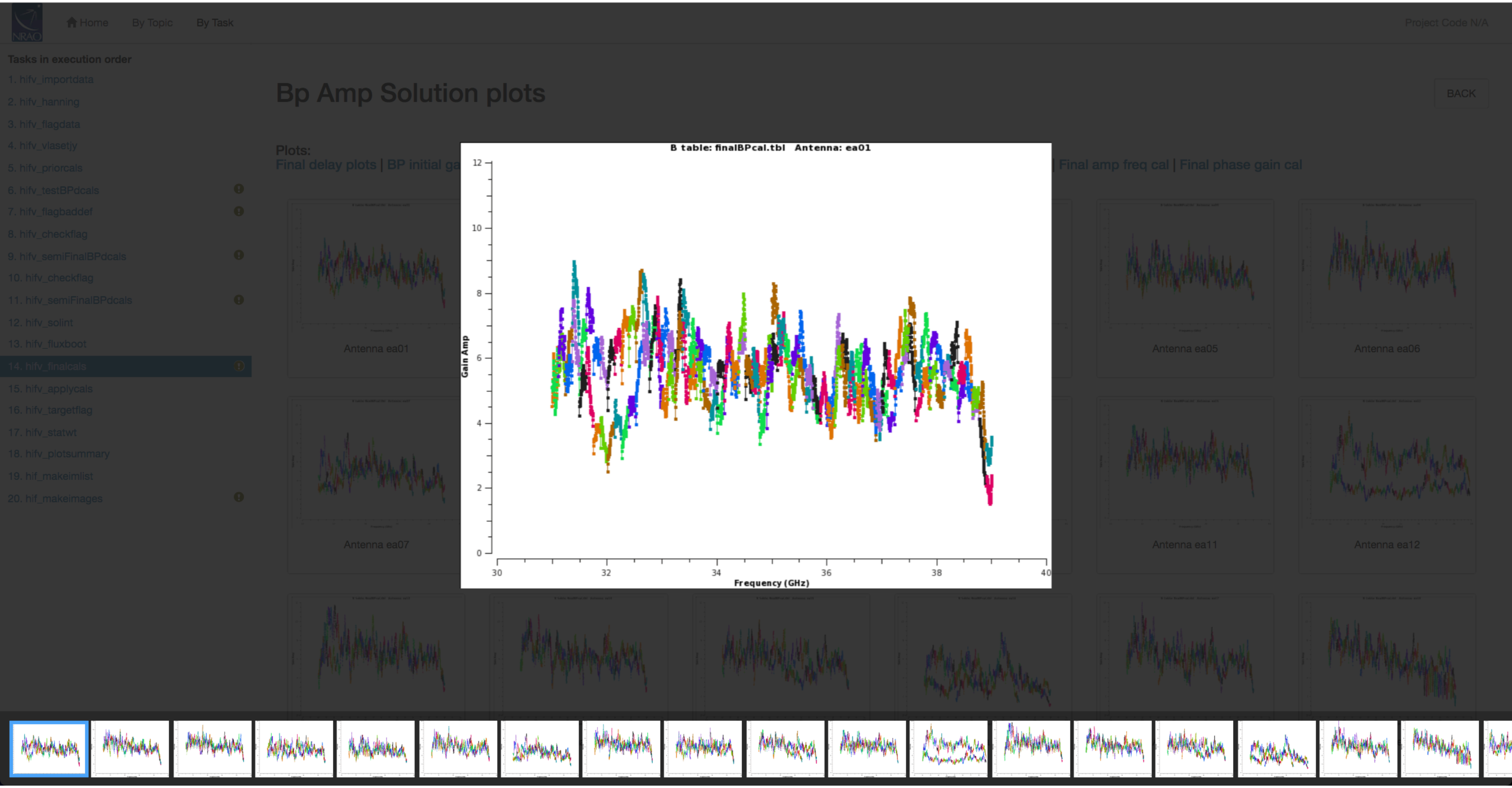
1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

Bp Amp Solution plots

BACK

Plots:
Final delay plots | BP initial gain phase | BP Amp solution | BP Phase solution | Phase (short) gain solution | Final amp time cal | Final amp freq cal | Final phase gain cal

Final Cal Tables: bandpass



Final Cal Tables: bandpass

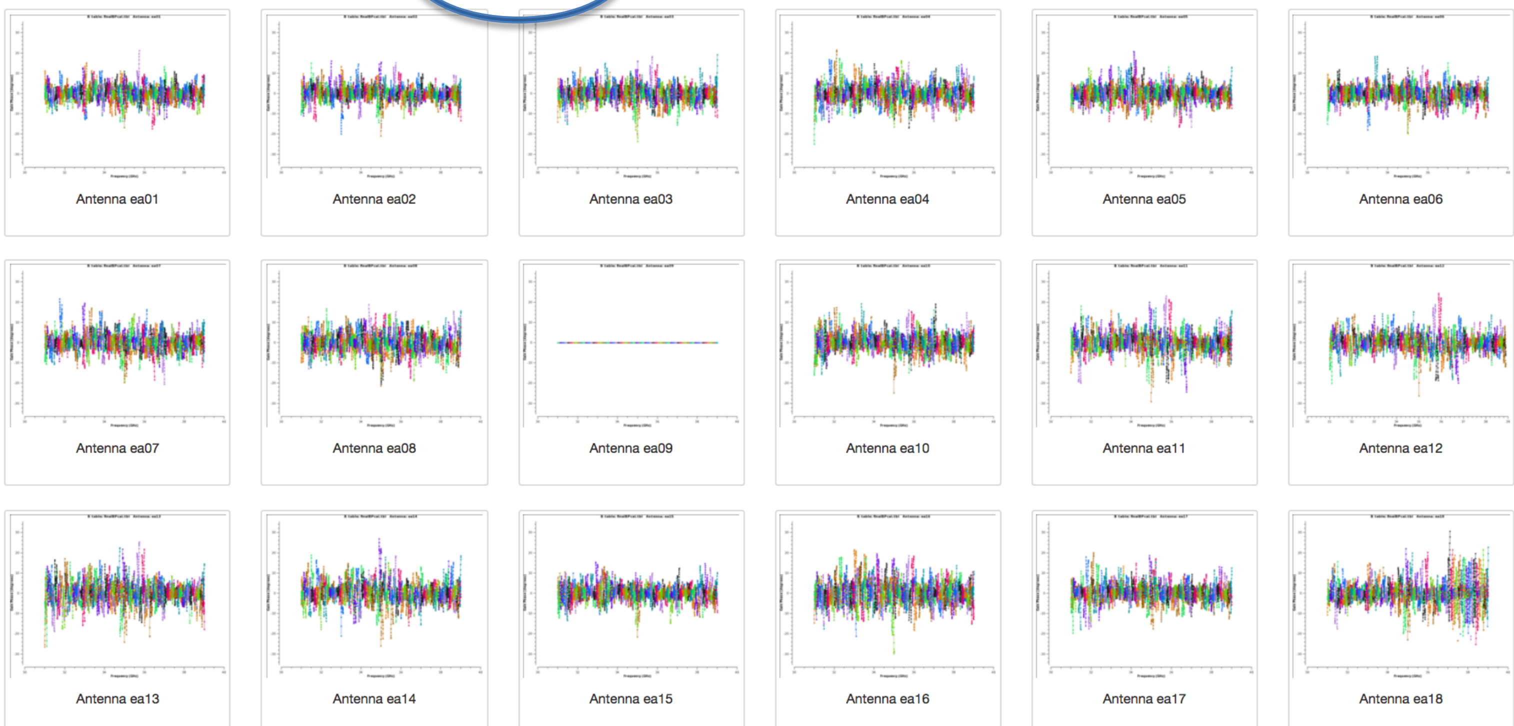
Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

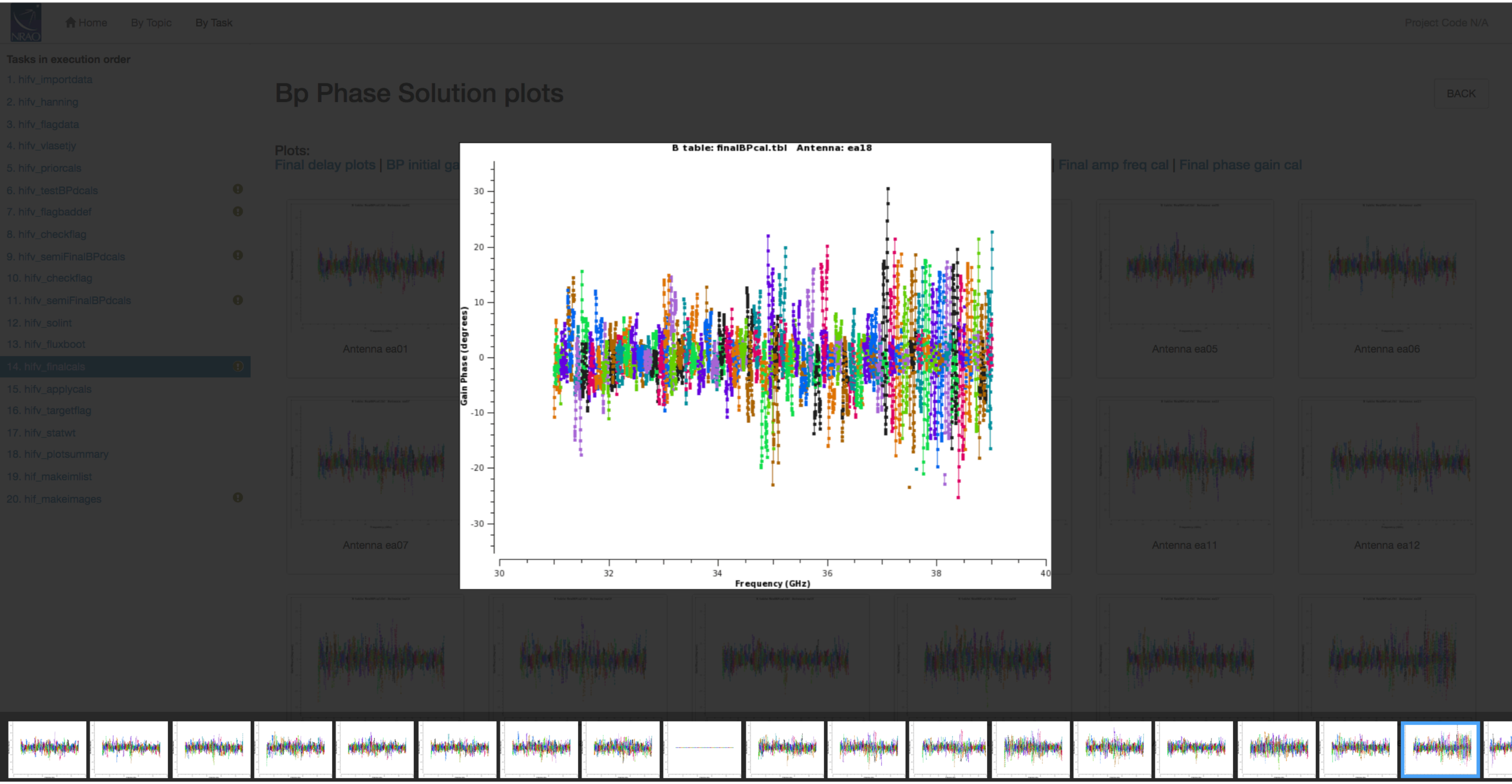
Bp Phase Solution plots

BACK

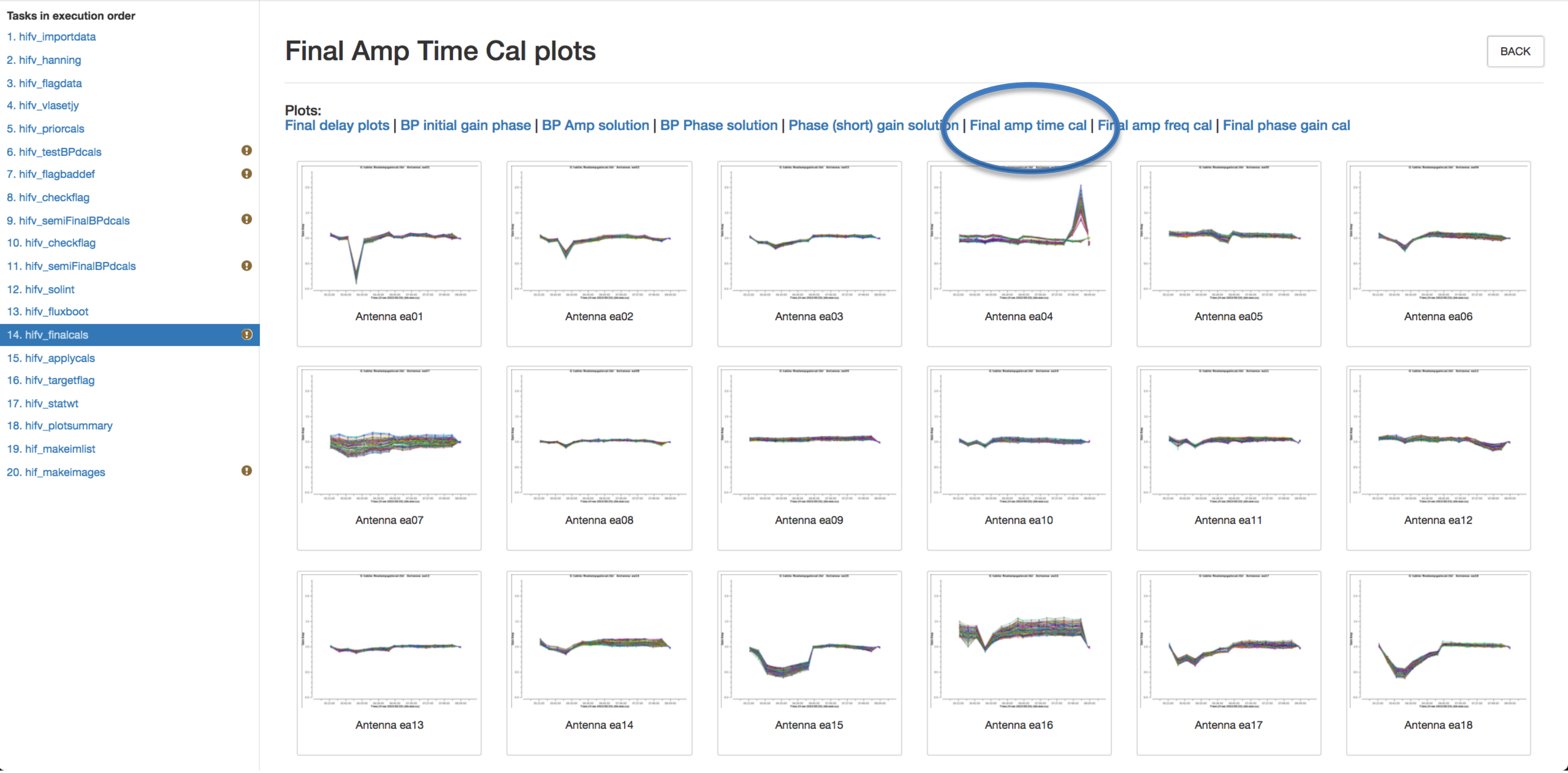
Plots:
Final delay plots | BP initial gain phase | BP Amp solution | BP Phase solution | Phase (short) gain solution | Final amp time cal | Final amp freq cal | Final phase gain cal



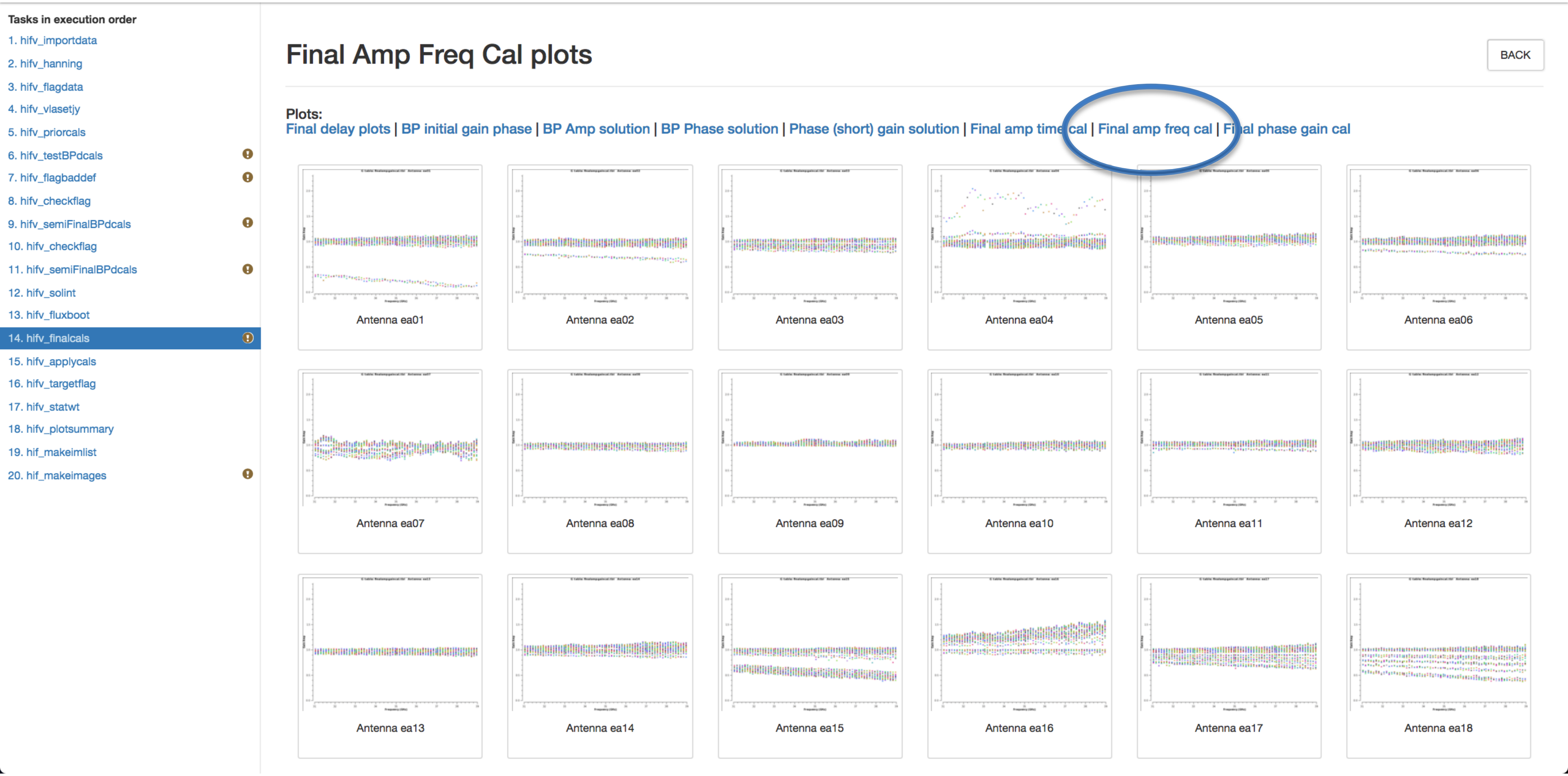
Final Cal Tables: bandpass



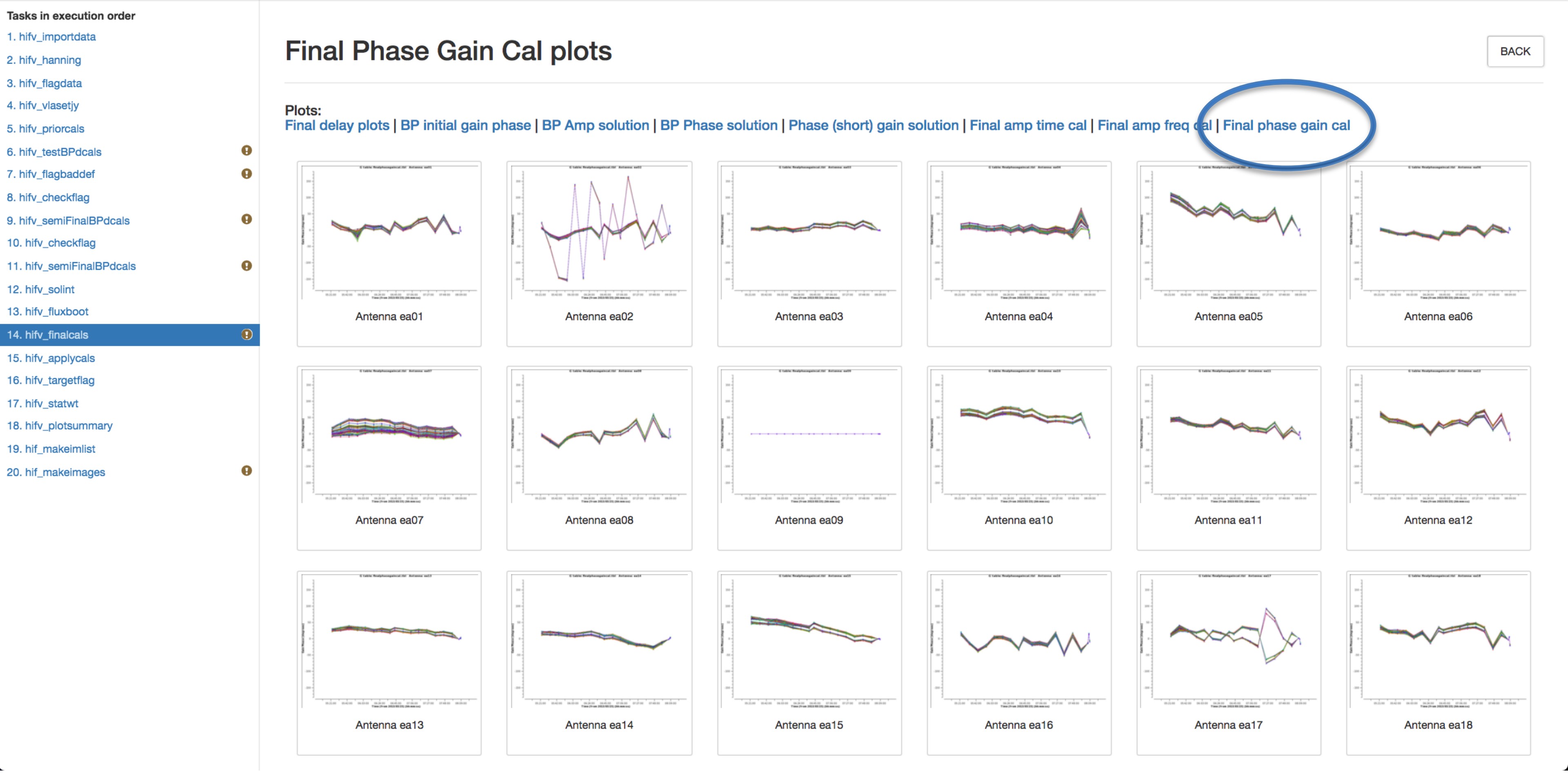
Final Cal Tables: amplitude and phase



Final Cal Tables: amplitude and phase



Final Cal Tables: amplitude and phase



Summary Plots (hifv_plotsummary)

Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

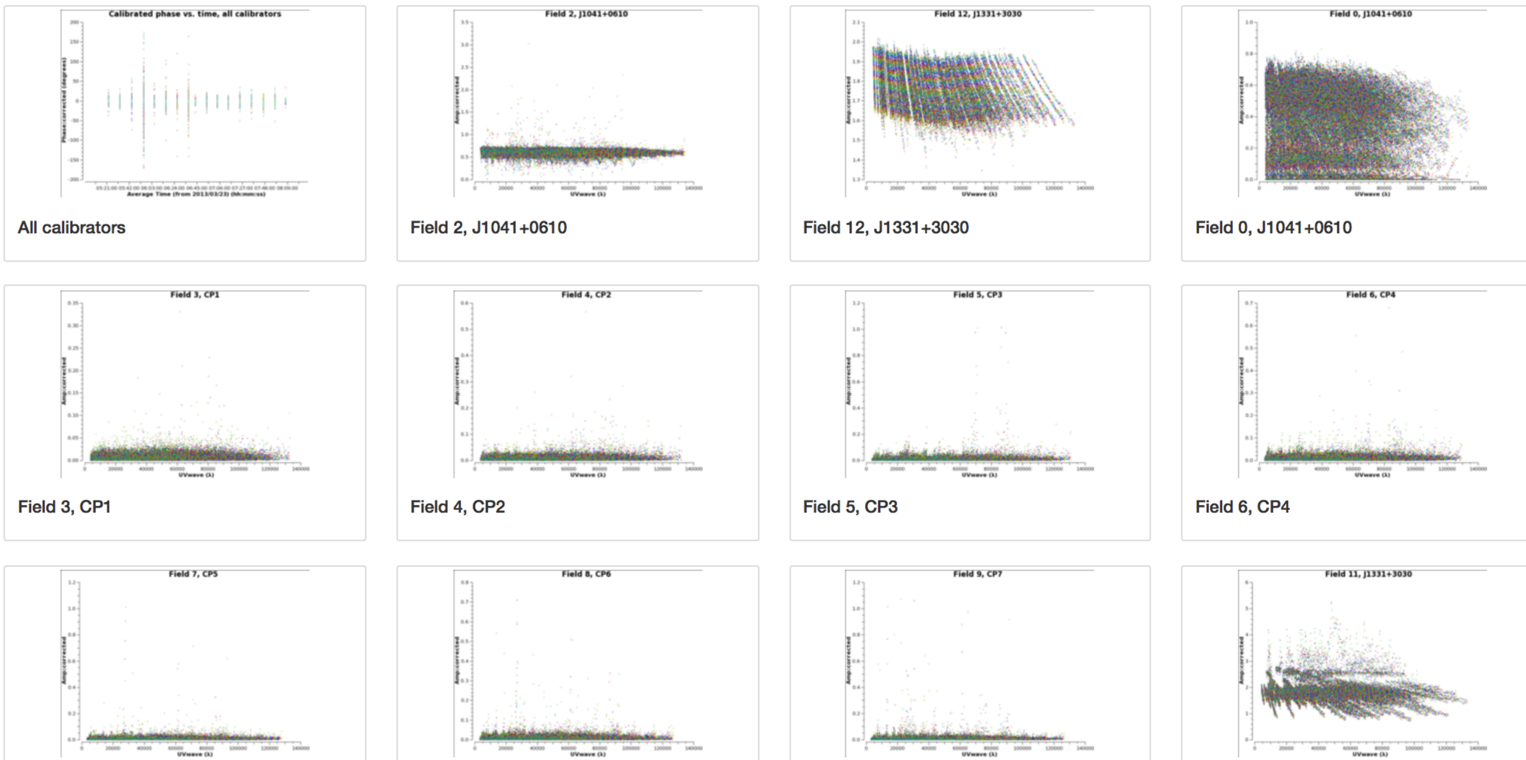
18. Plot Summary

BACK

VLA Pipeline Summary Plots

Phase vs. time for all calibrators, Amp vs. UVwave for all calibrators, as well as a representative selection of fields with intent='TARGET' with Amp vs. UVwave plots.

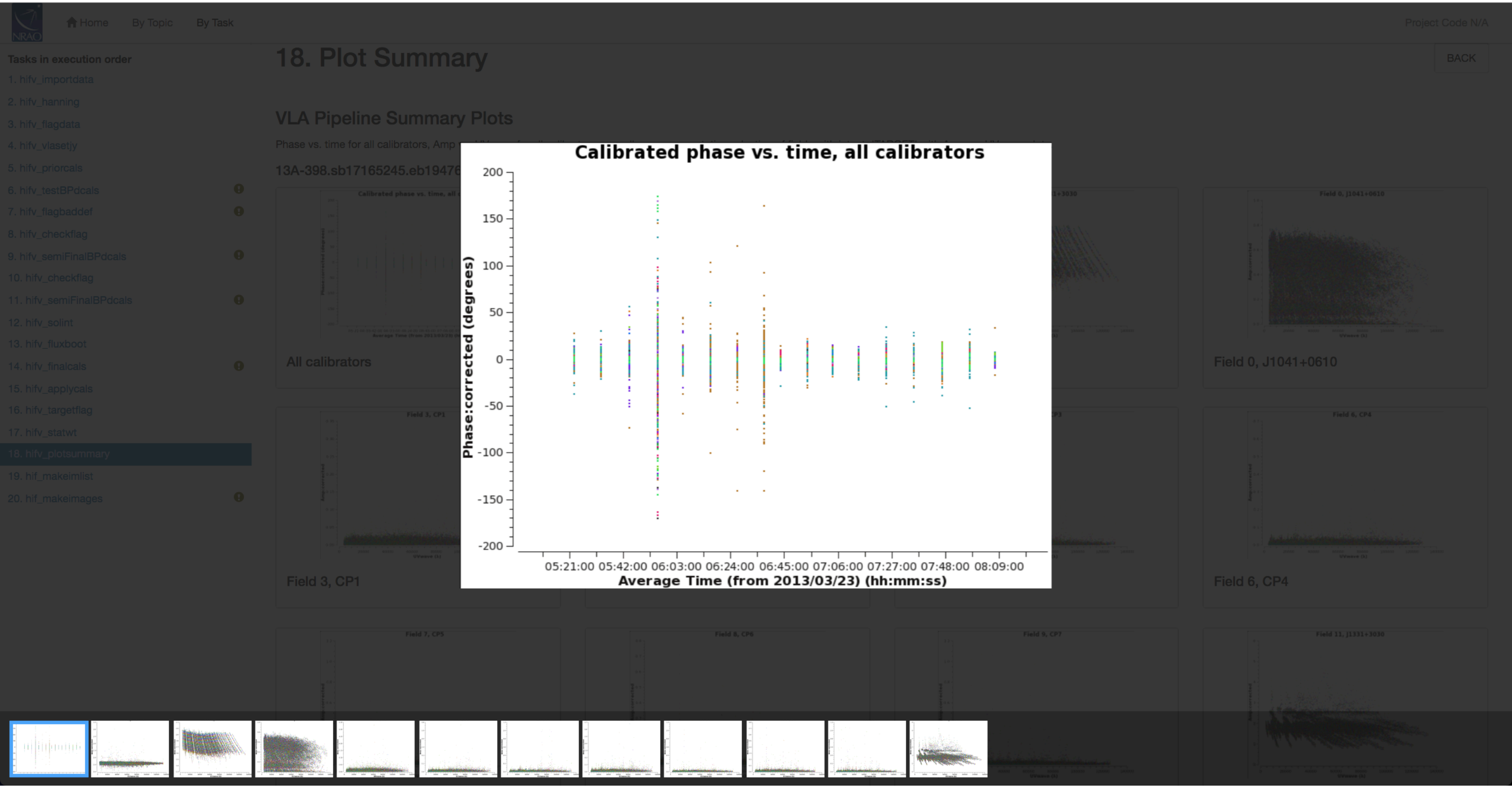
13A-398.sb17165245.eb19476558.56374.213876608796.ms



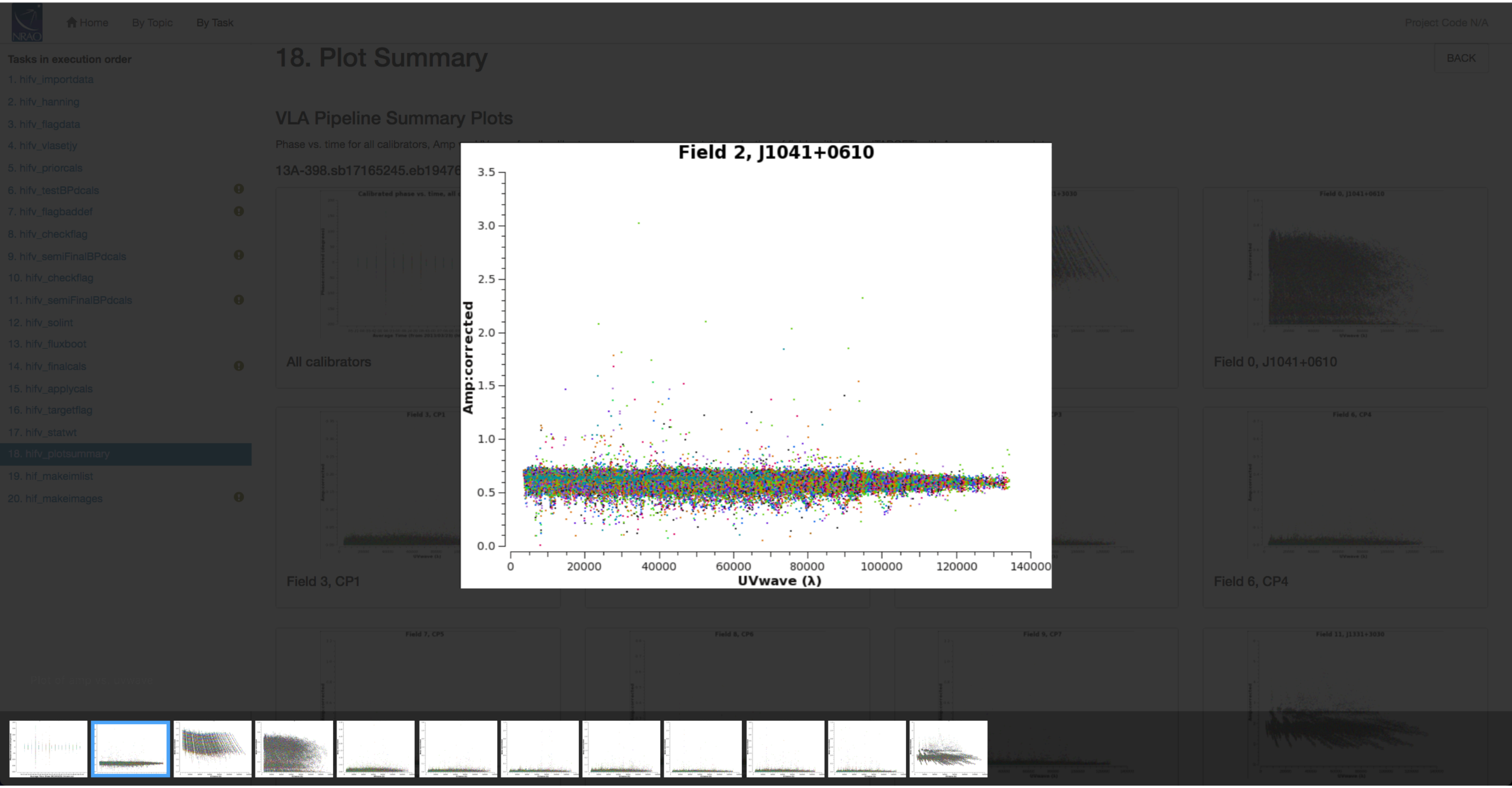
All calibrators | Field 2, J1041+0610 | Field 12, J1331+3030 | Field 0, J1041+0610

Field 3, CP1 | Field 4, CP2 | Field 5, CP3 | Field 6, CP4

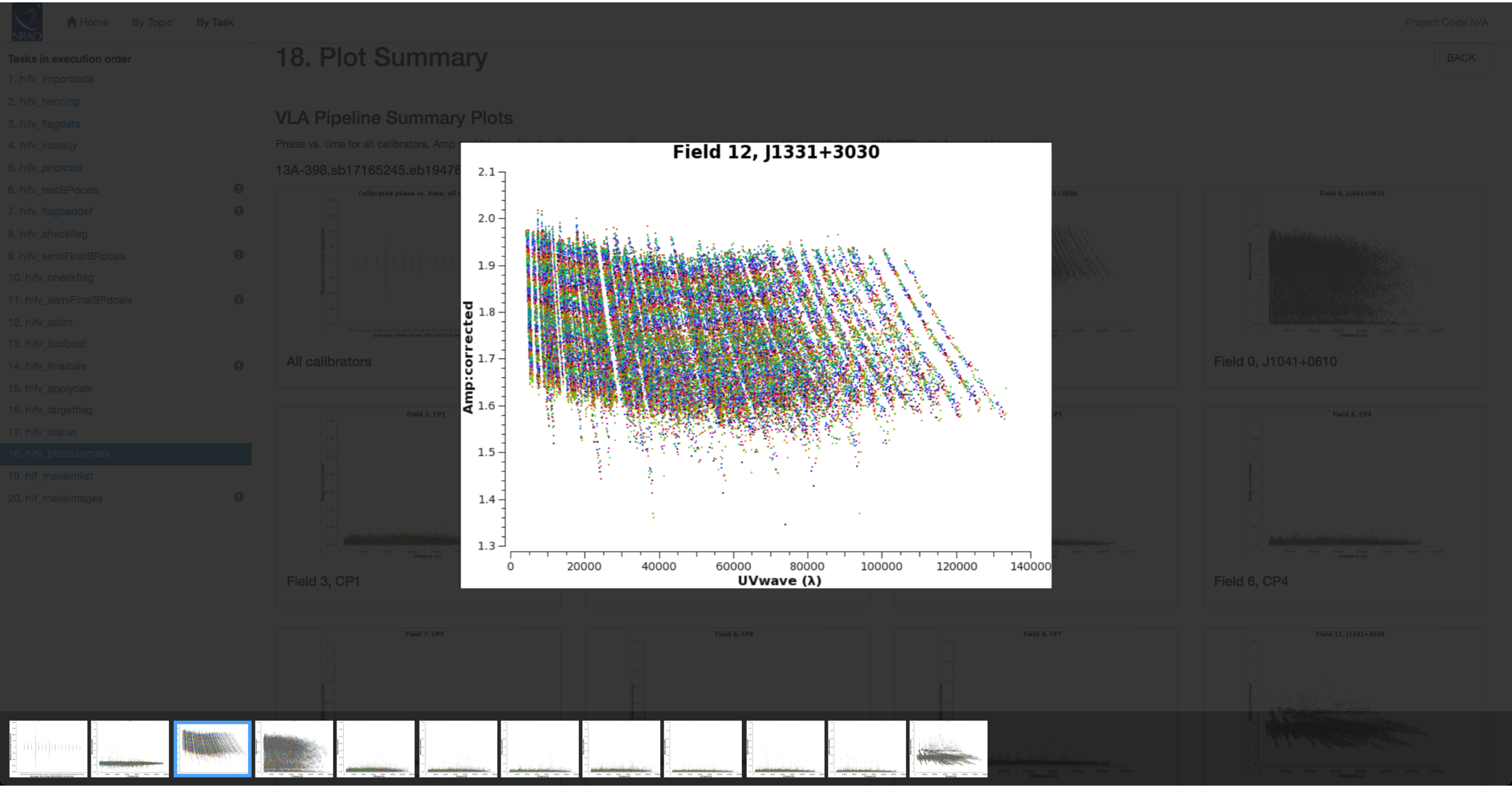
Summary Plots (hifv_plotsummary)



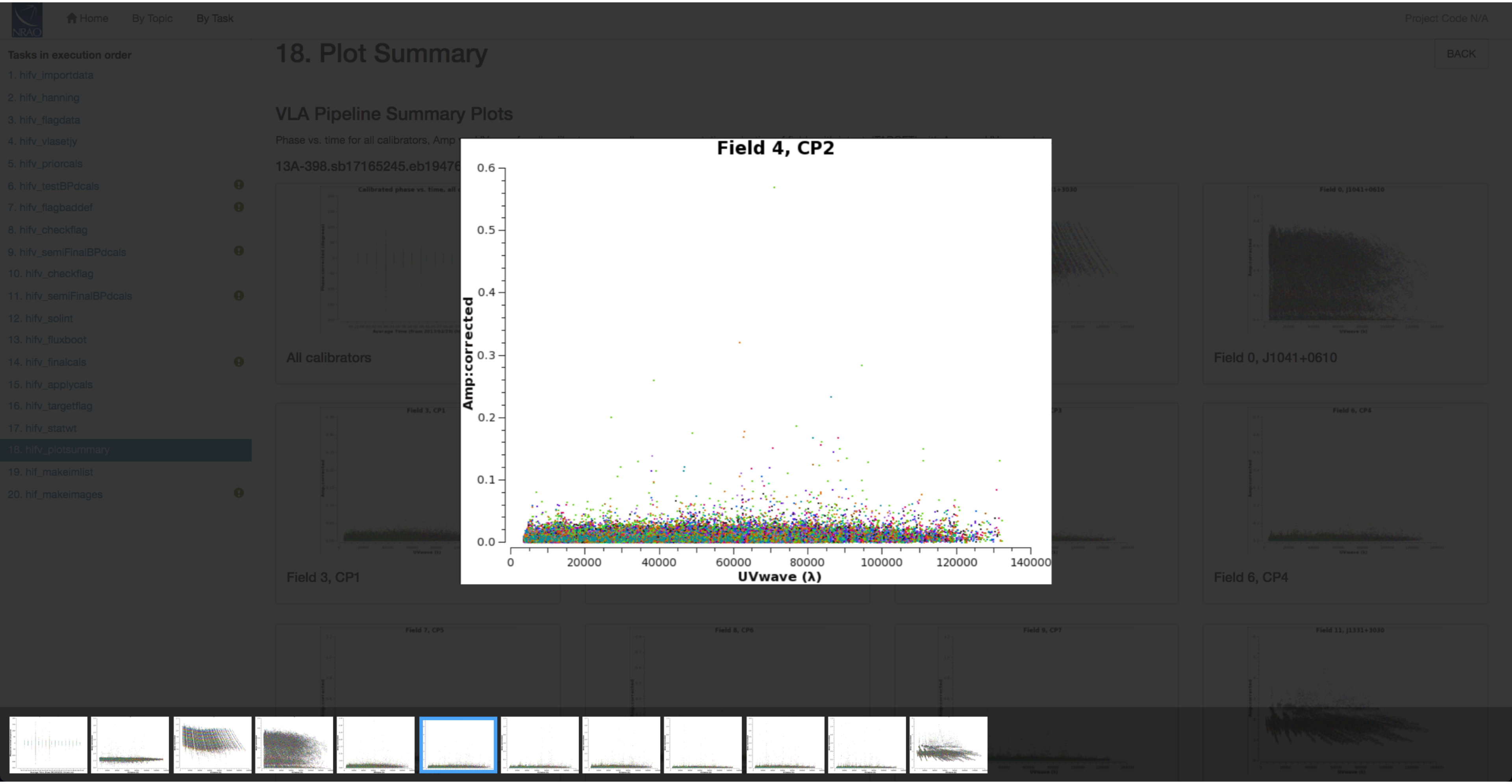
Summary Plots (hifv_plotsummary)



Summary Plots (hifv_plotsummary)



Summary Plots (hifv_plotsummary)



Calibrator Images (hif_makeimages)

Home | By Topic | By Task | Project Code N/A

Tasks in execution order

1. hifv_importdata
2. hifv_hanning
3. hifv_flagdata
4. hifv_vlasetjy
5. hifv_priorcals
6. hifv_testBPdcals
7. hifv_flagbaddef
8. hifv_checkflag
9. hifv_semiFinalBPdcals
10. hifv_checkflag
11. hifv_semiFinalBPdcals
12. hifv_solint
13. hifv_fluxboot
14. hifv_finalcals
15. hifv_applycals
16. hifv_targetflag
17. hifv_statwt
18. hifv_plotsummary
19. hif_makeimlist
20. hif_makeimages

20. Tclean/MakeImages

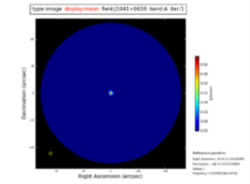
Calculate clean products

BACK

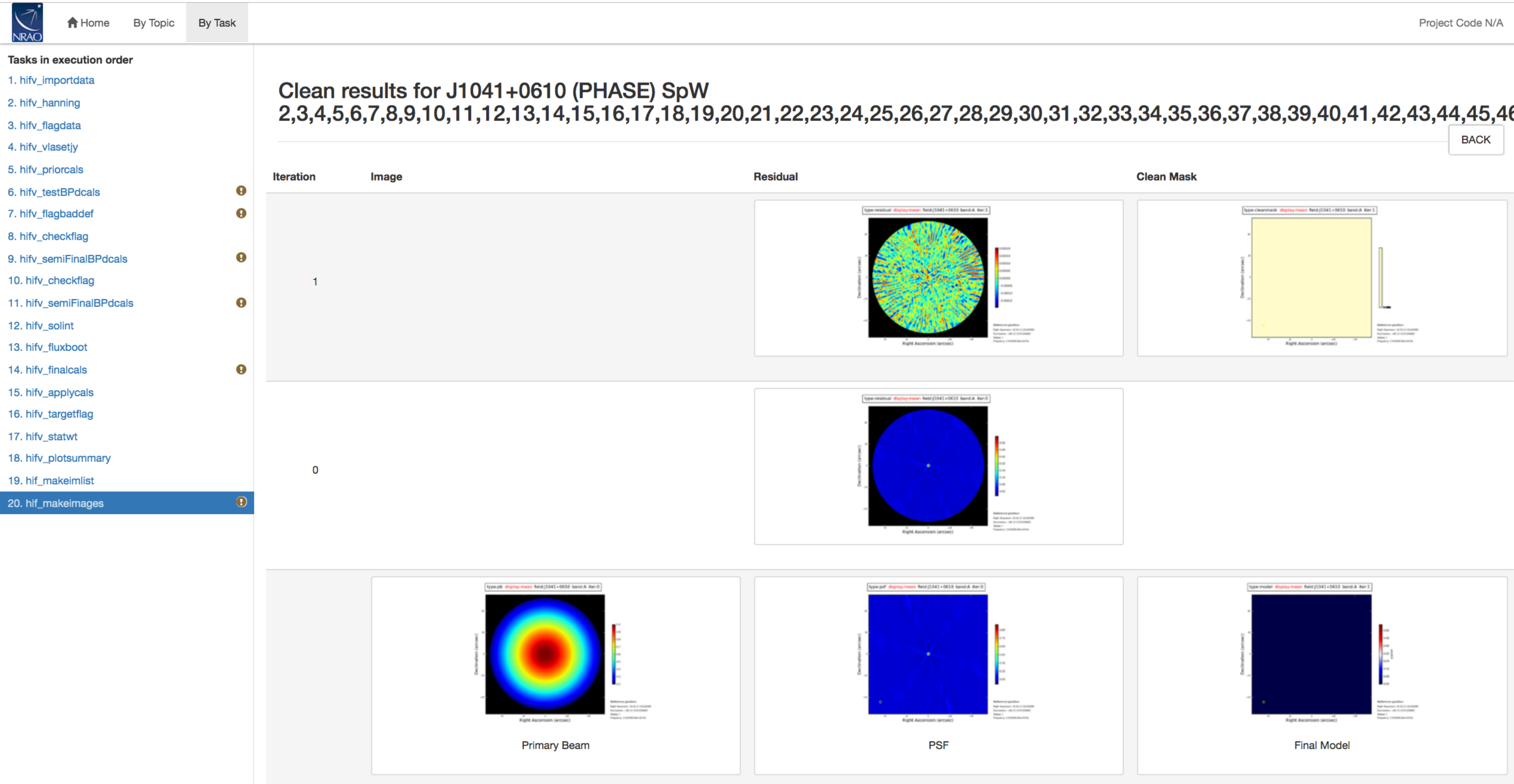
Task notifications

Warning! tclean reached niter limit of 5000 for J1041+0610 / spw2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65 !

Image Details

Field	Spw	Pol	Image details		Image result
J1041+0610 (PHASE)	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65 / EVLA_KA#A1C1#2, EVLA_KA#A1C1#3, EVLA_KA#A1C1#4, EVLA_KA#A1C1#5, EVLA_KA#A1C1#6, EVLA_KA#A1C1#7, EVLA_KA#A1C1#8, EVLA_KA#A1C1#9, EVLA_KA#A1C1#10, EVLA_KA#A1C1#11, EVLA_KA#A1C1#12, EVLA_KA#A1C1#13, EVLA_KA#A1C1#14, EVLA_KA#A1C1#15, EVLA_KA#A1C1#16, EVLA_KA#A1C1#17, EVLA_KA#A2C2#18, EVLA_KA#A2C2#19, EVLA_KA#A2C2#20, EVLA_KA#A2C2#21, EVLA_KA#A2C2#22, EVLA_KA#A2C2#23, EVLA_KA#A2C2#24, EVLA_KA#A2C2#25, EVLA_KA#A2C2#26, EVLA_KA#A2C2#27, EVLA_KA#A2C2#28, EVLA_KA#A2C2#29, EVLA_KA#A2C2#30, EVLA_KA#A2C2#31, EVLA_KA#A2C2#32, EVLA_KA#A2C2#33, EVLA_KA#B1D1#34, EVLA_KA#B1D1#35, EVLA_KA#B1D1#36, EVLA_KA#B1D1#37, EVLA_KA#B1D1#38, EVLA_KA#B1D1#39, EVLA_KA#B1D1#40, EVLA_KA#B1D1#41, EVLA_KA#B1D1#42, EVLA_KA#B1D1#43, EVLA_KA#B1D1#44, EVLA_KA#B1D1#45, EVLA_KA#B1D1#46, EVLA_KA#B1D1#47, EVLA_KA#B1D1#48, EVLA_KA#B1D1#49, EVLA_KA#B2D2#50, EVLA_KA#B2D2#51, EVLA_KA#B2D2#52, EVLA_KA#B2D2#53, EVLA_KA#B2D2#54, EVLA_KA#B2D2#55, EVLA_KA#B2D2#56, EVLA_KA#B2D2#57, EVLA_KA#B2D2#58, EVLA_KA#B2D2#59, EVLA_KA#B2D2#60, EVLA_KA#B2D2#61, EVLA_KA#B2D2#62, EVLA_KA#B2D2#63, EVLA_KA#B2D2#64, EVLA_KA#B2D2#65	I	**centre frequency of image**	35.0009GHz (LSRK)	 View other QA images...
			beam	2.09 x 1.86 arcsec	
			beam p.a.	5.3deg	
			final theoretical sensitivity	-	
			cleaning threshold	-	
			clean residual peak / scaled MAD	3.03	
			non-pbcor image RMS	8.7e-05 Jy/beam	
			pbcor	0.631 /	

Calibrator Images (hif_makeimages)



Pipeline Products and Outputs

- Flag versions and calibration tables (archived)
- Calibrated MS (available for 15 days, not archived)
- Logs, including weblog used by quality assurance (QA) staff and QA report.

Pipeline Products and Outputs

- The real-time pipeline produces a calibrated and flagged MS:
  - The products can be requested through the helpdesk (help.nrao.edu, VLA Pipeline Department):
    - For download over the internet, or for shipping on hard disk(s).
  - You may request a detailed QA2 report from the data analysts
  - If you are happy with the pipeline calibration, then:
    - Do further flagging if necessary
    - Split out your target and image
  - If you have the SDM or uncalibrated MS and the calibration and flag tables, instructions for applying flags and calibration tables may be found at http://go.nrao.edu/vla-pipe

Pipeline Products and Outputs

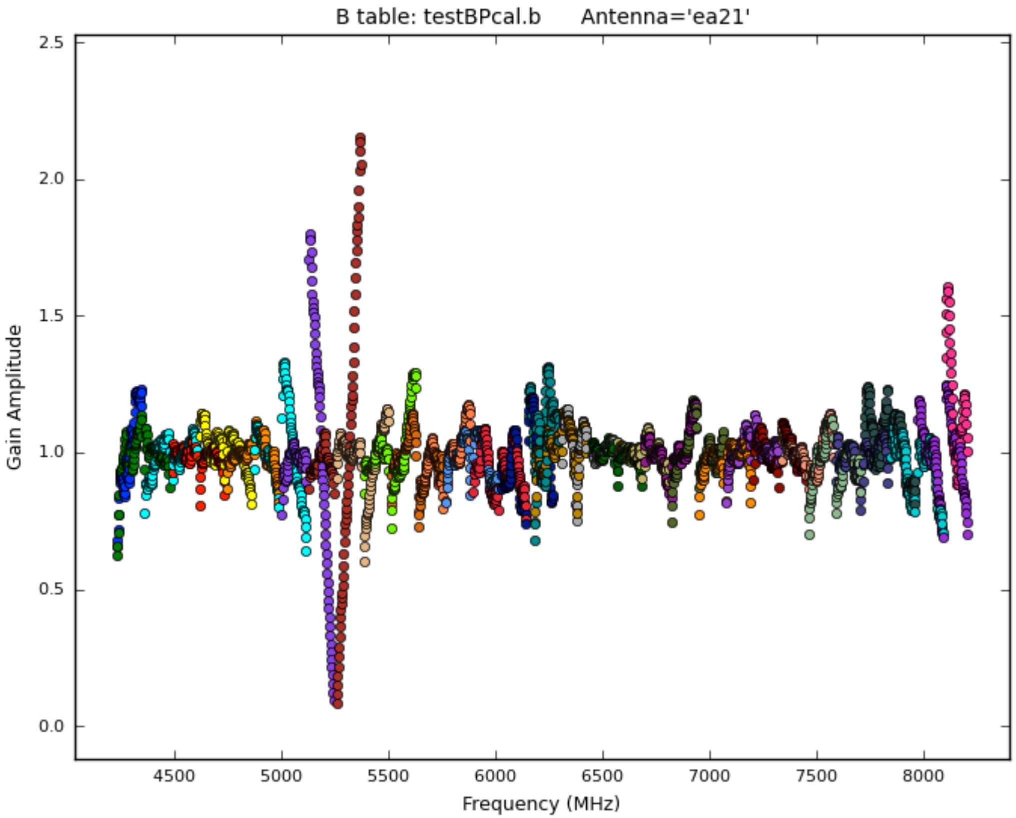
- In some cases the pipeline and/or the MS may need to be modified
  - Download the SDM from the archive plus pipeline scripts
  - Follow the directions at http://go.nrao.edu/vla-pipe
- In some cases the pipeline heuristics may not be appropriate for your data (e.g., some L-band set-ups do not work well with the pipeline yet)
  - Reduce data by hand

Known failure modes and issues

- In general the pipeline does very well, but there are possible failure modes:
  - No flux density or gain calibrator intents defined, or flux density calibrator not one for which we have models
    - *work around in scripted pipeline*
  - Wrong scan intents
    - *modify Scan.xml in SDM; see https://science.nrao.edu/facilities/vla/data-processing/pipeline#section-28*
  - Does not always identify deformatter problems (but does NOT usually have false positives – L-band may be an exception)
    - *flag remaining bad spws*
  - Calibrators are too weak for given spw bandwidth
    - *heuristics have been developed and are being tested*

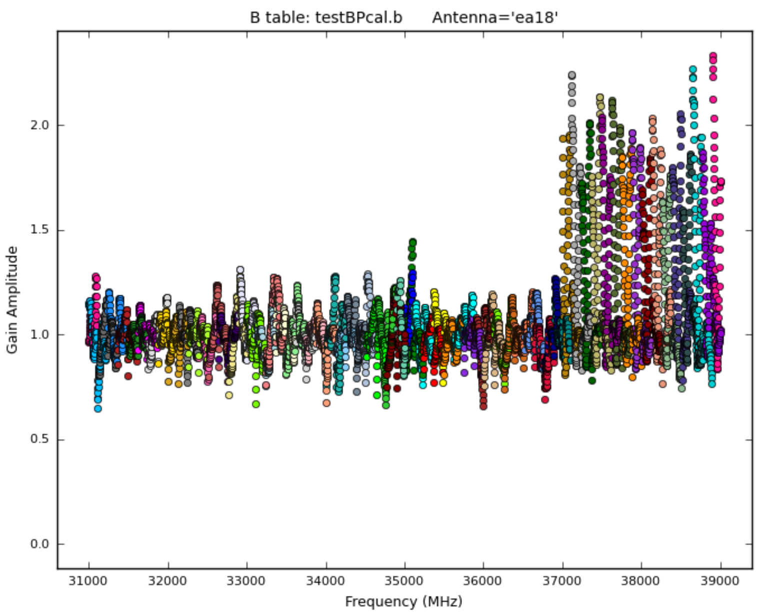
Known failure modes and issues

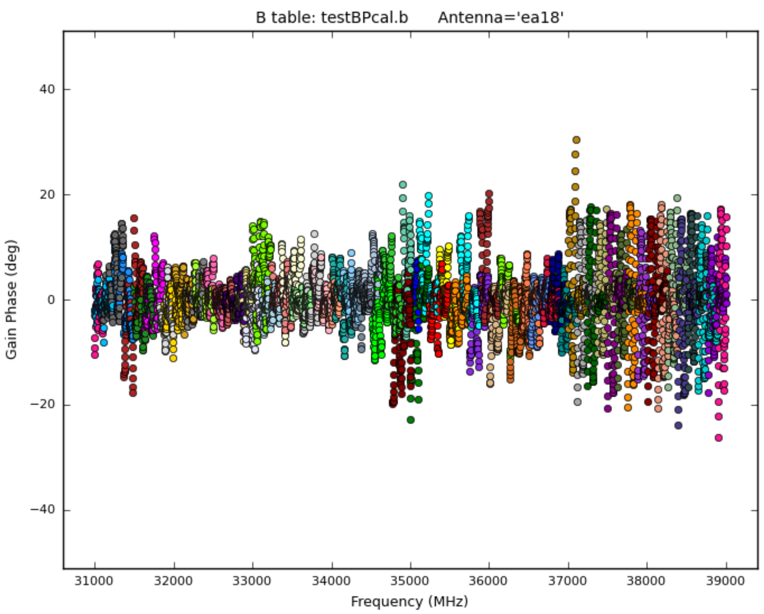
ea21 bandpass, bad data (DTS issue)



Known failure modes and issues

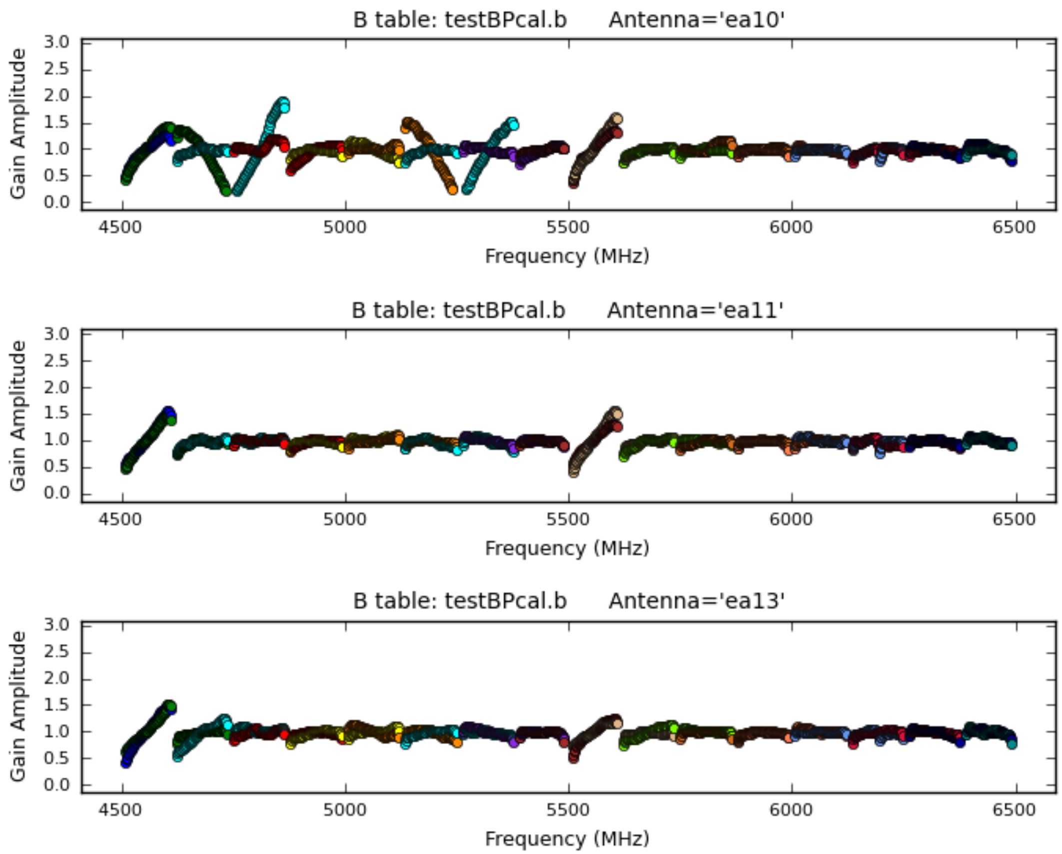
ea18 Amp **and** Phase affected (DTS issue for 37-39GHz)





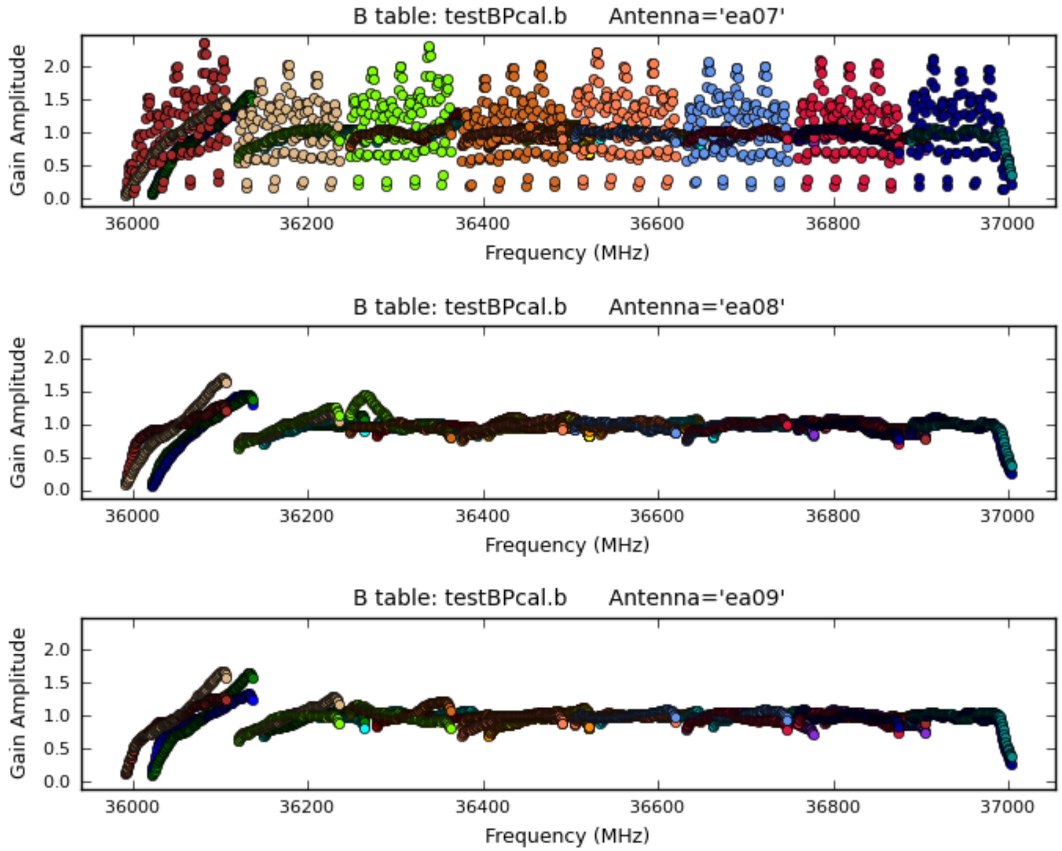
Known failure modes and issues

ea10 bandpass, bad data (DTS issue); ea11, ea12 OK



Known failure modes and issues

ea07 bandpass, bad data (DTS issue); ea08, ea09 OK



Spectral line data

- Several steps in the real-time pipeline may not be appropriate for spectral line data:
  - Hanning smoothing (increases effective channel width)
  - Flags 5% of ***each*** spw edge and the first and last 10 channels of each baseband
  - Last run of RFLAG on target (may eliminate your line as interference!)
  - Statwt calculates rms based on scatter of channels per spw, per visibility; may want to run manually with channel selection turned on to eliminate use of channels containing line emission in calculating the rms

$\Rightarrow$ *Specify a "cont.dat" file to avoid known lines for RFI flagging and statwt*

- With the above modifications, the pipeline will work with spectral line data as long as the calibrators are strong enough

Mixed correlator set-ups

- With WIDAR capabilities it is common to observe both wide and narrow spws to obtain both continuum and spectral line data simultaneously or multiple receiver bands
  - A single heuristic (e.g., gain calibration solution interval) for entire dataset may not be appropriate
- Solution:
  - Run pipeline through application of deterministic flags, including Hanning smoothing if you are going to use it
  - Split the MS by spw and/or scans
  - Run pipeline on split MSs WITHOUT Hanning smoothing (you have already applied it, if you are going to use it)
  - Warning: output flagging statistics may not be correct

Future Developments

- The NRAO Science Ready Data Products initiative is planning the following development over the next year:
  - Support for weak bandpass calibrators (implemented but not well tested)
  - Polarization calibration tested for VLA Sky Survey (S-band), need polarization calibrator models for other bands
  - More robust flux density bootstrapping that flags outliers
  - Improved RFI flagging and detection of system issues
  - Better support for multi-band observations
  - Use of switched power data for determining weights
  - Basic imaging pipeline

Questions?

- VLA CASA Calibration Pipeline information at:

  http://go.nrao.edu/vla-pipe

  CASA Integrated Pipeline & Scripted Pipeline available

- Have Questions?
- Need Help?
- Report a bug?

- Use the **NRAO HelpDesk**: **https://help.nrao.edu/**

- Submit your ticket under the **Pipeline Department.**

- Please include specific details when submitting HelpDesk tickets.
  (Project code, SB number, CASA/PL versions, errors, etc.)

www.nrao.edu
science.nrao.edu
public.nrao.edu

The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc.