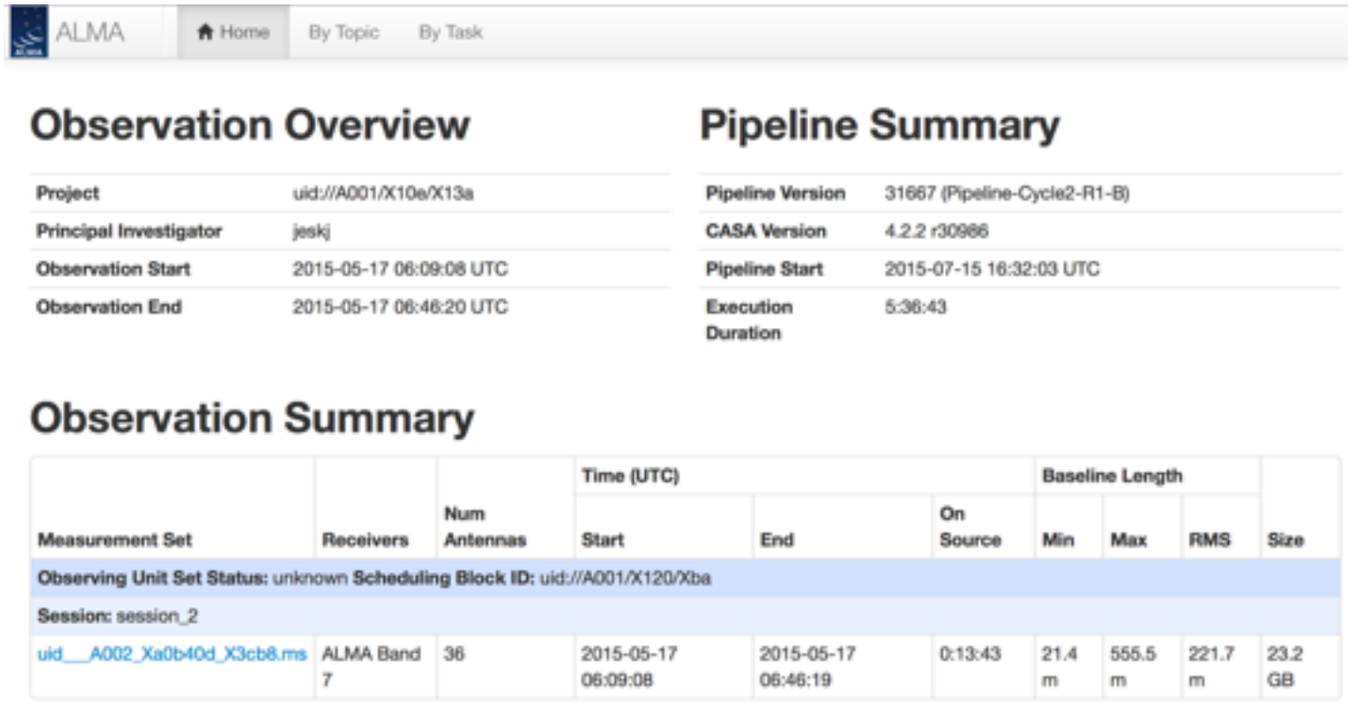
# Archive data weblog and QA2 report

## Obtaining information of the observation and calibration of ALMA Archive data

EUROPEAN ARC
ALMA Regional Centre || Italian

# Purpose of ALMA weblog/QA2 report



ALMA | Home | By Topic | By Task

## Observation Overview

| | |
|---|---|
| **Project** | uid://A001/X10e/X13a |
| **Principal Investigator** | jeskj |
| **Observation Start** | 2015-05-17 06:09:08 UTC |
| **Observation End** | 2015-05-17 06:46:20 UTC |

## Pipeline Summary

| | |
|---|---|
| **Pipeline Version** | 31667 (Pipeline-Cycle2-R1-B) |
| **CASA Version** | 4.2.2 r30986 |
| **Pipeline Start** | 2015-07-15 16:32:03 UTC |
| **Execution Duration** | 5:36:43 |

## Observation Summary

| | | | Time (UTC) | | | Baseline Length | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Measurement Set** | **Receivers** | **Num Antennas** | **Start** | **End** | **On Source** | **Min** | **Max** | **RMS** | **Size** |
| **Observing Unit Set Status:** unknown **Scheduling Block ID:** uid://A001/X120/Xba | | | | | | | | | |
| **Session:** session_2 | | | | | | | | | |
| uid___A002_Xa0b40d_X3cb8.ms | ALMA Band 7 | 36 | 2015-05-17 06:09:08 | 2015-05-17 06:46:19 | 0:13:43 | 21.4 m | 555.5 m | 221.7 m | 23.2 GB |

- **Information about the observation**: weather, antenna configuration, observation setup and strategy
- **Information about the calibration of the data:** contains plots of various calibration steps that allow you to check the calibration
- When pipeline reduced >> weblog. When reduced manually (mostly Cycle1 and older data), you find the QA2 report (plots and txt file).
- In future: more data reduced by pipeline, weblog will become common for most datasets

# Location of the weblog/QA2 report?

If you download the observation product the weblog will be in

project_code/
science_goal.sous/
group.gous/
member.mous/
qa/

weblog :
gunzip and untar weblog.tar.gz
cd weblog-date/html/
and open in browser index.html

In our example:
project_code=2013.1.00278.S
sous=uid___A001_X120_X100
gous=uid___A001_X120_X101
mous=uid___A001_X120_X102
date=20150715T163202

QA2 report:
uid*_qa2_part1.png, uid*_qa2_part2.png, uid*_qa2_part3.png, uid*_textfile.txt
(uid* will be the execution block names)

# Weblog home

calibration task and their products

ALMA | Home | By Topic | By Task

summary of tasks/warning/flags

## Observation Overview

| | |
|---|---|
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| **Execution Duration** | 5:36:43 |

scriptForPI.py needs to be run in this Casa version

## Observation Summary

for the list of execution blocks (in this case there is only one EB)

| Measurement Set | Receivers | Num Antennas | Time (UTC) Start | Time (UTC) End | Time (UTC) On Source | Baseline Length Min | Baseline Length Max | Baseline Length RMS | Size |
|---|---|---|---|---|---|---|---|---|---|
| **Observing Unit Set Status:** unknown **Scheduling Block ID:** uid://A001/X120/Xba | | | | | | | | | |
| **Session:** session_2 | | | | | | | | | |
| uid___A002_Xa0b40d_X3cb8.ms | ALMA Band 7 | 36 | 2015-05-17 06:09:08 | 2015-05-17 06:46:19 | 0:13:43 | 21.4 m | 555.5 m | 221.7 m | 23.2 GB |

Click for more info!

baseline lengths ☞ resolution

ALMA | Home | By Topic | By Task

SESSION 'SESSION_2'

uid___A002_Xa0b40d_X3cb8.ms

# Overview of 'uid___A002_Xa0b40d_X3cb8.ms'

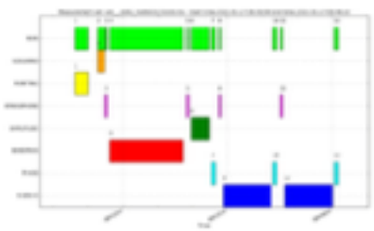
(the execution block)

Blue titles can be clicked for having more info

## Observation Execution Time

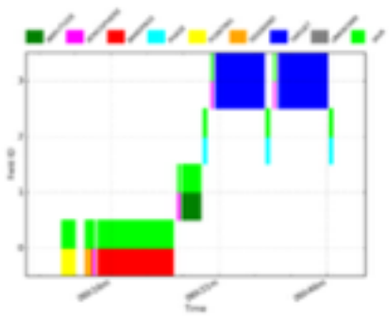
| | |
|---|---|
| **Start Time** | 2015-05-17 06:09:08 |
| **End Time** | 2015-05-17 06:46:19 |
| **Total Time on Source** | 0:32:29 |
| **Total Time on Science Target** | 0:13:43 |

listobs output → Observation summary file: incl. obs. schedule, source coordinates, spectral setup, antenna positions…



### Intent vs Time

Track observation intent vs time



### Field vs Time

Track observed field vs time

## Spatial Setup

| | |
|---|---|
| **Science Targets** | 'IRAS16293-2422' |
| **Calibrators** | 'J1517-2422', 'J1625-2527' and 'Titan' |

## Spectral Setup

| | |
|---|---|
| **All Bands** | 'ALMA Band 7' and 'WVR' |
| **Science Bands** | 'ALMA Band 7' |

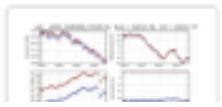
## Antenna Setup

| | |
|---|---|
| **Min Baseline** | 21.4 m |
| **Max Baseline** | 555.5 m |

## Sky Setup

| | |
|---|---|
| **Min Elevation** | N/A |
| **Max Elevation** | N/A |

## Weather



## Scans

Observation field of view is $1.13 \times \lambda/D$ [rad]

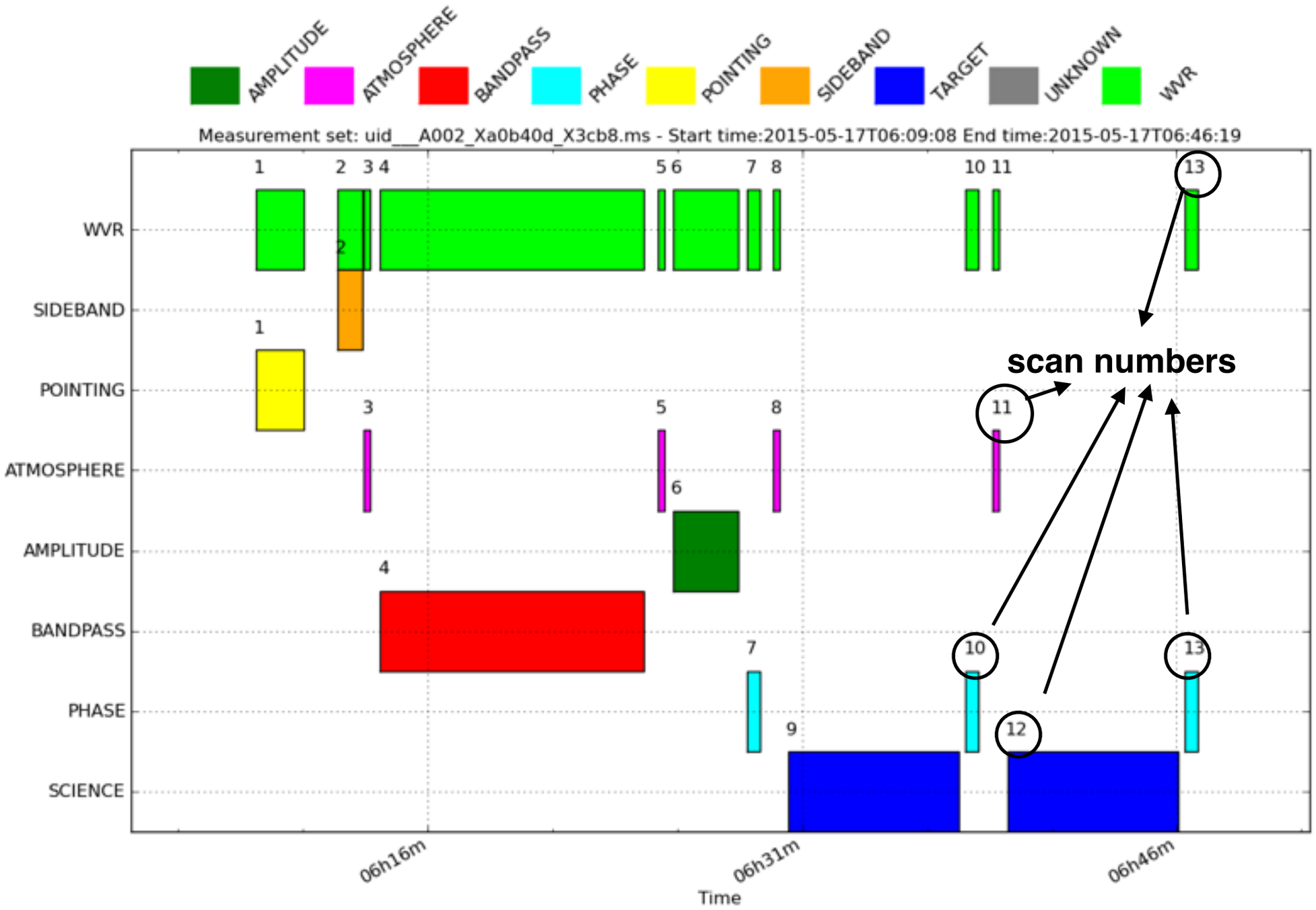
for D=12m, ν=335.5 GHz, λ=0.0894 cm

☞ FOV=17.4”

# Observation intent vs. time

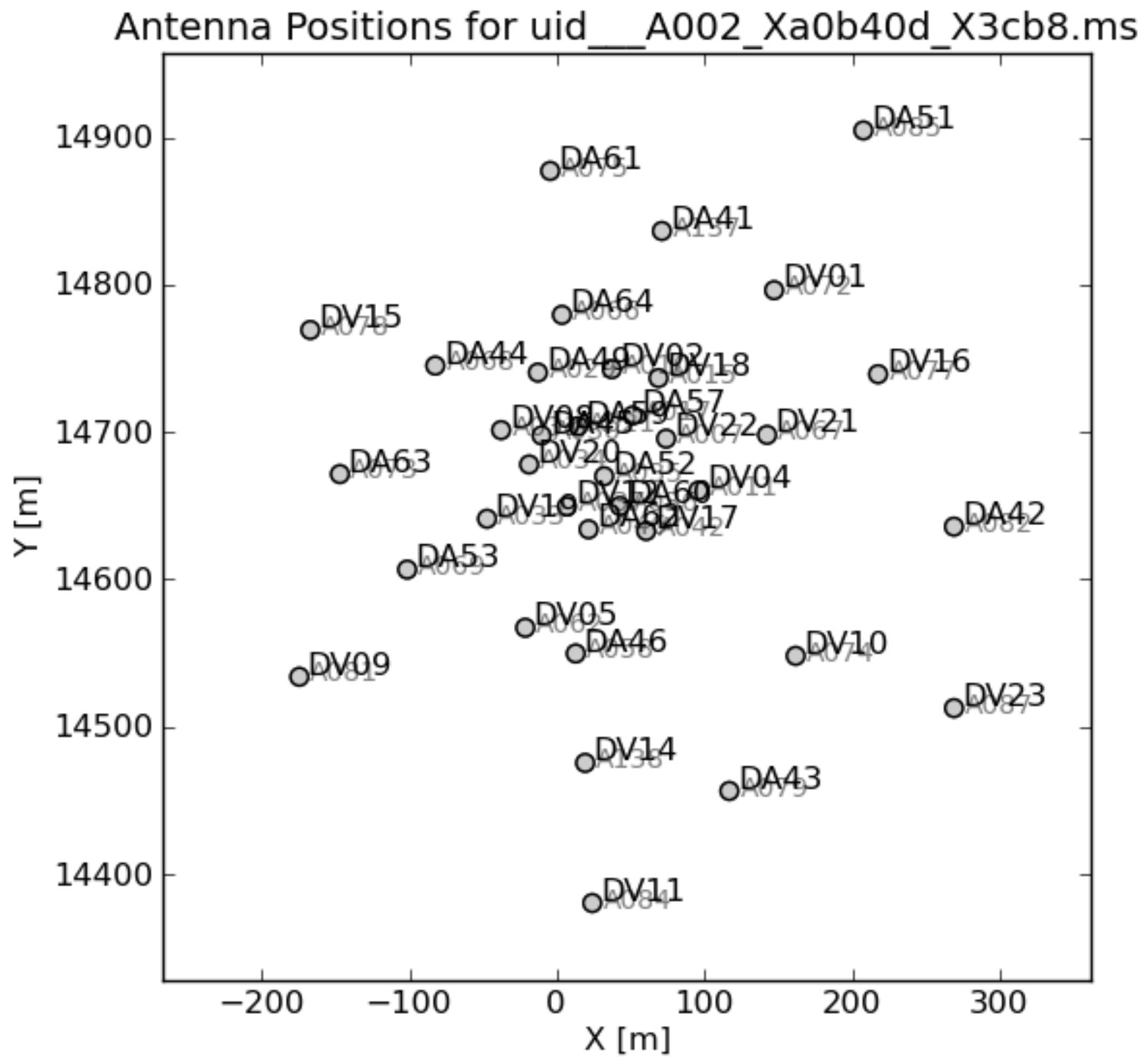
Shows the schedule of the observing track

**WVR is also done during science observations!**



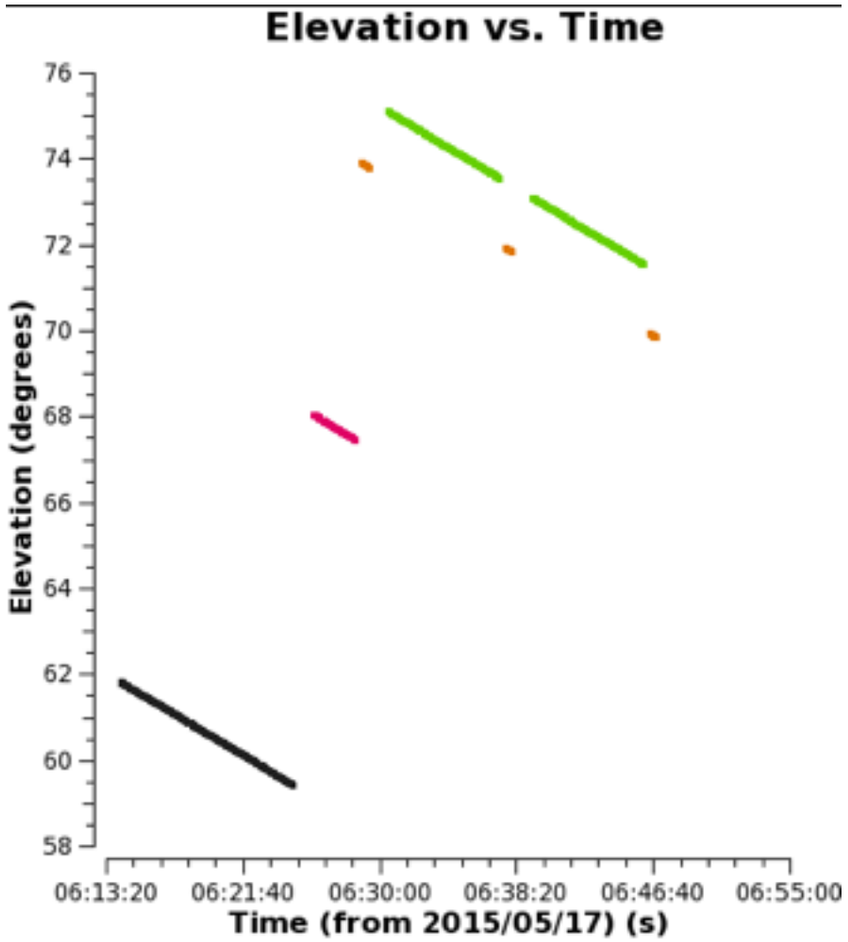
# Antenna setup

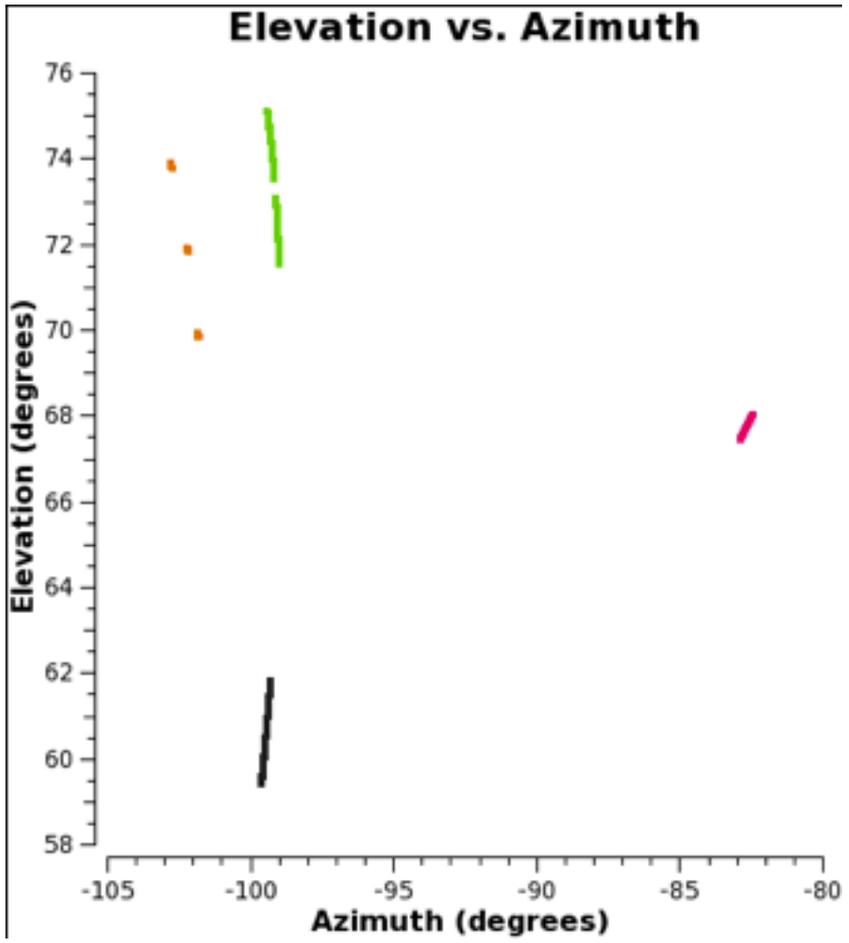
**Antenna configuration plot, see also the baselines for determining the ang resolution and largest angular scale**



# Sky setup plots

- In our case not present in **Sky Setup** of weblog, we can plot them ourselves in **plotms**:

ALMA | Home | By Topic | By Task

## Warnings and Errors

| Stage | Task | Type | Message |
|---|---|---|---|
| 6 | hifa_tsysflag | Warning | flag edgechans - uid___A002_Xa0b40d_X3cb8.ms iteration 1 raised 12 flagging commands |
| 6 | hifa_tsysflag | Warning | flag birdies - uid___A002_Xa0b40d_X3cb8.ms iteration 1 raised 2 flagging commands |
| 11 | hif_bpflagchans | Warning | uid___A002_Xa0b40d_X3cb8.ms iteration 1 raised 1 flagging commands |

## Tasks by Topic

| Topic | Lowest Scoring Task | | Min Score |
|---|---|---|---|
| Data Sets | 1. **hif_importdata**: Register measurement sets with the pipeline | | 1.00 |
| Calibration | 13. **hifa_timegaincal**: Gain calibration | X-Y deviation | 1.00 |
| Flagging | 14. **hif_applycal**: Apply calibrations from context | 22.36% data flagged | 0.81 |
| Imaging | No scoring tasks in this topic | | N/A |
| Miscellaneous | 4. **hif_refant**: Select reference antennas | | 1.00 |

## Flagging Summaries

summaries are per source:
100= completely flagged,
0= no flags

### uid___A002_Xa0b40d_X3cb8.ms

| spw | DA41 | DA42 | DA43 | DA44 | DA45 | DA46 | DA49 | DA51 | DA52 | DA53 | DA57 | DA59 | DA60 | DA61 | DA62 | DA63 | DA64 | DV01 | DV02 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 10.22 | 10.22 | 10.22 | 10.22 | 100.00 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 13.33 | 10.22 |
| 19 | 10.25 | 10.25 | 10.25 | 10.25 | 100.00 | 10.97 | 10.25 | 10.25 | 10.25 | 10.25 | 10.25 | 10.25 | 10.25 | 10.25 | 10.25 | 10.25 | 10.25 | 13.36 | 10.25 |
| 21 | 100.00 | 15.67 | 100.00 | 15.67 | 100.00 | 15.67 | 15.67 | 15.67 | 15.67 | 15.67 | 15.67 | 15.67 | 15.67 | 15.67 | 15.67 | 15.67 | 15.67 | 18.67 | 15.67 |
| 23 | 10.22 | 10.22 | 10.22 | 10.22 | 100.00 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 10.22 | 13.33 | 10.22 |

Flagging percentages for Source name: Titan, Intents: WVR,ATMOSPHERE,AMPLITUDE

| spw | DA41 | DA42 | DA43 | DA44 | DA45 | DA46 | DA49 | DA51 | DA52 | DA53 | DA57 | DA59 | DA60 | DA61 | DA62 | DA63 | DA64 | DV01 | DV02 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 8.53 | 10.31 | 8.53 | 8.53 | 100.00 | 10.31 | 8.53 | 12.17 | 10.28 | 10.36 | 9.42 | 11.25 | 8.53 | 8.53 | 9.42 | 8.53 | 10.25 | 12.58 | 12.56 |
| 19 | 8.55 | 10.33 | 8.55 | 8.55 | 100.00 | 11.05 | 8.55 | 12.19 | 10.30 | 10.38 | 9.44 | 11.27 | 8.55 | 8.55 | 9.44 | 8.55 | 10.27 | 12.60 | 12.58 |
| 21 | 13.89 | 15.56 | 100.00 | 13.89 | 100.00 | 15.56 | 13.89 | 17.31 | 15.53 | 15.61 | 14.72 | 16.44 | 13.89 | 13.89 | 14.72 | 13.89 | 15.50 | 17.72 | 17.64 |

| Score | Colour | Comment |
|---|---|---|
| 0.90-1.00 | Green | Standard/Good |
| 0.66-0.90 | Blue | Below standard |
| 0.33-0.66 | Yellow | Warning |
| 0.00-0.33 | Red | Error |

ALMA | Home | By Topic | By Task

# Task Summary

| Task | QA Score | |
|---|---|---|
| 1. **hif_importdata**: Register measurement sets with the pipeline | | 1.00 |
| 2. **hifa_flagdata**: ALMA deterministic flagging | 21.63% data flagged | 0.82 |
| 3. **hifa_fluxcalflag**: Flag spectral features in solar system flux calibrators | | 1.00 |
| 4. **hif_refant**: Select reference antennas | | 1.00 |
| 5. **hifa_tsyscal**: Calculate Tsys calibration | | 1.00 |
| 6. **hifa_tsysflag**: Flag Tsys calibration | 5.13% data flagged | 1.00 |
| 7. **hifa_wvrgcalflag**: Calculate and flag WVR calibration | | 1.00 |
| 8. **hif_lowgainflag**: Flag antennas with low gain | | 1.00 |
| 9. **hif_setjy**: Set calibrator model visibilities | | 1.00 |
| 10. **hif_bandpass**: Bandpass calibration | | 1.00 |
| 11. **hif_bpflagchans**: Flag channels of bandpass calibration | | 1.00 |
| 12. **hifa_gfluxscale**: Transfer fluxscale from amplitude calibrator | | 1.00 |
| 13. **hifa_timegaincal**: Gain calibration | X-Y deviation | 1.00 |
| 14. **hif_applycal**: Apply calibrations from context | 22.36% data flagged | 0.81 |
| 15. **hif_makecleanlist**: Compile a list of cleaned images to be calculated | | N/A |
| 16. **hif_cleanlist**: Calculate clean products | | N/A |

steps in calibration pipeline

Quality assessment score

**CASA logs and scripts**

- download casapy-20150715-163158.log (10.5 MB)
- download casa_commands.log (788.2 KB)
- download casa_pipescript.py (2.0 KB)

- logger output from pipeline execution
- casa commands used in pipeline
- script with pipeline commands

Pipeline scripts/commands, can be adapted (see doc)

**Documentation: ALMA Science Pipeline QuickStart Guide and Reference Manual on https://almascience.eso.org/documents-and-tools**

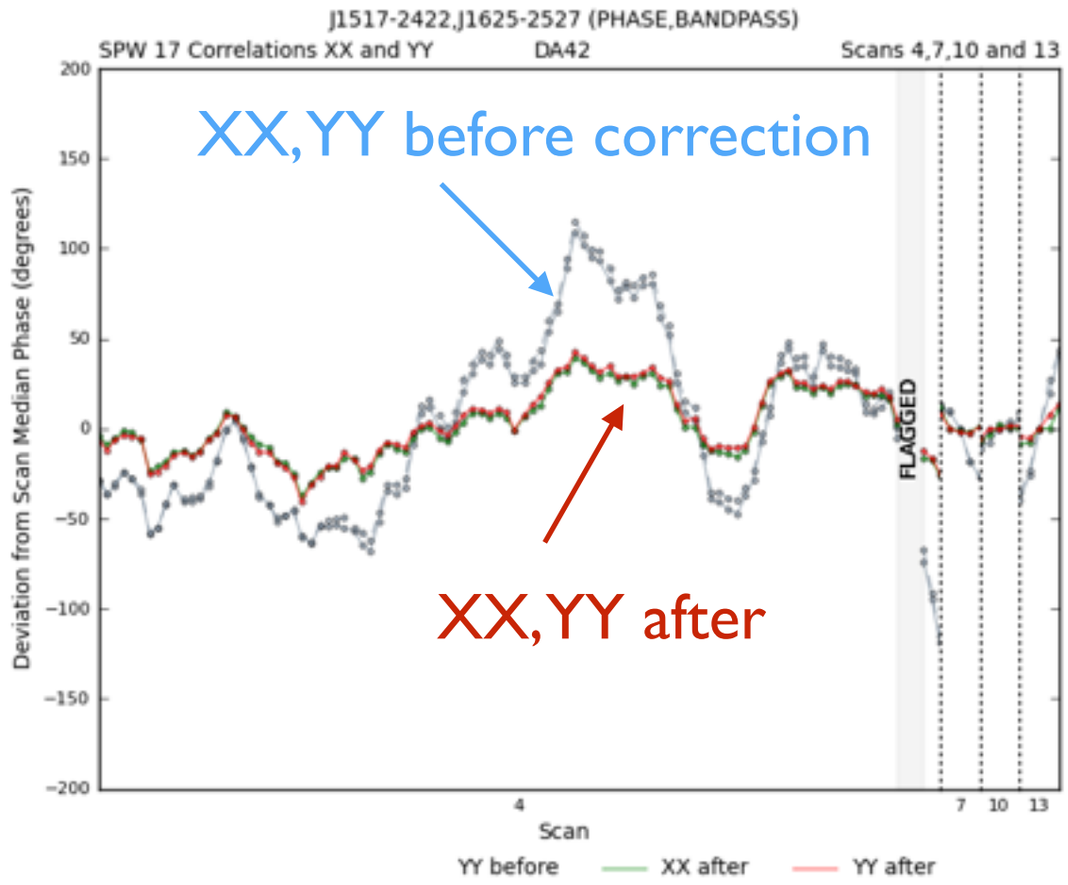
# WVR phase correction

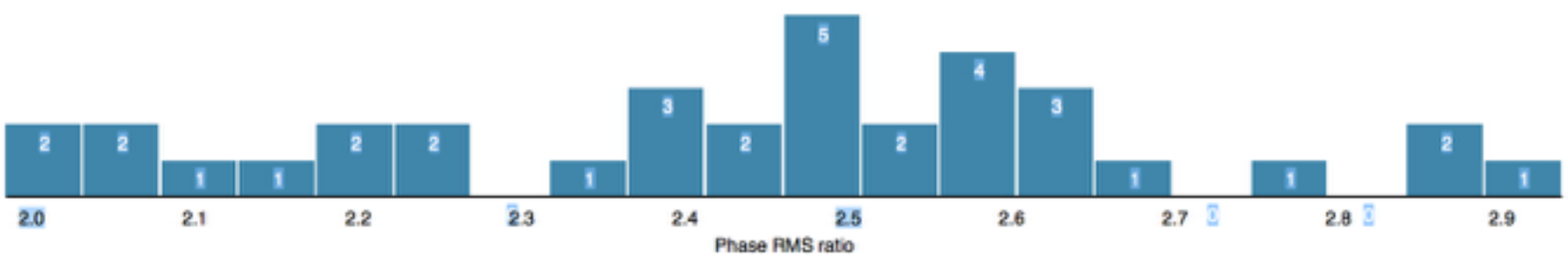
**Step hifa_wvrgcalflag:** shown phases before and after WVR correction for a spw for all antennas:

One can go through all plots per antenna

WVR correction: phases flatter and closer to zero

RMS before/after histogram



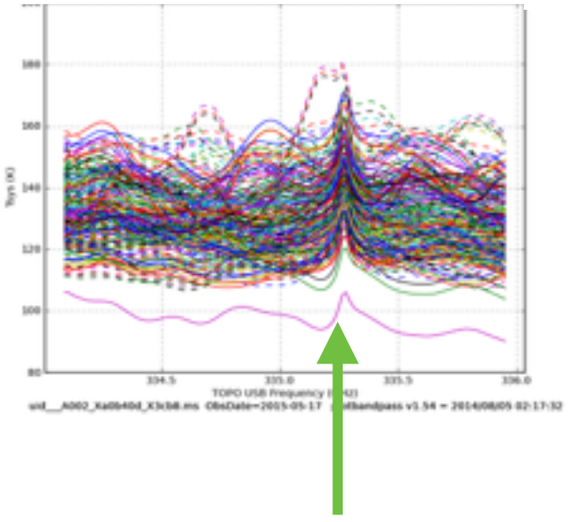



ALMA | Home | By Topic | By Task

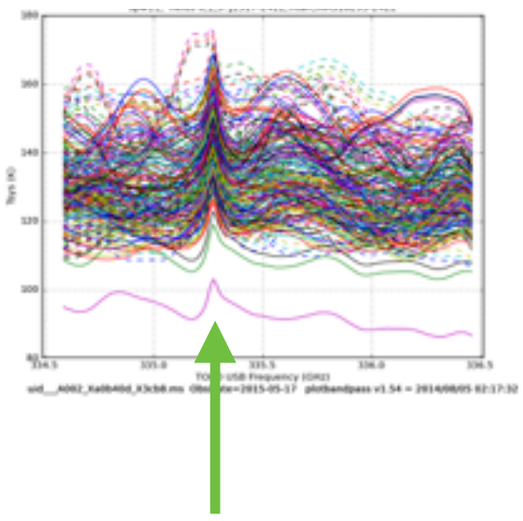
# Tsys plots per spw

## Step hifa_tsysflag

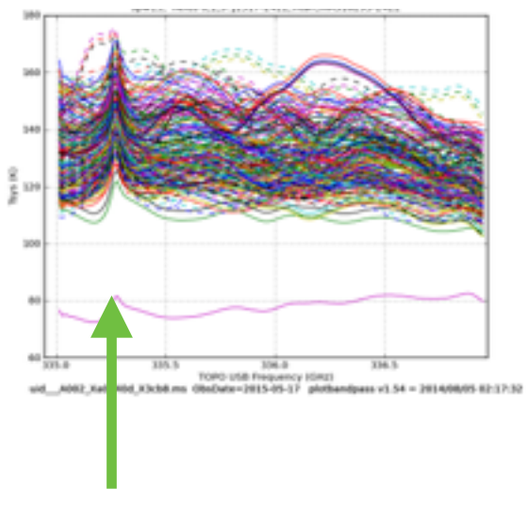
SPW 9



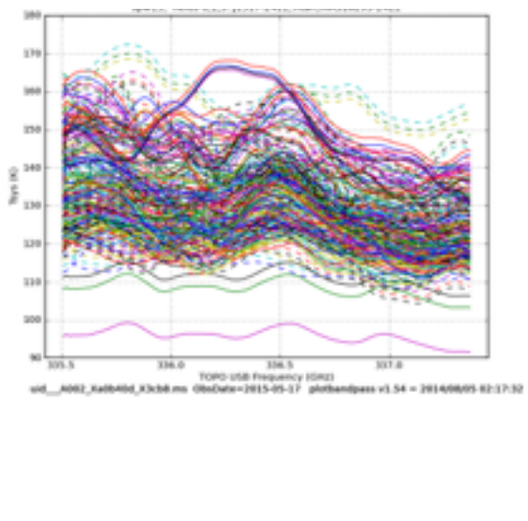
SPW 11



SPW 13

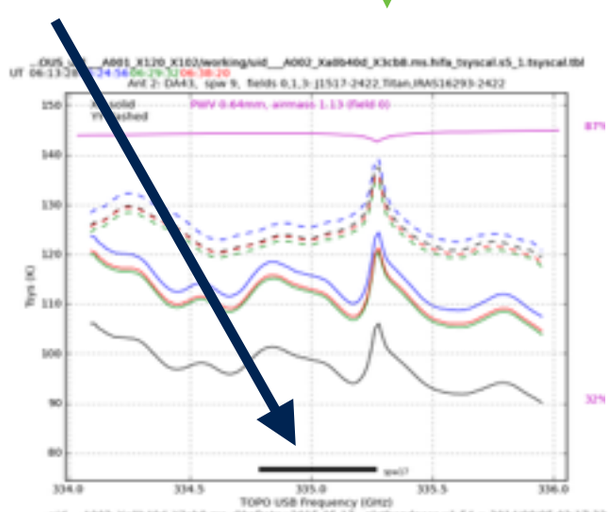


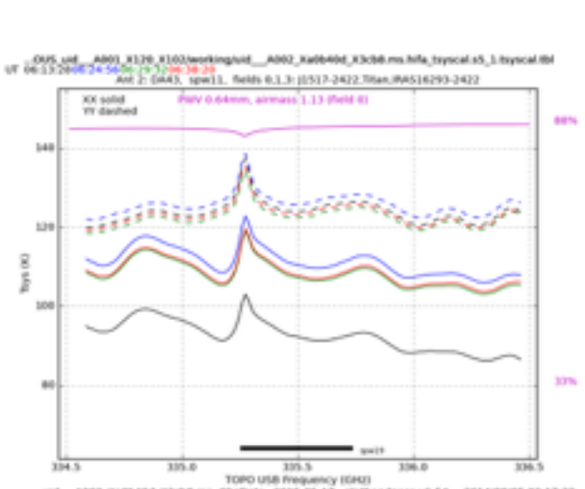
SPW 15

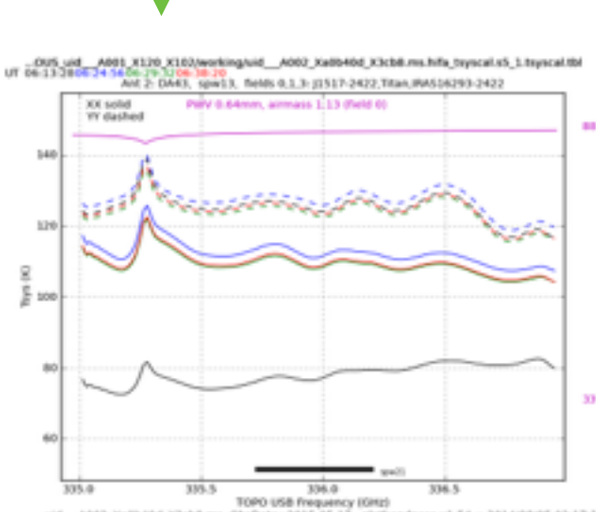


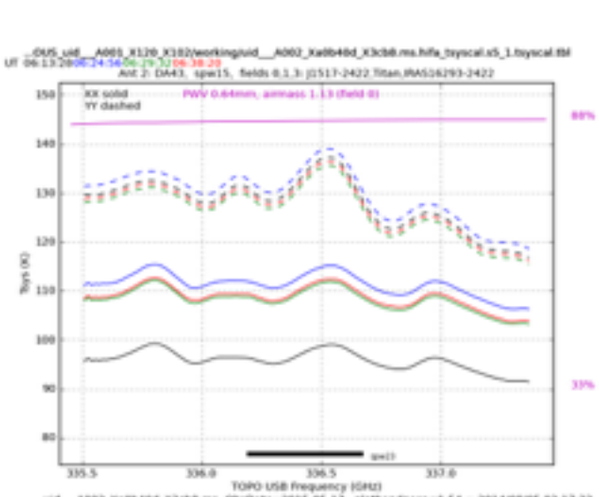
Atmospheric lines, of which most are known - use showatm=True in **plotbandpass** task to overlay atmospheric transmission curve or check single antenna Tsys plots

black bar = science spectral window





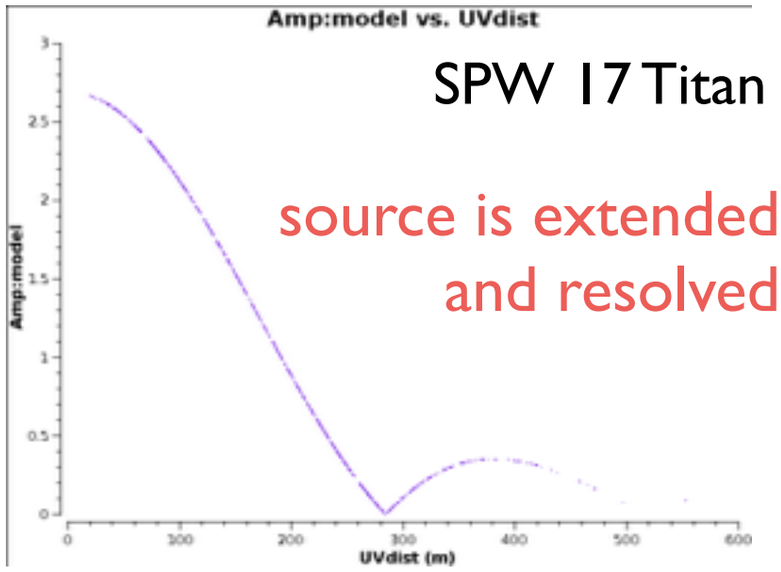




SPW 9, 11,13,15 for Ant DA41

# UVrange flux calibrator

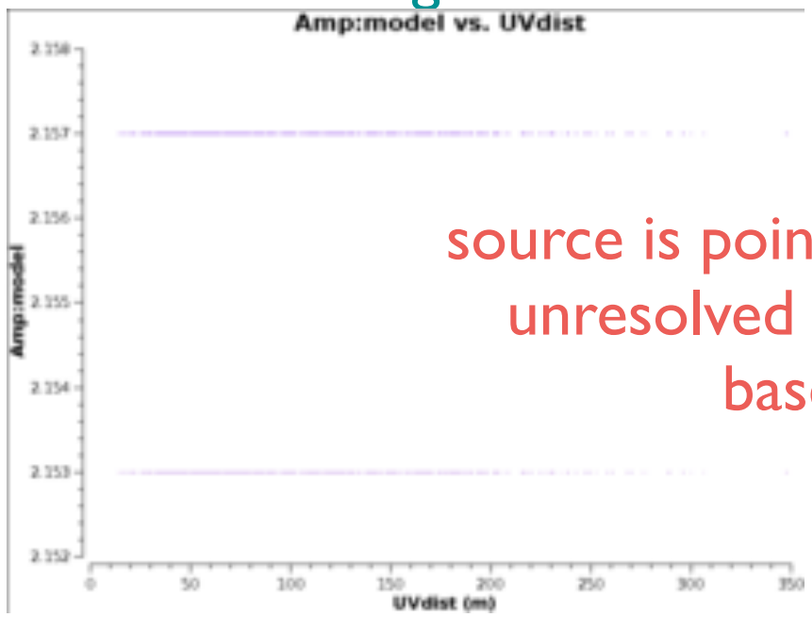
Step **hif_setjy:** For a Solar System flux calibrator a source model is used to obtain the flux measure




SPW 17 Titan

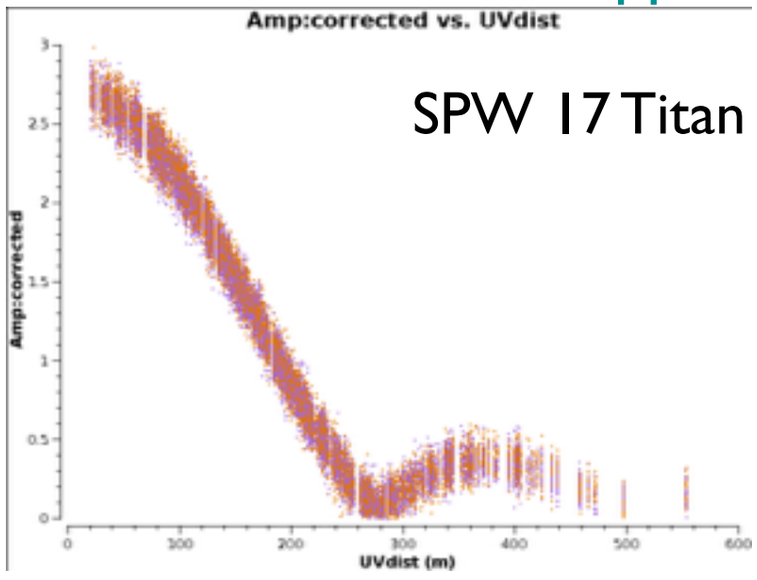
source is extended and resolved

Step **hif_setjy:** For a Quasar flux calibrator, the flux measure is taken from last monitoring session

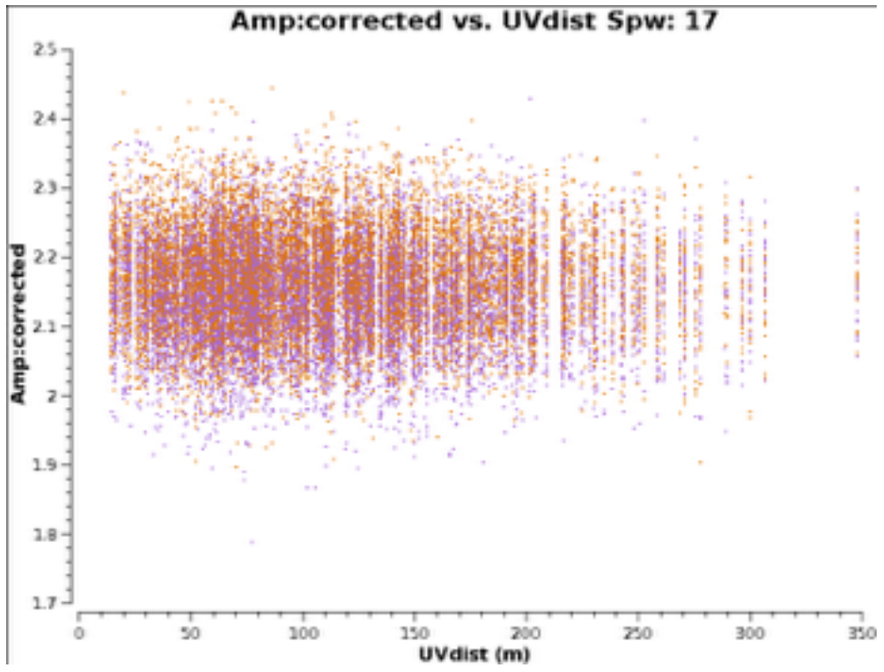



source is point-like, unresolved on all baselines

Step **hif_applycal:** uvdata flux calibrator with model applied




SPW 17 Titan



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# Computed flux densities

TASKS IN EXECUTION ORDER
1. hif_importdata
2. hifa_flagdata
3. hifa_fluxcalflag
4. hif_refant
5. hifa_tsyscal
6. hifa_tsysflag
7. hifa_wvrgcalflag
8. hif_lowgainflag
9. hif_setjy
10. hif_bandpass
11. hif_bpflagchans
12. hifa_gfluxscale
13. hifa_timegaincal
14. hif_applycal
15. hif_makecleanlist
16. hif_cleanlist

## 12. Phased-up fluxscale

Back

Because Titan's (flux cal) emission was extended only the inner antennas are used for fluxscale determination

### Results

#### Antennas Used for Flux Scaling

The following antennas were used for flux scaling, entries for unresolved flux calibrators are blank

| Measurement Set | Antennas |
|---|---|
| uid___A002_Xa0b40d_X3cb8.ms | DV19, DV18, DA64, DA49, DA62, DA60, DA45, DA44, DA46, DA41, DV14, DV17, DV16, DA63, DV21, DV10, DA52, DA53, DV22, DV12, DA57, DV08, DV09, DV04, DA59, DV02, DV01, DV20, DV05 |

Antennas for Flux Calibration

#### Computed Flux Densities

The following flux densities were set in the measurement set model column and recorded in the pipeline context:

| | | | Flux Density | | | |
|---|---|---|---|---|---|---|
| Measurement Set | Field | SpW | I | Q | U | V |
| uid___A002_Xa0b40d_X3cb8.ms | J1517-2422 (#0) | 17 | 1.142 Jy ± 3.968 mJy (0.3%) | 0.000 Jy | 0.000 Jy | 0.000 Jy |
| | | 19 | 1.149 Jy ± 5.600 mJy (0.5%) | | | |
| | | 21 | 1.145 Jy ± 13.350 mJy (1.2%) | | | |
| | | 23 | 1.136 Jy ± 4.577 mJy (0.4%) | | | |
| | J1625-2527 (#2) | 17 | 686.225 mJy ± 3.385 mJy (0.5%) | | | |
| | | 19 | 685.805 mJy ± 4.784 mJy (0.7%) | | | |
| | | 21 | 684.340 mJy ± 10.235 mJy (1.5%) | | | |
| | | 23 | 678.322 mJy ± 3.097 mJy (0.5%) | | | |

Phased-up Fluxscale Results

Resulting flux densities table of the bandpass and phase calibrators (QSOs) per spw.

Compare with ALMA CSC fluxes

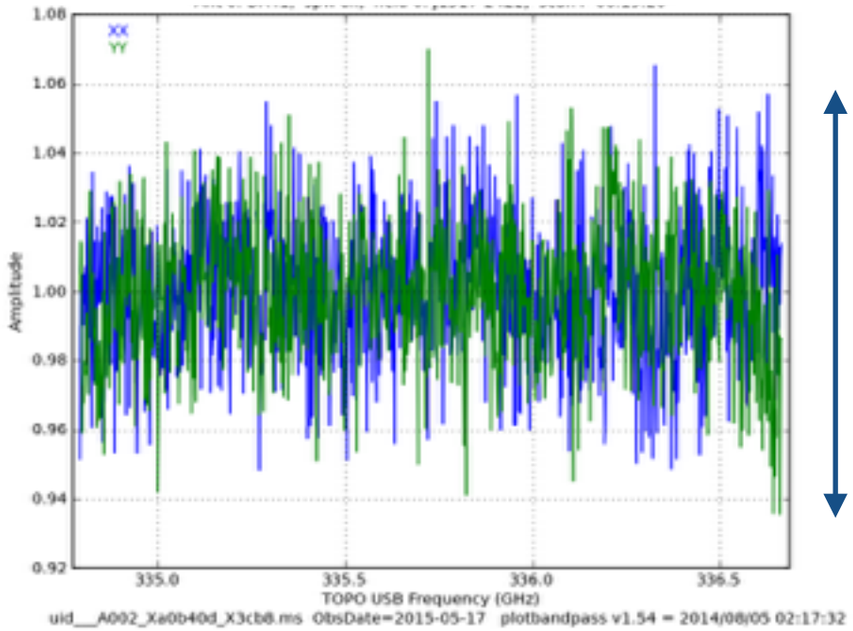
## ALMA Calibrator Source Catalogue

| Name | RA | RA Err. | DEC | DEC Err. | Freq. | Band | *Flux* | Flux Err. | UvMin | UvMax | Observed |
|---|---|---|---|---|---|---|---|---|---|---|---|
| J1625-2527 J162... | 16:25:46.8916 | ±0.0001 | -25:27:38.327 | ±0.0001 | 285.0 | 7 | 0.658 | ±0.07 | | > 300.0 | 2014-09-18 |

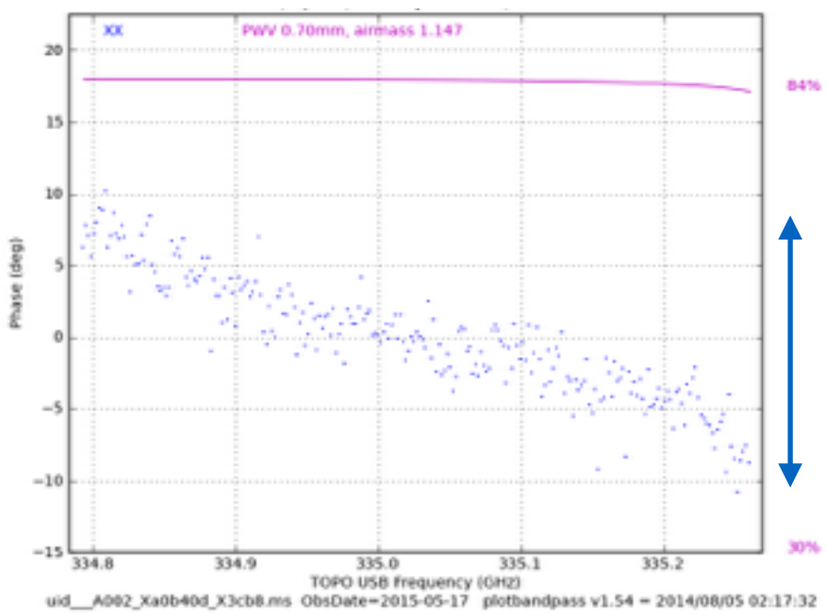
# Bandpass: amp & phase vs freq plots

## Steps hifa_bandpass hif_applycal

Amp vs Freq: ant DA41, all spw



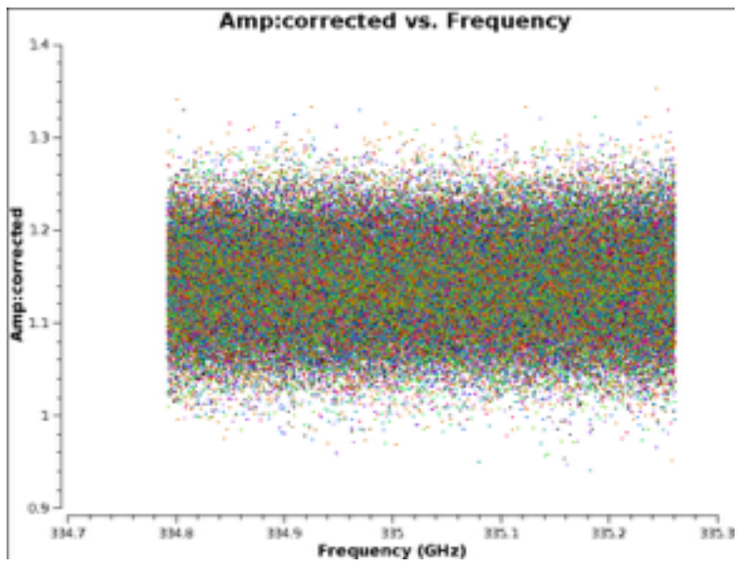

Phase vs Freq: ant DA41, spw 17




For each antenna one can look at the bandpass solutions, where a smooth fit and few noise are the way to recognize good quality solutions.

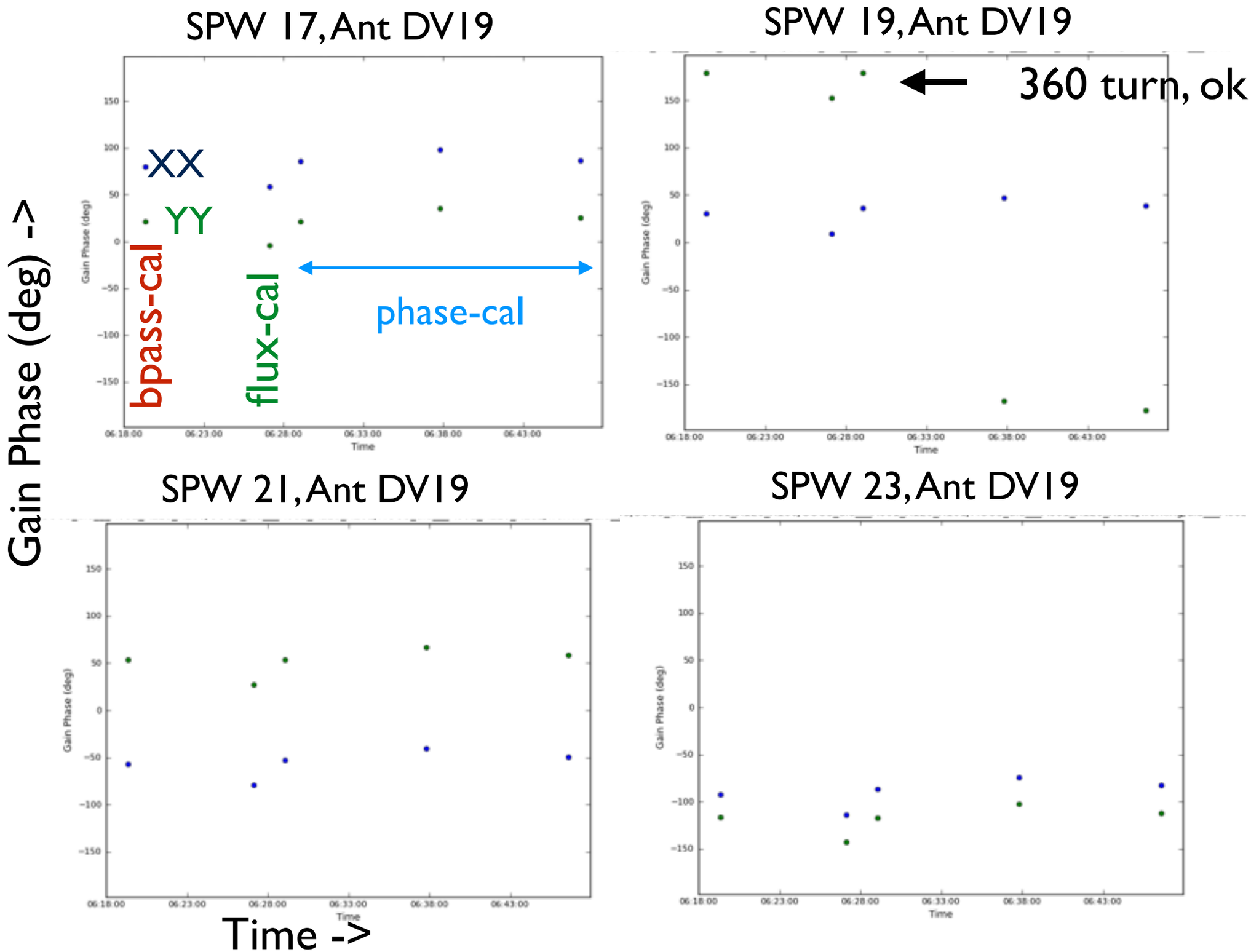
In Step hif_applycal one can see the ampl calibration of bandpass calibrator (all antennas shown) per spw. More elaborate plots can be done with plotms.

hif_applycal: SPW 17, all antennas



# Calibration tables: phase vs time

## Step hifa_timegaincal

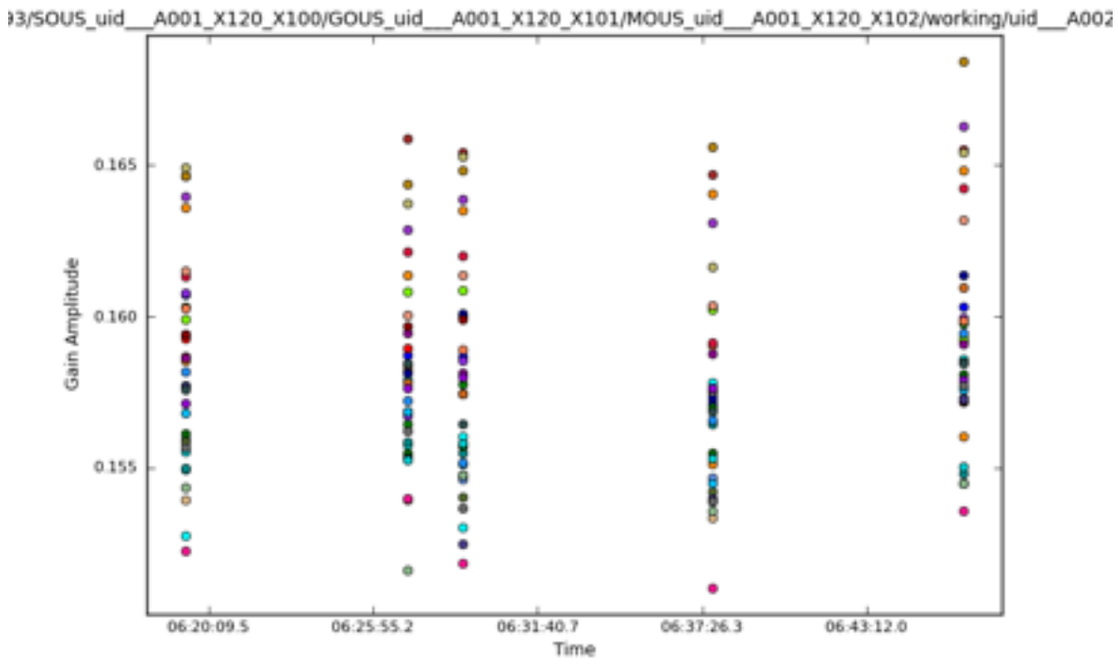


# Calibration plots: amplitude vs time

## Step hifa_timegaincal

The gain amplitude vs. time of the flux, bandpass and phase calibrators, per antenna, per spw or all ant. per spw. Better to see the various spw per antenna plot table **uid*hifa_timegaincal.s13_5.spw*solintinf.gacal.tbl** in the /calibrated/working/ directory

SPW 17, colors=antennas

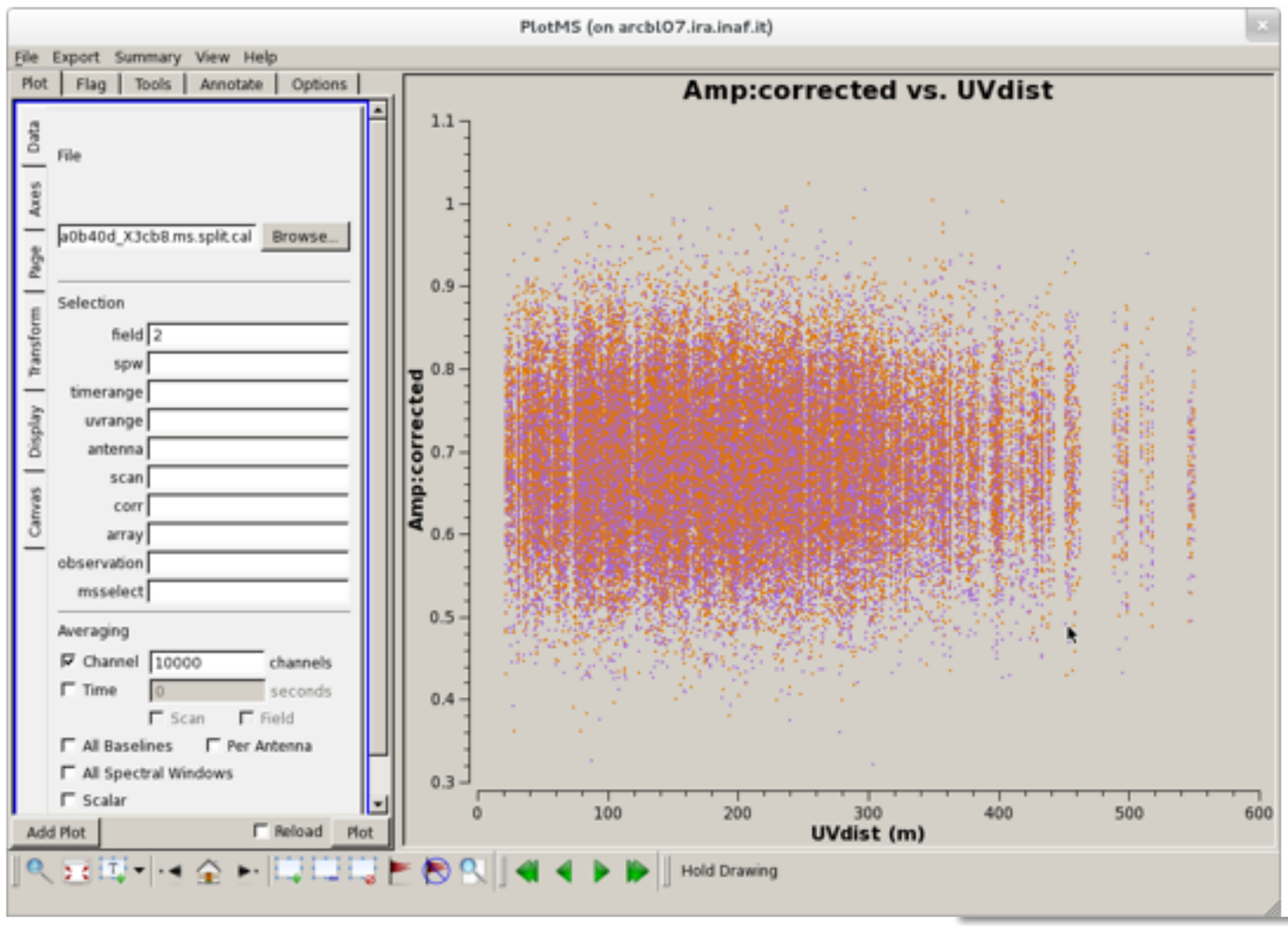


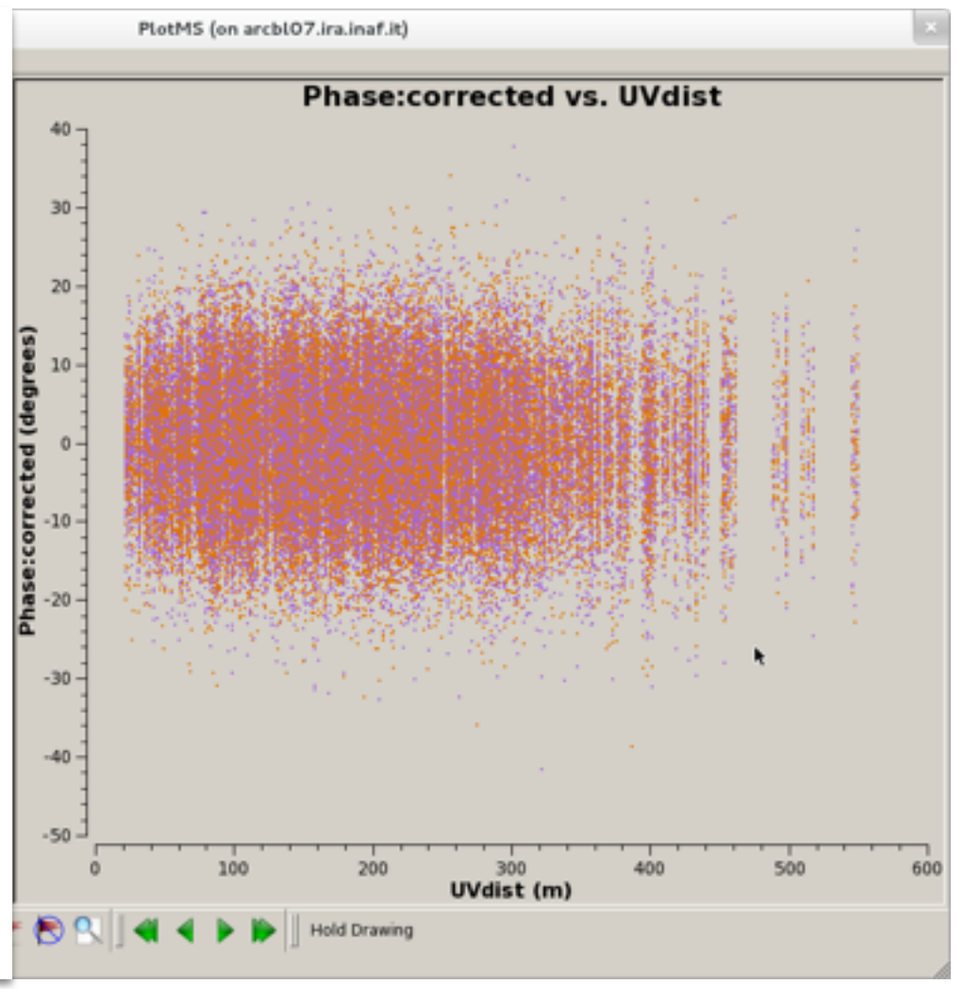
# UVdata phase calibrator

To check whether the phase calibrator is really compact it should have:

- a flat behavior in amplitude vs. uvdistance
- a small scatter (+- 5-20 degrees) and flat phases for all uvdistances

These plots are not present in weblog, but can be inspected with plotms()

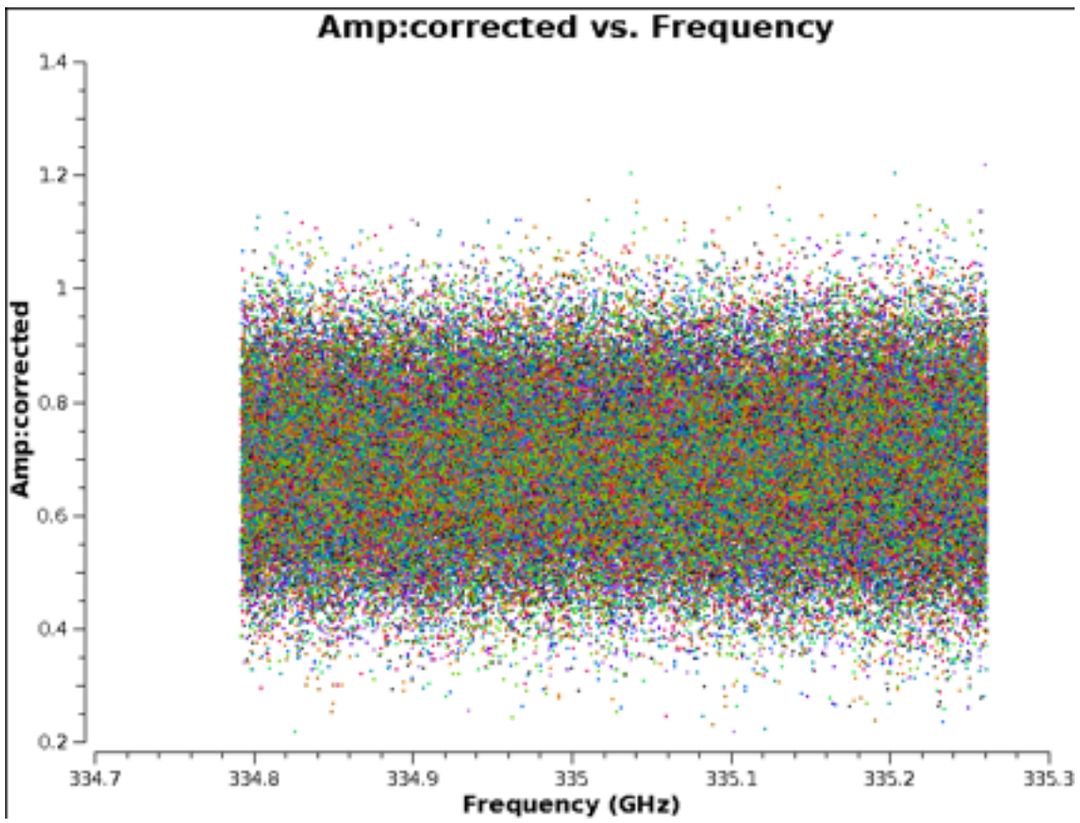


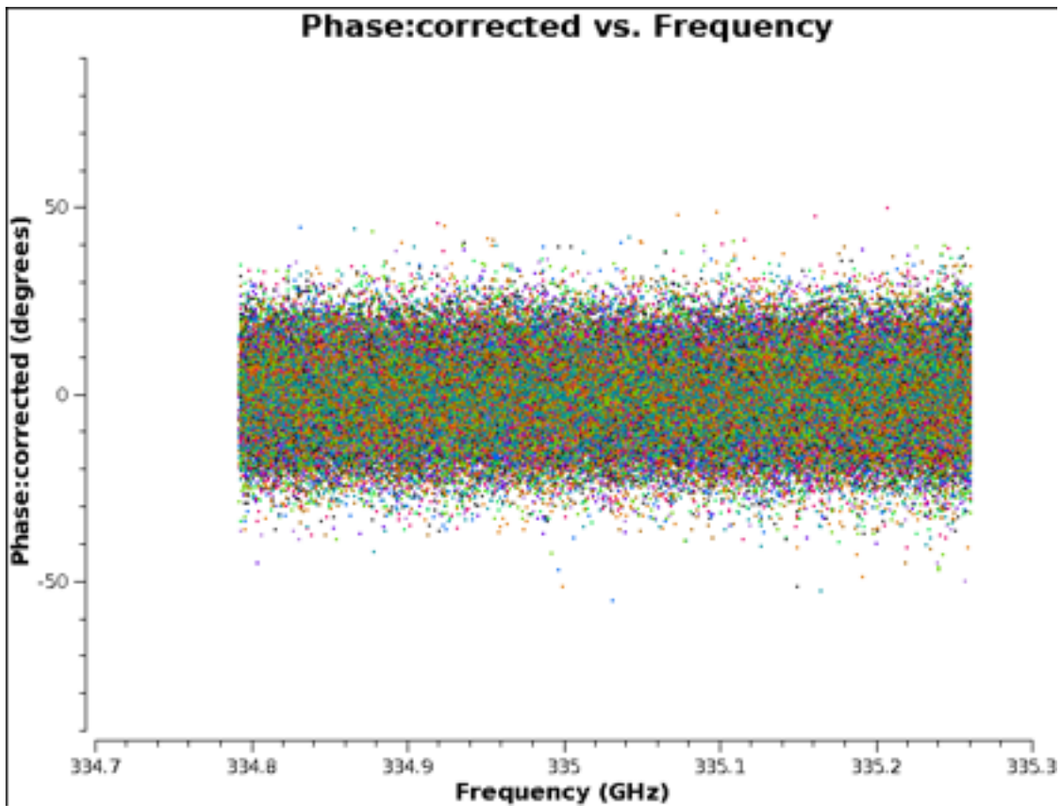



# Freq behavior of phase calibrator

**Step hif_applycal:** plots of phase and bandpass calibrator for each spectral window for amp/phase versus frequency per antenna (colored by antenna) averaged in time.

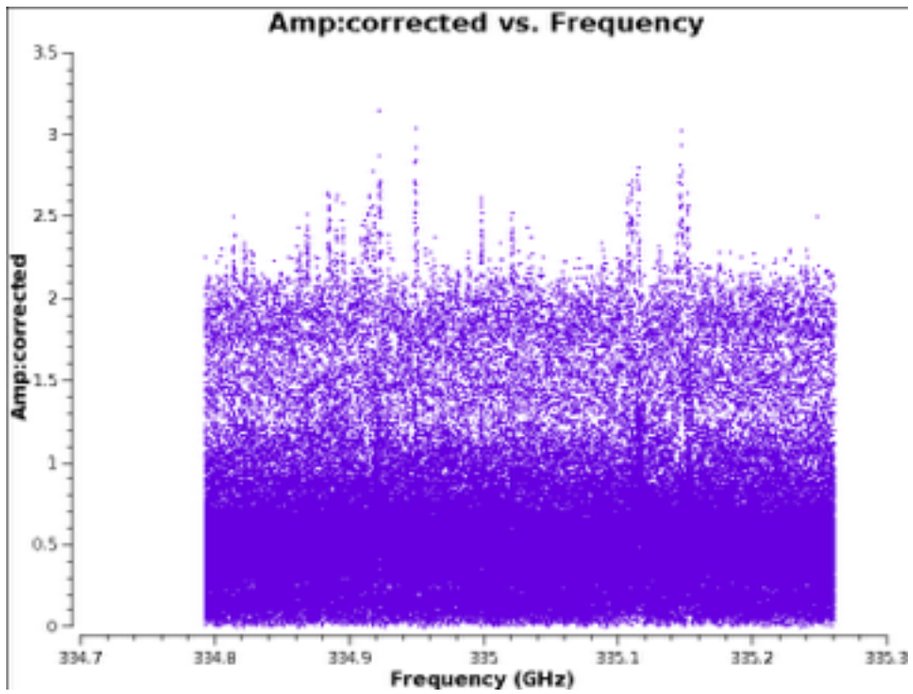
SPW 19, phase calibrator

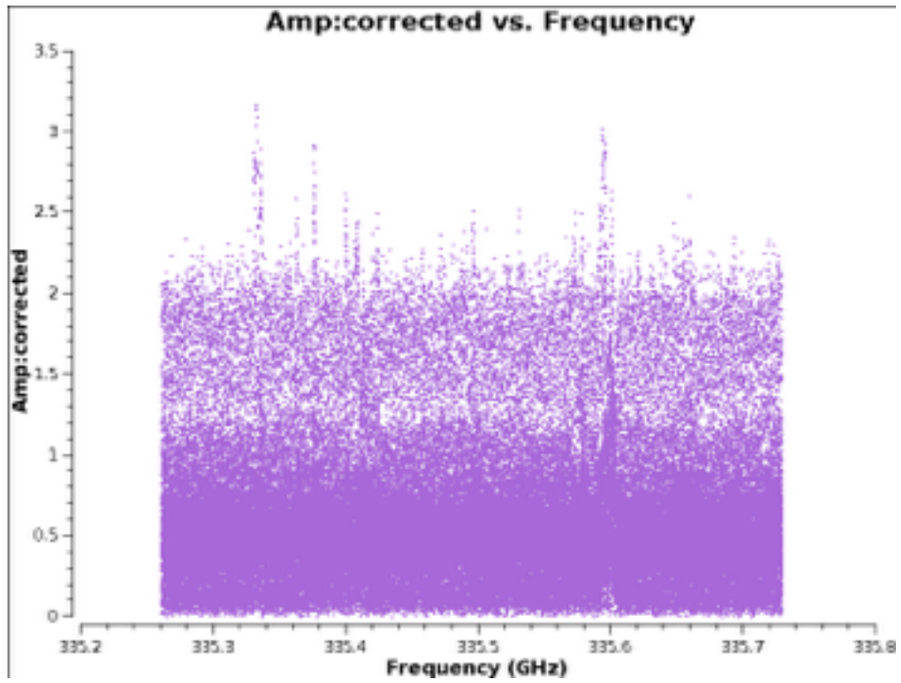


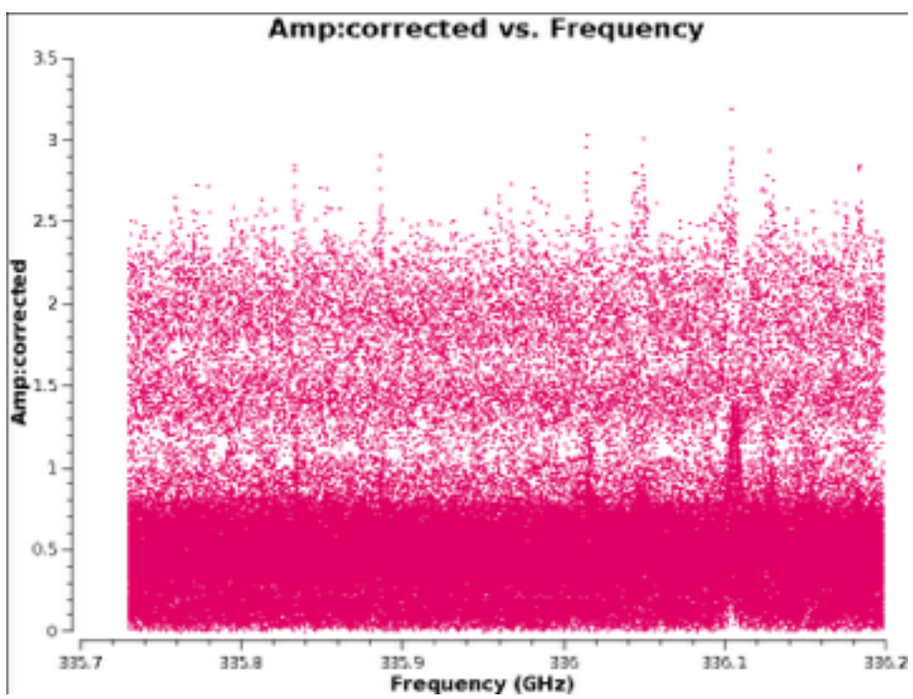



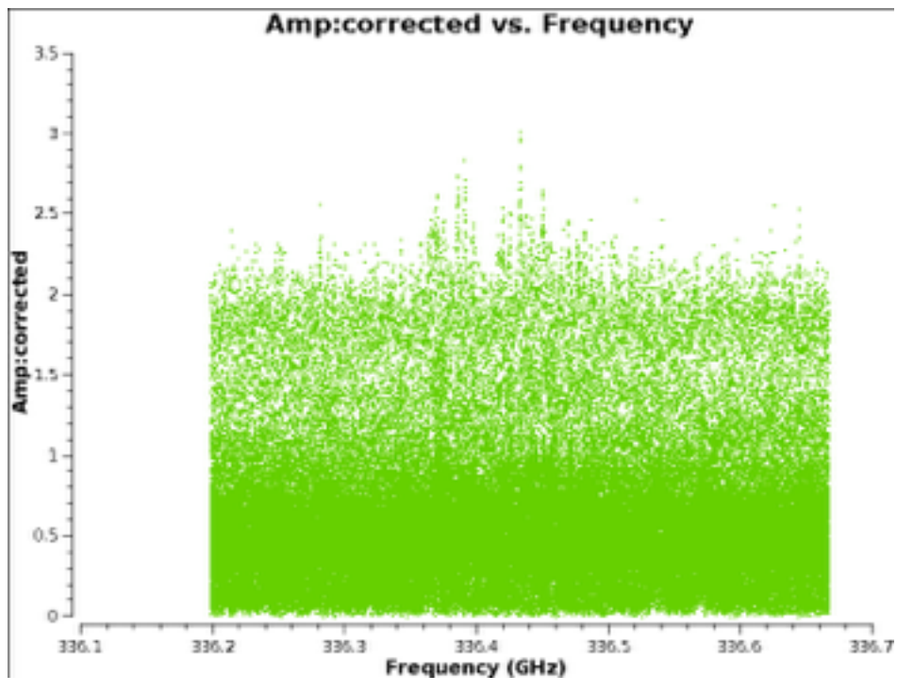
# Target spectra

## Step hif_applycal gives a first look into target spectra per spw



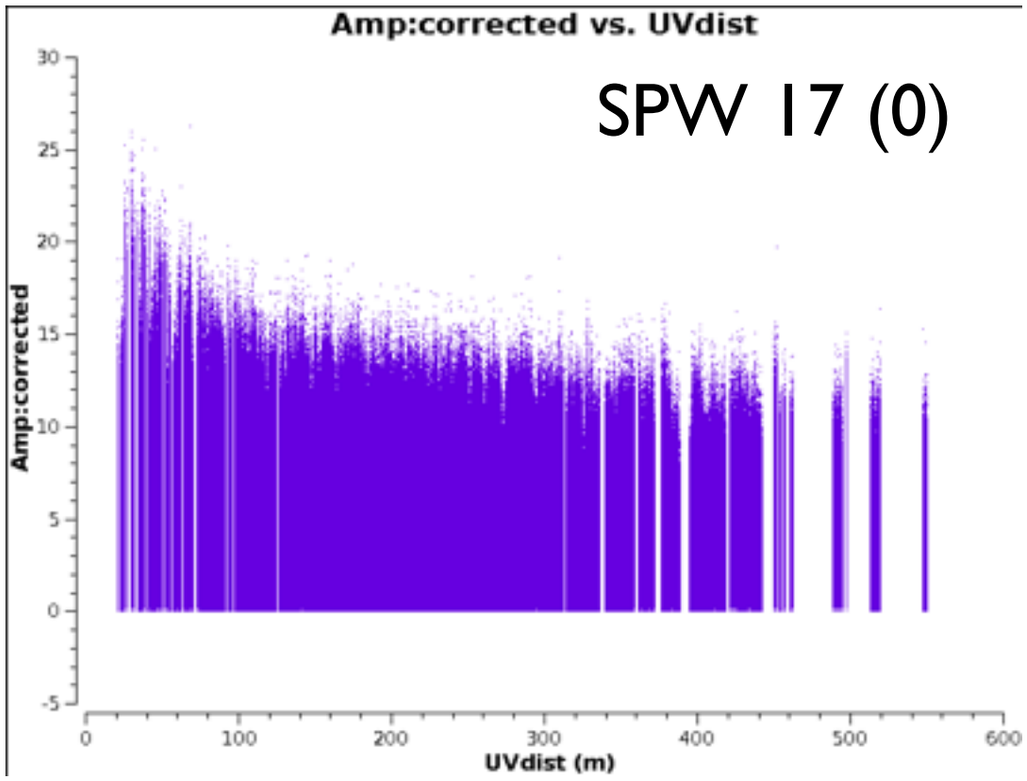



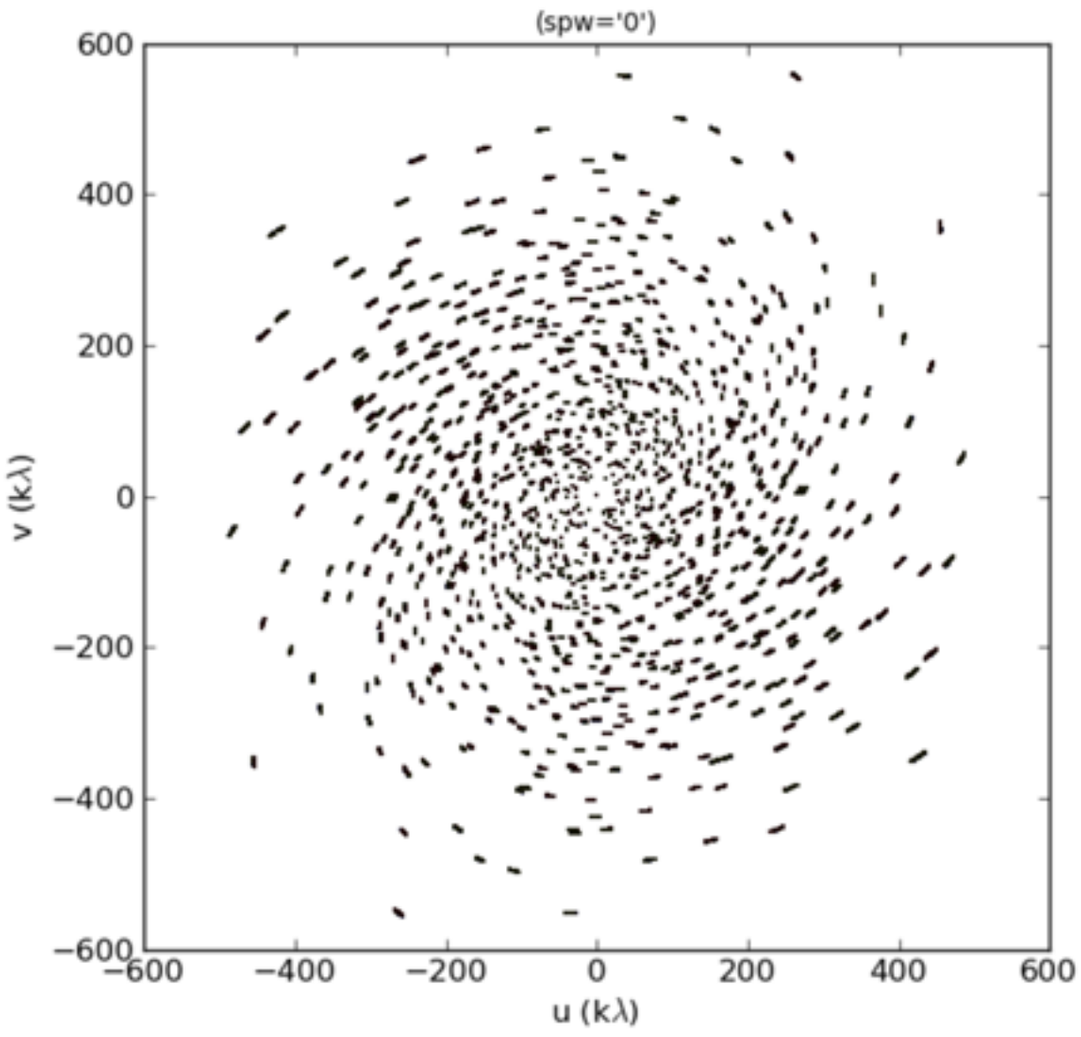



# UVplot of target

Not present in the weblog, but the amplitude vs uvdistance of the target (per spw) can be found in step **hif_applycal**



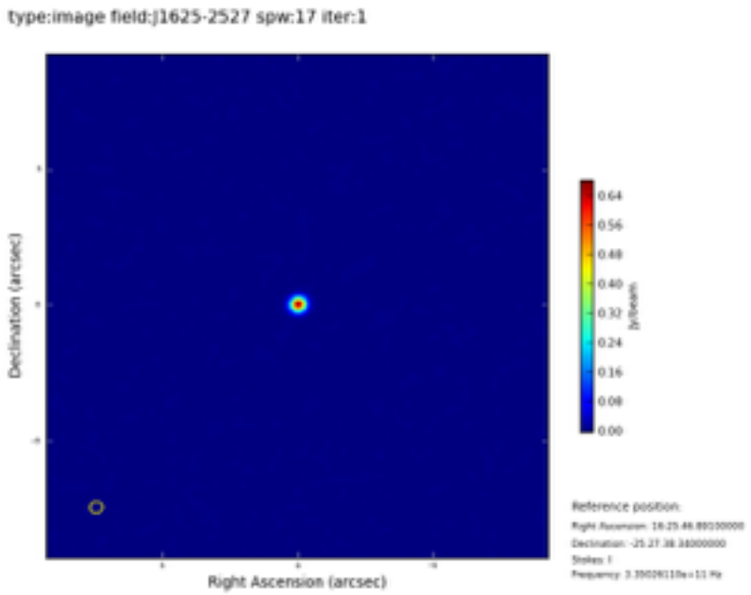

Uvdist max ~ 550m is up to ~600 klambda (lambda 0.09cm), which can be verified with plotms:



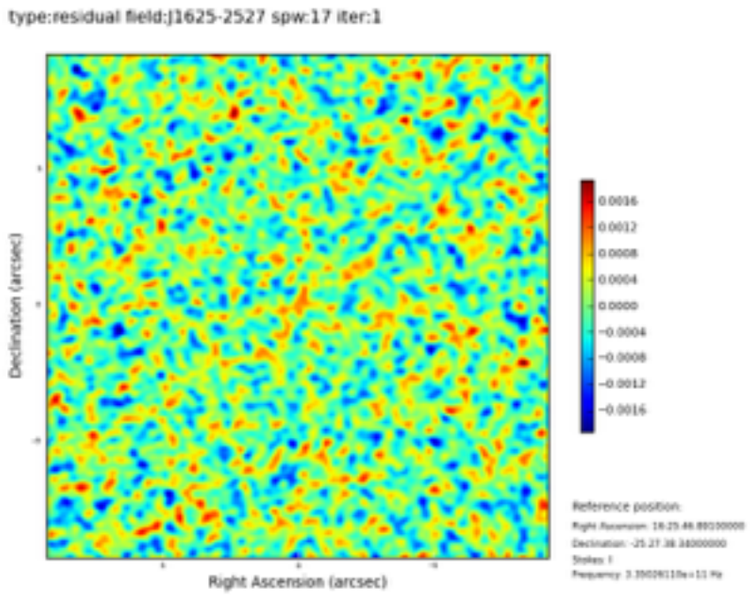
# Phase calibrator image

**Step hif_cleanlist:** images of phase and bandpass calibrators.
Images of the target have to made with the clean task in Casa.

## cleaned image




## check on clean: residuals




## dirty beam (PSF)