10th International VLBI Technology Workshop (IVTW)

Oct 21 – 25, 2025
Veras gräsmatta, Chalmers, Gothenburg
Europe/Stockholm timezone

Help desk
ivtw2025.event@chalme…

The 10th International VLBI Technology Workshop

The 10th International VLBI Technology Workshop (IVTW) will take place October 21-24, 2025. The meeting will be hosted by Chalmers University of Technology, Onsala Space Observatory, in Gothenburg, Sweden.

The scope of the workshop is to encompass all areas of VLBI hardware and software development and techniques on frontends, backends, recorders, correlation, image processing, potential space VLBI missions and RFI monitoring, mitigation and other strategies in today's rapidly changing environment.

In addition, we plan to arrange a visit to the clean room facility at Chalmers campus, used by the Onsala GARD group for receiver development, aa well as a site visit to the Onsala Space Observatory.
The observatory is located 45 km from Chalmers campus (and the city centre).

Program overview

- Optional: Tuesday, October 21: Vist to Clean room, GARD.
- Tuesday, October 21, Icebreaker, Chalmers area
- Wednesday, October 22: meeting, Chalmers, Veras Gräsmatta
- Thursday, October 23: meeting, Chalmers, Veras Gräsmatta
- Friday, October 24: meeting, Chalmers, Veras Gräsmatta
- Optional: Saturday, October 25: Visit Onsala Space Observatory

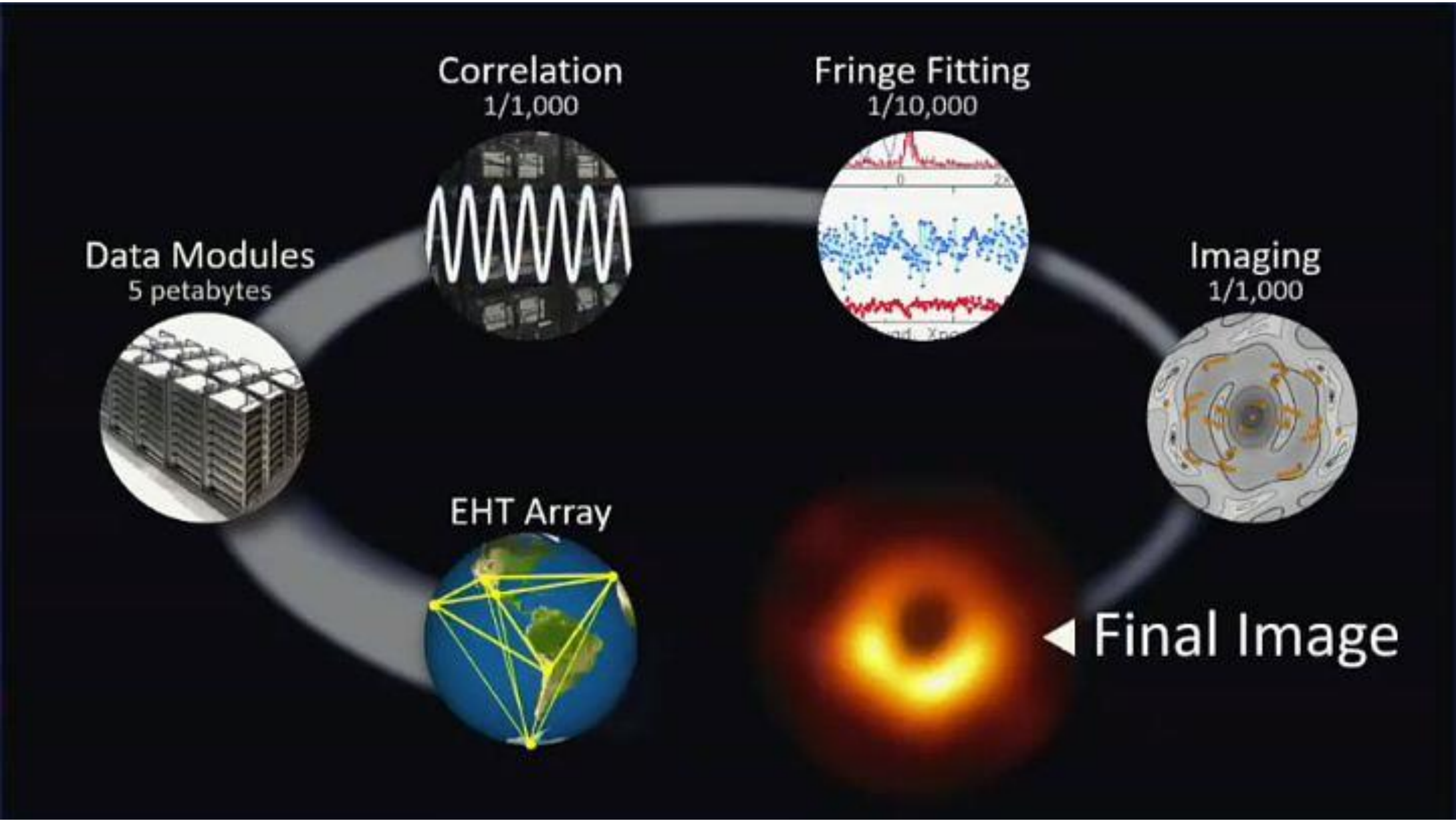
The registration fee for the IVTW is 1000 SEK, including VAT. This fee covers the icebreaker reception, coffee breaks, lunches, the conference dinner and the vist to Onsala Space Observatory.

The conference is sponsored by thematic area Space at Chalmers.

Antenna Gain Calibration

Slides from seminar: Station Amplitude Calibration (Eskil Varenius)

Why is calibration important?



Why is calibration important?

- Surprisingly faint source → No detection → time wasted & bad data
- Surprisingly strong source → “Too good” → time wasted

- VGOS observe dual linear (H,V) polarisations
- Geodetic analysis simpler in circular polarisation
- Can convert from linear → circular using e.g. “polconvert”

- Monitoring source flux density is interesting for astronomy!
- Regular monitoring is hard to get with astro-VLBI networks.
- With ampcal in IVS, we may get astronomical discoveries “for free”.

VGOS goal – source structure…

Why is calibration important?

Experimental Astronomy (2022) 54:137–155
https://doi.org/10.1007/s10686-022-09867-4

ORIGINAL ARTICLE

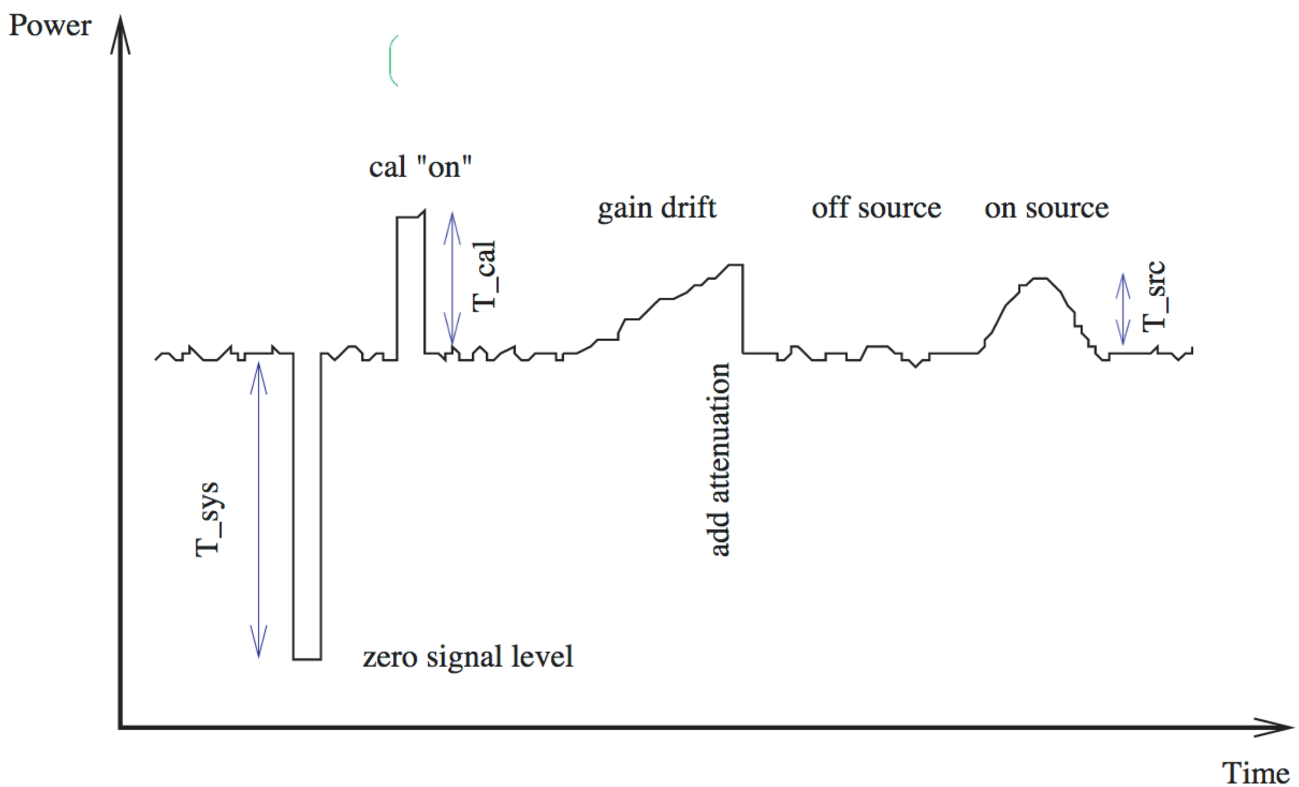
Broad band flux-density monitoring of radio sources with the Onsala twin telescopes

Eskil Varenius[1] · Francesco Maio[2] · Karine Le Bail[1] · Rüdiger Haas[1]

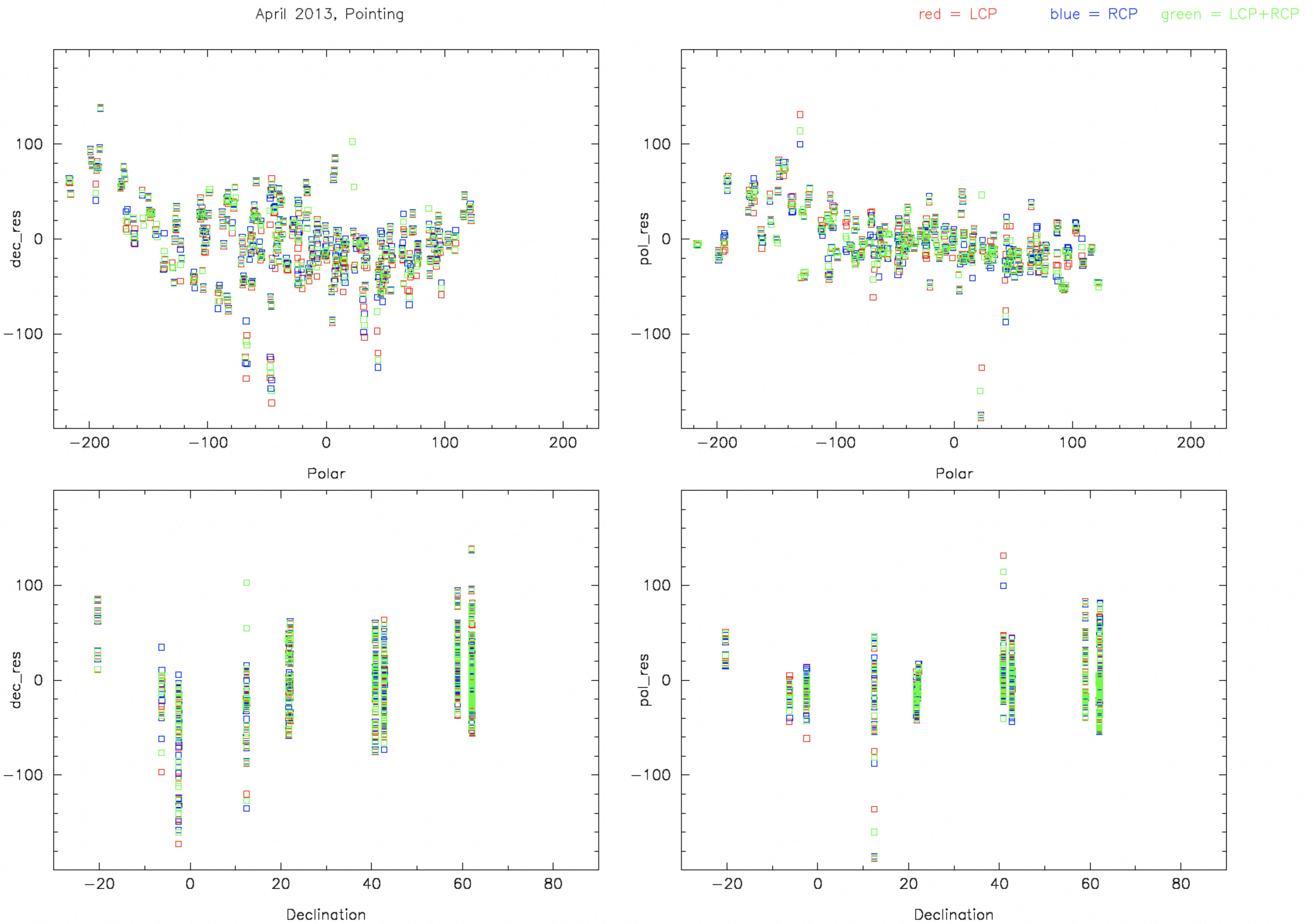
Received: 22 March 2022 / Accepted: 9 August 2022 / Published online: 23 August 2022

How can we deliver better calibrated data to the user/IVS?

- fivpt (pointing)
- onoff (determine: noise diode and gain curve)
- gnplt (analyse result from onoff)

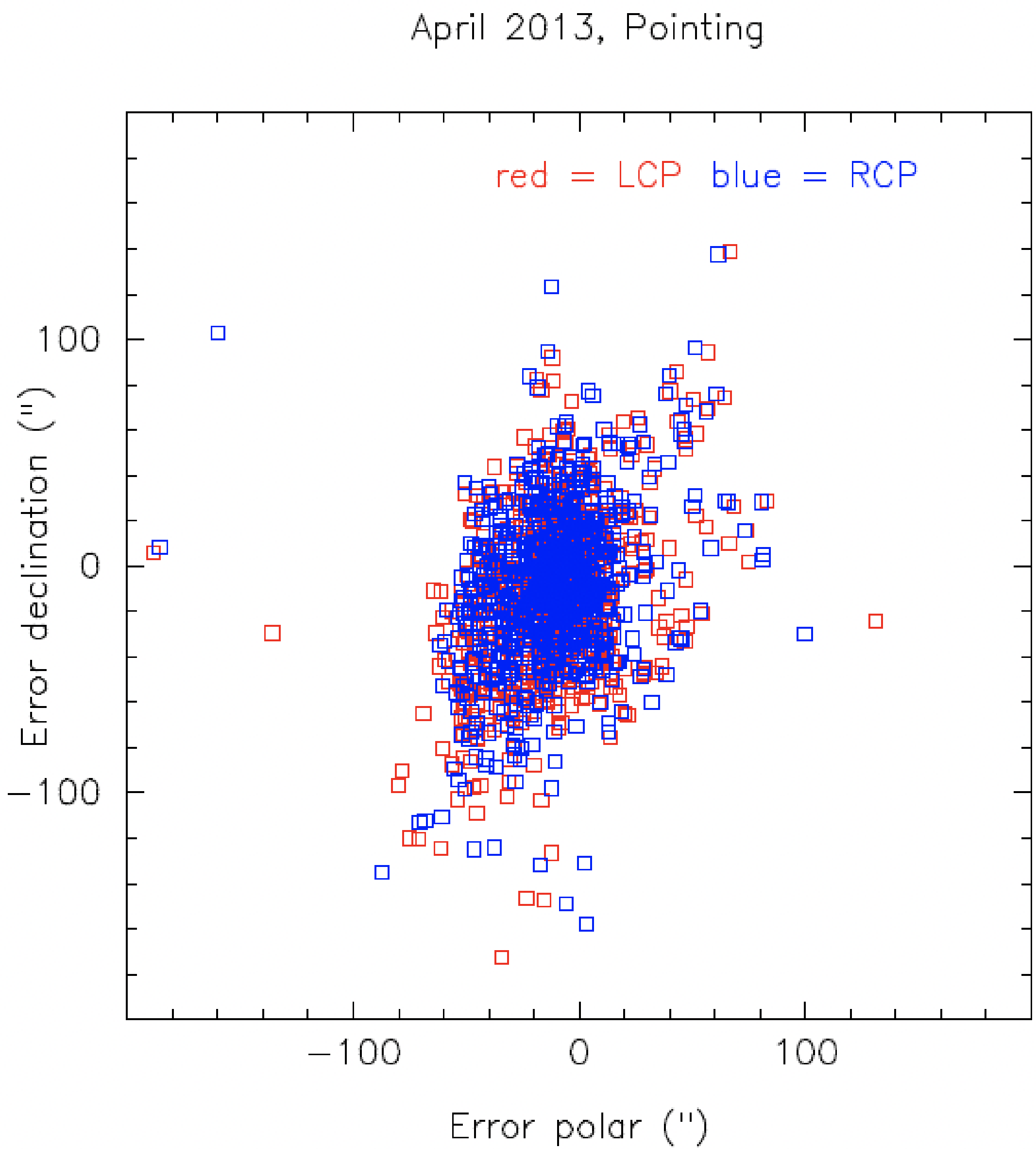


Pointing



April 2013, Pointing
red = LCP
blue = RCP
green = LCP+RCP
dec_res
pol_res
Polar
Declination
100
0
−100
−200
200
−20
20
40
60
80

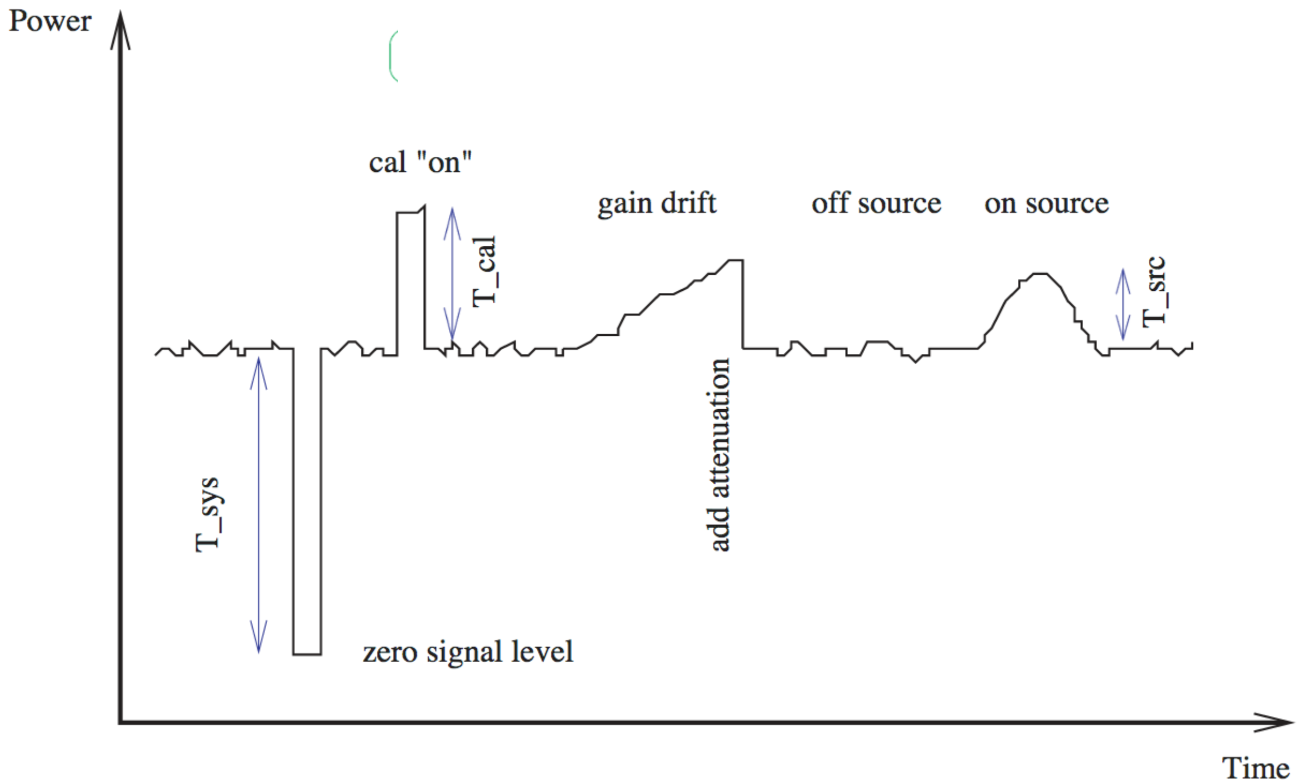
Pointing



April 2013, Pointing
red = LCP blue = RCP
100
0
−100
−100
0
100
Error declination (")
Error polar (")

How can we deliver better calibrated data to the user/IVS?

- fivpt (pointing)
- onoff (determine: noise diode and gain curve)
- gnplt (analyse result from onoff)



Important files

- flux.ctl /usr2/control
- *.rxg /usr2/control/rxg_files

flux.ctl

```
*                 freq MHz  ---- flux 10** ----    "     FS
* source  type  min   max  log    log(f) 2log(f) size  model
   3c48      c   500 23780 2.465 -0.004 -0.1251   1.5 gauss 100
   3c123     c   500 23780 2.525  0.246 -0.1638  23   gauss 100
   3c147     c   500 23780 2.806 -0.140 -0.1031   1   gauss 100
   3c161     c   500 10550 1.250  0.726 -0.2286   3   gauss 100
   3c218     c   500 10550 4.729 -1.025  0.0130  47   gauss 100
   3c227     c   500  5000 6.757 -2.801  0.2969 200   gauss 100
   3c249.1   c   500  5000 2.537 -0.565 -0.0404  15   gauss 100
```

```
* RXG file
* calonc.rxg - c band receiver parameter definition
range  4100 4600
* Line polarizations available
*
* one of both of lcp and rcp
*
lcp rcp
*
*  DPFU (degrees/Jansky) for polarizations in previous line in order
*
0.085000 0.08500
*
*  gain curve (only one) for ALL polarizations in 4th line
*
ELEV POLY 6.01702E-01 1.49994E-02 -3.36413E-04 4.27259E-06 -2.11736E-0
*
* tcal versus frequency
*
```

```
* RXG file
* calonc.rxg - c band receiver parameter definition
range  4100 4600
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*
ELEV POLY 6.01702E-01 1.49994E-02 -3.36413E-04 4.27259E-06 -2.11736E-0
*
* tcal versus frequency
*
```

ONOFF

Compare with the data in the rxg-file.

- Power on source [ONSO]
- Power on source with noise diode on [ONSC]
- Power off source with noise diode on [OFFC]
- Power off source with noise diode off [OFFS]
- Power off source with no signal for “zero” [ZERO]

ACQUIR = Run many ONOFFs in sequence

ONOFF

```
2017.059.07:55:21.15;onoff
2017.059.07:55:21.27#onoff#    De      Center  TCal    Flux     DPFU     Gain     Product    LO     T   FWHM
2017.059.07:55:21.27#onoff#APR 1l     4829.49 3.842   369.43  0.085000 0.96336  0.081886 4100.00 c 0.16950
2017.059.07:55:21.27#onoff#APR 3l     4829.49 3.842   369.43  0.085000 0.96336  0.081886 4100.00 c 0.16950
2017.059.07:55:21.27#onoff#APR 5l     4893.49 3.644   363.19  0.085000 0.96336  0.081886 4100.00 c 0.16728
2017.059.07:55:21.27#onoff#APR 7l     4893.49 3.644   363.19  0.085000 0.96336  0.081886 4100.00 c 0.16728
2017.059.07:55:21.27#onoff#APR 9l     4957.49 3.978   357.13  0.085000 0.96336  0.081886 4100.00 c 0.16512
2017.059.07:55:21.27#onoff#APR bl     4957.49 3.978   357.13  0.085000 0.96336  0.081886 4100.00 c 0.16512
2017.059.07:55:21.27#onoff#APR dl     5021.49 3.794   351.24  0.085000 0.96336  0.081886 4100.00 c 0.16302
2017.059.07:55:21.27#onoff#APR fl     5021.49 3.794   351.24  0.085000 0.96336  0.081886 4100.00 c 0.16302
2017.059.07:55:21.27#onoff#APR 1u     4831.49 3.841   369.23  0.085000 0.96336  0.081886 4100.00 c 0.16943
2017.059.07:55:21.27#onoff#APR 3u     4831.49 3.841   369.23  0.085000 0.96336  0.081886 4100.00 c 0.16943
2017.059.07:55:21.27#onoff#APR 5u     4895.49 3.640   363.00  0.085000 0.96336  0.081886 4100.00 c 0.16721
2017.059.07:55:21.27#onoff#APR 7u     4895.49 3.640   363.00  0.085000 0.96336  0.081886 4100.00 c 0.16721
2017.059.07:55:21.27#onoff#APR 9u     4959.49 3.990   356.94  0.085000 0.96336  0.081886 4100.00 c 0.16505
2017.059.07:55:21.27#onoff#APR bu     4959.49 3.990   356.94  0.085000 0.96336  0.081886 4100.00 c 0.16505
2017.059.07:55:21.27#onoff#APR du     5023.49 3.788   351.06  0.085000 0.96336  0.081886 4100.00 c 0.16295
2017.059.07:55:21.27#onoff#APR fu     5023.49 3.788   351.06  0.085000 0.96336  0.081886 4100.00 c 0.16295
```


```
 Center  TCal    Flux     DPFU     Gain     Product    LO     T   FWHM
4829.49 3.842   369.43  0.085000 0.96336  0.081886 4100.00 c 0.16950
4829.49 3.842   369.43  0.085000 0.96336  0.081886 4100.00 c 0.16950
```

ONOFF

more onoff-seq.log

```
[ttcyg.local](\!) more onoff-seq.log
2017.059.07:55:26.98#onoff#ONSO     3.4   0.00000   0.00000 1l  15264.3     156.8 3l  15264.3     156.8
2017.059.07:55:26.98#onoff#ONSO     3.4   0.00000   0.00000 5l  16826.3     188.3 7l  16826.3     188.3
2017.059.07:55:26.98#onoff#ONSC     3.4   0.00000   0.00000 1l  16124.3     179.8 3l  16124.3     179.8
2017.059.07:55:26.98#onoff#ONSC     3.4   0.00000   0.00000 5l  17744.3     177.6 7l  17744.3     177.6
2017.059.07:55:48.50#onoff#OFFC    25.0   6.16823   0.00000 1l   9587.7       6.6 3l   9587.7       6.6
2017.059.07:55:48.50#onoff#OFFC    25.0   6.16823   0.00000 5l  10617.0      16.0 7l  10617.0      16.0
2017.059.07:55:48.50#onoff#OFFS    25.0   6.16823   0.00000 1l   8711.3      19.0 3l   8711.3      19.0
2017.059.07:55:48.50#onoff#OFFS    25.0   6.16823   0.00000 5l   9703.7      22.2 7l   9703.7      22.2
2017.059.07:55:48.50#onoff#OFFS    25.0   6.16823   0.00000 9l   8964.0       5.3 bl   8964.0       5.3
2017.059.07:55:48.50#onoff#OFFS    25.0   6.16823   0.00000 5u   9727.7      20.3 7u   9727.7      20.3
2017.059.07:55:48.50#onoff#OFFS    25.0   6.16823   0.00000 9u   8925.0      18.3 bu   8925.0      18.3
2017.059.07:55:48.50#onoff#OFFS    25.0   6.16823   0.00000 du   8953.7      12.4 fu   8953.7      12.4
2017.059.07:55:48.50#onoff#ZERO    25.0   6.16823   0.00000 1l      0.0       0.0 3l      0.0       0.0
2017.059.07:55:48.50#onoff#ZERO    25.0   6.16823   0.00000 5l      0.0       0.0 7l      0.0       0.0
onoff-seq.log (END)
```

ONOFF

```
more onoff-seq.log
98#onoff#ONSO     3.4    0.00000    0.00000 1l  15264.3     156.8 3l  15264.3      156.8
98#onoff#ONSO     3.4    0.00000    0.00000 5l  16826.3     188.3 7l  16826.3      188.3
98#onoff#ONSC     3.4    0.00000    0.00000 1l  16124.3     179.8 3l  16124.3      179.8
98#onoff#ONSC     3.4    0.00000    0.00000 5l  17744.3     177.6 7l  17744.3      177.6
50#onoff#OFFC    25.0    6.16823    0.00000 1l   9587.7       6.6 3l   9587.7        6.6
50#onoff#OFFC    25.0    6.16823    0.00000 5l  10617.0      16.0 7l  10617.0       16.0
50#onoff#OFFS    25.0    6.16823    0.00000 1l   8711.3      19.0 3l   8711.3       19.0
50#onoff#OFFS    25.0    6.16823    0.00000 5l   9703.7      22.2 7l   9703.7       22.2
50#onoff#OFFS    25.0    6.16823    0.00000 9l   8964.0       5.3 bl   8964.0        5.3
50#onoff#OFFS    25.0    6.16823    0.00000 5u   9727.7      20.3 7u   9727.7       20.3
50#onoff#OFFS    25.0    6.16823    0.00000 9u   8925.0      18.3 bu   8925.0       18.3
50#onoff#OFFS    25.0    6.16823    0.00000 du   8953.7      12.4 fu   8953.7       12.4
50#onoff#ZERO    25.0    6.16823    0.00000 1l      0.0       0.0 3l      0.0        0.0
50#onoff#ZERO    25.0    6.16823    0.00000 5l      0.0       0.0 7l      0.0        0.0
```

ONOFF result

```
2011.067.07:43:29.45#onoff#    source       Az   El   De  I P   Center   Comp   Tsys   SEFD  Tcal(j) Tcal(r)
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 1u  1 l  4941.00 0.9850 57.62  736.3 193.744  1.05
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 2u  2 r  4941.00 0.9878 169.9  844.2  77.882  0.41
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 3u  1 l  4943.00 0.9938 57.61  729.9 193.649  1.04
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 4u  2 r  4943.00 0.9845 167.7  840.6  79.017  0.41
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 5u  1 l  4945.00 0.9851 57.66  729.9 193.592  1.04
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 6u  2 r  4945.00 0.9877 168.0  837.7  79.321  0.41
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 7u  1 l  4947.00 0.9833 57.81  727.6 190.954  1.03
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 8u  2 r  4947.00 0.9865 171.5  837.2  79.032  0.40
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 9u  1 l  4949.00 0.9959 58.03  718.5 187.139  1.02
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 au  2 r  4949.00 0.9907 172.8  839.8  78.740  0.40
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 bu  1 l  4953.00 0.9867 58.17  712.0 179.502  1.00
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 cu  2 r  4953.09 0.9939 171.5  834.4  77.979  0.40
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 du  1 l  4955.00 0.9900 58.04  713.0 175.949  1.01
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 eu  2 r  4955.00 0.9920 173.7  837.8  76.844  0.40
2011.067.07:43:29.45#onoff#    source       Az   El   De  I P   Center   Comp   Tsys   SEFD  Tcal(j) Tcal(r)
```


```
2011.067.07:43:29.45#onoff#    source       Az   El   De  I P
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 1u  1 l
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 2u  2 r
```

SEFD

- SEFD is the "system equivalent flux density" (Jy), defined as the flux density of a radio source that doubles the system temperature. Lower values of the SEFD indicate more sensitive performance. Unit is Jansky.

Example:

- Assume SEFD=2000 Jy at 8 GHz towards empty sky at el=45 deg.

- If we observe a 2000 Jy source in this direction, RF power doubles.

ONOFF result

```
2011.067.07:43:29.45#onoff#    source       Az   El   De I P  Center   Comp   Tsys   SEFD  Tcal(j) Tcal(r)
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 1u 1 l  4941.00 0.9850 57.62  736.3 193.744  1.05
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 2u 2 r  4941.00 0.9878 169.9  844.2  77.882  0.41
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 3u 1 l  4943.00 0.9938 57.61  729.9 193.649  1.04
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 4u 2 r  4943.00 0.9845 167.7  840.6  79.017  0.41
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 5u 1 l  4945.00 0.9851 57.66  729.9 193.592  1.04
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 6u 2 r  4945.00 0.9877 168.0  837.7  79.321  0.41
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 7u 1 l  4947.00 0.9833 57.81  727.6 190.954  1.03
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 8u 2 r  4947.00 0.9865 171.5  837.2  79.032  0.40
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 9u 1 l  4949.00 0.9959 58.03  718.5 187.139  1.02
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 au 2 r  4949.00 0.9907 172.8  839.8  78.740  0.40
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 bu 1 l  4953.00 0.9867 58.17  712.0 179.502  1.00
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 cu 2 r  4953.09 0.9939 171.5  834.4  77.979  0.40
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 du 1 l  4955.00 0.9900 58.04  713.0 175.949  1.01
2011.067.07:43:29.45#onoff#VAL cygnusa    161.7 72.8 eu 2 r  4955.00 0.9920 173.7  837.8  76.844  0.40
2011.067.07:43:29.45#onoff#    source       Az   El   De I P  Center   Comp   Tsys   SEFD  Tcal(j) Tcal(r)
```


Center	Comp	Tsys	SEFD	Tcal(j)	Tcal(r)
4941.00	0.9850	57.62	736.3	193.744	1.05
4941.00	0.9878	169.9	844.2	77.882	0.41

Gain Compression - This is obtained by calculating the ratio of variation in counts switching the cal on when on source to the change in counts when off source. This ratio should be close to one as much as possible.

$$\mathrm{Comp} = \frac{\mathrm{ONSC} - \mathrm{ONSO}}{\mathrm{OFFC} - \mathrm{OFFS}}$$

$$\mathrm{SEFD} = \mathrm{S} \times \frac{\mathrm{OFFS} - \mathrm{ZERO}}{\mathrm{ONSO} - \mathrm{OFFS}}$$

SEFD = 369.4 Jy x (8711.3-0)/(15264.3-8711.3) = 491 Jy

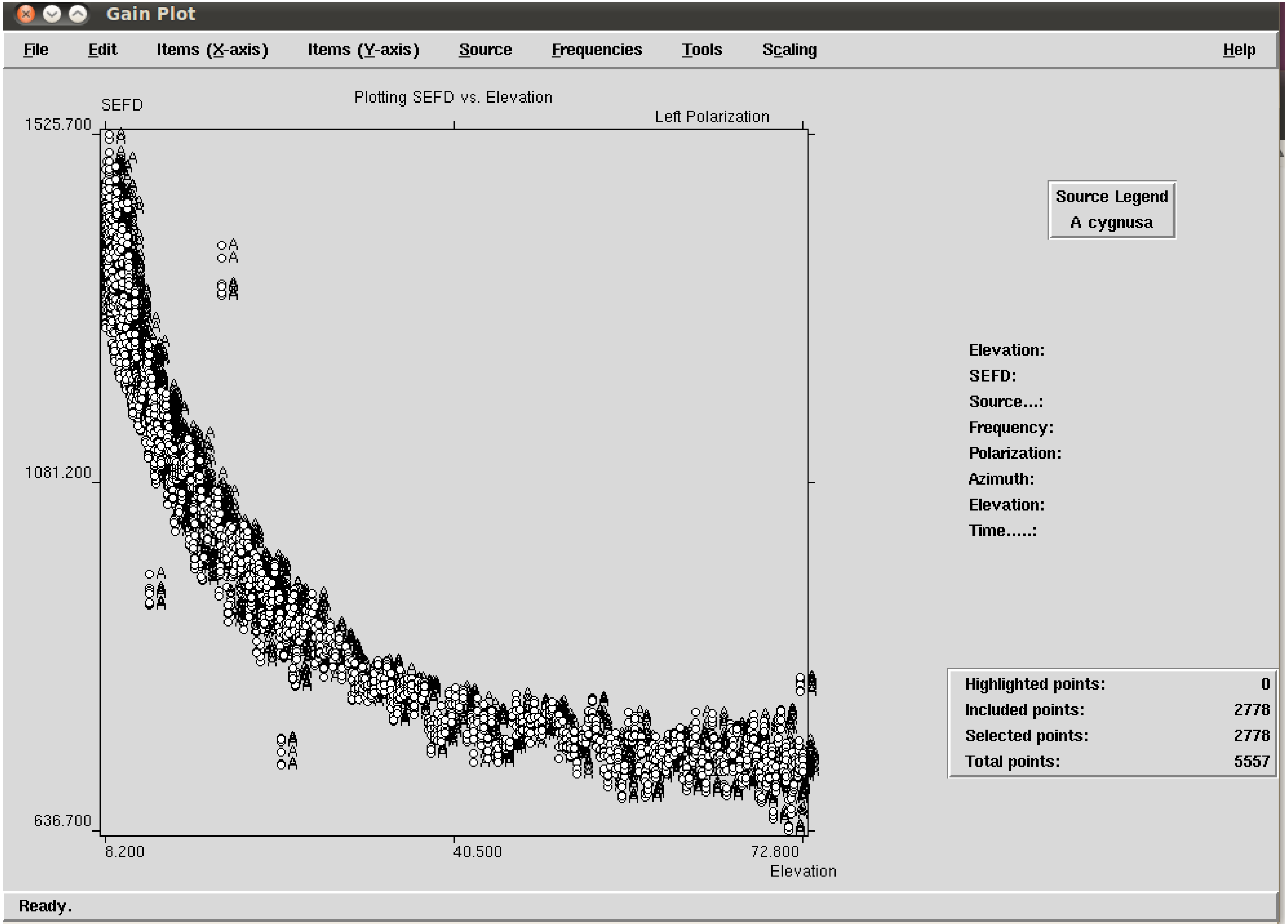
$$\mathrm{T_{sys}} = \mathrm{T_{cal}} \times \frac{\mathrm{OFFS} - \mathrm{ZERO}}{\mathrm{OFFC} - \mathrm{OFFS}}$$

$$\mathrm{T_{cal}(Jy) = S \times \frac{OFFC - OFFS}{ONSO - OFFS}}$$

$$\mathrm{T_{cal}(K) = DPFU \times gain(el) \times T_{cal}(Jy)}$$

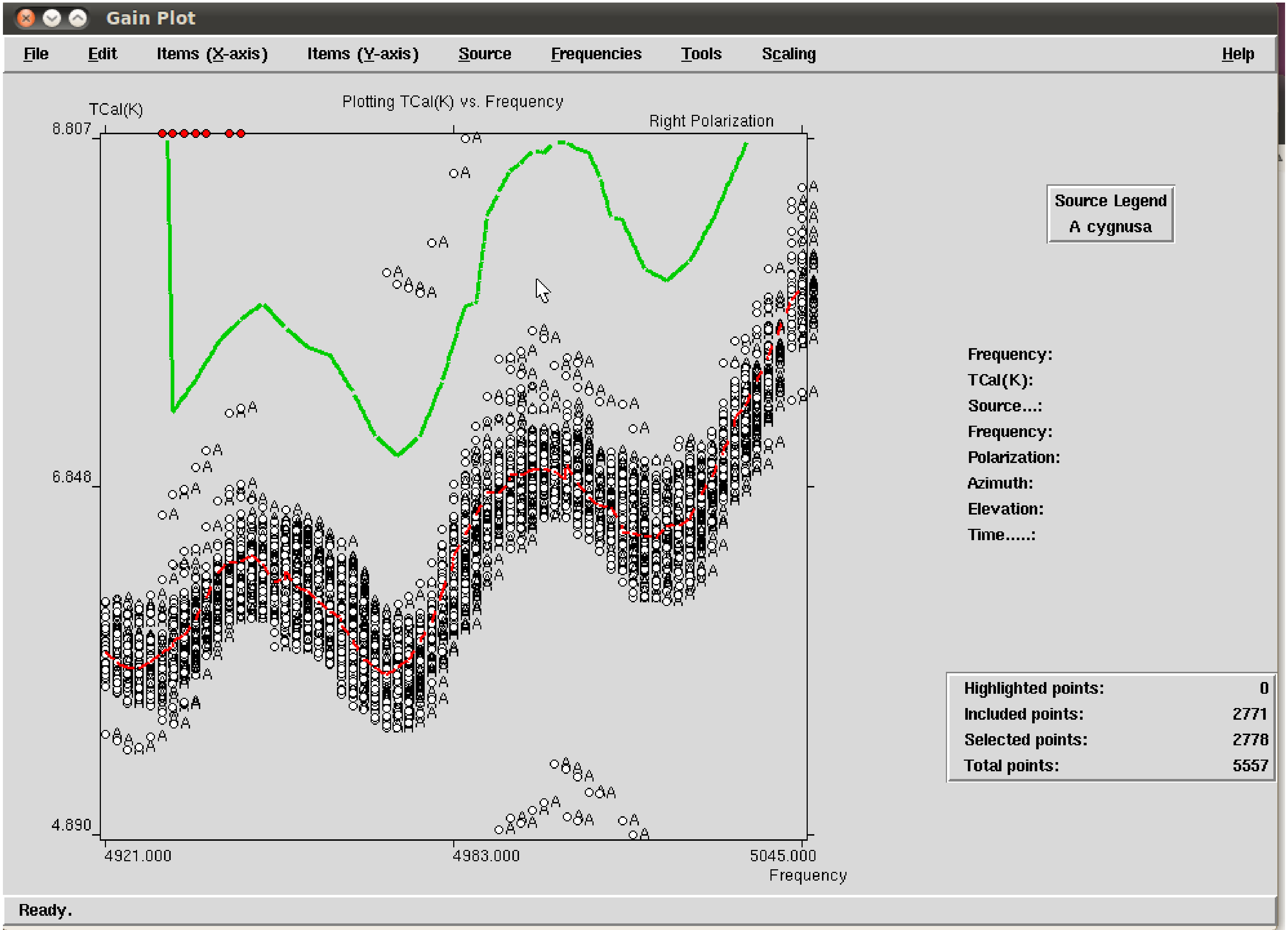
$$\mathrm{T_{cal}(r) = T_{cal}(K)/T_{cal,rxg}(K)}$$

SEFD



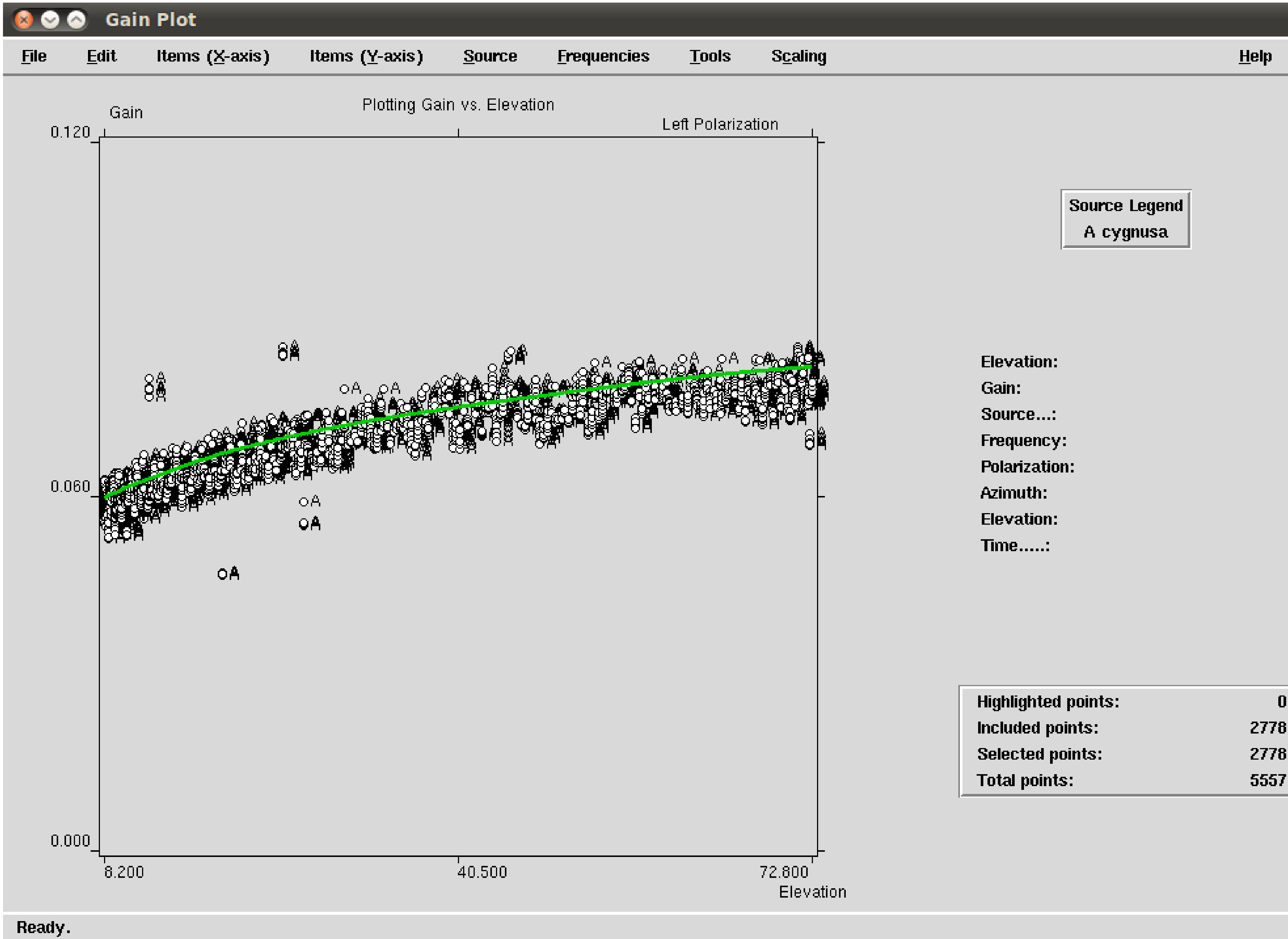
Gain Plot
File
Edit
Items (X-axis)
Items (Y-axis)
Source
Frequencies
Tools
Scaling
Help
Plotting SEFD vs. Elevation
SEFD
Left Polarization
1525.700
1081.200
636.700
8.200
40.500
72.800
Elevation
Source Legend
A cygnusa
Elevation:
SEFD:
Source...:
Frequency:
Polarization:
Azimuth:
Elevation:
Time.....:
Highlighted points: 0
Included points: 2778
Selected points: 2778
Total points: 5557
Ready.

Tcal



Gain Plot
File
Edit
Items (X-axis)
Items (Y-axis)
Source
Frequencies
Tools
Scaling
Help
Plotting TCal(K) vs. Frequency
TCal(K)
Right Polarization
8.807
6.848
4.890
4921.000
4983.000
5045.000
Frequency
Source Legend
A cygnusa
Frequency:
TCal(K):
Source...:
Frequency:
Polarization:
Azimuth:
Elevation:
Time.....:
Highlighted points: 0
Included points: 2771
Selected points: 2778
Total points: 5557
Ready.

Gain curve



Gain Plot
File
Edit
Items (X-axis)
Items (Y-axis)
Source
Frequencies
Tools
Scaling
Help
Plotting Gain vs. Elevation
Gain
Left Polarization
0.120
0.060
0.000
8.200
40.500
72.800
Elevation
Source Legend
A cygnusa
Elevation:
Gain:
Source...:
Frequency:
Polarization:
Azimuth:
Elevation:
Time.....:
Highlighted points: 0
Included points: 2778
Selected points: 2778
Total points: 5557
Ready.

EVN

```
EVN BLOCK SCHEDULE             SESSION 2 2025      Version 1.0        01 May 2025
=====================================================================================================================================================

-----------------
| PART 1  3.6cm |
-----------------
```

3.6 cm

```
CODE          EVN   TELESCOPES                                                    CORR   TOT   /ST     EVN UT-START     UT-STOP     COMMENTS
====== ================================================================== ===== ====== ===== == === ======================= =======================

N25X2  --- Wb1 Ef(Mc)On60 T6 Ur Tr -- Ys Hh Ir -- -- -- -- -- Km ---- --- EVN    30.41  2.76 Eu 149 0900(29/05)-1200(29/05) 3.6cm NME
EB113B --- Wb1 Ef(Mc)On60 T6 Ur Tr -- Ys Hh Ir -- -- -- -- -- Km ---- --- EVN   121.65 11.06 Eu 149 1300(29/05)-0100(30/05) NGC4278 ep.2
EB116A --- Wb1 Ef(Mc)On60 T6 Ur Tr -- Ys Hh Ir -- -- -- -- -- Km ---- --- EVN   243.30 22.12 Eu 150 0730(30/05)-0730(31/05) PRS/FRBs
EC100A --- Wb1 Ef(Mc)On60 T6 Ur Tr -- Ys Hh Ir -- -- -- -- -- Km ---- --- EVN   111.51 10.14 Eu 151 0930(31/05)-2030(31/05) IC 485
CL25X2 --- Wb1 Ef(Mc)On60 T6 Ur Tr -- Ys Hh Ir -- -- -- -- -- Km ---- --- EVN     0.00  0.00 Eu 151 2100(31/05)-0100(01/06) 3.6cm FS CAL
```

EB116A

EC100A

CL25X2

```
---------------
| PART 2  5cm |
---------------
```

5 cm

```
N25M1  Jb2 Wb1 Ef(Mc)On85 T6 -- Tr -- Ys Hh Ir Sr -- -- -- -- Km ---- --- EVN     8.29  0.69 Eu 152 1200(01/06)-1500(01/06) 5cm NME
CL25M1 Jb2 Wb1 Ef(Mc)On85 T6 -- Tr -- Ys Hh Ir Sr -- -- -- -- Km ---- --- EVN     0.00  0.00 Eu 152 1600(01/06)-2000(01/06) 5cm FS CAL
EK061  Jb2 Wb1 Ef(Mc)On85 T6 -- Tr -- Ys Hh Ir Sr -- -- -- -- Km ---- --- EVN    12.44  1.04 Eu 152 2030(01/06)-0530(02/06) 32.03+0.06, G35.20-1.74
```

```
-----------------
| PART 3  1.3cm |
-----------------
```

1.3 cm

```
N25K2  Jb2 --- Ef(Mc)On60 T6 Ur Tr Mh Ys Hh -- Sr Kt Ky Ku Kc -- ---- MER EVN    41.47  2.76 Eu 153 1200(02/06)-1500(02/06) 1.3cm NME
GP065A --- --- -- -- ---- -- -- -- -- -- -- -- -- -- -- -- -- ---- --- EVN    39.17  2.30 Eu 153 1600(02/06)-2100(02/06) VLBA Fornax A
                                                                                      3.23 Au 153 1600(02/06)-2300(02/06)    LBA

GP065B --- --- -- -- ---- T6 -- -- -- -- Hh -- -- Kt Ky Ku Kc -- ---- --- EVN    30.41  2.76 Eu 154 0000(03/06)-0600(03/06)  +LBA Fornax A
```

- onoff
- gnplt

- rxg-file (Tcal(K), DPFU, gaincurve)

log-file+rxg-file

antabfs

antab-file to the user

Feedback from JIVE

Median absolute error in gain calibration

L

Average at L band

Ar	Bd	Cm	Da	De	Ef	Hh	Ir	J1	J2	Km	Kn
N/A	N/A	0.181	0.2	0.314	0.116	0.113	0.304	0.0862	0.0991	N/A	0.476
Kt	Ku	Ky	Mc	Mh	Nt	O6	O8	Pi	Ro	Sr	Sv
N/A	N/A	N/A	0.0845	N/A	0.314	N/A	0.114	0.230	N/A	N/A	N/A
T6	Tr	Ur	Wb	Ys	Zc						
0.110	0.125	0.185	0.170	N/A	N/A						

C/M

Average at C/M band

Ar	Bd	Cm	Da	De	Ef	Hh	Ir	J1	J2	Km	Kn
N/A	N/A	0.305	0.149	0.335	0.0709	0.119	0.176	0.113	0.0826	N/A	0.200
Kt	Ku	Ky	Mc	Mh	Nt	O6	O8	Pi	Ro	Sr	Sv
N/A	N/A	N/A	0.0711	N/A	N/A	N/A	0.0996	0.179	N/A	0.164	N/A
T6	Tr	Ur	Wb	Ys	Zc						
0.0848	0.133	0.0921	0.116	0.0946	N/A						

X

Average at X band

Ar	Bd	Cm	Da	De	Ef	Hh	Ir	J1	J2	Km	Kn
N/A	N/A	N/A	N/A	N/A	0.0724	0.0417	0.0665	N/A	N/A	0.148	N/A
Kt	Ku	Ky	Mc	Mh	Nt	O6	O8	Pi	Ro	Sr	Sv
N/A	N/A	N/A	0.0821	N/A	0.150	0.0766	N/A	N/A	N/A	N/A	N/A
T6	Tr	Ur	Wb	Ys	Zc						
0.175	0.120	0.0715	0.102	0.0743	N/A						

K

Average at K band

Kt	Bd	Cm	Da	De	Ef	Hh	Ir	J1	J2	Km	Kn
0.178	N/A	N/A	N/A	N/A	0.0932	0.316	N/A	N/A	0.270	N/A	N/A
T6	Ku	Ky	Mc	Mh	Nt	O6	O8	Pi	Ro	Sr	Sv
0.0738	0.158	0.104	0.115	0.257	N/A	0.194	N/A	N/A	N/A	0.194	N/A
Tr	Ur	Wb	Ys	Zc							
N/A	N/A	N/A	0.389	N/A							

The table shows the median absolute amplitude error for EVN stations. These results were derived from the pipeline amplitude self-calibration results.

Feedback from JIVE

Summary

- Amplitude calibration will be important for optimal geodetic results
- Requirements: a working noise diode and a backend capable of communicating TPI values (preferably with FS) every second
- Stations: Measure GAIN and TCAL (FS)!
- FS tools ONOFF, ACQUIR and GNPLT can help you – please experiment!