

EVN Performance and Reliability

Gabor Orosz orosz@jive.eu

(on behalf of EVN Support Scientists)

Joint Institute for VLBI ERIC (JIVE)

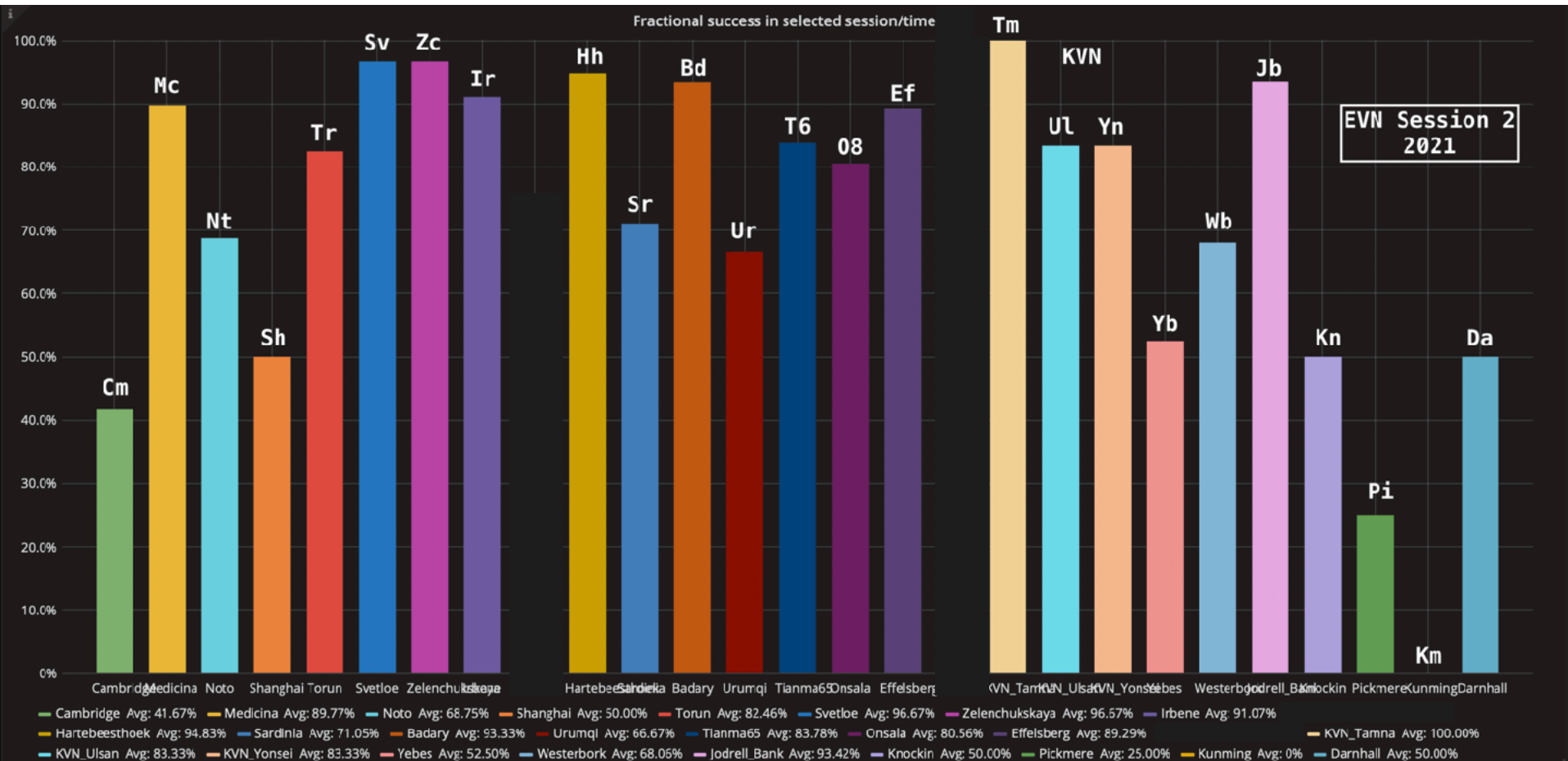
EVN TOG - February 8, 2022



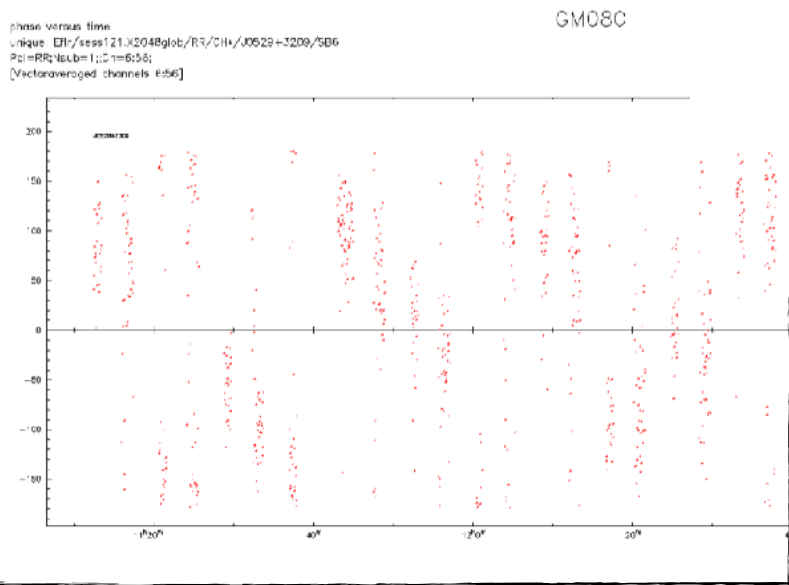
2021 Session 2 (May/June) notes and highlights

(including adjacent eVLBI sessions)

Cm: Technical problems (RCP or LCP only). **Mc:** Minor EI drive issues. **Nt:** Problems w/ servo system and no fringes in some expts (most of C-band). **Sh:** Problem with the noise tube (only observed few experiments). **Tr:** Receiver problems. **Ir:** ACU issue and **phase jumps** (caused by reconfiguring LOs in scan gaps). **Sr:** Technical issue with PFP. **Ur:** Problems with FS and national tasks. **T6:** Minor technical issues and national tasks. **O8:** Weather and minor technical issues. **Ef:** Some issue with Tsys vs airmass. Weather and minor technical issues. **KVN:** Only 2 experiments. **Yb:** ACU and noise diode problems. **Wb:** DBBC2 board configuration failure (cooling fan broke). **Jb:** Problems with LCP/RCP amplitudes in L-band. Issues with Tsys cal due to severe RFI. **Km:** Only 1 experiment. Az drive failure. **MER:** No fringes or single pol only (few experiments only). Problem w/ sampler stats and potential WIDAR related issues.

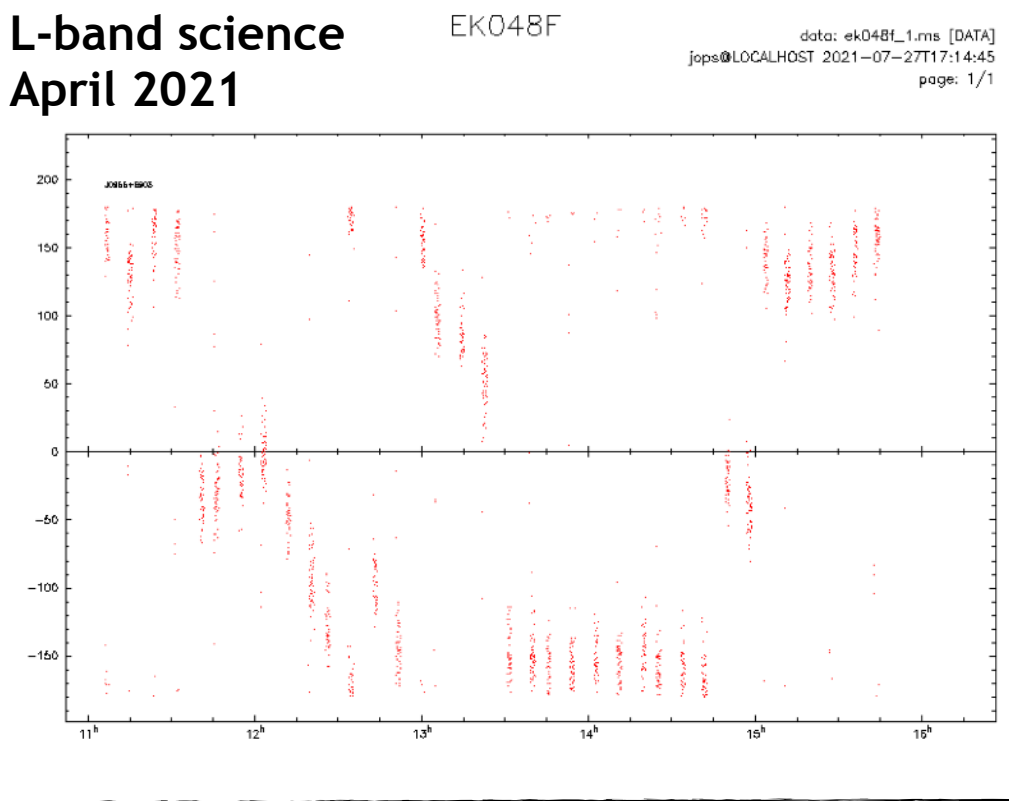


X-band science March 2021

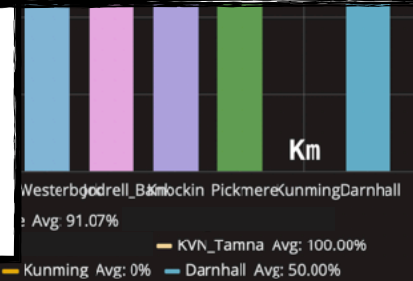
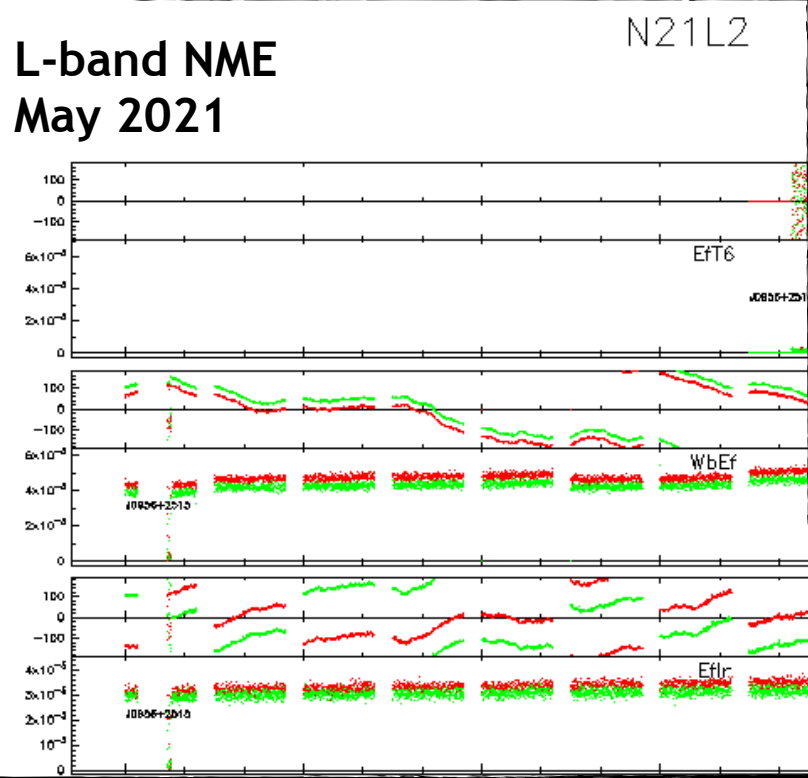


no system and no fringes in some exers
 Receiver problems. Ir: ACU issue and phase
 ms with FS and national tasks. T6: Minor

L-band science April 2021



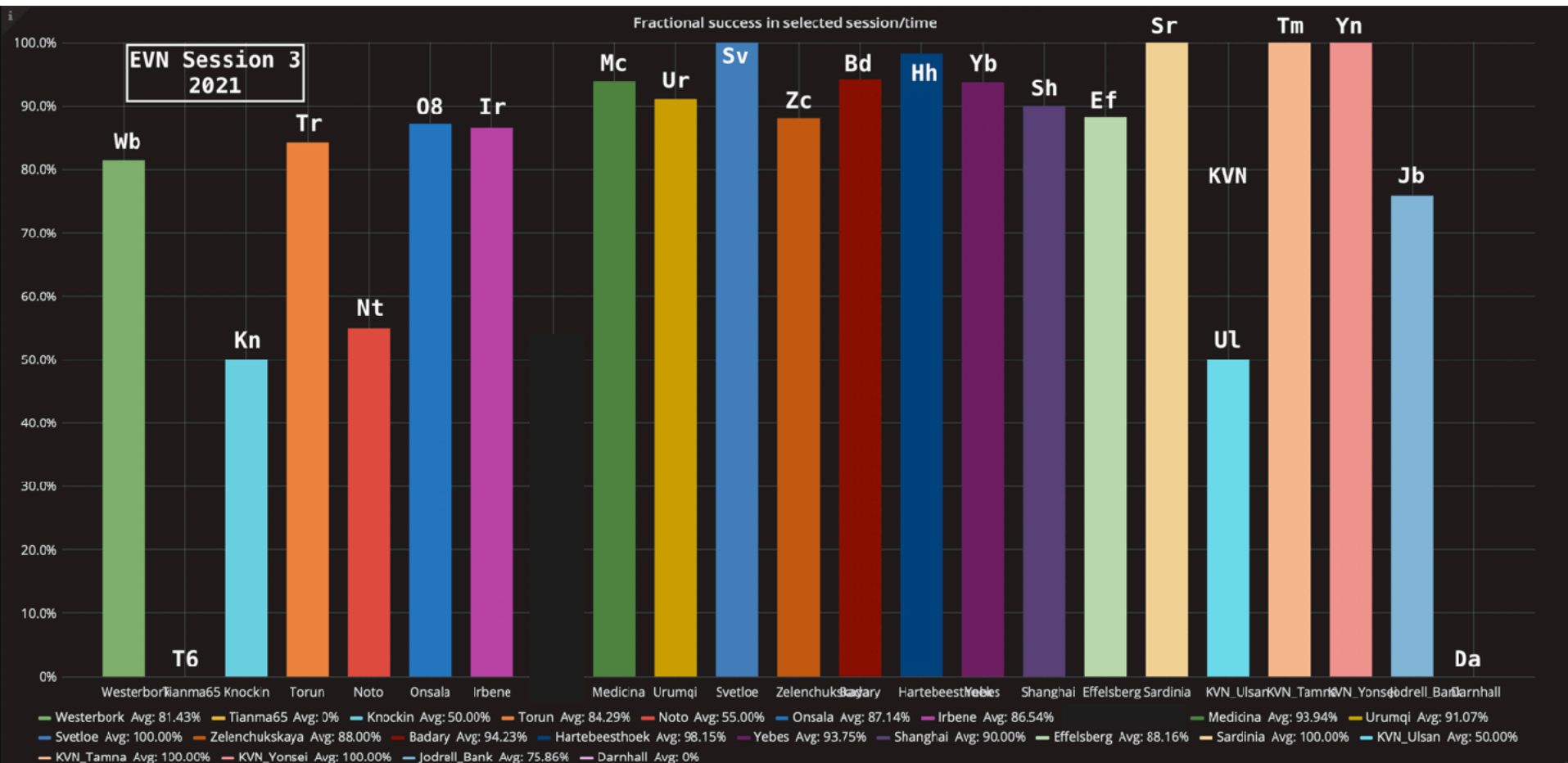
L-band NME May 2021



2021 Session 3 (Oct/Nov) notes and highlights

(including adjacent eVLBI sessions)

FAST: Tests w/o data transfer (see results in FAST talk, this TOG). **Wb:** Power outage. **T6/MER:** Only one experiment w/ technical issues. **Tr:** Drive and LO problems. Also, **first observation with new X-band receiver**. **Nt:** Weather stows, receiver cooling problems and broken DBBC2 (borrowed one from Sr). **O8:** Weather stows. **Ur:** **First participation in Q-band test**. Logged Tsys values in some experiments are unrealistic. **Zc/Bd:** Geo observations. **Sh:** National tasks. **Ef:** Weather stows and minor technical issues. **KVN:** Only one experiment, weather stows. **Jb:** Weather stows and technical issues. **Baby Ar (12m):** **first time in an X-band test**. **C-band:** **4 Gbps science experiments**.



2021 Session 3 (Oct/Nov) notes and highlights

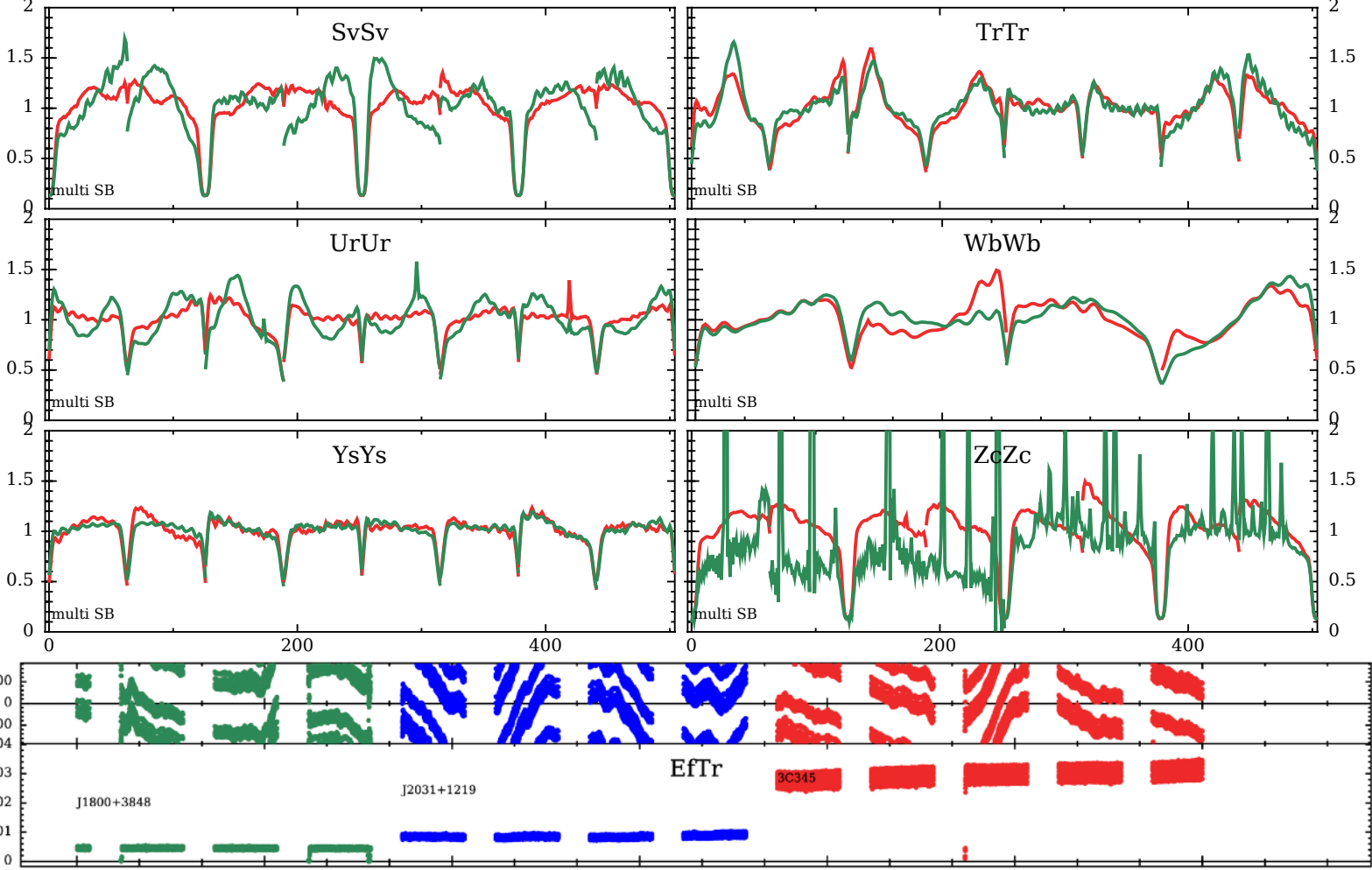
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N21X2

amplitude versus channel
unique: 12:57:00.00/sess321.X2048ar/J2031+1219
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jops@LOCALHOST 2022-01-18T16:20:10
page: 2/2

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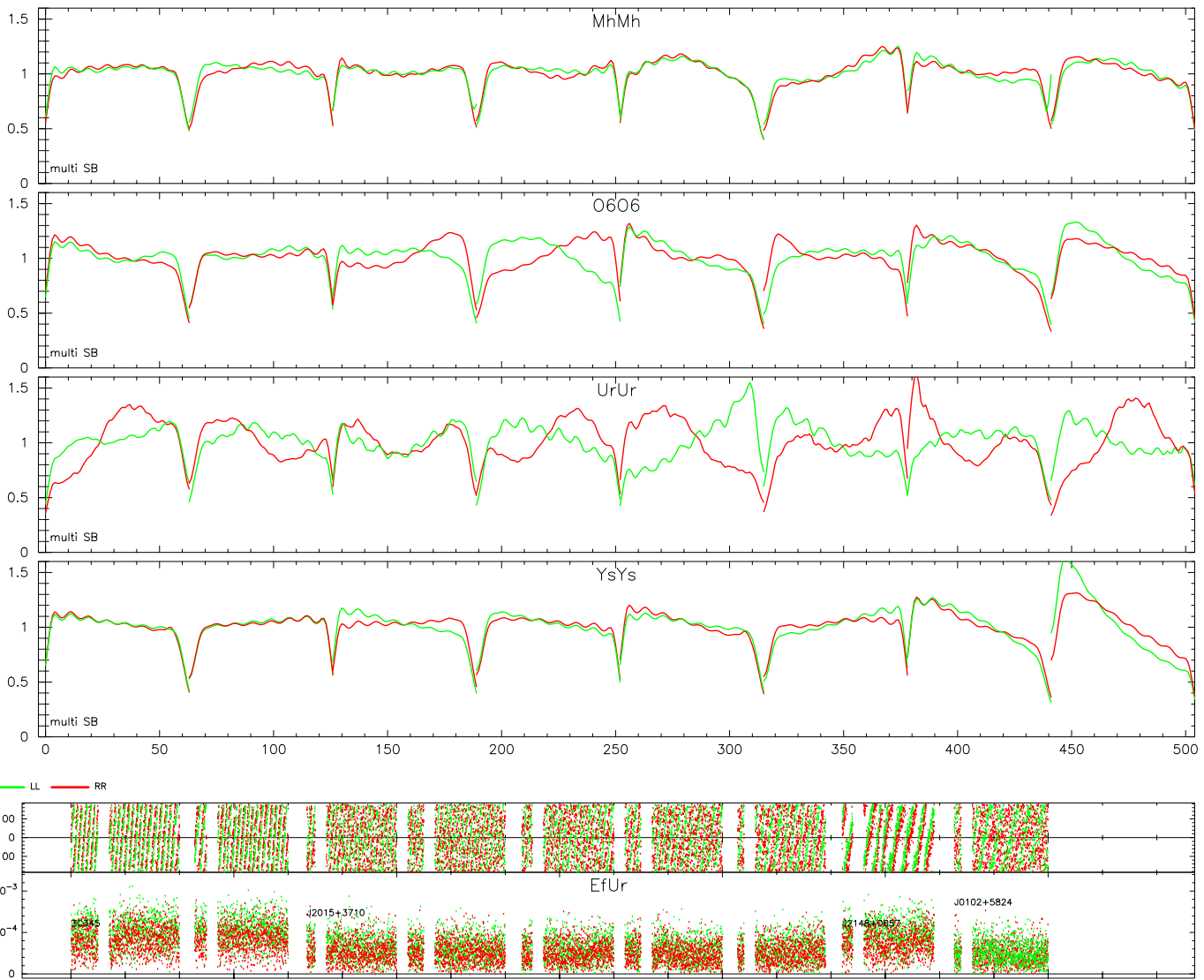
Westerbork Tianma65 Knockn Torun Noto Onsala Irbene Medicina Urumqi Svetloe Zelenchukskaya Badary Hartebeesthoek Yebes Shanghai Effelsberg Sardinia KVN_Ulsan KVN_Tamra KVN_Yonsei Jodrell_Bank Darnhall

Westerbork Avg: 81.43% Tianma65 Avg: 0% Knockn Avg: 50.00% Torun Avg: 84.29% Noto Avg: 55.00% Onsala Avg: 87.14% Irbene Avg: 86.54% Medicina Avg: 93.94% Urumqi Avg: 91.07%
Svetloe Avg: 100.00% Zelenchukskaya Avg: 88.00% Badary Avg: 94.23% Hartebeesthoek Avg: 98.15% Yebes Avg: 93.75% Shanghai Avg: 90.00% Effelsberg Avg: 88.16% Sardinia Avg: 100.00% KVN_Ulsan Avg: 50.00%
KVN_Tamra Avg: 100.00% KVN_Yonsei Avg: 100.00% Jodrell_Bank Avg: 75.86% Darnhall Avg: 0%

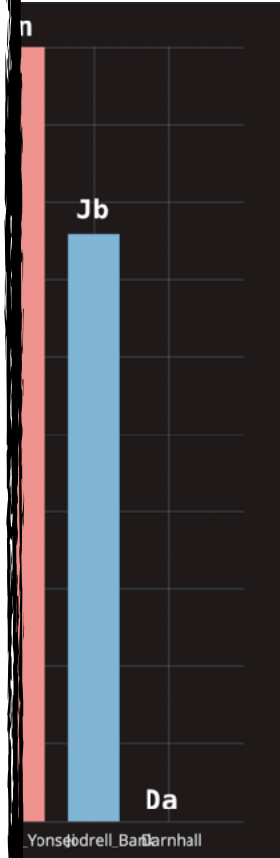
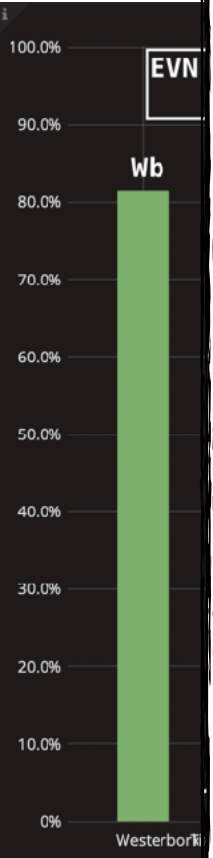
2021 Session 3 (Oct/Nov) notes and

(including FAST: Test technical cooling pr Logged Ts and minor Baby Ar (

amplitude versus channel N21Q1 data: n21q1_afterYsfocus.ms [DATA] jops@<??> 2022-01-14T12:49:48 page: 2/2
 unique: sess321.Q2048glob/14:02:30.00/J2148+0657
 Pol=LL,RR;Nsub=8;;
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periment w/ ws, receiver band test. other stows s.



- Westerbork Avg: 81%
- Svetloe Avg: 100.00%
- Zelenchuskaya Avg: 88.00%
- Badary Avg: 94.23%
- Hartebeesthoek Avg: 98.15%
- Yebees Avg: 93.75%
- Shanghai Avg: 90.00%
- Effelsberg Avg: 88.16%
- Sardinia Avg: 100.00%
- KVN_Tamna Avg: 100.00%
- KVN_Yonsei Avg: 100.00%
- Jodrell_Bank Avg: 75.86%
- Darnhall Avg: 0%
- Urumqi Avg: 91.07%
- KVN_Ulsan Avg: 50.00%

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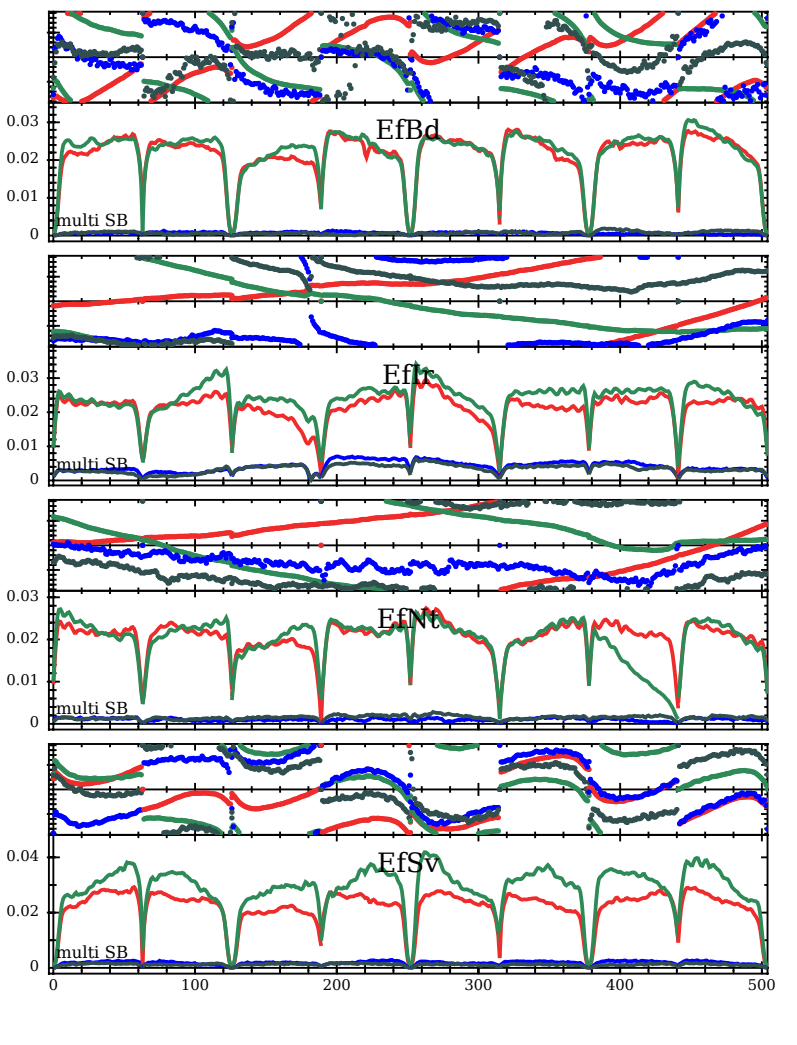
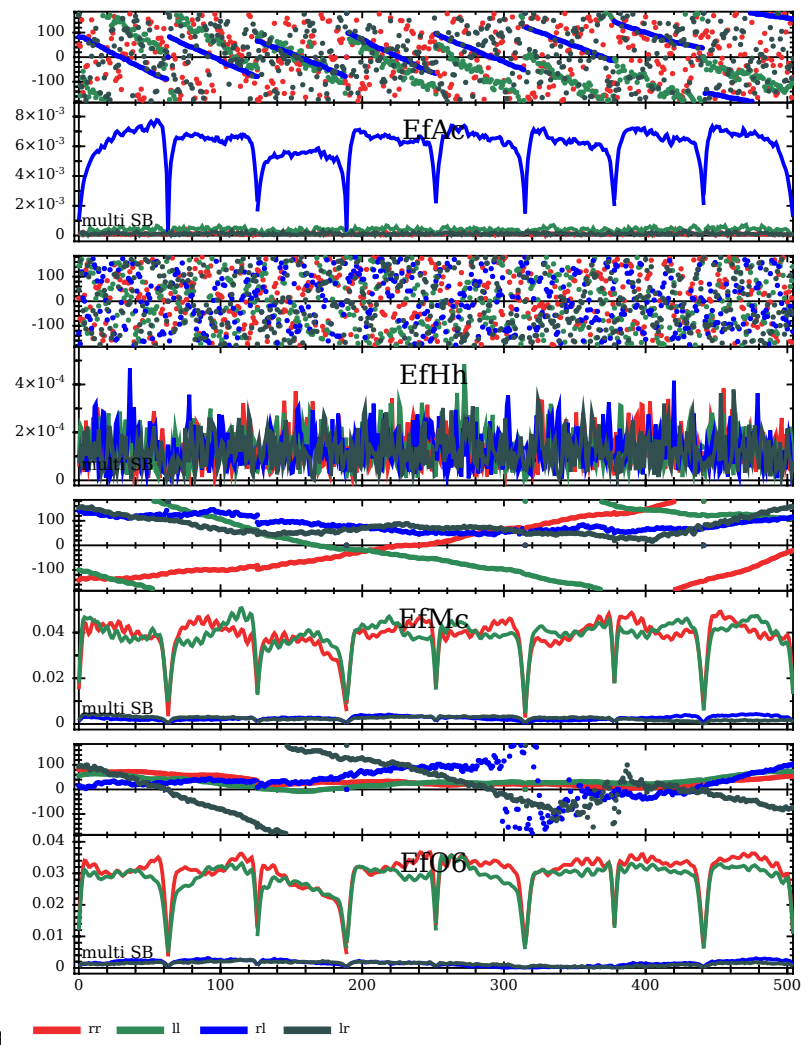
N21X2

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page: 1/2

amplitude+phase versus channel
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Pol=LR,LL,RR,RL;Nsub=8;;;
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rr ll rl lr

100.0%
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80.0%
70.0%
60.0%
50.0%
40.0%
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Westerbork Avg: 81.43%	Tianma65 Avg: 0%	Knockin Avg: 50.00%	Torun Avg: 84.29%	Noto Avg: 55.00%	Onsala Avg: 87.14%	Irbene Avg: 86.54%	Medicina Avg: 93.94%	Urumqi Avg: 91.07%
Svetloe Avg: 100.00%	Zelenchukskaya Avg: 88.00%	Badary Avg: 94.23%	Hartebeesthoek Avg: 98.15%	Yebees Avg: 93.75%	Shanghai Avg: 90.00%	Effelsberg Avg: 88.16%	Sardinia Avg: 100.00%	KVN_Ulsan Avg: 50.00%
KVN_Tamna Avg: 100.00%	KVN_Yonsei Avg: 100.00%	Jodrell_Bank Avg: 75.86%	Darnhall Avg: 0%					

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4 Gbps (and everything else) NME during Session 3

amplitude versus channel

N21C3

unique: sess321.C4096/14:45:01.00/J2031+1219

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page: 1/5

amplitude versus channel

N21C3

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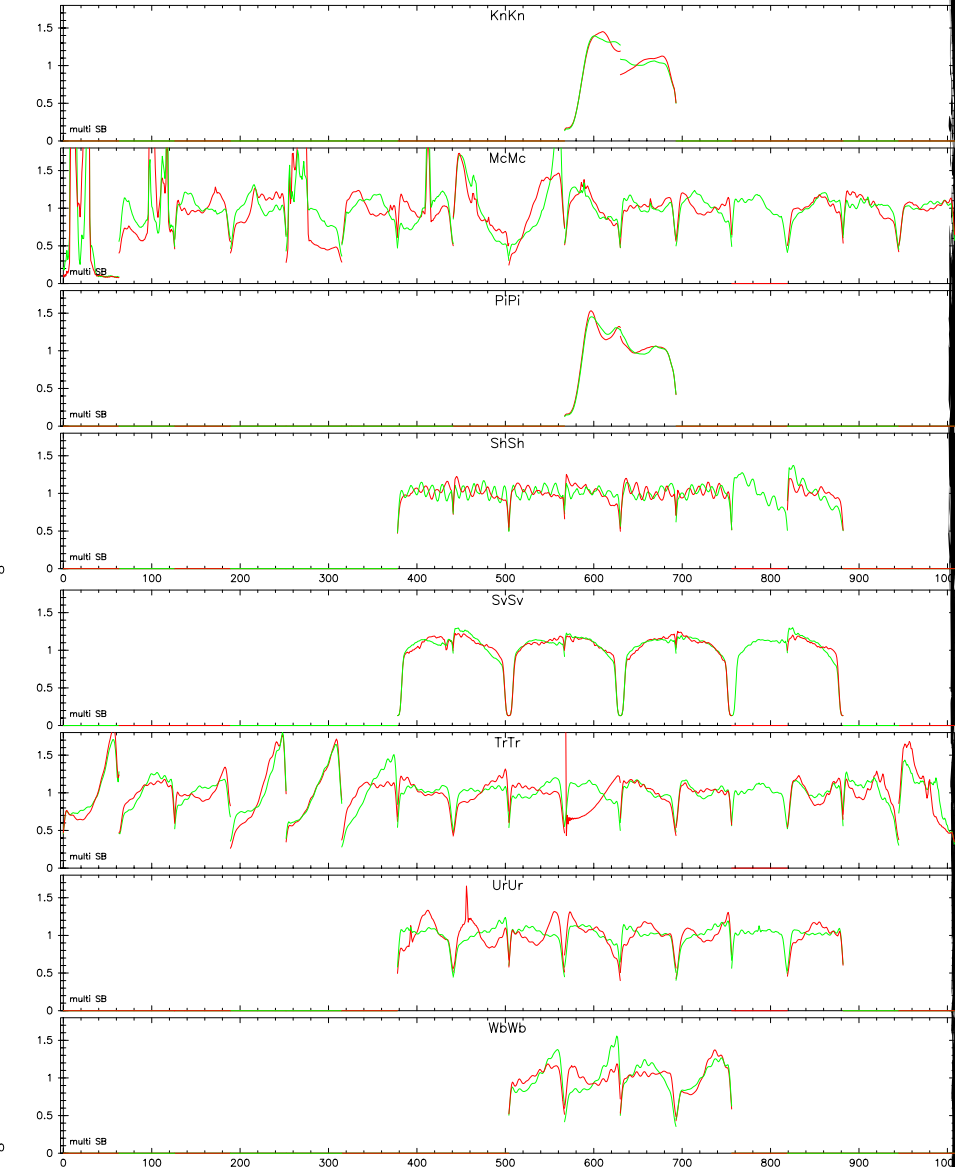
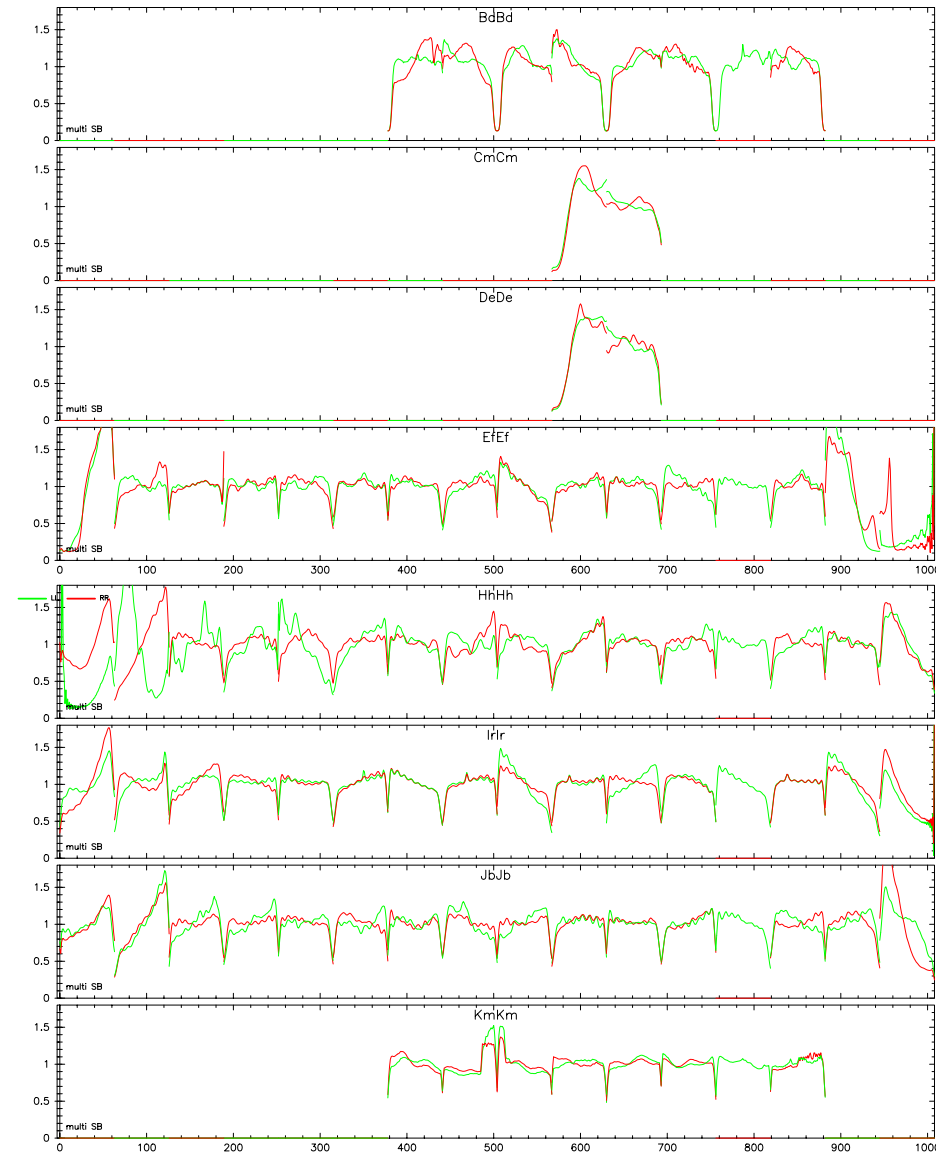
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[Vector avg'ed 21-Oct-2021/14:45:01.000->21-Oct-2021/14:45:01.000]

data: n21c3-scan12.ms [DATA]

jops@LOCALHOST 2021-10-22T11:35:06

page: 3/3



— LL — RR

Other experiments (May 2021–Jan 2022)

Yebes wideband C/X test, FT043

In December. Ef, Mc, Wb, Nt, O8, Yb. **Fringes in all three sub-bands.** (See also talk by Cristina Garcia-Miro: *The new wide band CX-receiver at Yebes.*)

Test of new Torun X-band RX, FT041

In May. Mc Nt O8 Ir Ib Tr. Fringes.

Testing new maser at Westerbork, FT042

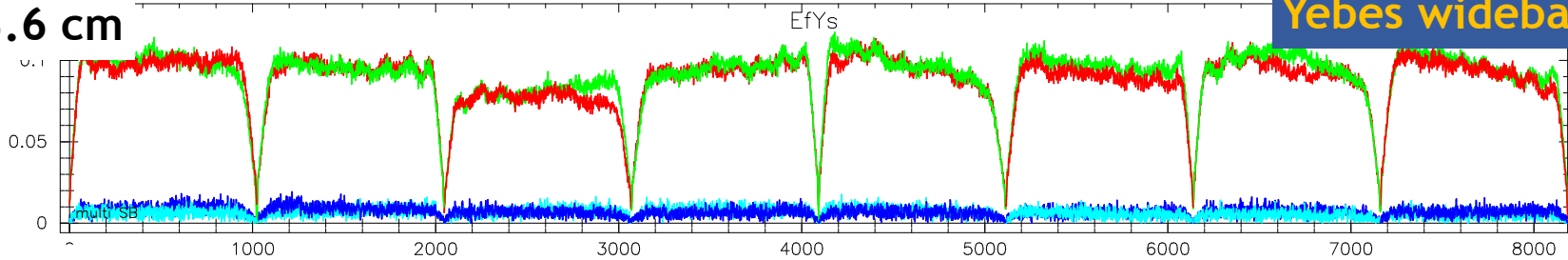
Also in May, L-band. Tr O8, Wb. Fringes.

ToOs and eVLBI

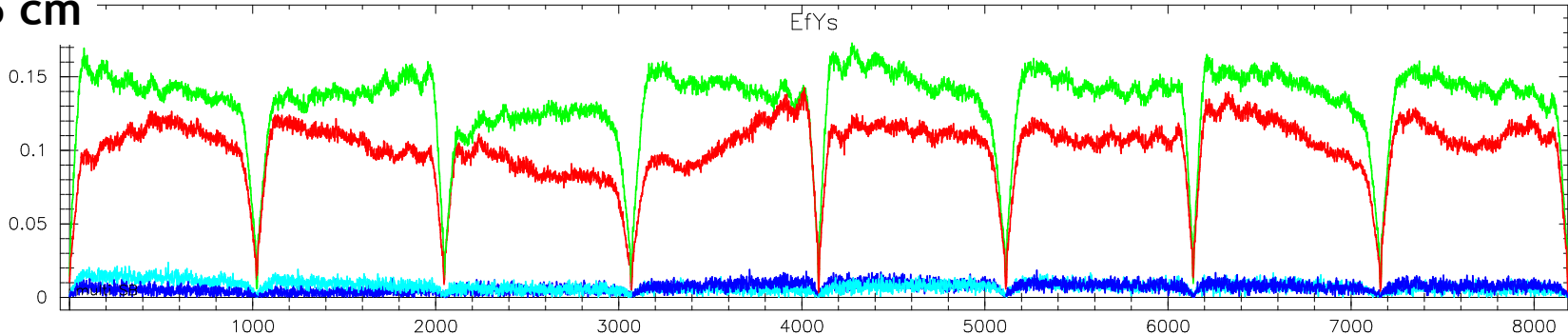
Several X/L monitoring experiments of a nova outburst (Aug~Oct). eVLBI is still going regularly every month. Multiple monitoring experiments, MPC and FRB observations (with parallel recording).



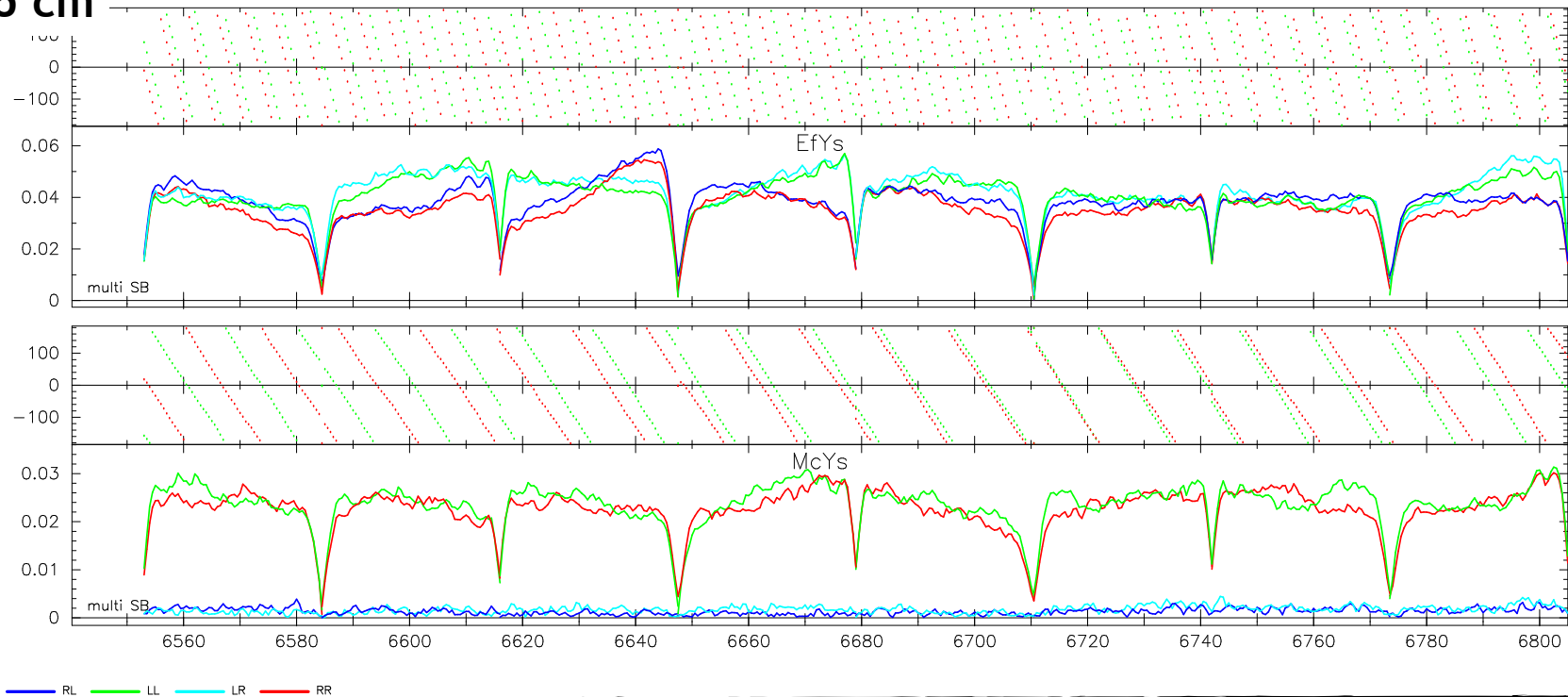
3.6 cm



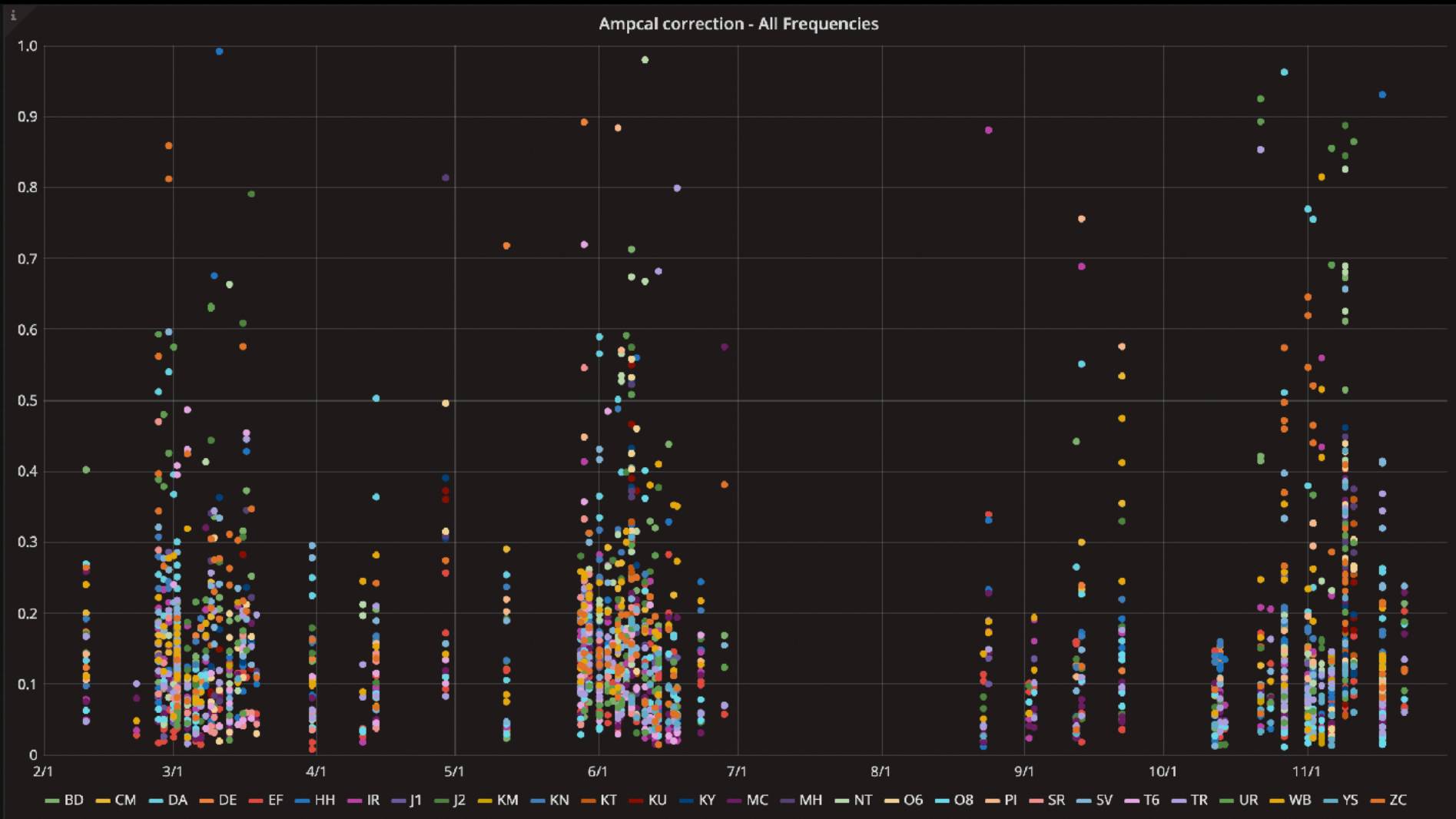
6 cm



5 cm



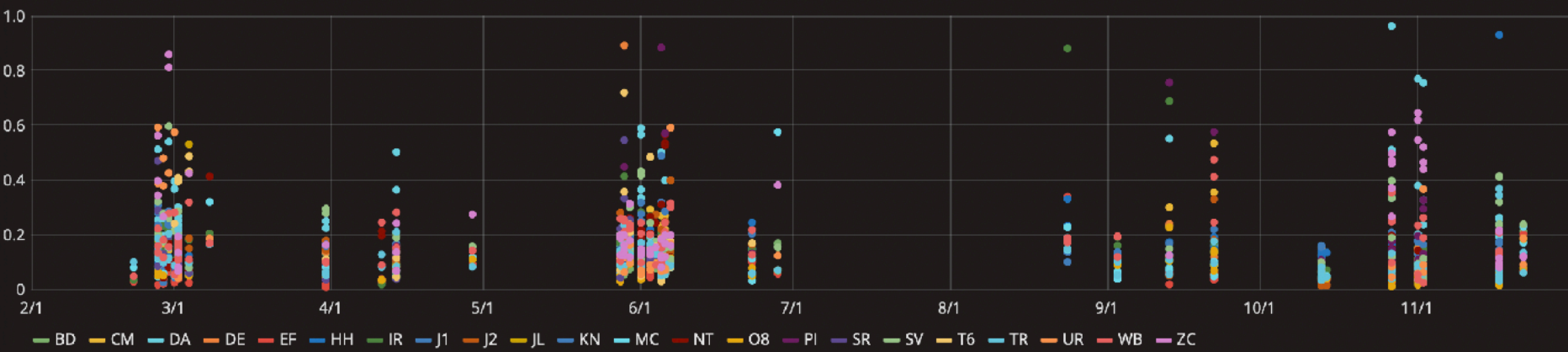
Median of absolute errors in gain calibration (February – November 2021)



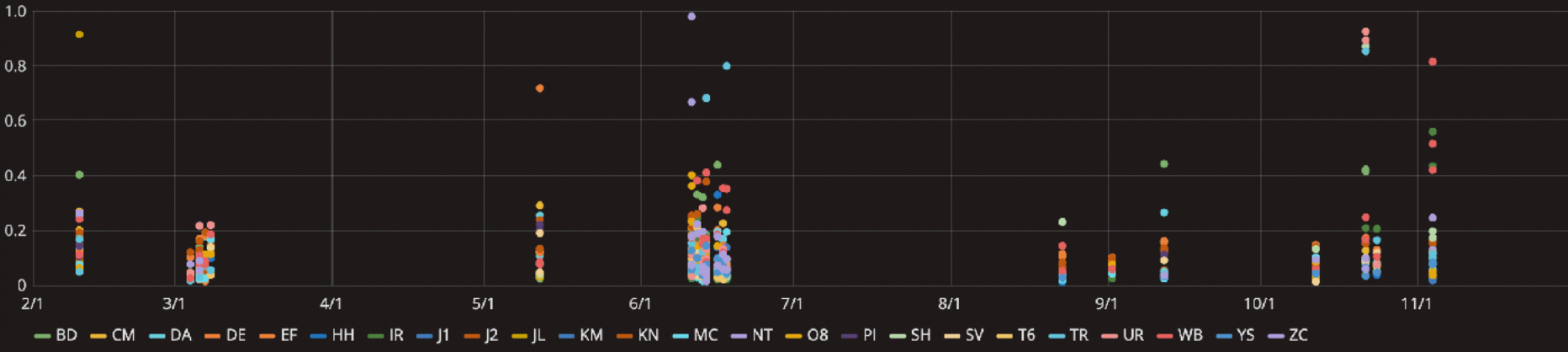
Note: these errors are calculated from AIPS amplitude gain corrections in each IF after self-calibration. It aims to characterize how "reliable" are the gain corrections at each station and experiment. Smaller the better (Difmap analogy: related to the variance in "gscale" values).



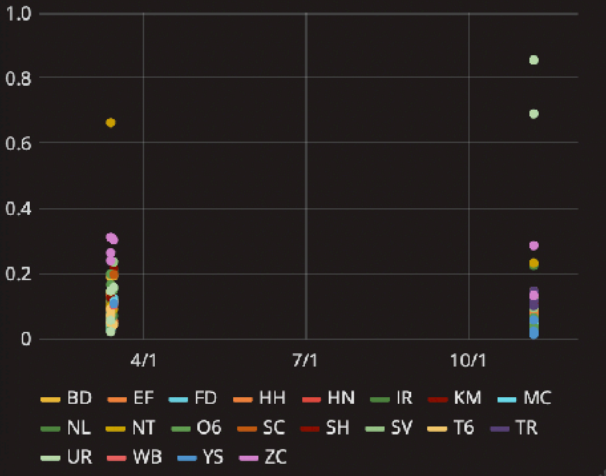
L-Band



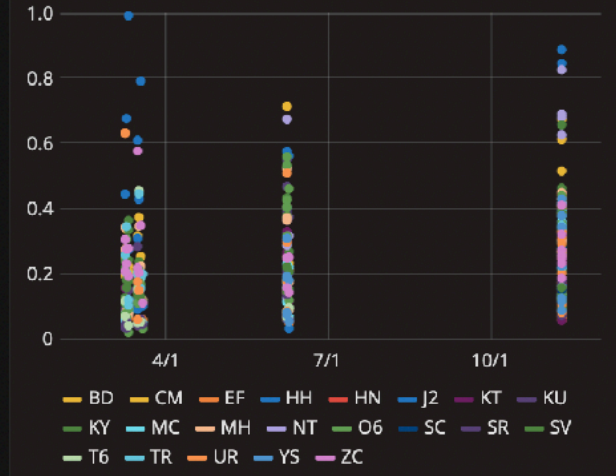
C/M-Band



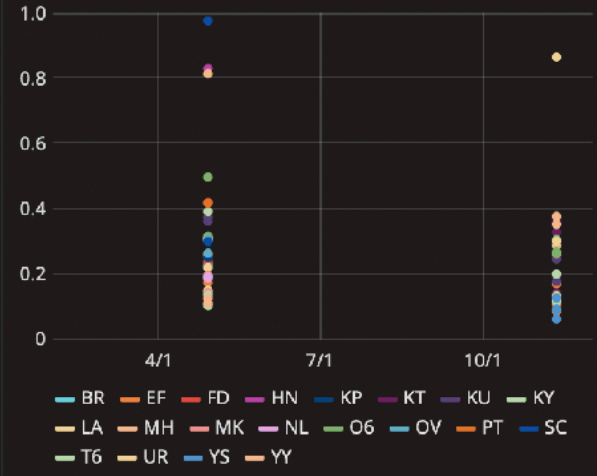
X - Band



K - Band



Q - Band



Median of absolute errors in gain calibration



These are the session averages of the previous experiment-by-experiment values. Numbers are sensitive to how many experiments were averaged out. Orange: above 20% average errors. Red: >50%.



Median of absolute errors in gain calibration

Ar	Bd	Cm	Da	De	Ef	Hh	Ir	J1	J2	Km	Kn
N/A	0.11	0.2	0.3	0.4	0.09	0.16	0.18	0.12	0.2	N/A	0.2
Kt	Ku	Ky	Mc	Mh	Nt	O6	O8	Pi	Ro	Sr	Sv
N/A	N/A	N/A	0.10	N/A	0.3	N/A	0.09	0.51	N/A	0.17	0.17
T6	Tr	Ur	Wb	Ys	Zc	L band (Session 2, 2021)					
0.17	0.12	0.13	0.19	N/A	0.16						

Bd	Cm	Da	De	Ef	Hh	Ir	J1	J2	Km	Kn	Kt
0.18	0.18	0.15	N/A	0.11	0.07	0.07	0.13	0.2	N/A	0.2	N/A
Ku	Ky	Mc	Mh	Nt	O6	O8	Pi	Ro	Sr	Sv	T6
N/A	N/A	0.08	N/A	0.8	N/A	0.15	N/A	N/A	N/A	0.07	0.08

Tr	Ur	Wb	Ys	Zc	C/M band (Session 2, 2021)						
0.2	0.11	0.2	0.07	0.10							

Ar	Bd	Cm	Da	De	Ef	Hh	Ir	J1	J2	Km	Kn
N/A	0.4	N/A	N/A	N/A	0.13	0.4	N/A	N/A	0.3	N/A	N/A
Kt	Ku	Ky	Mc	Mh	Nt	O6	O8	Pi	Ro	Sr	Sv
0.2	0.4	0.4	0.14	0.3	0.2	0.4	N/A	N/A	N/A	0.13	0.17

T6	Tr	Ur	Wb	Ys	Zc	K band (Session 2, 2021)					
0.11	N/A	0.3	N/A	0.15	0.20						

Median of absolute errors in gain calibration



Closing notes (summary of 2021)

- A lot of experiments, good looking amplitudes, new antennas, receivers. EVN = Earth VLBI Network?
- Urumqi started sending ANTAB files regularly, implemented antabfs. However, Tsys values seem to be random and are not always usable.
- Gains look good, but one issue: opacity corrections for K/Q-band is done differently (or not done) at each station, causing large errors.
- Automatic ANTAB flagging and uploading to vlbeer? It would be good to share tools between antennas (there is a GitHub set up for this).
- Please continue uploading ANTABs and LOG files without JIVE asking for it. Please also check if they are valid or not. However, there were huge improvements in this over the year. Thank you!
- More communication from stations during tests and NMEs to know what is going on.
- Block schedule for eVLBI sessions earlier, if possible, for easier key file preparation.

In general: communication, communication, communication. The key to VLBI.

Remarks? Comments? Did I miss something? (Please don't hesitate to get in touch.)

✉ orosz@jive.eu

\$ Tool for helping communication (in development, needs some monitoring data from stations):

evn-monitor.jive.eu

(See talk by Aard Keimpema: *A centralized real-time EVN monitoring system.*)

\$ Improvements in Grafana and Station feedback forms also in progress.

\$...

