EVN Technical and Operations Group Meeting

**By Zoom teleconference (COVID-19), Hosted by MPIfR/Bonn,
Feb 8 2022, 09:30 CET**

Minutes

Participants:
The number of online participants peaked at 46 (51 registered on the Indico event page[1]), from 16 countries and 19 organizations/stations. Screenshots of the participants list are attached at the end of the minutes.

Agenda:
The agenda is published online[2] on the Bonn RadioNet wiki.

Additional information on:
Indico Event Page:
https://events.mpifr-bonn.mpg.de/indico/event/246/
All station reports and presentation files:
https://radiowiki.mpifr-bonn.mpg.de/doku.php?id=na:sustainability:tog:2022_02

1. Local Arrangements/Opening Remarks (Bach (chair))
Bach welcomes everyone to the teleconference. No local arrangements necessary.

2. Approval & last-minute additions to Agenda (all)
Colomer asks for a GVA update to be added to the afternoon session pt 2 of the agenda.

3. Acceptance of minutes from last meeting (all)
Minutes of the previous zTOG, online, Apr 29th 2021, were approved without comments.

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[1] https://events.mpifr-bonn.mpg.de/indico/event/246/registration/registrants
[2] https://radiowiki.mpifr-bonn.mpg.de/doku.php?id=na:sustainability:tog:2022_02:tog-agenda-2022-02

4. Review of Action Items from last meeting (all)

1. **Bach:** investigate use of HOLOG for creating beam map
   Done; see agenda item 8 later on.
   Action remove action item

2. **All:** 80 Hz continuous calibration. Update the table on the wiki[3]
   TianMa 65m updated the table indicating availability of continuous cal for
   L- through K band. Decided to keep the Action Item on this list because of
   increased visibility with respect to the Permanent Action Item list.
   Action remains

3. **González:** find `atm` binary or preferably source code for distribution, that
   can be used to calculate opacity from FS weather information and inject it
   into the log.
   Gonzáles reports that FORTRAN code was found but was unable to
   compile on available system.
   Action remains for **González**

4. **Bach, Rottmann:** look at EHT station set-up document and see if it could
   be modified for use in the EVN
   Progress: documents shared by Rottmann; not modified for use with the
   EVN yet.
   Action remains

5. **Bach:** investigate how Tsys and opacity are determined at K band and
   higher at stations. Discussion continues on Mattermost.
   No progress, so action remains.
   Action remains, discuss on Mattermost

6. **Marcote, Bach, Campbell:** Improving the session feedback, how to
   provide a better feedback about the "success" of EVN observations in the
   feedback page and for future TOGs.
   Cont'd from previous TOG; some progress, small steps.
   Marcote: three separate actions identified. Update the feedback pages
   (cleaning up), some experiments on internal reporting done but put on
   hold because they require synchronization with changes in the archive
   and improve gains reported in Grafana. Agreed to change from absolute to
   relative gain in the latter; if implemented will break history of values.

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[3] https://deki.mpifr-bonn.mpg.de/Working_Groups/EVN_TOG/Continuous_calibration

Paragi comments that in the current system, when (sometimes huge) corrections have to be applied manually by support scientists - indicating a problem with a station - is hidden. **Marcote** Grafana indeed shows offset wrt ideal ANTABs, but does not show manual edits applied to get them into this state; want to include those in the future.
Action remains

7. **All:** Verify/improve the automatic ANTAB file upload script
The perl script also uploads the FS log files; expect failures to upload to be reported in the Reliability/Performance part of the agenda.
Action remove action item

8. **Paragi, Bach, Kettenis, Campbell:** Investigate most requested BBC filter bandwidths. Reducing the number of filters provided by DBBC3 firmware should free memory to improve the shapes of the remaining filters.

    Bach discussed this with Tuccari; bottleneck is number of BBCs on a single core board. A reduced version with 8 BBCs/IF at 128 MHz BW can give 16 Gbps with much more improved filter shape. A dedicated 32 Gbps version can follow. **Campbell** this is for DBBC3 only? **Bach** v108 for DBBC2 is in the pipeline (for a long time already), not released yet.
    Kettenis created histogram of filter bandwidths used in 2021. This is biased because PIs are driven towards what's currently best -- 32 MHz for continuum, having the flattest bandpass, < 32 MHz for spectral line, avoiding 2 MHz -- not what PIs request.

    Discussion follows about using spectral zooming to use (wide) filters with flattest bandpass for spectral line instead, and effect of whether Tcal is flat over wide spectral window, as well as on how to handle non-flat receiver, BBC bandpass, Tcal frequency response on calibration of mixed bandwidth or spectral zoom data.
    Bach Tuccari implemented higher resolution total power readouts on DBBC3. **All involved** agree this is better. As to calibration: CASA can handle the case where more calibration data is supplied than observed but not well tested; within AIPS not possible yet, would require significant development. **Paragi** we should coordinate BW compatibility in the GVA.

    Action remains, but changed to: discuss reduction of number of BBCs/core board and impact on (future) calibration of wide bands.

5. Review of Permanent Action Items (all)

Bach requests everyone to make sure their contact information is up to date. There is an intent to start a separate TOG mailman list: EVNtech has grown too broad an audience - it is used for general VLBI announcements these days such as CfPs. Privately sending a direct mail to > 50 recipients make some mail systems quickly mark the sender as spammer and disable sending for a limited time. **Verkouter** mentions there is a mail system change happening at ASTRON/JIVE, not sure if mailmain remains supported. **Kettenis** for the moment IT will keep it running in parallel since it could not be made to work in the new system. Suggestion is to keep EVNtech as equivalent to vlbi@nrao, and create new mailing list for addressing only EVN technical staff.
In the chat it is reported that the link to the EVNtech mailman list does not work, which turns out to be an erroneous link on the wiki page.
+Action Bach to fix the link.

Campbell some users get so frustrated by the lack of beam maps that they schedule measurements in their own experiments.

6. Reliability/Performance of the EVN

Presentation by **Orosz**[4].
During the presentation in the chat: **Jang** are the phase jumps between scans at `Ir` explained? **Campbell** they were traced to the LO being reset in gaps.

Garcia-Miró anything more on session III/Q-band? **Campbell** not fully correlated yet.

Bach during session III some schedules very late: halfway through session still receiving schedules, any idea why? **Campbell** many complex observations but certainly not main reason. **Gunn** two-week deadline mostly ignored anyway. After PC approves, still have to wait for communication with the PI to verify if what was given aligns with science goal, handle changes in constraints, GSTs, antennas that are more difficult to schedule (associate members), and then a few round trips between scheduler and PI to finalize, so in practice not much scope to shorten timeline.

Bach good to see that Mattermost is working well for communication. **Orosz** the EVN method of communication is scary to see how little (monitoring) information is flowing compared to LBA, which uses the Monica monitoring system that shows full telescope status real-time.

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[4] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:jive-scisu-report_tog-2022-02-08.pdf

Alef Q-band calibrations, are they opacity corrected or not, are discussions ongoing, how to implement? **Bach** there is still an AI on this, it sais K-band *and higher*. Some stations correct, some don't.

The discussion that follows deals with the FS's `gnplt` utility being able to plat Tsys versus elevation with opacity correction. **Himwich** sais the functionality exists but could do with proper use and testing. Some stations (**Ef**, **Ys**) report that when they tried it seems `gnplt` overestimates compared to measured values (e.g. comparing to the WVR at **Ef**). `gnplt` requires a spillover table in the station's `rxg`-file to be present.

+Action Bach compare `gnplt` opacity estimation versus WVR measurement.

7. Recent difficulties/problems/failures
These were already discussed under the previous agenda item.

8. Recent solutions
Bach presents the FS `holog` based procedure to measure beam maps[5]; it is a lot simpler than previously expected. The procedure takes under two hours on a slow dish as **Ef**. Script and documentation will be put on the EVN github[6].

Some discussion on the resulting (power)beam map follows, whether a gaussian is a good fit. **Keimpema** Airy certainly not model for physical dish, **Campbell** power beam has first side lobe suppressed anyway, possibly square of Airy? **Bach** many use sinc. Biggest problem is when PIs go out to 10' where the HPBW of **Ef** at 21cm is 11'; not necessary to model sidelobes. There is probably no need to repeat the procedure every *n* years, but sampling elevation could be useful. These maps are useful below C band.

9. Recorders: Mark 5, Mark6, Flexbuf
Bach continues presentation, reports on storage upgrades and who still have to initiate this process.

Paragi mentions that the user request for 4 Gbps has risen, making this a priority. **Campbell** the same is true for recorded e-VLBI, the demand of which has increased but which was never budgeted in the FlexBuff correlator storage setup. Some thought may be given to recording at the station instead.

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[5] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:tog_2022-02.pdf
[6] https://github.com/evn-vlbi/BeamMaps

4 Gpbs status: `Ur` unclear: still listed as Mark5, but if Mark6/Flexbuff available, could be a 4 Gbps station too. EVN 4 Gbps tests at C and K band, not at X band yet. Global 4 Gbps limited by VLBA tunability.

The meeting is suspended for a short coffeebreak, to resume at 10:40 UT.

10. Stations

Presentation *Status of VLBI at FAST* by **Chen**[7]. No specified time frame when FAST will join EVN observations yet, first require an agreement between NAOC and the EVN.

Presentation *RFI monitoring at Yebes Observatory* by **Bautista Durán**[8].
Bach remarks on increased RFI at high frequency (77 GHz) on account of car radars. The system seems interesting for the BRAND receiver as a-priori input into the system, which could use AI for non-const RFI flagging.
Verkouter could data be automatically flagged based on this? **Paragi** urges to not do that automatically. Maybe a flag file could be generated and then PIs can decide whether to apply it or not.

11. JIVE: eVLBI and operations

Presentation on *The centralized real-time EVN monitoring system* by **Keimpema**[9].

The discussion following the presentation revolves around two things: request to display on/off status, which would be extremely useful to know, and Tsys. For continuous Tsys monitoring the questions are: can you get it without the FS running and it is useful without knowing the full setup?

Himwich with the FS `display_server` it can be running all the time. The current system monitors only a limited amount of properties, this is by design, a very low barrier to entry. The whole system setup can be monitored but that requires a higher investment and buy-in from the station itself. Probably, for monitoring station health a continuous Tsys monitoring could be very useful, even without being able to verify/interpret the values.

Rottmann mentions that the Radboud Radio Lab monitoring system is actually quite advanced and could do with being looked at, it has been very useful.

[7] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:fastanditsvlbi.pdf
[8] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:tog_rfi_8feb2022.pdf
[9] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:evn-monitor.pdf

Presentation on *Technical operations and R&D at JIVE*[10] by **Verkouter**.

12. Technical developments
Presentation *The new wide band CX-receiver at Yebes* by **Garcia-Miró**.

There is some discussion on polarization issues on the (ultra-)wide band receivers, which are predominantly use linear polarization. In the `Ys` C/X receiver there is physical hybrid to convert to circular polarization, but Ef tech staff seem to advocate against it. **Paragi** in VLBI we're getting used to linear polarizations, there is some good coming out of it as well since it allows for feed angle calibration. **González** `PolConvert` is routinely used these days, but it relies on the phase cal signal.

This was the end of the morning session. Reconvene at 14:00 UT for the afternoon session with the US.

12. Technical developments (cont'd)
Before the break **Rottman** agreed to move his presentation *Update on the BRAND receiver[11]* to the start of the afternoon session.

Funding has been found at MPG to extend the sampler chip order to 30 units (minimum order size); from within the EVN 11 units have been ordered but more orders are still welcome.
BRAND is not a RadioNet project anymore and funding now has to be sought under three directors. The biggest part lacking at the moment is the shielding box.

Colomer have there been specific requests to build receivers by EVN stations?
Rottman after prototype has been demonstrated we expect interest to go up.

1. Field System, status and new features
Presentation **Himwich** about current FS status[12].

Brisken what is the status of the single VDIF thread per file code? **Verkouter** it's implemented, tested and in use for over two years now.

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[10] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:verkouter-r_d.pdf
[11] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:20220207togmeetingbrand.pdf
[12] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:weh_tog_feb_2022.pdf

The VEX2 status was discussed. It is supported at JIVE, some experiments cannot even be correlated without a VEX2 file.

Himwich VEX2 support is still missing in `DRUDG`, but it's only a small subset of VEX2 that's required, which means implementing it would be moderately simple, but strongly depends on GSFC's priority list.

2. VLBA and Globals

Colomer talks about the Global VLBI Alliance, stressing the need to get a global aspect into the TOG - a global TOG (GVAT). Other networks have organisations similar to the TOG and maybe a standing invitation to representatives of such to the TOG should be organized. Maybe consolidation between the annual International VLBI Technology Workshop (IVTW) and the GVAT could be investigated.

Presentation *Status on the EVN Technical roadmap* by **Bach**[13].

Presentation *VLBA status*, jointly given by **Blanchard** and **Brisken**[14].

Rottman lack of GMVA feedback primarily due to COVID-19 optimism; "it will be over soon". The spring session is still being correlated, having had to deal with investigating ALMA problems: after much effort, **Crew** found a 3 MHz LO offset. No major issues with the VLBA.

A discussion on direct sampling receivers and VLBA New Digital Architecture (VNDA)-like systems such as BRAND/DBBC3 or GPU-based backends ensues. When BRAND is up at `Ef` (time frame unknown) and produces VDIF it could stream (the subset NRAO can handle) into the VNDA system.

Bach remarks that in `Ef` more and more receivers, existing and new, are reworked to use direct sampling, following GPU-based backend processing. The protocol used is SPD (as used in e.g. MeerKAT), not VDIF.

Verkouter SPD only used locally, not for exchange to others?

Bach SPD only used for full band sampled into EDDB (Effelsberg Direct Digitalisation Backend), VLBI product (finer channels) will be stored in 2-bit VDIF by the DBBC3.

Kettenis this can also be done in GPUs, which would require development.

Bach these capabilities are already available in the DBBC3, problem is getting the data in, which is simpler than re-implementing on GPU.

Rottman EDDB designers prefer to duplicate DBBC3 functionality, but operationally difficult because then relies on third party to timely implement changes/fixes.

[13] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:tog_2022-02.pdf
[14] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2022_02:vlba-gmva-tog_2022.pdf

Kettenis a software module that implements this functionality on the GPU may materialize within the scope of the INFRA-TECH proposal, if funded.
Bach LBA, NARIT (Thailand) will likely use this technology too.

Himwich detailed implementation question: implement e-VLBI override in DRUDG (set target correlator to e-VLBI-JIVE), is it ok if `DRUDG` strips `/FiLa10G` from the rack type?
Quick this can be done safely, important FiLa10G setup done through `fmset`.

Campbell there is an upcoming L-band test between EVN and uGMRT, dual pol 16 MHz from 1443 MHz on Mon 14 Feb 2022, backup date 28 Feb.

The date and place of the next meeting were briefly discussed. A primary suggestion was to meet in September in Bonn since it was that TOG meeting that got cancelled. An alternative might be to meet in Socorro, setting the scene for a Global VLBI Alliance Technical operations group.

The TOG ended around 15:40 UT.

List of participants, sampled around 8 Feb 2022 09:42 UT

Participants (44)	Participants (44)	Participants (44)
Marjolein Verkouter (she/her) (me)	Christian	Nikom
Uwe Bach (Host)	Cristina Garcia Miro	Olga Bayandina
bob campbell	Ed	Paco Colomer (JIVE ERIC)
Gabor Orosz	Gabriele Surcis	Paweł Wolak
Aard Keimpema	Helge Rottmann	Preeti Kharb
Alastair Gunn	Javier Gonzalez	Richard Blaauw
Andrea Orlati	Jonathan Quick	Roger Hammargren
Ari Mujunen	Juha Kallunki	Roman Feiler
Benito Marcote	Jun Yang (Onsala, Sweden)	Salvo Buttaccio
beppe	Kitiyanee Asanok (NARIT, Thailand)	Viswesh Marthi
Bert Harms (JIVE)	Koichiro Sugiyama	Vladislavs Bezrukovs
Bob Eldering	Magnus Dahlgren	Walter Alef
Bong Won Sohn	Mark Kettenis	Yan Hao_XAO_Ur
Carlo Migoni	Marta	Zsolt Paragi
chenrr	Martin Leeuwinga	