EVN Technical and Operations Group Meeting

By Zoom teleconference (COVID-19), Hosted by MPIfR/Bonn,
Apr 29 2021, 10:00 CEST

Minutes

Participants:
The number of online participants peaked at 45 (39 registered on the Indico event page[1]), from 15 countries and 20 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.

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)
Rottmann asks for a BRAND update to be added to the agenda.

3. Acceptance of minutes from last meeting (all)
Minutes of the previous zTOG, online, Nov 24th 2020, were approved without comments.

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

1. **Bach:** investigate use of HOLOG for creating beam map
   Not done yet
   Action remains

2. **All:** 80 Hz continuous calibration. Update the table on the wiki[3]
   Only the "hard ones" remain – stations for which cont. cal. is difficult to implement. Decided to keep the Action Item on this list because of increased visibility with respect to the Permanent Action Item list.
   Action remains

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[1] https://events.mpifr-bonn.mpg.de/indico/event/188/registration/registrants
[2] https://radiowiki.mpifr-bonn.mpg.de/doku.php?id=na:sustainability:tog:2021_04:tog-agenda-2021-04
[3] https://deki.mpifr-bonn.mpg.de/Working_Groups/EVN_TOG/Continuous_calibration

3. **Vicente:** 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.
Vicente requests the Action Item to be transferred to Javier González García, who accepts.
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
No progress; the document still looks very applicable so:
Action remains

5. **Bach:** contact subgroup of interested/experts and to investigate how T_{sys} and opacity are determined at K band and higher at stations to improve K-band amplitude calibration
Document started and it seems that an expert group might not be needed; the document could become a HowTo.
Paragi: some confusion remains as some stations provide opacity corrected gain curves, some don't. Should the Action Item address this to clarify what needs to be done for calibration at high frequency?
Suggestion to move the discussion to Mattermost[4]
Action remains, discuss on Mattermost

6. **Marcote, Bach, Campbell:** Better impact reporting discussion and/or implementation
Discussion was started but not finished yet.
Marcote: followed up internal at JIVE, not communicated to Bach yet, pending finalization of internal discussion.
Bach: minor failures provide (a lot of) noise in the visual representation. This is being addressed.
Action remains

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[4] https://coms.evlbi.org/

7. **Bach:** Review Permanent Action Items
    Updated links in there to the new `evlbi.org` website, added beam-maps for wide-field VLBI to the list.
    The disk pool item mentions investment in Mark5 disk packs only: modified to mention FlexBuff capacity, including target to double FlexBuff storage to 500 TB at station and correlator each by the end of 2021.
    Some old items remain and might need further updating.
    Action remove action item

5. Review of Permanent Action Items (all)

In the list of Permanent_Action_Items[5] *Mark5C problems* should be reported to `verkouter@jive.eu`, and the session preparation needs an update (see **Action Item 5**).

6. Global VLBI Alliance (GVA)

Colomer presentation[6], introducing the concept of the Global VLBI Alliance as an IAU B4 working group, `www.gvlbi.org`.

A discussion about the added value of the GVA ensues. The conclusion is that more interoperability for new instruments and taking a set of ground rules for participating VLBI networks from the ad-hoc level to a standardized mode of operating is good. The GVA could be supplementary to the International VLBI Technology Workshop – a de-facto international TOG. Implications for SKA? SKA-VLBI will require a proper consortium; the GVA is not that but could be a springboard for that.

7. Reliability/Performance of the EVN

Bayandina presents a report on the EVN reliability/performance[7] for the last session; there has been only one since the last TOG. Stresses the importance of amplitude calibration to be able to meet the advertised EVN sensitivity and resolution.

Discussion points:

The ANTAB files sometimes take a (very) long time to appear on the `vlbeer` server for download by JIVE. Some have changed the local procedure (**Bach** added 20s delay before upload after schedule finished). **Maccaferri** if the schedule is canceled the `sched_end` procedure with automatic upload is not

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[5] https://deki.mpifr-bonn.mpg.de/Working_Groups/EVN_TOG/Permanent_Action_Items

[6] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2021_04:colomer-gva.pdf

[7] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2021_04:tog2021_evn_performance_reliability.pdf

executed. **Marcote** the Chinese stations are already working on improving this but current state unknown.

+Action All Verify / improve the automatic ANTAB file upload script

8. Recent difficulties/problems/failures
All stations send reports and no problems reported that are not already discussed in the previous agenda item.

9. Recorders: Mark 5, Mark6, Flexbuf
Bach presents TOG chair slide[8]: the standing issue is expansion of the storage; the target is to have 1 PB per station; 500 TB at the station and 500 TB at JIVE. **Campbell** stresses the fact that lately operations are already hampered by shortage of storage, necessitating experimenting of e-transfer *whilst* the session is still running. **Melnikov** enquires if stations have heard of a new cryptocurrency ChiaCoin which mines hashes on SSD / HDD characteristics and how this creates a surge in demand (and thus increased price). **Rottman/Bach** yes prices have gone up, quotes are only valid for ~two days now.

10. Stations
Ef reports having a new maser used since March, with demonstrated accuracy for 3mm observations. **Campbell** this explains a clock jump observed for Ef. **Nt** receiver is back; observations at C, K, M, L and X band should be possible from next session.
Ir RT32 will be out for vertex and secondary focus maintenance from July to October 2021.
Sv *might* miss some days at start of the next session due to cable replacement.

11+12. e-VLBI / JIVE
Presentation **Verkouter** on Technical operations and R&D at JIVE[9].

13. Technical developments
Continued presentation **Bach**[8] on technical developments.

DBBC3 update:
Campbell enquires about 64 MHz bandpass. **Bach** it's a lot better than the DBBC2 64 MHz filter.

[8] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2021_04:tog_2021-04.pdf
[9] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2021_04:verkouter-r_d.pdf

DDC_v125U is the unified 16 BBCs / core board with filters from 2 – 128 MHz[10]. DDC_v126 is underway, which will likely be the final version.
Rottman presents[11] a DBBC3 Python package[12] from the Bonn group with tools for controlling / monitoring the DBBC3.

A discussion on DBBC3 filter shape ensued.
Paragi a 32 MHz filter with very flat bandpass would be extremely useful for EVN users; this could even be used for spectral line observations since the software correlator has (practically) no limits to spectral resolution and can zoom in a part of the band to limit the output volume.
Rottman DDCU bandwidths supported in firmware are based on EVN request, if fewer required more resources for filter coefficients.
Alef/Kettenis/Campbell/Himwich flatter bandpass is for better total power calibration also and probably do not require full flexibility from 2 – 128 MHz.

The suggestion is to investigate the most requested/required bandwidths so *Tuccari* can be asked if a firmware with less bandwidths (e.g. 16-32-64 MHz) but flatter shape can be produced.

+Action Paragi, Bach, Kettenis, Campbell investigate most requested bandwidths for input to firmware with fewer bandwidths request.

Bach were differences between 16- and 32 MHz filters at L-band investigated? **Marcote** yes; in the end the difference is small as both are equally good (or bad) but for different reasons.

Kettenis is it an option to keep DBBC2 for the good 32 MHz bands and use DBBC3 for wider bands? After some discussion concluded that this might be operationally too complex and DBBC2 spare parts are becoming difficult to obtain.

14. EVN Technical roadmap
Bach continues slides[8] on CBD recommendations to implement the EVN technical roadmap.
Lindquist re common RFI monitoring scheme: CRAF is assessing impact of the multiple constellations of Low Earth Orbit satellites and be aware that local RFI monitoring data may not be shared internationally (e.g. would reveal use of licenced bands which falls under GDPR). Onsala is working on an FGPA

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[10] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2021_04:ddc_uv125.pptx.pdf
[11] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2021_04:20210429_tog_dbbc3python.pdf
[12] https://github.com/mpifr-vlbi/dbbc3

based Software Defined Radio solution to replace the spectrum analyzer approach.

Rottman presents update on the BRAND project. The order for samplers for BRAND was approved by MPI but the supplier remains at a minimum order of 30 items which there currently is not. The supplier informed that 200+ of these chips are stored in a climatized room but they won't go through the trouble of opening that room for less than 30 units. The upshot is that the purchase-by-December-2020 constraint is lifted: the samplers remain purchasable for the coming time.

This was the end of the morning session. Reconvene at 12:30 UT for the afternoon session with the US.

1. Field System, status and new features
Presentation **Himwich** about current FS status[13].

Bach we are running the FS on Debian Buster so it seems compatible with that too.

Campbell DBBC3 single mode per experiment: temporary or permanent?

Bach currently it's the only known/reliable way; a change of bandwidth requires a time sync whilst changing a BBC tuning doesn't. This restriction may change; depends on building up experience with DBBC3 operations.

Himwich the Python DBBC3 tools look very useful, maybe some of them may end up in the Field System.

2. Stations
Bach Roshi communicated that AO is working on getting the 12m outfitted with the room temperature X-band receiver and a request to NSF for a grant to purchase a proper wide-band system is in progress.

Quintero now there is time for work on the 12m. The receiver is being tested and finding some issues, e.g. saturation of the fibre downlink (due to RFI?). The 4x RDBE + 1 Mark6 can easily be repurposed to handling the 12m data, the only thing missing is adaptation of the 12m control system to the Field System, for which funding support is requested. If approved can ask support from **Himwich**.

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[13] https://radiowiki.mpifr-bonn.mpg.de/lib/exe/fetch.php?media=na:sustainability:tog:2021_04:weh_tog_apr_2021.pdf

3. VLBA and Globals
Brisken VLBA is already equipped with wideband C/X receivers.

Question/remark: use of DBBC3 with 4 GHz input might help improve tuning compatibility between EVN and VLBA as DBBC3 BBCs can be tuned anywhere within the 4 GHz.
Brisken current VLBA tuning is 500 x $n \pm 100$ MHz; the new synthesizers will allow sub-Hz tuning but probably either have a limited set of set-points or will be restricted to standard 10 / 25 kHz tuning.

Bach what about the recent announcement of a systematic amplitude difference between DDC and PFB mode at the VLBA?
Brisken the amplitude calibration is not guaranteed to better than 10% in general but this seems to be systematic and the advice is to wait with data analysis until the issue has been fully investigated.

On the new digital architecture, **Brisken** mentions that the sampler module will always produce 4 x 1 GHz channels in VDIF format into a 100 Gbps switch. Channelizer modules take those data and produce 16 channels at 2 – 8 bits per sample back into the switch and/or provide VLBI compatible BBC operation. Both modules are Linux servers outfitted with an FPGA expansion card.
Now that all VLBA sites have some form of proper internet connection real-time fringe tests are being added, which the operators welcome very much and prove an improvement in instrument reliability.

Campbell the current recycle time of VLBA Mark6 disk packs works for the NRAO time line?
Brisken yes, seems ok for now. We're slowly experimenting with e-transfers and may expand that in the future.

The TOG ended around 13:30 UT. **Bach** suggests to have the next TOG early 2022, with location as yet undecided but with a firm hope that by then an in-person meeting will be possible again. The proposal does not get challenged.

Window 1 (Participants 45):

Search

- Harro Verkouter (me)
- Uwe Bach (Host)
- Alastair Gunn
- Alexey Melnikov
- Ari Mujunen
- Arturs Orbidans
- Benito Marcote
- beppe
- Bert Harms (Jive)
- Bo Xia
- bob campbell
- bob eldering
- Christian Plötz
- Cristina GMiro
- Dhanya Nair
- Do-Young Byun
- Ed Himwich
- Gabriele Surcis (Sr)

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Window 2 (Participants 45):

Search

- garyh
- Helge Rottmann
- jgonzalez
- Jonathan Quick
- Juha Kallunki
- Jun Yang
- Lukas S
- Mark Kettenis
- Martin Leeuwinga
- Michael Lindqvist
- Mikhail Kharinov
- Oleg Ulyanov
- Olga Bayandina (JIVE)
- Pablo de Vicente
- Paweł Wolak (Tr)
- Rafael Sarniak
- Richard Blaauw
- Roger Hammargren

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Window 3 (Participants 45):

Search

- Roman Feiler
- Salvo Buttaccio
- STANLEY EUGENE KURTZ SMITH
- szomoru
- Vladislavs Bezrukovs (VIRAC)
- Walter Alef
- Wen CHEN (Kunming)
- Zsolt Paragi
- Mikhail Kharinov

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