

EVN Technical and Operations Group Meeting

Hybrid meeting, hosted online and at Toruń Center for Astrophysics/Poland,
13 Dec 2023, 09:00 CET

Minutes

Participants:

According to the event registration page (via the meeting site¹) thirty participants registered, of which sixteen participated in-person. Fourteen participants registered for online participation and sixteen showed up: two very welcome last-minute attendees joined the Zoom session. The participants represented thirteen institutes from ten countries. Several in-person attendants joined the Zoom session to be able to present their slides via screen sharing. A snapshot screenshot of the participants list at one point during the day is attached at the end of the minutes.

Agenda:

The agenda is published online² on the JIVE TOG wiki.

1. Local Arrangements/Opening Remarks

Katarzyński welcomes everyone to the Toruń observatory, **Gawronski** explains some details of the planning of the social events on day two of the meeting.

2. Welcome (Poppi (chair))

Poppi welcomes both online/remote and local participants.

3. Last-minute additions to Agenda (all)

No last-minute changes to the agenda are proposed.

4. Acceptance of minutes from last meeting (all)

The minutes of the previous TOG (Bonn, Jan 24th, 2023) were approved without comments.

¹ http://www.home.umk.pl/~astro_conf/evntog2023dec/

² <https://www.jive.eu/jivewiki/doku.php?id=tog:december-2023-torun>

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

Comparing the Current Action Items list on the MPIfR (Max Planck Institut Für Radioastronomie) Deki³ with Poppi's own list (TOG Chair notes) AI#7 is missing. Added to the minutes here.

1. **All:** 80 Hz continuous calibration. Update the table on the wiki⁴
Poppi stresses that stations keep the table updated and, when updating values, change the *last updated* column to reflect this.
Decided to keep the Action Item on this list because of increased visibility with respect to the Permanent Action Item list.
Action remains
2. **González:** integrate `atm` into the FS (Field System).
González sent code to **Himwich**, thinking about how to do that.
Discussion postponed to **Himwich** presentation, later on the agenda.
Action remains, coalesced with AI#4, AI#6 for **Himwich** (and **Bach**, see discussion at AI#4)
3. **Bach:** create master checklist for the EVN
Progress: Several checklists (EHT, IVS/TOW, local) collected but no master checklist generated from that yet.
Action remains
4. **Bach:** investigate how T_{sys} and opacity are determined at K band and higher at stations. The discussion continues on Mattermost.
Not much discussion happened on Mattermost. **Bach** notes that there are now three AIs, all related to opacity (AI#2, AI#4, and AI#6). Important work for e.g. 7mm so the AI should remain. **Verkouter** to poll **Bach**, **Himwich** for AI title.
Action remains, assign to **Himwich**, reword following suggestion
Bach, Himwich:
Investigate how to improve opacity and T_{sys} measurements at high frequencies in the Field System by incorporating the `atm` software

³ https://deki.mpifr-bonn.mpg.de/Working_Groups/EVN_TOG/Current_Action_Items

⁴ https://deki.mpifr-bonn.mpg.de/Working_Groups/EVN_TOG/Continuous_calibration

5. **Marcote, Bach, Campbell:** Improving the session feedback, how to provide better feedback about the “success” of EVN observations in the feedback page and for future TOGs (Technical and Operations Group).
Campbell: new system exists, submission using both systems end up in same database; need buy in from stations before old system gets shut off.
García-Miró: limitation in number of fields in the new dialog interface?
Verkouter: @Campbell: see my presentation later; @García-Miró: yes, documentation said there are limits, in practice we do not see them enforced.
Campbell: some (obsolete) questions were removed, can others at stations' request
Action can be removed

6. **Bach:** compare `gnplt` opacity estimation versus WVR measurement. This slipped under the radar but is still interesting
Action remains

7. **Stagni:** sftp server set up on vlbeer
Campbell, Verkouter, Poppi: Some discussion about the nuts & bolts of the AI such as directory structure and why is vlbeer hosted in Bologna. It is mostly for historic reasons. This could be re-evaluated but not all the relevant parties are present at this meeting (**Stagni**, EVN CBD).
Surcis: Since move to sftp no access to key-, log files from EVN Archive
Campbell: only public after proprietary period, so easy protection method is to stop linking to EVN Archive.
Surcis: what about ANTAB files - they not accessible either?
Campbell: users download raw ANTAB files and use those instead of those prepared by JIVE support scientists.
Surcis: Noticed errors in ANTAB file published on EVN Archive.
Campbell: Notify JIVE; should be fixed.
Verkouter: important discussion but not at this AI - should be discussed & fixed. Purpose of TOG is that stations coordinate and collaborate to deliver correct ANTAB files to JIVE.
Campbell: Support scientists can introduce errors and put into PI letter. Could (should?) be more explicit that if PI suspects issue(s) contact JIVE.
Verkouter: can we add point to EVN Operations item b/c this is important but not for this AI.
+Action remains as New Action Poppi: bring up at CBD meeting and involve (INAF) staff involved on discussion *where* to host the sftp server (all agree that there should be a *sftp*-server somewhere).

6. Review of Permanent Action Items (all)

Beam maps: not everyone has sent beam maps to JIVE yet - should EVN time be allocated to do that? **Verkouter** asked to coordinate that (by CBD chair).

Surcis also for W-band receiver?

Campbell lower frequencies are more important, so priority order for EVN should be L, C, M, P, everything else. Using EVN time means everyone doing at the same time implies sub-optimal solutions.

(Discussion ensues about when, why - needed for single dish science anyway and some EVN users start mapping out to 10-11' - , and how - e.g. FS tools exist to help measure it - to do best do beam maps; ultimately it should be the station's own responsibility but adding some external pressure might help getting this along: the item's been on here for a loooong time.)

+New Action Verkouter to coordinate.

+Reminder All to keep contact *and* receiver information *and* status table up to date – it is as easy as send plain text email to **Campbell** about updates/changes. **Campbell** uses table on Deki *exclusively* to assess capabilities!

(Discussion ensues on GPS/maser monitoring and the EVN Monitor at JIVE⁵ vs stations not always uploading daily files. The threshold to upload basic monitoring information is low and has already proven useful - e.g. in real-time VLBI observations - so there should be more stations doing it.)

+Action All set up basic monitoring information sent to the EVN Monitor at JIVE, contact **Keimpema** (keimpema@jive.eu) for setting it up.

Campbell stations who want to test - e.g. during NMEs - this is fine but please request it timely to avoid multiple versions of the schedule: these days it is common to have four or more (changes due to equipment failure are exempt; this will happen and cannot be helped). Having many versions poses an extra load on all other stations because of the need to re-DRUDG. Could imagine a deadline before which no schedules are disseminated, but of course this is in direct contradiction with the stations' request to have the schedules early. All the more reason to inform about tests/changes asap.

(Digression discussion ensues about schedules being disseminated during the session: ~50% these days. Several reasons, amongst which EVN not hugely oversubscribed and EVN PC allocating highly graded experiments in next session. Maybe have hard(er) deadline for PIs? *"If no answer by date X your*

⁵ <https://evn-monitor.jive.eu>

experiment is dropped from the queue" - but there was a case where PI in e-VLBI not answering in time turned out to be because of hospitalisation. EVN Scheduler should be working on session N+2 but currently, due to unknown disk-space constraints/availability that far in advance, JIVE cannot approve that schedule; presently the scheduler must focus on managing session N+1 in close dialog with JIVE, causing (very!) short response times for PIs.

Conclusion *conceptually trivially fixable by adding sufficient storage at JIVE or observe more/all in real time.)*

+Poppi added item to check status table *at least* just before session.

7. Reliability/Performance of the EVN

*Performance of the EVN*⁶ presentation by **Orosz**.

Orosz requests discussion on several topics:

`antabfs.py`: several stations' antabs have gotten *worse* lately, lot of hand-editing used to be done and several stations stopped doing that, so JIVE supp. sci. need to do *a lot* of hand editing, and too many versions of `antabfs.py`

González/García-Miró student working on this (auto flagging outliers), but does not use `antabfs.py`, could see if can be integrated, lack of resources.

Gawronski at Toruń have developed s/w using AI-based flagging works fine.

Orosz working is not the problem, it is not coordinated and no maintenance.

González Currently use quite different code from the git-based `antabfs.py`

Verkouter/Campbell We - the EVN, the stations - should know their equipment best and we should strive to deliver the best calibration in the archive, so PIs do not have to bother.

Marcote basic smoothing/flagging already in the old version; there is a Mattermost channel about this. Can we assign someone to do this as Yebes does not have resources.

Himwich be aware `antabfs.py` run on FS computer but Py2 is going away. Need someone to take responsibility.

Campbell should we have an archive of `.rxg` files?

(discussion on who/why re-run calibration after the observation)

Himwich `rxg` in FS log must be able to be overridden with external - newer - calibration information.

Verkouter put `.rxg` files under version control?

Marcote/Orosz badness more by station than by band.

[Note: the topic also came up in the 2nd day Open Discussion part – see below]

⁶ https://www.jive.eu/jivewiki/lib/exe/fetch.php?media=tog:jive-scisu-report_tog-2023-12-13.pdf

+Action ALL add .rxg to Deki, more instrument-specific data there already. communication/feedback: new station feedback tool, but some stations do not fill it in (eMerlin, Ir), and some fill it in without too much thinking: feedback says "Ok" but pipeline shows issues (e.g. Urumqi, Shanghai to lesser extent). Dropping out of NMEs w/o notification: JIVE does not have monitoring and NMEs are known months in advance, should be improved! Some of this seems to correlate with who show up at the TOG and who don't. (Note: Urumqi, when it's there, the data is fine - so it's really the communication).

Gunn the EVN is slowly losing its relevance over the last decade; the instrument's lagging behind many other instruments, being critically unsupportable for several reasons, such as reliability, quality of calibration, the way it is anachronistically run, how it cannot perform science anymore the way astronomers require, and its difficulty to acquire new users. None of these are the TOG's responsibility though, and the TOG has no authority.

Verkouter Whilst I agree with most of this, directors signed off on EVN Science Vision and are following the Technical Roadmap following from those requirements so it's not *all* bad ...

Surcis EVN's main advantage is flexibility, new science gets tried on EVN first.

Campbell time-domain science and frequency agility are weaker points.

Alef going back to reliability: it scales up and down with the dedication of staff at the telescope and how much the director allows them to follow up and that. Have had training sessions at the TOG before (besides the TOWs that are organised by the IVS) - consider repeating that?

11:07 CET coffee break, reconvene at 11:25 CET

8. DBBC3

- *DBBC3 News*⁷ presentation by **Rottman**.

Verkouter PolConvert on the FPGAs - will there be an option to switch it on/off? There are use cases to keep the linear polarisation signals.

Rottman doing PolConvert requires special way of cabling but will discuss option to switch conversion on/off with the **Dornbusch** and **Tuccari**.

Yang DDC_E v127 remark "Improved filter shapes" - which one(s)?

Rottman Improved bandpasses on all filters (channel widths).

Marcote bandpass plots available?

Rottman not yet, expect at next meeting.

⁷ https://www.jive.eu/jivewiki/lib/exe/fetch.php?media=tog:20231212_dbbc3status.pdf

(Discussion ensues about which stations can actually do ≥ 2 GHz bands? Many are limited not only by receiver but other parts in the signal chain. This is why it's on the Technical Roadmap and getting the DBBC3 operational is a necessary but not sufficient activity.)

Bach DBBC3 data taken in NME in parallel submitted by some stations to JIVE but feedback takes very long?

Campbell DBBC3 data requires generating VEX2 file and no file naming standard yet, and eventually, lack of personnel resources. Field System not handling VEX2 also doesn't help.

Verkouter that's why we now have a commissioning plan, but yes, ultimately, lack of personnel resources is main cause: can barely keep up with normal EVN observing and this is all new, which comes on top of it.

- *Commissioning plan*⁸ presentation by **Eldering**

Besides the presented solution of "use FlexBuff as router" to be able to easily switch from local recording to e-VLBI, the option exists to place a router between DBBC3 and FlexBuff but that solution is not available to all stations.

(Discussion ensues about DBBC3 "mode changing" [we should have a proper definition of what this *actually* means, sounds like there could be confusion between different ends of the conversation - Red.], e.g. how feasible changing BBC tunings, bandwidths, bitmasks are. Some evidence that some of these, e.g. VSI sample rate, require a DBBC3 resync, of which it is not clear that it can be automated. More coordinated switching to new firmware would be useful.)

Verkouter VEX2 at stations?

Himwich DRUDG issue, not quite Field System, depends on **Gipson**; discuss what "VEX2 support" means; minimum allows syntax. Note **Gipson** announced retirement by Oct 2024 or so.

Verkouter/Campbell may have to decide what level VEX2 support to ask for as most of DBBC3 config is static anyway.

(More discussion about how much the FS does, or does not do. Some observing modes rely on "lying" to the FS after which someone else takes over

⁸ <https://www.jive.eu/jivewiki/lib/exe/fetch.php?media=tog:eldering-dbbc3-tog.pdf>

(part of) the configuration - such as e-VLBI; maybe DBBC3 progress could go that way too. Agree to start doing baby steps and figure out how to move on.)

9. Report from stations

- *BRAND receiver update*⁹ presentation by **Rottmann**.

García-Miró what is the price of the sampler chips?

Rottman somewhat less than 10k€ / chip

García-Miró bandwidths not power-of-two?

Rottman yes, related to sample rate; an idea is to use DBBC3 I-mode to do band resampling but that is not implemented or tested yet

Verkouter for VLBI compatibility this would be essential: we cannot afford resampling at the correlator

Poppi BRAND is primary focus, but what about secondary focus?

Alef simulations for secondary focus done in Japan based on ninja-feed.

Extensive work was done but since not milestone or deliverable no final report generated; conclusion was that feasible if low-end frequency requirement relaxed, requiring 1.5 GHz or lower feed would be big (too big?), but it can be done.

- *Introduction TNRO*¹⁰ presentation by **Sugiyama**

13:12 CET meeting breaks for lunch, to reconvene at 14:00 CET

10. EVN Technical roadmap

- Compact Tri-band Receiver

Poppi several stations already have: Mc, Nt, Sr (installed, commissioning now). Problems with the IF system (wide band optical links).

According to station reports: Mh planned

García-Miró using tri-band system, Ys have demonstrated fringes with KVN in K, Q-band; backends at both ends *very* different so layout of channels was different. After finding out mapping recorrelated: fringes + frequency phase transfer works for K, Q, but does not work as well on long baseline to Ys as it does within KVN. First test done w/ DBBC2 (simpler), 2nd test done w/ DBBC3 for more bandwidth.

⁹ <https://www.jive.eu/jivewiki/lib/exe/fetch.php?media=tog:20231212togmeetingbrand.pdf>

¹⁰ https://www.jive.eu/jivewiki/lib/exe/fetch.php?media=tog:overviewtnro_evntog_ks20231213-14_rev1.pdf

Yang this is final receiver or developing another one?

García-Miró upgrading K-band from 18-32.* GHz; Q+W stay as they are. Not as nice/elegant as CTR, but it does work.

Verkouter What was the recording bandwidth?

García-Miró running into packet loss at 6 Gbps, **González** fixed it to do 8 Gbps, but would like to go higher. At URSI GA earlier this year Nobeyama 45m could participate as well.

González KVN records 512 MHz bands, we use DDC to end up with 512 MHz
Surcis intend to have SRT ready again by the end of the year, testing with Mc, Nt. Mc will stop for a while to upgrade main dish.

McKay Mh have ordered a CTR from MPIfR, will be a few years before operational though; have DBBC3 (not commissioned yet, planned for 2025); FINCA (Finnish Centre for Astronomy) will build backend.

Bach Ef CTR being built/constructed, scheduled for end of 2024.

- Wideband RX (Brand, C/X)

García-Miró Ys developing new receiver 4.5 - 18 GHz to replace 4.5 - 9 GHz

- DBBC4

*DBBC4 Developments*¹¹ presentation by **Rottmann**

Bach DifrEnd4T could be a way around IF limitations for stations that have problems here.

Rottmann yes can do sample + OCT firmware to filter 512 - 2048 MHz and output VDIF to the recorder or feed into DBBC3/DDC for channelisation.

11. Improvement of the operations

Introduction by **Gawroński**: think of this as free-thinking session: how to improve time-domain astronomy with the EVN to arrange observations on time scale of ~ a day. Maybe have a small group be on stand-by? Or the EVN PC decides that something important is happening and observations are done even before a proposal is received. Has impact on staffing, obviously. Or moving from three sessions/year to multi-day "e-VLBI" sessions with a part doing real-time, part disk-recording. Can build such a group to make the EVN more competitive?

¹¹ https://www.jive.eu/jivewiki/lib/exe/fetch.php?media=tog:20231212_dbbc4.pdf

(A long discussion ensues. See **ANNEX 1** for a brief summary ...)

First conclusion: the EVN needs to change its to remain competitive; not even just for science goals: users go to VLBA if different observing bands close together are desired.

Second conclusion: the TOG is convinced that from a technical point of view sufficient solutions exist to address many (if not most) of the requirements, but may not always be available to the station (or correlator).

In the end the discussion concentrates around two (three) main questions:

- **rapid response capability:** what does each station or correlator require from their director to be capable to handle a 2hr response time?

- **global/dynamic scheduling:** in order to more efficiently use the 1000 hrs need fast band switching and dynamic scheduling, what is needed for that?

- **keep current level of reliability and quality:** reliability and quality of the calibration are getting worse (see Pt 7 above). What is needed to stop the downward trend, taking that as a minimum.

+Action TOG Chair/vice chair questionnaire to stations and correlator to base document to CBD on to indicate needs of EVN to remain competitive.

12. Recorder status

*jive5ab multi-core network reading*¹² presentation by **Verkouter**

13. Field System

*Field System status/updates*¹³ presentation by **Himwich**

Maccaferri thanks for the new documentation! core3h resets are problematic.

Can have mode command that updates only what needs changing?

Verkouter seems like an excellent topic for in the Mattermost channel

14. JIVE status

*Projects at JIVE*¹⁴ presentation by **Verkouter**

15. Next TOG Meeting

Onsala agreed to host the TOG around midsommar 2024 (end of June-ish)

The TOG ends around 16:30 CET for today, resume tomorrow 9:00 CET

¹² <https://www.jive.eu/jivewiki/lib/exe/fetch.php?media=tog:verkouter-jive5ab.pdf>

¹³ https://www.jive.eu/jivewiki/lib/exe/fetch.php?media=tog:weh_tog_dec_2023.pdf

¹⁴ <https://www.jive.eu/jivewiki/lib/exe/fetch.php?media=tog:verkouter-jive-projects.pdf>

Thursday 14 December 2023 9:00 CET

The 2nd day starts with an open discussion where topics can be brought up that did not have a place in yesterday's agenda.

1. Open discussion

Verkouter Data from sessions are not correlated immediately and the result is that flexbuffs must be kept powered on, spinning the hard disks. Each flexbuff rack absorbs 20kW. This is not efficient, considering the global need of going green. A possible solution is to adopt tape library robots (e.g. LTO). This solution would have a greener impact because of the reduced power consumption. There is a license fee to take into account which makes the reduction in terms of cost less effective. There is also the side effect that more efforts are needed to pursue this solution.

Question: Could eVLBI reduce the quantity of data stored on flexbuff?

Answer: SFXC has options like multiphase center that eVLBI can not (fully) exploit. Correlating mixed bandwidths is inefficient: it is computationally expensive (depending on bandwidth ratios may not be feasible to perform in real-time) and multiplies data transmission inside the compute cluster, severely limiting performance.

Question: How to fund the tape library solution? Asking for national fundings or EU?

Answer: JIVE is ERIC and is not eligible for national funding.

Maccaferri

Question: In the permanent action items there is the request to upload uv-flag within two weeks the session is ended, is this file necessary?

Answer: the group agrees that uvflag file is no longer needed.

+New Action Poppi to remove from permanent action items.

Further discussion is about $r \times g$ file(s). Need for a efficient way to upload $r \times g$ s. There is a warning about the $r \times g$ s for widebands receivers, which are different from others receivers' $r \times g$ s.

After the coffee break the TOG finishes with a tour around the optical- and radio facilities on site and heads back to Toruń centre for a visit to Copernicus' house.

List of participants, sampled around 13 Dec 2023 14:30 CET

The screenshot shows a Zoom meeting interface with the following participants:

Name	Mute Status	Video Status
Marjolein Verkouter (she/her) (me)	Muted	Video Off
EVN TOG Toruń (Host)	Not Muted	Video Off
Helge Rottmann	Not Muted	Video Off
Artūrs (Irbene)	Muted	Video Off
Benito Marcote	Muted	Video Off
Beppe	Muted	Video Off
Bob Eldering	Muted	Video Off
Carlo Migoni	Muted	Video Off
Derek McKay	Muted	Video Off
Ed Himwich	Muted	Video Off
Gabor Orosz	Muted	Video Off
Jun Yang (Onsala, Sweden)	Muted	Video Off
Junghwan Oh	Muted	Video Off
Koichiro Sugiyama (NARIT)	Muted	Video Off
Roman Feiler	Muted	Video Off
Roman Feiler / KK	Muted	Video Off
Sergio Poppi	Muted	Video Off
Suma Murthy	Muted	Video Off

Buttons at the bottom: Invite, Unmute Me

ANNEX 1. The "full" discussion of Pt 11

Surcis suppose important event, what is more important: single dish or VLBI?

Gunn TOG cannot decide on scientific priority - that's the EVN PC, or, ultimately the station's director. TOG should focus on feasibility.

Campbell Point of View: there is no EVN unless it's scheduled; outside of allocated sessions have to ask for time at individual stations (e.g. triggered ToOs), so will always take \geq day.

Gunn looking at next-day scheduling requirements. The EVN's three session + ten e-VLBI days + out-of-session was ok long time ago but is not at all a match for today's science requirements. Transients are only *one* of the science areas - there are many more use cases that do not fit in the EVN way. CBD sais: ask TOG, TOG sais: we don't have the resources, back to CBD, who do not make the resources available: rinse & repeat. Three-day e-VLBI is *not* the solution, dynamic scheduling, on the other hand, is. 1000hrs of EVN is ~two days/week. No other instrument shuts down for two months *every year* like EVN - could still do ~two days / week for forty weeks, honouring the two-month shutdown. Require more staff. The three-day e-VLBI suggestion is from the CBD, not my suggestion!

Verkouter mixing real-time and disk-based VLBI in three days adds complexity for no reason.

Gunn tired of kicking the ball around - need to get this fixed

Verkouter I think I can speak for us, the TOG techno-nerds, if I say that we can do any/all of the suggestions except it costs resources that we don't have. Have the EVN PC take control of the instrument (directors relinquish control)

Gunn can have weekly observations (no unknown dates) and have me (the scheduler) decide what runs. Can even be overridden by ToO.

Campbell made a table (EXPREs) science cases and response times and selected "can do this", "can't do that". Supernova was lucky (gap in schedule didn't have to kick anyone off so just observed.)

(cont'd)

Gunn EVN becomes rapidly less competitive unless something radical is done. For three bands close together users go to VLBA; get stations to have standard set of receivers & swap quickly (table on Deki says "hour"-scale). Unless TOG puts fist on table nothing will change: tell CBD this is what's needed or else.

Yang optimise time, do not need more hours per se.

Verkouter going to two-and-half/three days e-VLBI then efficiency must go up: currently sometimes several hours lost during the night b/c something goes wrong. Requires appropriate staffing at stations and JIVE so you can run expensive infrastructure optimally, needs more shifts.

Gunn e-VLBI used for efficiency rather than for science capability (and undersubscribed). If we can switch bands within a session could schedule (much) more. TOG needs to tell us (PC and scheduler) so we can use it. Questions for each station: can you observe July/August, can you observe for few days continuously, how fast can you switch (e.g. during daylight hours)?

Campbell key issue: which constraints can be removed

Gunn want to have algorithm that matches what needs to be done against what can be done "next week"
TOG is not ready to write to CBD yet. something needs to be done.

Alef how can you also maintain the current level, because that's already turning out to be difficult (reliability + quality).

Gunn Are we ready for more rapid response? Two main areas: rapid response (say ~2hr response time), global/dynamic scheduling issue. The latter was raised years ago, overwhelmingly negative - this time respond positively: what do you need to make this happen.

+Action TOG Chair/vice chair questionnaire to stations and correlator to base document to CBD on