37th Directing Board Meeting – Summary Notes

Location: Chalmers University of Technology, Gothenburg, Sweden
Date: 19 May 2017
Note taker: Dirk Behrend
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Attending Board members: Axel Nothnagel (Chair), Dirk Behrend, Alessandra Bertarini, Patrick Charlot, Francisco ("Paco") Colomer, Ludwig Combrinck, John Gipson, Rüdiger Haas, Ed Himwich, Thomas Hobiger, Jim Lovell, Chopo Ma, Arthur Niell, Evgeny Nosov, Torben Schüler, Takahiro Wakasugi, Guangli Wang.

Excused: Alexander Ipatov, Ryoji Kawabata.

Guests: Bill Petrachenko, René Vermeulen.

1. Welcome (Axel Nothnagel)

Axel Nothnagel welcomed the attending Board members.

2. Approval of Agenda

The Board approved the agenda for the 37th DB meeting.

3. Approval of Minutes of the 36th DB Meeting (Axel Nothnagel)

The Board approved the notes of the 36th DB meeting.

4. Memorandum of Understanding between IVS and EVN (Axel Nothnagel, Dirk Behrend, Francisco Colomer, Rene Vermeulen)

René reported that the team developed a draft for a Memorandum of Understanding (MoU), and distributed it to the EVN and IVS. Both Governing Boards had meetings scheduled within a week's time, representing a good opportunity for discussions. The EVN CBD felt that the draft document had too much gravity and a too high level of formality. The current form of the draft was overly formal; instead, a lighter and shorter document was wished for. This could, for instance, be a Letter of Intent created as a condensed version of the MoU rather than a completely new document.

5. IVS DB Chair's Report (Axel Nothnagel)

Activities since the last Board meeting included:

- Draft of MoU between EVN and IVS
- Elections of the At-Large members
- Letter of endorsement of E-Grasp/Eratosthenes (again)
- Speech at Inauguration of OTT

6. IVS CC Director's Report (Dirk Behrend)

Main activities since the last Board meeting:

- Publications:
  - GM2016 Proceedings: published as NASA Conference Proceedings volume (NASA/CP-2016-219016) in print and online (https://ivscc.gsfc.nasa.gov/publications/gm2016/)
  - Biennial Report: editing work in progress
  - IVS Newsletter: two issues (December and April) published
- Talks and Reports:
  - AGU FM2016: Invited talk on Current Status and Future Plans of IVS
  - Talks for GGOS Bureau for Networks and Observations (given by C. Ma) at AGU and EGU
- Technical Operations Workshop 2017 (TOW2017): hands-on training of technical station staff, organized Program Committee, 60 registered participants from 17 countries, challenge of having legacy and broadband systems covered at the same time, many new faces.
- IVS 2018 General Meeting:
  - Program Committee (suggested): Thomas Hobiger, Chet Ruszczyk, David Hall, Torben Schüler, Lucia McCallum, Oleg Titov, Evgeny Nosov, John Gipson, Gino Tuccari, Dirk Behrend, Takahiro Wakasugi

Other activities:

- IVS Directing Board Elections 2016/17
- Notes of DB meeting #36 (Haystack)
- Data Centers:
  - CDDIS: switchover to new upload procedure
  - OPAR: issue after server update, is worked on
- Master Schedule 2017
- OPC, VPEG, and VTC participation

7. Election of the Chair for the period 2017–2021 (Dirk Behrend)

Axel was the sole candidate for the chair position and he was willing to stand for re-election. The Board unanimously elected Axel to be the chair for the period 2017–2021.

8. Short Reports of the Coordinators and Committee Chairs

8.1 Observing Program Committee Chair's report (Dirk Behrend)

Issues discussed in the period since the last board meeting were

- OPC membership: Jamie McCallum replaced Jim Lovell, Fengchun Shu replaced Guangli Wang, and Takahiro Wakasugi replaced Ryoji Kawabata. Torben Schüler was added.
- Irbene: The station at Irbene, Latvia was added to a few R1 sessions to determine its position.
- VGOS: Tests continue with 24-hour test sessions every other week. A repeat of Trial campaign #1 is on hold until smoother operations is achieved.
- *sked* covariance simulations: An incorrect nutation error estimate in the covariance simulations was traced back to a wrong partial introduced when changing the nutation nomenclature from ψ/ε to X/Y.
- Shanghai correlator: The Shanghai correlator increased its correlation load.
- R&D proposal to determine post-Newtonian parameter γ was withdrawn by the proposer.
- CONT17: The campaign will be held from November 28 through December 12, 2017. The focus is on the legacy S/X networks with two legacy networks observing (Legacy-1 with 13 IVS stations and Legacy-2 with ten VLBA and three IVS stations). In addition, a VGOS broadband demonstration network will observe part of the campaign period.

8.2 ICSU World Data System (Dirk Behrend)

No activity.

8.3 Technology Coordinator (Gino Tuccari)

Main activities of the Technology Coordinator (TC) since the last Board meeting included:

- Creation of tables of existing VGOS equipment
  - Contacted the existing and VGOS stations under construction
  - Received almost all required information, grabbed other info from presentations or public documents
  - Created a common table to be published and maintained (where?)
  - Helps to look at possible compatibility issues
- Organization of a compatibility meeting (EVGA splinter)
  - Discussion about existing definitions
  - Probably a synthetic short form of the main specifications would be useful
  - Current observing modes as base for current requirements
  - New signal chain schemes proposed (continuous frequency coverage)
  - New modes proposed: to be explored on experimental basis for those stations having interest
  - IVS TC will ask a small number of experts to act as Consultant Team
- Work on distributed correlation
  - a first test was performed under Alessandra's coordination (report given at EVGA)

- participation by enthusiastic ‘distributed’ correlators
- first evaluations under way: positive impression on cursory glance
- just a start, to be studied and continued

8.4 VGOS

8.4.1 VGOS Technical Committee (Jim Lovell)

General activities and items:

- Telecons held in December, January, March, and April
- Test/trial observations: teething troubles being ironed out so that good 24-hour session reliability can be achieved
- Work at Yebes and GSFC on HTS filters for WiFi and SLR radar
- VGOS band frequencies and compatibility between stations:
  - Need input from stations
  - Continuous frequency coverage proposal from Bill
- Good progress in VGOS installations/upgrades. In the next one to two years we will see many new facilities coming online.
- Monitor and control issue needs addressing
- Transmitter on Galileo II satellites

Summary of 17 May 2017 VTC Meeting:

- **VTC Future:** Bill commented that the original purpose of the VTC was to bring together all aspects of the VLBI technique. The group started out with a strong VGOS emphasis with simulations leading to specifications and then deployment. Alexander suggested a stronger VTC emphasis on providing direction would be helpful. Several people commented or agreed with the idea of a Project Manager for VGOS implementation.
- **Correlation and Data Transfer:** Issues of data transfer, the mix of e-transfer and physical shipping will require data buffers at the correlators. A stronger representation from the correlators is probably needed on the VTC in the future.
- **Source Structure:** CONT17: The idea of an ‘imaging day’, either before or after CONT17, or by taking a day out of CONT17 was discussed and generally supported.
- **Other items:** Monitoring and Control: A good definition of requirements is still needed. Some overlap exists with Jumping JIVE and Gino’s compatibility study.

Gino proposed to have a continuation with naming Jamie McCallum as Jim’s successor. The Board unanimously approved Jamie McCallum as the new VTC chair.

8.4.2 VGOS Project Executive Group (Hayo Hase, written report)

The VPEG held five telecons and had one face-to-face meeting since the last Board meeting. Discussions included the status of ongoing VGOS radio telescope projects as well as the progress and issues of getting ready for the VGOS trials. The VGOS Analysis Plan was delayed until after

the IVS Retreat; the efforts would be restarted once the time was ready. A concern was the strategy on how to expand VGOS to remote areas, as the global coverage was not satisfactory.

8.4.3 Observatory monitoring and control (Jim Lovell)

see TOP 8.4.1

8.5 Network Coordinator (Ed Himwich)

Data Yields 2016

- Analyzed results as of today
- Overall correlator yield by stations about 88%
- Overall data used by analysts: 69%

8.6 Analysis Coordinator (John Gipson)

In the transition of solutions to using the ITRF2014 as a priori, there were eight institutions that had done it and two that had not. USNO had to install the latest version of Calc/Solve.

The Unified Analysis Workshop was coming up in Paris.

At the IVS Analysis Workshop it was discussed why the higher data rates in the R1s did not lead to better results. The transition to using vgosDB was planned for the end of the year.

Work was commenced to revamp the session Web pages. The current version was some twenty years old. David Horsley had been working on redoing the session Web pages.

Experiments made outside of the IVS, e.g., the INT4 USNO Intensives observed on VLBA baselines, should be brought into its fold.

A policy for providing FITS-IDI files might be needed.

The Board approved to make the change-over to vgosDB on September 30, 2017.

8.7 Committee on Training and Education (Rüdiger Haas)

The next VLBI School will be held in Gran Canaria in two years in connection with the EVGA meeting.

9. Short Reports of IVS Working Groups and other IVS assignments

9.1 Correlator issues (Torben Schüler)

There were changes at the Bonn Correlator. The Bonn Correlator at Max-Planck-Institute for Radio Astronomy (MPIfR) is shared between astronomy and geodesy. The geodetic VLBI share is at 50%; MPIfR supplies the correlator hardware and provides support (e.g., data flow optimization, IT support). The current geodetic use was clearly below 50%. The geodetic correlation is effectuated by Reichert GmbH under a contract with BKG.

The current concentration of IVS correlation on two main correlators does not meet the needs of the future of IVS. In particular, BKG has no intention to increase the volume of the correlation contract as a consequence of the introduction of VGOS, although VGOS correlation activities will be supported by Bonn.

9.2 WG7 on Satellite Observations with VLBI (Rüdiger Haas)

The WG had a face-to-face meeting during the EVGA week. Some subgroups were formed. Work was done on simulations. J. Anderson proposed to look for overtones in GNSS satellites. The WG intends to request a couple of hours of VGOS observing time from the OPC.

Thomas said that for GNSS observations with VLBI it was important to understand the benefits as well as the drawbacks (e.g., loss of observation time to quasars) when doing a frame tie like this.

Rüdiger said that various versions of the near-field model and their comparison were planned.

9.3 Task Force on IVS Intensives (Rüdiger Haas)

Rüdiger reported that a draft of the final report was prepared. The final version of the report could be posted on the WG Web page and be included in the Biennial Report.

The Board accepted the report and the Task Force on IVS Intensives was closed.

9.4 Task Force on Seamless Auxiliary Data (Alexander Neidhardt)

No activity.

9.5 Working Group 8 on Galactic Aberration (Dan MacMillan)

The Working Group continued its work over the last six months with several new aberration estimation solutions and many estimation sensitivity tests. The geodetic estimates of GAC include global solutions (four Calc/Solve, 2 VieVS, one OCCAM, and many test solutions) with formal uncertainties of 0.2–0.4 µas/yr and estimates from source time series proper motion (two Calc/Solve solutions) with formal uncertainties of 1.1–1.4 µas/yr. Aberration could also be derived from recent (2009–2016) stellar astronomy measurements resulting in formal uncertainties of 0.3–0.6 µas/yr.

Based on the standard deviation of the estimates, the stellar astronomy estimates are more robust. For that, the stellar astronomy value of 5.0 µas/yr might be suggested (this was still being discussed), which would model the bulk of the effect. It was planned to have a recommendation ready in July 2017 in order for it to be used for the ICRF3 solutions.

10. Reports of Action Items of Last DB Meeting (all)

All action items have been worked and reported on. The collection of information about ITU registration of VLBI stations will continue.

11. Discussion of missing actions in IVS (all)

Axel presented a spreadsheet of missing actions in the IVS sorted by actions related to scheduling, observations, data transfer, correlation and fringe fitting, data storage, Web, outreach, analysis, telescope surveys, documentation, and public relations and advertising. This will be discussed in future meetings.

12. Marketing, outreach, public relations (all)

Skipped.

13. Safeguarding VLBI observing frequencies/CRAF (Hayo Hase, written report)

There was a CRAF meeting in early May. The main discussion points included:

- reorganization of the European Science Foundation: CRAF continues under its umbrella as expert board.
- CRAF stakeholder meeting (institutions funding the CRAF spectrum manager): analyzes how to receive more financial contributions from represented countries (IVS is a non-paying organization within CRAF).

- CRAF is recognized by CEPT and WRC.
- Capacity building:
  - School on spectrum management in Paris in 2018
  - Workshop on Compatibility Studies

Compatibility Studies:
- Compatibility studies are the key instrument in spectrum management to prevent radio astronomy service (RAS) sites from ever increasing RFI.
- CRAF intends to organize a workshop (within a year) to teach propagation models and maps as a tool to defend radio quiet ambience of RAS sites.
- target: to educate one expert per RAS site.

New satellite transmitters providing globally Internet to remote sites:
- OneWeb: 648 (+1972) satellites
  - down-link: 10.7–12.7 GHz
  - up-link: 12.75–13.25 GHz and 14.0–14.5 GHz
  - LEO satellite at ~1200 km altitude in 18 polar orbital planes
  - launch: 2018 (10 satellites), 2018 (648 satellites)
- SpaceX satellite constellation (2020): ~4000 satellites
- Samsung (>2020): ~4600 satellites

14. Items related to IAG, IAU, WDS, and related VLBI groups

14.1 IAG

14.1.1 Commission 1 and Sub-Commission 1.4, Commission 3 (Ludwig Combrinck)

Not much to report.

14.1.2 Newsletter contributions (Dirk Behrend)

A topic for the newsletter could be the inauguration of the Onsala Twin Telescopes.

14.1.3 GGOS (Axel Nothnagel, Dirk Behrend)

GGOS was calling for a new chair. The new VGOS chair was planned to be determined by the beginning of summer.

The GGOS Days 2016 were held at CfA in Cambridge, MA.

14.2 EVGA (Rüdiger Haas)

The last EVGA meeting was held at Chalmers. The next EVGA meeting will be in March 2019 in Spain (Gran Canaria) in conjunction with the inauguration of the RAEGE antenna there.

Rüdiger and Susana were re-elected as EVGA chair and secretary, respectively.

14.3 Asia-Oceania VLBI Group for Geodesy and Astrometry (Jim Lovell)

Observing program

- Six sessions in 2016:
  - 1 Gbps where possible
  - Five sessions correlated and released
- Six sessions in 2017
- Sharing of scheduling and correlation between GSI, SHAO, UTAS, and NGII (validation)
- Communications and collaboration working well

AOV status as of 2017

- AOV Elections:
  - New Chair: Takahiro Wakasugi
  - New Secretary: Lucia McCallum
- Next AOV meeting in Kobe, to coincide with IAG, August 2017

14.4 IERS (Chopo Ma, Rüdiger Haas, Axel Nothnagel)

Axel mentioned that as a result of ITRF2014 there was a strawman plan established by Brian Luzum as a discussion basis for the next ITRF.

14.5 IAU

14.5.1 IAU Division A (Patrick Charlot, Chopo Ma)

IAU General Assembly 2018

- Two symposia proposed that are of interest to IVS:
  - Reference Systems and Frames (Proposer: R. Gross)
  - High-Resolution and High-Precision Astronomy (Proposer: J. Moran)
- Also a focus meeting proposed
  - *Gaia* science (Proposer: T. Prusti)

A very large number of proposals was received.

Upcoming Meetings

- GREAT (*Gaia* Research for European Astronomy Training) symposium at EWASS 2017
  - Prague
  - 26-27 June 2017
  - Special session: Synergies with radio astrometry
- Journées 2017

14.5.2 ICRF3 (Patrick Charlot)

Face-to-face meeting

- very successful meeting at Haystack (17-18/10/16): eight ICRF3 WG members present in person, six members by videoconferencing
- Assessed ICRF3 prototype solutions
- extensive discussions

Declination bias issue

- Has been known for >2 years
- Now strong suspicion on phase cal at Hobart12
- But current solutions agree better with *Gaia* DR1 than ICRF2 does

Questions to be addressed

- Identification of a list of transfer sources from ICRF2 to ICRF3
- Treatment of Galactic aberration
- Identification of ICRF3 defining sources
- Decision on whether ICRF3 should be single-frequency, multi-frequency, or combined

Timeline

- 2017 June 30: second round of catalogs
- 2017 October 15: decide on final ICRF3 configuration
- 2018 January 1: produce final ICRF3
- 2018 (January – June): extensive checks of ICRF3, prepare IAU resolution, write Technical Note and ICRF3 paper
- 2018 August: adoption of ICRF3 by IAU

14.6 EVN (Patrick Charlot)

New officers

- EVN Consortium Board of Directors (from 1 July 2017): John Conway (chair), Raphael Bachiller (vice-chair)
- JIVE Council (from 4 May 2017): Simon Garrington (chair), John Conway (vice-chair)

EVN observing

- 2 Gbps to become the default recording mode for all EVN observations in the future

- Kunming to join EVN as an affiliate station (i.e., on a best effort basis)

Under study/preparation
- EVN Working Group set up to think about three points
  - Possibility of longer e-vlbi sessions
  - Possibility of implementing large/key observing programs
  - collaboration with LBO
- EVN vision document
- MoU with IVS

Jumping JIVE
- H2020 project to enhance the ERIC structure
- Jumping JIVE officers
  - Coordinator: Huib van Langevelde
  - Project manager: Paco Colomer
  - Board chair: René Vermeulen
- 10 work packages

Meetings
- Next EVN Consortium Board of Directors meeting: Onsala, Sweden

15. Highlights of recent meetings

The recent meetings of EVGA, TOW, and EGU have already been mentioned.

16. Upcoming Meetings

There will be an IAG meeting in Kobe, Japan. The Journées 2017 will be held in September in Alicante, Spain.

The International VLBI Technology Workshop (IVTW) will be held in Bologna, Italy together with the next IVS Directing Board meeting (October 12).

17. Summary of Action Items

There were six action items resulting from this Board meeting (separate document).

18. Miscellaneous (all)

None.