

# 23rd Directing Board Meeting – Summary Notes

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*Location:* University of Tasmania, Hobart, Tasmania, Australia  
*Date:* 12 February 2010  
*Note taker:* Dirk Behrend  
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Attending Board members: Harald Schuh (Chair), Dirk Behrend, Patrick Charlot, Rüdiger Haas, Hayo Hase, Kerry Kingham, Chopo Ma, Axel Nothnagel, Kazuhiro Takashima, Oleg Titov, Alan Whitney, Xiuzhong Zhang.

Attending guests: John Gipson (TOP 7.1), Leonid Gurvits (TOP 7.3), Arthur Niell (TOP 6.6), and Bill Petrachenko (TOPs 6.6 and 8).

## 1. Welcome (Harald Schuh)

Gino Tuccari, Ed Himwich, and Andrey Finkelstein could not attend. Four guests attended for the duration of their agenda topics: John Gipson, Leonid Gurvits, Arthur Niell, and Bill Petrachenko.

## 2. Approval of Agenda

The agenda was approved with adding TOP 7A “Recommendation from the DB” as suggested by Axel Nothnagel.

## 3. Approval of Minutes of the 22nd DB Meeting (Harald Schuh)

The formal approval of the notes was postponed to three weeks after the 23rd DB meeting. [The notes were then approved and posted.]

## 4. IVS DB Chair’s Report (Harald Schuh)

Correspondence together with Dirk Behrend:

- Letter to the Norwegian Mapping Authority in support of establishing a fundamental station at Ny Ålesund.
- Letter to the Geographical Survey Institute (GSI) in Japan recommending to become an IVS Analysis Center and to operationally analyze ultra-rapid Intensives.

Presentations on IVS and VLBI2010:

- German Geodetic Week, Karlsruhe, 09/2009
- University of Skopje, Macedonia, 10/2009
- Japan/Austria celebration of 140 years of collaboration, Vienna, 10/2009
- UACEG2009 International Conference, Sofia, Bulgaria, 11/2009

Discussions within the VLBI2010 Project Executive Group (V2PEG) about VLBI2010 related issues.

## 5. IVS CC Director's Report (Dirk Behrend)

Activities since the last board meeting were:

- Publication of August and December Newsletters
- Preparation of 2009 Annual Report
- Maintenance of mailing lists and Web site
- Observing program coordination
- Support of VLBI2010 Committee (V2C)
- Support of VLBI2010 Project Executive Group (V2PEG)

Correspondence:

- Letter to the Geographical Survey Institute (GSI) in Japan.
- Note to Florian Seitz nominating Oleg Titov as the IVS Representative to the IAU Commission 19 Organizing Committee.
- Note to Jan Vondrak with the IVS contribution to the Transactions IAU XXVIII B.
- Note to the chairs of GGOS WG on Data and Information Systems (Bernd Richter and Carey Noll) informing that Dirk Behrend is IVS Representative on the WG DIS.
- Several letters of invitation for the General Meeting in Hobart.
- Visa application support for Victus Uzodinma from Nigeria, including a letter of support to the Australian High Commission in Pretoria, South Africa.

For the General Meeting a Web page was set up including the abstract submission process. The Coordinating Center prepared and mailed out the 2nd Announcement, coordinated the Program Committee activities, and prepared the program booklet, which was also posted on the Web page.

The Coordinating Center coordinated the Very Large Astrometry Session IYA09 as an activity for the International Year of Astronomy 2009 and supported the Task Force for the IYA09. On the IVS Web site a dedicated Web page (<http://ivscc.gsfc.nasa.gov/program/iya09>) serves as repository of information for the IYA09 session.

CSIRO/ATNF submitted a proposal for Parkes to become an IVS Network Station. The Board unanimously approved the proposal.

All component application forms should be revised and updated prior to the next Board meeting for approval at that meeting. The coordinators, component representatives, and the Coordinating Center are tasked with this job.

Activities for the next several months include:

- Publication of April and August 2010 Newsletters.
- Publication of the 2009 Annual Report.
- Publication of the GM2010 Proceedings.
- Prepare Board elections.
- Continued participation in GGOS activities.
- Assume activities in the WDS, the successor to FAGS.
- Coordinate next Directing Board meeting.

## **6. Reports of the Coordinators and Committee Chairs**

### **6.1 Observing Program Committee Chair's short report (Dirk Behrend) and Proposal Concerning Ultra-rapid UT1 Sessions (Rüdiger Haas)**

Issues discussed in the period since the last board meeting were:

- IYA2009 Astrometric Session (see TOP 6.2).
- 2010 Planning.
- 2011 CRF sessions for southern hemisphere.
- Data Inclusion Policy: The OPC determined that data from non-IVS sessions should be included on request and with requirements for including ancillary information such as schedule files and correlator reports.
- Data Rate for R1 Sessions: The OPC decided to go back to 256 Mbps for the R1 sessions starting on November 1, 2009. The higher rate of 512 Mbps caused the R1s to be delivered later than the 15 required days.
- Media Shipment Budgets.
- Impact of Fortaleza Downtime.
- Extension of OPC: add Jim Lovell from University of Tasmania.

The geodetic media pool was very tight (due to, e.g., media tie-up in IYA09 and required early bulk shipments to stations with lengthy customs procedures); additional media purchases or upgrades of existing media were needed.

Rüdiger Haas proposed to operationally determine ultra-rapid dUT1 results for all R1 sessions with Onsala and Tsukuba. In addition, the idle time between 24-hour experiments at the two sites could be used to include further single baseline Intensive sessions. The Board created a Task Force on Intensive Sessions. The task force consists of Rüdiger Haas (chair), Dirk Behrend, Kerry Kingham, Brian Luzum (tbc), Axel Nothnagel, and Kazuhiro Takashima. It is anticipated to have a proposal ready by the next Board meeting in October.

## 6.2 IVS Contribution to the International Year of Astronomy (Patrick Charlot, Dirk Behrend)

The Task Force for the IYA09 discussed the various goals of the supersession and decided on the following:

- Science goals:
  - strengthen the ICRF2 by observing as many ICRF2 defining sources as possible in one single session (ultimately 243 out of 295);
  - provide the arc lengths between all sources without relying on source overlaps.
- Outreach goals:
  - press releases through the IYA2009 organization (IAU), IVS, and other organizations;
  - news coverage in regional and national media;
  - open doors at stations;
  - watching of progress of session via Internet in real time.

A dedicated Web page (<http://ivscc.gsfc.nasa.gov/program/iya09>) was established on the IVS Web site. At Bordeaux Observatory, Arnaud Collioud developed a dynamic Web page (<http://iya09-ivs.obs.u-bordeaux1.fr/>) where interested users were able to observe the progress of the IYA09 session in real time. Patrick Charlot was given the mandate to effectuate the porting of the dynamic Web page to general IVS use.

## 6.3 Analysis Coordinator's short report (Axel Nothnagel) and Call for Proposals for 'IVS Special Analysis Centers Specific Observing Sessions (SAC-SOS)' (Axel Nothnagel)

The timeliness of solution submissions from all contributing Analysis Centers (ACs) is crucial for productive combination solutions. The Board suggested pinging the delinquent ACs immediately after an expected submission day was missed. Harald recommended that a letter be sent to the ACs requesting timeliness. Axel Nothnagel will draft a letter.

Combination issues:

- The EOP combinations were taken over by BKG Frankfurt on 1 October 2009. Sarah Böckmann trained personnel at BKG. The fourth quarterly solution of 2009 and the first of 2010 are missing due to key personnel (Wolfgang Schwegmann) leaving BKG.
- There are different solutions for different purposes: SINEX files with maximum requirements for consistency (for combination), EOPS/EOPI files for other purposes.
- Incompleteness of data sets: in a quarterly solution only sessions should be exported that are suitable for reliable EOP determination; for TRF determinations *all* sessions are needed.

Axel Nothnagel was tasked to update the draft of the Call for Proposals for IVS Special Analysis Center for Specific Observing Sessions (SAC-SOS) and then distribute it via Dirk.

Lucia Plank and Axel Nothnagel were asked to prepare a call to extend the Delay and partial Derivatives Comparison Campaign (DeDeCC) communitywide. The call is to be distributed by the Coordinating Center.

#### 6.4 Network Coordinator's short report (Ed Himwich given by Dirk Behrend)

A project was started to identify problem stations. First it will be determined whether the correlation effort is worthwhile for the data contribution. Then ways will be identified to assist these stations. The correlators have submitted their information; the next step is for station contributions to be investigated by analysts.

Current station problems:

- Fortaleza antenna damaged, trying to determine cost and funding of repair.
- Svetloe antenna in repair, expected to return into service in March.
- TIGO has about 20% data loss:
  - Possibly LO related, no conclusive evidence
  - Investigating whether it is a source problem
- Kokee: one azimuth gearbox removed for repair for 6+ months; then the other gearbox needs repair.
- RFI in general, especially at S-band.

#### 6.5 Technology Coordinator's short report (Alan Whitney)

VLBI Data Interchange Format (VDIF) and VLBI Transport Protocol (VTP):

- VDIF:
  - full VDIF specification to be published in 2009 Annual Report
  - hardware: dBBC, DBE2, CDAS and others are being designed to implement VDIF format on 10GigE, compatible with Mark 5C and other VLBI data systems
  - DiFX software correlator has implemented simple VDIF format
- VTP:
  - task force appointed
  - members are: Chris Phillips (chair, ATNF), Mark Kettenis (JIVE), Mamoru Sekido (NICT), Richard Hughes-Jones (Univ Manchester), Alan Whitney (MIT)

VEX2 Task Force:

- VEX2 Task Force established to update VEX to support new devices and operational
- Walter Briskin (chair, NRAO), Ed Himwich (GSFC), Mark Kettenis (JIVE), Cormac Reynolds (Curtin Univ), Alan Whitney (MIT)
- time schedule: have initial draft by the end of the year

New/pending network connections:

- USNO: physically connected @ ~600 Mbps (OC-12), but NASA configuration issues remain for many connections

- Kokee: service is connected, but DREN configuration issues remain, USNO anxious to resolve

DiFX Progress:

- Input formats supported
  - Mark IV, VLBA, Mark 5B
  - LBADR (Australian LBA)
  - *VDIF: single thread implemented*
  - Other formats (e.g., K5) can be added
- Output formats supported:
  - FITS-IDI (via translation, post-correlation)
  - RPFITS (for now, retirement planned)
  - MPI working on support for geodetic output format
- Control format
  - VEX drives correlation by providing station, source and scan information
  - Certain data must be appended (clocks, EOPs,...)
  - Correlator control files derived from this annotated VEX file
  - *Multiple simultaneous fields-of-view implements*

## 6.6 VLBI2010 Committee report (Bill Petrachenko, Arthur Niell)

Bill reported that the Broadband Delay (BBD) has been much better understood. From the 2–14 GHz range, the current feed only uses up to 8 GHz; with full VLBI2010, up to 14 GHz will be used. BBD is on its way to become reality. There is still plenty of room for improvement; e.g., use of optimized frequency sequence, use of 1-GHz bands. The BBD must still be tested under many other conditions: baselines much longer than 600 km, a wide variety of sources, much longer time periods (24 hours), a more unstable ionosphere, and different RFI conditions.

The network is growing organically on its own. Fast-slewing antennas are already becoming a reality. The Vertex antenna for the Twin Telescope Wettzell is fully VLBI2010 compliant with an azimuth rate of 12°/s and an elevation rate of 6°/s. Other projects in various parts of the world are at different stages of development.

In other fields relevant for VLBI2010 progress has been made: e-VLBI is expanding; automation and remote-control of sites is progressing; new data structures are being handled by WG4; updated analysis packages are under development; analysis automation is working well for Intensives.

Arthur reported on the status quo of the proof-of-concept work. The basic system has been demonstrated. The next big step is to get the Eleven feed in. One Eleven feed is at Haystack, a second one is expected to be delivered. At Goddard the 12-m Patriot antenna has been sitting in containers since December 2009. It will take about two months to establish the 12-m antenna. Roger Cappallo is working on the adaptation of DiFX to fit it into Mark IV. A software correlator may be ready by summer 2010.

## 6.7 VLBI2010 Project Executive Group Chair's report (Hayo Hase)

The V2PEG had two face-to-face meetings (in Buenos Aires and in Hobart) and an exchange of ideas and information via e-mail. At the last face-to-face meeting the V2PEG discussed strategic goals and identified the following points:

- perform UT1 (or EOP) determinations with the VLBI2010 system from 2013 onwards;
- certification process for VLBI2010 compliance:
  - VLBI staff test,
  - qualification period,
  - bronze, silver, and gold level with validity period;
- identification of potential individuals in organizations and institutions to champion VLBI2010 activities (e.g., chair of SIRGAS).

V2PEG agenda:

- April 30: define the list of individuals to be approached by IVS;
- May 10: send out IVS letters;
- by next DB meeting: have a proposal on VLBI2010
  - work out a three-station VLBI2010 experiment for 2013
  - work out a VLBI2010 certification procedure.

Arthur noted that the certification system also would need to be administered.

## 6.8 Short Reports on Status and Progress of VLBI2010 Projects

Hayo reported that at Wettzell the towers of the telescopes have been constructed and that the new operations building is under construction. It is expected to be finished by the end of 2011.

Harald stated that the Finnish Geodetic Institute was granted funds for four years (salary for four people) for a VLBI project.

Patrick reported that for a VLBI station on Tahiti the idea was moving from a dream to some reality. A meeting with the funding agency (CNES) was planned for the week following the General Meeting week.

## 6.9 Data Administration with the IVS (Axel Nothnagel)

The IVS data structure is cluttered and a reorganization is needed. This should be given increased priority.

Dirk Behrend was given the mandate to merge the yearly bibliography lists of the Annual Reports to form a common data base.

## **7. Reports of the IVS Working Groups**

### **7.1 IVS WG4 on VLBI Data Structures, Chair's report (John Gipson)**

The work of the WG is coming to an end. It is planned to publish a short written report and a full description of the new data format. Both should be available as a final draft at the Board meeting in October 2010. The target is to introduce the new format in spring 2011 and then have an overlap between the new and old formats for about half a year. Goddard is working on a new analysis package ('new solve'), which supports the new format. Work is in progress to implement the format also in other packages, such as VieVS at TU Vienna.

### **7.2 Joint WG IERS/IVS/IAG/IAU on the Next ICRF (ICRF2), Chair's report (Chopo Ma)**

The IAU Working Group was geared towards the approval of the ICRF2 at the IAU. The work of the IAU WG is finished and the WG was closed.

The IERS/IVS WG still works on a journal paper, i.e., condensing the IERS Technical Note into a paper. It should be possible to close this WG at the Board meeting in the fall of 2010.

### **7.3 IVS WG5 on Space Science Applications, Chair's report and Final Approval of Members (Leonid Gurvits)**

The WG5 on Space Science Applications was formed in March 2009 and is co-chaired by Leonid Gurvits and Patrick Charlot. It is tasked with the investigation of synergies in scientific and technological areas between the IVS core activities and VLBI experiments in application to planetary and space science missions. Work has begun on a 'white paper' in October 2009 covering the goals, scientific applications (planetary and non-planetary), targets (e.g., Mercury, Mars, deep space astrophysical missions), specific technologies (hardware, software), and activities. It is foreseen to have an advanced draft ready by the October 2010 Board meeting.

The Board unanimously approved the suggested list of 14 members for WG5.

The synergies and reciprocity between Space Science and the IVS:

- Spacecraft (S/C) as VLBI targets:
  - frequency compatibility (S, X, and Ka bands)
  - compatibility of VLBI modes for geodesy and S/C tracking
  - correlator models
- Estimation of state-vectors of spacecraft
  - need for "higher-than-standard" accuracy in special cases (e.g., geodynamics and planetology, trajectory measurements in close vicinity of Solar System bodies, fundamental physics, space-borne astrometry missions)



- Geodetic support of antennas involved in S/C tracking. There is a difference in understanding what VLBI is between the geodetic and space craft communities.
- VLBI surveys of reference sources for S/C VLBI tracking

There are a number of missions in Solar System exploration (e.g., BepiColombo, EVE, Phobos-Grunt, ExoMars, MarsNet, EJSM, TSSM, and lunar missions) planned for 2011–2030 that entail VLBI usage. Similarly, several space missions (e.g., Odyssey, GAIA, Herschel, Planck, LISA, GNSS) could make use of VLBI tracking.

## **7.4 IVS WG6 on VLBI Education and Training, Chair's report and Final Approval of Members (Rüdiger Haas)**

The Working Group on VLBI Education and Training (WG6) was established at the March 2009 Board meeting in Bordeaux and the Charter of WG6 was approved at the August 2009 Board meeting in Buenos Aires. The other initial members are Oleg Titov, Hayo Hase, Bjørn Engen, Johannes Böhm, Dirk Behrend, and Alan Whitney. A Web page was set up at Chalmers University of Technology at <http://www.chalmers.se/rss/EN/research/research-groups/space-geodesy/projects/ivs-wg6>.

Plans for 2010:

- increase number of WG members
- submit applications (March–May 2010) for funding of a summer school in 2011
- prepare a list of university contacts (international) and later establish contacts
- start to develop educational material

Oleg Titov suggested the preparation of an IVS handbook on geodetic and astrometric VLBI. Harald mentioned that he and Johannes Böhm would contribute a chapter on VLBI to a Springer book; the chapter was expected to have some 30 pages.

## **7A. Recommendations from the DB (Axel Nothnagel)**

During the General Meeting it became apparent that the Board should prepare and send out a couple of official requests or recommendations. Axel Nothnagel agreed to prepare a draft of a general guideline for parallel operations of old and new antennas at the same site. Dirk Behrend was tasked to prepare a draft of general guidelines/recommendations for site selection (e.g., station elevation masks of 5 degrees) based on the V2C Progress Report.

## **8. DORIS Interference at IVS Stations (Bill Petrachenko)**

Work is under way to look into radio frequency interference from DORIS and aircraft avoidance radar (of SLR systems) at a co-location site on the S/X and VLBI2010 systems. Bill Petrachenko did theoretical computations which were corroborated by actual measurements done by Tom

Clark and Chris Beaudoin. Unlike the S/X system, where filters can be used to mitigate the RFI problem, with VLBI2010 RFI can be a major contributor to saturating the VLBI receiver. Bill thus recommended putting an obstruction (e.g., building, hill) between the DORIS and VLBI systems. These are preliminary findings only, however, and work on this topic will continue. It is planned to write a final report about the findings.

## **9. Items related to IAG, IAU, FAGS, and Related VLBI Groups**

### **9.1 IAG**

#### **9.1.1 IAG Newsletter Contributions (Dirk Behrend)**

Several items were submitted to the IAG Communication and Outreach Branch for publication in the IAG Newsletter. These included the Second Announcement of the 6th IVS General Meeting, a press release for the observation of the supersession as a contribution to the International Year of Astronomy 2009, and the call for the CONT08 Special Issue of Journal of Geodesy. Future items could be the announcement that the AuScope antennas were online.

#### **9.1.2 IAG Commission 1 (Chopo Ma, Harald Schuh)**

A symposium “Reference Frames for Applications in Geosciences (REFAG2010)” is planned for 4–8 October 2010 in Marne-La-Valée, France. Another meeting is foreseen for the IUGG General Assembly in Melbourne in June/July 2011. The papers submitted for the Proceedings of the IAG Scientific Assembly in Buenos Aires are in the review stage. The publication of the Proceedings volume is anticipated for the end of the year.

#### **9.1.3 Journal of Geodesy, Special Issue on CONT08 (Axel Nothnagel)**

A preliminary call was sent out to check on sufficient interest. The Editor-in-Chief then gave the go-ahead for a full call. The full call was issued with an abstract submission deadline of 31 May 2010. The special issue has a page allowance of about 100 pages (size of regular issue). The editors are Axel Nothnagel, Urs Hugentobler, and David Salstein.

### **9.2 EVGA (Axel Nothnagel)**

The next EVGA meeting will be held in Bonn in 2011. The dates are not fixed yet, but the meeting will probably be held for the length of two days in February/March 2011.

### 9.3 IAU (Patrick Charlot)

#### Future Meetings:

- Journées 2010 ‘New challenges for reference systems and numerical standards in astronomy’
- 20–22 September 2010, Paris, France
- Topics:
  - astrometric catalogues (optical and radio)
  - SI units, astronomical constants and numerical standards
  - relativity and reference systems
  - planetary ephemerides and their comparison
  - pulsars timing and time transfer
  - theory and observations of Earth orientation
  - educational efforts in relativistic astrometry and celestial mechanics
  - astronomical reference frames in the relativistic framework

#### Organization: Modification of Division I structure:

- retain the current definition and rules related to Commissions and Working Groups?
  - institute a new organizational body called a “Permanent Service”?
  - institute another organizational body called a “Permanent Committee”?
- Permanent Working Groups will become a Committee.

### 9.4 EVN (Patrick Charlot)

#### Meetings:

- Past:
  - last EVN CBD + JIVE Board: Jodrell Bank, 11–12 November 2009
    - EVN: Agreement signed with IAA for inclusion of Svetloe, Badary, and Zelenchukskaya in EVN
    - JIVE: MoU with NOAC (China) to be renewed for 2009–2010. Should be synchronized with the rest of Europe beyond 2010.
- Future:
  - next EVN CBD + Jive Board: Torun/Warsaw, 21–22 April 2010
  - next EVN Symposium: Manchester, 20–24 September 2010

#### Observations:

- e-EVN:
  - ten 24-hour sessions per year
  - e-EVN now recognized as an SKA pathfinder
- Upcoming regular EVN/Global sessions:
  - March 4–25 (Session 1)
    - 48 hours of Global VLBI scheduled for GAIA link; another 96 hours to follow
  - May 27 – June 17 (Session 2)
    - first observations with Russian antennas
  - October 21 – November 11 (Session 3)

JIVE:

- STFC (UK) to initiate a “managed withdrawal” from the JIVE foundation as a result of prioritization in UK
  - several other radio instruments/projects also concerned such as LOFAR-UK, ALMA-UK Regional Center
- investigation of potential new JIVE partners: Poland, Finland, South Africa
- studying possibility to change to a new European Research Infrastructure Consortium (ERIC) for JIVE instead of current MoU between individual partners
  - would provide a more reliable continuity

## 9.5 FAGS (Dirk Behrend)

covered in TOP 5

## 10. Next IVS DB Elections (Dirk Behrend)

The Board named the Election Committee for the upcoming elections with Kerry (chair), Oleg, and Dirk.

## 11. Meetings

### 11.1 Recent Meetings (GM2010, ...) (all)

Harald Schuh found the General Meeting to be a very good meeting; in particular the presentations were excellent. Special thanks should go to the local organizers. For the next General Meeting probably more participants should be expected.

### 11.2 GGOS Unified Analysis Workshop (Axel Nothnagel, Harald Schuh, Chopo Ma) and GGOS Retreat (Chopo Ma)

At the Unified Analysis Workshop everything appeared to go towards concentration and combination. The combination aspect had to be rated very high. There is a long list of action items to be worked on.

The GGOS Intergovernmental Committee (GIC) had its first meeting in November 2009 in Frankfurt/Main. At the Miami GIC meeting more agencies were represented. The meeting was chaired by Prof. Grünreich from BKG. Work was under way on a white paper. Progress was made on what the next steps would be. The white paper will be converted to a call for participation to be distributed to government agencies. There will be two meetings of the GIC as

reach outreach events (FIG in Melbourne, EGU in Vienna). The ultimate goal is to secure long-term funding for geodetic infrastructure.

The GGOS Retreat was organized around three possible themes with break-out sessions (unified height system, geohazards, sea level forecasting). ASI/Matera was confirmed as the Coordination Office of GGOS. Hans-Peter Plag resigned from his position as one of the two co-chairs of GGOS.

### **11.3 Next DB Meetings and General Meetings (Harald Schuh)**

The Board unanimously approved to hold the next IVS General Meeting in Madrid, Spain in 2012. Xiuzhong reconfirmed that Shanghai was available to host the General Meeting in 2014.

The next DB meeting was agreed to be held prior to the GGOS Earth Rotation symposium (25–28 October 2010) in Shanghai. The Board preferred 23 October 2010 as date for the Board meeting.

## **12. Miscellaneous (all)**

Hayo Hase reported about the situation at TIGO.