

# 25th Directing Board Meeting – Summary Notes

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*Location:* Institute for Geodesy and Geoinformation, Bonn, Germany  
*Date:* 1 April 2011  
*Note taker:* Dirk Behrend  
*Version history:* 1 April 2011

Attending Board members: Harald Schuh (Chair), Dirk Behrend, Alessandra Bertarini, Patrick Charlot, Jesús Gómez González, Rüdiger Haas, Hayo Hase, Ed Himwich, Kerry Kingham, Shinobu Kurihara, Chopo Ma, Axel Nothnagel, Fengchun Shu, Oleg Titov, Gino Tuccari, Alan Whitney, Xiuzhong Zhang.

Attending guests: John Gipson (TOP 9.1), Arthur Niell and Bill Petrachenko (TOPs 8.6–8.9).

## **1. Welcome (Harald Schuh)**

Harald Schuh welcomed the new DB members. Three guests attended for the duration of their agenda topics: John Gipson, Arthur Niell, and Bill Petrachenko.

## **2. Appreciation of outgoing DB members and welcome of new DB members (Harald Schuh)**

Xiuzhong Zhang and Kerry Kingham were presented with certificates of appreciation for their time on the board.

## **3. Approval of Agenda**

The Board approved the agenda for the 25th DB meeting.

## **4. Approval of Minutes of the 24th DB Meeting (Harald Schuh)**

The Board approved the notes of the 24th DB meeting.

## **5. Election of the Chair (Dirk Behrend)**

The Board elected Harald Schuh as the chair of the IVS Directing Board for the next four years.

## 6. IVS DB Chair's Report (Harald Schuh)

Axel Nothnagel was nominated as candidate for the next IAG Executive Committee (EC) elections (as Service Representative). There are three positions from the IAG services on the IAG EC. For each position always a pair of candidates will be elected on. Axel is paired with Tom Herring, the IERS Analysis Coordinator. Dirk Behrend was nominated as IVS contact person to the ISO standard on ITRS.

Harald represented the IVS at the GGOS Retreat in Zurich in February 2011. He was active in the VLBI2010 Project Executive Group, contacting various groups which have an interest in VLBI2010 and co-authoring letters concerning VLBI2010 (to Finland, Saudi Arabia, Spain, Sweden, and other countries). He moderated the IVS at-large Board elections.

Harald was in contact with the new ICSU World Data Systems (WDS). And he sent several letters on behalf of the IVS, e.g., to Vincenza Tornatore (Politecnico di Milano DIIAR, Italy) to welcome PMD as an IVS Associate Analysis Center.

Harald wrote the Chair's Report for the IVS 2010 Annual Report and contributed to the IVS report for the IAG Travaux 2007–2011, which was mainly written by Dirk.

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

Activities since the last board meeting were:

- Publication of December Newsletter; April issue in preparation
- Publication of the 2010 General Meeting proceedings
- Publication of the 2010 Annual Report (in preparation)
- Maintenance of mailing lists and Web site
- Observing program coordination
- Support of VLBI2010 Committee (V2C)
- Support of VLBI2010 Project Executive Group (V2PEG)

The CC coordinated the preparation of the TOW2011 workshop. This included the coordination of the Program Committee activities, the selection of classes and teachers, the preparation of the teaching schedule, and hosting the meeting Web page.

The CC created a draft version of an online VLBI bibliography based on the bibliography lists of the Annual Reports.

Activities for the next several months include:

- Publication of April and August Newsletters.
- Publication of 2010 Annual Report.
- Continue TOW2011 workshop coordination.
- Continue work on bibliography.

- Continue GGOS activities.
- Coordinate IVS' WDS activities.
- Coordinate next Directing Board meeting.

## **8. 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:

- Submission policy for proposals: The OPC decided that the proposal submission policy should be extended to address justification and operational needs in more detail.
- R&D proposal for Sept 12/13: The OPC decided to decline the proposal to observe the close approach event of Jupiter to 0229+131 in order to test gravitational delay.
- Japanese earthquake: The biggest impact of the major earthquake in Japan on the IVS observing program is that Tsukuba (and Kashima) cannot observe in the Intensive sessions until their position (and velocity) are re-established. Kokee Park will replace Tsukuba in the Int2 sessions and Sheshan in the Int3 sessions. The Japanese stations should observe in 24-hour sessions as soon as possible and as often as possible in order to re-establish position and velocity.
- CONT11: The CONT11 campaign is planned with 14 participating stations with a good southern hemisphere representation (5 stations). The campaign will be observed 15–29 September 2011 in 0–24 UT observation days and an observing rate of 512 Mbit/s.

### **8.2 Publication about IYA Super Session (Patrick Charlot)**

The Vienna group provided results for the EOP. The dUT1 estimates were 30–40% better than the best rapid-turnaround sessions (R1 and R4), the other EOP parameters (e.g., polar motion) are about as good as in regular sessions. The source imaging is still being worked on. The publication will be the next step.

### **8.3 Analysis Coordinator's extended report (Axel Nothnagel) and status of Call for Proposals for 'IVS Special Analysis Centers Specific Observing Sessions (SAC-SOS)' (Axel Nothnagel)**

The timeliness for submission of the rapid-turnaround sessions by the individual Analysis Centers continues to be unsatisfactory. Submission delays can be as large as one week. A table listing the individual submission dates is available on the Analysis Coordinator's Web site at <http://vlbi.geod.uni-bonn.de/IVS-AC> under the *Activities* part.

The Combination Center at BKG/DGFI prepared Web pages for the IVS combined series. The pages are available at <http://ida.bkg.bund.de/IVS/combination/RAPID/PHP>.

Dirk will add a link to the IVS Live site from the IVS home page.

The request for proposal for SAC-SOS resulted in only one submission: the proposal from the Vienna group.

## 8.4 Network Coordinator's report (Ed Himwich)

Summary of current station issues:

- Hobart12: sensitivity issues
- Kokee: Az gearbox will be replaced soon, more work needed, staff turn-over
- Kashima: maintenance
- Matera: both bands warm, under repair, antenna under repair, RFI
- Medicina: receiver warm
- Noto: antenna rail problem, returning late 2011
- Ny Ålesund: sensitivity issue, cause unknown, staff turn-over, Mark 5B under repair
- Shanghai, Urumqi: limited availability due to Chang'E operations
- Simeiz: severe 50 Hz modulation, receiver warm, sensitivity issues
- TIGO: sensitivity issues, cause unknown, computer upgrade problem
- Zelenchukskaya, Badary, Svetloe: minor antenna issues

There is good news from several stations:

- Metsahovi: three BBCs "fixed", only 2.5 bad ones now
- Wettzell: 20-m antenna successfully repaired
- Hobart12: now operational
- Warkworth: in testing
- Ny Ålesund: receiver cooling repaired
- Fortaleza: antenna repaired, may be available this month
- Tsukuba: antenna not seriously damaged by earthquake

Ed will post a list of Mark 5A to Mark 5B transitions on the Network Coordinator's Web page.

Upcoming activities:

- TOW, in early May
- CONT11 station testing, in spring/summer
- site training/tuning – Kokee, Australia/NZ

## 8.5 Technology Coordinator's report (Alan Whitney)

The VLBI Data Interchange Format (VDIF) continues to generate significant interest and there is a push to implement it. VDIF is widely recognized as important and is being implemented in several systems.

The VLBI Transport Protocol (VTP) Task Force is still debating some issues in an effort to make VTP as simple as possible. There is a push to have the final draft ready by mid-2011.

The VEX2 Task Force has been working on updating the VEX (VLBI Experiment Definition) format to support new devices and operational modes. The goal is to conclude by ~mid-year 2011.

DiFX Progress:

- input format supported: Mark IV/VLBA/Mark 5B, LBADR, VDIF; other formats can be added (e.g., K5)
- output formats supported: Mark IV correlator, FITS-IDI, RPFITS
- full phase-cal processing for all in-band tones now supported
- regular semi-annual international DiFX meetings now being held
- very active and dedicated development community

Alan will write a memo on the cost of a software correlator for VLBI2010.

VLBI Data Systems:

- Mark 5C prototype hardware has been delivered
  - tested extensively with RDBE at 2 Gbps to single module writing Mark 5B+ format data
  - 4-Gbps capability expected ‘real soon now’
  - read capability: FuseMk5
- beyond 4 Gbps:
  - 8-Gbps COTS system being evaluated at Haystack for next-generation VLBI data system; looks very promising

VLBI Technical Reference Web site:

- need has been expressed for centralized reference resource for VLBI technical information including both geodetic and astronomical systems
- proposal to extend `vlbi.org` Web site for this purpose
- Alan has volunteered to lead this effort

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

Bill reported on the work of the VLBI2010 Committee. The system development was progressing well. Digital back ends have been developed; also a new recording system appeared possible. There were still several options for feeds under consideration. The software correlator was developing. Bill presented his vision of a 5-year plan for a VLBI2010 roll-out. Recent VLBI2010 simulations with a mixed network showed a precision of ~3 mm. JPL is continuing to plan the GRASP (Geodetic Reference Antenna in Space) mission.

Possible impediments to a 1-mm performance could be instrumental effects, antenna deformations and site ties, source structure, and the atmosphere. VLBI2010 approaches to antenna deformations: VLBI2010 antennas are smaller, thermal offsets are monitored in real time, and/or gravitational models can be employed. Another approach for antenna deformations and site ties could be the use of a small reference antenna with connected element interferometry. Source structure causes phase variation across the broadband frequency range and complicates phase resolution across frequency which is required for broadband delay. For the atmosphere, the original studies with turbulence models were probably too optimistic. Possible solutions for improvement include improved scheduling algorithms, improved mapping functions using Numerical Weather Models, measuring water vapor content using WVRs, and the estimation of the spatial variability using a GNSS array.

Arthur described the VLBI2010 Prototype status. The proof-of-concept equipment was installed on two existing antennas (18-m antenna at Westford and 5-m antenna at Goddard) and observations were taken. Correlation is done on the DiFX software correlator and post-correlation with an enhanced version of `fourfit` to obtain phase delay and ionospheric value from two polarizations. Further system components are low noise broadband amplifiers, phase and noise calibration systems, flexible local oscillators for band selection, digital backends, and high data rate recorders. A polarization test was successfully performed on 4C39.25. First fringes were found with Goddard 12-m and VLBI2010 digital backends at GGAO and Westford on X-band. The next steps include at the antenna end to understand loss of signal, to increase the phase cal level, to reinstall DBE1s and Mark 5B+s, and to measure the performance over the full frequency range. At the back end level the DBE1/Mark5B+s should be replaced with RDBE/Mark5Cs and the QRFH feed should be installed as soon as the Dewar is ready.

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

The mission of V2PEG is to provide strategic leadership to the VLBI2010 project, to guide the transition from development to implementation, and to promote VLBI2010. Beyond the proof-of-concept studies, a roadmap for correlator enhancements to deal with 24h/7d and the automated analysis of VLBI2010 data is on the to-do list. A stimulation of the existing IVS network station members was achieved through a station survey in December 2010. The objectives of the survey have been to gather information about VLBI2010 plans, to trigger VLBI2010 discussion at network station level, and to get input on what the V2PEG can do to best support individual VLBI2010 projects. In summary, 20 new radio telescopes at 17 sites with full VLBI2010 compliance should become operational by 2017. Additional new stations might join. Thirteen radio telescopes will operate with partial VLBI2010 compliance. By 2014/2015 a sufficient number of VLBI2010-compatible radio telescopes will be available for initial VLBI2010 operations. The American/Pacific region will lack presence of VLBI2010 network stations.

V2PEG will address the needs of the network stations with a workshop about "VLBI2010 Technical Specifications" on 1–2 March 2012 at Wettzell. This workshop will directly precede the General Meeting in Madrid and will coincide with the inauguration of the Twin Telescopes. Another action will be the creation of VLBI2010 Web pages at the IVS Web site.

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

Oleg reported on the Russian VLBI2010 initiative at the University of Kazan. Kazan is about 1000 km east of Saint Petersburg. A group working on lunar exploration received a large amount of money, which they intend to use to start up VLBI activities. They might go for two telescopes: first a Patriot antenna and then later perhaps a Vertex antenna. The tender is due by April 2011. The budget for the first antenna is possibly around \$2 million.

Rüdiger reported about the initiative at Onsala to upgrade the site to a geodetic fundamental station (including a VLBI2010 twin telescope and a tide gauge). It is planned to submit a proposal by September; a response is expected by the end of the year. If funded, a construction by 2013 appears reasonable.

Patrick informed about the proposal for Tahiti for SLR and VLBI. In 2010 there was a request for large proposals in France. A proposal was submitted but not approved (mainly due to the high cost). Another round of proposals will probably be carried out in summer 2011. A suggestion was to bring down the full cost of the proposal.

Kerry mentioned the plans for Kokee. USNO has asked for money for a VLBI2010 telescope. The initial request was timed for 2013. It will probably be allocated in 2014/2015.

Chopo gave an update on the integrated station at Goddard. The site co-locates NGSLR, VLBI2010, and other techniques. The proposal is not approved by NASA HQ yet. LaBrecque hopes to get approval in the running fiscal year (ends September 2011). It is probably more likely to get approved next fiscal year. The design of the integrated station and the subsequent implementation of a network of integrated stations are still open.

Kurihara-san reported that the initial proposal was approved. RFI investigations and location search are underway. One candidate location is at GSI in Tsukuba; a second option is on top of a small mountain near a neighboring city to Tsukuba (about 13 km away) in bedrock. A big proposal (including a Twin Telescope) was submitted last week. An answer is expected in summer 2011.

Jesús presented the status of RAEGE. MT Mechatronics and Yebes personnel discussed the construction work, which is planned to start in about a month. The construction of the concrete tower is to start sometime during 2011. In Santa Maria (Azores), the location for the site was identified; the land is available. Of the Canary Islands, the most likely island is Tenerife with two possible sites.

## 8.9 RFI at IVS Stations (DORIS and SLR Radar Interference) (Bill Petrachenko)

Chris Beaudoin, Brian Corey, and Bill have done quite some work on this. A poster was presented at the AGU Fall Meeting 2010. The work looked into the co-location of the four geodetic space techniques. The analysis showed that if the techniques are co-located within a few



hundred meters, then some form of RFI mitigation is needed. Possible mitigation strategies include putting filters/blockage in place.

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

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

A draft proposal for the new data structure was circulated in 2009; the final proposal will be ready by the end of summer (August 2011). The Mark III databases need to be converted into the new format. There is a Calc/Solve problem, because the starting point of most IVS analysis systems is a Version 4 Mark III database. The replacement of the superfiles by OpenDB format began in fall 2010; many of the `lcodes` are read in the new format. It is expected to be complete in summer 2011. Interactive `solve` will be replaced by `nuSolve`. The switch-over to using the new format is scheduled for 1 January 2012.

### **9.2 IVS WG5 on Space Science Applications, Chair's report (Leonid Gurvits)**

Patrick mentioned that Leonid has started to write on the white paper. He was in contact with experts from outside the working group. These experts are in competition with each other. Everything is delayed. Harald urged the WG5 to finish their work.

### **9.3 IVS WG6 on VLBI Education and Training, Chair's report (Rüdiger Haas)**

A summer school on VLBI is proposed for the period August 29 through September 2, 2011. The school can be held at Onsala Space Observatory (OSO) with about 20–30 students and several international teachers. The biggest hurdle is to obtain funding. Assuming a successful funding, a possible program was presented.

Dirk and Rüdiger will transfer the WG Charter from the Onsala Web site to IVS Web site.

## **10. Report of Task Force on IVS Intensives (Rüdiger Haas)**

The Task Force discussed basically three topics: (1) three level INT products, (2) “unified analysis strategy for INT, and (3) ultra-rapids (routine automated ultra-rapid dUT1, ultra-rapid 24h dUT1, and additional ultra-rapids). A three-tier approach to Intensives appears to be a reasonable option: “Ultra-rapid dUT1” (< 1 h after INT session), “Rapid dUT1” (< 6 h after INT session), and “Final dUT1” (< 24 h after INT session). An implementation of such an approach needs to be coordinated with the IERS Rapid Service. Harald opined that it would be sufficient if the final dUT1 value was available after about three days.



The analysis strategy for the Intensives should be unified for models and procedures used, such as reference frames, precession/nutation, mapping functions, a-priori EOP, gradient handling, or atmospheric loading.

Future work includes the identification of responsible persons for the three different INT products, the finalization of the unified analysis strategy, the development of a combination approach, the continuation of the ultra-rapid dUT1 sessions, and the development of new analysis approaches (e.g., Kalman filter).

## **11. Items related to IAG, IAU, WDS, and Related VLBI Groups**

### **11.1 IAG**

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

Future contributions to the IAG Newsletter could be the announcement of the General Meeting in Madrid, the operativeness of the AuScope array, the CONT11 campaign.

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

The main activity of IAG Commission 1 was the REFAG meeting in Marne-La-Vallée, France in October 2010. One focus was on the ITRF2008; there is a need for calibration and the misclosure between different techniques at the stations needs to be addressed.

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

Four papers have been accepted, two papers are in a major revision stage. We will wait until at least one of the two ‘major-revision papers’ is accepted before going ahead with the publication of the special issue.

### **11.2 EVGA (Axel Nothnagel)**

The EVGA meeting was a very nice and fruitful meeting with a good participation. There were 40 oral papers, 10 poster, and close to 80 participants. The next meeting venue is not decided yet, but we should plan for up to 100 people.

### **11.3 IAU (Patrick Charlot)**

Meetings: The Web site for the Journées 2011 (19–21 September 2011) in Vienna has opened. The IAU General Assembly 2012 will be held in Beijing.

There is a proposal to introduce services to supplement commissions. The services would be permanent, the commissions non-permanent. The proposal was submitted to the General Secretary of the IAU. A decision is expected in May. Harald added that SOFA is intended to become a service.

There is a proposal to change the definition of the astronomical unit.

## **11.4 EVN (Patrick Charlot)**

There were EVN Board meetings in Torun and Warsaw. A TOG meeting is planned to be held in Arecibo in August 2011. An ERIS school is scheduled for 5–9 September 2011 in Rimini, Italy. A RadioNet Board meeting will be held in Cape Town on 11–12 November 2011.

The 2010 EVN Observing Schedule comprised about 1000 hours of observing, 300 hours of which were observed as e-EVN. About half of the e-EVN sessions were Target of Opportunity sessions. An experiment of continuous 65 hours observing in real-time was conducted.

JIVE will move to the ERIC (European Research Infrastructure Consortium) structure.

## **11.5 ICSU World Data System (Harald Schuh, Dirk Behrend)**

The World Data System (WDS) is getting off the ground. Dirk will fill out the membership application.

# **12. Meetings**

## **12.1 Recent Meetings (EVGA2011,...) (all)**

see TOP 11.2

## **12.2 GM2012, Status and Program Committee (Jesús Gómez González, Dirk Behrend)**

The 7th IVS General Meeting (GM2012) will be held in Madrid in the week 4–9 March 2012. A Web site was set up at OAN at the URL <http://www.oan.es/gm2012/>. The meeting venue is the Royal Observatory of Madrid (ROM); also a half-day excursion to Yebes Observatory is planned.

The Board agreed on the motto of the meeting with “Launching the Next-Generation IVS Network”. Further, the Program Committee was established with (alphabetical order): Dirk Behrend, Alessandra Bertarini, Jesús Gómez González, Hayo Hase, Ed Himwich, Shinobu Kurihara, Arthur Niell, Axel Nothnagel, Bill Petrachenko, Fengchun Shu, Oleg Titov, Gino Tuccari, and Alan Whitney.

### **12.3 Other Upcoming Meetings (Dirk Behrend)**

Workshop “The Growing Demands on Connectivity and Information Processing in Radio Astronomy from VLBI to the SKA”, Alveiro, Portugal, 24–25 May 2011.

Workshop “QSO Astrophysics, Fundamental Physics, and Astrometric Cosmology in the GAIA era”; Porto, Portugal, 6–9 June 2011.

### **12.4 Next DB Meeting and Plan for IVS Retreat (Harald Schuh)**

The next Board meeting will be held in Vienna on 23 September 2011. The IVS Retreat will be held over two days directly preceding the Board meeting.

## **13. Miscellaneous (all)**

Harald reported on the GRASP (Geodetic Reference Antenna in Space) mission concept; a meeting of the GRASP PI with several technique experts was planned to be held at the EGU 2011 meeting in Vienna (Monday and Tuesday of the EGU week).