

**IVS VLBI2010 Workshop on
Future Radio Frequencies and Feeds (FRFF)
March 18 – 21, 2009
Wetzell, Germany**

Second Circular

General information and goal:

Working Group 3 of the International VLBI Service for Geodesy and Astrometry (IVS) formulated a vision for the next-generation VLBI system, dubbed VLBI2010, which aims at an improved service for geodesy and astrometry, among other things. The VLBI2010 vision touches all VLBI elements and components, from observation, to correlation, to analysis.

Geodetic VLBI observations are currently carried out primarily on S- and X-bands (2.2-2.4 and 8.2-9.0 GHz). A major innovation of the VLBI2010 system is the use of broadband feeds (1 or 2 to 18 GHz and perhaps up to 32 GHz) to address issues related to delay precision, source structure, and RFI.

The goal of the FRFF Workshop is to develop recommendations to the IVS Directing Board on the definition of the VLBI2010 radio frequencies and the specifications for VLBI2010 feeds. Fixing these parameters is important for future VLBI2010 developments and the realization of VLBI2010 antennas such as the German Twin Telescope Wetzell (TTW). Toward that end, talks and discussions will address possible options for observation frequency ranges that will allow VLBI2010 systems to achieve the VLBI2010 goal of 1-mm position accuracy in 24 hours, within the real-world constraints imposed by RFI, feed and antenna design, broadband receiver technology, calibration, and other factors.

The FRFF Workshop is mostly geared toward VLBI experts and electronics/RF engineers, who are encouraged to contribute with their expertise to the definition of the VLBI2010 radio frequencies.

In conjunction with this 3-day workshop a one-day IVS VLBI2010 Committee (V2C) meeting will also be held.

Logistical information:

Meeting place: Landhotel Miethaner (4 km from Wetzell)
Höllenstein 13
94234 Viechtach-Höllenstein
Germany
Tel: +49 - (0)9942 - 9530
Fax: +49 - (0)9942 - 353199
Internet: <http://www.landhotel-miethaner.de>

Accommodation: same as meeting place (Landhotel Miethaner)

Accommodation at the Meeting Place will be guaranteed on a first-come-first-serve basis by a **completely filled out** registration form using the meeting Web page of the LOC at <http://www.fs.wetzell.de/veranstaltungen/vlbi/frff2009/frff2009.html>

as soon as possible but no later than December 15, 2008. (Already registered participants may complete their entries by a second registration replacing the previous one.). The LOC asks not to make a reservation directly with the hotel in order to avoid any confusion. No prepayment or security deposit is needed.

Program and Call for Contributed Talks:

A preliminary program for the three workshop days is given below. Each session consists of a leading tutorial talk of about 40 min length followed by a 20 min discussion time. The tutorial part is then followed by contributed talks. We request submission of titles (and possibly abstracts) for contributed talks via e-mail to frff2009@fs.wetzell.de by January 15, 2009. We intend the sessions to be rather informal with the talks serving as basis for discussion. Hence, no length limit will be set.

March 18-20, 2009

1. Unit

- Introduction

2. Unit

- Tutorial: *Broadband delay (bbd)*
(Content: Motivation for broadband delay (bbd)? How it works. Frequency and sensitivity requirements. Limiting factors, e.g. source structure, RFI. Fall back options, e.g. enhanced dual band system, fixed multi-band system. Other VLBI2010 frequency requirements, e.g. L-band to use GNSS for orbit determination and site ties; S/X band for transition period and CRF continuity; 18-26 GHz for line-of-site WVR, Ka-band for compatibility with DSN and reduced source structure.)
- Contributed presentations on all aspects of moving from S/X to broadband observations
- Discussion of Tutorial, Presentations, Definition of a common understanding what broadband observation means for the ongoing workshop
- Conclusion

3. Unit

- Tutorial: *Feeds*
(Content: Major feed characteristics (e.g. spreading angle, azimuthal isotropy, phase centre, frequency dependence, polarization) and their impact on antenna optics, signal processing, post processing and VLBI performance. Pros and cons of major feed options (both for bbd and potential fall backs) including technical problems with feed realization.)
- Contributed presentations on recent feed developments and test results
- Discussion of Tutorial, Presentations, advantages and disadvantages of different feed types with respect to broadband observations
- Conclusion

4. Unit

- Tutorial: *Polarization*
(Content: linear polarized feeds vs. circular polarized feeds – which is better, and do we have a choice?, constructing circular polarization from dual-linear signals prior to

correlation, dual-linear correlation, effects of cross-polarization, measuring cross-polarization, implications of polarization choice for backend & correlator design)

- Contributed presentations on polarization tests, correlations, cross polarization
- Discussion of Tutorial, Presentations, implications of polarization choice for broadband system design?
- Conclusion

5. Unit

- Tutorial: *Broadband receiver design*
(Content: receiver architecture, low-noise amplifiers, up/down frequency conversion, local oscillator(s), system temperature, noise calibration, phase/delay calibration, performance of receiver components, sampling at frontend?, conversion to optical (analog vs. digital))
- Contributed presentations on recent or future receiver developments, problems and tests, front end sampling
- Discussion on Tutorial, Presentations, experiences with new technologies
- Conclusion

6. Unit

- Tutorial: *Radio frequency interference*
(Content: what is RFI?, internal vs. external, how to measure RFI at the site? effect of RFI in VLBI observations (SNR, saturation in broadband receivers, what to do and what not to do at an observatory), RFI mitigation, do exist adaptive filter for broadband feeds?)
- Contributed presentations on observed RFI, mitigation methods, strategies against RFI, identification of a RFI source, how RFI determines the observation schedule
- Discussion on Tutorial, Presentations, RFI mitigation methods, future observation frequencies
- Conclusion

7. Unit

- Tutorial: *Small reference antenna for site ties, antenna deformation models and GNSS orbit determination*
(Content: Benefit for site ties and antenna deformation models. Geodetic benefit to combine GNSS with quasars. Implementation suggestions.)
- Contributed presentations on small reference antennas, site ties, antenna deformations and VLBI determination of GNSS orbits
- Discussion on Tutorial, Presentations, how important is L-band for future feed designs?
- Conclusion

8. Unit (scheduled for March 20, afternoon)

- Summary of all conclusions
- Discussion and formulation of the recommendation to the IVS-DB on future VLBI radio frequencies
- Discussion and formulation of the recommendation to the IVS-DB on future feed specifications
- Closing

March 21, 2009

- V2C Meeting: *VLBI2010 digital processing*. Discussions will cover requirements and implementation issues for the VLBI2010 DBE/DBBC and correlator. Detailed program t.b.d.

Deadlines:

- 2008-10-10 First Circular
- 2008-10-31 RSVP (*répondez s'il vous plaît*) on intent of participation
- 2008-11-12 Second Circular (with tutorial program, call for contributed presentations, and details on accommodation and meeting place)
- 2009-01-15 Submission of abstracts for contributed presentations
- 2009-01-31 Third Circular (with full program)