



# Report from the event supported by RadioNet

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**TITLE** *6<sup>TH</sup> INTERNATIONAL VLBI TECHNOLOGY WORKSHOP*

**DATE:** *09 – 11 OCTOBER 2017*

**LOCATION:** *BOLOGNA, ITALY*

**MEETING WEBPAGE:** *<https://indico.ira.inaf.it/event/2/>*

**HOST INSTITUTE:** *INAF - IRA*

**RADIONET  
BENEFICIARY / NO:** *INAF / 4*

# Report:

## 1. SCIENTIFIC SUMMARY

Rapid advances in technologies relevant to VLBI (very Longa Baseline Interferometry) are foreseen in many fields: data recording, transmission, correlation and data analysis. They imply to reconsider how to make use of the VLBI observing technique to attain prominent scientific progresses in both astronomy and geodesy. Reports on current and near-term progresses on VLBI technology are expected. Forward look to opportunity and views of VLBI technology in the years to come are encouraged. Suggested areas of interest:

- Direct-RF-sampling,
- Tbps-scale data recording/transmission/correlation,
- Time and Frequency Distribution,
- Developments on software including fringe-fitting,
- Combination of linear and circular polarization in VLBI observations,
- Potential VLBI facilities at low frequencies, and at mm and sub-mm wavelengths

The 6th International VLBI technology workshop took place on 9-11 October 2017 in Bologna/Italy. The workshop began with a series of reports that illustrated the present state and future improvement projects of many observatories engaged in VLBI observations. Their geographical distribution ranged from European countries to the United States, from the Asian countries to Down Under. In short, there have been a global participation. The presentations also covered developments in software to improve observations, data transfer and their correlation. There have been many interventions dedicated to hardware developments for VLBI data acquisition both for astronomical observations, including those of Space VLBI, and for geodesy. In particular, new backends, receivers, and tests on fiber optic transfer of the reference frequencies were discussed. All these are rather important and very useful topics to keep the stations of the European VLBI Network at the state of the art. Much followed was the presentation of the results achieved so far with the BRAND-EVN project funded by RadioNet. BRAND-EVN will develop and build a prototype broadband digital receiver, which will cover a frequency range from 1.5 GHz to 15.5 GHz. The BRAND receiver when deployed at a majority of EVN (European VLBI Network) telescopes will place the EVN to new levels of performance not achievable with any other astronomical VLBI network. The BRAND receiver may become the next generation VGOS (VLBI Global Observing System) receiver due to its superior sensitivity, its wider bandwidth, and the possibility to choose parts of the spectrum still uncontaminated by RFI (Radio Frequency Interference).

There have been two Panel discussions. The first, “Technical compatibility and software collaboration” (Chairman, Chris Phillips, CSIRO) was about the need to increase the effective software collaboration and the compatibility between systems. The second session, “Future Technologies for VLBI” (Chairman, Jon Romney, NRAO) was about the need to establish a “formal” committee coordinating efforts on codes and hardware projects. There has been a quite large exchange of ideas between participants. The overall discussion was very useful. A stronger collaboration between different institutions is foreseen.

The closing remarks of the 6<sup>th</sup> IVTW were made by Pablo de Vicente, EVN TOG Chairman.

The event webpage is: <https://indico.ira.inaf.it/event/2/>

## 2. AGENDA OF THE EVENT

### MONDAY, Oct 9

08.30	Registration and coffee	
10.00	Welcome and logistics	Tiziana Venturi
	<b>Session 1: SITE AND ARRAY STATUS REPORTS - (Chairman, Jon Romney)</b>	
10.20	VLBI Developments in Australia	Cormac Reynolds
10.40	Warkworth New Zealand VLBI Station report	Tim Natusch
11.00	The Activity report of Ishioka VLBI Station with newly developed VGOS equipment	Takahiro Wakasugi
11.20	Recent activities related to the broadband system of the Kashima VLBI group	Kasuhiko Takefuji
11.40	KVN Status Report	Bong Won Shon
12.00	Shanghai VLBI Center Updates	Chen Zhong
12.20	Lunch	
	<b>Session 2: SITE AND ARRAY STATUS REPORTS - (Chairman, Michael Lindqvist)</b>	
14.00	The IRA DIFX Correlator	Matteo Stagni
14.20	Status of the Sardinia Radio Telescope	Andrea Orlati
14.40	Report on VLBI status at Medicina 32m - a possible Antenna Upgrade up to 100 GHz	Alessandro Orfei
	<b>Session 3: ADVANCES IN TECHNIQUE - (Chairman, Bong Won Shon)</b>	
15.00	remoteFile = std::move( localFile )	Harro Verkouter
15.20	Development of IT Technologies for scientific experiments with Russian Space Telescopes	Marina Shatskaya
15.40	Coffee Break	
16.10	Analysis of phase stability of the signal chains of the VGOS-5 stations	Chester Ruszczyk
16.30	Operating experience of Data Transmission and Buffer System. Research of a disk subsystem performance	Ilya Bezrukov
16.50	Study on Prototype KVN high-speed Recorder Development using FirmOS	Se-jin Oh

### TUESDAY, Oct 10

#### Session 4: ADVANCES IN TECHNIQUE - (Chairman, Chris Phillips)

09.00	Wideband Cryogenic Feed Receivers for VLBI	Gregory Beddeleem
09.20	Multifunctional Digital Backend (MDBE) for "Quasar" VLBI-network	Evgeny Nosov
09.40	Realization of reference frequency distribution over optical fibres for the Onsala Twin-Telescopes	Leif Helldner
10.00	VLBI radio telescopes synchronization with T/F distribution on fibre optic links: the Italian case	Roberto Ricci
10.20	A proposal for K and C-band simultaneous dual-band Observing Systems	Aletha De Witt
10.50	Coffee Break	
11.20	<b>Panel discussion</b> "Technical compatibility and software collaboration" (Chairman, Chris Phillips )	
	- Effective software collaboration (possibly including technology also, eg FPGA techniques)	
	- Compatibility between systems (formats, frequency coverage, data transport)	
12.30	Lunch	
14.30	Departure for "Museo Ferrari"	
20.0	Conference dinner	

### WEDNESDAY, Oct 11

#### Session 5: NEW CONCEPTS - (Chairman, Walter Alef)

09.20	Celestial and atmospheric H <sub>2</sub> O detection by direct RF samplin	Mark Kettenis
09.40	CASA for VLBI	Noriyuki Kawaguchi
10.00	On the use of linear polarizers in VLBI	Ivan Marti-Vidal
10.20	Coffee Break	

#### Session 6: NEW CONCEPTS - (Chairman, Arpad Szomoru)

10.50	From correlation on the Vienna Scientific Cluster to geodetic parameter estimation in the Vienna VLBI and Satellite Software	Jakob Gruber
11.10	BRAND EVN Project	Gino Tuccari
11:30	Towards VGOS full-band processing using the new R2DBE/CASPER architecture	Ganesh Rajagopalan
11.50	Testing Multibit encoding schemes	Chris Phillips
12.10	Lunch	

#### Session 7: NEW CONCEPTS - (Chairman, Noriyuki Kawaguchi)

13.30	Global VLBI in the SKA era	Arpad Somoru
13.50	Concepts for a Next-Generation VLBA	Jonathan Romney
14.10	<b>Panel discussion</b> "Future Technologies for VLBI" (Chairman, Jon Romney) (Phillips, Romney, Lindqvist, de Vicente, Venturi, all participants)	
	- Need (or not) for "formal" committee coordinating effort	
	- How to share experience, code etc	
	- Joint hardware projects	
	Closing remarks (Chairman, Pablo de Vicente)	
15.30	End of workshop	

#### Poster Session:

- Dr. Aletha de Witt: A proposal for K and C-band simultaneous dual-band Observing Systems
- Mr. Dmitry Sychev: Long distance data transfer via the Internet for space VLBI projects
- Pablo de Vicente: A Broad Band Receiver for VGOS observations

### 3. PARTICIPANTS

Participants (64) came from all over the world. Participants from Europe came from Italy, Germany, Spain, Holland, Austria, Sweden and Norway. There were 22 participants from non-European countries like Russia, Korea, Japan, USA, South Africa, Australia, New Zealand and China. The most important radio astronomy Institutions in the world sent their representatives. Only 7 participants were female, which may due to the fact that women actives in technology subjects are unfortunately a small minority (12,5%). For such reason the financial support provided by RadioNet was given to three female scientists.



*6<sup>th</sup> IVTW – Participants picture taken in front to the CNR Conference building.*



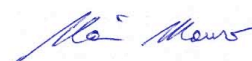
*Participants of the 6<sup>th</sup> IVTW.*



*The 6<sup>th</sup> IVTW secretariat.*

## 4. PARTICIPANT LIST

Bologna 6 <sup>^</sup> IVTW List of Partecipantes		
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## 5. RADIONET FINANCIAL CONTRIBUTION

The following workshop participants received RadioNet support to:

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The financial support was of 230 Euros each, equivalent to the registration fee to the workshop.

## 6. PUBLICATIONS

Publications are not foreseen. All presentations are available on the web site of the event:

<https://indico.ira.inaf.it/event/2/>