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### **Report from the TWS Workshop 1**

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## 1 Document information

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### 1.1 Dissemination Level

Dissemination Level		
<b>PU</b>	Public	X
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	

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## 2 NA - ERATec TWS meeting 1 report

Communication, training and scientific interaction between engineers and scientists involved in the development and operation of radio astronomical instruments represent a key issue in keeping these facilities at a world-class technical level. The Technical Workshop, held in Bonn in the week from April 8 – 12, 2013, brought together developing engineers, technical operators and observing astronomers. There were two days of general talks on RFI-related issues, which are of interest for the entire community followed by three days of more specific meetings of the individual groups. Furthermore, parallel training sessions were organized.

### 2.1 Scientific report

#### Technical Workshop

Summary of the 'Technical Workshop on RFI in Large Bandwidth Observations' in Bonn.

The workshop treated several topics of the large area of the problem of RFI in high sensitive radio astronomy observations. After a welcome address of the RadioNet project scientist Franco Mantovani and the ERATec Chairman Reinhard Keller a set of talks gave an overview of spectrum management for radio astronomy and RFI monitoring measurements as well as mitigation strategies. The rest of the day was dominated by talks of RFI measurements and related instrumentation. The second day was mainly dedicated to RFI mitigation and bookkeeping of measured data in related databases. The latter dominated the vivid forum discussion at the end of the workshop.

In conclusion, the generally shared view was that in future the expected minimum noise has to be balanced with signal purity and integrity. Observers cannot anymore expect to find RFI-free frequency ranges in all circumstances. Subsequently, Helge Rottmann described principles and various possibilities of appropriate databases. Sergio Poppi presented the CRAF RFI MySQL database. A discussion came up about the manual user interface being very subjective to the respective user.

During the discussion the privacy problem of measured data arose: Can we publish for instance measured military service data on the Internet? In this context we have to distinguish between a database to keep the protected bands clean and a database of local spectral occupancy at the different observatories. The latter should also foster appropriate RFI mitigation proposals. This would help observers to choose the right instrument, backend and observation mode. Another important usage of the database has to be the allocation of observatory-internal "interferers". It was especially during this discussion that the interdisciplinary approach of the Technical Workshops became obvious. Being a platform for engineers, technical operators and observing astronomers, the various views of the different groups could be presented and immediate clarifying response was possible.

In the end the wish for a RFI database workgroup was expressed. This workgroup will again be composed of representatives of the three involved groups, which should again provide an enormous increase of efficiency through the maximum exploitation of complementary capabilities among the groups and their observatories of origin. This will be an excellent example how the pooling of resources can lead to common solutions for common problems. Another example how best practices can be identified and shared will be the creation of a RFI archive for the European radio observatories. As certain common standards for data

acquisition and their formats are required to make it work for all observatories, frequent exchange of know-how, methods, and programmes will be required.

Furthermore, it was stressed that the RFI mitigation work of engineers and astronomers should be well recognized by institutes and their directors.

Before closing the workshop the next event in this series of meetings was announced on “Calibrating Multi Beam Receivers” October 28 – 29, 2013 at IRA/INAF, Bologna, Area di Ricerca CNR.

### **EVN TOG meeting**

The last EVN Technical Operation Group (TOG) meeting was held on April 10, 2013 in the framework of the 1st ERATec Technical Workshop on Radio Interference with Large Bandwidth Observations.

In total 35 people participated in the TOG-meeting, NRAO and Haystack participated via videoconference. The TOG-meeting was followed by a VLBI Hands-on workshop on April 11-12, 2013. The presentations, reports etc. from the TOG-meeting and the VLBI Hands-on workshop can be found on

<http://www.radionet-eu.org/radionet3wiki/doku.php?id=na:eratec:tog:tog-meeting-02>.

Examples of items discussed at the TOG-meeting:

- Normal reports (JIVE/Haystack/NRAO)
- Field System (FS)
- DBBC spare parts
- Future recording systems (Mark 6, XCube, Flexbuff)
- NRAO/EVN compatibilities
- Global VLBI experiments after the close down of the VLBA legacy system.
- New capabilities of jive5ab and when to use it also for disk recording (today it is used only for e-VLBI).
- RadioNet3/DIVA
- We had a presentation from a potential new EVN station, the Korea VLBI Network

On April 11-12, 2013, we had a VLBI Hands-on workshop with 4 parallel sessions. The topics, with a short summary, covered in the workshop were the following:

#### *DBBC Hardware/Maintenance*

The aim of the session was to describe the structure, hardware, software and maintenance of the DBBC.

#### *DBBC operation*

The aim of the session was to go through the scheduling, experiment setup using the Field System, continuous calibration and other operational aspects of the DBBC in the field.

#### *White-water-raft ride of VLBI data*

The aim was to present a white-water-raft ride of VLBI data (in the most general sense) from before observing, through correlation, through to the PI getting the data. The main goal was to illustrate what effects various actions/omissions at the stations may have on the quality of the final data and/or the difficulty of processing it.

#### *Practical Correlation*

The aim of the session was hands-on activities with the DiFX software correlator: brief introduction on what a correlator is, preparation of files for correlation and search for fringes with interpretation of the fourfit output.

### **Synergy (observing astronomers') meeting**

13 delegates of eleven observatories participated in the Synergy meeting, which took place on Thursday, Oct. 11, 2013. After some general considerations on the future activities within Synergy the conclusions drawn from the TWS on RFI were discussed. The group suggests that members start discussions within their home observatories on RFI-related work to create awareness of its importance, to encourage young astronomers to get involved in RFI work and to stress the importance of staff working in RFI-work.

An important aspect of Synergy work in the past was the development of NorthStar, the common submission tool for observing proposals. As NorthStar is by now used or in development at almost all European radio observatories, it was decided that Synergy will continue to support the exchange of information between the various developers at the different observatories. A specific item for further NorthStar development, which encounters considerable interest by most observatories is the treatment and statistical elaboration of metadata.

Another item for software development within, or independently of, NorthStar regards various 'electronic helpers' (exposure time calculators, user feedback forms etc.). The group will compile a list of available tools at the European radio observatories and thus provide a platform for exchange and development.

A common European archive of radio astronomical data was identified as a long-term goal of the observing community. A milestone would be a European archive of observing targets, which would be welcomed by the user community and Time Allocation Committees. The Synergy group will continue to support efforts toward a common European data archive.

Another essential step in this direction is the usage of a standard data output format from the European observatories. The MBFits format could be such a standard format for single-dish telescopes. Also a standard, commonly known data analysis package might be identified.

A longer discussion was held on the necessity for a mechanism to allow proposers the application for observing time at several telescopes also from different wavelength bands using one single proposal. This might be most interesting for the transient community. The usage of NorthStar should be helpful here. The necessity for a better advertisement for observing opportunities e.g. in the optical community by a European radio astronomy poster was brought up. Schools of radio astronomy should be enlarged with brief complementary wavelength sessions.

The long-standing request for a common web portal for European radio observatories could be addressed through a Wiki-based approach. This could also lead to the creation of a poster to be displayed at suited conferences.

Finally there was a suggestion to create from time to time a short (one-page) document which contains relevant weblinks to radio astronomical newsletters. This would also help to increase visibility of radio astronomy. It is important that this document can be produced on a minimum-effort basis.

The next Synergy meeting is planned to take place together with the next TWS meeting at Bologna on October 30, 2013.

## 2.2 Meeting programme

### Monday, April 8, 2013

09:00	<i>MANTOVANI, F</i>	Welcome Address from the RadioNet3 Project Scientist
09:20	<i>KELLER, R</i>	The Urge of RFI handling at large Single Dish Telescopes
09:50	<i>BOLLI, P.</i>	International Radio Astronomical Spectrum Management Representation
10:20	<i>BAAN, W</i>	RFI Mitigation: an overview
11:00	<i>Coffee Break</i>	
11:30	<i>AMBROSINI, R.</i>	Integrated strategies for monitoring and mitigation of RFI
12:00	<i>JESSNER, A.</i>	Ultra Wideband Devices and Radio Astronomy
12:30	<i>GRYPSTRA, K.</i>	The radio sky over Effelsberg
13:00	<i>Lunch Break</i>	
14:00	<i>BAAN, W.</i>	RFI Measurement procedures
14:30	<i>ILIN, G.</i>	RFI Measurements and Monitoring at QUASAR Network Observatories
15:00	<i>Coffee Break</i>	
15:30	<i>KEN, V.</i>	Designing VLBI2010 Software Correlator in IAA RAS
16:30	<i>VIUO, C.</i>	A new spectrometer for short wave radio astronomy near ionosphere's cutoff

### Tuesday, April 9, 2013

09:00	<i>WAGNER, J.</i>	RFI mitigation OTOH
09:30	<i>HELLBOURG, G.</i>	Spatial RFI mitigation - Concepts, implementation & performances
10:00	<i>VIUO, C.</i>	RFI mitigation R&D at Nançay Observatory
10:30	<i>Coffee Break</i>	
11:00	<i>SANCHES, S.</i>	RFI protection at the IRAM-30M Radio telescope
11:30	<i>COLOMER, F.</i>	RFI measurements for the selection of the RAEGE antenna sites
12:10	<i>TORNE TORRES, P.</i>	RFI Effects on Phase Array Feeds for Radio Astronomy
12:50	<i>Lunch Break</i>	
14:00	<i>ROTTMANN, H.</i>	Possibilities and constraints of RFI databases
14:30	<i>POPPI, S.</i>	CRAF RFI Database: a MySQL implementation
15:00	<i>Coffee Break</i>	
15:30	<i>POPPI, S. et al.</i>	Forum Discussion: RFI Monitoring and Databases
18:00	<i>Conference Dinner</i>	

**Wednesday, April 10, 2013**

09:00-17:00 TOG meeting  
in parallel:  
Trip to the Effelsberg 100-m telescope

**Thursday, April 11, 2013**

09:30 – 18:00 Synergies at Radio Observatories (observing astronomers' meeting)  
In parallel:

- Hands-on activities on the DiFX,
- DBBC Hands-on Workshop 1,
- VLBI data,
- DBBC Operations
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**Friday, April 12, 2013**

09:30 – 17:00 Hands-on activities on the DiFX, DBBC Hands-on Workshop 2, VLBI data, DBBC Operations

**2.3 Meeting Photo**

## 2.4 Participant list

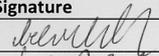
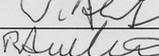
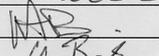
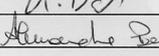
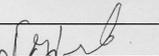
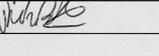
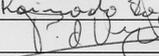
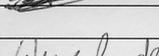
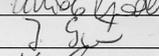
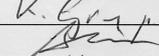
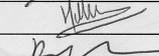
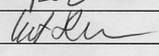
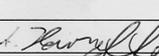
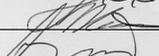
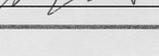
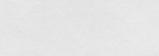
During the workshop there was a total of 74 participants. In addition, 3 persons participated via videocon in some of the meetings. Most attendees came from Germany (22), the Netherlands (12), and Italy (10). Among these there were 6 women. 11 participants came from outside the European Union (China, Russia, South Africa, South Korea, Norway).



ERATec Forum Workshop Week:  
Radio Interference in Large Bandwidth Observations

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### Participant List

Name	Institution	Signature
Aderhold, Norbert	MPIfR	
Alef, Walter	MPIfR	
Ambrosini, Roberto	INAF-IRA	
Baan, Willem	ASTRON	
Bach, Uwe	MPIfR	
Bertarini, Alessandra	MPIfR / Uni Bonn	
Beswick, Rob	JBCA	
Bezrukovs, Dmitrijs	VIRAC	
Bolli, Pietro	INAF	
Cassaro, Pietro	INAF-IRA	
Colomer, Francisco	IGN	
Concu, Raimondo	INAF	
de Vicente, Pablo	IGN	
Feiler, Roman	TCfA	
Frieswijk, Wilfred	ASTRON	
Garcia-Miro, Cristina	MDSCC	
Goddi, Ciriaco	JIVE	
Goliasch, Jens	MPIfR	
Grypstra, Karl	MPIfR	
Gunn, Alastair	JBO	
Hellbourg, Gregory	CNRS / OBSPARIS	
Hammargren, Roger	OSO	
Helldner, Leif	OSO	
Himwich, Ed	NASA / GSFC	
Horneffer, Andreas	MPIfR	
Ilin, Gennadii	IAA / RAS	
Jessner, Axel	MPIfR	



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Jung, Taehyun	KASI	<i>[Signature]</i>
Kallunki, Juha	AALTO	<i>[Signature]</i>
Keller, Reinhard	MPIfR	<i>[Signature]</i>
Ken, Voytsekh	IAA / RAS	<i>[Signature]</i>
Kesteven, Michael	CSIRO / CASS	
Klapers, Miks	VIRAC	<i>[Signature]</i>
Kronshnabl, Gerhard	BKG	<i>[Signature]</i>
Kunert-Bajraszewska, Magdalena	TCfA	<i>[Signature]</i>
Kuper, Geert	ASTRON	<i>[Signature]</i>
La Porta, Laura	IGG / Uni Bonn	<i>[Signature]</i>
Leeuwinga, Martin	JIVE	<i>[Signature]</i>
x Lindqvist, Michael	OSO	<i>[Signature]</i>
Liu, Xiang	XAO / CAS	<i>[Signature]</i>
Mack, Karl-Heinz	IRA-INAf	<i>[Signature]</i>
Martin, Jean-Michel	OBSPARIS / GEPI	<i>[Signature]</i>
Melis, Andrea	INAF	<i>[Signature]</i>
Mueskens, Arno	IGG / Uni Bonn	<i>[Signature]</i>
Orlati, Andrea	INAF-IRA	<i>[Signature]</i>
Paragi, Zsolt	JIVE	<i>[Signature]</i>
- Pazderski, Eugeniusz	TCfA	
Pisanu, Tonino	INAF	<i>[Signature]</i>
Polatidis, Antonios	ASTRON	<i>[Signature]</i>
Poppi, Sergio	INAF	<i>[Signature]</i>
Quick, Jonathan	HartRAO	<i>[Signature]</i>
Rastorgueva-Foi, Elizaveta	AALTO	<i>[Signature]</i>
Rottmann, Helge	MPIfR	<i>[Signature]</i>
Sanchez, Salvador	IRAM	<i>[Signature]</i>
Schäfer, Frank	MPIfR	<i>[Signature]</i>
Škirmante, Karina	ERI-VIRAC	<i>[Signature]</i>
Spitler, Laura	MPIfR	<i>[Signature]</i>
Stagni, Matteo	INAF-IRA	<i>[Signature]</i>
Surkis, Igor	IAA / RAS	<i>[Signature]</i>
Szomoru, Arpad	JIVE	<i>[Signature]</i>
Tangen, Leif Morten	NMA	<i>[Signature]</i>





ERATec Forum Workshop Week:  
Radio Interference in Large Bandwidth Observations

Tenkink, Hans	JIVE	<i>Hans Tenkink</i>
Thomasson, Magnus	OSO	<i>Magnus Thomasson</i>
Torne Torres, Pablo	MPIFR	<i>Pablo Torne Torres</i>
Tsaruk, Alexey	IAA / RAS	<i>Alexey Tsaruk</i>
Tuccari, Gino	INAF-IRA	<i>Gino Tuccari</i>
Uunila, Minttu	AALTO	<i>Minttu Uunila</i>
Verkouter, Harro	JIVE	<i>Harro Verkouter</i>
Viou, Cedric	OBSPARIS	<i>Cedric Viou</i>
Wang, Jinqing	SHAO	<i>Jinqing Wang</i>
Winkel, Benjamin	MPIFR	<i>Benjamin Winkel</i>
Wunderlich, Michael	MPIFR	<i>Michael Wunderlich</i>
Xu, Qian	XAO / CAS	
Yang, Jun	JIVE	<i>Jun YANG</i>
Zeitlhöfler, Reinhard	TU München	<i>Reinhard Zeitlhöfler</i>
Zhang, Ming	XAO / CAS	<i>Ming Zhang</i>
Zhao, Rongbing	XAO / CAS	<i>Zhao Rongbing</i>
Zheng, Weimin	XAO / CAS	<i>Zheng Weimin</i>

*Türk, Sener MPIFR-Bonn Sener Türk*

*Zensus, Anton MPIFR-Bonn Anton Zensus*

*Mantovani, Franco MPIFR - Bonn Franco Mantovani*

*Wagner, Jan MPIFR-Bonn Jan Wagner*

*Campbell, Bob JIVE Bob Campbell*



## **2.5 Information of the EC financial contribution**

The total amount spent for the entire TWS week is approximately 6000 Euros, of which almost 3500 Euros were used for direct support to participants of the workshop, the TOG and the Synergy meeting. The co-organization of these three events allowed us a drastic reduction of financial resources. It also permitted the attendance of persons who would otherwise not have had the possibility to attend. This regards in particular the workshop as many of the key speakers could be supported.