Third Annual Report

Contract N°	**HPRI-CT-1999-40003**
Start date of contract	01 March 2000
End date of contract	29 February 2004
Network Title	**Infrastructure Cooperation Network in Radio Astronomy (RadioNET)**
Website address	www.jive.nl/jive/jive/european/radionet.htm
Name of Coordinator	Dr. M.A.Garrett
E-Mail address	**garrett@jive.nl**

Partnership Summary

Participant number (Coordinating partner as participant N°1	Name of Participating Organisation	Name of responsible person	Role in network*
1.	Joint Institute for VLBI in Europe (JIVE)	M.A.Garrett	LSF-IHP
2.	National Research Council of Italy (CNR.IRA)	F.Mantovani	LSF-IHP
3.	Max-Planck-Gesellschaft zur Förderung der Wissenschaften (MPG.IRASTR)	K.Menten, J.A.Zensus	LSF-IHP
4.	Helsinki University of Technology (UHELS.MRRS)	S.Urpo	LSF-IHP
5.	Centro Nacional de Informacion Geografica (CNIGE.OAN)	J.Gómez-González	LSF-IHP
6.	Netherlands Foundation for Research in Astronomy (NFRA)	H.R.Butcher	LSF-IHP
7.	The Victoria University of Manchester (UMNC.NRAL)	P.J.Diamond	LSF-IHP
8.	Chalmers University of Technology (CUT.OSO)	R.S.Booth	LSF-IHP
9.	Nicholas Copernicus University (UNICO.DRA)	A.J.Kus	LSF-IHP
10.	Université de Bordeaux 1 (UBOD1.OSU)	A.Baudry	OTHER
11.	Institut de Radioastonomie Millimetrique (IRAM)	M.Grewing	LSF-OTH

* LSF-IHP: a research infrastructure funded for access under the IHP programme
LSF-TMR: a research infrastructure funded for access under the TMR programme
LSF-OTH: a research infrastructure outside the IHP or TMR programmes
USER: a research organization representative of users of the facilities covered by the Round-Table;
SOC: European scientific societies
IND: an industrial or commercial enterprise
OTHER: other types of participant

Table of contents

1. Executive Summary

The Infrastructure and Cooperation Network in Radio Astronomy (RadioNET) coordinates new initiatives in the field of radio astronomy and involves 11 leading European radio astronomy institutes and observatries. The RadioNET tasks include enhancing the quality of operations and making more effective use of the existing European VLBI Network of radio telescopes (EVN), and building up the necessary scientific, technical and organizational consensus for the two major future radio astronomy facilities, the Atacama Large Millimetre Array (ALMA) and the Square Kilometre Array (SKA).

During the third year, RadioNET supported coordination activities at six EVN institutes aimed at improved quality and interoperability of the network and improving the access to the research infrastructure. A special workshop was held at the Medicina Radio Astronomy Station (CNR.IRA, Italy, September 2002) to exchange best practices of VLBI operations, specifically focusing on EVN amplitude calibration issues. RadioNET participated in sponsorship of an EVN Symposium (Bonn, Germany, June 2002) and publication of its proceedings. The Network is also involved in the preparation for the Young European Radio Astronomy Conference 2003 (Bonn, Germany, September 2003).

RadioNET supported in part two ALMA working meetings for European astronomers on the ALMA project development (Bordeaux, France, May 2002; Garching, Germany, November 2002). This resulted, in particular, in achieving progress in such the issues as ALMA science operations strategy.

Finally, RadioNET supported participation of the European radio astronomical community in the world-wide effort of designing the Square Kilometre Array. This activity was coordinated through the European Square Kilometre Array Consortium established under aegis of RadioNET in 2000 and during the reported year included SKA simulations and preparation for the FP6 Design Study proposal.

In June 2002 ICN RadioNET successfully passed through the Technical Review of the FP5 IHP-ARI projects.

2. General Meetings

The third annual meeting of the contractors took place in Berlin (Germany) on 21 November 2002 to review progress on all the three components of the project. The summary of the meeting is attached as Annex 1. The meeting was hosted by the Max-Planck-Institut für Radioastronomie (Bonn, Germany), one of the RadioNET contractors (MPG.IRASTR). In addition, significant attention was given to the preparation of the current RadioNET network to the FP6 proposal campaign in 2003, including Integrating Initiatives and Design Studies.

The agenda for the meeting, chaired by R.T.Schilizzi, ICN RadioNET coordinator, was as follows:

09:00	1. Welcome, introduction	J.A. Zensus, R.T. Schilizzi
09:05	2. Minutes of the previous meeting in Manchester, November 2001 Results of the Mid-Term Review in Brussels, June 2002	
09:10	3. RadioNET coordination activity report:	
	3.1. EVN	
	3.1.1. Status of EVN	P.J. Diamond
	3.1.2 EVN reliability	M.A. Garrett
	Comments	EVN contractors
	3.1.3. EVN-2010	R.T. Schilizzi
	3.1.4. EVN Symposium/Users meeting 2002	J.A. Zensus
	3.1.5. Future EVN users meetings, symposia and schools	P.J. Diamond
10:30-11.00	**coffee**	
11:00	3.2. ALMA	R.S. Booth, A. Baudry
	3.2.1. Status of the ALMA project in Europe	
	3.2.2. RadioNET/ALMA activities	
11:20	3.3. SKA	A. van Ardenne
	3.3.1. Status of the SKA project in Europe	
	3.3.2. RadioNET/SKA activities	
11:40	4. Reports on other EC contracts	
	4.1 Access to Major Research Infrastructure	M.A. Garrett
	4.2 RTD - Faraday	I. W. A. Browne
	4.3 RTD – AVO	P.J. Diamond
12:00-13:00	**lunch**	
13:00	5. Sixth Framework Program Introductory remarks	P. Moschopoulos
13:15	FP 6 proposals	P.J. Diamond, R.T. Schilizzi
	1) RadioNET I-3 Networking I-3 Access	

	I-3 Joint Research Projects	
	2) I-3 & e-VLBI	
	3) Design Studies	
	4) EU public outreach project	R. Schwartz
	5) Contribution to Capital Costs	
17:00	6. Report on the meeting with OPTICON, and joint activities	R.T. Schilizzi
17:10	7. RadioNET Annual reports, brochure on Radio Astronomy, and other administrative matters	L.I. Gurvits
	8. AOB	
	9. Date and venue of the next General Meeting	

end 17:30

3. Work Progress of the Joint Scientific/Technological Activities or Studies

The Infrastructure Cooperation Network in Radio Astronomy (RadioNET) was established to provide a forum for the exchange of information on good practice amongst institutes and observatories forming the European VLBI Network (EVN) and between the EVN and its user community, as well as to monitor and stimulate progress in initiatives leading to future large-scale facilities in radio astronomy, the Atacama Large Millimetre Array (ALMA) and the Square Kilometre Array (SKA).

Specific goals of the Network are to

1) enhance the quality and quantity of the access provided to users of the EVN;

2) coordinate input on the scientific imperatives and technical requirements for the ALMA project from the wider astronomical community in Europe as part of the ongoing design, development and implementation phase of this project;

3) map out collaborations leading to a formal proposal for the construction of the Square Kilometer Array.

RadioNET closely coordinates its activities, especially related to the ALMA and SKA projects with the Infrastructure Cooperation Network in optical and infra-red astronomy (OPTICON). The second annual “Round Table” meeting on astronomy involving RadioNET and OPTICON took place at the annual meeting of the European Astronomical Society (JENAM 2002, Porto, Potugal) on 5 September 2002.

Progress has been made on each of these specific goals during the third year of the contract. Details are given in the following sections of the report.

3.1 Enhancing EVN operations

The goal of this theme of RadioNET is to coordinate the achievement of sustained reliable operation of the EVN as a whole. The work involves

1) organising workshops on VLBI-specific operational practices, optimum maintenance, and on automated systems:
2) coordination and synchronisation of the implementation of new practices and technical improvements at the radio telescopes, participating in VLBI observations;
3) coordination of observations with the EVN, testing the reliability achieved.

The deliverables at the end of the contract four-year period are:

1) improved inter-operability of the radio telescopes in the EVN measured in terms of sustained reliable operation, with the percentage of data lost due to equipment and operational failures being less than 10%;
2) frequency agile operation;
3) automated calibration and flagging of data.

According to the contract implementation plan, the peak of activities related to the EVN enhancement was reached in the second year of the contract. However, these activities continued during the reporting third year at most contractor institutions.

3.1.1 Specific objectives in year 3

The specific objectives for the third year of the contract were to

1) continue implementation of the measures aimed at achieving sustained reliable operation as agreed in the previous contract years, and

2) elaborate and test criteria and algorithms for calculating the performance of the array (deliverable no 1). The measures to be implemented are long term in nature and, as planned, will be pursued through the entire duration of the contract.

3.1.2 Progress made over the third contract year

3.1.2.1 Specific objective 1 – achieving sustained reliable operations

At the start of this ICN contract a detailed investigation was conducted into what factors limit EVN reliability. At this point the main problem was identified with recorder maintenance and check-out. The special-purpose recorders used by the EVN (and other VLBI networks) are now at the end of their development path. The maintenance and checkout of these systems were in the focus of RadioNET attention during the first two years of the contract. The recorder related issues formed the basis of the first and second RadioNET workshops reported in the First and Second Annual ICN RadioNET reports. Since the workshop took place, there appears to have been a dramatic improvement in the playback performance of the tapes now recorded by the EVN. During the third year of the contract the emphasis shifted toward improvements of the amplitude calibration of the European VLBI Network. A special RadioNET workshop on Calibration and Field System was hosted by CNR.IRA at the Medicina VLBI station near Bologna on 28.09.2002 (see Annex 2).

One of the efficient measures aimed at achieving sustainable reliable EVN operations became regular Network Monitoring Experiments organized and coordinated by JIVE, the RadioNET Coordinator. Their brief details are described in Section 3.1.2.2.1 below.

Another major network-wide initiative is being gaining momentum – switch from tape-based to disc-based VLBI recording media. During the hird contract year several initial steps were undertaken at various EVN observatories and institutes. They culminated in successful demonstrations of VLBI detections with two different prototype disc-based systems, PCEVN and Mk5. This direction of VLBI technology development is likely to dominate EVN agenda for the last year of the ICN RadioNET contract.

ICN RadioNET continued to play an important facilitating role in such the EVN activities which require a higher degree of coordination. These include frequency-agile VLBI operations, RFI robust receiver development, frequency switching, phase-cal switching, semi-automatic schedule checking, enhanced alarm monitoring via the Field System (FS), improved FS reliability, improved reliability of "remotely" operated telescopes, design studies of real-time fiber-optical links between the VLBI telescopes and the data processor.

3.1.2.2 EVN Data Archive

Eeropean VLBI Network began to form the EVN Data Archive which will allow astronomers to access VLBI data from experiments correlated at the Data Processor at JIVE, which have become public.

The whole structure, which will run the EVN VLBI data archive, is under evelopment. It consists of different steps, corresponding to different levels of service.

The first step will include release of public data, upon request addressed to the Chairman of the EVN Program Committee.

At present it is most likely that the raw correlated data will be released on experiment basis rather than on source basis. As second step, raw data will be supplemented by, preliminary calibration and first order images will become available, together with the necessary plots (visibilities and contour plots of the preliminary image). The intention is to process the released data through the pipeline developed at JIVE, and already applied to the calibration experiments and to the calibrator sources of general experiments.

The starting point of the search will be the catalogue of radio sources available at the special web page hosted at the CNR Istituto di Radioastronomia. :The construction of the archive is in progress, the work is led by Dr. T.Venturi (CNR.IRA)

3.1.2.3 Individual contractor's reports

As reported in the Second Annual report and according to the contract timeline, several contractors have either completed their tasks during the first two years of the project or performed their major tasks. These include Centro Nacional de Informacion Geografica / Observatorio Astronomico Nacional of Spain (CNIGE.OAN), the Helsinki University of Technology (UHELS.MRRS). Other partners continued with their project-related tasks during the third contract year – their reports follow. Two other contractors, NFRA and the Jodrell Bank Observatory (UMNC.NRAL) continued ther activities in line with the EVN-related theme of the ICN RadioNET contract but covered these activities from budgetary sources outside the present contract. Some remaining funds from the present ICN contract will be used during the last, fourth year for the contract. Such the re-scheduling, agreed upon with the Network Coordinator would allow to conduct network-wide tests in 2003, after completion of major ugrade activities at Jodrell Bank (UMNC.NRAL), Westerbork (NFRA) and Effelsberg (MPG.IRASTR).

3.1.2.3.1 Joint Institute for VLBI in Europe (JIVE)

Overall coordination of the improvement in EVN reliability has been the responsibility of the Chairman of the EVN Technical and Operations Group (TOG). This position was held until January 2002 by Dr Michael Garrett. After he became an interim Director of JIVE and RadioNET Coordinator, Dr., Walter Alef (MPG.IRASTR) took over as a new TOG Chairman.

As the Coordinator of ICN RadioNET, JIVE continued lsetting out the goals of the project, and monitoring progress at the different institutes – ICN RadioNET partners. This work was carried out by R.Schilizzi, M.Garrett, L.Gurvits and Z.Paragi. A significant part of this work dealt with the Network Monitoring Experiments (NME), in which Z.Paragi acted as principal investigator.

The main goals of the Network Monitoring experiments during the third year of the contract were to verify new procedures of the EVN amplitude calibration, test the Arecibo telescope as a new mmber of the network, test the new backend system at Westerbork, and, for the first time, monitor the K-band (22 GHZ) performance of EVN. Additionally, the February 2003 L-band NME targeted the EVN polarization performance, and included a Mk5 test.

The Mk5 test--L-band NME was carried out with the participation of four EVN observatories, Medicina, Westerbork, Jodrell Bank and Noto. The former two recorded onto tapes from headstack 1, and to disk from headstack 2 (the recording rate was 256 Mbit/s). The other two stations recorded only on tape. Mk5 fringes were

found at the EVN Data Processor at JIVE on all baselines and all combinations of recording media. The first EVN Mk5 map was produced.

It is expected that the activities mentioned above, especially related to the new data recording media will remain in the focus of RadioNET activities in the last year of the contract.

3.1.2.3.2 Institute of Radio Astronomy (CNR.IRA), Italy

The activities at the Medicina and Noto Stations during the third year of the contract were mainly aimed at improving the data acquisition quality. Most of the upgrading work was done in the electronic hardware and to improve the efficiency of the 32-m dishes. Great care was also taken to increase the reliability of the stations during the VLBI sessions. The tasks have been coordinated by the scientists and engineer supported by RadioNET funding.An engineer, A.Orlati was hired to work on the tasks of the Infrastructure CooperationProgramme RadioNET. The main duties for this engineer are:

1) check the observing schedules for VLBI projects and the requested data acquisition set-up;
2) coordinate the completition of the 'frequency agile' system for the antenna;
3) improve the station calibration information.

To the aim in point 3) above, observing sessions have been regularly scheduled along the year to improve the pointing model of the telescopes and to better define the Gain vs Elevation performace of the telescopes.

At the Medicina Station a new decoder has been integrated in the MK4 data acquisition system and it now regularly in use.

Two units of the MK5P system has been installed and tested in several experiments in parallel to the MK4 system.

The surface of the primary and secondary mirror of the Medicina 32-m antenna have been painted

The active surface system and new panels have been successfully completed at the Noto antenna. During 2002 the active surface system has been tested at 22 GHz and 32 GHz frequencies. The results confirm that it is possible to minimize the gravitational effects on the shape of the primary mirror. A good Efficiency (up to 40% at 32 GHz) and a flat Gain curve (Gain versus Elevation) can be achieved. Measurements at 43 GHz are in progress.

It has been completed the integration of the Medicina agility receiver system with the FS. Now the change of the observing frequency can be completely done via ad hoc snap command implemented in the Field System. This command can be also inserted in programme schedules for observations which require fast frequency switching. The FS version 9.5.9 has been installed.

A new driving system for the Noto 32-m dish has been installed. It includes new brush-less motors, high accuracy encoders, Antenna Control Unit, drive amplifiers and everything is related to the movement control. From this renewal it is expected a more reliable system, with the goal to realise fully automatic observations in absentia of operators.

One of the headstack in the Noto MKIV recorder have been replaced after almost five years of usage.

The Noto station participated to radar VLBI observations with a disk based narrow band acquisition terminal, developed for this experiments. This is part of a near real-time correlation system for a fast analysis of the observed detection. Noto is also developing the narrow band correlator software.

CSELT consigned the L and S/X band feeds, designed and built ad hoc for the Noto antenna. Laboratory measurements showed a good performance. The dewar has been designed and built with the collaboration of a workshop in Florence. Such system is responsible to cool both feeds and the entire set of front-end amplifiers. L band amplifiers, as those developed in Yebes, has been completely built in Noto, with the Arcetri group collaboration. Such job required to learn the complex techniques needed to operate with miniaturized chip components, and soldering methods as the ultrasonic bonding. The amplifiers show good performance at both ambient and cryogenic temperature. A new amplifier operating in S band has been fully designed in Noto and its realization in under the way.

A collaboration with the Shanghai Observatory was activated to design a new 43 GHz receiver to be later use in both Seshan and Noto antennas. In particular the development of a front-end amplifier was taken into account.

A cryogenic filter to mitigate the effects of a strong radar in the 21 cm band has been developed and is going to be realized. It was developed in collaboration with the Messina University.

3.1.2.3.3 Max-Planck-Institute for Radio Astronomy (MPG.IRASTR, Germany)

Under the ICN contract, MPIfR is enhancing the accuracy of the amplitude calibration data from Effelsberg and is improving the phase-referencing performance of Effelsberg through remote sensing of the atmosphere above the telescope. Future work will involve reduction of downtime due to wind and hardware setup errors.

Effelsberg amplitude calibration is already maintained well by Dr A. Kraus, so additional efforts by Dr A. Roy on the ICN contract are being directed towards measuring and correcting the atmospheric opacity. This will be done using water-vapour radiometry during high-frequency EVN experiments.

Construction of a 22 GHz radiometer has been completed during the year and system tests and software development are well advanced. The radiometer will be moved to Effelsberg from Bonn during March 2003 for demonstration tests in preparation for its first use during VLBI observations in April 2003. The radiometer was conceived for phase correction of 86 GHz VLBI experiments, but the ICN effort is focused on the extraction of the atmospheric opacity and on the incorporation of these values into the amplitude calibration data for distribution to EVN users. This item reduces the workload on PIs, who presently spend significant amounts of time recovering from poor amplitude calibration. Improved calibration will improve users' productivity.

Phase referencing observations often have poor dynamic range, most likely because the actual atmospheric delay is different from that assumed in the correlator model. Under the ICN programme, Dr A. Roy is testing the use GPS data to derive the zenith tropospheric delays from measurements made by dual-frequency GPS receivers co-located with the EVN stations. A dual-frequency GPS receiver has been

installed at Effelsberg for atmospheric measurements and for tying the VLBI reference point into the local geodetic network and data are being archived daily. Demonstration tests will follow. This item reduces the dominant source of error in the correlator model and will lead to the detection of fainter sources with greater reliability, and will consequently reduce the observing time required to achieve a given sensitivity and will reduce the number of re-observations due to failed phase-referencing experiments.

Downtime at Effelsberg has been mostly due to wind. A future study of site weather statistics at the EVN stations could allow optimization of the session dates to reduce the time lost due to wind. Downtime at Effelsberg has more rarely been due to swapped polarizations or incorrect filter selection. Both could be detected during the setup for EVN sessions if a test signal of known polarization and frequency could be radiated briefly into the front end. We will be considering such a project. This item improves the likelihood of Effelsberg participating in EVN sessions as scheduled, by reducing the most common causes of failure.

3.1.2.3.4 Chalmers University of Technology, Onsala Space Observatory (CUT.OSO, Sweden)

John Conway (Onsala Space Observatory) has been active in developing more accurate and robust amplitude calibration tools for the EVN. As part of this work a whole new infrastructure for handling amplitude calibration has been designed for the Field System (FS), a software controlling VLBI instrumentation at each station. During 2003 this design was finalised and implemented by Ed Himwich at Goddard Space Flight Centre in the US. The new system for the first time specifies the noise calibration temperature at each antenna as a function of frequency - the use of a single number was known to be a significant source of error in the previous system of amplitude calibration. To ensure that these calibration parameters can be checked and updated easily and hence be made reliable new software to make on-off observations of bright calibrator sources has been implemented on the Field System. For the first time standard spectra of these calibrators are available on the Field System to be used commonly by all telescopes which will reduce errors in amplitude scale between antennas.

An analysis programme (GNPLT) designed to reduce data from 'on-off' measurements and derive and update the station calibration parameters (Noise Cal temperature versus frequency, antenna peak gain, and antenna gain versus elevation) was also designed by J.Conway and has been implemented by Calle Holström working at GSFC under the supervision of Ed Himwich.

Finally to increase the time density of amplitude calibration data a new method of using total power monitoring was designed. The field system aspects of this have been implemented by Ed.Himwich and the software to convert measurements to system temperatures has been developed by C.Reynolds (JIVE) - both in collaboration with John Conway. To explain and demonstrate the new amplitude calibration system to stations a one day workshop was organised by J.Conway at the Bologna Technical and Operations Group meeting in September 2002. Documentation describing the EVN calibration improvements and the use of GNPLT were prepared in February 2003 and distributed for use at the EVN stations.

3.1.2.3.5 Nicholas Copernicus University (UNICI.DRA, Poland)

Further steps to improve the reliability of the Torun VLBI station were undertaken during the third year of the contract. Two more CTI 1020R compressors were

purchased in 2002, which now allow the station to keep the key receivers in the cooled state permanently and switch between them in a matter of seconds.

New improved IF distribution module was designed, built and installed. It has replaced the older one, which had been found to show excessively high channel cross-talk. The new tunable IF distribution has between-channel isolation better than 50 dB and also an ability to regulate the gain levels remotely in order to eliminate frequency-dependent losses in coaxial cables. This improvement has great impact towards reliability and sustained operation in EVN network as it allows fast change of the receiver and easy reliable automated operation. Thus man made errors are significantly reduces in process of VLBI operation.

Some simple observational tests were made at 86 and 111 GHz for the first time with receivers borrowed from Sweden. Results were used to improve pointing, tracking and to measure aperture efficiency. Further tests aiming towards high frequency operation were performed at 12 GHz with single channel uncooled receiver. The primary goal of this complementary to VLBI project is to conduct an antenna holography. In addition methanol 2.5 cm line has been surveyed among known strong 5 cm maser sources. The holography project continuous and first results on surface error distribution are known. Further observations and measurements are scheduled for summer 2003. The first holographic measurements were done using Eutelsat W2 satellite 11.7 GHz beacon. Measured RMS error of the antenna surface is about 1 mm. The final goal is to reset the surface panels to improve efficiency at high (10-30 GHz) frequency observations. The work can lead to increased sensitivity by about 50% at 22 GHz and to achieve the planned cut-off limit at 50 GHz.

The construction of the 22 GHz receiver has continued, which is very important for future EVN operation. The two feeds three-channel system has already been installed in the dewar
.
One cm two-beams cooled receiver constructed at the Jodrell Bank Observatory was installed on the 32 m antenna. After test observations we used this receiver for obtaining precise lookup table and for tuning secondary mirror positions.

There has been considerable improvement on data formatting and recording terminal. Several BBC's were repaired, broken LO synthesizer in one of them was replaced with the new one delivered by Paul Burgess of the Jodrell Bank Observatory. Remotely controlled attenuators were added on A and C inputs of the terminal. Now four more BBC's are inspected and will be installed soon in the rack. Our field system computer looks to be too obsolete for new FS versions and needs to be replaced with the new one.

A significant activity was carried out in respect of better management and organization. The local Friend of VLBI – Dr. K.Borkowski, who’s salary is paid from the ICN project, has been involved into coordination of all instrumental test measurements, organization of test and real EVN observations and analysis of station activity. He is also responsible for all activities related to time measurements and H-maser maintenance. This is important task since the atomic clock and GPS based time service made inside EVN telescopes are crucial for high quality operation.

3.1.2.4 Specific objective 2

Verification tests and Network Monitoring Experiments (described in Section 3.1.2.2.1) continued to play an important role in enhancing the reliability of the European VLBI Network. The later has been monitored using the EVN Reliability Index, introduced as a part of RaioNET-sponsored activities (see the Second RadioNET Annual Report). Feedback information based on verification and Network Monitoring experiments has been amended during the third year of the contract by routine post-processing pipelining, i.e. full data reduction through automated reconstruction of an image of the observed celestial source. Such the approach significantly improves the quality of feedback thus making a positive impact on the overall network performance. The feedback information, including pipelining results becomes available on the EVN web pages (www.evlbi.org/session/feedback.html) within several days after data arrive to the Data Processor.

The pipelining software developed originally for NMEs is becoming an important tool for other types of EVN observations, including PI-led ones. This development is welcomed by the EVN user community as it is clear from the EVN Users Meeting held in Bonn in June 2002. During the last year of the present RadioNET contract this work will be developed further.
NME experiments and their pipelining has been conducted by Support Scientists of the JIVE EVN Support Group, which includes Z.Paragi (partially employed via ICN RadioNET grant) as well as H.Imai, A.Biggs and C.Reynolds.

3.2. EVN Summer Schools and Symposia

3.2.1 EVN Symposium 2002

EVN Symposium 2002 was held in Bonn and hosted by the Max-Planck-Institut für Radioastronomie (RadioNET Contrator MPG.IRASTR) 25-28 June 2002. The Symposium was attended by more than 90 participants from more than 20 countries, Five young scientists and PhD students from European institutes were selected by the the Science Organizing Committee for RadioNET support. RadioNET also has facilitated organizing support to the Symposium and publication of the Symposium Proceedings. The latter contains acknowledgement of the RadioNET support.

As part of the EVN Symposium program, half a day was dedicated to the EVN Users Meeting. The latter is a traditional form of providing feedback to various operational structures of EVN from the users community.

The next EVN Symposium will be hosted by the Observatorio Astronomico Nacional of Spain (CNIGE.OAN) in 2004.

3.2.2 Planned activity: combined EVN School and YERAC 2003

Following suggestion by the annual meting held in Berlin (see Annex 1), RadioNET assumed responsibilities for re-starting the sequence of Young European Radio Astronomy Conferences (YERAC). According to the original RadioNET plan adopted in 1999, one of the European VLBI Summer School was scheduled for 2003. However, as was pointed out at the third RadioNET annual meeting, there was the NRAO VLBI Summer School in 2002, attended by a number of European participants. IRAM, one of the RadioNET contractors, is planning a Millimetre Radio Interferometry Summer School for 2004-2005. Since the areas of the latter school and European VLBI Summer School overlap considerably, it was suggested to

combine the Millimetre Interferometry and VLBI Summer schools in one event and hold it jointly by EVN and IRAM in 2004-2005. At the same time, RadioNET would support VLBI part of the YERAC-2003 programme de-facto fulfilling the task originally assigned to the EVN Summer School 2003, especially since the audiences of the EVN School and YERAC overlap considerably.

The YERAC 2003 will be held in Bonn and hosted by the Max-Planck-Institut für Radioastronomie (RadioNET Contrator MPG.IRASTR) in September 2003.

3.3. ALMA

RadioNET funds continued to be used for the coordination of scientific and technical input to the design and development phase of the Atacama Large Millimetre Array (ALMA). In particular, the aim is to establish European scientific and technical priorities for ALMA by organising workshops, writing reports on the outcomes for the ALMA project management, and presenting the outcomes of international scientific and technical meetings.

3.3.1 Specific objectives in year 3

The RadioNET-sponsored ALMA activities in Europe include a series of specialized scientific and technological meetings In particular, the following major workshops were held during the third year of the RadioNET contract

> ALMA Extragalactic & Cosmology Science Workshop on Dark Matter, Bordeaux, France, 22-24 May 2002;
>
> Science Operations with ALMA ESO Headquarters, Garching, Germany, 8 November 2002

The former workshop focused on cosmological scientific applications of ALMA and their implications for design specifications of ALMA instrumentation. The workshop was attended by 20 scientists from 6 European countries. The workshop materials are available at www.observ.u-bordeaux.fr/public/alma_workshop/darkmatter and are summarized in the Memo “Possible ALMA projects relevant to Dark Matter” (see Annex 3).

The latter workshop concentrated on the operational issues of the ALMA facility. With the recent approvals by the ESO Council and the US National Science Board of the construction of the Atacama Large Millimeter Array, it was thought timely to update the European astronomical community on the project and solicit input on the plans for science operations and user support. To this end, a one-day meeting was held at ESO Headquarters in Garching on 8 November 2002. It was very well attended; the auditorium was filled to capacity with some 100 participants from all over Europe.

The meeting began with an overview of the project and its current status by S.Guilloteau, interim ALMA Project Scientist. Three very stimulating talks reviewed some of the major science drivers for ALMA: the high-redshift Universe (S.Lilly), star and planet formation (A.Natta), and late-type stars (H.Olofsson). The meeting then moved on to consider operations: concepts and plans for the operations phase were outlined by E. van Dishoeck, D.Silva talked about the relevant operational lessons from the VLA, and R.Lucas discussed the ALMA data reduction software and observing tools. P.Cox discussed the coordination of the European astronomical community and preparation for ALMA, including the opportunities within the EU 6th Framework Programme. The discussion session then started with seven short

contributions on a variety of topics, which led on to a very stimulating and useful open discussion chaired by J.Richer and E. van Dishoeck. Topics of discussion included the role and nature of a possible European Regional Support Centre (RSC) which could assist users in the observational and data analysis process, and ideas and priorities concerning software, receiver bands, surveys, future enhancements, and preparation for ALMA science. In view of the success of this meeting, there will probably be more such meetings for the community as the project evolves.

The viewgraphs from the invited talks given at the meeting are posted on the ALMA website www.eso.org/projects/alma/meetings/gar-nov02/ . This website also contains the responses to a questionnaire that was circulated after the meeting to all participants, soliciting their views on ALMA science operations and software issues.

Organizing Committee:of the workshop included R. Bachiller, A. Benz, R. Booth, P.Cox, E.F. van Dishoeck (chair), S. Guilloteau, R.Kurz, J. Richer, P. Schilke, P.Shaver, M. Walmsley

3.3.3 Planned versus accomplished and future activities

Several ALMA workshops were planned for the third year of the contract, of which two major ones, described above, were held in Europe and supported by RadioNET. Four other major ALMA workshops were held outside Europe (in Canada, Chile, Japan and USA, one in each of the fur countries). Their direct support via RadioNET was not foreseen. But European scientists involed in RadioNET-sponsored studies were actively involved in the four events outside Europe. As was the case in the previous reporting periods, a prolongation of the RadioNET-sponsored ALMA activities into the next reporting period (the last year of the present contract) is highly desirable. In particular, a major workshop on ALMA Second Generation Correlator and Large Correlators is planned for a European venue in 2003 – beginning of 2004.

3.4 Mapping studies for the Square Kilometre Array (SKA)

The Square Kilometre Array (SKA) is gaining momentum as the major global radio astronomy project for the coming decades. The project undergoes a period of organization and establishing its infrastructure. In January 2003, the International SKA Steering Committee has appointed the first Director of the International SKA project Prof. Richard Schilizzi, formerly Director of the Joint Institute for VLBI in Europe and Coordinator of RadioNET.

The major SKA-related scientific event of the reporting year was the annual international SKA meeting this year, "SKA 2002", was hosted by ASTRON in Groningen, The Netherlands. The meeting highlighted the interaction between engineering and science, centred on the white paper reports from the technical concept development projects. The program and presentations can be found at http://www.lofar.org/ska2002/.

The main goal of RadioNET activities in the SKA area is to assist in mapping out the collaborations leading to a formal proposal for the telescope. The deliverable will be a document which outlines the scientific case for the SKA, the technical concepts to be employed, plans for prototyping critical elements, a proposal for managing the project including the division of responsibility amongst the partners, and a strategy for seeking funding for the project. This document, the so-called “SKA White Paper” was in preparation during the third RadioNET contract year and scheduled for release in

June 2003 prior to the next Internaional SKA Meeting (to be held in Geraldton, Australia, 27 July – 2 August 2003).

In preparation for the upcoming Sixth EC Framework Programme (FP6), a group of European radio astronomers representing most of the continent's professional radio astronomy groups, many of them – ICN RadioNET contractors, held a coordination meeting at the Jodrell Bank Observatory (United Kingdom) 14-15 September 2002. The main goal of the meeting was to plan radio astronomy proposals for FP6. In formation on the meeting can be found at www.jive.nl/jive/european/fp6-preparation.htm. A follow up meetings has been held at ASTRON on 17 December 2002, which concentrated on the preparation of the SKA FP6 Design Study proposal (see www.euska.org/18dec2002/).

3.4.1 Specific objectives in year 3

The main objectives were

1) to continue coordination efforts in Europe through the consortium of the institutes interested in contributing to the development of SKA,
2) to facilitate studies leading to justification of configuration concept of SKA telescope.

3.4.2 Progress

1). The first objective was addressed by active involvement of RadioNET–affiliated personnel in the organizing efforts for all SKA-related meetings and events described above. These activities were coordinated via the European SKA Consortium, formation of which was reported in the First RadioNET Annual Report. RadioNET continued its close interaction with the team of the European institutes condcting studies under the contract HPRI-CT-2001-50031 (FARADAY). It is expected that ths interaction ill be transformed into a well-defined collaboration and create a basis fir a FP6 Design Study proposal.

2). In order to address the second objective, ASTRON commenced SKA array simulation studies that have been making good progress since the end of 2002. The work was conducted by Dr. Y.Hagiwara. The current aim of these simulations is to generate relatively realistic SKA *uv*-data sets, consistent with the current European SKA concept and configuration.

The choice of simulation software package to use was the first topic of investigation. Eventually the AIPS data reduction package was chosen for the following reasons: 1) one can save significant time over developing a new program source code for the simulation, and 2) the AIPS package contains tasks, which are capable of generating fake *uv*-data sets. It soon became clear that simulating the full parameter space corresponding to the full SKA specification was unrealistic. It was impossible to generate the enormous data sets involved and even if they could be generated their analysis was certainly impossible without access to supercomputer facilities. Restrictions for some of the parameter space were adopted: in particular, a limited field of view, a maximum baseline length, and a number of stations were limited. The most recent simulations permit a field-of-view of a few tens of arcsecond, a baseline length of up to 2000 km and up to 100 stations. The initial goal of the simulations was to generate a multi-frequency-channel synthesis data set and investigate how the extensive *uv*-coverage can improve the image fidelity of the SKA. This is a crucial point since previous simulations have argued for a large number of stations (several thousand) but these have failed to take into account the gains that can be made (in terms of *uv*-coverage) by means of multi-frequency synthesis.

Two AIPS tasks, UVCON and DTSIM were examined as the most suitable for the purpose of SKA simulations. Simulations to test the performance of each task was then made. A combination of UVCON and DBCON scripts generating multi-channel data set appears to be the best option. Simulated plots of the *uv*-coverage for a short 'observing' time have been produced for different number of channels, total bandwidths, and different numbers of stations, assuming a single point source model in the sky and a random spatial distribution of the stations.

The preliminary results of the simulation studies are:
1) multi-channel synthesis is very useful in improving the *uv*-coverage of the SKA, particularly for snap-shot observations;
2) when the number of stations is more than 70-80, the *uv*-coverage will be better improved by increasing the number of frequency channels, rather than by adding more stations.

The following points, among others, should be addressed in the future studies:

i) How can be optimized the array configurations? So far, the stations were distributed simply by using random number generators. Conway (Onsala) has developed a code for optimising the ALMA configuration based on a fixed number of (64 + a few) stations. This program is running in MATLAB, not AIPS.

ii) How to generate a realistic model of the radio sky? Only a single (point) source model has been examined so far.

iii) A higher speed CPU with larger disk capacity is needed for full-track (e.g., 10 hours, 100 stations, and 100 channels) SKA simulations.

3.4.3 Planned versus accomplished activities

The planned activities were largely accomplished. It is expected that they will culminate in release of the European SKA White Paper in mid 2003.

3.4.4 Planned activities in year 4

- Continuation of SKA configuration studies.
- Preparatiion for release and community-wide discussion of the European SKA White Paper.
- Participation in International SKA Steering Committee meetings.

3.4.5 Meetings and workshops

Four workshops and coordination meetings directly related to the SKA project were held during the third contract year:

(i) "SKA 2002", 13-15 August 2002, Groningen, The Netherlands
(ii) SKA ISSC & EMT Meetings, 16-17 August 2002, Dwingeloo, The Netherlands
(iii) UK Workshop: The Scientific Promise of the SKA, 7 Nov 2002, Oxford, UK
(iv) SKA FP6 Design Stdy coordination meeting, 18 Dec 2002, Dwingeloo, The Netherlands

4. Deliverables

4.1 Enhancing EVN operations

The deliverables at the end of the contract period are:

i) improved inter-operability and quality of the EVN operations measured in terms of sustained reliable operation;
ii) complete pipelining of NME observing data;
iii) improvements of automated calibration and flagging of corrupted data.

At this point in the contract, it is obvious that the measures undertaken within the RadioNET project have a strong positive impact on the quality of EVN operations. It was foreseen originally that two workshops a year would be held. However, as in the previous years only one network operations workshop was held. It appears that the decreased frequency of workshops comparing to the original plan is optimal in present situation.

Standard procedures for the provision of data pipelining were adopted and tested in NME observations during the third contract year. These procedures will be applied to an increasing number of PI-led experiments during the final year of the contract.

4.2 EVN Symposia and Schools

EVN Symposium 2002 was organised as planned in Annex 1 to the contract. The Symposium and Users meeting fulfilled their goal of presenting scientific resultscof EVN to a broader astronomical community and supplying usrs eedback to EVN operations.

4.3 ALMA Workshops

During the first two years of the contract, six ALMA workshops should have taken place. However, due to delays in general ALMA funding that have had an impact on the priorities for workshop topics, two of these six workshops were held in the third year of the contract (see section 3.3.1).. Such the deviation from the original plan had no negative effect on the overall ALMA implementation rate

4.4 Mapping studies for the SKA

Two SKA meetings a year in Europe were foreseen in the original work programme. This rate has been achieved in the third contract year. In addition, European participants of the project were actively involved in the SKA-related events outside Europe (e.g. the SKA ISSC meting in Arecibo, Puerto Rico, Jan 2003, and SKA site evaluation visit to Western Australia in Jan-Feb 2003).

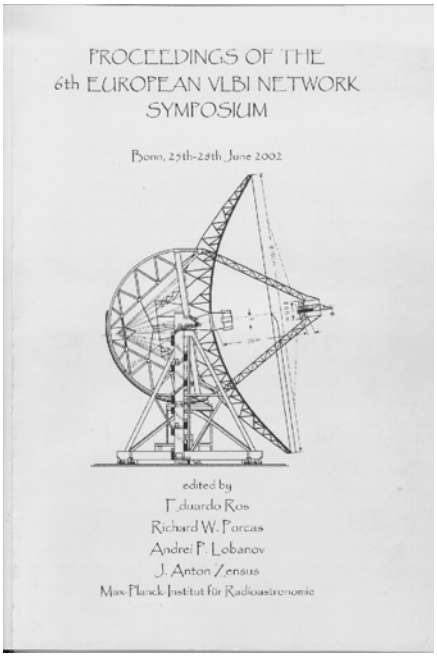
5. Exploitation and dissemination of results

The results of the workshops on good practice in the EVN are exploited by the individual RadioNET partners, and information on new capabilities for the EVN as a whole are advertised to the wide astronomical community via an action in the Access contract and Calls for EVN Proposals issued three times a year (see www.evlbi.org)

The results of the ALMA and SKA workshops directly influence the development of these two projects both from their scientific and technical environment. The science cases are disseminated to the astronomical community via reports and talks at conferences. Results of a technical nature are generally disseminated as memos, and form part of presentations on the projects at national and international meetings. They are widely cited in the official ALMA and SKA documents.

The Proceedings of the 6th EVN Symposium (eds. E.Ros, R.W.Porcas, A.P.Lobanov, J.A.Zensus, MPIfR) published in June 2002 ad distributed to all Symposium participants and major radio astronomy libraries world-wide (Fig. 1, left).

The brochure "European Radio Astronomy Facilities and Very Long Baseline Interferometry (Improving the Human Research Potential and the Socio Economic Knowledge Base)", EUR 20363 was published in the second half of 2002 (Fig. 1, right).



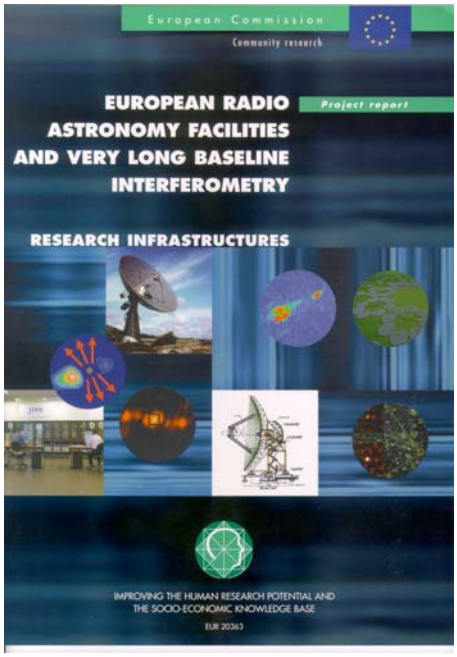


Figure 1. Covers of the Proceedings of the 6th EVN Symposium (left) and the EU brochure on European Radio Astronomy (right).

6. Management and coordination

6.1. General management

RadioNET is managed by the directors of the partner institutes. Coordination of activities took place via face-to-face meetings at the time of the RadioNET annual general meeting (Berlin, Germany, 21 November 2002), the twice-yearly meetings of the European VLBI Consortium (Shanghai, China, May 2002, and Berlin, Germany, November 2002), ALMA management meetings, and meetings of the International and European SKA Steering Committees. Communication at other times occurs via email and telephone. A website has been established for RadioNET at www.jive.nl/jive/jive/european/radionet.htm. This includes links to the EVN, ALMA and SKA homepages.

The RadioNET Secretariat is headed by Dr Leonid Gurvits at JIVE. His duties have involved organisation of meetings, administering the travel support provided to participants in EVN Symposium 2002 as well as to participants in the ALMA and SKA meetings, and writing reports.

The partnerships with institutes in Australia and Canada have not yielded RadioNET-related collaborations because no matching travel funds have been made available in those countries. Nevertheless, collaborations between RadioNET and ALMA and SKA groups in these countries continue under other the RadioNET-specific funds available in Australia and Canada.

6.2. Interdisciplinary issues – coordination with OPTICON

OPTICON is a project funded by the European commission as part of its Fith Framework Programme. OPTICON brings together providers and users of European astronomical infrastructures to identify common approaches and improve access for the benefit of all European astronomy. The RadioNET and OPTICON coordinators and many of the contractors from both networks meet on a regular basis during Joint European National Astronomy Meetings (JENAM and on other suitable occasions. These Round Tables provide a forum for discussion of the separate and joint activities in the two networks, as well as for the discussion of the timescales and priorities for future large projects in European astronomy. During the reporting period, the RadioNET-OPTICON Round Table meeting was held in Porto on 4 Sep 2002. Summary of this meeting is enclosed in Annex 4.

6.3. Budgetary issues

Table 1 summarizes the actual budget profile during the third year of the contract (columns “D” – declared)and the remaining balance (columns “B”).

Table 1: Budget profile in the year 3 of the contract (“D” – declared in the third contract year; “B” – balance)

Partner	Personnel cost (kEuro)		Travel costs (kEuro)		Other specific costs (publications) (kEuro)		Overhead (kEuro)	
	D	B	D	B	D	B	D	B
JIVE	30.1	11.8	1.8	2.4	0	3.3	0	0
CNR.IRA	17.6	-0.2	0	2.4	0	0	0	0
MPG.IRASTR	50.7	1.3	1.9	12.4	0	7.4	0	2.6
UHELS.MRRS	0	3.6	0	0	0	0	0	0
CNIGE.OAN	0	14.9	0	0	0	0	0	0
NFRA	7.8	15.2	1.5	3.5	0	0	0	0
UMNC.NRAL	0	7.1	3.1	4.4	0	0	0.6	2.3
CUT.OSO	2.5	0.1	8.4	7.7	0	0	0	0
UNICO.DRA	9.0	28.7	0.4	8.0	0	0	0.3	0.4
UBOD1.OSU	0	0	4.5	5.5	0	0	0.5	1.5
IRAM	0	0	0	-0.4	0	0	0	-0.1

Some deviations from the original budget spending profile have the following reasons:

1). JIVE, UHELS.MRRS, CNIGE.OAN, UMNC.NRAL and UNICO.DRA were involved in various comprehensive upgrades and modernization programmes during the third contract year. These include renovation of the reflecting surface of the Lovell 76-m radio telescope in Jodrell Bank (UMNC.NRAL, completed in April 2003) and installation of the first disc-based data acquisition system Mark 5 at several EVN observatories (ongoing at the time of this writing). All these new structures and devices will undergo coordinated verification tests in 2004. Such the task is relevant to the EVN reliability theme of the RadioNET contract. It was therefore decided by

the RadioNET management to save some budget for the mentioned contractors for the last year of the project.

2). NFRA used 7.8 kEuro (about 7.4% of the total personnel cost allocation) to fund work of Dr. Y.Hagiwara. on SKA simulations instead of secretarial support as planned originally. Secretarial support to the SKA project was not requested during the third year of the contract since the appointment of the International SKA Director went into effect from January 2003.

3). During the fourth year of the project several major international meetings on ALMA and SKA will take place. They will require participation of representatives from the majority of RadioNET contractors. Thus several contractors, in particular, CNR.IRA, MPG.IRASTR, NFRA, UMNC.NRAL, CUT.OSO and UBOD!.OSU, kept some travel budget for the fourth contract year.

Annex 1:

Infrastructure Cooperation Network "RadioNET"
Summary of the Third Annual Meeting
Berlin, Germany
21 November 2002, 9.00 - 17.30 h

Present: W.Alef, A. van Ardenne, W.A.Baan, R.S.Booth, I.W.Browne, P.Charlot, F.Colomer, P.Cox, P.J.Diamond, M.A.Garrett, S.T.Garrington, J.Gomez-Gonzalez, M.Greving, M.Guelin, L.I.Gurvits, F.Mantovani, L.I.Matveenko, P.Moschopoulos, G.D.Nicolson, R.W.Porcas, R.T.Schilizzi, R.Schwartz, G.Tofani, J.A.Zensus,

Chair: R.Schilizzi (Coordinator, RadioNET)

The meeting was opened by the Chairman and welcomed by A.Zensus on behalf of the Max Planck Society and MPIfR.

The Summary of the Second Annual meeting (Jodrell Bank, UK, 23 November 2001) was approved as distributed with the Second RadioNET Annual Report.

R.Schilizzi informed the meeting on positive results of the mid-term review conducted by the special panel of experts appointed by EC in June 2002.

3. RadioNET coordination activity report:

3.1. EVN activities.

P.Diamond gave a brief status report on the European VLBI Network (EVN) as the most sensitive VLBI network of the world. At present it undergoes significant upgrades which will result in further enhancement of EVN scientific productivity. These includes in particular measures aomed at improvement of the EVN reliability funded via the current ICN RadioNET grant.

M.Garrett (EVN TOG Chair) described the dynamic of EVN performance in terms of the EVN Reliability Index (ERI; see the RadioNET Second Annual Report). It shows that the overall network reliability is increasing reaching the benchmark of 90% in the latest completed EVN sessions. He underlined the role of RadioNET sponsored support scientists and engineers partially funded via RadioNET in improving the network reliability. In particular, the higher quality of EVN observations was achieved owing to the ongoing series of the Network Monitoring Experiments (NME) and improvements of the EVN calibration procedures. The latter was in the focus of a one-day workshop held at the Medicina VLBI station (CNR IRA, Italy) in September 2002.

EVN contractors (A.Zensus, R.Booth, F.Mantovani, P.Diamond) stressed the need of further concerted efforts in enhancing the EVN performance, in particular achieving high frequency agility and development of new fild system software.

R.Schilizzi presented the programme "EVN 2010" which will transform EVN into the most advanced VLBI network with the data rate per station measured in gigabits per second.

A.Zensus described the latest EVN Symposium and Users meeting held in Bonn in June 2002. A number of participants of the Symposium chosen by the Scientific Organizing Committee were supported by RadioNET. The Symposium's Proceedings published before the Symposium.

P.Diamond described future EVN Schools and Symposia. An invitation to host the EVN Symposium 2004 was received from the Natioanl Astronomical Observatory of Spain. This event will mark inauguration of the new 40-m radio telescope in Yebes. The invitation was supported by the RadioNET meeting (and later accepted by the EVN Consortium Board of Directors).

EVN and IRAM has agreed to organize jointly the next school on VLBI and mm radio interferometry in 2005. The proposal was supported by the meeting.

The meeting noted with regret that the 35-year-long sequence of annual Young European Radio Astronomy Conferences interrupted in 2001. These conferences were very effective in attracting young scientists and students into radio astronomy studies. It was suggested that RadioNET serves as a "corporate memory" for YERAC and helps to restart the sequence. It was further suggested to combine the YERAC 2003 with elements of the EVN School and host it in Bonn by MPIfR. The proposal was unanimously supported by the meeting. It was also suggested to investigate a possible role of FP6 infrastructures in supporting future YERACs.

3.2. R.Booth gave a status report on the Atacama Large Millimetre Array (ALMA). He described the specifications of the project and recent technical and managerial developments, in particular appointments of ALMA officers. Several meetings on various ALMA topics were conducted during the year under RadioNET sponsorship (full list will be presented in the third RadioNET Annual Report).

3.3. A. van Ardenne described status of the SKA project in Europe. The main current task is to work out the European White Paper on the project which is to be presented to the international SKA community by the time of the next SKA meeting (Geraldton, Australia, July 2003).

3.4. M.Garrett, I.Browne and P.Diamond gave brief reviews of activities conducted under EC-sponsored contracts on Access to Major Research Infrastructures, FARADAY project and Astronomical Virtual Observatory, respectively.

4. The second half of the annual meeting was dedicated to topics relate to the preparation of the FP6 proposal. It was opened by introduction by P.Moschopoulos (EC). In the course of the detailed discussion on this theme the following decisions were made and action items assigned:

4.1. To keep the name RadioNET for future radio astronomy networking and related radio astronomy activities in Europe under FP6.

4.2. To investigate options for an FP6 support for YERACs (A.Zensus).

4.3. To adopt the following timeline of the preparation of the FP6 proposal:

Call for proposals release by the EC	- 17 Dec 2002
RadioNET draft proposals ready	- 31 Jan 2003
FP6 proposal coordination meeting, Grenoble	- 6–7 Feb 2003
Final proposal draft ready for review by proposers	- 15 March 2003
Final proposal preparation, submission	- beginning of April 2003

4.4. To assign the following responsibility for preparing the FP6 RadioNET proposals:

Networking		P.Diamond
Transnational access		M.Garrett (overall coordination)
	EVN	M.Garrett
	MPIfR	A.Zensus
	MERLIN	P.Diamon
	IRAM	M.Grewing
	OAN	F.Colomer
	WSRT	W.Baan
Joint Research Projects		
Software developments		S.Garrington, H. van Langevelde
Mm receivers		M.Guelin, V.Belitskii
Focal array developments		I.Browne
Digital hardware for VLBI		P.Burgess, G.Tuccari, S.Parsley
RFI issues (CRAF etc.)		W.Baan
Public outreach activities		R.Schwartz

4.5. To investigate and, if feasible, include in the Transnational Access proposal the activities at OSO and IRA in support to the European Geodetic community (M.Garrrett).

4.6. To involve VIRAC (Latvia) in the FP6 proposal on digital BBC development (L.Gurvits in coordination with P.Burgess).

4.7. Future Design Study proposal to be coordinated between ALMA, SKA and ELT (FP5 RadioNET coordinator).

4.8. To invite ATNF to join the RadioNET Joint Research FP6 proposal where appropriate (P.Diamond).

Annex 2:

Report on the RadioNET EVN Amplitude Calibration Workshop
Medicina, Italy, 28 September 2002

The meeting was attended by "VLBI Technical Friends" (Heads of technical support and engineers) from all EVN observatories and institutes, about 40 people total. The purposes of the meeting was twofold:

1) To explain the changes made to the Field System (FS) over the last years to improve amplitude calibration of the EVN telescopes. These changes in particular were implemented under the TMR-LSF RTD Contract No. ERBFMGECT 980101 (via a sub-contract between JIVE and NASA Goddard Space Flight Center).

2) To discuss future directions for enhancing the quality of amplitude calibration data for the European VLBI Network and include feedback from EVN stations in the future versions of FS.

Both the new ACQUIRE/ON-OFF software and the gain analysis software for handling calibration data, updating gain-curves and Tcal versus frequency etc. were demonstrated. Specific problems arising from variety of technical instrumentation at different EVN stations were discussed during the afternoon session. These included high RFI at some stations, tied array WSRT issues, remote stations over link like Cambridge. All these specific topics were addressed in view of their impact on the EVN calibration procedures.

Agenda of the Calibration and Field System Workshop
Medicina, CNR IRA VLBI Station
Saturday, 28 September 2002.

Introduction	9.00 - 9.05	Mike Garrett
Calibration Fundamentals + Bonn experience	9.05 - 9.25. + 5 minutes discussion	Alex Kraus
Overview of recent FS improvements ('Closing the loop')	9.30 - 09.55 + 5 minutes discussion	John Conway
- continuous Tsys - Improved ONOFF/Tcal Tables/Source fluxes - Interactive Calibration Analysis software		
Results of Continuous Tsys tests in Feb and May/June 2002	10.00 - 10.10 + 5 minutes discussion	Cormac Reynolds
Implentation and detailed description of new calibration software	10.15 - 10.40 + 5 minutes discussion	Ed Himwich
Coffee	10.45 - 11.15	
Software Demo 1/station Tour	11.15 - 12.00	
Lunch	12.00 - 13.00	
Software Demo 2/station Tour	13.00 - 13:40	

Present hardware limitations at Stations and future new hardware discussion.	13.40 - 14:00 + 15 minutes	Paul Burgess
Discussion of Stations specific calibration problems and future improvements.	14.15 - 15.15	All
Summary and conclusions	15.15 - 15.30	John Conway
Leave for Bologna	15.30	

Annex 3:

Annex 4:

OPTICON-RADIONET Round Table Discussion
JENAM 2002, Porto, 4 September, 2002

An open Round-table discussion meeting was held for those interested in the common activities of the two astronomy EU Coordination Networks, Opticon (Optical/IR astronomy) and RadioNET (Radio astronomy).

This meeting was held as part of JENAM 2002, following the EAS General Assembly.

OPTICON REPORT

Gerry Gilmore presented an overview of recent OPTICON activities. Highlights from the last year include approval, funding and project initiation for three major OPTICON-sponsored activities:

1) the ASTRO-WISE RTD network;
2) the EURO-3D RTN network;
3) the Astrophysical Virtual Observatory (AVO) RTD program.

Full details on each of these can be found by the links from the OPTICON www page, www.astro-opticon.org/

Other activity includes continuing development of a Study of Elite Fellowships using EU Marie Curie funds, development of an access/enhancement program linking Europe's medium-sized telescopes, and continuing work towards the next generation large optical/IR telescope, now named the ELT, European Large Telescope.

OPTICON will have a poster presentation by request at the EU FP6 launch conference, Brussels, November 11-13, 2002.

A brochure has been published by the EU outlining the OPTICON network, and is available on request.

RADIONET REPORT

Richard Schilizzi presented an overview of recent RadioNET activities. Highlights have been

1) the continuing successful operation of the European VLBI network of radio observatories,

2) the sixth EVN Symposium held in Bonn, and

3) co-sponsorship of a number of ALMA and SKA scientific and technical meetings.

A meeting of all European radio facilities, including ALMA, will be held at Jodrell Bank Observatory on 16 and 17 September to prepare for an FP6 I3 proposal. This proposal will include a request through the GEANT programme to provide high-bandwidth fibre links between the radio facilities, vastly improving their scientific effectiveness.

An EU brochure has been prepared, and will be available in the near future.

Details of RadioNET activities can be found on www.jive.nl/jive/jive.html

Spectrum Protection

Spectrum protection is a daily routine for radio astronomy, but has not yet impinged on the optical/IR. However, the International Telecommunication Union (ITU) has recently decided that it can allocate all frequencies, up to and including the optical. In the short term, this may affect the 20THz-375THz band (15-0.8micron), where satellite communications systems are beginning to operate. cf documents 4A/271-E (25/11/2001) and 7D/TEMP/29-E (13/02/02).

This potentially is a major problem for optical/IR astronomy. The radio community warned that early and active involvement in ITU planning and document preparation is essential to preclude future problems.

Willem Baan explained in detail how the ITU operates, and how critical information can, and must, be made available before decisions are fixed.

CRAF (an ESF committee) is the european group dealing with passive spectrum use, and IUCAF (representing URSI, IAU, Cospar) deals at the ITU level with spectrum matters. It appears that these groups are the ideal groups to take the optical threats on board as they are coming into the forefront. If the optical spectrum is expressed in THz values, then the mandate of these committees already incorporates this role.

These committees form the natural structure for allocating these issues.

The problem is inherently international, but no natural structure is yet in place, and something must be done.

ACTION: on OPTICON chair to ensure this issue is raised in ESO-ESA discussions, and elsewhere as advised by W. Baan. Willem Baan generously agreed to serve as opticon-radionet liaison with these committees.

Major Project Reports:
Astrophysical Virtual Observatory
Square Kilometre Array
European Large Telescope

AVO:
Phil Diamond (Jodrell Bank) gave a more detailed description of the management structure and current activities in the AVO project. This has become such a major activity that it is likely that AVO will develop an existence independent of its origins, and apply for EU FP6 support as an Integrated Initiative, inside the IT/GRID part of FP6. AVO is inherently both multi-national and multi-wavelength in its development.

SKA:
Phil Diamond (again) reported on the status of plans and performance estimates for SKA. An important feature not previously appreciated by all is that SKA spatial resolution will be well-matched to that of next generation optical (ELT) and high-frequency (ALMA) facilities.

A joint scientific meeting, addressing the common and complementary science goals of ALMA, SKA and ELT is planned for early October 2003, in Berlin.

ELT:
Gerry Gilmore reported on developments in the design study for the European Large Telescope study. A single proposal for FP6 funding, and a single coordinated activity, had been agreed by all the currently active ELT-related groups. These particularly include the ESO `OWL' project and the Lund-led `Euro-50' project, as well as various other national activities. A detailed project structure was being established.

European Astronomical Society Issues:

Harvey Butcher noted that progress was underway in the EAS in identifying commonly-agreed national priorities in European astronomy. While there is no Europe-wide set of priorities comparable to, eg, the US Decadal Surveys, there is in practice remarkable similarity in national priorities. By identifying and highlighting these common goals, the EAS (as does OPTICON and RadioNET) hopes to stimulate greater cooperation. An early draft document is available.

NEXT MEETING:

In order to foster wider appreciation of the European aspects of astronomy, the EAS executive has agreed that future JENAM meetings will include a plenary session reporting the status of major new projects/facilities, and the activities of the multi-national organisations.

ACTION: Harvey Butcher, Birgitta Nordstrom.

Gerry Gilmore (OPTICON)
Richard Schilizzi (RADIONET)