Medicina and Noto Stations Report

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Abstract

In this contribution we report on the progresses made after the 12th Working Meeting held in Hønefoss, Norway, at the two Radioastronomy Stations of Medicina and Noto run by the Istituto di Radioastronomia di Bologna del Consiglio Nazionale delle Ricerche.

Introduction

In the last couple of years, the main goal at both the Medicina and the Noto Stations was to get the telescope agile in changing the observing frequency. Achiving this goal will greatly increase the observational efficiency of the telescopes. Moreover it will make the operation of changing the receivers more safe and it makes this task independent to the weather conditions.

The first part of the project has been completed at both telescopes and the new subreflector is fully in operation at both stations. The increased flexibility in changing frequency, together with the facility of recording both thick and thin tapes implemented at all the European VLBI Network (EVN) stations, has immediately produced an increase in the number of geodetic VLBI observations to which mainly the Medicina Station will take part in 1999.

On the other hand, the increased observational efficiency asks for more time to be spent as telescope operators to the technicians during the observations. In order to get a reasonable compromise between the time spent checking and upgrading hardware and software, and the time spent as operator by this personnel, we have implemented the remote control for both the observations and the equipment, working at the same time for a greater reliability of the telescope as a whole. The goal is to safely run absentee observations.

Medicina Station Report

In the following we list the main upgrading in both hardware and software done at the Medicina Station:

Tape Recording

a) The thin tape capability has been installed at the station with good results.

b) A problem due to the sliding of thin tapes has been solved adopting a new capstan with deeper grooves.

c) The write-head has been replaced at the end of 1998, since it worned out. The new one is of the old Metrum type. The read-head is also on its way to die. The new ordered head, made by Spin Physics, will have two triple cap heads to be mounted.

Computer Control

a) A new version of the remote control programme for the SX receiver has been implemented. It allows a monitoring of the receiver status (criogenic temperature, vacuum pressure and so on) in real time.

b) To serve different type of observational projects, the computers facilities have been reorganized. Three computers are now available:

- a computer runs the Field System. It can be used to prepare schedules and procedures. The Fiels System version implemented is 9.3. This machine is connected to the server of the computer centre in Bologna.

- a computer with the Windows NT operating system, serves equipments like the polarimetre and the antenna levelmeters. Moreover, it acquires the GPS-Formatter clock offsets data, it keeps under control the receivers and it drives the movements of the secondary mirror.

- a computer with either Linux or Windows95 operating systems, is used as a general purpose machine and for data acquisition during spectroscopic observations making use of the autocorrelator, etc.

Upgrading of the telescope

There are two projects for upgrading the telescope. The first is the completion of the frequency agility project. The second aims to a better efficiency at higher frequencies.

a) In order to complete the frequency agility project for the Medicina dish we are planning to place in the secondary focus room a series of receivers which covers the frequencies between 4.3 GHz and 48 GHz. The electromagnetic design of the eight feeds system is ready and the parameters to design the mechanical support for the receivers are now available. The design of the electronics part of the eight receivers is also at a good stage. The priority is to build the 6 cm and the 5 cm receivers first, to fulfil the EVN requirements about the observing bands which should be available at any station.

b) A project is going on for the implementation on the telescope of an active surface to compensate the loss in efficiency due to gravity deformation of the primary mirror of the parabolic antenna. After a series of tests with the prototype of a mechanical actuator, calculations have been made to figure out the parameters for an 'actuators network' which will keep under control the full surface of the dish. In the meantime we are looking for a proper electronics to be used and for an engineering phase of the linear actuator. Furthermore, the cost of more accurate panels for the dish and of the actuators itself have been assessed. A system of this kind, together with new panels of enhanced precision surface, will rise very much the antenna efficiency at frequencies up to 43GHz.

Equipment for Single Dish Observations

a) Polarimetric observations facilities has been implemented. Besides astronomic uses, it is now possible to measure the amount of crosstalk polarization between Left and Right Circular Polarization locally.

b) A project is in progress to design a dicroic mirror to observe at two different frequencies (7 GHz and 22 GHz) at the same time.

c) By exploiting a new system for very high resolution spectrum analyzer (Serendip IV), which is working in parallel with the observations, a window on a real time database of the narrow band interferences situation at Medicina should be open. In the next months the machine will be enhanced to cover about 15 MHz of istantaneous bandwidth. The software to accumulate files, processing and displaying the results is almost ready and preliminary outputs are already available.

d) The software of the 'time and frequency high resolution spectrometer' it has been completed. A single dish observation with up to 20 MHz istantaneous bandwidth and up to 132000 channels can now be automatically performed. Single shot as well as more complicated observing schedule are possible. A real time displaying of the accumulating spectra is available.

Geodetic Observations

The geodetic experiments run by the Medicina Station in **1998** are listed in Table 1. Three expriments 'Mars Pathfinder VLBI', designed for the determination of the Martian

Tab. 1 - List of Geodetic VLBI observations in 1998

EXPERIMENT	DATE	TIME	STATIONS
CORE-B207	26-JAN	18:30	Ft-Gc-Kk-Ka-Ny-Sm-Mc
EUROPE-7	02-FEB	12:00	Ny-On-Wz-Sm-Ma-Mc-Nt-Yb
VLBA7	09-FEB	14:00	VLBA- Kk-On-Gc-Mc-Gn-Gg-Wf-Ny
VLBA8	15-APR	20:00	VLBA- Kk-On-Gc-Mc-Gn-Gg-Wf-Ny
EUROPE-42	20-APR	12:00	Ny-On-Wz-Sm-Ma-Mc-Nt-Yb
CORE-B208	22-APR	18:30	Ft-Gc-Kk-Ka-Ny-Sm-Mc
CORE-B209	17-JUN	18:30	Ft-Gc-Kk-Ka-Ny-Sm-Mc
EUROPE-43	22-JUN	12:00	Ny-On-Wz-Sm-Ma-Mc-Nt-Yb
VLBA9	24-JUN	20:00	VLBA- Kk-On-Gc-Mc-Gn-Gg-Wf-Ny
CORE-B210	15-JUL	18:30	Ft-Gc-Kk-Ka-Ny-Sm-Mc
VLBA10	10-AUG	14:00	VLBA- Kk-On-Gc-Mc-Gn-Gg-Wf-Ny
EUROPE-44	17-AUG	12:00	Ny-On-Wz-Sm-Ma-Mc-Nt-Yb
VLBA11	01-OCT	14:00	VLBA- Kk-On-Gc-Mc-Gn-Gg-Wf-Ny
CORE-B211	07-OCT	18:30	Ft-Gc-Kk-Ka-Ny-Sm-Mc
EUROPE-45	12-OCT	12:00	Ny-On-Wz-Sm-Ma-Mc-Nt-Yb
EUROPE-46	14-DEC	12:00	Ny-On-Wz-Sm-Ma-Mc-Nt-Yb-Eb
CORE-B212	16-DEC	18:30	Ft-Gc-Kk-Ka-Ny-Sm-Mc
VLBA12	21-DEC	16:00	VLBA- Kk-On-Gc-Mc-Gn-Gg-Wf-Ny

Precession Constants, of the relativistic precession of the perihelion of Mars to a few parts per thausands,of the Martian Len gth of Day to about 1 millisecond, were run on the following dates:

07 Jul MARS-15 (04:00 - 16:00 UT)

14 Aug MARS-16 (03:00 - 15:00 UT)

04 Sep MARS-17 (03:00 - 16:00 UT)

Since the Station has fulfilled the requirements to be a 'CORE' (Continuous Observations of the Rotation of the Earth) Station (namely: a) flexible and automatic frequency change; b) MKIV terminal; c) TAC for station timing system; d) daily GPS acquisition), it will take part to the 'CORE' projects. Moreover, during the present year **1999**, the Station will continue to observe the EUROPE and VLBA experiments. The 38 scheduled projects are listed in Table 2. The list contains 20 experiments more than in 1998, which represents an increase of more than 100% in observing time allowed for geodetic VLBI.

Tab. 2 - List of Geodetic VLBI observations in 1999

DATE	EXPERIMENT	DATE	EXPERIMENT
12-JAN	CORE-A053	29-JUN	CORE-A065
13-JAN	CORE-B401	13-JUL	CORE-A066
26-JAN	CORE-A054	15-JUL	CORE-B404
01-FEB	EUROPE-47	27-JUL	CORE-A067
09-FEB	CORE-A055	02-AUG	VLBA17
08-MAR	VLBA13	10-AUG	CORE-A068
09-MAR	CORE-A057	12-AUG	CORE-B405
23-MAR	CORE-A058	16-AUG	EUROPE-50
24-MAR	CORE-B402	24-AUG	CORE-A069
06-APR	CORE-A059	07-SEP	CORE-A070
15-APR	VLBA14	05-OCT	CORE-A072
20-APR	CORE-A060	11-OCT	EUROPE-51
26-APR	EUROPE-48	19-OCT	CORE-A073
04-MAY	CORE-A061	02-NOV	CORE-A074
05-MAY	CORE-B403	13-DEC	EUROPE-52
10-MAY	VLBA15	14-DEC	CORE-A077
18-MAY	CORE-A062	16-DEC	CORE-B406
21-JUN	VLBA16	20-DEC	VLBA18
28-JUN	EUROPE-49	28-DEC	CORE-A078

NOTO Station Report

In the following, the main upgrading done in the recent past at the Noto Station are described.

The new subreflector

During 1998 summer the new automatic subreflector positioning system has been mounted and successfully tested. The system similarly to Medicina, allows now to switch between the secondary mirror and the primary focus receiver in few minutes. The new equipment avoids the possibility to loose geo-experiments due to bad weather conditions.

A 12 GHz receiver for holography

A new 12 GHz receiver has been added in the primary focus box, able to work phase-locked with H-maser. It is mainly oriented to holography of the main dish. Indeed the efficiency at 22 GHz is only a little bit increased with respect to the past, due to the use of a new subreflector mirror (rms 0.12 mm), and then the determination of the surface errors is mandatory.

A new primary focus receiver system

The new primary focus receiver system is under construction and is expected to be operative in middle 1999. It includes 2.5, 3.6, 13, 18, 21, 49, 92 cm bands in dual polarization. It represents the second phase of the frequency agility program in Noto. The third phase will get the 0.7, 1.3, 6 cm bands operative in the secondary focus switching in few seconds through subreflector movement. In particular the new X will cover 8.1-8.9 GHz (wide band), and both SX bands will be cryogenically cooled.

New software

New software procedures has been created in order to automatically set the system with the requested observing band.

The MKIV formatter

The MKIV formatter is fully integrated in the VLBA environment and both formatters, VLBA and MKIV, are available.

Geodetic Observations

In 1998 the Noto Station took part to 12 Geodetic VLBI experiments, namely 5 CORE-B, 5 EUROPE, 1 NEOS and BF43A.

In 1999 6 CORE-B, 6 EUROPE and 1 CRF experiments involving the Noto Station have been scheduled.

It is worth to mention that the Noto telescope is deeply involved in the VSOP (plus ground based telescopes which make use of the Canadian S2 recording terminal) survey, of compact extragalactic radiosources.