АСТРОФИЗИКА

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PERSPECTIVES OF THE ROT 54/32/2.6 IN ASTRONOMY

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Perspectives for the Radio-Optical-Telescope 54/32/2.6 are given for the scientific research in radioastronomy. Its characteristics and potential scientific fields are summarized in the frame of the present french-armenian collaboration. A 3-phase upgrade plan including a detailed technical evaluation of the antenna is presented.

1. *Introduction.* The Radio-Optical-Telescope 54/32/2.6 (ROT) is located in Orgov (Armenia) and has been operated for the first time in 1986 [1]. Since this is one of the largest millimeter radiotelescopes of the world, the ROT can be a scientifically productive instrument if it is upgraded and made available to the astronomy community.

A preliminary technical evaluation of its characteristics has started in October 1994 with the visit of the Institute of Radiophysics Measurements (Prof. P. Herouni) and of the Byurakan Observatory (Dr. A. Petrossian) by J.-M. Martin and C. Rosolen [2].

2. *The ROT and some radiotelescopes which are available to french astronomers in the world.*

2.1. *The ROT:*

- useful diameter : 32 meters
- surface accuracy : 70/100 μm ⟹ working wavelength : λ = 30 mm — 3 mm (2 mm)
- site relatively dry in the mountain
- low background radio-noise and also the antenna is well protected against radio interferences.

2.2. *French radiotelescopes:*

- IRAM (Veleta):	30 m,	λ = 3 mm — 1 mm
- IRAM (Bure):	5 x 15 m,	λ = 3 mm — 1 mm
- NANCAY (NRT):	200 x 35 m,	λ = 22 cm — 9 cm

2.3. *Main single-dish radiotelescopes used by french astronomers:*

Name	Diameter	Typical working wavelength
SEST (ESO, Chile)	15 m	3 mm — 1 mm
JCMT (Hawaii)	15 m	mm/up to 0.5 mm
KITT PEAK (USA)	20 m	1 cm — 3 mm
ONSALA (Sweden)	20 m	1 cm — 3 mm
NRO (Japan)	45 m	3 cm — 3 mm
NRAO (Green Bank, USA)	43 m	up to 1 cm
EFFELSBERG (Germany)	100 m	50 cm — 6 mm
ARECIBO (USA)	300 m	50 cm — 3 cm
MEDICINA (Italy)	32 m	21 cm — 6 mm
PARKES (Australia)	64 m	50 cm — 3 cm
JODRELL BANK (UK)	76 m	50 cm — 5 cm
etc...		
Under construction :		
GBT (USA; 1998)	100 m	50 cm — 3 mm
Mexican-US antenna (2000?)	45 m	(sub?)millimeter
VLBI antennas (Russia; ?)	64 m	?

3. *Possible scientific fields for the ROT.*

- Cosmology : evolution of galaxies, physics of galaxies at large z; gravitational lenses, jets (VLBI).
- Physics of galaxies : gas and dust content, physical processes in galaxies, nuclear activity.
- Physics of our Galaxy : star forming regions, young stellar objects, molecular clouds.
- Evolved stars : OH/IR stars, C stars, evolution of the envelopes, variability.
- Pulsars (rather prospective) : spectra of extremely strong pulsars.
- Solar System : search of new molecules in comets and planetary atmospheres.

4. *How to work with the ROT?*

- Observation of large samples of objects : active galaxies, blue compact galaxies,

evolved stars

==> large amount of telescope time needed.

==> collaboration with the Byurakan observatory and Orgov institute staffs needed.

==> New catalogues, new reference samples.

- Variability studies :
  * In continuum (quasars)
  * in spectroscopy (stars, clouds...)

  ==> long term projects.

  ==> also large amount of telescope time and collaborations are needed.
- VLBI : the ROT could be associated with the European VLBI network, to extend its u-v coverage.

5. The ROT's upgrade is necessary. Due to the very long stop of the telescope (1990-1995). For the upgrade to be done, 3 phases can be identified.

5.1. FIRST PHASE: 1995-1996

In order to obtain a good technical evaluation and expertise for the upgrade.

Started in 1995 with funds from Ministère des Affaires Etrangères and from the PICS n°147.

- collaboration between the Radiophysics Measurements Institute and the Byurakan Observatory
- correction of the main reflector
- pointing and guiding system of the radiotelescope
- hardware and software for the radiotelescope control
- tests and upgrade of the interfaces
- 1 cm receiver
- tests of the complete instrument
- measurements on radiosources in order to determine the efficiency, pointing accuracy, stability, etc...
- decision to start phase 2.

5.2. SECOND PHASE: 1996-1997

According to the measurements done in phase 1.

- detailed definition of the technical improvements, according to the scientific and cost requirements. (working wavelentgh, receivers)
- evaluation of the global conditions for the scientific exploitation in the future
- collaboration with other countries
- identification of the main scientific programs

- fundings, official agreements, etc...
- decision to start phase 3.

5.3. THIRD PHASE: 1997-1998

- Upgrade of the radiotelescope *according to* phase 2.
- construction of the receivers
- preparation of the scientific programs, scientific collaborations, fundings...
- implementation of the data-analysis system
- organisation of the local staff and of the scientific commities
- start of operations.

6. *Conclusion.* With a strong collaboration between the Institute of Radiophysics Measurements and the Byurakan Observatory, the upgrade of the ROT would provide to the armenian and international astronomical communities a very interesting and powerful radiotelescope. The ROT should be dedicated to long term scientific projects, which could involve complementary observational work done with the Byurakan Observatory 2.6m telescope.

ПЕРСПЕКТИВЫ РОТ 54/32/2.6 В АСТРОНОМИИ

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Изложены перспективы радио-оптического телескопа 54/32/2.6 для научных исследований в радиоастрономии. Кратко описаны его характеристики и потенциальные научные области применения в рамках настоящего франко-армянского сотрудничества. Представлен план восстановления в три этапа, включая детальную техническую оценку антенны.

REFERENCES

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