

New connectivity brings real-time global radio astronomy to SA

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THE recent installation of superfast broadband connectivity at the Hartebeesthoek Radio Astronomy Observatory (HartRAO) means that the South African radio telescope can now, for the first time, participate in major global astronomical experiments in real time.

The first such experiment involving HartRAO took place in the first week of this month (May) and it also marked the start of the connection between the South African National Research and Education Network (SANReN) and Europe's Geant2, which is the largest computer network in the world devoted to research and education.

The South African radio telescope was linked to the European Very Long Baseline Interferometry (VLBI) radio telescope network. The new connectivity was funded by the Department of Science and Technology and implemented by the Meraka Institute of the Council for Scientific and Industrial Research.

"This is an exciting glimpse of future radio astronomy," enthuses HartRAO director Professor Roy Booth. "We will be able to observe unpredictable and unusual phenomena as they happen. With the new high-bandwidth connection at HartRAO, South Africa is able to take part in this cutting-edge astronomy."

The connectivity upgrade is also in support of South Africa's participation in the giant international Square Kilometre Array (SKA) radio telescope project. South Africa and Australia are the two countries shortlisted to host the SKA (see Engineering News May 9, 2008).

The experiment involved real-time VLBI, or e-VLBI as it is called. VLBI is a technique which allows radio astronomers to image the sky with ultra-high resolution and in great detail. This permits examination of the most distant and faintest regions in space.

This is achieved by having radio telescopes in different locations look at the same part of the sky at the same time. In effect, they become one huge, powerful, and sensitive, instrument. The more radio telescopes involved, and the greater the distance between them, the more powerful and the more sensitive the array becomes. Thus, HartRAO's location at the southern end of Africa is extremely useful for radio astronomers in Europe - it offers them a much longer baseline within a similar time zone.

HartRAO has been involved in VLBI for many years, but hitherto the South Africans (and, until recent years, every one else as well) had to record the VLBI data on tape and ship the tapes to a central processing facility for analysis, which could take months.

Now, e-VLBI does it all in real time. HartRAO's first e-VLBI experiment saw it linked with radio telescopes in Italy, Poland, Sweden, the UK and even, briefly, to the Arecibo dish in Puerto Rico. Data was shared between these observatories over the internet, at a data transfer rate of 32 Mb/s.

The significance of the event is shown by the fact that HartRAO was visited by a high-level EU delegation to observe the experiment. The European delegation was headed by EU Directorate-General: Research Director-General José Manuel María Rodríguez and Directorate-General: Information Society and Media Deputy Director-General Antti Peltomäki. They were both in this country for the seventh meeting of the South Africa/European Commission Joint Science and Technology Cooperation Committee (see Engineering News May 16, 2008).

Further e-VLBI experiments are planned in the coming months. These will be part of Europe's three-year Express Production Real-time e-VLBI Service (EXPReS) project, which seeks to create an intercontinental, distributed, large-scale, radio astronomy instrument. EXPReS is being coordinated by the Joint Institute for VLBI in Europe (JIVE).