# African Very Long Baseline Interferometry Network

## Concept

The African Very Long Baseline Interferometry Network (AVN) is a network of radio telescopes across Africa linked to each other by broadband Internet. Either existing, redundant 30-metre class telecommunications antennae will be converted for astronomy/geodesy purposes or new 30-metre class equivalent, or smaller, radio telescopes will be built. Countries where antennae will be erected will be chosen on the basis of three criteria: (1) whether they are an SKA African partner country, (2) whether they are in a place that maximises the science possible with the network, and (3) whether they express strong commitment to the AVN. The AVN will operate in single-dish mode, African VLBI mode, or be linked to global VLBI networks. Where possible, each site will be equipped with an automated weather station and a permanent global positioning satellite receiver.

## History of the AVN

Only one radio telescope in Africa, the Hartebeesthoek Radio Astronomy Observatory (HartRAO), is involved in global geodetic and astronomical very long baseline interferometry (VLBI) experiments. The AVN would become an entirely African facility capable of doing both astronomy and geodesy. The African SKA project involves nine partner countries (Botswana, Ghana, Kenya, Madagascar, Mauritius, Mozambique, Namibia, South Africa and Zambia). Of these countries, only South Africa and Mauritius had astronomy programmes in local universities prior to the African bid to host the SKA in 2006. It was proposed at the first African SKA Working Group meeting in Pretoria in February 2008 that a single antenna be built in each partner country to be used for research and training purposes. Later it was proposed that such a group of antennae could be linked to create the first African VLBI network capable of world-class scientific research in both astronomy and geodesy. Finally, it was discovered that several very large, 30-metre class, telecommunications antennae had become redundant as a result of new submarine fibre optical cables on the east and west coasts of Africa. Such antennae could be converted for astronomy/geodesy purposes.

## Science

The AVN will be capable of doing single-dish mode radio astronomy (excellent for the introduction of astronomy to students at all levels), astronomical VLBI experimentation and geodetic VLBI experimentation.

There is no accurate reference frame for Africa because currently only HartRAO is able to carry out geodesy experiments globally. Geodetic VLBI experiments will accurately fix positions for the African reference frame – vital for accurate surveying and mapping.

The AVN can be used to study the structure of very distant radio sources (e.g. galaxies or quasars), bright compact galactic sources (e.g. supernovae and pulsars), and narrow emission line sources (e.g. masers).

Human capital development

At each AVN station engineers and technicians will be trained along with students using the facility for research projects. This provides immediate experience in radio astronomy and related engineering techniques, including ICT, radio frequency engineering, receiver design and development, precision timing, data collection and reduction, and astronomy/geodesy research.