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Another radio telescope being established in SA

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The South African dish of the international C-Band All Sky Survey (C-Bass) radio astronomy project has now been erected in the Karoo at Klerefontein, near Carnarvon, in the Northern Cape province. South African telecommunications giant Telkom effectively donated two 7,6-m-diameter dishes for the local component of C-Bass, to promote science and education in this country.

"They were satellite tracking dishes and their control systems have had to be modified to make them suitable for use as radio telescopes. "The first dish is at the Hartebeesthoek Radio Astronomy Observatory (HartRAO), where it is being used to develop control systems. "It is much more convenient to do this prototyping at HartRAO, because it has the necessary workshops and technicians," explains Square Kilometre Array (SKA) South Africa associate director: science and engineering Professor **Justin Jonas**. "Eventually, this dish will be used for outreach programmes."

The second dish is the one that has been set up at Klerefontein and this will be the operational dish. Technical staff from HartRAO gave extensive assistance in the establishment of this dish at its Karoo site. The Klerefontein dish will become operational when it is fitted with its receiver and its recording system.

The receiver is being developed by Oxford University, with support from the University of Manchester (the latter is a world-renowned centre for radio astronomy, operating the famous Jodrell Bank observatory). One of those involved in developing the receiver is a South African, **Oliver King**, who is an MSc graduate of Rhodes University (a former student of Jonas) and now doing a PhD at Oxford. The recording electronics are being developed by the California Institute of Technology (Caltech). The receiving and recording systems will first be installed on the California dish of C-Bass, and debugged there. "The South African dish should be fully operational by the middle of next year," reports Jonas.

C-Bass comprises two radio telescopes, one each in the southern and northern hemispheres. Klerefontein is the southern hemisphere dish; the northern hemisphere dish is at the Owens Valley observatory, in California.

The dish for the California telescope was also, effectively, donated to the project, this time by the world-renowned Jet Propulsion Laboratory (JPL) – this dish is a different design to the South African ones. Founded by Caltech in the 1930s, the JPL is today managed by Caltech on behalf of the US National Aeronautics and Space Administration (Nasa). JPL's main mission is to build and operate Nasa's robotic planetary and interplanetary space probes.

The South African element of C-Bass is managed by another Rhodes MSc graduate, **Charles Copley**, and falls under SKA South Africa, as does South Africa's MeerKAT radio telescope array project. Indeed, Klerefontein is the support base for MeerKAT, and the MeerKAT infrastructure team used their recently acquired mobile cranes to set up the C-Bass dish. SKA South Africa is a business unit of the National Research Foundation, which, in turn, is an agency of the Department of Science and Technology.

Overshadowed by MeerKAT and by the giant international SKA project, C-Bass is still an important programme. It seeks to create a precise map of the galaxy in the C-band of the electromagnetic spectrum. The C-band lies in the microwave section of the spectrum, spanning wavelengths from 3,75 cm to 7,5 cm and frequencies from 8 GHz to 4 GHz (the shorter the wavelength, the higher the frequency). C-Bass will measure the total power and linear polarisation (that is, are the radio waves vertical or horizontal relative to the receiver?) of the C-band radiation reaching earth.

This work will also support the analysis of data from the European Space Agency's Planck space telescope, which was launched on May 14.

Planck will measure, with unprecedented precision, minute fluctuations in the cosmic microwave background (CMB) radiation. The CMB was generated by the Big Bang that created our universe and is, so to speak, a faint

echo of that event. To be able to precisely identify the CMB in the data from Planck, scientists will have to be able to very accurately 'subtract' the 'foreground' radiation from our galaxy. C-bass will provide data needed to do this subtraction.

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