The Australian SKA Pathfinder

New funding for an “Australian SKA Pathfinder” will contribute to the development of technology for the future Square Kilometre Array (SKA) telescope, and help to demonstrate the potential for the SKA to be located in Australia.

The Square Kilometre Array radio telescope (SKA) is under consideration by a consortium of researchers from 17 countries. If it proceeds, the SKA will be a next-generation radio telescope, 50-100 times more sensitive than any telescope currently available. It will be able to probe key questions in cosmology and physics, including the early origins of the universe. The estimated cost of the SKA is AU$1.8 billion. Australia, with a core site for the SKA in inland Western Australia, is one of two regions short-listed to site the SKA; southern Africa is the other.

As part of the Australian 2007-08 budget, the Australian Minister for Education, Science and Training, the Hon Julie Bishop MP, announced $56.7 million in Australian Government funding for the Australian Square Kilometre Array Pathfinder (ASKAP). The ASKAP will be one of the world’s foremost radio telescopes and an important test-bed for SKA technology.

This funding includes AU$51.7 million to CSIRO for construction of the ASKAP and AU$5 million for Australian Government engagement in the international Square Kilometre Array (SKA) program, including participation in the EU FP7 program to conduct a preparatory study (funded for four years from 2008) for the SKA construction phase. The new funding adds to approximately $49.2 million already committed for the telescope through Minister Bishop’s portfolio.

The Australian Government is working with the Western Australian State Government on further development of the Western Australian site as the site for the core of the ASKAP and to meet the stringent requirements of the SKA. CSIRO’s early work on SKA technology and the quality of the WA site (which has exceptional “radio quietness”) has already attracted collaboration and investment from research bodies in the USA and Canada.

The new funding takes the Australian Government’s commitment to the ASKAP to $100.9 million over the next four years. The funding will enhance Australia’s contribution to the development of the SKA concept and technology and help to demonstrate the potential for the SKA to be located in Australia. It builds on Australia’s world class standing in both the science of radio astronomy and the innovative engineering that underpins it. The announcement is consistent with the priority placed on the development of new radio astronomy infrastructure in WA articulated in the Australian Astronomy Decadal Plan 2006-15.

The Australian SKA Pathfinder telescope

Existing investment has enabled research and development for a preliminary version of the pathfinder telescope, called the Australian SKA Pathfinder (ASKAP).

The ASKAP is expected to attract further international scientific collaboration and research partnerships. As a result of the new funding the Australian SKA Pathfinder radio telescope will probably incorporate:

- an increase from 30, to possibly as many as 45, parabolic dishes equipped with phased array receivers, and a low-frequency array of 512 antenna “tiles”;
• cooled phased-array receivers to increase sensitivity. CSIRO is well positioned to have a leading role internationally in the development of cutting-edge phased-array receiver technologies, and the funds provided for this work have the potential to enable a major breakthrough for astronomy and for communications technology more generally;
• a remote array-station in NSW linked to the telescope core in WA via fibre-optic infrastructure, demonstrating the “long baseline observing” that is a key feature of the full SKA (requiring approximately one quarter of the extra funds); and
• key infrastructure and operations resources to demonstrate the Australian sites for the SKA, including a high bandwidth optic-fibre link between Geraldton and the WA telescope site, characterisation and maintenance of the radio-quiet zone, and suitable power solutions for the telescope and for the SKA remote array-stations (requiring almost one third of the extra funds).

In addition, funds will be available to ensure deep engagement in the international SKA processes to maximise benefit to the international SKA program and to Australian SKA developments in particular, including Australian participation in the proposed European Union Framework Program 7 Preparatory Study on SKA.

The Pathfinder telescope will give unprecedented opportunities for students at all levels to work with a world-leading professional telescope. A CSIRO astronomy outreach program in regional WA, called Wildflowers in the Sky, is already highlighting for students the possibilities of careers in science and technology and will link students in WA with students in Canada, one of the other partner countries in the ASKAP project.

Science

The ASKAP telescope will carry out ground breaking scientific programs. Access to the telescope will be available to the international community on the basis of scientific merit, similar to current practise on Australia’s existing radio astronomy National Facilities.

The new funds will significantly increase the scientific impact of the ASKAP telescope through an increase in its survey speed by a factor of five. As an example, the telescope will detect two million hydrogen-rich galaxies in its first year of operation, a 400-fold increase over the number known today. The ASKAP telescope will also deliver world-leading performance in a wide range of applications including pulsar astronomy, the study of transient radio sources, cosmology, and the structure and magnetic field of our own Galaxy.

The cross-continent baseline will be an important demonstration of “SKA readiness”, and will enable rapid transient follow-up and improved e-VLBI capability. The full science case for the ASKAP telescope is available from the ASKAP website, including an ‘expansion’ scenario that outlines the increased scope that will be facilitated by the Australian SKA Pathfinder program.

For further information:

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