

Australian Industry Engagement in R&D for the xNTD

The eXtended New Technology Demonstrator (xNTD)

CSIRO's extended New Technology Demonstrator (xNTD) project is being led by the ATNF. It will build a new radio telescope based on an array of 20 antennas, each equipped with a focal plane array (FPA). The xNTD will be based at Mileura in Western Australia.

The xNTD is an ambitious project with a challenging specification: The xNTD antennas will be between 12 and 20m in diameter and will operate across the 500 MHz to 2.5 GHz frequency range with high spatial resolution over a wide field of view (10's of square degrees). Many of the technologies developed for the xNTD are critical to the realisation of the Square Kilometre Array (SKA) - International Project: www.skatelescope.org

Here we illustrate how we are engaging with Australian-based industry for xNTD and SKA R&D.

Industry & Astronomy Initiating xNTD project engagement with Industry

The Australian Electronics Industry Action Agenda (EIAA) Implementation group has endorsed the SKA project. With advice from industry groups and support from AEEMA we have developed the "SKA cluster mapping project" to determine capability, gaps and strategic goals within Australian-based electronics and ICT industry. The initial mapping project is expected to foster the development of industry-led SKA R&D projects in the future, offering global exposure to potential new astronomy markets, as well as the exploitation of SKA technologies beyond radio astronomy.

An initial 'core' consortium comprising AEEMA, CSIRO, Boeing Australia Ltd, BAE SYSTEMS Australia, Cisco Systems, Global Innovation Centre Pty Ltd, Raytheon Australia Pty Ltd, RLM Management Pty Ltd, Tenix Pty Ltd, RF Technologies Aust Pty Ltd and Radio Frequency Systems Pty Ltd has been identified with all partners expressing strong support for the aims of the cluster mapping project. This core consortium, via the facilitator, Mr John Humphreys of GIC Pty Ltd, has submitted an application for funding to AusIndustry's "Industry Cooperative Innovation Program" (ICIP).

The SKA industry cluster mapping project will work to maximise the benefits from xNTD- and SKA-related R&D to

- Identify industry capability
- Manage a potentially very large number of interested Australian companies with high expectations of potential benefits from the SKA project
- Raise the profile of SKA-related R&D via active engagement with the Commonwealth Government's "Action Agendas"

Through these activities CSIRO will be actively engaged with Industry-capability-building initiatives - providing evidence of impact and relevance of CSIRO R&D to the Australian economy.

More information on the cluster's current activities can be found on the ASPO Industry web pages: www.atnf.csiro.au/projects/ska

xNTD R&D & the SKA Industry Cluster Mapping Project

Key areas of R&D in the xNTD project for Industry collaboration are

- Antenna designs & prototyping— underway & discussed elsewhere on this poster
- Low-noise RF CMOS integrated receivers suitable for use in phased arrays – has international potential & interest as show on this poster
- High-speed (Tbps) digital fibre links (distance ranges vary)
- Low-cost high-speed A-D converters (Gbps)

These will be explored via the SKA Industry Cluster Mapping project: the EIAA is under carriage of AEEMA



SKA Industry Cluster - Next Event

CSIRO ATNF in collaboration with AEEMA, BOEING AUSTRALIA, BAE SYSTEMS, CISCO SYSTEMS, RAYTHEON AUSTRALIA, RLM MANAGEMENT, TENIX, RFS WORLD, GLOBAL INNOVATION & RF TECHNOLOGIES

Invite you to the inaugural Cluster Event

'The SKA Cluster Initiative – Australian Industry Capabilities & Project Opportunities'

Monday 5 December: 10.30 am – 4.15pm
CSIRO Australia Telescope National Facility (ATNF)

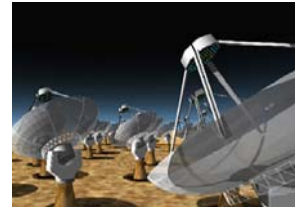
Some international concepts & demonstrators towards the SKA:

Focal plane arrays & Aperture arrays

Netherlands & UK
Aperture Arrays



Australia – CSIRO NTD/xNTD
Focal plane arrays & small dishes



International SKA Concepts & New Array Technologies

The science goals of the SKA demand high sensitivity and high angular resolution in multiple fields-of-view in the (low) frequency range 0.1 – 1.5 GHz. To meet this spec, SKA concepts based on phased arrays are the most versatile and technologically advanced option.

Phased arrays work by electronically altering the path length between the antenna elements (or groups of elements) allowing 'beams' to be formed in many directions at once.

Phase arrays can be realised as "Aperture Plane" arrays built as large collectors where the electric field is sampled directly, or as "Focal Plane Phased" arrays where the same array is placed at the focus of a reflector (paraboloid or cylindrical). In the case of a focal plane array the passive reflector provides the physical collecting area and the smaller array maximises our ability to collect the radio signal. The challenge is to understand the cost and performance issues with both options and determine which provides the best solution for the full SKA.

The EU SKA Design Study (SKADS) will develop

- The EMBRACE aperture array concept, based on the THEA (thousand-element array)
- 2PAD – the 'next generation' THEA, a 2-polarization, fully digital aperture array

CSIRO's NTD and xNTD projects are highly-complementary to the EU projects: they will contribute and share developments with EU SKADS in

- Digital backend design and implementation
- Optical data transport
- Software for phased arrays
- RFI mitigation techniques
- Multi-beaming and wide field-of view



A THEA array tile developed by ASTRON, NL

xNTD Antenna Design & Prototyping

To explore the interest within industry in developing the xNTD antenna, we held a half-day workshop at Marsfield on 15 September 2005. Twenty representatives from Boeing Australia Ltd, Connell Wagner, Australian Institute for Commercialisation, Sinclair Knight Mertz, Ball Solutions, BAE Systems Australia, Tenix Pty Ltd, Raytheon Australia Pty Ltd and Radio Frequency Systems attended and the initial feedback has been very positive.

The xNTD project has invited industry to prepare brief proposals to conduct a design study for the xNTD antenna by 25 November 2005.

From there the project anticipates entering into detailed design concept development phase to ~mid-March 2006.

Depending on the outcome of these studies the xNTD team will consider progressing one (or more) to the prototyping stage.

Follow-up information from the workshop, including the presentations made on the day can be found at

http://www.atnf.csiro.au/projects/ska/industry_2/pw-antennas.html.



Participants at the Antennas design for the xNTD workshop admire one of the two 13.8m diameter FOCUS telescope dishes, refurbished and now installed on the Marsfield range. These antennas will form the NTD.