

August 2007

SKA International News

<http://www.skatelescope.org/>

1. \$E60M funding has been approved for China's FAST telescope which will act as a pathfinder telescope for the SKA. The FAST (Five hundred meter Aperture Spherical Telescope) will be the largest telescope in the world constructed in Guizhou Province in southwest China. More info at: <http://www.bao.ac.cn/english/home.asp>

2. Please note the NEW advertisement of several senior engineering positions within ISPO

3. The latest SKA newsletter reports that: The PrepSKA proposal was submitted to the European Commission; substantial additional funding for Australian SKA activities; and funding for the next 4 years for the Technology Development Program for the SKA by the USA's National Science foundation.

SKA specifications are being reviewed by a "Tiger Team" under director Richard Schilizzi's chairmanship. The draft document will be discussed at the September meeting in Manchester. Initial specifications for the SKA and Phase 1 will be reviewed in January 2008.

http://www.skatelescope.org/PDF/news/SKA_NEWSLETTER_VOLUME_12.pdf

SKA NZ News

1. Three successful industry workshops were held in Auckland, Wellington and Christchurch in July, hosted by the Auckland University of Technology, NZ Supercomputing Centre and Telecom, and the Canterbury Development Corporation (CDC). About 80 attendees from 30 industries, 8 Ministries and government agencies, 5 Research institutes and 4 Universities, heard presentations by "Team ANZAC" (as pictured below: Carole Jackson and Phil Crosby from ATNF, Sergei Gulyaev from AUT-SKANZ, Brett Biddington from CISCO). The workshops highlighted the potential to NZ industry of the SKA and underlined the critical importance of NZ demonstrating eVLBI capability to seal the Australasian bid to host the SKA.



Briefly:

Brett Biddington, Chair of the SKA Telescope Committee (ex Uni lecturer, RAAF Intelligence, Cisco) gave an overview of the strong interrelationship and commitment needed between government, research agencies and industry if 'Team ANZAC' were to achieve its aim to beat South Africa and give the world the finest radio telescope. He described the initial and succeeding stages of Australian government/industry/research interaction, emphasizing the importance of building the right relationships early on. He gave an overview of the complexity of the

ASKAP (Australian SKA PathFinder) project within which CSIRO's MIRA project comprising

two instruments MIRANdA and the Mileura Widefield Array covering a frequency range ~80MHz to ~2 GHz.) sits and outlined the establishment of the SKA Industry cluster which will continue as 'friends of SKA'. Examples of different international contracting models demonstrated that there would always be unanticipated outcomes, and he urged Australia and NZ to be realistic about what to expect because of their relatively small scales (Australia to the US and NZ to Australia). But even a small part in such a long lasting project – the SKA is expected to be operational for 50 years after its completion in 2020 – would give ample returns. He suggested NZ was on track to being part of a southern hemisphere eVLBI network including Antarctica by 2012.

Sergei Gulyaev (AUT) gave an overview of radio astronomy and drew attention to the International Year of Astronomy in 2009. He drew an analogy between the scientific revolution that followed from Galileo's observations using a telescope that was 100x more powerful than the human eye and the revolution in knowledge that will happen with the SKA which is 100x more sensitive than current RTs. He demonstrated two approaches to construction of the SKA, with 50 -100 dishes in each of 50-100 stations, which clearly showed the advantages in establishing the longest baseline as soon as possible and 'filling in the gaps' later. **In other words the early inclusion of NZ sites could be a key differentiator in the Australasian bid** because it would afford the greatest benefit soonest. That means that NZ has to be 'up and running' with proven eVLBI capability asap. Thanks to his own and his team's expertise, Aussie collaborators, the NZSC and Brent Addis, whose 6m dish enabled the first Trans Tasman and later trans Pacific experiments (with Japan) to be successfully conducted, we are well on the way. AUT is now awaiting its \$1 million 12m dish from Patriot Antennas which will not only form part of the Aussie geo-science network AuScope, but will also be a SKA pathfinder. He showed the contribution that RA would make to the Kiwi Advanced Research and Education Network and the important link between KAREN and AARNET for real-time eVLBI. He discussed some industry opportunities and quoted Venture Southland engineer Robin McNeil: "Big Science attracts brains and money – and we want both." Sergei highlighted some of advantages of NZ's geographic location with the following graphic slide and ended by highlighting some of the important global connections which SKA will facilitate for NZ including the 16 other SKA partners, the fibre networks, EXPReS telescopes etc. "The world is ready for the SKA, How about Us?"

CSIRO astronomer **Dr Carole Jackson** outlined ASKAP– a major SKA pathfinder (ASKAP) which represents 1% of the capacity of the SKA. She described the SKA configuration for the Australian site at Boolardy in WA ~125 stations, 50% collecting area within 5 km, baseline of 3000 extended to 5000 with the inclusion of NZ; smart phased array feeds for the 12m antennas for the selected Focal Plane Array (FPA); anticipated data rates per hour (4 Terabytes) and Computer processing (1 Teraplop) for each antenna! The ASKAP support facility will probably be located at Geraldton and the site will be fibrelinked to Geraldton and Perth. She then described the ASKAP challenges and R & D projects and collaborators: developing 'receiver on a chip', antenna designs, computing platforms, network architecture etc.

Phil Crosby gave an overview of the linkages and benefits between radio astronomy and Industry. The particular challenges of RA – extremely faint signals buried in 'the mush', rising RFI and enormous amount of data - are being overcome with smart technologies and huge computing power. He mentioned that new technologies developed in Australia by the ATNF had kept Parkes' radio telescope at the forefront of astronomy for 45 years (though he neglected to mention that it was the NZ Director of CSIRO Cliff White who'd championed having Parkes built in the first place!). Successful collaborations such as that between CSIRO and Connell Wagner to develop the Australia Telescope Array have resulted in the transfer of new technologies to the market place. As Bob Fraters observed, "innovative capacity in radio astronomy and electronic engineering ... maximises speed and minimizes cost of the design/development process." Phil detailed the transition from traditional RA focused on large dishes and narrow frequencies to SKA requirements for large focal plane arrays with broad bandwidth generating huge amounts of data. – more than Europe's current internet traffic. There is a large reliance on industry to lift innovation and efficiencies. AKSAP will

comprise ~45 12m dishes. Phil's shopping list included low cost antennas and wideband feeds, phased array receivers and receiver chips, data transport storage and processing RFI mitigation techniques, imaging algorithms, project management etc. -the full SKA is equivalent to building a 100m telescope every 20 days. Direct and indirect benefits for members of the SKA industry cluster were listed and workshop participants were invited to join.

PLEASE contact Sergei.gulyaev@aut.ac.nz if you need further information

Larry Podmore, CDC's Director of Technologies, said that Industries attendees were both surprised and excited by the scale of opportunity afforded by the SKA. "Particular interest in partnership opportunities with AUT was expressed by the University of Canterbury with its new Blue Gene Supercomputer," said Mr Podmore. "And the existing high level of engagement between Australia and NZ bodes well for a successful outcome for the Australasian bid."

The Australians were delighted with the response saying: It was clear that the scientific benefit of having NZ as an eastern extension of perhaps both ASKAP and the SKA, as well as the potential to solve some significant technical challenges for the pathfinder (ASKAP) has been realised. The team were particularly pleased to note New Zealand's developing supercomputing capacity, i.e. a 2000-CPU NZ Supercomputing Centre in Wellington plus a dual IBM BlueGene P-series supercomputer at the University of Canterbury, Christchurch and which we hope will be put to good use in the SKA context.

2. AUT is testing RFI in potential sites for the 12 metre Radio telescope and consulting with Patriot Antennas on its design. In addition they are working with Australians on two major projects: AuScope (see ww.auscope.org.au) and ASKAP. Establishing a NZ SKA Industry cluster is also a priority.

3. Venture Southland is working with REANZ and government to extend KAREN to Invercargill so that NZ eVLBI experiments between AUT and Southland can proceed as planned. Telstra Clear are prepared to provide a 1Gb link from Dunedin to Invercargill basically on the back of the 10Gb/s fibre. Work on extending that link to the Awarua site is proceeding. From there 3 km of fibre will link to one of Telecom's brand new spare fibres down the Invercargill-Bluff highway. (Telecom engineers have kindly left a loop in their cable for this link.) REANNZ seem somewhat reluctant to provide the necessary POP in Invercargill, but since Southland has already attracted over \$5 million foreign investment and several international research partnerships with Australia, the ESA, and NASA, and considering the government's commitment to Regional Development, the aims of the Digital strategy, and indeed the KAREN strategy which was to use links between research and education institutes to extend the network into the regions, that situation should soon be rectified.

4. At the recent Kiwi Advanced Research and Education Network (KAREN) workshop, radio astronomy and the SKA were specifically mentioned by many international speakers, including Ian Foster, as prime exemplars of leading edge high performance computing and communications technologies.

SKA News for Australian Industry

1. Computing Architecture: Call for Expressions of interest from Industry. CONRAD is the Australian-South African partnership developing software systems for both ASKAP and KAT, 2 major 'SKA pathfinder' projects. A new public website for CONRAD has been set up and 2 briefs on CONRAD requirements are now available at <http://www.atnf.csiro.au/projects/mira/computing.html>
2. A. CONRAD Architecture: describes the overall computing systems architecture required to support the CONRAD software.
B. The impact of convolutional resampling on ASKAP and SKA phase I computing costs: this paper describes the dominant processing algorithm for astronomical

imaging

Call for industry input: The ASKAP project is now seeking feedback from companies with expertise in either of the above areas (networking solutions or implementing the resampling algorithm on specialised processors). A brief is available from the website.

3. Updated ASKAP antenna can be found at <http://www.atnf.csiro.au/projects/mira/antennas.html> <
4. Updated Technology roadmap: <http://www.atnf.csiro.au/projects/mira/technology.html>