FACULTY OF SCIENCE

THE UNIVERSITY OF SYDNEY

SKAMP Newsletter

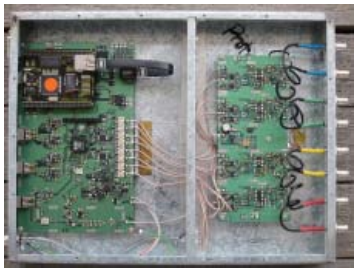
ISSUE 05
MAY 2011

SKAMP HARDWARE

Duncan Campbell-Wilson has now completed the new board design and layout of the FPGA receiver board after solving the LO phasing noise issue. The software to control and test the synthesiser has been written. Duncan and Lindsay Harkness have also implemented a Front-End Test Box to send signals to the down-converter boards, testing the power supply and signal integrity of the board.

Four down-converter and FPGA receiver boards have been fully assembled and now await testing, in preparation for the demonstration of SKAMP 1.5, where they will be brought together with one PFB and one Correlator board to make-up a 16-channel system. The final production run of the down-converter board is now underway, following the resolution of a minor parasitic oscillation in the input stage. Documentation for the parts placement for a production run of 100 is in preparation.

We'd like to thank Professor Frank Briggs (ANU) who recently visited the observatory to collaborate with Duncan on a final review of the FPGA receiver board prior to production. The findings of the review were positive and Duncan will continue working on the final components before the boards go into full production.



Receiver FPGA board (left) and down-converter board (right). Courtesy Dick Hunstead

SKAMP 1.5

The next major milestone for the SKAMP project is the demonstration of SKAMP 1.5 at the end of this month. The demonstration will employ 16 antennas, 4 bays, and 4 receivers. Initial testing will start with 2 antennas (1 baseline) and generate fringes from a transiting celestial source (no tracking), with the signal processed by most of the system. The technical team has defined and identified all performance indicators and the results will be announced in the next newsletter.

Emeritus Professor Bernard Mills at the Molonglo 40th Anniversary in 2005. Courtesy Crys Mills.

DEATH OF AN ASTRONOMY PIONEER

Emeritus Professor Bernard Mills, designer of the Mills Cross radio telescope, died on Anzac Day aged 90, after a short illness. Bernie stands as a giant of 20th century astronomy, both in the Australian and international context. After working on the development of radar systems with CSIRO Radiophysics during the war, he moved to the radio astronomy group in 1948 where he devised the innovative cross-type telescope design that bears his name. The Mills Cross carried out the first survey of the southern radio sky, cataloguing some 2200 radio sources and establishing Australia's credentials as a leader in the then-new science of radio astronomy.

In 1960 Bernie moved to Sydney University and began the design and construction of the one-mile aperture Molonglo Cross. Its major task was to carry out a much deeper radio survey of the southern sky, completed in 1978 with the publication of the Molonglo Reference Catalogue of 12000 sources. At that time Bernie was planning a further development of the telescope to turn the east-west arm into the Molonglo Observatory Synthesis Telescope. This change was realised and the telescope has continued to produce world-class images for three decades.

Bernie retired in 1985, but his legacy of challenging the conventional wisdom and technology of the day lives on throughout the world in the lives of the numerous students and colleagues whom he mentored. His pioneering contributions were recognised in 2006 with the award of the Grote Reber Medal for Radio Astronomy at the International Astronomical Union meeting in Prague.

SKAMP SOFTWARE

Following experimentation with a number of file formats for SKAMP visibilities and meta-data, Jay Banyer has implemented an initial version of SKV, and created some SKV tools. Jay has also implemented a basic version of the ingest daemon, a tool for receiving correlator UDP and writing SKV output files. The ingest process is currently undergoing preliminary testing, including addressing UDP packet loss issues.

The new members of the software team have assembled a conceptual description of the full SKAMP 2 signal pathway. Greg Madsen has developed an interactive tool to visualise and diagnose the large data volumes from SKAMP, affectionately referred to as the 'Skumpaliser' (See Figure). The Skumpaliser was demonstrated to the project group in March where it was met with much enthusiasm. A final version of this tool will be completed this month.

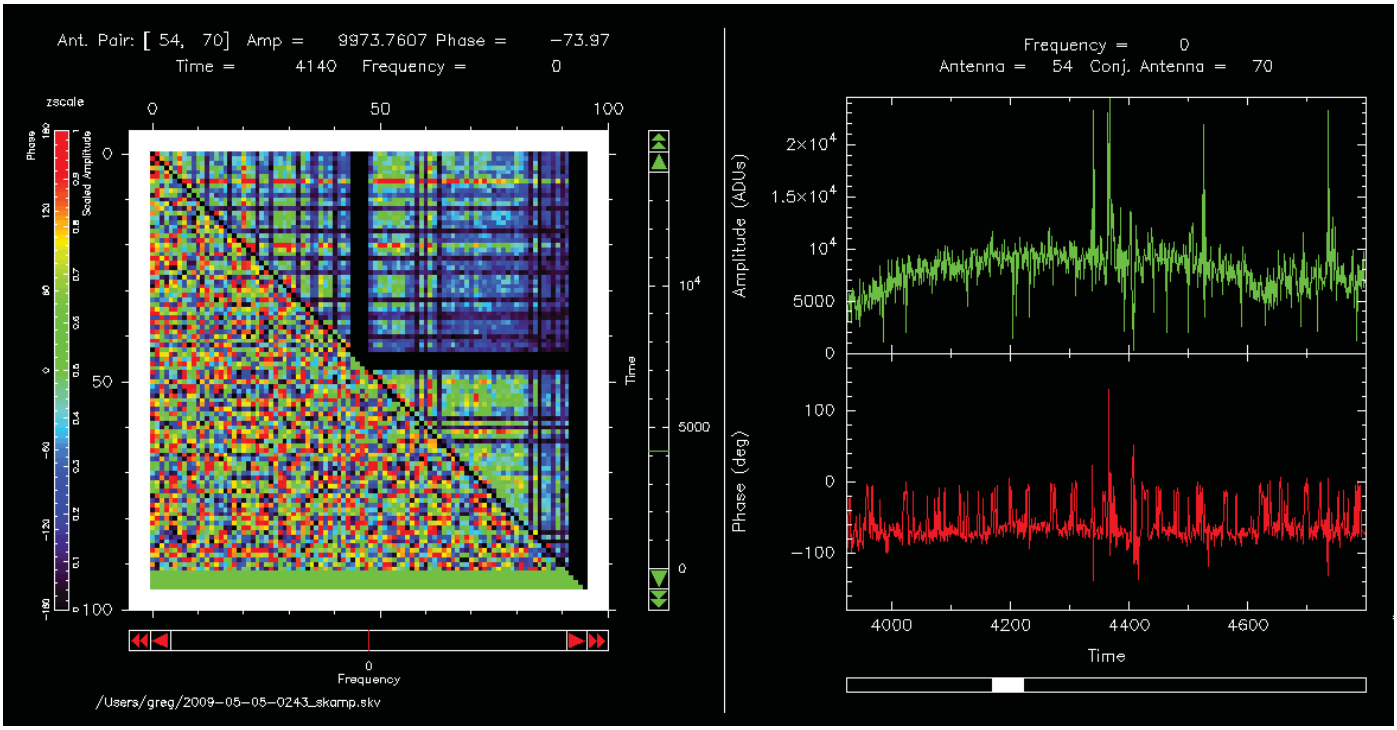
Greg has also started to simulate the idealised output of the SKAMP 2 correlator, which will enable testing of the full system and prepare for future output requirements.

SKAMP CORRELATOR

Firmware development for the correlator has been progressing well. Darshan Thakkar has studied and instantiated the Xilinx Gigabit Ethernet Media Access Controller (GigEMAC) core and determined that it will be used for the SKAMP correlator.

The module to interface the core with the rest of the SKAMP system has been designed and proven. Minor modifications to the cell control system are being carried out so that the visibilities can be sent to the data pipeline computers at the full rate. This will be followed by packeting the cell output in the format agreed by the project team before being sent out on the Ethernet cables.

The software team has written tools which will be used to validate the output packets and the reliability of the pipeline. Initially, a data generator (datagen) module simulating the correlator input packets will be used to drive the cells. The validation of the correlator output corresponding to the inputs generated by this datagen will be followed by feeding live packets from the Polyphase Filterbank (PFB) to the correlator.



Screenshot of the 'Skumpaliser'. Visibility data from the SKAMP-1 archive are shown for every antenna pair (left) and as a function of time (right). This interactive tool will enable efficient diagnosis of real-time data from the SKAMP-2 system. Courtesy Greg Madsen.

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We would like to thank all of the SKAMP project group at The University of Sydney for their contributions to the progress of the SKAMP project covered in this issue.

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