

Bluering Prototype System Results

G. Hampson, D. Humphrey, K. Bengston, W. Cheng, J. Bunton, Y. Chen, R. Chekkala, P. Roberts, R. Beresford

CSIRO Astronomy and Space Science

Corresponding Author(s): grant.hampson@csiro.au

Bluering is the CSIRO name given to a new generation of radio astronomy array receivers based on Xilinx's Radio Frequency System on Chip (RFSOC) technology. Bluering was initially designed for low frequency radio astronomy applications (such as the MWA telescope), but has grown to be a receiver also capable of L-band radio astronomy (such as Phased Array Feeds). Bluering is not only an array receiver; the spare FPGA resources can be used to form multiple wideband beams, compute the array covariance matrix, RFI mitigation, and even pulsar timing.

To enable many types of astronomy receiver applications an RF daughter board, called Taipan, can be customised to have coaxial and fibre inputs. Available to each Taipan is a tuneable LO signal (which can double the number of RF inputs for some frequencies), attenuator control bits as well as a calibration signal. With all these features it is possible to customise the Taipan to most astronomy applications.

CSIRO has developed a prototype Bluering system based around the 16 input 2GSPS 12-bit ADC version of the RFSOC. This paper presents some of the design details, including liquid cooling, RFI shielding, optical timing, embedded control system, as well as signal processing and communications firmware. Prototyping results are also presented - in particular RFI shielding, power, weight, SNR, etc. will be shown. Following the development and testing of this initial version CSIRO is planning on building a second version (without some of the bugs!) and aims to improve the general performance of the system.