

New Challenges in Signal Processing in Astrophysics: the SKA case

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Signal processing and communications are driving the latest generation of radio telescopes with major developments taking place for use on the Square Kilometre Array, SKA, the next generation low frequency radio telescope. The data rates and processing performance that can be achieved with currently available components means that concepts from the earlier days of radio astronomy, phased arrays, can be used at higher frequencies, larger bandwidths and higher numbers of beams. Indeed it has been argued that the use of dishes as a mechanical beamformer only gained strong acceptance to mitigate the processing load from phased array technology. The balance is changing and benefits in both performance and cost can be realised.

In this talk we will mostly consider the signal processing implementation and control for very large phased arrays consisting of hundreds if thousands of antennas or even millions of antennas. This can use current technology for the initial deployments. These systems are very large extending to hundreds of racks with thousands of signal processing modules that link through high-speed, but commercially available data networking devices. There are major challenges to mitigate power consumption and make the system maintainable.