

## TAKING A NARROW VIEW: DIVING DEEPER INTO THE DESIGN OF A NARROWBAND CORRELATOR

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The MeerKAT radio telescope is commissioned to be a multi-mode instrument. Initial modes include a wideband correlator-beamformer and pulsar search instrument. The current correlator-beamformer is focused on wideband channelisation performed by an FEngine prior to cross multiplication in the XEngine to form a correlation instrument. The wideband correlator-beamformer operates in L-Band with an instantaneous bandwidth of 856 MHz with future bands including UHF and S-Band. An additional narrowband channelisation mode is under development and is currently being tested prior to inclusion with the growing collection of modes to expand the scientific capabilities of the MeerKAT radio telescope. The initial narrowband mode operates in L-Band and has a bandwidth of 107 MHz selectable over the full wideband 856 MHz range with a band centre resolution of 100Hz. To achieve band selection a mixing stage with digital down-conversion and filtering is required. The channeliser decomposes the band into 32k channels operating on dual polarisation with a spectral resolution of 3.265 kHz per channel offering an 8x improvement in frequency resolution. This presentation will discuss the development of the processing stages using the CASPER toolflow with focus on the digital down-conversion and decimation stage as well as the changes to the Polyphase Filter Bank and channeliser. Consideration will also be given to additional modifications required to realise a narrowband correlator - both in FEngine and XEngine designs. The presentation will include design considerations and constraints and will provide operational results.