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# *High-frequency tecno-signatures search with MeerKAT Band 5B*

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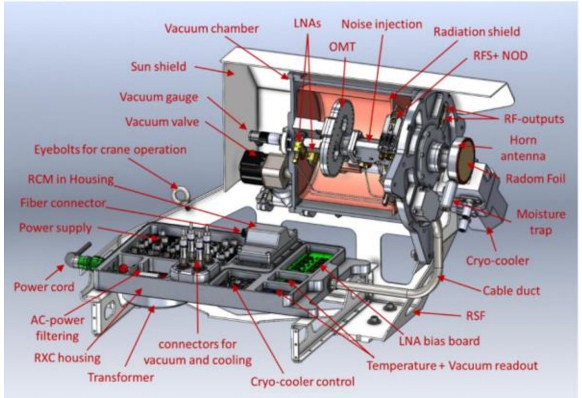
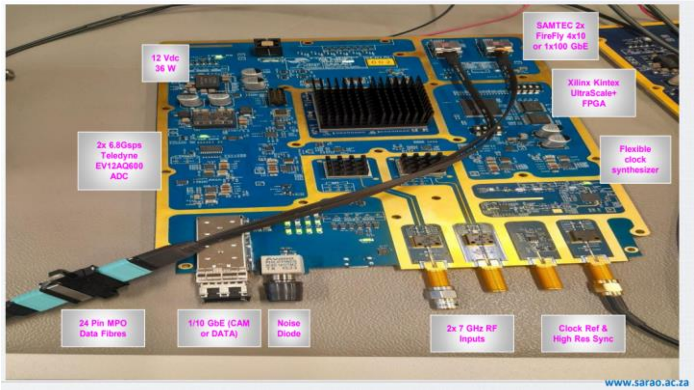
# Overview of the MeerKAT Band5B project




- **64 receivers, 8.3 – 15.4 GHz**
- *Instantaneous bandwidth: 7.1 GHz*
- *They will be installed in the MeerKAT X-Band slot, which is currently not populated*
- *Max-Planck-Institut für Radioastronomie won the tender to build the 64 receivers*

- **64 digitizers, instantaneous bandwidth of 2.5 GHz per polarization.**
- *Two 12-bits e2v EV12AQ600 ADCs are employed and a large Xilinx Kintex Ultrascale+ FPGA manages the data, packetize the data stream and send this out – toward the correlator – via two QSFP+ links.*
- *The design and construction of the 64 digitisers was awarded to SARAO.*

# Why is Band 5B important for SETI?

- Higher frequency bands are less crowded with human RFI. Pipelines for finding signals can allow for a lower SNR and thus search candidates over a larger range without too many RFI candidates.

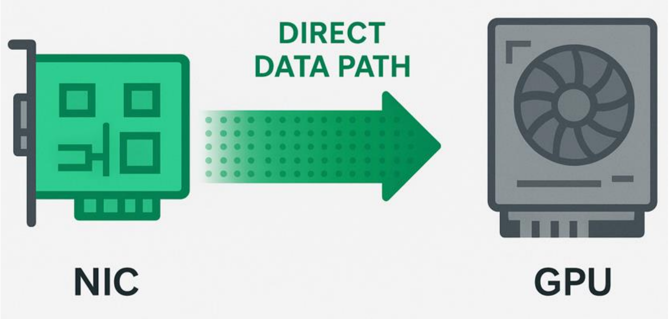
- More reliable association with targets: observing at higher frequencies results in a smaller field of view and improved angular resolution.

- Less spectral broadening of narrowband signals: Roughly 70–75% of all stars are M dwarfs, whose habitable zones lie much closer than 1 AU. These stars produce strong stellar winds with dense plasma and intense magnetic activity, causing radio signals to broaden in a frequency-dependent way as they pass through the turbulent environment. At higher frequencies, this broadening is weaker, so signals remain narrowband and are more readily detected by current software.

# Nvidia IGX with Holoscan

## NVIDIA IGX

- Industrial-grade edge platform for real-time AI
- High-performance GPU compute directly at the edge (i.e. nearest to the data source)
- Integrated GPU (iGPU) + optional discrete GPU, es. NVIDIA RTX A6000




## NVIDIA Holoscan

- Direct NIC-to-GPU data path – eliminates unnecessary copies and CPU overhead
- Ultra-low latency processing for real-time applications
- Higher throughput and performance thanks to zero-copy data transfer

# Nvidia IGX with Holoscan at the Allen Telescope Array

- *Infrastructure deployed for searching FRBs.*

- *Traditional de-dispersion techniques can be tricky to handle high-speed data (100 Gbit/sec); designed a pipeline based on deep learning to detect FRBs in real time without any de-dispersion process.*

- *Specifically, designed a modified neural network model called masked ResNet-38, optimized for the task of FRB detection. For the training, “synthetic injections” are used to simulate FRB signal inserted into the background data, to train the network on positive and negative cases.*

- *The system does real-time triggering. Once a possible FRB is detected, offline de-dispersion be applied for scientific analysis.*

- *Next step: employing the same hardware for the technosignature search*

- *Porting to MeerKAT, with special focus on Band5B*

- *A simplified machine will be installed at the Sardinia Radio Telescope*


*Ma, Peter Xiangyuanet al.: "**A deployed real-time end-to-end deep learning algorithm for fast radio burst detection**", Astronomy & Astrophysics, Volume 702, id.A181, 15 pp., November 2025.*

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