A database for monitoring radio-frequency interference at the Murchison Radio-astronomy Observatory

Research Field
Engineering

Project Suitability
Masters / Honours / potentially expandable to a PhD level

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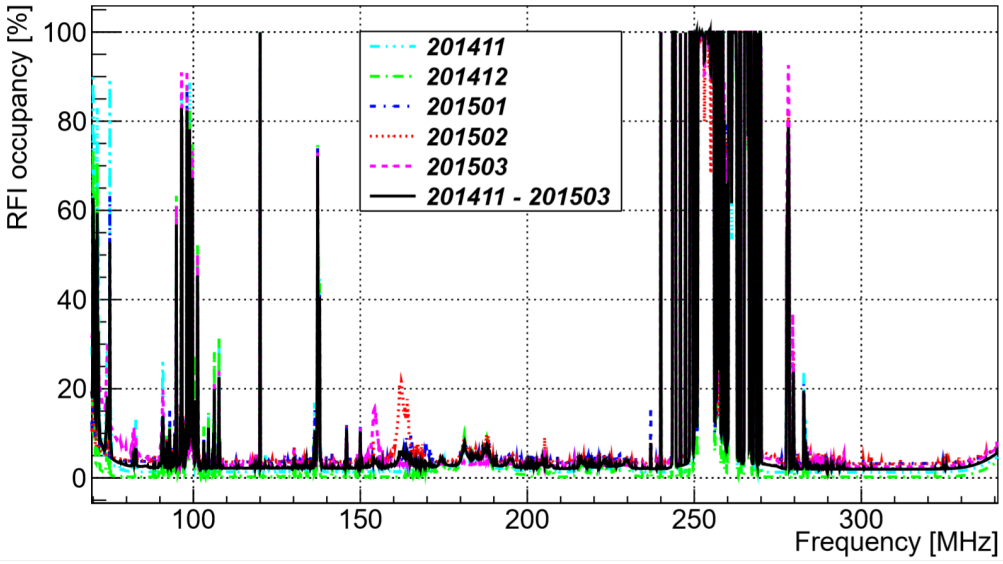
The Murchison Radio-astronomy Observatory (MRO) is located in a remote area of Western Australia where a Radio Quiet Zone (RQZ) has been established in order to ensure high quality astronomical data. The MRO currently hosts several low-frequency (50 – 350 MHz) radio-telescopes including the Murchison Widefield Array (MWA; Tingay et al 2013), precursor stations of the low-frequency component of the Square Kilometre Array (SKA-Low) amongst the other instruments. The SKA-Low is a huge international endeavour to be built at the MRO in the next decade. Although the MRO is located at a designated RQZ with significant regulatory protections, radio-frequency interference (RFI) from aircraft and satellite (for example ORBCOMM communication satellites) is often observed as well as occasional interference from distant FM radio and digital TV transmitters.

The BIGHORNS broadband antenna at the MRO

In order to monitor and characterise the RFI environment at the MRO several RFI surveys have already been conducted in the recent years. Two of them used BIGHORNS broadband system (Sokolowski et al, 2015) in order to characterise RFI occupancy of the observing band between 50 – 350 MHz (Sokolowski et al, 2016) and frequency of occurrence of long-distance propagation events, so called tropospheric ducting (Sokolowski et al, 2017).

The goal of the this project is to create a database of RFI using the archival and new data from BIGHORNS and other instruments operating at the MRO. The database will be updated as new data are being collected and will be used in order to enable daily monitoring of the RFI quality of the future site of the SKA-Low telescope and provide information to astronomers using data from radio-telescopes already operating at the MRO. The RFI database will also enable software programs to verify quality of the data from these instruments (for example the MWA) by flagging particular time intervals where in-band or out-of-band (especially strong) RFI was observed.



Occupancy of the 70 – 350 MHz band over a couple of months in 2014 and 2015 obtained from analysis of BIGHORNS data