

Monitoring repeating Fast Radio Bursts with the Onsala 25m Telescope

Background

Fast Radio Bursts (FRBs) are among the most mysterious phenomena in modern Astrophysics. The majority of FRBs have only been seen once as a very bright and short (~1ms) burst of radiation at radio frequencies. A few of them have been reported to repeat. Today we know of a few hundred detected FRBs but we still do not know what type of star or physical mechanism causes these bursts. Key to understanding their origin is to (1) localise them within their host galaxy and, thus, constrain the environment within which they occur; and (2) collect many bursts of one and the same FRB – preferably across a wide frequency band – to study the bursts morphology, spectral energy distribution, and repetition rate among other things. Fortunately, we know of about a dozen repeating FRBs (<https://arxiv.org/abs/1603.00581>, <https://arxiv.org/abs/1908.03507>) that allow such studies (e.g. <https://arxiv.org/abs/1903.02249>) and which have led to the precise localisation of one such repeater (<https://arxiv.org/abs/1701.01099>). The remaining – and also yet to be discovered – repeaters still need to be associated with a host galaxy and also need to be monitored regularly to constrain FRB-physics.

Task description

The student will be involved in implementing and analysing regular observations of several repeating FRBs with the Onsala 25m telescope. She/he will analyse both single dish observations as well as interferometric data taken in conjunction with other European radio telescopes. The aims are multi fold, ranging from constraining burst rates to potentially localising one or more of the repeaters.

Required education and potential course requirements

The course “Radio Astronomy” is highly recommended for this Master’s research project. Familiarity with Linux and some programming skills, specifically in Python, are helpful, but may also be developed as part of this thesis.

Credits

30 or 60 credits

Contact information of supervisor

Franz Kirsten, franz.kirsten@chalmers.se, Astronomy and Plasma Physics

Jun Yang, jun.yang@chalmers.se, Onsala Space Observatory

Wouter Vlemmings, wouter.vlemmings@chalmers.se, Astronomy and Plasma Physics