

A continuum-imaging search for pulsar candidates in Omega Centauri

Abstract

The short spin periods and high timing stability of millisecond pulsars (MSPs) makes them powerful tools for a range of astrophysics, such as gravitational wave astronomy, tests of general relativity, probing intra-binary and inter-stellar material, and more. Globular clusters, where the stellar interaction rate is high, are a fertile birthplace for MSPs, and may host some of the most extreme MSP systems to be discovered, such as pulsar-black hole systems. However, traditional pulsar search techniques may not be sensitive to such extreme pulsars. An alternative technique is to identify pulsar candidates via radio continuum images, on the basis of circular polarisation, steep radio spectra, variability, or association with high-energy sources. This technique has recently proved fruitful, and does not suffer the same selection effects as traditional pulsar searches, therefore making it more sensitive to unusual and extreme systems. In this proposal, we seek to search for new pulsar candidates in Omega Cen by conducting deep continuum imaging in total intensity and polarisation, allowing us to cover the entire cluster (its core and beyond) with unprecedented sensitivity. With its high mass and dense core, this globular cluster is a promising region to search for new pulsars, including some of the most unusual and extreme pulsar systems yet discovered.