Contribution ID: **190** Type: **Oral**

Constraining properties of neutron star merger outflows with radio observations

Thursday, 5 December 2019 17:00 (15 minutes)

The detection of the first neutron star merger, GW170817, heralded the dawn of a new era in multi-messenger astronomy. Observations of radio emission from the resulting afterglow helped constrain merger parameters including the jet opening angle, the energetics of the merger and the circum-merger density. However, these observations alone were insufficient to distinguish between two competing models for the merger geometry - where a relativistic jet launched along the merger axis either successfully breaks out of the dense surrounding medium, or dissipates within it ("choked" jet or cocoon). The tension between these models was not resolved until observations using Very Long Baseline Interferometry (VLBI) detected superluminal motion, suggesting that the late-time emission was jet- dominated.

In this talk I will discuss prospects for the detecting future compact object mergers and the versatility of radio observations in localising mergers and constraining their properties. I show that while the late-time outflow structure of nearby events can be constrained using VLBI observations to either directly image the outflow or detect centroid motion produced by the presence of a jet, these observations cannot be used to understand early-time behaviour. Instead we can place meaningful constraints on the early-time source size via the detection of interstellar scintillation from high-cadence multi-frequency observations. This technique also has a further effective range than VLBI follow-up, and will enable study of the geometry of events out to (and beyond) the horizon of third-generation gravitational wave detectors.

Primary author: DOBIE, Dougal (University of Sydney)

Presenter: DOBIE, Dougal (University of Sydney)

Session Classification: Parallel

Track Classification: Gravitational waves and followup