

# Analysing Beaming Profiles of Short Gamma-Ray Bursts using Gravitational Waves

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GRB170817A had the weakest observed emission of any short gamma-ray burst (sGRB). It is postulated that either SGRBs can be intrinsically weaker than previously thought, that GRB170817A was viewed off-axis, or that SGRBs have some non-uniform energy distribution within the jet. Determining the true beam profile would explain the dimness of GRB170817A, as well as give insight into the astrophysics behind the jet formation. This is achievable with the promise of coincident gravitational wave and sGRB detections in the future, bolstered by the development of future generation detectors. A number of models with different beam profiles have been proposed, including Gaussian, structured power-law and top-hat beams. We have been working on an analysis to allow for model comparison between the different profiles, as well infer the underlying model parameters. Another approach is to infer the beaming profile without assuming a model, but instead use a Gaussian process prior, allowing for a non-parametric analysis. This talk will focus on how we can use future events to determine the most favourable beam profile, and how many events would be necessary before the models can be discerned with significance. The talk will also outline our ongoing work with the non-parametric case and discuss how it could give us an unbiased perspective on the astrophysics of binary neutron star merger.