Contribution ID: **30** Type: **Presentation**

Robustness of Markov Chain –Monte Carlo in parameter estimation of gravitational waves emitted during Core-Bounce phase of Core Collapse Supernovae.

Friday 25 July 2025 15:50 (20 minutes)

In this work we use an analytical model that fits the Core-Bounce phase of Core Collapse Supernovae and it depends upon one physical parameter (the rotational rate) and two more phenomenological ones, which adjust the waveform to a Richers catalog of 2D axisymmetric simulations. Three different scenarios were considered in this work. The first one aims to test Markov Chain –Monte Carlo robustness in terms of prior sensitivity, using uniform, triangular, and LogUniform probability density functions in 37 injections at 11 kpc, showing that there is a difference in the uncertainties among the posteriors associated with each prior. The second scenario analyzes how different reparametrizations (parameter transformations) affect the estimated values and posterior probability densities. We found out that there is actually worse performance when there is a transformation of the parameters. The last situation tests the relative probability of different models (varying the number of parameters) calculating the bayesian evidence and comparing them to show which model suits better the 2D simulated waveforms, and it turns out that the model which includes only one parameter is preferred. In a more general way, a set of 126 injections showed that the reconstructed waveforms using Markov Chain –Monte Carlo yielded better Fitting Factors compared to the ones calculated recurring to frequentist methods.

Primary authors: Dr MORENO, Claudia (University of Guadalajara); AVILA, Emmanuel (Tecnologico de Monterrey); Dr ANTELIS, Mauricio (Tecnologico de Monterrey); ZANOLIN, Michele (Embry-Riddle Aeronautical University, Prescott)

Presenter: AVILA, Emmanuel (Tecnologico de Monterrey)

Session Classification: Detection