



Contribution ID: 527

Type: **Invited talk in a parallel session**

How to do multi-messenger forecasts in the Einstein Telescope era: addressing present and future challenges

Friday, 12 July 2024 15:50 (25 minutes)

Next-generation gravitational-wave detectors will be able to explore a broad range of science case studies. Evaluating their detection and parameter-estimation capabilities is a mandatory step in the planning process. We will start by discussing currently available data analysis tools that allow us to do forecasts. In particular, we will talk about GWFish, a software that simulates gravitational-wave detector networks and calculates measurement uncertainties based on the Fisher matrix approximation. We will then present the results obtained with GWFish on the scientific perspectives for different designs for the Einstein Telescope (ET), the European next-generation gravitational-wave observatory. The talk will overview the impact of different detector geometries and sensitivities, focusing on the multi-messenger capability of ET operating in synergy with electromagnetic observatories, where localization capabilities have a crucial role, especially for sending pre-alerts for detecting prompt and early emissions.

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Session Classification: New frontier of multi messenger astrophysics: follow up of electromagnetic transient counterpart of gravitational wave sources

Track Classification: Multimessenger Astrophysics (MA): New frontier of multi messenger astrophysics: follow up of electromagnetic transient counterpart of gravitational wave sources