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NEMO, the concept of a high frequency gravitational wave detector

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Abstract:
GW170817 was a golden event for multi-messenger astronomy made possible by gravitational wave detection. This this event allowed us to gleam an insight into short gamma-ray bursts, neutron star mergers, jet formation and topology, r-process nucleosynthesis but information about the merger and post-merger phases of the system are still unbeknown to us. A gravitational wave detector engineered to focus on signal frequencies between 0.9 –3 kHz would allow us to probe the exotic nuclear physics in the cores of neutron stars in a regime not accessible with the current terrestrial experiments. The Australian gravitational wave detector concept, NEMO [1] builds on a 4 km long dual recycled Fabry-Perot Michelson design with additional upgrades in terms of Silicon test masses, cryogenic suspensions, long signal recycling cavities to allow for a strain sensitivity comparable to 3G detectors in the frequency band of 0.9 –3 kHz. In this talk, we also discuss some of the preliminary results pertaining to tunability of the NEMO detector using a variable reflectivity signal recycling mirror [2].

References :

[1] Ackley, K., Adya, V., Agrawal, P., Altin, P., Ashton, G., Bailes, M., . . . Zhu, X. (2020). Neutron Star Extreme Matter Observatory: A kilohertz-band gravitational-wave detector in the global network. *Publications of the Astronomical Society of Australia*, 37, E047. doi:10.1017/pasa.2020.39
[2] Glenn de Vine et al 2002 Class. Quantum Grav. **19** 1561

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