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Scattering of gravitational plane waves by a compact body

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We consider time-independent scattering of gravitational waves by a compact horizon-less body such as a neutron star. The neutron star is modelled with a polytropic equation of state. The metric perturbation in the exterior can be solved for using the gauge invariant master functions and formalism presented by Martel and Poisson [2005]. For the interior we work in Regge-Wheeler gauge and solve the perturbed Einstein field equations for odd and even parity. We will show that in this scenario, there can be rainbow scattering, similar to that seen in nuclear experiments. An associated caustic (a focusing of null geodesics) forms near the body's surface. This feature is imitated in the wave picture. We will compare our results with black hole scattering studies.

Summary

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