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Gravitational Radiation in General Spacetimes

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Gravitational waves transport information from faraway regions of the Universe. Studies of gravitational waves have been devoted mostly to sources such as binary black hole mergers or neutron star mergers, or generally sources that are stationary outside of a compact set. These systems are described by asymptotically-flat manifolds solving the Einstein equations with sufficiently fast decay of the gravitational field towards Minkowski spacetime far away from the source. Waves from such sources have been recorded by the LIGO/VIRGO collaboration since 2015. Thibault Damour has made vast contributions to this field of research. In this talk, I will present new results on gravitational radiation for sources that are not stationary outside of a compact set, but whose gravitational fields decay more slowly towards infinity. A panorama of new gravitational effects opens up when delving deeper into these more general spacetimes. In particular, they generate new structures in gravitational radiation and memory. These are deeply connected with an "appealing story of non-peeling" curvature and geometric components. The new effects emerge naturally from the Einstein equations both in the Einstein vacuum case and for neutrino radiation. The latter results are important for sources with extended neutrino halos.

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