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Multimessenger Gravitational Lensing in Black Holes Spacetimes

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Usually, when we talk about gravitational lensing we either speak of gravitational lensing of light or gravitational waves. However, in the presence of a black hole also massive particles like neutrinos can be gravitationally lensed. While nowadays most neutrino detectors are not sensitive enough to resolve neutrino events with an angular resolution that is high enough so that we can completely resolve the resulting lensing features, they still have the potential to provide supplementary information to more conventional lensing observations. Therefore, in this talk, we will now discuss how gravitational lensing of massive particles can provide this additional information. For this purpose, we will treat the massive particles as test masses and assume two simple black hole spacetimes from general relativity: The Schwarzschild spacetime and the so-called Newman-Unti-Tamburino (NUT) spacetime. Using the lens equation and the travel time in terms of the time coordinate and the proper time we will illustrate which differences occur compared to light rays and how they may contribute to correctly characterising black hole spacetimes in the context of a multimessenger approach.

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