Contribution ID: **14** Type: **not specified**

Spinoptics in the Kerr Spacetime: Polarized Wave Scattering

Saturday, 1 November 2025 12:15 (15 minutes)

We study propagation of high-frequency electromagnetic and gravitational waves in the gravitational field of a rotating black hole. Due to the interaction of the spin of the field with the spacetime curvature, the standard geometric optics approximation that is used for obtaining the approximate high-frequency solutions of the wave equation should be modified. The corresponding modified spinoptics equations show that the worldline of the spinning massless particle is still null, but no longer a geodesic. We demonstrate that using the hidden symmetries of the Kerr metric one can obtain the corresponding spinoptics equations in the leading order of a $1/\omega$ expansion in an explicit form. We focus on the case of the spinning massless fields scattering in the region near

the equatorial plane. We demonstrate that the asymptotic planes of the corresponding null ray's motion are slightly tilted. We study this effect and its dependence on the spin of the black hole.

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Session Classification: Saturday Morning Session 2