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Properties of Quartic Mass Shells[1] THOMAS MULKEY, Georgia Southern University, MAXIM DURACH, Department of Physics, Georgia Southern University — If one compares different metamaterials from a common prospective, it appears that they can propagate a large variety of waves, depending on their individual properties. Specifically, one can control the shape of the mass shell for photons in the bulk metamaterials, modifying from the spherical shell to ellipsoidal and hyperbolic in hyperbolic metamaterials. Additionally, one can change the spin state of the photons by adding or combining birefringence and chirality. However, we are interested in an unknown material that supports photonic waves with a desired mass shell and desired spin state distribution over the mass shell. Starting from this set of photonic waves, we can find a set of 36 material properties, which such a material should have. Of particular note are the unique mass shells characterized by multivariate quartic equations. These mass shells represent novel metamaterials, and will be the topic of discussion in this poster. The discussed properties of these mass shells include asymptotic behavior, K near zero behavior, and non-trivial photonic spin. Mapping these mass shells will assist in the direct engineering of metamaterials propagating the appropriate optical waves for various situations.

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