Antipodal Identification in Reissner-Nordström Spacetime[1]
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We extend the discussion of the antipodal identification of black holes to the Reissner-Nordström (RN) spacetime. We solve the massless Klein-Gordon equation in the RN background in terms of scattering coefficients and provide a procedure for constructing a solution for an arbitrary analytic extension of RN. The behavior of the maximally extended solution is highly dependent upon the coefficients of scattering between the inner and outer horizons, so we present the low-frequency behavior of, and numerical solutions for, these quantities. We find that, for low enough frequency, field amplitudes of solutions with purely positive or negative frequency at each horizon will acquire only a phase after passing both the inner and outer horizons, while at higher frequencies the amplitudes will tend to grow exponentially either to the future or to the past, and decay exponentially in the other direction. Regardless, we can always construct a complete basis of globally antipodal symmetric and antisymmetric solutions for any finite analytic extension of RN. We have characterized this basis in terms of positive and negative frequency solutions so that they could be used to begin constructing the corresponding quantum field theory.

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