

THE KERR BLACK HOLE IN NEAR-HORIZON AND ASYMPTOTIC COORDINATES

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Abstract

The usual Bondi-Sachs coordinates at null infinity, as well as Gaussian null coordinates near an event horizon, are both examples of coordinate systems where the radius is a (potentially non-affine) parameter along a geodesic congruence with vanishing twist. While the Eddington-Finkelstein coordinates in Schwarzschild are members of these classes (Bondi-Sachs for outgoing and Gaussian null for ingoing), the typically-used analogue in Kerr, ingoing and outgoing Kerr-Newman coordinates, are not. This complicates comparisons between black hole perturbation theory with more general results for general asymptotically flat spacetimes or general spacetimes possessing horizons. Over the past few decades, there have been many efforts to transform between Boyer-Lindquist coordinates and these more appropriate coordinate systems. In this talk, I will discuss the various approaches which have been taken, and I will describe in detail a new variation on an old approach that is particularly well-behaved.