Kerr black hole s:ker Kerr!black hole

Introduction

Having studied the Schwarzschild black hole in the preceding chapters, we turn now to its rotating generalization: the Kerr black hole. The Kerr metric is arguably the most important solution of general relativity, largely because of the no-hair theorem, according to which all stationary black holes in the Universe are Kerr black holes (cf. Sec. s:sta:no-hair).

In this chapter, the Kerr solution is first presented in terms of the standard Boyer-Lindquist coordinates and its basic properties are discussed (Sec. s:ker:Kerr$_solution).ThenKerrcoordinatesareintroducedinSec. s : ker : extens$
$Lindquistcoordinates, theyareregularonthetwoKillinghorizonsofKerrspacetime.KerrcoordinatesarealsotiedtooneofT$
$theprincipalnullgeodesics, whichareintroducedinSec. s : ker : principal_geod.Thesecondcongruence, thatoftheso-$
$calledoutgoingprincipalnullgeodesics, providesthegeneratorsoftheblackholeeventhorizon, whichisstudiedinSec. s : ker$
$mass, angularmomentumandhorizonarea.Section s : ker : observerspresentsvariousstandardfamiliesofobserversinK$

The Kerr solution s:ker:Kerr$_solution$

Expression in Boyer-Lindquist coordinates s:ker:expr$_BL$

The Kerr solution depends on two constant non-negative real parameters: itemize

t he mass parametermass!parameter of Kerr solution $m > 0$, to be interpreted in Sec. s:ker:Komar$_massasthespacetime$

t he spin parameterspin!parameter of Kerr solution $a \geq 0$, to be interpreted in Sec. s:ker:Komar$_Jasthespecificangularm$