POST-NEWTONIAN EXPANSION OF GRAVITATIONAL WAVES FROM A PARTICLE IN CIRCULAR ORBITS AROUND A ROTATING BLACK HOLE :EFFECTS OF BLACK HOLE ABSORPTION

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Coalescing compact binaries are the most promising candidates for detection by near-future, ground based laser interferometric detectors. It is very important to investigate detailed wave forms from coalescing compact binaries. When one (or two) of the stars is a black hole, some of those waves are absorbed by the black hole. Here, we consider a case when a test particle moves circular orbit on the equatorial plane around a Kerr black hole, and calculate the the energy absorption rate by the black hole. We adopt an analytic techniques for the Teukolsky equation which was found by Mano, Suzuki, and Takasugi (1996). We calculated the energy absorption rate to $O((v/c)^{13})$ beyond the Newtonian-quadrupole formula of gravitational waves radiated to infinity, assuming $v/c \ll 1$. Here v is the velocity of the particle. We find that, when a black hole is rotating, the black hole absorption appear at $O((v/c)^5)$ beyond the Newtonian-quadrapole formula. These effects become more important as the mass of the black hole becomes larger. We also found that the black hole absorption is more important when a particle moves to the same direction of the black hole rotation. All the details of this paper is presented in Tagoshi et al. (1997).

References

S. Mano, H. Suzuki and E. Takasugi, (1996) Prog. Theor. Phys. **95**, 1079.
H. Tagoshi S. Mano, and E. Takasugi, (1997) Prog. Theor. Phys. **98**,

K. Sato (ed.), Cosmological Parameters and the Evolution of the Universe, 163.