

The ISCO for Binary Black Holes

3PN approximation to GR (conservative part):

$$c^2 E_{3PN} \equiv \hat{H}_N + \hat{H}_{[1PN]} + \hat{H}_{[2PN]} + \hat{H}_{[3PN]}$$

$$E_{3PN}(x) = -\frac{x}{2} + \left(\frac{3}{8} + \frac{1}{24}\nu\right)x^2 + \left(\frac{27}{16} - \frac{19}{16}\nu + \frac{1}{48}\nu^2\right)x^3 \\ + \left(\frac{675}{128} + \left(-\frac{34445}{1152} + \frac{205}{192}\pi^2\right)\nu + \frac{155}{192}\nu^2 + \frac{35}{10368}\nu^3\right)x^4$$

$$\text{ISCO: } \frac{dE_{3PN}}{dx} = 0$$