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Transition from a Riemann ellipsoid to a Mclaurin spheroid: gravitational wave emission and some astrophysical implications (online talk)

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Semi-analytical models of gravitational wave (GW) radiation are constructed following first principles. They are more than mere academic exercises and can be used to compute qualitative and quantitative results. We study a semi-analytical approach to gravitational radiation from rotating ellipsoids (Riemann ellipsoids), whose internal matter is described by a polytropic equation of state. It was found an early period when the GW has an increasing frequency and amplitude. This object is called a chirping ellipsoid (CEL), and its waveform when the polytropic index is close to 3, is almost identical to one of an inspiral binary. The almost perfect match occurs when the mass of the CEL is of the order of the chirp mass of the binary. These CELs are detectable by low-frequency detectors such LISA, Taiji or TianQin. The equivalent binary can be identified with an extreme-mass-ratio inspiral composed of an intermediate-mass black hole and planet-like object or with a double-detached white dwarf. On the other hand, these CELs can be also used to model the post-merger object of BNS merger or a DWD merger. It will be shown the transition from a Riemann ellipsoid to a Mclaurin spheroid. From the conservation of angular momentum and baryonic mass, some parameters of the initial state of the ellipsoid can be obtained. Also, the time it takes the CEL to make the transition can be used to constrain the initial ellipticity of the CEL.

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