

**High Energy Particle Produced by Ballooning Modes
Driven by the Modulated Gravitational Field of Collapsing Binaries***

R. Spigler¹ and B. Coppi²

¹*C.N.R. (Italy)* and ²*MIT*

A novel theoretical process [1] to create high energy particle population during collapse of neutron star - neutron star or black hole - black hole binaries is formulated. The oscillatory gravitational potential that is associated with the rotating binary is characterized by two frequencies, in the case where the masses of the two components are not equal, that reduce to one (the main) when the two masses are equal. Consequently the gravitationally confined plasma surrounding the considered binary will oscillate with the same frequencies. When one of these (e.g. the main) will become about equal to the frequency (about that of the compressional Alfvén wave) of a newly identified vertically localized ballooning mode the amplitude of this can be sustained by the relevant oscillatory vertical gravitational force. Then the involved characteristic mode-particle resonances can raise the energy of a super-thermal fraction of the electron distribution up to relativistic values and lead to produce observable high energy radiation emission. *Sponsored in part by the U.S. Department of Energy and by C.N.R. of Italy.

[1] B. Coppi, *Plasma Physics Reports*, **45**, 5 (2019).