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Ejected Pairs of "Beamed Gravitational Phonons" from Gravitational Waves Emitters*

Bruno Coppi[1,2]
[1]CNR, [2]MIT
coppi@mit.edu:

Ejected pairs of "Beamed Gravitational Phonons" are found as double-helix plasma structures emerging from disks in which (GR) gravitational wave emitters (e.g., black hole binaries before their collapse) can be expected to be imbedded. The pair components [1] are a combination of ballooning modes and vertically propagating ion sound helical waves considering disk electron temperatures well in excess of those of the nuclei. The toroidal rotation frequency is, for both modes, equal to the rotating frequency Ω_{ob} of binaries involving, for simplicity, two equal BH masses. Then, the modes' frequencies are multiple of $2\Omega_{ob}$, and differ by $2\Omega_{ob}$, both waves propagating in the same vertical direction with equal wave numbers. The nonlinear coupling of the pair constituents is driven by the periodic vertical force associated with the time-dependent tridimensional component of the relevant gravitational potential or by a periodic modulation of the vertical plasma inflow velocity to which the disk may be subjected [1]. Clearly, the collimation of the ejected double-helix can be undermined by encounters with regions of rarefied plasma turbulence.

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References

[1] B. Coppi, Pl. Phys. Rep. (and Fizika Plazmy) 47, 9 (2021).