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Null cosmic strins as sources of gravitational bursts

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Along with the more well-known massive cosmic strings, their massless counterparts can also exist in the universe. Such strings, having no tension, have a linear energy density and therefore can contribute to the gravitational wave background, generating gravitational bursts of various durations. We are investigating two different mechanisms for the generation of these gravitational bursts.

Using the previously introduced stress-energy tensor for the null string [1], we can, in linear approximation, establish a connection between the gravitational shockwave from a massless particle (Aichelburg-Sexl solution) and the gravitational burst from a null string of arbitrary time-dependent shape. At the same time, the null string can also be considered as a moving topological defect in space-time, which changes the gravitational field of other massive bodies. From the point of view of distant observers, the dynamic change in the gravitational field induced by the string can also look like a gravitational burst of some duration.

In the general case, one can expect that gravitational bursts from null strings can be experimentally detected due to the gravitational memory effect. We will discuss the characteristic parameters of bursts and the corresponding memory for some model problems and the theoretical possibilities of their detection in gravitational wave experiments.

[1] E.A. Davydov, D.V. Fursaev, V.A. Tainov, Phys.Rev.D 105 (2022) 8, 083510. e-Print: 2203.02673 [gr-qc].

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