BISER: A New Tool for Laboratory Astrophysics

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Singularities in multi-stream flows of emitting media cause constructive interference of emitted traveling waves, forming extremely localized sources of bright coherent emission. This phenomenon is called BISER, Burst Intensification by Singularity Emitting Radiation [1].

BISER was originally discovered as an extremely bright coherent soft x-ray source in relativistic laser plasma [2, 3]. Moreover, the BISER concept is applicable to astrophysical plasma as well, where bright electromagnetic and/or gravitational wave sources can be formed in media exhibiting multi-stream flows. Analogously to our observations in laser plasma, the cosmic BISER sources should be much brighter than the background incoherent emission. These BISER sources can be the progenitors of the observed astrophysical electromagnetic pulses such as Gamma-Ray Bursts (GRBs) and Fast Radio Bursts (FRBs), and can enrich the range of theoretically predicted waveforms used for signal searches in gravitational wave astronomy.

In this presentation we introduce the BISER concept, show the experimental results obtained to date, and discuss possible laser plasma experiments for modeling the bright localized cosmic sources of electromagnetic and gravitational waves.

[1] A. S. Pirozhkov, T. Zh. Esirkepov, T. A. Pikuz, *et al.*, "Burst intensification by singularity emitting radiation in multi-stream flows," *Sci. Rep.* 7, 17968 (2017).

[2] A. S. Pirozhkov, M. Kando, T. Zh. Esirkepov, *et al.*, "Soft-X-Ray Harmonic Comb from Relativistic Electron Spikes," *PRL* 108, 135004 (2012).

[3] A. S. Pirozhkov, M. Kando, T. Zh. Esirkepov, *et al.*, "High order harmonics from relativistic electron spikes," *New J. Phys.* 16, 093003 (2014).