BISER control at 150 TW: keV photons and microjoule pulses in the 60-100 eV range

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Burst Intensification by Singularity Emitting Radiation (BISER) [1] is a strong intensification (constructive interference, N^2 effect) of traveling wave emission from singularities produced by multi-stream flows. In particular, bright coherent x-rays [2], [3] are produced by point-like sources, i.e. relativistic plasma singularities driven by high-quality [4] multi-TW femtosecond lasers in gas targets. Here, the density singularities are produced by multi-stream plasma flow resulting from the wake and bow waves [5]. In previous experiments, BISER resulted from relativistic self-focusing, which is a laser beam instability. To improve the stability, we have recently demonstrated a BISER control technique using a 20 TW laser and tailored plasma density, as it was suggested by our simulations with the Particle-In-Cell code REMP [6].

Here we present new experimental results on the BISER control technique obtained with the J-KAREN-P laser [7],[8] at the power of 150 TW. We extended the BISER emission up to the keV spectral region and obtained an order of magnitude enhancement of the photon yield (up to 1 μJ pulse, 10^{11} photons in the 60-100 eV spectral range within a 10^{-2} sr acceptance angle).

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