

BISER at the keV spectral range

A. S. Pirozhkov¹, T. Zh. Esirkepov¹, B. González-Izquierdo¹, A. Sagisaka¹, T. A. Pikuz^{2,3}, Z. E. Davidson⁴, K. Ogura¹, A. Bierwage⁵, K. Huang¹, N. Nakanii¹, J. K. Koga¹, A. Ya. Lopatin⁶, Y. Fukuda¹, D. Neely^{7,4}, P. McKenna⁴, E. N. Ragozin^{8,9}, S. A. Pikuz³, N. I. Chkhalo⁶, N. N. Salashchenko⁶, S. Namba¹⁰, H. Kiriyama¹, M. Koike¹, K. Kondo¹, T. Kawachi¹, M. Kando¹

¹Kansai Photon Science Institute, QST, 8-1-7 Umemidai, Kizugawa-city, Kyoto 619-0215, Japan

²Open and Transdisciplinary Research Initiatives, Osaka University, Suita, Osaka, 565-0871, Japan

³Joint Institute for High Temperatures RAS, Izhorskaja Street 13/19, Moscow 127412, Russia

⁴Department of Physics, SUPA, University of Strathclyde, Glasgow G4 0NG, UK

⁵Naka Fusion Institute, QST, Ibaraki, 311-0193, Japan

⁶Institute for Physics of Microstructures RAS, GSP-105, 603087 Nizhny Novgorod, Russia

⁷Central Laser Facility, Rutherford Appleton Laboratory, STFC, Chilton, Didcot, Oxon OX11 0QX, UK

⁸P. N. Lebedev Physical Institute RAS, Leninsky Prospekt 53, Moscow 119991, Russia

⁹Moscow Institute of Physics and Technology (State University), Institutskii 9, Dolgoprudnyi, 141700, Russia

¹⁰Graduate School of Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashihiroshima, Hiroshima 739-8527, Japan

We have discovered BISER (Burst Intensification by Singularity Emitting Radiation) in underdense laser plasma [1-3], Fig. 1. BISER produces ultra-bright, spatially and temporally coherent, tightly-focusable x-ray emission from singularities of a multi-stream plasma flow driven by multi-TW femtosecond lasers. We have validated the BISER mechanism by direct imaging of point-like x-ray sources, high-resolution spectra and dedicated numerical simulations [3].

Here we demonstrate BISER control using shocks in supersonic gas jets. The experiments have been performed with the upgraded J-KAREN-P laser [4-5]. We have significantly reduced source position jitter and achieved important breakthrough in the coherent x-ray source performance: enhanced the photon yield by an order of magnitude resulting in up to 1 μ J pulse (10^{11} photons) in the 60-100 eV spectral range within a 10^{-2} sr acceptance angle, and extended BISER to the keV spectral region.

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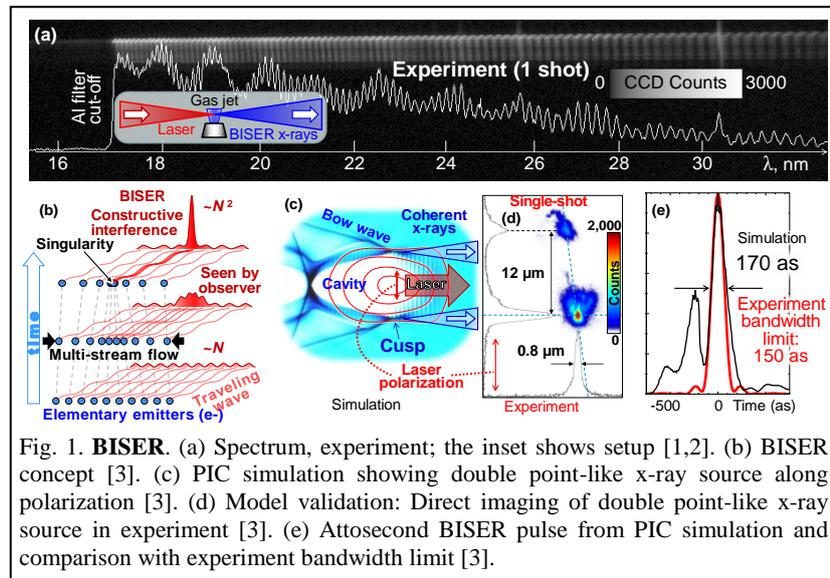


Fig. 1. **BISER**. (a) Spectrum, experiment; the inset shows setup [1,2]. (b) BISER concept [3]. (c) PIC simulation showing double point-like x-ray source along polarization [3]. (d) Model validation: Direct imaging of double point-like x-ray source in experiment [3]. (e) Attosecond BISER pulse from PIC simulation and comparison with experiment bandwidth limit [3].