



Contribution ID: 16

Type: Oral

Intense laser focused profile measurement by scanning electron beam via laser-Compton scattering

Thursday 10 September 2015 11:00 (15 minutes)

Laser-Compton scattering (LCS) is a feasible technique to realize the compact, high brightness X-ray source. The laser photons are scattered by high energy electrons and the energy of the electrons is transferred to the photons. Tightly focus of both laser and electron beam makes it possible to achieve the high brightness X-ray source. The LCS is also a quite useful technique for diagnostics. The laserwire beam size measurement, which laser spot is much smaller than that of electron beam, are well-known. On the other hand, laser focused spot measurement for extremely high peak power laser has not been achieved yet. We proposed to use LCS technique for such a high power laser profile measurement by using very small electron beam, which is an inverse procedure of laserwire that the electron beam size have to be much smaller than that of laser. As a focused electron source, we used a photocathode rf electron gun and very strong solenoid lens. The rf gun can generate very small emittance beam and the beam size of 20 μ m rms was achieved with the charge of 50 pC/bunch. We have installed an electron beam scanning system and high power CO₂ laser for the demonstration. The principle of laser profile measurement by LCS, recent results of experiments and future prospective will be presented at the conference.

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Session Classification: 1. General Aspects of Physical Phenomena and Processes Associated with Electromagnetic Radiation

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