Post-Deadline Submissions

THPOS65

A Novel Diagnostics of Ultra-short Electron Bunches Based on Detection of Coherent Radiation from Bunched Electron Beam in an Undulator

Evgeny Saldin, Evgeny Schneidmiller, Mikhail V. Yurkov (DESY, Hamburg)

We propose a new method for measurements of the longitudinal profile of 100 femtosecond electron bunches for X-ray Free Electron Lasers (XFELs). The method is based on detection of coherent undulator radiation produced by modulated electron beam. Seed optical quantum laser is used to produce exact optical replica of ultrashort electron bunches. The replica is generated in apparatus which consists of an input undulator (energy modulator), and output undulator (radiator) separated by a dispersion section. The radiation in the output undulator is excited by the electron bunch modulated at the optical wavelength and rapidly reaches a hundred-MW-level power. We then use the now-standard method of ultrashort laser pulse-shape measurement, a tandem combination of autocorrelator and spectrum (FROG - frequency resolved optical gating) providing real-time single-shot measurements of the electron bunch structure. The big advantage of proposed technique is that it can be used to determine the slice energy spread and emittance in multishot measurements. We illustrate with numerical examples the potential of the proposed method for electron beam diagnostics at the European X-ray FEL.

THPOS66

Expected Properties of the Radiation from VUV-FEL at DESY (Femtosecond Mode of Operation)

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For the next three years the nominal "long pulse" (200 fs) mode of FEL operation at VUV-FEL, based on a linearized bunch compression, is not available due to the lack of a key element - a 3rd harmonic RF cavity. Essentially nonlinear compression leads naturally to a formation of a short high-current leading peak (spike) in the density distribution that produces FEL radiation. Such a mode of operation was successfully tested at VUV-FEL, Phase I. In this paper we present optimized parameters of the beam formation system that allow us to get a current spike which is bright enough to get SASE saturation for the VUV-FEL, Phase 2 at shortest design wavelength down to 6 nm. The main feature of the considered mode of operation is the production of short (15-50 fs FWHM) radiation pulses with GW-level peak power that are attractive for many users. Main parameters of the SASE FEL radiation (temporal and spectral characteristics, intensity distributions, etc.) are presented, too.

THPOS67

ELBE FEL - First Lasing

Peter Michel (Forschungszentrum Rossendorf, Dresden - Sachsen), Thomas Dekorsy, Pavel Evtushenko, Frank Gabriel, Eckart Grosse, Manfred Helm, Marcel Krenz, Ulf Lehnert, Wolfgang Seidel, Dietrich Wohlfarth, Andreas Wolf, Rudi Wuensch (FZR, Dresden)

First lasing of the mid infrared FEL at ELBE was achieved on May 7, 2004. The Radiation Source ELBE at the Forschungszentrum Rossendorf in Dresden is currently under transition from commissioning to regular user operation. Presently the electron linac produces an up to 18 MeV, 1 mA (cw) electron beam which is alotted to generate various kinds of secondary radiation. After the successful commissioning of the bremsstrahlung and channeling-X-ray facilities during 2003 stable lasing has now been observed in the IR range (15 to 22 µm). The oscillator FEL is equipped with two planar undulator units, both consisting of 34 hybrid permanent magnet periods of 27.3 mm (K_{rms} = 0.3 - 0.8). The distance between the two parts is variable and the gaps can be adjusted and tapered independently. At 19.6 µm an optical power of 3W was out-coupled in a macro pulse of 0.6 ms duration using an electron beam energy of 16.1 MeV and an energy spread of less than 100 keV; the micropulse charge was 50 pC and its width slightly above 1ps. With the installation of a second acceleration module for additional 20 MeV smaller wavelengths will become available in the near future.

Modified Abstracts

MOCIS01

Bunching, non Linear Harmonic Generation, Exotic Undulators and Cascade Undulator FELs

Giuseppe Dattoli (ENEA C.R. Frascati, Frascati - Roma)

It is shown that the non linear harmonic generation in high gain FEL device can be described using a semi-analytical method, which provides a transparent understanding of the physical mechanisms underlying the process itself. The problem of the sensitivity of the higher order harmonics on the beam qualities is discussed in detail and it is shown that the method we propose is useful to design FELs operating in cascade undulator configuration or with exotic undulator devices.

THBIC01

High Brightness Electron Beam Generation

James Rosenzweig (UCLA, Los Angeles, California)

Fourth-generation light sources are based on an emerging class of electron beams which possess ultra-high brightness, and ultra-short pulse lengths. Much recent theoretical and experimental work has been dedicated to understanding the inter-related processes of emission, emittance optimization, compression, transport, and focusing of these beams. We review progress in these areas, with particular emphasis on experimental results. As examples of integration of such electron injectors into frontier light sources, we examine their use in high duty cycle SASE FELs, and in inverse Compton-scattering X-ray sources.

Withdrawn Contributions

MOPOS72	Short Pulse Amplification in FEL Sergei Georgii Oganesyan (OSG, Yerevan)
MOPOS73	Cherenkov Oscillator Based on Stimulated Spin-Flip Effect Sergei Georgii Oganesyan (OSG, Yerevan)
TUPOS30	Wavelength Stabilization in the Beijing Free Electron Laser Yonggui Li (IHEP Beijing, Beijing)
TUPOS55	Progress of a High-Average-Current RF Photoinjector for 100 kW FEL Thomas John Schultheiss (AES, Medford, NY)
THCOS03	Short X-Ray Pulses Diffraction on 'Frozen' Crystals Souren Grigorian (RAS/CRYS, Moscow)
THPOS32	Coherent Far-Infrared Radiation Generation from Bunched Electron Beam by Using PAL Test Linac Jung Yun Huang (PAL, Pohang)
THPOS34	Chemical Composition Image and Spectral Analysis by Using SNIM Technology Yonggui Li (IHEP Beijing, Beijing)
THPOS55	Nonlinear Beam Dynamics in the Storage Ring with FEL Wigglers Ying K. Wu, Jingyi Li, Stepan F. Mikhailov (DU/FEL, Durham, North Carolina)