

A Novel Undulator Magnet Gap-Separation Mechanism

John Skaritka, Ed Haas, George Rakowsky, Chris Stelmach, Li-Hua Yu

National Synchrotron Light Source, Brookhaven National Laboratory,

Upton, New York 11973, U.S.A.

Phone: (631) 344-7411; Fax: (631) 344-3238

E-mail: skaritka@bnl.gov

Abstract

A novel gap-separation mechanism has been designed for a permanent magnet undulator that is applicable for both FEL and synchrotron radiation sources. An upgrade to the SASE FEL currently in operation at BNL's Source Development Laboratory (SDL) is anticipated. Seeding with a 266-nm Ti Sapphire laser to produce 1 μJ of deep ultraviolet coherent radiation at 88 nm is being incorporated. A further improvement will be to incorporate high-gain harmonic generation (HG) to produce 200 μJ at 200 nm and a third harmonic of 1 μJ at 66 nm. This will require introduction of a modulating prebunch undulator magnet. Presented is a novel, relatively low-cost method to control the gap of the modulator magnet. A gap separation mechanism and corresponding magnet support structure have been designed. The rail-mountable undulator magnet support structure is to be incorporated with a precision rail and motorized strut-driven beam-based alignment system that is already in place on the beamline. A single motor is used to drive the separation mechanism. This novel approach can provide gap control and parallelism to within 20 microns, while allowing easy access to the gap for magnetic measurements, vacuum chamber installation, and beam diagnostics. The paper presents the detailed design of the system and describes assembly, testing, and installation procedures.

Keywords: SDL, HG, SASE FEL, undulator, gap separation

Presentation: Poster