Easy Access Shielding Structures for the DUVFEL Beamline at BNL's Source Development Laboratory

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Abstract

A novel method of beamline shielding has been implemented that maximizes radiation safety and allows easy access to beamline components while minimizing the stacking of lead bricks. This method can be applicable to other beamline shielding applications. A radiation analysis established minimum shielding requirements for the Near Infrared Scalable Undulator System (NISUS) and the Deep Ultraviolet Free Electron Laser (DUVFEL) beamline at BNL's Source Development Laboratory (SDL). In addition to the 1.2-meter-thick modular concrete walls that surround the beamline additional shielding above and on either side of the NISUS gap was required to prevent skyshine and secondary particles from becoming a radiological hazard to personnel in the SDL building. The challenge of the shielding design was to eliminate the radiation hazard while maintaining easy access to the many beam monitors and a various diagnostics on the NISUS table and beamline that require hands-on manipulation. A novel approach to shielding design has been implemented around the NISUS magnet: 2,000 pounds of lead and 18,000 pounds of boronated polyethelyne were incorporated. In addition, over 25,000 pounds of cast lead plates surround other areas of the beamline. Presented is the detailed design of the movable shielding. This novel approach allows a single user to gain full access to NISUS within a matter of seconds. Administrative and engineered safeguards are implemented prior to interlocking to prevent any noncompliant occurrence. This shielding system greatly simplifies the earlier method of lead-brick stacking and can be used in future beamlines to eliminate overhead skyshine problems. This method greatly simplifies and improves the immediate access to the beamline, shortening shut down periods and reducing operational costs.

Keywords: SDL, NISUS, radiological safety, shielding, easy access

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