N. Gmür

Environmental & Waste Management Services Division

81 Cornell Avenue, Bldg. 120
P. O. Box 5000
Upton, NY 11973-5000
Phone 631 344-8107
Fax 631 344-6079
bhooda@bnl.gov

BROOKHAVEN
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Memo

Date: *June 3, 2004*

To: *W. Robert Casey and Nicholas F. Gmür*

From: *Benny Hooda*

Subject: *NESHAPs Review of SDL (DUV-FEL) for the Safety Assessment Document*

As per your request, a NESHAPs compliance review of the information provided in the memo dated April 23, 2004 to update the Safety Assessment Document (SAD) of the Source Development Laboratory (SDL), and two previous memos' of the NSLS 200 MeV Accelerator Evaluation (1992) and the SDL NESHAPs review (1997) was completed.

The facility is in compliance with NESHAPs regulations even with the DUV-FEL equipment of 300 MeV energy, 20nA current, and 10Hz frequency of the operation as the potential for emissions is still extremely low from the Source Development Laboratory (now known as the Deep Ultraviolet- Free Electron Laser). This is because the electrons have a finite range in matter and are scattered by the air on which they impinge thereby producing miniscule quantities of radionuclide with short half-lives. The principal radionuclides that may have any significance from an environmental risk and compliance dose perspective are ^{13}N ($T_{1/2}$ = 10 min., β^+) and ^{15}O ($T_{1/2}$ = 2 min., β^+). The positrons saturation concentration in the enclosed space of the building will be well below the derived air concentration (as shown in the April 23 memo), and consequently the effective dose contribution to the members of public would be insignificant at the BNL site boundary.

Any potential risk due to the formation of ozone was also evaluated even though the electron beam is enclosed and does not traverse the air. The ozone production was evaluated in a small gap (4 inch) between the faradays cup and the lead shield. The National Council on Radiation Protection, Appendix I of the NCRP 51 publication was used to estimate the ozone production. The following assumptions/parameters were used to perform the calculations: 1) there is no ventilation, 2) uniform mixing, and 3) no disassociation of ozone. The parameters used: an irradiation time of 12 hours/day, the collision stopping power of electrons at STP of 3.9 keV/cm (extrapolated), and the volume of the room that contains the beam (94, 100 cubic feet). The ozone concentration would be 4.2E-5 ppm for 12 hours of irradiation, and the Threshold Limit Value (TLV) of the ozone is 0.1 ppm. Therefore the potential risk due to ozone production would also be miniscule.

If you have any questions please call me at extension 8107.

BH:car

Distribution: D. Bauer G. Goode R. Lee X. Wang

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