SKYSHINE MEASUREMENTS AT THE NSCL USING BUBBLE DOSIMETERS

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Personnel doses from penetrating radiation at accelerators originate in part from line-of-sight penetration of shielding. However, air-scattered radiation, "skyshine", from radiation penetrating a "thin" shielding roof may also contribute to the dose.

This year, we have made first measurements of skyshine doses from neutrons, produced during "typical" operations at the NSCL. These data should also prove useful for anticipating doses when coupled-cyclotron operations commence. To make these measurements, we purchased five BD-100R neutron "bubble" dosimeters, developed by Ing and Birnboim [1], from Bubble Technologies Industries [2]. Each has a sensitivity of 47 bubbles per millirem at 20 degrees Celsius, with an accuracy of ± 20% when calibrated by an ^{241}AmBe (a, n) neutron spectrum.

The dosimeters were placed at 50, 75, 100, and 115 (two of them here) meters from the expected source of the neutron sky-shine, the roof of the NSCL's Analysis Hall. This point is above the first pair of dipoles in the A1200 analysis system. Typically, high intensity beams used for radioactive beam production, stop in thick bars of aluminum inside of the first dipole.

To further characterize the source term, an Eberline NRD neutron detector was placed on the roof, above the stopped beam. The detector was used to integrate the total dose at this point. Measurements using Bonner-spheres were also made at this point. The sphere diameters were 2, 3, 5, 8, 10, and 12 inches. Additionally, data were collected using the Bonner-sphere system's bare detector, this detector covered by cadmium, and using a polyethlyene cylinder that approximates an 18-inch diameter sphere.

Data were taken for two primary beams, 140A MeV ^{4}He, and 80A MeV ^{22}Ne. These data are now being analyzed, and the results will be presented at the 15th International Cyclotron Conference, Caen, France, June, 1998 [3].

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References

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