

AbstractID: 1505 Title: An Open Ceiling Radiosurgery Vault for the Practical Source Reloading of the Leksell Gamma Knife Unit

Standard approaches to shielding a radiosurgery Gamma Knife (GK) unit, use a totally enclosed vault similar to traditional shielding of a radiotherapy linear accelerator. This results in repeated high GK reloading costs and downtime every 5 years, associated with partial vault demolition to allow the 12-ton source loader to dock and exchange the 201 Cobalt-60 sources. We have designed a partially opened vault with a removable skylight using vertical shielding buttresses. These measure 45cm thick and 260cm high to absorb secondary and tertiary scattered photons, hence only negligible radiation reaches the skylight. This design permits easy lowering of both the GK source body and the remote arm loader into the vault, and subsequent rapid docking and source exchange. Shielding calculations accounted for (1) this particular open vault geometry, (2) un-decayed source strength (6140 Curies), (3) the C-model characteristic exposures in horizontal and vertical planes, (4) a weekly workload of 15,000 cGy/week, (5) appropriate occupancy and use factors, and (6) exposure limits from NCRP report 49. Resulting exposure measurements around the vault and outside the atrium in particular, were very low in both open and closed beams, thus meeting ALARA and NRC-10CFR-20 requirements. The paper will present this "open-roof vault" approach to shielding a gamma knife radiosurgery unit, discuss its practical advantages and "regulatory eyebrows" it raised concerning potential exposures outside the vault.