

**C-AD**

Issued: July 9, 2008

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**Radiation**

**Safety** Minutes of Radiation Safety Committee of July 1, 2008

**Committee**

**Subject: RFQ test at LINAC**

**Present:** D. Beavis, J. Alessi, R. Karol, A. Etkin, D. Raparia, M. Okamura, and P. Bergh

The subcommittee reviewed an RFQ to be tested in the Linac area. The committee approved the testing starting tomorrow. The required items are simple enough and the risk sufficiently low enough that an official check-off list was not required.

The RFQ has been previously tested in Japan before being shipped to the US. Only low levels of x-rays were detected during these tests and only on a window where the self shielding of the RFQ housing was thin. At this location the dose rate was measured to be 0.1 mrem/hr on contact and when a stainless cover plate was replaced with a glass plate the dose rates escalated to 4 mrem/hr on contact. The glass cover plate will not be used during the test.

The RFQ will be tested without a source. When a source (non-electron) is introduced the committee does not expect any additional issues but may require additional surveys.

The RFQ does not appear to be a concern for x-ray dose when operating normally. M. Okamura presented a simple calculation to estimate the dose in the event of sparks (see attachment 1). At 10 Hz of sparking the expected dose without the self shielding of the RFQ wall is 0.23 mrem. These numbers are calculated at 1 meter. The RFQ should shutdown is less than a second due to the transmitter protection. The steel wall thickness is approximately 2 inches thick offering a large attenuation. R. Karol (ref 1) used Mircoshield to estimate the attenuation of 2 inches of steel as 1/5954. It appears that M. Okamura used mass attenuation factors without the buildup factor. Even with sparking there is not expected to be x-rays outside the main RFQ housing.

The RFQ was compared to other existing RFQ. No one was aware of any RFQ with a similar design requiring shielding. The RFQ wall thickness was not designed for self shielding but for mechanical stiffness. No x-rays have been detected from the present RFQ in operation at the Linac, which has an operating voltage of 70 kV and 120 kW of power.

The area of the linac building is presently posted as a controlled area. RCD will rope off an area around the RFQ as a Controlled Area-TLD required until the dose levels are properly documented. The first full survey will be conducted at 100 kW. The next full survey will be conducted at 150 kW if deemed appropriate by the RCT/RCD. The full power operation of the RFQ is 220 kW at 120 kV.

Asher Etkin has completed the initial work to register the device as an RGD (radiation Generating Device).

**Attachments (file copy only)**

- 1) M. Okamura written estimates the dose from a spark, July 1, 2008.

**References**

- 1) R. Karol e-mail to D. Beavis, July 1, 2008.

**CC:** Present  
RSC  
RSC Minutes file  
RSC EBIS File  
RSC Linac File