C-AD

Radiation Safety Committee

Issued: January 7, 2005

Minutes of Radiation Safety Committee of December 14, 2004

Subject: Removal of NRC monitors and Chipmunk Locations at the Tandem

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It has been proposed that the NRC monitors be replaced with chipmunks. These monitors are causing reliability issues. Light ion running requires that the accelerator and target room are locked and therefore is not affected by the changes considered in this review.

This issue was partially considered in the past. C. Schaefer had sent J. Alessi an e-mail (see attachment 1), which stated that the substitution of a chipmunk for an NRC unit should be appropriate. A plot showing the comparison of NRCs to chipmunks was provided for a series of ions. The chipmunks are set with a quality factor of 2.5. The chipmunks agree well with the NRCs if the chipmunk is multiplied by a factor of 3. Rather than raise the chipmunk quality factor from 2.5 to 5 it was decide to leave it at 2.5 and take this difference into account on the review of the placement. Since almost all chipmunks around the CA complex are deployed with a quality factor of 2.5 this will avoid a potential error in the future of a replacement device having the "wrong" quality factor. The chipmunks have a switch for setting the quality factor at 1, 2.5 and 5.

The committee approved the replacement of NRC units with chipmunks.

(CK-tandem-all-fy2005-421) A procedure to limit access with the energy above 5 MeV/amu will be used to require the appropriate zone be reset. Redundant devices are not needed. If the 5 MeV/amu limit needs to be relaxed, the need for redundant chipmunks and locations will be examined.

(CK-tandem-all-fy2005-422) The chipmunks must interlock at 2.5 mrem/hr and also have the keep alive circuit in the interlocks as a failsafe feature.

The locations for the chipmunks was discussed. If a zone is reset the chipmunks in the zone will not stop the beam. Since personnel can stand outside the zone a chipmunk in the adjacent area must be place to limit dose to an area that is allowed to be occupied.

There will be a chipmunk near MP6 but outside the MP6 high energy zone. **(Ck-FY2005-all-tandem-423).**

There will be a chipmunk near MP7 but outside the MP7 high energy zone. **(Ck-fy2005-all-tandem-424) .**

The high-energy beam stops will have all the beam interact when they are closed. There will be a chipmunk near each of the high-energy bean stops. **(ck-fy2005-all-tandem-425)**

For ions of carbon and above there are always multiple charge states emerging from the tandem. At the first focal point a minimum of 20% of the beam will be lost due to the difference if focal length for the various charge states. For the heavier ions this will will be much higher than 20% due to number are charge states. Typically it is expected that one third of the beam will be lost at the first focal point. A chipmunk will be placed near the first focal point of each tandem. **(Ck-fy2005-all-tandem-426)**

These chipmunks may be sufficient to prevent radiation levels in the subsequent transport. For example the chipmunk at the focal point will interlock at 2.5 mrem/hr, with a typical loss of 1/3 of the beam. This means that losses downstream can typically be 2 times higher or 5 mrem/hr. Taking into account the response of a factor of 3 for the chipmunk, the actual dose is expected to be less than 15 mrem/hr at the highest loss point downstream.

The slits which are used to regulate the tandems are a know loss point. Since a chipmunk exists at the MP6 slit it was decided to leave it there. It was decide that a chipmunk at the MP7 slits was not necessary.

The two targets rooms were also considered. There will be a chipmunk near the beam stop of each target room. In addition, there will be a chipmunk near the headwall of each target room. **(Ck-fy2005-tandem-all-427)**

The design of the structure inside the tandem tanks prevents electrons from being accelerated over large potential differences. In addition, the thickness of the tank wall prevents any need for radiation monitors to protect personnel from x-rays from the tanks.

Attachments (file copy only)

1) E-mail of C. Schaefer to J. Alessi, March 29, 2001.
2) Plot comparing NRC readings to chipmunks provided by J. Alessi.

CC: Present
RSC
C. Schaefer
RSC Minutes file
Tandem file