C-AD

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Radiation

Safety Minutes of RSC Subcommittee of June 10, 2015

Committee

Subject: Upgrade of Booster Access Control System

Present: D. Beavis, J. Sandberg, R. Karol, C. Schaefer, C. Theisen, G. Wagner, H. Hartmann, D. Hillis, C. Naylor, and A. Etkin

The committee continued the discussion from the May 6, 2015 meeting for the options in the upgrade to the Booster access control system.

Device Shut-off for Electrical Issues

The device to signal for shutdown if a gate is opened are:

- Main magnet
- Horizontal quads
- Vertical quads
- Sextuples

Open/Closed Command

The committee did not identify any increased risk with changing to a three position switch "opening/closing" the injection beam stops.

B6 Shutter

The B6 shutter logic was discussed. The B6 shutter prevents the risk of exposure to a single pulse in NSRL or the AGS if the Booster is operating with an extended[1] cycle time. The B6 shutter prevents a single pulse of beam from being extracted to NSRL if the Booster beam stops lose permission to be open. The logic for the shutter is part of the NSRL Access Control System. If an AGS gate is crashed and the AGS critical device is set for the Booster beam stops then the B6 shutter will close. If the selector switch is F6 and DH2,3 then F6 and DH2,3 power supplies will be disabled. The maximum exposure would be from one pulse crashing in the Booster ring, which would be about 1 mrem[2]. The operation of the B6 shutter and at least Zone 3 of NSRL is functionally checked for Booster operation.

Linac Zone 3&4

[1] An extended cycle time is possible with unusual RF modes of operation. Such a cycle time would allow personnel to enter a gate and get close to the accelerator.

[2] This is based on Booster Fault studies 9 and 11.

At present zones 3 and 4 of the Linac are required to be secured to operate the Booster with EBIS or TtB beam. Linac zones 3 and 4 must be secured to open the TtB beam stops due to potential radiation levels from TtB beam Faults. The highest potential dose rates are less than 50 rem/hr at a foot and are caused by deuteron beam. The TtB tunnel has a single layer of interlocks and the system to limit the beam energy and intensity was designed to prevent less than 50 mrem/hr at a foot. Zones 3 and 4 are also required to be secured to prevent exposure due to beam faults in the TtB stub tunnel near the booster. **The committee recommended to allow the zones not be reset for the Booster to operate if possible.**
An estimated of the potential dose rates in the spur tunnel and potentially inside the beam tube should be made. **(CK-Booster-June 30, 2015- Beavis&Karol-944)**

The dose rates are expected to be small for radiation coming through shielding into the spur. A gate at the transition of the spur to the Linac tunnel could be used to prevent access. The dose through the beam pipe could still be large. The placement of a chipmunk near such as gate and the TtB beam line could protect personnel from TtB faults and Booster beam faults. This would allow TtB to operate without LINAC zones 3 and 4 being swept/secured for beam operations. This option should be considered in the potential design.

Key Tree

There was an extended discussion on the key-tree plans for the Booster. The current plan is to install a new key tree at the Booster that would either require a BNL ID to unlock the cover over the keys or a simple push button. Members were concerned about key security and wanted to keep as much control on the keys as possible. There was also concern that if a key was not returned how operations would track down the missing key. The persons Lab ID would be scanned and recorded onto the gate log automatically. There are no plans in the proposed design for a key switch to bypass the key-tree should a key become missing. The gate would have standard remote controlled access with the operators monitoring the personnel entering the gate.

The plan is to have this key-tree system become the standard and the other areas eventually become retrofitted with it. This system is different from the Linac key-tree and also different from the key-trees at the AGS. There was concern expressed of having so many different key-tree types about the facility. It was decided that there should be a separate meeting of the ACG personnel and operations to discuss the operational experience and options. It is desired that all parties are comfortable with the new design chosen for the key-tree system. The group will develop minutes and report back to the committee.
Review design of new key-tree system. (CK-Booster-Reich&Naylor-July 1, 2015-942)

Safety Tags

The PLCs will produce and consume safety tags for inter-machine sweeps and the status of critical devices. These safety tags follow an industry standard and do not limit the ACS to a particular vendor or system.

Prevent High Intensity Beam Pulses to Thompson Road

The interlock system for proton operations checks that the beam is not high intensity. Historically this is called the B15 transformer cross interlock. If either of the two B15 transformers register a large pulse with the 8 and 20 degree bends on then the interlock:

- Closes high/low valve at the Linac
- Disables LTB 1 and 2 Beam Stops
- Disables the 8 and 20 degree bends power supplies in the U line

The g-2 program in the V beam line was operating at the time of the design of the interlock. The V line operated at high intensity and was a branch off the U line. The 8 degree and 20 degree magnet power supplies were chose so that the g-2 program could operate. The V line is obsolete and the Department has noted that there would be no high intensity operations to the U line concurrent with RHIC operations.

The present and proposed interlock are described in a memo[3] written by J. Reich. The ACG has requested the removal of the high/low valve at the Linac source. This valve determines whether the high intensity source or the polarized proton source is being used for the protons. It has already been recommended[4] in the past that the dual transformers could make the valve unnecessary. The committee should reaffirm this decision at the next meeting.
(Ck-U-Reich&Beavis-June 30, 2015-943) Decide on high/low valve at next RSC meeting and complete the interlock specification.

CC:

Present
RSC
RSC Minutes File
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[3] J. Reich, April 7, 2015, Proposed Modification of the B15 Transformer Interlocks (cross-interlock);
[4] See RSC Minutes of Feb. 8, 2005; http://www.c-ad.bnl.gov/esfd/RSC/Minutes/02-08-05%20Minutes.pdf