Meeting Minutes: UITF PSS BCM

May 10, 2018

In attendance: Jerry Kowal, Roger Araiza, Keith Cole, Omar Garza, Jim Kortze, Chad Seaton, Andrew Kimber, Scott Higgins, Pam Kjeldsen, Matt Poelker

Kick off meeting, design and build the UITF PSS BCM

Action Items:

1. Poelker to create a specifications document
2. Gather all relevant materials, especially those documents created by Trent Allison, post them to wiki (Poelker and Garza)

We discussed the UITF PSS philosophy of devices and technologies, to detect unsafe condition and to turn OFF beam. Will we adopt the “3 devices and 2 technologies” methodology for PSS at the UITF? Answer is No, see below.

We discussed the two modes of operation I envisage at the UITF: a) one BCM for low current operation, where beam trips OFF when current exceeds ~ 100nA, and b) two BCMs configured to function like a Beam Loss Accounting (BLA) system, where higher current beam (e.g., 100uA) trips OFF when the two BCM values differ by ~ 100nA.

How to switch between these two modes of operation? Configurable beam destination menu? How to guarantee the correct configuration is chosen? The default is low current 100nA, and we imagine hardware interlocks to prevent high current beam from going to the wrong destination.

Specifications to include: current resolution, current measurement accuracy, integration time, two modes of operation and how to guarantee the correct configuration, acceptable operation in Tune Mode

We will need a calibration procedure, and calibrated/certified ammeters. We imagine there will always be a faraday cup (insertable or fixed dump) placed near the PSS BCM. The two monitors should read nominally the same value, and there should be great confidence that there is no beam loss between the devices.

For the BCM near the QCM, we imagine it should be relatively simple to compare the current upstream of the QCM using insertable faraday cup, and the current just downstream of the differential pump station on MeV side of QCM. Apertures in the keV region (master slit, A3 and A4) can be temporarily removed for PSS BCM calibration. Beam loss monitors can be located near the differential pump cans.

We must familiarize ourselves with the Conduct of Engineering guidelines for design of credited controls.

Following the meeting, I learned:

Bob May says we do not need “3 devices and 2 technologies” for PSS at the UITF. Where “devices” describe things that detect an unsafe condition, and “technologies” describe the ways to turn OFF beam to eliminate the safe condition. At CEBAF, we must adhere to “3 devices and 2 technologies” because one accelerator provides beam to 4 destinations which can be occupied by people while the accelerator is ON. At UITF, because there is only one space, we can abide by “2 devices and 1 technology”, where the 2 devices = 2 BCM detector antennas/circuits and the 1 technology = the laser shutter. But this must be verified via the SCMB.

Vashek says we BCM should reliably detect when average current exceeds 200nA within 2 minutes of creating this condition.