

Report on Beam Dump Monitoring

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This report has been produced in response to concerns expressed over the current state of the Beams Division's beam dump monitoring program. In generating the report considered the following questions relevant to the problem.

- 1) Have all active beam dumps been identified and does a documented analysis exist which establishes the annual intensity limit?
- 2) Are the devices used to measure the intensity delivered to each dump properly maintained and calibrated?
- 3) Are all these devices being read out and the data recorded through a properly maintained data acquisition system?
- 4) Have roles and responsibilities in the reporting process been properly defined?

In the following sections we address each of these questions, highlighting deficiencies and recommending corrective measures where necessary.

1. Documentation of Annual Limits

Status

A list of the currently active Beam Dumps and their associated annual limits was obtained from the ES&H department's Radiation Safety group. This list is reproduced below.

Dump	Operating Limit (protons/year)
NTF dump	No limit
Linac Dump #1	6.40E20 @ 400MeV
Linac Dump #2	6.40E20 @ 400MeV
Booster 8 GeV Dump	6.90E19 @ 8GeV
Radiation Damage Facility	3.80E18 @ 8GeV
AP0 Target Station	2.15E22 @ 120GeV
MI40 Abort	1.00E19 @ 150GeV
A0 Tevatron Abort	1.50E16 @ 1TeV
C0 Absorber	3.58E18 @ 1TeV
Switchyard Dump	7.00E16 @ 1TeV
KTeV	2.00E18 @ 1TeV
MCenter	5.85E16 @ 1TeV
MTest	4.68E16 @ 1TeV

We note that there was some difficulty encountered in putting a complete list together even though all the appropriate documentation did exist.

Recommendations

BD ES&H department should establish procedures to ensure that the current list of dumps and annual limits is always readily available and is kept up to date with the lab's changing physics program.

2. Hardware Maintenance and Calibration

Status

Appropriate toroids and SEM's were identified for each dump or beam line in question. However, a uniform program for maintenance and calibration of these devices does not currently exist. Some devices are the responsibility of the RF & Instrumentation department whereas others fall under the care of the departments in whose beam line the device resides. The toroid and associated electronics for the C0 absorber are inappropriately being maintained by the Operations Department.

Recommendations

Since these devices are an important part of the division's radiation safety system, it is recommended that their maintenance become the responsibility of a single department (most appropriately the RF & Instrumentation department). Procedures should be established by that department (in consultation with the ES&H department) for regular calibration and testing of the monitoring hardware.

3. Data Acquisition

Status

Till now, most of the data required for monitoring the number of protons delivered to each area, has been accumulated by the Operations Department through a specialized module called ODDMOD. The use of this system poses maintenance issues which were at the heart of the concerns which initiated this report. The rest of the data is being acquired and processed using procedure dating from the days of the old Research Division.

An alternative DA system, the BBM (Beam Budget Monitor), exists and is actively supported by the Accelerator Controls department. Moreover, all the relevant devices except the fixed target beam line SEM's are already being logged through the BBM system. The fixed target devices will need to be migrated into ACNET from the existing EPICURE control system.

The devices that are already present in the BBM system are not all being monitored in an unambiguous and consistent manner. The variations are due to complications arising from issues such as varying event types (e.g. T:ABTINT is summed into two BBM devices TEVABRT 47 and TEVABRT4b), problems with background subtractions, and cases where multiple toroids contribute to the same dump (e.g. beam from the Main Injector measured on I:TOR003 and the Recycler measured on R:TOR003 both contribute to the MI40 abort's annual rate).

Recommendations

The Accelerator Controls department should work with the ES&H department to establish an agreed upon list of devices (composite where necessary) which are to be used for monitoring the radiation dose delivered to each dump or target station. Ideally there would be one device per area which incorporates all necessary energy weights and background corrections and which is obtained by an appropriate sum (or difference) of the relevant toroids.

4. Reporting Roles and Responsibilities

Status

Currently the official annual report on beam limits is sent on request to the ES&H section, by the Operations Department. The Operations Department uses their ODDMOD system to obtain the data and have no formal procedures for correcting the data for acquisition deficiencies such as missing or noisy pulses. Meanwhile, the BD ES&H department's Radiation Safety group independently monitors the dumps using a different acquisition system (a mixture of the BBM and Epicure systems) and presumably make different corrections. The potential problems with this situation are self evident.

Recommendations

The Radiation Safety group should have the responsibilities for maintaining the list of areas to be monitored, collecting the data, applying any necessary data quality corrections, and producing the report to sent to the ES&H section.