

New BLM System Basics

General features:

- 1) Continuous Integration (No Missed Losses) using a dual integrator in a “Ping-Pong” scheme.
- 2) Fast Sampling ~ 20 uSec
- 3) Up to 12 channels/Crate
- 4) Multiple abort types and Fast abort response.

Data Structures:

- 5) Classical “Flash”, “Display”, and “Profile” buffers 1k deep, as in current system, 1 mSec integration time.
- 6) Multiple Circular Diagnostic Buffers:
 - a) Raw Measurement Buffer 32k “turns” deep, 20uSec integration time. Readable only during off times, ie. Abort has happened.
 - b) 1 mSec “Snapshot” buffer 8k deep, 1 mSec integration time. Always available.
 - c) Long Time buffer 8k deep, 10 to 100 mSec integration time. Always available.
- 7) All data structures time stamped with 1 uSec time resolution. “Real Time Clock”. Time with 1 sec

resolution from host. Microseconds timer zeroed by clock reset event.

Beam Abort Capabilities:

8) Multiple Abort Modes

- a) Instantaneous Loss measurement (20 uSec)
- b) Integrated loss in 1 mSec (Sliding Sum)
- c) Integrated Loss in N mSec (Sliding Sum)($N < 500$)
- d) Integrated Loss in M mSec(Sliding Sum)($M < 500$)
- e) Time over Threshold (in seconds from 1 to 10^6)

9) Each Abort Type Has an associated “Multiplicity” or required number of reporting channels to cause an abort. Data from masked off channels is still recorded.

10) Abort Timing less than 1 Tevatron Orbit (20 uSec)

11) Each channel has a mask bit for each abort type, this bit determines if the channel is allowed to participate in an abort.

12) There are 64 different “States” set by clock events, each state has its own abort thresholds,

masks, and Multiplicities. Switching times between states less than 1mSec.

- 13) Five Abort Output lines. (“OR”, Immediate, Slow, Fast, “TOT”)

Communications:

- 14) TeV Clock decoder included
- 15) EDB at startup to mimic Old BLM
- 16) Enhanced EDB when new BPM system is ready to increase functionality.
- 17) 10/100 BaseT Ethernet Possible for independent BLM operation.
- 18) Dedicated MADC output for each channel
- 19) Selectable single MADC/Diagnostic Out

Mechanics:

- 20) 3U, 19” rack mountable chassis. PCB 3Ux220, Based on IEEE Standard 1101.1.

- 21) Two Channels/Card, up to 12 channels/Crate
- 22) Settable and readable HV as well as return HV readback.

Performance:

- 23) Raw Data LSB = 170 nRad in at 20 uSec interval.
- 24) Full Scale = 2.79 mRad in 20 uSec Interval
- 25) 1 mSec LSB = 170 nRad
- 26) 1 mSec Full Scale = 139 mRad (139 Rad/Sec)
- 27) Noise RMS with 600 ft cable = 640 nRad in 20 uSec
- 28) Error in LSB of 1 mSec sum = 4.5 uRad

By digitizing often with fine resolution and then summing, we are able to make detailed low loss measurements and still respond to large losses.