

“*dI/dt* or *Single Bunch*” Trigger debugging.

Evgeny Medvedko

Introduction

A new addition to the BOAT BPM is a Single Bunch Interlock (SB). SB detects overcharged bunches, generates a trigger and sends it to the BAT system which aborts the beam. It is important to have such an interlock, because at excessive charge, the bunch can induce damaging peak power to the beam monitoring equipment, and the feedback amplifiers. Then a lot of effort, time and money will be spend to fix it.

An ultra-fast comparator is used in the SB design as a threshold detector. The comparator has two differential inputs. A beam signal goes to one of those inputs, and a threshold signal goes to the other. The comparator generates an output pulse when the beam signal exceeds the threshold level (Fig. 1).

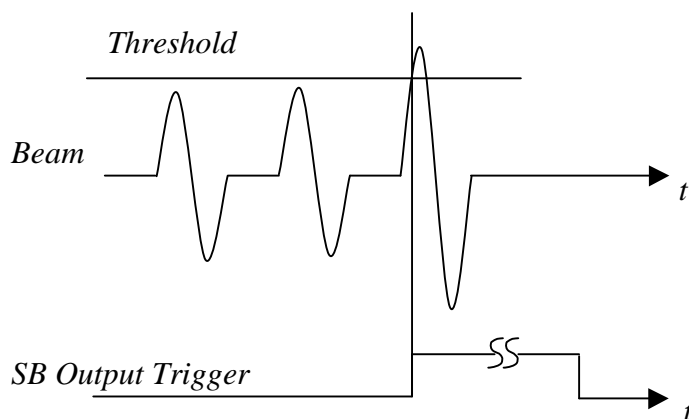


Figure 1. SB time diagram.

The HER and LER SB thresholds are adjusted to approximately 3 mA/bunch. Because the *Single Bunch* interlock was not anticipated, it shares a BAT channel with the *dI/dt* interlock.

Debugging.

How to identify which interlock tripped: the *dI/dt* and *Single Bunch* triggers are OR-ed together. By looking at the BATS status, there is no way to recognize which trigger trips the beam. See it on the BOAT BPM panel (Fig. 2). The path to the BOAT BPM panel is:

- <High Energy Ring Panel> (or <Low Energy Ring Panel>)
- <Beam Abort System Panel>
- <Big Orbit BPM Panel>

On the panel, in the “Trigger Status” section, there are two indicators “*Board 6 di/dt*” and “*Single Bunch Status*”. When the BOAT BPM detects an out-of-range beam, it generates

a trigger, and a corresponding indicator changes status from OK to TRIP. A first trigger latches, so only one indicator shows TRIP (“Board 6 I” status is the exception).

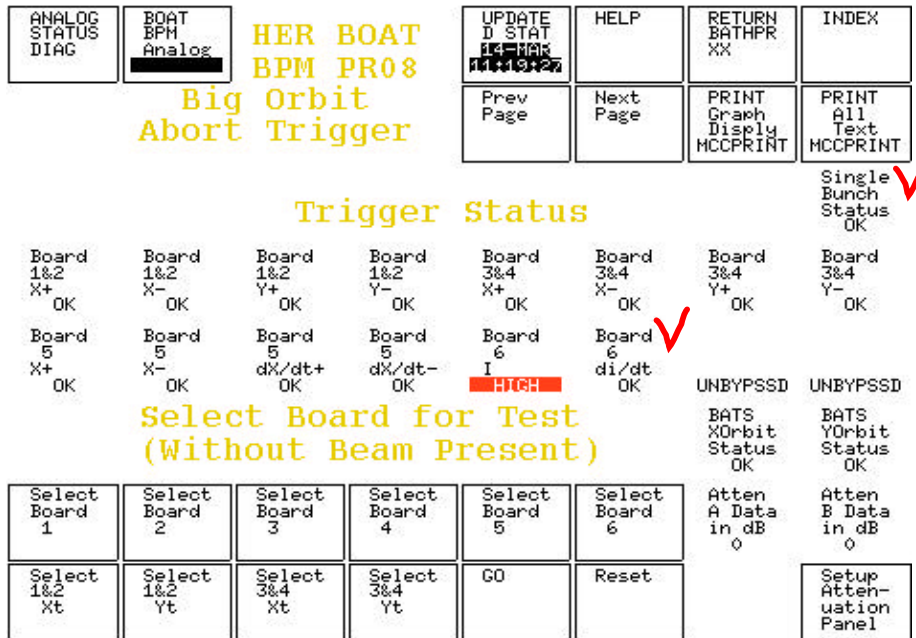


Figure 2. HER BOAT BPM Panel, “Board 6 di/dt” and “Single Bunch Status” are marked ✓.

Action Items.

As soon as the beam trips, check the BOAT BPM trigger status and record it. The indicator holds the TRIP status for only about 1.5 minutes after the trip event then resets to OK.

Record the trip conditions: beam current, number of bunches, current per bunch, beam status (injection or stable), injection rate.

Do not bypass BOAT output triggers (BATS inputs) for long periods. If it is necessary to bypass it, set it for an hour. After bypass, check the trigger status again at the same conditions as the previous trip. If the trip does not repeat, unbypass the trigger. Remember, this interlock is there to protect the machine.

Call, or page me: Evgeny Medvedko, phone 2685, pager 650 849 – 9698, or Steve Smith, phone 3916, pager 650 424 – 7065.

Hint.

The di/dt trigger should TRIP during a beam dump. To identify the event, go to “Error Panel” and check the ERRLOG Page.