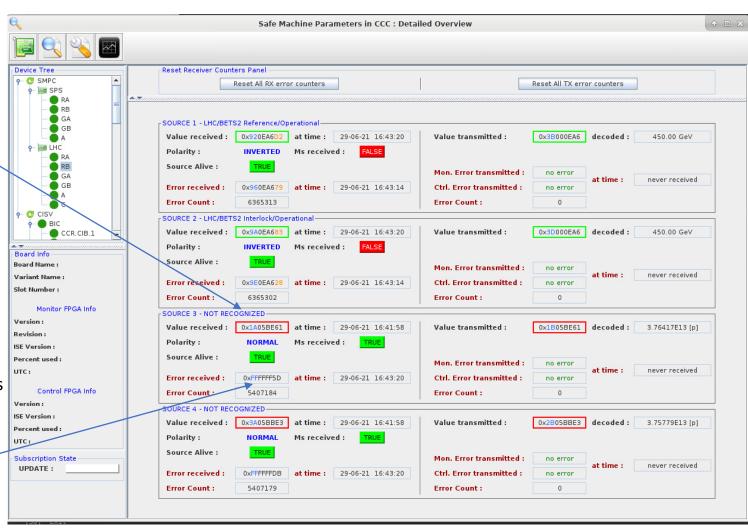# LHC BCT B for SBF issue

- Problem
  - MTT Header was corrupted, to the point that even the source *identifier* was unrecognizable

- Cause
  - During LS2, the (16 bit) BCTDCLHC2 FESA Class was heavily re-engineered
  - BCT background reading drifts over time (change in temperature, humidity etc)
    - Calibration *offsets* are used to remove this background
      - current = equipment_value – calib_offset
    - Calibration code was *missing* in new FESA class allowing negative readings
      - When equipment_value < calib_offset
  - Negative reading corrupts the top 8 bits used to identify data

```
signed int current = …
frame = 0x00ffffff & current;
frame |= getFrameHeader();
```

LHC BCT B for SBF issue

- Mitigation
  - Clamp the current to >=0 in FESA class
    ```
    if (current < 0)
            current = 0;
    ```
    - In fact the 24 bit BCT already has this logic in the code
      ```
      if (iBeamInt1 < 0) iBeamInt1 = 0;
      if (iBeamInt2 < 0) iBeamInt2 = 0;
      ```
  - Re-implemented the calibration code in FESA and made a new sequencer task
    - Triggered before each fill

- Side-effects of mitigation
  - The system effectively hides negative values from the BCT
    - If negative, clamp to zero
    - This is the same behaviour as run2
  - Negative values should never be seen anyway if the sequencer executes before each fill
    - Sequencer issues a *calibration* request which effectively removes the background level when no beam in the machine