

# DIRECT DUMP BLM TEST DURING 2018 COMMISSIONING

---

W. Bartmann, C. Bracco, E. Effinger, N. Magnin, C. Zamantzas

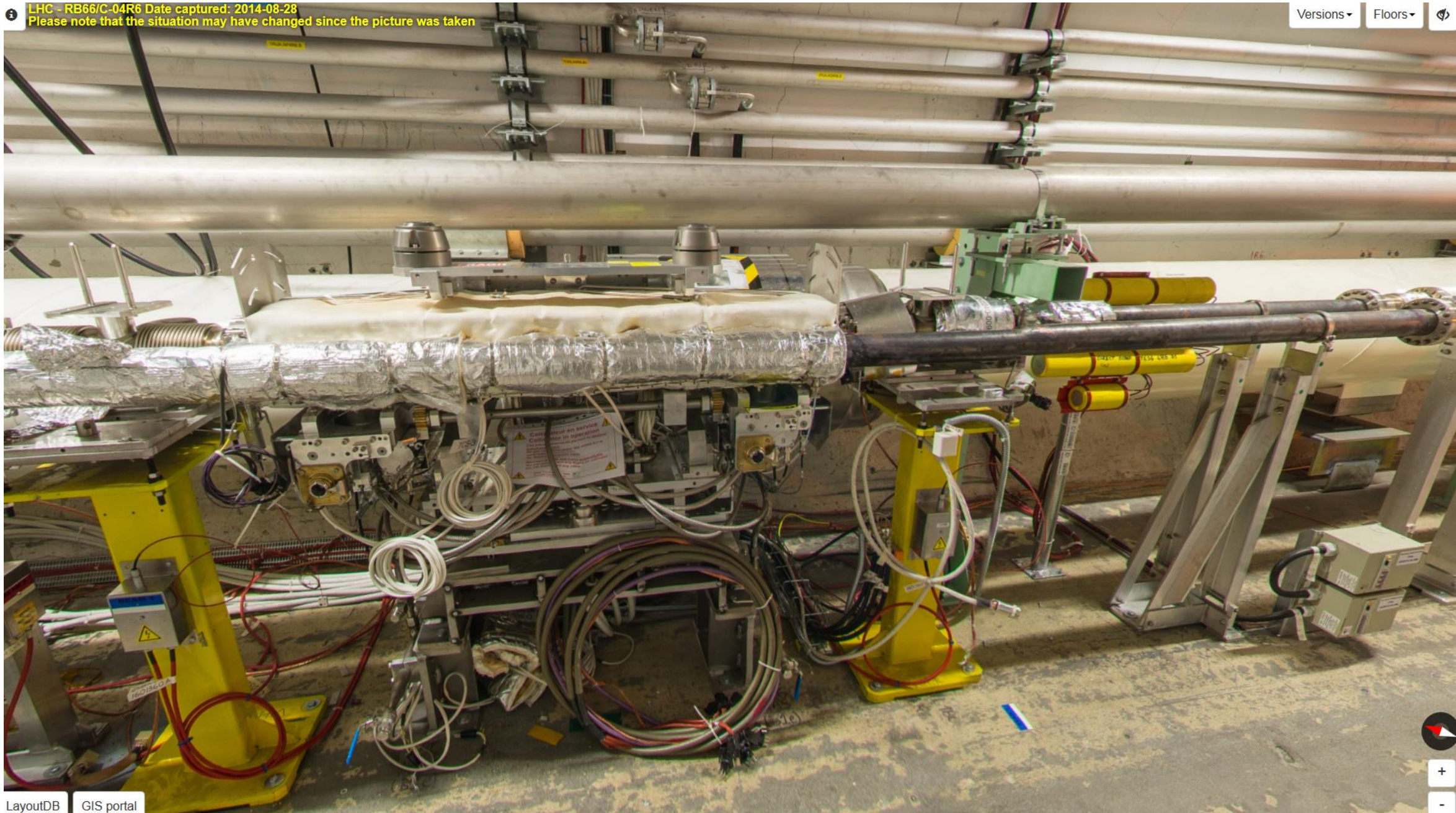
MPP 18<sup>th</sup> May 2018

# Direct Dump BLMs

- [EDMS 715795](#)
- In the [2005 review](#) of the LHC Machine Protection system [1], the subject of worst case failures was raised, with concerns over potential failures of the LBDS and BIS. To provide an extra degree of safety, **in the event of a failure of the BIS to forward a trigger signal to the LBDS** (either through a total failure of e.g. the BLM system or the BIS itself), one simple and robust extra measure is to locate **dedicated BLMs at the TCDQ/Q4 in IR6**, where the horizontal beam size is relatively large due to the high  $\beta$  value. These BLMs can be **hardwired directly to the dump trigger TSU without passing through the BIS**. Obviously these direct interlock BLMs need much higher thresholds than the other BLMs in the ring, and should also be based on a different technology. This system is intended to alleviate the effects of such a catastrophic failure, probably restricting damage to the LHC collimation system.
- 4 BLMPIs installed on TCDQ and TCSP 4L|R6
- Thresholds can only be set in tunnel
- Threshold level similar to standard IC thresholds

LHC - RB66/C-04R6 Date captured: 2014-08-28  
Please note that the situation may have changed since the picture was taken

Versions Floors





# Test on 26<sup>th</sup> April 2018

## \*\*\*[Summary of Direct Dump BLM Test](#)\*\*\*

- The original aim of the test was to see the BLMDD not only triggering but also as first client in the TSU
- This requires a complicated setup of beam intensity, dump protection collimator settings and monitor factors changes; since the orbit changes after a new commissioning and injection oscillations and intensity vary from shot-to-shot, all the parameters have to be tried out every year again which can be very time consuming
  - Now decided (with two rMPP members) that seeing the trigger from the BLMDD from both BLMs is OK

### New procedure:

- Close the TCDQ
- dump a fat pilot ( $\sim 2e10$ ) on the TCDQ and trigger both BLMs, verify on TSDS IPOC that BLMDD dump requests were activated
- **dump a normal pilot, should not trigger --> gives a calibration of BLMDD**
- **separate testing of the two BLMDDs per beam (on TCDQ and TCSP) to be discussed**
- Powercycling of the BLMDD crate to turn off the current loop which activates the TSU client --> standard MPS test of TSU clients, was done during check-out

# Suggested test procedure

- **In case of HW intervention: test IC with battery**
  - Standard procedure from BLM team
- **After shutdown powercycle BLMDD crate to check link between BLMPI and TSU:**
  - Standard procedure from LBDS team
  - [http://elogbook.cern.ch/eLogbook/event\\_viewer.jsp?eventId=2138662](http://elogbook.cern.ch/eLogbook/event_viewer.jsp?eventId=2138662)
    - Test of **TSU-B B1 clients**:  
Power OFF the BLMDD crate to activate **TSU** client.  
`/mcr/reset/rem_reset -p cfv-ua67-blmdd`  
**TSU-A** triggered on BLMDD, but **TSU-B** on BETS.  
On IPOC we see that the client is activated, but 100 us after **TSU-A**, so after the BETS.  
Tried a second time, same result.  
We have ~100 us more delay on **TSU-A** than on **TSU-B**.  
- BLMDD: OK
- **After shutdown test BLMDD trigger in TSU with beam**
  - Standard procedure from BLM/LBDS teams

# Suggested test procedure - test with beam

- Conditions
  - I&D
  - Fat pilot  $\sim 2e10$  – requires changing intensity limit and short setup in the injectors (a few more turns in the PSB, beam quality not relevant)
  - No modifications to monitor factors
- Test
  - Close TCSP
    - Increase pilot intensity until trigger of BLMPI...TCSP – limit of 20.000 bits
    - Check TSU input signal
  - Close TCDQ
    - Trigger BLMPI...TCDQ and BLM...TCSP
    - Check TSU input signal – can't distinguish the two BLMPI inputs → redundancy cannot be checked on TSU side but on the IC reading
- Validation:
  - If chamber reading above 20.000 bits and TSU input → OK
    - Standard BLMs will trigger as well and faster
    - Difference to previous procedure: we see the input on the LBDS side but it is not necessarily the first input