

49th BLM Threshold WG Meeting (UFO Special #6)

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892-1-D20 (CERN)

1 Brief summary of UFO-induced BCM dumps in 2015 and 2016

Anton LECHNER

Compared to the year 2015, the number of UFO-induced beam dumps by the experiments has increased, both as a fraction of all dumps and in absolute numbers (1 of 22 in 2015 as opposed to 5 of 21 in 2016).

Anton showed the detailed information from the machine side concerning each of the cases: one for ALICE, two for ATLAS, one for CMS, and two for LHCb. From the analysis it follows that BLM signals on the triplet quadrupoles were not high, which suggests that those events were not endangering the machine.

It is therefore important to find out whether those beam dumps were necessary from the point of view of experiments' protection and, if not, the beam dump threshold re-adjustment may be suggested to the experiments.

Discussion outcome: As the showers initiated by the UFO close to an interaction point are partially stopped by the material of the detector, the conclusion about insignificant UFO effect cannot be made based on the low signals from BLMs near the interaction point. To properly address this issue, the simulations of UFO initialised showers propagation through the detector are needed.

2 Report on UFO-induced dumps by ATLAS

Nicola VENTURI

Nicola explained the structure of detector protection systems of ATLAS composed of Beam Condition Monitor (BCM) and Beam Loss Monitor (BLM), which are complementary to each other. Then he explained the thresholds and beam abort conditions for those two systems, which are very different, to allow for operation in single-bunch/multi-bunch modes, but are deduced from the damage threshold of the most sensitive subsystem Silicon Central Tracker (SCT). He also pointed out that the BLM threshold has already been raised in 2011 by means of tuning of the readout card. BCM system is also already functioning

in the regime with no margin. To support this point Nicola demonstrated the results of the beam abort analysis from the ATLAS detector side for the event in 2015 and in 2016.

Discussion on the plot on slide 14 (Right, Top): The time span of the signal does not look typical for the UFO. However, the experts say that such a lengthy duration of a signal is possible in the regions near the beam crossing, as multiple interactions of a UFO with both beams are possible.

To summarize, on both occasions of the UFO-induced beam dumps by ATLAS, both safety systems were functioning properly and met their abort conditions, one at the SCT damage level; at the same time the propagation of beam losses inside of the ATLAS detector through the material of the detector to the nearest LHC BLM cannot be predicted without proper simulation.

3 Report on UFO-induced dumps by LHCb

Federico ALESSIO

Federico described the detector protection system of LHCb, the BCM, the currently used thresholds and the beam dump algorithm. He then showed the analysis of the two events of beam dump by the LHCb detector protection system.

The concurrent analysis of the LHCb subsystems (Silicon detector and inner GEM muon detectors) behaviour shows that the beam losses in these events were far from endangering those detectors. Therefore from the point of view of detector protection there is no problem with re-adjusting of the thresholds of BCM. However, those thresholds are encoded in the firmware of BCM readout board, and the original developers are not around anymore, while the documentation is not detailed enough. Two main options then include operation with current settings (expecting to dump the beam again without any danger for detectors) or investing time into recompiling the firmware with the new set of thresholds, which needs to be determined. Then, at the same time, other features could be added, such as the option of masking the dump during special injection tests, for which the special beam mode would be needed.

4 Update on MB dust particle analysis

Laura Katharina GLOB

As dust particles are the most probable candidate for the UFO, studies of the dust inside the vacuum

chamber are important to shed light on the UFO phenomenon. Laura started by describing the procedure of a lattice dipole removal during the shutdown. Then she described various studies to be performed. That includes:

Studies of the samples of a beam screen (from the edge and from the center) for surface structure analysis (to be performed by the external company).

Studies of the plug-in modules.

Samples of "wipe tests" of the beam screens of neighboring magnets (samples are collected from all four sides of the beam screen, as well as the entire circumference).

Studies of the dust, collected from a long segment of the beam screen. Two possible options for dust extraction are: by solving in liquid and by blowing out. Both of those methods however would require prior verification of a dust collection technique.

Minutes by Tatiana