



MD#3207: Proof of principle for UFO dynamics study during physics operations

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Motivation

UFOs (type 1) might become a limitation when operating the LHC with 7 TeV (lower quench margins) and with LIU bunch brightness:

- Confirm plane of movement of UFOs type 1
- Compare energy deposition and number of nuclear interactions with simulations -> identify type of matter / size of particles interacting with beam
- Understand reproducibility of particle movement / dynamics
- Validate and improve models for UFOs type 1
- Method of blown-up bunches already used successfully in MD#2036 and MD#2889

Goals of MD:

- Verify that LHC can run with some non-colliding blown-up bunches
- Trigger dBLM IR7 readout with UFOs to record sufficient statistics during normal beam operation
- Establish an operational procedure for exciting the bunches during start of fills with minimal impact on operations (*parameters of the excitation*)

Procedure

First Part

- Inject **b1 & b2** for normal physics fill
- In the **12b train**, blow up **1b** horizontally and **1b** vertically (**b1 & b2, x2 emittance**), separated by min 1 untouched bunch
- Ramp to top energy and go into SB
- Acquire **IR7 dBLM** data triggered on UFOs
- Verify absence of impact on physics (no bunch instabilities, ADT operating normally, tune measurement normal...)

Second Part

- Establish operational procedure with minimal impact on the time required for setting up each fill.
- If no negative impact on other users, increase excitation windows to maximum of **4b** horizontal and **4b** vertical
- Verify for the operational procedure, that the parameters used for the excitation result in expected emittance in a second pre-fill MD

Summary

Number of MDs	2
Time required per MD [h]	1
Beams required	1&2
Beam energy [GeV]	450 -> 6500
Optics	Injection -> SB
Bunch intensity [#p]	1.25e11
Number of bunches	2556
Transv. emittance [mrad]	2.5e-6
Bunch length [ns @ 4s]	1
Optics change	No
Orbit change	No
Collimation change	No
RF system change	No
Feedback changes	No
What else will be changed?	Some witness bunches will be blown-up (2x emittance)
Are parallel studies possible?	No
Other info/requests	Pre-fill MD

Following successful verification of absence of impact on physics, it is proposed to operate with a few blown-up non-colliding bunches during normal physics production

Triggering of dBLM is currently being implemented, will be tested this week

Current UFO rate, ~a few per day