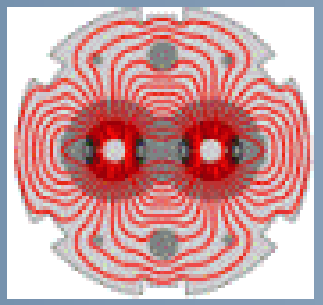
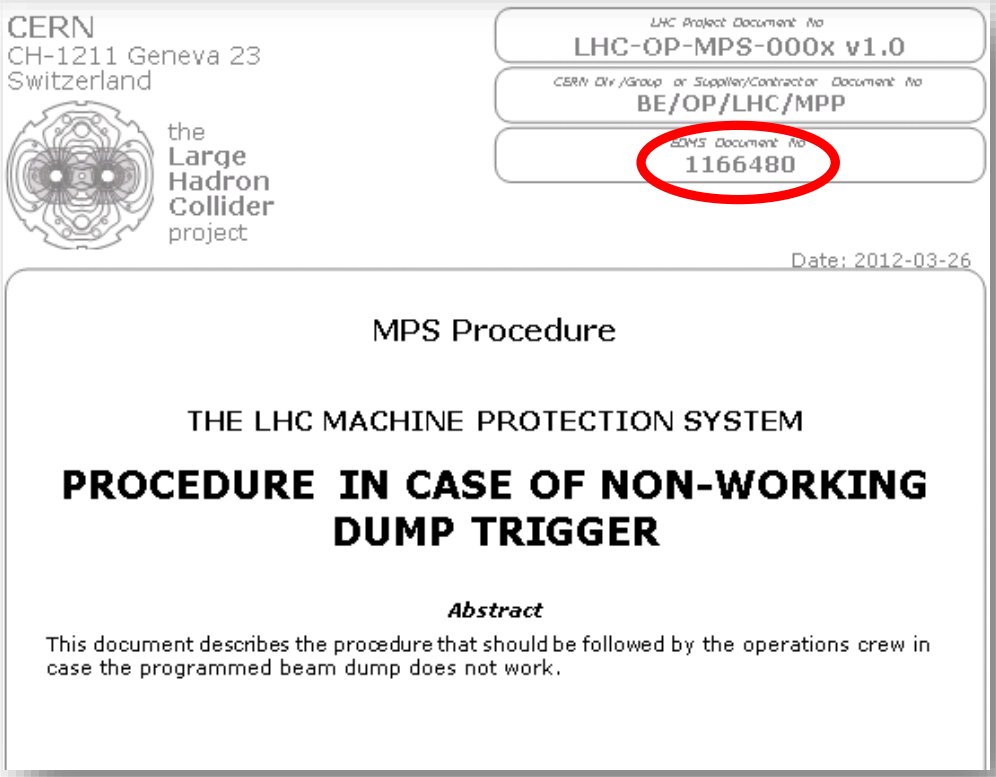
Emergency dump - update



Goal

This document describes the procedure that should be followed by the operations crew in case the programmed beam dump does not work.



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the Large Hadron Collider project

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EDMS Document No
1166480

Date: 2012-03-26

MPS Procedure

THE LHC MACHINE PROTECTION SYSTEM

PROCEDURE IN CASE OF NON-WORKING DUMP TRIGGER

Abstract

This document describes the procedure that should be followed by the operations crew in case the programmed beam dump does not work.

GENERAL STRATEGY

- Force open the BIS loop
- Generate an internal fault in the LBDS
- Scrape the beam away

Information flow

- LHC Machine coordinator
- OP LHC section leader
- OP group leader
- LHC MPP chairman

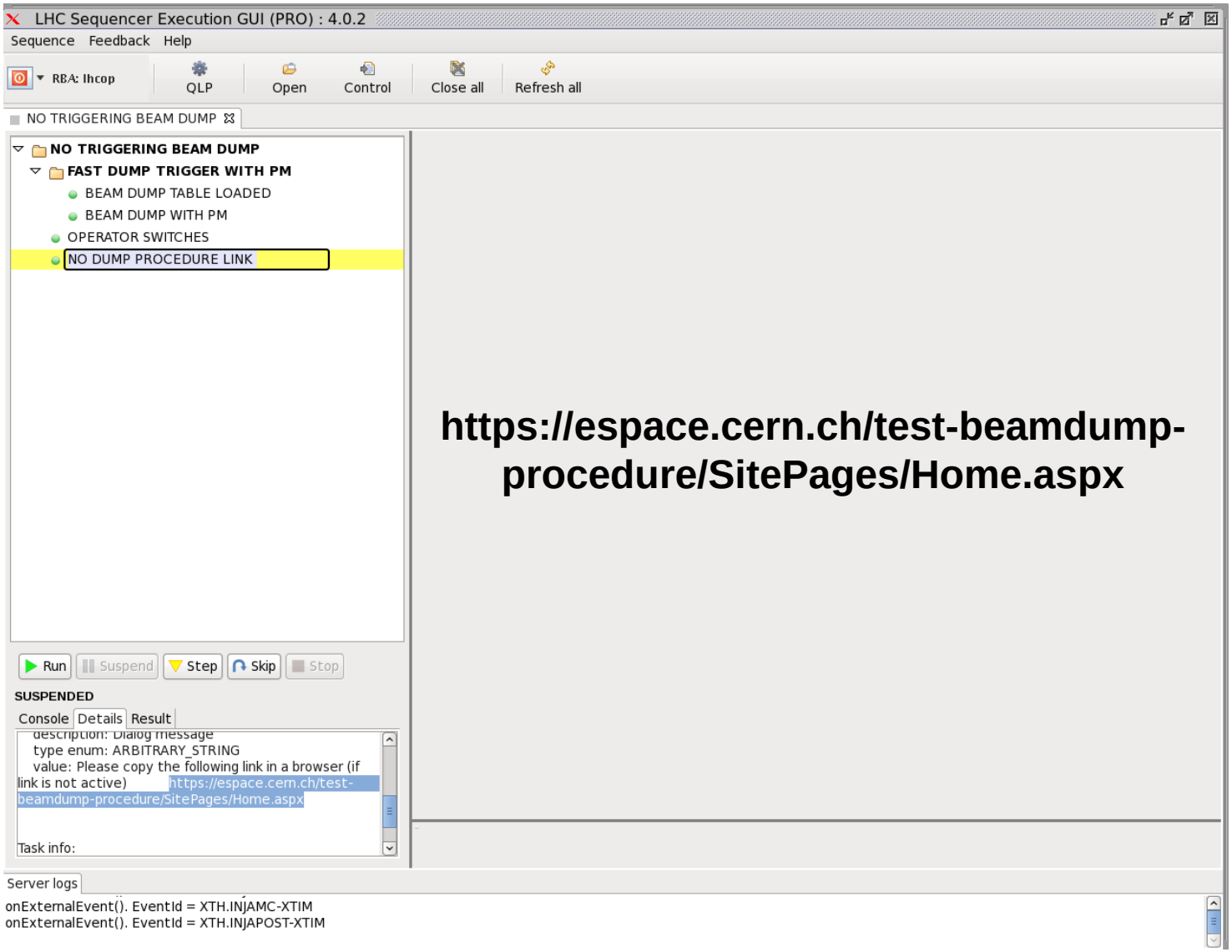
Nota Bene: Details for all “non-physical”, SW based actions are not contained in the EDMS procedure, but only in the version stored on TN:

- Accessible also from the OP sequence
- A paper copy must be available in CCC

Actions

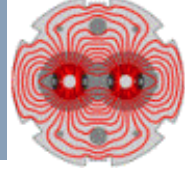
ACTION n.	ACTION	OPTION
#1	Timing event	
#2	OP switches	
#3	Different BIC user input	AC-dipole activation
		ADJUST mode set (in case present mode = SB)
		SIS trigger by stopping BLM subscription
#4	BIS controller power cycle	
#5	Switch off MKB generator	
#6	Disable RF freq on LBDS	
#7	LBDS VME crate power cycle sync async BD!!	
#8	Scrape the beams away	ADT blow-up
		Third resonance tune move

Sequence



https://espace.cern.ch/test-beamdump-procedure/SitePages/Home.aspx

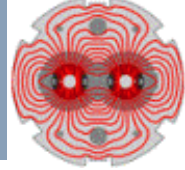
Tests



TEST NAME	DATE	TIME of Execution	Result
Software Interlock System - 1 (BLM)	17/03	13.28.07	OK, it takes ~30sec
Put one MKB generator in NOT_READY state	21/03	10.01.36	OK, it has to be done twice for the 2 beams. LHCOP log-in is enough
Power cycle of Beam Interlock crate - 1 (command)	22/03	00.19.31	OK, but it required IPOC of BIC signature
Stop frequency revolutionreceived by LBDS	22/03	14:16:38 (B1) 14.18.23 (B2)	OK, it has to be done twice for the 2 beams. LHCOP log-in is enough
Software Interlock System - 2 (BPM)	23/03	06.48.08	OK, it takes ~30sec
Power cycle of Beam Interlock crate - 2 (crate button)	23/03	07.04.45	OK
LBDS crate reset	26/03	08.52.35	OK, the dump was asynchronous synchronous

- **All steps to be re-checked with experts**
- **All steps to be retested**
- **Procedure to be updated**

Section 3.8



3.8 - BLOW UP BEAMS WITH ADT

In case the previous steps did not trigger the beam dump, the last resort action is to slowly scraping away the beam WITHOUT quenching a magnet.
Use the ADT to slowly blow-up the beam in a controlled way. According parameters should be calculated in advance to not exceed losses of say 100kW on the primary collimators to make sure not to exceed the quench limits. The beam losses in the DS downstream of the collimation regions (IR3 and IR7) must be closely monitored to ensure that there is a sufficient margin with respect to the dump threshold.

TODO: Add detailed procedure/sequence to be launched. – D.Valuch/W.Hoefle

3.81 - VERTICAL TUNE TO RESONANCE

In case the blow-up with the ADT should not work for any reason, the VERTICAL tune must be moved slowly towards the third order resonance. The beam lifetime should be reduced to the values given in the table (guideline only!). The higher the intensity, the higher the lifetime in order not to quench any magnet. The beam losses in the DS downstream of the collimation regions (IR3 and IR7) must be closely monitored to ensure that there is a sufficient margin with respect to the dump threshold.

TODO: Add guidelines for lifetime of beams as a function of intensity – M.Zerlauth

Section 5 – future improvements

To further increase the dependability of the beam dump transmission, **two new hardware developments** should be envisaged:

- Implementation of a **redundant triggering of the LBDS** (in parallel to the existing interface), using e.g. an output of the local BIC in IR6
- Implementation of **additional direct dump switches in the CCC** that will provide a direct entry into the re-triggering of the LBDS. Note that this would trigger an asynchronous dump but would avoid all levels of dependencies.

For additional diagnostics in case of major failures in the LHC control system (e.g. power cuts in the CCC...) a **fully passive 'beam presence' display in the CCC** could be envisaged…?????