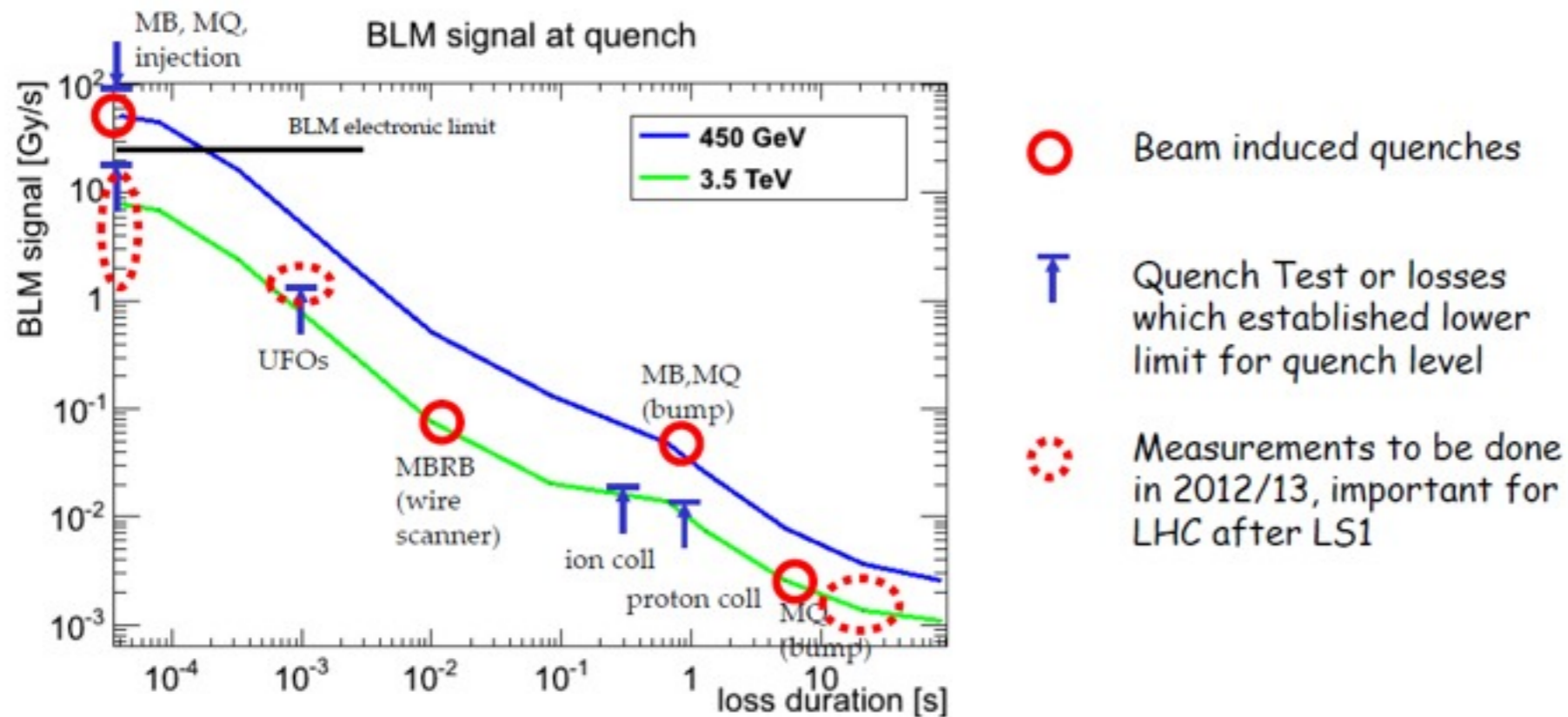




# Review of BLM thresholds for quench tests.

E. Nebot for the BLM team

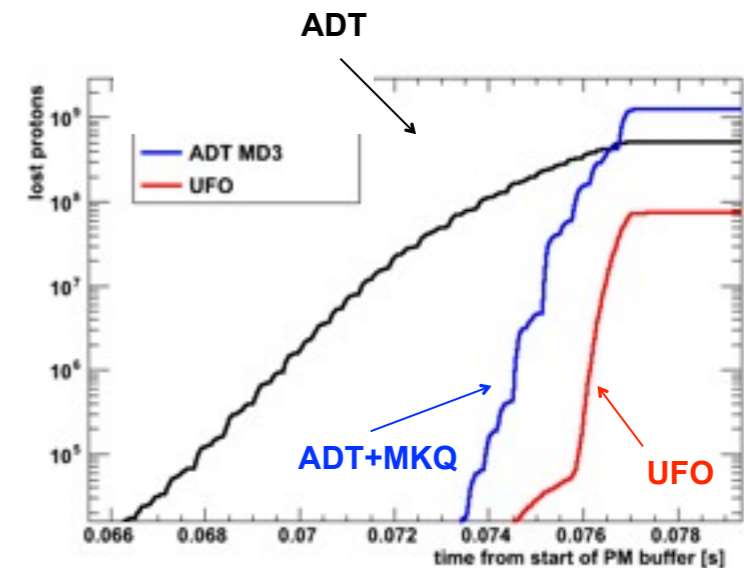
# Quench tests



- High priority test
  - ms scale. UFO-like losses
  - Steady-state in DS with collimation system (protons/ions)
- Other proposed test
  - Steady-state with orbital bump
  - Fast losses at injection (Q6L8)

# QT ms scale

- ADT + MKQ + bump @Q12L6
  - From QP3 (MB)  $Q_L = 30 \text{ mJ/cm}^3$
  - MQ Geant 4 simulations → quench expected for a few  $10^8$  lost protons
  - Signals on the order of  $\sim 1 \text{ Gy/s}$  in RS05
  - Only a few (6 BLMs @ Q12) monitors affected.



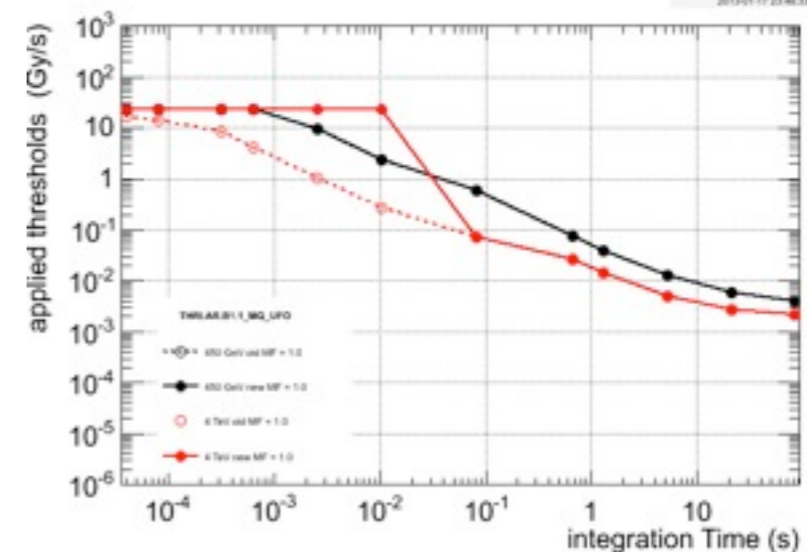
☒ M.Sapinski et al., “UFO timescale quench test preparation”, LSWG, 26.10.2012

Current situation.

MASTER THRESHOLD =  $3 \times Q_L$   
 can be reached by increasing MF

BLM position	RS05 (Gy/s)	RS06 (Gy/s)	RS07 (Gy/s)
1	1.057	0.264	0.070
2 & 3	0.726	0.181	0.040

**PROPOSED TO ALLOW CONSTANT RATE ( $\sim 23 \text{ Gy/s}$  @ 4TeV ? ) FOR**



# QT in DS with collimation system (protons)

- Require large scale of threshold modifications.
- Quench test 08.05.2011. Threshold changes described in detail in LHC-BLM-ECR-0020  
<https://edms.cern.ch/document/1143931/2>
- ▶ Warm magnets (MQW) in IR7 (20 BLMs)
- ▶ Q6, Q8 and Q9,Q11 in IR7 (18 BLMs) **78 BLMs**
- ▶ Q4 and Q5 in IR6 (4 BLMs)
- ▶ Collimators (36 BLMs)
- Thresholds increase in RS09 and above (**only at 3.5 TeV**).
- Requested computation of Master Thresholds for 5 new families
- 14 BLMs had thresholds increase via MF

- Test @ 4 TeV. Thresholds for previous test where only modified for 3.5 TeV. Recalculation of specific thresholds for this test may be needed.
- Current settings allow to reach (via MF) 500kW.
- In previous test 500kW was reached without observation of quench.
- New list of monitors to be modified to be computed from loss maps?

# QT in DS with collimation system (ions)

- Require large scale of threshold modifications.
- Quench test 06.12.2011. Threshold changes described in detail in LHC-BLM-ECR-00209  
<https://edms.cern.ch/document/1173323/1>
- ▶ Q8, Q9, Q10, Q11, Q15, Q17 and Q27 (29 BLMs)
- ▶ TCLAs (5 BLMs)
- ▶ MB9, MB11 (17 BLMs)
- ▶ Q8, Q9, Q10, Q11, Q15, Q17 and Q27 (29 BLMs)
- Master threshold calculation required for 2 BLMs (Q9) to allow further losses in ~1s.

**80 BLMs**

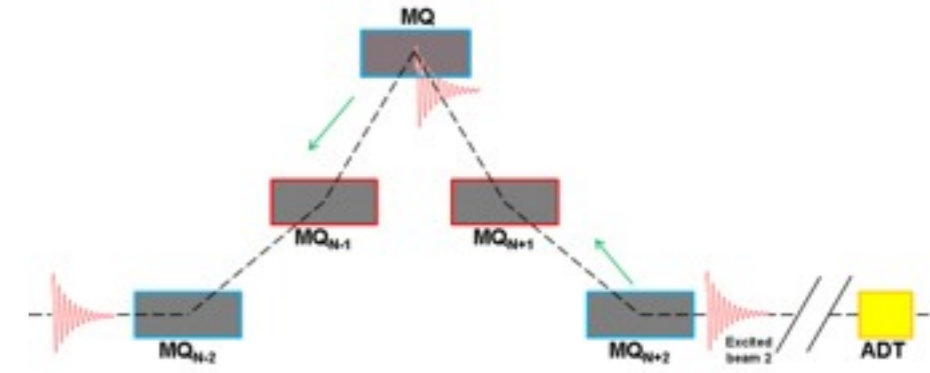
- History of the test. Three ramps:
  - ▶ Ramp 1. Dumped by losses (10 ms) in Q9. Thresholds not adapted for fast losses required further increase of threshold in short RS via MF (2 BLMs).
  - ▶ Ramp 2. Dumped by losses in (80 ms) Q19. Unforeseen loss location required further increase of thresholds via MF (**26 BLMs** @ MQs and MBs in cells 11L7, 19L7, 29L7 and 24R5 )

- Potential increase of thresholds for all BLMs in ARC ( R7, L7 and potentially others ) via .
- New list of monitors to be modified to be computed from loss maps?

# Quench tests III

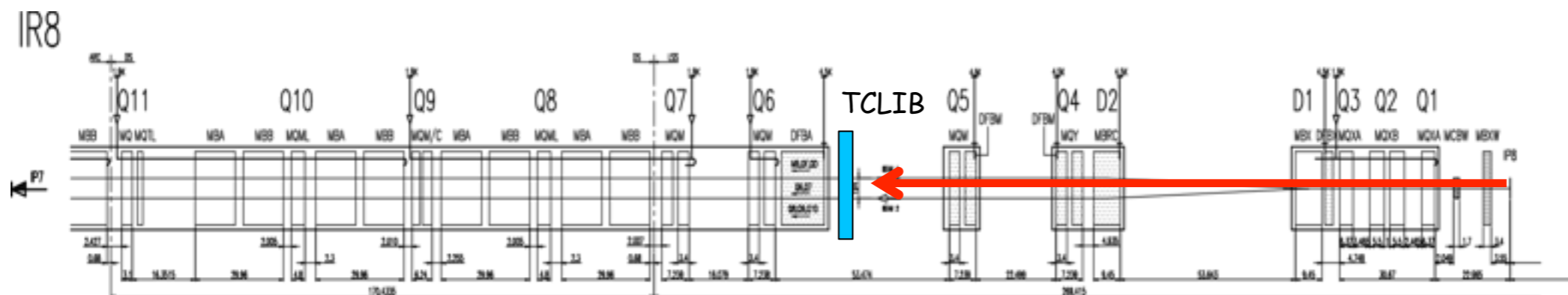
- Steady-state with orbital bump

- Local increase of thresholds.
- **6 BLMs** protecting Q14R2
- Currently **MF = 0.1** (one third of Quench level)



- Q6. Fast losses.

- Local increase of thresholds.
- **6 BLMs** protecting Q6L8
- Currently **MF = 0.1** (one third of Quench level)



# Summary and conclusions

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- Quench test in DS with collimation system requires large scale of changes. Specific thresholds for 4 TeV are needed. Input required:
- UFO quench test. Master threshold to be recalculated for 6 BLMs. Only changed in RS06 (10 ms) and below.
- Other two test require only local BLM increase. Can be handled by increasing MF.