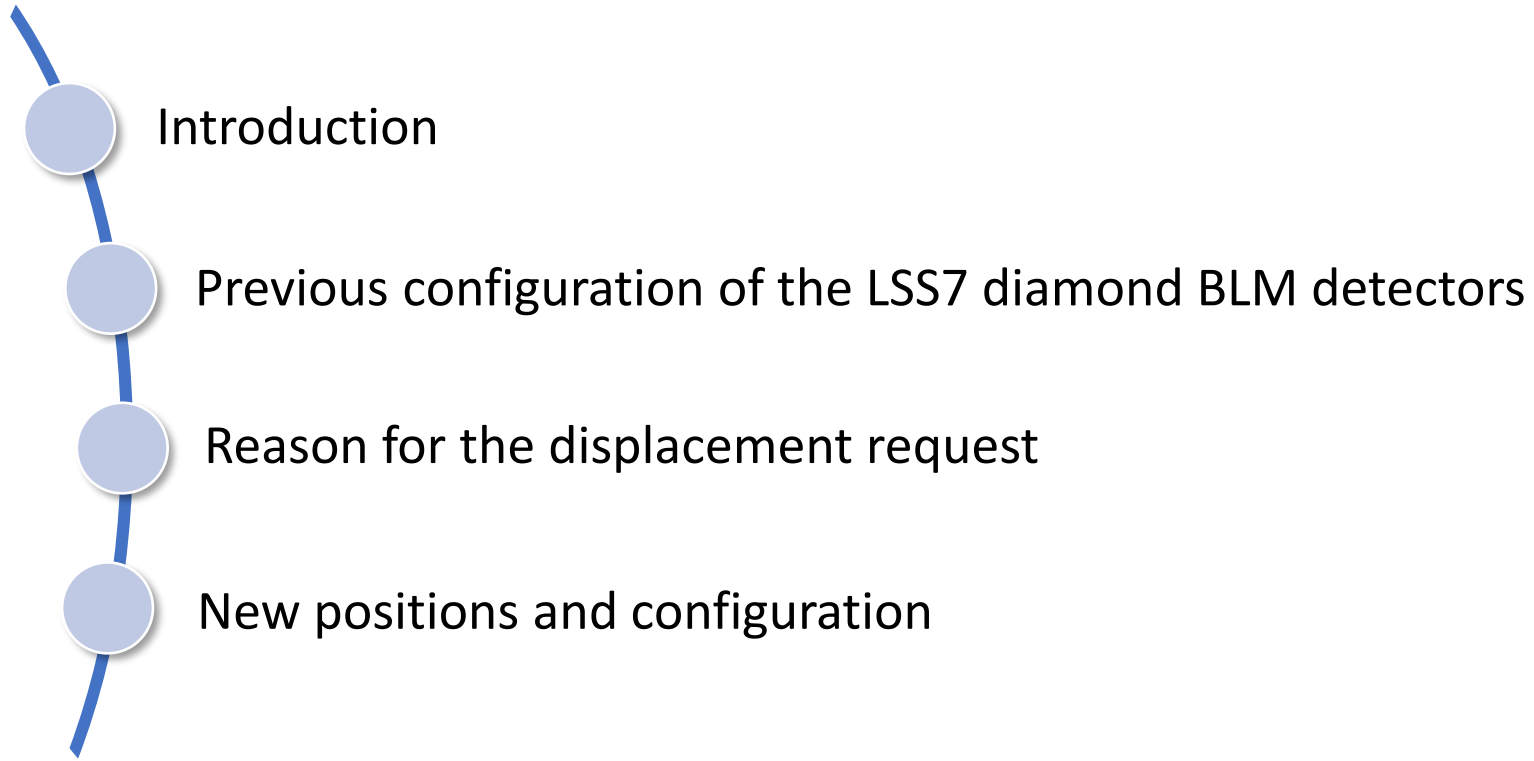
DISPLACEMENT OF TWO DIAMOND BEAM LOSS MONITORS IN THE LHC LSS7 REGION

Eva Calvo (CERN, BI-BL)

Outline


Introduction
Previous configuration of the LSS7 diamond BLM detectors
Reason for the displacement request
New positions and configuration

Introduction

- ECR LHC-BLM-EC-0017 currently in circulation with causes, old and new positions explained, as well as new detector names
- Proposal to displace a diamond BLM detector on left and right LSS7 regions after analysis of loss maps and beam scrapping measurements performed during 2022
- Arrived in February, near the end the YETS-22/23.
- It required re-cabling of current infrastructure, so it was necessary to organize it in brief delays, in order to make it happen during YETS and reduce personal radiation doses

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EDMS NO.	REV.	VALIDITY
2856450	0.1	DRAFT

REFERENCE
LHC-BLM-EC-0017

LHC

Date: 2023-03-13

ENGINEERING CHANGE REQUEST

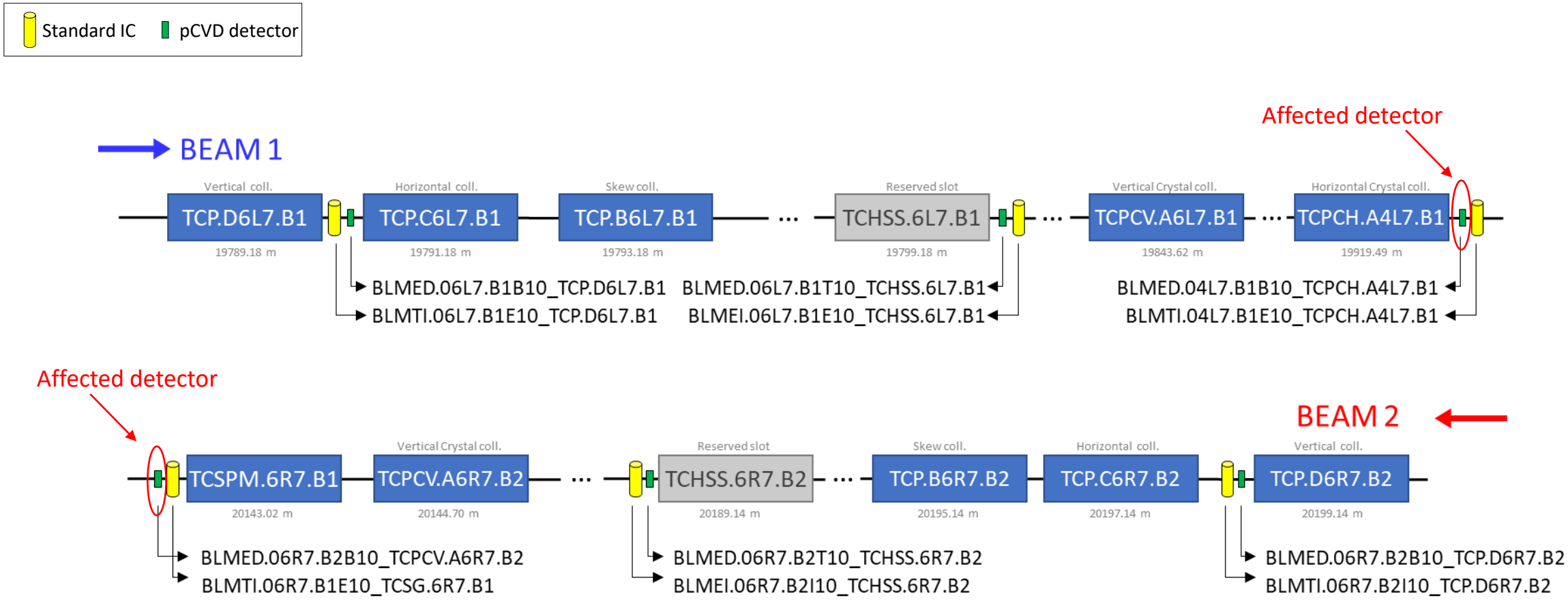
Displacement of two Diamond Beam Loss Monitors in the LHC LSS7 region

BRIEF DESCRIPTION OF THE PROPOSED CHANGE(S):

The LHC straight section in IR7 (LSS7) contains the main LHC Collimation system dedicated to betatron halo cleaning. For this reason, most of the beam losses at the LHC are concentrated in this location. This area is fully equipped with the standard BLM system composed by ionisation chambers covering the machine protection beam loss detection functionality. In addition, beam loss monitors based on pCVD diamond sensors are also installed at strategic locations to monitor bunch-by-bunch losses thanks to their very fast time responses, in the order of nanoseconds.
We request here the displacement of two of these diamond sensors within the same LSS7 region to a more suitable location based on a study of beam loss maps performed during 2022.

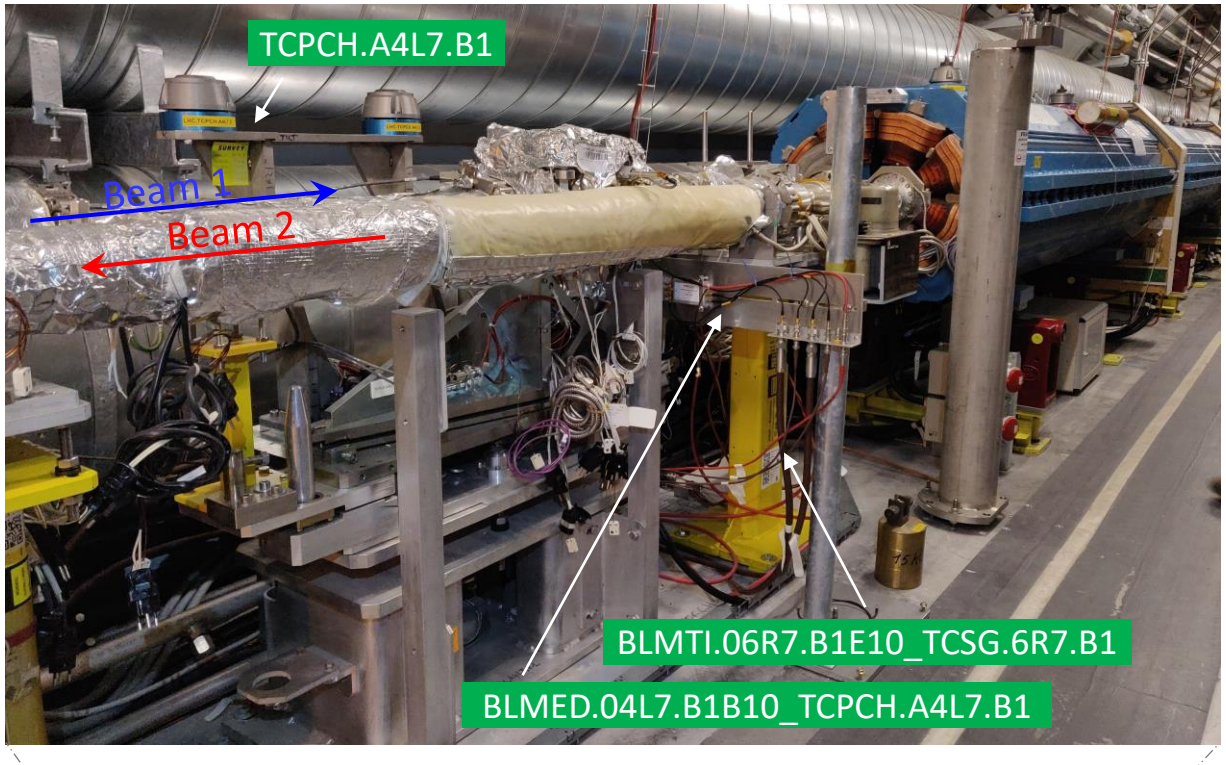
DOCUMENT PREPARED BY:	DOCUMENT TO BE CHECKED BY:	DOCUMENT TO BE APPROVED BY:
E. Calvo (SY-BI) B. Salvachua (SY-BI) S. Morales (SY-BI)	A. Bardon, M. Barberan, M. Bernardini, E. Bravin, J. P. Corso, J. Coupard , M. D'Andrea, J-M. Fernandez, A. Funken, C. Gaignant, A. Infantino, R. Jones, T. Lefevre, D. Mirarchi, L. Pereira, M. Pirozzi, S. Redaelli, R. Steerenberg, F. Van Der Veken, J. Wenninger, D. Wollmann, C. Zamantzas	M. Lamont (on behalf of the LMC)

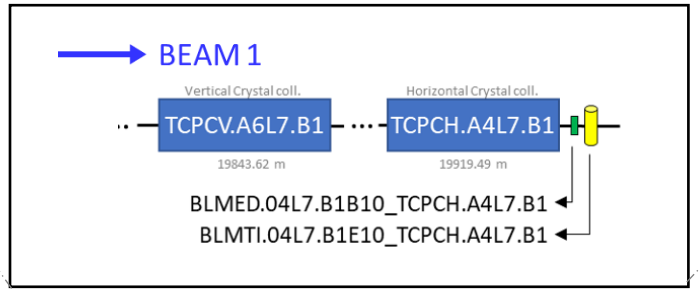
Previous configuration of LSS7 diamond BLM detectors

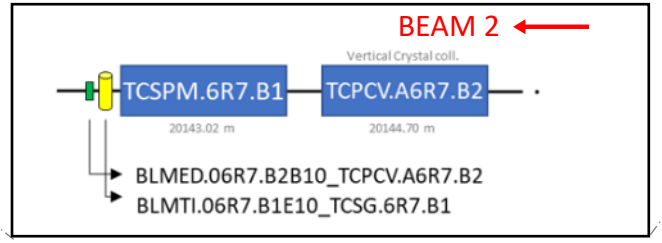


Presented at LBOC 29-06-2021

Affected detectors before YETS-22/23



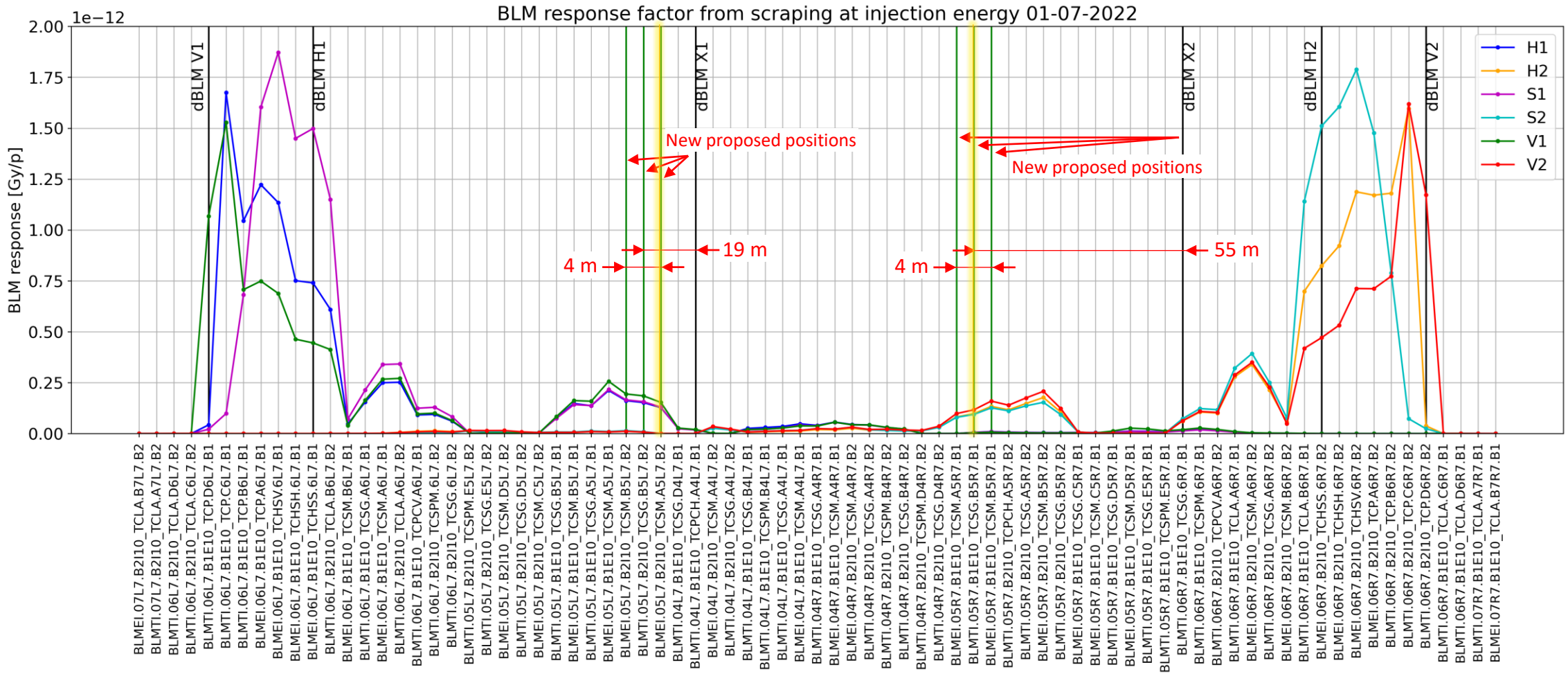




Presented at LBOC 29-06-2021

LSS7 BLMs response during beam scrapping at inj. energy

Graphic courtesy of S. Morales (SY-BI-BL)



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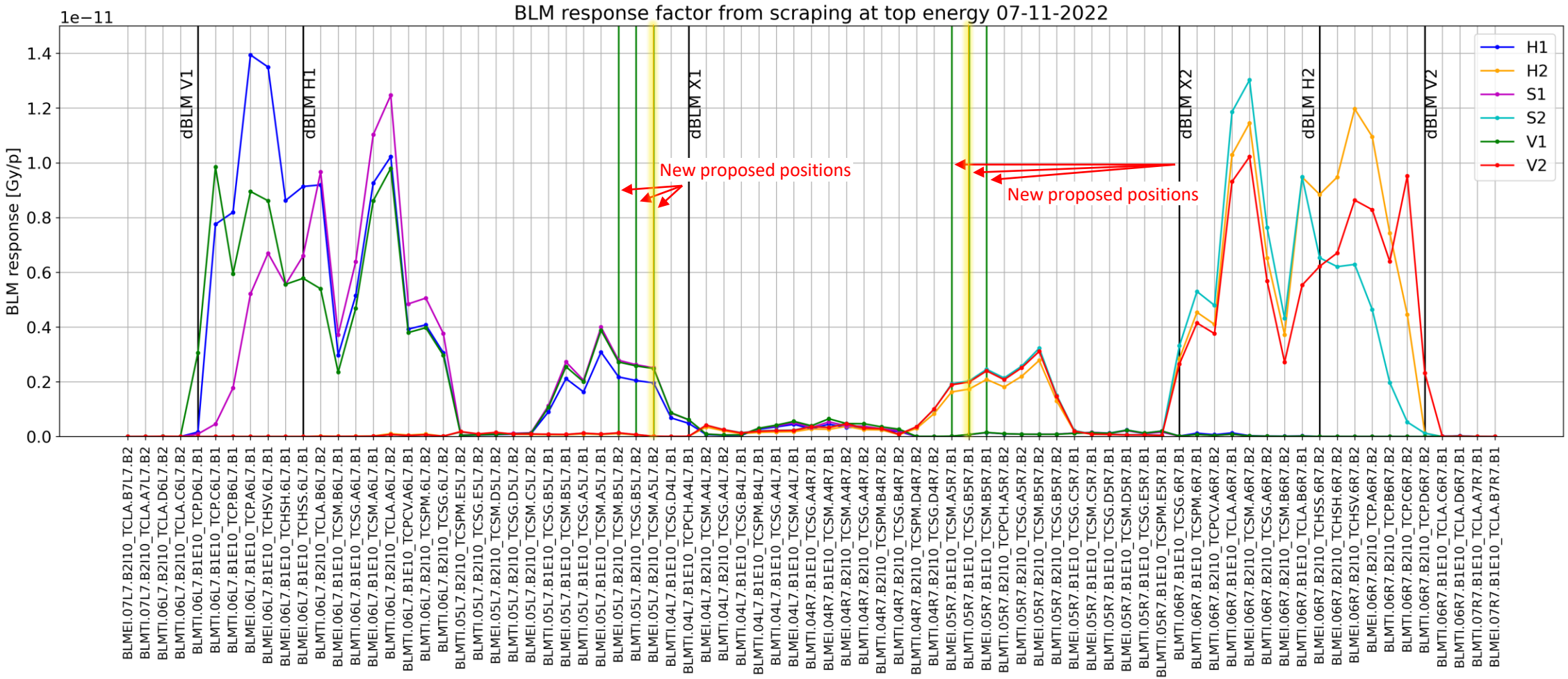
dBLM H1 = BLMED.06L7.B1T10_TCHSS.6L7.B1 dBLM
dBLM X1 = BLMED.04L7.B1B10_TCPCH.A4L7.B1 dBLM

dBLM V2 = BLMED.06R7.B2B10_TCP.D6R7.B2
dBLM H2 = BLMED.06R7.B2T10_TCHSS.6R7.B2
dBLM X2 = BLMED.06R7.B2B10_TCPCV.A6R7.B2

LSS7 BLMs response during beam scrapping at top energy

Graphic courtesy of S. Morales (SY-BI-BL)

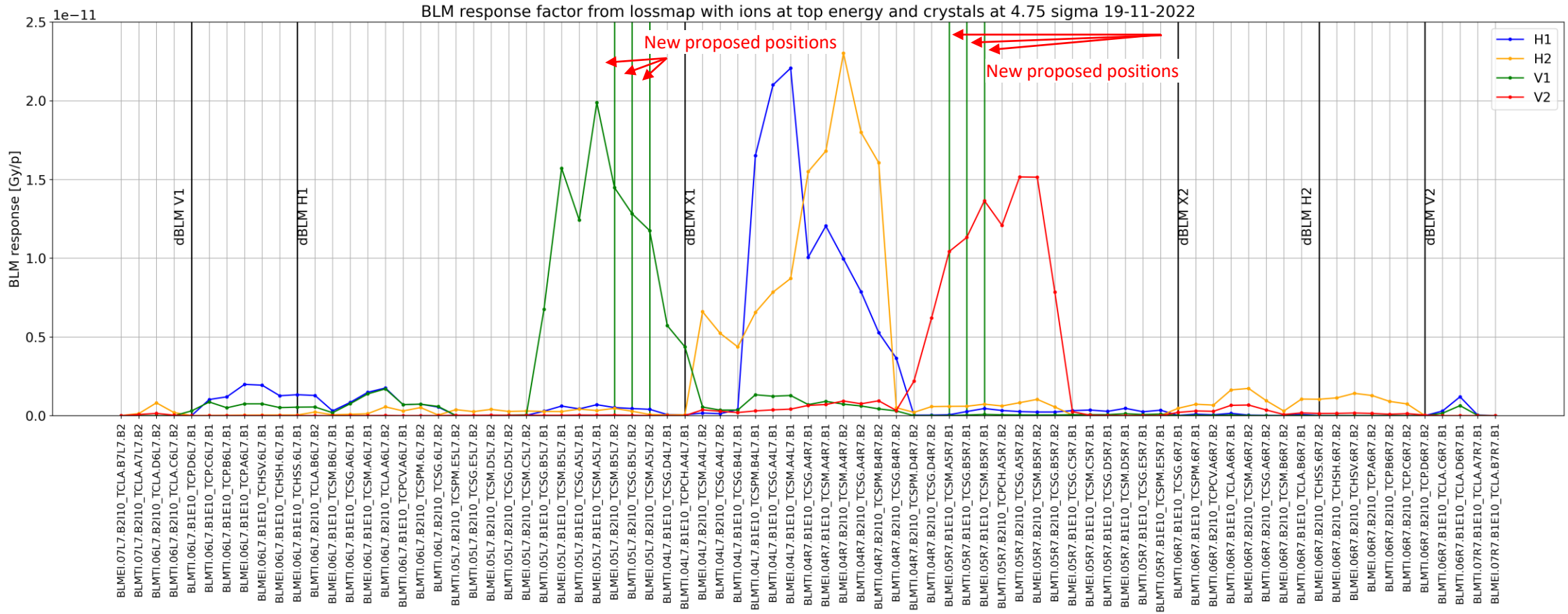


dBLM V1 = BLMED.06L7.B1E10_TCP.D6L7.B1dBLM
dBLM H1 = BLMED.06L7.B1T10_TCHSS.6L7.B1 dBLM
dBLM X1 = BLMED.04L7.B1B10_TCPCH.A4L7.B1 dBLM

dBLM V2 = BLMED.06R7.B2B10_TCP.D6R7.B2
dBLM H2 = BLMED.06R7.B2T10_TCHSS.6R7.B2
dBLM X2 = BLMED.06R7.B2B10_TCPCV.A6R7.B2

LSS7 BLMs response during ions loss maps at top energy

Graphic courtesy of S. Morales (SY-BI-BL)

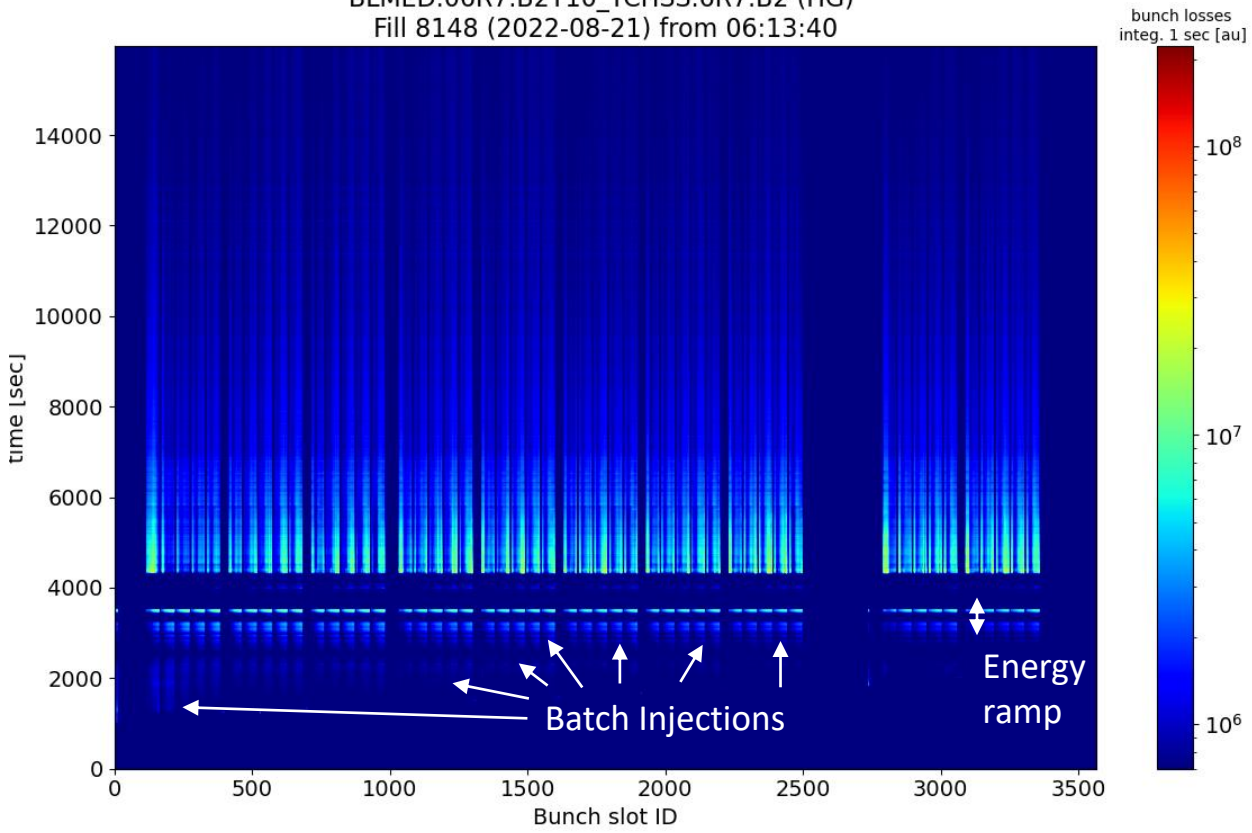


dBLM V1 = BLMED.06L7.B1E10_TCP.D6L7.B1dBLM
dBLM H1 = BLMED.06L7.B1T10_TCHSS.6L7.B1 dBLM
dBLM X1 = BLMED.04L7.B1B10_TCPCH.A4L7.B1 dBLM

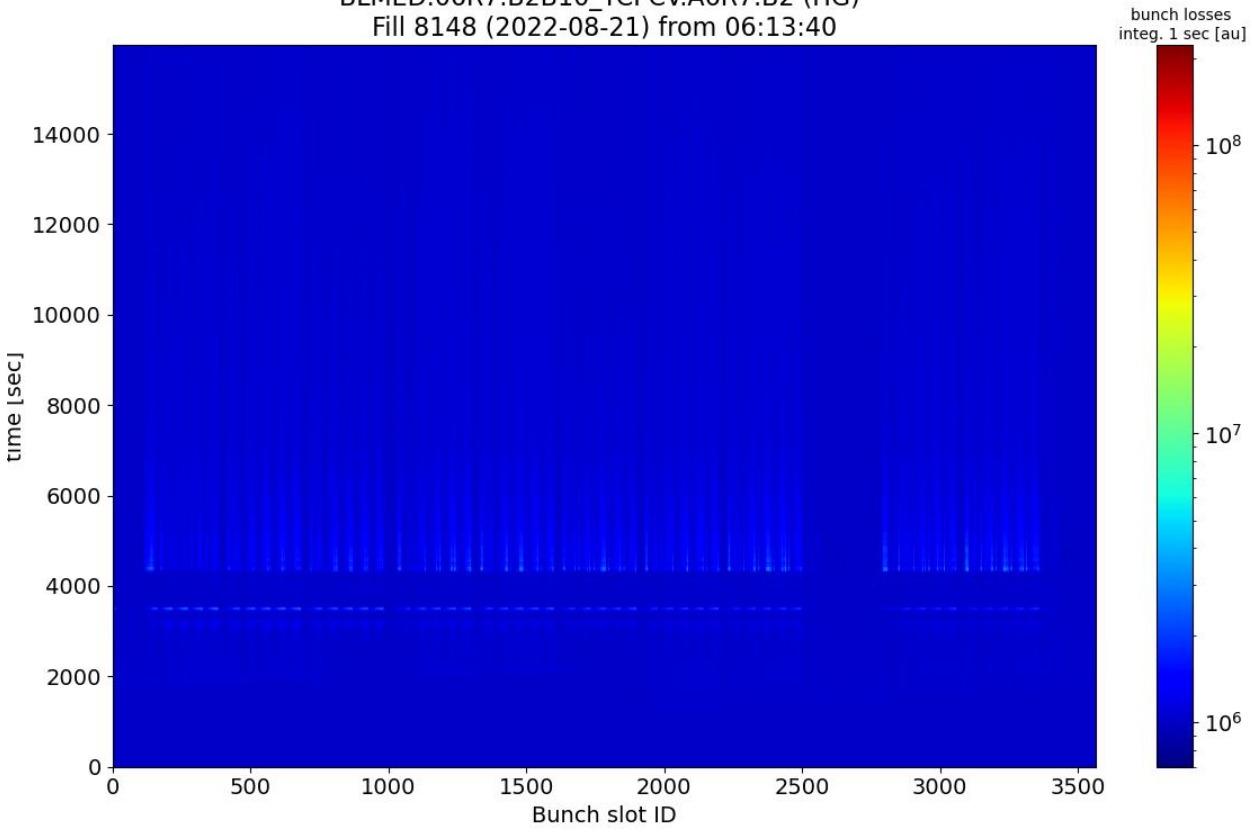
dBLM V2 = BLMED.06R7.B2B10_TCP.D6R7.B2
dBLM H2 = BLMED.06R7.B2T10_TCHSS.6R7.B2
dBLM X2 = BLMED.06R7.B2B10_TCPCV.A6R7.B2

Detectors signal comparison (I)

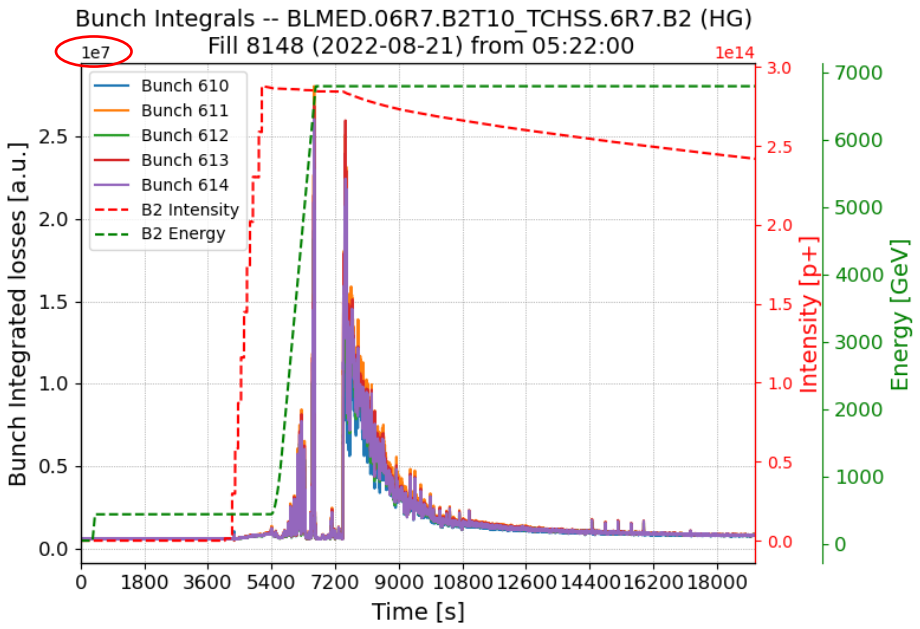
dBLM H2

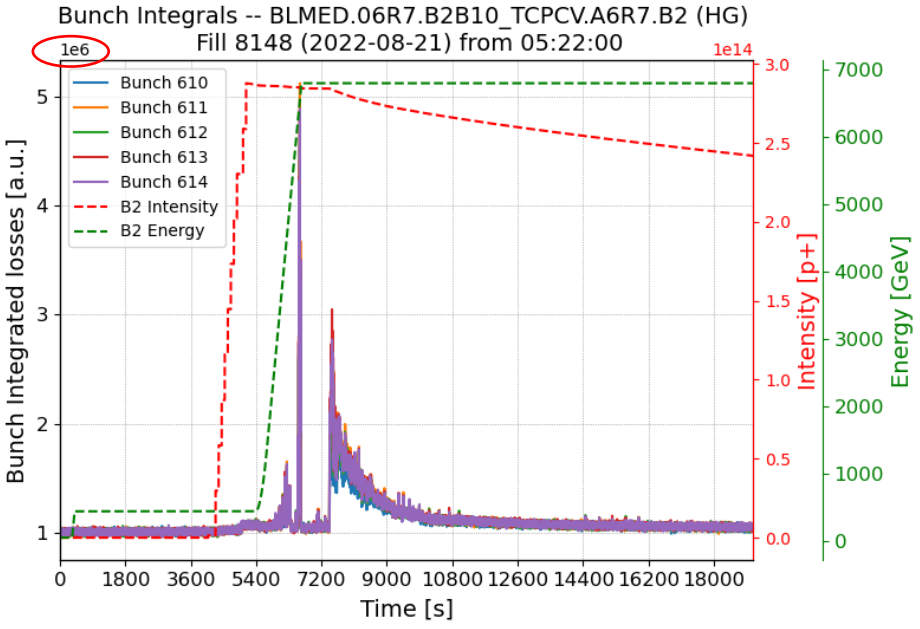


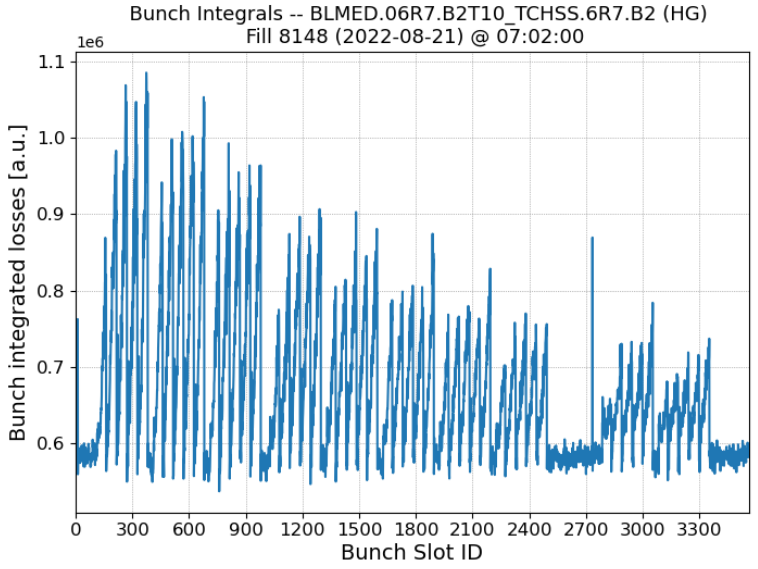
dBLM X2

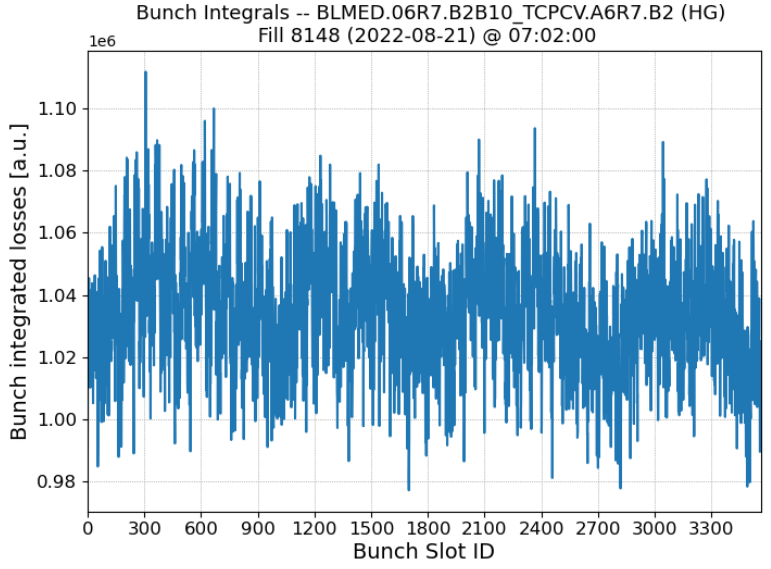


Detectors signal comparison (II)



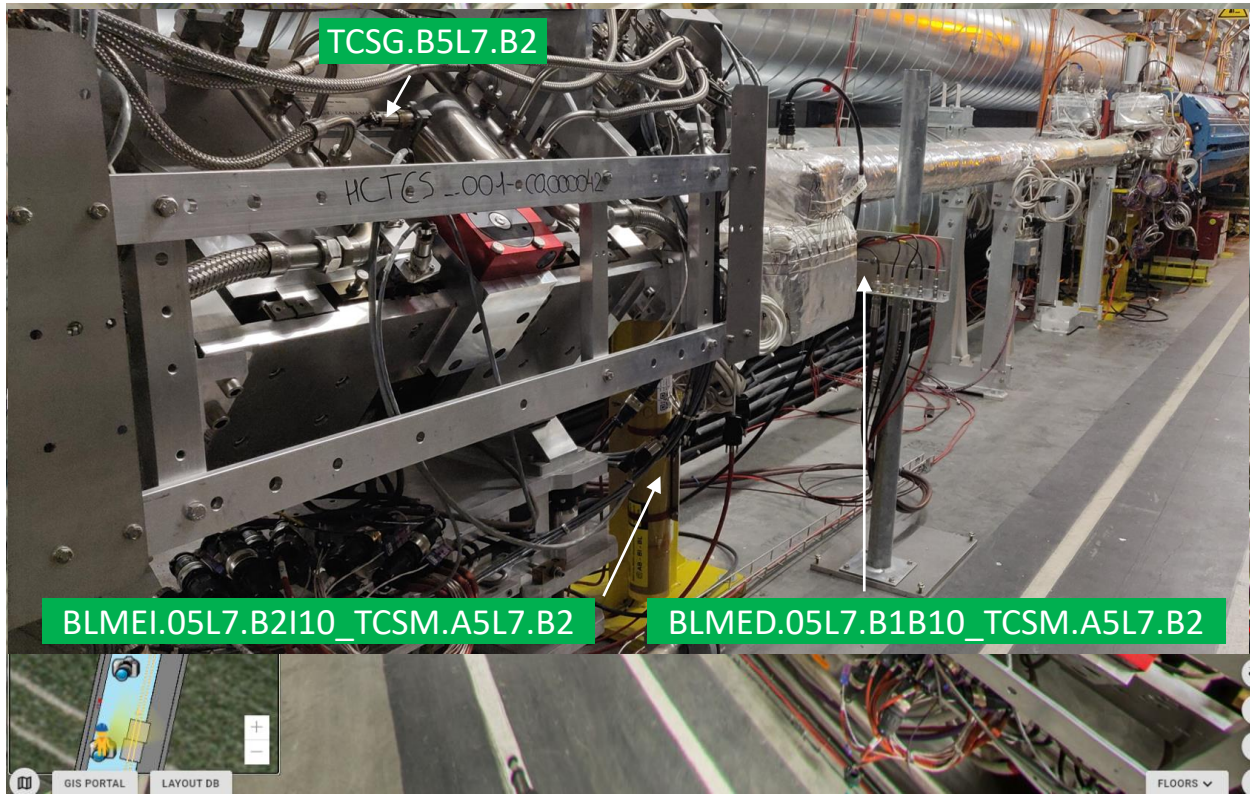






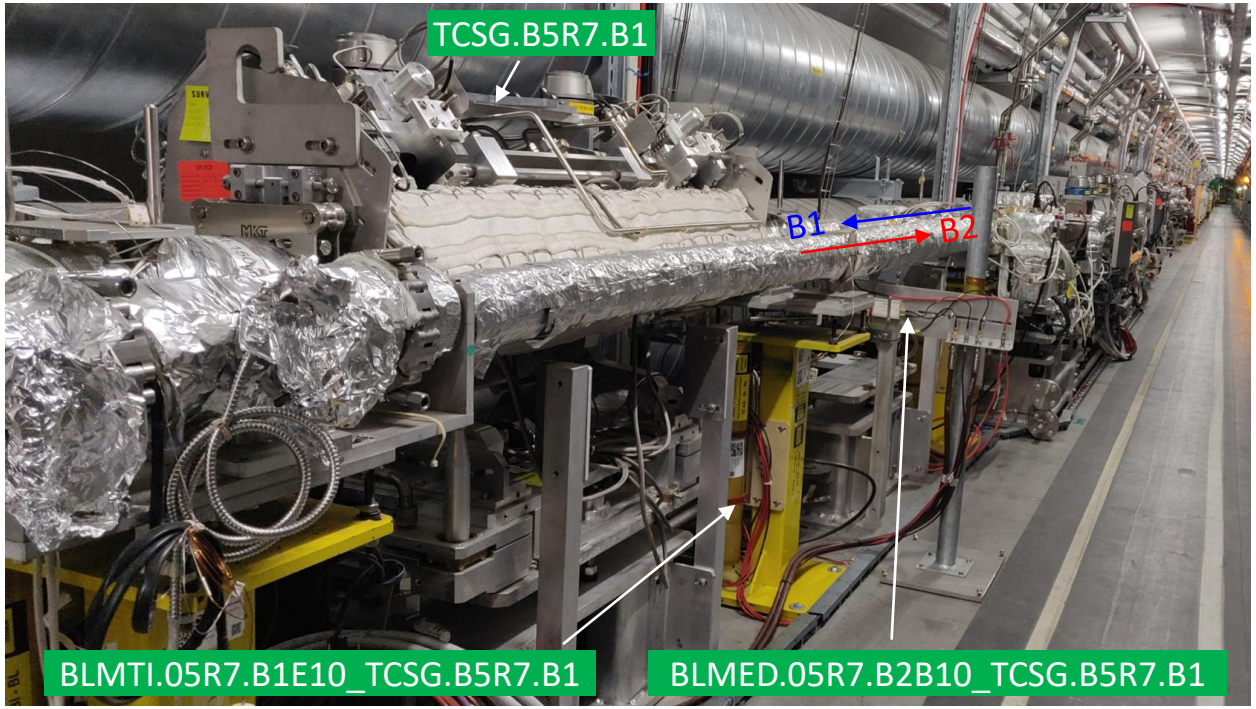
Diamond BLM detectors at the new positions

LSS7 LEFT SIDE



A set of 5 cables x side needed to be modified

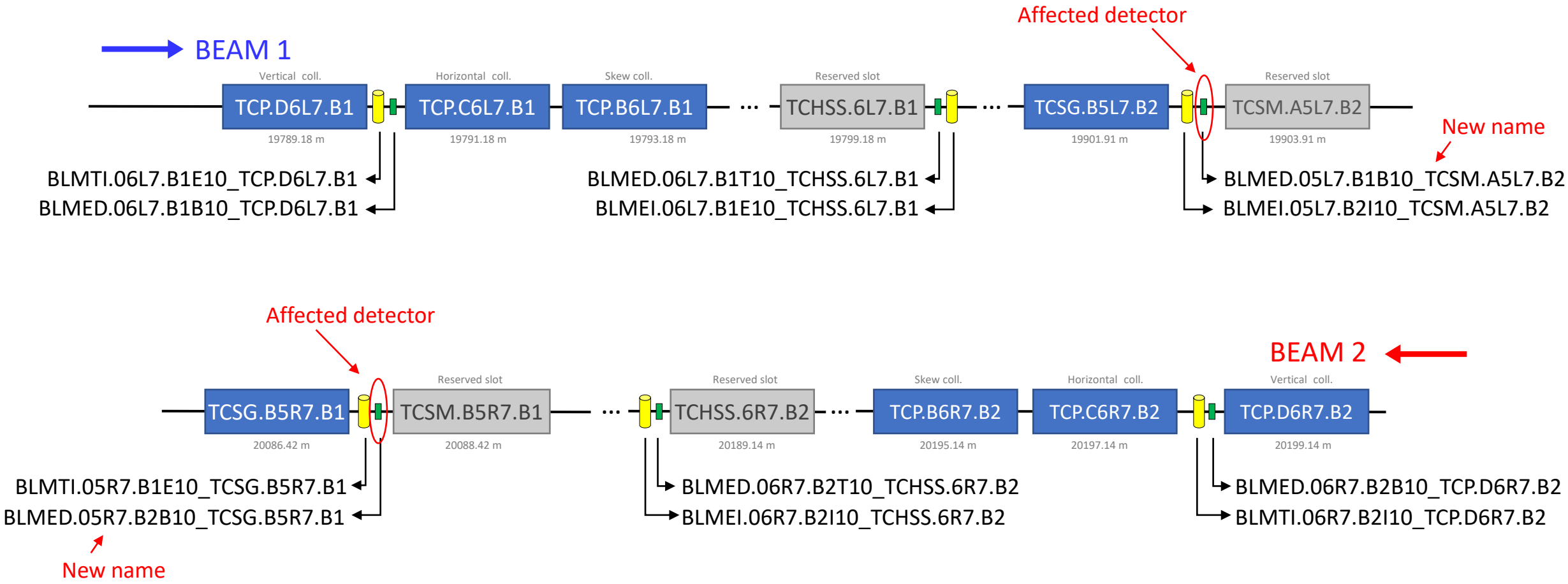
LSS7 RIGHT SIDE



Detectors placed ~50cm after the shown ionization chamber

Intermediate interconnects along the tunnel, made the change more feasible

Current configuration of of LSS7 diamond BLM detectors



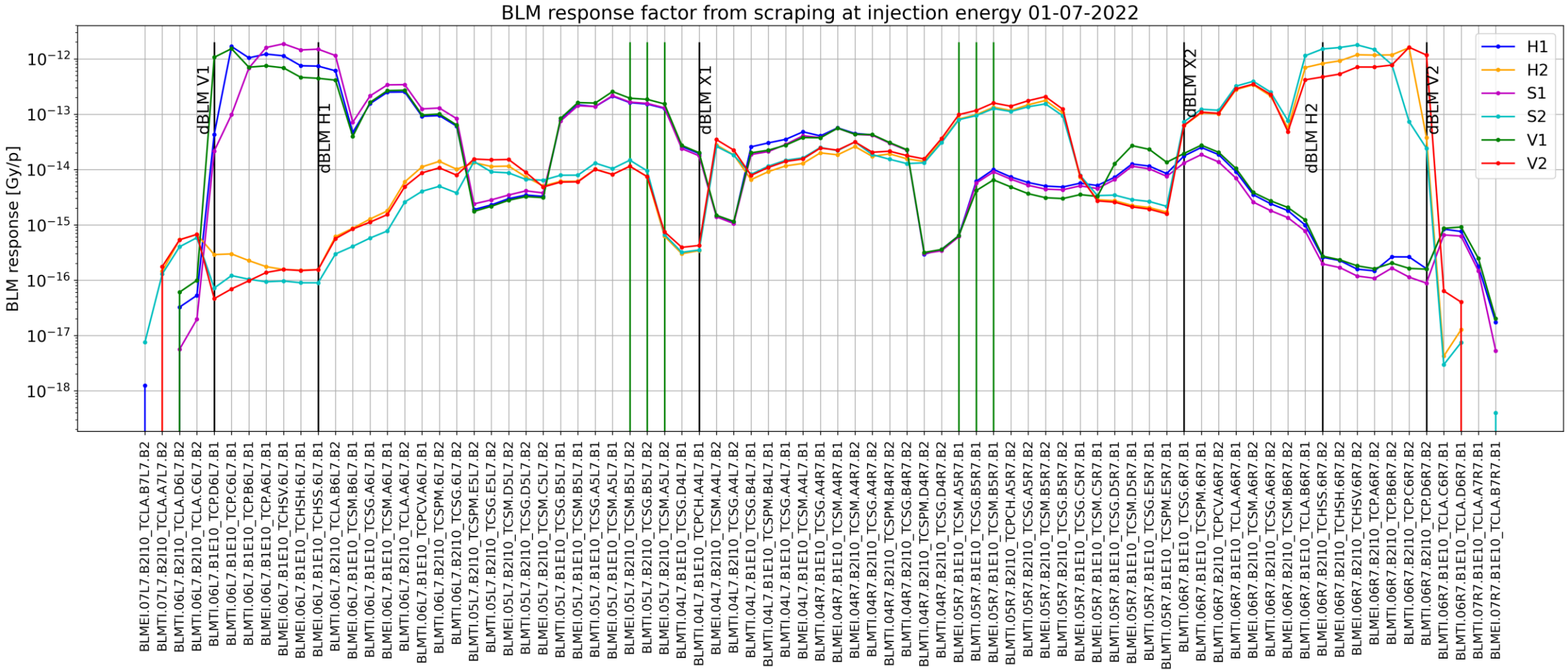
It is expected to have better quality signals in the current position

B1 - B2 configurations are more symmetrical than before

THANK YOU

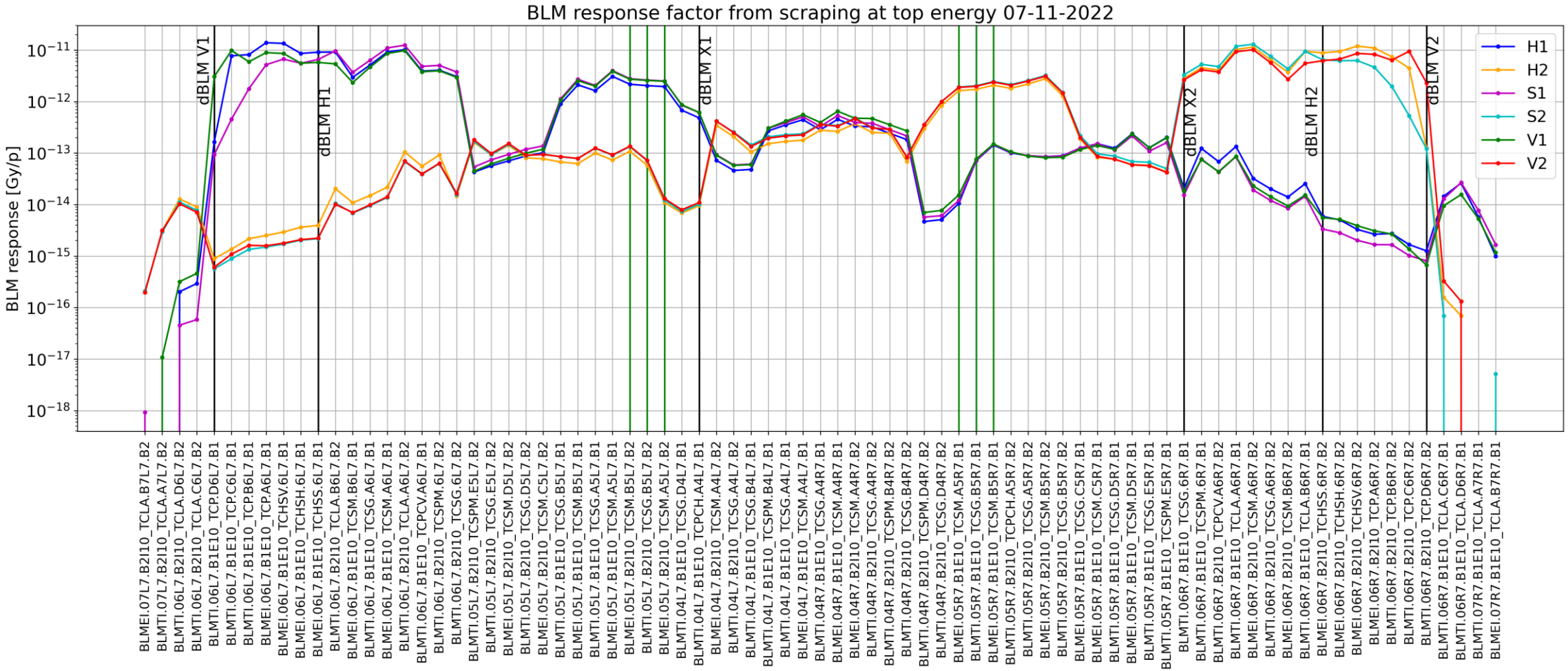
LSS7 BLMs response during loss maps at inj. energy

Graphic courtesy of S. Morales (SY-BI-BL)



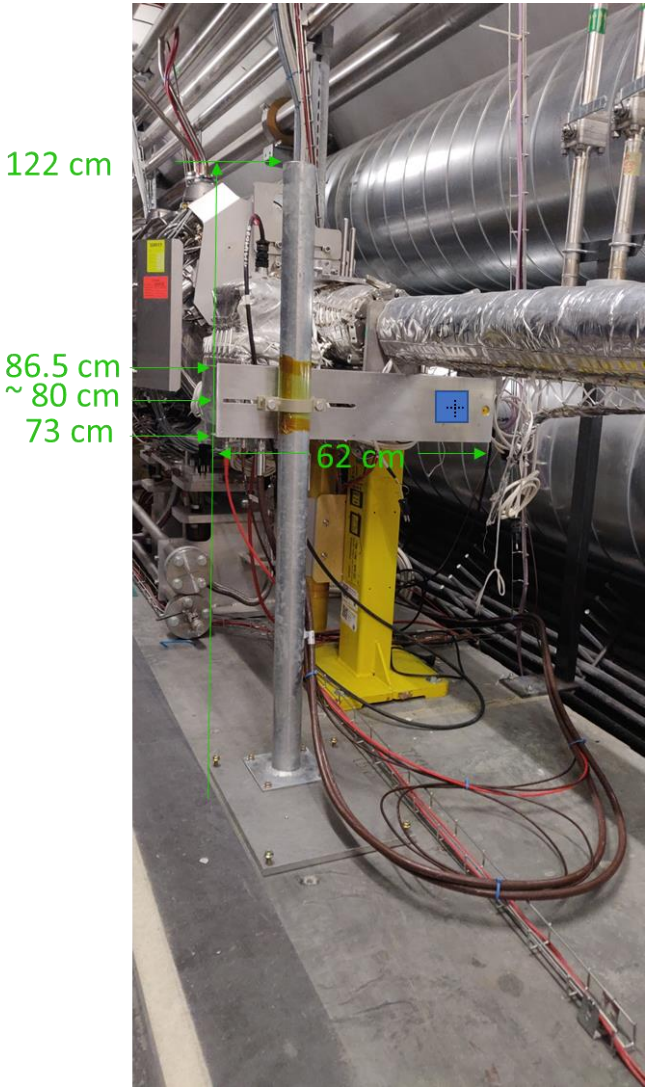
LSS7 BLMs response during loss maps at top energy

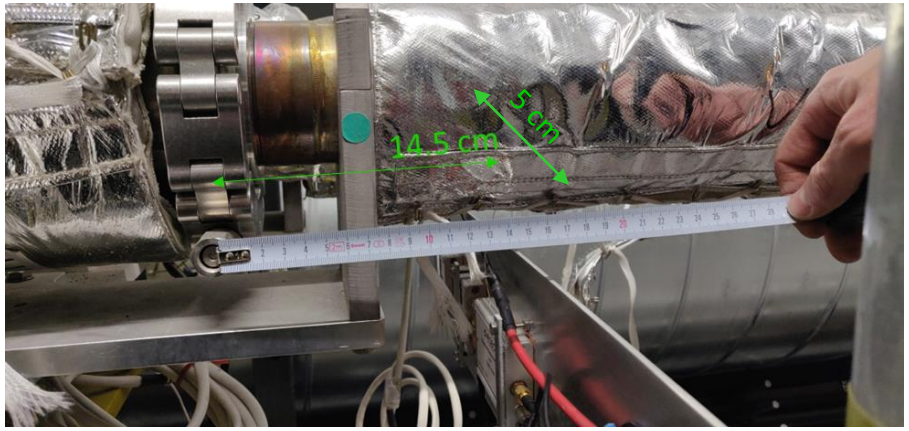
Graphic courtesy of S. Morales (SY-BI-BL)

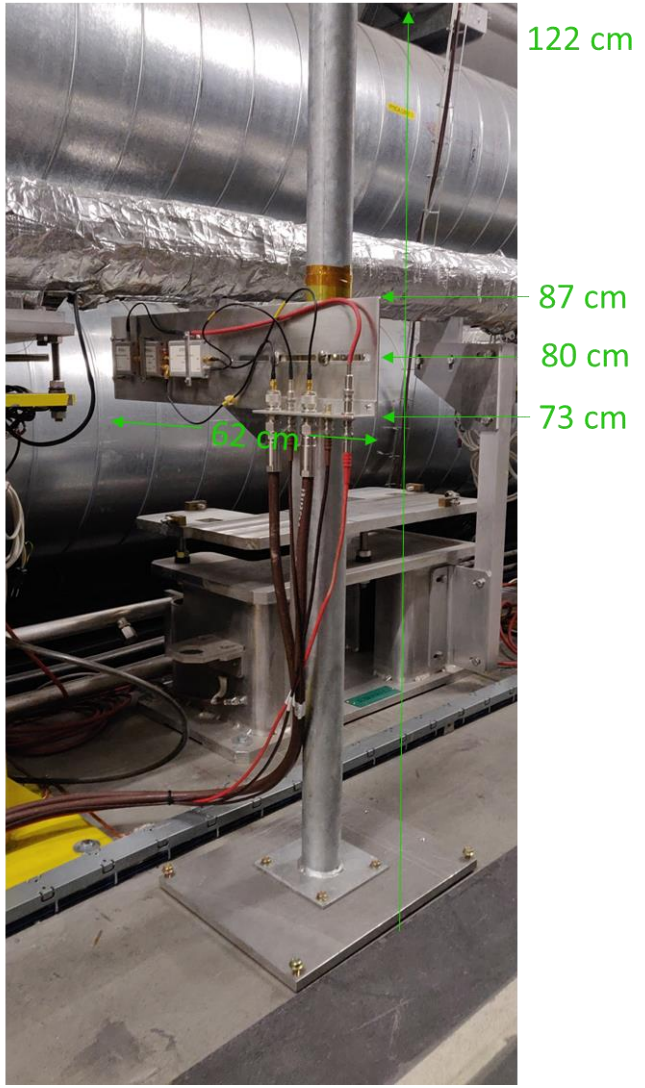


Detailed positions

BLMED.05L7.B1B10_TCSM.A5L7.B2







BLMED.05R7.B2B10_TCSG.B5R7.B1