



# 2024 BLM thresholds for Quench Test 6.8 TeV Beam 1

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# Introduction

BLM thresholds in IP7 are today set as :

- Master Thresholds to 500 kW
- Applied Thresholds to 300 kW with Monitor Factor = 0.6

Strategy for Quench Test 2024:

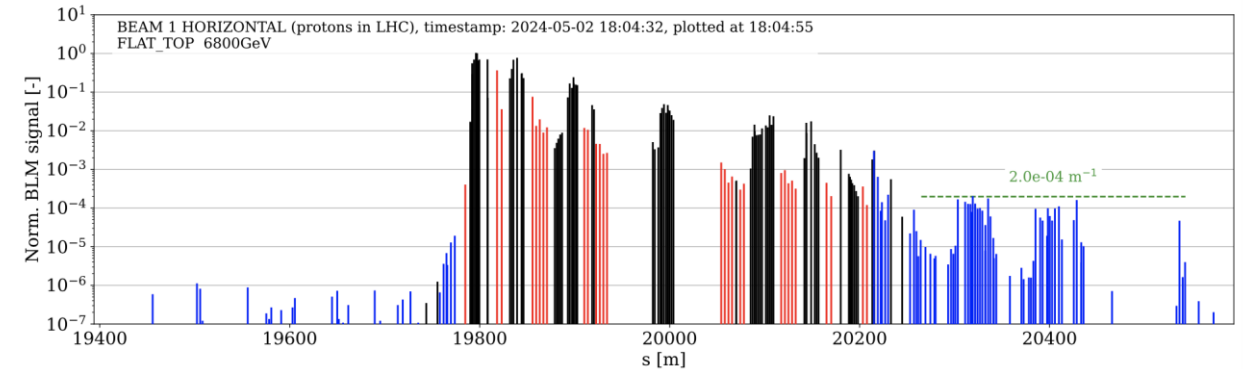
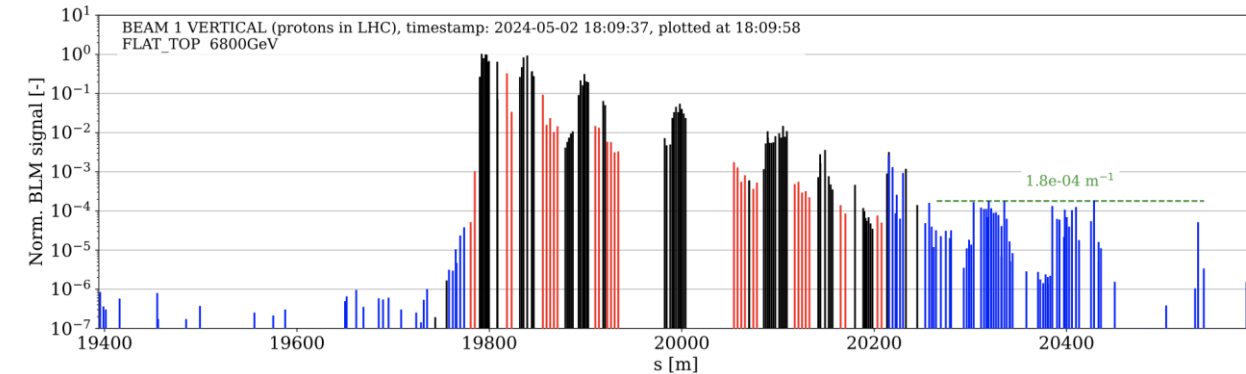
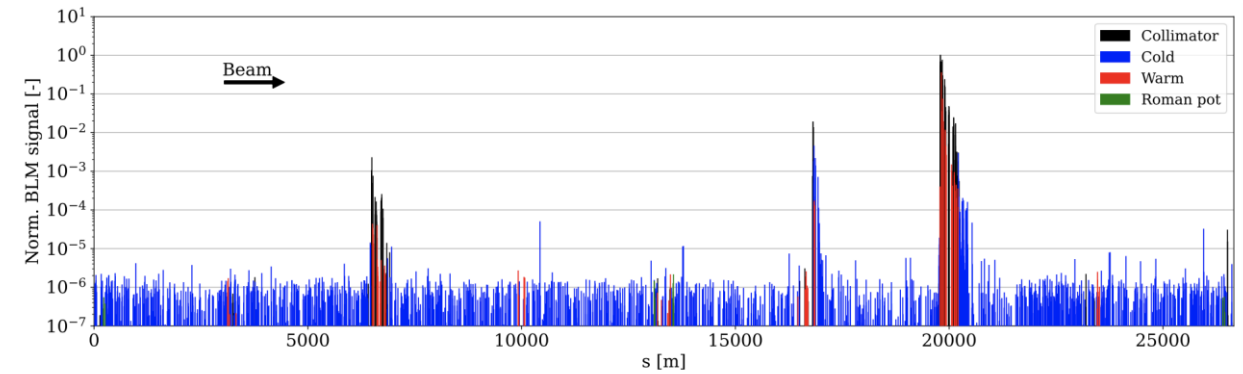
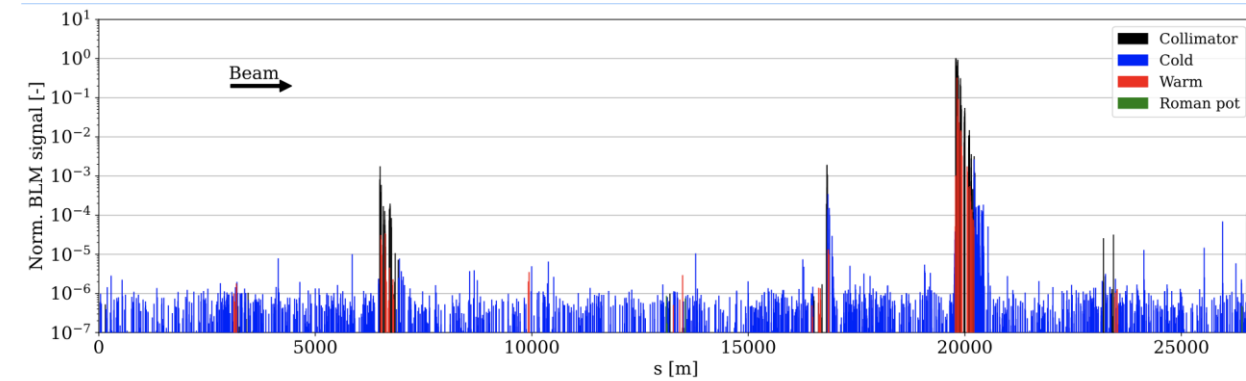
- Monitor Factor: keep it at 0.6
- Build Master Thresholds using RELAXED Collimation settings to allow for:
  - 1200 kW for BLMs with response  $> 1e-14$  Gy/proton
  - 3x1200 kW for BLMs with response  $< 1e-14$  Gy/proton
- Warm magnets, Q6 : adjust to Collimation losses
- DS and IR6

Same approach as 2022

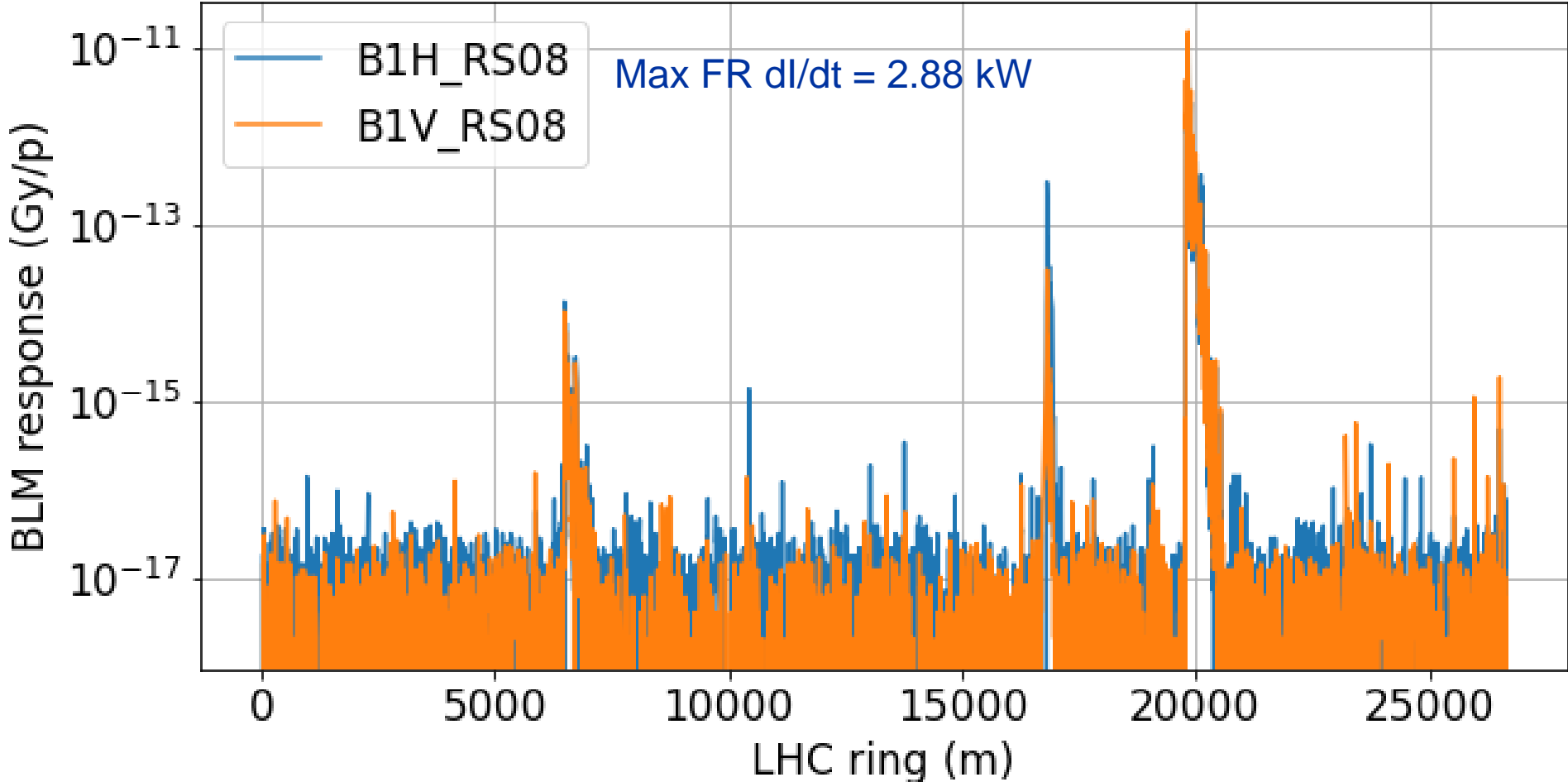
# Loss maps

- B1H RELAXED: 2024-05-02 18:04:55
- B1V RELAXED: 2024-05-02 18:09:58

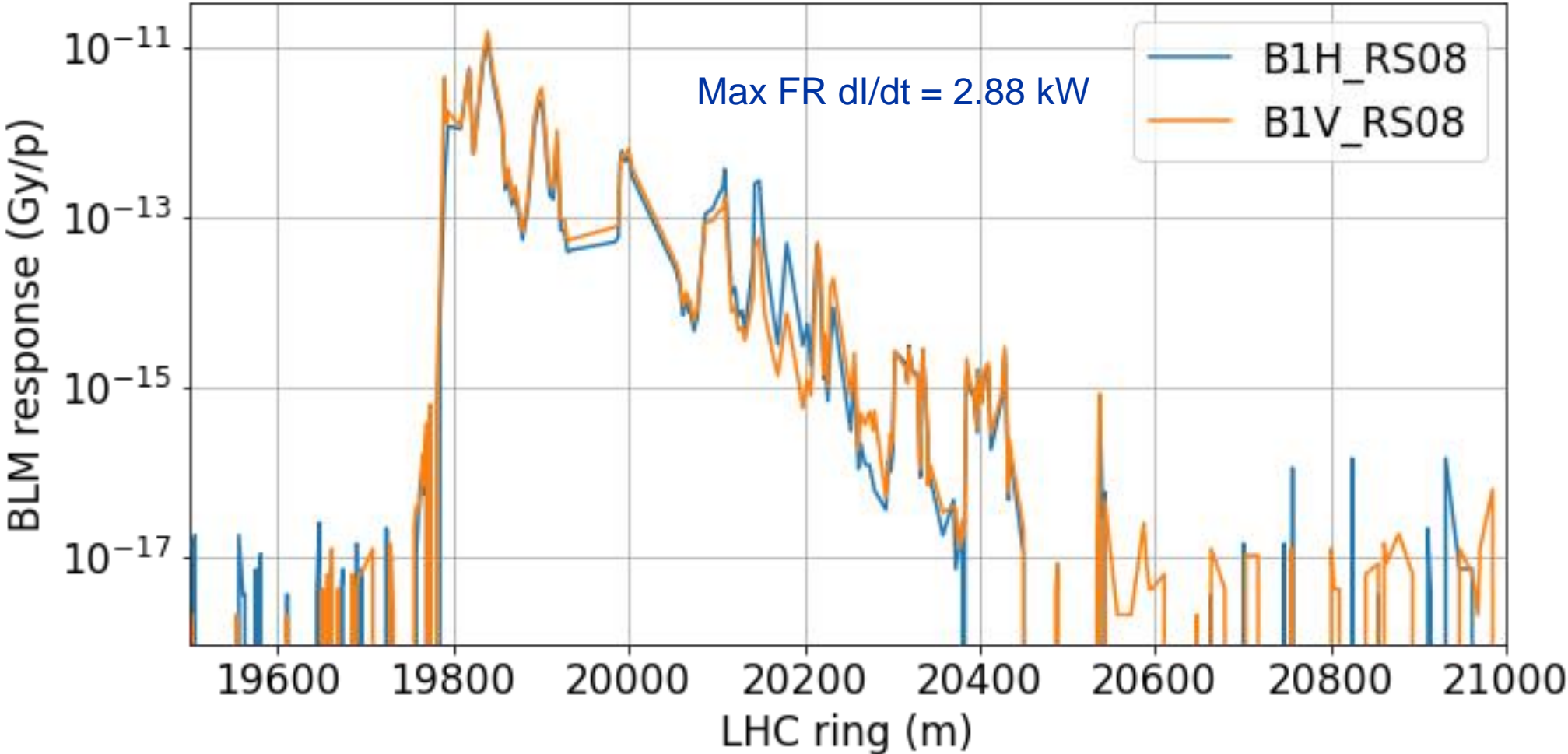
Carlo Emilio Montanari



# Relaxed settings: B1H and B1V



# Relaxed settings: B1H and B1V (zoom)



# B1V - RELAXED SETTINGS

# Primary, Secondary, Absorbers Collimators (B1V)

Scaling of Applied Thresholds from 300 kW to 1MW x 1.2 factor margin  
Keep Monitor Factor at 0.6 and add all the scaling in the master tables.

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_1200kW
BLMTI.06L7.B1W10_TCP.C6L7.B1	THRI_COLL_7_TCPPM_WALL	0.280626	0.6	0.168376	0.003304	0.749537	4.451572	5.341886
BLMTI.06L7.B1W10_TCP.B6L7.B1	THRI_COLL_7_TCP_WALL	0.405438	0.6	0.243263	0.004530	1.027644	4.224417	5.069301
BLMTI.06L7.B1E10_TCP.D6L7.B1	THRI_COLL_7_TCPPM	3.084012	0.6	1.850407	0.011456	2.599304	1.404720	1.685664

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_1200kW
BLMTI.06L7.B2I10_TCSG.6L7.B2	THRI_COLL_7_TCSG_ME	1.468728	0.6	0.881237	0.011772	2.670739	3.030673	3.636807
BLMTI.06L7.B2I10_TCSPM.6L7.B2	THRI_COLL_7_TCSPM_HI	2.316538	0.6	1.389923	0.015706	3.563222	2.563611	3.076334
BLMTI.06L7.B1E10_TCSG.A6L7.B1	THRI_COLL_7_TCSG_HI	3.016372	0.6	1.809823	0.019949	4.525760	2.500664	3.000797
BLMTI.05L7.B2I10_TCSG.B5L7.B2	THRI_COLL_7_TCSG_ME	1.468728	0.6	0.881237	0.008619	1.955354	2.218875	2.662650
BLMTI.05L7.B1E10_TCSG.A5L7.B1	THRI_COLL_7_TCSG_ME	1.468728	0.6	0.881237	0.006924	1.570765	1.782456	2.138947
BLMTI.04L7.B1E10_TCSG.D4L7.B1	THRI_COLL_7_TCSPM_LO	0.619560	0.6	0.371736	0.002734	0.620247	1.668517	2.002220
BLMTI.04R7.B2I10_TCSG.A4R7.B2	THRI_COLL_7_TCSG_LO	0.606921	0.6	0.364153	0.001681	0.381098	1.046534	1.255840
BLMTI.05L7.B1E10_TCSG.B5L7.B1	THRI_COLL_7_TCSG_ME	1.468728	0.6	0.881237	0.003924	0.890146	1.010110	1.212132
BLMTI.04L7.B1E10_TCSG.A4L7.B1	THRI_COLL_7_TCSG_LO	0.606921	0.6	0.364153	0.001411	0.320002	0.878758	1.054509
BLMTI.04R7.B1E10_TCSG.A4R7.B1	THRI_COLL_7_TCSG_LO	0.606921	0.6	0.364153	0.001391	0.315461	0.866287	1.039545

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_1200kW
BLMTI.06L7.B2W10_TCLA.B6L7.B2	THRI_COLL_7_TCLA_HI_WALL	0.367077	0.6	0.220246	0.002998	0.680225	3.088477	3.706172
BLMTI.06L7.B2I10_TCLA.A6L7.B2	THRI_COLL_7_TCLA_HI	5.162335	0.6	3.097401	0.039560	8.975258	2.897674	3.477208
BLMTI.06R7.B1E10_TCLA.D6R7.B1	THRI_COLL_7_TCLA_LO	0.031788	0.6	0.019073	0.000133	0.030107	1.578509	1.894211

# IP7: MQW and MQTL (B1V)

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_1200kW
BLMQI.05L7.B1E10_MQWA.D5L7	THRI.IP7_MQW_FT	0.467096	0.6	0.280258	0.003885	0.881418	3.145028	3.774034

Scaling of Applied Thresholds from 300 kW to 1MW x 3.6 factor margin -> to avoid premature dumps due to low signal during loss maps

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_3600kW
BLMQI.06R7.B1E10_MQTL	THRI.IP7.P1_MQTL_FT	0.007377	0.6	0.004426	0.000055	0.012531	2.831342	10.192832
BLMQI.06R7.B1E20_MQTL	THRI.IP7.P2_MQTL_FT	0.001658	0.6	0.000995	0.000011	0.002472	2.484933	8.945758
BLMQI.06R7.B2I20_MQTL	THRI.IP7.P2_MQTL_FT	0.001658	0.6	0.000995	0.000004	0.000836	0.840283	3.025019



# IP6 (B1V)

Secondary collimator thresholds in IP6 does not need to be increased

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_2000kW
BLMTI.04R6.B1E10_TCSPA4R6.B1	THRI_TCSG	0.04763	1.0	0.04763	8.196039e-05	0.018508	0.388573	0.777145
BLMTI.04L6.B2I10_TCSPA4L6.B2	THRI_TCSG	0.04763	1.0	0.04763	3.811340e-07	0.000004	0.000076	0.000152

MQY thresholds would allow for 1MW but for 1MW x 3.6 margin we would need a factor increase:

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_3600kW
BLMQI.05R6.B1E10_MQY	THRI.LS.P1_MQY_FT	0.004382	0.4	0.001753	0.000007	0.001437	0.819666	2.950798
BLMQI.04R6.B1E10_MQY	THRI.LS.P1_MQY_FT	0.004382	0.4	0.001753	0.000006	0.001319	0.752412	2.708684

Family Name	Factor		Family Name	Factor
THRI_TCSG	-		THRI.LS.P1_MQY_FT	2.95 (Scale to 3.6 MW)
THRI_TCD_RC	-		THRI.LS.P2_MQY	-
			THRI_B1.1_MB	-

# Summary of B1V thresholds proposal

DS bottlenecks - they do not appear in the loss maps. The same increase of 2022 will be applied which comes from previous quench tests.

Propose to Mask the 2 bottlenecks BLMs found during 2022 test that should protect for Beam 2 losses:

BLMTI.06L7.B2I10\_TCLA.A6L7.B2

BLMTI.06L7.B2W10\_TCLA.B6L7.B2

Family Name	Factor		Family Name	Factor
THRI_COLL_7_TCPPM	1.68		*THRI_COLL_7_TCLA_HI	3.7 - BLMTI.06L7.B2I10_TCLA.A6L7.B2
THRI_COLL_7_TCPPM_WALL	5.34		*THRI_COLL_7_TCLA_HI_WALL	3.5 - BLMTI.06L7.B2W10_TCLA.B6L7.B2
THRI_COLL_7_TCP_WALL	5.07		THRI_COLL_7_TCLA_LO	1.90
THRI_COLL_7_TCSG_HI	3.08		THRI.IP7_MQW_FT	3.78
THRI_COLL_7_TCSG_ME	3.64			
THRI_COLL_7_TCSG_LO	1.26			
THRI_COLL_7_TCSPM_HI	3.07		THRI.IP7.P1_MQTL_FT	10.19 (Scale to 3.6 MW)
THRI_COLL_7_TCSPM_LO	2.00		THRI.IP7.P2_MQTL_FT	8.94 (Scale to 3.6 MW)

Family Name	Factor		Family Name	Factor
THRI_TCSG	-		THRI.LS.P1_MQY_FT	2.95 (Scale to 3.6 MW)
THRI_TCD_RC	-		THRI.LS.P2_MQY	-
			THRI_B1.1_MB	-

# B1H - RELAXED SETTINGS

# Primary, Secondary, Absorbers Collimators (B1H)

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_1200kW
BLMTI.06L7.B1W10_TCP.B6L7.B1	THRI_COLL_7_TCP_WALL	0.405438	0.6	0.243263	0.001771	0.893856	3.674445	4.409335
BLMTI.06L7.B1W10_TCP.C6L7.B1	THRI_COLL_7_TCPPM_WALL	0.280626	0.6	0.168376	0.000830	0.418849	2.487587	2.985105

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_1200kW
BLMTI.06L7.B2I10_TCSG.6L7.B2	THRI_COLL_7_TCSG_ME	1.468728	0.6	0.881237	0.005409	2.731043	3.099103	3.718924
BLMTI.06L7.B2I10_TCSPM.6L7.B2	THRI_COLL_7_TCSPM_HI	2.316538	0.6	1.389923	0.007243	3.657220	2.631240	3.157488
BLMTI.06L7.B1E10_TCSG.A6L7.B1	THRI_COLL_7_TCSG_HI	3.016372	0.6	1.809823	0.009316	4.703794	2.599035	3.118842
BLMTI.05L7.B2I10_TCSG.B5L7.B2	THRI_COLL_7_TCSG_ME	1.468728	0.6	0.881237	0.003623	1.829281	2.075812	2.490974
BLMTI.05L7.B1E10_TCSG.A5L7.B1	THRI_COLL_7_TCSG_ME	1.468728	0.6	0.881237	0.002978	1.503597	1.706235	2.047482
BLMTI.04L7.B1E10_TCSG.D4L7.B1	THRI_COLL_7_TCSPM_LO	0.619560	0.6	0.371736	0.001083	0.546879	1.471149	1.765379
BLMTI.04L7.B1E10_TCSG.A4L7.B1	THRI_COLL_7_TCSG_LO	0.606921	0.6	0.364153	0.000911	0.459679	1.262325	1.514790
BLMTI.04R7.B2I10_TCSG.A4R7.B2	THRI_COLL_7_TCSG_LO	0.606921	0.6	0.364153	0.000778	0.392308	1.077316	1.292779
BLMTI.05L7.B1E10_TCSG.B5L7.B1	THRI_COLL_7_TCSG_ME	1.468728	0.6	0.881237	0.001693	0.854628	0.969806	1.163767
BLMTI.04R7.B1E10_TCSG.A4R7.B1	THRI_COLL_7_TCSG_LO	0.606921	0.6	0.364153	0.000682	0.344040	0.944768	1.133722
BLMTI.04L7.B1E10_TCSPM.B4L7.B1	THRI_COLL_7_TCSPM_LO	0.619560	0.6	0.371736	0.000671	0.338425	0.910392	1.092471
BLMTI.04R7.B2I10_TCSPM.B4R7.B2	THRI_COLL_7_TCSPM_LO	0.619560	0.6	0.371736	0.000591	0.297949	0.801507	0.961808

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_1200kW
BLMTI.06L7.B2W10_TCLA.B6L7.B2	THRI_COLL_7_TCLA_HI_WALL	0.367077	0.6	0.220246	0.001651	0.833517	3.784482	4.541379
BLMTI.06L7.B2I10_TCLA.A6L7.B2	THRI_COLL_7_TCLA_HI	5.162335	0.6	3.097401	0.018086	9.132559	2.948459	3.538150
BLMTI.06R7.B1E10_TCLA.D6R7.B1	THRI_COLL_7_TCLA_LO	0.031788	0.6	0.019073	0.000071	0.035966	1.885721	2.262865
BLMTI.06R7.B1E10_TCLA.C6R7.B1	THRI_COLL_7_TCLA_LO	0.031788	0.6	0.019073	0.000043	0.021293	1.116430	1.339716

# IP7: MQW and MQTL (B1H)

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_1200kW
BLMQI.05L7.B1E10_MQWA.D5L7	THRI.IP7_MQW_FT	0.467096	0.6	0.280258	0.001771	0.893972	3.189820	3.827784
BLMQI.05L7.B1E10_MQWB.5L7	THRI.IP7_MQW_FT	0.467096	0.6	0.280258	0.000460	0.232367	0.829118	0.994941

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_3600kW
BLMQI.06R7.B1E10_MQTL	THRI.IP7.P1_MQTL_FT	0.007377	0.6	0.004426	0.000015	0.007471	1.687944	6.076598
BLMQI.06R7.B1E20_MQTL	THRI.IP7.P2_MQTL_FT	0.001658	0.6	0.000995	0.000004	0.001649	1.657581	5.967290
BLMQI.06R7.B2I20_MQTL	THRI.IP7.P2_MQTL_FT	0.001658	0.6	0.000995	0.000002	0.000963	0.968177	3.485436

# IP6 (B1H)

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_2000kW
BLMTI.04R6.B1E10_TCSPA4R6.B1	THRI_TCSG	0.04763	1.0	0.04763	4.584877e-04	0.231336	4.856984	9.713967
BLMTI.04L6.B2I10_TCSPA4L6.B2	THRI_TCSG	0.04763	1.0	0.04763	3.866577e-07	0.000005	0.000113	0.000227

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_2000kW
BLMTI.04R6.B1E10_TCDQM.4R6.B1	THRI_TCD_RC	0.127424	1.0	0.127424	3.222847e-04	1.626162e-01	1.276182	2.552364
BLMTI.04R6.B1E10_TCDQA.B4R6.B1	THRI_TCD_RC	0.127424	1.0	0.127424	4.682425e-05	2.351538e-02	0.184544	0.369089

BLM_NAME	FAMILY_NAME	MASTER_THRES_RS08	MONITOR_FACTOR	THRES_RS08	BLM_MAX_VAL_RS08	RS08_1MW	RS08_ratio_signal_thres_1MW	RS08_ratio_signal_thres_3600kW
BLMQI.05R6.B1E10_MQY	THRI.LS.P1_MQY_FT	0.004382	0.400	0.001753	0.000052	0.025946	14.802251	53.288103
BLMQI.04R6.B1E10_MQY	THRI.LS.P1_MQY_FT	0.004382	0.400	0.001753	0.000044	0.021870	12.477221	44.917994
BLMQI.04R6.B1E20_MQY	THRI.LS.P2_MQY	0.004382	0.500	0.002191	0.000025	0.012176	5.557184	20.005862
BLMQI.05R6.B1E20_MQY	THRI.LS.P2_MQY	0.004382	0.500	0.002191	0.000016	0.007949	3.627904	13.060453
BLMBI.08R6.B0T10_MBA-MBB_08R6	THRI.ARDS_MBMB	0.001973	0.333	0.000657	0.000003	0.001345	2.046513	7.367445
BLMQI.04R6.B2I20_MQY	THRI.LS.P2_MQY	0.004382	0.500	0.002191	0.000009	0.004462	2.036320	7.330754
BLMQI.04R6.B1E30_MQY	THRI.LS.P3_MQY	0.087640	0.333	0.029184	0.000109	0.054637	1.872152	6.739747
BLMQI.04R6.B2I10_MQY	THRI.LS.P1_MQY_FT	0.004382	0.400	0.001753	0.000006	0.002619	1.494258	5.379329
BLMAI.05R6.B1E10_DFBLB	THRI_B1.1_MB	0.007862	1.000	0.007862	0.000017	0.008552	1.087809	3.916112
BLMQI.05R6.B2I20_MQY	THRI.LS.P2_MQY	0.004382	0.500	0.002191	0.000003	0.001397	0.637792	2.296052
BLMQI.05R6.B1E30_MQY	THRI.LS.P3_MQY	0.087640	0.333	0.029184	0.000033	0.016602	0.568856	2.047881

# Summary of B1H thresholds proposal

DS bottlenecks - they do not appear in the loss maps. The same increase of 2022 will be applied which comes from previous quench tests.

Family Name	Factor		Family Name	Factor
THRI_COLL_7_TCPPM	-		*THRI_COLL_7_TCLA_HI	3.53 - BLMTI.06L7.B2I10_TCLA.A6L7.B2
THRI_COLL_7_TCPPM_WALL	2.99		*THRI_COLL_7_TCLA_HI_WALL	4.54 - BLMTI.06L7.B2W10_TCLA.B6L7.B2
THRI_COLL_7_TCP_WALL	4.40		THRI_COLL_7_TCLA_LO	2.26
THRI_COLL_7_TCSG_HI	3.11		THRI.IP7_MQW_FT	3.82
THRI_COLL_7_TCSG_ME	2.49			
THRI_COLL_7_TCSG_LO	1.51			
THRI_COLL_7_TCSPM_HI	3.16		THRI.IP7.P1_MQTL_FT	6.07 (Scale to 3.6 MW)
THRI_COLL_7_TCSPM_LO	1.76		THRI.IP7.P2_MQTL_FT	5.96 (Scale to 3.6 MW)

Family Name	Factor		Family Name	Factor
THRI_TCSG	9.71		THRI.LS.P1_MQY_FT	53 (Scale to 3.6 MW)
THRI_TCD_RC	2.55		THRI.LS.P2_MQY	20.00
			+ OTHERS	+

# Summary

- Factors needed to allow 1000 kW with Relaxed collimator settings presented
- BLM thresholds proposed contain some margin:
  - High response channels they are set to 1000 kW x 1.2 margin
  - Low response channels they are set to 1000 kW x 3.6 margin
- B1V has less leakage into IR6
- **Next steps:**
  - **Create new families \_QT24 with the required factors applied to ALL RS**
  - **Fix RS08-RS12 to RS08**
  - **Monitor factors remain unchanged (i.e. MF = 0.6)**
- **During test:**
  - **Before test: DB state will be acquired.**
  - **After recovery: DB state will be compared to the one applied.**