BLM Thresholds for the 2024 Ion Quench Test

Sara Morales Vigo and Belen Salvachua

Ad-hoc BLM Thresholds WG Meeting
15/11/2024

BLM Thresholds Power Loss Limits for B1H - Today

- 2024 Ion Quench test scheduled for the 24th of November, increasing losses in **B1H** with crystal in **channeling**
- Power loss limits for the **master thresholds** RS09 (1.3 s) at top energy in **B1H** with the dedicated ion families
- Overall, B1H limit of ~55kW in channeling, ~16kW in amorphous, ~17kW in VR

BLM Family Name	Power Loss Limit Channeling B1H [kW]	Power Loss Limit Amorphous B1H [kW]	Power Loss Limit Volume Reflection B1H [kW]	
THRI_COLL_7_TCLA_LO_ION	113	**20**	30	IR7 collimators
THRI_COLL_7_TCSPM_LO_ION_H_CH	**66**	329	217	
THRI_COLL_7_TCSPM_LO_ION_V_CH	25840	16644	7456	
THRI_COLL_7_TCSG_LO_ION_H_CH	**55**	257	148	
THRI_COLL_7_TCSG_ME_ION_V_CH	6491	1263	934	
THRI_COLL_7_TCSG_ME_ION_V_AM	375	68	32	
THRI_COLL_7_TCSPM_LO_ION_H_AM	118	**22**	**17**	
THRI.IP7.P1_MQTL_FT_ION_COLL	237	42	64	IR7 Q6
THRI.IP7.P2_MQTL_FT_ION_COLL	298	55	77	
THRI.IP7.P2_MB_ION_COLL	81	**16**	**24**	IR7 DS
THRI.IP7.P3_MB_ION_COLL	312	59	95	
THRI.ARDS_MBMB_ION_COLL	294	45	85	
THRI.ARDS.P1_MQ_ION_COLL	177	31	82	
THRI.ARDS.P3_MQ_ION_COLL	6512	653	421	

New family created for bottleneck this year, in V plane

Target power loss in each RS in channeling

RS	Duration	kW channeling operation	kW channeling quench test?
RS01	40 us	375000	625000
RS02	80 us	187500	312500
RS03	320 us	46875	78125
RS04	640 us	23438	39062
RS05	2.56 ms	5859	9766
RS06	10.24 ms	1465	2441
RS07	81.92 ms	732	1221
RS08	655 ms	91	153
RS09	1.3 s	60	100
RS10	5.2 s	60	100
RS11	21 s	29	48
RS12	84 s	24	40

Do we want to change the target power loss limit from ~60kW to ~100kW in RS09/RS10 (scaling similarly the rest of RS) for the quench test?

Factors needed to reach 100kW (RS09-10) in B1H Channeling

BLM Family Name (B1 / B2)	RS01	RS02	RS03	RS04	RS05	RS06	RS07	RS08	RS09	RS10	RS11	RS12
THRI_COLL_7_TCLA_LO_ION	Max	Max	Max	Max	1.2	1.2	0.9	0.9	0.9	0.9	0.9	1.2
THRI_COLL_7_TCSPM_LO_ION_H_CH	Max	Max	Max	Max	Max	Max	1.6	1.6	1.5	1.5	1.5	1.5
THRI_COLL_7_TCSPM_LO_ION_V_CH	Max	Max	Max	Max	Max	0.004	0.004	0.004	0.004	0.004	0.003	0.001
THRI_COLL_7_TCSG_LO_ION_H_CH	Max	Max	Max	Max	Max	Max	1.6	1.6	1.8	1.8	1.8	1.8
THRI_COLL_7_TCSG_ME_ION_V_CH	Max	Max	Max	Max	Max	0.02	0.01	0.01	0.02	0.02	0.01	0.01
THRI_COLL_7_TCSG_ME_ION_V_AM	0.17	0.14	0.1	0.1	0.1	0.4	0.3	0.3	0.3	0.3	0.2	0.1
THRI_COLL_7_TCSPM_LO_ION_H_AM	Max	Max	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	1.5
THRI.IP7.P1_MQTL_FT_ION_COLL	Max	Max	0.7	0.7	0.7	0.7	1.0	0.6	0.4	0.4	0.2	0.2
THRI.IP7.P2_MQTL_FT_ION_COLL	Max	Max	0.1	0.1	0.1	0.1	0.8	0.5	0.3	0.3	0.2	0.1
THRI.IP7.P2_MB_ION_COLL	9.9	8.9	4.3	3.6	0.9	0.9	1.2	1.2	1.2	1.2	1.1	1.1
THRI.IP7.P3_MB_ION_COLL	6.9	3.9	1.6	1.3	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.6
THRI.ARDS_MBMB_ION_COLL	1	0.6	0.6	0.5	0.4	0.2	0.2	1	0.4	0.3	0.4	0.6
THRI.ARDS.P1_MQ_ION_COLL	1.4	1.1	0.6	0.5	0.2	0.2	0.8	0.6	0.6	0.6	0.6	0.5
THRI.ARDS.P3_MQ_ION_COLL	0.07	0.04	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.004

Max: Threshold already at maximum electronics limit
In red: would need to apply factor to reach 100kW (RS09-10) or equivalent
In green: not limiting

Other bottlenecks:

- BLMTI.06R7.B1E10_TCLA.C6R7.B1 and BLMTI.06L7.B2I10_TCLA.C6L7.B2 in THRI_COLL_7_TCLA_LO, **factor 1.1 in RS07-08**
- BLMQI.06R7.B2I20_MQTL in THRI.IP7.P2_MQTL_FT, **factor 1.2 in RS07, 1.1 in RS08 -> move to THRI.IP7.P2_MQTL_FT_ION_COLL?**
- BLMs with a filter in THRI_TCD_RC would need corrections in RS01-04, not sure about scaling