

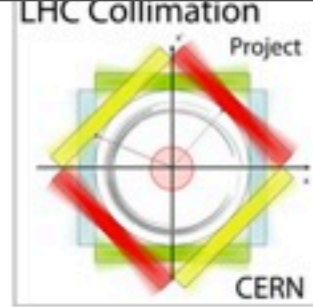


Proposal for BLM thresholds in IR7

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Introduction



Recently we had some fills dumped by beam loss with losses occurring at primary collimators with $\sim 50\text{-}60\text{kW}$

- ➡ Compare losses in these fills with losses during collimation loss maps
- ➡ Calculate new BLM thresholds for higher power loss

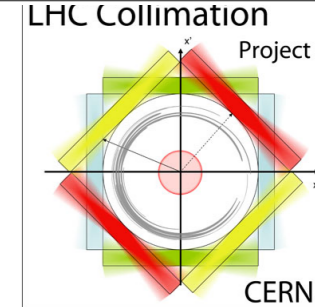
Why can we go up?

- ➡ The collimation system is designed for 500kW losses in IR7 for up to 10 s (200 kW continuously)
- ➡ In MD we tested the collimation system for 500kW for $1\text{-}2\text{ s}$ without quench

Target value for losses without dump: 200kW , as tentatively agreed at rMPP



Two Physics Fills Analyzed



Beam Dump during SQUEEZE

Date	Fill	Reason
2012-05-06 12:36:02	2589	Losses in Q4.L6
2012-05-07 04:34:12	2592	Losses in Q4.L6

During these fills the power loss before dump was $\sim 50-60\text{kW}$.
Beam lost at primary collimators and then cleaned away

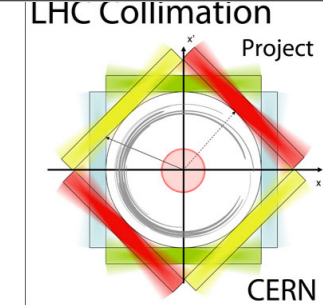
Leakage to IR6 TCGS resulted in high BLM signal at Q4 which then triggered beam dump.

We verified that these squeeze losses are very close to collimation loss maps. So we can use collimation loss maps to define thresholds.

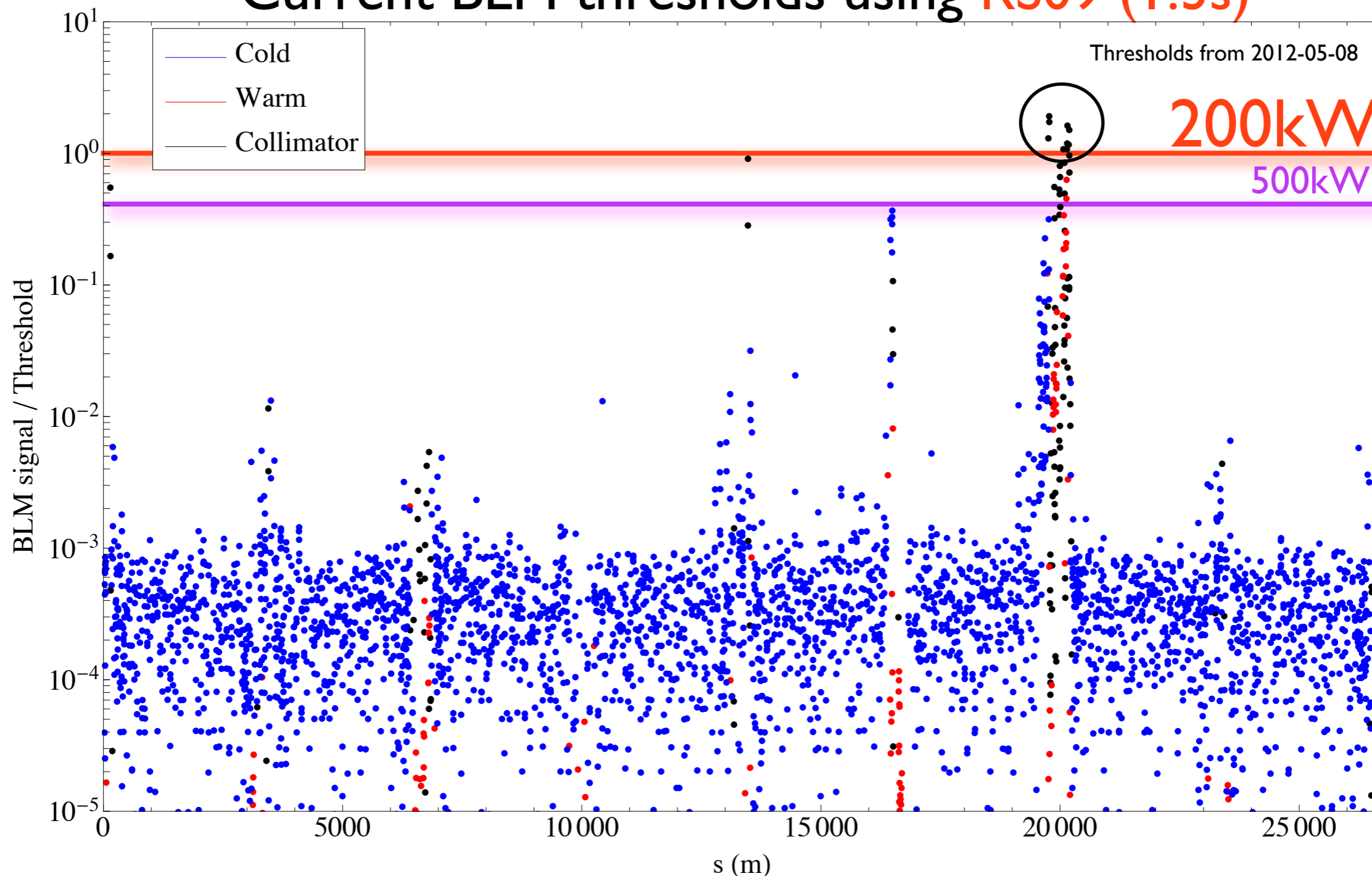


Ratio Loss to Threshold

(Loss map B2 HOR)



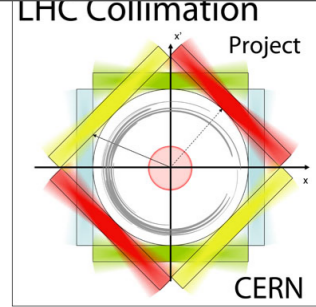
Comparison of expected losses for 200kW with
Current BLM thresholds using **RS09 (1.3s)**



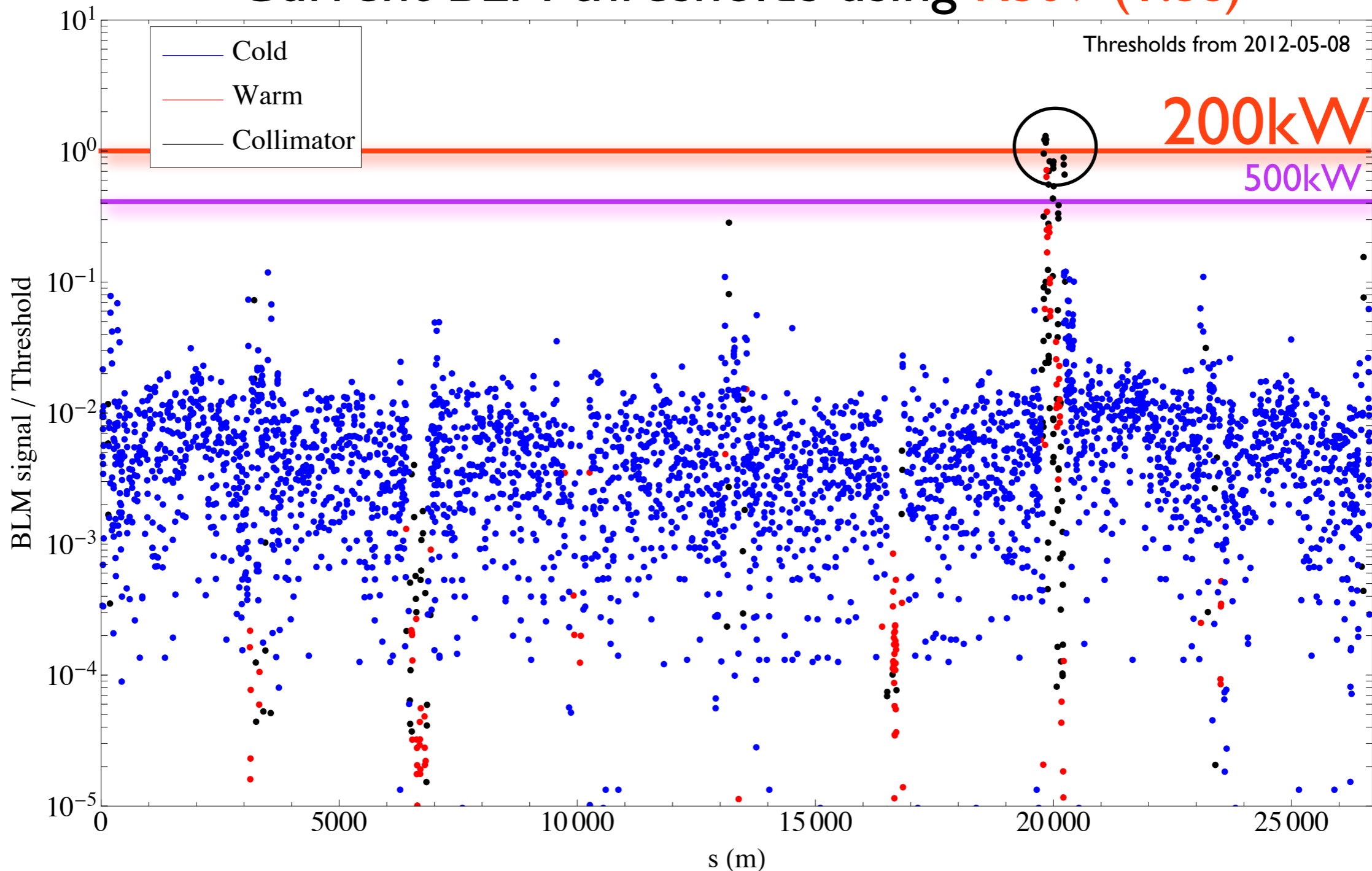


Ratio Loss to Threshold

(Loss map BI VER)



Comparison of expected losses for 200kW with
Current BLM thresholds using **RS09 (1.3s)**



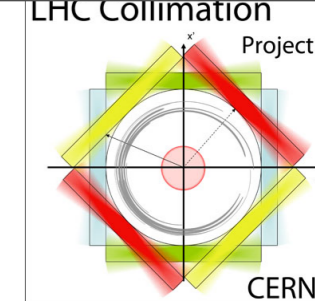
16th May 2012

D. Wollmann & B. Salvachua



Increase Factors for BLM Thresholds

(200 kW, max BI/2 and H/V)



From BI and B2 loss maps:

RS09

Thresholds from 2012-05-08

BLM name	s [m]	Ratio 200kW/Current	Current [Gy/s]
BLMEI.06L7.B2I10_TCLA.D6L7.B2	19773.09	1.92	0.003501531
BLMEI.06L7.B2I10_TCLA.C6L7.B2	19775.09	1.73	0.003501531
BLMEI.06R7.B2I10_TCSG.A6R7.B2	20154.65	1.68	0.8751161
BLMEI.06R7.B2I10_TCP.A6R7.B2	20192.14	1.51	1.750238
BLMEI.06L7.B1E10_TCP.A6L7.B1	19796.18	1.41	1.750238
BLMEI.06R7.B1E10_TCLA.C6R7.B1	20213.23	1.41	0.003501531
BLMEI.06R7.B1E10_TCLA.D6R7.B1	20215.23	1.37	0.003501531
BLMEI.06L7.B1E10_TCSG.A6L7.B1	19833.68	1.30	0.8751161
BLMEI.07L7.B2I10_TCLA.A7L7.B2	19755.46	1.30	0.001750764
BLMEI.06L7.B2I10_TCSG.6L7.B2	19846.3	1.22	0.8751161
BLMEI.06L7.B2I10_TCLA.B6L7.B2	19808.36	1.22	2.187791
BLMEI.06R7.B1E10_TCLA.B6R7.B1	20179.96	1.22	2.187791
BLMEI.07R7.B1E10_TCLA.A7R7.B1	20232.86	1.19	0.001750764
BLMEI.06R7.B1E10_TCLA.A6R7.B1	20149.09	1.19	2.187791
BLMEI.06L7.B2I10_TCLA.A6L7.B2	19839.24	1.16	2.187791
BLMEI.06R7.B1E10_TCSG.6R7.B1	20142.02	1.08	0.8751161
BLMEI.04R7.B2I10_TCSG.D4R7.B2	20070.09	1.08	0.1750286

Increase of BLM thresholds (families)

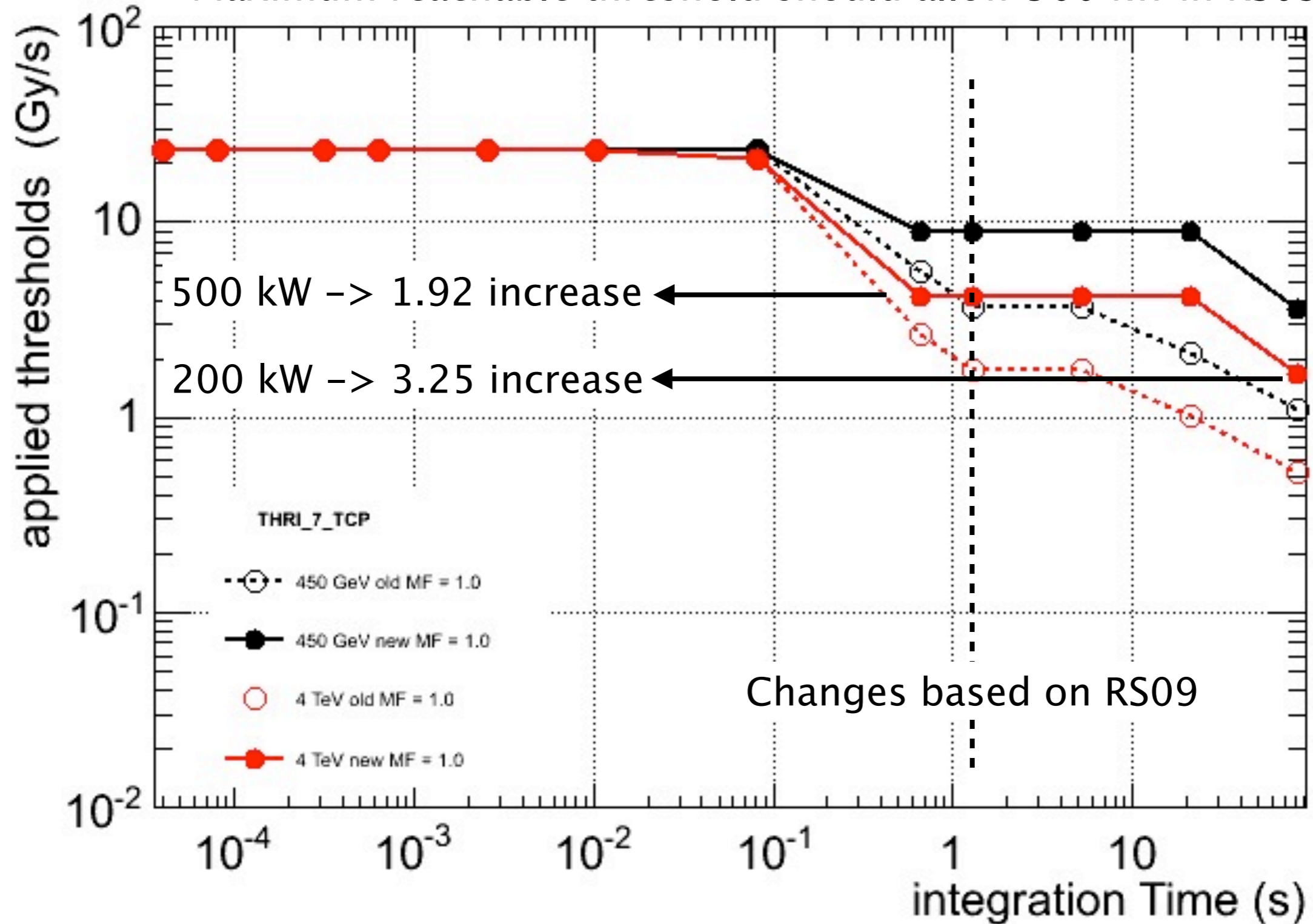
- 17 (37) collimators require threshold increase of up to a factor ~ 2 (~ 5) in RS09 in order to allow 200 kW (500 kW).
- For consistency we propose to change thresholds for all monitors belonging to one family in which at least one BLM require increase.
- Approach: Master threshold (MF = 1) allow 500 kW (200 kW) in RS09 (RS12). Set MF = 0.4 to allow 200kW (80 kW).

Family name	App thres (Gy/s)	MF	# of monitors	Factor
THRI_7_TCP	1.7500	1	6	2.5
THRI_7_TCSG	0.1750	1	13	2.7
THRI_7_TCSG_F5	0.8751	1	10	4.2
THRI.06_7_A_TCLA	2.1880	1	2	3.0
THRI.06_7_B_TCLA	2.1880	1	2	3.1
THRI.06_7_C_TCLA	0.0035	0.2	2	4.4
THRI.06_7_D_TCLA	0.0035	0.2	2	4.8
THRI.07_7_A_TCLA	0.0018	0.1	2	3.3
THRI.07_7_B_TCLA	0.0018	0.1	2	< 1.0
THRI_MQW	0.18	0.5	48	1.8

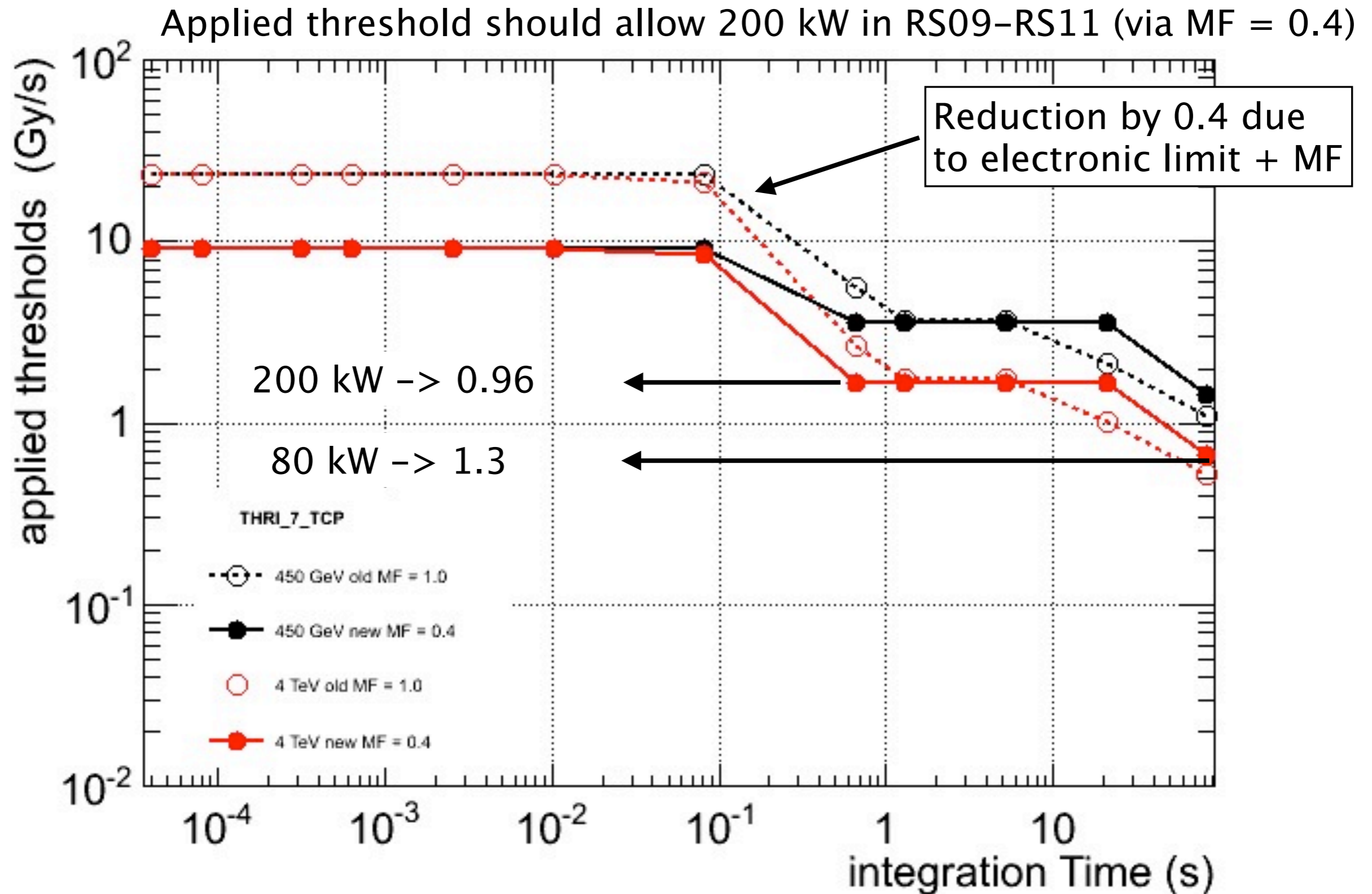
41 BLMs at collimators and 48 BLMs at warm magnets

Threshold comparison I (TCP)

Maximum reachable threshold should allow 500 kW in RS09-RS11



Threshold comparison II (TCP)



Threshold comparison III (families with MF=1)

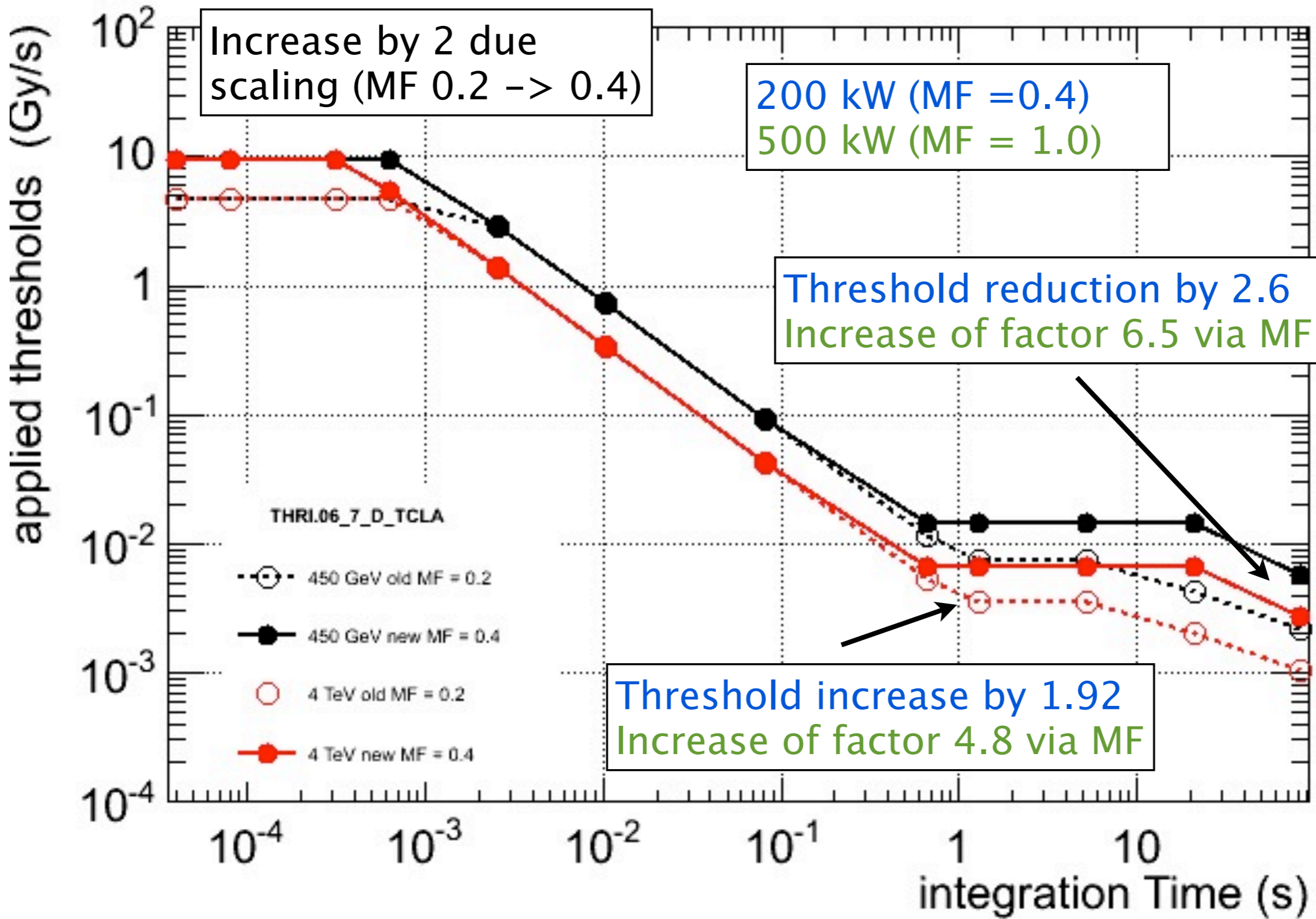
Ratio of proposed thresholds to current thresholds.

Family name	Ratio (MF =0.4)			Ratio (MF= 1.0)		
	RS01	RS09	RS12	RS01	RS09	RS12
THRI_7_TCP	0.4	0.96	1.30	1.0	2.4	3.25
THRI_7_TCSG	0.4	1.08	1.46	1.0	2.7	3.65
THRI_7_TCSG_F5	0.4	1.68	2.27	1.0	4.2	5.675
THRI.06_7_A_TCLA	0.4	1.24	1.68	1.0	3.1	4.2
THRI.06_7_B_TCLA	0.4	1.24	1.68	1.0	3.1	4.2

signals/threshold < 0.1 systematically in RS01/RS05/RS07 for fills 2589 and 2592 (BLMs at TCP.C/B6L7.B1 went to 0.11 during injection).

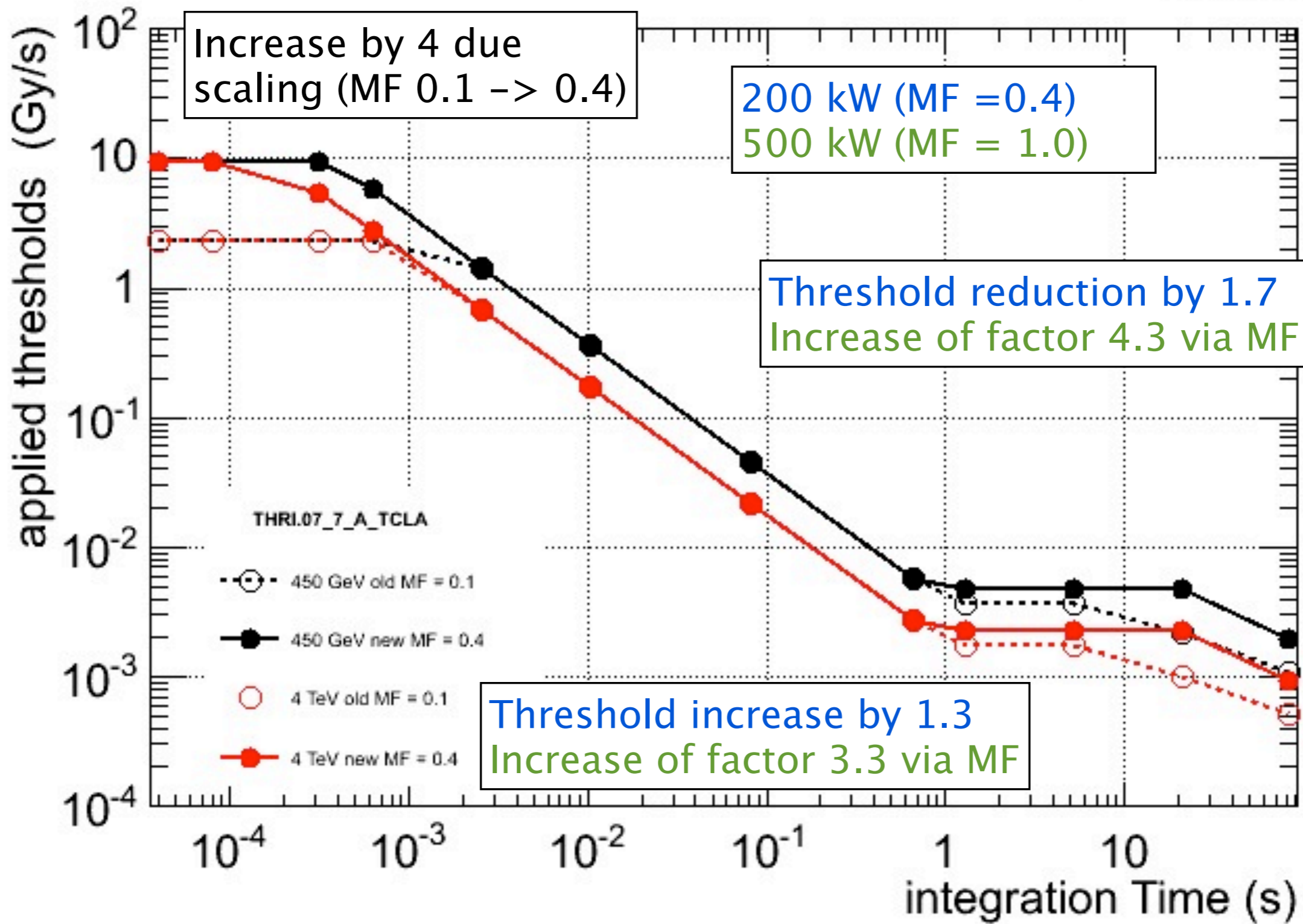
Threshold comparison IV. THRI.06_7_C/D_TCLA

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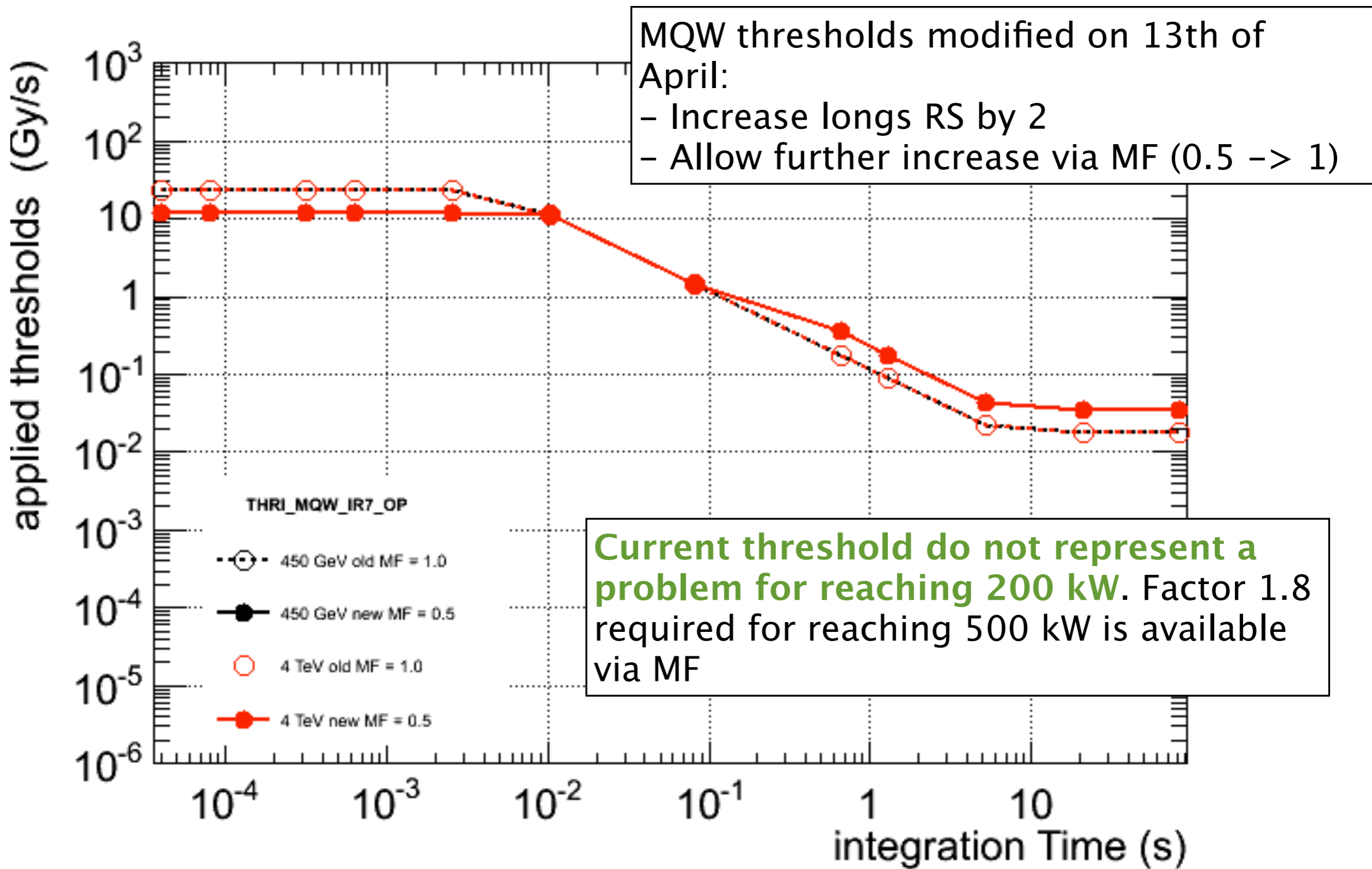


Threshold comparison V. THRI.07_7_A/B_TCLA

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Threshold comparison VI. THRI_MQW



Summary and Conclusions

- Thresholds adapted to be able to reach 500 kW (200 kW) in the 1.3 s (83 s) running sum and above via MF.
- $MF = 0.4 \implies 200 \text{ kW (80 kW)}$ in the 1.3 s (83 s) running sum
- In order to not dump in previous integration windows RS08 (0.655 s) is required increase to be increased to the same dose rate as in RS09.
- Allowed dose rate constant between 0.655s and 20 s.
- Thresholds generally decrease by 2.5 in the short RS due to the use of the MF
- No need to modify thresholds on MQWs for reaching 200 kW. Factor 2 available via MF.

Extra Slides

Master Threshold. THRI.06_7_C/D_TCLA

