





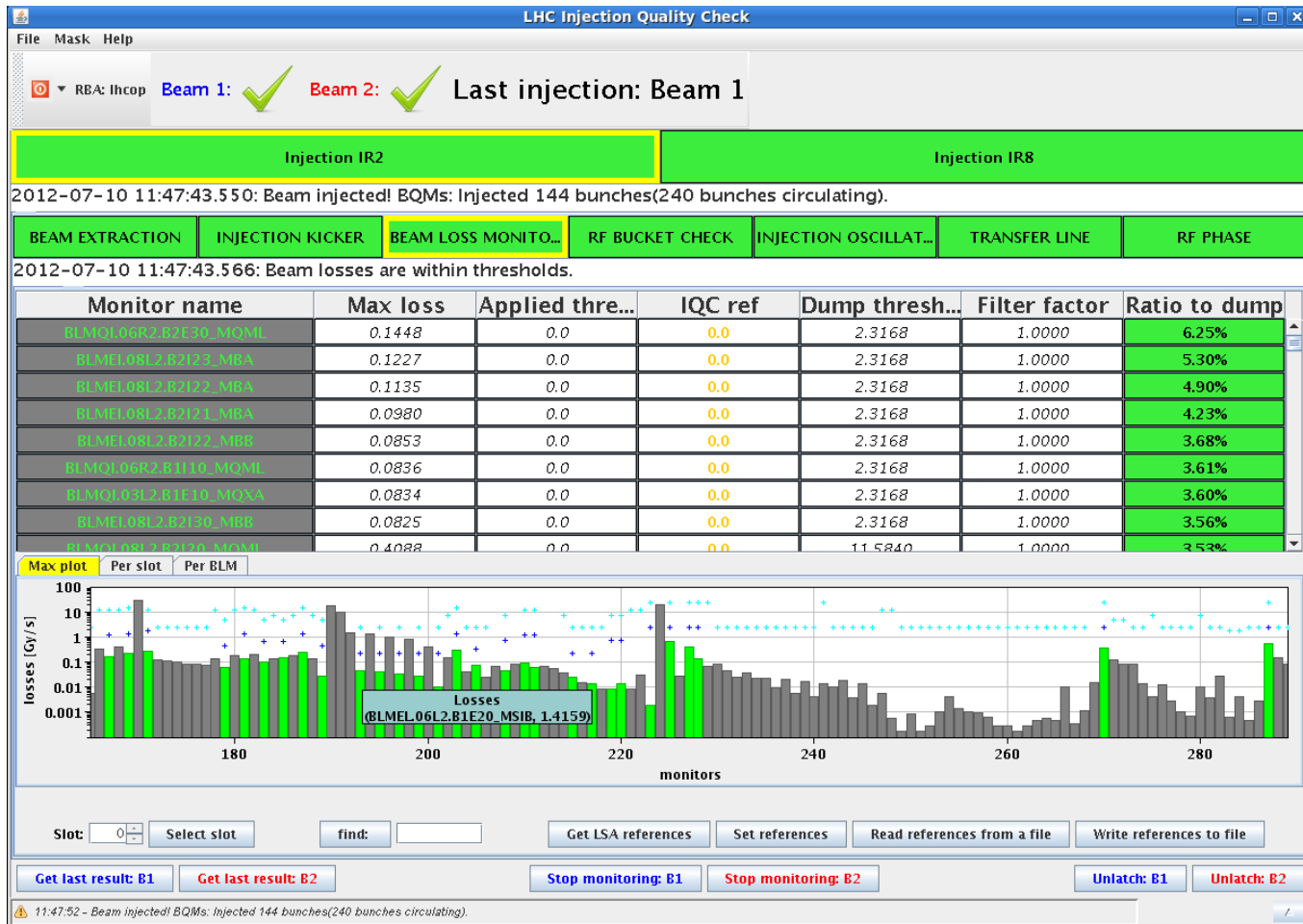
149th SPS and LHC Machine
Protection Panel Meeting
June 23, 2017

Injection Quality Check: present and future modifications

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Pedersen, C. Zamantzas, M. Gabriel

The IQC

- Very powerful tool, which is used to assist the LHC injection phase
 - It relies on **many** operational tools
 - Possibly blocks the next injection if the present one was not OK



How to improve the IQC?

Wolfgang, Chiara and Florian

- Run 1, 144 bpi, 25 ns, 2012
 - injection losses were dominated by TL shower
- Run 2, 96 bunches
 - Injection losses mostly dominated by satellites

- Mitigation of longitudinal losses in LHC:
 - Injection gap cleaning put in operation to reduce losses from un-bunched beam
 - Increase MKI pulse length
 - Sunglasses

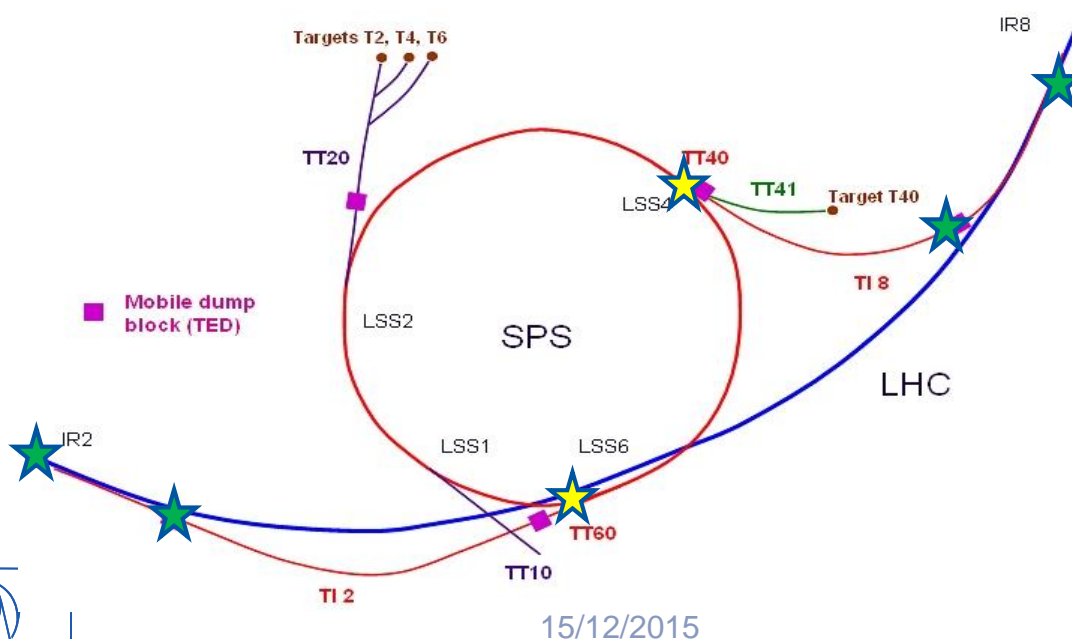
- The request came on how to improve the interpretation of losses at injection, keeping in mind that
 - Transverse losses scale relatively well with injected intensity
 - Longitudinal losses are much more dependent on beam type (Standard vs BCMS, 12b) and equipment configuration (PS cavities for bunch rotation, MKI flattop length) than number of bunches injected

DBLMs for extraction / injection

Florian, Christos and Stephan

- Monitor injection losses / beam quality with nanosecond time resolution
 - @ TPSG in the SPS for extraction losses
 - @ TCDIh in TI2 and TI8
 - @ TDI to measure injection losses
 - in combination with dBLMs at the TCPs in Pt7

★ IR7



	Read-out	PM
TDI Pt2	Scope	x
TDI Pt2 – low gain	Scope	x
TDI Pt8	Scope	x
TDI Pt8 – low gain	Scope	x
TCDI TI2	Scope	x
TCDI TI2 – low gain	Scope	x
TCDI TI8	Scope	x
TCDI TI8 – low gain	Scope	x
TPSG BA4	Scope	x
TPSG BA6	Scope	x
TCP & crystals dBLMs IR7	ROSY	eos

Integration of dBLMs in IQC

Florian

- Make diamond detector data visible in IQC.
- Identify origin of losses at injection:
 - PS ghost bunches
 - SPS recaptured beam
 - Scraping failures
 - Pilot beam over-injection on MKI rise or fall
 - Functioning of injection gap cleaning
 - Losses due to kicked circulating beam or injected beam
- Measure MKI rise, f.t. and fall time.

9/20/2016 F. Burkart - LIBD 5

IQC

2016-09-19 2:38:49.885: Beam injected! BQMs: Injected 1 bunches(1 bunches circulating).

2016-09-19 2:38:49.901: Beam losses are within thresholds.

Monitor name	Max loss	IQC applied	IQC ref	Dump threshold	Ratio to dump
BLMOI.08L2.B1E10_MQML	0.0006	0.0479	2.3	2.3168	0.41%
BLMOI.07L2.B1E10_MQML	0.0030	0.0192	0.92	2.3168	0.13%
BLMOI.08L2.B1E30_MQML	0.0156	0.0479	2.3	11.5840	0.13%
BLMOI.07L2.B2I20_MQML	0.0035	0.0483	2.32	3.4752	0.10%
BLMAI.08L2.B2I20_MBA	0.0006	0.0	0.0	8.3405	0.08%
BLMEI.08L2.B1E20_MHIB	0.0057	0.0096	0.46	7.7149	0.07%
BLMEI.08L2.B1E20_MHIB	0.0016	0.0096	0.46	2.3168	0.07%
BLMEI.08L2.B1E20_MHIB	0.0016	0.0096	0.46	2.3168	0.07%

Max plot | Per slot | Per BLM

Get LSA references | Set references | Read references from a file | Write references to file | Slot: | Select slot | Find

Playback | Previous event | Replay event | Next event | Show data dump

No Exception to display...

12:54:00 - WARNING: NO OCCURRENCE FOR BLM/HIC/BLM/DRZ/R/CD16.CH12

Add additional tab and visualize dBLM data.

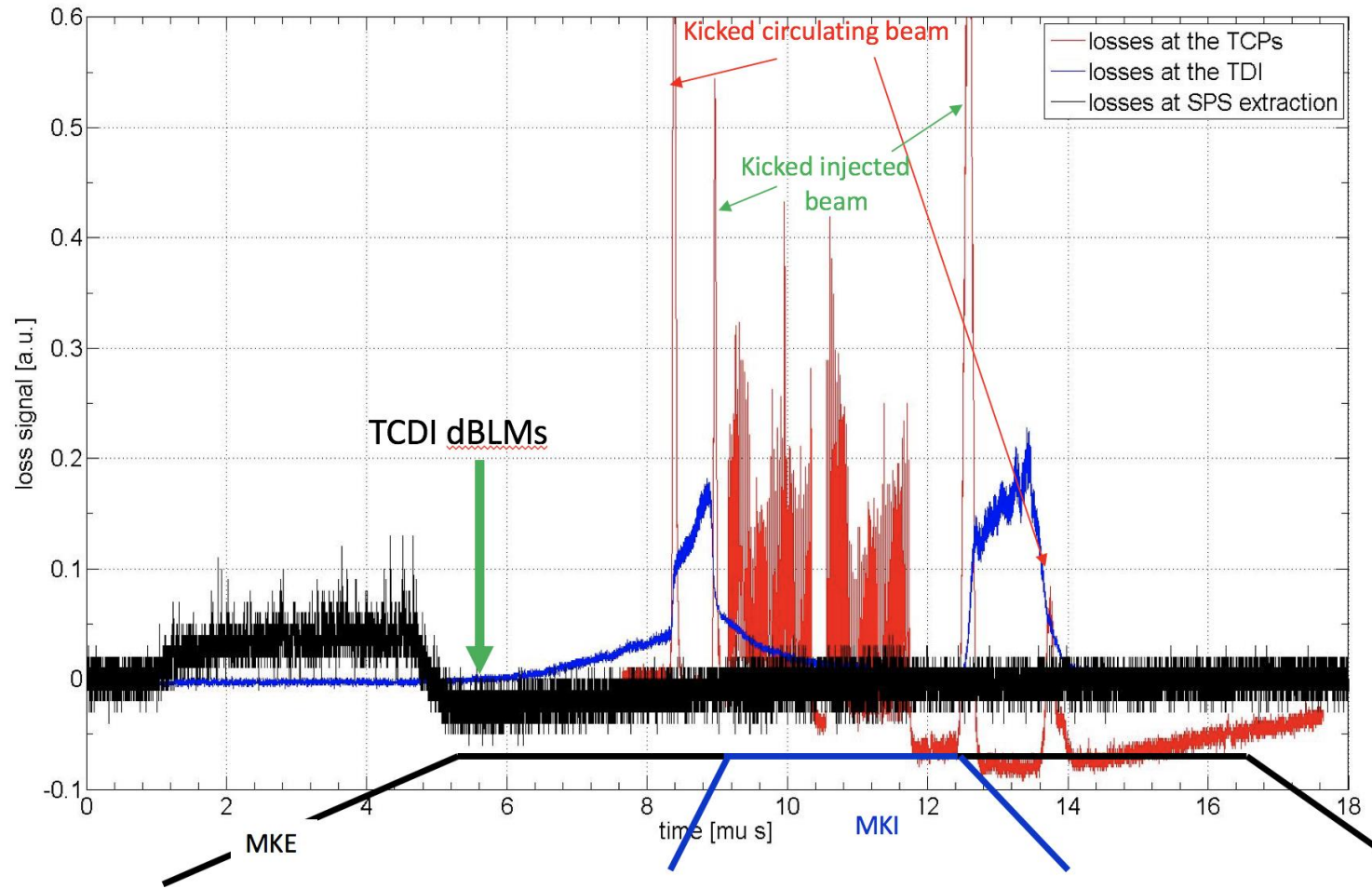
Which signals should be available?

9/20/2016

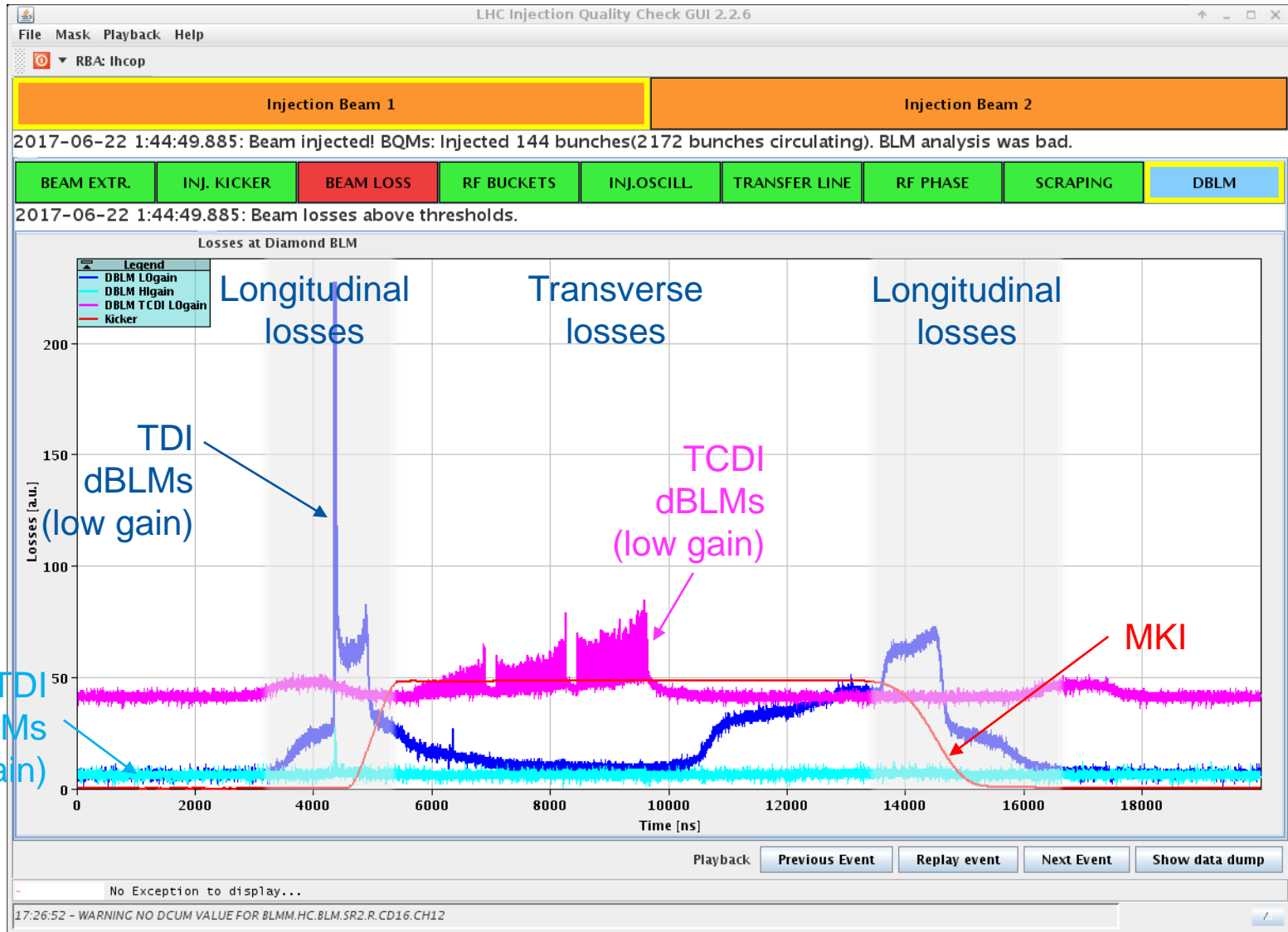
F. Burkart - LBOC

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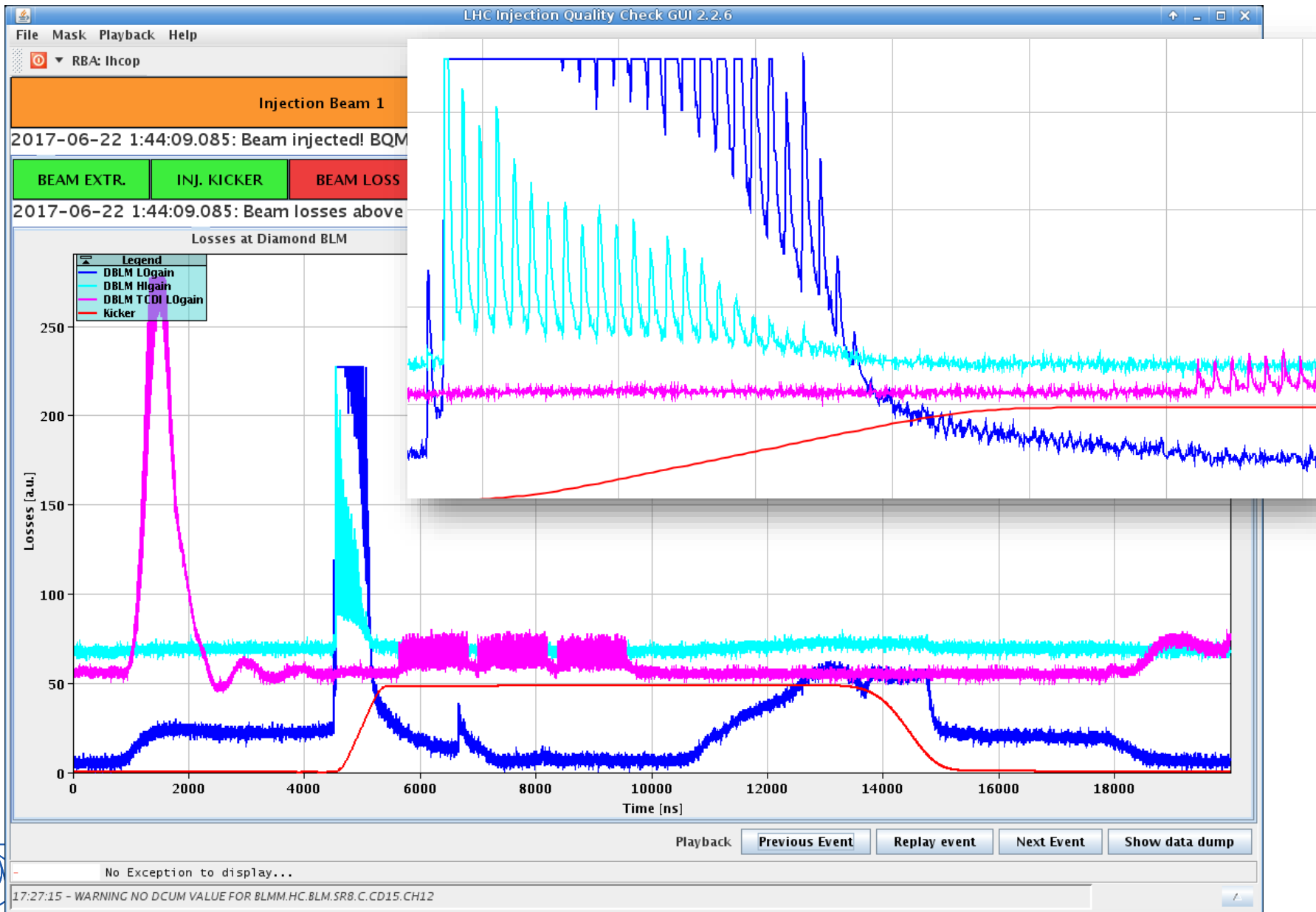
In combination with the other dBLMs



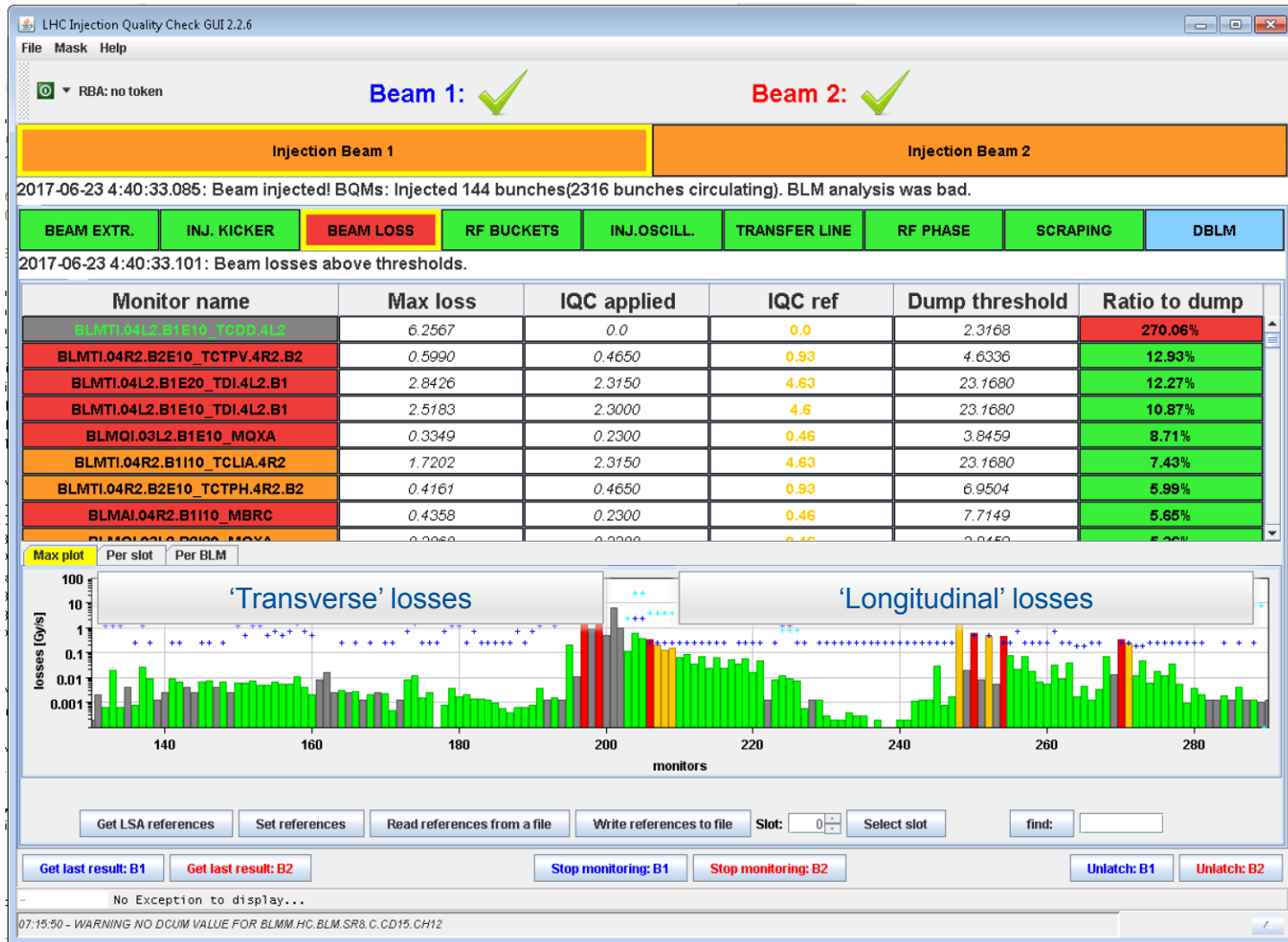
New IQC dBLM module



New IQC dBLM module_cont



Next step: improve 'beam loss' panel



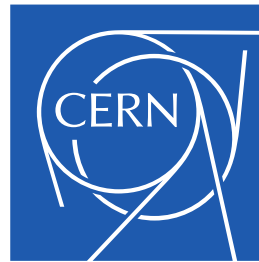
Modification of the IQC thresholds

Wolfgang and Chiara

- Transverse plane is ok as it is
 - Should have enough margin for 288 b and 4.5 sig TCDI settings

- Suggest static thresholds for longitudinal plane losses:
 - TDI:
 - Loss < 30% - green
 - Loss between 30% and 50% - orange
 - Loss > 50% - red
 - MQX:
 - Loss < 10% - green
 - Loss between 10% and 25% - orange
 - Loss > 25% - red

Thank you for the attention!



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