LHC Collimator Working Group meeting

Geneva, 16th June 2008

Preliminary results of TI2 collimator beam commissioning

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Special thanks to R. Giachino

Hardware involved

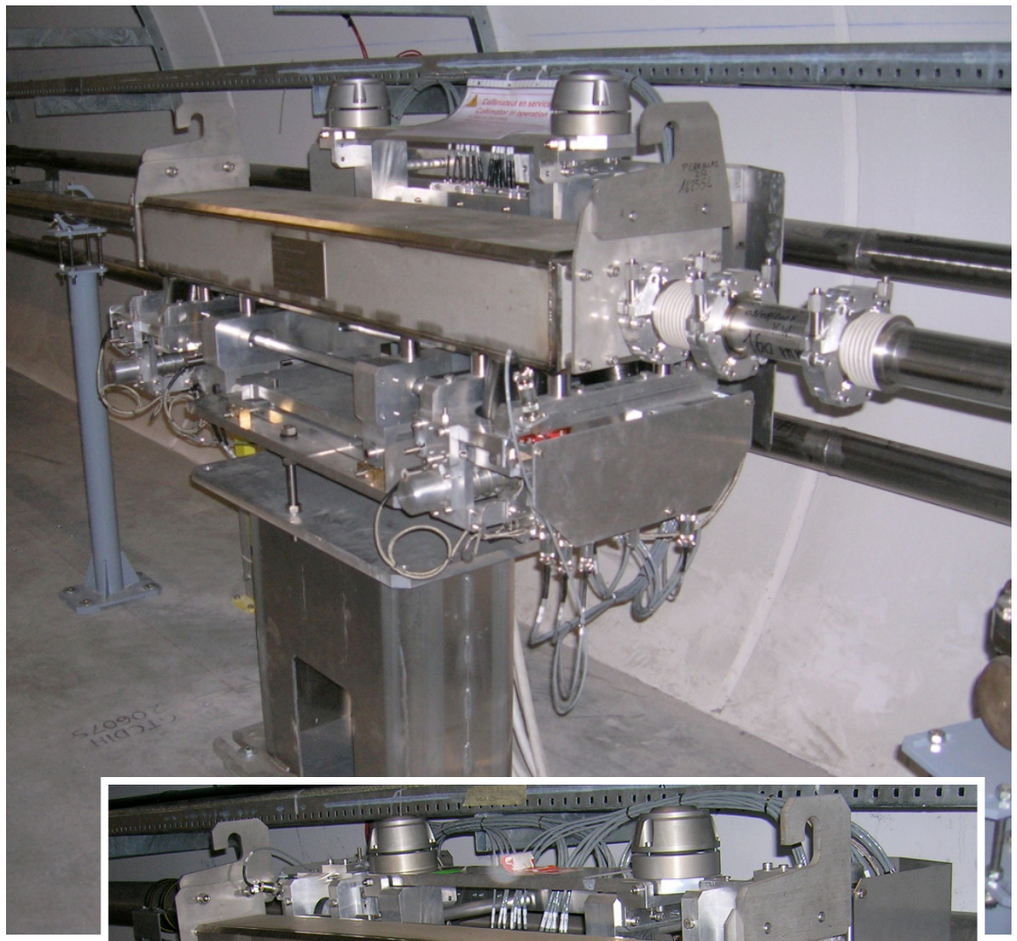
LHC Collimation Project

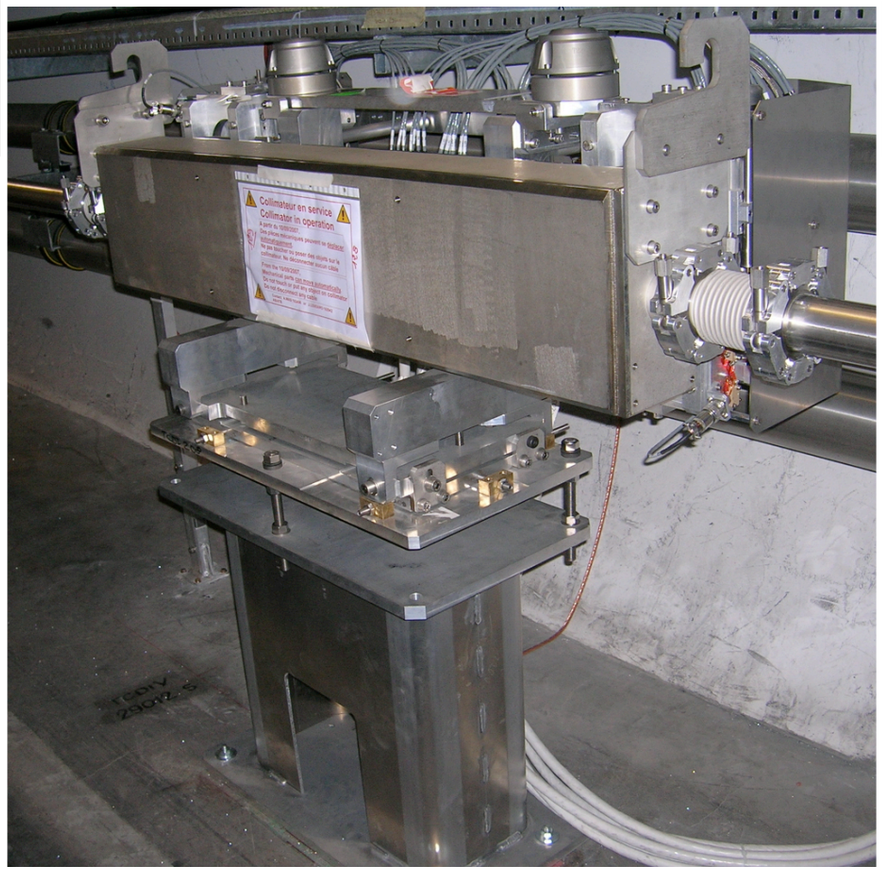
Home of the Project for the LHC Collimation System

Top	Project Team	Notes	Collimator List	Sounds/Movies	Meetings
Links	Papers	Talks (WG)	Layout IR3/7	AB Departm.	Pictures

Collimator operational information

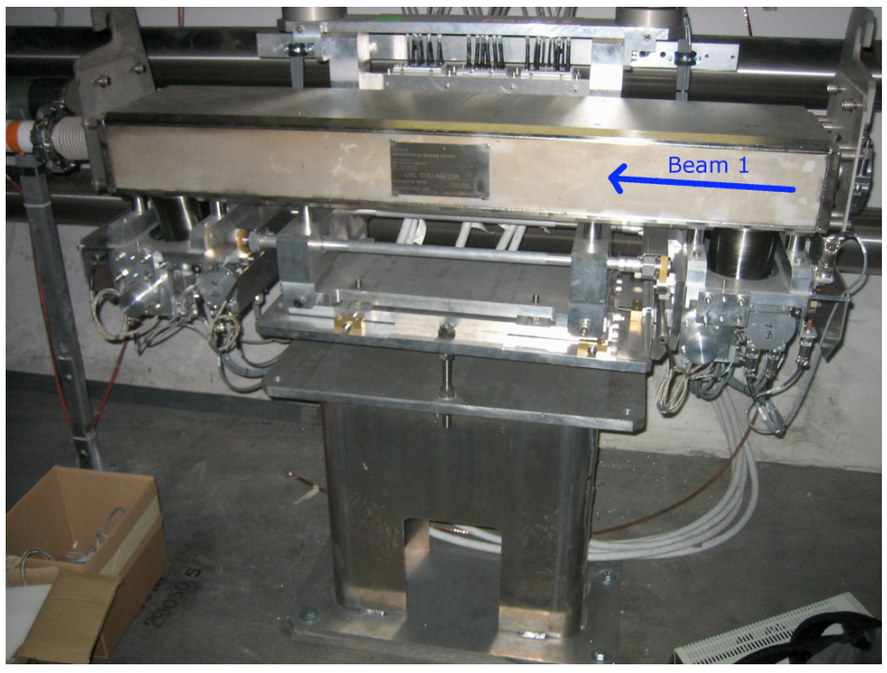
NAME	MTF link	FAMILY	IP	BEAM	ANGLE	Install Angle	Jaw Orientation	Summary
TCDIH.20607	TCDI207 Acceptance (ProDB)	TCDIH	TI2	B1	180.0	180.0	A/C/B/D	xls/pdf
TCDIV.29012	TCDI208 Acceptance (ProDB)	TCDIV	TI2	B1	90.0	90.0	B/D/A/C	xls/pdf
TCDIH.29050	TCDI209 Acceptance (ProDB)	TCDIH	TI2	B1	180.0	180.0	A/C/B/D	xls/pdf



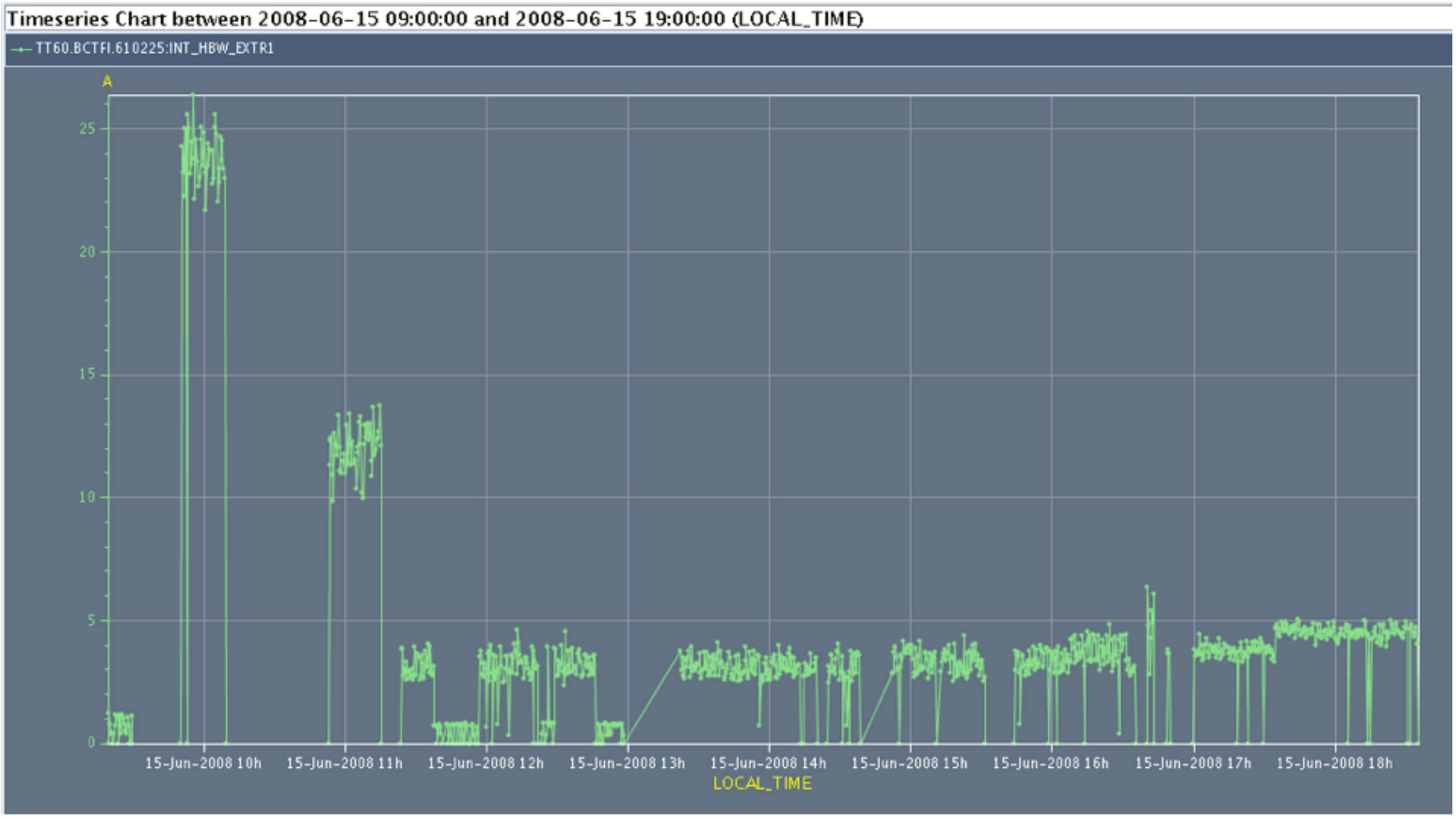


Beam commissioning of **THREE TCDI collimators in TI2**

Beam conditions: single and multi-bunches, ~5×10^{10}p per bunch

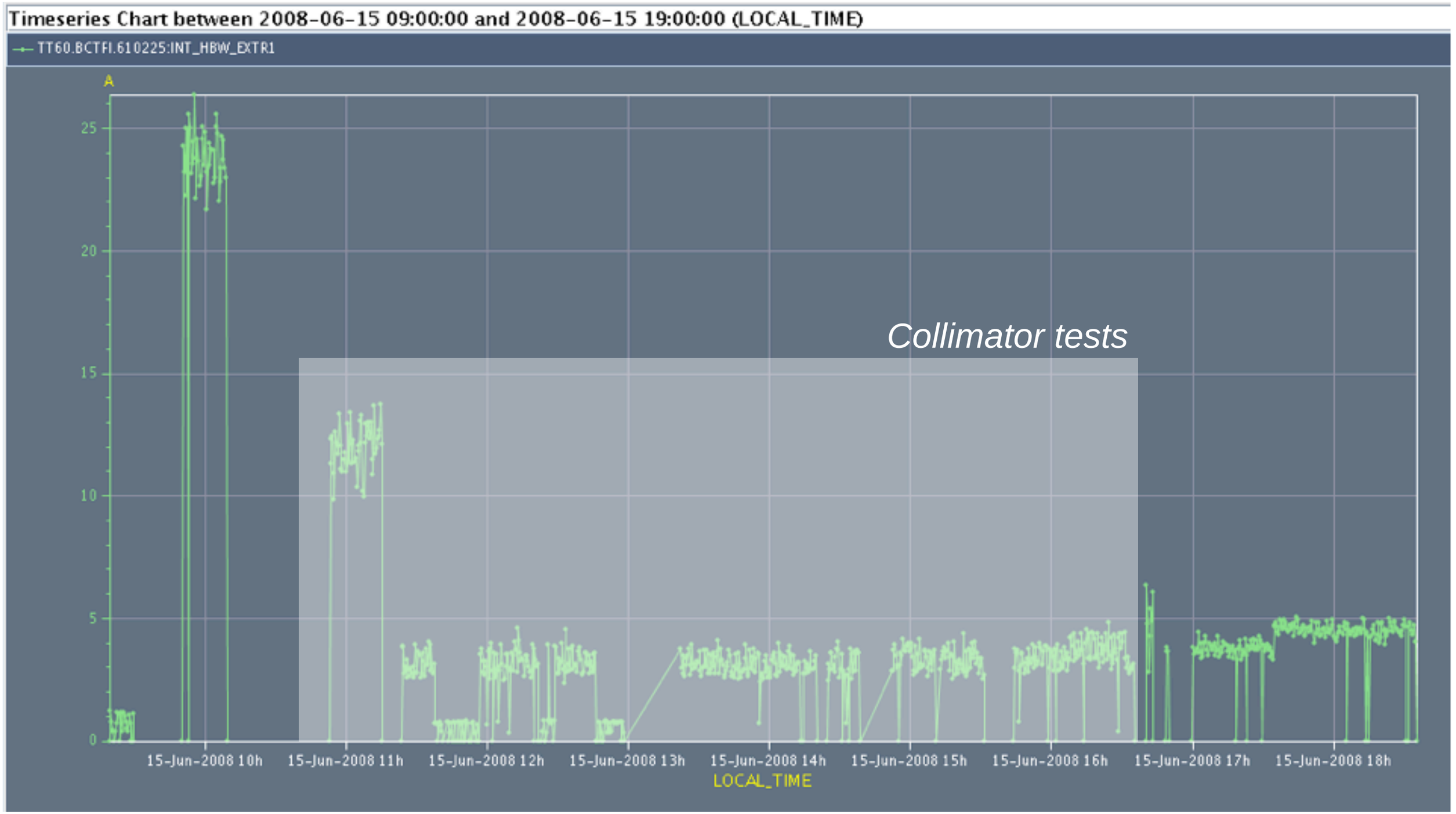


Beam availability - extracted intensity



Very good conditions for collimator set-up studies: stable orbit an optics.
Extracted beam intensity stable to 10-20%

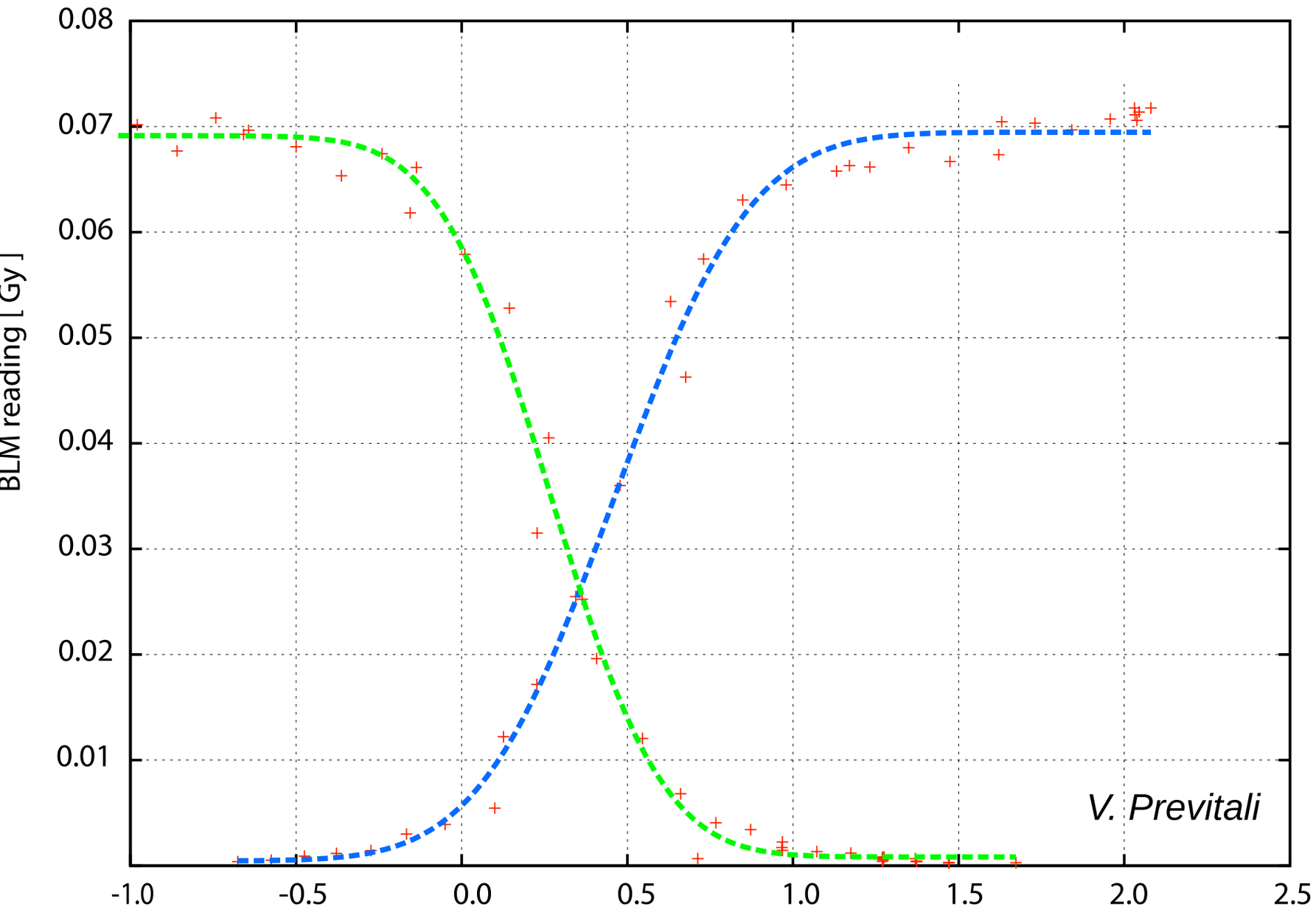
Beam availability - extracted intensity

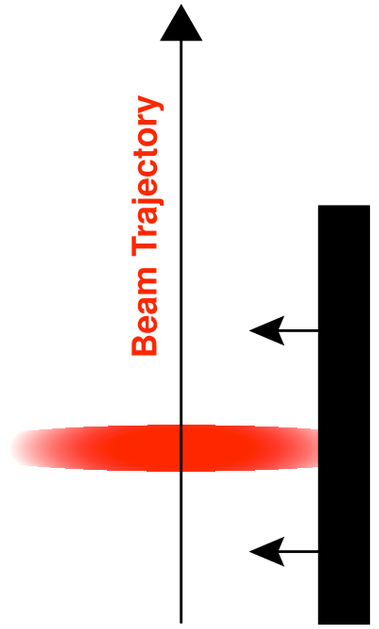


Very good conditions for collimator set-up studies: stable orbit an optics.
Extracted beam intensity stable to 10-20%

Beam-based set-up

Basic idea: scan jaw through the beam and measure beam losses / intensity transmission.
Preliminary results in good agreement with independent measurements of beam emittance (using nominal optics).
Analysis of beam intensity data (transmission / scale BLM reading) to be done.





Example: scans with LEFT and RIGHT for the TCDIV-29012 ($\sigma_y \approx 300$ µm)

Collimator settings with LSA TRIM

Trim Editor

LHC | BP | OP

return

Beams	IPs	Families	ParametersTypeGroups	Parameters
B1	TI2	TCDIH	PHYSICS : COLL_JAW_TOLERANCE	TCDIH.20607/BBCentre
B2		TCDIV	PHYSICS : COLL_JAW	TCDIH.20607/BBParam#sigma_x
			PHYSICS : COLL_BBOptics	TCDIH.20607/BBParam#sigma_xp
			PHYSICS : COLL_NSIGMA	TCDIH.20607/BBParam#sigma_y
			PHYSICS : COLL_BBParam	TCDIH.20607/BBParam#sigma_yp
			PHYSICS : COLL_BBCentre	TCDIH.20607/NSIGMA
			PHYSICS : COLL_HalfGap_TOL	TCDIH.29050/BBCentre
			PHYSICS : COLL_HalfGap	TCDIH.29050/BBParam#sigma_x
Select All	Select All	Select All	Select All	Select All

Setting part: Value / Target / Correction | Trim History | Time base: SuperCycle / Cycle/BeamProcess

Parameter	ramp_5TeV_ir5@0_[START]
TCDIH.20607/BBCentre	0.85
sigma_x	0.62
TCDIH.20607/NSIGMA	4.5

Trim

return

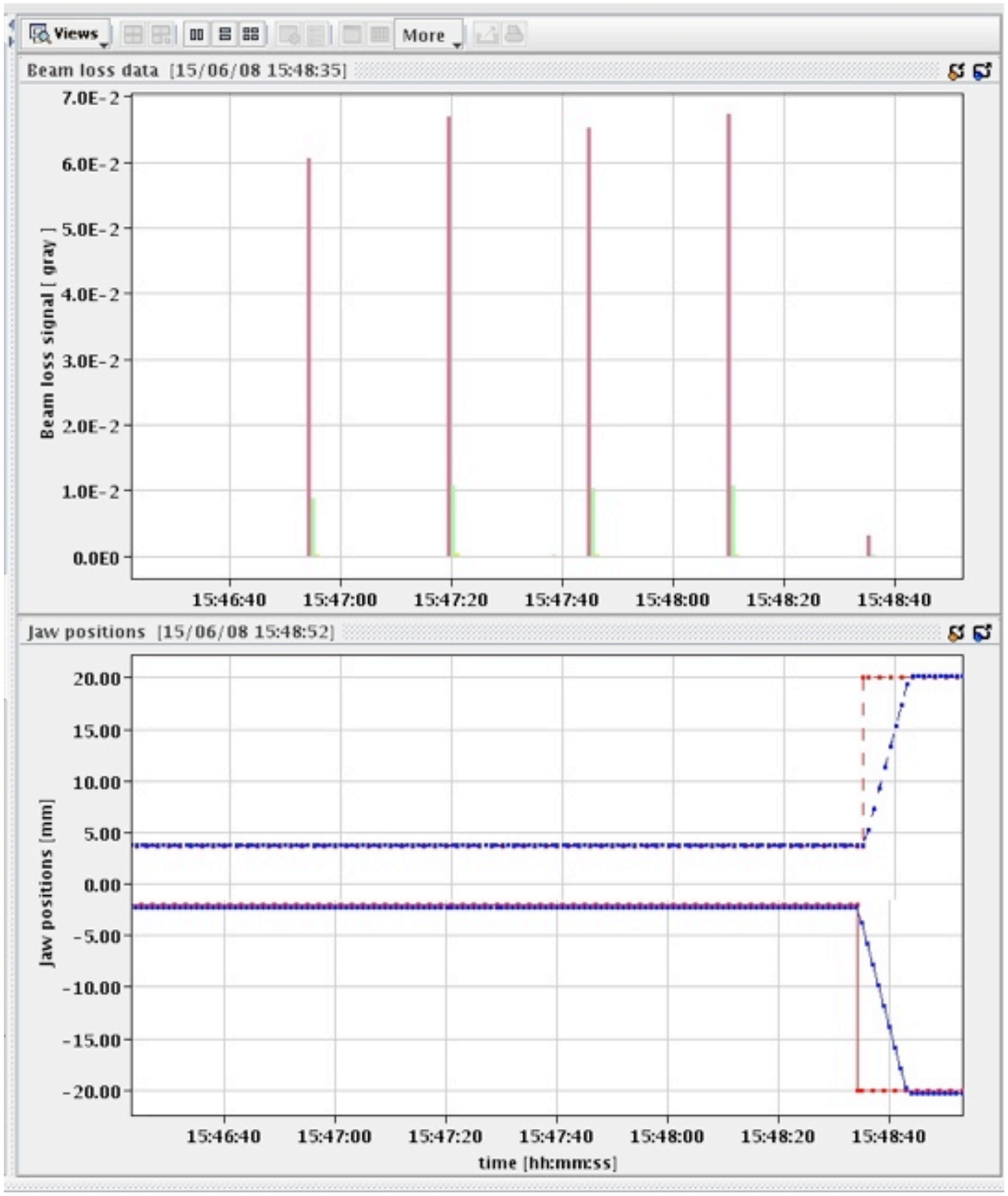
Beam Processes	Beams	IPs	Families	ParametersTypeGroups	Parameters
_NON_MULTIPLEXED_LHC	B1	TI2	TCDIH	PHYSICS : COLL_JAW	TCDIH.29465/RequiredAbsPositionFunct#left_downstr
DISCRETE_LHCRING_INJ_KICKER_V1	B2		TCDIV	PHYSICS : COLL_BBOptics	TCDIH.29465/RequiredAbsPositionFunct#left_upstrean
ramp_5TeV_ir5@0_[START]				PHYSICS : COLL_NSIGMA	TCDIH.29465/RequiredAbsPositionFunct#right_downst
Collimator_testV1.TRACKING-TEST-7TeV.BP0				PHYSICS : COLL_BBParam	TCDIH.29465/RequiredAbsPositionFunct#right_upstrea
PRECYCLE-TEST-V2_MIKE-V1				PHYSICS : COLL_BBCentre	TCDIH.20607/RequiredAbsPositionFunct#left_downstr
RAMP-IR5-4.135TeV@0_[START]				PHYSICS : COLL_HalfGap_TOL	TCDIH.20607/RequiredAbsPositionFunct#left_upstrean
RAMP-IR5-4.135TeV_V1				PHYSICS : COLL_HalfGap	TCDIH.20607/RequiredAbsPositionFunct#right_downst
RAMP-IR5-4.2TeV_V1				PHYSICS : COLL_NSIGMA_TOL	TCDIH.20607/RequiredAbsPositionFunct#right_upstrea
RAMP-IR5@0_[START]				HW SETTINGS : COLL_MOTOR_TOLERANC	TCDIH.29050/RequiredAbsPositionFunct#left_downstr
RAMP-IR5V1.RAMP-IR5.BP0				HW SETTINGS : COLL_MOTOR_POSITION	TCDIH.29050/RequiredAbsPositionFunct#left_upstrean
Show hidden	Select All	Select All	Select All	Select All	Select All

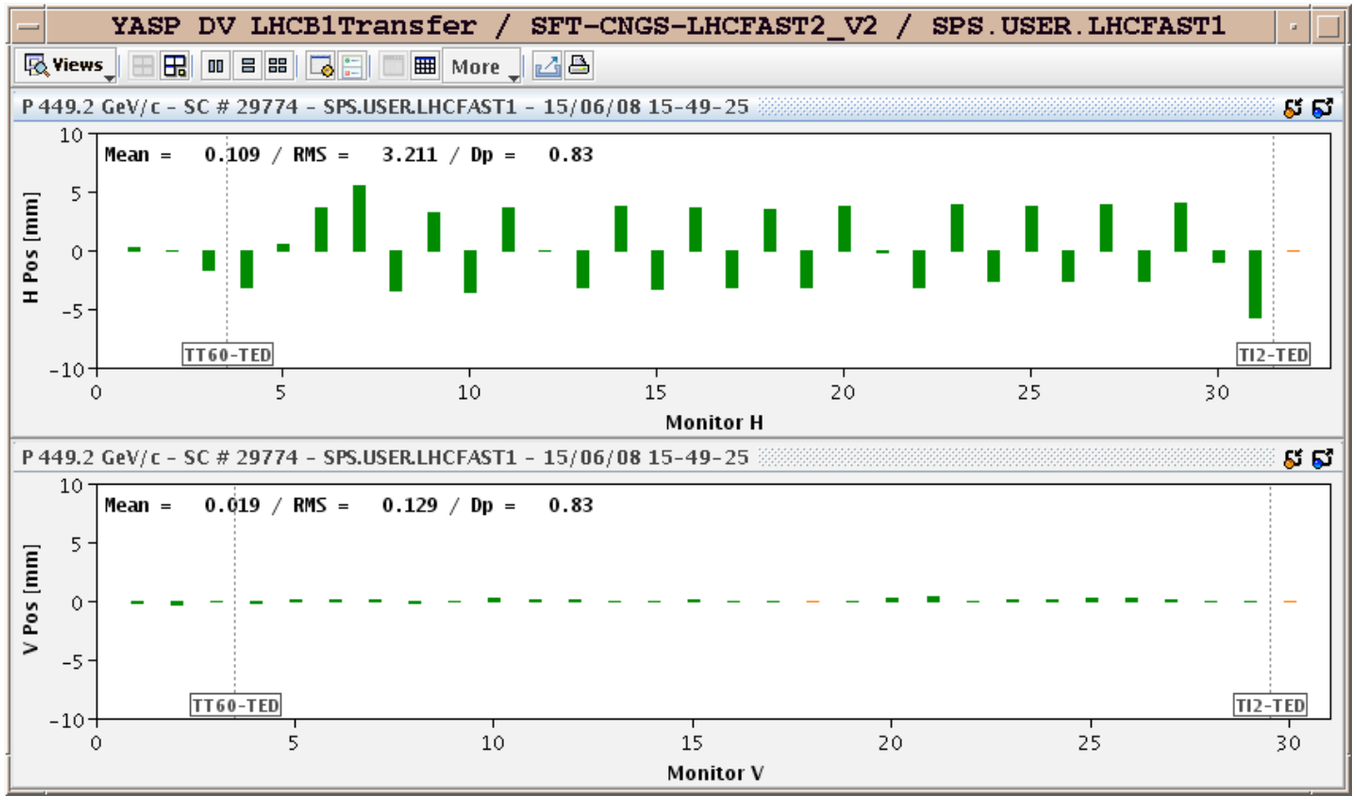
Setting part: Value / Target / Correction | Trim History | Time base: SuperCycle / Cycle/BeamProcess

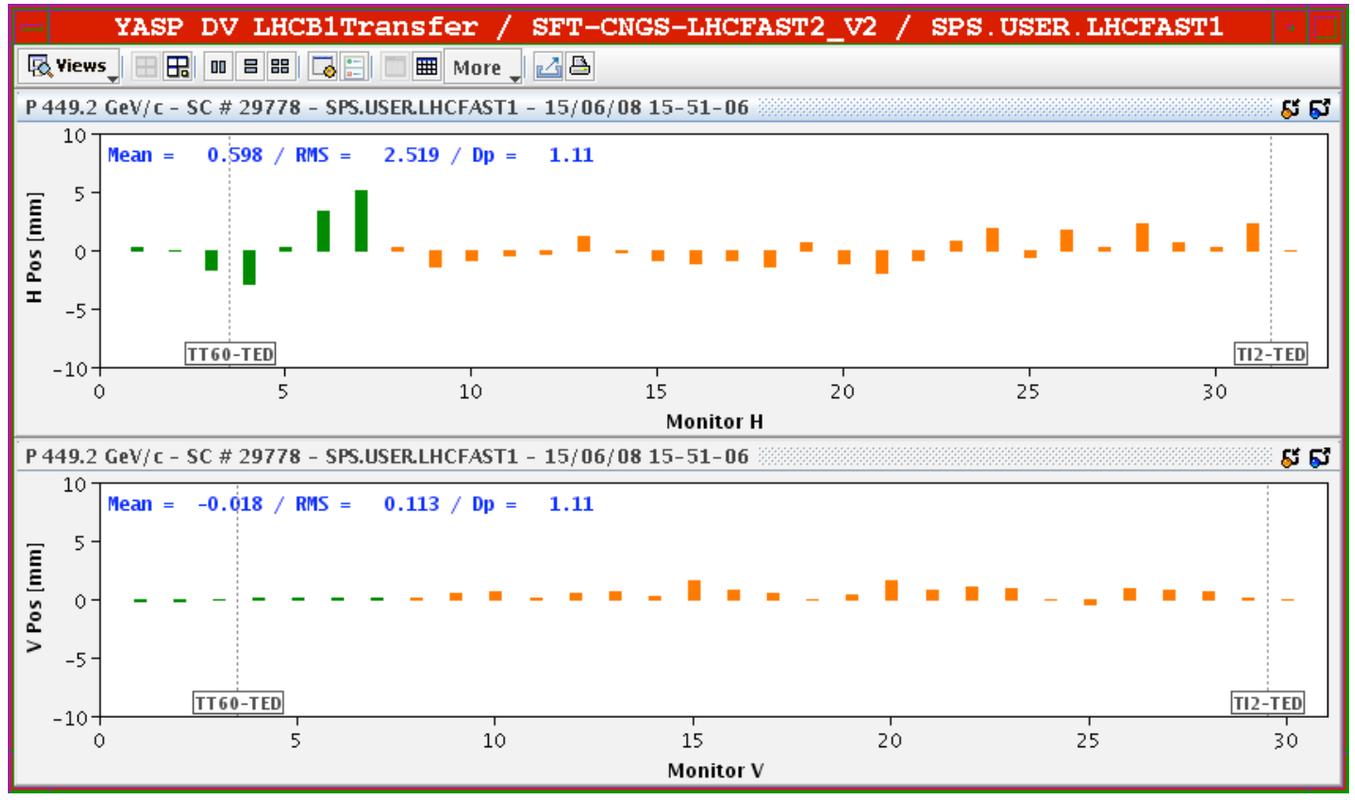
Parameter	ramp_5TeV_ir5@0_[START]
left_downstream	3.6399500556074607
left_upstream	3.6400499443925396
right_downstream	-1.9400499443925394
right_upstream	-1.9399500556074605

Trim

Collimator in “protect” settings



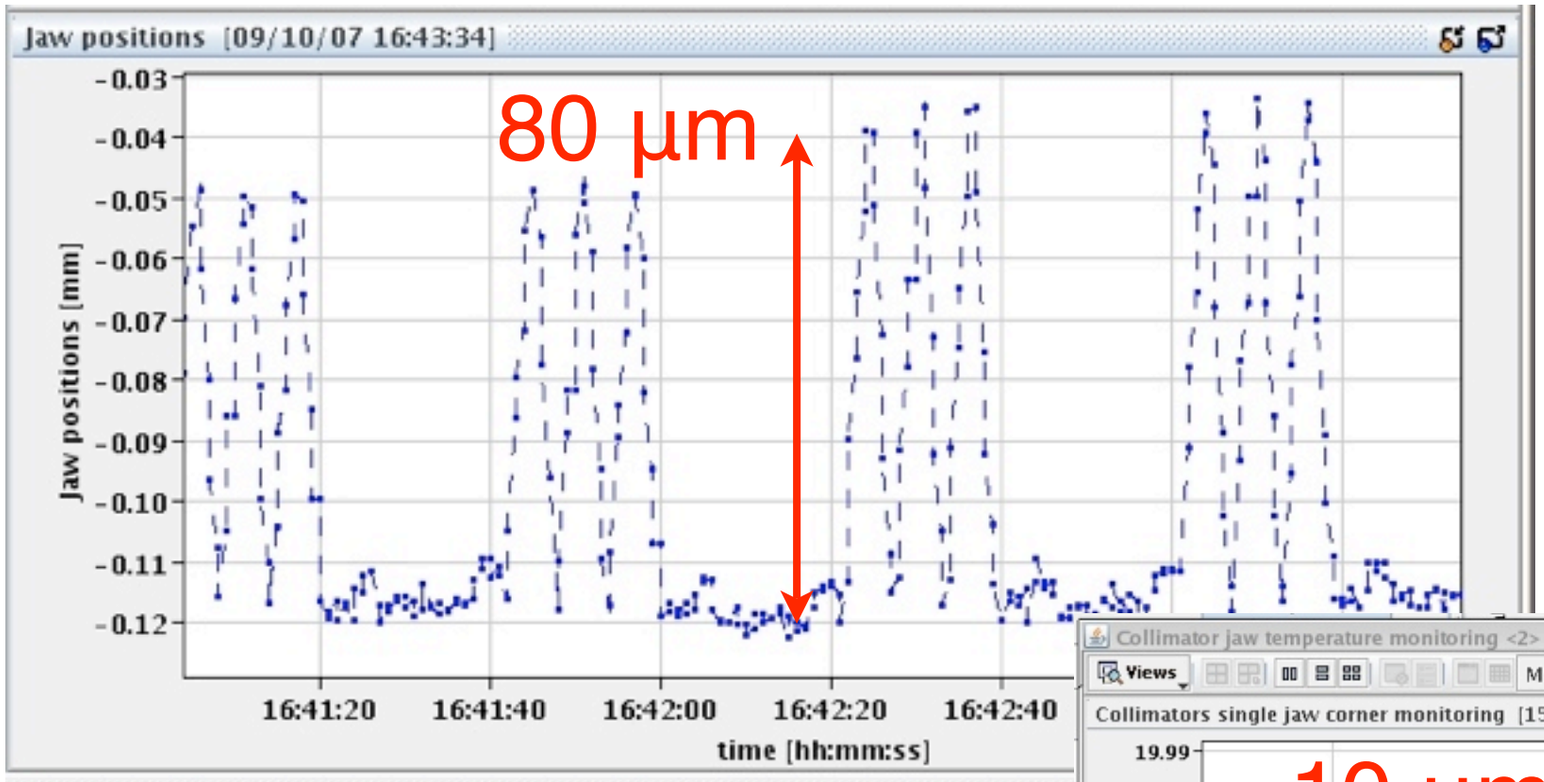




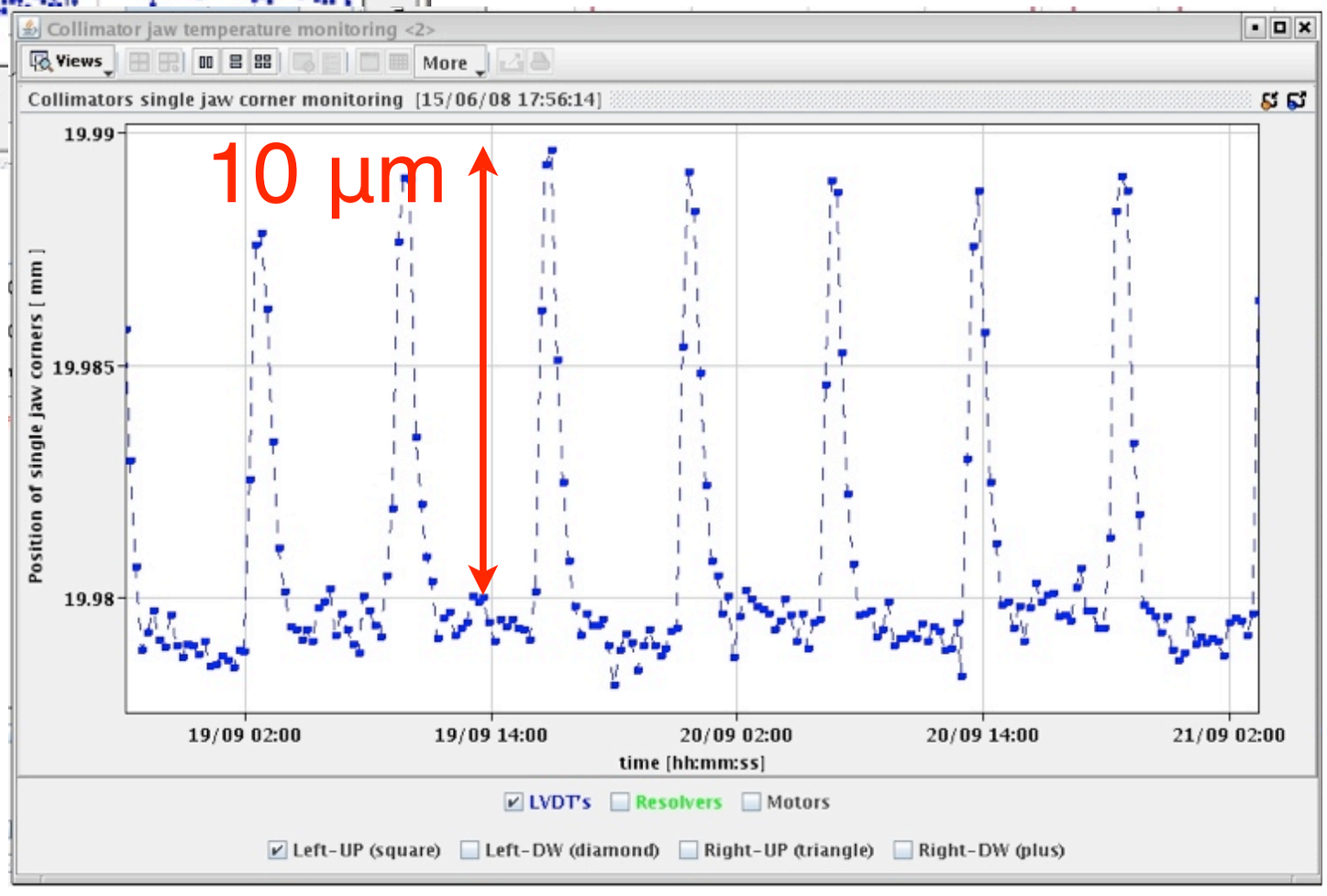
V. Kain

LVDT noise reduction

2007: TI2 pulsing, no beam

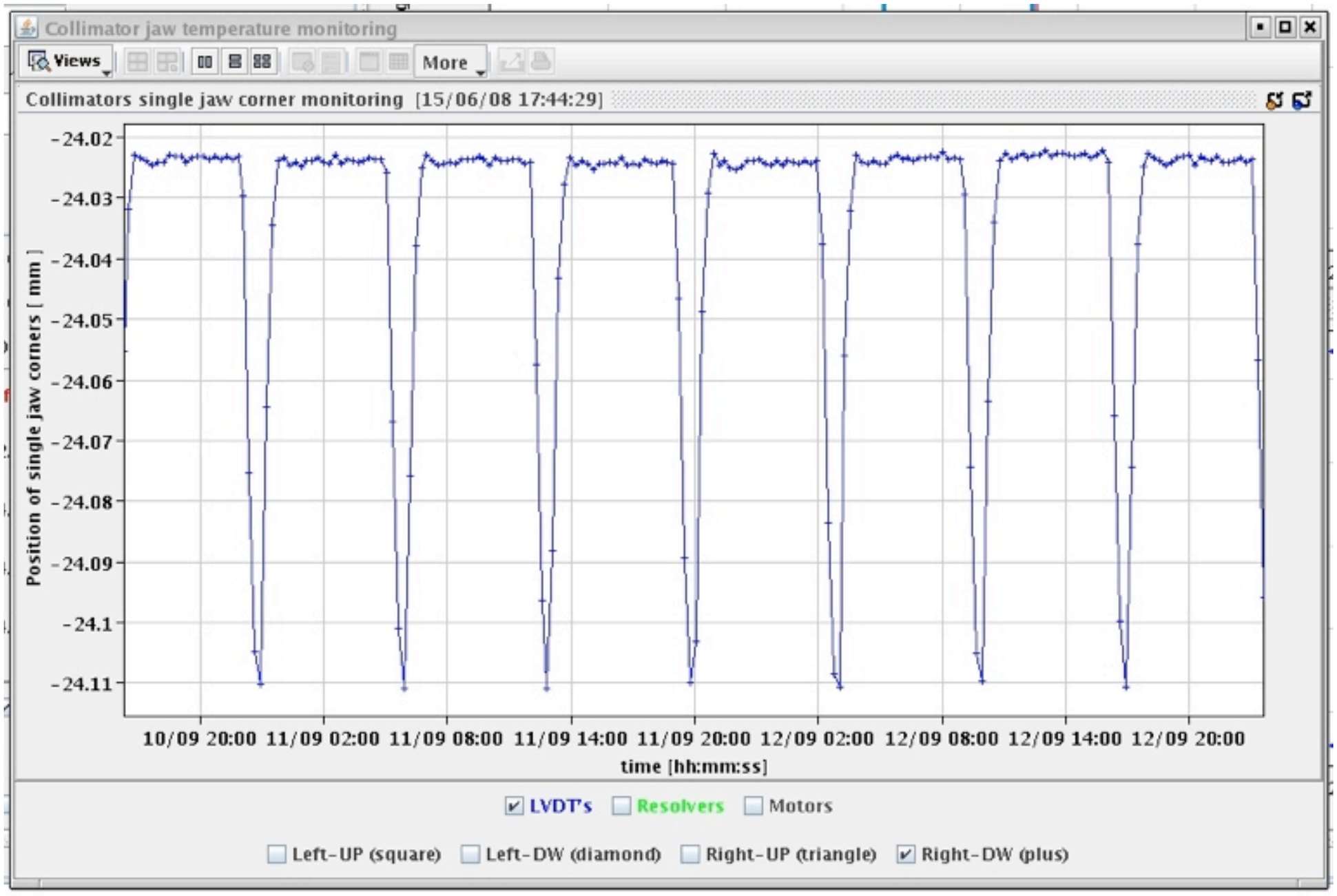


2008: TI2 pulsing, with beam

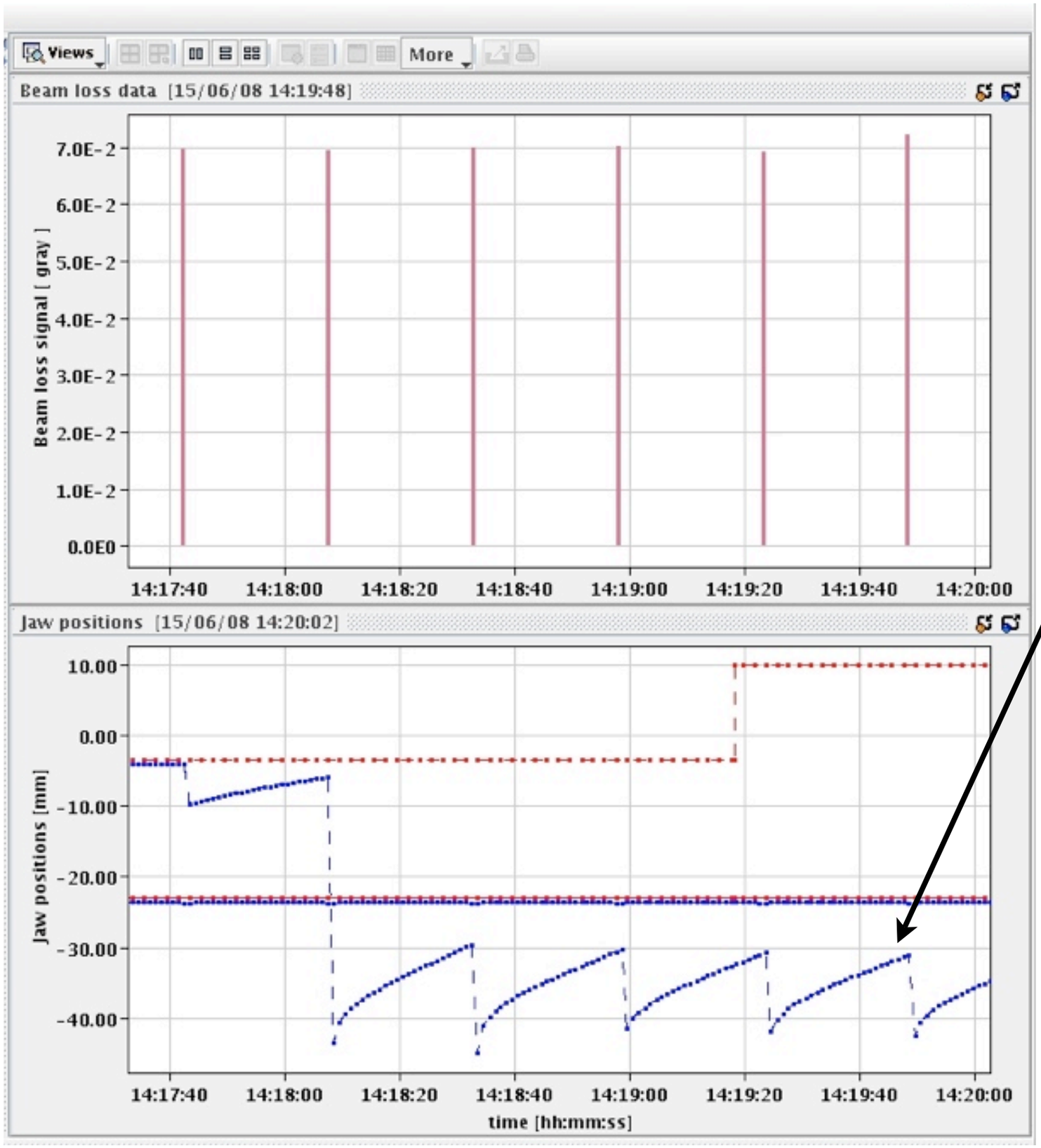


Still one bad guy...

LVDT Right-Downstream of TCDIH-29050



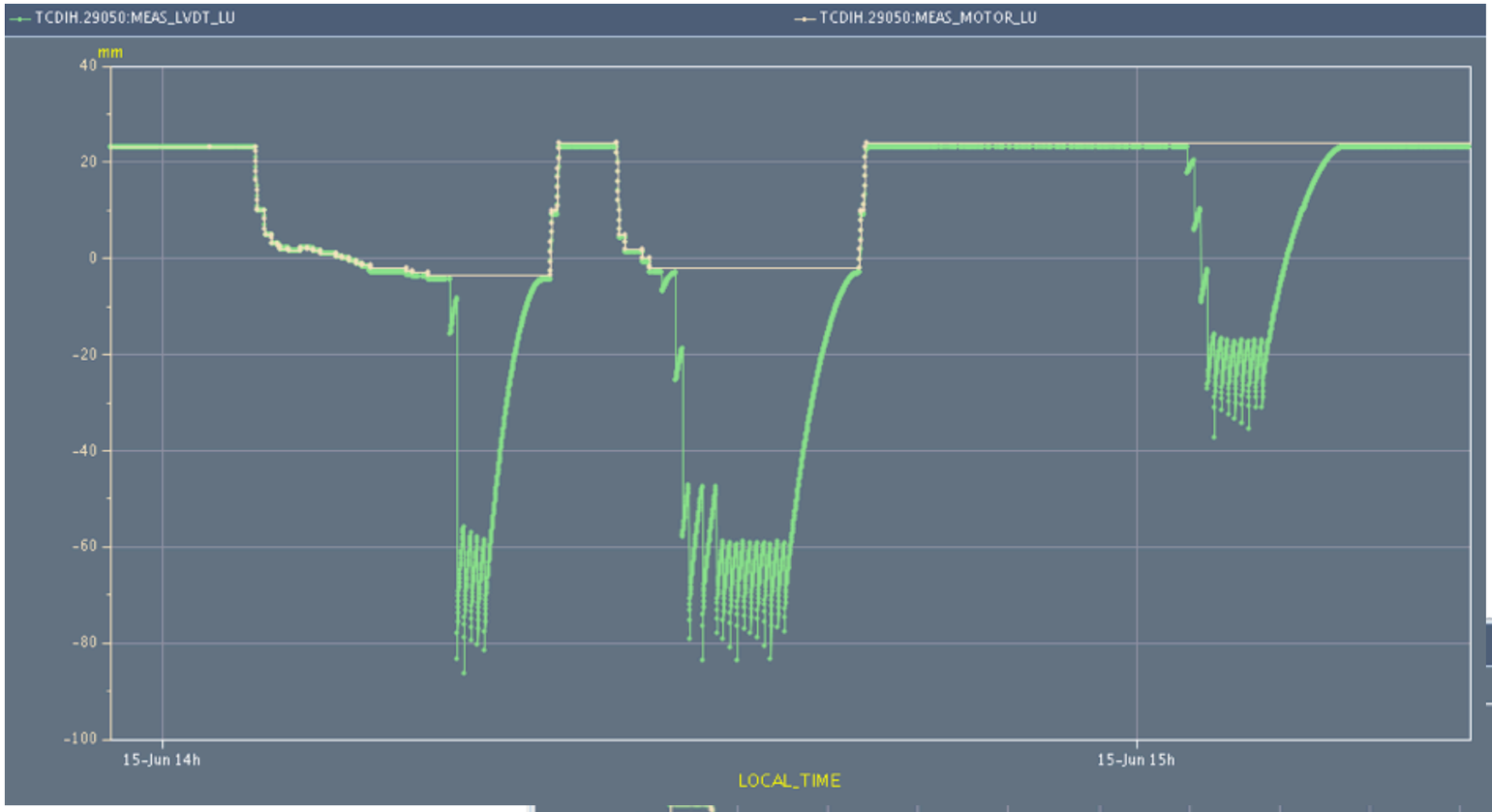
LVDT noise induced by the beam (I)

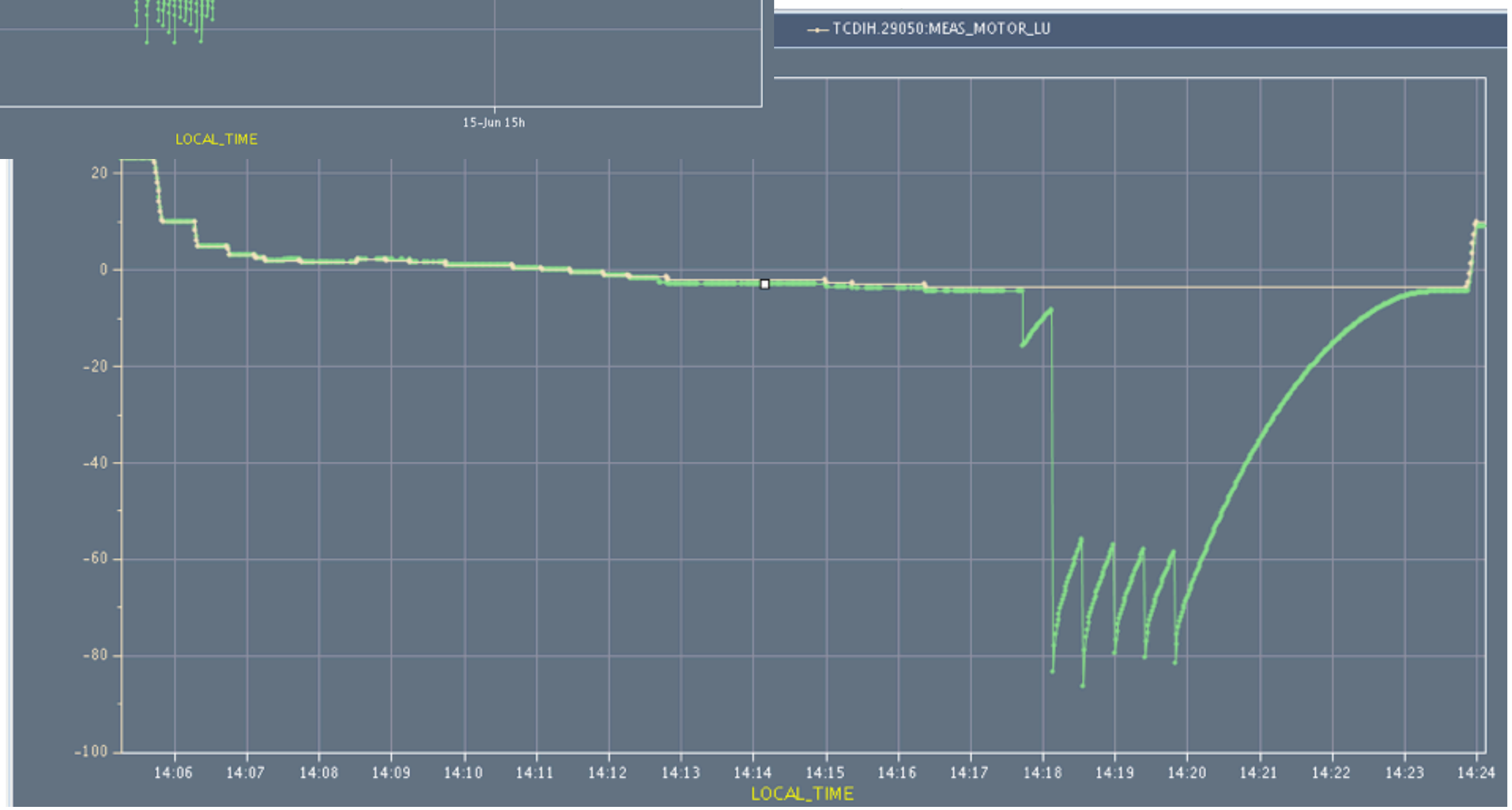


Drift of the LVDT read-out value when the beam impacted on the collimator jaw.

Signal goes back to the correct value if we switch the beam off.

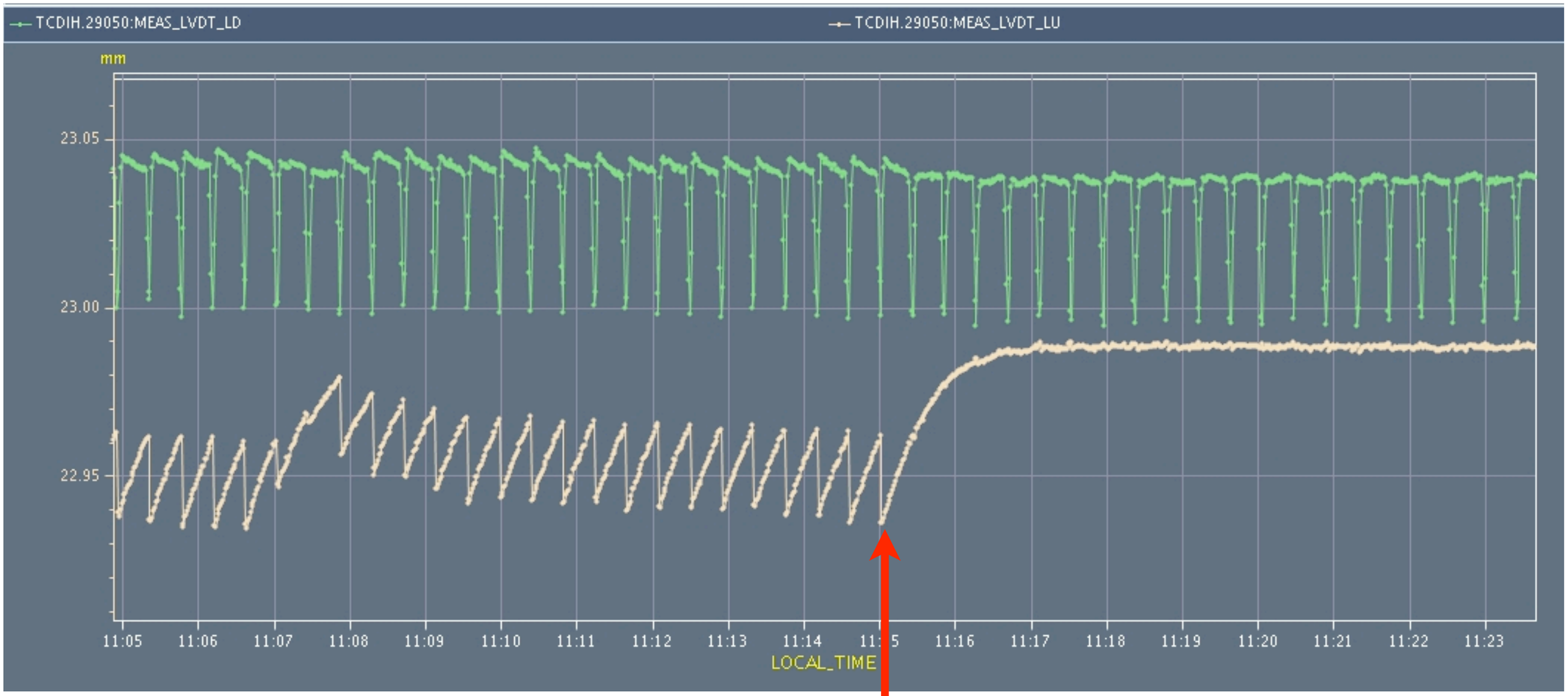
LVDT noise induced by the beam (II)





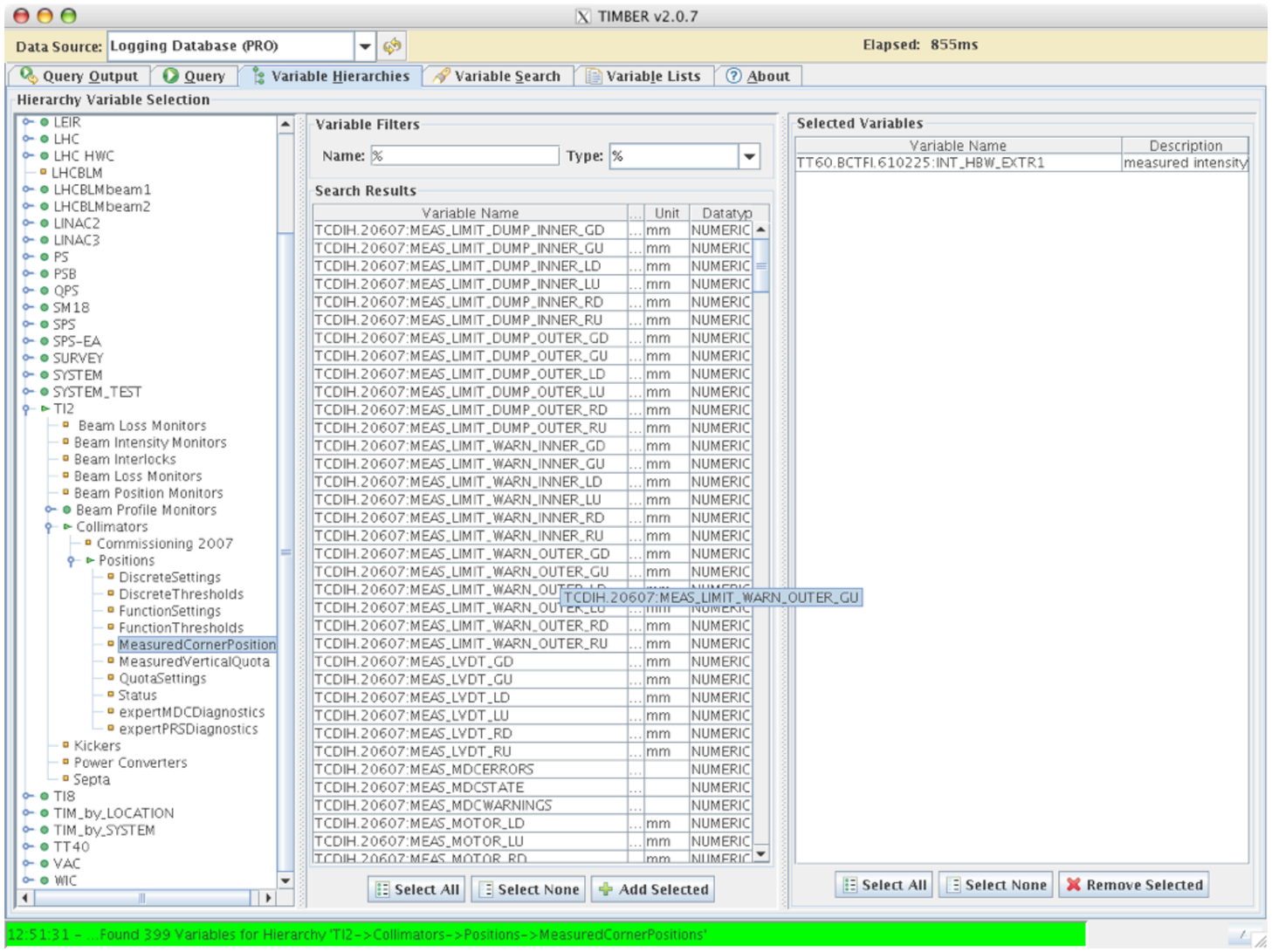
Could reproduce this effect three consecutive time, but ~1h later this feature disappeared!

Magnet versus beam noise



Last beam shot

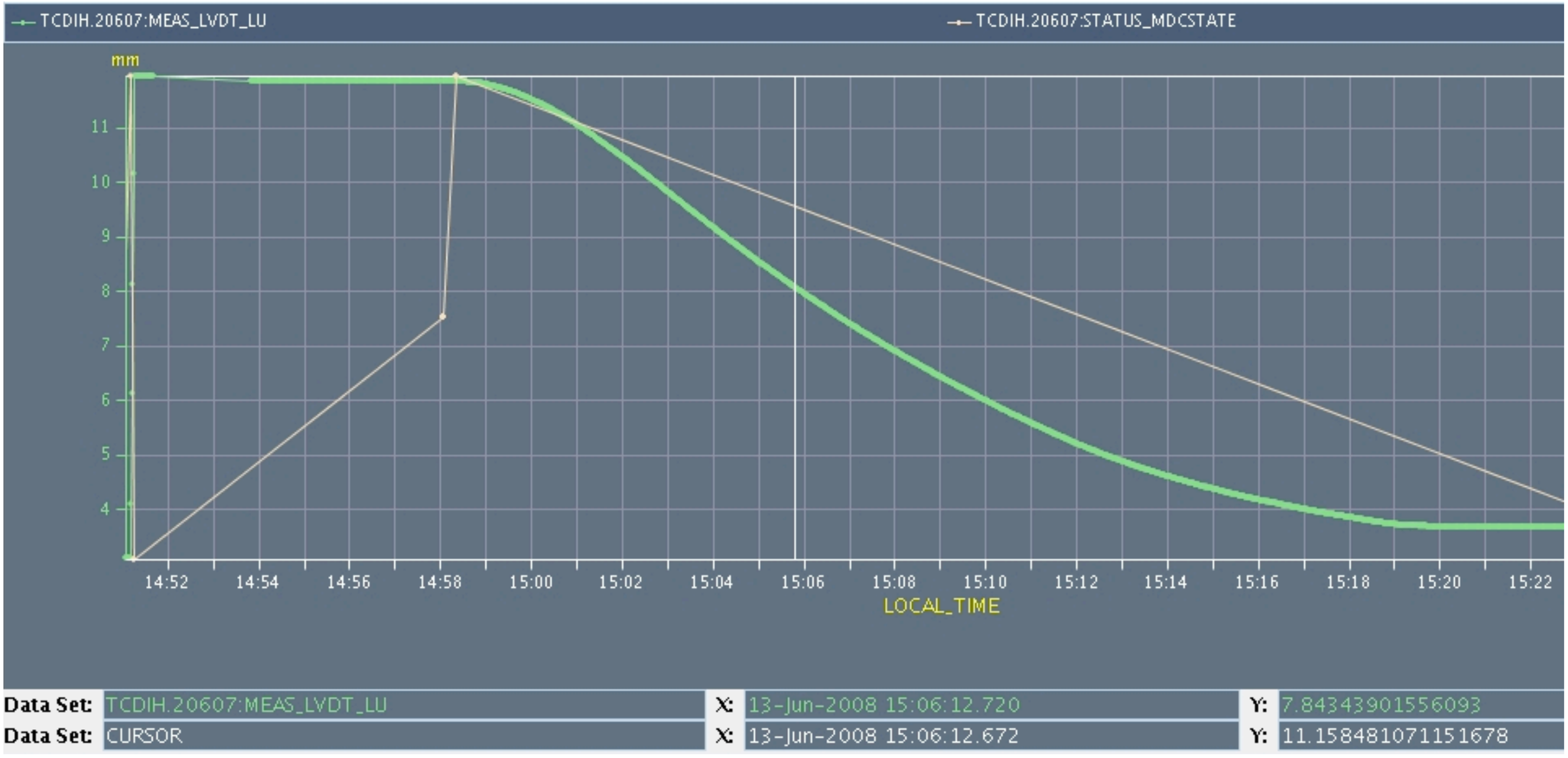
Collimator Logging



1246 logging variables set-up for 7 collimators in TI2 (test-bench for the complete system).
Still need to check them all systematically, but the first feedback is very positive! Temperature logging not yet configured.

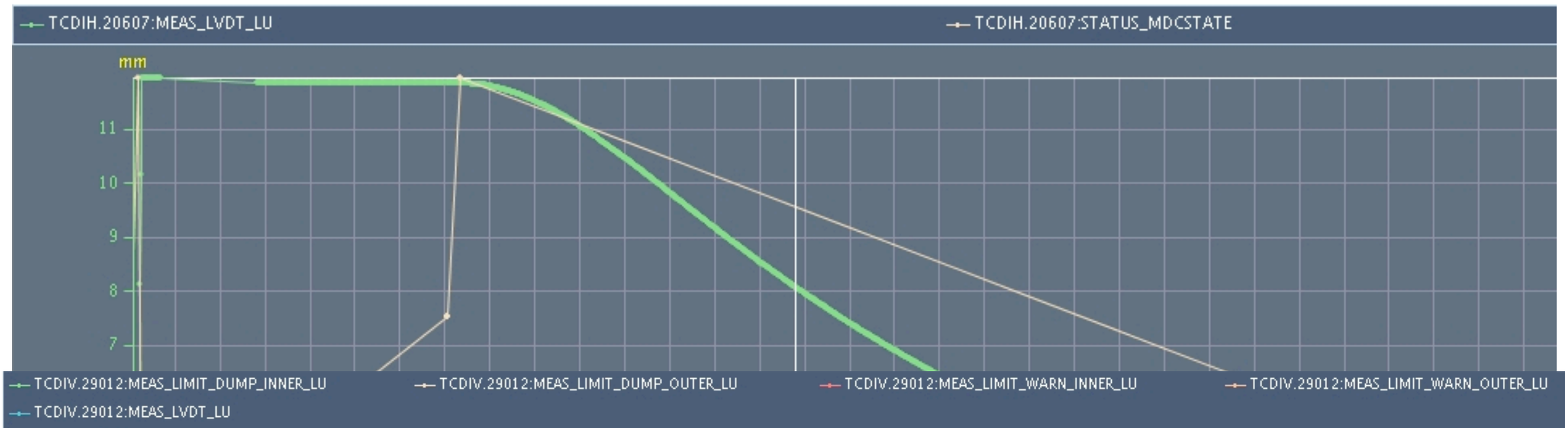
Thanks: R. Billen, C. Roderick, N. Hoibian, M.Gourber-Pace

Examples



Data Set:	TCDIH.20607:MEAS_LVDT_LU	**X:**	13-Jun-2008 15:06:12.720	**Y:**	7.84343901556093
Data Set:	CURSOR	**X:**	13-Jun-2008 15:06:12.672	**Y:**	11.158481071151678

Examples


TCDIH.20607:MEAS_LVDT_LU
TCDIH.20607:STATUS_MDCSTATE
mm
11
10
9
8
7
TCDIV.29012:MEAS_LIMIT_DUMP_INNER_LU
TCDIV.29012:MEAS_LIMIT_DUMP_OUTER_LU
TCDIV.29012:MEAS_LIMIT_WARN_INNER_LU
TCDIV.29012:MEAS_LIMIT_WARN_OUTER_LU
TCDIV.29012:MEAS_LVDT_LU
mm
13
12
11
10
17:12
17:13
17:14
17:15
17:16
17:17
17:18
LOCAL_TIME

Conclusions

- Very preliminary report of the **TI2 collimator beam commissioning**
- Good beam conditions and appropriate beam intensity allowed us to perform systematically the **beam-based alignment** of 2 TCDI collimator
- Could not study the adjustment of the collimator jaw angles
- Generation of **beam references** and preliminary tests of **protection settings** were performed for one collimator
- More systematic **analysis** of the results is needed, however the tools are in place!
- Beam influence on one LVDT sensors needs further investigation