



UFO-Induced Signals at Collimators/XRPs vs BLM Thresholds

A. Mereghetti, on behalf of the LHC Collimation Team

4 dumps in LSSs due to UFO activity nearby collimators:

- Fill 4978
- Fill 4983
- Fill 5018
- Fill 5021

4 dumps in LSSs due to UFO activity nearby collimators:

- **Fill 4978**
- Fill 4983
- Fill 5018
- Fill 5021

Fill 4978



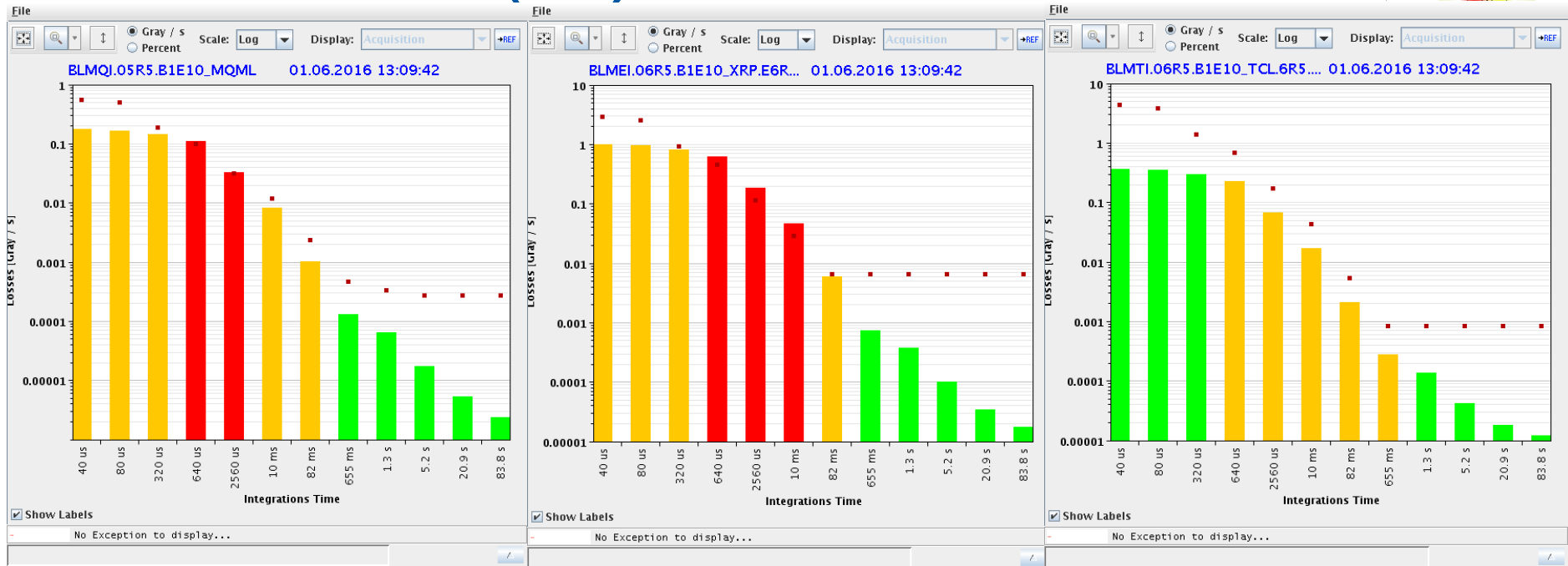
Signals at TCTs reflect dump event

UFO between Q4 and TCL5

Fill 4978:

- 2016-06-01, 13:09:41;
- Few seconds after start of IP1/5 physics BP;
- Dumped by XRP.E6R5 (RS04-RS06) and MQML.5R5 (RS05-RS06);
- Dump cut out development of UFO;

Fill 4978 (III)



- Signals at TCL6 at 40% (ie 1/2.5) of dump thresholds of RS05-RS07;
 → In case of large increase factors at MQML / XRPs, TCL6 may become the bottleneck;
 → increase by 50% RS03-RS07 on TCL6 family (ie THRI_TCL_W)? Reluctant, due to (limited) robustness of W jaws...
- Signals at TCL5 at least one order of magnitude below thresholds;

4 dumps in LSSs due to UFO activity nearby collimators:

- Fill 4978
- **Fill 4983**
- Fill 5018
- Fill 5021

Fill 4983

blm_blmhc >> Version: 1.0.4 Responsible: Fabio Follin

Unit: Gray/s Scale: Log Integration Time: 40 us Losses: Single Display: Acquisition

Filter (104 / 3936)

Monitor	40 us	80 us	320 us	640 us	256...	10 ms	82 ms	655...	1.3 s	5.2 s	20.9 s	83.8 s	Type
BLMTI.06L1.B2E10_TCL.6L...	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Dump	Ok	Ok	Ok	Ok	<input checked="" type="checkbox"/> IC
BLMTI.04L6.B1E10_TCDSA...	Dump	Dump	Dump	Dump	Dump	Dump	Dump	Ok	Ok	Ok	Ok	Ok	<input type="checkbox"/> LIC
BLMTI.04L6.B1E10_TCDSB...	Dump	Dump	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	<input type="checkbox"/> FIC
BLMTI.04L6.B2I10_TCDAQ...	Dump	Dump	Dump	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	<input type="checkbox"/> DS
BLMTI.04R6.B2I10_TCDSB...	Dump	Dump	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	<input type="checkbox"/> SEM
BLMTI.04R6.B2I10_TCDSA...	Dump	Dump	Dump	Dump	Dump	Dump	Dump	Ok	Ok	Ok	Ok	Ok	<input type="checkbox"/> Diamond
BLMTI.04R6.B2I10_TCDSA...	Dump	Dump	Dump	Dump	Dump	Dump	Dump	Ok	Ok	Ok	Ok	Ok	<input type="checkbox"/> Silicon
													<input type="checkbox"/> ARC
													<input checked="" type="checkbox"/> Right
													<input type="checkbox"/> 2 <input type="checkbox"/> 6
													<input type="checkbox"/> 3 <input type="checkbox"/> 7
													<input checked="" type="checkbox"/> Beam 2
													<input type="checkbox"/> 4 <input type="checkbox"/> 8
													<input checked="" type="checkbox"/> Centre

UFO at ~Q5

Fill 4978:

- 2016-06-03, 12:29:29;
- ~30s after start of IP2/8 physics BP;
- Dumped by TCL.6L1 (RS08);
- Series of UFO events;

Losses [Gray/s]

Monitors

Monitor Losses versus Time

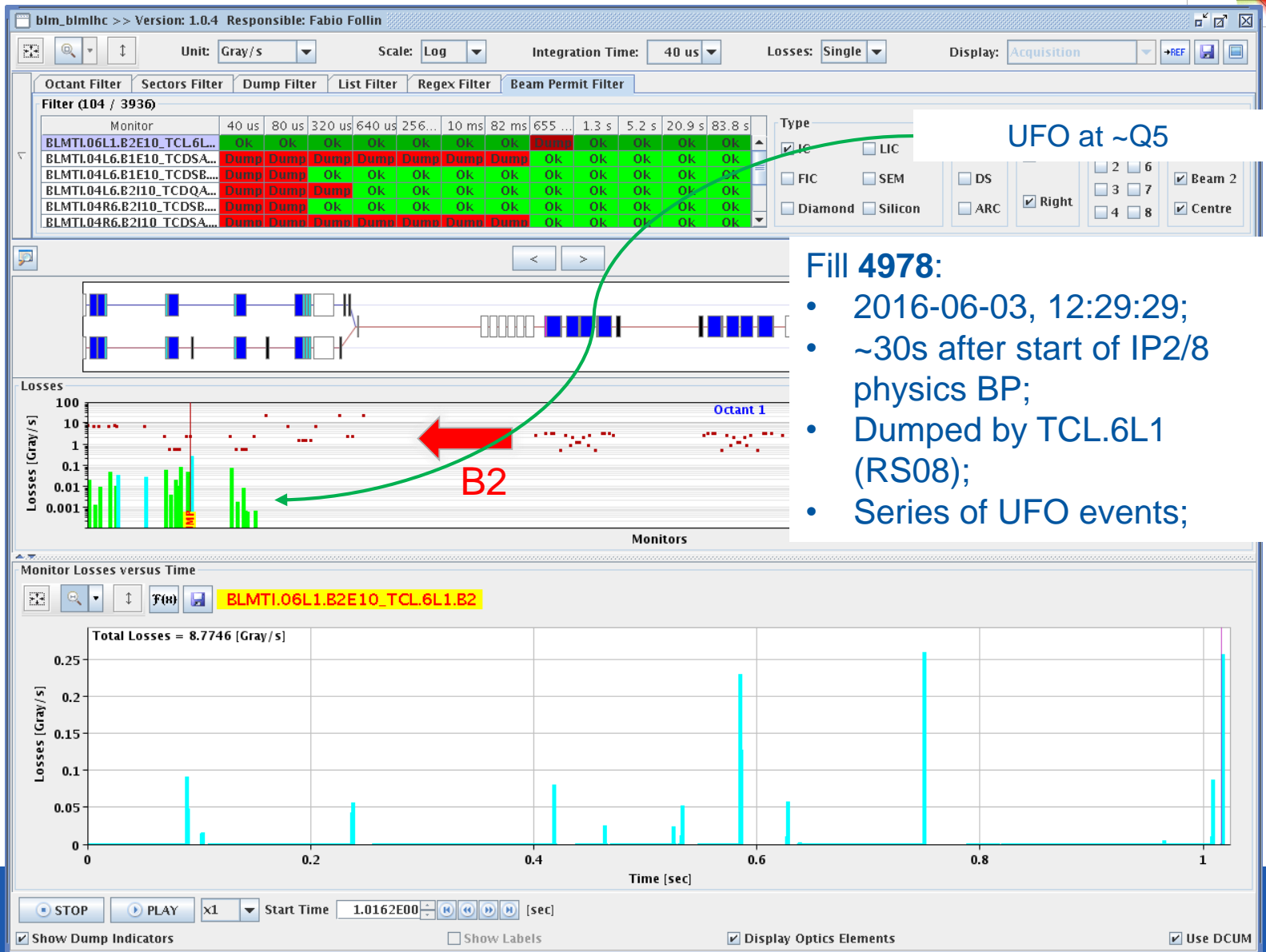
Total Losses = 8.7746 [Gray/s]

Losses [Gray/s]

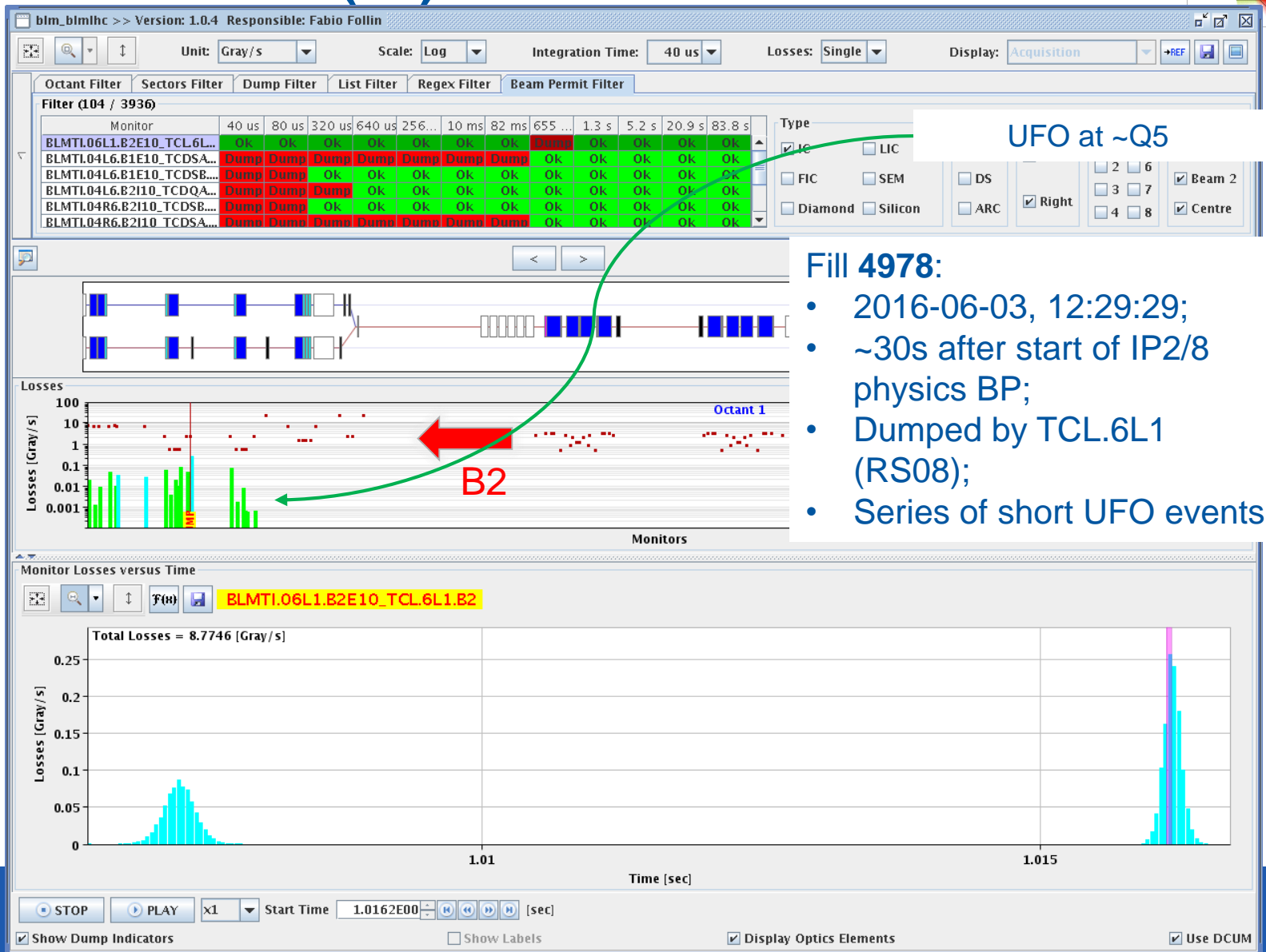
Time [sec]

STOP PLAY x1 Start Time 1.0162E00 [sec]

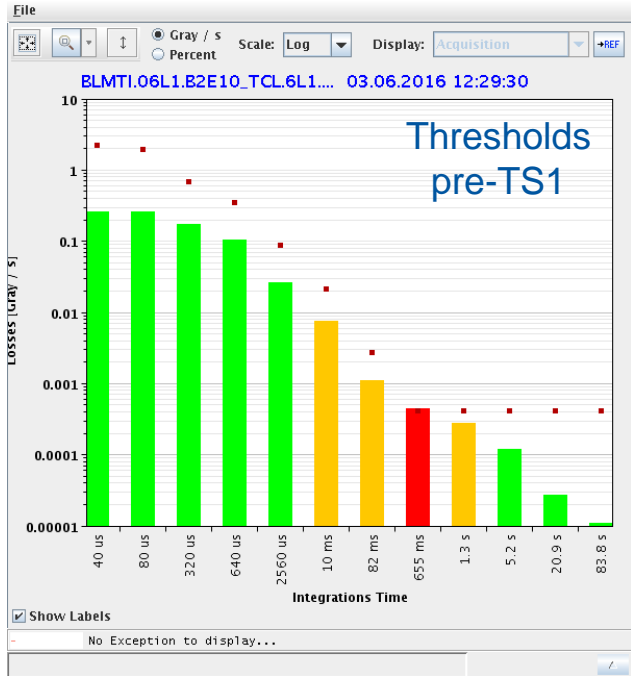
Show Dump Indicators Show Labels Display Optics Elements Use DCUM



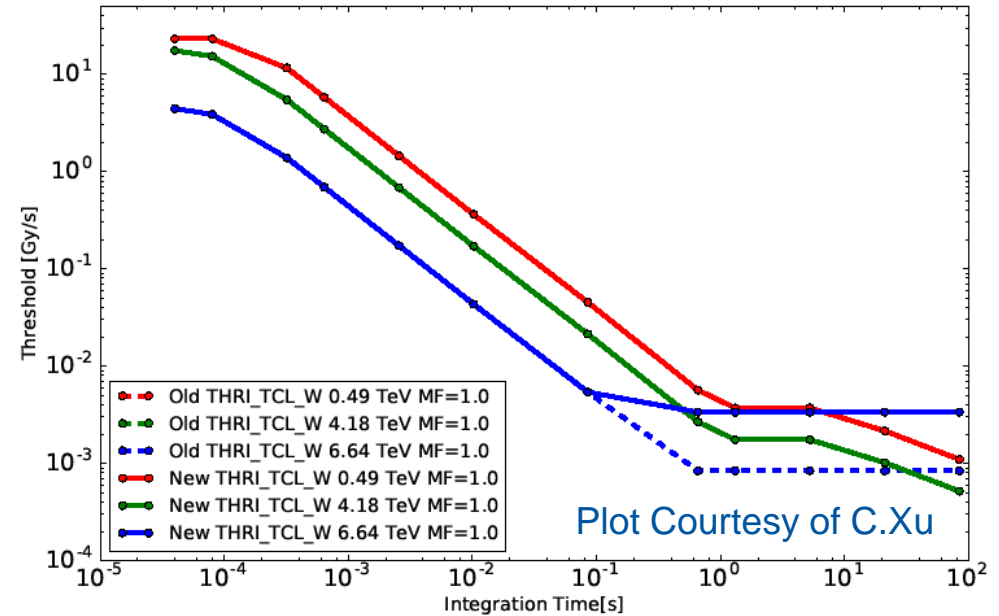
Fill 4983 (II)



Fill 4983 (III)



Changes during TS1



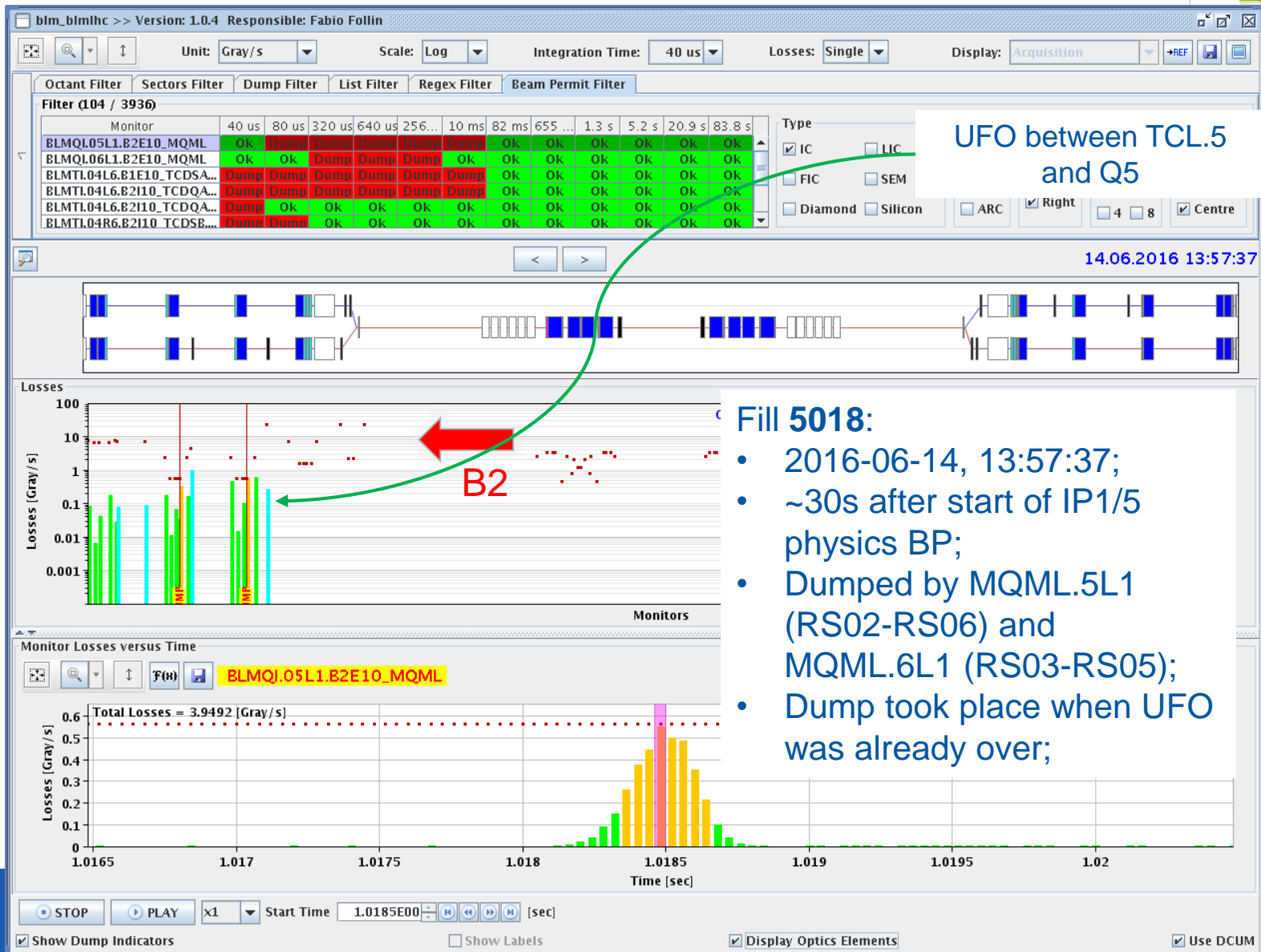
Remarks:

- Changes during TS1 already in direction of avoiding this dump:
 - Increase by factor 4 long RSs (ie RS08→RS12);
 - TCL6 in IR1: MF=0.5 → MF=1;
- No action required!

4 dumps in LSSs due to UFO activity nearby collimators:

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- Fill 4983
- **Fill 5018**
- Fill 5021

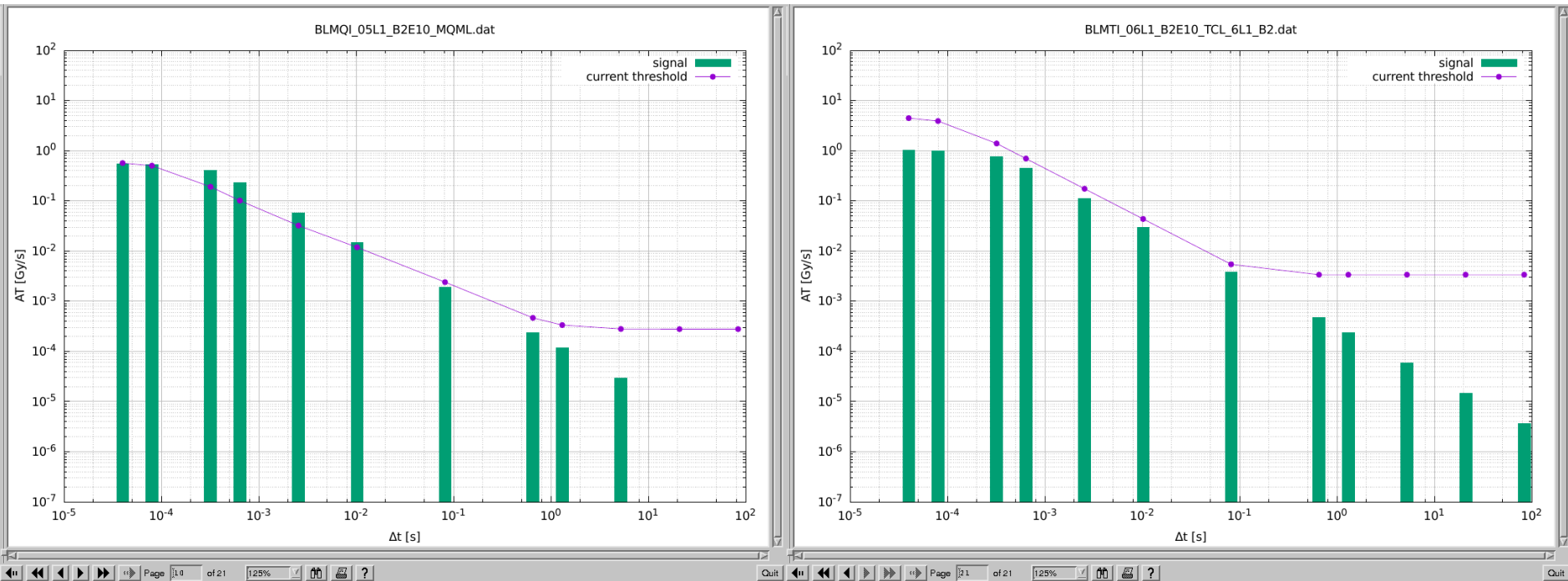
Fill 5018



Fill 5018:

- 2016-06-14, 13:57:37;
- ~30s after start of IP1/5 physics BP;
- Dumped by MQML.5L1 (RS02-RS06) and MQML.6L1 (RS03-RS05);
- Dump took place when UFO was already over;

Fill 5018 (II)

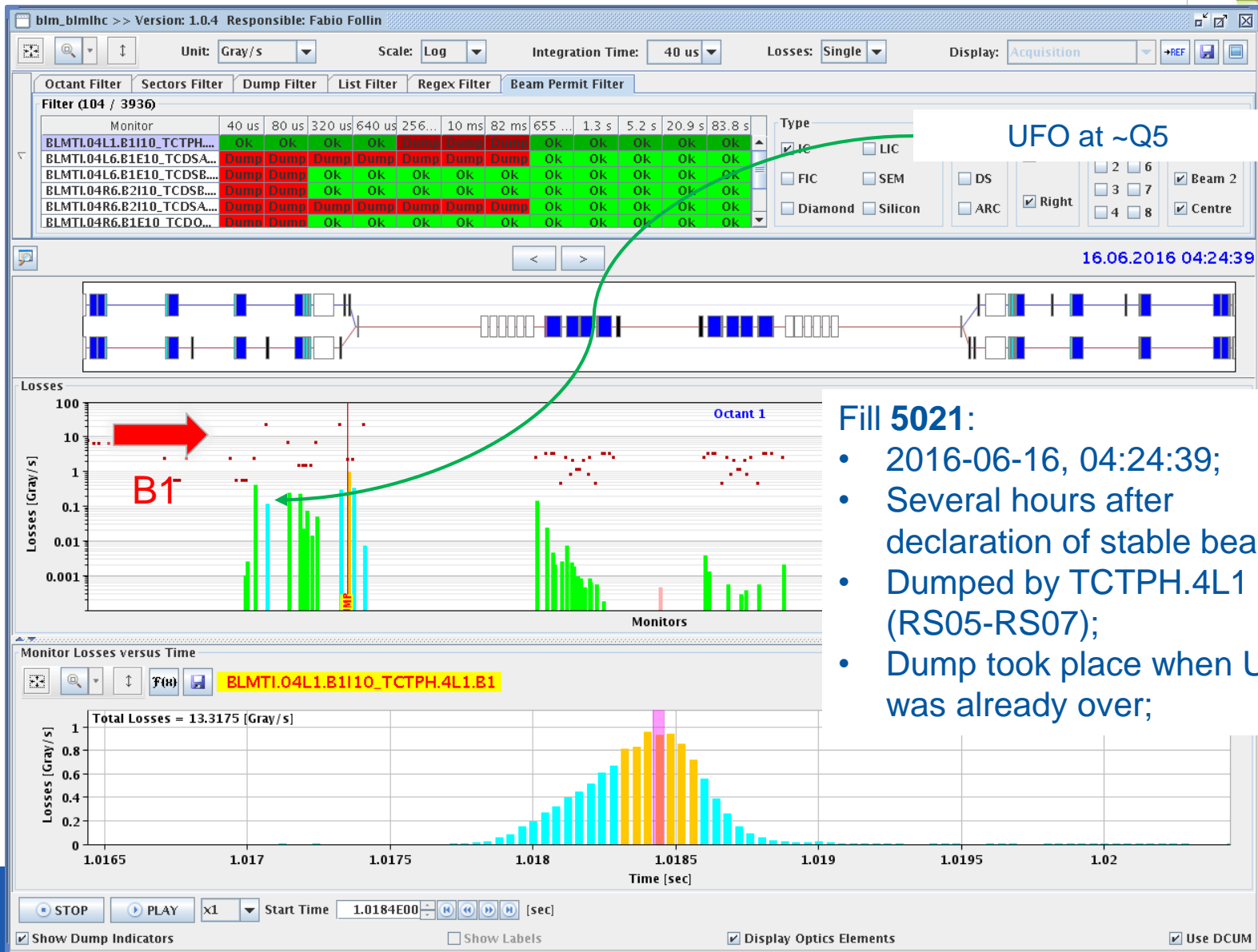


- Signals at TCL6 at 70% of dump thresholds of RS07;
 → In case of large (~3) increase factors at MQML, TCL6 may become the bottleneck
 → increase by x2 RS03-RS07 on TCL6 family (ie THRI_TCL_W)? Reluctant, due to (limited) robustness of W jaws...
- Signals at TCL5 at least one order of magnitude below thresholds;

4 dumps in LSSs due to UFO activity nearby collimators:

- Fill 4978
- Fill 4983
- Fill 5018
- **Fill 5021**

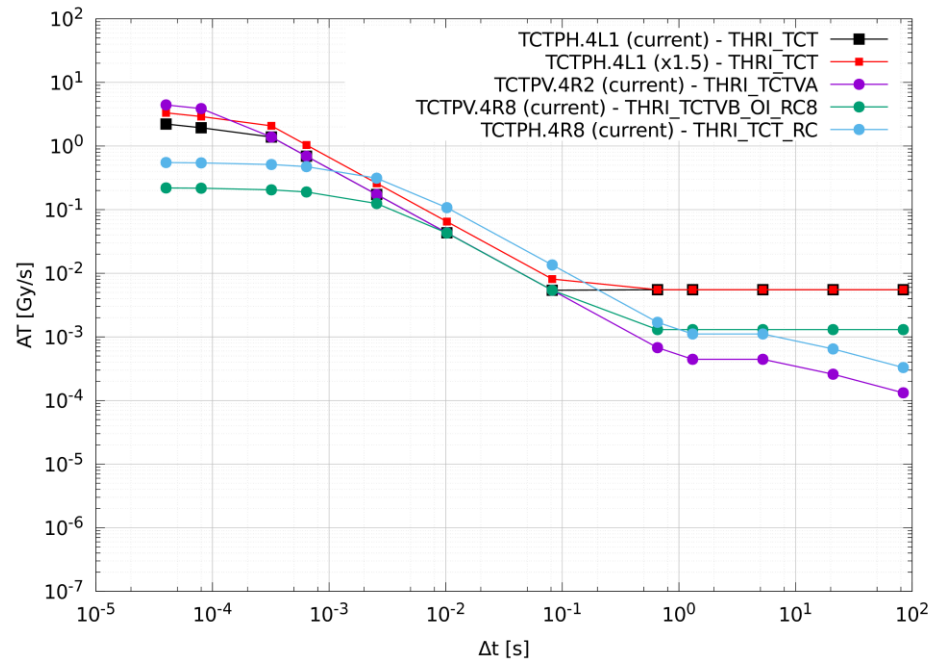
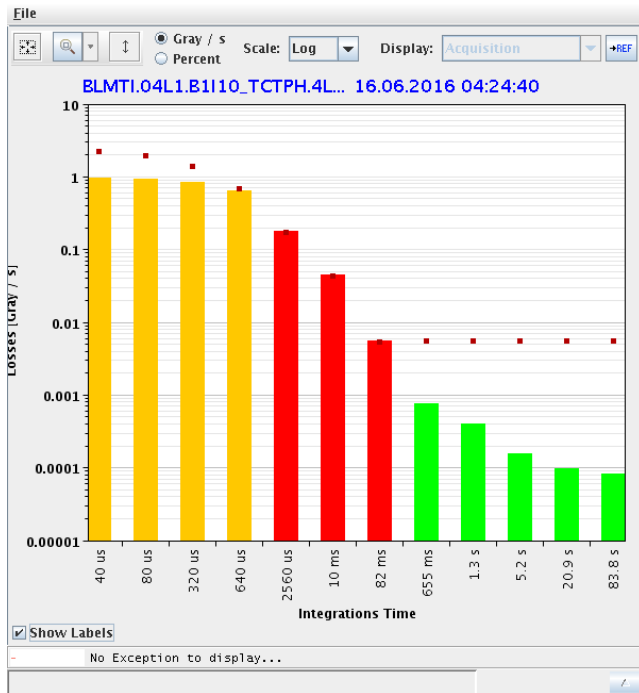
Fill 5021



Fill 5021:

- 2016-06-16, 04:24:39;
- Several hours after declaration of stable beams;
- Dumped by TCTPH.4L1 (RS05-RS07);
- Dump took place when UFO was already over;

Fill 5021 (II)



Remarks:

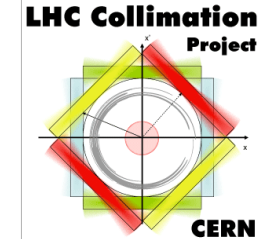
- Possible mitigation action: increase by 50% RS03-RS07 (only at FT);
→ Families THRI_TCTVA and THRI_TCTVB_OI_RC8 should be changed as well;
- 2015: FT corrections:
 - x2 on RS03-RS07 for THRI_TCTs (ie IR1/IR5 TCTs + TCTs left of IR8);
 - X2 on RS01-RS07 for THRI_TCTVB_OI_RC8 (ie TCTV right of IR8);

Conclusions

- Recent UFO activity in LSSs of experimental IRs lead to few (avoidable) beam dumps;
- Possible mitigation actions on collimators present there:
 - increase by 50% RS03-RS07 of THRI_TCT, THRI_TCTVA and THRI_TCTVB_OI_RC8 families, only at FT (following a dump – fill 5021);
 - Increase by x2 RS03-RS07 only THRI_TCL_W family (harmonization wrt change of BLM thresholds at LSS cold magnets – fill 5018);
- It should be kept in mind that all the changes involve W collimators, the least robust among all collimator families... do we really need these changes?

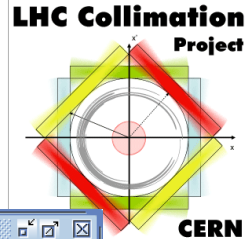
Reserve Slides

TCL5



Fill	TCL	Moment in LHC cycle	UFO seen by concerned TCL	comment
4978	TCL.5R5.B1	Few s after start of IR1/5 Physics BP	y	
4983	TCL.5L1.B1	~30s after start of IR2/8 Physics BP	n	UFO attack
5018	TCL.5L1.B1	~30s after start of IR1/5 Physics BP	y	

Fill 4978 (IV)



blm_blmhc >> Version: 1.0.4 Responsible: Fabio Follin

Unit: Gray/s Scale: Log Integration Time: 40 us Losses: Single Display: Acquisition

Octant Filter Sectors Filter Dump Filter List Filter Regex Filter Beam Permit Filter

Filter (110 / 3936)

Monitor	40 us	80 us	320 us	640 us	2560...	10 ms	82 ms	655 ...	1.3 s	5.2 s	20.9 s	83.8 s
BLMEI.06R5.B1E10_XRPE6R...	OK	OK	OK	Dump	Dump	Dump	OK	OK	OK	OK	OK	OK
BLMQL.05R5.B1E10_MQML	OK	OK	OK	Dump	Dump	Dump	OK	OK	OK	OK	OK	OK
BLMTI.04L6.B1E10_TCDSA...	Dump	Dump	Dump	Dump	Dump	Dump	OK	OK	OK	OK	OK	OK
BLMTI.04R6.B2I10_TCDSB...	Dump	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
BLMTI.04R6.B2I10_TCDSA...	Dump	Dump	Dump	Dump	Dump	Dump	OK	OK	OK	OK	OK	OK

Type: IC LIC FIC SEM Diamond Silicon

Section: LSS DS ARC

Left Ri...: Left Right

Octant: 1 2 3 4 5 6 7 8

Beam: Beam 1 Beam 2 Centre

10.06.2016 13:09:41

Inccac

Monitor Losses versus Time

BLMTI.04L6.B1E10_TCDSA.4L6.B1

Total Losses = 43.3801 [Gray/s]

STOP PLAY x1 Start Time 1.0184E00 [sec]

Show Dump Indicators Show Labels Display Optics Elements Use DCUM

Total Losses = 2.1306 [Gray/s]

STOP PLAY x1 Start Time 1.0184E00 [sec]

Show Dump Indicators Show Labels Display Optics Elements Use DCUM

Fill 5018 (III)

blm_blmhc >> Version: 1.0.4 Responsible: Fabio Follin

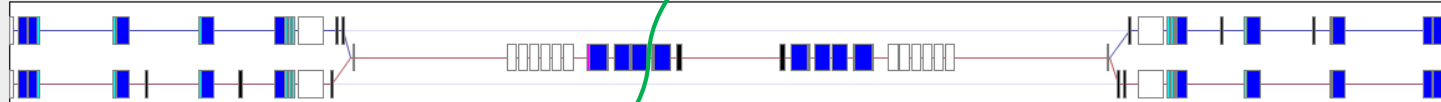
Unit: Gray/s Scale: Log Integration Time: 40 us Losses: Single Display: Acquisition

Filter (104 / 3936)

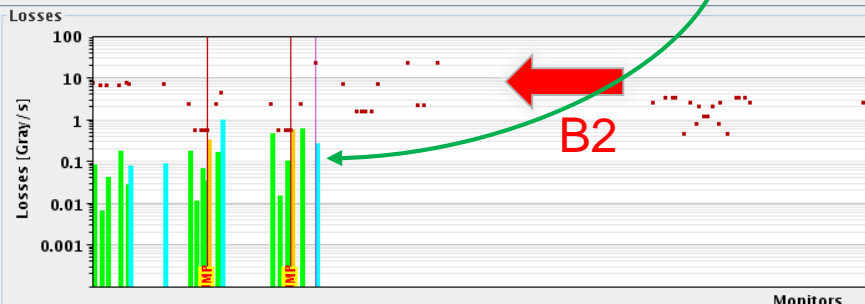
Monitor	40 us	80 us	320 us	640 us	256...	10 ms	82 ms	655...	1.3 s	5.2 s	20.9 s	83.8 s
BLMQI.05L1.B2E10_MQML	Ok	Dump	Dump	Dump	Dump	Dump	Ok	Ok	Ok	Ok	Ok	Ok
BLMQI.06L1.B2E10_MQML	Ok	Ok	Dump	Dump	Dump	Dump	Ok	Ok	Ok	Ok	Ok	Ok
BLMTI.04L6.B1E10_TCDSA...	Dump	Dump	Dump	Dump	Dump	Dump	Ok	Ok	Ok	Ok	Ok	Ok
BLMTI.04L6.B2I10_TCDQA...	Dump	Dump	Dump	Dump	Dump	Dump	Ok	Ok	Ok	Ok	Ok	Ok
BLMTI.04L6.B2I10_TCDQA...	Dump	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok
BLMTI.04R6.B2I10_TCDSE...	Dump	Dump	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Ok

Type: IC LIC FIC SEM Diamond Silicon ARC Right 4 8 Centre

14.06.2016 13:57:37



Losses (Gray/s)

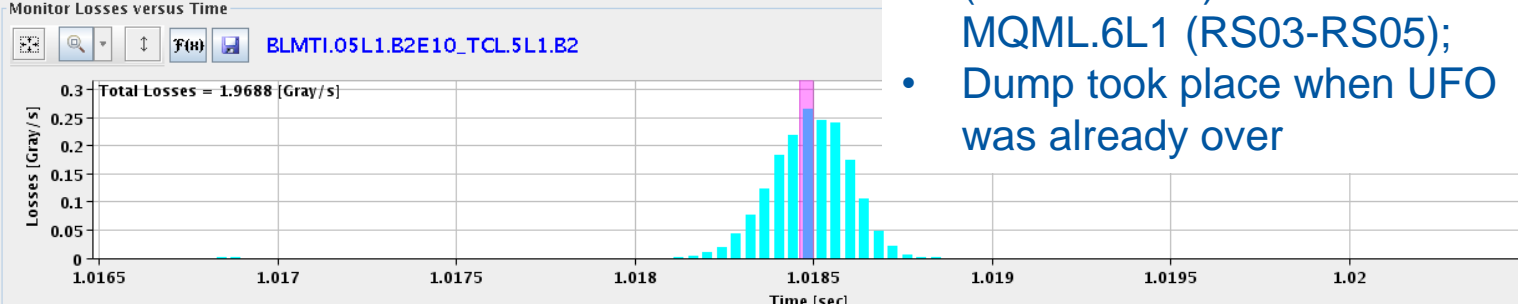


Monitors

Monitor Losses versus Time

BLMTI.05L1.B2E10_TCL.5L1.B2

Total Losses = 1.9688 [Gray/s]



STOP PLAY x1 Start Time 1.0185E00 [sec]

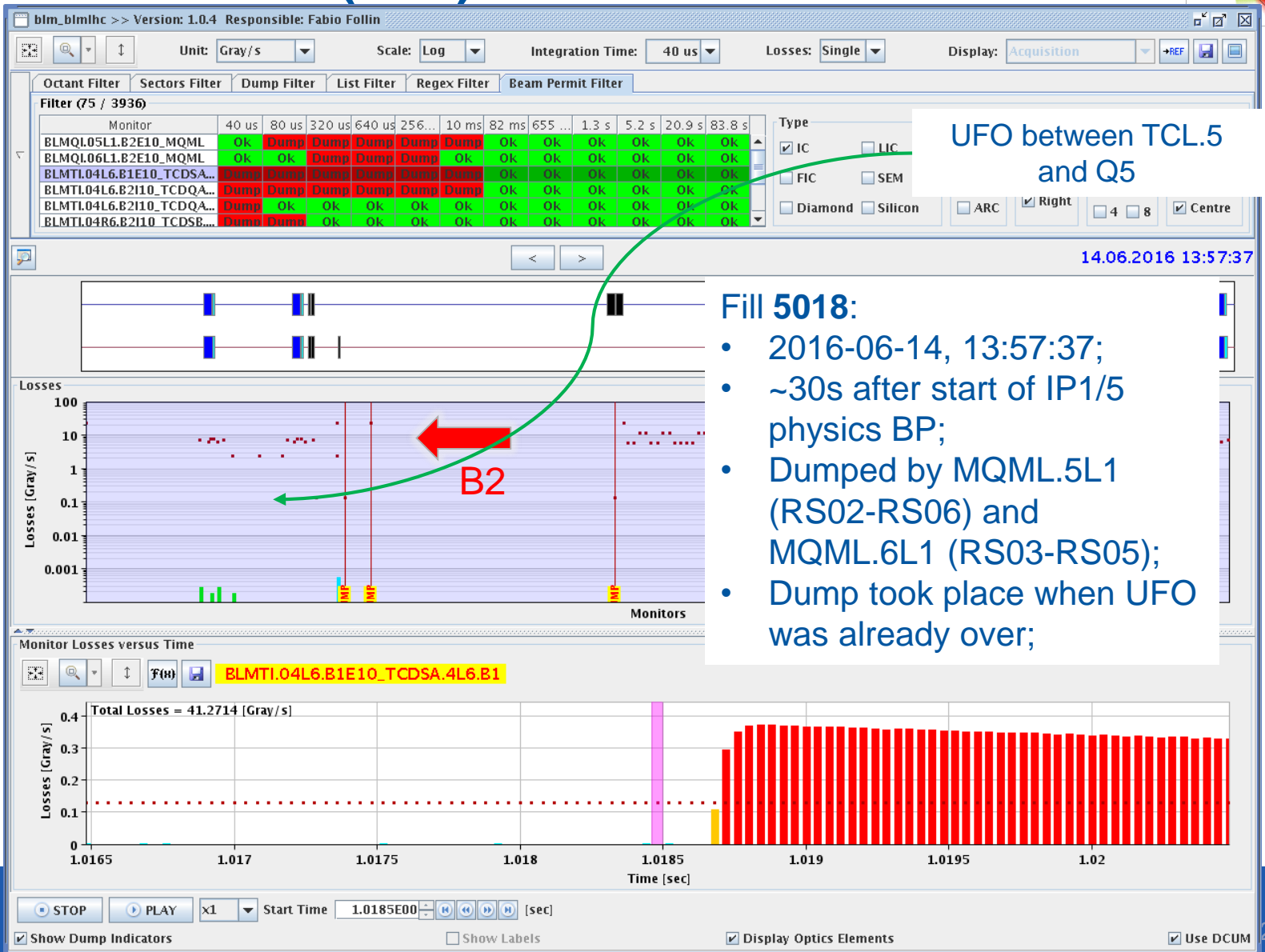
Show Dump Indicators Show Labels Display Optics Elements Use DCUM

UFO between TCL.5 and Q5

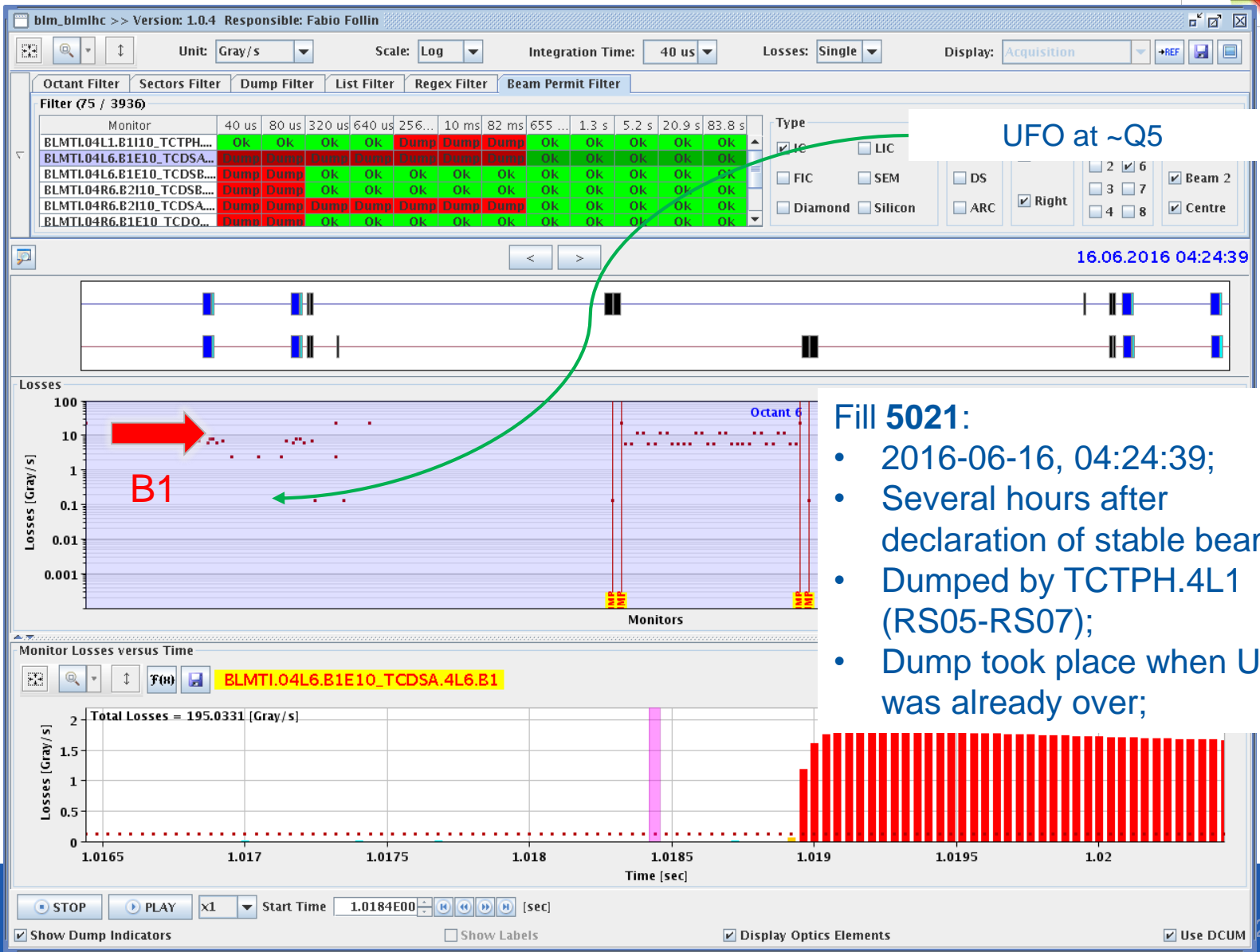
Fill 5018:

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- Dumped by MQML.5L1 (RS02-RS06) and MQML.6L1 (RS03-RS05);
- Dump took place when UFO was already over

Fill 5018 (IV)



Fill 5021



Fill 5021:

- 2016-06-16, 04:24:39;
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