



Status of the newly installed BeamLoss Detectors

Laura Torino

DEELS 2017, 12/06/2017

On the previous episodes...

What we had

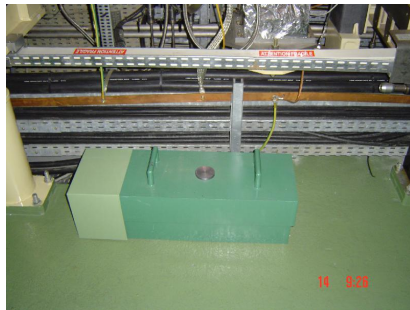
- 64 "Slow" Beam Loss Detectors
 - PMT + scintillator
 - Read out $< 1\text{Hz}$
- 64 Ionization Chambers
 - Extremely heavy



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- Something flexible
 - Slow Losses
 - Fast Losses
- Something handy
- Something "off shelf"
 - Systematically located

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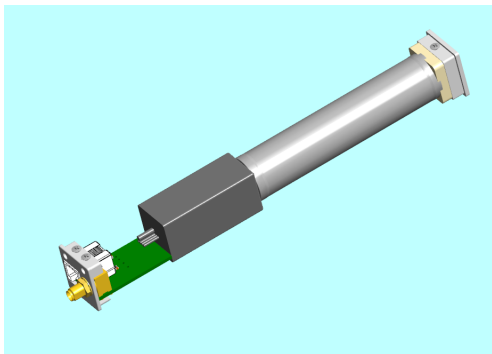
What we wish to have

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What we decided to have

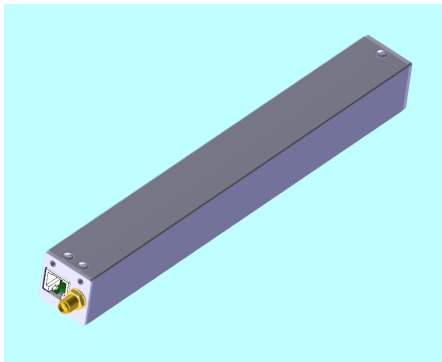
Off-shelf PMT coupled with a scintillator and Commercial electronic to control and read the results

New ESRF BLM System – BLD



- PMT Hamamatsu H10721-110
 - 8 mm active area
 - Powered 5 V
 - 0-1 V gain control
- EJ-200 scintillator rod (100x22mm)
 - Wrapped in reflective foil
- "Light" lead shielding

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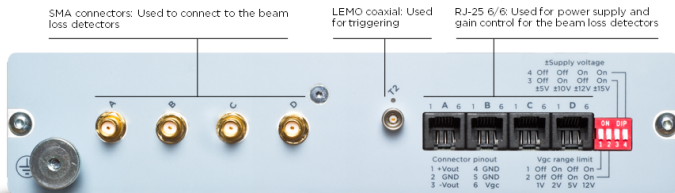
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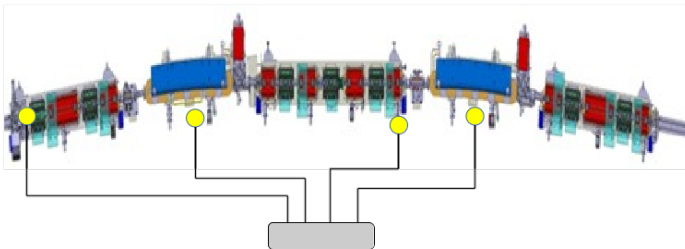


New ESRF BLM System – BLM



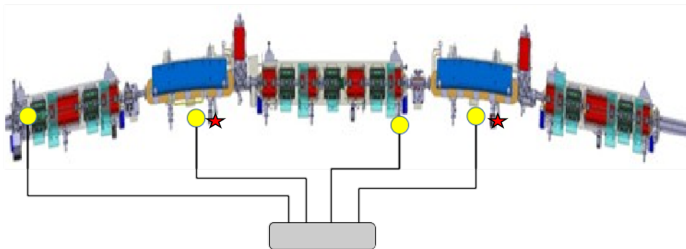
- General power supply
- Trigger input
- 4 independent gain control channels
- 4 independent impedance settings ($50\ \Omega/1\ \text{M}\Omega$)
- 4 independent read out channels
- 8 ns ADC sample

BLDs Location



32 ESRF cells \Rightarrow 32 Libera BLM units
4 BLDs per cell \Rightarrow 128 BLDs

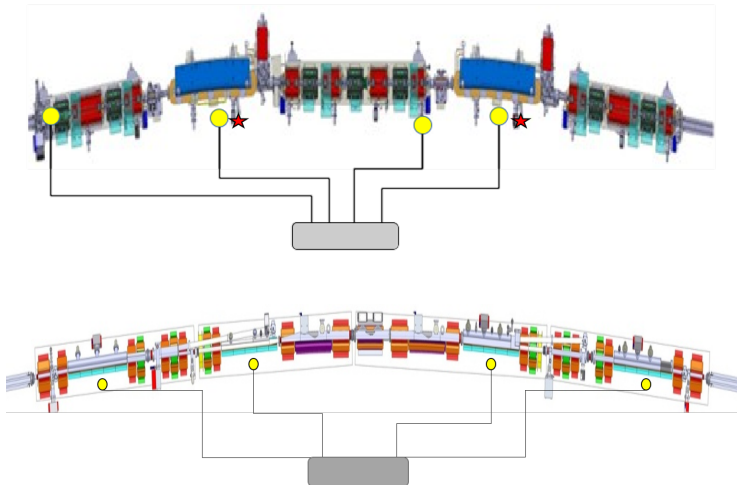
BLDs Location



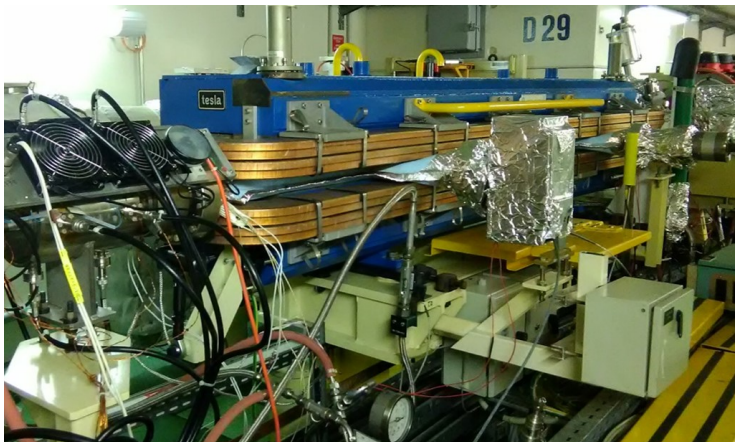
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Direct comparison with the current BLD
system

BLDs Location



Example



- 128 BLDs relatively calibrated
- 128 BLDs installed
- Cell 4 to Cell 26 (92 BLDs) commissioned
- Cell 1 to Cell 3 and Cell 27 to Cell 32 installed (preliminary results)

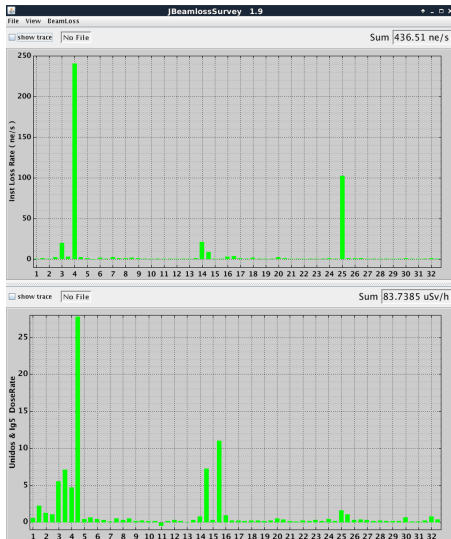
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⇒ Slow Losses

⇒ Fast Losses

⇒ Turn by Turn Losses

Slow Losses – Current System



Usefull tool during machine operation

Slow Losses – New System

Settings

- High Impedance
- Decimation Level
- Integration Time

AtkPanel 5.5 : ss/d-blm/c10

File View Preferences Help

ss/d-blm/c10

The device is in ON state

TerminationD	1 MOhm	1 MOhm
AttenuationA	20	20
AttenuationB	20	20
AttenuationC	20	20
AttenuationD	20	20
TZTrigDelay	237	237
TZTrigCount	4676725	4676725
AdcEnable	<input type="checkbox"/>	False
AdcLength	100	100
SumEnable	<input type="checkbox"/>	False
SumLength	100	100
AvgEnable	<input type="checkbox"/>	False
AvgLength	100	100
SalHistoryEnable	<input checked="" type="checkbox"/>	True
SalHistoryLength	600	600
CounterEnable	<input type="checkbox"/>	True
CounterDataRate	10	10
SalEnable	<input checked="" type="checkbox"/>	True
AdcMaskOffset	0	0
DecimationSum	352	352
AdcMaskWindow	352	352
DecimationAvgN	4	4
DecimationAvgVal	16	16
DecimationSalN	17	17
DecimationSalVal	131072	131072

Scalar	AdcA	AdcE	AdcC	AdcD	SumA	SumE	SumC	SumD
AvgA								
AvgE								
AvgC								
AvgD								
SalHistoryA								
SalHistoryE								
SalHistoryC								
SalHistoryD								
CounterC								
CounterD								
SalA								
SalE								
SalC								
SalD								

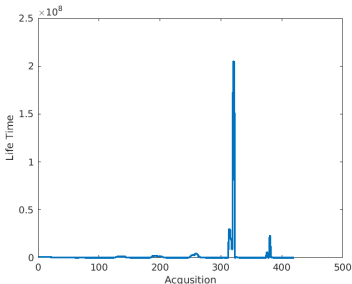
Synchrotron Radiation Influence – Test

X-rays produced by synchrotron radiation interact with the BLD scintillator and produce unwanted background

Low losses condition
(Low current/High
Lifetime)



Only synchrotron
radiation is detected



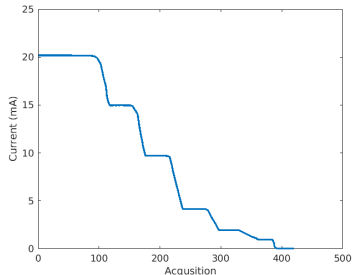
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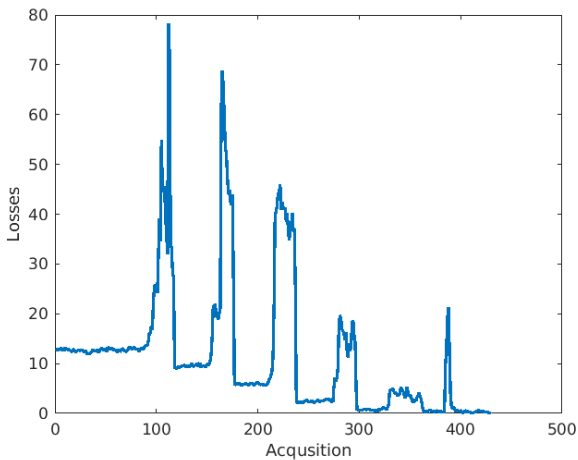
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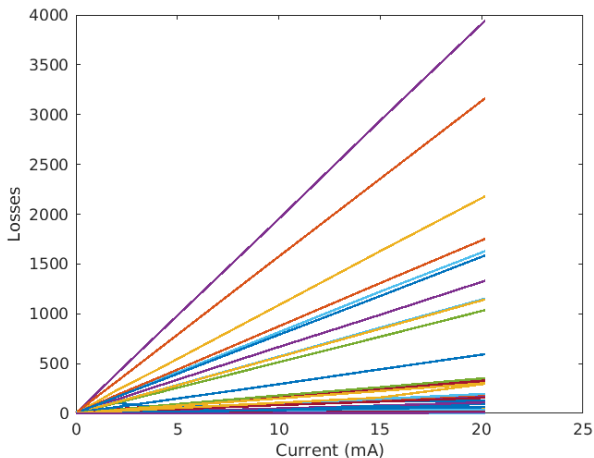
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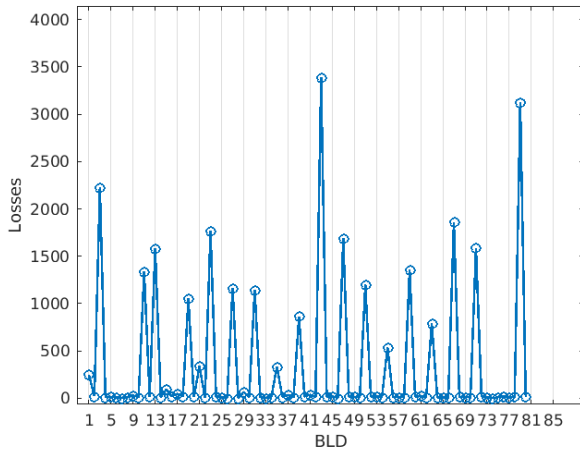
Synchrotron Radiation Influence – Evidence



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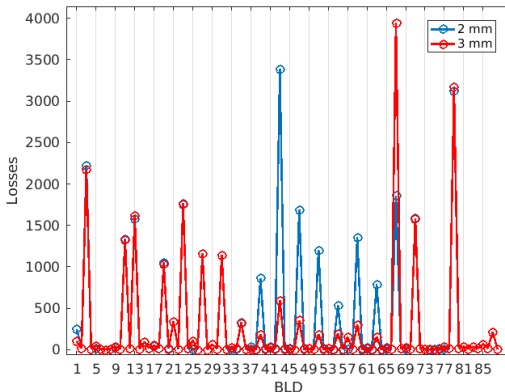


Synchrotron Radiation Influence – Evidence



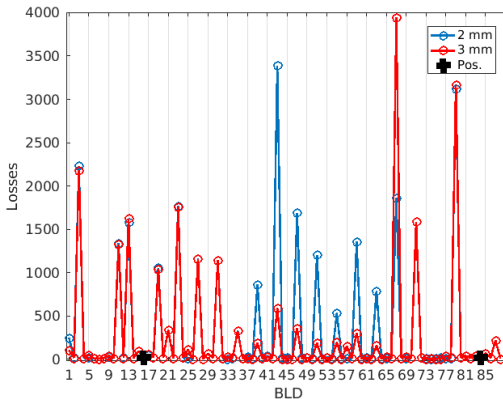
Synchrotron Radiation Influence – Shielding

Increase the lead shielding from 2 to 3 mm (Cell 13 to Cell 19, preliminary)

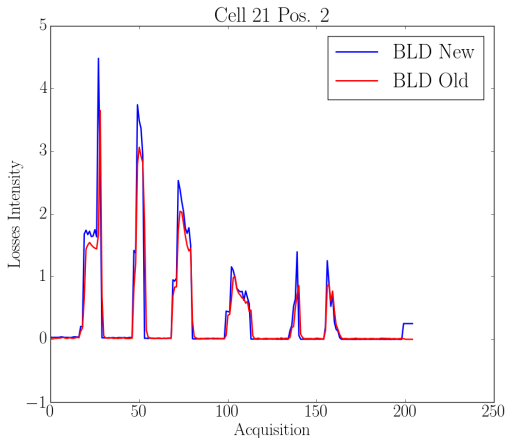


Synchrotron Radiation Influence – Position

Design a specific support of BLDs in position 3



Comparison Current/New BLDs

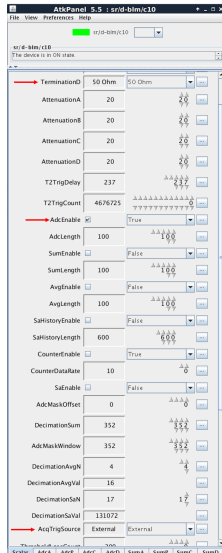


Data acquired during top-up injection

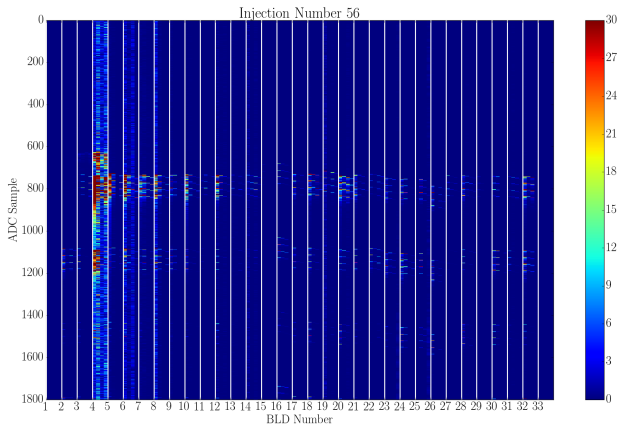
Fast Acquisition

Settings

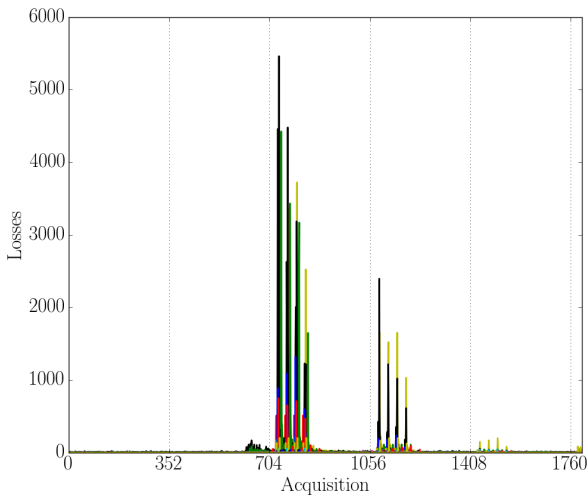
- 50 Ω Impedance
- ADC Sample (8 ns)
- External Trigger



Fast Acquisition – Injection Monitoring

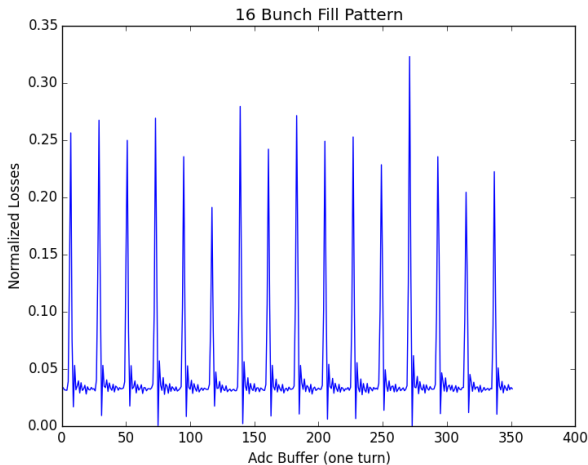


Fast Acquisition – Injection Monitoring



Fast Acquisition – Bunch by Bunch Losses

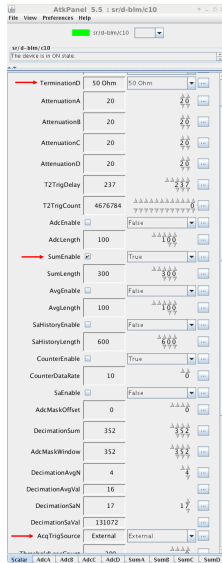
BLD after a vertical scraper (7.2 mm) aperture \Rightarrow Counting mode



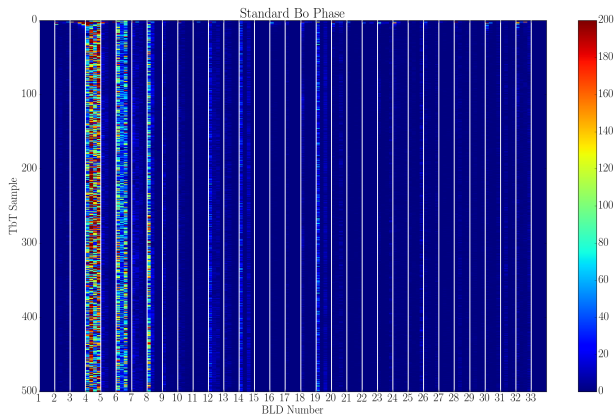
Turn by Turn Acquisition

Settings

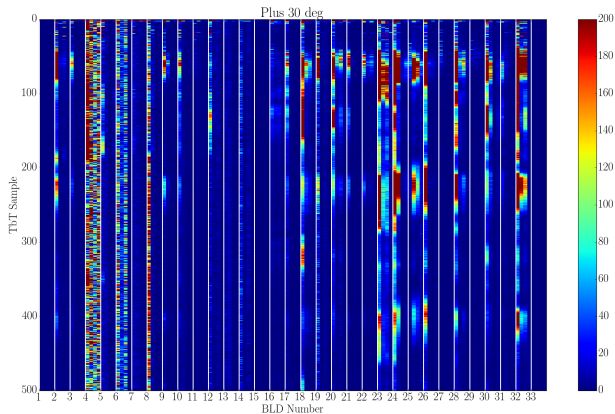
- 50 Ω Impedance
- DecimationSum = 1 turn (352)
- External Trigger



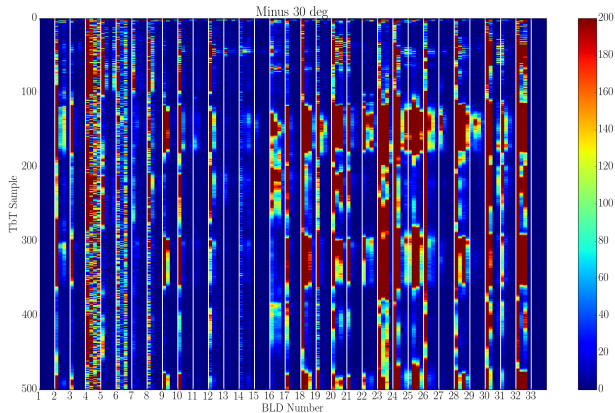
Turn by Turn – Booster Phase Shift



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Summary

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- Reliable and user-friendly software ✓
- Good option to substitute the current system ✓
- Additional feature (fast and turn by turn acquisition) ✓

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Many thanks to K. Scheidt, F. TaouTaou, N. Benoist, J.L. Pons