

Results of BLM filter verification

113th SPS and LHC Machine Protection Panel Meeting

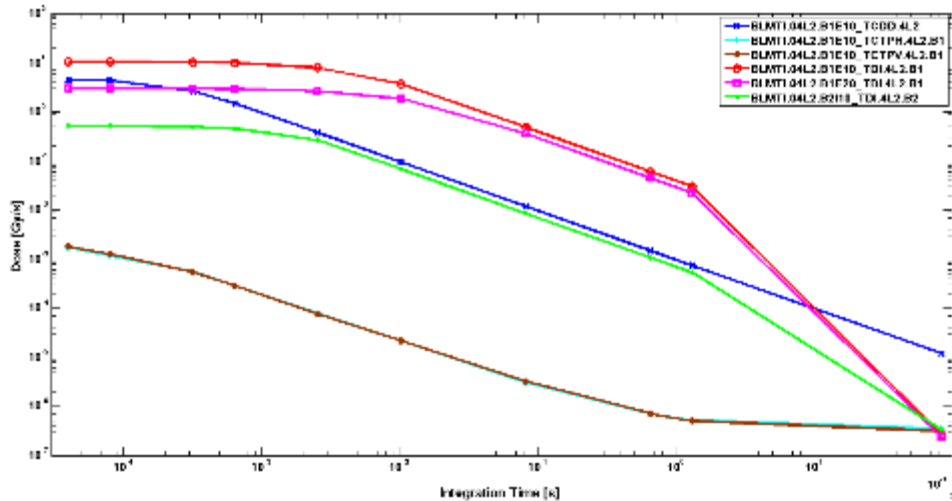
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BE-BI-BL

14/08/2015

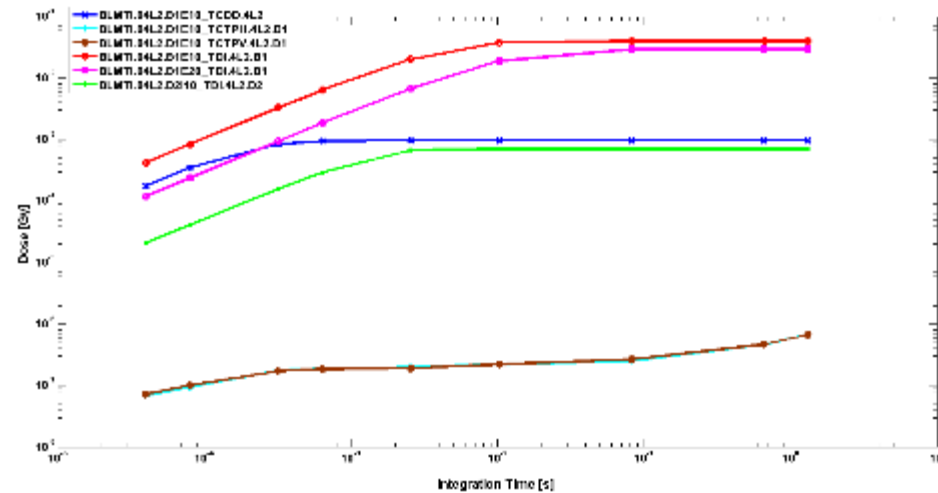
Monitors with filters

- In the LHC ring, there are 181 monitors with filters
 - 80 ICs, 101 LICs
- Two filter types
 - Big filter: $C = 47000 \text{ pF}$, $R = 150 \text{ k}\Omega$, $\tau = 0.33 \text{ ms}$
 - 34 ICs, 101 LICs
 - Small filter: $C = 2200 \text{ pF}$, $R = 150 \text{ k}\Omega$, $\tau = 7.05 \text{ ms}$
 - 46 ICs
- In addition, dump line ICs have also filters
 - $C = 1 \text{ }\mu\text{F}$, $R = 100 \text{ k}\Omega$
 - Not checked

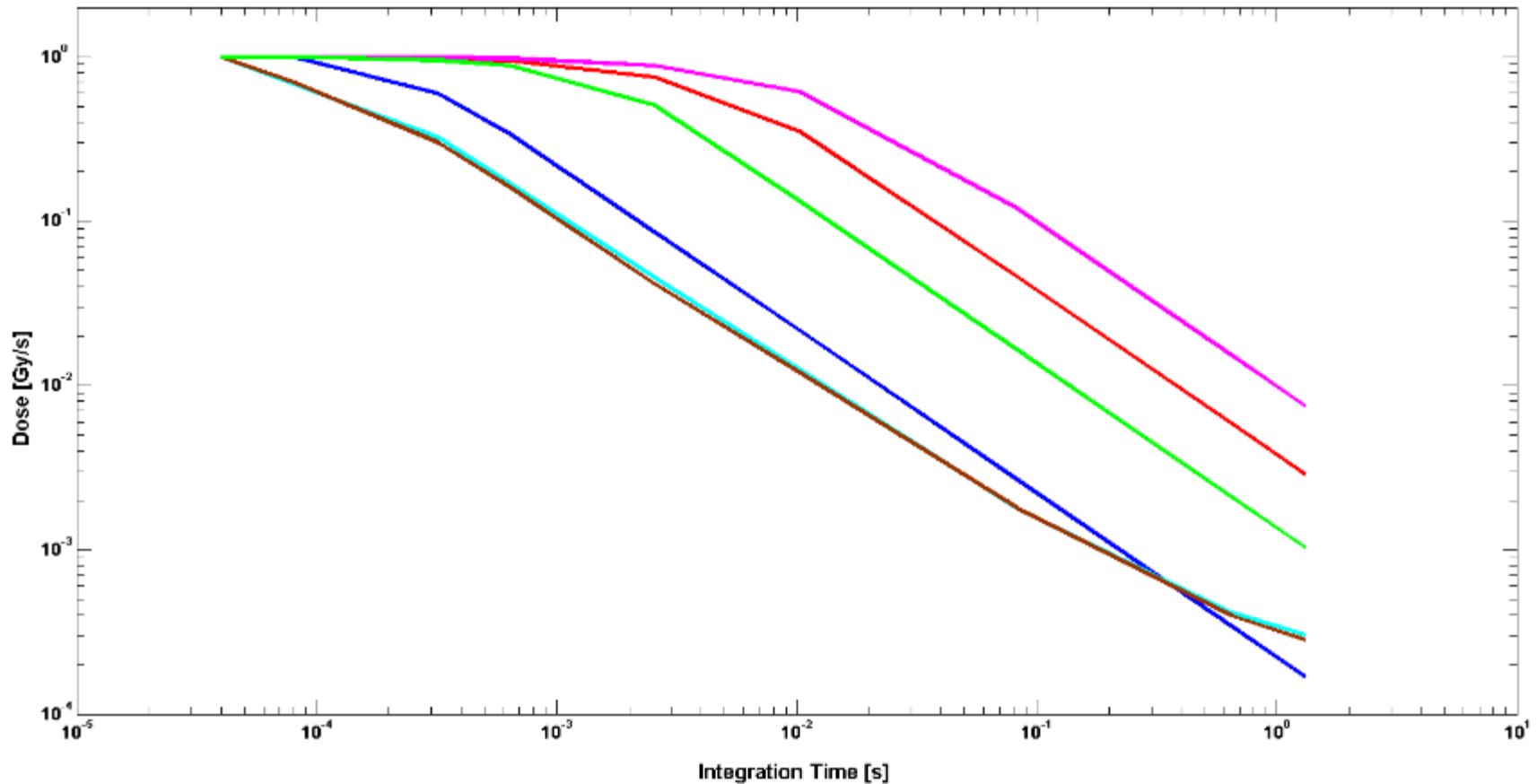
Beam loss measurement with monitors with RC filter



BLMTI.04L2.B1E10_TCDD.4L2 *NF*
 BLMTI.04L2.B1E10_TCTPH.4L2.B1 *NF*
 BLMTI.04L2.B1E10_TCTPV.4L2.B1 *NF*
 BLMTI.04L2.B1E10_TDI.4L2.B1 *SF*
 BLMTI.04L2.B1E20_TDI.4L2.B1 *BF*
 BLMTI.04L2.B2I10_TDI.4L2.B2 *SF*



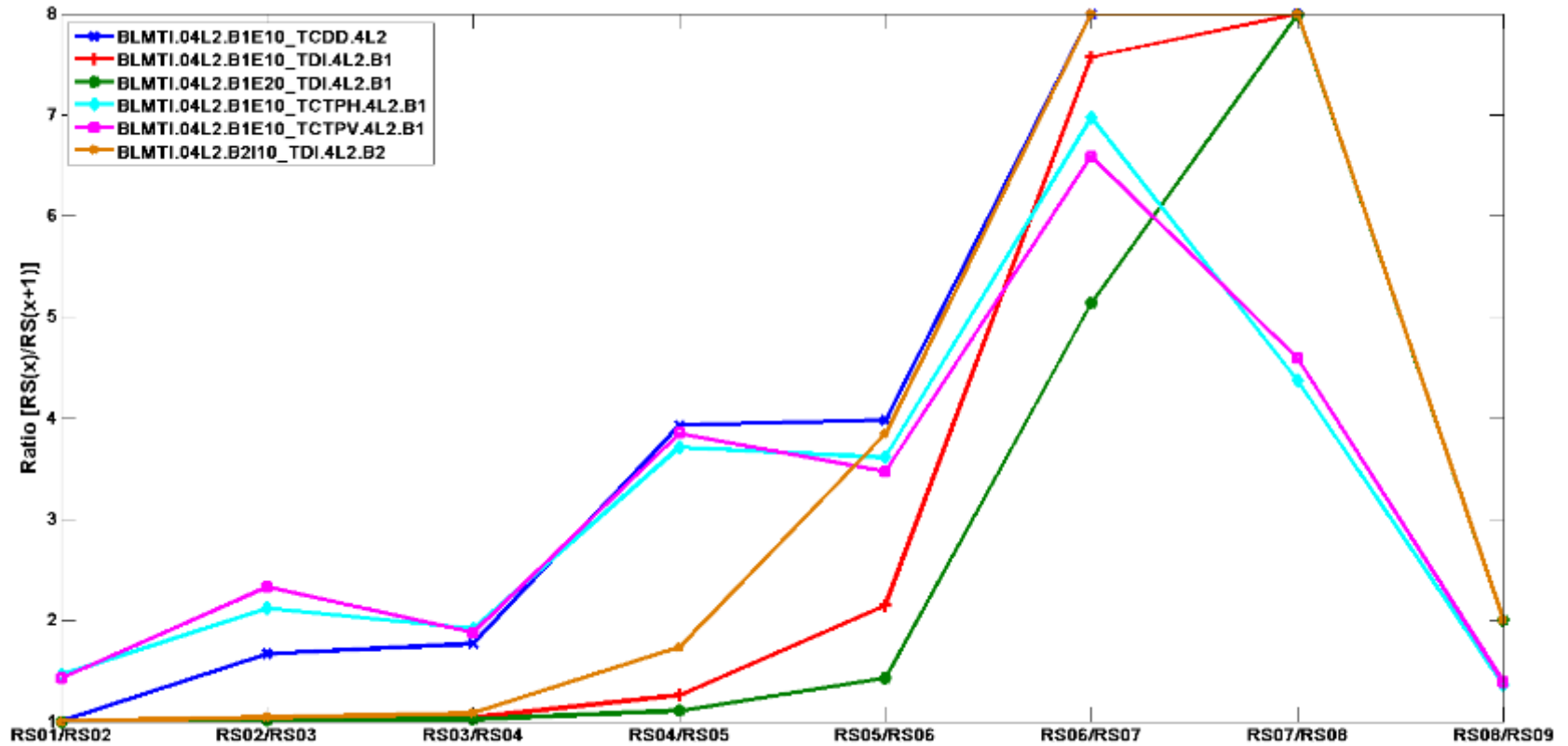
Beam loss measurement with monitors with RC filter



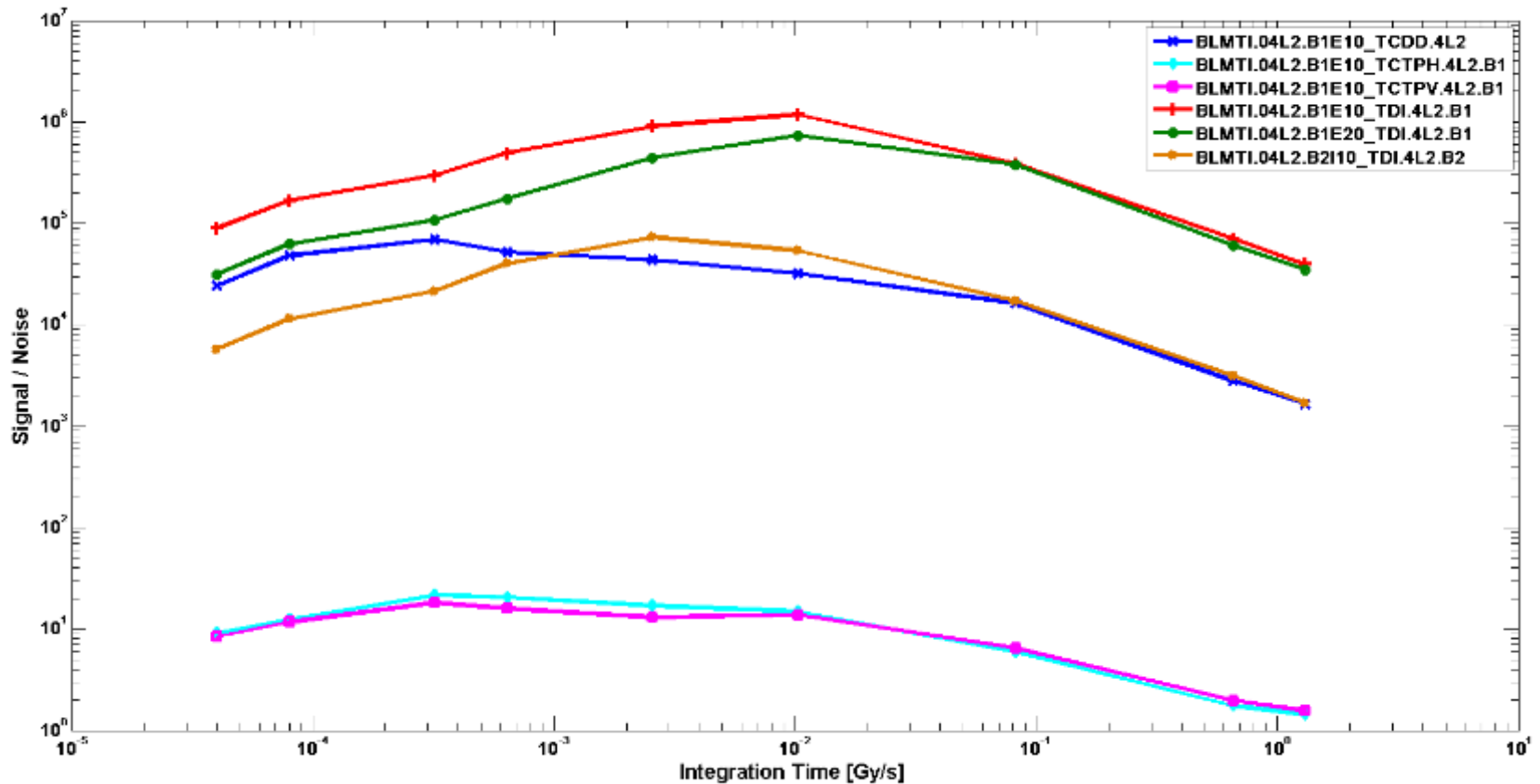
Running Sums

| Running Sum | Time [s] | Ratio Dose[RS(x)]/Dose[RS(x+1)] | With Small Filter | With Big Filter |
|-------------|----------------|---------------------------------|-------------------|-----------------|
| RS1 | 0.00004 | 2 | 1 | 1 |
| RS2 | 0.00008 | 4 | 1 | 1 |
| RS3 | 0.00032 | 2 | 1 | 1 |
| RS4 | 0.00064 | 4 | ~ 1 | ~ 1 |
| RS5 | 0.00256 | 4 | ~ 2 | < 2 |
| RS6 | 0.01024 | 8 | >= 6 | < 6 |
| RS7 | 0.08192 | 8 | 8 | 8 |
| RS8 | 0.65536 | 2 | 2 | 2 |
| RS9 | 1.31072 | | | |

Comparison of different filter types



Signal to Noise Ratio



Status of the IC filter checks

14/08/15

- All but one filters have been verified
 - For BLMQI.06L8.B1E30_MQML no losses have been seen ($S/N < 10$)
 - Analysis is run once a month to seek possible loss events => verification on first loss

LICs with filters

- None of the LICs are in BIS
 - Less critical
- LICs are a factor of 60 less sensitive than ICs
 - Most loss events have small S/N ratio
- 1 filter installation missing
- 32 LICs with filters verified by data
 - 26 can be verified to have a big filter
 - 6 behave as ICs with small filters
 - Need to understand better LIC performance, simulations ongoing

