

SPS BLM MD 15-16 Nov 2006 results and 2007 MD proposal

Daniel Kramer BI-BL

SPS Beam Conditions

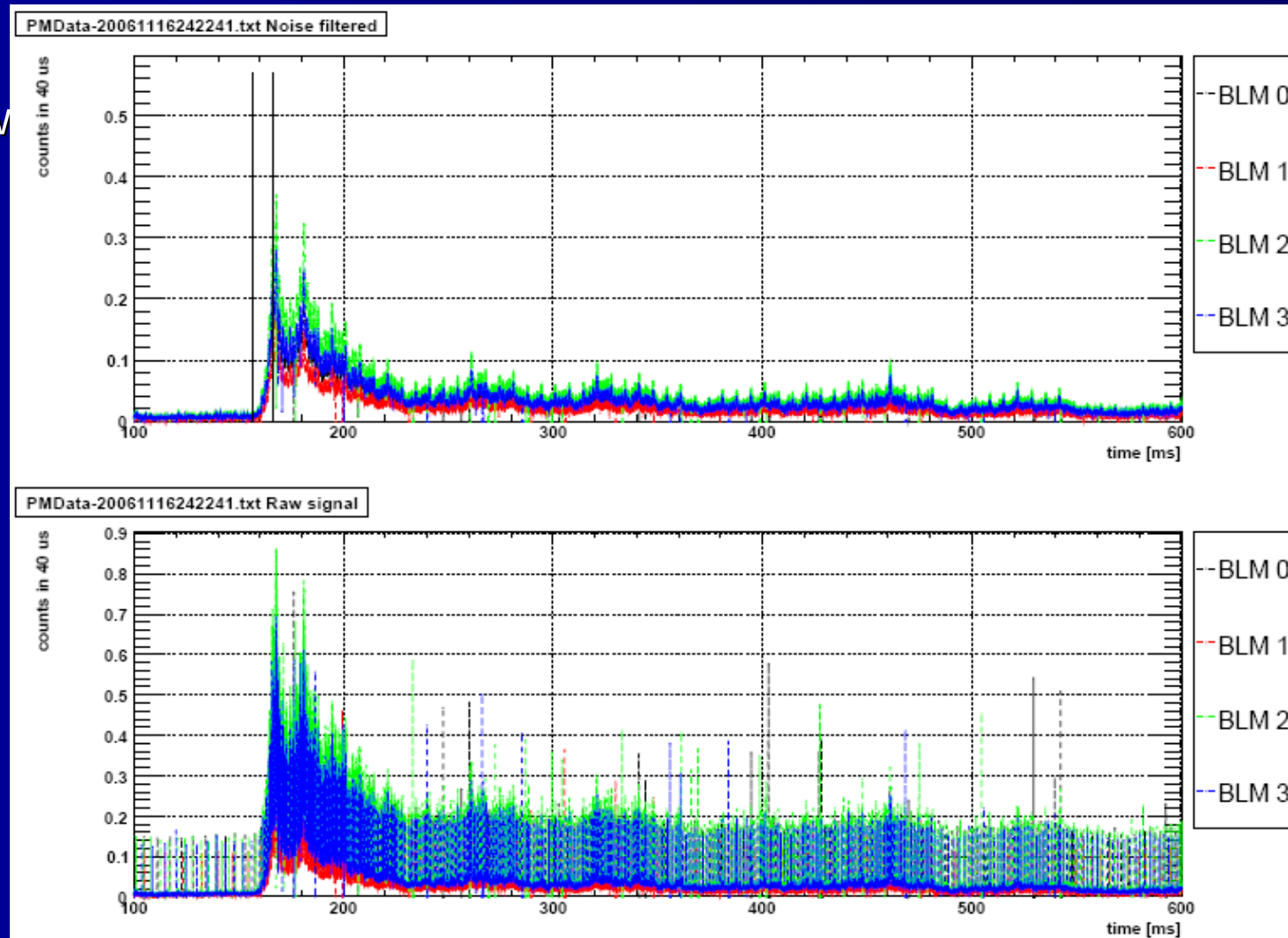
- Coasting beam 270 GeV
- Type LHC2
- Intensity 4 bunches ($1.1 \times 10^{11} p^+ / \text{bunch}$)
- RF ON
- LHC Collimator in LSS5 active

Available data

- 4 BLMIs installed downstream the collimator (~10m)
- 2 positions per jaw (motors) recorded
 - Single jaw moved (parallel displacement)
- 1.7s long Post Mortem triggered by collimator movement (40us integration time)
- 80 ms long Collimation Logging triggered by collimator movement (2.52 ms integration time)
- Peak of 12 Running Sums every second

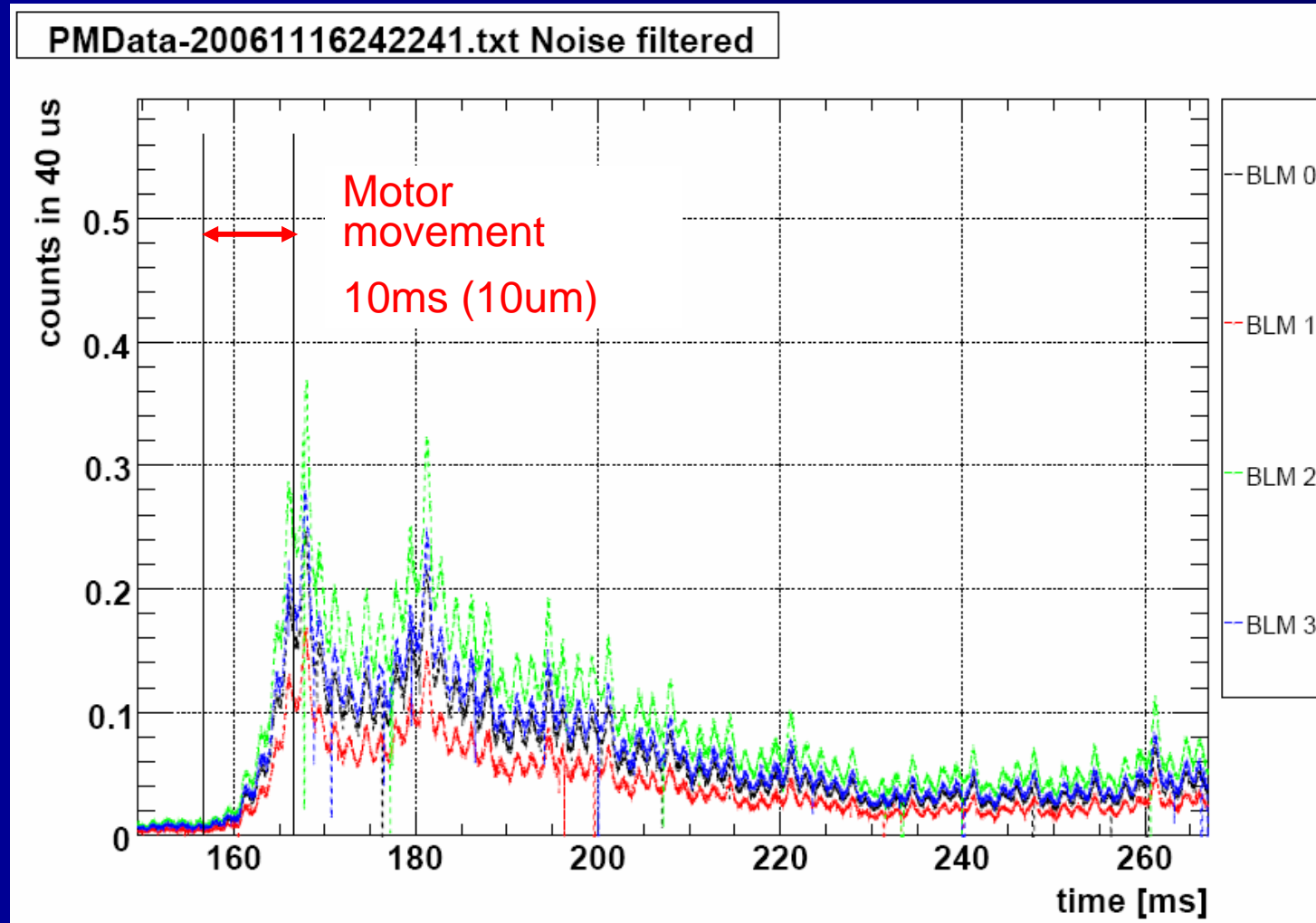
Filtered + raw Post Mortem data

- 1 mm/s assumed for jaw speed
- Start @ trigger + 9ms
- CFC electronics introduces systematically additional counts
 - problem solved for the new version



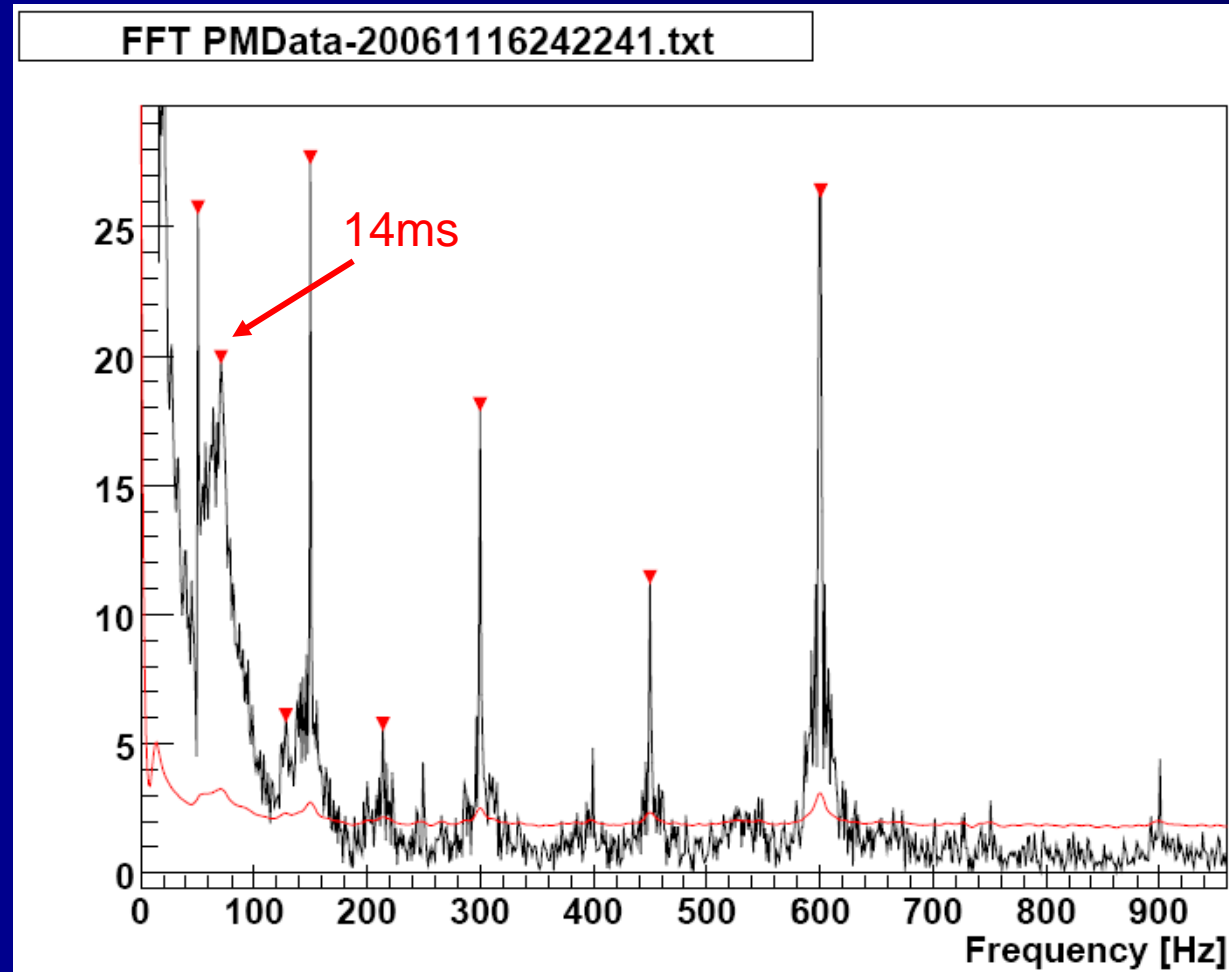
PM data zoom with jaw Start Stop marked

- Offline filtering does not change spectra (adapted for the specific CFC miscounting)
- Most visible ripple: 600Hz



FFT of the filtered PM data (previous plot) zoom

- Dominant frequencies from 3-phase Magnet Power Supplies
 - 50 150 300 450 600 Hz
- 71 Hz from the jaw bending..?
($\tau = 14\text{ms}$)

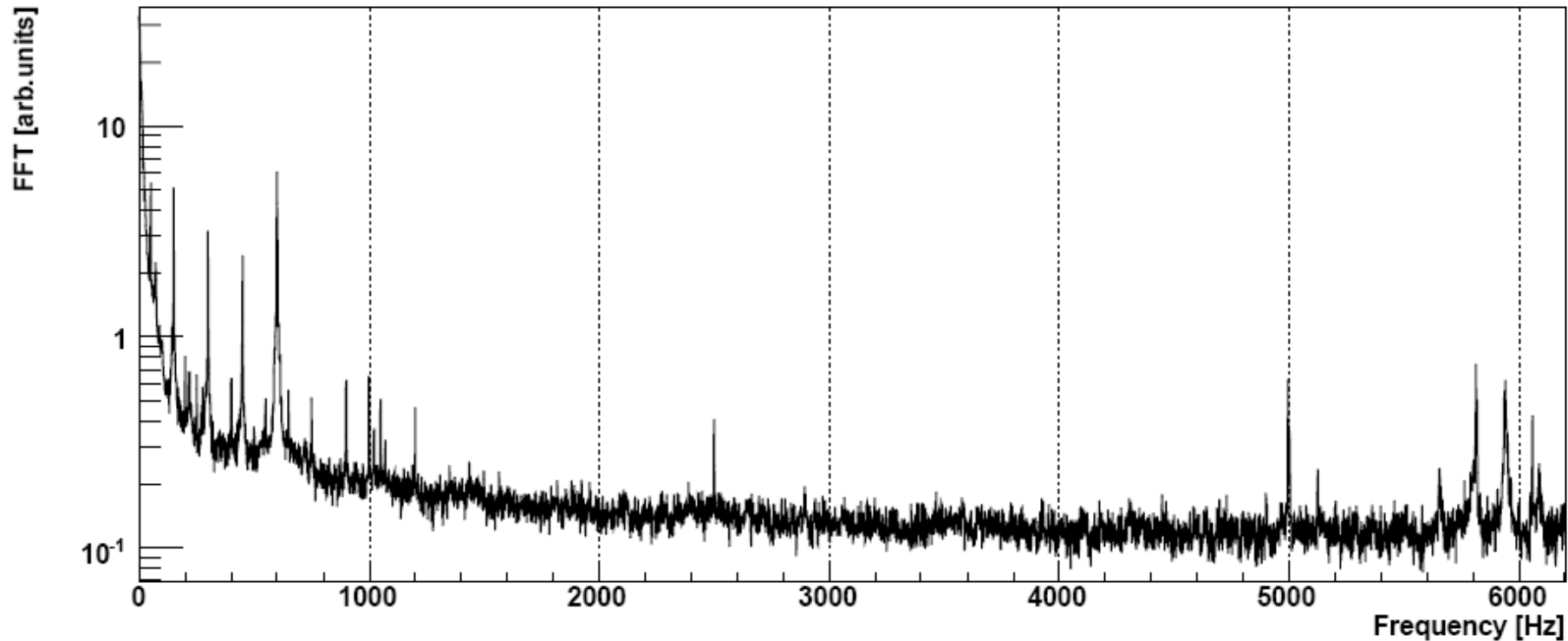


Possible sources of the ripple

- HV BLM power supply
 - Low pass filter at the HV input to the BLM
 - Single phase PS (would not have 600Hz)
- EMC into the BLM signal or HV cables
 - Unlikely as not seen if no losses occur
- Introduced by transverse beam oscillations

Sum of FFTs of relevant PM files

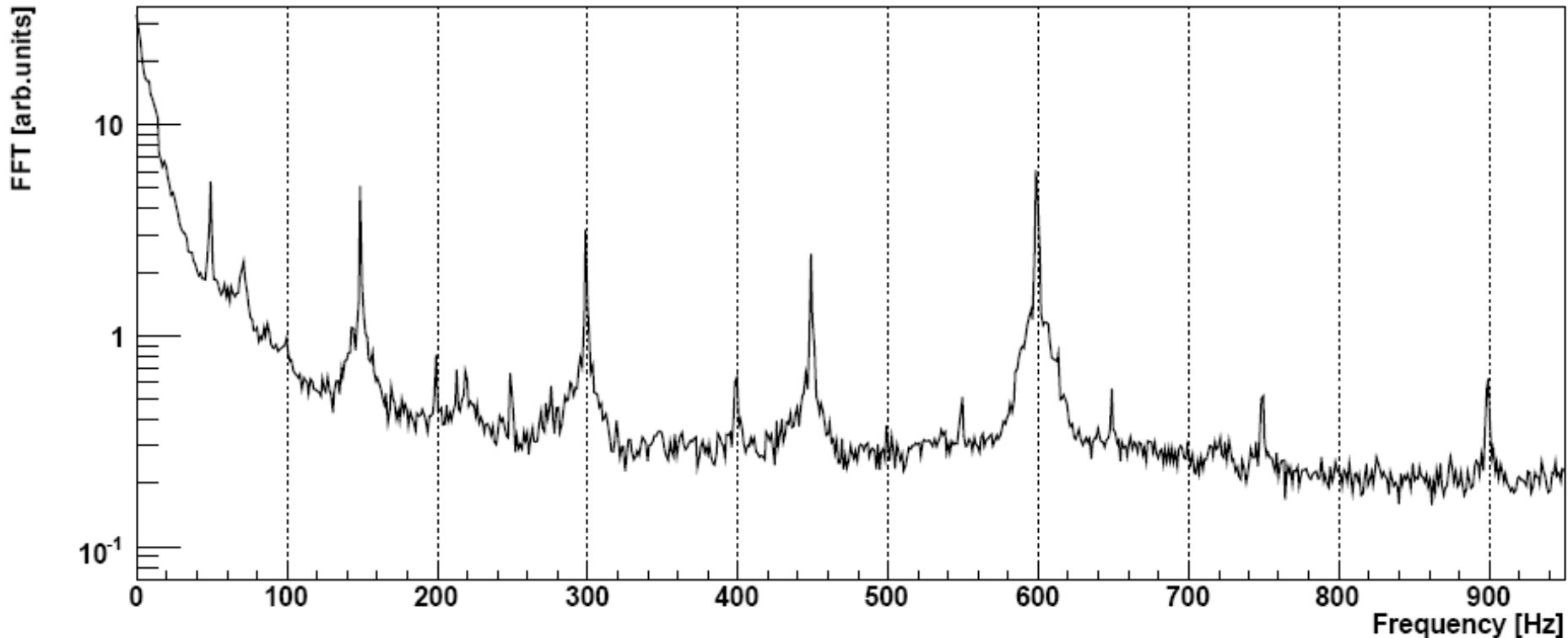
Sum of FFTs of PostM data 16/11/06



- High frequency lines to be identified
 - H & V tune + Qs
 - Electronics chain effects

Zoom of previous plot (sum over 32 collimator movements)

Sum of FFTs of PostM data 16/11/06



- Frequency spectra stable over ~2h time

FFT of Quadrupole voltage from "Power Supply Ripple Study at the SPS" (1994)

Highest peak at
600 Hz and
50 Hz

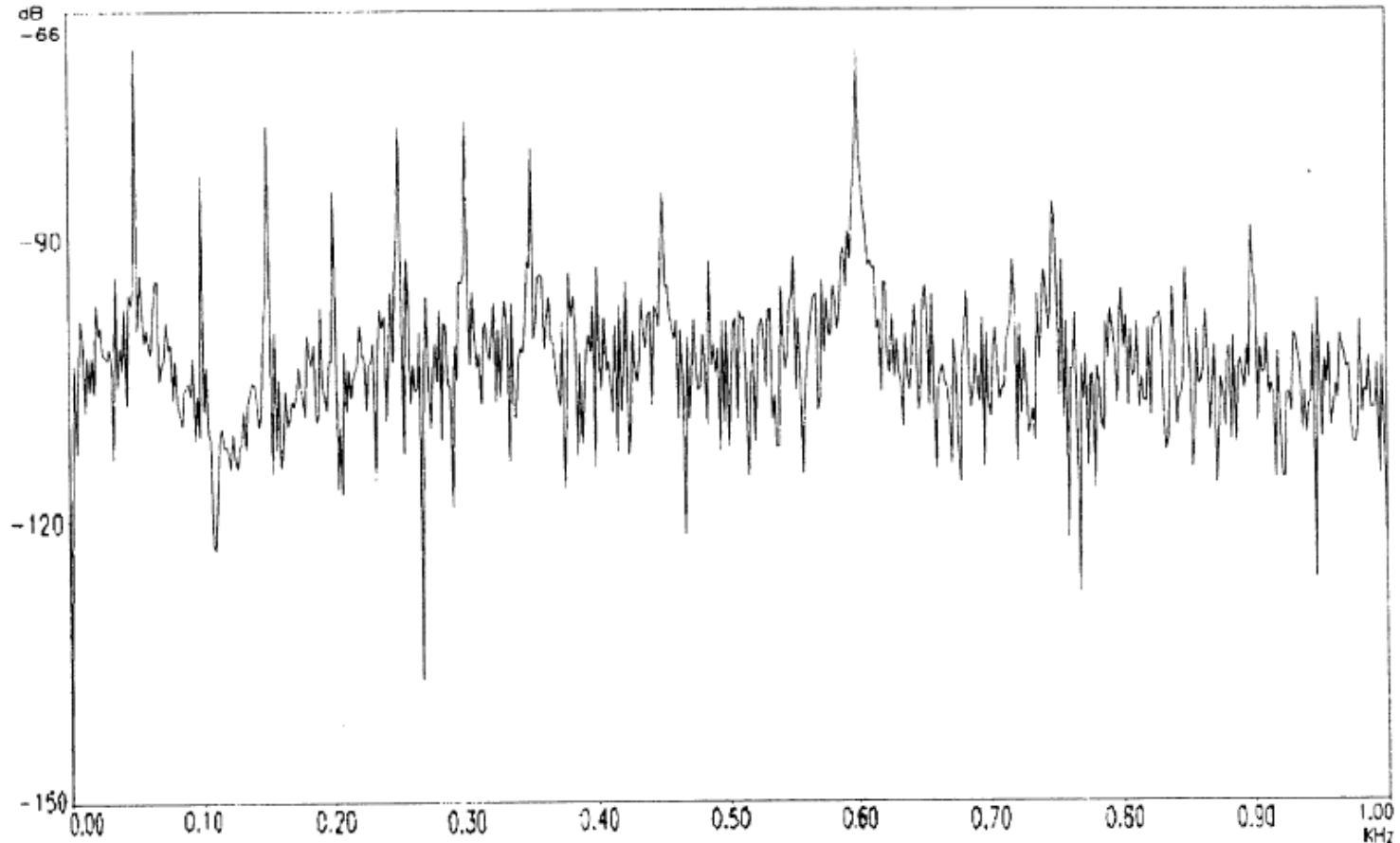


Figure 25: Voltage Measurement of Q_{12} Quadrupole Chain

SPS Horizontal tune ripple measurements (92 & 93)

- 200,500 and 1000 Hz do not come from MPC
- 150,300,600 are also in the voltage spectra
- Inconsistency of the 150 Hz line in 1993

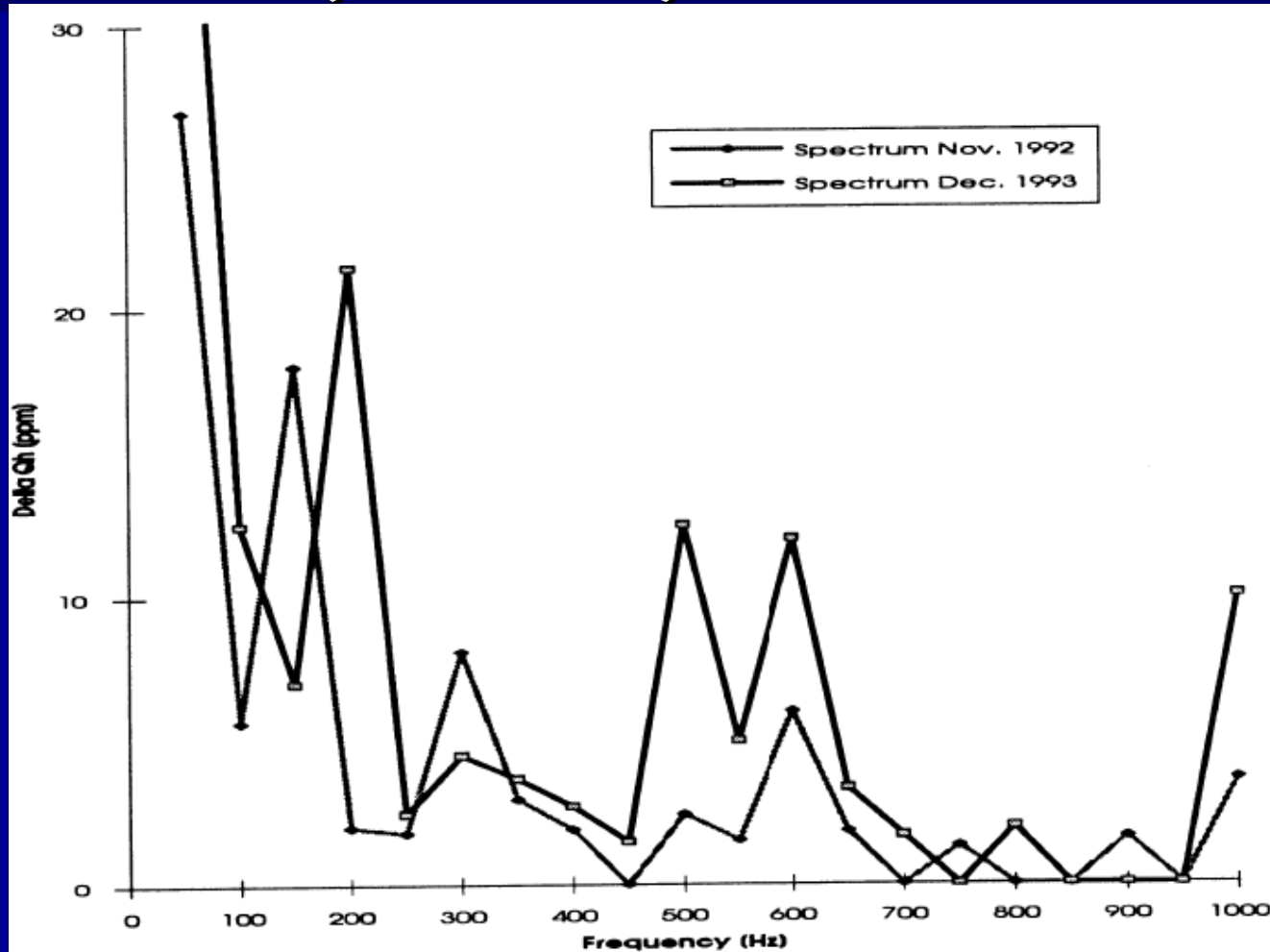
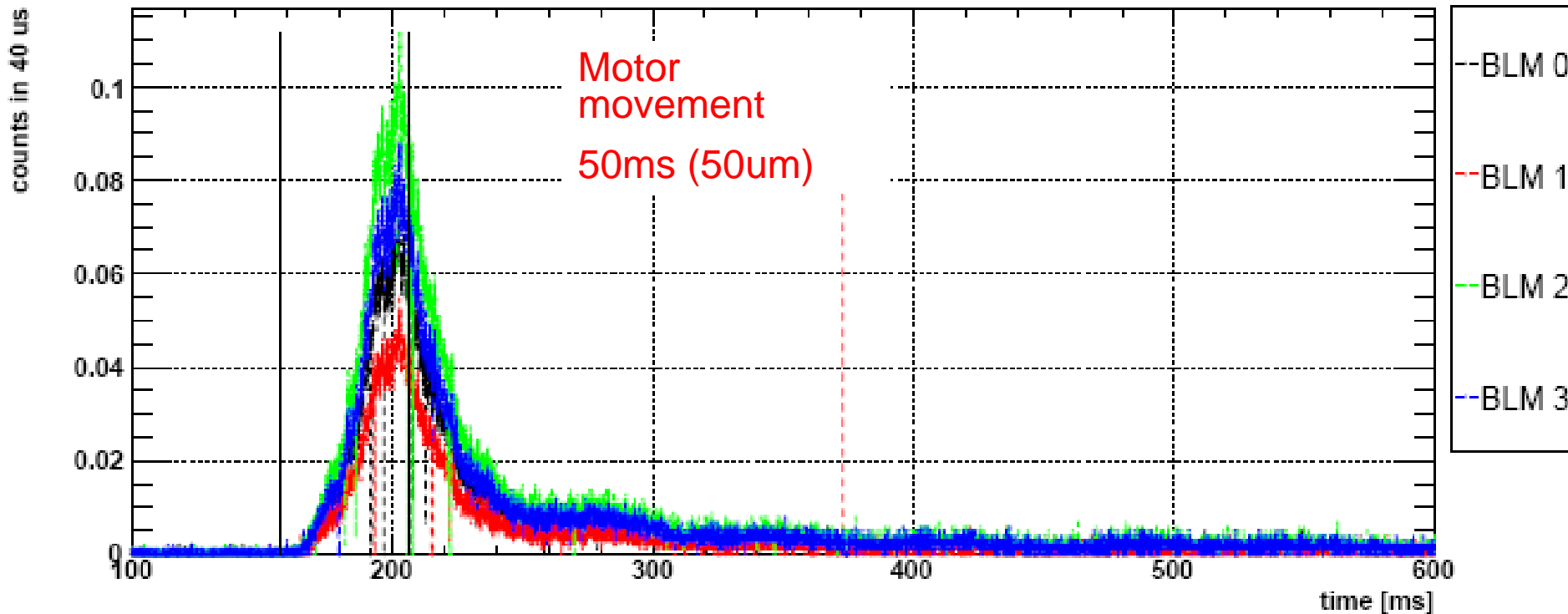


Figure 29: Comparison of Schottky Tune Ripple Measurements

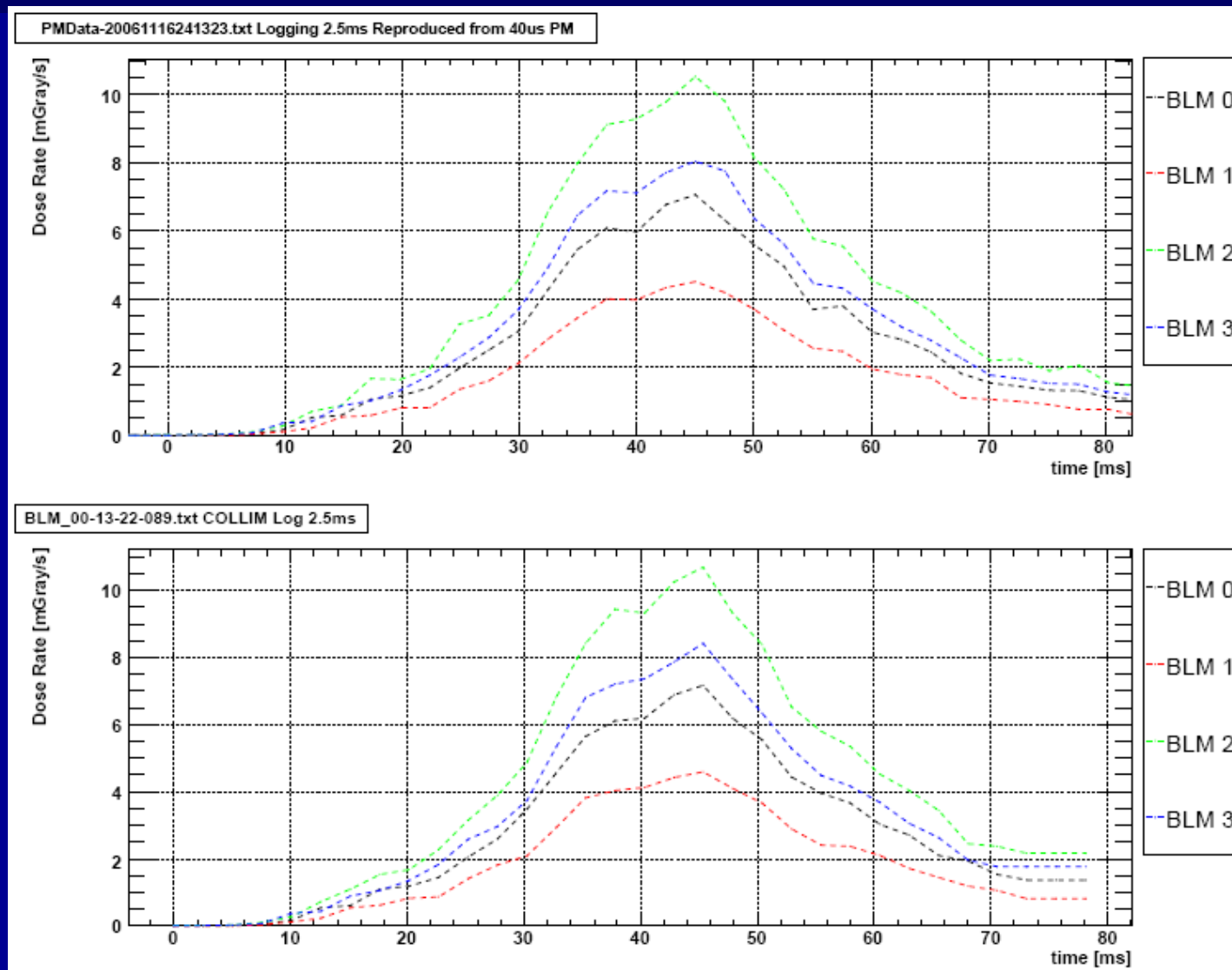
Example of longer jaw movement

PMDData-20061116241323.txt Noise filtered



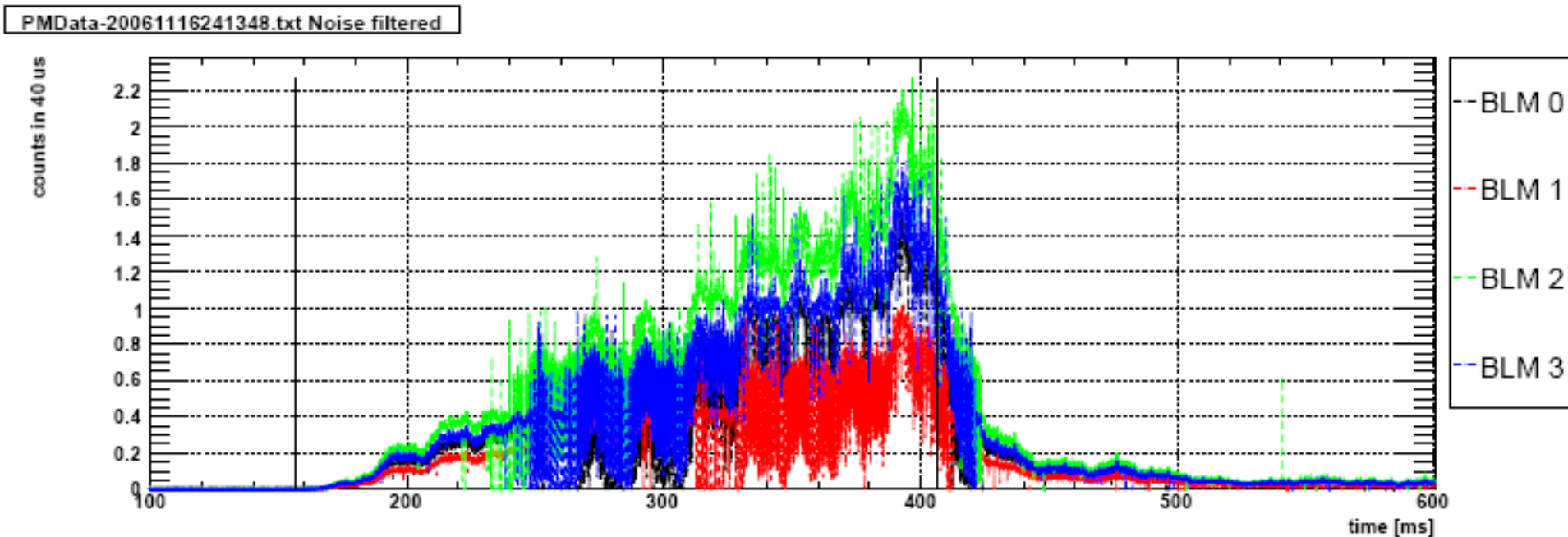
Collimation logging was verified by reproducing it from PM data

- PM file timestamp: 00:13:23
- Logging timestamp: 00:13:22
- Standard offset of 1.7s?



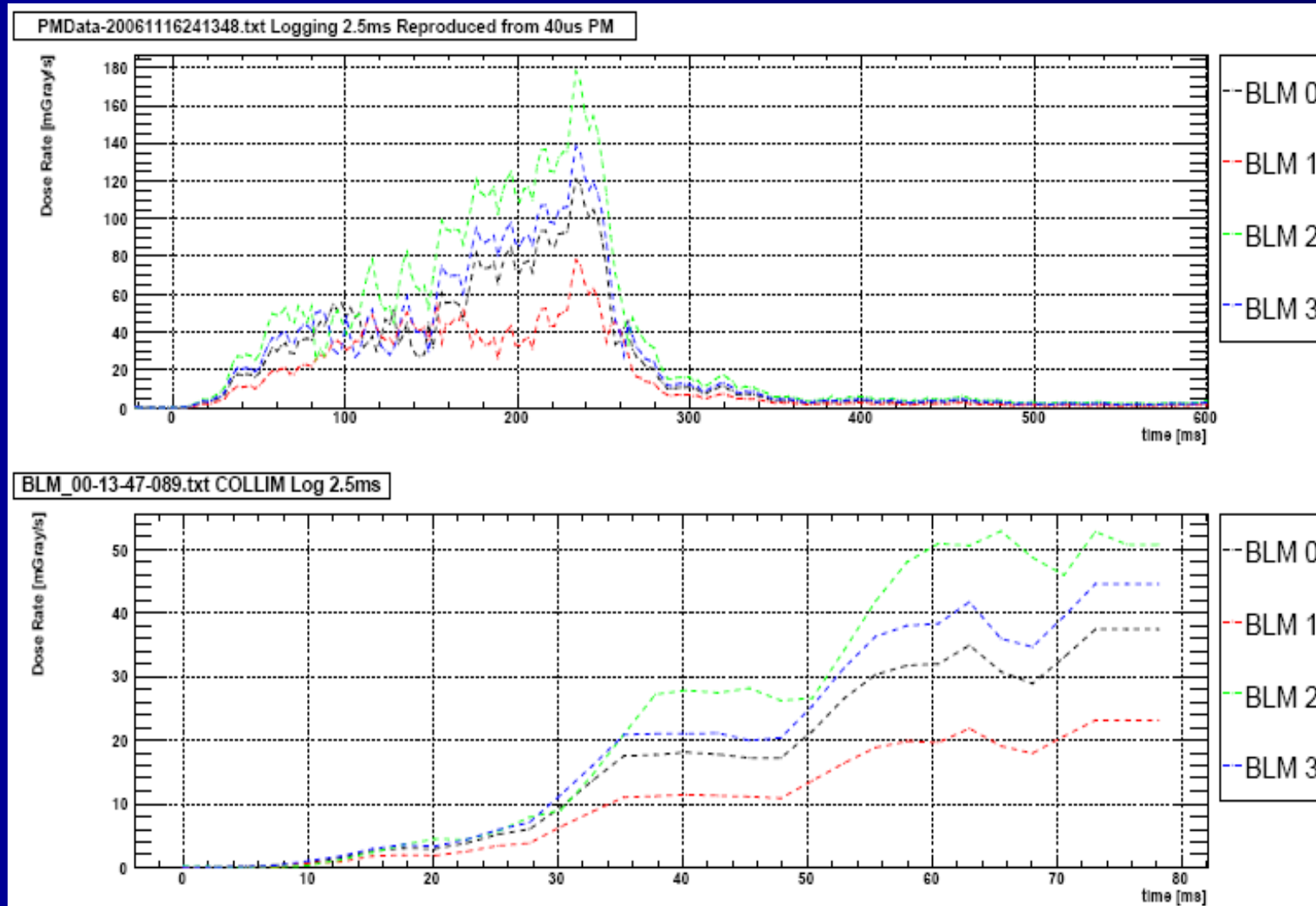
Long jaw displacement

- Nonlinear behavior at 1 count due to miscounting of the ADC in the CFC electronics
- Jaw movement long compare to 80ms logging



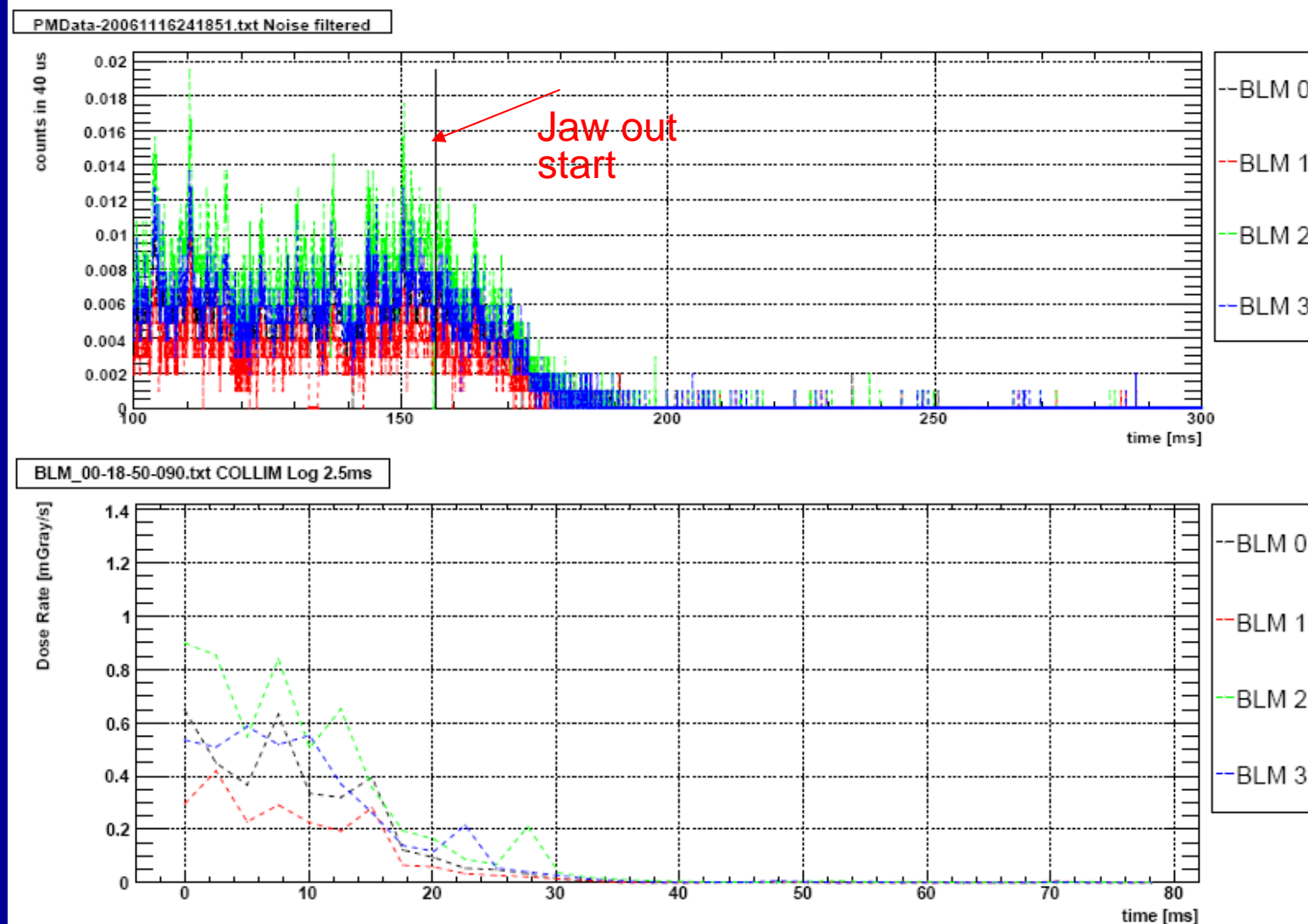
Corresponding Logging data

- Please notice the different time scales



Jaw move out of the beam

- Please notice the different time scales



LSS5 MD request for 2007

- Tests of the new electronics version
- Investigation of the beam loss signal oscillations (influence of RF, Transverse Damper, no HV Power Supply)
- Final prototype of SEM (BLMS) to be installed instead of 1 BLMI (next to the beam pipe)
- Optimization of the Collimation Data

Conclusions & remarks

- 80 ms Collimation logging might not be enough?
- Important horizontal beam oscillations – possible cause for tail repopulation? (to be confirmed...)
- 2007 MD time for testing the SEM and firmware upgrade

Spare plots: Measured Relative quadrupole current/voltage ripple in SPS 1993

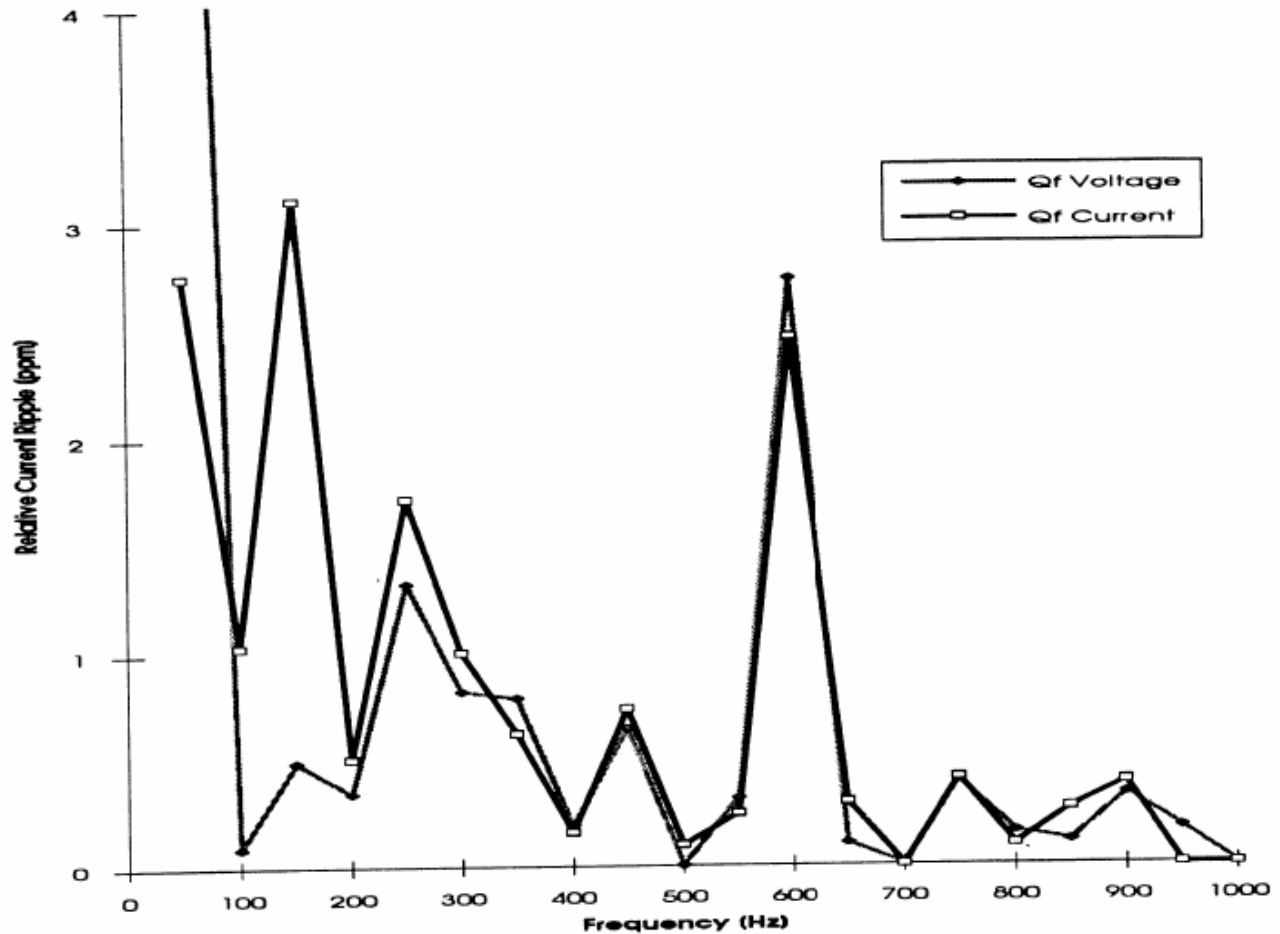
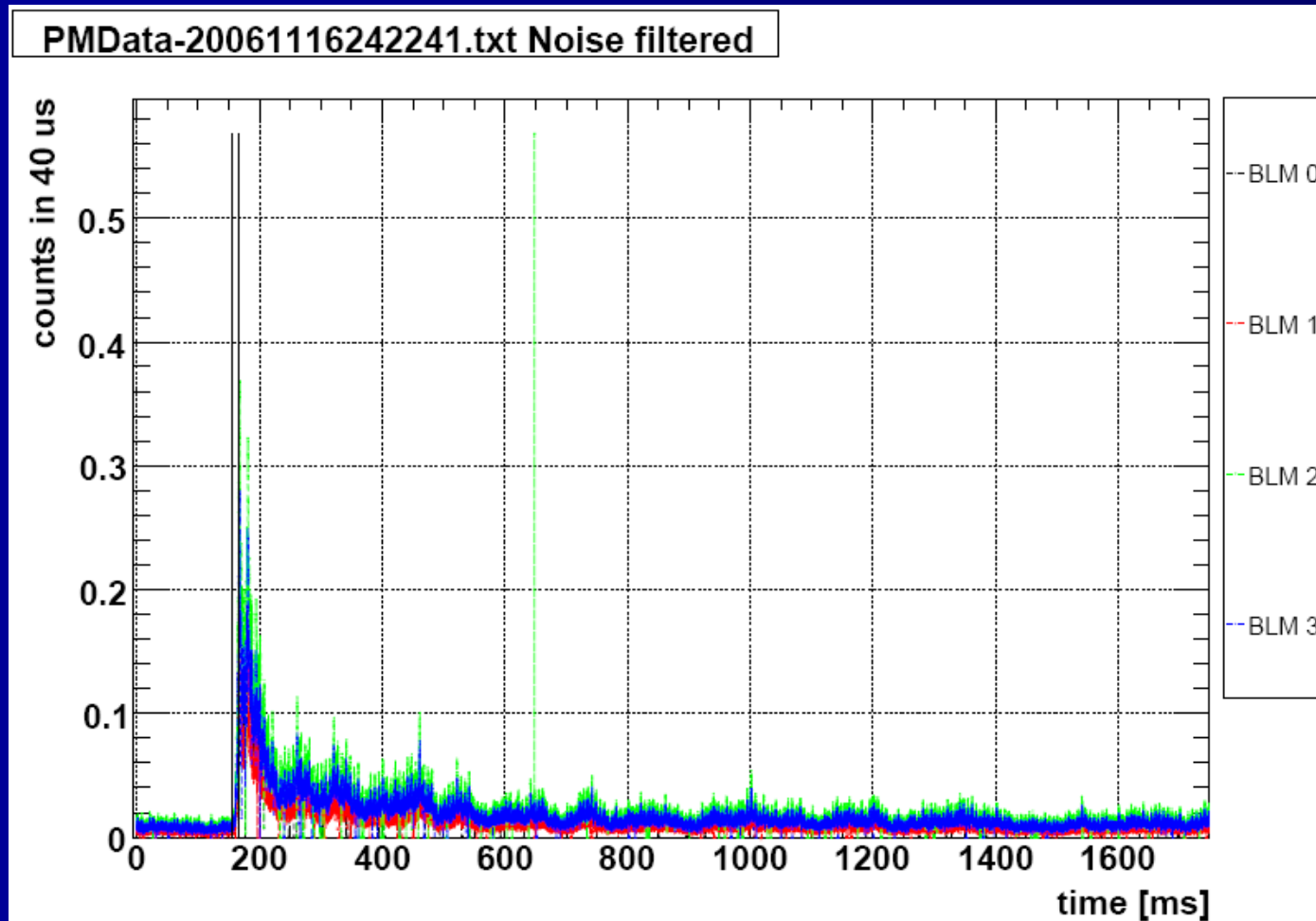


Figure 26: Relative Current Ripple

0:22:41 full PM file length



0:22:41 Logging reproduced from full PM file length

