Pixel Efficiency

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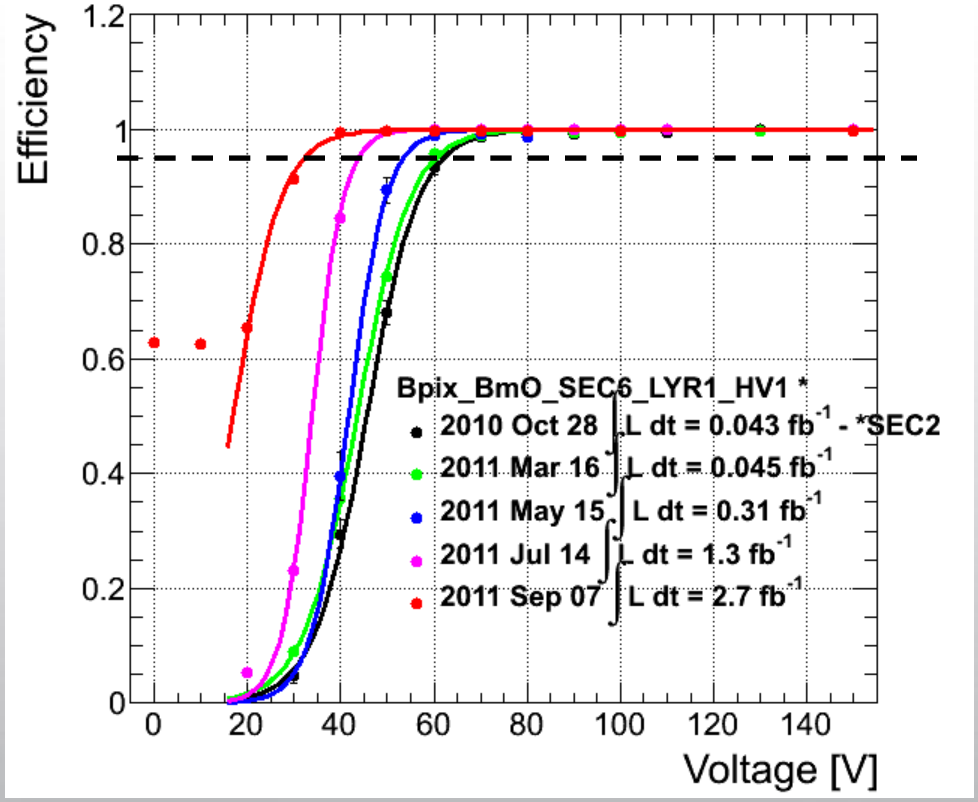
High Voltage Bias Scans

- Regular scans are carried out to monitor the performance of the silicon sensors
- Measuring depletion voltage is one way to observe effects of radiation
- Comparison of observation to the theoretical model shows good agreement so far

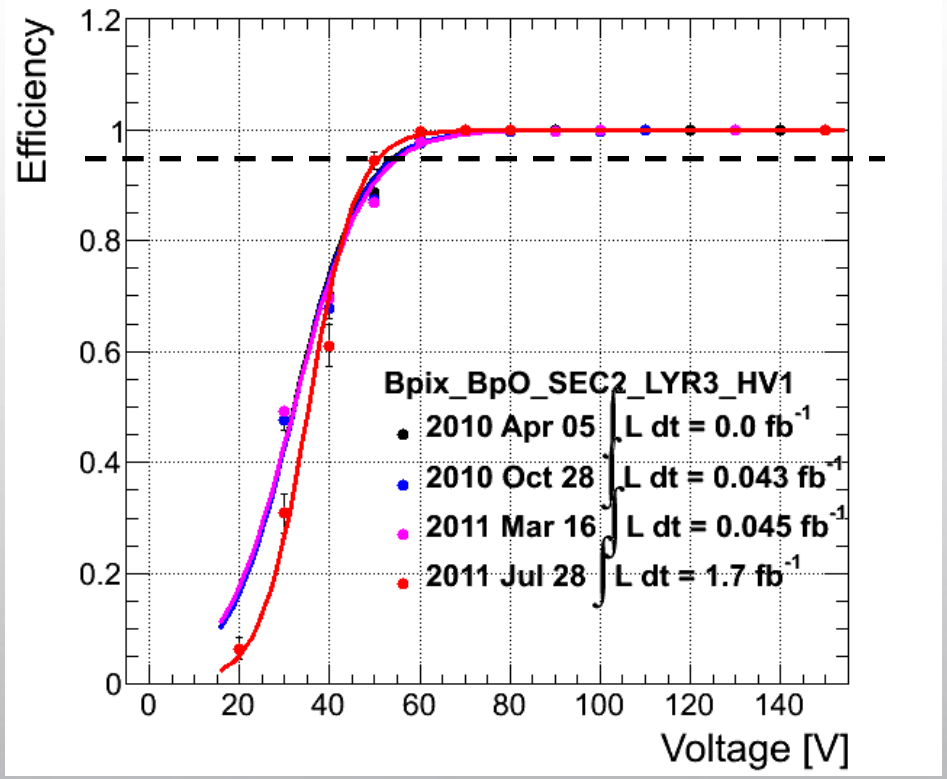
All Layer 1 Scans (1 HV channel)



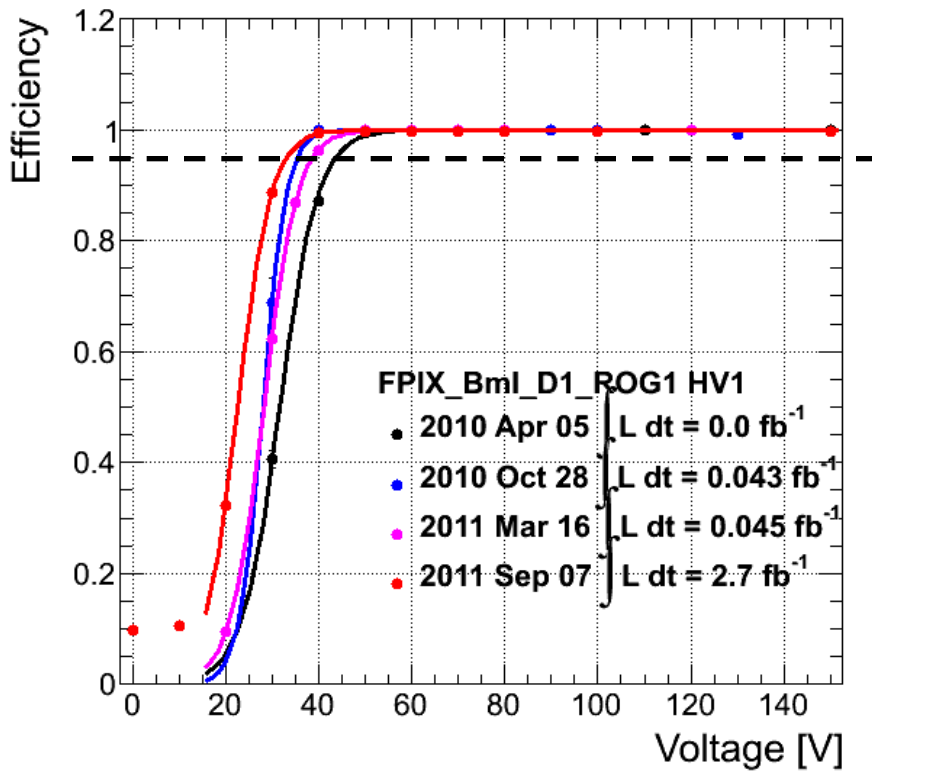
- Points were fitted with a turnon curve: $1 / (1 + \exp[(V_{50} - X)/TW])$, where V_{50} is the 50% Efficiency Point (V_{50}) and TW is the Turnon Width The 95% Efficiency Point was calculated: $V_{95} = V_{50} + 2.944\ TW$
- Consider detector „fully depleted" at 95% efficiency

All Layer 3/FPix Scans

Layer 3

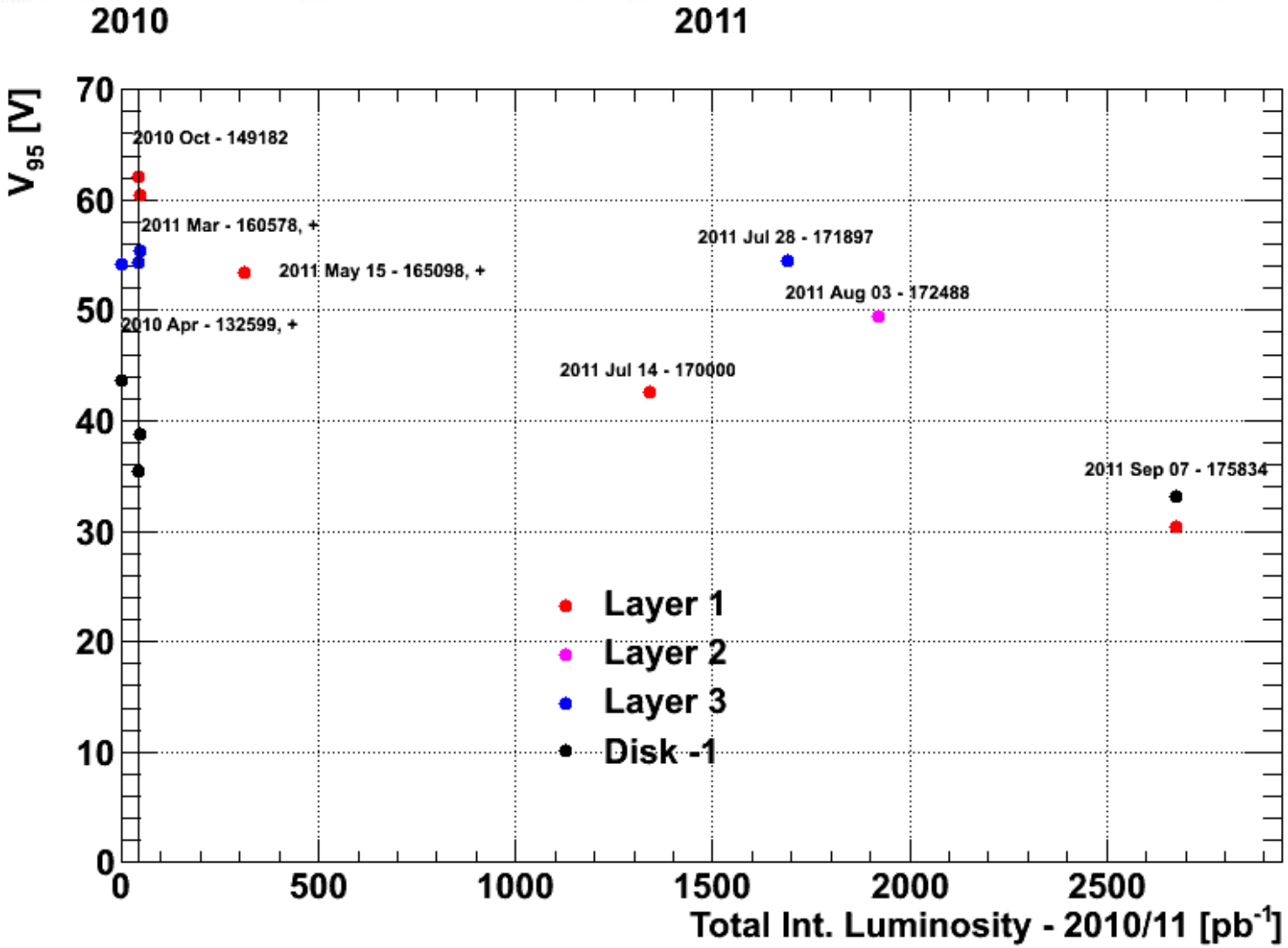


FPix



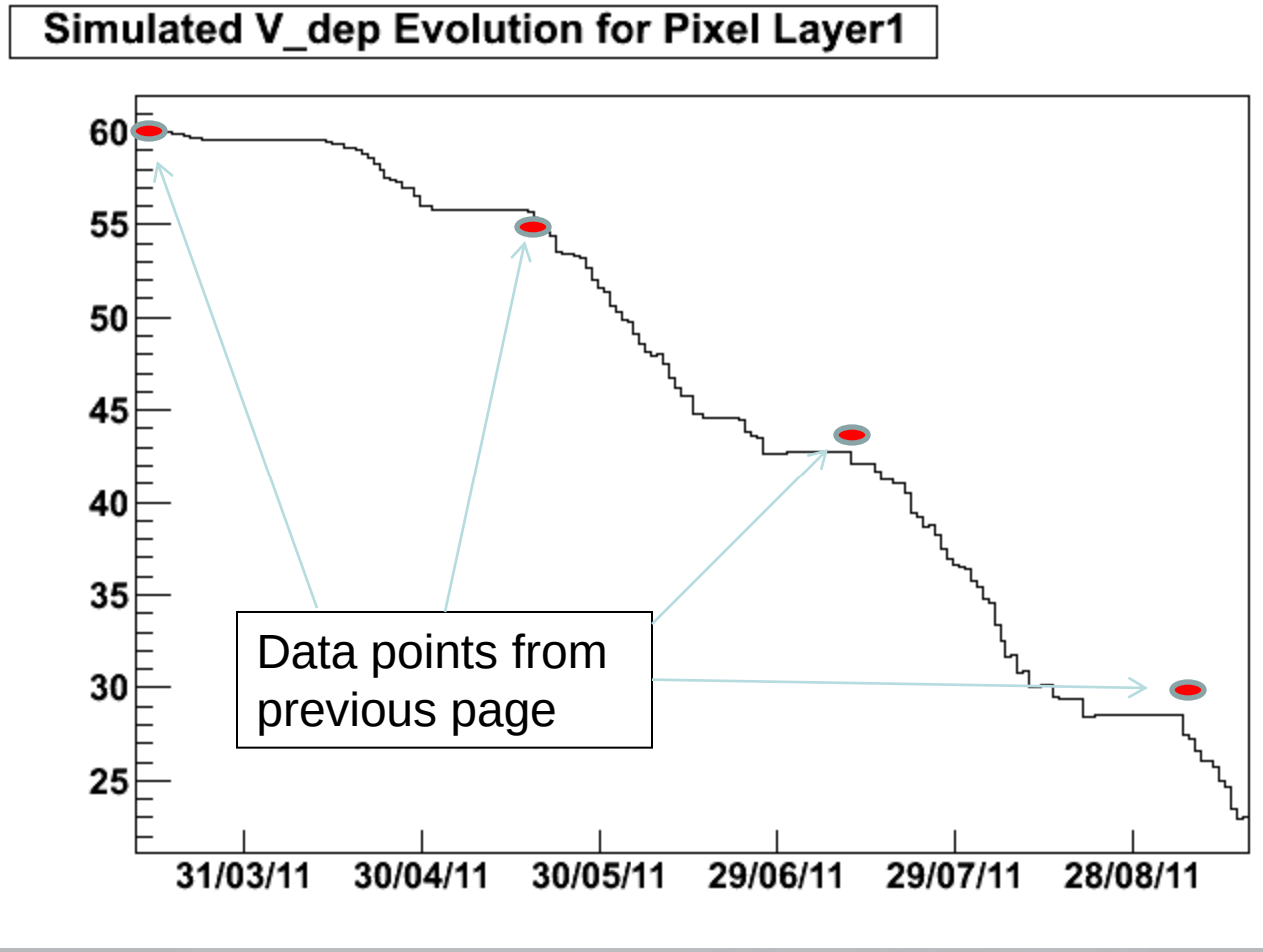
- First 3 measurements on Layer 3 overlap
- Only one measurement was performed on Layer 2 so far

All HV scans up to date – V_{95}



Comparison with the model: depletion voltage

Data added with powerpoint on top of the output of the simulations



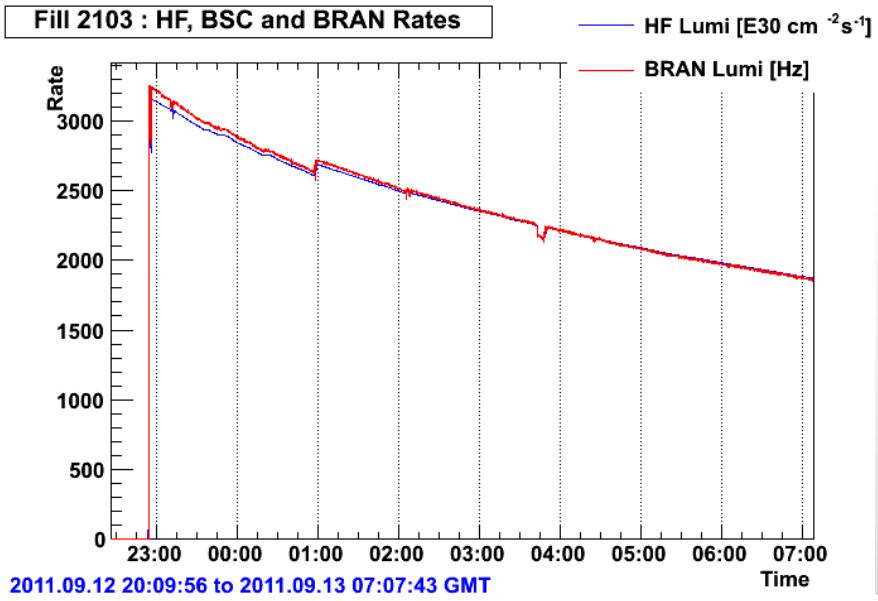
Plots from the model were generated after the data point were measured. Was there a retuning of the model?

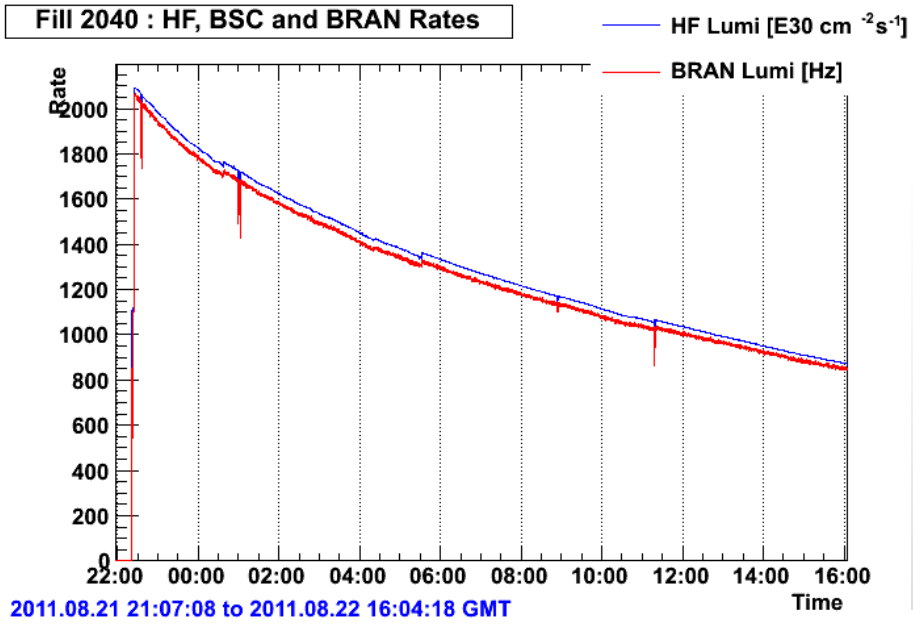
Efficiency Loss studies

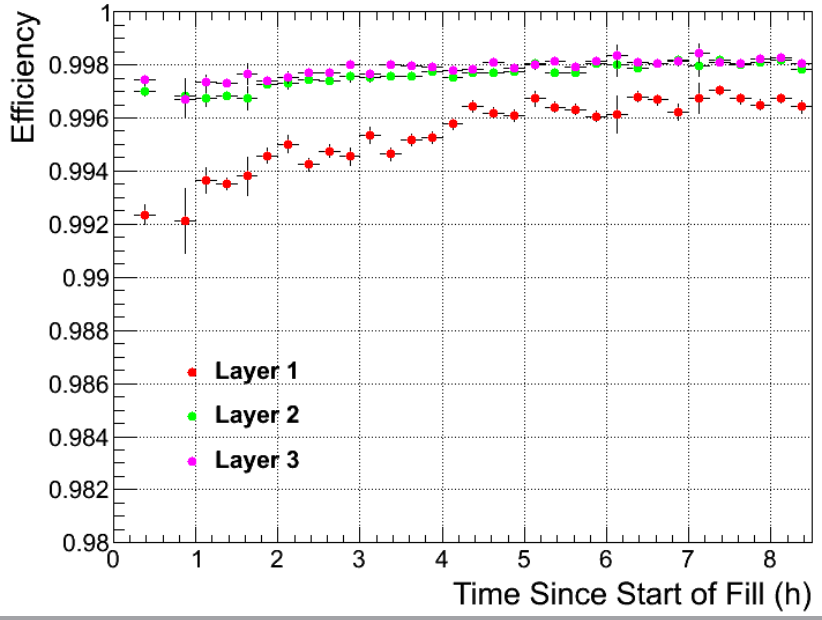
- Dynamic Efficiency losses
  - Efficiency seen to depend on:
    - Instantaneous Luminosity
    - L1 Trigger Rate
    - Position on orbit
- Single Event Upset, other losses
  - Intermittent low efficiency ROCs
  - FED errors

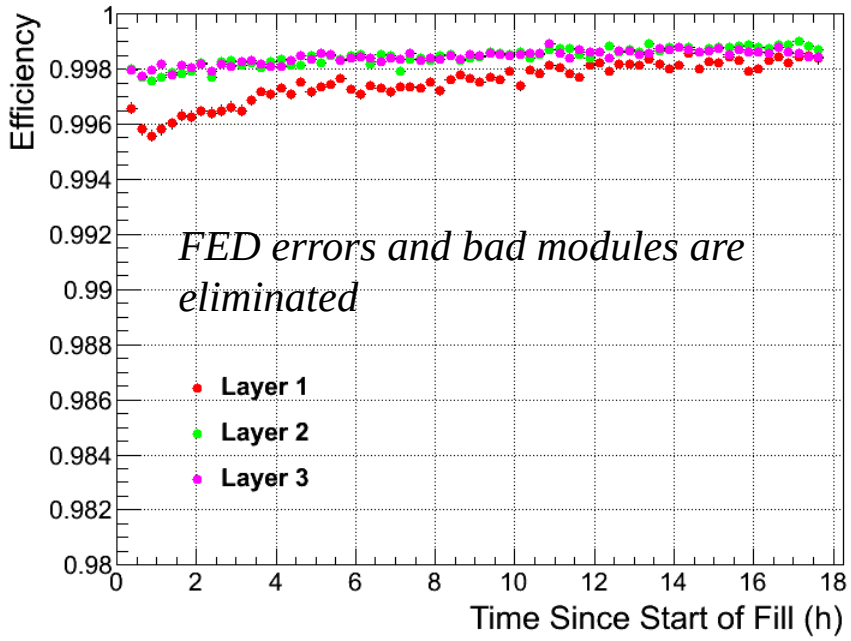
Fill 2103

Fill 2040

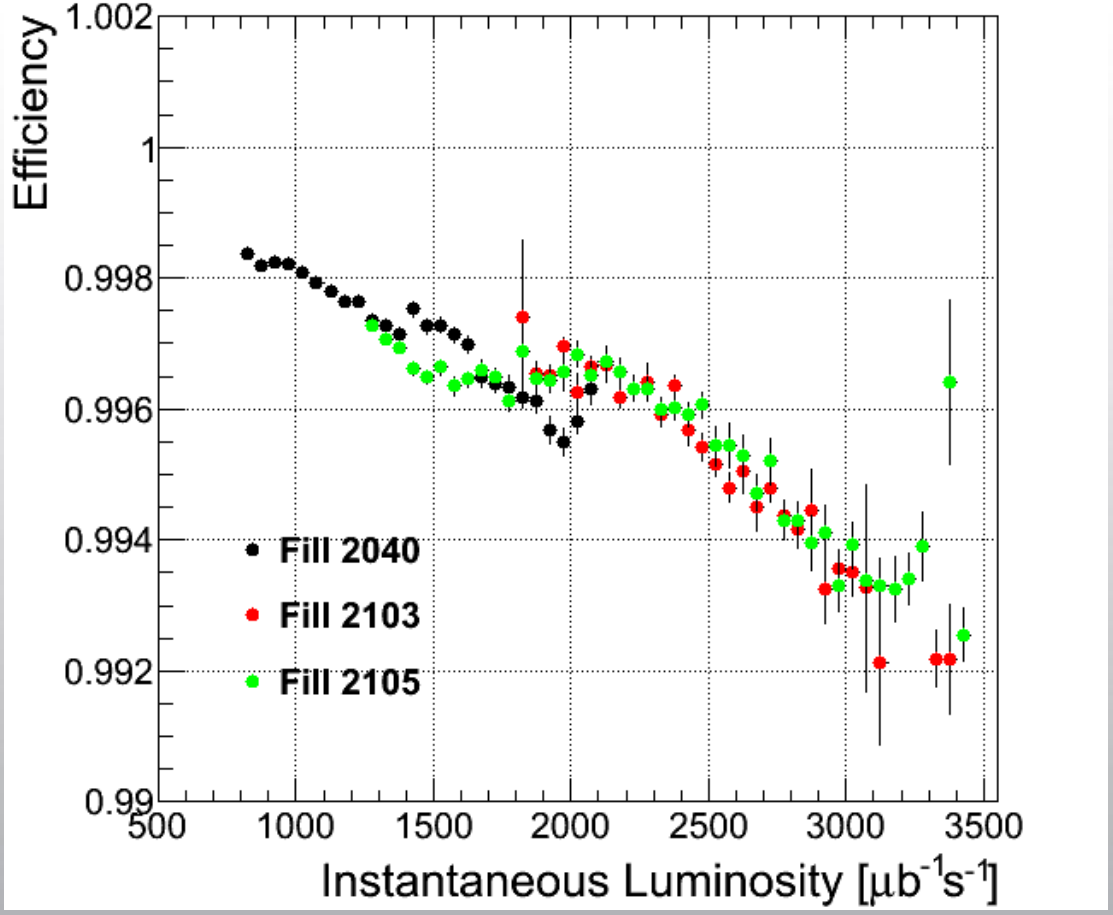








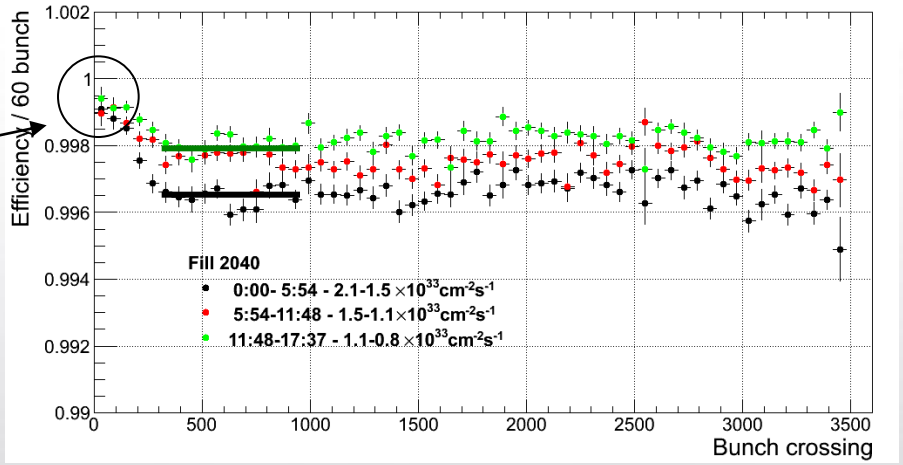
Dynamic Efficiency Losses – Layer 1

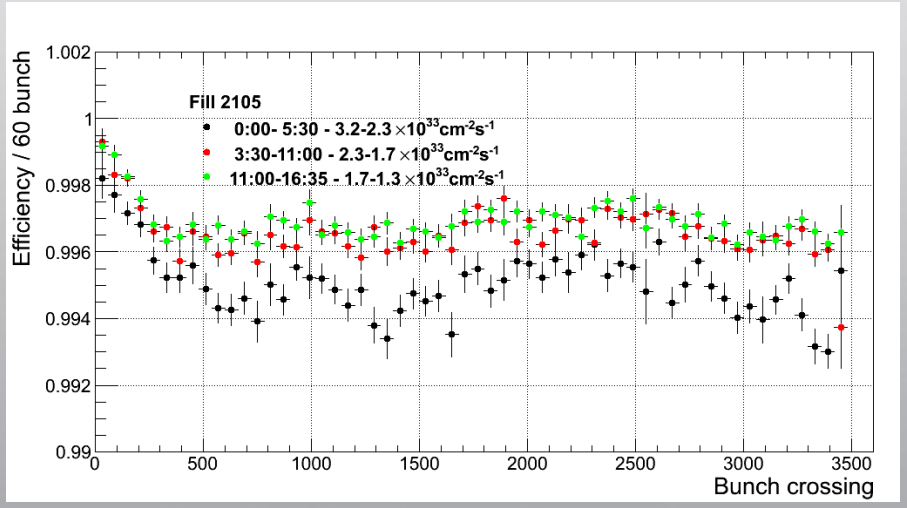


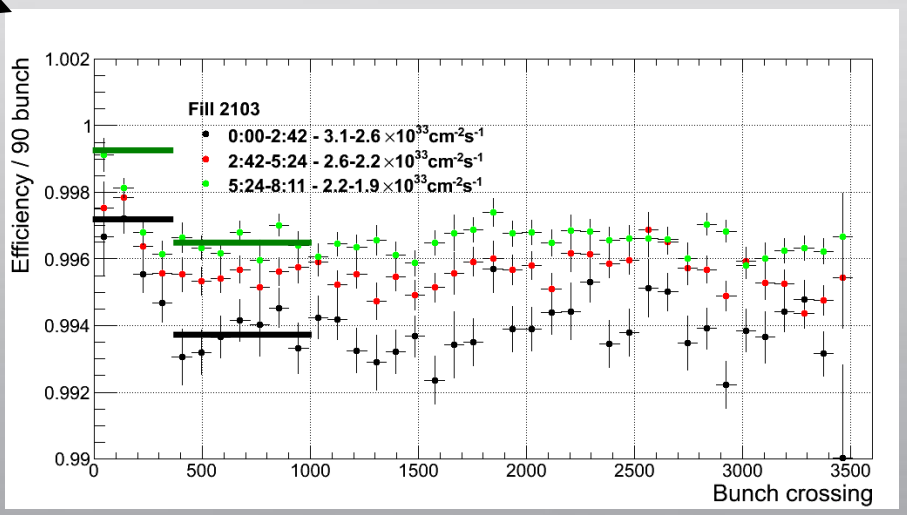
- Excluded FED errors and intermittent bad ROCs (explained later)

Dynamics Efficiency Loss

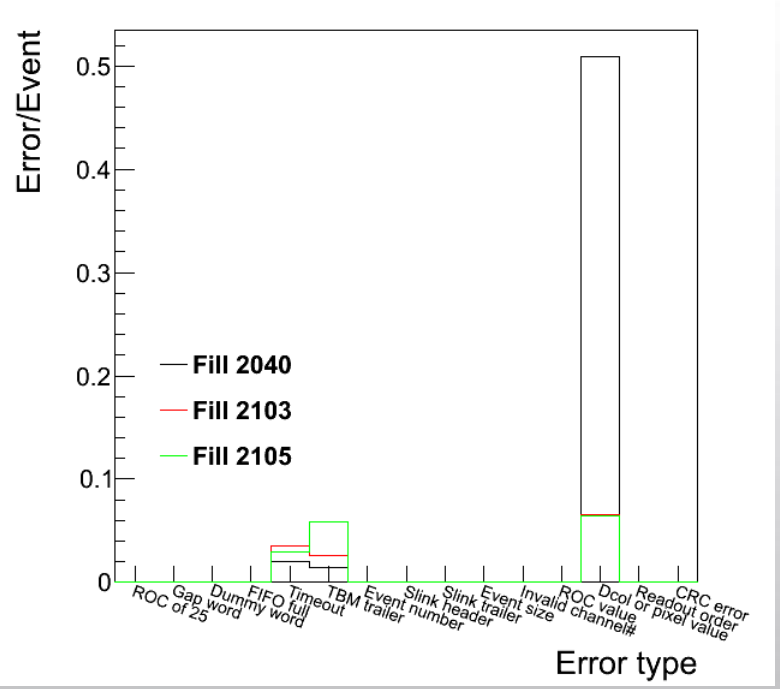
- Max efficiency is 99.95%: small systematics in the measurement
- „Low instantaneous lumi”: efficiency loss seems mostly due to buffer filling
- „High instantaneous lumi”: there is also a common offset

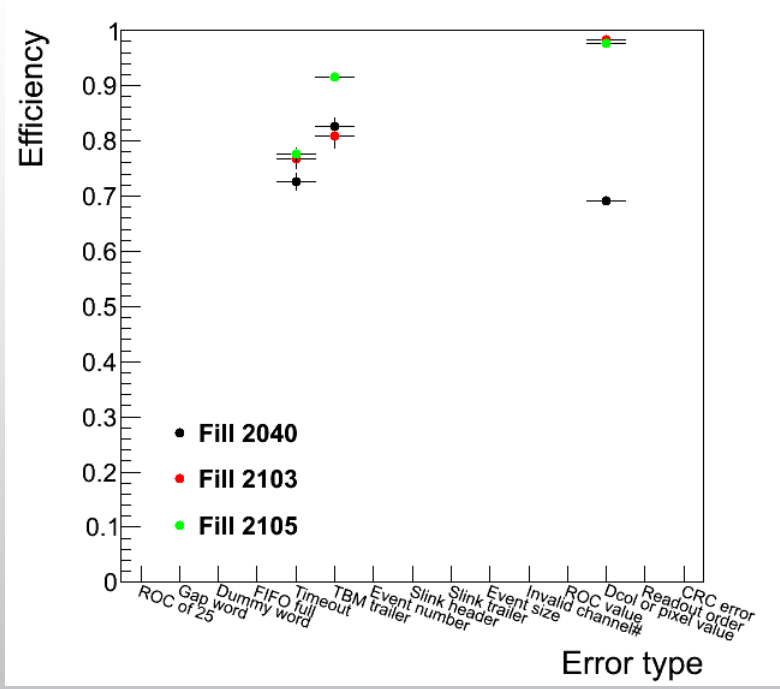






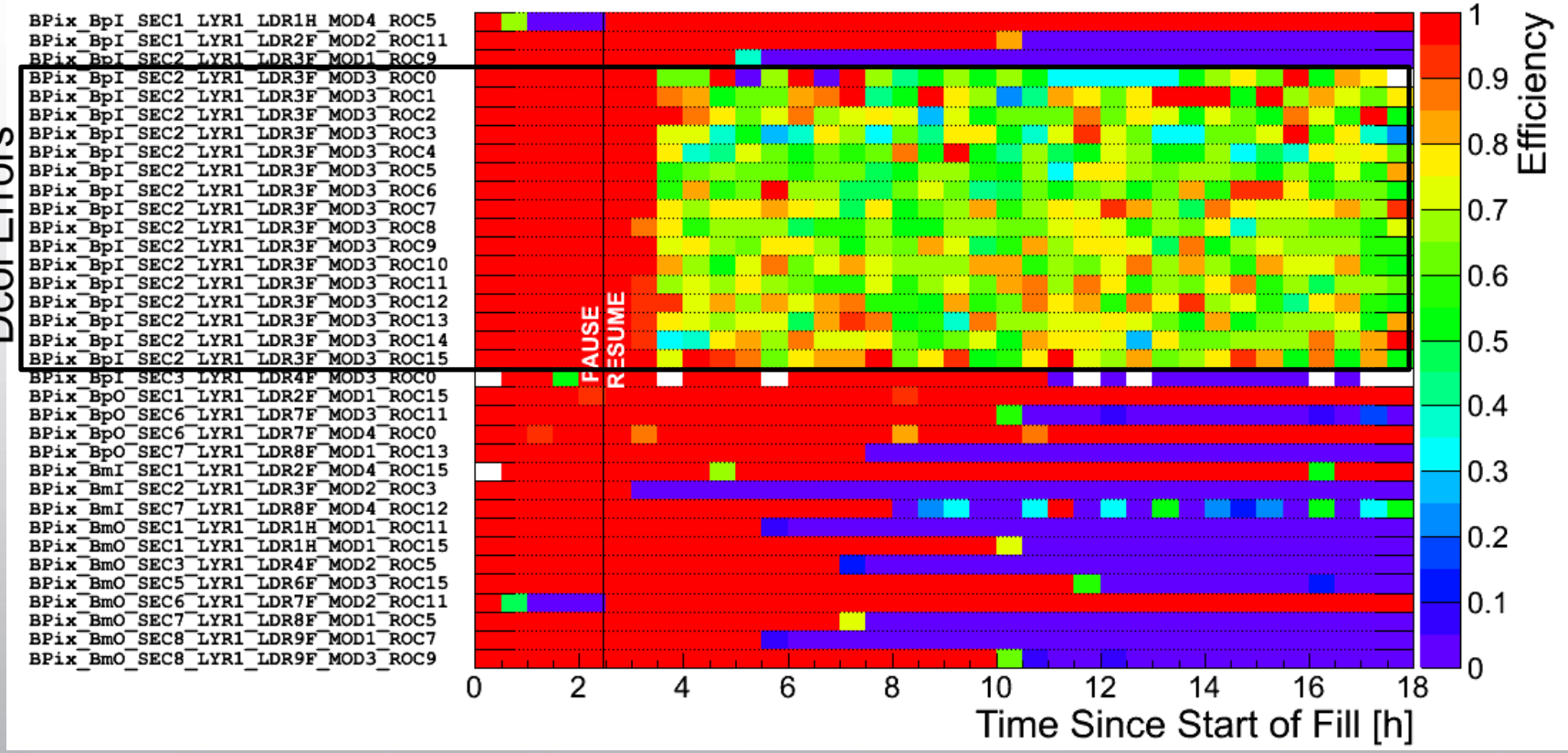
Fed Errors





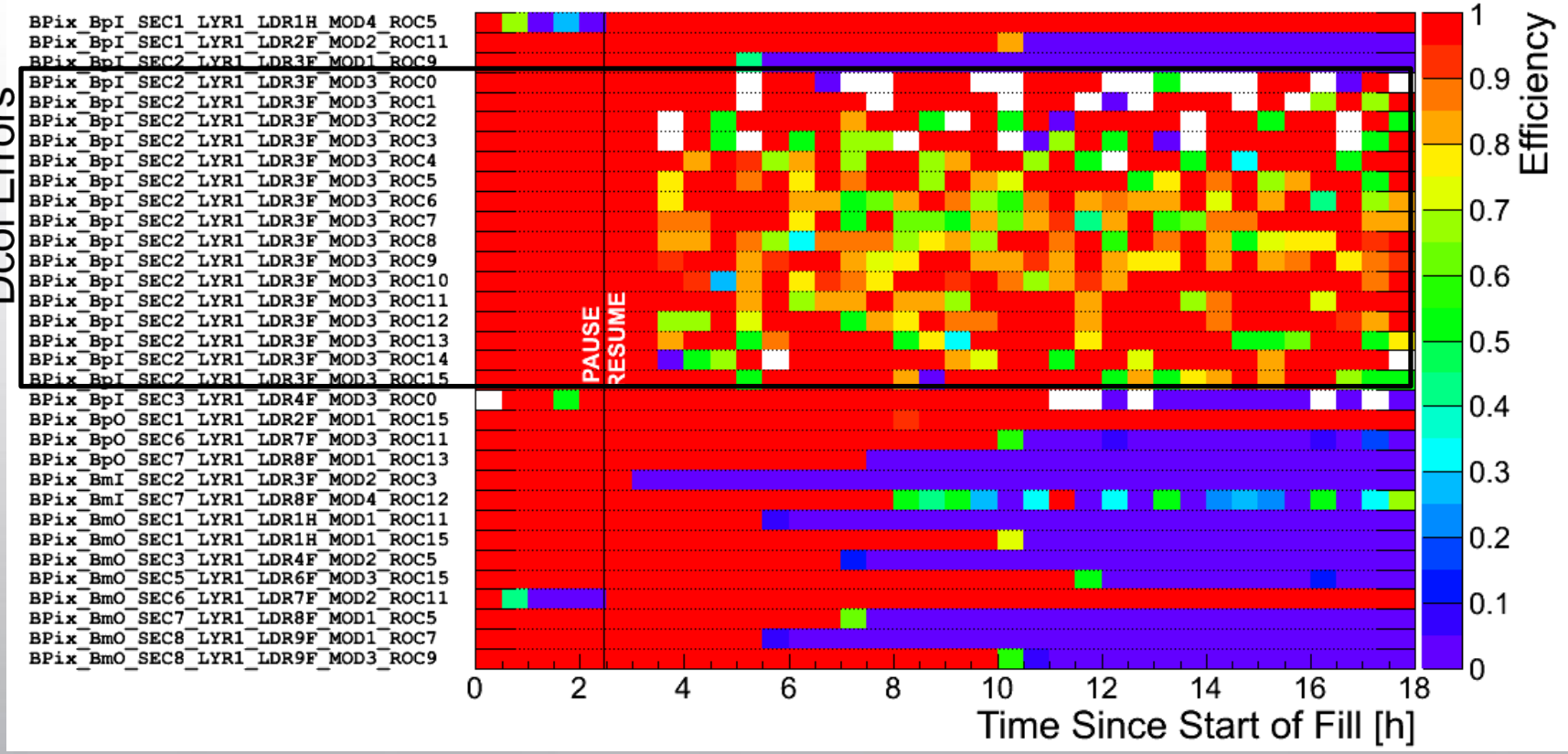
- High number of DCol errors, not seen previously
- Most of the errors seen on intermittent bad ROCs are not signaled by FED errors

Low Eff ROCs – Fill 2040– Layer 1



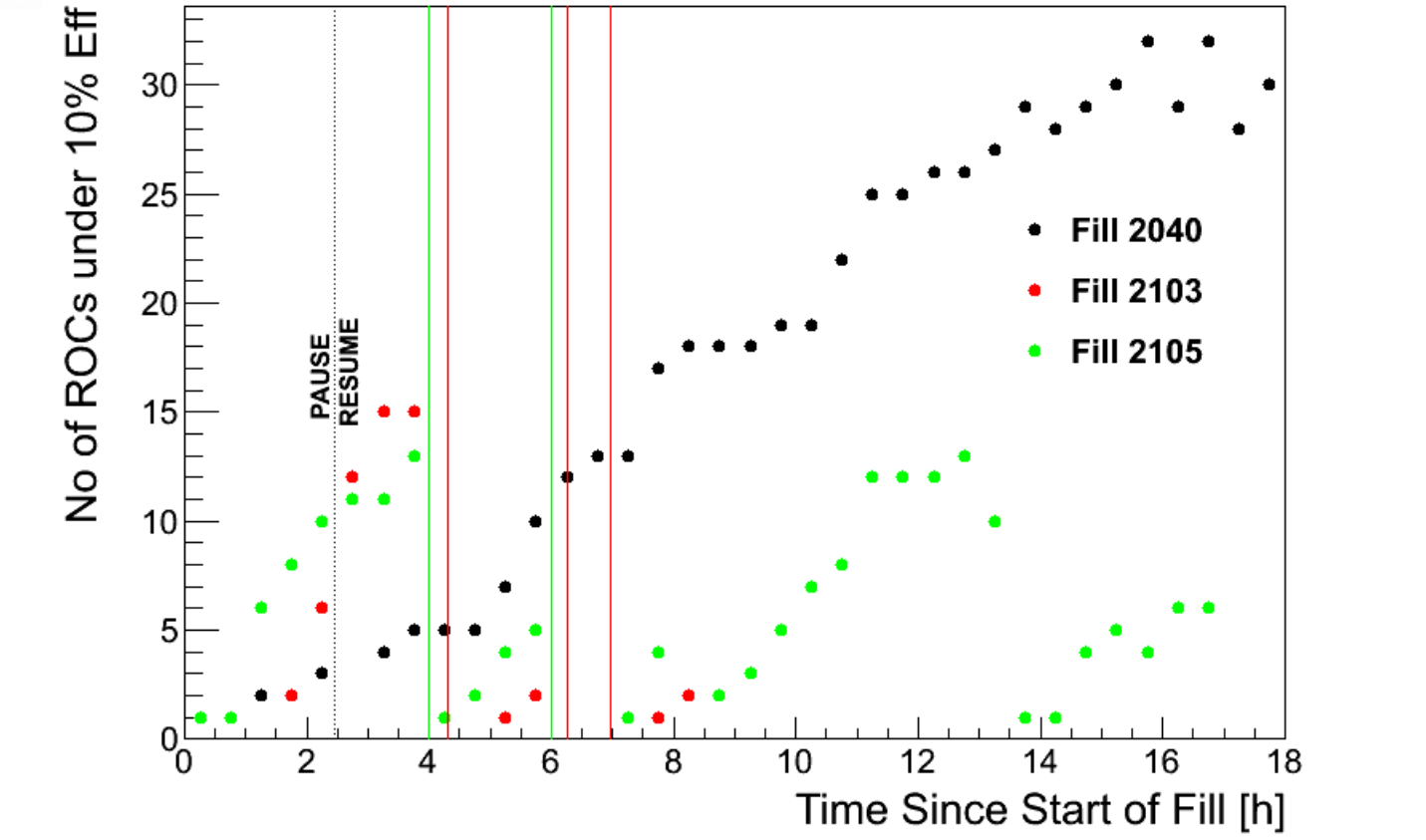
- ROCs switch off after certain point, but recover after a PAUSE/RESUME

Low Eff ROCs – Fill 2040– Layer 1



- FED errors excluded
- Module with FED erros is still low on efficiency

Number of bad ROCs vs time – BPix



- The Number of bad ROCs seem to increase linearly with time
- Straight lines show starts of new runs, which reset the intermittent bad ROCs
- 2 additional PAUSE/RESUME found in DAQ elog for Fill 2105: 14 sep 2011 – 10:34, 15:46 (GMT+1)
  → Fill 2105 started at 0:14 (GMT)