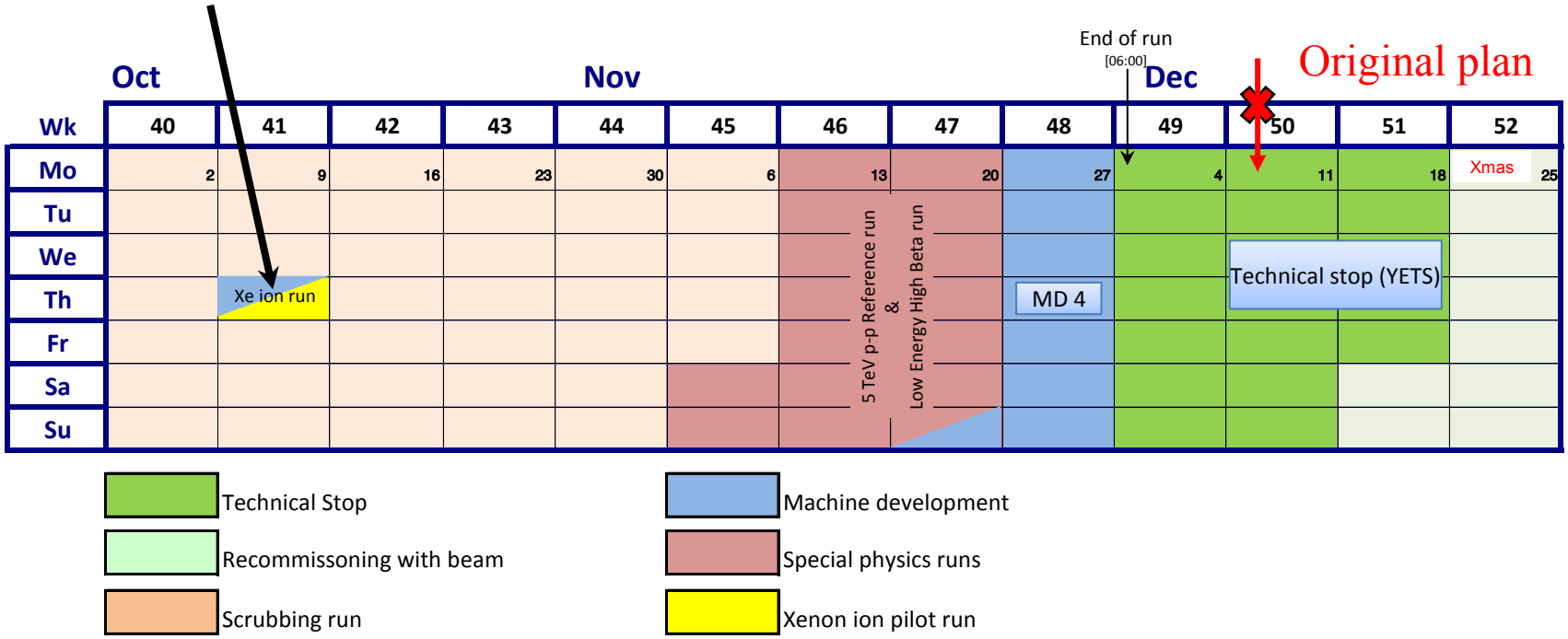
CMS AND LHC STATUS

Hannsjörg Weber (Fermilab)

All Experimenter's Meeting
2017/11/06

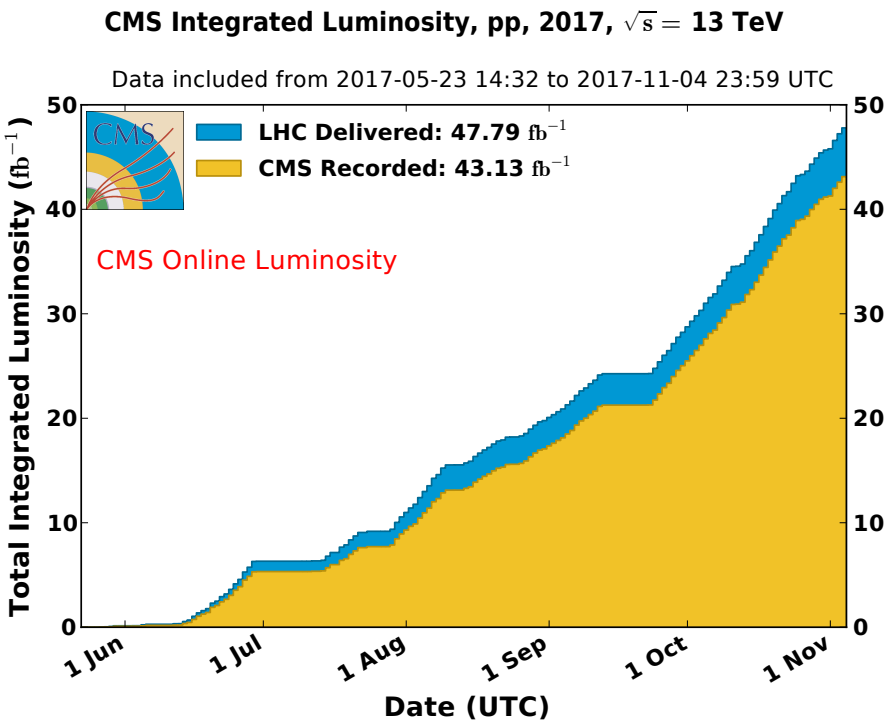
LHC schedule

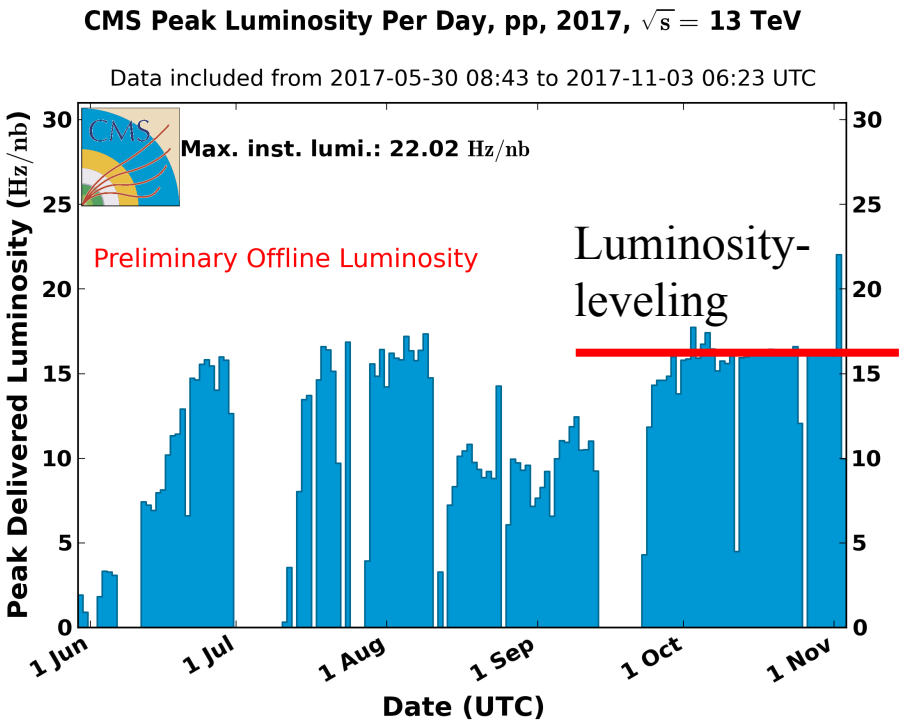
- Schedule has been cut by a week to get access to the CMS detector (see later).
- Still plan to have machine development and special runs (such as 5 TeV pp reference runs).
  - Two machine development periods merged to one.
- Special Xe-Xe ion run provided 3 μb^{-1} data (8h fill - compare to 10 μb^{-1} in a month during 2010). With significant preparation before the fill, CMS took data very successfully.



LHC performance

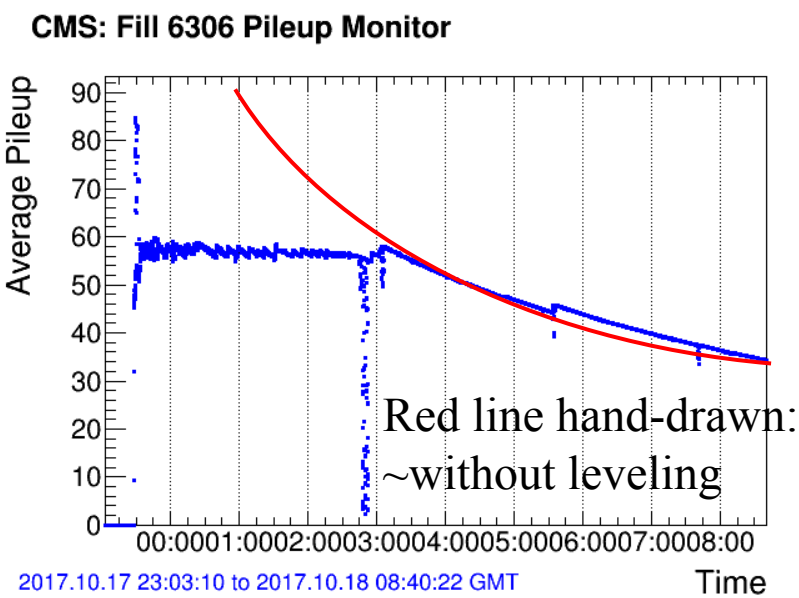
- The LHC has been performing very well.
  - Could provide luminosities > 2×10^{34} $cm^{-2}s^{-1}$
  - Experiments (ATLAS and CMS) decided to level luminosity (next slide).
  - ATLAS and CMS have collected >100 fb^{-1} of total data since 2010.



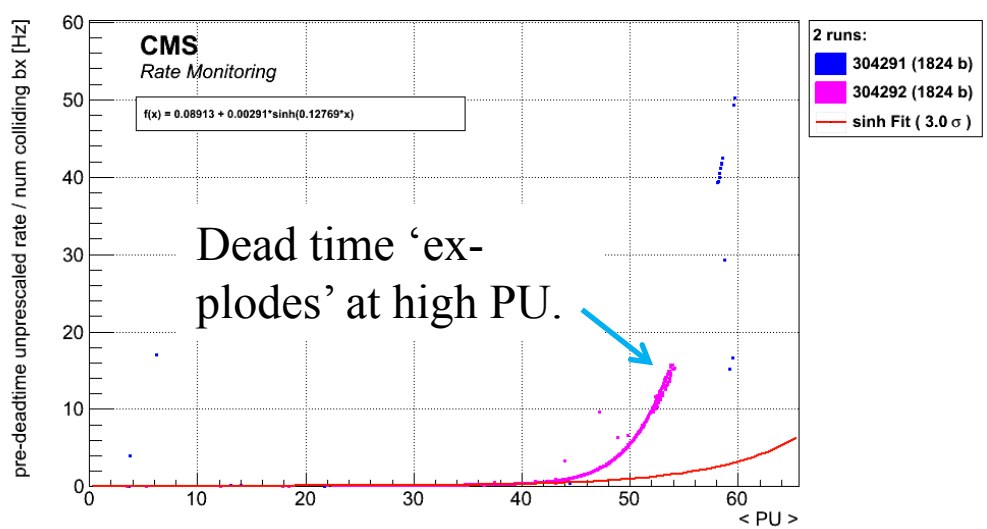


Luminosity-leveling

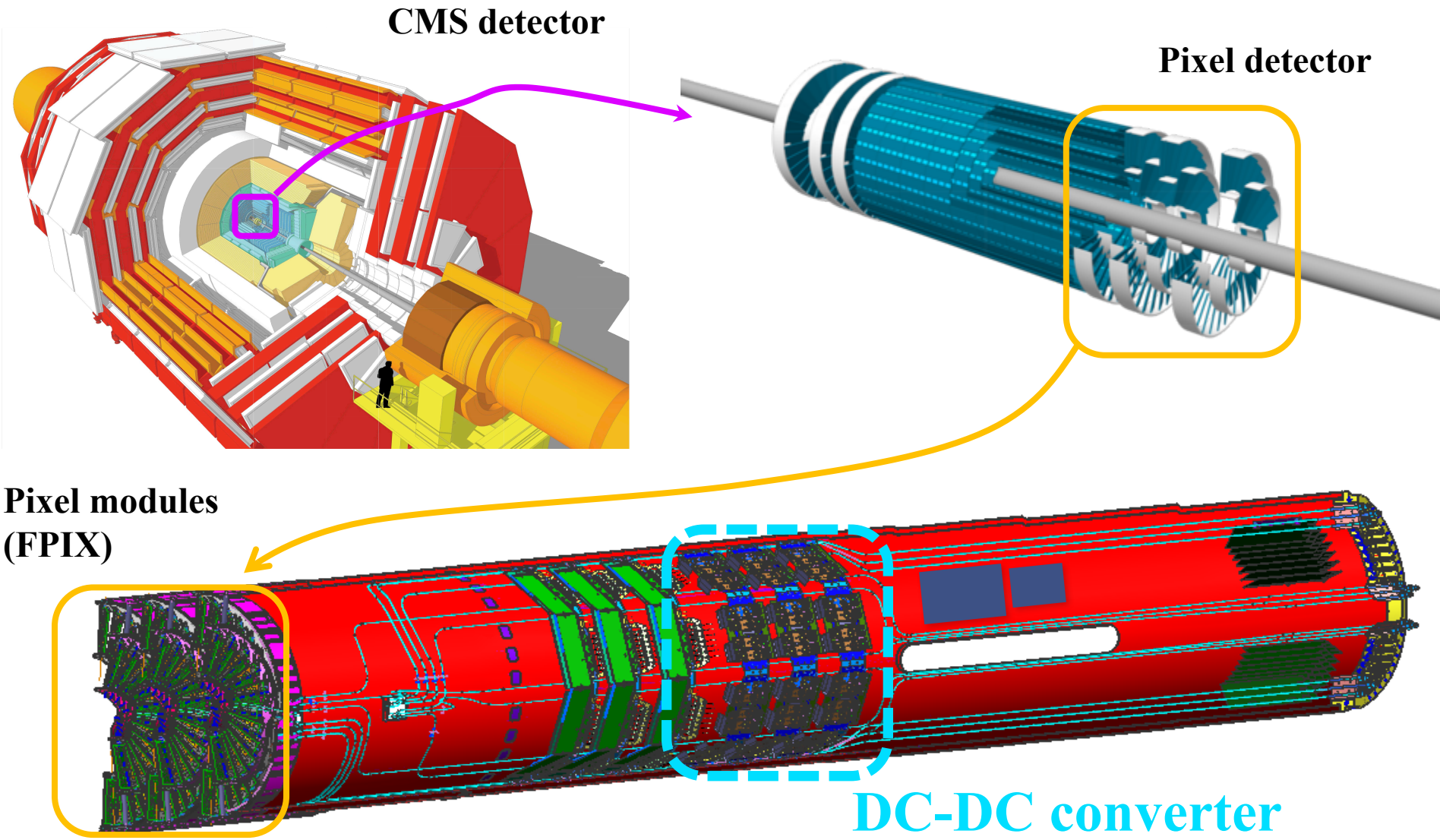
- Due to the excellent performance of the LHC, the instantaneous luminosity is already >2 times higher than the design.
- For CMS, the level-1 trigger system cannot handle very high pileup collisions without having significant dead times.
  - Due to non-linearity of several trigger paths
- Leveling is achieved by adjusting β*.



Extreme case trigger seed: L1_QuadJet



DC-DC converter issue with CMS pixels



DC-DC converter issue with CMS pixels

- DC-DC converters introduced during phase-1 upgrade to handle powerload:
  - Convert about 10 volts currents to 2.5/3.5 volts currents needed for pixel modules.
  - They are about 1-2 meter downstream from pixel modules (i.e. inside detector!).

- Starting 5th October, we loose roughly one DC-DC converter per day for the pixels.
- We have ruled out many reasons, however underlying cause not understood.
  - Investigated list of O(50) reasons.
- A loss happens during power-cycling of DC-DC converters (needed to activate token bit manager chip on pixel modules that became stuck due to single event upsets) – estimate loosing roughly one converter per 100 cycles.
- Currently lost about 40 converters → affects about 8% of the detector.
- Pixel task force is investigating: Among many studies, we will do measurements with DC-DC converters and magnetic field in the coming weeks here at Fermilab.

- In order to extract/fix them, we need access to the detector (i.e. open up CMS) and (hopefully) fix the issue durin the year-end technical stop (will start a week early).

Backup