

**НАУЧНАЯ СЕССИЯ  
ОТДЕЛЕНИЯ ФИЗИКИ ВЫСОКИХ ЭНЕРГИЙ  
27 декабря 2011**



# **Проект CMS в 2011**

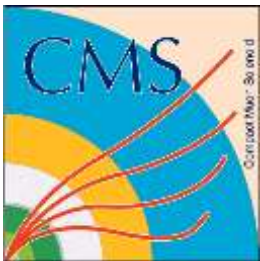
## **В.Сулимов**

# The CMS Collaboration

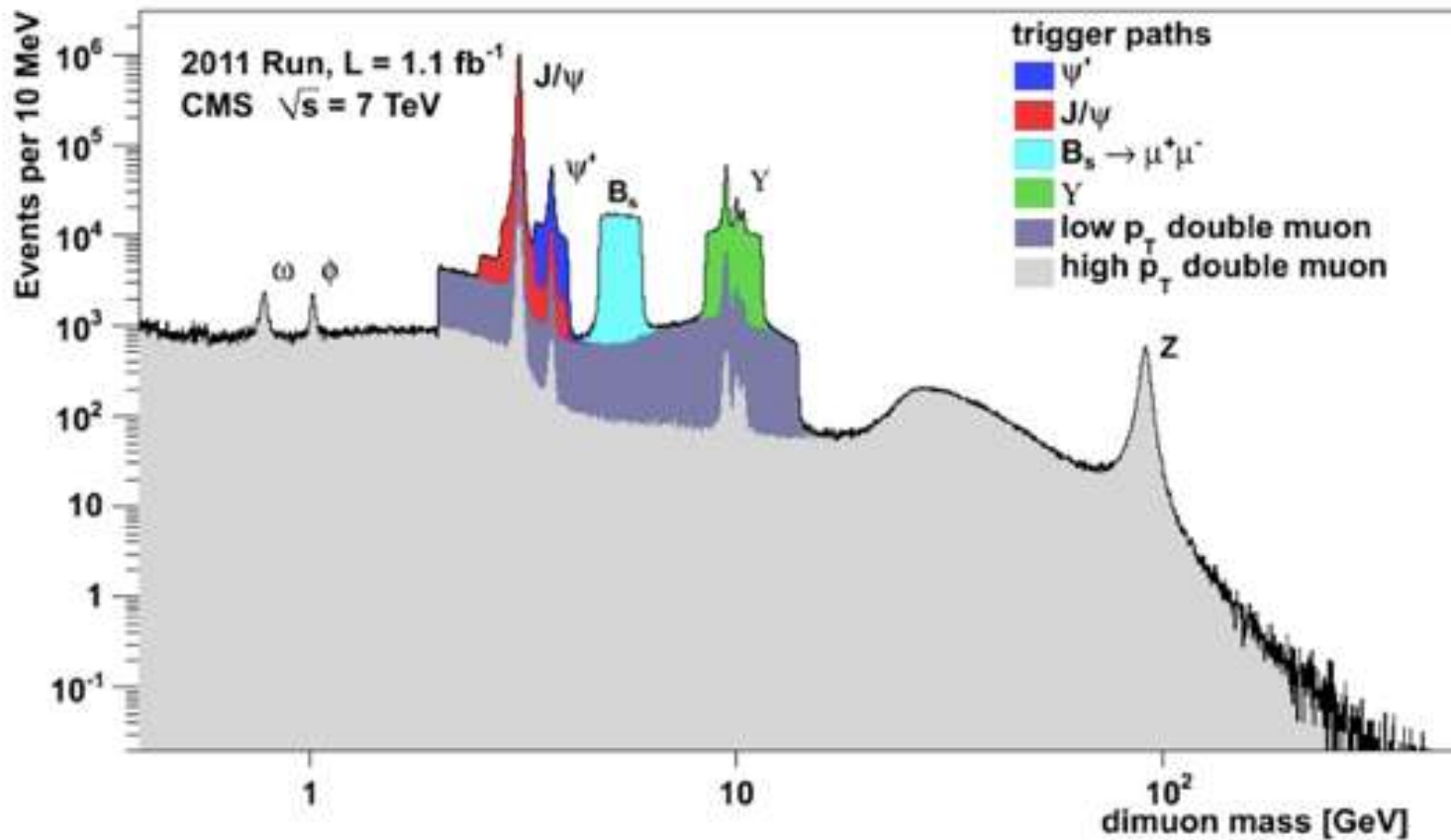
**3381 scientists and engineers (including ~840 students) from 173 institutes in 40 countries**

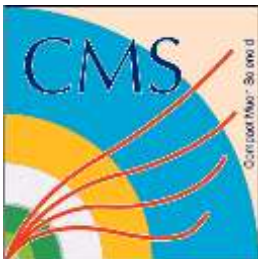
**~ 1/4 of the people who made CMS possible**

27.12.2011

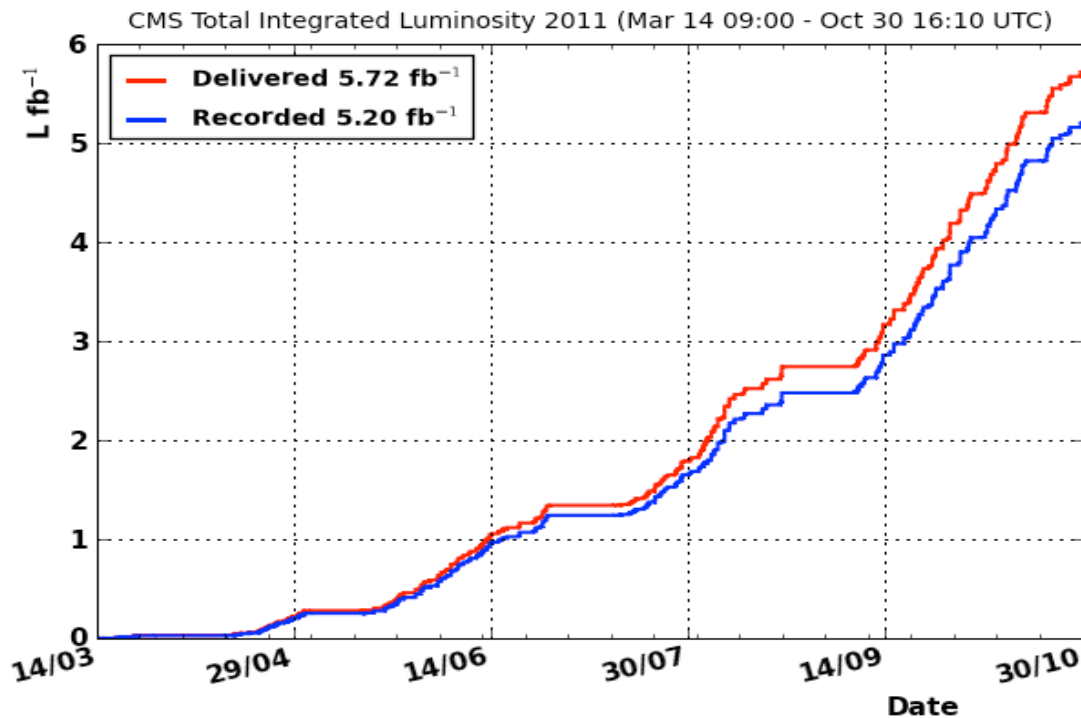


# The Standard Model at 7TeV

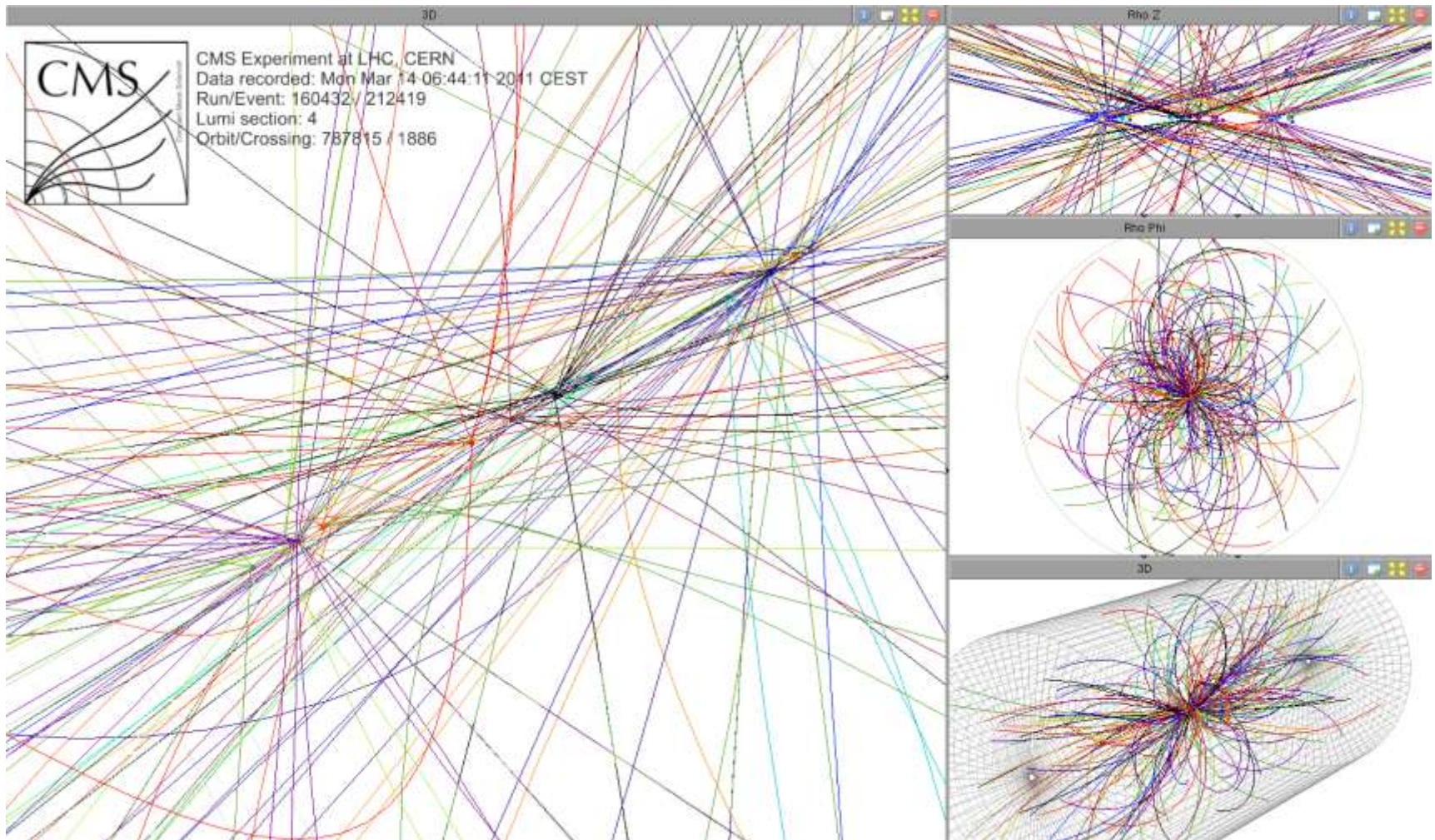




# LHC Performance in 2011



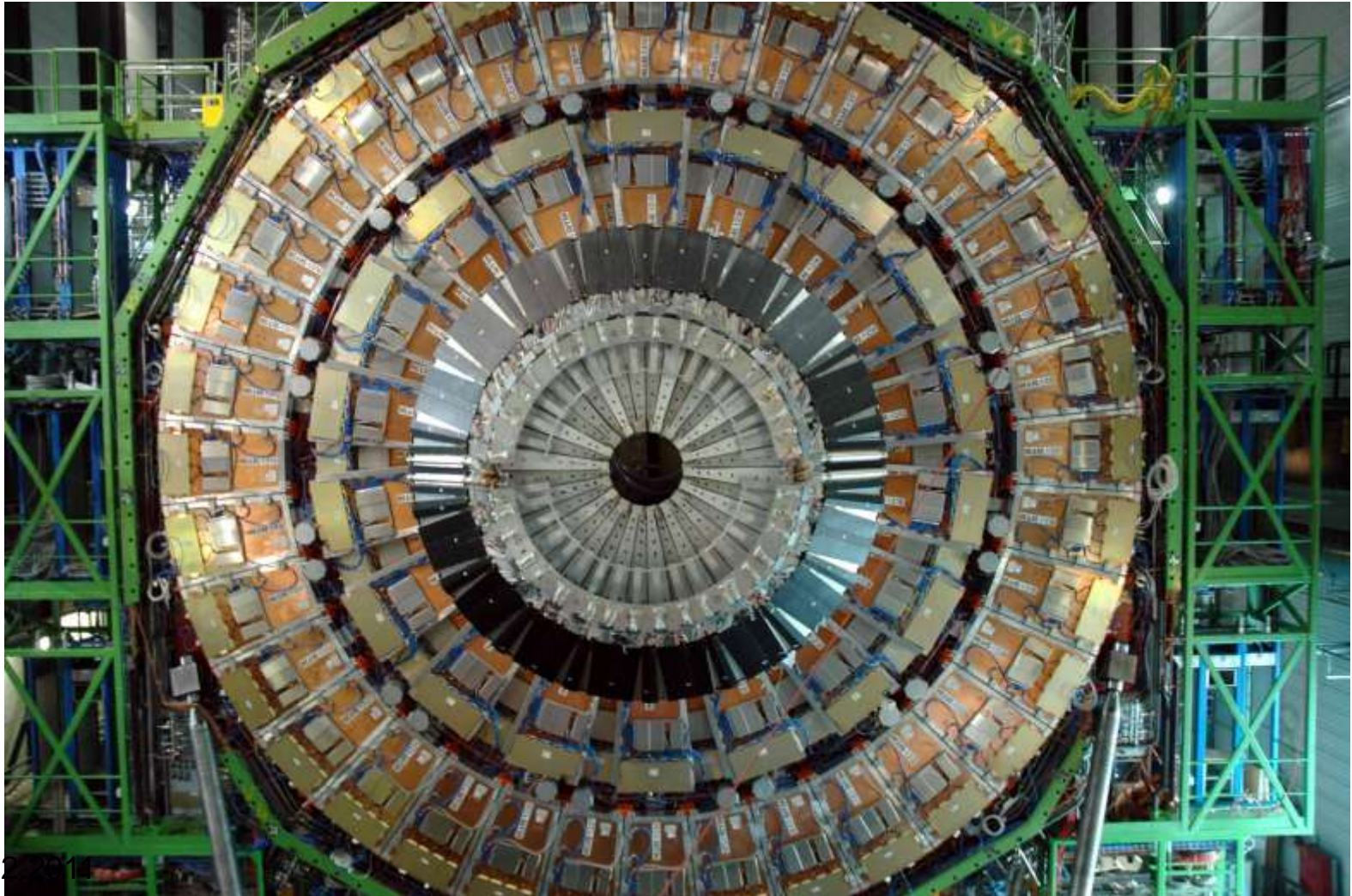
**Rapid Increase in instantaneous luminosity:  
April ( $L=2 \times 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$ ) – October ( $3.5 \times 10^{33}$ )  
1 day in October - more data than the entire 2010 run**

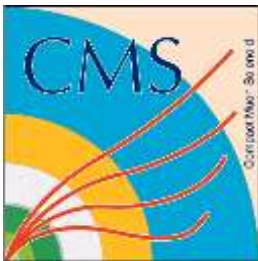


**Event shown above has 13 reconstructed vertices**



# Muon Subsystem

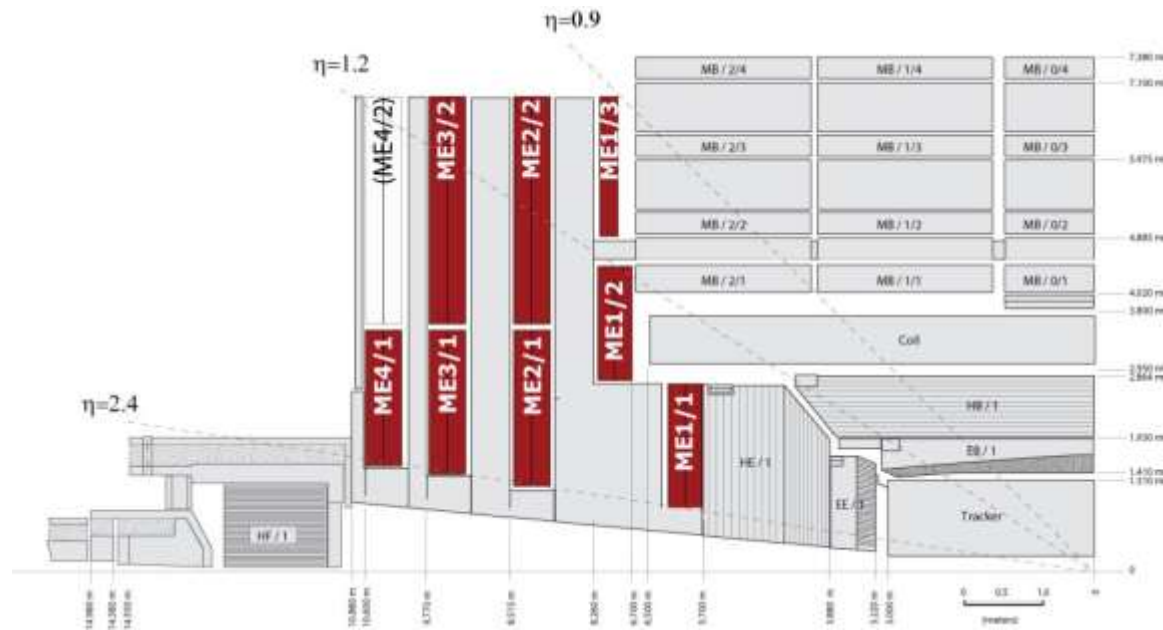


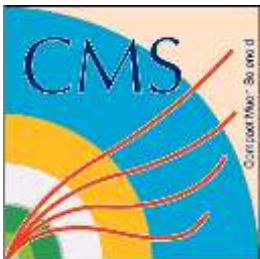


# Status Muon Subsystem



- ME1/1 72 1.5×0.5 m<sup>2</sup>**
- ME1/2 72 1.6×0.8 m<sup>2</sup>**
- ME1/3 72 1.7×0.9m<sup>2</sup>**
- ME 2/1 36 1.9×1.25 m<sup>2</sup>**
- ME3/1 36 1.7×1.25 m<sup>2</sup>**
- ME4/1 36 1.5×1.25m<sup>2</sup>**
- ME23/2 144 3.2×1.3m<sup>2</sup>**
- ME4/2 5 3.2×1.3m<sup>2</sup>**
- 473 CSCs (cover about 6000 m<sup>2</sup> )**
- 2.3 10\*\*6 anode wires**
- 183168 anode readout channels**
- 217728 cathode readout channels**

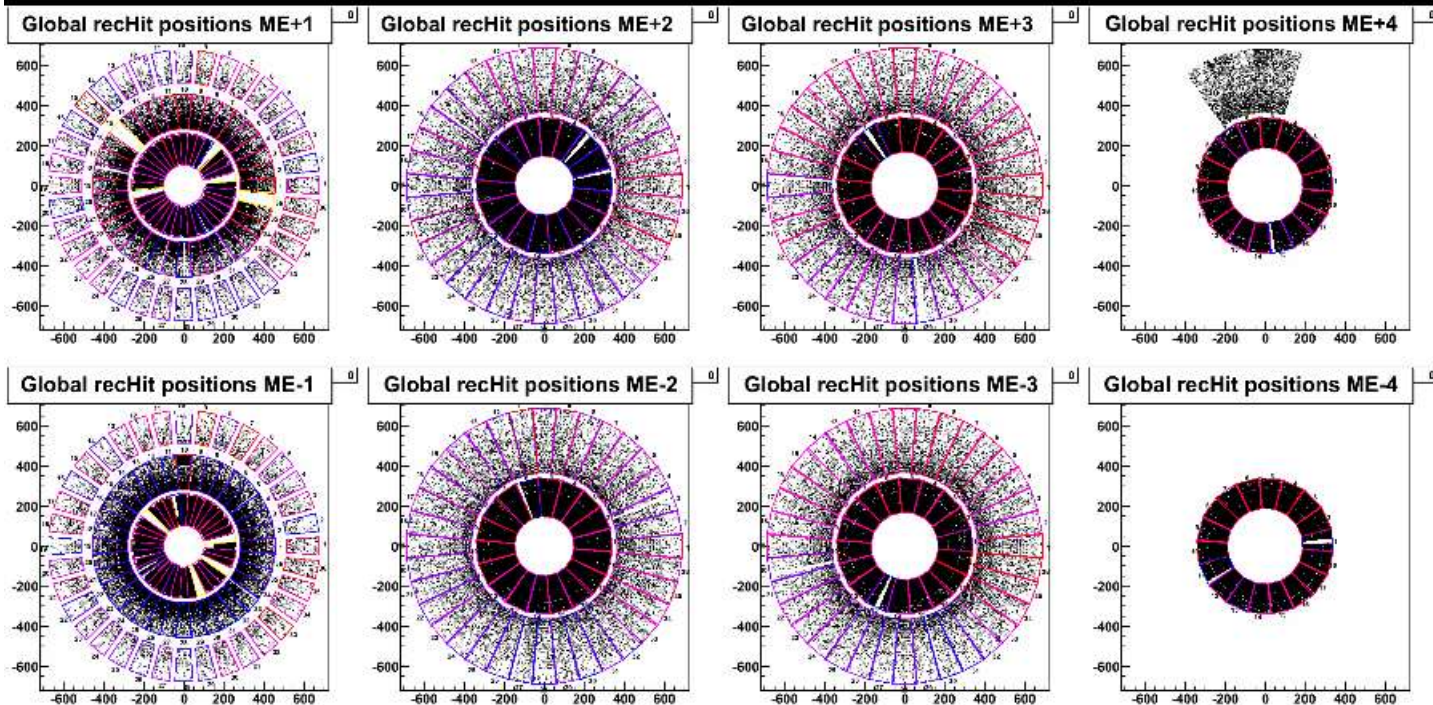




# CSC status at the end of LHC proton run



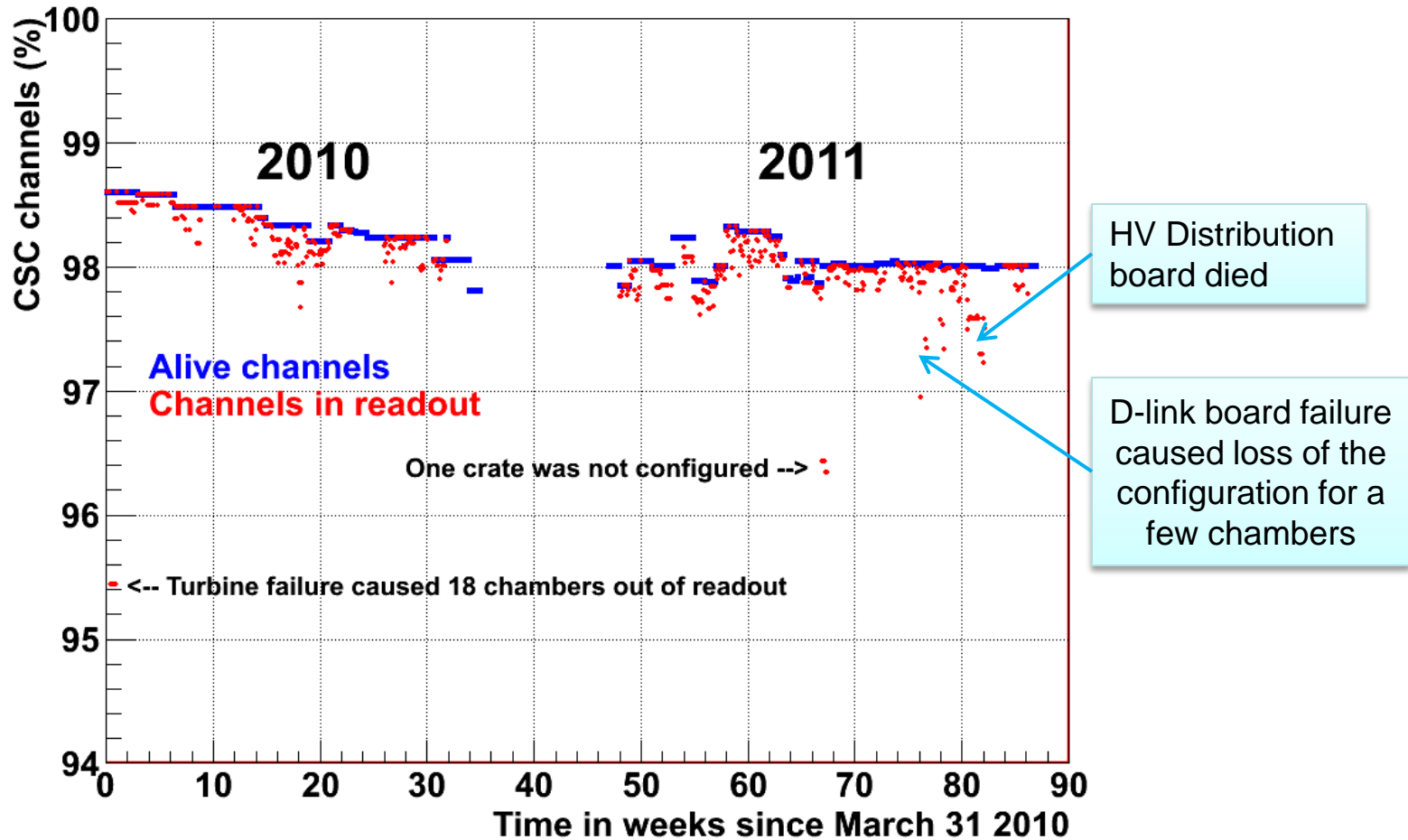
## rechHit Global Positions



**CSC demonstrated high efficiency in 2011.  
But without access to the chambers we cannot improve it.**

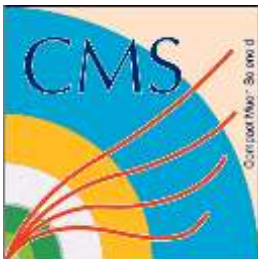


# CSC real run efficiency



# Preparation for stable running in 2012

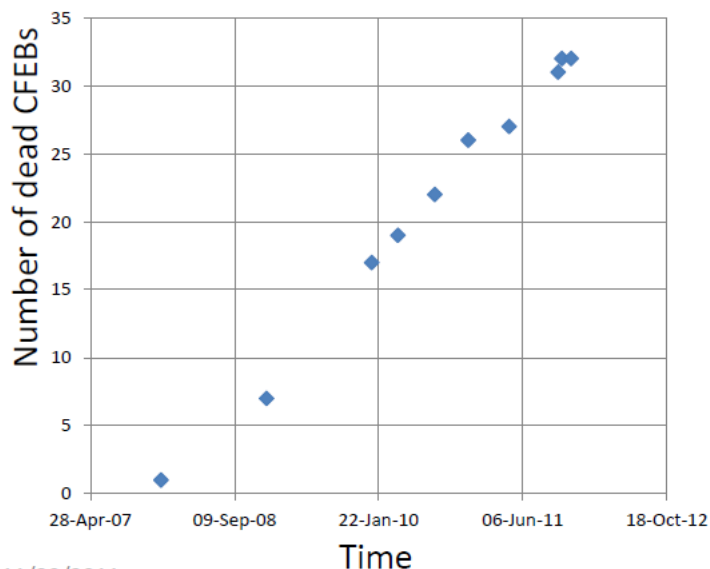
- LV
  1. Replacing 3.3 V fuses on the TMB boards.
  2. Connectivity test of 7 V lead to the on-chamber electronics.
- HV
  1. Implement new protocol of the DCS- HV server communication.
  2. Increase threshold for HV current trips in the inner ME rings.
- EPROM reloading
  1. Automate EPROM downloading procedure.
  2. Test of an effect of regular refreshing of the EPROM contents.



# Losses of on-chamber electronics



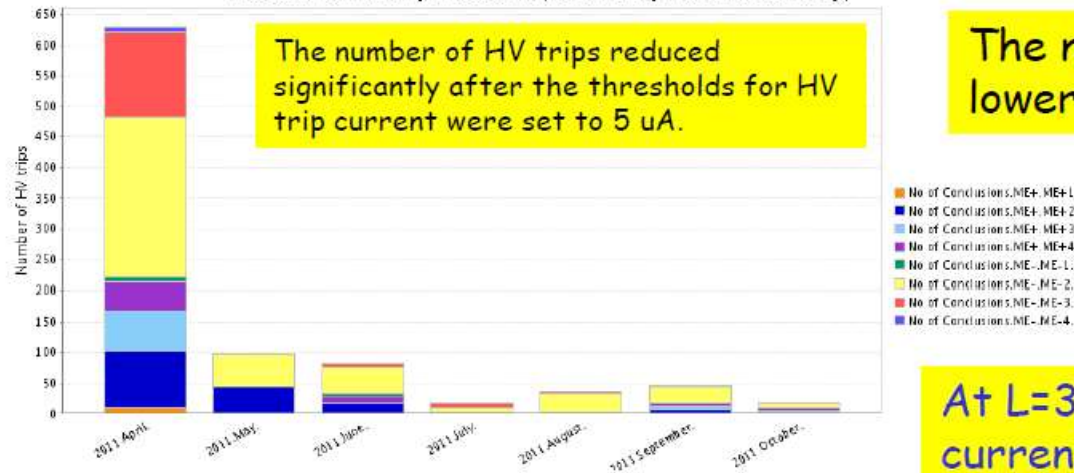
1. We have lost only 1 ALCT in 2011. It was not unexpected. This ALCT didn't have JTAG communication since 2009 and as soon as EPROMs lost firmware the board has been lost.
2. The accumulated rate of dead CFEBs is 7 boards a year. The reasons are different (CFEBs, LVDB, cables). **Right now we have 32 dead CFEBs.**



**One can expect to have 39-40 dead CFEBs at the end of 2012.**

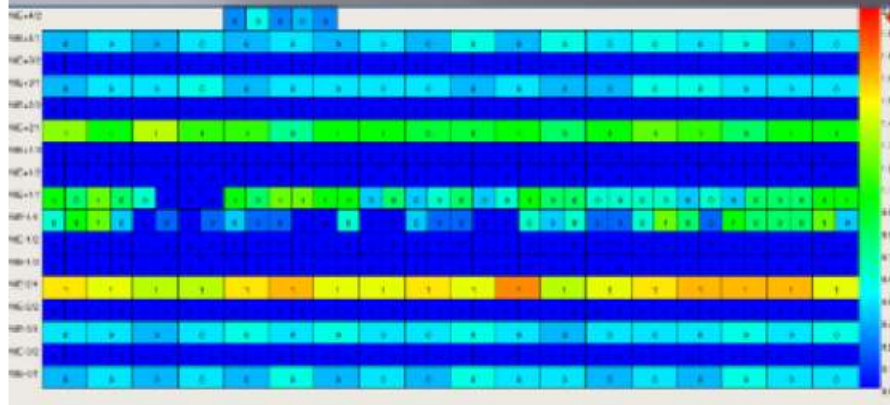
# CSC raises the threshold for HV trip current

Number of HV trips vs. time (non-ME1/1 chambers only)



The number of channels at lower HV is 85 (out of 9400).

HV current at  $L=2.9 \times 10^{33}$



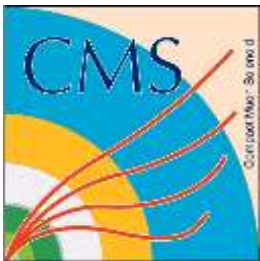
At  $L=3.5 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$  the HV current of the CSCs in the inner rings is already higher than 2 uA.

At  $L=7 \times 10^{33}$  we have no choice and must raise the threshold of the HV current trip to 10 uA in the inner rings. The CSC of the outer rings can stay with the current 5 uA threshold.



**После 2 лет стабильной работы CSC  
сталкивается с другой проблемой:**

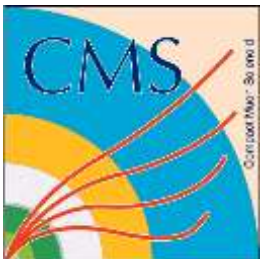
**без доступа к детектору мы должны  
обеспечить стабильную работу CSC в течении  
еще одного года в условиях повышенной  
светимости LHC**



# ISR → 904



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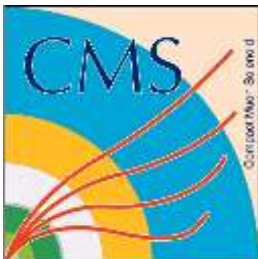


# Shifts in 2011



General Requirement for 2011: 6 points per Author

- PNPI participates in Trigger and DCS Central shifts --- **79 shifts (94.5 shift-points)**.
- CSC DQM shifts --- **42 shifts (6 weeks)**



# CSC Upgrade I



- Original design unfinished – ME4/2 not built
- 72 ME4/2 chambers to complete system
  - Identical to chambers already built and working well
  - Increase redundancy of system
  - Efficient triggering at high luminosities

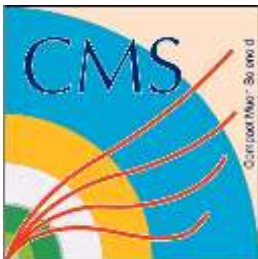


# ME4/2 Upgrade



R&D  
Production of 31 CSC

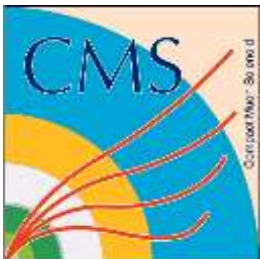




# CSC Production Plans



- **Assembly in B904 factory at CERN**
  - Currently being renovated – occupancy end of 2010
  - ~1000 m<sup>2</sup> space with good services
  - CERN will provide two clean rooms for CSC
- **Shipped tooling and parts from Fermilab**
  - Parts for approximately 3 prototypes + spares
  - Shipment has arrived in B904
- **Plans for 2011**
  - Plan to set up machines in January – February 2011
  - Then produce 2-3 prototypes as part of a learning curve (debug systems and train personnel)

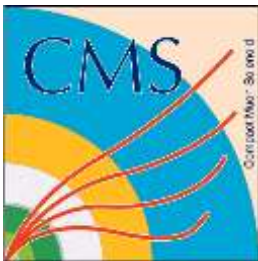


# CSC tooling in B904

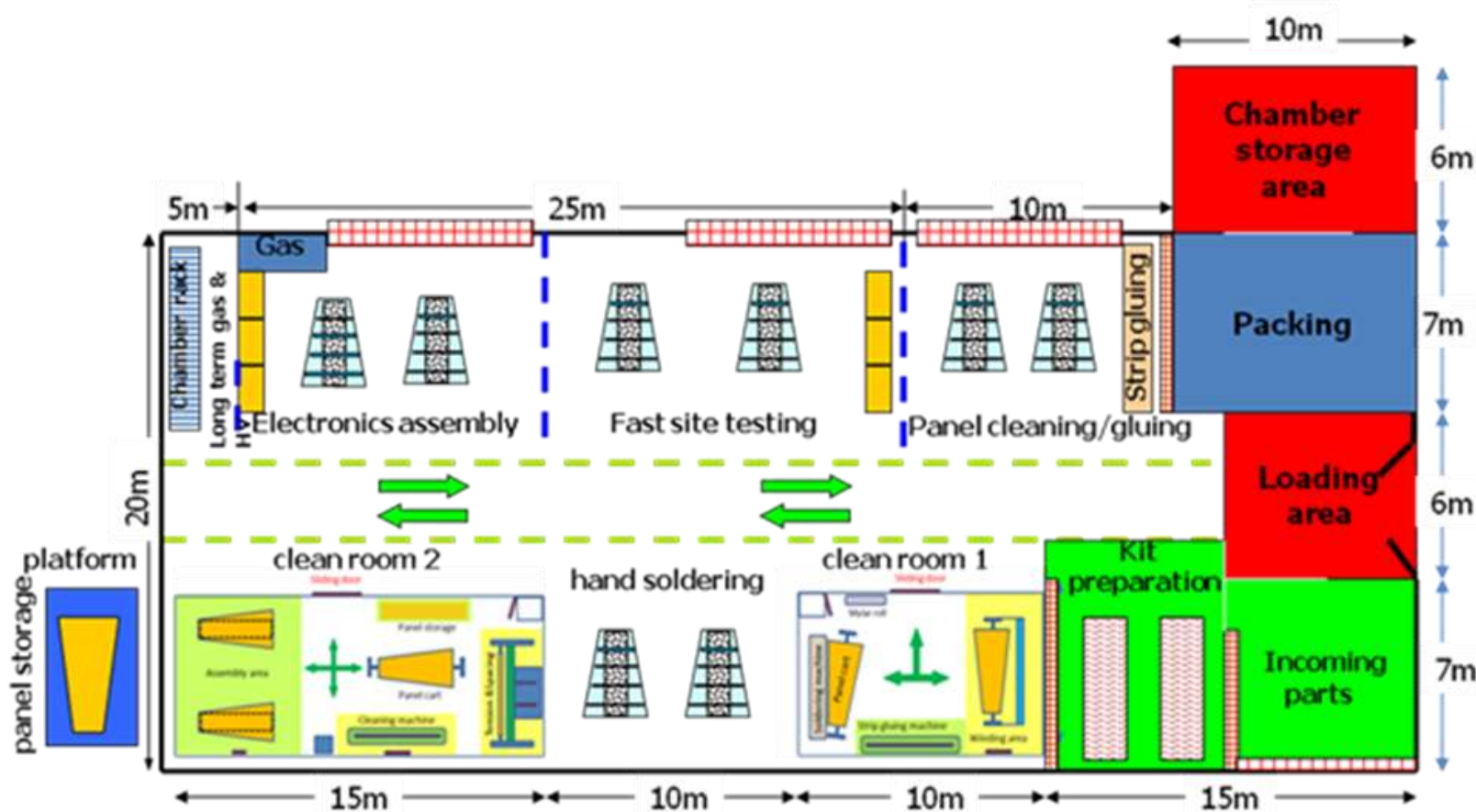


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# ME4/2 Upgrade



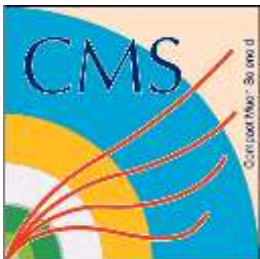


# ME4/2 Upgrade

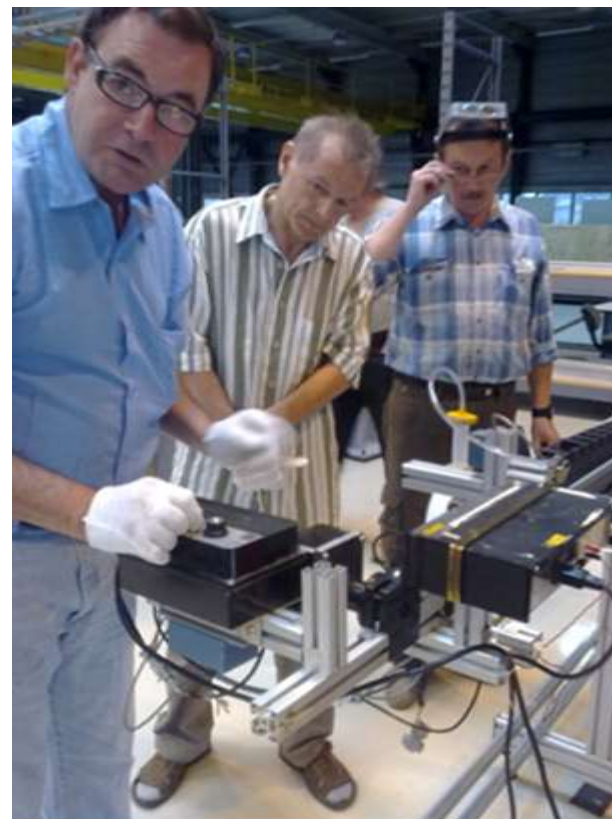


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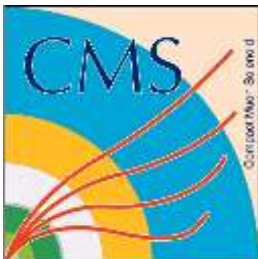
# ME4/2 Upgrade





# ME4/2 Upgrade





# ME4/2 Upgrade

