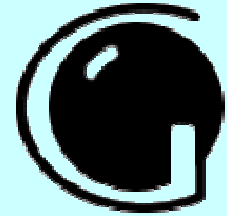




Сессия Ученого Совета ОФВЭ  
27 декабря 2006



# Проект CMS в 2006

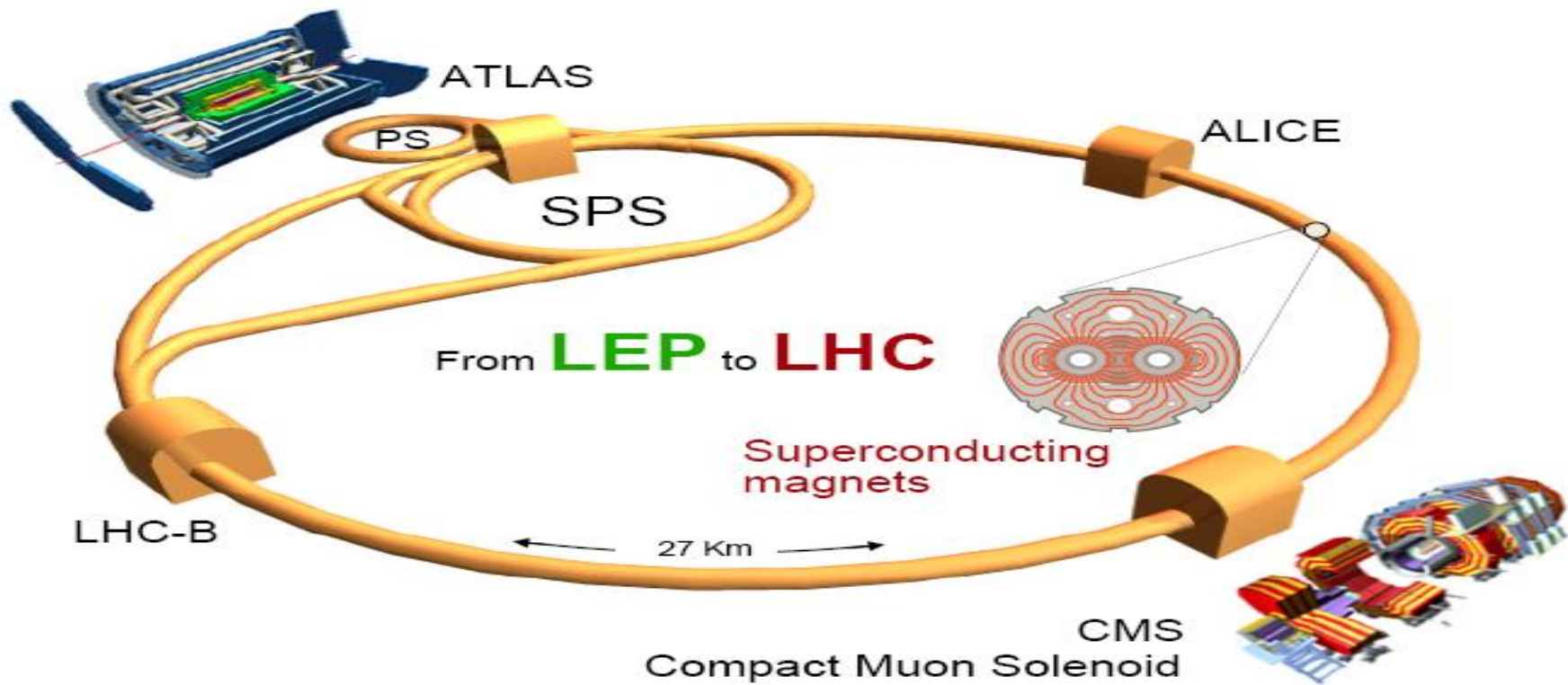
Ю.М.Иванов  
В.В.Сулимов

# ПИЯФ в CMS

В проект вовлечены

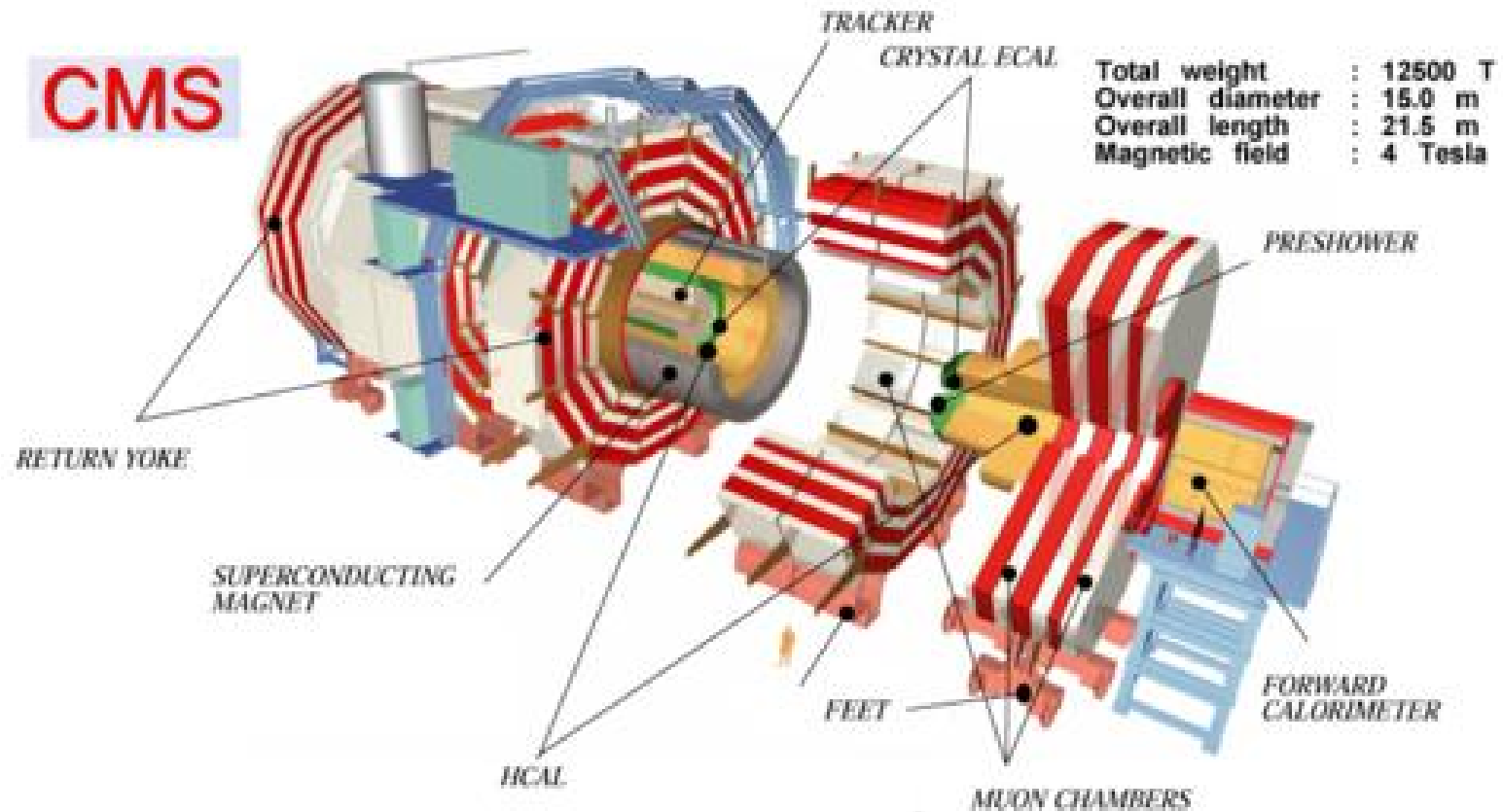
- Лаборатория физики элементарных частиц ОФВЭ
- Лаборатория мезоатомов ОФВЭ
- Группа экзотических ядер ОФВЭ
  
- Отдел мюонных камер ОФВЭ
- Отдел радиоэлектроники ОФВЭ
- Отдел вычислительных систем ОФВЭ

# The Large Hadron Collider (LHC)



|            | Beams       | Energy   | Luminosity                               |
|------------|-------------|----------|--|
| <b>LEP</b> | $e^+$ $e^-$ | 200 GeV  | $10^{32} \text{ cm}^{-2} \text{ s}^{-1}$ |
| <b>LHC</b> | p p         | 14 TeV   | $10^{34}$                                |
|            | Pb Pb       | 1312 TeV | $10^{27}$                                |

# CMS



# End-Cap Muon System

468 CSCs, not counting ME4/2

- 144 Large CSCs ( $3.4 \times 1.5 \text{ m}^2$ ):

- 72 ME2/2 chambers

- 72 ME3/2 chambers

- Small CSCs ( $1.8 \times 1.1 \text{ m}^2$ ):

- 72 ME1/2 chambers

- 72 ME1/3 chambers

- 72 ME1/1 chambers

- $20^\circ$  CSCs ( $1.9 \times 1.5 \text{ m}^2$ ):

- 36 ME2/1 chambers

- 36 ME3/1 chambers

- 36 ME4/1 chambers

- Frontend Electronics:

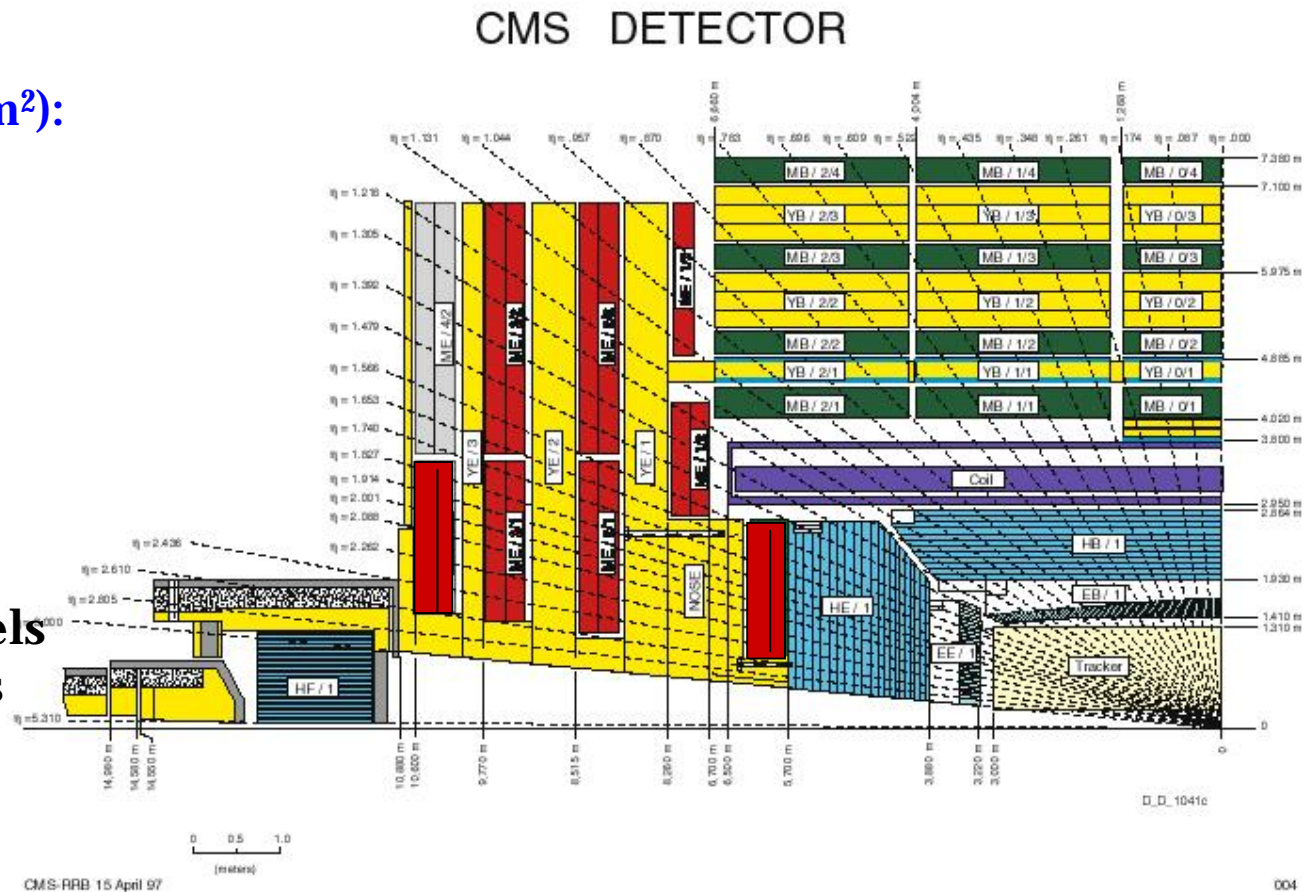
- 170K Cathode channels

- 140K Anode channels

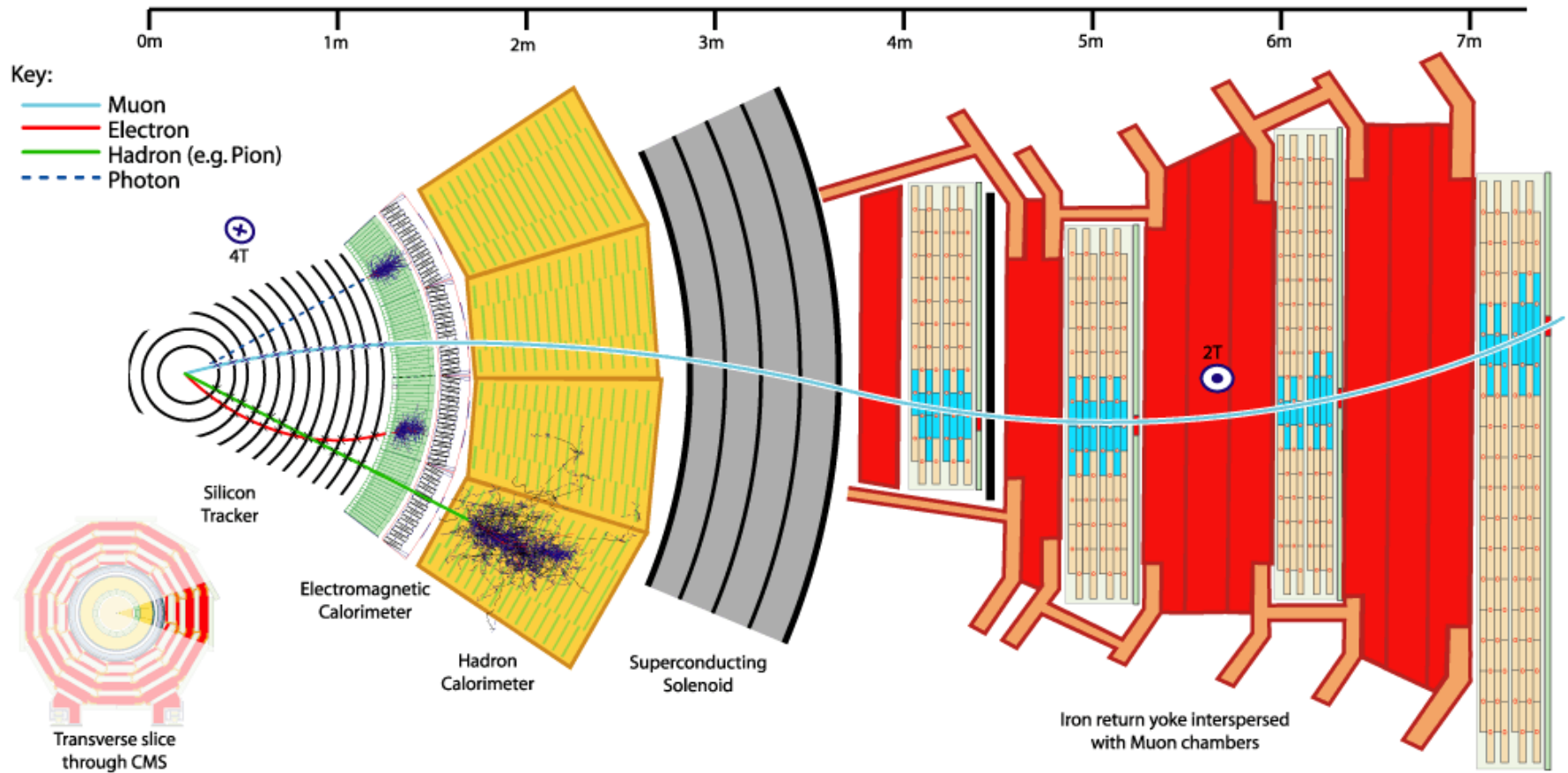
- Trigger&DAQ

- (on-chamber part)

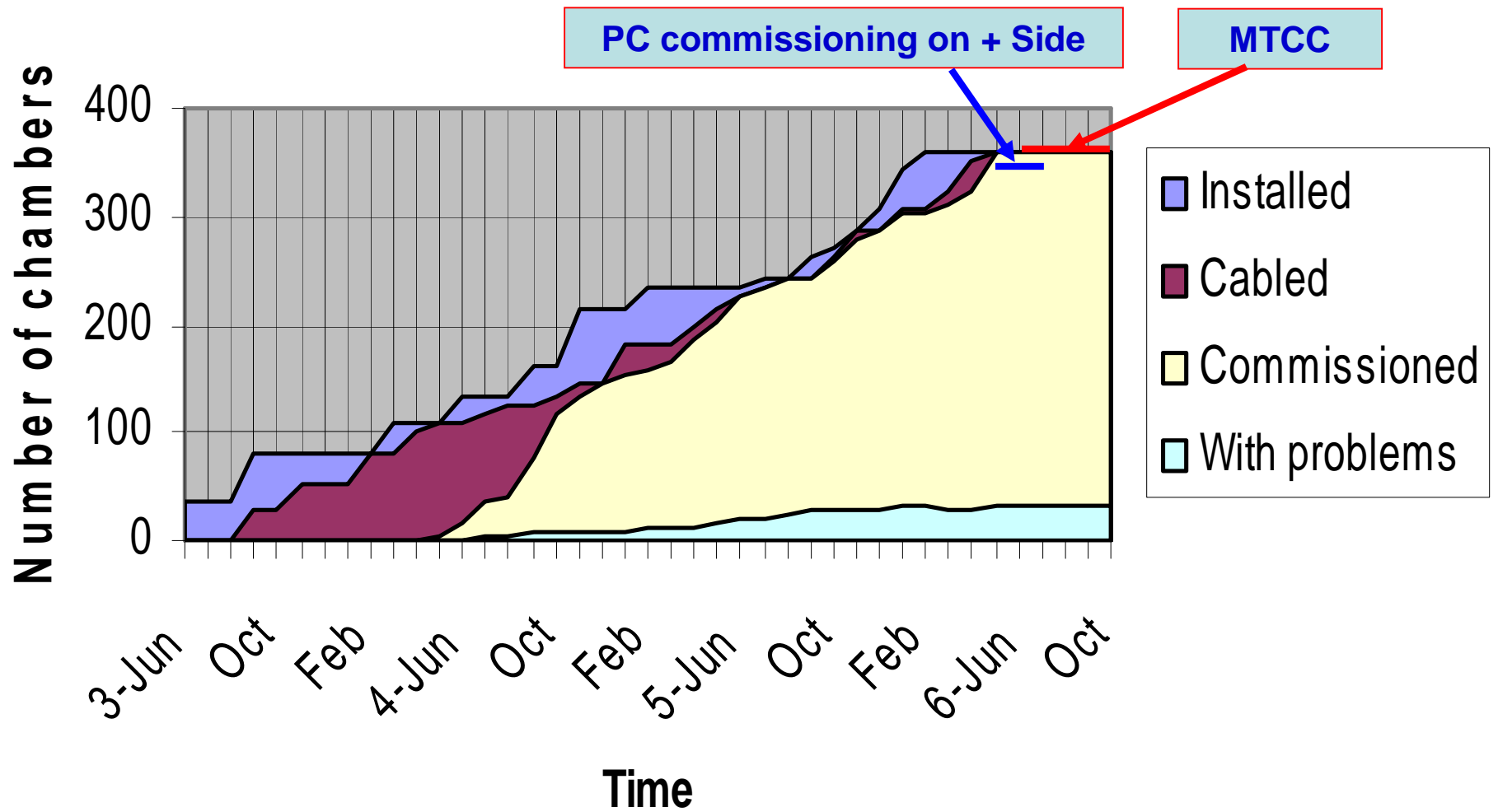
- Alignment&Services



# CMS



# Time diagram of CSC installation and commissioning



# Statistics of electronics boards on installed chambers

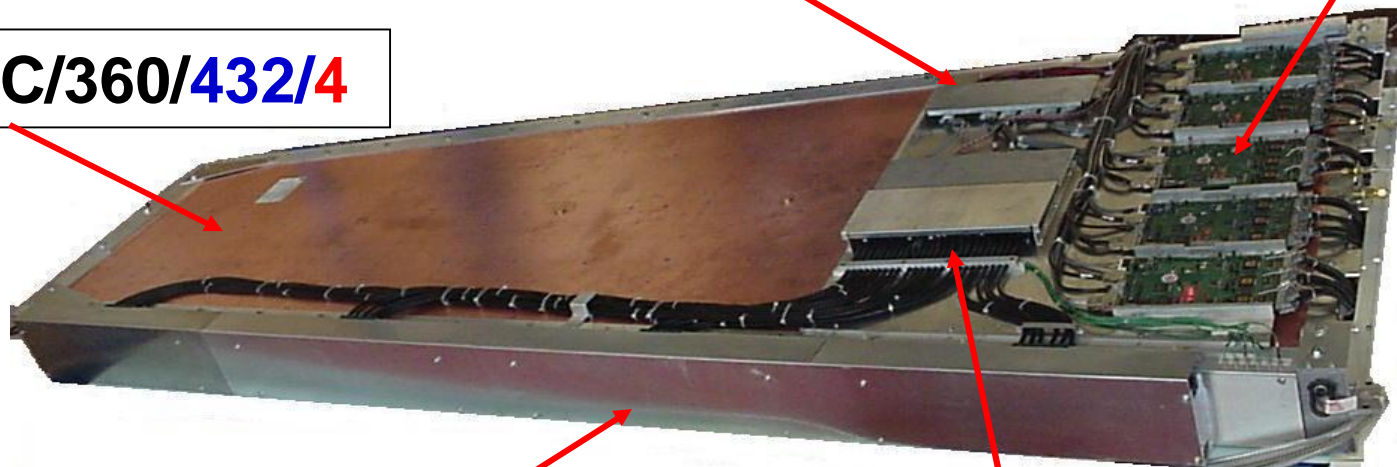
Board type/on\_US\_CSCs/total/replaced

LVDB/360/432/6

LVMB/360/432/7

CFEB/1764/2124/22

CSC/360/432/4



AFEB/10152/11448/2

ALCT /360/432/5



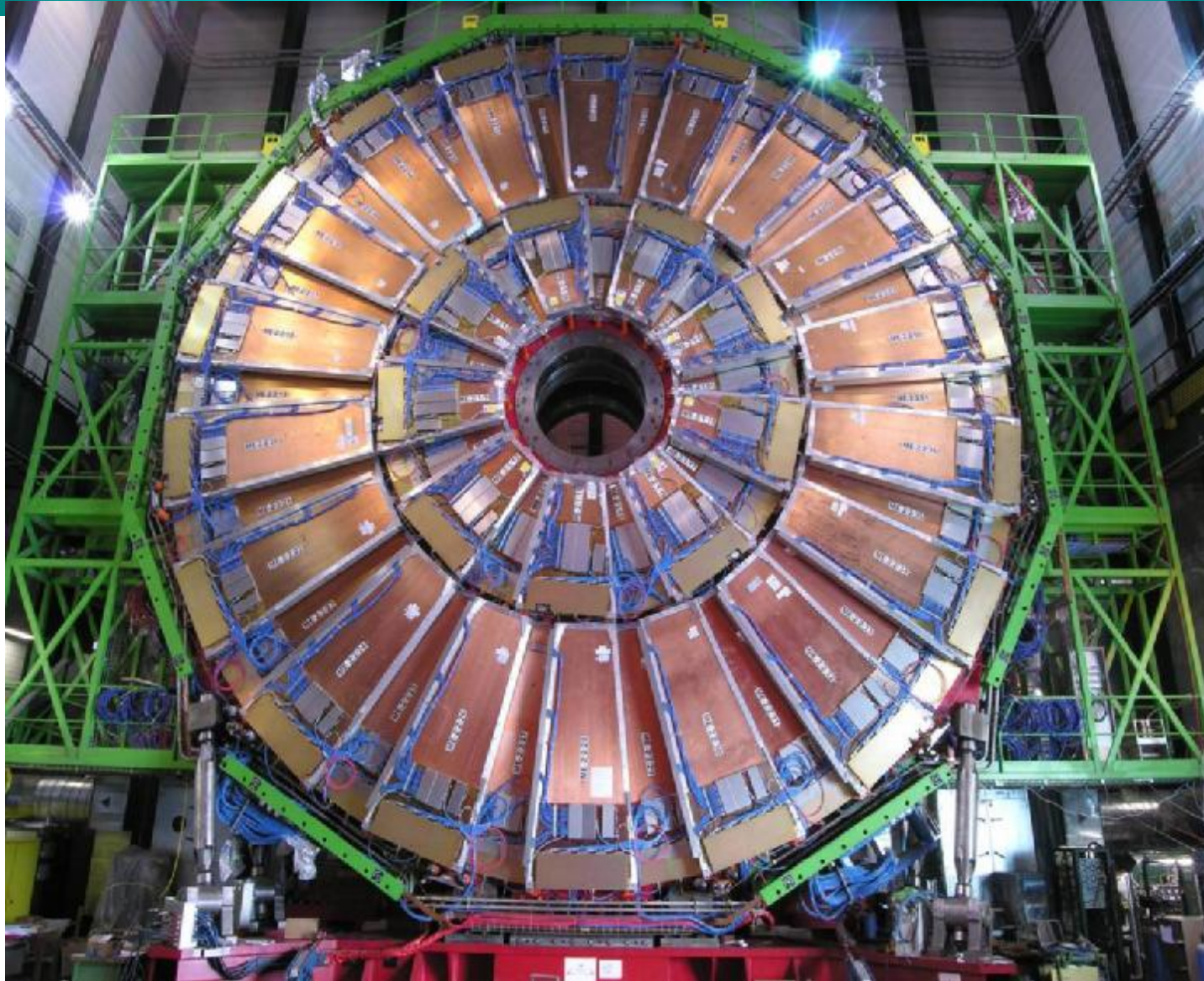
# Summary of replacements

- **5 boards had mechanical damages:**
  - LVDB – broken input connector
  - LVMB – broken switch
  - ALCT – broken input connector
  - CFEB – broken latch, input connectors
- **20 CFEBs were replaced:**
  - a. 14 CFEBs – dead channels, low response to the test pulse, no comparators, no data, ...
  - b. 6 CFEBs - by mistakes
- **5 LVMB – read wrong currents**
- **5 ALCT:**
  - a. four boards had 1.8 V fuse burnt out
  - b. one board couldn't been readout
- **9 cables:**
  - a. one DMB-LVDB was damaged
  - b. eight skew clear cables
- **4 CSCs:**
  - a. two chambers couldn't hold HV > 2.7 kV
  - b. two chambers had unacceptable level of noise

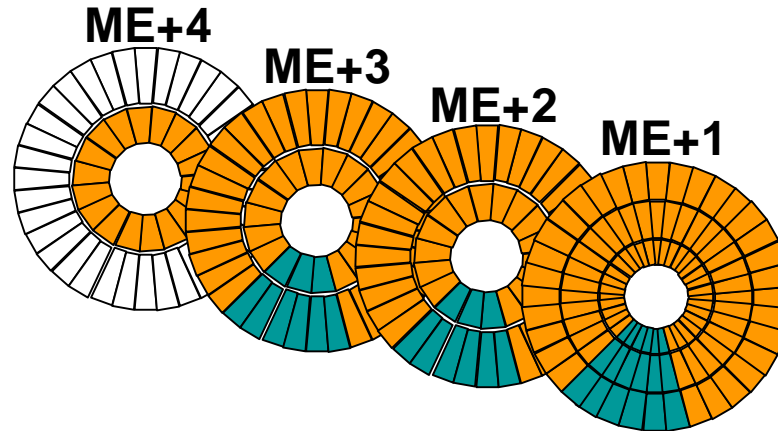
# HV long term test stand at ISR



# CSC: MTCC à START-UP



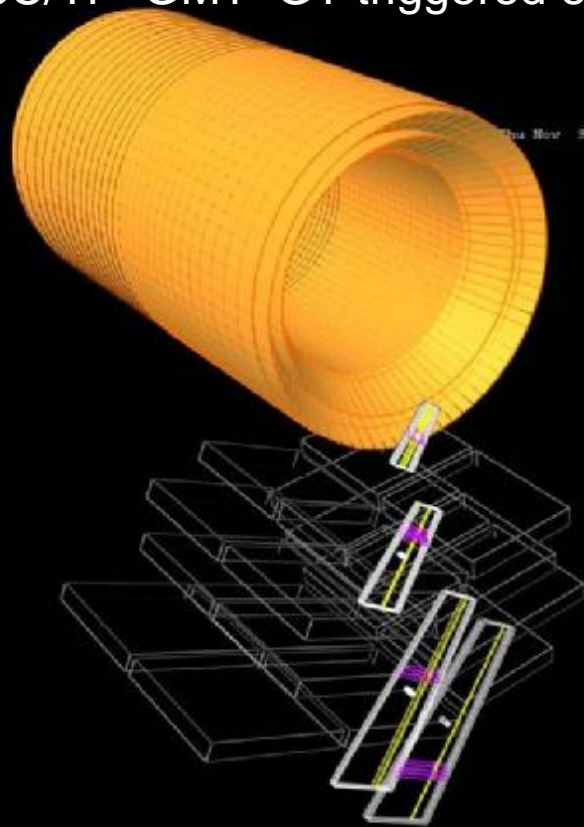
# CSC Scope at MTCC



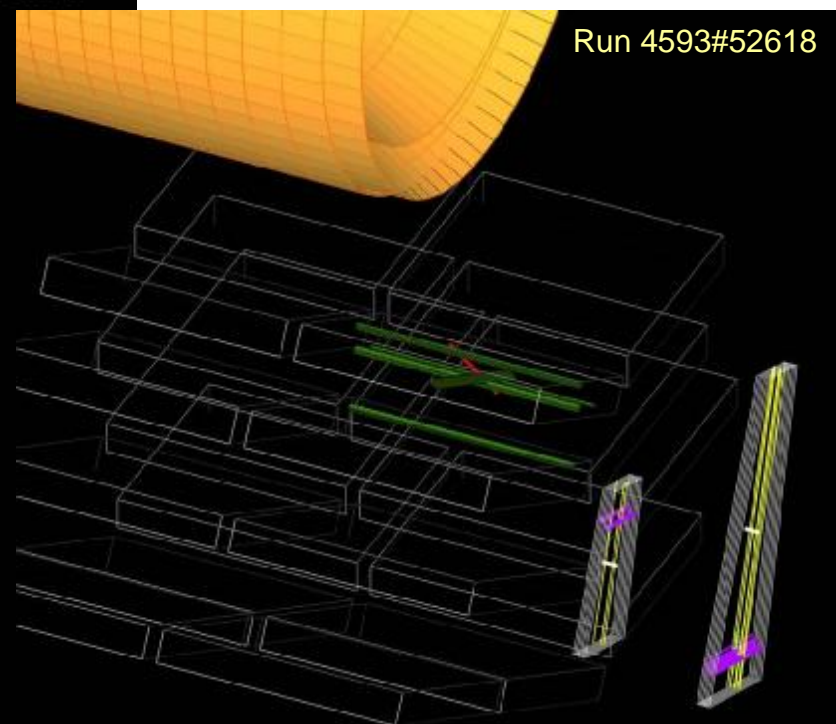
|  | MTCC      | EMU        |            |
|--|-----------|------------|------------|
| <b>Cathode Strip Chambers</b>                              | <b>36</b> | <b>468</b> | <b>8%</b>  |
| <b>High Voltage (distribution boards)</b>                  | <b>21</b> | <b>298</b> | <b>7%</b>  |
| <b>Low Voltage (Maraton PS)</b>                            | <b>3</b>  | <b>36</b>  | <b>8%</b>  |
| <b>Peripheral Crates (off-chamber on-disk electronics)</b> | <b>4</b>  | <b>60</b>  | <b>7%</b>  |
| <b>DDU (read out by Local DAQ and input to DCC)</b>        | <b>4</b>  | <b>36</b>  | <b>11%</b> |
| <b>Local DAQ PCs</b>                                       | <b>2</b>  | <b>18</b>  | <b>11%</b> |
| <b>DCC (input for Global DAQ)</b>                          | <b>1</b>  | <b>4</b>   | <b>25%</b> |
| <b>Muon Trigger Sector Processor</b>                       | <b>1</b>  | <b>12</b>  | <b>8%</b>  |

# Online Event Display

CSC-CSC/TF-GMT-GT triggered event



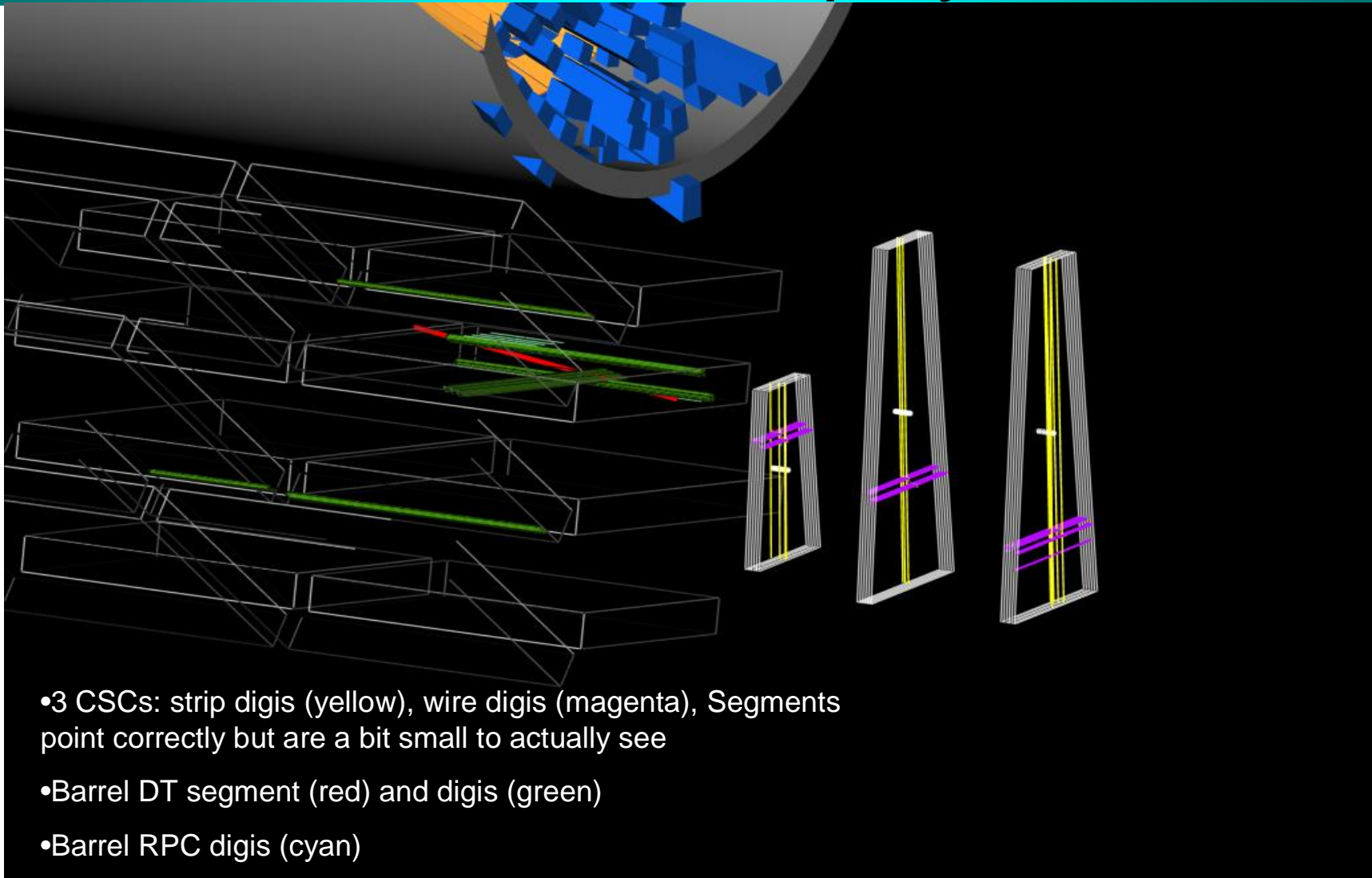
CSC/DT-GMT-GT trigger integration, with Global DAQ readout



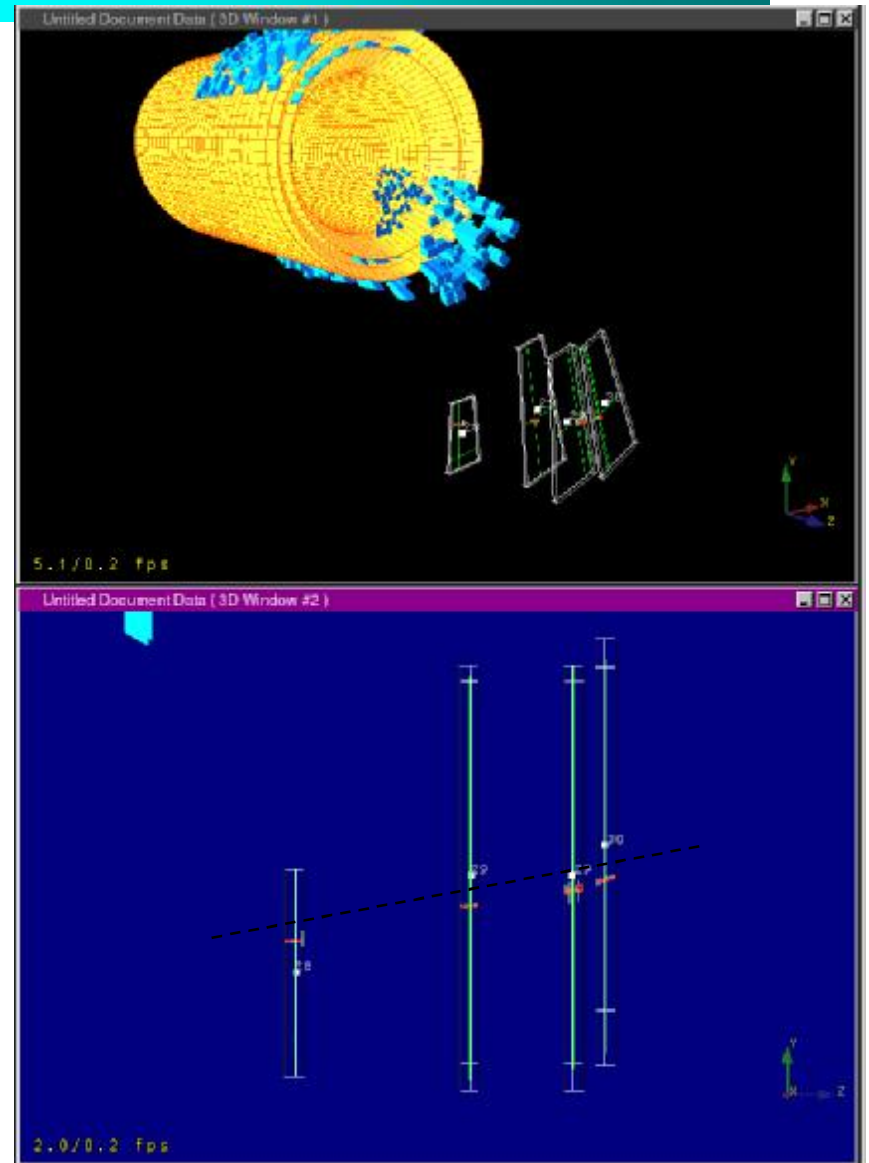
CSC+DT triggered event  
(using GMT+GT)

Ilaria Segoni, Dan Holmes, et al.

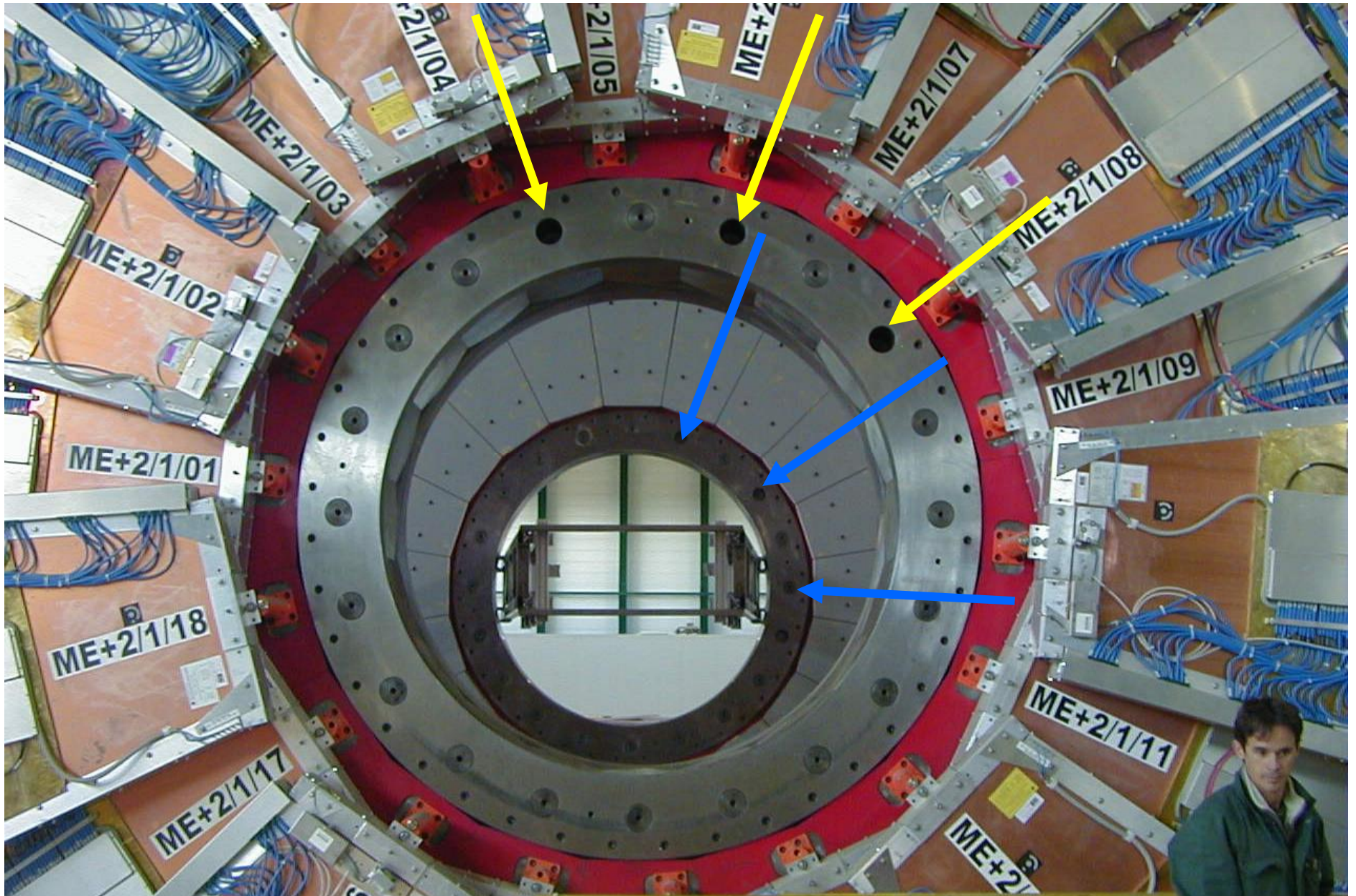
# More Event Displays ...



# MTCC à START-UP: Event Display



**Missing dowel pins on YE+3 (back, blue arrows) and YE+2 (front, yellow arrows)**





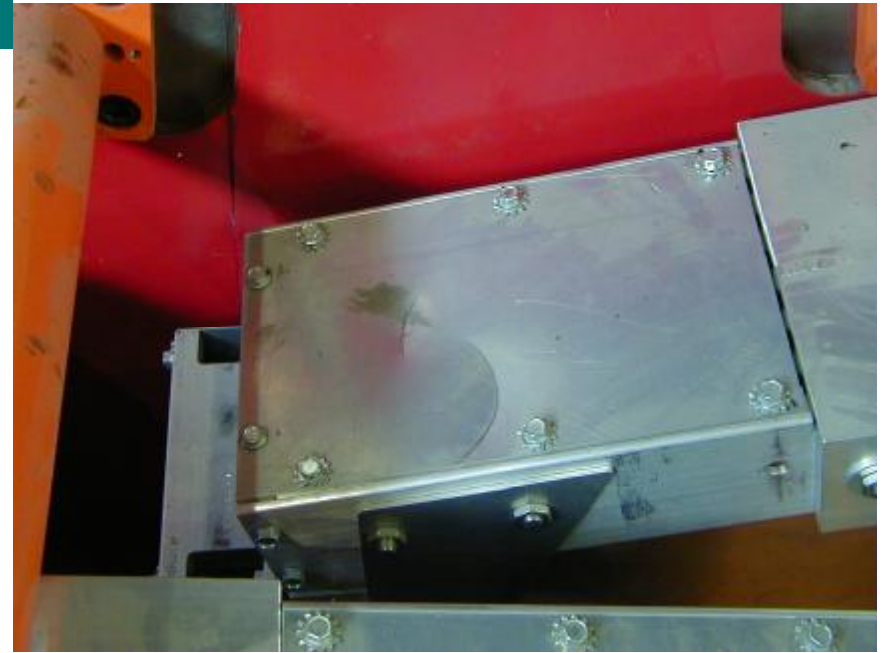
**Missing dowel pins on YE+3**



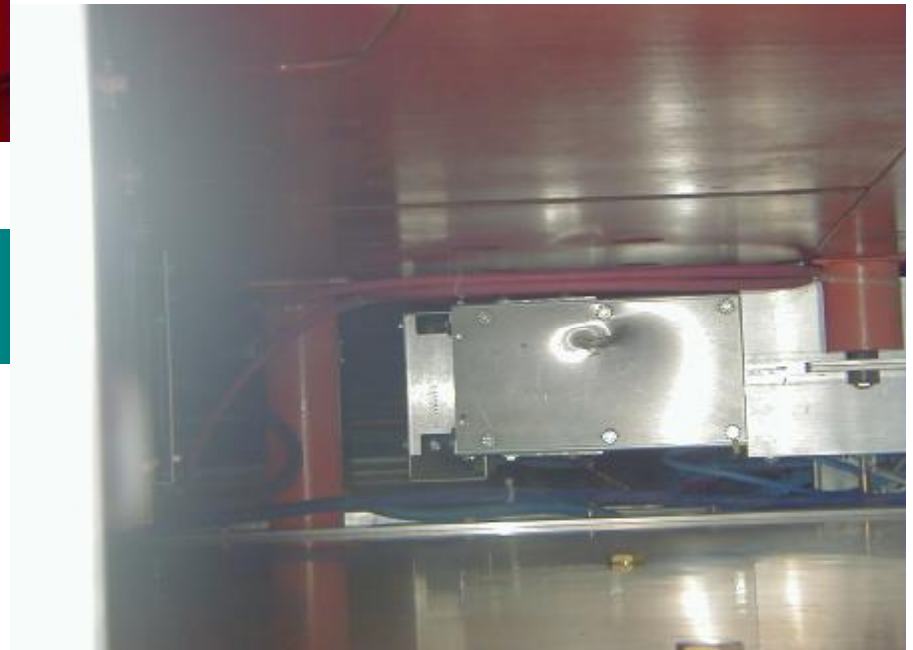
**Damaged CFEB cover on ME+3/2/27 due to falling pin**



**Missing dowel pins on YE+2**



**Damaged CSC ME+2/1/13 (top) and ME+2/2/27 (bottom) due to falling pin**



# MTCC à START-UP: Mechanical installation and cabling

## MTCC lessons (opening/closure experience)

- fell-out dowel pins: fixed
- damaged alignment sensors: precautions taken
- magnetic cable strain relieves and covers (ME1/1): fixed

### SX5 (- endcap)

Setup 6-18 chambers for SliceTest 2007

... **SX5 Slice Test 2007 (sync task force)**

36 ME-1/3 chambers: install, cable, commission

30 peripheral crates: install, commission

HV system: install, cable, commission

LV system: install junction boxes, cable

Alignment: install, cable, commission

... **thoroughly test all chambers (last underground!)**

prepare for lowering (summer 2007)

### UXC55 (+ endcap)

reinstall mini-racks and cooling

install mini-cable chains

route cables, fibers, and services

LV system: install junction boxes, cable

... **thoroughly test all chambers**

LV system: install Maraton PS, commission

... **Slice Test 2007 moves underground**

... Integrate with CMS Trigger/DAQ

### UXC55 (- endcap)

reinstall mini-racks and cooling

install mini-cable chains

route cables, fibers, and services

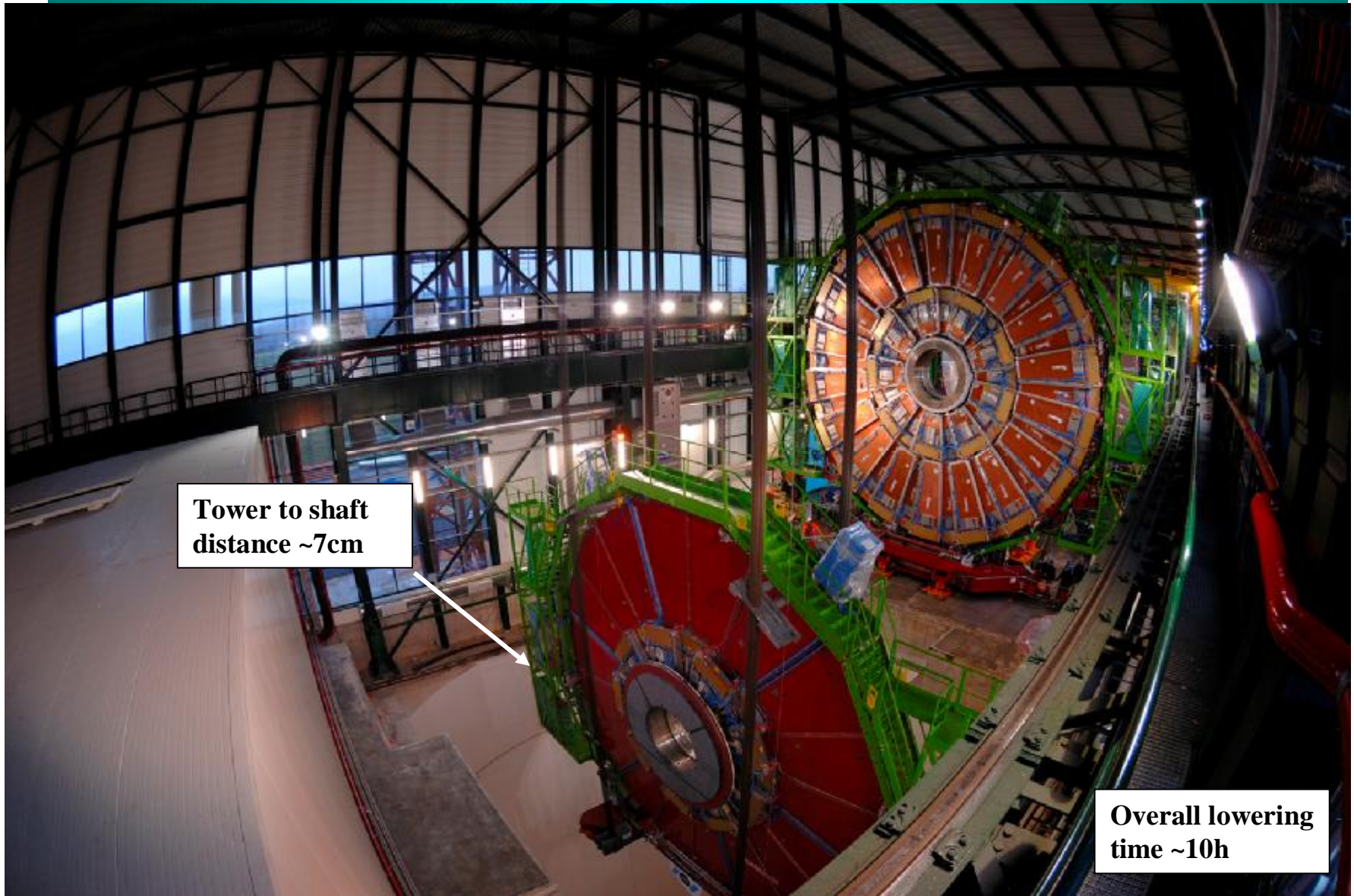
Need UXC55 schedule!

# YE+3 prep



# YE+3 lowering

30<sup>th</sup> November



Tower to shaft  
distance ~7cm

Overall lowering  
time ~10h

# YE+3 landing in UXC55



# YE+2 lowering

12<sup>th</sup> December



# YE+2 landing in UXC55

