# MB DT ELECTRONICS STATUS & PERSPECTIVES

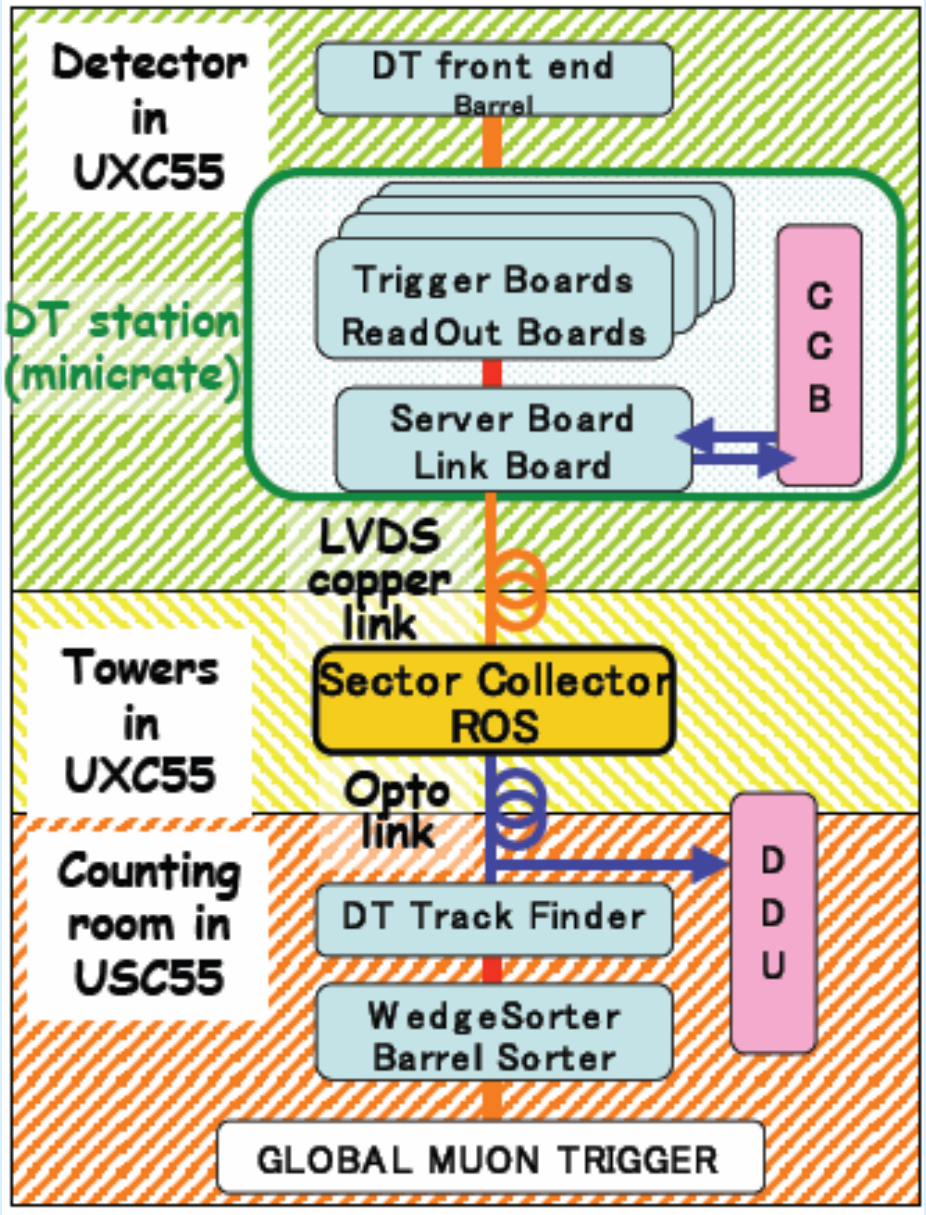
## CMS week

Cristina Fernández.

CERN. June 20th, 2006.

# DT RO/TR ELECTRONICS






## RESPONSIBILITIES

CIEMAT, MADRID
HEPHY, VIENNA
INFN, PADOVA
INFN, BOLOGNA
INFN, TORINO
U. AUTONOMA, MADRID

& LV, HV PS SYSTEMS

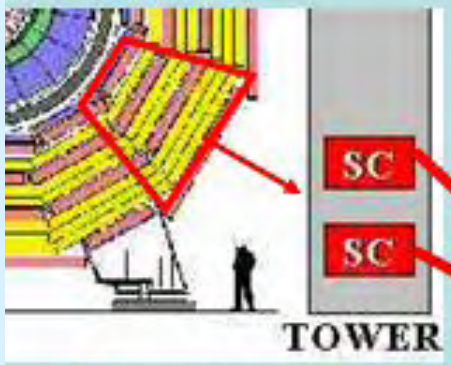
# SC STATUS

## CMS week.

## CERN. June 20th, 2006.

# SECTOR COLLECTOR (UXC55)



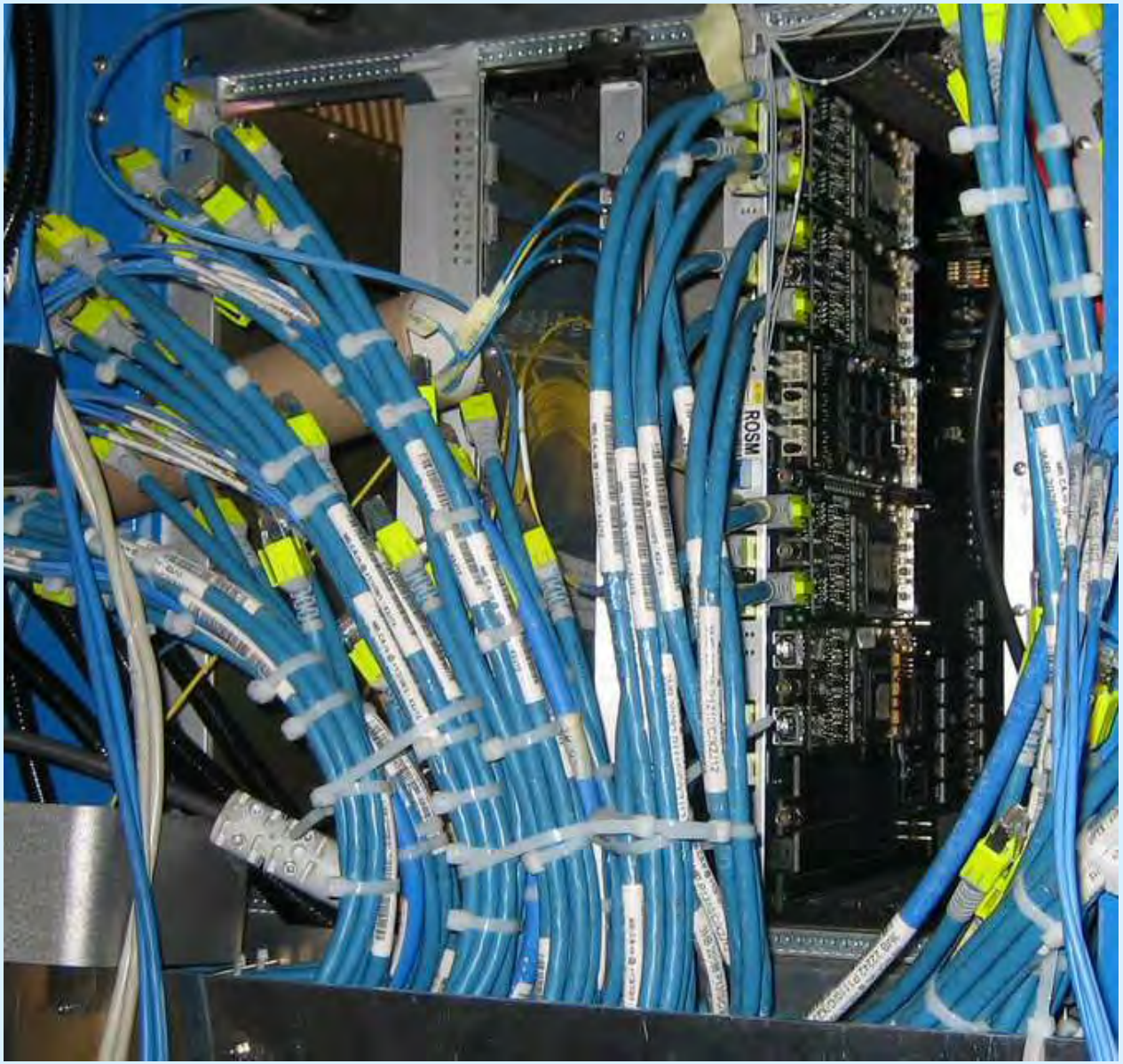



10 Sector collector crates, 2 per wheel

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VME CONTROLLER | OPT. RS-485 CONV. | TTCoc | TTCoc | 1X2 TTC Splitter | | TIM (TTC Interface Module) | ROS 6 or 7 | SC 6 or 7 | ROS 5 or 8 | SC 5 or 8 | ROS 4 or 9 | SC 4 or 9 | ROS 3 or 10 | SC 3 or 10 | ROS 2 or 11 | SC 2 or 11 | ROS 1 or 12 | SC 1 or 12 | ROB-ROS PP + OPTICAL LINK + LV PP | 9U |

# SECTOR COLLECTOR - MTCC STATUS

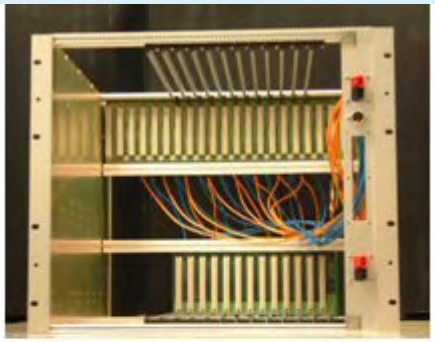





- 2 Crates w/BP
- 2 TIM
- 3 ROS-25
- 3 TRG SC
- 2 RO PP

# Ciemat Prototypes: MTCC





## SC crate: 3 units

- 2 units at CERN for Magnet Test.
- 1 at Legnaro for local integration tests.

## ROS-25: 5 units

- 3 ROS-25 at CERN for Magnet Test.
- 4th ROS-25 is staying at Madrid for further testing.
- 5th ROS-25 at Torino for DDU testing.

## TIM: 3 units

- 2 boards assembled and tested. They are at CERN for Magnet Test.
- 3rd at Madrid for further testing.

# Ciemat Production Plans (1)



## SC crates: 10 units

- All mechanics parts have arrived to CIEMAT.
- Mechanization of some pieces is needed.
- Assembly will start in two weeks and all crates can be ready for delivery in 4 months. Some units could be delivered sooner if needed.

## TIM: 10 units + 2 spares

- Its functionality has been validated at CIEMAT and at Legnaro.
- It is a small production, PCBs are already available and are being assembled.
- They will be ready by end of the summer.
- One TIM module will be sent to Bologna in the following weeks for their tests.

# Ciemat Production Plans (2)



**ROS-25: 60 units + spares = 70 units**

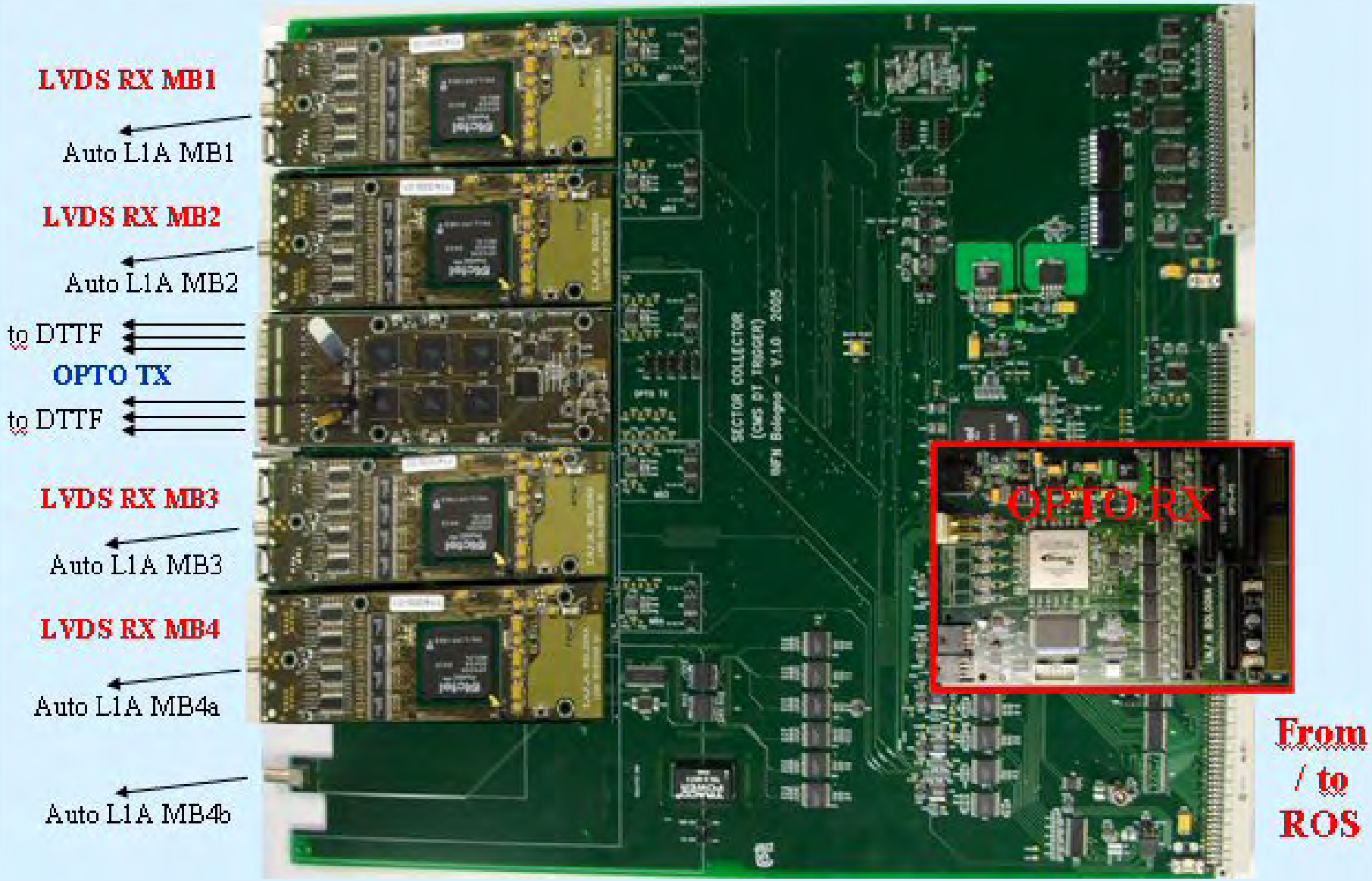
**70 ROS-25 mother boards**
**70 ROSCTRL mezzanines**
**70 GOLROS mezzanines**
**280 CEROS mezzanines**

- **Functionality tests have been successfully performed on the prototypes:**
  - **Validation tests at lab at CIEMAT,**
  - **Read-out chain with 2 DT chambers at Legnaro in local mode,**
  - **Optical link between ROS-25 and DDU,**
  - **SC to ROS-25 interface, etc.**
- **Also, during Magnet Test its functionality will be validated.**
- **Final production can start as soon as they are performed.**
- **Production will take around 6-8 months starting after validation tests.**

# Trigger Sector Collector status



**INFN Bologna team: F. Odorici, L. Guiducci, G. Torromeo, G. Pellegrini, R. Travaglini**



# Trigger Sector Collector status



INFN Bologna team: F. Odorici, L. Guiducci, G. Torromeo, G. Pellegrini, R. Travaglini

## FULL SYSTEM TEST in preparation for MTCC

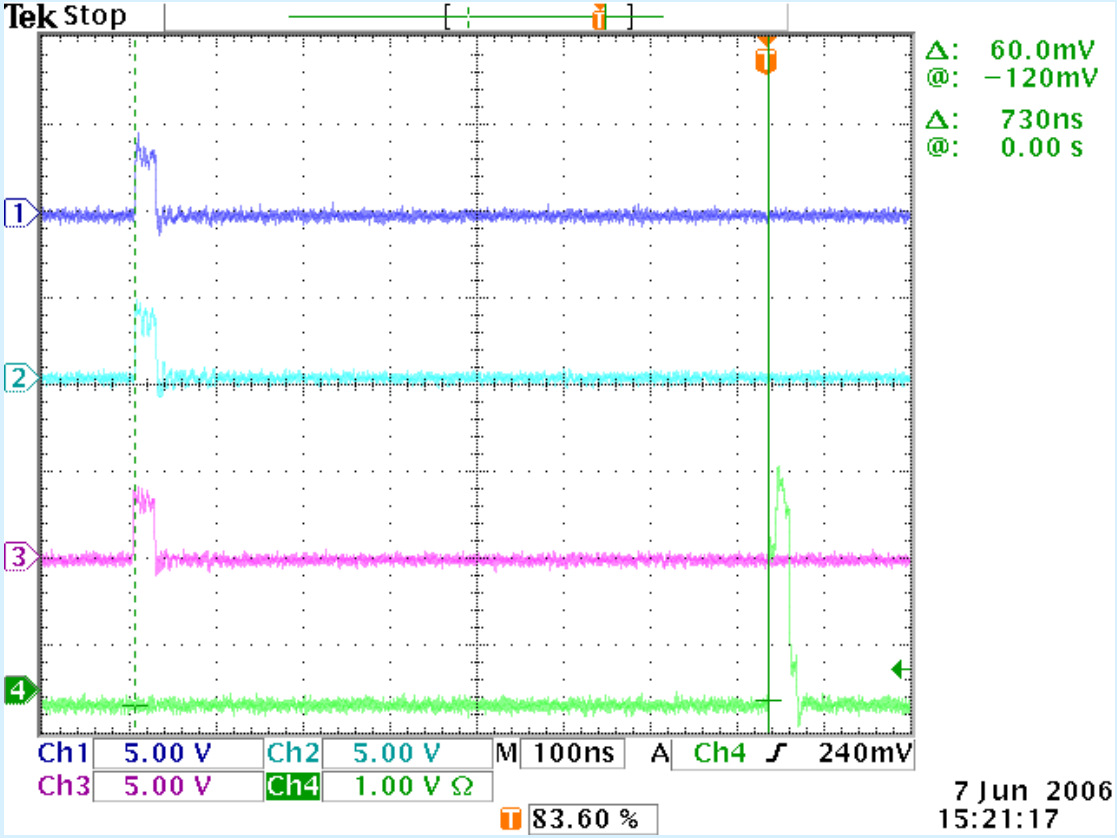
**1 trigger SC board with LVDS RXs and OPTO transmission was operated in a full system test in YB+1 with cosmics.**

- **connection to chamber Minicrates and chamber synchronization**
- **interface with the TTC system via TIM, and ROS25**
- **optical link to DTTF (links for 3 sectors tested)**

# Trigger Sector Collector status



**INFN Bologna team: F. Odorici, L. Guiducci, G. Torromeo, G. Pellegrini, R. Travaglini**




**Courtesy of Janos Ero**

**The three upper tracks are the Muons detected in the DT Station #1, #2 and #3, processed in the chamber minicrates, transmitted (LVDS 480 MHz at the SectColl), Opto transmitted (1.6 GHz) to the DTTF and observed at the Input of the PHTF Board.**

**The fourth Track is the BS Trigger output for CMS.**

# Trigger SC Production Plans



**INFN Bologna team: F. Odorici, L. Guiducci, G. Torromeo, G. Pellegrini, R. Travaglini**

| Boards | Q.ty (+ spares) | Prod start | Prod (+test) End |
|---|---|---|---|
| Opto Tx piggy | 60 (15) | Jul Q1 – 2006 | Dec Q4 – 2006 |
| Opto Rx board | 96 (24) | Jul Q1 – 2006 | Dec Q4 – 2006 |
| LVDS Rx 2 ch piggy | 200 (40) | Jul Q1 – 2006 | Dec Q4 – 2006 |
| Mother board | 60 (15) | Sep Q1 – 2006 | Dec Q4 – 2006 |
| LVDS Rx 4 ch piggy | 10 (8) | Sep Q1 – 2006 | Dec Q4 - 2006 |

# LV STATUS

## CMS week.

## CERN. June 20th, 2006.

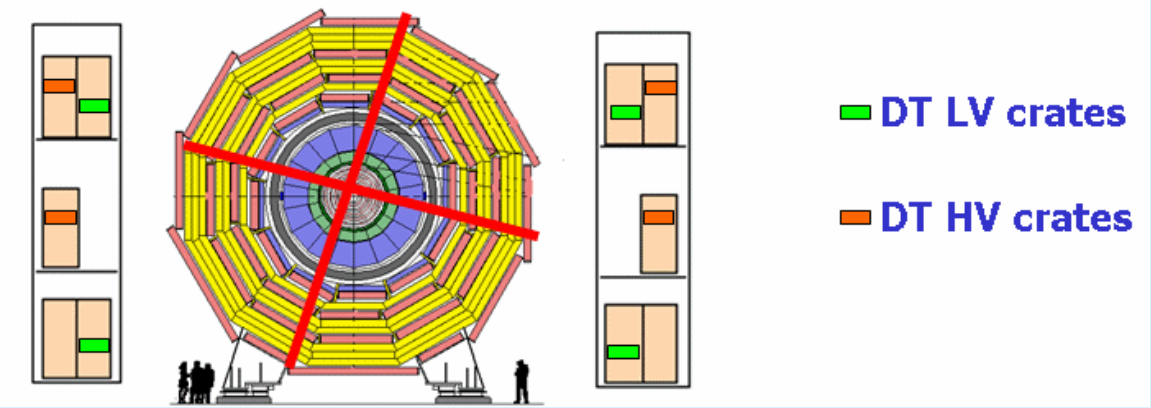
# LV PS - MTCC Status



- For MTCC we have all what is needed, except:
  - Two A3050 now at Pool for acceptance tests
  - No spares except for A3009.
- Now YB+1 is working. If Pool tests are successful we can operate 2 wheels once YB+2 will be closed to YB+1.
- In case Pool tests fail we could operate MC's on YB+2 with standard PS (not under magnetic field).

# LV Power Supplies






| MODULES | NEEDED | SPARES | TOTAL | ORDERED | TO BE ORDERED |
|---|---|---|---|---|---|
| A3050 | 130 | 6 | 136 | 7 | 129 |
| A3009 | 70 | 3 | 73 | 4 | 69 |
| A3100 | 10 | 2 | 12 | 2 | 10 |
| A1676A | 11 | 1 | 12 | 2 | 10 |
| A3486S | 41 | 2 | 43 | 2 | 41 |
| EASY3000S | 60 | | 60 | 3 | 57 |

# USC55

## CMS week.

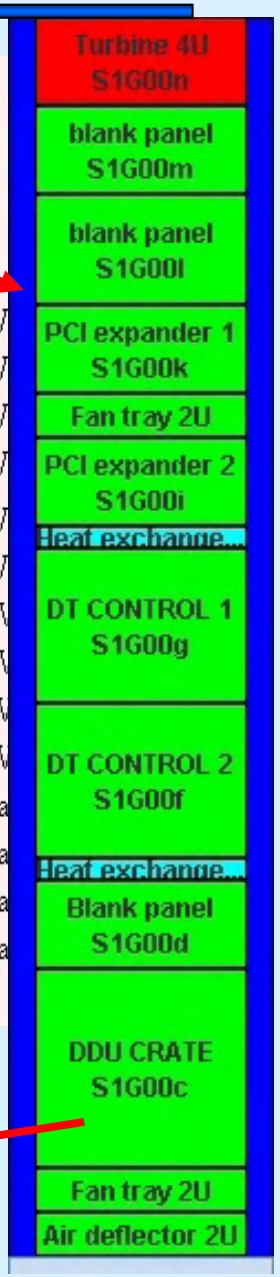
## CERN. June 20th, 2006.

# Rack Layout in USC55 (v7.3 ) Lower Floor



| +Z | | | Lower | Floor | (Zone S1) | | | |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H |
| 00 | -- | -- | Presh. ULR | Presh. ULR | TK. FEC | TK. FEC | DT/RO/SC | -- |
| 01 | -- | -- | DAQ | DT TrkFnd | Opt.Cpl. | RPC Trig | Pixel FEC | -- |
| 02 | TK. Ctrl | DAQ | DAQ | DT TrkFnd | TTC | RPC Trig | Pixel Ctrl | RPC B HV |
| 03 | TK. Ctrl | TK. FED TIB+TID | TK. FED TOB | DT TrkFnd | %TTC | RPC Trig | Pixel FED | RPC B HV |
| 04 | TK. Ctrl | TK. FED TIB+TID | TK. FED TOB | CSC TrkFnd | Global | RPC Trig | Pixel FED | RPC B HV |
| 05 | TK. Ctrl | TK. FED TIB+TID | TK. FED TOB | CSC TrkFnd | %Cal Global | %RPC Trig | DAQ | RPC B HV |
| 06 | TK. Ctrl | DAQ | DAQ | FRL PC | TTS | DAQ | CSC FED | RPC B HV |
| 07 | TK. Ctrl | DAQ | DAQ | DT HV | TTS | x | CSC FED | RPC B HV |
| *08 | TK. Ctrl | TK. FED TEC- | TK. FED TEC+# | DT HV | BPTX | x# | CSC FED | RPC E+ HV |
| *09 | TK. Ctrl | TK. FED TEC- | TK. FED TEC+# | DT HV | LHC | DAQ# | DAQ PP | RPC E+ HV |
| 10 | CSC HV | TK. FED TEC- | TK. FED TEC+ | DT HV | BPM | DSS | ME1/1 HV | RPC E- HV |
| 11 | CSC HV | DAQ | DAQ | DT HV | DSS | DSS | DSS | RPC E- HV |
| 12 | CSC HV | TK. Ctrl | Work Area | Work Area | Work Area | Work Area | Work Area | Work Area |
| 13 | CSC HV | TK. Ctrl | Work Area | Work Area | Work Area | Work Area | Work Area | Work Area |
| 14 | CSC HV | TK. Ctrl | Work Area | Work Area | Work Area | Work Area | Work Area | Work Area |
| 15 | Rack Pwr | TK. Ctrl | Work Area | Work Area | Work Area | Work Area | Work Area | Work Area |

<-- Passageway -->

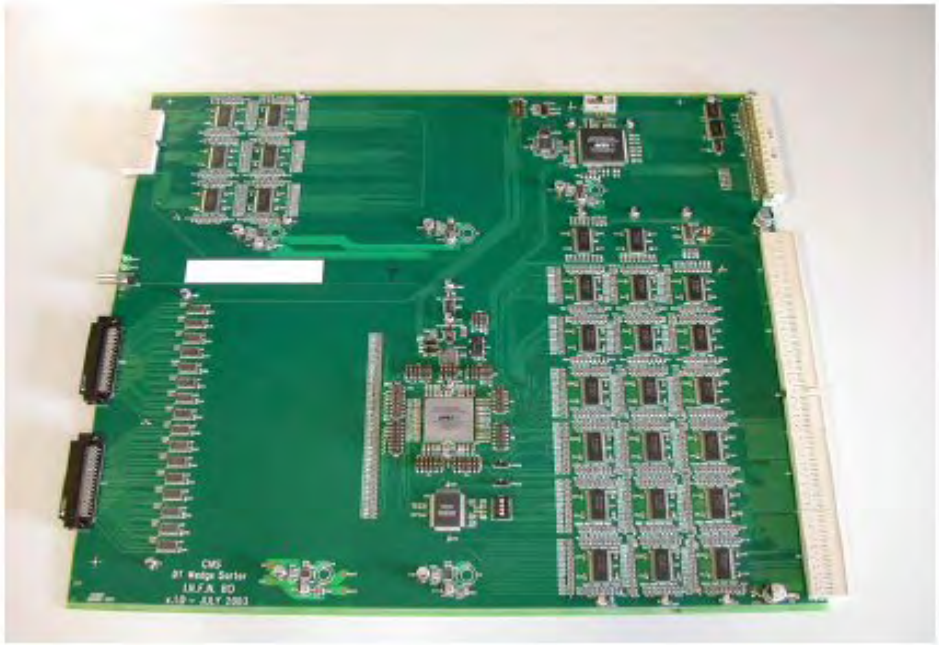


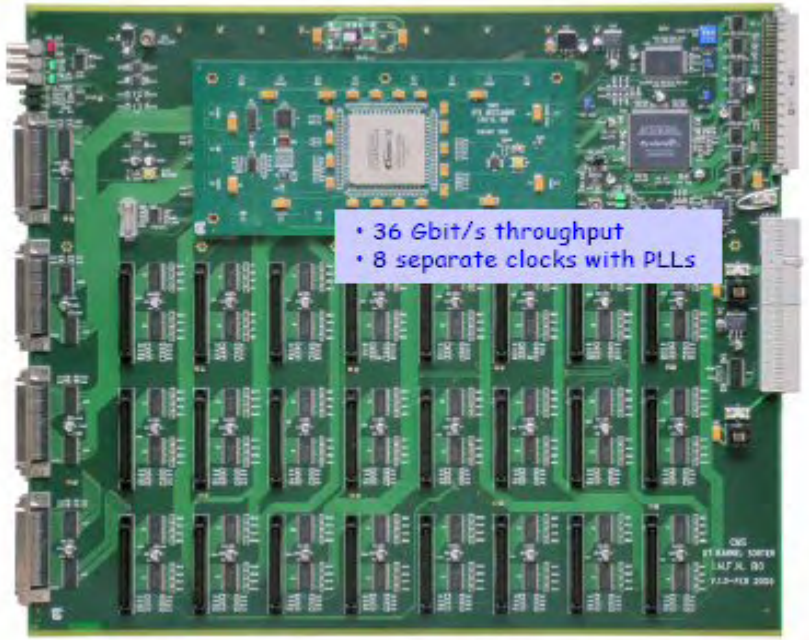

**DDU+Control (S1G00)**

# DT Muon Sorter: 12 Wedge Sorters + 1 Barrel Sorter



INFN Bologna: A. Montanari






WS: all board(12)+spares(6) produced and tested

- selection of 2 best muon candidates along a wedge
- ghost suppression

WS+BS successfully integrated with PHTF for MTCC: trigger generation OK!

BS: all boards(1) + spares(2) produced and tested

- selection of 4 best DT muons in the barrel
- ghost suppression
- local trigger generation under programmable conditions (used in MTCC !)
- check syncronization of 12 WS
- check trigger data through spy registers

# DTTF SYSTEM STATUS



- PHTF: 80 boards assembled, tested (72 needed)
- ETTF: 15 boards assembled, tested (12 needed)
- WS: all boards assembled, tested (12 needed)
- BS: 3 boards assembled, tested (1 needed)
- DCC: 1 board assembled, 2nd in assembly
- DLI: 1 board assembled, tested, another in ass. (6 needed)
- TIM: 3 boards assembled, tested (7 needed)
- Crates: 6 DTTF crates available, 2 ass., 1 in ass.
  1 Central crate – not yet arrived
  1 Test crate – not yet arrived
- Crate controllers, control PC's: not yet arrived

**All hardware expected to be ready by September.**

**Time for installation: 2-3 weeks.**

# DT DDU/FED STATUS



INFN Torino: G. Dellacasa, V. Monaco

- One pre-production board tested
  - in Torino (LAB tests, S-link output to the Fedkit, etc.)
  - at CERN (S-link output to FRL)
  - in Legnaro (optical inputs from 2 ROS).

- DAQ integration (local VME acquisition) performed in Legnaro.
- Further tests (output to FRL, TTS interface with the FMM) and final DAQ integration for the MTCC start this week at CERN.

- Another board is in Torino for final debugging.
- Still working on the debug of the TTCrx part (we are now 100% sure it's a mounting problem, electrical tests show no problems on the PCB).

- The TTCrx mounting problem should be fixed soon.

**Final production (5 boards+spares) planned for September.**

# BACKUP

## CMS week.

## CERN. June 20th, 2006.

# ROS Production Plans

In order to speed up ROS production, an accelerated scenario is being taken into consideration:

- Mid July: Validate ROS functionality with specific tests during 1 week at CERN. (We don´t need Magnet ON but full electronics chain and DAQ working ).

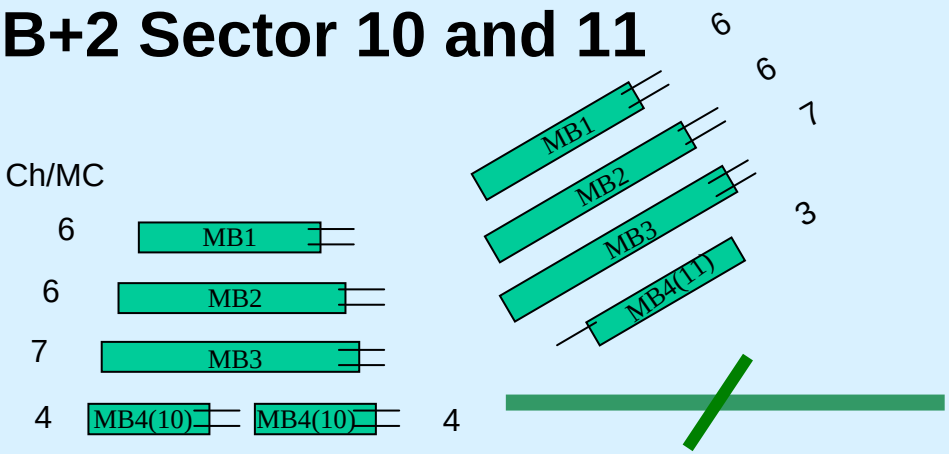
- End July: Launch PCB production right after that to have PCBs ready by September.

- Sept-Oct: Assembly at the industry and testing at CIEMAT.

- First boards can be ready for delivery by November 06.

This plan is very optimistic and may work provided we do not find unexpected problems.

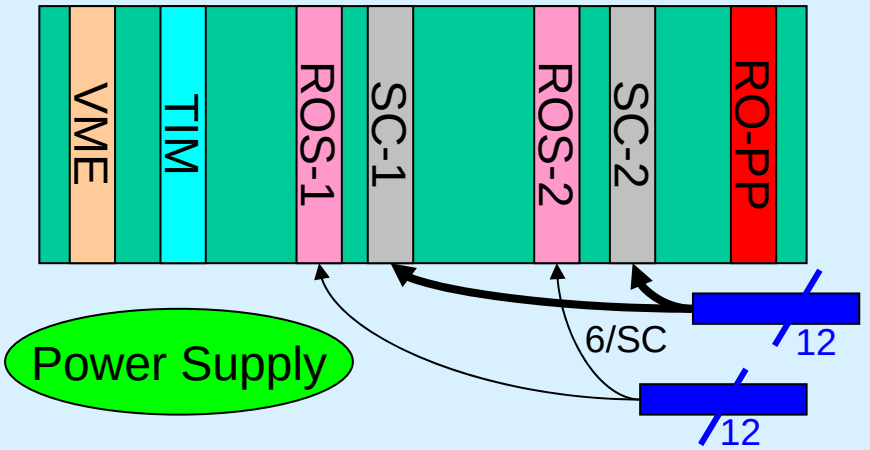
# YB+2 Sector 10 and 11




10 + 7 = 17 RO-FTP cables
(49 RO-channels)

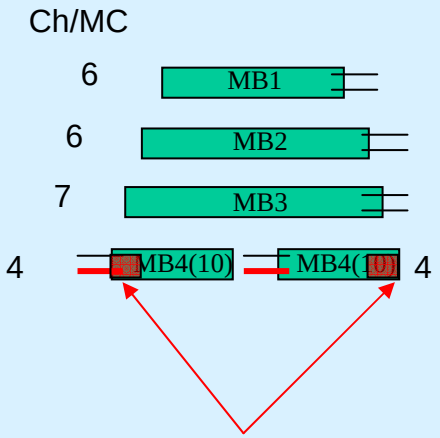
10 + 8 = 18 SC-FTP cables

Sector Collector Rack YB+2




2 Optical ribbon of 12 fibers/each
2 for RO + 12 for SC

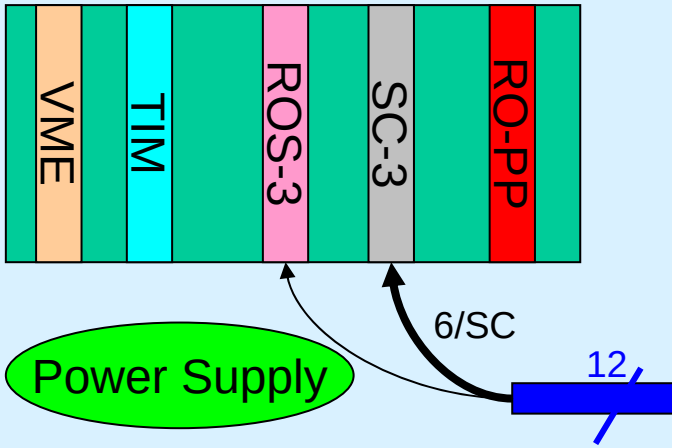
# YB+1 Sector 10




10 RO-FTP cables
(27 RO-channels)

10 SC-FTP cables

Sector Collector Rack YB+1




**2 ROBs at the ends of the MB4(10)´s will not be read.**

Optical ribbon of 12 fibers
2 for RO + 6 for SC

# HV STATUS

## CMS week.

## CERN. June 20th, 2006.

# HV POWER SUPPLIES

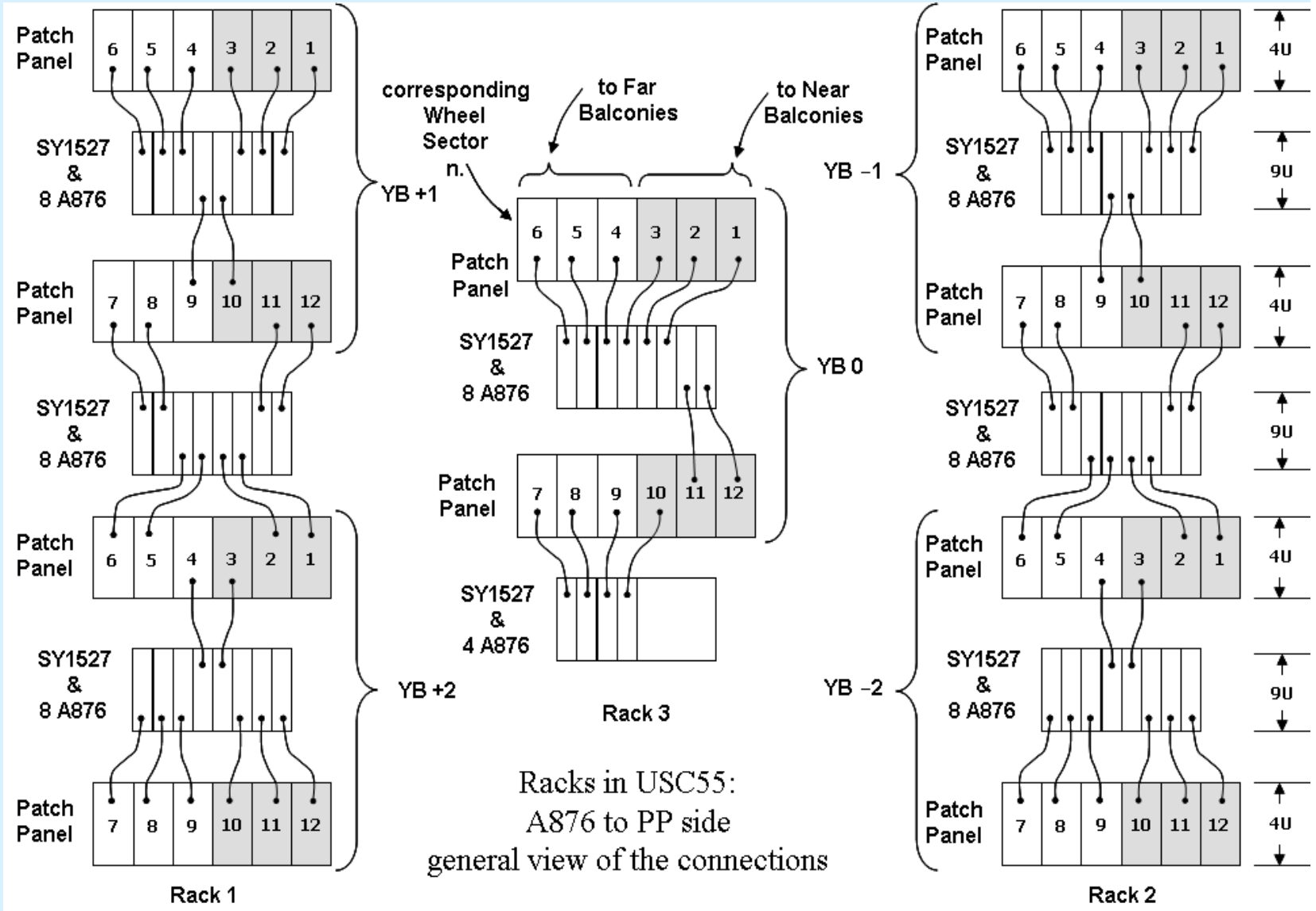


| | Needed | Ordered | To be Ordered | Location |
|---|---|---|---|---|
| SY1527 | 8 | 8 | | USC55 |
| A876 | 60+5(sp) | 50 | 15 | USC55 |
| A877-12ch | 180+10 (sp) | 190 | 0 | UXC55 |
| A877-8ch | 60 | | 60 | UXC55 |

- Delivered modules are going to be tested at ISR.
- Cables (detector -> UXC) are ready and waiting for installation.
- Cables (UXC->USC) are bought and stored at CERN, its connectors have not yet been ordered.
- Patch pannels prototypes will be probably ready for cosmic challenge.
- Junction boxes are in process of upgrading.

# USC55: HV RACKS STATUS

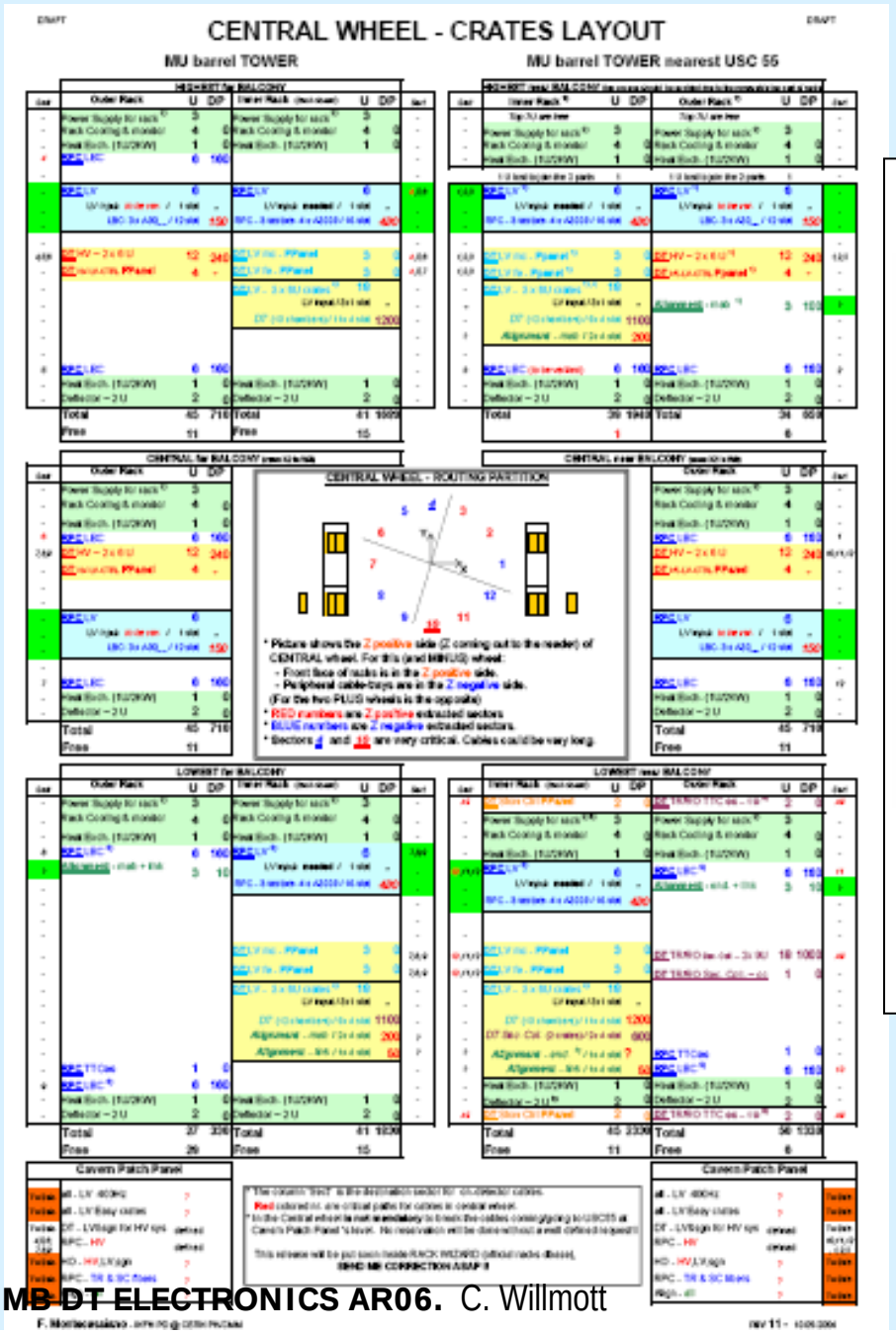


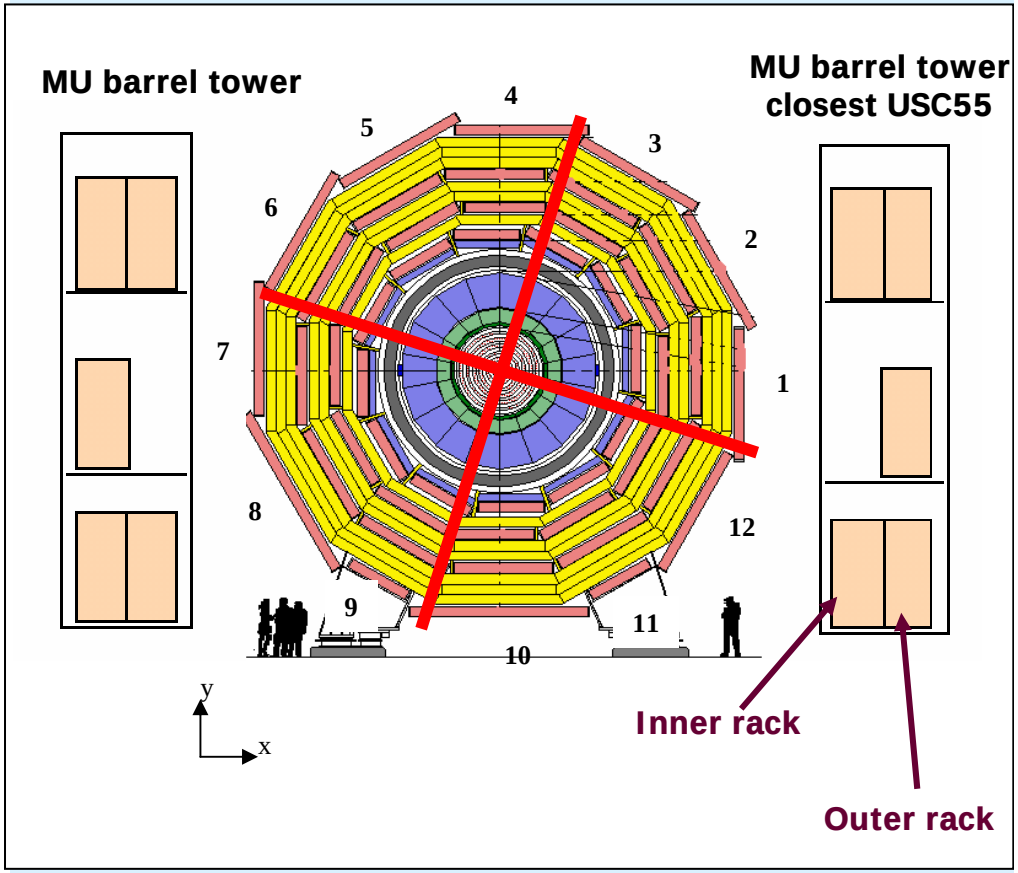




Racks in USC55:
A876 to PP side
general view of the connections

# ON TOWERS AROUND WHEELS

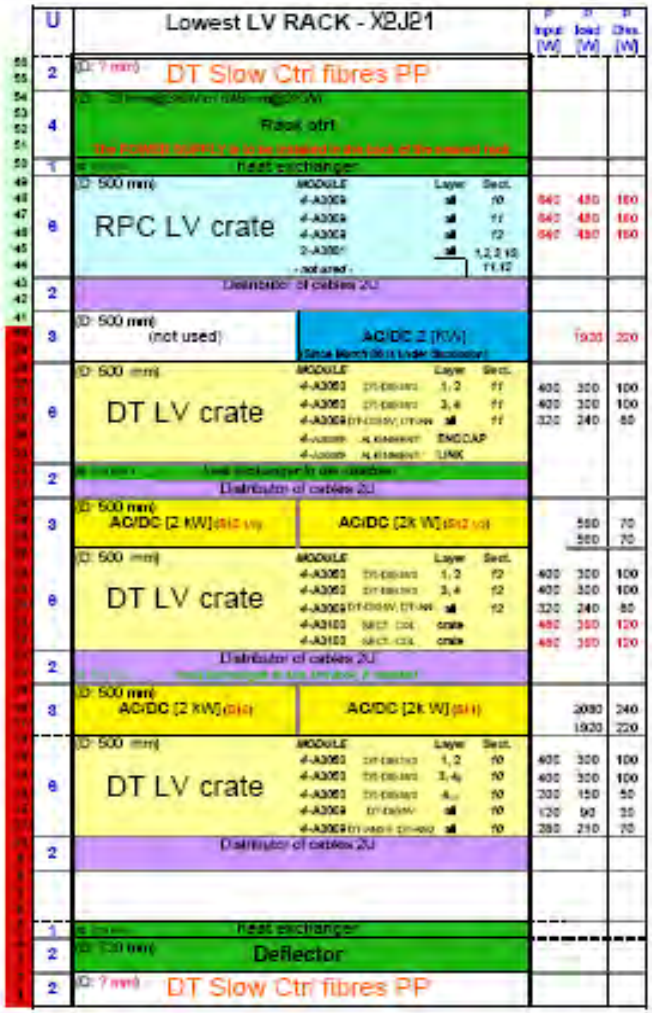




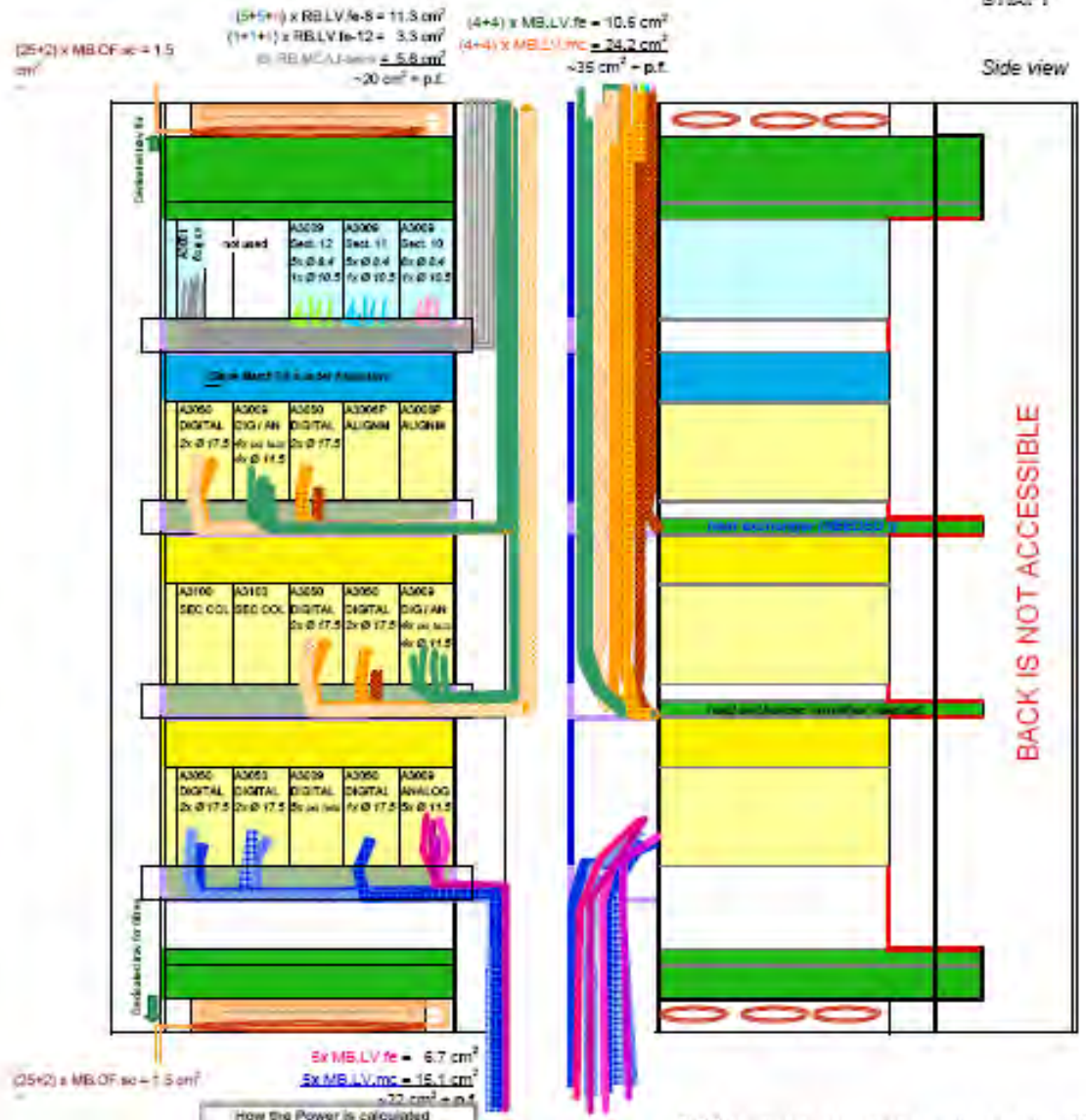
# LV RACK AT UXC55 (X2J21)

DRAFT




53 U used
3 U free

NOTES about extraction of crates and boxes from rack
- D: it's the depth of crate. I assumed this as length that is needed in front of rack in order to extract the crate.
- Front extraction depth limited to 720mm in the lowest balcony (diving board)
- Front extraction depth can be more then 720mm
- STD pieces (Turbine, heat exch. ...) have to be verified !



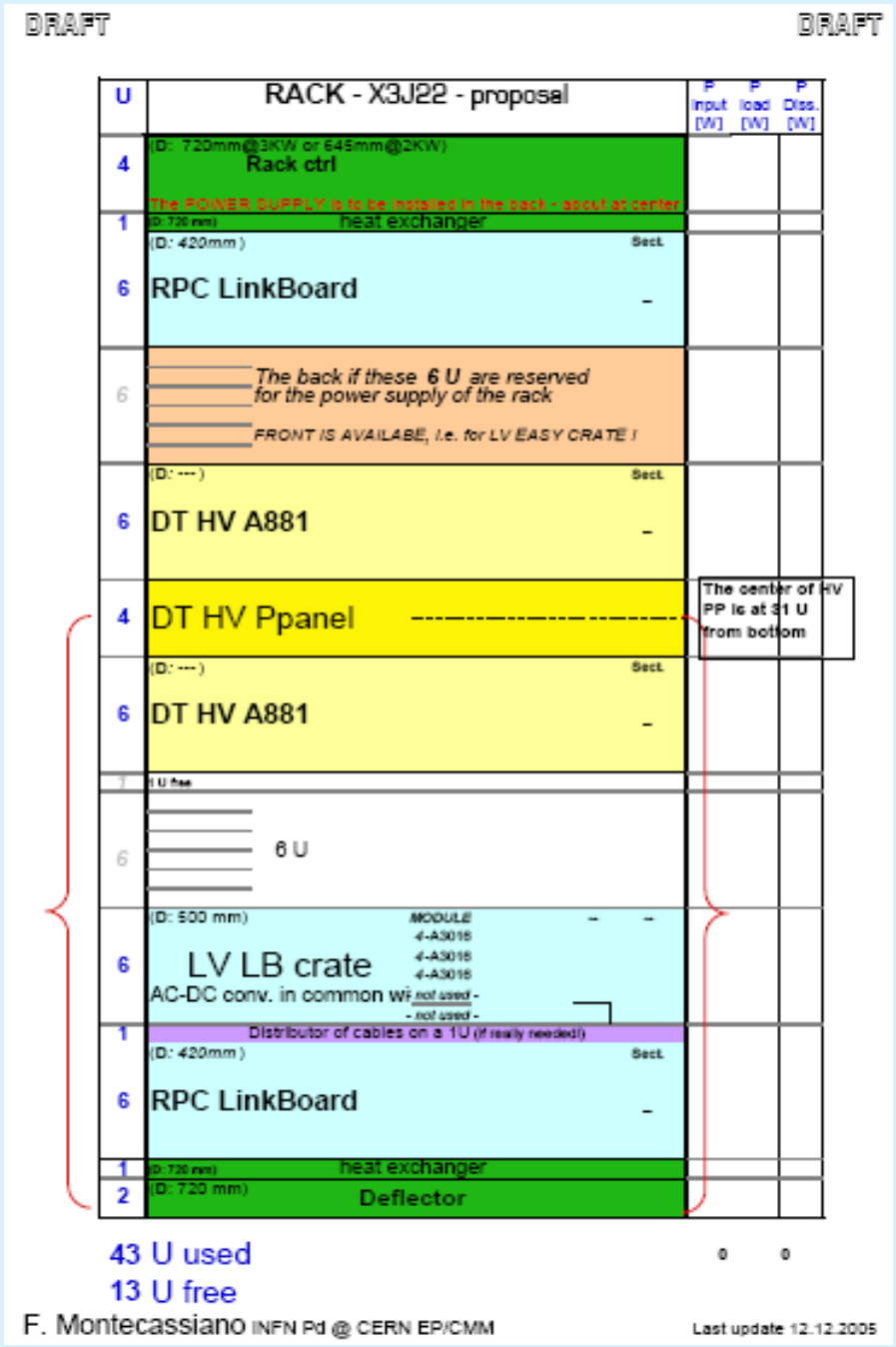

How the Power is calculated
Pload [EASY CRATE] = (input variable)
eta [EASY CRATE]= 0.75
eta [AC/DC conv]= 0.9
then we have
Pinput =Pload/eta
Pdiss = Pload * (1-eta)/eta

NB The sketch doesn't show all the cables. Missing:
- CRATES control cables
- LV Alignment cables
- AC/DC power and RACK services cables
- Fibres

Last update 10.4.2006

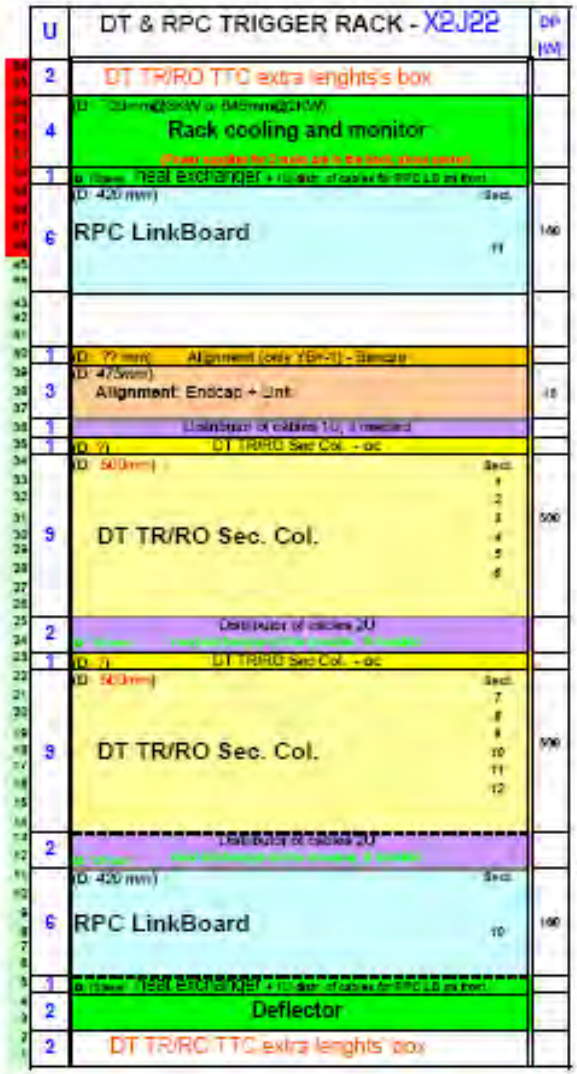
# HV RACK AT UXC55 (X3J22)





# SC RACK AT UXC55 (X2J22)






53 U used

3 U free

1330 [W]


* DT's TR & RO
8 cables (each SLOT) x 12 SLOTs
+ 2x 2 cables ROB-ROS 20° in the richest (blue and red/green)
TOTAL TR&RO: 100x Ø 7.4 mm
* DT's veto: 6x Ø 9 mm

NOTES about extraction of crates and boxes from rack

- D: it's the depth of crate. I assumed this as length that is needed in front of rack in order to extract the crate.
- Front extraction depth limited to 720mm in the lowest balcony (diving board)
- 45 U Front extraction depth can be more then 720mm
- STD pieces (Turbine, heat exch. ...) have to be verified !

NB The sketch doesn't show all the cables. Missing:
- DT tr-ro cables other then MB.CA.tr & MB.CA.ro
- Alignment cables
- RPC cables