



ISR status

(summary + update from AR'05)

CMS week June 05, DT session

20/June/05

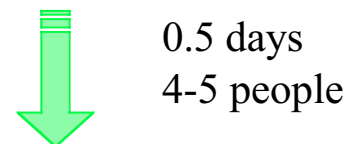
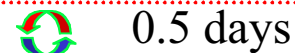
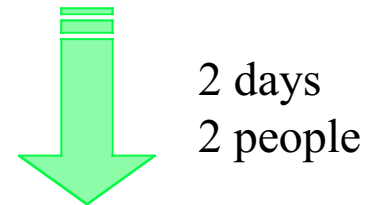
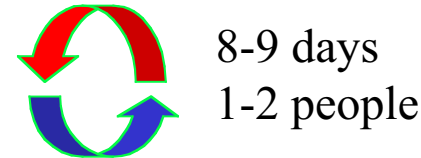
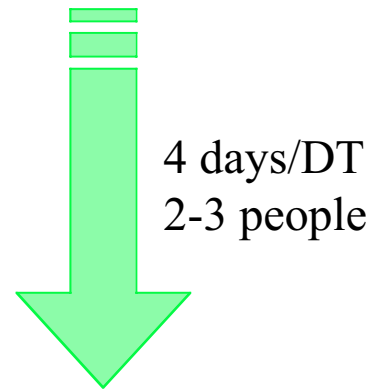
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Testing & dressing procedure @ISR



1. Chamber reception
2. Alignment (G. Bencze, Z. Szillasi...)
3. Dressing
 1. HV cables
 2. Grounding straps
 3. Gas manifolds
 4. PADCs
 5. Balance beam, insertion guides, stops
 6. FE protections, stickers...
4. HV, FE & Cosmic tests
5. Gas tightness
6. HV long term tests
7. Dressing (II)
 1. Theta FE cabling
 2. Cooling loop
 3. Minicrate
8. Scaler & MC tests
9. Final dressing (carters, protections...)
10. RPC coupling & mounting on transport tools



Another activities such as chamber handling, component preparation (HVBs, connectors, cables, etc.) are carried out in parallel.



Current status



Chambers@ISR = 129 chambers

- **120** aligned & dressed
- **9** to be aligned at the end of June
 - From last shipments= **1MB2,4MB4/10, 2 MB3, 2MB4/4** chimney
 - 4 Turin & 4 Aachen** chambers expected for this alignment round
- **67** with HVB5/HVBI
 - 8 for YB+2 (6 MB4 To + 2 Aachen MB4 with HVBI)
 - 22 for YB+1
 - 33 already replaced for the magnet test (rest of wheels)
 - (12 MB3 + 10 MB2 + 3 MB1 + 6 MB4/10 + 2 MB4/11)
 - 2 new MB3 just arrived from Legnaro
 - 2 MB4 feet chambers with HVB-I (for YB-2)
- **62** still with old HVB
- **20** certified
- **6** with MCs

Installation will continue after the CMS week



HVB replacement



- **Chambers at ISR with HVB5 (63)**
 - 6 for wheel +2 (Turin MB4s).
 - 22 for wheel +1 (all except big MB4s).
 - 35 for rest of wheels
(+ 5 MB1s, only theta SL)
- Replaced at the ISR = 60 chambers (3 big MB4s, 32 for YB+1, 25 for rest)
- **Available HVB at the ISR = 1200**
- HVB Shipments foreseen
 - 750 HVB expected from IHEP in the next days
- Next replacement rounds
 - This week for MB1s, once decided the solution for MB1/YB0 problem (4 sectors with 1 single cable)
 - Several teams @ ISR during this summer

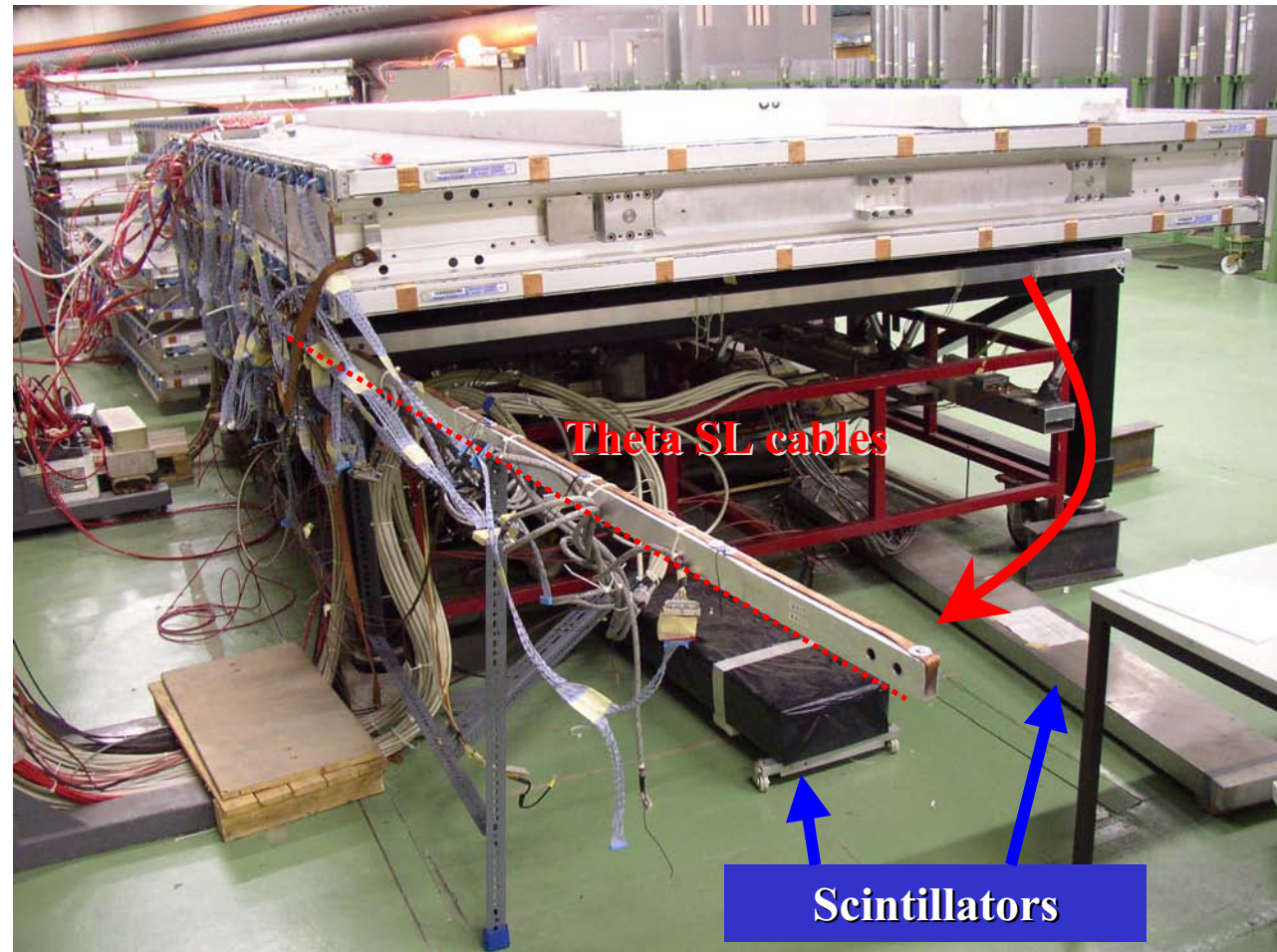
HVB production is out of the critical path



MB4 cosmic testing



- Since last CMS week, cosmic bench was adapted for MB4 testing
 - 2 additional scintillators
 - Low occupancy at both ends. Higher statistics required.



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Problems with HV/B replacement



Almost all HV/Bs for YB+1 chambers have been replaced at ISR.

Statistics (over MB1/2/3 of YB+1, 30 chambers):

- 79 cosmic rounds (2.63 rounds/chamber)
- 95 SL opened (3.17 SL / chamber)
- **Components substituted:**
 - **12 FEBs**
 - **14 HVCs**
 - **2 FE covers**
 - **17 HV/Bs**
- **No significant degradation of gas tightness**
- **5 additional dead channels (broken wires, FE problems)**

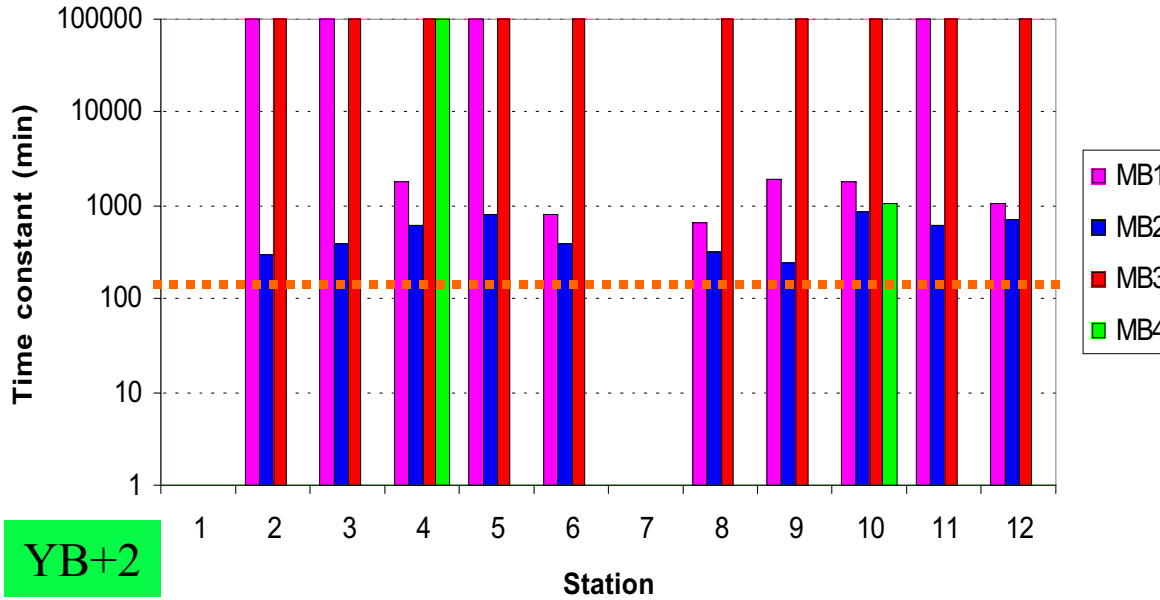
Time required (per chamber):

- 1 day substitution/first tests
- At least 2 days for gas cleaning
- Test HV & reparation. 2 more days for cleaning
- Cosmic tests (1 day).
- After reparation, 2 days before retesting.

- In average between 8-9 days of work on each chamber for replacement & certification. Except cosmic tests, activities could be carried out in parallel... with more available manpower...

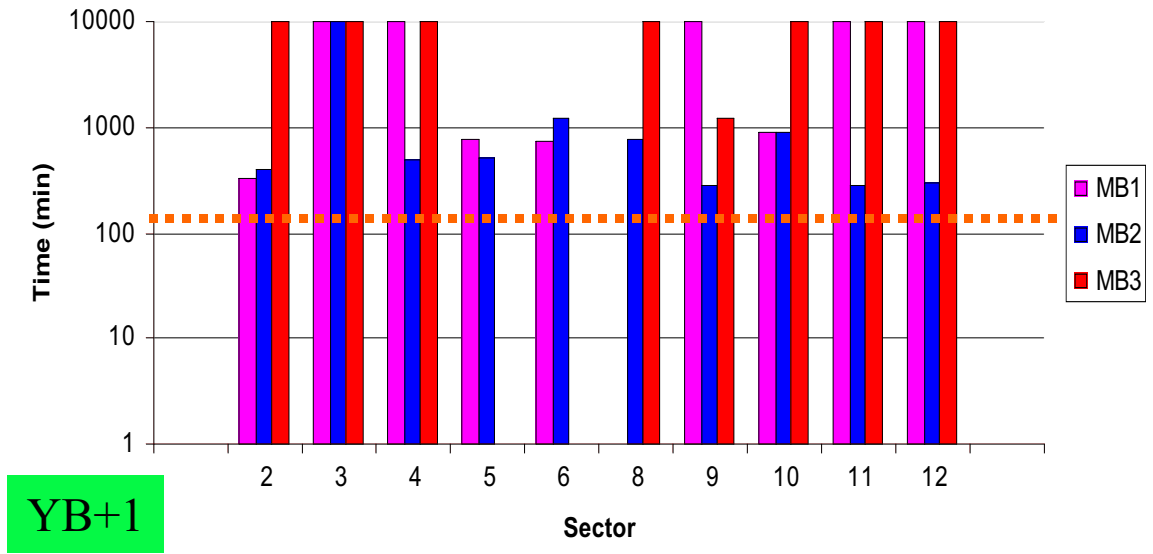


Gas tightness tests



YB+2

Minimum time constant required = 120 min



YB+1

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HV long term



Before and after cosmic tests, chambers are kept under HV.

Two different systems are used for this purpose, both of them controlled through PVSS software developed and maintained by M. Giunta & P. Giacomelli:

- **Old CAEN SY127 modules** (one chamber per HV channel)
- **CAEN SY1527 system** (final design for CMS. Better granularity = half layer wires)

Currents are monitored and stored constantly.

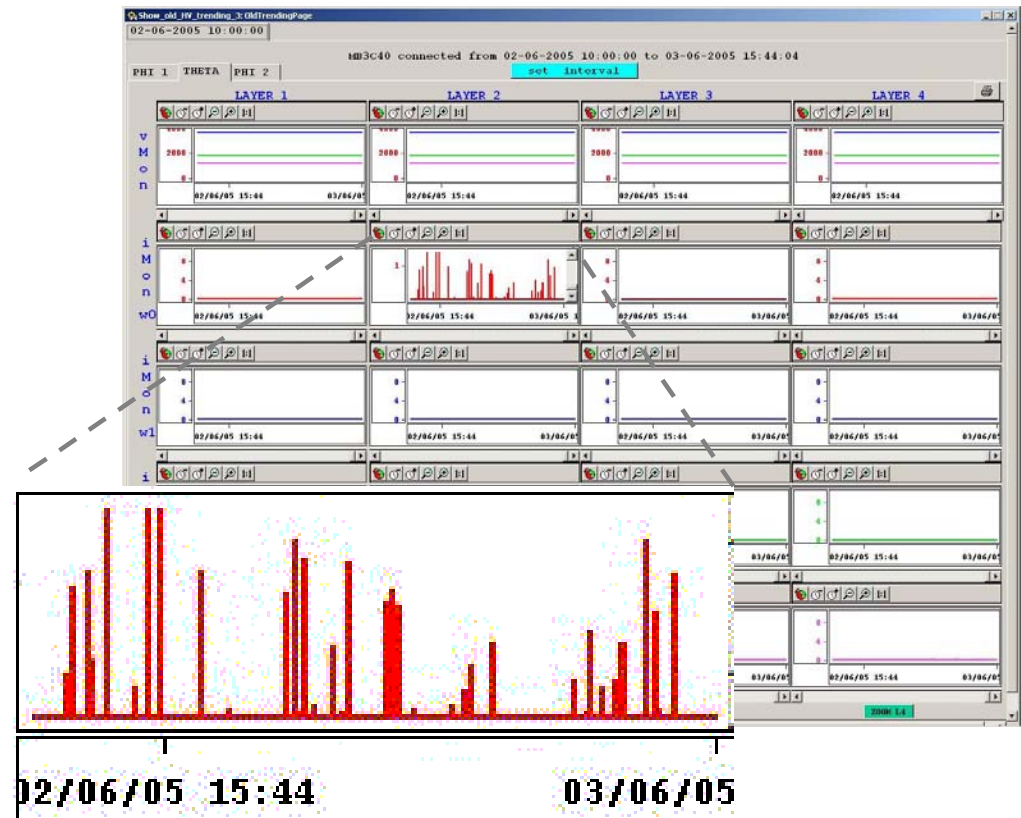
52 chambers can be kept under HV with the current configuration and availability of HV suppliers (32 SY127 + 20 SY1527)

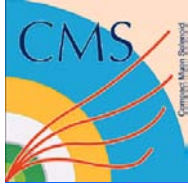
Chambers are kept under HV for several weeks. Some problems only show up after some time, when the gas purity inside the chamber is good enough.



Possible “zoology” of HV problems:

- 1. Eventual wire-cathode 10 μ A discharges:** Usually due to dust/dirt inside the cells. They cure by themselves
- 2. Large (10 μ A) and constant discharges wire to ground:** Normally indicators of disconnected cables or serious damages. If discharges are very frequent the system trips to prevent major problems. Normally they are easily fixable (by visual inspection once the region is known)
- 3. “Grass-like” discharges.** Small (1-2 μ A) discharges wire-ground, variable frequency. Can be due to bad isolation of cables/boards, pores in isolating tubes... Its localization is rather difficult (iterative procedure of disconnecting pins), and normally there is no obvious (visual) reason/damage. If the frequency is high, all HV related components are substituted.





Minirate coupling



MC insertion is carried out only when the chamber has been **fully certified** (HV, cosmics, gas...)

MC dressing at the sites (BO+LNL) include signal, TP and DCS cabling for the phi SLs. Theta cabling, LV cabling & splitter boards are installed at ISR.

FIRST TEST @ ISR: Before insertion, a boundary scan test is performed on MCs to test connectivity of all boards.

test boot info (info send by mc on boot)
test serial ports
test mc program info (info send by mc after loading internal control program)
check results of the mc internal test
boundary scan test to check all internal connections
check configurability (BTI, Traco, TSS, TSM, TDC, Threshold, Width)

3 failures detected so far at this stage:

YB+2: Bad connection SB-TRB (flat cable and TRB changed)

YB+1: 2 missing BTI-TRB connection (TRBs changed)



Minicrate coupling



SECOND TEST @ ISR After MC coupling, several functionality tests are done (connectivity and programmability):

test boot info (info send by mc on boot)
test serial ports
test mc program info (info send by mc after loading internal control program)
check results of the mc internal test
test boundary scan
check configurability (BTI, Traco, TSS, TSM, TDC, Threshold, Width)
check tdc functionality
bti connectivity test (emulation and with test pulse)
test xtalk (cables, connections) with testpulse
test correctness of cabling
test aligment functionality
test PADC

YB+2 Tested MCs @ ISR : **8**

11 problems

Cabling: 4

Mc: 2

Chamber: 5

(3 FM problem, 1 shortcut feedthru, 1 TP)

YB+1: Tested MCs @ ISR: **22**

13 Problems

Cabling: 7

Mc: 1

Chamber: 5

(3 broken wires, 2 malfunctioning FM)



Chamber certification statistics



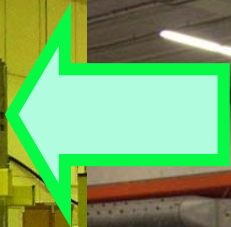
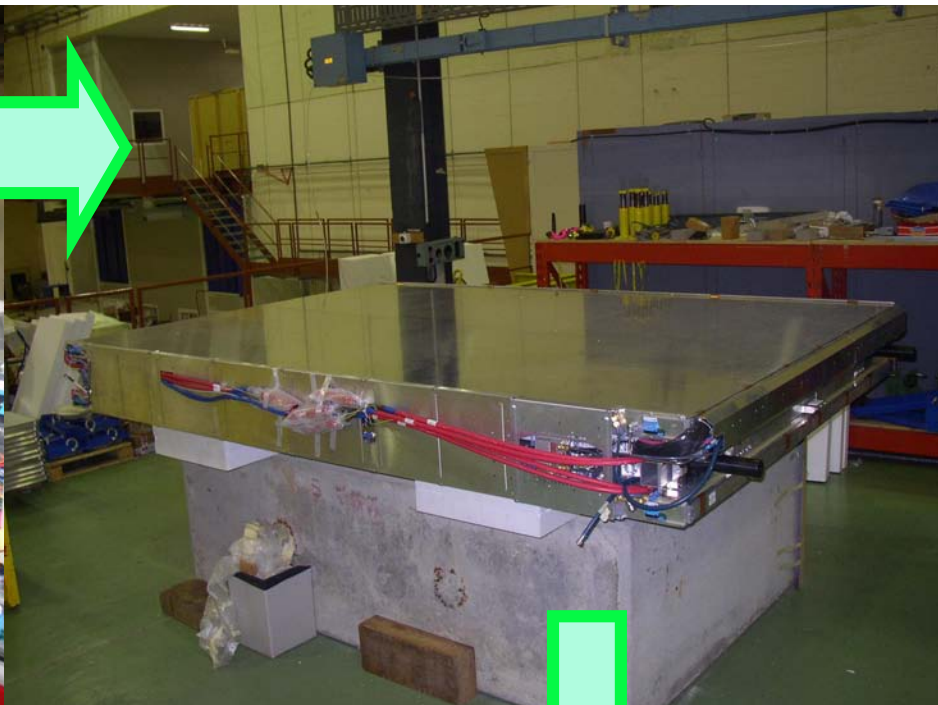
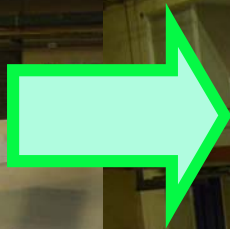
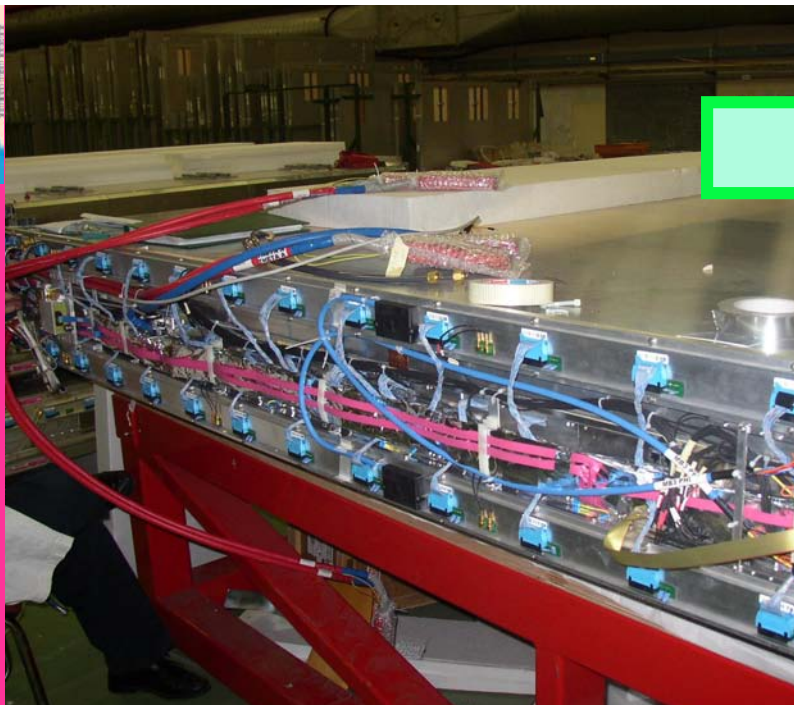
Problems statistics

Number of interventions

Problem	MB1	MB2	MB3	MB4	%
Disc. pin	7	16	7	3	36.3
FE problem	4	5	3		13.2
Bad cathode	5	3	1	1	11.0
HV problem (grass)	2	2	5		9.9
Bad HVB	1	4	2		7.7
Sparks	2	1	4		7.7
MC problem	2	3			5.5
Others	4	2	1	1	7.7

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Final dressing & RPC coupling

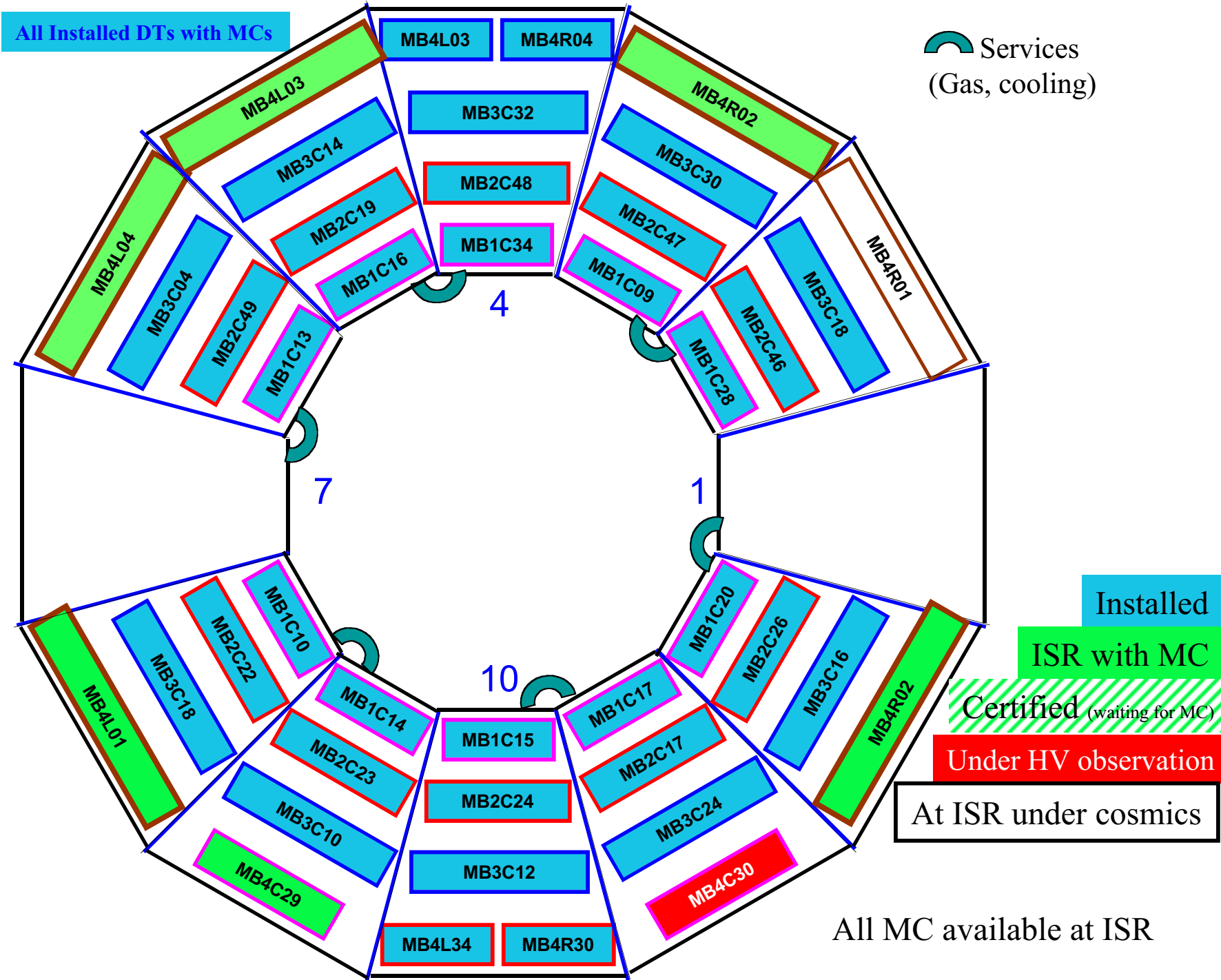




YB+2 chambers status



- Only 6 large MB4s and the 2 small feet MB4s are missing in the yoke
 - All them (except 1 big MB4, under cosmic tests and one MB4 feet chamber under HV observation) are **dressed, certified, and equipped with their minicrates.**
 - **MCs for remaining chambers are available at ISR**
- 6 of them will be installed after the CMS week.
- Big MB4s will be installed with HVB5. Rest (including 2 feet chambers) installed with previous (improved) version of HVBs. No failures detected so far!





YB+1 chambers status



MB1,2,3

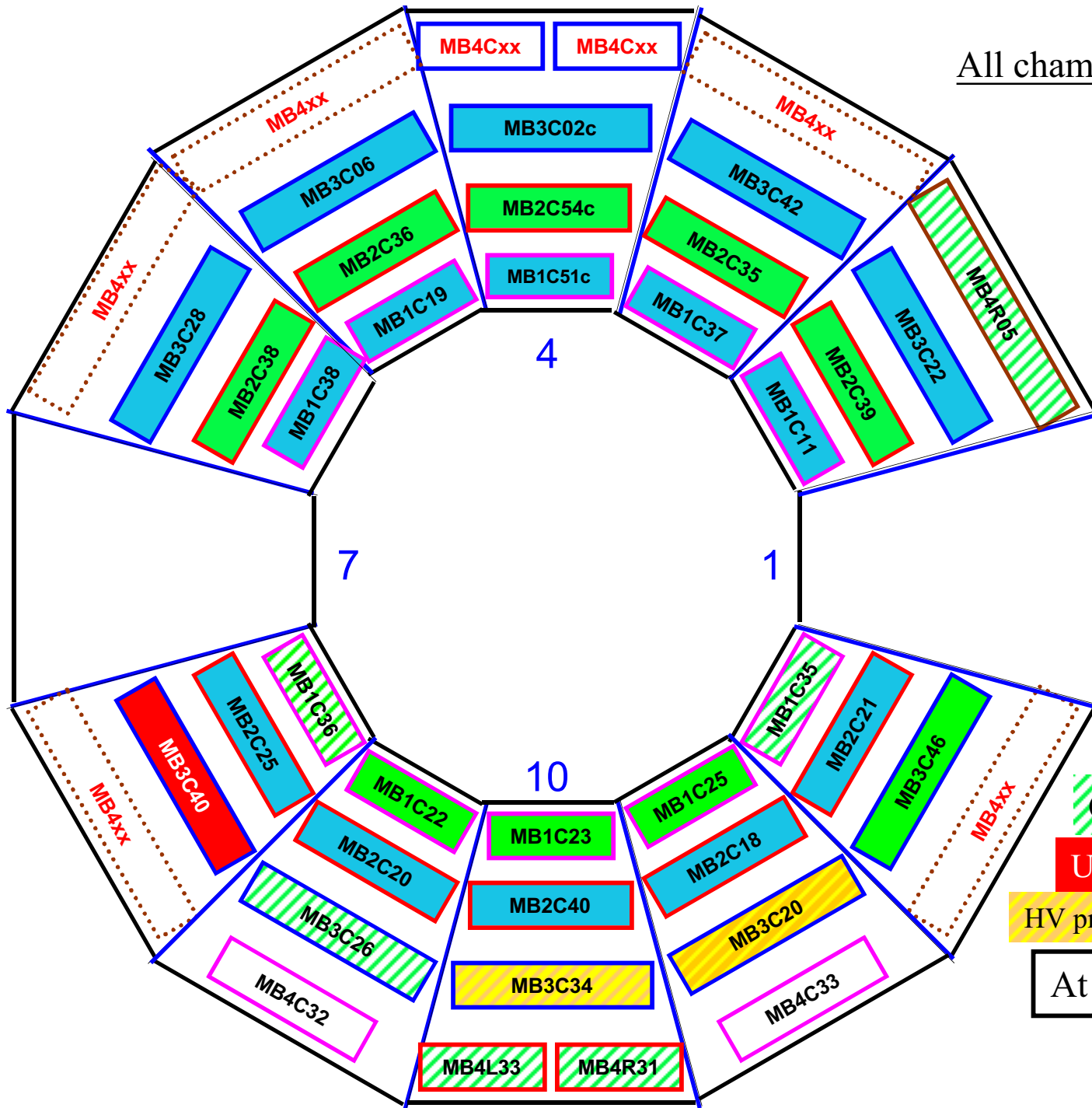
- **15** already delivered to SX5 and **installed**
- **9** **equipped with MC** to be shipped (4 of them already on transport frames coupled to RPCs)
- **6** fully **certified**, waiting for MC (only 1 MB1 MC available)
- **2** HV problems fixed, to go for the **last cosmic round**.
- **1** under observation of **HV**.

MB4

- **2** MB4 feet (AA) **to be tested**
- **2** MB4/10 (CIE) fully **certified**, waiting for MC
- **1** MB4 (TO) at ISR, **certified** and waiting for MC
- **5** MB4 (TO) **not yet at ISR**
- **2** MB4/4 chimney (LNL) **just arrived** (to be aligned, dressed, tested...)



YB+1 status



All chambers with HVB5

Installed
ISR with MC
Certified (waiting for MC)
Under HV observation
HV problems fixed (cosmics)
At ISR (to be tested)
Not yet at ISR



YB0,-1,-2, sectors 1,7



For wheels YB0, YB-1 and YB-2 and sectors 1 & 7 (spares not included):

	Remaining total	ISR	HVB5
MB1	40	24	3 (+5 theta SLs)
MB2	40	27	10
MB3	40	29	13
MB4	22	0	-
MB5	6	6	1
MB6	6	6	6
MB7	6	6	0
MB8	6	0	-
Total	166	98	33 (+5 theta SLs)

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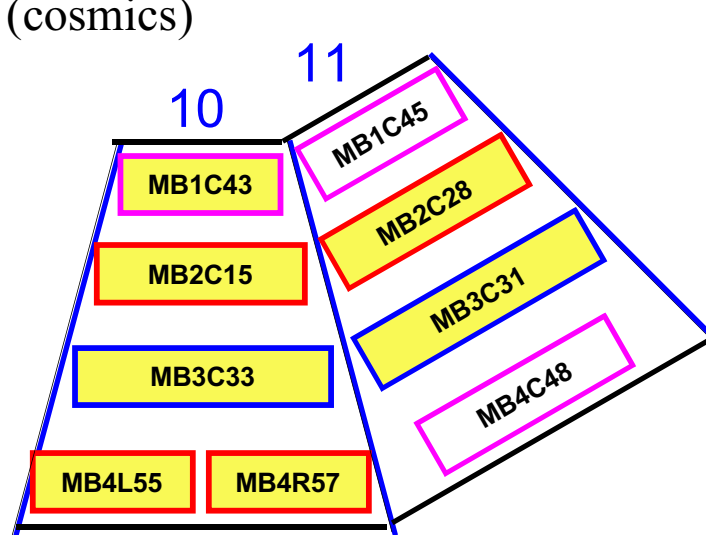
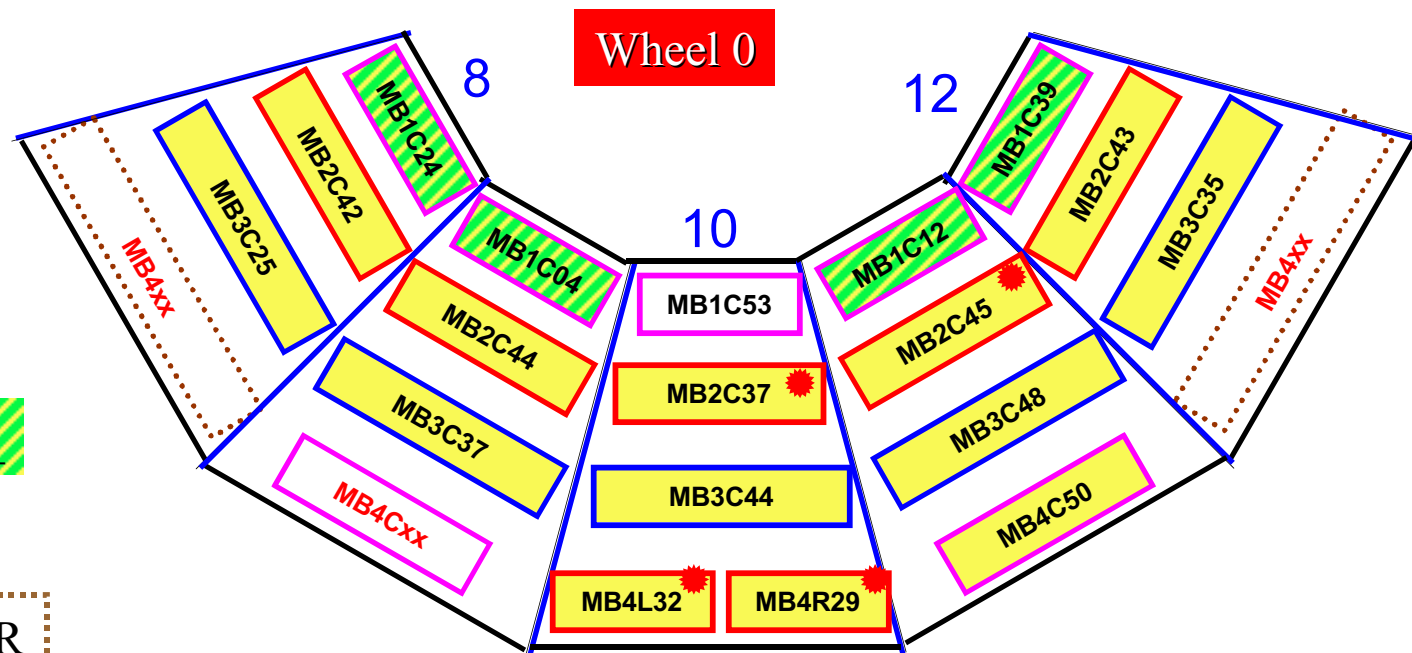


Chambers for magnet test

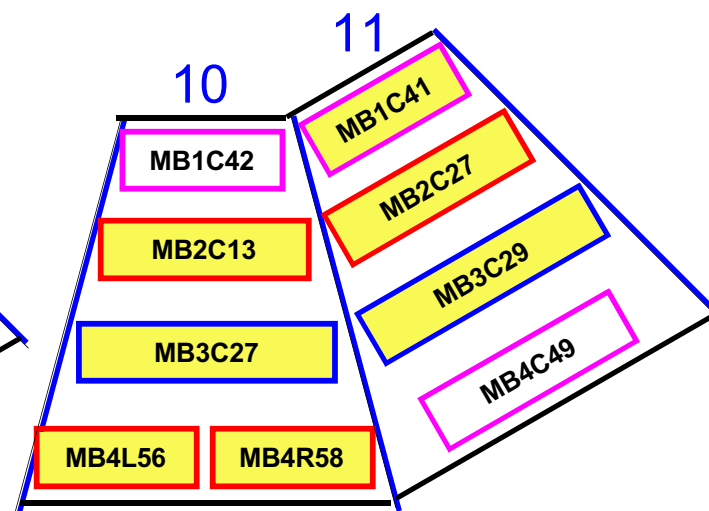


- HVB5
- HVB5 only
- Old HVBs
- Not yet at ISR

☀ Already tested (cosmics)



Wheel -1



Wheel -2



Perspectives



- Certification **almost finished for YB+1**, waiting for MB4s
- Final certification is recently being conditioned by settlement of **HV problems**.
- Final dressing and declaration of ready-to-install chambers **conditioned by MC availability**.
- **HVB** have been **substituted** for (almost) all chambers needed **for magnet test**.
The certification procedure has just started for them, now that some space in the working area of the ISR has been released thanks to installed and ready-to-install chambers.
- **HVB production and delivery is out of the critical path**.
- HVB substitution will continue in the following months. **Certification procedure is expected to be less painful due to experience acquired and additional scaler tests performed**.