ISR Work and Plans for Installation and Commissioning

CMSWeek,

CERN September 21st 2004

A. Benvenuti

INFN Bologna

A detailed and up to date report on the ISR activities and plans for installation and commissioning can be downloaded from the Muon AR04 agenda.

In the following a summary of the main points:

- All chambers at ISR have gone through the alignment calibration procedure.
- HVB substitution with HVB_I for YB+2 is completed
- Partial dressing (only what does not interfere with HVB substitution) has been completed for all chambers
- The HV Cable test system is not working properly, it gives many “Bad” cables (some previously tested OK)
- One bad Phi cable found with several conductors shorting to the ground shield. Most probably a Kerpen production problem. The cable was replaced.

- First pass cosmic ray test still to be done on the last MB1 shipment (8 chambers)
- Certification of the last batch of MB2 chambers (4 with HVB_I) has been particularly time consuming (JPP) and is not yet finished
- Chambers from recent shipments have a lot of noise outside time box that disappears after ~ weeks under HV. Probably not seen before due to HV long term test.
==> Keep chambers under HV
- Ancillary work for chamber dressing in progress:
    - LV and DCS cable preparation,
    - F-end cable shielding and preassembly,
    - Parts preparation

Chambers for Surface Installation

Type	Need		@ISR	Align		HV/ Gas	HV Cable	Θ FE Cables	CR TEST
	L	R		L	R				
MB1P	13	12	24	11	13	24	24	10	24
MB1M	12	13	15	8	7	15	15	0	9
MB4/9,11	5	5	5	2	3	2	2	0	4
All MB1, 4	30	30	44	21		22	41	10	37
MB2P	13	12	28	14	14	28	28	9	24
MB2M	12	13	14	7	7	14	14	0	8
MB4/10 L	3	2	3	2	1	0	0	0	3
MB4/10 R	3	2	3	2	1	0	0	0	3
All MB2,4	31	29	48	25	23	42	42	9	38
MB3P	13	12	23	11	12	23	23	12	23
MB3M	12	13	17	9	8	17	17	0	16
MB4/4	6	4	5	2	3	0	0	0	4
All MB3,4	31	29	45	22	23	40	40	12	43
MB4P	8	7							
MB4M	7	8							
All MB4	15	15							
Total	210		137						

Chambers for first Installation July/October 2004

	YB + 2				
Sectors	+8	+9	+10	+11	+12
Services	Left (ZpB)	Right (ZpA)	Left (ZpB)	Right (ZpA)	Left (ZpB)
Chambers	MB1P10	MB1P14	MB1P15	MB1P17	MB1P20
Chambers	MB2P22	MB2P23	MB2P24	MB2P17	MB2P26
Chambers	MB3P08	MB3P10	MB3P12	MB3P24	MB3P16
Balance B	Right	Right	Right	Left	Left
Chambers		MB4C29	MB4 L34 / MB4 R30	MB4C30	
Balance B			R / L		

- Underlined chambers were installed beginning of July
- MB1 could not be installed for lack of support rails and HO related work
- MB4/9-11 cannot be installed until cabling across feet is completed
- Worst for MC insertion: MB1 in sectors 2,6, 8,11

Chambers for first Installation October/November 2004

YB+2 Top

Sectors	+2	+3	+4		+5	+6
Services	Left (ZpB)	Right(ZpA)	Left (ZpB)		Right(ZpA)	Left (ZpB)
Chambers	MB1P28	MB1P09	MB1P34		MB1P16	MB1P13
Chambers	MB2P46	MB2P47	MB2P48		MB2P19	MB2P49
Chambers	MB3P18	MB3P30	MB3P32		MB3P14	MB3P04
Balance B	Left	Left	Right		Right	Right
Chambers			MB4 4C3	MB4 4C4		
Balance B			L	R		

MB1 Sector 3 , MB2 Sector 5 to be installed next year for lack of RPCs.

RPCs for MB2 ready beginning of November

Chamber Preparation for Installation

- Some problems found during the final tests (JPP):
  - One leaking SL (damaged cover, replaced)
  - Bad Theta F-end cable (connector badly crimped) found with scaler test, it was replaced
  - One unaccounted for dead channel (SL opened and HV jumper reconnected to the wire, + CR…)
- One HV intervention on MB3C14 already with RPCs and mounted on transport frame. HV behavior OK need cosmic test with CIEMAT standalone system before going back to the transport frame.

Chamber Preparation for Installation

- 7 Chambers complete with RPCs ready for installation and mounted on transport frame
- 3MB1, 1MB3, 2MB4/4 ready for RPCs
- Theta SL cabling started on 4 MB2s

YB+2 installation is still pending on the following items:

- Work on CSC and HE (scaffolding must be removed)
- Survey work on End Cap
- mounting of HO supports and readout Boxes
- mounting of slides for HV junction boxes

Furthermore SX5 must be cleaned for the CERN open day starting October 14th

==> Next Installation October 18th to 30th

BMU Installation (YB+2)

- Next installation in October(18-29):

MB1 Sectors 9, 10, 11, 5; 4
MB3 Sectors 3, 4, 5; **MB1** Sector 2, 8
MB2 Sector 8, **MB3** Sector 2

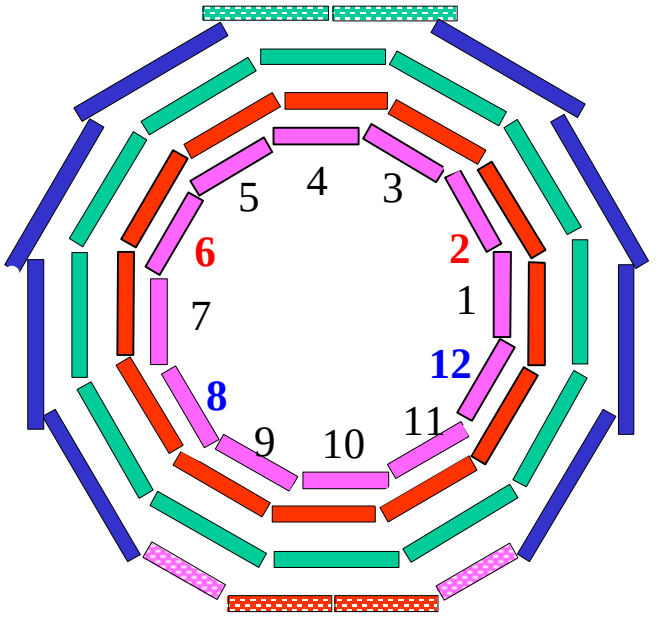
==> 12 Chambers (= 3 MC)

- MB2 RPCs for YB2 Top expected by the middle of November

- Continue YB2 installation end of November:

MB1 Sectors 12, 6, MB2 Sectors 2, 3, 4,6 MB3 Sector 6 and 2 MB4/4 (if RPC OK) Chambers with MC indicated in RED

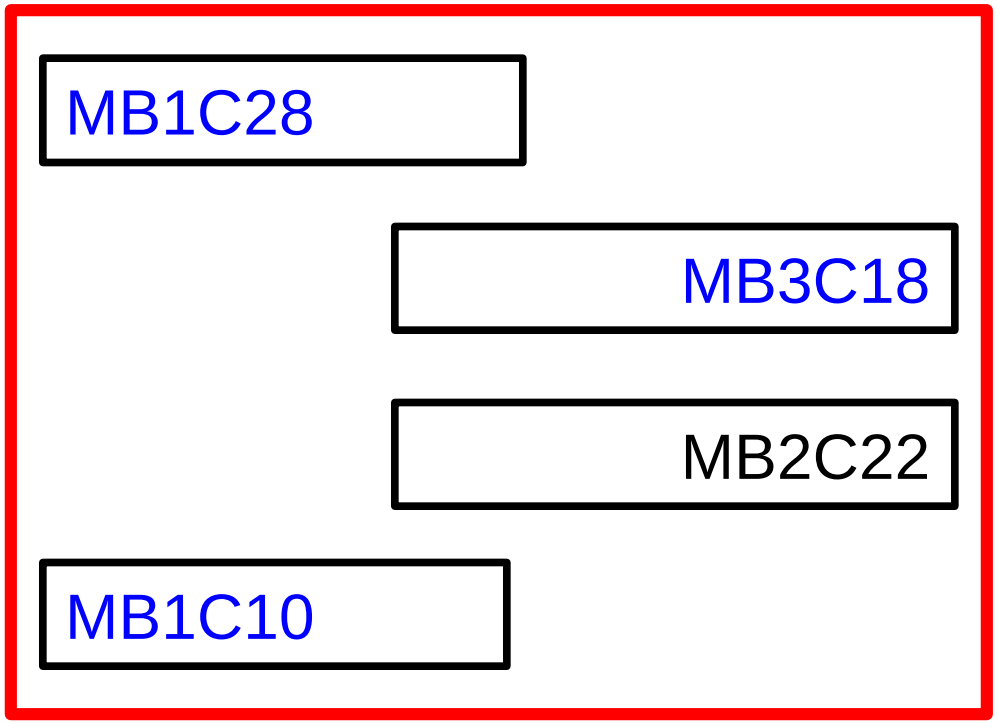
32 Installed Chambers



Still missing:

MB1 Sector 3
MB2 Sector 5

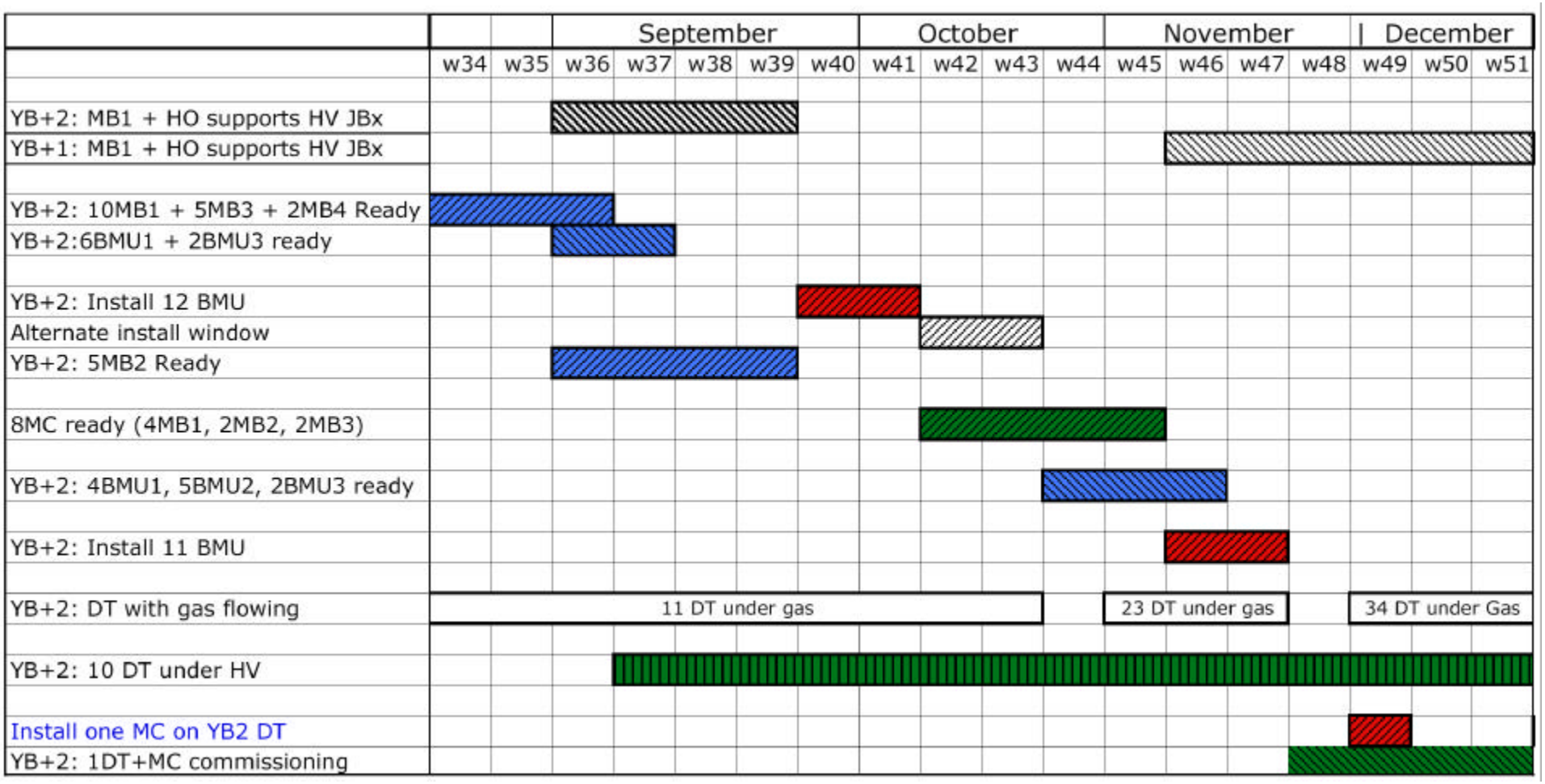
Third Transport Frame
October 04 Installation



MB1C28	S02
MB3C18	S02
MB2C22	S08
MB1C10	S08

MB1C10, MB3C18 (used in test beam)
and MB1C28 with Minicrates

YB2+ Installation



Beyond YB+2 Installation

- The schedule is driven by HVB substitution and DT certification.
- HVB production will remain critical until January 2005.
- YB+1 installation can be done in February/March provided:
  - all the HVB are reserved for YB+1 chambers
  - there is sufficient technical support for HVB substitution (2 teams) and repair
- 6 large MB4 (MB4To) should be ready for the next round of “alignment calibration” in February

Chambers for Installation in YB+1 Bottom

	YB + 1				
Sectors	+8	+9	+10	+11	+12
Services	Right(ZpA)	Left (ZpB)	Right(ZpA)	Left (ZpB)	Right (ZpA)
Chambers	MB1P36	MB1P22	MB1P23	MB1P25	MB1P35
Chambers	MB2P25	MB2P20	MB2P40	MB2P18	MB2P21
Chambers	MB3P38	MB3P06	MB3P34	MB3P20	MB3P22
Balance B	Right	Right	Right	Left	Left
Chambers		MB4C32		MB4C33	
Balance B			R L		

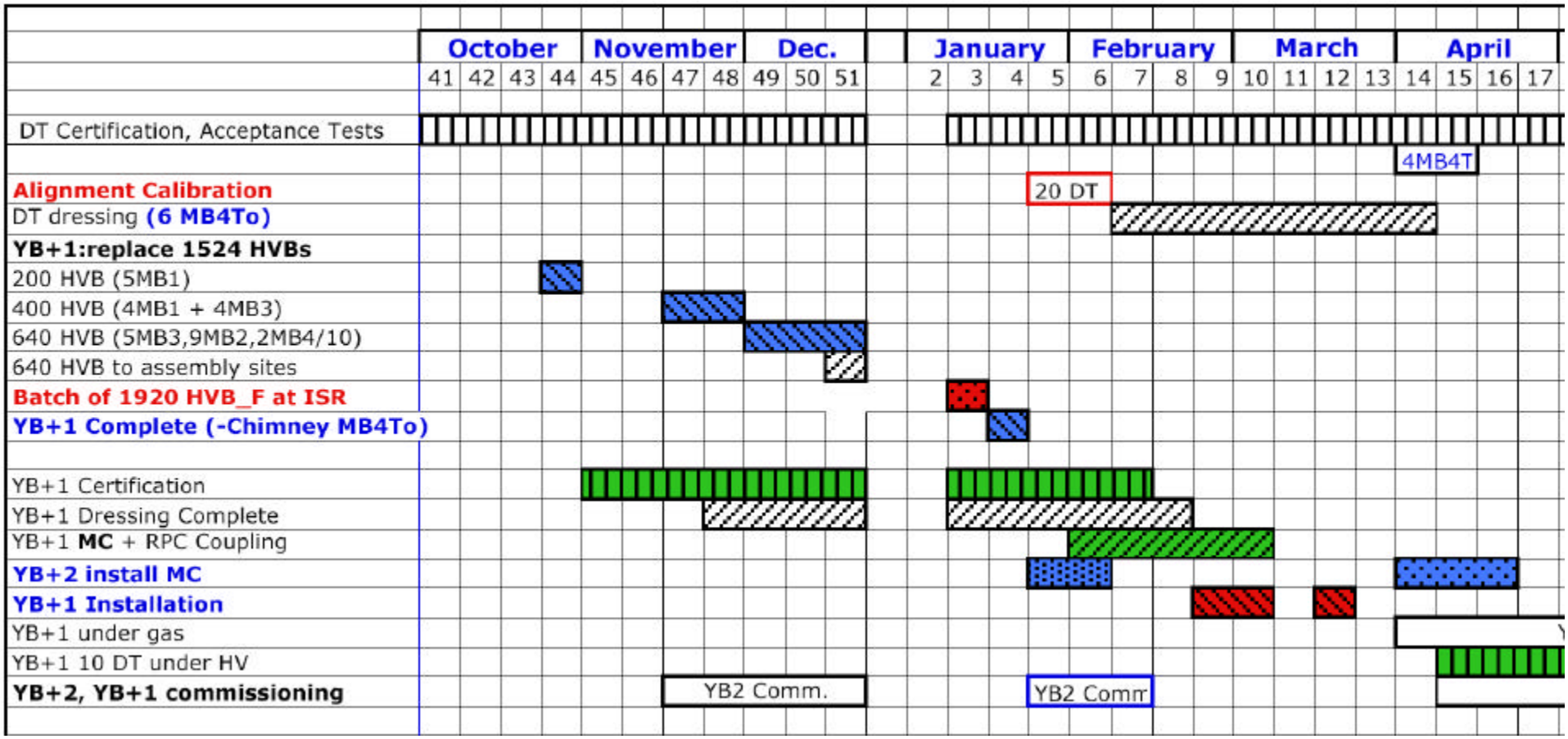
- In black the MB2 with Theta cabling completed

Chambers for Installation in YB+1 Top

	YB + 1				
Sectors	+2	+3	+4C	+5	+6
Services	Right(ZpA)	Left (ZpB)	Right (ZpA)	Left (ZpB)	Right(ZpA)
Chambers	MB1P11	MB1P37	MB1P00	MB1P19	MB1P38
Chambers	MB2P39	MB2P35	MB2P00	MB2P36	MB2P38
Chambers	MB3P46	MB3P42	MB3P00	MB3P26	MB3P40
Balance B	Left	Left	Right	Right	Right
Chambers					
Balance B			L	R	

HVB Production Model

- PCBs shipped to IHEP in 2004:
  - 200 at the firm 27/09/04
  - 1700 (Now 1281) at the firm on 11/10
  - 1900 standard + 350 HVB8 at the firm on 1/11
  - 1900 at the firm before the end of the year
- The firm produces 320 HVB/week
- IHEP tests 160 HVB/week up to October 18th and then 320/week
- The HVB can be used at the ISR 3 weeks after shipping
- However, with 1280 HVBs no margin between batches



- Depending on the DT certification after HVB replacement YB+1 should be ready to install by end of February beginning of March
- MB4To for YB+2 should be available for alignment calibration by end of January and ready for Installation by end of May

DT Commissioning

The commissioning of the installed chamber progresses through 3 basic stages:

1) DTs under gas flow (all chambers) and HV (10 chambers) with temporary cables, HV supplies and monitoring as at ISR. Requires HV junction boxes related support plates and trays.

2) Chamber functionality with MC, standalone DAQ, DCS, DSS and LV supplies (test beam system). Cooling can be either standalone or final system. The chamber is read on a self trigger mode either from one SL or combinations of SLs. Special trigger configurations are required to select a reasonable illumination for sectors 1,2,6,7,8,12.

DT Commissioning

3) Sector test: 4 or 5 MC fully operational readout with self-triggering from single chamber, combination of chambers or external trigger.

Requirements:

- Cooling system
- “final” LV supplies
- Sector Collector, ROS master, TTC system…
- MC cabling to balcony
- DCS, DSS system
- Data monitoring program

Commissioning Status

- The chambers installed in YB+2 are under gas flow (Gerd F.) since the middle of August. (Chambers in series since it saves money and the“final” piping is not yet usable
- Support plates for HV Jbx mounted on iron
- 9 Chambers cabled to stand-alone HV system last week
- Turn on HV this week (after PC is online and gsm alarm is active
- Commissioning 2) should begin in November after the first complete chambers are installed
- At least one MC should be mounted in an installed chamber Before the end of the year
- Real Commissioning requires people and two test stands

Installation MiniReview

We were asked to present an installation schedule up to completion in UX5.

Guidelines:

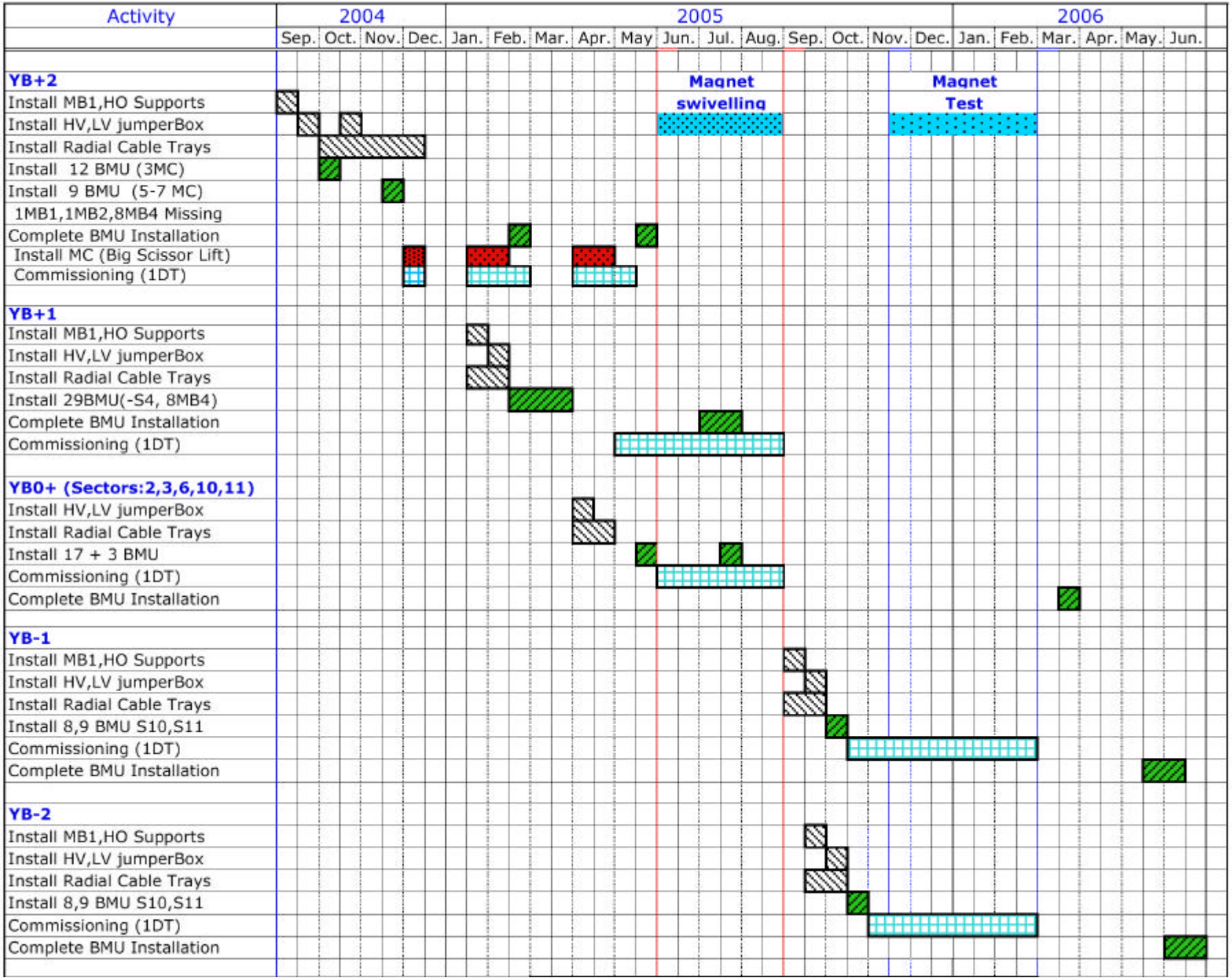
1) YB+2 ready for cabling as soon as possible
2) Complete the cabling before the wheel is lowered to UX5
3) Install Sectors 1 and 7 as soon as the Wheel is lowered in the cavern, before it is moved to the beam line

Point 1) requires 6 MB4To to be at CERN by February 05 and cabling could start in June

Point 3) implies completing installation in SX5 up to YB0 and then lowering the tooling for UX installation

Installation Schedule Comments

- YB+2 Completion: MB1,MB2 (MB4/4) February 05 6MB4To in May 05 (calibrated Jan./Feb. 05)
- YB+1: All chamber but MB4To, MB4/9-11, Chimney installed Feb./Mar. 05
- YB+1 Completion: Chimney + 6 MB4To Jul./Aug.05 assumes 9 MB4To calibrated end of June
- YB+0: 17BMU end of May; 3MB4To end of July 05
- YB-1: Sector 10,11 beginning October 05,
- YB-2: Sector 10,11 end October 05,
- YB-0: 19BMU + 3 MB4T0 end of March06
- YB-1 Completion: 28 BMU + 6 MB4To May/June 06
- YB-2 Completion: 28 BMU + 6 MB4To June 06
- YB+2,YB+1,YB0 Completion in UX5 (24 BMU) April/May 06
- YB-1,YB-2 Completion in UX5 (16 BMU) July 06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Magnet swivelling
Magnet Test
YB+2
Install MB1,HO Supports
Install HV,LV jumperBox
Install Radial Cable Trays
Install 12 BMU (3MC)
Install 9 BMU (5-7 MC)
1MB1,1MB2,8MB4 Missing
Complete BMU Installation
Install MC (Big Scissor Lift)
Commissioning (1DT)
YB+1
Install MB1,HO Supports
Install HV,LV jumperBox
Install Radial Cable Trays
Install 29BMU(-S4, 8MB4)
Complete BMU Installation
Commissioning (1DT)
YB0+ (Sectors:2,3,6,10,11)
Install HV,LV jumperBox
Install Radial Cable Trays
Install 17 + 3 BMU
Commissioning (1DT)
Complete BMU Installation
YB-1
Install MB1,HO Supports
Install HV,LV jumperBox
Install Radial Cable Trays
Install 8,9 BMU S10,S11
Commissioning (1DT)
Complete BMU Installation
YB-2
Install MB1,HO Supports
Install HV,LV jumperBox
Install Radial Cable Trays
Install 8,9 BMU S10,S11
Commissioning (1DT)
Complete BMU Installation

Tooling
MC Production
Commissioning

CMSWeek,

CERN September 21st 2004

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INFN Bologna

Tooling Update (Massimo)

- Interface pieces for L3 scissor lift were shipped to CERN mid August and got lost in transit from Bldg28 and the ISR at the beginning of September. L3 scissor lift is needed for YB0 installation under vacuum tank.
- Third transport frame to be shipped to CERN next Friday
- Second cradle for MB4To installation will be shipped to CERN at the beginning of October. Rail supports were modified to fit the motorized chamber pushing tool designed by Carlos Burgos
- Stand alone tool for displacing chambers inside the iron pockets should be designed ASAP
- Z-stops to be anchored to the iron (memento)

MiniCrate Update (Flavio)

- 10 MC have been assembled cabling not yet completed
- The first MC has been fully and successfully tested
- There are components(TRB) for 2 more MC. Next batch expected beginning of October
- Priority is to get 1MB1 and 1 MB3 ready for the test beam (One more MB1 MC needed for installation!)
- Lorenzo Castellani will take part in the set-up of the test system at the ISR. This will introduce a delay in the MC production

Commissioning

- Portable cooling systems under construction using heat exchangers from LEP era fastbus racks, fans and closed circuit loop with a 30 liter tank.
- LV Interlock system required to operate the MC without shifters (Marco Bellato)
- Second test system needed for commissioning at SX5. Moving one set-up from ISR to SX5 is not an option. Needed at beginning of November at the latest
- At least 2MB1 and one MB3 will be installed with MCs before the end of October. We should see cosmics before the December CMS week
- Mount at least one MC in an installed chamber this year!

MiniCrates Long Term Test

- The aim is to maintain the MC fully operational for a period of at least a week.
- This is not feasible at the ISR after the MC are inserted in the chambers (logistics, access, cabling….)
- It is possible to perform the test without connecting the front-end cable using the method developed in Bologna (guaranteed for the trigger part, the readout is under investigation with the CIEMAT colleagues)
- We have a scheme for the mechanics and cooling system capable of operating up to 12 MC simultaneously
- Sector Collectors and (ROS?) could be available for a partial set-up by the end of the year if we decide to do it

MiniCrates Long Term Test

- I have contacted Peter Sharp to find out what he can come up for a LV system
- Hardware investment should be of the same order as for the usual MC stand alone test system
- DCS and DSS is more demanding but could be seen as part of what is needed for the Sector Test

==> We should decide if a Long Term test is required or desirable for the MC "now" or it will be too late

DT Production and Installation Schedule

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BMU Installation (YB+2)

- Next installation in October(18-29):

MB1 Sectors 9, 10, 11, 5; 4
MB3 Sectors 3, 4, 5; **MB1** Sector 2, 8
MB2 Sector 8, **MB3** Sector 2

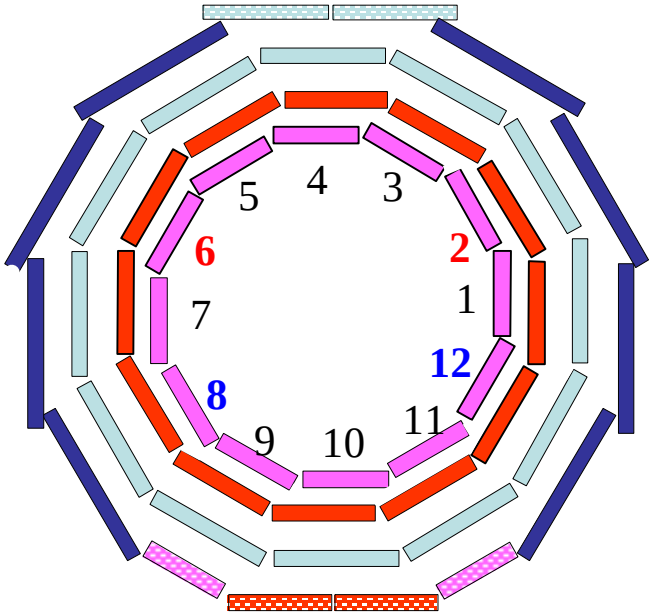
==> 12 Chambers (= 3 MC)

- MB2 RPCs for YB2 Top expected by the middle of November

- Continue YB2 installation end of November:

MB1 Sectors 12, 6, MB2 Sectors 2, 3, 4,6 MB3 Sector 6 and 2 MB4/4 (if RPC OK) Chambers with MC indicated in RED

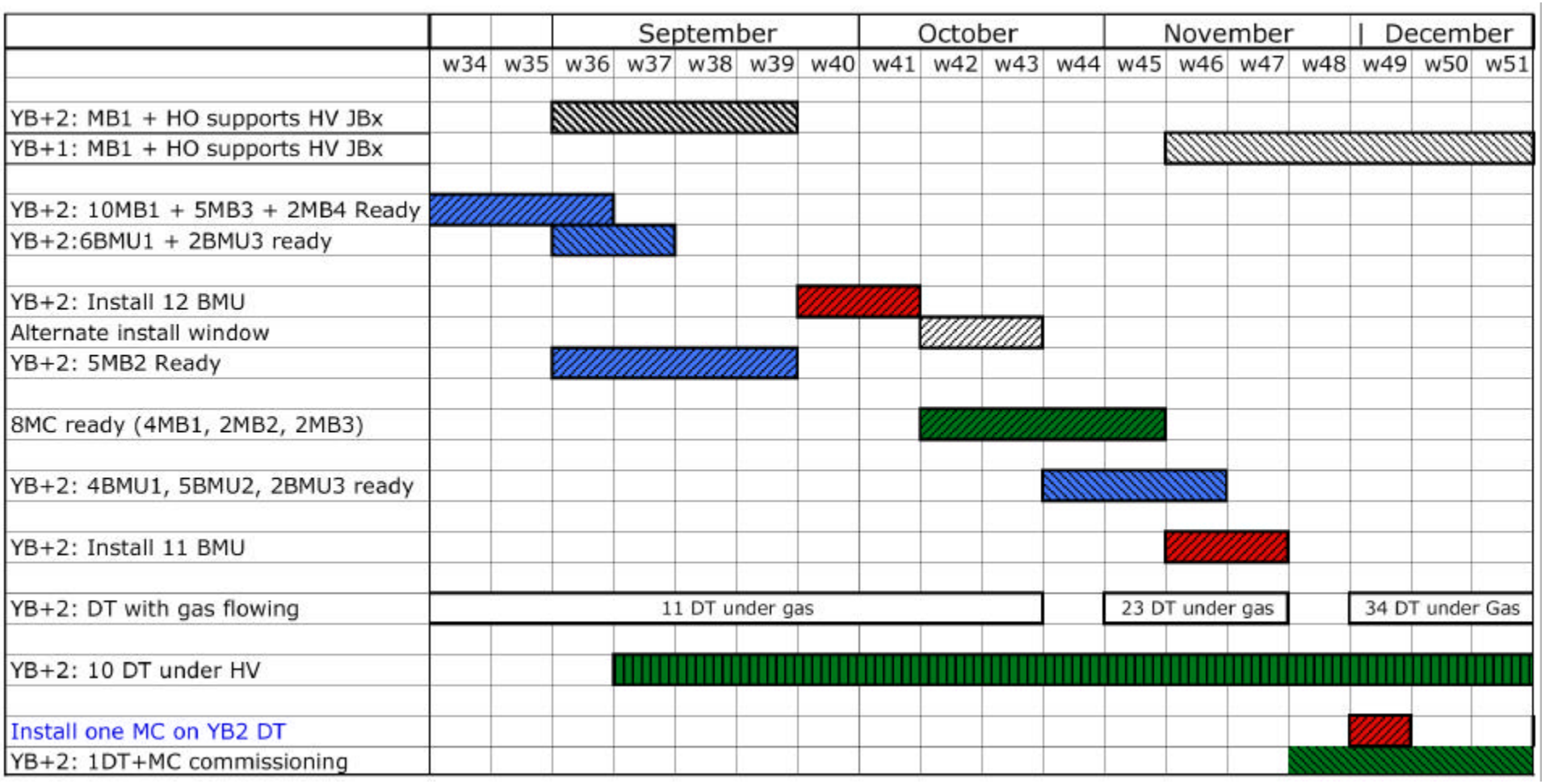
32 Installed Chambers



Still missing:

MB1 Sector 3
MB2 Sector 5

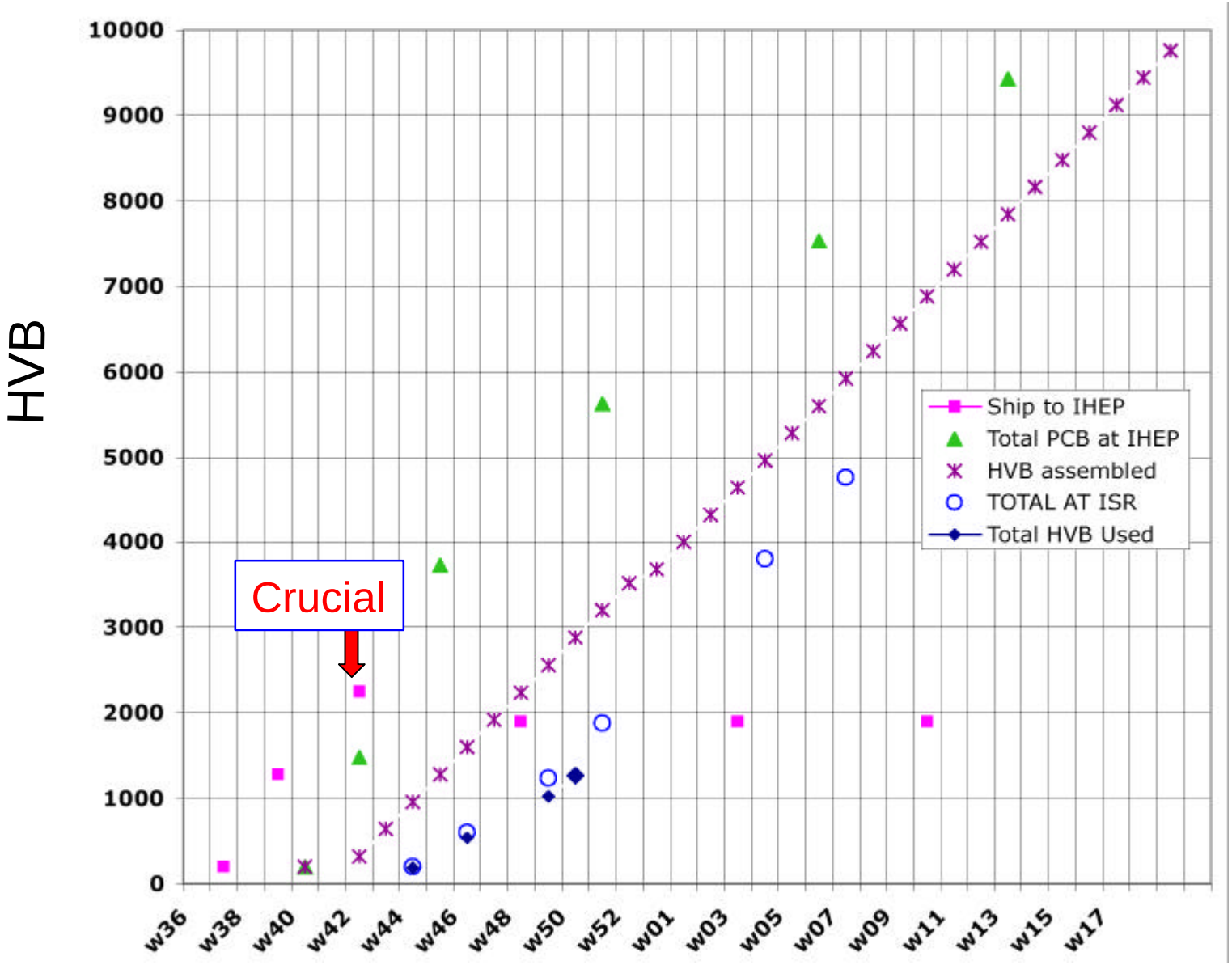
YB2+ Installation

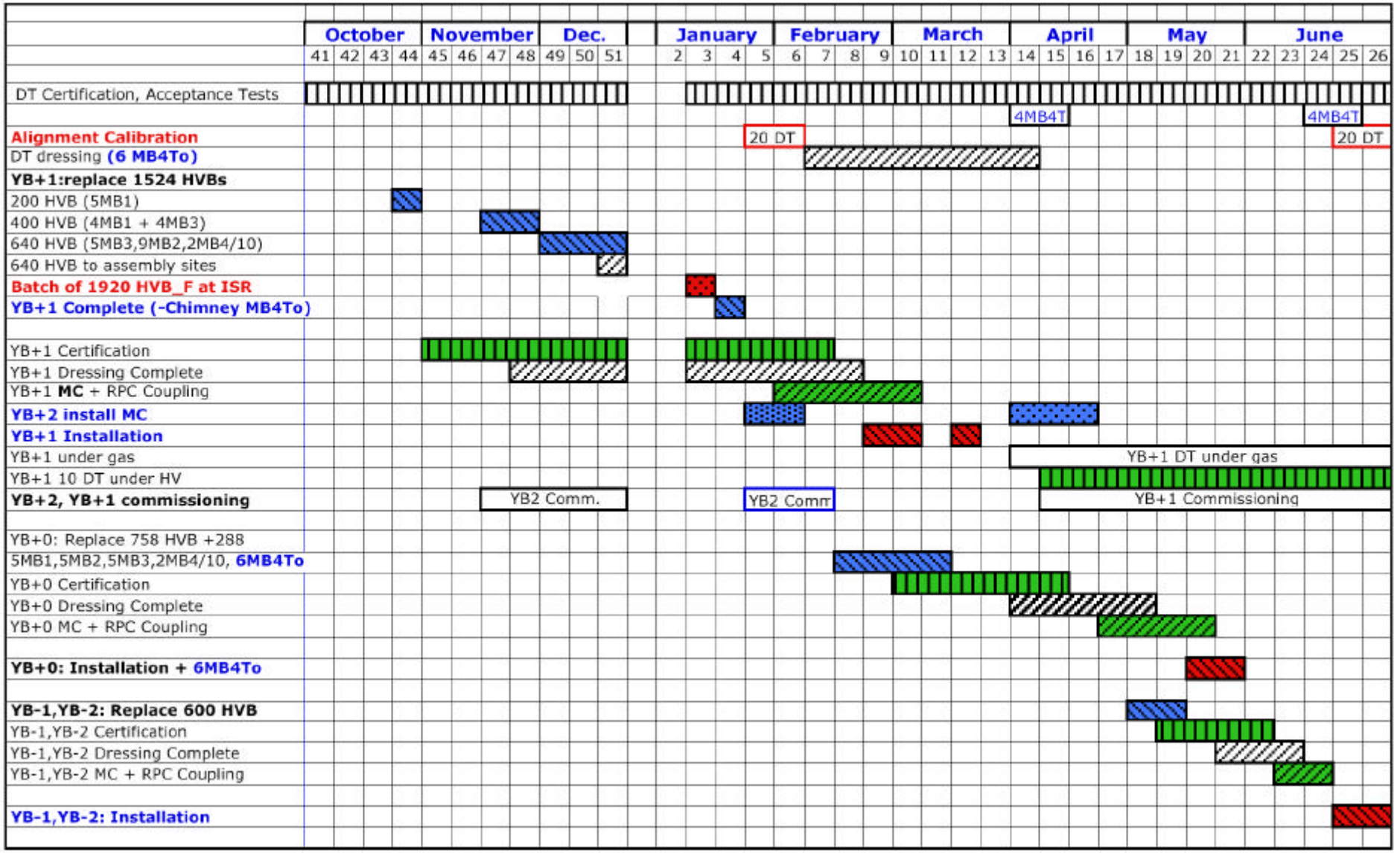


DT Ready for Installation Schedule in Brief

- YB+2 with HVB_I will be completed this year
- YB+1 With HVB_F is feasible with “Corona“ expected production but on time delivery is crucial to maintain HVB assembly and test in Beijing
- ~ 600 HVB_F available for assembly sites end of December if above is valid
- 4th Shipment before end of December (not later than 8/12/04 at CERN) critical to maintain HVB assembly in January and provide HVB buffer to share with sites
- YB0 and YB- for Magnet test is totally dependent on a smooth HVB production and delivery

HVB Production Plan

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DT Certification, Acceptance Tests
4MB4T
4MB4T
Alignment Calibration
20 DT
20 DT
DT dressing (6 MB4To)
YB+1:replace 1524 HVBs
200 HVB (5MB1)
400 HVB (4MB1 + 4MB3)
640 HVB (5MB3,9MB2,2MB4/10)
640 HVB to assembly sites
Batch of 1920 HVB_F at ISR
YB+1 Complete (-Chimney MB4To)
YB+1 Certification
YB+1 Dressing Complete
YB+1 MC + RPC Coupling
YB+2 install MC
YB+1 Installation
YB+1 under gas
YB+1 DT under gas
YB+1 10 DT under HV
YB+2, YB+1 commissioning
YB2 Comm.
YB2 Comm
YB+1 Commissioning
YB+0: Replace 758 HVB +288
5MB1,5MB2,5MB3,2MB4/10, 6MB4To
YB+0 Certification
YB+0 Dressing Complete
YB+0 MC + RPC Coupling
YB+0: Installation + 6MB4To
YB-1,YB-2: Replace 600 HVB
YB-1,YB-2 Certification
YB-1,YB-2 Dressing Complete
YB-1,YB-2 MC + RPC Coupling
YB-1,YB-2: Installation

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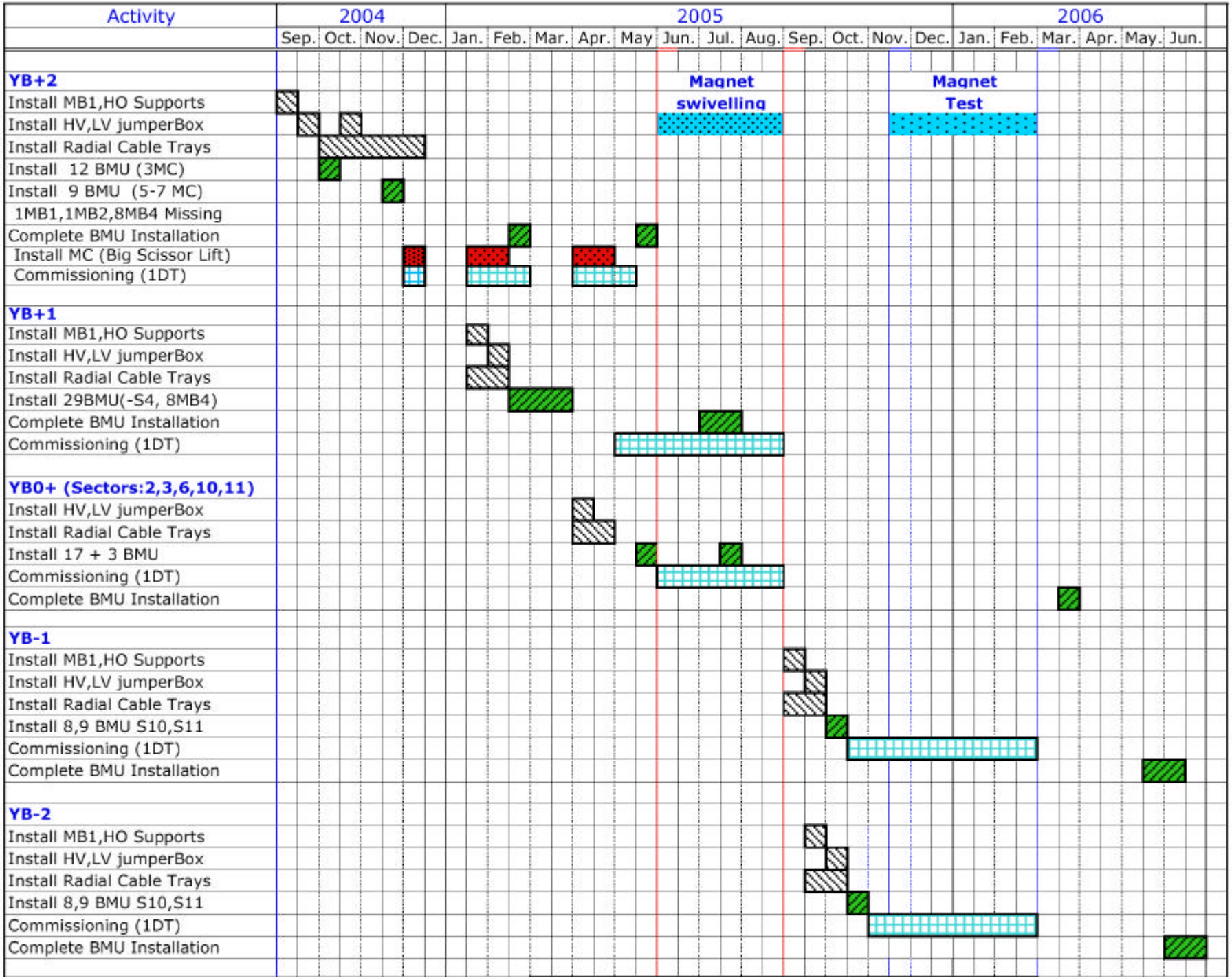
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Commissioning (1DT)
Complete BMU Installation
YB-2
Install MB1,HO Supports
Install HV,LV jumperBox
Install Radial Cable Trays
Install 8,9 BMU S10,S11
Commissioning (1DT)
Complete BMU Installation

Feedback from Mini Installation Review

- Scaffolding under HE/EE for ME11 installation prevents installation in YB+2
- EMU and BMU installations are not compatible, conflicts are possible coordination is essential
- Installation in YB+1 requires moving YB+2 and EndCaps to clear access for tooling, transport frame storage and staging area
- Changing installation wheel is going to be time consuming
- June 05 seems the earliest window for YB+2 cabling

Feedback from Mini Installation Review

- DT cabling and commissioning can be streamlined if the MC cables (apart for LV) are routed under the services (permanent cabling). Issues are:

  - cross-sections availability (check the choke points as given in drawings)

  - conflicts with HV cables for HO

  - cable length for trigger readout cables

- Cabling must be included in our installation plan

- MC long term test is not acceptable for Alain, should be done before chamber installation

- In the present schedule there is not enough time to commission the chambers installed after the magnet test.