Preparing HO for MTCC

Was it ready last Friday?

MTCC jobs and some problems

- YB 0 Sector 10
  - Layer 0 tray problem
  - Mega tile cables from HB's spare capacity
- YB +1 Sector 10 and 4
  - Special problem with Sector 4 cabling
- YB +2 boxes; light tightness etc
- HV, LV, DCC hub, TTC, water, cooling etc
- Orange cable identification problems (3 cases)
- Convention problem with HO mapping (w.r.t JR's)
- Problem with RBX burn-in (RMs heating up); chilled water connection

Problem of HO mega-tile routing for HO-YB+1

Shown in Fig 1 is the readout box of YB+1 Sector 10. The low voltage power supply cables (yellow in colour), originating from the backside of the readout box (on the right side) as well as the RBX coolant water tubes and HV supply cables (on the left).

In Fig 2, we show a close up view of the readout box area along with its mega-tile cables that connect the scintillators to the readout boxes. One can notice that the mega-tile cables are experiencing tension on their way to the RBX, at the point of intersection with the MB gas pipe.

We propose the following remedies for solving the problem. The HO group can bring out and route all the cables (LV and HV) as well as the water tubes on to the right side of the readout box. The MB group can increase the length of the gas pipe a little longer and also orient the gas tube bend a little forward. These steps will result in some extra room for the HO mega-tile cables so that they can routed comfortably.

Fig 1: Readout box of HO-YB+1 Sector 10 (SX5)

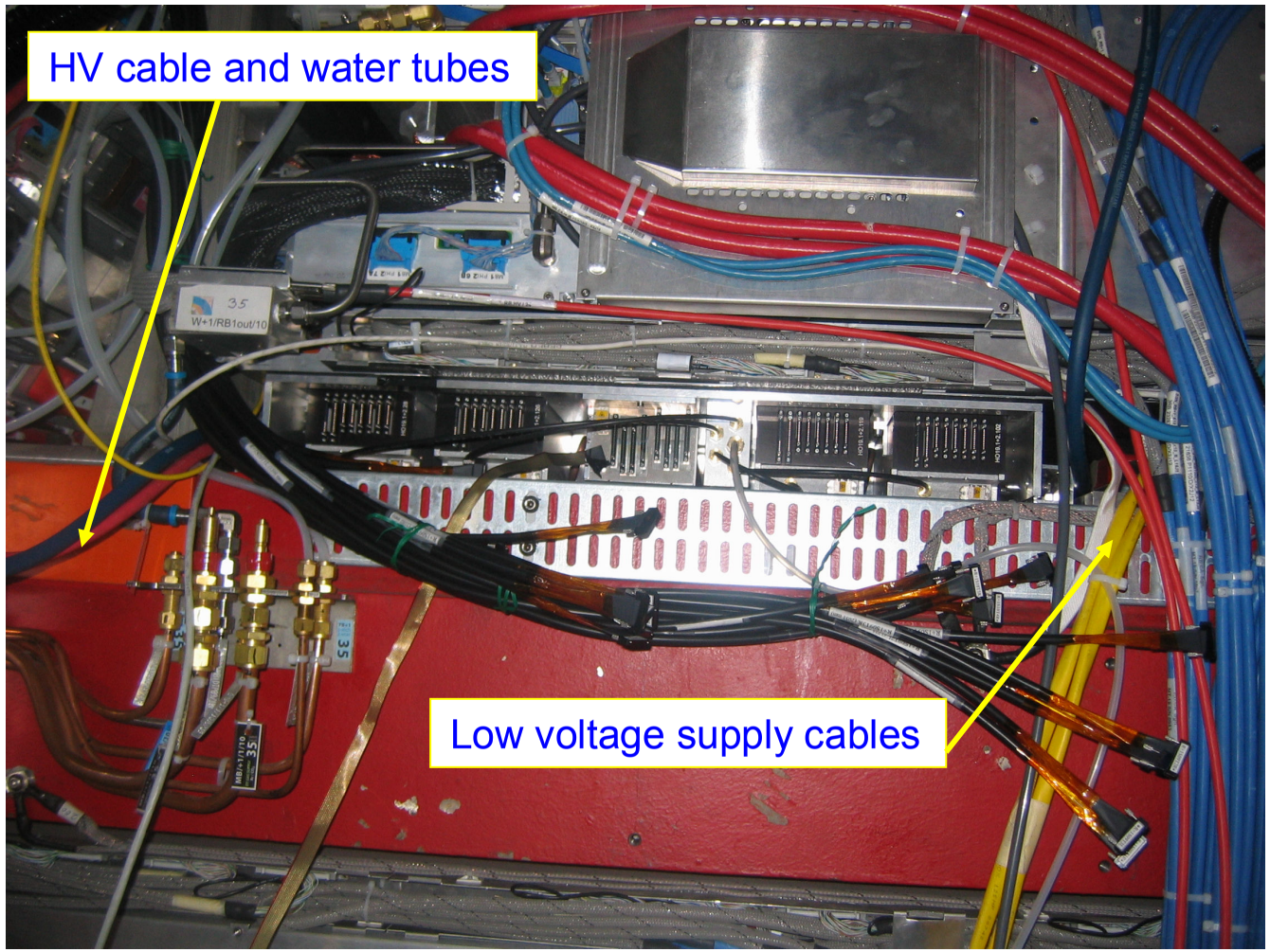
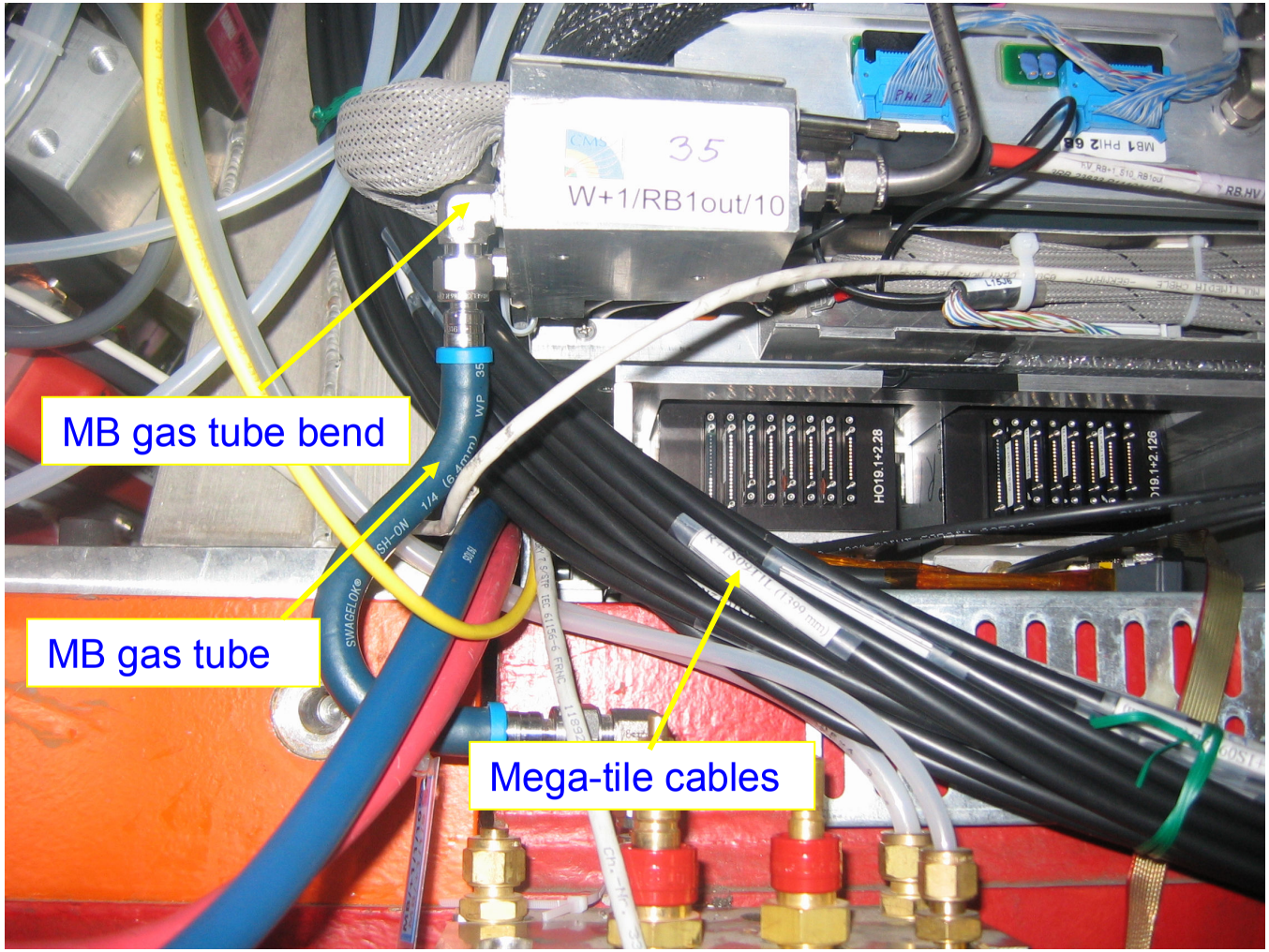
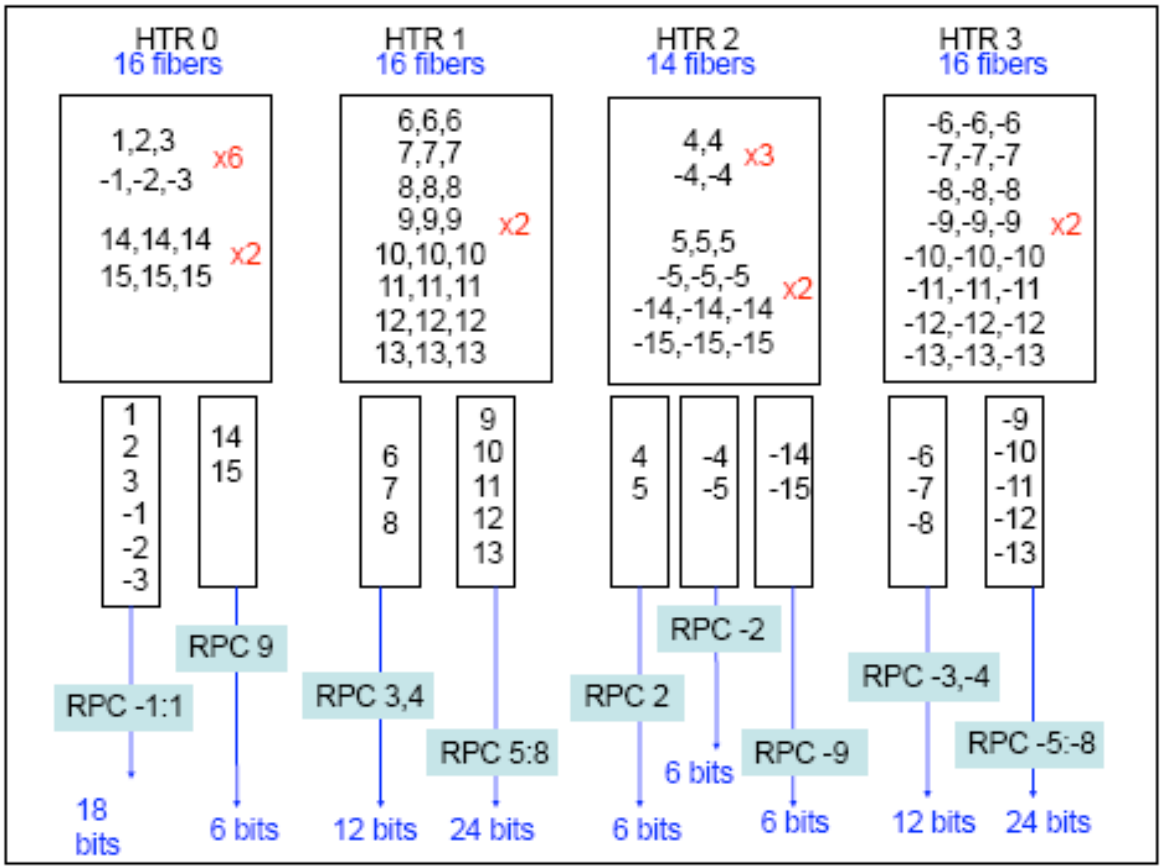


Fig 2: Close-up view of the problematic area (SX5)



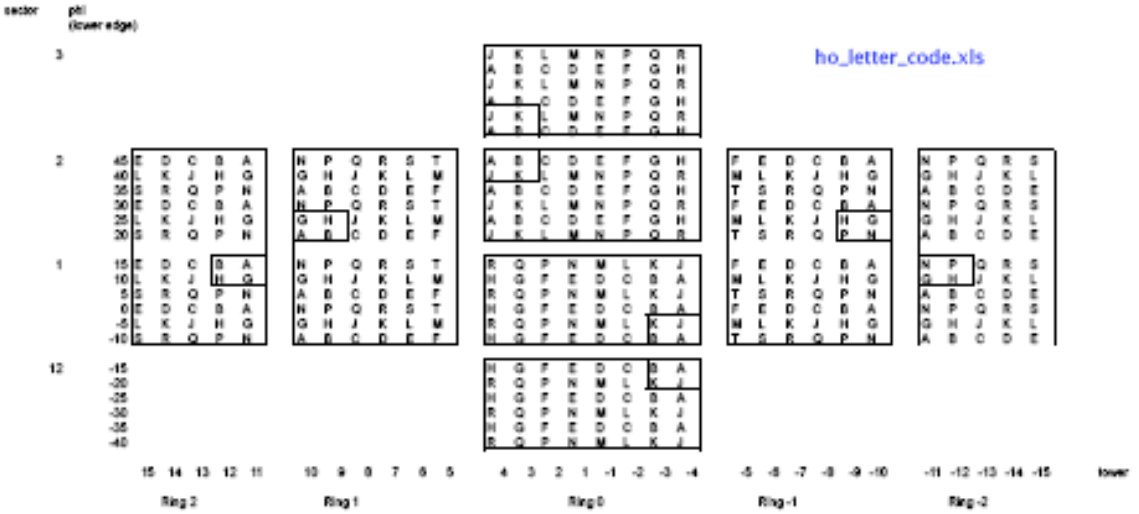
RPC tower grouping (J Rohlf)



HO tower representation (J Rohlf)

HO Interface Cards.pdf

Digital Fiber #	Towers		
	HO±1	HO±2	HO 0
1	E, L, S	E, L, S	E, G, F
2	M, T, F	Not Used	Q, N, P
3	C, J, Q	C, J, Q	A, n/c, J
4	K, R, D	K, R, D	n/c, R, H
5	A, G, N	A, G, N	D, C, B
6	H, P, B	H, P, B	L, M, K



HO tower grouping for MTCC

Digital Fiber #	Towers		
	HO±1	HO±2	HO 0
1	E, L, S	E, L, S	E, G, F
2	M, T, F	Not Used	Q, N, P
3	C, J, Q	C, J, Q	A, n/c, J
4	K, R, D	K, R, D	n/c, R, H
5	A, G, N	A, G, N	D, C, B
6	H, P, B	H, P, B	L, M, K

Ring-1 HPD:
towers 5 to 10 x 3 phi

Ring-2 HPD:
towers 11 to 15 x 3 phi

Ring-0 HPD:
towers -4 to 4 x 2 phi

AJ: η=-4
ϕ=n,n+1

RH: η=+4
ϕ=n,n+1

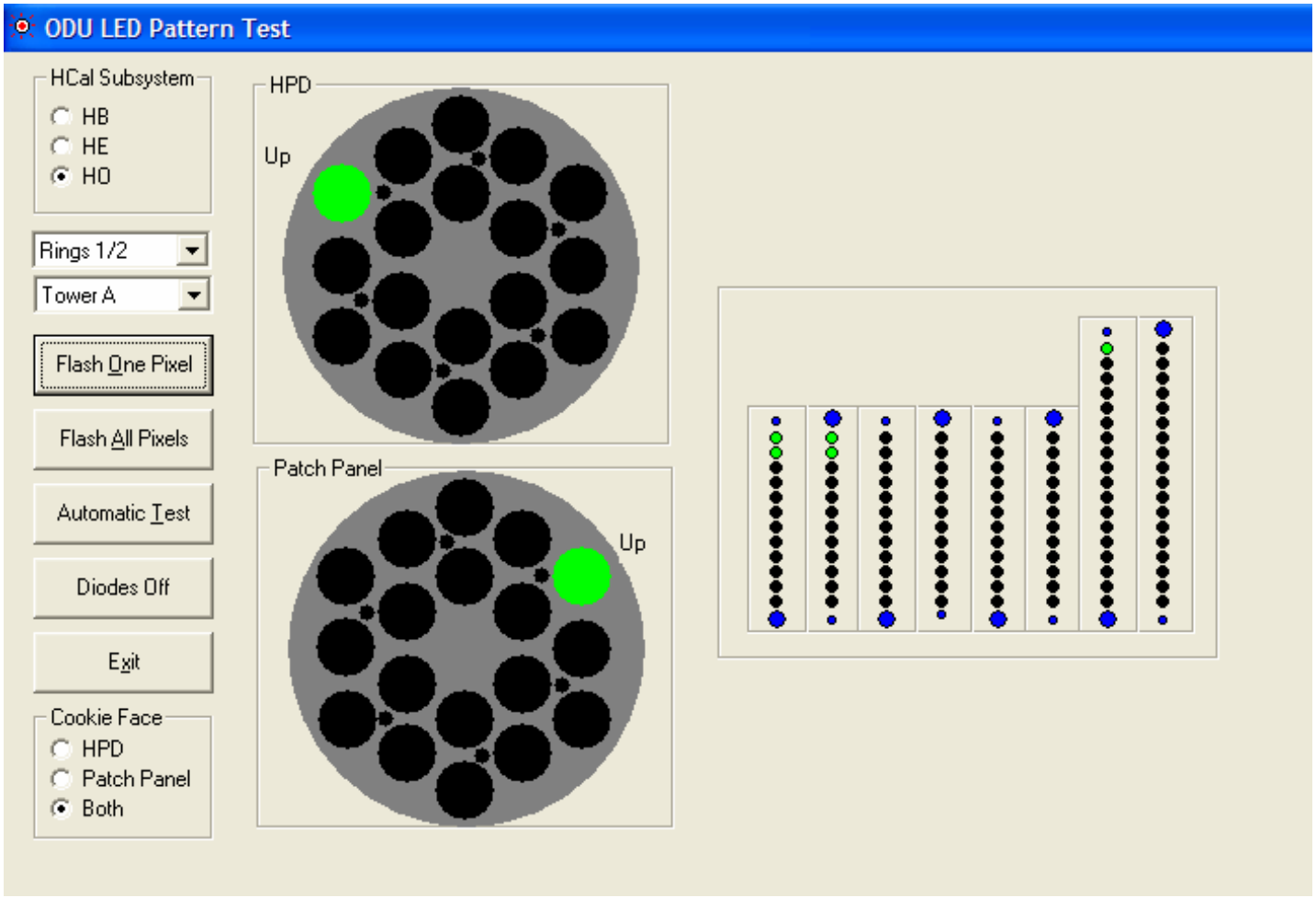
DCB: η=-1,-2,-3
ϕ=n

QNP: η=3,1,2
ϕ=n+1

LMK: η=-2,-1,-3
ϕ=n+1

EGF: η=1,3,2
ϕ=n

ODU flasher


ODU LED Pattern Test
HCal Subsystem
HB
HE
HO
Rings 1/2
Tower A
Flash One Pixel
Flash All Pixels
Automatic Test
Diodes Off
Exit
Cookie Face
HPD
Patch Panel
Both
HPD
Up
Patch Panel
Up

HO mapping procedure

Final mapping information for Ring +1 (Shown Sectors 9 & 10 as an example)									
Sector	Tray	Tile	RM	Tower	HPD Pixel	QIE Cha	Fiber	HTR Cha	Eta
9	1	1	4	A	19	0	6	13	5
9		2	4	B	16	3	7	18	6
9		3	4	C	11	0	4	7	7
9		4	4	D	5	3	5	12	8
9		5	4	E	12	0	2	1	9
9		6	4	F	1	3	3	6	10
9	2	1	4	G	18	1	6	14	5
9		2	4	H	15	4	7	16	6
9		3	4	J	6	1	4	8	7
9		4	4	K	9	4	5	10	8
9		5	4	L	7	1	2	2	9
9		6	4	M	4	4	3	4	10
9	3	1	4	N	17	2	6	15	5
9		2	4	P	14	5	7	17	6
9		3	4	Q	2	2	4	9	7
9		4	4	R	13	5	5	11	8
9		5	4	S	3	2	2	3	9
9		6	4	T	8	5	3	5	10
9	4	1	2	A	19	0	6	13	5
9		2	2	B	16	3	7	18	6
9		3	2	C	11	0	4	7	7
9		4	2	D	5	3	5	12	8

CMS phi number ordering

Phi number convension

Looking into Z = 0 from plus side

X axis is East and Y axis is North. Z axis is getting out of paper

The counting is anti-clock wise

S1	71 - 04
S2	05 - 10
S3	11 - 16
S4	17 - 22
S5	23 - 28
S6	29 - 34
S7	35 - 40
S8	41 - 46
S9	47 - 52
S10	53 - 58
S11	59 - 64
S12	65 - 70

Grouping HO towers - 1

HTR0: 16 fibers (48 towers)							
Groups	Eta	Towers	Fibers	Towers	Fibers	Towers	Fibers
1	15	E,L,S	21-2	E,L,S	23-2		
1	14	D,K,R	21-5	D,K,R	23-5		
2	-3	B,K	02-6,7	B,K	03-6,7	B,K	04-6,7
2	-2	C,L	02-6,7	C,L	03-6,7	C,L	04-6,7
2	-1	D,M	02-6,7	D,M	03-6,7	D,M	04-6,7
2	1	E,N	02-2,3	E,N	03-2,3	E,N	04-2,3
2	2	F,P	02-2,3	F,P	03-2,3	F,P	04-2,3
2	3	G,Q	02-2,3	G,Q	03-2,3	G,Q	04-2,3

HTR1: 16 fibers (48 towers)					
Groups	Eta	Towers	Fibers	Towers	Fibers
3	6	E,L,S	11-2	E,L,S	13-2
3	7	D,K,R	11-5	D,K,R	13-5
3	8	C,J,Q	11-4	C,J,Q	13-4
4	9	B,H,P	11-7	B,H,P	13-7
4	10	A,G,N	11-6	A,G,N	13-6
4	11	F,M,T	21-6	F,M,T	23-6
4	12	B,H,P	21-7	B,H,P	23-7
4	13	C,J,Q	21-4	C,J,Q	23-4

Grouping HO towers - 2

HTR2: 14 fibers (42 towers)							
Groups	Eta	Towers	Fibers	Towers	Fibers	Towers	Fibers
5	-15	E,L,S	-21-2	E,L,S	-23-2		
5	-14	D,K,R	-21-5	D,K,R	-23-5		
6	-5	F,M,T	-11-3	F,M,T	-13-3		
6	-4	A,J	02-4	A,J	03-4	A,J	04-4
7	4	H,R	02-5	H,R	03-5	H,R	04-5
7	5	F,M,T	11-3	F,M,T	13-3		

HTR3: 16 fibers (48 towers)					
Groups	Eta	Towers	Fibers	Towers	Fibers
8	-6	E,L,S	-11-2	E,L,S	-13-2
8	-7	D,K,R	-11-5	D,K,R	-13-5
8	-8	C,J,Q	-11-4	C,J,Q	-13-4
9	-9	B,H,P	-11-7	B,H,P	-13-7
9	-10	A,G,N	-11-6	A,G,N	-13-6
9	-11	F,M,T	-21-6	F,M,T	-23-6
9	-12	B,H,P	-21-7	B,H,P	-23-7
9	-13	C,J,Q	-21-4	C,J,Q	-23-4

HTR fiber number convention

HTR fiber number convension (as viewed from the front-panel)

Top	1	5
	2	6
	3	7
	4	8
Bottom	1	5
	2	6
	3	7
	4	8

Patch panel - HTR	
Top 1-1	Bot 2-1
Top 1-2	Bot 2-2
Top 1-3	Bot 2-3
Top 1-4	Bot 2-4
Top 1-5	Bot 2-5
Top 1-6	Bot 2-6
Top 1-7	Bot 2-7
Top 1-8	Bot 2-8

HO mapping as seen on HTR

Sector 10 - On HTR 0	
02-3 (1,2,3:53)	02-6 (-3,-2,-1:54)
02-2 (1,2,3:54)	03-7 (-3,-2,-1:55)
03-3 (1,2,3:55)	23-2 (14:55,54,53)
02-7 (-3,-2,-1:53)	23-3 (15:55,54,53)
03-2 (1,2,3:56)	04-7 (-3,-2,-1:57)
04-3 (1,2,3:57)	04-6 (-3,-2,-1:58)
04-2 (1,2,3:58)	21-2 (14:58,57,56)
03-6 (-3,-2,-1:56)	21-3 (15:58,57,56)

Sector 10 - On HTR 1	
13-7 (6:55,54,53)	13-3 (10:55,54,53)
13-4 (7:55,54,53)	23-7 (11:55,54,53)
13-5 (8:55,54,53)	23-4 (12:55,54,53)
13-2 (9:55,54,53)	23-5 (13:55,54,53)
11-7 (6:58,57,56)	11-3 (10:58,57,56)
11-4 (7:58,57,56)	21-7 (11:58,57,56)
11-5 (8:58,57,56)	21-4 (12:58,57,56)
11-2 (9:58,57,56)	21-5 (13:58,57,56)

Sector 10 - On HTR 2	
02-5 (4:54,53)	-11-6 (-5:58,57,56)
03-5 (4:56,55)	-23-2 (-14:55,54,53)
04-5 (4:58,57)	-21-2 (-14:58,57,56)
-13-6 (-5:55,54,53)	
02-4 (-4:54,53)	11-6 (5:58,57,56)
03-4 (-4:56,55)	-23-3 (-15:55,54,53)
04-4 (-4:58,57)	-21-3 (-15:58,57,56)
13-6 (5:55,54,53)	

Sector 10 - On HTR 3	
-13-7 (-6:55,54,53)	-13-3 (-10:55,54,53)
-13-4 (-7:55,54,53)	-23-7 (-11,55,54,53)
-13-5 (-8:55,54,53)	-23-4 (-12:55,54,53)
-13-2 (-9:55,54,53)	-23-5 (-13:55,54,53)
-11-7 (-6:58,57,56)	-11-3 (-10:58,57,56)
-11-4 (-7:58,57,56)	-21-7 (-11:58,57,56)
-11-5 (-8:58,57,56)	-21-4 (-12:58,57,56)
-11-2 (-9:58,57,56)	-21-5 (-13:58,57,56)

HO mapping as seen on patch panel

Sector 10 - HTR 0 on patch panel	
02-3 (1,2,3:53)	03-2 (1,2,3:56)
02-2 (1,2,3:54)	04-3 (1,2,3:57)
03-3 (1,2,3:55)	04-2 (1,2,3:58)
02-7 (-3,-2,-1:53)	03-6 (-3,-2,-1:56)
02-6 (-3,-2,-1:54)	04-7 (-3,-2,-1:57)
03-7 (-3,-2,-1:55)	04-6 (-3,-2,-1:58)
23-2 (14:55,54,53)	21-2 (14:58,57,56)
23-3 (15:55,54,53)	21-3 (15:58,57,56)

Sector 10 - HTR 1 on patch panel	
13-7 (6:55,54,53)	11-7 (6:58,57,56)
13-4 (7:55,54,53)	11-4 (7:58,57,56)
13-5 (8:55,54,53)	11-5 (8:58,57,56)
13-2 (9:55,54,53)	11-2 (9:58,57,56)
13-3 (10:55,54,53)	11-3 (10:58,57,56)
23-7 (11:55,54,53)	21-7 (11:58,57,56)
23-4 (12:55,54,53)	21-4 (12:58,57,56)
23-5 (13:55,54,53)	21-5 (13:58,57,56)

Sector 10 - HTR 2 on patch panel	
02-5 (4:54,53)	02-4 (-4:54,53)
03-5 (4:56,55)	03-4 (-4:56,55)
04-5 (4:58,57)	04-4 (-4:58,57)
-13-6 (-5:55,54,53)	13-6 (5:55,54,53)
-11-6 (-5:58,57,56)	11-6 (5:58,57,56)
-23-2 (-14:55,54,53)	-23-3 (-15:55,54,53)
-21-2 (-14:58,57,56)	-21-3 (-15:58,57,56)

Sector 10 - HTR 3 on patch panel	
-13-7 (-6:55,54,53)	-11-7 (-6:58,57,56)
-13-4 (-7:55,54,53)	-11-4 (-7:58,57,56)
-13-5 (-8:55,54,53)	-11-5 (-8:58,57,56)
-13-2 (-9:55,54,53)	-11-2 (-9:58,57,56)
-13-3 (-10:55,54,53)	-11-3 (-10:58,57,56)
-23-7 (-11,55,54,53)	-21-7 (-11:58,57,56)
-23-4 (-12:55,54,53)	-21-4 (-12:58,57,56)
-23-5 (-13:55,54,53)	-21-5 (-13:58,57,56)

Entries' convension: [Ring][RM]-[Fiber] ([Eta(s)]:[Phi(s)])

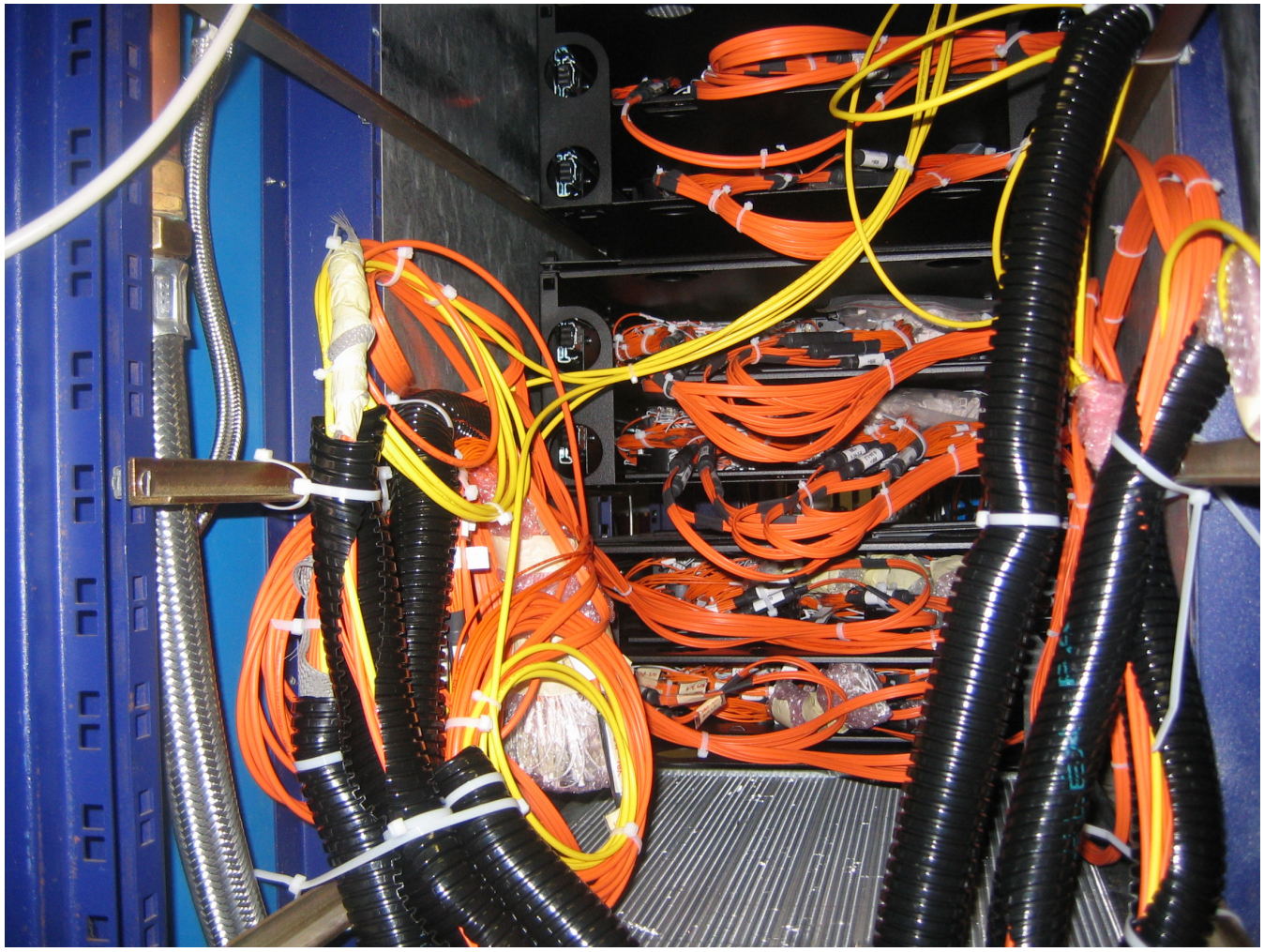
Some comments on HO mapping - 1

Three HTRs are needed for sector; no HTR 3				
So, total of 12 HTRs are needed for MTCC.				
They are all housed in crate 2 in green barrack.				
No -ve side towers are connected on the patch panel.				
Rings and sectors readout for MTCC				
Ring 0 (YB0): Sector 10				
Ring +1 (YB+1): Sectors 4, 9, 10				
Ring +2 (YB+2): Sectors 3, 4, 9, 10				

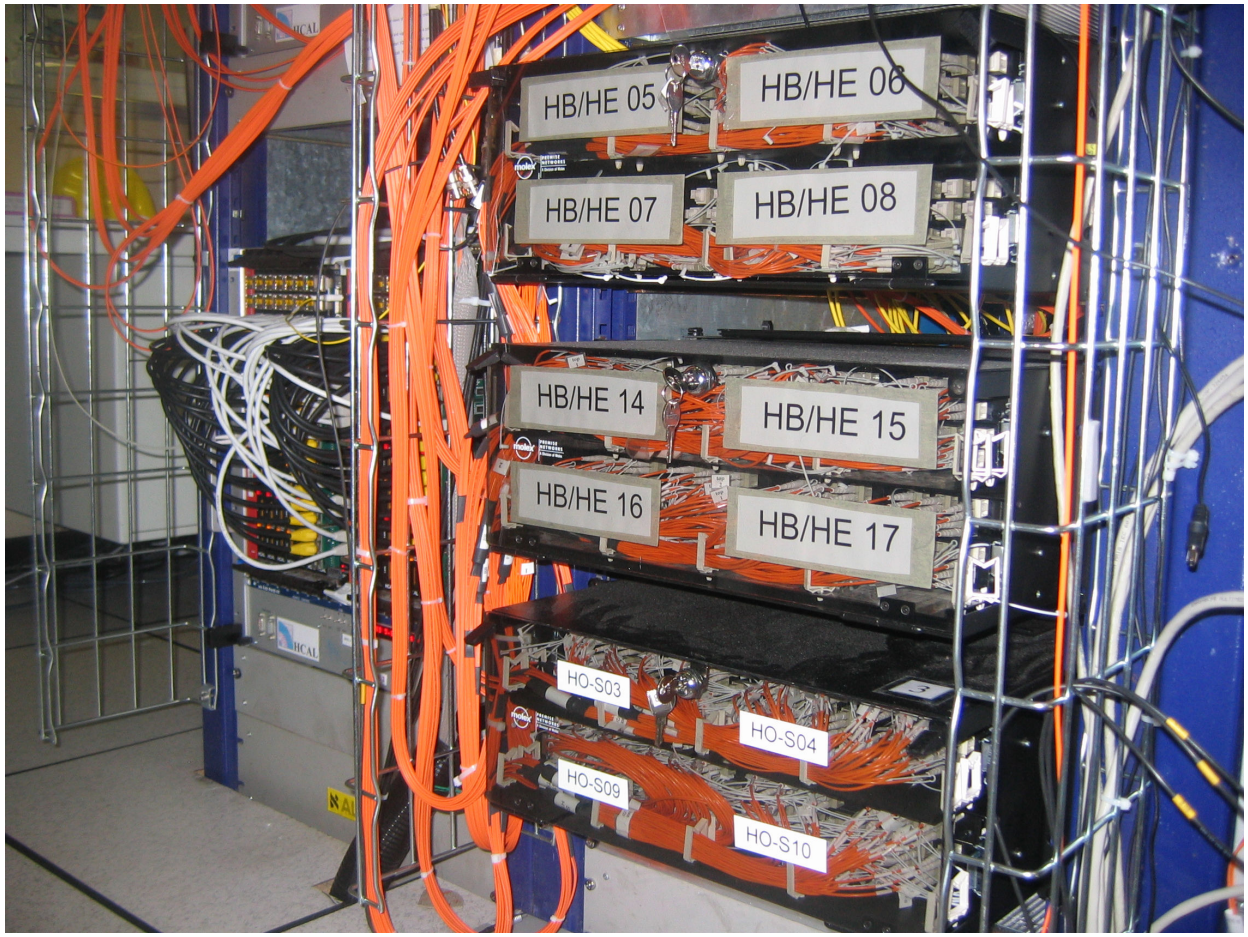
Some comments on HO mapping -2

Fiber naming convention: YR-F1[,F2]			
Y = Ring number			
R = RM number			
F1 = Fiber #1			
F2 = Fiber #2			
Mapping for 30 degree phi sectors			
of all rings and etas			
30 etas * 6 sectors (5 degree)			
>>> 180 towers			
>>> 60 fibers (in implementation 62 fibers)			
>>> 11 RBXs			
4 HTRs / 30 degree sector			
>>> 48 HTRs for the entire HO			
Housed in 4 crates (12 HTRs each)			

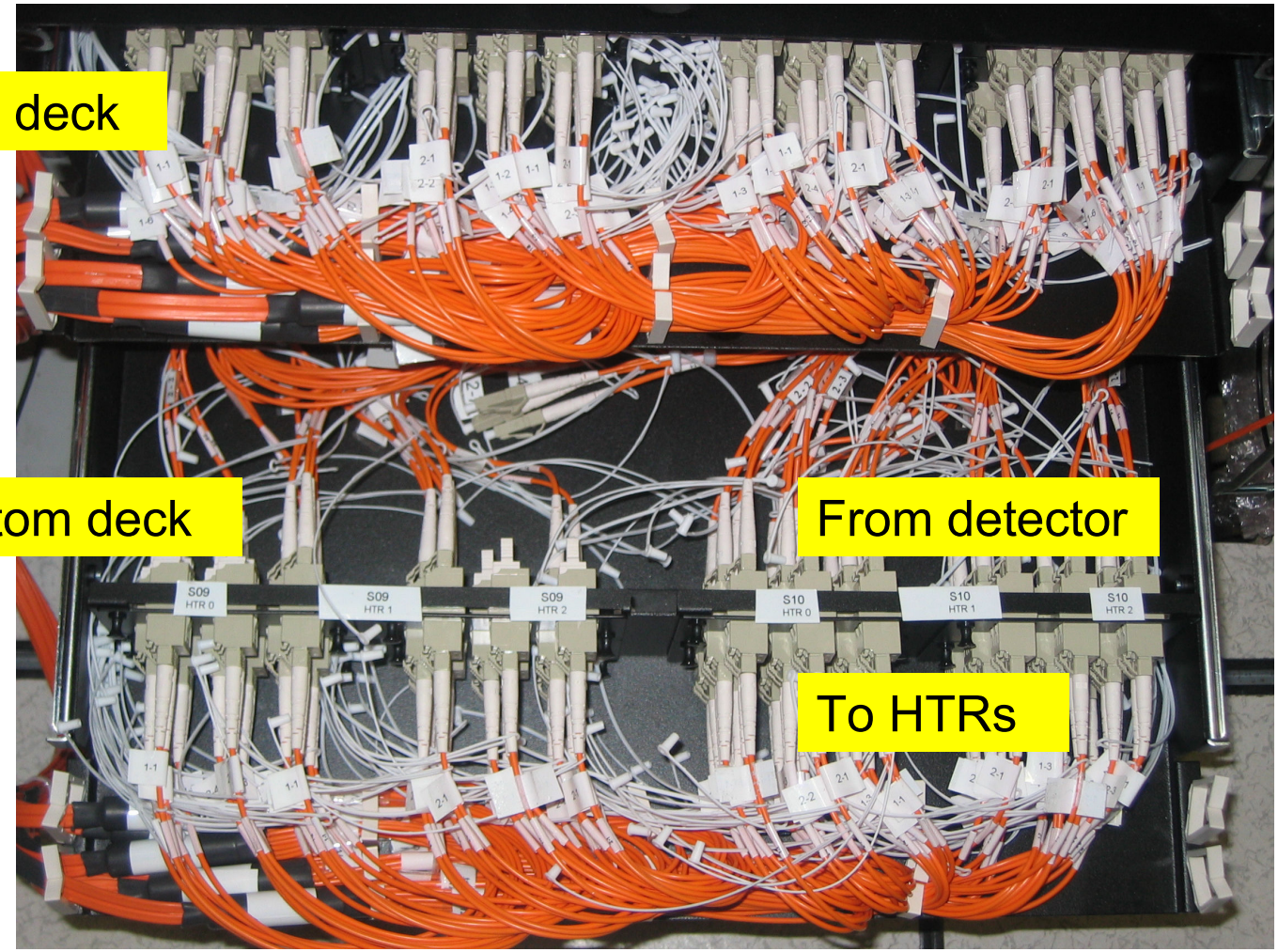
HCAL cable hut (GB)



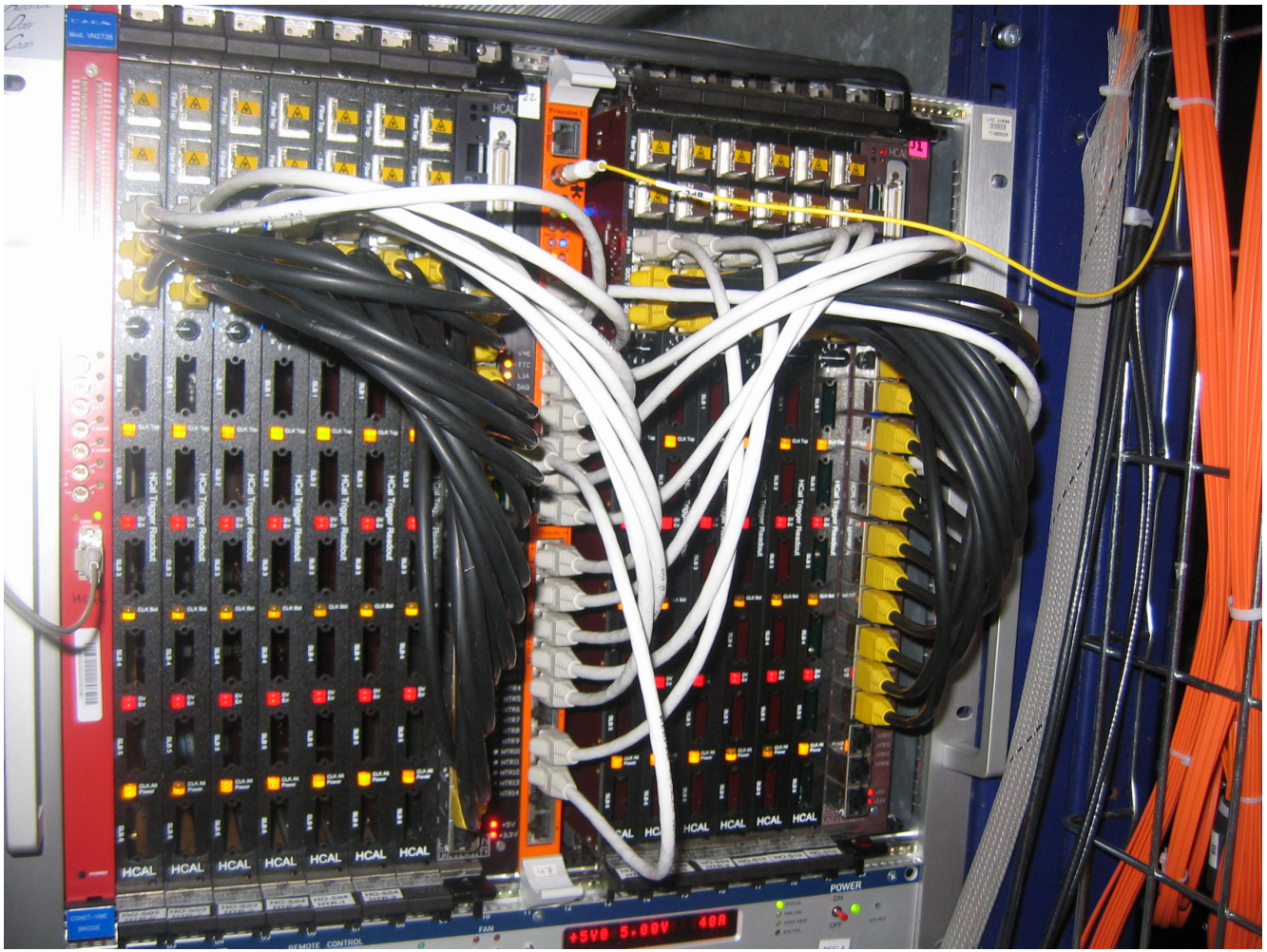
Patch panels for HCAL (GB)



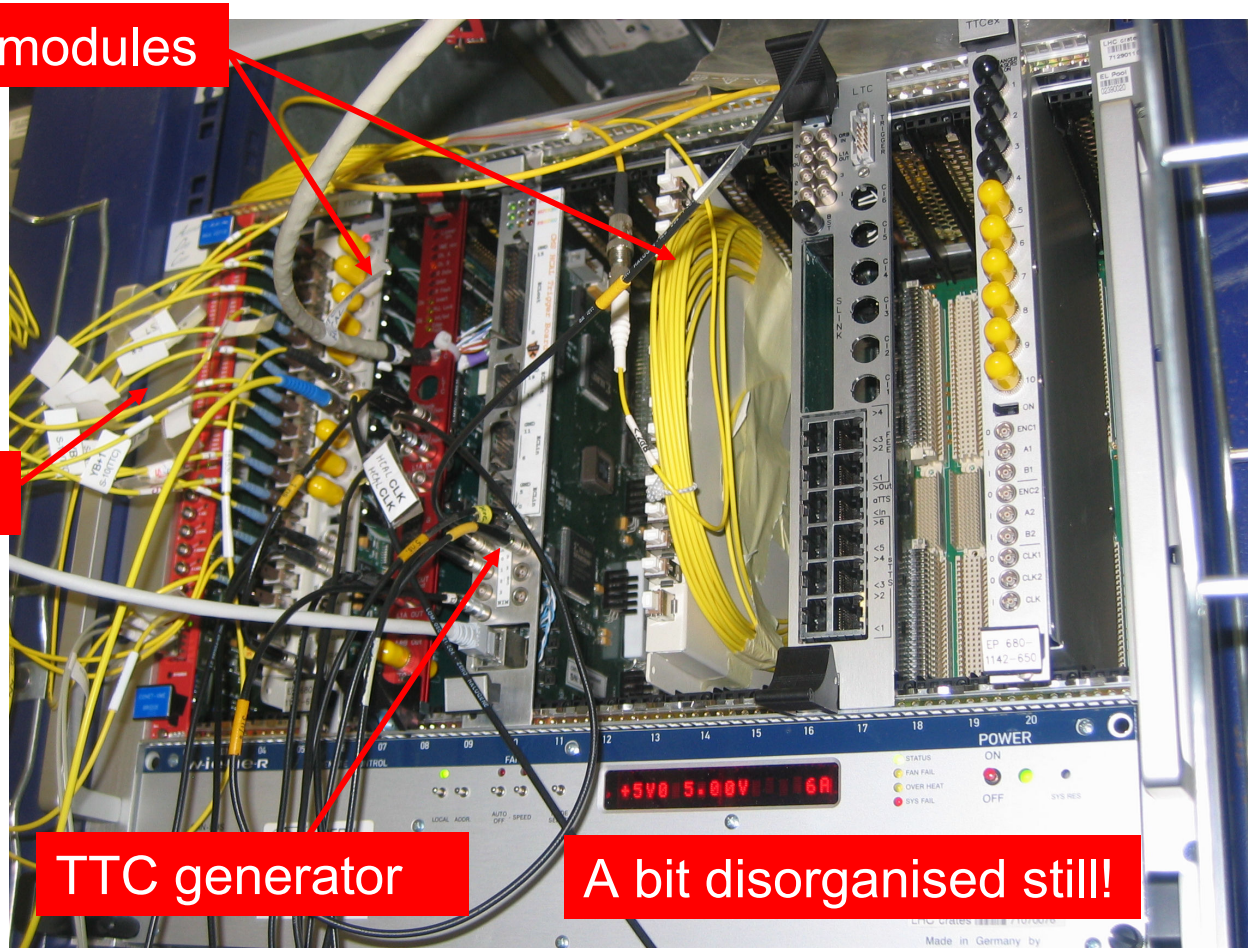
HO patch panel wiring (GB)



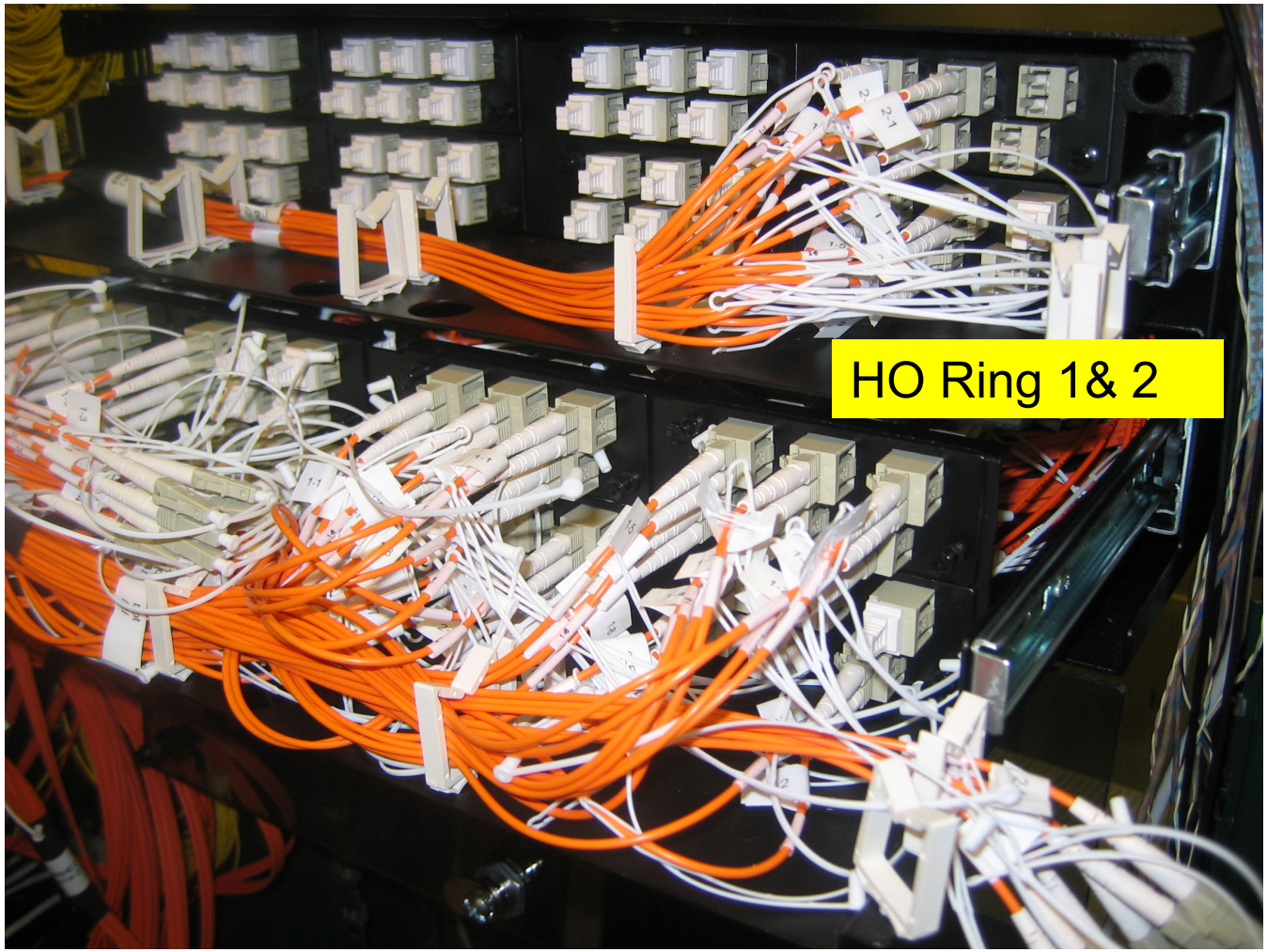
HO's DCC crate (GB)



TTCs for HO (GB)



HO patch panel (H2)



HO DCC crate in HO (H2)