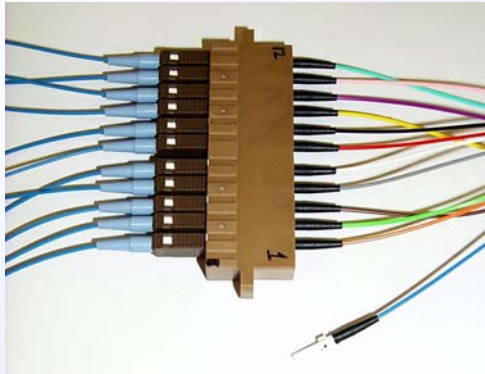

CABLING and GROUPING of Read-Out Fibers, Mapping Front-End to FEDs

Components

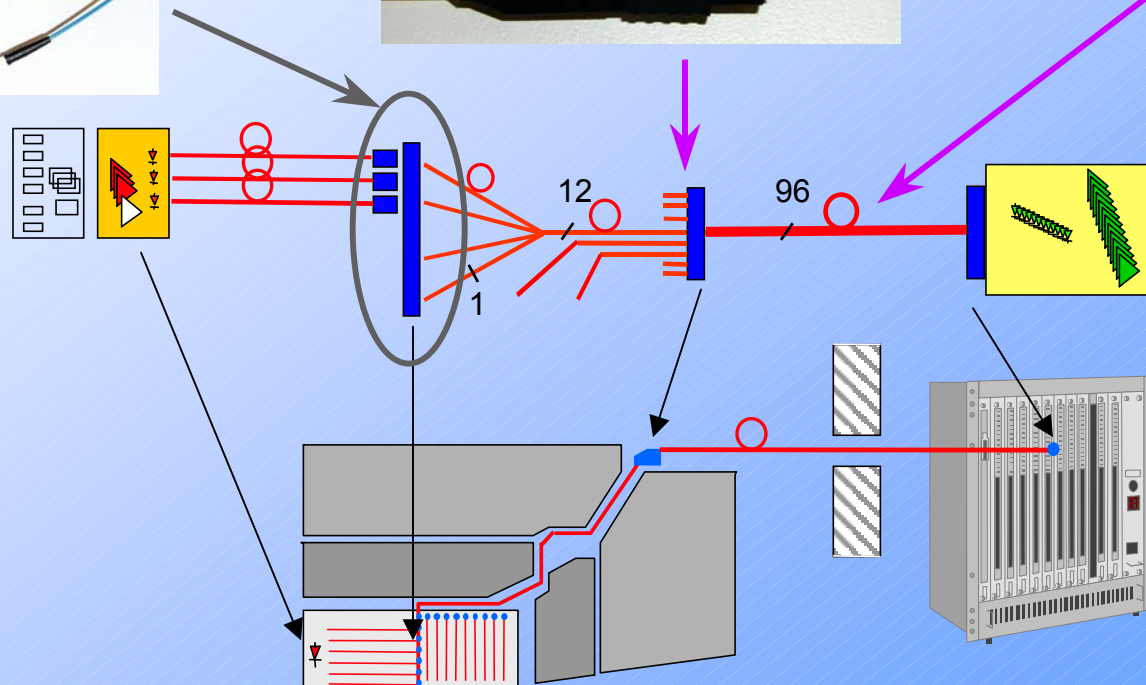
Single-mode Fibers



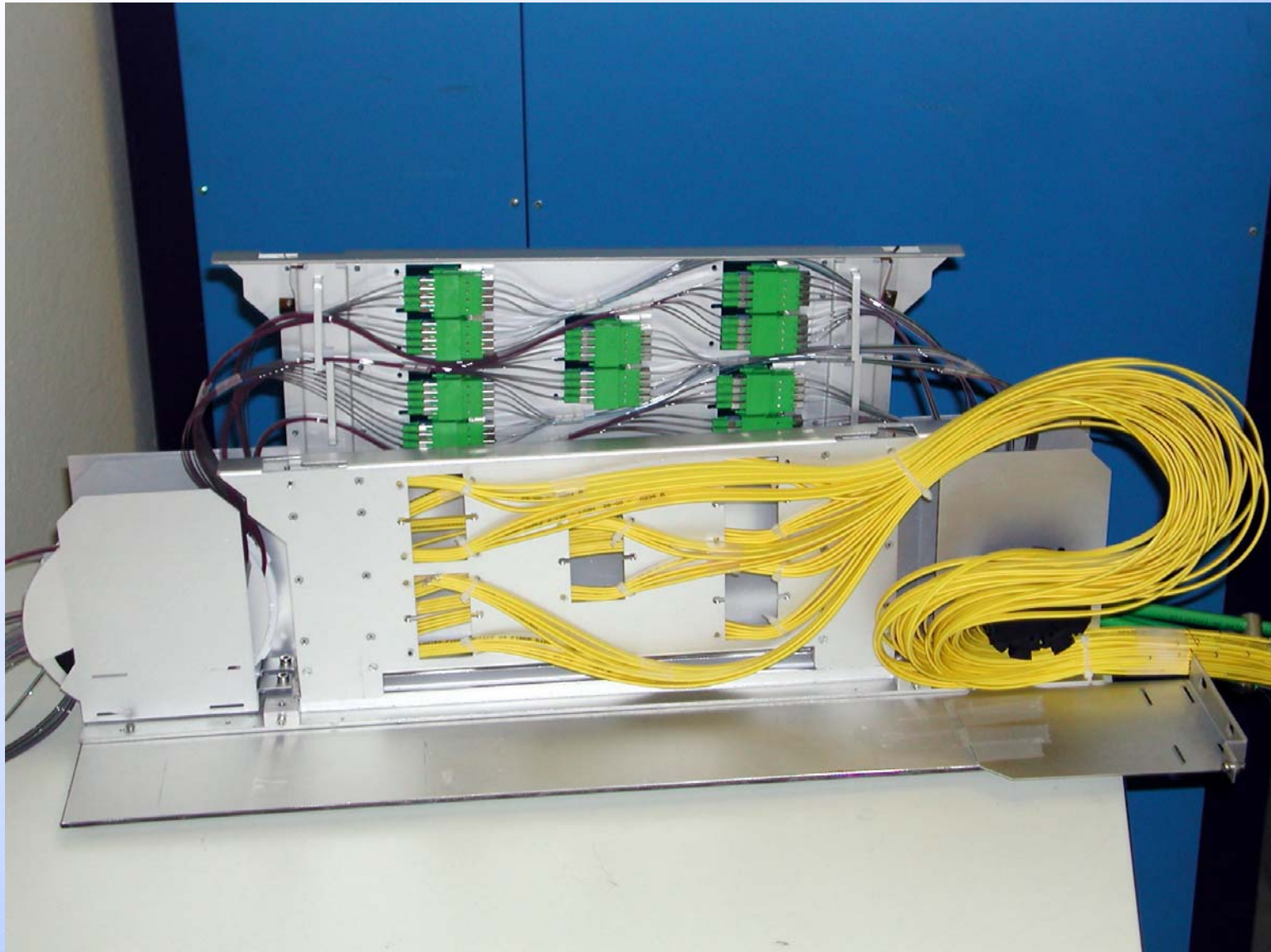
Ruggedized 12-fibers Ribbon



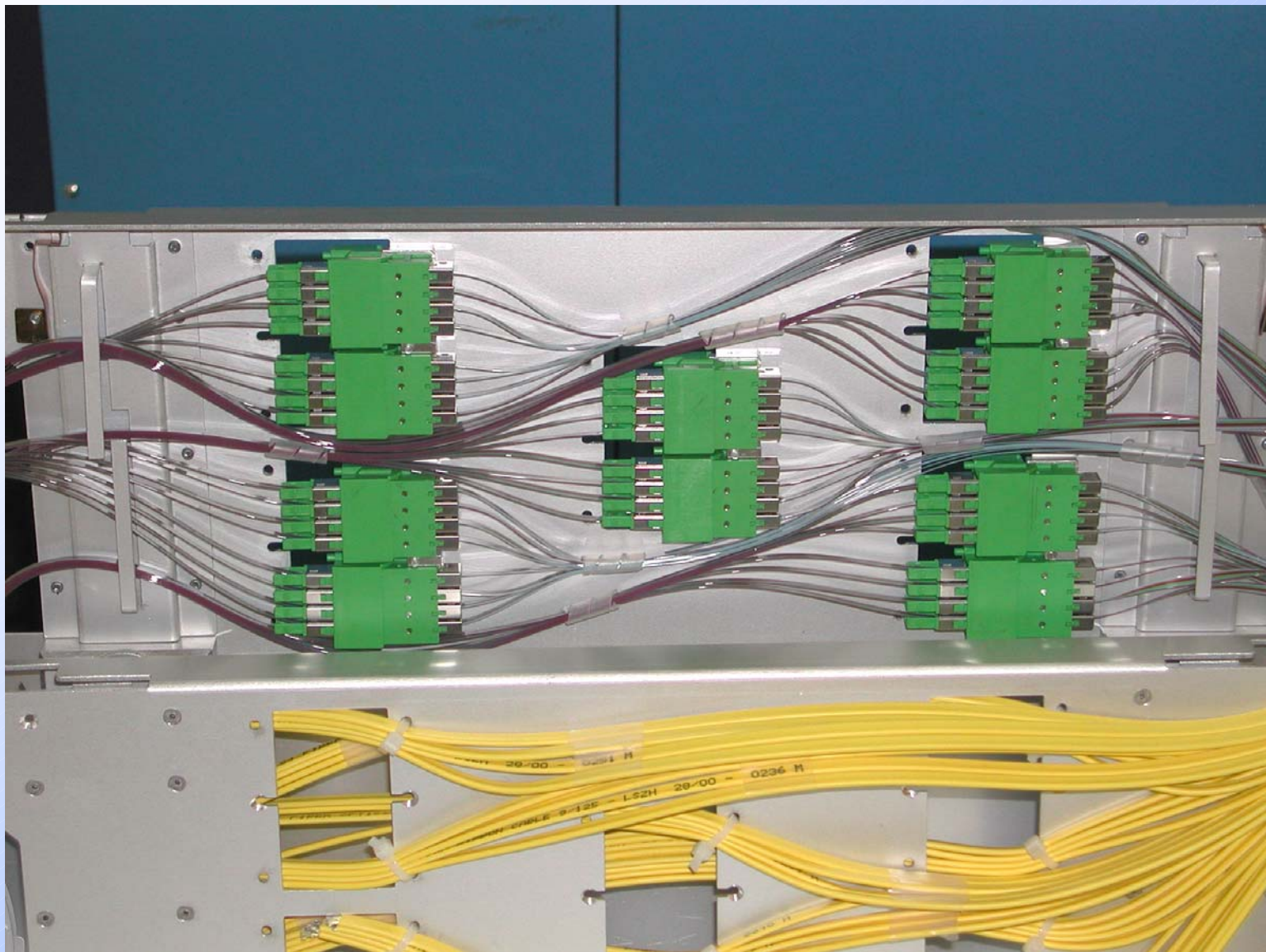
8x12-way Cable



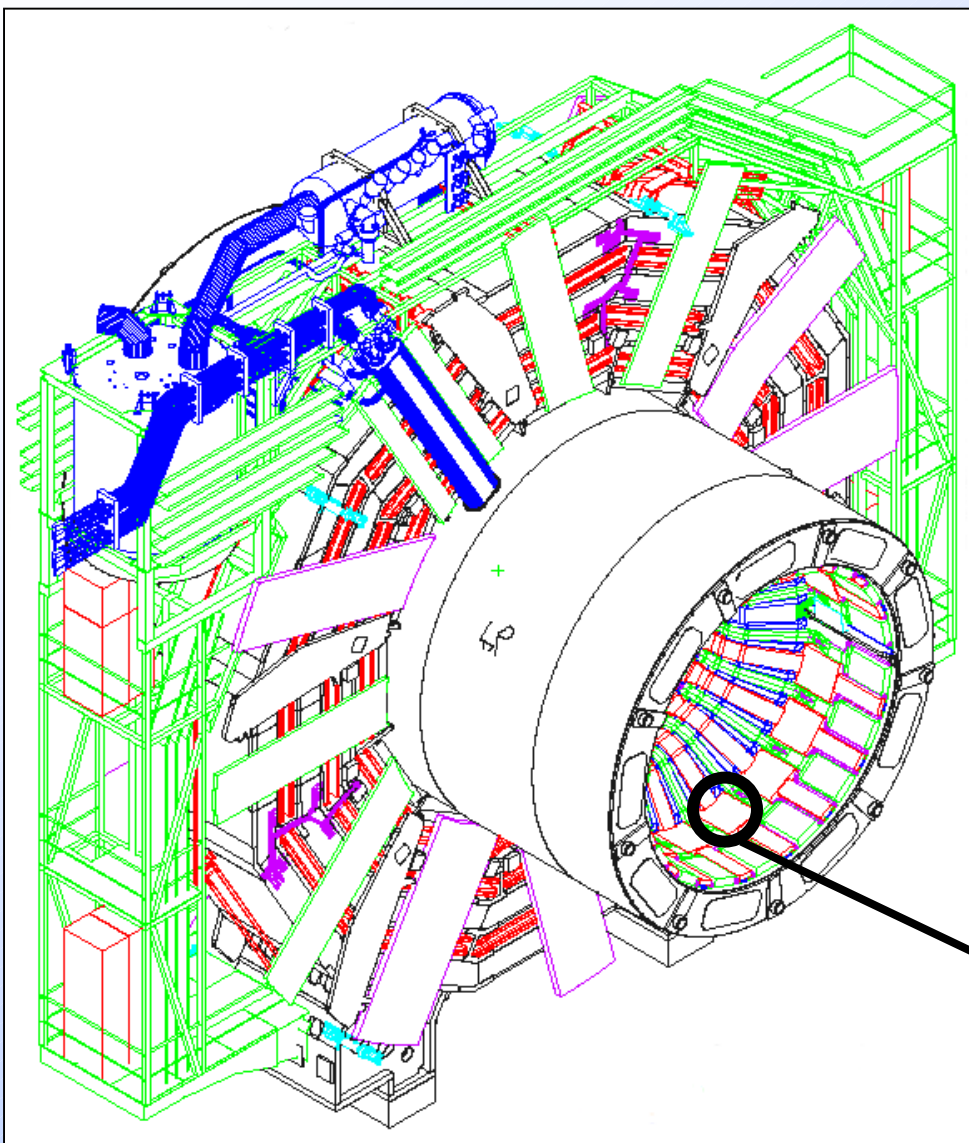
Inline PatchPanel



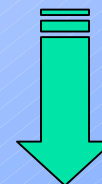
Inline PatchPanel - Detail



Environment



- 18 Total Sectors
- 2 Sectors reserved for mechanical support

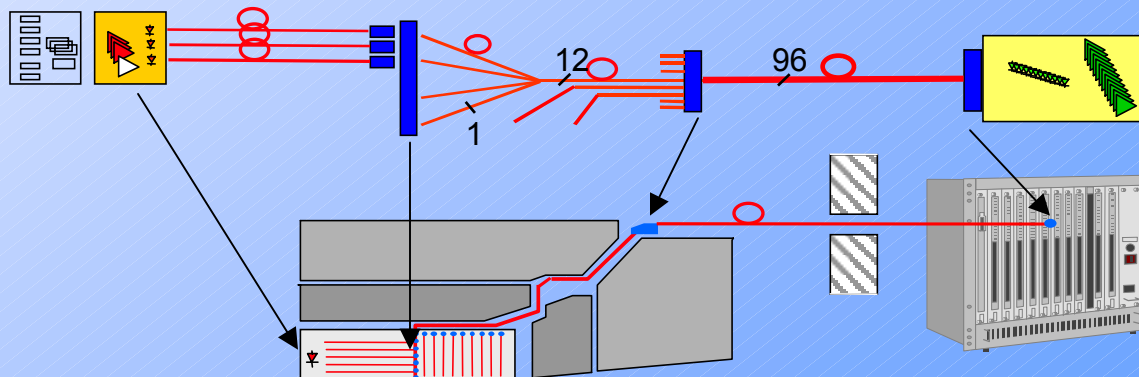


- 16 Available Sectors

Inline PatchPanel

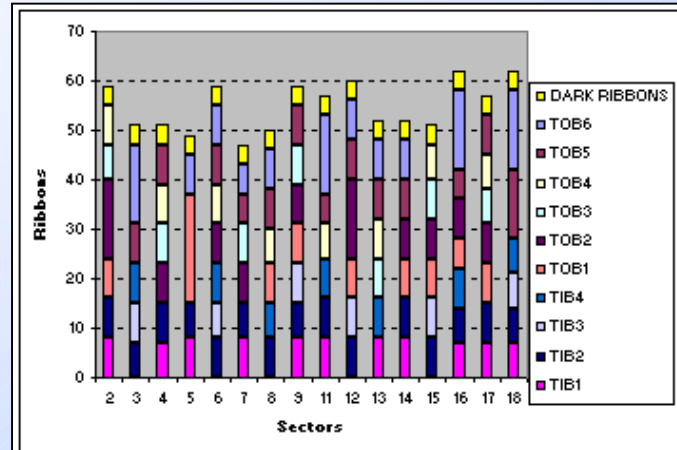
Constraints Overview

- MECHANICAL
- 2 Sectors already busy
 - Fixed Size of the Channels (max 40 ribbons/ch, 2 channels/sector)
 - Fixed Space for Inline P.P. (max 4 cassettes/sector)
- OPTICAL
- Granularity of Opto-Hybrid (2-3 fibers), Ribbons (12 fibers), Cables (8 ribbons) and FEDs (1 cable)
 - Modularity of Distributed P.P. (12 fibers/adaptor) and Inline P.P. (5x8 ribbons/cassette)
- INTEGRATION
- Integrate Read-out with Control Systems (and possibly Cooling)
 - Ease of Installation and Maintenance

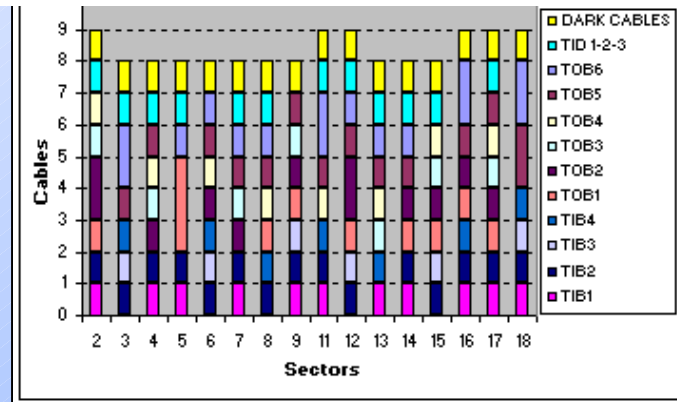


Mapping Front-End to FEDs

	Rods	APVs	Fibres / Rod	Fibres	Ribbons Needed / Layer
TOB6	74	36	18	1332	111
TOB5	66	36	18	1188	99
TOB4	60	48	12	720	60
TOB3	54	24	12	648	54
TOB2	48	48	24	1152	96
TOB1	42	48	24	1008	84
TIB4	54	24	12	648	54
TIB3	46	24	12	552	46
TIB2	38	72	36	1368	114
TIB1	28	72	36	1008	84



Ribbons & Cables Distributed evenly over sectors



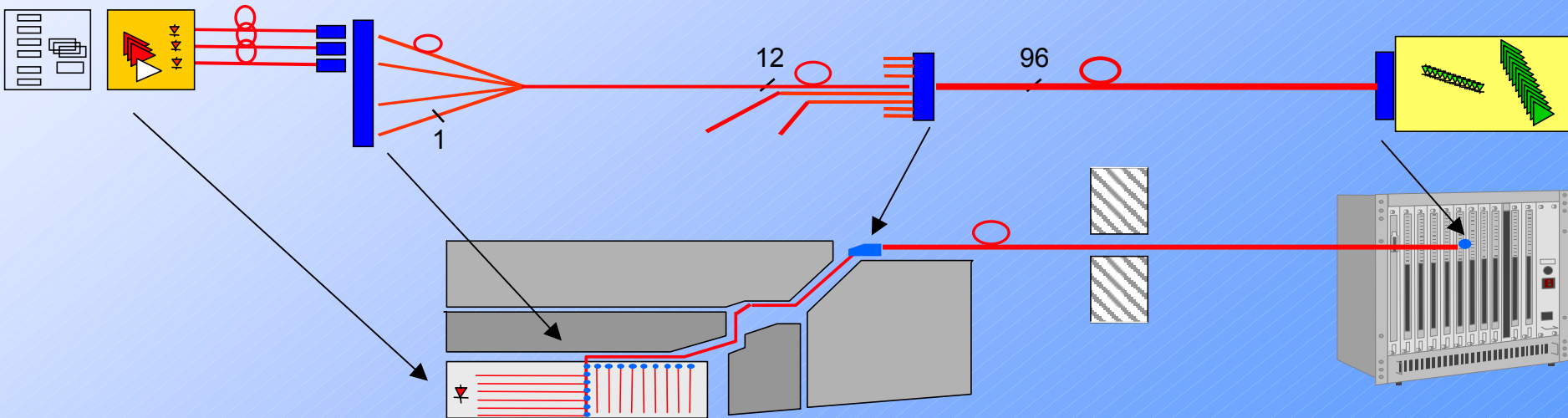
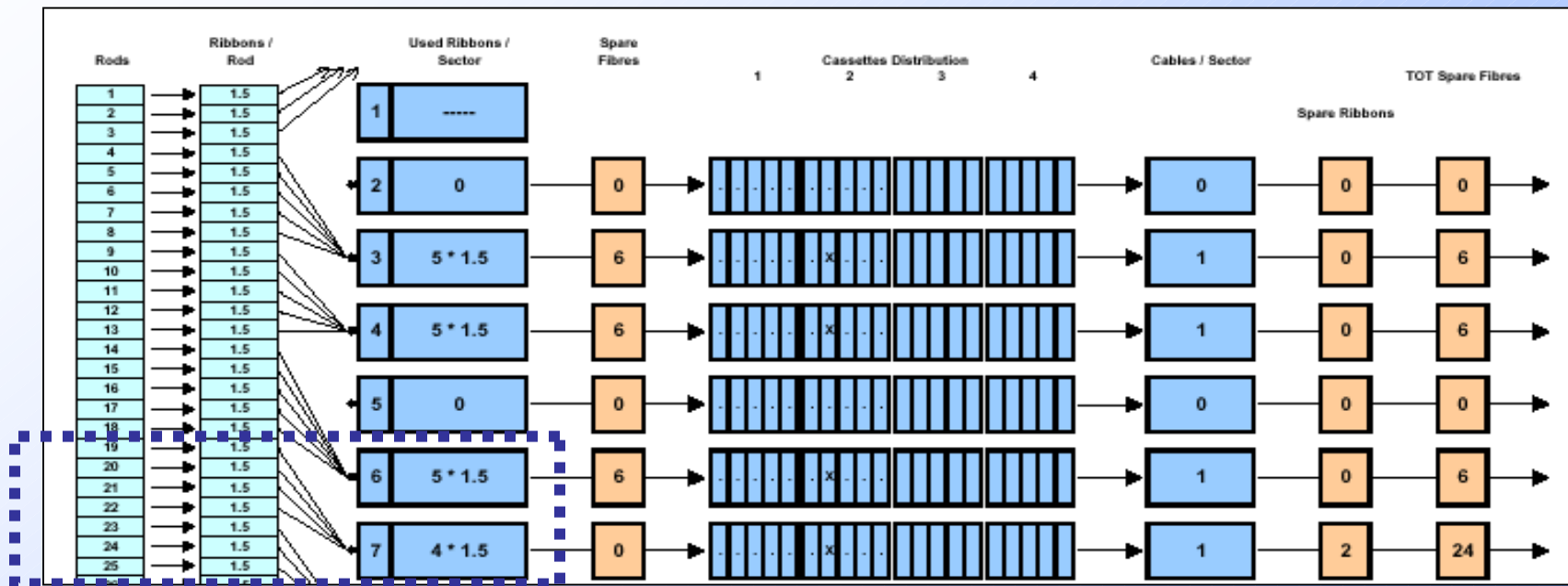
Layout data



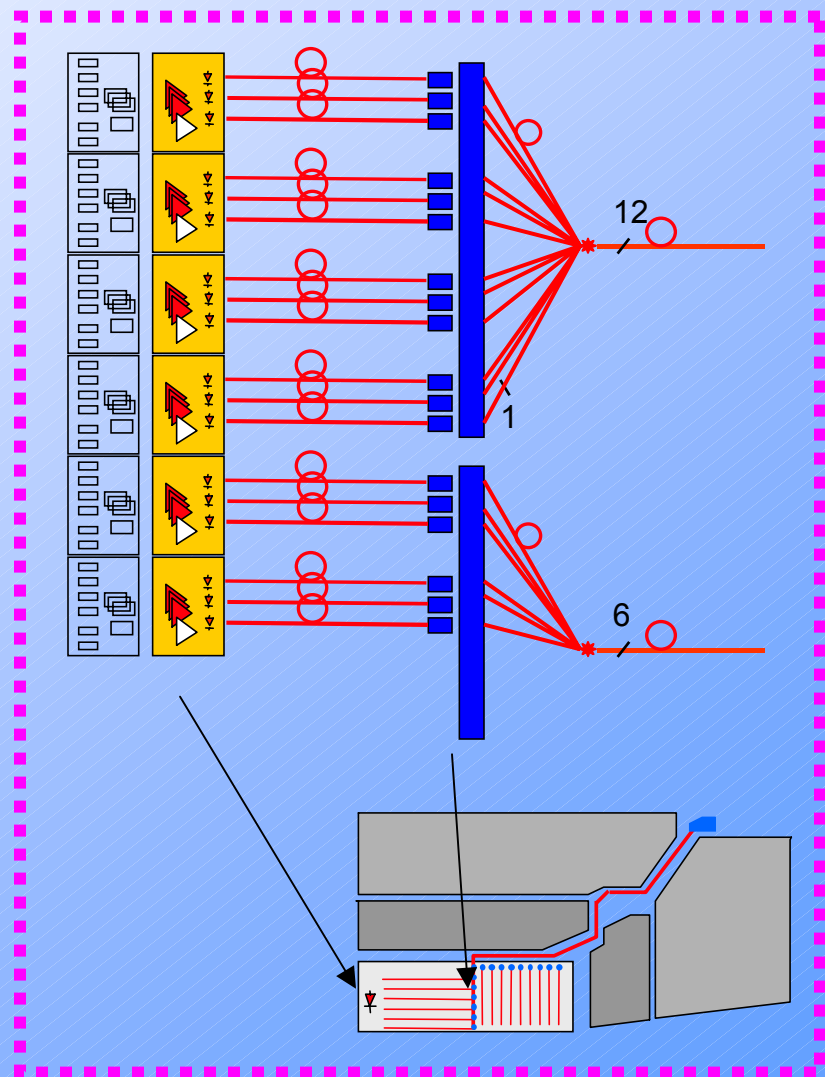
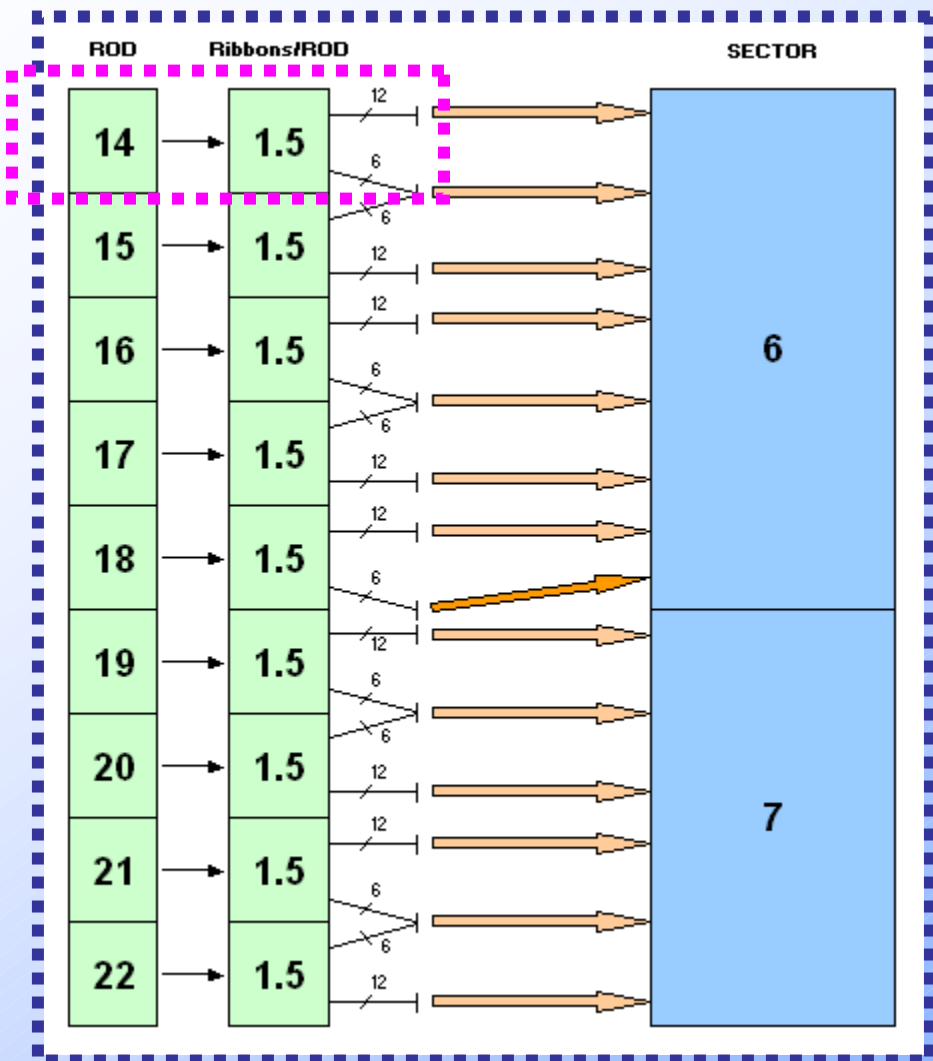
FED requirements

	FEDs					
	Full FED			Non-Full FED		
	#	Ribbons / FED	Spare fibres	#	Ribbons / FED	Spare fibres
TOB6	14	8	84	1	6	24
TOB5	10	8	60	4	6	96
TOB4	4	8	0	4	7	48
TOB3	5	8	0	2	7	24
TOB2	12	8	0	0	0	0
TOB1	9	8	0	2	6	48
TIB4	5	8	0	2	7	24
TIB3	4	8	0	2	7	24
TIB2	9	8	0	6	7	72
TIB1	7	8	6	4	7	48
	91		198	27		408

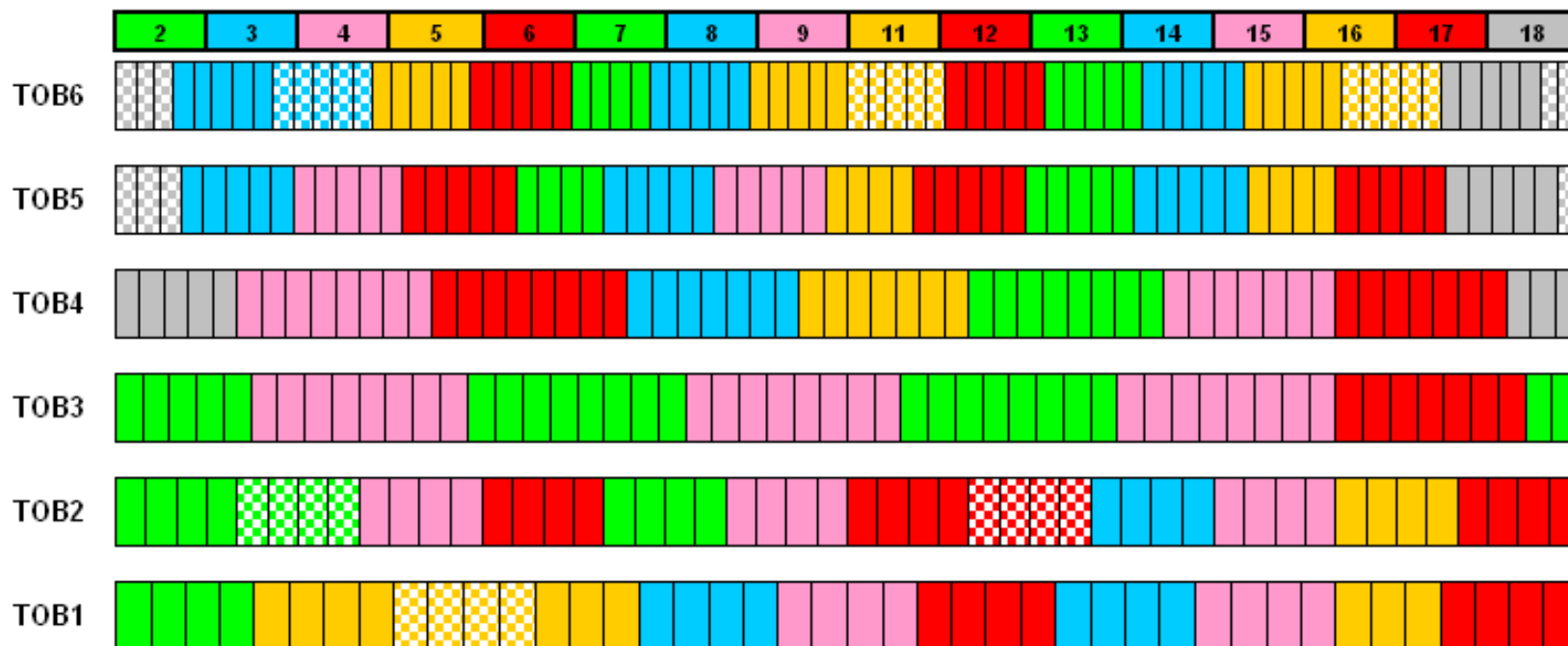
Barrel Grouping Scheme (TOB5)



Merging Fibers - Details (TOB5)



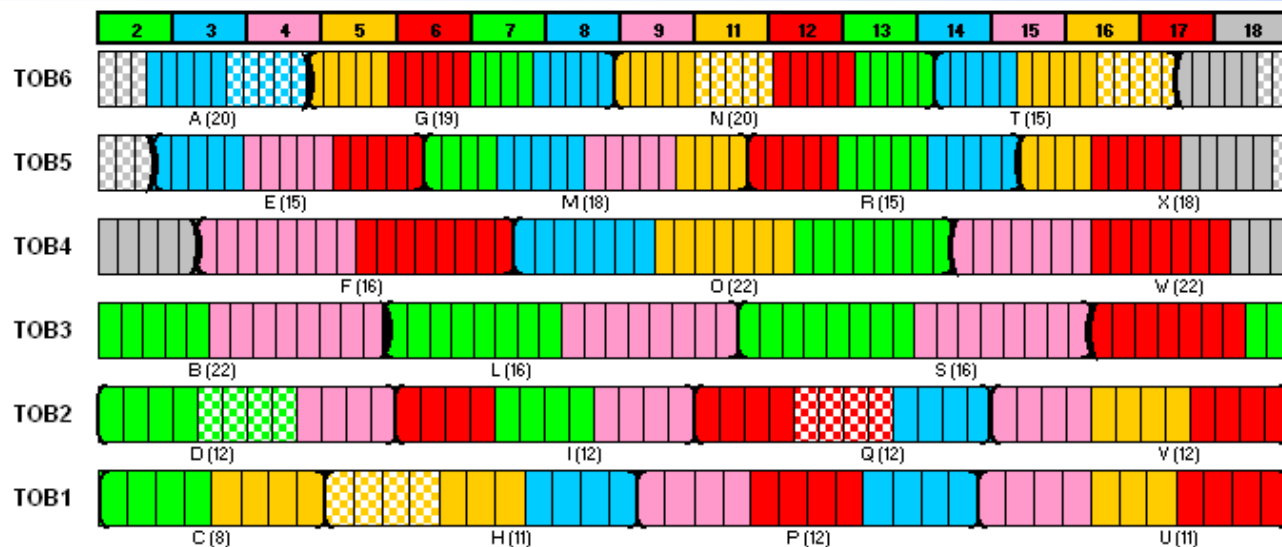
TOB Read-out Grouping



RODs / SECTOR

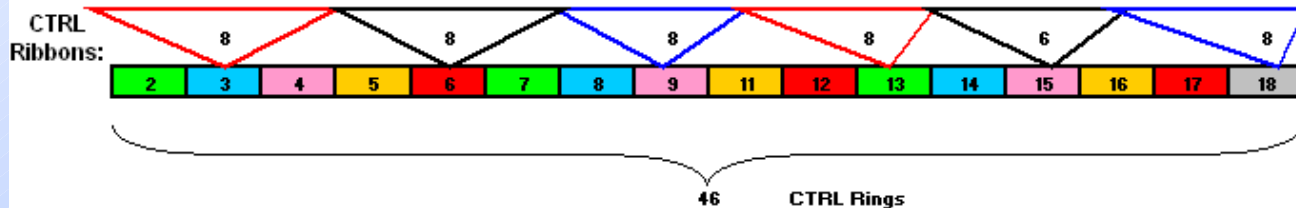
	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17	18
TOB6		5 + 5		5	5	4	5		5 + 5	5	5	5		5 + 5		5 + 5
TOB5		5	5		5	4	5	5	4	5	5	5		4	5	5 + 4
TOB4			8		8		7		7		8		7		7	8
TOB3	7		8			8		8			8		8		7	
TOB2	4 + 4		4		4	4		4		4 + 4		4	4	4	4	
TOB1	4			4 + 4 + 3			4	4		4		4	4	3	4	

TOB Control Grouping



RODs / SECTOR

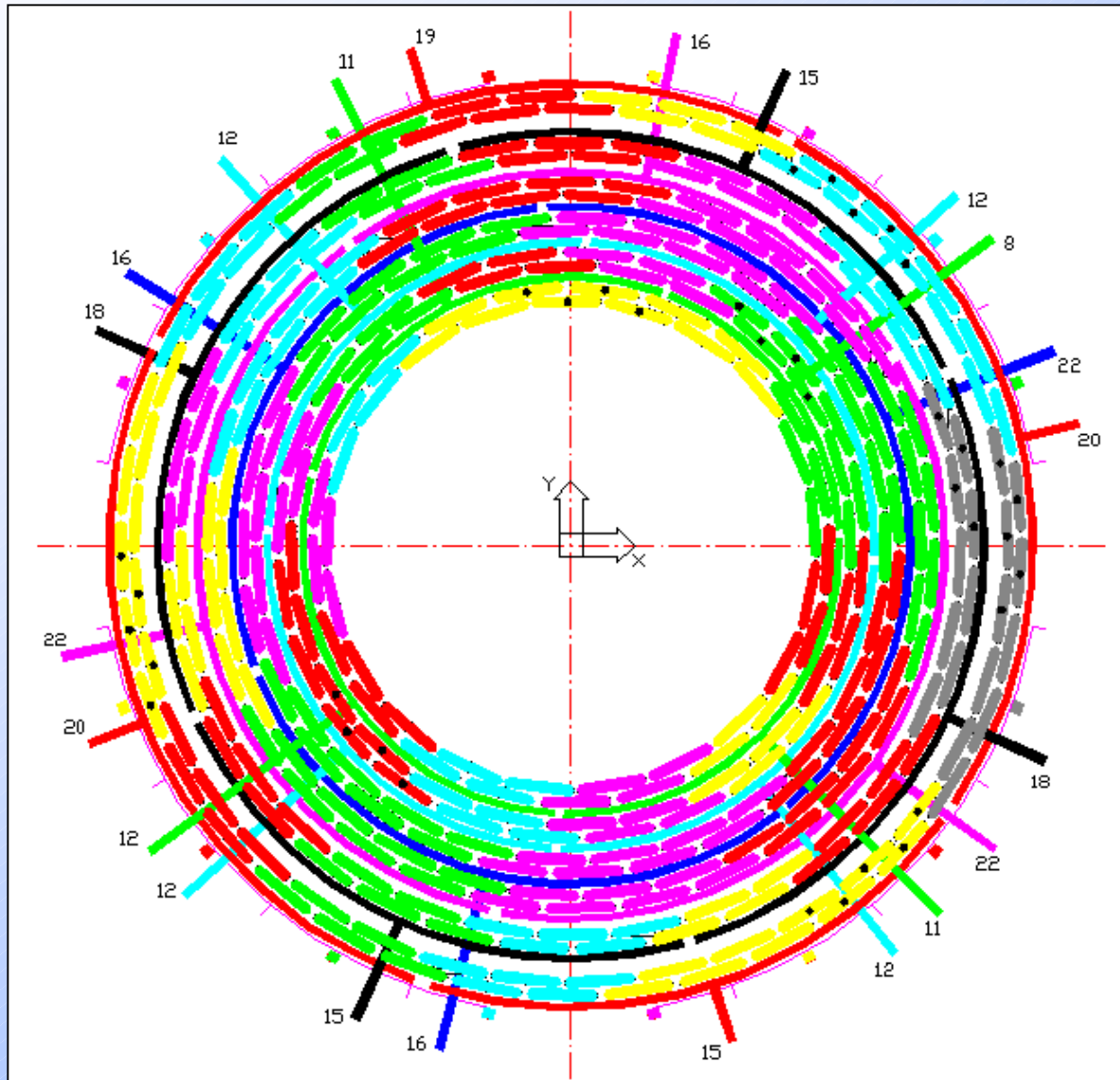
	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17	18
TOB6		5+5		5	5	4	5		5+5	5	5	5		5+5		5+5
TOB5		5	5		5	4	5	5	4	5	5	5		4	5	5+4
TOB4			8		8		7		7		8		7		7	8
TOB3	7		8			8		8			8		8		7	
TOB2	4+4		4		4	4		4		4+4		4	4	4	4	
TOB1	4			4+4+3			4	4		4		4	4	3	4	



CTRL Rings	Bad FEDs	ng Group	manifolds lenght	CTRL groups size
8	0	4	15 - 20	5 - 10
8	0	4	15 - 18	5 - 10
8	0	3	16 - 22	7 - 8
7	0	3	16 - 22	7 - 8
8	0	4	12	4 - 8
7	0	4	8 - 12	4 - 8

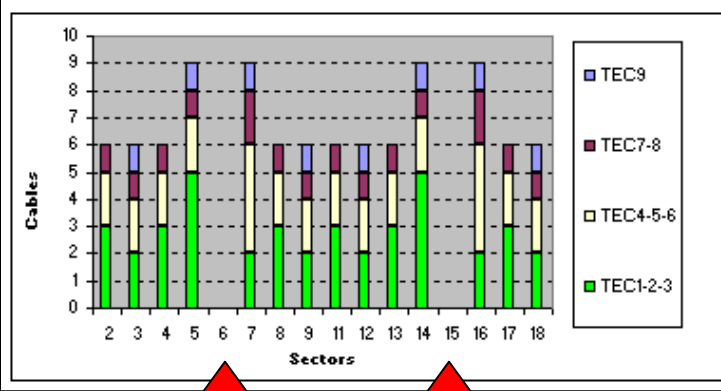
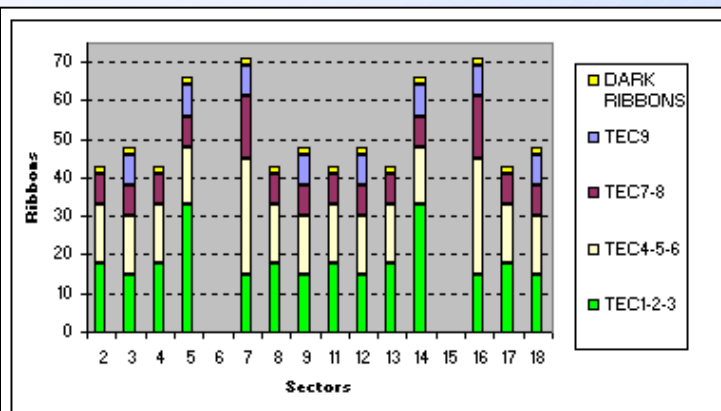
Y	Y
0	22

Read-out, Control & Cooling Grouping



Mapping TEC Front-End to FEDs

	Rings / Petal	Fibres / Fpetal	Fibres / Bpetal	Ribbons / FRONT petal	Ribbons / BACK petal
TEC9	4	38	40	4	4
TEC8	5	44	44	4	4
TEC7	5	44	44	4	4
TEC6	6	56	50	5	5
TEC5	6	56	50	5	5
TEC4	6	56	50	5	5
TEC3	7	68	56	6	5
TEC2	7	68	56	6	5
TEC1	7	68	56	6	5

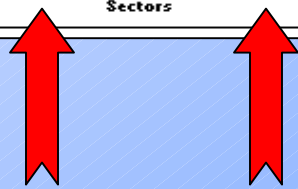


Layout data



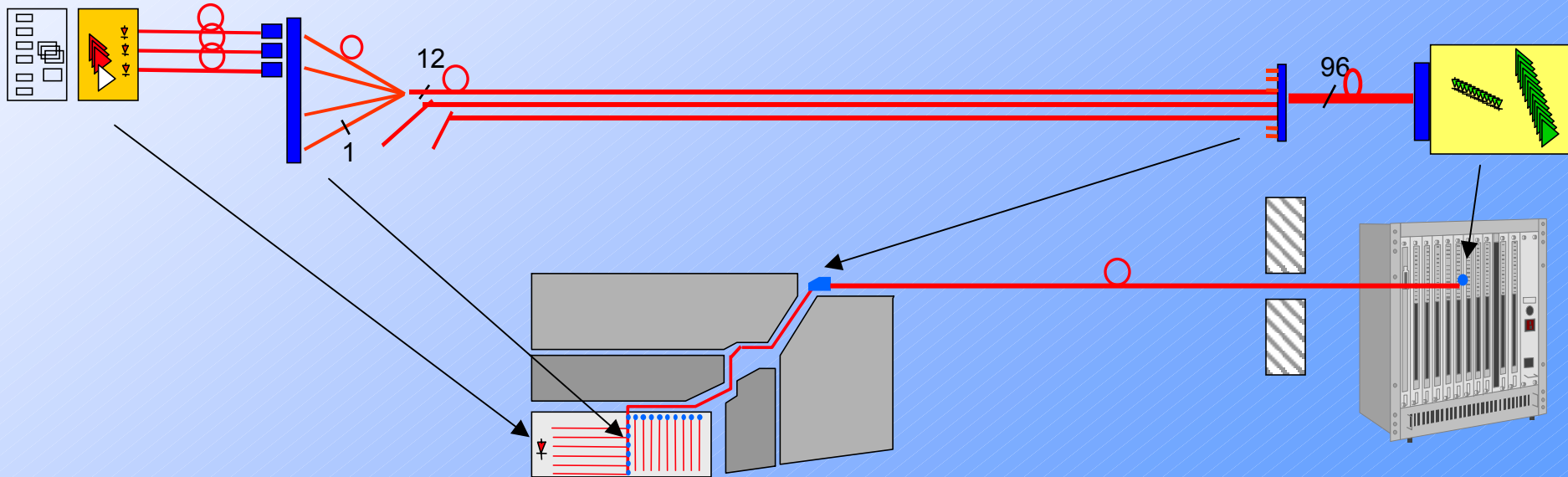
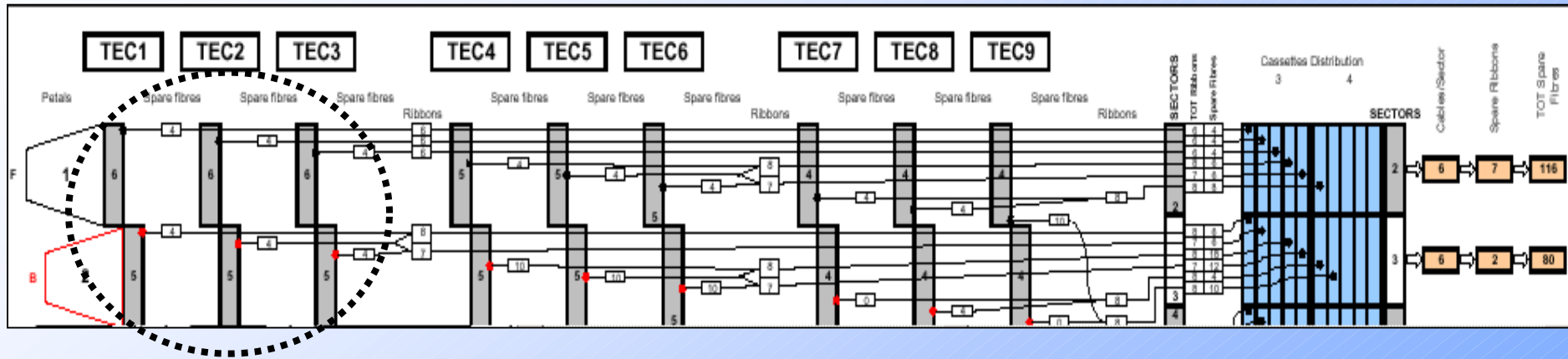
FED requirements

PIXEL Channels

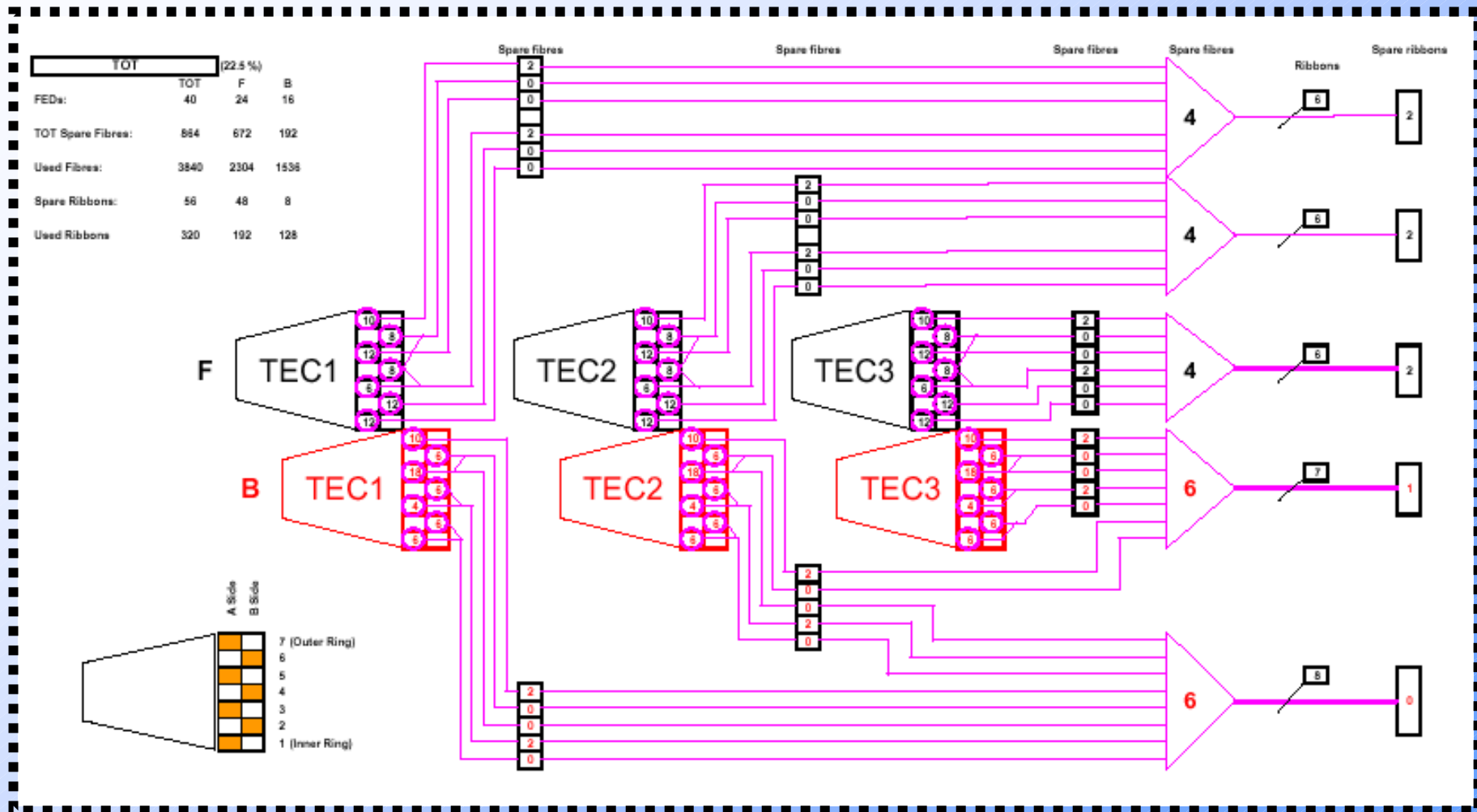


	FEDs					
	Full FED			Non-Full FED		
	#	Ribbons / FED	Spare fibres	#	Ribbons / FED	Spare fibres
TEC9	8	8	144	0	0	0
TEC8	16	8	128	0	0	0
TEC7						
TEC6	16	8	336	16	7	192
TEC5						
TEC4						
TEC3						
TEC2	8	8	192	32	24x6 + 8x7	672
TEC1						
	48		800	48		864

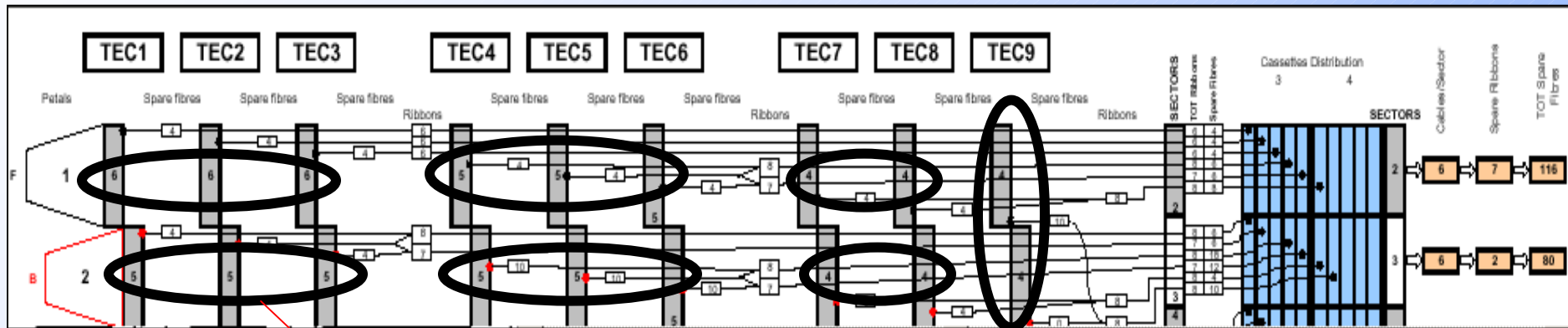
TEC Grouping Scheme



TEC Grouping Details



TEC Control



Control Loop

➡ 8 x 7 = 56 Control Ribbons = 7 Control Cables

Summary

- ✓ Uniform Distribution of the Cables and Ribbons across Sectors
- ✓ High Level Mapping defined for TOB (rod to FED) & TEC (petal to FED)
- ✓ Grouping defined for TOB and TEC
- ✓ Cabling Efficiency: 94% for TOB, 83% for TEC
- ✓ Perfect Overlap with Control System (TOB + TEC) and Cooling (TOB)
- ✓ Dark Cables Available

Future Work:

- TIB and TID Grouping
- FED Allocation
- Estimate Cable Length
- Low Level Mapping (module to FED-channel)
- Connectivity DataBASE
- Publication of Grouping Table to the Web