

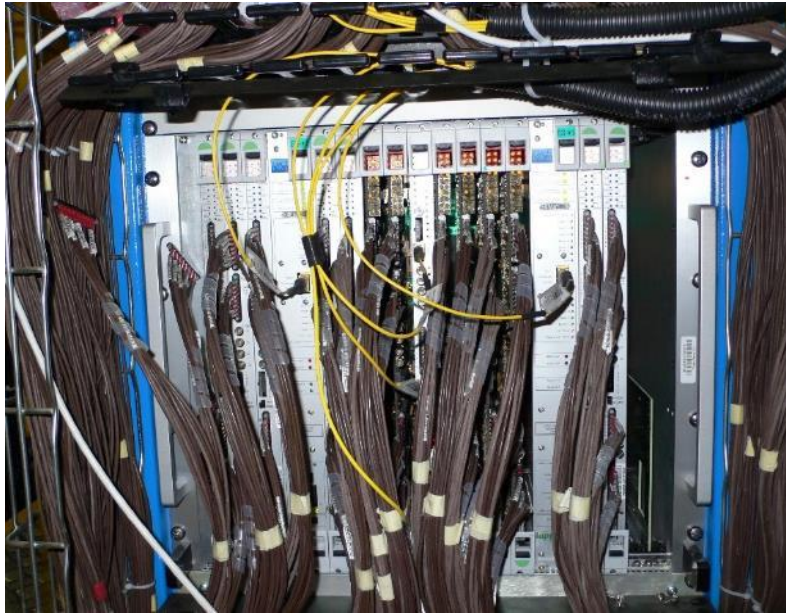


Infrastructure for LHCb Upgrade workshop: CALO electronics & SPD/Lead/PS dismantling

20 February 2015

Pascal Perret
LPC Clermont

XCAL Electronics Dismantling



◆ New cables will have to be installed in the cable chains:

- Optical fibres

- ◆ ECAL & HCAL electronics have to be dismantled to be replaced by the upgraded electronics
 - Signal cables and connectors will have to be well protected
 - Re-gripping could be needed
 - LED system to be protected
 - Other cables are from Patch Panel to platforms:
 - Some are not needed anymore:
 - Optical fibres (2+1/CROC)
 - Specs (1/CROC)
 - L0 trigger cables
 - Some have to be kept
 - LV cables (Maraton)
 - DSS (CAN bus turbines)

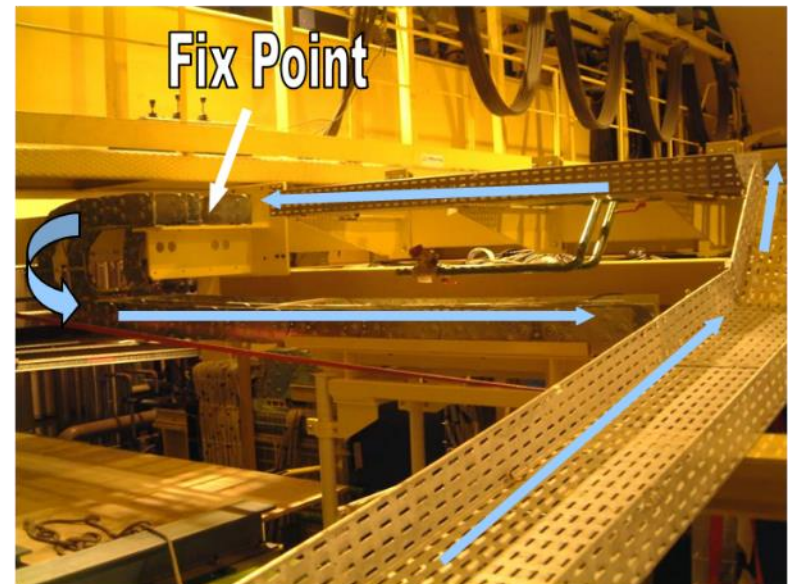
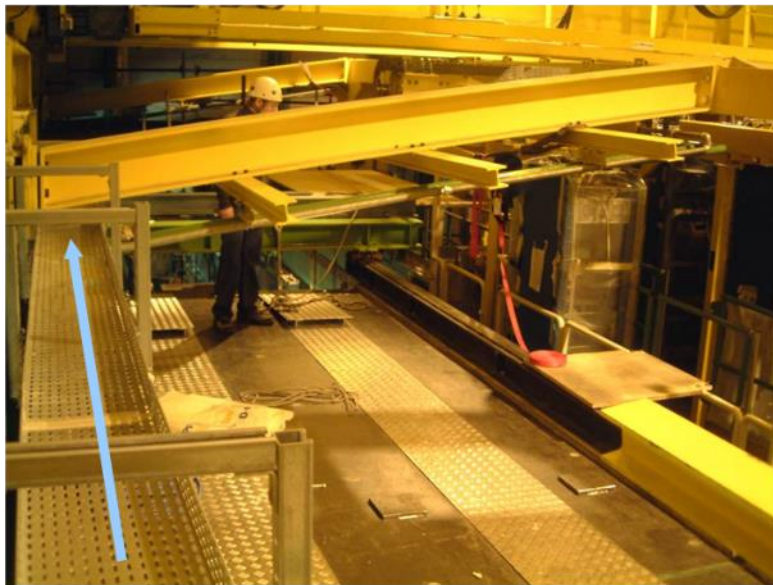
Cabling from platform to patch panel

March 2007

Cable Status from PP to Detector (C-Side)

- Cables were cut in length and stored on the Muon Filter (C-Side)
- Cable integration (copper cables) has started this week
- Flexible of water cooling will be order this week (delivery 2-3 weeks)

Optical cables on very critical path! Delivery unclear...

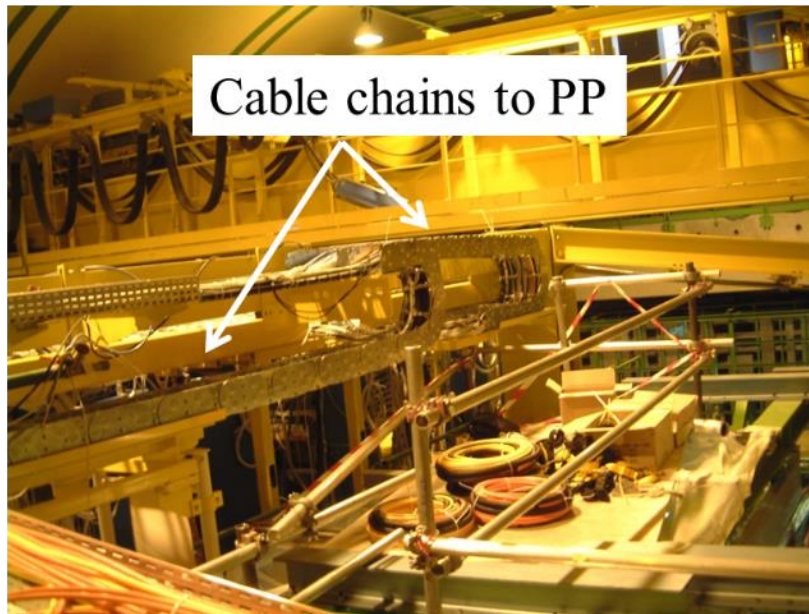


Cabling from platform to patch panel

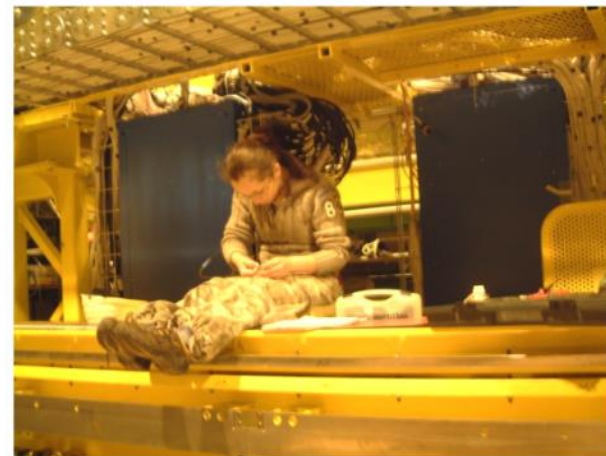
June 2007

Cabling from platform to patch panel (behind muons)

- C-side finished !
- A-side almost done...
 - Optical, Trigger + some of DSS to be installed
 - Labels on A+C side
 - Some Connectors



05/06/2007



4

Robert KRISTIC

~3 months for installation

Cabling from HCAL to ECAL platform

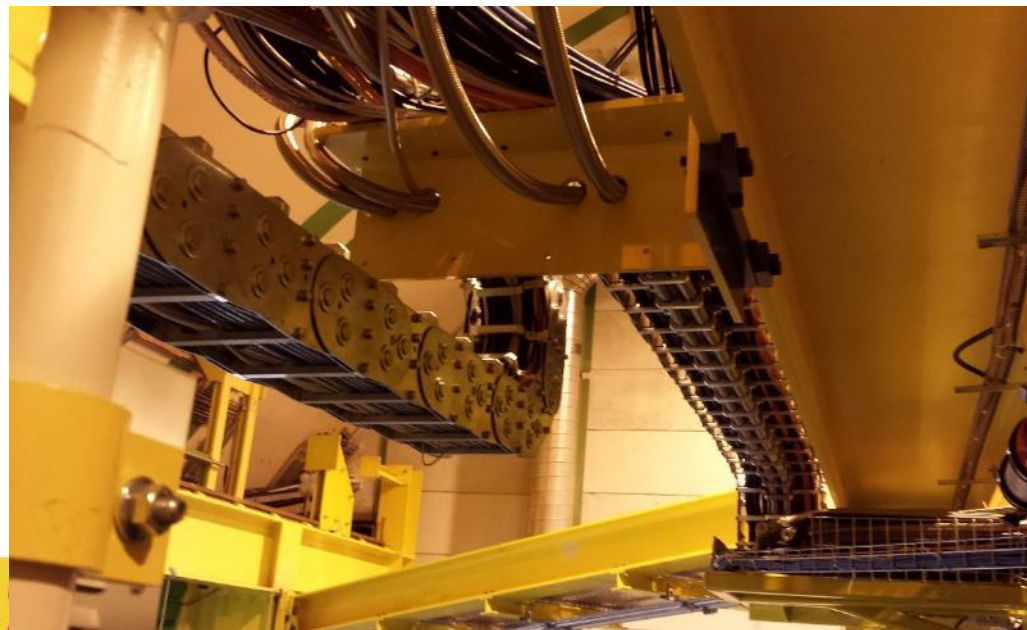


◆ Installation

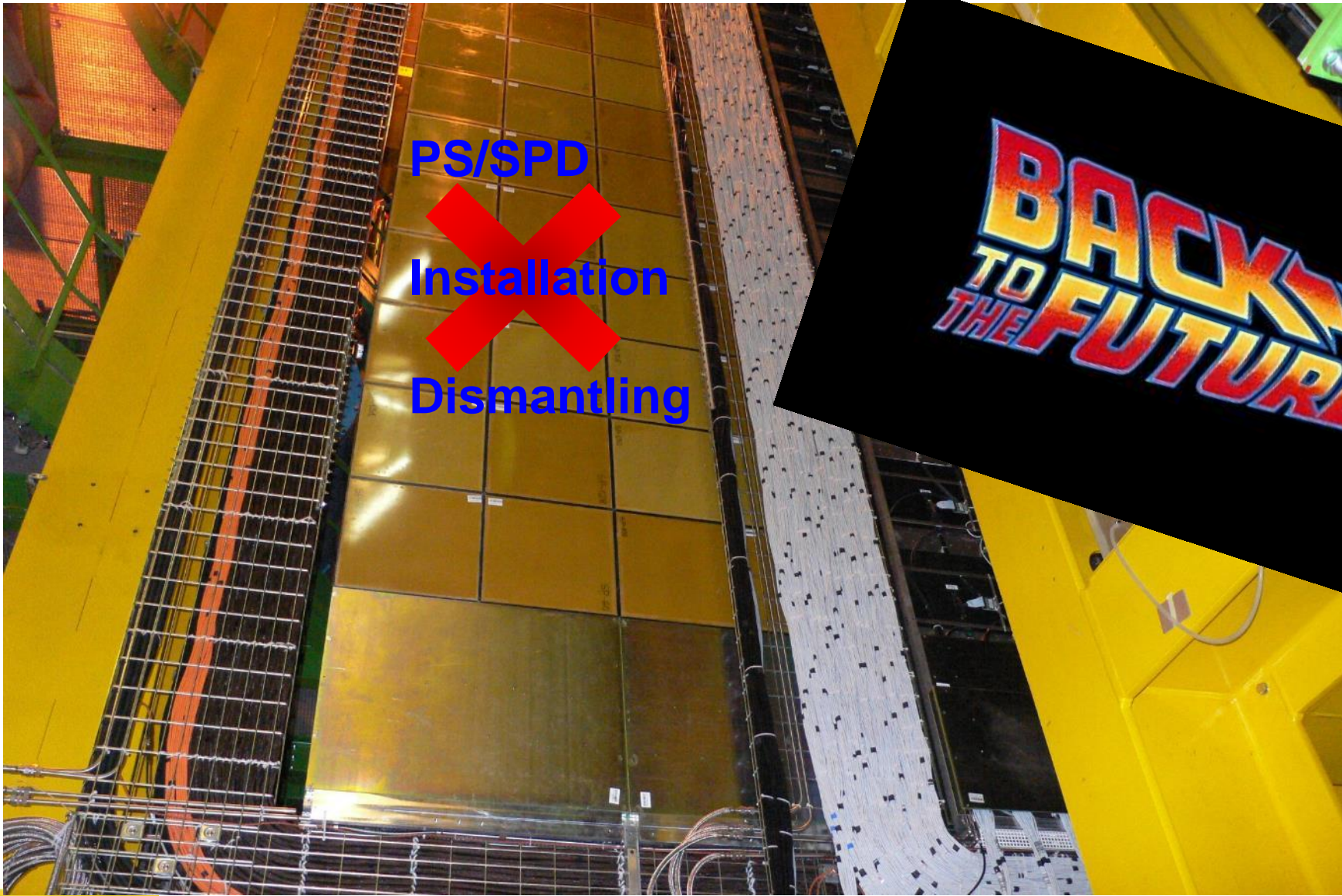
- ~3 months needed
- ~2 persons

◆ Dismantling:

- ~2months/2persons?
 - Cables to be kept or not will have to be sort out!
 - Some cables could be recycled (Maraton)
- Good access needed
 - CALO position
 - Platform above muon filters, nacelle, etc.
- Could be done (partially?) in parallel with electronics



SPD/Lead/PS Dismantling





PS/SPD
~~Installation~~
Dismantling



SPD/Lead/PS Dismantling

Installation

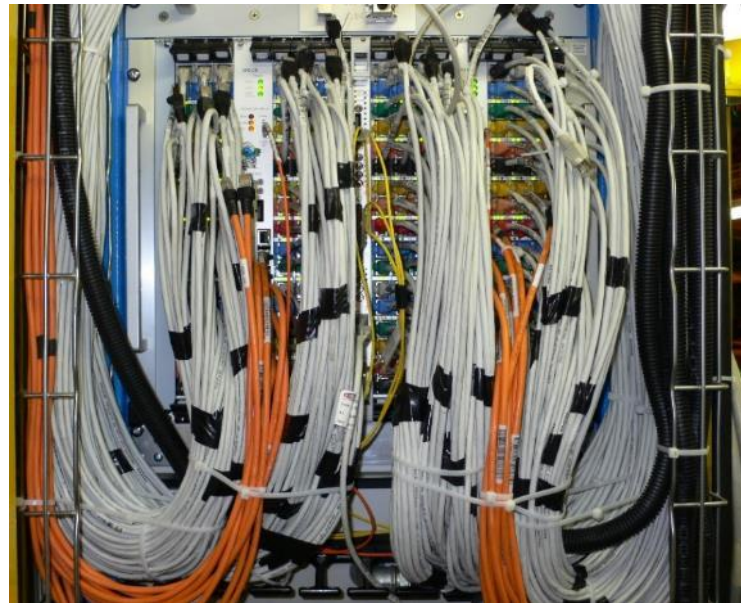


Lead	2 days
Super Modules	1 week
Boxes + cooling system	3 weeks
Preparation	~3 months
Cables PS top - bottom	7 weeks
Cables PS top - bottom	5 weeks
Cables SPD top – bottom	4 weeks
Cables SPD top – bottom	4 weeks
Electronics	~1 month

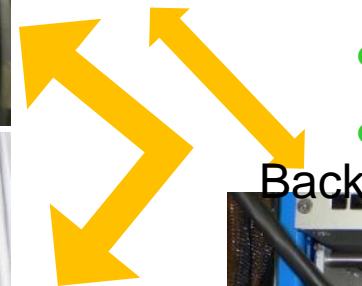
Dismantling

PS/SPD FE Electronics

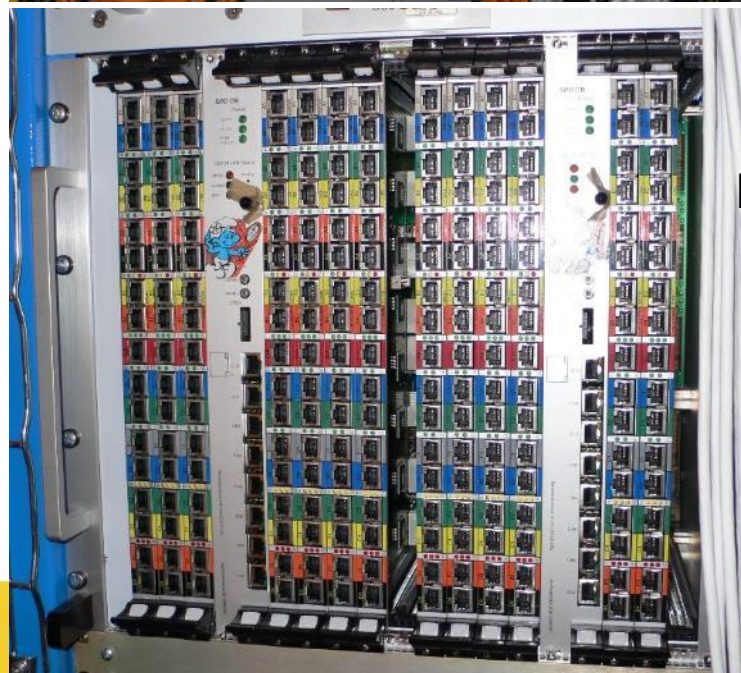
- ◆ On the calorimeter platform
- ◆ The easiest part!
 - 8 crates
 - 100 FEB
 - 1800 PS +116 SPD signal
 - + Trigger cables (bw racks)
 - 16 SPD CB: 144 cables
 - 8 CROC: optical fibres, SPECS



After Front



Before

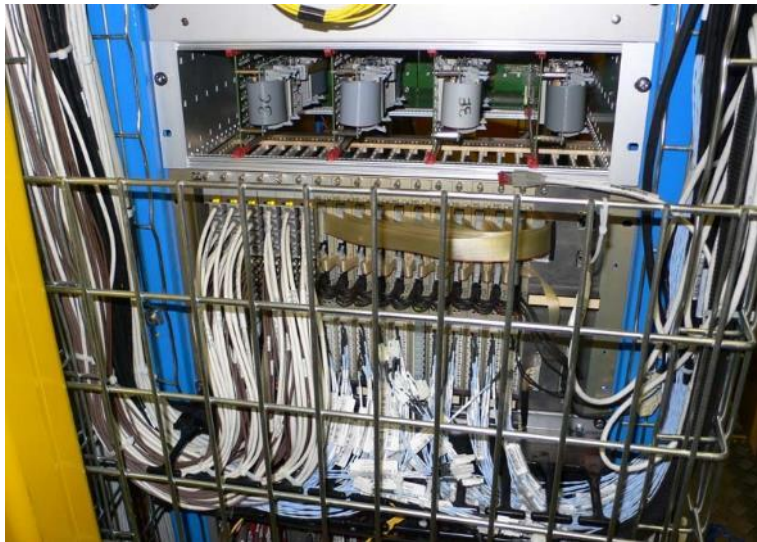


Pascal



Back

HV + LED monitoring system



- ◆ On the calorimeter platform
- ◆ The easiest part!
 - 2 crates PS temperature monitoring
 - 32 cables
 - 2 crates HV +LED
 - 60(x4) HV cables
 - LED
 - Trigger cables
 - Power supply cables
- ◆ Roof ECAL platform
 - DSS
 - Thermoswitches: 32 cables
 - Water leak detection: 8 cables

PS/SPD VFE LV system



- ◆ On the calorimeter platform
- ◆ The easiest part!:

- ◆ PS

- 100 cables + spares
 - Rack L3B03 & L3B13

- ◆ SPD

- 2x(16 cables + 2 spares)
 - Roof of ECAL platform



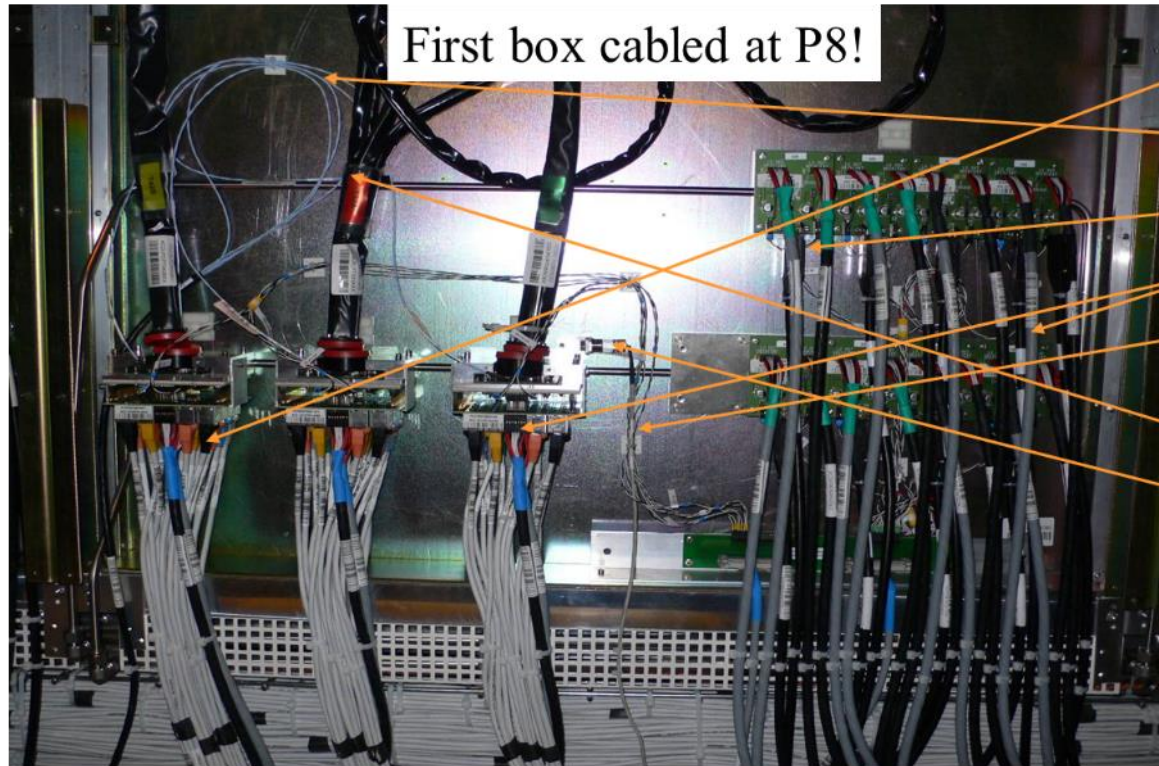
PS VFE

March 2007

➤ **PS VFE Installation started on Monday !**

PS VFE installed after cabling => cable connections + test with FE board

- **MAPMT blocks + REG + cables + optical bundles and μ -metal**
- **Procedure and training done at lab !**



8 cables types:

- signal
- HV
- LV (to ps)
- LV (REG - VFE)
- Temperature sensors (inside box)
- Temperature
- DSS: thermoswitch
- DSS: water sensor
- + LED monitoring

x16 boxes

LHCb week March 2007

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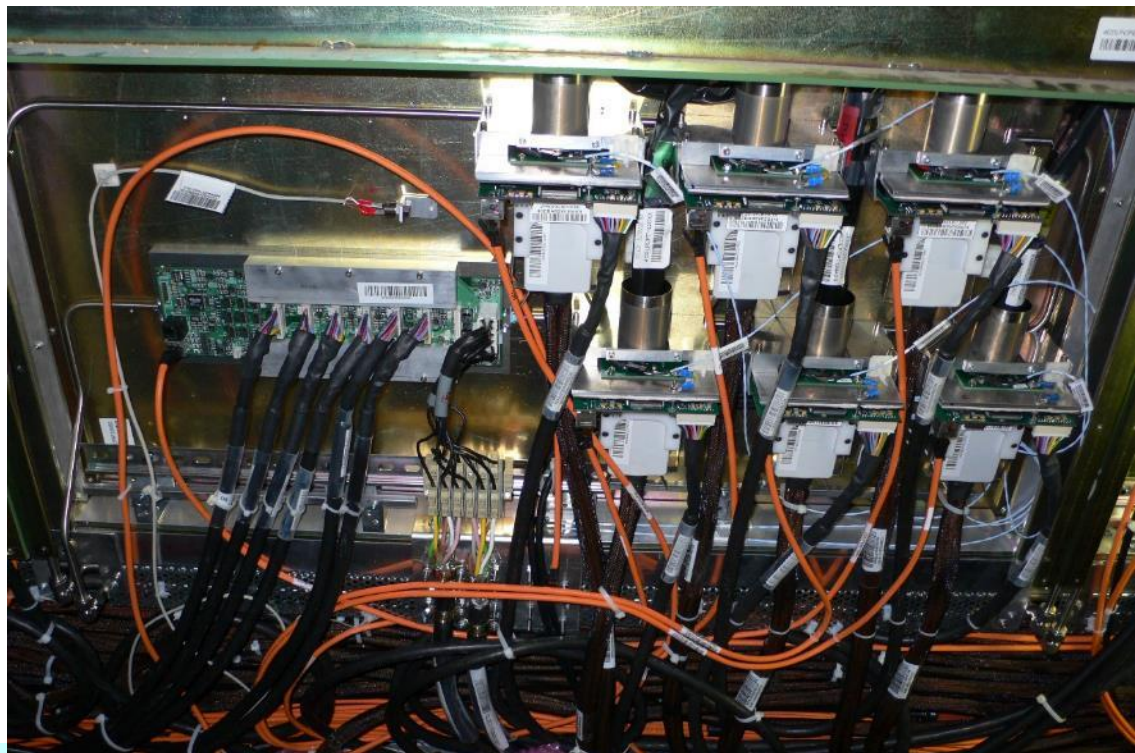
Andreas Schopper

PS/SPD VFE



◆ PS VFE box

◆ SPD VFE Box



Summary PS cables (x2)

RECAPITULATIF PS (1/2 DETECTOR)

Version 5 25/05/06

													Version 5 25/05/06								
		Elements		de	vers	ref cable	type de section	Dia ext	Section	R courb	Poids g/m	Longueur maxi	Qte /elem	nbre /elem	nbre SPARES	qte	Section	Poids			
SUPER MODULE TOTAL	boites PM hautes	Ensemble PMT	vfe	64 signal output	carte VFE	PL	Toron		17,1	230	171	204	27	3	27		81	18602,32	446,15		
				clock and reset	carte VFE	PL													0		0
				VFE LV power supply	carte VFE	INT	F 7221P002	circulaire	10	79	100	92			3	2	27		54	4241,15	14,90
			Sonde température	carte VFE	PL	F PV 28T		7,8	48	0	0			20	1	5		5	238,92	0,00	
			PMT base	HV power supply		PL	TK24-U	circulaire	7,2	41	45	48		20	1	7	1	8	325,72	7,68	
			set Regulator LV power supply	LV IN	regulator	PL	F 6214-P003	circulaire	9	64	50	165		20	1	27	3	30	1908,52	99,00	
				Sonde température	regulator	PL	F PV 28T		7,8	48	0	0		20	1	3		3	143,35	0,00	
				LV IN/OUT	regulator	INT	F 7221P002	circulaire	10	79	100	92		1	2	4		8	628,32	0,74	
				LV IN	regulator	boite	F 7221P002	circulaire	10	79	100	92		3	2	23		46	3612,83	12,70	
				LV OUT	regulator	boite	F 7221P002	circulaire	10	79	100	92		3	2	23		46	3612,83	12,70	
	cooling																				
	LED	SPLITTER	IN LV	splitter	PL	RJ11	circulaire	4	13	0	0		20	1	11		11	138,23	0,00		
			IN Trigger	splitter	PL	LEMO	circulaire	4	13	0	0		20	1	25		25	314,16	0,00		
			OUT	splitter	driver	RJ11	circulaire	4	13	0	0		8	8	38		304	3820,18	0,00		
		DRIVER	IN	driver	splitter	RJ11	circulaire	4	13	0	0							0	0	0	
	OUT		driver	module	CABLE PLAT												0	0	0		
	Total de cables vers la plate forme								section totale cables	21671,2		552,8					163	21671,22	552,83		
	Total de cables IN boîtes									3612,8								46	3612,83	12,70	
	Total de cables OUT boîtes									3612,8								46	3612,83	12,70	
	boites PM basses	Ensemble PMT	vfe	64 signal output	carte VFE	PL	Toron		17,1	230	171	204	27	3	23		69	15846,42	380,05		
clock and reset				carte VFE	PL													0		0	
VFE LV power supply				carte VFE	INT	F 7221P002	circulaire	10	79	100	92		3	2	23		46	3612,83	12,70		
Sonde température			carte VFE	PL	F PV 28T		7,8	48	0	0		30	1	5		5	238,92	0,00			
PMT base			HV power supply		PL	TK24-U	circulaire	7,2	41	45	48		30	1	7		7	285,01	10,08		
set Regulator LV power supply			LV IN	regulator	PL	F 6214-P003	circulaire	9	64	50	165		27	1	23	3	26	1654,05	115,83		
			Sonde température	regulator	PL	F PV 28T		7,8	48	0	0		30	1	3		3	143,35	0,00		
			LV IN/OUT	regulator	INT	F 7221P002	circulaire	10	79	100	92		1	2	3		6	471,24	0,55		
			LV IN	regulator	boite	F 7221P002	circulaire	10	79	100	92		3	2	20		40	3141,59	11,04		
			LV OUT	regulator	boite	F 7221P002	circulaire	10	79	100	92		3	2	20		40	3141,59	11,04		
cooling																					
Total de cables vers la plate forme								section totale cables	18167,7		506,0					110	18167,74	505,96			
Total de cables IN boîtes									3141,6							40	3141,59	11,04			
Total de cables OUT boîtes									3141,6							40	3141,59	11,04			
TOTAL																					
		Elements		de	vers	ref cable	type de section	Dia ext	Section	xeffi 3,5	Poids kg	Longueur maxi	Qte /elem	nbre /elem							
Total de cables vers la plate forme								section totale cables	39839,0	139436,4	1058,8						273				
Total de cables IN boîtes									6754,4	23640,5	23,74						86				
Total de cables OUT boîtes									6754,4	23640,5	23,74						86				

Summary SPD cables (x2)

RECAPITULATIF SPD (1/2 DETECTOR)

Version 5 25/05/06

													Version 5 25/05/06					
	Elements	de	vers	ref cable	type de section	Dia ext	Section	R courb	Poids g/m	L Max	Qte /elem	nbre /elem	nbre SPARES	qte	Section	Poids		
boîtes PM hautes	Ensemble PMT	vfe	64 signal output ser	carte VFE	PL	N100.371	circulaire	20	314	150	250	20	1	27	4	31	9738,94	155,00
			clock and reset	carte VFE	PL	N100.451	circulaire	6,1	29	50	50	20	1	27	4	31	905,96	31
			VFE LV power supply	carte VFE	INT	Twisted shield	circulaire	13,5	143	135		3,5	1	27	0	27	3864,75	0,00
			-	-	-	-			0			3	0	27	0	0		
		PMT base	HV power supply		PL	TK24-U	circulaire	7,2	41	45	48	20	1	7	1	8	325,72	7,68
		set Regulator LV power supply	LV IN	regulator	PL	Twisted shield		20	314	200		22	2	4	1	9	2827,43	0,00
			Regulator control	regulator	PL	RJ	circulaire	6	28			20	1	4	0	4	113,10	0,00
			LV IN/OUT	regulator	INT	Twisted shield		13,5	143			2,5	1	4	0	4	572,56	0,00
			LV IN	regulator	boite	Twisted shield		13,5	143			3,5	1	22	0	22	3149,05	0,00
			LV OUT	regulator	boite	Twisted shield		13,5	143			3,5	1	22	0	22	3149,05	0,00
	cooling																	
	LED	SPLITTER	IN LV	splitter	PL	RJ11	circulaire	4	13	0	0	20	1	11		11	138,23	0,00
			IN Trigger	splitter	PL	LEMO	circulaire	4	13	0	0	20	1	25		25	314,16	0,00
			OUT	splitter	driver	RJ11	circulaire	4	13	0	0	8	8	38		304	3820,18	0,00
		DRIVER	IN	driver	splitter	RJ11	circulaire	4	13	0	0					0	0	0
		OUT	driver	module	CABLE PLAT										0	0	0	
	Total de cables vers la plate forme						section totale cables	14363,5		193,7					119	14363,54	193,68	
	Total de cables IN boîtes							3149,1							22	3149,05	0,00	
	Total de cables OUT boîtes							3149,1							22	3149,05	0,00	
	boîtes PM basses	Ensemble PMT	vfe	64 signal output ser	carte VFE	PL	N100.371	circulaire	20	314	150	250	28	1	23	4	27	8482,30
clock and reset				carte VFE	PL	N100.451	circulaire	6,1	29	50	50	29	1	23	4	27	789,07	39,15
VFE LV power supply				carte VFE	INT	Twisted shield	circulaire	13,5	143	135		3,5	1	23	0	23	3292,19	0,00
-				-	-	-			0			3	0	23	0	0		
PMT base			HV power supply		PL	TK24-U	circulaire	7,2	41	45	48	30	1	7	0	7	285,01	10,08
set Regulator LV power supply			LV IN	regulator	PL	Twisted shield		20	314	200		32	2	4	1	9	2827,43	0,00
			Regulator control	regulator	PL	RJ	circulaire	6	28			29	1	4	0	4	113,10	0,00
			LV IN/OUT	regulator	INT	Twisted shield		13,5	143			2,5	1	3	0	3	429,42	0,00
			LV IN	regulator	boite	Twisted shield		13,5	143			3,5	1	20	0	20	2862,78	0,00
			LV OUT	regulator	boite	Twisted shield		13,5	143			3,5	1	20	0	20	2862,78	0,00
cooling																		
Total de cables vers la plate forme						section totale cables	12496,9		238,2					74	12496,90	238,23		
Total de cables IN boîtes							2862,8							20	2862,78	0,00		
Total de cables OUT boîtes							2862,8							20	2862,78	0,00		
TOTAL																		
	Elements	de	vers	ref cable	type de section	Dia ext	Section	xeffi 3,5	Poids kg	L Max	Qte /elem	nbre /elem	qte					
Total de cables vers la plate forme						section totale cables	26860,4	94011,6	431,9					193				
Total de cables IN boîtes							6011,8	21041,4	0,00					42				
Total de cables OUT boîtes							6011,8	21041,4	0,00					42				

PS Cables

Sept. 2006

Cable preparation ...

Has started!



Corresponding to 1 box (8 MAPMT) ...

LHCb week Sep. 2006

Time consuming ...

- ~1h30 / reel
- ~400 reels to prepare
- A lot of space is needed
- A new setup has been ordered ...
- and 2 additional people employed (next week)
- ... to be ready on time ...

➔ Cable installation will start mid October!

Andreas Schopper

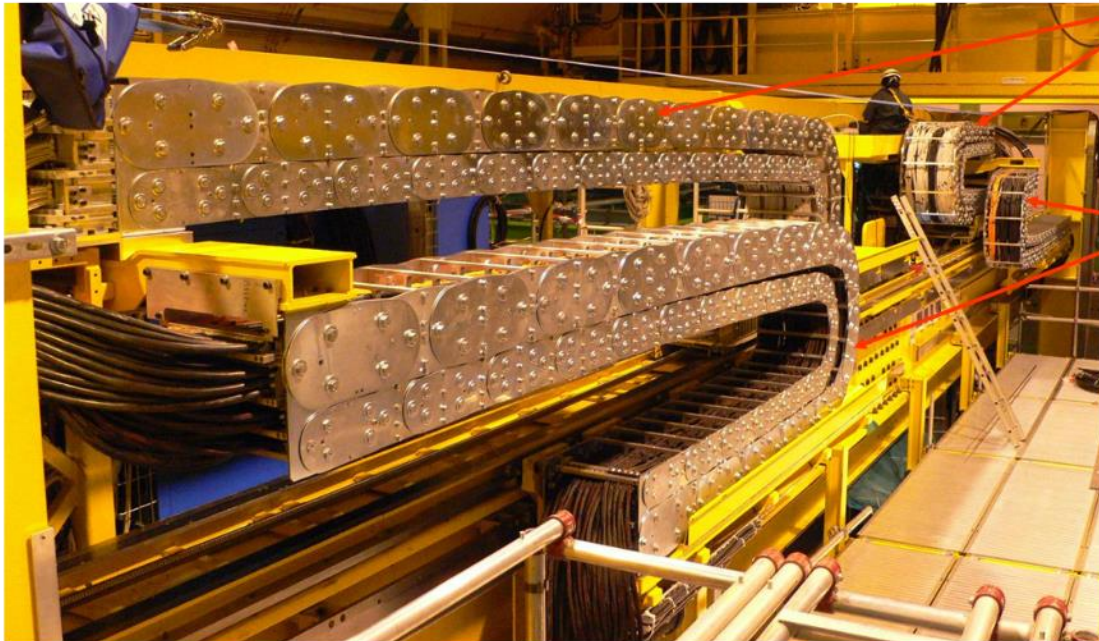
34

PS/SPD cables: installation

Cabling

Sept. 2007

- ◆ PS & SPD cabling is achieved!



PS cable
Chains

SPD cable
Chains

- ◆ Cabling from platform to patch panel (behind muons) almost:
 - Some CAN bus cables (and rad monitoring) and connectors to be pulled this week (Elena + Stas back); Labeling
 - Optical cabling: done

10-14 Sept. 2007

Pascal Perre

LHCb Week

St-Nectaire



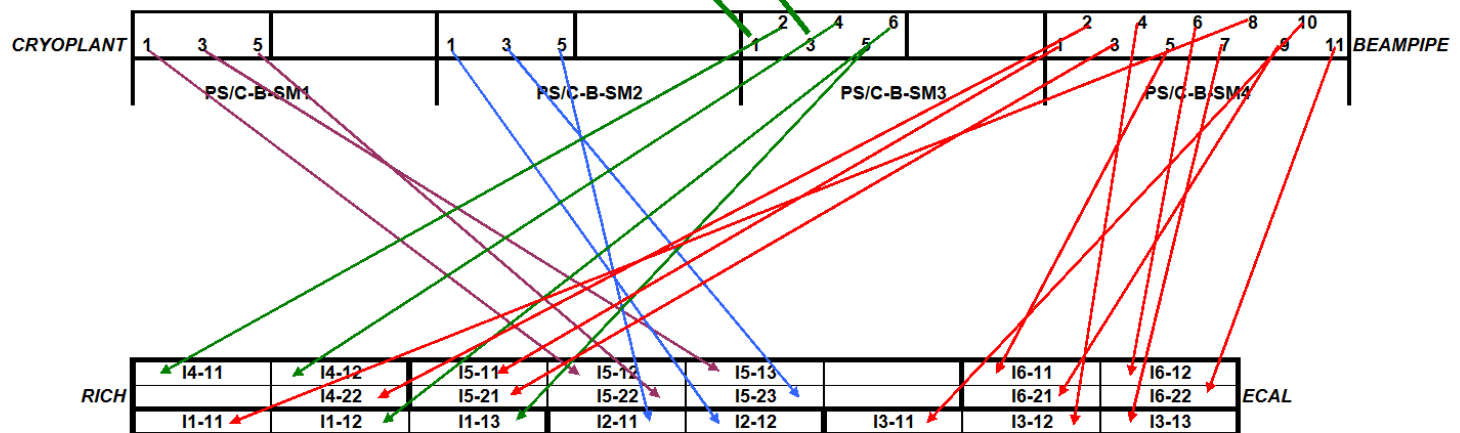
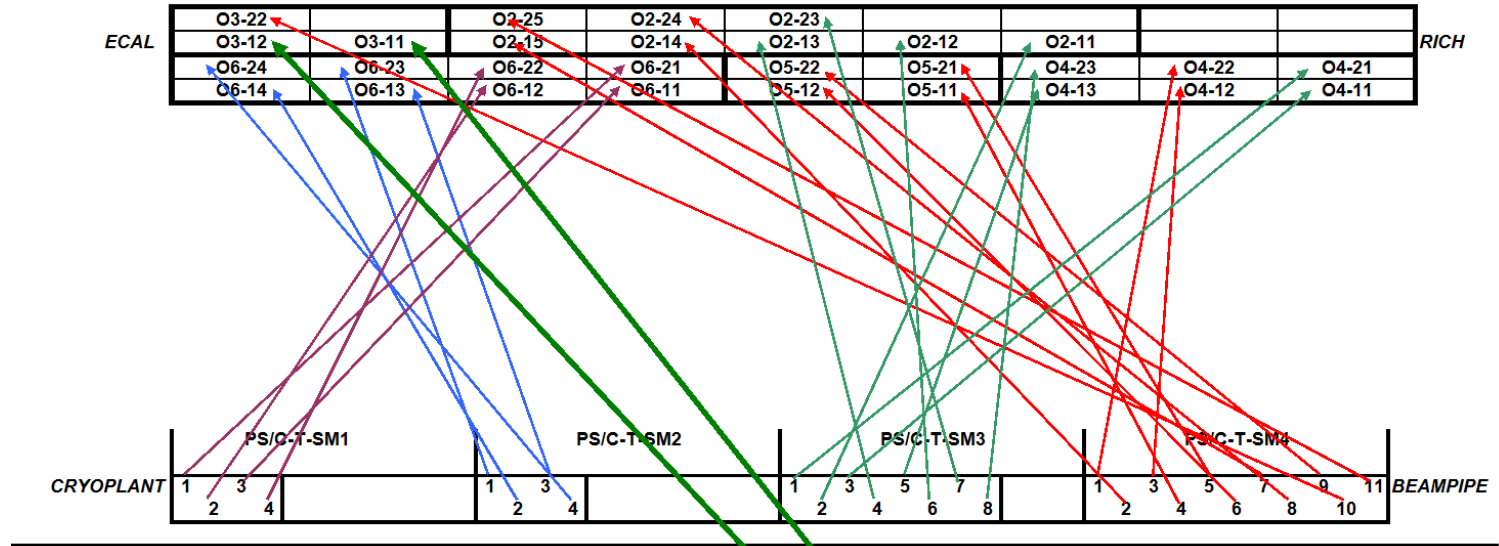
Cables Topology

Sept. 2006

CABLES TOPOLOGY PS CRYO SIDE

Each arrow corresponds to 3 bundles of 6 cables

CHAIN OUTER



CHAIN INNER

LHCb
Calorimeters

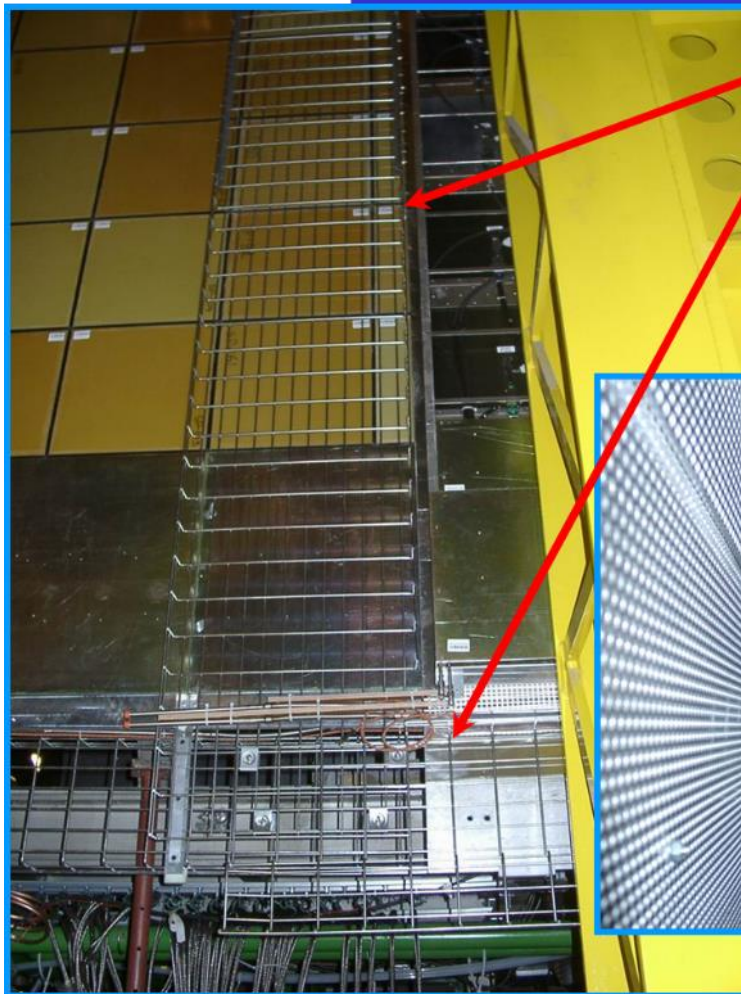
PS/SPD cables: installation



PS cabling status and planning



PS/SPD bottom tray



Lateral cable tray 800 cm x (60 x 5.4) cm²

Bottom tray 425cm x (30 x 5.6 + 44 x 5.4) cm²

Bottom tray suspension
3mm thick on lead side



SPD/C bottom tray
425cm x (30x10.4)

6

13.03.2007 Rustem DZHELYADIN (CERN&IHEP, Protvino)

PS/SPD cables: installation

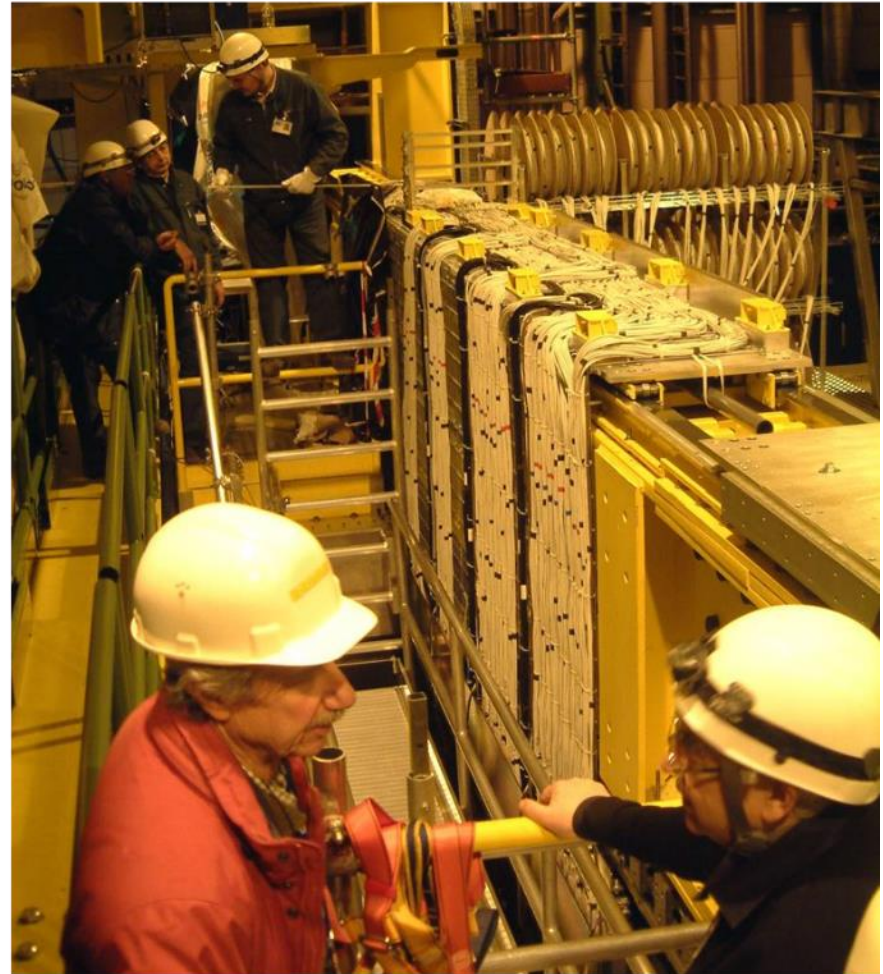
March 2007

Status of the Calorimeter System

Three sessions on two afternoons:

- Installation status and planning
- Software
- Commissioning

Cabling of the Preshower
at 10m above ground...



PS cables: installation

PS cabling status and planning

PS/C top cabling



LHCb
Feb. 2007



PS/C in **CENTRAL**
later
moved to **OPEN**

All cables have been
arranged to
“Attachment” grid:
Thanks to “Passerelle”

**GOOD ACCESS
is IMPORTANT**

2

14.02.2007 Rustem DZHELYADIN (CERN&IHEP, Protvino)

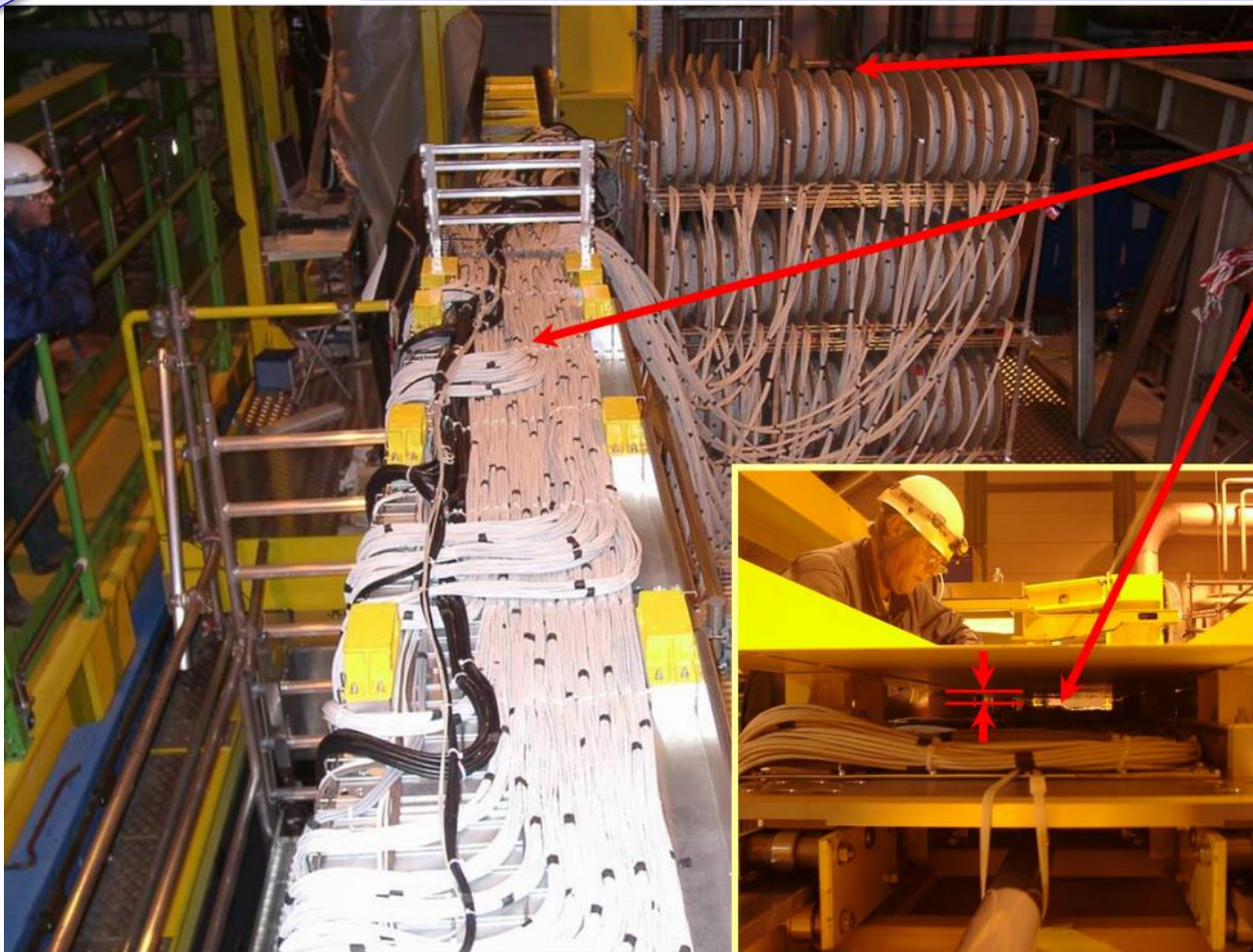
PS cables: installation

PS cabling status and planning

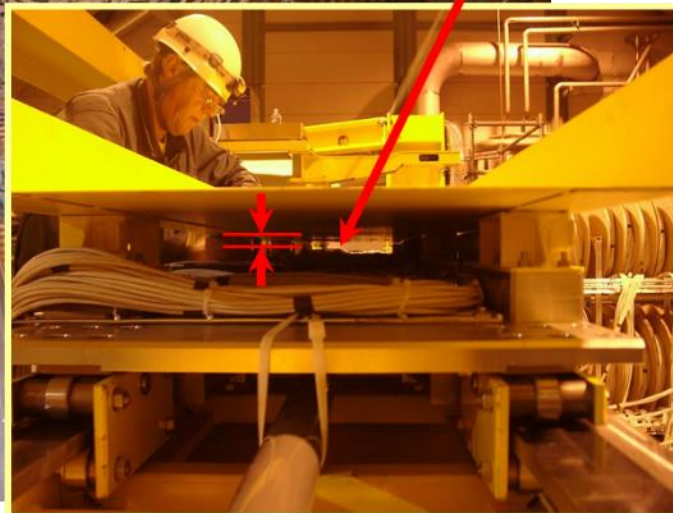
PS/C top cabling (2)



LHCb
Feb. 2007



101 reels – PS/C-top
Two bundle layer of 38mm
17mm gap left (of 92mm)



3

14.02.2007 Rustem DZHELYADIN (CERN&IHEP, Protvino)

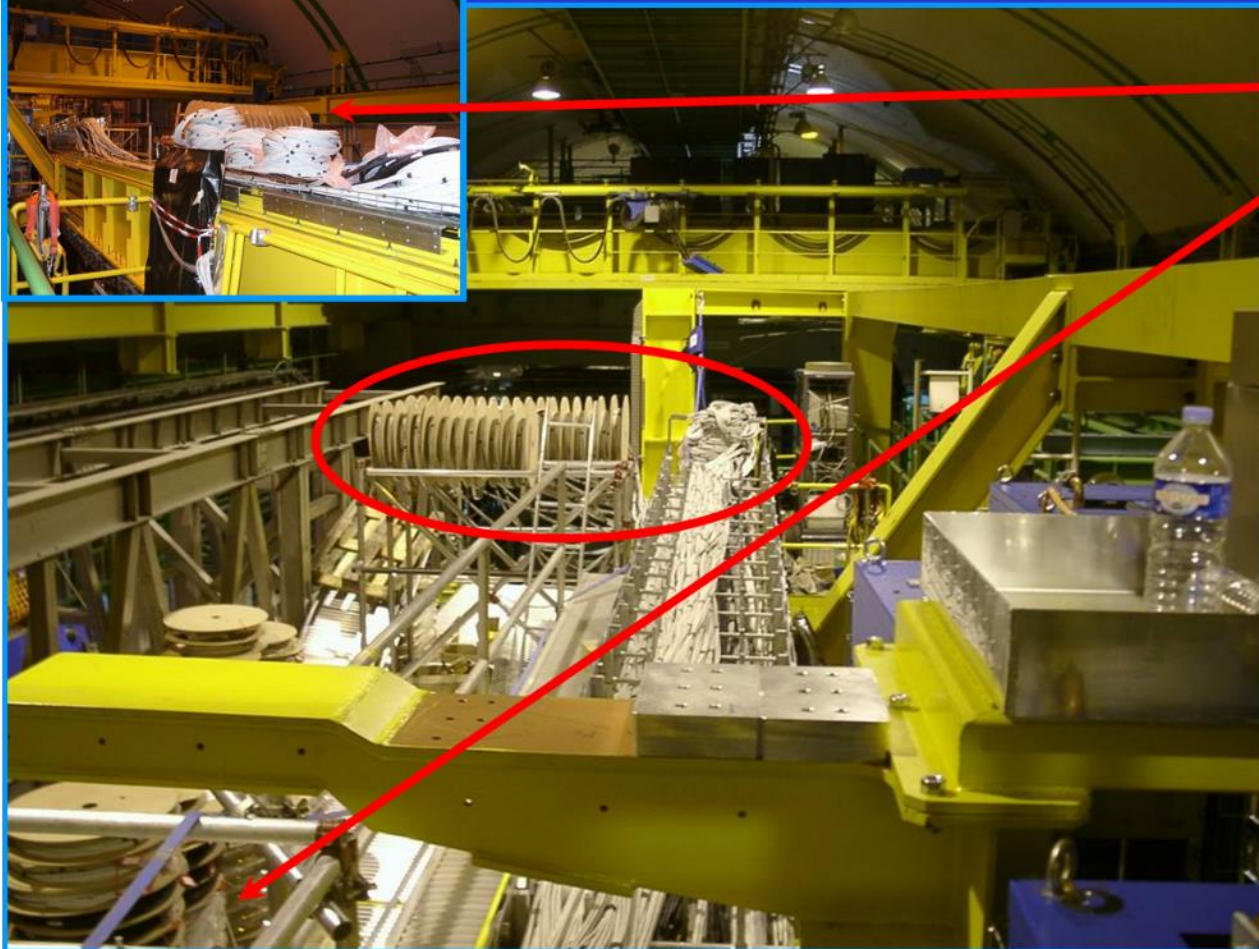
PS cables: installation

PS cabling status and planning

Further problems



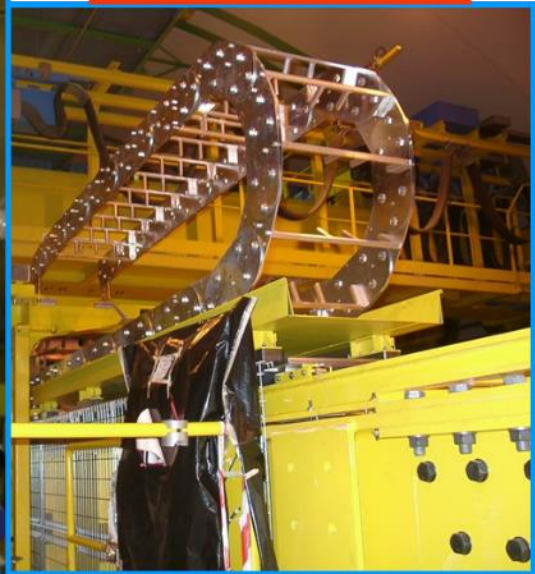
Feb. 2007



101 reel (top)
+ 82 reel (bottom)

183 reel total PS/C

To be bent like this



14.02.2007 Rustem DZHELYADIN (CERN&IHEP, Protvino)

PS/SPD cables: installation

Ref.: EDMS 741051

Sept. 2006

ROLL COUNT FOR 1/2 PS/SPD DETECTOR

	<i>top</i>	<i>bottom</i>
<i>PS1 (outer)</i>	32	22
<i>PS2(outer)</i>	32	22
<i>PS3(middle)</i>	47	28
<i>PS4(inner)</i>	52	38
<i>total:</i>	163	110
ALL	273	

	<i>top</i>	<i>bottom</i>
<i>SPD1 (outer)</i>	20	12
<i>SPD2(outer)</i>	23	15
<i>SPD3(middle)</i>	35	20
<i>SPD4(inner)</i>	41	27
<i>total:</i>	119	74
ALL	193	

OVERALL, rolls

466

CABLE WEIGHT FOR 1/2 PS/SPD DETECTOR

	<i>top</i>	<i>bottom</i>
<i>PS</i>	552,83	505,96
ALL	1058,79	

	<i>top</i>	<i>bottom</i>
<i>SPD</i>	193,68	238,23
ALL	431,91	

TOTAL CABLES, kg

1490,7

Total cable weight ~3 t

What about LED cables???

0 kg so far

PS cables: installation

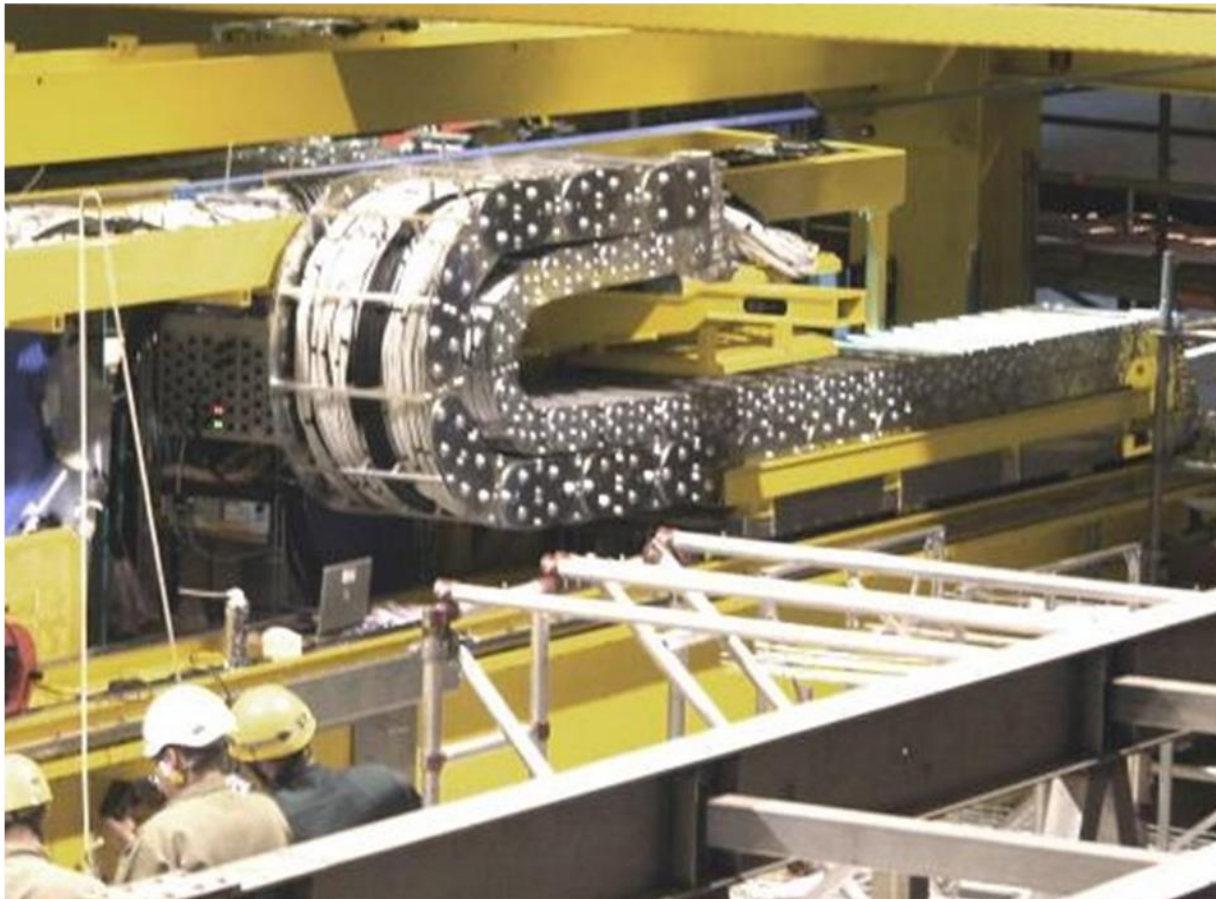


PS cables: installation

March 2007

PS cabling status and planning

The final look



101 reel (top)
+ 82 reel (bottom)

183 reel total PS/C

**Has been bent without
need of crane!**

LHCb week March 2007

Andreas Schopper

PS/SPD cables: installation

PS/SPD cabling status

Overview

June 2007

Since last LHCb week:

- PS/A cabling completed
- SPD/C cabling completed
- SPD/A cabling ongoing, completion by end of June



LHCb week June 2007

6

SPD cables: installation



SPD cables: installation



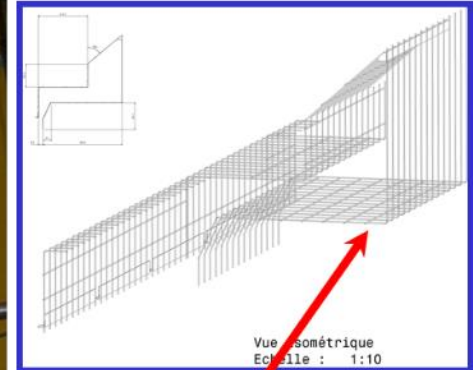
SPD cables: installation

PS/SPD cabling status

Connecting tray



June 2007



Is it really needed?

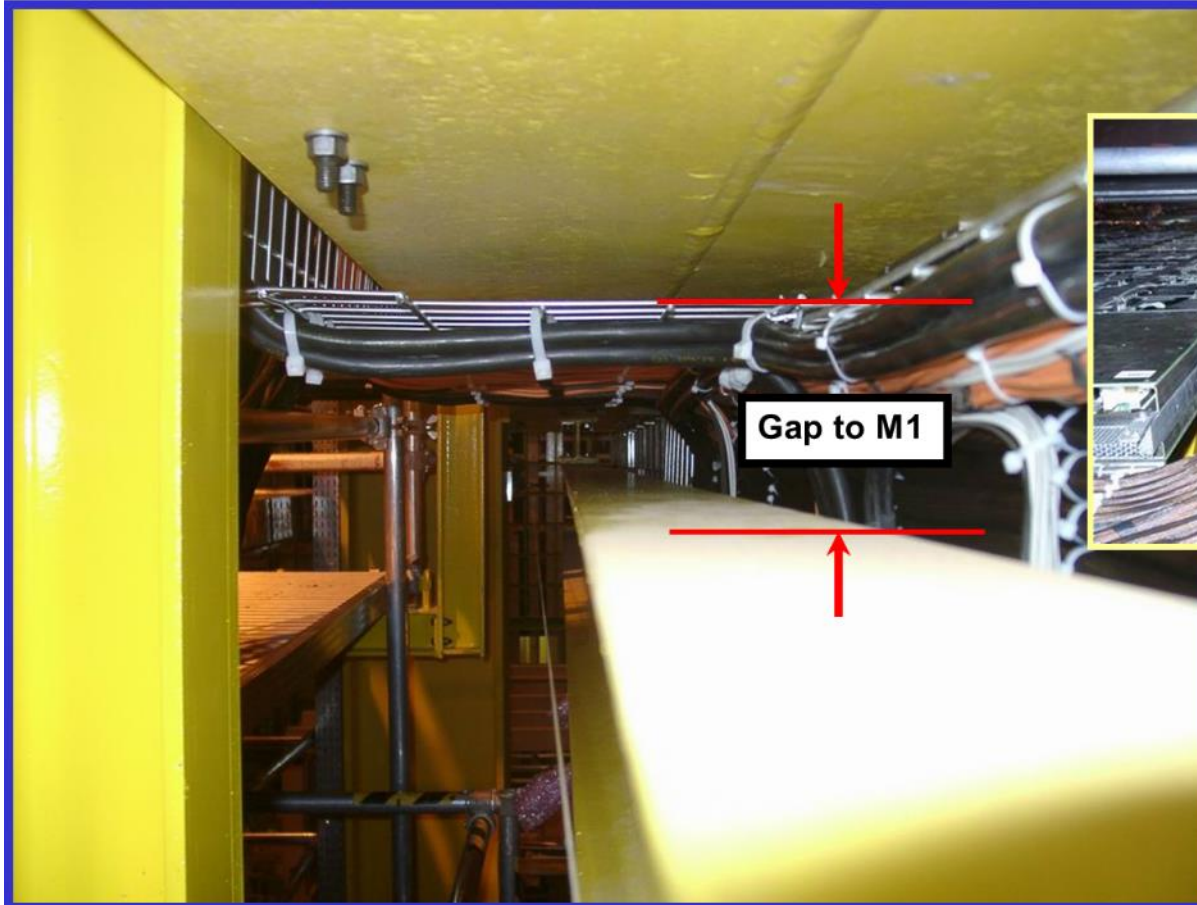
SPD cables: installation

PS/SPD cabling status

Connecting tray



June 2007



Lateral tray (8 m)

8

05.06.2007 Rustem DZHELYADIN (CERN&IHEP, Protvino)

PS/SPD cables: installation

Cabling

Sept. 2007

- ◆ PS & SPD cabling is achieved!



PS cable
Chains

To remove with
moving system

SPD cable
Chains

- ◆ Cabling from platform to patch panel (behind muons) almost:
 - Some CAN bus cables (and rad monitoring) and connectors to be pulled this week (Elena + Stas back); Labeling
 - Optical cabling: done

10-14 Sept. 2007

Pascal Perre

LHCb Week

St-Nectaire

PS/SPD cables: installation

- ◆ ECAL platform roof!



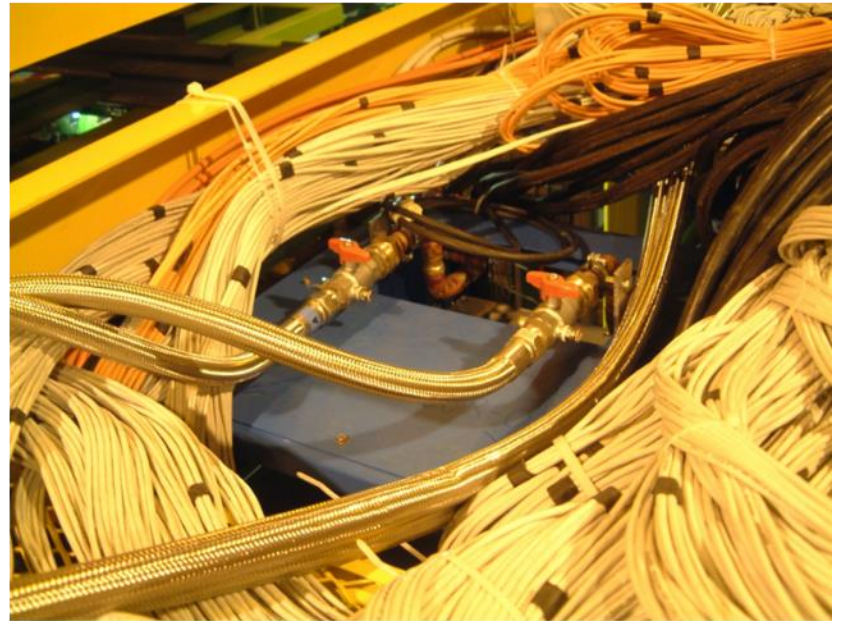
Water cooling system on platform

◆ To disconnect?

June 2007

Water cooling system on platform

- ECAL C-side finished and operational
- HCAL C-side and all of A-side ongoing



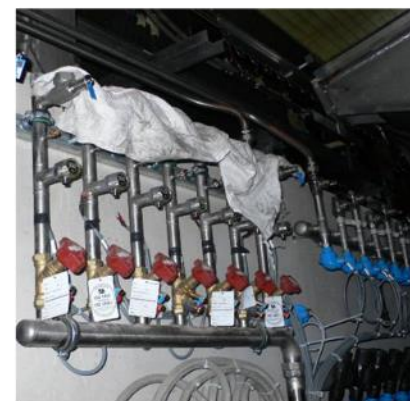
PS/SPD VFE Water Cooling System

June 2007

PS/SPD VFE Water Cooling System

- ◆ Made of many parts:
 - Pipes inside the boxes: installed
 - Distribution circuits along boxes: installed
 - Pipes along lateral cable trays: installed thanks to rustem team's
 - Flexible from end of pipes to end of rails: installation this week + tubes + cable chain: to be designed (Annecy)
 - Manifolds on the pilar, pipes, primary manifolds: installed
 - Tests: detector side: this week?
 - Commissioning of the system (demineralized water) mid-June

Missing connection



LHCb Week June 2007

Pascal Perret - LPC Clermont

PS/SPD VFE Water Cooling System

Feb. 2007

◆ Along the boxes

July 2007

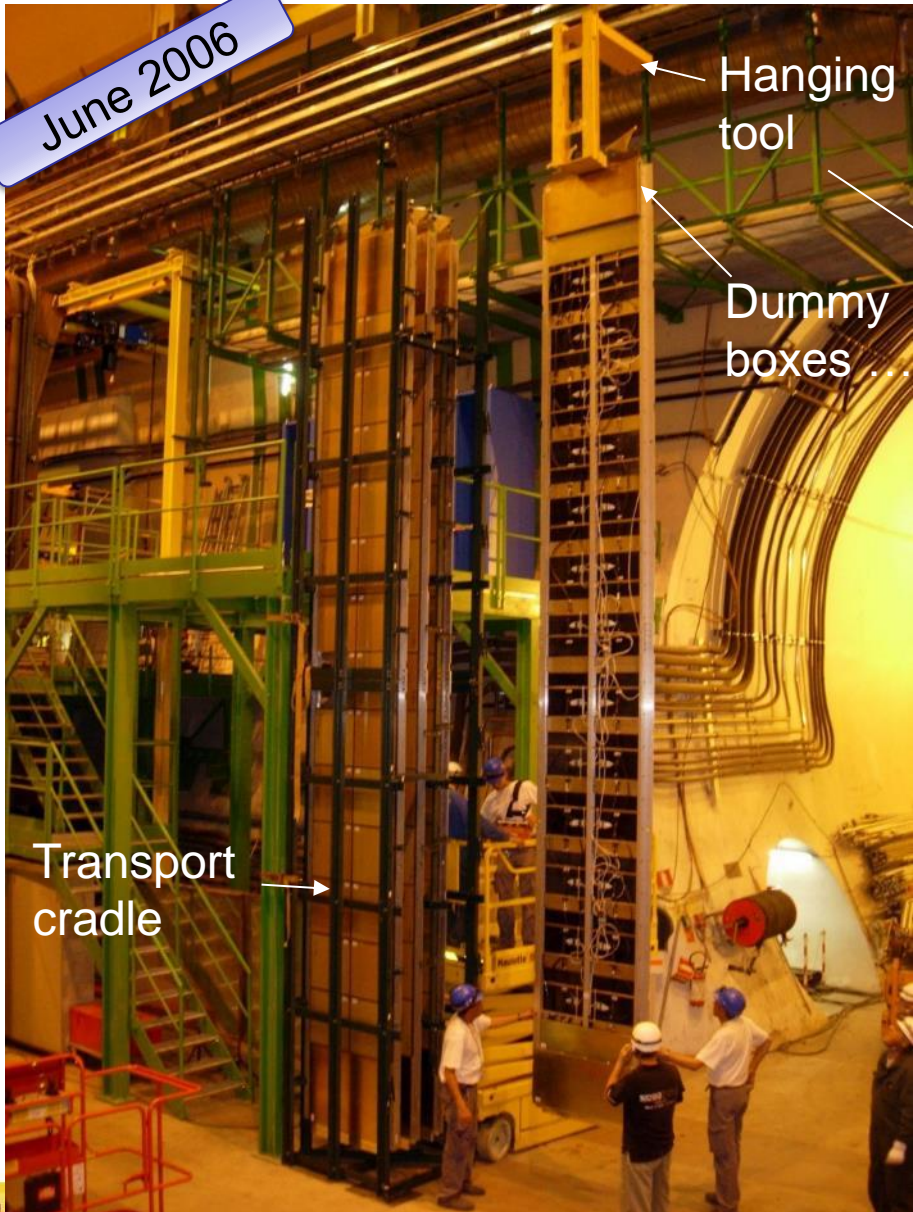
Oct. 2006

After cable installation

◆ Inside the box

Super Module Installation

June 2006



PS/SPD Super-Module assembly

Nov. 2005

Cosmic test set-up

4 outer(w/o fibers)
4 middle frames

Inner frame

Transport cradle
3 Inner frames

Assembly cradle

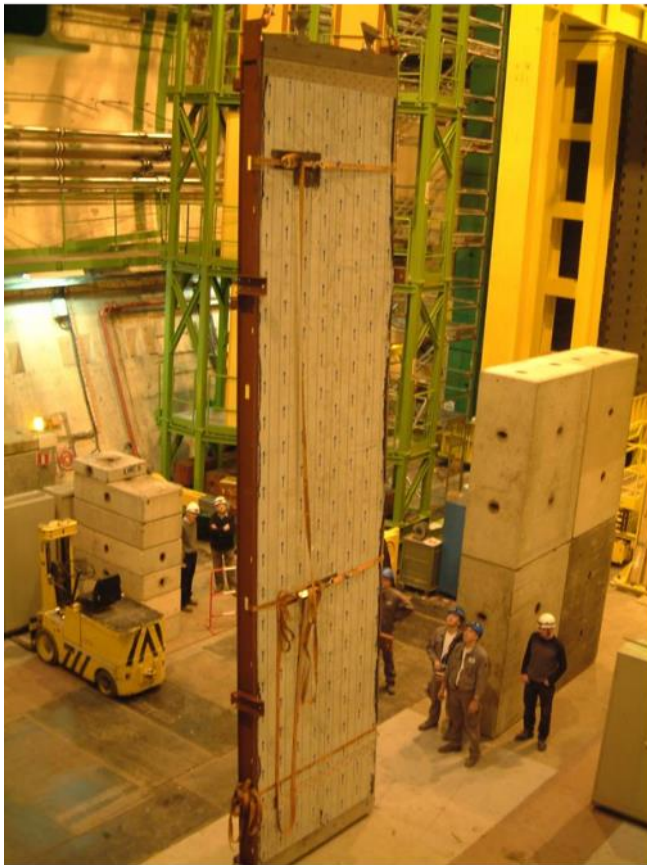
29.11.05 Rustem DZHELYADIN (CERN&IHEP, Protvino)

Lead Installation

March 2006

Preshower Lead absorber

(LAPP-Annecy, CERN)



2 out of 4 lead plates hanging on 31 January



Straight and no discontinuity between plates !!!

Last 2 plates should arrive today(!), to be hanged on Monday



LHCb week March 2006

7

Andreas Schopper

Installation Summary

Main dates	PS/SPD
March 2006	Lead installation
June 2006	SM installation
October 2006	Box and water cooling installation
November 2006	Start of preparation cable installation
January 2007	Start of PS cable installation
July 2007	End of SPD cable installation
June-July 2007	PS electronics installation
September- December 2007	Water cooling installation

SPD/Lead/PS Dismantling

- ◆ Electronics dismantling to do first
- ◆ Cables: Good access is important, good preparation too
 - Platform above the RICH
 - Scaffoldings
 - PS passerelle
 - PS, SPD, ECAL detectors have to be in different blocked positions to allow access during this period: no move possible
 - Cables from the bottom to do first (SPD first, then PS):
 - Before cable chain dismantling
 - Some differences:
 - M1 not there!
 - Do we have to dismantle it first?
 - No RICH2 towers
 - Could we re-use some cables for upgrade?
 - LV, HV, etc. ?

SPD/Lead/PS Dismantling

- ◆ Water cooling circuit
- ◆ Cable trays

- ◆ SM & lead dismantling:
 - Beam pipe has to be removed
 - Radioactive waste ?
 - Zone?
 - Specific tools will be needed
 - Hanging tool
 - VFE boxes were not there at installation time
 - Transport cradle
 - Storage?
 - Storage cradle

SPD/Lead/PS Dismantling

Dismantling

	Installation	Dismantling
Electronics	~1 month	2 weeks
Preparation	~3 months	~3 months
Cables SPD bottom- top	4 weeks	4 weeks
Cables SPD bottom- top	4 weeks	3 weeks
Cables PS bottom- top	7 weeks	5 weeks
Cables PS bottom- top	5 weeks	4 weeks
Boxes + cooling system	3 weeks	1 week
Super Modules	1 week	1 week
Lead	2 days	2 days
TOTAL	~5 months + preparation	

Conservative?

4 persons

Installation

- ◆ First experience will help to adjust the planning!