BMU Cables

Status of MB and RB cables starting from detector

CMS week - TB – 21.06.2005

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Contents

- Status of procurement
- Status of cutting lenghts
- Cabling & cooling of racks
- LinkBoard VME crate proposal
- Cables' support inside rack
- Conclusion

Procurement for cables starting from detector - 1/2

- **HV cables** (**12**%)
  > **MB** (6%) Fully procured and delivered at CERN.
  > **RB** (6%) Fully procured and delivered at CPE (IT).
- **LV cables** (**8**%).
  > **MB** (4.5%) Fully procured and delivered at CERN.
  > **RB** (3.5%) Fully procured and delivered at CPE (IT).
- **Optical Fibers** (**8**%)
  > **MB** (8%) Ready to be cut at UNIFIBRE (IT).
  > **RB** (0%) *None*.
- **Signal cables** (**71**%)
  > **MB** (21%) Fully procured and delivered at CERN.
  > **RB** (50%) All except TRIGGER cable (43%) was fully procured and delivered at CPE (IT).

The RPC's TRIGGER cable is under a Cern tender.
Today we have enough q.ty for 2 sectors from NOVACAVI; further 12 Km needed to complete one wheel was ordered from NOVACAVI.
The remaining 60Km will be from the tender's winner.
Its final connector has been chose at beginning of June.

All connectors are now defined.

All the **procured cables has been tested and accepted by TIS** and can be installed inside UXC55.

Procurement for cables starting from detector - 2/2

Cable name	Supplier	Respons. person	% length	TIS (fire tests)	Order status (full prod.)	Delivering time sect test	Delivering time full prod.	Manufacture time (working weeks)[3] First 2 sectors	1 wheel	5 wheels
MB.LV.mc	NOVACAVI	*Willmott*	*2.3*	*accepted*	delivered	delivered	delivered	2 w @ ISR / CIEMAT	2 w @ ISR / CIEMAT	7 w @ ISR / CIEMAT
MB.LV.fe	INTERCOND	*Pegoraro*	*2.3*	*accepted*	delivered	delivered	delivered	1 w @ ISR / IHEP	3 w @ ISR / IHEP	12 w @ ISR / IHEP
MB.HV	KERPEN	*Borsato*	*6*	*accepted*	delivered	delivered	delivered	done	done	done
MB.OF.ttc-mc	UNIFIBRE	*Bellato*	*4*	*accepted*	available [2]	available @ UNIFIBRE		3 w @ UNIFIBRE	3 w @ UNIFIBRE	3 w @ UNIFIBRE
MB.OF.sc	UNIFIBRE	*Bellato*	*4*	*accepted*	pre-ordered [2]	available @ UNIFIBRE		3 w @ UNIFIBRE	3 w @ UNIFIBRE	3 w @ UNIFIBRE
MB.CA.sc	CERN STORE	*Bellato*	*1.5*	*accepted*	delivered	delivered		1 w @ ISR / IHEP	2 w @ ISR / IHEP	4 w @ ISR / IHEP
MB.MCA.veto	NOVACAVI	*Bellato*	*4*	*accepted*	delivered	delivered	delivered	1 w @ ISR / IHEP	3 w @ ISR / IHEP	12 w @ ISR / IHEP
MB.CA.tr	DAETWYLER	*Odorici*	*7.8*	*accepted*	delivered	delivered		5 w @ DAETWYLER	6-8 w @ DAETWYLER	6-8 w @ DAETWYLER
MB.CA.ro			*7.8*	*accepted*						
RB.LV.fe-8	NOVACAVI	*Ranieri*	*2.8*	*accepted*	delivered	delivered	delivered	3 w @ CPE	3 w @ CPE	5 w @ CPE
RB.LV.fe-12	NOVACAVI	*Ranieri*	*0.5*							
RB.HV	NOVACAVI	*Ranieri*	*6*	*accepted*	delivered	delivered	delivered	3 w @ CPE	3 w @ CPE	5 w @ CPE
RB.CA.sgn[1]	NOVACAVI	*Piccolo*	***43***	*accepted but* [1]	CERN tender	delivered	**see** [1]	3 w @ CPE	3 w @ ?	6 w @ ?
RB.CA.dcs-6	NOVACAVI	*Piccolo*	*3.2*	*accepted*	delivered	delivered	delivered	3 w @ CPE	4w @ CPE	6 w @ CPE
RB.CA.dcs-9			*0.6*	*accepted*	delivered	delivered	delivered			
RB.MCA.t-sens			*3.2*	*accepted*	delivered	delivered	delivered			
WORST CASES							**RB.CA.sgn**	5 w (DT tr-ro cables)	8 w (DT tr-ro cables)	12 w (DT LV fe & veto)

REMARKS

1) Procurament of the RPC's trigger cables (RB.CA.sgn) is under a CERN TENDER. The q.ty needed for 1 wheel was ordered. It will be discussed by D. Piccolo Thu. June 23.
2) DT fibers need cutting lenghts to be ordered. MB.OF.sc was pre-ordered to get BLUE color - now is ready to be cut.
3) Format is: nr. of **WEEKS** @ **WHERE** / **WHOM**

for updates see: http://cern.ch/montecas/pub_doc/CABLES/UXC-status-short.pdf

Cutting lengths for cables starting from detector - General 1

- A cutting length of each cable is composed by 3 parts
  - Radial length
  - Peripheral length.
  - Length inside the rack or feet patch panel, depending where the cable ends.

  which are developed independently and composed in order to obtain the total length of each cable, by means of an semi automated excel worksheet.

Connector		Services description		Length components							Total length [mm]		SOURCE	STATUS	PROPOSED						USED		
Dbase granularity /W/L/S	Conne tmp	Chambel type	Extrac side	Services' side	Radial Cables-Tray Rad. C-Tra	Δ	(+CT-extra	Periph Path*	Rack/Foot to cross	extra-length	inside	Connect. inside			CUT Length [m] min	max	Chosec [cm]	Δ [cm]	LABEL		LABEL		[m]
MB/2/1/10	A		P	ZpL	2820	-80	300	14776	0	1200	1520	40	20576		Sec	20	21	21	42.4	MB.CA.tr	21	MB.CA.tr	21	21
MB/2/1/10	B		P	ZpL	2820	-80	300	14776	0	1200	1520	40	20576		Sec	20	21	21	42.4	MB.CA.tr	21	MB.CA.tr	21	21
MB/2/2/10	A		P	ZpL	1900	280	300	14776	0	1200	1520	40	20016		Sec	20	21	20	-1.6	MB.CA.tr	20	MB.CA.tr	20	20
MB/2/2/10	B		P	ZpL	1900	280	300	14776	0	1200	1520	40	20016		Sec	20	21	20	-1.6	MB.CA.tr	20	MB.CA.tr	20	20

....

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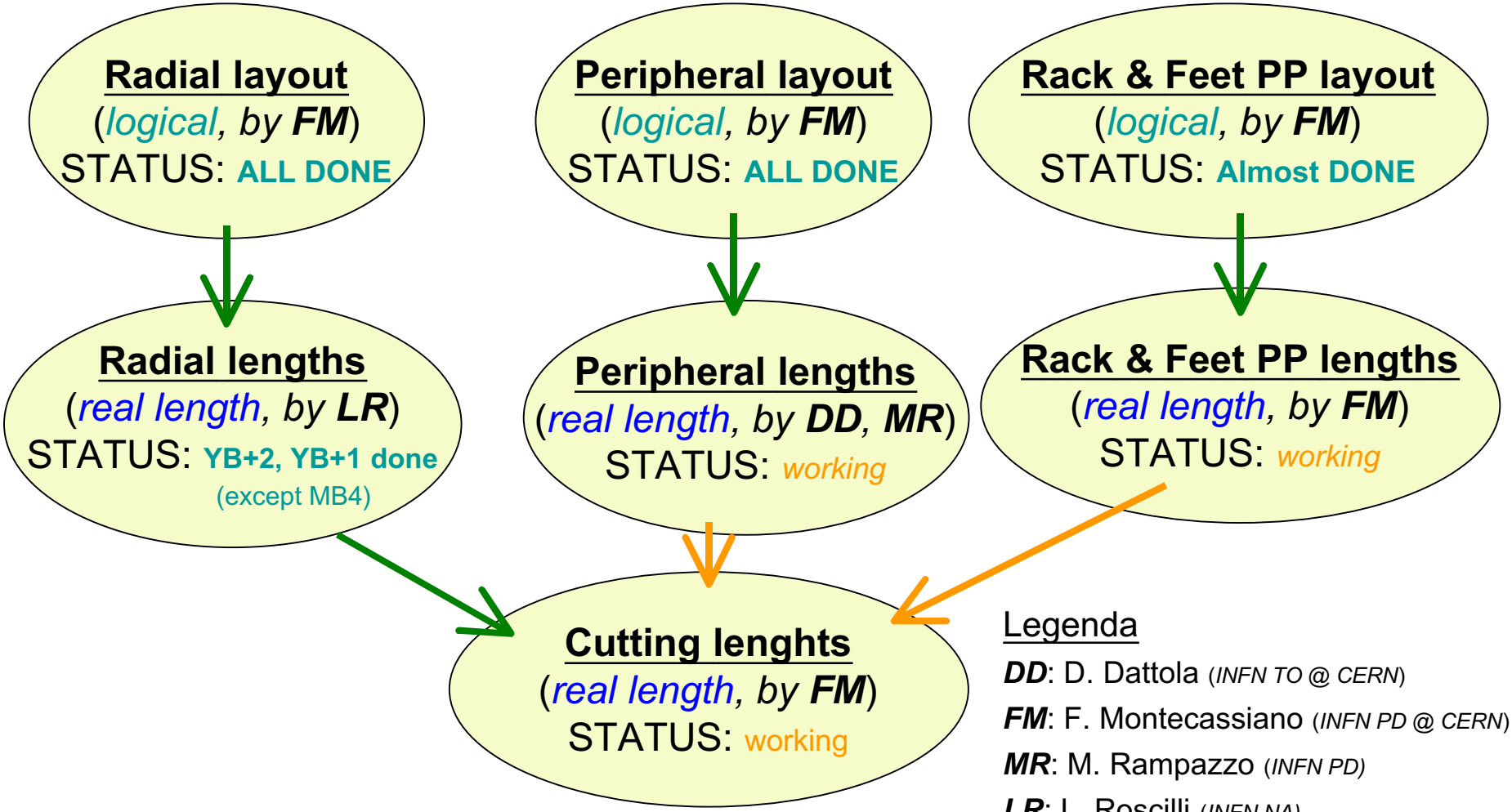
In this way is possible to avoid the detailed study of each cable by using of all defined symmetries.

- Due to the few space available for storing extra lengths, we have to be very precise in defining lengths. We fixed extra safety length to 1.5 m, so we expect about 3Km-5Km/wheel) to be stored for the about 2K cables/wheel.

Cutting lengths for cables starting from detector - General 2

Process flow in making MB and RB cutting lengths



Legenda

DD: D. Dattola (*INFN TO @ CERN*)

FM: F. Montecassiano (*INFN PD @ CERN*)

MR: M. Rampazzo (*INFN PD*)

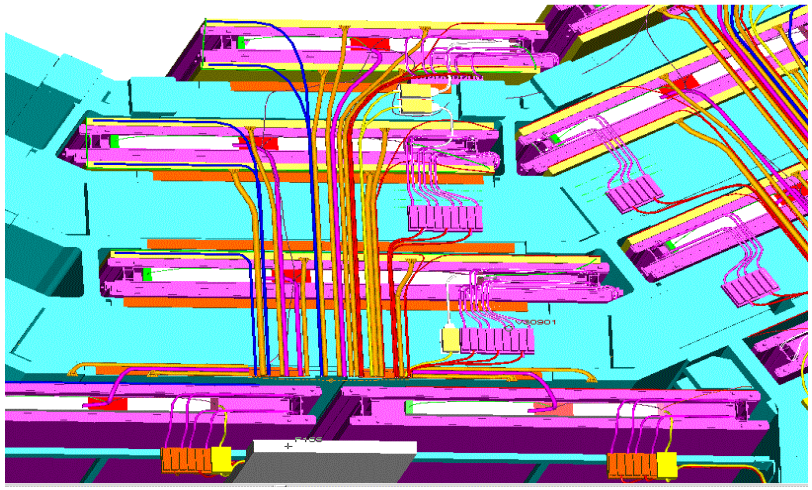
LR: L. Roscilli (*INFN NA*)

Cutting lengths for cables starting from detector - RADIAL 1

Radial layout & lengths (Montecassiano, Roscilli)

It's the length which begins from the connector inside the detector or on the iron face and ends to the MB3's iron corner.

For all 5 wheels there are only **4 type of sectors**, depending on the extraction side of the chambers (Z plus or Z minus) and the relative position of services (Left or Right).



i.e. YB+2 - S10 is a Z plus - Left services (**ZpL**).

STATUS:

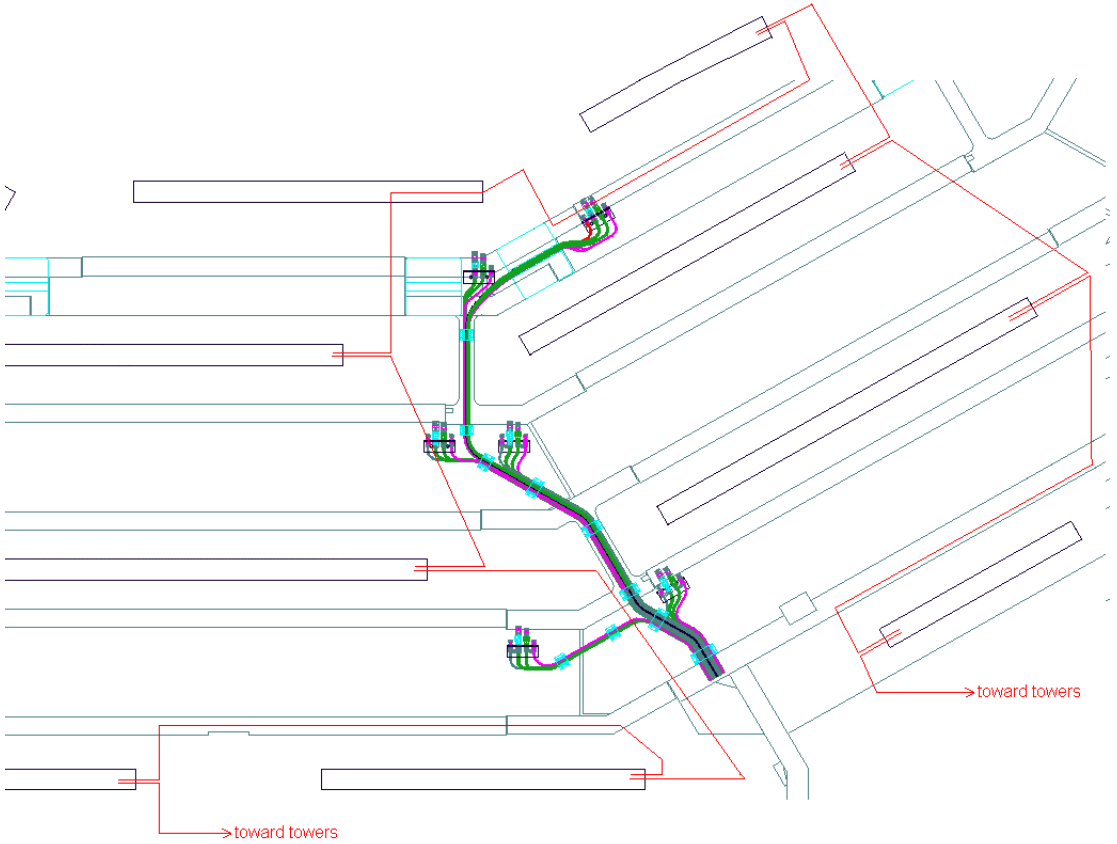
The radial lengths for positive extracted chambers (YB+2, YB+1 and half YB0) are already defined for layer 1, 2 and 3. Layer 4 (MB4) is not completed because it depend from position of LV patch connectors, which are under working.
In order to avoid to wait for this missing information, in agreement with Domenico, I'm going to use estimates for the lengths of MB4's minicrate LV cables.
The others MB4's minicrate cables are under working by Lorenzo.

The 2 layouts for negative extracted chambers (YB-1, YB-2 and half YB0) are under development.

Cutting lengths for cables starting from detector - RADIAL 2

Radial layout & lengths (Dattola, Montecassiano)

- The copper slow control (MB.CA.sc) is a daisy-chain among the DT of 2 adjacent sectors (see picture). There are 44 short cables per wheel.
- The MB4 (external layer) of each sector is connected to the conversion electronic (485->fibres) inside towers. There are 12 long cables per wheel.
- Domenico and Vincenzo are taking real measurements on the face of YB+2 for the short cable. The aim is to find an 'almost permanent' routing valid for all sectors of YB+2 and YB+1.
- This study is urgent because these cables are to be manufactured by IHEP at ISR



MB.CA.sc routing on YB+2 -S10 and S11

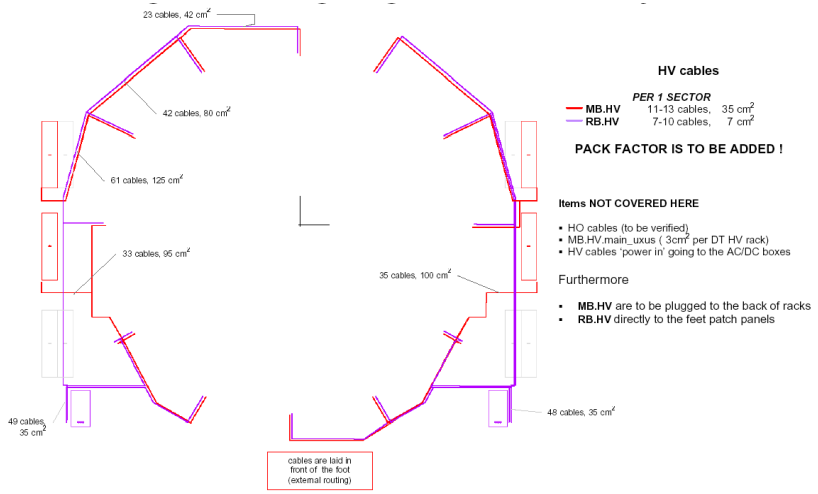
Cutting lengths for cables starting from detector - Peripheral 1

Peripheral layout (Montecassiano)

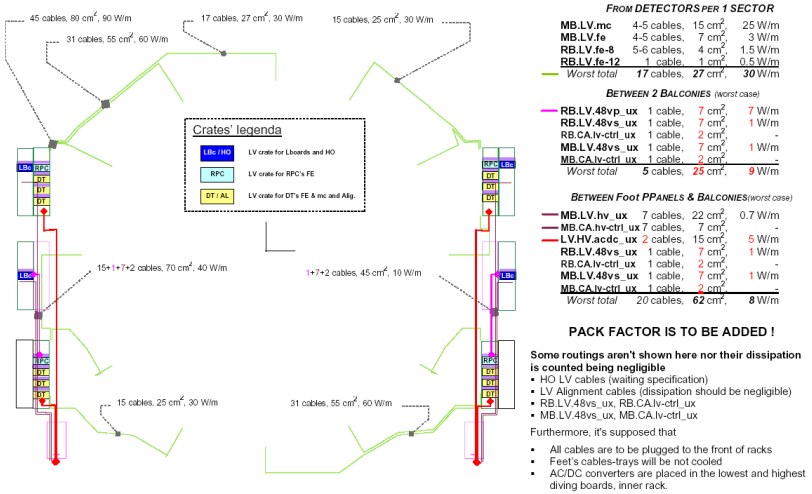
It's the length from the MB3's iron corner up to the rack or feet patch panel, on the periphery.

STATUS

Logical schemas defining the routing was released for all cables families



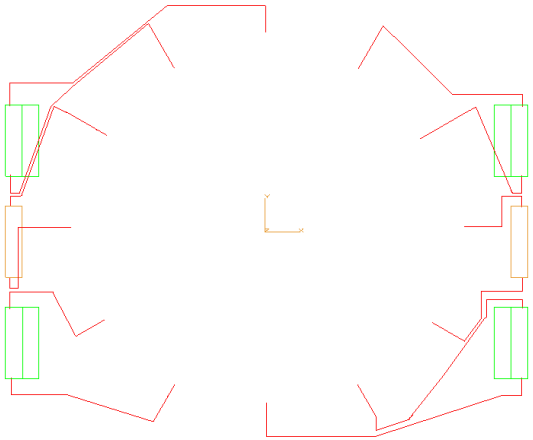
MB & RB HV



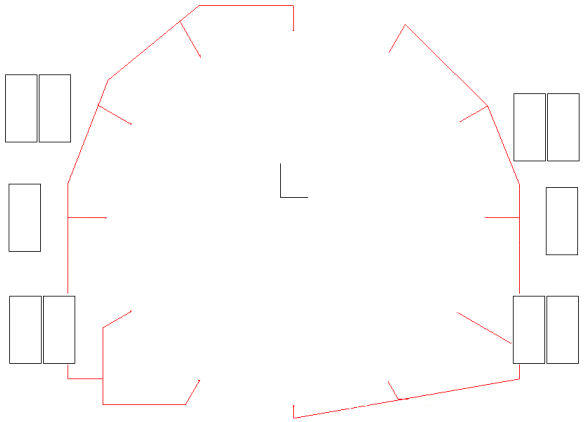
MB & RB LV

Cutting lengths for cables starting from detector - Peripheral 2

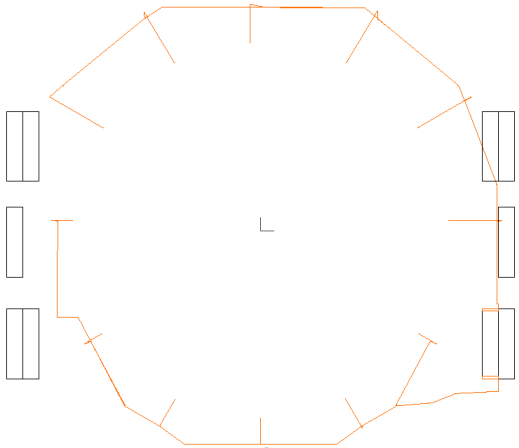
Peripheral layout (Montecassiano)



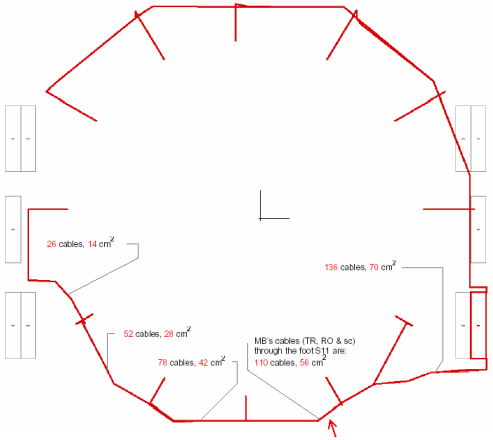
RB tr & dcs



RB t-sensing



MB sc fibres



DT's TR, RO & sc cables

Peripheral cross-sect per 1 sector	
MB.CA.tr	8-10 cables, 5.5 cm²
MB.CA.ro	8-10 cables, 5.5 cm²
MB.CA.sc	1 cable, 0.3 cm²
MB.MCA.veto	1 cable, 0.9 cm²
Worst total	*18-22* cables, ***13*** cm²
MB.OF.ttc-mc	4-5 fibres, 0.5 cm²
MB.OF.sc	4-5 fibres, 0.3 cm²
Worst total	*8-10* fibres, ***1*** cm²

PACKING FACTOR IS TO BE ADDED !

ITEMS NOT COVERED HERE and REMARKS

- All tr-ro-sc cables and fibres going to Foot PP and USC55, i.e.
  MB.CA.hv-ctrl_ux- daisy-chain for HV A887 modules
  MB.CA.lv-ctrl_ux- daisy-chain for LV crates
  .....

Furthermore

- All cables go to the front of the SEC. COL. crate !
- MB.MCA.veto is a multi-cable. It will be split entering in the radial tray.
- Optical fibre will be radial and removable, protecdet by a corrugatd divisible tube.
- The MB4/9 and MB4/11 chambers have to wait the lay of cables to be put inside feet. In particular, for Foot S11, there are also the ~86+7 cables (~ 100 cm²) for the LBoard crate serving sector 10.
  The agreement for the **HO** an **Alignment**' cables is that they will be installed in front of each foot without enter inside.

MB tr, ro, sc, veto, ttc fibres

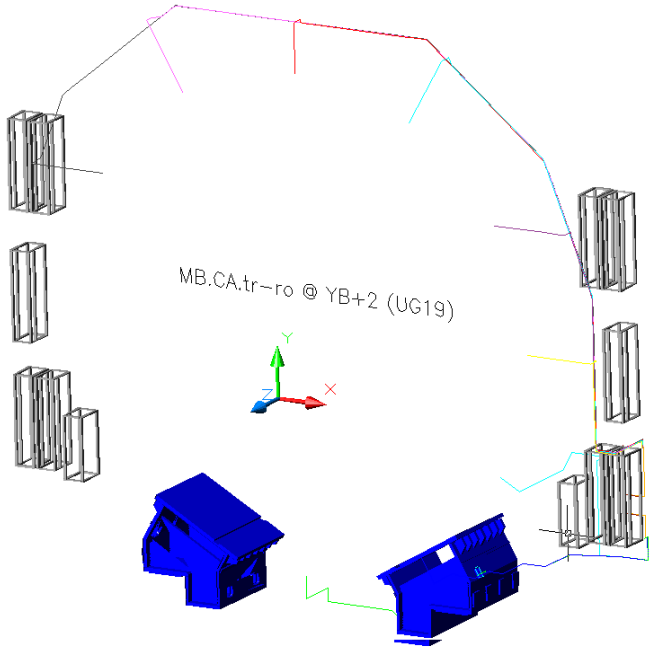
Cutting lengths for cables starting from detector - Peripheral 3

Peripheral lengths (Dattola, Montecassiano, Rampazzo)

- In order to calculate the cutting lengths the peripheral layout has to be transformed in real paths by mechanical studies.
- We also made real measurement to get missing info.

STATUS

- Almost all paths around the wheel serving the higher sectors (from S1 to S6 and partially S7) are '**ready**' for both **YB+2** and **YB+1**.
  They can be extended to **YB-2** and **YB-1** with minor modifications.
- The feet area is critical.
  YB+2:
  S10 & S11 was released.
  Sectors 7,8,9,12 are under working now.
  YB+1:
  It's needed some minor modification in order to use the work done for YB+2

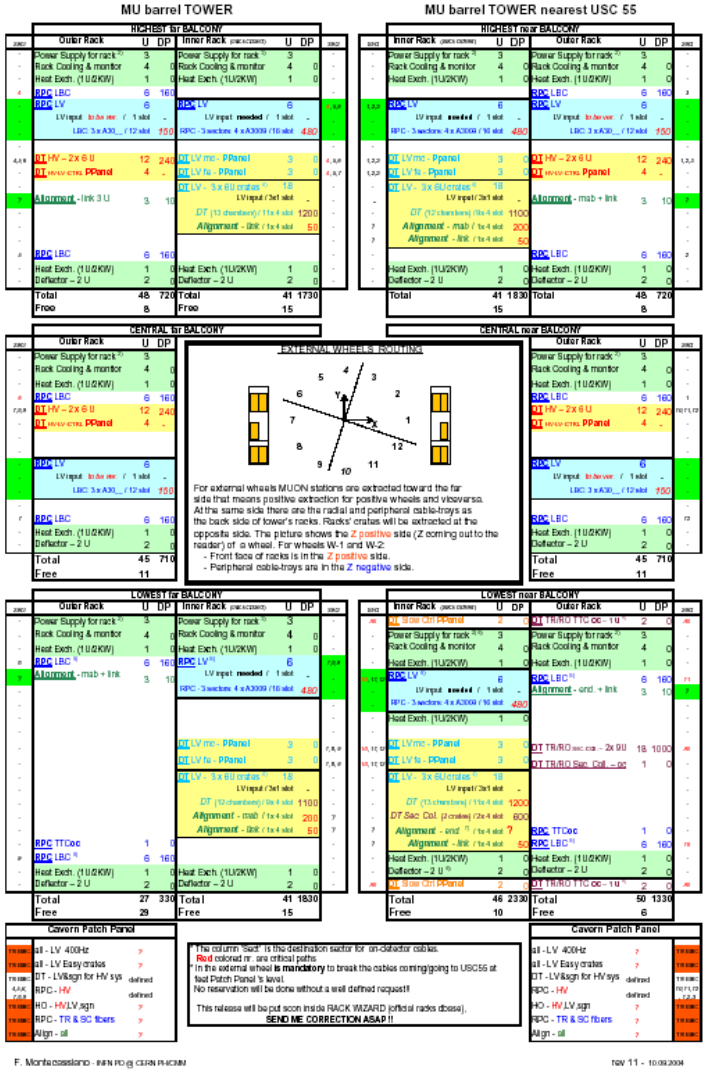


MB tr, ro, sc, veto, fibres

Cutting lengths for cables starting from detector - Racks 1

Racks layout and cables (Montecassiano)

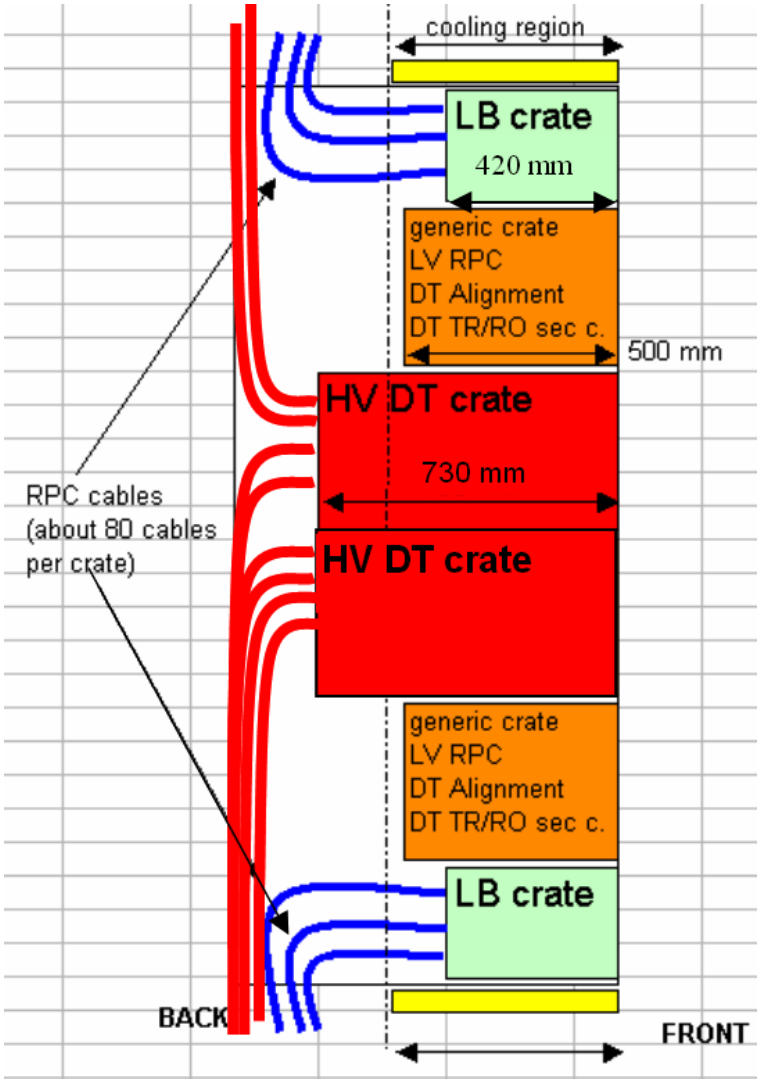
- The rack general layout was released but some changes could be still requested because not all crates are fully specified. One is the RPC Link board VME crate which is still under discussion for cooling questions. It affects all external rack, 6/10 of racks' wheel.
- The layout is still to be put inside RACK WIZARD.



Cutting lengths for cables starting from detector - Racks 2

LinkBoard VME crate proposal

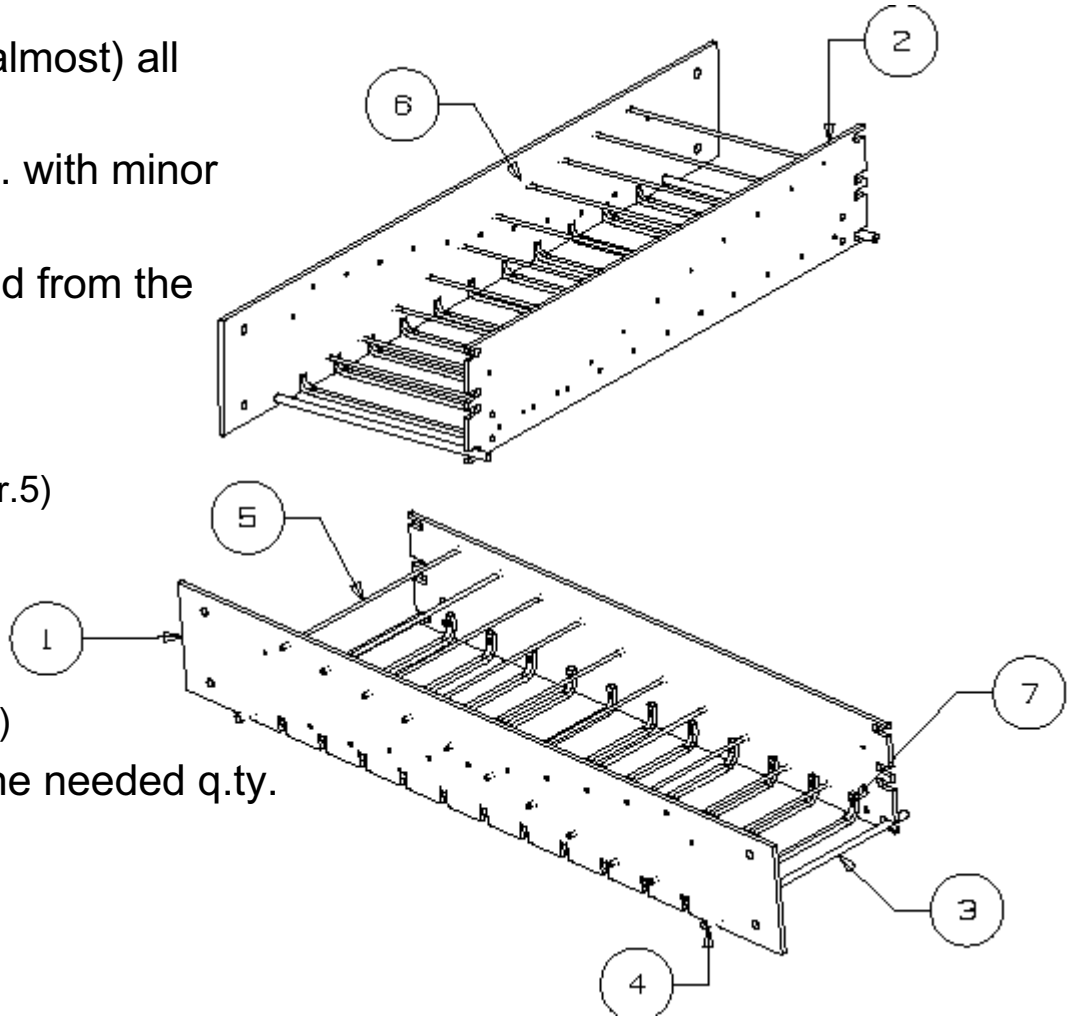
- The picture shows the last proposal about the Link Board crate from the RPC group. The new proposed depth is 420mm, 80 mm less then the others 'small' crates'.
- The open question is how this small crate will affect the cooling of the others crates inside the same rack, in particular for the CAEN A877 HV DT modules.
- The RPC group is requesting to the DT group and in particular to Enrico & Paolo (as the DT HV experts) and Carlos (as the electronics coordinator) an evaluation and hopefully an approval to this new proposal.
- A mailing exchange is running about this subject.



Cutting lengths for cables starting from detector - Racks 3

Cables' support inside rack (Montecassiano, Rampazzo)

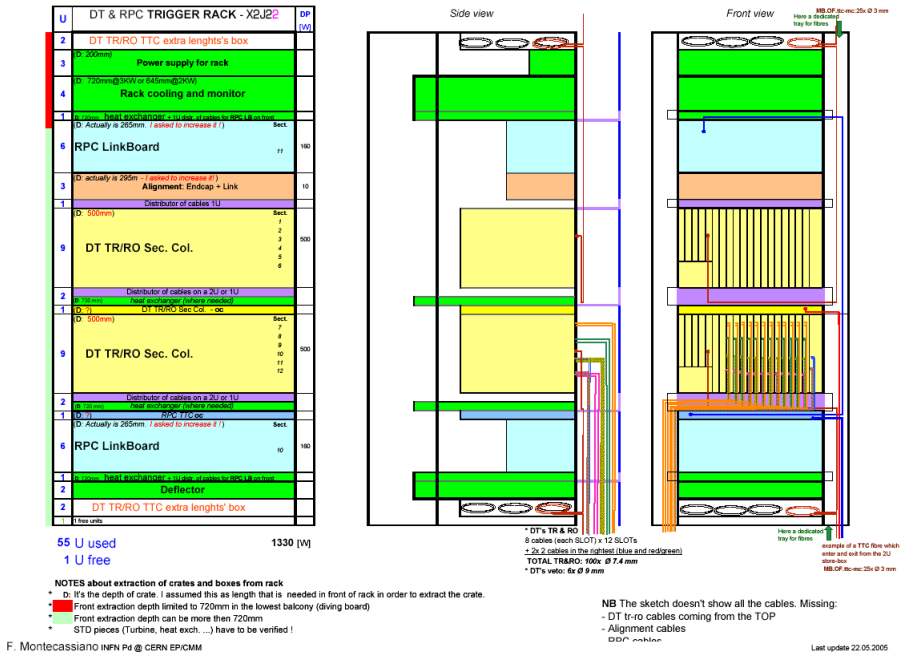
- This support is designed to work with (almost) all crates.
- It can be put in front of an HEAT EXCH. with minor work.
- There are 3 production drawings derived from the same design
  - 2U - DT's TR support (see pictures)
    10 pieces - only DT
  - 2U - LV crates (as pictures without piece nr.5)
    60 pieces DT
    20+10 pieces RPC (ITALY+POLAND)
  - 1U (as the picture, 1U, without piece nr. 5)
    about 15-20 pieces for ALIGNMENT (?)
    60pieces for RPC Poland (LinkBoard crate)
- Looking for a firm in order to produce the needed q.ty. How to pay these ?



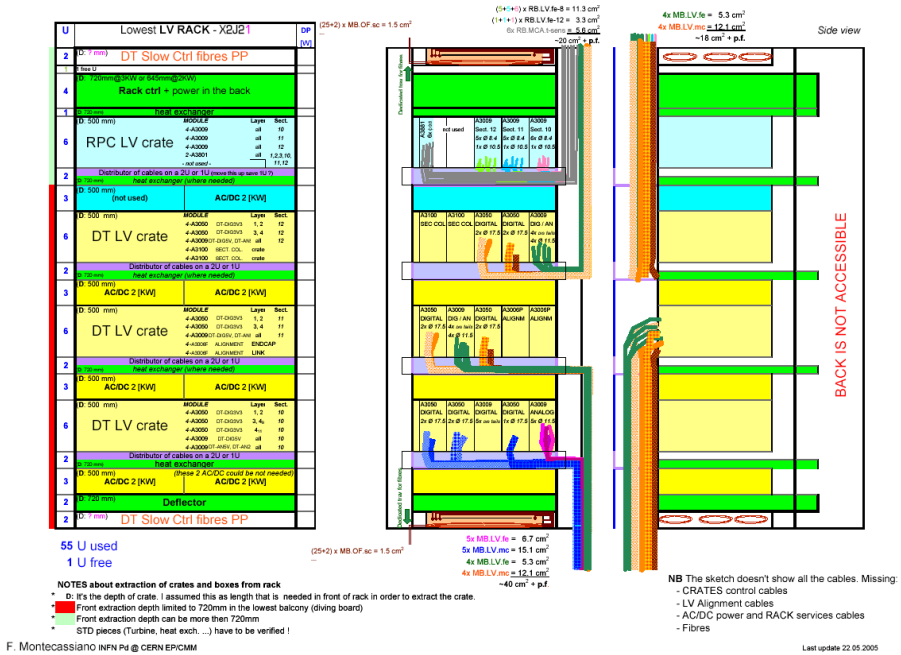
Cutting lengths for cables starting from detector - Racks 4

Racks lengths (Montecassiano)

- It's the length inside the rack up to the far connector inside the specific crate.
- I have frozen the position of crates for which the cables cutting lengths has released.



DT & RPC TRIGGER rack (X2J22 - outer)

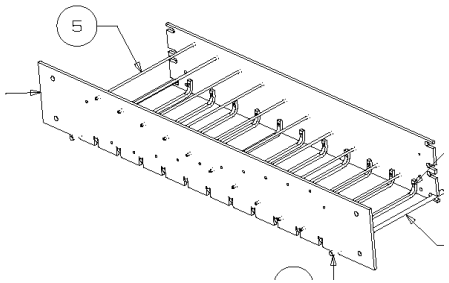


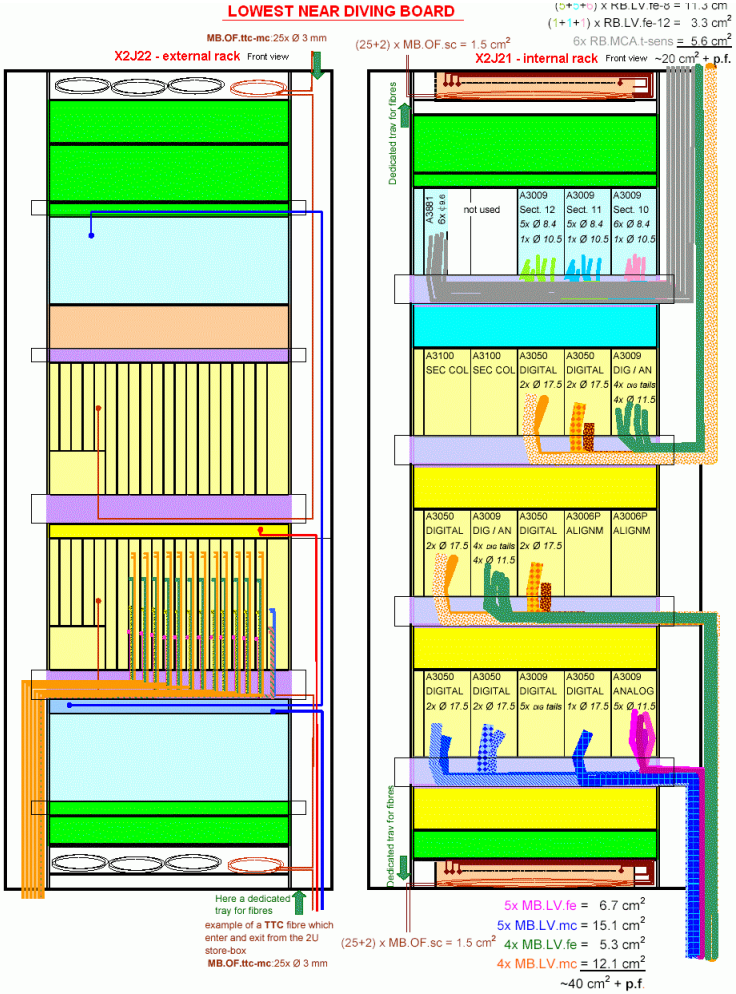
DT & RPC LV rack (X2J21 - inner)

Cutting lengths for cables starting from detector - Racks 5

Racks lengths (Montecassiano)

- The picture shows the front view of the lowest diving board - near side
- A moke up of these racks is under construction
- Here you can see how the horizzontal support works





Cutting lengths for cables starting from detector - Feet PP

Feet Patch panels layout (Montecassiano)

- It's the splitting area between the bottom of each tower and the moveable cable chain.
- A detailed internal organization of users PP was proposed.
- From RPC and DT detectors, only the RPC HV cables (RB.HV) end inside the PP. All other MB and RB cables come from towers' racks.
- Next step will be the detailed study of all cables and pipes.

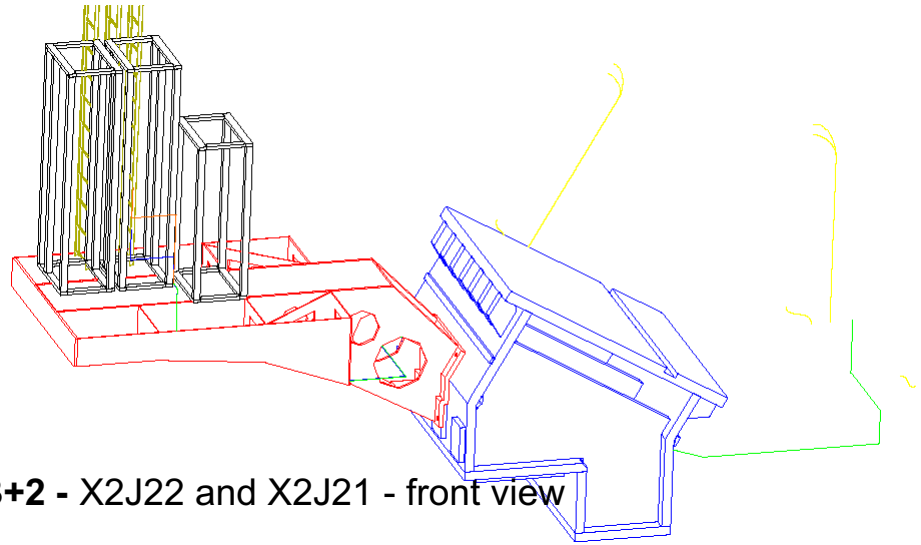
Patch Panel name	Type of cables	Hight [mm]	width for connectors [mm]	From wheels: cables	From wheels: cm² only cables	To cable-chain: cables	To cable-chain: cm² only cables		Resonsible person	Remarks
Free to cross	HV,LV,sgn,fiber	200	max							min high 150
		45	max							
RB fibres	(BOX 25/28cm depth)	55	450	37	10	2	10	Boxes area & Fibres	K. Doroba	Fibres come from vert. c-tray, same length!
		50	max							
HO	sgn, fibres (BOX ? depth)	200	450 to be reduced	36	13	36	13		P. DeBarbaro	CABLES & FIBRES (HV cables only in the FAR PP - x<0): 24x HO.OF# + 6x HO.CA + 6x HO.LA. The width over 450mm up to 700mm will be used for bending radius and extra lengths of HO cables and fibres. I NEED DRAWINGS of these boxes!
		50	max							
Align	LV, sgn, fibres	50	450	9	5	9	5		E. C. Alamillo	
		50	max							
RB LV	LV, sgn	100	300	6	30	6	30	LOW Voltages & stiff cables	A. Ranieri D. Piccolo	Assuming 1x 48V service cabl/LV crate, 1x FE LV ctrl cabl + 1x LBC LV ctrl cabl per tower. It's over-dimensionated waiting for the design.
		50	max							
MB LV	LV, sgn	100	300	7	40	7	40		C. Willmott M. Pegoraro	Assuming 1x 48V service cabl/LV crate + 1x LV ctrl cabl per tower. It's over-dimensionated waiting for the design.
		50	max							
MB HV system	LV, sgn	200	450	7 7	22 7	7 7	22 7		E. Borsato L. Modenese	Diameter of connettors about 50mm
AC power in	220AC, sgn ?	100	300	4	21	4	21		S. Akhtar	There are 10 LV crates per tower, the **worst** case is 8 AC/DC x 4[KW] converters. Assuming 2x cables 3-phase AC 50Hz per LV rack
		50	max							
Services	220AC, sgn	200	450	20	73	20	73	High Voltages & stiff big cables	A. Gaddi / ESS	4 cables/rack x 5 racks/tower. 20 cables, TOTAL ~ 75 cm2. REQUESTED: min. is 120*700. ASSIGNED: **200 x 450** (to be agreed)
		50	max							
RB.HV	HV	300	450	50	35	6	55		A. Ranieri D. Piccolo	A slice 300mm high was requested but 200 mm should be sufficient to satisfy the worst case. To be verified and agreed with RPC group.
		50	max							
pipes	-	150	max						D. Dattola	
Tot.		**2100**	[mm]	183 **256** cable cm2		104 **276** cable cm2				

NOTE FOR THE USER:

* RED numbers are **very guessed** because I'm waiting specification from responsible person
  BLUE numbers are still under discussion
* It's responsibility of each User to cross-check this proposal.
* Compacting the width of your patch panels will permit a better storing of extra lengths of your cables !
* **The position of the User's Patch Panels inside the structure could change, whether needed or requested!**
* **Some Patch Panels will share the space for extra-lengths storage** (see PP grouped by the the bracket **{**)

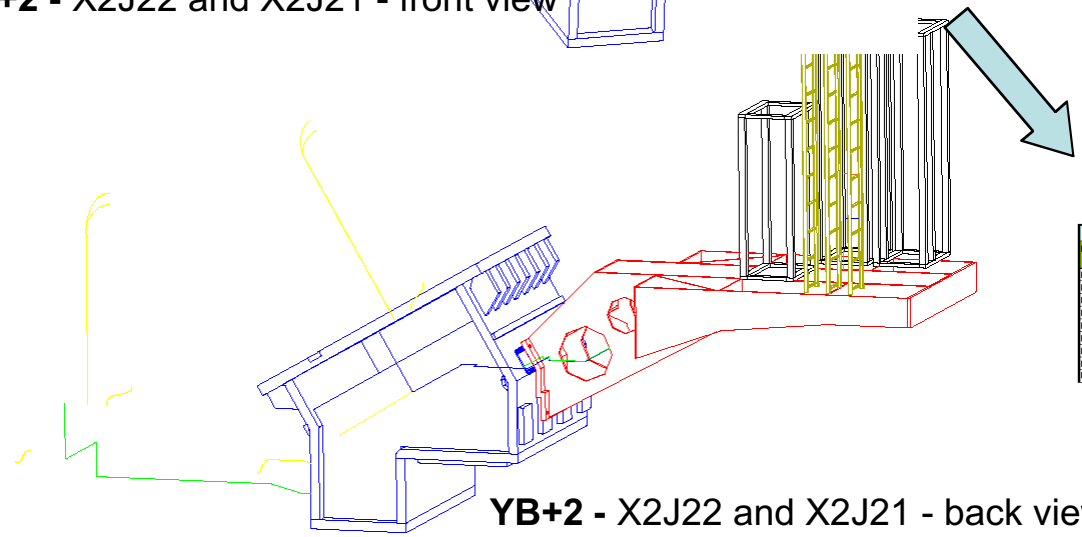
Cutting lengths for cables starting from detector - Cutting lengths 1

Cutting lengths (Montecassiano)



YB+2 - X2J22 and X2J21 - front view

- The 2 pictures are the front and back view of the same diving board
- Some difficulties (time consuming) arise from compatibilities' problem among the different CAD software (EUCLID, UNIGRAPHICS, I-DEAS, AUTOCAD)
- The 'final' assembly is done in AUTOCAD by FM
- Only external wheels now!



YB+2 - X2J22 and X2J21 - back view

Connector		Services description		Length components									Total length [mm]	Shielded	Twisted	PROPOSED			USED		
Obase granularity W / L / S	Conn. [mm]	Chamber where type	Services side	Radial Cables-Tray Sel. C-Trad	Δ	Channels	Periph Path*	Rack/Foot to cross	Rack/Foot inside	Connect. inside						CUT Length [m] min	max	Chosen [cm]	LABEL	LABEL	[m]
MB / 2 / 1 / 10		P	ZpL	2490	-240	300	13474	0	1200	1162	300	18646		Sec		19	19	19	35.4	MB.LV.mc	19	19
MB / 2 / 2 / 10		P	ZpL	2330	-240	300	13474	0	1200	1162	300	18526		Sec		19	19	19	47.4	MB.LV.mc	19	19
MB / 2 / 3 / 10		P	ZpL	390	-450	300	13474	0	1200	1162	300	16376		Sec		16	17	17	62.4	MB.LV.mc	17	17
MB / 2 / 4 / 10 9		P		300	-460	300	13474	0	1200	1162	300	16356		Sec		16	17	17	66.5	MB.LV.mc	17	17
MB / 2 / 4 / 10 11		P		1110	-4560	300	13474	0	1200	1162	300	13046		Sec		13	14	13	-4.6	MB.LV.mc	14	14
MB / 2 / 1 / 11		P	ZpR	2450	-250	300	8226	0	1200	1647	300	13873		Sec		13	14	14	12.8	MB.LV.mc	14	14
MB / 2 / 2 / 11		P	ZpR	2350	-240	300	8226	0	1200	1647	300	13783		Sec		13	14	14	21.8	MB.LV.mc	14	14
MB / 2 / 3 / 11		P	ZpR	340	-470	300	8226	0	1200	1647	300	11563		Sec		11	12	12	43.7	MB.LV.mc	12	12
MB / 2 / 4 / 11		P		970	-766	300	8226	0	1200	1647	300	11883		Sec		11	12	12	11.8	MB.LV.mc	12	12

TOT= 9 cables DELTA MAX= 0.3 [m] Cable Name: MB.LV.mc

Cutting lengths for cables starting from detector - Cutting lengths 2

Cutting lengths status

- There are 16 families of cables starting from detector, 10 K cables in total.
- ***Already released lengths***

  MB.CA.tr: →DAETWILER @ CH
  (25.05.05) Released 1st small batch 18 cables (YB+2 S10 and S11)
  (2.06.05) Released full YB+2 and YB+1 batch 200 cables (with some estimation)

  MB.CA.ro: →DAETWILER @ CH
  (25.05.05) Released 1st small batch 18 cables (YB+2 S10 and S11)
  (2.06.05) Released full YB+2 and YB+1 batch 200 cables (with some estimation)

  MB.LV.mc: CIEMAT @ ISR
  (25.05.05) Released 1st small batch 18 cables (YB+2 S10 and S11)

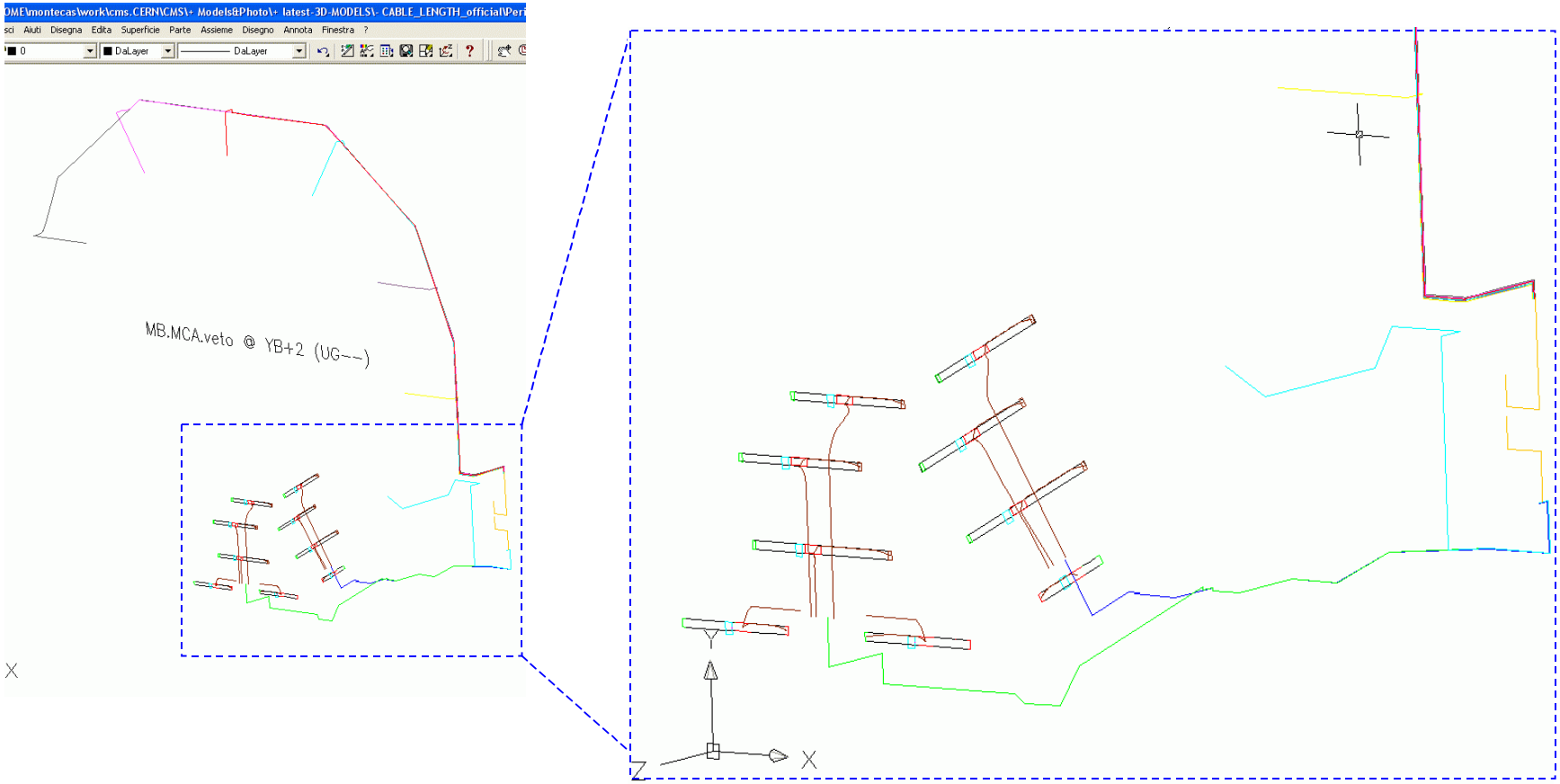
  For these I've requested a crosscheck to the INTEGRATION OFFICE
- ***Under working lengths***

  MB.CA.sc: 1st small batch (YB+2 S10 and S11) → IHEP @ ISR
  MB.MCA.veto: 1st small batch (YB+2 S10 and S11) → IHEP @ ISR
  MB.LV.fe: 1st small batch (YB+2 S10 and S11) → IHEP @ ISR
- ***To be done***

  MB.OF.ttc-mc & MB.OF.sc: Full for YB+2 and YB+1 → UNIFIBRE @ IT
  RPC cables: → CPE @ IT

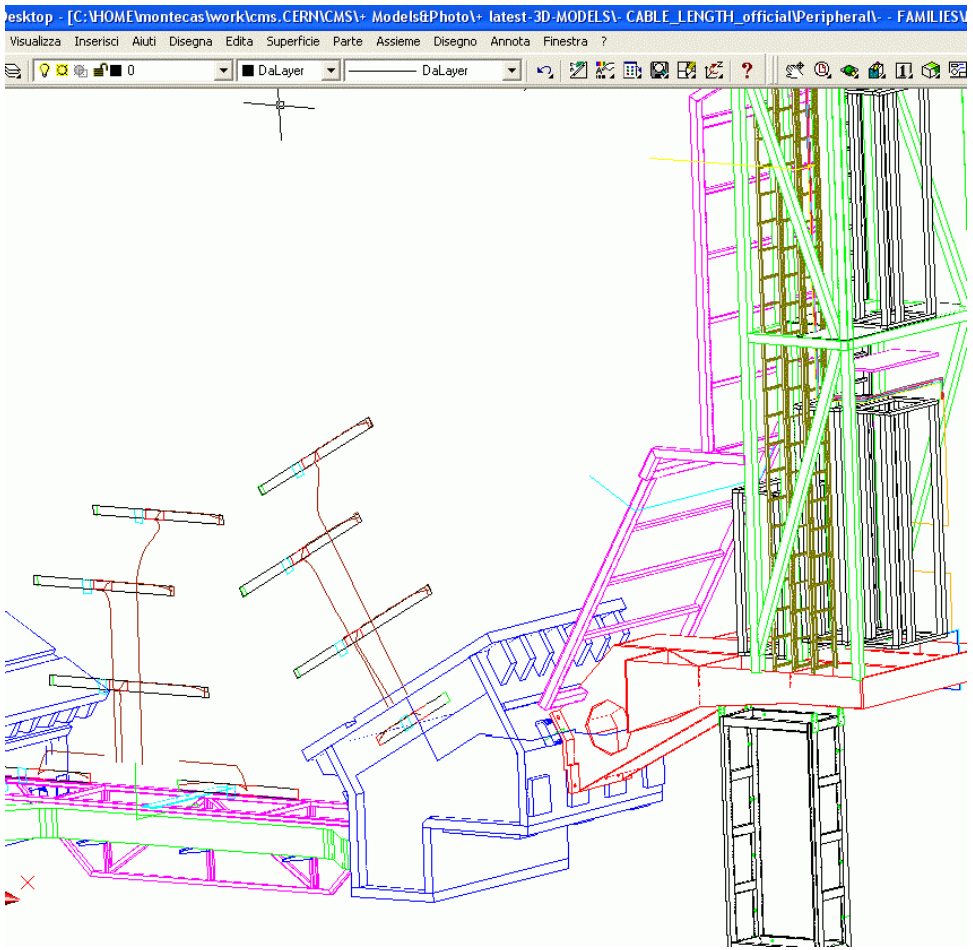
Cutting lengths for cables starting from detector - Cutting lengths 3

Cutting lengths - MB.MCA.veto



Cutting lengths for cables starting from detector - Cutting lengths 4

Cutting lengths - MB.MCA.veto



I'm producing cutting lenghts for YB+2 (9/12) and YB+1 (6/12).
A total of 15 multicables (63 DT chambers)

The order in releasing cutting lengths is driven by manufacturing time and costs

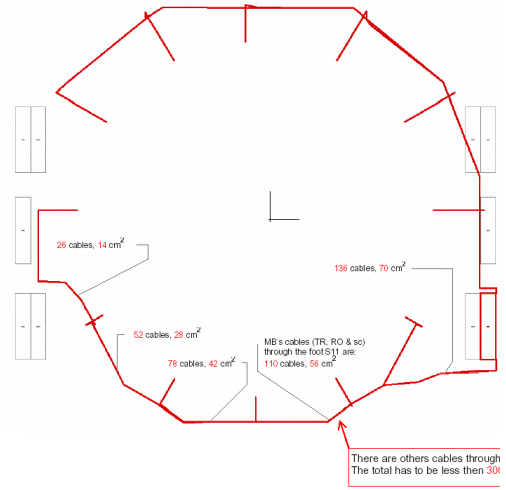
YB2's foot in sector 11

Through foot S11 (we have reserved a total of 300cm2)	nr.	cm2
All cables S10 but all HV cables	151	140
All MB's TR-RO-SC cables coming from sectors 7, 8, 9 (10 already compted)	78	42
	229	**182**

In front of foot S11 (we should have a total of 100 cm2)	nr.	cm2	*bending Radius*
MB.HV (from S10)	13	35	16
RB.HV	8	7	
Align cables		10	
HO cables			
		52	

Question: **Allowed bending radius ?**

- The installation of MB4 chamber inside feet (S9 and S11) is blocked waiting the installation of all cables inside feet (DT tr, ro, sc and fibres & LV cables)
- Installing by sector could be not the best because we need all families at the same time



MB tr, ro, sc, veto, fibres

CONCLUSION

- MB and RB Procurament is almost done
  TR RPC cable was orderd for 1 full wheel.
- TIS accepted all the already procured cables
- Cutting lengths are late. Some families was released.
  Others are coming
- Details and cutting lengths for **HO** and **Alignment** has to be defined by Integration Office.
- All this has to be extended to YB0 - a lot of work.
- The others cables - inside towers and from UX to US - will be urgent very soon

  We have to release an official decision about the installation's tecnique of fibres between UX-US.
  My understanding is that we (DT) don't want to use the *blow of micro dutch* proposed some months ago by the cern group specialized on this.

- About cabling for COSMIC CHALLANGE ...