



HL-LHC: lay out update ready for official release

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Presented by

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With the key contributions of all the WPs

23/06/2014

The lay-out that will be discussed today is...

- The present reference from TAS to Q6 (included). For the moment is applied to the **5R**
- It is the results of separate discussion with the various involved WP and groups
- It has been submitted to 2 review meetings (20/05 and 23/05) collecting all main stakeholders remarks (more then 40 participants THANKS !!!!)
- It will be circulate as formal CDD approval after this meeting
- In addition to the version resulting of the 2 reviews some extra improvement have been added
 - Naming convention completed and therefore integrated in the drawing
 - The magnets mechanical lengths take into account the compensation for the thermal contraction between room temperature and operating temperature
 - The Corrector Package has been slightly modified in the correctors positions using the lengths coming from 1st round of 3D magnetic optimization. No impact outside the CP and nested dipole corrector not moved

From the document point of view it will be ...

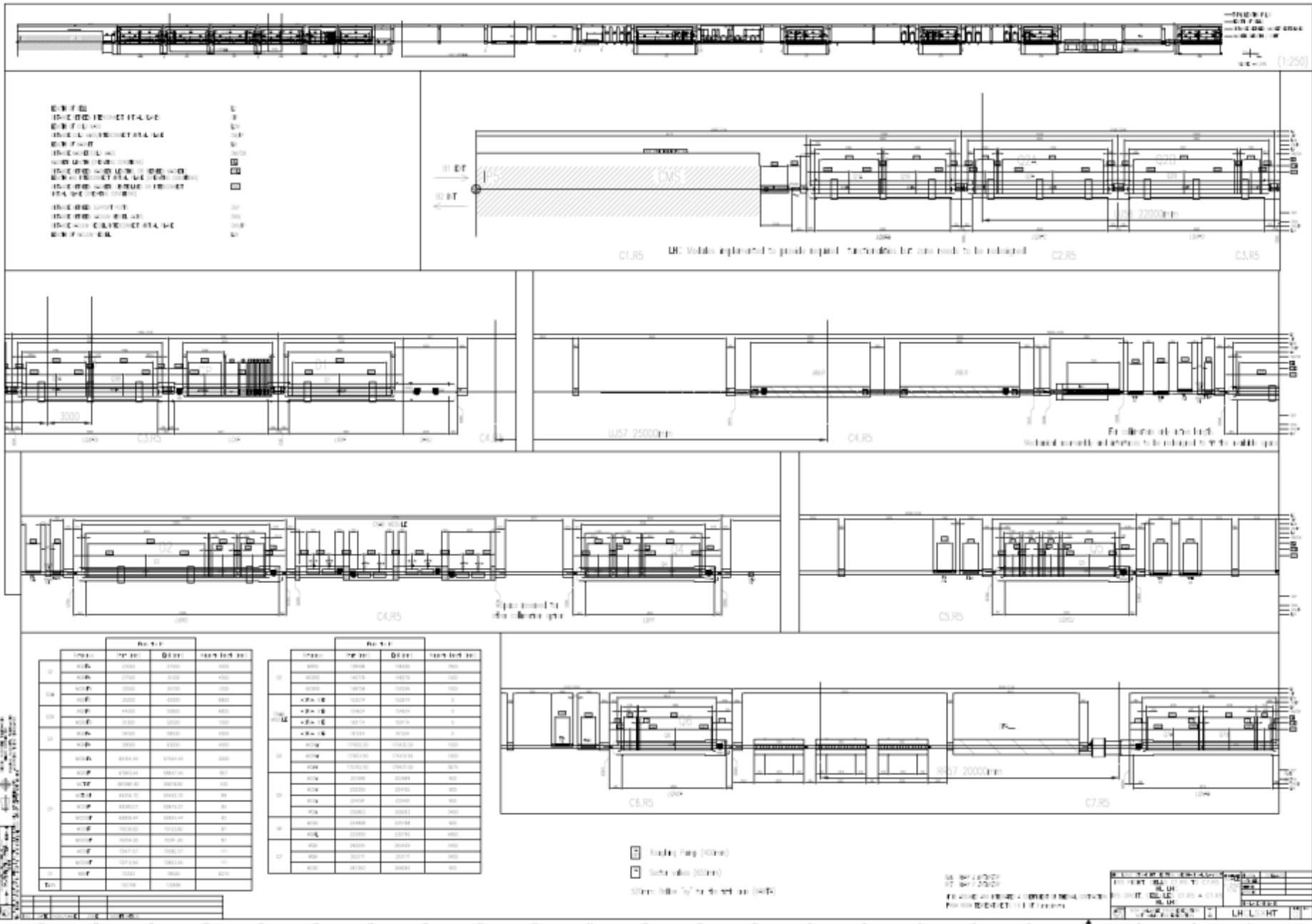
- A lateral view in drawing LHCLSXH_0001
- For the time being a top view in drawing LHCLSXHT_0001 (this we will be kept just in the initial project phases)
- An EDMS document providing for each magnet the magnetic centre and the magnetic length and the BPM positions (to be finalised)

In summer we will add ...

- The study on 5L,1R and 1L to deal with the effect of the slope in order to minimise assembly families, but to keep the object functional position the same
- Update the 3D model of 5R
- Establish the format of complementary drawings to provide all the required information to be prepared from the next release

Some important remarks

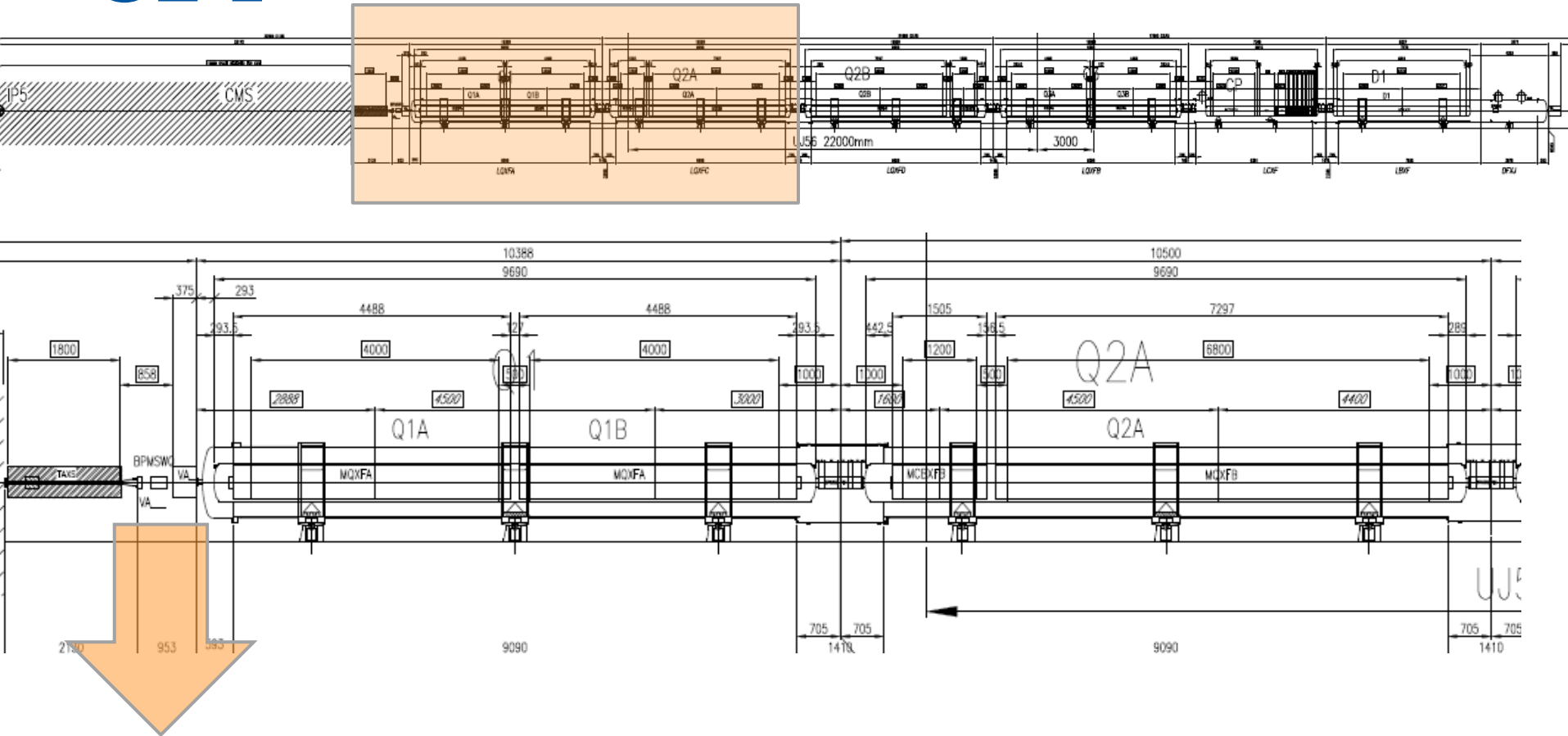
- BPM added in the according to the best knowledge of today (still to add near crab cavities)
- Magnet according to the latest knowledge
- Vacuum system as results of analysis of the needs and using LHC proven solutions, providing all the required functionalities
- Interconnections lengths, all equals.
- Item that could impact the present lay-out leading to important changes are
 - DFM: this is the only equipment that has not been introduced in the lay-out. The way in which the magnet from D2 to Q6 will be fed could affect the space availability. The DFM is the only equipment for which we do not have yet a 1st guess in the way it will be positioned.
 - The collimation between TAXN and D2 does not fit in the available space. Other collimation options have to be identified or new hardware shall be developed
 - The correctors in the D2 and Q4 are in a very early development stage showing difficulty to deal with the cross talk between the 2 apertures. This could lead to the need of more length
 - Real mask (Q4, Q5, Q6) needs will be revised during the summer by the energy depositions studies
 - Alignment system. We looked in the beginning to the available solutions for alignment. The proposed approach is very invasive from a point of view of accessibility to the equipment for maintenance. It will probably require complete new approach



No. 1-6			
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W200	2000	10000	10000
W300	3000	10000	10000
W400	4000	10000	10000
W500	5000	10000	10000
W600	6000	10000	10000
W700	7000	10000	10000
W800	8000	10000	10000
W900	9000	10000	10000
W1000	10000	10000	10000
W1100	11000	10000	10000
W1200	12000	10000	10000
W1300	13000	10000	10000
W1400	14000	10000	10000
W1500	15000	10000	10000
W1600	16000	10000	10000
W1700	17000	10000	10000
W1800	18000	10000	10000
W1900	19000	10000	10000
W2000	20000	10000	10000
W2100	21000	10000	10000
W2200	22000	10000	10000
W2300	23000	10000	10000
W2400	24000	10000	10000
W2500	25000	10000	10000
W2600	26000	10000	10000
W2700	27000	10000	10000
W2800	28000	10000	10000
W2900	29000	10000	10000
W3000	30000	10000	10000

No. 7-12			
TYPE	REF. NO.	QTY	REMARKS
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W3200	32000	10000	10000
W3300	33000	10000	10000
W3400	34000	10000	10000
W3500	35000	10000	10000
W3600	36000	10000	10000
W3700	37000	10000	10000
W3800	38000	10000	10000
W3900	39000	10000	10000
W4000	40000	10000	10000
W4100	41000	10000	10000
W4200	42000	10000	10000
W4300	43000	10000	10000
W4400	44000	10000	10000
W4500	45000	10000	10000
W4600	46000	10000	10000
W4700	47000	10000	10000
W4800	48000	10000	10000
W4900	49000	10000	10000
W5000	50000	10000	10000

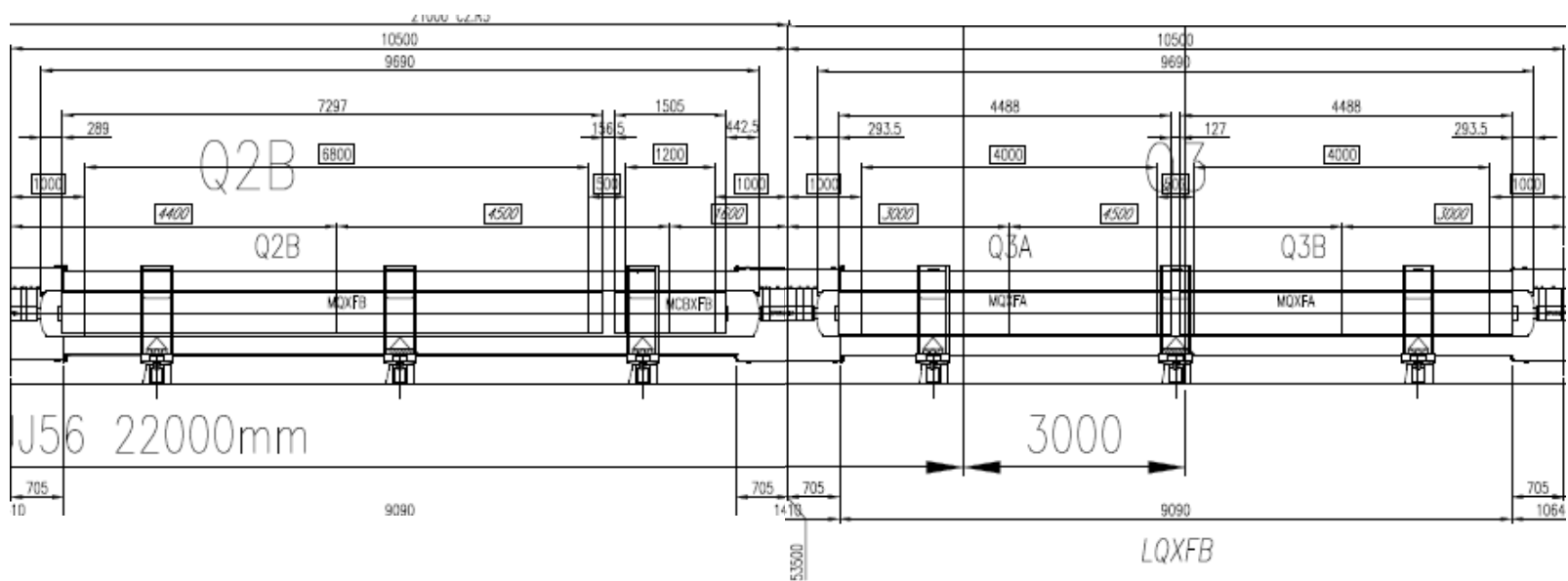
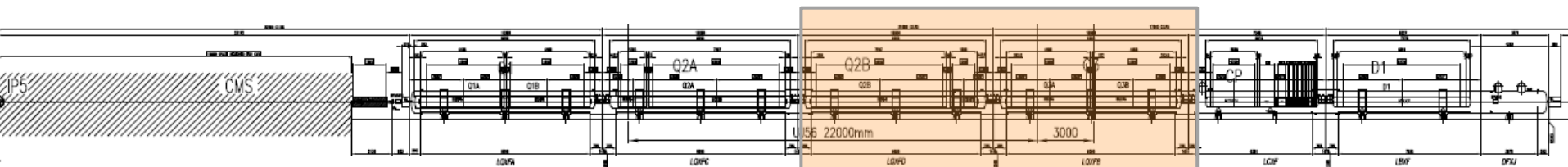
C2 I



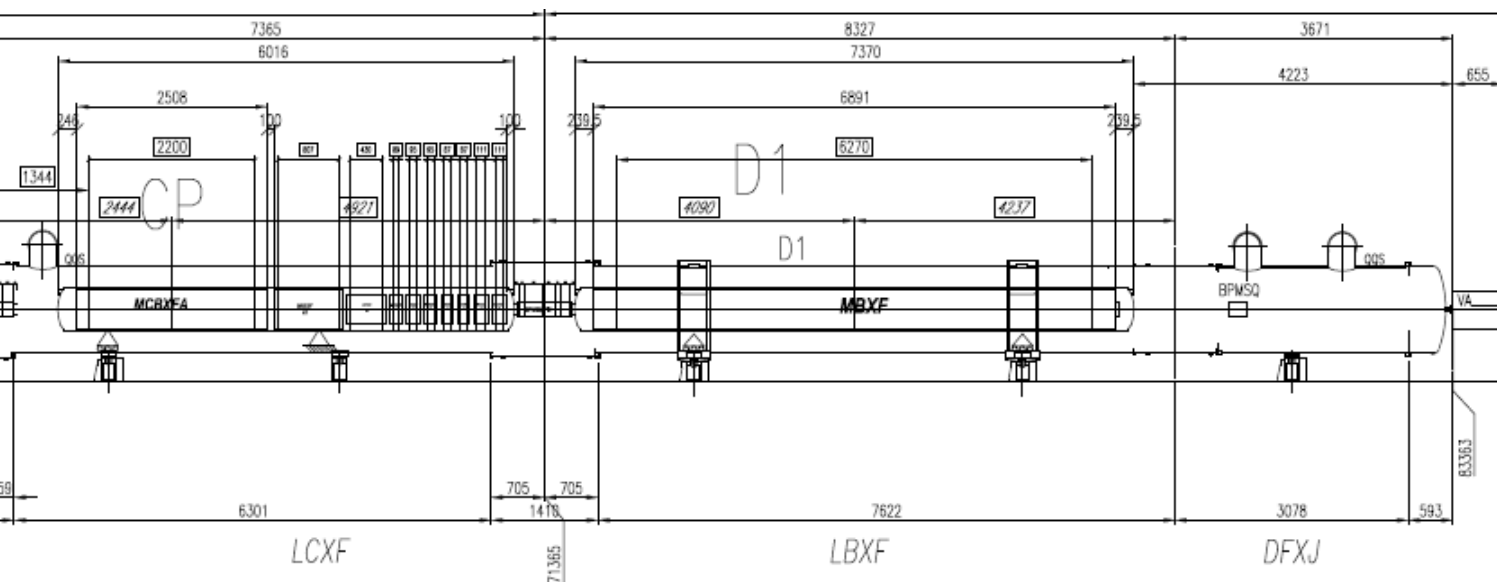
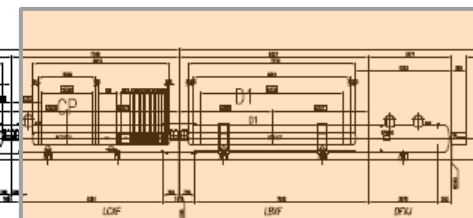
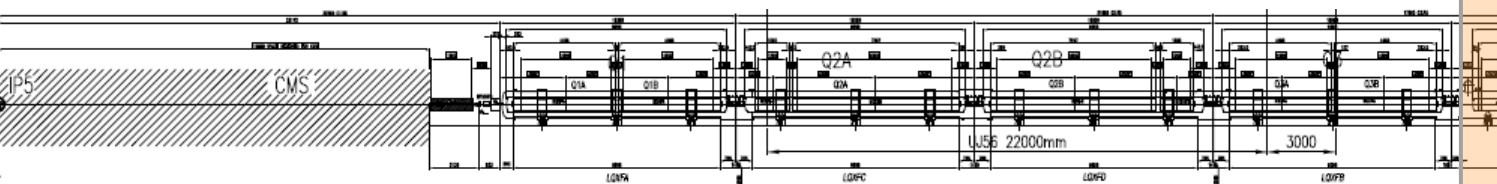
Main issues

- Redesign TAS area, it will be a new object, but it shall also be in line with very high radiation dose. It is necessary to review real needs taking into account scenario for access and therefore radiation exposure estimation
- Presently we have shown the LHC adopted solutions in order to recall the required functionalities

C2-C3 II



C3-C4

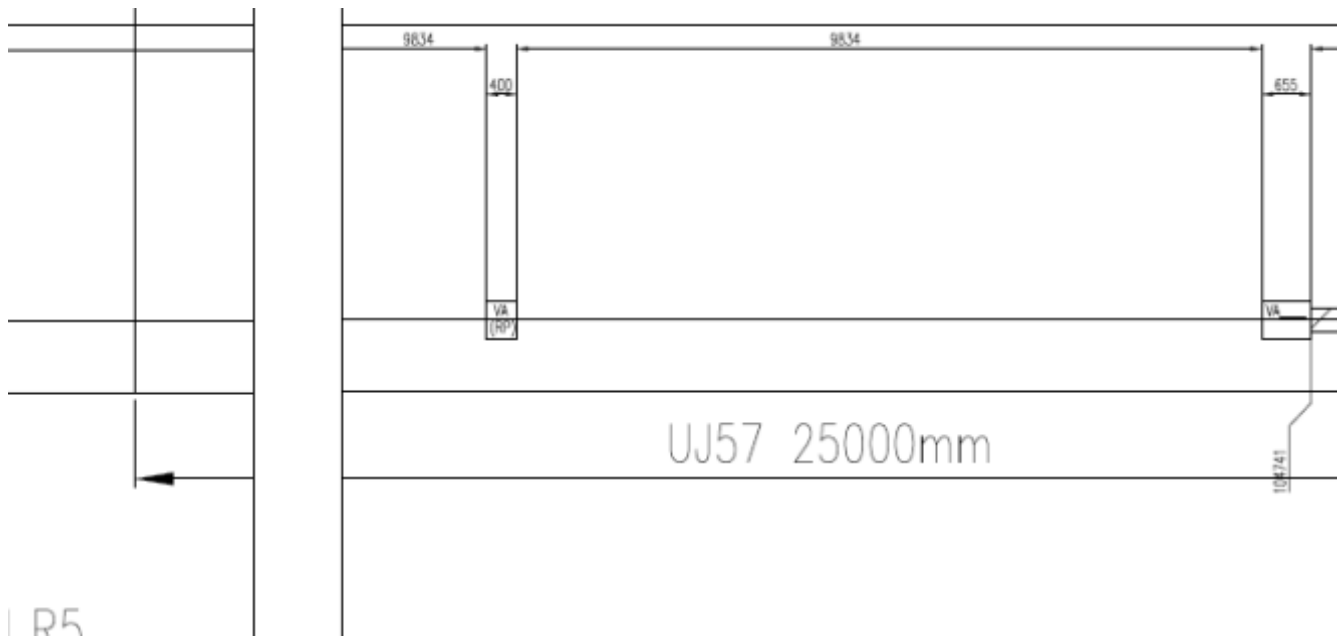
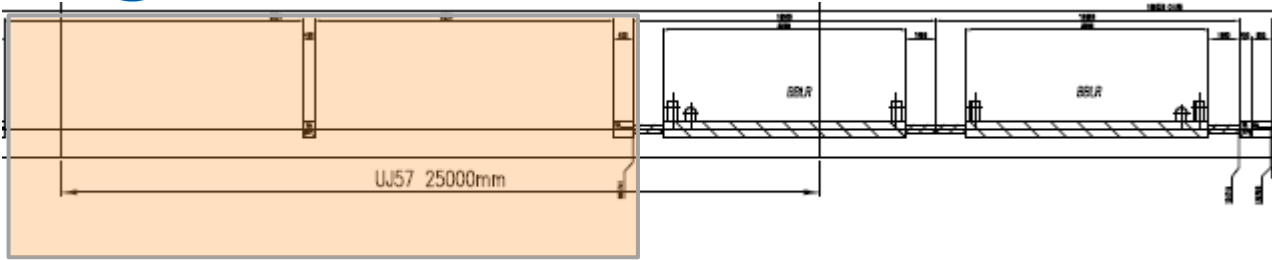


Main issues

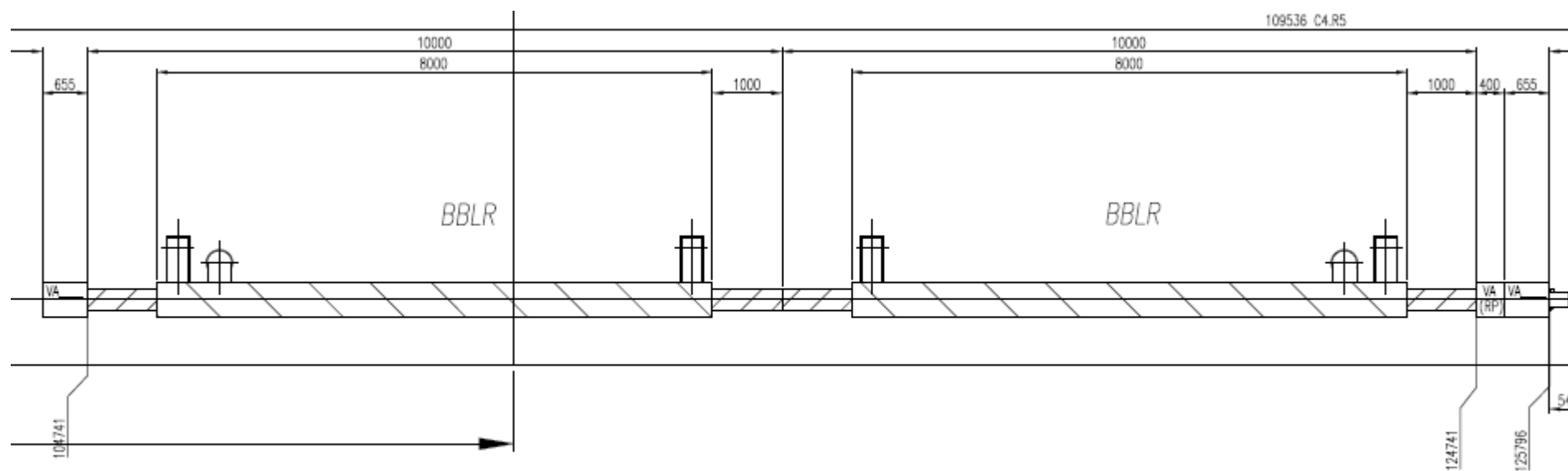
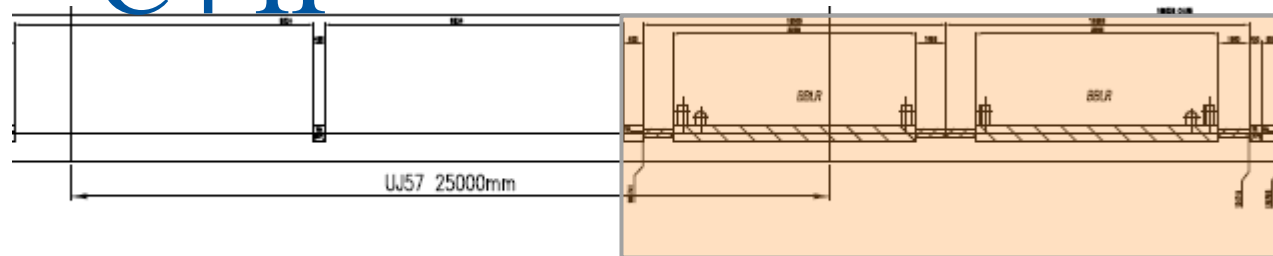
- Bus bar routing: if outside cold mass it will impact the transversal integration and this could affect the longitudinal one
- Better assessment of the lengths needed between Q3b and CP and after D1 in order to feed all the services. Space occupation based on 1st assumptions
 - BPMSXQ moved to cold area. Known as tricky point for present LHC vacuum
 - Service module with BPM will require detailed vacuum engineering

	Reference	From the IP		Magnetic length (mm)
		Start (mm)	End (mm)	
Q1	MQXFA	23000	27000	4000
	MQXFA	27500	31500	4000
Q2A	MCBxFB	33500	34700	1200
	MQXFB	35200	42000	6800
Q2B	MQXFB	44000	50800	6800
	MCBxFB	51300	52500	1200
Q3	MQXFA	54500	58500	4000
	MQXFA	59000	63000	4000
CP	MCBFA	65344.44	67544.44	2200
	MQSXF	67840.44	68647.44	807
	MCTXF	687881.82	69218.82	430
	MCTSXF	69356.70	69445.70	89
	MCDXF	69580.07	69675.07	95
	MCDSXF	69809.44	69904.44	95
	MCOXF	70036.82	70123.82	87
	MCOSXF	70254.20	70341.20	87
	MCSXF	70471.57	70582.57	111
	MCSSXF	70712.94	70823.94	111
D1	MBXF	72320	78590	6270
TAXN		125796	130696	

C4 I



C4 II



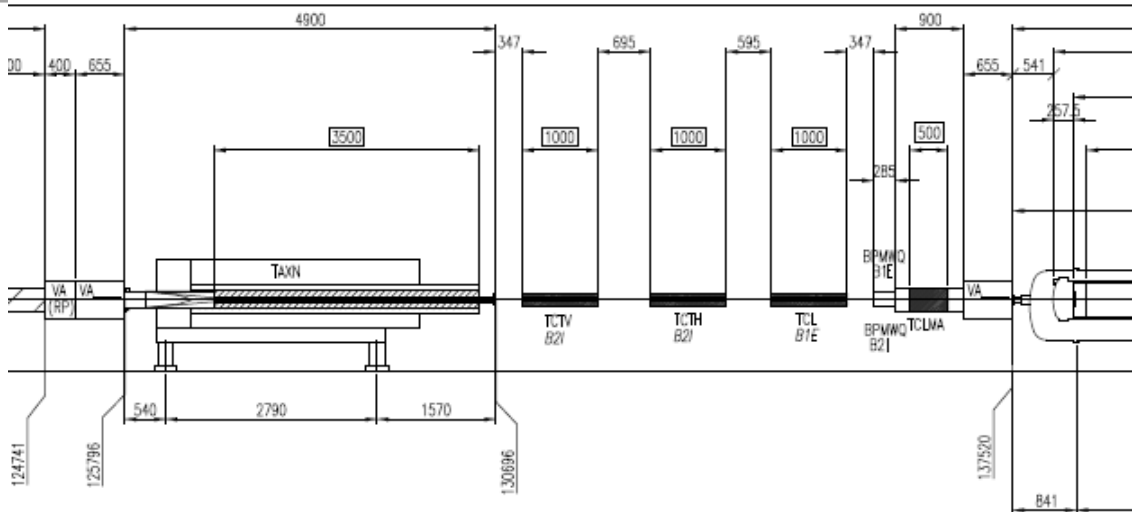
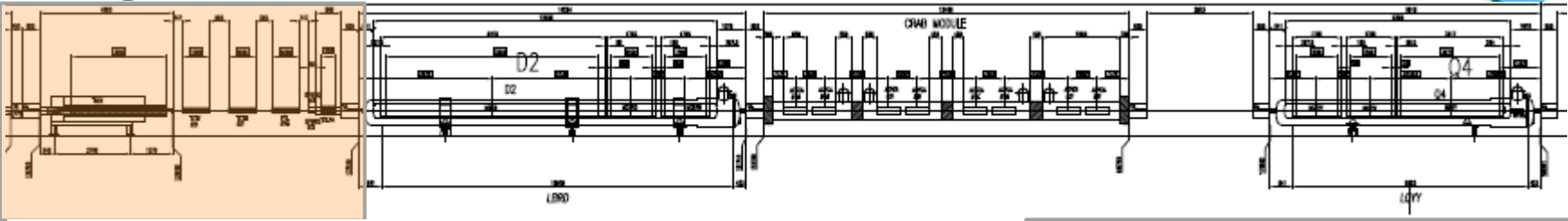
C4 R5

Mechanics

Main issues

- BBLR: added jumper and e-gun for better schematics.

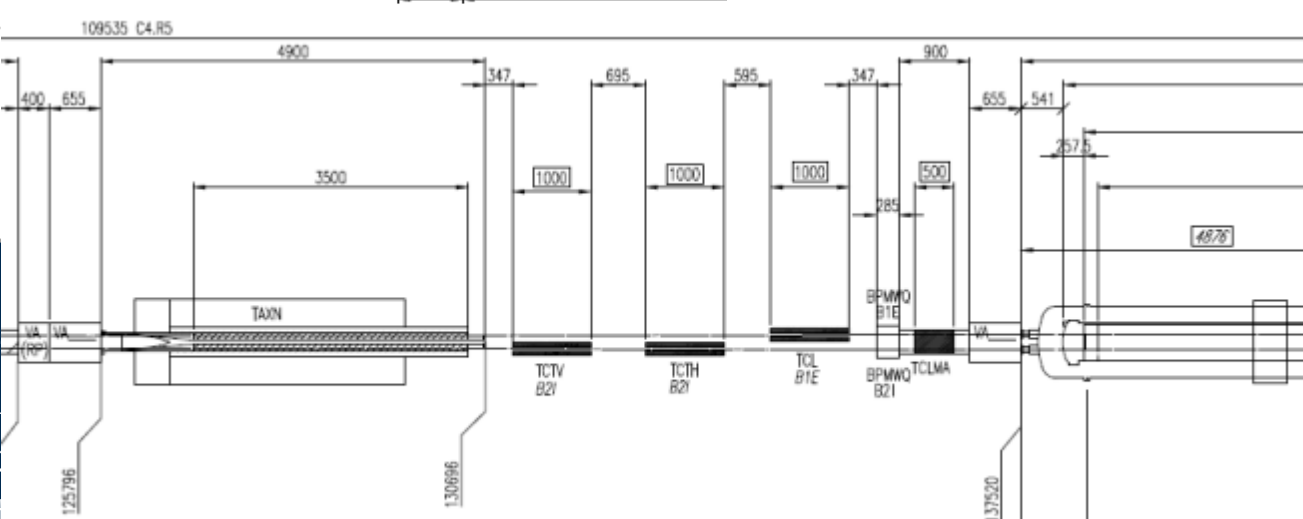
C4 III



Main issues

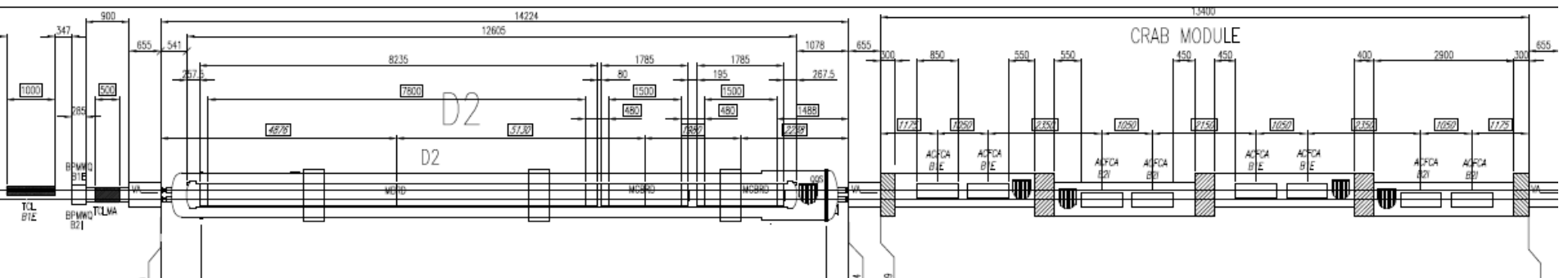
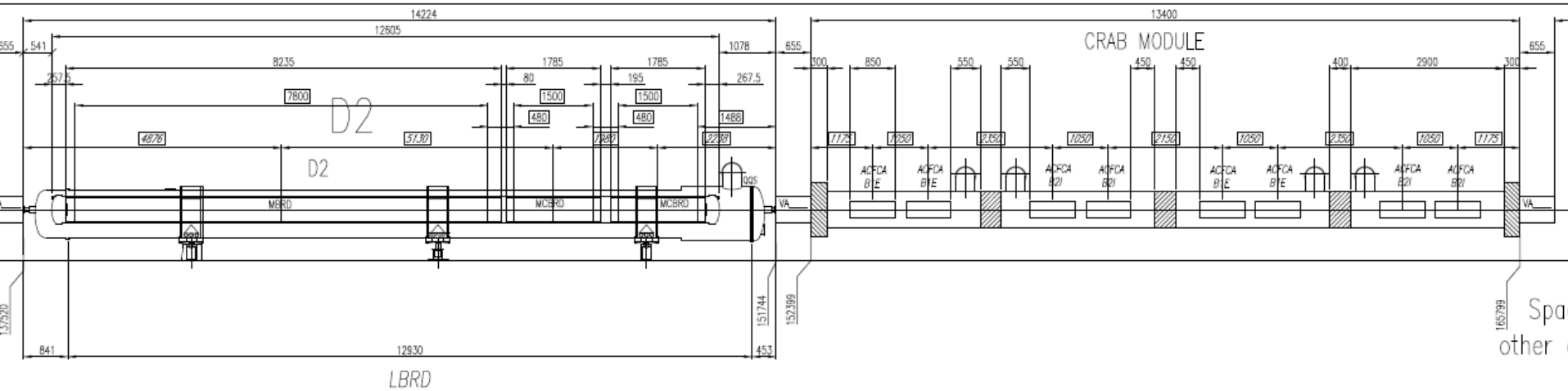
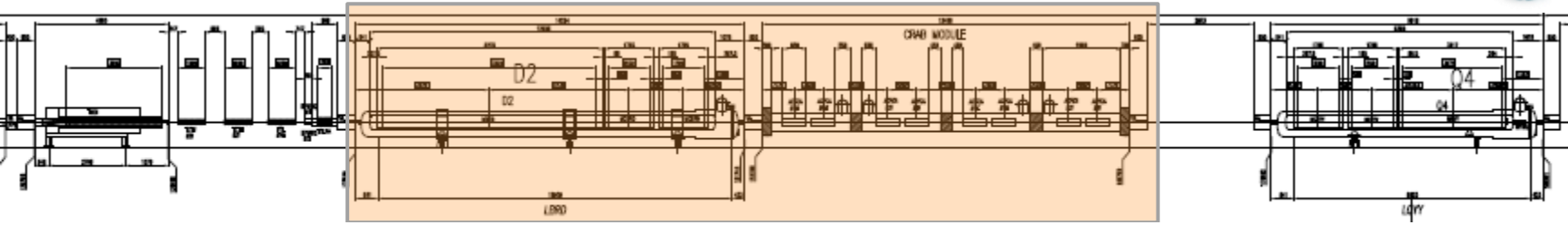
- The TAXN Q4 area is the most tricky. It has changed several time and it was object of an ad hoc meeting where a compromise was found among the different WP

For collima
Mechanical assmely and interfaces



- Not enough space between
are only the active pa
agreed to review possi

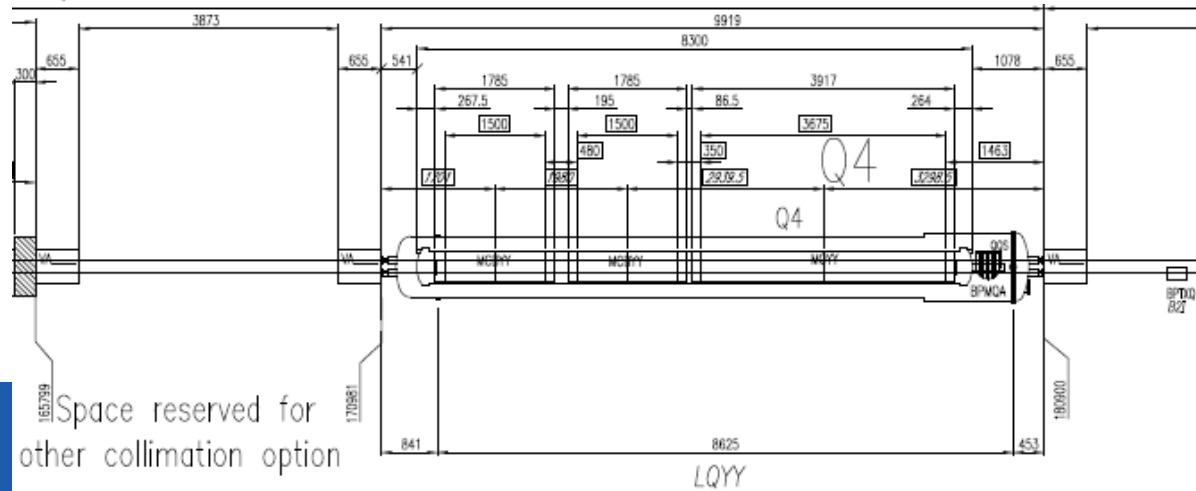
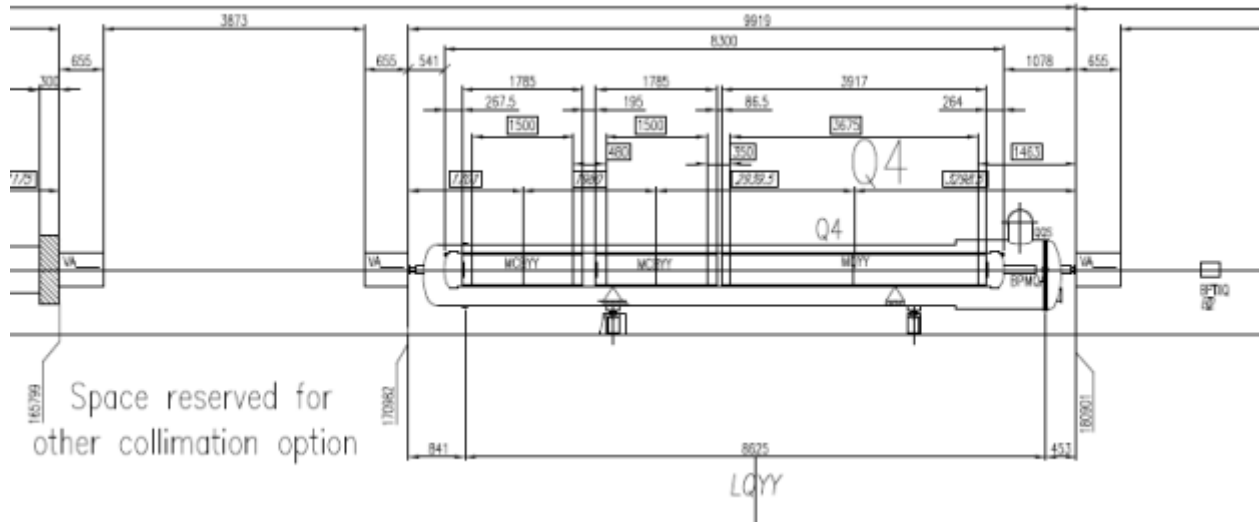
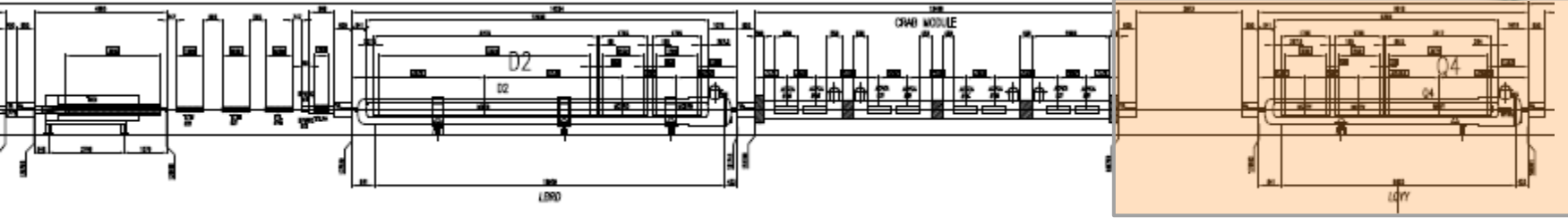
For collimators only active length.



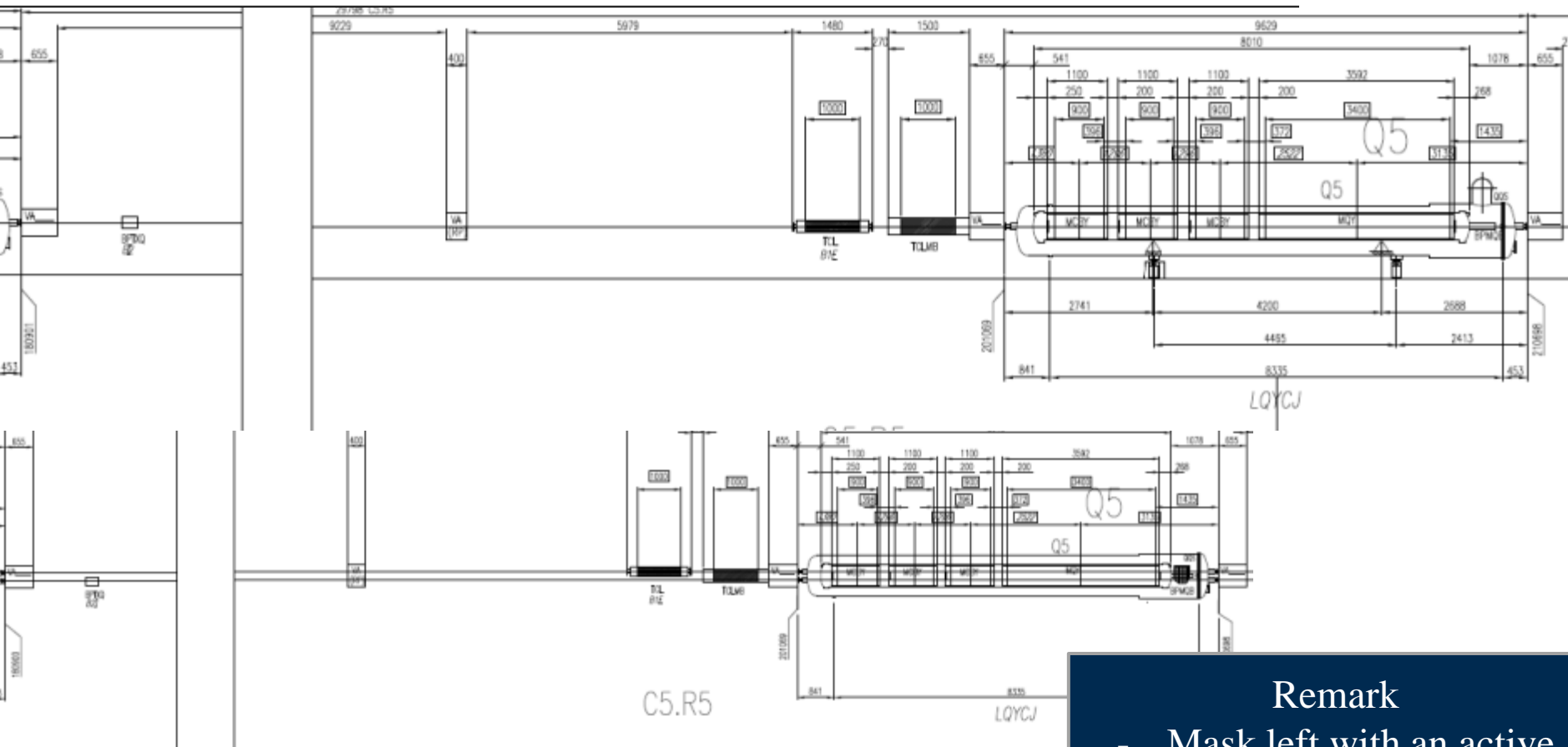
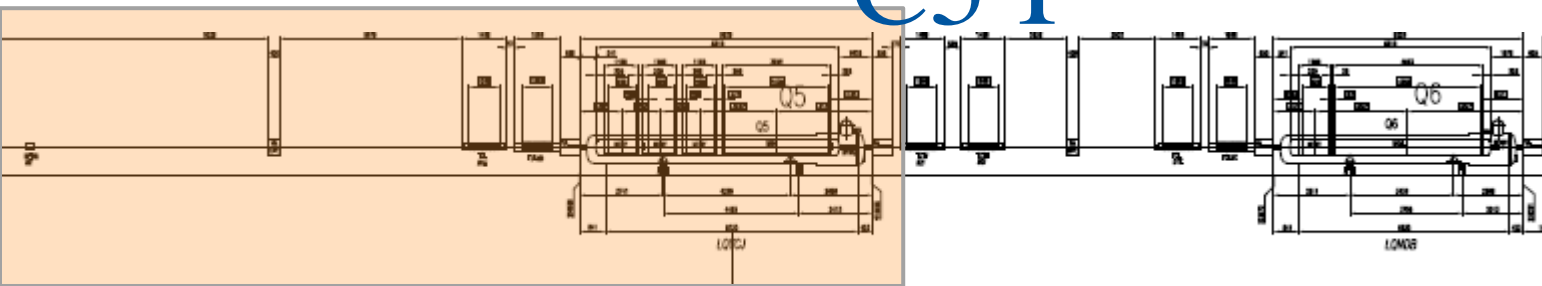
Main issues

- Grey areas between the modules of the crab will be occupied by instrumentation and vacuum equipment for the crab and therefore not available for other installations

C4 VI



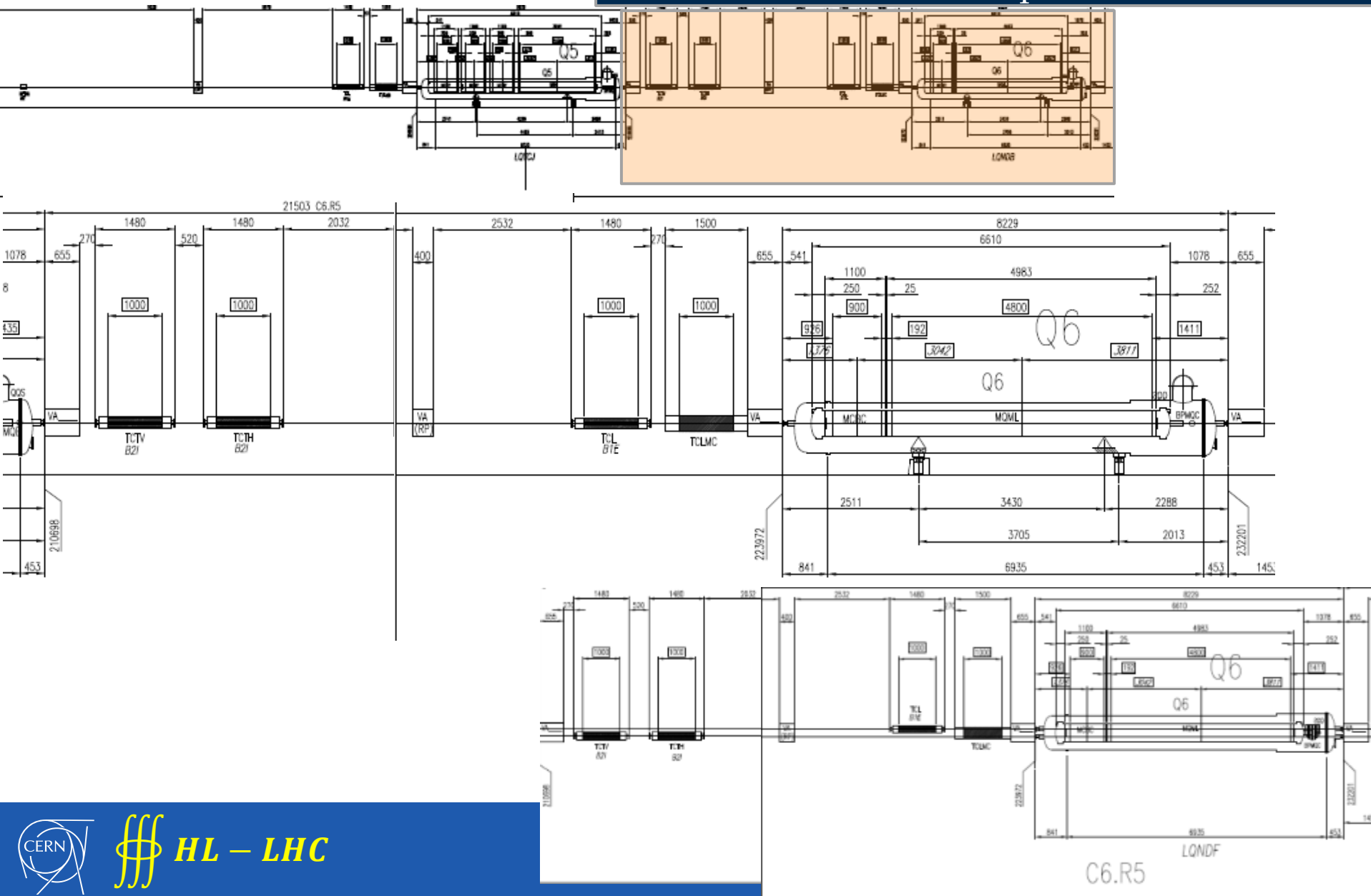
C5 I



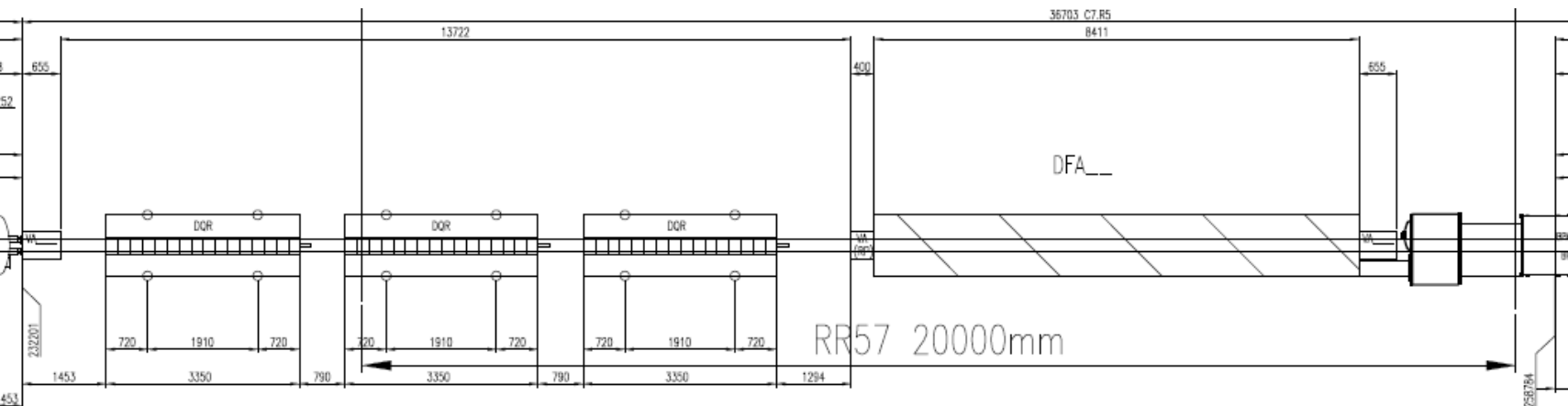
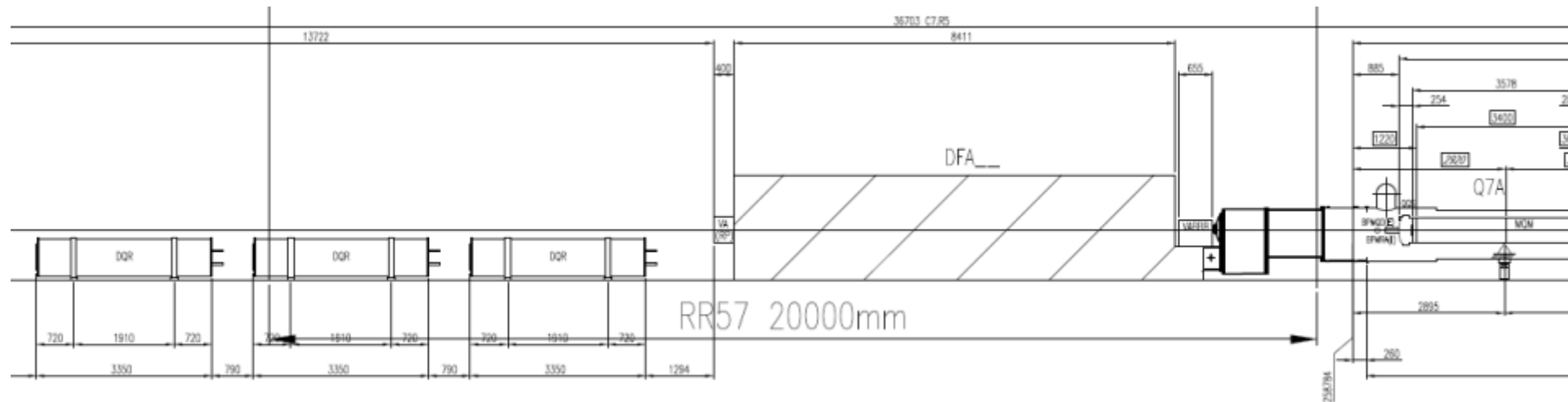
Remark
- Mask left with an active part of 1000 mm because we have space

C5 II-C6

Remark
- Mask left to 1000 mm active part because we have space



C6 II-C7



C7.R5

		From the IP		
	Reference	Start (mm)	End (mm)	Magnetic length (mm)
D2	MBRD	138496	146296	7800
	MCBRD	146776	148276	1500
	MCBRD	148756	150256	1500
CRAB MODULE	ACFCA. B1E	153574	153574	0
	ACFCA. B1E	154624	154624	0
	ACFCA. B1E	160174	160174	0
	ACFCA. B1E	161224	161224	0
Q4	MCBYY	171932.50	173432.50	1500
	MCBYY	173912.50	175412.50	1500
	MQYY	175762.50	179437.50	3675
Q5	MCBY	201999	202899	900
	MCBY	203295	204195	900
	MCBY	204591	205491	900
	MQY	205863	209263	3400
Q6	MCBC	224898	225798	900
	MQML	225990	230790	4800
Q7	MQM	260004	263404	3400
	MQM	263771	267171	3400
	MCBC	267362	268262	900

Conclusions

- The 2 drawings are going to be put in EDMS/CDD approval in the incoming days
- The following issues are open points that could have possible impact on the lay-out
 - DFM and related links to feed magnets from D2 to Q6
 - Collimation between TAXN and D2 and possible modular/movable TAXN
 - Correctors in the D2 and Q4
 - Triplet bus bar
 - The need of masks (Q4, Q5, Q6) will be revised during the summer by the energy depositions studies
 - Alignment system
 - Pick ups for the crab cavities
- New iteration in **October** taking into account
 - New energy deposition studies
 - Optics verifications
 - Collimation optimisation
 - D2 and Q4 correctors design
 - Possibly DFM and related links concepts
- Remark: the supporting solution adopted for the jacks in the drawing is not necessarily representative of the final solution that will be adopted
- Thanks once more to participants of the 2 review meetings
- P.S. more and more key discussions will take place in the HL-TC and therefore large participations from the key players and group is important