



**Dedicated
Experiment for
CP violation
Study at
LHC**

Date: 06/05/2004

Engineering Note

DETECTOR GEOMETRY DATABASE

This document summarizes all information of the different LHCb sub detectors geometry, which guarantees the integration of the LHCb experiment as a whole. The numbers will be updated as soon as the geometry of a sub detector changes and the new design is agreed within the LHCb collaboration. Sketches of the sub detectors are included.

Keywords: Geometry, Envelope

Prepared by :
R. Lindner
[EP/LBD/CERN]
[rolf.lindner@cern.ch]

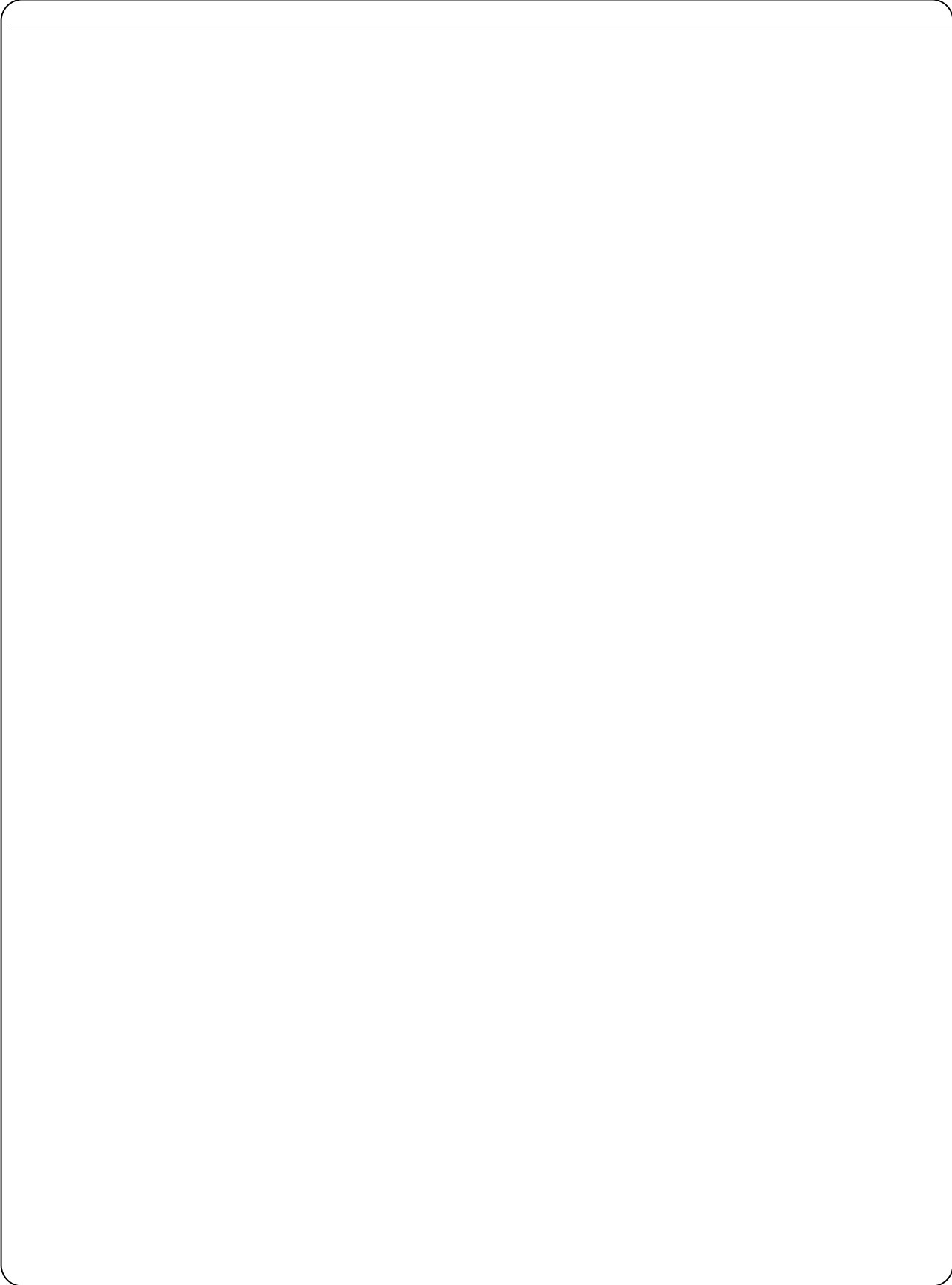
Checked by :

Approved by :

Date: 01.12.2001

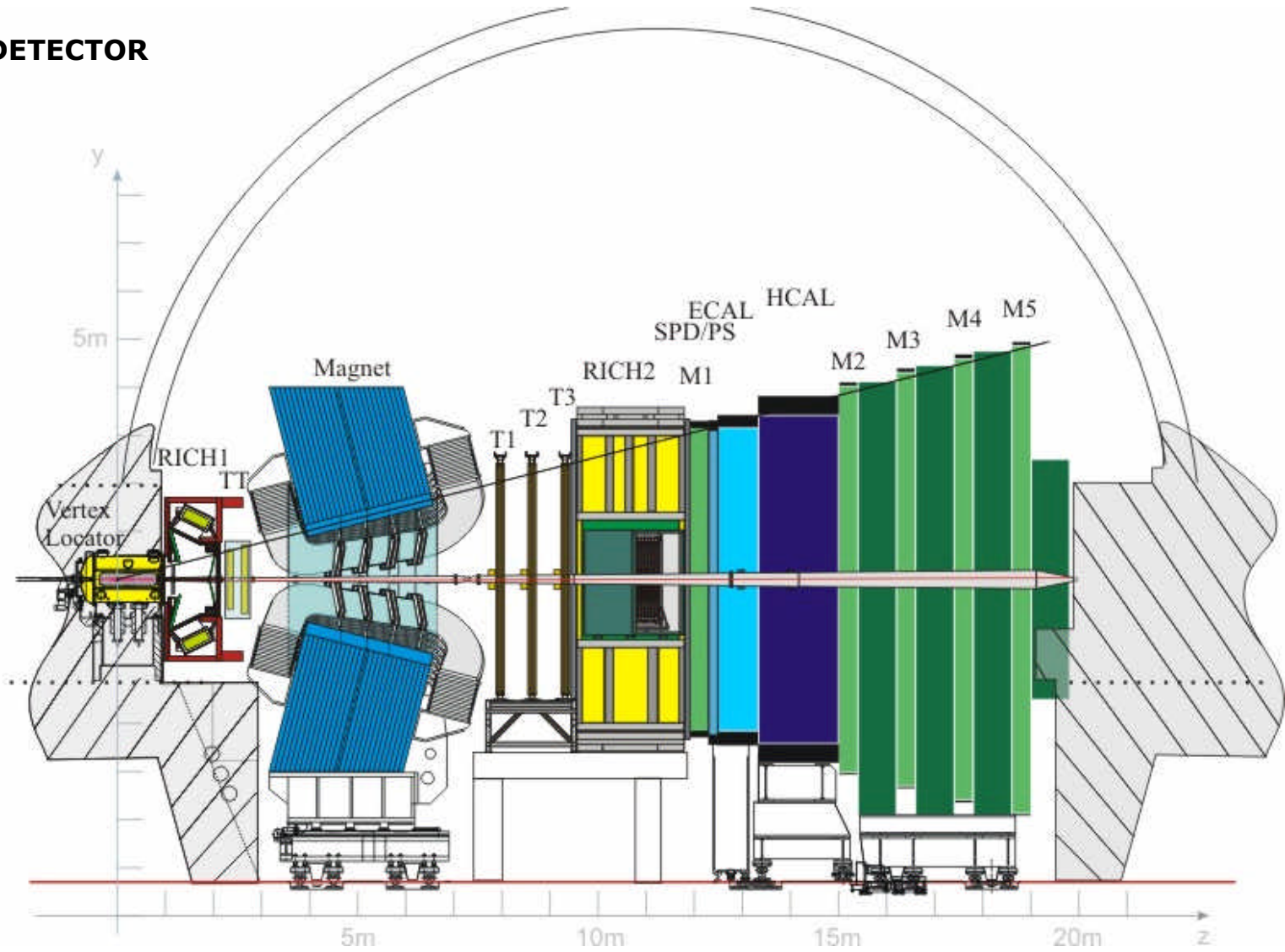
Document Status Sheet

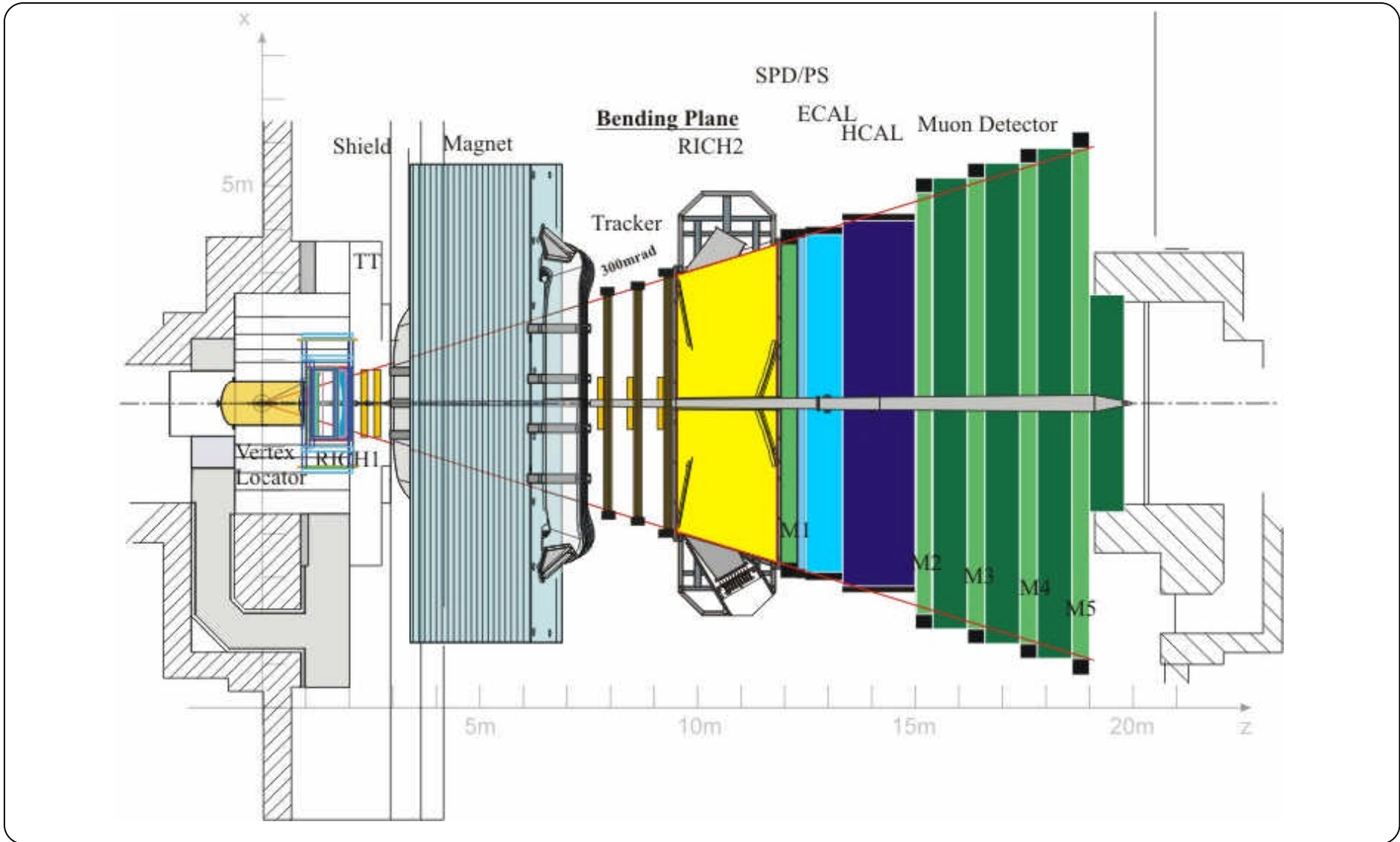
Version	Date	Pages	Comments or Description of Changes
1.0	2001-12-01	16	First upload (Pilot Project)
2.3	2002-02-26	16	Correct y of magnet from 3800mm to 4000mm
2.4	2002-03-27	16	Beam height at z-mean of each detector, beam slope 3.601 mrad
2.5	2003-02-13	16	LHCb light: TT1 and three Tracker seeding stations, no magnetic shielding. Shift of Calorimeter and Muon system downstream by 100mm
2.6	2003-06-26	16	TT station as full silicon
3.0	2003-10-21	16	Magnet envelope increase due to additional Support for coils TT shifted by 10mm to leave clearance after 25mrad cone RICH 1 reoptimized design, MF and Muon station envelope corrected.
4.0	2004-05-06	16	TT, IT, OT new z envelopes due to z-increase. VELO stations reduced from 27 to 25 and position changed RICH 1 included tolerance in z by +/- 5mm



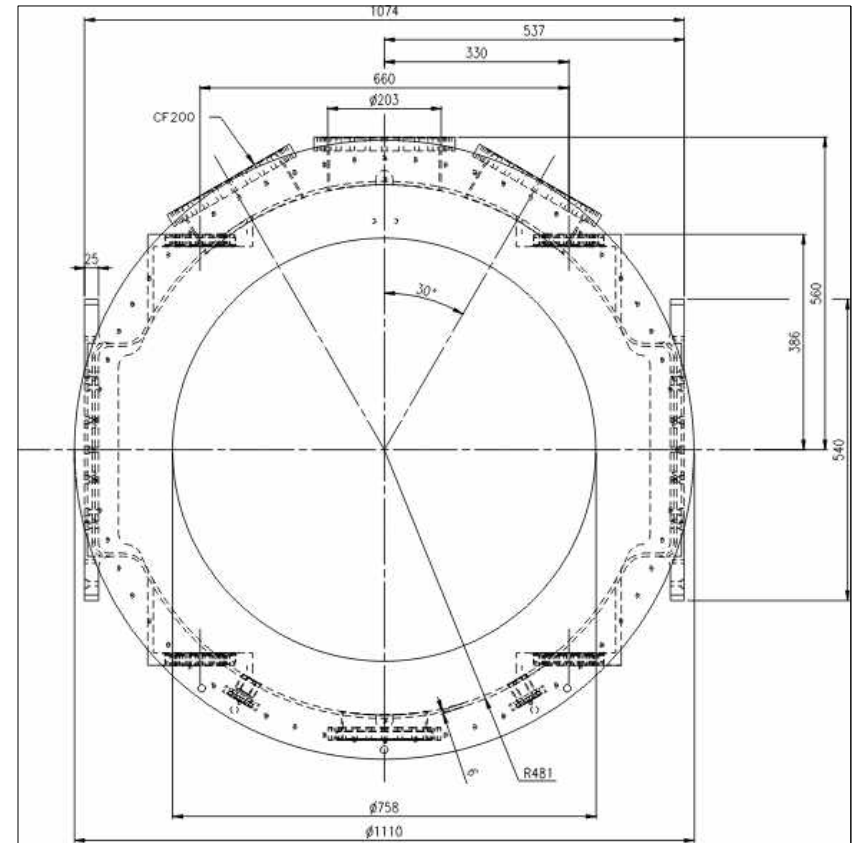
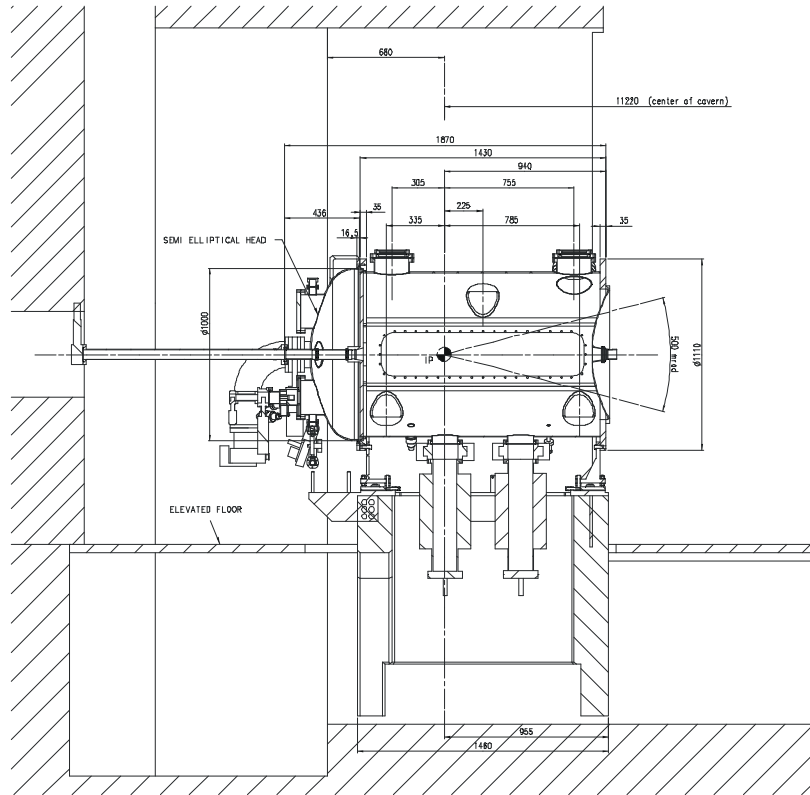
1.	LHCB DETECTOR	5
2.	VERTEX LOCATOR	7
3.	THE TRACKING SYSTEM	9
4.	THE RICH SYSTEM	11
5.	CALORIMETER SYSTEM	14
6.	MUON SYSTEM	16
7.	MAGNET	17

1. LHC DETECTOR





2. VERTEX LOCATOR



sub-detector	mean Z of station	beam height at z mean*	Z upper half wafer	Z lower half wafer	min X of total material	max X of total material	min Y of total material	max Y of total material	max theta of total in X	min theta of total in X	max theta of total in Y	min theta of total in Y
station 1	-167.5	6259.0	-175	-160	8	42	8	42	246	48	246	48
station 2	-137.5	6259.1	-145	-130	8	42	8	42	296	58	296	58
station 3	-107.5	6259.2	-115	-100	8	42	8	42	372	74	372	74
station 4	-797.5	6256.7	-805	-790	8	42	8	42	53	10	53	10
station 5	-47.5	6259.4	-55	-40	8	42	8	42	724	167	724	167
station 6	-17.5	6259.5	-25	-10	8	42	8	42	1176	429	1176	429
station 7	12.5	6259.7	5	20	8	42	8	42	1282	569	1282	569
station 8	42.5	6259.8	35	50	8	42	8	42	779	186	779	186
station 9	72.5	6259.9	65	80	8	42	8	42	525	110	525	110
station 10	102.5	6260.0	95	110	8	42	8	42	389	78	389	78
station 11	132.5	6260.1	125	140	8	42	8	42	307	60	307	60
station 12	162.5	6260.2	155	170	8	42	8	42	253	49	253	49
station 13	192.5	6260.3	185	200	8	42	8	42	215	42	215	42
station 14	222.5	6260.4	215	230	8	42	8	42	187	36	187	36
station 15	252.5	6260.5	245	260	8	42	8	42	165	32	165	32
station 16	282.5	6260.6	275	290	8	42	8	42	148	28	148	28
station 17	312.5	6260.7	305	320	8	42	8	42	134	26	134	26
station 18	342.5	6260.8	335	350	8	42	8	42	122	23	122	23
station 19	432.5	6261.2	425	440	8	42	8	42	97	18	97	18
station 20	482.5	6261.3	475	490	8	42	8	42	87	17	87	17
station 21	532.5	6261.5	525	540	8	42	8	42	79	15	79	15
station 22	582.5	6261.7	575	590	8	42	8	42	72	14	72	14
station 23	632.5	6261.9	625	640	8	42	8	42	66	13	66	13
station 24	682.5	6262.1	675	690	8	42	8	42	61	12	61	12
station 25	732.5	6262.2	725	740	8	42	8	42	57	11	57	11

z mean Z start Z end X min X max Y min Y max
envelope -2200.0 975

* The floor of RB84 follows the slope of 3.601 mrad, the height of the IP in this region is 2415 mm

2. THE TRACKING SYSTEM

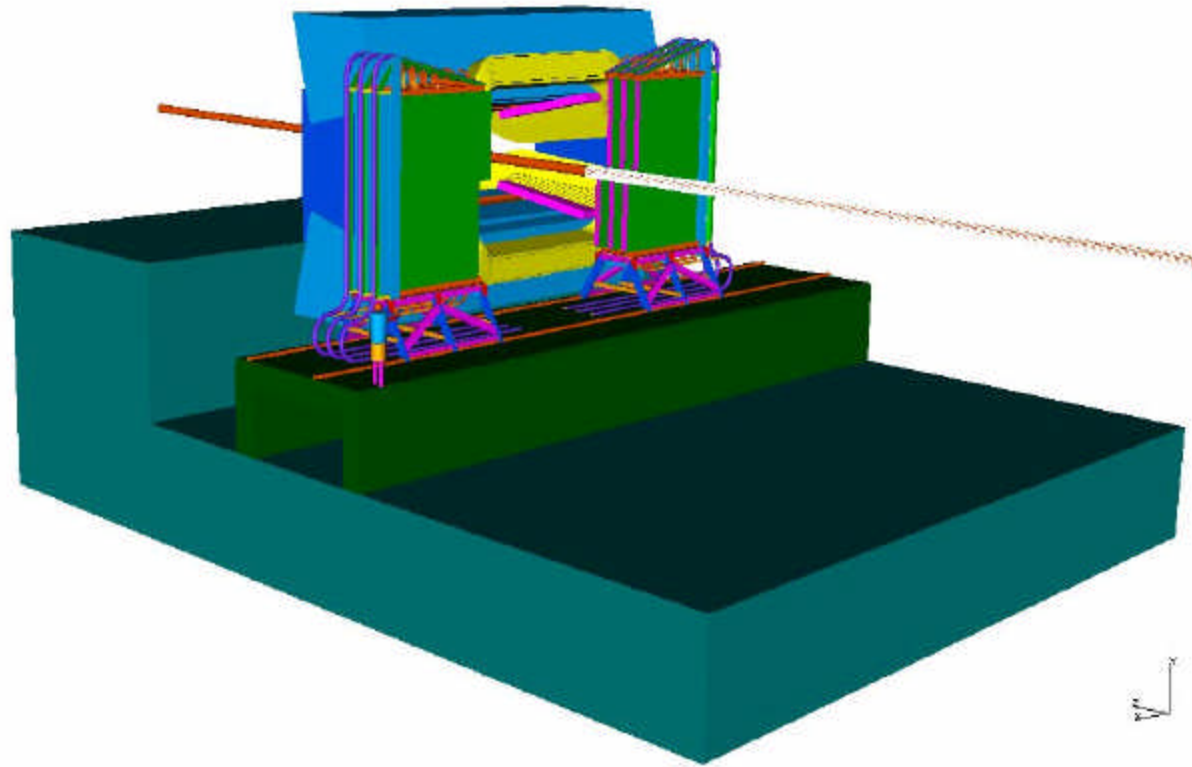


Figure 2-1: The final support structure will be different from the one shown in this sketch

sub- detector	mean Z	<i>delta Z of total area</i>	<i>Z_start of total area</i>	<i>Z_end of total area</i>	beam height at Z mean	<i>min X material</i>	<i>max X material</i>	<i>min Y material</i>	<i>max Y material</i>	<i>min theta in X</i>	<i>max theta in X</i>	<i>min theta in Y</i>	<i>max theta in Y</i>
TT	2485	430.0	2270.0	2700.0	6268.6	5	1398	5	1314				
inner tracker T1	7733	190.0	7638.0	7828.0	6287.4								
outer tracker T1	7943	210.0	7838.0	8048.0	6288.2								
clearance		242.0											
inner tracker T2 +MFD	8400	220.0	8290.0	8510.0	6289.8								
outer tracker T2	8625	210.0	8520.0	8730.0	6290.7								
clearance		285.0											
outer tracker T3	9320	210.0	9215.0	9425.0	6293.2								
TT Ymax is given by rail to rail													

3. THE RICH SYSTEM

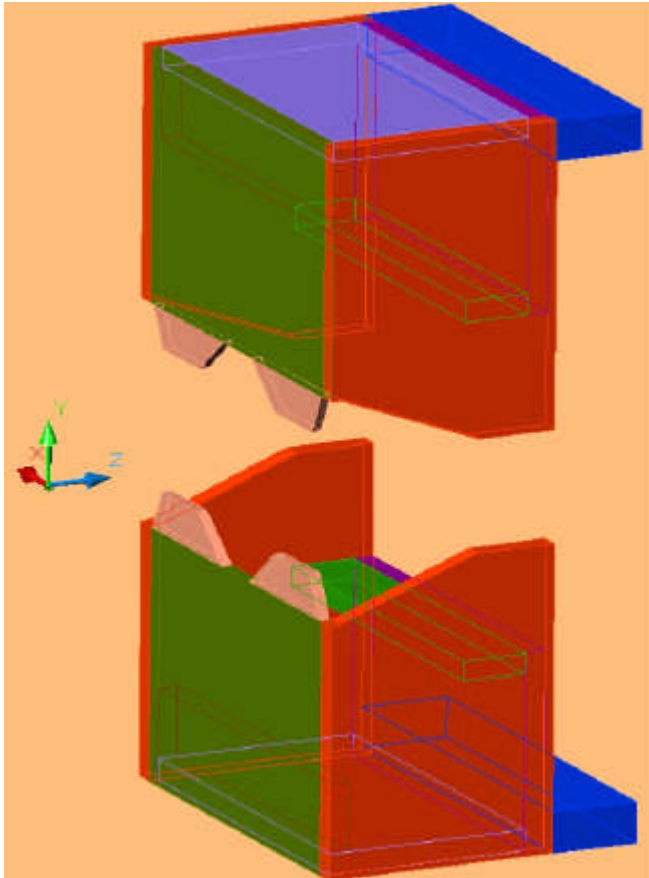


Figure 3-1: RICH1 3D-view

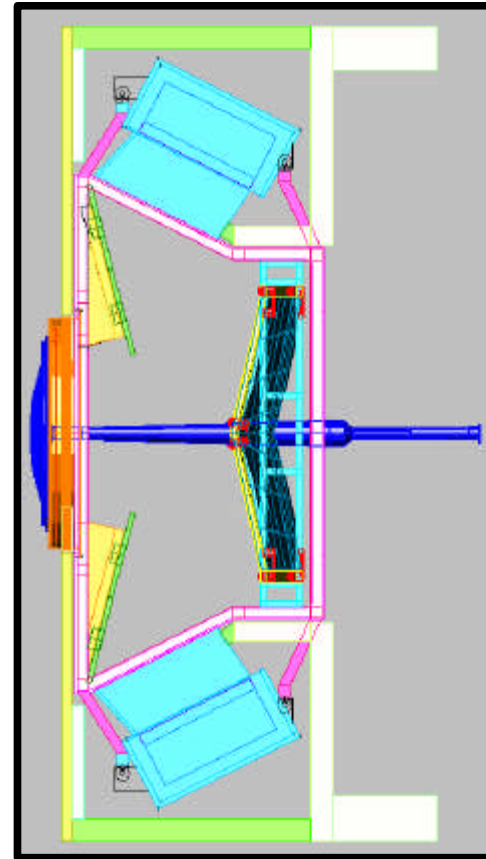
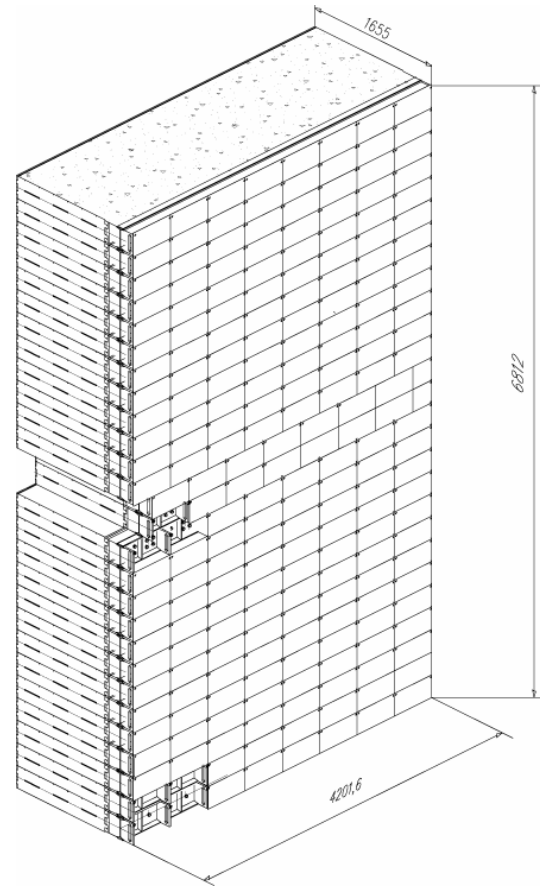
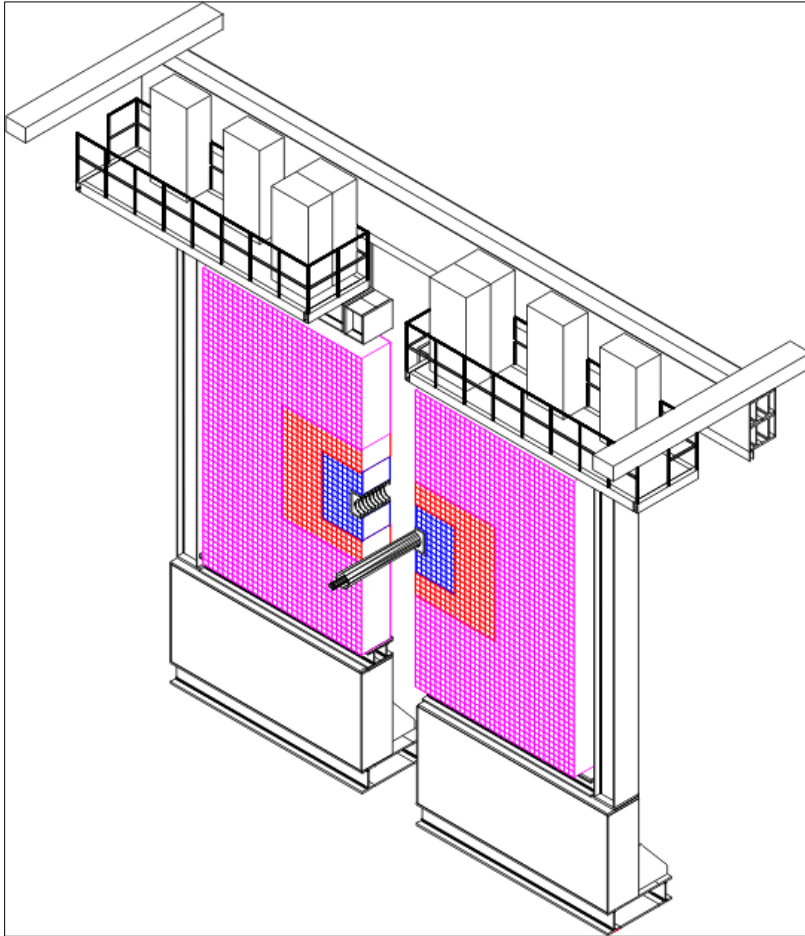


Figure 3-2: RICH1 side-view

	sub- element	delta Z	Z_start	Z_end	beam height at Z	theta of accep in X	min X	max X	theta of accep in Y	min Y	max Y
up-stream RICH						300			250		
	surrounding frame	1185	985	2170	6265			925		550	2000
	gas volume										
	aerogel										
	Shielding	445	2165	2610				925		1800	2000
down-stream RICH						120			100		
	surrounding frame	2450	9450	11900	6298		144	4880		144	3510
	HPD	485	10342	10827			3400	3951		0	600
	gas volume	2300	9550	11850			145	3666		145	3460

4. CALORIMETER SYSTEM



Calorimeters:

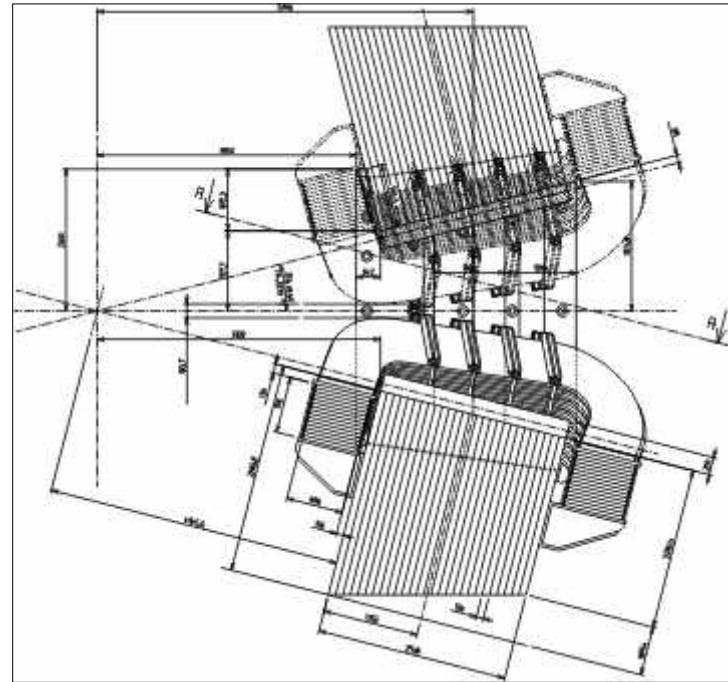
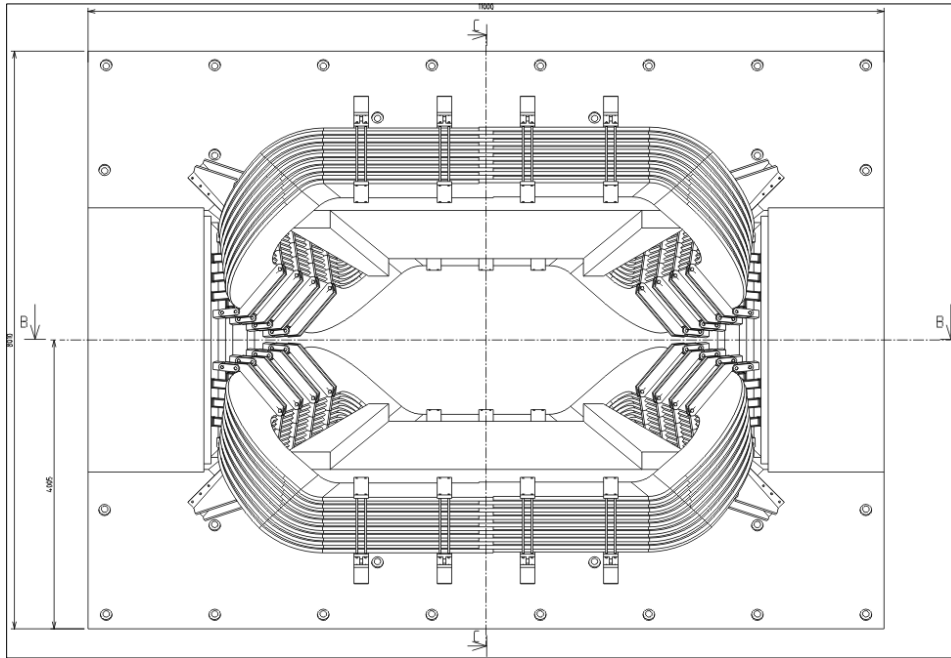
remark: space between beam-pipe and min X,Y to be filled up with shielding material

sub-detector	mean Z	delta Z of active	delta Z of total available	Z start	Z_end	beam height at Z mean	min X of active material	max X of active material	min X of total material	min Y of active material	max Y of active material	min Y of total material
SPD	12335		70	12300	12370	6302		3810			3095	
Lead	12390		20	12380	12400	6302						
PS	12445		70	12410	12480	6302		3827.5			3110	
E-cal	12932.5		825	12520	13345	6304	323.2	3878.4	242.4	323.2	3151.2	242.4
H-cal	14217.5		1665	13385	15050	6309	393.9	4201.6	262.6	393.9	3413.8	262.6

5. MUON SYSTEM

sub-detector	mean Z	delta Z of active area	delta Z of total available space	Z start of total material	Z end of total material	beam height at Z mean	min theta of total in X	max theta of total in X	min X of totale material	max X of total material	min theta of total in Y	max theta of total in Y	min Y of total material	max Y of total material
station-1	12100		360	11920	12280	6303	15	315	179	4001	15	265	180	3235
station-2	15270		360	15090	15450	6315	15	315	226	5034	15	255	228	3934
shield-2	15870		820	15460	16280	6317	15	315	232	5305	15	255	233	4030
station-3	16470		360	16290	16650	6319	15	315	244	5425	15	255	246	4246
shield-3	17070		820	16660	17480	6321	15	315	250	5696	15	255	252	4343
station-4	17670		360	17490	17850	6323	15	315	262	5816	15	255	264	4559
shield-4	18270		820	17860	18680	6325	15	315	268	6087	15	255	270	4656
station-5	18870		360	18690	19050	6328	15	315	280	6207	15	255	282	4872
shield-5	19400		820	19080	19900	6329	15	130	286	2602	15	113	286	2165

6. MAGNET



sub-detector	mean Z	delta Z	Z_start	Z_end	beam height at Z mean	Theta min in x	Theta max in x	X min	X max	Theta min in y	Theta max in y	Ymin	Y max
yoke	5146	3492	3400	6892	6278.1	300			5500	250			4005
coil	5164.5	4925	2702	7627	6278.2	300				250			