11T Dipole – New Baseline

HL-LHC Parameter and Layout Committee
2015-03-12

F. Savary on behalf of the WP11 team
Input from V. Baglin, D. Ramos

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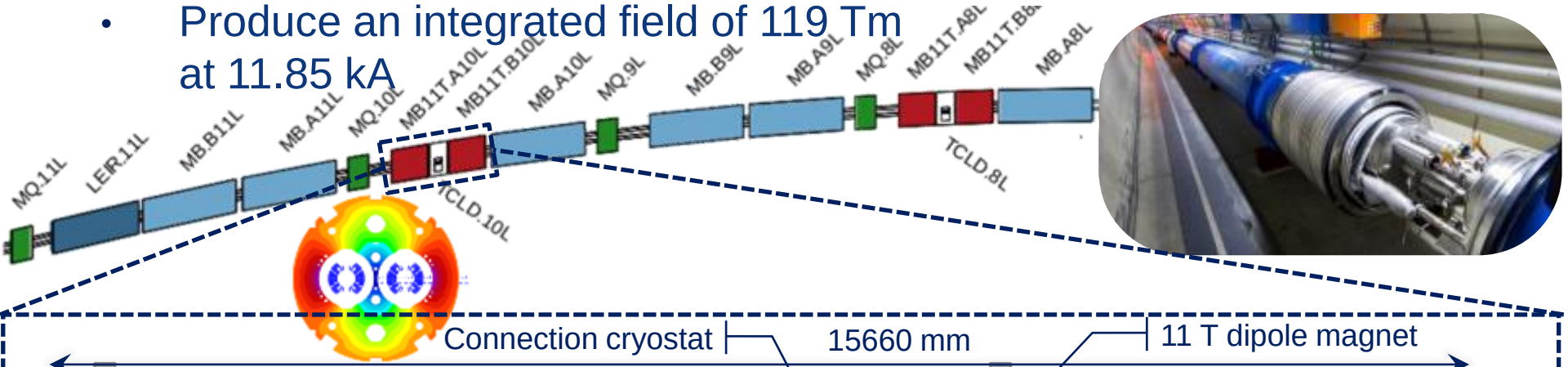
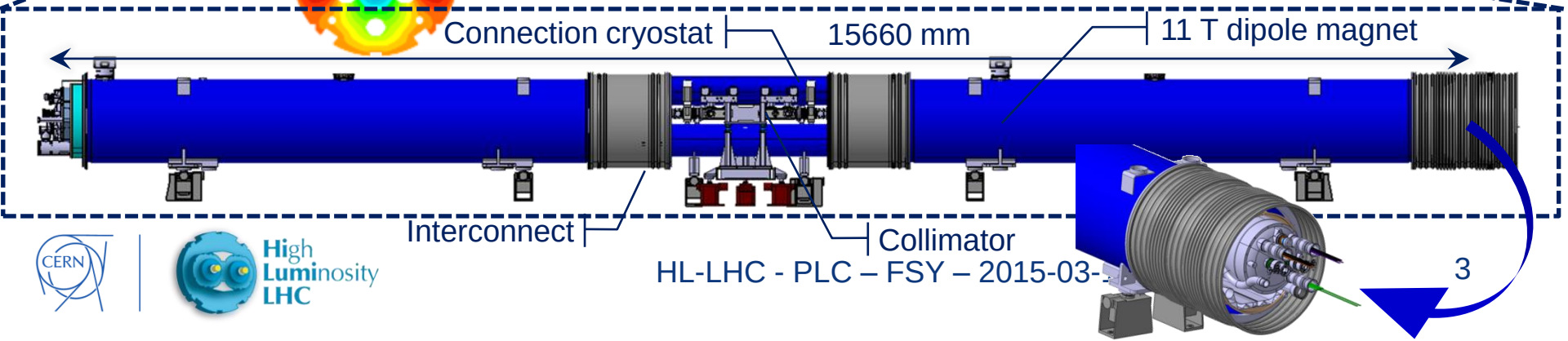
Outline

- Background information
- New baseline
- By-pass cryostat for collimator integration
- Recent news

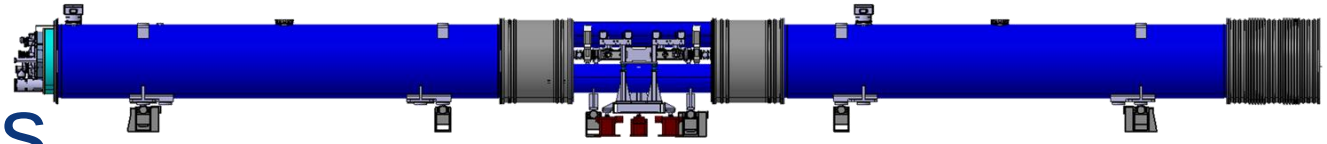
Background information

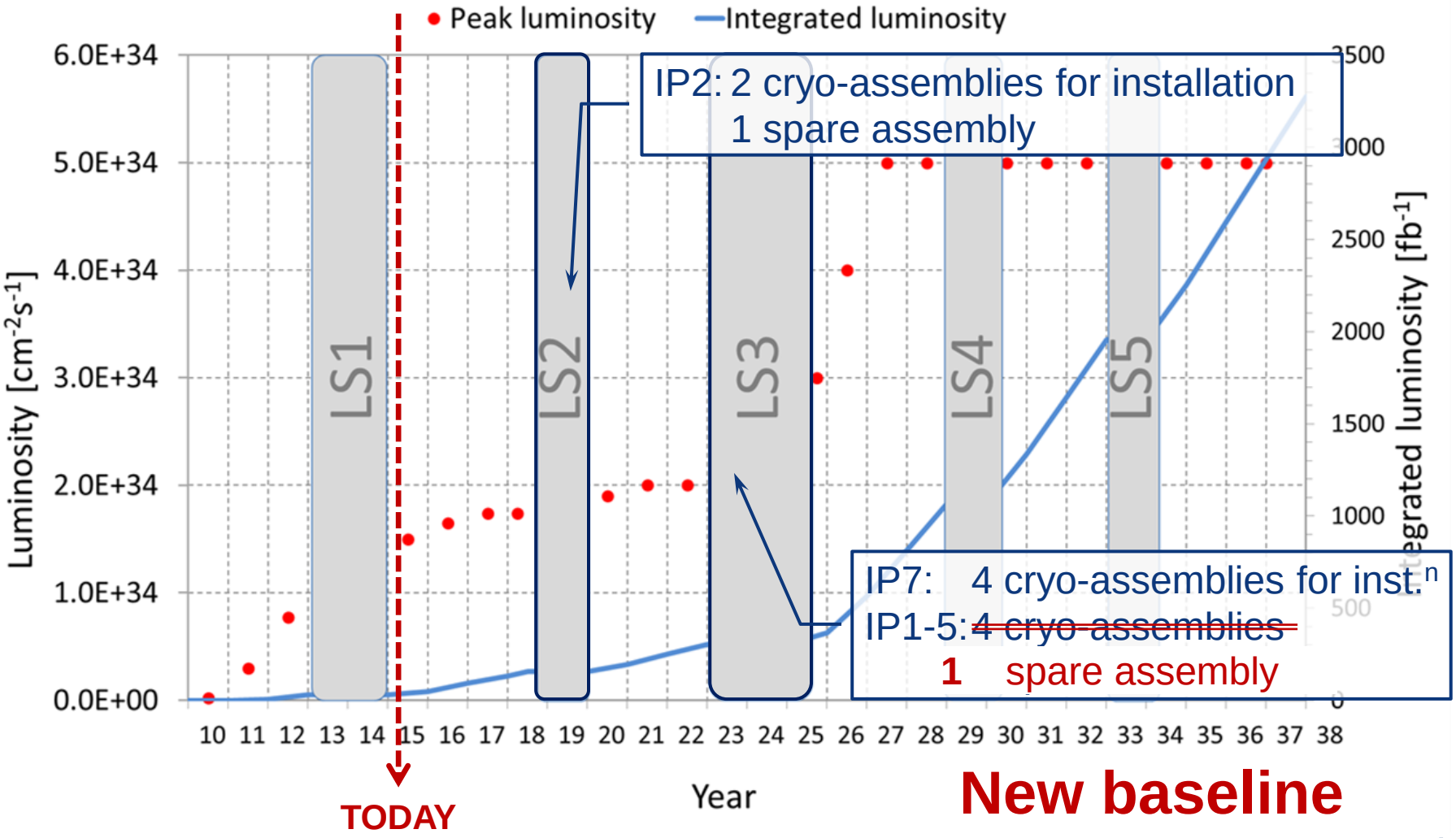
- Create space in the dispersion suppressor regions of LHC, i.e. a room temperature beam vacuum sector, to install additional collimators (TCLD), which are needed to cope with beam intensities that are larger than nominal, such as in the High Luminosity LHC (HL LHC)
- Replace a standard MB by a pair of 11T dipoles (a pair of MBH's)
- Produce an integrated field of 119 Tm at 11.85 kA





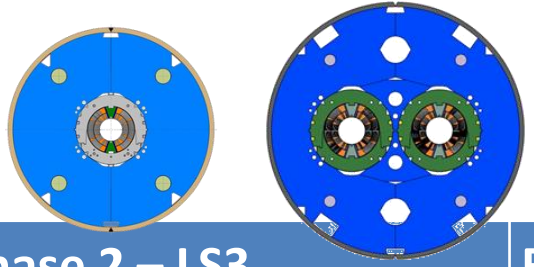
Two phases





Graph showing nominal upgrade parameters - 3000 fb^{-1} would be reached in 2036 *Courtesy L. Rossi*

Scope in numbers

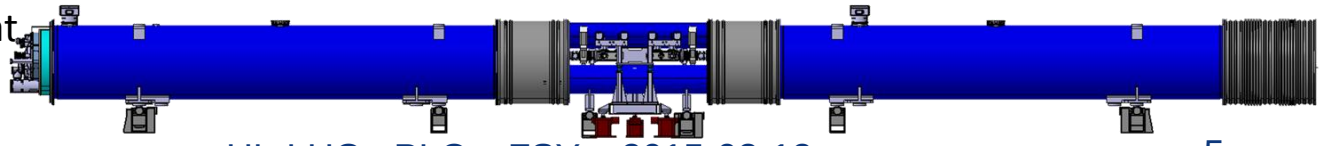


	Phase 1 - LS2 [all RRP]	Phase 2 – LS3	Remark

Models	• 4 single aperture / 1-in-1
	• 2 double aperture / 2-in-1
		• PIT (new X-section):
		  • 4 single aperture / 1-in-1
		  • 2 double aperture / 2-in-1
		• RRP (new X-section):
		  • 2 single aperture / 1-in-1
		  • 1 double aperture / 2-in-1
			New X-section is necessary for PIT conductor (suffering from excessive degradation when the current keystone angle is used)

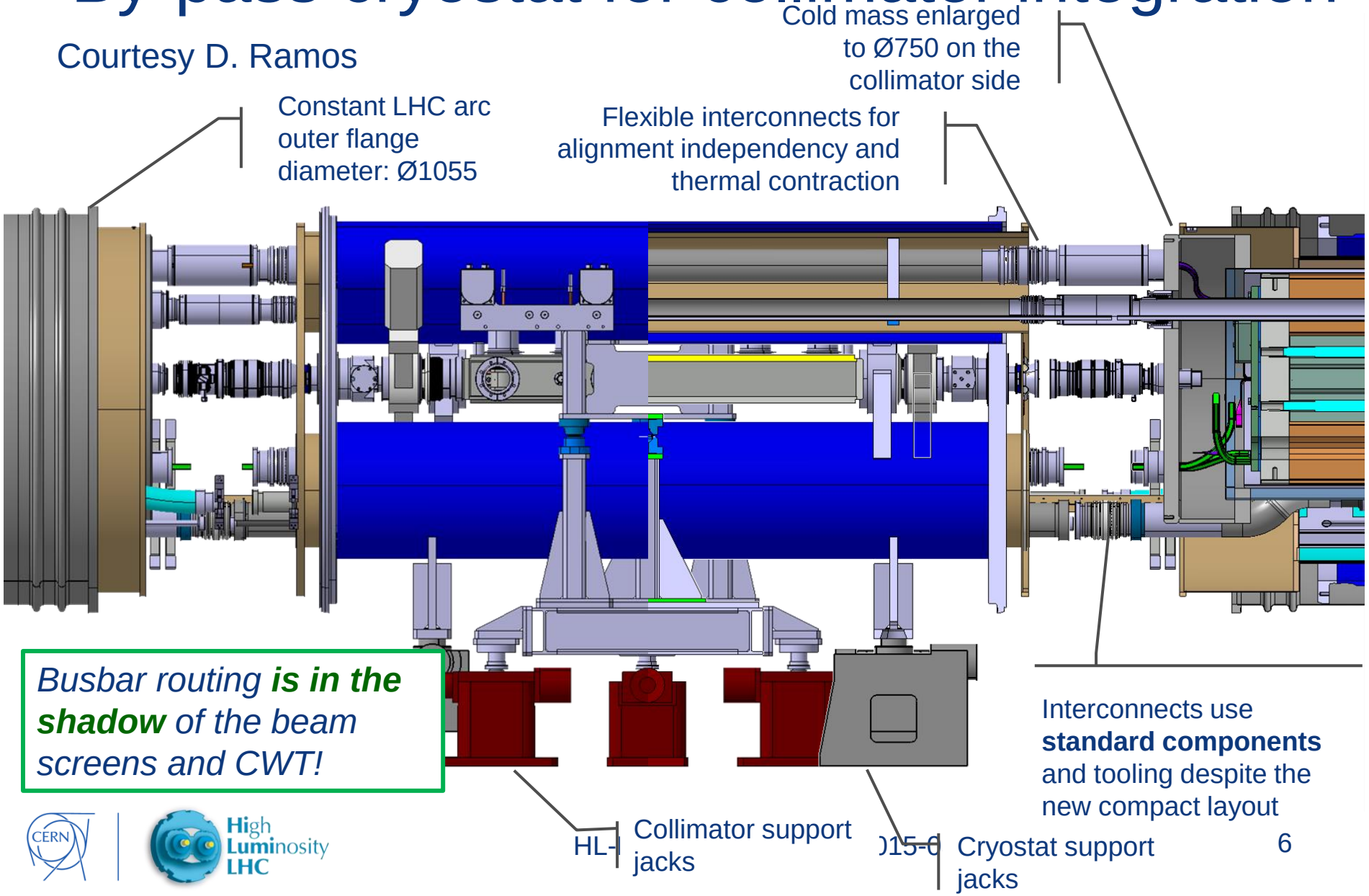
Prototypes	• P1: MBH_P001	• P2: MBH_P002 [PIT] • P3: MBH_P003 [RRP]	• 1 prototype cryostat
Series baseline	• **IP2** • **2 x (2 MBH__ + 1 BPC*)**	• **IP7** • **4 x (2 MBH__ + 1 BPC)**	
Series spares	• **1 x (2 MBH__ + 1 BPC)**	• **1 x (2 MBH__ + 1 BPC)**	
Option	-	• IP1-IP5 • Max. 8 x (2 MBH__ + 1 BPC)	• Exact number and installation time t.b.d. later

*BPC stands for by-pass cryostat



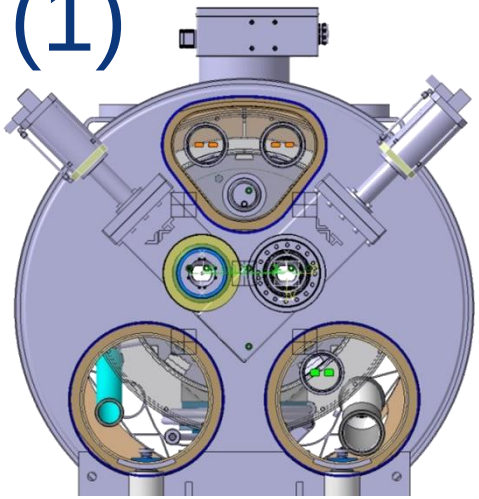
By-pass cryostat for collimator integration

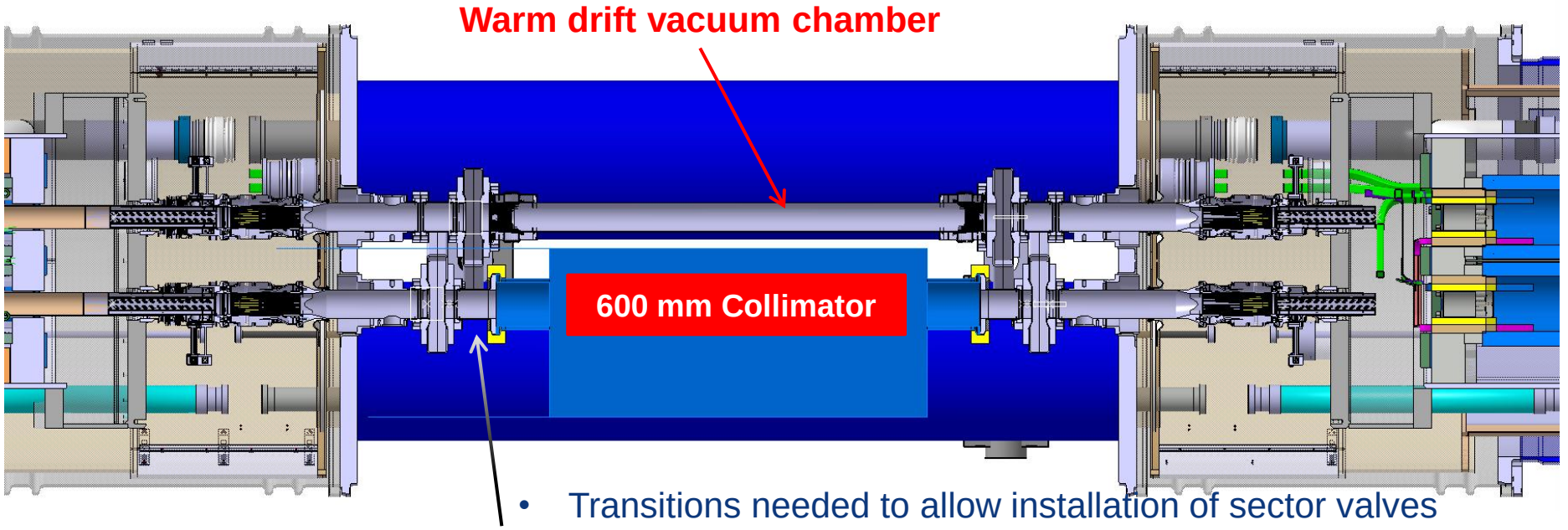
Courtesy D. Ramos



Beam vac. & Collimator length (1)

Courtesy D. Ramos



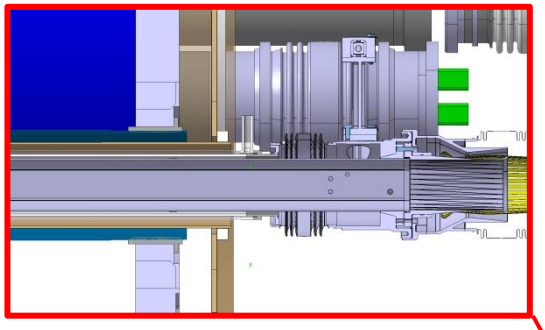


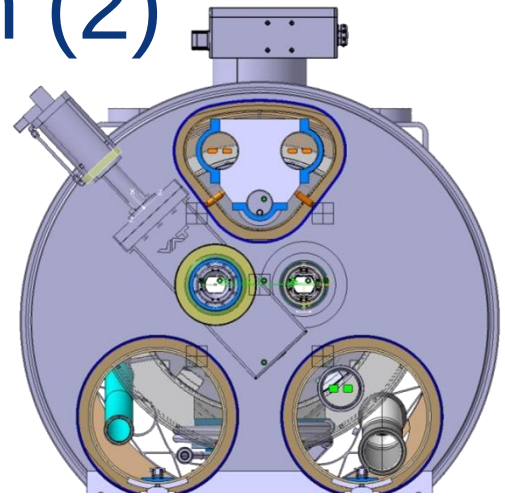
- Transitions needed to allow installation of sector valves
- Very tight integration

Beam vac. & Collimator length (2)

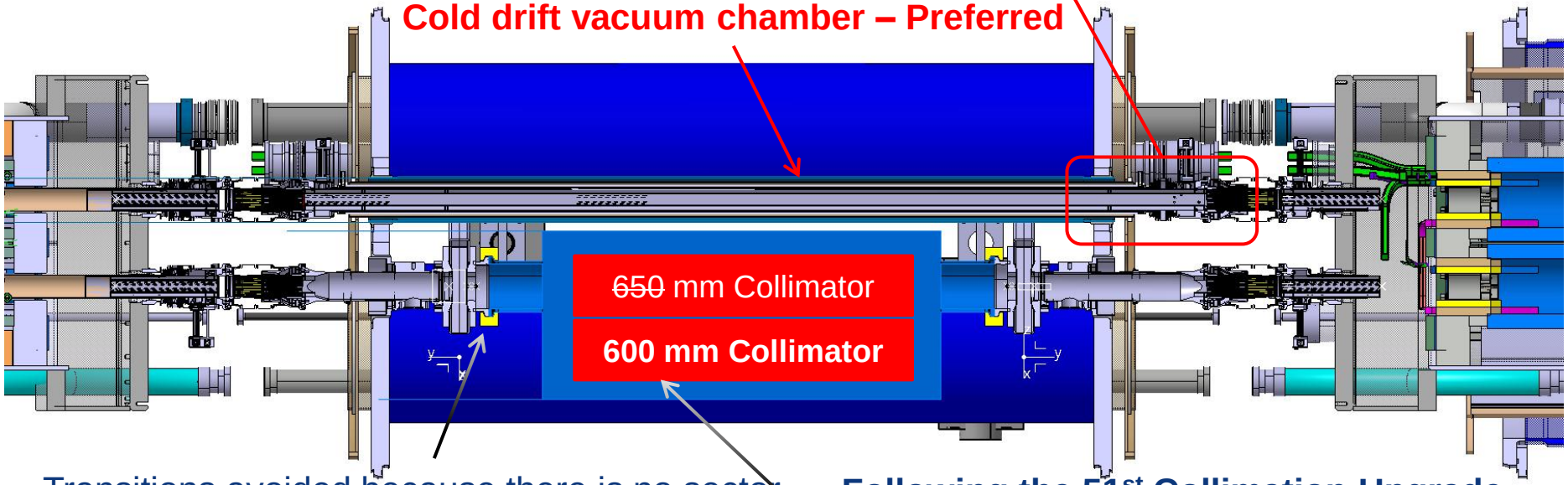
Courtesy D. Ramos

Work to make a mock-up by-pass cryostat has started





- Interconnects become longer because of the beam screens
- Very compact cold line because of the sector valve RF shielding



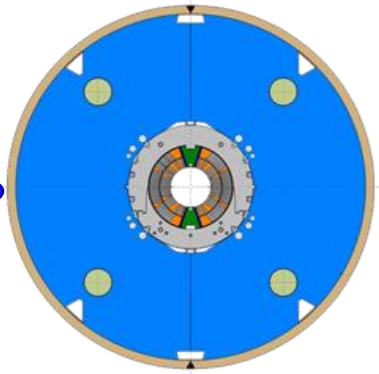
Transitions avoided because there is no sector valve on the other beam line

Following the 51st Collimation Upgrade Specification Meeting held on Jan. 30, 2015 ColUSM #51

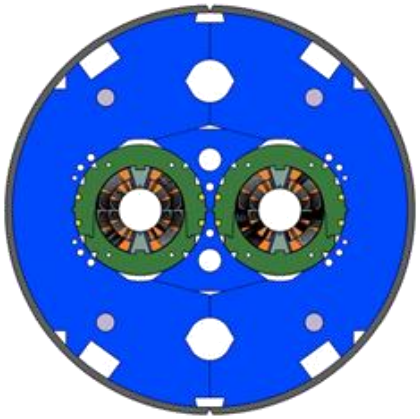
Recent news on the models @ CERN

Model #	Coil #	Status / plan
MBHSM101	101-105	Tested [coil 101 made of copper]
MBHSP101	106-107	Tested
MBHSP102	106-108	Coils available, test in April/May 2015
MBHSP103	109-111	Coils in production, test in June/July 2015
MBHDP101	SP102-SP103	Assembly to start in Sept. 2015, Test in Nov. 2015
MBHSP104	112-113	Coil production to start in April/May 2015
MBHSP105	114-115	
MBHDP102	SP104-SP105	
MBHSP106	202-203	Coil production to start in second half of 2015
MBHSP107	204-205	
MBHDP103	SP106-SP107	

Collaring imminent



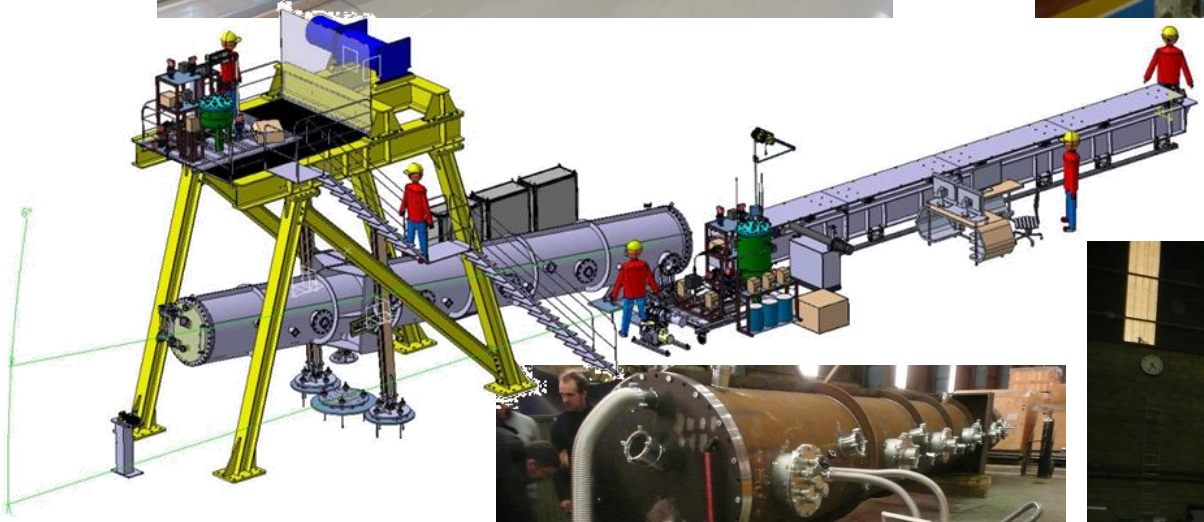
RRP



PIT

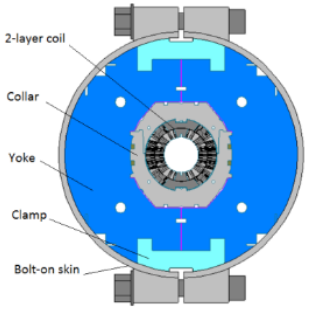
Not an end here!

Tooling for full-length MBH @ CERN

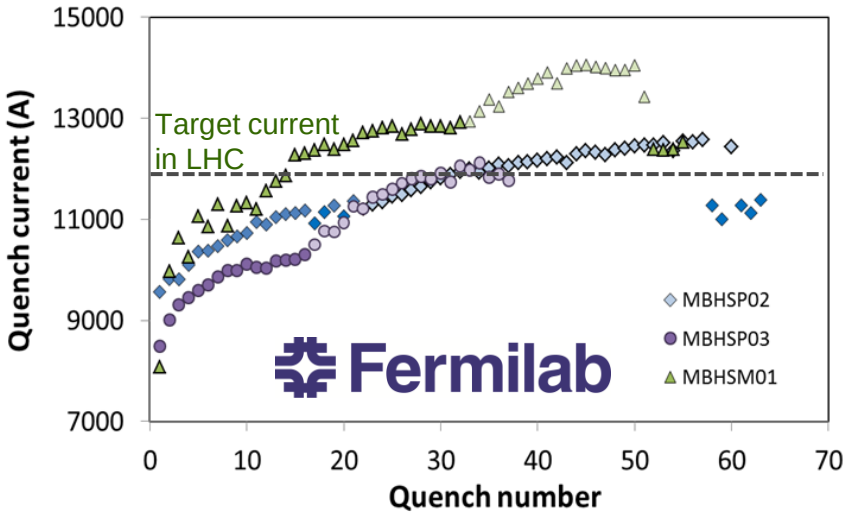


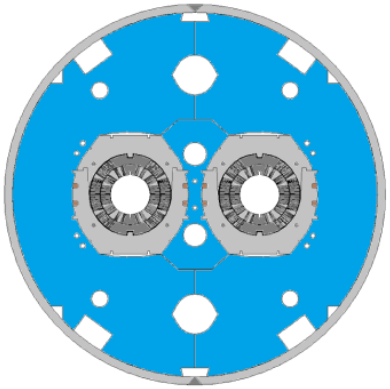
Start winding first low grade sc cable in the middle of April 15

And on the side of FERMILAB



MBHSP03:
Bmax = 11.7 T at 1.9 K
97.5% of Bdesign = 12 T
no holding quenches





First two-in-one MBHDP01:
Bmax = 11.5 T at 1.9 K
after 36 quenches

Thank you for your attention