

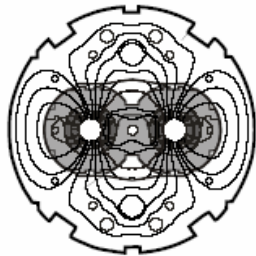
# The collimator design for two beams

- Preliminary specifications –

R. Assmann  
21.04.2005

**CERN**

CH-1211 Geneva 23  
Switzerland



the  
**Large  
Hadron  
Collider**  
project

*LHC Project Document No.*

**LHC-LJ-EC-0003**

*EDMS Document No.*

**507947**

*Engineering Change requested by ( Name & Div./Grp. ) :*

**R. Assmann AB/ABP, C. Fischer  
AB/BDI, D. Macina TS/LEA**

Date: 2004-11-25

## **Engineering Change Order – Class I**

# **Integration of Tertiary Collimators, Beam-Beam Rate Monitors and Space Reservation for a Calorimeter in the Experimental LSS's**

**Table 1: TCT positions in the various experimental insertions. The reservations for the TCT's go from the tunnel floor to take into account the collimator supports.**

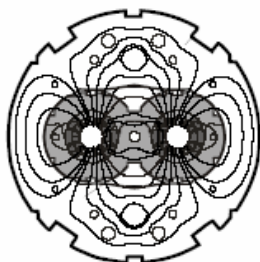
Insertion	Collimator	Acting on beam	Location (distance from IP) [m]	Number of beams in tank
<b>1 (and 5)</b>	TCLP.4L1.B2 <sup>1</sup>	2	-(150.47-148.99)	1
	TCTH.4L1.B1	1	-(148.26-146.78)	1
	TCTV.4L1.B1	1	-(146.58-145.10)	1
	TCTV.4R1.B2	2	145.10 - 146.58	1
	TCTH.4R1.B2	2	146.78 - 148.26	1
	TCLP.4R1.B1 <sup>1</sup>	1	148.99 - 150.47	1
<b>2 (and 8)</b>	TCTH.4L2.B1	1	-(118.688-117.208)	1
	TCTV.4L2.B1	1	-(74.23-72.75)	2
	TCTV.4R2.B2	2	72.75-74.23	2
	TCTH.4R2.B2	2	117.208-118.688	1

<sup>1</sup> For the TCLP.4 reservation in IR5 please see Section 4.

Two beam design with Copper/Tungsten!

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the  
**Large  
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project

*LHC Project Document No.*

**LHC-T-EC-0001**

*EDMS Document No.*

**494246**

*Engineering Change requested by ( Name & Div./Grp. ) :*

**B.Goddard AB/BT, V.Kain AB/CO**

Date: 2004-09-23

## **Engineering Change Order – Class I**

# **NEW LAYOUT OF INJECTION PROTECTION ELEMENTS AROUND IP2 AND IP8**

### ***Brief description of the proposed change(s) :***

This Engineering Change Request summarises changes to the injection protection elements around IP2 and IP8, for LHC V6.5:

- Modified layout of the TDI, TCDD and BPMSX;
- Changed positions of TCL collimators (renamed TCLIA and TCLIB), addition of 2 new TCLIM masks.

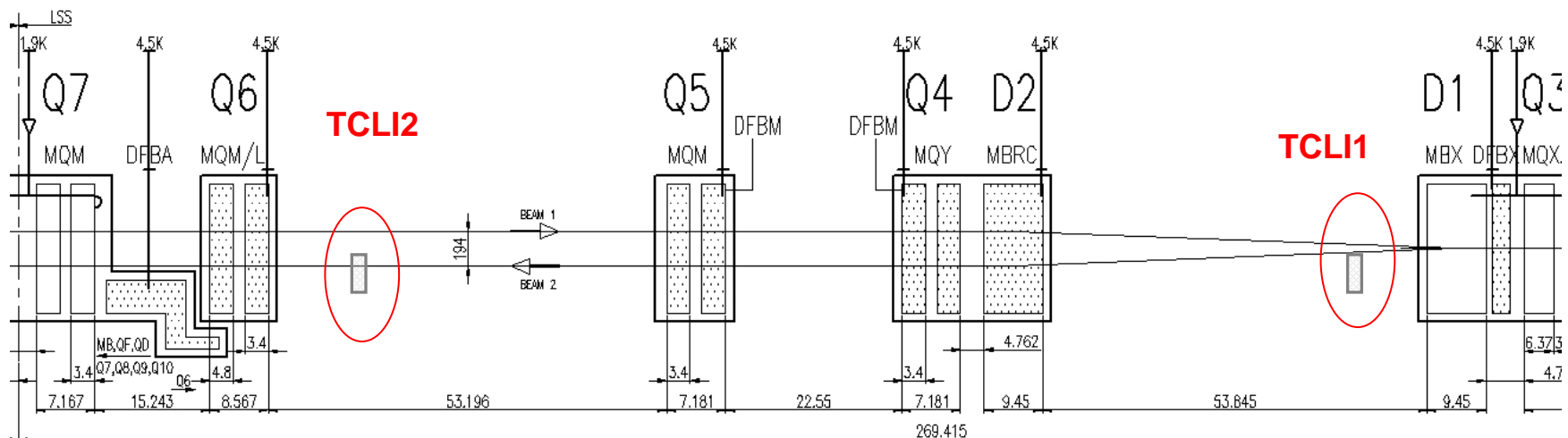
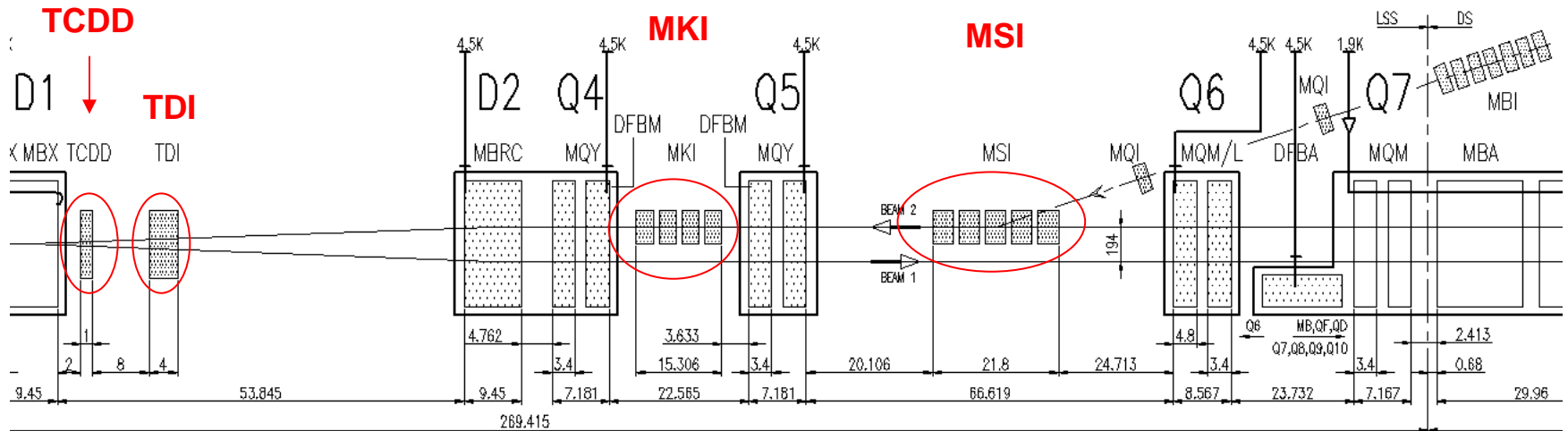
IR2R	Total Length [mm]	Element Length [mm]	Centre position wrt IP [mm]
D1 exit	0	0	69098.0
Bellows	200	200	69198.0
<b>BPMSX</b>	<b>285</b>	<b>285</b>	<b>69440.5</b>
VAEH	645	645	69905.5
[Drift]	2000	0	71228.0
TCTV.4R2	2520	1000	73488.0
<b>TCLIA.4R2</b>	<b>2000</b>	<b>1000</b>	<b>75748.0</b>
TCLIB.6R2	2520	1000	227654.0
TCLIM.6R2	1000	500	234399.0

IR8L	Total Length [mm]	Element Length [mm]	Centre position wrt IP [mm]
D1 exit	0	0	-69098.0
Bellows	200	200	-69198.0
<b>BPMSX</b>	<b>285</b>	<b>285</b>	<b>-69440.5</b>
VAEH	645	645	-69905.5
[Drift]	2000	0	-71228.0
TCTV.4L8	2520	1000	-73488.0
<b>TCLIA.4L8</b>	<b>2000</b>	<b>1000</b>	<b>-75748.0</b>
TCLIB.6L8	2520	1000	-216683.0
TCLIM.6L8	1000	500	-223428.0

Two beam design with C-C!

# Slide from V. Kain

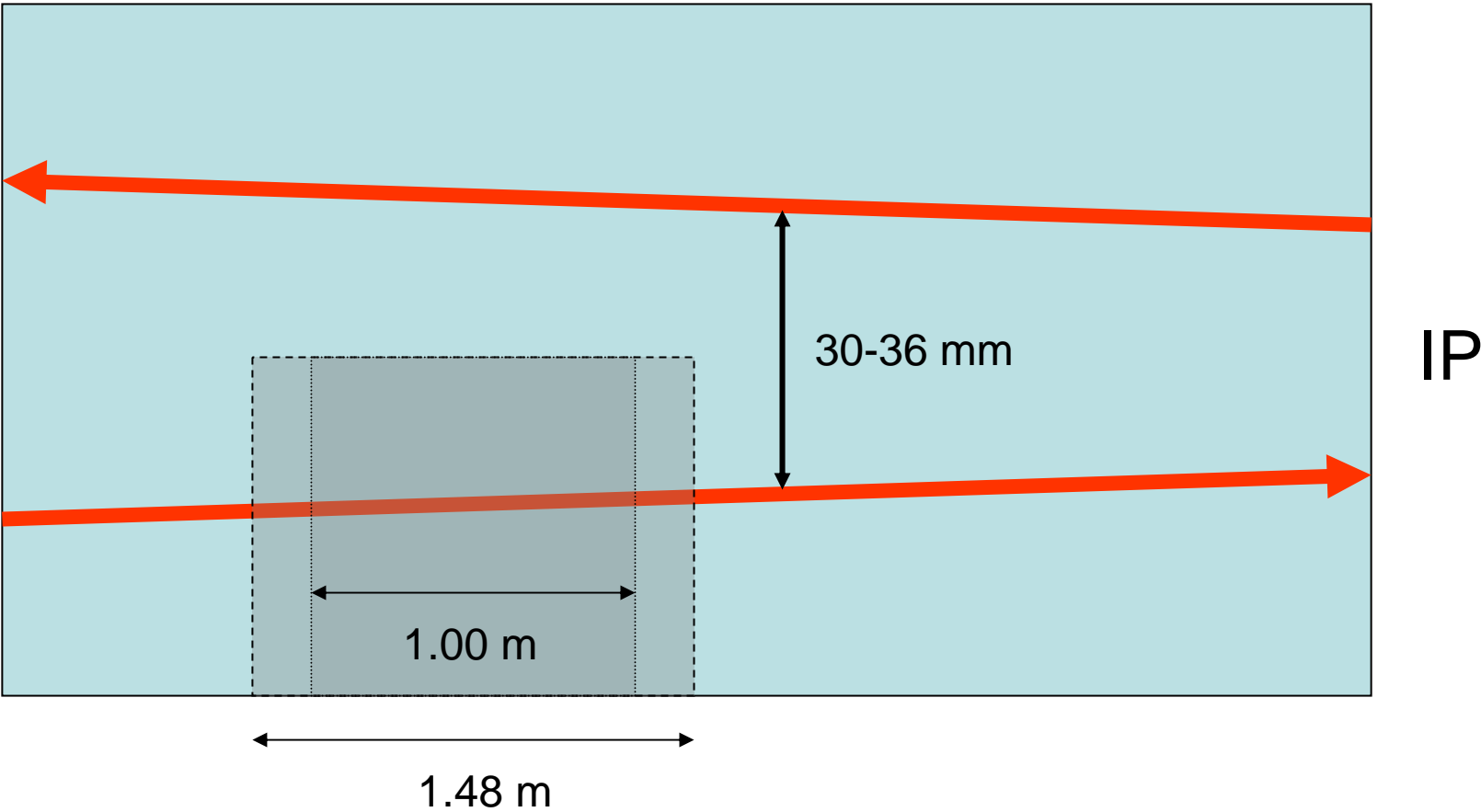
## Overview of injection region (IR8)



# General remarks

- All two beam collimators are active in the **vertical plane!**
- Watch out: Vertical crossing in IR2 and horizontal crossing in IR8). No effect?
- They all act on the **incoming beam!**
- They should **not perturb the outgoing beam** (keep aperture as defined close-by): for TDI 212 mm chamber ID?!
- Constraints from **experimental detectors** for outgoing beam!
  - Vacuum layout close by (→ C. Rathjen).
  - Transmission of spectator protons for the ZDC to be checked by ALICE (→ D. Macina).
- **Minimum full gaps** are (allowing  $10\sigma$  setting at 7 TeV):
  - Injection (TCLIA): ~ 13 mm
  - Top energy (TCTV): ~ **2.5 mm**
- **Maximum full gaps** are: 10 mm for  $40\sigma$  at 7 TeV  
**20 mm** for  $20\sigma$  at 450 GeV  
→ Check with aperture for experiments!!!
- Cu/W jaw for TCTV and C-C jaw for TCLIA!

# Top view

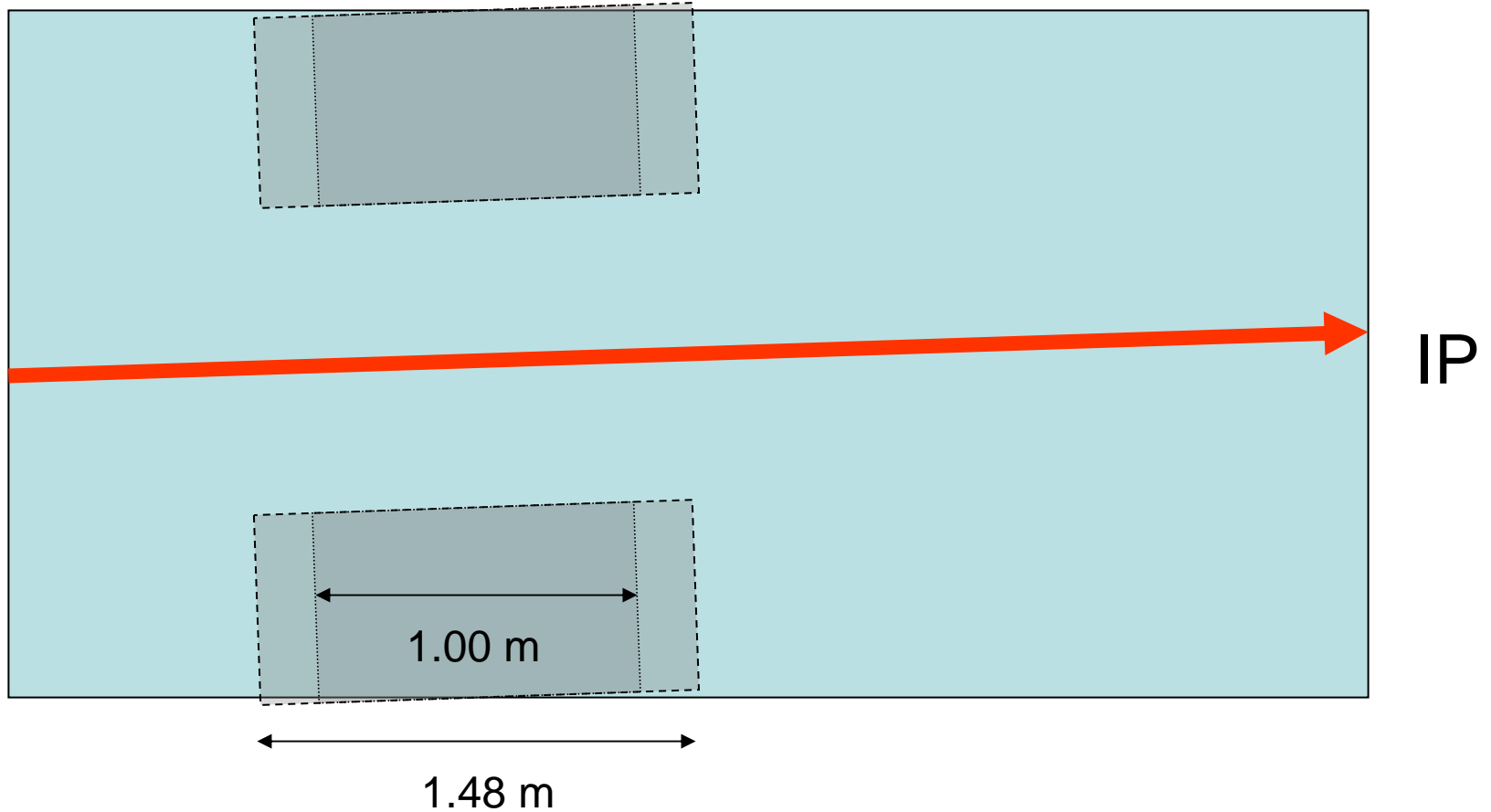


Total length of tank: 1.48 m

Length of jaw flat top: 1.00 m



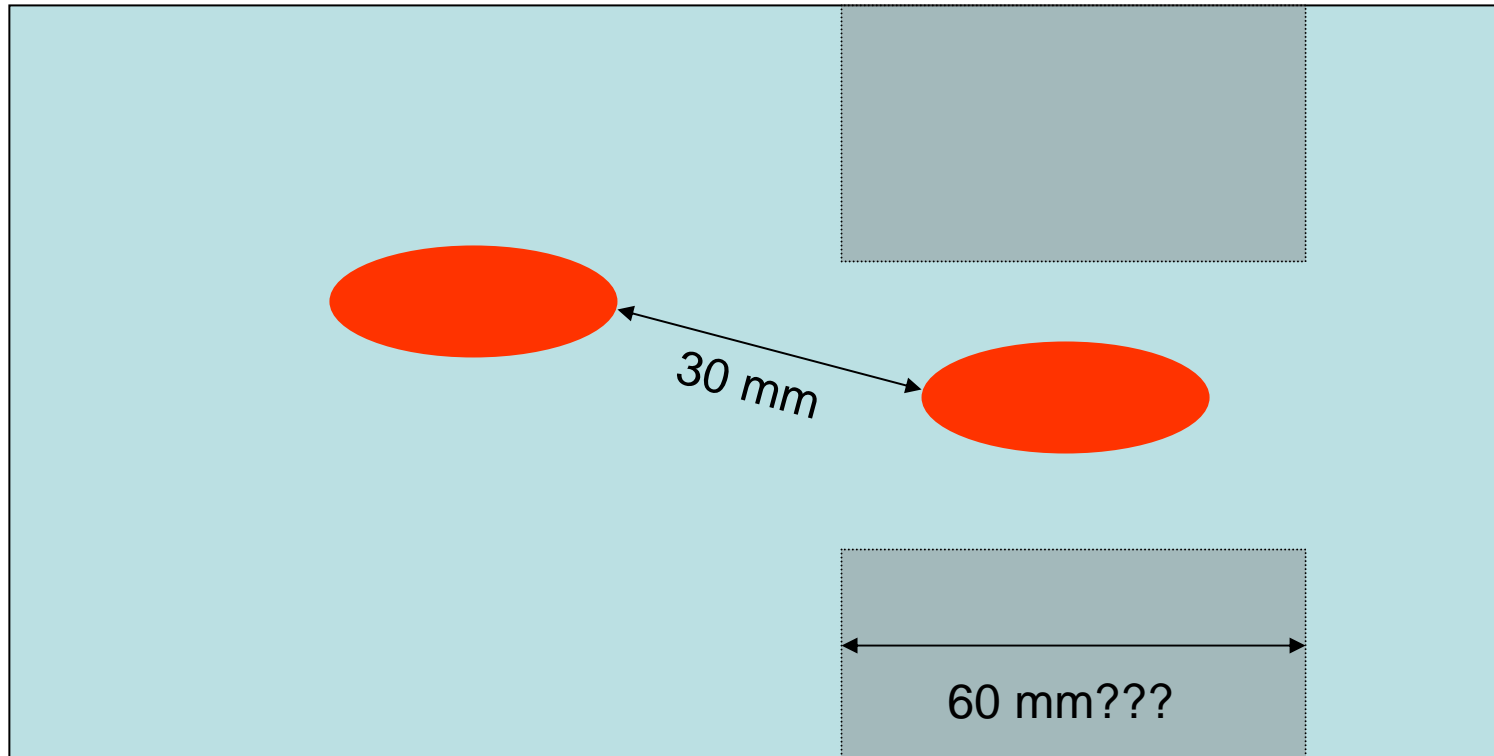
# Side view incoming beam



Total length of tank: 1.48 m

Length of jaw flat top: 1.00 m

# Front view



Check for impedance of the jaw edges → F. Ruggiero et al!

# Degrees of freedom

- Same as for TCP/TCS:
  - position at each end of jaw.
  - movement of whole tank to adjust edge of collimator with respect to outgoing beam!?