Layout of HL-LHC IR1&5
TAXN – D2 collimators

Brief introduction
HL-LHC IR1&5 collimation for local protection

- **TCTH4 and TCTV4** (incoming beam in cell 4)
  - Local Triplets protection from regular losses (cleaning) and irregular losses (asynch dump)
  - Lower back-ground to the experiments
  - Matching Section magnets – inner bore protection from IP debris? (see F. Cerutti today)

- **TCT6** (incoming beam in cell 6)
  - Q4-Q5 protection (magnet aperture – alignment/orbit/optics errors – see H. Garcia Morales IPAC2015) + downstream

- **TCLX** (outgoing beam in cell 4) for D2 protection + downstream

- **TCL5-6** (outgoing beam in cell 5-6) for Q5-Q5 protection + downstream

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Figure 9: Collimation layout for incoming and outgoing beams in IR1. The IR5 layout is equivalent.

**Collimator upgrade for HL-LHC** (Chamonix 2014)

S. Redaelli, A. Bertarelli, R. Bruce, I. Efthymiopoulos, A. Lechner, J. Uythoven
Figure 1: Layout of IR1, around the ATLAS experiment at s = 0, in the LHC during its first run 2010–2013 (top) and in HL-LHC (bottom) for B1, going from left to right. Collimators and fixed absorbers are indicated by orange color.

**COLLIMATOR LAYOUTS FOR HL-LHC IN THE EXPERIMENTAL INSERTIONS** *(IPAC 2015)*

*R. Bruce, et al.*
• Aperture between D2 and TAXN required: required Ø80mm → vacuum chambers of Ø80/94 mm (ID/OD).
• VA and VMT modules as present
• TCT, TCLX tank as present
Aperture and dimensions

- Aperture between D2 and TAXN required required Ø85mm (R. de Maria) ➔ vacuum chambers of Ø90/94 mm (ID/OD) (V. Baglin).
  - The VA module downstream D2 should be 755 mm long, because Ø100mm ID valves can only be installed staggered. For the moment ignored in the integration studies
  - VMT modules (=modules with bellows to accommodate for the 5th axis) should be of bigger diameter (deeper convolutions) or longer (more convolutions). For the moment ignored in the integration studies
- All elements installed centered around the circulating beam
- TCLX with ~20mm thicker jaws (F. Cerutti, ColUSM #52 – 20.02.2015) ➔ 40mm wider tank
- TCT tank as present
TCLX
Studies by Nicolas Joannon

With 25+5mm bakeout ~ 58mm interference
6.3mm + 5mm bake-out interference between collimator cooling tube and parallel chamber
TCTPH
Studies by Nicolas Joannon

With 25+5mm bakeout ~ 43mm interference
Summary of integration and questions

- **Tranverse**
  - **TCLX**: 58mm interference. 2 beams collimator? *(see A. Bertarelli)*
  - **TCTPH**: 43mm interference. Should/could we move it behind Q4 or change design ??? Simulation on going *(H. Garcia Morales)*
  - **TCTPV**: 6.3mm between a cooling tube and the Ø90/94 chamber (+5mm bake-out = 11.3mm). Could we solve clash with minor modifications to the design?

- **Longitudinal**
  - VA and VMT length?
  - TAXN?