# R2E Update: P7 DS measurements and FLUKA v1.3

**HL-LHC Integration Meeting N61 – December 2, 2016**

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Input:

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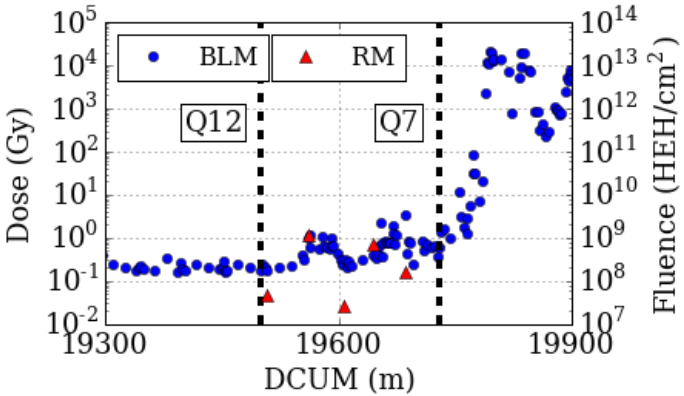
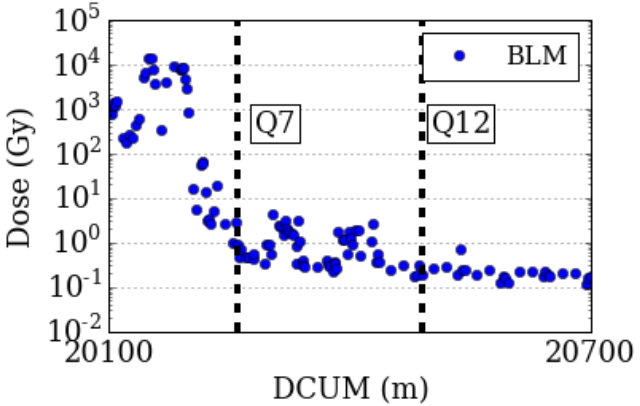
# Context

- P7 DS measurements:
  - Focus with respect to 11T related equipment as well as presently installed systems
  - 11T QHPS: option of 1st level in RR seems difficult due to accessibility during operation
- FLUKA v1.3 P1 & P5:
  - Dose levels near beam line in LSS
  - Updated RR shielding

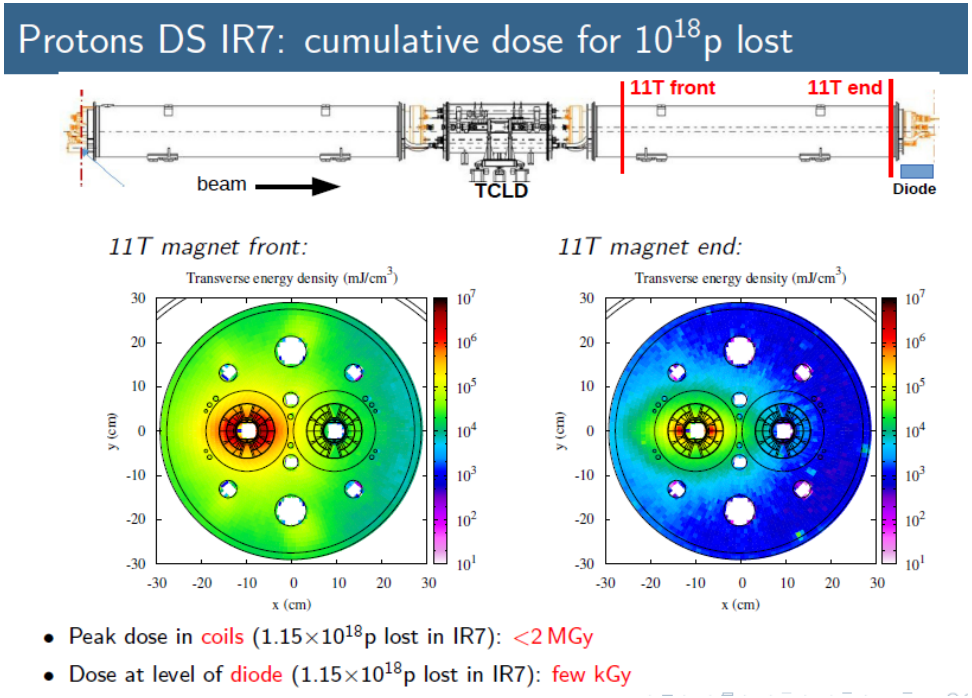
# P7 DS measurements

- For area upstream the TCLD 11T collimator (before half of cell 8) present annual levels can be scaled by a factor 10
- Downstream the TCLD, dedicated simulations will need to be implemented and analysed (Q1 2017) in order to check the levels below the magnets and define an exclusion zone
- Measurements for 2016 (full proton run):



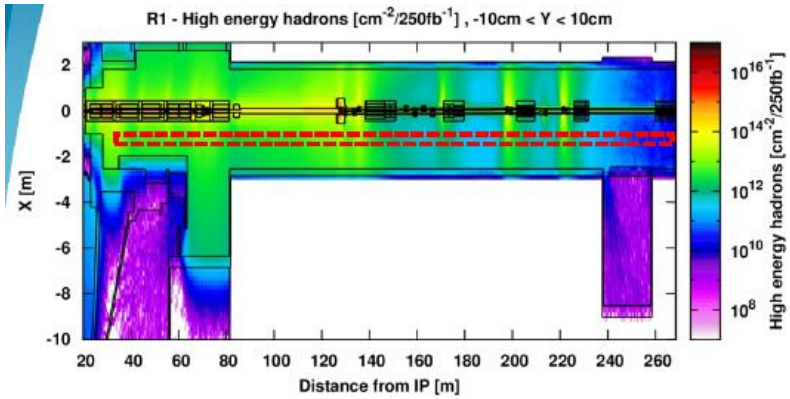
# P7 DS simulations

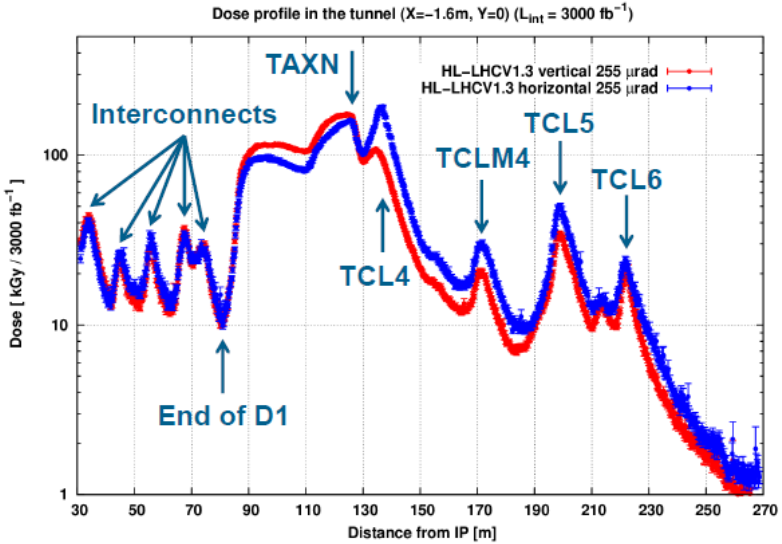



*A. Lechner, HL TCC (2016)*

- For cell 8 upstream TCLD, HL-LHC levels can be estimated as ~50 Gy/yr worst case according to 2016 measurements and scaling
- For cell 8 downstream TCLD, levels at diode location (e.g. after 11T magnet) were estimated as a few 100s of Gy/yr
- Levels closer to the TCLD are expected to be larger – to be quantified through dedicated FLUKA simulation

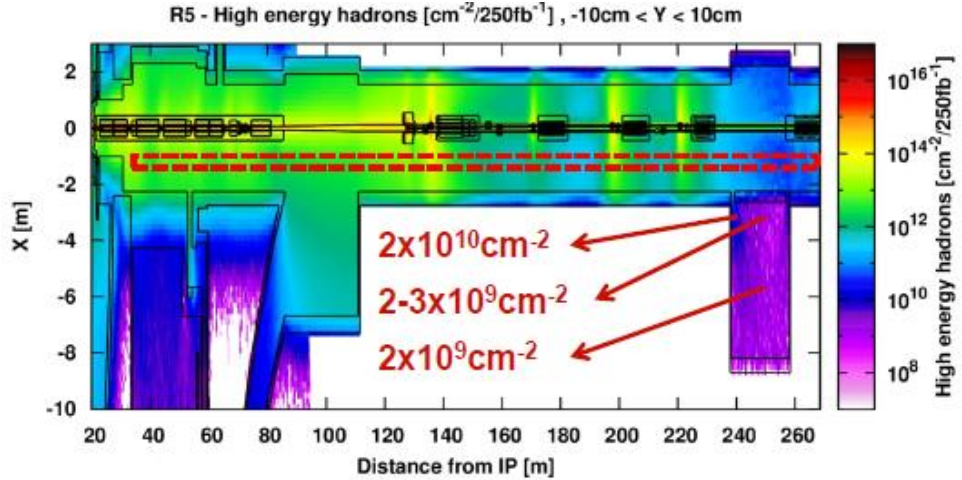
# FLUKA v1.3 P1 & P5




*A. Tsinganis, HL-LHC annual meeting (2016)*

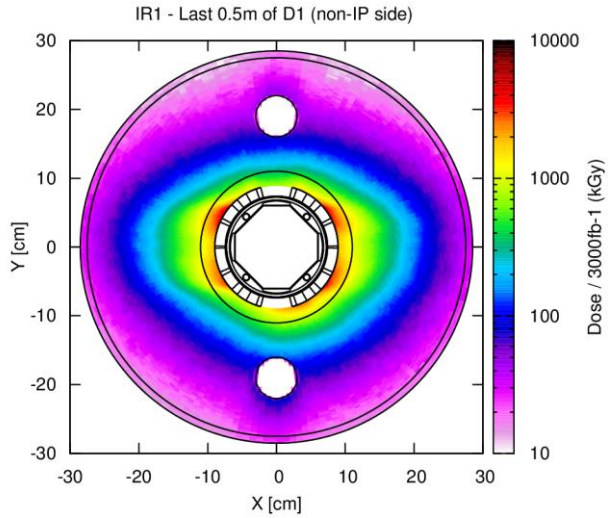
# FLUKA v1.3 P1 & P5




- HE hadron fluence in RRs:
  - Up to 2x10$^{10}$cm$^{-2}$ near entrance
  - few x 10$^{9}$cm$^{-2}$ elsewhere

*A. Tsinganis, HL-LHC annual meeting (2016)*

# FLUKA v1.3 P1 & P5




*A. Tsinganis (FLUKA team)*

- Expected HL-LHC dose at non-IP side of D1
- ~30 kGy/3000 $fb^{-1}$ towards outside of cold mass

# Summary

- P7 DS:
  - In parallel to the FLUKA study, it will be important to carefully check equipment (both already installed and to be installed), radiation lifetime and SEE failure cross section (if known) and qualification planning (i.e. CHARM) when needed
  - FLUKA results for locations below magnets in DS (Q7-Q12) can be expected for end of Q1 2017