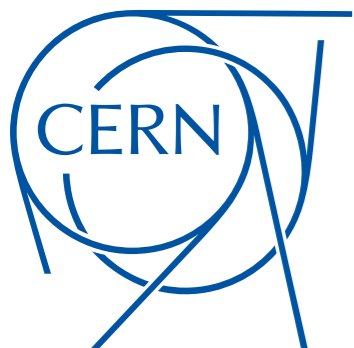


$L^*=45\text{m}$ IR optics design

Andy Langner

Acknowledgments: X. Buffat, R. Martin, D. Schulte, R. Tomás

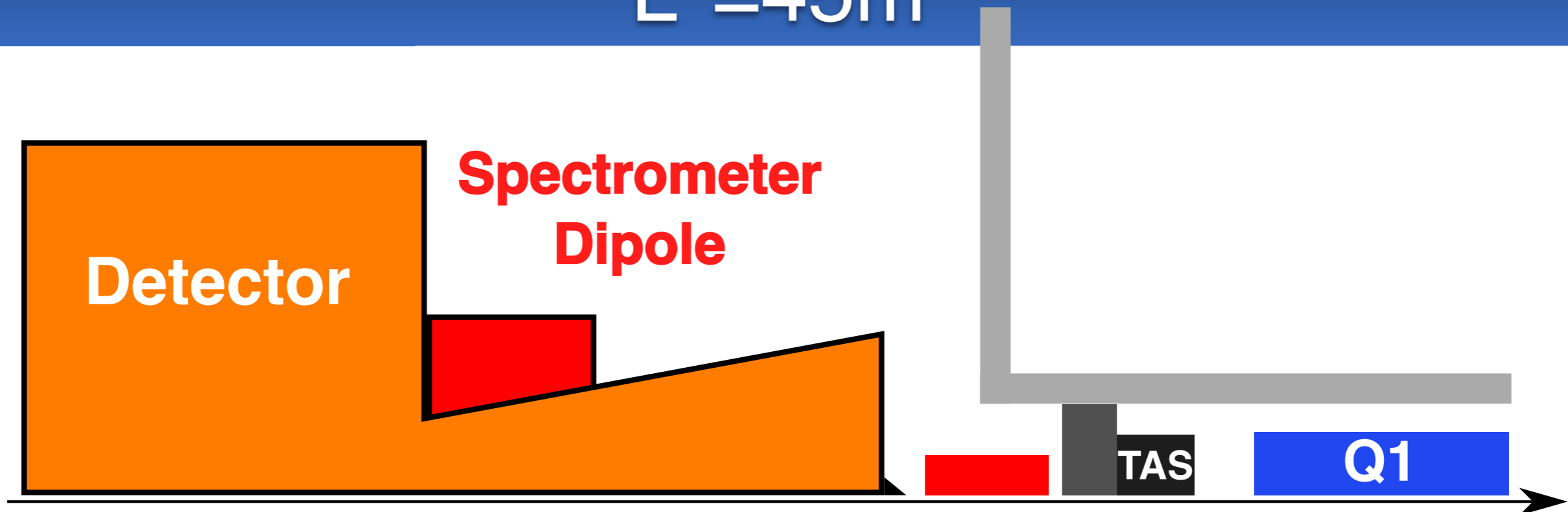
FCC-hh General Design Meeting, 18.02.2016



Conclusions from β^* reach study

- ▶ Choose **smallest** L^* that does not restrict detector design
- ▶ then **increase triplet length** until DA becomes a problem
- R.Martin in FCC-hh General Design Meeting February 04, 2016

$$L^* = 45\text{m}$$

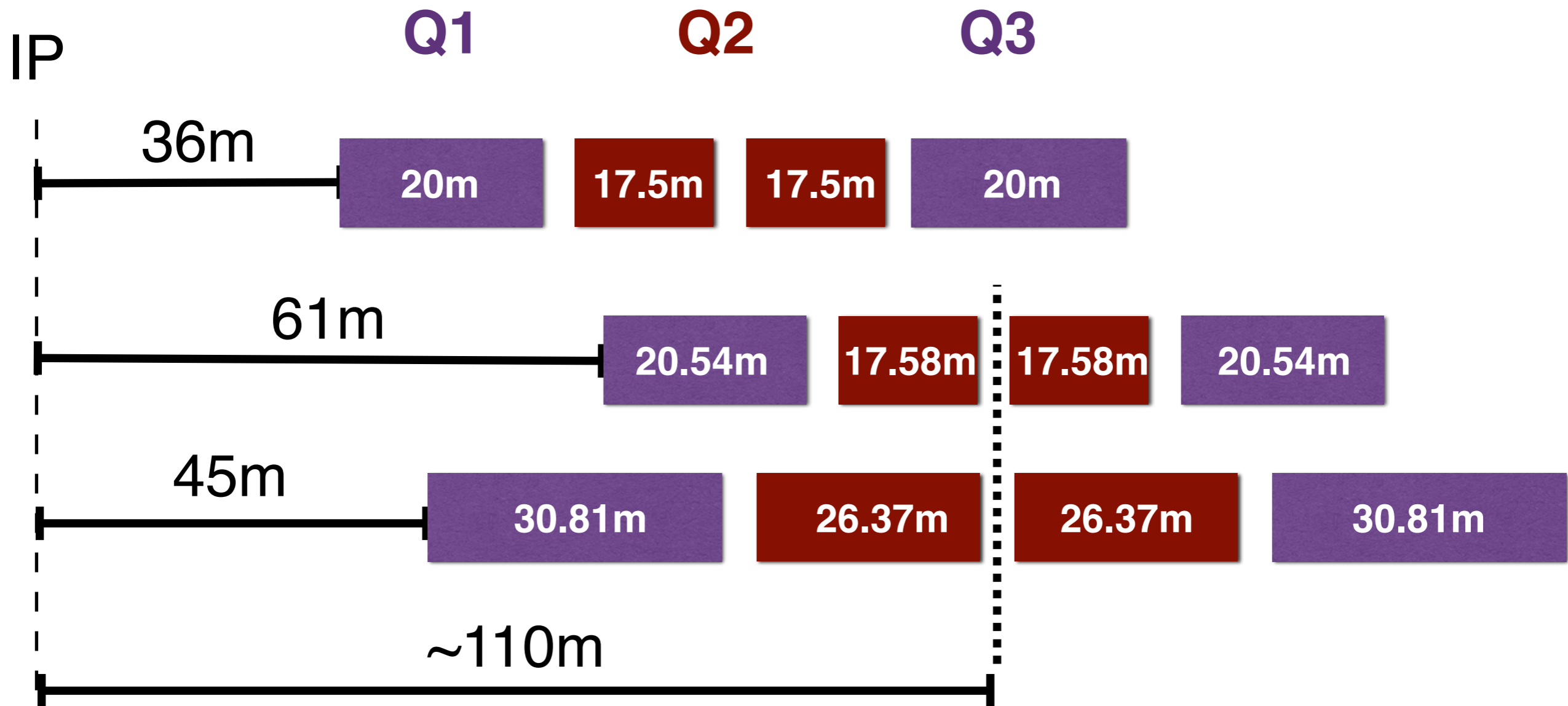


- **Spectrometer dipole** (10 Tm):
 $z = 14.8\text{ m}$ to $z = 21\text{ m}$
- **Detector forward region**:
 $z = 21\text{ m}$ to $z = 31.5\text{ m}$
- **End of conical beam pipe**:
 $z = 32.3\text{ m}$
- **Warm orbit corrector** \mathcal{O} (7 Tm):
 $z = 33\text{ m}$ to $z = 37.5\text{ m}$
- **Shielding from TAS**: $z = 38\text{ m}$ to $z = 40\text{ m}$
- **TAS**: $z = 40\text{ m}$ to $z = 43\text{ m}$
- **Q1**: $z = 45\text{ m}$ to $z = 75\text{ m}$

As presented by W. Riegler

- ▶ First checks on beam-beam effect concluded that a 7Tm corrector is sufficient, cf. [BDS meeting \(29.01.16\)](#)
- ▶ L^* of 45m would be feasible

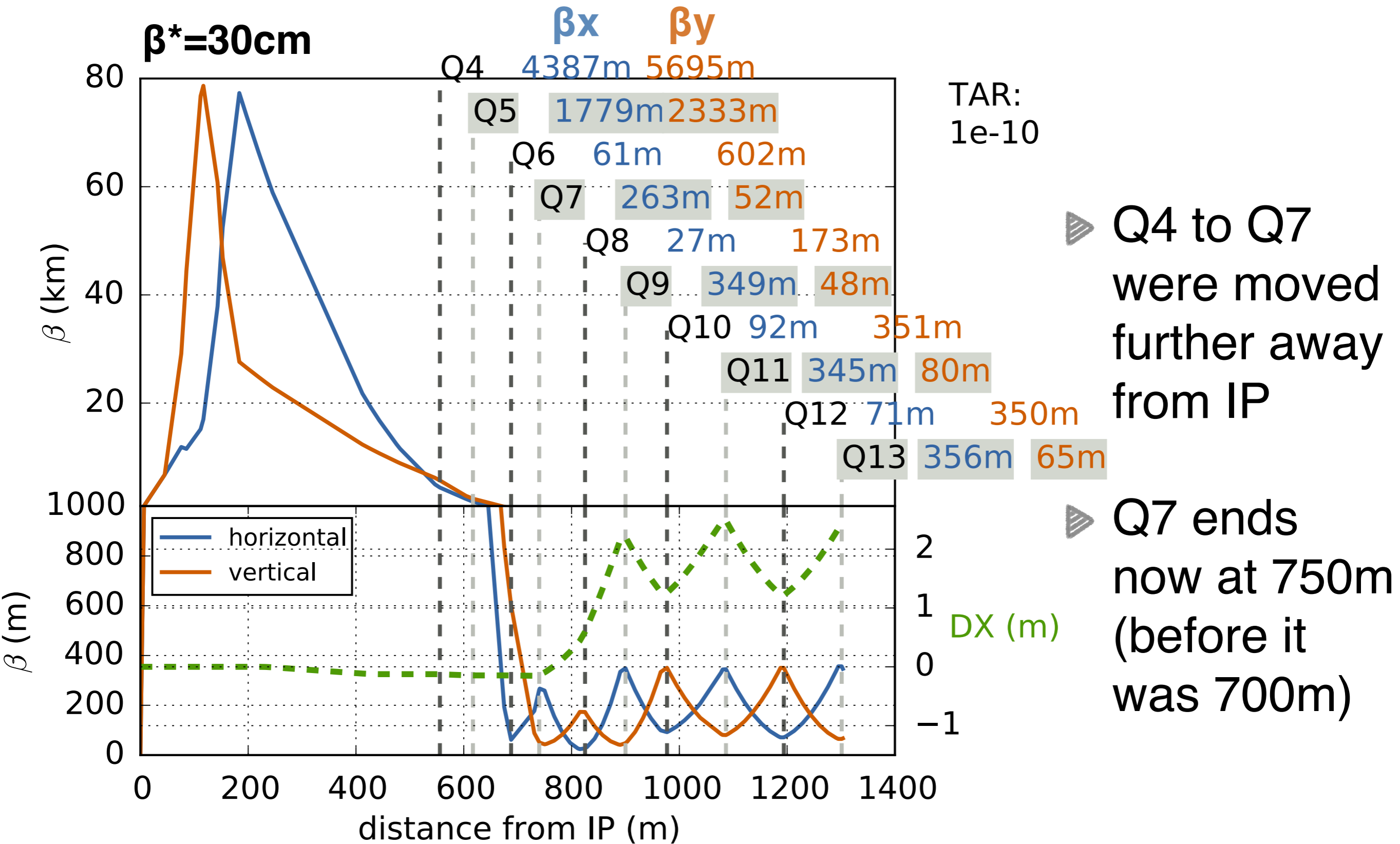
Triplet design



45m triplet design (compared to 61m design):

- ▶ Increased length of each triplet magnet by 50%
- ▶ Kept a similar distance from IP to the center of the triplet

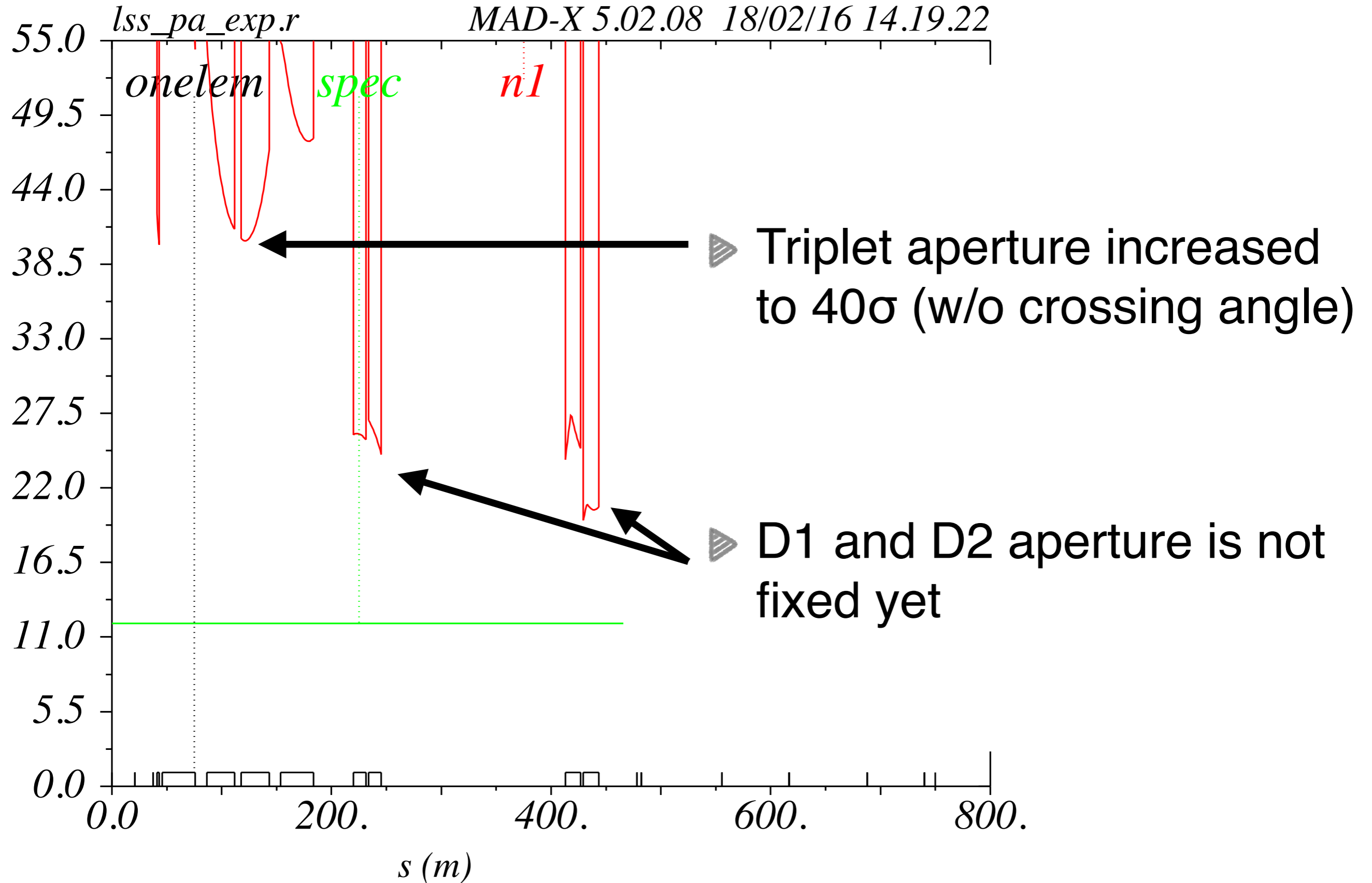
Triplet matching and lattice integration



Crossing angles

- ▶ Suggested crossing angles were calculated for constant long range beam-beam effects
- ▶ Without detector spectrometer:
 - ▶ horizontal/vertical crossing angle -> **89 μ rad**
- ▶ With detector spectrometer
 - ▶ vertical crossing angle -> **85 μ rad**
 - ▶ horizontal crossing angle -> **110 μ rad** or **71 μ rad**
(depending on the spectrometer field direction)
- ▶ Detailed beam-beam studies pending

Aperture



Where to find it?

- ▶ Lattice files are provisionally available at:
`/afs/cern.ch/work/m/martinr/public/FCC-hh_IR_V5_*`
- ▶ They will be moved to the repository when the apertures of D1 and D2 are fixed
- ▶ We will try to provide more optics files (injection, 20cm...)