Progress on Mechanics Design in Interaction Region

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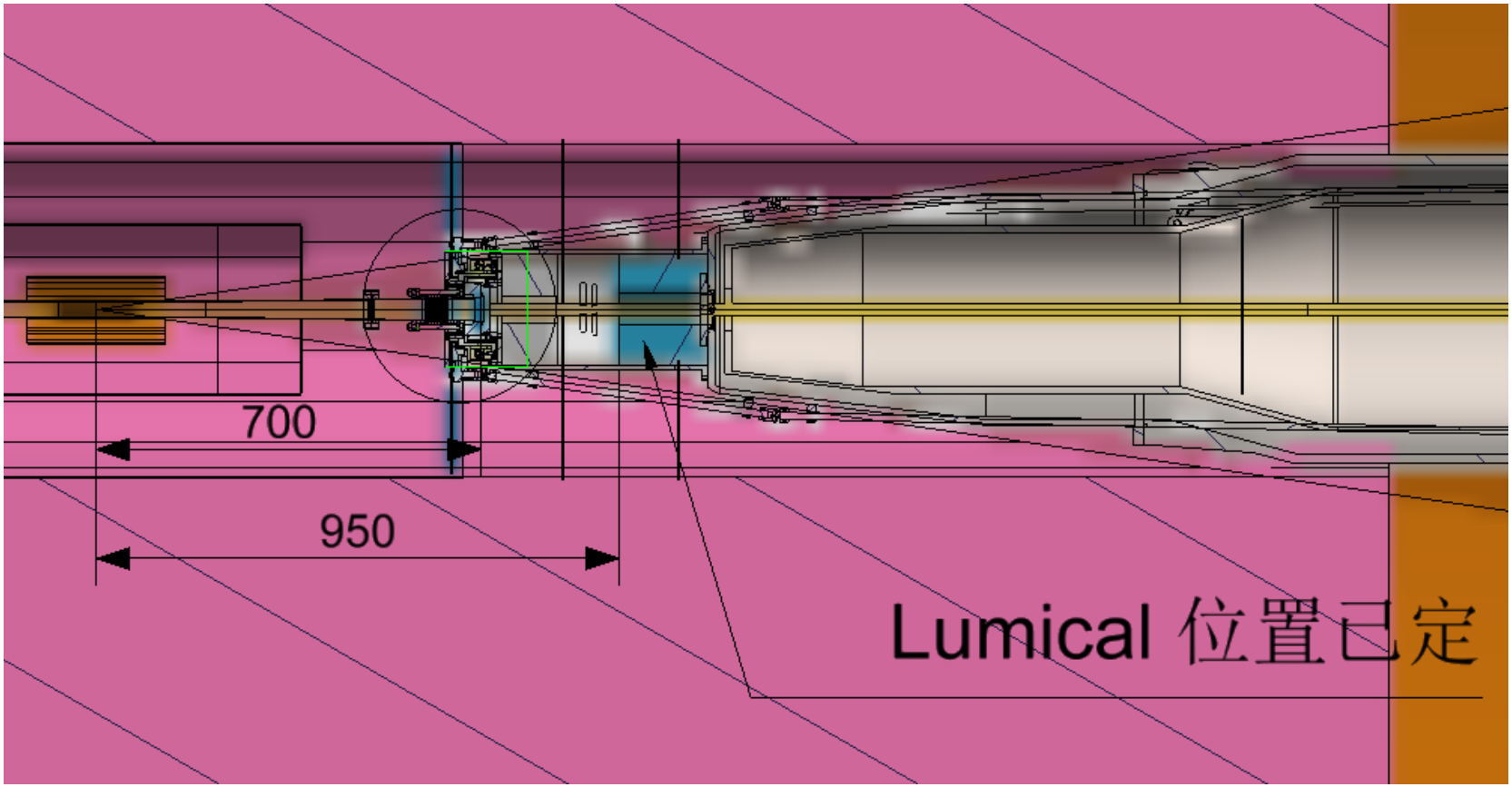
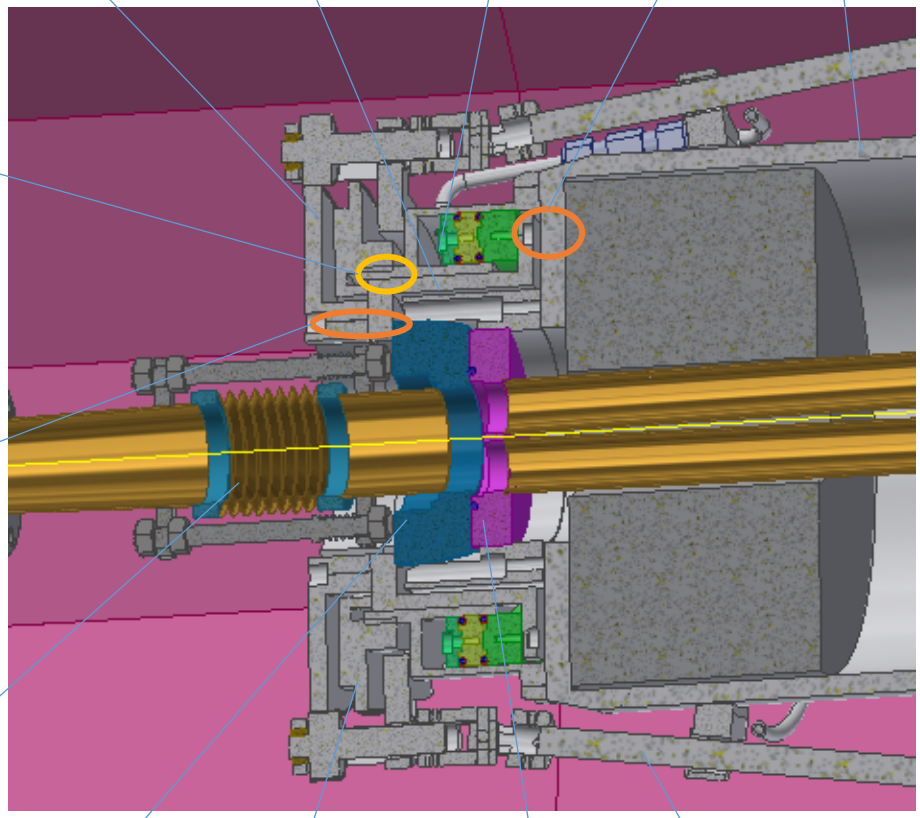
for Prof. Quan Ji

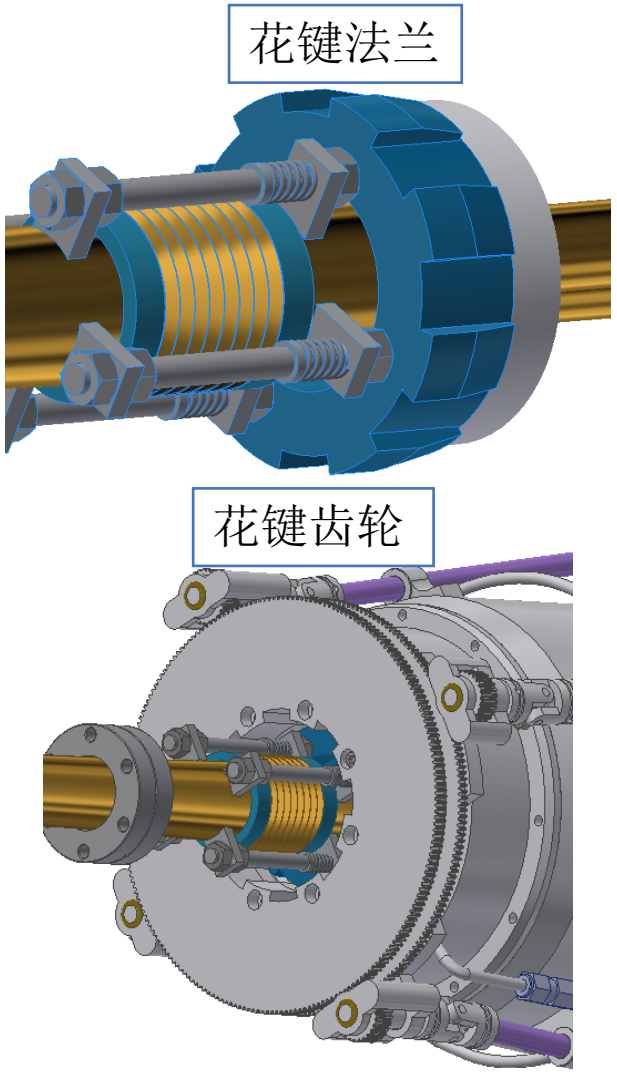
MECHANICAL STRUCTURE IN CDR



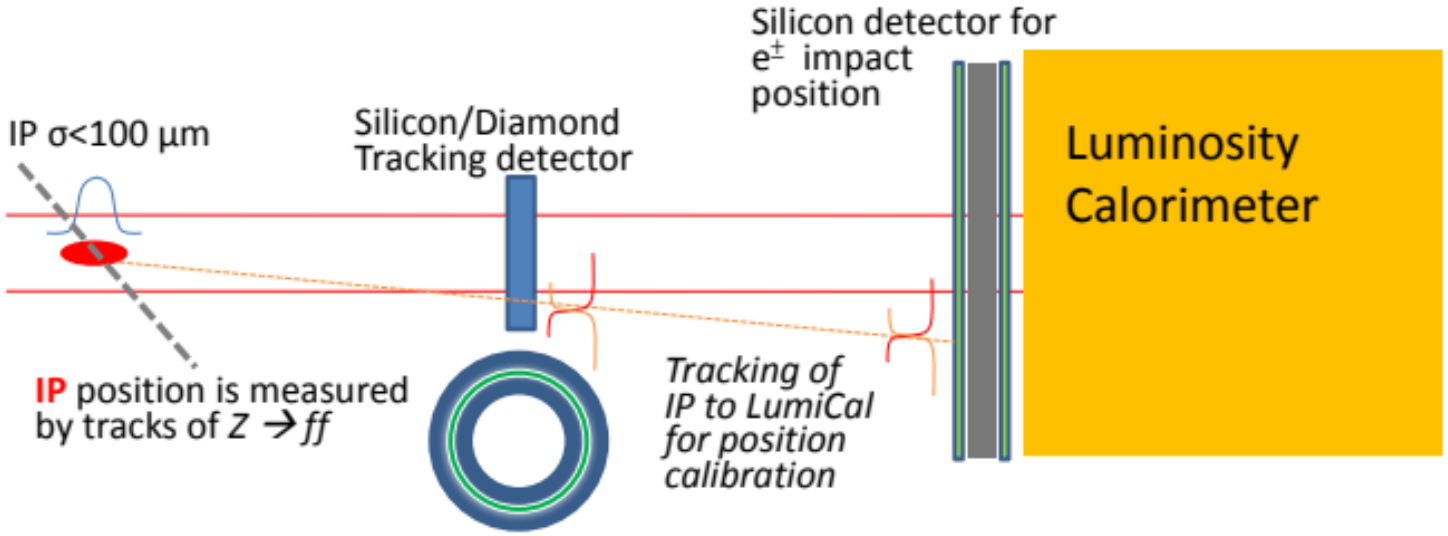
Being pursued by the machine design group

BASELINE INSTALLATION SCHEME -- RVC





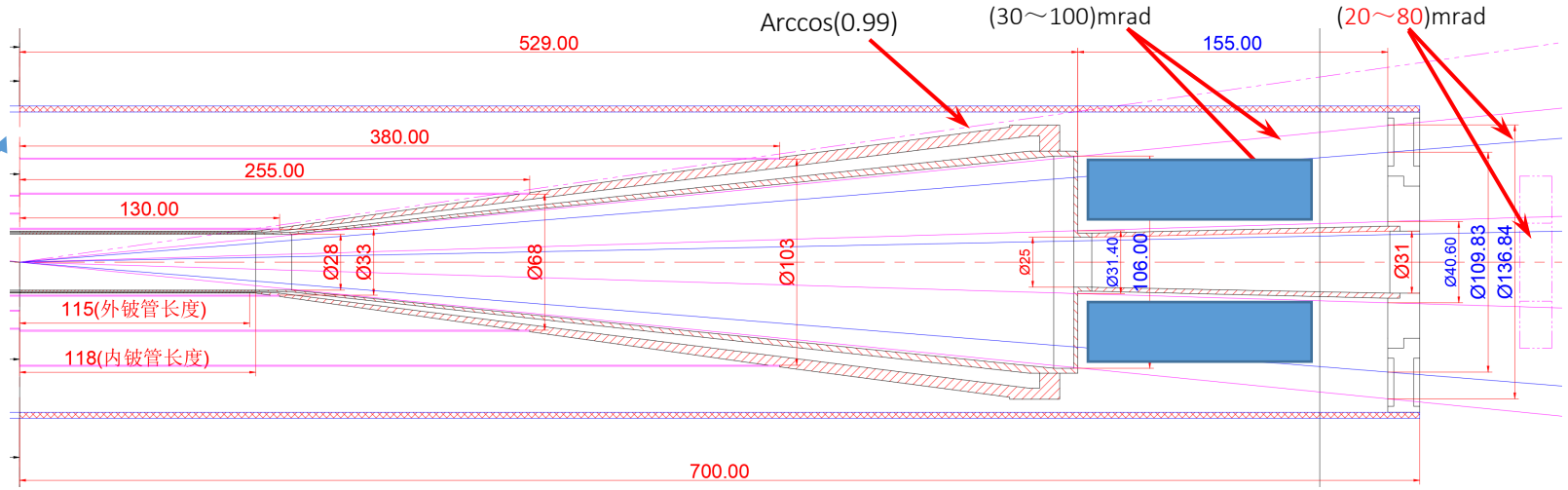
LumiCal Design in CDR



- LumiCal mounted on the quadrupole and inserted together into the interaction region via RVC → challenging
- Large amount of material in front → impossible for precise position determination → additional tracking devices, LumiCal for particle identification and energy measurement
- More drawbacks: high alignment precision imposed on tracking devices, not enough space

New Design of LumiCal

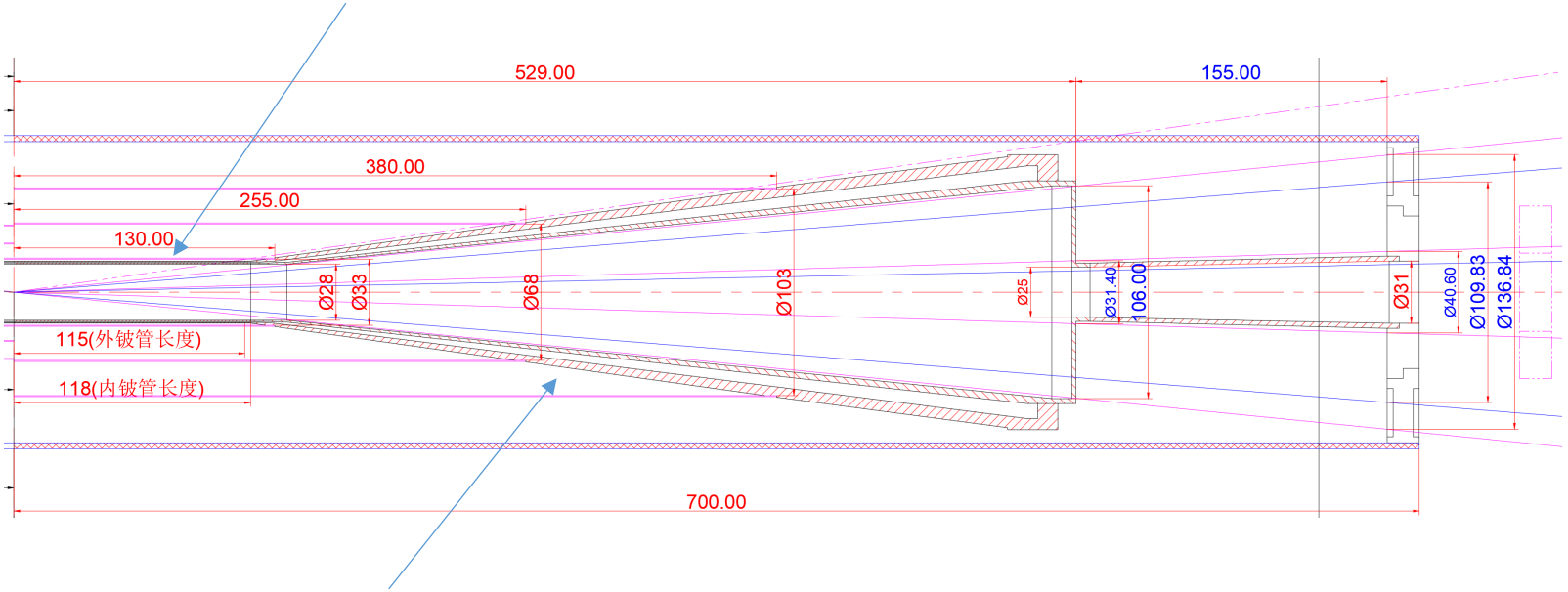
- **New**: move LumiCal closer to the IP and mount it on the detector supporting structure (with reduced weight)



- **Location:** between 529 – 684 mm, angle coverage between 30 – 100 mrad (or less to leave space for routing cables)
- **Structure:** Si-W ~ 20 X_0, total weight of 10 kg hung on the supporting structure made with carbon fiber

BEAM PIPE

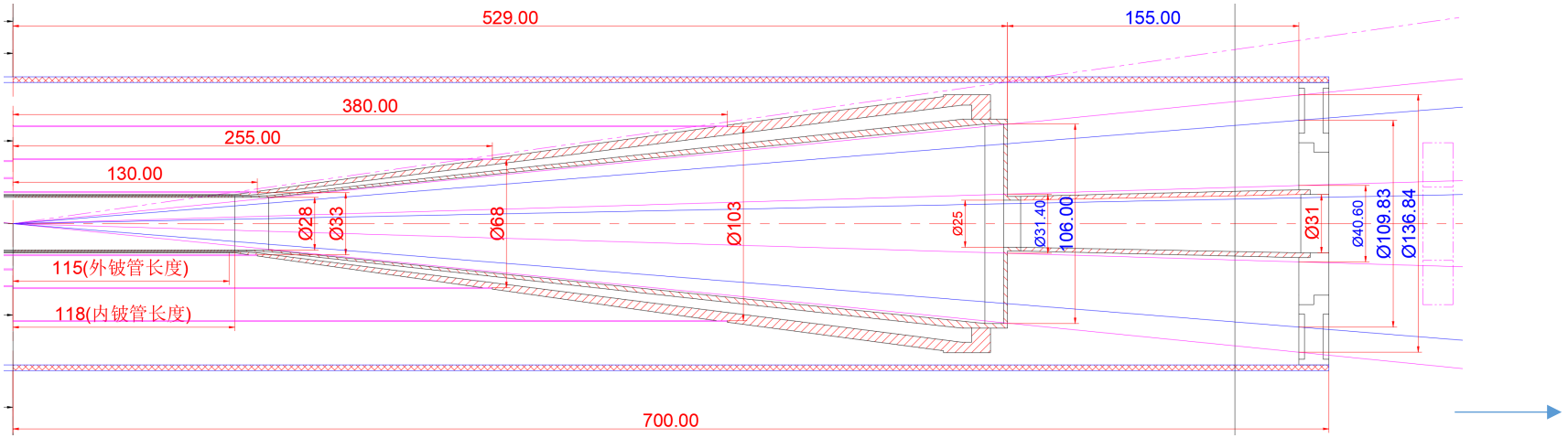
- Central beryllium beam pipe extended from z=±70 mm to ~±130 mm; double layer structure, inner layer thickness 500 um, outer layer thickness 350 um, gap ~350 um filled up with coolant



- Forward region with shape of opening cone shape with double layers of aluminum, gap filled up with coolant (water)?, ending wall of thin aluminum in front of LumiCal

SUPPORTING STRUCTURE (TUBE)

- Introduced additional supporting structure for LumiCal and the long beam pipes, *exact design to be decided*



to Accelerator

- **Pros:** *easier IR installation, enclosed structure (improved air flow control and thermal management);*
- **Cons:** *added material before SIT, not feasible to position FTD's as they where they are (layout redesign required)*

FURTHER EVALUATION

- LumiCal
  - Si-W or Si + Scintillator, R&D depending on the availability of the required components (readout electronics)
  - Angle coverage to be checked, with space required for cabling taken into account, and corresponding precision requirements
- Beam pipe: heat loads (HOM, SR) -- with inputs from machine design, current cooling structure sufficient (?); air cooling for VTX layers
- Supporting structure: light-weighted structure (+ flange), stress analysis with LumiCal loaded
- VTX: new layout (long barrel layers or alternative structures)
- Backgrounds: mask design against SR photons, back-scattered charged particles into the Tracker

A credible design before the November CEPC workshop