GEANT Description of the Material in the Inner Tracker: an update

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Status

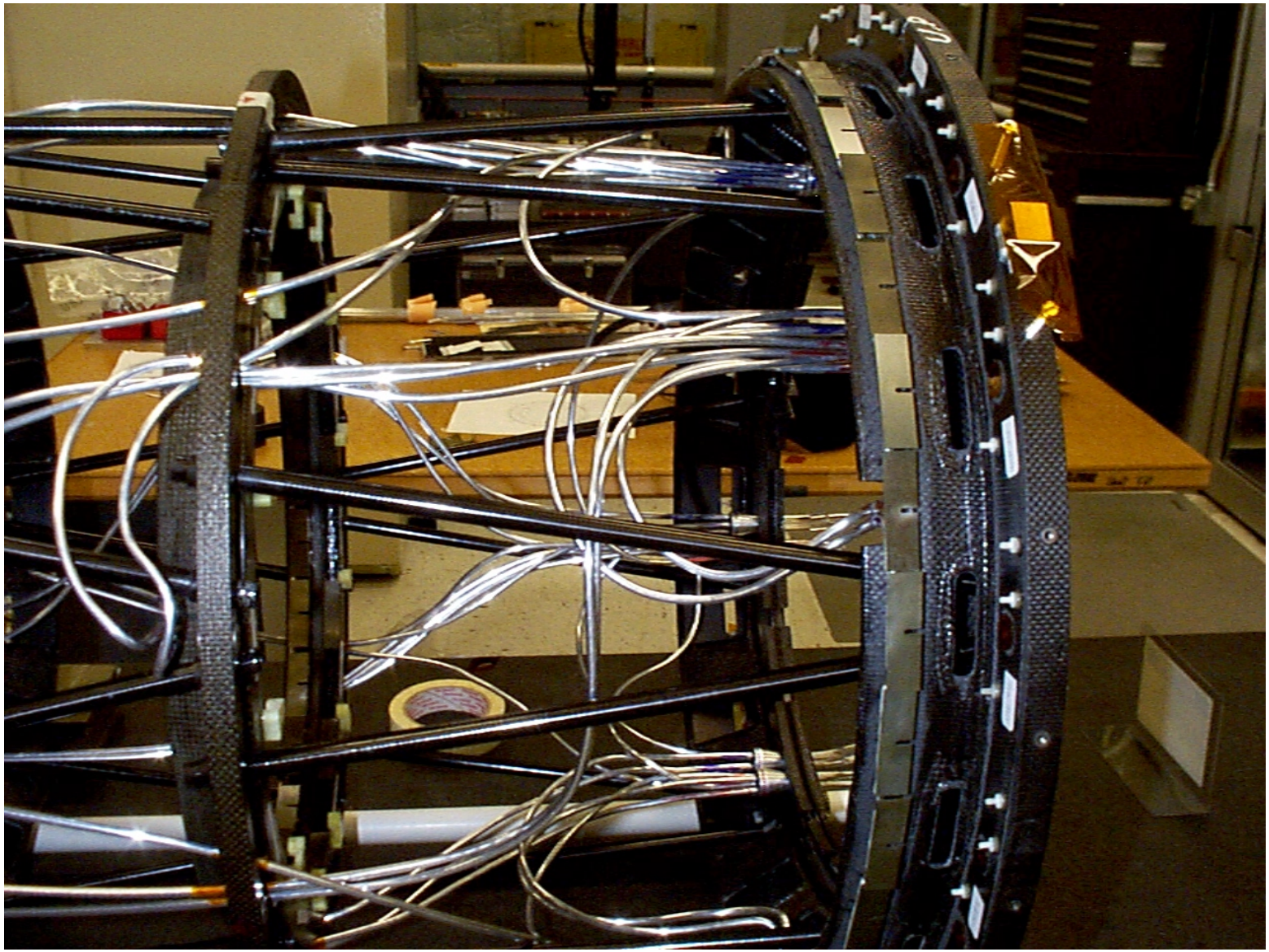
- A few numbers
  - ~4500 physical volumes
  - ~20 new material/compounds definitions
  - 64 kg of material
    - mostly in the tracking acceptance
    - actual weight: 120 kg (including outside tracker acceptance)
  - documented in note 5825

- Global amount of material checked in data
  - conversions (early study): OK to 15-20%
  - J/Ψ mass (recently): same level of agreement

Latest improvements

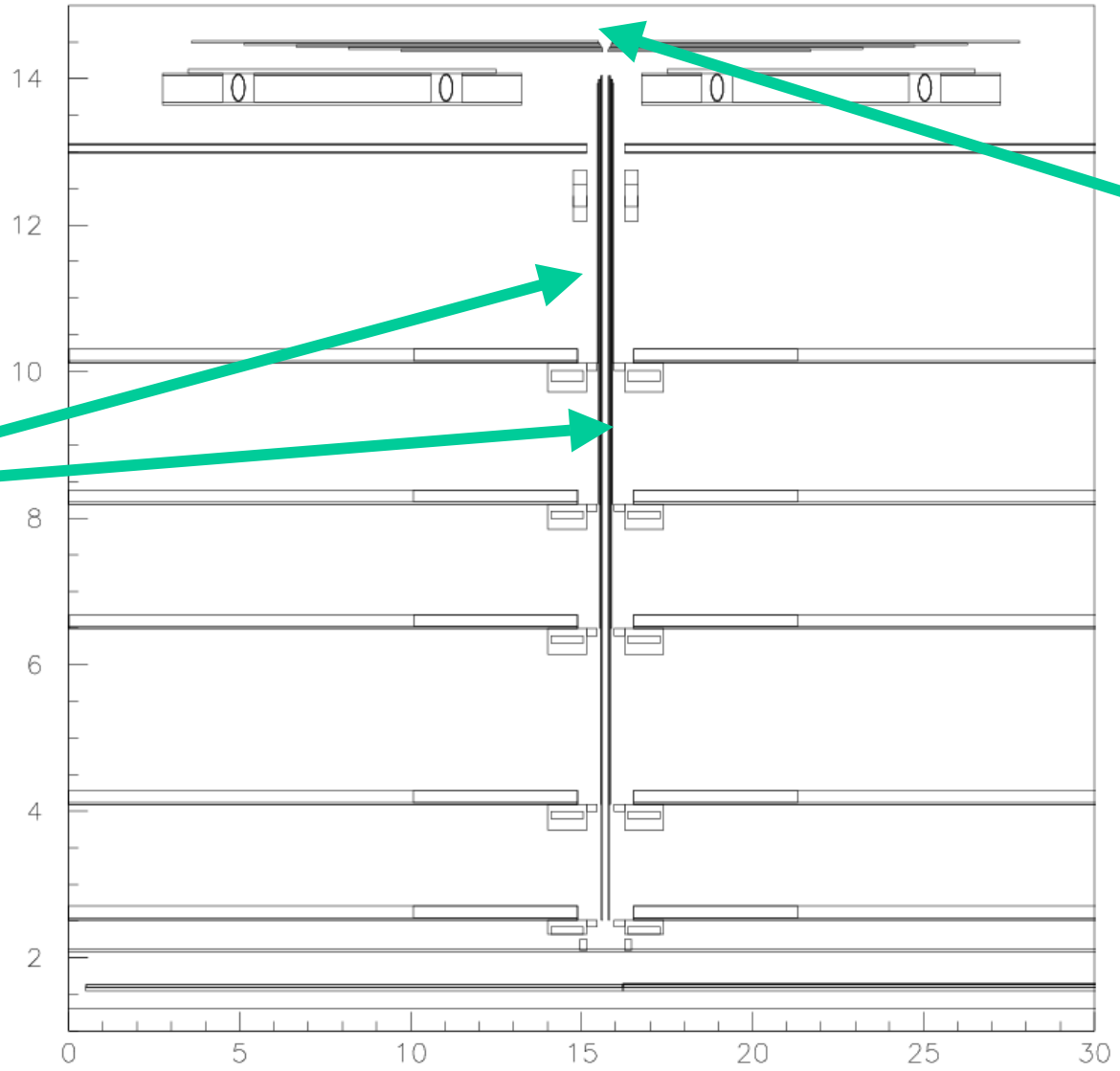
- Trying to recover the 15% missing:
  - no large pieces obviously missing
  - must be a combined effect of many little pieces
- New pieces added:
    - carbon-fiber support rails (SVX, ISL)
    - insulation layer (ISL)
    - carbon fiber rods over layer 6C (ISL)
    - spool piece (ISL)
    - connector on hybrid (ISL)
    - longitudinal cooling pipes (partial) (ISL)
    - HDIs (SVX)
    - “5%” carbon-fiber blocks (SVX)

ISL cooling: difficult to model !



SVX support rails for ladders

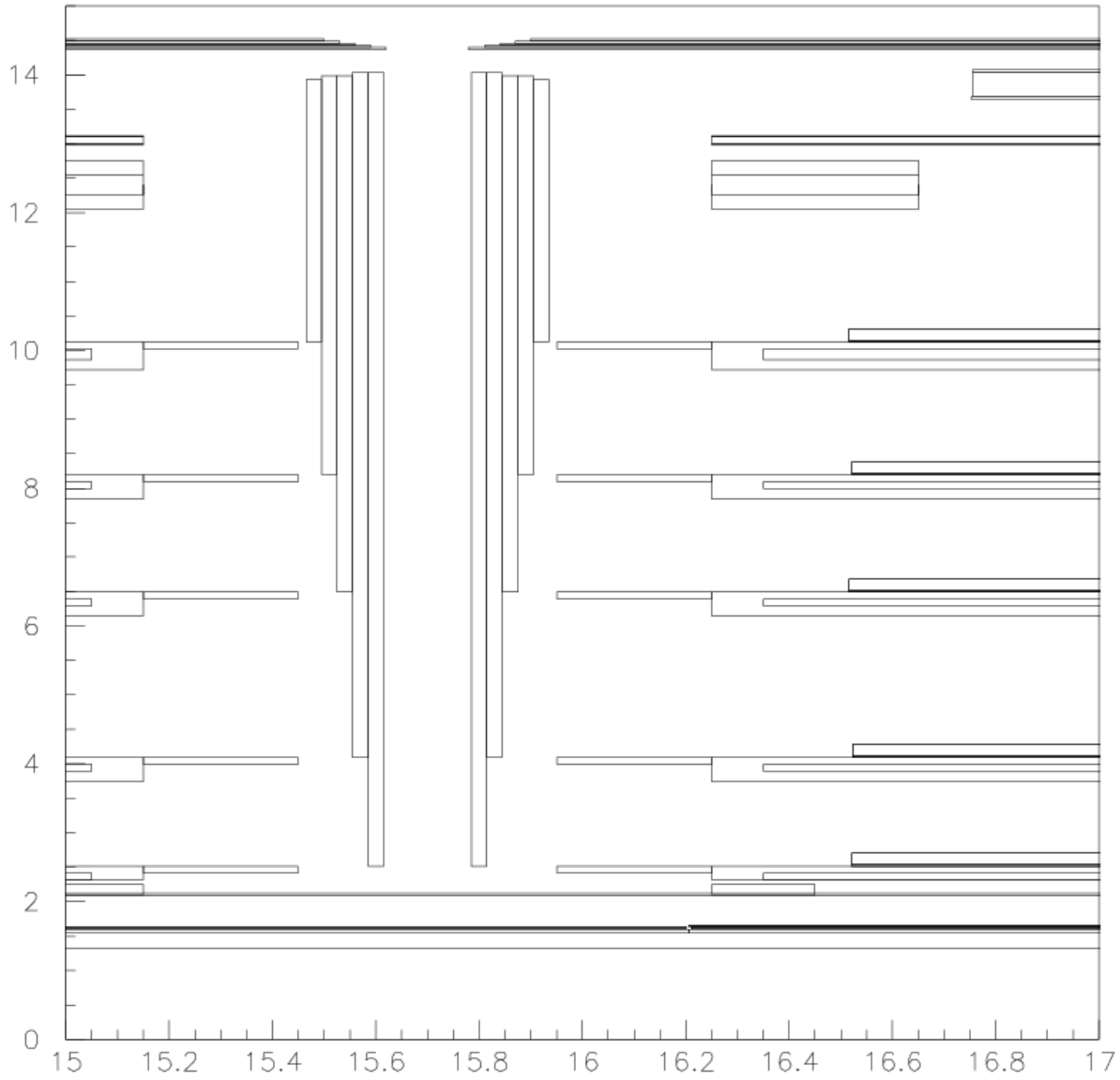
SVX: HDIs



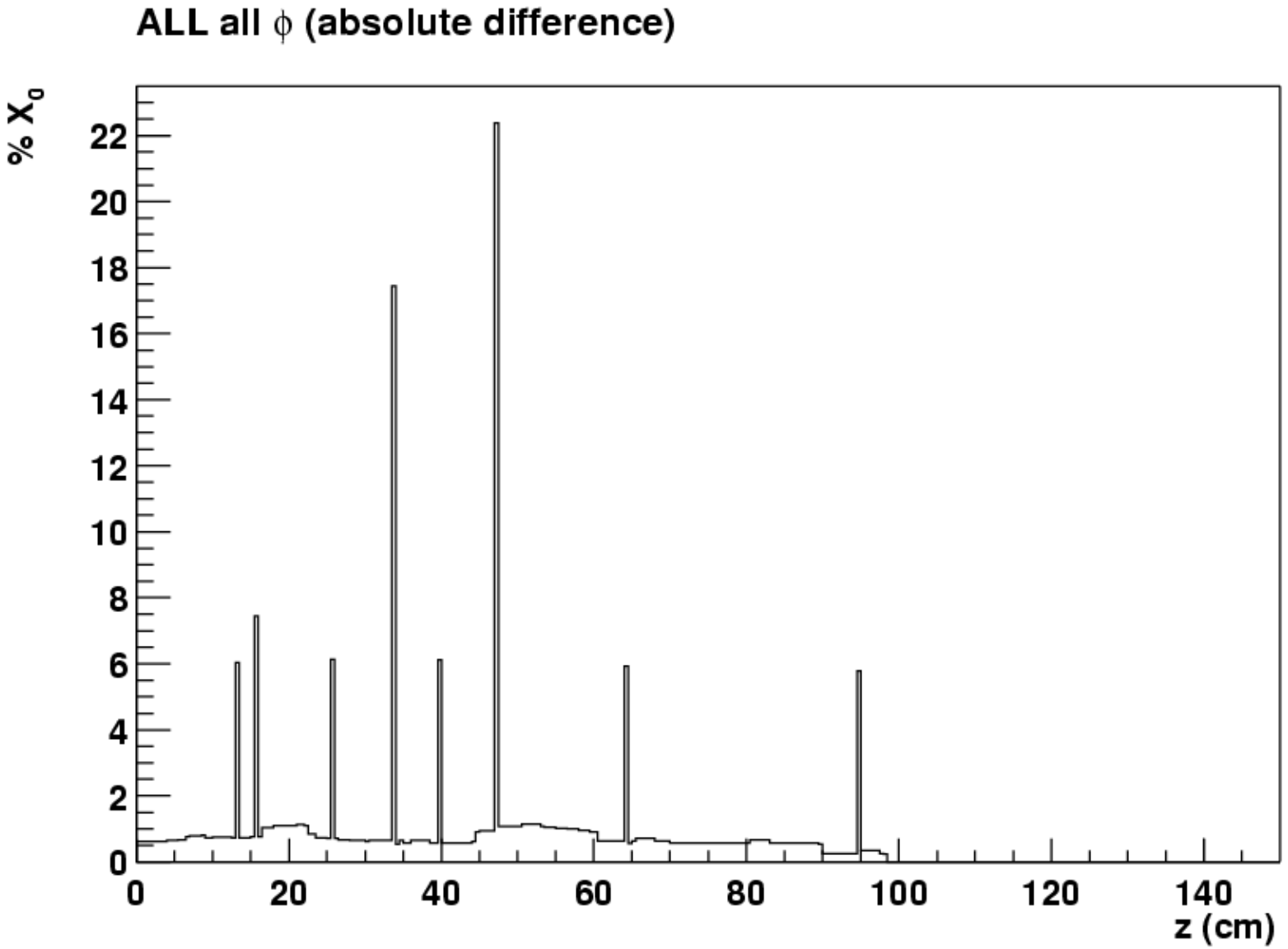
vertical sections

portcard sections

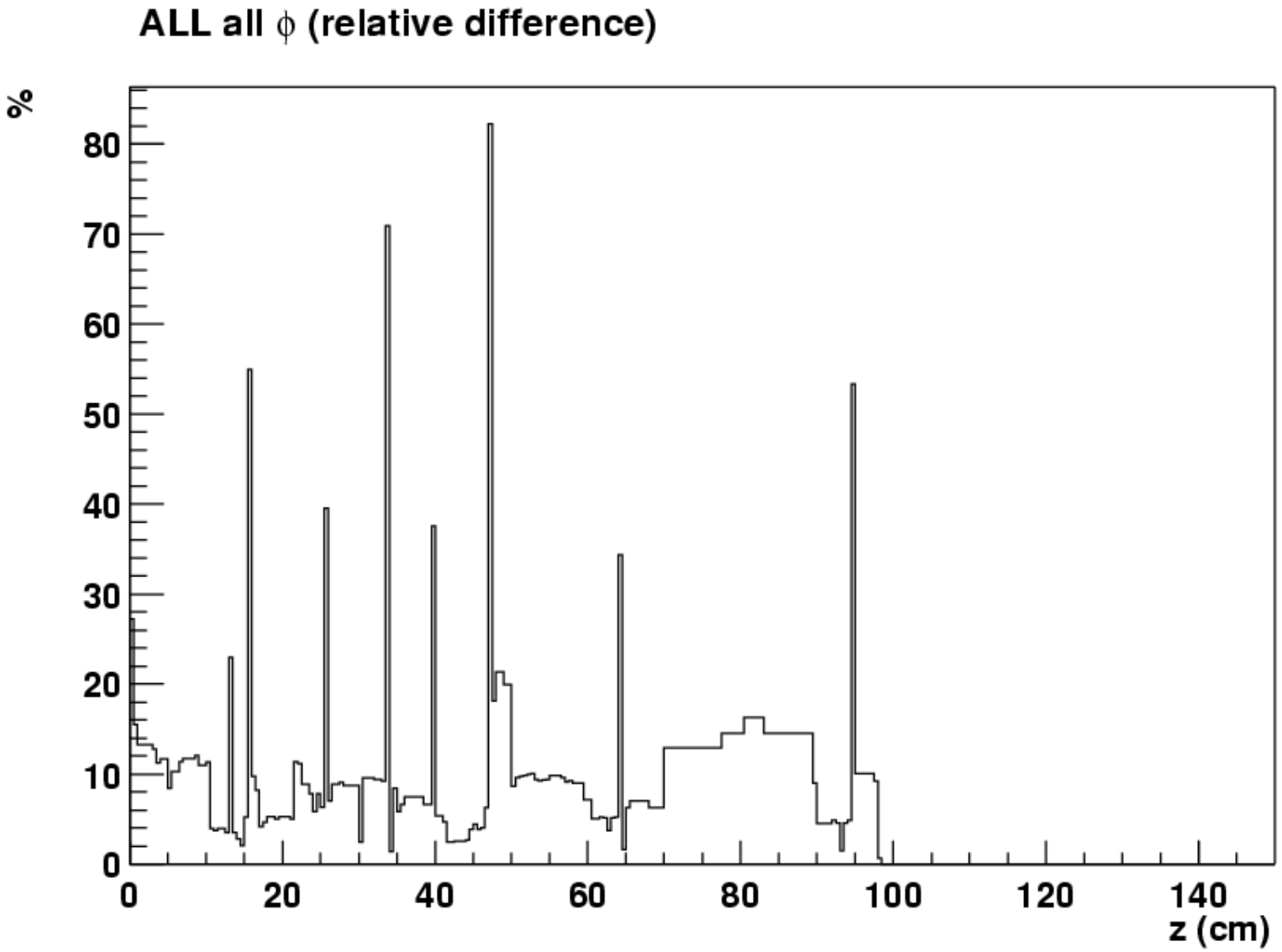
SVX: HDIs



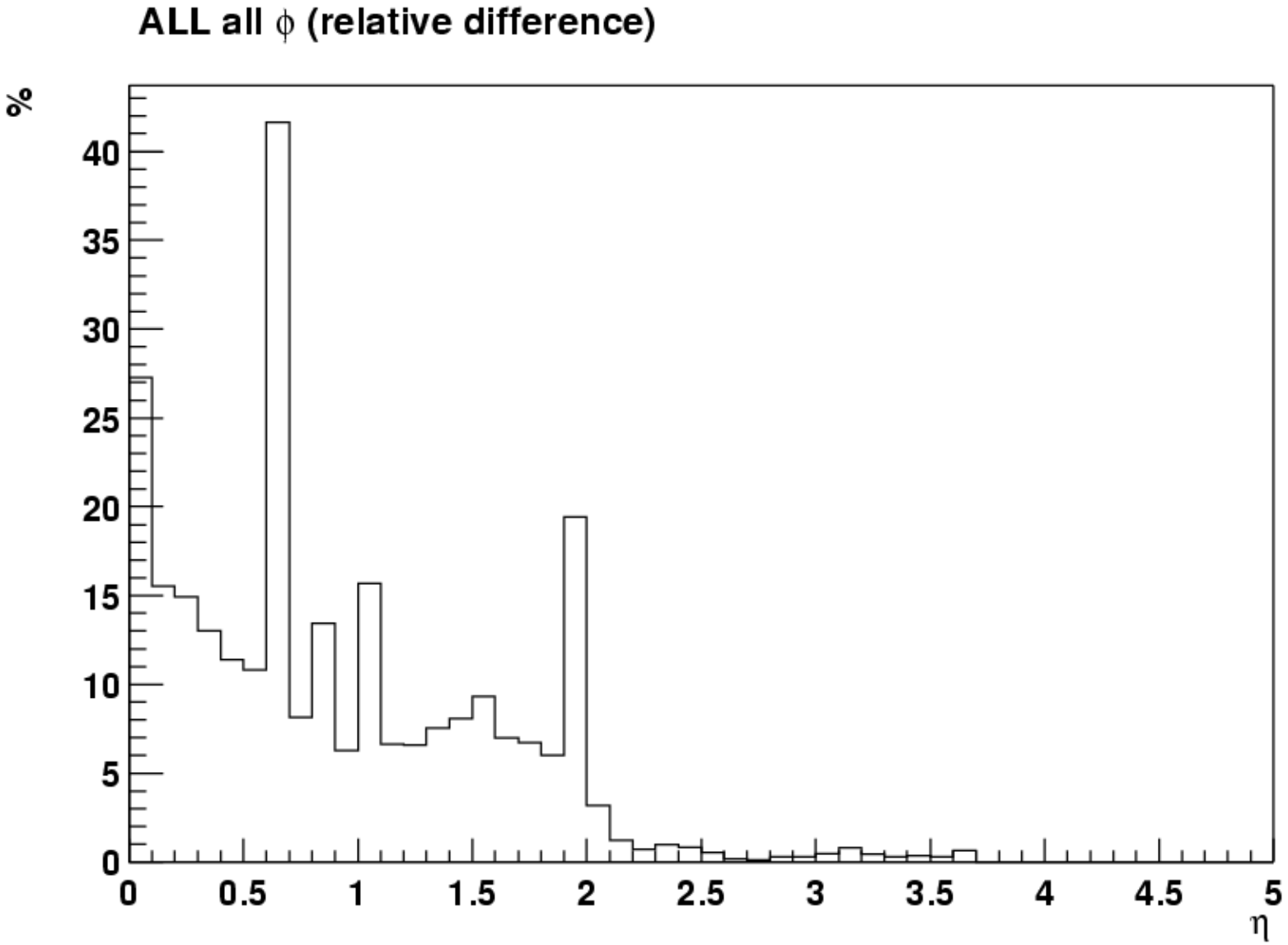
Relatively small absolute gain



however not negligible in relative



Relative increase in X_0 vs η



Recent change in the beam-pipe

- Overlap found in simulation: beampipe/L00
  - 300 micron overlap for the low-radius ladders
  - beampipe description turned out to be wrong
  - fixed by Elena on Tuesday, should be OK in 4.6.1
- Features: old vs. new:
  - thickness: 583.8 μm ➔ 508 μm
  - outer radius: 1.31318 cm ➔ 1.26238 cm
  - ➔ radiation length change: ~0.16% X_0 ➔ ~0.14% X_0
- Impact on physics
  - almost none
  - e.g.: ~1% change in total X_0 seen by a track (?<0.5)

Summary

- Recent improvements in description
  - gain in weight: 8 kg (72 kg total)
  - 50% of the estimated material seems to be recovered
  - being checked by the J/ψ folks
  - available in CVS this week
  - new volume hierarchy ➔ speed improvement (x4)
- Plan for the description
  - very little hope to add the missing parts:
    - lack of documentation, drawings
    - difficult to model
    - the description is already too complex:
      - very difficult to debug and check for volume overlaps

Plan

- Tuning of the description with data
  - photon conversions
  - comparison with single photons shot in the description
  - 50% of data already reprocessed
  - generation of MC sample on-going
- Normalization issues
  - the bad news: X_0 of COT can not well known
  - try to use silicon of ISL layer 6: 300 +/- 15 μm
  - eventually use the COT wires (long run)