Capability of MAPS+Si-strip +thinner outer tracker

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Introduction and motivation

- I will present a capability of MAPS+Si-strip+"thiner outer tracker" for
  - general tracking, i.e., efficiency and purity
  - DCA measurements leading to b-tag jets
  - Upsilon measurements.

- "Thiner outer tracker" does not necessarily mean DC or TPC, but is assumed to have good φ and z resolutions:
  - $\delta\varphi = 100\mu m$ && $dz = 1mm$
  - several layers placed just before EMCAL.

- Motivation of this study is to demonstrate that a combination of MAPS +Si-strip+thiner outer tracker ***'minimum model'*** can provide good DCA resolution and Upsilon mass.

Tracker overview

- ***Inner tracker***
  - First MAPS layer with 100 % live area: R = 2.335 cm.

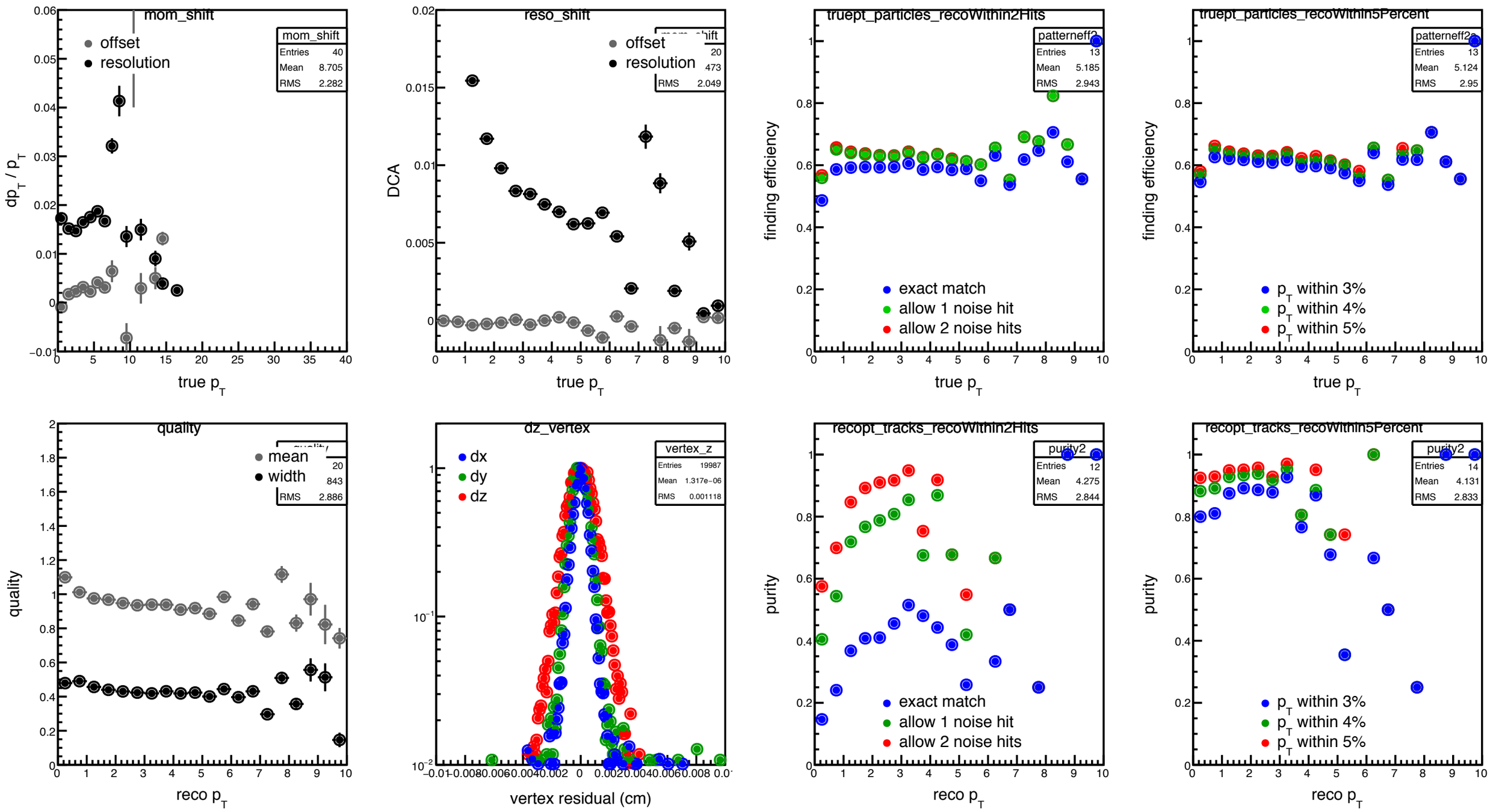
- ***Intermediate tracker***
  - four layers of silicon-strip detectors: R = 6, 8, 10, 12 cm
  - one strip corresponds to 80 μm (φ) x 12 mm (z)
  - one chip per one cell, so no strip ganging.

- ***Outer tracker***
  - a chamber consisting of six pads/layers placed at R = 77.5, 79.0, 80.5, 82.0, 83.5, and 85.0 cm
  - modeled as very thin si-strip with $\delta\varphi$ = 100μm and dz = 1mm.

Momentum, DCA, efficiency and purity

Central HIJING 10,000 events
- |DCA|<0.1
- chi2<2.0

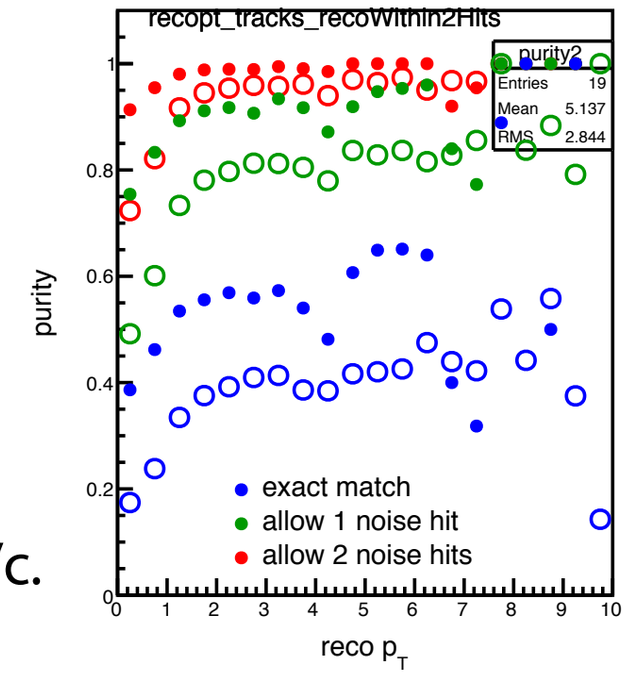
Missing points in purity plots are due to low statistics.
"allow 1 noise hit" goes > 90% at p_T > 5 GeV/c.

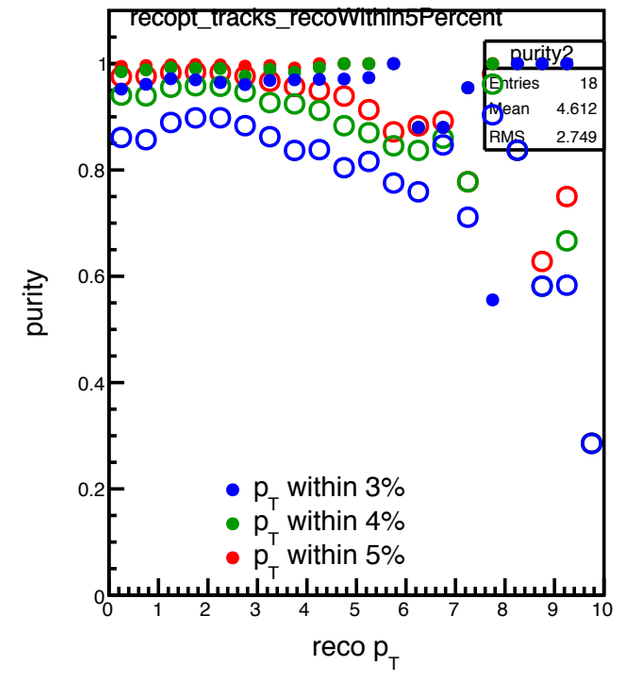


Effects of DCA and chi2 cuts to purity

Central HIJING 20,000 events
Filled circles: chi2<3 & **DCA<0.005**
Open circles: chi2<3 & **DCA<0.1**

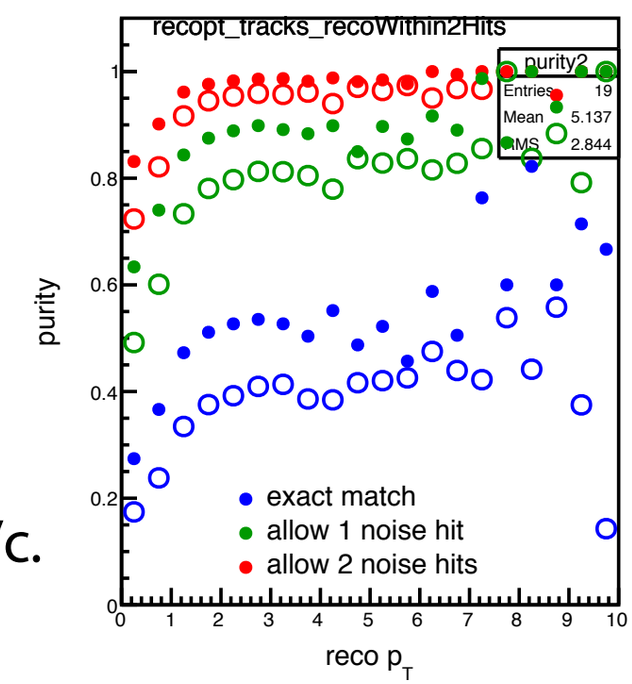
Tracking requires all 11 layers.
"allow 1 noise hit"~95% at $p_T > 5$ GeV/c.

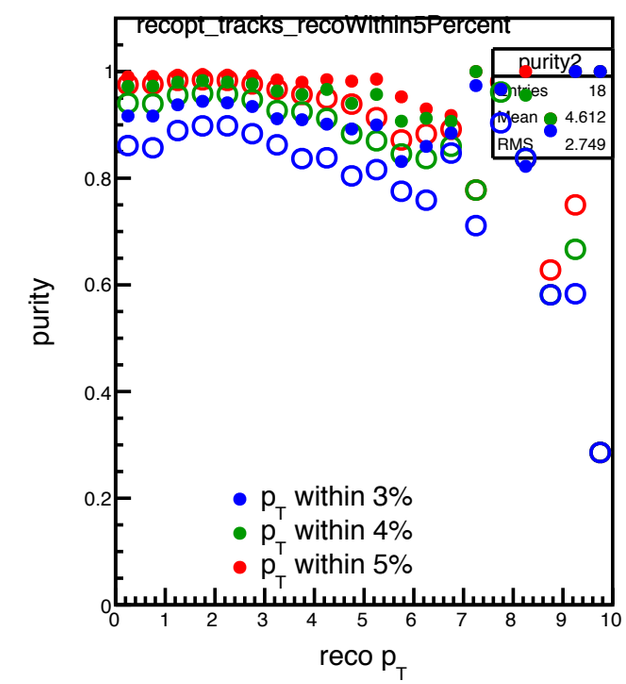




Central HIJING 20,000 events
Filled circles: **chi2<2** & DCA<0.1
Open circles: **chi2<3** & DCA<0.1

Tracking requires all 11 layers.
"allow 1 noise hit"~90% at $p_T > 5$ GeV/c.
Further study ongoing.

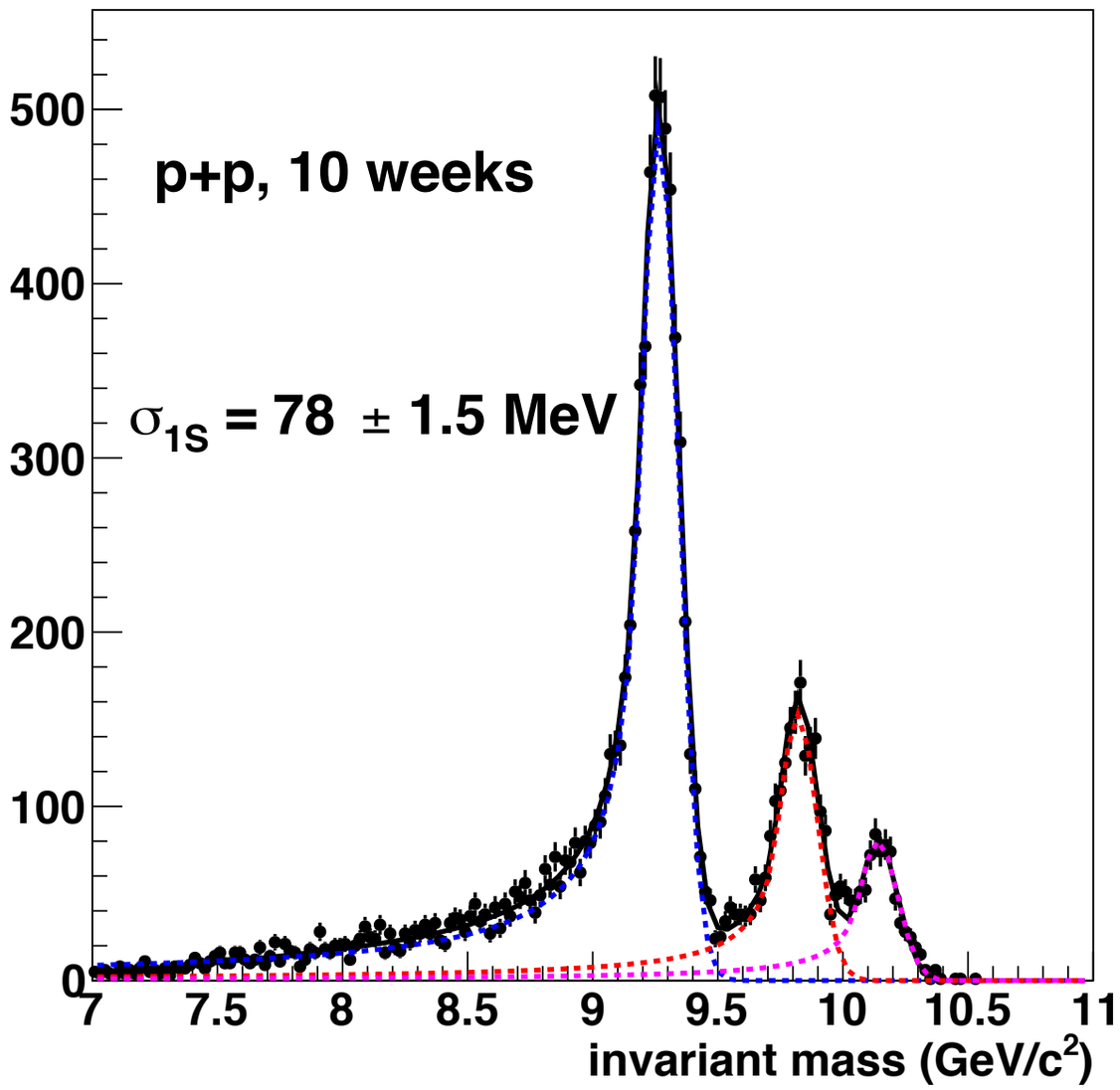


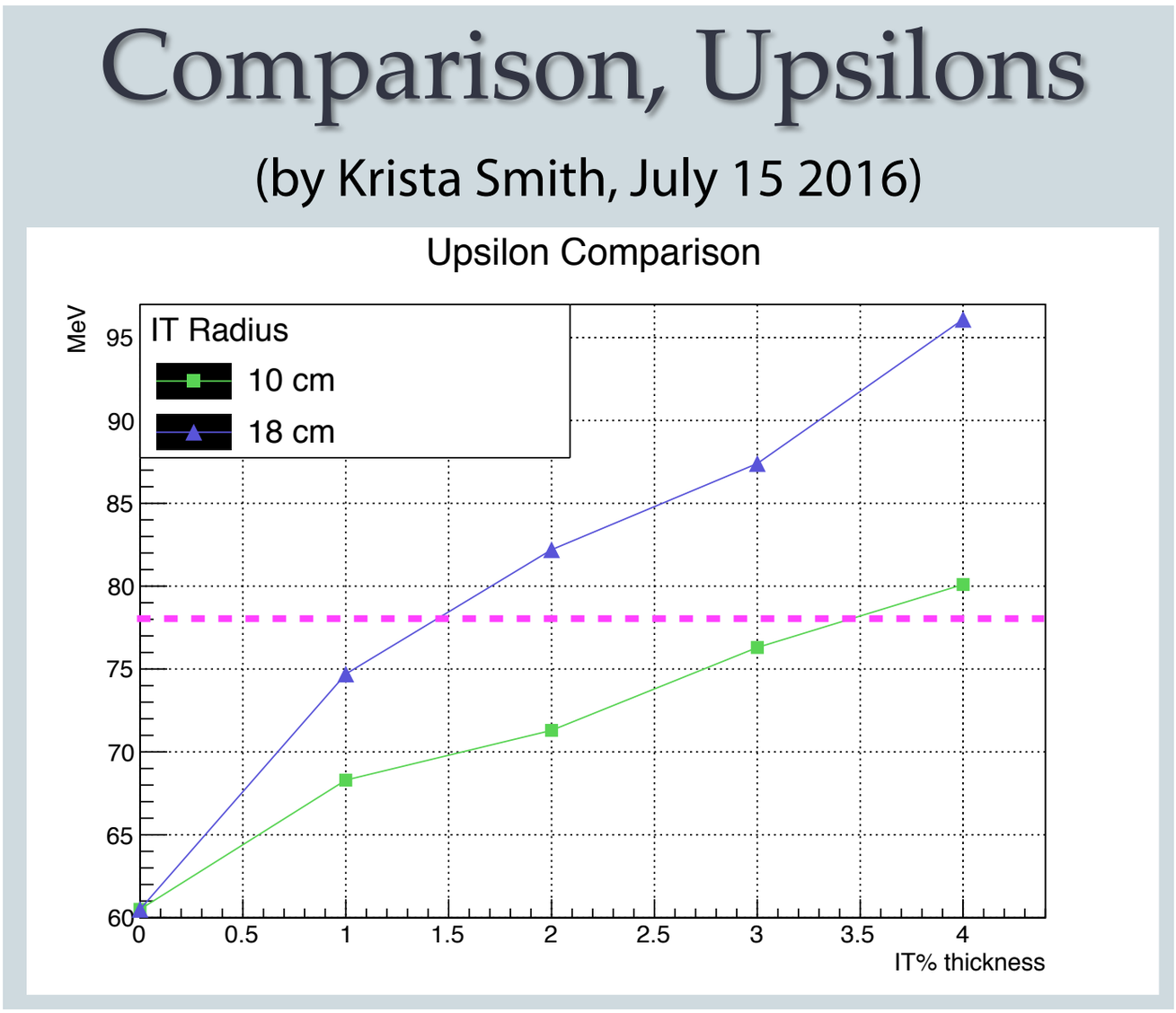


Upsilon measurements

Single upsilon
(with internal Bremsstrahlung)

$\Upsilon(1S,2S,3S) \rightarrow e^+e^-$





Upsilon embed in central HIJING ongoing…

Summary

- MAPS+Si-tracker+thiner outer tracker can provide reasonable purity and good upsilon mass resolution.
- Note that the purity highly depends on the DCA and chi2 cut criteria.
- Several studies are still ongoing, for example mass resolution vs. si-tracker's R-position (R=6, 9, 12, 15 cm etc…)