Preparations for a Proposal to Upgrade the SSD

(and a request for ideas and help)

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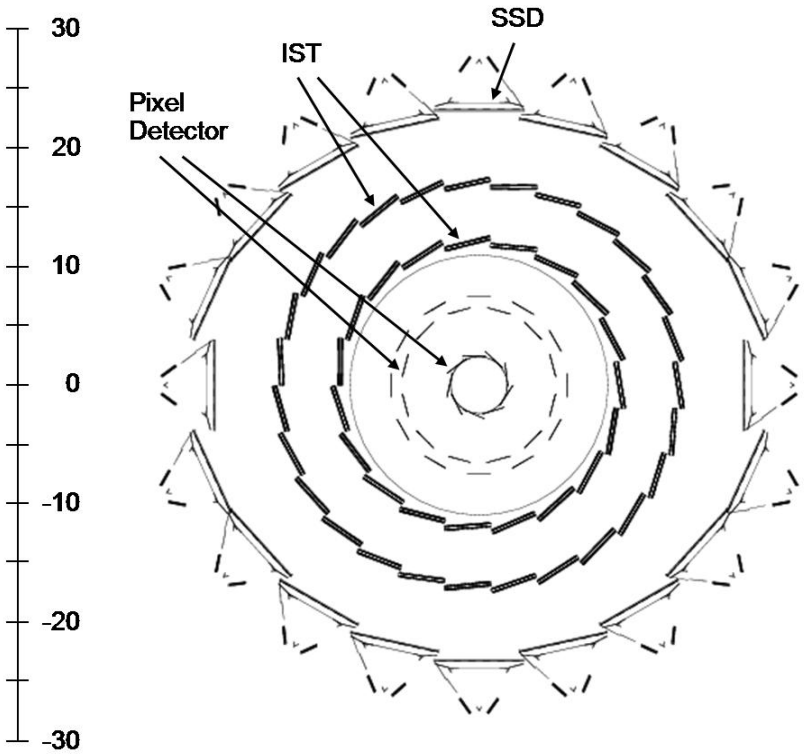
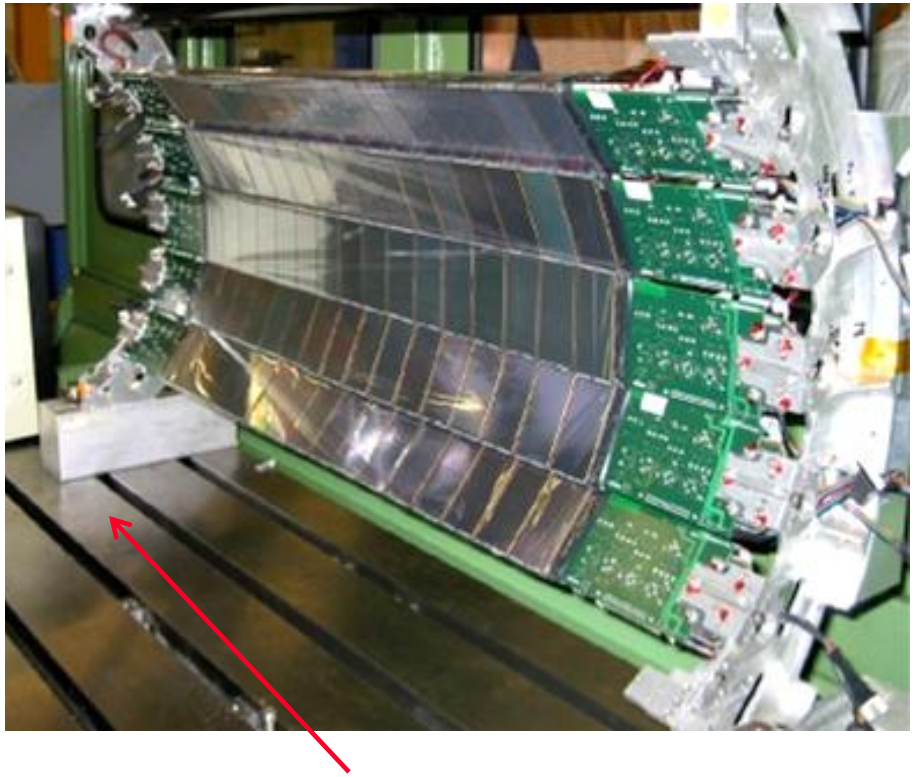
Why Upgrade the SSD

- **It's a beautiful detector – it needs to be upgraded to meet the DAQ 1000 era specifications**
- **It will deliver incremental improvements in the reconstructable yield of the strange mesons and baryons**
  - **K, Λ, Ξ, Ω**
- **It will have improved single-track high p_T resolution**
- **It will improve the invariant mass resolution for resonances and spectra measurements**
- **It is thin – and so can improve signal to noise ratio for non-photonic electrons**
- **It is essential for the HFT Upgrade (~$16M)**

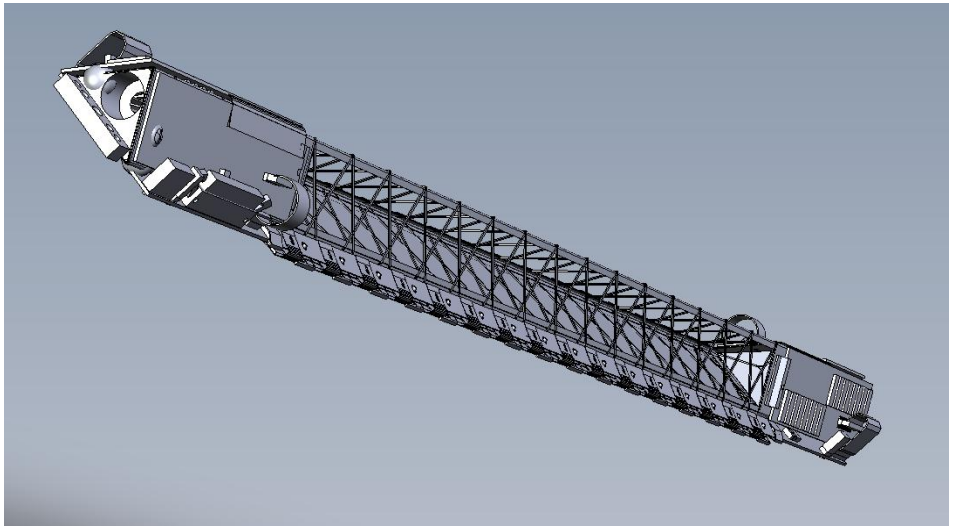
It's a beautiful detector



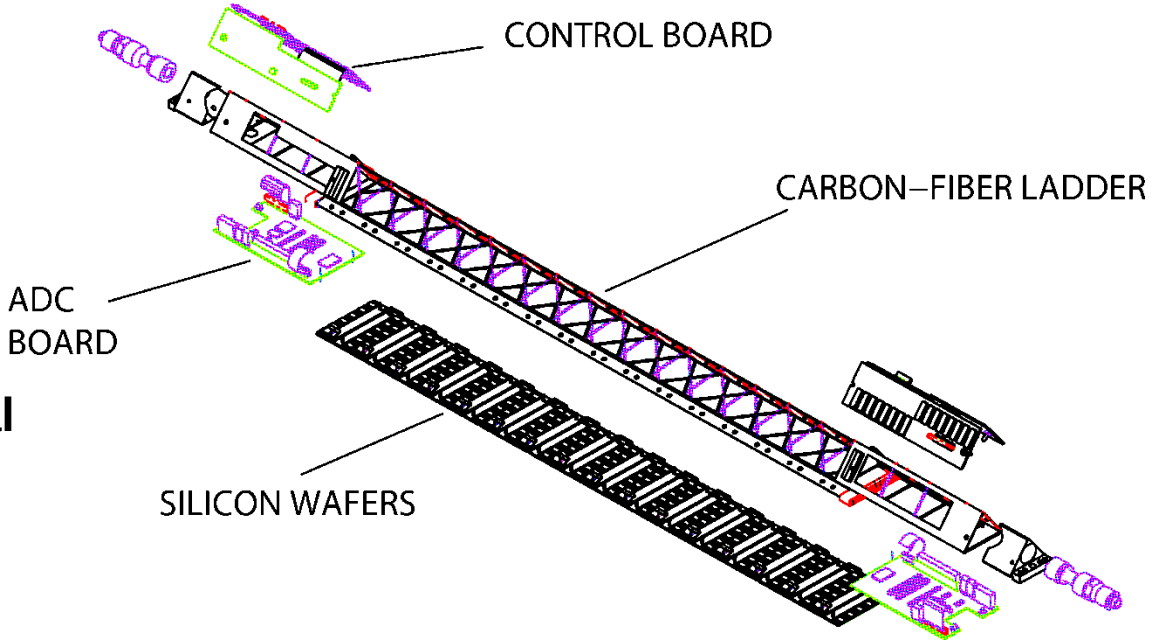


- **The SSD *is* visually appealing (4 cm wafers at 23 cm radius)**
- **Technology**
  - **30 μm x 750 μm resolution at 23 cm radius (compare TPC at 1.5 x 1.5 mm)**
  - **Thin – 1% radiation length**
  - **Crossed strips with charge sharing … no ambiguous hits**
- **DAQ rate limited to 200 Hz**

The Upgrade

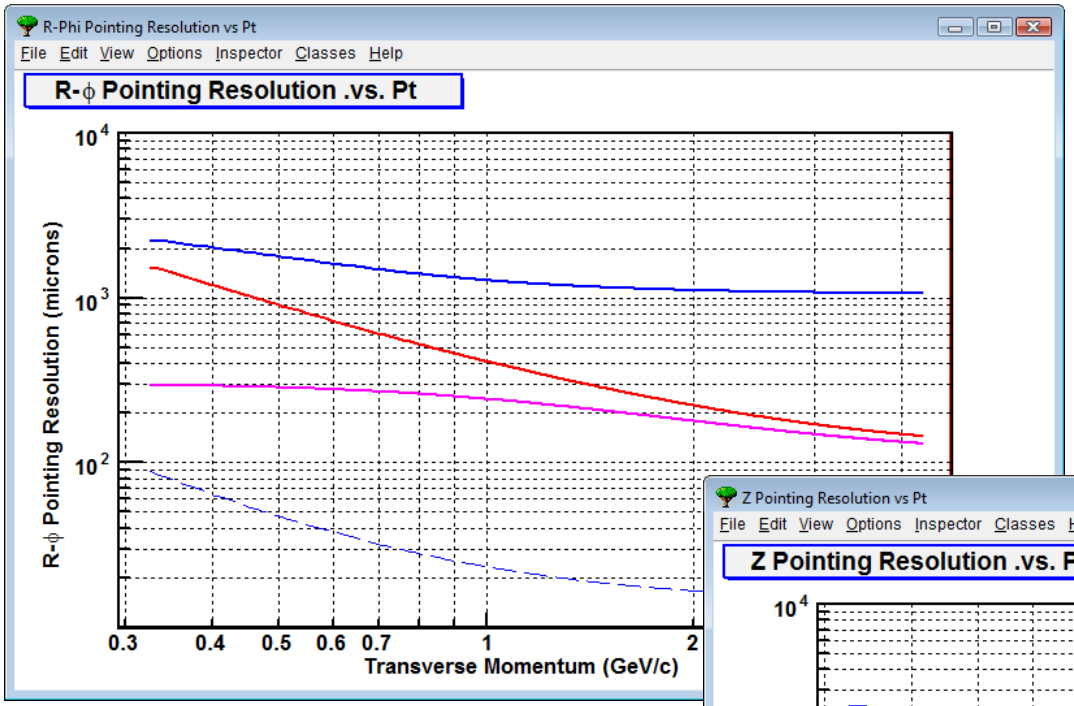


- **Upgrade to DAQ 1000 Specs**
  - **Control Board**
  - **ADC Board**
  - **RDO board (not shown)**
- **Si Wafers remain the same**
  - **Mechanical structures remain the same**

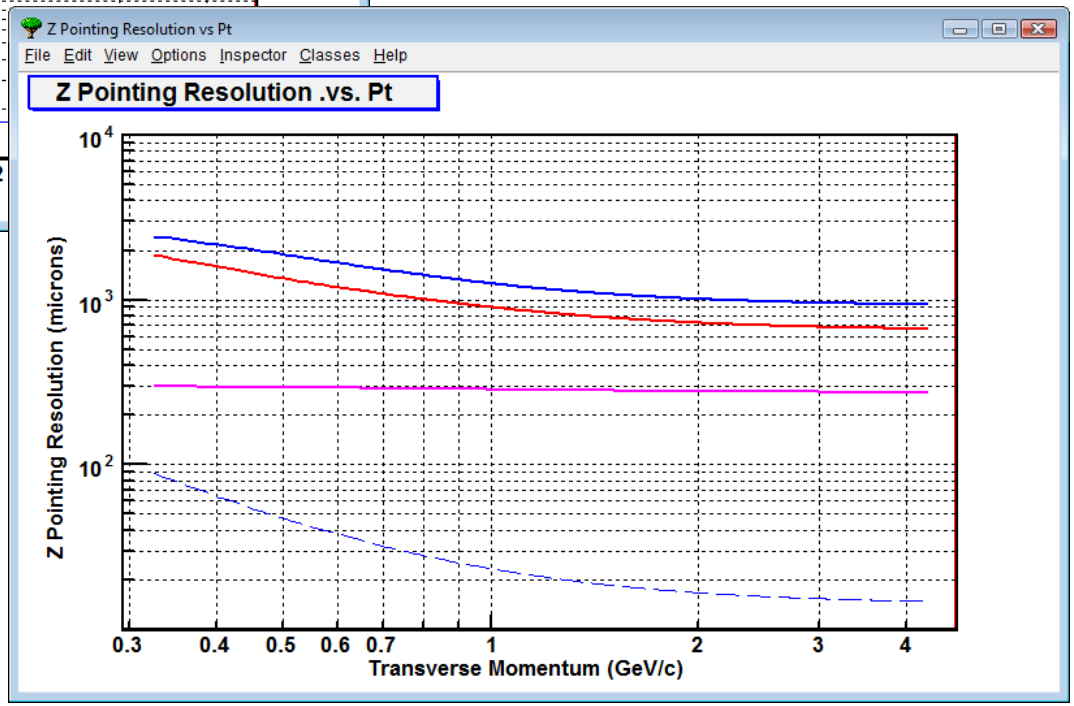


- **Cooling and conventional systems also need an upgrade to improve reliability**

The SSD Delivers High Spatial Resolution

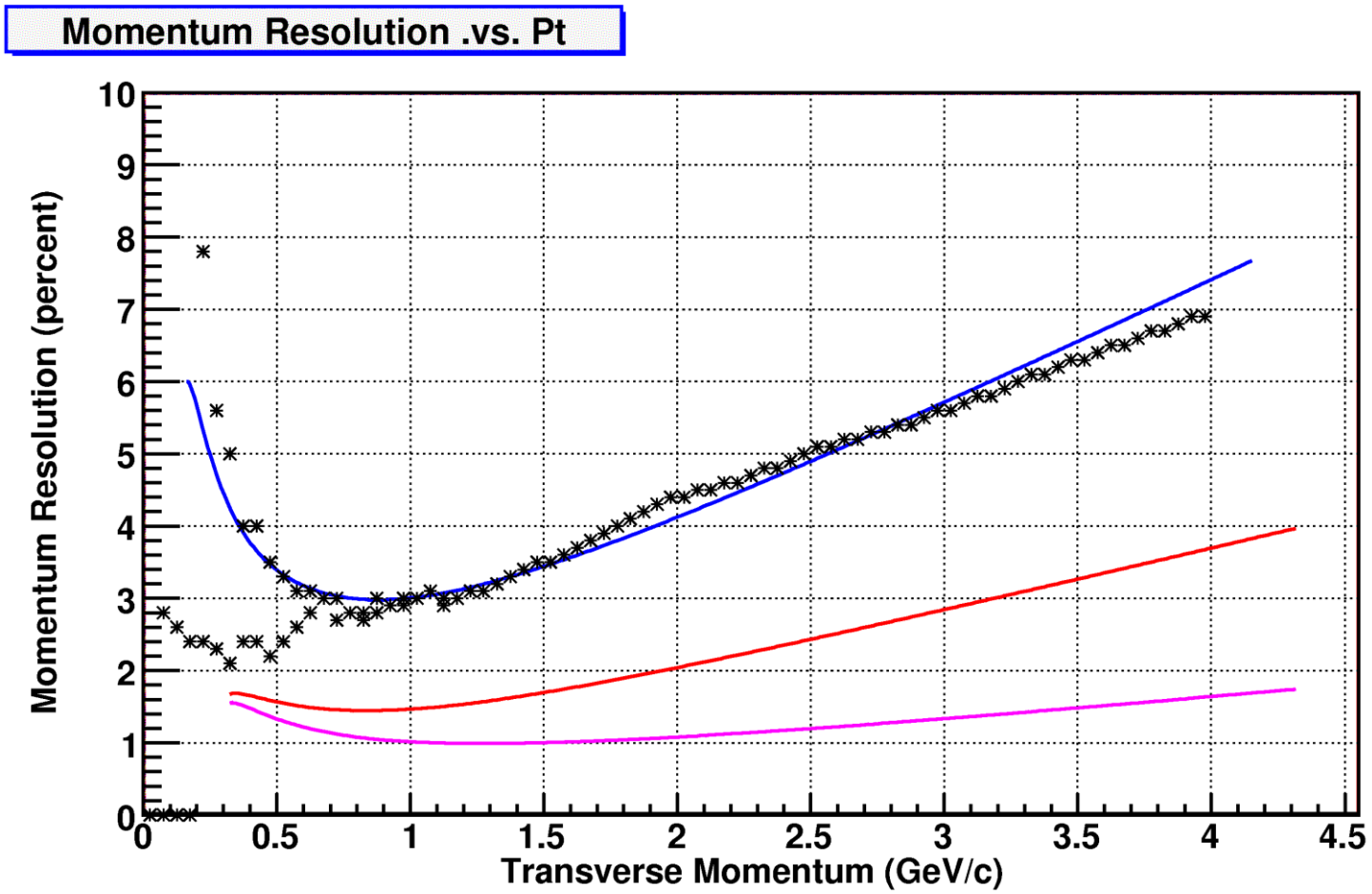


- **The STAR tracking resolution drops to 400 μm in the R-ϕ direction**
  - **Track by track basis**
  - **No vertex constraint**
  - **Values quoted a 1 GeV**



- **I cannot tell a lie …**
  - **George Washington**
- **The SSD has asymmetric pointing resolution**
  - **TPC alone (blue)**
  - **TPC+SSD (red)**
  - **300 μm vertex constraint**

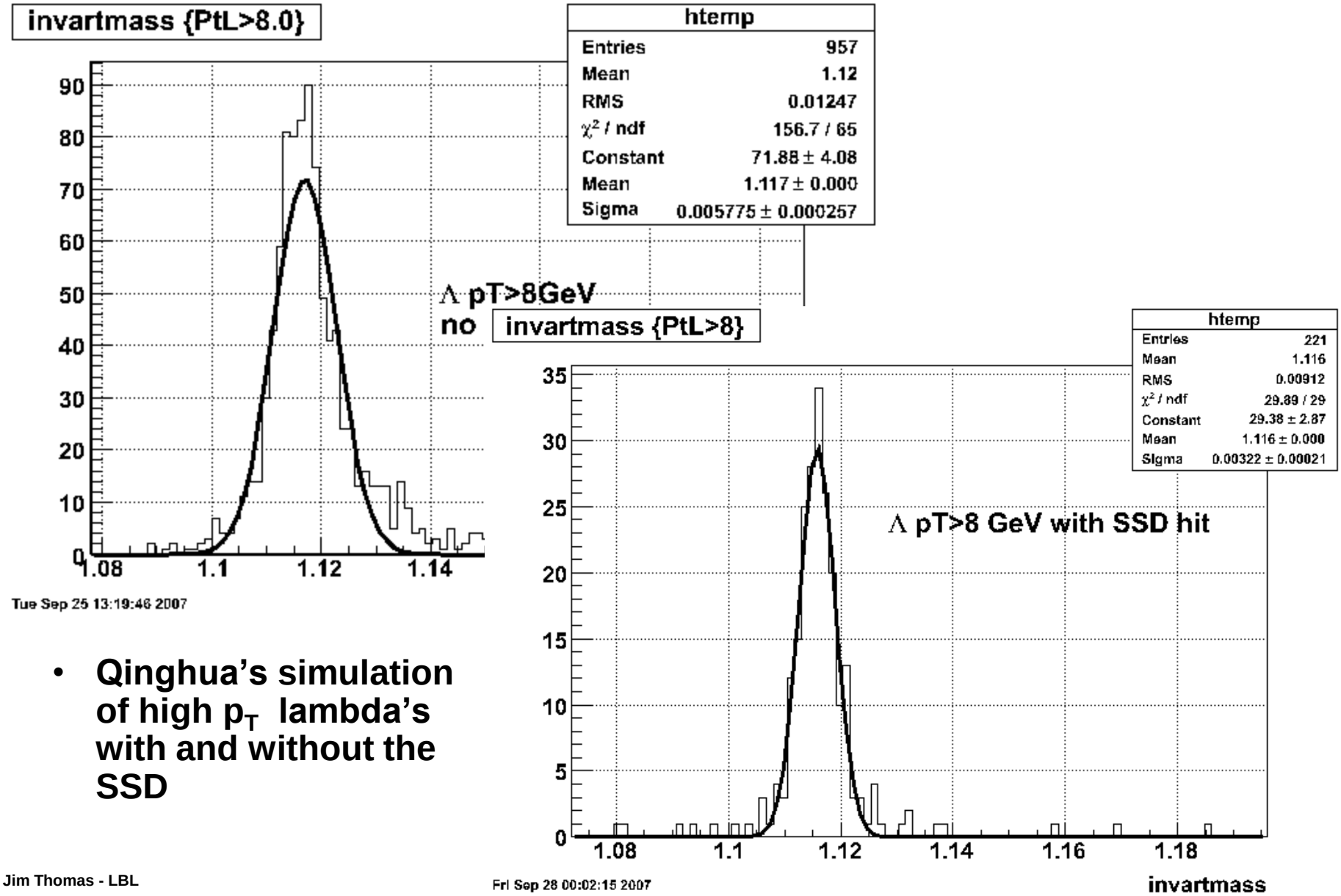
The SSD Delivers High P_T Momentum Resolution



- **TPC pointing resolution without a vertex constraint**
- **½ field (blue), full field (red), and full field with the SSD (pink)**

The SSD doubles the high p_T resolution on a track by track basis

Λ Invariant Mass Resolution



- Qinghua's simulation of high p_T lambda's with and without the SSD

Conclusion & a request for help

- **The SSD delivers improved pointing resolution and invariant mass resolution**
- **It can do this on a track by track basis**
  - **Without resort to a vertex constraint**
- **It works for single tracks but also in p-p, minBias, and UPC collisions where the vertex is not well defined**
- **I would like other examples to show the benefits of the SSD**
  - **Quantify the improvement in for the strange mesons and baryons ?**
  - **The ϕ ?**
  - **Anything else that I forgot ??**