sPHENIX Event Plane Detector and its flow capabilities

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on behalf of the **sPHENIX** collaboration

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Brookhaven National Laboratory

LEHIGH UNIVERSITY

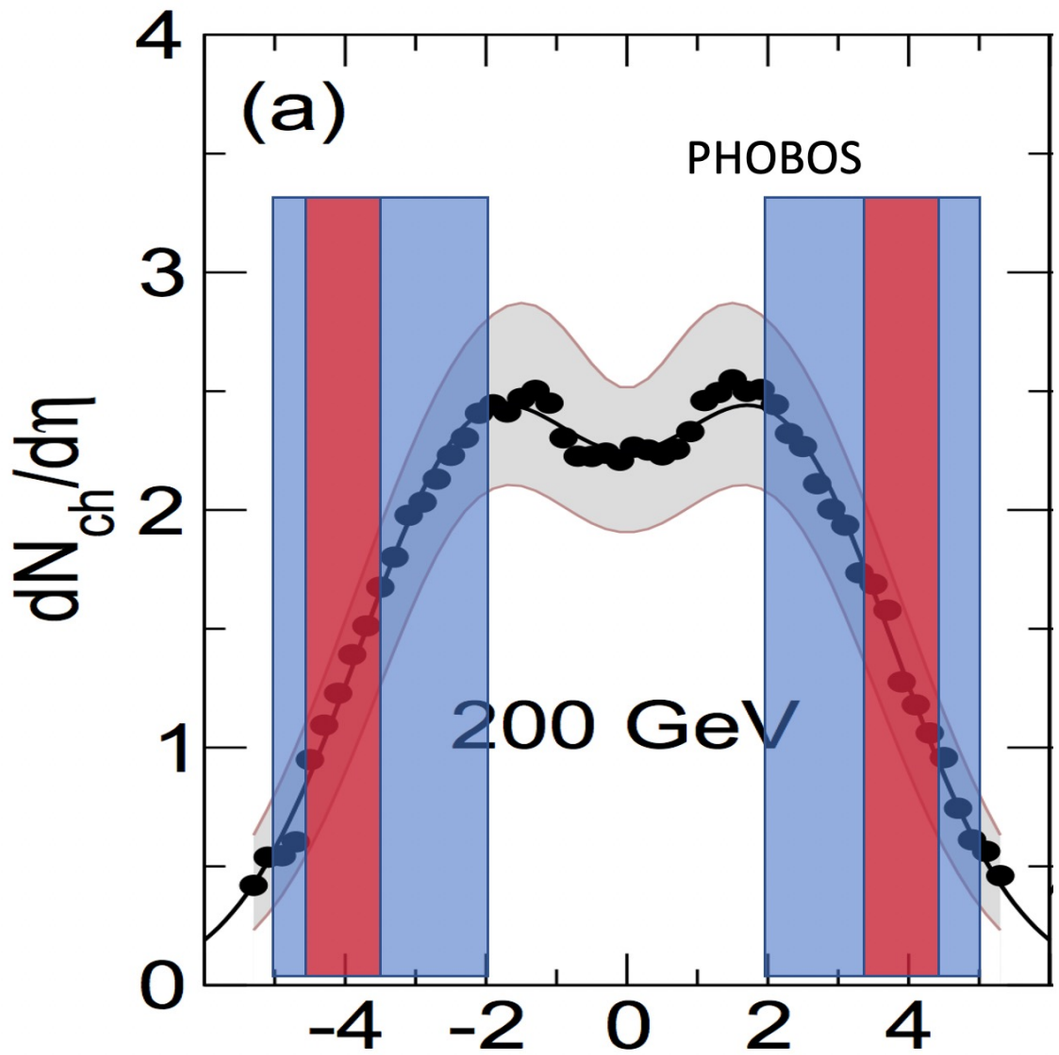
NSF

sPHENIX

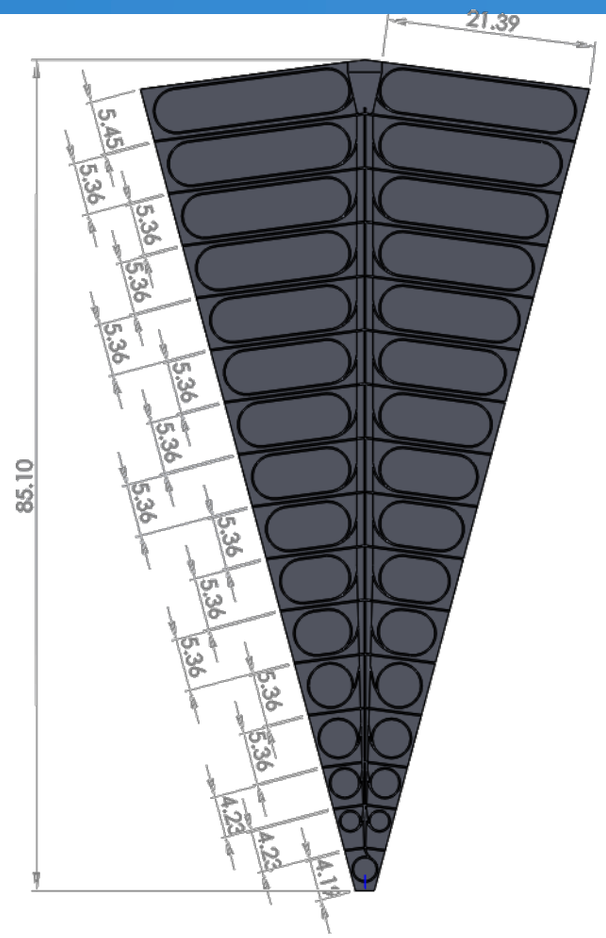
sPHENIX Event Plane Detector (sEPD)

- **sPHENIX** will be the first **new collider detector** at RHIC in over 20 years
  - Enable new measurements of the microscopic nature of QGP
  - Large and hermetic electromagnetic and hadronic calorimetry
  - high precision tracking
  - high DAQ and trigger rate
- The **kinematic overlap with LHC** and unique opportunities for lower energy
  - complementary to the LHC
- It would be **helpful for the sPHENIX science mission** to be able to measure the **event plane AND centrality** outside of mid-rapidity.
  - Avoids auto-correlations with the presence of a hard process → Jets/HF
  - Allows a more apples-to-apples comparison with data from LHC experiments → Complementarity
  - Will also improve sPHENIX ←→STAR data comparisons
  - sEPD was not part of the MIE → NSF MRI to build an event plane detector similar to the STAR EPD

Slide with two pictures and text

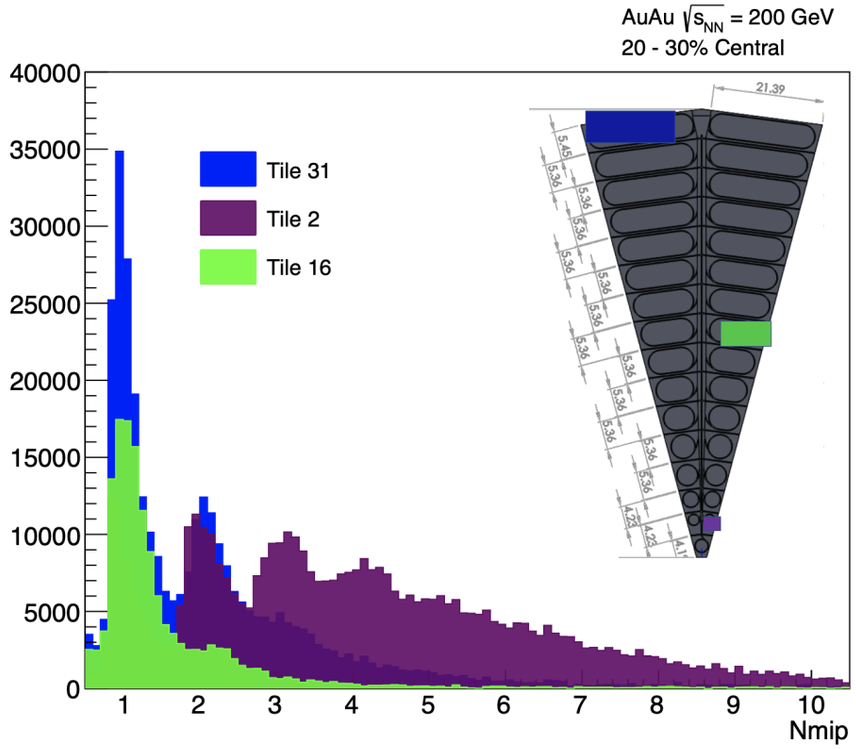


- **sEPD 2.0 < |η|< 4.9 (z=319 cm)**
- **MBD: 3.51 < |η| < 4.61**
- Large acceptance with azimuthal symmetry with h gap from mid-rapidity is very useful for many analyses
  - Especially important for small systems



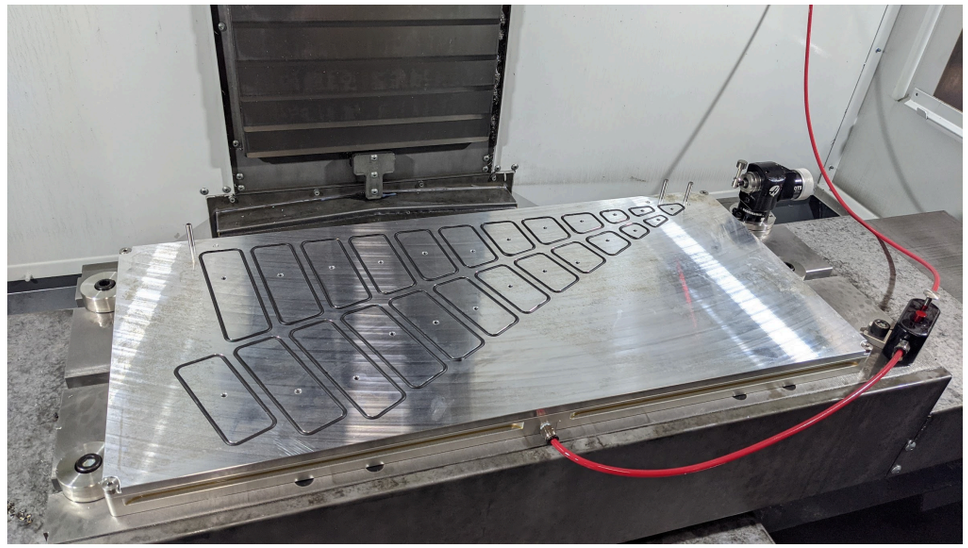
- 2 Wheels of 12 sectors with 31 optically-isolated tiles
  - **1.2-cm-thick scintillator**
- Total of 12x31x2=**744 channels**
- R_{outer} = 0.9 m, R_{inner} = 4.6 cm
- Wavelength shifting fibers (3x loops) glued into tiles
- Machined out of a single piece of scintillator

sEPD Construction Process



Simulated Response

Landau tail requires signal truncation

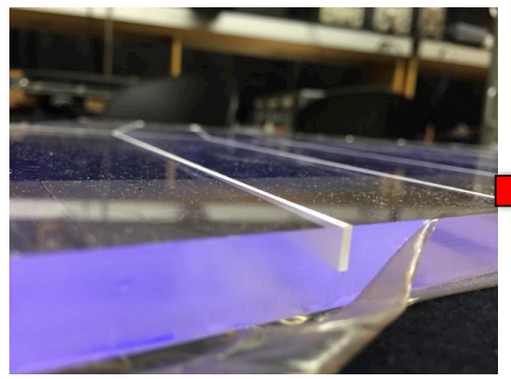


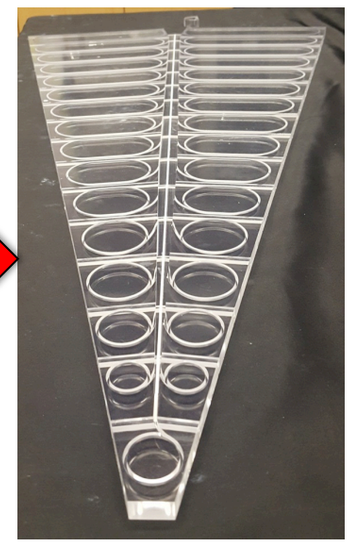
Vacuum Plate

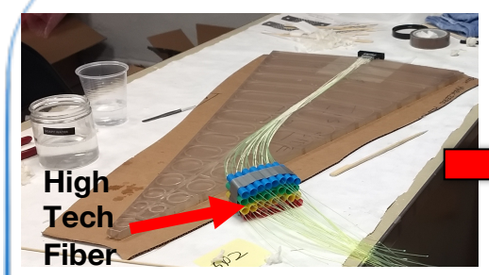
Anchors scintillator for machining

Machining process

Machine back →
TiO_2 reflective epoxy →
Machine front



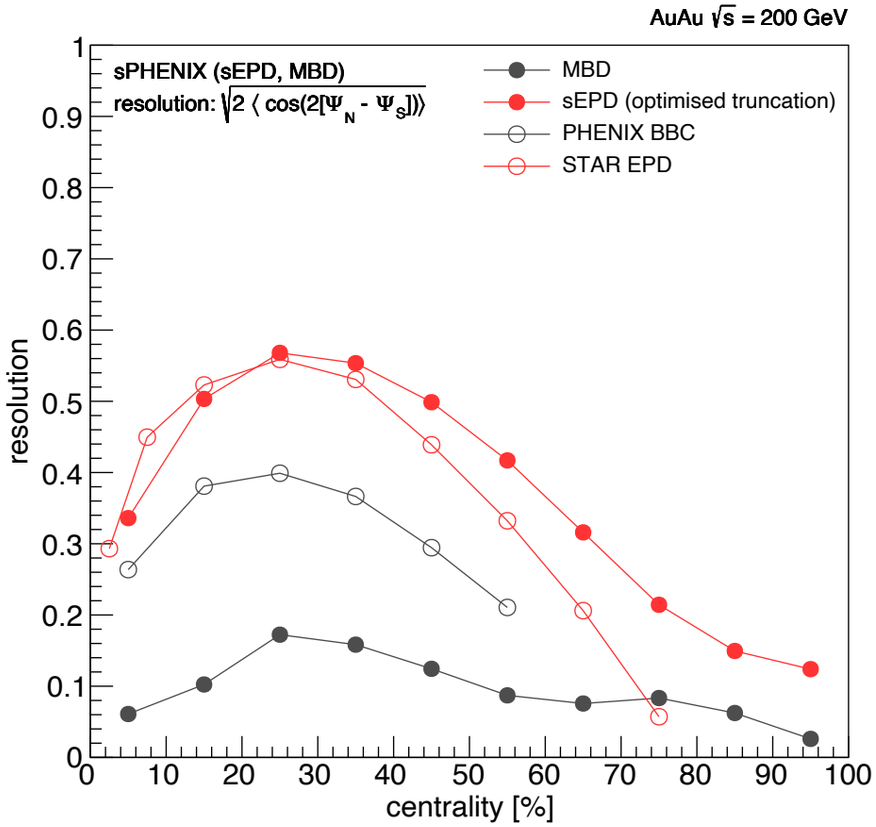


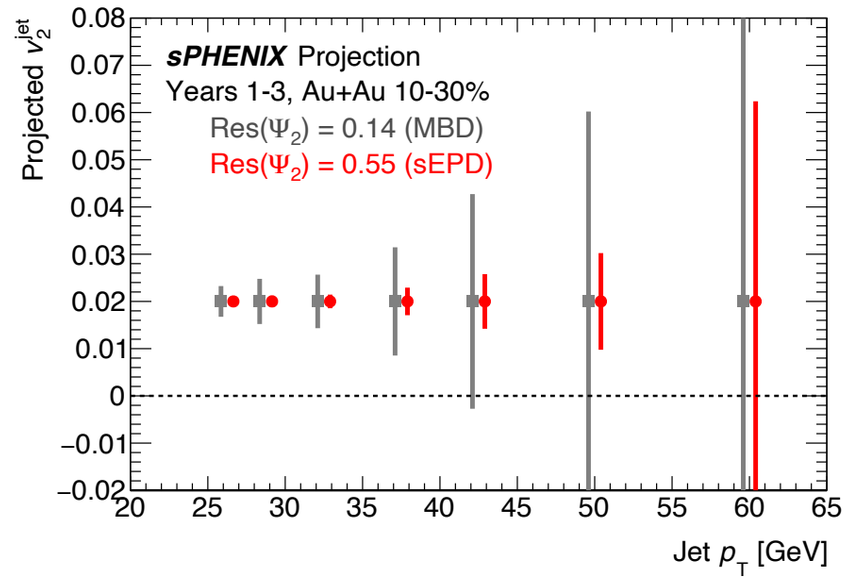


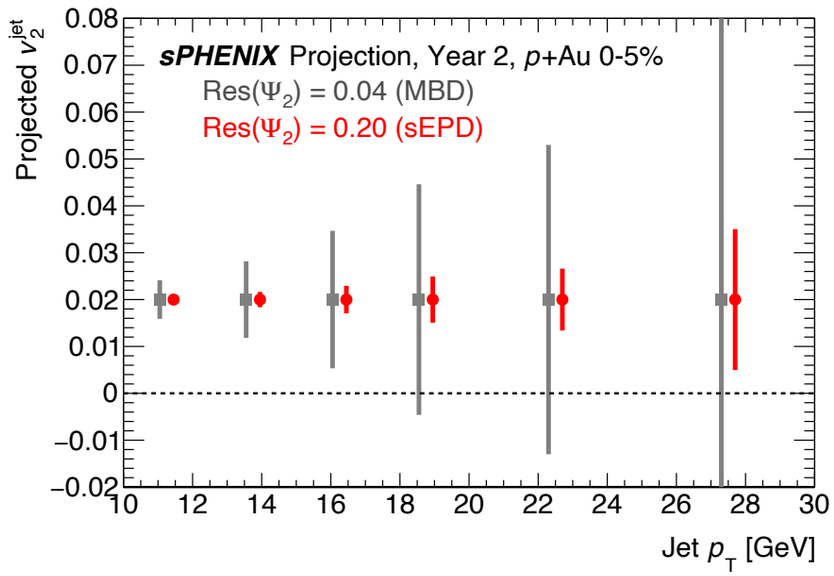
WSL Fiber Gluing

Prepared WSL fiber bundles are glued with optical epoxy w/3 loops per tile

Summary







- **sEPD high resolution**
  - Better resolution than MBD → Larger acceptance
  - Weighting ring-by-ring can improve resolution
- Allows measurements of the modification of the jet yield with respect to the reaction plan (jet v_2)
  - Path-length dependent Energy Loss
  - Absolutely required for small systems jet v_2!

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