

ePIC TOF Endcap Mechanics on the PED request from 10/22

Mathieu Benoit, Friederike Bock, Oskar
Hartbrich, Constantin Loizides, Ken Read,
Nico Schmidt

Project Engineering Design Resource Request

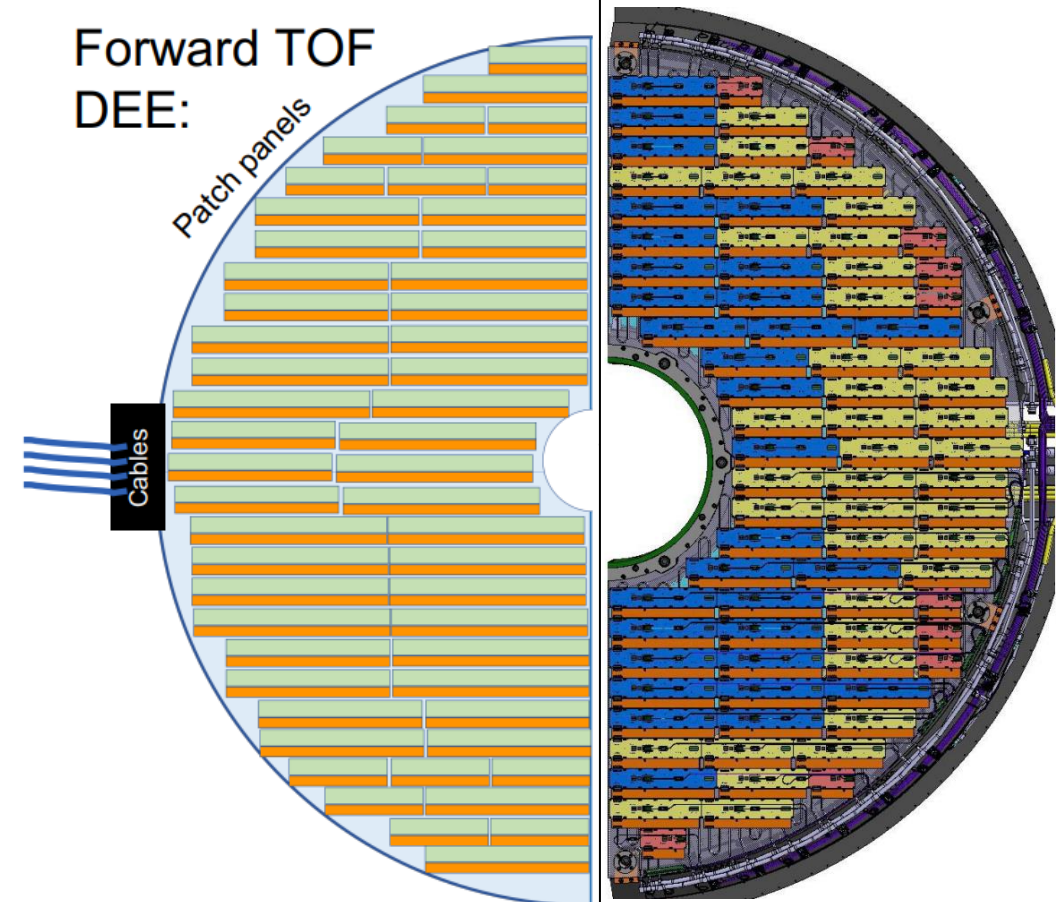
- ePIC TOF PED request submitted in October '22
 - ORNL: Endcap mechanics + cooling
 - Purdue + NCKU: Barrel mechanics
- No feedback received
 - No significant design progress: lack of funding

ORNL: TOF Endcap Mechanical Engineering

EPIC TOF

CMS ETL

- TOF endcap needs preliminary engineering design for TDR/CD2
- ORNL has available engineers to for TOF endcap mechanics
 - Estimated ~0.2FTE funded effort
- Plan based on initial engineering estimates:
 - 2x 1mm Al plates + cooling pipes + services
 - 8% X_0 overall



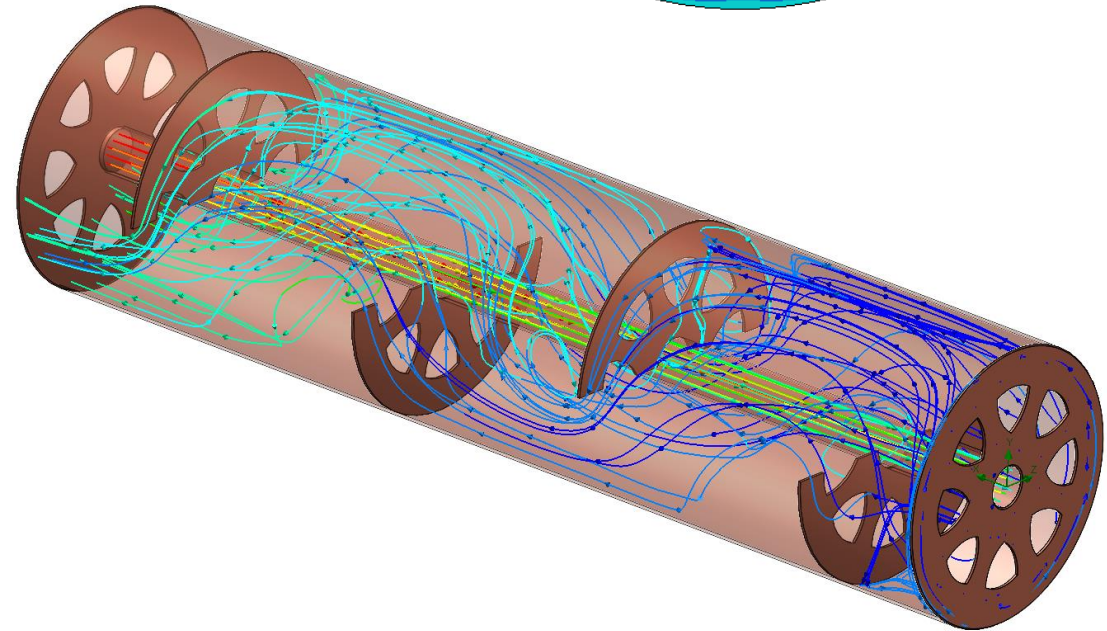
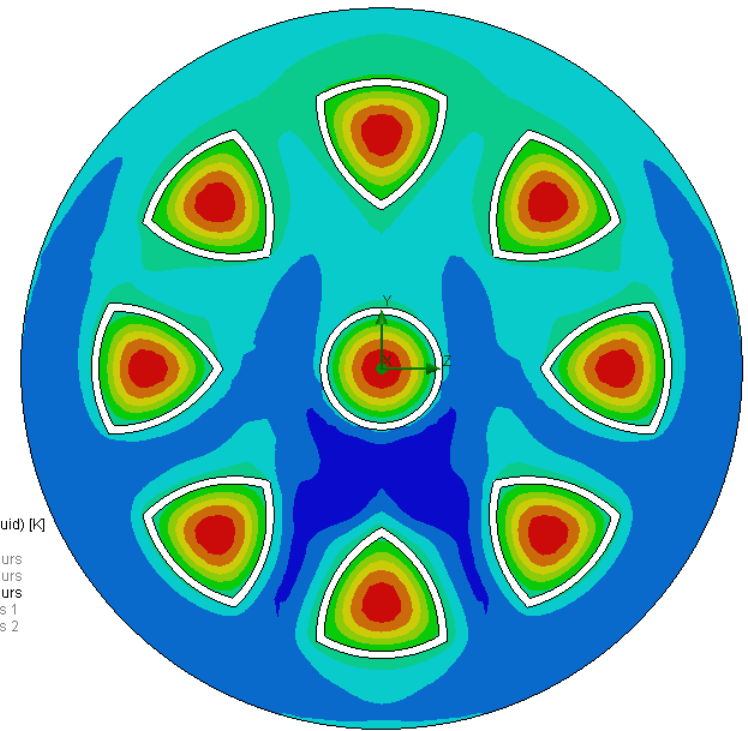
ORNL: TOF Endcap Cooling System

- TOF endcap heat dissipation has been discussed frequently
 - Project agreed that the issue needs to be studied by engineers in simulations
- ORNL engineers have the expertise and tools
 - Estimate ~0.15FTE funded effort

350.00
344.44
338.89
333.33
327.78
322.22
316.67
311.11
305.55
300.00

Temperature (Fluid) [K]

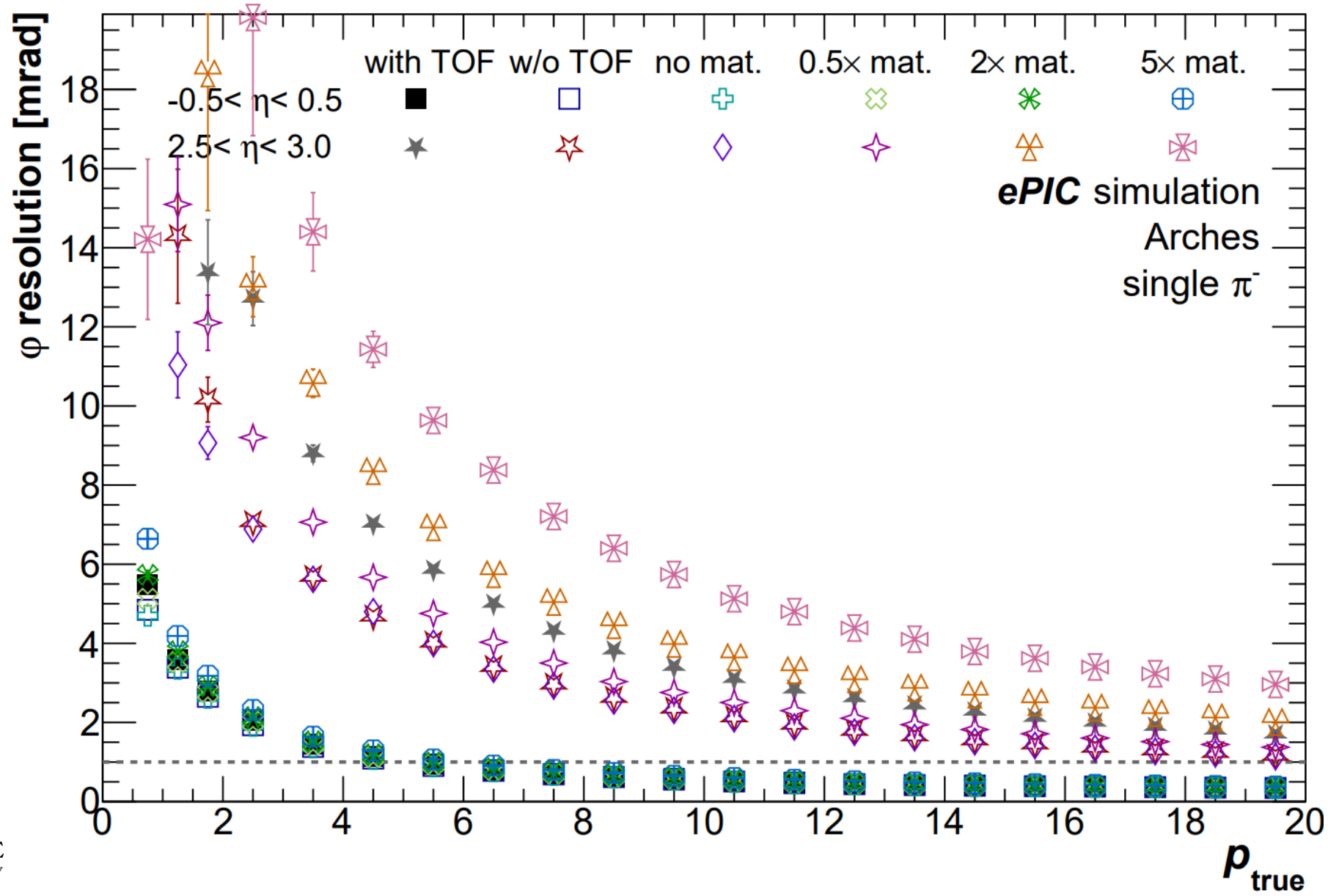
Cut Plot 2: contours
Cut Plot 3: contours
Cut Plot 4: contours
Flow Trajectories 1
Flow Trajectories 2



In the Meantime ...

- ORNL simulations: 8% X_0 in TOF endcap has impact on angular track resolution on Cherenkov detector surfaces
 - ORNL engineers are not accustomed to cutting-edge low mass designs, limited expertise in composite materials
- ORNL RNP group now has less available cycles to contribute to TOF mechanics than anticipated 6 months ago
 - Detector engineering needs scientist support to be
- CMS-ETL mechanical engineers realize now that their Aluminium design has significant challenges...

Tracking Angular Resolution Simulation Study



Nicolas Schmidt
(ORNL)

Summary

- ORNL can provide engineering for the EPIC TOF endcap...
 - ... realistically limited to a “conservative” Aluminium design
 - ... with limited availability of in-kind scientist contributions
- A **super lightweight composite** endcap would improve the performance of the Cherenkov detectors
 - **Purdue/NCKU** have demonstrated **experience** and **expertise** in such constructions
 - Building TOF barrel and endcap from the same material, designed in one hand will improve overhead ratio and **cost effectiveness**
- ORNL is **fully committed** to TOF within our core fields of expertise (Mathieu Benoit, Ken Read, Jo Schambach, Nicolas Schmidt, OH):
 - TOF flex R&D (eRD109) in strong synergy with ITS3 and LFHCAL
 - Simulation and reconstruction studies
 - Readout electronics, sensor/module characterization, precision timing distribution