Status of the Jet Cal R&D at UCLA

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and Zhiwan Xu

UCLA

Oleg Tsai – Overwhelmed with STAR Forward Cal Upgrade
stationed at BNL since late Sept.
catch up the schedule from covid-19 delays

Zhiwan Xu – stuck in Shanghai since last December
no visa official is working at US embassy/consulate

Optimizing EMCal+Hcal configuration for Jet measurements

Where do we stand regarding jet energy resolution
and
with the space constraint?

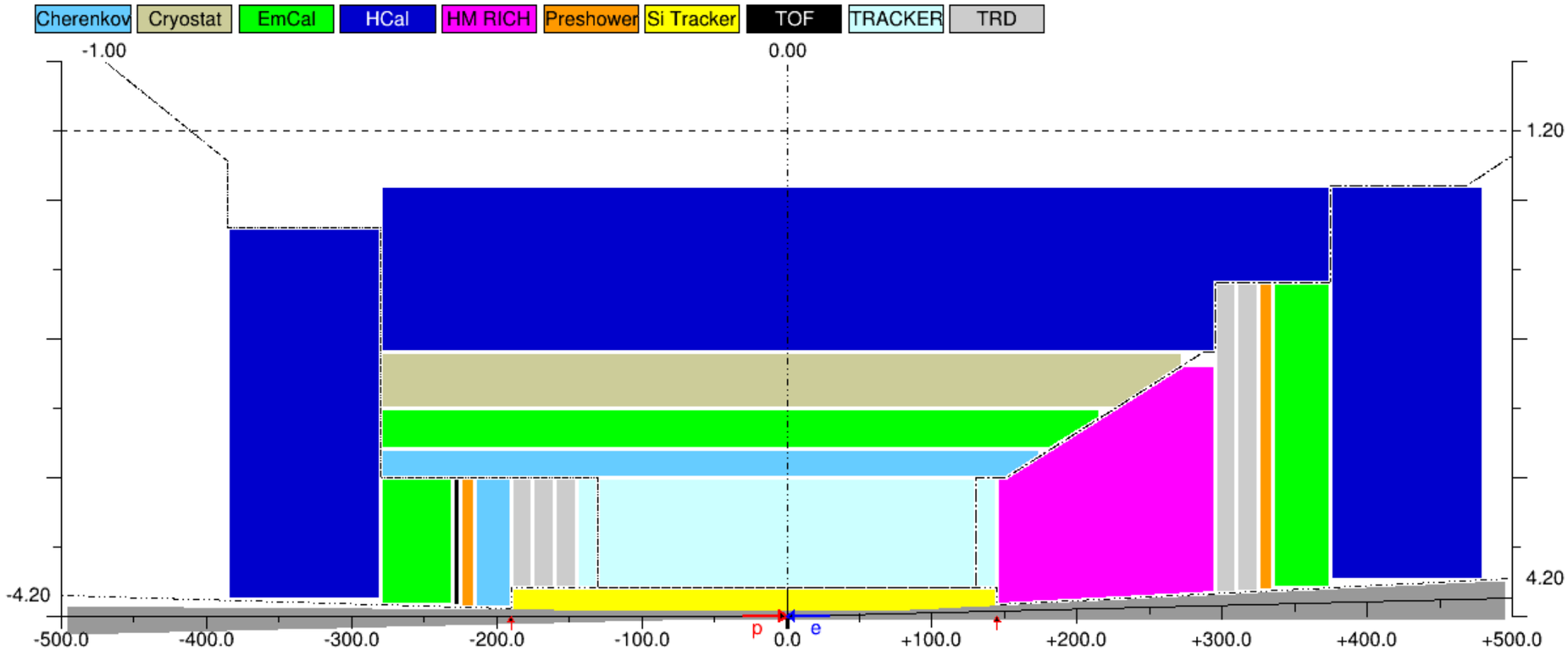
~ 70%/sqrt(E) + c – STAR forward Cal, no problem

~ 50-60%/sqrt(E) + c – need optimization, probably can

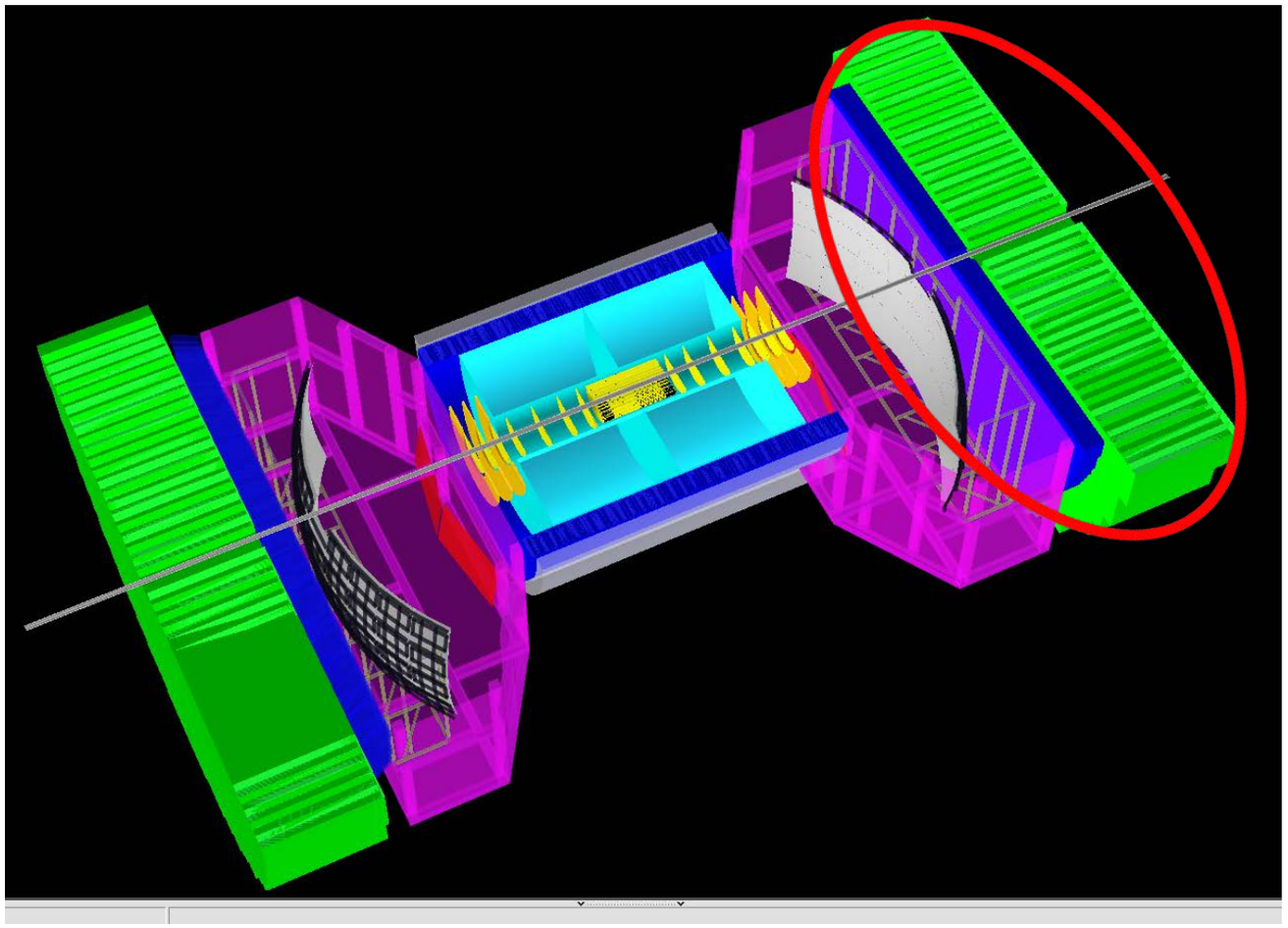
~40%/sqrt(E) + c or better –
need R&D, Prototyping and other Explorations

with an expected Z length ~100-110 cm for Hcal Energy leakage serious issue

From Alexander Kiselev



Hadron Endcap Jet Calorimeter System



EC^2 Requirement:

Energy resolution
Compact – limited space
Cost effective

Detector Technology under study:
Shashlyk EMCal + Fe/Sc Plate
W/ScFi + Fe/Sc Plate (more compact and preferred in our approach)

Optimization of HCal Section

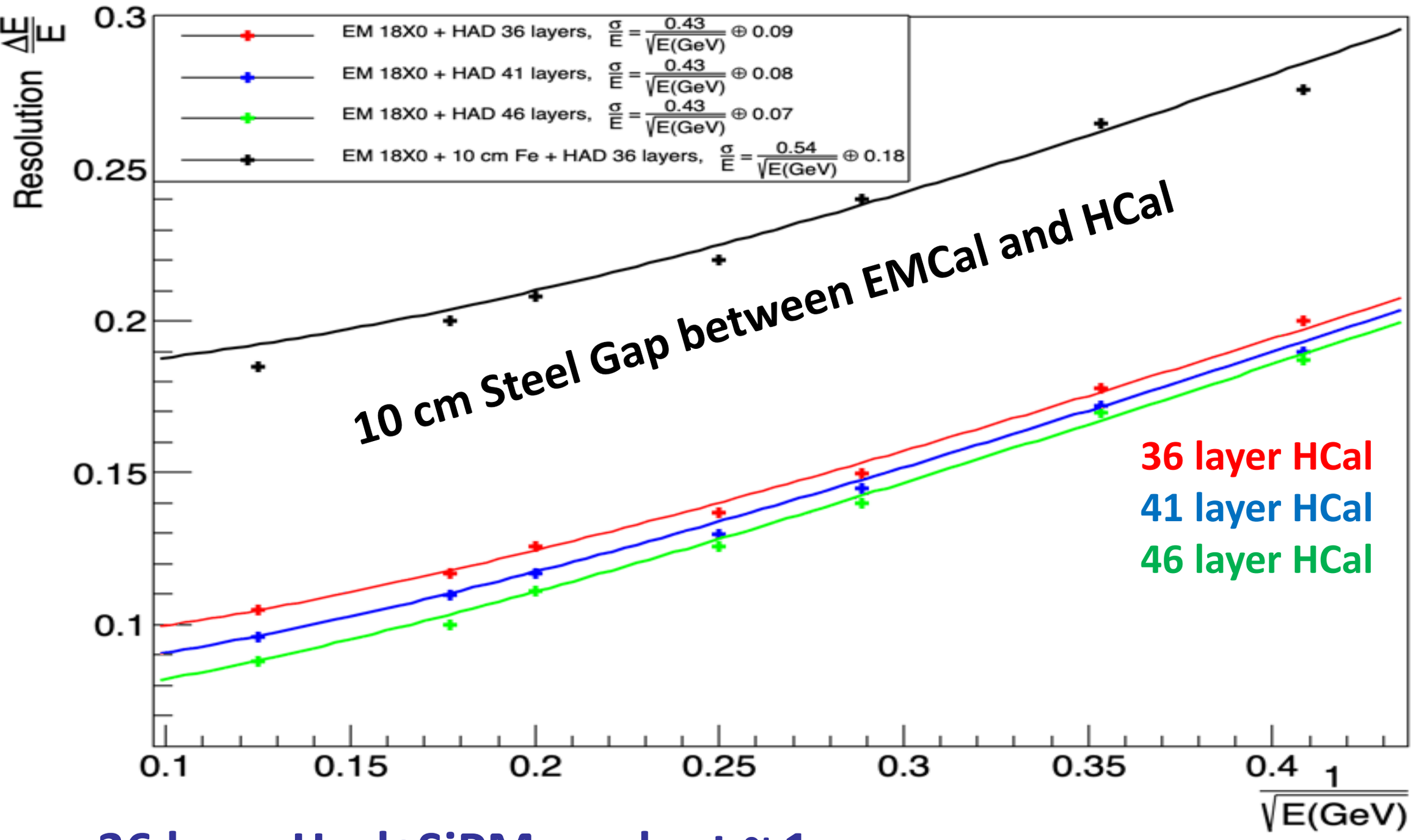
Issues being investigated with MC

- Total depth
- Dead material between EMCal and HCal
- Sampling frequency
- W/WO tail catcher implementation

STAR Forward Upgrade

STAR Forward Calorimeter System (FCS) Upgrade:
p+p 500 GeV run 2022 for Cold QCD Physics
Phenix Shashlyk EMCal (66 Pb/Sc (1.5/4 mm))
+ Fe/Sc HCal (20/3 mm)
Oleg Tsai – major role in FCS design and construction task
Performance validation, construction technique and operation experience for an EIC Jet Calorimeter System

Shashlyk + Fe/Sc (20/3 mm)

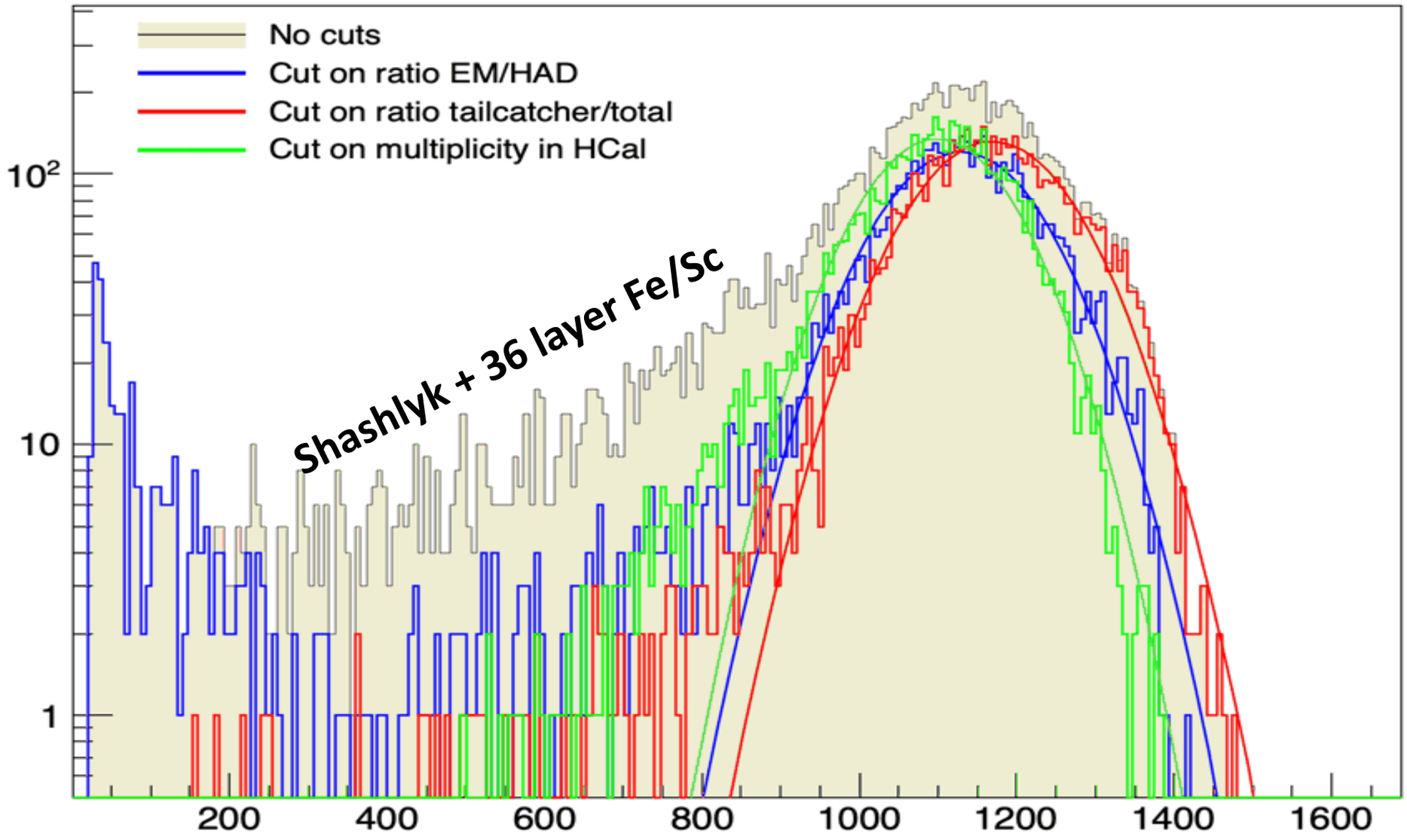


36 layer Hcal+SiPM readout ~ 1 m

Mechanical Support for EMCal HCal -- important factor

Energy leakage – unavoidable and more investigations

Energy Leakage Study



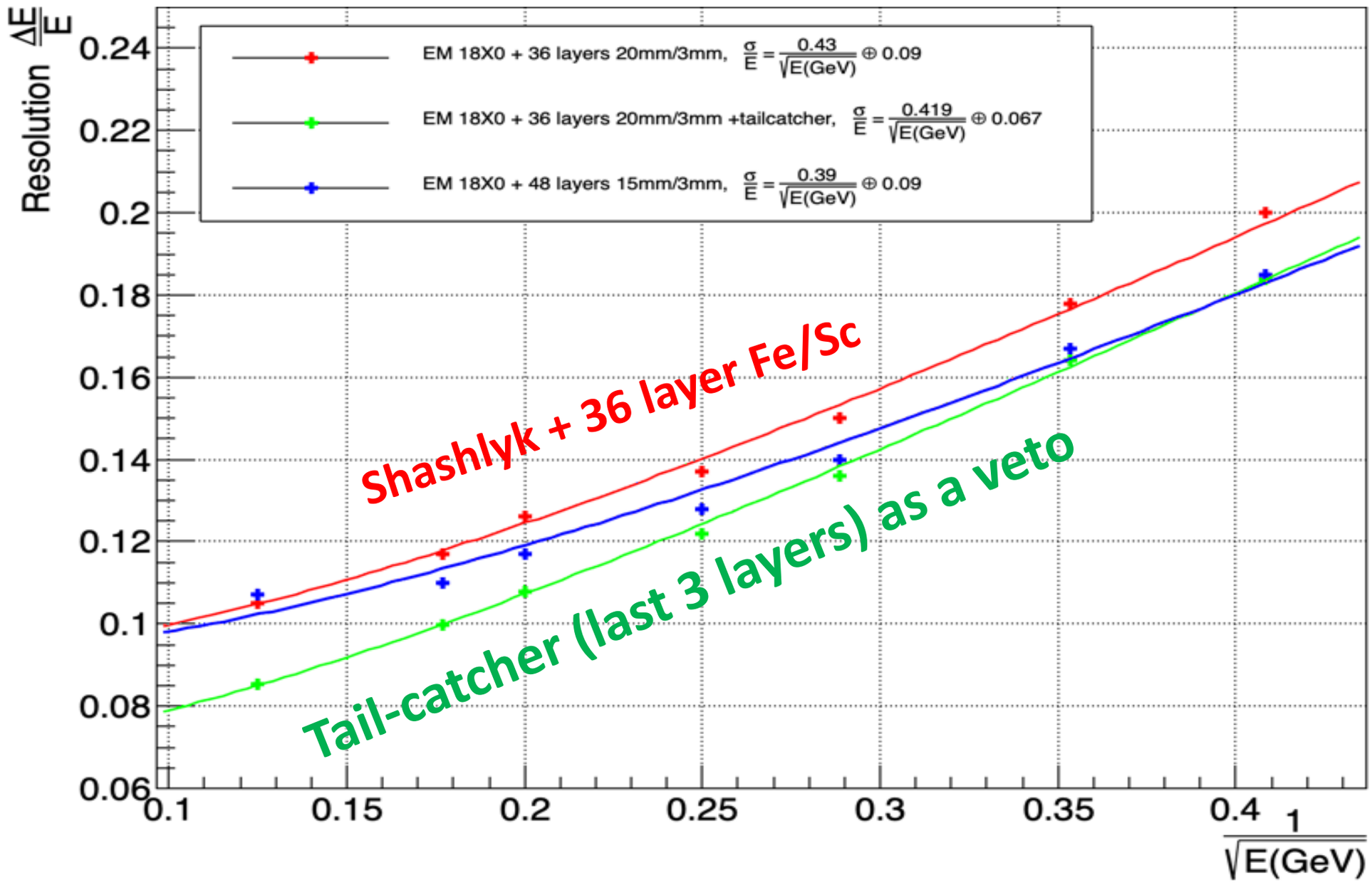
Tail-Catcher Method: Additional readout for last a few Sc plates

Cut on HCal multiplicity

Cut on EMCal/HCal energy ratio

Not work for event-by-event correction; impact on Jet measurement?

Tail-Catcher as a Veto



Tail-Veto – Improves energy resolution over all energy range

Detection Efficiency Loss:

10% loss at 6 GeV;

50% loss at 64 GeV for charged pions

FY21 Tasks– Optimization of Cal System for Jet Physics

1) Finish Evaluation of (Shashlyk + HCal vs. W/SiFi + HCal) + Tail-Catcher (Veto)

2) Optimization of EMCal + HCal for Jets at EIC explore energy weighting parameters for improving energy resolutions preliminary calorimeter design to meet EIC YR requirements and space constraints (had a meeting with Miguel about how to do jet simulations, but we are behind our schedule)

3) SiPM Evaluations
   Performance characteristics; vendors

Questions to the Consortium
IP6 versus IP8?

Thank You !