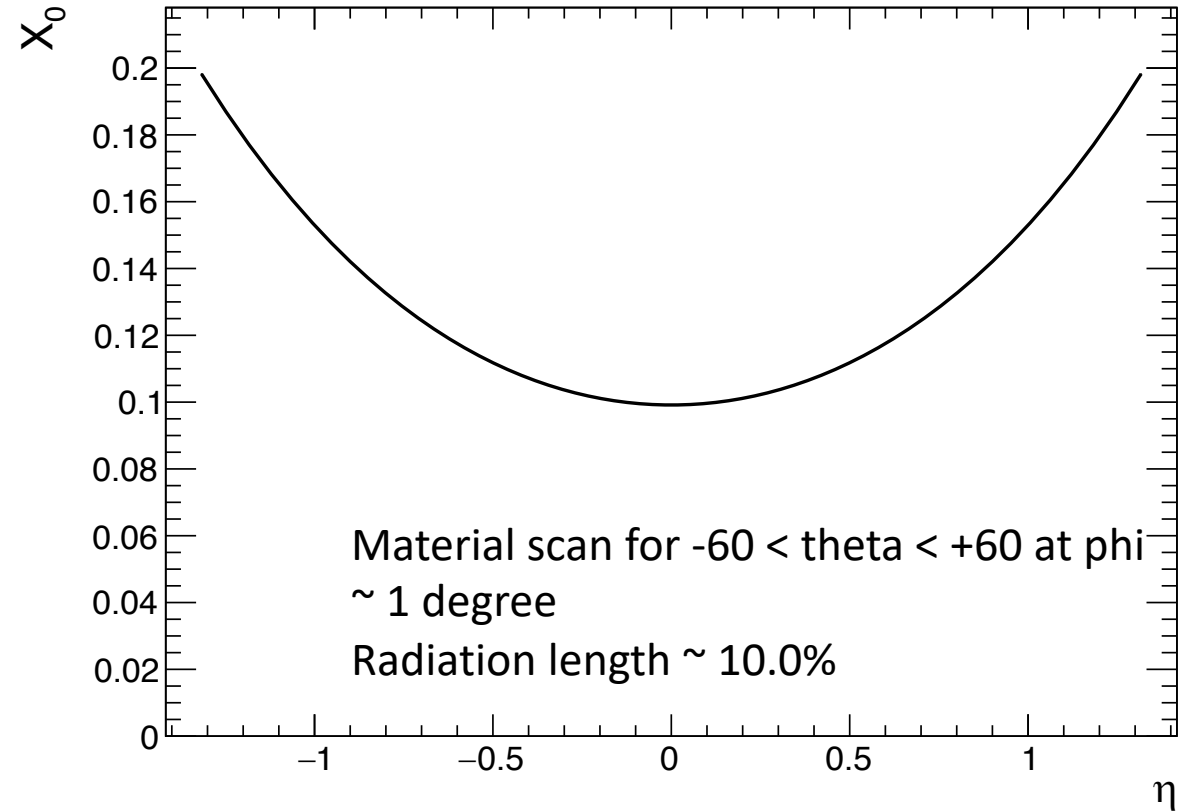
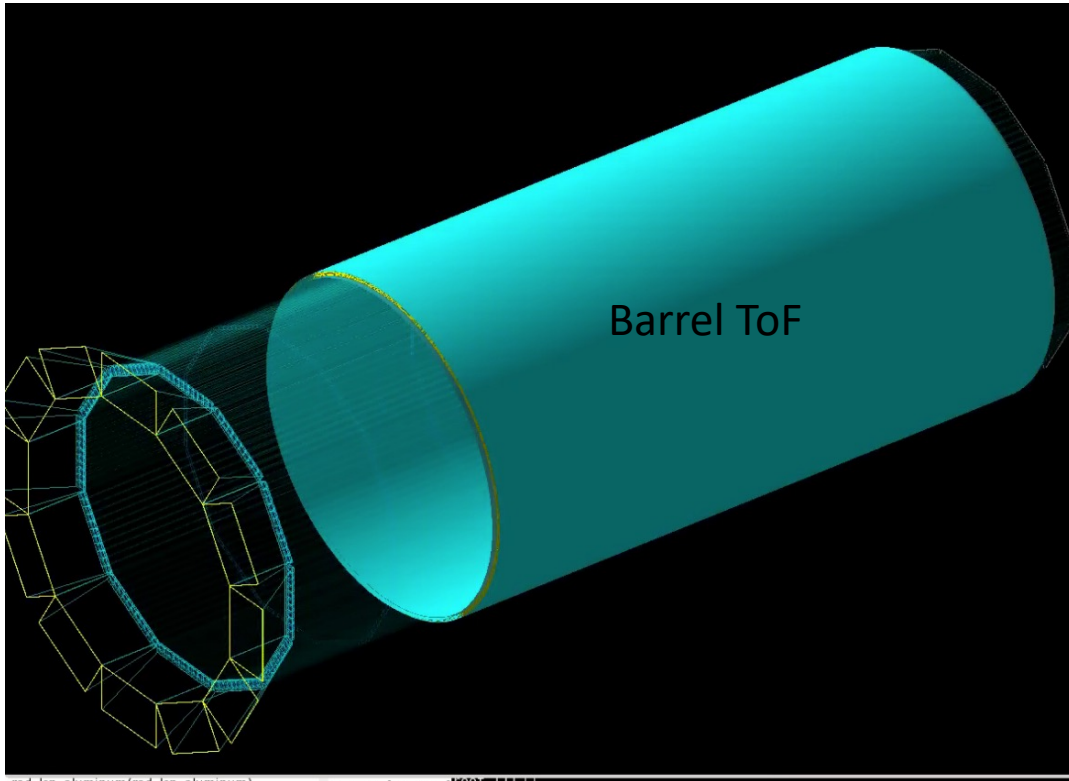


# ECCE barrel MRPC geometry

Sourav Tarafdar  
Vanderbilt University

# Geometry parameters



- Barrel mRPC ToF placed at  $R = 82$  cm and length = 300 cm (length was selected for this study but in final configuration will increase up to 430 cm)
- Uniform cylindrical geometry with relevant number of active gas layers and mRPC layers.
- Almost all the material budget accounted for.
- Not included in the geometry staggered arrangement . Currently the total width along R is  $\sim 2.8$  cm but in real scenario under staggered arrangement it will be about 5.6 cm.

Opened pull request <https://github.com/ECCE-EIC/macros/pull/76>

# Tracking performance with and w/o mRPC ToF

## Studies done with tracking evaluator

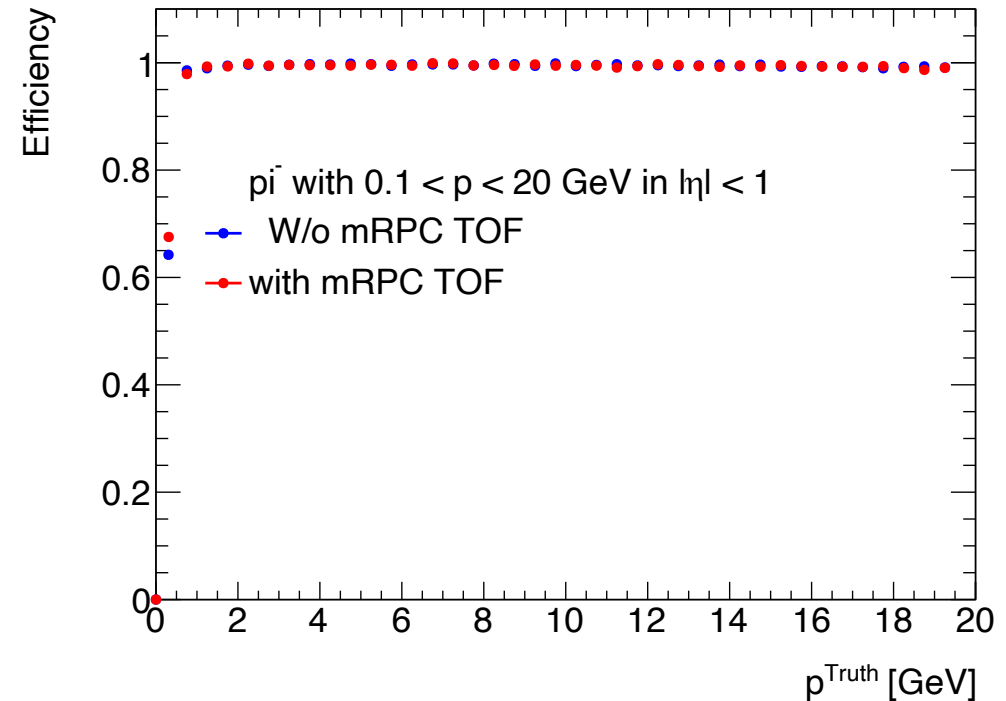
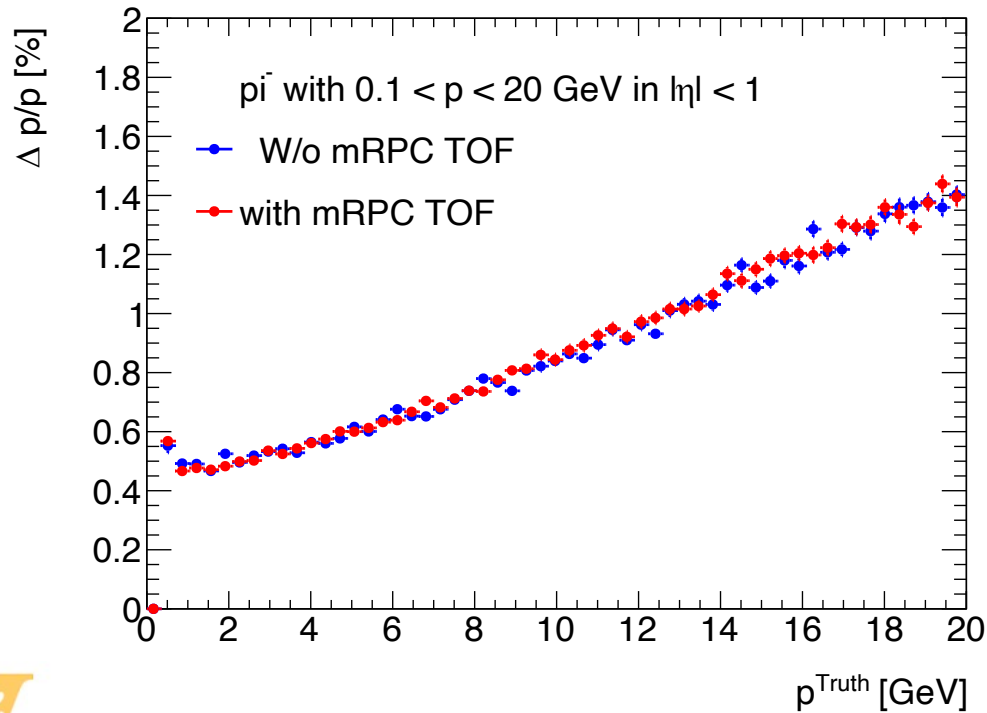
- Subsystems in both configurations (with and without mRPC ToF) :

Si + mRwell (@ R =44, 46, 80 cm) + DIRC + iHCAL **without tracking services**

- Generated particle phase space

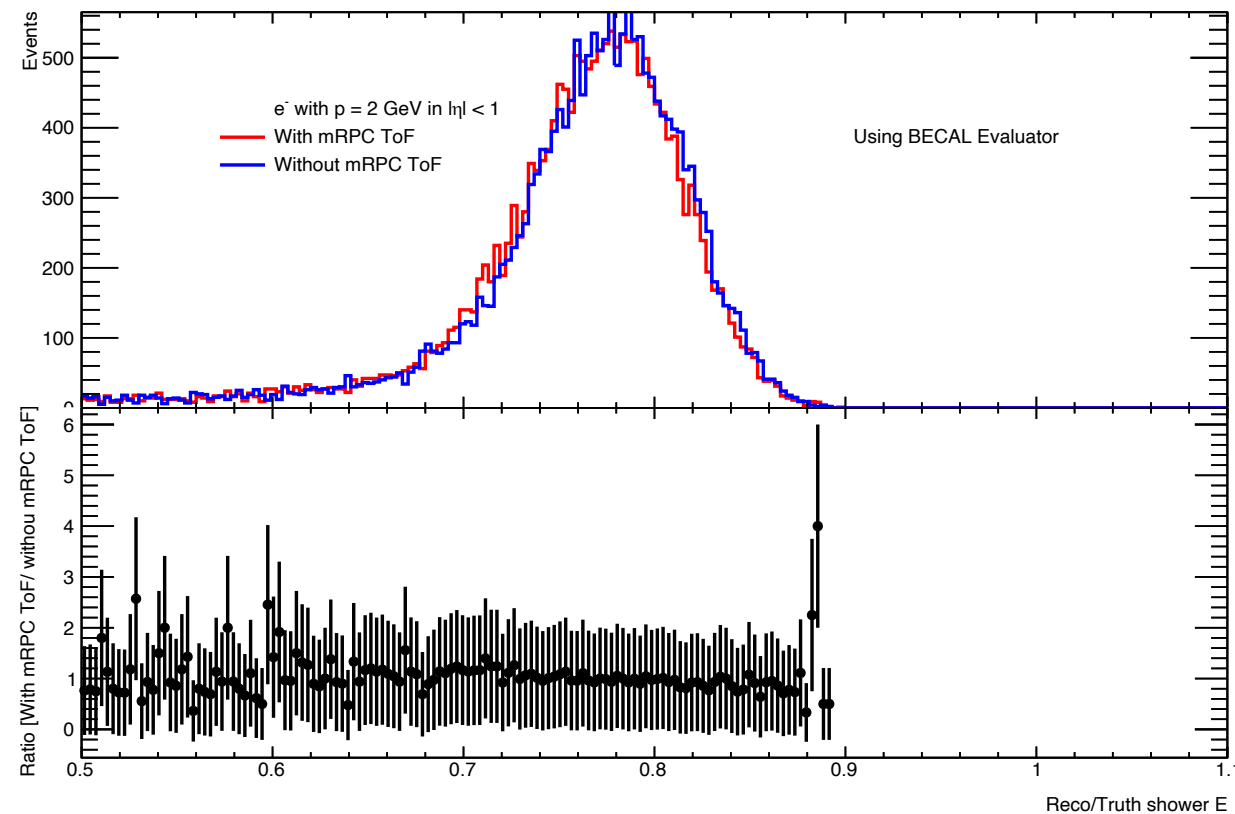
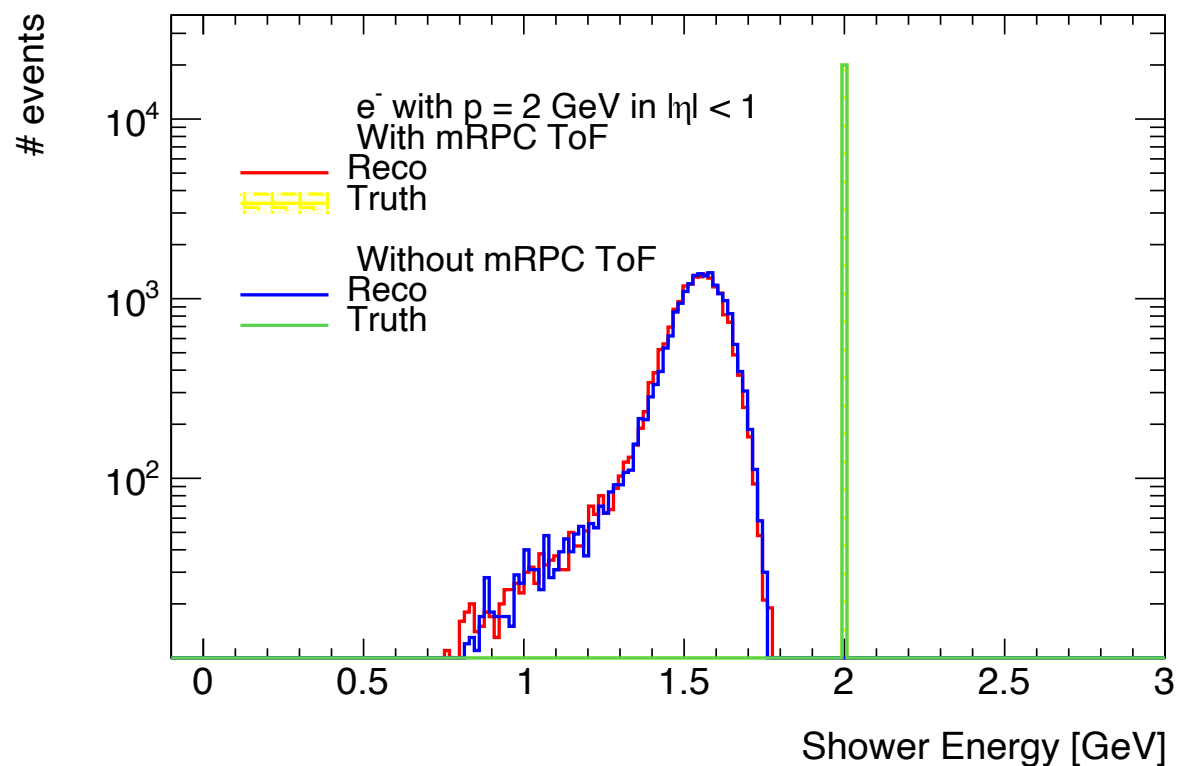
5 pions per event with  $0.1 < p_T < 20$  GeV ,  $|\eta| < 1$  and  $0-2 \cdot \pi$  phi

- mRwell phi and z resolution is 75 um in this study. mRPC ToF phi and z resolution is taken as 5 mm.
- More detailed tracking performance for different locations of barrel MPGD trackers can be found at <https://indico.bnl.gov/event/12862/>



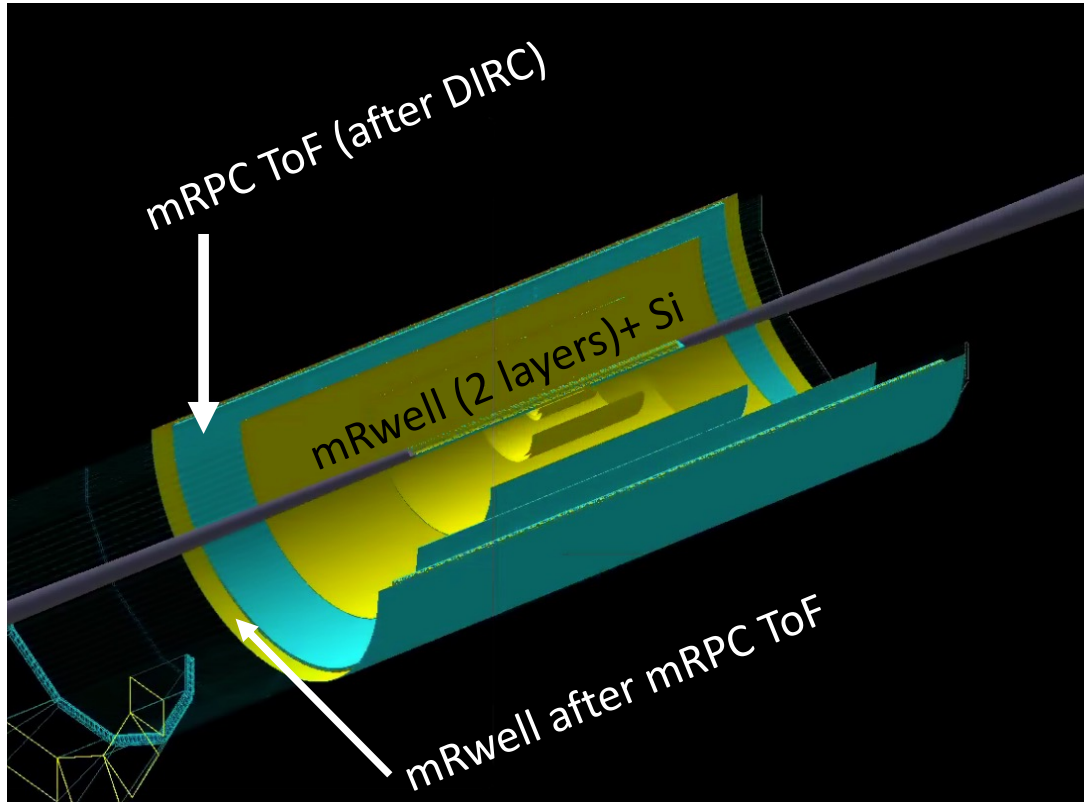
# Effect of mRPC ToF on Barrel EMCAL

- Subsystems in both configurations (with and without mRPC ToF)  
Si + mRwell (@ R =44, 46, 80 cm) + DIRC + Barrel EMCAL
- 1 e- per event with  $p = 2$  GeV in  $|\eta| < 1$ .
- BECAL evaluator with shower information matched to best cluster is used (ntp\_gshower).



No effect on e- line shape in Barrel EMCAL due to barrel mRPC ToF

# 2<sup>nd</sup> configuration of mRPC ToF and mRwell



If EMCal has readout in outer radius:

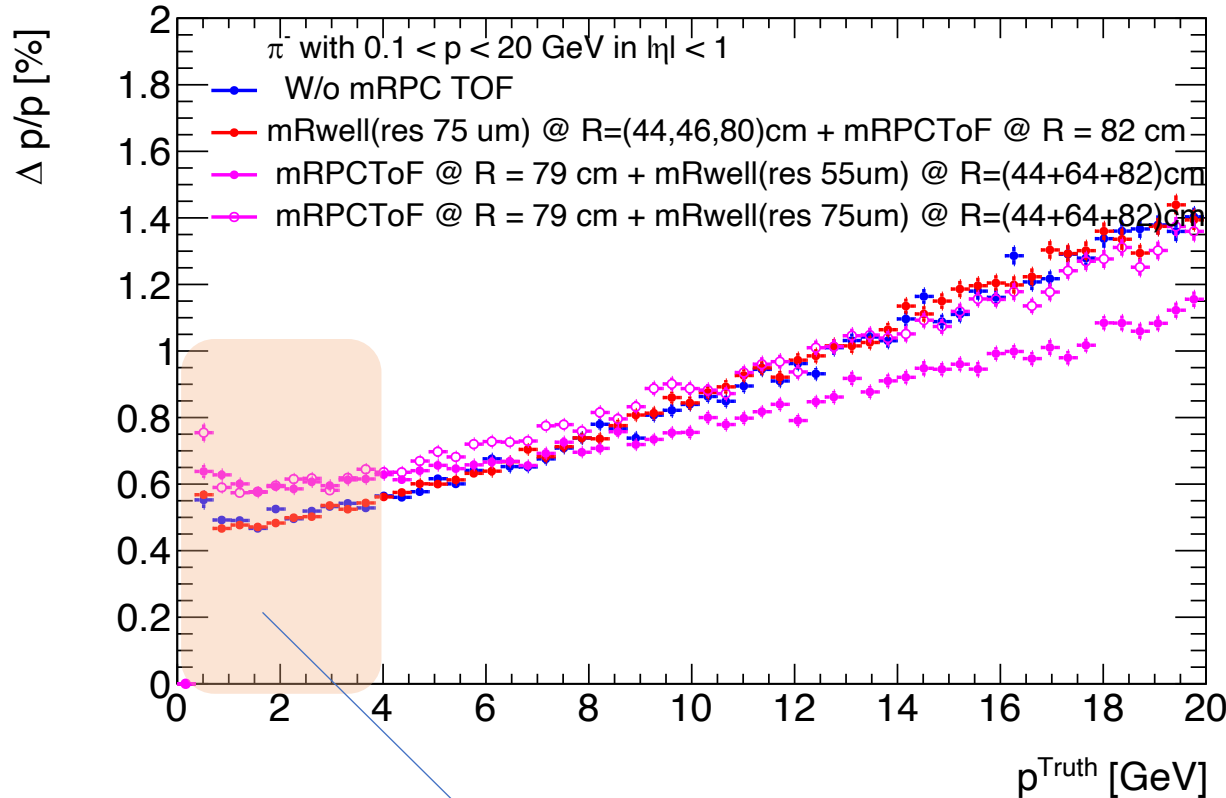
Top level layers	R-in [cm]	R-out [cm]	R-Thickness
Magnet	140	170	30
EMCal support (instrumented)	134	140	6
EMCal Readout (near eta=0)	130.5	134	3.5
EMCal Glass	85	130.5	45.5
EMCal Inner support	84.5	85	0.5
muRwell	82.5	84.5	2
mRPC (partly in DIRC frame)	74.5	82.5	8
Outer DIRC Frame	74.5	77	2.5
DIRC	71.5	76.6	5.1
Inner DIRC Frame	65	71.5	6.5
muRwell	63	65	2
(Not used, low mass BdL)	50	60	10
Inner tracker	3	50	47

Jin's suggestion → mRwell at  $R \sim (44, 63, 83)$  cm  
and mRPC ToF @  $R = 75$  cm

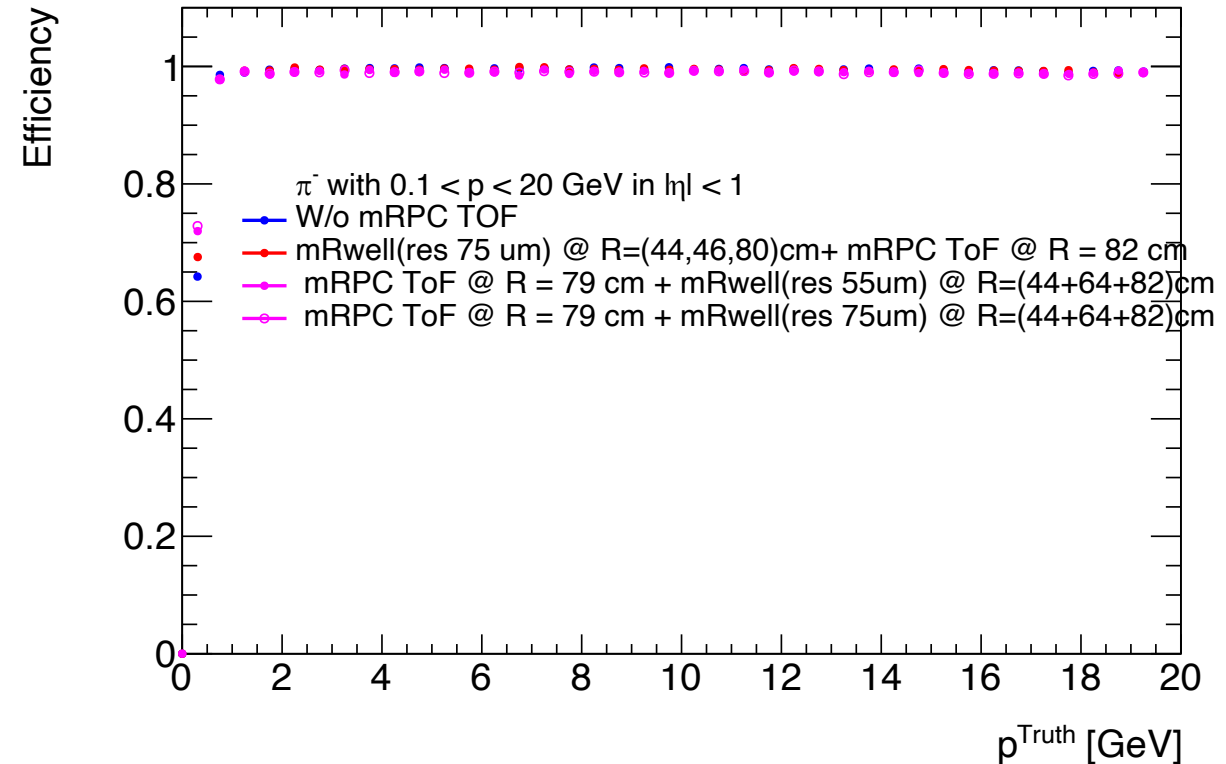
2<sup>nd</sup> configuration consists of mRwell @  $R = 44, 64$  and  $82$  cm + mRPC ToF @  $R = 79$  cm

# Tracking performance for 2<sup>nd</sup> configuration

- Subsystems in the current configuration :  
Si + mRwell (@ R =44, 64, 82 cm) + DIRC + mRPC ToF @ R = 79 cm + BECAL + iHCAL **with tracking services**
- Generated particle phase space  
5 pions per event with  $0.1 < p_T < 20$  GeV ,  $|\eta| < 1$  and  $0 < 2\pi < \phi < 2\pi$



- Difference in low p tracking resolution might be because of either using tracking services in 2<sup>nd</sup> configuration or using only 1 mRwell layer in barrel region ( $R < 50$  cm)



Implementing mRPC ToF doesn't deteriorate the tracking and EMCAL performance in central rapidity region