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# Emittance Analysis Solenoid Mode

T. Lord

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12/02/2019 / MICE Analysis Workshop / Strathclyde University

## Run Selection

Cooling Channel tag : 2017-02-6

3,4,6,10-140 LH2-full, LH2-empty, empty + LiH

MC + Data



**3-140 LH2**

9883, 9888, 9893, 9897,  
9903, 9906

**3-140 LH2-EMPTY**

10243, 10248, 10253,  
10254, 10255, 10256

**3-140 No Absorber**

10313, 10314, 10323, 10327,  
10333

**3-140 LiH**

10508, 10511

**4-140 LH2**

**4-140 LH2-EMPTY**

**4-140 No Absorber**

10315, 10317, 10322, 10328,  
10334

**4-140 LiH**

10504, 10505, 10506, 10507

**6-140 LH2**

**6-140 LH2-EMPTY**

**6-140 No Absorber**

**6-140 LiH**

9884, 9885, 9889, 9894,  
9898, 9904, 9905

10245, 10247, 10249

10318, 10324, 10329, 10335

10509, 10510

**10-140 LH2**

**10-140 LH2-EMPTY**

**10-140 No Absorber**

**10-140 LiH**

9886, 9887, 9890, 9891,  
9892, 9895, 9896, 9899,  
9900, 9901, 9902

10246, 10250, 10251,  
10252, 10257, 10258,  
10259, 10260

10319, 10321, 10325, 10326,  
10330, 10331, 10332

## Note

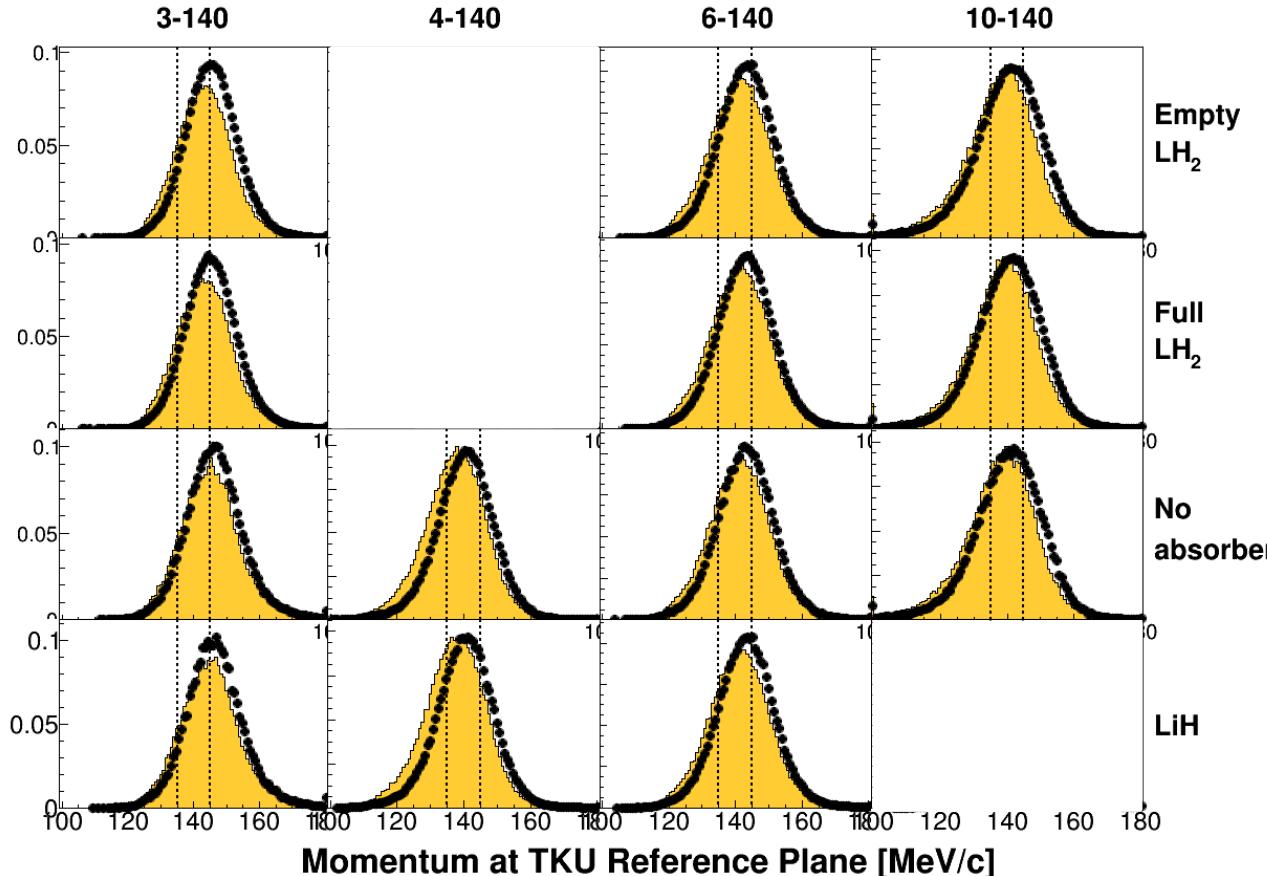
Only 10-140 LiH solenoid mode data is for cooling channel settings with :  
LiH vs no absorber  
&  
LiH 3,6,10 – 140, 3-170,200,240

LiH systematics amplitude analysis is crashing during rebinning.. Under investigation



# Sample Selection

# Momentum cut US

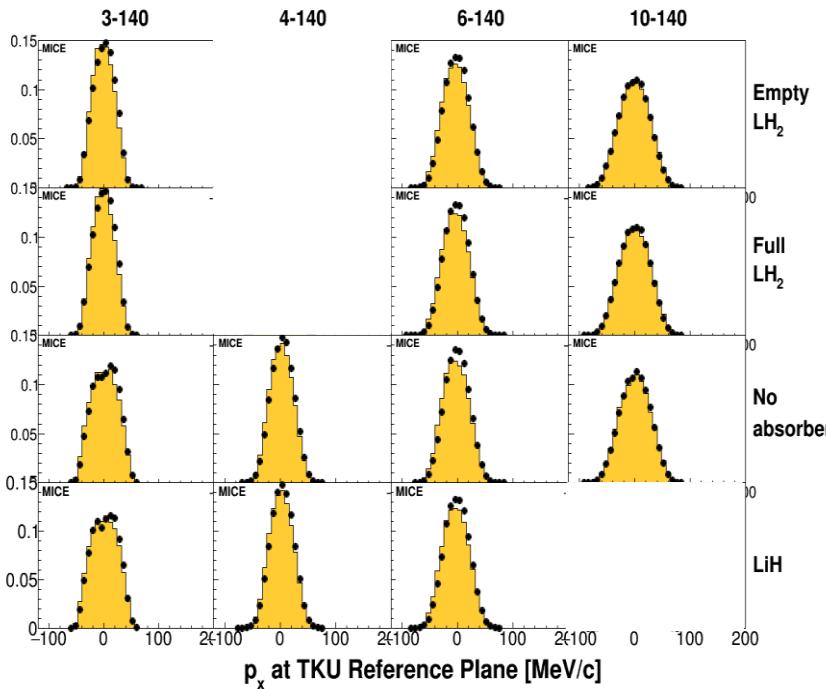


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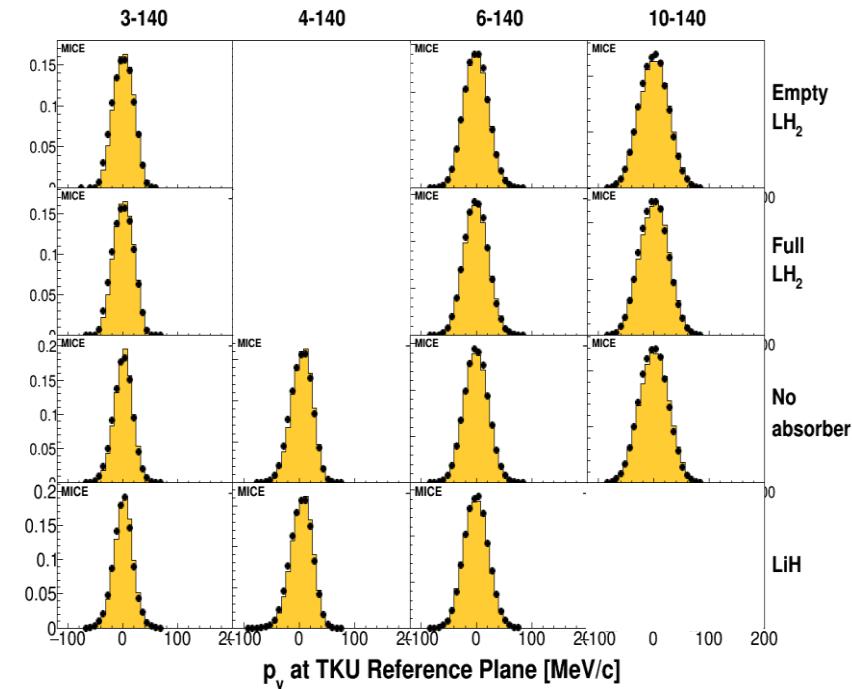
Further MC tuning  
needed for tku  
momentum  
agreement for 4-140

The Warwick University logo, featuring a stylized purple jagged line graphic above the word "WARWICK" in a bold, purple, sans-serif font.

Px

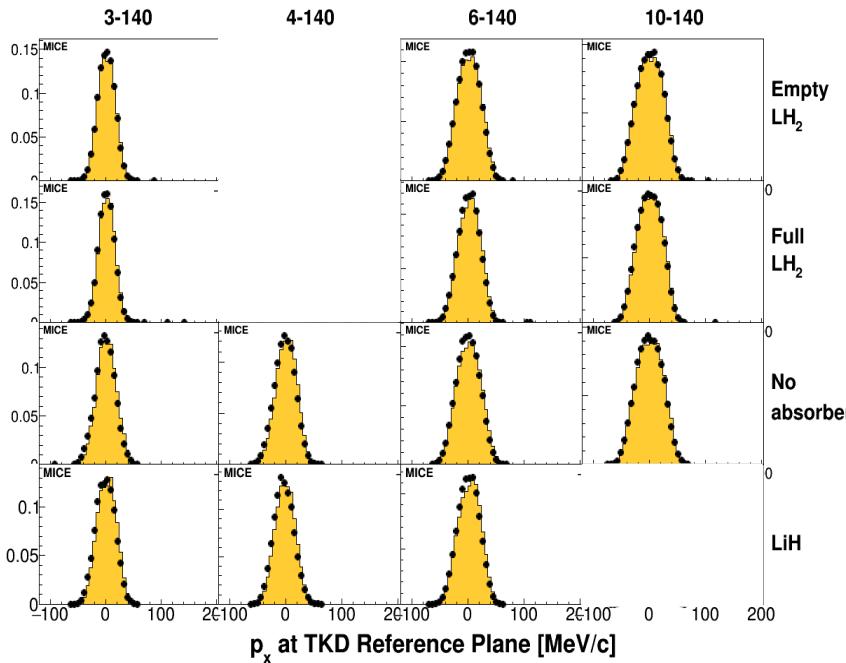


Py

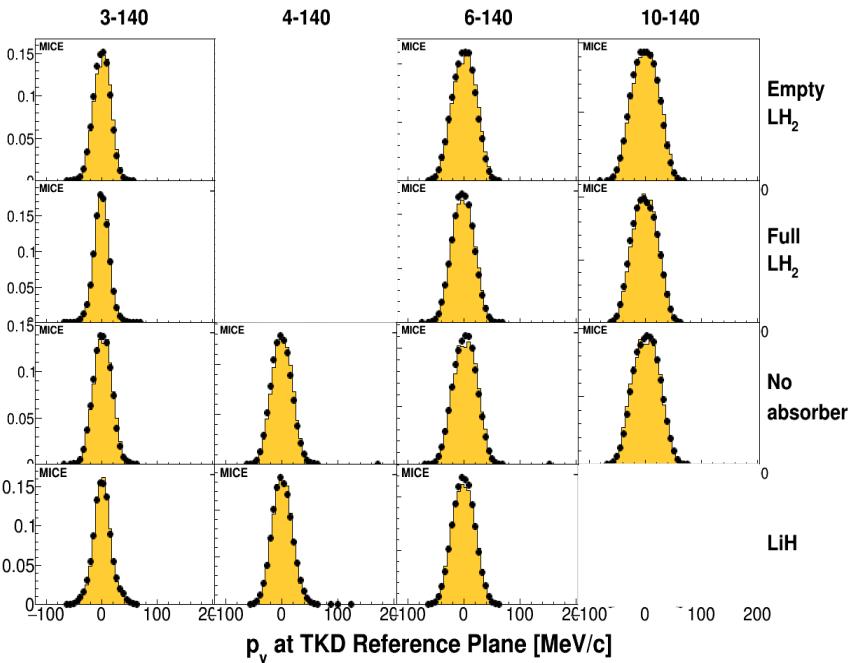


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Px



Py

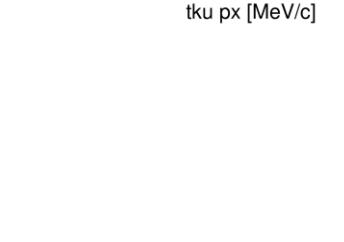
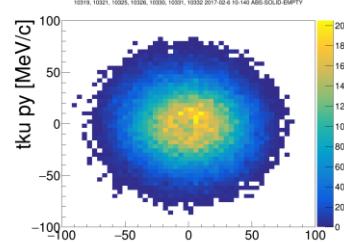
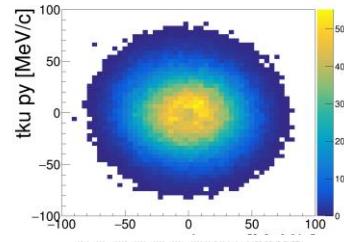
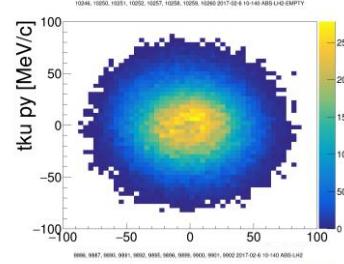
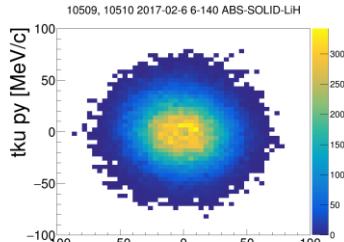
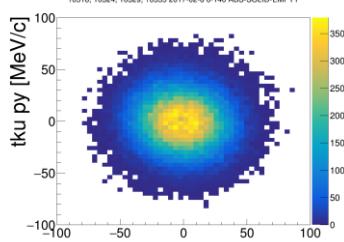
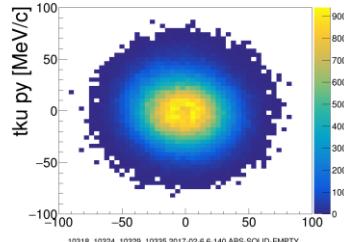
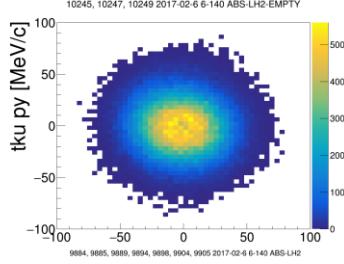
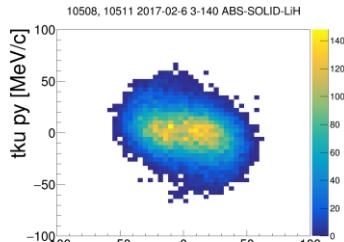
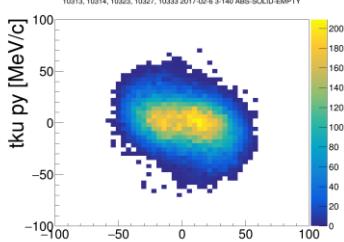
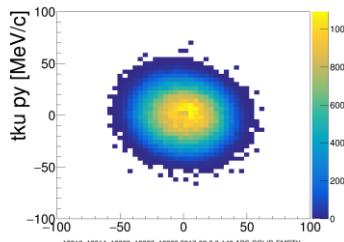
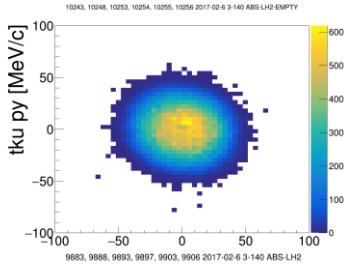


3

4

6

10



LH2-Empty

LH2

Beam – PX,  
PY US

Empty

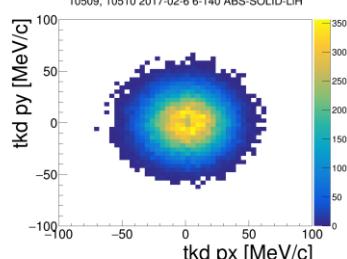
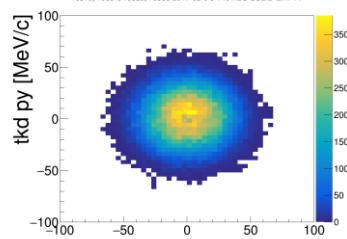
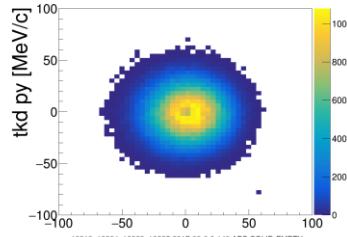
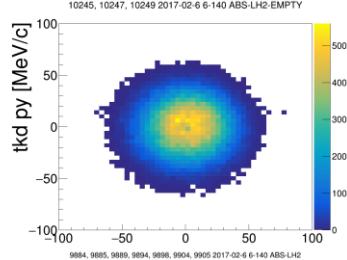
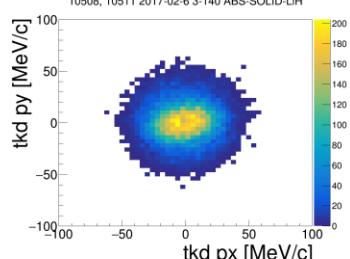
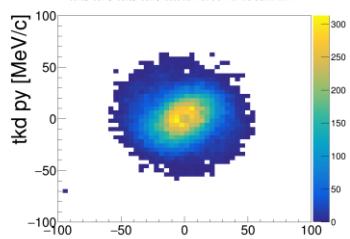
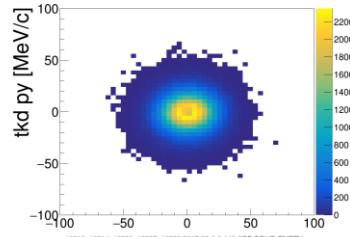
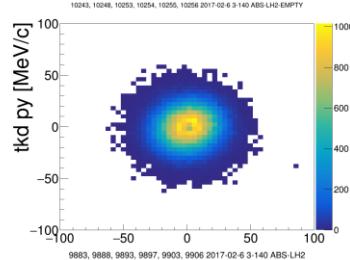
LiH

3

4

6

10



LH2-Empty

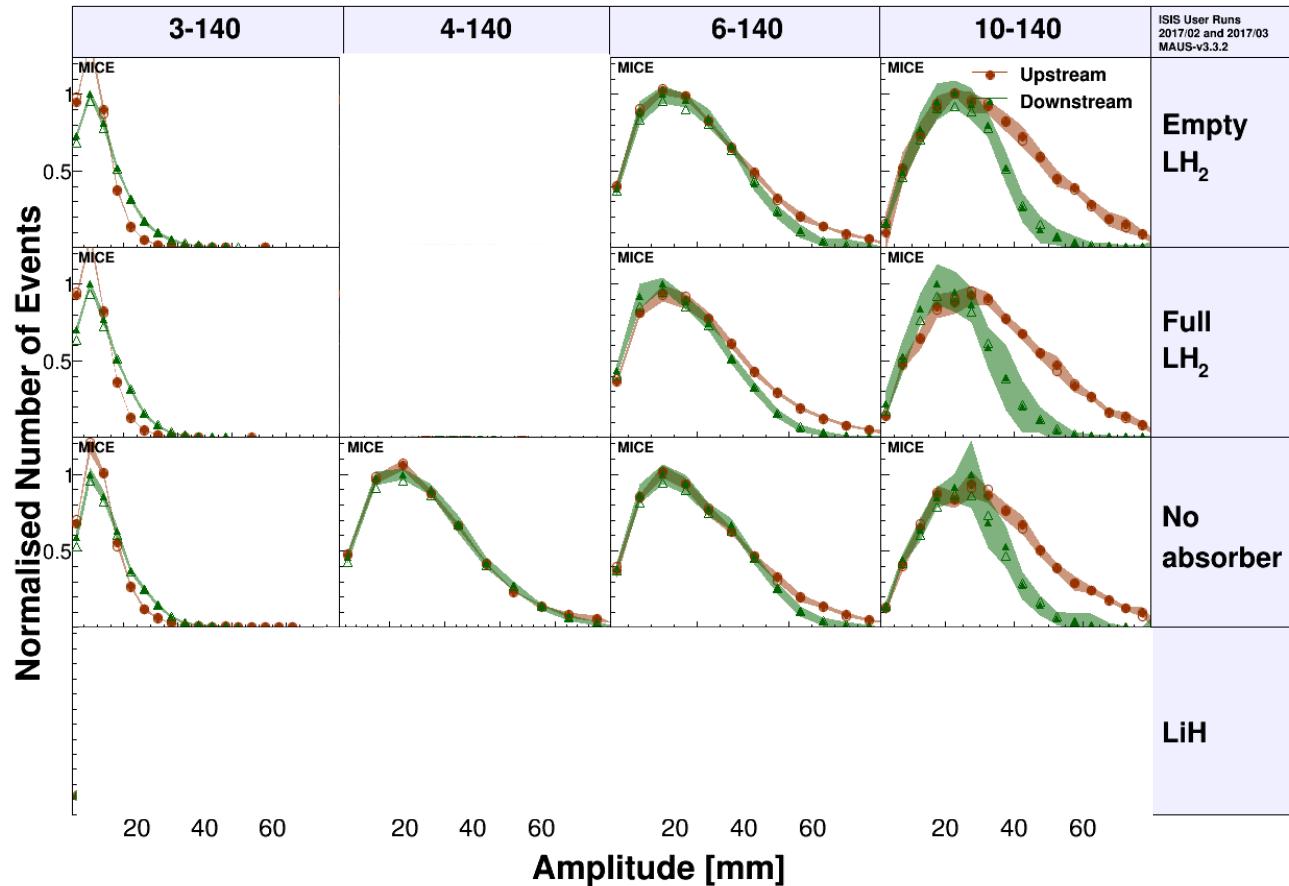
LH2

Beam – PX,  
PY DS

Empty

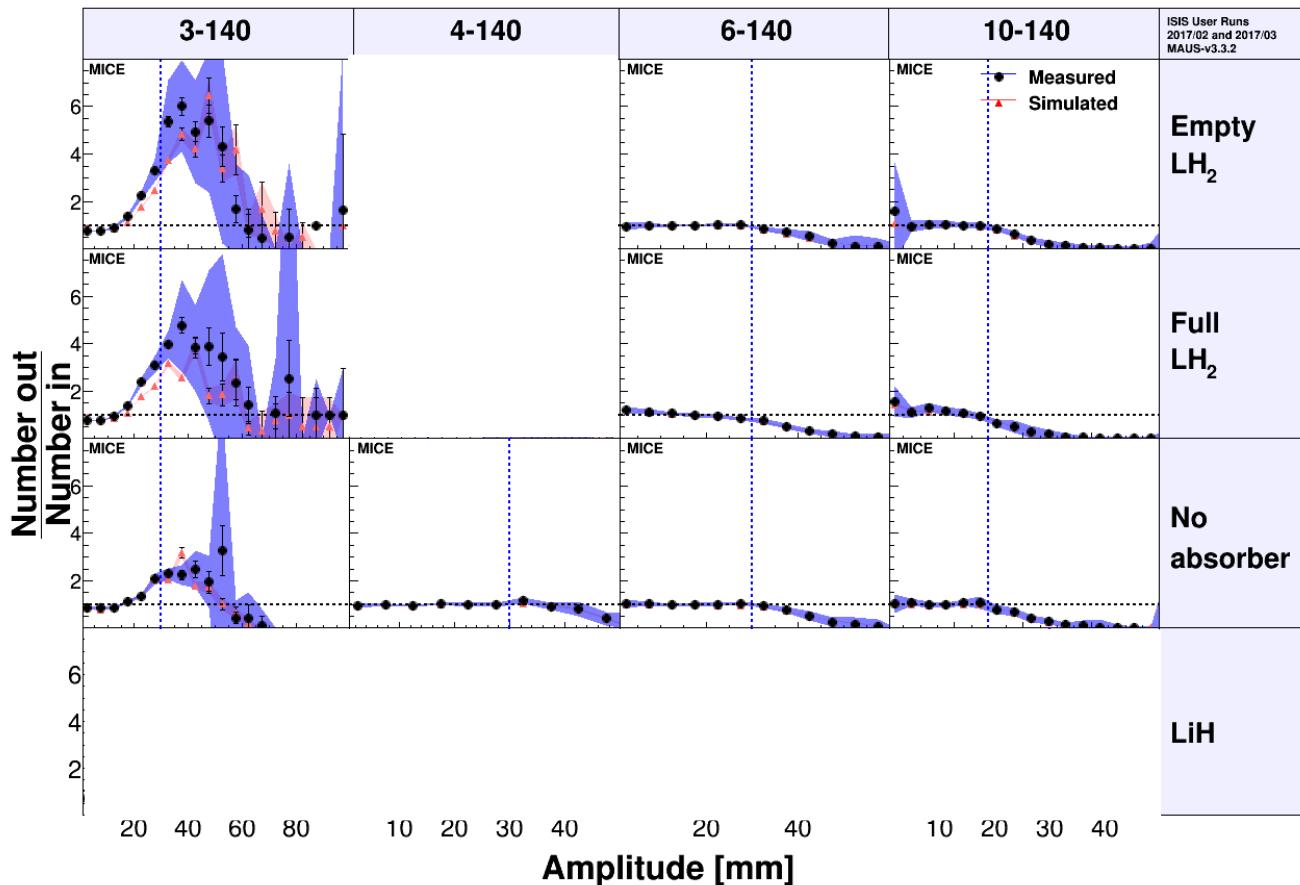
LiH

# Amplitude PDFs



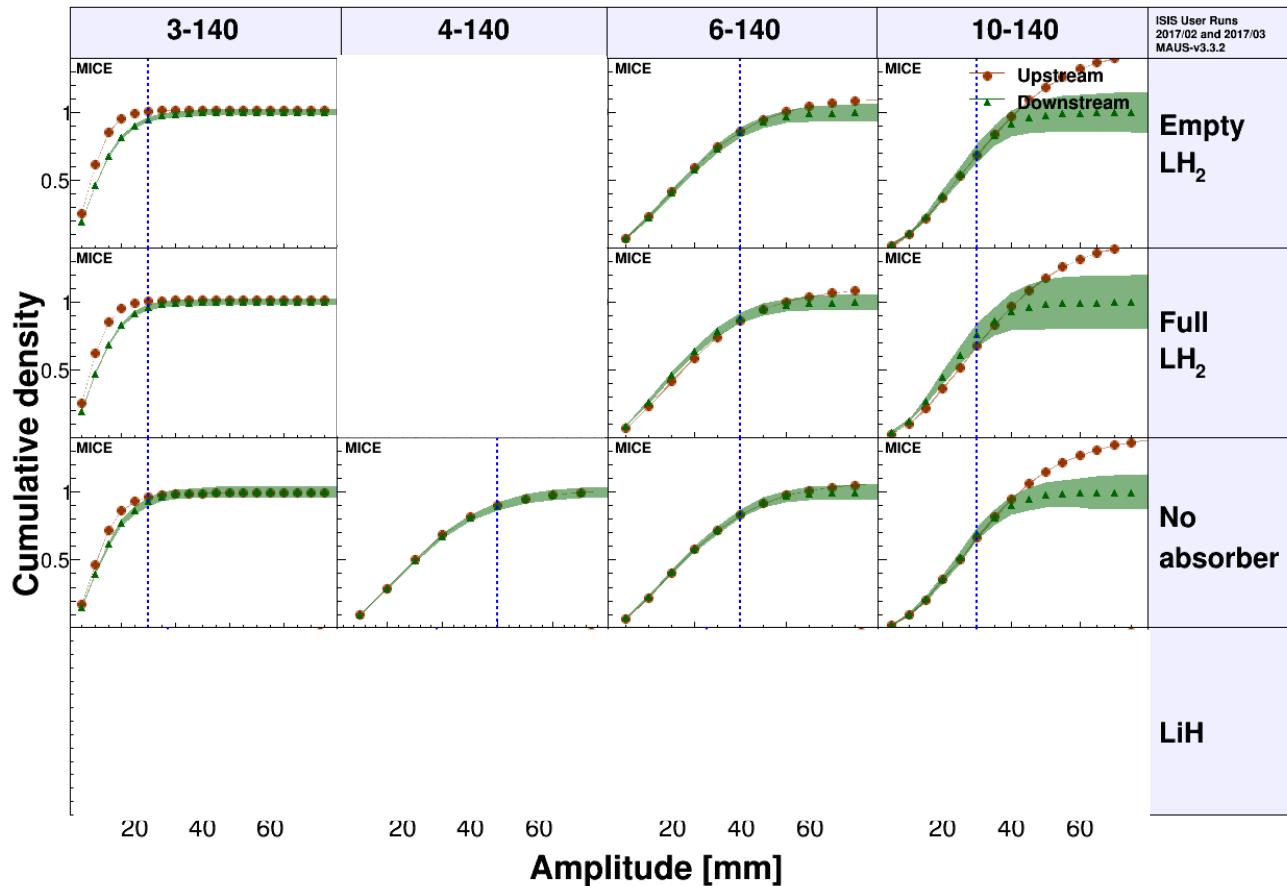
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# Amplitude PDF Ratios – Data vs MC



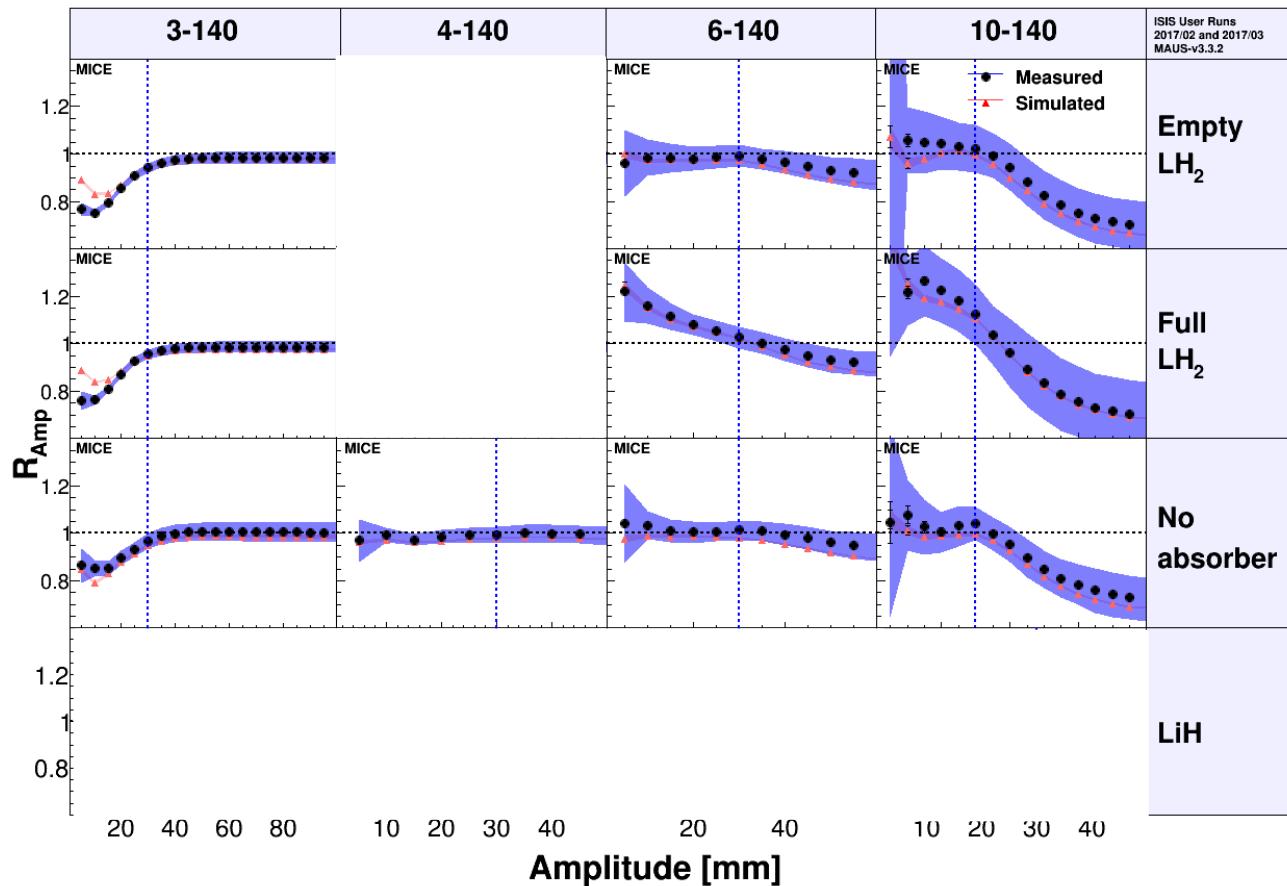
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# Amplitude CDFs

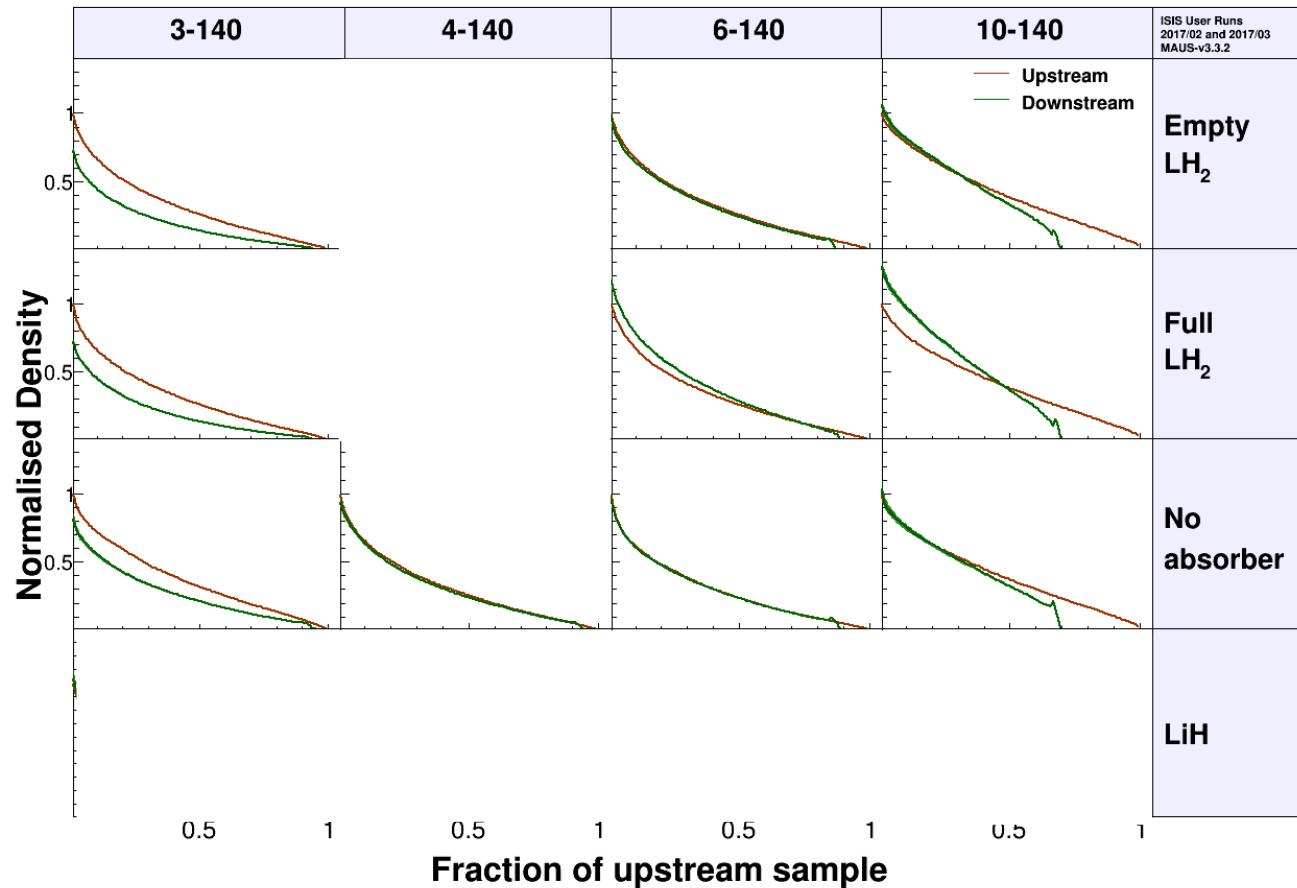


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# Amplitude CDF Ratios – Data vs MC



# Density – US vs DS





## Higher momentum runs

Field tuning for momentum agreement at tku

Running iterations of maus reco with/without TOFTracker





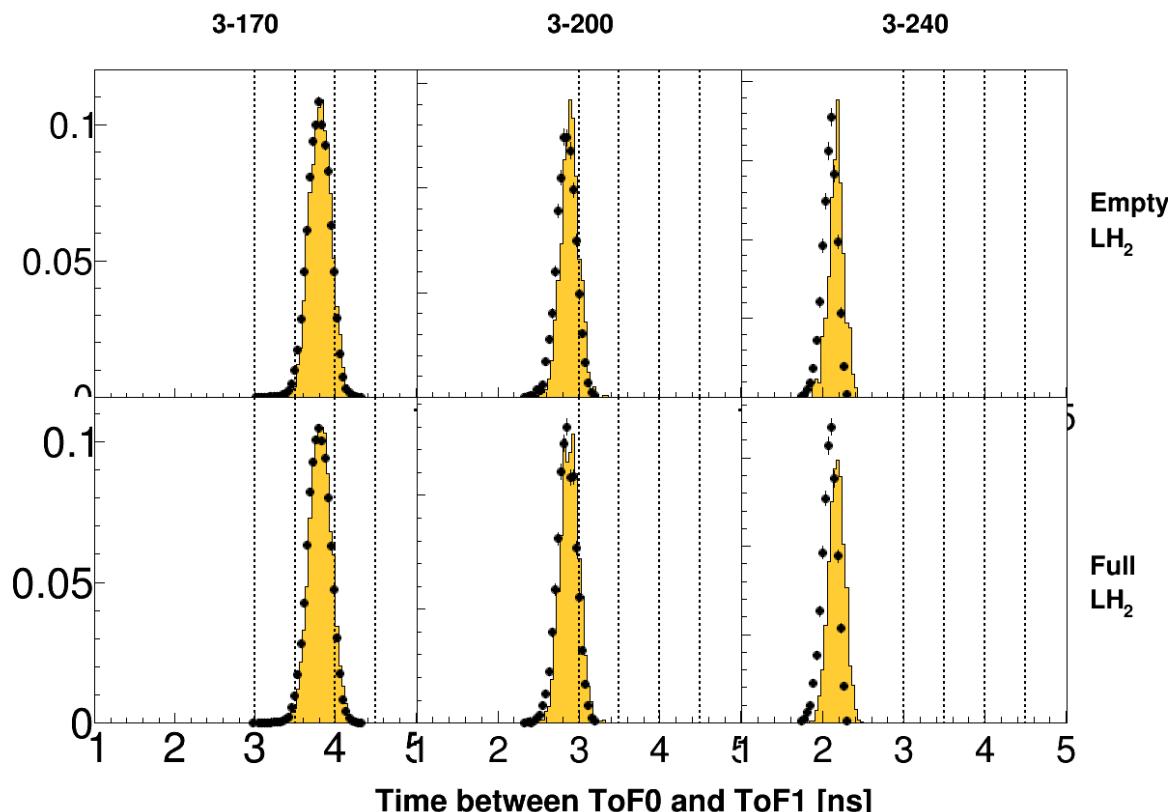
Shown :

Cooling Channel tag : 2017-02-6

3 – 170, 200, 240

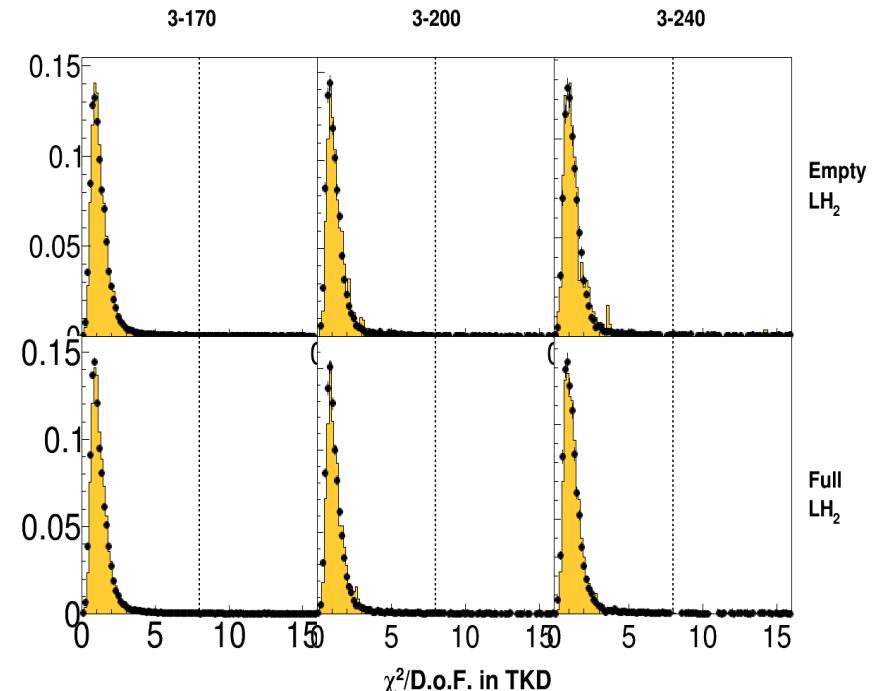
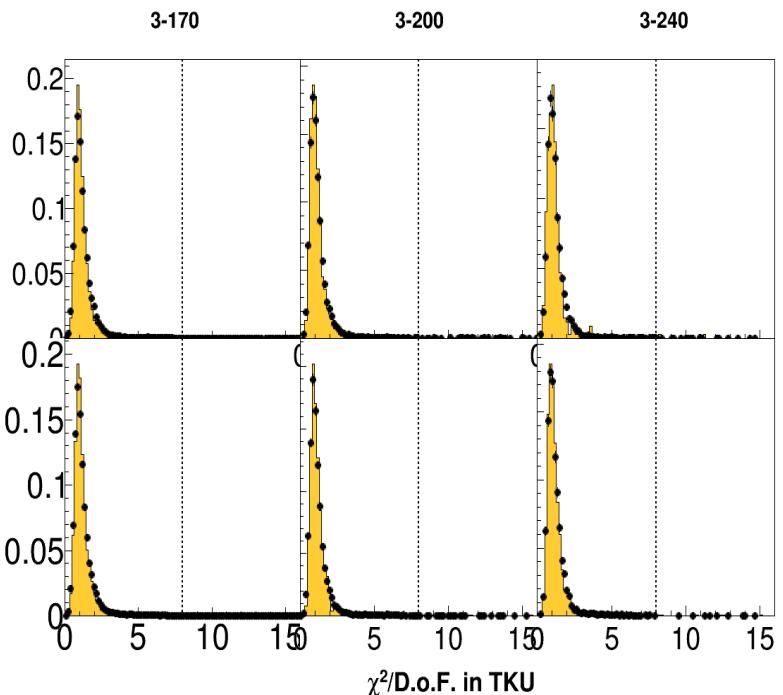
LH2, LH2-empty

# Higher momentum runs, solenoid mode

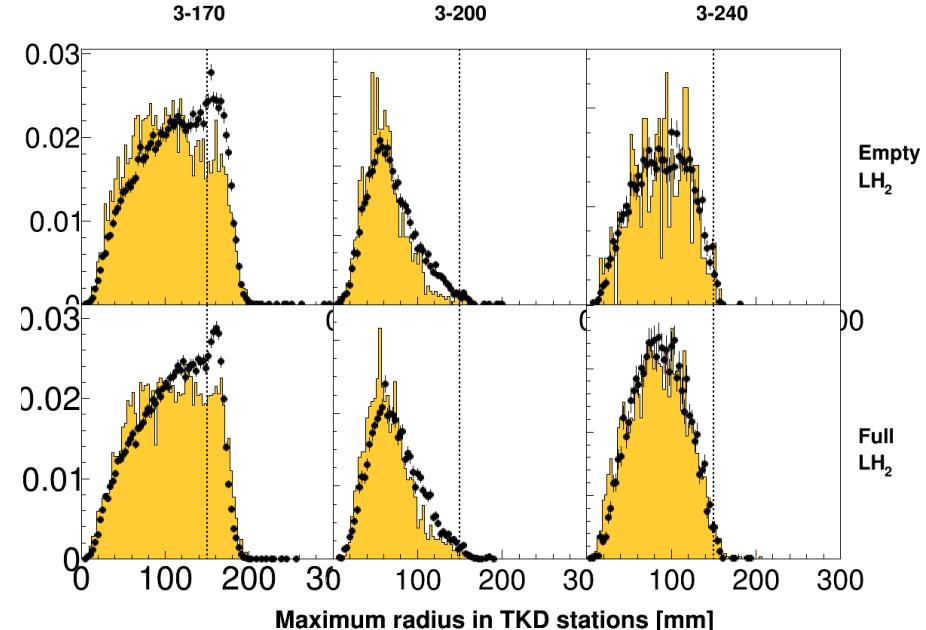
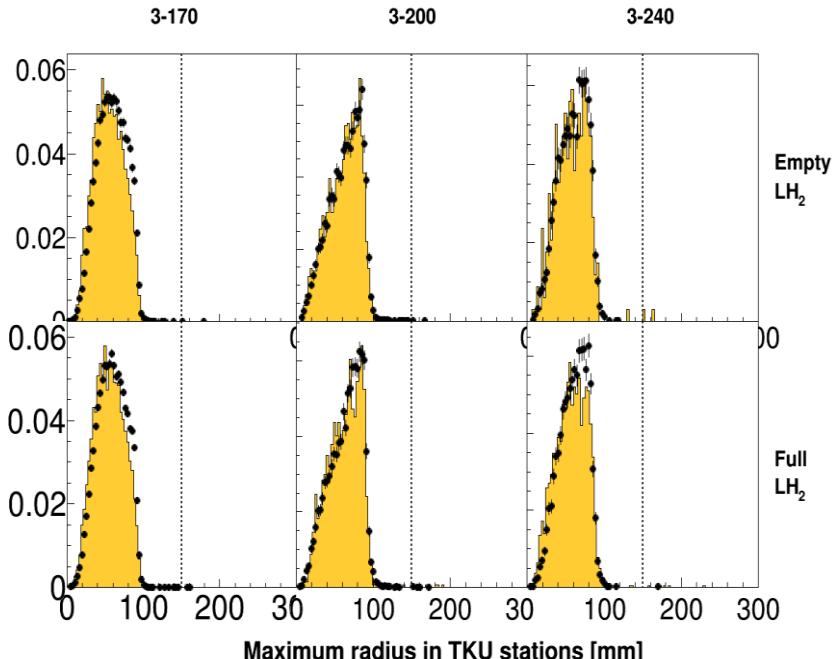


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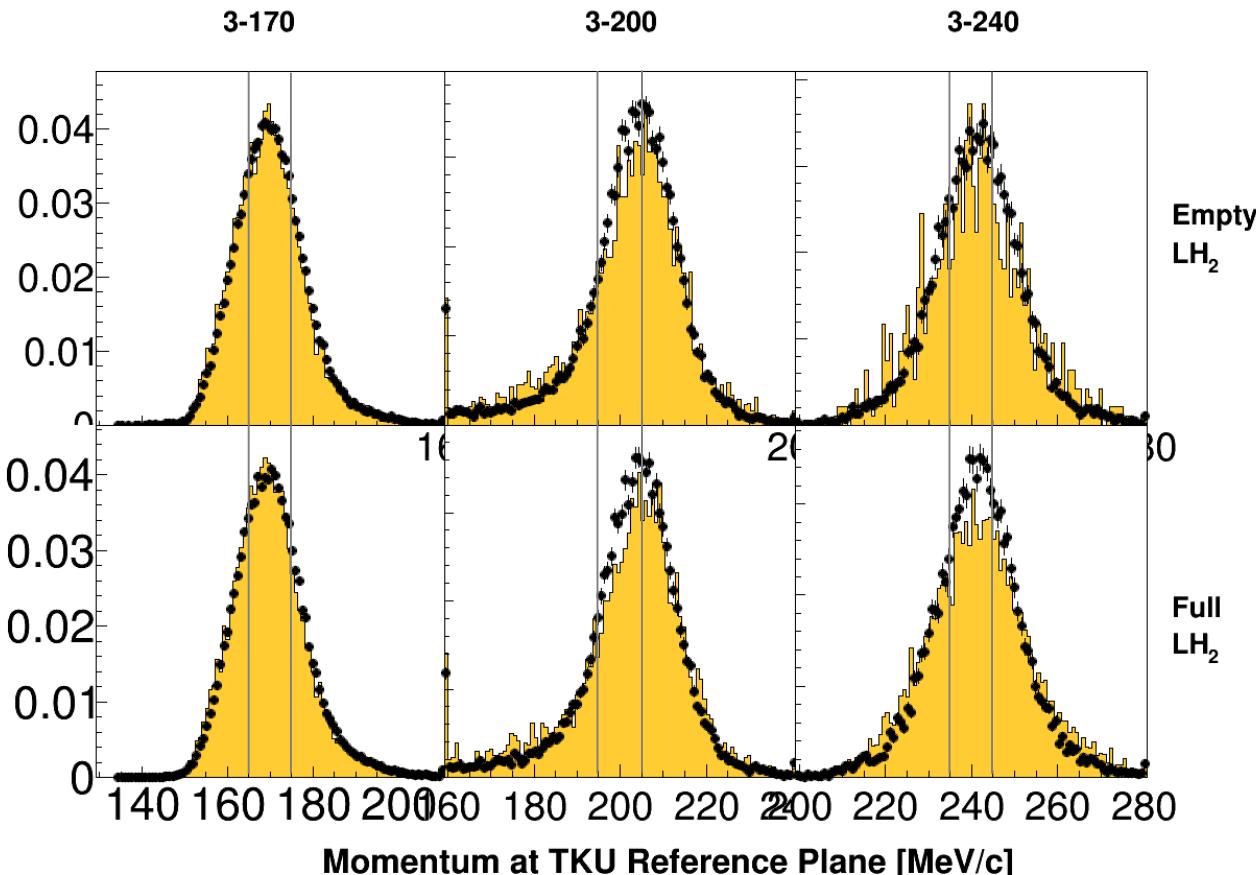
# Higher momentum runs, solenoid mode



# Higher momentum runs, solenoid mode

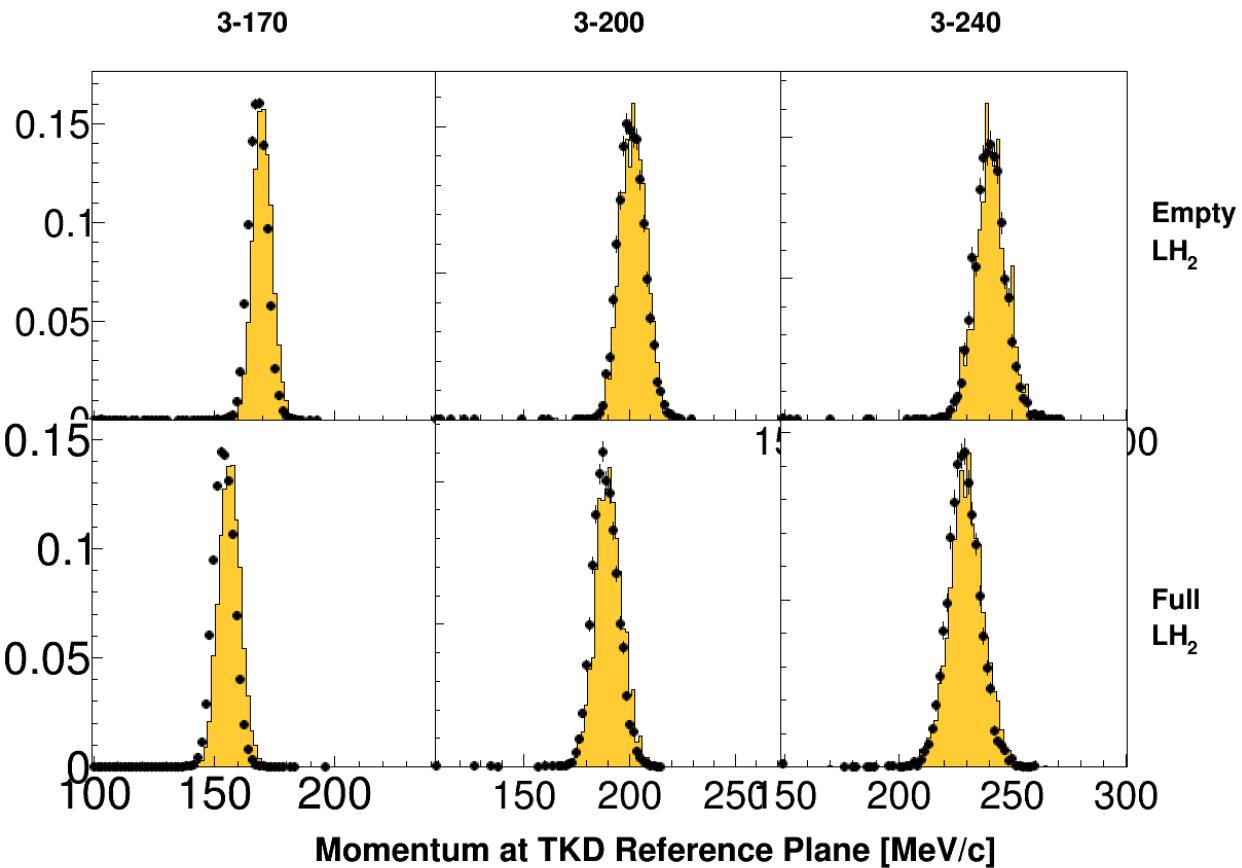


# Higher momentum runs, solenoid mode



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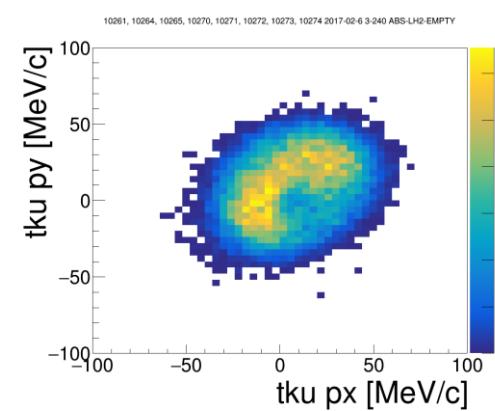
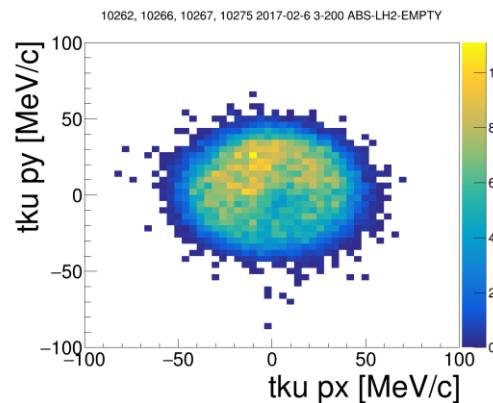
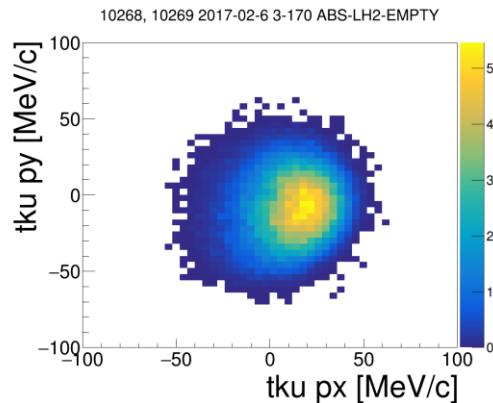
# Higher momentum runs, solenoid mode



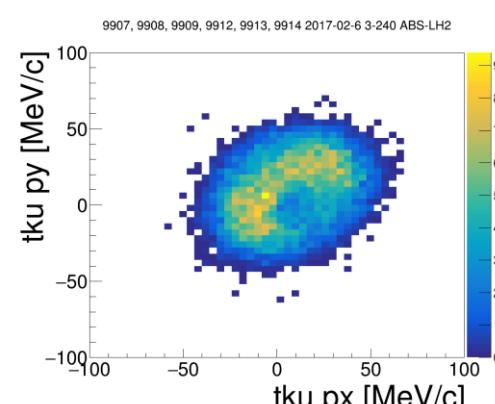
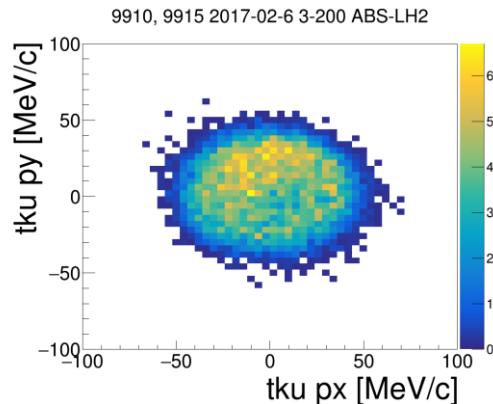
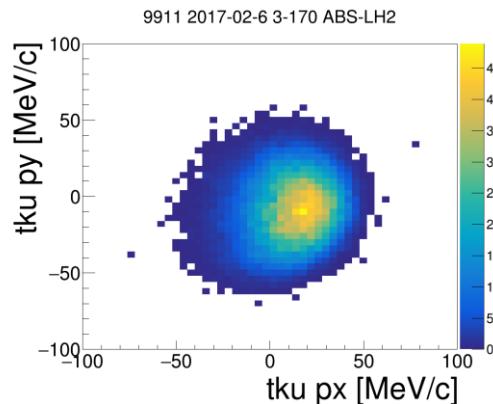
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# Higher momentum runs, solenoid mode

Strong bias in pxpy plots for higher mom beamline. Suggestion is this could be from refitting of momentum based on TOF01 + TRACKER combined refit – Testing without TrackerTOFCombinedFit to see if this changes



LH2-Empty

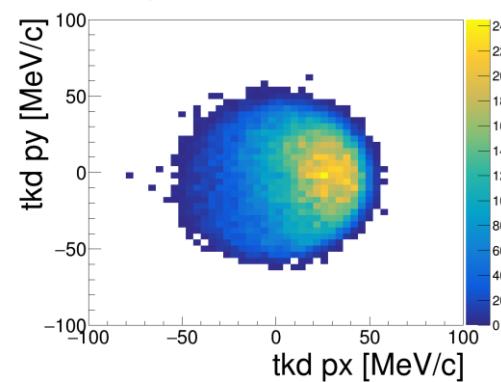


LH2

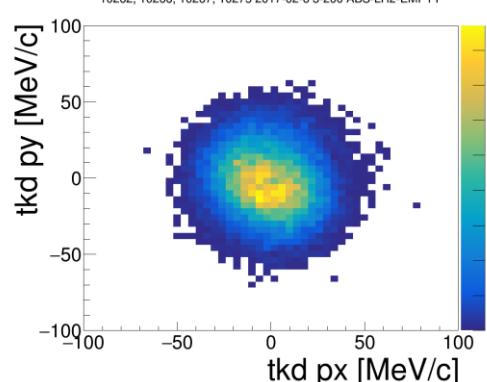
# Higher momentum runs, solenoid mode

Strong bias in pxpy plots for higher mom beamline. Suggestion is this could be from refitting of momentum based on TOF01 + TRACKER combined refit – Testing without TrackerTOFCombinedFit to see if this changes

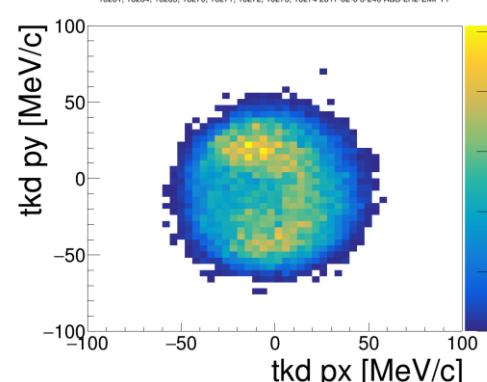
10268, 10269 2017-02-6 3-170 ABS-LH2-EMPTY



10262, 10266, 10267, 10275 2017-02-6 3-200 ABS-LH2-EMPTY

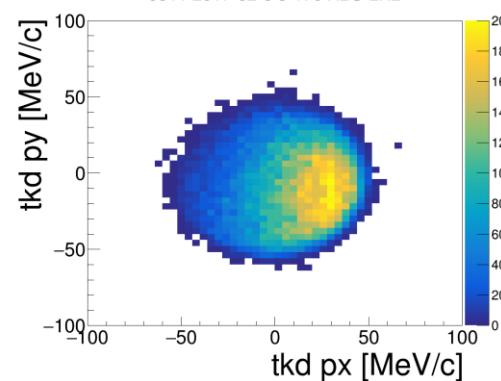


10261, 10264, 10265, 10270, 10271, 10272, 10273, 10274 2017-02-6 3-240 ABS-LH2-EMPTY

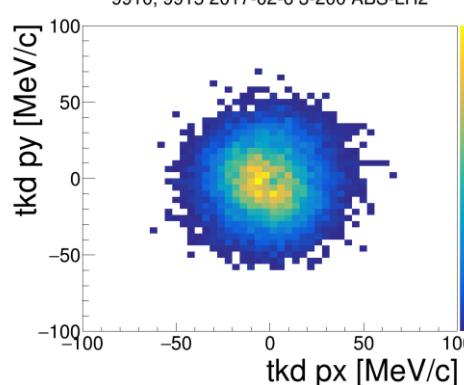


LH2-Empty

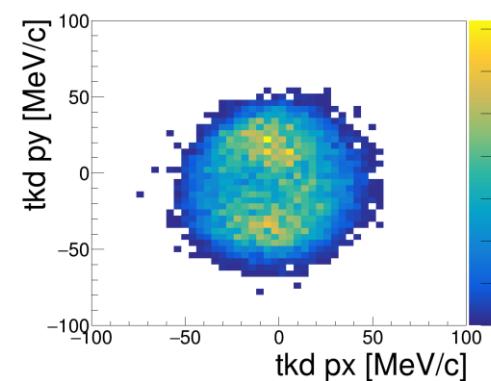
9911 2017-02-6 3-170 ABS-LH2



9910, 9915 2017-02-6 3-200 ABS-LH2



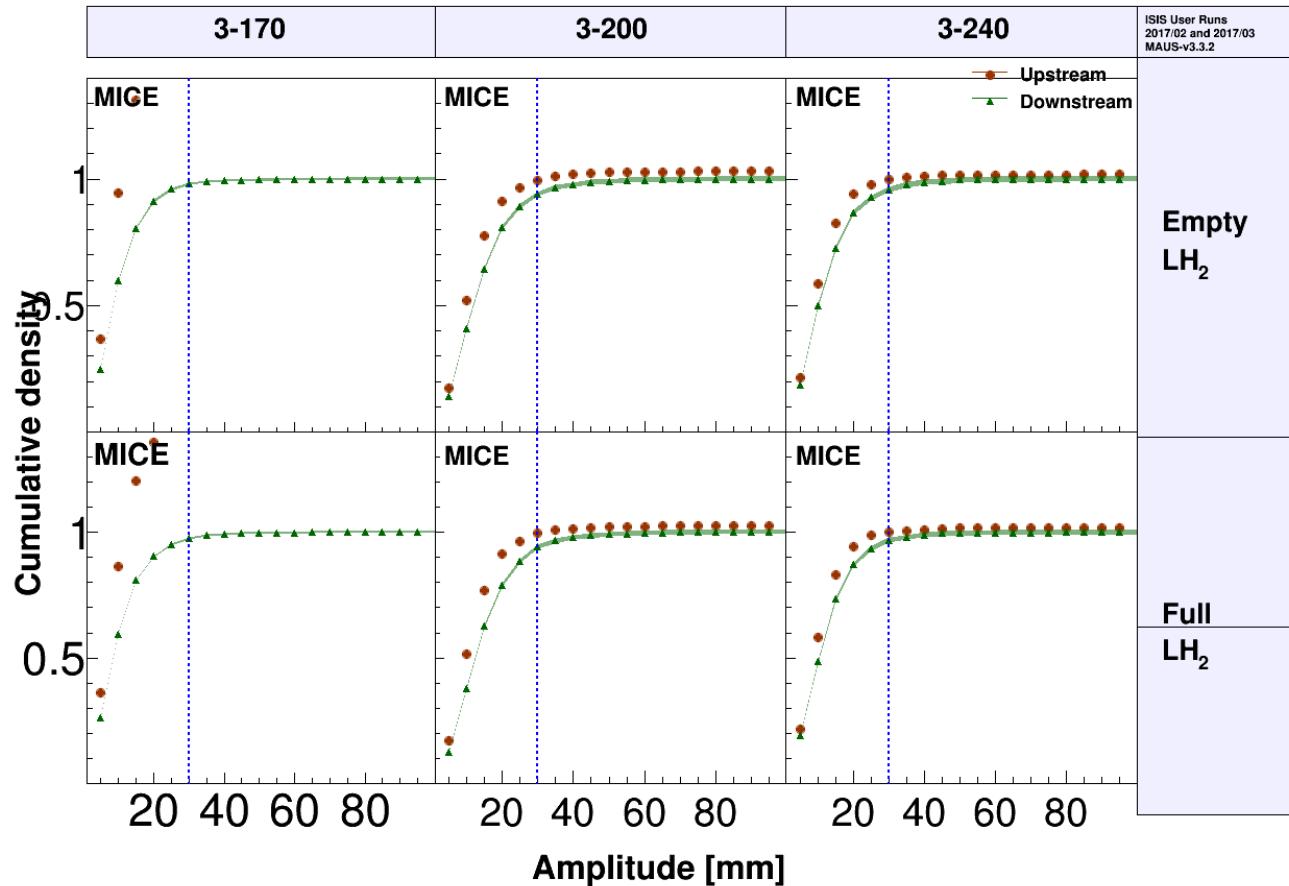
9907, 9908, 9909, 9912, 9913, 9914 2017-02-6 3-240 ABS-LH2



LH2

# Higher momentum runs, solenoid mode

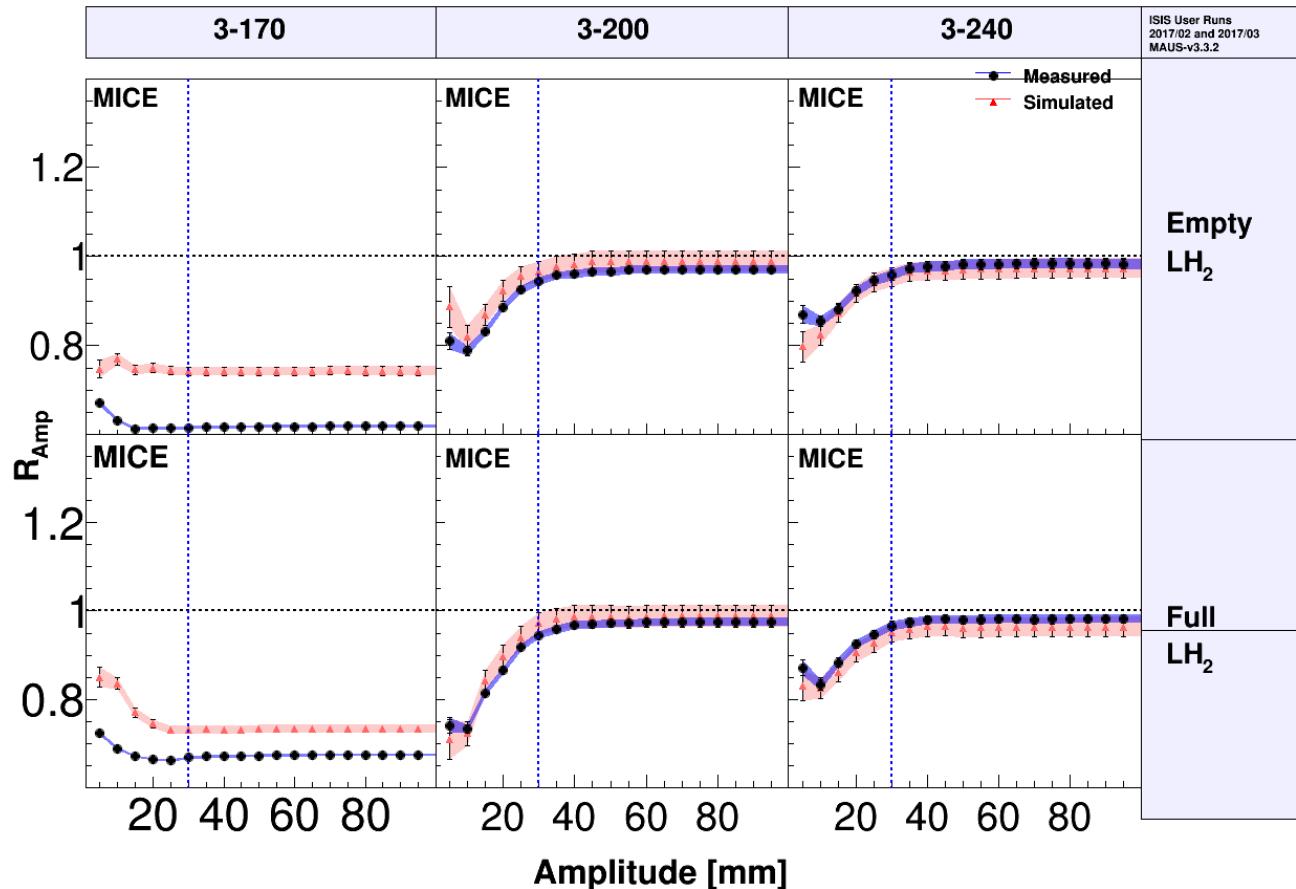
CDF



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# Higher momentum runs, solenoid mode

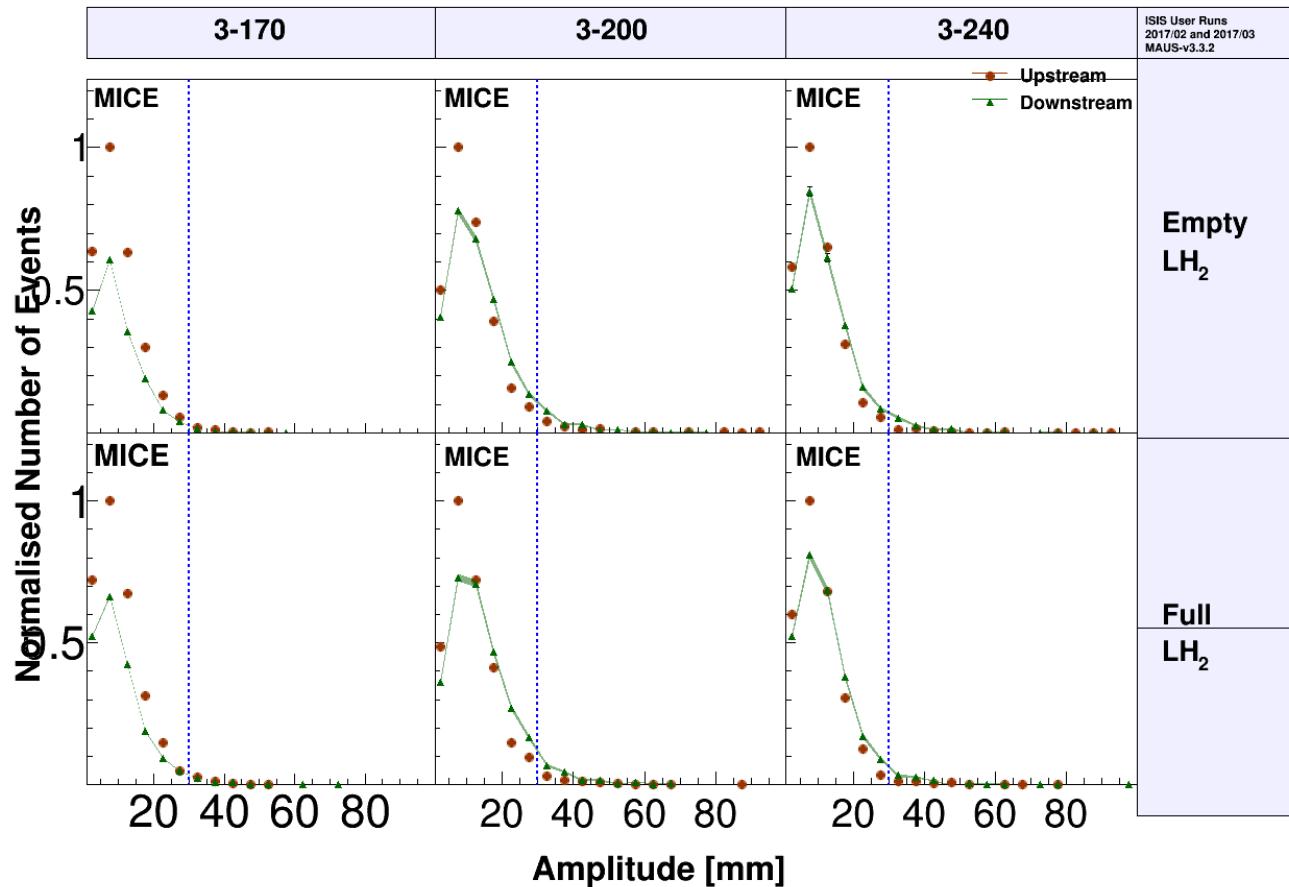
## CDF ratios



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# Higher momentum runs, solenoid mode

PDF



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# Backup Slides



## Cuts

US :

1 TOF0 & TOF1 SP

TOF01 (rescaled wrt electron peak)

1 Scifi track US

Scifi fiducial US ;  $r < 150\text{mm}$

Chi2 US  $< 8$

TOF01 vs P – banana cut

P tot US  $\pm 5$

US aperture ;  $r < 90\text{mm}$

DS :

1 Scifi track DS

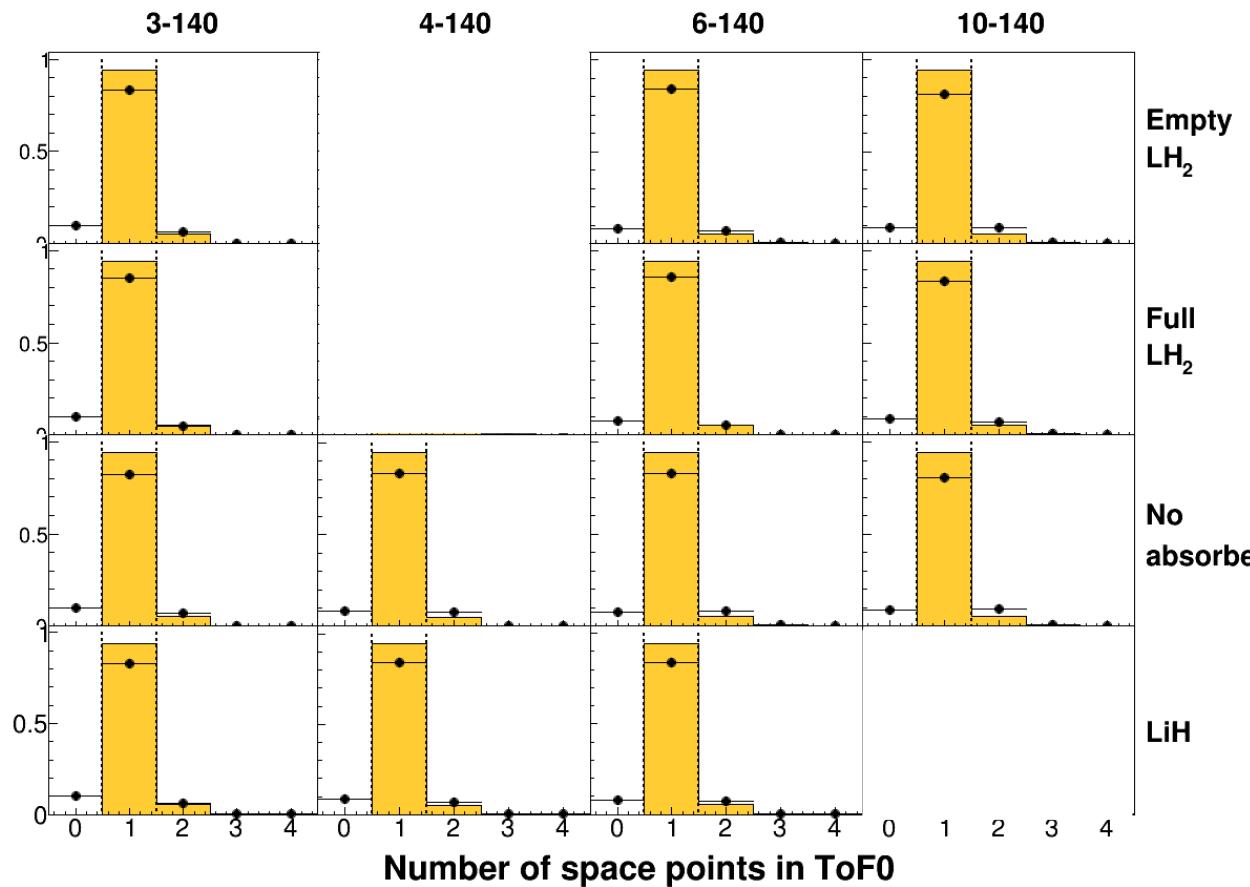
Chi2 DS  $< 8$

Scifi fiducial DS ;  $r < 150\text{mm}$

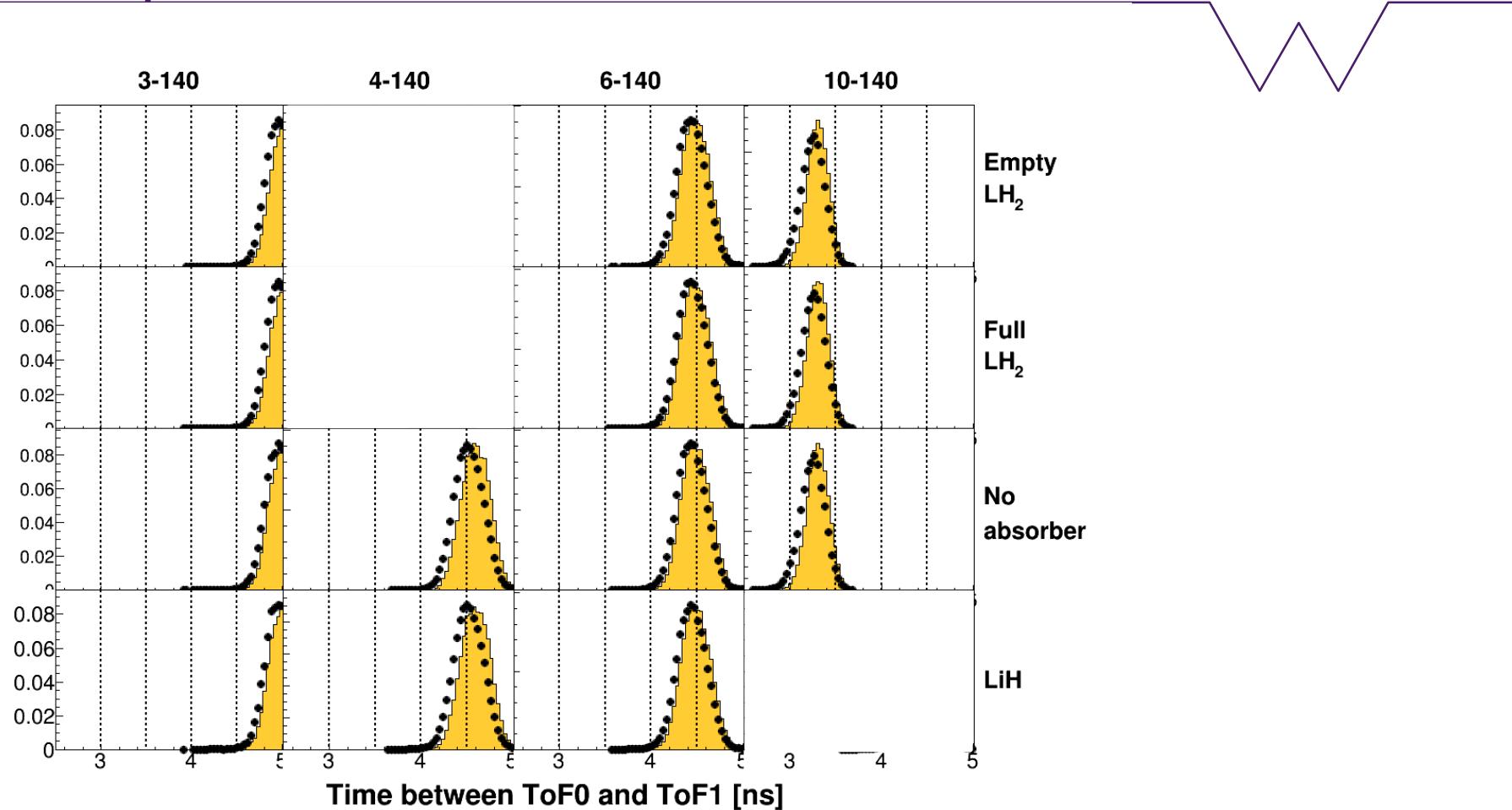
$90 < P_{\text{tot}} \text{ DS} < 170$

DS aperture ;  $r < 90\text{mm}$

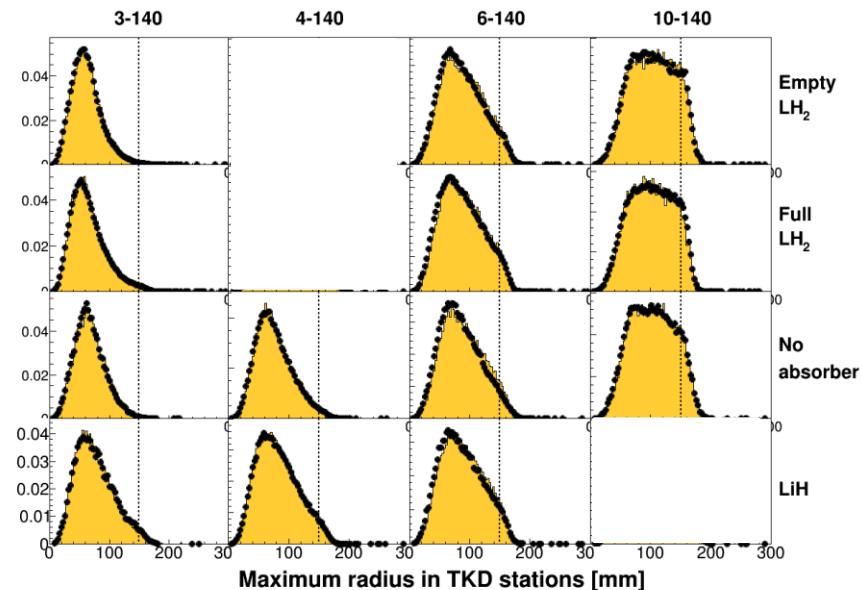
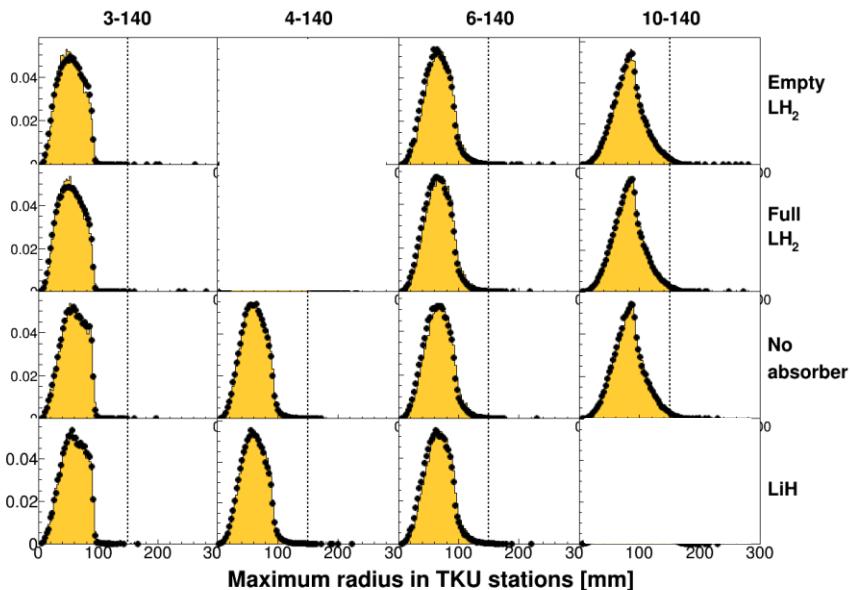
# Sample Selection



# Sample Selection

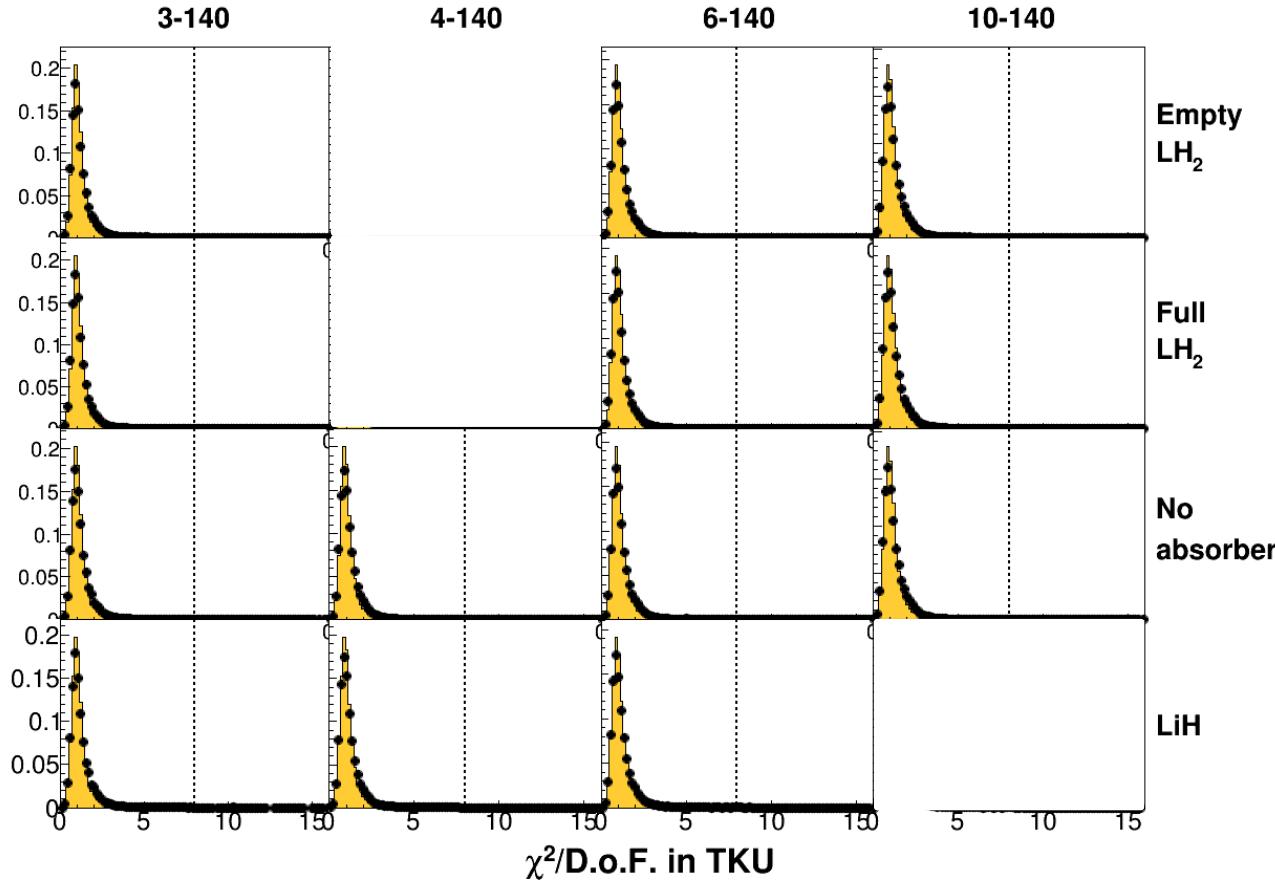


# Sample Selection



# Sample Selection

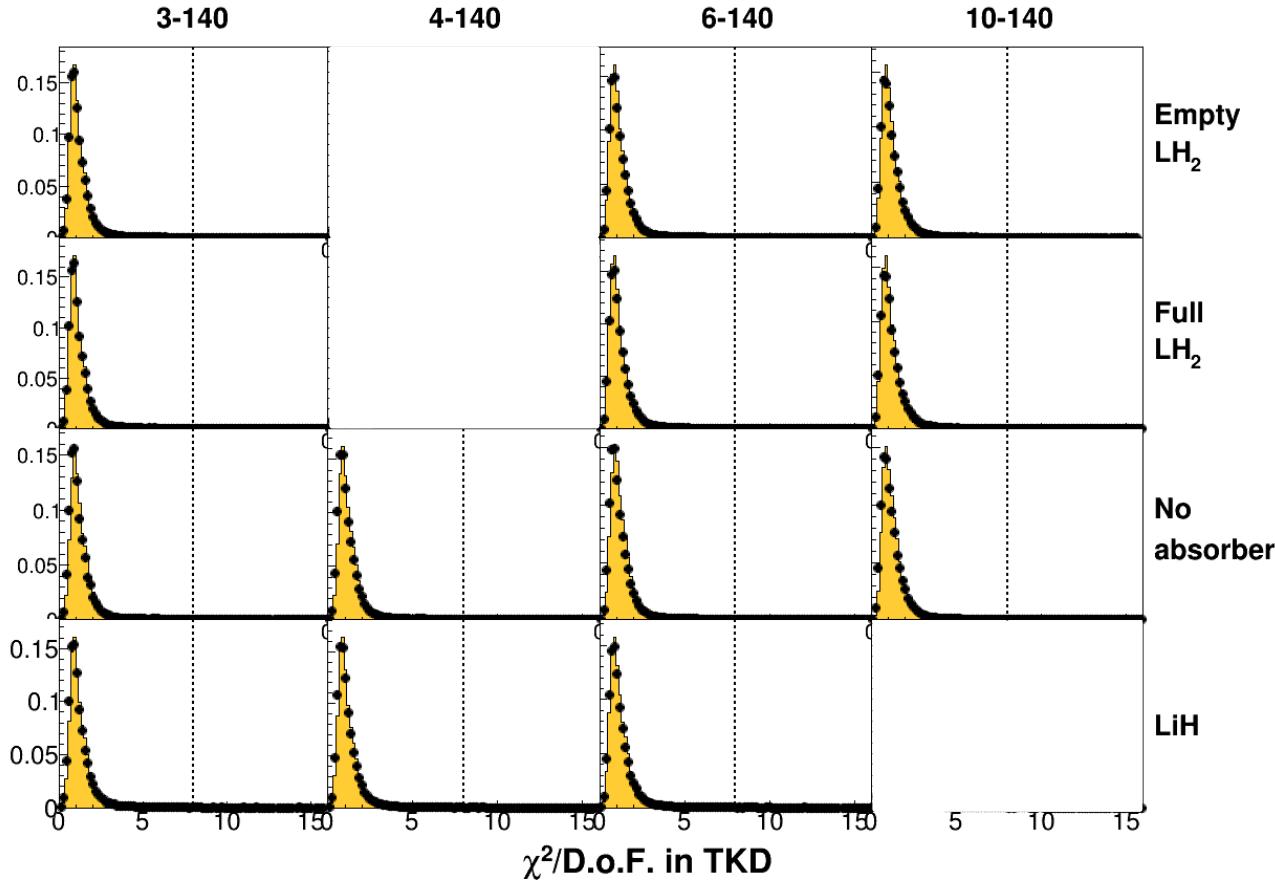
# TKU Chi2 cut



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# Sample Selection

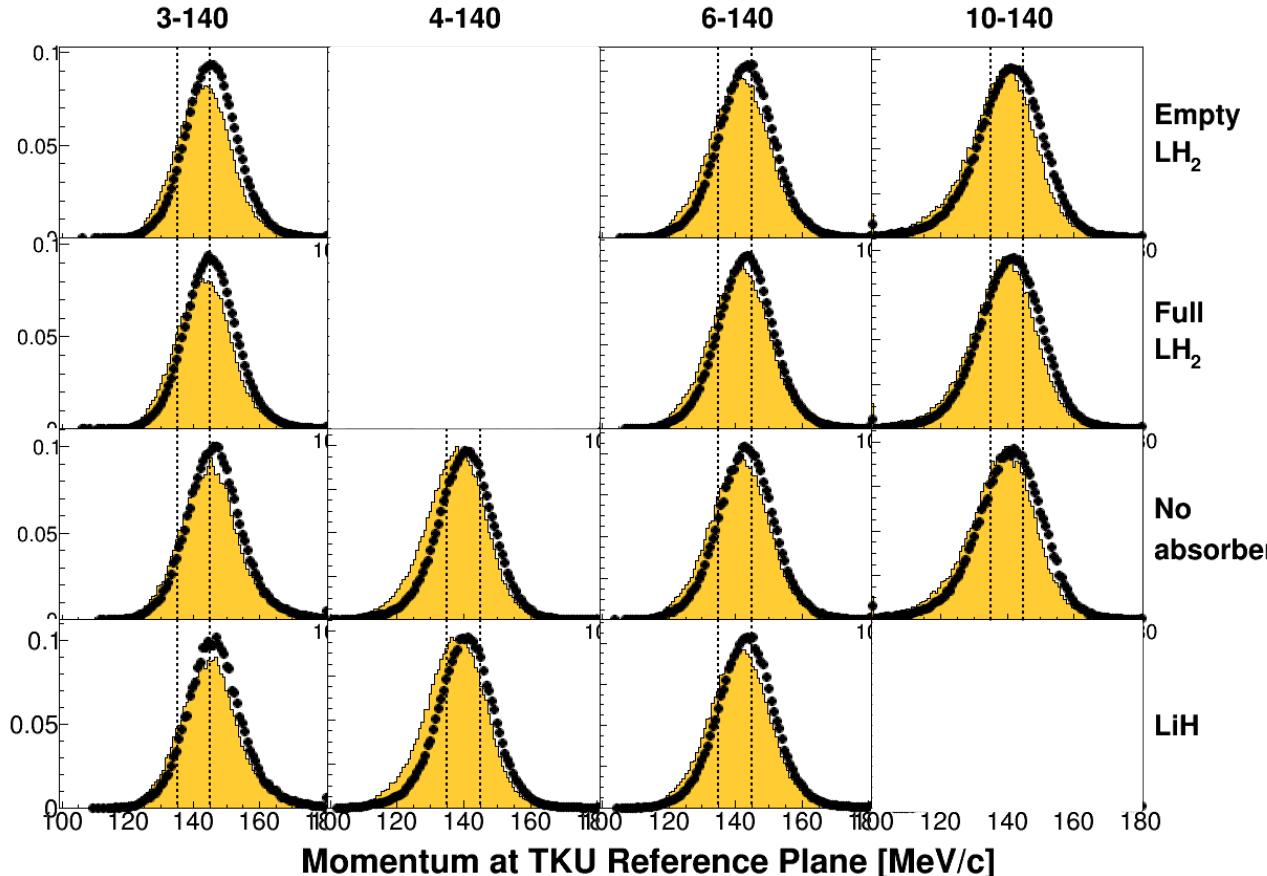
# TKD Chi2 cut



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# Sample Selection

# Momentum cut US

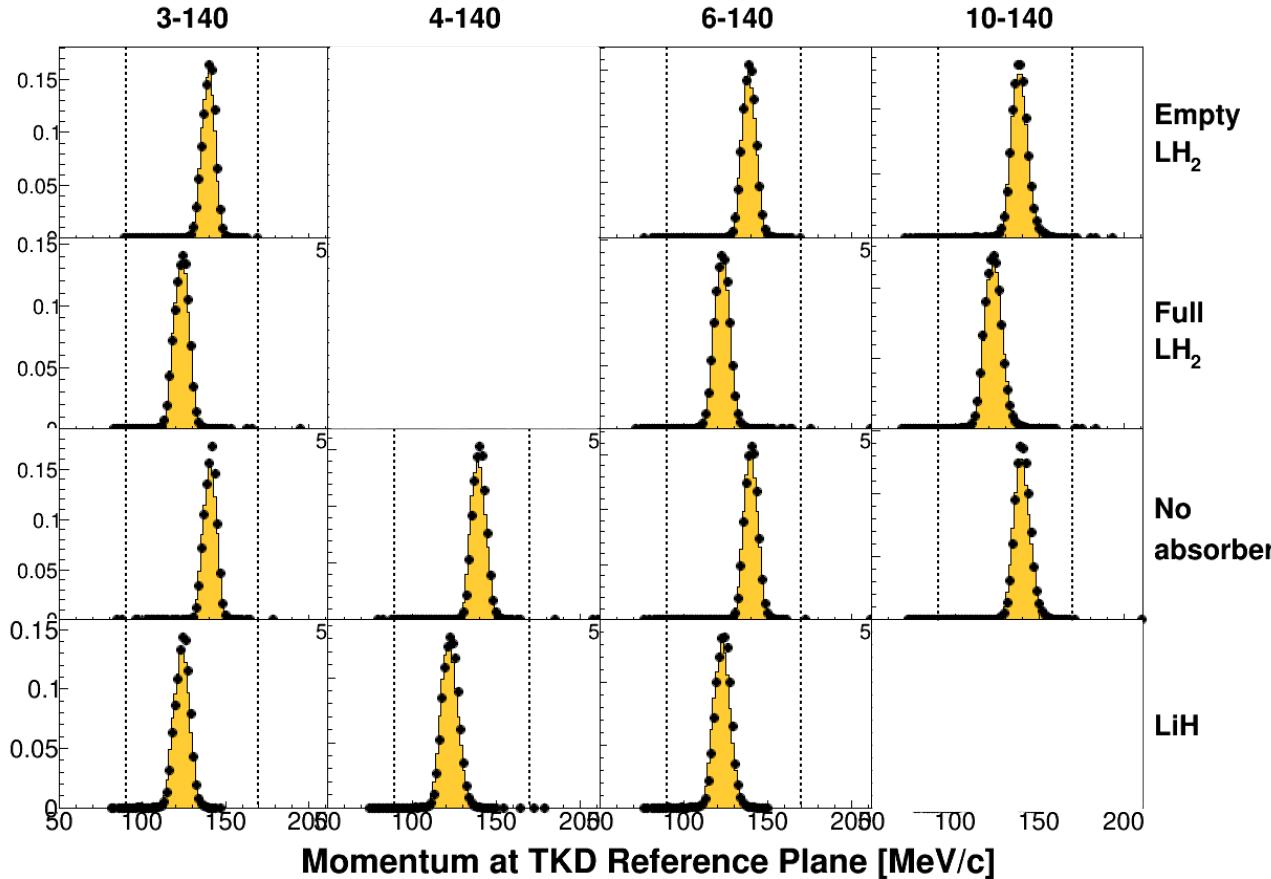


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Further MC tuning  
needed for tku  
momentum  
agreement for 4-140

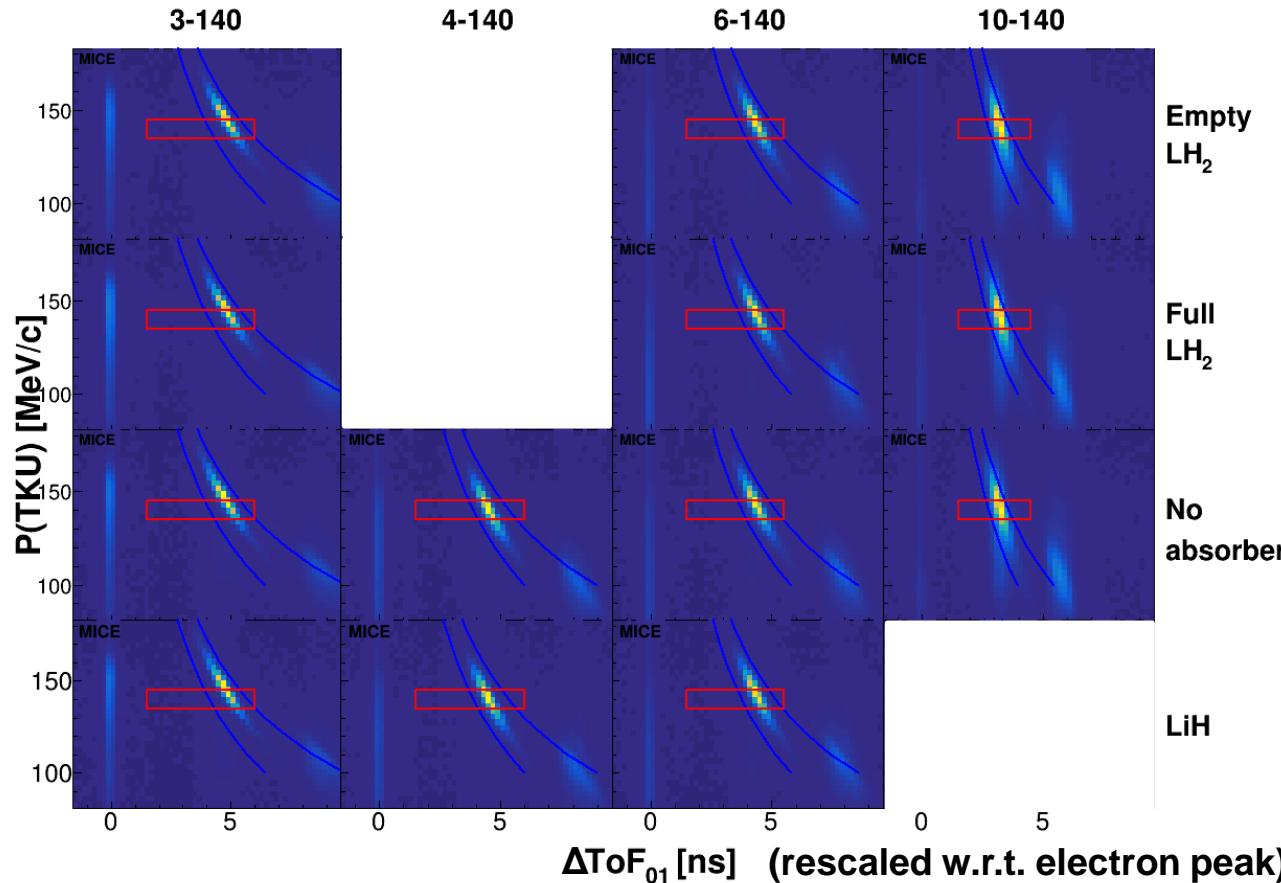
# Sample Selection

# Momentum DS



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# Sample Selection



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**DATA**  
No cuts

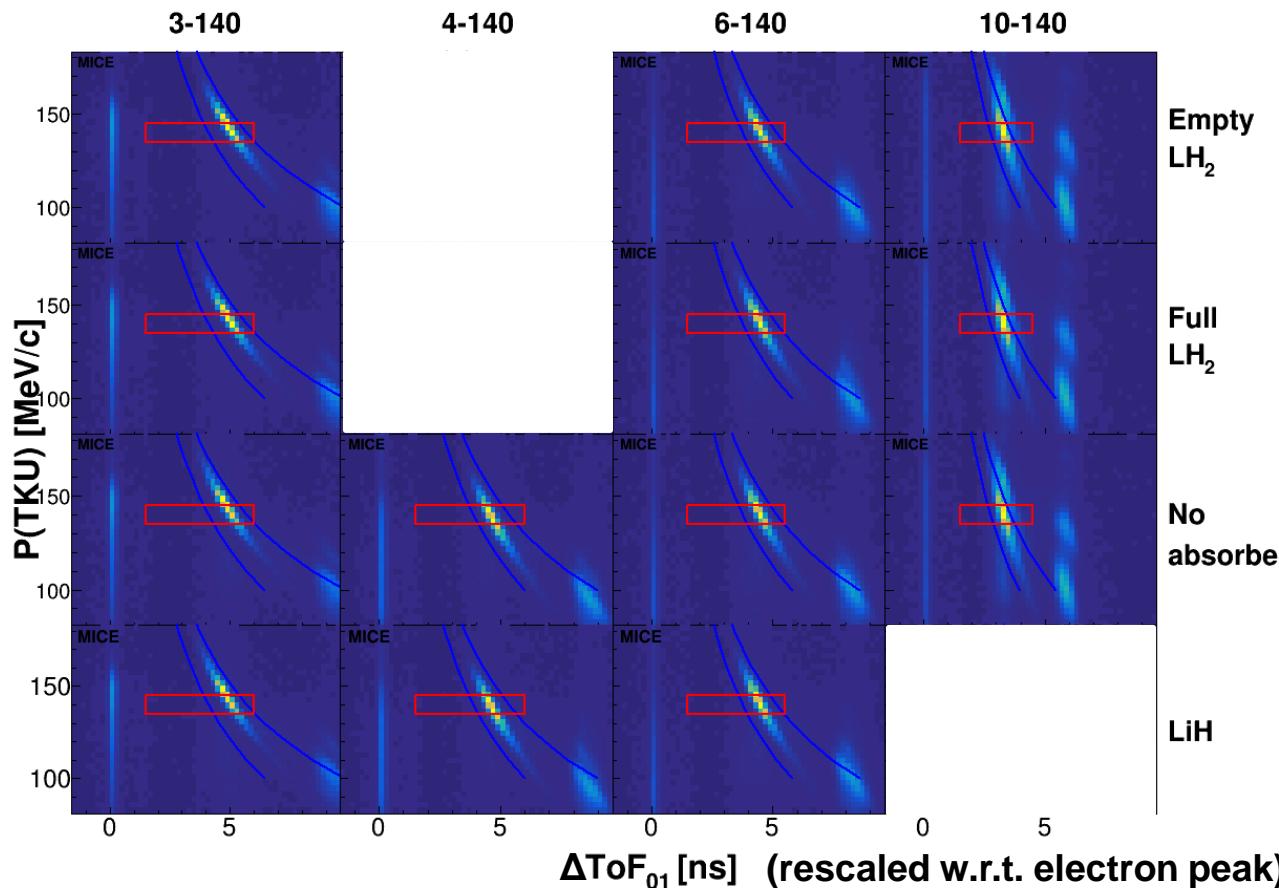
Empty  
 $\text{LH}_2$

Full  
 $\text{LH}_2$

No  
absorber

LiH

# Sample Selection



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MC  
No cuts

Empty  
 $\text{LH}_2$

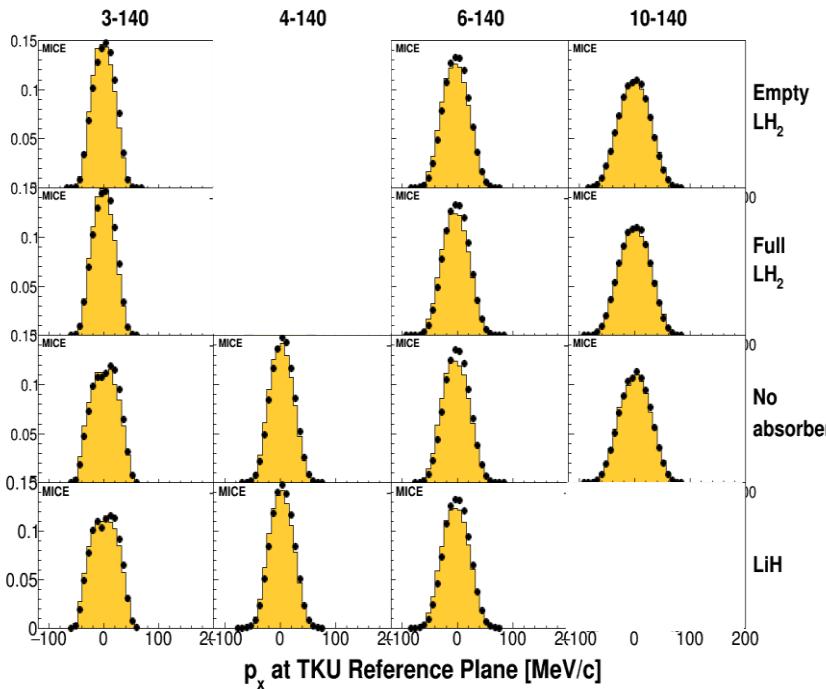
Full  
 $\text{LH}_2$

No  
absorber

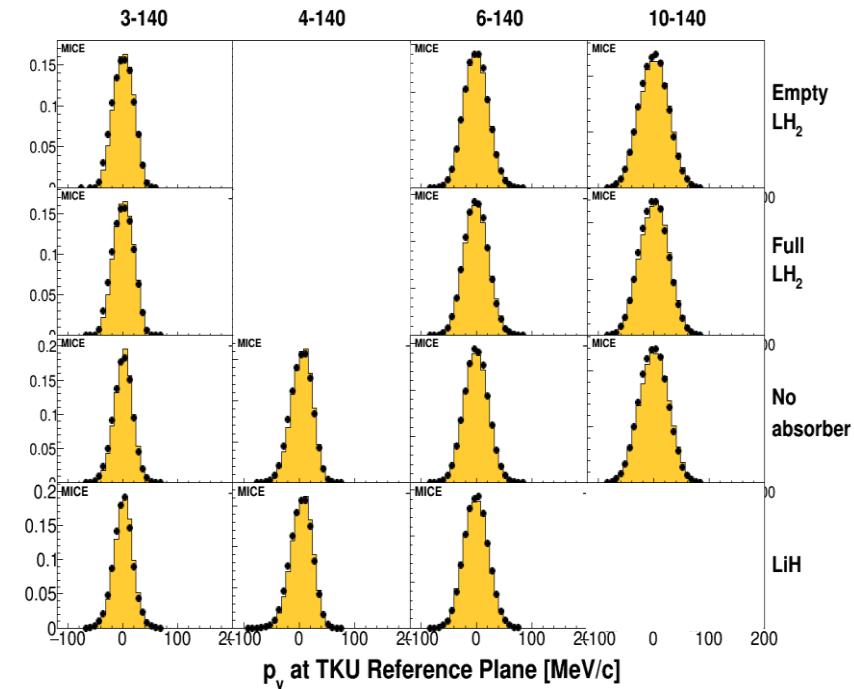
LiH

The Warwick University logo, featuring a stylized purple jagged line graphic above the word "WARWICK" in a bold, purple, sans-serif font.

Px



Py



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