



# Intermittency update

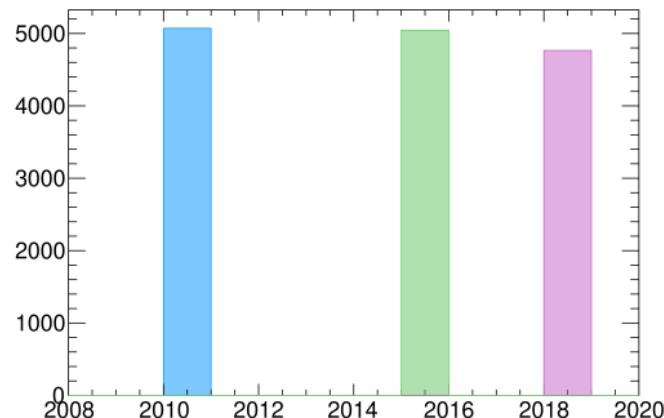
PAG-EbyE - 2025-10-30

**Salman Khurshid Malik, Ramni Gupta**  
**Department of Physics, University of Jammu**

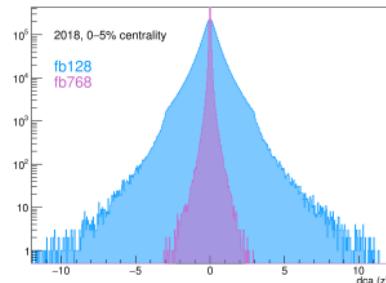
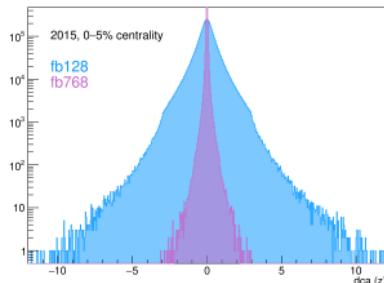
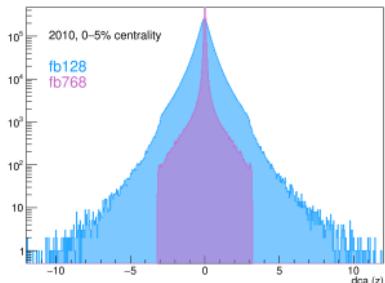
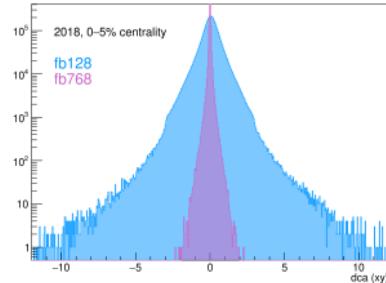
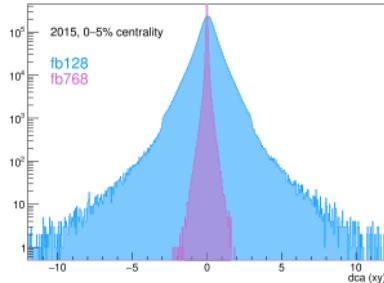
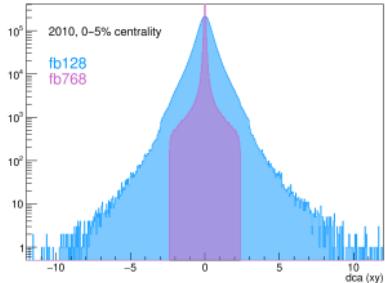
**Filterbits QA**

# Dataset

- Comparison of filterbit QA results.
- HIJING three datasets: **2010 (2.76 TeV)**: LHC11a10a\_bis, **2015 (5.02 TeV)**: LHC20j6a, **2018 (5.02 TeV)**: LHC20e3a.
- $\sim 5000$  events for each dataset.
- Centrality: 0–10%.
- $|v_z| < 10$ ,  $|\eta| < 0.8$ .



# DCA<sub>*xy*, *z*</sub> comparison



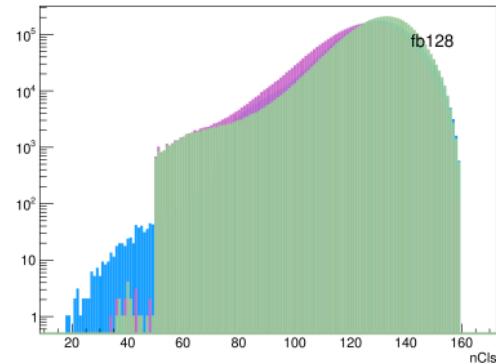
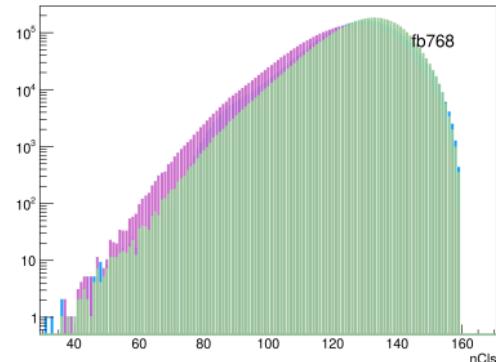
# TPC #clusters comparison

## Definition of fb128.

$|dca_{xy}| < 2.4, |dca_z| < 3.0,$   
 $TPCNClusters > 50,$   
 $\chi^2_{\text{per TPC cluster}} \leq 4.$

- The method used to check filterbits in AODs:

```
AliAODTrack *track =  
    static_cast<AliAODTrack  
*>(fAOD->GetTrack(i));  
track->TestFilterBit(128);
```

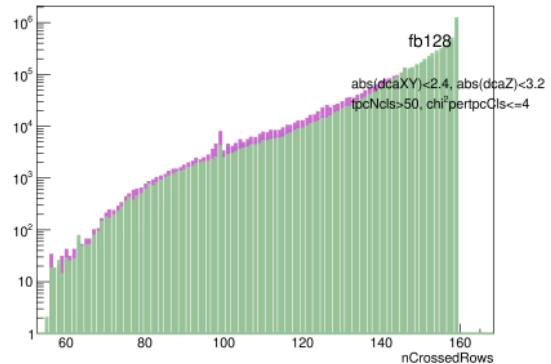
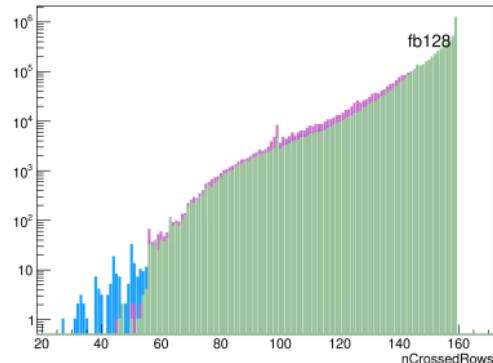


# TPC #crossed rows comparison

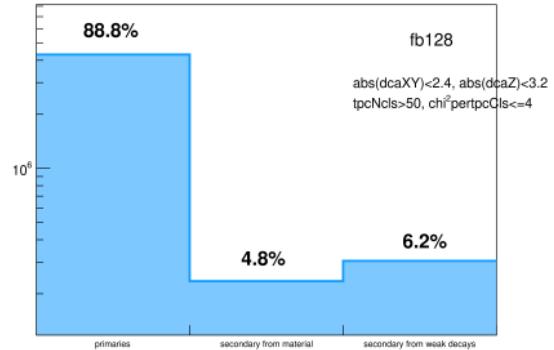
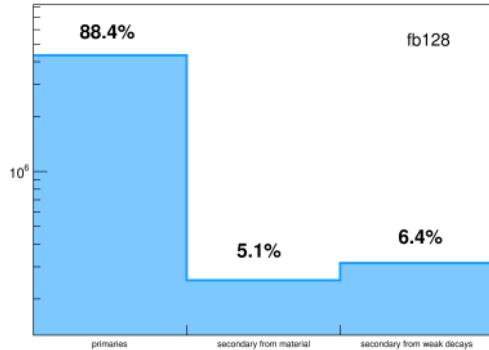
- The method used to check filterbits in AODs:

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AliAODTrack *track =  
static_cast<AliAODTrack  
*>(fAOD->GetTrack(i));  
track->TestFilterBit(128);
```

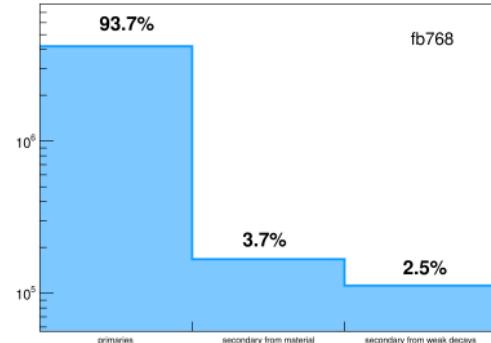
- does not work for 128.
- Applying cuts manually does work.



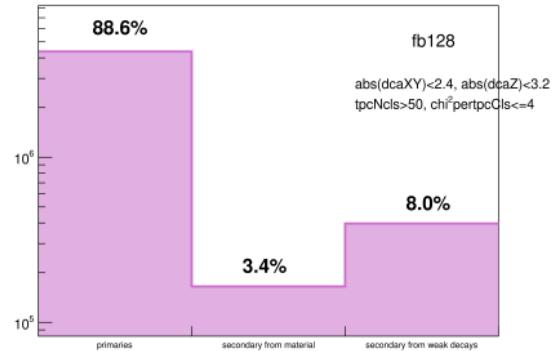
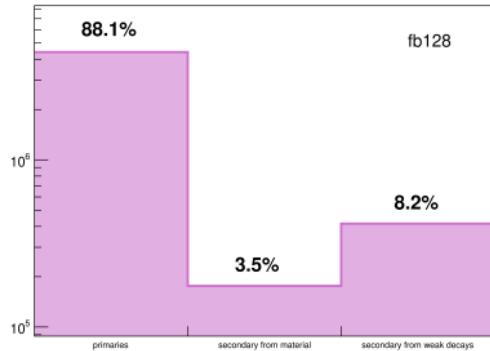
# Contamination in filterbits



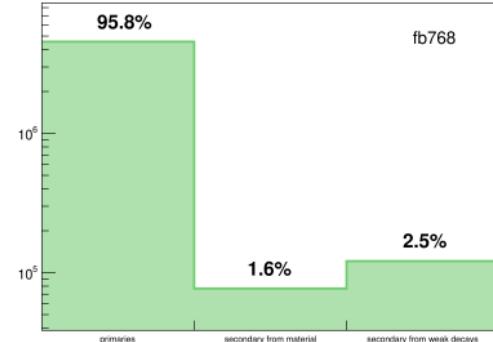
- for 2010 dataset.
- secondaries from material and weak decays both larger in fb128.



# Contamination in filterbits



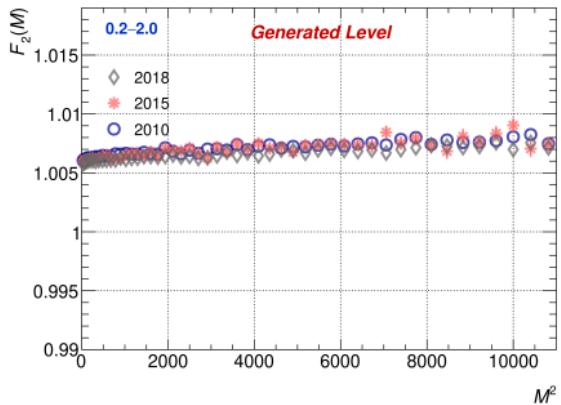
- for 2015/2018 dataset.
- secondaries from material and weak decays both larger in fb128.
- fb768 works fine with less contamination.



**HIJING Closure**

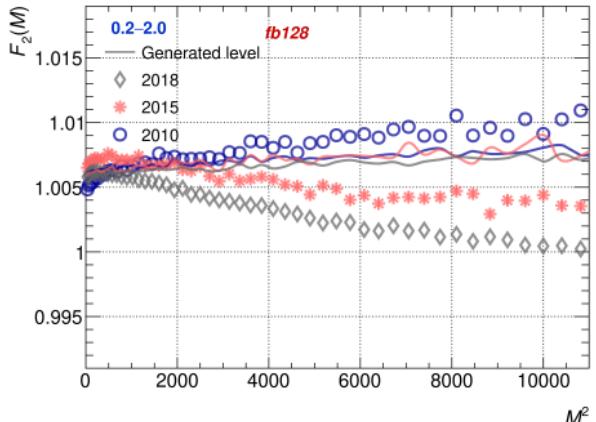
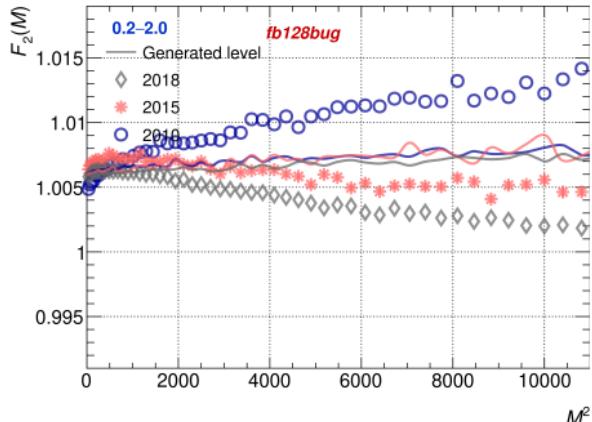
# Dataset

- HIJING:
  - **2010 (2.76 TeV)**: LHC11a10a\_bis,
  - **2015 (5.02 TeV)**: LHC20j6a,
  - **2018 (5.02 TeV)**: LHC20e3a.
- 0–5% centrality,  $|v_z| < 10$ ,  $|\eta| < 0.8$ .

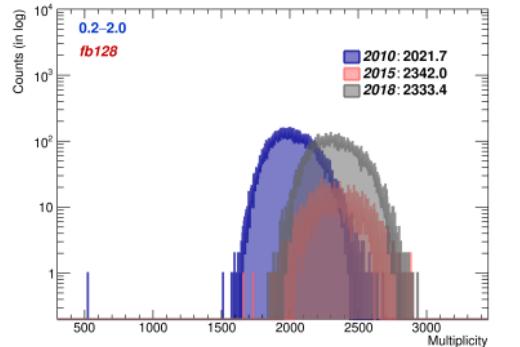


Generated Level ( $0.2 \leq p_T \leq 2.0$ )

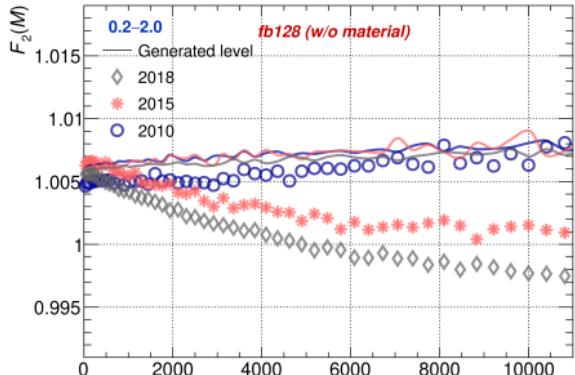
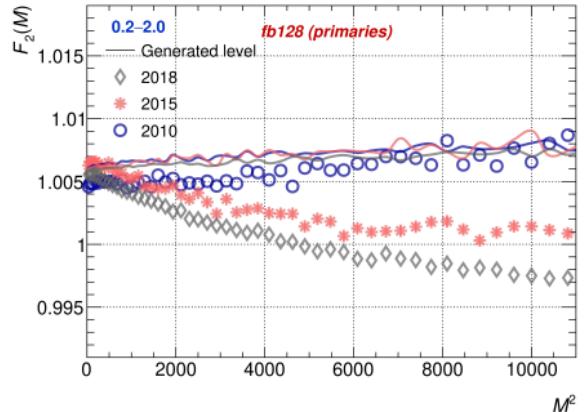
# fb128 ( $0.2 \leq p_T \leq 2.0$ )



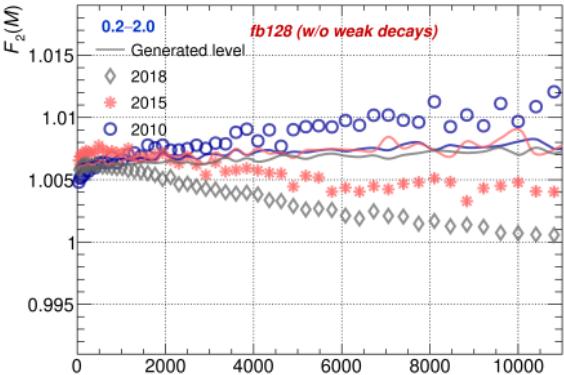
- *fb128* (right) is the actual closure (with cuts in *fb128* applied manually).
- Closure for 2010 better than 2015/2018.



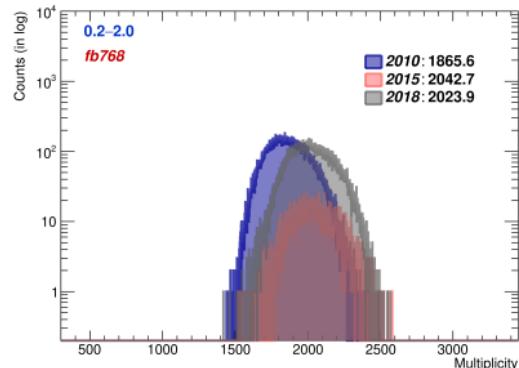
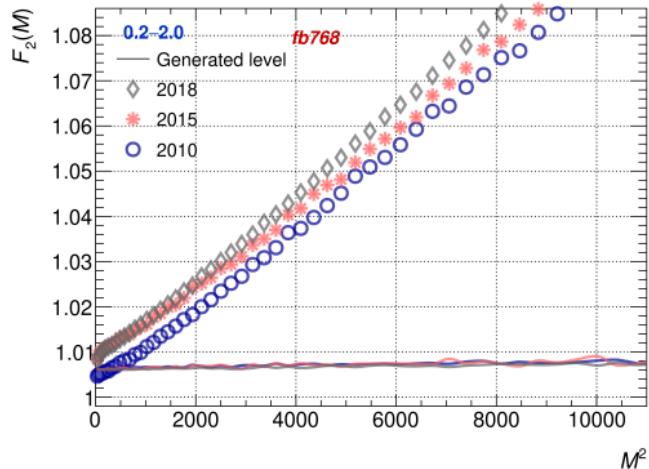
# $\text{fb128} (0.2 \leq p_T \leq 2.0)$



- Closure for 2010 better than 2015/2018.

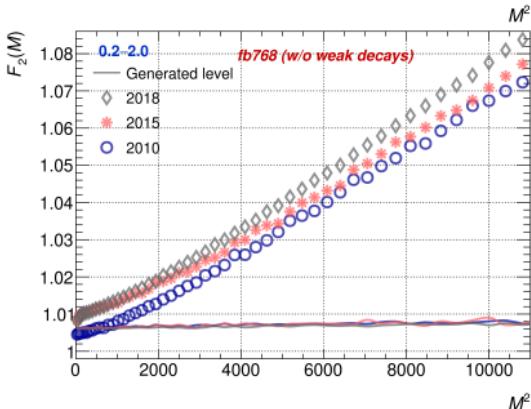
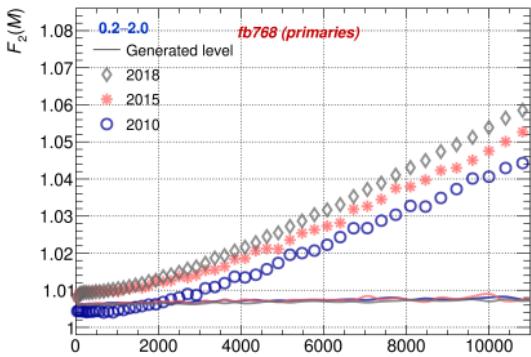
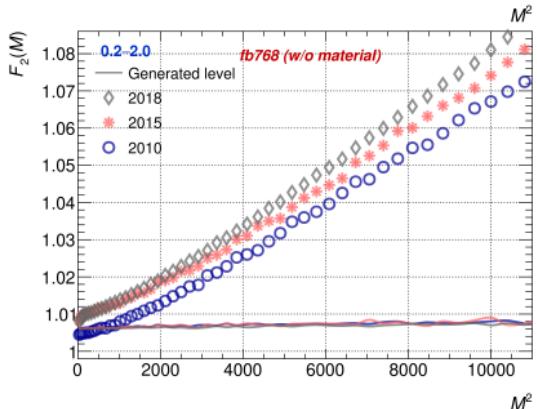
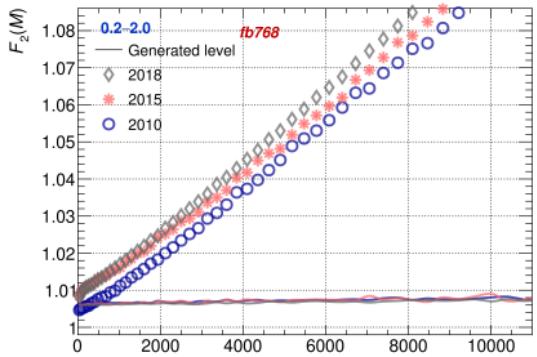


## $fb768$ ( $0.2 \leq p_T \leq 2.0$ )



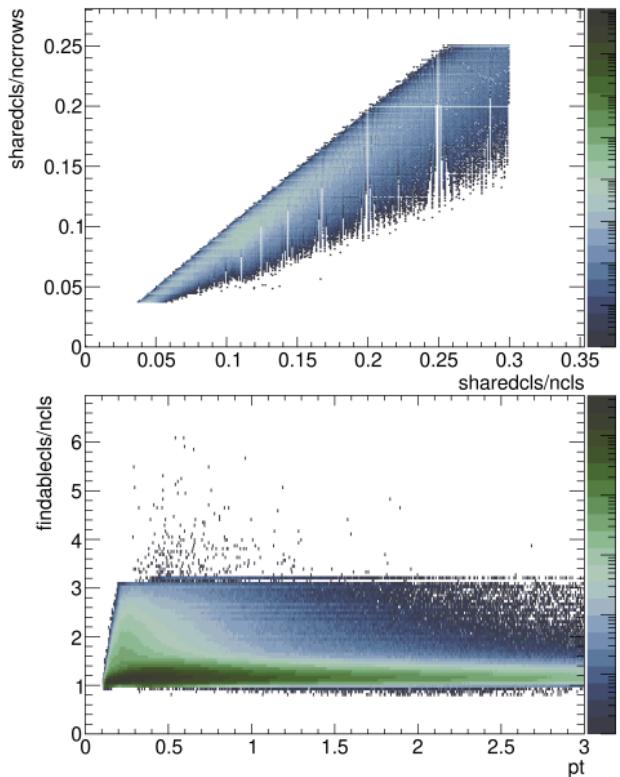
- $fb768$  does not show good closure for 2010, 2015/2018.
- the trends for all the datasets are alike.
- stricter cuts can improve the closure.

# $\text{fb768 } (0.2 \leq p_T \leq 2.0)$



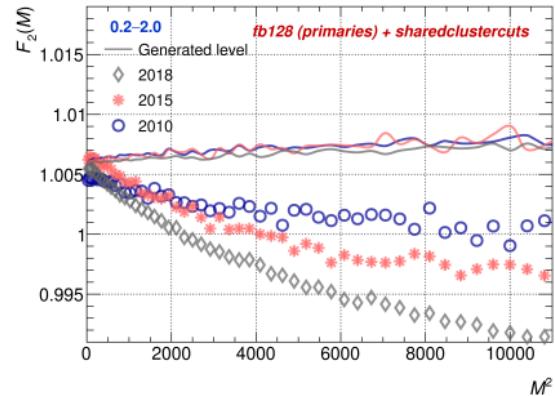
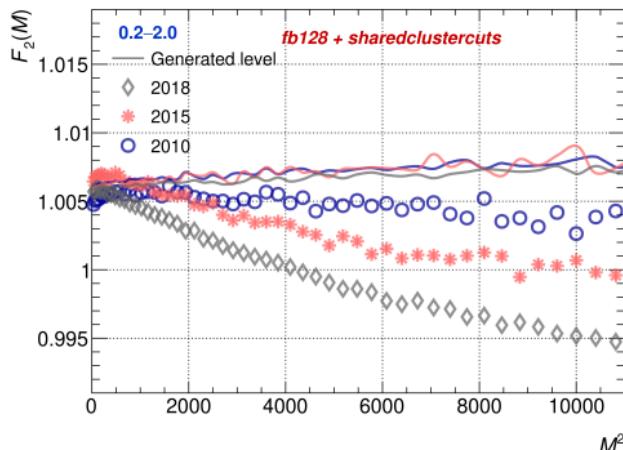
# TPC clusters cuts

- An additional set of cuts to reduce track splitting/merging effects.
- $\#\text{sharedclusters}/\#\text{clusters} \leq 0.3$ .
- $\#\text{sharedclusters}/\#\text{crossedRows} \leq 0.25$ .
- $\#\text{findableclusters}/\#\text{clusters} \geq 0.8$ .



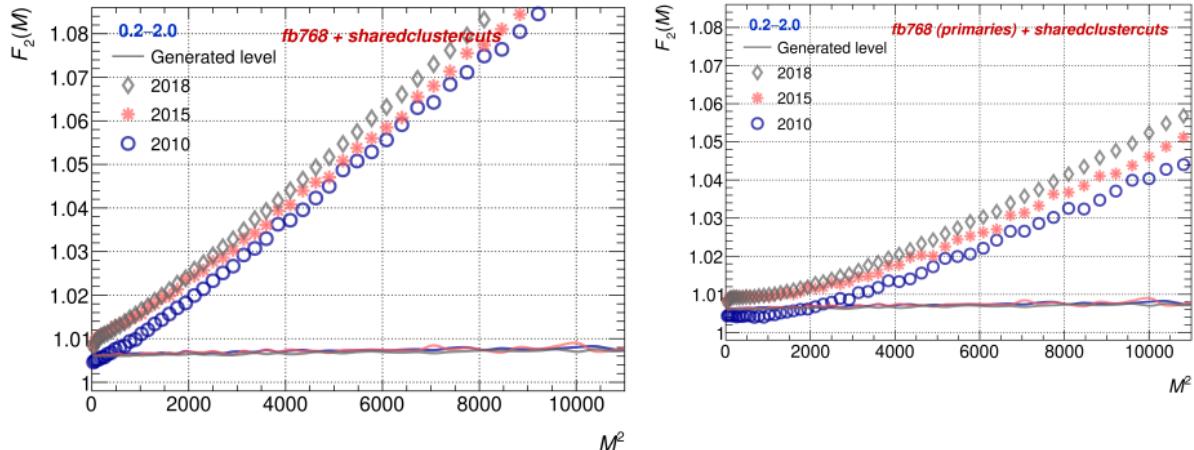
cuts taken from analysis note: <https://alice-notes.web.cern.ch/node/1653>.

# $fb128$ ( $0.2 \leq p_T \leq 2.0$ ) with TPC clusters cuts



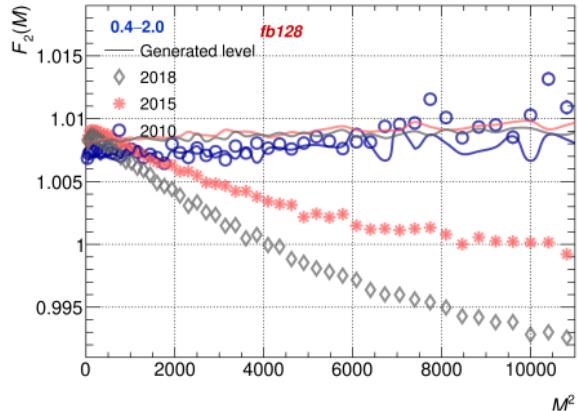
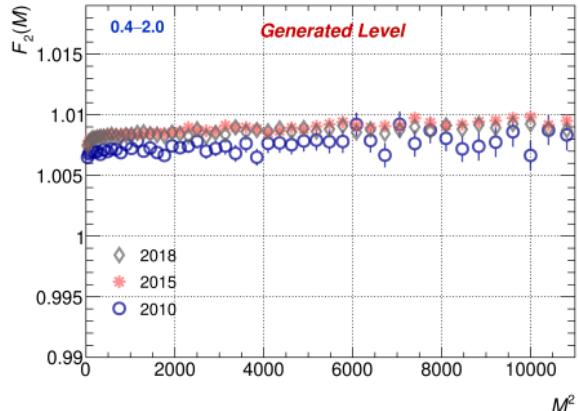
- Closure worsens for all the datasets.

## fb768 ( $0.2 \leq p_T \leq 2.0$ ) with TPC clusters cuts

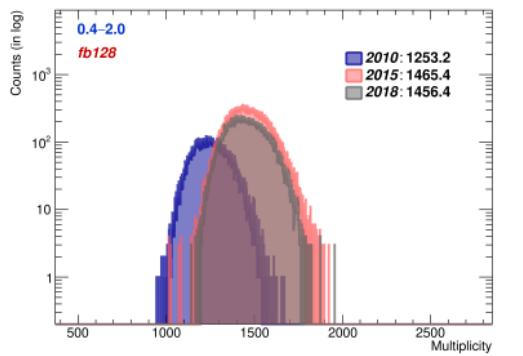


- Closure improves for all the datasets.
- Similar trend across datasets.
- $0.2 \leq p_T \leq 0.4$  has different efficiency for 2.76 TeV and 5.02 TeV.
- Should check  $0.4 \leq p_T \leq 2.0$ .

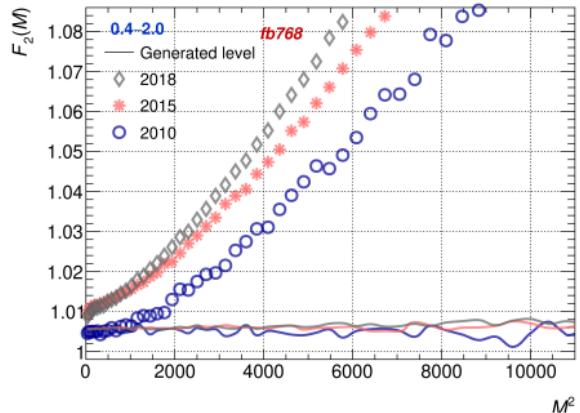
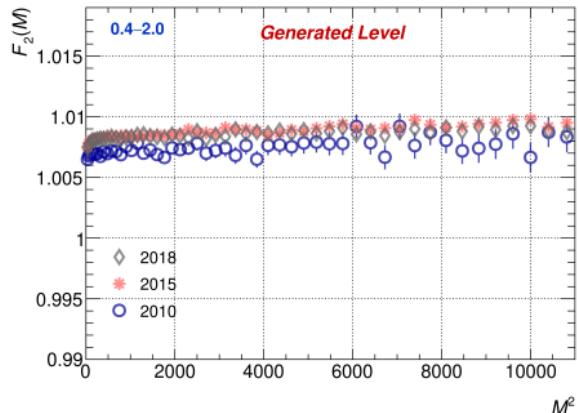
# Generated and fb128 ( $0.4 \leq p_T \leq 2.0$ )



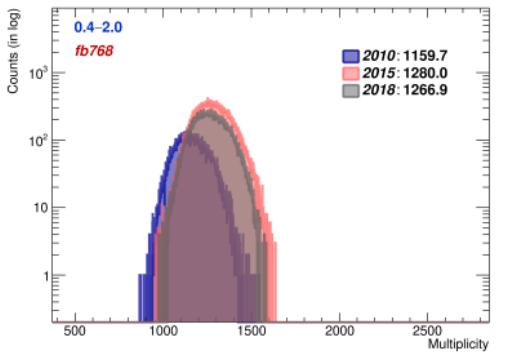
- Closure for 2010 better than 2015/2018.



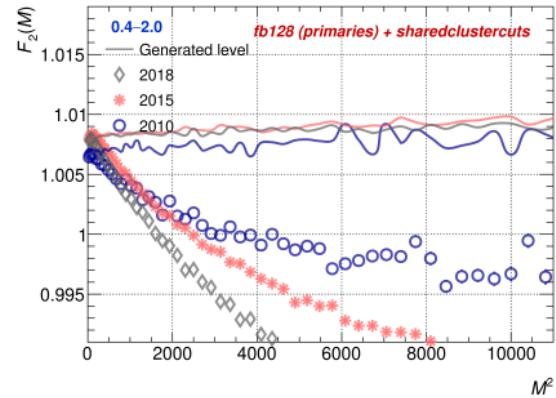
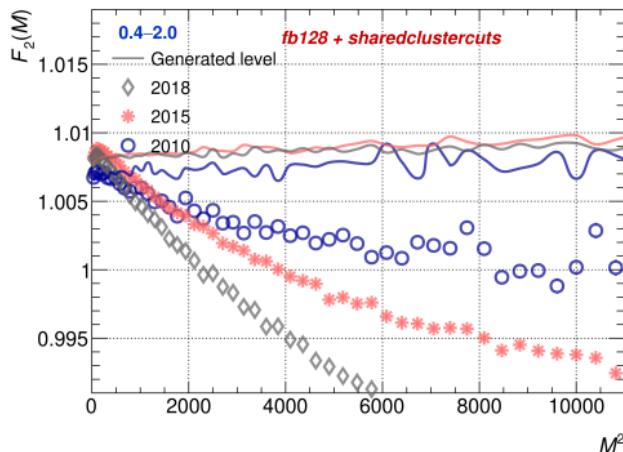
# Generated and fb768 ( $0.4 \leq p_T \leq 2.0$ )



- Closure not good for all datasets.

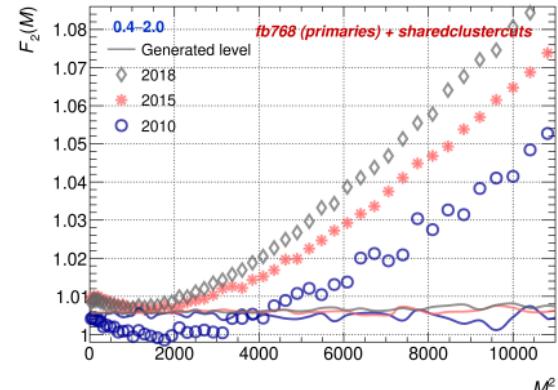
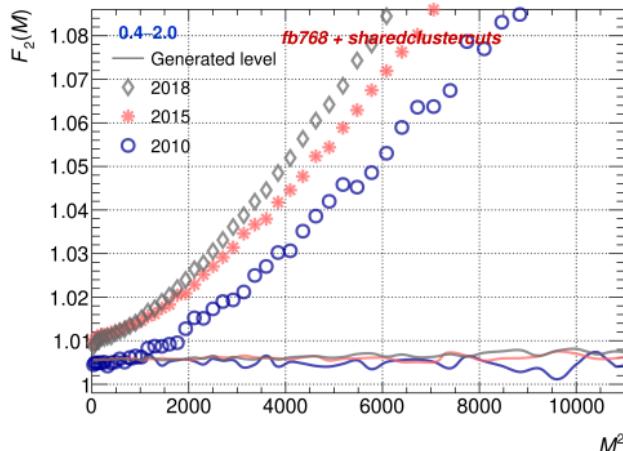


# $\text{fb128} (0.4 \leq p_T \leq 2.0) \text{ with TPC clusters cuts}$



- Closure deteriorates for all the datasets.

# fb768 ( $0.4 \leq p_T \leq 2.0$ ) with TPC clusters cuts



- Closure improves with TPC clusters cuts for fb128

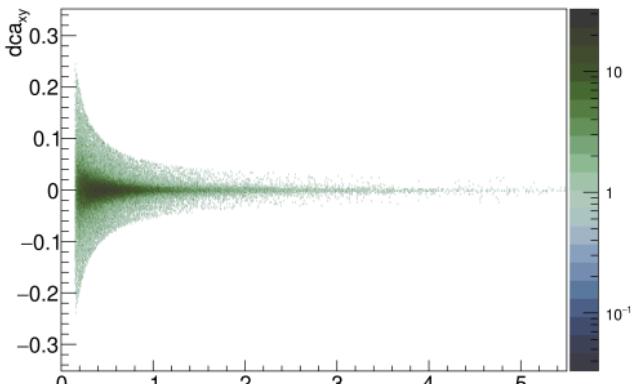
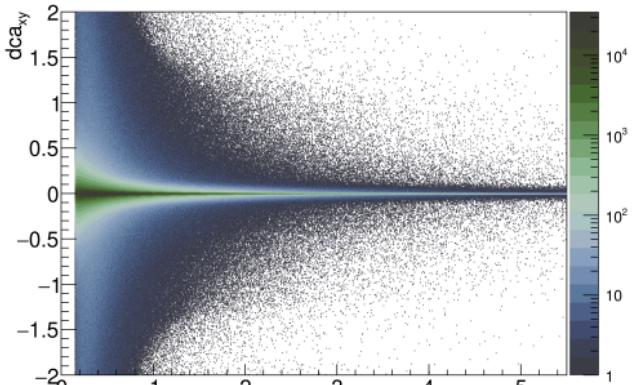
# $p_T$ dependent DCA cuts

- An additional set of cuts to improve the closure.
- 2015/2018 data: Maximum  $DCA_{xy}$  cut:  $0.028 + 0.04 * p_T^{(1.01)}$

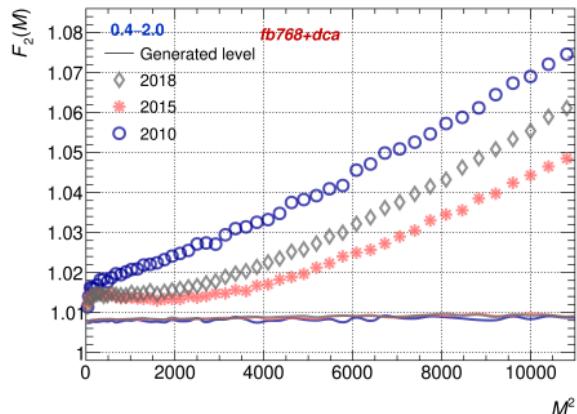
cut taken from analysis note: <https://alice-notes.web.cern.ch/node/1653>.

- 2010 data: Maximum  $DCA_{xy}$  cut:  
 $0.0182 + \frac{0.035}{p_T^{(1.01)}}$

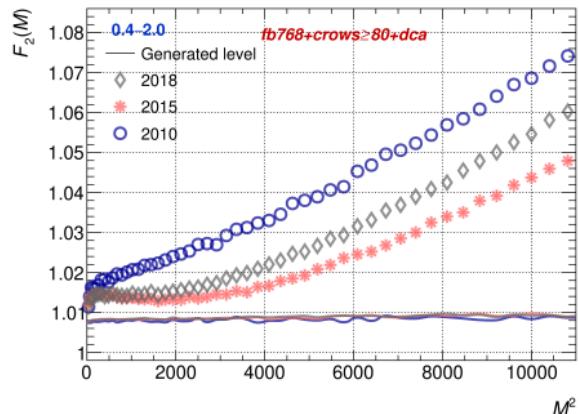
cut taken from analysis note: <https://alice-notes.web.cern.ch/node/736>.



# fb768 ( $0.4 \leq p_T \leq 2.0$ ) with multiple cuts

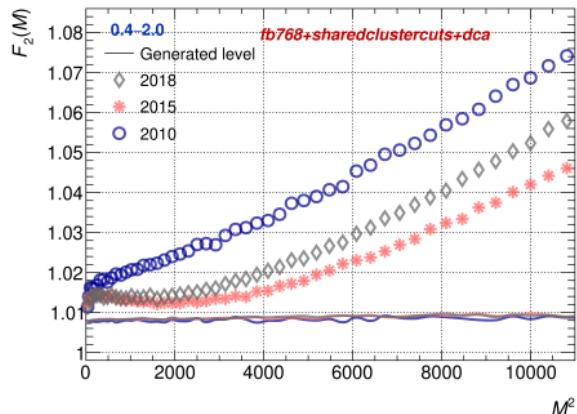


fb768 with DCA cut

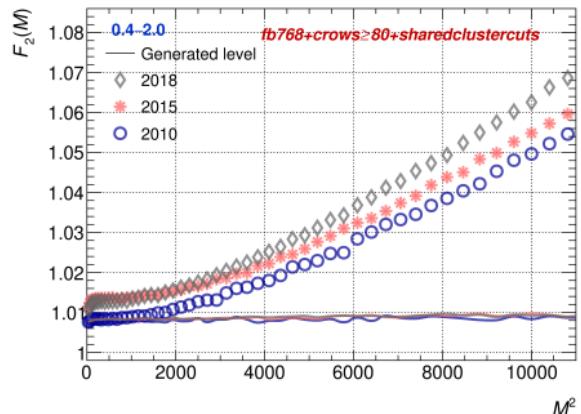


fb768 wih DCA cut and tpc #crossed rows  $\geq 80$

# fb768 ( $0.4 \leq p_T \leq 2.0$ ) with multiple cuts

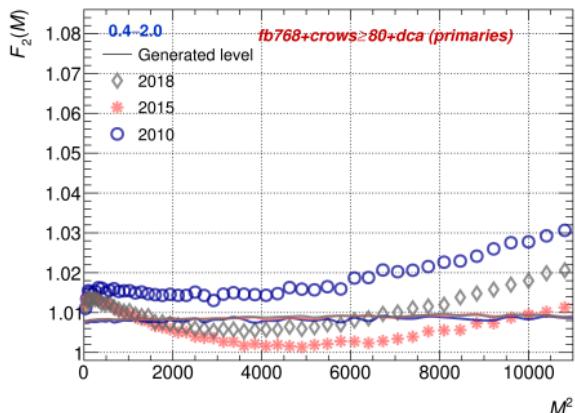


fb768 with DCA cut and  
sharedclusters cuts

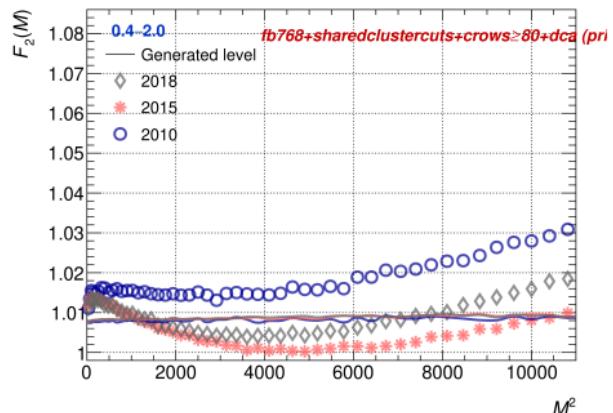


fb768 wih shared clusters cuts and tpc  
#crossed rows  $\geq 80$

# fb768 ( $0.4 \leq p_T \leq 2.0$ ) with multiple cuts (primaries only)

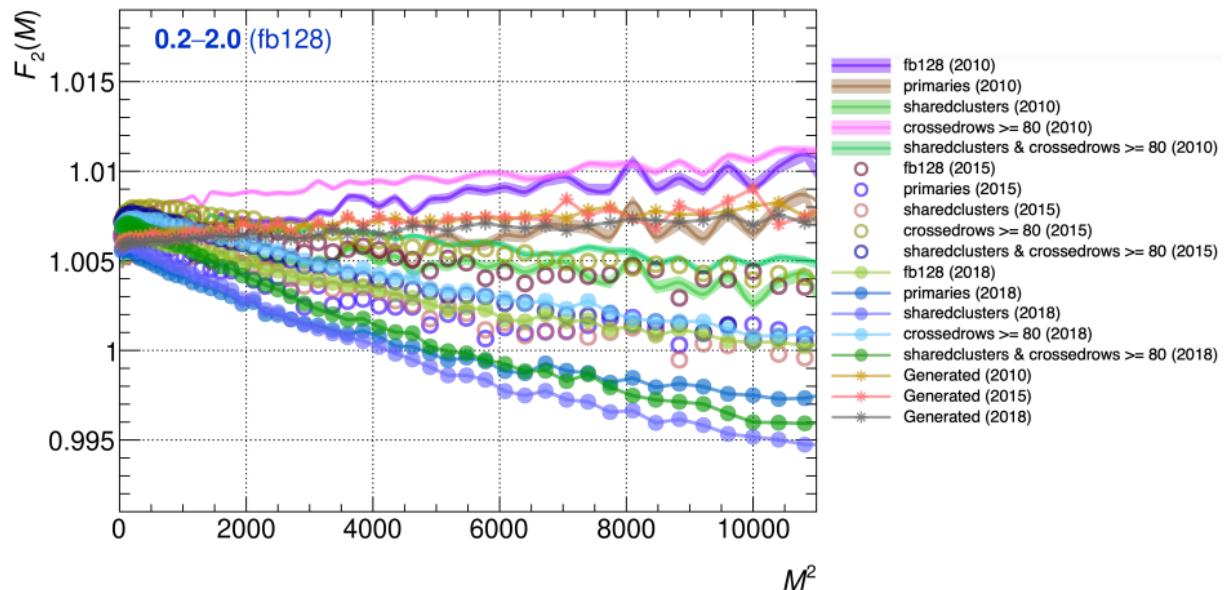


fb768 with DCA cut and tpc #crossed rows  $\geq 80$

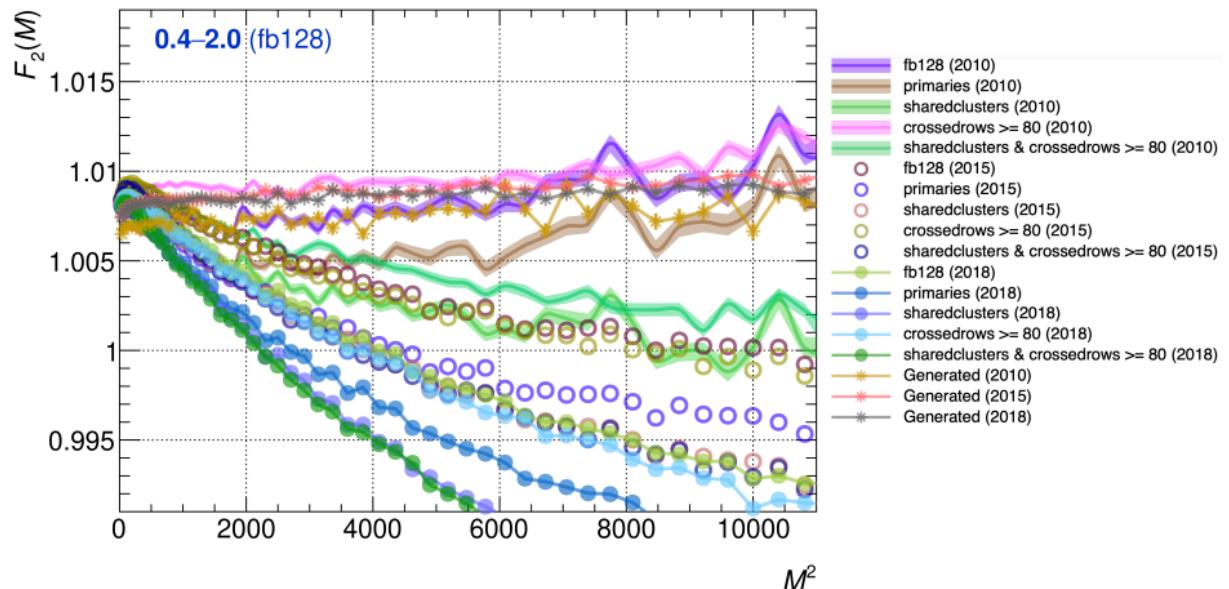


fb768 with DCA cut, shared clusters cuts and tpc #crossed rows  $\geq 80$

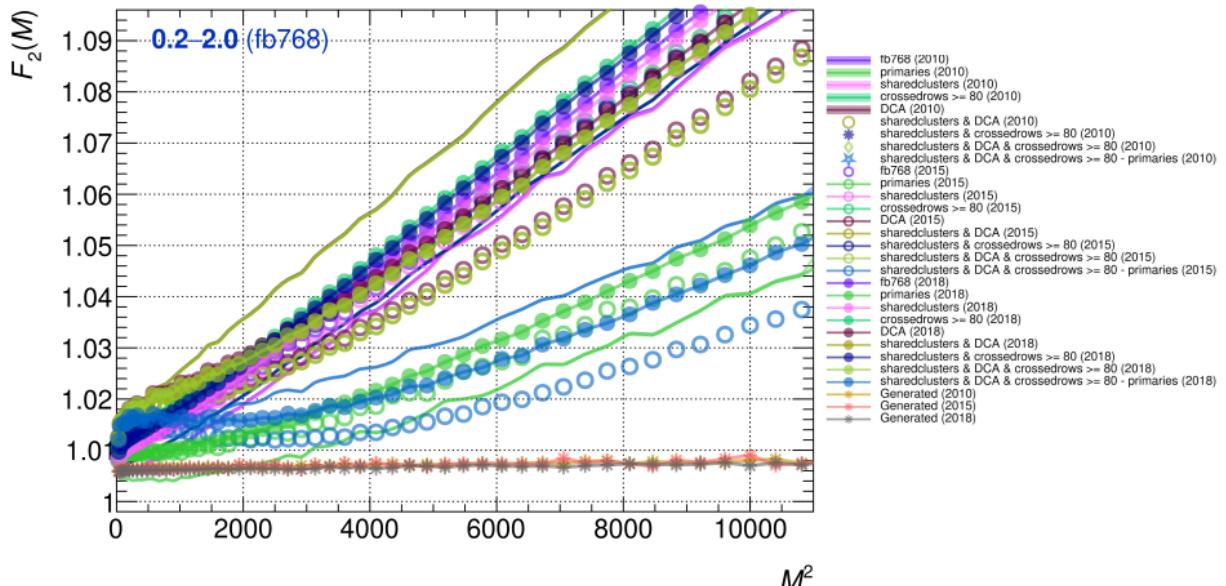
# Final fb128 ( $0.2 \leq p_T \leq 2.0$ )



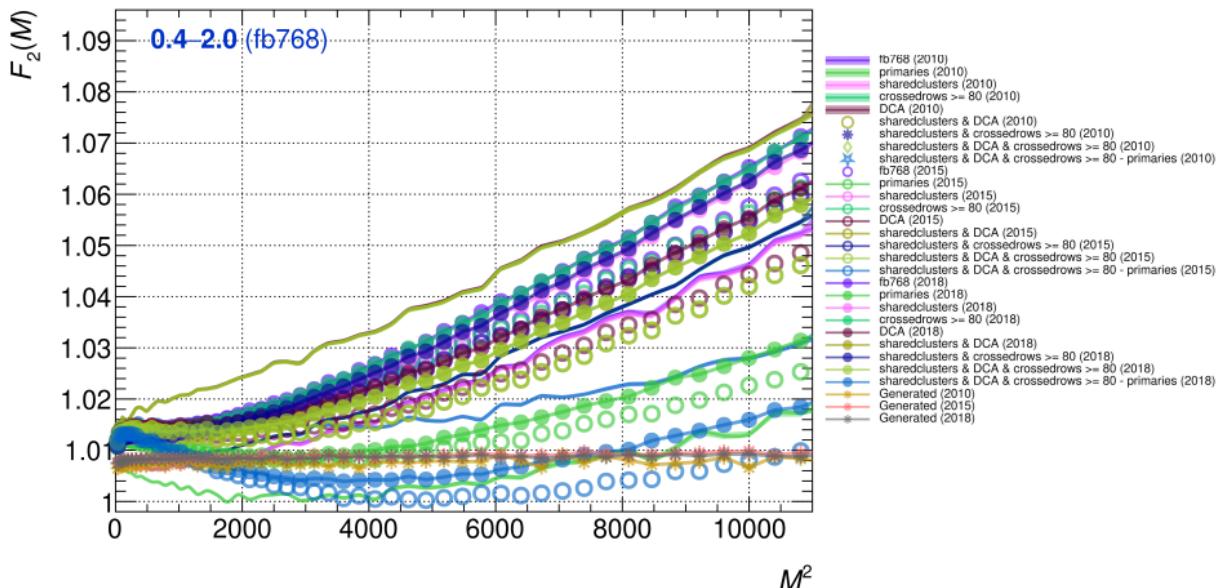
# Final fb128 ( $0.4 \leq p_T \leq 2.0$ )



# Final fb768 ( $0.2 \leq p_T \leq 2.0$ )



# Final fb768 ( $0.4 \leq p_T \leq 2.0$ )



# Conclusions

# Conclusions

- filterbits (128 and 768) studied for Pb–Pb HIJING datasets of 2010 (2.76 TeV), 2015 (5.02 TeV) and 2018 (5.02 TeV):
  - QA within  $|v_z| < 10$ ,  $|\eta| < 0.8$ , 0–10% central events of each dataset.
  - closure behaviour of  $F_q(M)$  within  $|v_z| < 10$ ,  $|\eta| < 0.8$ ,  $p_T$  ranges: 0.2–2.0 and 0.4–2.0, and most central 0–5% events.
- fb128 method unreliable in AODs. Manual cuts work but show higher contamination (material + weak decays) across datasets. Good baseline closure for 2010 but trends alike.
- fb768 cleaner but poorer closure baseline.
- TPC shared cluster cuts used to mitigate track splitting/merging effects:  
 $\#sharedclusters/\#clusters \leq 0.3$ ,  $\#sharedclusters/\#crossedRows \leq 0.25$ , and  
 $\#findableclusters/\#clusters \geq 0.8$ . fb768 closure improves consistently with TPC clusters cuts, worsens for fb128.
- $p_T$  dependent DCA<sub>xy</sub> cuts used:
  - Combined with  $\#crossedRows \geq 80$  and shared-clusters cuts → best performance for fb768.

**Thank you**