

# $\pi^0$ yield run dependence

**Justin Stevens**

**Analysis Meeting: 9.13.17**

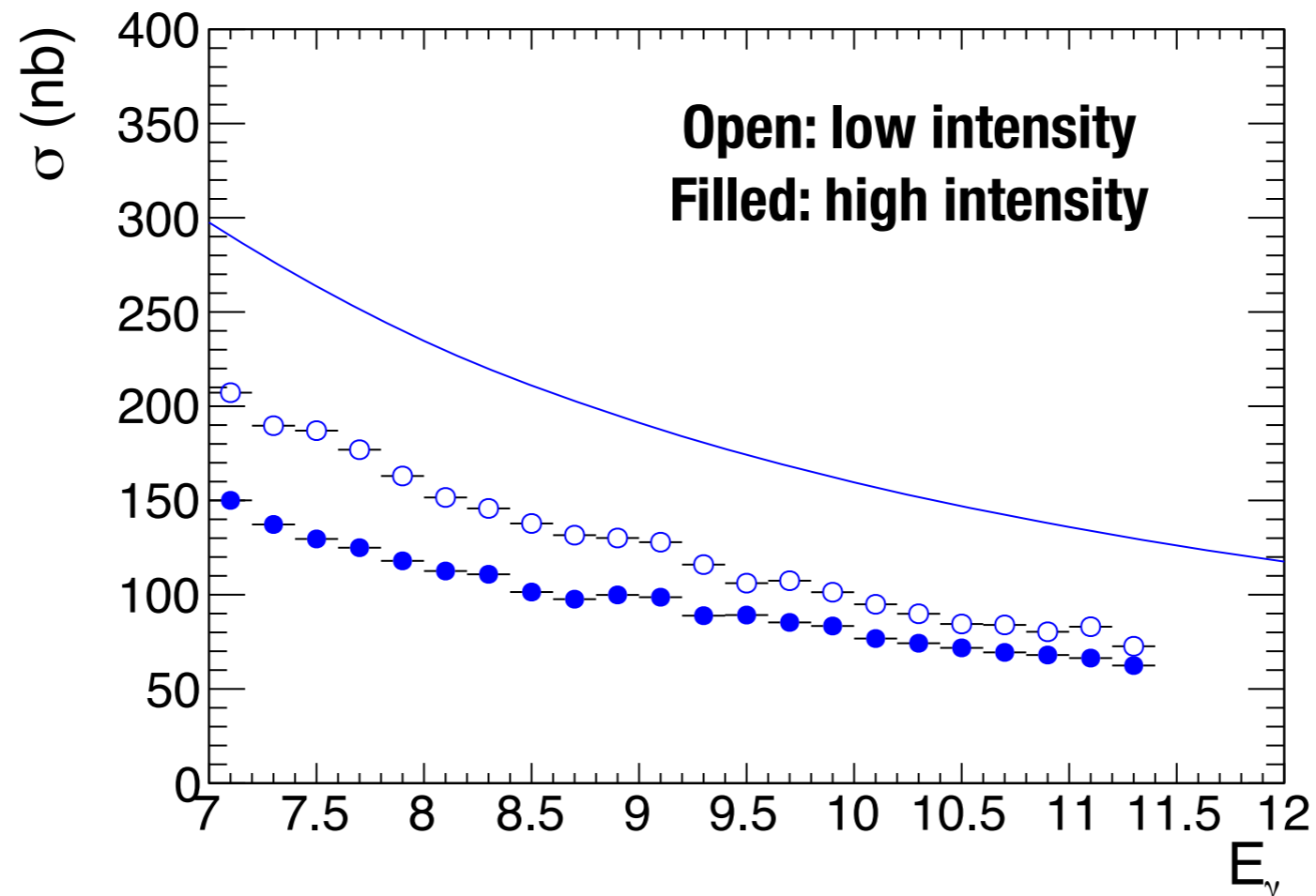


**WILLIAM & MARY**

CHARTERED 1693

# Initial goal: understand 2017 difference

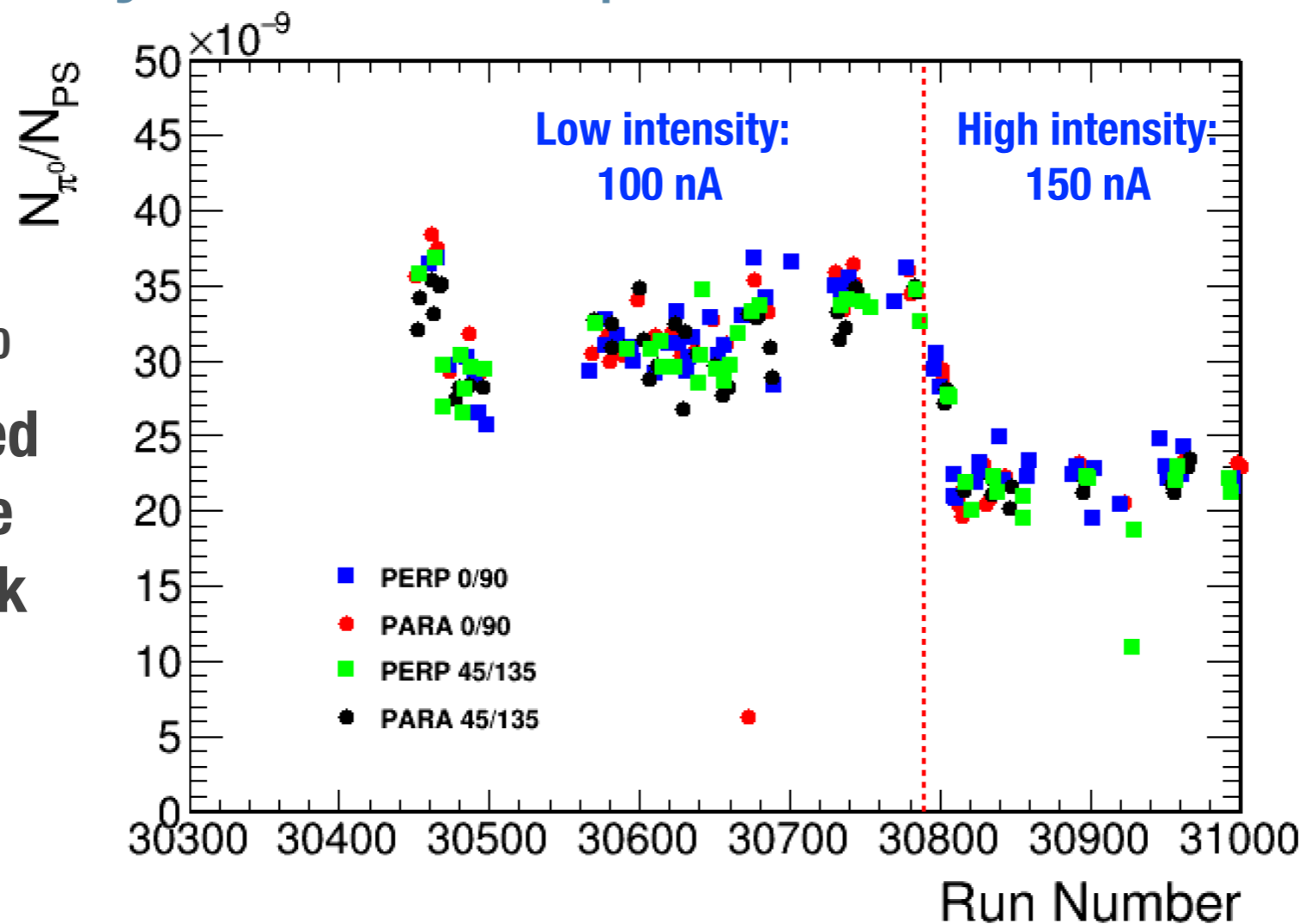
**Spring 2017:**  $\gamma p \rightarrow p\pi^0$



- \* No clear indication that flux or MC efficiency can produce such a large discrepancy for only 50% larger intensity
- \* Try breaking it down by individual runs...

# Run-by-run comparison: $N_{\pi^0}/N_{PS}$

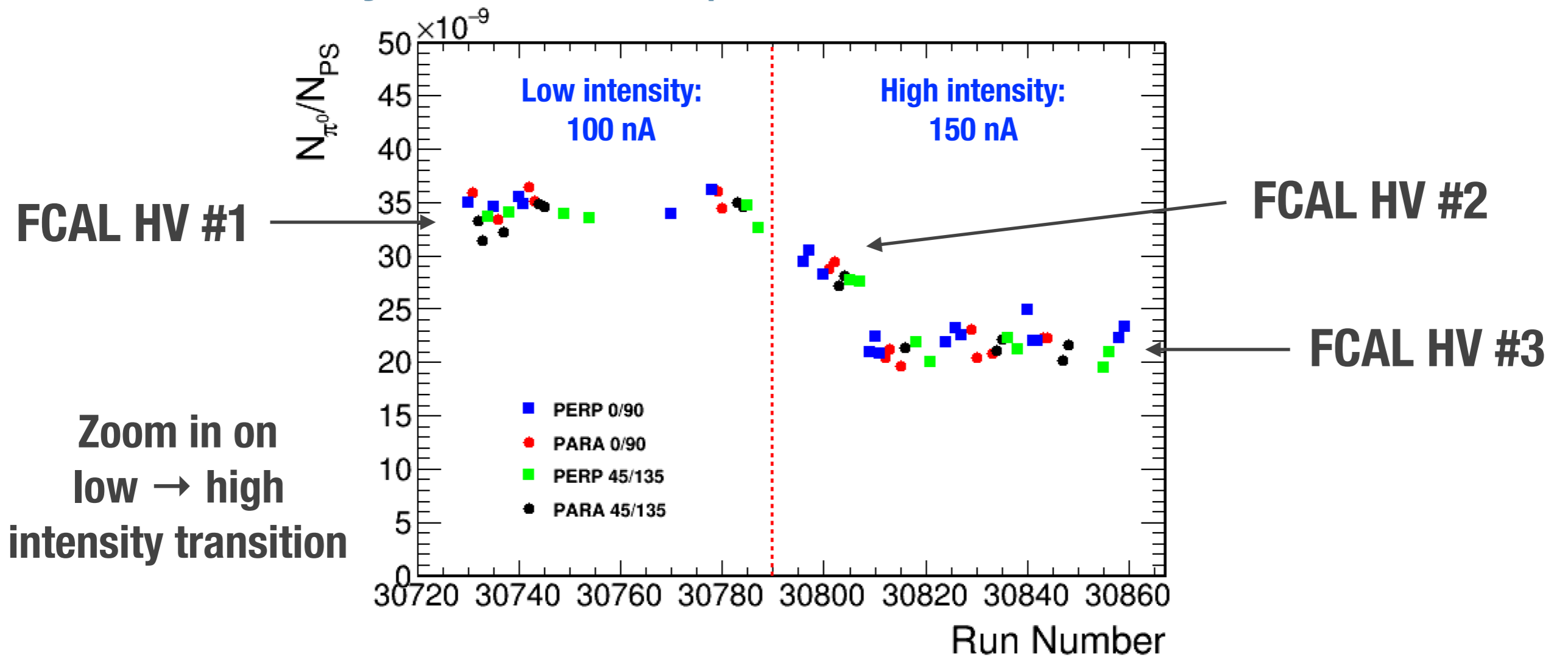
Normalize  $\pi^0$  yield by tagged PS flux in the coherent peak



RunNumber	Beam Current (nA)	FCAL HV Set	TAGM bias/ threshold Set	Low-E TAGH HV
30274-30788	100	1	1	On
30789-30807	150	2	2	Off
30808-31057	150	3	2	Off

[https://halldweb.jlab.org/wiki-private/index.php/Spring\\_2017\\_Dataset\\_Summary#Global\\_Events](https://halldweb.jlab.org/wiki-private/index.php/Spring_2017_Dataset_Summary#Global_Events)

# Run-by-run comparison: $N_{\pi^0}/N_{PS}$

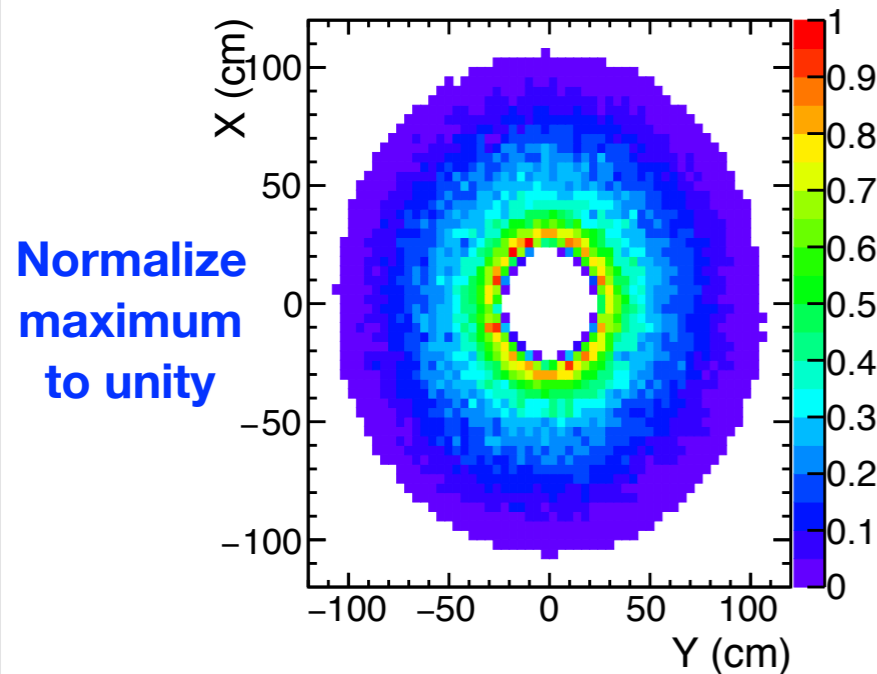


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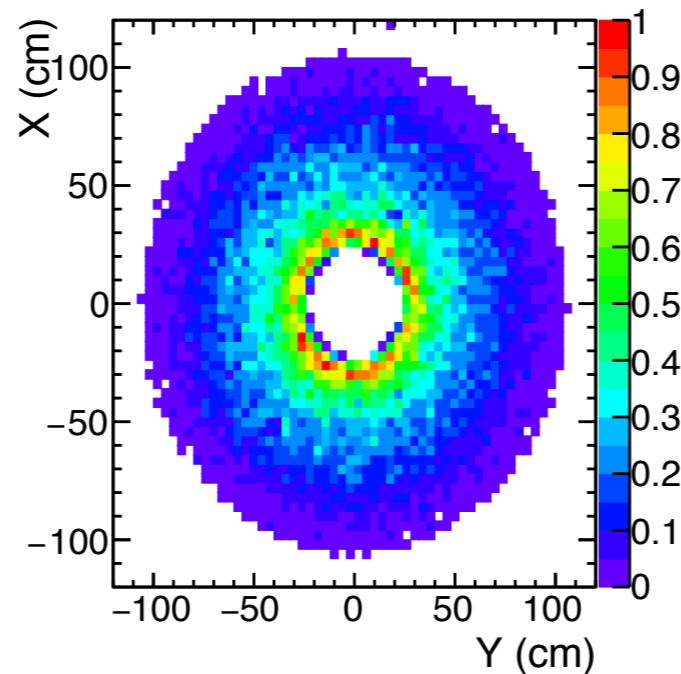
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# FCAL shower XY position: $\pi^0$ events

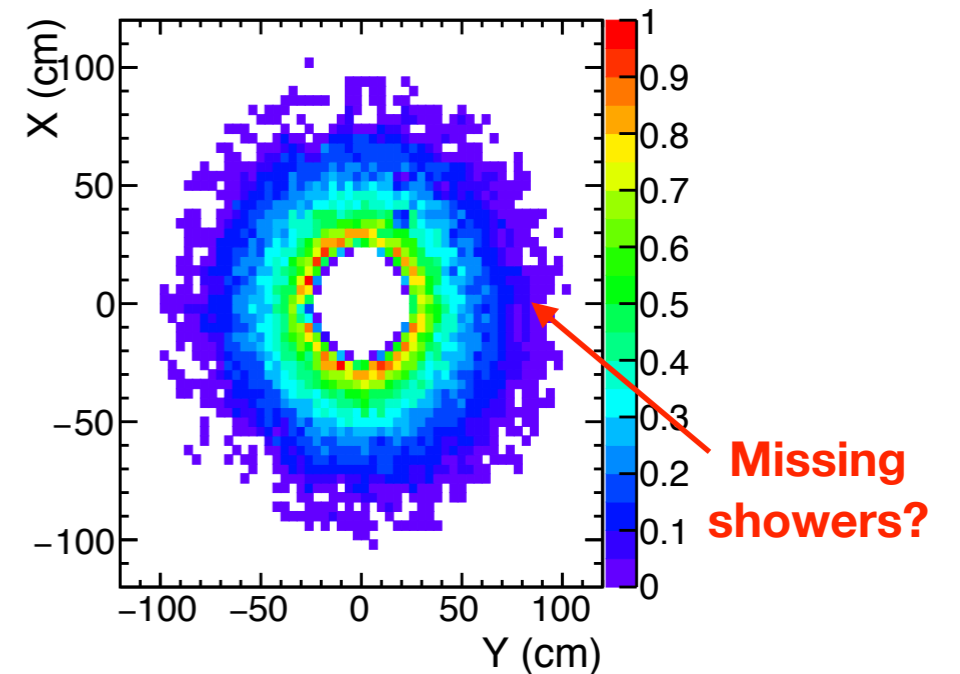
**FCAL HV #1**  
**30700-30788**



**FCAL HV #2**  
**30796-30807**



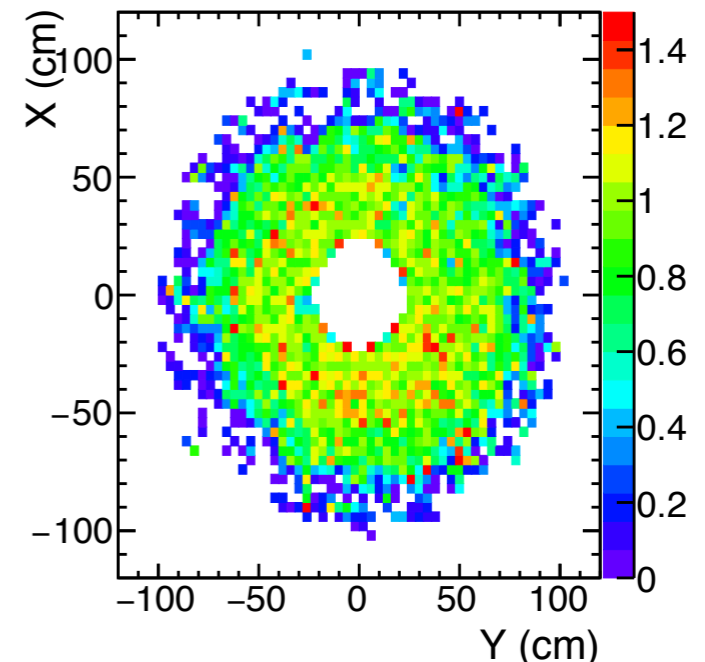
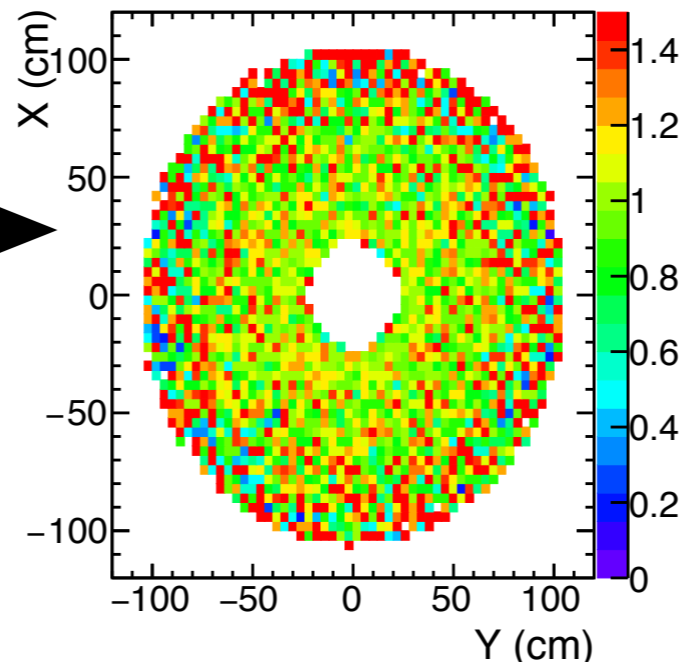
**FCAL HV #3**  
**30806-30860**



**Take ratio w.r.t.**  
**FCAL HV #1**

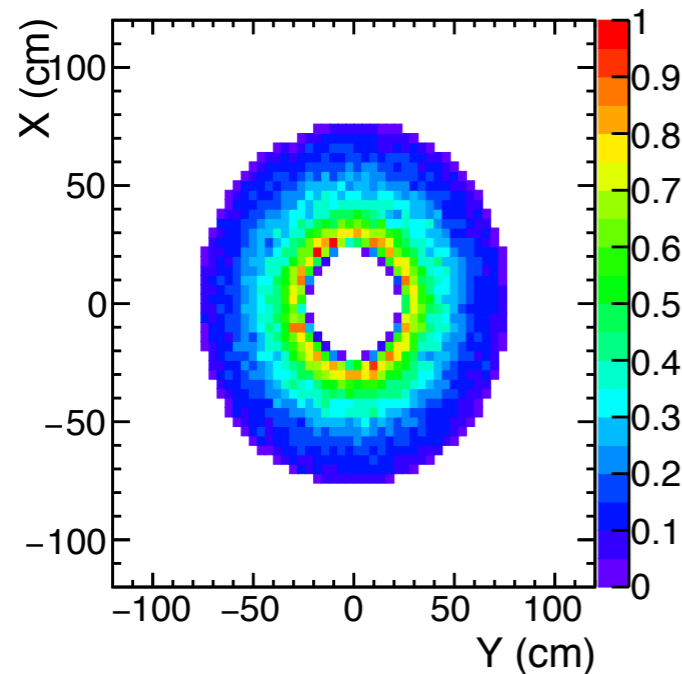


**Showers at larger radii are lost in FCAL HV set #3**

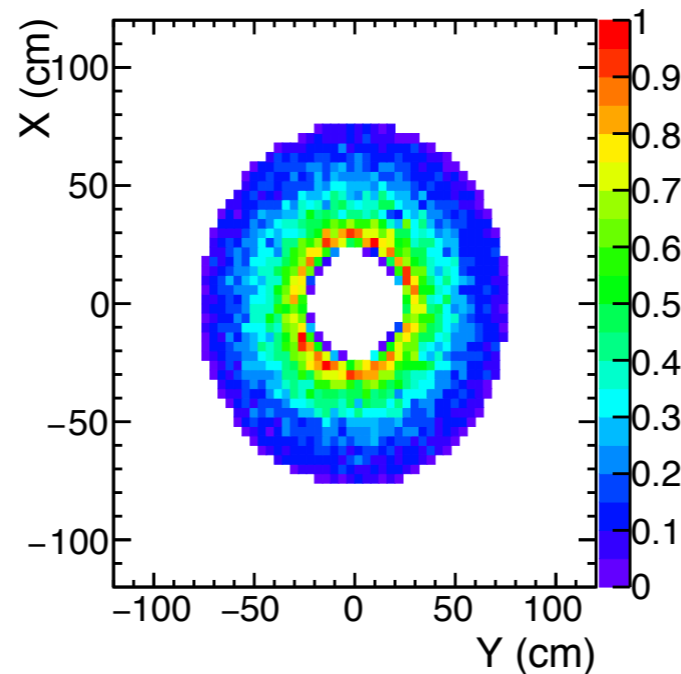


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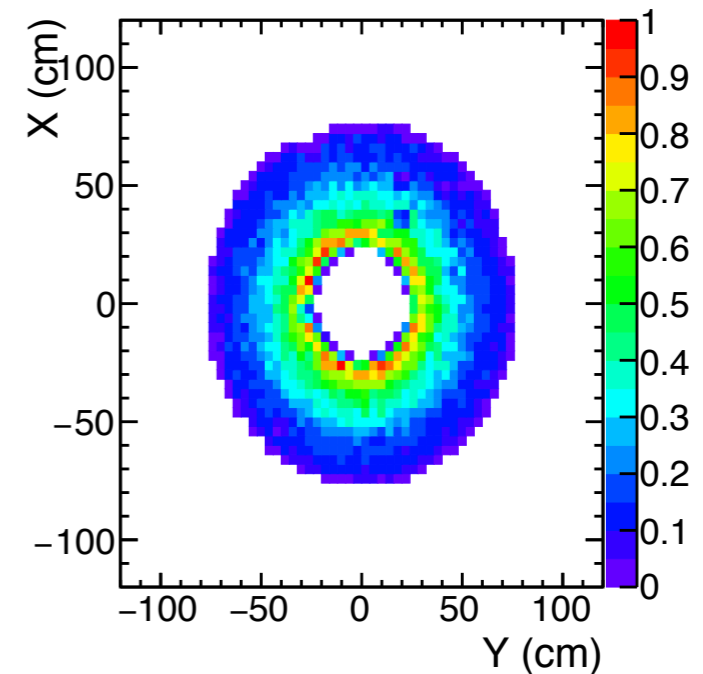
**FCAL HV #1  
30700-30788**



**FCAL HV #2  
30796-30807**

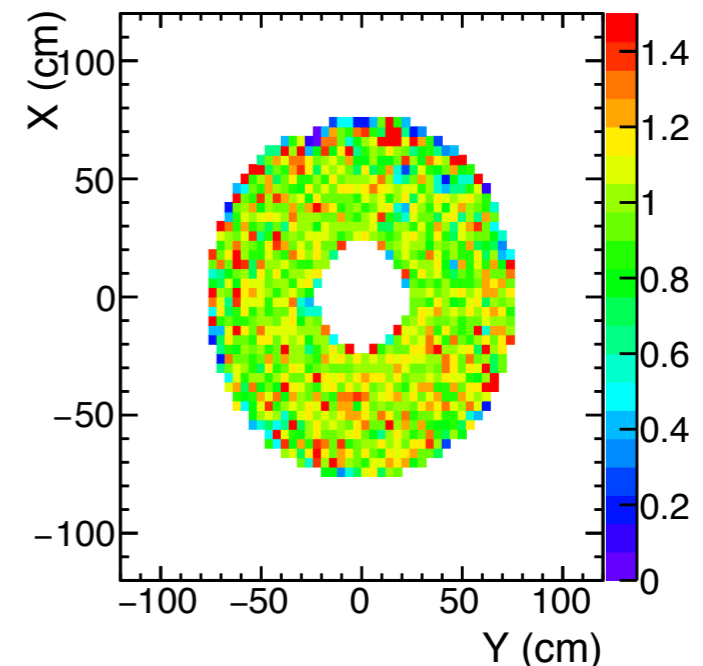
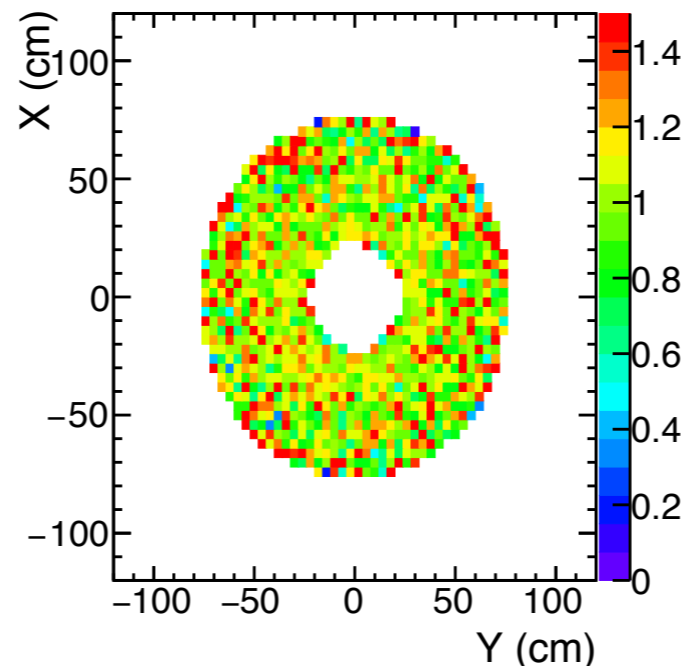


**FCAL HV #3  
30806-30860**

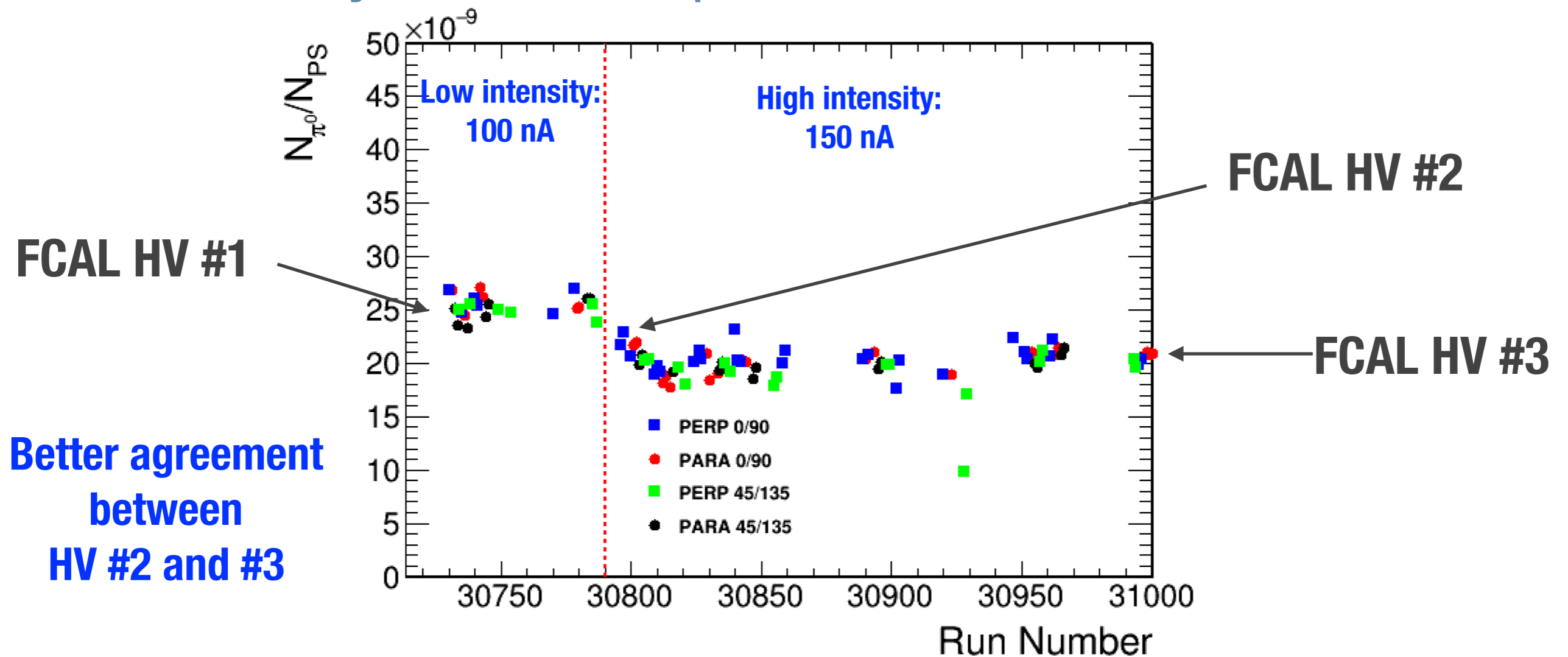


**Make a fiducial cut  
to remove all showers  
with  $R_{XY} > 75$  cm**

**Then compare  
normalized  $\pi^0$  yields**



# Run-by-run comparison: $N_{\pi^0}/N_{PS}$



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# Summary

- \* Observed changes in normalized  $\pi^0$  yield with FCAL HV settings near low  $\rightarrow$  high intensity transition
- \* Showers from the  $\pi^0$  events in the outer radius of the FCAL seem to be suppressed in HV set #3
- \* A fiducial cut on to exclude the outer radius brings the HV #2 and #3 into reasonable agreement
- \* Interest in comparing to all charged channels which may be less sensitive to FCAL HV
  - \* Or they may have larger trigger-dependent effects?