

π^0 yield run dependence

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Analysis Meeting: 9.13.17

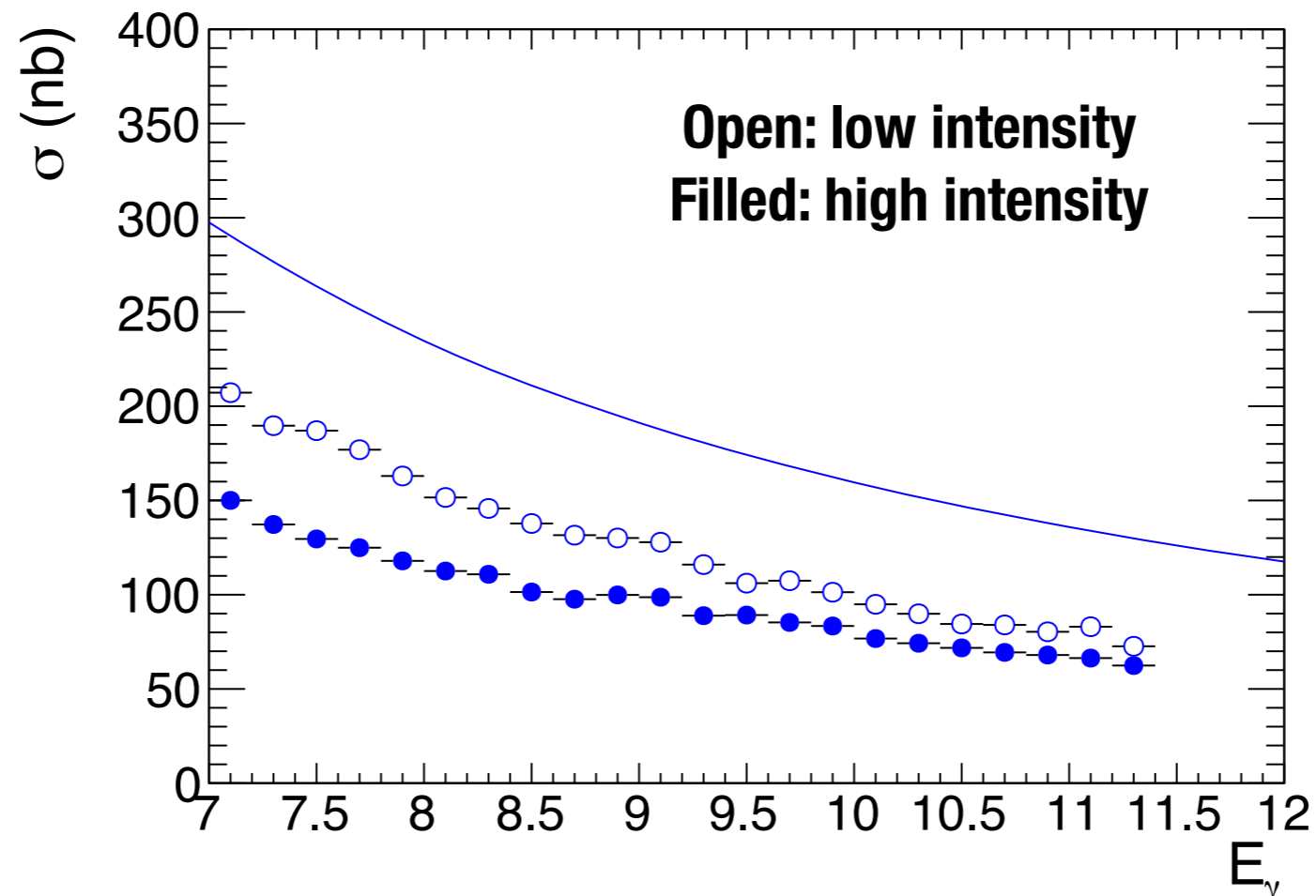


WILLIAM & MARY

CHARTERED 1693

Initial goal: understand 2017 difference

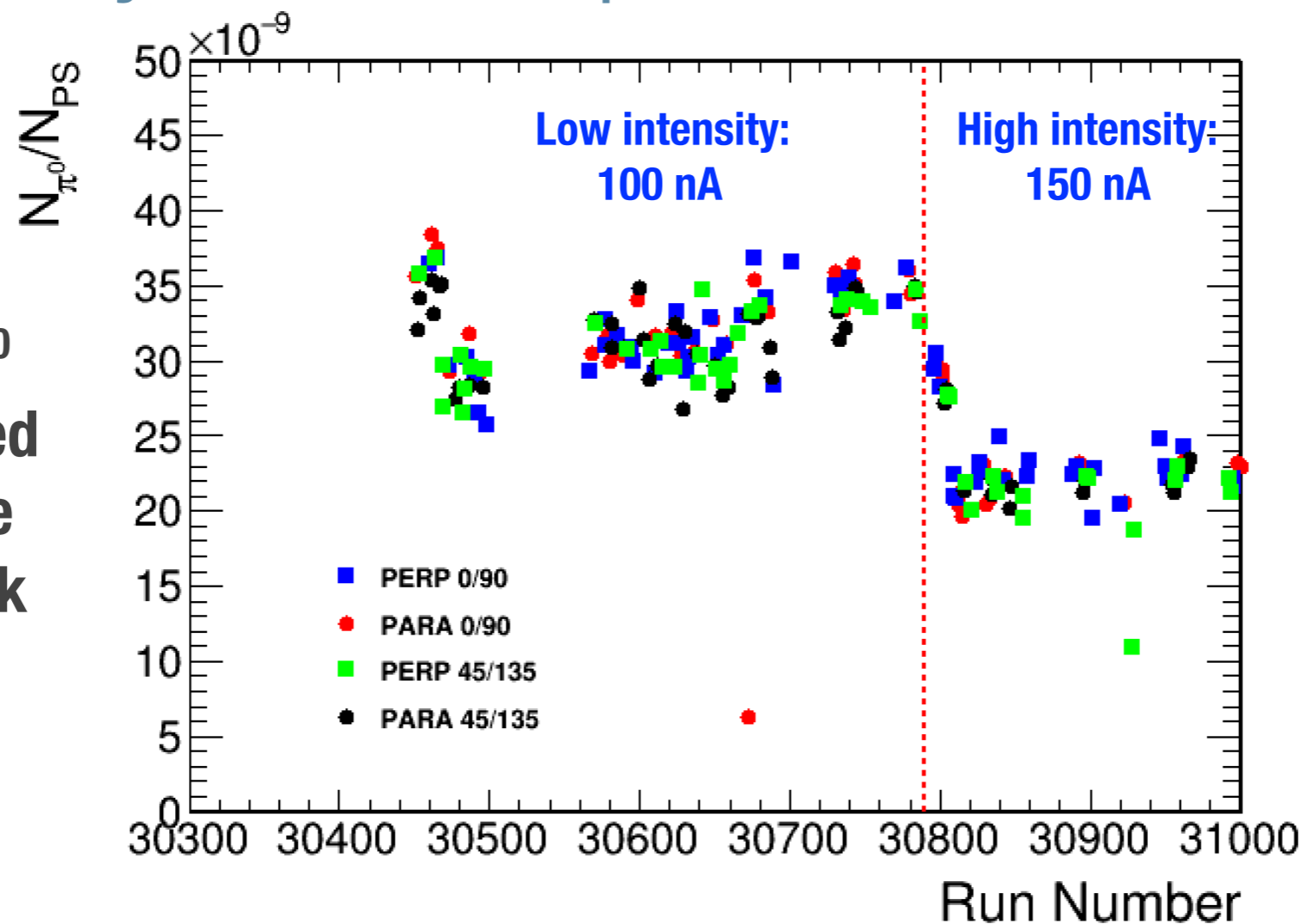
Spring 2017: $\gamma p \rightarrow p\pi^0$



- * 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_{π^0}/N_{PS}

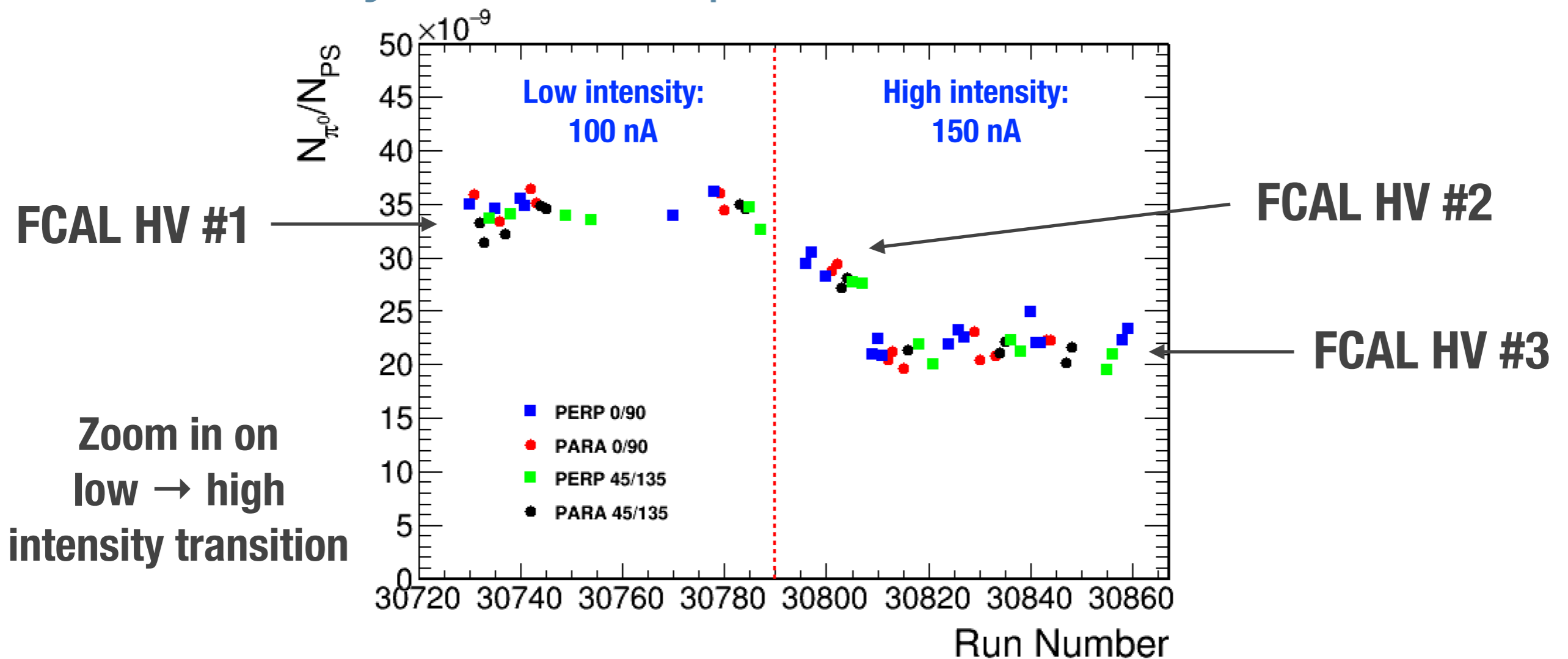
Normalize π^0 yield by tagged PS flux in the coherent peak



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

Run-by-run comparison: N_{π^0}/N_{PS}

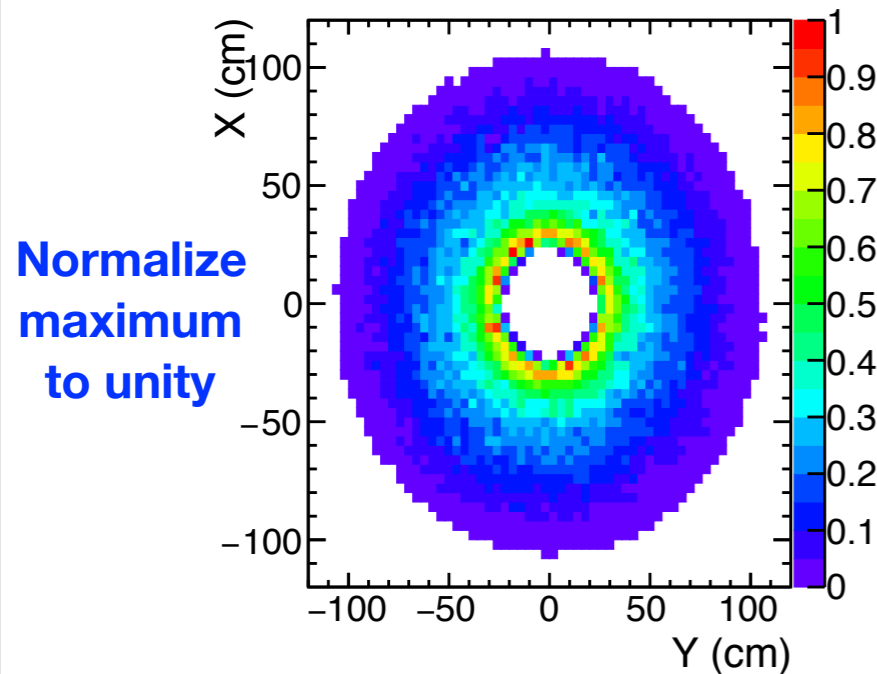


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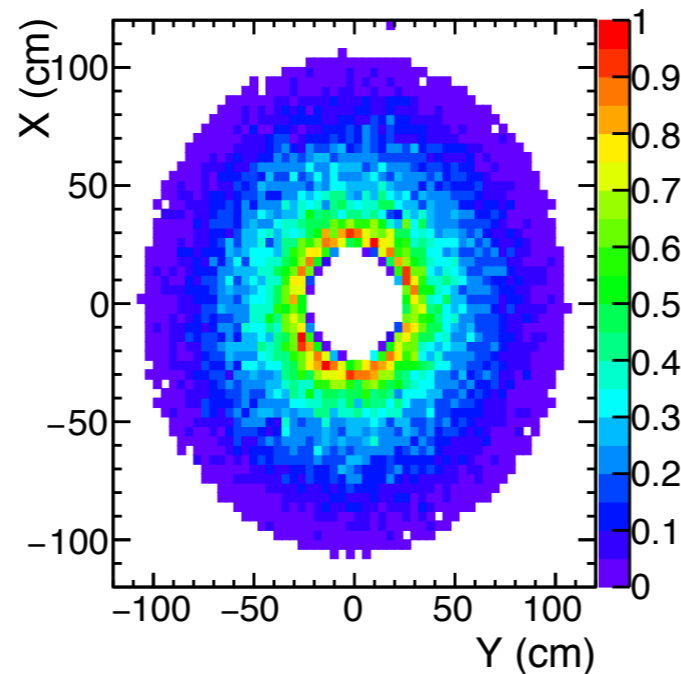
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FCAL shower XY position: π^0 events

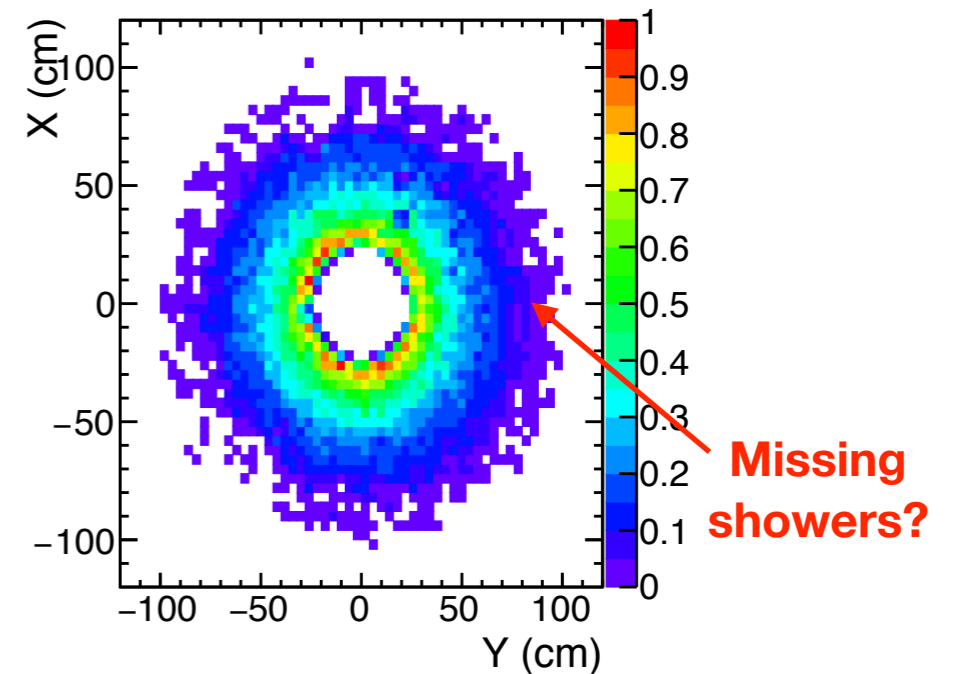
FCAL HV #1
30700-30788



FCAL HV #2
30796-30807



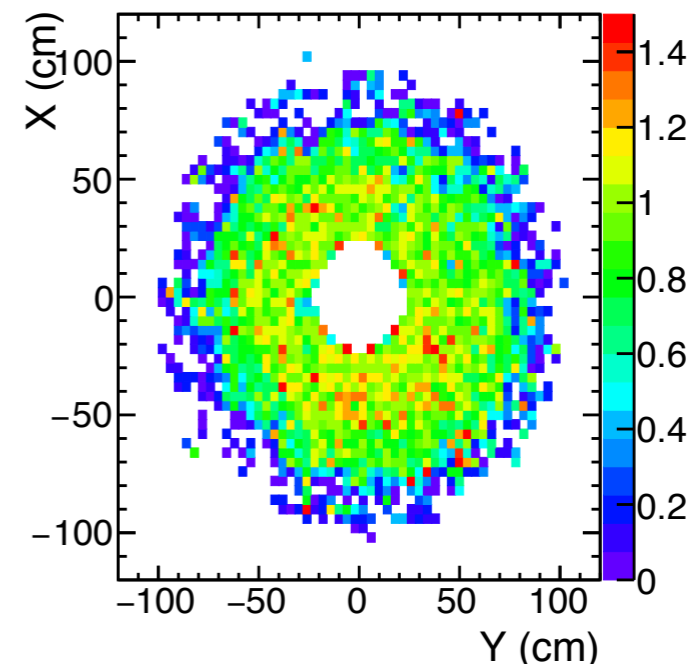
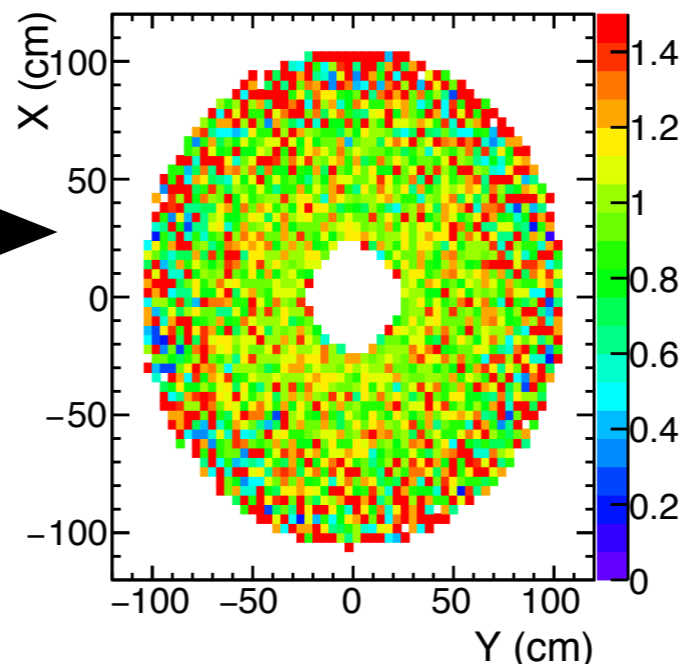
FCAL HV #3
30806-30860



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

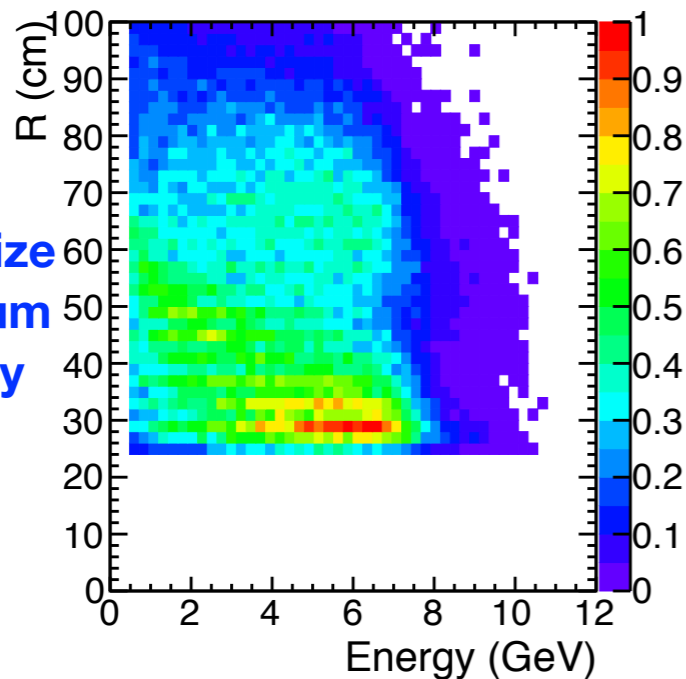


Showers at larger radii are lost in FCAL HV set #3



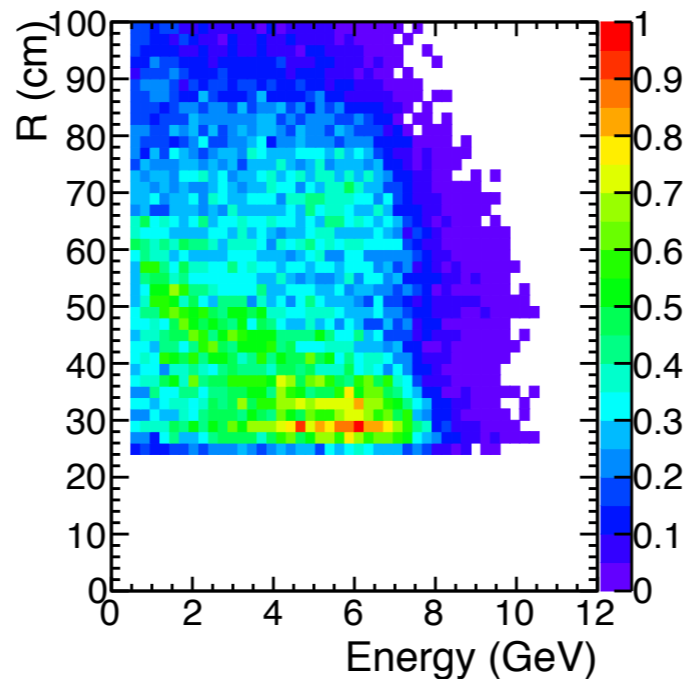
FCAL shower XY position: π^0 events

FCAL HV #1
30700-30788

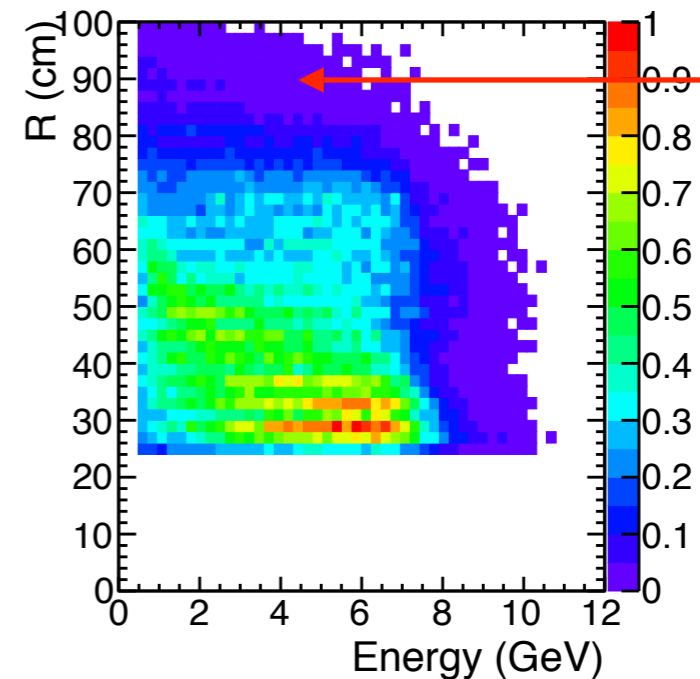


Normalize
maximum
to unity

FCAL HV #2
30796-30807



FCAL HV #3
30806-30860

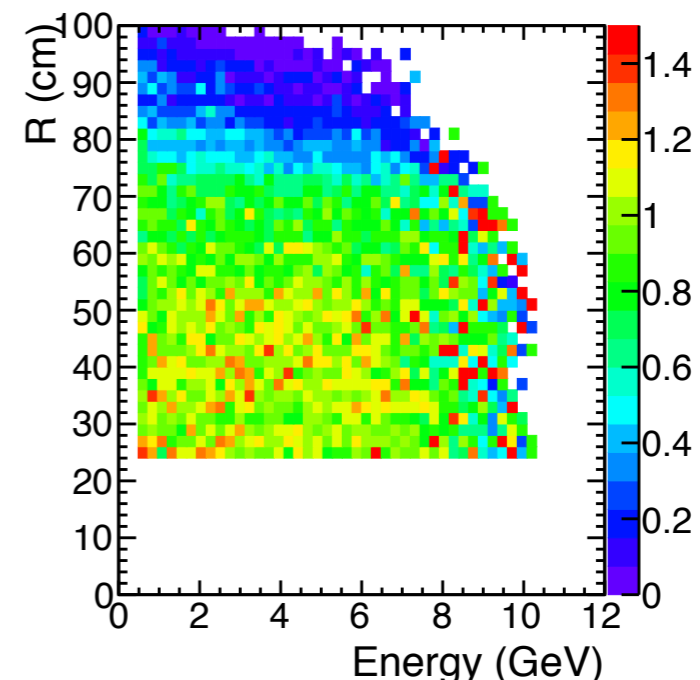
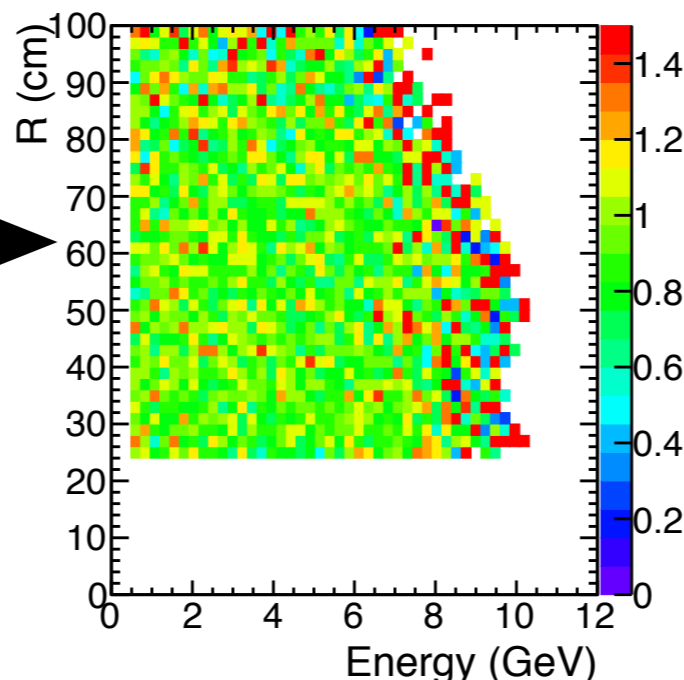


Missing
showers?

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

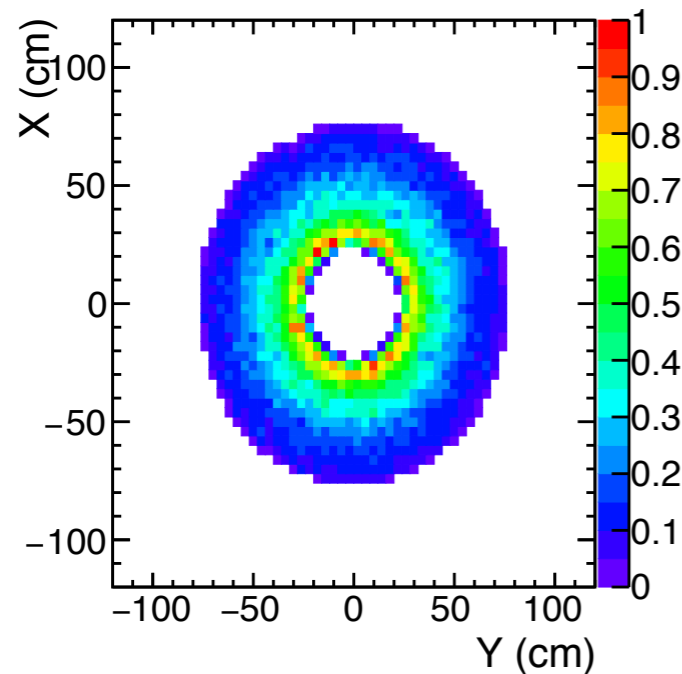


Showers at larger
radii are lost in
FCAL HV set #3

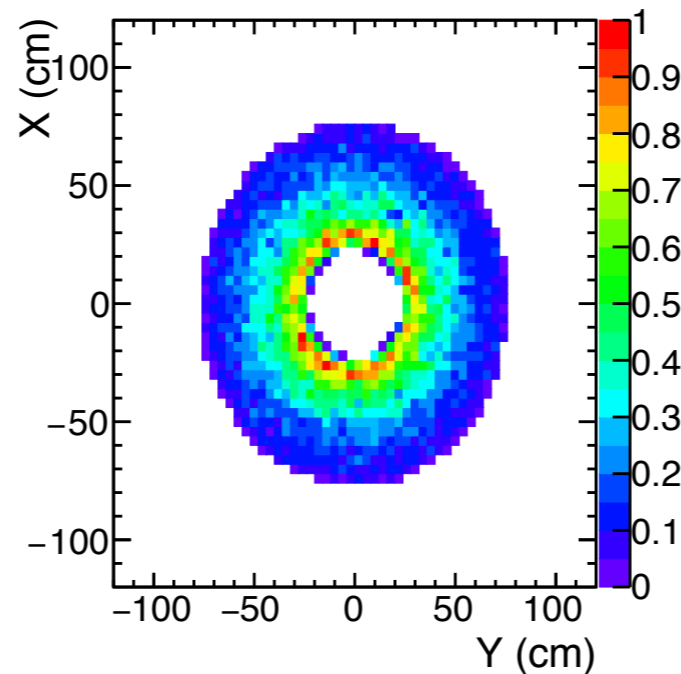


FCAL shower XY position: π^0 events

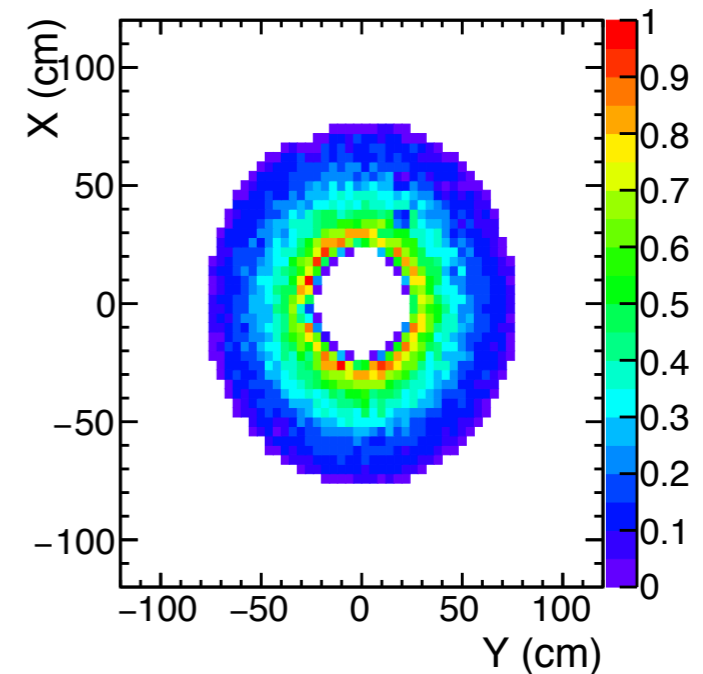
**FCAL HV #1
30700-30788**



**FCAL HV #2
30796-30807**

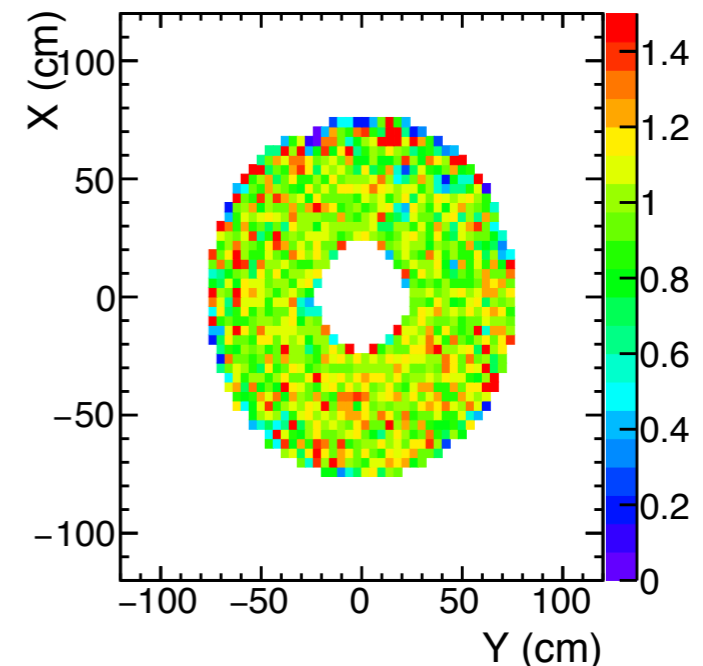
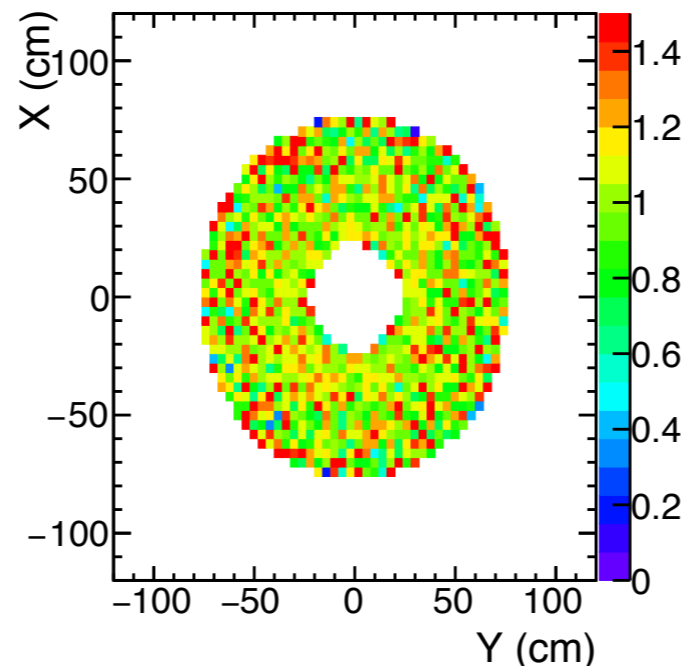


**FCAL HV #3
30806-30860**

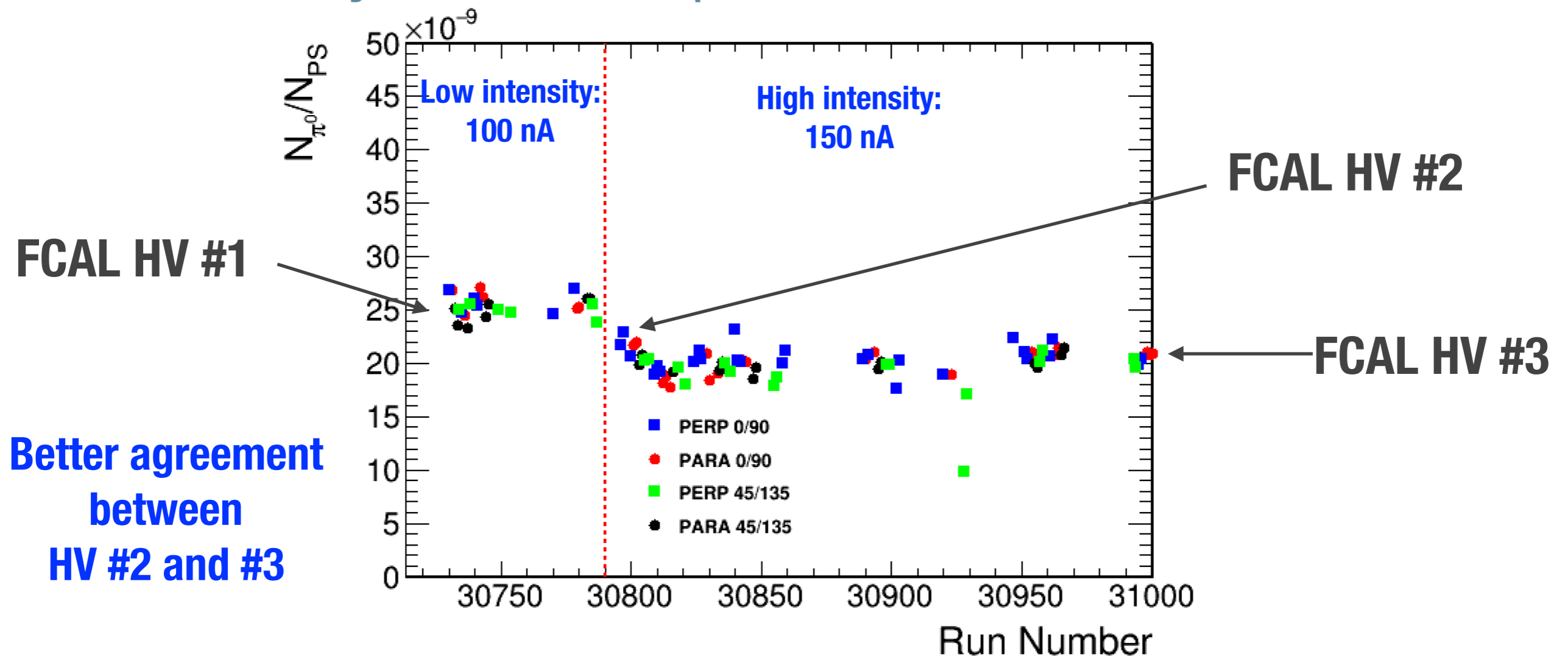


**Make a fiducial cut
to remove all showers
with $R_{XY} > 75$ cm**

**Then compare
normalized π^0 yields**



Run-by-run comparison: N_{π^0}/N_{PS}



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Relevant FCAL CCDB tables

FCAL/gains

30000	30606	2017-04-04 08:27:21	default	view
30607	30788	2017-04-04 08:27:44	default	view
30789	30807	2017-04-04 08:28:19	default	view
30808	30991	2017-04-04 08:28:48	default	view
30992	2147483647	2017-04-04 08:29:15	default	view

FCAL/shower_calib_pieewise

30000	30807	2017-04-04 08:32:59	default	view
30808	2147483647	2017-04-04 08:33:12	default	view

- * Gain were calibrated for each HV set independently
- * Non-linear correction different for HV set #3

Summary

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