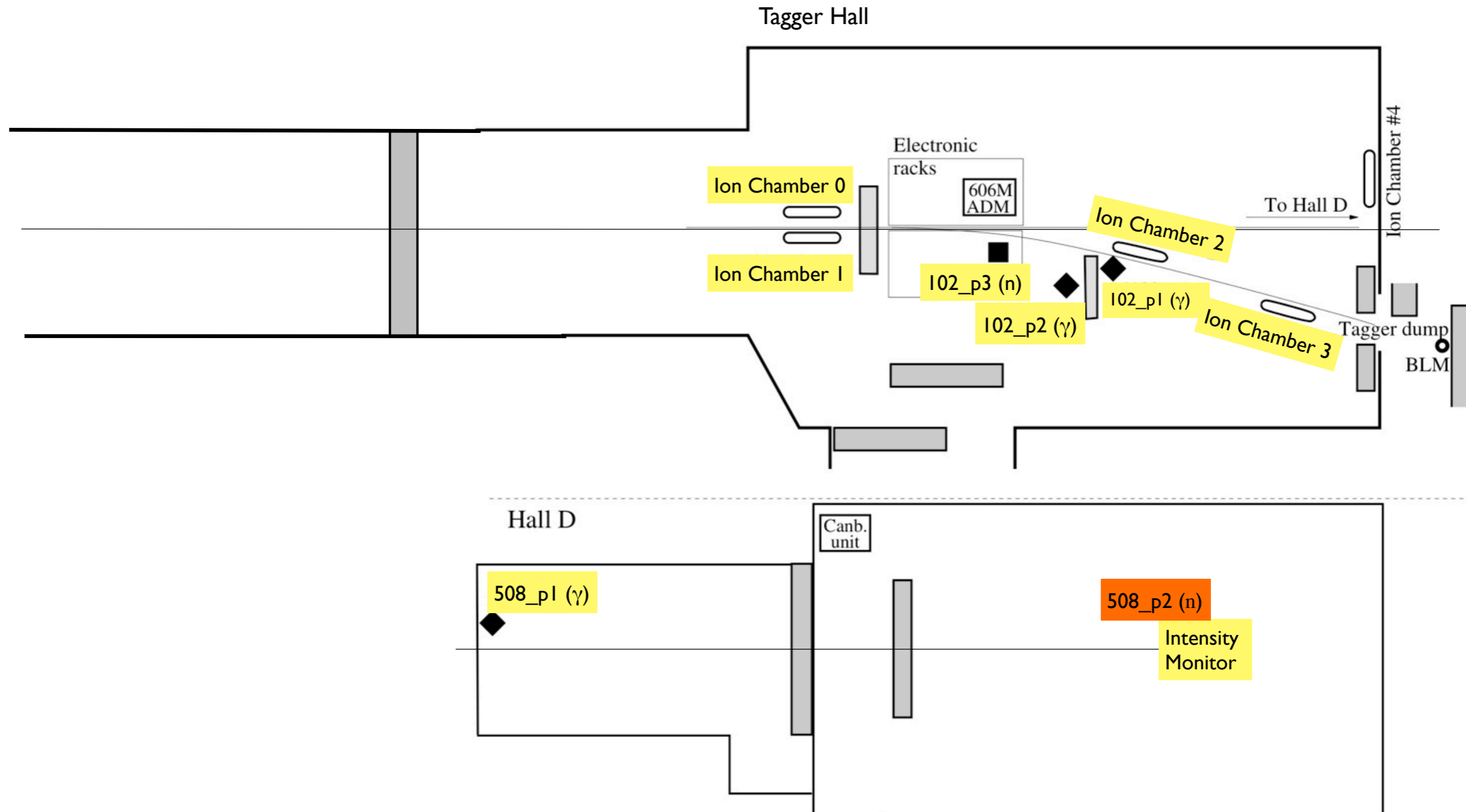


# Background conditions in tagger vault and collimator cave during the 2015 Fall run.

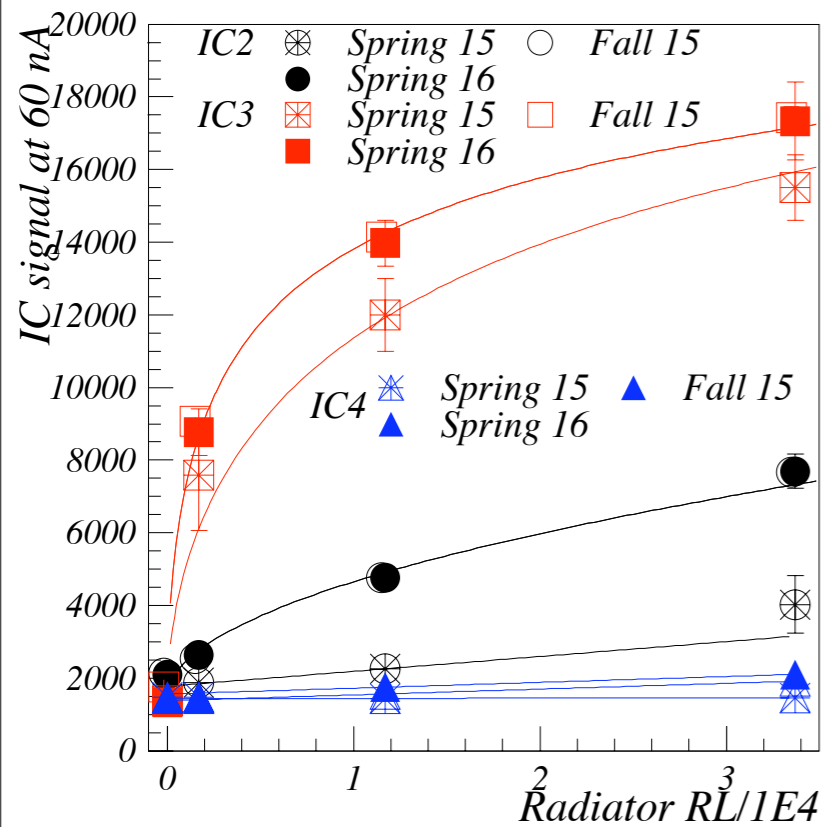
A. Deur

# Devices relevant to this analysis



# Comparing Spring15 (5.5 GeV) and Fall15/Spring16 (12 GeV)

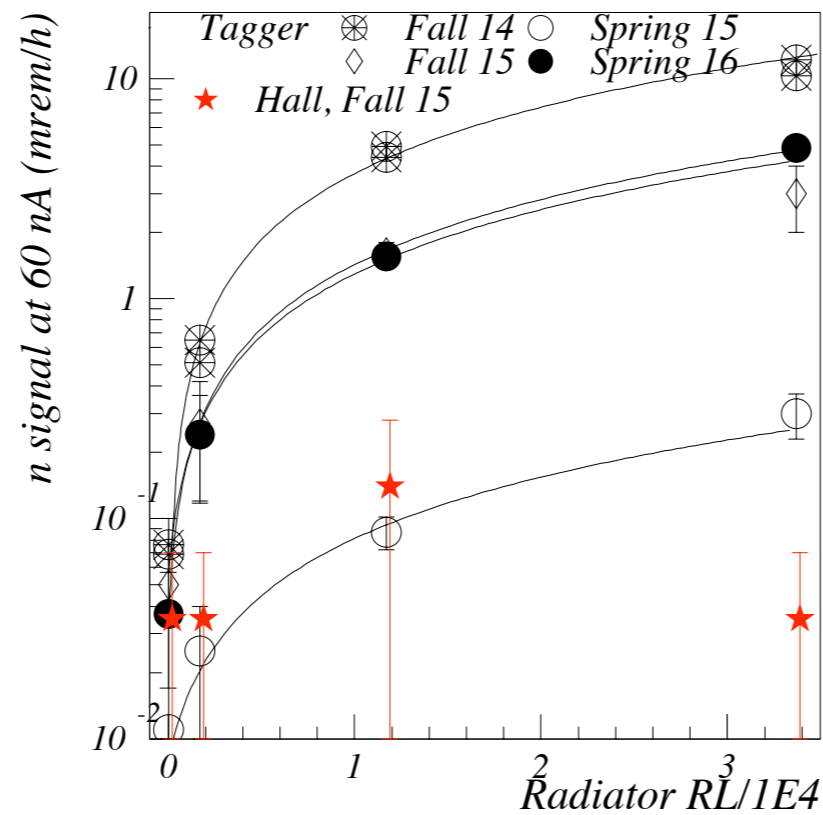
## Ion chamber dependences with radiator thickness



- Similar levels in Fall 15 and Spring 16. Worst than Spring 15. Expected to be due to beam tune.
- See expected log dependence for ICs. Rates now high enough for IC2 to show log dep.
- Spring 15: IC0, IC1, IC4 insensitive to RL or beam current (unless the beam is not well tuned). Fall 15: IC4 sensitive to both.

# Comparing Fall 14 (10.1 GeV) Spring 15 (5.5 GeV) and Fall 15/Spring 16 (12 GeV)

## Neutron signal dependences with radiator thickness

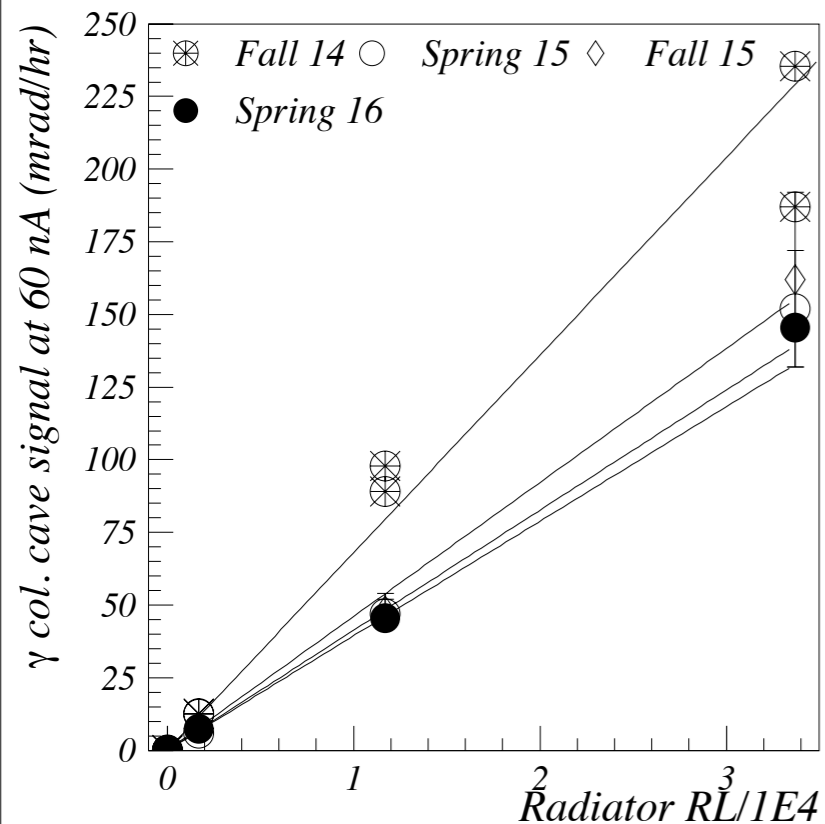


- (approx. values for Fall 14. no error estimate)
- Similar levels in Fall 15 and Spring 16. Worst than Spring 15. Expected to be due to beam tune.
- See expected linear dependence with RL. New n probe in Hall has large baseline. Evidence of neutrons (worst beam tune?)

# Comparing Fall 14 (10.1 GeV) Spring 15 (5.5 GeV) and Fall 15/Spring 16 (12 GeV)

## Col. cave $\gamma$ -probe dependences with radiator thickness

- (approx. values for Fall 14. no error estimate)
- Similar levels in Fall 15, Spring 16 and Spring 15.
- See expected linear dependence with RL.



# Comparing Fall14 (10.1 GeV) Spring15 (5.5 GeV) and Fall15/Spring16 (12 GeV)

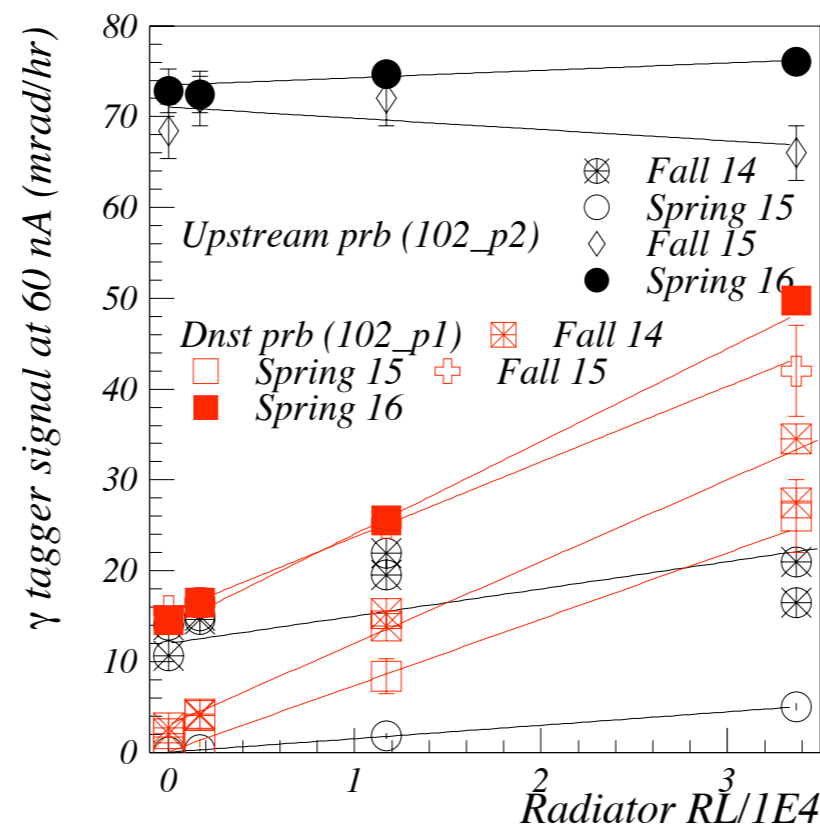
## Tagger $\gamma$ -probe dependences with radiator thickness

•(approx. values for Fall14. no error estimate)

•Similar levels in Fall15 and Spring 16. Worst than Spring 15. Expected to be due to beam tune.

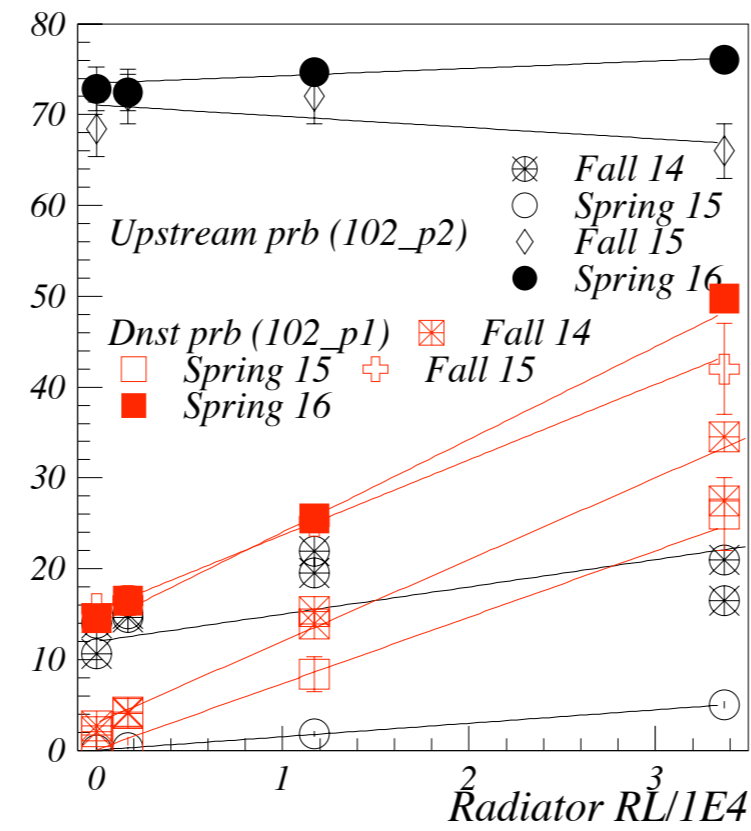
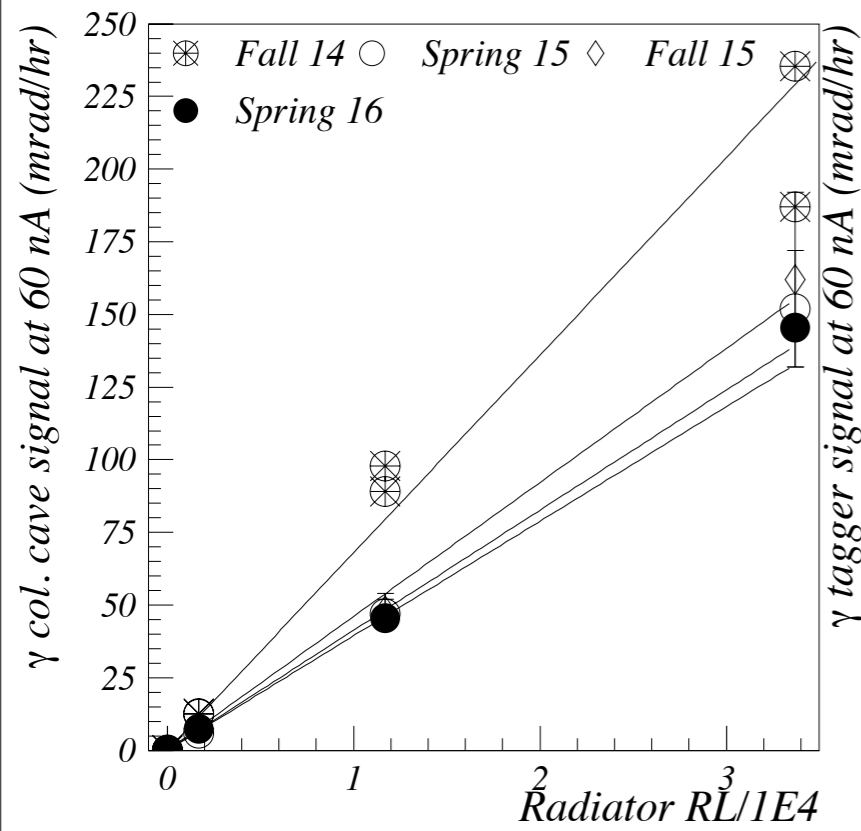
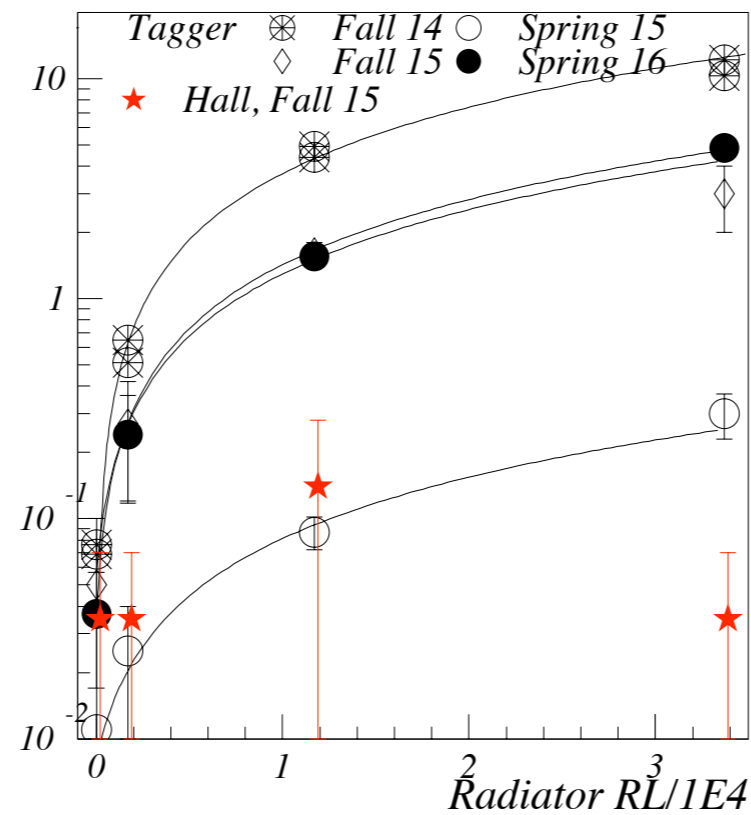
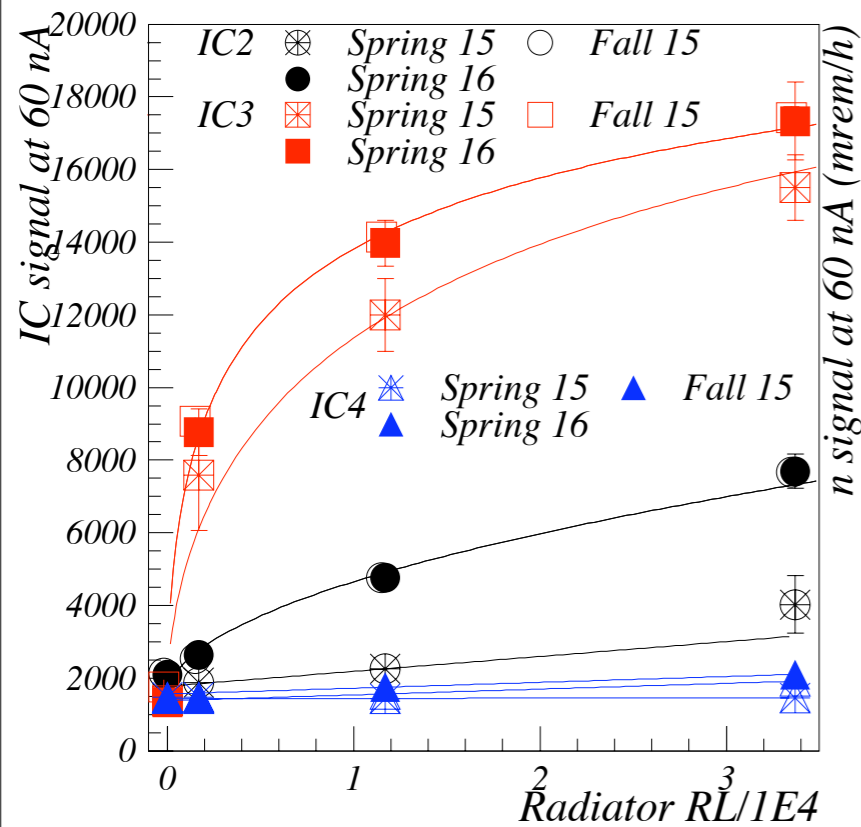
•See expected linear dependence with RL for  $\gamma$ -probe 102\_P1. 102\_P2 linear only in Spring 15.

•Fall14, Fall15, Spring16: 102\_P2 very large and independent of RL. Beam hit tagger entrance? Compatible with low energy electrons background sometimes seen in hodoscope. (Spring15 RL-dependence fixed by adding tagger shielding)



# Comparing Fall 14 (10.1 GeV) Spring 15 (5.5 GeV) and Fall 15/Spring 16 (12 GeV)

## Rad. monitor dependences with radiator thickness



•(approx. values for Fall 14. no error estimate)

•Similar levels in Fall 15 and Spring 16. Worst than Spring 15. Expected to be due to beam tune.

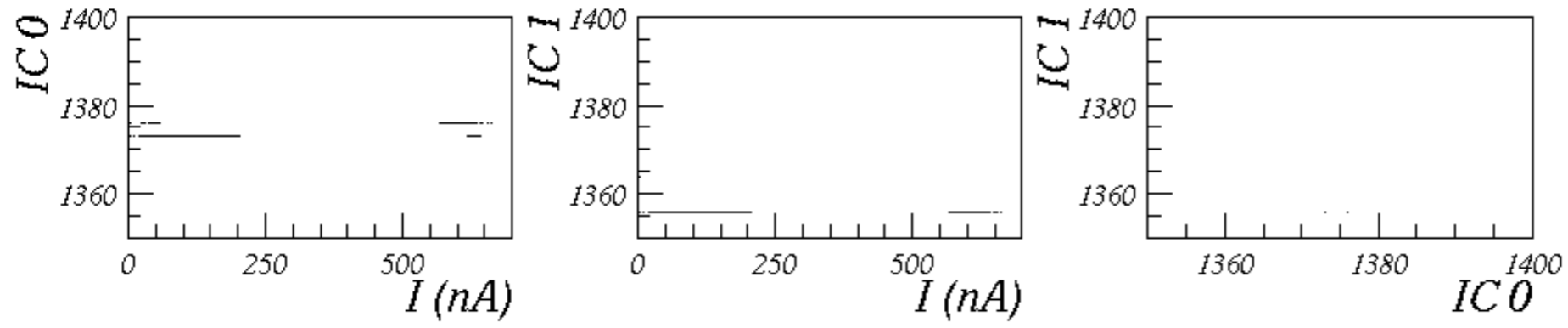
•See expected linear dependence with RL for  $\gamma$  and n probes in tagger/collimator cave. New n probe in Hall has large baseline. evidence of neutrons (worst beam tune?)

•See expected log dependence for ICs. Rates now high enough for IC2 to show log dep.

•Spring 15: IC0, IC1, IC4 insensitive to RL or beam current (unless the beam is not well tuned). Fall 15: IC4 sensitive to both.

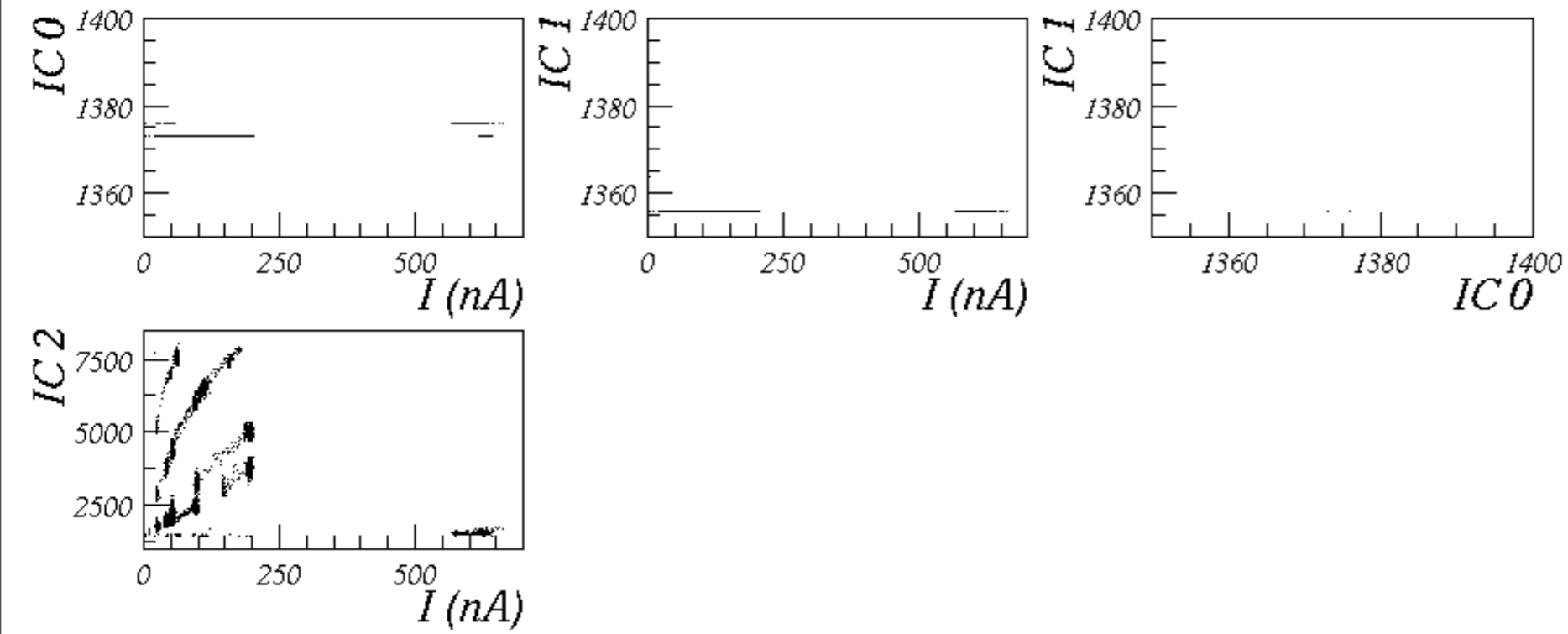
•Fall 14, Fall 15, Spring 16: 102\_P2 very large and independent of RL. Beam hit tagger entrance? Compatible with low energy electrons background sometimes seen in hodoscope. (Spring 15 RL-dependence fixed by adding tagger shielding)

# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)

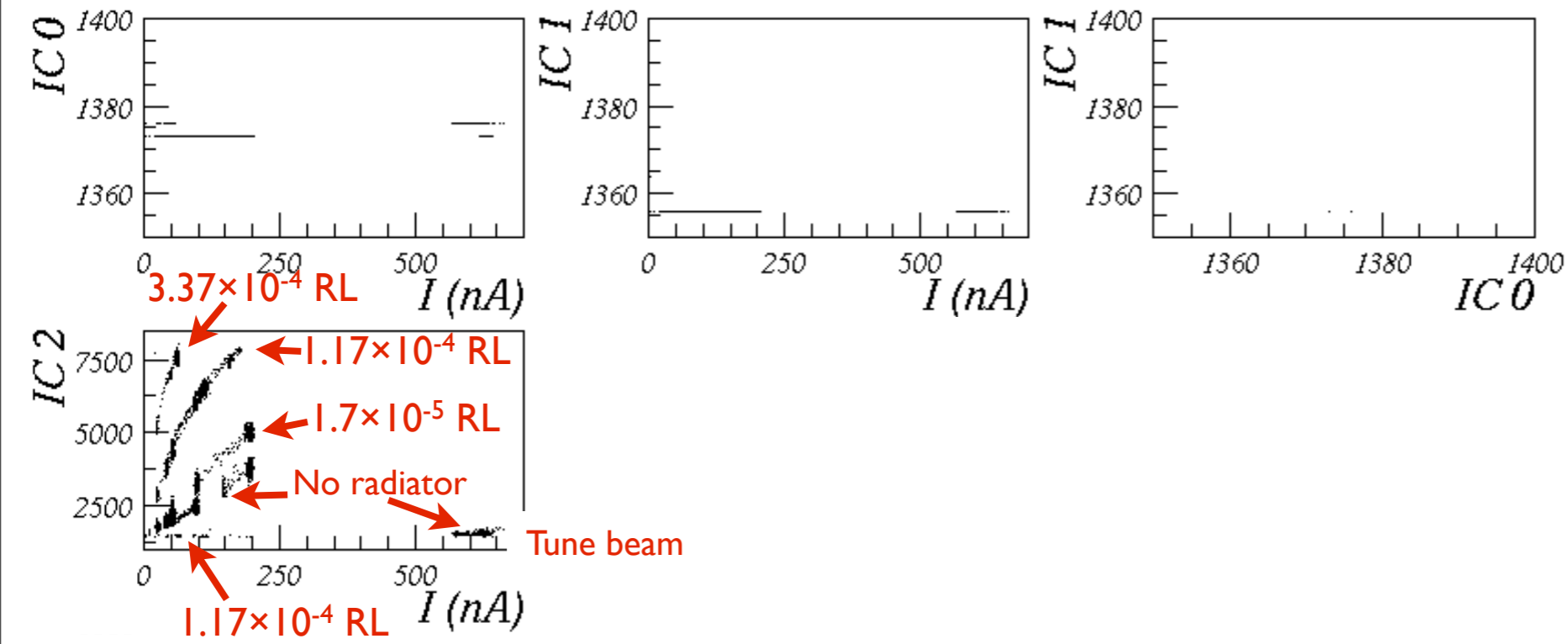




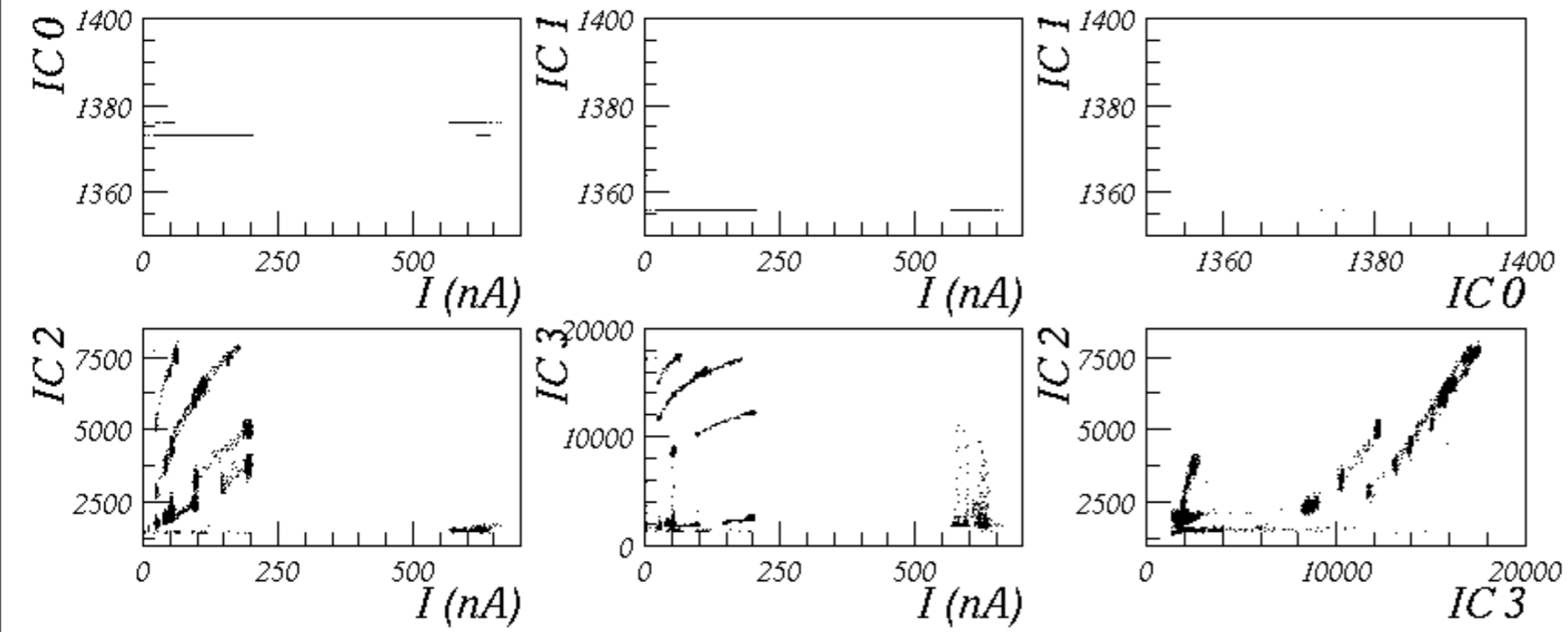
# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)



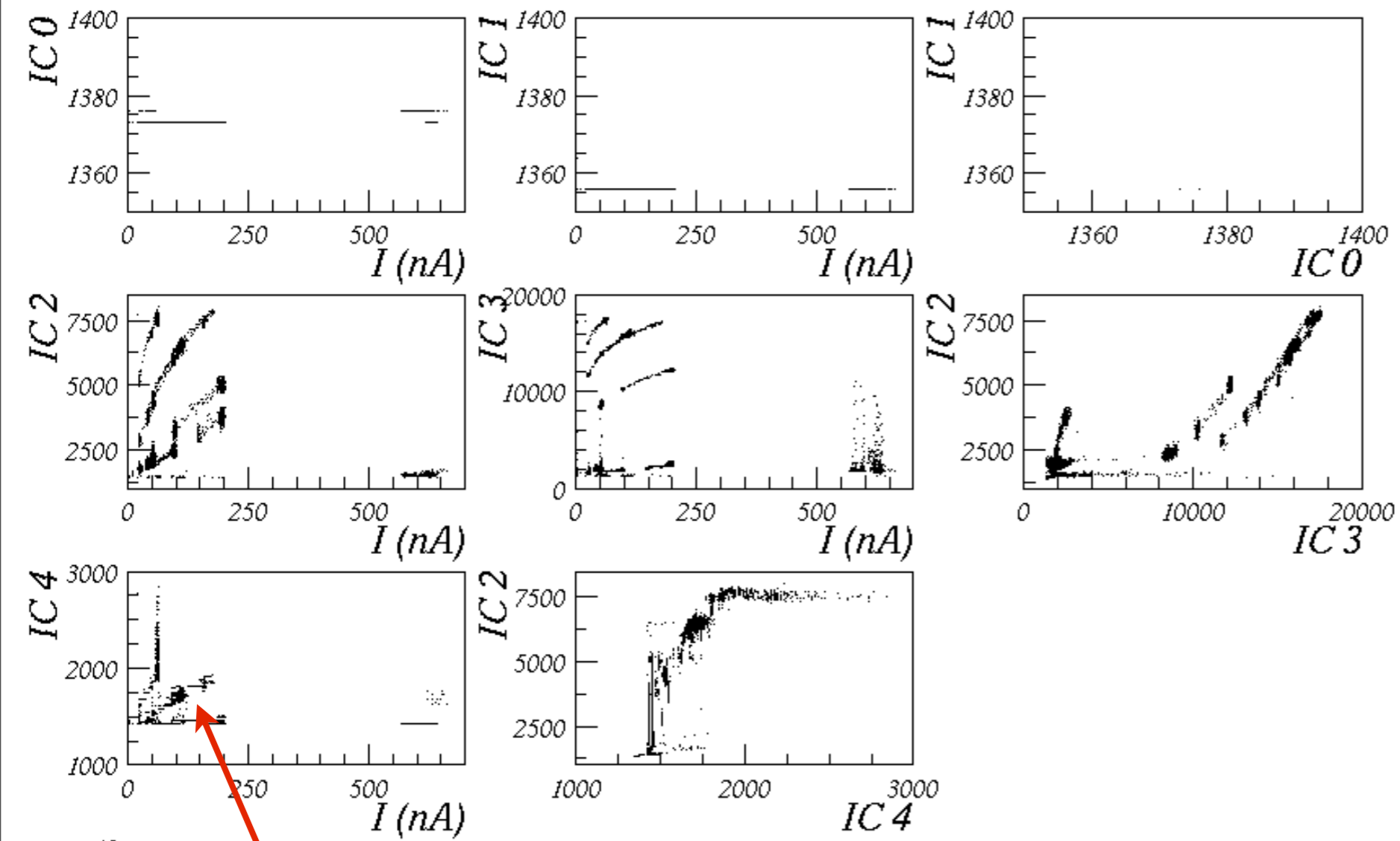
# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)



# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)



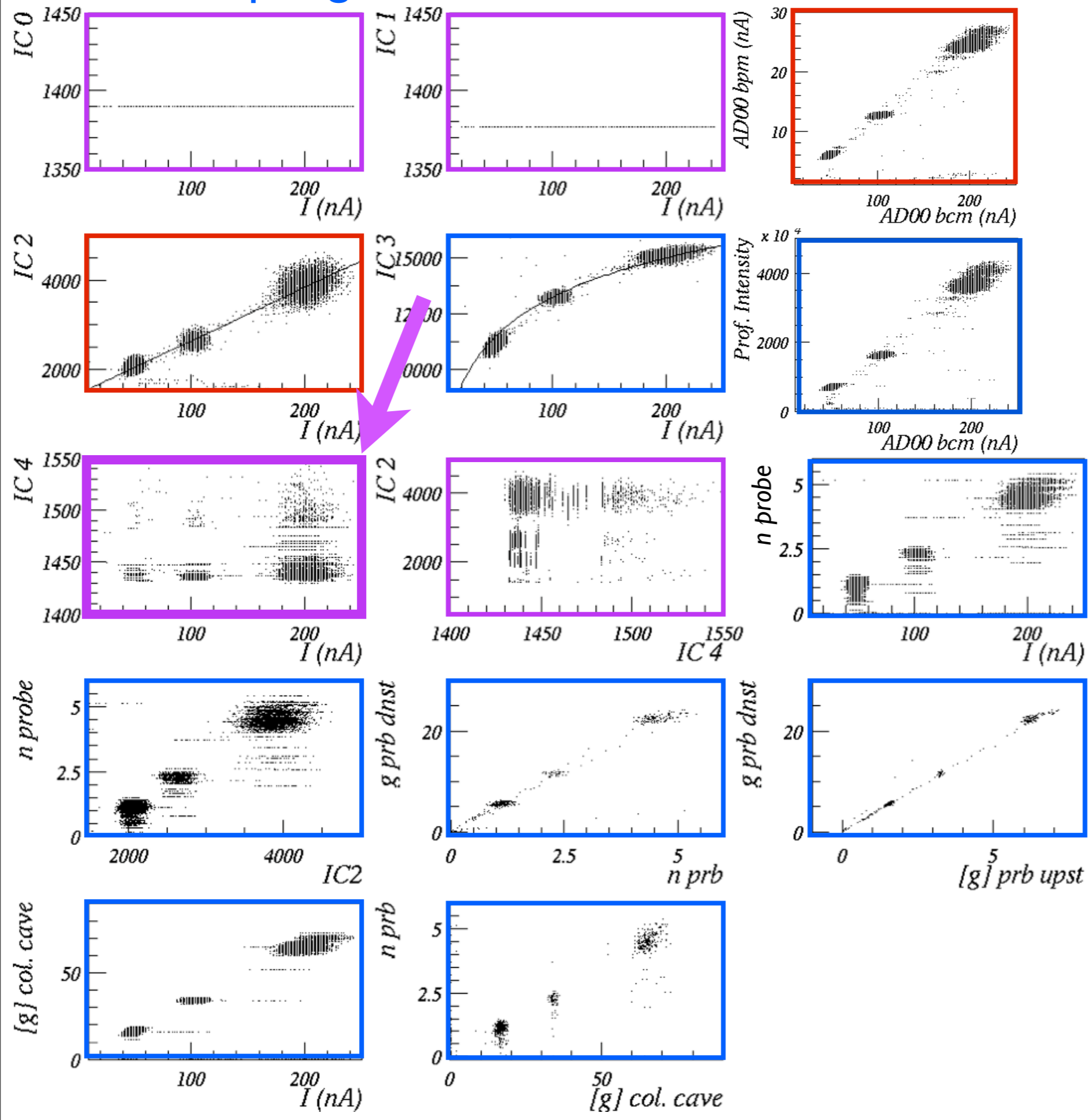
# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)



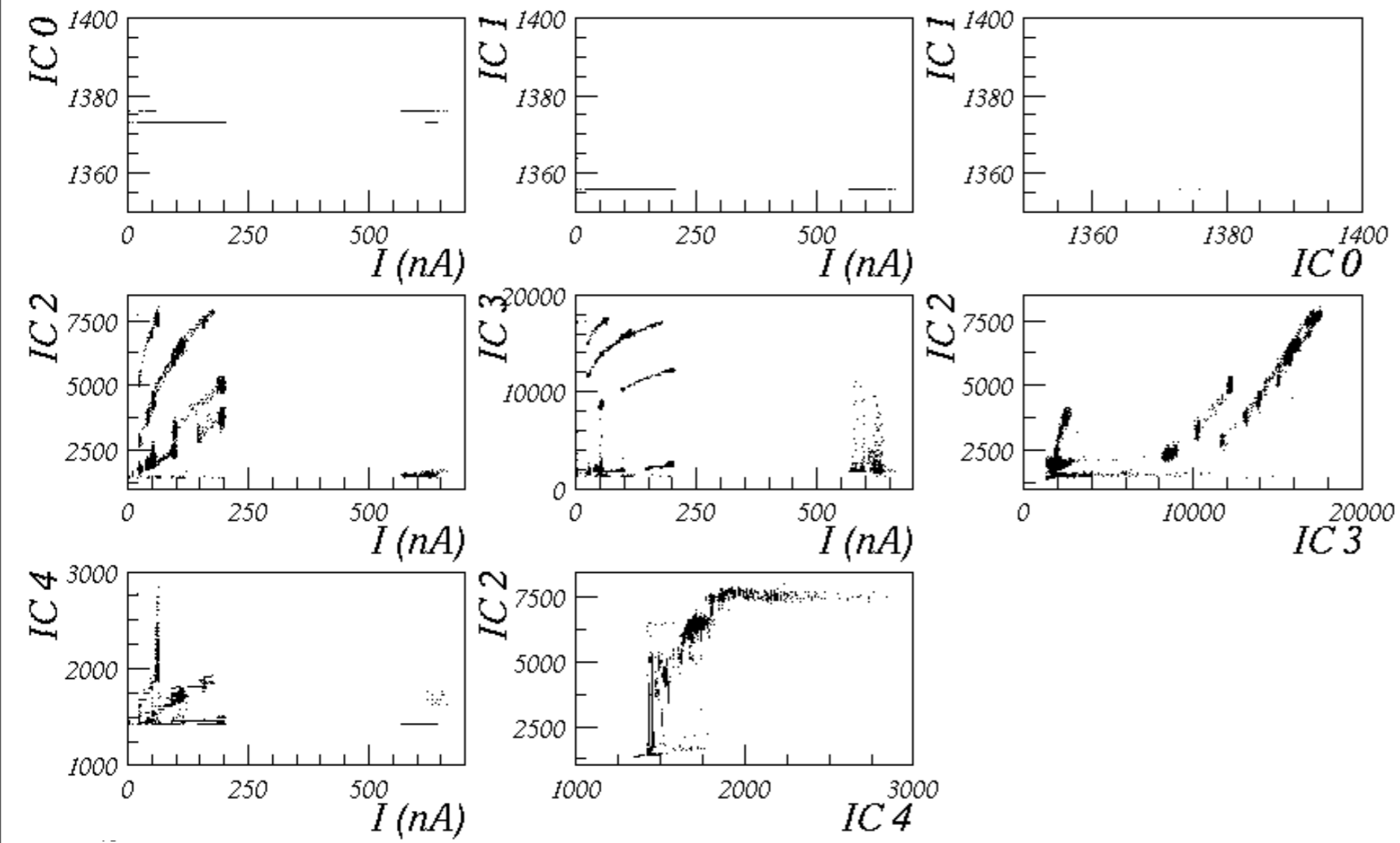
New feature. Used to be independent of beam current. Sign of lower beam tune?

Data from Spring 15 (May 1<sup>st</sup>, afternoon)  $I_{\text{beam}}$  varies, Beam pos. stable  $\Rightarrow$  Check dependence with  $I_{\text{beam}}$

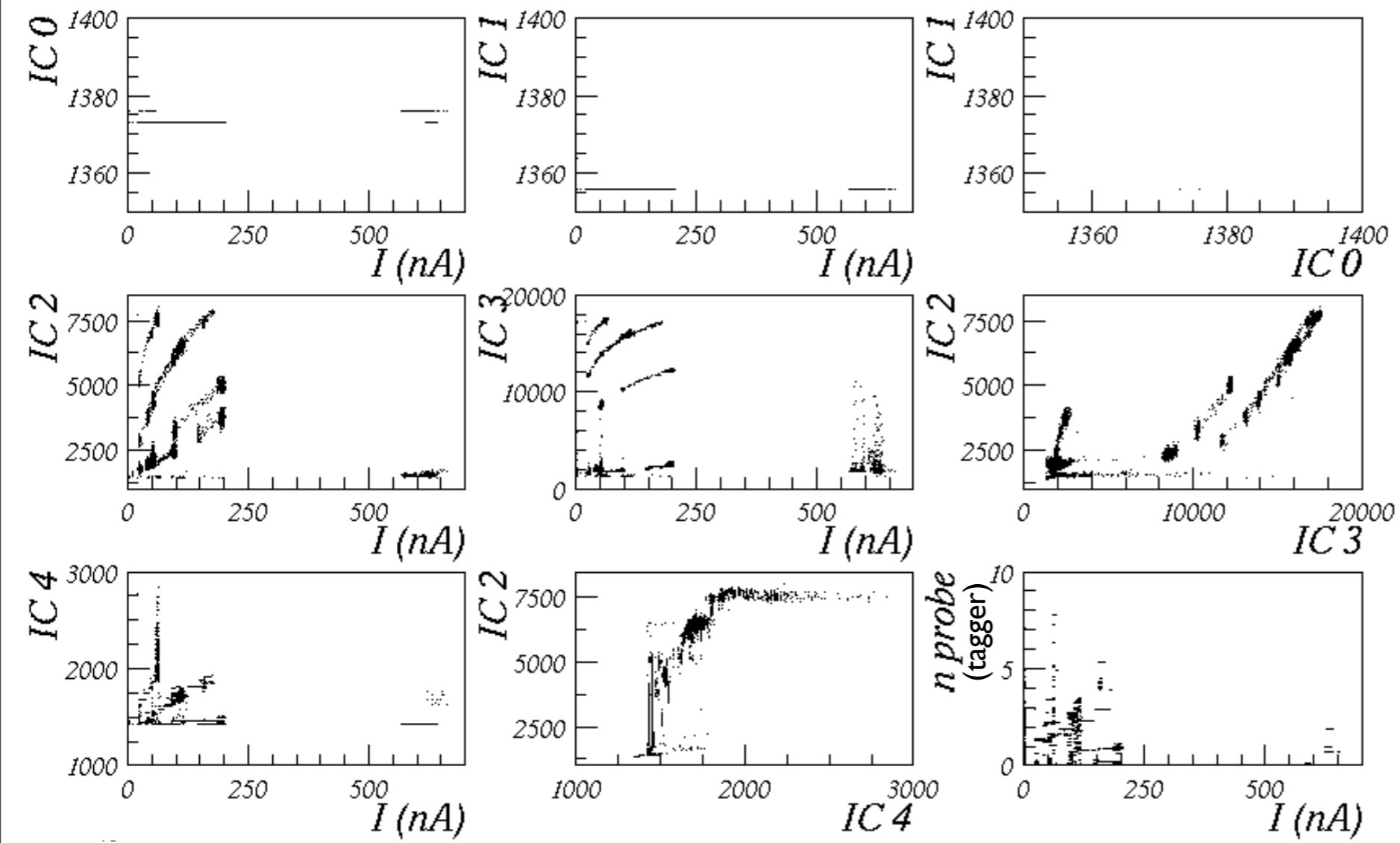
Blue: Expected  
 Red: unexpected  
 Magenta: I don't know



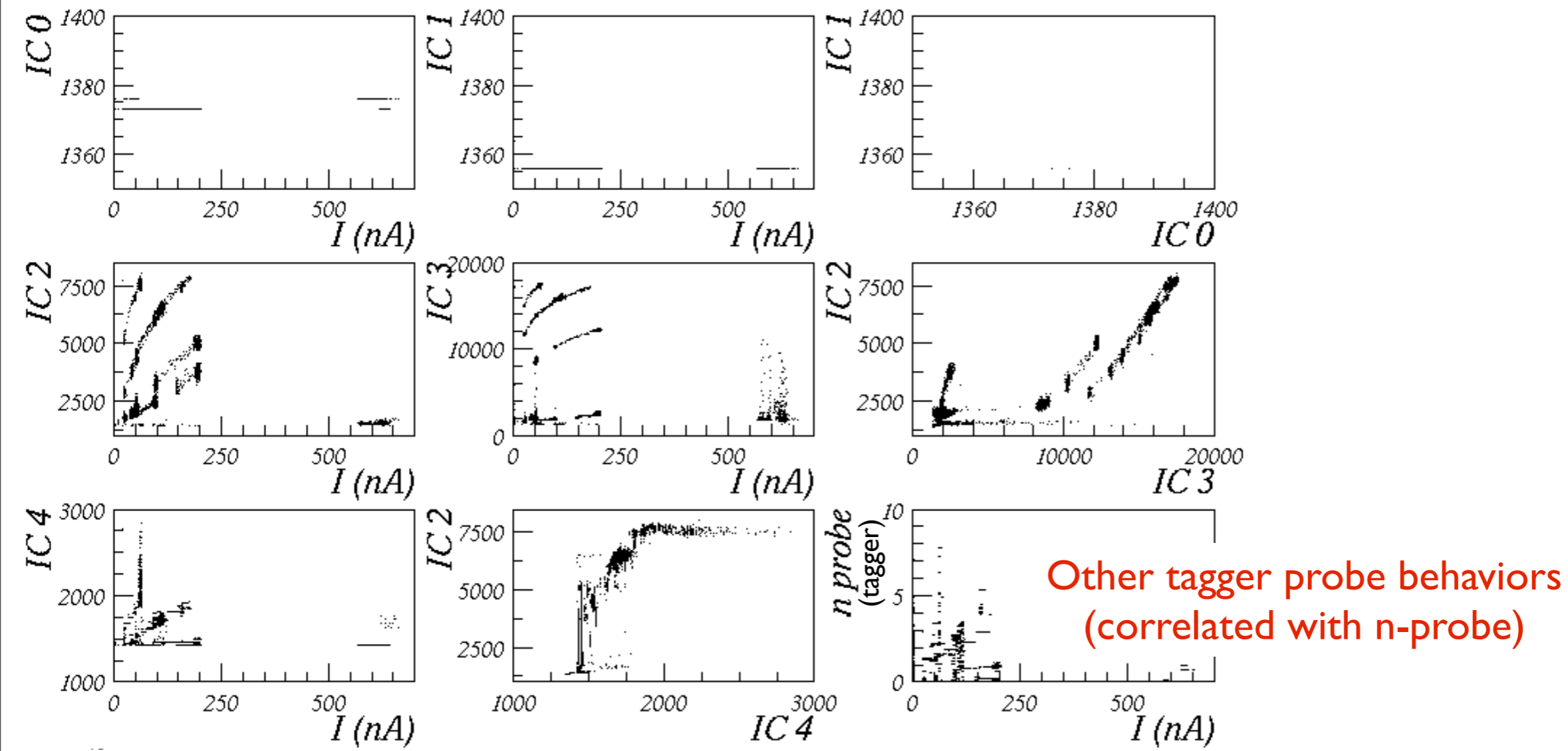
# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)



# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)

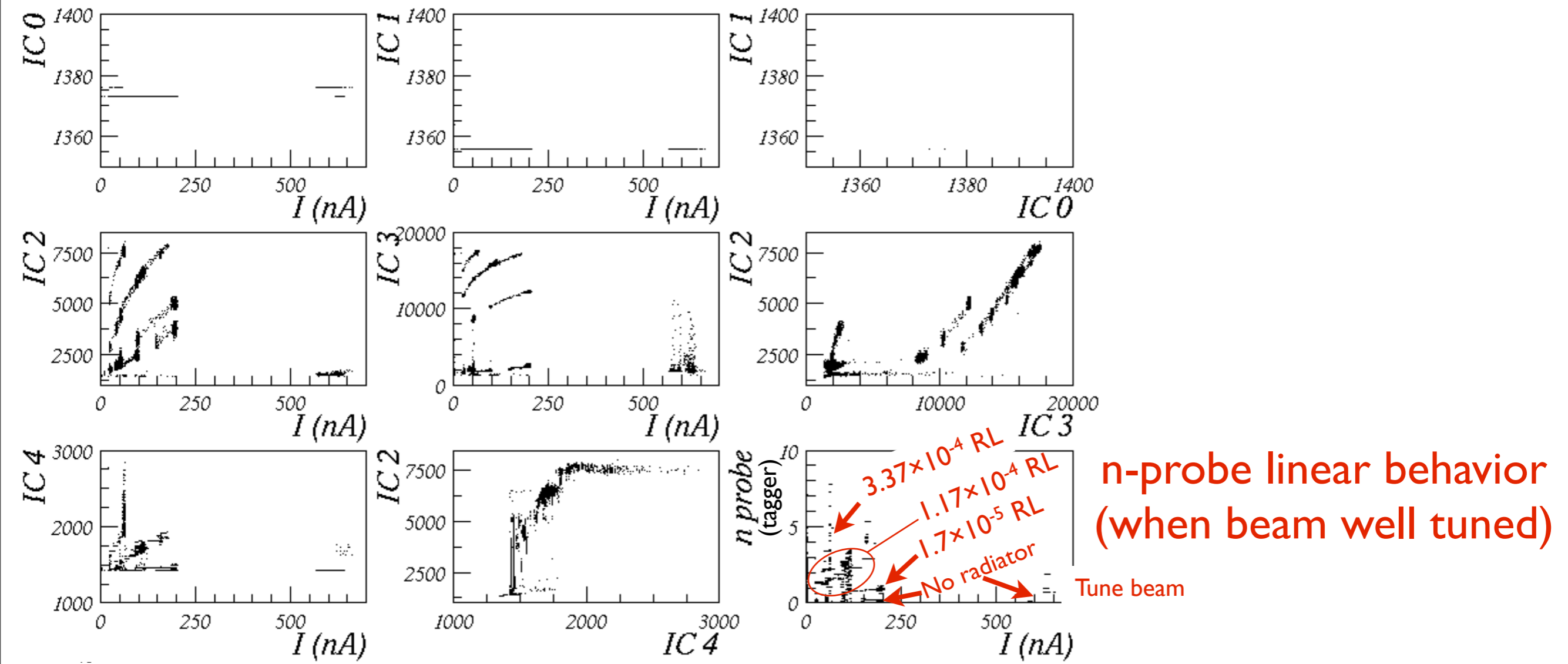


# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)

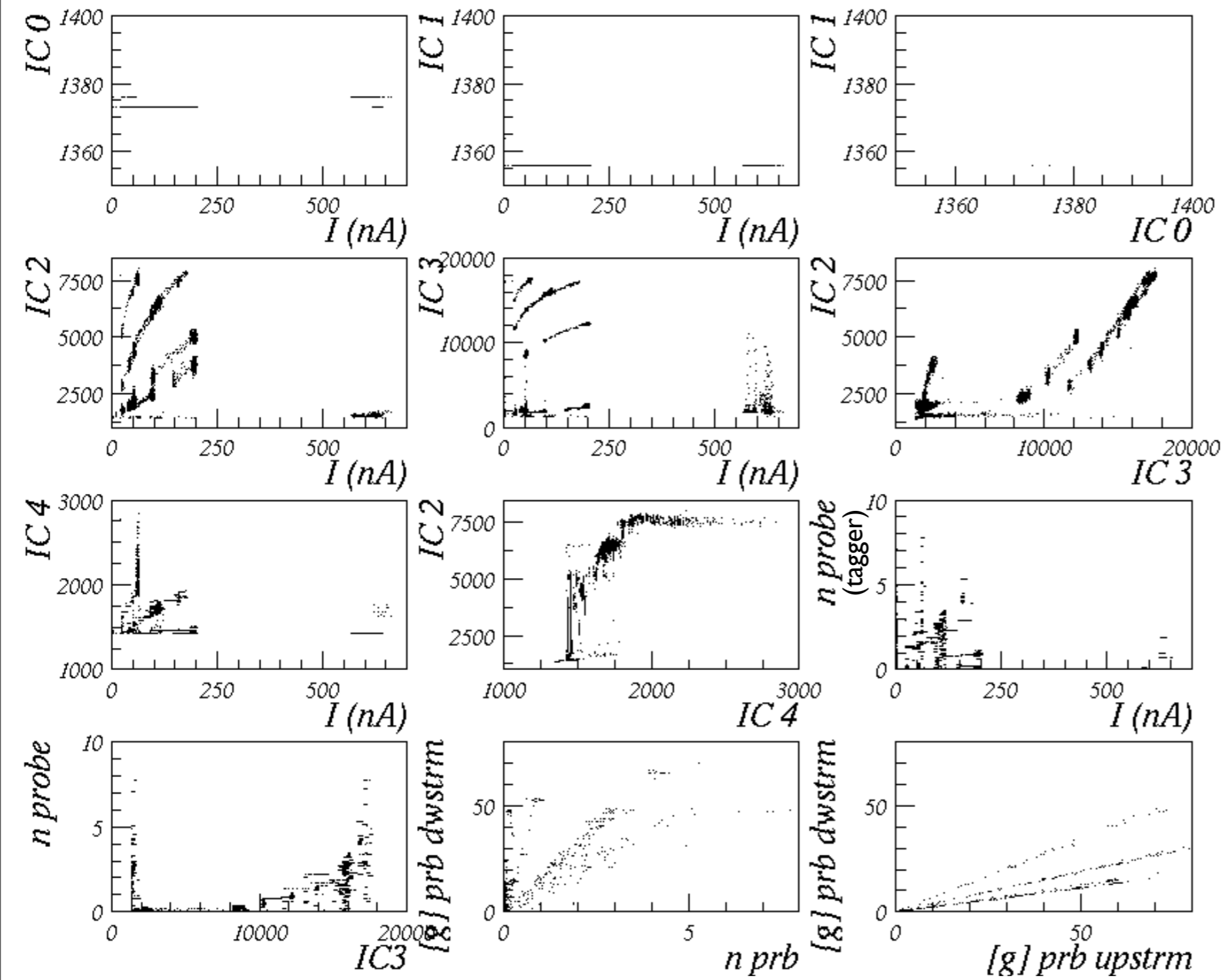




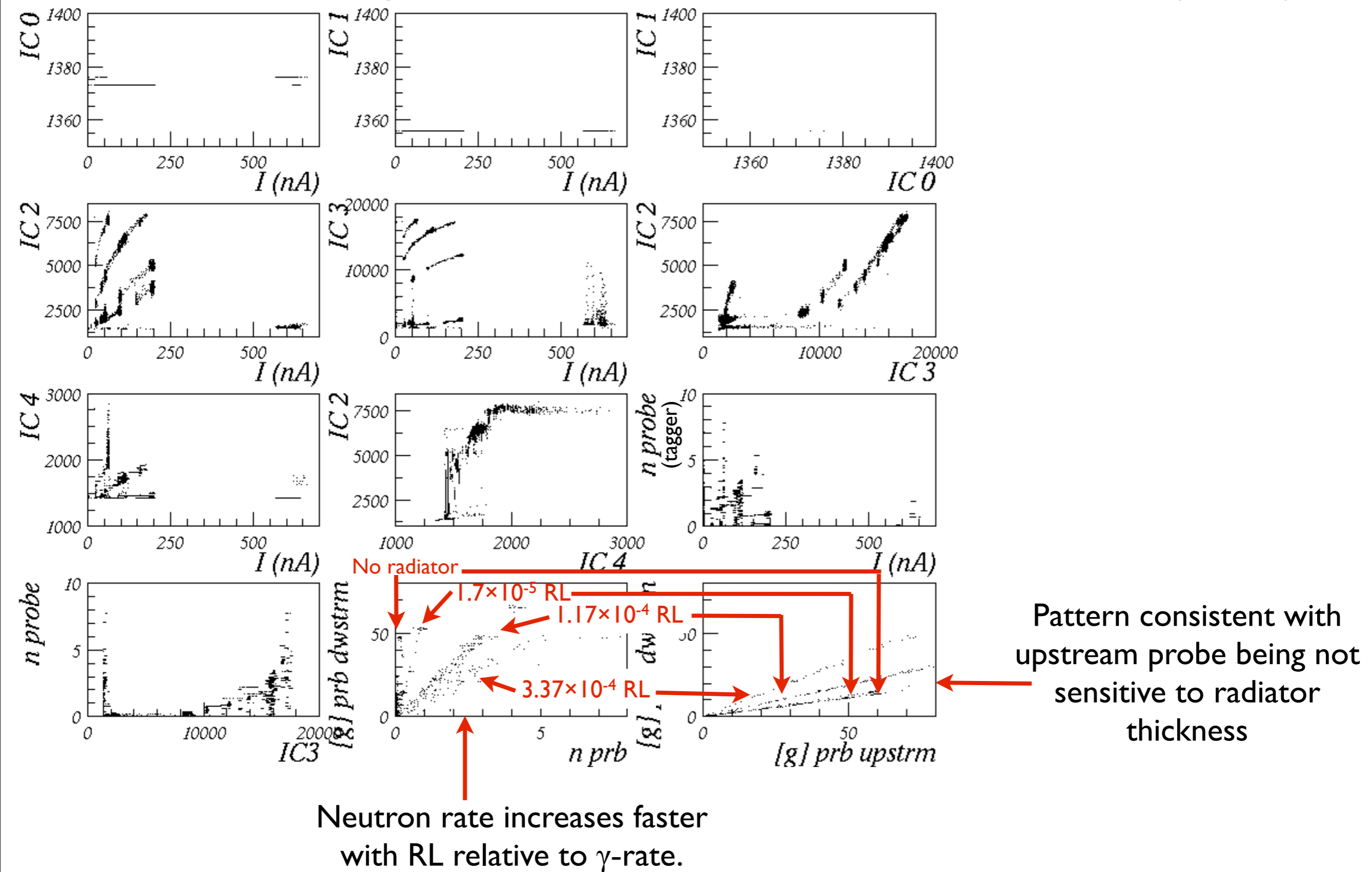
# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)



# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)



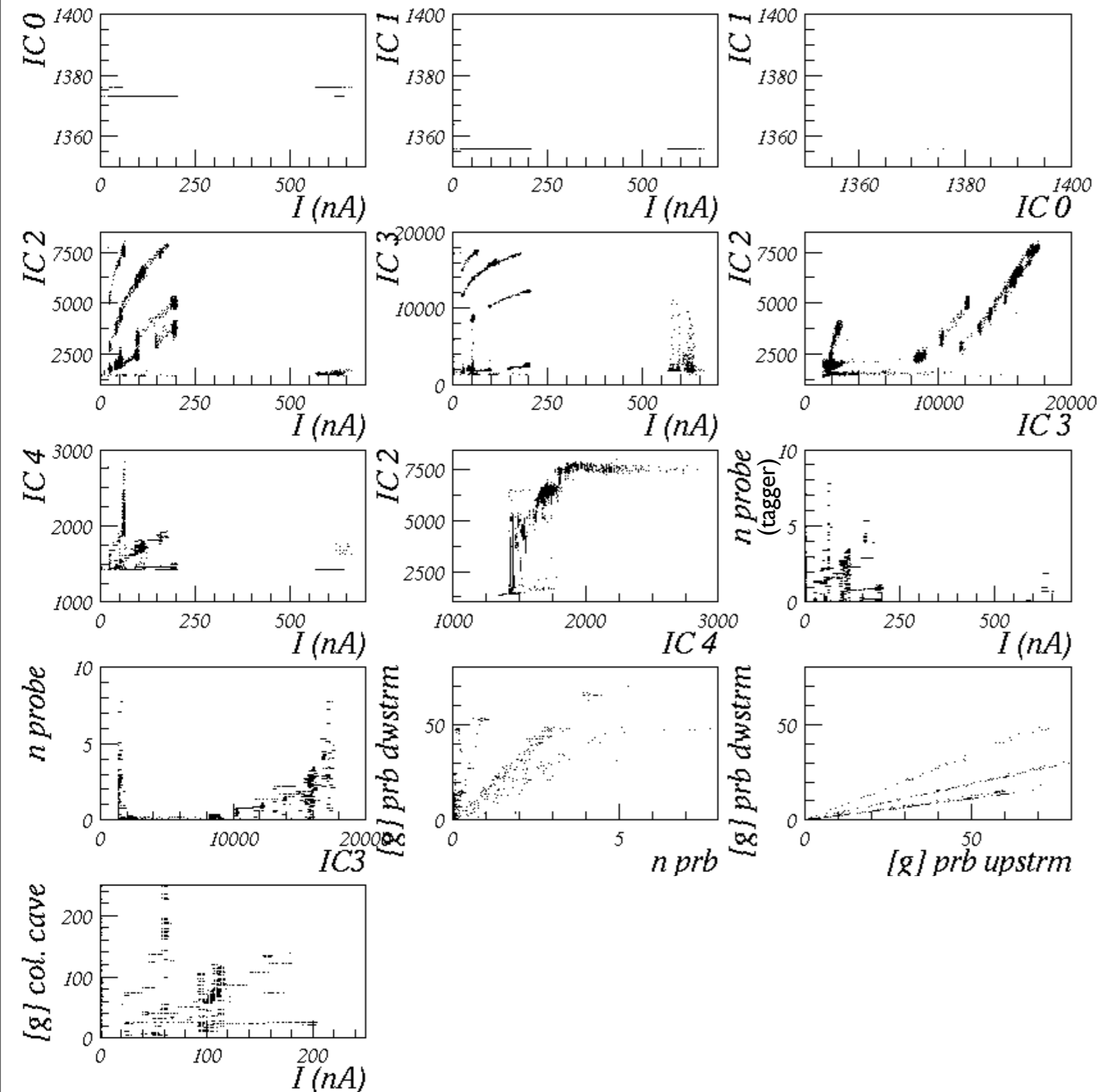
# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)



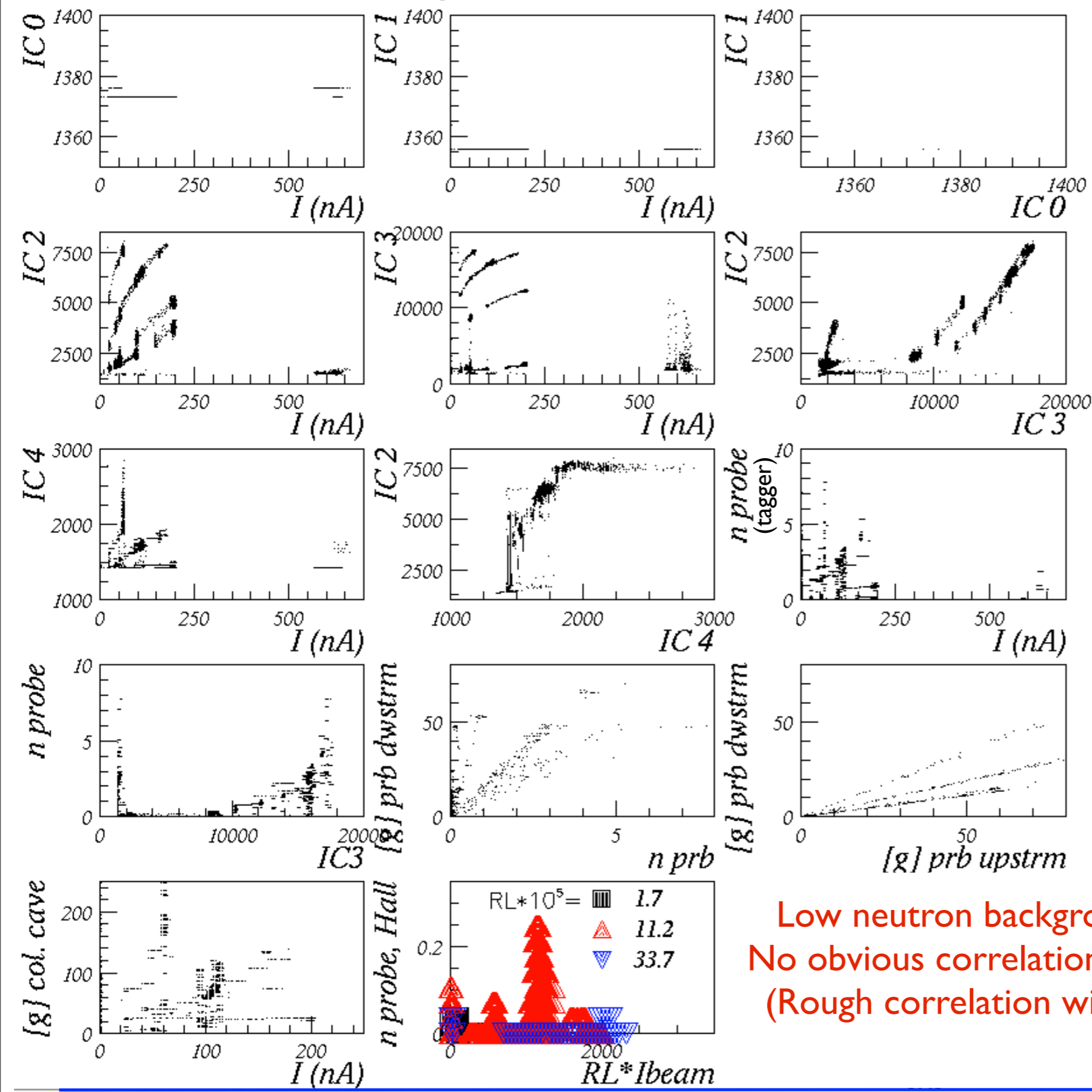
Pattern consistent with upstream probe being not sensitive to radiator thickness

Neutron rate increases faster with RL relative to  $\gamma$ -rate.

# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)

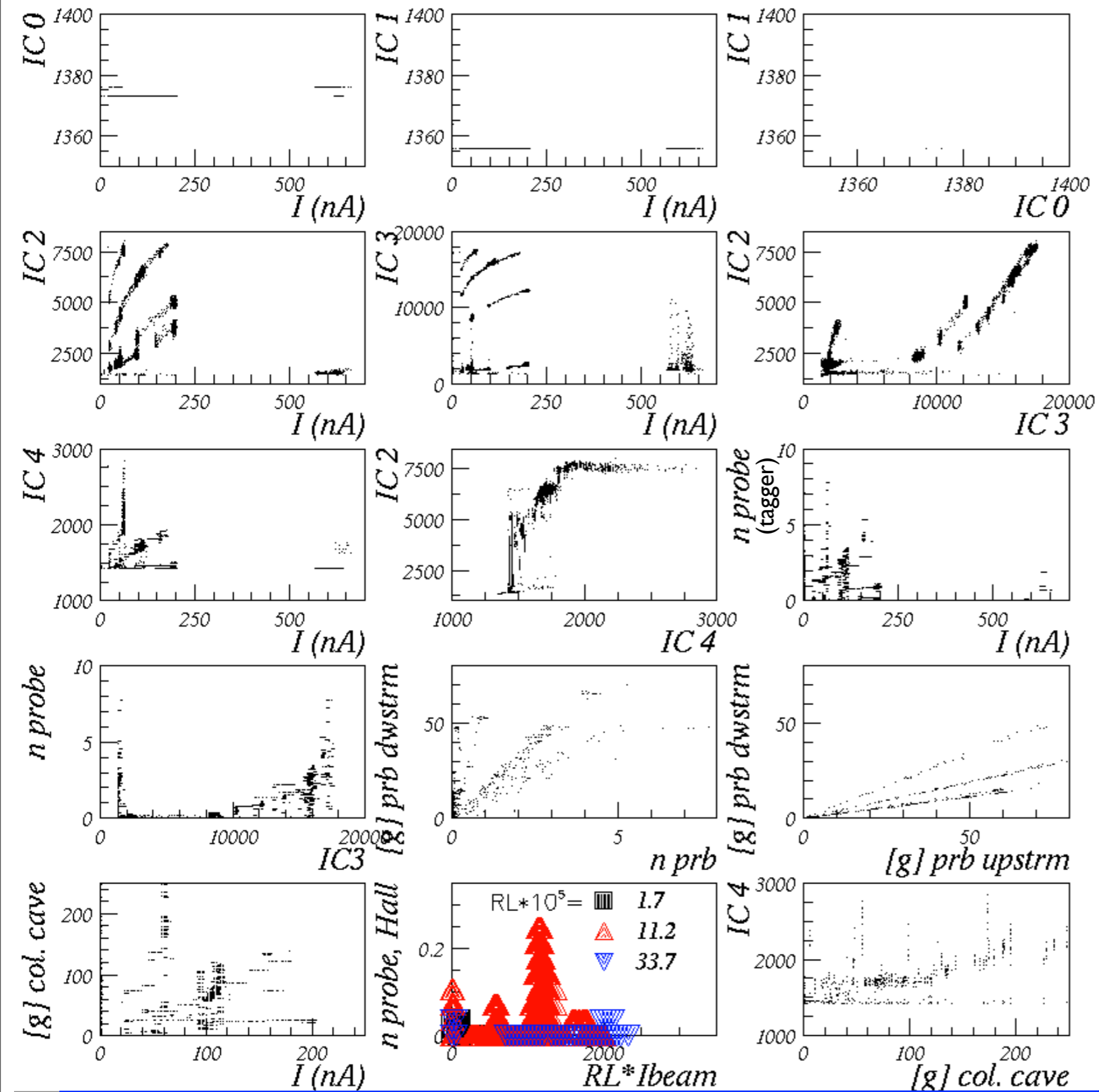


# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)



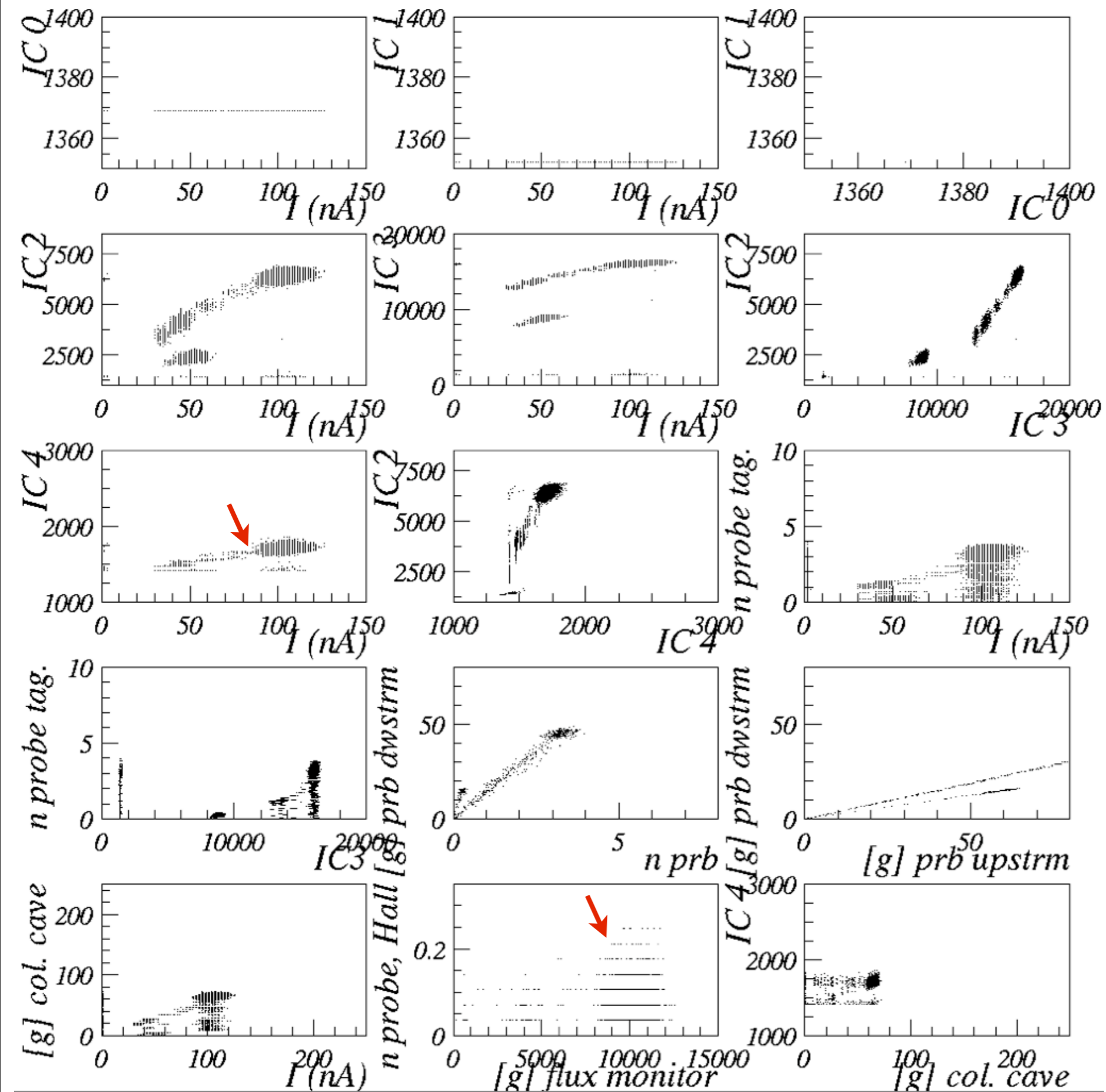
Low neutron background in the Hall.  
 No obvious correlation with  $RL \cdot \text{current}$ .  
 (Rough correlation with flux monitor.)

# Rad. monitor dependences with $I_{\text{beam}}$ and radiator thickness (Fall 15)





# Correlations at the end of the Fall 15 run (Dec 20, 20pm - Dec 21, 6am)



Results are similar.  
IC4 correlation  
with  $I_{\text{beam}}$  still here

# Conclusions

Beam quality was worst than in Spring 15:

- Higher rates from radiation monitors.
- Satellite peak in profiler, independent of radiator. Not present when beam off.
- Low energy electron background in the hodoscope.
- Upstream  $\gamma$ -probe independent of radiator thickness.
- IC #4 is showing signal above background. Correlates with beam current.

Suspect that it is due to beam halo scraping material upstream of the tagger magnet.

Low neutron background in the Hall. Only loosely correlated with  $\gamma$ -flux.

Radiation monitors behave as expected.

No systematic study done yet for the Fall 15 run.