SVT Background Study with FullSim

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SuperB Bkg Weekly Meeting

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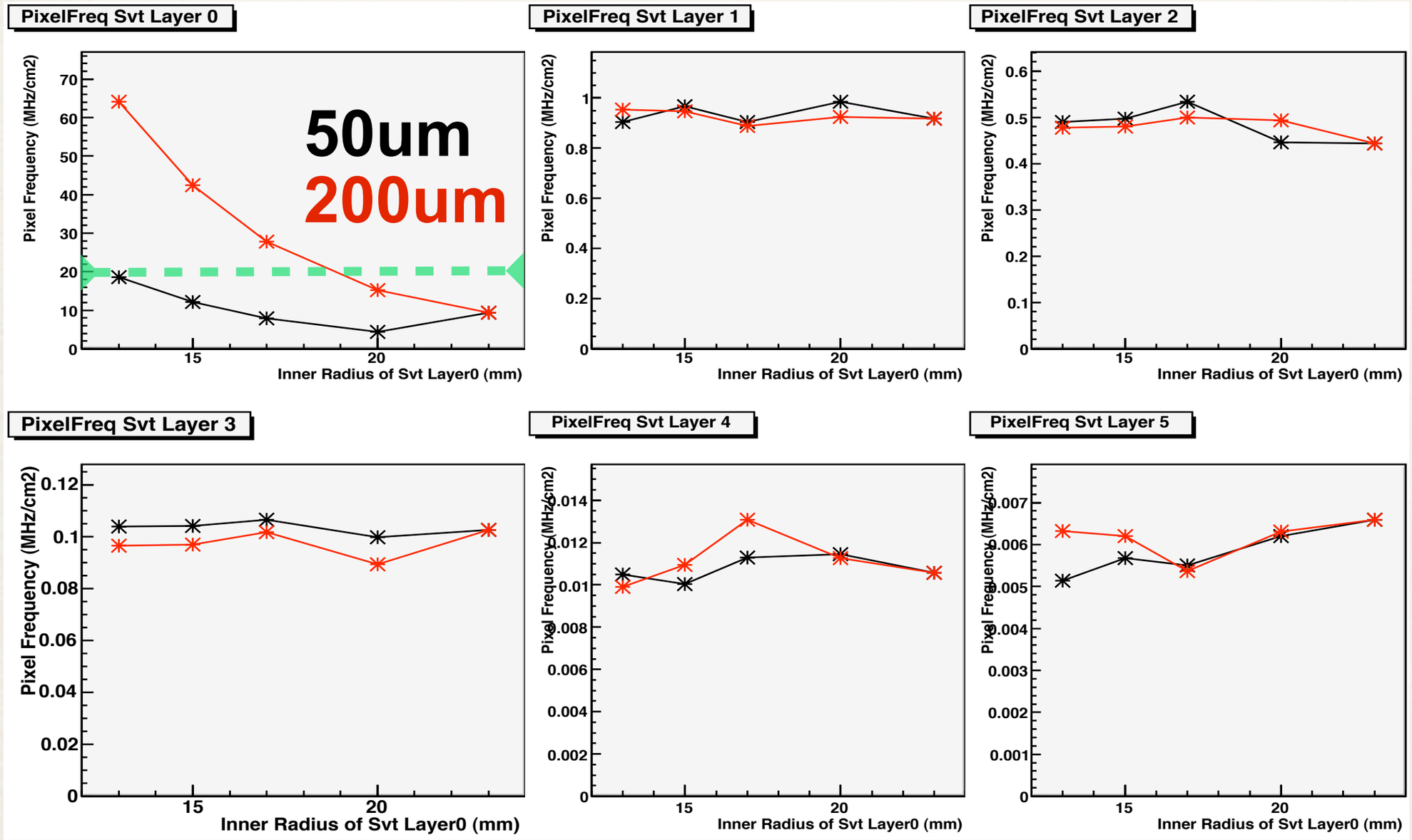
Open issues

- Bkg rate (mainly from pairs) below 20 MHz/cm^2, which radius for L0?
  - Striplets, 200um Si
  - Pixel, 50um Si
- Hot spots, Z-Phi distribution
- Radiation on L0 electronics
  - New volume and additional G4 steps list
- Radiative Bhabha background with B field turned on (waiting for details on compensation from IR people)

- **Note: results here with r356, no diff compared to Feb production**

Rate for pixel and striplet devices

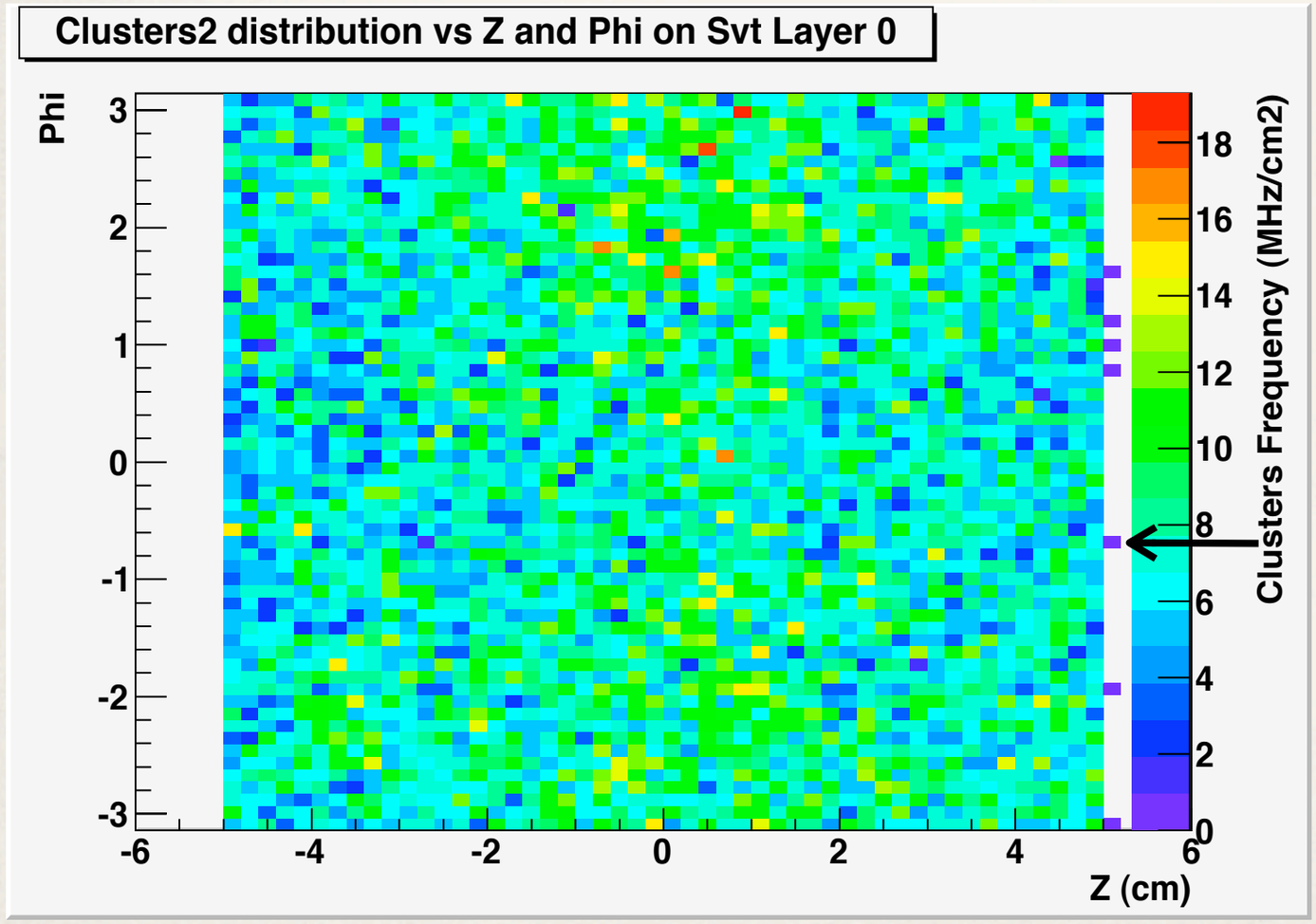
- L0 thickness changed to 50 and 200um
- L0 radius 13 -> 23mm

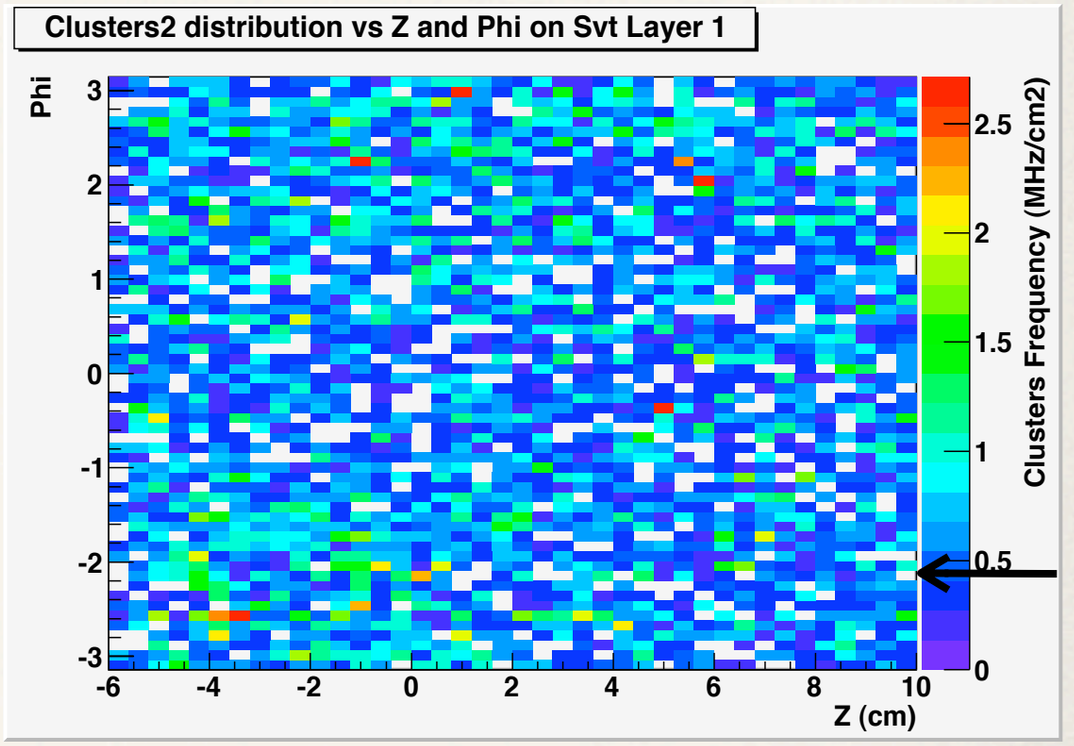


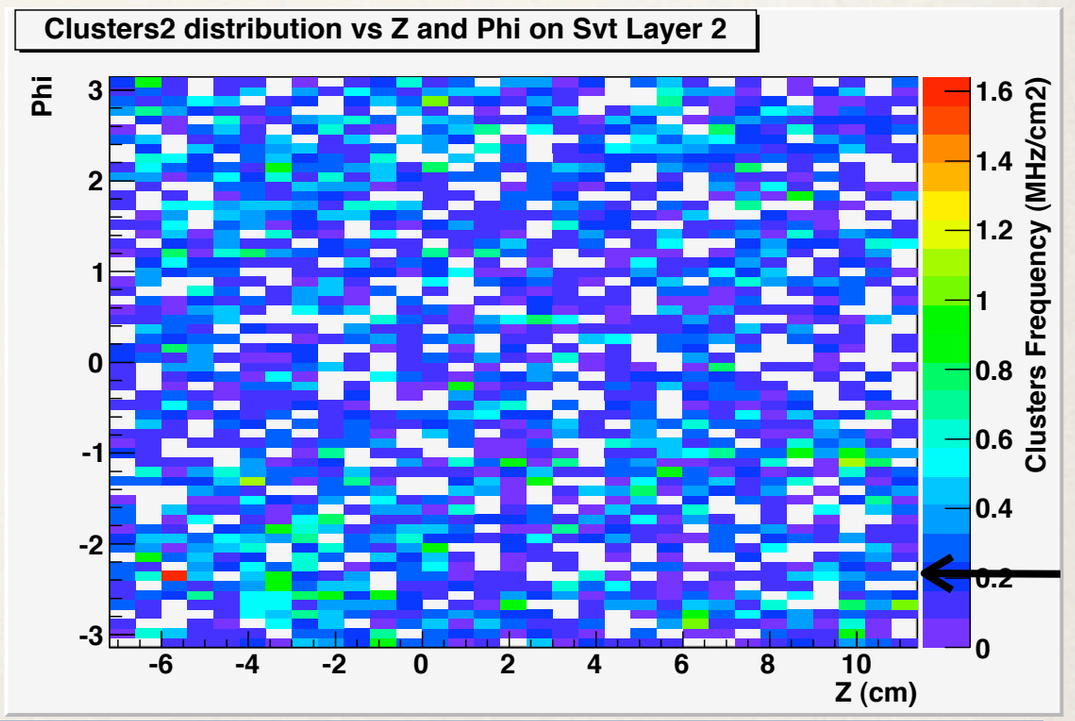
- Bkg **ok** for pixels, need to go above **19mm** for striplets

Phi-Z cluster distribution (L 0,1,2)

- Check for hot spots, not visible
- Average on z scale by arrow

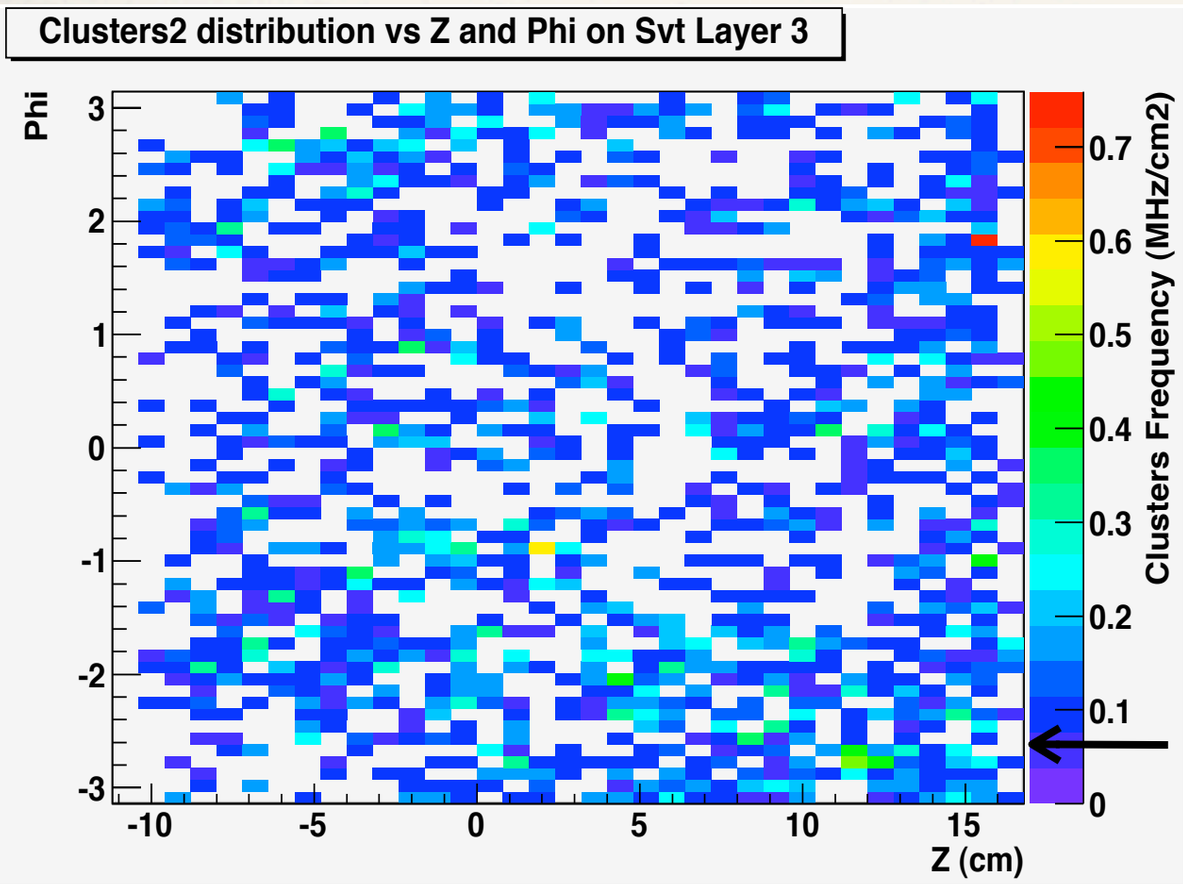


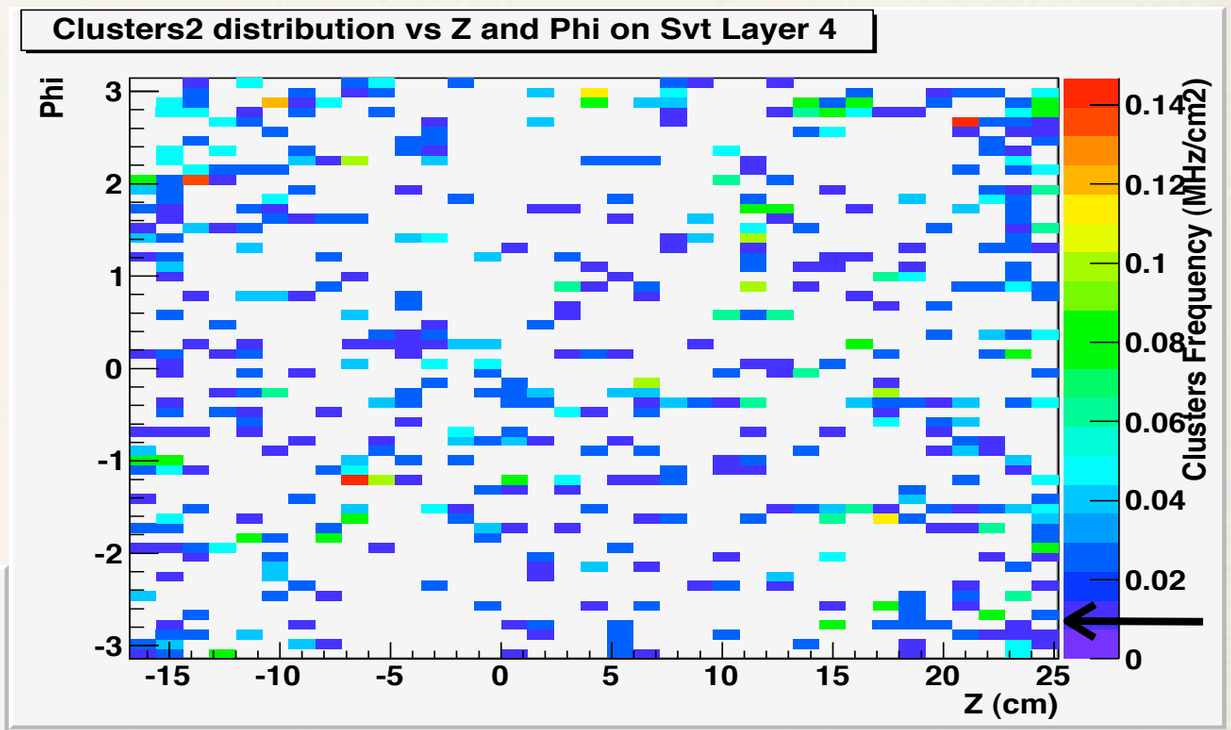


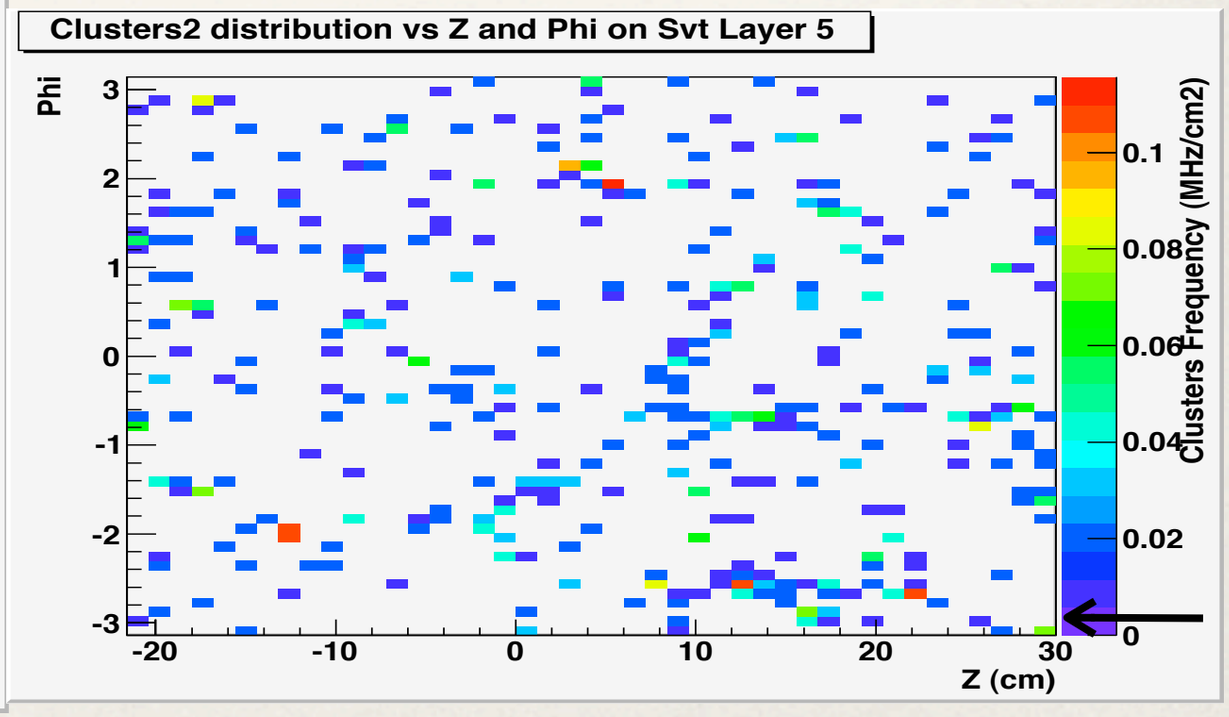


Phi-Z cluster distribution (L 3,4,5)

- Check for hot spots, not visible
- Average on z scale by arrow
- More statistics for outer layers

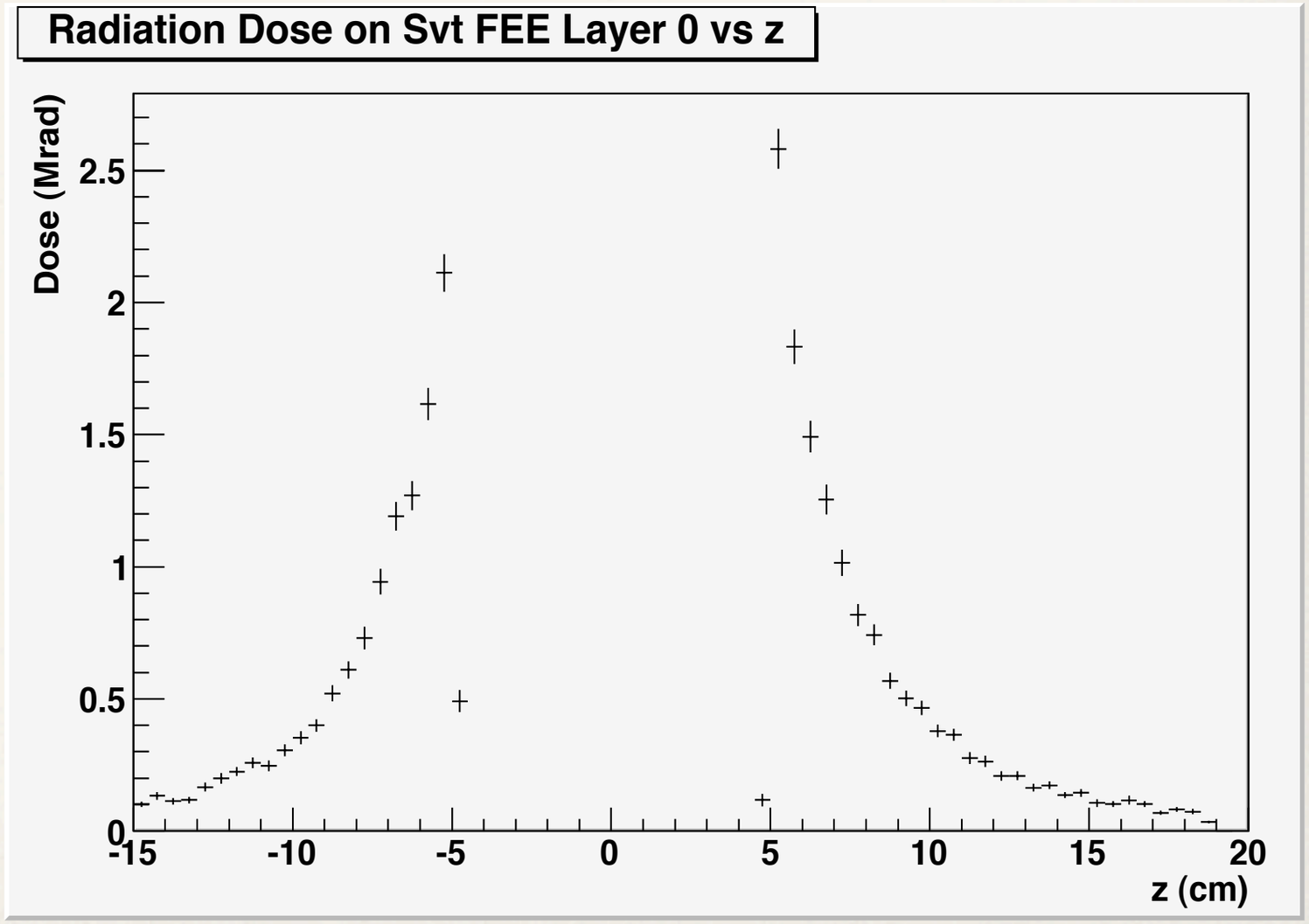






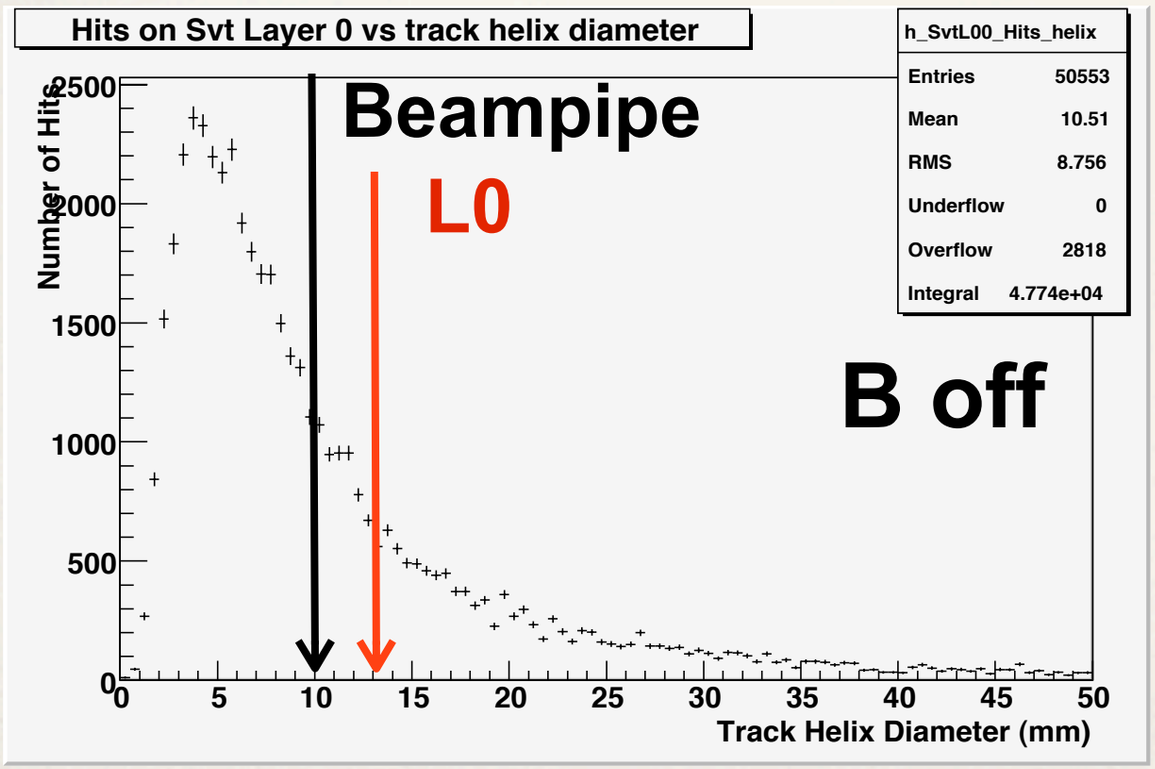
Radiation on L0 electronics

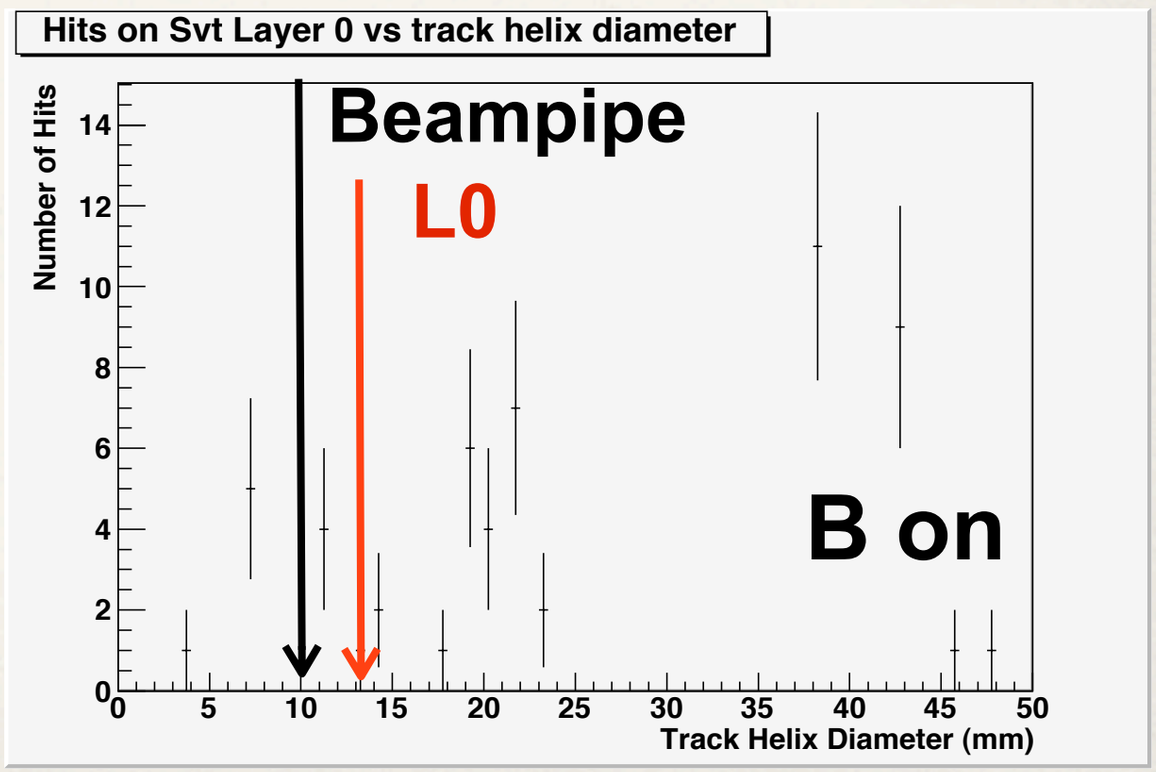
- Additional 2 volumes around IR tungsten cones close to L0, 1mm of silicon at 2mm of distance, just as a radiation probe
- Sensitive volumes, additional BrnRootHits list dumped
- Average dose:
  460 krad
  (only pairs bkg)
- Much higher close to L0 edges, ~2 Mrad
- Other areas can be easily tested using also more realistic materials



RadBhabha with B field on (1)

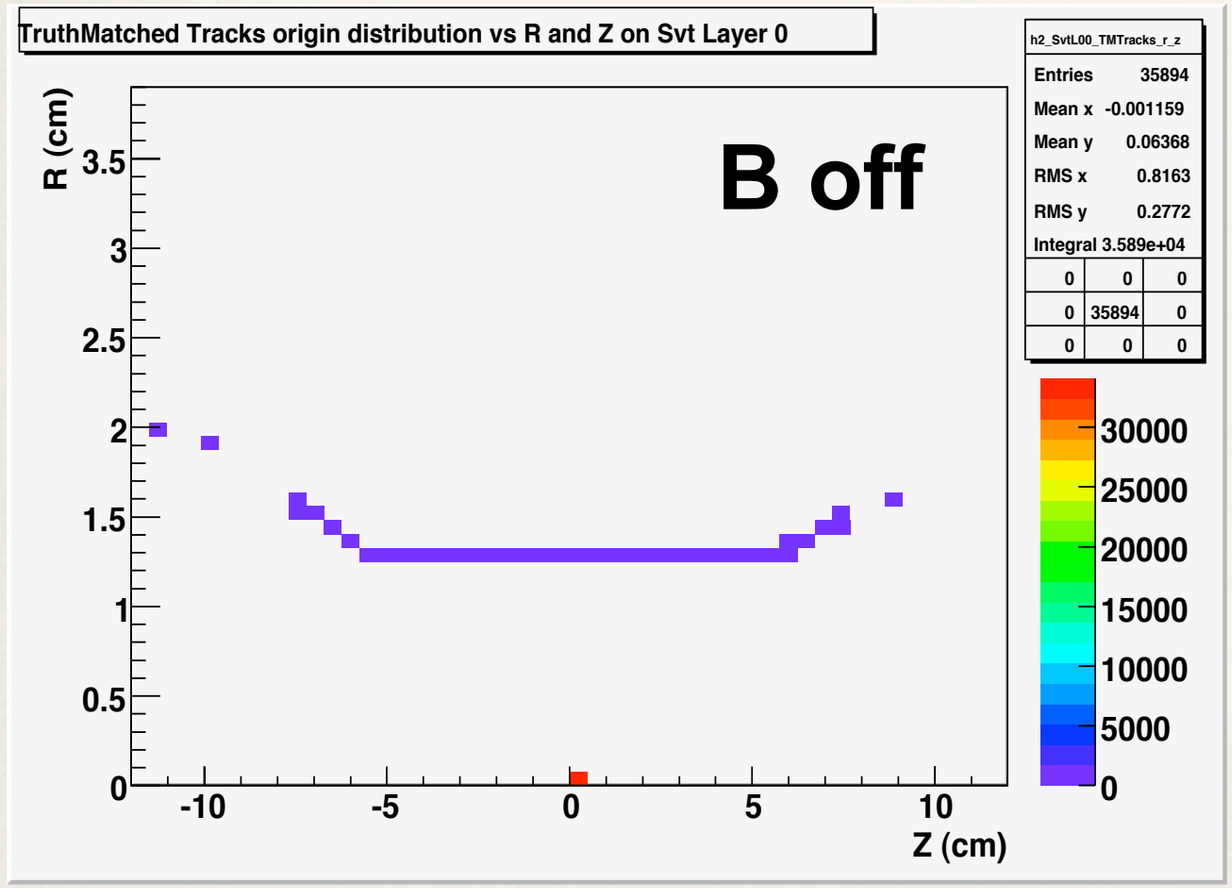
- Waiting for final configuration of magnetic field around IP
  - Compensation: field on inside L0 but not upstream and down stream to avoid off energy particles to be driven into the shielding
- For best results with pairs bkg B field in IR has been turned on by hand (hardcoded in Bruno, off by default in svn rep)
- Problems also with RadBhabha, comparison with B field **Off** (Feb Prod, **300umSi,** r13mm) / **On** (500k evts, **200umSi**, r13mm)

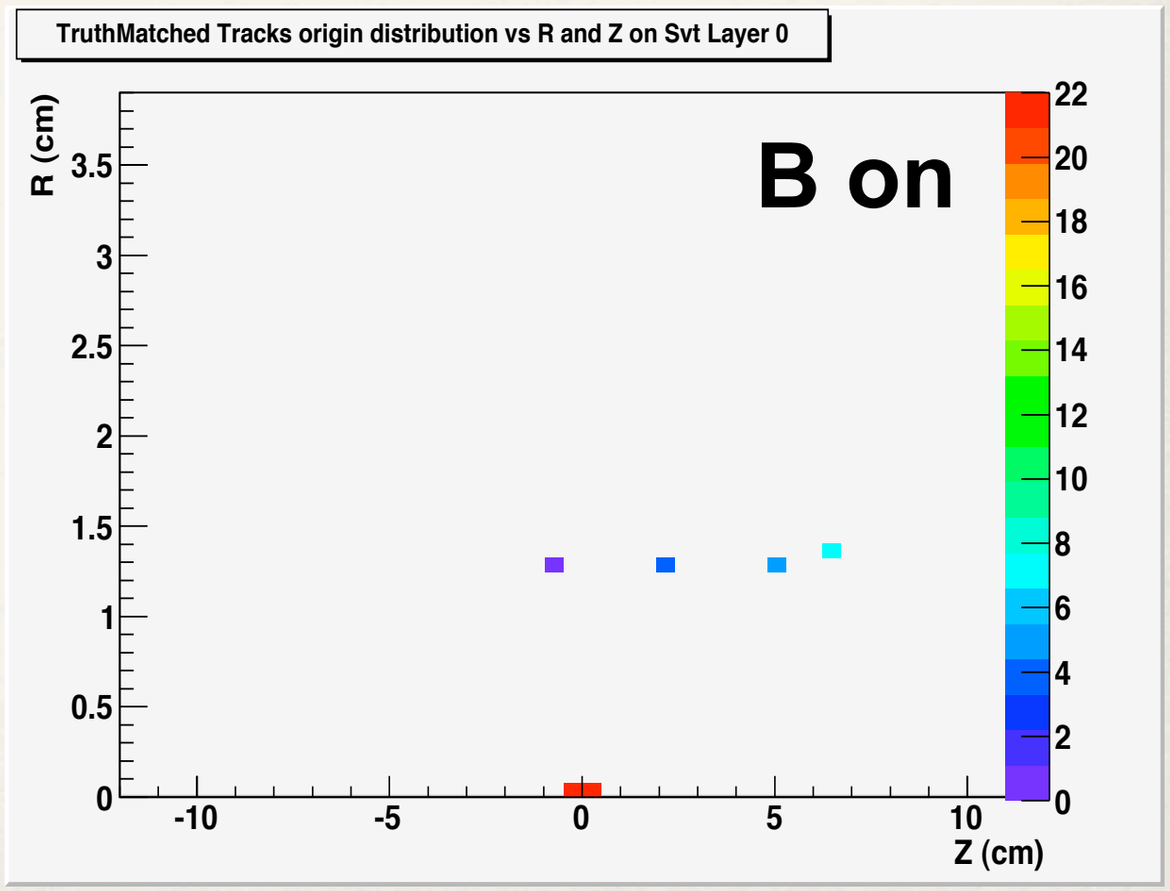




RadBhabha with B field on (2)

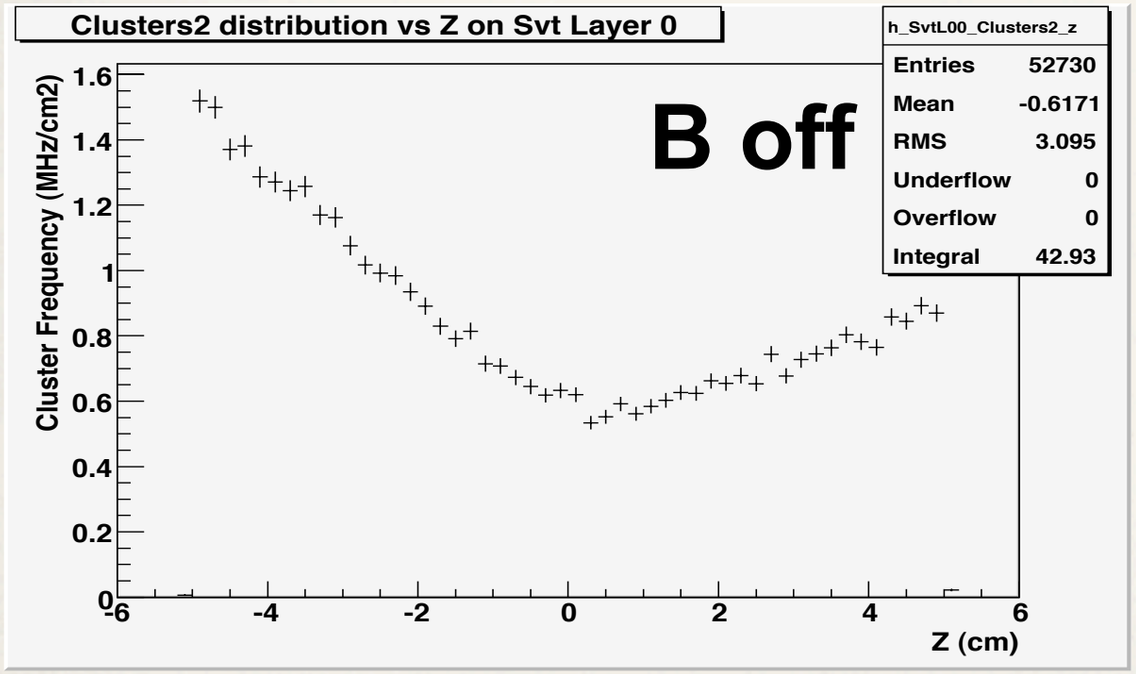
- R-Z distrib for origin of tracks that generate clusters in L0
- Again low statistics
- B field on, 2 bins at 0, 2 x 20 x 400 = **16k**
- B field off, **32k**

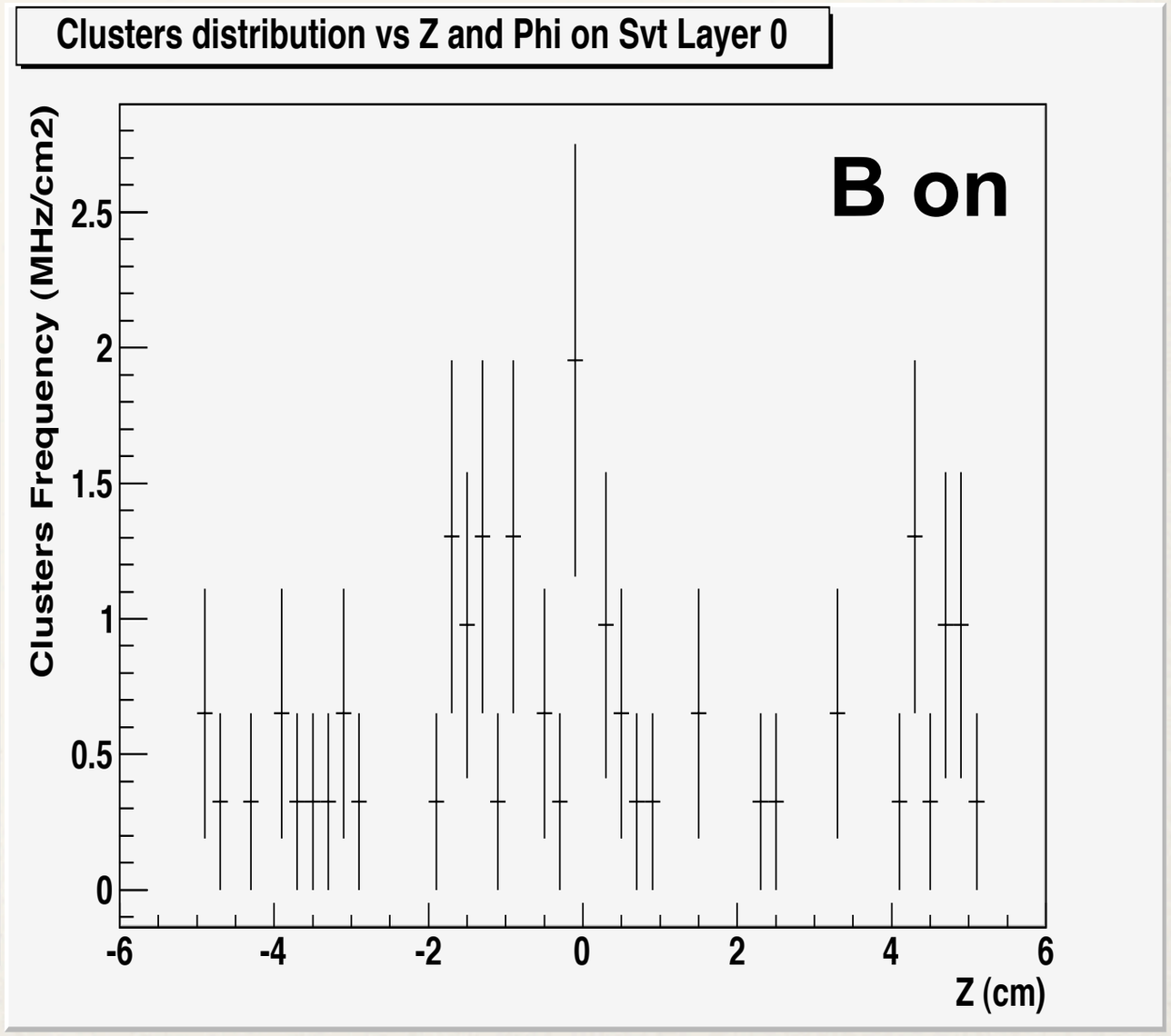




RadBhabha with B field on (3)

- Cluster rate z distribution: Feb Prod (B off) vs Test (B On)
- Factor 400 in statistics, not easy to compare the results but decrease in cluster rate is clear





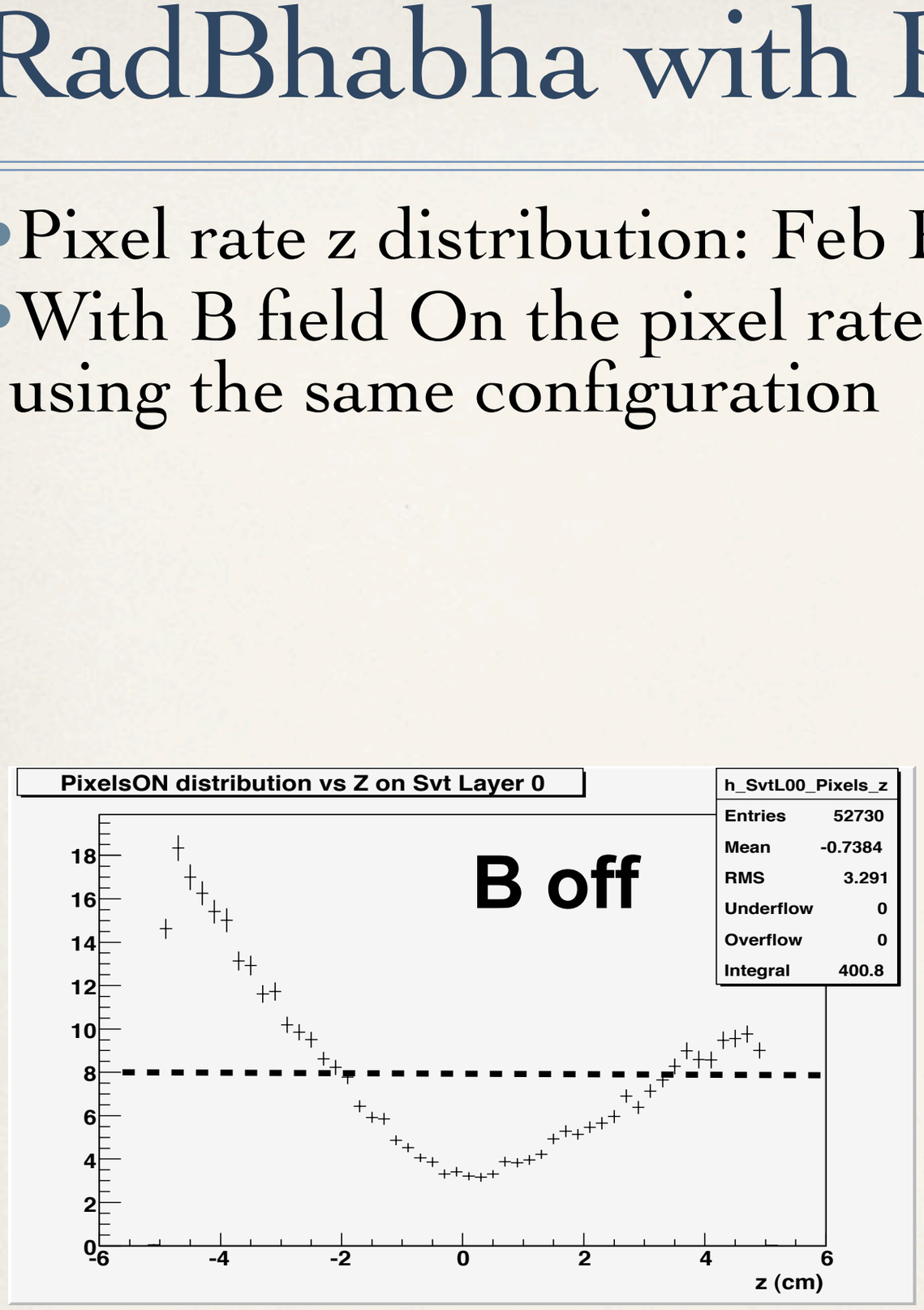
RadBhabha with B field on (4)

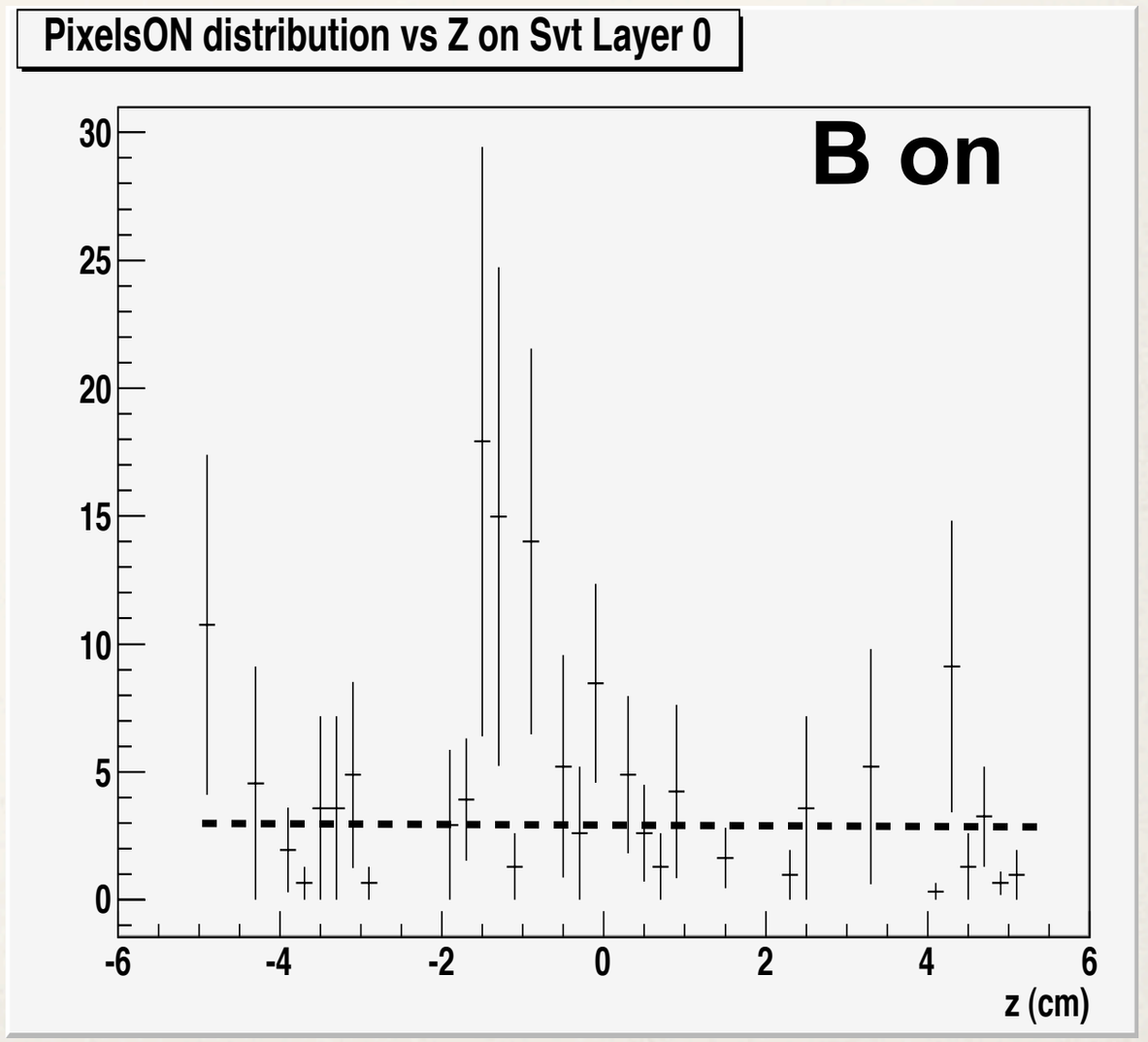
- Total cluster and pixel rates for all the layers
- B field on lowers by a factor 2 the cluster rate everywhere
- Pixel rates for L0 affected also by Si thickness (300 vs 200um)

Svt Layer	Cluster Rate (kHz/cm²)		Pixel Rate (kHz/cm²)	
B field	**B off**	**B on**	**B off**	**B on**
Layer 0	858	417	8016	2840
Layer 1	62	33	116	65
Layer 2	38	14	71	83
Layer 3	15	11	28	22
Layer 4	3.4	4.4	5.4	6.9
Layer 5	2.1	3.1	3.4	5.3

RadBhabha with B field on (5)

- Pixel rate z distribution: Feb Prod (B off) vs Test (B On)
- With B field On the pixel rate is 5% of value for bkg pairs using the same configuration





Conclusion

- Minimum radius for L0 considering bkg pairs only
  - Pixels: 13mm
  - Striplets: 19mm
- No visible hot spots, more statistics need for outer layers
- High level of radiation close to L0 just outside the tungsten shielding, share info with people that design FEE
- B field on in the IR moves down rates by a factor 2, not big as expected
  - Waiting for final configuration for B field at IR