

Update on pair background studies

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Reminder: we have been trying to understand why many  
MC particles from GuineaPig input files are  
stopped in the beampipe vacuum

Akiya has been investigating why these particles are killed

- when extrapolation to next step boundary deviates from  
the first estimate by some “large” amount
  - multiple retries
  - gives up [???
  
- suggested limiting maximum step length 10 m (default) → 1 cm  
[in the beampipe region only]  
minimum kinetic energy cut: 1 MeV

Simulated GP pairs from ~20 bunch crossings in various setups.

250 GeV (TDR parameters)

250 GeV (new high lumi parameters)

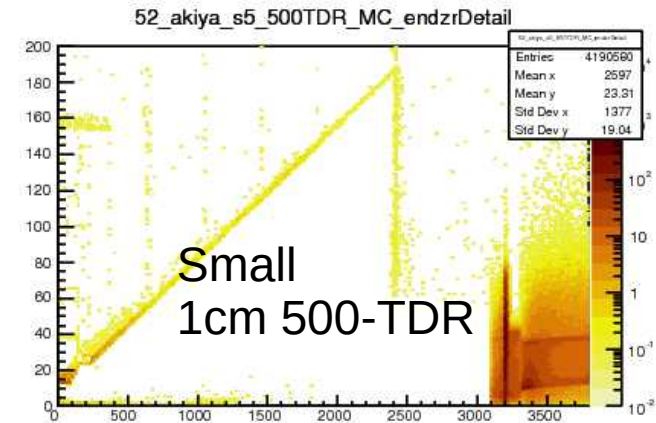
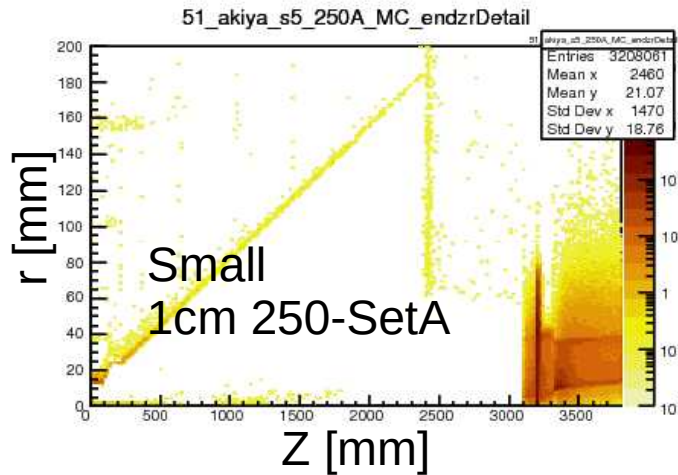
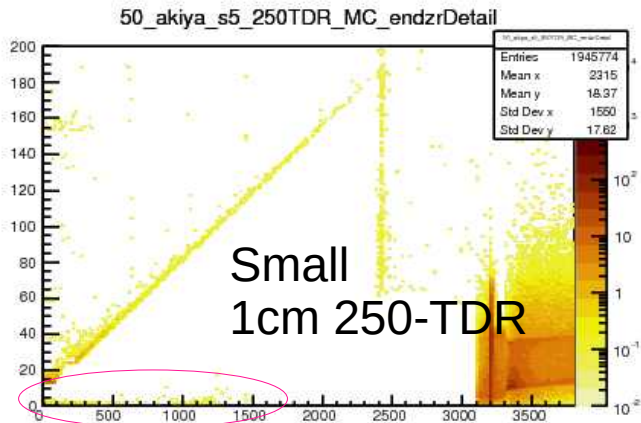
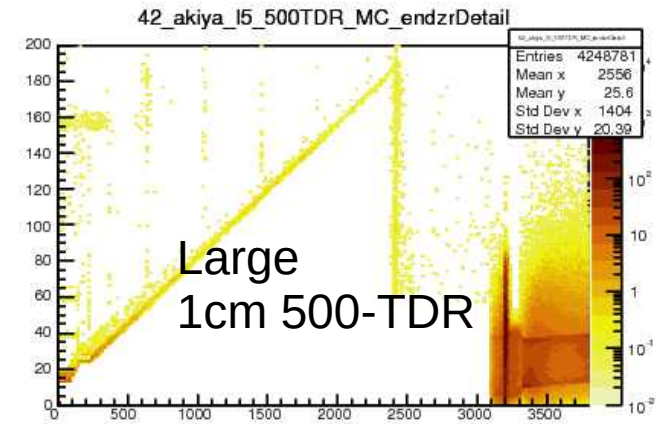
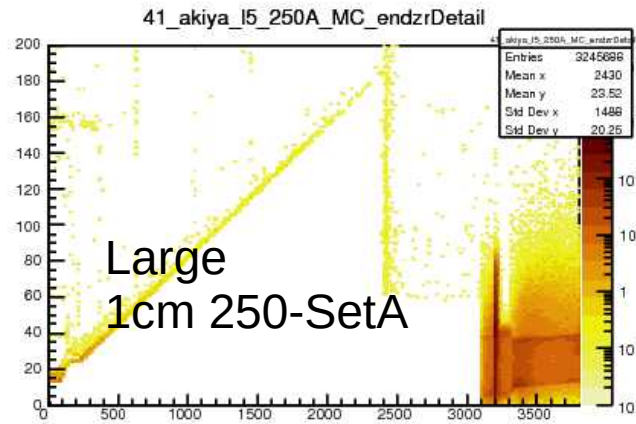
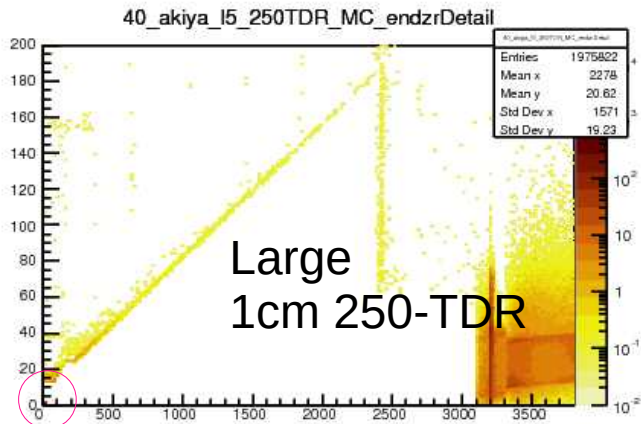
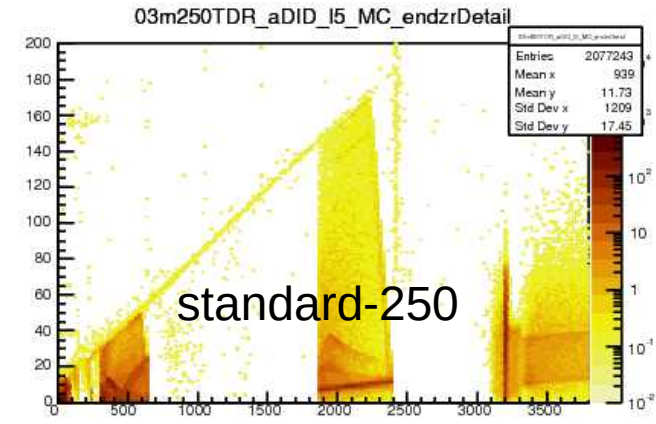
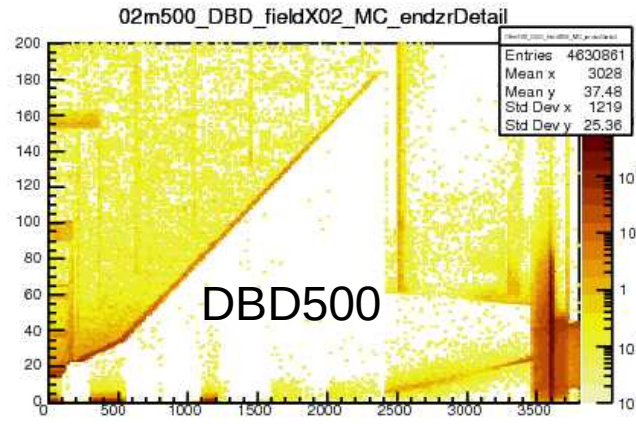
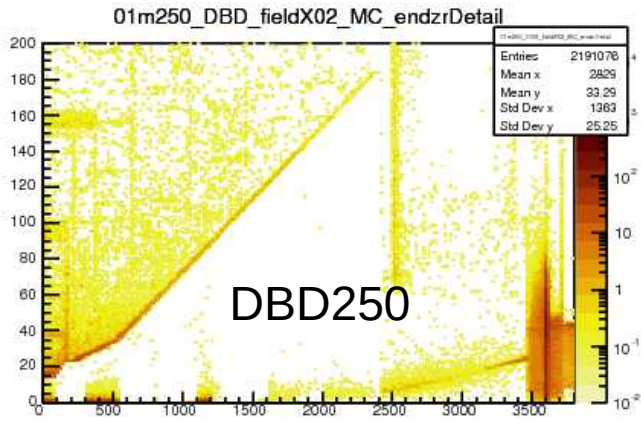
500 GeV (TDR parameters)

large and small ILD models

compare to DBD results (for TDR parameter sets)

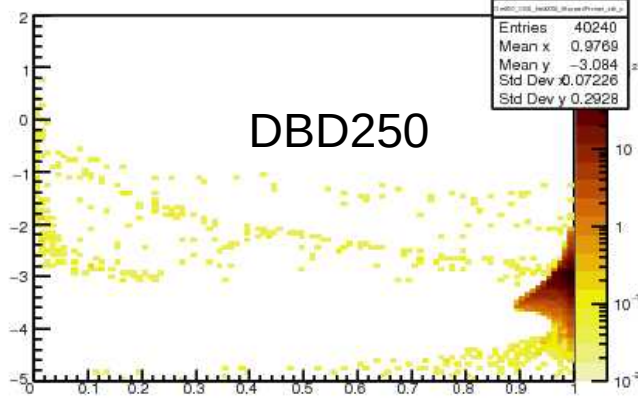
include B field map, anti-DID, forward magnets

# Endpoint of MC particles : $|z|$ vs. radius [GP pairs]

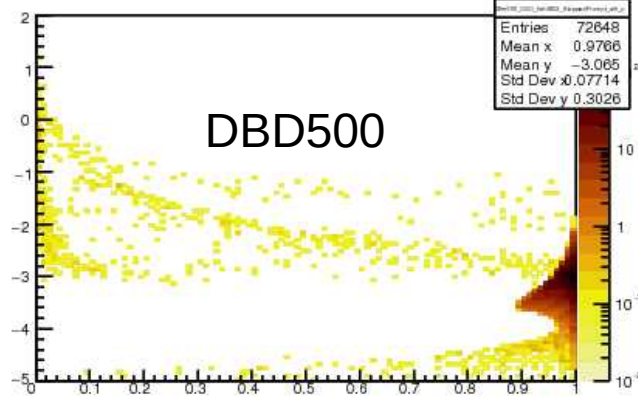


# MC particles stopped in beampipe: $\sin(\theta)$ vs. $\log_{10}(\text{momentum [GeV]})$

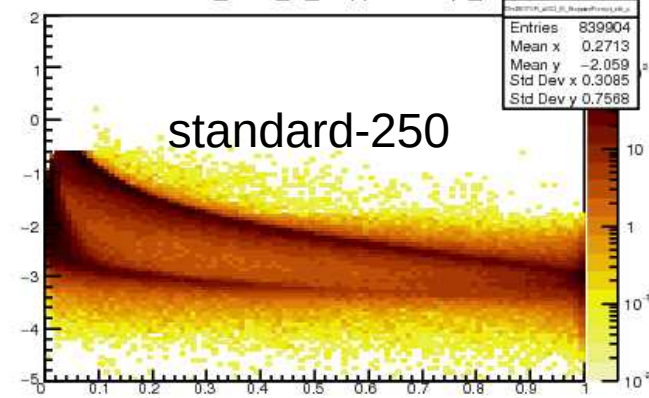
01m250\_DBD\_fieldX02\_StoppedPrompt\_sth\_p



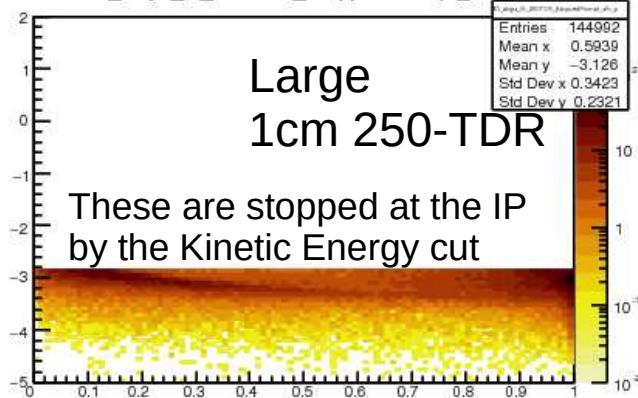
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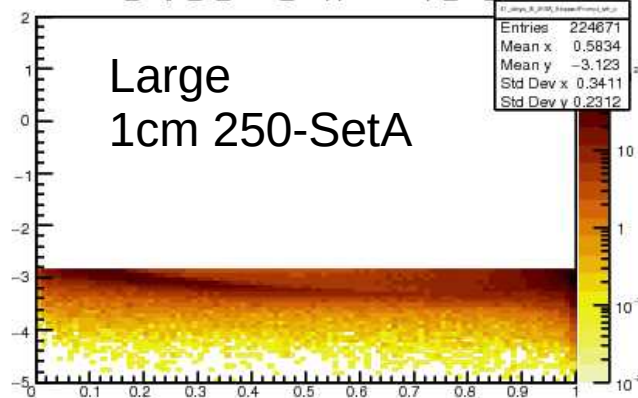
03m250TDR\_aDID\_I5\_StoppedPrompt\_sth\_p



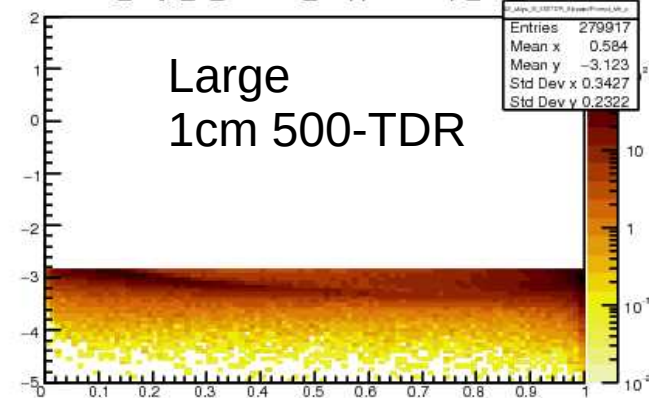
40\_akiya\_I5\_250TDR\_StoppedPrompt\_sth\_p



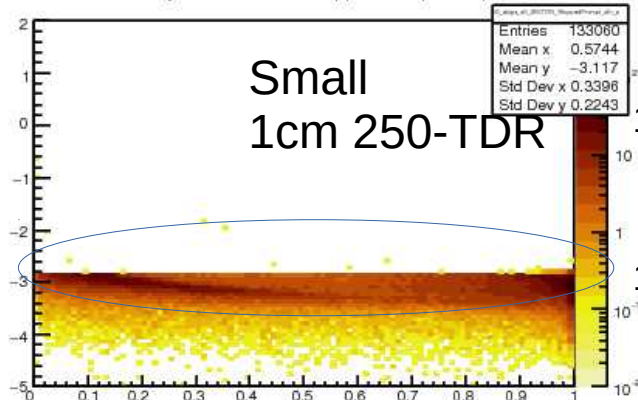
41\_akiya\_I5\_250A\_StoppedPrompt\_sth\_p



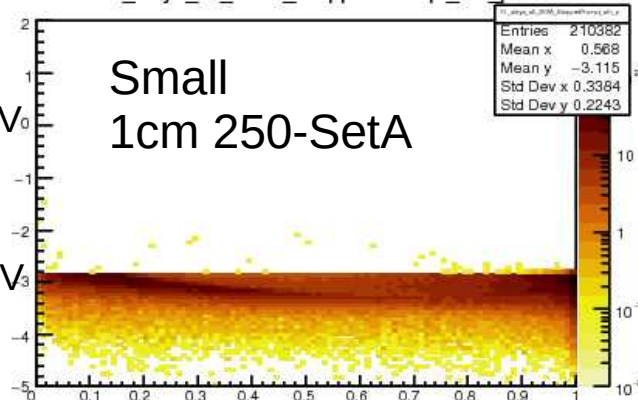
42\_akiya\_I5\_500TDR\_StoppedPrompt\_sth\_p



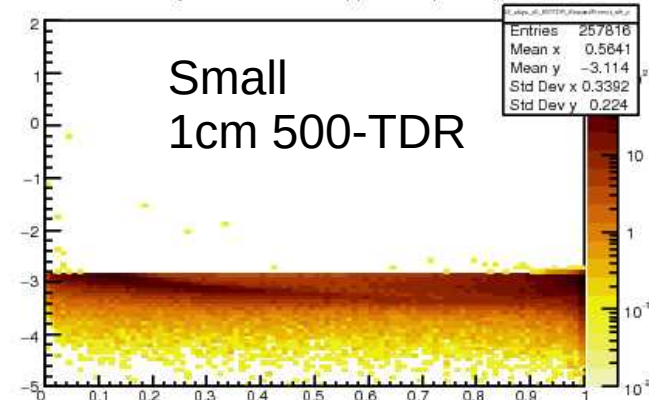
50\_akiya\_s5\_250TDR\_StoppedPrompt\_sth\_p



51\_akiya\_s5\_250A\_StoppedPrompt\_sth\_p

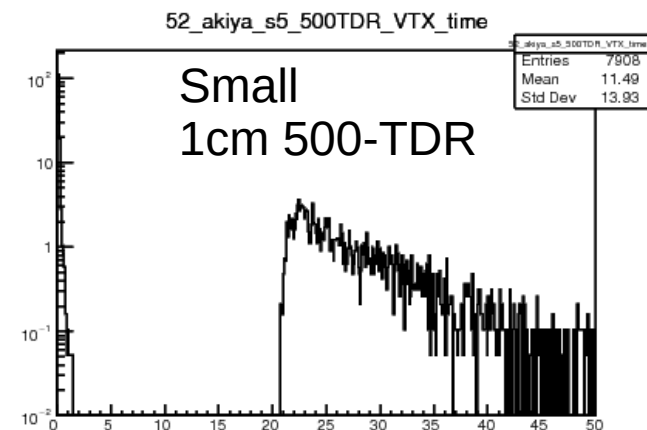
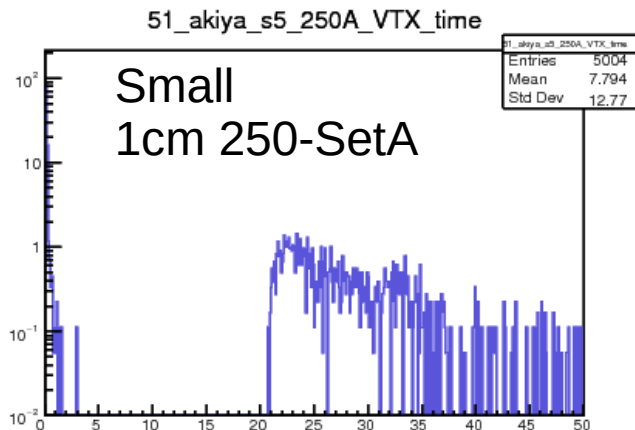
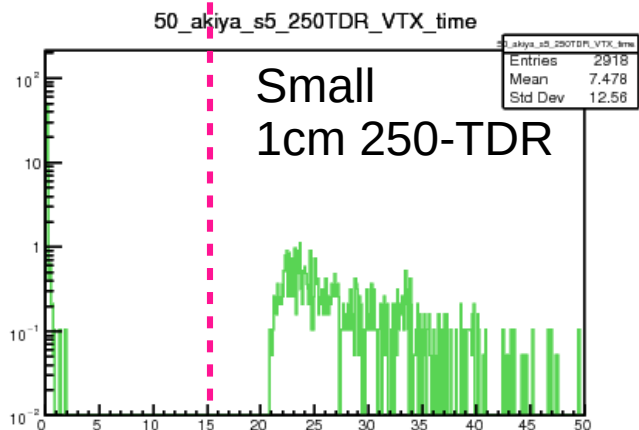
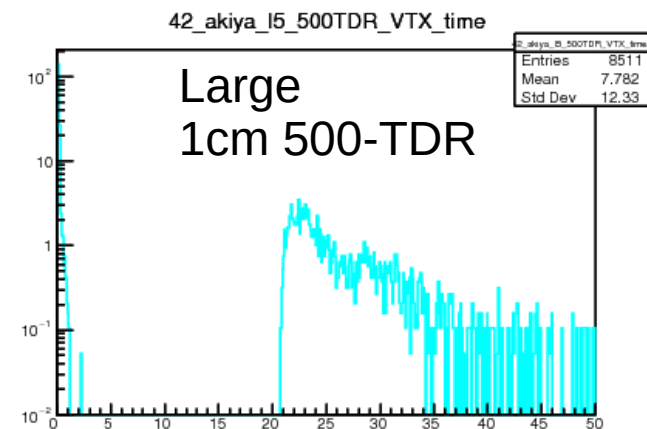
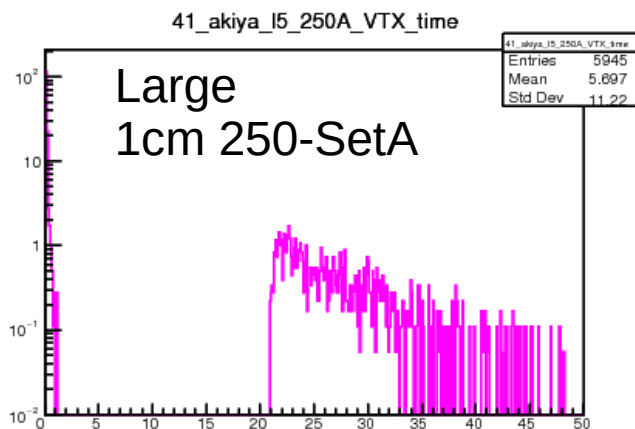
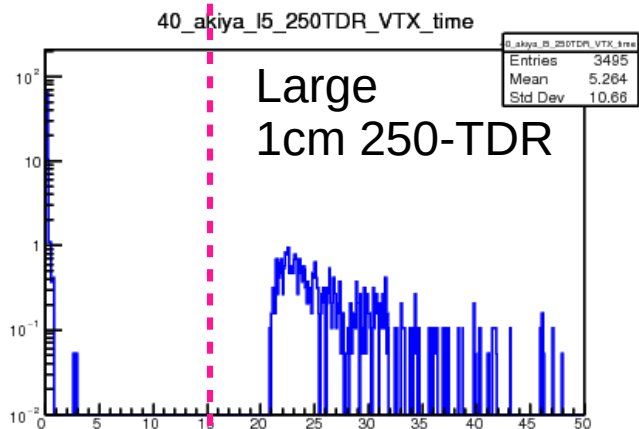
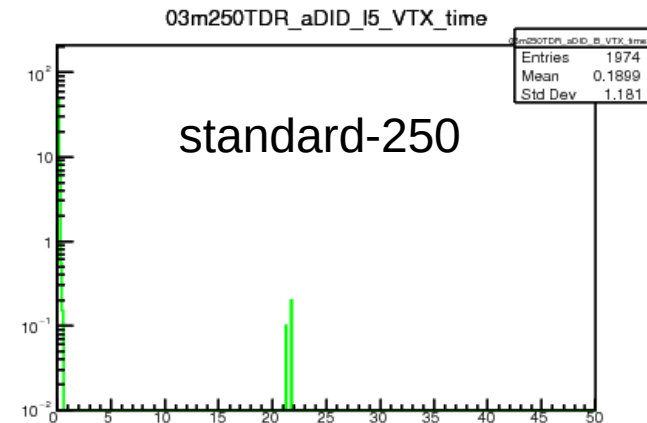
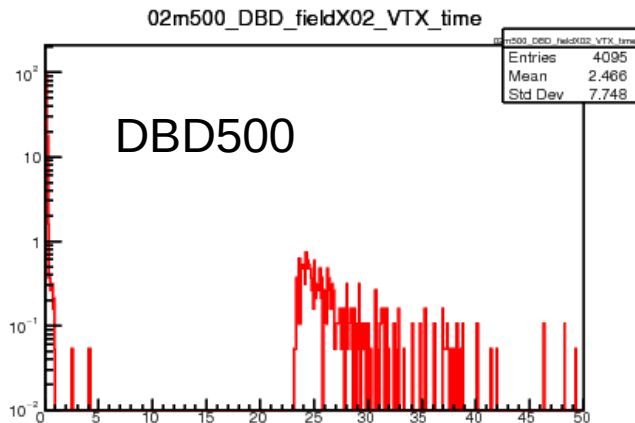
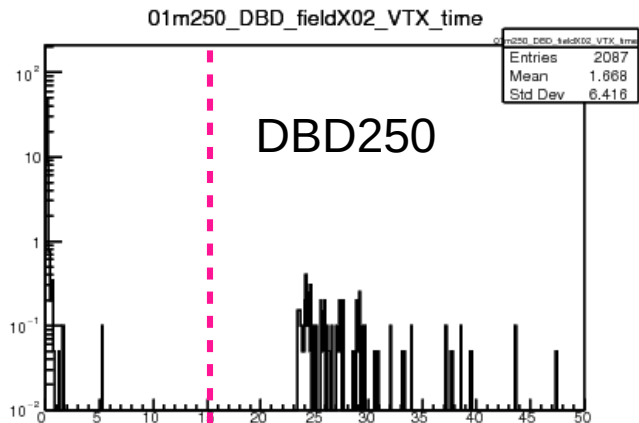


52\_akiya\_s5\_500TDR\_StoppedPrompt\_sth\_p



Sin ( theta )

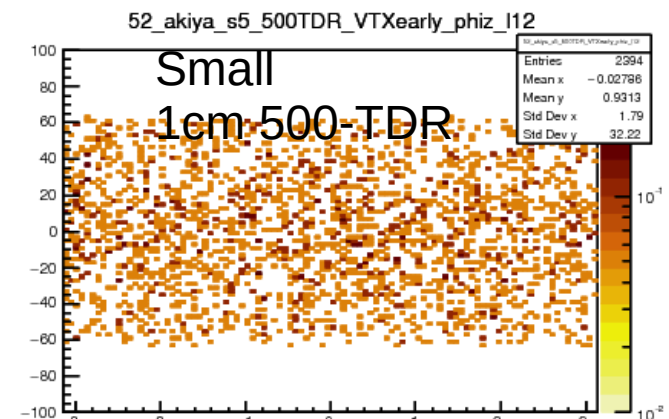
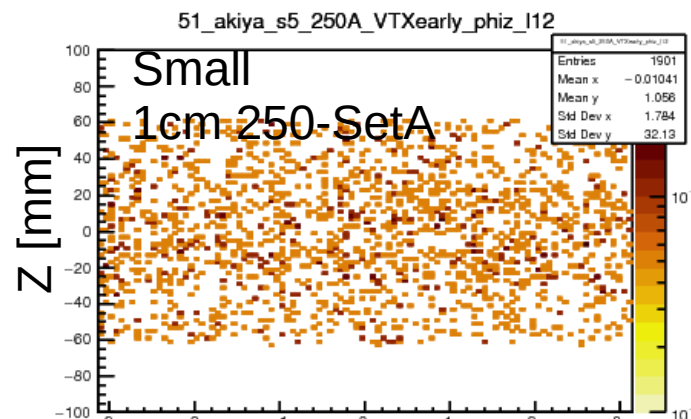
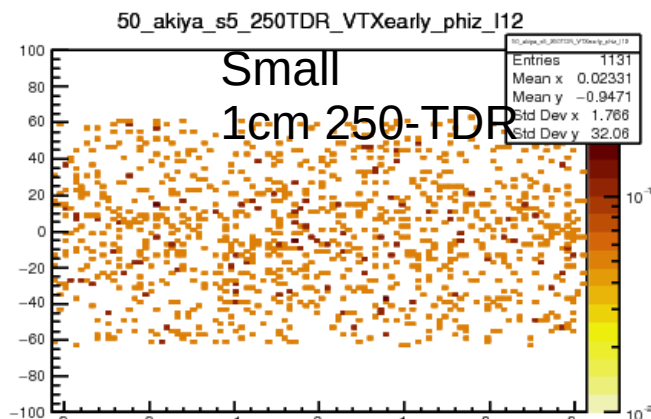
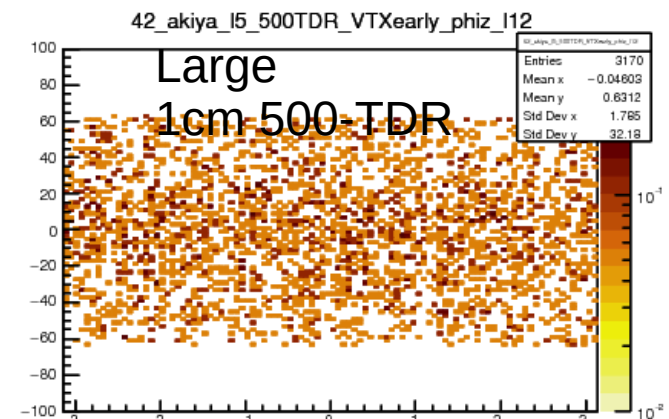
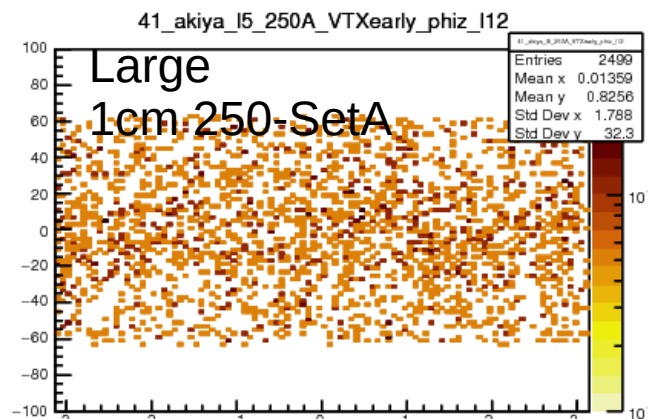
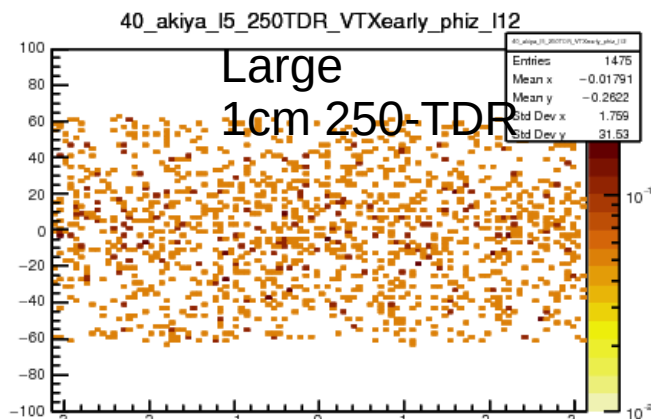
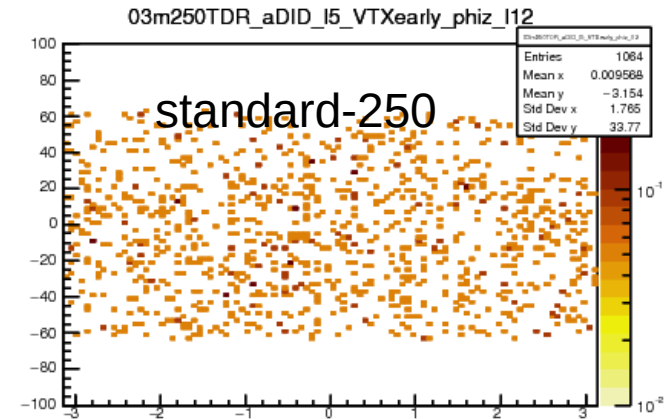
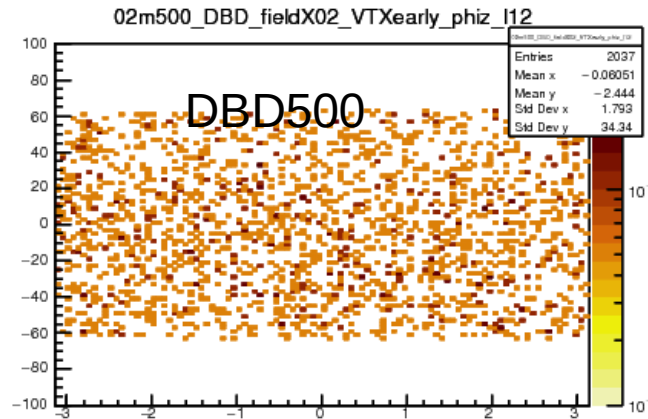
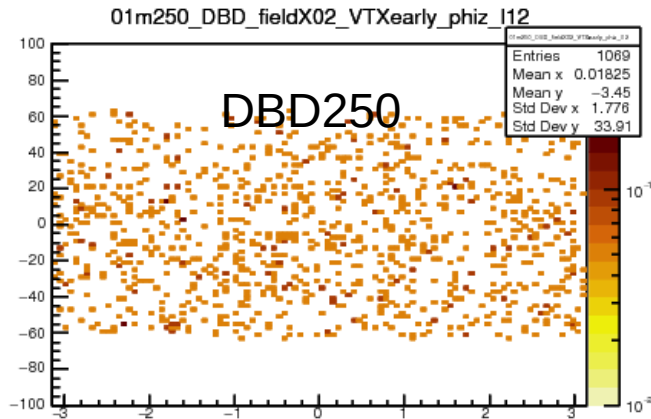
# Time of VTX hits



Hit Time [ns]

# Phi – z map of early VTX hits in L1/2 :

hits/bin/BX

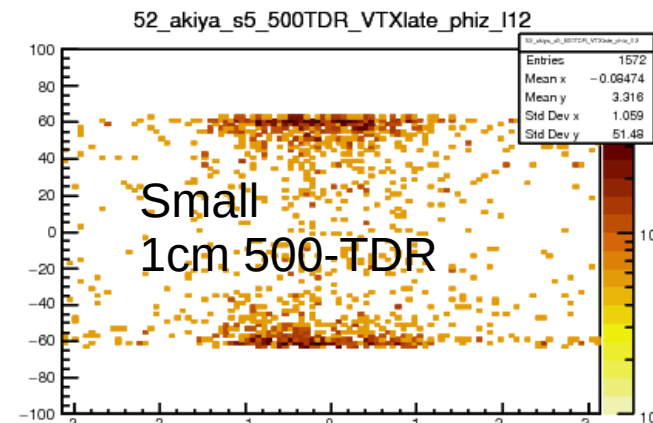
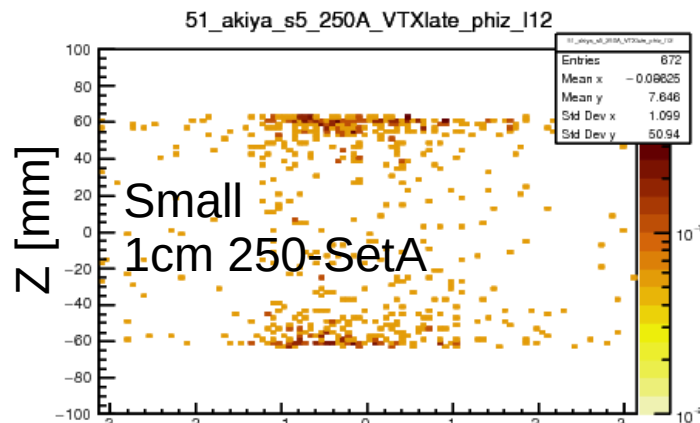
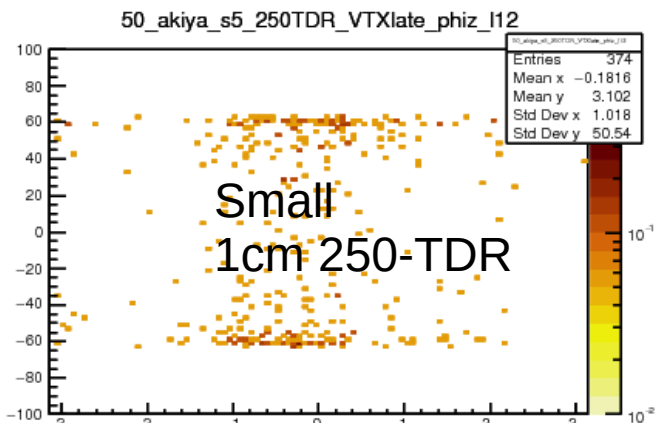
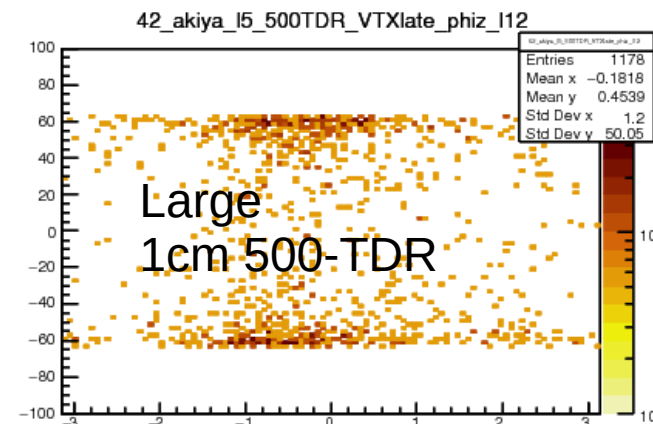
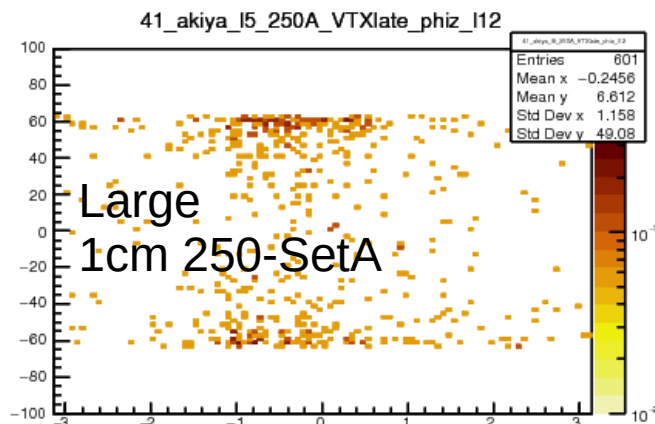
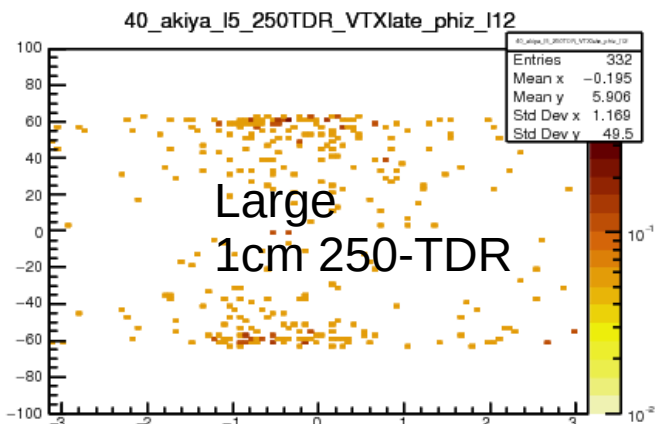
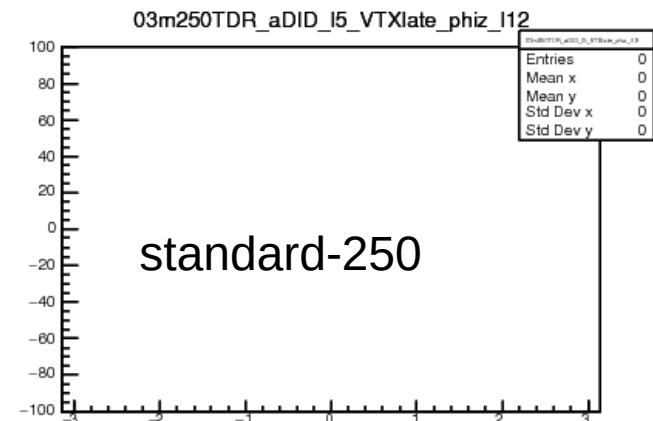
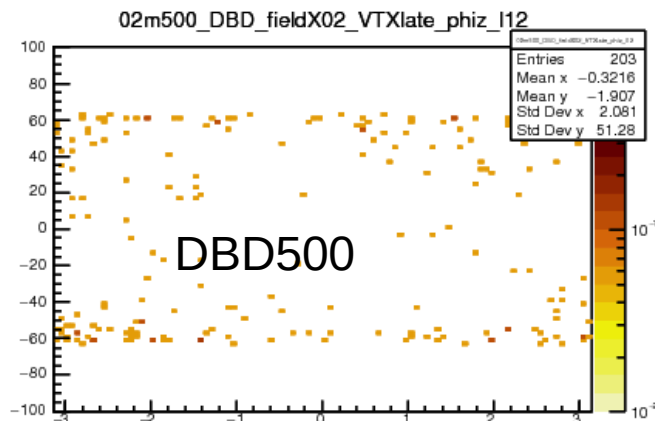
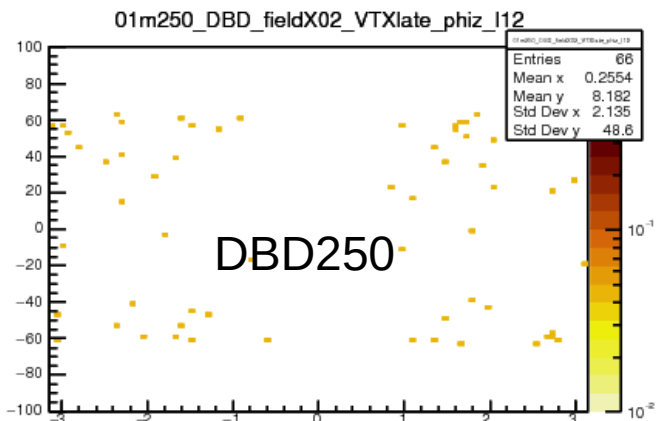


Phi [rad]

Z [mm]

# Phi – z map of late VTX hits in L1/2 :

hits/bin/BX



Phi [rad]

Z [mm]



# Number of Vertex detector SimTrackerHits in layers 1&2 / BX, split into early and late components

## All with B-field map, anti-DID

### Large detector

beamPars:	250-TDR		250-new		500-TDR	
	early	late	early	late	early	late
DBD_fieldX02	98	5.6			196	17
Default ILD_I5_v05(6)	98	0				
New Akiya params	145	34	257	65	311	120

### new Akiya parameters

	Large detector		Small Detector	
	early	late	early	late
250-TDR	145	34	110	38
250-SetA	257	65	196	72
500-TDR	311	120	236	161

Now looking at

- effect of turning off anti-DID field
- smaller maximum step length for smaller model  
[maybe fix remaining particles stopping in beampipe ?]
- effect of reducing the kinetic energy cut

### My conclusion

I think we're converging on a set of  
defendable and more-or-less understood estimates of  
pair backgrounds in VXD