Signal & Background at e-LASER IP & Fwd Spectrometer (Cerenkov)

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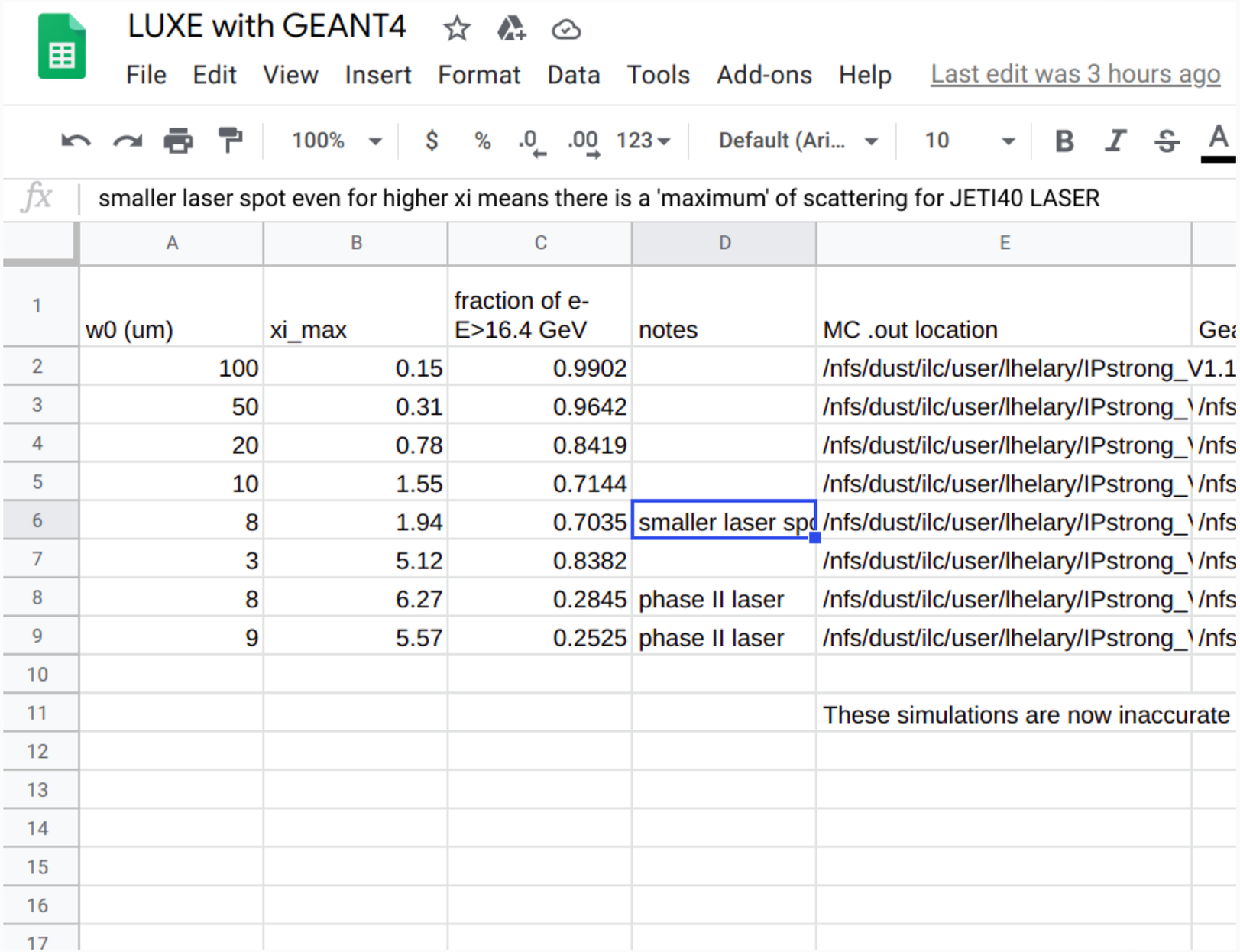
03/12/2020

LUXE

DESY.



LUXE with GEANT4

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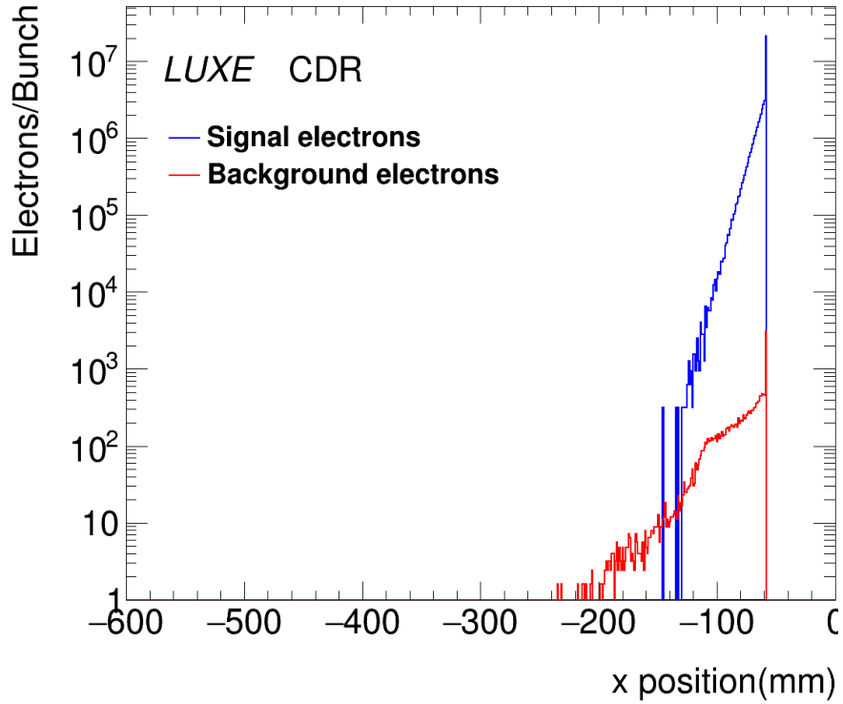
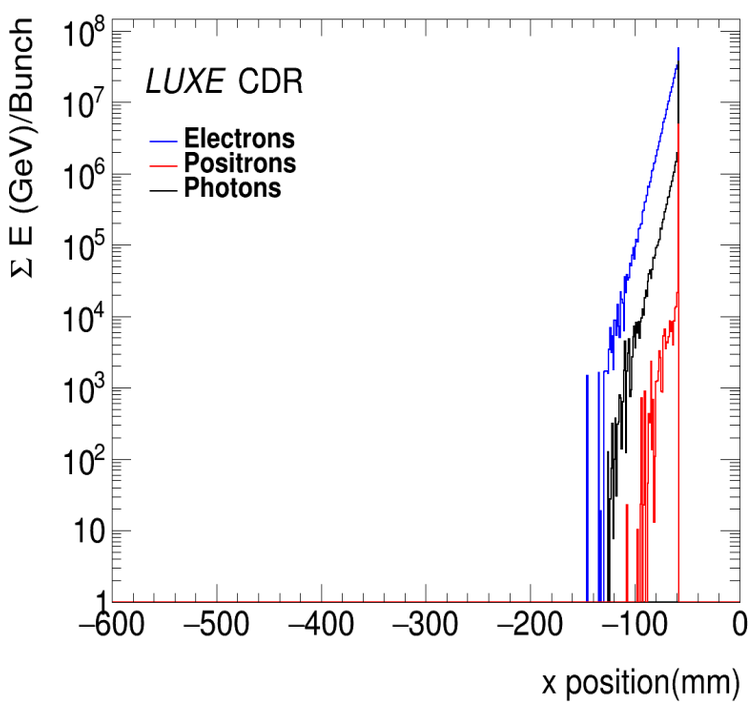
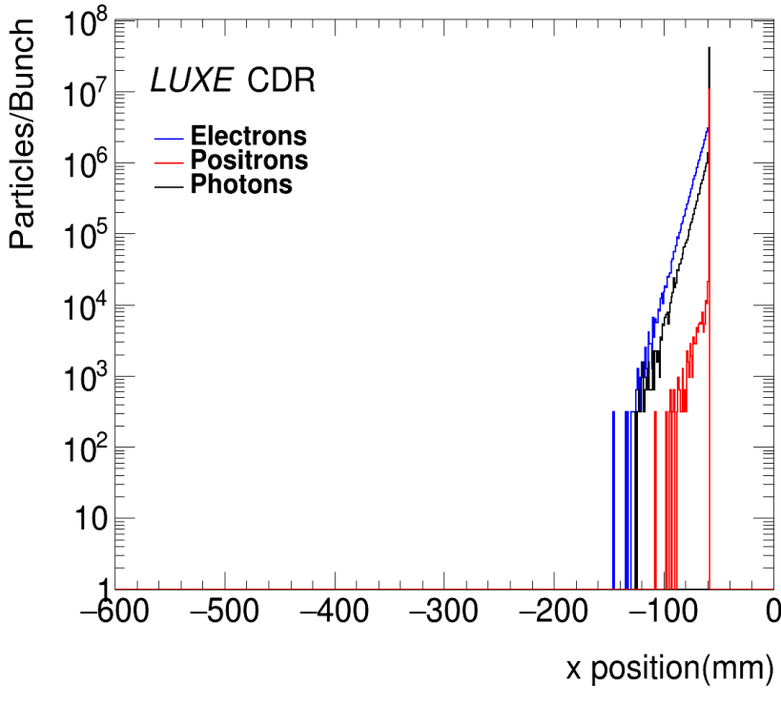
smaller laser spot even for higher xi means there is a 'maximum' of scattering for JETI40 LASER

	A	B	C	D	E	
1	w0 (um)	xi_max	fraction of e- E>16.4 GeV	notes	MC .out location	Gea
2	100	0.15	0.9902		/nfs/dust/ilc/user/lhelary/IPstrong_V1.1	
3	50	0.31	0.9642		/nfs/dust/ilc/user/lhelary/IPstrong_\	/nfs
4	20	0.78	0.8419		/nfs/dust/ilc/user/lhelary/IPstrong_\	/nfs
5	10	1.55	0.7144		/nfs/dust/ilc/user/lhelary/IPstrong_\	/nfs
6	8	1.94	0.7035	smaller laser spo	/nfs/dust/ilc/user/lhelary/IPstrong_\	/nfs
7	3	5.12	0.8382		/nfs/dust/ilc/user/lhelary/IPstrong_\	/nfs
8	8	6.27	0.2845	phase II laser	/nfs/dust/ilc/user/lhelary/IPstrong_\	/nfs
9	9	5.57	0.2525	phase II laser	/nfs/dust/ilc/user/lhelary/IPstrong_\	/nfs
10						
11					These simulations are now inaccurate	
12						
13						
14						
15						
16						
17						

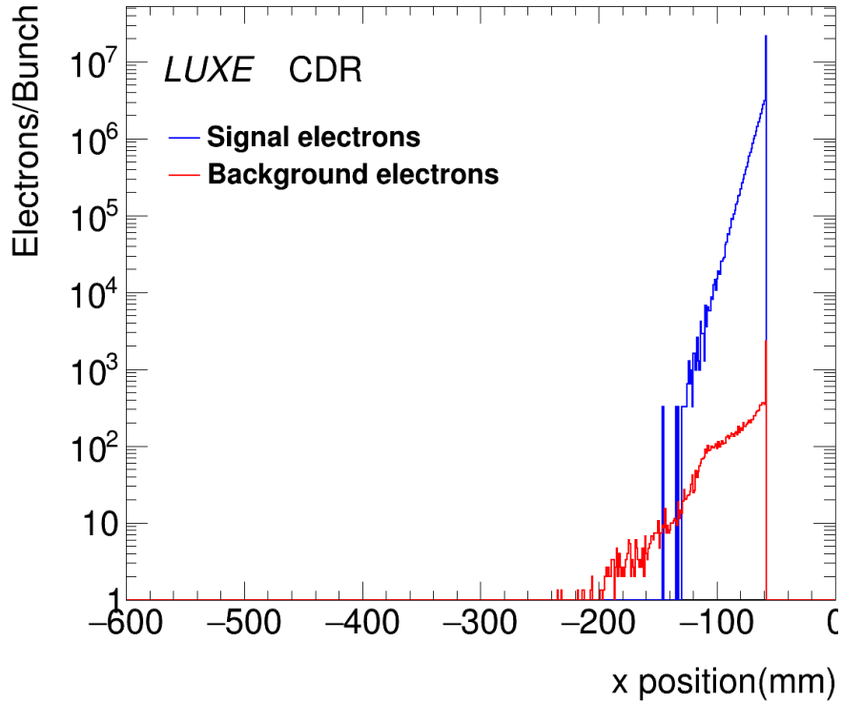
E-LASER postIP e^- region – High Xi (5.12) – Cerenkov – E>20 MeV selection

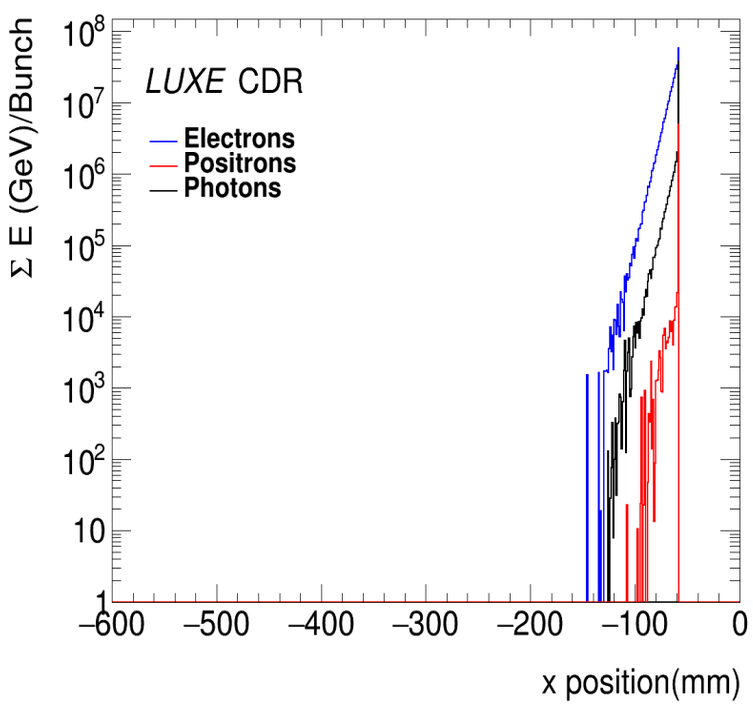


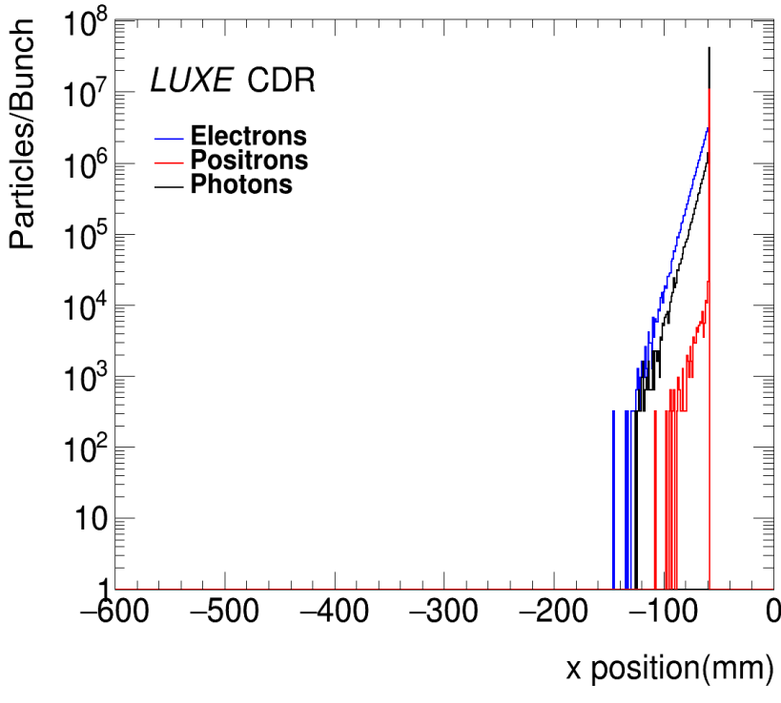


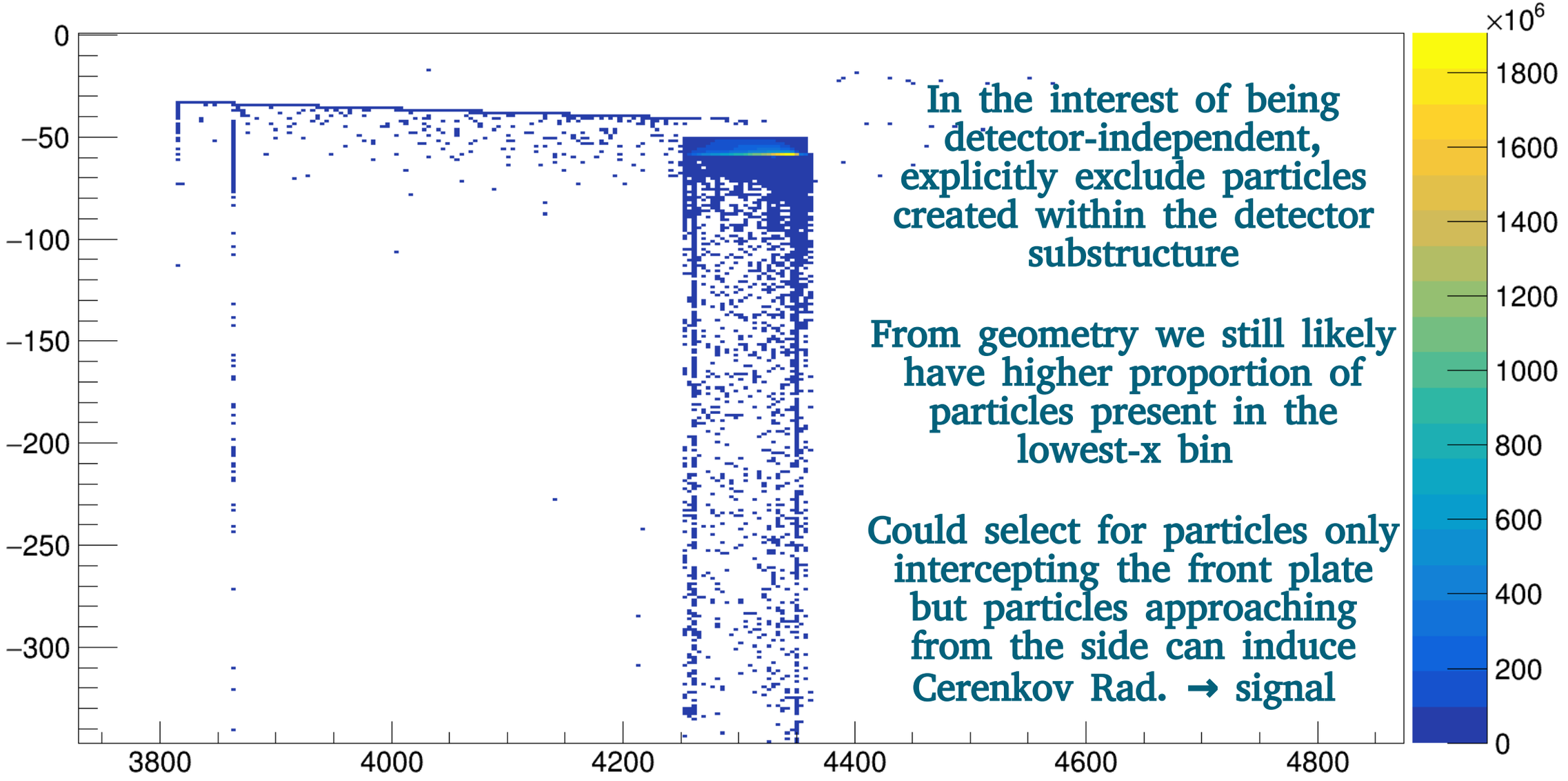


New reduced e-beam pop. E-LASER postIP e^- region – High Xi (5.12) – Cerenkov – E>20 MeV selection







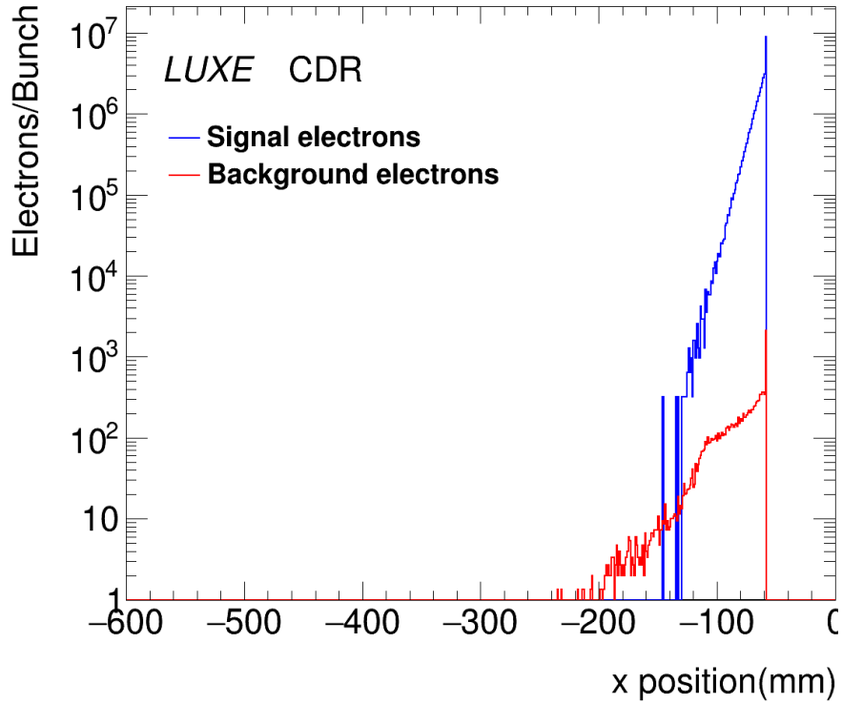


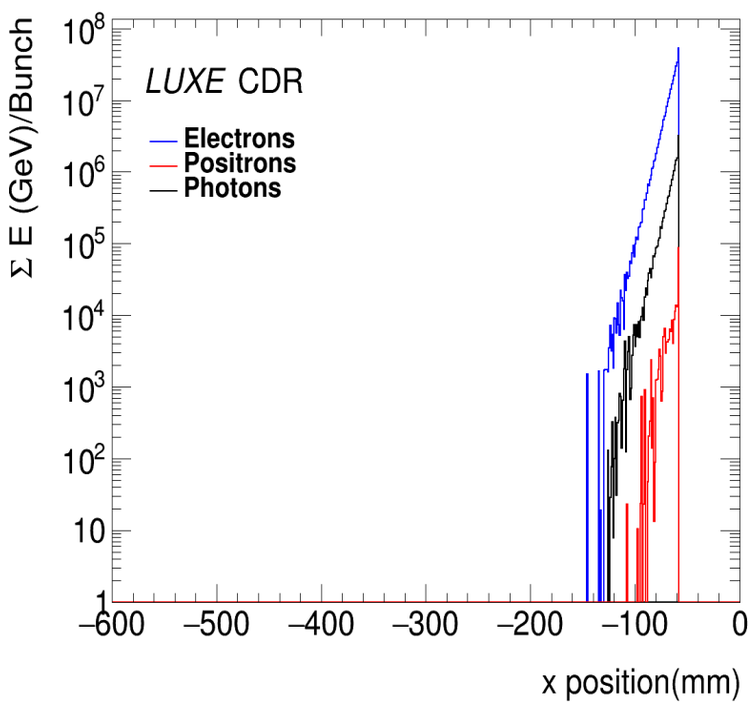
In the interest of being detector-independent, explicitly exclude particles created within the detector substructure

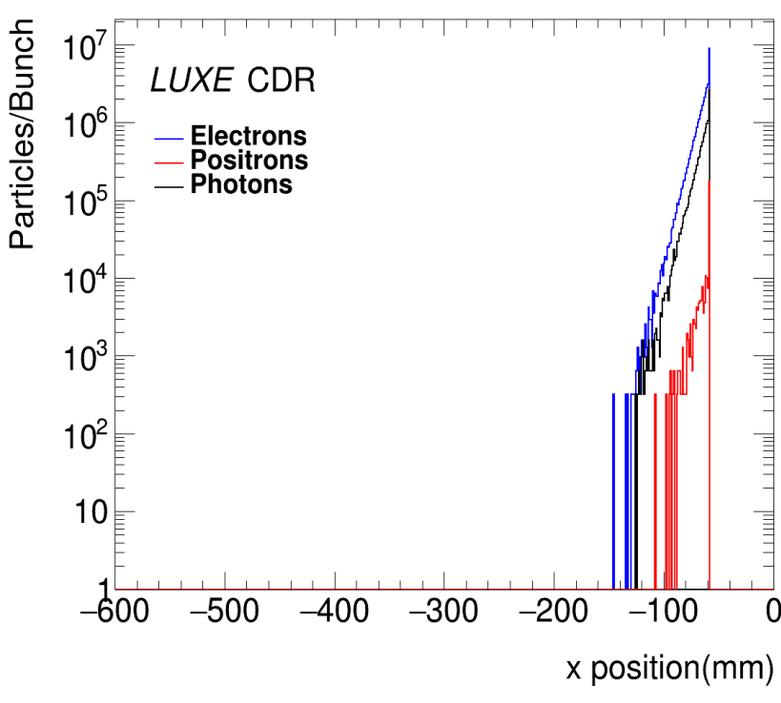
From geometry we still likely have higher proportion of particles present in the lowest-x bin

Could select for particles only intercepting the front plate but particles approaching from the side can induce Cerenkov Rad. → signal

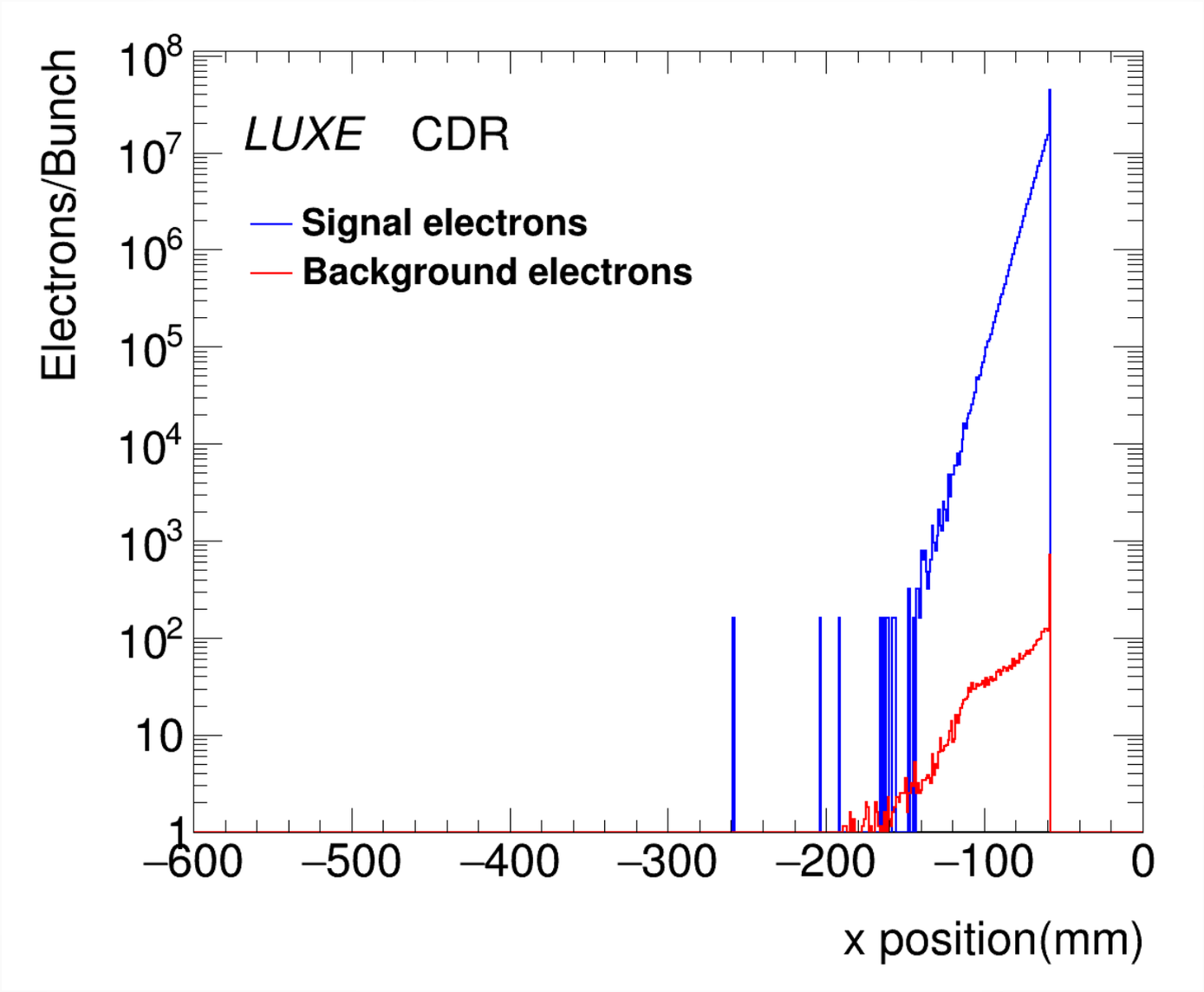
New reduced e-beam pop. E-LASER postIP e^- region – High Xi (5.12) – Cerenkov – E>20 MeV selection





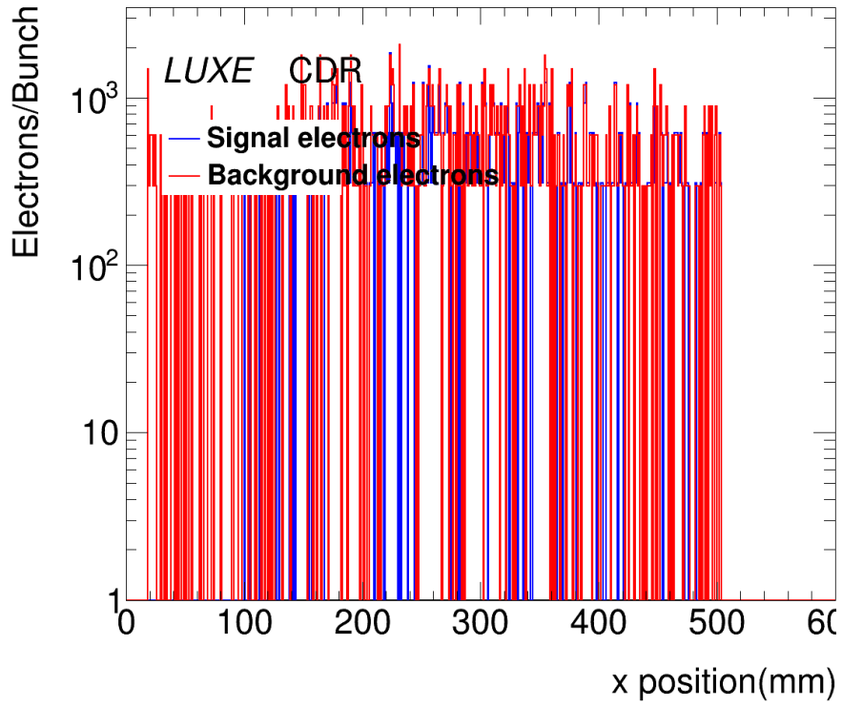


New reduced e-beam pop. E-LASER postIP e^- region – High Xi (6.27) Phase 2 – Cerenkov – E>20 MeV selection

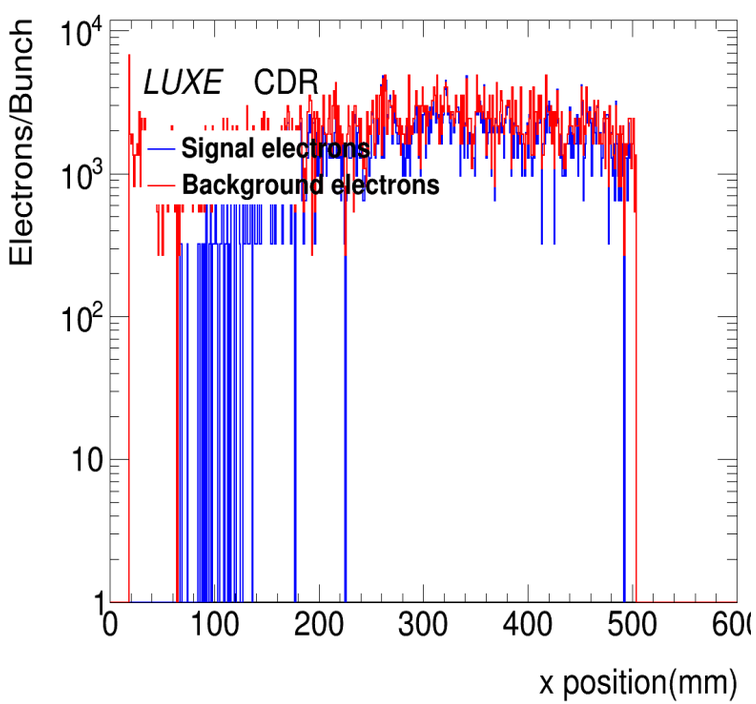


With analyses of Background numbers of forward Cerenkov, I have automatically generated some plots for the forward spectrometer Cherenkov detectors

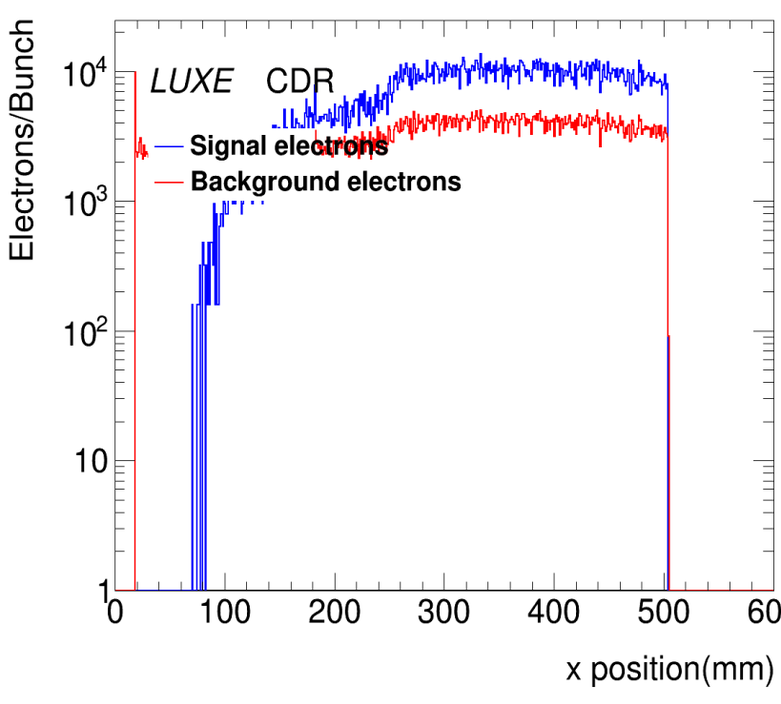
I can take charge of supplying (beautified) plots of these detectors for the Simulation chapter of the CDR



Low-Xi



High-Xi

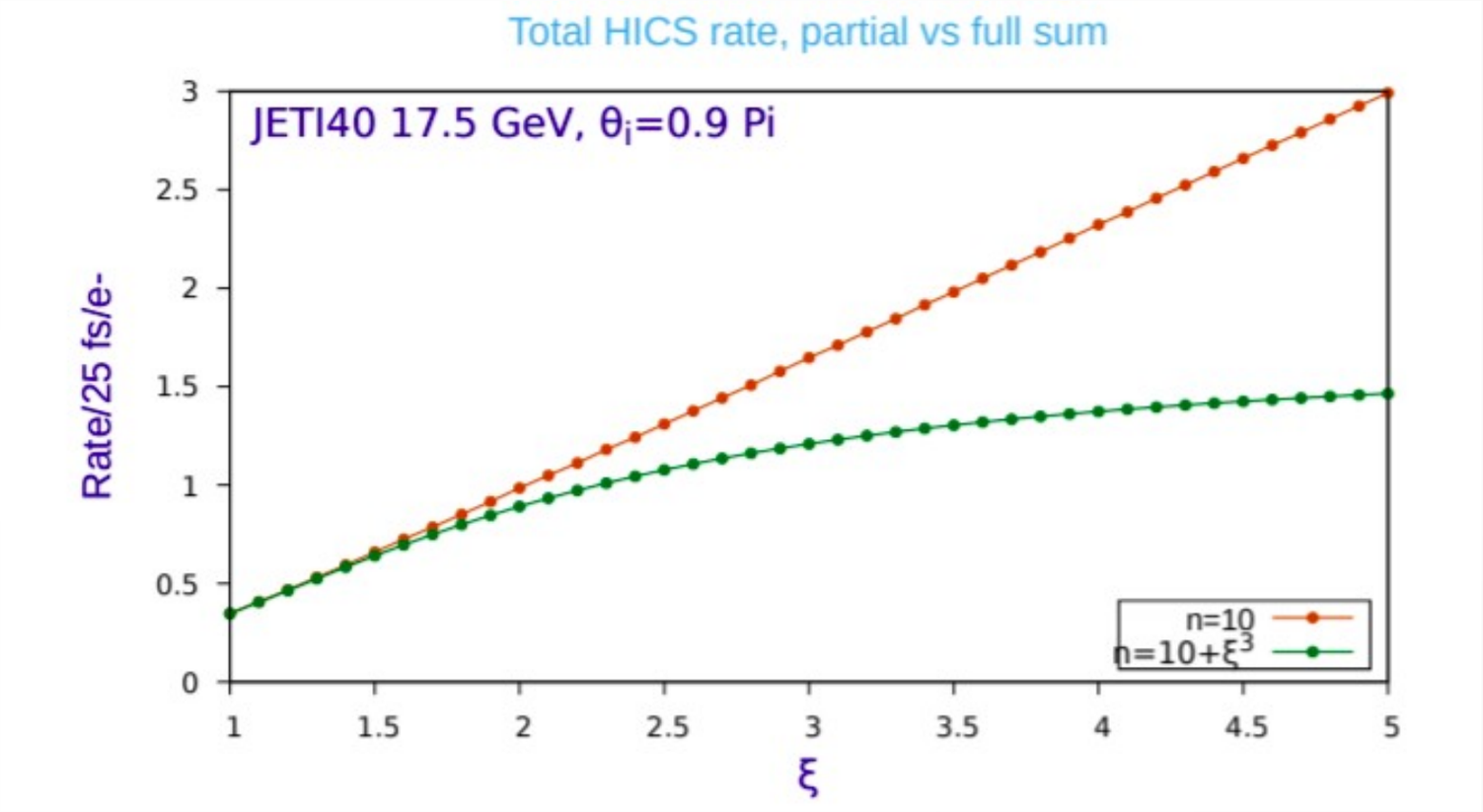


High Xi Phase2

- no effect on low xi

- ~100% increase for high-xi near 5

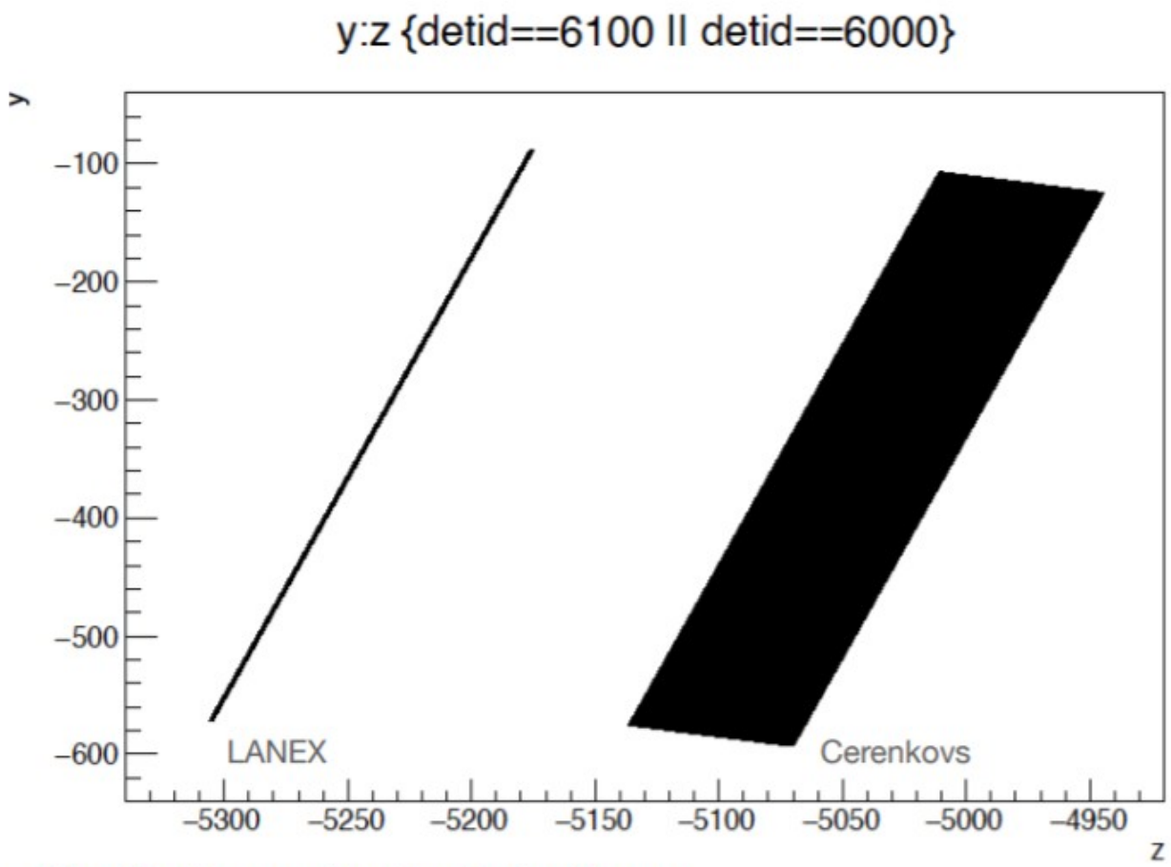
- re-run simulation at key (high-xi) parameters



Tony's slides 24/11/20

Backup

Brems system

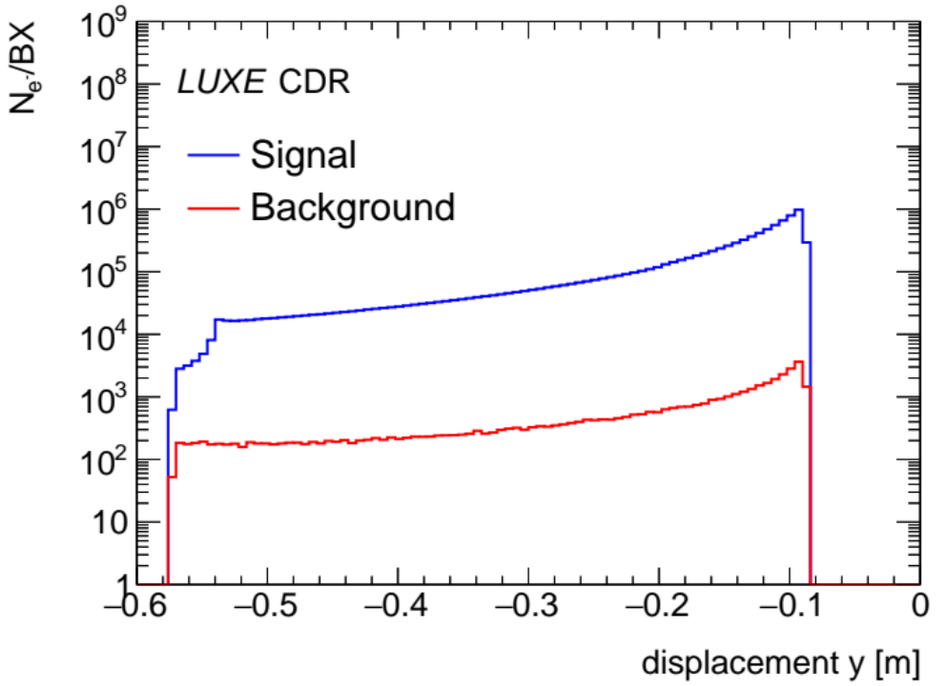


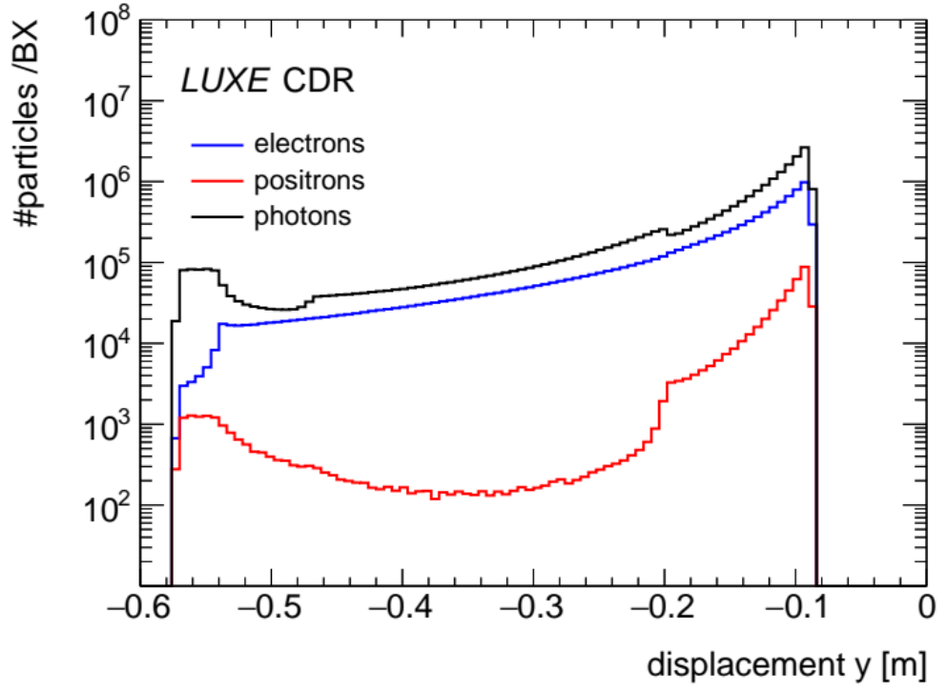
- Lanex screen and Cerenkovs in initial Brems spectrometer

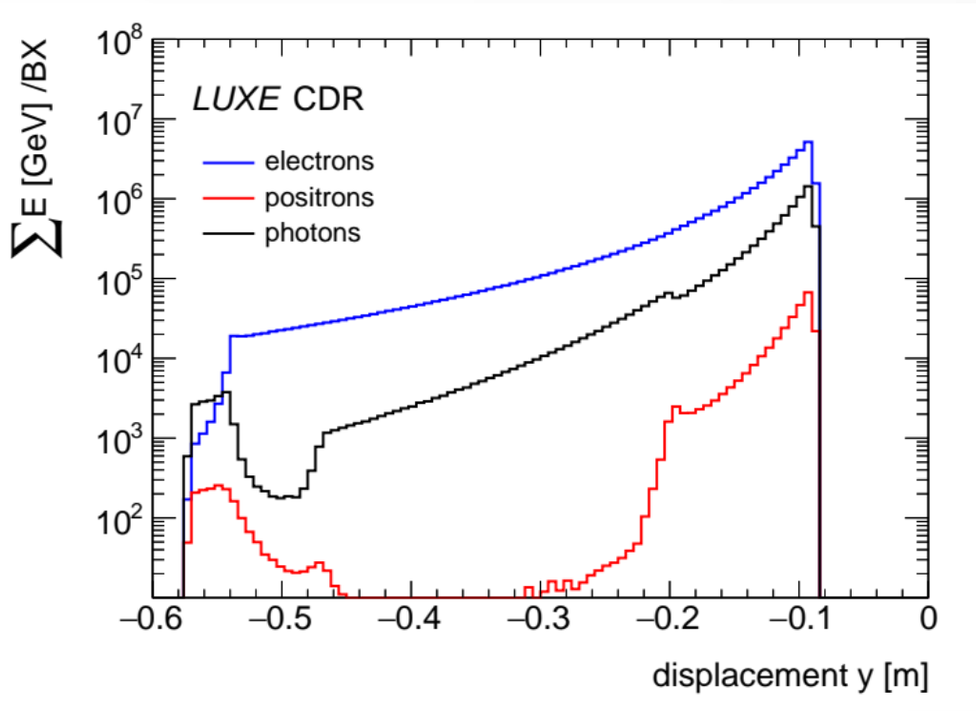
- Aim: Background estimate for Brems
- we have no simulation “without the target”
- expect beam background will mostly come from the back of the detectors (expect little interaction of the beam electrons on their way to the Brems system)

Use vtxz>-5170 for LANEX and vtxz>4940 for Cerenkovs to select Backgrounds!

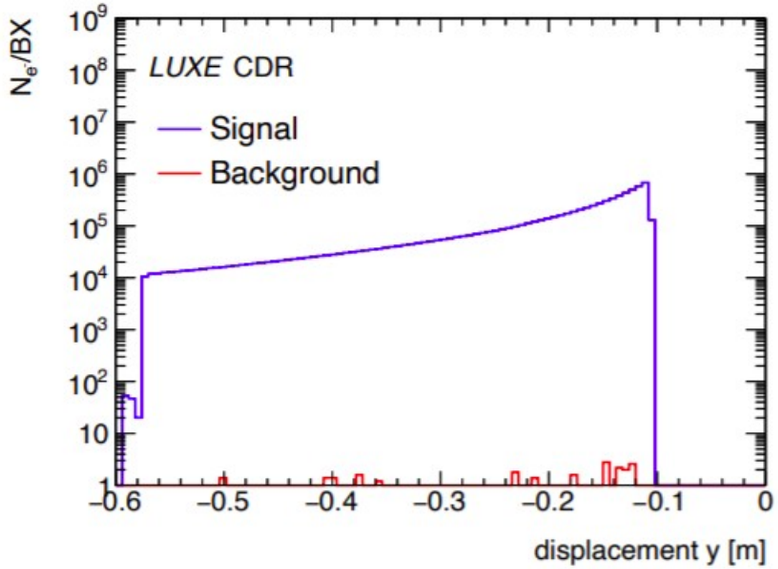
Gamma-LASER Brem. Region Scintillation screen (from Ruth)

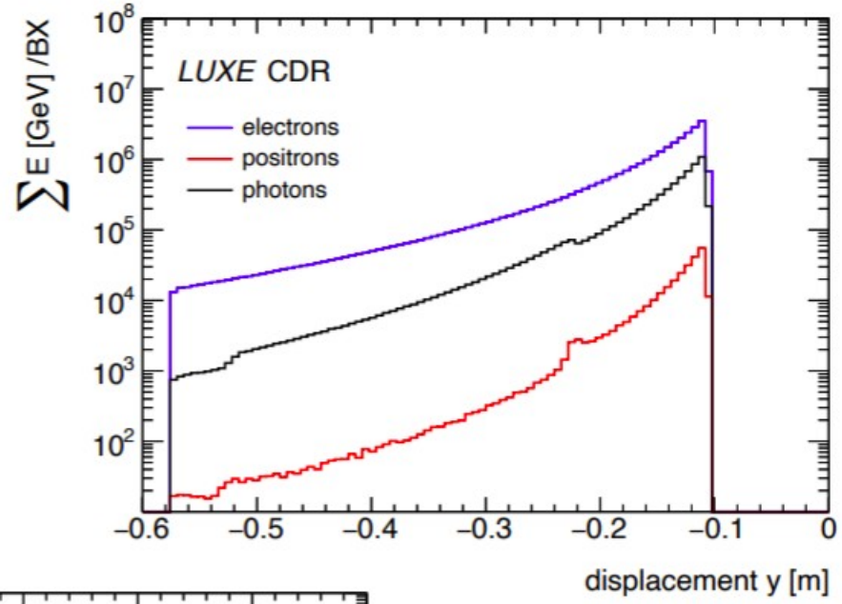


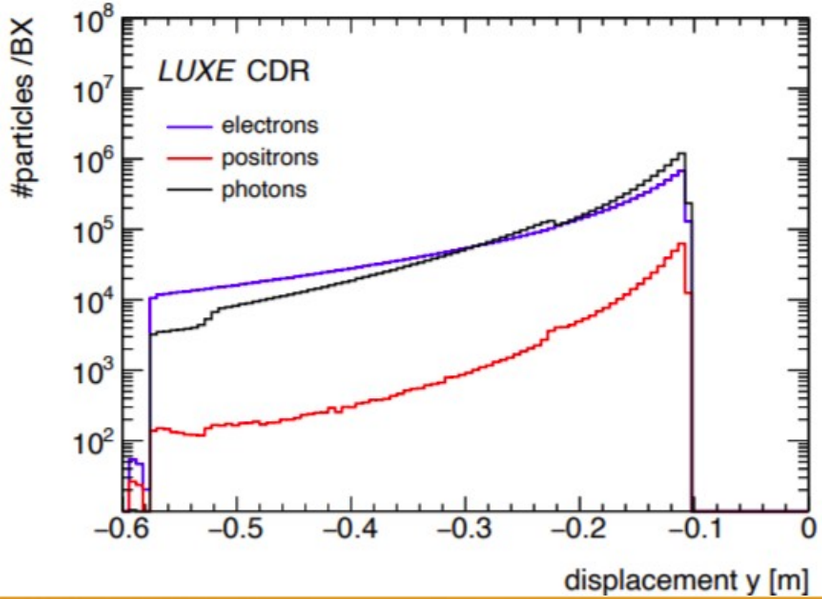




Gamma-LASER Brem. Region – Cerenkov Detector (from Ruth)





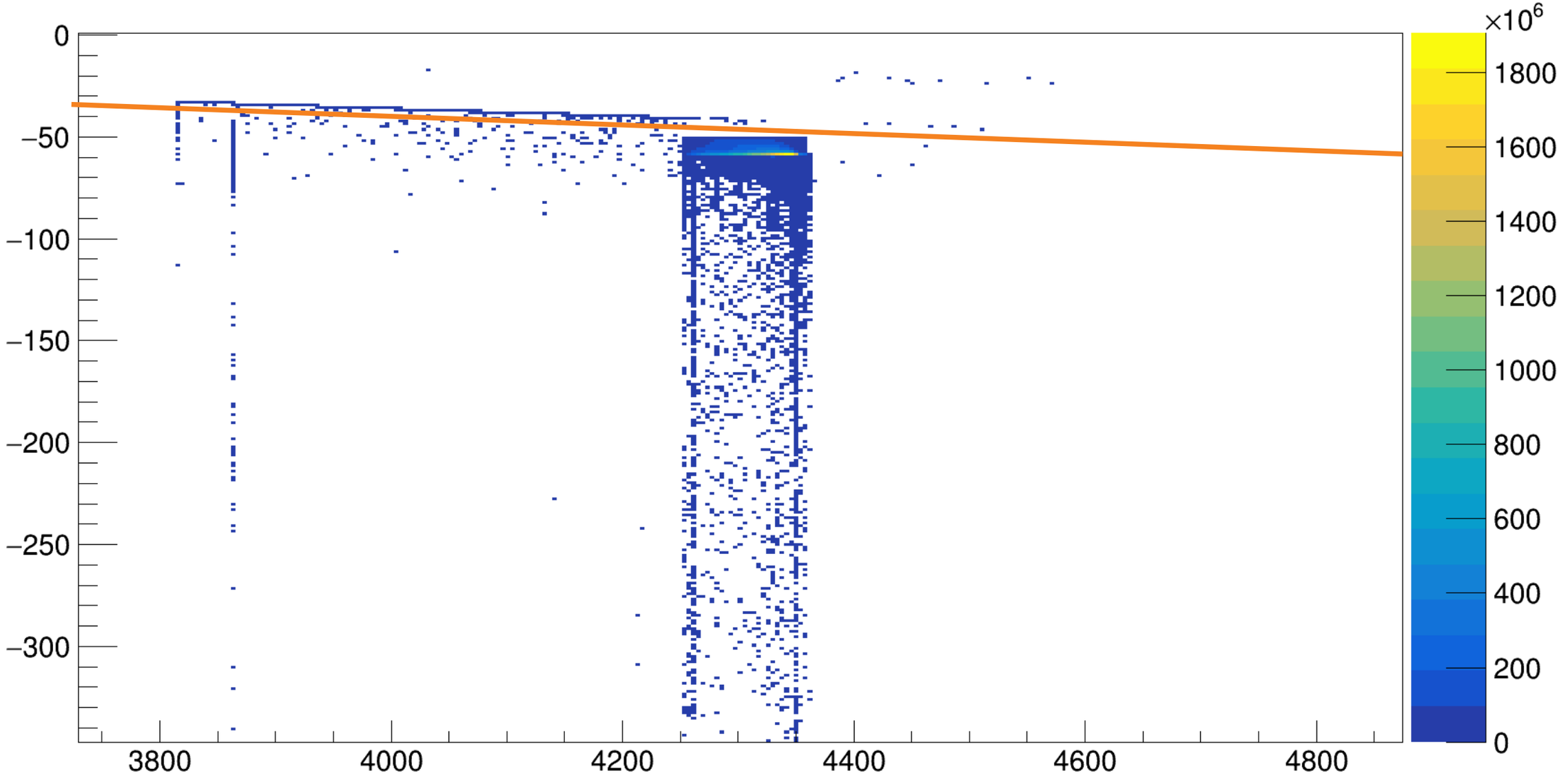


+ numbers for bar charts
(integrals of these plots)

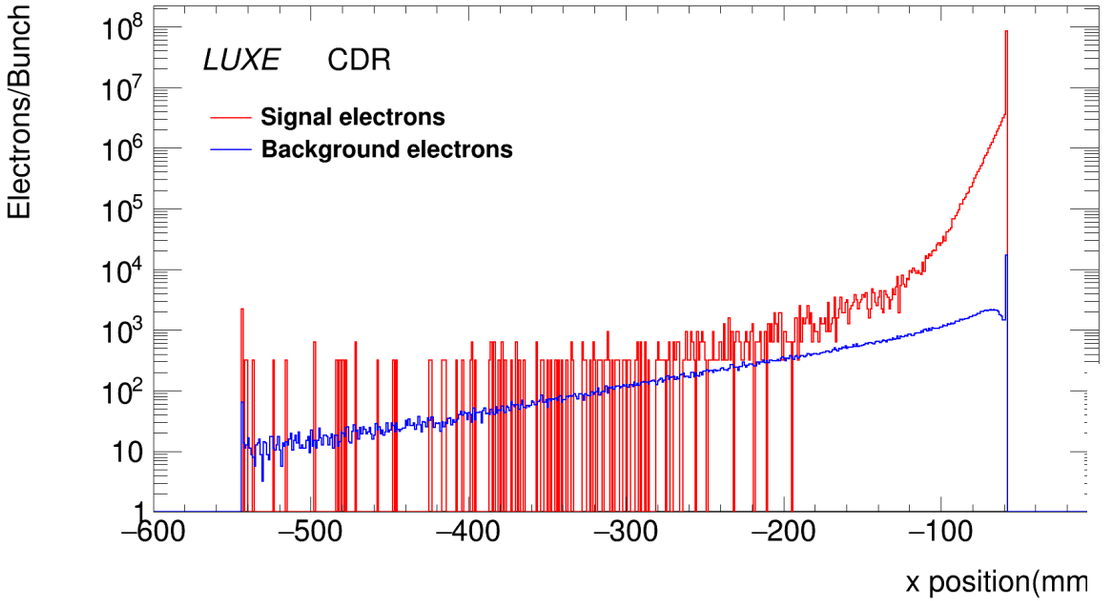
- For e-laser IP region, we have a special simulation of just the (16.5 GeV) e^- beam which can act as background. We can then use the simulation of Ipstrong MC ouput, propagated through G4 as signal

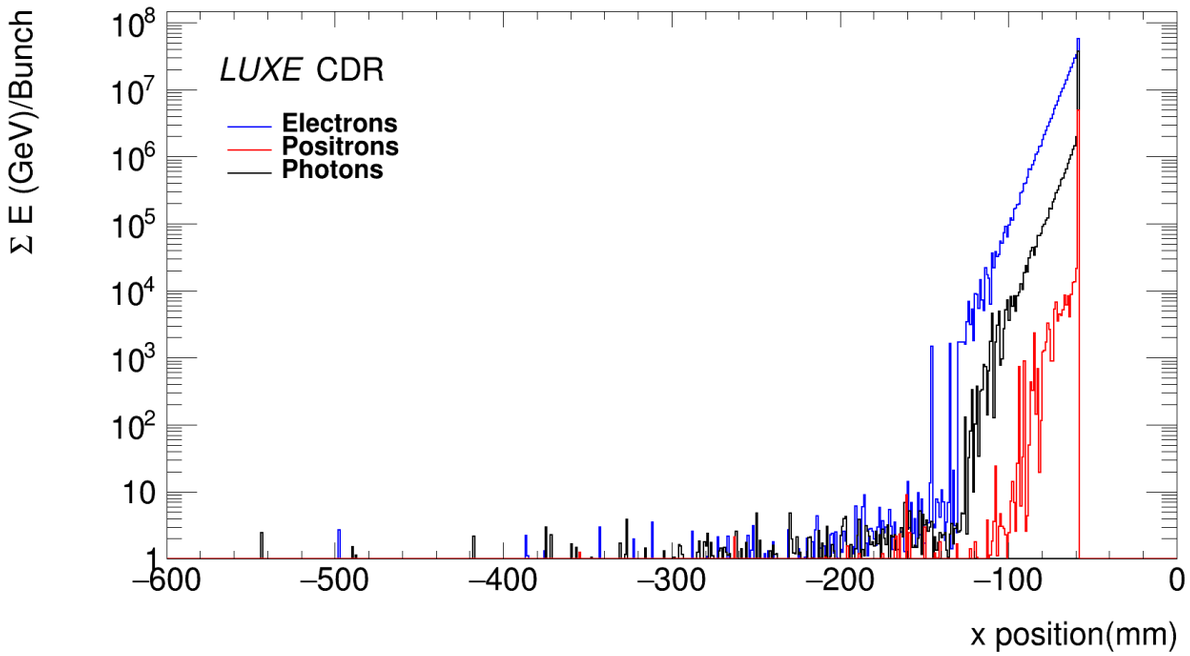
- These files still include the electron beam (minus e^- scattered to lower E) so we need to exclude the effect of this beam still

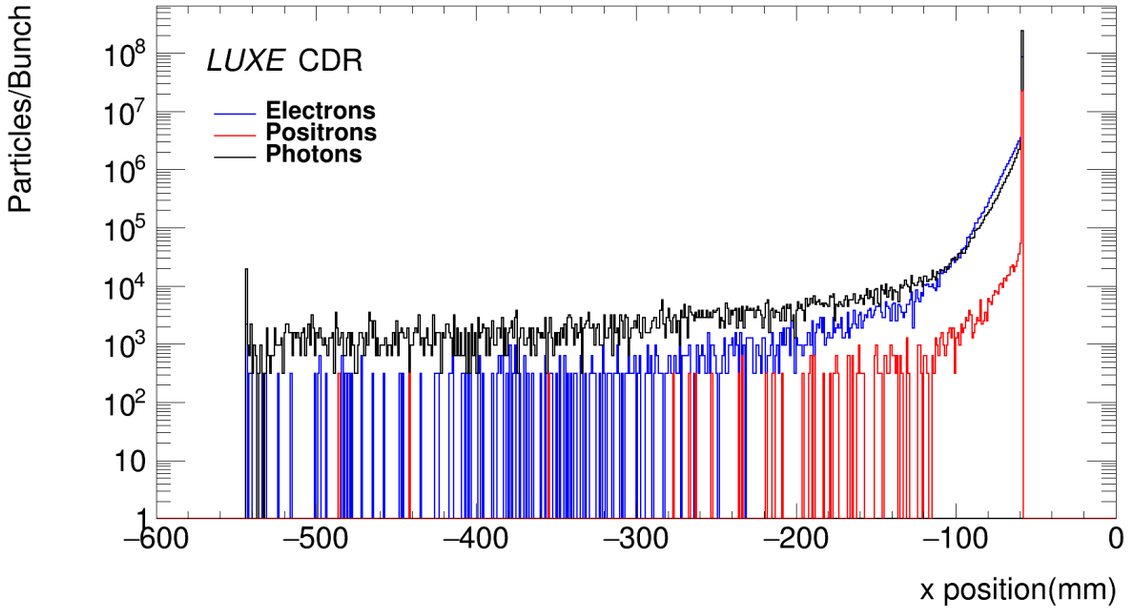
- I have made a try of this with a simple geometric plane cut with the creation vertex of particles


vtxx:vtxz {weight*(detid==6300 && pdg==11 && trackid!=1)}
0
−50
−100
−150
−200
−250
−300
3800
4000
4200
4400
4600
4800
×10^6
1800
1600
1400
1200
1000
800
600
400
200
0

E-LASER postIP e^- region – High Xi – Cerenkov







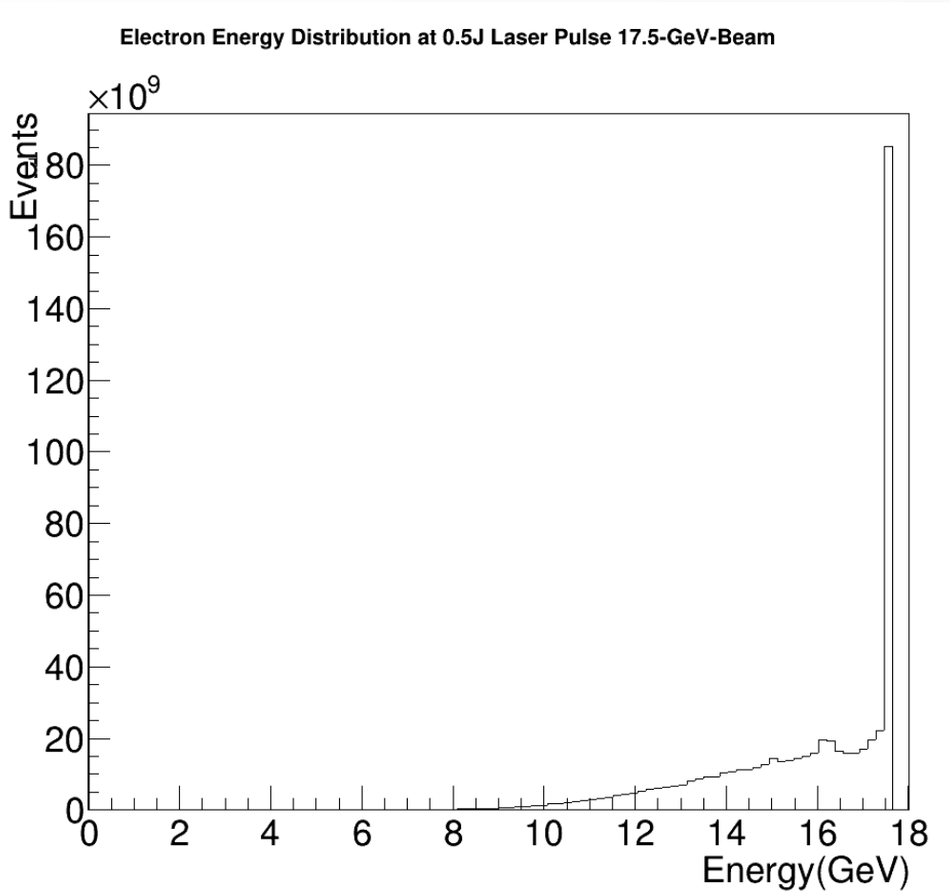
- important to maintain units in these similar plots? (m) vs (mm)?

- vary binning plot-to-plot to ensure readability?

- Large spike at low x in Cerenkov plots not seen in Brem. Plots. Likely due to subtleties in S & B definitions

- Still need to evaluate effect of reduced beam population from scattering pushing e^- into detector acceptance (signal). First look at xi~2 shows almost 2/3 of e- have E<16.4 GeV, so the bkg lines will be reduced but not by more than factor 10. Need to check I am using the correct files, however!

- All this dependent on Ipstrong MC simulations, including HICS rate – which is now corrected to be greater (for higher xi)



E spectrum for e^- for 100 BX, Xi = 1.8