

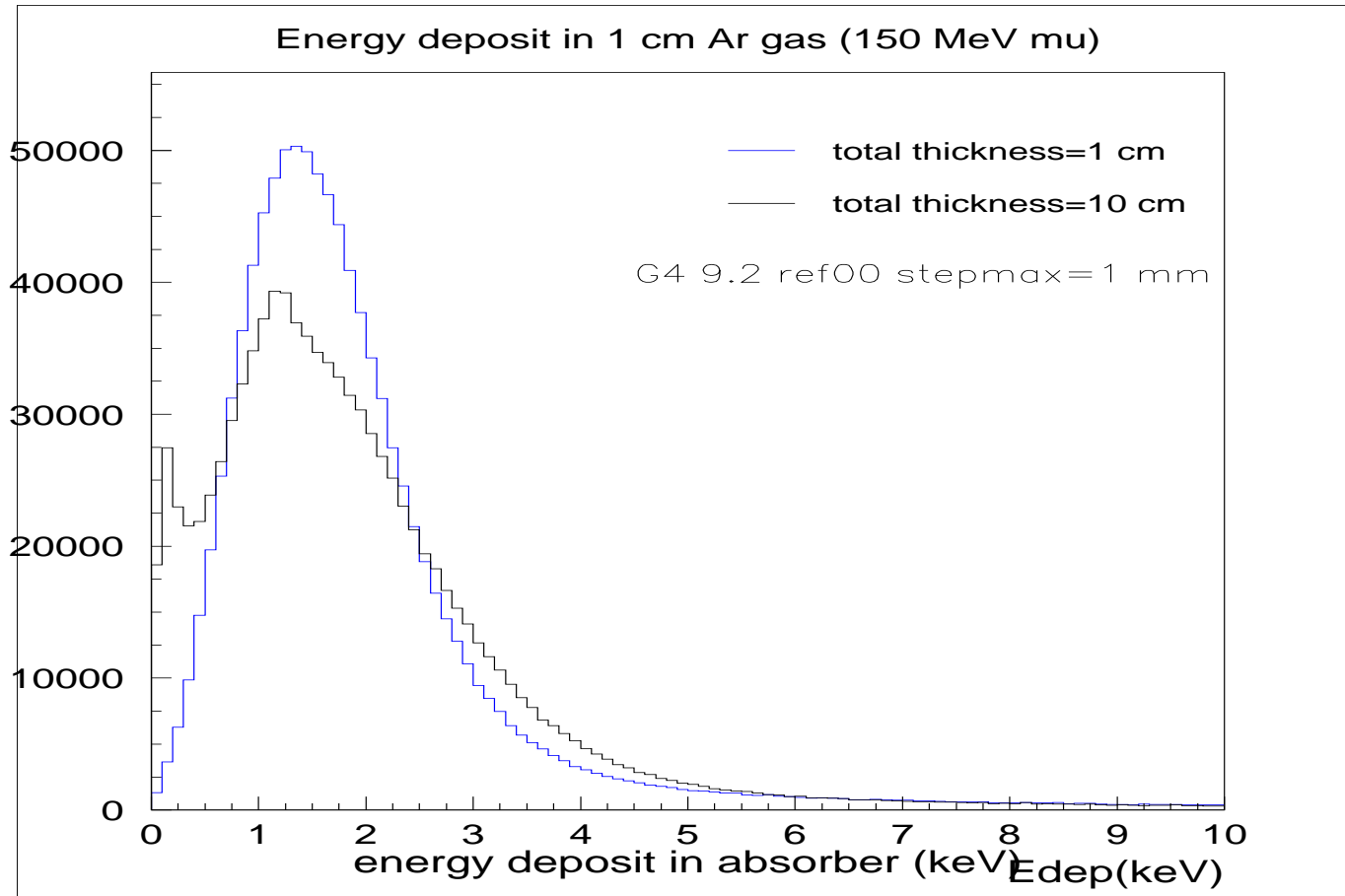
# Changes in the fluctuation model (G4UniversalFluctuation)

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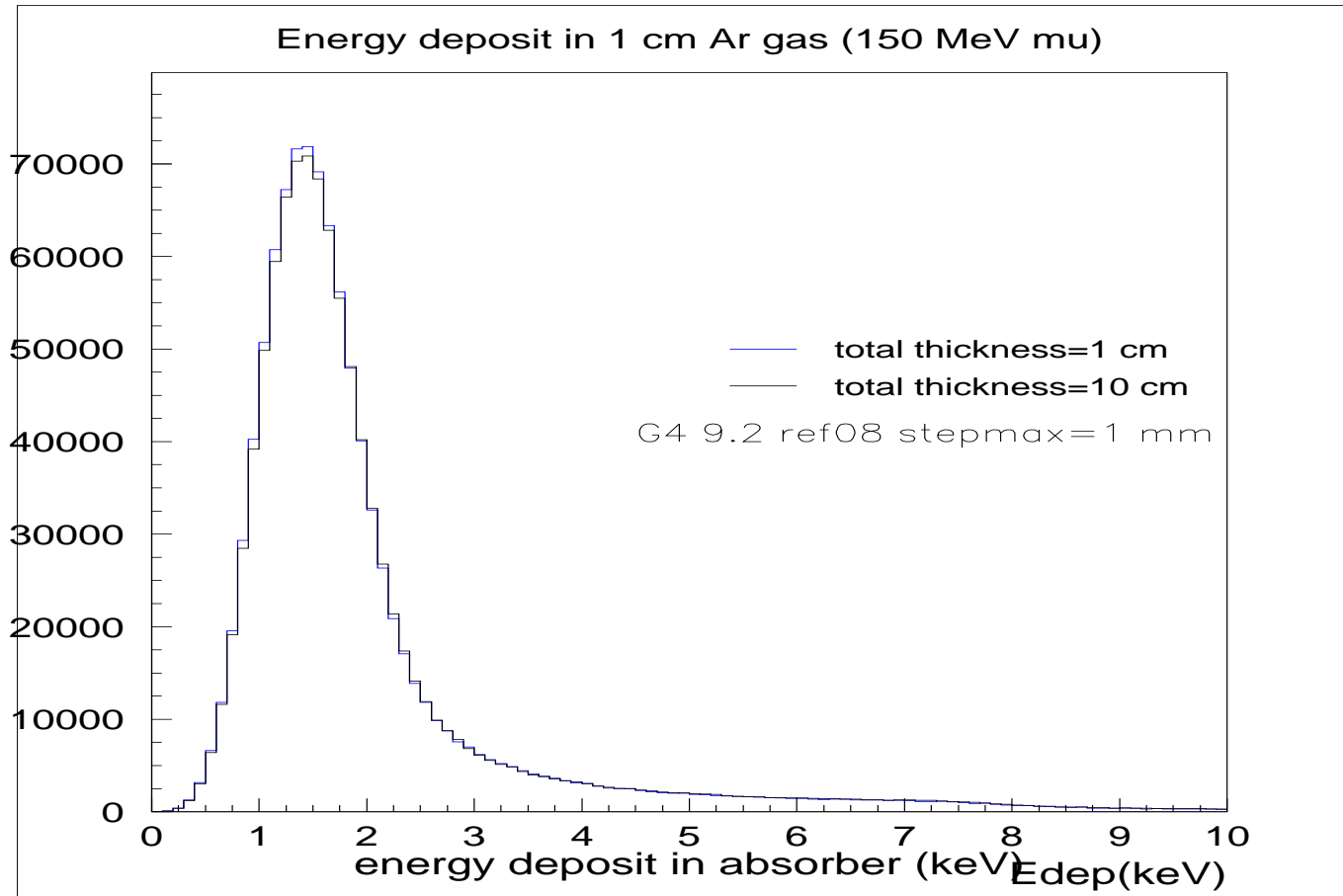
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START : T2K issue of TPC simulation

Big TPC chamber filled with gas mixture, data read by modules each of them read data from a restricted region of the chamber (thickness  $\approx 1\text{cm}$ ). The problem can be modelled using example TestEm5 and simulating the energy deposit in 1 cm slices of a volume filled with Ar gas.

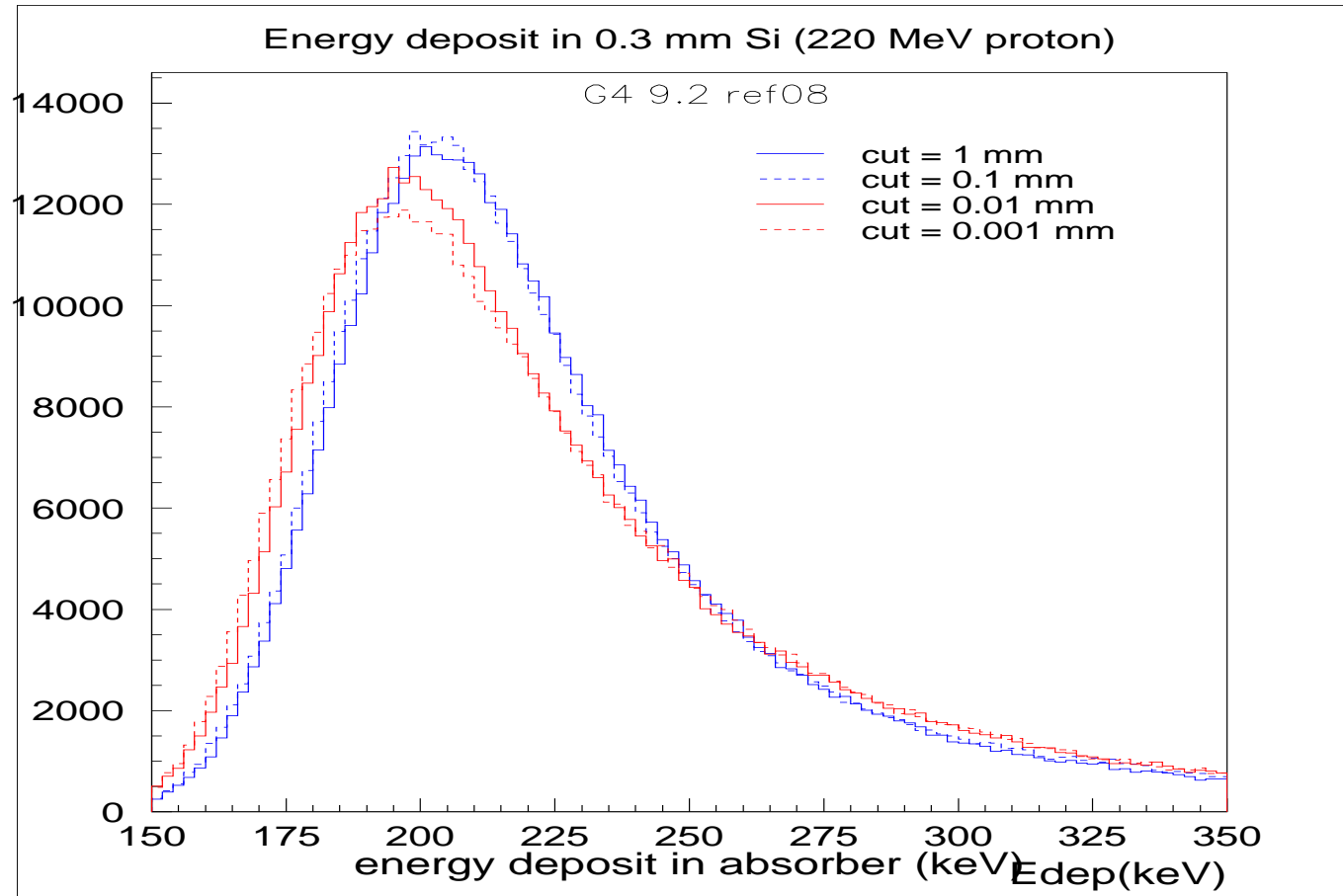


The reason of the strange behaviour is the so called width correction algorithm in the fluct. model. In this algorithm the energy fluctuation for a given step can depend on the energy deposit values in the preceding steps. Introducing a different width correction algorithm -where the correction depends on the actual energy deposit only- cures this anomalous behaviour.



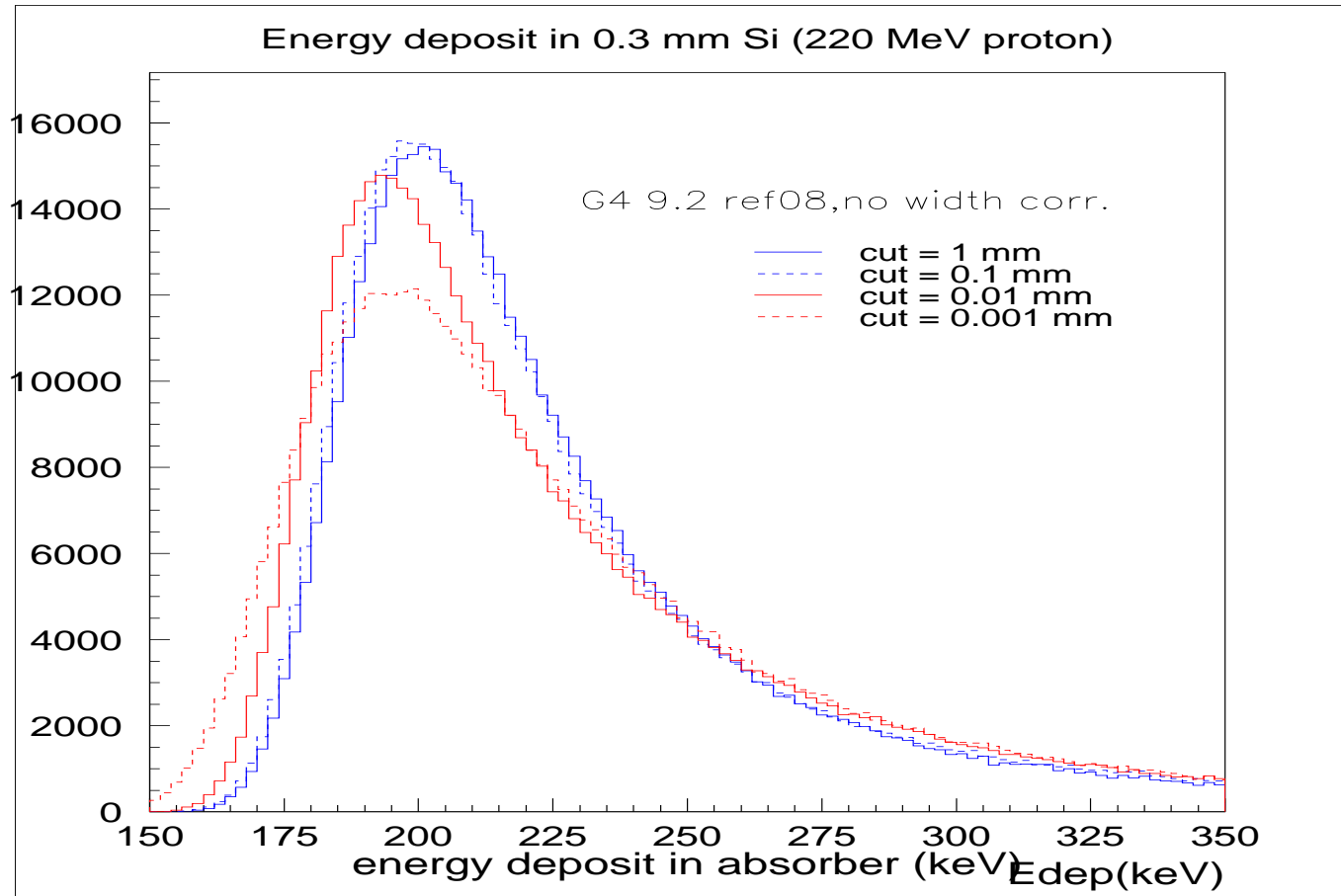
Do we have the final version of the fluctuation model ?

Unfortunately this is not the case, because -even with the new width correction- there is a cut dependence in the results ...



Do we need the width correction algorithm ? Perhaps we can have better stability -i.e. smaller cut dependence- without this correction ? This is not the case, see next slide....





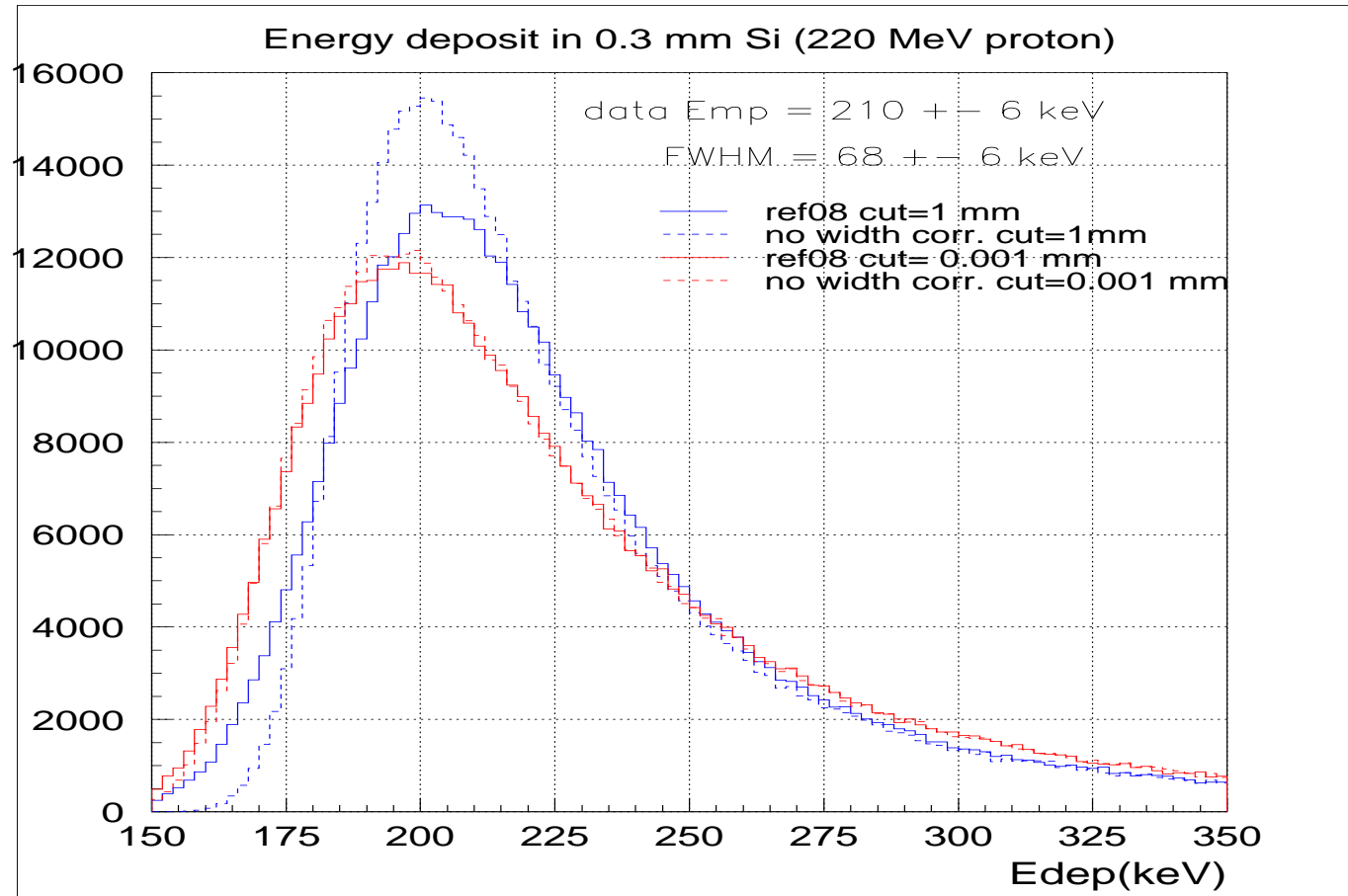
What about the data - simulation comparison?

220 MeV proton, 300 micrometer silicon

version	cut	Emp	FWHM
-	(micrometer)	(keV)	(keV)
data	-	210+-6	68+-6
Bichsel*	-	193	67.9
ref08	1000	204+-2	66+-4
ref08	1	198+-2	65+-4
nowidth	1000	202+-2	50+-4
nowidth	1	196+-2	65+-4

\* Bichsel theory

see next slide



conclusion:

we need a width correction algorithm in order to reproduce data  
the width corr. algorithm is good for small cut value, but it has  
cut dependence

plans:

- modifications in the model, in the width correction algorithm  
(long procedure , not for the release )
- try to create another fluctuation model ?  
— Bichsel ? it is a good theory, but does not include cuts and  
it is material dependent + it would be probably slower than the  
present model
- ??????