Subject: Deviation in multi-neutron simulations
Posted by C. A. Douma on Tue, 24 May 2016 12:56:51 GMT
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Dear Mr. Kresan,

I am trying to reproduce your results on multi-neutron simulations from your page https://www.r3broot.gsi.de/multi-neutron-simulation

I follow the steps indicated by r3blandsim.C and precalibr.C: First I run Monte Carlo simulations for 1-5 neutrons on 600 MeV per particle (I used r3ball.C)
I fire the particles from the origin with a box generator with Ptot = 600 MeV + rest energy (consistent with relativity), theta = 0 - 80 mrad, phi = 0-360 deg.
I only have NeuLAND at 13 m from the origin and no other detectors in the cave. Then I run the digitizer, cluster finder and R3B pre-calibrator as indicated by precalibr.C
(I use calibr_mini.C to compute the cuts).

However, my histograms do not look at all like your histograms. I do not mean the efficiencies and the cuts, I mean the shape and color of the blobs themselves.
Initially I thought the difference was due to the use of land/neuland digitizer, so then I decided to test both of them (50000 events), but the histograms are
nearly identical (land digitizer is just a lot slower).

What I find even more strange is that the picture of your histograms on
https://www.r3broot.gsi.de/multi-neutron-simulation
also does not look like the histograms on page 56 of the NeuLAND technical design report.
And the pictures on Jan Mayer his talk of March 1st (slide 7) look again
different. I do not mean the cuts, efficiencies or even the amount of red in the blobs (this just depends on how much you zoom in the z-cirection). I mean the x and y location of the blob center and the relative pattern of the colors and of the dispersion of the hits. This is somewhat different in all distinct cases.

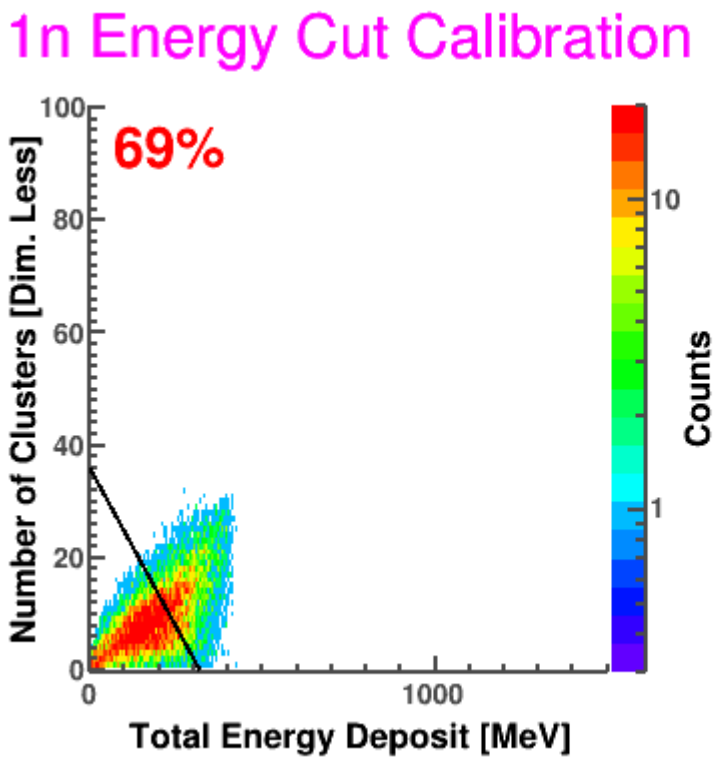
Can you explain the nature and reasons for these differences to me? And maybe help me to improve my histograms?

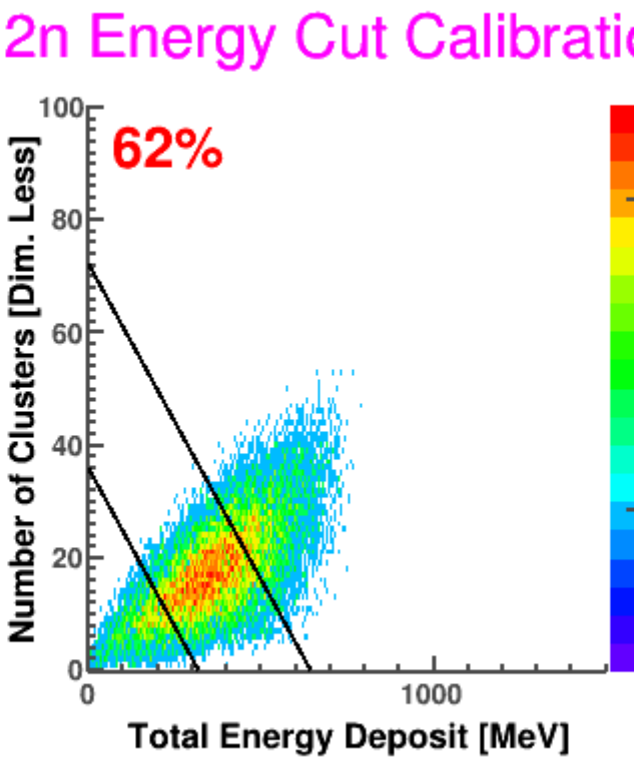
Yours sincerely,
Christiaan Douma.

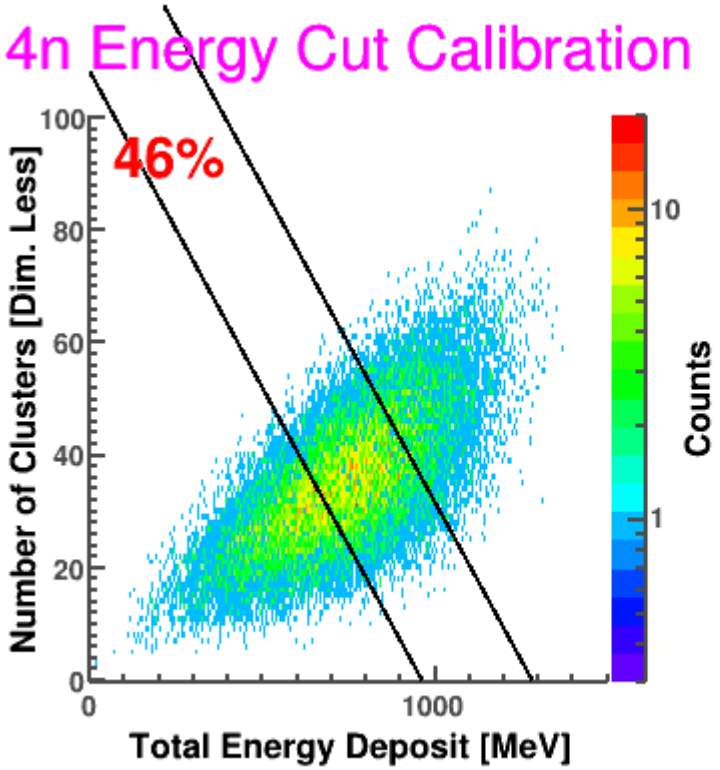
PS: The LAND_Digitizer.png picture I will upload in a response since I can only upload one picture at a time.

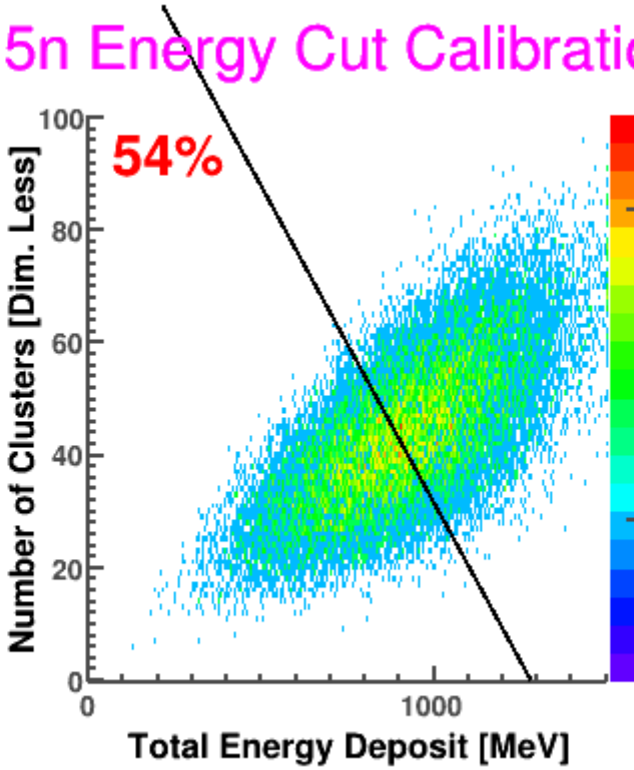
File Attachments

1) NeuLAND_Digitizer.png, downloaded 547 times









Subject: Re: Deviation in multi-neutron simulations
Posted by C. A. Douma on Tue, 24 May 2016 13:00:34 GMT
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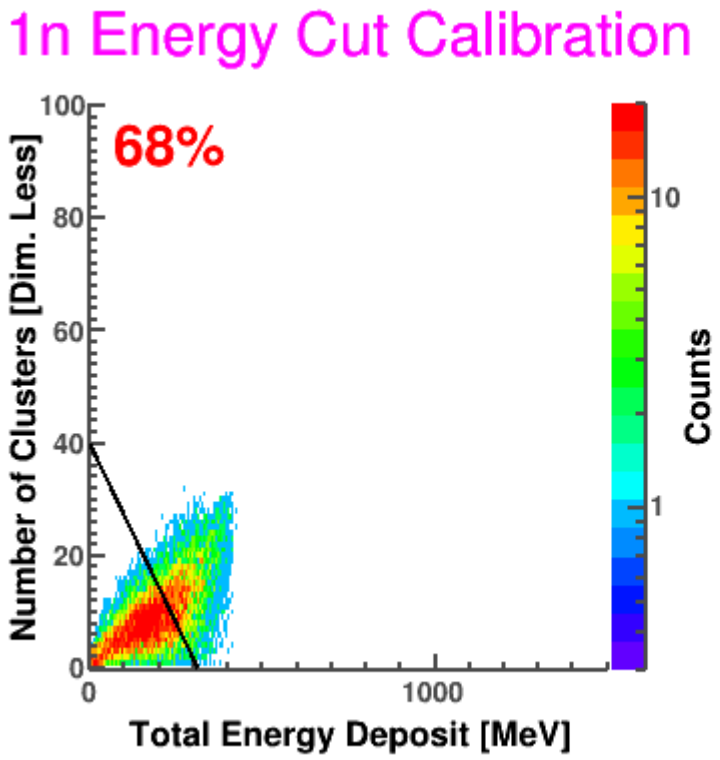
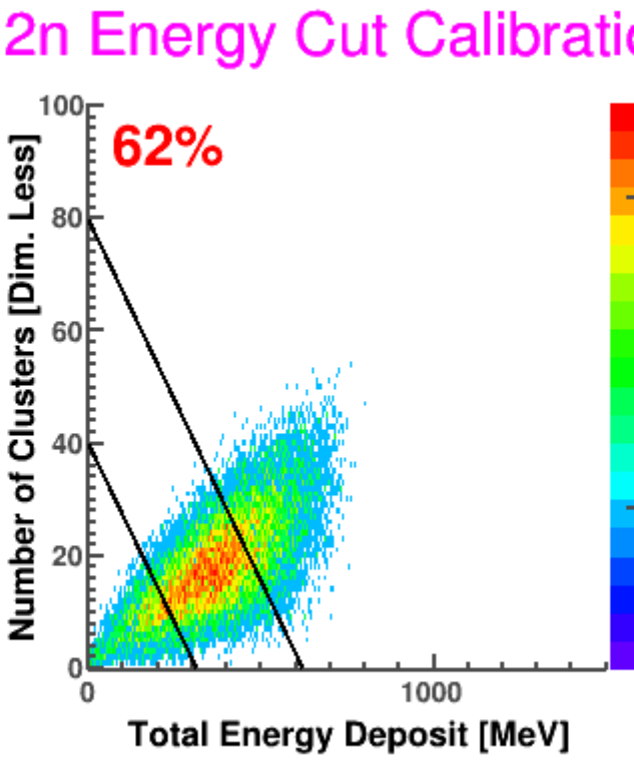
second picture.

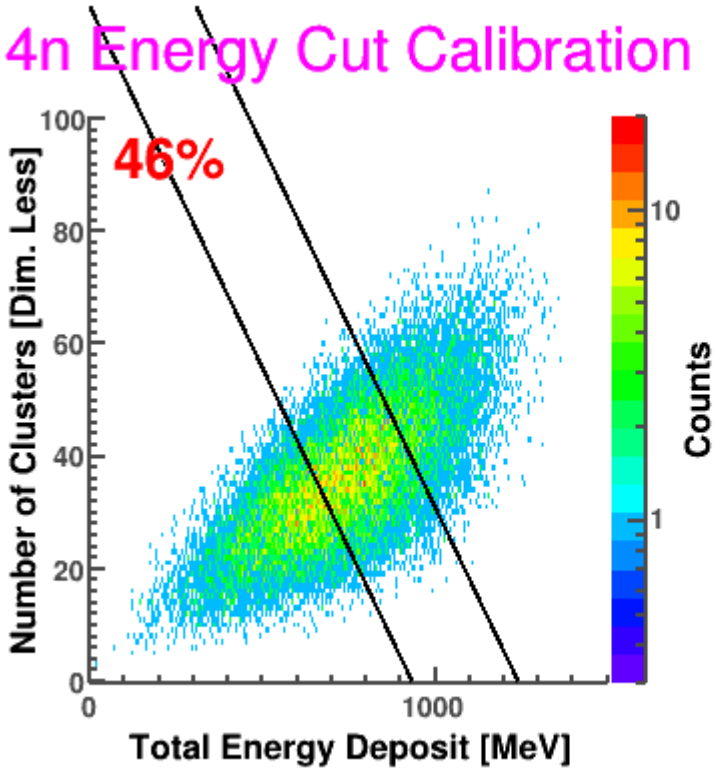
Christiaan.

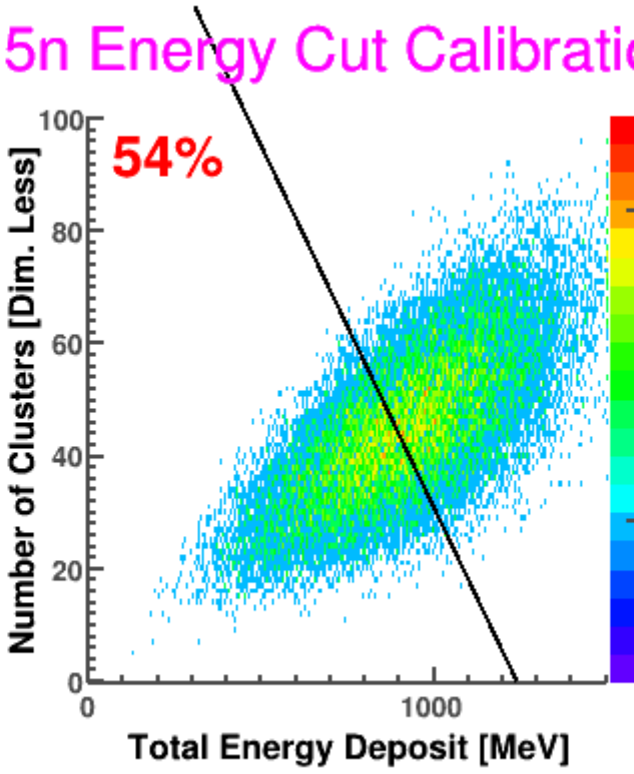
File Attachments

1) LAND_Digitizer.png, downloaded 429 times









Subject: Re: Deviation in multi-neutron simulations
Posted by Dmytro Kresan on Tue, 24 May 2016 13:11:39 GMT
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Dear Christiaan,

can you please repeat your simulations with Geant3 and input ASCII files (link on the https://www.r3broot.gsi.de/multi-neutron-simulation). Then we can validate your results. Treatment of neutrons in Geant3 has better agreement with experimental results.

Best regards,
Dima

Subject: Re: Deviation in multi-neutron simulations
Posted by C. A. Douma on Tue, 24 May 2016 13:45:03 GMT
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I already used Geant3 for my simulations. I can repeat my simulations with your ascii input file (And I will),
but this still does not explain the differences between the results of your web page and the TDR and Jan Mayer his results.

Christiaan.

Subject: Re: Deviation in multi-neutron simulations
Posted by Dmytro Kresan on Tue, 24 May 2016 13:53:14 GMT
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Status at the time of TDR: in order to have an agreement with old LAND experiments, we introduced 0.4 factor scaling to the deposited energy/light per MC particle.

Afterwards, in the simulations of Jan Mayer, we removed this factor, and introduced PMT saturation model together with final QDC resolution of 5%. Maybe Jan can comment on status of agreement of this stage with experimental data.

This is where the differences in deposited energy are coming from.

And picture on the web is just an example, do not take it as quantitative recommendation. If I remember correctly, when I produced it - there was no PMT saturation and no scaling factor.

Best regards,
Dima

Subject: Re: Deviation in multi-neutron simulations
Posted by C. A. Douma on Tue, 24 May 2016 14:25:59 GMT

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Thank you for this explanation. It clarifies much to know which differences there are in the software between the pictures. In order to get a good agreement with your picture on the web, I am now running the simulations with your ascii-input files. From initial view I can already see that the angular spread of the neutrons in your ascii-files is much smaller than with me. So for the complete picture for me: can you explain precisely which
distributions in energy, momentum, etc. you used for the neutrons to generate your pictures on the web?

PS: I am using Jan Mayer his NeuLAND digitizer for this run, so that would mean that I have the
PMT saturation model together with final QDC resolution of 5% in the simulation.

Christiaan.

Subject: Re: Deviation in multi-neutron simulations
Posted by Dmytro Kresan on Wed, 25 May 2016 07:45:16 GMT
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ASCII files for multi-neutron simulation contain realistic distribution from interaction of 132Sn beam on a hydrogen target. The angular distribution of neutrons and a fragment is calculated assuming 500 keV relative energy between this particles - in transversal direction. This relative energy is delta-function like - to test reconstruction resolution. Longitudinal momentum comes from beam energy of 600 MeV.

Yes, digitiser of Jan contains saturation and 5% gaussian smearing.

Best regards,
Dima

Subject: Re: Deviation in multi-neutron simulations
Posted by C. A. Douma on Wed, 25 May 2016 09:03:01 GMT
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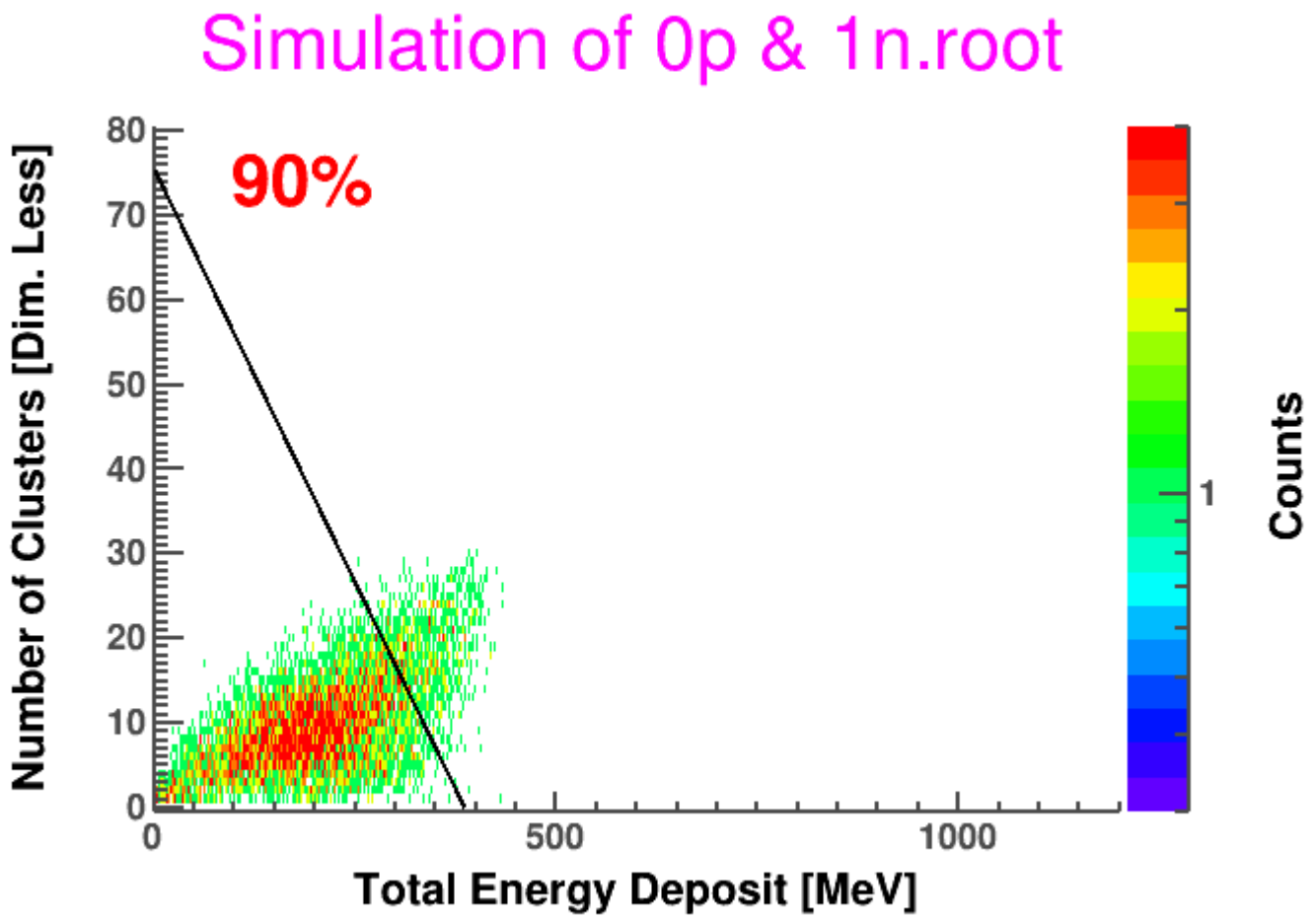
With the ASCII-files (600 MeV) from the web page I still do not get the same as (or close to) your pictures. Do you have any Idea what I'm doing wrong?
I just use r3ball.C (2500 Ampere ALADIN field) and then I use Jan Mayer his digitizer, then the clusterfinder and then NeutronCalibr2D.

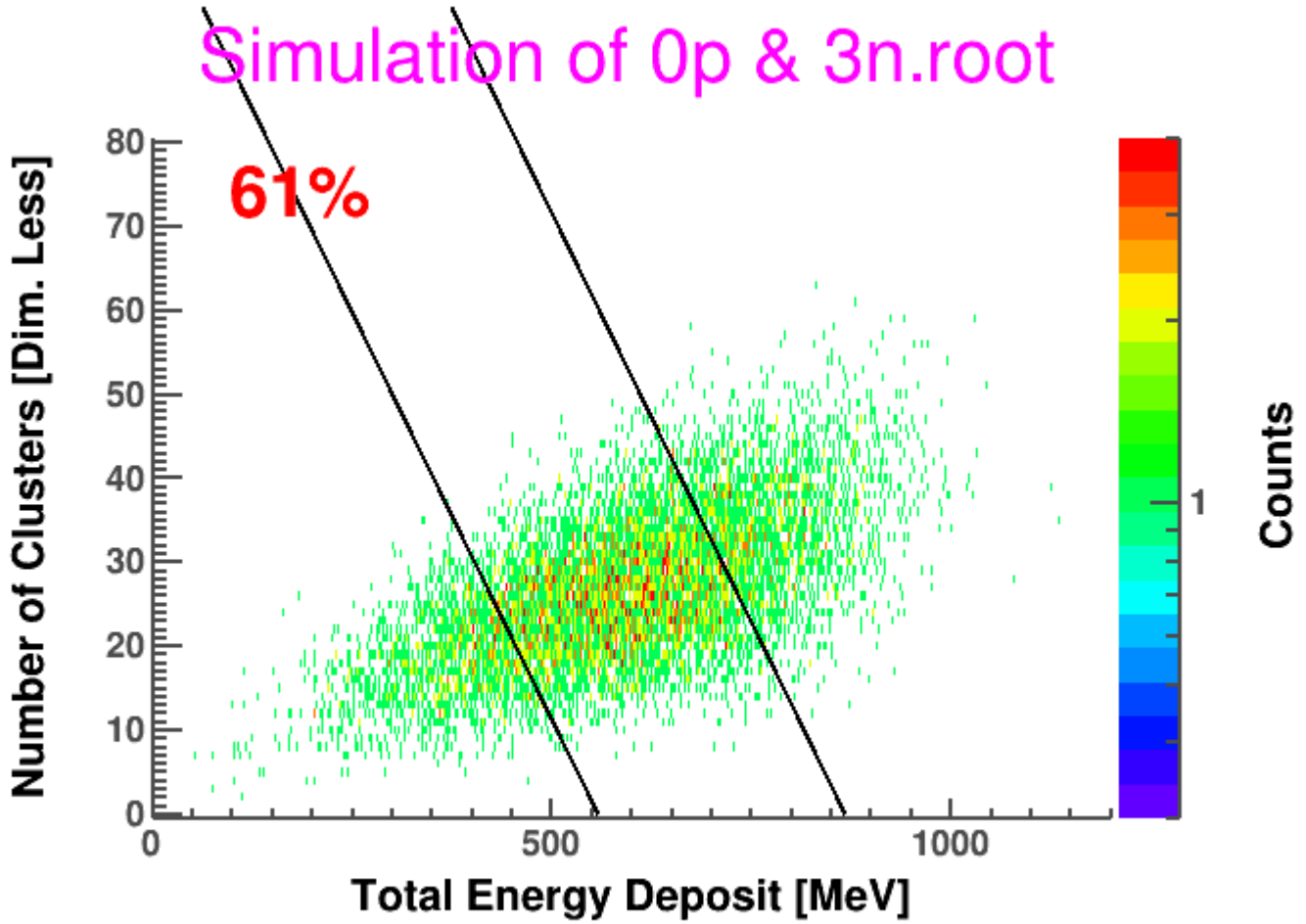
Also about the distribution of the neutrons: I understand the concept of a 'realistic distribution', but do you know what this distribution approximately is?
Is it uniform in angular spread or Gaussian, etc?

Christiaan.

File Attachments

1) NeutronCalibration_0p.png, downloaded 426 times


Simulation of 0p & 1n.root
90%
Number of Clusters [Dim. Less]
Total Energy Deposit [MeV]
Counts
0
10
20
30
40
50
60
70
80
500
1000
1


Simulation of 0p & 3n.root
61%
Number of Clusters [Dim. Less]
Total Energy Deposit [MeV]
Counts
0
10
20
30
40
50
60
70
80
500
1000
1

Subject: Re: Deviation in multi-neutron simulations
Posted by Dmytro Kresan on Wed, 25 May 2016 09:46:20 GMT
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I did not generate the ASCII files myself. I wrote already everything I know about this input.

How do your pictures compare with Jan's results?

If you want to find what goes wrong, and compare quantitatively your plots with ones from r3broot web page, please use also the same digitizer, like in the step-by-step instructions on the web. Cluster finder algorithm depends on digis input it gets.

Best regards,
Dima

Subject: Re: Deviation in multi-neutron simulations
Posted by C. A. Douma on Wed, 25 May 2016 09:48:53 GMT
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The pictures do not reproduce Janhis results. I already tried to use the land digitizer instead of the neuland digitizer.
(not for the Sn-ASCII-files, but for my initial try with box generator). There is almost no difference in the histograms (I uploaded them).

Christiaan.

Subject: Re: Deviation in multi-neutron simulations
Posted by Jan Mayer on Wed, 25 May 2016 12:31:16 GMT
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First let me say that the last set of Plots (NeutronCalibration_0p.png) does look reasonable - positioning of the cuts is debatable, we had that topic before.

It is quite difficult to find the cause of deviations from afar. It is not the "fault" of the Digitizer.

I propose the following:
- Please go to R3BRoot/macros/r3b/neuland/matrices/
- In the *.sh files for Step 0, 1 and 3 in for NDOUBLEPLANES in $(seq xx xx); do replace the seq(xx xx) with seq(30 30) so you only do the simulations for 30dps
- Run all the scripts in order
- Post the result.

Subject: Re: Deviation in multi-neutron simulations
Posted by C. A. Douma on Thu, 02 Jun 2016 09:58:44 GMT
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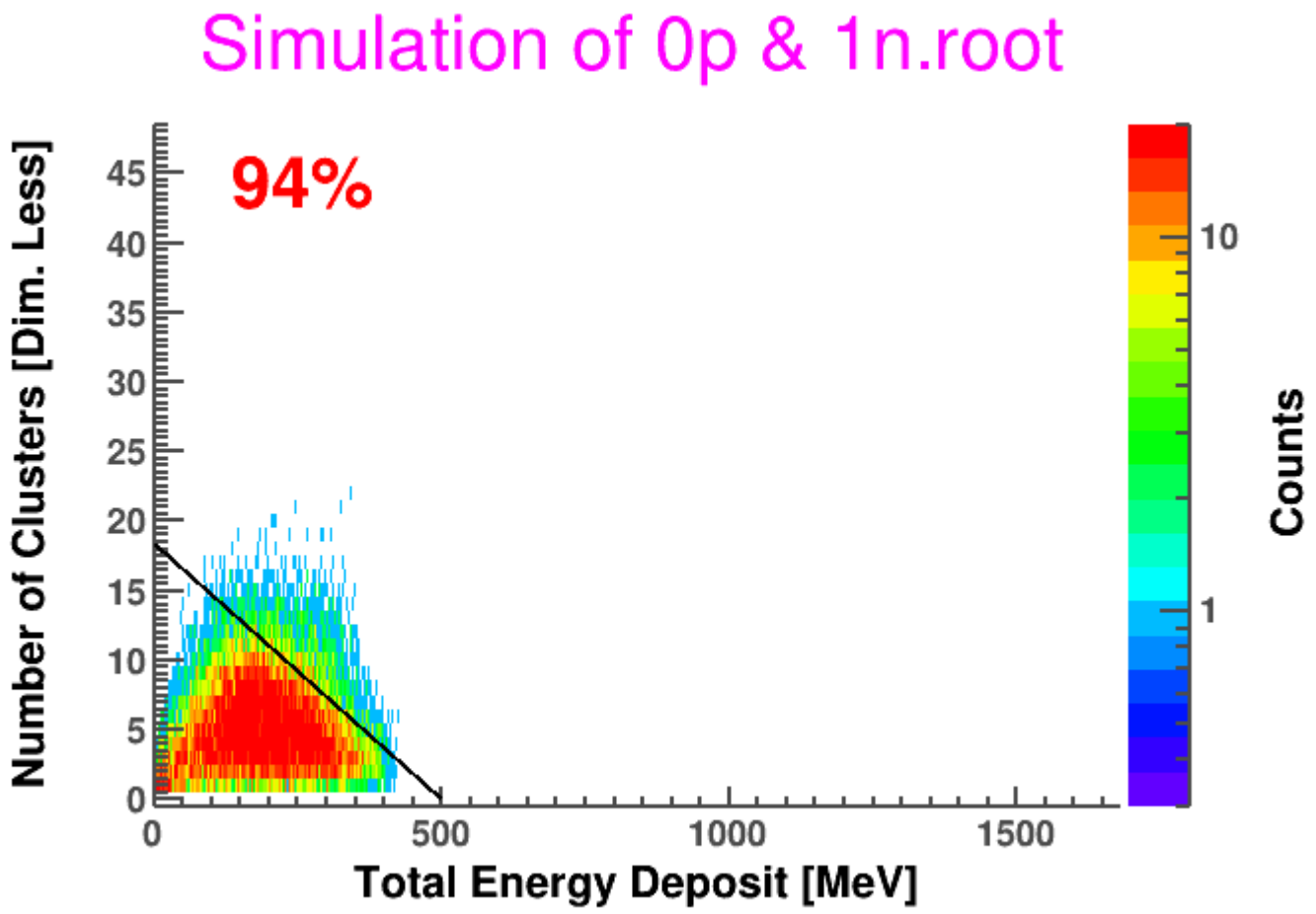
Dear all,

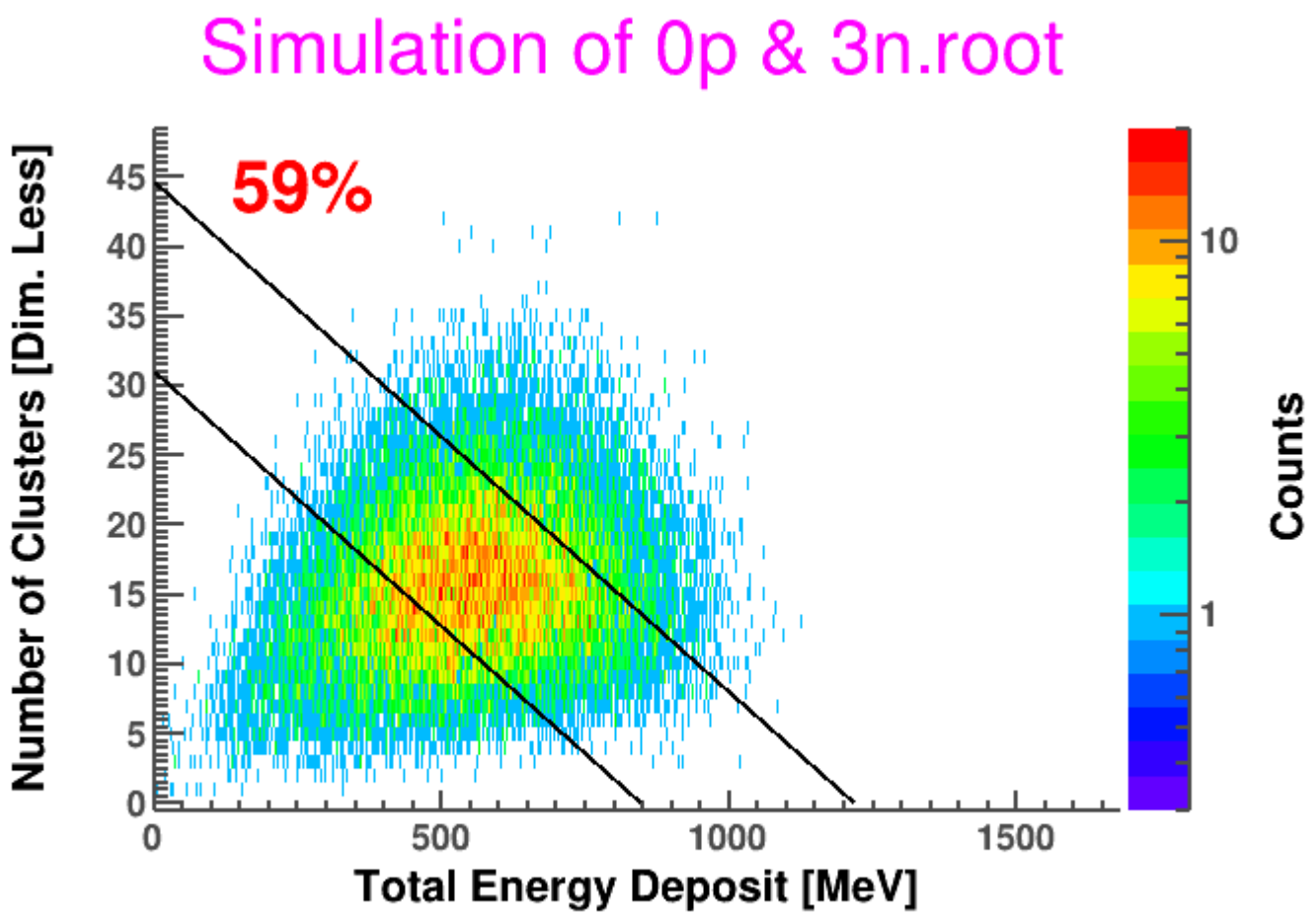
Thanks for your help and suggestions. The problem is now solved.
In my simulations I did not use the standard orientation of NeuLAND. The digitizer was not equipped to
handle this. After adding a piece of code for this, the histograms look fine.

Christiaan.

File Attachments

1) NeutronCalibration_0p.png, downloaded 497 times


Simulation of 0p & 1n.root
94%
Number of Clusters [Dim. Less]
Total Energy Deposit [MeV]
Counts
0
5
10
15
20
25
30
35
40
45
500
1000
1500
1
10


Simulation of 0p & 3n.root
59%
Number of Clusters [Dim. Less]
Total Energy Deposit [MeV]
Counts
0
5
10
15
20
25
30
35
40
45
500
1000
1500
1
10