NEW MULTIHIT RECONSTRUCTION METHOD

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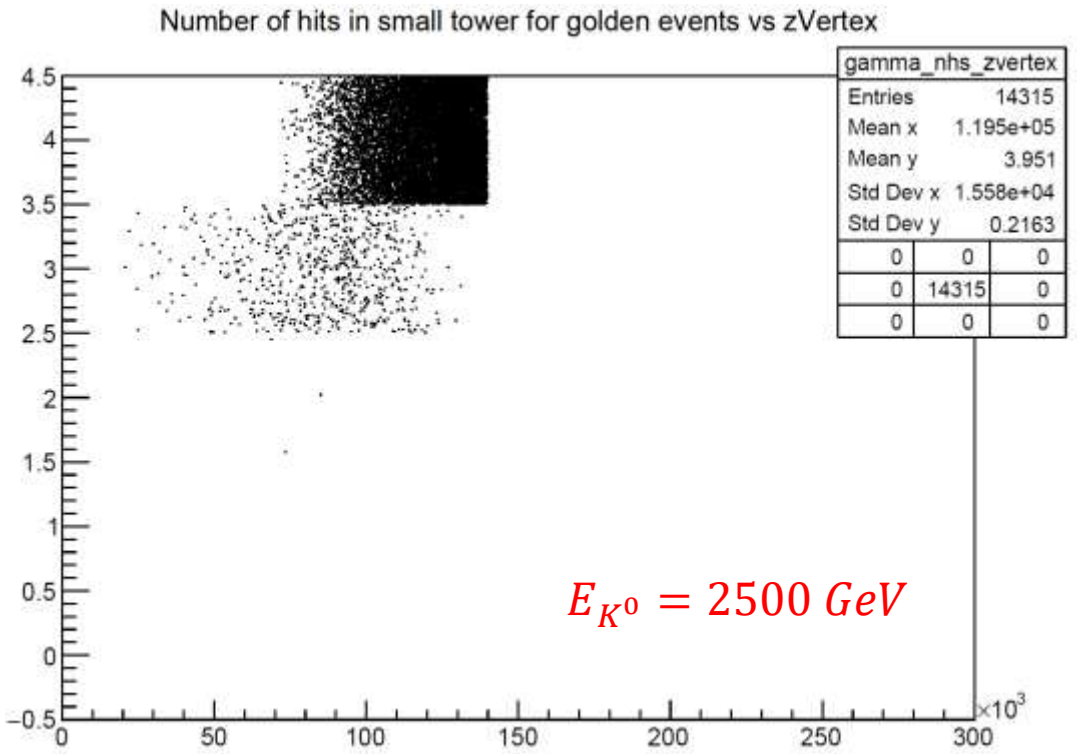
PRELIMINARY WORK FOR K^0 RECONSTRUCTION

- **As shown by Oscar, to detect K^0 mesons in LHCf-Arm2 a good reconstruction of multihit (N>2) events is needed!**



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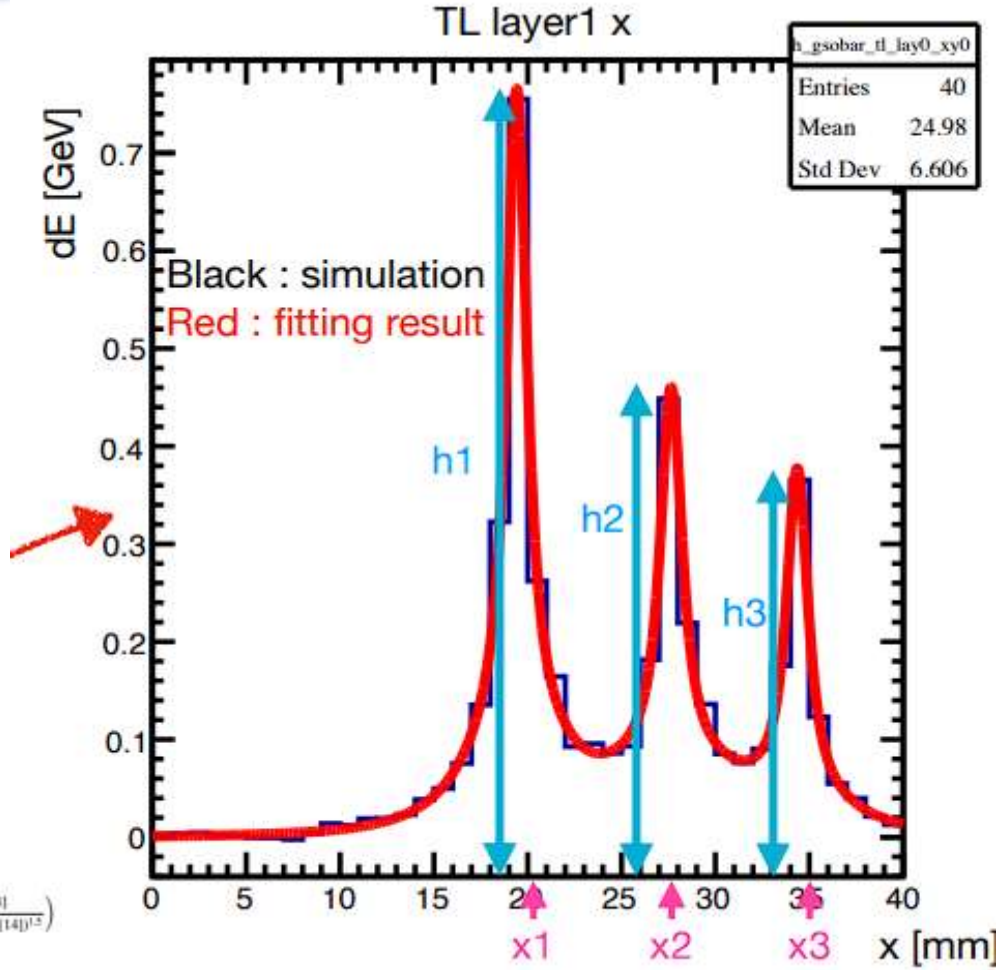
- **As shown by Oscar, to detect K^0 mesons in LHCf-Arm2 a good reconstruction of multihit (N>2) events is needed!**
- Multihit are actually reconstructed by founding the position for each peak using **TSpectrum** then by fitting with a sum of **3-components Lorentzian function for each peak** (7xN_{hit} parameters)**.**
- Energy of each hit is evaluated by using **the ratio of peak height.**



Npeak = 3, triple

$$func = [2]\times\left([4]\times\frac{0.5\times[0]}{((x-[1])^2+[0])^{1.5}}+(1-[4])\times\frac{0.5\times[3]}{((x-[1])^2+[3])^{1.5}}\right)+[5]+[8]\times\left([10]\times\frac{0.5\times[6]}{((x-[7])^2+[6])^{1.5}}+(1-[10])\times\frac{0.5\times[9]}{((x-[7])^2+[9])^{1.5}}\right)+[13]\times\left([15]\times\frac{0.5\times[11]}{((x-[12])^2+[11])^{1.5}}+(1-[15])\times\frac{0.5\times[14]}{((x-[12])^2+[14])^{1.5}}\right)$$

Three-peaks function

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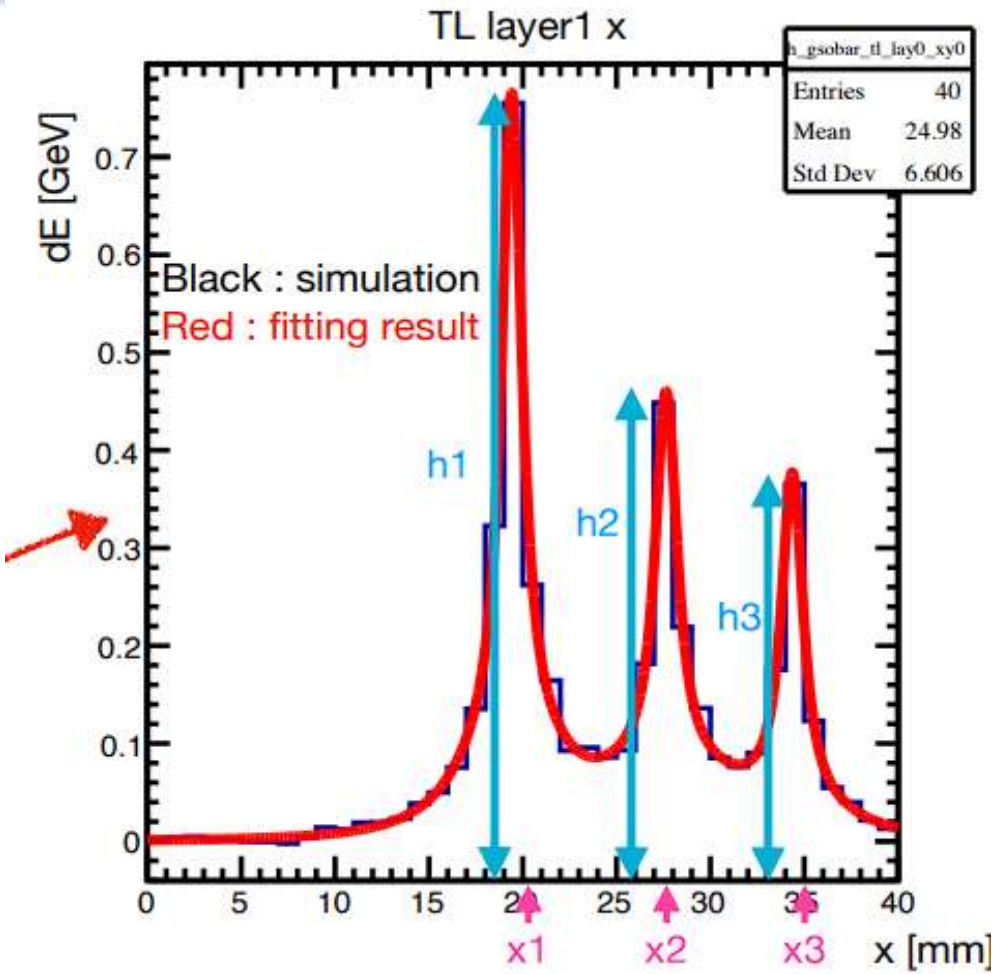
- Energy of each hit is evaluated by using **the ratio of peak height.**
- We have to verify that peak identification, peak regression and **energy share method** work well (efficiency, time consuming..) and eventually **update them using machine learning methods**.



JUST A FEW IDEAS

- **Both the peak-finding/regression method and the energy-sharing method could be improved using machine learning techniques.**
- The former is **more complex and probably not necessary**. The main issue could be the time consuming to **fit 21-28 parameters**. I cannot currently provide a good idea to work on.
- **The second is certainly better dealt with and could provide interesting results. One could think of a network trained to understand how to perform energy-sharing using MC simulations.**
- Various architectures and techniques could be used (ANN, CNN, transfer learning, etc.). The fit parameters and/or some calorimetric information could help. The current method could be used as a baseline to see how much and if we gain.
- **Before starting to work on it, it might be useful to use the new simulations to deal directly with the current problem.**

THANK YOU FOR THE ATTENTION!!

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