GRAN SASSO SCIENCE INSTITUTE
CENTER FOR ADVANCED STUDIES INFN

CYGNO Experiment

Updates on loglikelihood method for DM discrimination

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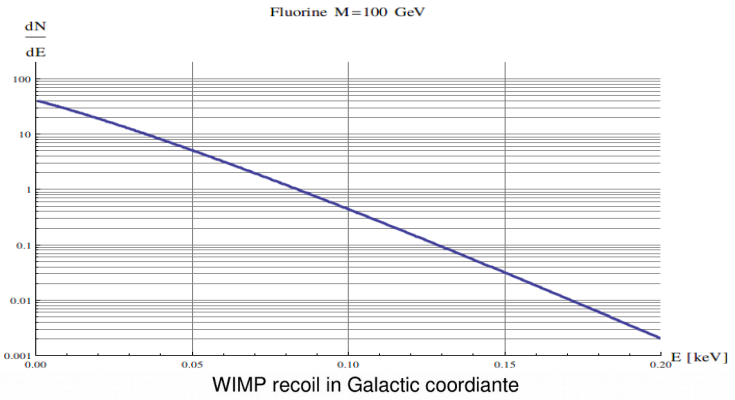
Previously on this work

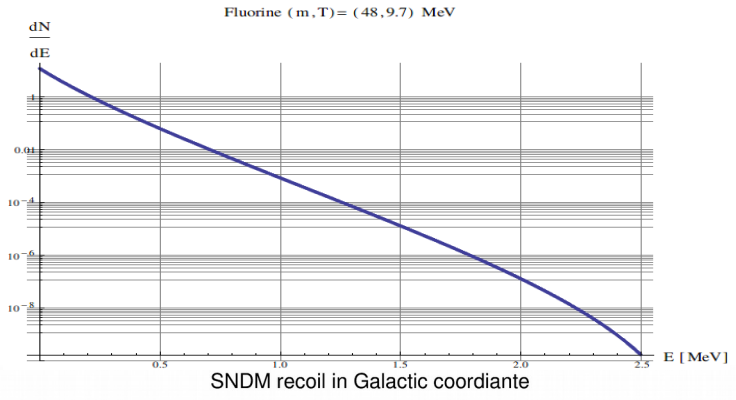
- Two different models to be distinguished using the lowest possible number of events

WIMP



Still using F as target

SNDM



Statistical Analysis with Likelihood

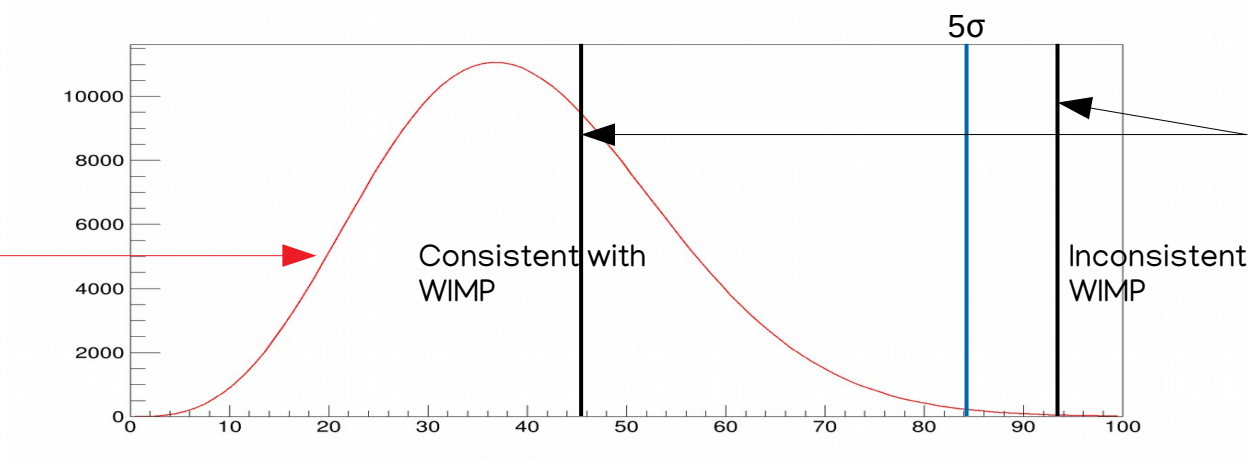
- We divide the spectra in bins and we create the distribution of the variable

$$L = \prod_{i=1}^{N_{bin}} \frac{\nu_i^{n_i}}{n_i!} e^{-\nu_i}$$

ν_i: expected counts in bin i
n_i: actual counts in bin i

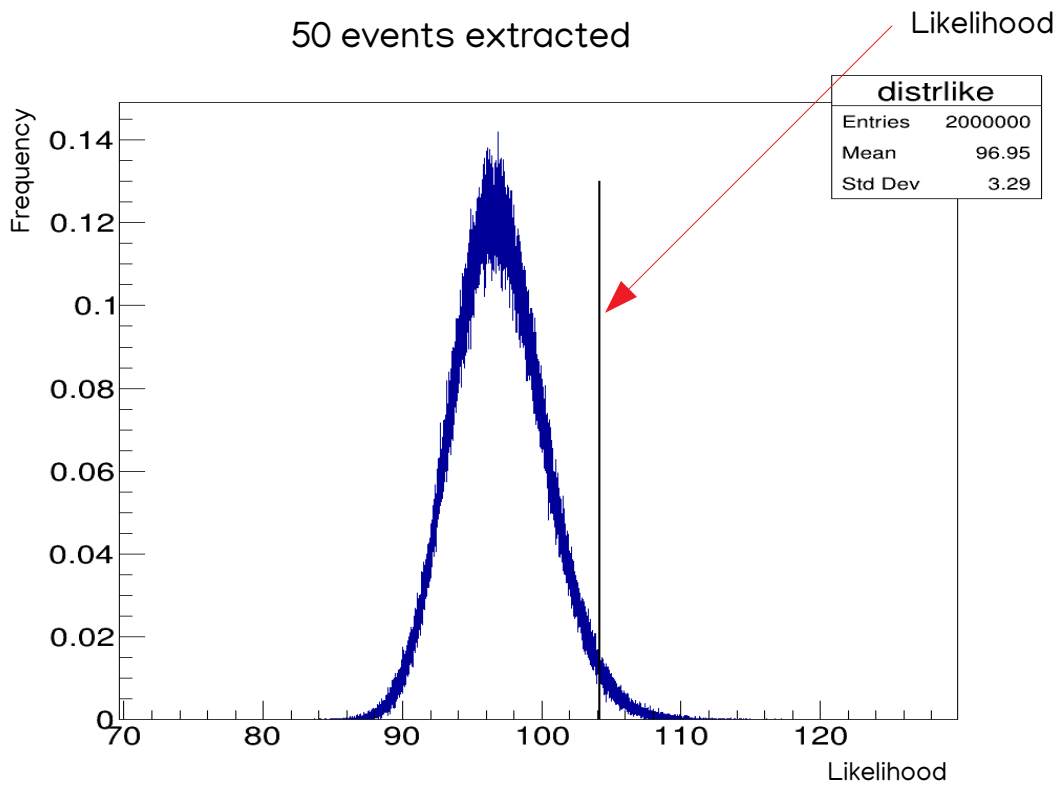
extracting N_{events} randomly events from the WIMP one.

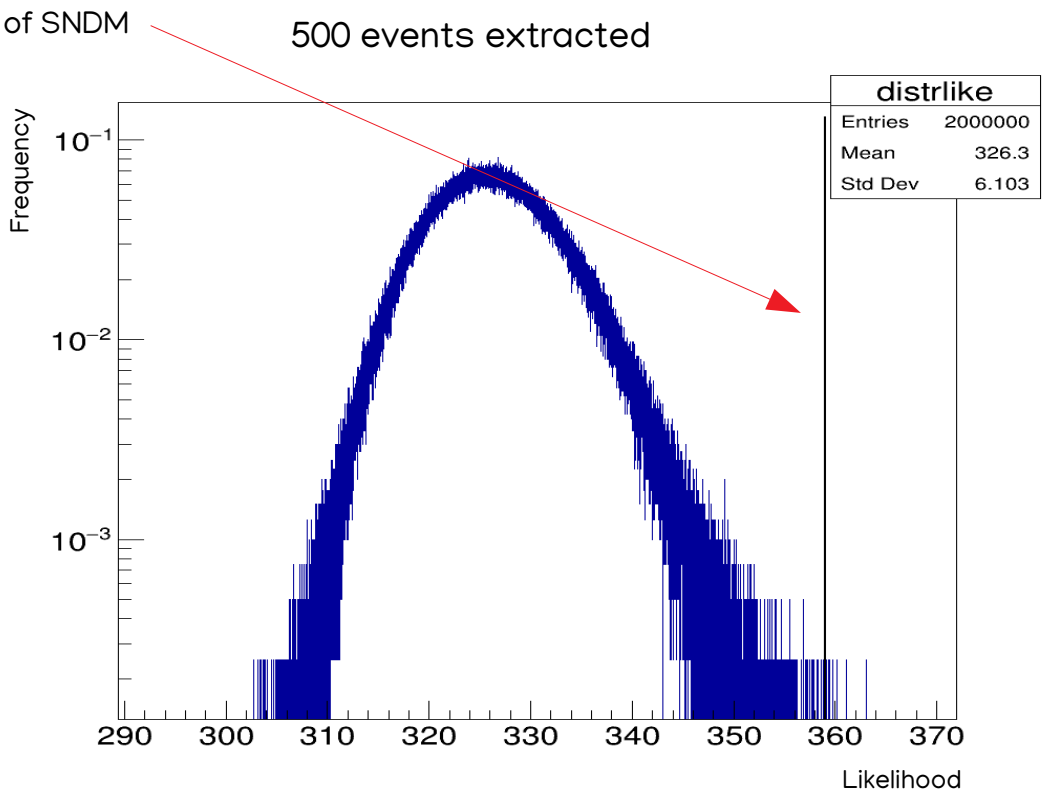
- Then, one extracts the same number of events from the SNDM spectrum obtaining an L value. This must be checked to see if it is found more or less probable then the p-value of 5σ.



Statistical Analysis with Likelihood

- Examples of Loglikelihood distributions obtained from energy spectra

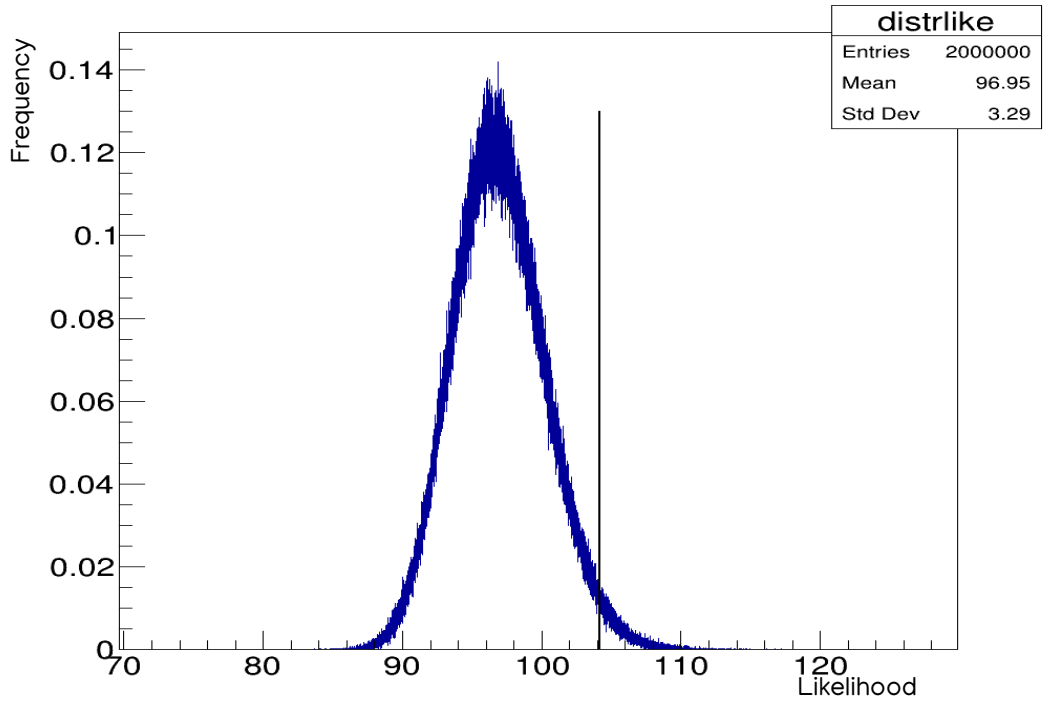




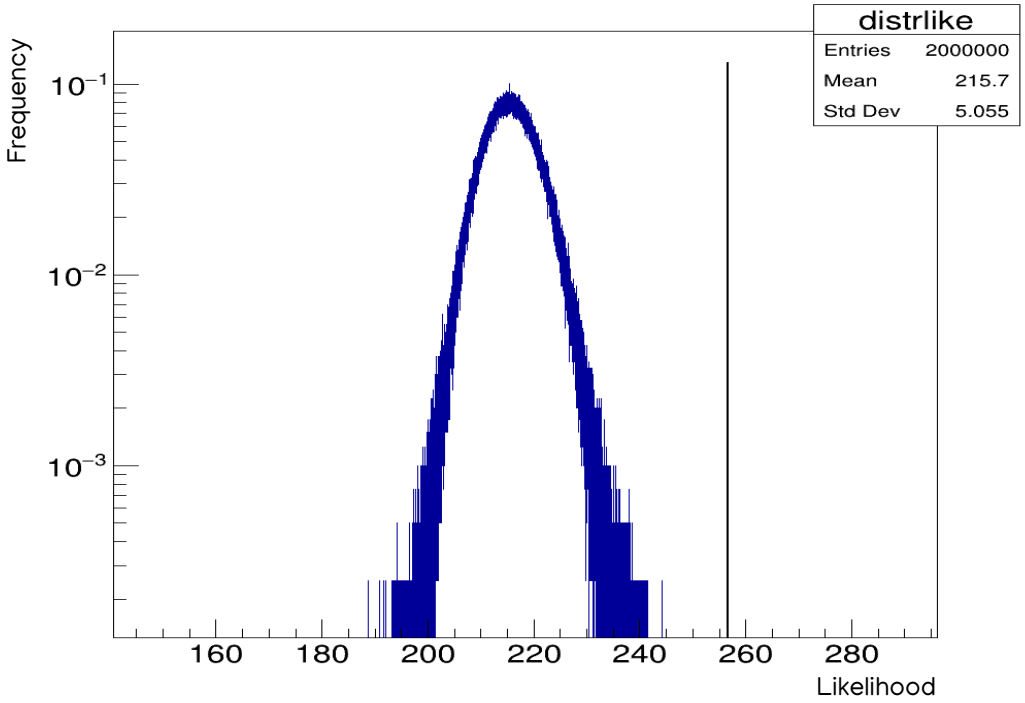
Statistical Analysis with Likelihood

- Comparison of Loglikelihood distributions obtained from energy and angle spectra

50 events extracted from energy

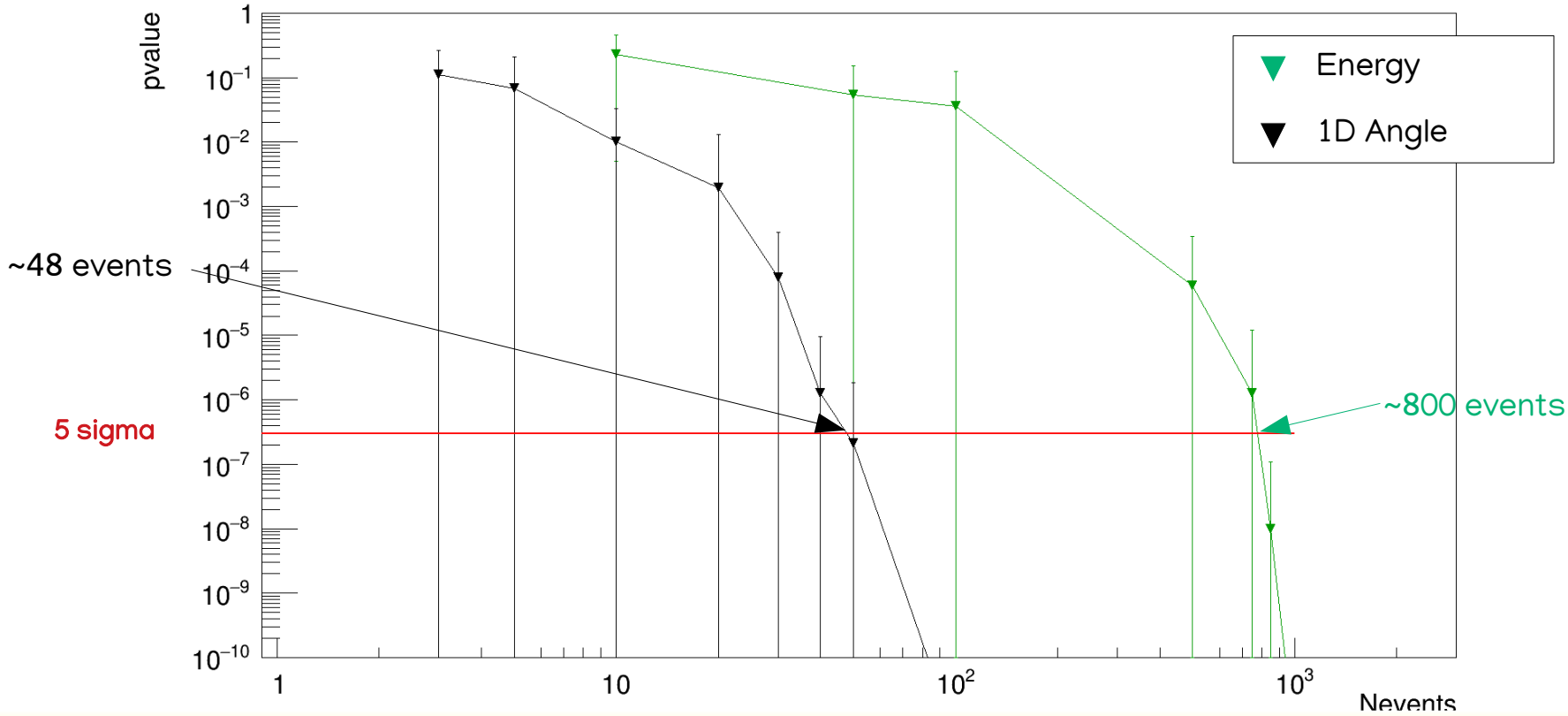


50 events extracted from angle



Testing Different Number of Events

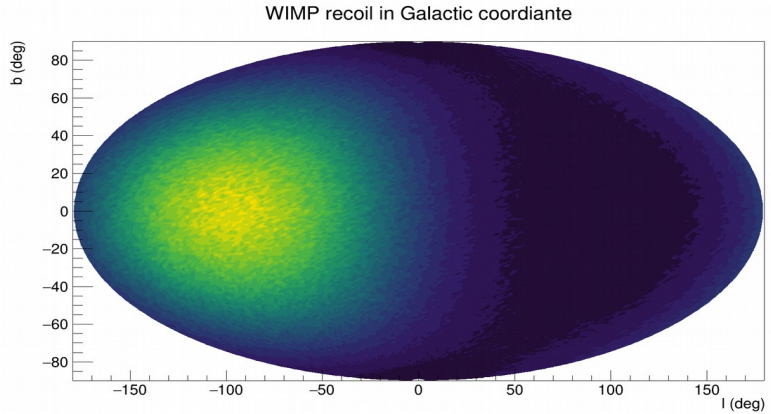
- Extracting different number of events, it is possible to have an idea of how many one needs to reach 5 sigma level

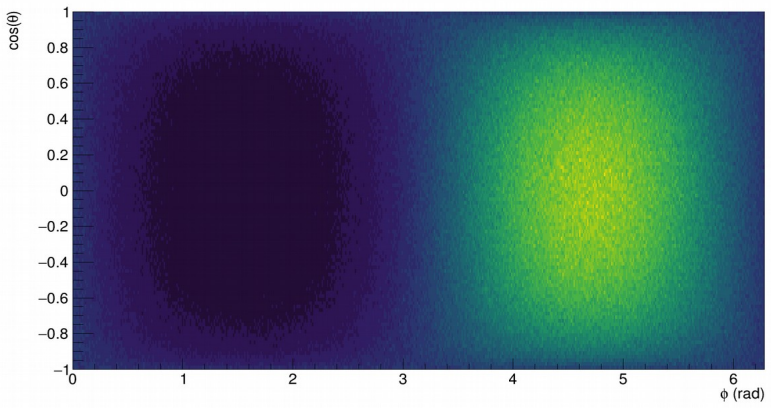


Next: Using 3D Angular Distribution

- Work ongoing to exploit the 3D information of the angle

WIMP





Still using
- as target

SNDM