Clustering Update
(for SNB event selection)

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Re-Tuning of Clustering

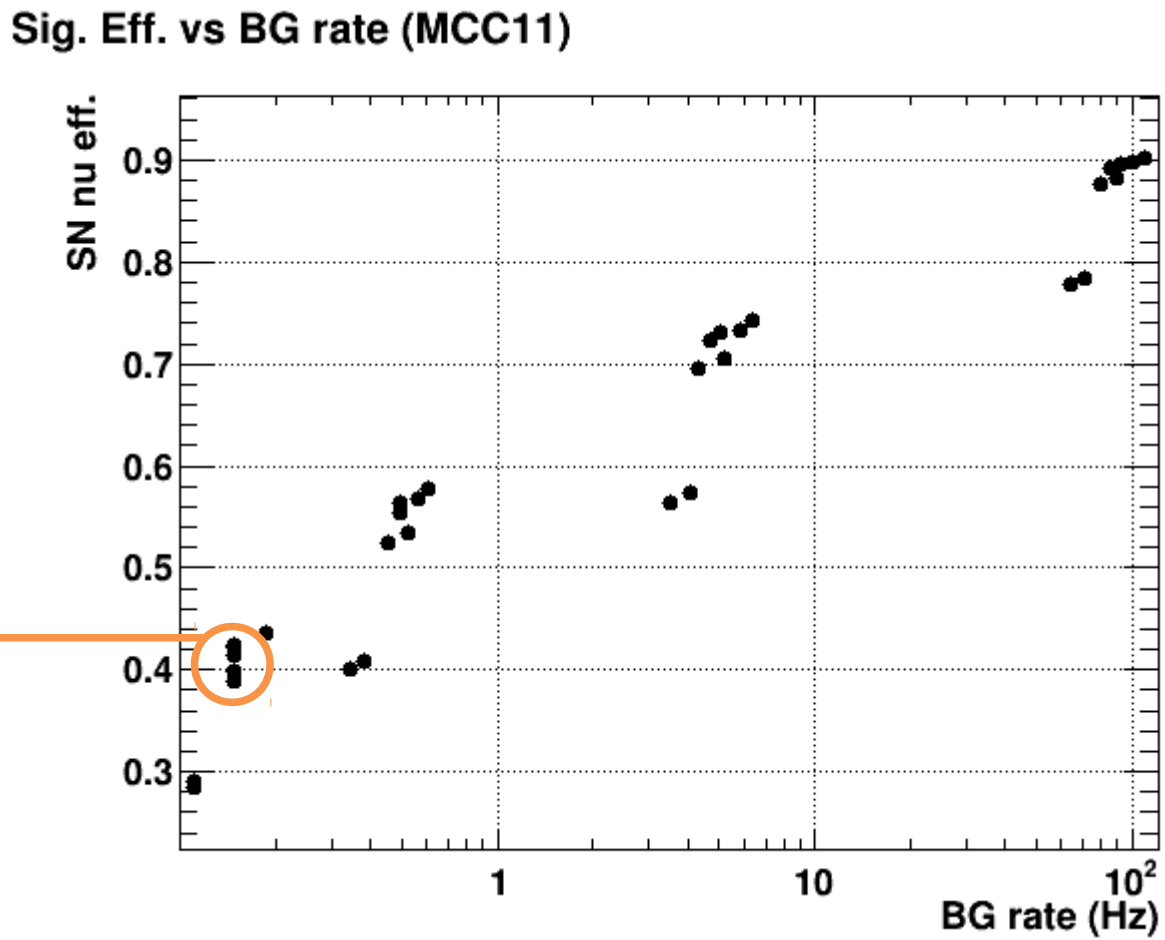
- Neutron rate decreases with new BG model (Aran's talk)
  - Capture rates on 1x2x6: 80 Hz → 3 Hz
- Clustering selection depends on:
  - Number of hits (6)
  - Channel tolerance (1)
  - Time tolerance (20 ticks)
  - Minimum channels (2)

    (value used so far)

SN eff vs BG rate

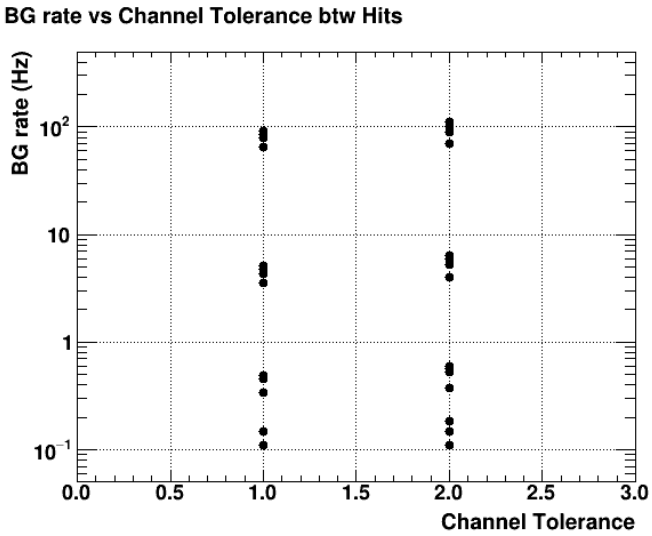
- Check against a few combination sets:
  - Number of hits: 3, 4, 5, 6
  - Channel tolerance: 1, 2
  - Time tolerance: 5, 10, 15, 20 ticks

SN eff vs BG rate

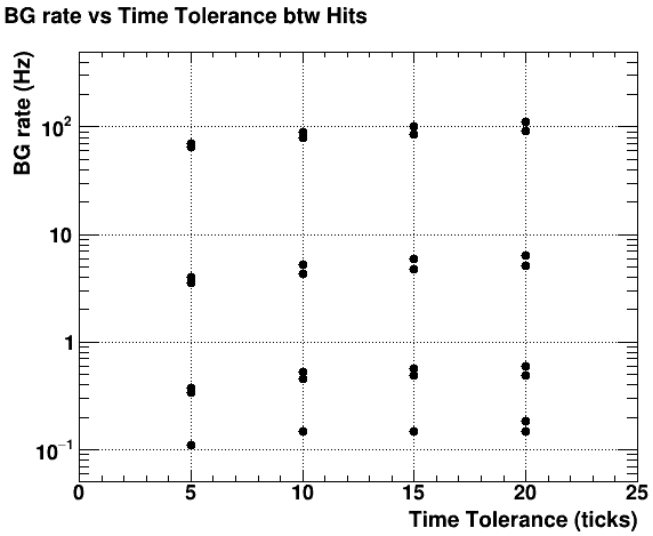


We are here currently

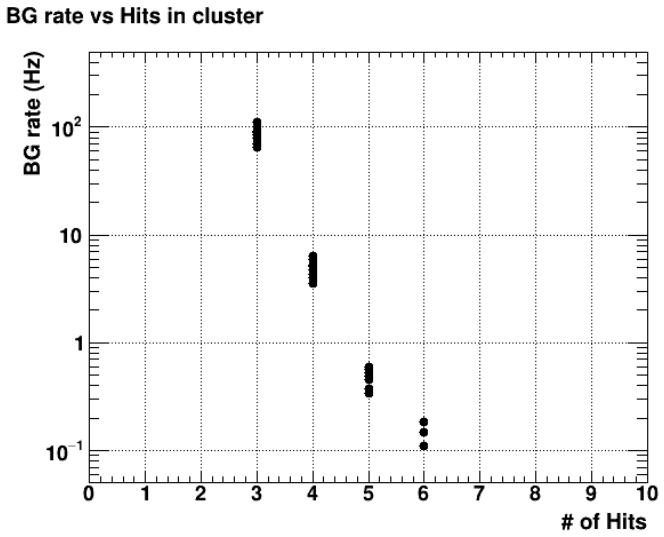
BG rate vs Clustering Param.



Channel Tolerance



Time Tolerance

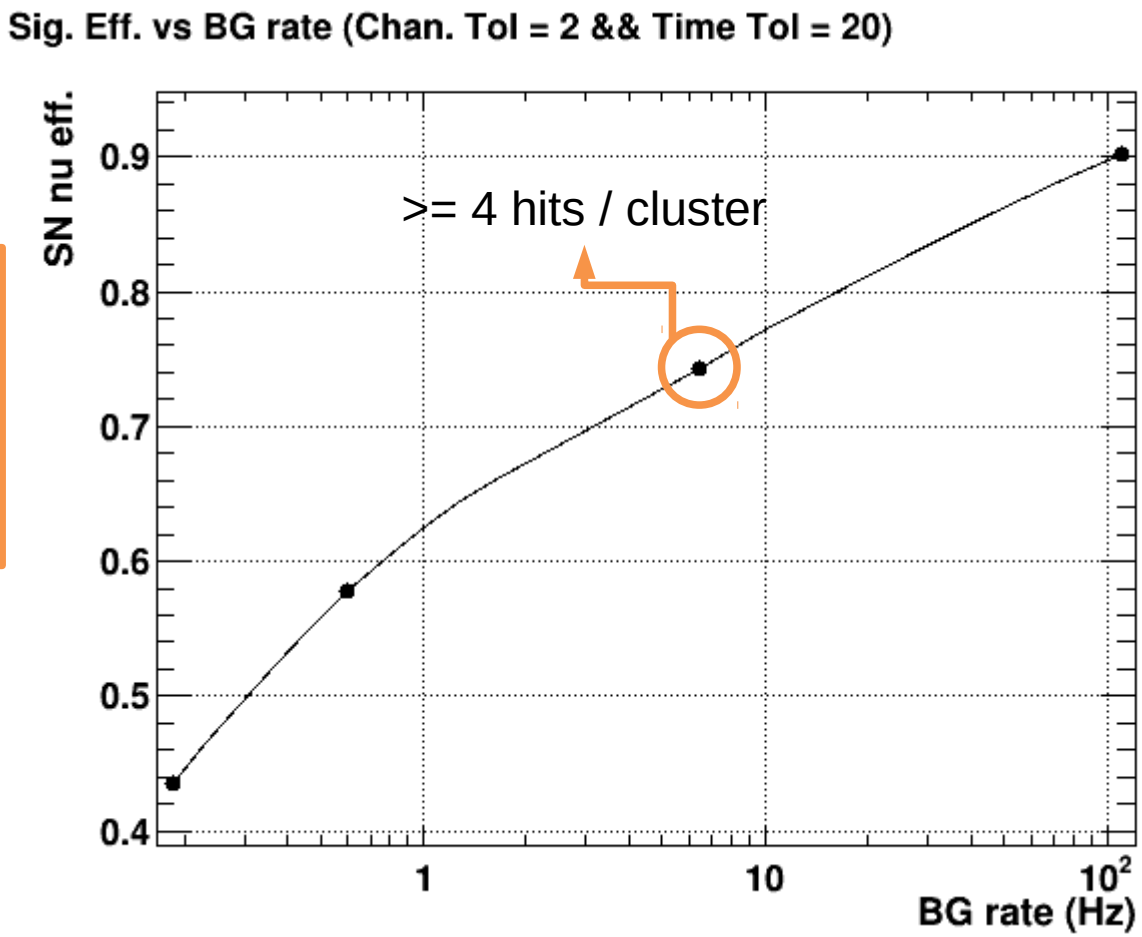


Hits per Cluster

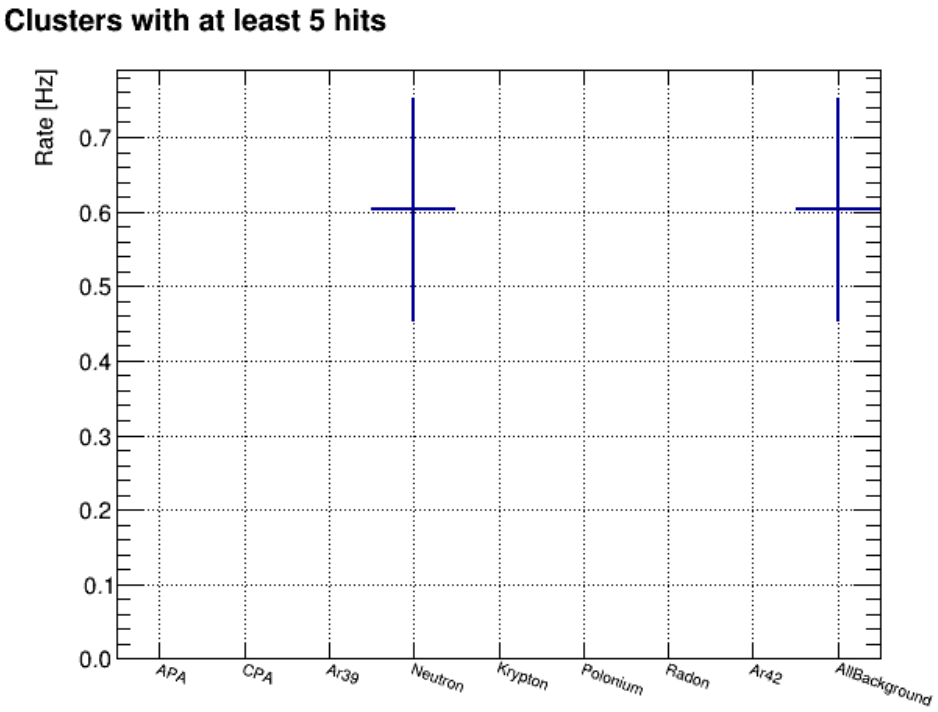
SN eff vs BG rate

Channel and Time Tolerance Fixed

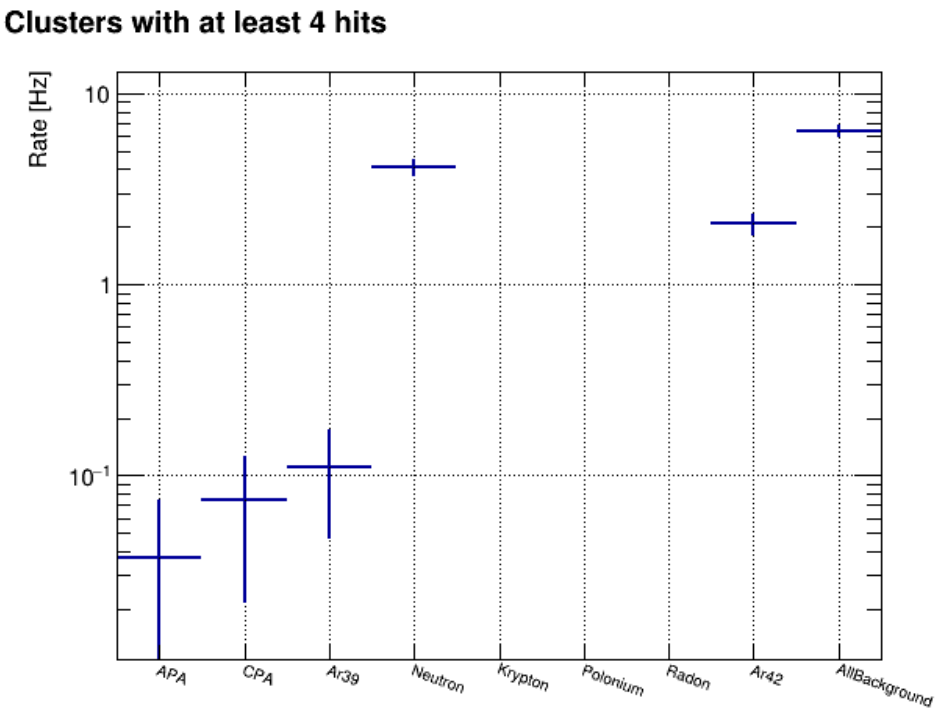
Varying #Hits



Background Rates Breakdown

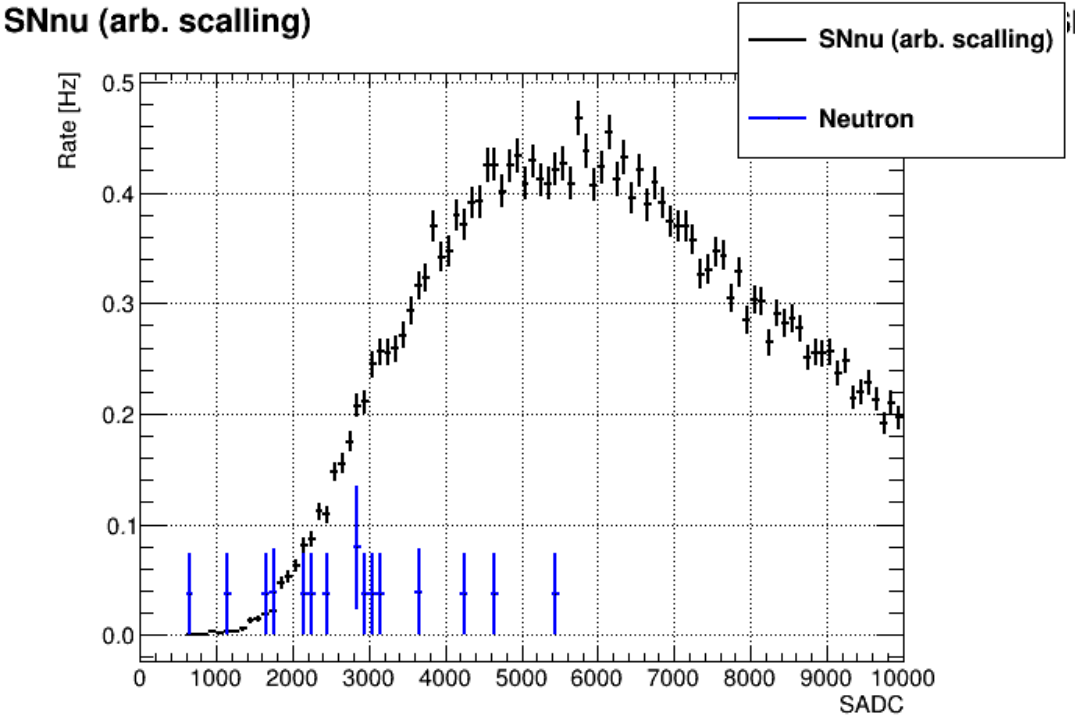


>= 5 Hits

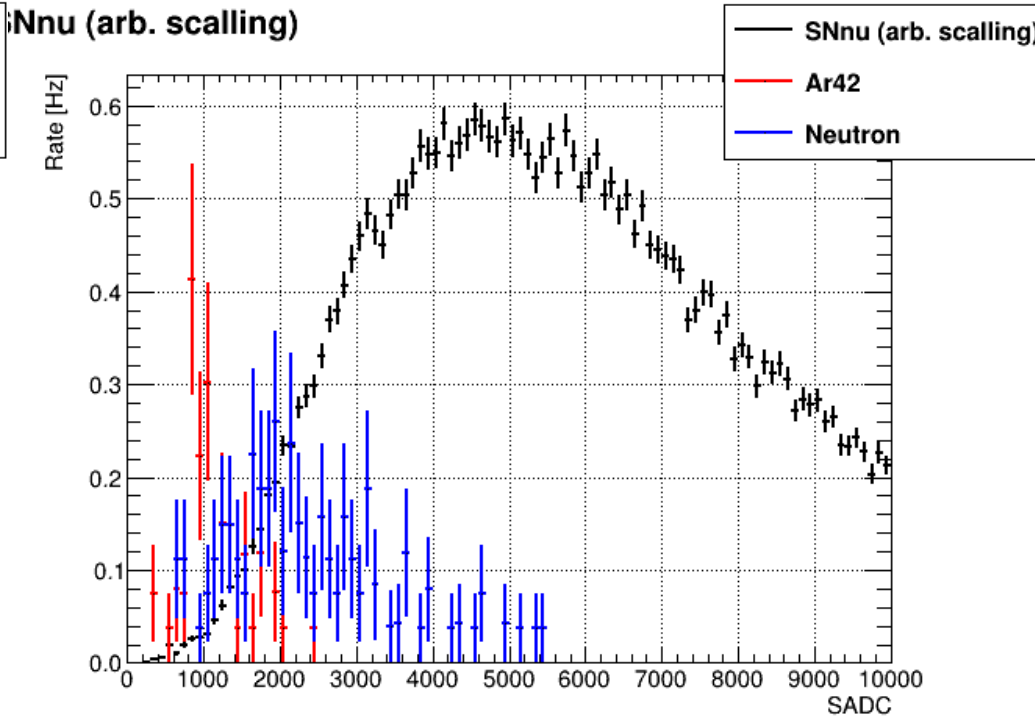


>= 4 Hits

SADC Spectrum

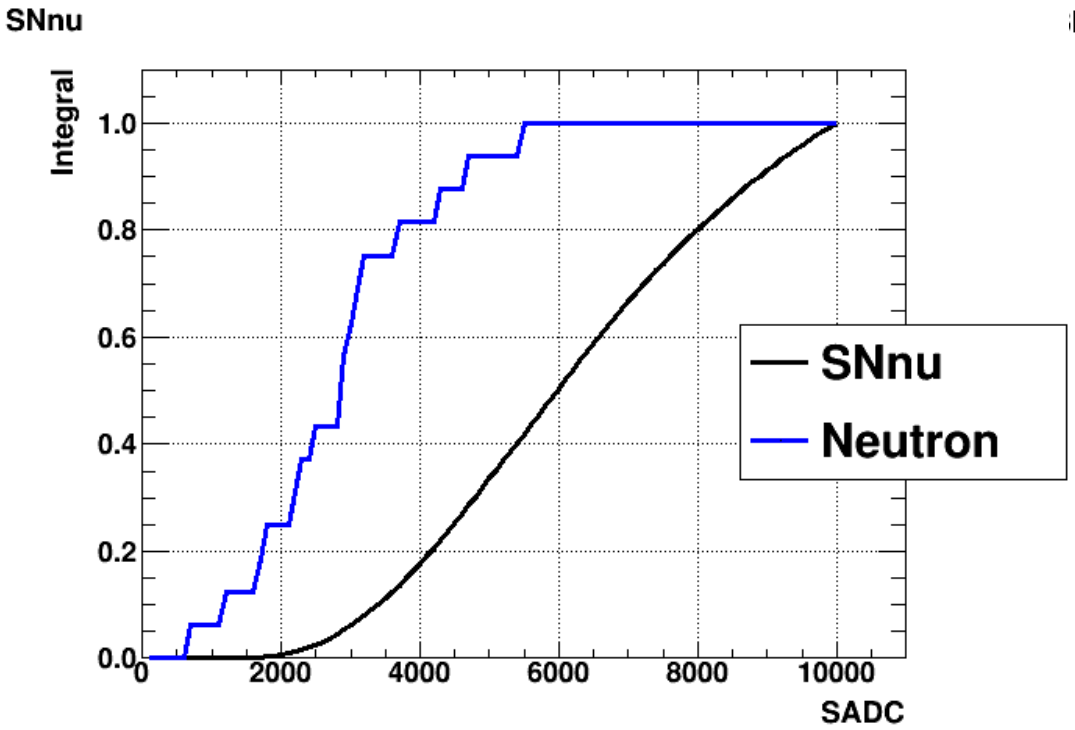


>= 5 Hits

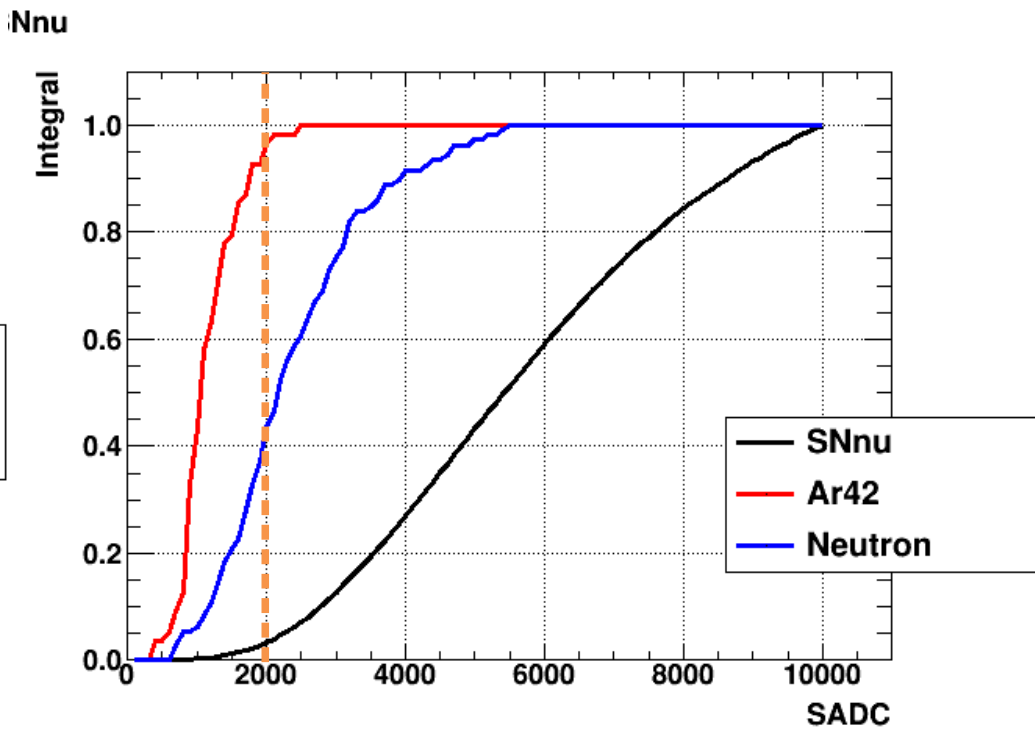


>= 4 Hits

SADC Spectrum Integral

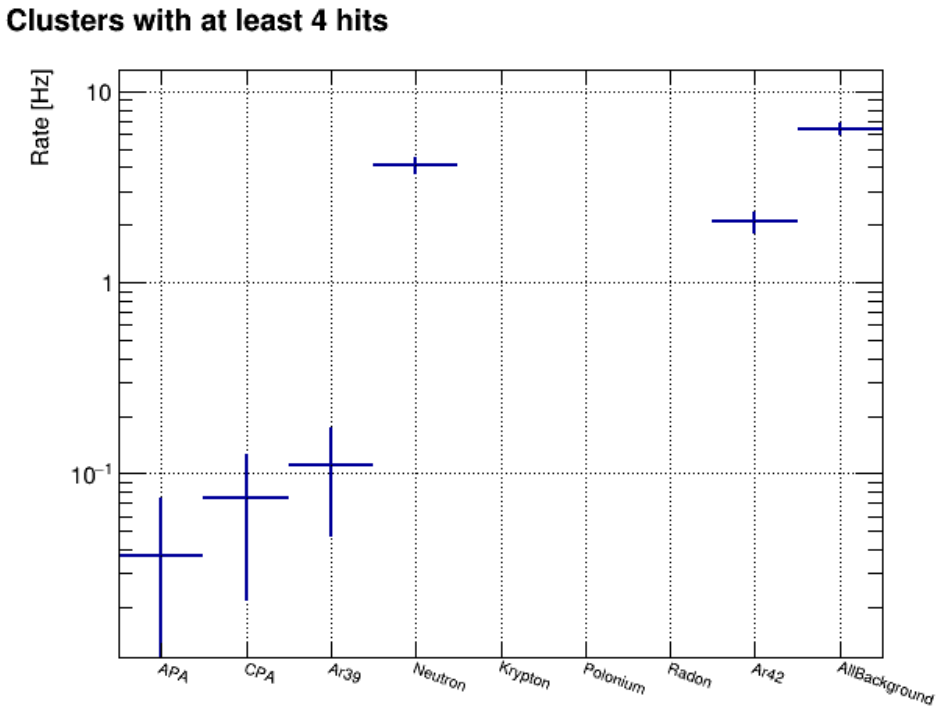


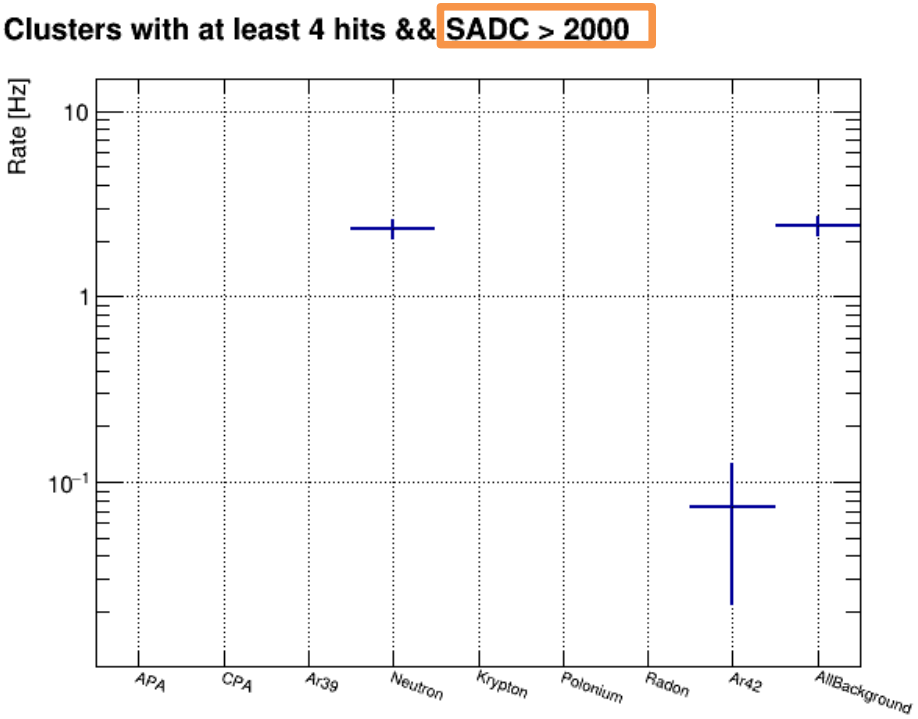
>= 5 Hits



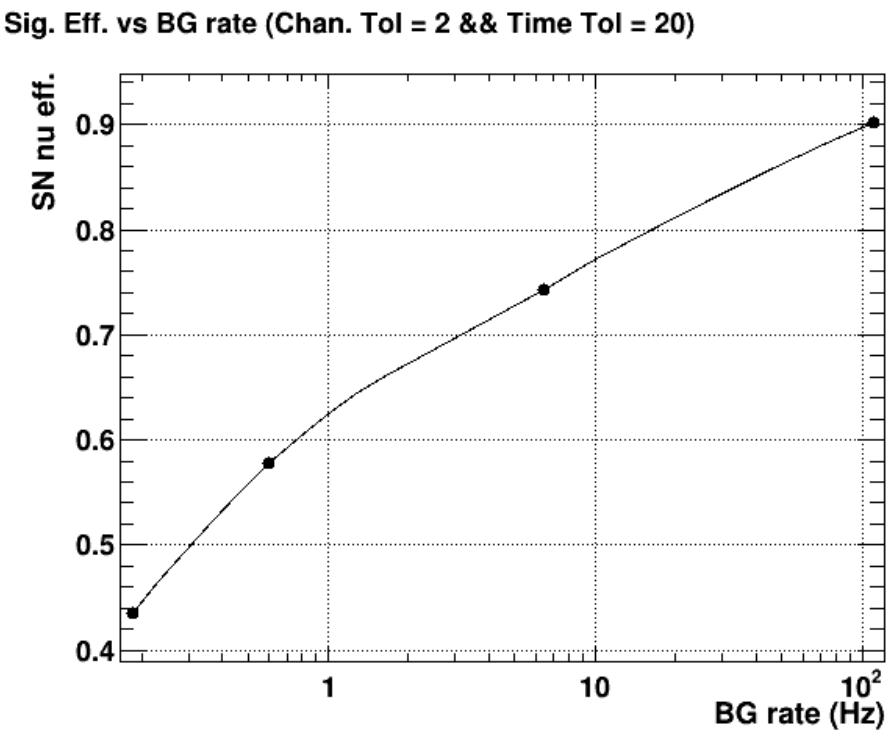
>= 4 Hits

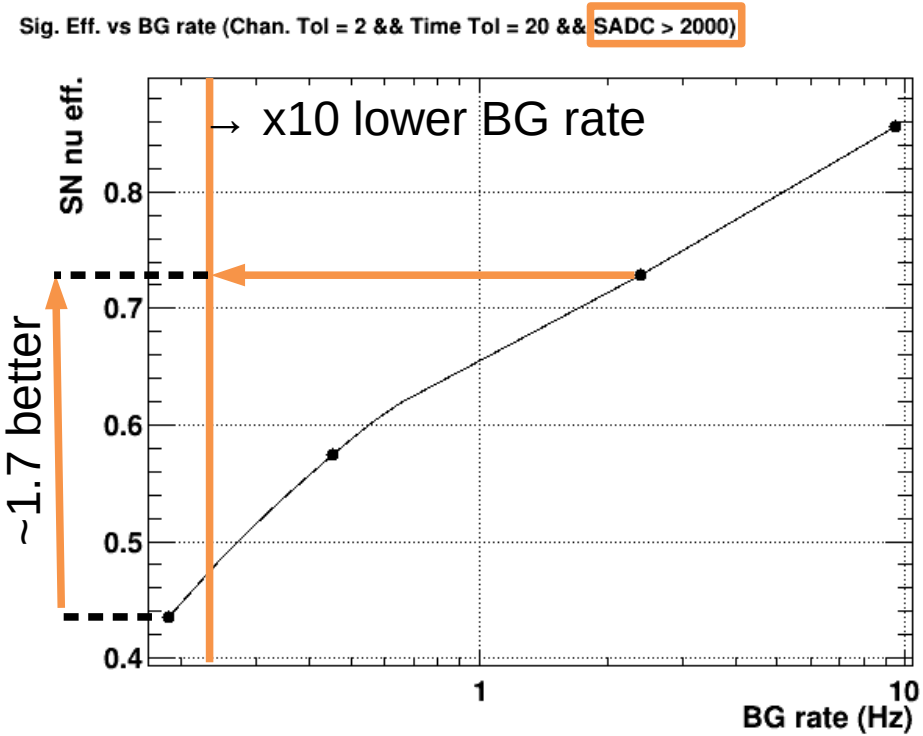
Addition of SADC thr.



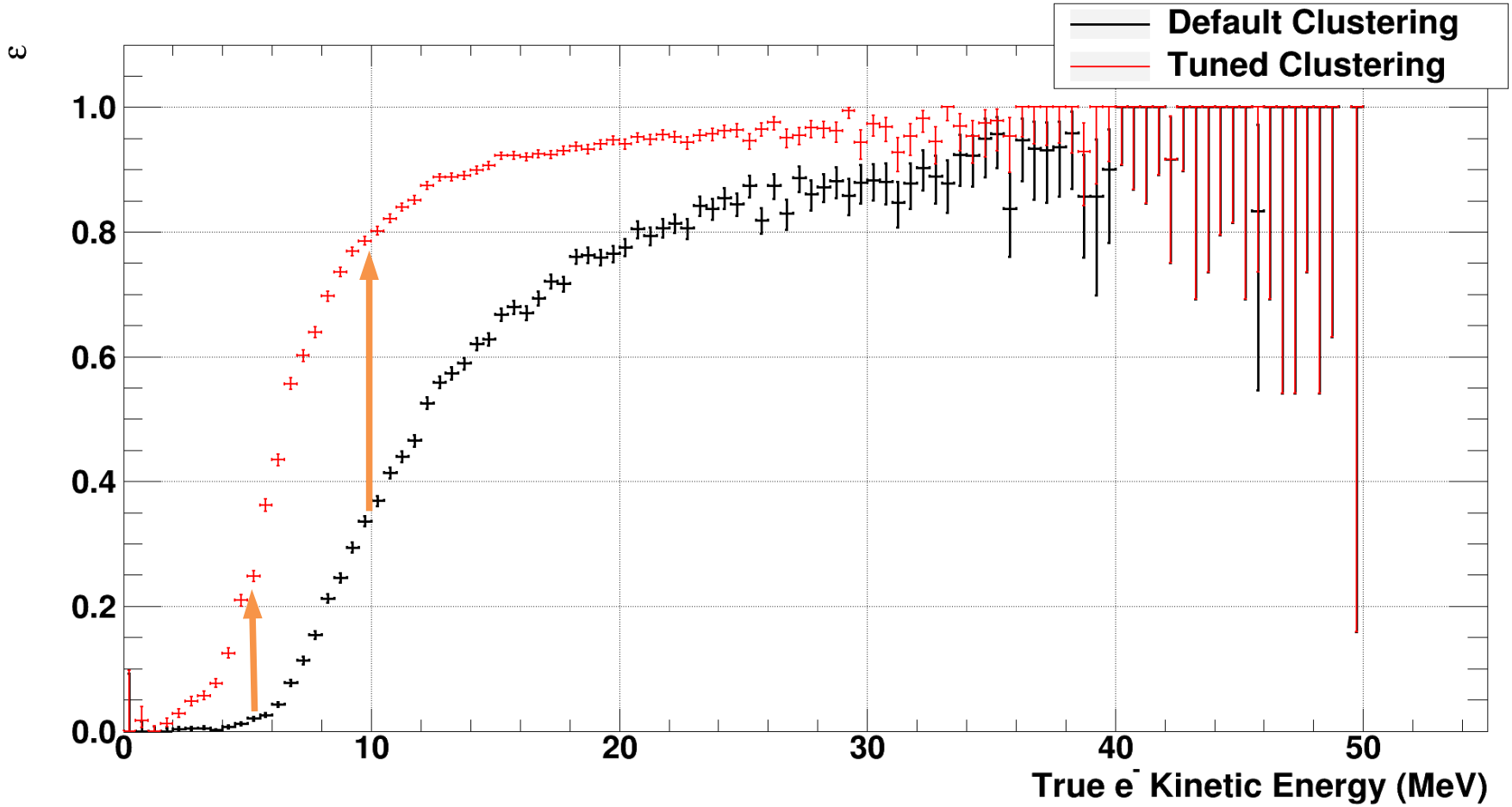


Addition of SADC thr.

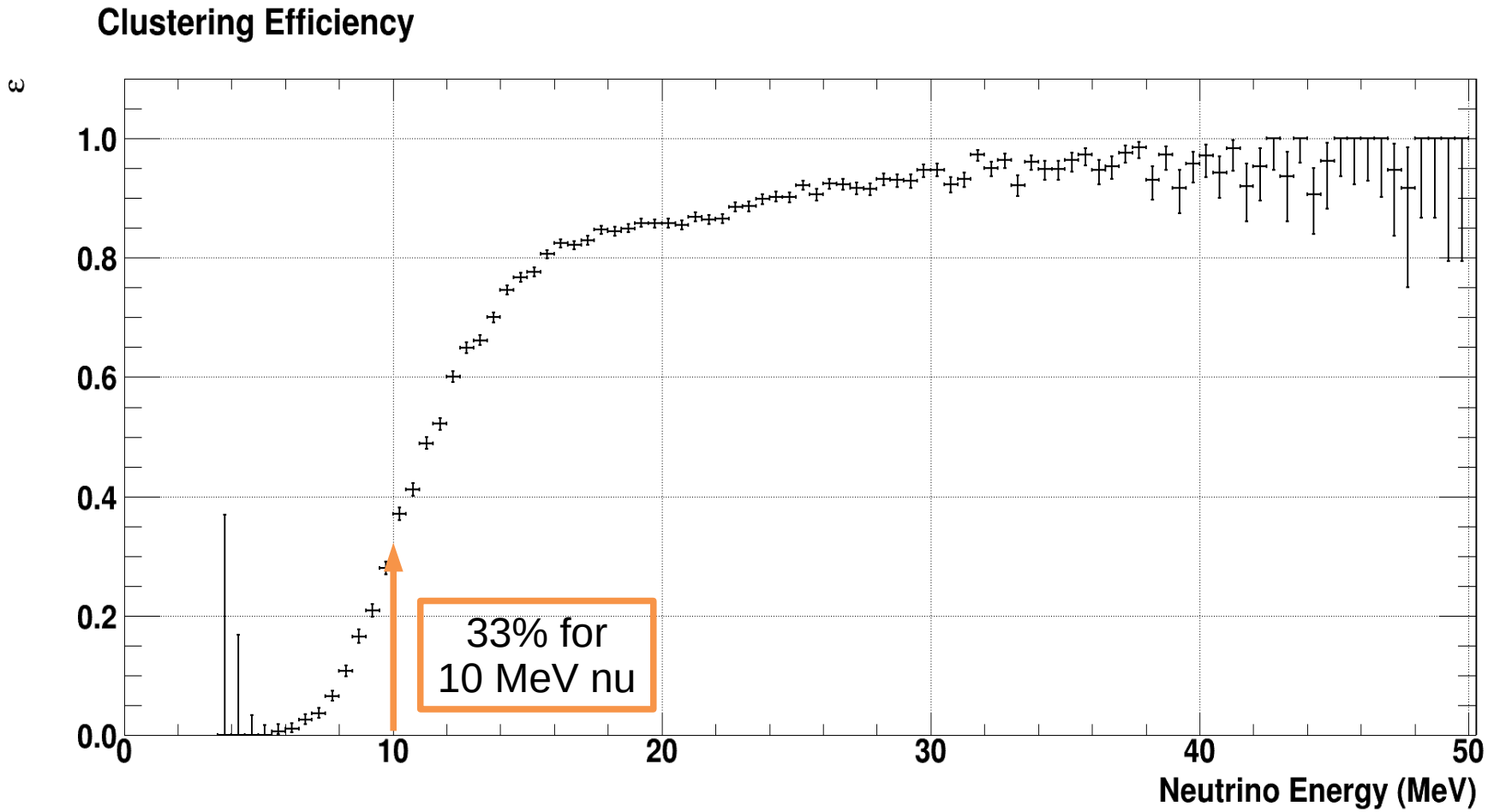




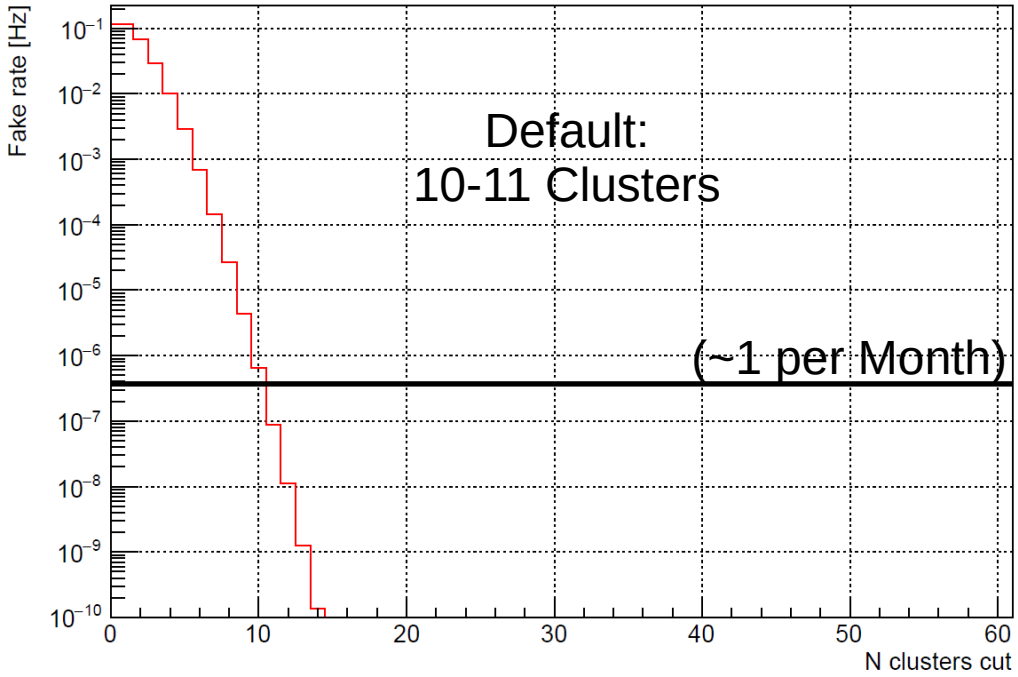
SN Signal Efficiency update



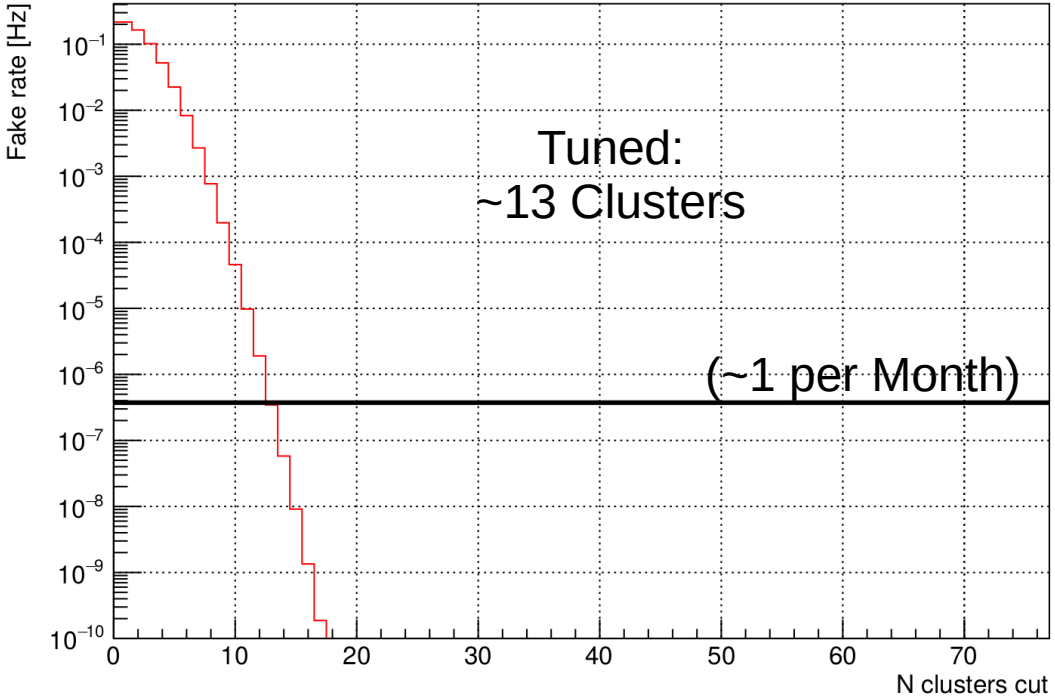
SN Signal Efficiency update



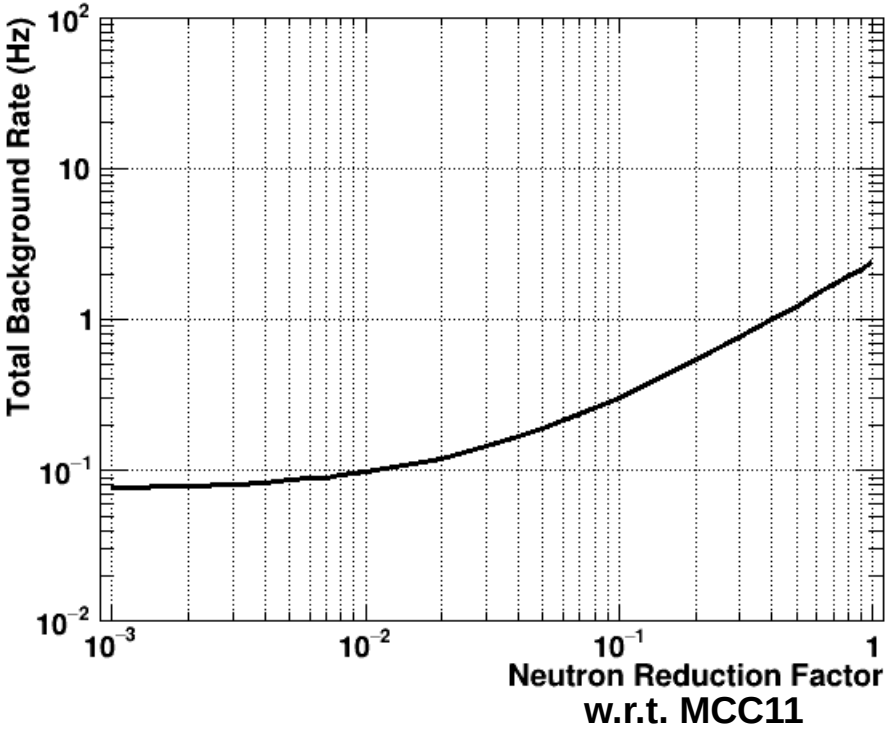
Impact on Fake Trigger Rate

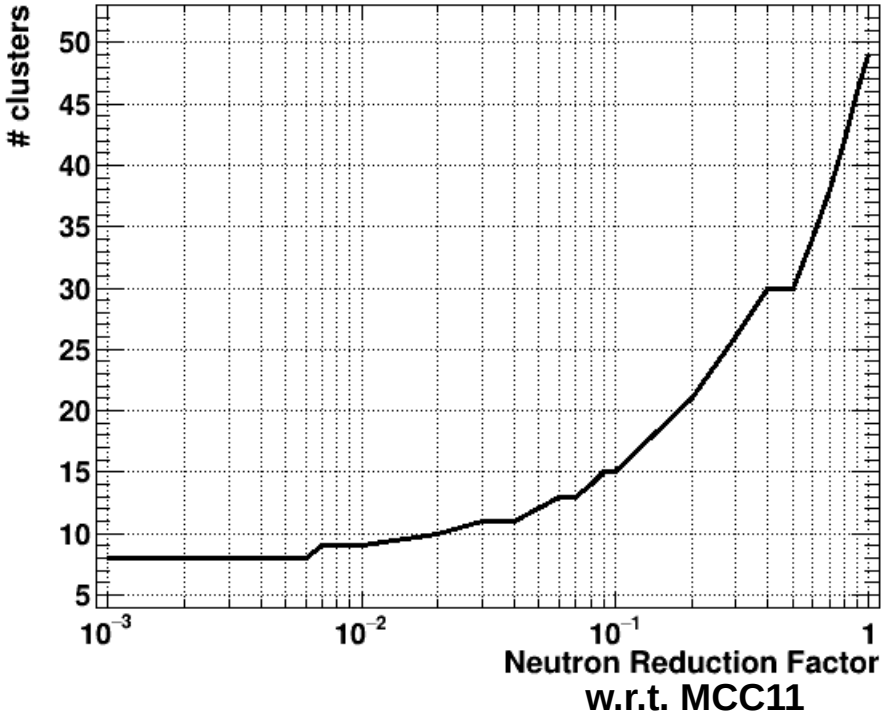


considering ~10x lower BG rate



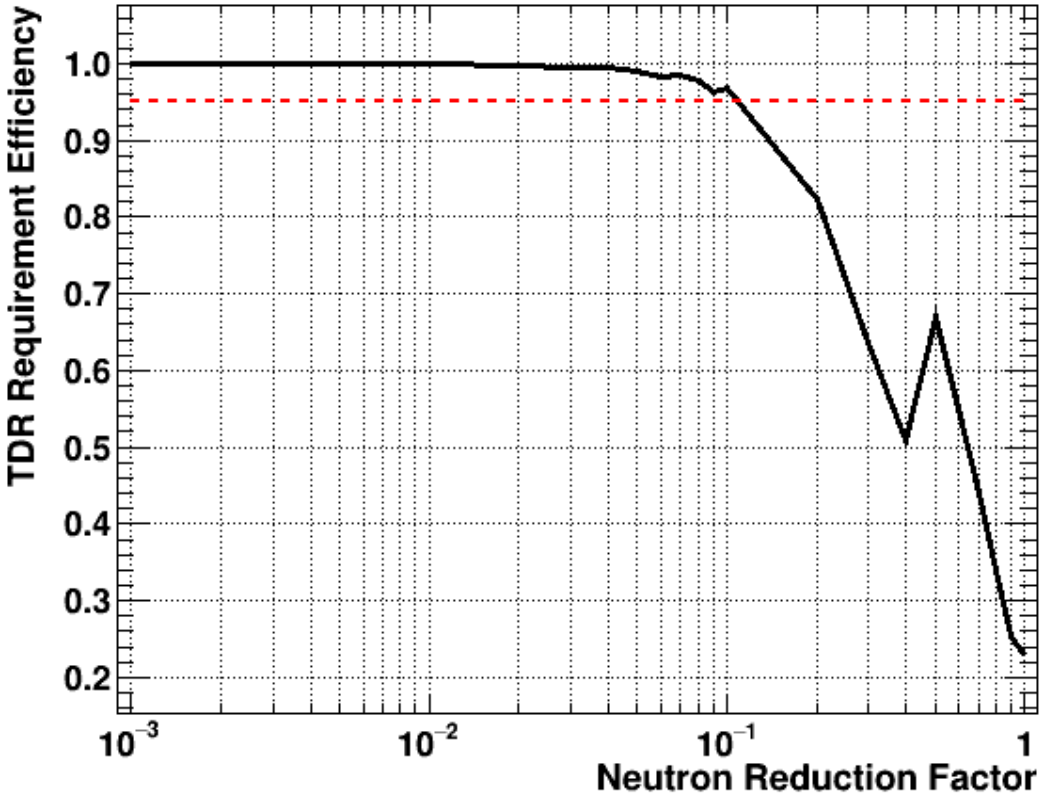
Neutron Reduction vs Fake Trig. Rate





TDR Requirement

"… the >95% expected efficiency for a SNB with at least 60 interactions each of minimum 10 MeV in true neutrino energy…"



(w.r.t. MCC11)

Data Volume Exercise

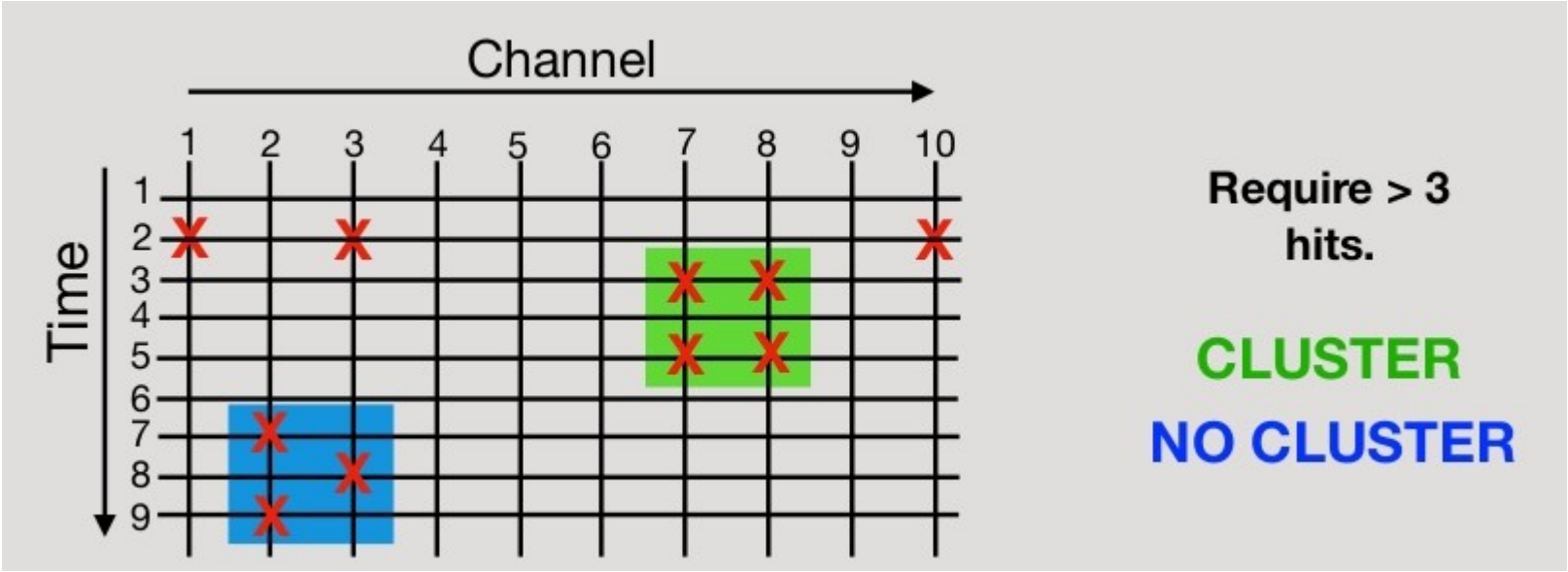
- Using numbers from DUNE-doc-9240 (table below)
- And a LE trigger rate of 0.305 Hz:
  - 26’352 LE-BKG/day/module * 6.22 GB / event * 365 days / year = **59.8 PB / year**
  - or **0.40 PB / year / APA**
  - *uncompressed* data

Table 1:

Parameter	Value
ADC Dynamic Range	12 bits
ADC Sampling Rate	2 MHz
Event Readout Window	5.4 ms
Supernova Burst Readout Window	30 s
Total Number of Channels/Module	384000
Number of Channels/APA	2560
Size of a DUNE Event	6.22 GB

Summary

- Re-tunning clustering for SNB selection
- If neutron rate is ~10x lower:
  - Clusters with ≥**4** hits are viable
  - Needs a **2000** SADC cut, to remove ^{42}Ar
  - **0.30 Hz** of backgrounds with **73%** signal efficiency (against 0.15 Hz and 43% before)
  - 1 fake trigger per month kept, assuming 15 instead of 10 clusters in a 10 sec. window
  - ~33**%** eff. for 10 MeV neutrinos
  - SNB requirement on verge of achievement
- Caveats: Updates also expected on
  - Radon; Argon; Electron live-time;

Backup Slides

Clustering Sketch