Measurement of the ^{241}Am(n,γ) cross section at low energies at EAR2

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^{241}Am(n,γ) at n_TOF

Previous measurement at n_TOF:

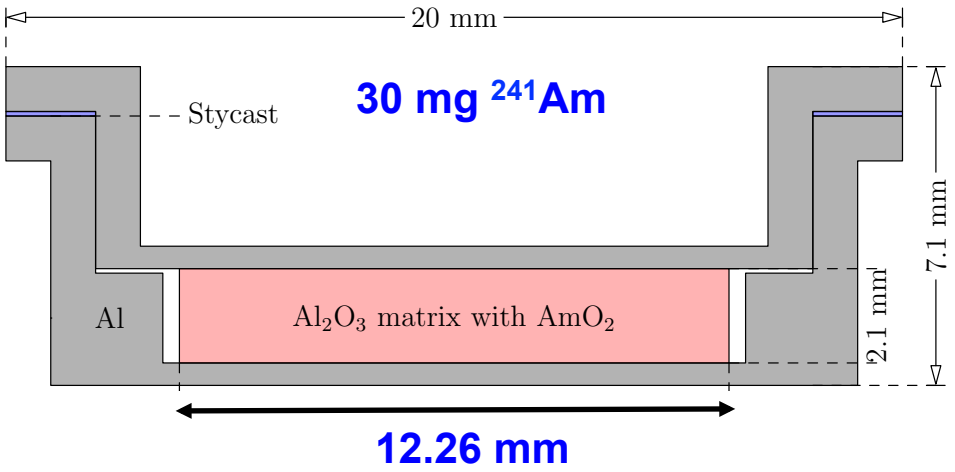
- Two measurements performed at n_TOF (EAR1) in 2010
  - one with BaF_2 TAC
  - one with C_6D_6
- Same sample was used for both capture setups
- About 3 GBq activity, mainly, but not only, 60 keV γ, high background from radioactivity (90% near thermal)
- Broken dummy sample containing Sm (high thermal cross section)
- Thermal energy point (25.3 meV) not covered

Proposal:

- Measure now same sample in EAR2
  – extended DAQ time-range, fully covers thermal region
  – highly improved signal to (radioactive) noise ratio

^{241}Am sample

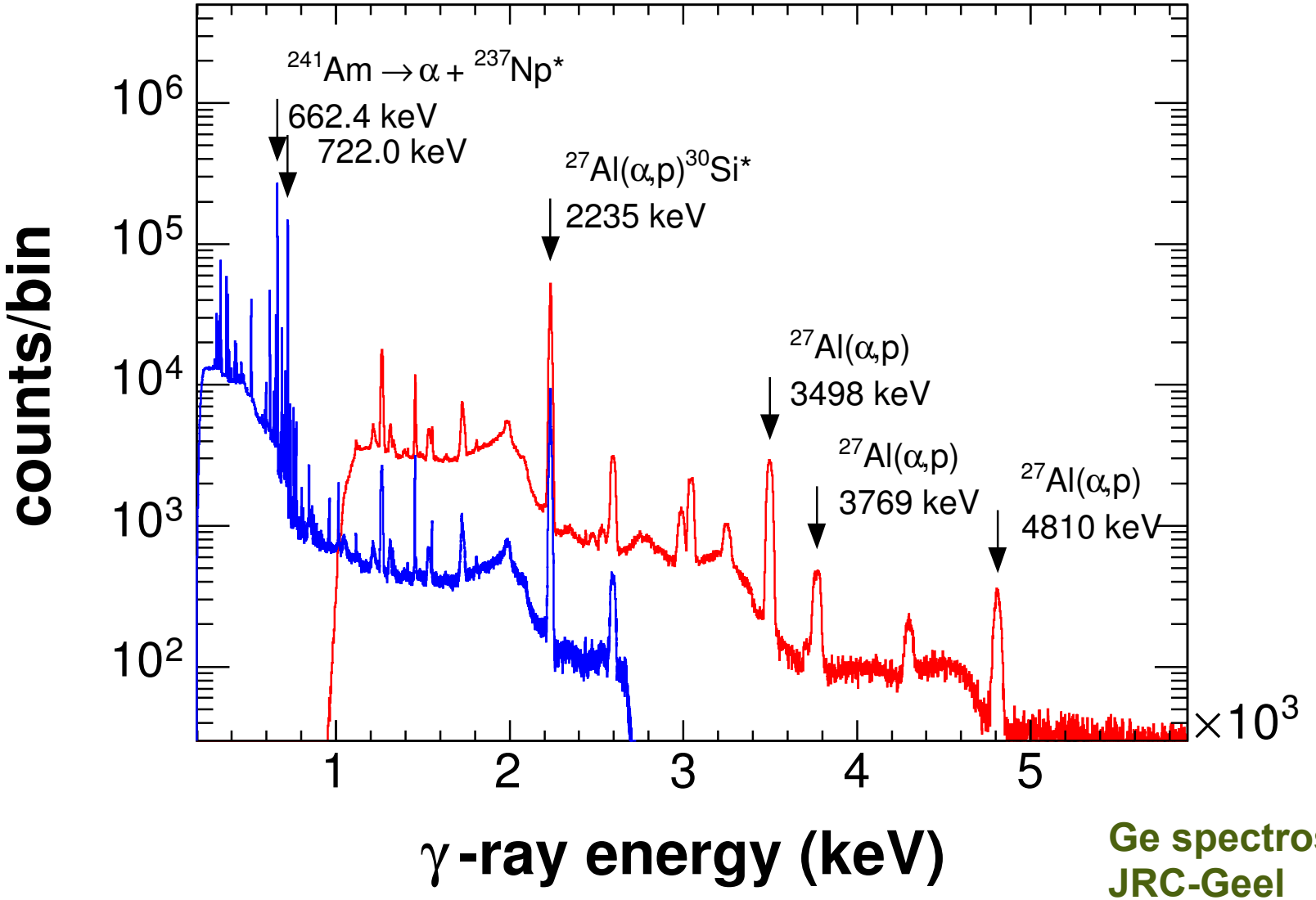
Sample preparation:
ORNL → CEA(Marcoule/Cadarache) → JRC-ITU
1 sample AmO_2 in Y_2O_3 (300 mg)
9 samples AmO_2 in Al_2O_3 (30-40 mg)



@JRC-Geel: (n,2n) ← Sage et al. PRC81 (2010) 064604

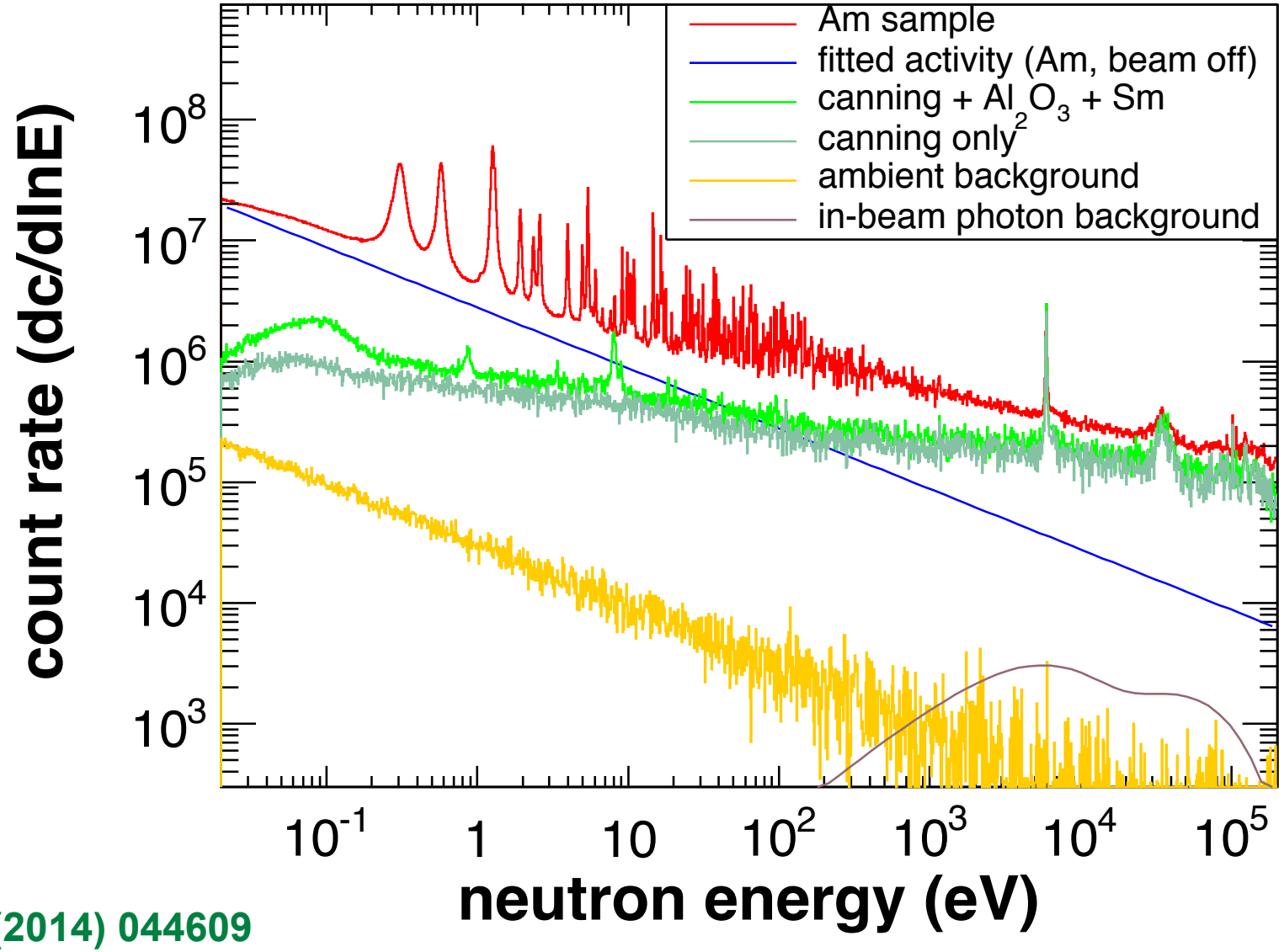
@n_TOF-CERN: (n,γ) ← Fraval et al. PRC89 (2014) 044609
← Mendoza et al. ND2016

Radioactive background ^{241}Am sample



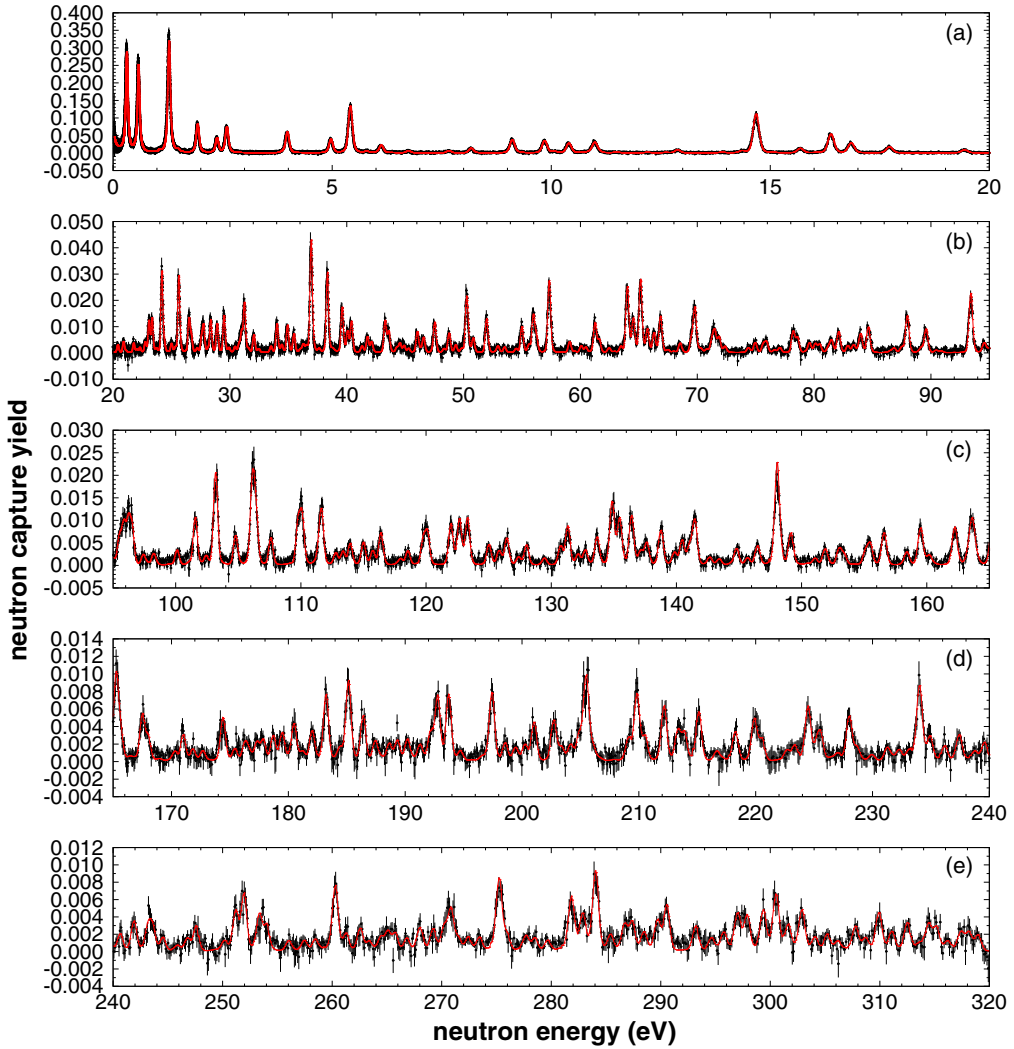
Ge spectroscopy JRC-Geel

Spectra ^{241}Am(n,γ) n_TOF C_6D_6



PRC 89 (2014) 044609

Spectra ^{241}Am(n,γ) n_TOF C_6D_6



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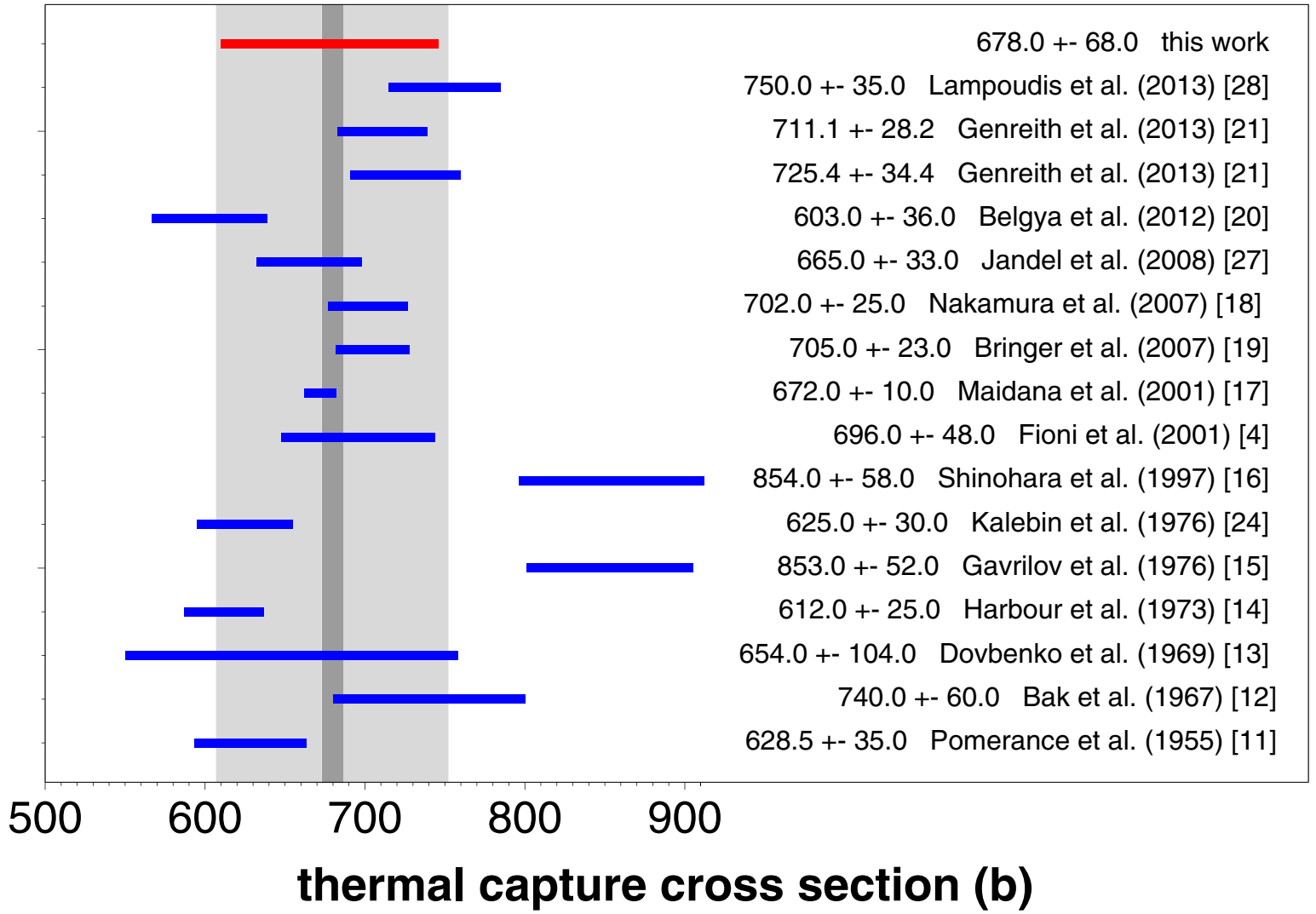
^{241}Am(n,γ) Results from previous measurement

Previous measurement at n_TOF:

- Resolved resonance analysis up to 320 eV (limit was 150 eV)
- 362 resonances of which 172 new ones
- Statistical analysis of levels (level density)
- Estimated thermal cross section (25.3 meV) has 10% uncertainty
- Unresolved resonance analysis up to 150 keV

^{241}Am(n,γ) thermal cross section



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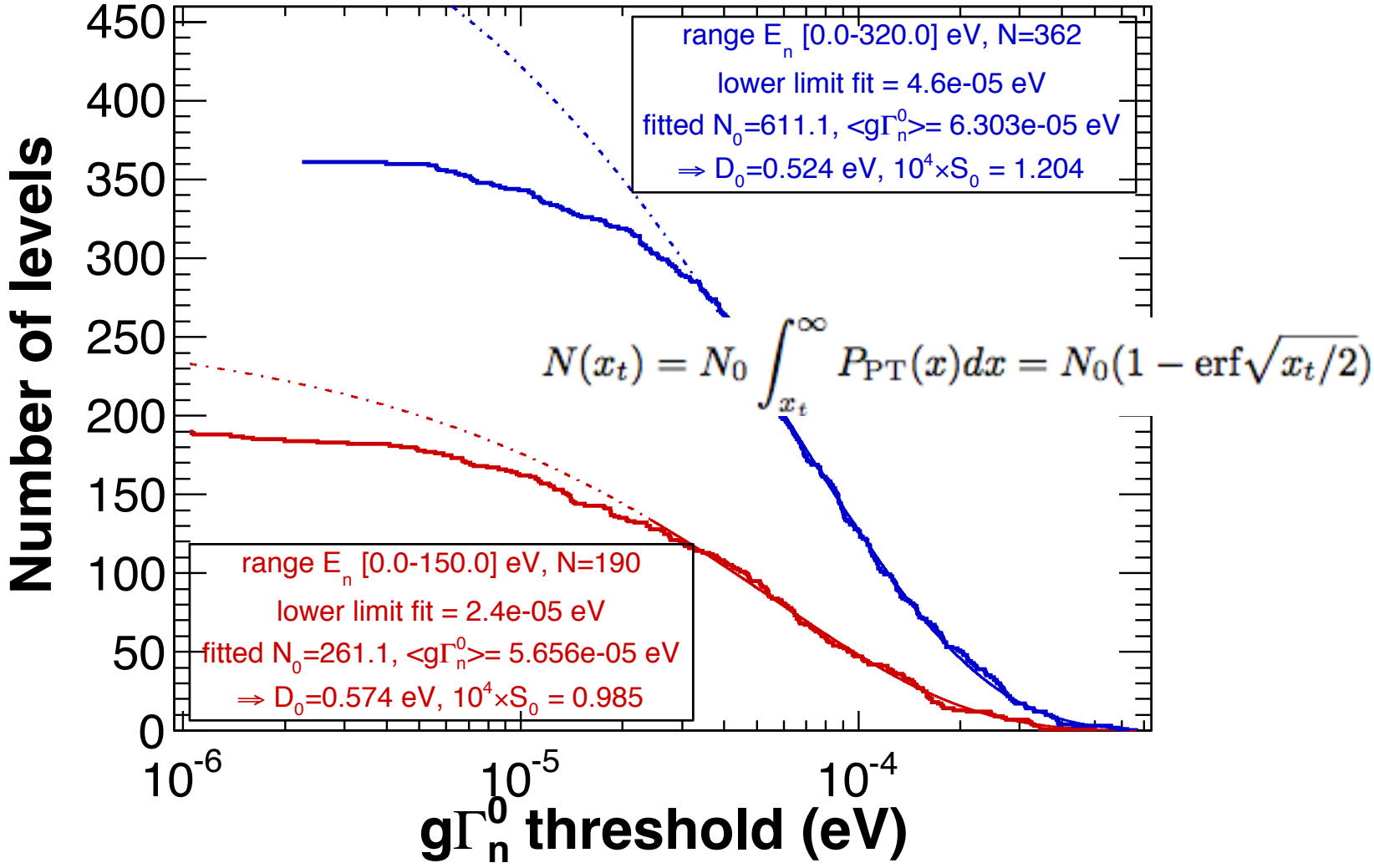
^{241}Am (n,γ) resonances, cumulative Porter-Thomas distribution



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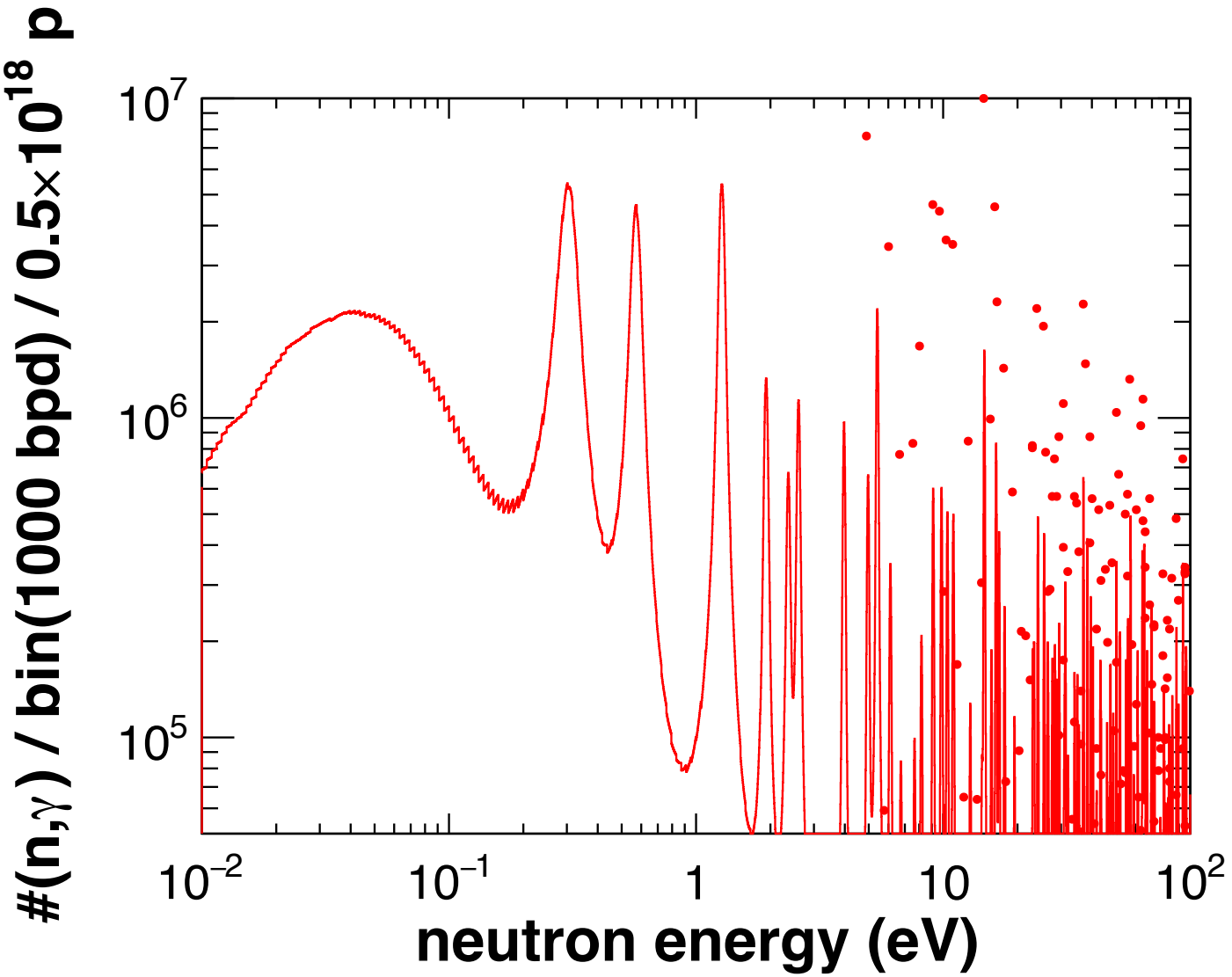
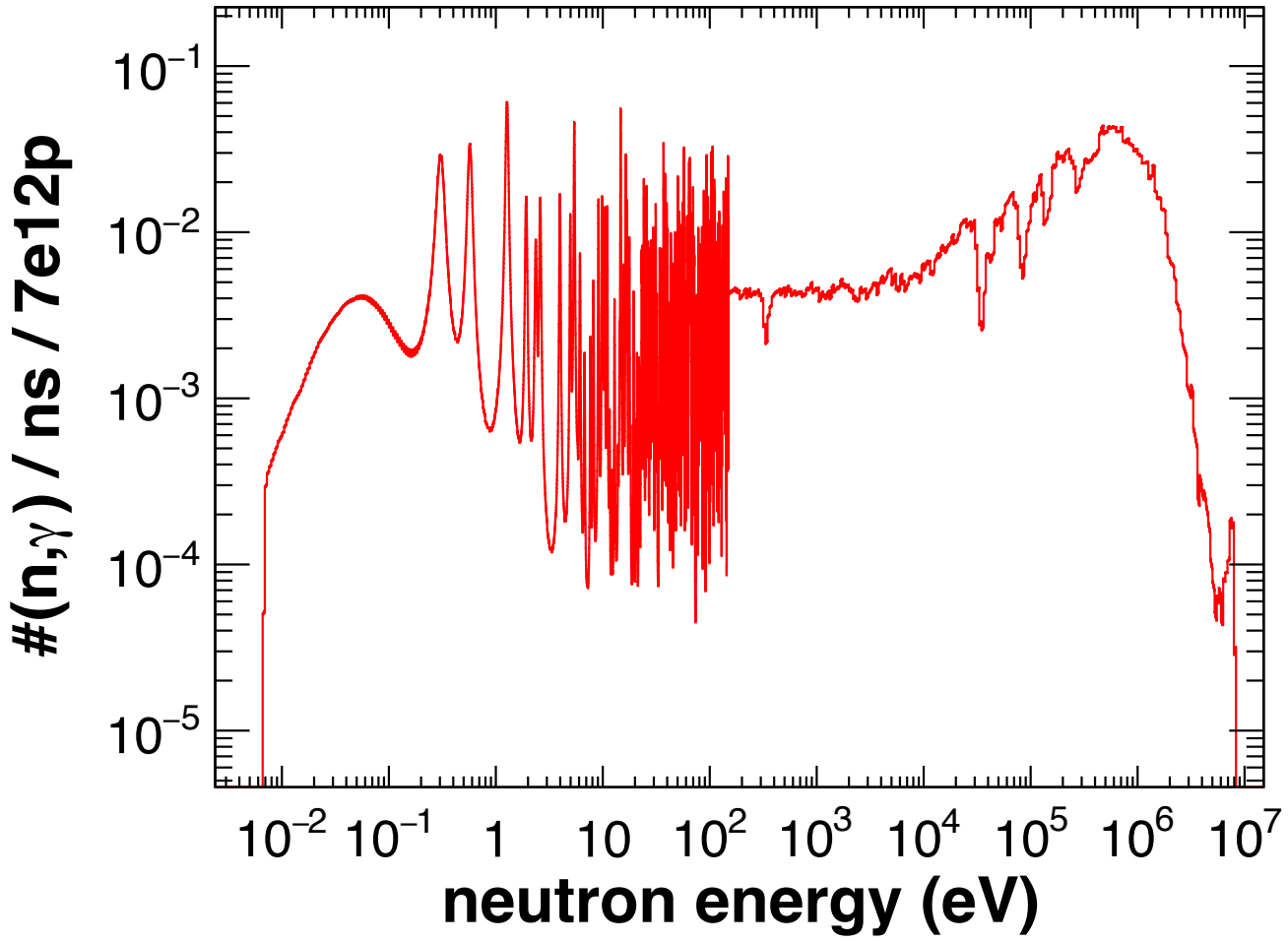
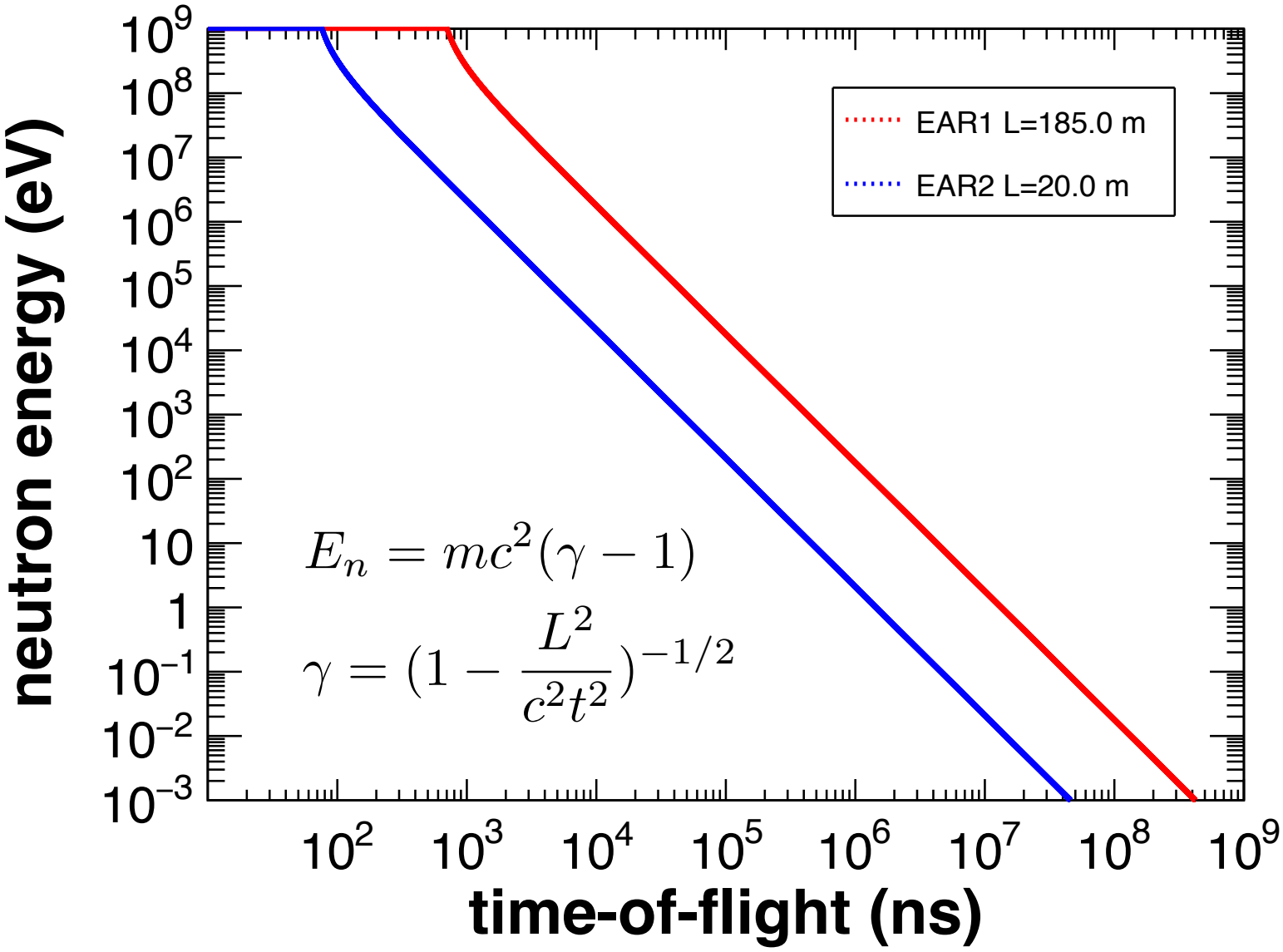
^{241}Am(n,γ) reactions/bin in EAR2



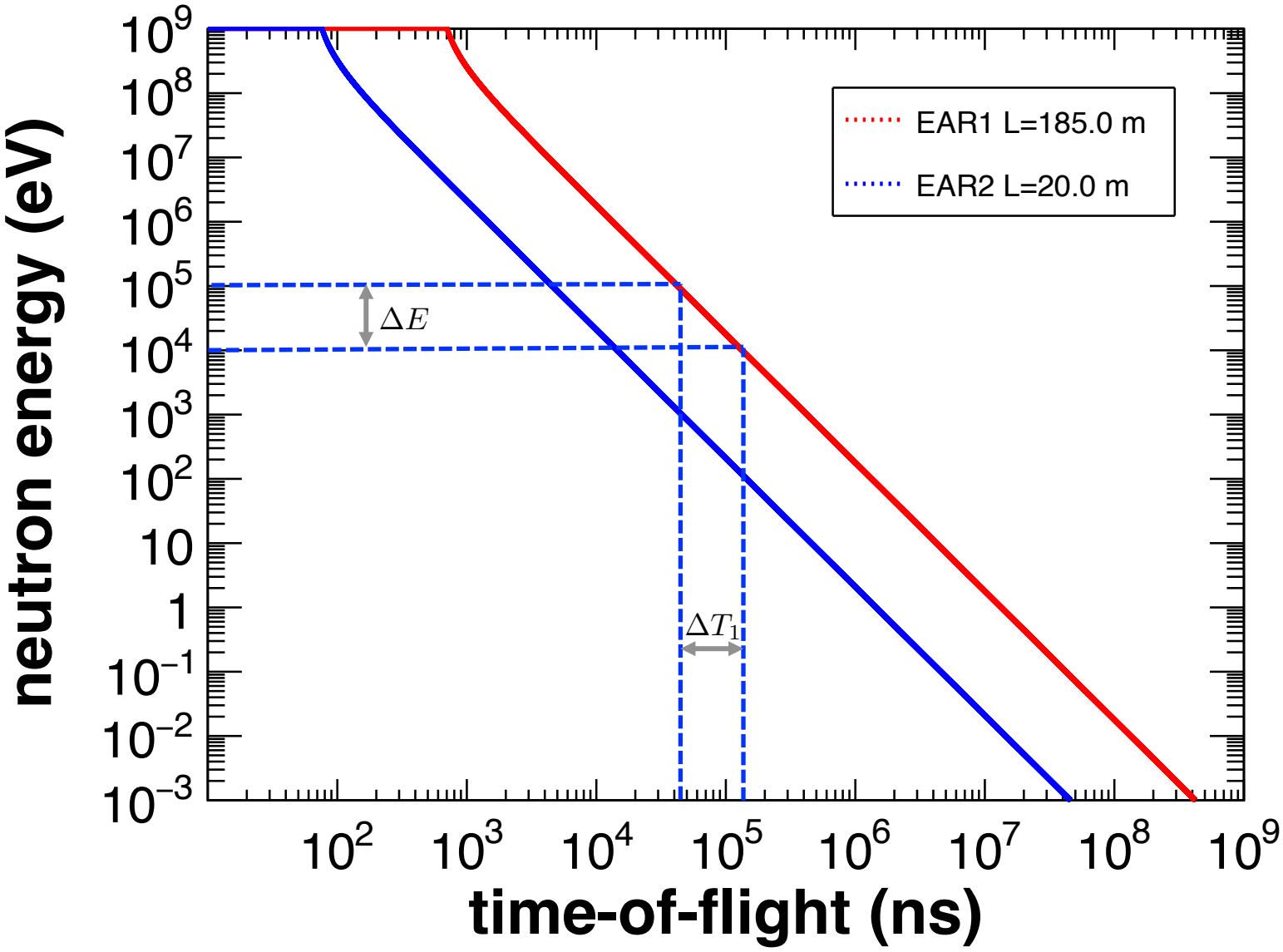
^{241}Am(n,γ) reactions/ns in EAR2



TOF-energy relation at n_TOF



TOF-energy relation at n_TOF



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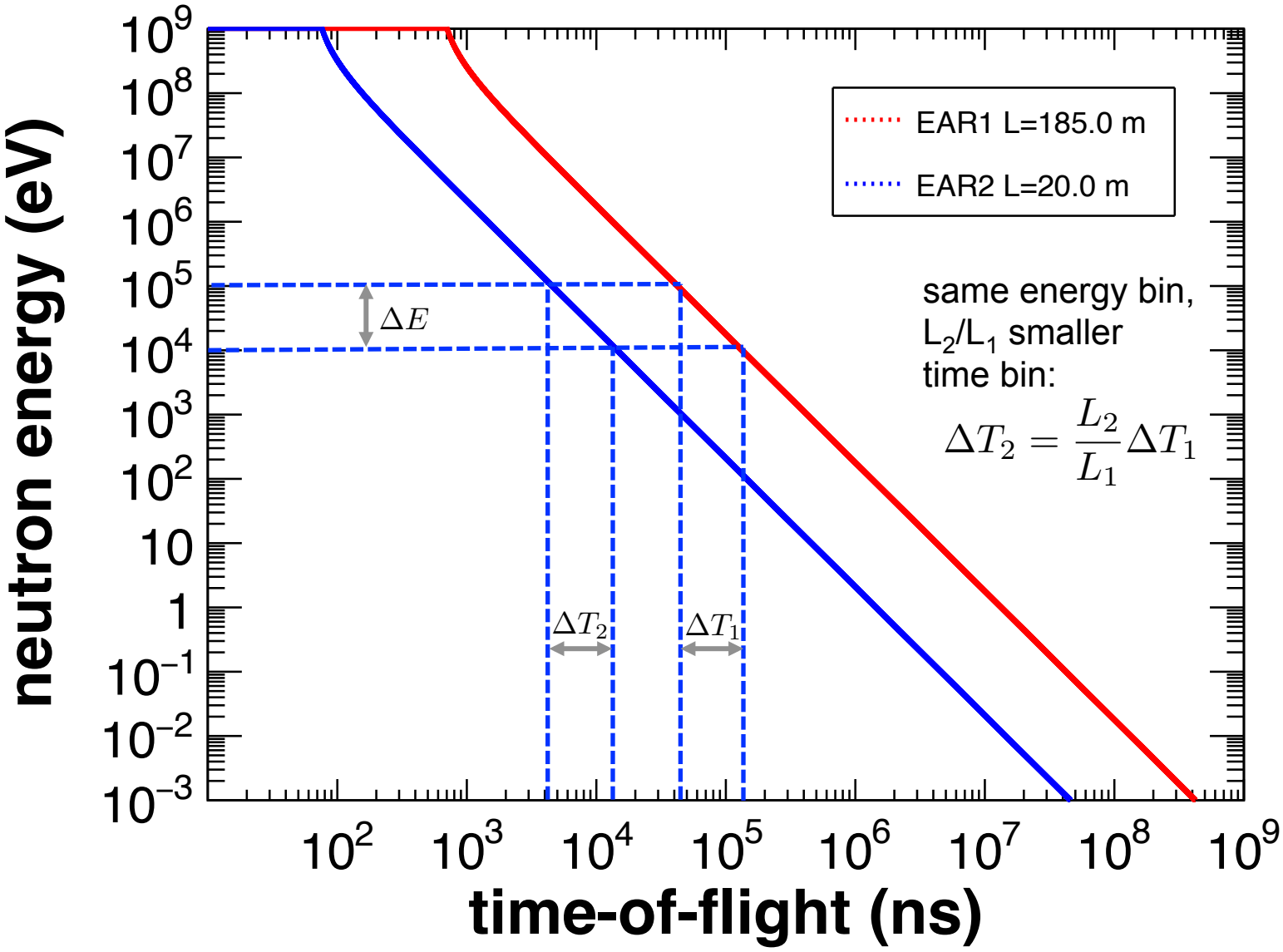
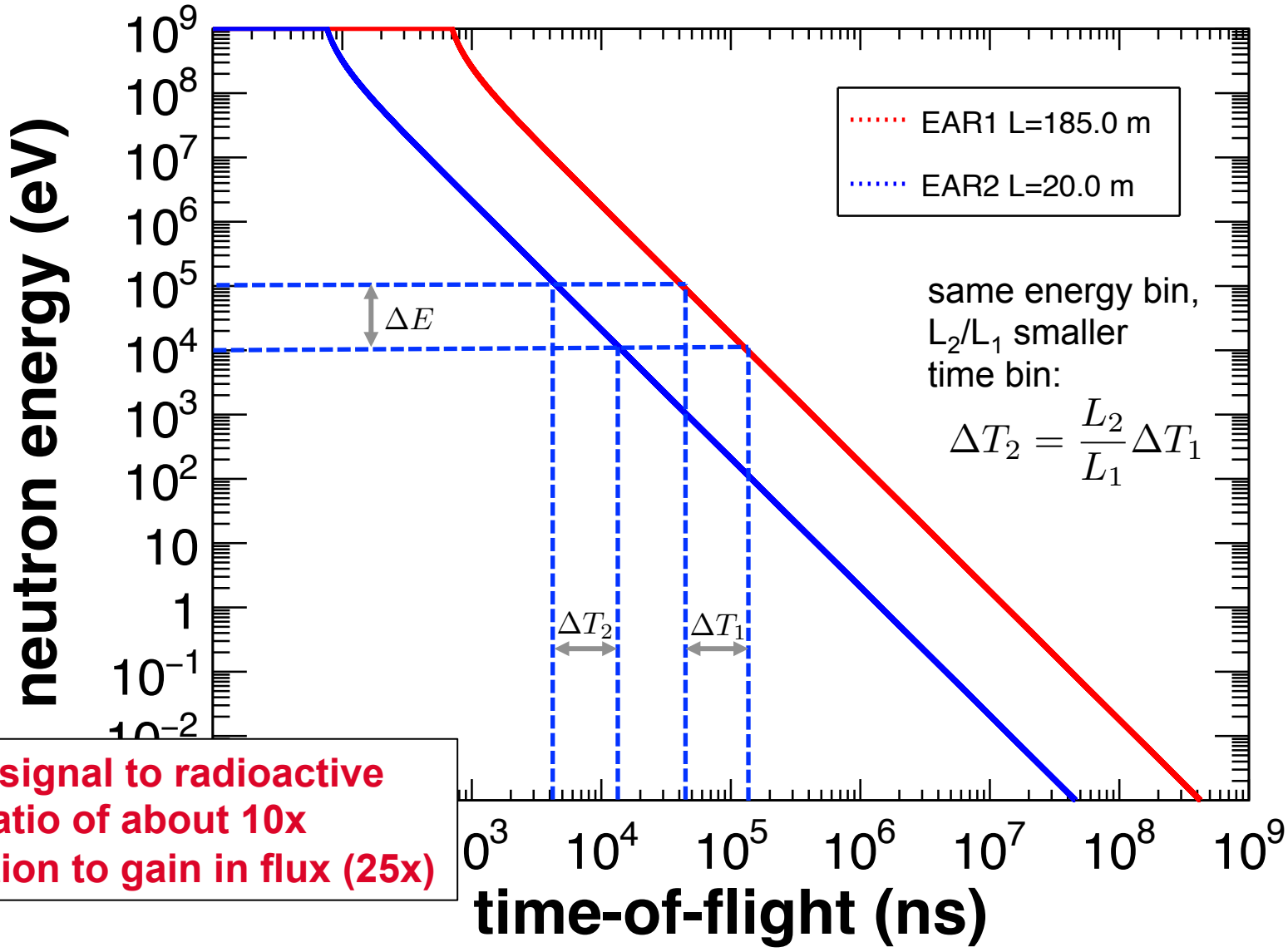


TOF-energy relation at n_TOF



gain in signal to radioactive noise ratio of about 10x in addition to gain in flux (25x)

Conclusion

Improvements over 2010 measurement in EAR1:

- less impact in EAR2 from huge radioactive background
- extended DAQ range in time (down to subthermal energies)

Beam time request (EAR2):

- focus on low energy region

sample	protons $\times 10^{18}$
^{241}Am	0.5
dummy	0.2
empty can	0.1
^{nat}C	0.1
^{197}Au, ^{nat}Ag, ^{nat}U	0.4
neutron filters	0.2
contingency	0.1
total	1.6