Rate Measurement of the Nuclear Excitation by Electron Capture process

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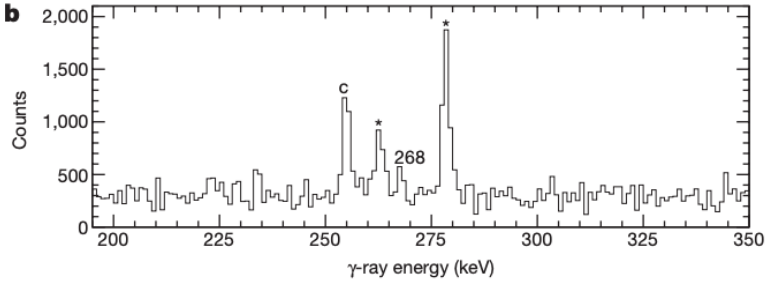
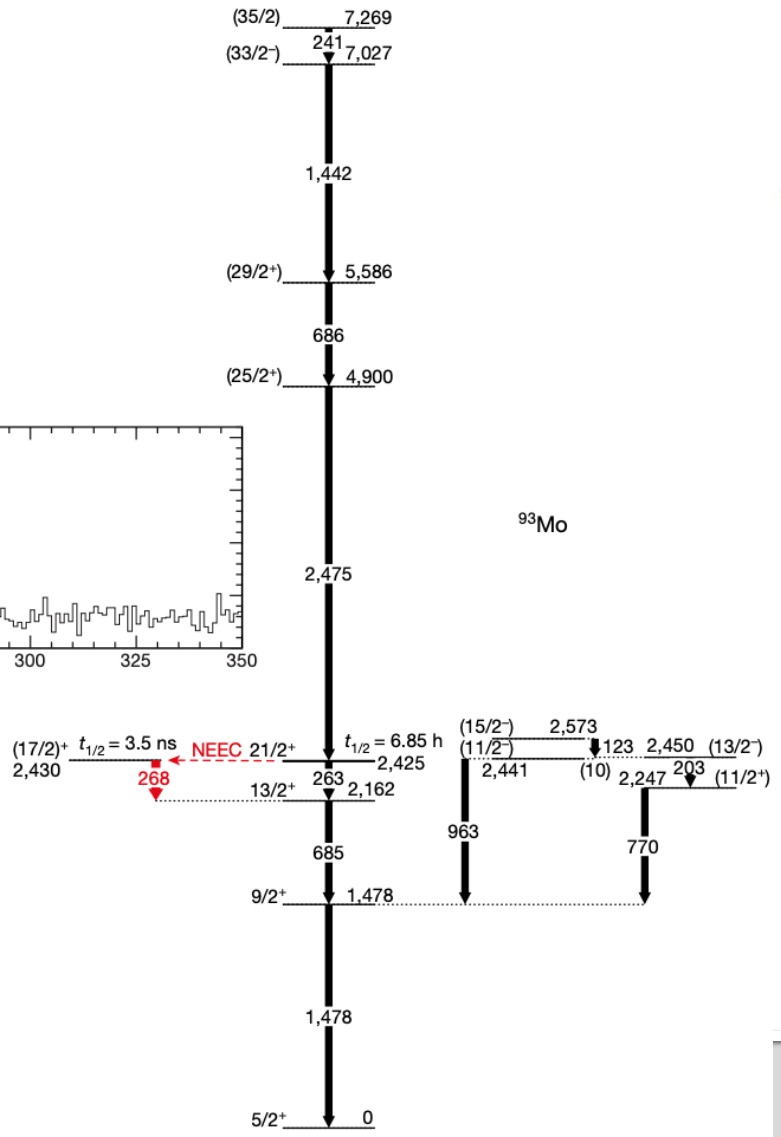
There is significant debate in the literature about a recent claimed observation of NEEC:

C. Chiara et al., Nature 554, 216 (2018)

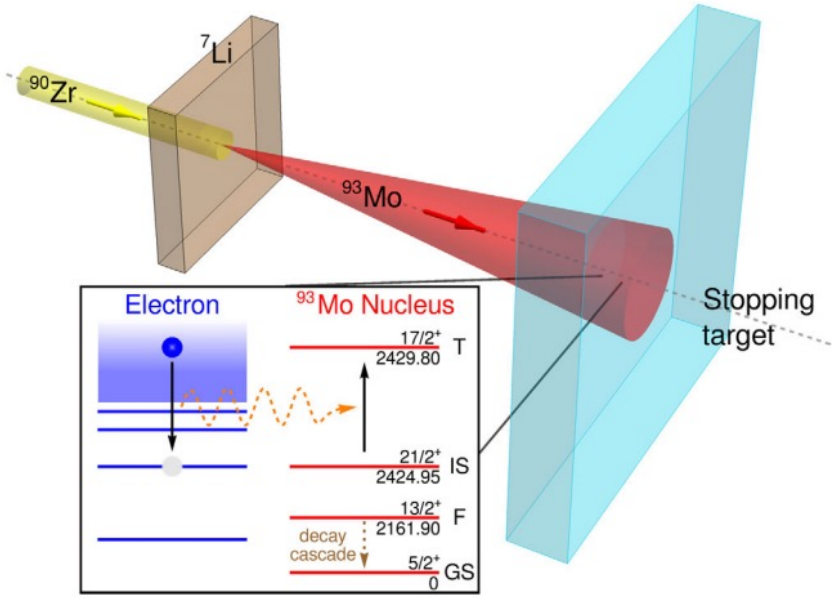
Decay data





Attributed observed rate to NEEC

Figure from Wu et al, PRL 122, 212501 (2019)
9 orders of magnitude discrepancy with theory



More recent theory papers also unsuccessful at explaining this data [Rzadkiewicz et al., PRL 127, 042501 (2021)]

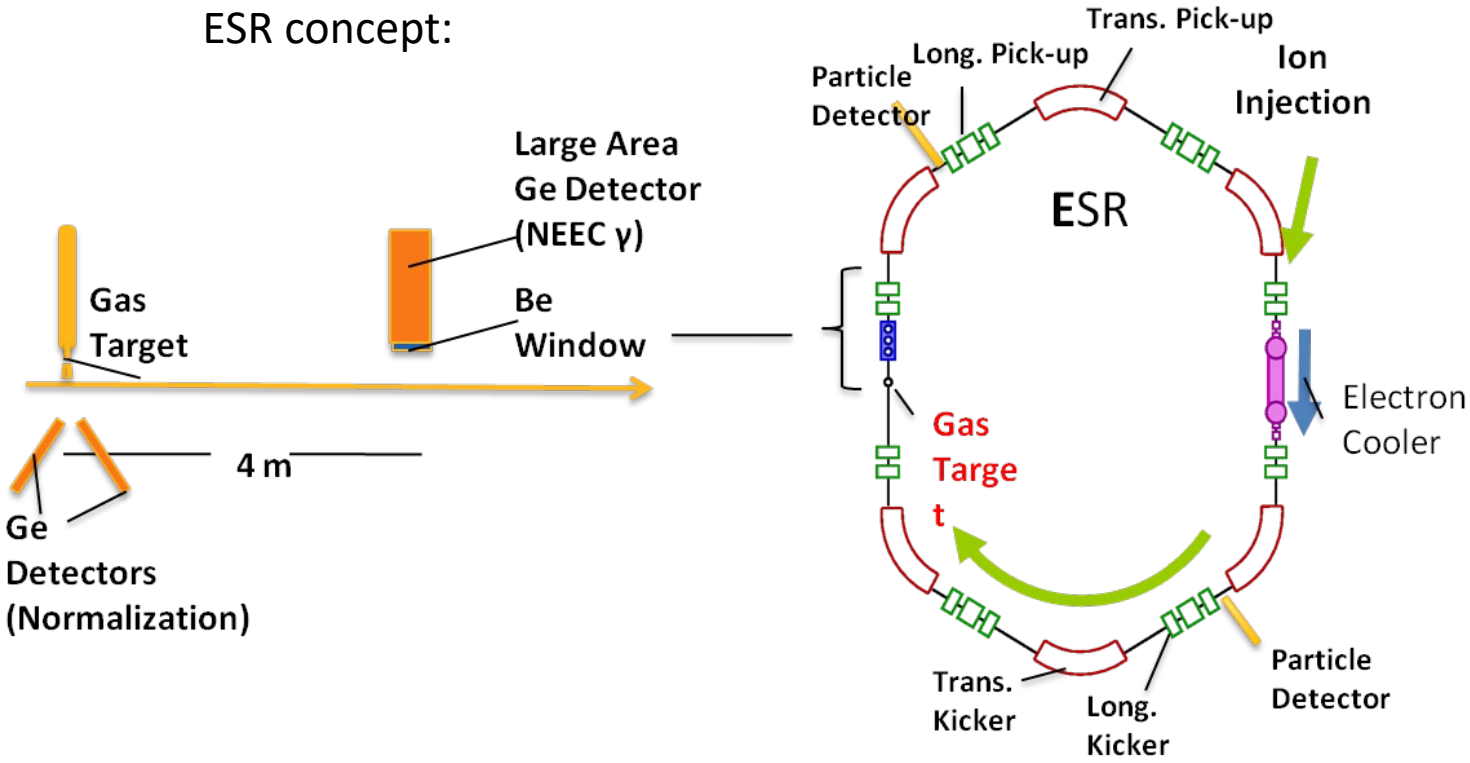
Can we get more unambiguous NEEC data, or at least an upper limit on the rate?

ESR measurement concept

- Capture electron in gas target in L shell
- NEEC excites 44.9keV state in 238U
- Electron decays quickly to K shell
- Detect γ emission from decay downstream
- Coincidence with charge state change

Initial estimates suggested up to ~100 counts per day are potentially possible

ESR concept:



This data will provide an important contribution to the discussion around the NEEC rate