ICRM-GSWG

Benchmark for Monte Carlo simulation - part II - Coincidence summing corrections

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PENELOPE Codes – Methodology

- PENELOPE 2018 (performed by all participants)
  - Two kinds of simulations were performed:
    - For specific energies - full energy peak efficiency (FEPE) calculation
    - For the whole isotope decay scheme (subroutine pennuc) – full energy peak efficiency calculation for energies of interest with the use of emission intensity for each energy – subtraction of continuum background was performed
  - TCC factor calculation

$$\frac{FEPE\ from\ whole\ isotope\ decay\ scheme\ simulation}{FEPE\ from\ specific\ energy\ simulation}$$

PENELOPE Codes – Methodology

- PENELOPE 2005 (performed by Savva M.I.)
  - The code was modified to simulate the cascade emission of Co-57, Co-60, Cs-137 and Y-88 and a Compton Suppression system (Savva & Anagnostakis, 2016)
  - Specific γ-rays and decay schemes were simulated only for Cs-134 and Co-60
  - TCC was calculated using the aforementioned formula

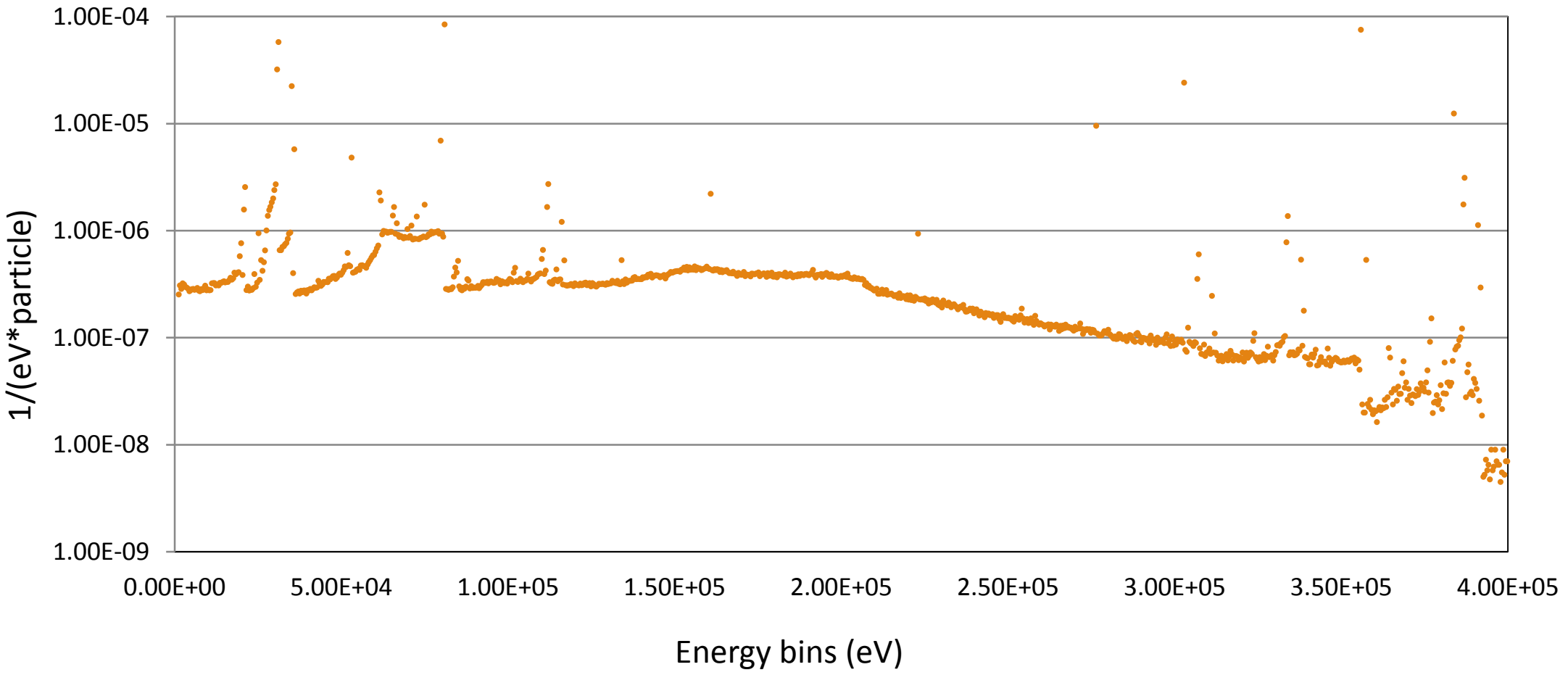
Challenges

- Amount of simulations required (240) and number of required showers ($2*10^6$ to 10^7) to achieve uncertainty<1%
  - Simulations lasted from several hours to a few days

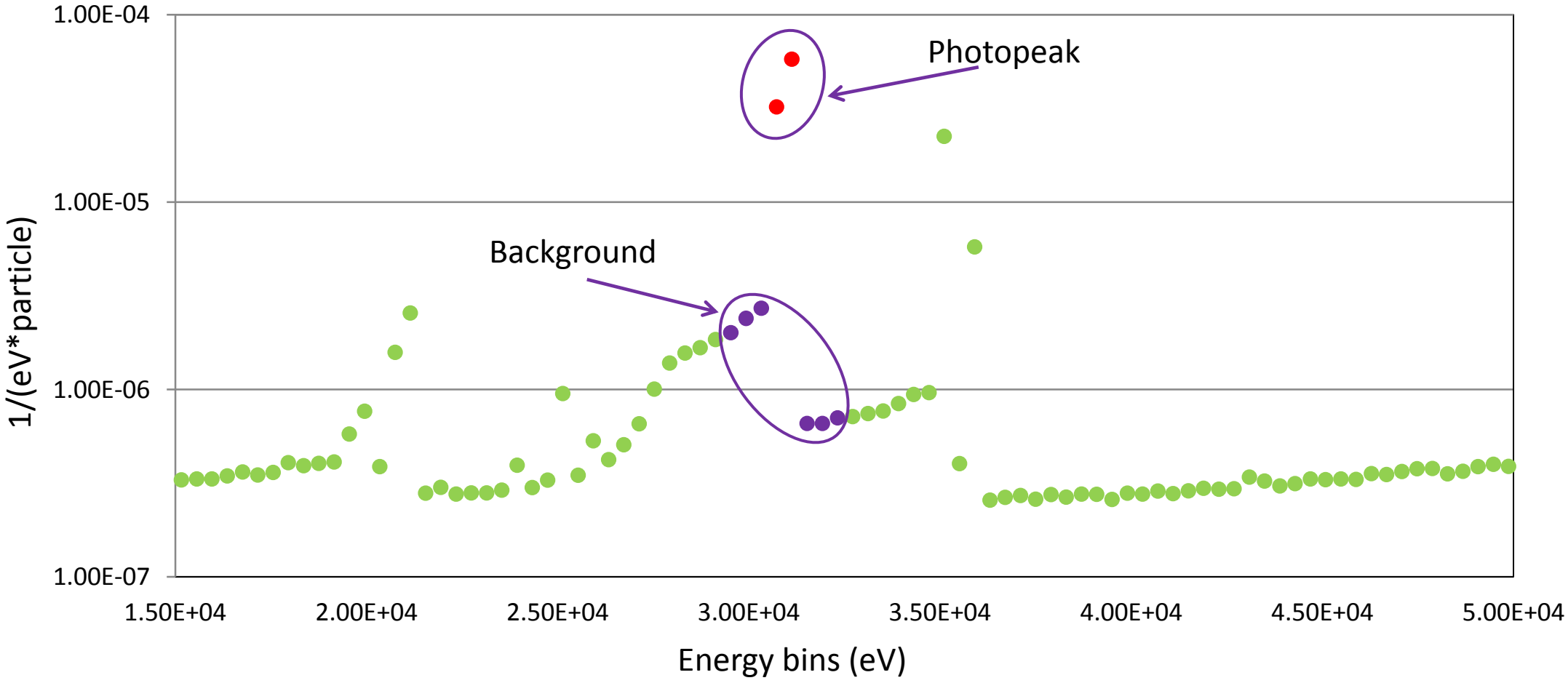
- Continuum Background Subtraction (use of channels left and right of the photopeak of interest)

- X-ray peak formation from whole isotope decay scheme simulations

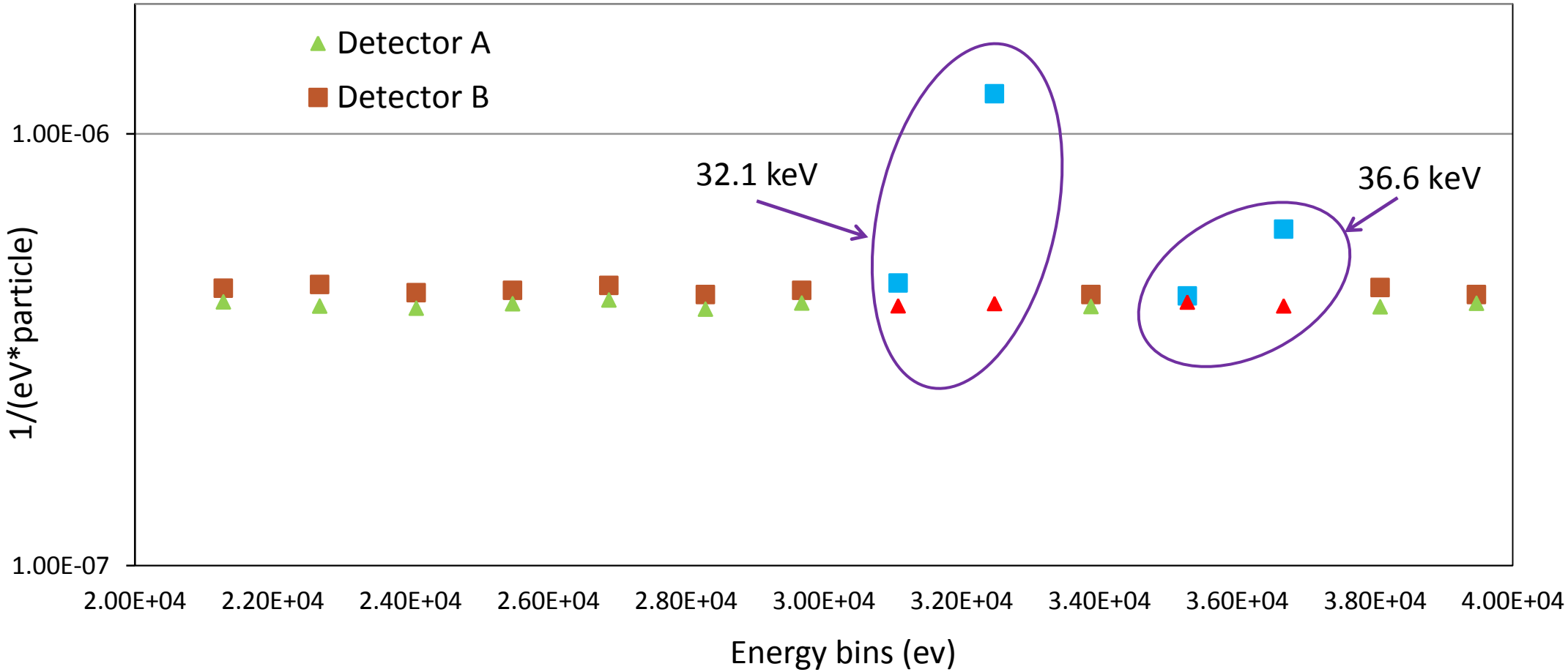
Example – Detector B Soil ^{133}Ba



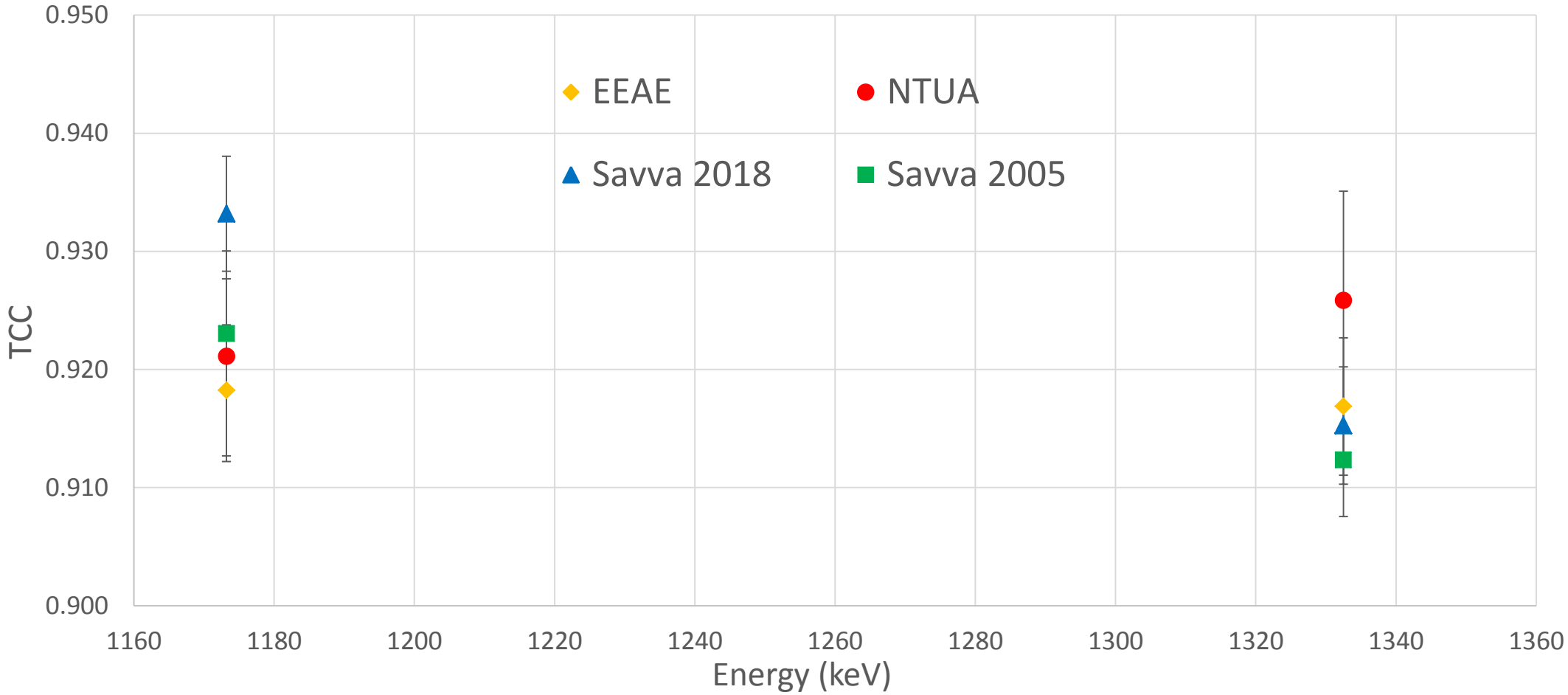
Example – Detector B Soil ^{133}Ba



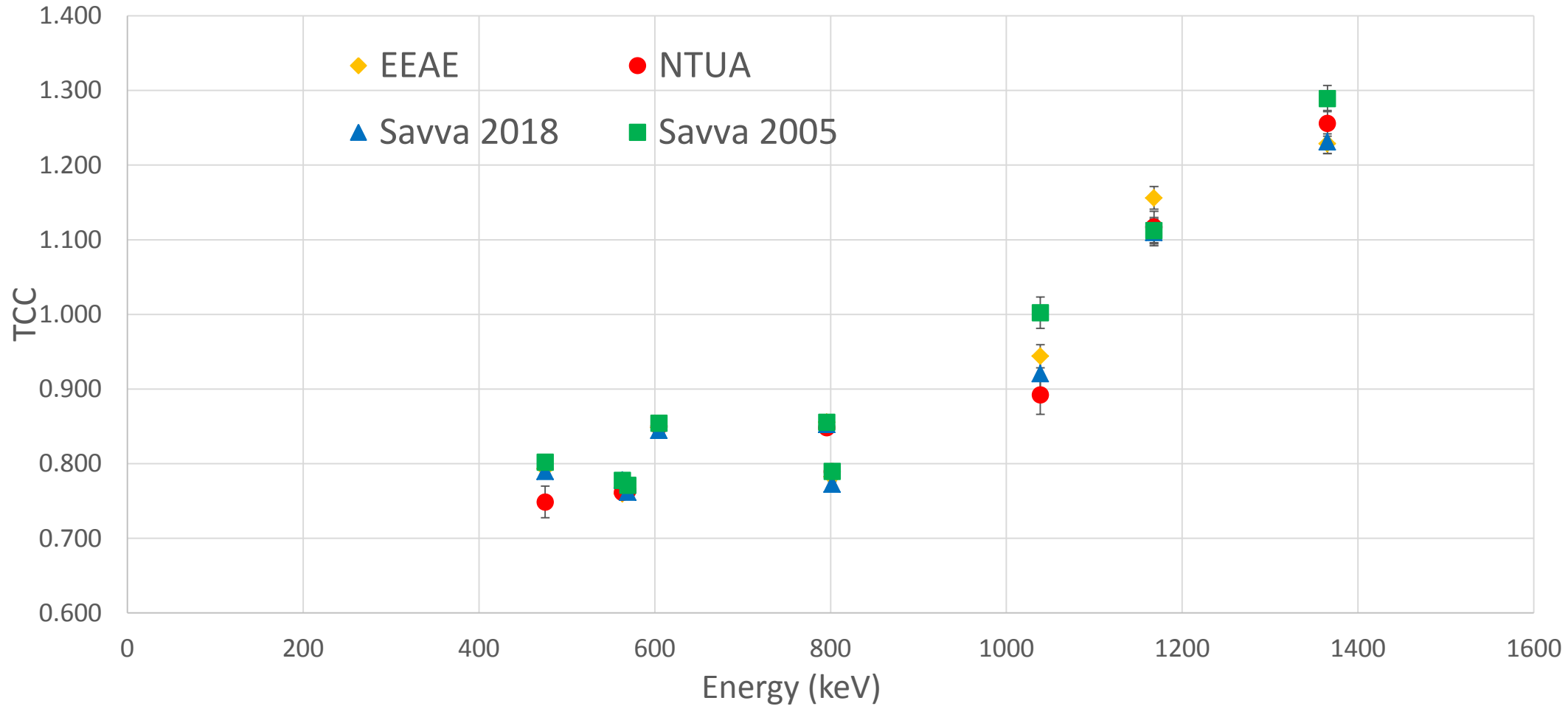
Point Source Cs-134 - X-rays



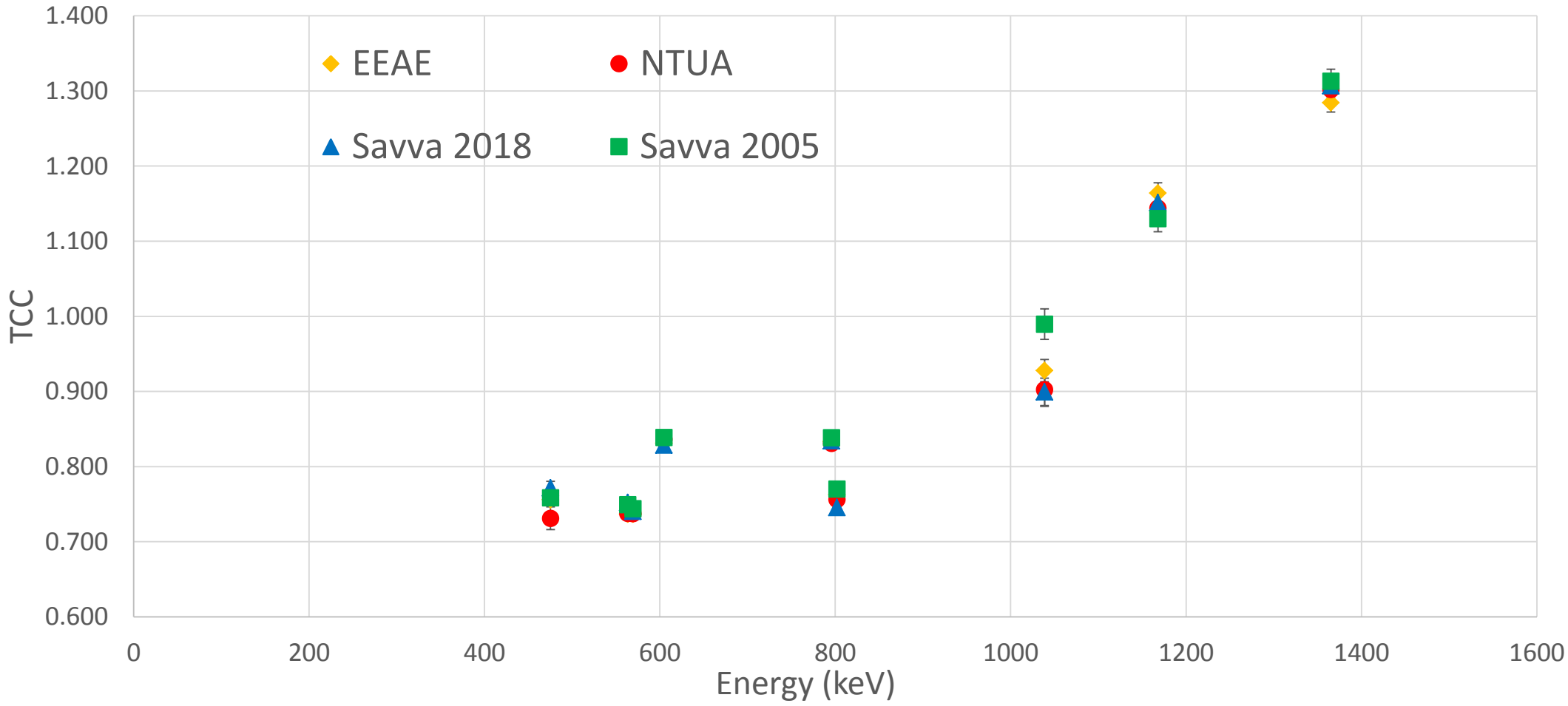
Indicative Results – Detector A Water ^{60}Co



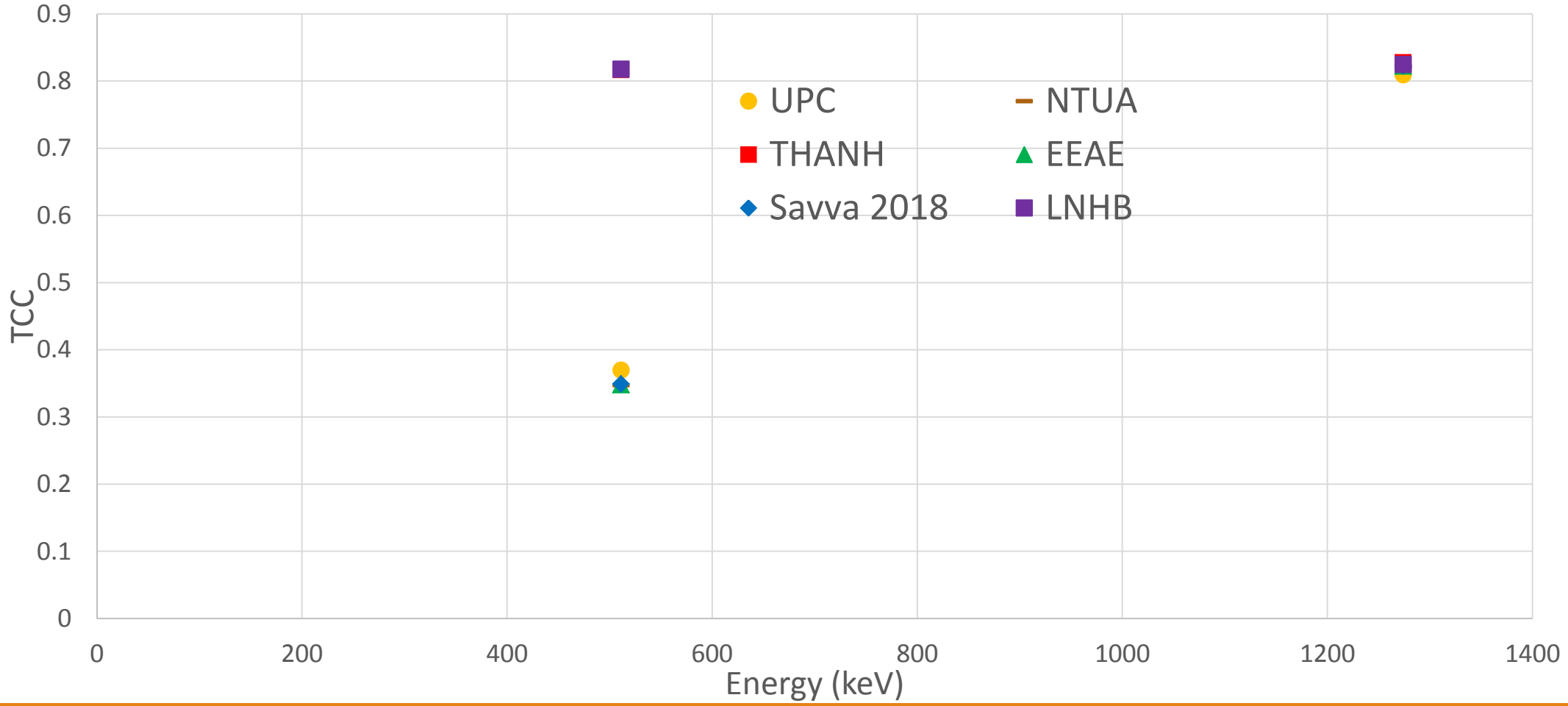
Indicative Results – Detector A Soil ^{134}Cs



Indicative Results – Detector B Soil ^{134}Cs



Indicative Results – Detector A Point Source ^{22}Na




Thank you!