

Weekly Report

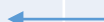
2018-02-01

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Event rates (last week)

$$A_{Bq} = nN_A \frac{\ln(2)}{t_{1/2}}$$

$$t_{\frac{1}{2}} = 12.32 \text{ yr} = 3.89 \times 10^8 \text{ s}$$

# of implanted ^3H decay (one sensor?)	Mass/g	Frequency/Hz	Fall time
$\sim 5 \cdot 10^{13}$	2.49×10^{-13} 	89.1 ($\sim 0.1\text{k}$)	$\sim 10 \text{ ms}$
$\sim 5.6 \cdot 10^{15}$	2.8×10^{-11} 	10k	100 μs

More events are allowed, so the expected resolution can be higher.

Event rates

$$A_{Bq} = nN_A \frac{\ln(2)}{t_{1/2}}$$

$$t_{\frac{1}{2}} = 12.32 \text{ yr} = 3.89 \times 10^8 \text{ s}$$

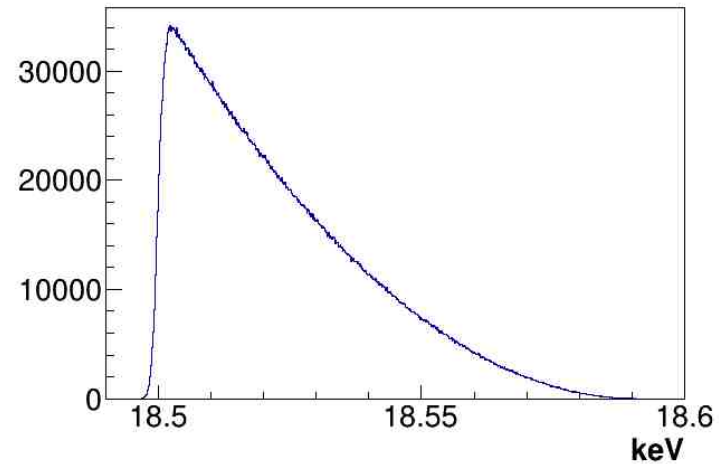
# of implanted ^3H decay (one sensor?)	Mass/g	Frequency/Hz	Fall time
$\sim 5 \cdot 10^{13}$	2.49×10^{-1310} $\longrightarrow$	89.1k (~ 0.1M)	$\sim 10 \text{ n}\mu\text{s}$
$\sim 5.6 \cdot 10^{1512}$	2.8×10^{-11} $\longleftarrow$	10k	100 μs
$2.039 \cdot 10^{14}$ (5 years for $\sim 5 \cdot 10^{13} \approx 24.52\%$)	1.016×10^{-9} $\longrightarrow$	363.5k	2.751 μs

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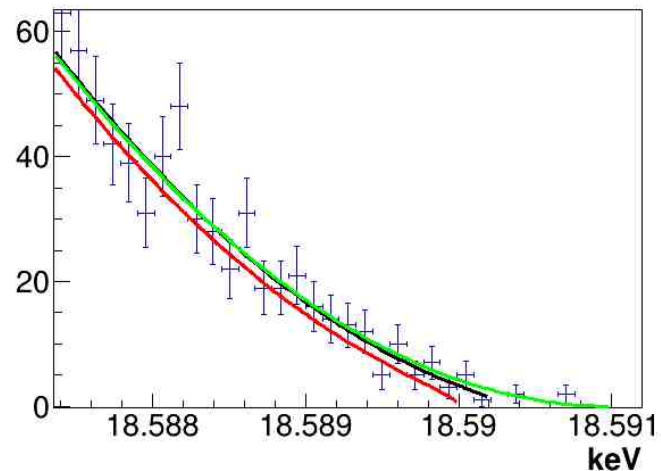
If we use 10kHz-measurement-rate sensor, we need about 40 detectors.

Geant4 Simulation $m_\nu=1$ eV with detector resolution (last week)

18.5-18.591 keV, 1 eV, 1 eV



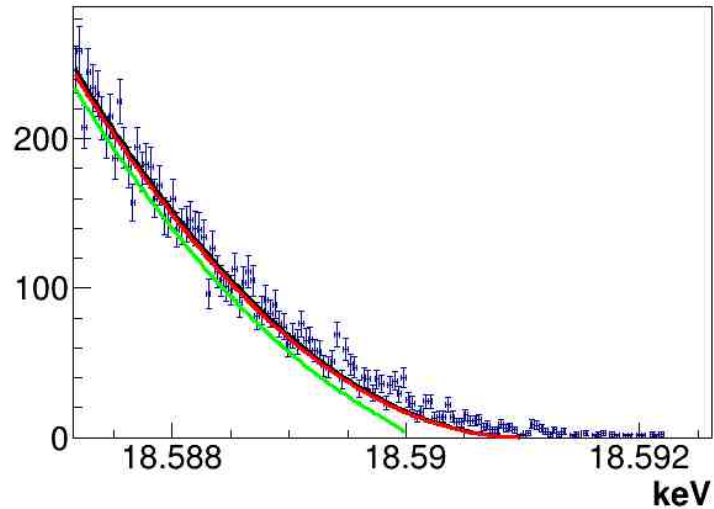
18.5-18.591 keV, 1 eV, 0.5 eV



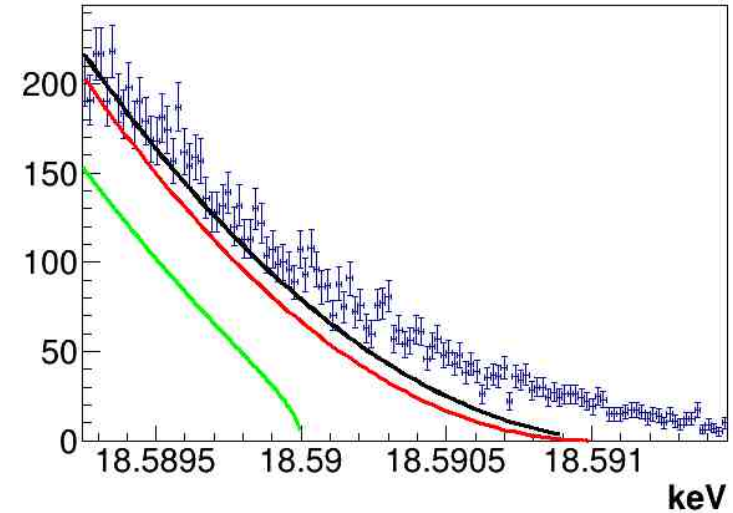
resolution/eV	Q-value/keV	m_ν/eV
0	18.5911 ± 0.00002	1.02472 ± 0.044720
0.5	18.5911 ± 0.00002	0.750430 ± 0.527601
1.0	18.5910 ± 0.00002	0.000066 ± 73.0844

Geant4 Simulation $m_\nu=1$ eV with detector resolution

reso=1eV



reso=1eV



(10 ⁷) 이벤트 발생 범위/keV	전체 이벤트 개수	Q-value/keV	m_ν/eV
18.5-18.591	$\sim 5 \cdot 10^{13}$	18.5910 ± 0.00002	0.000066 ± 73.0844
18.55-18.591	$\sim 5.5 \cdot 10^{14}$	18.5910 ± 0.00006	0.0000004 ± 3.36359
18.57-18.591	$\sim 4 \cdot 10^{15}$	18.5911 ± 0.00005	0.00006 ± 2.18196