Weekly Report

2018-03-14

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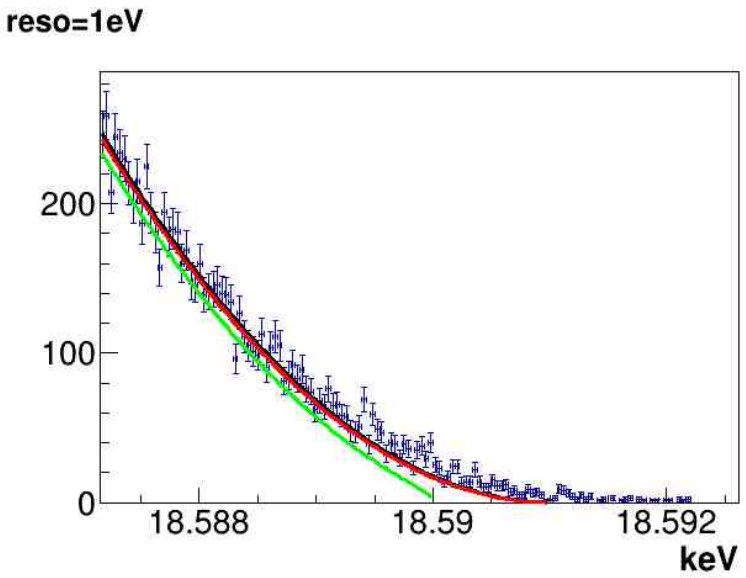
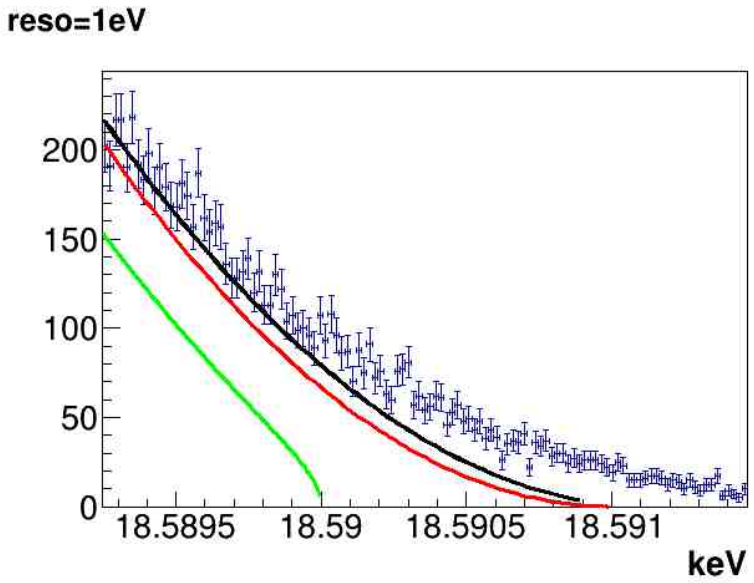
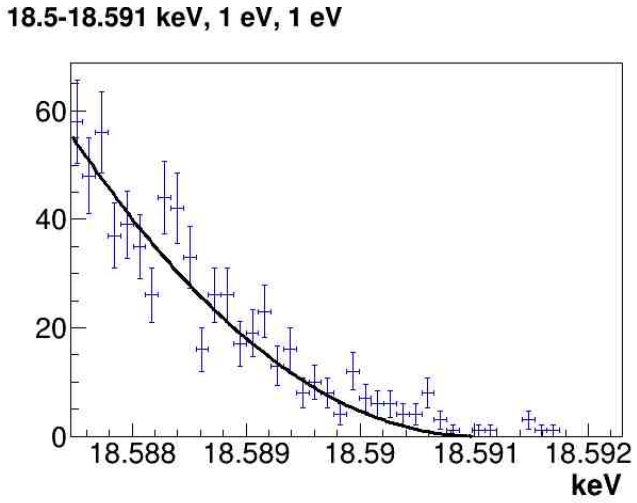
Geant4 Simulation m_ν=1 eV with detector resolution (last)

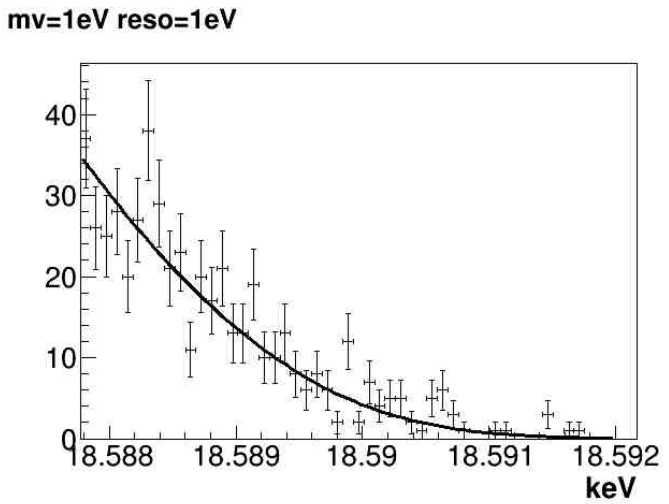




(10^7) 이벤트 발생 범위/keV	전체 이벤트 개수	Q-value/keV	m_ν/eV
18.5-18.591	~$5\cdot10^{13}$	18.5910±0.00002	0.000066±73.0844
18.55-18.591	~$5.5\cdot10^{14}$	18.5910±0.00006	0.0000004±3.36359
18.57-18.591	~$4\cdot10^{15}$	18.5911±0.00005	0.00006±2.18196

Geant4 Simulation m_ν=1 eV with detector resolution (last)





(10^7) 이벤트 발생 범위/keV	전체 이벤트 개수	Q-value/keV	m_ν/eV
18.5-18.591 (old)	~$5\cdot10^{13}$	18.5910±0.00002	0.000066±73.0844
18.5-18.591 (new)		18.5910±0.00001	1.28993±0.00213

So accurate ???

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 ^{3}H decay (one sensor?)	Mass/g		Frequency/Hz	Fall time
~5·10^{13}	$2.49 \times 10^{-13\sout{13}10}$	→	89.1k (~ 0.1M)	~ 10 ~~m~~μs
~5.6·10$^{\sout{15}12}$	2.8×10^{-11}	←	10k	100 μs
2.039·10^{14} (5 years for ~5·10^{13} ≈24.52%)	1.016×10^{-9}	→	363.5k	2.751 μs

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

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