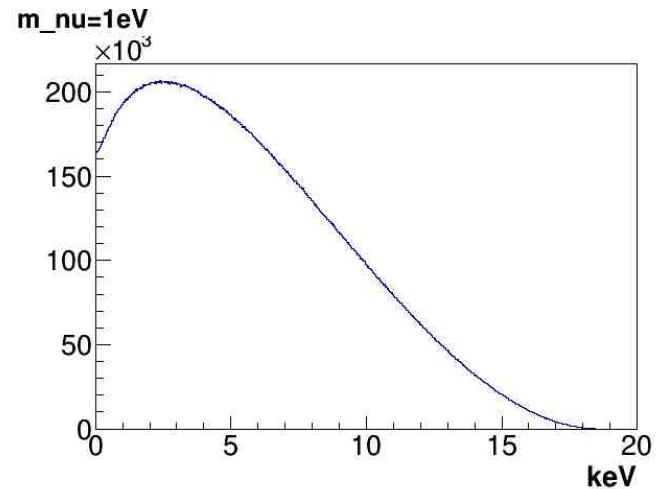


Weekly Report

2018-01-11

Kim, Hanbeom

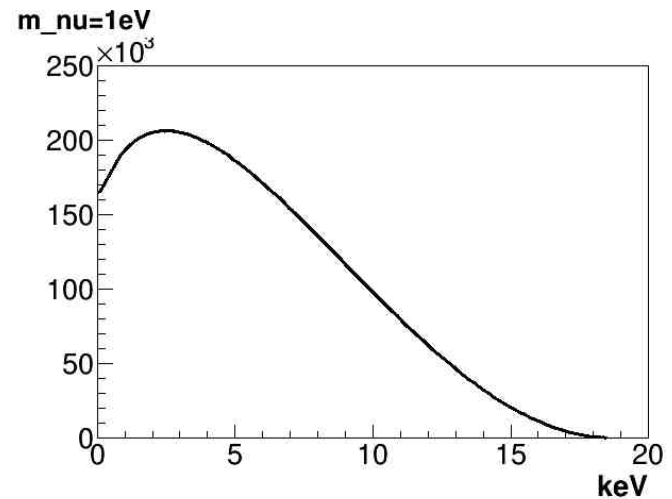
Geant4 Simulation $m_\nu=1$ eV (Previous)



Simulation Input:

$Q=18.591$ keV

$m_\nu=1$ eV

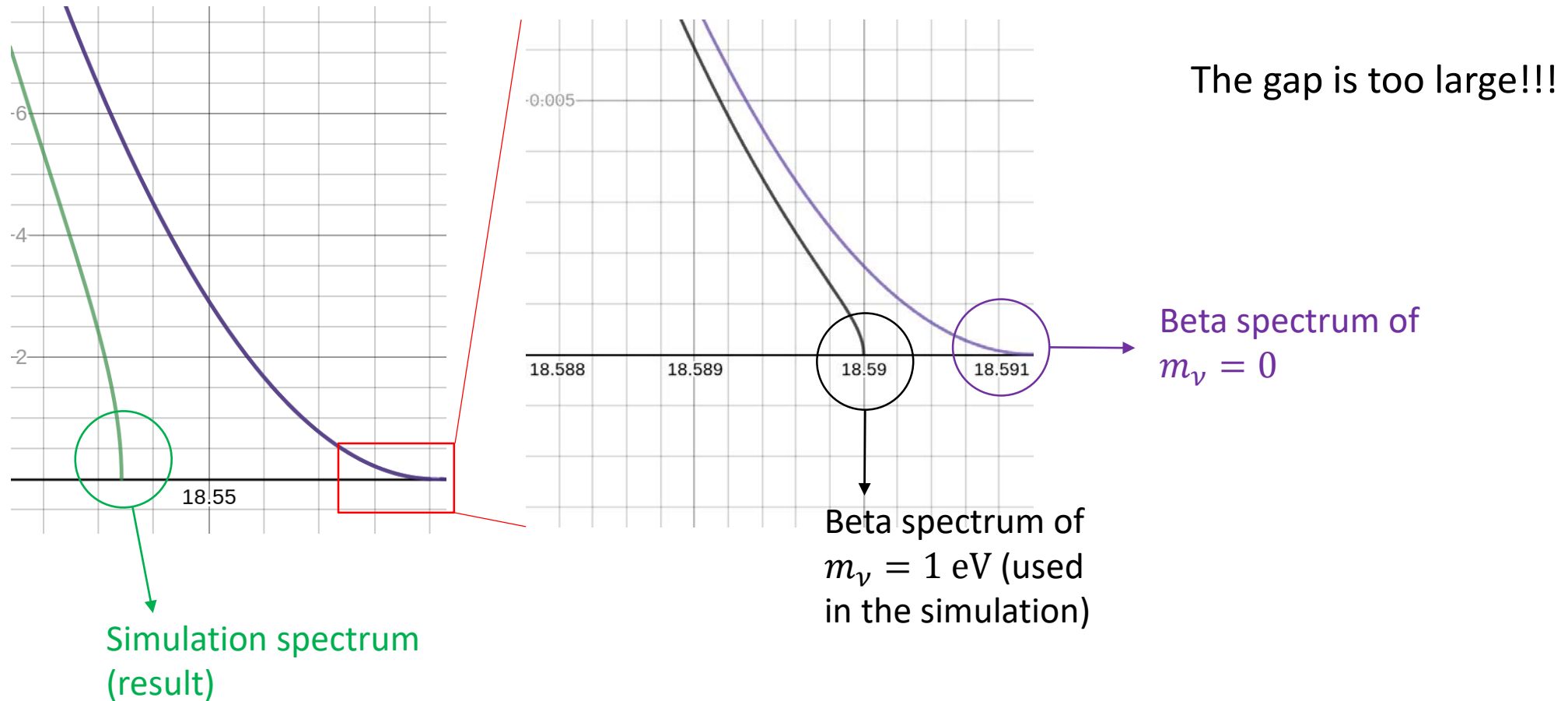


Output (from fitting result spectrum):

$Q=18.5921 \pm 0.0009$ keV

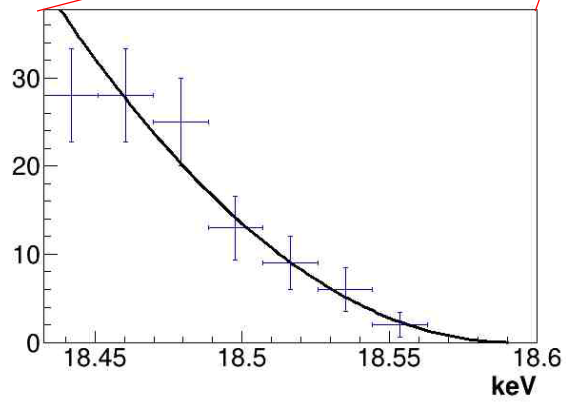
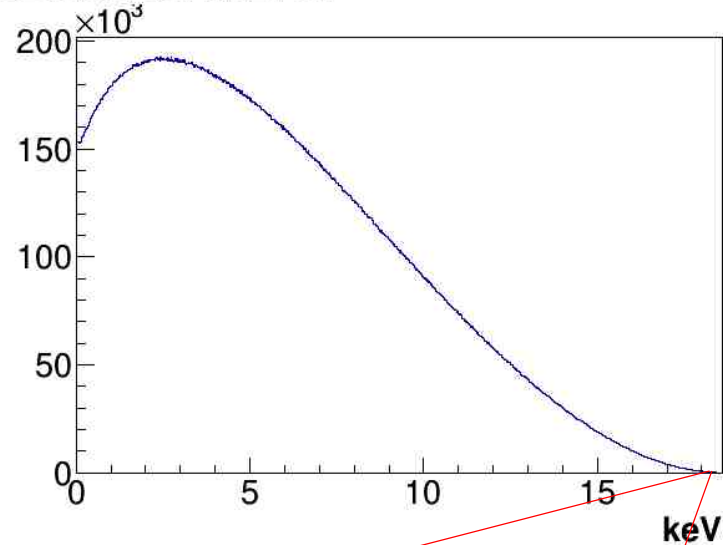
$m_\nu=57.8855 \pm 5.5358$ eV

Geant4 Simulation $m_\nu=1$ eV (Previous)



Geant4 Simulation $m_\nu=1$ eV (Improved input spectrum)

Q=18.591 keV $m_\nu=1$ eV



Simulation Input:

Q=18.591 keV

$m_\nu=1$ eV

Output (from fitting result spectrum):

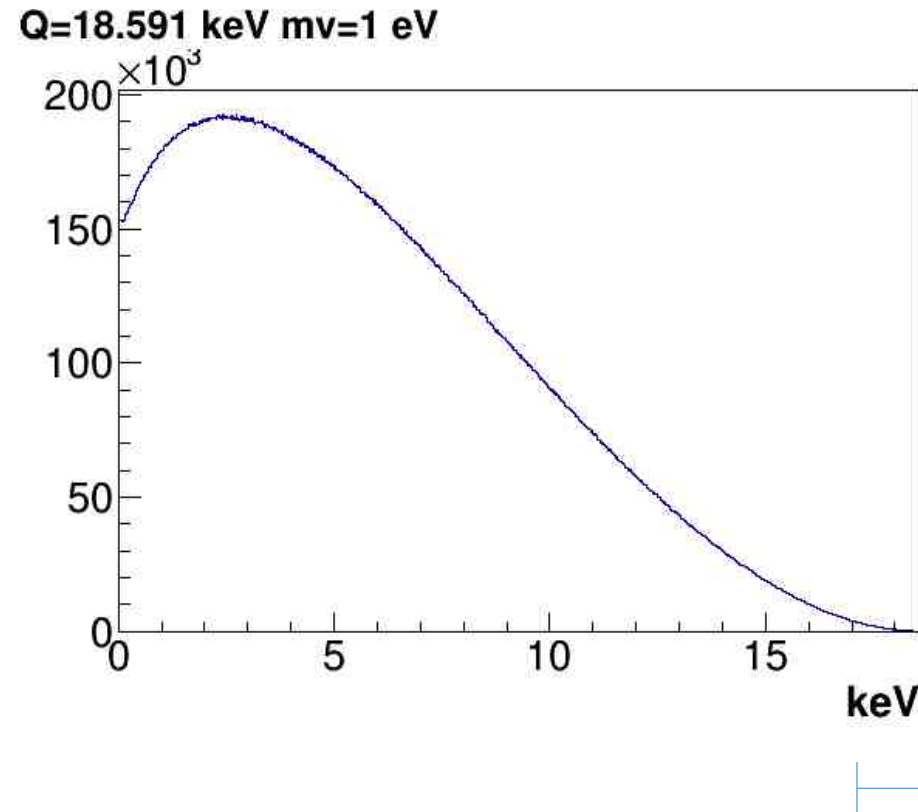
Q=18.5914 $\pm$ 0.0009 keV

$m_\nu=3.79414 \pm 89.0094$ eV

More accurate expected value

Larger error

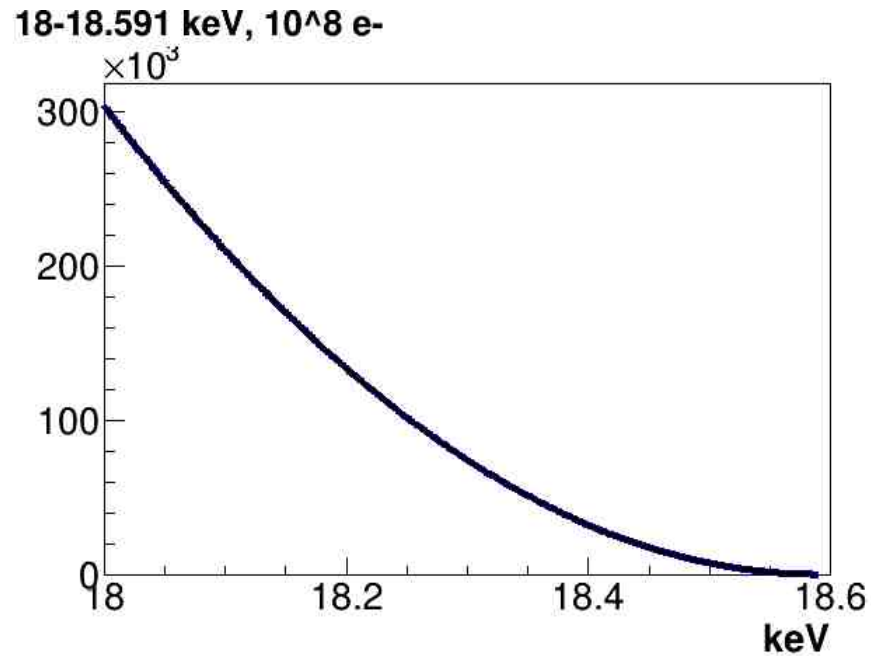
Geant4 Simulation $m_\nu=1$ eV (Improved input spectrum)



of e-
0 keV ~: 10^8
18 keV ~: 6042 $\rightarrow 10^8$
18.5 keV~: 19 $\rightarrow 10^7$

Through the simulation, choose
small range of the spectrum near
the endpoint

Geant4 Simulation $m_\nu=1$ eV (Improved input spectrum)



of electron: 6042 $\rightarrow 10^8$

Simulation Input:

$Q=18.591$ keV

$m_\nu=1$ eV

Output (from fitting result spectrum):

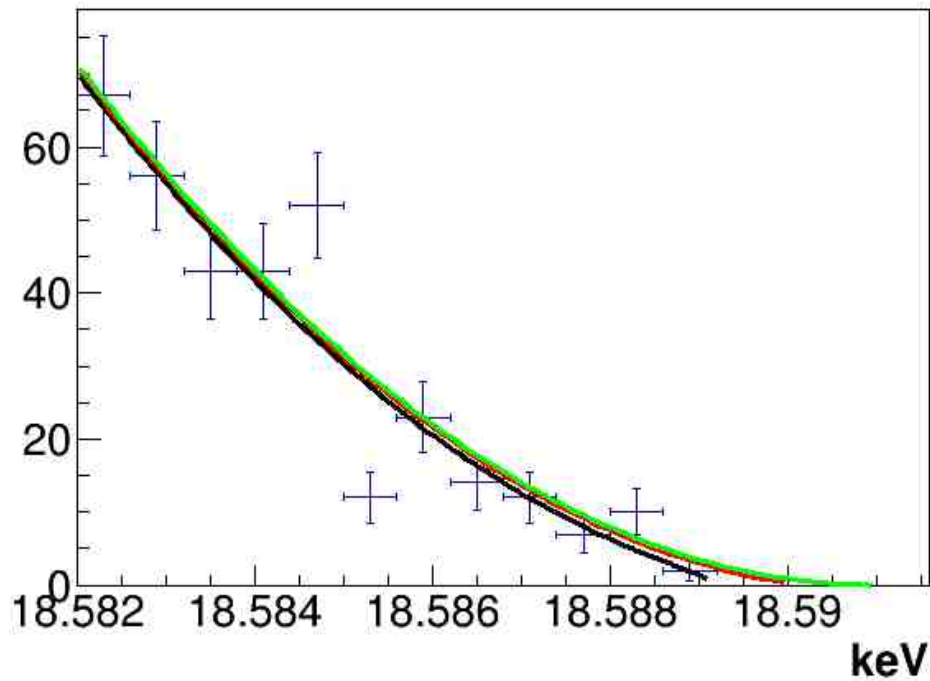
$Q=18.5910 \pm 0.00004$ keV (accurate)

$m_\nu=1.87188 \pm 0.33812$ eV

Geant4 Simulation $m_\nu=1$ eV (Improved input spectrum)

Near the endpoint:

18-18.591 keV, 10^8 e-

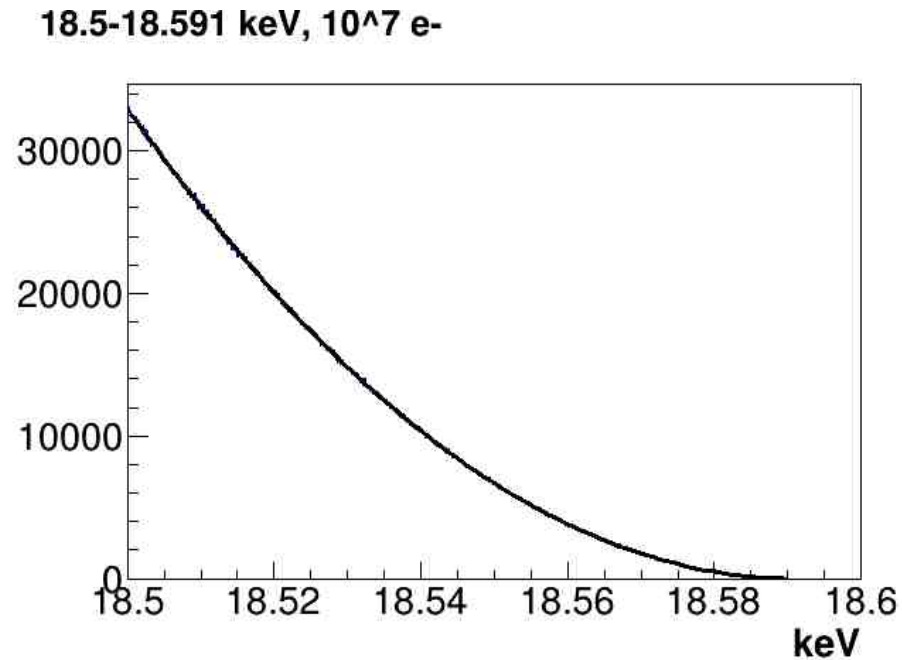


Black: fitted spectrum

Red: calculated spectrum
with $m_\nu=1$ eV

Green: calculated spectrum
with $m_\nu=0$ eV

Geant4 Simulation $m_\nu=1$ eV (Improved input spectrum)



of electron: 19 -> 10^7

Simulation Input:

$Q=18.591$ keV

$m_\nu=1$ eV

Output (from fitting result spectrum):

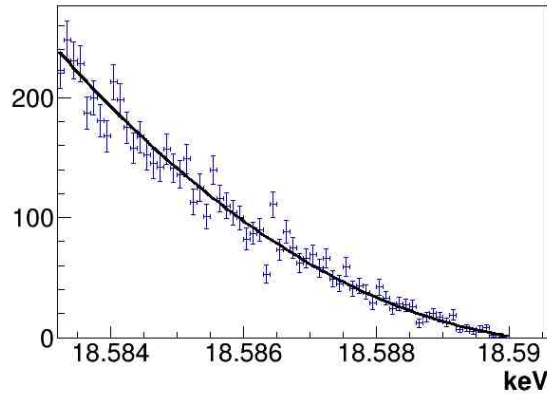
$Q=18.5910 \pm 0.00002$ keV (accurate)

$m_\nu=1.02472 \pm 0.044720$ eV

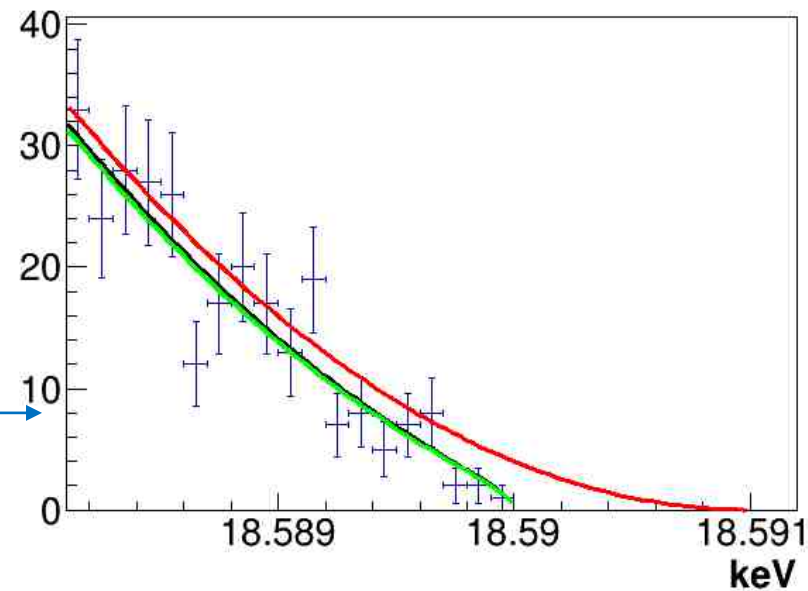
Geant4 Simulation $m_\nu=1$ eV (Improved input spectrum)

Near the endpoint:

18.5-18.591 keV, 10^7 e-



18.5-18.591 keV, 10^7 e-



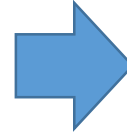
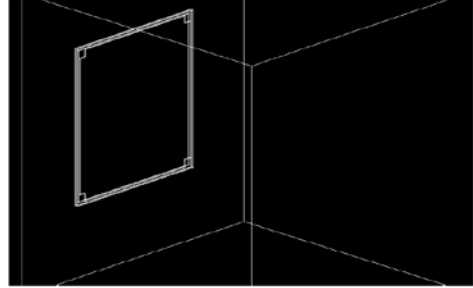
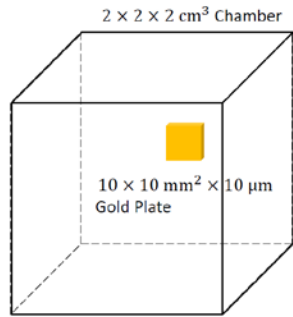
Black: fitted spectrum

Green: calculated spectrum with $m_\nu=1$ eV

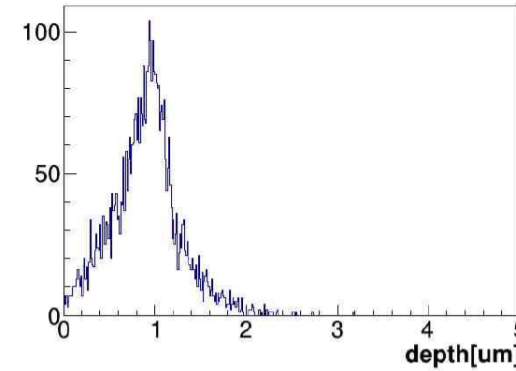
Red: calculated spectrum with $m_\nu=0$ eV

Fitted one and
calculated one
almost overlap.

Geant4 Simulation $m_\nu=1$ eV



Triton Implantation [4930/10000000]



$$4930/10^7$$

19 out of 10^8 electrons throughout the spectrum are between 18.5 and 18.591 keV.

We have an error scale of ~ 0.01 eV with 10^7 electrons in the range of 18.5~18.591 keV.



For an error scale of ~ 0.01 eV,
of implanted ^3H decay: $\sim 5 \cdot 10^{13}$
of $^3\text{He}(n,p)^3\text{H}$ nuclear reaction need = $\sim 10^{17}$

$^3\text{He}(n,p)^3\text{H}$ reaction & HANARO specs (170615)

- Cross section: 5330 b
- He atom density under 1 atm: $2.69 \times 10^{19} \text{ cm}^{-3}$

Holes	Functions	Neutron Flux(n/cm ² ·sec)	³ H production rate(³ H/cm ³ ·sec)	For 1.2 cm ³ chamber(paper, ³ H/sec)
IP(17)	Multifunctional	$1.8 \times 10^{13} \sim 1.3 \times 10^{14}$	$2.6 \times 10^{12} \sim 1.9 \times 10^{13}$	$3.1 \times 10^{12} \sim 2.2 \times 10^{13}$
NTD(2)	Si dopping	$3.7 \sim 4.0 \times 10^{13}$	$5.3 \sim 5.7 \times 10^{12}$	$6.4 \sim 6.9 \times 10^{12}$
LH(1)	Isotope production	7.4×10^{13}	1.1×10^{13}	1.3×10^{13}