Symmulation of Fe58 activation with proton beam

— Results —

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Penetration depth

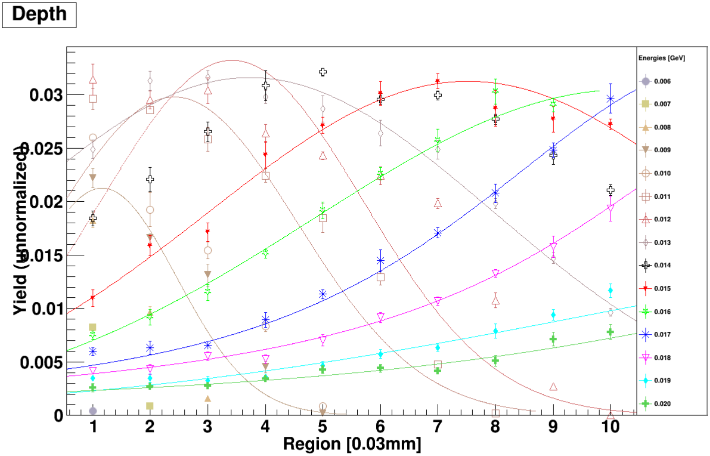


Figure: Yield of Co58 in various depths

Isotope yields

Iron target

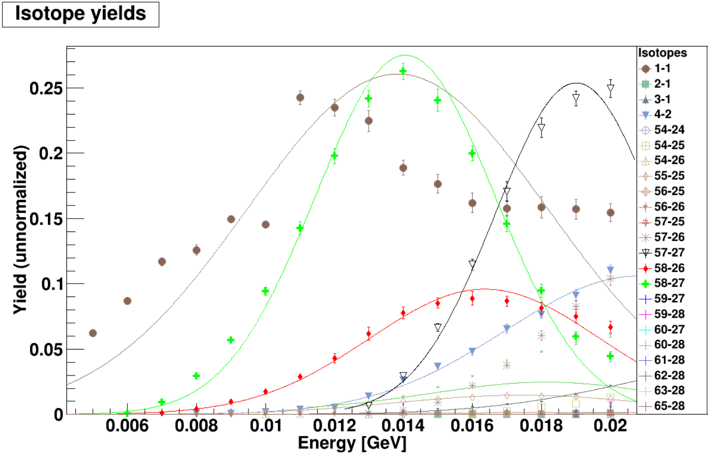


Figure: Isotope yield distribution for energies $\in [0.006 : 0.020]$GeV

Isotope yields

Iron target

- ${}^{54}_{24}Cr$ - stable
- ${}^{54}_{25}Mn$ - stable
- ${}^{54}_{26}Fe$ - β^+ $7.5 \cdot 10^4 a$
- $\underline{{}^{55}_{25}Mn \text{ - } \beta^-,\ \gamma\text{: } 1332,\ 1173}$
- ${}^{56}_{25}Mn$ - stable
- ${}^{56}_{26}Fe$ - stable
- ${}^{57}_{25}Mn$ - stable
- $\underline{{}^{57}_{26}Fe \text{ - } \beta^-,\ \text{no } \gamma}$
- $\underline{{}^{57}_{27}Co \text{ - } \beta^-,\ \text{no } \gamma}$
- $\underline{{}^{58}_{26}Fe \text{ - stable}}$
- ${}^{58}_{27}Co$ - β^+, 70.86d
- ${}^{59}_{27}Co$ - stable
- ${}^{59}_{28}Ni$ - β^+, $7.5 \cdot 10^4 a$
- ${}^{60}_{27}Co$ - β^-, γ: 1332, 1173, 5.272a
- $\underline{{}^{60}_{28}Ni \text{ - stable}}$
- ${}^{61}_{28}Ni$ - stable
- ${}^{62}_{28}Ni$ - stable
- ${}^{63}_{28}Ni$ - β^-, no γ
- ${}^{65}_{28}Ni$ - β^-, γ: 1482, 1115, 2.52h

Isotope yields

Iron target

Figure: 'Nuclear neighbourhood' of Iron(58)

Isotope yields

Iron target

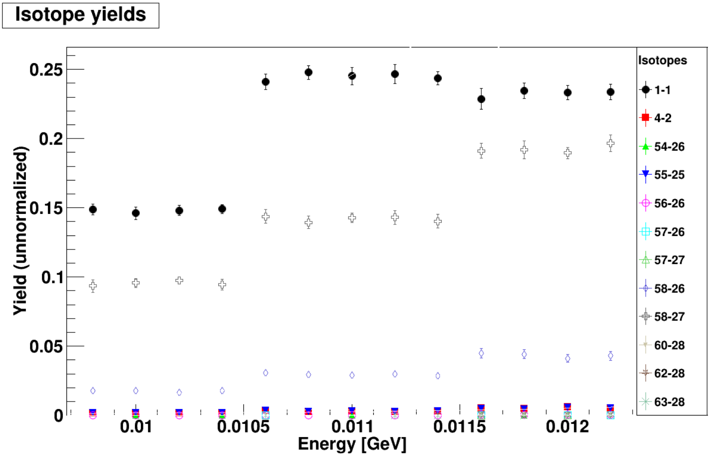
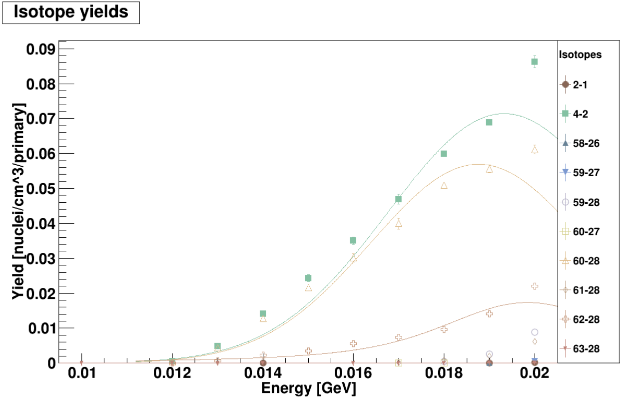


Figure: Multiple steps in yields for energies $\in [0.010 : 0.012]$GeV

Isotope yields

Copper target



- ${}^{58}_{26}Fe$ - stable
- ${}^{59}_{27}Co$ - stable
- ${}^{59}_{28}Ni$ - β^{+} $7.5 \cdot 10^{4}a$
- ${}^{60}_{27}Co$ - β^{-}, γ: 1332, 1173, 5.272a
- ${}^{60}_{28}Ni$ - stable
- ${}^{61}_{28}Ni$ - stable
- ${}^{62}_{28}Ni$ - stable
- ${}^{63}_{28}Ni$ - β^{-}, no γ

Energy deposition

Figure: Energy deposition for energies $\in [0.012 : 0.016]\mathrm{GeV}$

Energy depostion

Detailed look

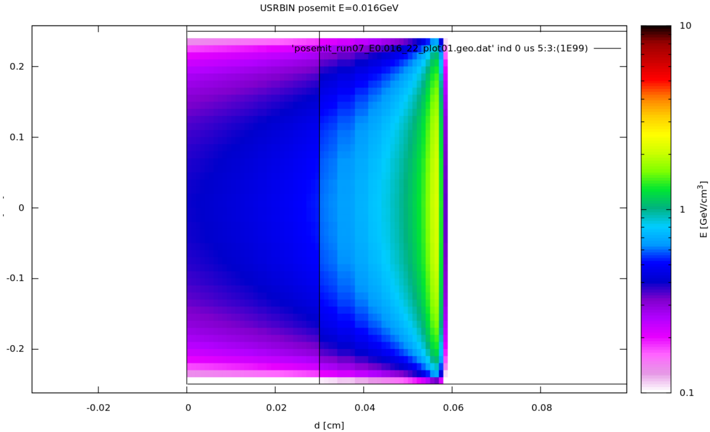


Figure: Energy distribution at its maximum

Energy deposition

in numbers

Parameters

- Average energy deposition density: $\rho = 1.0[GeV/cm^3]$
- Volumetric heat capacity of Iron: $C_{p,V} = 3.537[\frac{J}{cm^3 K}]$
- Volumetric heat capacity of Copper: $C_{p,V} = 3.450[\frac{J}{cm^3 K}]$

$d[mm]$	$V[cm^3]$	$E[GeV/prmry]$	$P[J/s]$
0.38	7.4613e-03	7.4613e-03	5.9690e+03
0.43	8.4430e-03	8.4430e-03	6.7544e+03
0.48	9.4248e-03	9.4248e-03	7.5398e+03
0.54	1.0603e-02	1.0603e-02	8.4823e+03
0.60	1.1781e-02	1.1781e-02	9.4248e+03

Fluence

Figure: 2D projection of fluence for energies $\in [0.012 : 0.016]$GeV