Group meeting
08/03/2018

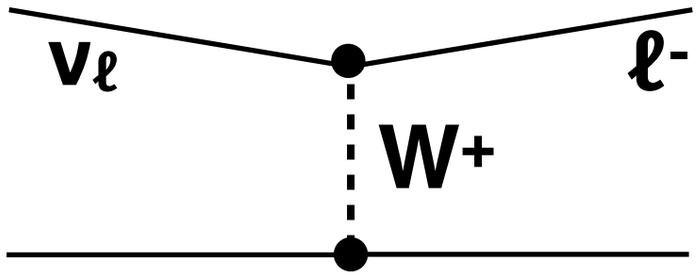
ν cross sections at high energies

Alfonso Garcia

GENIE:

- Try to understand how it computes the cross section.

$$\frac{d\sigma^{\nu,\bar{\nu}}}{dxdy} = \frac{G_F^2 M E_\nu}{\pi}\left[y\left(xy + \frac{m_l^2}{2E_\nu M}\right)F_1 + \left(1 - y - \frac{Mxy}{2E_\nu} - \frac{m_l^2}{4E_\nu^2}\right)F_2 \pm \left[xy\left(1-\frac{y}{2}\right) - y\frac{m_l^2}{4ME_\nu}\right]F_3 + \left(xy\frac{m_l^2}{2ME_\nu} + \frac{m_l^4}{4M^2E_\nu^2}\right)F_4 - \frac{m_l^2}{2ME_\nu}F_5\right],$$



ū [sea]	d̄ , s̄
d [val]	u , c
d [sea]	u , c
s [sea]	u , c

< m_{charm}

$$F_2^{CC}(\nu p) = 2x[d\cos^2\theta_c + s\sin^2\theta_c + \bar{u}\,\blacksquare],$$

$$xF_3^{CC}(\nu p) = 2x[d\cos^2\theta_c + s\sin^2\theta_c - \bar{u}\,\blacksquare]$$

q = q(x,Q²)

> m_{charm} [Slow rescaling]

$$z = x + \frac{m_c^2}{m_p(E_\nu - E_l)}$$

$$F_2^{CC}(\nu p) = 2z[d + s + \bar{u}\,\blacksquare],$$

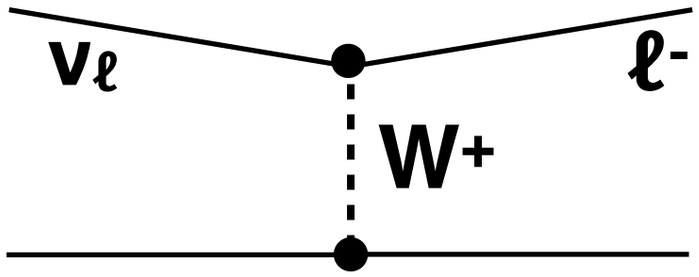
$$xF_3^{CC}(\nu p) = 2z[d + s - \bar{u}\,\blacksquare],$$

q = q(z,Q²)

GENIE:

- Try to understand how it computes the cross section.

$$\frac{d\sigma^{\nu,\bar{\nu}}}{dxdy} = \frac{G_F^2 M E_\nu}{\pi}\left[y\left(xy + \frac{m_l^2}{2E_\nu M}\right)F_1 + \left(1 - y - \frac{Mxy}{2E_\nu} - \frac{m_l^2}{4E_\nu^2}\right)F_2 \pm \left[xy\left(1-\frac{y}{2}\right) - y\frac{m_l^2}{4ME_\nu}\right]F_3 + \left(xy\frac{m_l^2}{2ME_\nu} + \frac{m_l^4}{4M^2E_\nu^2}\right)F_4 - \frac{m_l^2}{2ME_\nu}F_5\right],$$



ū [sea]	d̄ , s̄
d [val]	u , c
d [sea]	u , c
s [sea]	u , c
c̄ [sea]	d̄ , s̄

< m_{charm}

$$F_2^{CC}(\nu p) = 2x[d\cos^2\theta_c + s\sin^2\theta_c + \bar{u} + \bar{c}],$$

$$xF_3^{CC}(\nu p) = 2x[d\cos^2\theta_c + s\sin^2\theta_c - \bar{u} - \bar{c}]$$

q = q(x,Q²)

> m_{charm} [Slow rescaling]

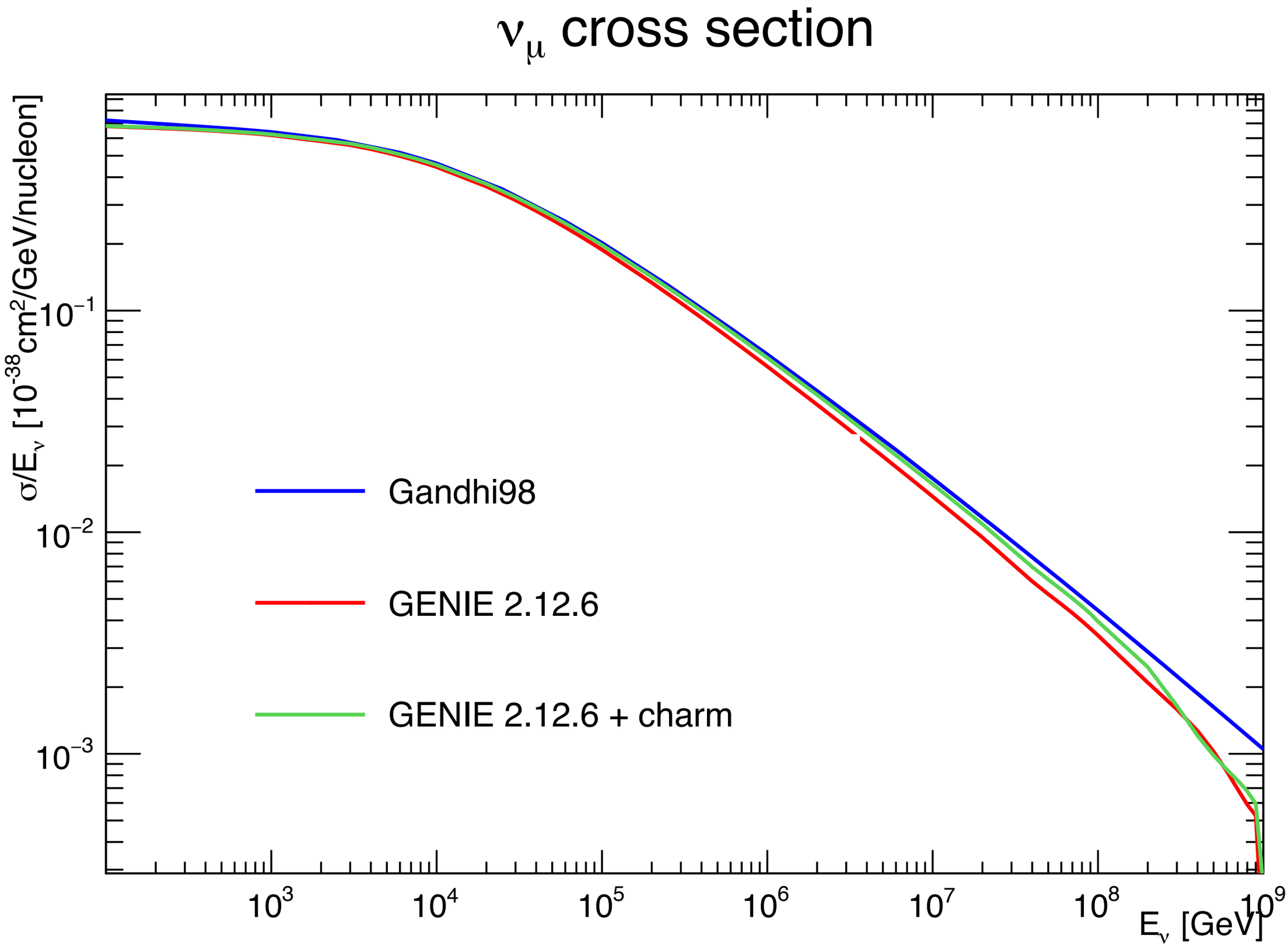
$$z = x + \frac{m_c^2}{m_p(E_\nu - E_l)}$$

$$F_2^{CC}(\nu p) = 2z[d + s + \bar{u} + \bar{c}],$$

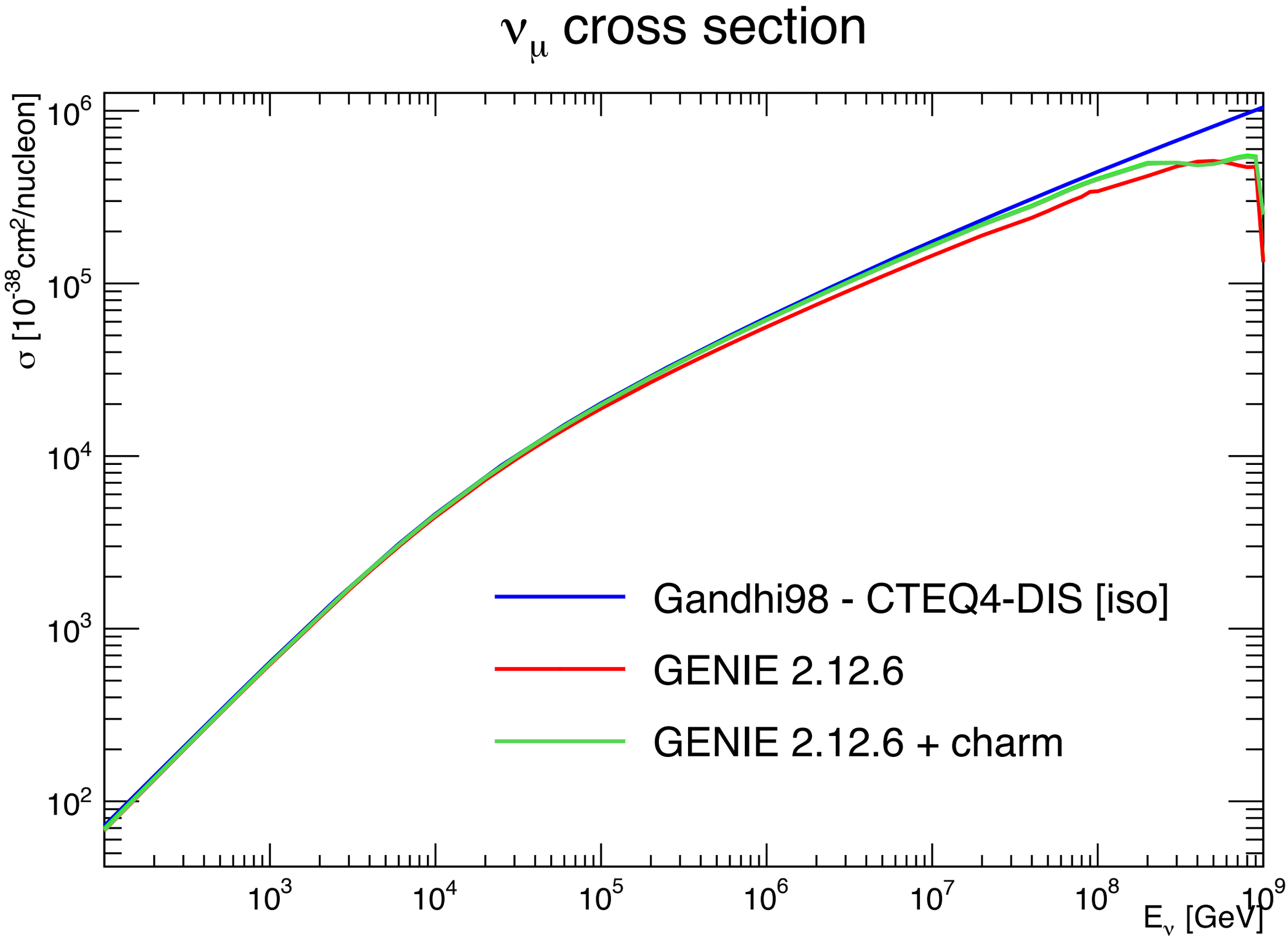
$$xF_3^{CC}(\nu p) = 2z[d + s - \bar{u} - \bar{c}],$$

q = q(z,Q²)

GENIE:


ν_μ cross section
σ/E_ν [10^{-38}cm^2/GeV/nucleon]
10^{-1}
10^{-2}
10^{-3}
Gandhi98
GENIE 2.12.6
GENIE 2.12.6 + charm
10^3
10^4
10^5
10^6
10^7
10^8
10^9
E_ν [GeV]

GENIE:


ν_μ cross section
σ [10^{-38}cm^2/nucleon]
10^6
10^5
10^4
10^3
10^2
10^3
10^4
10^5
10^6
10^7
10^8
10^9
E_ν [GeV]
Gandhi98 - CTEQ4-DIS [iso]
GENIE 2.12.6
GENIE 2.12.6 + charm