$$\cancel{G_E = \int \rho(\vec{r})\, e^{i\vec{r}\vec{g}}\, d\vec{r}\, d\Omega}$$

$$\rho(\vec{r}) =$$

$\frac{x^3}{3}$

$$\langle r^2 \rangle = 4\pi \int \rho(r)\, r^2\, r^2\, dr$$

$$G(g^2) = \int_0^\infty \int_{-1}^{+1} \int_0^{2\pi} \rho(r) \Big[1 - \frac{1}{2!} \left(\frac{g\, r}{\hbar} \right)^2 \cos^2\Theta +$$

$$+ \frac{1}{4!} \left(\frac{|g|\, r}{\hbar} \right)^4 \cos^4\Theta - \frac{1}{6!} \left(\frac{|g|\, r}{\hbar} \right)^6 \cos^6\Theta + \dots \Big] d\varphi\, d\cos\Theta\, dr$$

$$= 2\pi \Big[\underbrace{2 \int_0^\infty \rho(r)\, r^2\, dr}_{} - \cancel{\frac{1}{2}} \int_0^\infty \frac{g^2 r^2}{\hbar^2} \cdot \cancel{\frac{2}{3}} \cdot \rho(r)\, r^2 dr +$$

$$+ \frac{1}{24} \int_0^\infty \frac{g^4 r^4}{\hbar^4} \cdot \frac{2}{5}\, \rho(r)\, r^2\, dr - \frac{1}{720} \cdot \int_0^\infty \frac{g^6 r^6}{\hbar^6} \cdot \frac{2}{7} \rho(r) r^2 dr + \dots \Big]$$

This is three vector!

$$= 4\pi \cdot \left(\frac{1}{4\pi} - \frac{g^2}{6 \hbar^2 c^2} \int_0^\infty r^2\, \rho(r)\, r^2 dr + \frac{g^4}{120\, \hbar^4} \int^\infty r^4 \rho(r) r^2 dr \right.$$

$$\left. - \frac{1}{5040} \frac{g^6}{\hbar^6} \int_0^\infty r^6 \rho(r)\, r^2 dr . \right.$$

(1)

$$\underline{Q^2} = -q^2 = -\left(q_0^2 - \vec{q}^{\,2}\right) = \underline{\vec{q}^{\,2}} - q_0^2$$

It has the same sign! However at high energies q_0 can not be forgotten!

Defining now:

$$G(Q^2) = 1 - \frac{Q^2}{6(\hbar c)^2}\langle r^2\rangle + \frac{Q^4}{120(\hbar c)^4}\overset{a}{\overset{\shortparallel}{\langle r^4\rangle}} - \frac{Q^6}{5040(\hbar c)^6}\overset{b}{\overset{\shortparallel}{\langle r^6\rangle}} + \ldots$$

Now lets remove the $\hbar c$ out of the formula:

Normalization

$$G(Q^2) = \left[1 - \frac{Q^2}{6} r^2 + \frac{Q^4}{120} a - \frac{Q^6}{5040} b\right]\cdot N$$

I need to calculate FF for different values of $a \pm \sigma_a$ and $b \pm \sigma_b$. This will give me the model dependent part of the uncertainty!

$$a = 2.59 \pm \underbrace{0.19 \pm 0.04}_{\text{In quadrature}} = 2.59 \pm 0.194$$

$$b = 29.8 \pm 7.6 \pm 12.6 = 29.8 \pm 14.71$$