MATHEMATICAL MODEL FOR A CONTINUOUS MASS ATOM AND PHOTON

The charge neutral continuous mass atom is held together by a strong field some 38 orders of magnitude greater than the gravitational field and kept from collapse by internal vibrations. It is the internal vibration that replaces the concept of charge and that is what keeps the continuous mass atom from collapse.

Within the context of Newton's Laws and the Galilean Transform as derived in chapter 3 of the text, the continuous mass atom with mass m, radius r_o and density $\rho(r)=\frac{(p+3)m}{4\pi r_o^3}\left(\frac{r}{r_o}\right)^p$, $0 \le r \le r_o$ and $-3<p\le 0$; is held together by a field force of form

1. $\Psi(r)=-\frac{mH}{r_0}\frac{1}{(p+2)}\left[(p+3)-\left(\frac{r}{r_0}\right)^{p+2}\right]$, $r \le r_o$, $-3<p\le 0$ $p\neq -2$, $H\approx 10^{30}\frac{\text{erg cm}}{\text{gm}^2}$

2. $\Psi(r)=-\frac{mH}{r_0}\left[1-\ln\left(\frac{r}{r_0}\right)\right]$, $r \le r_o$, $p=-2$

The internal pressure $P_\Psi(r)\frac{\text{dy}}{\text{cm}^2}$ of the atom due to $\Psi(r)$, holds the atom together and is given by,

3. $P_\Psi(r)=P_\Psi(r_0)+\frac{1}{3}\int_r^{r_0}\rho(w)\frac{d\Psi}{dw}dw=P_\Psi(r_0)+\frac{m^2H}{24\pi r_0^4}\frac{(p+3)}{(p+1)}\left[1-\left(\frac{r}{r_0}\right)^{2(p+1)}\right]$, $r \le r_o$, $-3<p\le 0$ $p\neq -1$

4. $P_\Psi(r)=P_\Psi(r_0)-\frac{m^2H}{6\pi r_0^4}\ln\left(\frac{r}{r_0}\right)$, $r \le r_o$, $p=-1$

The internal contact pressure $P_c(r)\frac{\text{dy}}{\text{cm}^2}$ of the atom due to internal vibration $U_{rms}\frac{\text{cm}}{\text{sec}}$ is,

5. $P_c(r)=P_c(r_0)-\frac{1}{3}\int_r^{r_0}\rho(w)U_{rms}[w]\frac{dU_{rms}}{dw}dw$

It is $P_c(r)$ that keeps the atom from collapse and replaces the concept of charge for the continuous mass atom and its collision products. Note that both $P_\Psi(r)$ and $P_c(r)$ are positive as pressure is never negative.

Using $\frac{dP_\Psi}{dr}=\frac{dP_c}{dr}$ yields: $\frac{1}{3}\rho(r)\cdot U_{rms}\cdot\left(\frac{dU_{rms}}{dr}\right)+\frac{1}{3}\rho(r)\frac{d\Psi}{dr}=0$ and integrating from r to r_o yields,

6. $[\frac{1}{2}U_{rms}^2(r)+\Psi(r)]=[\frac{1}{2}U_{rms}^2(r_o)+\Psi(r_o)]=C_1$. In a stable atom, $C_1<0$.

Multiply both sides of eq. 6. by $\rho(r)dV=4\pi r^2\rho(r)dr$ and integrate from 0 to r_o. This yields,

7. $2\pi\int_0^{r_o} r^2\rho(r)U_{rms}^2(r)dr+4\pi\int_0^{r_o} r^2\rho(r)\Psi(r)dr=mC_1<0$. $mC_1<0$ is the total internal energy of a stable atom.

Collisions between two continuous mass atoms, generate charge neutral, small mass (~10^-10 amu) collision fragments. These collision fragments i.e. small mass photons, replace the concept of the electromagnetic field. The charge neutral models have been applied to historically important physics experiments to yield numerical results e.g. the generation of spectral lines using the charge neutral small mass photon, Rutherford Gold foil scattering, Millikan oil drop experiment, gold foil attraction and repulsion, electric current, cyclotron etc... All of this is done without using the concept of charge. i.e. The aim is to get rid of the concept of charge within the context of the charge neutral continuous mass atom and photon.