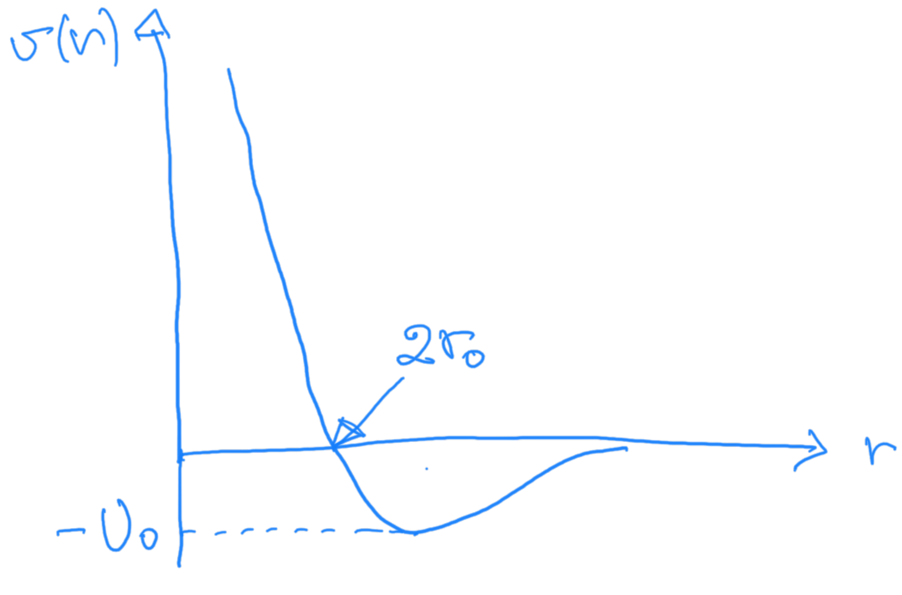
$$PV = NT \qquad P = nT$$

$$P = nT\left[1 + n B(T) + n^2 C(T) \dots\right]$$

Van der Waals



$$P = \frac{nT}{1 - nb} - a n^2$$

$U_0 / T \ll 1$

$$b \simeq 16\pi \frac{r_0^3}{3} \simeq 4\left(\frac{4}{3}\pi r_0^3\right)$$

$$a = 2\pi \int_{2r_0}^{\infty} r^2 dr \, |v(r)| > 0$$

$$\left[P + \left(\frac{N}{V}\right)^2 a\right](V - Nb) = NT$$

$$V_c = 3Nb \qquad T_c = \frac{8a}{27b}$$

$$P_c = \frac{a}{27b^2}$$

A densità $\gtrsim 2 \; 10^{14} \, g \, cm^{-3}$

fluido uniforme $n \, p \, e \, [\mu]$

$n_B \quad Q = 0$

$$\epsilon = \frac{E}{V} = \epsilon(n_B, n_p, n_n, n_e)$$

$$F = \epsilon + \lambda_B (n_B - n_p - n_n) + \lambda_Q (n_p - n_e)$$

$$\left(\frac{\partial F}{\partial n_p}\right)_{V, \ldots} = 0 = \left(\frac{\partial F}{\partial n_n}\right)_{V, \ldots}$$

$${}_{V, n_n, n_e}$$

$$= \left(\frac{\partial F}{\partial n_e} \right)_{V \ldots} \qquad \frac{\partial F}{\partial \lambda_B} = \frac{\partial F}{\partial \lambda_Q} = 0$$

$$\mu_i = \left(\frac{\partial E}{\partial N_i} \right)_{V, N_{j \neq i}}$$

$$= \left(\frac{\partial \epsilon}{\partial n_i} \right)_{V, n_{j \neq i}}$$

$$\begin{cases} \mu_p - \lambda_B + \lambda_Q = 0 \\ \mu_n - \lambda_B = 0 \\ \mu_e - \lambda_Q = 0 \end{cases}$$

$$\boxed{\mu_n = \mu_p + \mu_e}$$

$$\mu_i(n_B, n_i)$$

$$n_p = x\, n_B \qquad n_n = (1-x)\, n_B$$

$$n_e = n_e(x)$$

npe

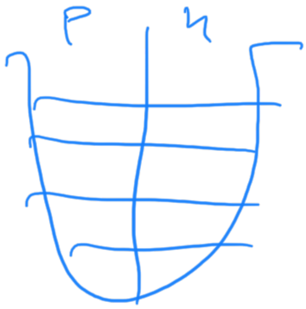
1/2

$$\mu_i = \left[m_i^2 + p_{F_i}^2 \right]^{1/2}$$

$\propto n_i^{2/3}$

$$\frac{E(n_B, x)}{N_B} \qquad x \approx 1/2$$

$A \qquad xA \; p \qquad (1-x)A \; n$



$$e + A \to e' + A$$

$$\left(\frac{d\sigma}{d\Omega}\right)_A = |F(q)|^2 \left(\frac{d\sigma}{d\Omega}\right)_{point}$$

fattore di forma

$$\rho_{ch}(r) = \int \frac{d^3q}{(2\pi)^3} \, F(q) \, e^{i \vec{q} \cdot \vec{r}}$$

$\underline{\underline{n_0 = 0{,}16 \text{ fm}^{-3}}} \qquad R_A \simeq r_0 A^{1/3}$

$$\frac{BE}{A} = Zm_p - (A-Z)\,m_n - M_A$$

$$\approx a_0 + b_0 A^{-1/3} + \ldots$$

$$\lim_{A\to\infty} \frac{BE}{A} = a_0 \approx 16\ \frac{\text{MeV}}{A} = e_0$$

Isospin-symmetric matter $(x = 1/2)$

$$\frac{E}{N_B} = e(n) = e_0 + \text{const}\,(n-n_0)^2 + \ldots$$

$$\hookrightarrow \sim \frac{\partial^2 e}{\partial n^2} \sim \frac{\partial P}{\partial n}$$

K