

Theme: SN1a as standard candles

1. figure out how many binaries we have in the average.

what are their common masses and distances?

2. A type 1a SN has no hydrogen lines but silicon lines: why do we want especially this SN?

3. A white dwarf with mass m_2 sucks mass from its partner (let it be a red giant) with mass m_1 and radius r_1 :

derive the Roche-limit

4. build a formula for the gravitational Energy of a star:

a) for constant density ρ .

b) for a density-function $\rho(r) = \rho_0 e^{-k \cdot r}$

5. from Heisenbergs relation follows the localisation-energy of a particle with mass m

$$dE = \frac{h^2}{8\pi^2} m \cdot dr^2$$

This is also the Fermi-Energy of an Elektron-gas.

Show, that The pressure p is

$$p = \frac{h^2}{12\pi^2 m_e} \rho^{5/3} / (m_y \cdot m_p)^{5/3}$$

and compare to the hydrostatic pressure.

m_e : electronmass

m_p : protonmass

ρ : average stardensity

m_y : molar mass (=2 for every Proton there is a Neutron in average)