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Abstract:

Keywords:

If the universe is [matter-dominated](http://en.wikipedia.org/wiki/Matter-Dominated_Era), then the mass density of the universe **ρ** can just be taken to include matter so

 **ρm** = **ρm0** **/ a3**....................................(1)

Here**ρm =**Mass density of universe which vary with scale factor **a**, **ρm0** **=**Present mass density of universe.

Mass density parameter is given by

**Ωm = ρm0** **/ρc**...................................................................(2)

Here**ρc=**Critical density of universe

**ρm0** = **Ωm ρc/ a3** .............................................................(3)

Critical density of universe is given by

 **ρc=3HO2/8 ΠG**.............................................................(4)

Here **HO=** Hubble parameter

Thus (3) becomes

**ρm0** = **Ωm3HO2/ 8 ΠG a3**.............................................(5)

By multiplying the equation (5) by **C2**

We get

**ρm0 C2**= **Ωm3HO2 C2/ 8 ΠG a3**...................................(6)

The vaccum energy is constant and given by

**ρva**=**Λ C2/8 ΠG**..........................................................(7)

here **Λ=**Cosmological constant(dark energy).

**ρva / Λ** = **C2/8 ΠG**

Thus(6)becomes

**ρm0 C2**= **Ωm3HO2 ρva / a3 Λ**.....................................(8)

Cosmological (Dark energy)density parameter is given by

**Ω Λ= Λ C2/3HO2**

**3HO2/ Λ= C2/ Ω Λ**......................................................(9)

Thus (8) becomes

**ρm0 C2**= **Ωmρva C2 / a3 Ω Λ**.....................................(10)

**ρm0** = **Ωmρva / a3 Ω Λ**..............................................(11)

Let us know consider matter and dark energy dominated universe

Density parameter of matter and dark energy dominated universe is given by

**Ω = Ωm+ Ω Λ**............................................................(12)

Thus (11) becomes

**ρm0 a3/ ρva = (Ω**- **Ω Λ) / Ω Λ**....................................(13)

**ρm0 a3/ ρva = (Ω / Ω Λ**-1).......................................(14)

Present mass density of universe is defined as mass of matter distributed per unit volume of universe and it is mathematically given by

 **ρm0=m0/V**

Here **V=**Volume of universe

Thus (13) becomes

**V**= **m0 a3/ ρva(Ω / Ω Λ**-1)........................................(15)

Here **m0=** Present mass of matter in universe

 **a=**Scale factor of universe

 **ρva=** vaccum energy

 **Ω=** Density parameter of matter and dark energy dominated universe

 **Ω Λ=** Density parameter of dark energy dominated universe

References: