Determination of the energy density of the cosmological constant with Planck units and the cosmological constant.

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Abstract.

We propose a simple relation to obtain the density of the cosmological constant from the Planck units and the value of the cosmological constant.

Introduction.

To date, and to the best of the author's knowledge, there is no connection between Planck units and the cosmological constant Λ. We will propose in this short paper a determination of the density of the cosmological constant using these data.

Let us consider
- the reduced Planck constant :

$$\hbar = 1,054572\ 10^{-34} kg\ m^2/s$$

- the Planck time :

$$t_{Pl} = 5,391246\ 10^{-44} s$$

- the Planck volume:

$$V_{Pl} = l_{Pl}^3 = (1,616255\ 10^{-35})^3$$
$$\mathrm{V}_{Pl} = 4,222111167\ 10^{-105} m^3$$

- the cosmological constant Λ, for H Hubble constant = 67.66 km/s/Mpc :

$$\Lambda = 1,1056\ 10^{-52}\ m^{-2}$$

And for a density parameter of the cosmological constant ΩΛ=0 .6889

We have empirically its density:

$$\rho_\Lambda = \frac{\hbar\ t_{Pl}\ \Lambda}{8\pi V_{Pl}}\ kg/m^3$$

from which, its energy density is equal to its determination in general relativity :

$$\rho_\Lambda\ c^2 = 5,3239\ 10^{-10}\ J/m^3$$

Conclusion

We have empirically determined the energy density of the cosmological constant. This could eventually constitute a beginning of deterministic rapprochement between general relativity and quantum mechanics.