The **Oh-My-God** particle

(observed 1991-10-15)

had an *energy* of: $E_{\mathrm{OMG}} \approx 3.2 \times 10^{20}$ eV

and it most probably was a proton.

A *proton*'s *rest energy* is: $E_{0,p} \approx 938.3$ MeV.

We have:

$$E^2 = (mc^2)^2 + (pc)^2 = m^2c^4 + \frac{m^2v^2c^2}{1-\frac{v^2}{c^2}} \therefore \left(\frac{E}{mc^2}\right)^2 = 1 + \frac{v^2c^2}{c^4\left(1-\frac{v^2}{c^2}\right)} = 1 + \frac{v^2}{c^2-v^2} = 1 + \frac{\beta^2}{1-\beta^2} = \frac{1}{1-\beta^2} = \boldsymbol{\gamma^2}$$

$$\therefore \boldsymbol{\gamma = E/mc^2}$$

Doesn't this simply imply: $E = \gamma mc^2 = m_{\mathrm{rel}}c^2$?

Of course there's nothing wrong about the *energy-momentum* relation,

but using it as a ~~correct~~ effective statement is plain B****CKS.

***E* does** equal $\boldsymbol{mc^2}$ if you properly define $\boldsymbol{m}$, nincompoop!

It renders a *Lorentz factor*

of: $\gamma_{\mathrm{OMG}} = \frac{E_{\mathrm{OMG}}}{E_{0,p}} = \frac{3.2\times10^{20}}{938.3\times10^{6}} \approx 341 \times 10^{9}$.

Hence, its *velocity* was

$$\beta_{\mathrm{OMG}} = (\gamma^2 - 1)/\gamma^2 \approx 0.999\,999\,999\,999\,999\,999\,999\,991\,400$$

$$\approx 1 - 8.60 \times 10^{-24}$$

$$\therefore v_{\mathrm{OMG}} \approx 299\,792\,457.999\,999\,999\,999\,997\,422 \text{ m/s}$$

$$\approx c - (2.578 \times 10^{-15} \text{ m/s}).$$

SUPPOSE it originated from a source at the

Hubble distance, which equals: $D_{\mathrm{H}} \approx 1.30 \times 10^{26}$ m

(presuming $H = 71$ km/s/Mpc).

Then its *travel time* in ***our*** frame was:

$$\Delta t_{\mathrm{our}} = \frac{D_{\mathrm{H}}}{\beta c} \approx \frac{1.30\times10^{26}}{299792458(1-8.60\times10^{-24})} \approx 4.3363 \times 10^{17} \text{ s}$$

$$\approx 13.74 \text{ Ga}.$$

Cf. the *Hubble time*: $t_{\mathrm{H}} \approx 13.77$ Ga.

In ***its*** *proper time* this journey took merely

$$\Delta t_{\mathrm{prop}} = \frac{\Delta t_{\mathrm{our}}}{\gamma_{\mathrm{OMG}}} \approx 1\,271\,652 \text{ s}$$

$$\approx 0.040 \text{ years} \approx \mathbf{14d17:14},$$

i.e. **two weeks** to traverse the entire cosmos.

Copyright © 2026, Henk Reints, MSc.