

Electrical Moonshine

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January 2018

Abstract. The electrical constant a and its Eddington approximation 137 are both 10 ppb connected with the dimension $d = 26$ of bosonic string theory and the 'moonshine entropy' $\ln D$. The involved pi-approximations implies a 0.3 ppb formula for a , and, using the first Mathieu group order, this confirms the Coherent Cosmology value $G \approx 6.67544 \times 10^{-11} \text{ kg}^{-1} \text{ m}^3 \text{ s}^{-2}$, compatible with the BIPM measurement, but at 4 sigma from the tabulated one. Direct connection between a , 137, d and $D = 196883$, reveals the string central number 496, about the 20th root of the Monster order, whose square corresponds to 125.6 GeV (BEH Boson), directly tied to the Monster order entropy via the tau and muon masses. The Monster order correlates with canonical economic numbers, leading to a value for the tau mass compatible with the Koide relation in the 10 ppb range, and confirming again the BIPM value for G . The fifth power of the Monster order is directly connected to D and d via the number 24 of transverse dimensions, involving the economic number $3^{(24^2+1)}$. This confirms the arithmetical character of Physical laws.

A bridge was established between two very different mathematical domains : the group theory and the conformal field one, which is related to the string theory [1]. The starting common point is the dimension of the Monster group $D = 196883$. In its treatment of the bosonic string theory, of dimension $d = 26$, Witten [2] considers the corresponding entropy $\ln D$, and compare it with the natural term 4π . But there are two 10^{-8} precise relations implying 137 and the electric constant [3] $a \approx 137.035999138(31)$.

$$6d \ln D \approx (137/\pi_1)^2 \approx (a/\pi)^2 - 1$$

π_1 being the classical approximation $355/113$, *confirming the arithmetical character* of Physics revealed by the Monster Group [4], Topological Axis [5], and the Eddington number 137 [6][7]. *As predicted [8] the physical constants are tied to rational approximations of π* . Indeed, writing $a^2 = 137^2 + \pi_a^2$, one finds a value corresponding, in the Lenz-Wyler [9] formula to the whole number $1834 \approx 6\pi_a^5$. This corresponds to the value :

$$a_{1834} \approx 137.035999098$$

at -3.0×10^{-10} (-1.3σ) from the above measured value [3]. In the measured 30 ppm range, the main strange mesons are given by :

$$\begin{aligned} a/(\pi_a-3) &\approx 972.80 \approx K_0-1 \\ a/(\pi'-3) &\approx 966.10 \approx K_{\pm} \end{aligned}$$

where $\pi' = 443/141$, corresponding to $\sqrt{(Hn/d_e)}$ within 0.3 ppm, where H and n are the Hydrogen/electron and neutron/electron mass ratio, and $d_e \approx 1.001159652$ is the electron magnetic factor [3]. With $u \approx 0.23129(5)$ the weak-mixing angle, one observes that

$$7 + 2u^2 \approx (\pi_u-3)^{-1}$$

induces a value π_u compatible with $p_G + 2$ where $p_G = P/2^{127/2}$, with P the canonical mass ratio Planck/electron. Introducing the order of the first Mathieu group $O_1 = 7920$, one observes :

$$(p_G + 1)/O_1 \approx 0.23138 \approx e/\sqrt{(\sqrt{137}a) + 1}$$

This is a 1 ppm connexion between electricity and gravitation, corresponding to $G \approx 6.675441 \times 10^{-11} \text{ kg}^{-1}\text{m}^3\text{s}^{-2}$, at 2 ppm the Coherent Cosmology value, confirming the BIPM G measurement [10], at 4 σ the controversial tabulated value (200 ppm).

Detailed analysis shows that, in the ppb range :

$$D = 12d(136 + 496 - 1) + 11 \approx 12d(a + 496 - 2) - u \approx H(8H/a - 1/12)$$

where 496 the third perfect number, central in string theory [11], whose square is very close to s , the 10th root of the Monster order, corresponding, by respect to the electron energy, to 125.6 GeV, nearly compatible with the BEH mass 125.09(24) GeV [3].

Also the mass ratio Muon/Electron μ and Tau/Electron τ appear in the entropy of the Monster order O_M :

$$\ln O_M/137 \approx e/3 \approx \ln \tau/9 \approx 10\mu \ln D/8\tau$$

involving $\ln O_M/10 = \ln s$:

$$137/8 \approx \tau \ln s/\mu \ln D$$

Also τ is tied to the cube of the 'economic number' $e^{(2)} = e^e$. In fact the

measured value 3477.22(23) is compatible with the following value, involving : $e^{(3)} = e^{(e^e)}$:

$$\tau \approx 137^2 e^{(3)}/(2a)^3 \approx 3477.439674$$

This value is compatible with the 2.2×10^{-8} precise μ value $\approx 206.7682836(47)$, in the Koide relation [12], prolonged with the term $4\pi(apH)^{1/4}$:

$$(1+\mu+\tau)/2 \approx (1+\sqrt{\mu}+\sqrt{\tau})^2/3 \approx 4\pi(apH)^{1/4}$$

It is significant that the best determined particle mass is that of the tau. Albeit the Koide formula have corrected a 3 sigma deviation for tau mass measurement, it is not taken seriously. This shows how the particle standard model is disconnected from the profound physics behind. Also, within 40 ppb, where $f \approx 8.434467749$ is the Bizouard strong coupling [4]: $\tau \approx ae^{(3)2}/e^{(2)}fpD\ln D\sqrt{(a-136)}\sqrt{(H-p)} \approx 3477.43954$, implying the following relation:

$$8(a^2/137)^2 e^{(3)}/e^{(2)} \approx fpD\ln D\sqrt{(a-136)}\sqrt{(H-p)}$$

illustrating the importance of 136, the first Eddington's approximation for a .

The economic numbers play also a decisive role in the *incredible* connexion (0.2 ppm) of the Monster groupe order with that of the pariah group J_3 [4] :

$$O_M \approx J_3^7 d_e \sqrt{(p/6\pi^5)}$$

where p the mass ratio proton/electron, $6\pi^5$ being its above Lenz-Wyler approximation.

Also, the economic numbers appears in :

$$e^{(4)/4} \approx (4a^2/3\pi^2)P^{(a-1)^2} \approx (\pi/6) (4n/\pi d_e^2)^{s/2} \approx (6/\pi)^{(e^{(2)})^2} (a/d_e)^{3/2}$$

$$e^{(3)}/(2e^{(2)})^3 \approx 137$$

$$e^7/2^3 \approx a^2/137$$

$$e^{(3)}/e^{(2)} \approx a\sqrt{(pH)} \approx \sqrt{(\pi/3)} sa/137 \approx a^{13} \sqrt{(d_e(H-p))}/P$$

where P is the mass ratio Planck/electron. The last relation

corresponds again to a value for G both compatible with the Coherent Cosmology one and BIPM measurement.

The following relation may be useful, since 24 is the number of transverse dimensions, and $D+1$ appears in the moonshine correlation :

$$(D+1)^{2 \times 26} \approx 3^{24^2 + 1} \approx (e^3 O_M / \sqrt{2})^5$$

precise to 5×10^{-5} and 9×10^{-6} on a number of 275 decimal digits. The term $O_M / \sqrt{2}$ appears directly in c-free dimensional analysis [4], as well in the relation :

$$O_M / \sqrt{2} \approx (a/137)^{3aW^2/4\pi F}$$

inside the imprecision on W , the charged weak boson mass, by respect to the electron one, while F is the Fermi mass, while in the ppb range :

$$a/137 \approx 3^{a/F} \approx (P\sqrt{(3/2)})^{1/(D+11)}$$

This confirms that $a/137$ is a mathematical ratio.

As well as mathematicians take profit of computer, they could be guided also by those formula, obtained by the *physical approach method* i.e. to look for direct connexions between pertinent numbers.

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