

Pi-theory of the fundamental physical constants: the absorption coefficient of graphene - possible new fundamental physical constant

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Konstantin S. Novoselov, in his Nobel Lecture (GRAPHENE: MATERIALS IN THE FLATLAND, Nobel Lecture, December 8, 2010), gives the following information:

“*Graphene optics*

Can one expect anything interesting from the optical properties of graphene? Rather counterintuitively, despite being only one atom thick, grapheme absorbs quite a large fraction of light. In the infrared limit the absorption coefficient is exactly $\pi\alpha \approx 2.3\%$ (where $\alpha = e^2 / \hbar c$ is the fine structure constant), and the corrections to this number in the visible range of the spectrum are less than 3% [131–134]”.

(Source: http://www.nobelprize.org/nobel_prizes/physics/laureates/2010/novoselov_lecture.pdf)

If so, by dividing the absorption coefficient of graphene σ_g on the number pi, we obtain the numerical value of the fine structure constant α .

One evidence of Pi-Theory of the fundamental physical constants (hereinafter - Theory) will direct experimental determination of the constant of scale invariance $f_{\pi s}$ (bottom symbol "π" means parameter Theory).

One outcome of the Theory is the exact analytical solution for a constant of scale invariance $f_{\pi s}$.

$$f_{\pi s} = \alpha_{\pi} \cdot \beta_{\pi}.$$

$$f_{\pi s} = 7.2992579083693880159095620869115 \cdot 10^{-3}.$$

α_{π} – the fine structure constant.

$\beta_{\pi} = \frac{f_{\pi s}}{\alpha_{\pi}}$ – coefficient of relationship of the fundamental constants.

$$\alpha_{\pi} = 7.2973525725198574235458586243837 \cdot 10^{-3}.$$

$$\beta_{\pi} = 1.0002610996016152003731797946565.$$

The absorption coefficient of graphene can be equal to:

$$\sigma_{\pi g1} = \pi \cdot f_{\pi s} = 0.0229312950215904695610389693968 \text{ or } 2.2931\dots\%$$

$$\sigma_{\pi g2} = \frac{\pi \cdot f_{\pi s}}{\beta_{\pi}} = 0.0229253092324829629843693670744 \text{ or } 2.2925\dots\%$$

$$\sigma_{\pi g3} = \frac{\pi \cdot f_{\pi s}}{\beta_{\pi}^2} = 0.0229193250058546450365896860999 \text{ or } 2.2919\dots\%$$

The three options $\sigma_{\pi g}$ can be written as:

$$\sigma_{\pi g} = 0.022\ 925(6).$$

It should point out a very important fact. The constant of scale invariance $f_{\pi s}$ – is a new fundamental physical constant.

Allow myself to a brief comment.

If the experiment is confirmed by any of the three options, it would mean:

1. The unconditional experimental confirmation of the Theory. In Theory, all, without exception, the micro and macro physical parameters include (in one form or another) $f_{\pi s}$, $\frac{f_{\pi s}}{\beta_{\pi}}$ and $\frac{f_{\pi s}}{\beta_{\pi}^2}$.

2. The absorption coefficient of graphene – is a new fundamental physical constant.

Think, that the experiment should confirm option $\sigma_{\pi 1} = \pi \cdot f_{\pi s}$.