Klaus von Klitzing Formula and Stability Frequency

by Moisés Domínguez Espinosa

moi_de@ciencias.unam.mx FC-UNAM

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Abstract

In this paper, we build the von Klitzing formula from the stability formula that arises in the dynamic quantization model.

Let us assume that $E_H = eV_H$ is the Hall voltage energy and $E_\xi = h\nu_\xi$ is the stability energy which is associated to ν_ξ .

We propose (hypothesis 1) that

$$E_H = E_\xi \tag{1}$$

therefore

$$eV_H = h\nu_\xi \tag{2}$$

Where

$$\nu_\xi = \frac{2Rc}{n^4} \tag{3}$$

We substitute equation (3) in equation (2)

$$eV_H = h\left(\frac{2Rc}{n^4}\right) \tag{4}$$

We rewrite equation (4) as

$$V_H = \frac{h}{ne}\left(\frac{2Rc}{n^3}\right) \tag{5}$$

Now we know that the revolution frequency of the electron in the Bohr model is

$$\nu_B = \frac{2Rc}{n^3} \tag{6}$$

We substitute (6) in (5)

$$V_H = \frac{h\nu_B}{ne} \tag{7}$$

If we multiply and divide (7) by the electron charge e we have

$$V_H = \frac{he\nu_B}{ne^2} \tag{8}$$

If we accept (hypothesis 2) that the term $I = e\nu_B$ is the current generated by the electron turning around the proton, thus from equation (8)

$$V_H = \frac{hI}{ne^2} \tag{9}$$

If $\frac{V_H}{I} = R_H$ is the Hall resistance

$$R_H = \frac{h}{ne^2} \tag{10}$$

finally

$$R_H = \frac{R_K}{n} \tag{11}$$

We know R_K as von Klitzing constant

$$R_k = \frac{h}{e^2} = 25812.8075\ \Omega \tag{12}$$

References

Paul A. Tipler, Física, Editorial Reverté, Tercera Edición p. 804

A Simple Model of Quantization: an Approach from Chaos, Moises Dominguez-Espinosa, Jaime Melendez-Martinez, viXra:1603.0377, 2016