ABOUT THE CALCULATION OF THE PHOTON POWER

Lecture on the APS March Meeting, Dr. Sergej Reissig, EFBR

Owing to the pioneer works of Einstein and Planck at the beginning of the 20 century, we are able to calculate the energy of one photon today. With rapid growing meaning of the nanotechnologies and the development of the processes, which are based on the laser or solar power, the factor power will play a larger role in the future, however.

The performance analysis and the determination of the efficiency makes a competent and safe control as well as the more economical use of complex plants and system processes possible. On which factors the power of the photon is dependent and how it changes quantitatively, is not clearly.

From thermodynamics we know that the power can be determined by the temporal change of the work. The achieved work could be defined by temporal change of the process energy, hereby:

$$P = \frac{dL}{dt} = -\frac{dE}{dt} \tag{1}$$

According to the world-famous formula of Planck and the model of the photon, which was suggested in the applications [1, 2], the formula for the practical determination of the power of a light particle can be deduced. The differentiation of the Planck formula $E = hf$ in the form:

$$\frac{dE}{dt} = h \cdot \frac{df}{dt} \tag{2}$$

as well as the consideration of the photon rotation, which made possible to express the time interval in the following form - $dt = d\lambda / c$, led to the equation:

$$\frac{dE}{dt} = h \cdot \frac{df}{dt} = hc \cdot \frac{df}{d\lambda} = hc^2 \cdot \frac{d\left(1/\lambda\right)}{d\lambda} = -hc^2 \frac{1}{\lambda^2} = -hf^2 \tag{3}$$

If we now put the expression (3) in to eq. (1) we will have the formula for the calculation of the photon power, finally:

$$P = hf^2$$

References

1. About the dualism of the light. S. Reissig, *The 12th General Conference of the European Physical Society "Trends in Physics", 2002*
2. About the nature of the photon. S. Reissig, *www.efbr.de/de/publikationen/EFBR%20Publikationen.htm, 2003*
3. Bewegungsgleichung der Photonen. S. Reissig. *www.efbr.de/de/publikationen/EFBR%20Publikationen.htm, 2002*