Stepovich M. A., Turtin D. V., Seregina E. V.*, Kalmanovich V. V.*, Filippov M. N.** (Ivanovo, *Kaluga, **Moscow, Russia). **On one possibility of constructing a stochastic model of target heating by an electron beam of medium energies.** A stochastic model of target heating during its irradiation with an electron beam of medium (up to 50 keV) energies is considered. The following theorem is proved

Theorem. *For the mathematical model of target irradiation by an electron beam of medium energies and the distribution of energy losses by the electron beam in the target in the form* $\rho(\vec{r},\ t) = \rho^*(\vec{r}) \cdot f(t)$, *where the factor* $\rho^*(\vec{r})$ *corresponds to stationary irradiation, and the factor* $f(t) \sim \sin(\omega t)$ *corresponds to the non-stationary part, that can change randomly, the heating temperature of the target is determined as*

$$T(\vec{r},\ t) = \frac{1}{c_0\rho_0} \int\limits_0^t \int\limits_{-\infty}^{+\infty} \int\limits_{-\infty}^{+\infty} \int\limits_0^{+\infty} \frac{\rho^*(\xi)\, f(\tau)}{\left[2a\sqrt{\pi(t-\tau)}\right]^3} \exp\left\{-\frac{|\vec{r}-\xi|^2}{4a^2(t-\tau)}\right\} d\xi d\tau,$$

where $d\xi = d\xi_1 d\xi_2 d\xi_3,\ \rho^*(\xi) = \rho^*(\xi_1,\ \xi_2,\ \xi_3),\ |\vec{r}-\xi|^2 = (x-\xi_1)^2 + (y-\xi_2)^2 + (z-\xi_3)^2.$

For parameters typical for electron beam technologies, the target heating estimate is given by the formula

$$T(x,\ y,\ z,\ t) = \frac{b^5\left[1+\sin(\omega t)\right]}{16a^2 e\sqrt{\pi} c_0\rho_0} \cdot \frac{1}{zz_0}\sqrt{\frac{4a^2t+z_0^2}{4a^2t+b^2}} \cdot \left(-\frac{1}{x^2+y^2+z^2}\right) \times$$
$$\times \left[\exp\left(-\frac{x^2+y^2+z^2}{b^2}\right) - \exp\left(-\frac{x^2+y^2+z^2}{4a^2t+b^2}\right)\right].$$

The influence of random changes in the function $f(t)$ on the nature of target heating is considered.

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