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STEP

AUTHORS: Klymyshyn, I. A. and Kravchuk, A. L.

TITLE: Increase of radiation intensity before a shock wave reaches the surface of a homogeneous medium

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 7, no. 10, 1962, 1083-1088

TEXT: It is assumed that the shock wave moves with constant velocity and the energy  $F$  radiated from a surface unit of the front is independent of time. The amount of energy  $J(u)$  radiated from  $u = -\infty$  to  $u$ ; when the wave reaches an optical depth  $(u_0 - u)v$ , is computed by integrating the probability function given by V. V. Sobolev;  $u = t/t_1$ ,  $t_1$  being the average duration of a quantum in absorbed state;  $v$  is the dimensionless velocity of the wave:

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$$J(u) = \frac{F}{v^2(1-a^2)} \left[ Q_1 e^{-(u_0-u)v\sqrt{\alpha_1}} + Q_2 e^{-(u_0-u)v\sqrt{\alpha_2}} + Q_3 e^{-(u_0-u)v\sqrt{\alpha_3}} \right] \quad (9)$$

Here  $a^2 = 1 - \lambda$ ,  $\lambda$  is the relative amount of scattered energy,  $\alpha_1, \alpha_2, \alpha_3$  are the roots of

$$(a^2 + x^2)^2 + v^2 x^2 (1 + x^2)^2 = (x^2 + \alpha_1)(x^2 + \alpha_2)(x^2 + \alpha_3) \quad (7)$$

$Q_1, Q_2, Q_3$  depend on these roots, and on  $v$  and  $a$ . Simplified expressions are obtained for several special cases. If the velocity

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is 100 km/sec and the density  $n = 10^{12} \text{ cm}^{-3}$  brightness increases  $e$  times in  $10^{-5}$  sec near spectral line frequency. The above expression does not apply to rarefied media if the frequency is near that of a spectral line. The authors thank Professor S. A. Kaplan for the formulation of the subject of the paper.

ASSOCIATION: L'vivs'kyy derzhuniversytet im. Iv. Franka (L'viv State University im. Iv. Franko)

SUBMITTED: March 2, 1962