self-focusing of pulses it is necessary to take into account the energy distribution over the spectrum. At the same time, these results are directly applicable to those cases when some frequency ν_0 is strongly pronounced in the spectrum of the envelope (for example, the frequency of intermode beats in a laser with giant pulse or the spike repetition frequency in a high-power laser operating in the free generation mode). Then the self-focusing beam can break up into "resonant" filaments with transverse scale $a_0 \simeq u/\nu_0$ (see [12]). We note that the foregoing procedure allows us to analyze temporal nonlinear aberrations connected with thermal effects; these aberrations are quite appreciable in the case of giant pulses.

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CONCERNING ONE POSSIBLE MECHANISM OF PRODUCTION OF THE MESIC-MOLECULAR ION $(dd\mu)^+$

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There is great disparity between the experimentally obtained rate of $(dd\mu)^+$ production [1] and the theoretical estimates [2]. It seems to us that this occurs because $(dd\mu)^+$ has a level K = 1, ν = 1 with low binding energy. The binding energy obtained for this state in the adiabatic approximation [2] is $|E_d| \approx 7$ eV. Although variational calculations [3] did not yield this level, they do not, in our opinion, contradict its existence.

Assuming that $(dd\mu)^+$ has the level $K = 1$, $v = 1$, let us consider the mechanism of $(dd\mu)^+$ production by means of an E1 transition with transfer of the binding energy to the excited vibrational levels of the D_2 molecule.

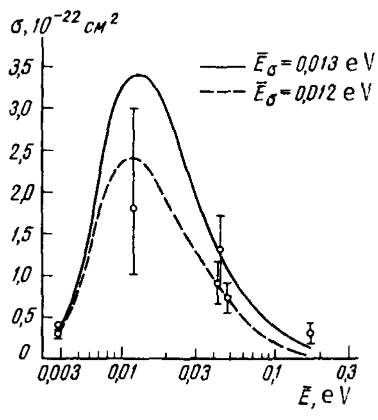
Let R_1, R_2, and R_μ be respectively the radius vectors of the two d nuclei and of the muon, and let ρ_1 be the radius vector of the third d nucleus. We introduce the notation $R = R_1 - R_2$, $r_1 = R_\mu - R_1$, $r_2 = R_\mu - R_2$, and $\rho = \rho_1 - R_2$. Then the dipole moment of the $dd\mu$ system is $D = (e/2)(r_1 + r_2)$, and the action on the third nucleus is $V \approx e(D\rho/\rho^3)$. It should be borne in mind, following [4], that the $d\mu$ particles incident on the deuterium molecule have the following energy distribution relative to the mean kinetic energy $\bar{E}$:

$$\gamma(E) = \frac{1}{\sqrt{2\pi}} \frac{1}{\bar{E}} \sqrt{\frac{E}{\bar{E}}} \exp\left(-\frac{E}{2\bar{E}}\right) \quad (1)$$

and $\gamma(E)dE$ is the probability that the particle has an energy between E and E + dE. We obtain the differential rate of $dd\mu$ production:

$$dw = \frac{8\pi^2}{27} N a_e^3 \left(\frac{a_\mu}{a_e}\right)^5 \frac{e^4}{a_e^2 \hbar} \gamma(E)\delta(|E_d| + E - E_n)\, dE$$
$$\times \left| \int f(R)\, g(R)\, R\, dR \int h_0^0(\rho)\, h_n^1(\rho) \frac{d\rho}{\rho^2} \right|^2, \quad (2)$$

where a_e and a_μ are the Bohr radii of the electron and the muon, $N = 4 \times 10^{22}$ cm^{-3} is the density of the nuclei, E_n is the energy necessary to excite the n-th vibrational level of the molecule D_2, $f(R)/R$ and $[h_0^0(\rho)]/\rho$ are the radial parts of the wave functions of $dd\mu$ and D_2, respectively, in the initial state, and $[g(R)]/R$ and $[h_n^1(\rho)]/\rho$ are the same in the final state. We see from (2) and (3) that the rate of production depends on $\bar{E}$, having the maximum at $\bar{E}_w = E/3$. This dependence was observed experimentally earlier [1]. The maximum can be established by normalizing the rate w to the experimental data. Satisfactory agreement is obtained with $\bar{E}_w = 0.016$ eV. The figure shows a plot of $\sigma = w/N\bar{v}$ on $\bar{E}$ at two different values of $\bar{E}_\sigma = 3\bar{E}_w/4$.



Dependence of experimentally measured cross sections on the average kinetic energy after [1]. Curves - dependence as obtained in the present work.

The integral

$$I_1 = \int f(R)\, g(R)\, dR \quad (3)$$

can be calculated by taking Morse wave functions [2]. The integral

$$I_2 = \int h_0^0(\rho)\, h_n^1(\rho) \frac{d\rho}{\rho^2} \quad (4)$$

can be estimated in two limiting cases: 1) If the transition is from the state $K = 0$, $v = 0$

to the state $K = 1$, $\nu = 0$, in which case we can obtain, starting from the Schrödinger equation for $K = 0$ and $K = 1$, that

$$I_2 = \frac{m_d}{2}(E_0^0 - E_0^1)\int_0^\infty h_0^0(\rho)\,h_n^1(\rho)\,d\rho \approx 0,5; \qquad (5)$$

2) If the transition is to a high vibrational level lying at the dissociation boundary, then we can take in (4) quasiclassical wave functions. Such an integral was calculated in [5], where it was found that $I_2 \approx 10^{-4.5}$.

Assuming that $|E_d| < 4.6$ eV, we obtain for $\bar{E}_w$ the following limits for the production rate: $2 \times 10^{12} > w > 3 \times 10^2$ sec^{-1}. Comparing with the expected value $w = 1.7 \times 10^6$ sec^{-1}, we conclude that the mechanism considered above explains the experimentally observed effects if $(dd\mu)^+$ indeed has a level of several eV.

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CURRENTS PRODUCED BY LIGHT PRESSURE WHEN A LASER BEAM ACTS ON MATTER

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Absorption of light in a conducting medium may induce conduction currents under the influence of light pressure. The field intensity equivalent to the action of the light pressure is $E_{eq} \simeq (Ik_1)/(cn_e e) \simeq (eE_0^2\nu)/[m(\omega^2 + \nu^2)c]$, where e and m are the charge and mass of the electron, E_0 and ω the amplitude and frequency of the light field, ν the electron collision frequency, k_1 the linear light-absorption coefficient, and I the flux density of light radiation. The field E_{eq} is nonpotential, and its action is equivalent to the action of an electromotive force that pumps the electrons through the volume where the light pressure is localized and produces a system of closed currents.

We have registered the currents produced by light pressure on the surface of a metal and in the plasma of the flare produced when a laser beam acts on a surface.

We used an ordinary ruby laser which was Q-switched by a rotating prism. The laser beam was focused on the surface of a small target which could be turned to any angle relative to the beam axis. An induction coil recording the current field was fastened to the edge of