electric field is Ωt at the time the light passes through the origin. In this case

$$\psi = \frac{1}{2} L\lambda BE_0^2\left[1 + A_i \frac{\sin KL}{KL}\cos(2\Omega t + \varphi)\right],$$

$$A_i = [1 + (2\Omega)^2\tau_i^2]^{-1/2}, \quad K = 2\pi/\Lambda. \qquad (5)$$

Choosing the length of the Kerr cell so that $L = \Lambda/4$, where Λ is the wavelength in the medium, we have

$$\psi = \frac{1}{2} Lb_i\lambda BE_0^2\left[1 + \frac{2}{\pi} A_i \cos(2\Omega t + \varphi)\right]. \qquad (6)$$

Taking account of Eqs. (2) and (6) and substituting the values n_p and n_s in Eq. (1), we have

$$Y_a = Y_p \frac{1}{2i}\exp\left[i\left(\omega t - \frac{4}{3}a - kLn \pm \frac{\pi}{2}\right)\right]\left\{\exp(i2a)\right.$$
$$\times \exp\left[ia\frac{4}{3\pi}A_i\cos(2\Omega t + \varphi)\right]$$
$$\left.\times \exp\left[ia\frac{8}{3\pi}A_i\cos(2\Omega t + \varphi)\right]\right\}, \qquad (7)$$

where $a = \frac{1}{2}\pi LBE_0^2$. Expanding Y_a in Eq. (7) in Bessel functions and computing the intensity of the n-th component at frequency $2n\Omega$ (n is an integer) we have

$$I_n = Y_a^* Y_a = \frac{1}{4} I_p\left\{J_n^2\left(\frac{4}{3\pi}aA_s\right) + J_n^2\left(\frac{8}{3\pi}aA_p\right)\right.$$
$$\left. - 2(-1)^n J_n\left(\frac{4}{3\pi}aA_s\right) J_n\left(\frac{8}{3\pi}aA_p\right)\cos 2a\right\}. \qquad (8)$$

The quantity A_i varies from zero to unity and at small values of a the ratio of $I_{\pm 1}$, the intensity of the light at frequency $\omega \pm 2\Omega$, to I_0, the intensity of the light at the fixed frequency, will be zero (assuming that $A_p = A_s$, i.e., that $\tau_p = \tau_s = \tau$)

$$I_{\pm 1}/I_0 = \pi^{-2}[1 + 4\Omega^2\tau^2]^{-1}. \qquad (9)$$

Equation (10) can be used to find τ.

The relaxation time for the anisotropy can also be found from the formulas given above without assuming that $\tau_p = \tau_s = \tau$.

A very clean pattern of discrete splitting of the frequency of light transmitted through a Kerr cell filled with nitrobenzene has been observed at a modulation frequency $\Omega = 2\pi \times 10^7$ cps[4] and light has been modulated at $\Omega \sim 2\pi \times 10^{10}$ cps;[6] these results indicate the effectiveness of the method and show that it may be useful in resolving the discrepancy between the measurement of τ in the Kerr effect[7] and in scattering of light.[8]

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COMPARISON OF THE ABSOLUTE MEASUREMENTS OF THE ENERGY IN A BREMSSTRAHLUNG BEAM PERFORMED IN THE LABORATORIES OF DIFFERENT COUNTRIES

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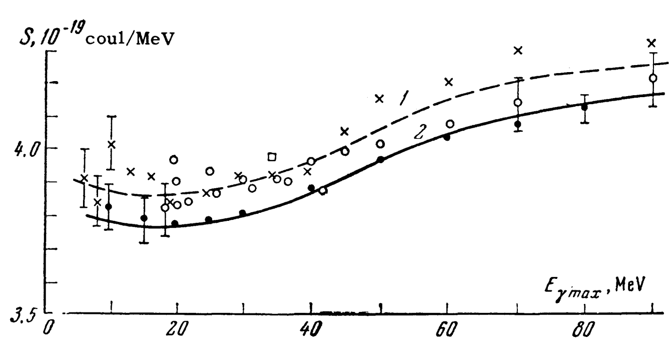
At present the energy in a bremsstrahlung beam is measured in different laboratories by several types of ionization chambers, which are calibrated by means of a calorimetric or some other absolute method.

In several Soviet Laboratories the measurements are performed by means of a standard chamber developed by the A. F. Ioffe Physico-technical Institute. The sensitivity of this chamber was determined calorimetrically in the energy range $E_{\gamma\,max} = 10-90$ MeV.[1] In the USA the Cornell thick-walled chamber[2] and the duraluminum chamber of the National Bureau of Standards are used; the latter has been calibrated by means of a calorimeter in the range $E_{\gamma\,max} = 7-170$ MeV.[3]

The duraluminum chamber is used also in several laboratories in Germany (where it has been calibrated calorimetrically at 34.5 MeV[4]), as well as in France, Switzerland, Yugoslavia, and Japan.[5]

In order to compare our absolute measurements with the data of the other laboratories we constructed a copy of the duraluminum chamber and determined its sensitivity by comparison with our standard chamber. All essential dimensions of the chamber as well as the composition of the duraluminum were the same as in the original. The measurements were performed with the bremsstrahlung beam of the synchrotron of the Physico-technical Institute in the energy range $E_{\gamma\,max} = 10-90$ MeV. The photon beam emerging from the donut of the accelerator (the wall thickness is equivalent to $2.5\,g/cm^2$ aluminum) was collimated, went through a thin-walled ionization chamber ($1.5\,g/cm^2$) serving as a monitor, was cleared of electrons and positrons by a magnetic field, and entered the duraluminum chamber. The charges collected simultaneously in the duraluminum chamber (q_d) and in the monitor (q_m) were measured by a compensation method.[1] The ratio of q_d to q_m gives the relative sensitivity of the duraluminum chamber and the monitor. The duraluminum chamber was then removed from the beam and replaced by the standard chamber, for which the analogous ratio to the monitor was determined. From these two ratios follows the ratio of the sensitivities of the two chambers; since the absolute sensitivity of the standard chamber has been calibrated earlier by means of a calorimeter, we can compute from this ratio the absolute sensitivity S of the duraluminum chamber.

The experiments were performed at ten values of the energy $E_{\gamma\,max}$. The obtained dependence of S on the maximum energy of the bremsstrahlung spectrum is shown in Fig. 1. The data obtained by the U.S. National Bureau of Standards and by the Max Planck Institute for Biophysics at Frankfurt are also shown. As can be seen the results of the measurements performed by different methods at different accelerators agree to an accuracy of 2%, which lies within the limits of the experimental errors.



Dependence of the sensitivity of the duraluminum chamber on the maximum energy of the bremsstrahlung spectrum: Curve 2 corresponds to the results of this paper; Curve 1 is drawn from the data of the US National Bureau of Standards (○ – calorimetric measurements, × – scintillation spectrometer) and of the Max Planck Institute for Biophysics (□ – calorimetric measurements).

This comparison of the calibrations makes it possible to compare precisely the results of measurements of absolute cross sections, reaction yields etc., which have been obtained at different accelerators (when using either chamber for the measurement of the intensity).

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STANDING MAGNETOPLASMA WAVES IN BISMUTH, CONNECTED WITH HYBRID RESONANCE

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WE have previously investigated[1,2] standing magnetoplasma waves of frequency ω in bismuth, in the region of strong magnetic fields for which $\omega_c \gg \omega$ (ω_c — cyclotron frequency). However, as shown by Smith, Hebel, and Buchsbaum (SHB)[3], undamped plasma waves with nonlinear dispersion can also propagate in bismuth in a field interval between the electron-electron hybrid resonance and the dielectric anomaly, if the carrier spectrum