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SECOND HARMONIC GENERATION IN THE CRYSTAL $BeSO_4.H_2O$

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Among the piezoelectric crystals used for second-harmonic generation, the number of substances having relatively large components of the non-linear polarizability tensor and simultaneously satisfying the synchronism condition is very limited. One such substance is the crystal $BeSO_4.4H_2O$ [1]. The crystal belongs to the tetragonal system and has a symmetry space group I $\bar{4}2c$ [2].

$BeSO_4.4H_2O$ is colorless and transparent in the ultraviolet down to 1700 Å. The crystal was grown from an aqueous solution on an oriented primer by the method of lowering the temperature. The growth rate along {101} faces was 1.5 mm in a day. The linear dimensions reached several cm. The crystals can be worked with a filamentary saw [3] and polished on resin with the aid of chromium oxide.

The refractive index of beryllium sulfate in ultraviolet are still unknown, but the crystal symmetry and extrapolation of the dispersion on curves give grounds for assuming that a second-harmonic extraordinary wave can be generated with the aid of the ordinary wave of laser radiation.

The sample was 12 mm thick and was cut in such a way that a laser beam normally incident on its front face made an angle $\theta = 60°$ with the optical axis and an azimuth angle $\phi = 45°$. The second harmonic was observed in the lights of a helium-neon laser with $\lambda = 6328$ Å. The signal was registered with a photomultiplier or photographed on a film placed in the focus of a quartz lens with f = 150 mm. The experimentally measured synchronism angle was $\theta_0 = 60 \pm 1°$ The conversion coefficient compared with a KDP crystal of the same thickness and $\theta = 57°$ is 1/3. The parameters of the angular structure are practically the same as for KDP, indicating that the birefringence coefficients of these two crystals are close, and consequently it can be assumed that the component of the nonlinear polarizability tensor d_{36} of $BeSO_4.4H_2O$ is 1/3 the corresponding component of KDP. The high sharpness of the spatial-structure picture was evidence that the crystal was optically perfect and there were no polysynthetic twins in the investigated sample.

It should be noted that beryllium sulfate, being harder than KDP and ADP, is easier to work mechanically.

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DECAY AND THE VENEZIANO MODEL

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Recently, the Veneziano formula [1] for the crossing-symmetry amplitude, the Regge behavior of which in all three channels is generated by an infinite system of equidistant pole-resonances with linear trajectories, has gained great popularity. The Veneziano amplitude claims to describe hadron processes in the entire Mandelstam plane, and particularly in the decay region, where all three variables s, t, and u are positive. Lovelace [2] and many others [3 - 5] have shown that the Veneziano formula describes a number of decay processes fairly well.

In this paper we consider ω decay into three pions in the same model.

The amplitude of the ω meson decay is given away

$$\varepsilon^{abc}\,\epsilon_{\mu\nu\rho\sigma}\,e_\mu\,p_\nu^{(a)}\,p_\rho^{(b)}\,p_\sigma^{(c)}\,A(s,t)\,, \qquad (1)$$

$$A(s,t) = B(s,t) + B(t,u) + B(u,s),$$

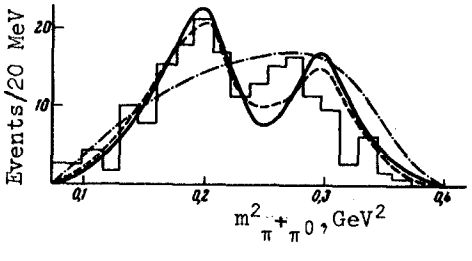
where e_μ is the polarization vector of the ω meson, p are the pion momenta,

$$B(x,y) = \beta\frac{\Gamma(1-\alpha(x))\,\Gamma(1-\alpha(y))}{\Gamma(2-\alpha(x)-\alpha(y))}\,,$$

and β is independent of s, t, or u. The ρ-meson trajectory is $\alpha(s) = 0.48 + 0.88\,s$. β can be expressed in terms of the constants $g_{\omega\rho\pi}$ and $g_{\rho\pi\pi}$, of the $\omega \to \rho\pi$ and $\rho - \pi\pi$ transitions which are used in the ω-decay model [6]. A simple comparison yields $\beta = \alpha' g_{\omega\rho\pi} g_{\rho\pi\pi}$.

This relation leads, as shown also in [5], to a correct value of the total width of the ω meson (11 - 12 MeV, depending on the choice of the width of the ρ meson and the constant $g_{\omega\rho\pi} = 17 - 20\ \mathrm{GeV}^{-1}$).

The figure shows the distribution with respect to the square of the mass of the $\pi^+\pi^0$ system in ω decay (solid curve), which follows from the Veneziano formula (1). For comparison, the figure shows also the curve corresponding to the "crossing-symmetry Breit-Wigner model"



$$A(s,t) = (1/1-\alpha(s)) + (1/1-\alpha(t)) + (1/1-\alpha(u))$$

(dashed curve), and the curve corresponding to A(s, t) = const (dash-dot curve). The histogram was taken from [7]. The curves are normalized to equal areas.

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