calculations have shown that the eddy-current loss is small compared with the hysteresis loss.

Comparison of the theoretical and experimental curves (see Fig. 1) has shown the following:

a) In the region $H_0/H_{c2} \sim 1$ the experimental plot of $-4\pi M_c(H_0/H_{c2})$ agrees qualitatively with the theory [2].

b) When $H_0 \to H_{c3}$ the experimental data deviate markedly from those predicted by the theory [2,3].

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FEASIBILITY OF GENERATING AND RECEIVING COHERENT GRAVITATIONAL WAVES BY OPTICALLY "CLOSED" SYSTEMS

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We discuss the possibility of creating a superradiating gravitational state (SGS) of quantum systems [2] that are in a super-nonradiating electromagnetic state (NES) [2]. The latter denotes that the quantum emits under certain conditions photons at a power lower than the power of spontaneous emission of an isolated particle.

The ratio of gravitational and electromagnetic power ($I^{(g)}$ and $I^{(e)}$) radiated by free particles in free space in interatomic and internuclear transitions are respectively $\eta = I^{(g)}/I^{(e)} \sim 10^{-42}$ and 10^{-36}. It was shown in [2] that the use of lasers increases η by a factor $N_c\lambda^3Q$ as a result of a decrease in the spontaneous electromagnetic radiation in the resonator, and by a factor $\tau_p\tau^{-1}N$ as a result of retaining the photons in the resonator (N_c - number of resonator modes, Q - resonator figure of merit, λ - photon wavelength, τ_p and τ - photon lifetime in resonator and duration of particle phosphorescence in free space, respectively, and N - number of particles). As a result the total increase in η may be by 10^{15} - 10^{20} times. In addition, $I^{(g)}$ increases by $\sim N$ times as a result of the coherence of the gravitational waves.

Further increase of η can be obtained by using the directional property of radiation from large systems. The intensity of the coherent part of the spontaneous emission of such systems is (ξ = e or g)

$$I^{(\xi)} \sim \int I_0^{(\xi)}(\mathbf{k}) \sum_{p\neq q} \{ \exp | i[(\mathbf{k} - \sum_{\zeta,\theta} a_{\zeta\theta}\mathbf{k}_{\zeta\theta})\mathbf{r}_p]| \exp|-i[(\mathbf{k} - \sum_{\zeta,\theta} a_{\zeta\theta}\mathbf{k}_{\zeta\theta})\mathbf{r}_q]|\} d\Omega, \qquad (1)$$

where $I_0^{(\xi)}(\vec{k})$ is the spontaneous-emission intensity in a unit solid angle Ω in the direction of the wave vector $\vec{k}$, $\vec{r}_p$ and $\vec{r}_q$ are the radius-vectors of the radiating particles, $a_{\zeta\theta}$ are integers on the order of unity, and $\vec{k}_{\zeta\theta}$ are the wave vectors of the exciting electromagnetic pulses (ζ - serial number of pulse sequence, and θ numbers the wave vectors within the limits of one pulse in the case of multiquantum excitation). An essential feature is that the dependence of $I_0^{(\xi)}(\vec{k})$ on the direction of $\vec{k}$ is determined only by the multipolarity of the transition and by the nature of the generated radiation, whereas the sum $\sum_{p\neq q}\{\ \}$ has a sharply pronounced maximum in the direction $\vec{k} = \sum_{\zeta,\theta} a_{\zeta\theta}\vec{k}_{\zeta\theta}$, determined fully the character of the external excitation. It is therefore possible to select the excitation in such a way that the sum $\sum_{p\neq q}\{\ \}$ will have a maximum in a direction $\vec{n}_0$ for which $I_0^{(e)}(\vec{k}_0^{(e)}) = 0$. If we use levels for which only quadrupole electromagnetic transitions are allowed, then $I_0^{(g)}(\vec{k}_0^{(g)})$ has a maximum in the direction where $I_0^{(e)}(\vec{k}_0^{(e)}) = 0$ [3]. If we now excite the system in such a way that the maximum of the sum $\sum_{p\neq q}\{\ \}$ coincides with the direction of $\vec{n}_0$, we simultaneously obtain by the same token SGS and "close" the system to electromagnetic radiation in the $\vec{n}_0$ direction; $\vec{k}_0^{(e)}$ and $\vec{k}_0^{(g)}$ are respectively the wave vectors of the photon and graviton, $\vec{k}_0^{(\xi)} = |\vec{k}^{(\xi)}|\vec{n}^0$, ξ = e or g; $|\vec{k}^{(\xi)}| = k^{(\xi)}$.

It must be borne in mind that in a substance with a dielectric constant $|\varepsilon| \neq 1$ we can have $k^{(g)} \neq k^{(e)}$ for the same transition frequency ν_0. Therefore, to satisfy the equality $\vec{k}^{(g)} = \sum_{\zeta,\theta} a_{\zeta\theta}\vec{k}_{\zeta\theta}^{(e)}$ it is necessary to use two-quantum excitation. For example, it is possible to excite the system simultaneously by two laser pulses with $\vec{k}_{11}^{(e)} = k_{11}^{(e)}\vec{n}_0$ and $\vec{k}_{12}^{(e)} = -k_{12}^{(e)}\vec{n}_0$ with carrier frequencies $\nu_{11} = \nu_0/2(1/\sqrt{\varepsilon} + 1)$ and $\nu_{12} = \nu_0/2(1 - 1/\sqrt{\varepsilon})$. Two-quantum electromagnetic excitation is physically equivalent to a certain effective frequency $\nu_0 = \nu_{11} + \nu_{12}$ and $k\vec{n}_0 = \vec{k}^{(g)}$. Then, according to (1),

$$I^{(t)} \sim I_0^{(t)}(k^{(t)}\mathbf{n}_0)\, N^2 \left(\frac{c}{L\nu_0}\right)^2 \sin^2\phi, \quad \phi \sim \hbar^{-2}\nu_0^{-1} E_{11} E_{12} \mu^2 \Delta t, \tag{2}$$

where c is the speed of light in vacuum, E_{11} and E_{12} the light-wave electric field intensities, μ the electric dipole matrix element, Δt the duration of the exciting pulse, and L the length of the sample in the $\vec{n}_0$ direction.

Formula (2) coincides in form with the result of [1], but it was obtained with allowance for the difference between the photon and graviton velocities in matter with the superradiating electromagnetic state (SES) completely excluded, thus increasing η by another $N(c/L\nu_0)^2$ times (for $N = 10^{19}$, L = 1 cm, and ν_0 = 3 10 sec^{-1} we get an additional increase of η by 10^9 times). We recall that there is no electromagnetic radiation at frequency ν_0 at all in the $\vec{n}_0$ direction.

To prevent occurrence of superradiating electromagnetic generation, it is convenient to excite gravitational echoes in the two-quantum mode. Since the echo is not produced immediately after the termination of the exciting pulses, but after a time lapse $t < T_2$, the excitation can be carried out in space with modes at frequencies ν_{11} and ν_{12}, and the echo will be observed in an electromagnetic resonator supporting no modes at the frequencies ν_{11}, ν_{12}, and ν_0. Here T_2 is the time of phase relaxation ($T_2 \sim 10^{-6}$ sec in $Al_2O_3:Cr^{3+}$ at a Cr^{3+} concentration on the order of 10^{-3}). In the ideal limit when the electromagnetic radiation at frequencies ν_{11}, ν_{12}, and ν_0 are completely eliminated it is possible to obtain $\eta >> 1$.

It is best to receive pulses of coherent gravitational waves with the aid of analogous quantum systems in the following manner: We first excite an SES which decays after a time $T_2^* << T_2$ as a result of inhomogeneities of the local fields [4]. By the same token we obtain a system in which are stored energy and information on the phase and on the wave vectors of the exciting pulse, making directional reception possible. At an instant of time $T_2^* < t < T_2$ this system is subject to pulses of gravitational and laser beams, in which the directions of the wave vectors and the frequencies are such that an SES is produced in the system. After a time 2t the system begins to generate, in the required direction, coherent electromagnetic waves whose intensity is given by Eq. (3) of [1]. In such a method of reception, the gravitational pulse serves as the mean that permits, at the required instant of time and in the required direction, the release of the energy stored in the receiver. As shown in [2,5], in regular lattices containing excited nuclei SES and NES can spontaneously occur for γ quanta, and consequently SGS can occur at the frequency of the γ quanta relative to the nucleonic mass quadrupoles. The nuclei in a specially selected lattice can be polarized in such a way that SGS are produced in the $\vec{n}_0$ direction and there are no directions for which SES can occur. In superdense matter, where $\lambda^2 L^{-2} N > 1$(λ - wavelength of γ quanta) the lattice can be arbitrary. when the number of excited nuclei is approximately 10^{10} and $\nu_0 = 10^{18}$ sec^{-1} it is possible to obtain from the receiver one count in 10^3 sec.

It is stated in [6] that owing to the difference in the angular distributions of the radiation intensities of the mass and electric quadrupoles it is impossible to excite high-frequency radiation by means of an alternating electric field. This statement is incorrect: first, directions exist along which both the mass and the electric quadrupole radiate; second, in [1] we considered excitation of a mass quadrupole by means of an electric dipole transition, making it possible to let the mass quadrupole to emit at maximum intensity.

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WAVE FUNCTIONS OF BARYONS AND FUNDAMENTALS OF QUARK DYNAMICS

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In the quark model, the baryons are classified according to their orbital angular momenta L. It is accepted as an empirical fact that the baryon parity is $P = (-1)^L$ [1]. We show in this article that the parity of a three-particle system (without internal parity) is $P = (-1)^k$, where k is the projection of L on the running perpendicular to the particle plane, and that