Taking into account the fact that a maser with magnetic field of the order of 10^3 Oe has already been constructed [3], the superposition of an electrostatic field (1), reaching an order of 10^4 V at r = 1, should result in a more intense source, emitting electromagnetic waves with wavelength on the order of 10 cm.

We note that in the relativistic (and especially the ultrarelativistic) case, as in the case of the "radiating" electron (see [4]), we can use higher multipoles, i.e., start operating with shorter wavelengths.

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CORRELATION OF INTERNAL-CONVERSION ELECTRON POLARIZATION

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The polarization state of internal-conversion electrons emitted in nuclear cascade transitions is determined by a correlation function $W(\vec{\nu}_1, \vec{\nu}_2, \vec{\zeta})$ which depends on the rest-frame directions of the first and second emitted particles $\vec{\nu}_1$ and $\vec{\nu}_2$ and of the polarization vector $\vec{\zeta}$. The calculation of such a correlation function with exact account of the Coulomb field of the nucleus is a rather complicated problem. There are at present no tables of "particle parameters" determining the correlation of the polarizations, and the existing [1] general formulas do not make it easy to obtain numerical values of these parameters. The need for numerically integrating radial integrals and the nontrivial kinematics of the rotation-group representations makes the calculation quite laborious.

However, by using the Furry-Sommerfeld-Maue approximation (cf. the bibliography in [2]), we can obtain for the polarization-dependent particle parameters, by relatively simple means, formulas that can be readily reduced to numerical form.

In this paper we present the results of calculations in this approximation.

If the correlation function of the directions of the double cascade "pure multipole γ transition - mixed 2^L magnetic + 2^{L+1} electric conversion transition on the K shell" is written in the form

$$W_{\gamma-e}(\vec{\nu}_\gamma, \vec{\nu}_e) = W^{I}(\vec{\nu}_\gamma, \vec{\nu}_e) + \delta W^{II}(\vec{\nu}_\gamma, \vec{\nu}_e) + \delta^2 W^{III}(\vec{\nu}_\gamma, \vec{\nu}_e), \qquad (1)$$

$$W^{J}(\vec{\nu}_\gamma, \vec{\nu}_e) = \sum_S B_S^J P_S(\cos\theta), \quad \cos\theta = (\vec{\nu}_\gamma, \vec{\nu}_e), \quad J = I, II, III, \qquad (2)$$

where δ is the ratio of the mixture in the mixed transition and $\vec{\nu}_\gamma$ and $\vec{\nu}_e$ are the photon and conversion-electron emission directions, then the polarization-dependent correlation function is determined by relation (1), in which the quantities $W^j(\vec{v}_\gamma, \vec{v}_e)$ must be replaced by

$$W^j(\vec{v}_\gamma, \vec{v}_e, \vec{\zeta}) = \sum_S B_S^j \{P_S(\cos\theta) + \Delta_S^j \frac{P_S^{(1)}(\cos\theta)}{(\sin\theta)} \vec{\zeta}[\vec{v}_\gamma \times \vec{v}_e]\}, \quad (3)$$

where

$$\Delta_S^I = \frac{\sqrt{\frac{(2L+1)(2S+1)}{S(S+1)}} \begin{Bmatrix} S & L & L \\ L & S & 1 \end{Bmatrix} 2\,\mathrm{Im}\,(H_L^0 F_L^{0*})}{|H_L^0|^2 - (2L+1)\begin{Bmatrix} L & L & S \\ L & L & 1 \end{Bmatrix} |F_L^0|^2} \quad (4)$$

determines the correlation function for the pure multipole transition of the magnetic type, and

$$\Delta_S^{II} = \frac{C_{L0,L+10}^{S-10}\left[\sqrt{\frac{2L+1}{S}}\begin{Bmatrix} S & L & L+1 \\ L & S-1 & 1 \end{Bmatrix}\mathrm{Im}(F_L^0 H_{L+1}^{1*}) + \sqrt{\frac{2L+3}{S}}\begin{Bmatrix} S & L+1 & L \\ L+1 & S-1 & 1 \end{Bmatrix}\mathrm{Im}(F_{L+1}^1 H^{0*})\right]}{\frac{S+1}{2S+1}\sqrt{\frac{2L+1}{L+2}}\begin{Bmatrix} L+1 & L & S \\ L & L & 1 \end{Bmatrix} C_{L0;L0}^{S0}\,\mathrm{Re}(F_L^0 \cdot F_{L+1}^{1*})} \quad (5)$$

determines the interference part.

The quantity D_S^{III}, which determines the correlation function for a pure multipole transition of the electric type, is obtained from Δ_S^I by replacing L with L + 1 and H_L^0 and F_L^0 with H_{L+1}^1 and F_{L+1}^1.

The functions H_L^λ and F_L^λ are connected with the quantities P, Q, and R given in [2]:

$$F_L^1 = \frac{L}{2L+1}(R_2 + R_3) - P_1 + iP_3\,, \quad (6)$$

$$H_L^1 = \sqrt{\frac{L}{L+1}}\left\{R_1 - i\frac{L}{2L+1}R_2 + i\frac{L+1}{2L+1}R_3 + iP_1 - P_2\right\}, \quad (7)$$

$$F_L^0 = Q_1 - \frac{L+1}{2L+1}Q_2 - \frac{L}{2L+1}Q_3\,, \quad H_L^0 = \frac{\sqrt{L(L+1)}}{2L+1}(Q_2 - Q_3)\,. \quad (8)$$

It follows from (4) and (5) that the dependence of the correlation function on the polarization $\vec{\zeta}$ disappears if F_L^λ and H_L^λ remain real, as is the case in the Born approximation. In addition, these relations show that the polarization dependence occurs also in the case of pure multipole transitions, unlike the polarization correlation of spin-1/2 particles produced in nuclear reactions [3].

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