THE KINETICS OF THE PAIR CREATION IN A STRONG ELECTRO- MAGNETIC FIELDS

S.M.Schmidt, D.V.Vinnik[1],
A.V.Reichel, S.A.Smolyansky and A.V. Tarakanov[2],

(1) Institute of Theoretical Physics, Tuebingen University, auf der Morgenstelle, 14, 72076 Tuebingen, Germany, (2) Physics Department, Saratov State University, 410071, Saratov, Russia.

It were research some dynamical features of the process of electron- positron vacuum creation under combined action of strong external electromagnetic fields: a periodic time-dependent space- homogeneous electric field and collinear with one a constant magnetic field, so that $A^{\mu}(\bar{x},t) = (0,0,-Hx^1, A^3(t) = A(t))$ and hence $\bar{E}(t) = (0,0,E^3(t) = -\frac{dA^3(t)}{dt})$, and $\bar{H} = (0,0,H)$. In that case the Dirac equation allows the total variables separation [1]. By of the time - dependent Bogolubov's transformation it pass to the quasiparticle description [2] and allow to get the kinetic equation for the distribution function of the quasiparticles on the basis of nonpertubative method [3]

$$\dot{f}_{nr}(p^2,P,t) = \frac{1}{2}w_{nr}(P,t)\int_{-\infty}^{t} dt' w_{nr}(P(t,t'),t')[1-2f_{nr}(P,t')]cos\{2\int_{t'}^{t} d\tau \omega_{nr}(t,t')\}. \quad (1)$$

Where $P(t,t') = P - e\int_{t'}^{t} d\tau E(t)$, $w_{nr}(P,t) = \frac{eE(t)\varepsilon_{nr}}{\varepsilon_{nr}^2+P^2}$, $\varepsilon_{nr}^2 = m^2 + eH[1+2n+(-1)^r]$. As it fellows from Eq. (1) $f_{nr}(p^2,P,t) = f_{nr}(P,t)$ describes the p^2degenerate projection of system states. Besides, the effective wide of the vacuum gap remains as minimal one $\Delta = 2m$ in the state $n=0, r=1$. These two features lead to effective growth of intensity of vacuum particle creation at the increase of magnetic field strength. This fact is well known for static field [1,2]. We study this effect in the dynamical regime here. On the Fig. it is showed the change of the number density as the result of the switching on the magnetic field for the case of the $E(t) = E_0 \sin \Omega t$.

[1] A.I.Nikishov, JETPh, **57**, 1210 (1969).
[2] A.A.Grib, S.G.Mamaev and V.M.Mostepanenko, *Vacuum quantum effects in strong external fields*, (Atomizdat, Moscow, 1988).
[3] S.A.Smolyansky et. all, hep- ph /9712377; S.M.Schmidt et. all, Int. J. Mod. Phys., E7, 709 (1998); Phys. Rev., D59, 094005 (1999).