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The production of particles with well determined angular momentum in external Coulomb field on de Sitter expanding universe

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We study pair production processes from vacuum of scalar particles and fermions in the presence of an external Coulomb field on de Sitter expanding universe assuming that, the quantum fields are minimally coupled with gravity. Our study is done in the chart with spherical space coordinates and the produced particles are described by the spherical wave solutions of the field equations. In this chart we define the transition amplitude in the first order of perturbation theory and we obtain for the first time the dependence of the probability on the angular quantum numbers. Our analytical results show that, the angular momentum of the produced particles is conserved in the sense that the quantum numbers are related trough the following relations: l= l' and m= -m'. Our graphical results show that, the most probable transitions are those that generate particles with small angular momentum. We obtain that, this process is significant when the Hubble's constant is large and vanishes in the Minkowski limit.

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