THE PHOTON-PLASMON TRANSITIONS AND DIAGNOSTICS OF THE SPACE PLASMA TURBULENCE

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Energy approach in QED theory [1] is applied to modelling photon-plasmon transitions with emission of photon and Langmuir quanta in the astrophysical plasma. It is well known that the positronium Ps is an exotic hydrogen isotope with ground state binding energy of 6.8 eV. The ortho-*Ps* atom has a metastable state 2^3s_1 and probability of two-photon transition to 1^3s_1 state 0,0018 $s^{-1.}$. In space plasma there is the competition process of destruction of the metastable level - the photon-plasmon transition 2s-1s with emission of a photon and a Langmuir quanta. We performed the estimate of the probability of the photon-plasmon transition in the Ps within the energy approach [1]. Standard S-matrix calculation with using an expression for tensor of dielectric permeability of the isotropic plasma and dispersion relationships for transverse and Langmuir waves allows getting the corresponding probability *P*(*ph ¡ pl*). Numerical value of *P*(*ph- pl*) is $5{,}2\cdot10^6$ s^{-1}, where *U* is density of the Langmuir waves energy. Our value is correlated with the estimate [2]: *P*(*ph- pl*) is $6\cdot10^6$ s^{-1}Comparison of obtained probability with lifetime *t* (3γ) allows getting the condition of predominance of photon-plasmon transition over 3-photon annihilation. The considered transition may control the population of 2*s* level and search of the long-lived Ps state can be used for diagnostics of the astrophysical plasma turbulence [3].

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