Influence of photon-neutrino processes on the magnetar cooling

M. V. Chistyakov*, D. A. Rumyantsev†

Yaroslavl State (P.G. Demidov) University

The photon-neutrino processes $\gamma e^\pm \rightarrow e^\pm \nu \bar{\nu}$, $\gamma \rightarrow \nu \bar{\nu}$ and $\gamma \gamma \rightarrow \nu \bar{\nu}$ are investigated in the presence of a strongly magnetized dense electron-positron plasma. The amplitudes of the reactions $\gamma e^\pm \rightarrow e^\pm \nu \bar{\nu}$ and $\gamma \gamma \rightarrow \nu \bar{\nu}$ are obtained for the first time. In the case of a cold degenerate plasma, contributions of these processes to the neutrino emissivity are calculated. It is shown, that the contribution of the process $\gamma \gamma \rightarrow \nu \bar{\nu}$ to the neutrino emissivity is suppressed in comparison with the contributions of the processes $\gamma e^\pm \rightarrow e^\pm \nu \bar{\nu}$ and $\gamma \rightarrow \nu \bar{\nu}$. The constraint on the magnetic field strength in the magnetar outer crust is obtained.

*E-mail: mch@uniyar.ac.ru
†E-mail: rda@uniyar.ac.ru