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Author

Dyakonova, N (Dyakonova, N.); El Fatimy, A (El Fatimy, A.); Meziani, Y (Meziani, Y.); Coquillat, D (Coquillat, D.); Knap, W (Knap, W.); Teppe, F (Teppe, F.); Buzatu, P (Buzatu, P.); Diforte-Poisson, MA (Diforte-Poisson, M. -A.); Dua, C (Dua, C.); Piotrowicz, S (Piotrowicz, S.); Morvan, E (Morvan, E.); Delage, SL (Delage, S. L.)

Title

THz Emission Related to Hot Plasmons and Plasma Wave Instability in Field Effect Transistors

Source

ACTA PHYSICA POLONICA A, vol.120,no.5. NOV 2011, 924-926.

Abstract

The current flowing in two-dimensional channel of field effect transistors can generate different types of charge density perturbations. They can have a form of uncorrelated hot plasmons or plasma waves. The mechanism of plasma wave generation depends on the parameter omega t and on boundary conditions of the channel. At omega t << 1 only hot plasmons can be generated. The THz emission due to radiative decay of hot plasmons has a broad spectrum and can be only poorly controlled by the transistor gate. The tunability of THz emission can be obtained in the case of the Dyakonov-Shur plasma wave instability. In this work we present experimental studies of THz emission in InGaP/InGaAs/GaAs and GaN/AlGaN based field effect transistors. We report on two types of emission onset: (i) a smooth one typical for hot plasmons generation and (ii) threshold-like one characteristic for plasma waves instabilities. The tunability and spectra of emission change depending on the transistor configuration. We discuss the results suggesting several possible mechanisms of plasma wave excitation.