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Investigating the resonant response of a field-effect transistor subjected to an ac signal MANVIR KUSHWAHA, Institute of Physics, University of Puebla, Mexico — A theoretical investigation is made of the response of a field-effect transistor (FET) to an incoming electromagnetic radiation in the presence of a perpendicular magnetic field within the framework of hydrodynamics. The treatment is valid for a nondegenerate electron gas in which the mean free path for electron-electron scattering λ_{ee} is much smaller than the device length L and than the mean free path due to collisions with impurities and/or phonons λ_{coll}. These requirements, written as $\lambda_{ee} \ll L \ll \lambda_{coll}$, are fulfilled for magnetic fields weak enough to prevent Landau quantization. It is our general observation that the shorter device lengths, weaker magnetic fields, and lower temperatures (or higher electron mobility) are most favorable to achieve a greater resonant response of the device to an ac signal. Such resonant response makes FET a promising device for new types of sources, detectors, mixers, and multipliers in the GHz and THz frequency range.

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