Description of Universe accelerating expansion without dark energy

L.M. Tomilchik
Laboratory of Theoretical Physics, Institute of Physics NAS Belarus, Minsk, Belarus,
e-mail: lmt@dragon.bas-net.by

It is shown on the basis of exactly conformally invariant one-particle Lagrangien model that the observable dark energy effect be, in principle, interpreted as manifestation of the observers's reference frame noninertiality.

Exploiting carrier lifetimes for optimizing the dynamic response of quantum-dot lasers

K. Luedge, B. Lingnau, E. Scholl
Institut fur Theoretische Physik, Technische Universitat Berlin, Berlin, Germany,
e-mail: luedge@physik.tu-berlin.de

Quantum-dot (QD) laser devices offer a variety of advantages over conventional quantum-well (QW) lasers due to their low threshold currents and their high temperature stability. In general, QD lasers show strongly damped relaxation oscillations (RO) after an electric pump pulse, which decreases their sensitivity to optical feedback. On the other hand, the possibility for fast dynamic response to an electrically modulated pump current is limited by the small RO frequency and the strong damping of the RO oscillations. The resulting comparably low modulation bandwidth of QD lasers is often attributed to the slow charge carrier capture into the QDs. However, we show that this is in fact not the limiting process, as the impact of the electron-electron scattering between QD and QW on the damping of the relaxation oscillations (RO) is strongly nonlinear showing a maximum for scattering rates that are on the order of the relaxation oscillation frequency. Exploiting this nonlinearity opens up the possibility to optimize the device performance by either band structure engineering or by careful tuning of the resonator properties. We show that a QD laser device can be operated in three different dynamical regimes depending on the ratio between RO frequency and scattering lifetime between QW and QD states. This is a crucial results for optical as well as electrical modulation properties of the device.

Theoretical study of beam quality improvement in broad area semiconductor devices

M. Radziunas, K. Staliunas
Research Group "Laser Dynamics", Weierstrass Institute, Berlin, Germany,
e-mail: radziuna@wias-berlin.de

Broad area (BA) lasers are robust, compact, high power and highly efficient devices, which, however, suffer from a poor spatial and temporal beam quality.