Merging nanoepitaxy and nanophotonics

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In recent years remarkable progress took place in the fields of nanoepitaxy and nanophotonics:

- Quantum dot (QD) lasers are demonstrated to be degradation-robust with extrapolated lifetime in excess of 10^6 hours at 40^oC for 1300 nm-range single-mode devices.
- QD lasers are shown to be degradation robust also on foreign substrates. 1400-1500 nm devices grown on InGaAs defect-reduced buffers on GaAs substrates operate at 50 mW continuous wave single mode power and on-chip temperature of 70^oC above ~1000 hours without noticeable degradation.
- Ultrashort-pulse mode-locked QD lasers with ultrahigh peak power and low jitter are now available commercially.

Merging of advanced nanoepitaxy with nanophotonics concepts is a next step.

- Merging of the tilted cavity unidirectional photonic crystal and QDs enabled demonstration of Purcell effect in planar microcavities and enables highly-directional light-emitting diodes.
- All-epitaxial tilted cavity concept enabled VCSEL-like wavelength stabilization in high-power edge emitting lasers.

I will also address nanophotonics concepts enabling >40 Gbps low threshold low power consumption VCSELs and other epitaxial nanophotonics issues.