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Quantum-Dot Lasers May Lead to Practical Nanosurgery

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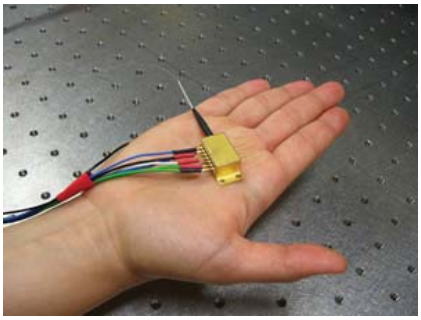

German researchers at Technische Universität Darmstadt have been playing around with a way to quickly tune laser frequencies, a technique that may lead to highly precise laser surgery for life science research and clinical applications.

From the press release:

> Laser action in semiconductor lasers usually starts off with emission of photons corresponding to transitions originating from the lowest energy level. Emission of high energetic, ie short-wavelength, photons does not normally commence until the pumping current has been increased to well above the lasing threshold.
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> Under the EU's FAST-DOT project, researchers from the Semiconductor Optics Group at the Technische Universität Darmstadt's Institute for Applied Physics headed by Prof. Dr. Wolfgang Elsäßer have recently discovered that, under some circumstances, quantum-dot lasers do emit first short-wavelength photons and then long-wavelength photons.
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> Elsäßer explained that "this inverted hierarchy of emission states that we are the first to discover effectively allows generating intentionally custom-tailored wavelengths covering a wavelength range of interest in many applications. Furthermore, the method not only allows switching back and forth between two wavelengths and but also exploiting beneficially effects occurring in the laser systems involved for improving pulse parameters."
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> Quantum-dot lasers operable at high pulse-repetition rates are capable of reaching pulse energies that will allow modification of living cells, eg making accurately controlled incisions in cell structures, while minimizing the attendant effects on cellular environments.
>
> Summarizing their capabilities, Elsäßer said that, "They may be employed as high-precision scalpels, with which cell structures may be parted in controlled manners."
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> In addition, certain cell organelles might be deactivated or individual intracellular or extracellular molecules activated, which would open up unforeseen opportunities in molecular surgery, which allows making incisions two-thousand times finer than a human hair. In the future, these qauntum dot lasers might allow destroying cancer cells very specifically or applying them simultaneously either for corneal surgery or diagnostics.

Press release: Laser Physics Turned Upside Down

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