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NL Nanosemiconductor Announces Mode-Locked Lasers Demonstrating a 5X Improvement in Peak Power

Dortmund, Germany/San Jose, California 30 Sep 2005 – NL Nanosemiconductor GmbH, a leader in the development of semiconductor lasers, announced results that demonstrate 5X greater peak power than have been previously shown for passive monolithic semiconductor mode-locked lasers (MLLs). "This is significant in terms of the performance value for money which these lasers are now able to provide – a host of new applications in the medical, industrial and computer markets can now be enabled." noted Juergen Kurb, NL Nanosemiconductor's CEO.

The team produced the mode-locked lasers with an active region based on self-organized quantum dots (QDs) to create pulses with a peak power over 1 W and a pulse width of 5.1 ps at 30^0C. An increase in the operational temperature was actually found to be favorable for the enhanced mode-locking regime, resulting in a peak power as high as 1.7W at 60^0C with a pulse width of 3.2 ps. The 1.3 μm wavelength devices were measured operating at a frequency of 5 GHz. Similar performance is expected for the wavelength range of 1064nm to 1320 nm using quantum dot (QD) technology.

"We now are approaching the performance level of solid-state lasers, which are much more expensive as compared to diode lasers – all this is done at a fraction of the size and with reduced power requirements due to greater efficiency." said Alexey Kovsh, COO of NL Nanosemiconductor. "Additional benefits include extremely low jitter and amplitude noise as well as a peak pulse energy of up to 5 pJ." The results stem from the team's quantum dot expertise and their unique design approach, combined with the properties of the QD active material used for the short-pulsed lasers. This proprietary approach enables stable mode-locking for a much wider combination of input parameters and operating temperatures than possible with conventional diode lasers. "It seems that QDs were naturally born for mode-locking." observed Dr. Kovsh.

In medicine, such ultra-short pulsed lasers enable precise processing and treatment of biological materials such as hard and soft tissue as well as ablation of extremely thin and small areas without heating surrounding tissue. Medical imaging is another promising area of application which promises to benefit directly from these compact and efficient QD based short-pulsed lasers with high peak power.

In addition, the company is working on a revolutionary new application which involves providing an optical timing source for the coming generations of processors, memory, communications and high-end graphics devices. As clock speeds increase beyond 10 GHz, it becomes increasingly difficult to convey data and timing using copper traces on integrated circuits (ICs) due to signal attenuation, crosstalk and especially heat dissipation. "At 20 GHz it becomes impossible to use the conventional approach. PC system clocks are currently approaching 5 GHz and are expected to exceed 10 GHz by 2008 and reach 20 GHz by 2012[1]." explained Dr. Kovsh. "Now is the time to optimize this technology in anticipation of the inevitable shift in future semiconductors towards internal photonics." emphasized Mr. Kurb, adding "These results indicate that our technology and expertise will be able to meet not only the performance needs, but also the cost requirements of this high volume market."

About NL Nanosemiconductor GmbH (www.nanosemiconductor.com)
Originally spun-out of the Ioffe Physico-Technical Institute in St. Petersburg, Russia, NL Nanosemiconductor offers innovative mode-locked and high power laser semiconductor chips and modules for the medical, industrial and computer markets. Its quantum dot technology and proprietary design concepts enable tangible improvements in cost, performance, and quality in compound semiconductor devices used in opto-electronics.

[1] According to the 2004 forecast by ITRS – International Technology Roadmap for Semiconductors, the "Bible" for how CPU line widths, frequencies, etc. are expected to progress in the coming 10-15 years. See http://public.itrs.net/