

All-Optical Flip-Flop Operation using an AR-coated Distributed Feedback Laser Diode

Koen Huybrechts, Wouter D'Oosterlinck, Geert Morthier, Roel Baets

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Packet switched optical networks are gaining a lot of interest due to the increasing demand for faster internet traffic. Being one of the key building blocks for these optical networks, several concepts for all-optical flip-flops have been proposed but they suffer from disadvantages such as difficult fabrication, high power consumption and slow switching. We propose a new concept for all-optical flip-flop operation consisting of a single AR-coated DFB laser diode.

Under the injection of a CW beam into the laser diode, two stable states can exist. In the first one the laser is lasing and the amplification of the injected beam is low due to gain clamping, resulting in a rather uniform carrier density. In the other state the amplification of the external light is high which causes a strong non-uniformity of the carrier density. It is well-known that this non-uniform distribution may increase the threshold of the DFB laser, ultimately causing the laser to switch off even though the average gain is higher.

One can switch from the lasing state to the non-lasing state by injecting a short and strong optical pulse on one side of the device. Switching from the non-lasing state to the lasing state happens by restoring the spatial uniformity through the injection of a strong and short optical pulse from the opposite direction.

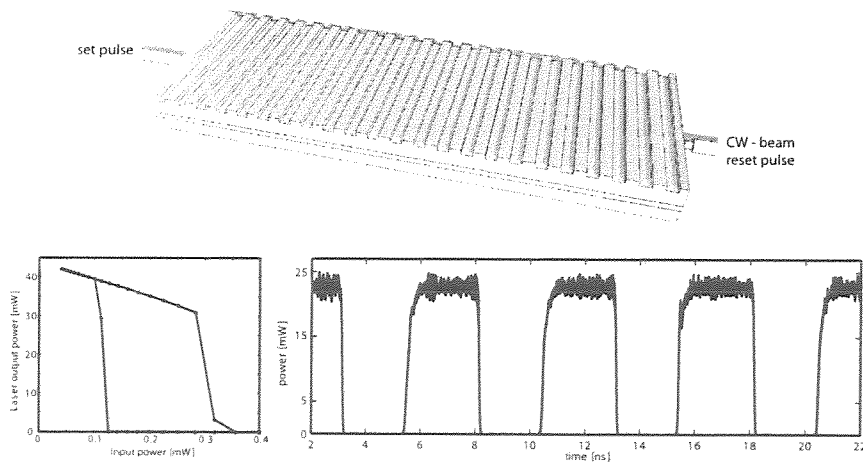


Figure 1: Illustration of the set up (top), lasing power vs. injected power (bottom left) and flip-flop behavior (bottom right).

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3. **Aude-Reine Bellancourt:** First Demonstration of a Modelocked Integrated External-Cavity Surface Emitting Laser (MIXSEL)
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7. **Pietro Binetti:** Membrane couplers and photodetectors for optical interconnections on CMOS ICs
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9. **Mike Bülters:** A Vertical Electroabsorption Transceiver Consisting of Multiple Heterostructures
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15. **Jose David Domenech Gomez:** Analysis of non-uniform integrated optics Bragg gratings using GNU/GPL MEEP FDTD
16. **Rafal Dylewicz:** Inductively coupled plasma etching of GaN using SiCl₄/Cl₂/Ar for submicron-sized features fabrication
17. **Stephen Elsmere:** Fiber Amplification of VECSEL seed pulses
18. **Dimitri Geskus:** Fabrication of optical active devices in KYW:Yb
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20. **Lina Huang:** Statistical study of optical trapping efficiency
21. **Koen Huybrechts:** All-Optical Flip-Flop Operation using an AR-coated Distributed Feedback Laser Diode
22. **Olena Ivanova:** Variational effective index mode solver
23. **Roman Kappeler:** Simulations on Contacting Schemes for Active Photonic Crystals (PhC)
24. **Peter Kaspar:** Electrical Contacts on Active Photonic Crystal Structures
25. **Edwin Klein:** Reconfigurable Optical Router based on vertically coupled thermally tunable Si₃N₄/SiO₂ microring resonators
26. **Abigaël Kok:** Modeling of efficient coupling structures for integration of pillar photonic crystal waveguides with ridge waveguides
27. **Christian Koos:** Ideal Contour Trajectories for Low-Loss Waveguide Bends
28. **Antonio La Porta:** Design of an integrated multiwavelength laser with RF optical modulator for burst-mode transmitters in packet-switching based metropolitan area networks
29. **Maria Latorre:** Bathymetry Analysis by Lidar Signal
30. **Tomas Lauerma:** Modeling of nonlinear propagation in a microring resonator
31. **Szymon Lis:** SiO₂ – TiO₂ Thin Film for Integrated Optics Fabricated by the Sol-Gel Technique
32. **Ping Ma:** Design, Fabrication and Characterization of Photonic Crystal Slab Waveguides for TM-Polarized Light
33. **Deran Maas:** First Demonstration of a Modelocked Integrated External-Cavity Surface Emitting Laser (MIXSEL)
34. **Antonio Malacarne:** An optical Flip-Flop Based on Erbium-Ytterbium Doped Fibre
35. **Fabien Mandorlo:** Integration of a CMOS compatible electrically pumped InP based micro laser
36. **Milan Marell:** Non-linear behavior in quantum-well polarization converters

Poster Session 2

37. **Ahmad Rifqi Md Zain:** Tapered Periodic Photonic Crystal (PhC) micro-cavity filters embedded in a ridge waveguides
38. **Gabor Mezosi:** Semiconductor Ring Laser Bistables
39. **Pascual Munoz:** Design of Multiwavelength Arrayed Waveguide Sagnac Interferometer-based Terahertz Optical Add Drop multiplexers
40. **Paolo Navaretti:** 1.3 μm all-GaNAs modelocked VECSEL
41. **Patrick Nedel:** Fabrication of Photonic Quantum Information Devices based on InAs Quantum Dots and GaAs Photonic Crystals
42. **Guido Piaszenski:** 3D pattern definition via UV-Nanoimprint Lithography
43. **Roberto Proietti:** Unrepeated 16x10 Gb/s DPSK transmission over 140 km single-mode fiber by means of two commercial SOAs
44. **Antonio Quattieri:** Colloidal nanocrystals air bridge fabricated by direct lithography
45. **Adrian Quarterman:** Active stabilisation of VECSEL sources
46. **Roxana Ileana Rebigan:**
47. **Lars Rindorf:** Integrated photonic crystal fibers for biosensing and photonic components
48. **Gunther Roelkens:** A die-to-wafer bonding approach to photonics integration
49. **Richard Royce:** Lasing characteristics and physical properties of 1.3 μm emitting modulation doped quantum dot lasers.
50. **Benjamin Rudin:** First Demonstration of a Modelocked Integrated Absorber External-Cavity Surface Emitting Laser (MIXSEL)
51. **Jonathan Schrauwen:** Focused ion beam fabrication of photonic structures in silicon-on-insulator
52. **Ekber Selcuk:** Guided self-organized anisotropic strain engineering through step engineering on shallow-patterned substrates for complex quantum dot ordering
53. **Yaocheng Shi:** Carrier lifetimes in dry-etched InP-based photonic crystals
54. **Joanna Skiba-Szymanska:** Record high nuclear magnetic field in a 40 nm InP quantum dot
55. **Nut Sritirawisarn:** Surface morphology induced InAs quantum dash-dot shape transition on InGaAsP/InP (100)
56. **Tiziana Stomeo:** Integrated Photonic Crystal devices in InP-membrane for metropolitan optical networks
57. **Patric Strasser:** Photonic crystal etching process characterization: Losses, carrier lifetime and surface roughness
58. **Mikael Svalgaard:** High precision AFM characterization of planar photonic crystals
59. **Dominik Szymanski:** Ultrafast all optical switching using photonic crystals integrated into a Mach Zehnder interferometer
60. **George The:** Single-photon detectors for multiple-photon number resolution and other applications
61. **Ruth Thompson:** Ultra-Compact Integrated Interferometric Devices for Pulse Regeneration
62. **Mark Thompson:** Pulse Generation in Quantum Dot Laser Diodes
63. **Frederik Van Laere:** Polarization diversity and wavelength monitoring in BCB-bonded InP-membranes.
64. **Wouter Van Parys:** Transparent amplifying waveguide optical isolator
65. **Kristof Vandoorne:** A Photonic Implementation of Reservoir Computing
66. **Yongqiang Wei:** 10 Gb/s modulation of 1.3 μm GaInNAs lasers up to 110 $^{\circ}\text{C}$
67. **Christopher Wiesmann:** Altering the Radiation Pattern of Light Emitting Diodes by 2D Photonic Crystals
68. **Georg Winzer:** Low birefringence Mach-Zehnder-Delay Interferometer on Silicon-on-Insulator (SOI) substrates
69. **Ling XU:** A reflective transceiver at 1.55 μm for the access network
70. **Jing Yang:** Judd-Ofelt Analysis of Nd(TTA)₃Phen-doped 6-FDA/Epoxy Planar Waveguides
71. **Hua Zhang:** Fabrication, Electrical and Optical Characterisation of Terahertz Microdisk Quantum Cascade Lasers
72. **D Zhou:** Position and Number Control of InAs Quantum Dots Grown on Truncated InP Pyramids by SA MOVPE