Ueno Laboratory, National University of Electro-Communications, Tokyo, Japan

Research Themes in FY2008-FY2011

2009/11/19 Yoshiyasu Ueno
2010/01/06 Yoshiyasu Ueno

(1) Innovative device-schemes research with using optical semiconductor materials, for both accelerating all-optical gates and for saving their dc-electric-energy consumptions

ref: Ueno 2009, http://www.ultrafast.ee.uec.ac.jp/pubs/ueno-apmp2009.pdf

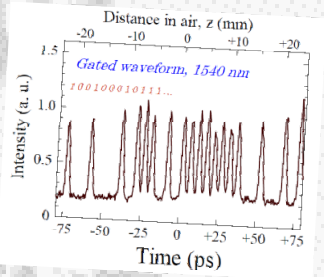
(a) Physical modeling for reducing the electric-energy consumption level
of all-optical gates, with optically accelerating the gates (for 10-200 Gb/s and 1-10 pJ/bit). --- new idea in the world
ref: Sakaguchi et al. 2007, http://www.ultrafast.ee.uec.ac.jp/pubs/sakaguchi-optics-express2007.pdf
Sakaguchi PhD thesis 2008, http://www.ultrafast.ee.uec.ac.jp/pubs/sakaguchi-thesis2008.pdf

(b) Optical frequency synthesis, for compensating for
ultrafast material's inherently distorted relaxation behaviors (for 300G and beyond). --- new idea in the world
ref: Nishida et al. 2009, http://www.ultrafast.ee.uec.ac.jp/pubs/nishida-ieee-leos2009.pdf

(c) Optical XOR gating, with building ultrafast data generators and their monitoring systems,
for getting closer to practical future-applications.

(d) Ultrahigh-presicion, ultrafast, tunable, optical frequency comb-clock generation. --- new idea in the world
ref: Suzuki et al. 2006, http://www.ultrafast.ee.uec.ac.jp/pubs/suzuki-cleo2006.pdf

Our Annual Report:
http://www.ultrafast.ee.uec.ac.jp/annual.pdf
Next-generation visions under studies:
200-300Gb/s speed
near or less than 1pJ/bit energy (dc-bias energy)
future integration (100-1,000 gates)



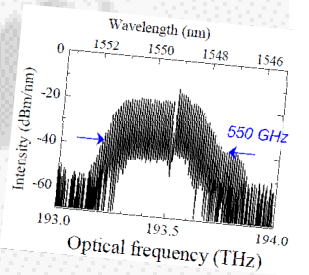
(2) More applied-physics research on optical semiconductor materials

(*) with custom-ordered and commercial SOA chips from top-level vendor companies CIP (UK) and InPhenix (USA).

(a) Characterizing gate transmittance in degenerate-frequency input scheme --- continuing as a part of research (1)(d)

(b) Characterizing degree of optical acceleration in original degenerate-frequency input scheme, with respect to that in
conventional non-degenerate-frequency input scheme. ref: Yamaji et al. 2008-2009 (unpublished). --- new idea in the world

(c) Characterizing the unknown upper limits of all-optical gate speeds,
being influenced by electron's equilibrium-temperature relaxation processes



(3) Original developments of our ultrafast, experimental facility and techniques

(a) Home-made pump-and-probe, optical heterodyne characterization techniques with sub-picosecond temporal resolution,
for any fast materials in wavelength range from 1.1 to 1.7 microns. ref: Salleras et al. 2007, http://www.ultrafast.ee.uec.ac.jp/pubs/honma-aict2007.pdf
http://www1.ttcn.ne.jp/gagnon/research-activities.html#pump-and-probe
(b) Home-made broad-band optical-gain-spectrum characterization tequniques, for characterizing more broadly than conventional C band.
(c) High-stability, high-density-electron injection techniques, for dc-biasing electron-hole density with strongly accelerating the gates.
(d) Optical data multiplexing and waveform monitoring techniques,
for our experiments with 200-Gb/s optical signals and beyond.
(e) Numerical simulators, for modeling the core parts of our devices and experiments
ref: Ueno, Toyoda et al. 2006, http://www.ultrafast.ee.uec.ac.jp/pubs/ueno-toyoda-pdsmz-oe2006.pdf
Ueno, Nakamoto et al. 2006, http://www.ultrafast.ee.uec.ac.jp/pubs/nakamoto-optics-express2006.pdf

Other optics professors (as of 2007),
in our National University of Electro-Communications, UEC
http://www.ultrafast.ee.uec.ac.jp/pubs/coherent_members_e.pdf