

## Book reviews

### Picosecond Electronics and Optoelectronics

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[pp. i-x + 258, with 202 Figs.]

The book reviewed covers the problems presented at the first national Picosecond Electronics and Optoelectronics Conference in which more than 240 participants took part. The problems discussed are arranged in the following way:

1. *Ultrafast optics and electronics.*
2. *High-speed phenomena in bulk semiconductors.*
3. *Quantum structures and applications.*
4. *Picosecond diode lasers.*
5. *Optoelectronics and photoconductive switching.*
6. *Cryoelectronics.*

In the last few years an essential progress in ultrarapid light pulse generation has been observed. Special systems of either dye and semiconductor lasers or nonlinear comparison lines make it possible to obtain light pulses of duration of about  $10 \times 10^{15}$  s, in other words, of 10 fs (!), whereas the semiconductor systems elaborated in the field of microelectronics enable the modulation of 20 GHz frequency, and the switching effects in the junctions may occur also in the time of order of picoseconds. Thus, a kind of both rapprochement and mutual penetration of optics and electronics took place in the domain of microsystems working in the picosecond domain. It is rather difficult to review a book which is a selection of a large number of contributing papers. Most of them are communications concerning particular problems. Only the papers, by D. H. AUSTON et al., *Ultrafast optical electronics: From femtoseconds to terahertz*, and N. CHAND and H. MARKOC, *Prospects of high-speed semiconductor devices*, treat the subject in a more general way.

Femtosecond optics enables examination of electronic processes in semiconductor materials and electronic systems and, in particular, examination of photoconducting materials as well as those displaying electrooptic effects. The materials showing electrooptic effect may play part of effective sources of very short electromagnetic transients based on inverse electrooptic effect. As to the semiconductor materials they are used in heterojunctions GaAs/AlGaAs (MODFET transistor), heterojunction bipolar transistor (HBT), resonant tunnelling devices and hot electron transistors with semiconductor or metal base. A good insight into the subject matter of the conference is given by the very titles of the selected papers, i.e.:

- R. CASTAGNE, G. NUZILLAT, *GaAs integrated circuit technology for high speed analog and digital electronics*,
- K. E. MEYER, G. A. MOUROU, *Two dimensional E-field mapping with subpicosecond resolution*,
- B. H. KOLNER, K. J. WEINGARTEN, M. J. W. RODWELL, D. M. BLOOM, *Picosecond electronics sampling and harmonic mixing in GaAs*,

- S. WILLIAMSON, G. MOUROU, *Picosecond electro-electron optic oscilloscope,*
- J. M. WIESENFELD, *Acoustic phonon generation in the picosecond dynamics of dense electron-hole plasmas in InGaAsP films,*
- R. D. BURNHAM, W. STREIFER, T. L. PAOLI, R. L. THORNTON, D. L. SMITH, *Properties of GaAlAs/GaAs quantum well heterostructures grown by metalorganic chemical vapor deposition,*
- J. HO, R. O. GRONDIN, *Hot electron diffusion in superlattices,*
- M. IZUTSU, H. HAGA, T. SUETA, *Ultrafast travelling-wave light modulators with reduced velocity mismatch,*
- L. M. WALPITA, W. S. C. CHANG, H. H. WIEDER, T. E. VAN ECK, *Modulation of an optical beam by a second optical beam in biased semi-insulating GaAs,*
- J. E. BOWERS, C. A. BURRUS, R. S. TUCKER, *22-GHz bandwidth InGaAs/InP PIN photodiodes,*
- R. A. LAWTON, *Pulse waveform standards for electro-optics,*
- C. S. CHAND, M. J. RHEE, C. H. LEE, A. ROSEN, H. DAVIS, *Kilovolt sequential waveform generation by picosecond optoelectronic switching in silicon,*
- J. ETCHEPARE, I. THOMAZEAU, G. GRILLON, A. MIGUS, A. ANTONETTI, *Femtosecond nonlinearities of standard optical glasses,*
- R. W. RALSTON, *High-speed analog signal processing with superconductive circuits,*
- P. WOLF, *Picosecond sampling with Josephson junctions,*
- J. SONE, J.-S. TSAI, H. ABE, *Picosecond Josephson logic gates for digital LSIs.*

The book containing 256 pages is addressed rather to the persons working in the field of ultrarapid optoelectronics, since no introductory articles are offered. The graphic form of the book – similarly as in all the other books of the Springer-Verlag series – is very carefully prepared. The other advantage is that the book has been published not later than only some months after the conference. Therefore the material presented reflects the current scientific problems solved in many laboratories all over the world and in American laboratories in particular.

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