PROCEEDINGS PAPER

Femtosecond pulse propagation in cryogenic GaAs waveguides

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Published: **9 July 2001**; 11 pages; 78 papers;
DOI: **10.1117/12.432615**

Paper Abstract

High-speed optoelectronic devices must be interconnected with optical waveguides. Furthermore, it is quite likely that optical waveguides will be required to interface with superconducting devices that operate at cryogenic temperatures. Thus, it is important to examine femtosecond pulse propagation in cryogenic waveguides. Our approach uses the time domain susceptibility by Fourier transforming frequency domain models of semiconductors developed by Adachi. The resulting time domain susceptibility functions are closed form and cover the temperature range from 0 to 800 K. With this new model, time domain solutions to Maxwell's equations are now obtained for a femtosecond pulse propagating in a GaAs waveguide. The effects of linear dispersion and attenuation are examined for waveguides at different temperatures. However, the solution is limited to one spatial dimension in the direction of propagation to simplify the numerical algorithm.

This paper was published in SPIE Proceedings Vol. 4283
Physics and Simulation of Optoelectronic Devices IX, Yasuhiko Arakawa; Peter Blood; Marek Osinski, Editors, pp.619-629