Abstracts

A Microwave-to-Optical Transducer

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My theoretical predictions and initial experimental results show that intravalent absorption in semiconductors can be used to modulate light with electric fields that vary at 35 GHz. To produce electric fields of 50-1000 V/cm in a WR(28) waveguide, I use a microwave source that generates a 10- to 160-kW pulse lasting 100-ns. With this source, I can modulate more than 16% of the 3.39-µm light from a HeNe laser at 77 °K and more than 8% at 300 °K. The percentage of modulation is better than expected. In this paper I develop the light modulation theory, present my initial experimental results, and speculate on how to build a practical microwave-to-optical transducer. I also point out that the transducer, fabricated from germanium, can be used to create fast rise-time optical pulsesin the 2- to 4-µm region of the spectrum.

❑ Return to main document.