

Pulse Propagation in an Absorbing Medium

In a recent Letter, Chu and Wong¹ measure the envelope velocity of a picosecond laser pulse tuned to a strong absorption maxima of the A-exciton line in GaP:N. They state, on the basis of autocorrelation scans, that for $\Delta\nu_{\text{laser}} \ll \Delta\nu_{\text{abs}}$ no significant pulse distortion occurs. We wish to point out that a second-order autocorrelation scan gives no information as to pulse shape but can reveal changes in pulse width. It is insensitive to pulse asymmetries and will not reveal any frequency modulation. In fact the pulse shape must be separately known to determine the pulse half-width from an autocorrelation trace.² Figure 2 in Chu and Wong's Letter would indicate that some pulse reshaping and/or compression has taken place near the absorption peak.³ The autocorrelation scans at -0.039 and $+0.020$ meV have full width at half maximum (FWHM) of 39 ps while those further off resonance have FWHM of 48 ps.

For a Gaussian pulse shape the autocorrelation of two pulses of widths a and b is a Gaussian of width $(a^2 + b^2)^{1/2}$. This indicates that the on-reso-

nance pulse was compressed from 34 to 19 ps.⁴ For a double-sided exponential pulse shape their data imply an off-resonance pulse width of 18 ps and an on-resonance pulse width of 13 ps.

Single-pulse measurements using a streak camera, commercially available, with a resolution of 2 ps, will give direct measurements of pulse shape and velocity changes.

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¹S. Chu and S. Wong, Phys. Rev. Lett. **48**, 738 (1982).

²E. Ippen and C. V. Shank, in *Ultrashort Light Pulses*, edited by S. L. Shapiro, Topics in Applied Physics Vol. 18 (Springer-Verlag, Berlin, 1977).

³M. D. Crisp, Phys. Rev. A **1**, 1604 (1970).

⁴E. Ippen and C. V. Shank, in *Ultrashort Light Pulses*, edited by S. L. Shapiro, Topics in Applied Physics Vol. 18 (Springer-Verlag, Berlin, 1977), pp. 87-88; the ratio of autocorrelation FWHM to pulse FWHM is 1.41 for a Gaussian.