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Spectral Broadening in an InGaAsP Optical Waveguide with χ(3) Nonlinearity Including Two Photon Absorption

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Abstract : We have studied a method to widen the spectrum of optical pulses that pass through an InGaAsP waveguide for application to broadband optical communication. In particular, we have investigated the competitive effect between spectral broadening arising from nonlinear refraction (optical Kerr effect) and shrinking due to two photon absorption in the InGaAsP waveguide with chi^(3) nonlinearity. The shrunk spectrum recovers broadening by the enhancement effect of the nonlinear refractive index near the bandgap of InGaAsP with a bandgap wavelength of 1490 nm. The broadened spectral width at around 1525 nm (196.7 THz) becomes 10.7 times wider than that at around 1560 nm (192.3 THz) without the enhancement effect, where amplified optical pulses with a pulse width of 2 ps and a peak power of 10 W propagate through a 1-cm-long InGaAsP waveguide with a cross-section of 4 um^2.

Keywords : InGaAsP waveguide, Chi^(3) nonlinearity, spectral broadening, photon absorption
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