

Optical Fiber Mirror Using Cascaded Second-order Nonlinearity

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In recent years there has been a revival of interest in frequency conversion based on second-order nonlinearities. This interest has been primarily due to progress in the periodic poling of crystals [1] and silica glasses [2]. These new technologies have permitted efficient quasi-phase matched frequency conversion in both bulk and waveguide geometries. On the other hand, studies of frequency down-conversion have demonstrated that the pump wave can experience a nonlinear phase shift if it is accompanied by a weak injected second harmonic signal [3]. This has become known as the *cascaded second-order effect*.

In this report, using the earlier concept of distributed feedforward parametric frequency conversion in quasi-phase matched structures [4], a further development using an injected second harmonic signal is proposed. This is a nonlinear Sagnac loop mirror, based on the cascaded effect, in a loop created by connecting the ends of a $\chi^{(2)}$ fiber grating. A comprehensive analysis is used and enables us to create experimental set-up with useful output characteristics.

References

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