Low Cost All Optical Swept Source For Optical Communication Applications

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Introduction

An introduction of periodic modulation in a waveguide creates an interaction between forward- traveling and backward-traveling modes of an optical waveguide. Bragg grating is a perfectly periodic structure which has sharply defined beginning and end point.

Basic Idea

Bragg grating may be a one dimensional iffraction grating which diffracts light from the forward-traveling mode into the backward traveling mode. The condition for diffraction light from the forward-travrling mode.This condition into reverse traveling mode is called Bragg grating. The Bragg period Λ must be related to free space wavelength λ_o by

$$\Lambda = \lambda_o / 2n_{eff} \quad (1)$$

Bragg grating condition for an mth order Bragg grating is

$$\Lambda = m\lambda_o / 2n_{eff} \quad (2)$$

Swept Source We can classify a swept source into three category:

- Time domain swept source
- Fourier domain swept source
- Wavelength domain swept source

Principle

Wavelength sweep generation is providing light where a wavelength of the light is changed according to the sweep function: interrogating one or more reflective optical elements with the wavelength swept light to produce reflective optical signals.

COMSOL Multiphysics Model

While simulating this model using COMSOL Multiphysics®, we have used fre-quency domain study to evaluate the effect of the particular wavelength on the particle. Also we have determined the power at different points of the geometry

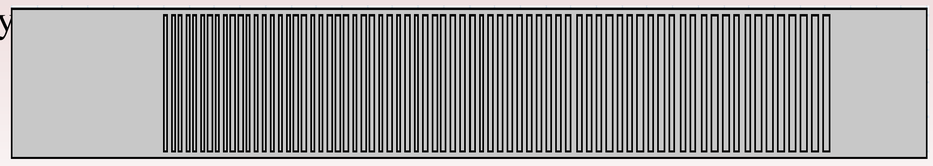


Fig.1 Design of Chirped Waveguide used with COMSOL® for swept source generation.

RESULTS

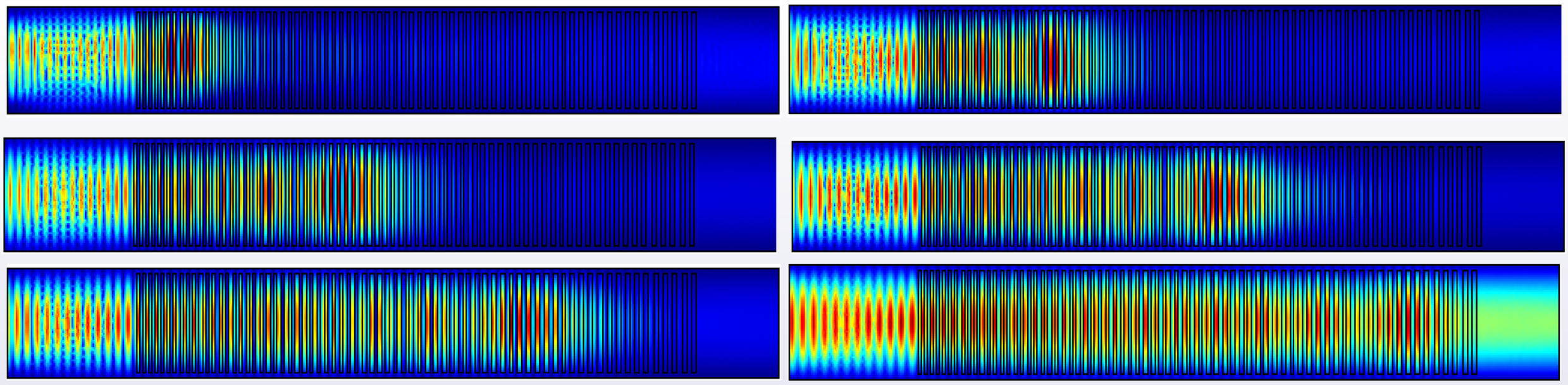
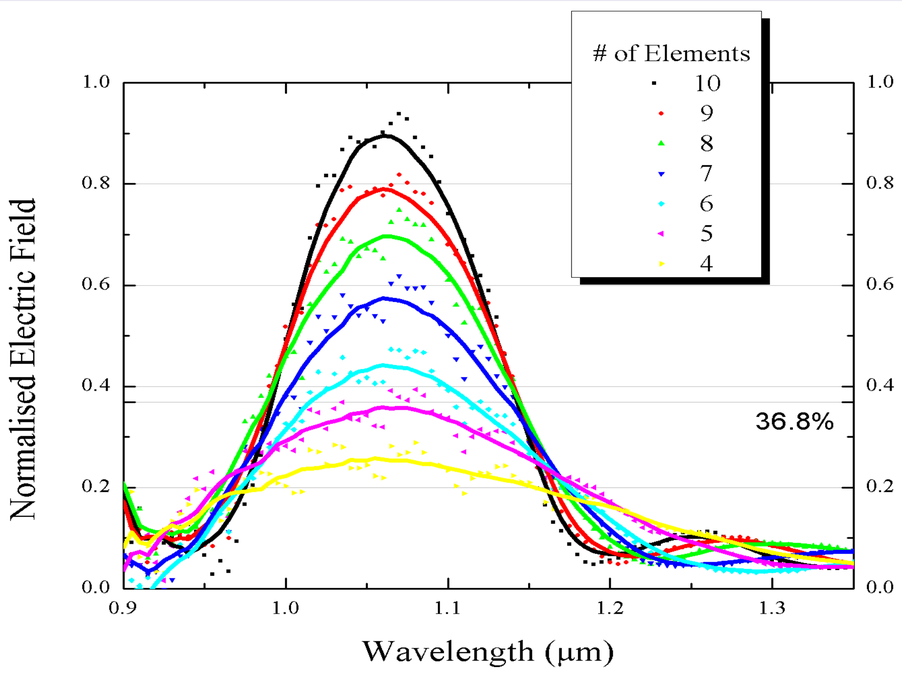
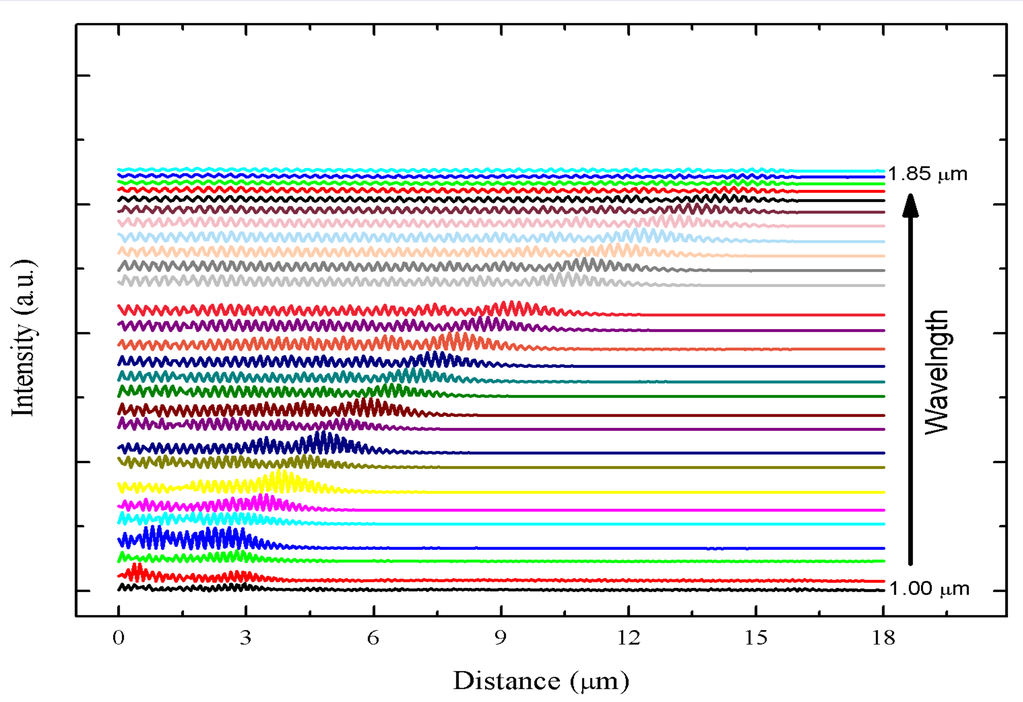


Fig.2: Simulated results of wavelength chirping at various wavelengths.



Figs.3: Normalised reflected electric field component with wavelength.



Figs.4: Plot of Intensity of chirped wave with wavelength.

Conclusions

We have simulated the chirped Bragg grating and optimize the number of grating elements used for reflection of particular wavelength. Chirped Bragg gratings are found to delay different wavelengths in time and may act as swept wavelength source.

References

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2. Curtis A. Toyoda et al.,"Wavelength Swept Source", United States Patent, UA2013/0286454A1, (2013).

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