

Recent advances in long dispersion compensating fibre Bragg gratings

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Abstract:

A great variety of versatile grating techniques have been developed over the past years, such that grating designs to meet nearly any application now can be manufactured. Long fibre gratings have received increased attention from a dispersion compensation point of view, due to the increased bandwidth over which the chromatic dispersion compensation can be performed. The application of long gratings to dispersion compensation is a schizophrenic one though, as on one hand, the linearity of the dispersion is highly improved when longer gratings are employed. The dispersive response of the gratings can also easily be tailored to meet specific applications, whilst the sensitivity to imperfections such as phase-errors caused by the fabrication process and even effects from the fibre imperfections will play a greater role.

We will in this paper discuss some of the recent advances in the area of long fibre gratings and discuss theoretical designs to increase the useful bandwidth of gratings designed to compensate both linear and combined linear and higher order dispersion. Furthermore design rules to reduce the effects of environmental caused imperfections from the fibre will be given. Techniques to increase the dispersion bandwidth product, $D \cdot \Delta\lambda$, will also be shown through the use of sampled gratings. All designs will be supported by experimental verifications and the application of some of the grating designs to transmission system experiments.