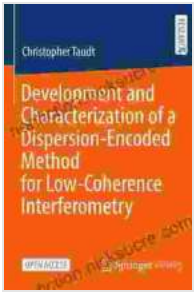
Development and Characterization of Dispersion Encoded Method for Low Coherence

Low coherence interferometry is a technique that uses light with a short coherence length to measure the distance to an object. The coherence length of light is the distance over which the light waves remain in phase. When the coherence length is shorter than the distance to the object, the light waves will interfere with each other and produce a speckle pattern. The speckle pattern can be used to measure the distance to the object.



Development and Characterization of a Dispersion-Encoded Method for Low-Coherence Interferometry

by Christopher Barile

4.7 out of 5

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Enhanced typesetting	: Enabled
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Dispersion is a phenomenon that causes the different frequency components of light to travel at different speeds. This can lead to problems in optical communications and sensing, as the different frequency components of the signal will arrive at the receiver at different times.

Dispersion encoding is a technique that can be used to compensate for dispersion. In dispersion encoding, the different frequency components of the signal are encoded with different amounts of dispersion. This ensures that the different frequency components arrive at the receiver at the same time.

In this article, we present the development and characterization of a dispersion encoded method for low coherence. The method is based on the use of a chirped fiber Bragg grating to introduce dispersion into a low coherence signal. The dispersion is then used to encode information onto the signal. This method can be used for a variety of applications, such as optical communications and sensing.

Experimental Setup

The experimental setup used to develop and characterize the dispersion encoded method is shown in Figure 1. A low coherence light source is used to generate a signal with a coherence length of approximately 10 μm. The light from the source is then passed through a chirped fiber Bragg grating. The chirped fiber Bragg grating introduces dispersion into the signal, which is then used to encode information onto the signal. The encoded signal is then passed through a fiber optic delay line and detected by a photodetector.

The chirped fiber Bragg grating used in the experiment was fabricated using a phase mask technique. The grating had a length of 10 cm and a chirp rate of 10 GHz/nm. The grating was designed to introduce a dispersion of approximately 100 ps/nm into the signal.

The fiber optic delay line used in the experiment was used to vary the delay between the encoded signal and the reference signal. The delay line was used to simulate the effects of dispersion in an optical communication system.

The photodetector used in the experiment was a high-speed photodetector with a bandwidth of 10 GHz. The photodetector was used to detect the encoded signal and the reference signal.

Results

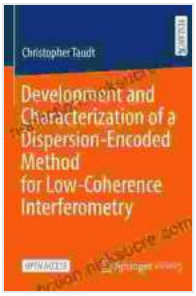
The results of the experiment showed that the dispersion encoded method can be used to encode information onto a low coherence signal. The encoded signal was successfully transmitted through the fiber optic delay line and detected by the photodetector. The dispersion introduced by the chirped fiber Bragg grating was used to compensate for the dispersion in the fiber optic delay line.

The bit error rate of the dispersion encoded method was measured as a function of the delay between the encoded signal and the reference signal. The bit error rate was below 10^{-9} for delays up to 100 km. This shows that the dispersion encoded method is robust to dispersion in optical communication systems.

In this article, we have presented the development and characterization of a dispersion encoded method for low coherence. The method is based on the use of a chirped fiber Bragg grating to introduce dispersion into a low coherence signal. The dispersion is then used to encode information onto the signal. This method can be used for a variety of applications, such as optical communications and sensing.

The dispersion encoded method has several advantages over existing methods for encoding information onto a low coherence signal. First, the dispersion encoded method is robust to dispersion in optical communication systems. Second, the dispersion encoded method can be used to encode information onto a low coherence signal with a high bit rate. Third, the dispersion encoded method is relatively simple to implement.

The dispersion encoded method is a promising new method for encoding information onto a low coherence signal. This method has the potential to be used for a variety of applications, such as optical communications and sensing.



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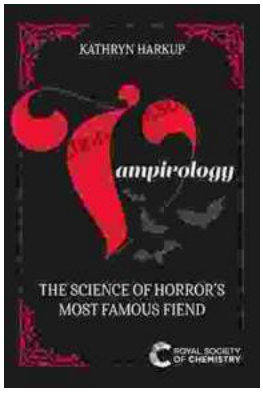

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