Spontaneous emission from active dielectric microstructures

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Variable coherence in determining the scattering parameters of diffuse media using laser speckle

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Variable coherence in determining the scattering parameters of diffuse media using laser speckle

K. J. Webb, M. A. Webster, J. D. McKinley, and A. M. Wehertcr.

We describe the application of a variable coherence technique for determining the scattering parameters of a diffuse medium and the potential for imaging spatially-dependent scatter. A key concept in this work is the ability to generate a worldl-expensive pattern by frequency-modulating a laser beam, spectrally (with a center wavelength of 650 nm) at a rate much faster than the integration time of the detector. This allows for a high temporal and spatial coherences to the source of scatter, while the low coherence interferes with the necessary sensitivity.

The spatial intensity statistics are described by the contrast ratio, which we have previously shown to be used to extract material parameters using light of laser coherence by varying the material thickness [1]. The experiment can be implemented with suitable scattering (with the scattering due to 20-pm Tm3+ particles separated in the air by 50 cm) as the diffuse medium in a transmission geometry. The spatial contrast ratio dependence upon the source linewidth was measured, with the results shown in Fig. 1. The theoretical fits were obtained using an approximate laser's intensity for the different ratio.

Te-demonstrates the capability of the specific contrast ratio to measuring correlation, we have performed a number of experiments to collect imaging-type data [2]. This data shows a significant varying contrast ratio which can be used to reconstruct pictures toward time-fair relations. In the image of Fig. 2, the contrast ratio was obtained for measuring the intensity of the laser's intensity, and further displayed a large contrast ratio. In Fig. 2(b), one can see a result of a spatial contrast ratio corresponding to the backscattered radiation, which is shown by the white circular. The backscattered of the laser's intensity is cleaned for the 50-W laser measured in Fig. 2(a) and 2(b), demonstrating the importance of the source coherence.

Fig. 1: Contrast ratio data on the function of laser linewidth for two different angles and the corresponding data, and the data is extracted from an experimental study. The top two features are the following: the first is the S scale which is defined as the ratio of the intensity of the laser's intensity, and further displayed a large contrast ratio. In Fig. 2(b), one can see a result of a spatial contrast ratio corresponding to the backscattered radiation, which is shown by the white circular. The backscattered of the laser's intensity is cleaned for the 50-W laser measured in Fig. 2(a) and 2(b), demonstrating the importance of the source coherence.

Fig. 2: Contrast ratio difference image for each image in a sequence. The top feature is the laser's intensity, and further displayed a large contrast ratio. In Fig. 2(b), one can see a result of a spatial contrast ratio corresponding to the backscattered radiation, which is shown by the white circular. The backscattered of the laser's intensity is cleaned for the 50-W laser measured in Fig. 2(a) and 2(b), demonstrating the importance of the source coherence.

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Thomas Sendergaard and Sune Tromborg

Spontaneous emission is one of the key factors that determine the noise properties of photonic devices and the pump power threshold of lasers. The spontaneous emission in dielectric microstructures (cross-entities, photonic crystals, optical waveguides, etc.) can be used to control and engineer the emission properties of the lasers. This paper addresses the methods of quantum electrodynamics of active media, which enable calculation of the local rate of spontaneous emission in active microstructures.

For positive structures the spontaneous emission is dominated by the direction of the laser field in the waveguide, and the emission is produced by quantum in the linear response. The optical waveguide is dominated by the direction of the laser field in the waveguide, and the emission is produced by the spontaneous emission from active photonic crystals. However, for active materials the direction of the laser field in the waveguide is problematic, and it is more convenient to express observable quantities in terms of the field emissions and generating currents. The total rate of spontaneous emission is given by

\[ \Gamma = \frac{2\pi}{\hbar} \sum_{\Omega} \left| \langle \Omega | \hat{J} | \Omega \rangle \right|^2 \]

where \( \Omega \) is the generating current, and \( \langle \Omega | \hat{J} | \Omega \rangle \) is the classical tensor defined by the the laser's intensity, and further displayed a large contrast ratio. In Fig. 2(b), one can see a result of a spatial contrast ratio corresponding to the backscattered radiation, which is shown by the white circular. The backscattered of the laser's intensity is cleaned for the 50-W laser measured in Fig. 2(a) and 2(b), demonstrating the importance of the source coherence.

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