

## **Direct density of states measurements of 3D photonic crystal**

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Three dimensional photonic crystals are artificial materials with periodic index of refraction in all three dimensions. This results in optical bandgaps similar to semiconductors. Because of the periodic structure, the photonic density of states inside the crystal is enhanced at frequencies near the bandedge and is suppressed to null inside the bandgap. This is the physical origin of enhanced absorption near the bandedge and inhibited emission at the bandgap. This quantity is usually calculated with the assumption that the crystal is of infinite extent, but in reality, measurements are performed on photonic crystals that are finite and in contact with free-space. However, the validity of this approximation has never been checked. Because this quantity is used in many optical properties calculations, it is important to measure this quantity directly. In this paper, we will describe the methodology of this measurement using white light interferometry and present experimental results. The methodology is based on the fact that the group velocity is inversely proportional to the density of states and it can be deduced from the phase difference between the reference and sample arm of a Michelson interferometry. Experimental results will be compared with density of states calculation.

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