Institut d'Electronique Fondamentale

UMR 8622 – CNRS -Université Paris Sud

Séminaire

Attention :
jour et heure inhabituels !!!

Vendredi 12 mars à 14h00

Centre scientifique d'Orsay - Bât. 220 – **salle 44** - F 91405 ORSAY

New Classes of Non-Crystalline Photonic Band Gap Materials

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Due to their ability to control the most fundamental properties of light, photonic band gap materials open a new frontier in both basic science and technology. Until recently, the only materials known to have complete photonic band gaps were photonic crystals, periodic structures, and it was generally assumed that long-range periodic order was instrumental in the band gap formation. In this talk, I will challenge this assumption and show that there exists a more general class of systems, called hyperuniform photonic structures, which exhibit large and complete photonic band gaps. This classification includes not only crystalline structures, but also non-crystalline materials, ranging from quasicrystals with crystallographically-forbidden rotational symmetries to isotropic, translationally-disordered structures. Both periodic and aperiodic photonic-band gap structures can be systematically generated from hyperuniform point patterns through a universal tessellation protocol.

I will show that the photonic band gap formation results from a combination of global hyperuniformity, uniform local topology, and short-range geometric order, and I will also introduce the first example of a hyperuniform dielectric structure ever fabricated. The hyperuniform non-crystalline photonic systems offer advantages for a series of applications, including isotropic light sources, lossless waveguides with arbitrary bending angles and flexible optical insulator platforms, and may have fundamental implications for electronic and phononic systems as well.

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