SFB/TRR 21 - Colloquium

21. November 2014, Stuttgart

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Photonic topological insulators and pseudomagnetism

I will present two examples in which artificial gauge fields lead to surprising photonic effects that would be difficult (if not impossible) to achieve with real fields. Firstly, I will present the first observation of the topological protection of light - a 'Photonic Floquet Topological Insulator' [1]. The structure is an array of coupled helical waveguides (the helicity generates a fictitious circularly-polarized electric field that leads to the TI behavior). Second, I will demonstrate artificial magnetic fields ('pseudomagnetism') in photonic lattices [2]. The pseudomagnetic field is generated by inhomogeneously straining the system (thus breaking periodicity), and leads to photonic Landau levels with very high photonic density of states. Potential applications include robust photonic devices and strong light-matter interaction over large areas.
[1] Rechtsman, M. C. et al. Nature **496**, 196–200 (2013). [2] Rechtsman, M. C. et al. Nature Photon. **7**, 153–158 (2013).

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