PDE and Applied Mathematics Seminar

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Time-reversal of ultra-short pulses in systems with zero-width bandgaps

Time-reversal of pulses has a variety of applications in fields such as communication systems, acoustics, THZ- and bio-imaging as well as quantum information and computing. To date, time-reversal of optical pulses can be achieved by employing fairly complicated, band-limited and inefficient schemes, usually relying on several powerful (nonlinear) wave sources.

In my talk, I will discuss a novel approach to time-reversal of ultra-short optical pulses using special photonic structures having zero-width bandgaps and show how these systems may allow overcoming these difficulties. I will discuss several possible systems with this property and focus on zero-gap periodic systems. I will show that simple tuning in time allows for time-reversal of ultrashort optical pulses with unprecedented simplicity and efficiency. I also suggest several specific designs for the implementation of our scheme and discuss several possible future directions.