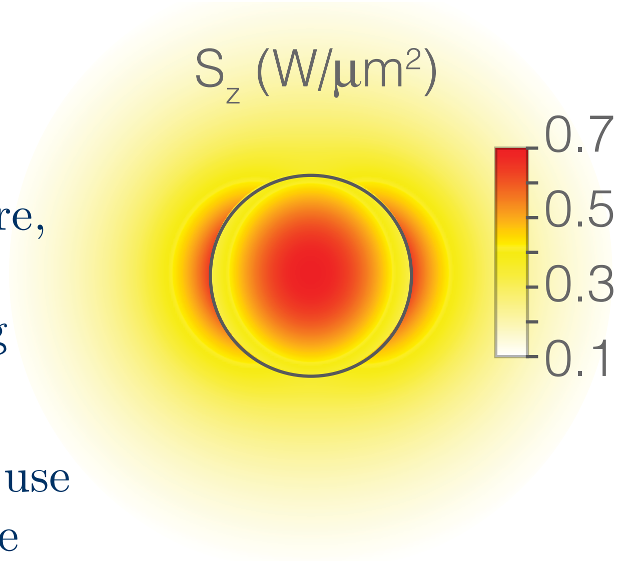
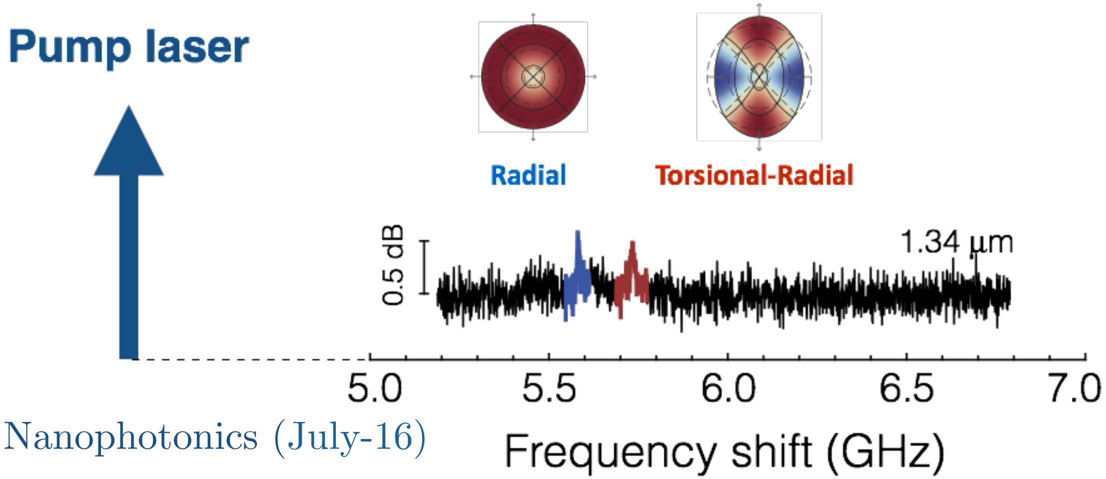
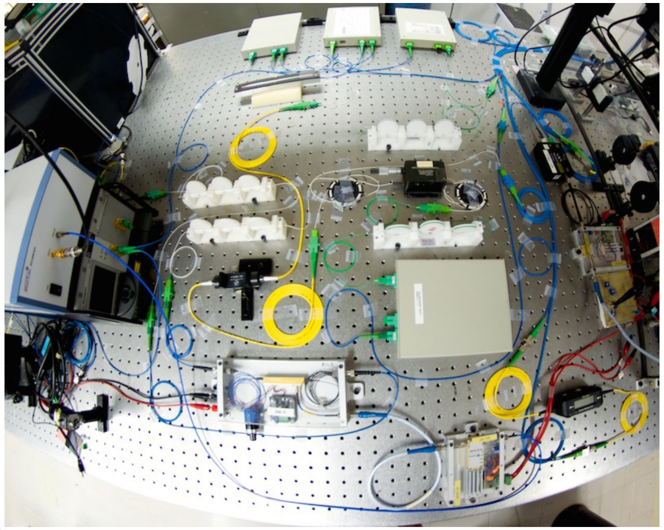
Brillouin interaction in silica nanowires

- In this experiment, the student will explore the nonlinear phenomenon of Brillouin scattering, which arises from the interaction between a photon and an acoustic phonon. By confining the optical fields in a sub-wavelength scale silica wire, the interaction enters a new regime in which surface effects compete with bulk effects – leading to the Brillouin scattering self-cancellation effect (Dainese – class 2).



- The experiment is divided in two parts: first the student will use a heterodyne technique to determine the frequency shift of the scattered light. Then, a sequence of pulses at a repetition rate that matches the measured frequency shift will be used to coherently excite acoustic phonons, resulting in an enhanced photon-phonon response.





Modulation Instability effect in Optical Fibers

- In this experiment, the student will set up an experiment to observe nonlinear effects in optical fibers, in particular the Modulation Instability (MI) effect (Dainese – class 1)
- By tuning the pump laser wavelength, the student will determine the position of the zero dispersion wavelength. Then, in the anomalous dispersion regime, the MI spectrum will be recorded as a function of pump power.
- Work out the equations and answer…
- Can we obtain the waveguide parameter second-order dispersion parameter (β_2) and the nonlinear coefficient (Υ) from the Modulation Instability spectrum?