

Nonlinear Optics in Surface Nanoscale Axial Resonators

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Surface nanoscale axial photonics resonators (SNAPRs) are whispering gallery mode resonators created by manufacturing a minuscule variation of the effective radius (the product of the radius and the refractive index) in an optical fibre [1]. They can be considered to be a type of very shallow microbottle resonator where a variation of refractive index contributes to the optical confinement. There are many ways to create this variation, and we have used the heat from a flame to fabricate our SNAPRs using commercial optical fibres of different diameters [2, 3]. Our resonators have ultra-low losses, as we have observed Q factors as high as a few tens of millions. Thanks to these extremely low losses, we have been able to observe different nonlinear optical phenomena, such as cascaded four wave mixing and the generation of optical frequency combs [4] as well as optomechanical oscillations in different SNAPRs [5].

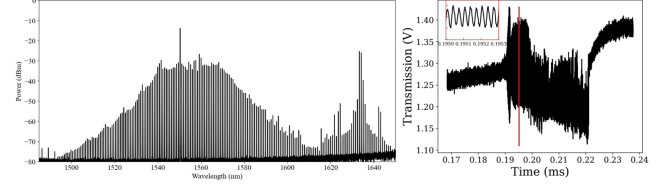


Figure 1: Left panel: Optical frequency comb on the azimuthal modes of a SNAPR with a diameter of 220 μm . Right panel: Optomechanical oscillations observed in a SNAPR with a diameter of 125 μm

References

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