Optical frequency combs have revolutionized precision spectroscopy and metrology [1], and in recent years miniature frequency combs or microcombs have been demonstrated using chip-based whispering gallery resonators [2]. These devices use the optical Kerr effect to induce mode locking through formation of solitons. In addition, the solitons are able to regenerate through parametric amplification that is also provided by the Kerr effect. Soliton microcombs offer the prospect of shifting advanced metrology and spectroscopy tools from the realm of laboratory-scale systems to compact portable systems.

After briefly discussing the principle of soliton microcomb generation, recent developments in soliton microcomb performance and applications using high-Q silica microresonators [3] will be overviewed. This will include efforts to reduce soliton repetition rates to low GHz rates [4] as well as direct pumping of 10 GHz rate soliton microcombs from low-power diode lasers. Several application areas including spectroscopy [5], LIDAR [6], imaging [7], and astronomy [8] will also be reviewed.

Fig. 1: Soliton microcombs (in red box) and applications to spectroscopy [5], LIDAR [6], imaging [7], and astronomy [8].

References