

## Crystalline Silicon Optical Whispering Gallery Mode (WGM) Resonators for Precision Measurements

**Authors :** Igor Bilenko, Artem Shitikov, Michael Gorodetsky

**Abstract :** Optical whispering gallery mode (WGM) resonators combine very high optical quality factor (Q) with small size. Resonators made from low loss crystalline fluorites (CaF<sub>2</sub>, MgF<sub>2</sub>) may have Q as high as 10<sup>10</sup> that make them unique devices for modern applications including ultrasensitive sensors, frequency control, and precision spectroscopy. While silicon is a promising material transparent from near infrared to terahertz frequencies, fundamental limit for Si WGM quality factor was not reached yet. In our paper, we presented experimental results on the preparation and testing of resonators at 1550 nm wavelength made from crystalline silicon grown and treated by different techniques. Q as high as 3x10<sup>7</sup> was demonstrated. Future steps need to reach a higher value and possible applications are discussed.

**Keywords :** optical quality factor, silicon optical losses, silicon optical resonator, whispering gallery modes

**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development

**Conference Location :** Chicago, United States

**Conference Dates :** December 12-13, 2020