

## One Ring to bind them all: three wave mixing in non-linear WGM resonators

*Harald G. L. Schwefel*

Max Planck Institute for the Science of Light, Erlangen, Germany

Efficient coherent conversion of THz or microwave radiation into the near infrared is a challenging but worthwhile endeavor. Nonlinear parametric sum-frequency generation conserves both the phase and amplitude of the initial state and is thus ideal for such an attempt. Even in the best second order non-linear crystals however, the non-linearity is so weak, that very high interacting field strengths are necessary for sufficient conversion rates. I will report on generating such high fields within crystalline whispering gallery mode (WGM) resonators. Within such resonators the radiation is bound by total internal reflection along the equator of a convex dielectric, a process that works as well for THz radiation [1,2] as it does for optical light [3,4]. Combined with appropriate phase-matching of the three interacting waves, conversion with a few percent quantum efficiency is possible [1].

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