Robust, Field-deployed Laser Modules For Next Generation Quantum Sensors

Kevin Knabe[1*], Henry Timmers[1], Andrew Attar1, Bennett Sodergren1, Dylan Tooley1, and Kurt Vogel[1]

[1]Vescent Photonics, United States

Next-generation quantum sensors are constrained to laboratory settings due to the low maturity, large size, and/or high electrical power consumption of lasers and physics packages. Over the last 5 years, Vescent Photonics has been developing, integrating, and testing small, field-deployable lasers suitable for quantum sensing applications. The first laser system that will be discussed is a heterodyne agile laser (HAL) system that contains two DBR lasers, a Rb spectroscopy cell, and necessary electronics for laser stabilization and control. The HAL system capabilities will be discussed, and applications such as cold-atom clocks and atom interferometers will be mentioned. The second laser system that will be discussed is the FFC-100, our commercial fiber frequency comb. This rack-mount unit offers turn-key operation that can support high-performance optical atomic clocks, dual comb spectroscopy, optical frequency generation, low phase-noise microwave generation, and many other comb applications. Based on the government funding supporting this work, we have developed deployable optics modules that have volumes less than 1 liter and require less than 20 W to operate. The performance and size of these optics modules will be summarized and future performance improvements and size and power reductions will be discussed.

Biography

Dr. Knabe has extensive experience with laser stabilization and precision optical measurements including saturated absorption spectroscopy in hollow-core photonic crystal fibers (under Dr. Kristan Corwin at Kansas State University), comb-assisted spectroscopy using a quantum cascade laser in the mid-IR for rapid broadband spectroscopy (under Dr. Nathan Newbury at NIST), and stabilization of a wide range of laser sources to high finesse optical cavities to produce lasers that have sub-Hertz linewidths (at Stable Laser Systems). As Director of Research and Development at Vescent Photonics he oversees both commercial and government funded projects related nextgeneration quantum sensors

KEYNOTE SPEAKER