Quartz-tuning-fork-based laser spectroscopy sensing

National Key Laboratory of Laser Spatial Information
Harbin Institute of Technology, Harbin 150000 China
Yufei Ma
Email: mayufei@hit.edu.cn

Quartz tuning fork (QTF) is originally used to provide the clock rate in crystal watches, timers and electronic circuits. Standard commercial QTFs possess a resonance frequency of 32.768 kHz and a Q-factor of ~10000 in a standard atmosphere pressure. The unique quadrupole structure of a QTF provides an excellent immunity to environment interference. Photoacoustic spectroscopy (PAS) is identified as an advanced technique for trace sensing. In traditional PAS, a microphone is used as an acoustic wave detector. A recent improvement of microphone-based PAS is quartz-enhanced photoacoustic spectroscopy (QEPAS) technique. This technique uses a low cost, commercially available mm sized piezoelectric QTF as an acoustic wave detector which possesses a high detection sensitivity and immunity to ambient acoustic noise. In this presentation, the latest research progress of our group in QEPAS sensing field will be discussed. It main includes diode laser, quantum cascade laser, EDFA amplified diode laser and solid state laser based QEPAS techniques. The long distance, quasi-distributed measurement will also be discussed.

Short Bio:

Yufei Ma received his PhD degree in physical electronics from Harbin Institute of Technology, China, in 2013. From September 2010 to September 2011, he spent as a visiting scholar at Rice University, USA. Currently, he is a professor at Harbin Institute of Technology, China. He is the winner of National Outstanding Youth Science Fund. His research interests include optical sensors, trace gas detection, laser spectroscopy, solid-state laser and optoelectronics. He has published more than 100 publications and given more than 20 invited presentations at international conferences. He serves as area editor for Elsevier *Photoacoustics* and Wiley *Microwave and Optical Technology Letters*, associate editor for Optica *Optics Express*, SPIE *Optical Engineering*, and *Frontiers in Physics*. He also serves as topical editor for CLP *Chinese Optics Letters* and

editorial board member for *Sensors* and *Applied Sciences*.