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Novel frequency comb spectroscopies in the near and mid infrared spectral region

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Abstract

There is an ongoing revolution in the field of spectroscopy based on frequency comb lasers (FCL). This is due to their broadband high spectral resolution, and high detection sensitivity. Several methods have been and are being developed to utilize their regular comb structure of millions of laser modes. Especially in the infrared, a plethora of green house and other gases have molecular fingerprint spectra that can be studied with FCL, based mainly on the Er-,Yb doped fiber lasers with their wavelength ranges extended by optical parametric oscillation processes, super continuum or difference frequency generation. This talk will present our research to quantify the sensitivity and selectivity of greenhouse gas detection in various detection schemes including multipass absorption, dual comb, and Vernier frequency comb spectroscopies. In addition our initial efforts to use FCL to monitor the methane content of seawater in the aftermath of the oil spill in the Gulf of Mexico, and the detection of atmospheric methane from natural seeps, and produced during fracking at the large shale gas reservoirs in the US and elsewhere will be described.

Biography

Hans Schuessler earned a PhD in physics in 1964 from the University of Heidelberg. He held faculty appointments at the Technological University of Berlin, and the University of Washington, before joining in 1989 Texas A&M University, where he currently heads the SIBOR (Stored Ion Bio Optical Research) and Atto-Second laser laboratories. His collaborations include TAMUQ at Doha, Qatar, the MPQ at Garching, Germany, and RIKEN at Tokyo, Japan. He holds a Chair in Optical and Biomedical Physics at TAMU, is Eminent Scientist at RIKEN, and Distinguished Scientist at JAERI, and Fellow of APS. He has published about 200 papers.