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High performance tunable semiconductor lasers for spectroscopy

Siamak Forouhar
Jet Propulsion Laboratory, USA

Recent calculations by Professor Anderson's research group at Harvard University have shown that warmer surface temperatures can lead to a wetter and cooler stratosphere, which relaxes the threshold condition for ozone destruction through chemical reactions of certain key halogens such as HCl. A better understanding of the dynamics of water vapor transport into the stratosphere and the subsequent halogen chemistry can be attained by studying the atmospheric distribution of halogens and water isotopologues, for instance semi-heavy water, HDO. However, the very low concentration of the gases of interest presents a challenge for traditional multi-pass tunable laser spectrometers (TLS). In contrast, integrated cavity output spectroscopy (ICOS) is a technique well suited to measure low-concentration gas species in the atmosphere due to a much longer optical path length, which increases the sensitivity by a factor of 10-100 as compared to typical multi-pass instruments. The main drawback of the ICOS system is the requirement of single-frequency tunable lasers emitting in the mid-infrared wavelength region with an order of magnitude higher output power than that necessary for a TLS system. We report on the fabrication and record performance of diode and interband cascade (IC) lasers for use in an ICOS instrument that is currently being developed by Harvard University.

Biography

Siamak Forouhar is a recognized expert in the field of infrared semiconductor lasers for space. He is currently the Director of Microdevices laboratory (MDL) of Jet Propulsion Laboratory (JPL). He has published more than 70 articles in refereed journals, several patents in his name, and has been awarded the NASA Exceptional Engineering Achievement Award for the development of tunable diode lasers and the Jet Propulsion Laboratory Exceptional Technical Excellence Award for significant achievements in technology development and demonstration of tunable diode lasers for planetary *in-situ* studies.

siamak.forouhar@jpl.nasa.gov