

Quantum Cascade Laser Spectrometer for the Unambiguous Detection of Biogenic Methane over Mars

T. K. Ramkumar

National Atmospheric Research Laboratory, Dept. of Space, Govt. of India, Gadanki

Email: tkram@narl.gov.in

Abstract

The isotopologues of methane of biogenic and chemical origin can emit strong mid-infra-red radiations with centre wavelength separation of the order of fraction of picometer. Distinguishing these wavelengths with normal Fourier Transform Infra-Red (FTIR) spectrometer needs bulky and heavy materials with large power handling mechanisms for sources as well as dissipation of power. For spaced observation of methane of other planets particularly the Mars, it is a highly discouraging option to select FTIR because it involves strong mechanical movement also along with the said parameters. Quantum Cascade Laser (QCL) heterodyne spectrometer is a practical solution for space based detection of Martian methane of biogenic as well as chemical origin. The main obstacle here is that to know the exact mid-IR frequency of QCL, the laser chip needed to be placed in a thermostat with milli Kelvin accuracy. Space based control of such high precision thermostat is a very challenging task but the detection of biogenic methane will herald a new philosophy of life like whether god decided only the Earth where living things can survive. The present paper addresses this issue and detailed information will be presented.