REAL TIME DETECTION OF ETHYLENE IN AUTOMOBILE EXHAUSTS AND CIGARETTE SMOKE

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We have developed a pulsed quantum cascade laser spectrometer which uses a long duration top hat profile current pulse to produce a laser pulse which has an almost linear frequency down chirp. The spectrometer comprises a DFB QCL operating at a wavelength of 10.26 μm, excited by current pulses of up to 300 ns at repetition rates of up to 50 kHz. The output from the QCL passes through an astigmatic Herriott cell with an effective path length of approximately 100 m. The detection system following the cell comprises a fast photovoltaic HgCdTe detector, 1 GHz bandwidth amplifier and fast digitiser, and has an overall bandwidth of 500 MHz. The transform limited resolution is approximately $0.14\ \mathrm{cm}^{-1}$. We will show that this spectrometer is able to detect the very weak carbon dioxide and water lines which lie within the laser chirp range, 974.5 to 972 cm^{-1}, and also to detect ethylene in automobile exhausts and in cigarette smoke.