Spectroscopy of lasing lines of ammonia and deuterium oxide near 1 THz

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Optically pumped THz lasers (OPTL) with molecular gas as active medium are used for a long time[1]. For optical pumping of these lasers is usually used gas discharge laser (mostly CO_2 or N_2O) tuned in mid infrared spectral range. Because of this, OPTL are bulky and unpractical. Required coincidence between lines of pumping laser and THz active medium limits possible lasing lines and affect laser performance. With development of mid infrared quantum cascade lasers (MIR QCLs), which offer precise tunability and high power in wide spectral range, is possible to excite lines inaccessible by gas laser and obtain new THz lasing lines[2].
In our contribution we present spectroscopic measurements of ammonia (NH_3) and deuterium oxide (D_2O) lasing lines near 1 THz during optical pumping by MIR QCL. NH_3 spectra were obtained by frequency domain measurement employing THz multiplication chain and InSb hot electron bolometer. For measurement of D_2O lines was used vector network analyser applying time domain method. Measurements were performed at changing vapour pressures, different tunnings and powers of pumping MIR QLCs. Results show interesting gain values for measured lines which are perspective for construction of new powerful OPTLs.

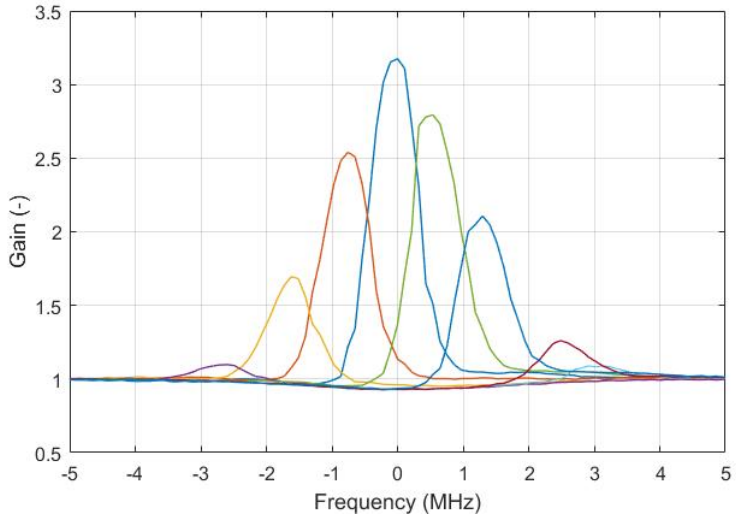

Fig.1. Spectra of NH_3 line 1.073 THz optically pumped by MIR QCL tuned at slightly different frequencies. Measured in 50 cm long gas cell.

References

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