FEASIBILITY STUDIES IN HIGH RESOLUTION THz SPECTROSCOPY

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The development of powerful radiation sources and sensitive detector systems plays a key role to achieve good signal to noise ratios for THz spectroscopy. Several spectrometer setups based on heterodyne detection have been explored recently in our laboratory. Absorption and emission spectra of D_2O have been recorded by the use of the 1.5 THz heterodyne receiver CONDOR [a]. Different heterodyne setups based on superlattice devices (SL) as mixer elements have also been tested. Further investigations indicate that superconducting NbTiN Hot Electron Bolometers (HEB) can be used as direct detectors with improved sensitivity compared to ordinary InSb bolometers. Also the development of THz-quantum cascade lasers (QCL) make substantial progress. Potential output powers on the order of milliwatts make them very attractive for spectroscopy applications. Phase-stabilized operation of a 1.5 THz QCL has been achieved by using a HEB mixer and a SL multiplier as a reference oscillator, which poses an important step towards their application in high-resolution spectrometers. Prospects of these developments for future THz spectrometers will be discussed.

[a] M. Wiedner et al. Astron. Astrophys., **454**, L33-L36 (2006)