A SUPERSONIC JET SPECTROMETER FOR TERAHERTZ APPLICATION

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The chemistry of interstellar clouds and star forming regions is quite different from terrestrial conditions. Among the molecules which have been found in the interstellar medium and in the shells of late type stars many unstable molecules like highly unsaturated hydrocarbons, light hydrids and their ions have been detected. It is most likely that many more hitherto unknown molecules will be observed in the near future, leading to a better and more detailed understanding of astrochemical processes. New astronomical instruments like the HIFI spectrometer aboard the Herschel satellite and SOFIA an airplane based telescope will open the Terahertz frequency region for high resolution observation of stellar objects and the interstellar medium.

Contrary to space where reactive species are quite abundant they are extremely difficult to be produced in sufficient amounts under laboratory conditions and thus not easy to be characterized by means of high resolution spectroscopy. It is the purpose of this newly designed spectrometer to produce unstable molecules of astrophysical relevance and to obtain spectroscopic data for their undoubted identification in space.

Backward wave oscillators (BWO) in the frequency range between 100 and 1200 GHz were used to obtain the spectra of adiabatically cooled molecules of a supersonic discharge source. Two operation modes are possible: Frequency stabilized with high frequncy accuracy ($\sim$10 kHz) or free running for fast scans over a wide frequency range. We use a quadrupole plasma analyser to monitor and to optimise the conditions for a high yield of molecules. Technical details and first results will be presented.