THE KASSEL LABORATORY ASTROPHYSICS THZ SPECTROMETRS

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We present a brief overview of the recently established laboratory astrophysics group in Kassel/Germany with a focus on our THz technology. After an outline of our laboratory equipment and recent projects the talk will focus on our new fast spectral scan technique for molecular jet experiments.

Here, a new test setup for broadband fast sweep spectrometry in the MW to submm wavelength region has been realized and can be applied to identify transient molecules in a supersonic jet. An arbitrary waveform generator (AWG) is used to generate chirped pulses with a linear frequency sweep in the MHz regime. Pulse durations are of a few microseconds. These pulses are up-converted in frequency, e.g. into the 50 GHz microwave frequency range utilizing a synthesizer, or using a synthesizer plus standard amplifier multiplier chain (AMC) to reach the 100-300 GHz region. As test, NH_3 has been measured between 18-26 GHz in a supersonic jet of 500 μs duration. Acetonitrile (CH_3CN) was tested in the (90-110) GHz range. The spectrometer is capable of providing fast, broadband and low-noise measurements. Experiments with non-stabel molecular production conditions can greatly benefit from these advantages. The setup enables the study of Vander-Waals-clusters, as well as carbon chain molecules and small metal-containing refractory molecules when combined with appropriate molecule sources.