A COAXIALLY ORIENTED BEAM-RESONATOR ARRANGEMENT FOURIER TRANSFORM MICROWAVE (COBRA-FTMW) SPECTROMETER: GOING CRYOGENIC

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After the initial experiments of microwave spectroscopy in the time domain [a] it took more than two decades before the technique was re-born. First as a steady gas-waveguide [b], later as a molecular beam-resonator [c] application, the experiment became an established spectroscopic method. During the past years a number of improvements were introduced to the technique. Namely the coaxially oriented beam-resonator arrangement (COBRA) [d e] has dramatically improved the resolution and the sensitivity of the Fourier transform microwave (FTMW) spectrometer.

Our current efforts are aiming at an improvement of the COBRA-FTMW sensitivity by means of reduction of the thermal noise background, i.e. reducing the 300K thermal noise power of P_N = kTRB at room temperature to the equivalent of 77K - the temperature of liquid nitrogen.

We will present a detailed theoretical background which is needed to approach the expected gain in S/N for a spectrometer operated at temperatures significantly below the thermal environment.

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