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EXPERIMENTAL TECHNIQUE FOR STUDYING THE ROTATIONAL SPECTRA OF HEAVY MOLECULES DURING THEIR INTERACTION WITH A MICROWAVE FIELD AT FREQUENCIES 2 - 4 GHZ *)

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The report is devoted to an experimental technique for studying the rotational spectra of heavy molecules during their interaction with a microwave field. We consider molecules in which transitions between lower rotational levels have frequencies of several gigahertz. The study of such spectra is of interest from both a fundamental point of view (establishing the lengths of interatomic bonds in molecules) and practical (analysis of chemical compounds, analysis of the isotopic composition of molecules, etc.).

In contrast to previously developed methods of rotational spectroscopy in the gigahertz region, our experiments are based on the use of a plasma relativistic microwave generator operating in the broadband generation mode [1]. A unique feature of this source is the generation of microwave radiation in a wide frequency range, which significantly simplifies the technique of spectroscopic research. The object under study is placed in a waveguide along the output radiation path between two antennas, the signals from which are recorded using an oscilloscope with a 4 GHz bandwidth and then subjected to computer processing using fast Fourier transform (FFT). To carry out measurements, the design of the radiation output system was developed taking into account the exclusion of radiation reflections from the walls of the diagnostic room. The problem of transition from multimode generation to single-mode generation was also solved, which made it possible to increase the sensitivity of measurements of amplitude and phase changes.

References

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*) abstracts of this report in Russian