SIMULATIONS TOWARDS THE GENERATION OF ULTRA-SHORT PULSES WITH COUPLED GYRO-DEVICES

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ABSTRACT

For a large number of fundamental problems and practical applications, including diagnostics of plasma, photochemistry, biophysics, new locating systems, and the spectroscopy of various media, powerful pulsed sources of millimeter and sub-millimeter waves are useful. Therefore, in this project the generation of a periodic sequence of powerful short pulses is studied [1]. The pulses are formed by a feedback loop of an amplifier and a nonlinear absorber. Both, amplifier and absorber should be realized as gyrotron-traveling-wave-tubes with helical corrugated interaction-region [2]. The amplifier will run in a regime optimal for the maximal amplification of ultra-short pulses, while the absorber will run in the so called Kompfner [3] dip regime. In the Kompfner dip regime low-energy pulses are absorbed while powerful pulses can pass the absorber without loss of energy. Simulations of the helical interaction region without electrons and of additional components as mirror systems for input/output systems are performed in a first step of the project. Currently, "hot" simulations including the interaction of electrons are performed with the advanced simulation program PICLas [4], developed by the Institute of Aerodynamics and Gas Dynamics at the University of Stuttgart.
In the presentation, an overview of the physical principals and the performed simulations will be given.

Acknowledgements
The research is supported by the joint RSF-DFG project (Je 711/1-1) "Generation of Ultrashort Pulses in Millimeter and Submillimeter Bands for Spectroscopy and Diagnostic of Various Media Based on Passive Mode-locking in Electronic Devices with Nonlinear Cyclotron Absorber in the Feedback Loop".

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