SIMULATIONS OF A FEEDBACK SYSTEM FOR COUPLED GYRO-DEVICES AT 263 GHz

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ABSTRACT

For a large number of fundamental problems and practical applications, including plasma diagnostics, photochemistry, biophysics, new locating systems, and spectroscopy of various media, powerful pulsed sources of millimeter and sub-millimeter waves are useful. Therefore, in a joint RSF-DFG project led by the Institute of Applied Physics (IAP-RAS) in Nizhny Novgorod, Russia, and supported by the Institute for Pulsed Power and Microwave Technology (IHM-KIT), the generation of a periodic sequence of coherent, powerful, ultra-short RF 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 (TWTs) with helically corrugated interaction-region [2]. The amplifier will run in a regime optimal for the maximal amplification of ultra-short pulses, while the absorber will operate 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. As the amplifier and saturable absorber should be realized in two separate gyro-TWTs, a feedback system is required to couple the amplifier and absorber devices with each other and to decouple the output signal from the feedback loop. As the output signal consists of ultra-short pulses (≈0.25 ns) with a high power (≈300 W at 263 GHz), the feedback system must provide a high bandwidth and low losses.
In the presentation, an overview of the designed feedback system, based on overmoded waveguides, and the performed simulations will be given.

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References
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