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Experimental Studies of sub-THz Gyrotron with Pulsed Solenoid for Air Breakdown Investigation[1] DMYTRO KASHYN, GREGORY NUSINOVICH, JOHN RODGERS, CARLOS ROMERO-TALAMÁS, ANATOLY SHKVARUNETS, University of Maryland, College Park, IREAP — The development of sub-THz gyrotron for air breakdown studies is one of the research tasks under the Center of Applied Electromagnetics program in University of Maryland. The goal is to remotely detect concealed radioactive materials as described by V. L. Granatstein and G. S. Nusinovich (J. Appl. Phys **108** 063304 (2010)). There it was proposed to focus high-power sub-THz radiation in a small volume where the wave field exceeds the breakdown threshold. The presence of the radioactive material in the vicinity ($\leq$ 20-40m) of such volume significantly increases the probability of the air breakdown. The gyrotron can serve as a source of sub THz radiation required for this scheme. We report our experimental activities on the sub-THz gyrotron operating at 670 GHz at TE 31,8 mode with 28T pulsed magnetic field. This tube was developed in collaboration with Institute of Applied Physics of Russian Academy of Science. Our team was responsible for the design of major components while our colleagues manufactured the tube. We achieved 80 kW of output power in 10μs pulses which corresponds to 0.2 J of energy. We introduced several improvements to the original design addressing the issues with discharges and multipactoring that were impeding the performance of the tube. Unfortunately we had a catastrophic failure which ruined the existing device. We are now working on the design of another gyrotron that will operate at 220 GHz and can be capable of delivering 250-350 kW of RF power.

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