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**Optical emission spectroscopy characterization of a kHz pulsed atmospheric pressure $N_2$ microwave plasma** EMILE CARBONE, FEDERICO D'ISA, ANTE HECIMOVIC, URSEL FANTZ, Max Planck Institute for Plasma Physics, Garching, Germany — Non-equilibrium plasmas have the potential of producing, energy efficiently, large amounts of species while operating at low gas temperatures. Pulsed power modulation is one of the tools for minimizing gas heating processes and increasing the overall non equilibrium of the plasma. In this contribution, we present a fundamental characterization of a kHz pulsed microwave discharge by optical emission spectroscopy in pure nitrogen at atmospheric pressure. The plasma is operated at 2.45 GHz and generated inside a cylindrical cavity coupled to a coaxial resonator. The coaxial resonator is designed with a metallic pin to enhance the electric field at the bottom of the cylindrical cavity. The microwave generator (0-3 kW peak power) can be pulsed in the 500 Hz-20 kHz range. A tangential gas flow injection (5-45 L/min) is used to stabilize the plasma in the center of the reactor. Rotational and vibrational temperatures of radiatively emitting species such as $N_2(C)$, $N_2(B)$ and $N_2^+(B)$ are measured both in continuous and pulsed operation regimes. The effects of gas flow and power variation on the spatial and temporal properties of the plasma are experimentally investigated. It is shown that power pulsing strongly affects the spatial distribution of the plasma inside the resonator.

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