
Contribution ID: **862** Type: **Invited**

# The influence of microwave pulse length and repetition rate on laminar burning velocity in lean methane-air flames

*Friday 28 June 2019 11:15 (30 minutes)*

An experimental setup and data analysis method for determination of the laminar burning velocity of flames exposed to pulsed microwaves is presented, and used to investigate lean methane-air flames. The results show an increase in laminar burning velocity with increasing duration of the microwave pulses, at constant electric field strength and for increasing field strength with the same pulse duration. A strong increase in flame instantaneous chemiluminescence is observed as a result of microwave irradiation. High-speed imaging data display a gradual build up of this increased photon emission, the enhancement is strongly dependent on the pulse duration (10 -50 μs) of the microwaves. The rate of increase and the subsequent saturation of photon emission indicate that microwave-flame interaction takes place in a thin layer of the flame. The thickness of this layer correspond to the thickness of the heat release zone where CH and free electrons reach peak density in the flame. A study on pulse length and pulse repetition frequency reveal that, although the average power is held constant in all experiments, longer microwave pulses cause higher burning velocities than short pulses at higher repetition frequency. This indicate that, at least at the rather low values of E/N used in these experiments, the increase in species that contribute to an enhanced laminar burning velocity is slow in comparison to microwave pulse length.

**Author:** Dr HURTIG, Tomas (Division of Defence & Security, Systems and Technology, FOI –Swedish Defence Research Agency)

**Co-authors:** Mr ZETTERVALL, Niklas (Division of Defence & Security, Systems and Technology, FOI –Swedish Defence Research Agency); Dr FUREBY, Christer (Division of Defence & Security, Systems and Technology, FOI –Swedish Defence Research Agency); Dr EHN, Andreas (Combustion Physics, Lund University); Dr NILSSON, Elna (Combustion Physics, Lund University); Dr SUNDBERG, Hanna (Division of Defence & Security, Systems and Technology, FOI –Swedish Defence Research Agency)

**Presenter:** Dr HURTIG, Tomas (Division of Defence & Security, Systems and Technology, FOI –Swedish Defence Research Agency)

**Session Classification:** 1.6 Plasma Chemistry

**Track Classification:** 1.6 Plasma Chemistry