Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Plasma assisted ignition with nanosecond surface dielectric barrier discharge. Two modes of nanosecond surface discharge SERGEY SHCHERBANEV, Ecole Polytechnique, Paris, NIKOLAY POPOV, Skobeltsyn institute of nuclear physics, Moscow State University (MSU), Moscow, SVETLANA STARIKOVSKAIA, Laboratory of Plasma Physics, Ecole Polytechnique, Paris, LPP TEAM, LIA FRANCE-RUSSIA COLLABORATION — Nanosecond surface dielectric barrier discharge (nSDBD) is an efficient tool for a multi-point plasma-assisted ignition of combustible mixtures at elevated pressures. In combustible mixtures, nSDBD initiates numerous combustion waves propagating from the electrode. This work presents a comparative experimental study of the surface dielectric barrier discharge initiated by high voltage pulses (U =(20-60) kV) of different polarities in air at elevated pressures (P=1−12 bar). Discharge morphology, deposited energy, and spectroscopy of the discharges are analyzed. Differences between the discharges of the different polarity, as well as the changes in the discharge morphology with changing of a gas mixture composition, are discussed. The initiation of combustion with nSDBD was studied experimentally at high initial pressures up to 6 bar on the example of lean H_2/Air. The ignition is initiated with two different discharge modes: streamer and filamentary. The influence of the discharge structure and energy deposition on the ignition is demonstrated. Three regimes of multi-point ignition were observed: ignition with a few kernels, quasi-uniform ignition along the edge of high voltage electrodes and ignition along the plasma channels.

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Date submitted: 09 Jun 2016 Electronic form version 1.4