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**SI Engine with repetitive NS spark plug** SERGEY PANCHESHNIY, LAPLASE, ANDREY NIKIPELOV, EUGENY ANOKHIN, Moscow Institute of Physics and Technology, ANDREY STARIKOVSKIY, Princeton University, LAPLASE TEAM, MIPT TEAM, PU TEAM — Now de-facto the only technology for fuel-air mixtures ignition in IC engines exists. It is a spark discharge of millisecond duration in a short discharge gap. The reason for such a small variety of methods of ignition initiation is very specific conditions of the engine operation. First, it is very high-pressure of fuel-air mixture – from 5-7 atmospheres in old-type engines and up to 40-50 atmospheres on the operating mode of HCCI. Second, it is a very wide range of variation of the oxidizer/fuel ratio in the mixture – from almost stoichiometric (0.8-0.9) at full load to very lean ( $\varphi = 0.3-0.5$ ) mixtures at idle and/or economical cruising mode. Third, the high velocity of the gas in the combustion chamber (up to 30-50 m/s) resulting in a rapid compression of swirling inlet flow. The paper presents the results of tests of distributed spark ignition system powered by repetitive pulse nanosecond discharge. Dynamic pressure measurements show the increased pressure and frequency stability for nanosecond excitation in comparison with the standard spark plug. Excitation by single nanosecond high-voltage pulse and short train of pulses was examined. In all regimes the nanosecond pulsed excitation demonstrate a better performance.

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