

## Dynamics of MW discharge formation under laser spark initiation

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Main task of presented work was investigation of MWD formation dynamics by Schlieren method. The time resolution of using gated CCD camera was 100 ns, space resolution of Schlieren system –less than 0,2 mm.<sup>1</sup> the parameters of experimental setup permit to investigate of laser-spark (LS) gas-dynamic processes influence on MW gas-dynamic structures at different MW-LS interaction stage, different air pressure and determine of maximum delay of MW initiation by laser spark under different condition.

The results of visualization of these processes are show on Fig.1. The impulse of MW radiation directed from left to right, and has electric field density 5 KV/cm and duration 5  $\mu$ s. The focusing laser beam directed from up to bottom and has energy 200 mJ and duration 10 ns.

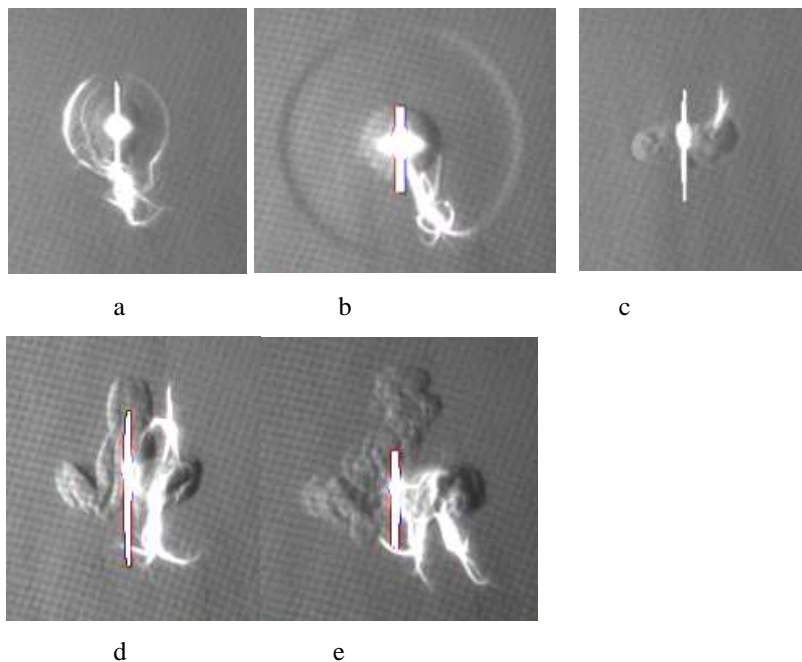


Fig.1 Schlieren photo of MW discharge initiated by laser spark; MW – laser delay ( $\mu$ s): a) 5, b) 20, c) 210, d) 505, e) 964

Analysis of experimental data clearly shows, that three main regimes may be pointed in MW-Laser Discharge formation:

- The first regime is MW discharge initiation on highly conductive laser plasma - “metal sphere” - and is limited by the first 80 $\mu$ s.
- The second regime is MW discharge initiation via breakdown in rarefied and moderate-conductive spark domain when electric field begins to penetrate in it and reduced field grows up relative outside (applied) one.
- The last is spark plasma heating (or energy deposition) in sub-breakdown undisturbed field, resulting in shock waves generation. This regime ranges in time up to several hundreds of microseconds.
- Principle stages of MWD formation: 10mcs – MW channels start from poles LS area and very often are developing along SW front; 300mcs–density hole is formed in LS area and is visualized under the MW radiation action; MW channels as a rule are developing from the hole’s boundary region;500mcs – vortex is formed in LS area and MWD takes its configuration

### References

1. Afanasyev S., Brovkin V., Kolesnichenko Yu., Mashek I. The influence of gas-dynamic processes on the structure and thresholds of laser-spark initiated MW discharge. Letters for JETPh, 2011, vol.37,issue 15, p40-46.