VISUALIZATION OF PLASMOIDS AFTERGLOW TRACKS AND PROCESSES OF THEIR INTERACTION WITH AERODYNAMIC BODIES IN SUPERSONIC FLOWS

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Investigation of temporal and spatial behavior of afterglow areas, arising in air flow on the places, when the MW discharge was ignited may be very useful for interpretation of Schlieren picture of Plasma-body interactions. Optical complex for observing of weak luminescence in supersonic flow based on strongly intensified and gating CCD camera. The sensitivity of this camera approaches to sensitivity of photo multiplier, operating in photo counter regime, with minimal open gate state is about 1 mcsec. This system also can be used for investigation of discharge spatial structure evolution in active phase with microsecond-scale temporal resolution. Spectral range of camera photo-cathode is 360 - 800 nm, amplification factor for brightness - more than 60 000. Each stage has a high-voltage power supply (10 kV), the first stage has electrostatic gate with managing voltage 1 kV. The time of open-gate state can be done as short as 1 -10 μs, repetition frequency corresponds to frequency of MW discharge and is about 500 Hz. The moments of open - gate state has a time delay relatively MW impulses. This delay is controlled by CAMAC system and changes from 2-3 μs to 600 μs. Time-averaged pictures in CCD sensor are recorded in PC. Natural spatial resolution of this EOA is 30 lines/mm for the central part of luminescent anode. The typical frames of record of Shlieren system and Weak-Luminescent system presents on the Fig.1 and 2. The delay for bought frames is the same, 75 microsec. The Fig 1 clearly shows the dramatically changes of bow shock shape, the fig 2 is demonstrate the physical reason of these changes – the vortex formation under the bow shock.

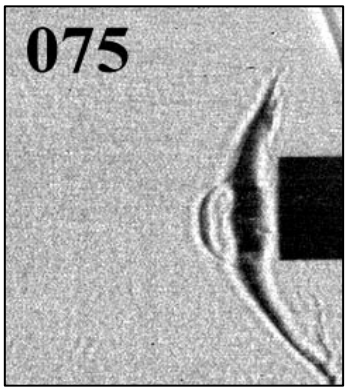

Fig1

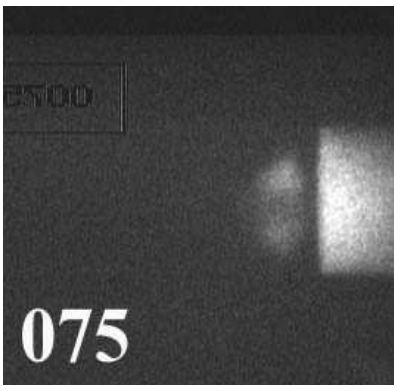

Fig2

References

Knight D.,Kolesnichenko Yu.Brovkin V.,Lashkov V.aqnd I.Mashek. Interaction of a Microwave Plasma with a Hemisphere Cylinder at Mach 2,1. AIAA Jornal, Vol.47, No. 12, 2009, pp.2996-3010