TIME RESOL VED IMAGES OF PLASMA BULLET 
FOR DIFFERENT ELECTRODE GAPS

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In the last few decades, there has been a huge advance in 
atmospheric pressure plasma research; many plasma devices 
have been constructed and analyzed using various diagnostic 
techniques. One of the promising devices is atmospheric 
pressure plasma jet operating in the plasma bullet mode with 
applied frequencies varying from 5 to 120 kHz and applied 
voltages can be in sinusoidal or pulsed [1, 2]. Several authors 
report that the plasma jet that is formed is not continuous.

Atmospheric pressure discharge which was investigated was 
obtained in the regime of sine wave excitation at a frequency 
of 80 kHz. The length of the coated PET electrodes was 
15 mm and the distance between them was varied. We follow 
complete development of the plasma packages in atmospheric pressure plasma jet (APPJ) from their formation 
as a discharge close to the instantaneous cathode, following 
their motion between and inside the electrodes (by using 
transparent conductive material for electrodes) to their 
emergence at the edge of the glass tube and formation of a 
plasma bullet. Emergence of the plasma at the edge of the 
tube leads to formation of a plasma bullet with selfgenerated 
fields to sustain it, propagate it at a very large speed and even 
allow for its growth.

The formation and the shape of the plasma bullet strongly 
depend of the gap distance between the electrodes. For the 
smallest gap when plasma bullet was formed it was more 
elongated along the axis of the tube as compared to the case 
when the gap was 15 mm. Also, the residual plasma emission 
after the bullet was more pronounced in the case of the 
shortest gap. In case of the 20 mm gap (and larger ones) 
between the electrodes the bullet was never formed. The 
measurements also open issues of proper geometry of 
electrodes and distance from the edge of the electrode to the 
edge of the glass tube but direct observation of the recorded 
images provides an insight into what the main mechanisms 
could be leaving to modeling to seek quantitative agreement 
of predictions as a proof.

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