

## INVESTIGATIONS OF THE PLASMA BULLET VELOCITY BY ELECTRICAL AND OPTICAL TECHNIQUES\*

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The propagation velocity of the atmospheric helium pulsed plasma jet/bullet generated by the plasma pencil has been investigated through electrical and optical diagnostic techniques. The electrically-based technique measures the jet velocity from the time delay between the jet current peaks along the jet propagation axis. Using optical emission spectroscopy (OES) the temporal evolution of the reactive species along the plasma jet axis was observed and this evolution provided a measure of the average and instantaneous plasma bullet velocity. The measured velocities are compared to the velocity obtained from the images of the plasma jet taken at different times by using an ICCD camera. It is found that the magnitude of the velocity measured by the electrical technique is little higher than the velocity measured by imaging and spectroscopy techniques, which produced similar results. However, in all cases, the bullet velocity is in the same order of magnitude ( $\ast 10^5$  m/s). It is also shown that each pulse generates a single bullet and this bullet propagates leaving a low density plasma channel behind it.

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