

# Turkish Journal of Physics

Turkish Journal

of

Physics

Filamentation of Light Emission in an Infrared-Visible Image Converter with a Semiconductor Photodetector

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**Abstract:** This work studies the light emission patterns associated with the spatial modulation of the transversal distribution of the current density in a converter cell with a GaAs semiconductor cathode. Such light emission exhibits spatial structures of current filaments depending on the feeding voltage, illumination intensity, gas pressure and the surface treatment of the electrodes. When the current is increased above the stable limit, breakdown or small current filamentations begin. However, n-GaAs exhibits an S-shaped current-density-field relation due to impact ionization of carriers from shallow donors into the conduction band under high electric fields. The assessment of the filament formation is then based on analysis of the discharge light emission, recorded through a transparent anode. The filamentation was primarily due to the formation of a space charge of positive ions in the discharge gap, which changed the discharge from the Townsend to the glow type.

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Turk. J. Phys., **26**, (2002), 67-72.

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