Michelson interferometery of terahertz discharge in N_2

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The terahertz frequency range is interesting from the fundamental and applied point of view. Nevertheless, it is still less studied area mainly because of the lack of high-power terahertz radiation sources.

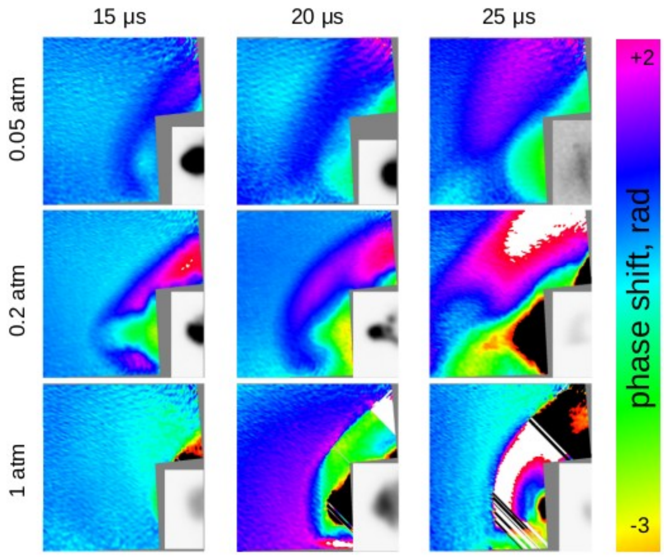

Fig. 1: Spatial-time dynamic of THz nitrogen discharge under a different background pressure. Laser beam phase shift maps (size 15 to 15 mm) of the discharge (in color) and discharge glow photographs in optical band (negative, gray). Terahertz radiation falls from the left to right. Time delay was counting from start of terahertz pulse.

In our work, the radiation source was the gyrotron[1] with maximum pulse power of about 40kW at frequency 0.67THz and duration 20µs. The main diagnostic tool was laser interferometry, based on the analysis of changes in the fringe structures made by a probe beam crossing the plasma cloud[2]. The Michelson interferometer scheme with a diode laser at 532nm was used. The diameter of the beam near the discharge plasma was 25 mm (at $1/e^2$ level). The phase shift maps are shown in fig. 1.

This technique allowed us to investigate spatial-time dynamic of THz nitrogen discharge in the background pressure range from a few torrs to one atmosphere. The work discuss issues of discharge propagation mechanism and shock wave formation.

References

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