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In-situ Measurements of the Temperature Gradient in Complex Plasmas — •Aleksandr Pikalev, Mikhail Pustylnik, Christoph Räth, and Hubertus Thomas — DLR, Institut für Materialphysik im Weltraum, Gruppe Komplexe Plasmen, Münchener Str. 20, 82234 Weßling

Complex or dusty plasma is a medium containing ionized gas and micron-sized solid particles. The microparticles are sensitive to the thermophoretic force. Thermophoresis is often a disturbing factor in microgravity complex plasma experiments or a way to control the microparticle suspensions. In spite of that, no attempts to measure the temperature gradient in-situ in complex plasma are known in the literature. We present such measurements performed in Ar rf discharge used for complex plasma experiments with the help of laser spectroscopy.

The experiments were performed in the PK-3 Plus chamber, where we could control the axial temperature gradient up to 5 K/cm by heating the bottom electrode. We used tunable diode laser absorption spectroscopy (TDLAS) and laser induced fluorescence (LIF) for the temperature measurement from Doppler profiles. In the case of TDLAS, two parallel laser beams passed through the discharge with a height difference of 1.5 cm. They allowed us to measure line-integrated temperatures at those two positions. The temperature differences could be measured with accuracy better than 0.5 K. The fluorescence was observed with a video camera through a narrow bandpass filter in a direction, perpendicular to the laser beam, hence the temperature could be determined locally in both axial and radial directions.

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