# Simulation of fringe normalization for analyzing phase shift in plasma diagnostic using laser interferometry

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In plasma diagnostics using interferometry, the phase shift caused by the plasma in the fringes is extracted to determine the plasma density. To extract the phase shift from the fringes, the commonly employed method is the Fast Fourier Transform (FFT). However, this technique encounters challenges when dealing with insufficient fringe numbers, spatially varying fringe frequencies, or extremely sharp phase changes. These challenges result in errors and hinder the acquisition of precise phase measurements. To tackle this issue, we have introduced the Fringe Normalization (FN). Through simulations, we have confirmed that the FN method accurately extracts phase information, surpassing the capabilities of the FFT method [1]. As a result, this advancement enables more precise plasma diagnostics by mitigating errors that arise during the phase data processing. We plan to apply this method in the field of laser-plasma acceleration to analyze the density distribution of a plasma source with a sharp density profile.

[1] K. Okada, E Yokoyama, and Hidetoshi. M. *Electronics and Communications in Japan*, Part 2, Vol. 90, No. 1, (2007)

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