Correlation analysis-based fringe jump compensation method for the zero-crossing phase measurement in the HCN laser interferometer on EAST

Yuan Yao [1], Haiqing Liu [1,2] , Yao Yang [1], Jiaxing Xie [1], Yao Zhang [1] and Yinxian Jie [1]

1) Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, Anhui, China

E-mail : yyao@ipp.ac.cn

2) Institute of Energy, Hefei Comprehensive National Science Center, Hefei, Anhui, China

.

A fringe jump compensation analysis method has been studied for phase measurement with fringe jumps in HCN laser interferometer [1]. The method is based on correlation analysis and is considerably useful in the case of the phase detectors whose front-end using zero-crossing method. Due to the noisy environments of the Tokamak devices, the phase signals at the jump points generate ambiguous slopes with certain width instead of a sharp drop. The slopes make it difficult to determine the exact jump point, which in turn affects the electron density calculation. The ambiguity can be minimized by adopting another signal whose phase shifted by a half fringe from the original signal. The method has been applied to process the phase measurement results of the HCN laser interferometer on EAST. The method can be implemented in hardware for real-time application.

References

[1]   Y, U, Nam, et al. Fringe jump compensation techniques for the time-averaging zero-crossing phase measurement in the KSTAR millimeter-wave interferometer.[J]. Review of Scientific Instruments, 2018.