Note: Real-time wavelength matching system designed for the motional Stark effect polarimeter on HL-2A tokamak

W. J. Chen, a) D. L. Yu, L. W. Yan, B. S. Yuan, X. X. He, L. Liu, Y. L. Wei, J. Wang, Z. B. Shi, Y. Liu, and Q. W. Yang
Southwestern Institute of Physics, P.O. Box 432, Chengdu 610041, China

(Received 24 July 2018; accepted 12 November 2018; published online 5 December 2018)

A 7-channel motional Stark effect diagnostic based on dual photo-elastic modulators is installed and operated routinely for rather low beam energy and magnetic field on the HL-2A tokamak, with a spatial resolution of ~3 cm and a temporal resolution of 10 ms. The instrument observes the σ component of the full energy Dα from the first or the fourth ion source of a neutral beam injector. However, the change in beam energy during a discharge causes variation of the Doppler shift with the maximum of 1 Å, which leads to the polarization fraction drop from 30%–40% to 10% and then makes the signal-to-noise ratio of the system become very poor. Therefore, a real-time wavelength matching system is designed to promote polarization fraction. The beam emission spectra are filtered by using a monochromometer in real time. And a narrowband filter is tilted by using an absolutely calibrated rotator through beam energy in order to make sure that the deviation of wavelength matching is less than 0.1 Å. Published by AIP Publishing. https://doi.org/10.1063/1.5049613