

## **Absolute sensitivity calibration of vacuum and extreme ultraviolet spectrometer systems and $Z_{\text{eff}}$ measurement based on bremsstrahlung continuum in HL-2A tokamak<sup>a)</sup>**

Hangyu Zhou,<sup>1,b)</sup> Zhengying Cui,<sup>1</sup> Shigeru Morita,<sup>2</sup> Bingzhong Fu,<sup>1</sup> Motoshi Goto,<sup>2</sup> Ping Sun,<sup>1</sup> Chunfeng Dong,<sup>2</sup> Yadong Gao,<sup>1</sup> Yuan Xu,<sup>1</sup> Ping Lu,<sup>1</sup> Qingwei Yang,<sup>1</sup> and Xuru Duan<sup>1</sup>

<sup>1</sup>*Southwestern Institute of Physics, P.O. Box 432, Chengdu 610041, China*

<sup>2</sup>*National Institute for Fusion Science, Toki, Gifu 509-5292, Japan*

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A grazing-incidence flat-field extreme ultraviolet (EUV) spectrometer has been newly developed in HL-2A tokamak. Typical spectral lines are observed from intrinsic impurities of carbon, oxygen, iron, and extrinsic impurity of helium in the wavelength range of 20 Å–500 Å. Bremsstrahlung continuum is measured at different electron densities of HL-2A discharges to calibrate absolute sensitivity of the EUV spectrometer system and to measure effective ionic charge,  $Z_{\text{eff}}$ . The sensitivity of a vacuum ultraviolet (VUV) spectrometer system is also absolutely calibrated in overlapped wavelength range of 300 Å–500 Å by comparing the intensity between VUV and EUV line emissions. © 2012 American Institute of Physics. [<http://dx.doi.org/10.1063/1.4729671>]