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10.31 Development of Wavelength Calibration Techniques for High-Resolution X-ray Imaging Crystal Spectrometers on EAST

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Newly developed large-area pixelated two-dimensional detector and two-crystal assemblies were deployed for the first time on tokamaks to enable time-resolved Bragg-diffracted x-ray imaging with good framing rate and water-cooling capabilities for in-vacuum long-pulse operations. High-quality Helium-like and Hydrogen-like Argon spectra have been observed simultaneously for the first time on a single detector for a wide range of plasma parameters to infer both ion temperature and rotation profiles and support studies on spontaneous rotation, impurity transport and RF physics. Since tokamak plasmas rotate in both the poloidal (\theta) and toroidal (\Phi) directions, a reliable wavelength calibration is needed to account for the correct Doppler shift as well as to compute the spectrometer's instrumental function. K_\alpha and L_\alpha lines emitted from Cd and Ti x-ray tubes are currently being used as 'markers' to provide an in-situ calibration of the EAST-XICS systems measuring He- and H-like Argon as well as Ne-like Xenon spectra. Other indirect calibration methods using locked-mode discharge scenarios, local comparison with CXRS measurements as well as NTM-frequencies at specific rational surfaces were also studied as complementary methods.

Primary author(s) : LYU, Bo (Institute of Plasma Physics, Chinese Academy of Sciences)

Co-author(s) : CHEN, Jun (School of Nuclear Science and Technology, University of Science and Technology of China); HU, Rui Ji (School of Nuclear Science and Technology, University of Science and Technology of China); DELGADO-APARICIO, L.F. (Princeton Plasma Physics Laboratory); WANG, F.D. (Institute of Plasma Physics, Chinese Academy of Sciences); BITTER, M. (Princeton Plasma Physics Laboratory); HILL, K. (Princeton Plasma Physics Laboratory); PABLANT, N. (Princeton Plasma Physics Laboratory); YANG, X.S. (Institute of Plasma Physics, Chinese Academy of Sciences); ZHANG, H.M. (Institute of Plasma Physics, Chinese Academy of Sciences); LEE, S.G. (National Fusion Research Institute); YE, M.Y. (School of Nuclear Science and Technology, University of Science and Technology of China); SHI, Yuejiang (Department of Nuclear Engineering, Seoul National University); WAN, Baonian (Institute of Plasma Physics, Chinese Academy of Sciences)

Presenter(s) : LYU, Bo (Institute of Plasma Physics, Chinese Academy of Sciences); CHEN, Jun (School of Nuclear Science and Technology, University of Science and Technology of China); HU, Rui Ji (School of Nuclear Science and Technology, University of Science and Technology of China); DELGADO-APARICIO, L.F. (Princeton Plasma Physics Laboratory); WANG, F.D. (Institute of Plasma Physics, Chinese Academy of Sciences); BITTER, M. (Princeton Plasma Physics Laboratory); HILL, K. (Princeton Plasma Physics Laboratory); PABLANT, N. (Princeton Plasma Physics Laboratory); YANG, X.S. (Institute of Plasma Physics, Chinese Academy of Sciences); ZHANG, H.M. (Institute of Plasma Physics, Chinese Academy of Sciences); LEE, S.G. (National Fusion Research Institute); YE, M.Y. (School of Nuclear Science and Technology, University of Science and Technology of China); SHI, Yuejiang (Department of Nuclear Engineering, Seoul National University); WAN, Baonian (Institute of Plasma Physics, Chinese

Academy of Sciences)

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