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4.25 Development of optical probe for local emission profile measurements in Versatile Experiment Spherical Torus

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Optical probe has advantage of direct measurement although it may lead to plasma perturbation in contrast with conventional optical emission spectroscopy. An optical probe with outer diameter of 8 mm and viewing dump of knife-edge type is designed and installed in Versatile Experiment Spherical Torus (VEST) to measure local emissivity directly, which gives radial profiles of impurity emission intensities via shot-to-shot measurements at various radial positions. In the optical probe system, collimated light is transmitted via vacuum feed-through and collected to two types of spectroscopic system, i.e. spectrometer with electron multiplying charge coupled device (EMCCD) and band-pass filter with photo multiplier tube (PMT); the spectrum at specific time and time evolution of intensity in fixed wavelength can be obtained, respectively. Time evolution of radial electron density profile near the edge can be calculated by collisional-radiative model using ratio between $H\alpha$ and $H\beta$ line after intensity calibration. Besides, impurity emission profiles (e.g. oxygen, carbon) in several charge states of concern to impurity transport study can be measured. Then, Zeff will be also attainable using OPEN-ADAS database.

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