

## Design Status of ITER VUV spectrometer and the prototype R&D in KSTAR tokamak

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The ITER vacuum ultraviolet (VUV) spectrometer provides the measurements of impurity ion species in plasmas with regards to the plasma operation and machine protection, and three sets of VUV spectrometers for core survey, edge, and divertor region enable the measurement in different regions of plasmas in ITER tokamak, registered as a nuclear facility, INB-174. ITER VUV spectrometer has been designed and developed from the engineering design phase of ITER in early 2000's, and now the design is in the final design stage, and the manufacturing of some components was started. VUV edge imaging spectrometer (17 ~ 32 nm) located in the upper port plug is designed as the 1-dimensional imaging spectrometer for ~ 1 m long edge region of upper part of plasmas. VUV core survey spectrometer consists of five spectrometers with different wavelength range to provide full coverage from 2.5 nm to 160 nm with relatively high spectral resolution of 200 ~ 500. [1, 2]

To verify the design of spectrometers, various R&D has been performed from the year of 2010. Especially prototype survey spectrometer for wavelength range from 156 – 50 nm has been operated in KSTAR from the year of 2013. In the experimental campaign of KSTAR in 2021 year, installation of divertor VUV spectrometer with 5 - 20 nm wavelength range with upgrade was finished, and is under commissioning with plasmas. Furthermore special filtered telescope for ~ 6 nm wavelength was also installed to observe 2-dimensional image of plasmas especially targeted to observe emission from tungsten ions. [3, 4]

Not only the spectrometer R&D but also R&D of choosing the appropriate mirror material for ITER VUV spectrometer has been performed. Thermal cycling and steam ingress test in ITER condition was performed to validate the choice of mirror material.

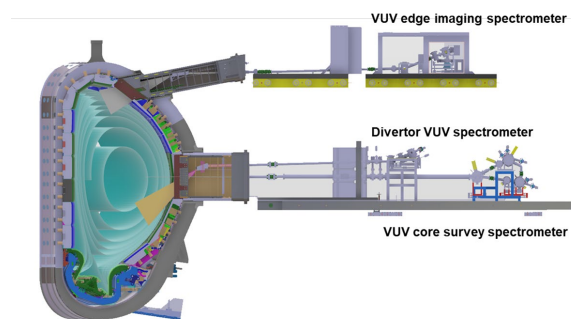


Figure 1 Current design status of ITER VUV spectrometers

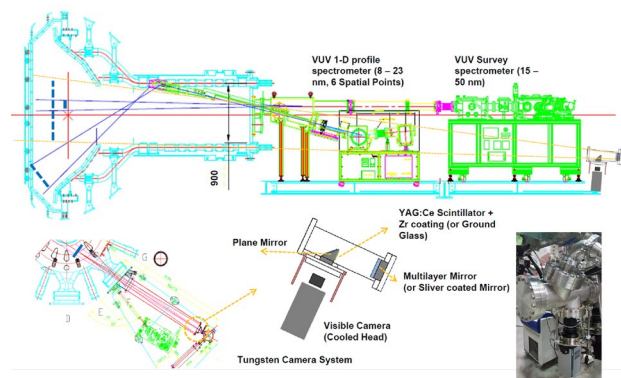


Figure 2 The prototype VUV spectrometers and 2-dimensional telescope for VUV range in KSTAR tokamak

### References

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