

Development of liquid target for beam-target neutron source & two-channel prototype ITER vacuum ultraviolet spectrometer

**B. N. Ahn^{1,2}, Y. M. Lee¹, J. J. Dang³, Y. S. Hwang³, C. R. Seon⁴,
H. G. Lee⁴, W. Biel⁵, R. Barnsley⁶, D. E. Kim², J. G. Kim¹**

¹Vacuum Measurement Technology, Pohang, Korea, ²Department of Physics, POSTECH, Korea, ³Dept. of Nuclear, Seoul National University, Korea, ⁴National Fusion Research Institute, Deajeon, Korea, ⁵Forschungszentrum Jülich GmbH, Jülich, Germany, ⁶ITER Organization, Saint-Paul-Lez-Durance, France

The first part is about development of a liquid target for a neutron source, which is designed to overcome many of the limitations of traditional beam-target neutron generators by utilizing a liquid target neutron source. One of the most critical aspects of the beam-target neutron generator is the target integrity under the beam exposure. A liquid target can be a good solution to overcome damage to the target such as target erosion and depletion of hydrogen isotopes in the active layer, especially for the one operating at high neutron fluxes with no need for water cooling. There is no inherent target lifetime for the liquid target neutron generator when used with continuous refreshment of the target surface exposed to the energetic beam. In this work, liquid target containing hydrogen has been developed and tested in vacuum environment. Potentially, liquid targets could allow a point neutron source whose spatial extension is on the order of 1 to 10 μ m.

And the second is about the vacuum ultraviolet (VUV) spectrometer which is designed as a five-channel spectral system for ITER main plasma measurement. To develop and verify the design, a two-channel prototype system was fabricated with No. 3 (14.4 nm~31.8 nm) and No. 4 (29.0 nm~60.0 nm) among the five channels. For test of the prototype system, a hollow cathode lamp is used as a light source. The system is composed of a collimating mirror to collect the light from source to slit, and two holographic diffraction gratings with toroidal geometry to diffract and also to collimate the light from the common slit to detectors. The two gratings are positioned at different optical distances and heights as designed. To study the appropriate detector for ITER VUV system, two different electronic detectors of the back-illuminated charge coupled device and the micro-channel plate electron multiplier were installed and the performance has been investigated and compared in the same experimental conditions. The overall system performance was verified by measuring the

spectrums.

Keywords: Liquid Target, Beam-Target Neutron Source, Vacuum Ultraviolet Spectrometer