Contribution ID: **395** Type: **Poster**

ITR/P5-35: Progress on Design and R&D for ITER Diagnostic Systems in Japan Domestic Agency

Thursday, 11 October 2012 08:30 (4 hours)

Japan Domestic Agency (JADA) has been conducting the design and R&D for six ITER diagnostic systems that JADA is responsible for. In summary: For the Microfission Chambers, the prototyping of the vacuum tight triaxial connector has indicated that it could be used in the ITER environment, and a neutron transport analysis has shown that the cooling water pipe in the blanket module should be filled with water for in-situ calibration of the diagnostic. For the Edge Thomson Scattering System, the stray light level can be reduced by a factor of 10 by a new beam dump design with chevron shaped fins. The target performance of the prototype YAG laser system, i.e. 5 J of output energy and 100 Hz repetition rate, has been successfully achieved. A novel in-situ calibration method has been proposed based on the detection of bremsstrahlung emissions. For the Poloidal Polarimeter, a new design of robust mirror modules in the port plugs has been developed, in which the plasma facing mirrors and mirror support structure are unified. Optical analyses of the retroreflectors, which are deformed by nuclear heating, have indicated that about 50%~70% of the laser power can be returned to the diagnostic hall. For the Divertor Impurity Influx Monitor, the detected signal would increase by a factor of 10 using a new design of equatorial port optics with components which are tolerant to gamma-ray irradiation. The bidirectional reflectivity distribution function of the tungsten block has been measured for the first time to study the surface reflection effect. For the Divertor Thermocouples (Outer Target), an R&D result indicated that a metal foil could be bonded to the divertor target as an attachment point for the thermocouples. Finally, for the Divertor IR-Thermography, the requirement specifications for the optics have been studied using estimated spectral radiance of the target.

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Session Classification: Poster: P5

Track Classification: ITR - ITER Activities