

THE U.S. ROLE IN ITER DIAGNOSTICS*

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Plasma diagnostics on ITER will play key roles machine protection, plasma control, and the measurement of the parameters needed to understand and optimize burning plasmas. Negotiations on the sharing of the diagnostics among the parties have resulted in a provisional list for the U.S. This talk will discuss the U.S. responsibilities in this area. It will highlight the technical challenges, list anticipated R&D needs, and present a picture of the evolving organizational plan for providing these systems.

Unique challenges include ITER's environment and its high reliability standards. Relative to existing diagnostics on large tokamaks, ITER systems will be subject to much higher neutron and gamma fluxes ($\times 10$) and fluences ($\times 10^6$), significant nuclear heating, higher fluxes of energetic neutrals ($\times 5$), and longer pulse lengths ($\times 10^2$). This environment precludes the use of refractive optics and fiber optics within the radiation shield. Diagnostic viewing front-ends will be housed in massive shielded port plugs, designed to optimize access while controlling radiation streaming. These structures will become activated and will require remote handling to maintain. The difficulty of maintenance will drive robust designs and thorough testing to demonstrate high reliability.

The U.S. microwave systems are the electron cyclotron emission diagnostic and the low-field-side reflectometer. The U.S. visible systems are the upper visible/infrared wide-angle viewing systems and the motional Stark effect diagnostic. The infrared systems include the toroidal interferometer/polarimeter and the divertor interferometer. The U.S. is responsible for the residual gas analyzers. In addition, the US will provide two upper, two equatorial, and one divertor port, and for integrating into these ports diagnostic front-ends from various parties.

A brief description of the present design concepts for the US diagnostic systems will be followed by an assessment of critical issues and recommended R&D. A snapshot of a procurement plan, presently being formulated, will also be presented.

*Supported by US DOE Contract No. DE-AC02-76CH03073