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Endoscope Emulator Test Stand for ITER Dust Monitor Diagnostic

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ITER is a basic nuclear installation and as such, safety is one of the most important drivers in the design. The ITER Licensing agreement requires that the quantity of dust in the vacuum vessel must remain below given limits. The maximum amount of mobilizable dust in the vessel is 1000 kg. A technique based on a flexible endoscope was selected as a tool for diagnostic of dust in ITER. The diagnostic will consist of two tools – one for fine viewing of dust with a resolution down to a few tens of microns in few mm spot and another one for dust collection. Both of endoscopes will have coarse viewing with resolution of few hundred microns over wider area to allow the possibility for more general inspection of the surrounding environment. The Endoscope will have to work in a harsh environment where the activation limit reaches a few hundreds of Gy/h, at a magnetic field of about 8T, and at a temperature of 100C. Ideally it will have to work in vacuum in order to allow inspections of the tokamak between shots or after disruptions. The Endoscope will have to go up to 20m deep inside the tokamak to the inspection region. Due to the specific design features of ITER, the endoscope will have to go upward on an inclined surface for inspection about 18 meters away from the insertion point. In order to ensure that the endoscope gets to the desired region of inspection it will be pushed through guide tubes having a number of bends along their length. Initial estimations of endoscope jacket materials, endoscope stiffness and push/pull forces were defined experimentally. This paper will give a brief reminder of the overall strategy for Dust/Erosion/Tritium monitoring in ITER and the role of the dust monitor in this context. It focuses on experimental results of real-size tests inside guide tubes of the behaviour of different endoscope emulators under various conditions.

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