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P2.134 Rescue tool for ITER Blanket Remote Handling System

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If a remote-handling system were to become stuck and unrecoverable from the vacuum vessel, the fusion reactor would be forced to cease all operations. Proven recovery technology must be established for remote-handling systems of fusion reactors to ensure the system is recoverable from expected failures. The recovery technology for the ITER Blanket Remote Handling System is in the form of rescue scenarios, in which a rescue tool is introduced into the vacuum vessel and then remotely positioned and secured to the failed joint of the remote-handling system where it is then actuated externally. To this end, the rescue tool must be capable of being remotely positioned from every conceivable angle. This paper presents the design and test results of the rescue tool of the ITER Blanket Remote Handling System.
We designed a rescue tool having both guide and compliant mechanisms for six degrees of freedom (6DoF); motors, reduction gears, and a hexagonal socket interface to drive failed joints; and image processing markers for remote positioning. For compliance testing, the rescue tool was mounted to a mock-up of a failed joint, both with and without the compliant mechanism enabled, and the reaction forces during mounting for both cases were compared. For integration testing, the rescue tool was positioned using a robot vision system having a hand-eye camera, and then mounted to the mock-up. We found that the compliant mechanism greatly reduced the reaction force and allowed for remote positioning and installation of the rescue tool and conclude that the rescue tool developed can be used in rescue scenarios for ITER.

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