# SUPERVISORY SYSTEM FOR DTP2 REMOTE HANDLING OPERATIONS

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The purpose of the Divertor Test Platform 2 (DTP2) is to demonstrate the proof-of-concept level operations with remote handling of ITER divertor maintenance devices, from a dedicated control room. In order to remotely operate these devices safely, Supervisory system that is composed of several sub-systems is needed.

For each of the maintenance devices, a remote handling control system should be embodied. In the Control room, there is no direct visual contact to the devices operating in the Divertor Region Mock-up (DRM) area and therefore a remote viewing system, having special cameras subject to high radiation dose rates, proves itself useful. In various occasions, should the camera feeds be unavailable or with limited visibility, a 3D visualization system should be utilized for showing a virtual model of the scene directing the user. The major benefit of virtual reality (VR) based visualization system is an ability to provide multiple user-specified virtual 3D cameras from different angles for the operator. As the maintenance sequences are often complicated with many stages, having them all well designed beforehand is essential, as is the provision of this expert information in meaningful ways during the operations. Similar, traceable executions should be ensured for every time and while the controlling is done in a man-in-a-loop fashion, it's important to recognize the right application areas for human operators, full automated systems and various degrees of assisted solutions.

In this paper, we present the software, hardware, and communications interfaces designed and already implemented as a complete solution for the DTP2 remote handling operations, but also some future aspects of the project. We present the modular division of systems, each of them also in smaller detail, but concentrating more on a goal-oriented, holistic view. We go through several design choices made during the current and past DTP2-projects, explaining their impact regarding safety, efficiency and real-world usability, all being dominant premises during the process. Preliminary application of the Supervisory system in various aspects of remote operating the Water Hydraulic Manipulator (WHMAN) and Cassette Multifunctional Mover (CMM) robots is presented.