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## P2.046 Flexible vacuum vessel bolometer camera design in ITER to adapt to the final position of the gaps between blanket modules

Tuesday, 18 September 2018 11:00 (2 hours)

Bolometer cameras in ITER will be mounted in Port Plugs, on Divertor Cassettes and on the Vacuum Vessel (VV) wall behind Blanket Modules (BMs). For the first assembly phase the platform (Cable fixations and the lower part of the internal signal chain) of VV cameras has to be delivered to fix the signal cables and protect their termination. During First Plasma, the as-built magnetic axis and magnetic flux surface will be measured and the BMs fixation will be adjusted to align them to the shape of the magnetic flux surfaces. Movements of the BMs of up to 15 mm in toroidal and vertical direction and up to 25 mm in radial direction are foreseen. Accordingly, VV cameras need adjustments, too, to assure a proper view of the plasma.

Calculations have been performed to define the impact of the possible BM movements onto the bolometer viewing cones. The toroidal and poloidal movements can be followed by shifting the collimator and the sensor along with the BMs. The sensor temperature needs to be kept below 350 °C. Thus, optimal thermal management of the cameras and an efficient thermal flow path to the VV wall is required. Therefore, the radial movement of BMs was transferred to an additional poloidal shift of the detector and collimator. The resulting camera design with its complex space envelope will be presented. It provides an alignment flexibility of the cameras of +/-31 mm poloidally and +/- 15 mm toroidally. Because of the short period between magnetic measurements and second assembly phase, the number of customizable parts is kept as low as possible, which means in practice that only a part of the upper camera body and few elements of the internal signal chain are designed to be customizable. All other elements can be manufactured in advance.

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