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Preliminary test results of final bolometer sensor prototypes for ITER

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Bolometer sensors are used to measure the total radiated power. These sensors have an important role in fusion devices, since they can measure the radiative power loss from the magnetically confined plasma, and provide important information about the plasma behavior and help to control the experiment [1]. Since more than 10 years, several sensor types with different properties have been tested in the IBOVAC facility in the vacuum condition and up to 450 °C [2,3]. In these studies, important physical properties of the sensors, i.e. cooling time constant τ, normalized heat capacity κ, and sensitivity s have been characterized as described in reference [4].

In the present series of the measurements, 3 different sensor types, namely two types of sensors with Au absorbers on ZrO membranes, and one type with Au absorbers on SiN membranes supported by a Si frame, will be investigated. These sensors have been provided as results of the R&D contracts from F4E. The aim of the study is to understand the effects of different manufacturing properties and techniques, such as the material choices and the thicknesses of different layers, on the physical properties and durability of the sensors at different temperatures. In order to characterize the uncertainties, LabView and Python programs have been developed to take several calibration runs into account. These results will be used, together with other upcoming tests such as irradiation testing, to select the most suitable sensors to be employed in ITER.

References

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