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EXTERNAL REFERENCE

Report High Heat Flux Testing Report template

This document outlines the main chapters to be reflected in the Report, containing parameters and data to be recorded and reported in order to assess performance of HHF Tests and tested objects in the frame of Procurement Arrangements and associated activities related to High Heat Flux Tests of In-Vessel components. Some additional information can be found in the presentation : HHF Test Report Template (MU2X9U)

Approval Process			
	<i>Name</i>	<i>Action</i>	<i>Affiliation</i>
<i>Author</i>	Fedosov A.	19 Feb 2014:signed	IO/DG/DIP/TKM/INC/DIV
<i>Co-Authors</i>			
<i>Reviewers</i>	Escourbiac F. Raffray R.	20 Feb 2014:recommended 20 Feb 2014:recommended	IO/DG/DIP/TKM/INC/DIV IO/DG/DIP/TKM/INC/BKT
<i>Approver</i>			
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The High Heat Flux Testing Report Template

This template outlines the main chapters to be reflected in the Report, containing parameters and data to be recorded and reported in order to assess performance of HHF Tests and tested objects in the frame of Procurement Arrangements and associated activities related to High Heat Flux Tests of In-Vessel components.

Exhaustive data array and its format shall be proposed by the supplier, reflected in the related HHF Testing Protocol and accepted by IO.

1. Purpose

The chapter shall describe the purpose of performed HHF testing. The testing report shall use only mutually agreed terminology in order to avoid confusion.

2. Applicable documentation

The chapter shall contain a list of documentation which is applicable to this report.

3. Description of installed mock-ups

The chapter shall contain photos of the mock-ups before and after HHF testing together with mock-ups' identification. This chapter shall also include description of functional cooling scheme.

4. Chronology of the testing

The chapter shall contain the following table:

Number of step	Date of step	Area	Observation and/or unexpected events
N. M.	begin: dd/mm/yyyy end: dd/mm/yyyy	n	

Table 2. Chronology of the HHF testing.

5. Generated documentation

The chapter shall contain a list of all documents generated during the HHF testing execution.

6. Results of IR-diagnostics' calibration

The chapter shall contain results of calibration of IR-camera and pyrometers on a black body and on a material.

7. Results of verification of power profile

The chapter shall contain description and results of verification of power profile with respect to criteria – $\pm 5\%$ of its average value.

8. Explanation of the method of calculation of IR average temperature

This chapter shall describe a definition of the average¹ monoblock's temperature by an infrared picture.

¹ Way of determination of an average surface's temperature shall be proposed in a Testing Protocol produced by Supplier and accepted by IO

9. Behavior of surface's temperature

The chapter shall contain graphs showing behavior of an average surface's temperature (T_{surf}) of each tested monoblock as a function of cycle's number for each step of cycling.

As minimum, the chapter shall contain sets of control IR-pictures per each step of cycling. Exact sets of control pictures shall be proposed in the Testing Protocol and accepted by IO.

10. Data for the acceptance criteria

10.1. Test execution

This chapter aimed to access an overall performance of the Testing Campaign. As minimum, the following acceptance criteria shall be reflected in the report:

10.1.1. Absorbed heat flux

This chapter shall demonstrate that value of Absorbed Heat Flux (AHF) remained within the $\pm 10\%$ around the target value during each step of cycling.

All the graphs shall be marked with defined thresholds of target values.

10.1.2. Hydraulics

This chapter shall demonstrate that the cooling parameters remained within tolerances: $\pm 5\%$ for the inlet water pressure and for the water flow rate; $\pm 10\%$ for the inlet water temperature during the whole HHF testing execution. Evidence of this shall be given for each step of cycling.

All the graphs shall be marked with thresholds of target values

This chapter shall also demonstrate that requirements regarding water chemistry in primary circuit of the testing facility are met.

10.2. Assessment of tested component performance

This chapter aimed to access the performance of the tested mock-ups. As minimum, the following acceptance criteria shall be reflected in the report:

10.2.1. Thermal mapping

This chapter shall demonstrate whether any variation of the maximum surface temperatures in $^{\circ}\text{C}$ exceeding 20% was observed during testing. Demonstration of the maximum surface temperatures between the initial and the intermediate thermal mapping and between the intermediate and final thermal mapping shall be given. Temperature values to be reflected shall be given as per monoblocks.

Given average temperatures, shall correspond to control IR-pictures.

10.2.2. Cycling

This chapter shall demonstrate whether an appearance of any “hot spot” during the cycling was observed. As a general rule the hotter region shall be considered as “hot spot” if its maximum surface’s temperature is higher than 30% (measured in °C) when compared to the other properly bonded tiles.

The minimum data to assess the above point shall be reflected in a following way:

A graph of normalized () steady-state surface’s temperature of each monoblock as a function of number of cycles for each step of the cycling.*

All the graphs shall be marked with thresholds of target values

() Normalization to the initial temperature and to the flux:*

$$T_criteria(n) = [(T(n) - T(cycle\ 1))/T(cycle\ 1)] * [AHF(1)/AHF(n)]$$

10.3 Conclusions

As minimum, this chapter shall contain the following conclusions:

- 1) Assessment of performance of the tests (arguments in writing).*
- 2) Assessment of performance of mock-ups (arguments in writing).*
- 3) Following photos of mock-ups surfaces (with mock-up’s identification) in order to see evolution of mock-ups’ surface:*
 - Before beginning of tests;*
 - After completion of cycling;*
 - In case of mock-up(s) failure an additional picture shall also be provided).*

Test Report shall also contain an explanation of any unexpected event or measurement of observation although it’s an artifact.

12. Shot history

The shot history shall be added to the testing report as its annex.