

SIRHEX – a new experimental facility for high heat flux testing of plasma facing components

André Kunze¹, Bradut-Eugen Ghidersa¹, Flavia Bonelli²

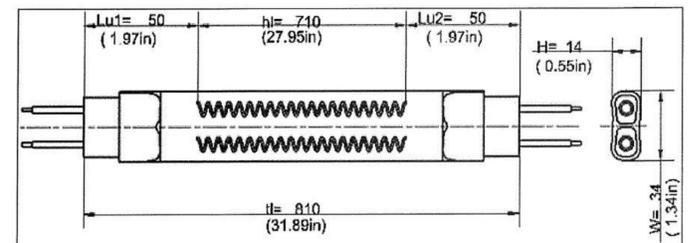
¹ Institute for Neutron Physics and Reactor Technology - Karlsruhe Institute of Technology (KIT), Germany, Corresponding author: andre.kunze@kit.edu

² Politecnico di Torino, Dipartimento Energia, Italy

SIRHEX (“Surface Infrared Radiation Heating Experiment”) is a small-scale experimental facility at KIT, which has been built for testing and qualifying high heat flux radiation heaters for blanket specific conditions using an instrumented water cooled target.

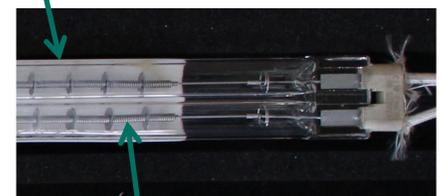
In the first series of tests a commercial infrared heater is tested to answer the following questions:

- Is it possible to reach heat flux densities up to 500 kW/m² at a temperature of 500°C on the surface of the target?
- How homogeneous is the heat distribution?
- How many cycles is the heater able to withstand?

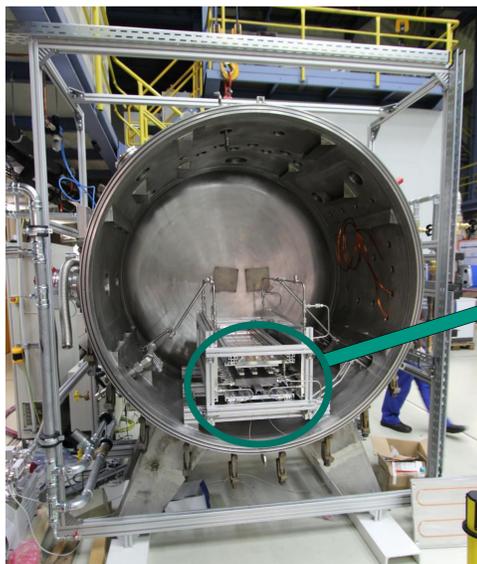


Infrared Heater
(supplied by Heraeus
Noblelight GmbH)

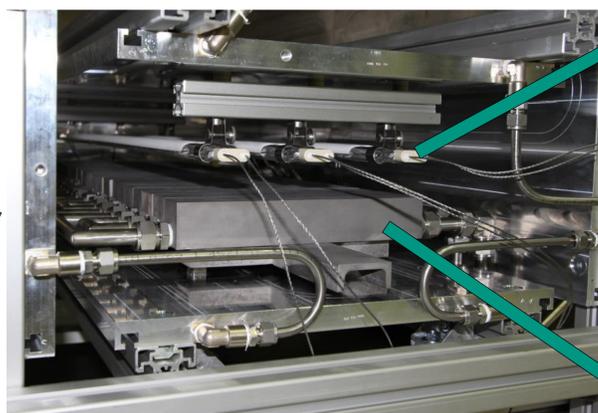
Quartz reflective coating



Tungsten filament



Test assembly inside opened vacuum vessel

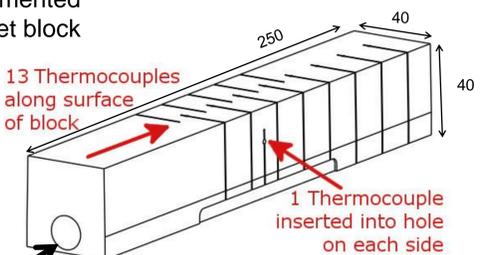


Instrumented
target block

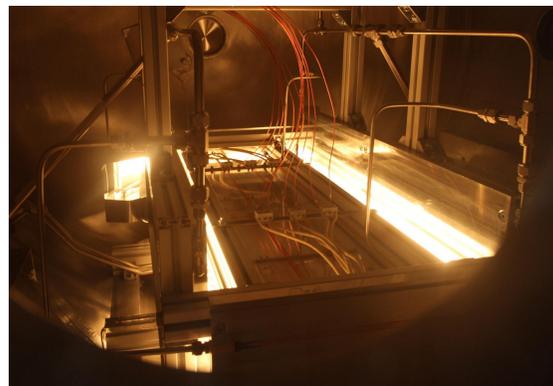
13 Thermocouples
along surface
of block

Water cooled through
Ø 12 mm hole

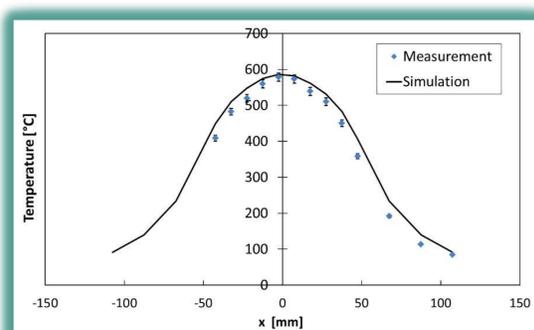
1 Thermocouple
inserted into hole
on each side



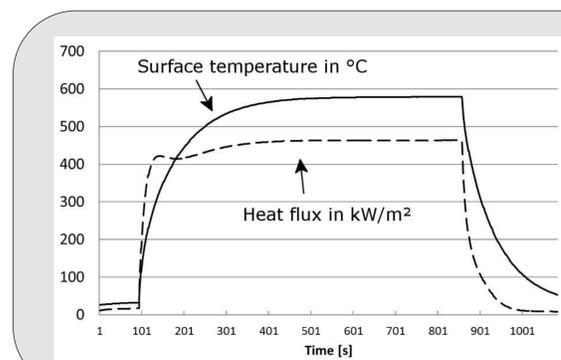
View into
vacuum vessel
with heaters
operating at
full power



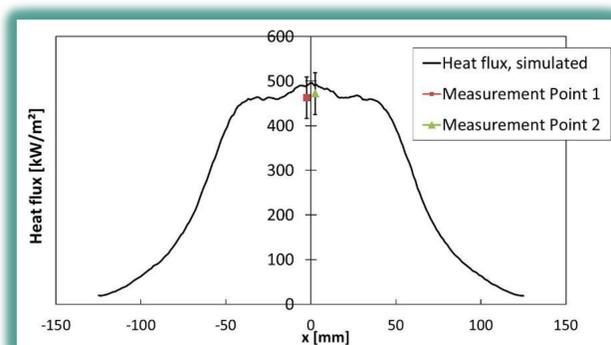
Results



Steady state
temperature
distribution after
800 s



800 s test run with
3 heaters at
maximal heating
power of 45 kW.
The distance of the
heater filaments to
the target surface
was 14 mm and
between the center
of heaters 36 mm.



Steady state heat
flux after 800 s

Summary

	Goals	Achieved
Surface heat flux	500 kW/m ²	470 kW/m ²
Surface temperature	500°C	>550°C
Homogeneity of heat distribution	+/- 5% of nominal value	+5.2/-3 % of average value (below heaters)
Lifetime	3000 cycles with 400 s at max. power	226 cycles