



W and W-armored heat sinks

A quick review of US development

Presenter: Richard Nygren (Sandia National Laboratories)

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
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The US pioneered W-rod armor for ITER.

- **Watson showed only a small cell size (<5mm) would substantially reduce thermal stresses in armor. We developed W-rod armor for the ITER divertor.**
- **US R&D in the mid-1990's on design, fabrication and HHF testing for ITER was a significant effort and influenced the designs in the EU and Japan.**

Sandia

Bob Watson
Richard Nygren
Dennis Youchison
Mike Ulrickson
Ben Odegard
Chuck Cadden
Jim McDonald
Tom Lutz
Ken Troncosa
Fred Bauer

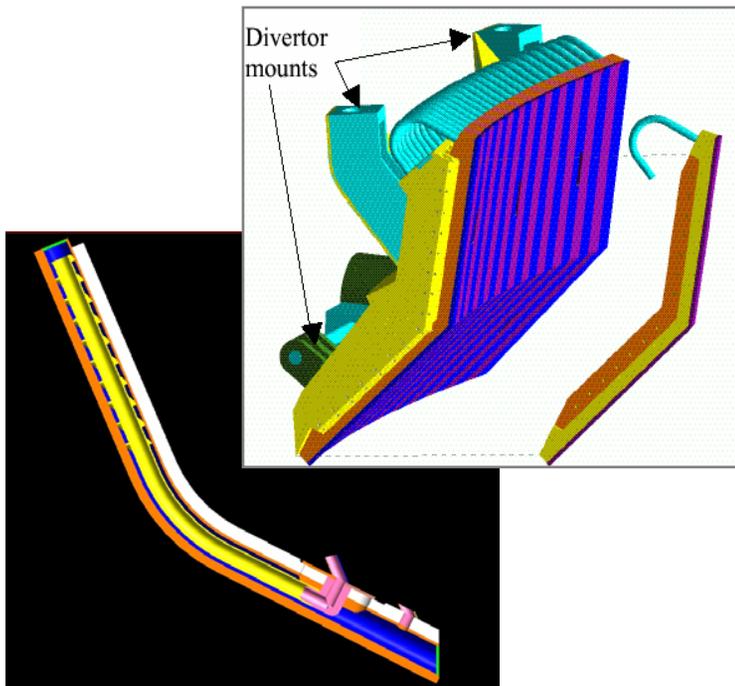
Other Institutions

Boeing (previously MDAC)
Dan Driemeyer, Kevin Slattery,
Jerry Willie

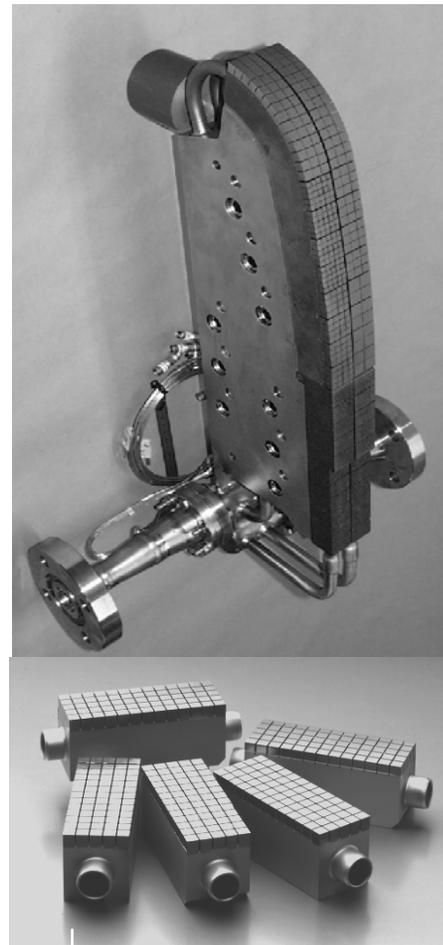
Plasma Processes, Inc.
Tim McKechnie, J. Scott O'Dell

JAERI
Koichi Ezato, Kazuyoshi Sato,
Masato Akiba, others

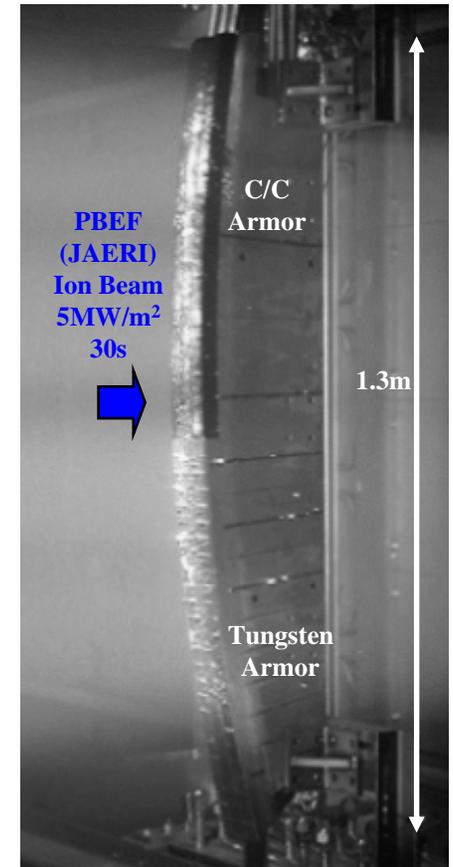
Designs for the ITER & FIRE divertors use W cell armor on a CuCrZr heat sink.



FIRE divertor design with W rod armor



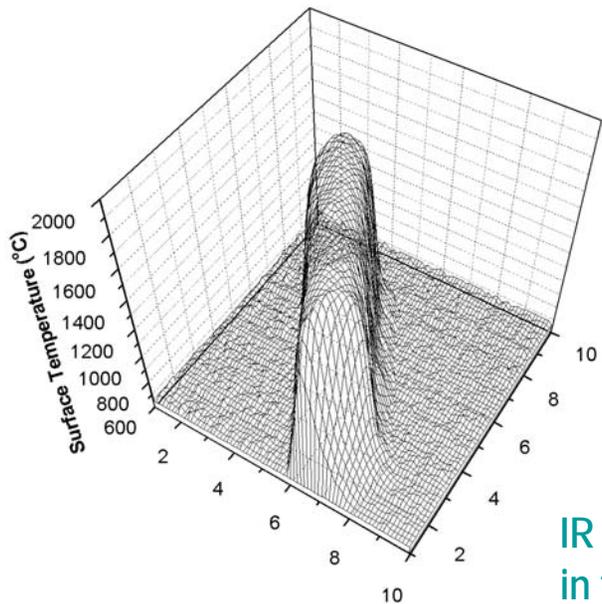
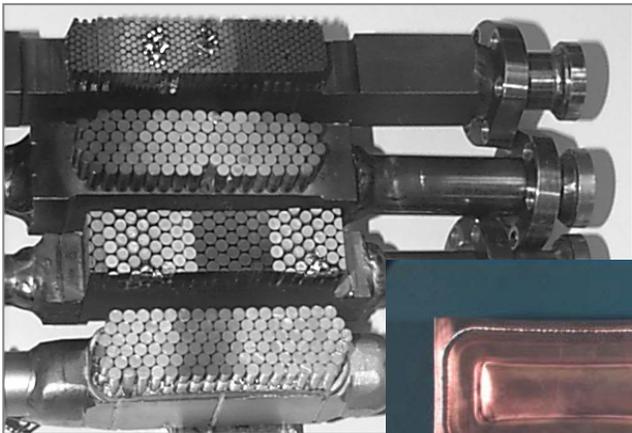
EU ITER divertor mockups
CFC armor (top) and
castellated W (bottom)



Japan ITER divertor mockup
with CFC and W armor
during testing in PBEF

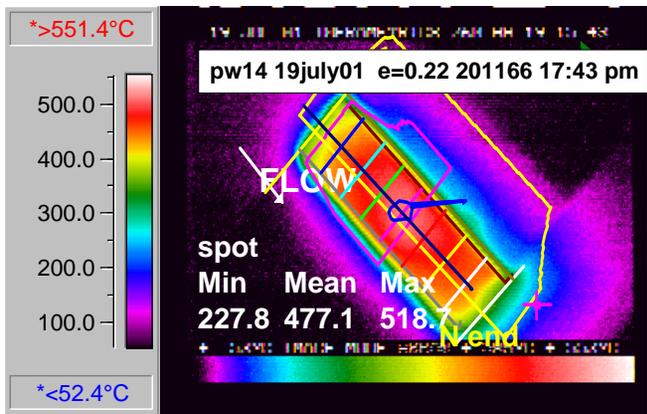


The US has world-class test capabilities and expertise at Sandia in HHF testing and valuable experience in industry.



IR thermographs in tests of PW14

SandIR plot from IR data processing program by Youchison of Sandia



Colorized FLIR (Inframetrics) plot