



WPSA General meeting

2022-05-05

Enhancement IR diagnostics

FROM RESEARCH TO INDUSTRY

RO: X. Courtois
IRFM IR team

2022 May 5th

The technical experience acquired over 20 years and the availability of skills at IRFM allows us to support the development of IR diagnostics for JT60SA.

From the
Conception of IR Diag
Up to
Operation and data analysis

&

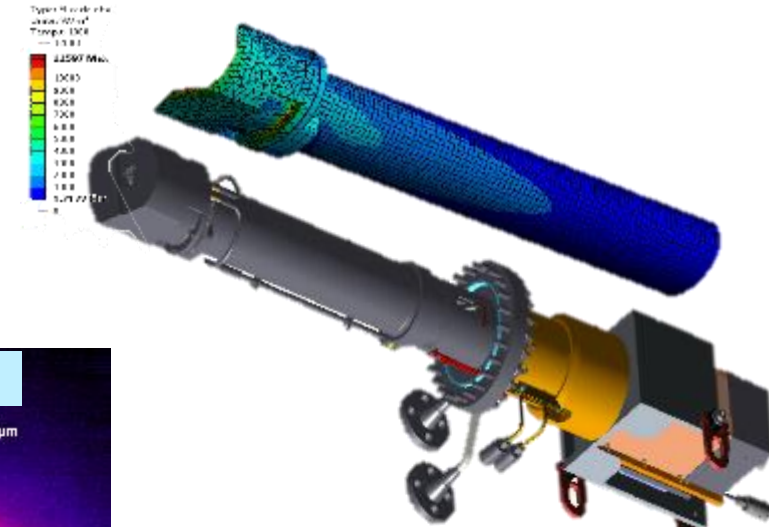
For the
Machine Protection
And the
Scientific Program

- Optical, mechanical, thermal Conception IR lines**
- Home-made IR cameras**
- Laboratory work with calibration test beds and methods to get accurate T °C**
- Development of drivers and acquisition systems**
- Development of on-line and off-line data processing software**
- Development of real-time machine protection (and Machine learning)**
- R&D capabilities, and engagement in Scientific Programs (experiments and data analysis)**

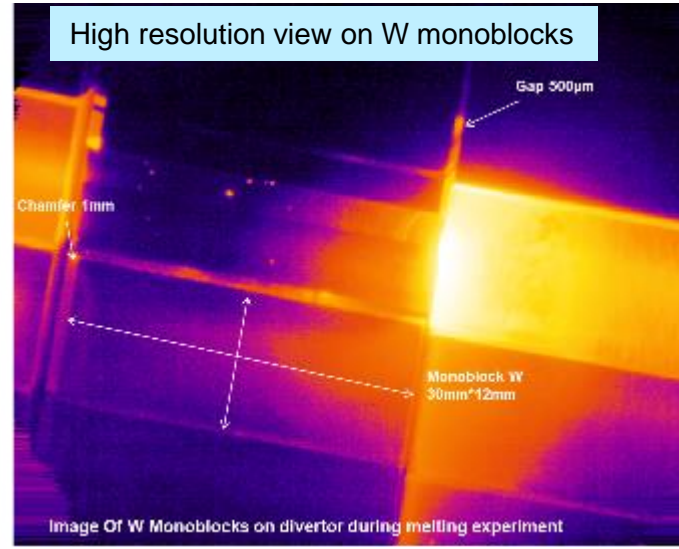
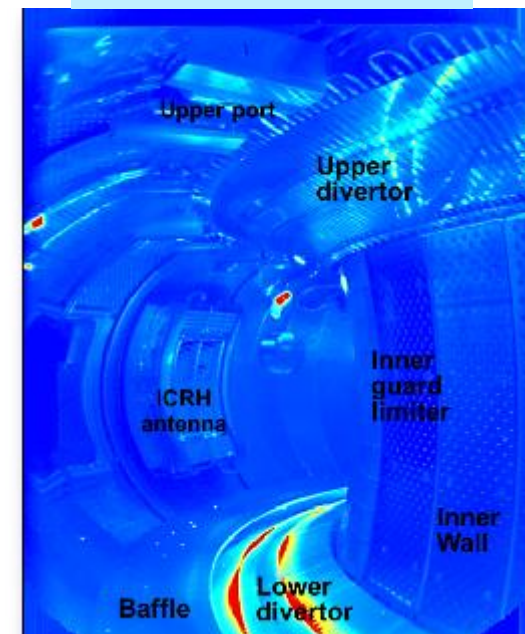
Design, calculations, manufacturing following and mounting of all parts:

- IR-cameras
- Endoscope optics & opto-mechanics
- Mechanical integration, cooling, shielding
- Acquisition system

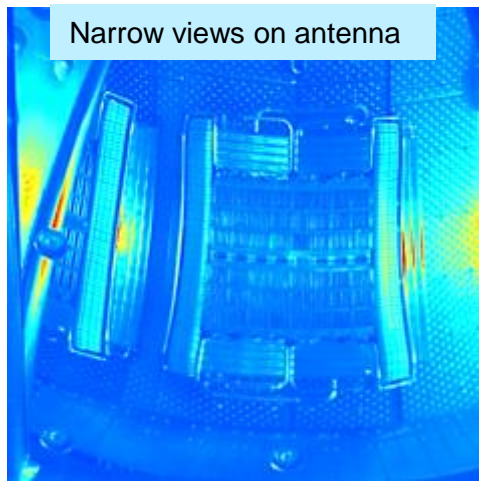
Skills:
Optical design
Photonic simulation
Mechanics & thermo-mechanics



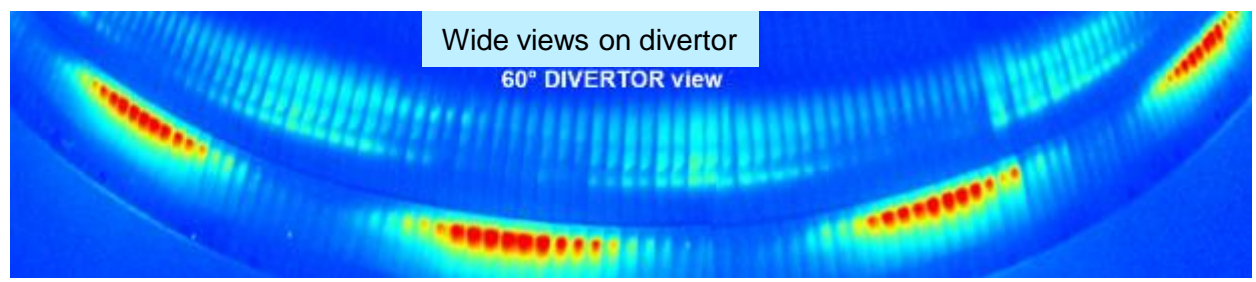
Tangential Wide angle view



High resolution view on W monoblocks



Narrow views on antenna



Wide views on divertor

60° DIVERTOR view

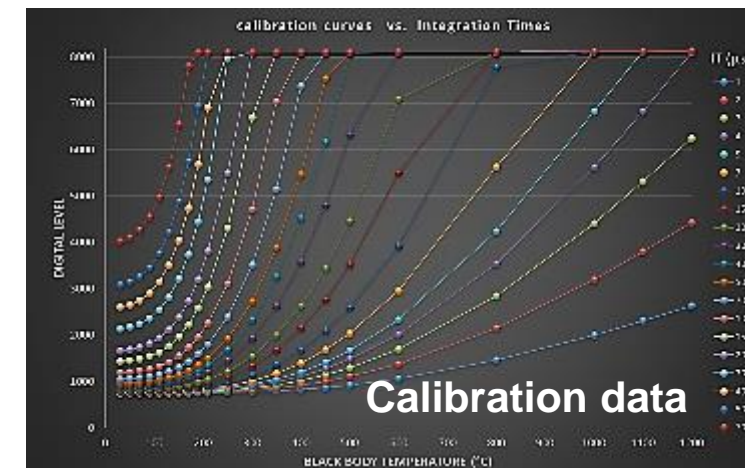
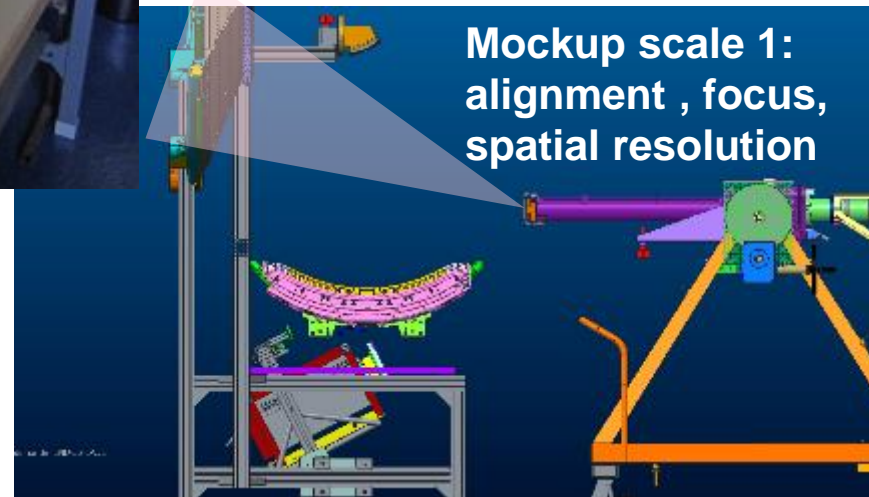
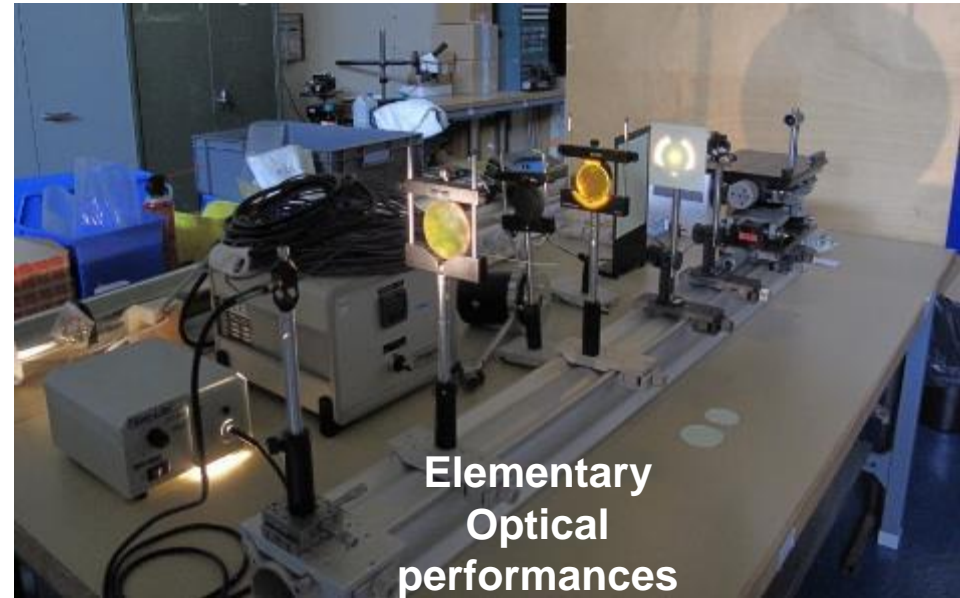


Home-made IR cameras

13 IR cameras
18 lines of sight
on WEST

Laboratory means and know-how:

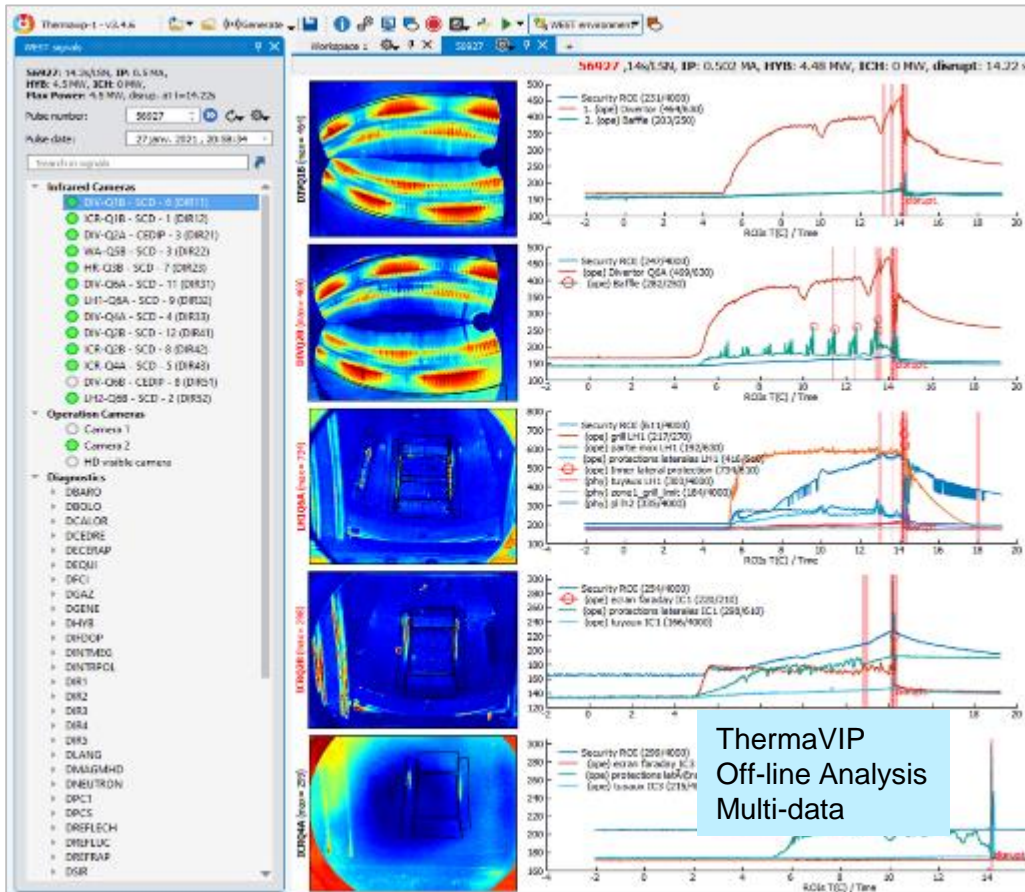
- Optical, mechanical parts assembling
- Optical test bed for elementary tests
- Full diagnostic test with electronics and data acquisition
- IR test beds for calibration and IR performances (resolution,...)



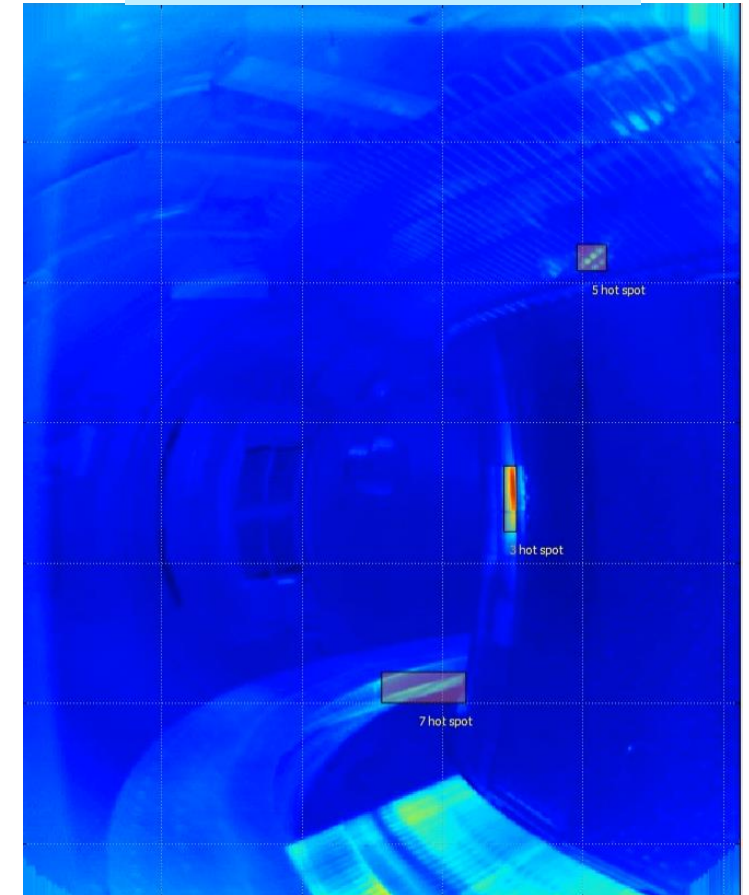
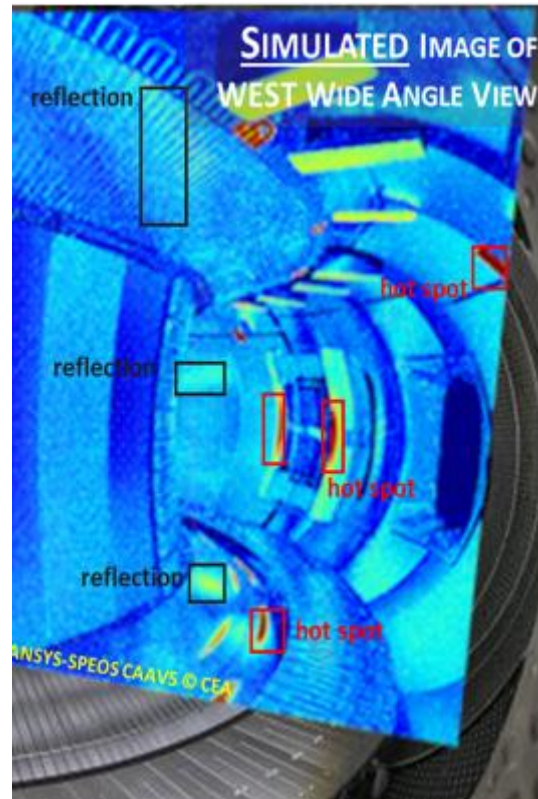
Software suit for enhanced Data Analysis and RT Machine protection:

- Visualisation and Interpretation of IR measurements + cross-data analysis (*ThermaVIP*)
- Real Time processing for power feedback control and machine protection
- End to end simulation for enhanced interpretation (complex scene in metallic env.)
- Automatized detection and identification of hotspots (AI)

Automatized Hot Spot detection



Simulation for IR data interpretation



Deliverable D01 Report on possible improvements for QST IR diagnostics in terms of mechanics, optics and IR data use for physics and machine protection:

- Analysis any QST documents related to IR diagnostic, like preliminary and/or detailed on optical and mechanical designs, cameras specifications, port integration, compatibility with environmental conditions, data management system.
- Identify/define requirements for applications in future divertors (carbon, carbon cooled and tungsten) and PFC.
- Provide the WPSA team with IRFM experience feedback from Tore Supra and WEST regarding the use of IR data for physics and machine protection.

Manpower : 1 pm 50% standard



Thanks for your attention