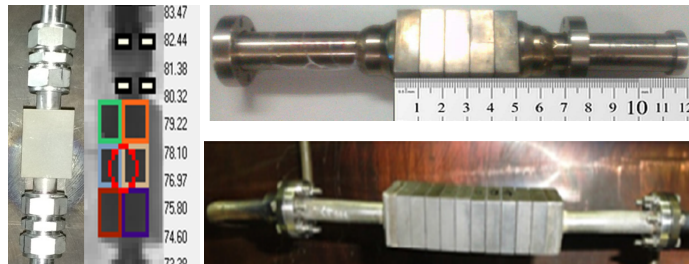
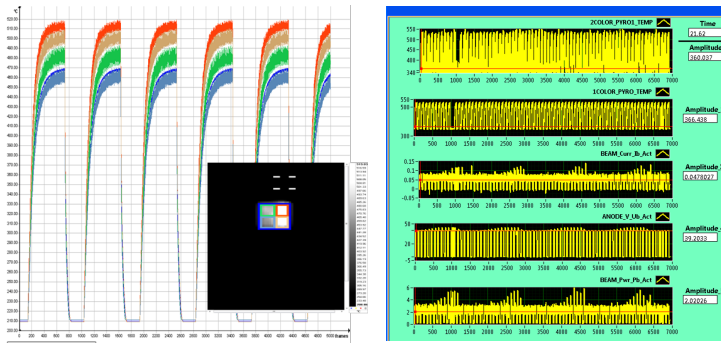


High Heat Flux Tests

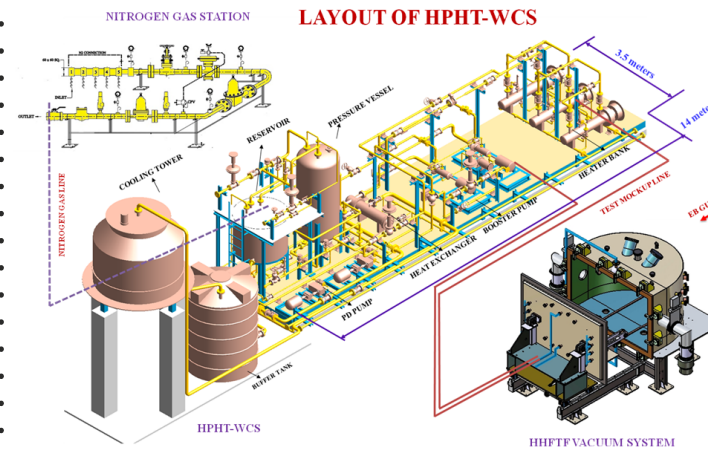


Typical Test Mockups



Typical HHF Experimental Data

Electron Beam Cross-Sectional Profile Studies At Various Beam Power



Features

- Qualification of Plasma Facing Components
- Study of damages in various materials by thermal shock, melting, evaporation etc
- Study of thermal strength and thermo-cyclic life time of multi layer structures

CONTACT

Website: www.ipr.res.in/httd/index.html
 Ph-No: +91-79-2328 1023
 Fax.No: +91-79-2396 2277
 E-mail id: technology@ipr.res.in

HIGH HEAT FLUX TEST FACILITY



High Temperature Technologies Division



Institute for Plasma Research
 Bhat, Gandhinagar, Gujarat,
 India-382428
www.ipr.res.in

ELECTRON GUN SYSTEM

Maximum Electron Beam Power	: 200 kW
Maximum Accelerating Voltage	: 45 kV
Rise / Fall Time of Beam Power	: ~ 1 ms
Beam Deflection Angle	: +/- 25 deg
Beam Diameter	: Gaussian radial $\sigma \sim 4 \text{ mm} / 8 \text{ mm}$ at 80 / 200 kW

HHF VACUUM CHAMBER

Configuration	: D-Shaped Double Walled SS 304L chamber
Size of opening flange	: 1.5 m (Vertical) x 2.5 m (Horizontal)
Diameter (Volume) of D-shaped chamber	: 2.5 m (5 m ³)
Operating Pressure	: 5E-6 to 5E-4 mbar (Adjustable)
Max. Size / Weight of Test Component	: 1 m x 1 m / 1 Ton

VACUUM PUMPING SYSTEM

Vacuum Pump - 1	: Turbo-molecular Pump (1900 l/s for N ₂)
Vacuum Pump - 2	: Cryosorption Pump (4500 l/s for N ₂)
Roughing Pump	: Roots Pump (150 m ³ /hr)
Backing Pumps	: Rotary Pump (60 m ³ /hr)

COOLING SYSTEMS

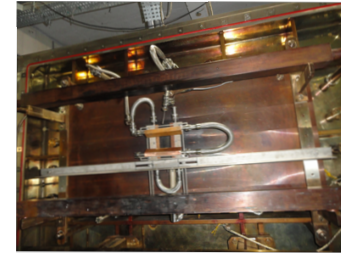
HPHT WCS - 1 (Maximum Operating Parameters)	
Temperature: 100 degC, Pressure: 18 bar, Flow rate: 100 LPM	
HPHT WCS - 2 (Maximum Operating Parameters)	
Temperature: 160 degC, Pressure: 60 bar, Flow rate: 300 LPM	

DIAGNOSTICS

Pyrometers	: 350°C to 3500°C (1-Color & 2-Color)
Thermocouples	: 0 to 1260°C (K-type with ungrounded Shield)
RTD	: PT-100
Digital IR-Cameras	: RT to 3000°C and RT to 1500°C
Cavity Black Body	: 500°C to 3000°C (Calibration of IR)
Calibrator	: Thermocouple Calibrator for 150°C to 1200°C
Mass Analyzer	: Residual Gas Analyzer up to 300 AMU
Calorimetry	: Fast response RTD Pt-100
High Speed Camera	: 640x240 Pixels @ 10,000 fps
Safety Devices	: X-ray dosimeter, X-ray area monitor



Vacuum Chamber & EB system



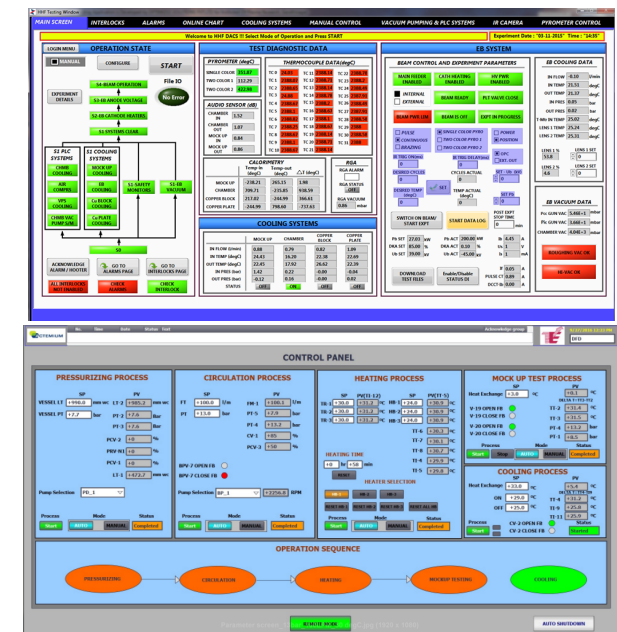
Target Handling System



HPHT WCS - 1&2

DATA ACQUISITION

Configuration	: PXI & PLC based real time DACS
Sequential / Simultaneous sampling	: 90 S/s to 750 kS/s per channel
Communication	: Ethernet, RS232/ 485, USB, Modbus, OPC
Interlocks	: Sequential and operational
Safety chain	: Software and Hardwired
Control Loops	: Vacuum Regulation PID control loop (~ ms)
Data format	: TDMS



ANALYTICAL CAPABILITIES

Available Softwares:

ANSYS Multiphysics, Star CCM+, MATLAB, ABAQUS, CATIA V5, Hypermesh, Sysweld, CIVA

Available Hardware:

4 HP Workstations including one with GP-GPU Capability