Effects of transient heating events on plasma facing materials in a steady-state plasma environment

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Plasma Only Plasma + Laser UC-PISCES

- At low flux and bulk temperature, 1Hz transient heating during plasma exposure increases retention and Deuterium is released at
 - higher temperatures but flash heating after exposure to plasma only decreases retention
- At high flux, moderate bulk temperature and 1Hz transient heating, Deuterium is released at higher temperatures and retention is nearly unchanged
- Impact is that Be PFCs subjected to simultaneous D plasma and



Plasma Only

transients will retain significantly more D above 250C, the planned heating temperature of the Be walls for ITER



Plasma + Laser

• Transient heating can cause evaporation of Be • Important to monitor temperature in real-time



BS: 50/50 Beamsplitter Filter 1: Bandpass @ λ_1 Filter 2: Bandpass @ λ_2 Laser Filter: Blocks 1064nm



System Characteristics

- Resolve temperature changes at 10µsec rate
- LabVIEW-based DAQ
- NIR System
 - measures at 1300 and 1550nm
 - T_{meas} > 400°C
 - NIR PMT Detectors
- IR System
 - measures at 2.7μm and 3.5μm
 - 50°C < T_{meas} < 1000°C
 - InSb Detectors

Initial measurements indicate that under normal laser irradiation conditions above, Be surface is heated to a peak $\Delta T \sim 475^{\circ}C$



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X5,000

15kU

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