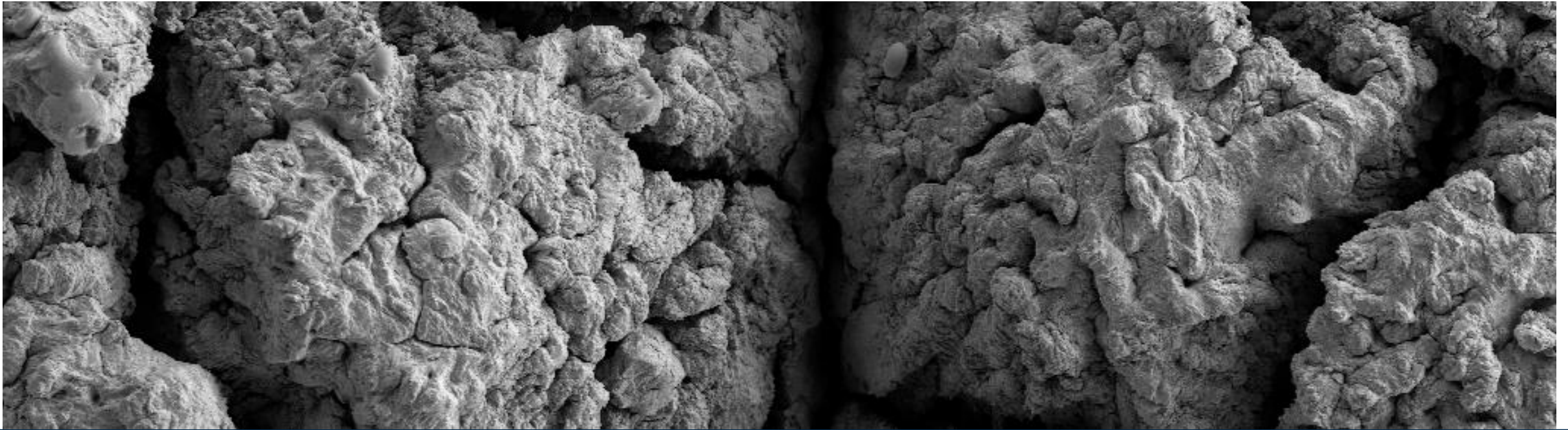




High power test of ITER plasma-facing components, including damaged or below specification components

17th May 2019 | M. Wirtz, J.W. Coenen, Y. Corre, Th. Loewenhoff

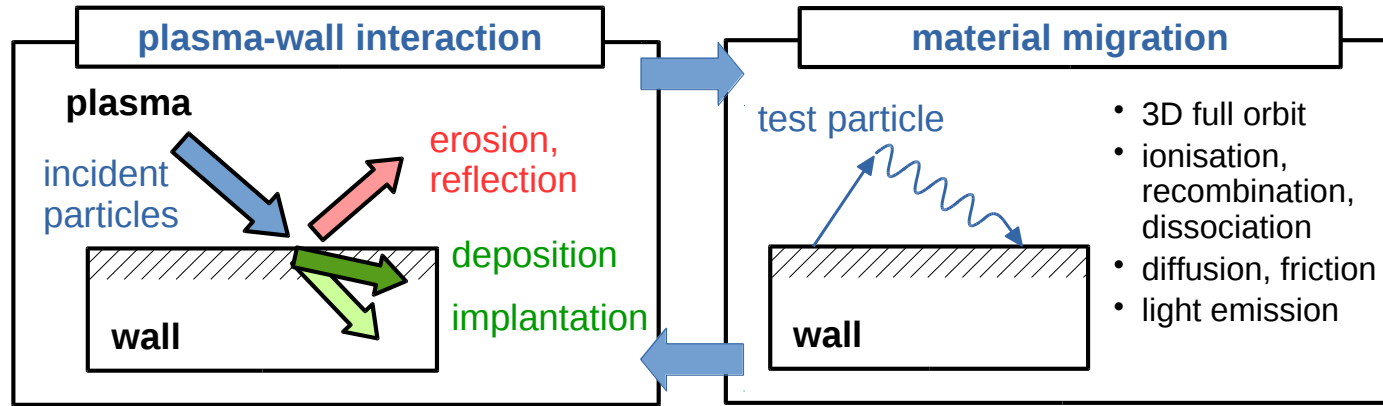
Forschungszentrum Jülich GmbH, Institut für Energie- und Klimaforschung, 52425 Jülich, Germany

CEA, IRFM, F-13108 Saint-Paul-Lez-Durance, France

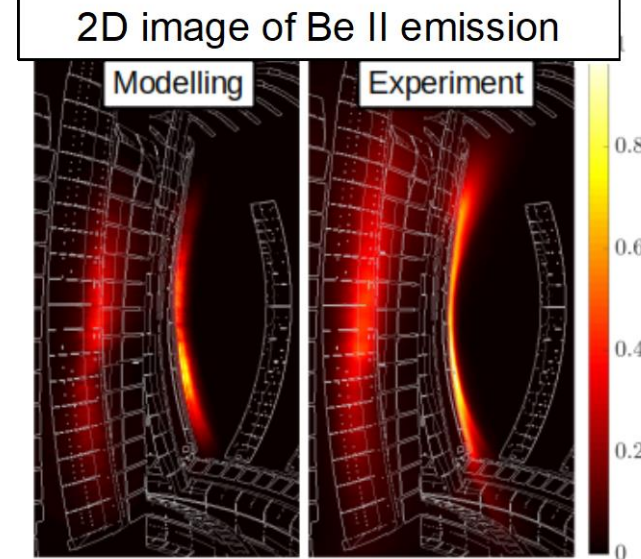
- **Post mortem analyses of pre-damaged (JUDITH 2) and plasma exposed (WEST) PFUs (optical microscopy, SEM, laser profilometry, metallography)**
- **Pre-damaging of W-PFUs with heat loads that induce more severe surface damages (broad cracks > 10 μm , crack network + melt droplets)**
 - Investigate changes in the surface morphology and damage after the exposure in WEST
 - Impact of surface damages on the plasma performance
- **Preparation of molten/solidified (disruption) and laser repaired W-surfaces**
 - Performance of molten/repared surfaces during operation
 - Impact of these surface structures on the plasma performance
- **“Melt experiment” with intentionally misaligned mono block**

FZJ modelling activities

ERO2.0 and EIRENE in-house modelling activities



The 3D Monte-Carlo code ERO2.0



Application example: JET ITER-like wall

Key topics of FZJ Modeling Activities: Development of concepts for integrated PWI and edge plasma physics models, as well as their validation against the experiment

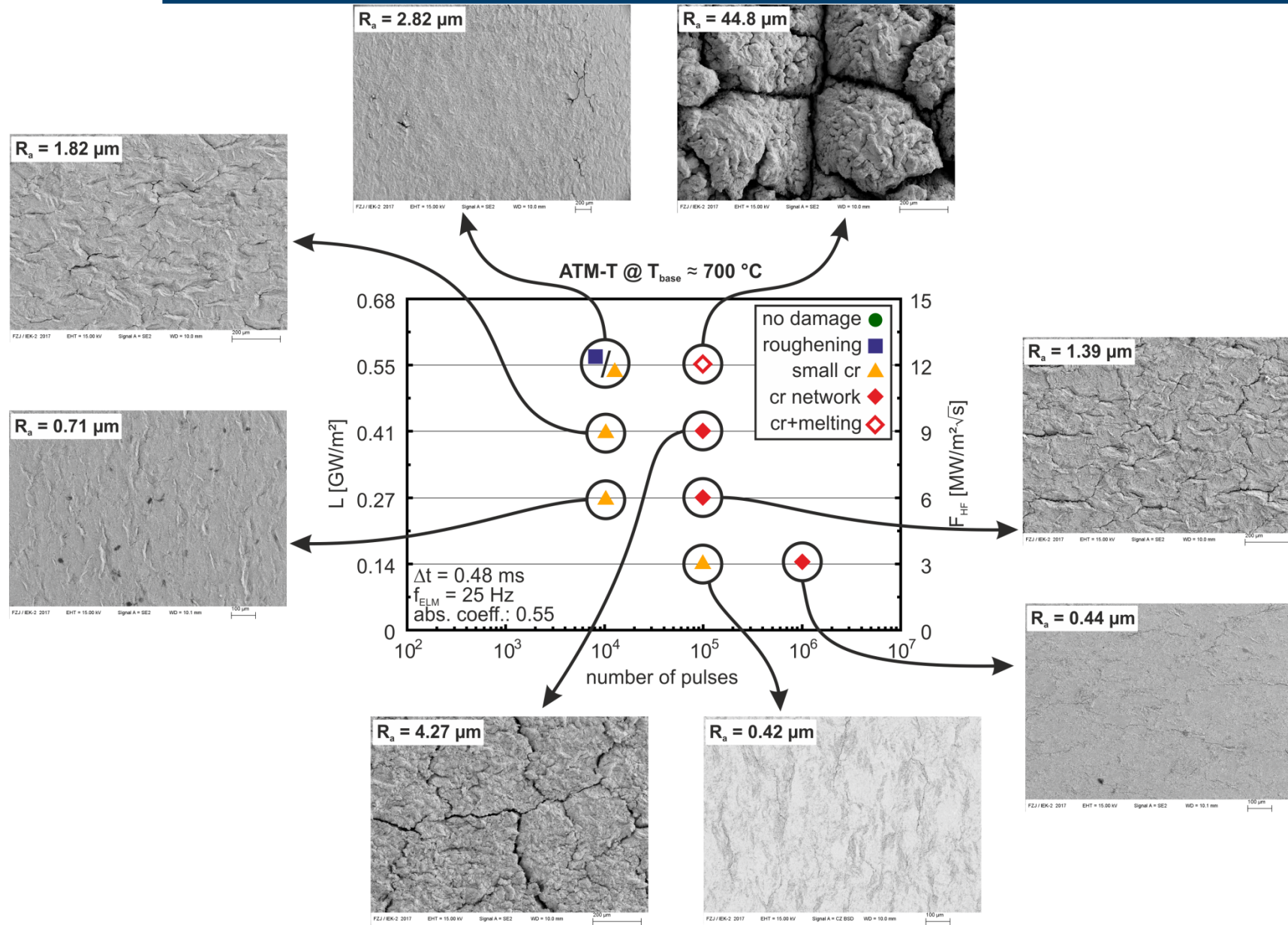
Example:

- **ERO2.0 requires input:** plasma and neutrals background distributions from 2D/3D edge codes: SOLPS-ITER and EMC3-EIRENE
- In particular charge-exchange **neutral wall impact distributions (flux, energy, angle)** from **EIRENE** can be generated
- **The plasma/neutral backgrounds have to be validated by comparing to experiments:** to constrain open model parameters like: (anomalous) transport, plasma flows (drifts), dissipation by (impurity) radiation and neutral kinetics (molecules & atoms) & PWI

- ERO2.0 modeling of W erosion and transport in D and He plasma
- Comparison with spectroscopy
- SOLEDGE2D – EIRENE plasma backgrounds as input
- Temperature scans to detect W sputtering threshold
 - additionally, parameter scans in O concentration

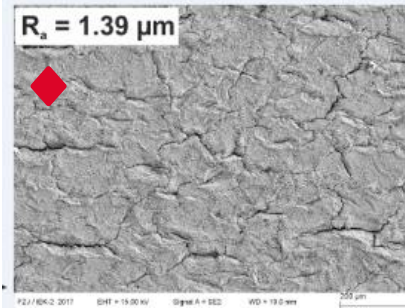
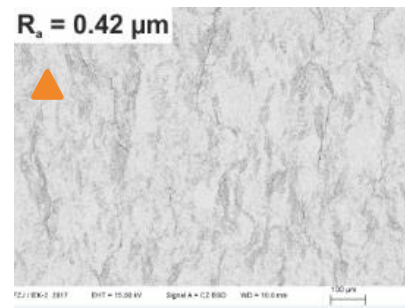
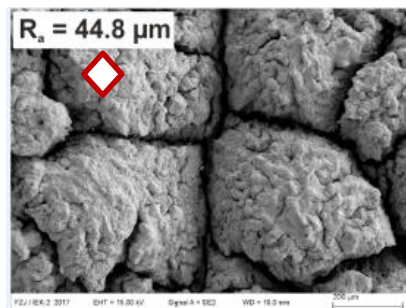
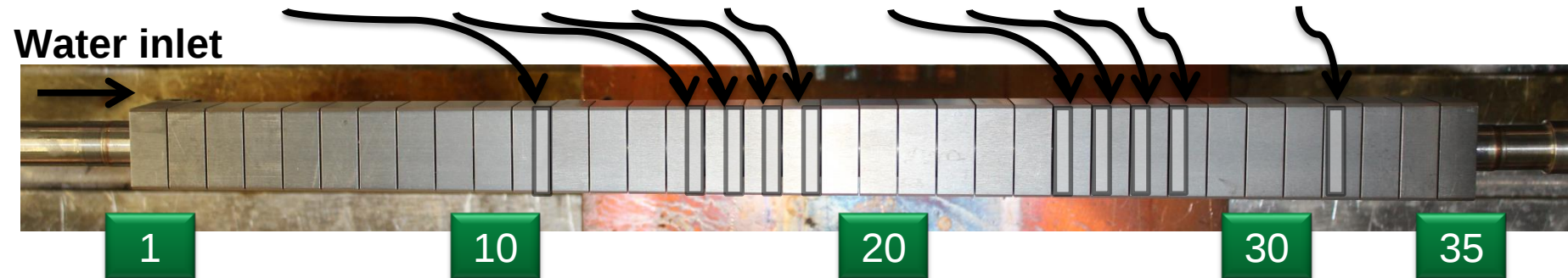
Backup

Pre-characterization experiments in JUDITH 2



Pre-damage HHF loading on WCAT004

	MB# 													
Inner side Monoblock Min. Width	11	...	15	16	17	18	...	25	26	27	28	...	32	Outer side Monoblock Max. Width
Damage														
F(MW/m ² /s)	12		3	3	6	6		6	6	3	3		12	
pulse count	10 ⁵		10 ⁵	10 ⁵	10 ⁵	10 ⁵		10 ⁵	10 ⁵	10 ⁵	10 ⁵		10 ⁵	



-  Damage 1 (small cr)
-  Damage 2 (Cr network)
-  Damage 3 (Cr melting)

Pre-damaged component position

