



## Overview of plasma-wall interaction activities in Wendelstein 7-X

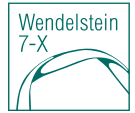


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D. Naujoks and the W7-X team



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- The W7-X Team: Author list in T. Sunn Pedersen et al, Nucl. Fusion 62 (2022) 042022

# W7-X Plasma-facing components (PFCs)

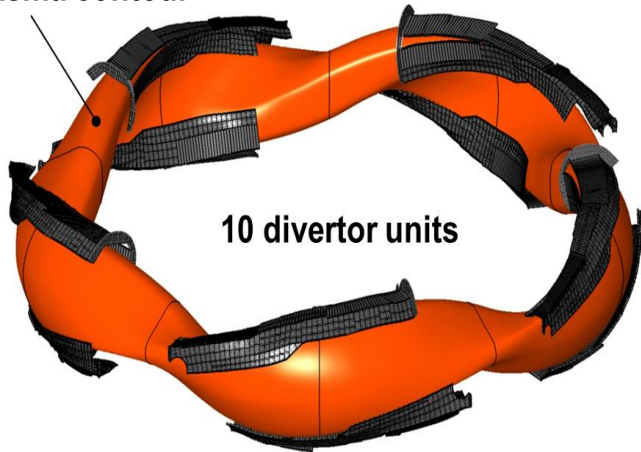
## PFC areas:

Carbon: 108 m<sup>2</sup>

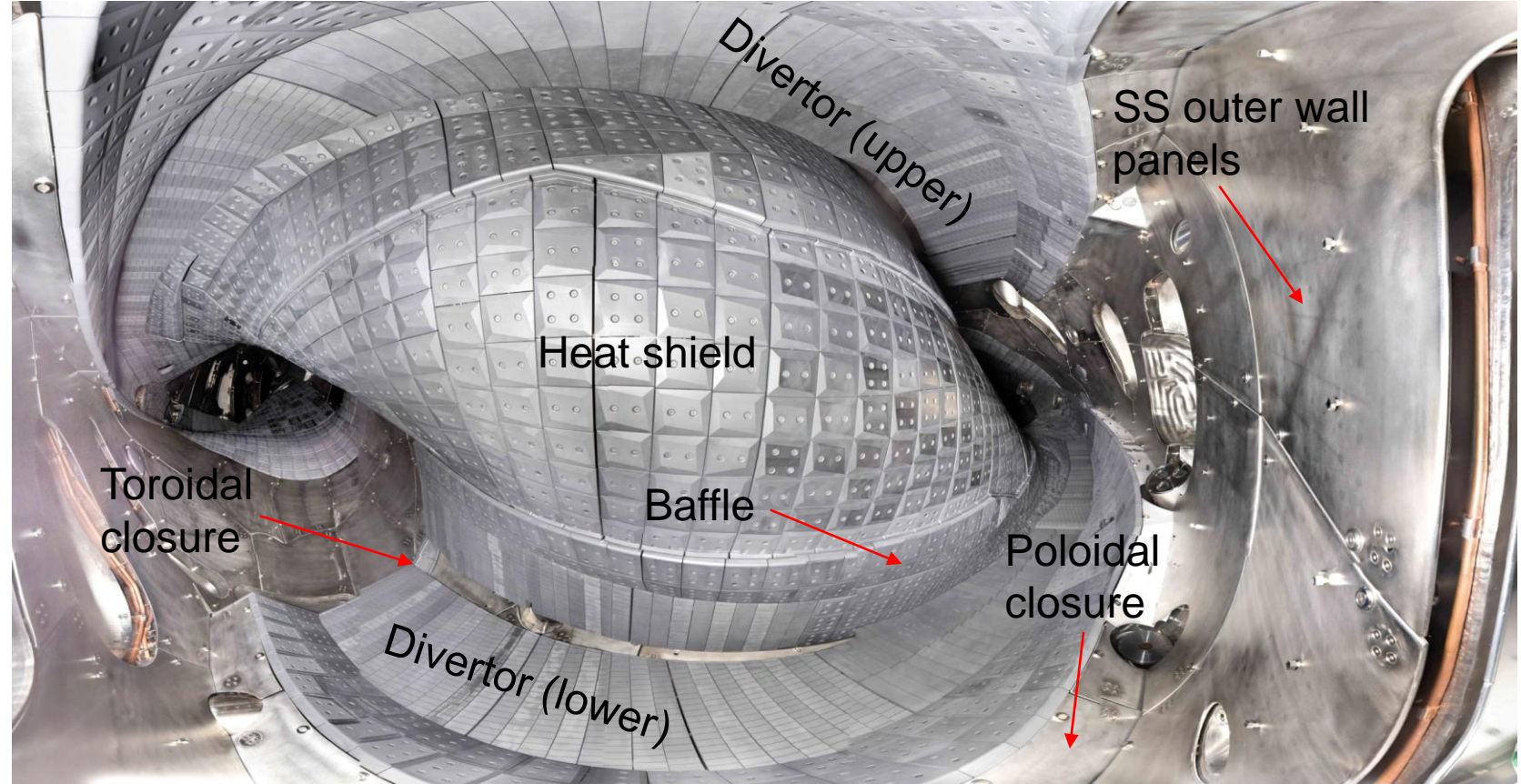
Stainless steel: 71.4 m<sup>2</sup>

All the PFCs are water cooled (OP2).

plasma contour



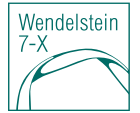
Panorama view (module 4)



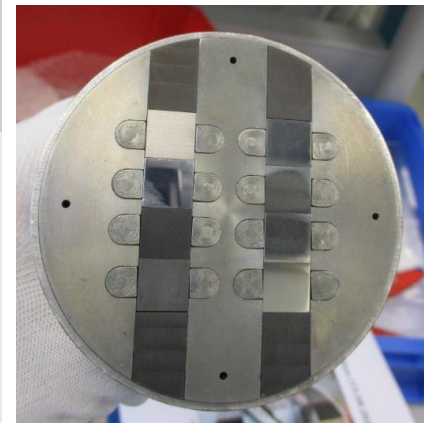
Divertor material: Fine grain graphite (FGG) for OP1.2 (Test divertor unit (TDU)), changed to carbon-fiber composite (CFC) for OP2 (High heat flux (HHF))



# PWI activities: Overview

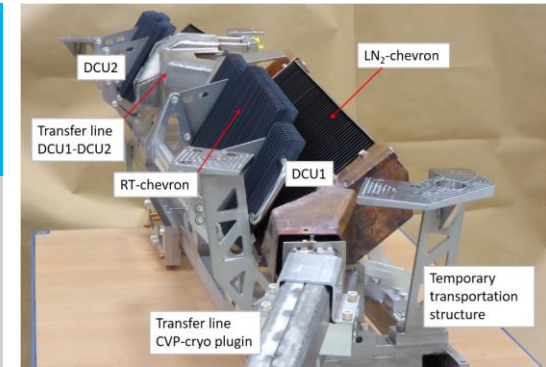


Activities / Topics	Collaborators (with IPP-HGW)
<p>1. Erosion, deposition, fuel retention investigations</p> <ul style="list-style-type: none"> <li>a. Post-mortem analysis: Retrieved divertor targets, first wall tiles, TZM screws and other components, ca. 120 tiles are retrieved after OP2.1 which are available for the analysis</li> <li>b. Colorimetry (optical (RGB) reflection) measurements: First wall, poloidal closure, pumping gap panels, divertor surfaces</li> <li>c. Arc-traces investigations: whole plasma-facing components (PFCs) and diagnostics</li> <li>d. Dust / loosely bound layers: Collected dust, probes (loose layers)</li> </ul>	<p>AMU, FZJ, IPP-GAR, NIFS, WIT, VTT</p> <p>NIFS</p> <p>IPP-GAR, UTsu, UTok</p> <p>IPP-GAR</p>
<p>2. Wall conditioning (Glow discharge Boronization)</p> <ul style="list-style-type: none"> <li>a. Optimization of discharge: Investigation on retrieved GD electrodes</li> <li>b. Characterization of deposited layer: Sample exposures via manipulator, retrieved tiles, in OP2.2, 2. boronization on 18.10.2024</li> </ul>	<p>FZJ, IPP-GAR</p> <p>FZJ, IPP-GAR</p>

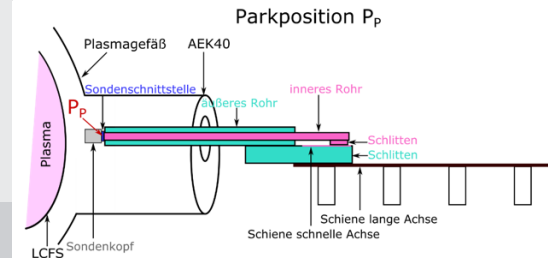


# PWI activities: Overview

Activities / Topics	Collaborators (together with IPP-HGW)
3. Exhaust studies <ul style="list-style-type: none"> <li>a. Divertor Cryo-vacuum pump: Performance optimization</li> <li>b. Neutral gas simulations: In the sub-divertor region</li> </ul>	KIT, NIFS KIT
4. Experiments with tungsten PFCs (W-transport, accumulation, erosion/ deposition) <ul style="list-style-type: none"> <li>a. Tungsten PFCs: Divertor targets, baffles, heat shield</li> <li>b. Tungsten samples from Multi-purpose manipulator</li> </ul>	IPP-HGW, UW FZJ, IPP-GAR, NIFS
5. Simulations (Carbon / tungsten PFCs) <ul style="list-style-type: none"> <li>a. EMC3-EIRENE</li> <li>b. ERO2.0</li> <li>c. WalIDYN3D</li> <li>d. DIVGAS</li> </ul>	IPP-HGW, UW FZJ IPP-GAR KIT



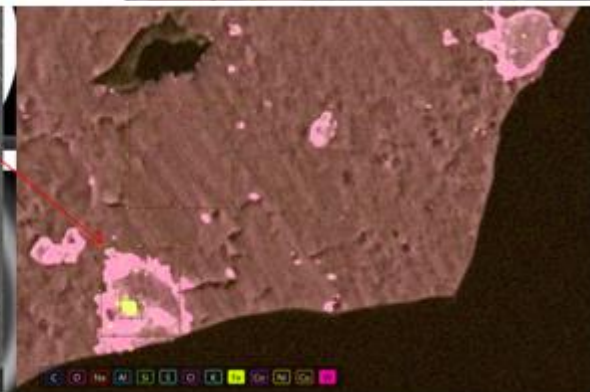
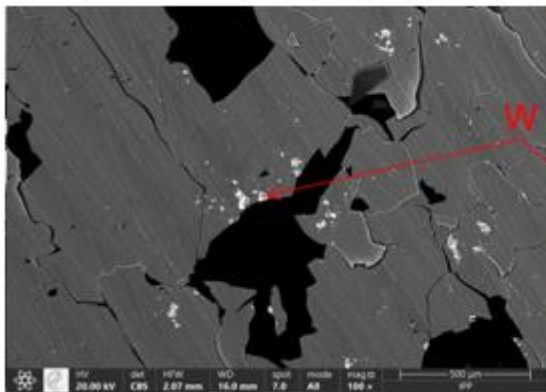
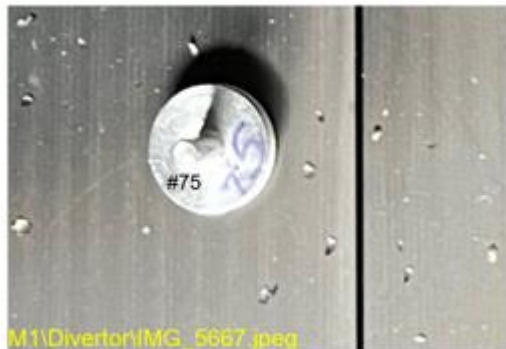
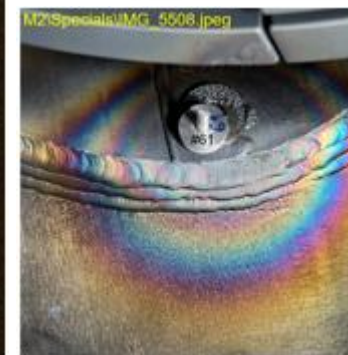
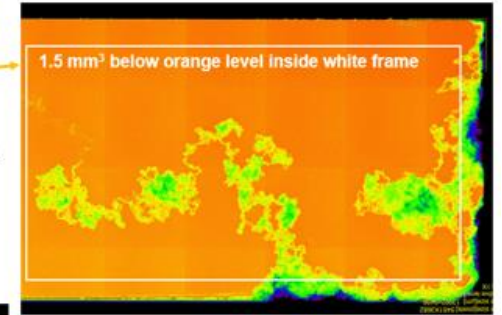
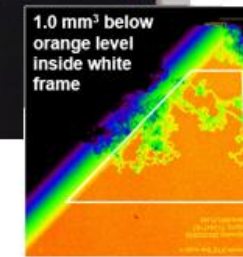
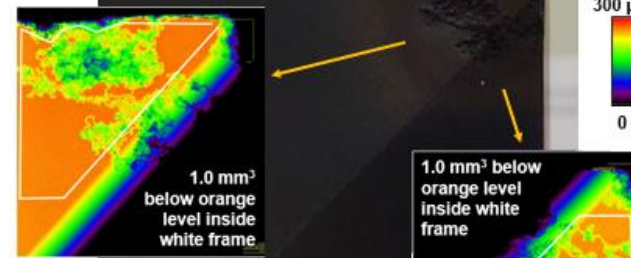
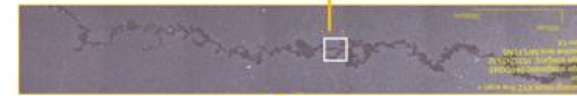
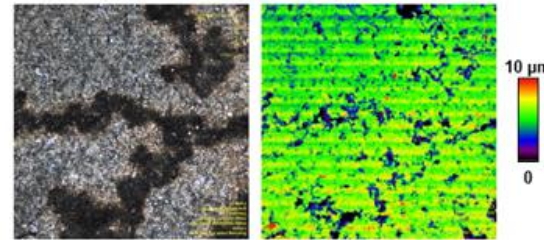
Ref.: G. Ehrke



Ref.: C. Killer

# Investigations on dust, loosely bound layers, Arcs (M. Balden)

- Ca. 100 samples collected after OP1.2b and OP2.1
- Investigations showed a number of samples with C-flakes, C+O+ co-depositions with W, Fe, Si, Cu, Cl etc. impurities



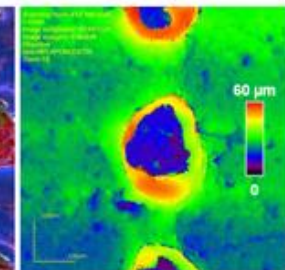
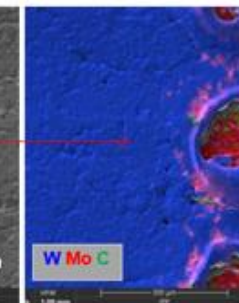
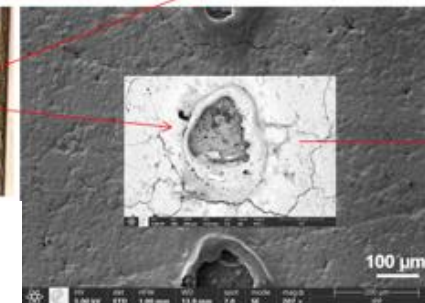
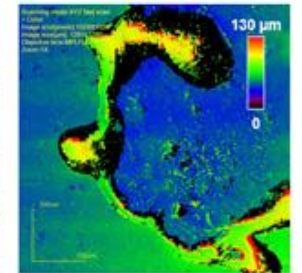
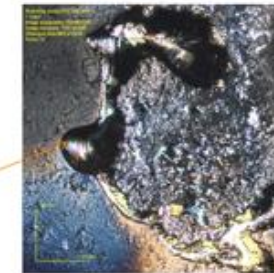
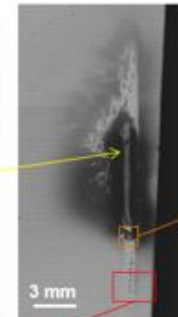
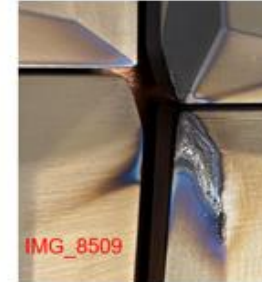
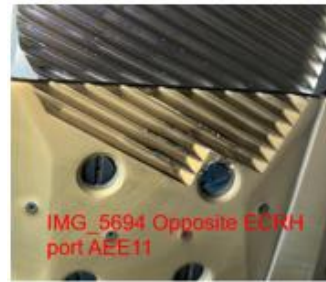
Fast ion detector tile:  
ca. 3.5 mm<sup>3</sup> was eroded by arcing



# Investigations on W-coated tiles, melting events (M. Balden)



IPP\_D\_2KLQUC: Photo documentation of PV after MP2.2



Collaborators are very welcome to propose the experiments and join the PWI studies in W7-X.