WPPWIE SP-B-2/3: MPG activities in 2021: analysis of AUG, WEST and MAGNUM-PSI samples – plans and capabilities

Martin Balden, IPP
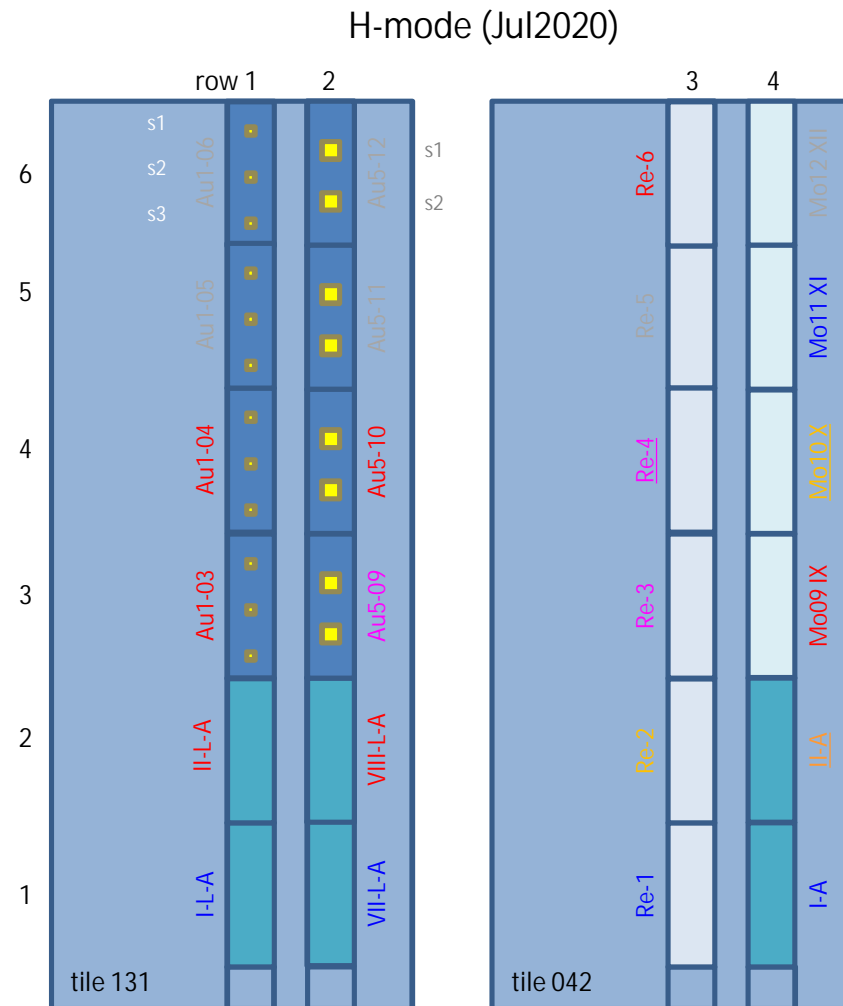
Regarding AUG (1): marker & roughness

❖ **Analyses of samples exposed with DIM to H-mode discharges (2020-07-09)**

❖ Post characterization with SEM/EDX and partially with RBS
⇨ obtain comparable data to previous L- and H-mode experiments (see IAEA Hakola)

❖ Support preparation of talk and publication

H-mode (Jul2020)

Regarding AUG (2): gap loads

❖ **Analyses of samples from WPMST1 T17 - toroidal gap loads experiment (2021-03-18)**
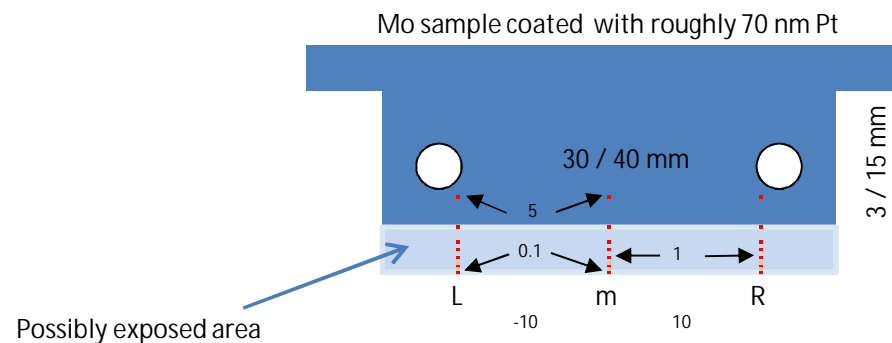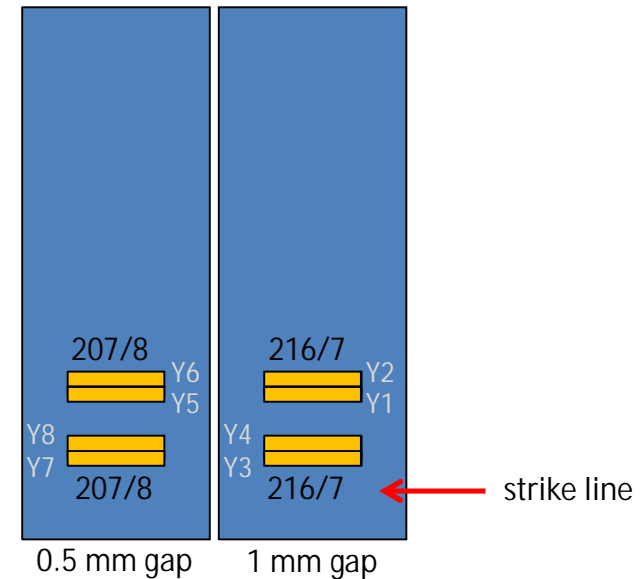
❖ Follow-up experiment with opposite field
   1st: 2020-02-14: rev. I_p / B_t
   2nd: 2021-03-18: co. I_p / B_t

❖ Preparation, pre- and post-characterization with RBS and SEM/EDX
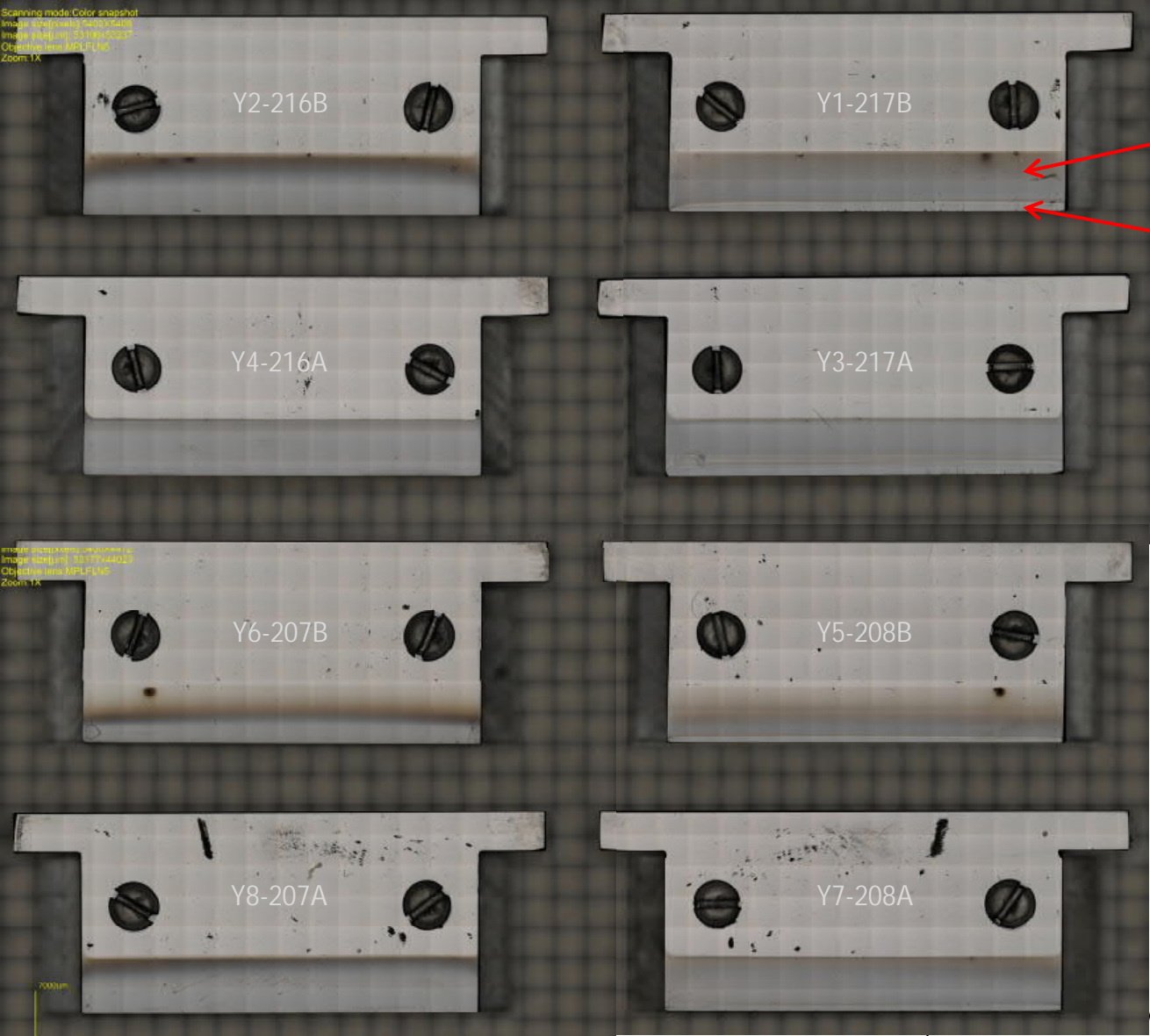   (PIXE in Zagreb)

❖ Preparation of publication

207/8   216/7
Y6   Y2
Y5   Y1
Y8   Y4
Y7   Y3
207/8   216/7

0.5 mm gap   1 mm gap

strike line

Mo sample coated with roughly 70 nm Pt

30 / 40 mm

3 / 15 mm

5

0.1

1

L   m   R

-10   10

Possibly exposed area

Regarding AUG (2): gap loads

Top side face

Bottom side face

Y2-216B

Y1-217B

Y4-216A

Y3-217A

Y6-207B

Y5-208B

Y8-207A

Y7-208A

Exposed area

Eroded area

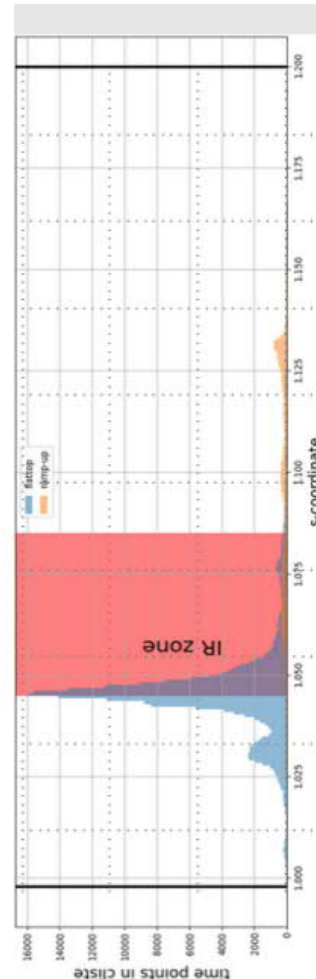Checker board patter is an artefact of stitching of the CLSM images
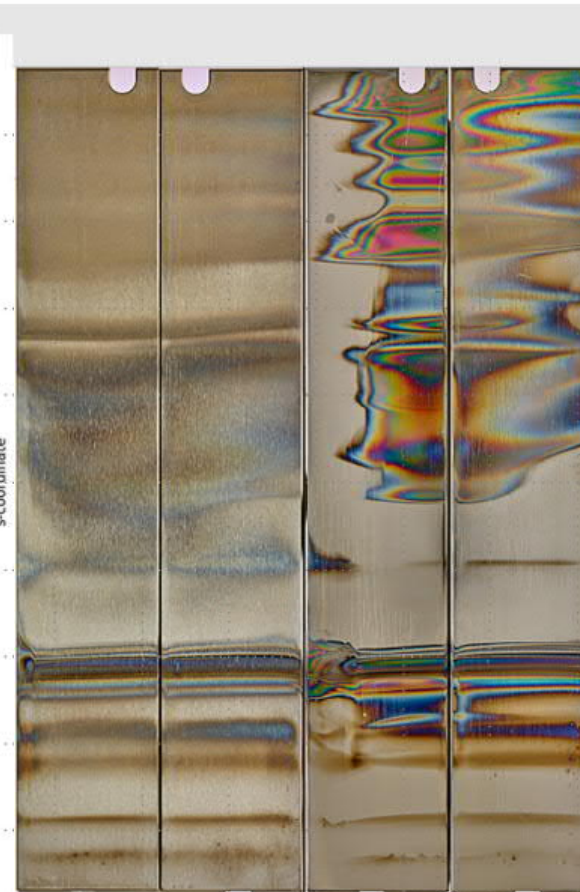
Regarding AUG (3): IR-relevant layers

❖ **Analyses of samples exposed on DIM to rev, I_p / B_t (2021-02-23…03-02)**

❖ Prepare polished W standard divertor tiles

❖ Post-characterization of deposition (SEM/EDX)
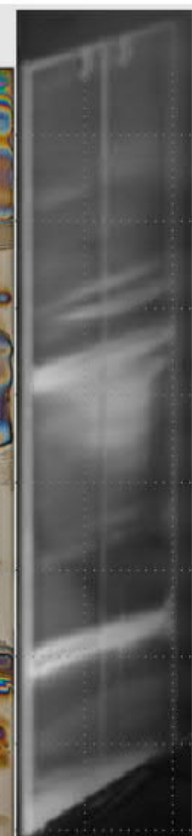 ⇨ Which effect on IR-diagnostic for heat load determination?
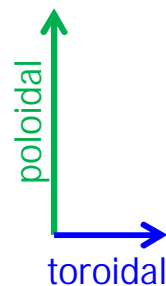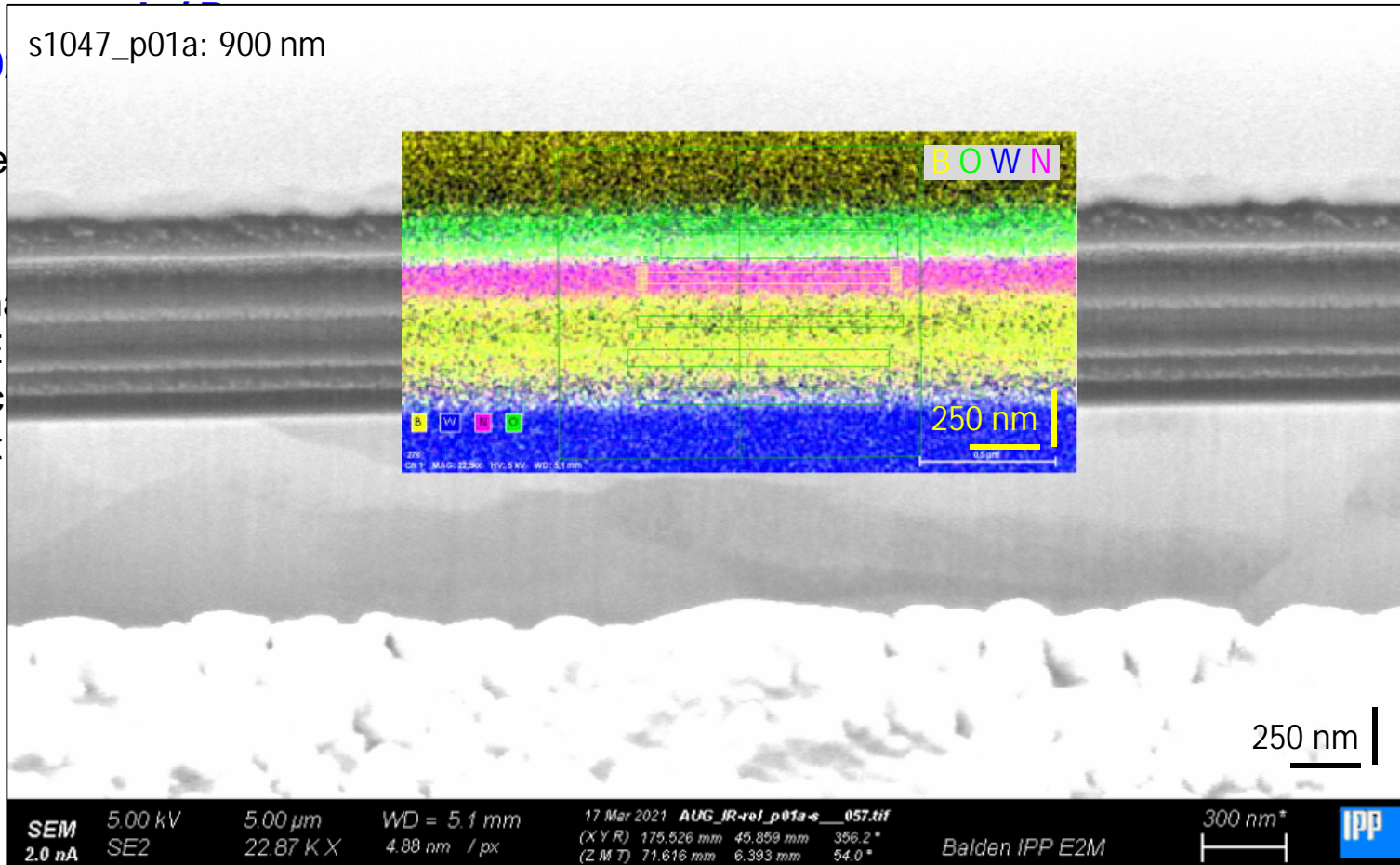
Strike line distribution   Photos of tiles   IR image

poloidal

toroidal

❖ **Analyses of samples exposed
on DIM** ....
(2021-0...

❖ Prepare ....
divertor ....

❖ Post-ch....
(SEM/E....
⇨ Whic....
for heat....

s1047_p01a: 900 nm

B O W N

250 nm

250 nm

SEM 5.00 kV 5.00 µm WD = 5.1 mm 17 Mar 2021 AUG_IR-rel_p01a-s___057.tif 300 nm*
2.0 nA SE2 22.87 K X 4.88 nm / px (X Y R) 175.526 mm 45.859 mm 356.2 ° Balden IPP E2M
(Z M T) 71.616 mm 6.393 mm 54.0 °
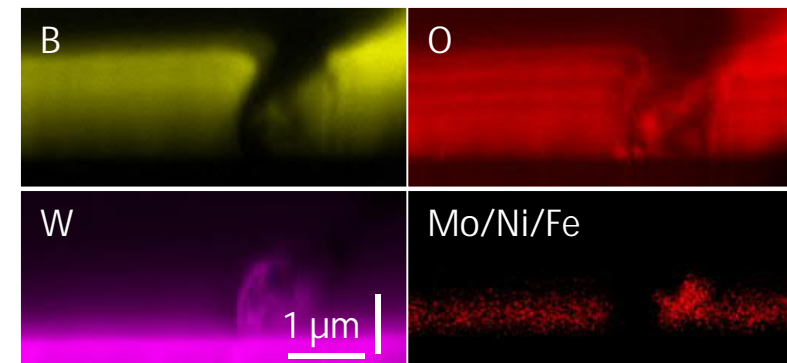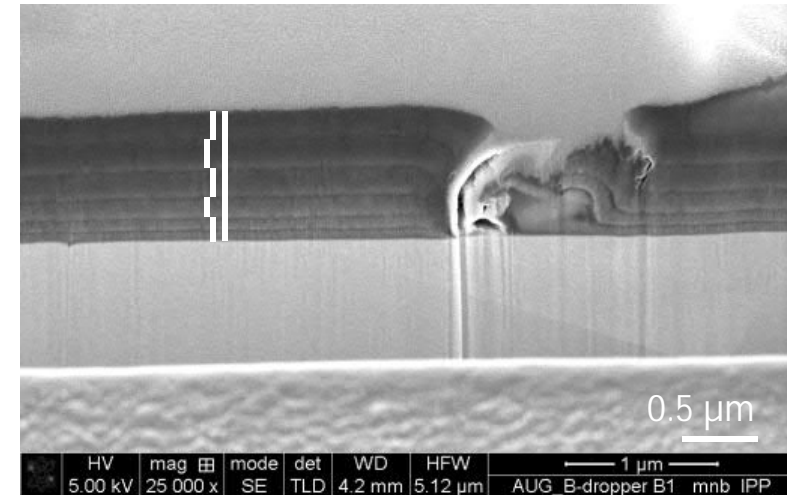
Regarding AUG (4): boron dropper

❖ **Analyses of samples resulting from boron dropper experiment together with piggy back task (2020-06-25, 2021-06-08)**

❖ Prepare polished insert samples

❖ Pre- & post-characterization of
 - deposition (IBA & SEM/EDX)
  - sputtering (CLSM & EBSD)

0.5 µm

| HV | mag ⊞ | mode | det | WD | HFW | —— 1 µm —— |
| 5.00 kV | 25 000 x | SE | TLD | 4.2 mm | 5.12 µm | AUG_B-dropper B1 mnb IPP |

B

O

W

Mo/Ni/Fe

1 µm

S-coordinate

Regarding AUG (5): melting

❖ **Analyses of samples resulting from melt experiment (Nb, Ir) (2021-05-07)**

❖ Post-characterization of deformation by melting (CLSM)

Example data of experiment 2016

AUG W divertor tile with inlet for melting studies

40 mm

216x77

0.6 mm

2 mm

0
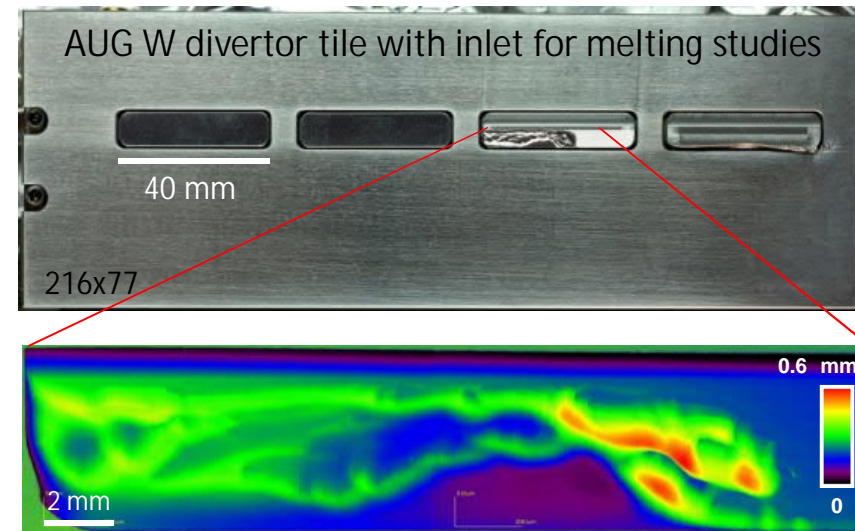
Regarding AUG (6): arcing

❖ **Progress arc insert samples install at inner baffle of AUG**

❖ Post-characterization of erosion by arcing on insert samples (CLSM)

❖ Preparation talk and paper

Regarding WEST

- ❖ **Analyses of marker and standard tiles from WEST after campaign C4 and C5**

- ❖ Determine the erosion/deposition pattern after C4 and compare to results after C3 (1st results presented at PFMC) (RBS/NRA & SEM/EDX on entire tiles)

- ❖ Progression on two C5 marker tiles (beyond 2021)

- ❖ Enlarge data base of strong arcing on the further two C4 marker tiles & additional C4 & C5 standard tiles (beyond 2021)

- ❖ Evaluate potential of analyses of sections of ITER PFUs (beyond 2021)

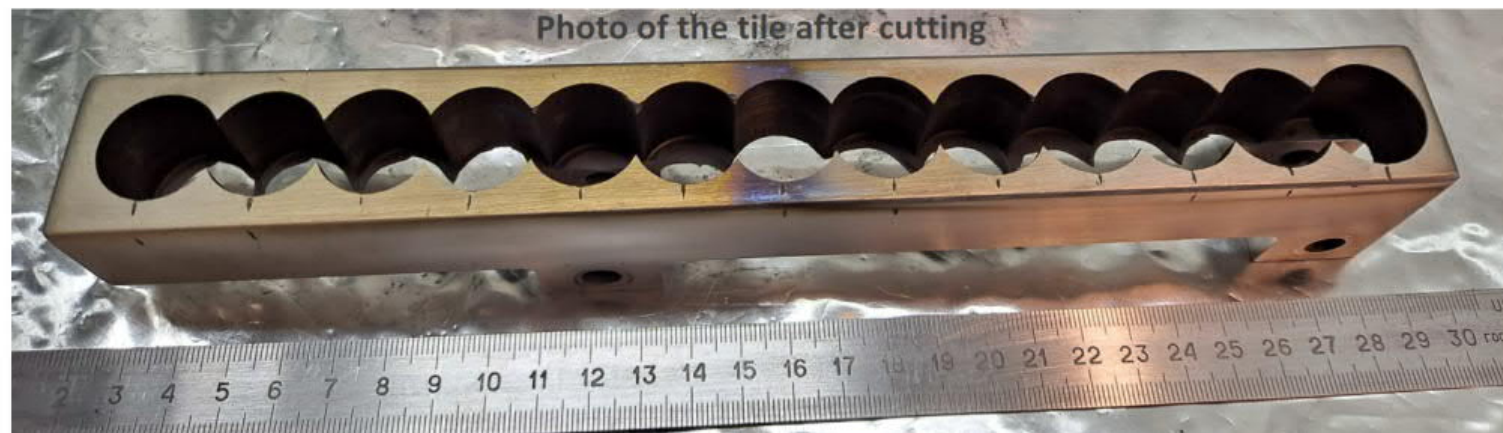- ❖ Prepare/support talks and publications
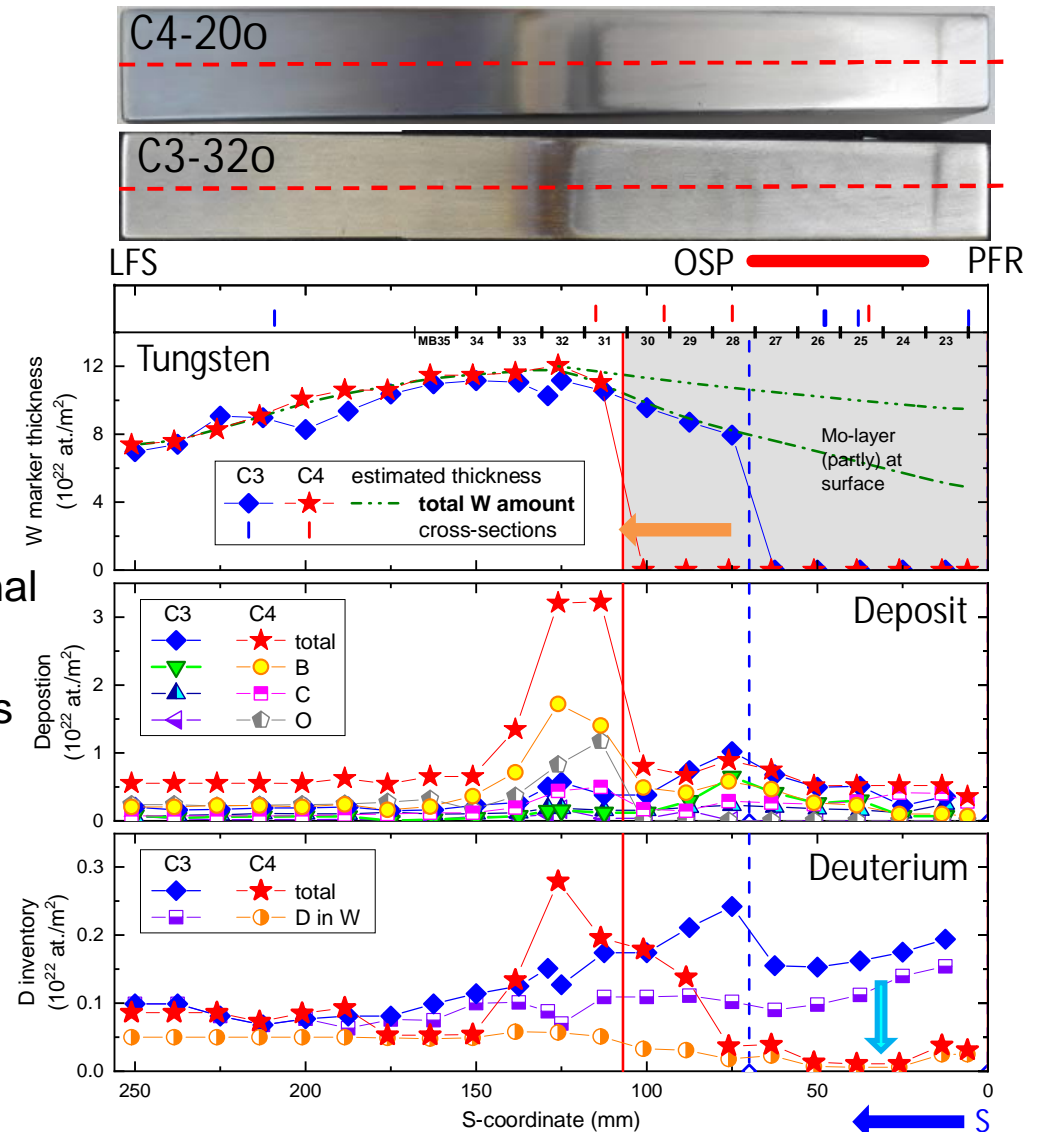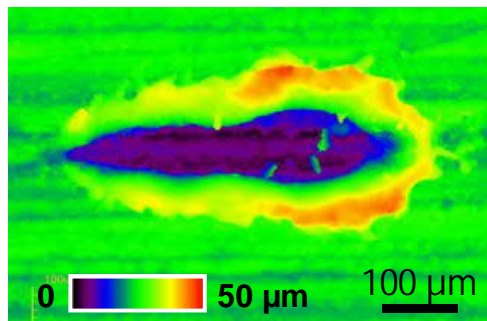
Regarding WEST - additional
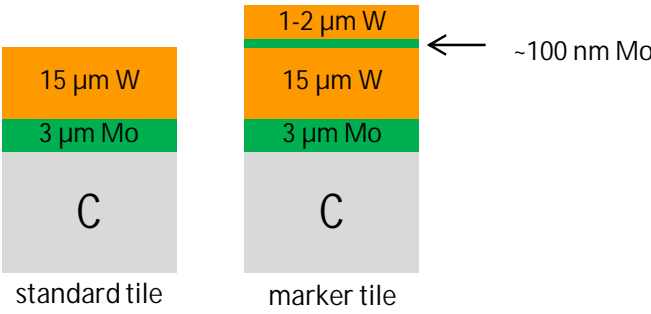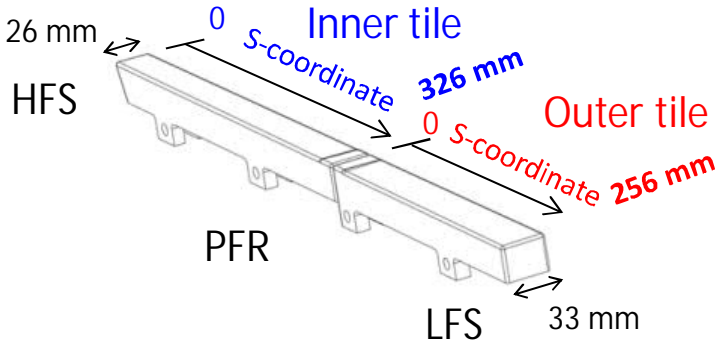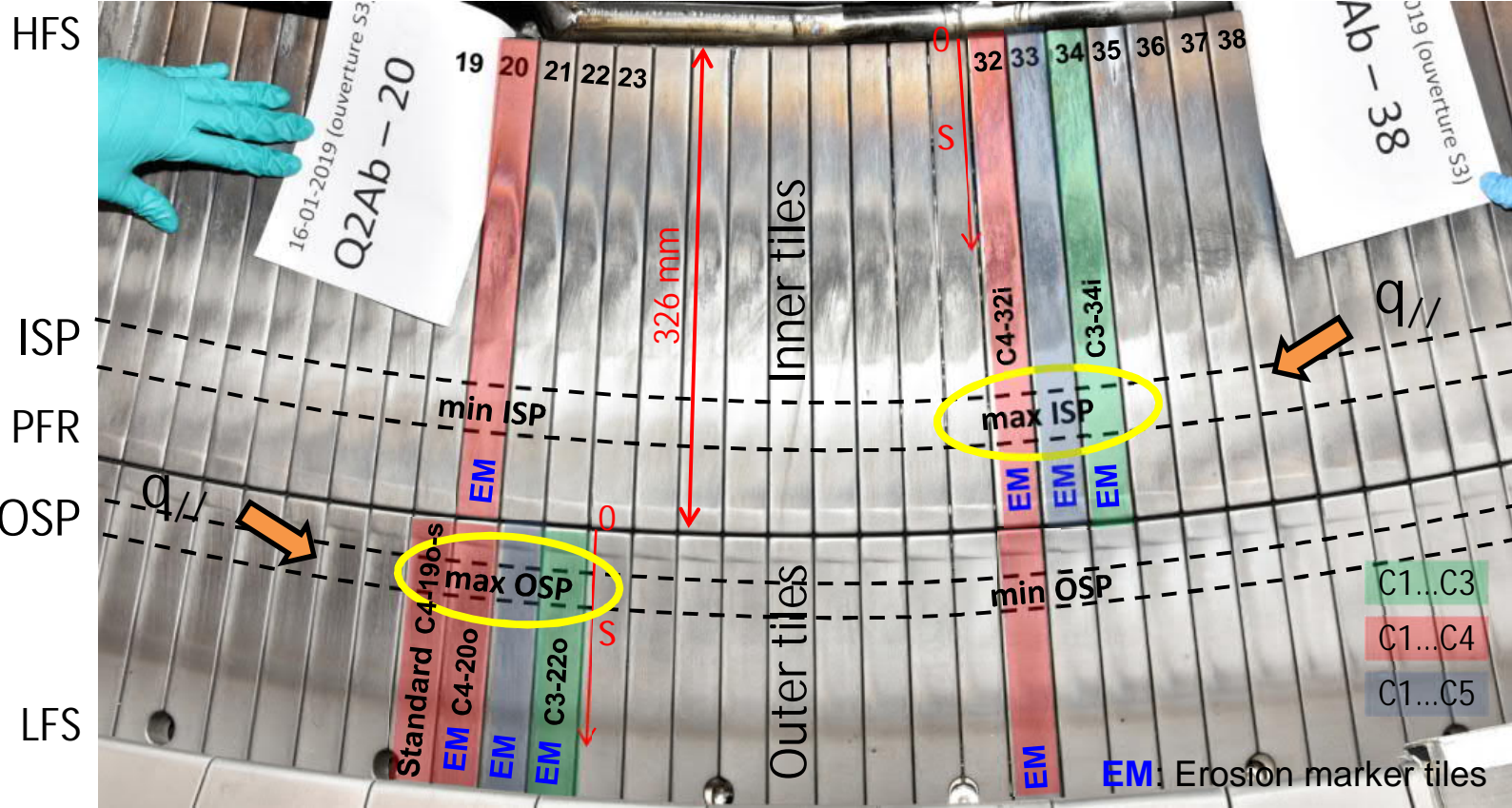
Regarding WEST - additional

❖ **C3 marker tile cut into smaller pieces for further analyses**

Regarding Magnum-PSI

❖ **Microscopic analyses of samples exposed at Magnum-PSI**

❖ Combined high fluence and high cycle number transient loading of ITER-like monoblocks in Magnum-PSI
⇨ Finalize data evaluation of SEM/CLSM results obtained on W-monoblock chains

❖ Support preparation of talks and publication (PSI, IAEA)

❖ Further samples from recrystallization studies under SP A in Magnum-PSI (beyond 2021)