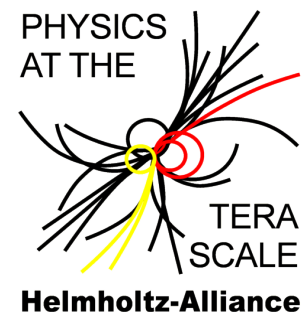


Optical mapping of Nb surfaces in SRF cavities

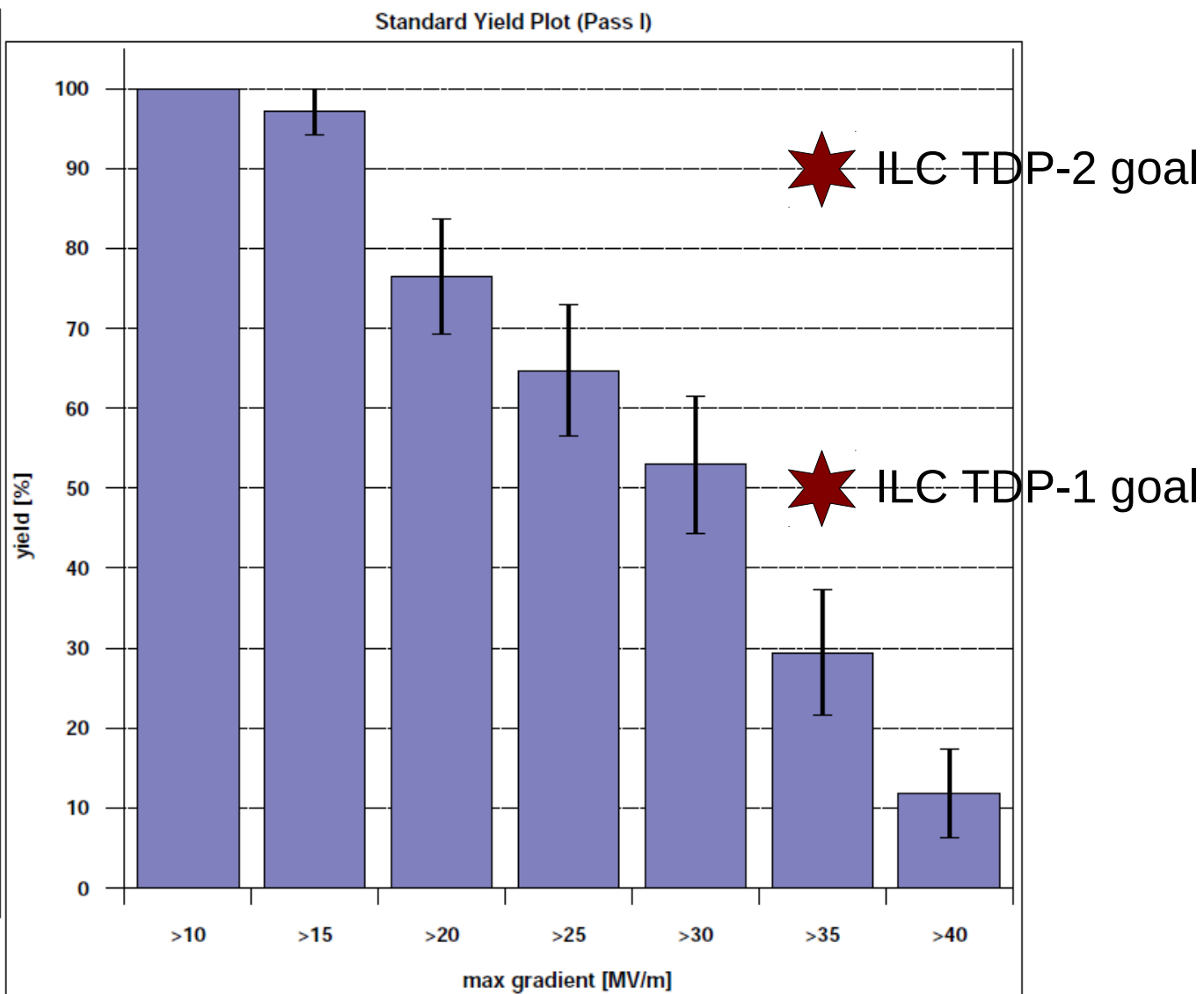
Sebastian Aderhold
DESY

4th Annual Workshop 'Physics at the Terascale'
Dresden, 02.12.2010



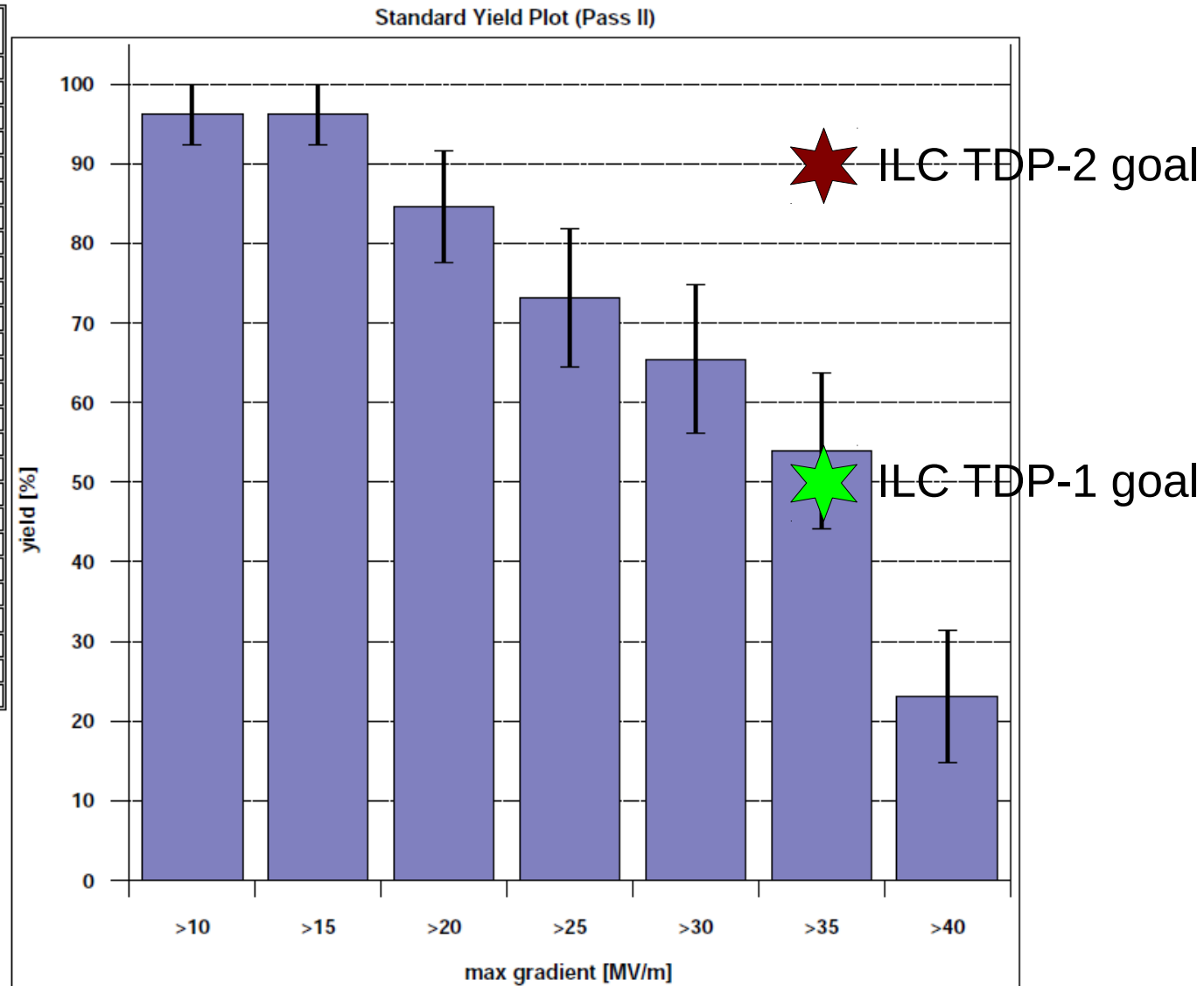
Towards the ILC goals

No.	Cavity	Test Date	Max. Eacc [MV/m]
1	TB9ACC013	01.Dec.08	41.80
2	TB9ACC014	09.Feb.09	41.50
3	TB9AES008	26.Aug.09	41.10
4	TB9AES007	16.Mar.10	41.00
5	AC122	26.Aug.08	38.88
6	AC115	11.Dec.07	38.60
7	TB9RI019	11.Jun.10	38.00
8	TB9AES010	06.Nov.09	37.70
9	TB9ACC011	21.Aug.08	37.00
10	TB9ACC012	07.Jul.08	35.10
11	Z134	13.Nov.09	34.94
12	AC125	15.Jul.08	34.59
13	AC150	30.Jan.09	34.33
14	TB9AES009	18.Aug.09	33.40
15	Z143	09.Oct.08	32.57
16	Z106	21.Feb.07	31.70
17	AC127	13.Feb.09	31.25
18	TB9ACC016	14.Dec.09	31.20
19	ACCEL7	05.Sep.06	29.00
20	AC149	28.Jan.09	26.51
21	AC124	05.Feb.09	26.01
22	Z137	24.Feb.09	25.23
23	Z139	12.Sep.08	24.93
24	AC146	06.May.10	23.63
25	Z142	01.Jul.09	20.58
26	TB9AES005	27.Mar.09	20.50
27	ACCEL6	12.Dec.06	19.00
28	Z141	16.Apr.08	18.29
29	TB9ACC015	02.Jul.08	18.00
30	Z130	01.Sep.08	17.30
31	Z131	20.Aug.08	17.17
32	Z132	19.Aug.08	16.83
33	AC126	05.Sep.08	16.37
34	TB9AES006	09.Apr.09	14.10

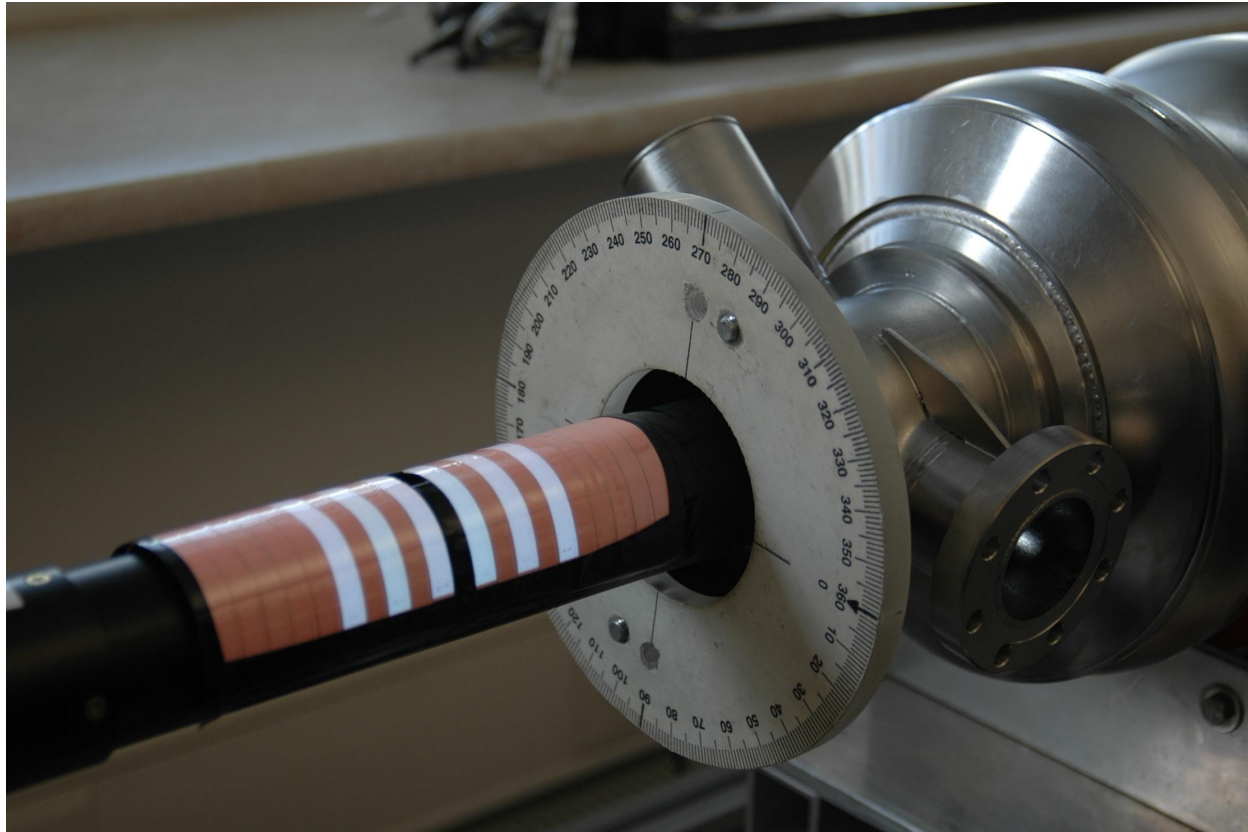
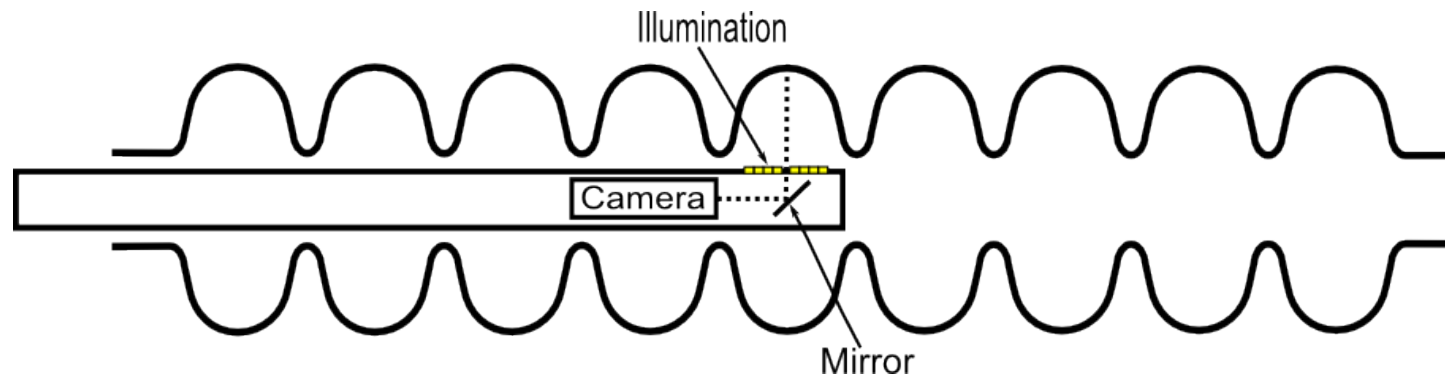


Towards the ILC goals (2)

No.	Cavity	Test Date	Max. Eacc [MV/m]
1	TB9ACC013	01.Dec.08	41.80
2	TB9ACC014	09.Feb.09	41.50
3	ACCEL7	18.Jan.07	41.20
4	TB9AES008	26.Aug.09	41.10
5	TB9AES007	16.Mar.10	41.00
6	Z143	12.Nov.08	41.00
7	TB9ACC016	11.Feb.10	39.30
8	AC122	26.Aug.08	38.88
9	AC115	11.Dec.07	38.60
10	TB9RI019	11.Jun.10	38.00
11	TB9AES010	06.Nov.09	37.70
12	TB9ACC011	21.Aug.08	37.00
13	TB9AES009	07.Oct.09	36.00
14	TB9ACC012	07.Jul.08	35.10
15	AC150	08.May.09	33.23
16	Z139	20.Oct.08	32.75
17	AC124	19.May.09	30.93
18	ACCEL6	23.Jan.07	29.00
19	AC127	11.Jun.09	27.85
20	TB9AES006	11.Sep.09	22.20
21	Z141	14.May.08	20.70
22	TB9AES005	09.Apr.09	20.50
23	TB9ACC015	14.Jul.08	19.00
24	Z131	25.Nov.08	17.96
25	Z130	15.Oct.08	16.60
26	AC126	21.Oct.08	6.14



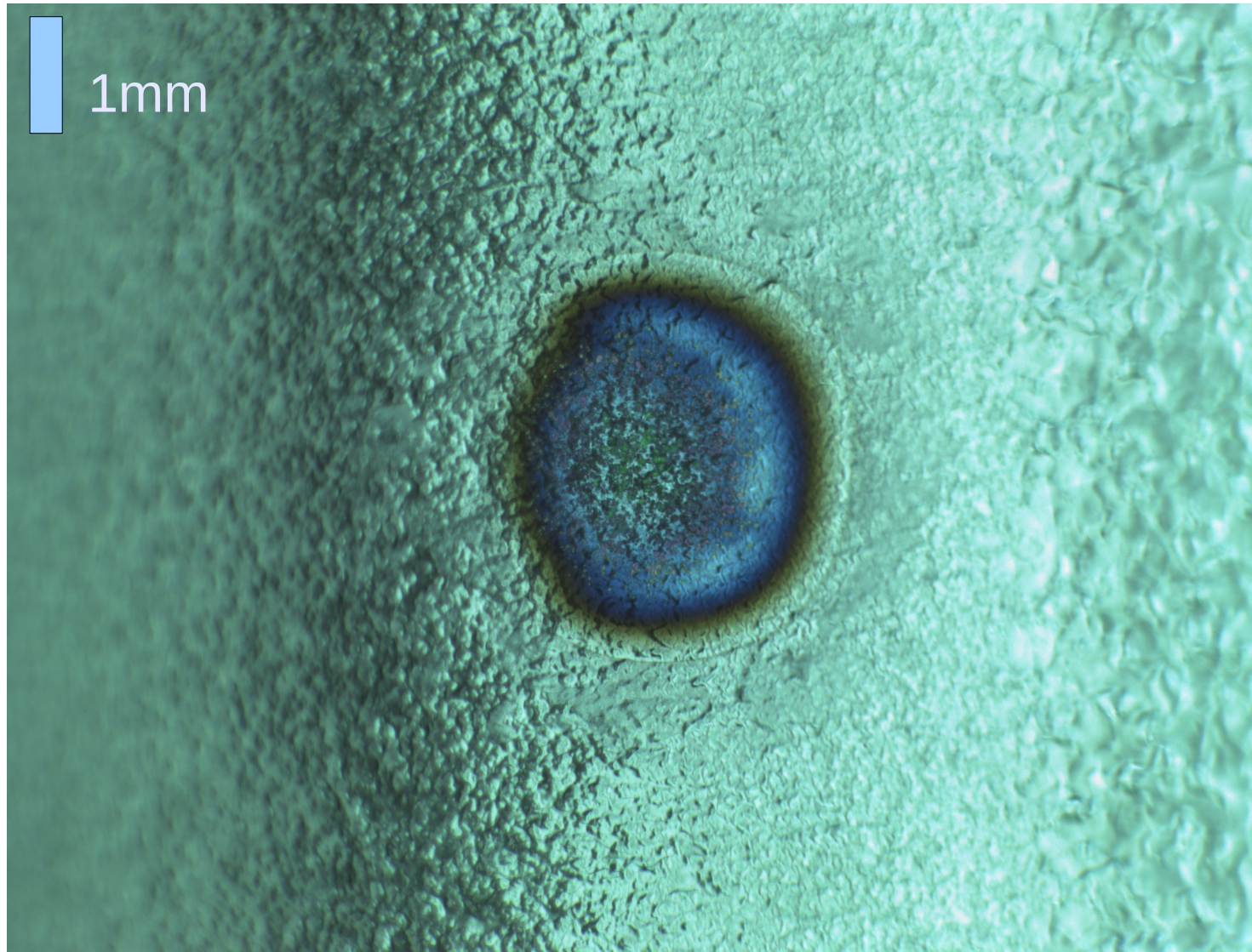
The optical inspection system



The optical inspection system

- Developed at Kyoto University and KEK
- in operation at DESY since August 2008
- High resolution camera
 - Pixel-size: $1.75\ \mu\text{m}$
 - Effective resolution: $3.5\ \mu\text{m}/\text{pixel}$
- Sophisticated lighting system
 - Adapted to difficult conditions (mirror-like surface)
 - Lighting from different angles possible
- Data-set of more than 30 cavity-inspections available

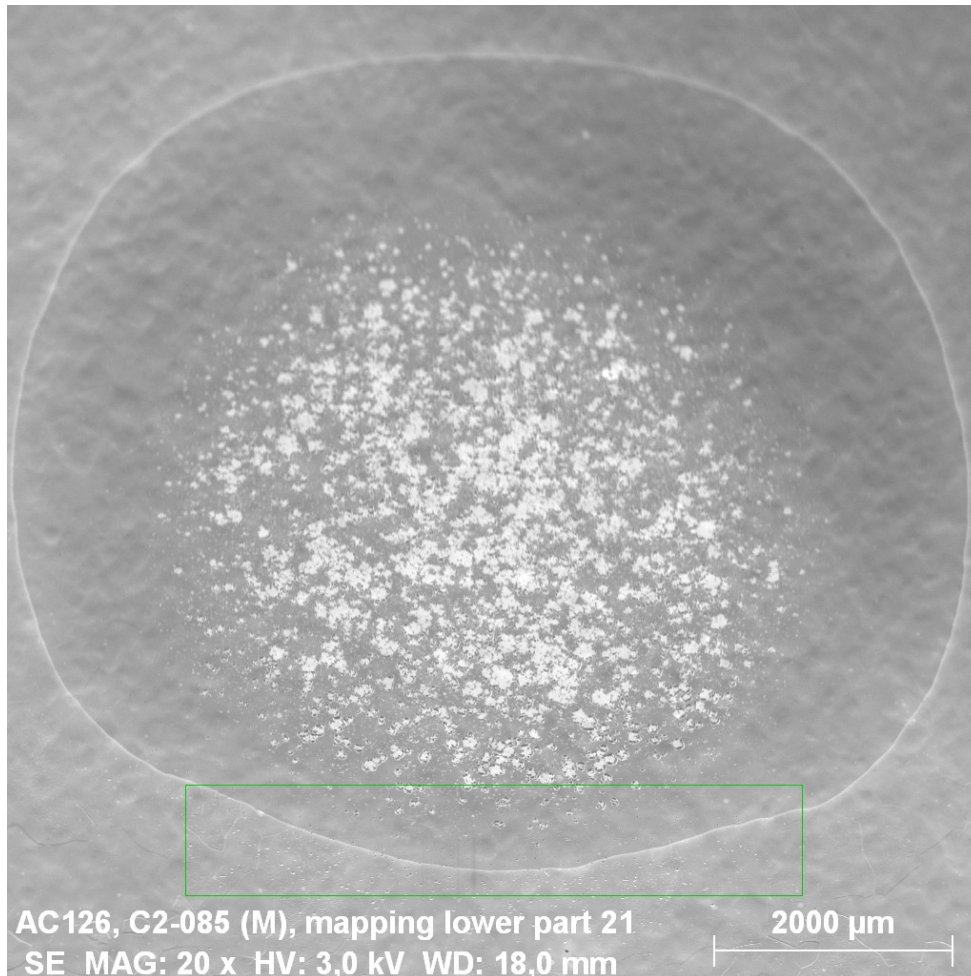
Quench location in AC126



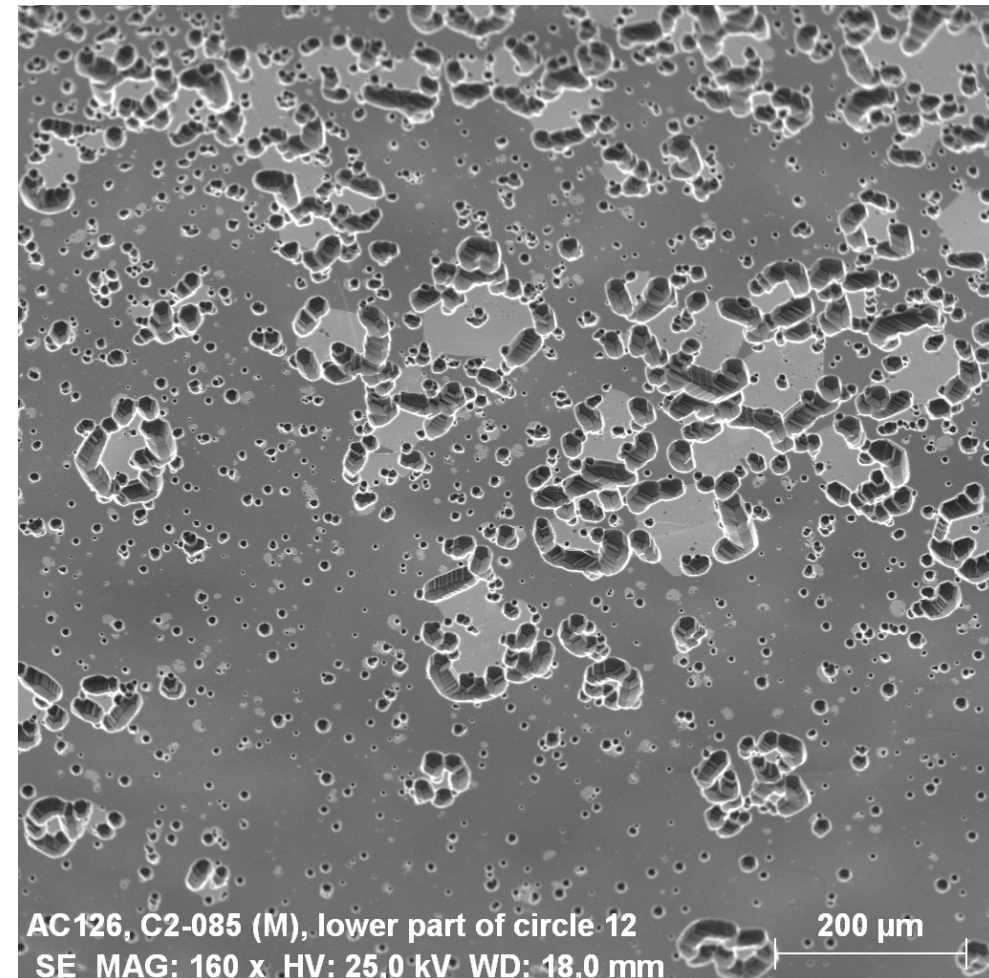
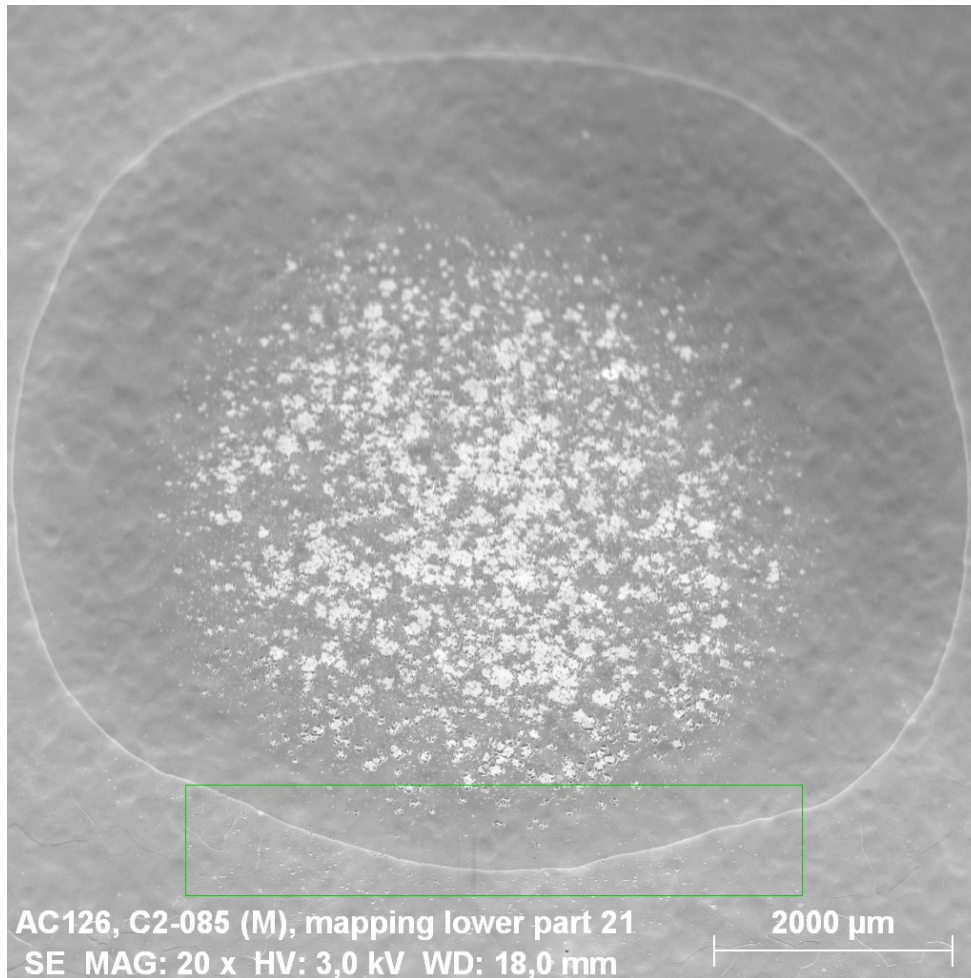
- 8 stains found
→ HPR
- Cavity has been cut
 - Detailed analysis possible

Quench position indicated by 2nd sound: cell 2, t=85 deg, next to equator

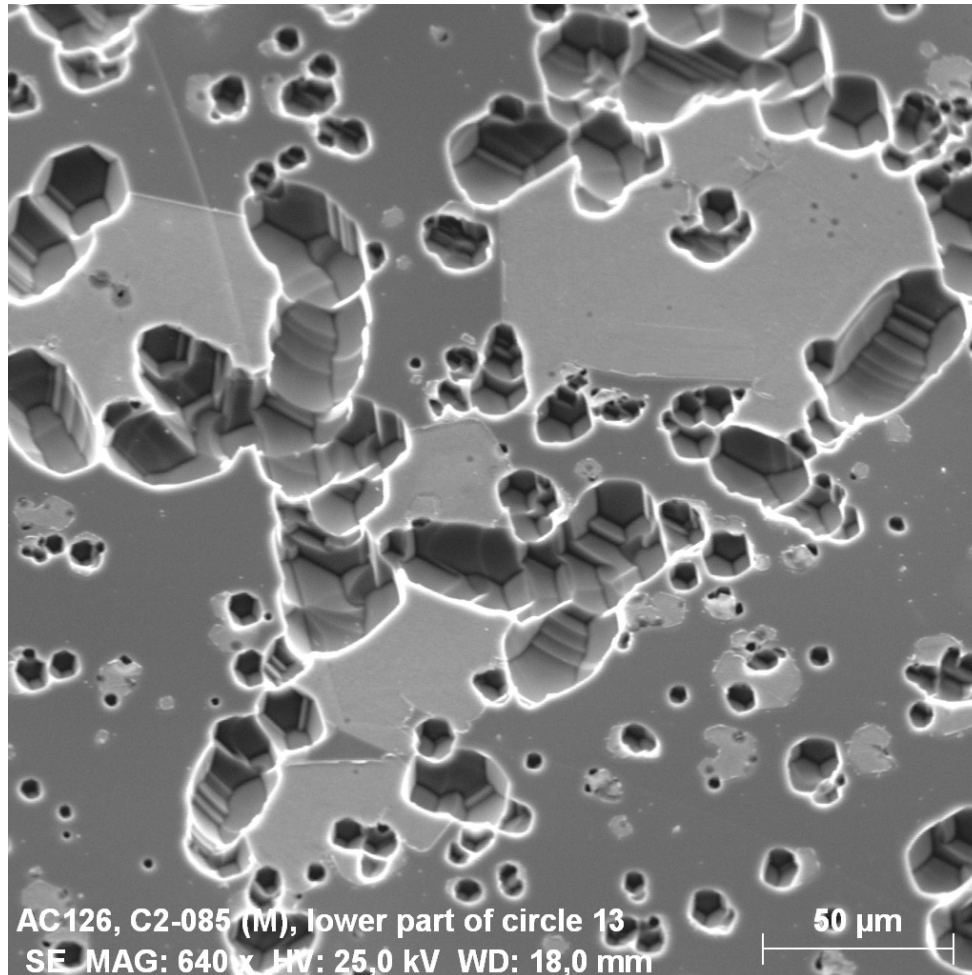
SEM pictures of defect in AC126



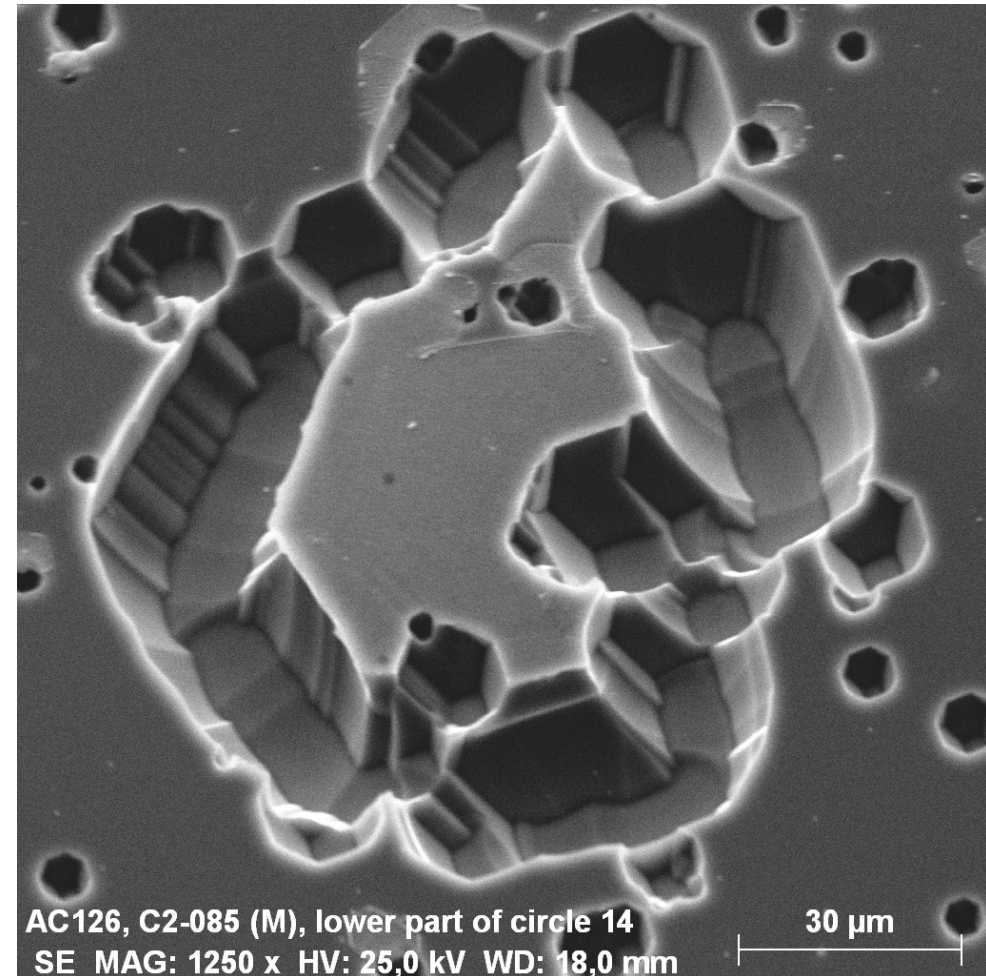
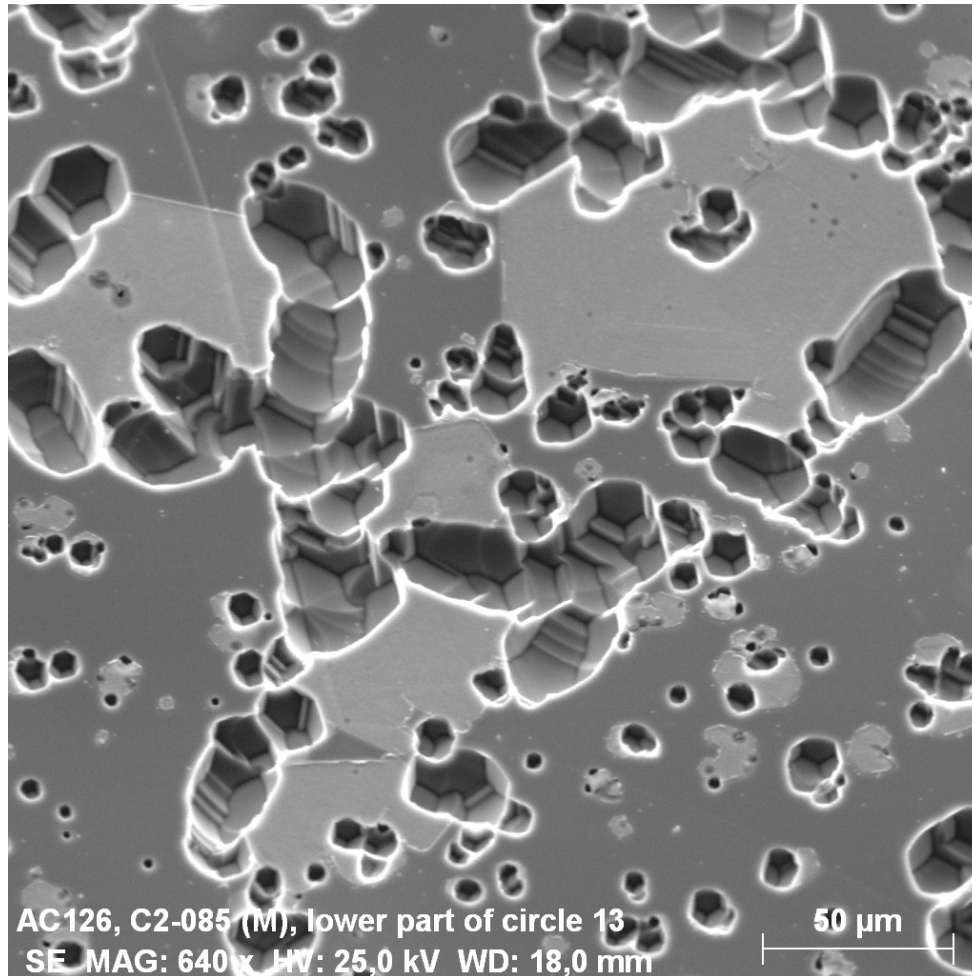
SEM pictures of defect in AC126



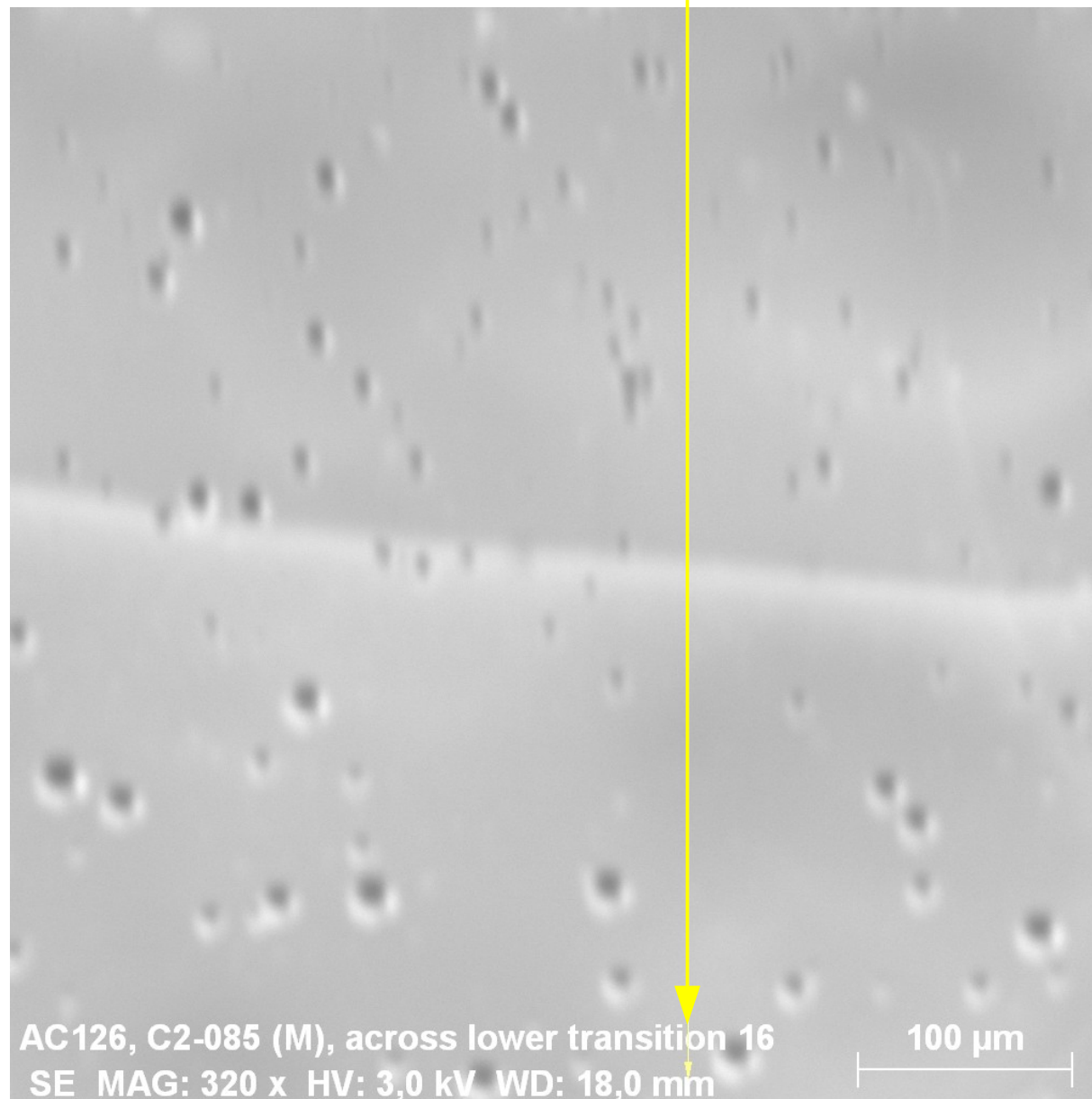
SEM pictures of defect in AC126 (2)



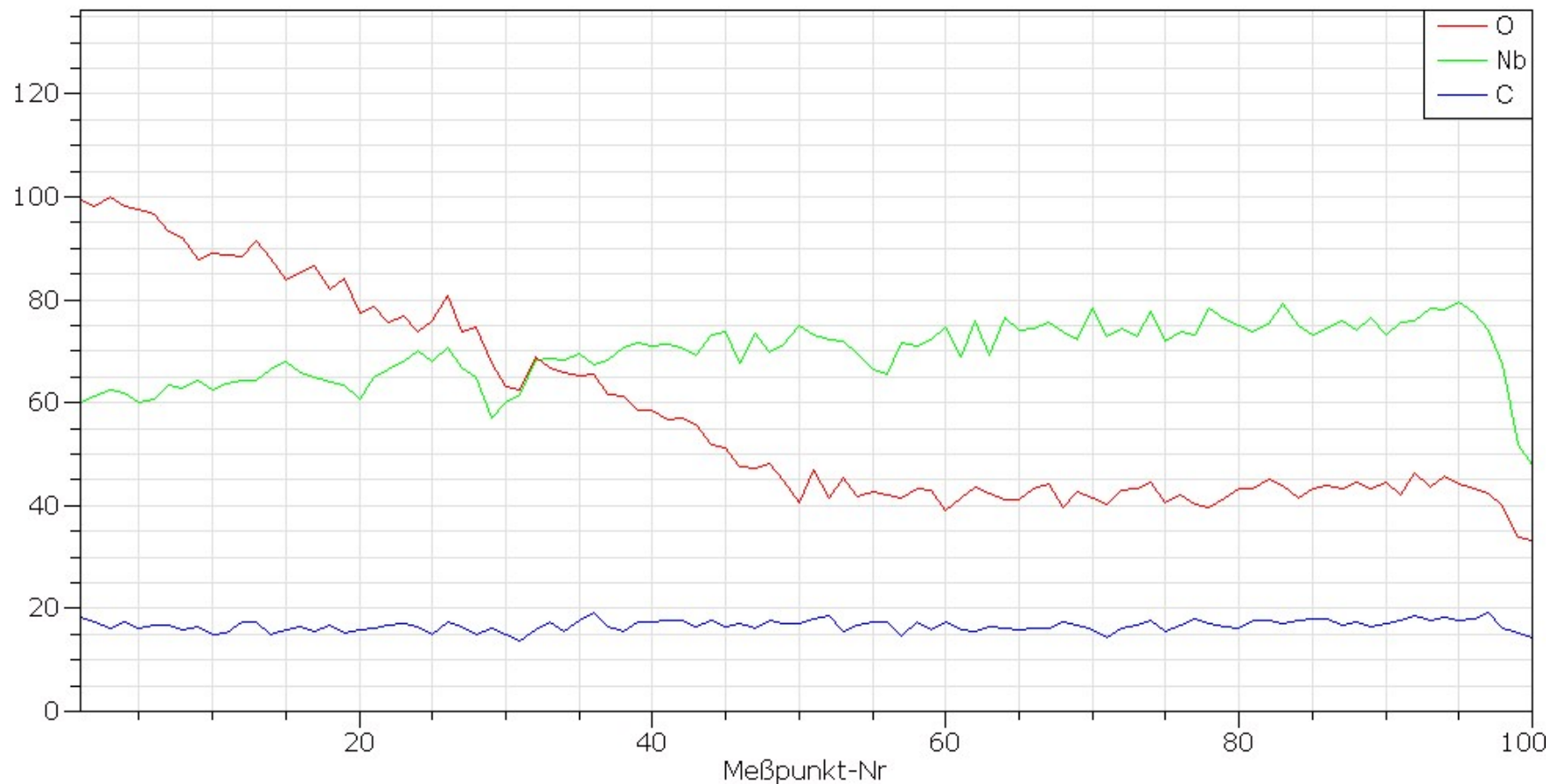
SEM pictures of defect in AC126 (2)



Line scan across lower transition

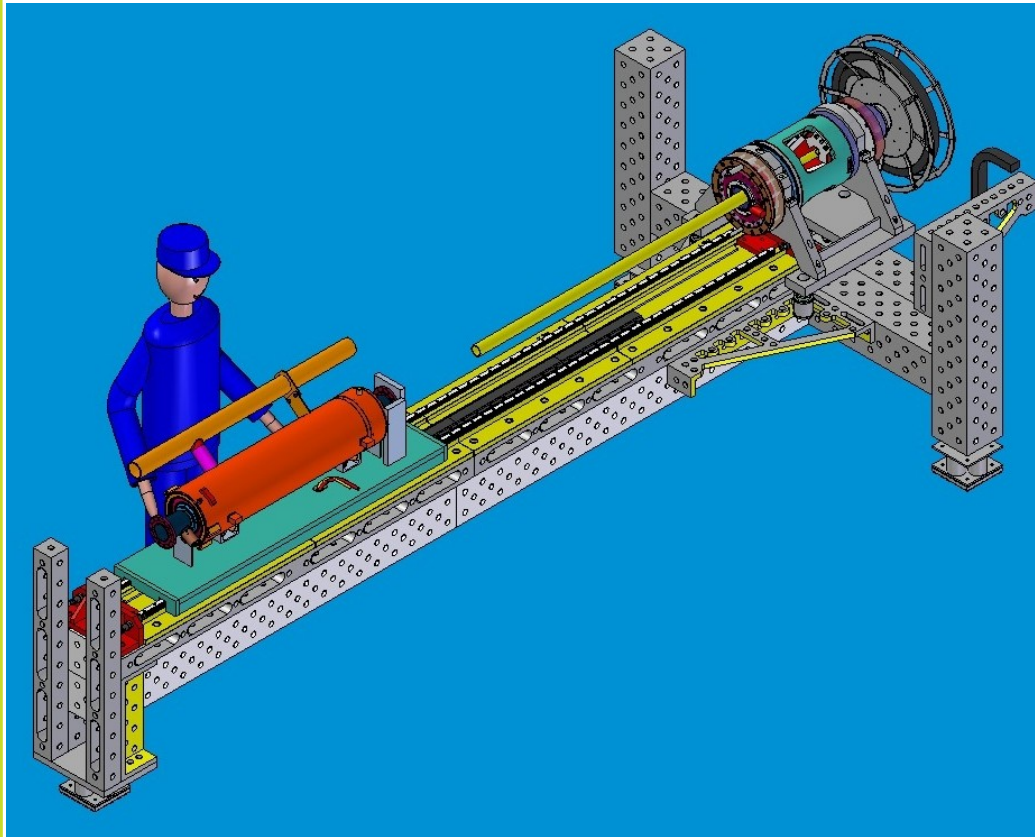


Line scan across lower transition



OBACHT

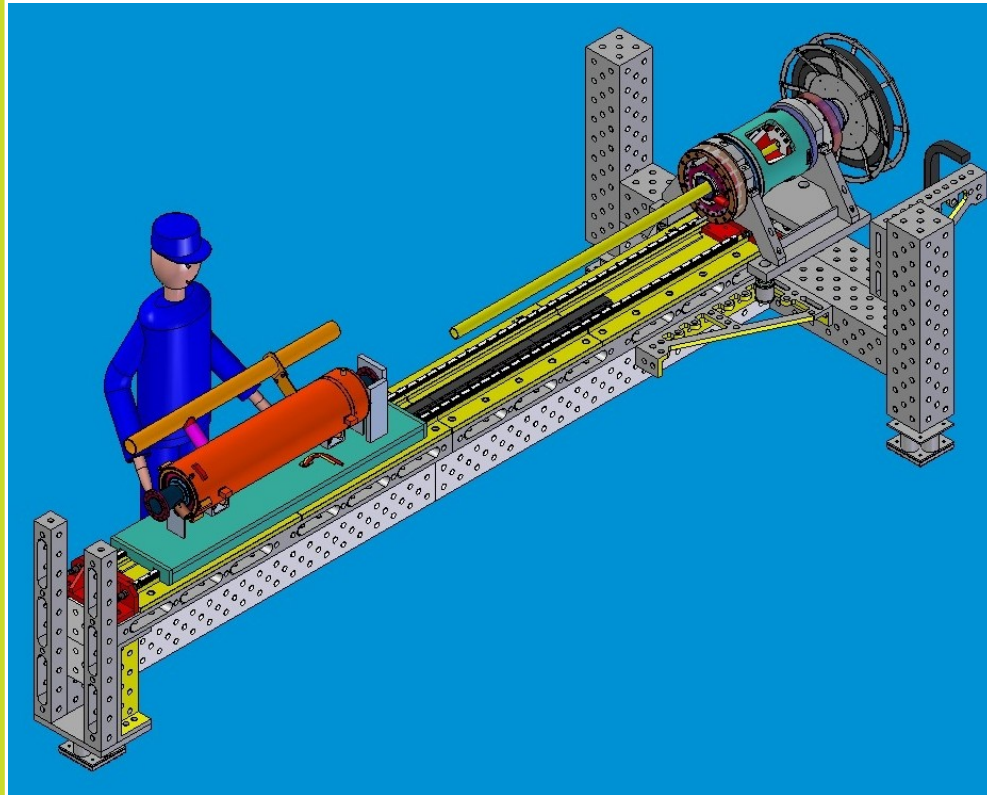
Optical Bench for Automated Cavity inspection with High resolution on short Timescales



- Cavity on sliding carriage
- Camera rotated by torque motor
- Done:
 - Mechanical support
 - Linear motor
 - Electronics control cabinet
- To Do:
 - Cavity mounting
 - Camera mounting
 - Control software for automated inspection

OBACHT

Optical Bench for Automated Cavity inspection with High resolution on short Timescales



Summary

- Optical inspection helps improving the high gradient yield
- Correlations between optical inspection and quench spots
- Rare occasion of cutting cavities gives valuable information
- Automation of inspection system OBACHT is ongoing
- Large amount of pictures being produced
 - automated analysis needed
 - See M. Wenskat's talk