Qualification of linear cavity welds

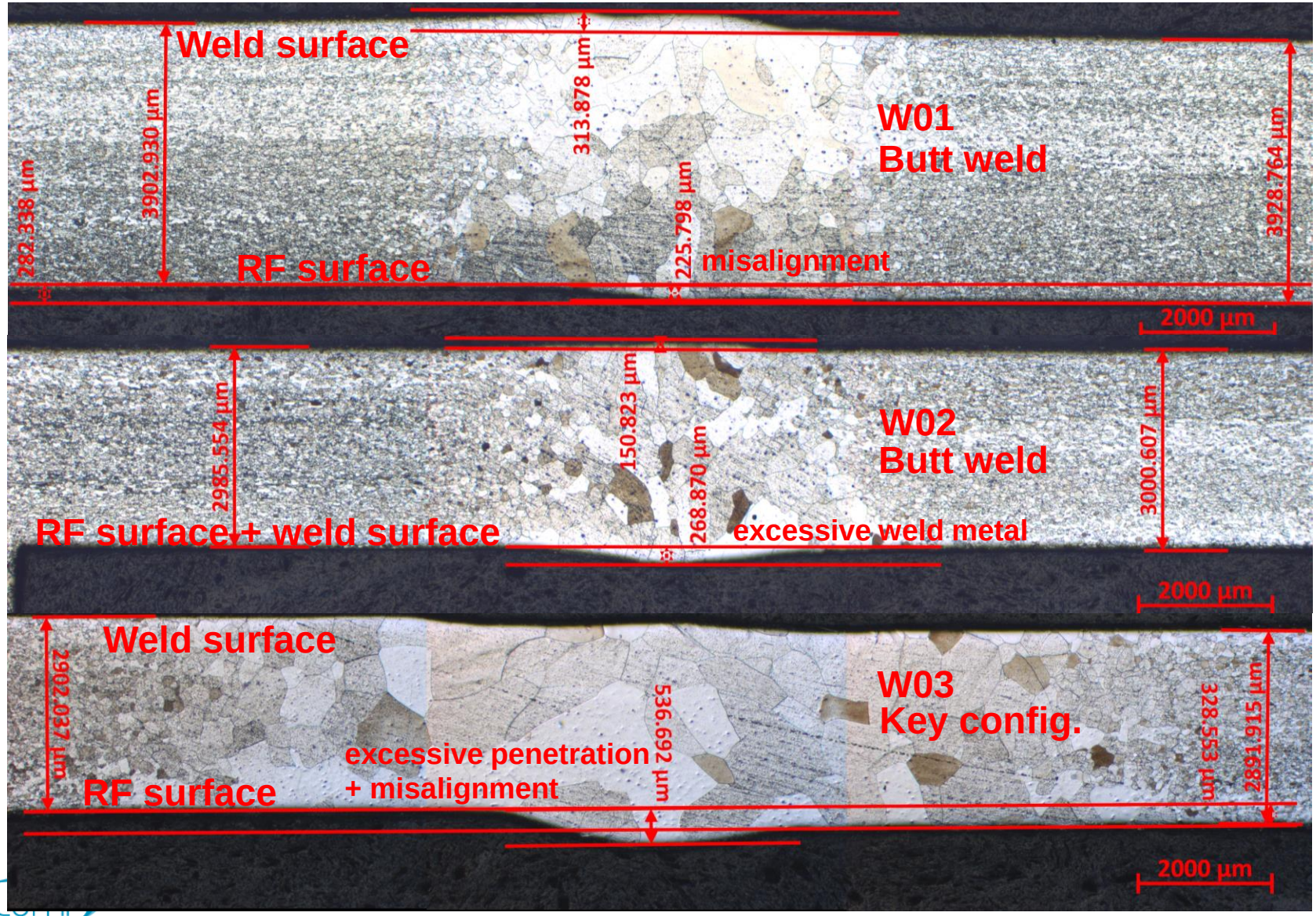
Konrad Eiler

31/10/2016

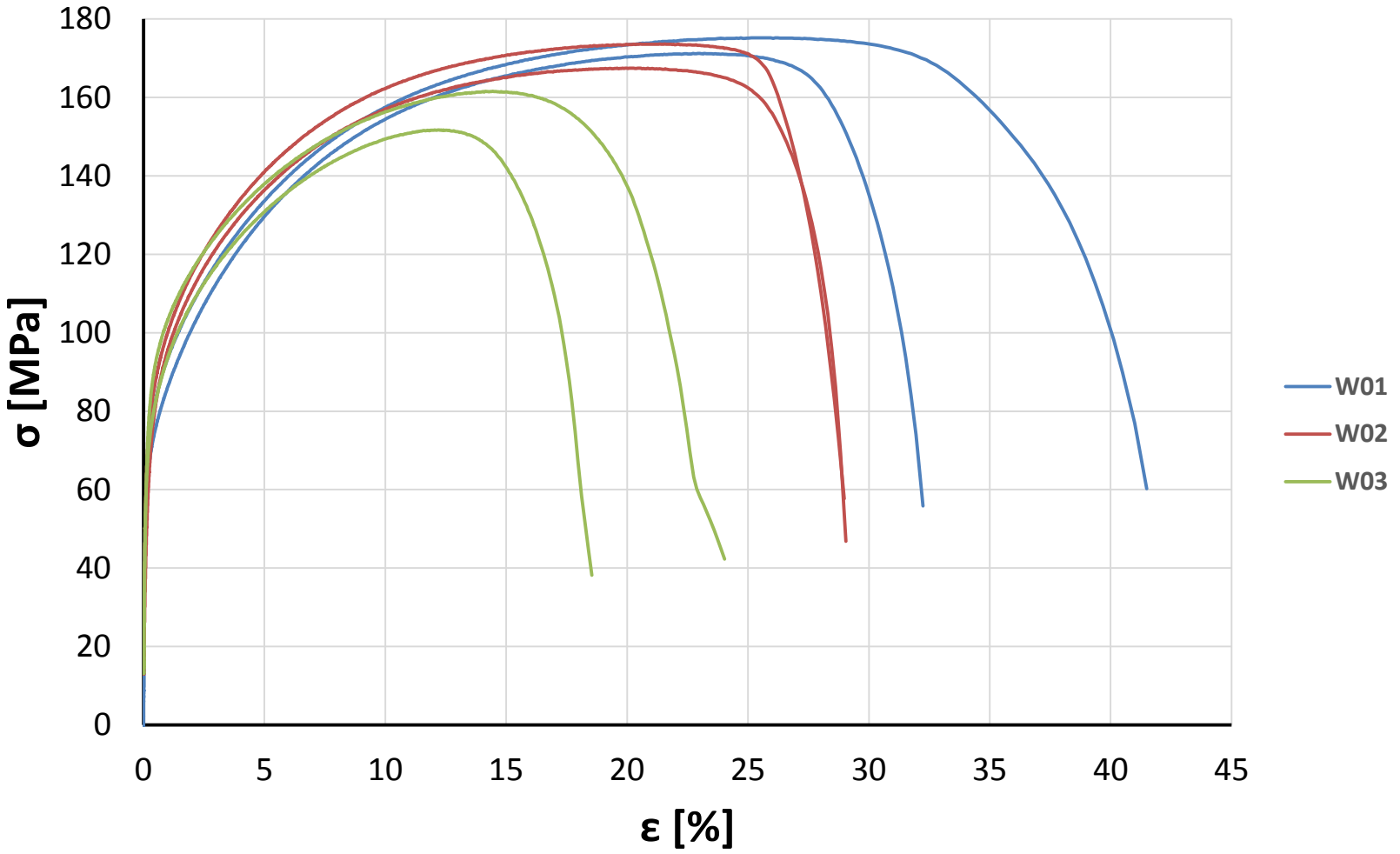
Contents

- Cavity welds
  - Metallography
  - Tensile tests
  - Bending tests
- Metallography:
  - ISO 13919-2:
    - 4 mm thickness: Excessive weld metal, linear misalignment max. 0.4 mm
    - 3 mm thickness: Excessive weld metal, excessive penetration max. 0.65 mm, linear misalignment max 0.3 mm
  - Engineering specifications:
    - Excessive penetration, linear misalignment max. 0.1 mm

Nb cavity welds
Metallography



Nb cavity welds transversal tensile tests



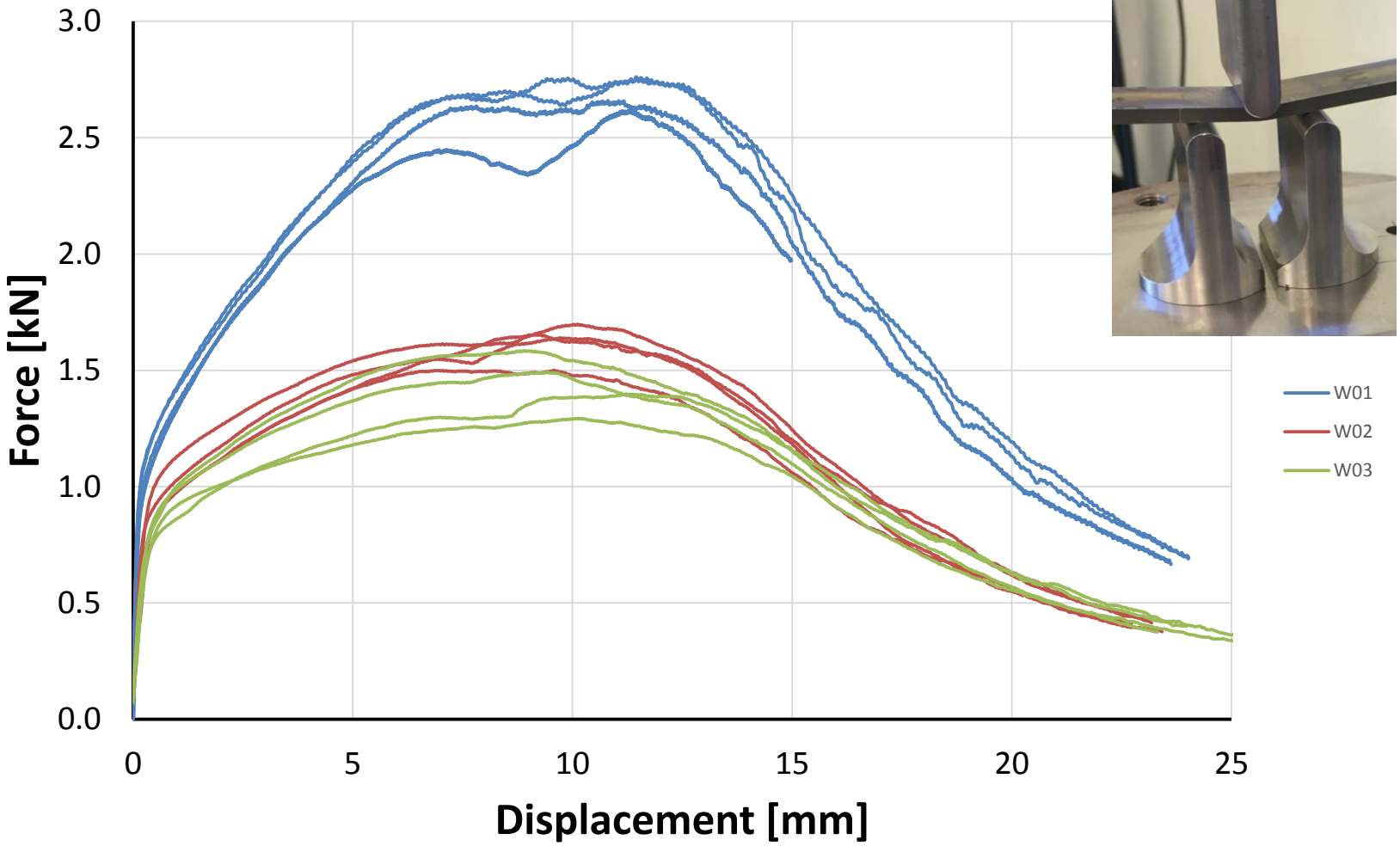
Nb cavity welds transversal tensile tests

- Acceptance criteria (ISO 15614-11): tensile strength must not be lower than the minimum specified for the application
- Minimum tensile strength (CERN): **140 MPa**

	R_m	$R_{p0.2}$	A_g	A
W01	173	71	23.8	36.8
W02	171	73	20.2	29.0
W03	157	78	13.0	24.0

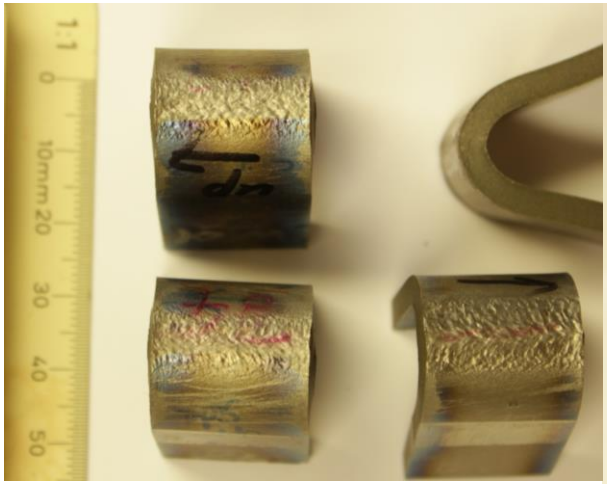
- Result: all welds acceptable

Nb cavity welds transversal bending tests

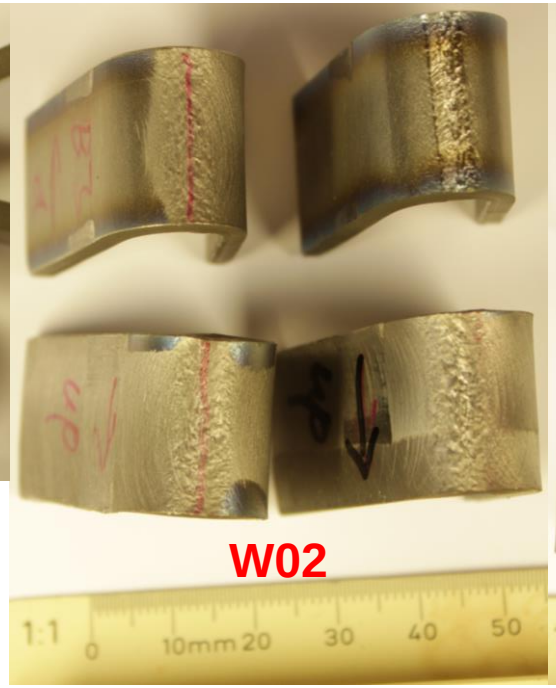


Nb cavity welds transversal bending tests

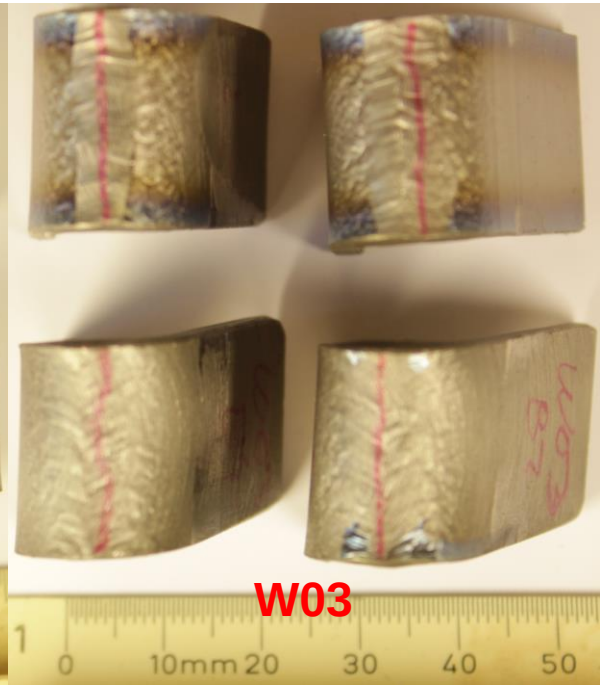
- Acceptance criteria: the specimen must not present any defect longer than 3 mm



W01



W02



W03

Result: all welds acceptable after bending until 180°

Nb cavity welds
Outlook

- Repeat welding and metallography of W03
- Qualification of circular welds
- Tolerances of Engineering Specifications to be adjusted according to measured values and RF simulations

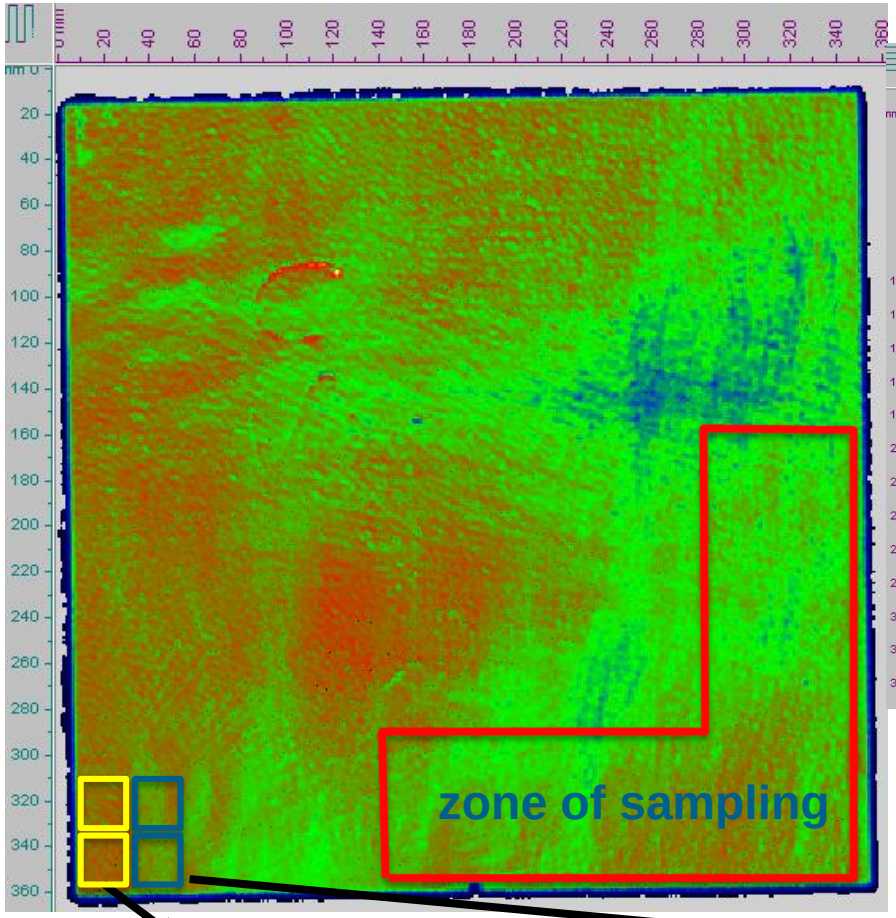
Explosion bonding Ti to 316L with pure Ta interlayer

Konrad Eiler

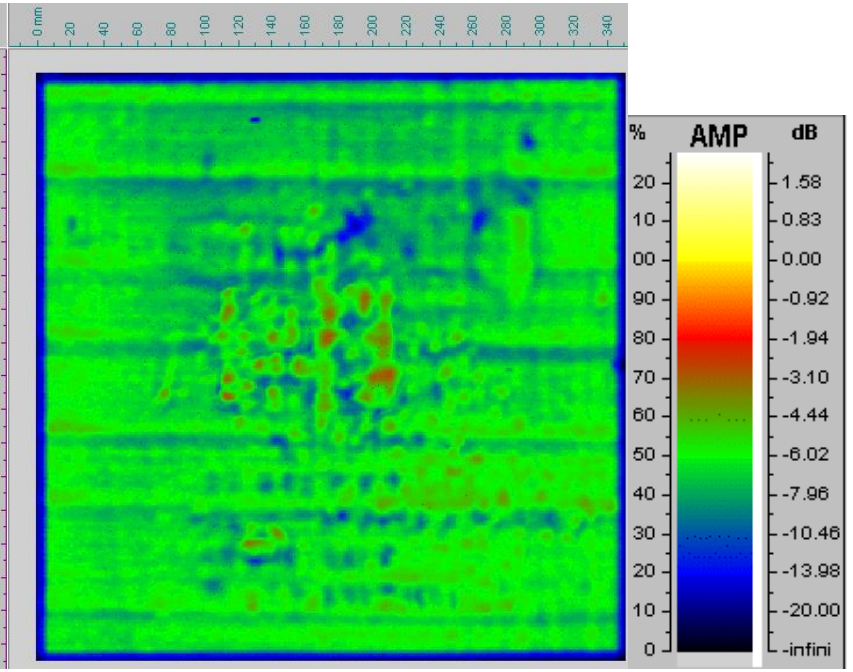
31/10/2016

Explosion bonding Ti/Ta/SS
Ultrasonic Testing

Interface Ti>Ta



Interface SS>Ta



2 samples from “red” area for metallography

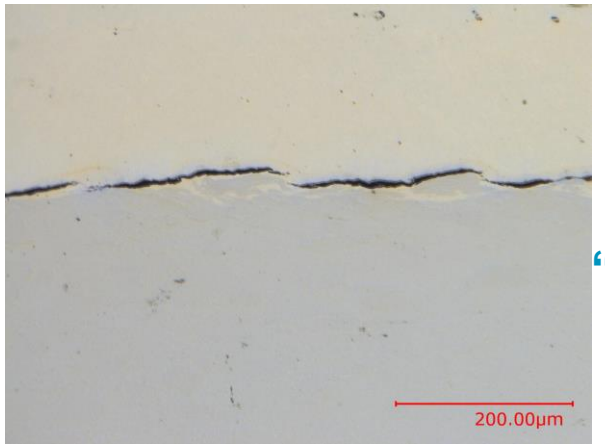
2 samples from “green” area for metallography

Explosion bonding Ti/Ta/SS
Metallography

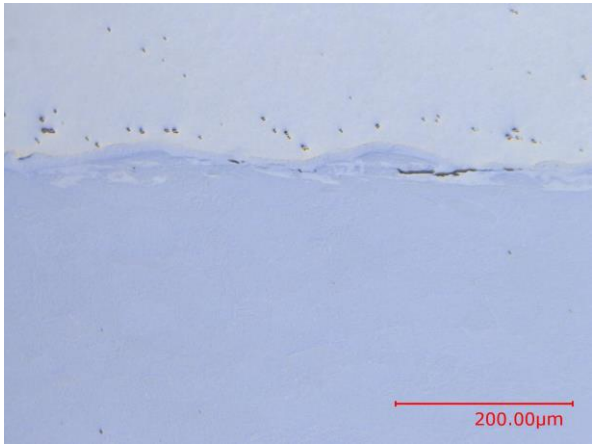
Ti/Ta interface

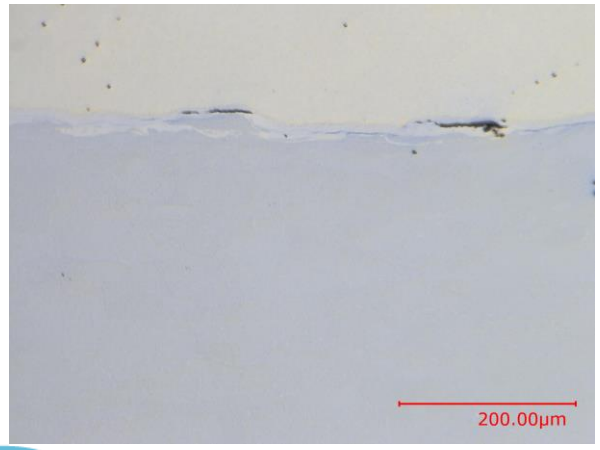
First observation: No typical waveform evident

Red | **Green**

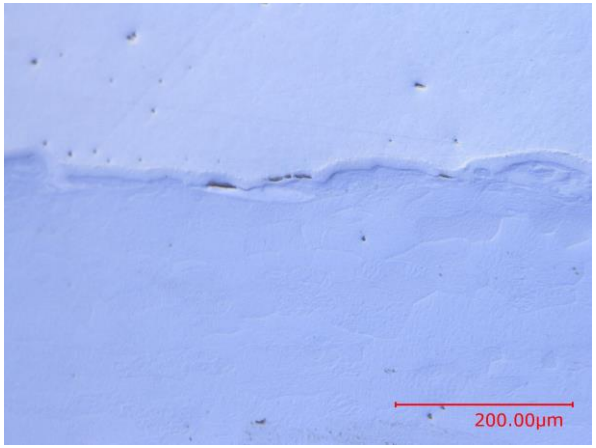


“Longitudinal”



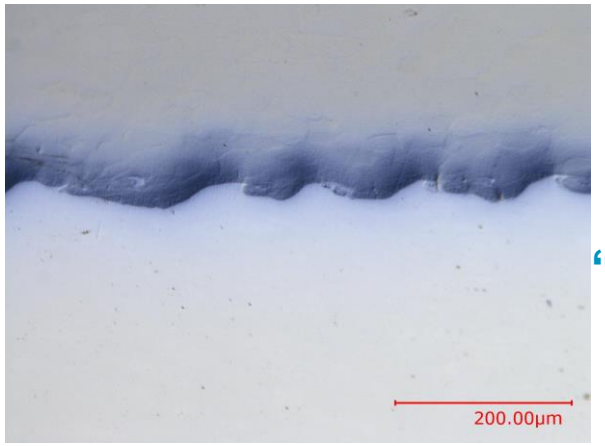
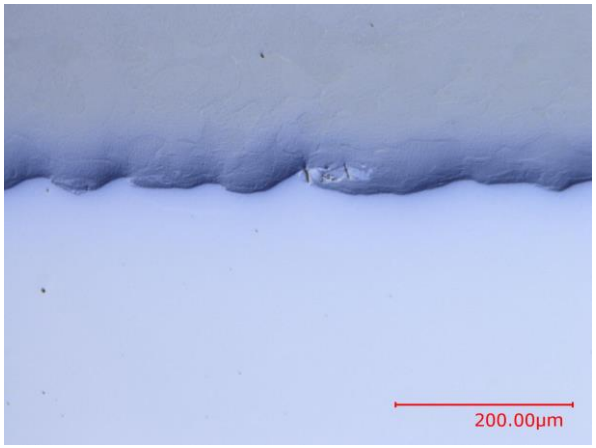
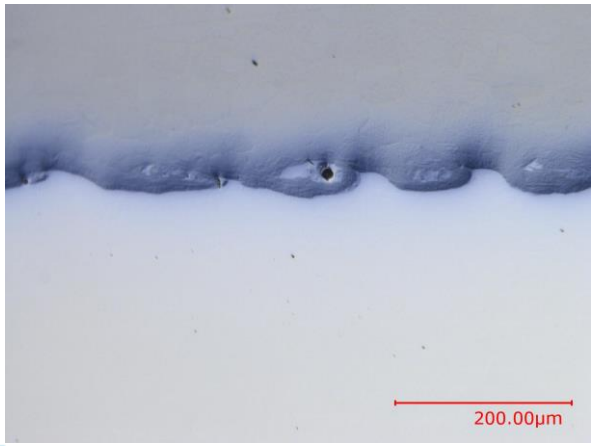
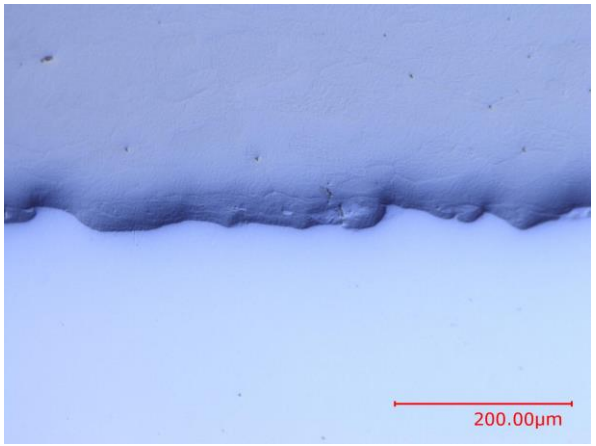


“Transversal”



Explosion bonding Ti/Ta/SS Metallography

Ta/SS interface

Red		Green
	"Longitudinal"	
	"Transversal"	

Explosion bonding Ti/Ta/SS
First conclusions and Outlook

- Ti/Ta interface
  - Defects (cracks at the interface) in all cases
  - Higher density of cracks in area with more reflections in UT
  - Intermetallics? Don’t exist between Ti and Ta
- Ta/SS interface
  - Few regions of intermetallics with cracks ➔ SEM

- Next tests: Shear, tensile and leak tightness

Thank you for your attention!