Result of Optical Inspection at STF

（MHI-05 and MHI-06）

Ken Watanabe （KEK）

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Inspection of MHI cavities before Vertical test

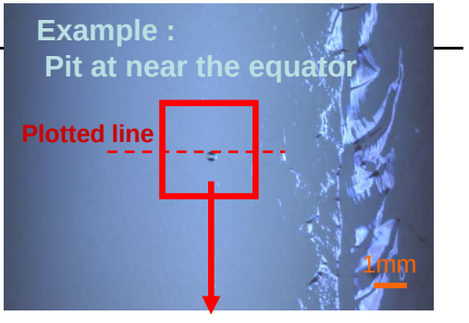
The inspection of the STF Baseline cavities #5, #6 (MHI-05, MHI-06) are done at each process.

*As received : Important for quality control and feedback to EBW operators.

*After Pre-EP and EP-1 : Measurement, Analysis and Marking of the cat eye pits (Suspicious spots). etc….

*After anneal process

*After EP-2 and V.T. **with T-map** : Inspection of a heating location.



Two type of spots (Suspicious spots) were observed in MHI-05, MHI-06

1) Bump at near the equator (diameter: ~ 800 um)

2) Pit at near the equator (diameter: 300 ~ 500 um, depth : ~ 30 um)

Location : Outside Weld area between 15mm from joint of equator.

MHI-05 has,

One bump (#1), Fourteen pits (#1, #2, #3, #4, #5, #6, #7, #9 cell).

MHI-06 has,

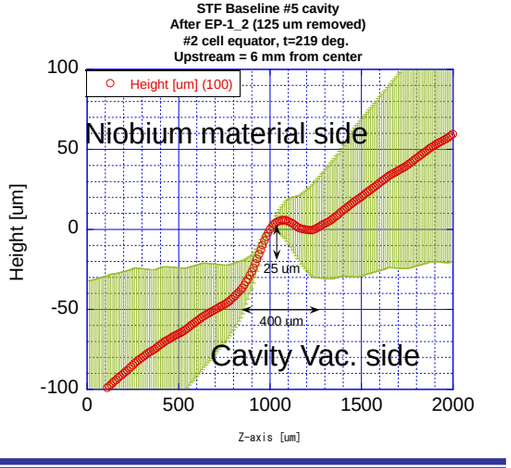
Fifteen pits (#2, #3, #4, #5, #6, #7, #8 cell).

We have interest in the following thing,

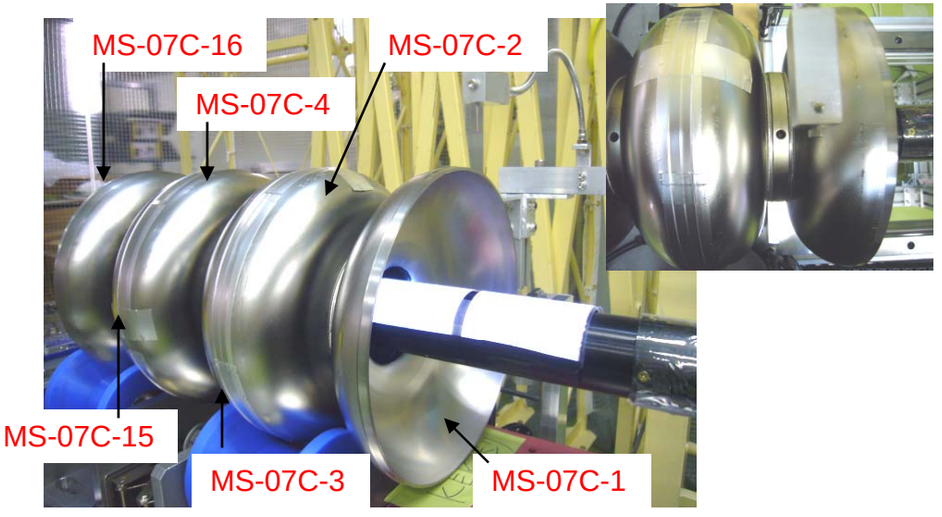
When were these suspicious spots made ? : Searched by Dambel for MHI-07.

Are these suspicious spots heating source ? : Checking by T-map.

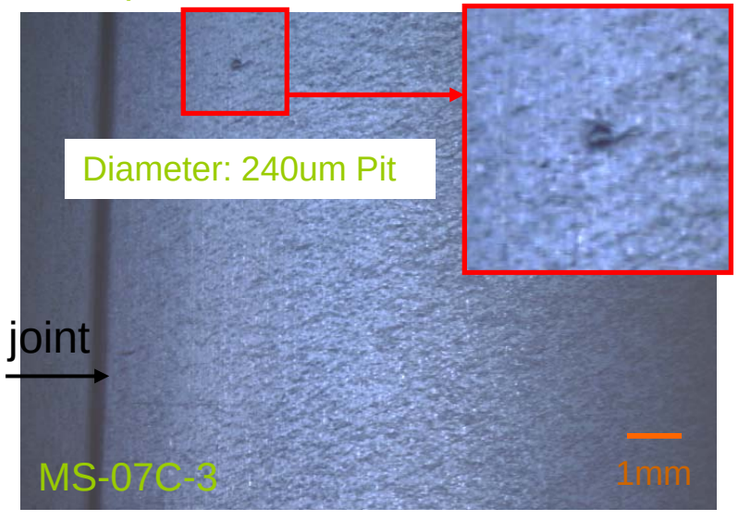
-> No heating these suspicious spots at ~ 39.9 MV/m

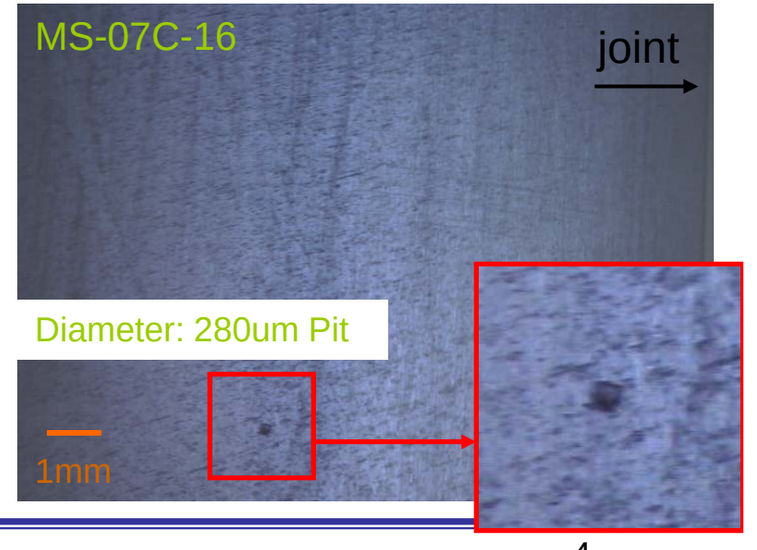


When were suspicious spots made ? : Searched by Dambel for MHI-07 before EBW



Example:





To search that “When were suspicious spots made ?”,

We tried to be inspection by using a three dambels for the MHI-07.

Result :

*The spots were observed on the surface at point of the dambels.

(The spots does not occur in the Surface treatment.)

*The location of the spots are between 15mm from a joint point.

However, a heating of similar spots are not detected at V.T. for MHI-05 and MHI-06

(Presented by Y. Yamamoto)

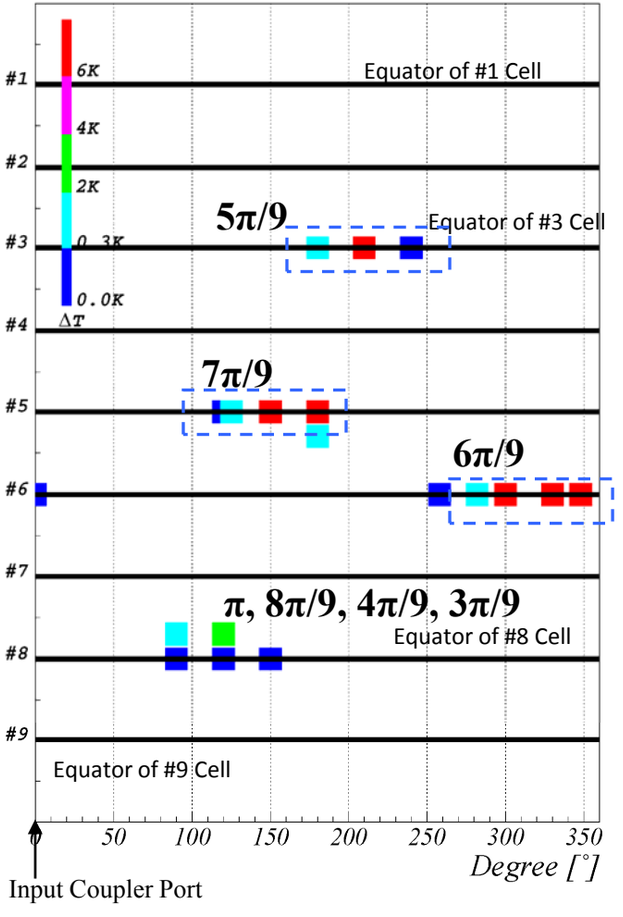
Observation of the heating location by T-map

Cavity	# of V.T.	Eacc [MV/m] @ Mode Cause of limitation	Heating location	Result of inspection (after V.T. with T-map)
MHI-05	1st	27.3 @ Pi-mode Field emission ?	#5 cell equator, t=60~150deg.	Unstable : Width of the EBW seam is narrow. No defect in outside weld area.
	2nd	19.7 @ Pi, 8/9, 4/9, 3/9 Defect ? Quench	#8 cell equator, t=90~150deg.	No defect in outside weld area.
		25.6 (max 32.9) @ 5/9 Quench	#3 cell equator, t=180~240deg.	Unstable : Width of the EBW seam is narrow. No defect in outside weld area.
		29.2 @ 7/9 Quench	#5 cell equator, t=120~180deg.	Unstable : Width of the EBW seam is narrow. No defect in outside weld area.
		32.9 @ 6/9 Quench	#6 cell equator, t=270~360deg.	Unstable : Width of the EBW seam is narrow. No defect in outside weld area.
MHI-06	1st	25.7 @ Pi-mode Field emission ?	#7 cell equator, t=150~180deg.	Unstable : Width of the EBW seam is narrow. No defect in outside weld area.
		35.4 @ 3/9 Quench	#5 cell equator, t=200~300deg.	Unstable : Width of the EBW seam is narrow. No defect in outside weld area.
	4th	19.6 @ Pi, 8/9, 7/9, 6/9, 5/9, 4/9. Defect ? Quench	#9 cell equator, t=300~350deg.	No defect in outside weld area.
		39.9 @ 3/9 Quench	#5 cell equator, t=200~300deg.	Unstable : Width of the EBW seam is narrow. No defect in outside weld area.

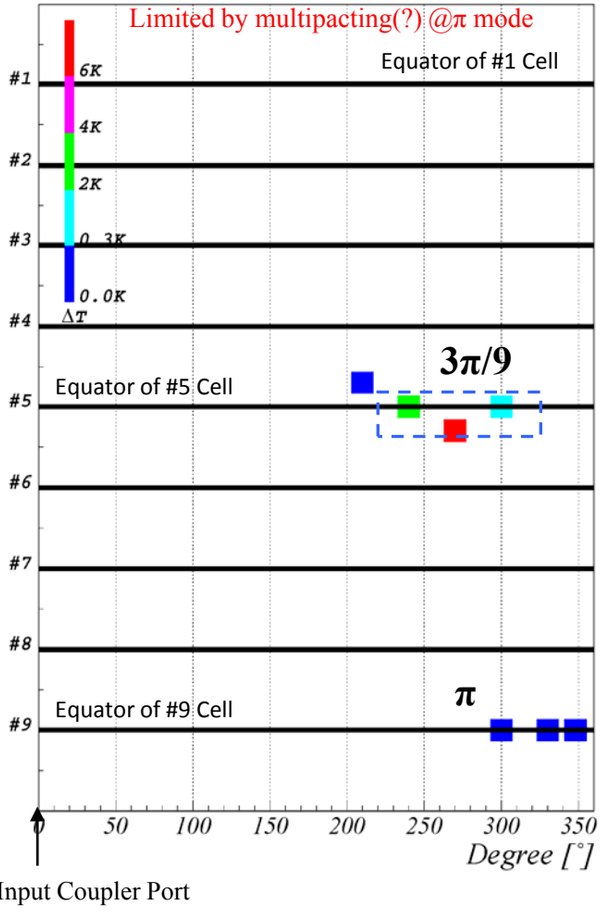
* The observed heating location at high field were near unstable area of the EBW seam at equator.

Results of T-Map by Y. Yamamoto

: MHI-05 2nd V.T.



: MHI-06 4th V.T.



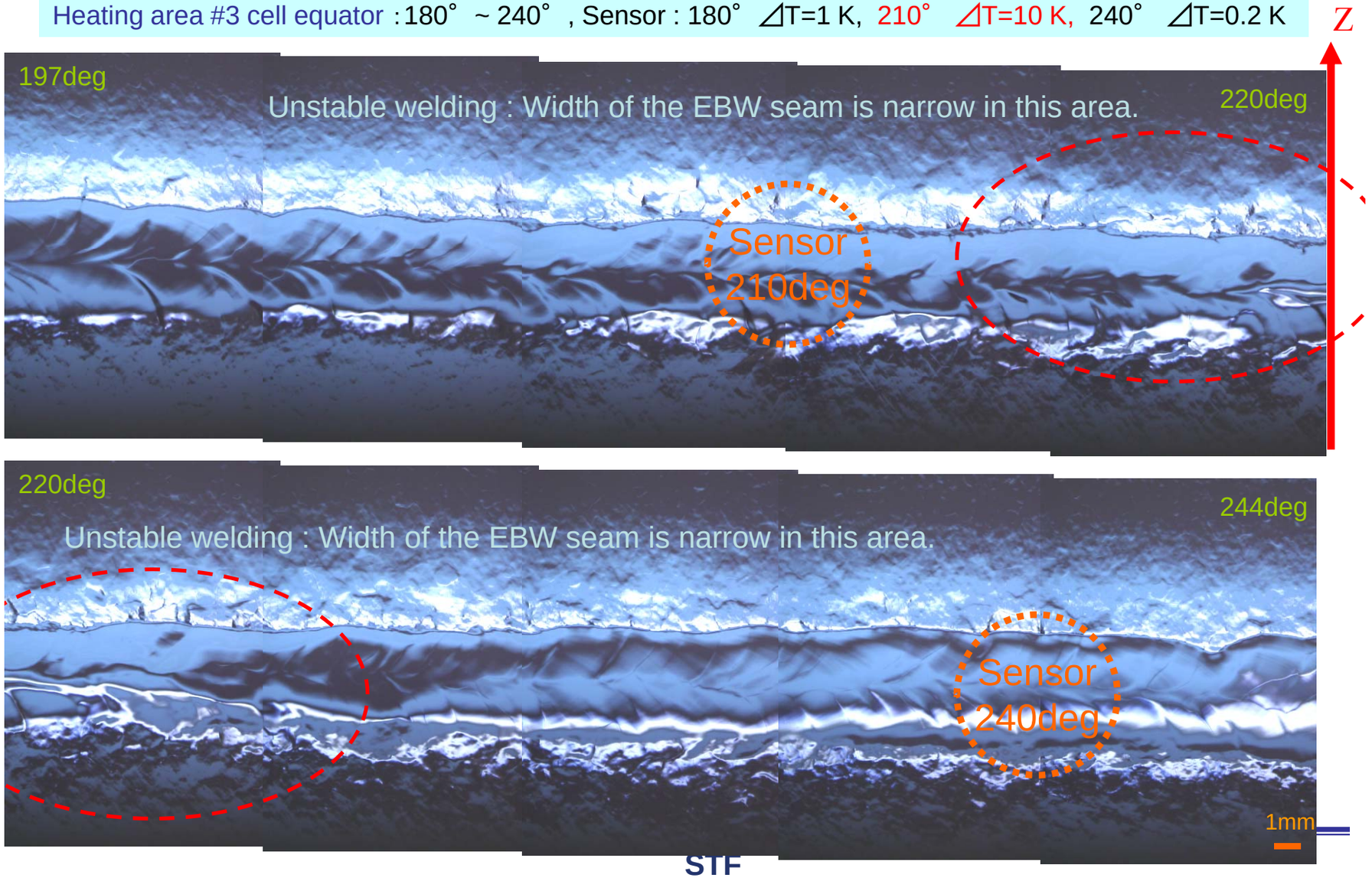
The pictures of the heating location (enclosed with blue broken line) are shown in next slides.

MHI-05 cavity

MHI-05 2nd V.T. : #3 cell equator, 25.6MV/m @ 5/9

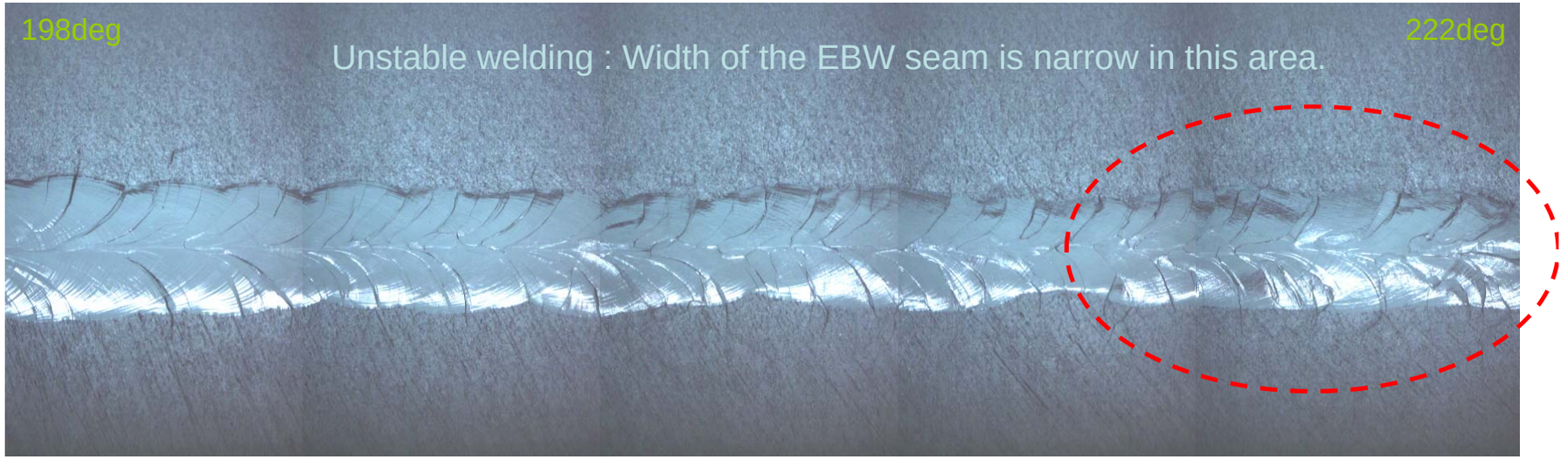
superconducting rf test facility

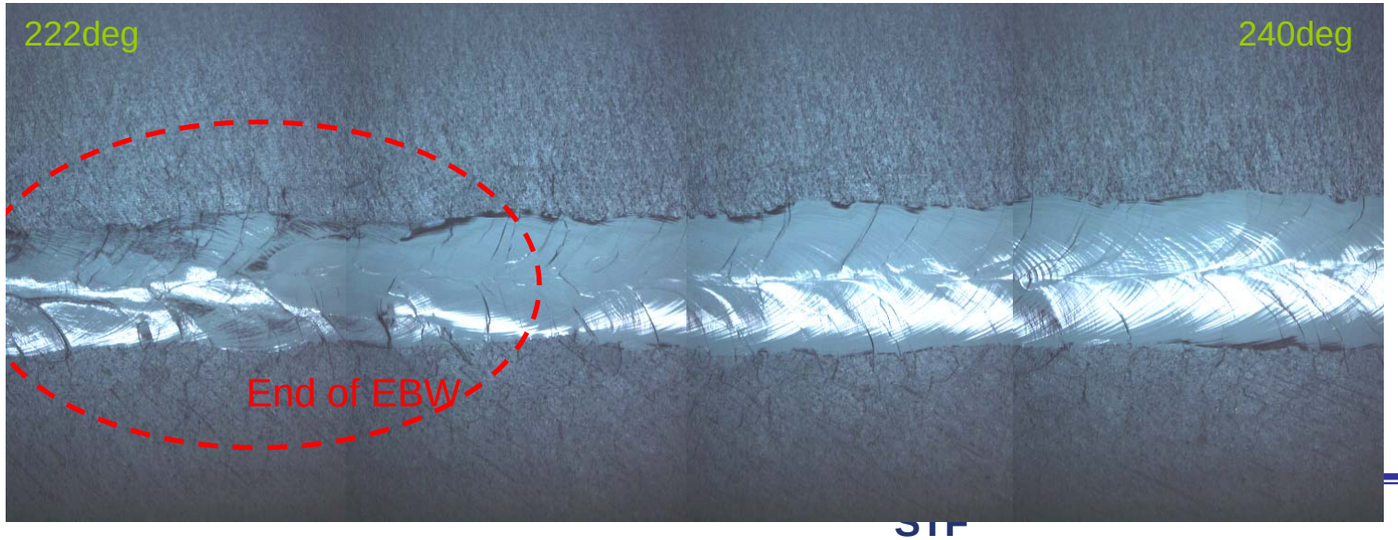
Heating area #3 cell equator : 180° ~ 240° , Sensor : 180° ⊿T=1 K, 210° ⊿T=10 K, 240° ⊿T=0.2 K



Comparison with As received, MHI-05 2nd V.T. : #3 cell equator

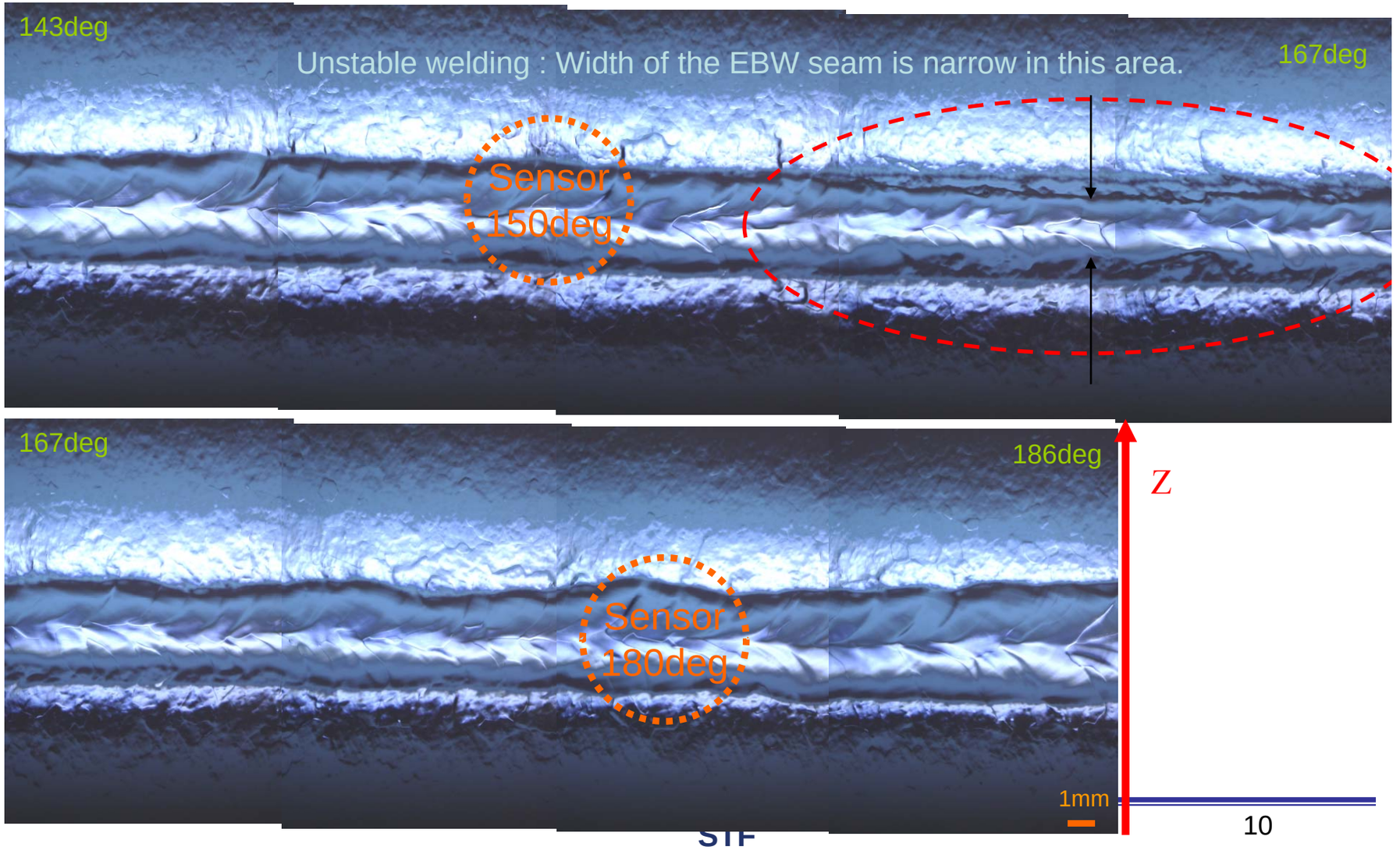
#3 equator, 198 ~ 240 degree. Condition : As received.





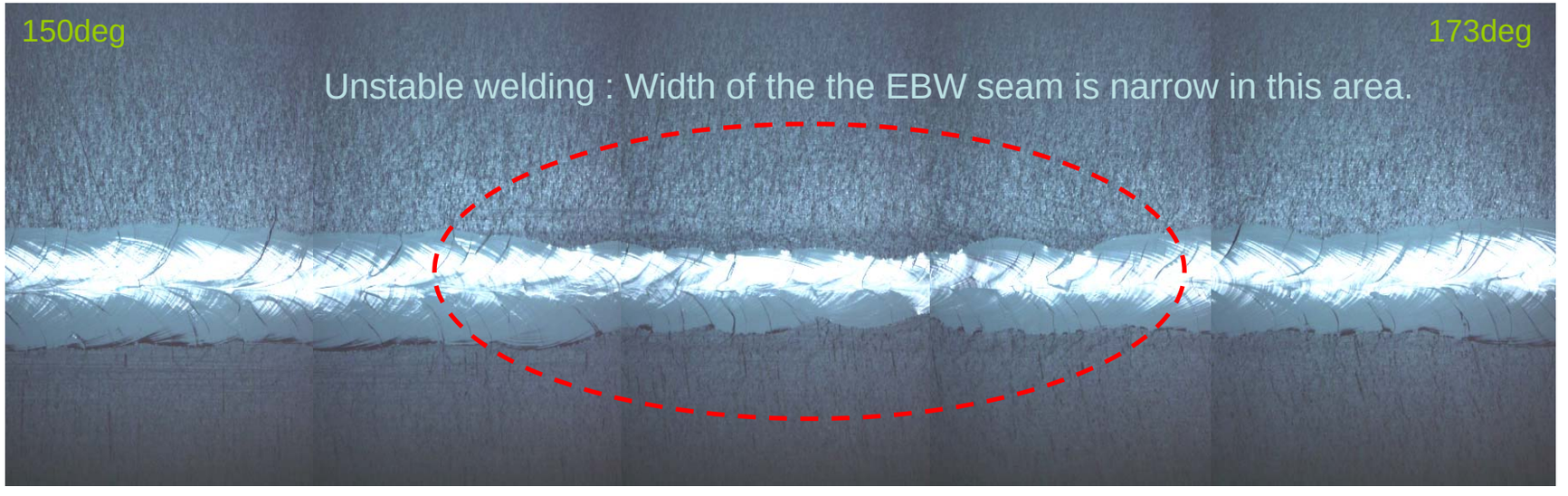
MHI-05 2nd V.T. : #5 cell equator, 29.2MV/m @ 7/9

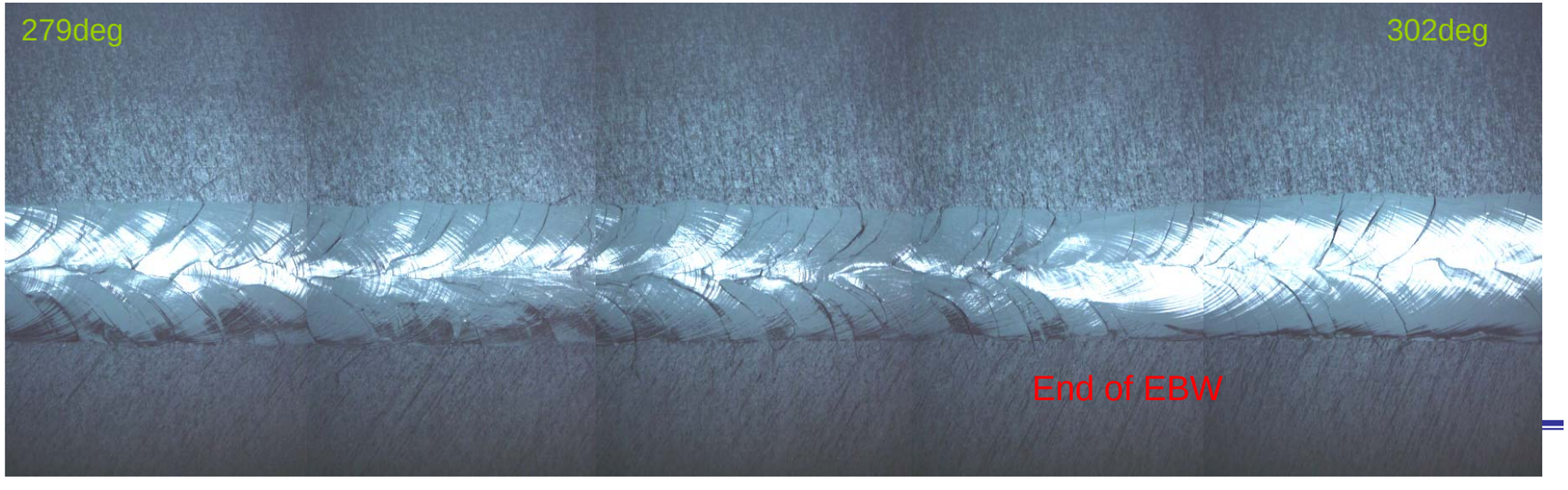
Heating area #5 cell equator : 120° ~ 180° : Sensor 120° ⊿T=1 K, 150° ⊿T=10 K, 180° ⊿T=5 K



Comparison with As received, MHI-05 2nd V.T. : #5 cell equator

#5 equator, 150 ~ 173 and 279 ~ 302 degree. Condition : As received.

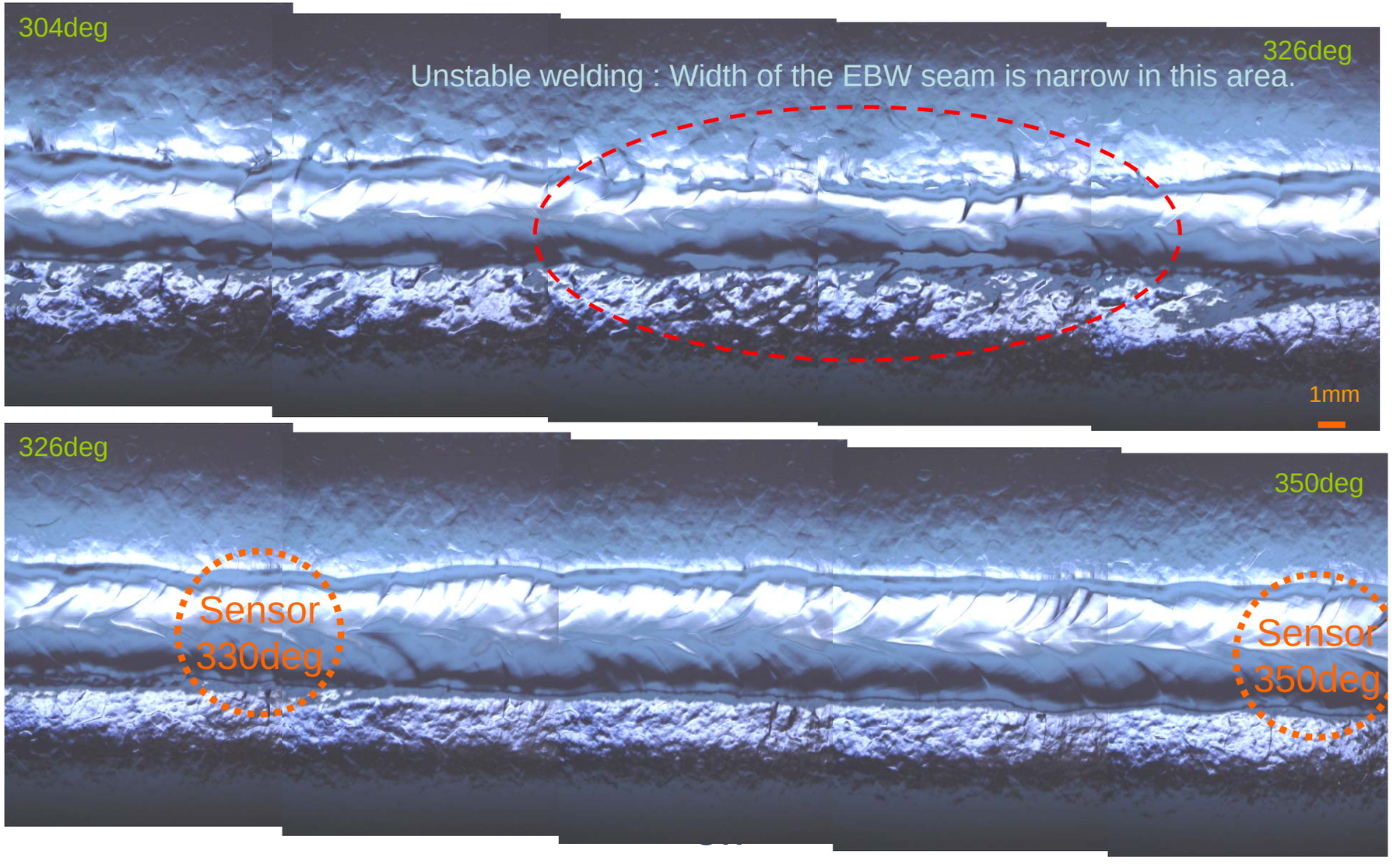




MHI-05 2nd V.T. : #6 cell equator, 32.9MV/m @ 6/9

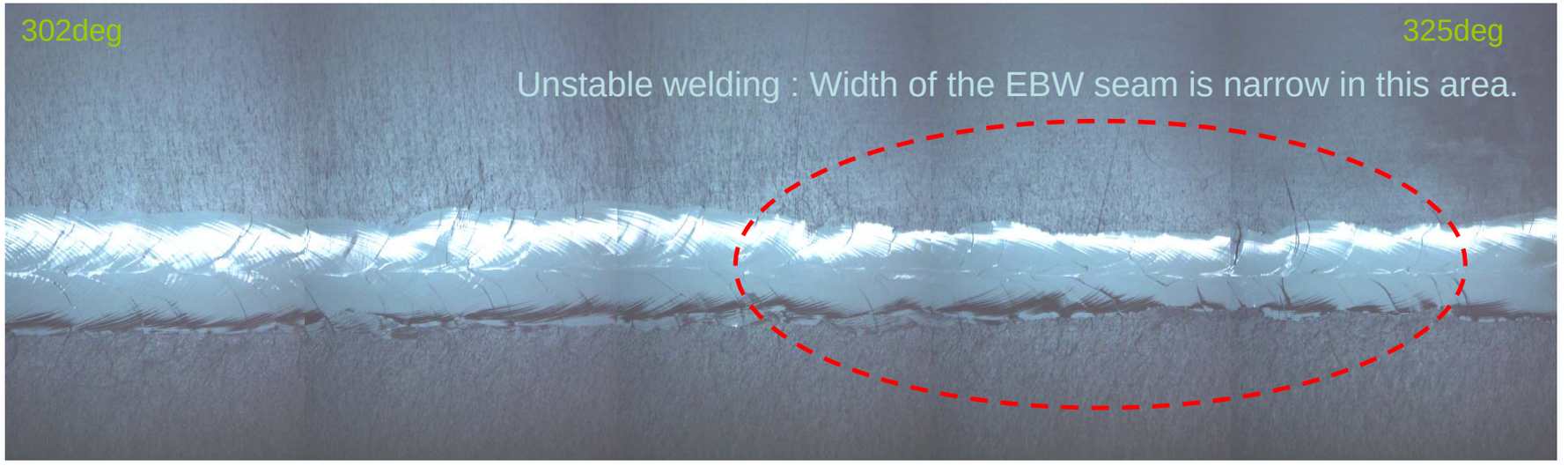
superconducting rf test facility

Heating area #6 cell equator : 270° ~ 360° : Sensor 300° ⊿T=10 K, 330° ⊿T=10 K, 350° ⊿T=8 K



Comparison with As received, MHI-05 2nd V.T. : #6 cell equator

#6 equator, 279 ~ 325 degree. Condition : As received.

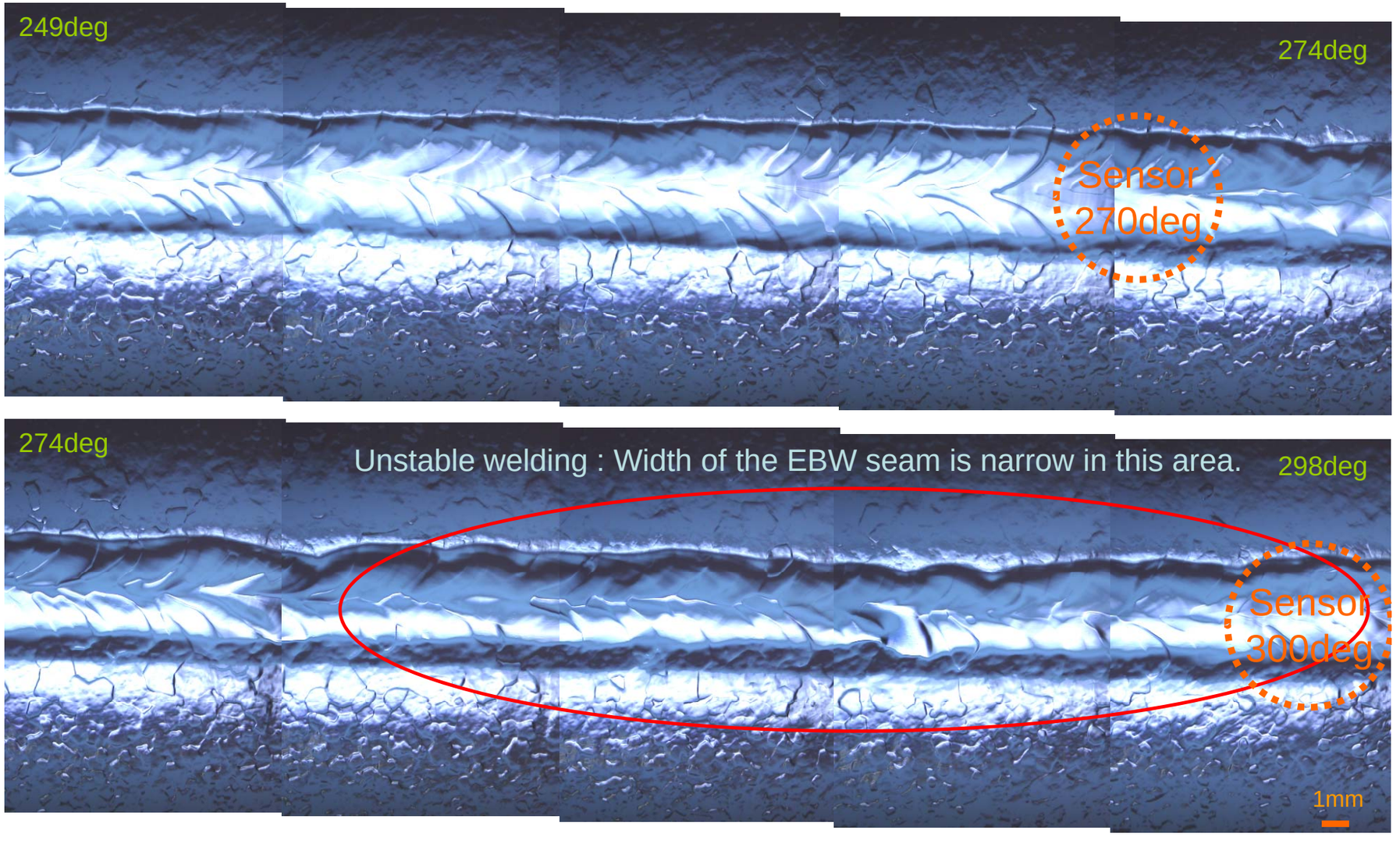


MHI-06 cavity

MHI-06 4th V.T. #5 cell equator, 39.9MV/m @ 3/9

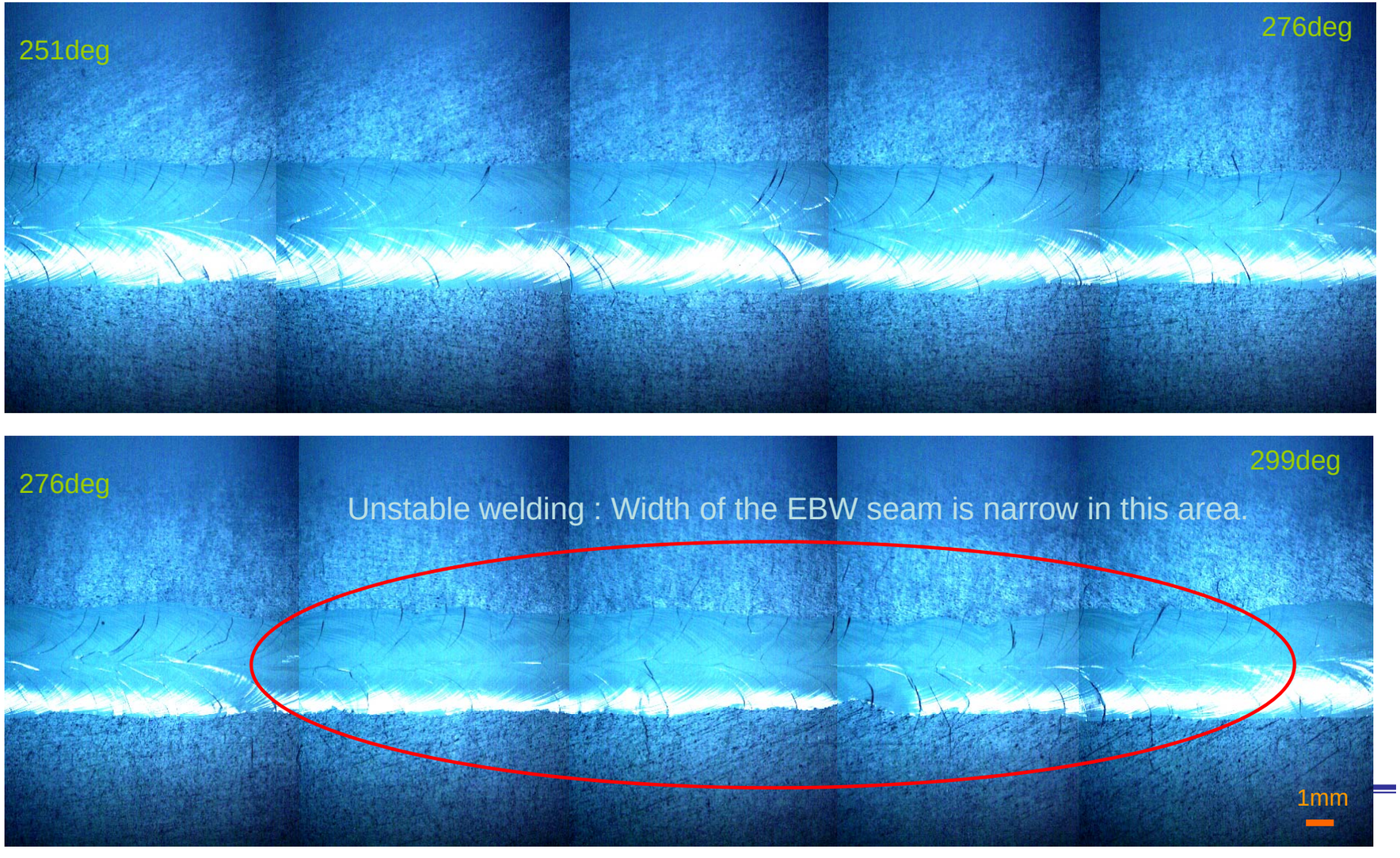
superconducting rf test facility

Heating area #5 cell equator : 240° ~300° : Sensor 240° ⊿T=2 K, 270° ⊿T=10 K, 300° ⊿T=1 K



Comparison with As received, MHI-06 4th V.T. : #5 cell equator

#5 equator, 251 ~ 299 degree. Condition : As received.



Summary

The heating of the suspicious spots were not detected by T-map.

(Location : Outside welding area between 15mm from joint of equator.)

The suspicious spots are observed on the surface at point of the dambels.

(by using three MHI-07 dambels).

Observed the heating location at high field were unstable area of the EBW seam at equator.

(Unstable welding : Width of EBW seam is narrow.)

Heating locations at accelerating mode were inspected, but there were no defect.

(Problem of the Surface treatment ?)

*Now, The MHI-07, MHI-08 and MHI-09 are under inspection at “As received”.

Thank you for your attention