

# ISONIC EXPERT

PAUT – Ultrasonic Phased Array  
Inspection of Planar and  
Circumferential Butt Welds



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## ISONIC EXPERT Technology

- Planar butt welds
- Circumferential butt welds
- 3- and 4- members welds
- Scanning with wedged linear array probe along the fusion line:
  - Manual
  - Mechanized
  - Automatic
- 100% raw data capturing
- True-to-Geometry imaging:
  - Top View (C-Scan)
  - Side View
  - End View
  - 3D-View
- FMC/TFM Protocol for the data acquisition and imaging
- Comprehensive postprocessing



Item	Order Code (Part ##)
Inspection SW Application for ISONIC 3510 , ISONIC 3510T- Phased Array Modality: <b>Expert - Weld Inspection - planar cross section butt welds / girth welds</b>	SWA 3510004
Inspection SW Application for ISONIC 2010 / ISONIC 2010 EL - Phased Array Modality: <b>Expert - Weld Inspection - planar cross section butt welds / girth welds</b>	SWA 910804
Inspection SW Application for ISONIC 2009 UPA-Scope - Phased Array Modality: <b>Expert - Weld Inspection - planar cross section butt welds / girth welds</b> ⇒ True-To-Geometry Weld Overlay Volume Corrected Imaging - Cross Sectional and Top (C-Scan)- / Side- / End- View and 3D ⇒ Sector-Scan and B-Scan (Linear Scan) Cross Sectional Coverage ⇒ Intuitive Image Guided PA Pulsar Receiver with Beam Forming View ⇒ DAC / TCG Normalization ⇒ Built-In Weld Geometry Editor and Ray Tracer - Scanning Pattern Design ⇒ Independent on TCG Angle Gain Compensation / Gain Per Focal Law Correction ⇒ Automatic Coupling Monitor ⇒ Automatic Scanning Integrity Monitor ⇒ Detection of the defects in the parent material simultaneously with weld inspection ⇒ Encoded and Time based C-Scan ⇒ 100% Raw Data Capturing ⇒ FMC/TFM Protocol for the data acquisition and imaging ⇒ Automatic Defects Alarming Upon C-Scan Acquisition Completed ⇒ Automatic Generating of Editable Defects List ⇒ Automatic Creating of Scanning Integrity Report Upon C-Scan Acquisition Completed ⇒ Comprehensive Postprocessing Including: → Recovery and Evaluation of Captured A-Scans from the Recorded Cross Sectional Views (Sector Scan) and C-Scans → Recovery of Cross Sectional Views from the Recorded C-Scans → Converting Recorded C-Scans or their Segments into 3D Images → Off-Line Gain Manipulation → Off-Line DAC to TCG / TCG to DAC toggling for all types of stored files (A-Scans, cross-sectional views, C-Scans, etc) → Off-Line DAC Normalization of the Recorded Images / DAC Evaluation → Off-Line editing of Angle Gain Compensation / Gain per Shot Correction applied to the stored the Cross-sectional Views / C-Scan data → Numerous Filtering / Reject Options ( by Geometry / Position / By Amplitude / dB-to-DAC / etc ) → Defects Sizing → Generating of Defect List and Storing it Into a Separate File → Creating of Scanning Integrity Report → Automatic creating of inspection reports - hard copy / PDF File	SWA 909804



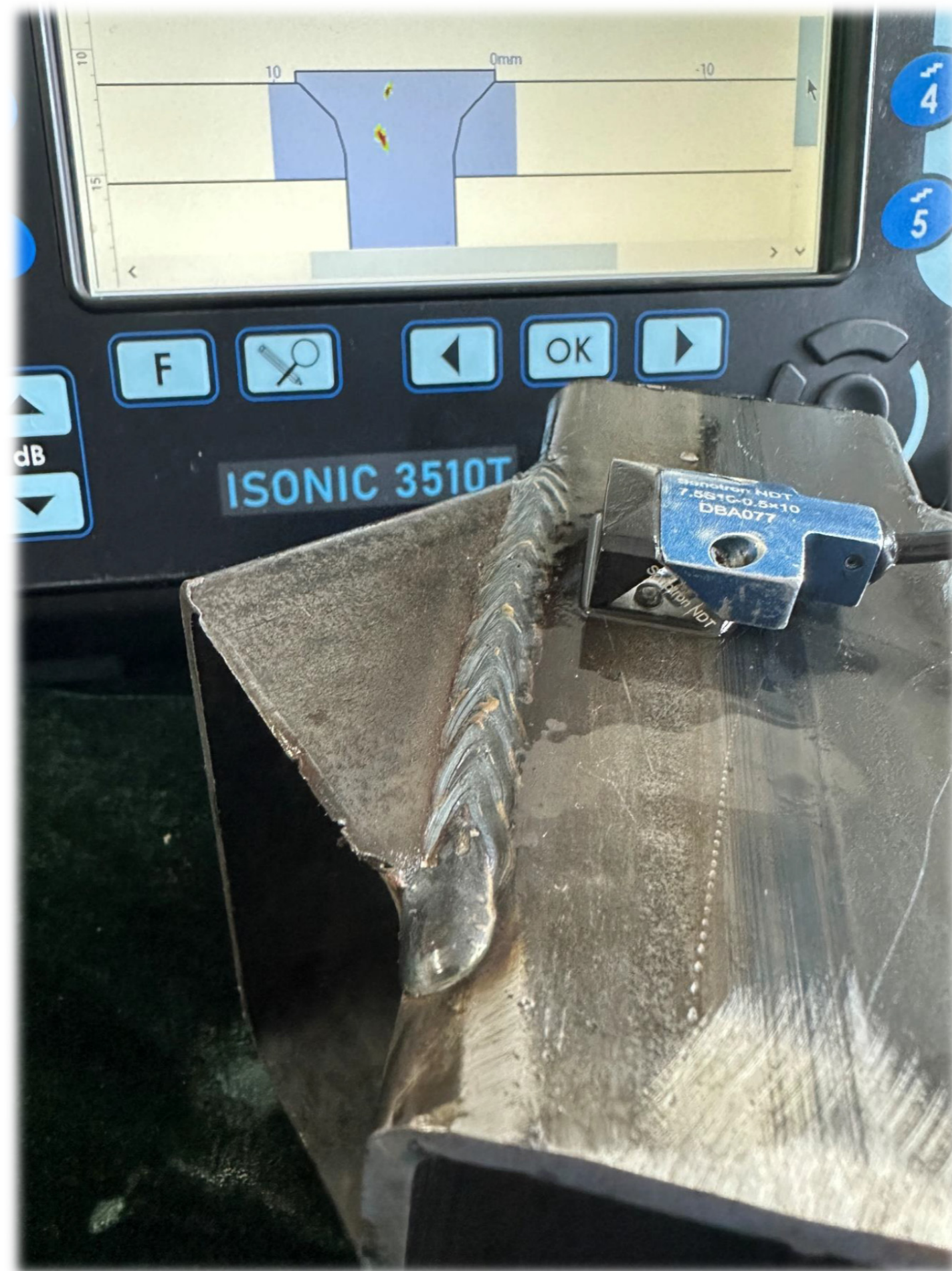
Inspection of planar butt weld



*Inspection of planar butt weld*



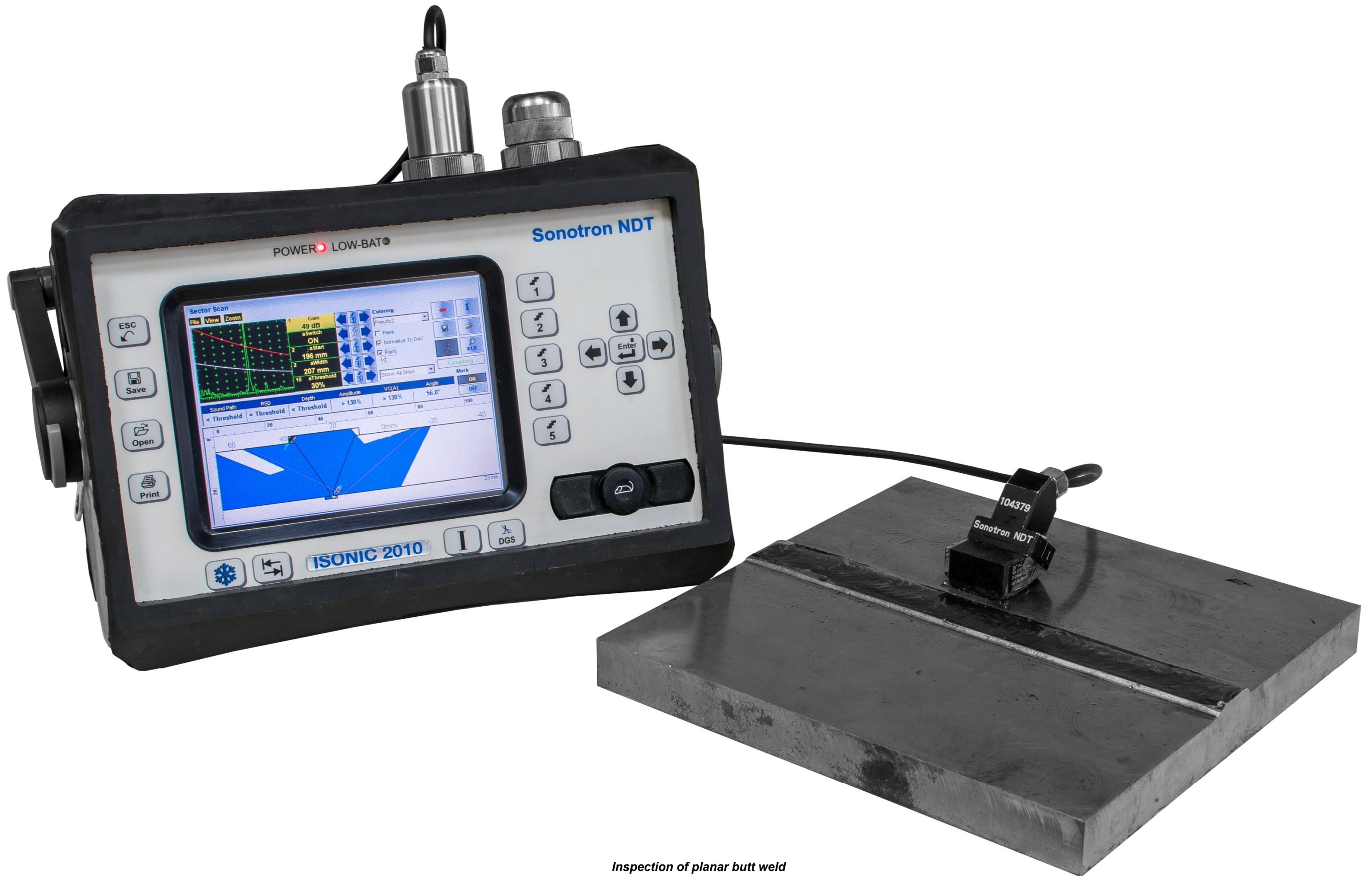
*Structural butt weld between the thin wall hollow rectangle cross-section profiles*



*Structural triple-wall butt weld between the thin wall hollow rectangle cross-section profiles*



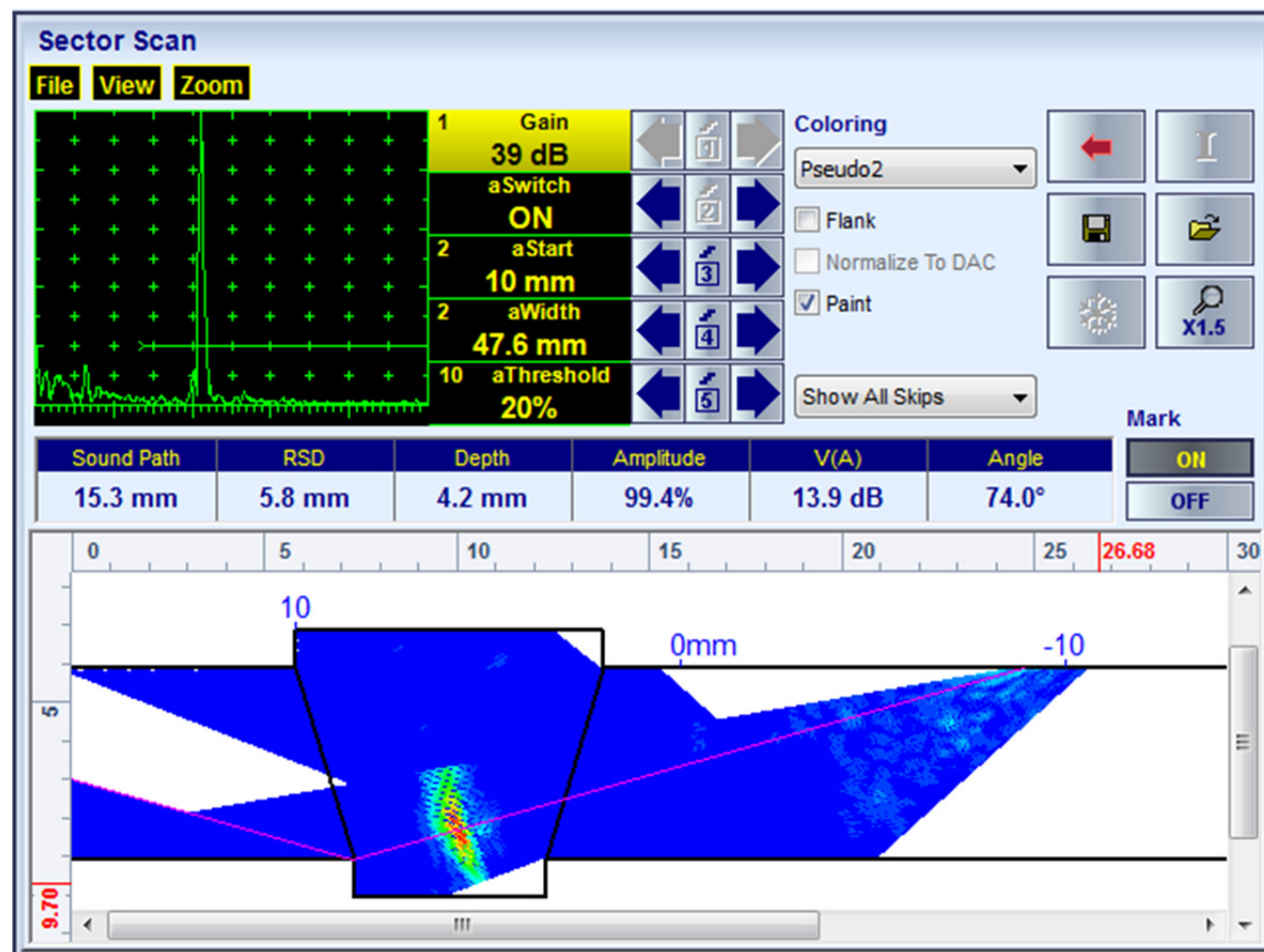
*Inspection of planar butt weld*



*Inspection of planar butt weld*



Inspection of circumferential butt weld – boiler tubes



Inspection of circumferential butt weld – boiler tubes



Sonotron NDT

Power ● Low-Bat ●

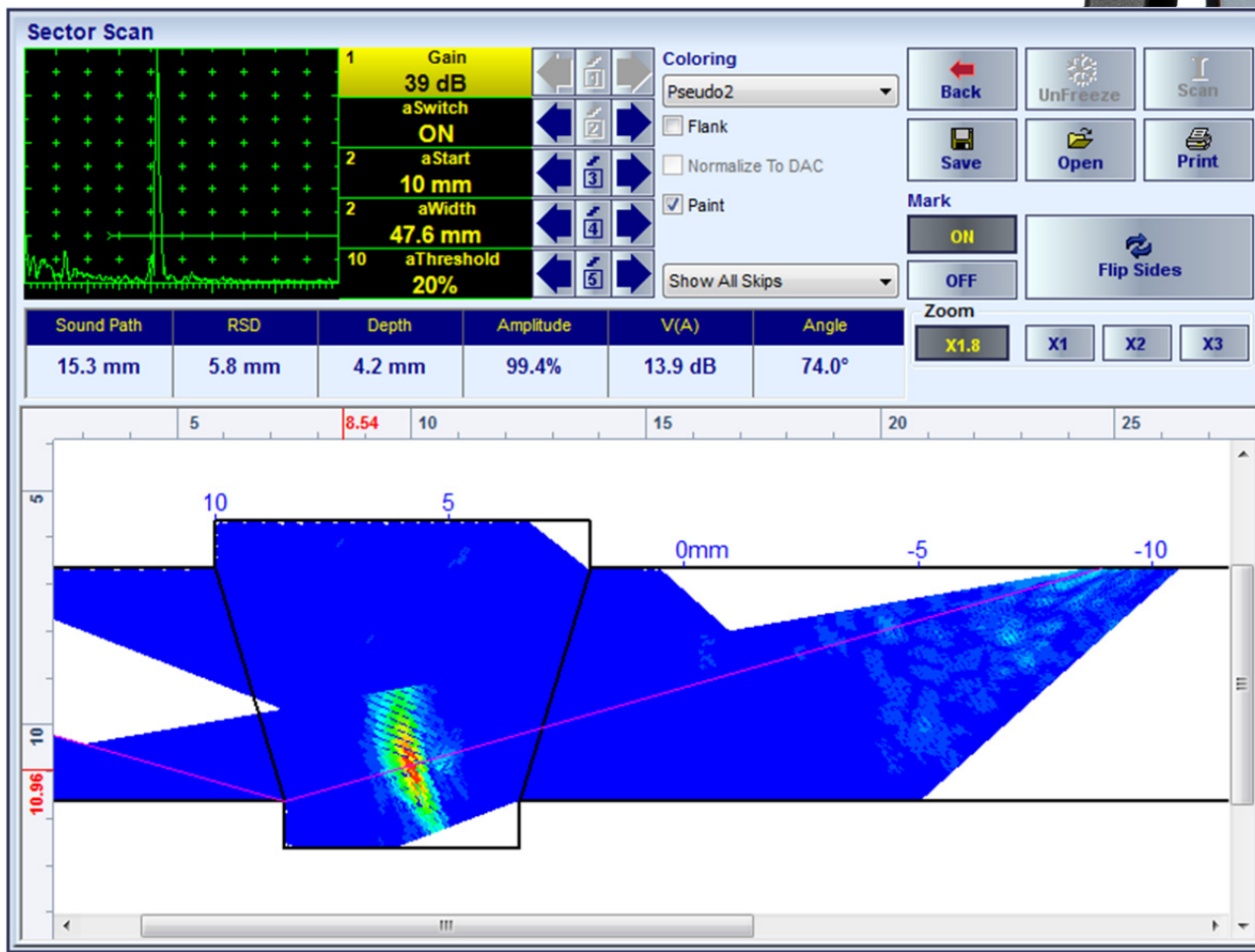


ISONIC 2009

UPA-Scope

W

E

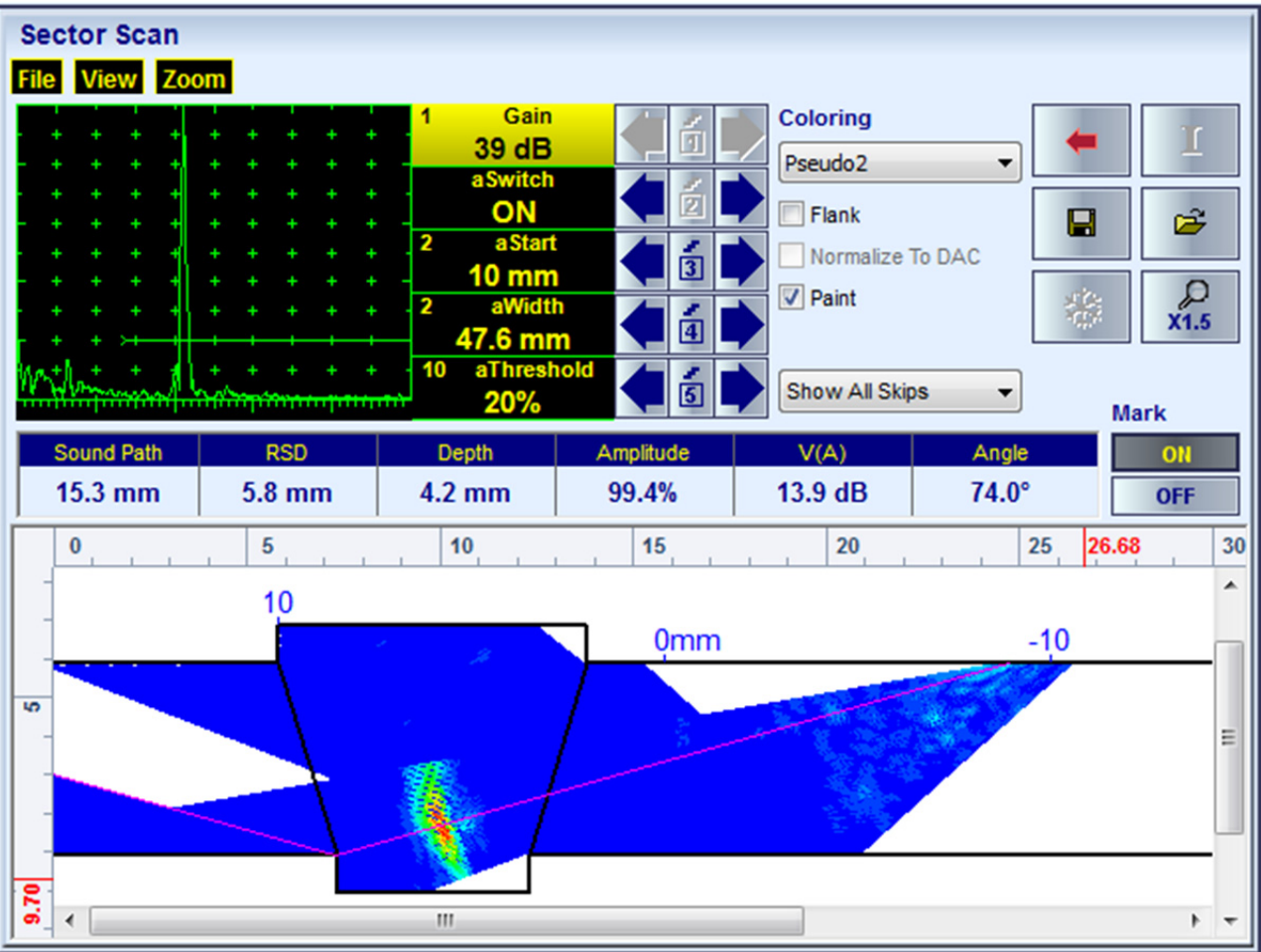


SONOTRON NDT

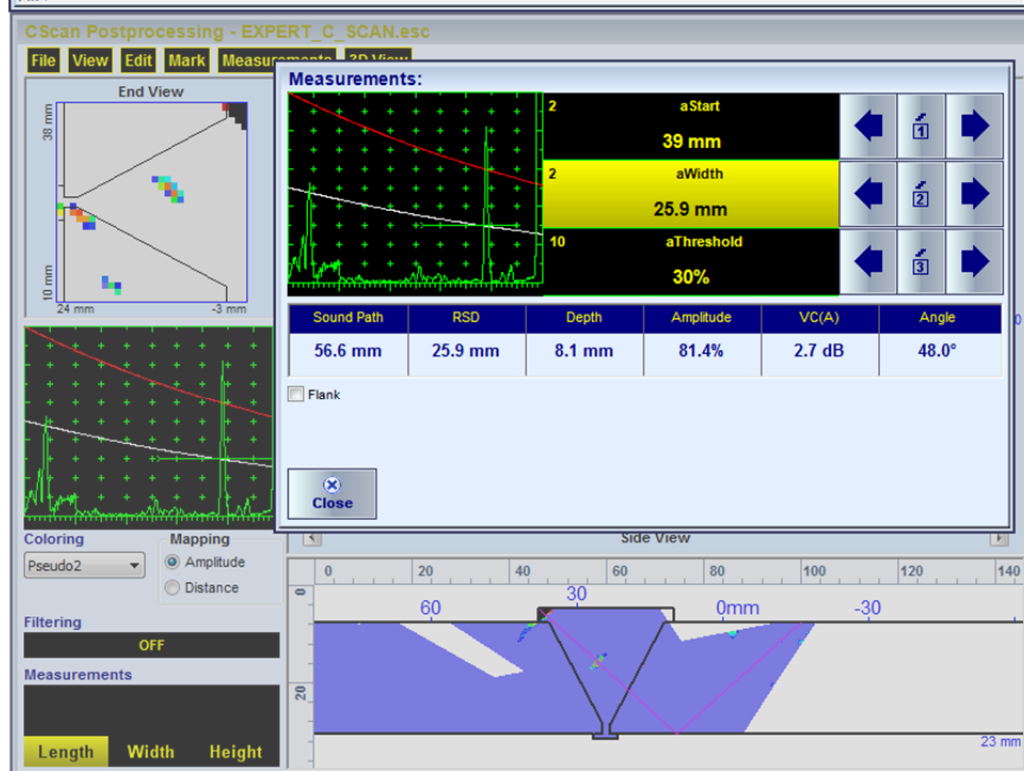
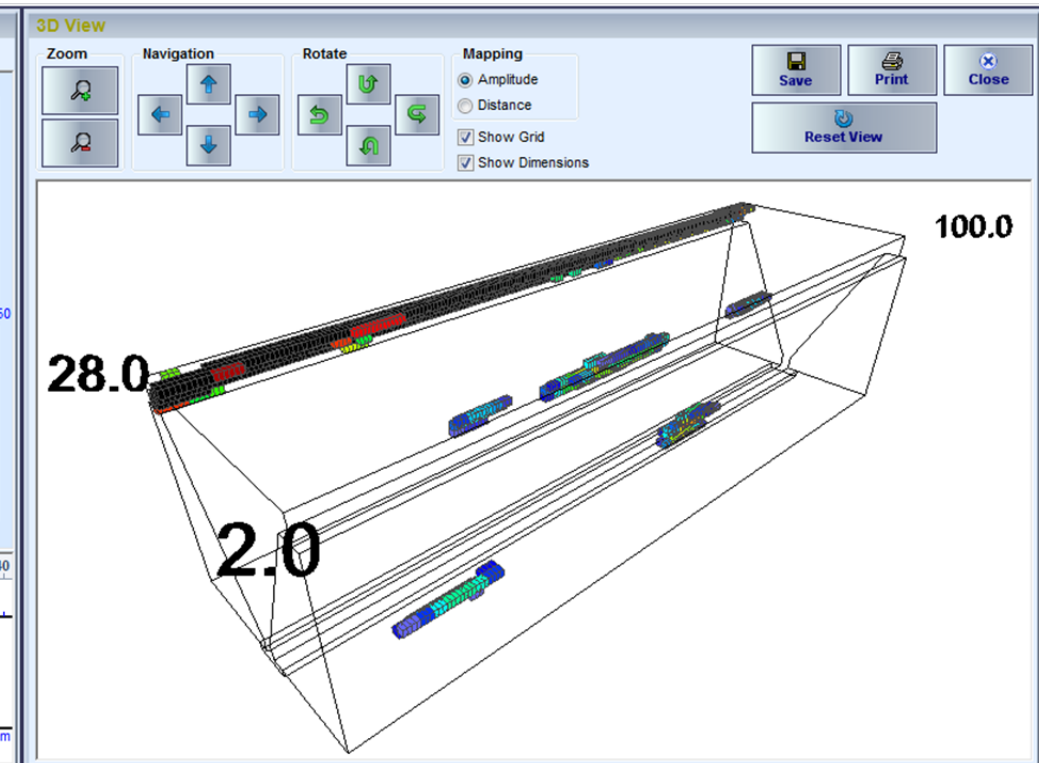
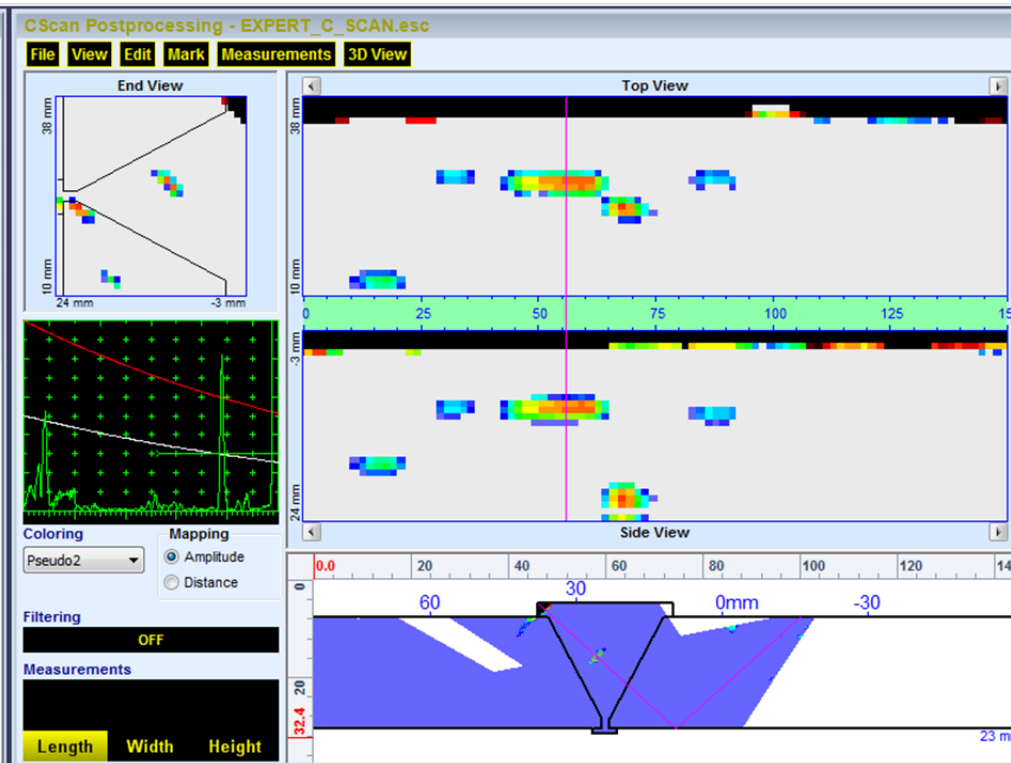
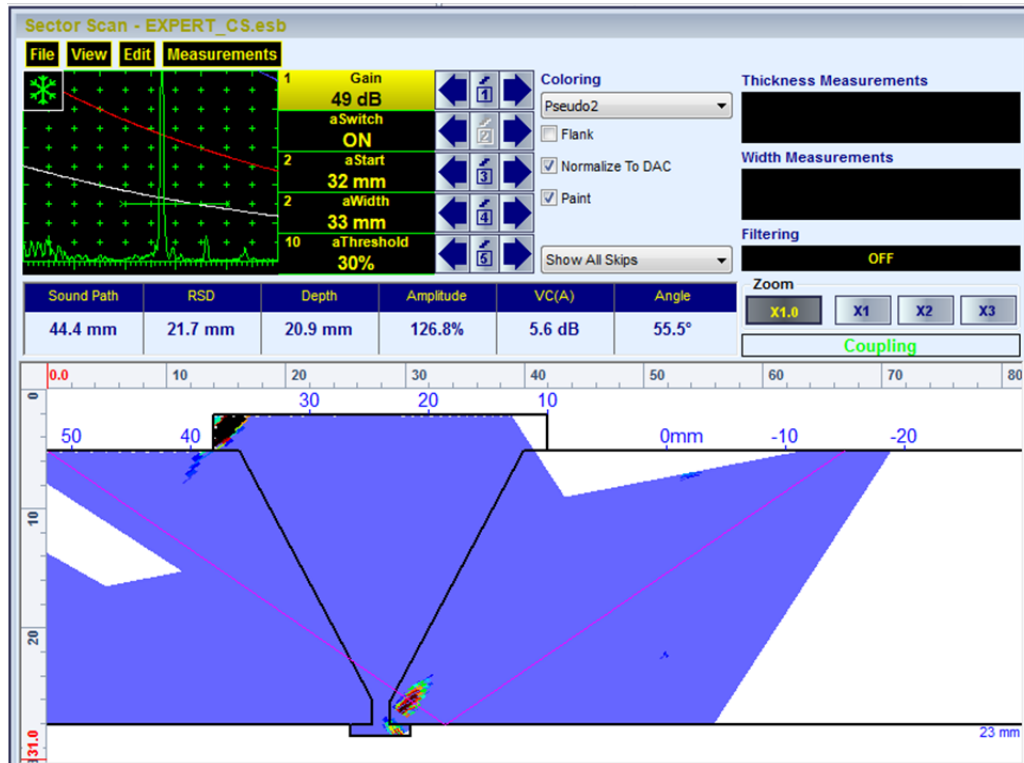


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Inspection of circumferential butt weld – boiler tubes

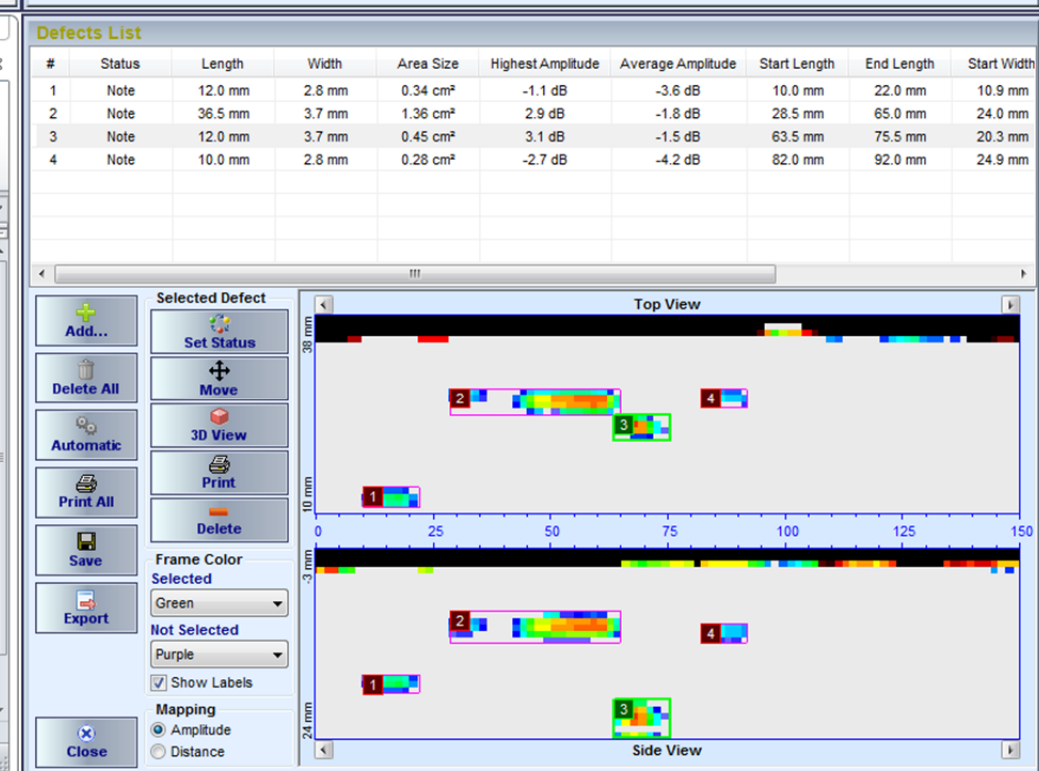


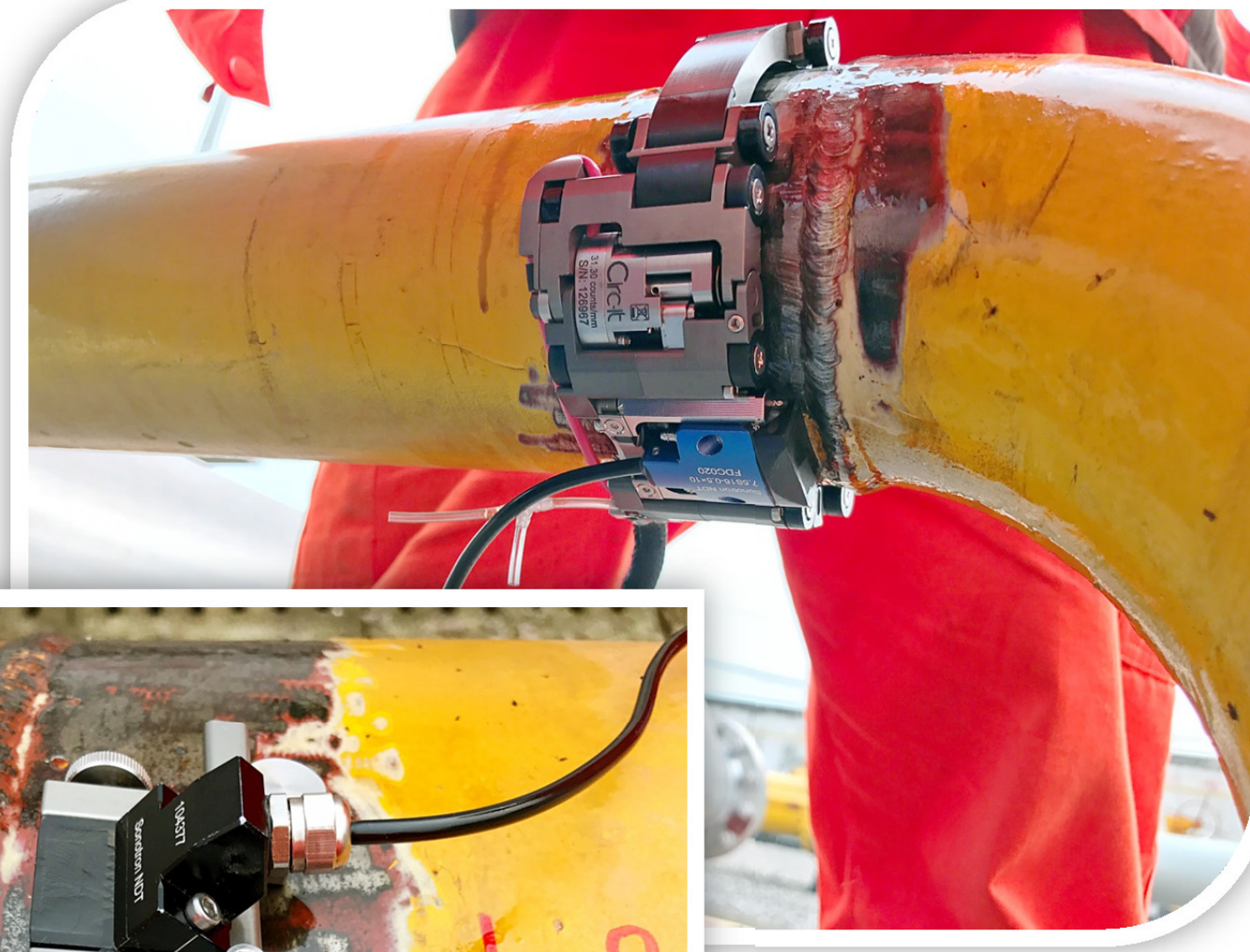
Typical Postprocessing Screenshots



XLS00001.xls [Compatibility Mode] - Microsoft Excel

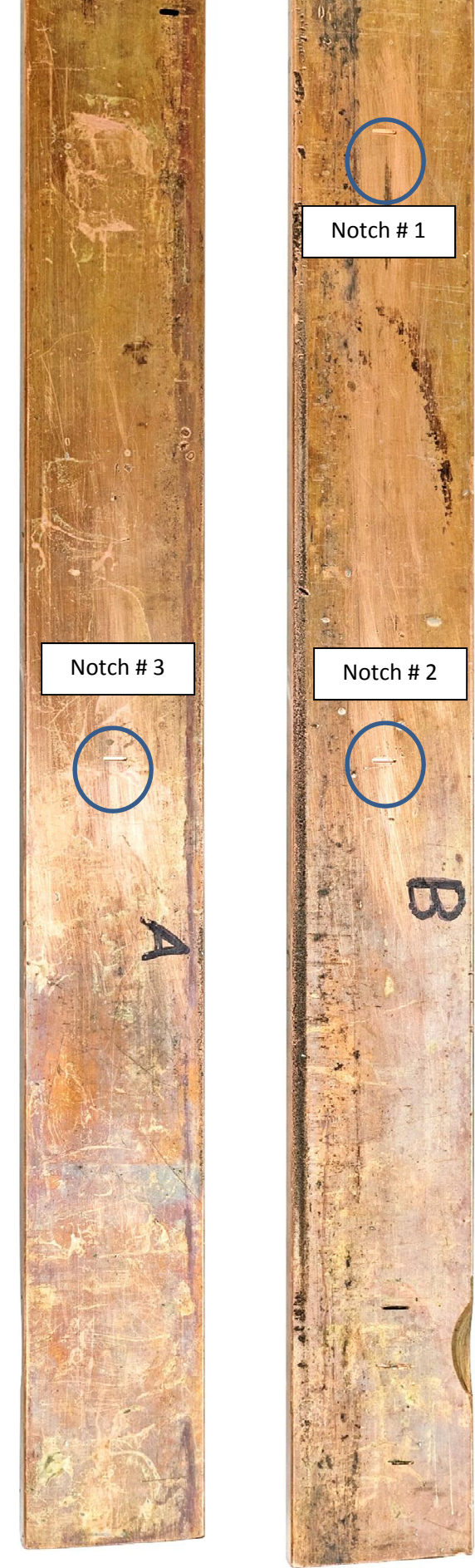
#	Status	Length (mm)	Width (mm)	Area Size (cm²)	Highest Amplitude (dB)	Average Amplitude (dB)	Start Length (mm)	End Length (mm)	Start Width (mm)	End Width (mm)
1	Note	12.0	2.8	0.34	-1.1	-3.6	10.0	22.0	10.9	13.7
2	Note	36.5	3.7	1.36	2.9	-1.8	28.5	65.0	24.0	27.7
3	Note	12.0	3.7	0.45	3.1	-1.5	63.5	75.5	20.3	24.0
4	Note	10.0	2.8	0.28	-2.7	-4.2	82.0	92.0	24.9	27.7

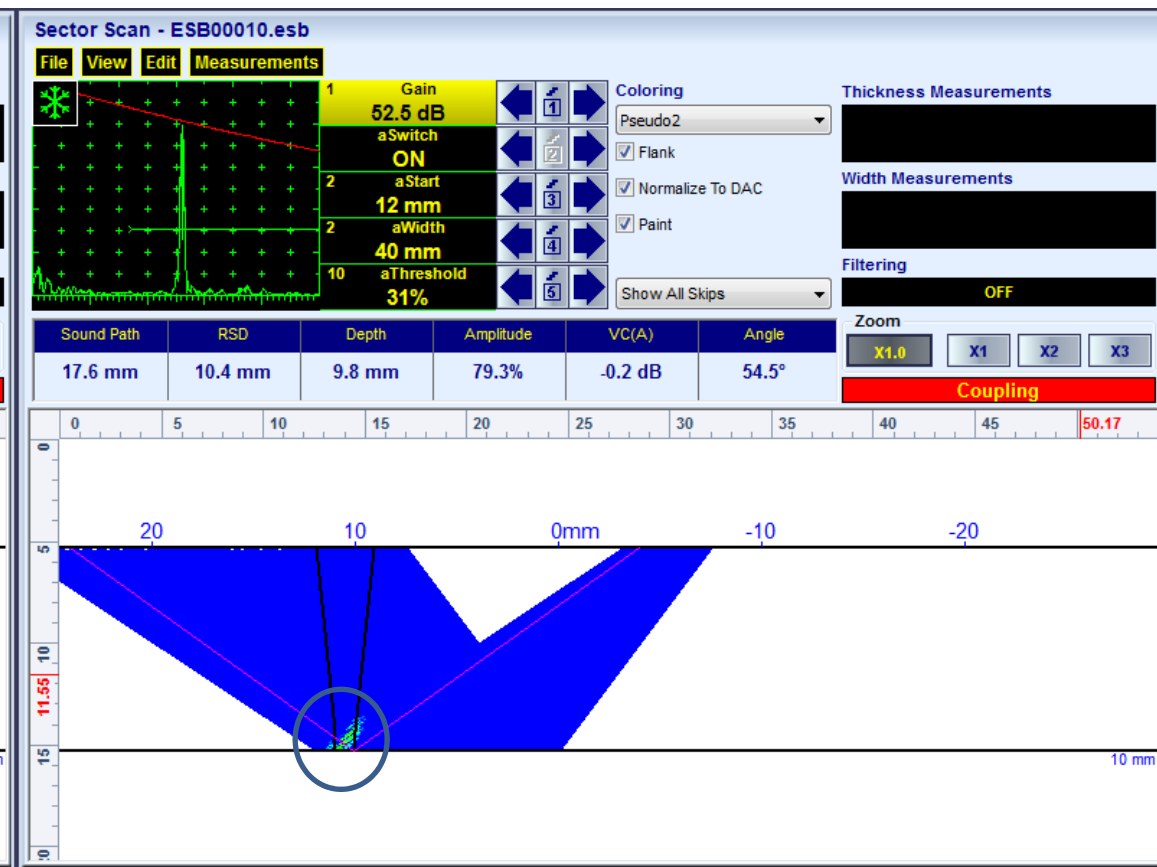
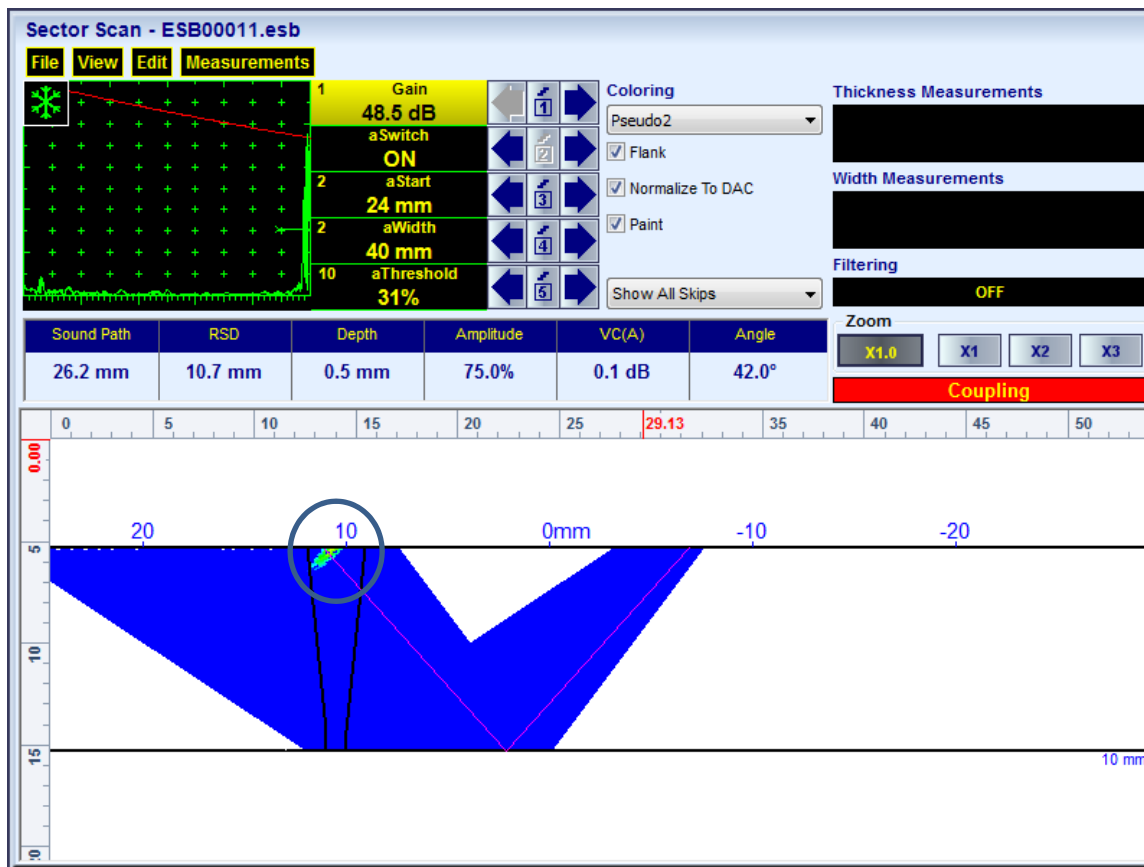




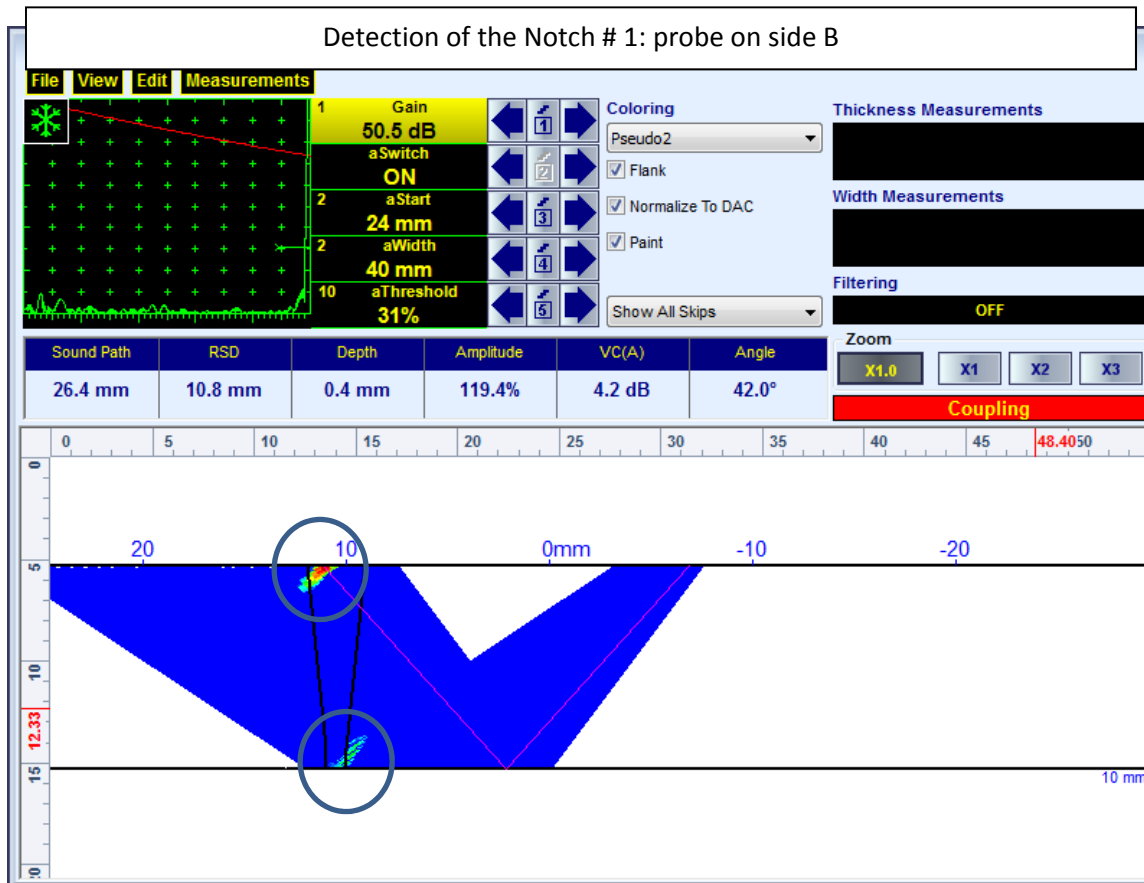
*Inspection of circumferential butt weld – AGI*

Detection of the reference notches in the calibration block for the inspection of copper welds

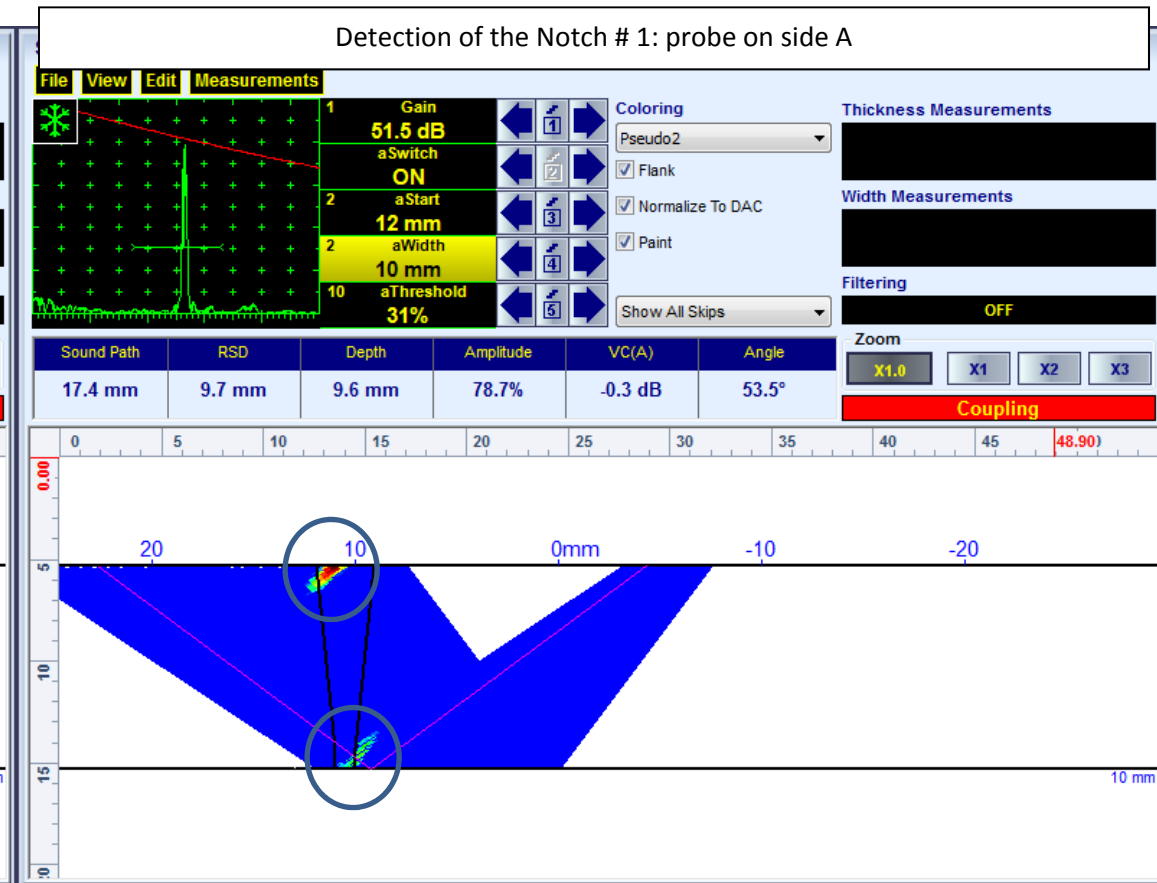




Detection of the Notch # 1: probe on side B

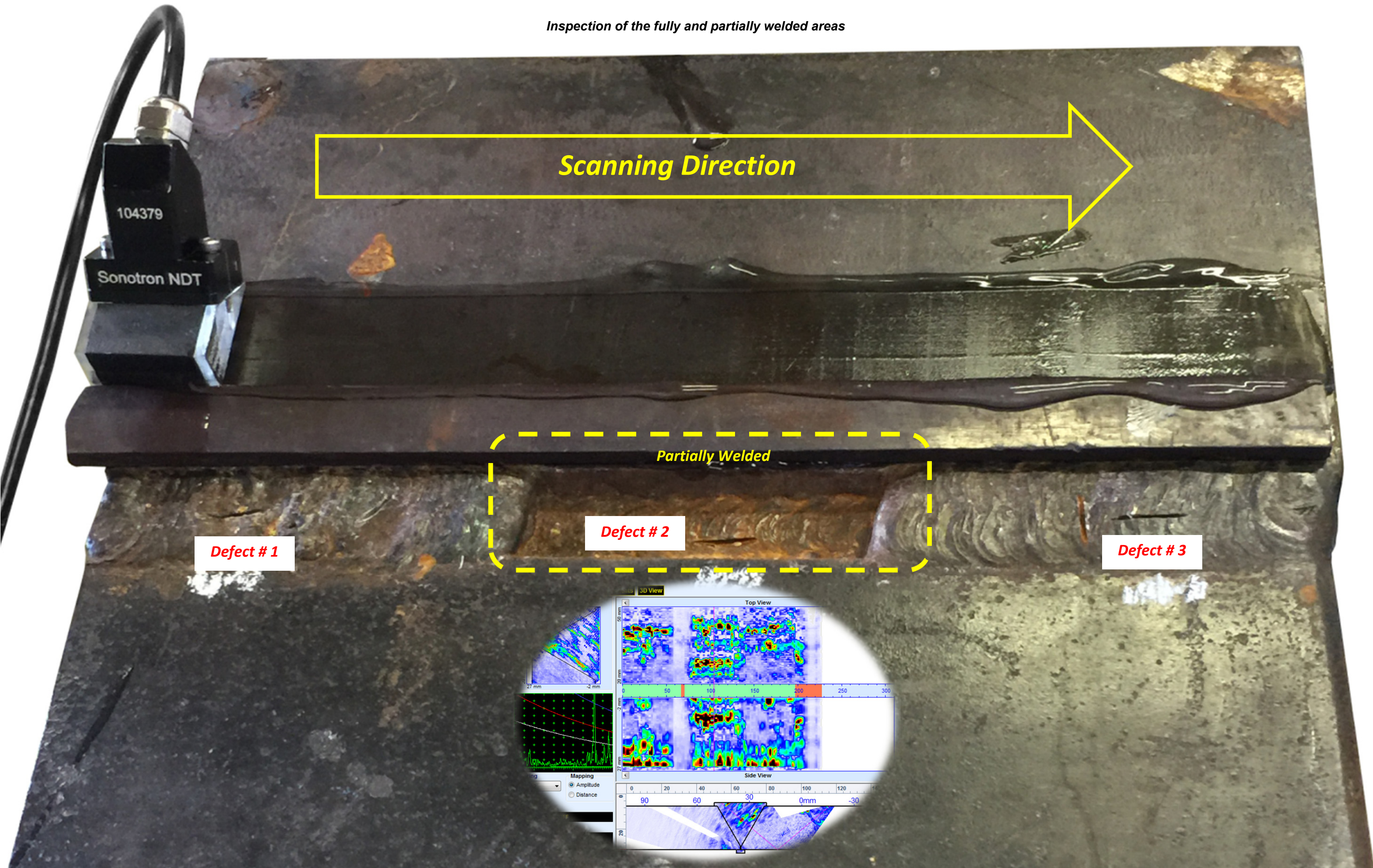


Detection of the Notch # 1: probe on side A



Detection of the Notches ## 2 and 3: probe on side A or B

Inspection of the fully and partially welded areas







**Defect #1**

### CScan Postprocessing - PW\_D1.esc

File View Edit Mark Measurements 3D View

**End View**

**Top View**

**Side View**

Coloring: Pseudo2  
 Mapping: Amplitude (selected), Distance  
 Filtering: OFF  
 Measurements: Length 37.6, Width, Height

### Sector Scan - PW\_D1.esb

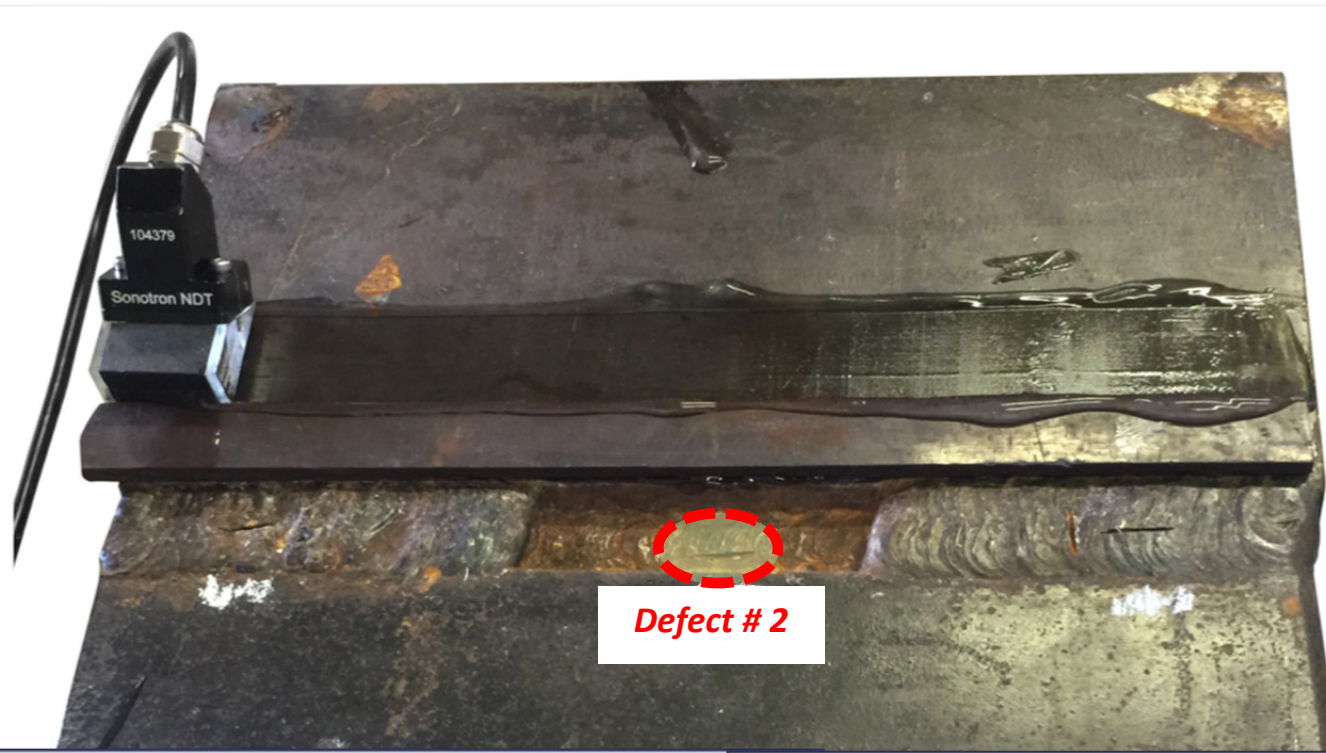
File View Edit Measurements

1	Gain	52 dB
	aSwitch	ON
2	aStart	30 mm
2	aWidth	46.2 mm
10	aThreshold	1%

Coloring: Pseudo2  
 Flank  
 Normalize To DAC  
 Paint  
 Show All Skips: OFF

Sound Path	RSD	Depth	Amplitude	V(A)	Angle
30.0 mm	5.6 mm	20.5 mm	89.6%	39.0 dB	47.0°

Thickness Measurements: [ ]  
 Width Measurements: [ ]  
 Filtering: OFF  
 Zoom: X1.0, X1, X2, X3  
 Coupling: [ ]



Defect # 2

### CScan Postprocessing - PW\_D2.esc

File View Edit Mark Measurements 3D View

**End View**

50 mm  
20 mm  
27 mm -2 mm

**Top View**

50 mm  
20 mm  
0 50 100 150 200 250

**Side View**

27 mm  
0 20 40 60 80 100 120 140

Coloring: Pseudo2  
Mapping:  Amplitude,  Distance  
Filtering: OFF  
Measurements: Length, Width, Height

### Sector Scan - PW\_D2.esb

File View Edit Measurements

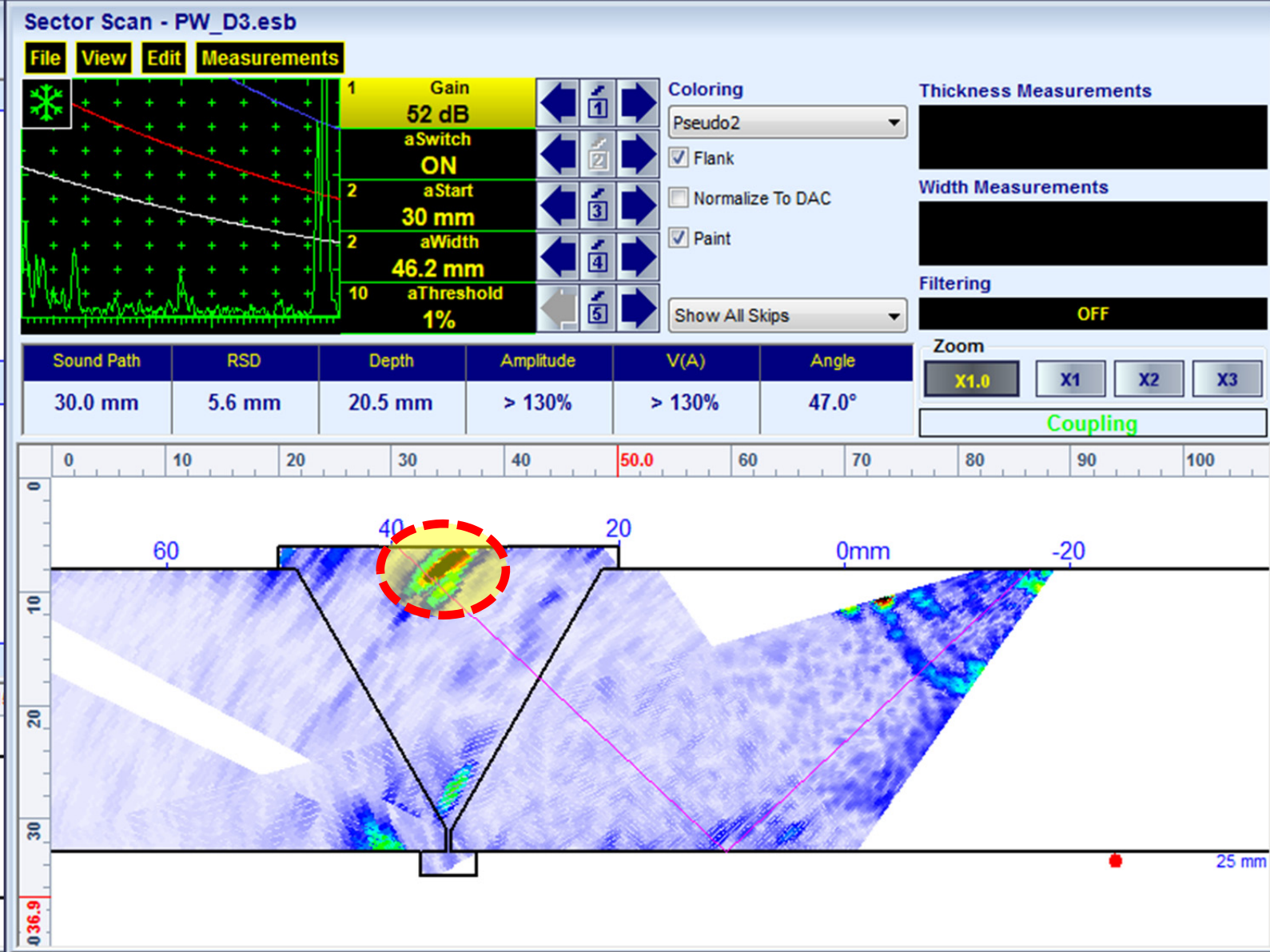
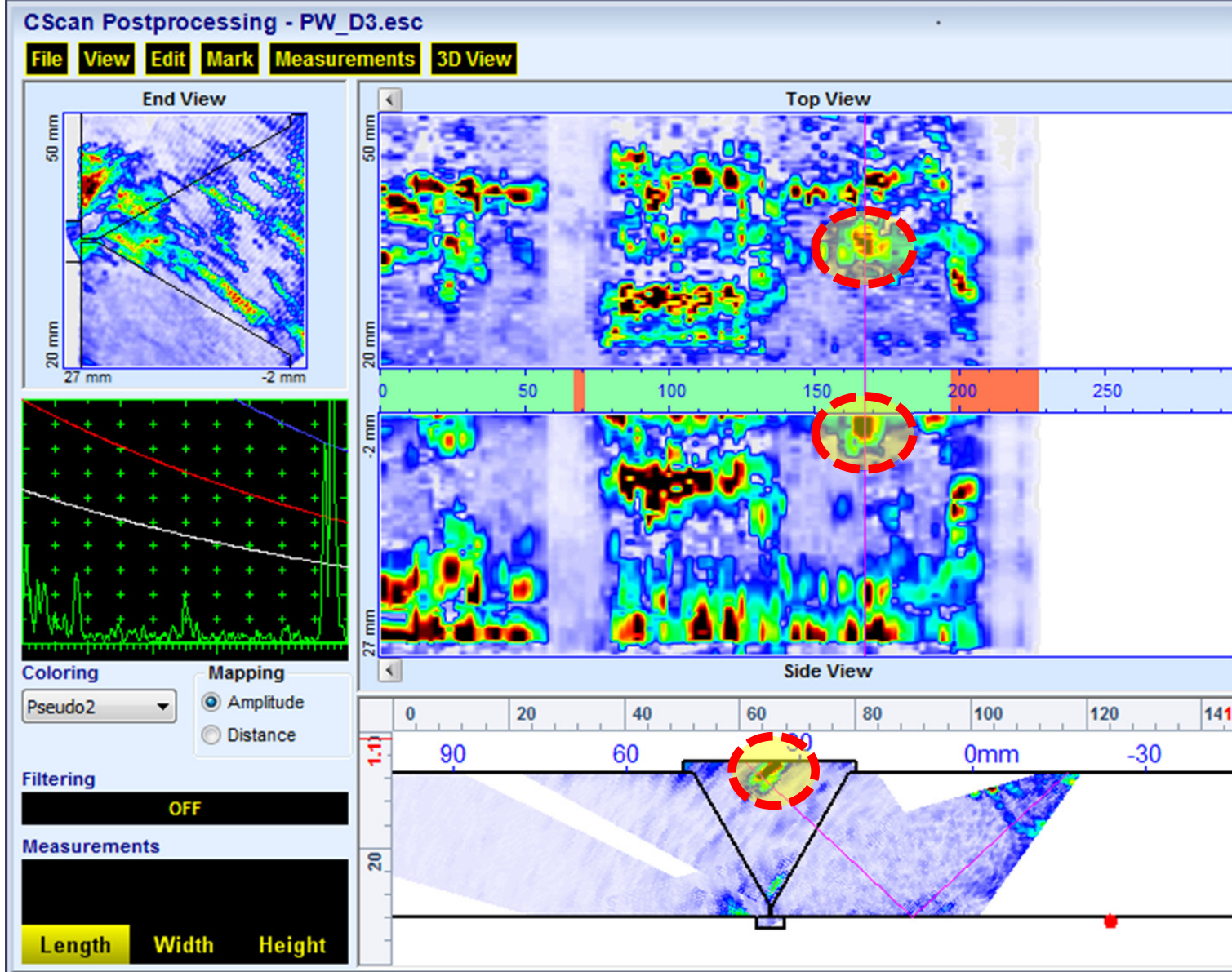
1	Gain	52 dB
	aSwitch	ON
2	aStart	30 mm
2	aWidth	50.9 mm
10	aThreshold	1%

Coloring: Pseudo2  
 Flank  
 Normalize To DAC  
 Paint  
Show All Skips: OFF

Thickness Measurements: [ ]  
Width Measurements: [ ]  
Filtering: OFF  
Zoom: X1.0, X1, X2, X3

Sound Path	RSD	Depth	Amplitude	V(A)	Angle
30.0 mm	7.2 mm	19.3 mm	128.4%	42.2 dB	50.0°

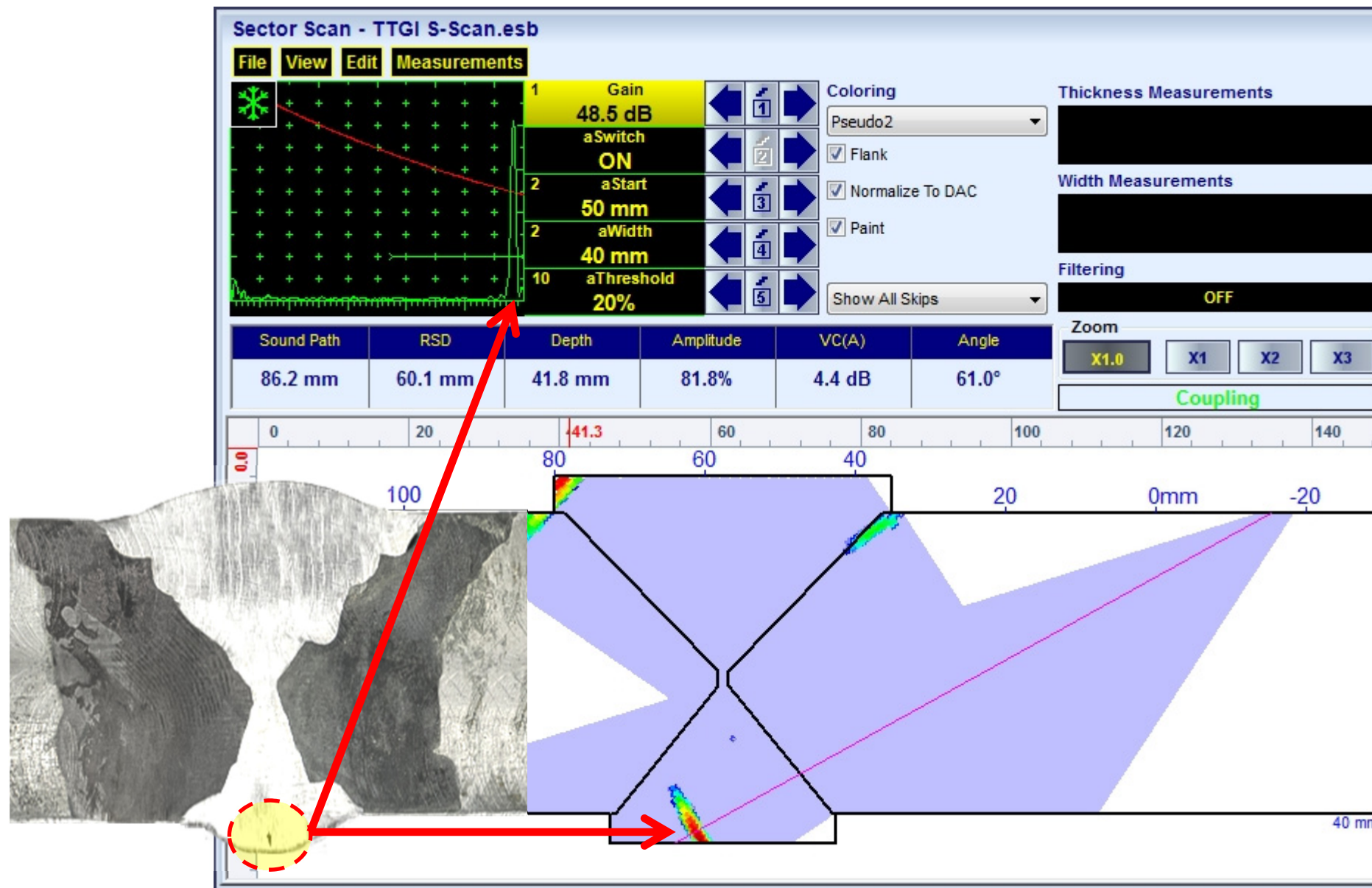
0 10 20 30 40 50 60 70 80 90 100  
0 10 20 30  
60 40 20 0mm -20  
25 mm



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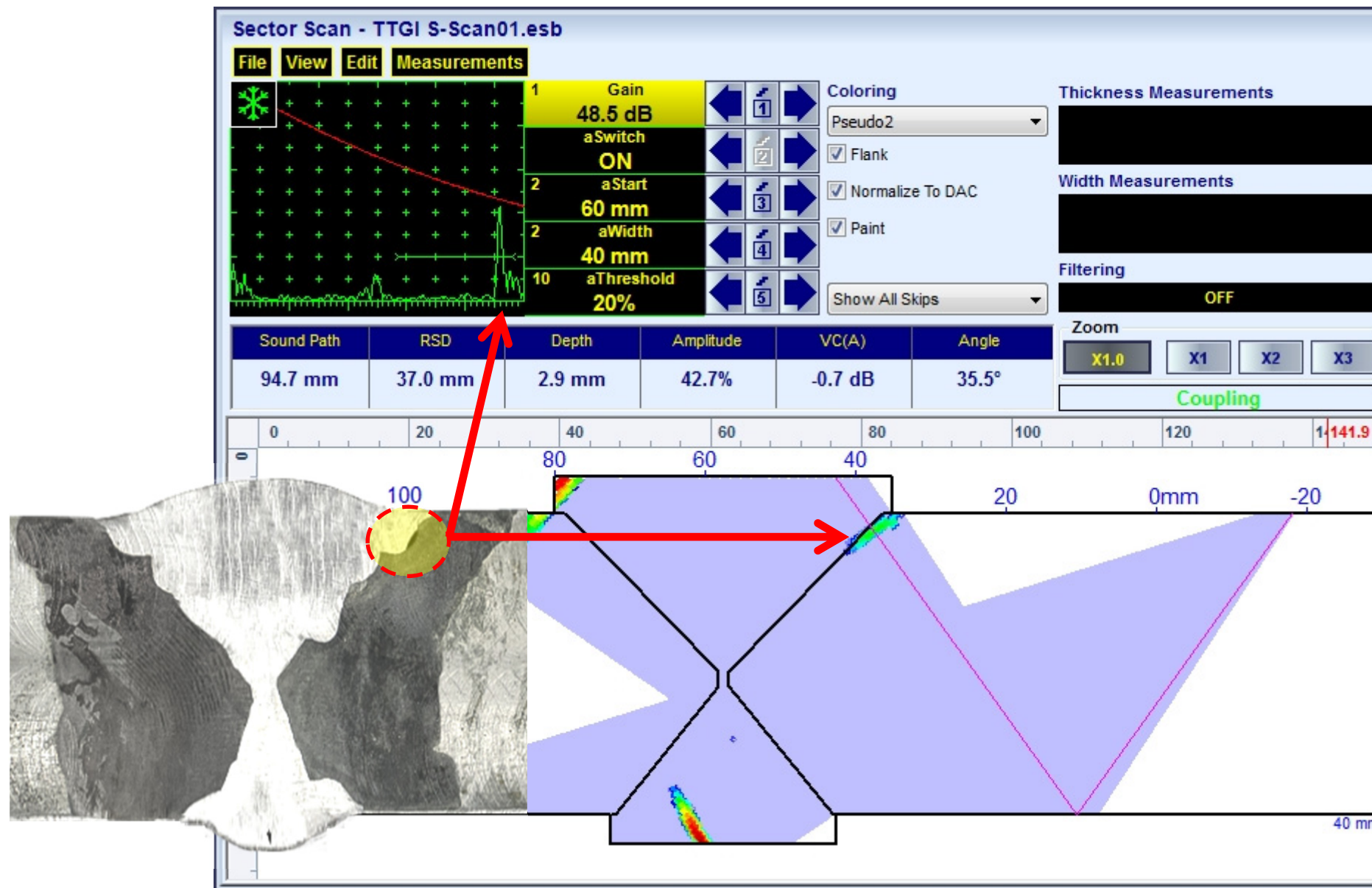
# Cross-Section of the Butt Weld with Crack in the Excessive Root Material and Lack of Fusion (LoF)

## 1. Crack in the Excessive Root Material



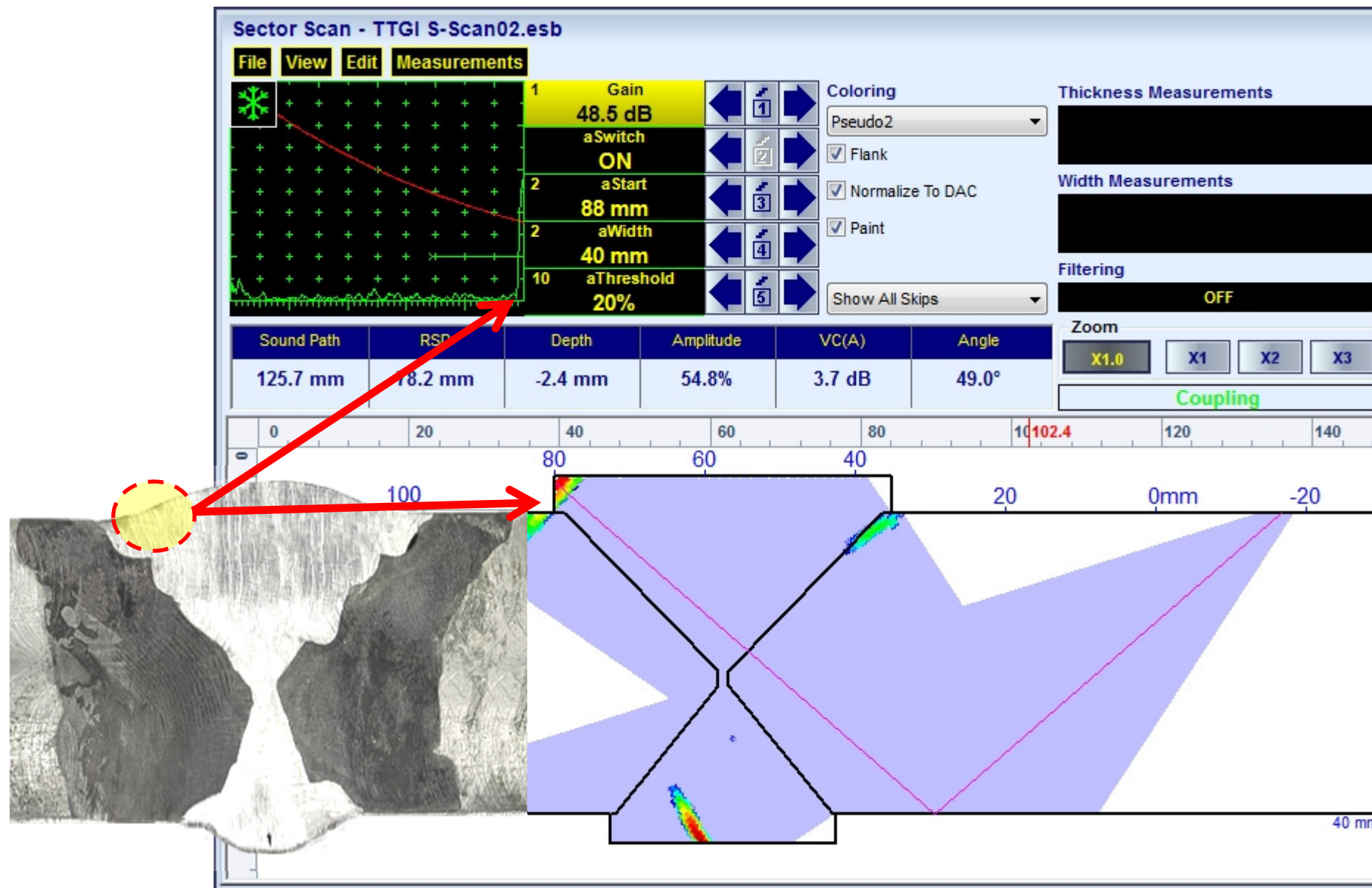
Cross-Section of the Butt Weld with Crack in the Excessive Root Material and Lack of Fusion (LoF)

2. Lack of Fusion



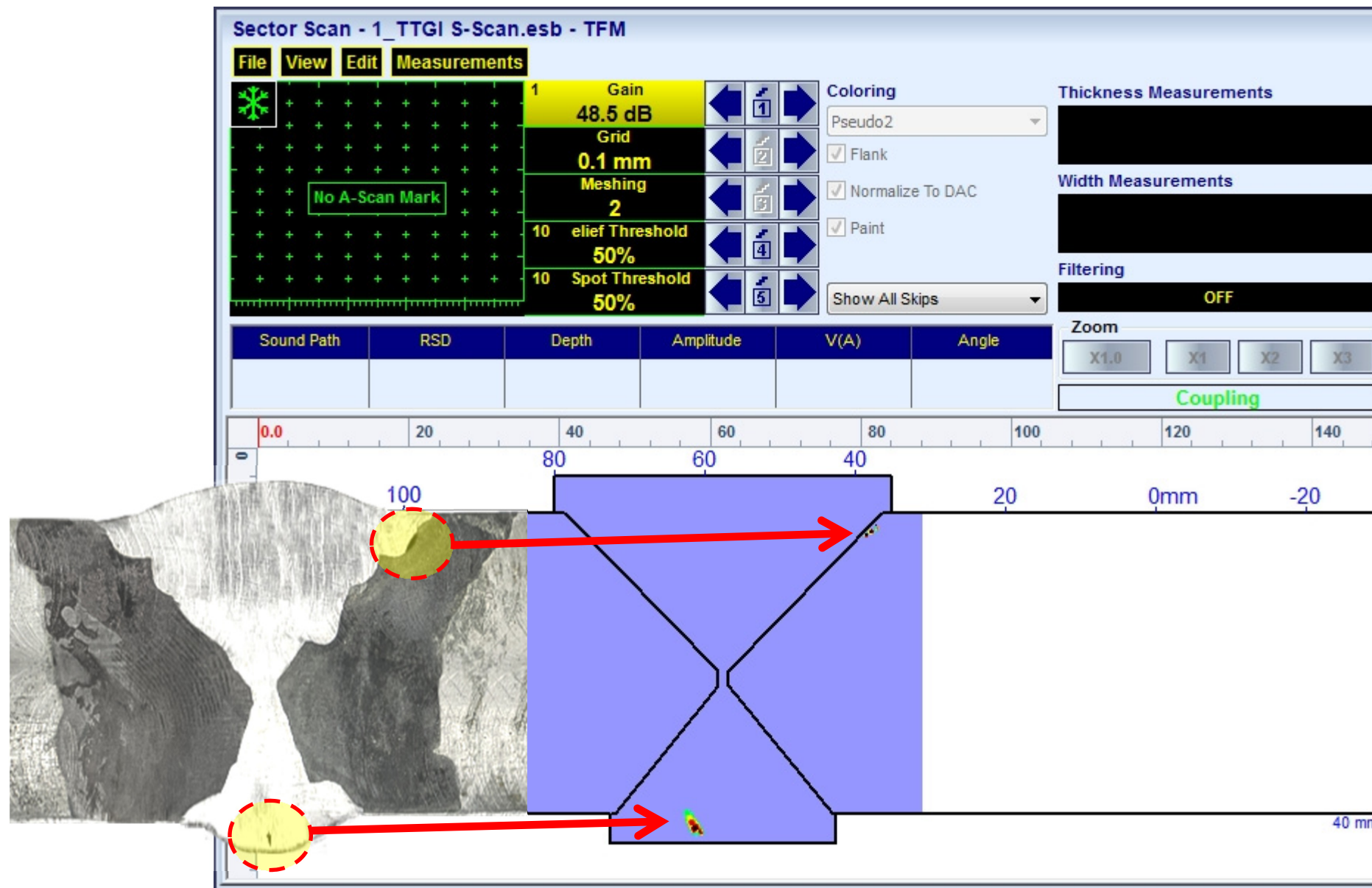
# Cross-Section of the Butt Weld with Crack in the Excessive Root Material and Lack of Fusion (LoF)

## 3. Geometry Echo



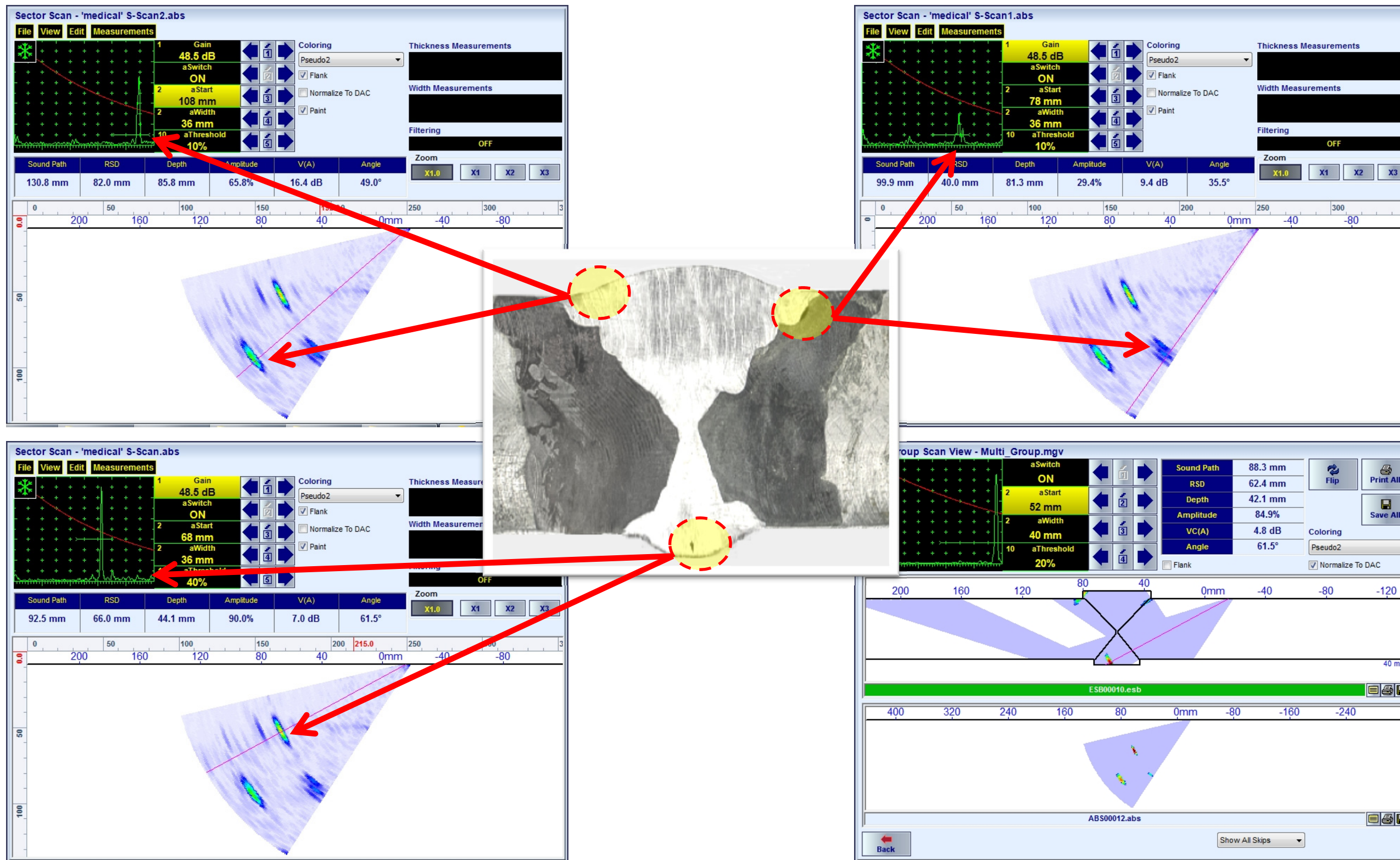
Cross-Section of the Butt Weld with Crack in the Excessive Root Material and Lack of Fusion (LoF)

4. TFM Image reconstructed out of data composing the True-To-Geometry Sectorial Scan Image



Cross-Section of the Butt Weld with Crack in the Excessive Root Material and Lack of Fusion (LoF)

4. Comparison with the "medical" sectorial scan image







Inspection of stainless steel circumferential butt weld between cladded pipes – shear waves out of small aperture 2 MHz probe



*Inspection of stainless steel circumferential butt weld between cladded pipes – shear waves out of small aperture 2 MHz probe*

Inspection of the rail thermite welds







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