APPENDIX C

1.5-MHZ PHASED-ARRAY DATA ON FLAWS IN THE PRESSURIZER SURGE LINE SPECIMEN

APPENDIX C

1.5-MHZ PHASED-ARRAY DATA ON FLAWS IN THE PRESSURIZER SURGE LINE SPECIMEN

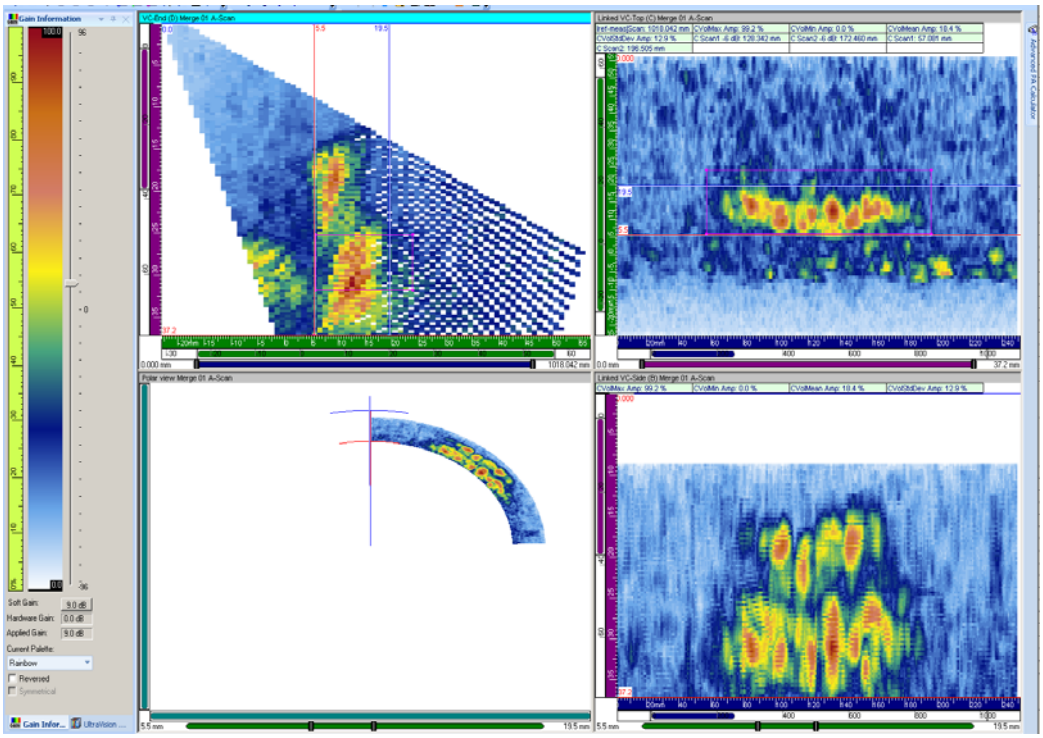


Figure C.1 1.5 MHz Data on Pipe Side of 7C-059, Flaw 1, Merged Image for Length Sizing

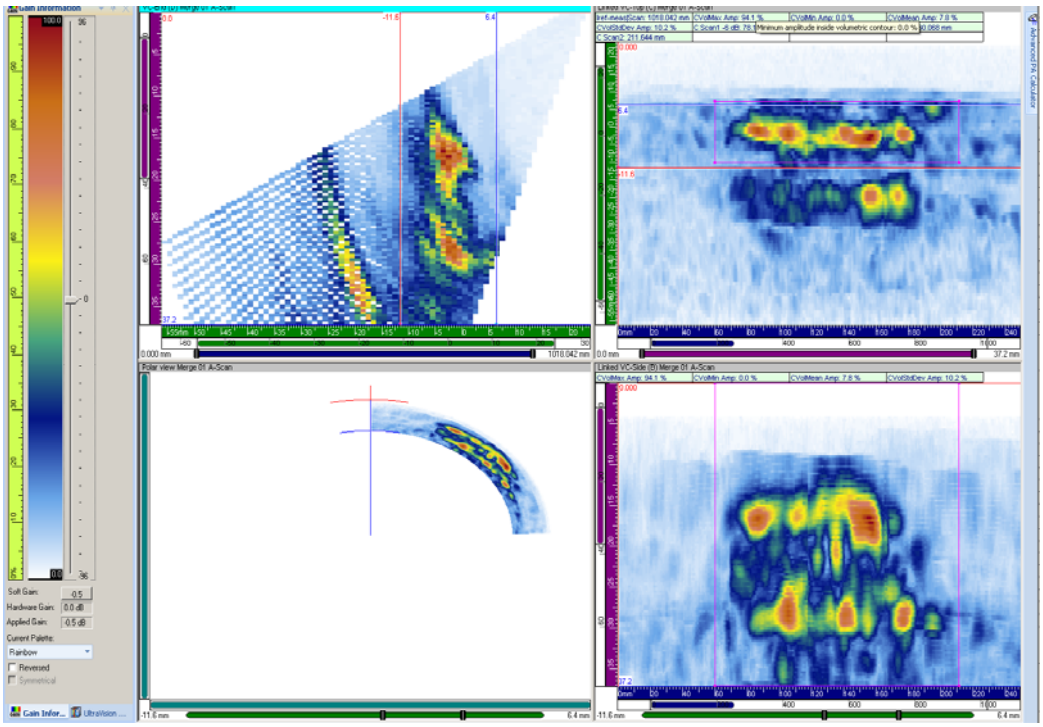


Figure C.2 1.5 MHz Data on Elbow Side of 7C-059, Flaw 1, Merged Image for Length Sizing

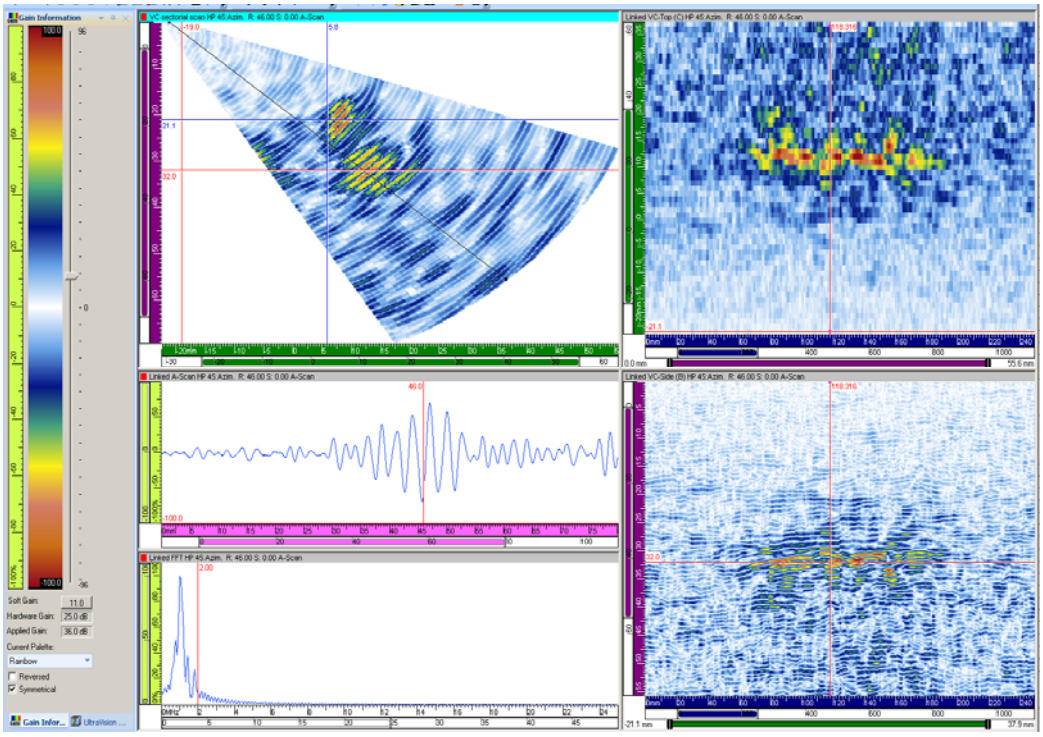


Figure C.3 1.5 MHz Data on Pipe Side of 7C-059, Flaw 1, for Depth Sizing

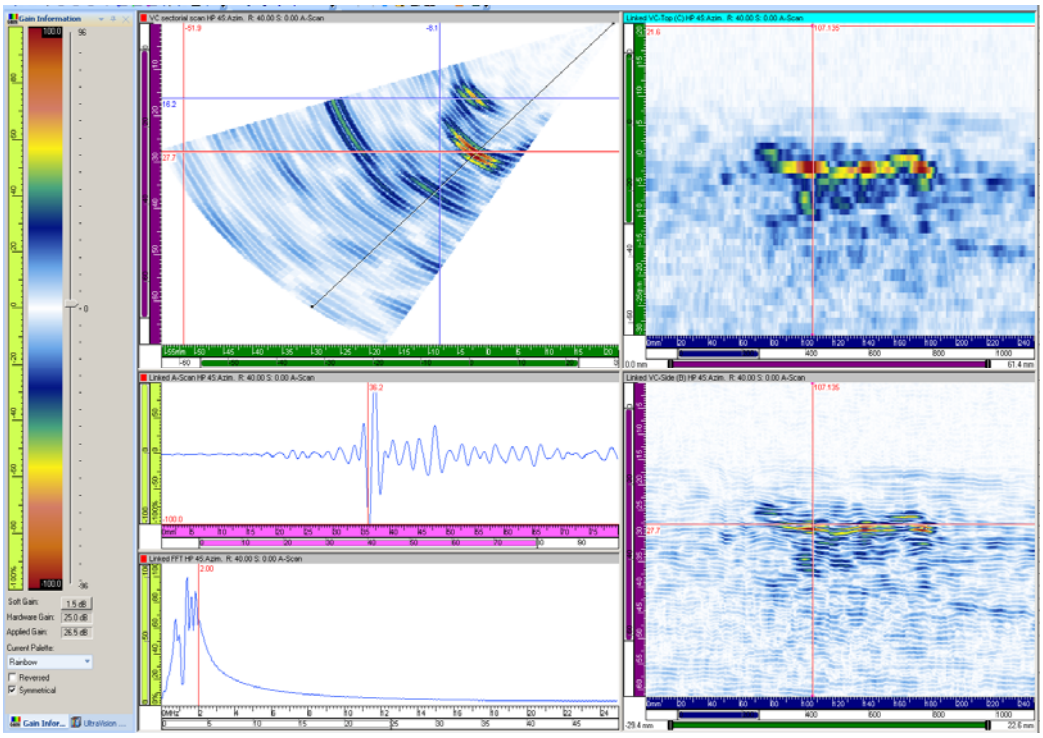


Figure C.4 1.5 MHz Data on Elbow Side of 7C-059, Flaw 1, for Depth Sizing

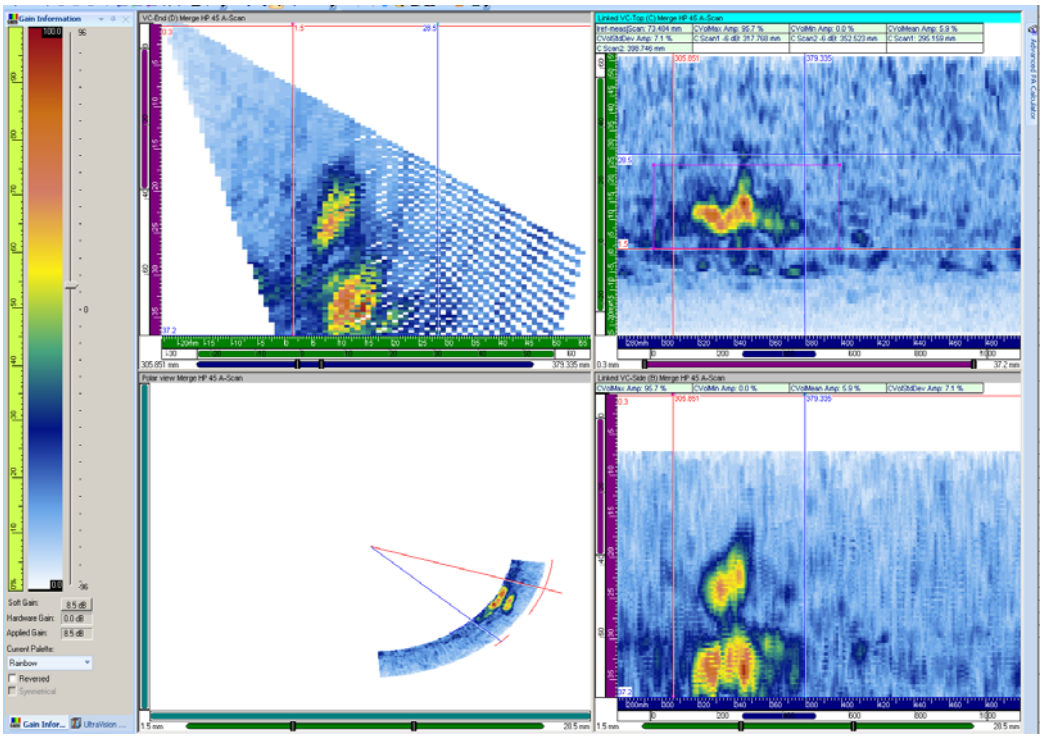


Figure C.5 1.5 MHz Data on Pipe Side of 7C-059, Flaw 2, Merged Image for Length Sizing

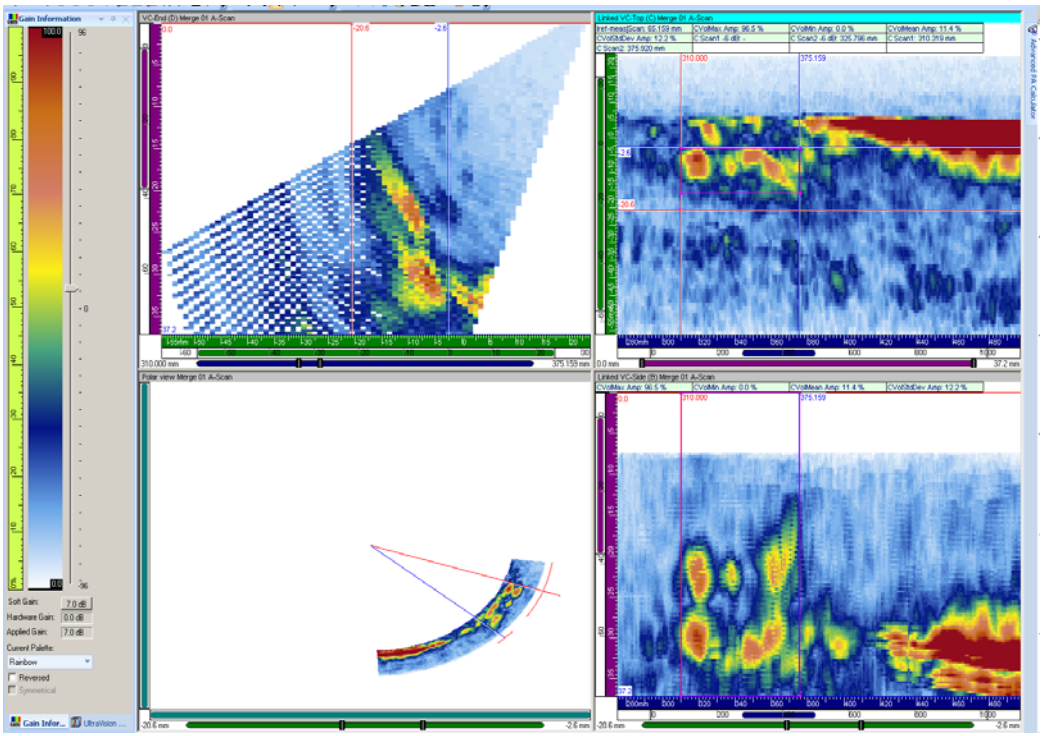


Figure C.6 1.5 MHz Data on Elbow Side of 7C-059, Flaw 2, Merged Image for Length Sizing

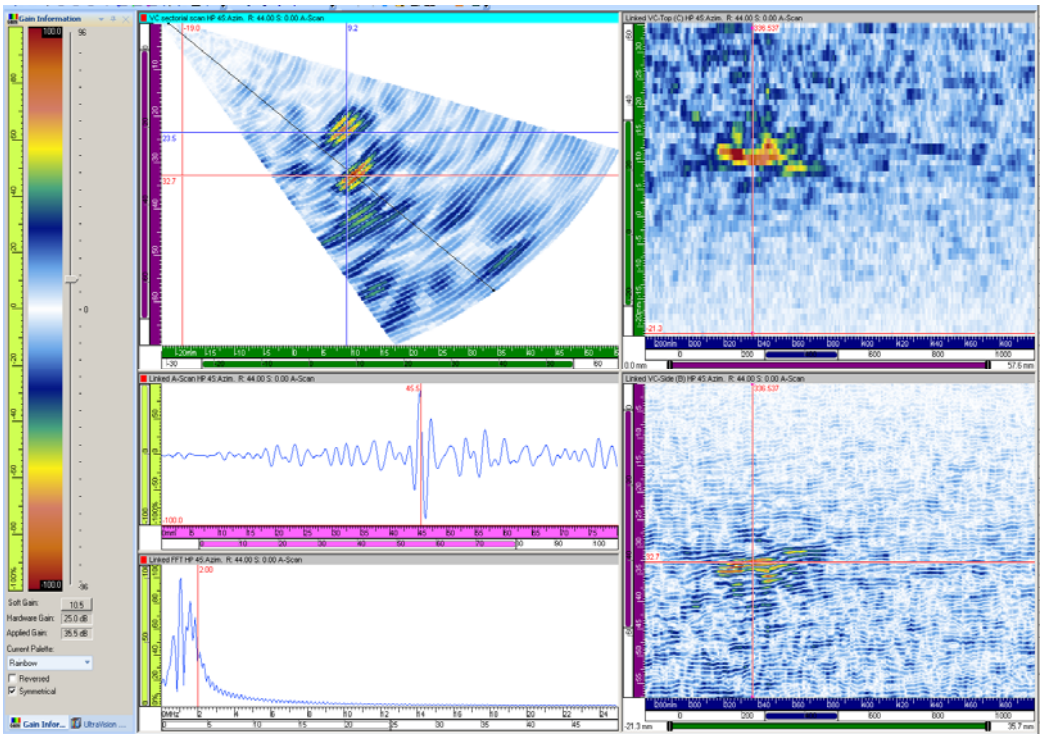


Figure C.7 1.5 MHz Data on Pipe Side of 7C-059, Flaw 2, for Depth Sizing

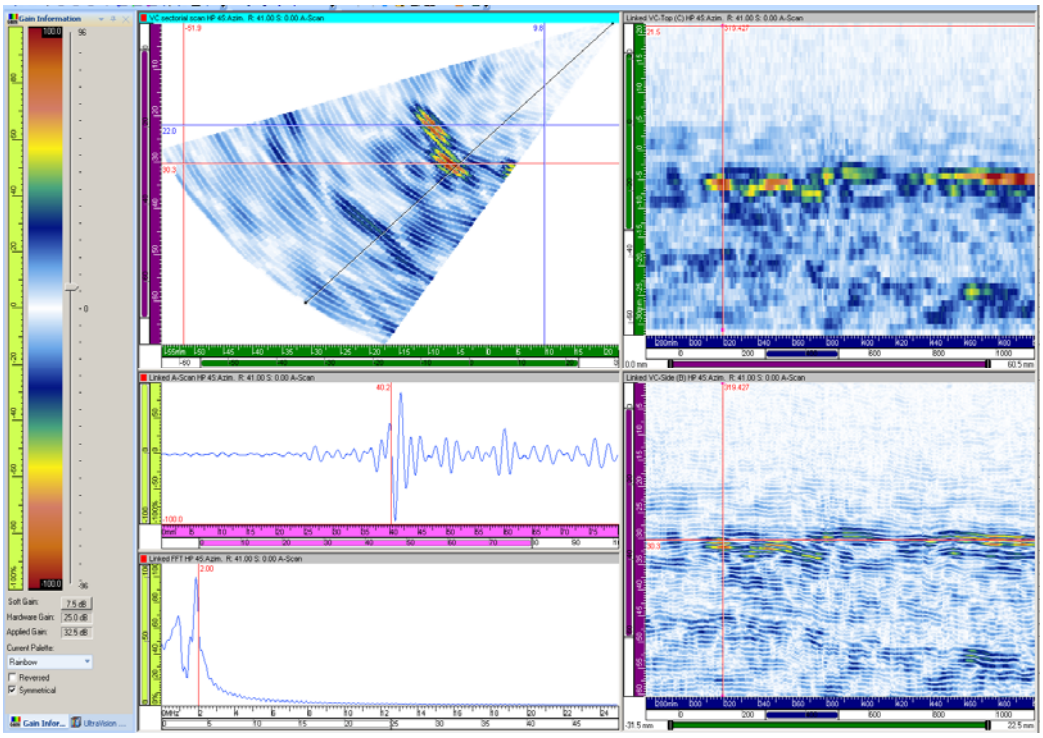


Figure C.8 1.5 MHz Data on Elbow Side of 7C-059, Flaw 2, for Depth Sizing

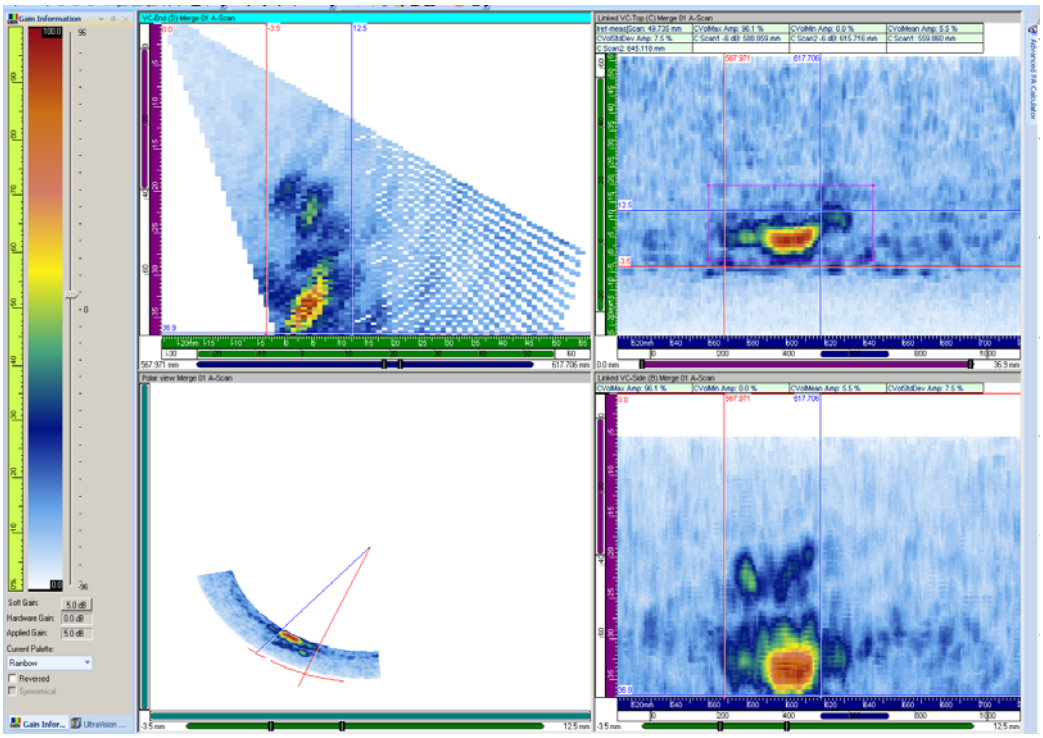


Figure C.9 1.5 MHz Data on Pipe Side of 7C-059, Flaw 3, Merged Image for Length Sizing

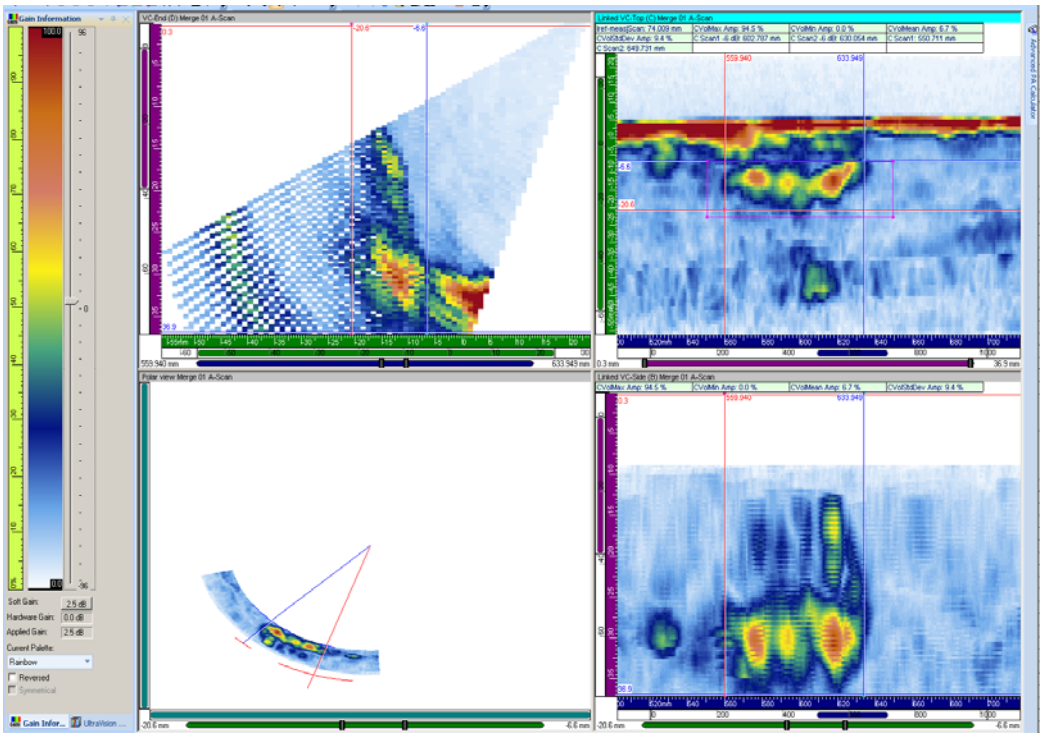


Figure C.10 1.5 MHz Data on Elbow Side of 7C-059, Flaw 3, Merged for Length Sizing

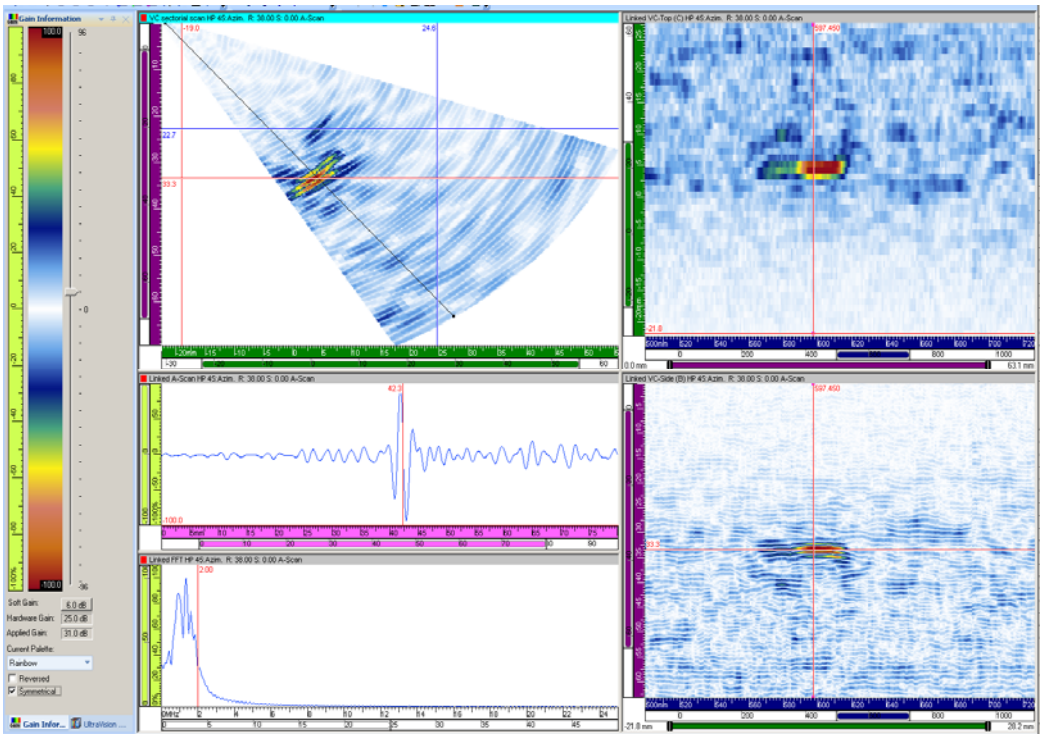


Figure C.11 1.5 MHz Data on Pipe Side of 7C-059, Flaw 3, for Depth Sizing

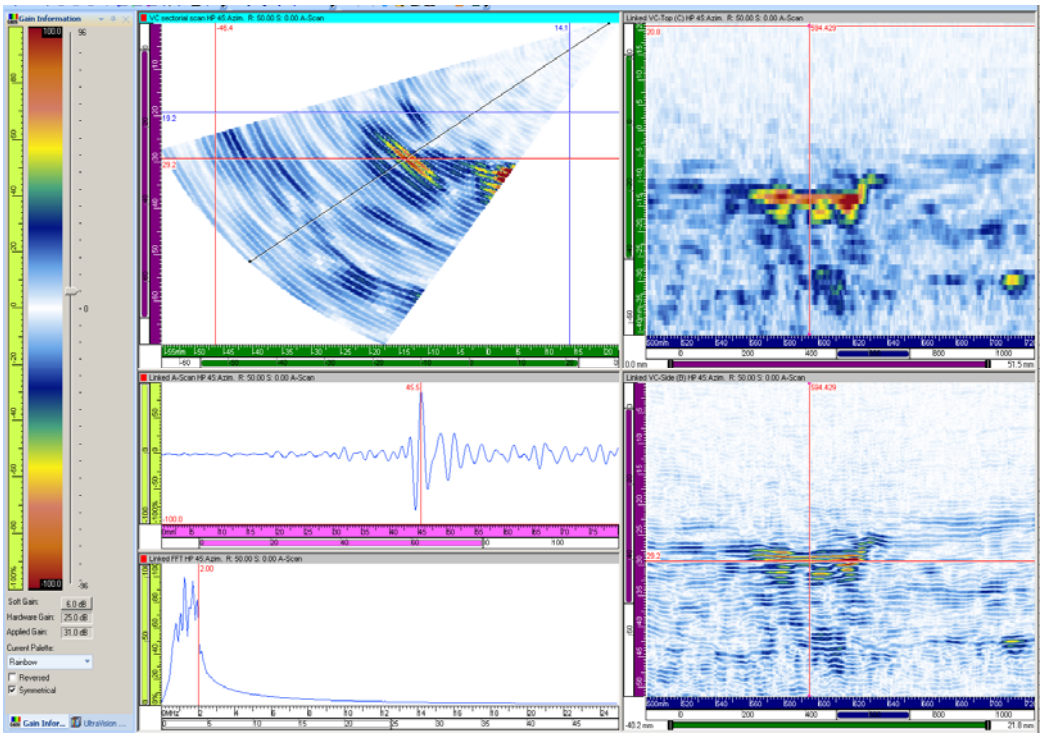


Figure C.12 1.5 MHz Data on Elbow Side of 7C-059, Flaw 3, for Depth Sizing

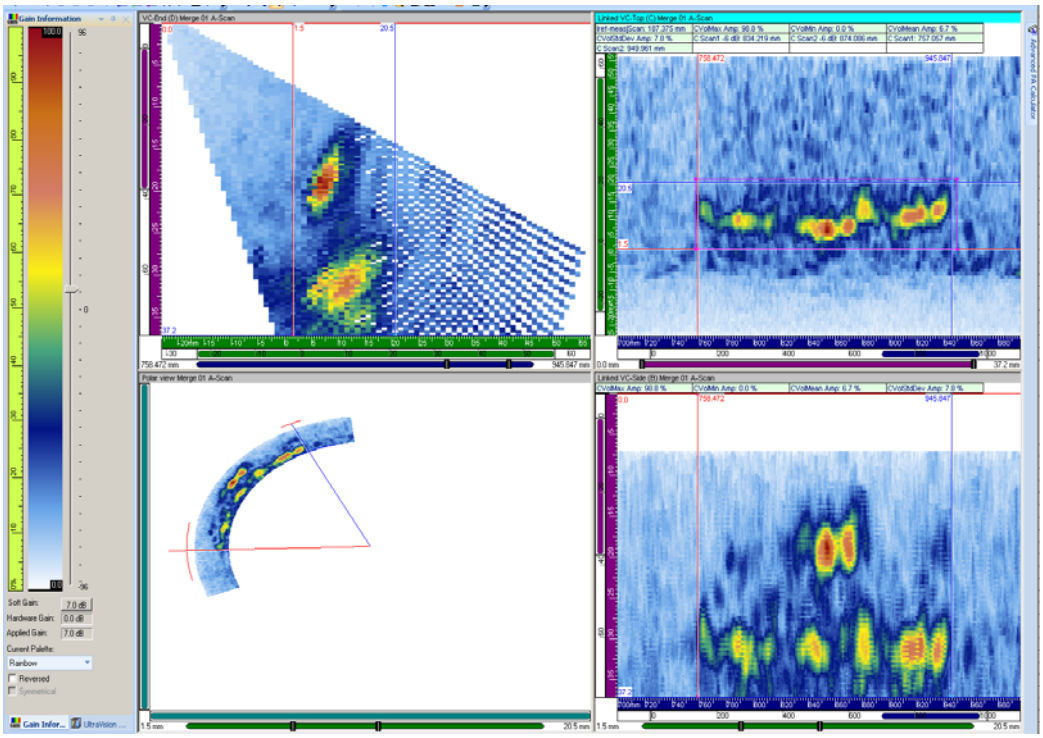


Figure C.13 1.5 MHz Data on Pipe Side of 7C-059, Flaw 4, Merged Image for Length Sizing

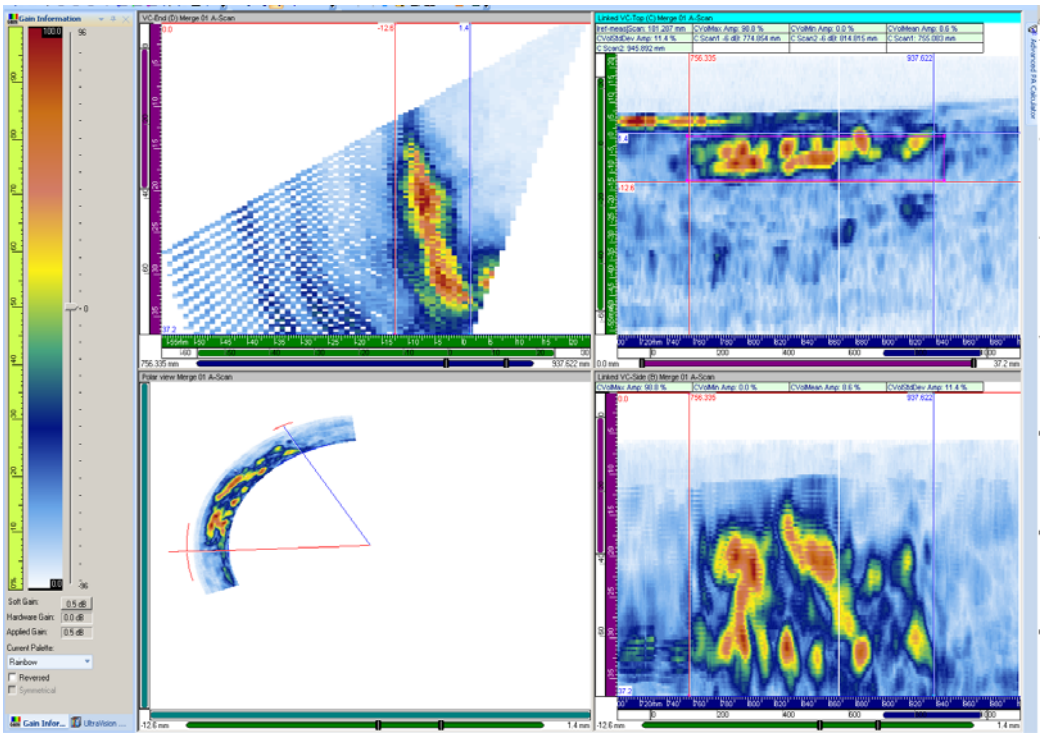


Figure C.14 1.5 MHz Data on Elbow Side of 7C-059, Flaw 4, Merged Image for Length Sizing

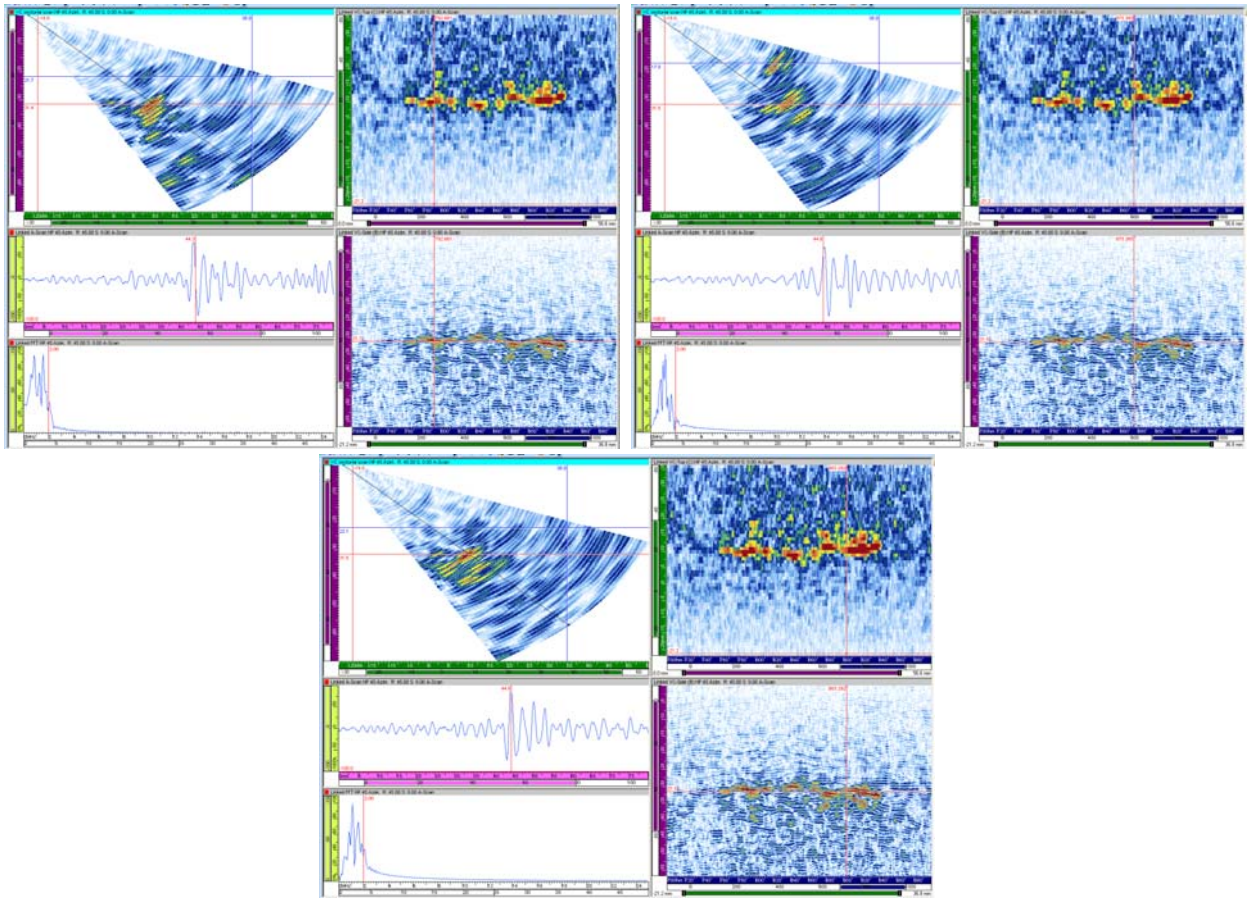


Figure C.15 1.5 MHz Data on Pipe Side of 7C-059, Flaw 4a, 4b, and 4c, for Depth Sizing

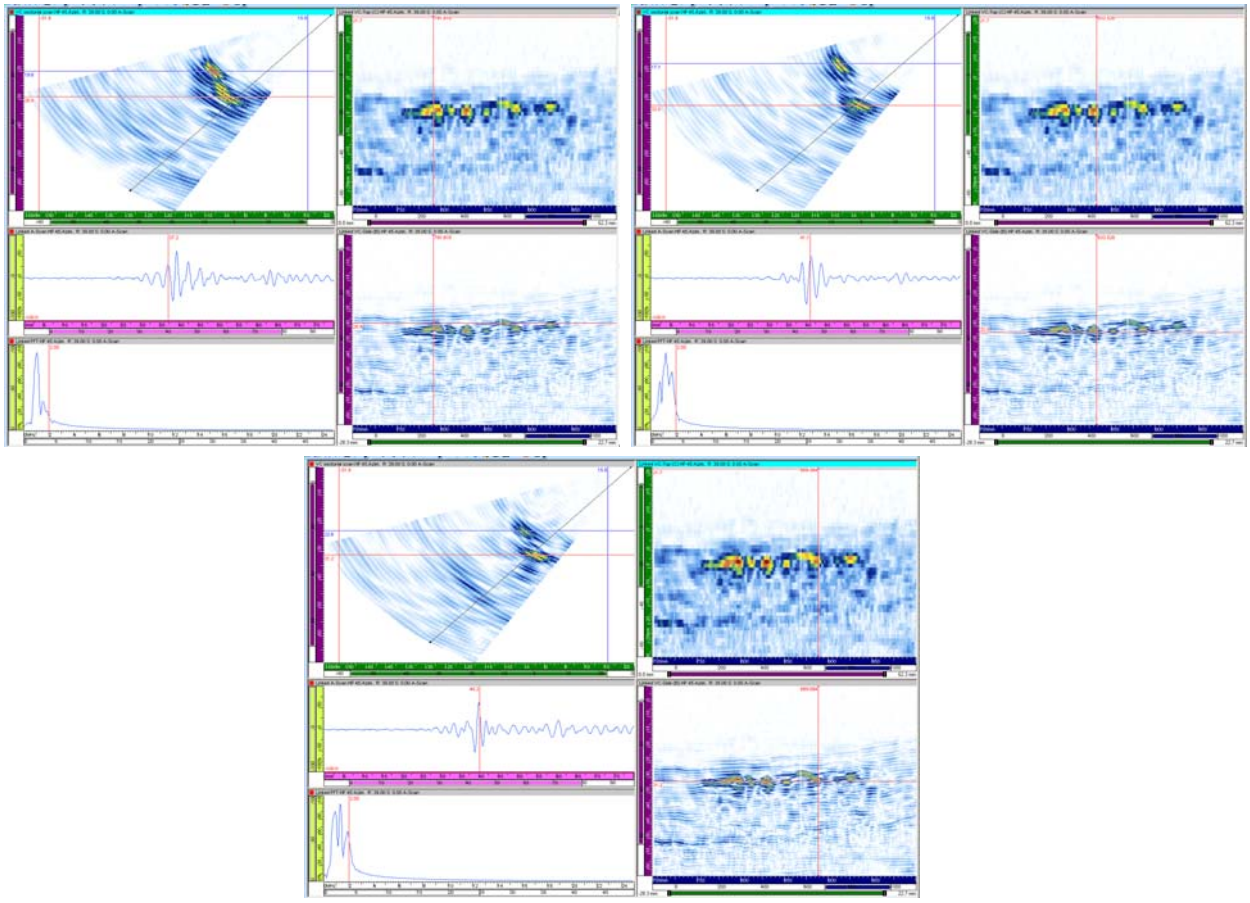


Figure C.16 1.5 MHz Data on Elbow Side of 7C-059, Flaw 4a, 4b, and 4c, for Depth Sizing

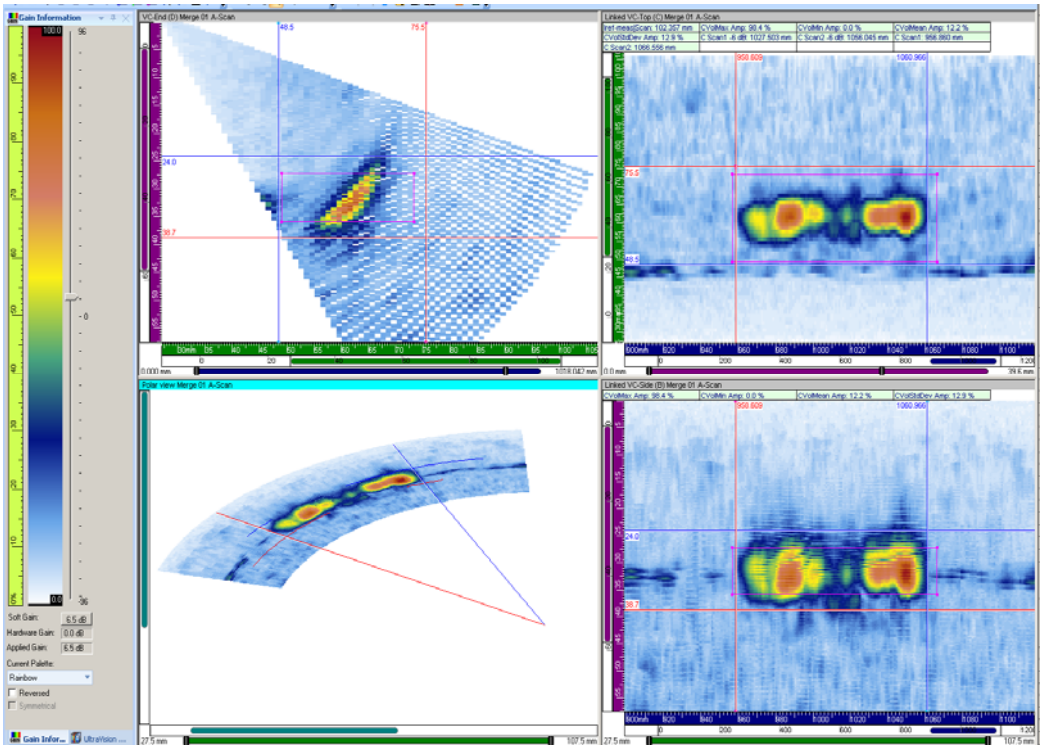


Figure C.17 1.5 MHz Data on Pipe Side of 9C-001, Flaw 1, Merged Image for Length Sizing

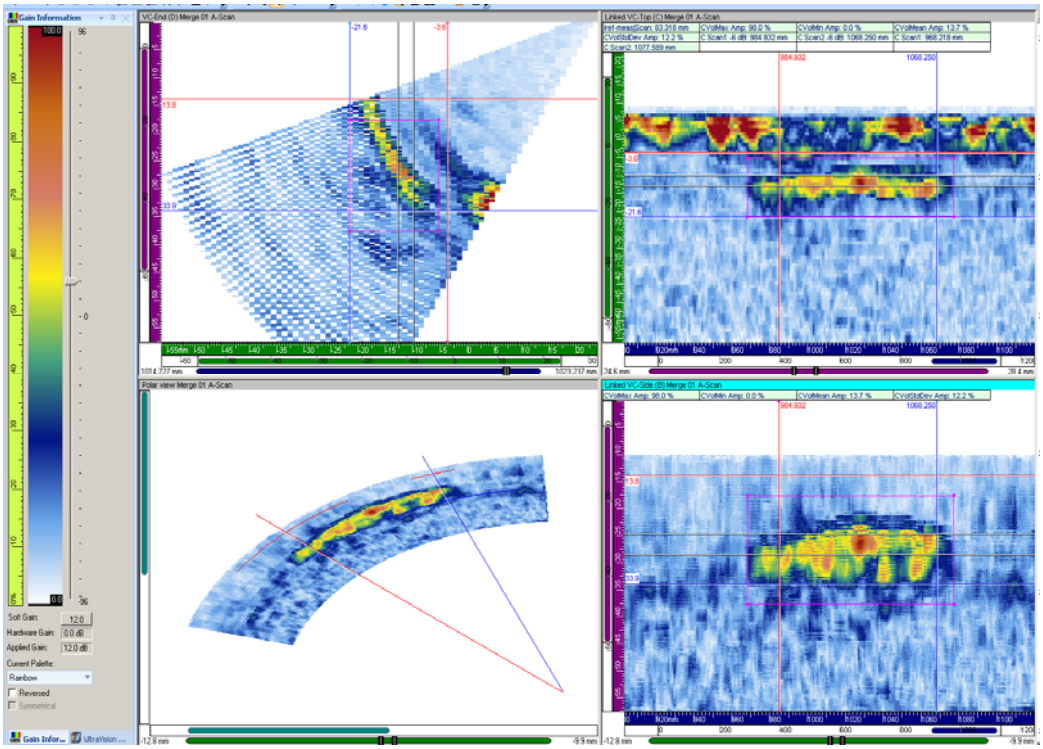


Figure C.18 1.5 MHz Data on Elbow Side of 9C-001, Flaw 1, Merged Image for Length Sizing

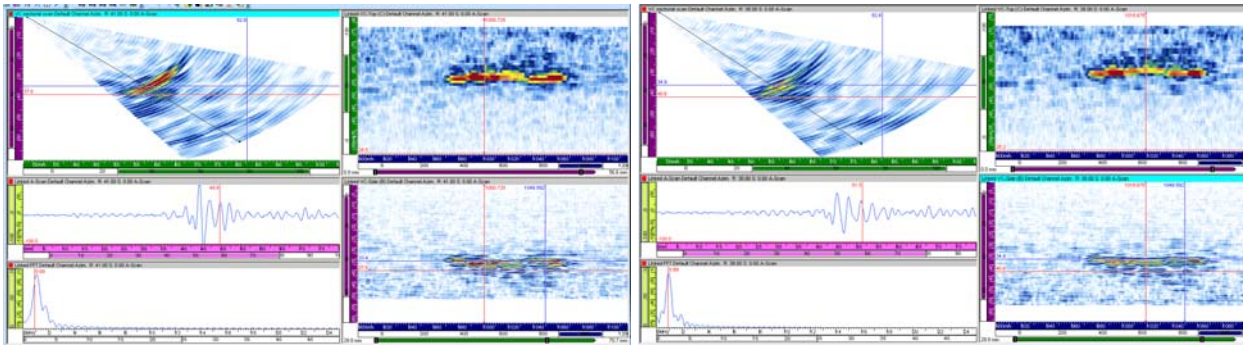


Figure C.19 1.5 MHz Data on Pipe Side of 9C-001, Flaw 1a and 1b, for Depth Sizing

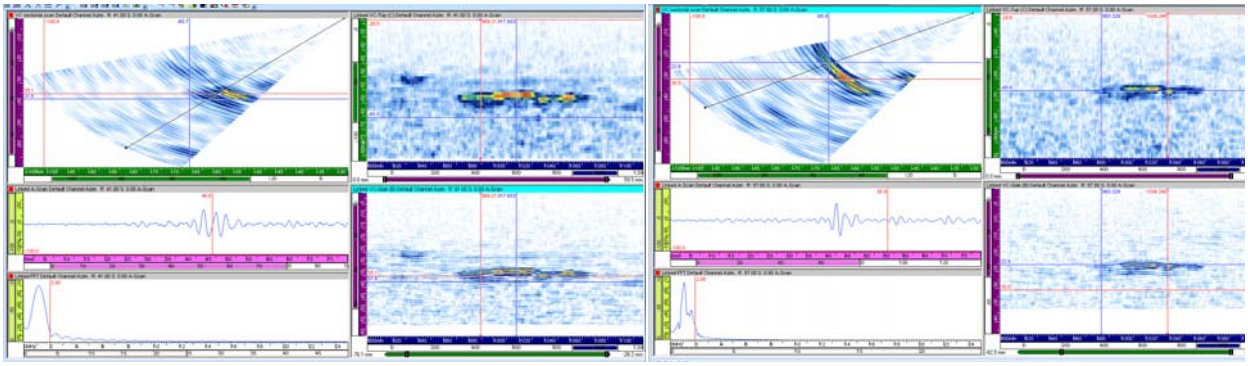


Figure C.20 1.5 MHz Data on Elbow Side of 9C-001, Flaw 1a and 1b, for Depth Sizing

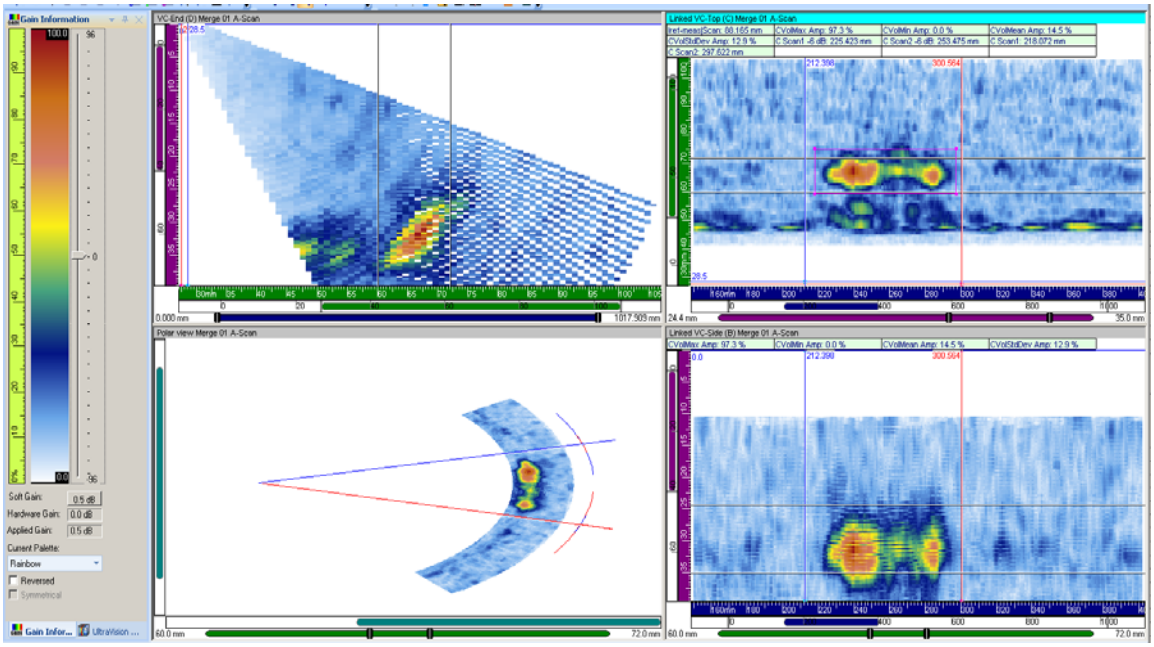


Figure C.21 1.5 MHz Data on Pipe Side of 9C-001, Flaw 2, Merged Image for Length Sizing

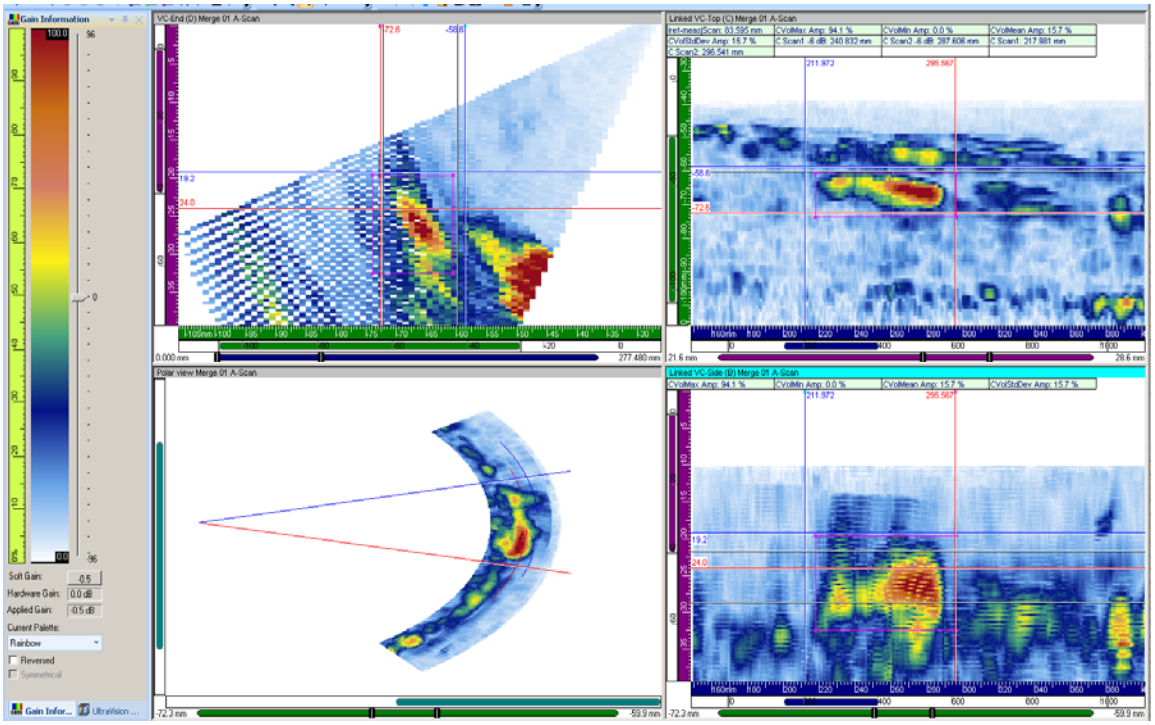


Figure C.22 1.5 MHz Data on Elbow Side of 9C-001, Flaw 2, Merged Image for Length Sizing

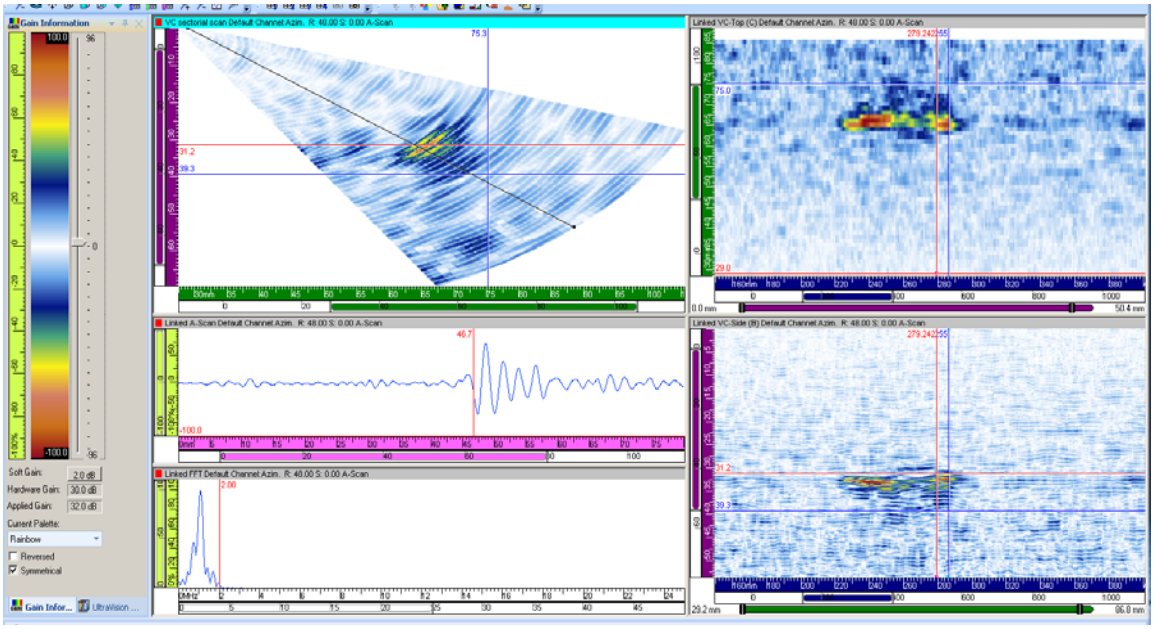


Figure C.23 1.5 MHz Data on Pipe Side of 9C-001, Flaw 2, for Depth Sizing

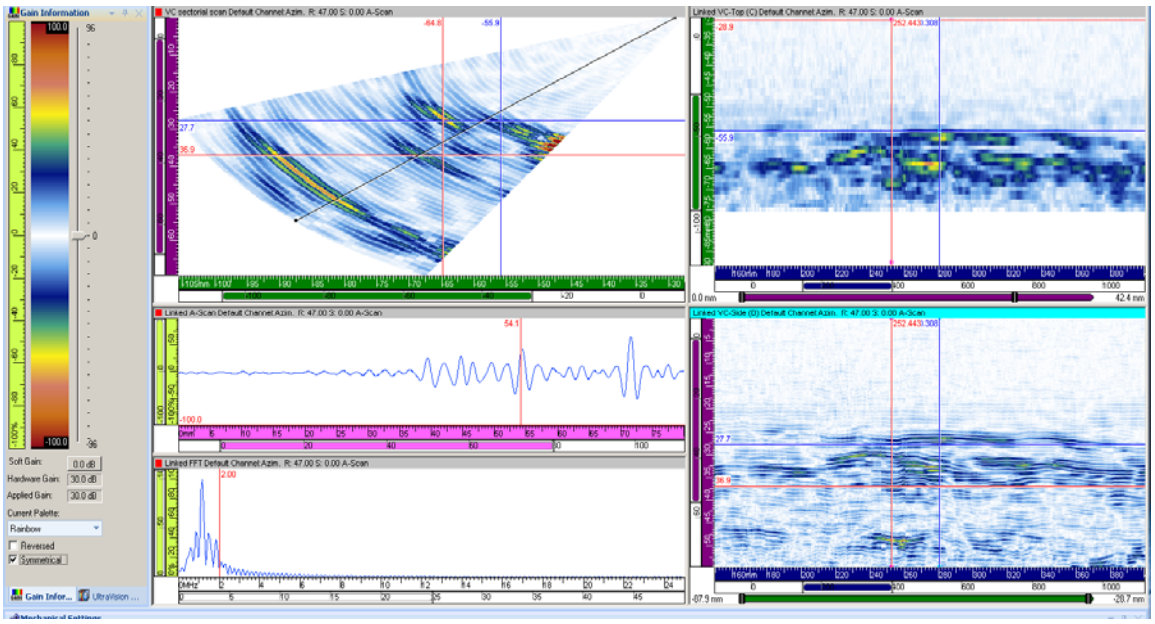


Figure C.24 1.5 MHz Data on Elbow Side of 9C-001, Flaw 2, for Depth Sizing

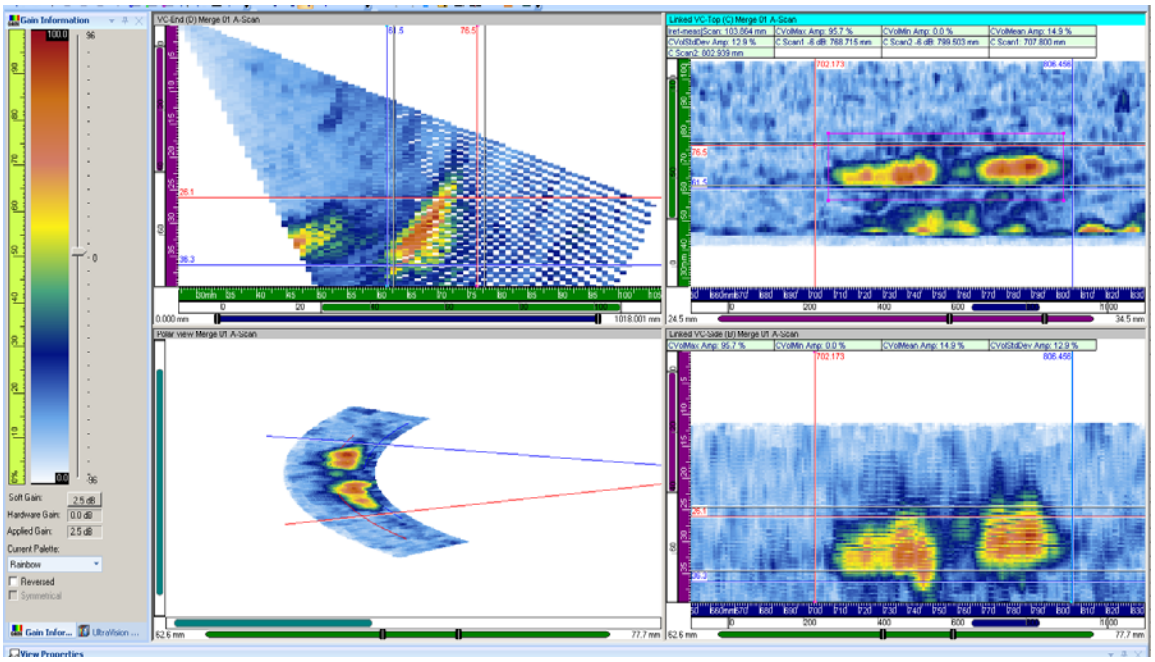


Figure C.25 1.5 MHz Data on Pipe Side of 9C-001, Flaw 3, Merged Image for Length Sizing

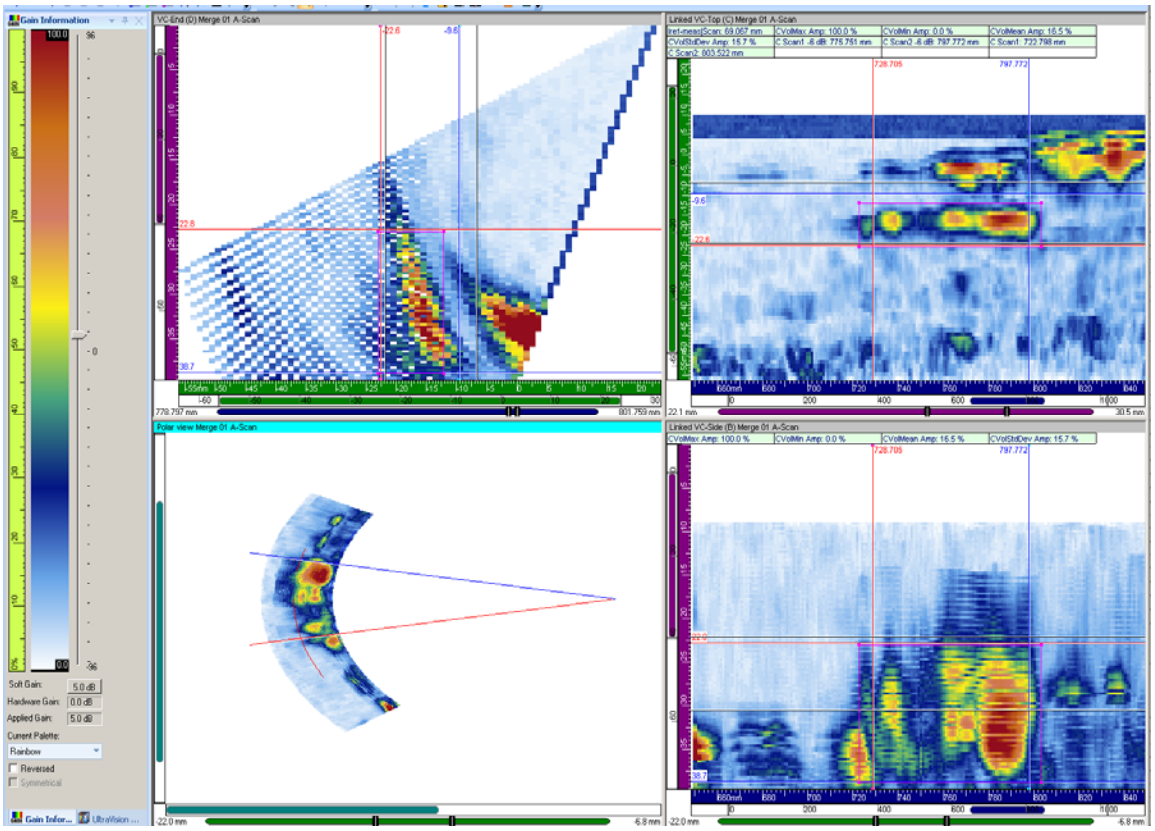


Figure C.26 1.5 MHz Data on Elbow Side of 9C-001, Flaw 3, Merged Image for Length Sizing

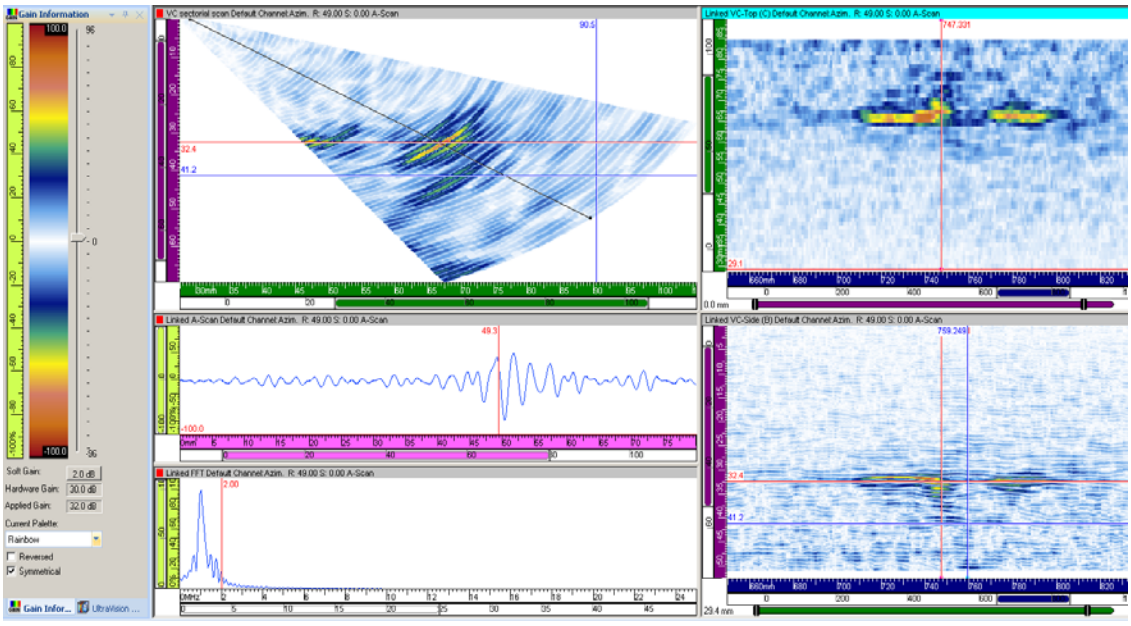


Figure C.27 1.5 MHz Data on Pipe Side of 9C-001, Flaw 3, for Depth Sizing

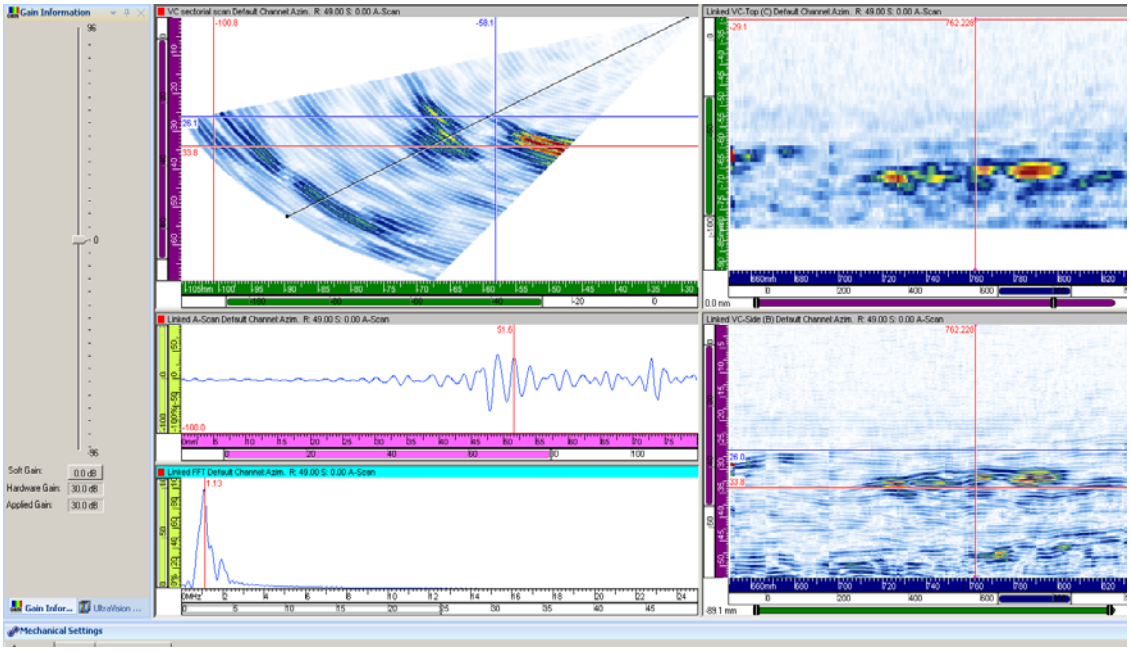


Figure C.28 1.5 MHz Data on Elbow Side of 9C-001, Flaw 3, for Depth Sizing

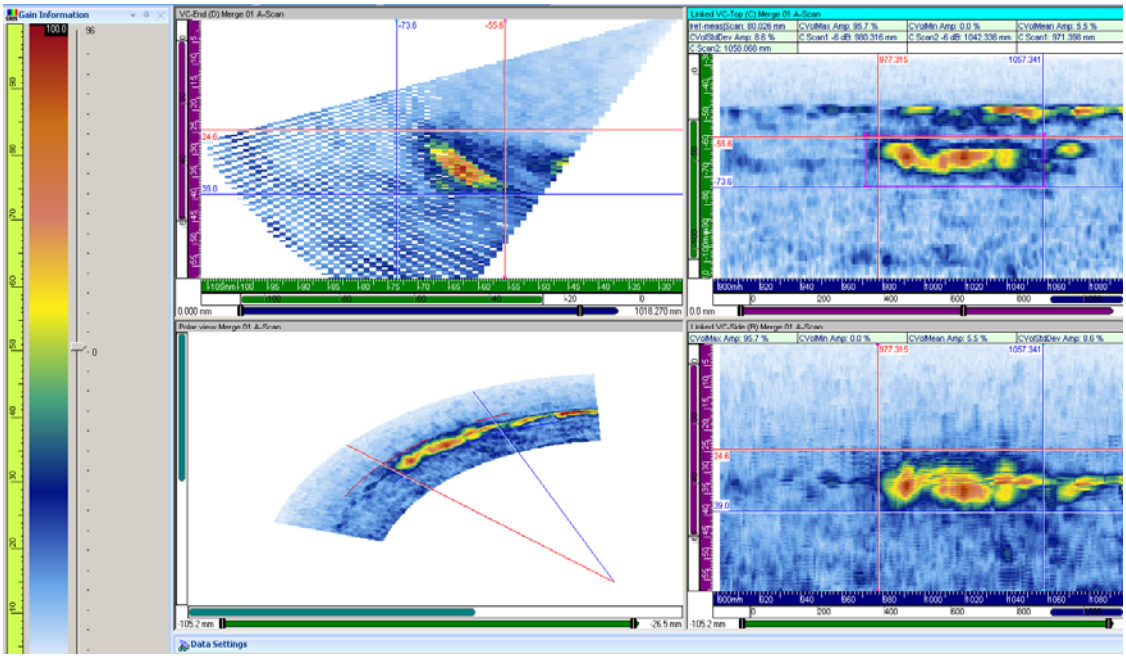


Figure C.29 1.5 MHz Data on Pipe Side of 9C-002, Flaw 1, Merged Image for Length Sizing

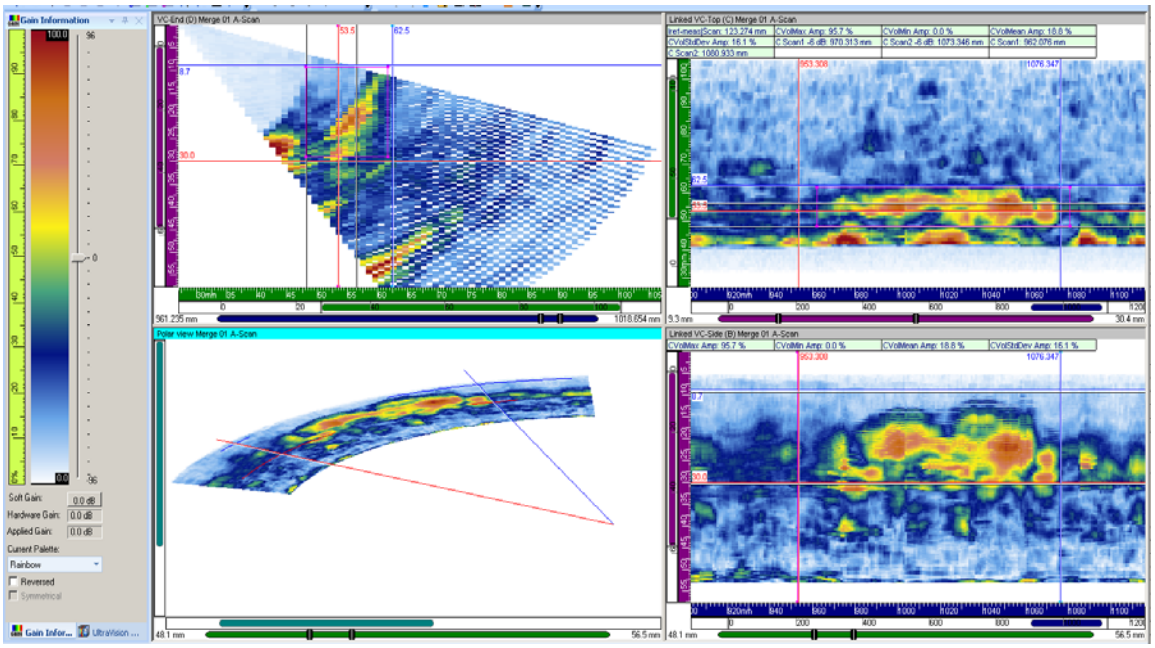


Figure C.30 1.5 MHz Data on Elbow Side of 9C-002, Flaw 1, Merged Image for Length Sizing

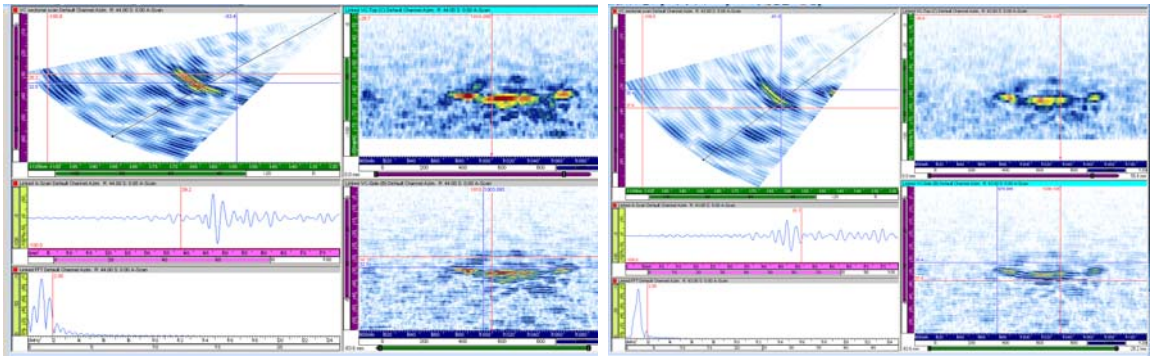


Figure C.31 1.5 MHz Data on Pipe Side of 9C-002, Flaw 1a on the Left and 1b on the Right for Depth Sizing

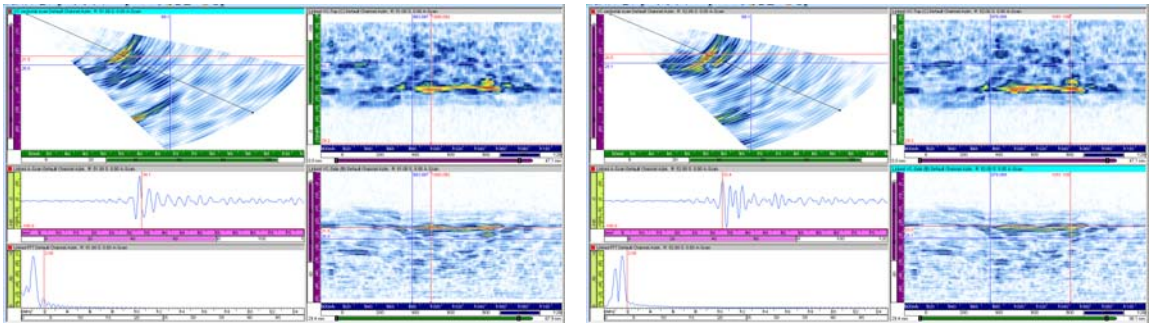


Figure C.32 1.5 MHz Data on Elbow Side of 9C-002, Flaw 1a and 1b, for Depth Sizing

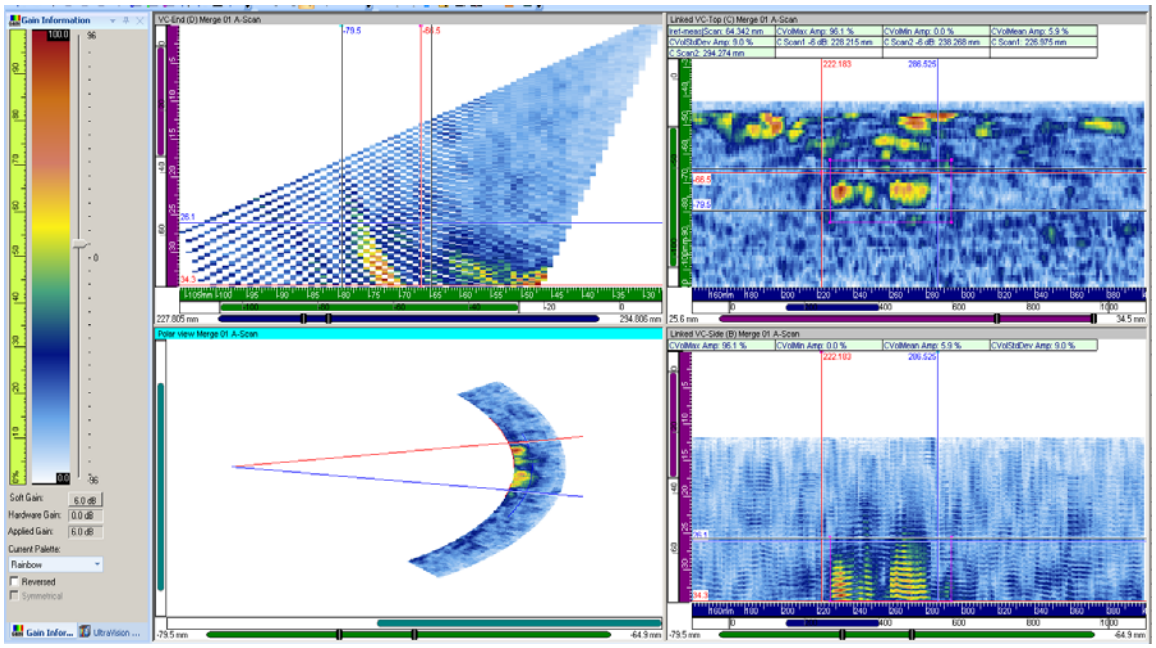


Figure C.33 1.5 MHz Data on Pipe Side of 9C-002, Flaw 2, Merged Image for Length Sizing

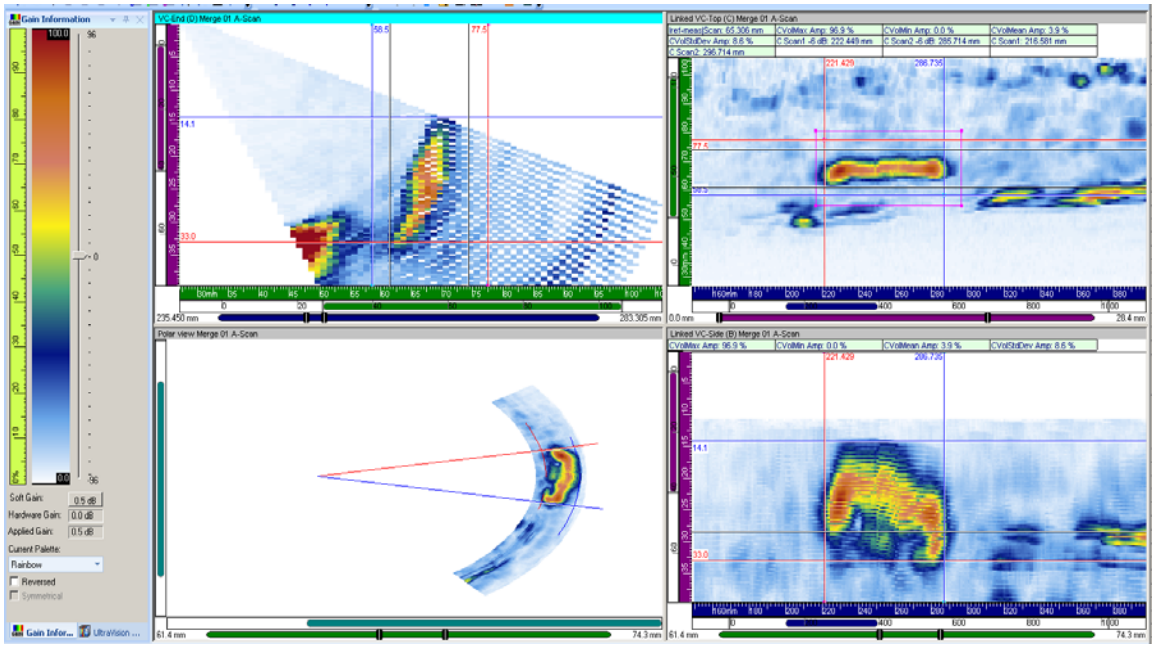


Figure C.34 1.5 MHz Data on Elbow Side of 9C-002, Flaw 2, Merged Image for Length Sizing

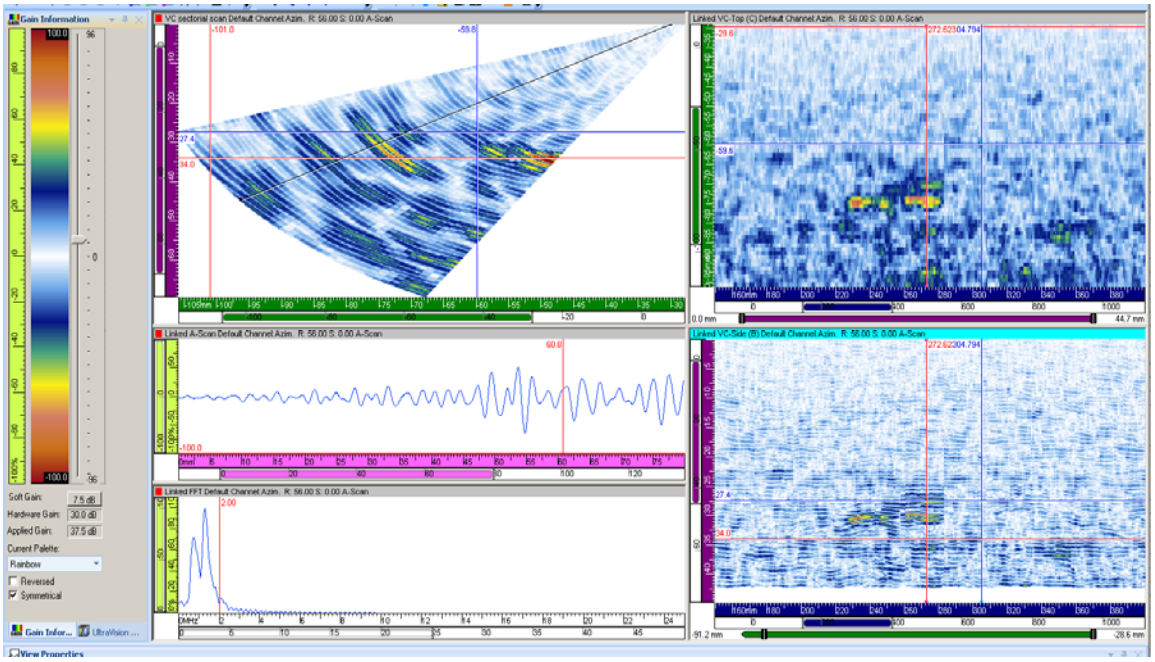


Figure C.35 1.5 MHz Data on Pipe Side of 9C-002, Flaw 2, for Depth Sizing

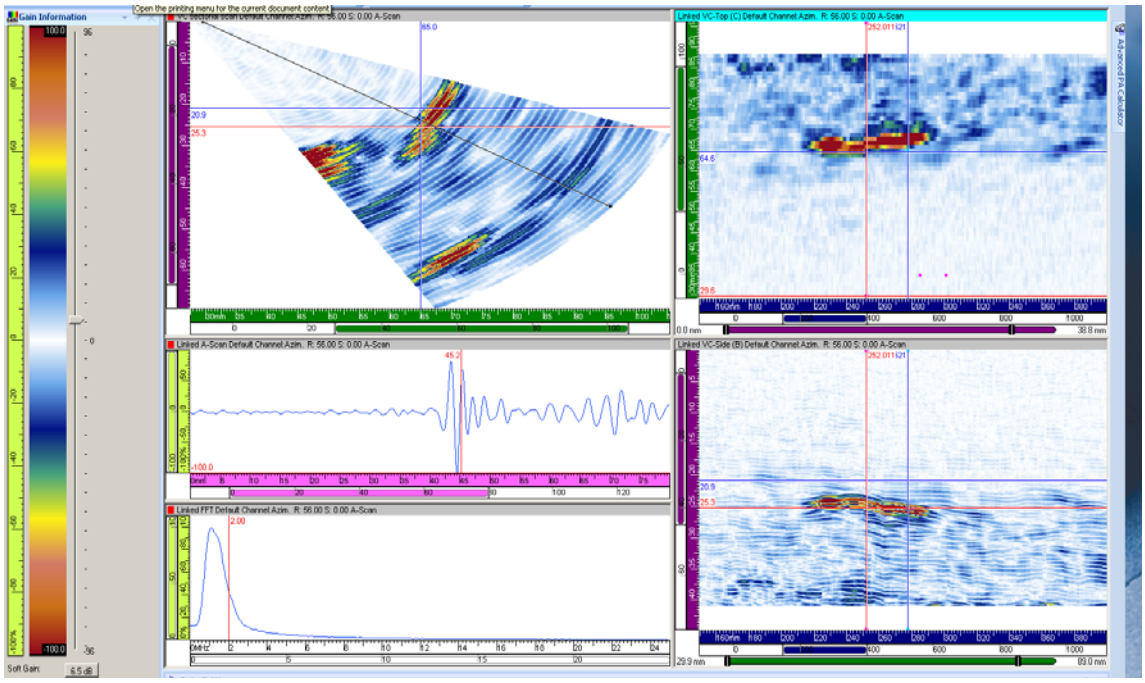


Figure C.36 1.5 MHz Data on Elbow Side of 9C-002, Flaw 2, for Depth Sizing

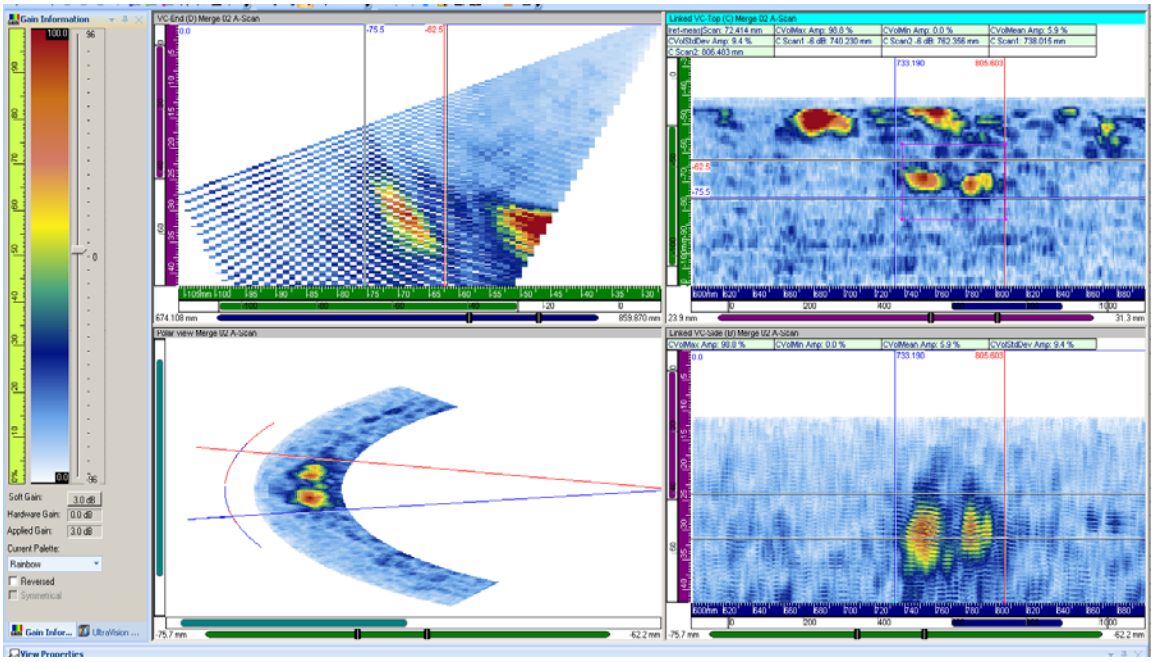


Figure C.37 1.5 MHz Data on Pipe Side of 9C-002, Flaw 3, Merged Image for Length Sizing

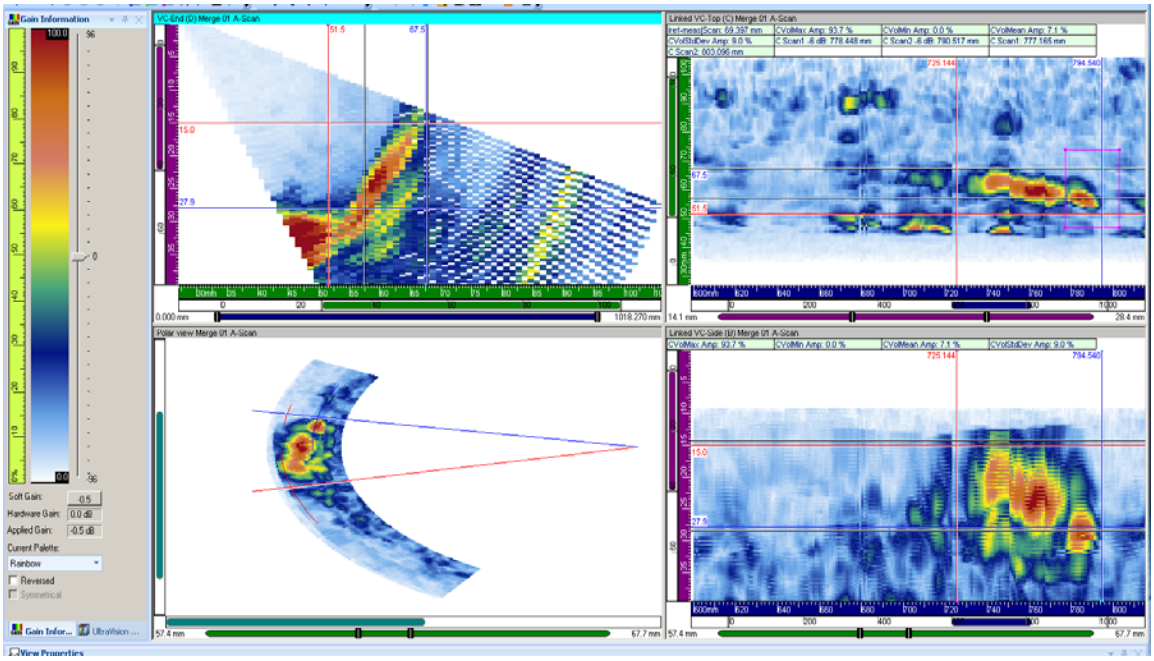


Figure C.38 1.5 MHz Data on Elbow Side of 9C-002, Flaw 3, Merged Image for Length Sizing

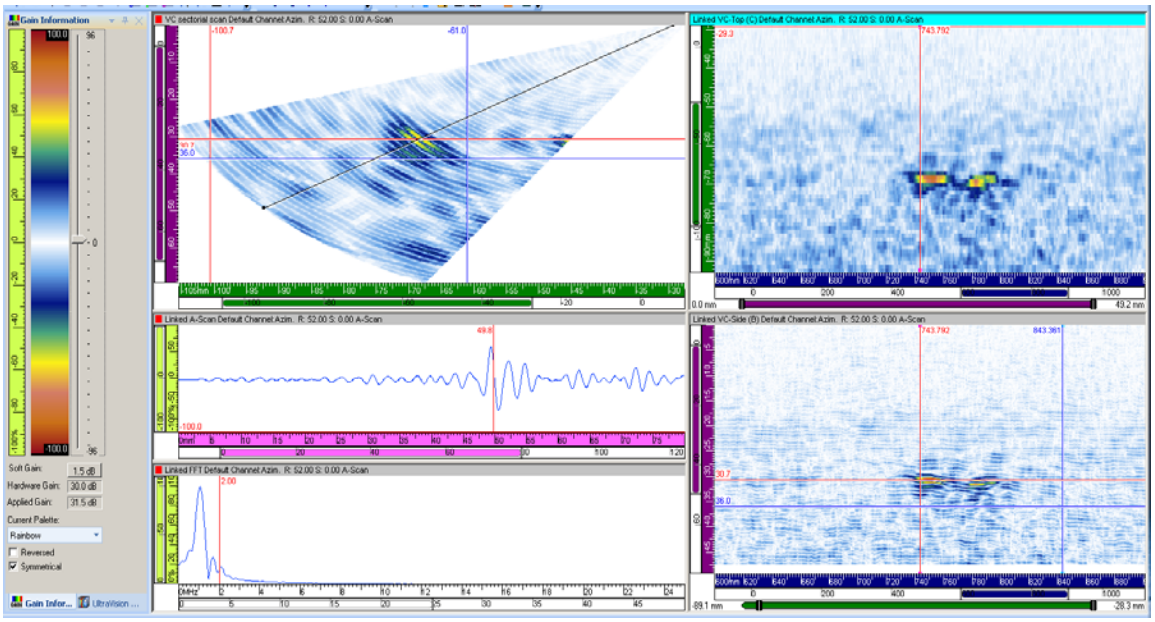


Figure C.39 1.5 MHz Data on Pipe Side of 9C-002, Flaw 3, for Depth Sizing

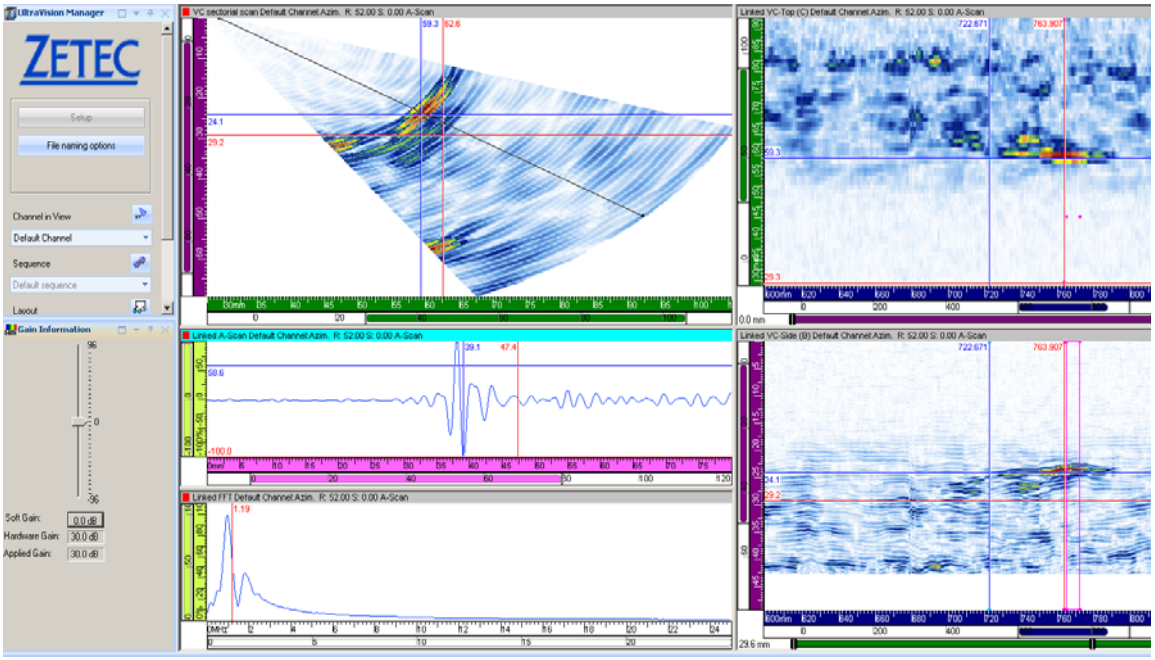


Figure C.40 1.5 MHz Data on Elbow Side of 9C-002, Flaw 3, for Depth Sizing

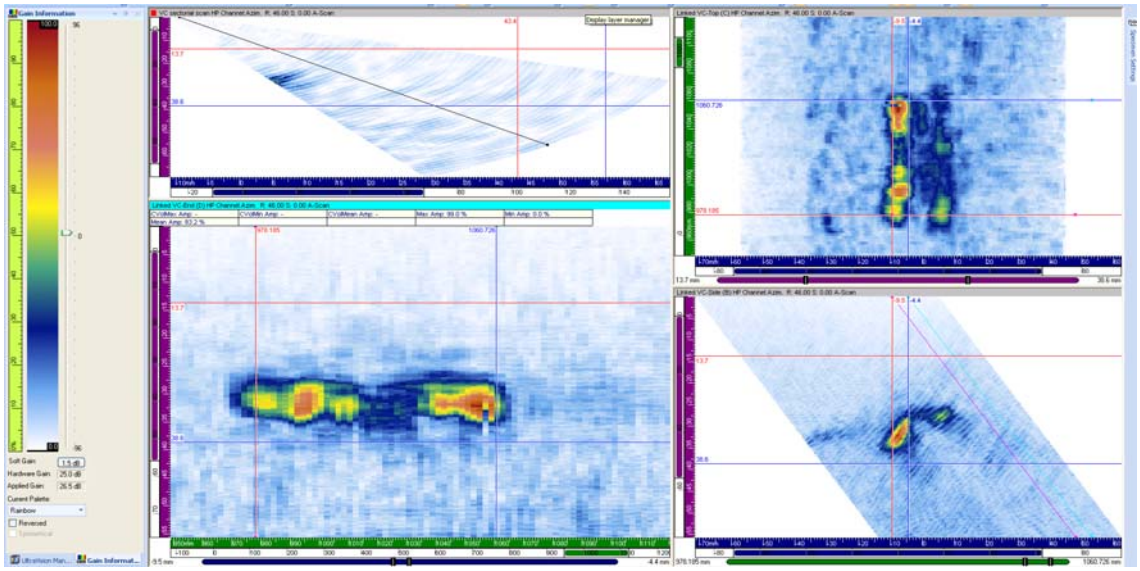


Figure C.41 Raster Data at 1.5 MHz on the Pipe Side of Specimen 9C-001, Flaw 1

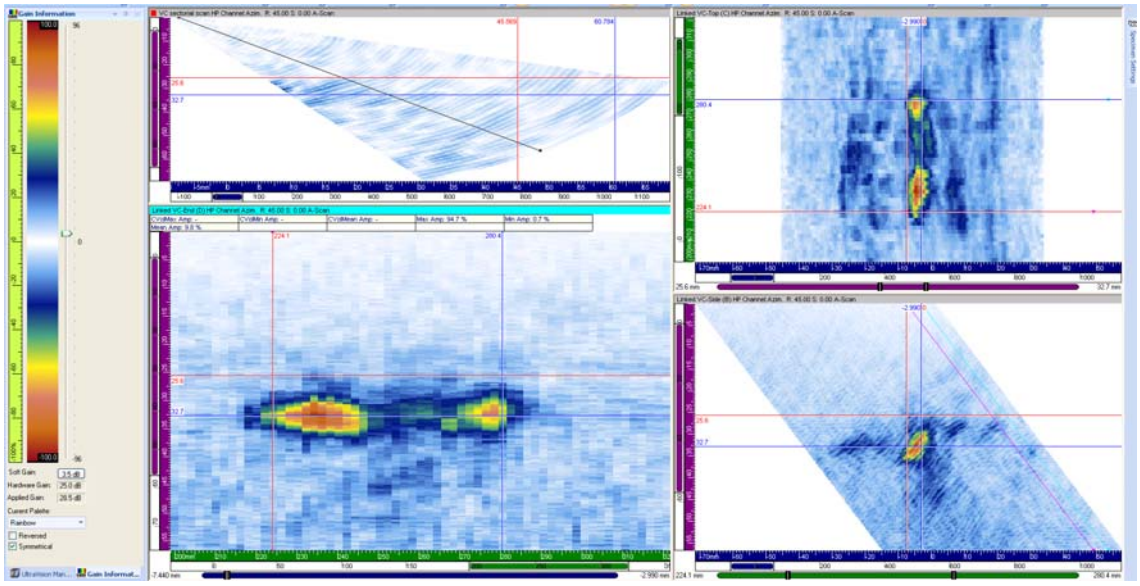


Figure C.42 Raster Data at 1.5 MHz on the Pipe Side of Specimen 9C-001, Flaw 2

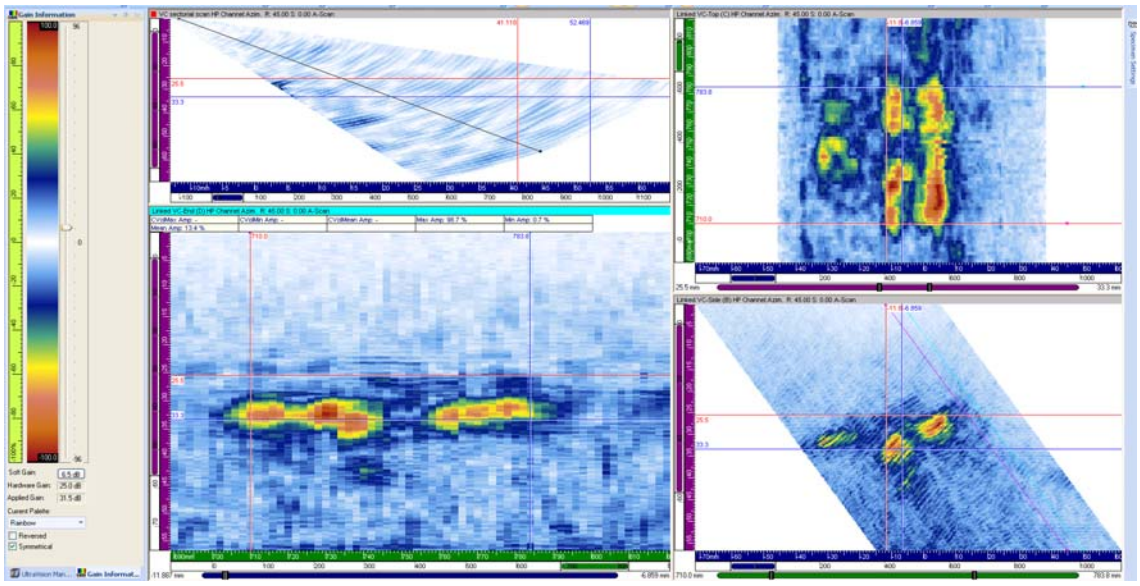


Figure C.43 Raster Data at 1.5 MHz on the Pipe Side of Specimen 9C-001, Flaw 3

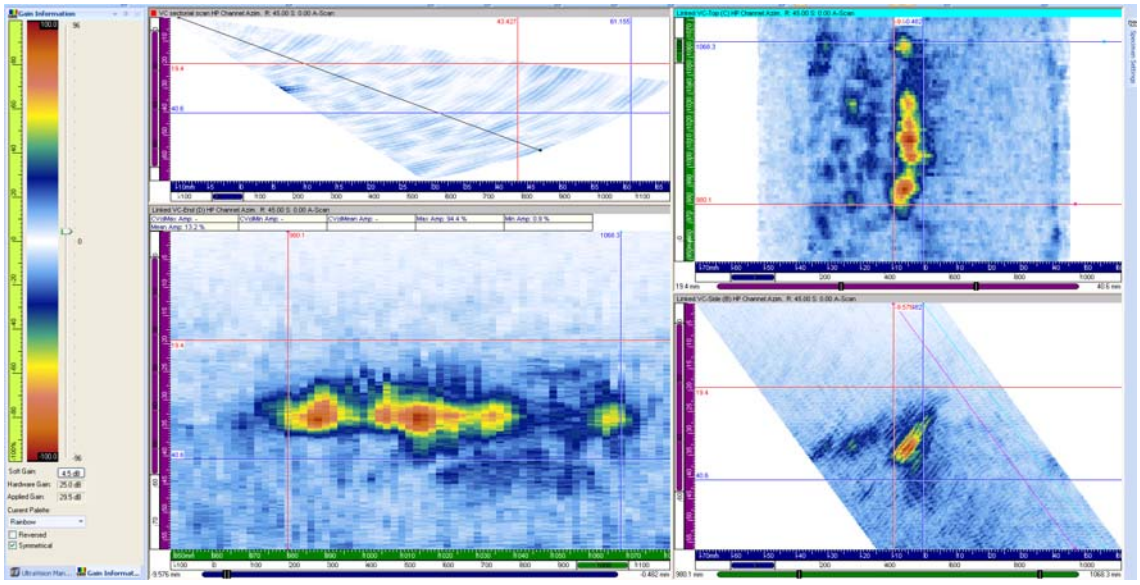


Figure C.44 Raster Data at 1.5 MHz on the Pipe Side of Specimen 9C-002, Flaw 1

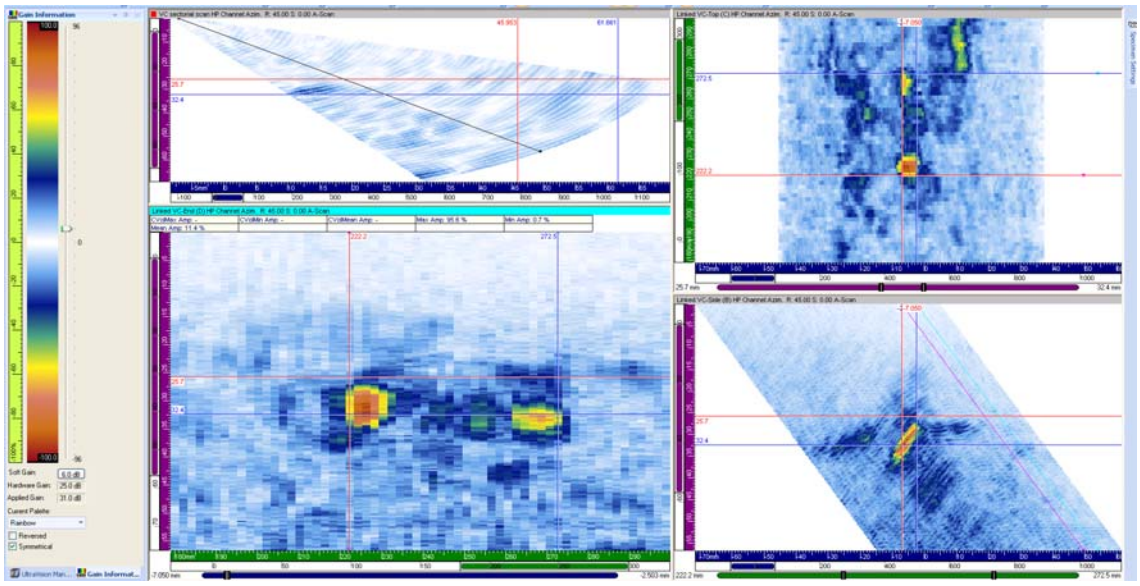


Figure C.45 Raster Data at 1.5 MHz on the Pipe Side of Specimen 9C-002, Flaw 2

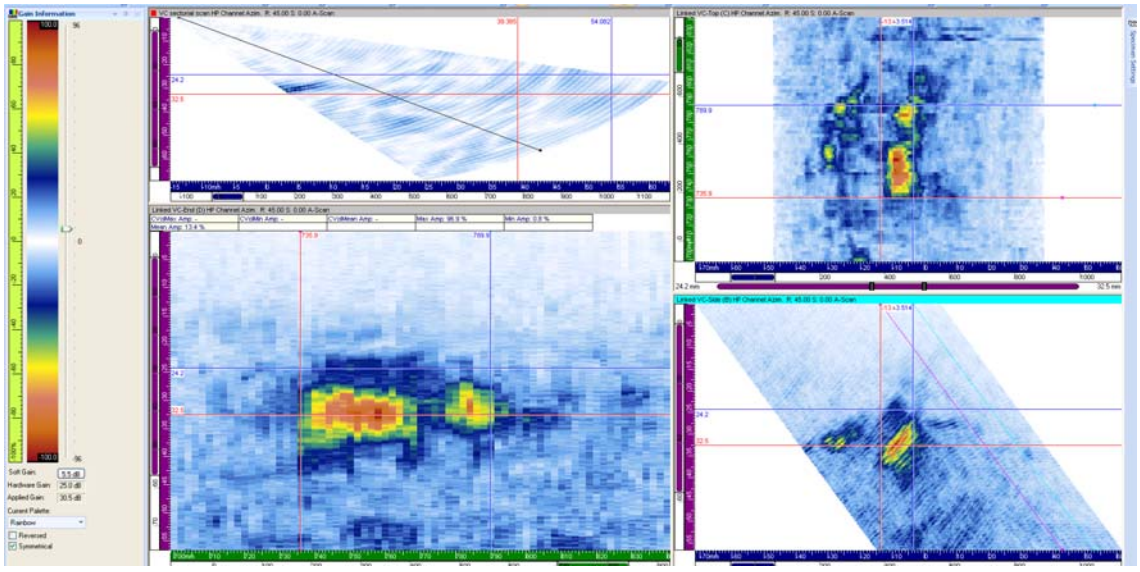


Figure C.46 Raster Data at 1.5 MHz on the Pipe Side of Specimen 9C-002, Flaw 3

APPENDIX D

2.0-MHZ PHASED-ARRAY DATA ON FLAWS IN THE PRESSURIZER SURGE LINE SPECIMEN

APPENDIX D

2.0-MHZ PHASED-ARRAY DATA ON FLAWS IN THE PRESSURIZER SURGE LINE SPECIMEN

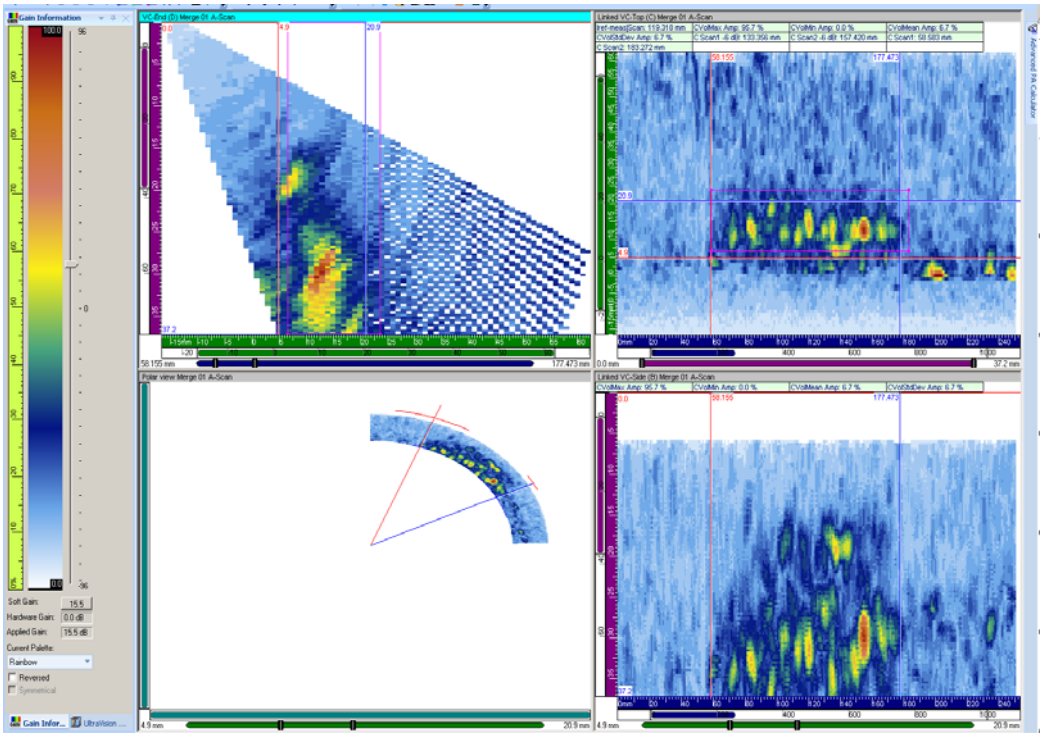


Figure D.1 2.0 MHz Data on Pipe Side of 7C-059, Flaw 1, Merged Image for Length Sizing

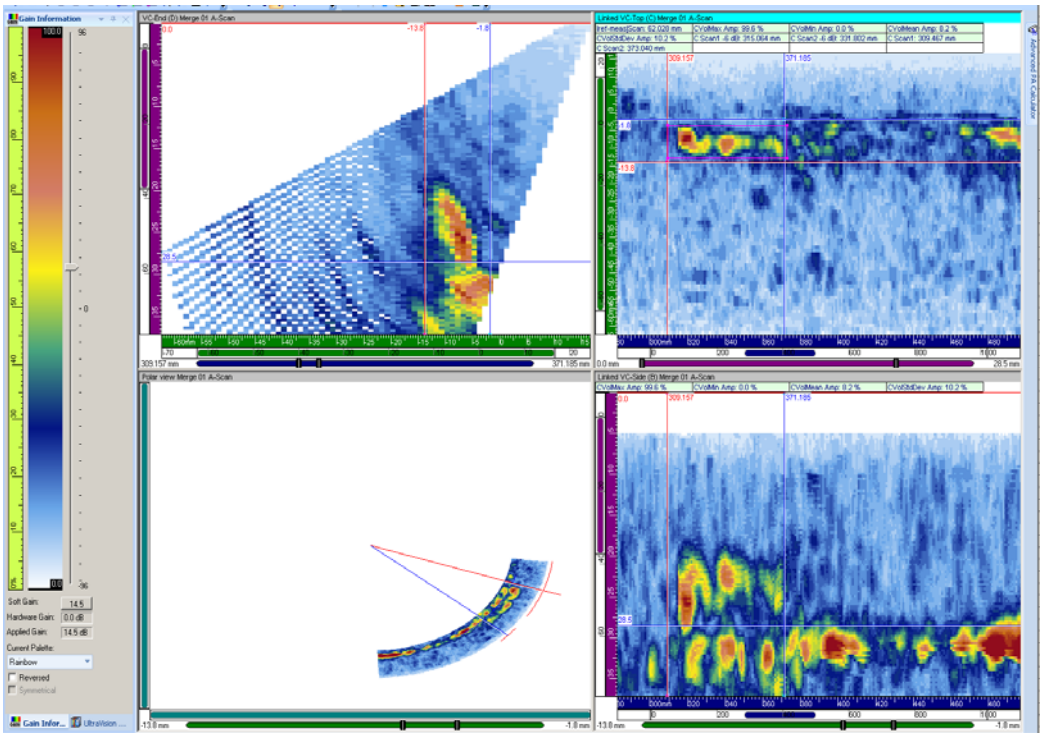


Figure D.2 2.0 MHz Data on Elbow Side of 7C-059, Flaw 1, Merged Image for Length Sizing

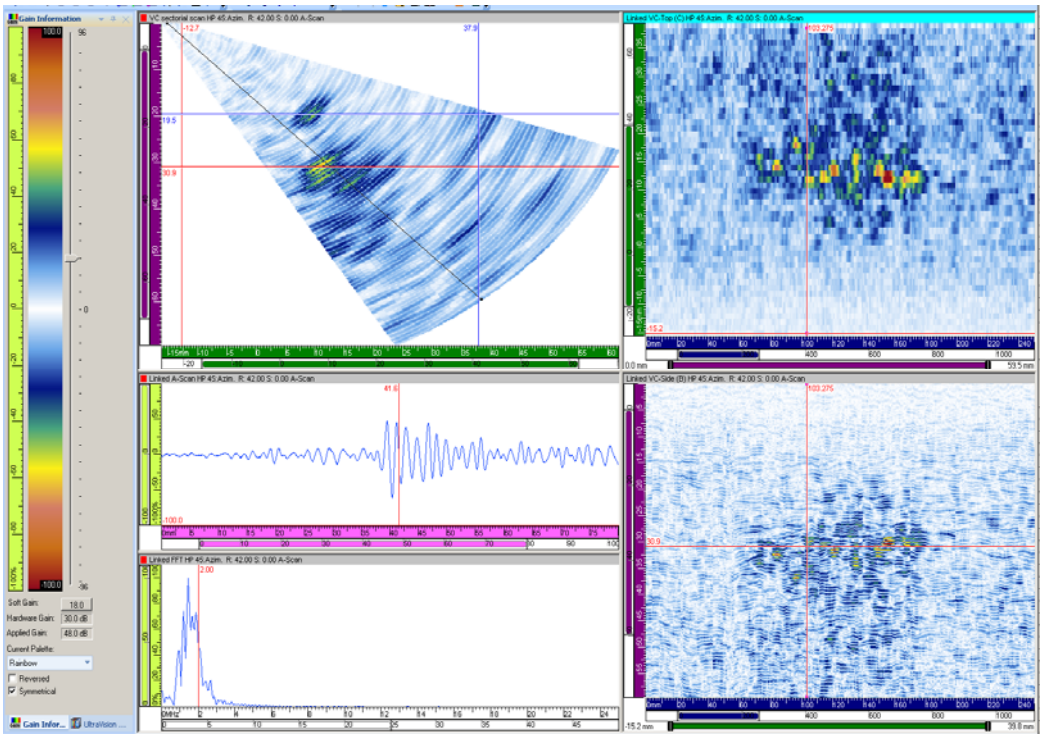


Figure D.3 2.0 MHz Data on Pipe Side of 7C-059, Flaw 1, for Depth Sizing

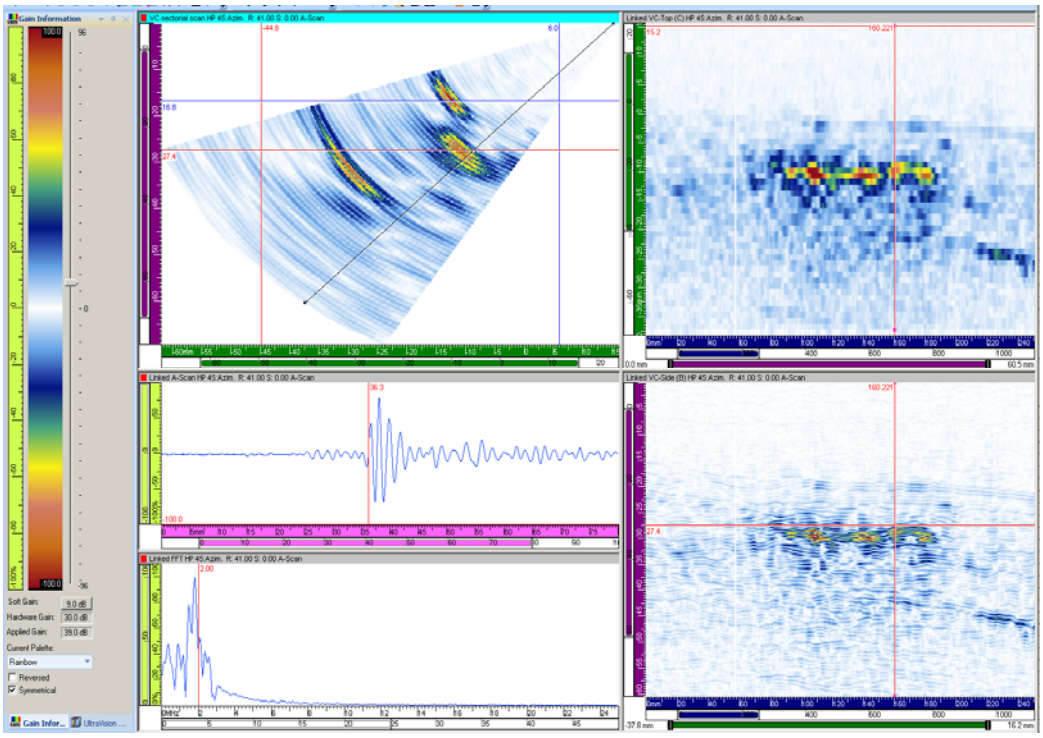


Figure D.4 2.0 MHz Data on Elbow Side of 7C-059, Flaw 1, for Depth Sizing

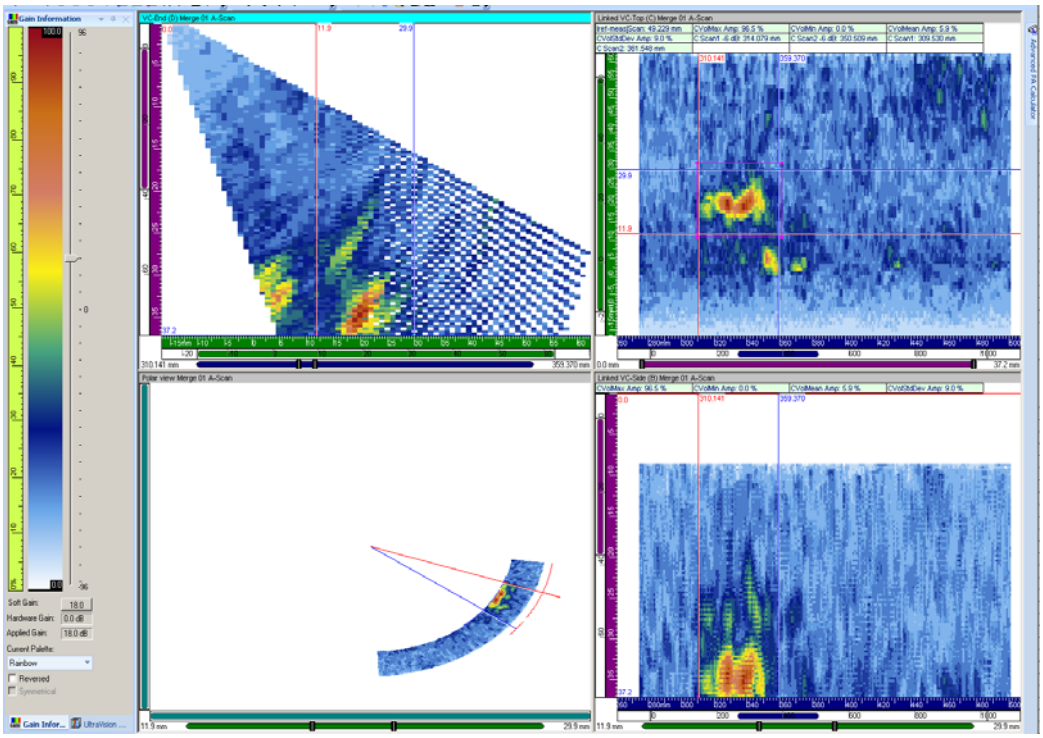


Figure D.5 2.0 MHz Data on Pipe Side of 7C-059, Flaw 2, Merged Image for Length Sizing

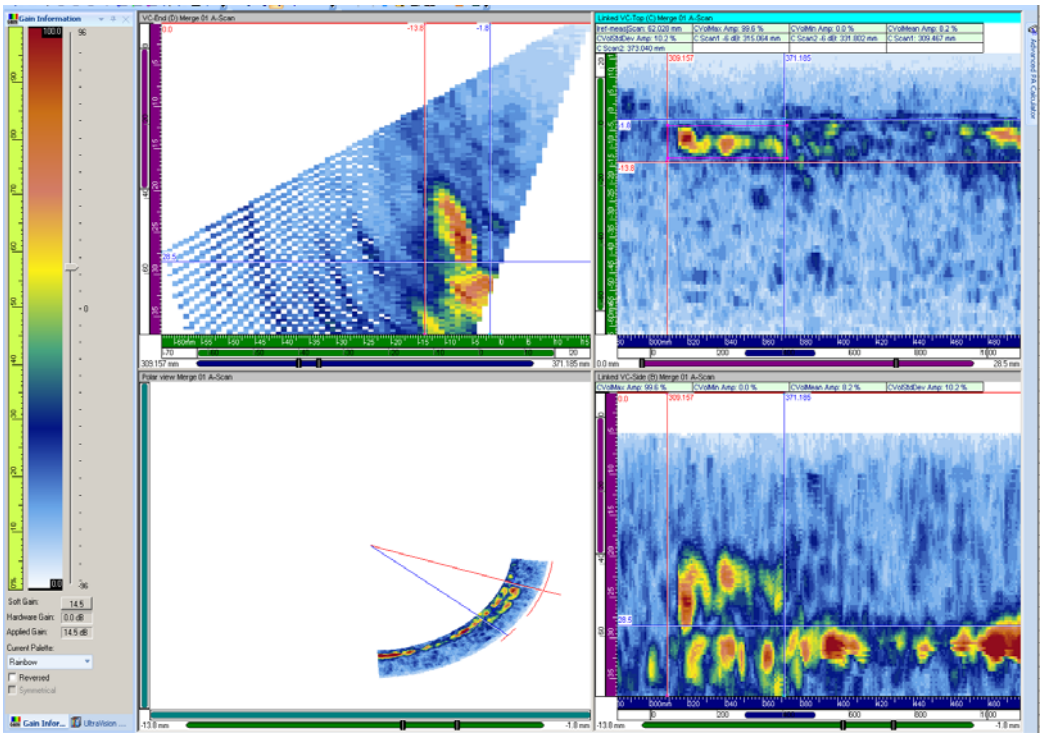


Figure D.6 2.0 MHz Data on Elbow Side of 7C-059, Flaw 2, Merged Image for Length Sizing

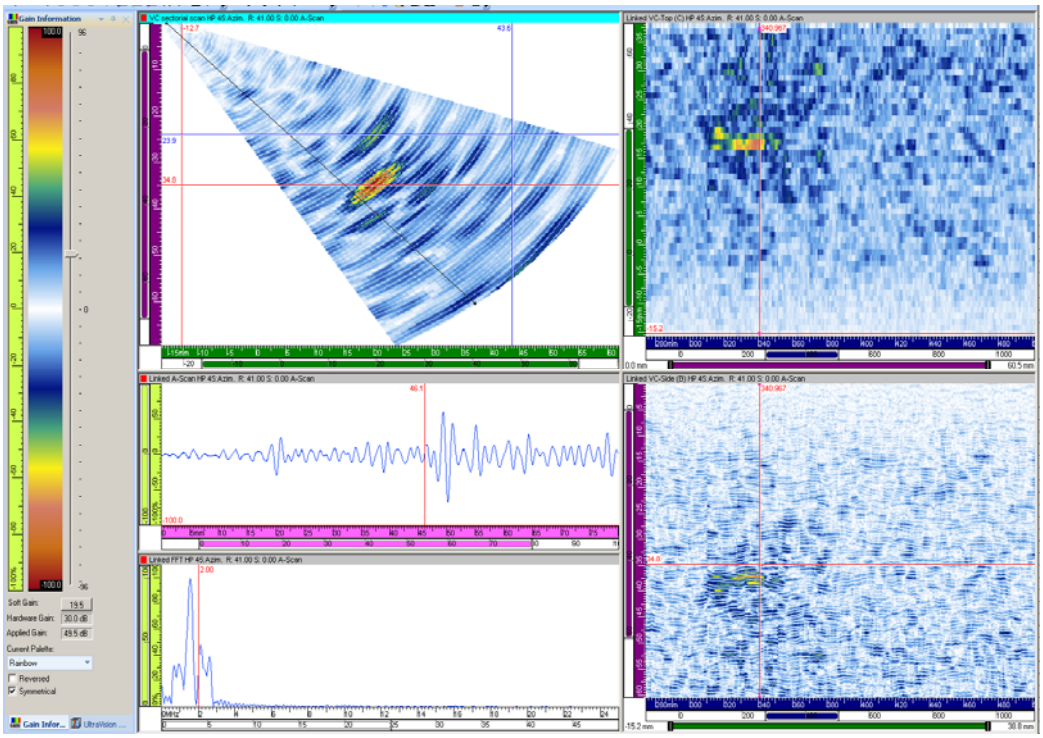


Figure D.7 2.0 MHz Data on Pipe Side of 7C-059, Flaw 2, for Depth Sizing

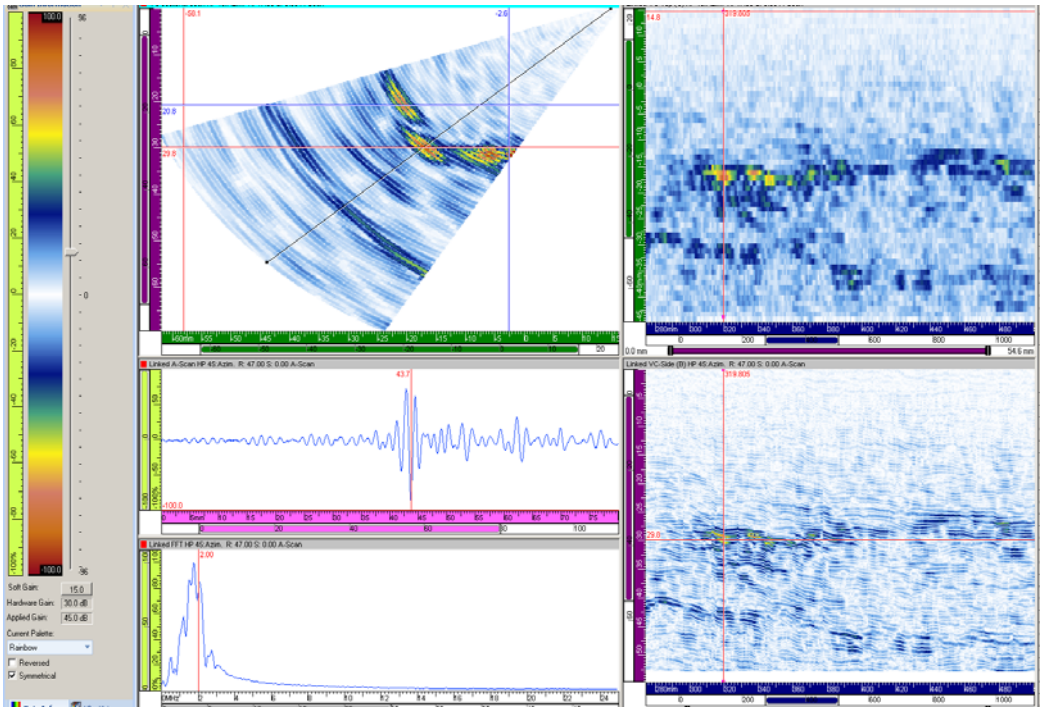


Figure D.8 2.0 MHz Data on Elbow Side of 7C-059, Flaw 2, for Depth Sizing

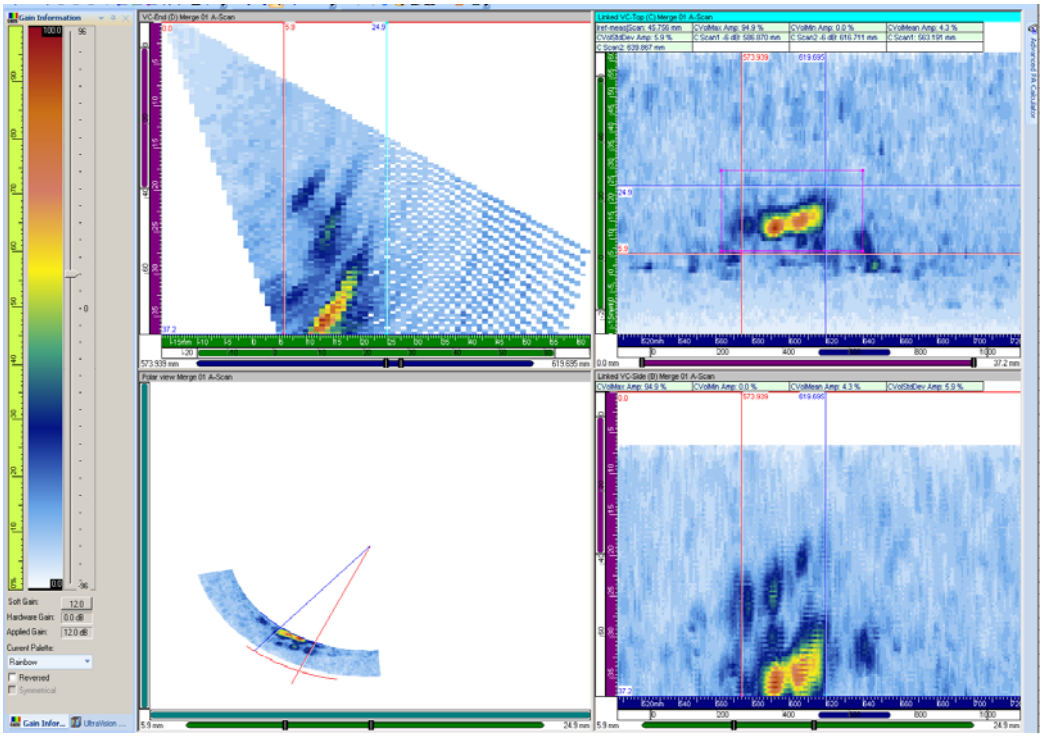


Figure D.9 2.0 MHz Data on Pipe Side of 7C-059, Flaw 3, Merged Image for Length Sizing

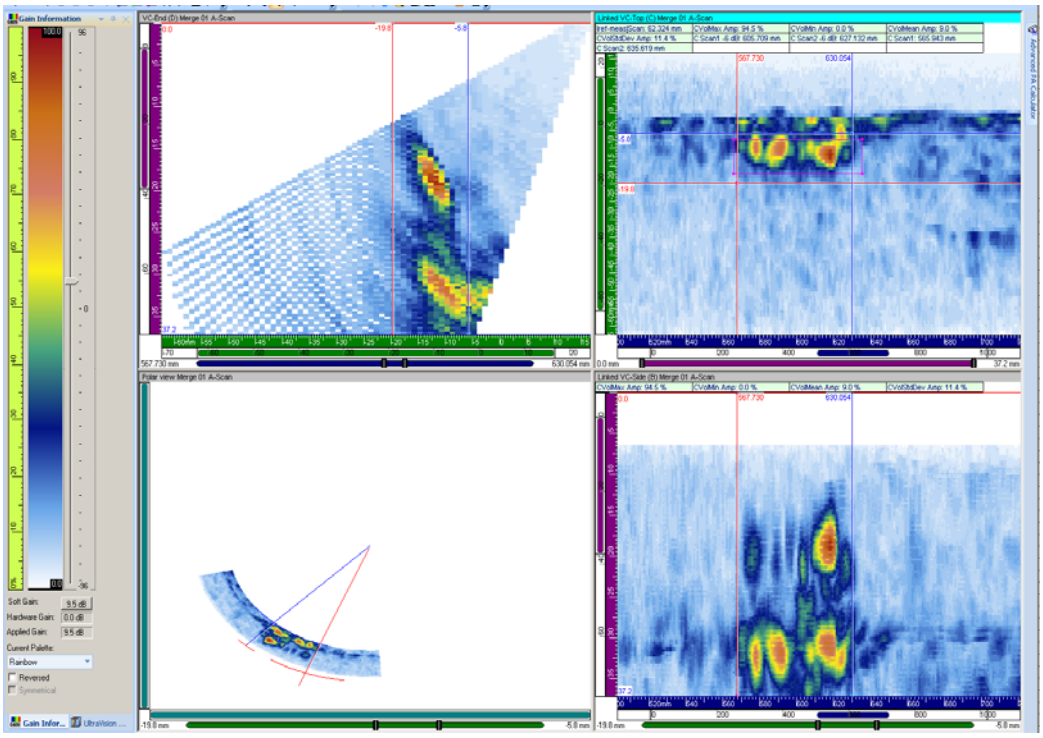


Figure D.10 2.0 MHz Data on Elbow Side of 7C-059, Flaw 3, Merged for Length Sizing

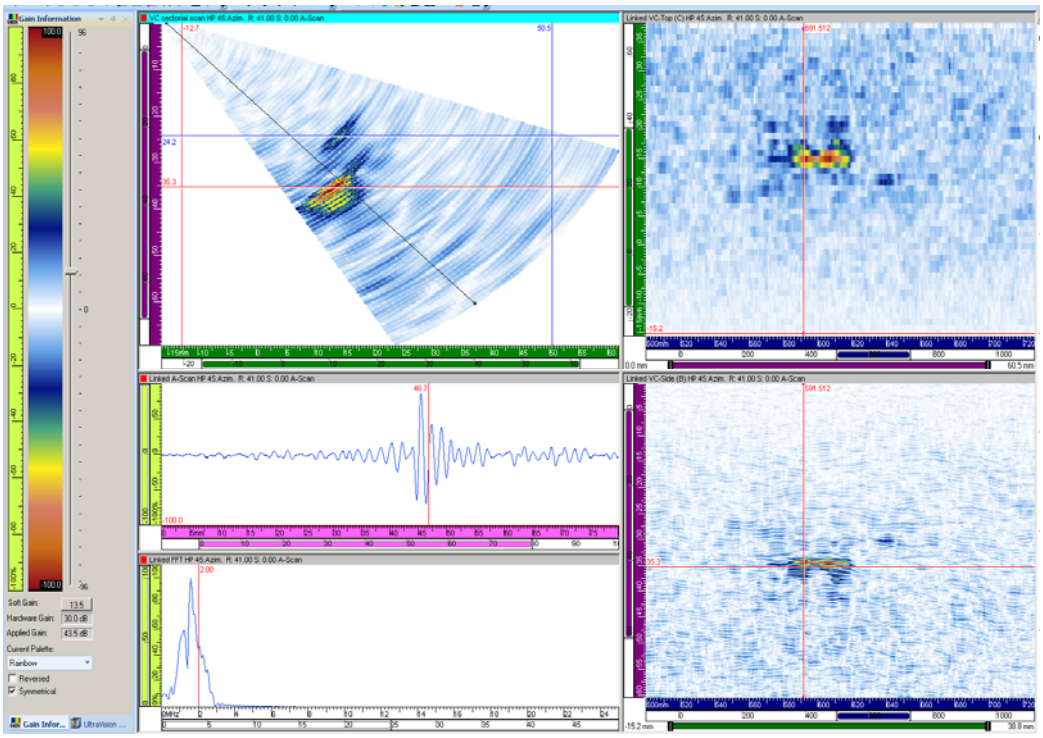


Figure D.11 2.0 MHz Data on Pipe Side of 7C-059, Flaw 3, for Depth Sizing

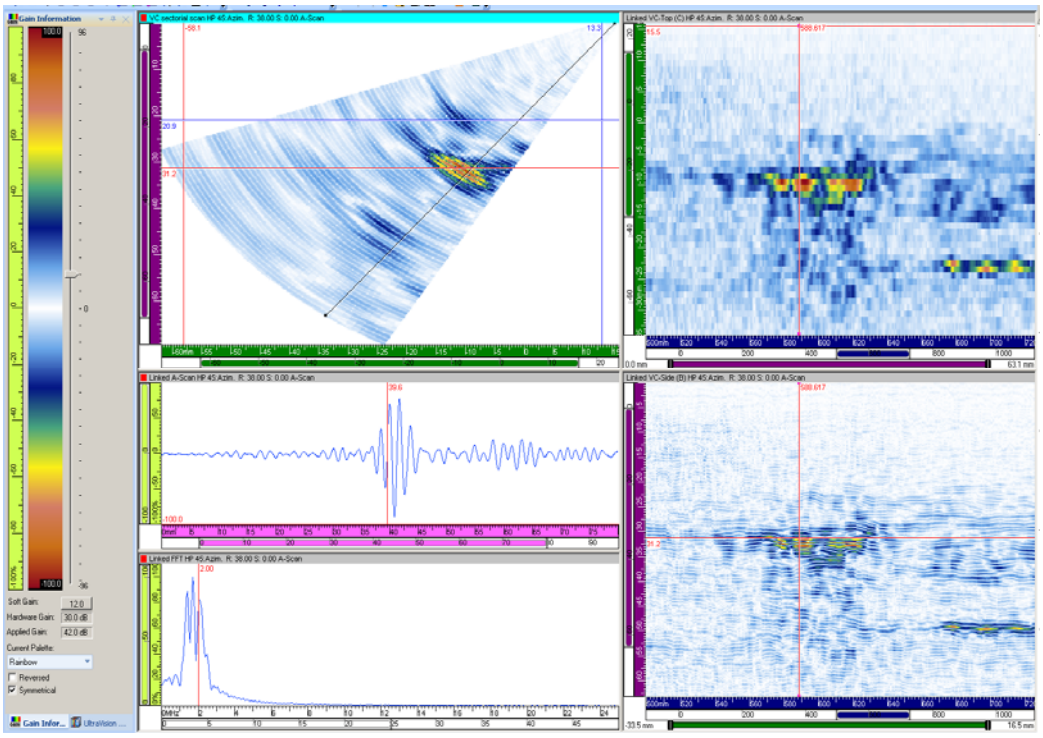


Figure D.12 2.0 MHz Data on Elbow Side of 7C-059, Flaw 3, for Depth Sizing

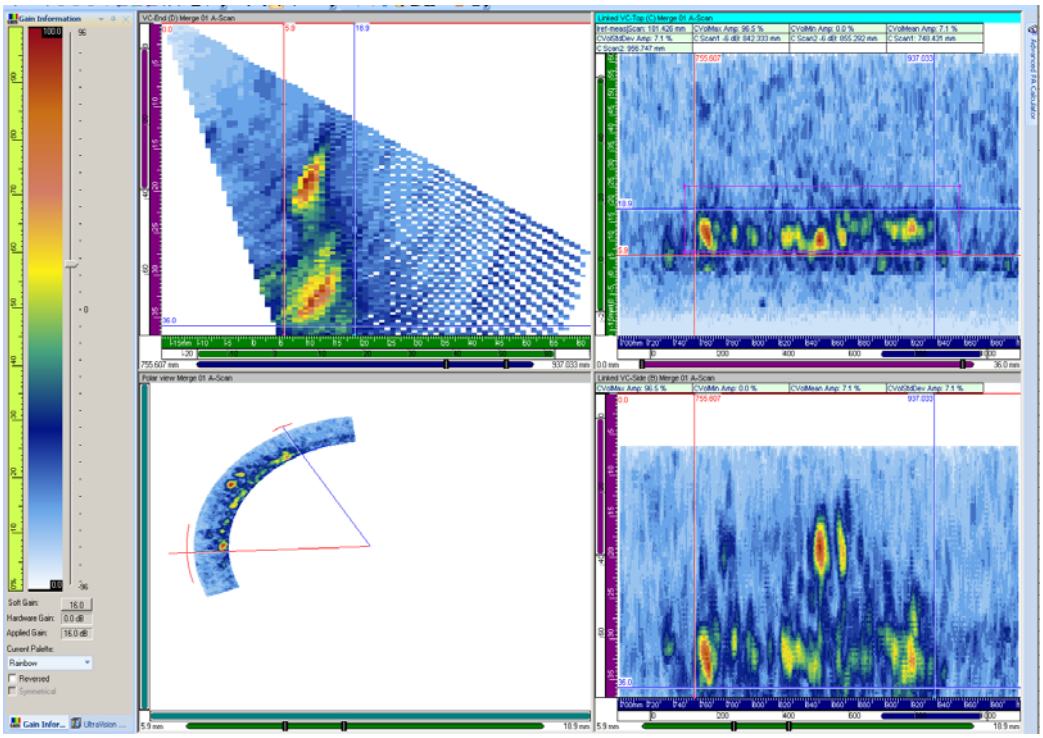


Figure D.13 2.0 MHz Data on Pipe Side of 7C-059, Flaw 4, Merged Image for Length Sizing

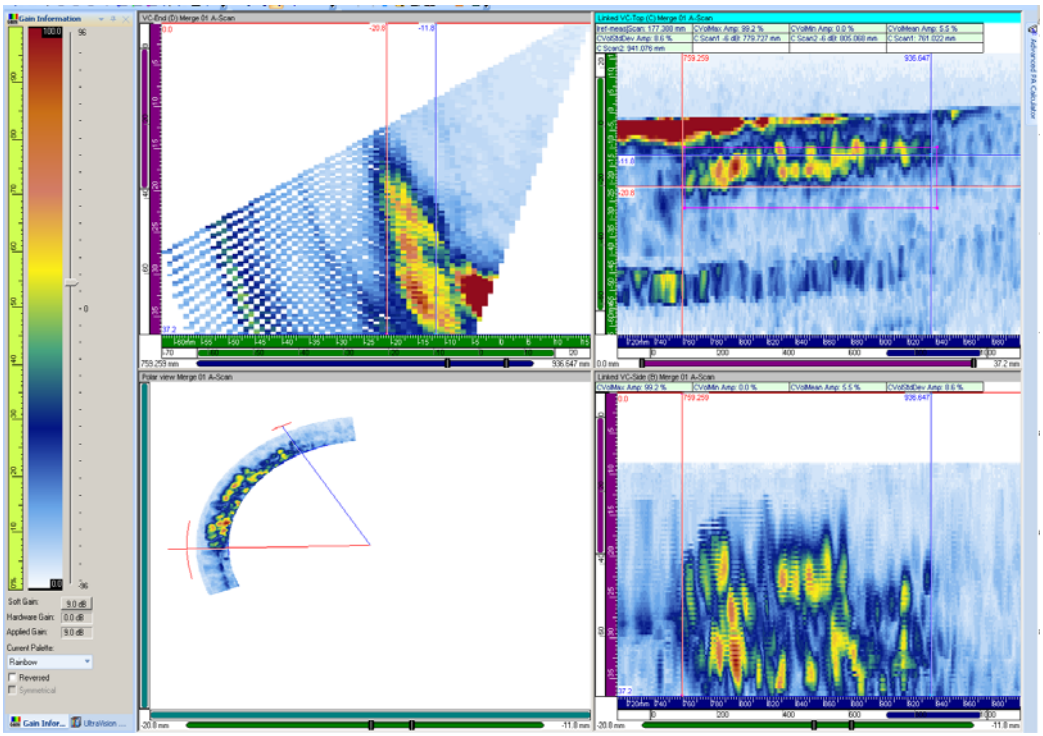


Figure D.14 2.0 MHz Data on Elbow Side of 7C-059, Flaw 4, Merged Image for Length Sizing

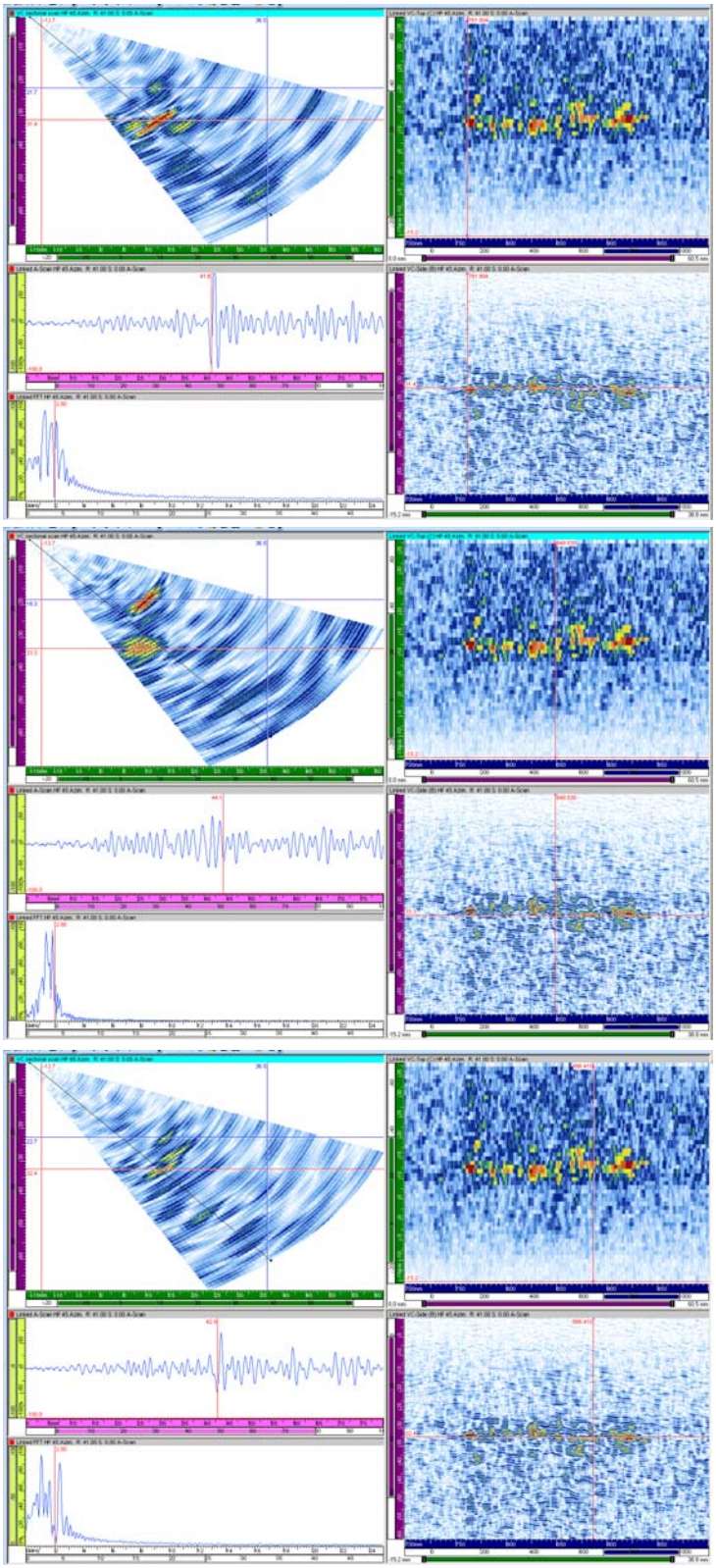


Figure D.15 2.0 MHz Data on Pipe Side of 7C-059, Flaw 4a, 4b, and 4c, Top to Bottom, for Depth Sizing

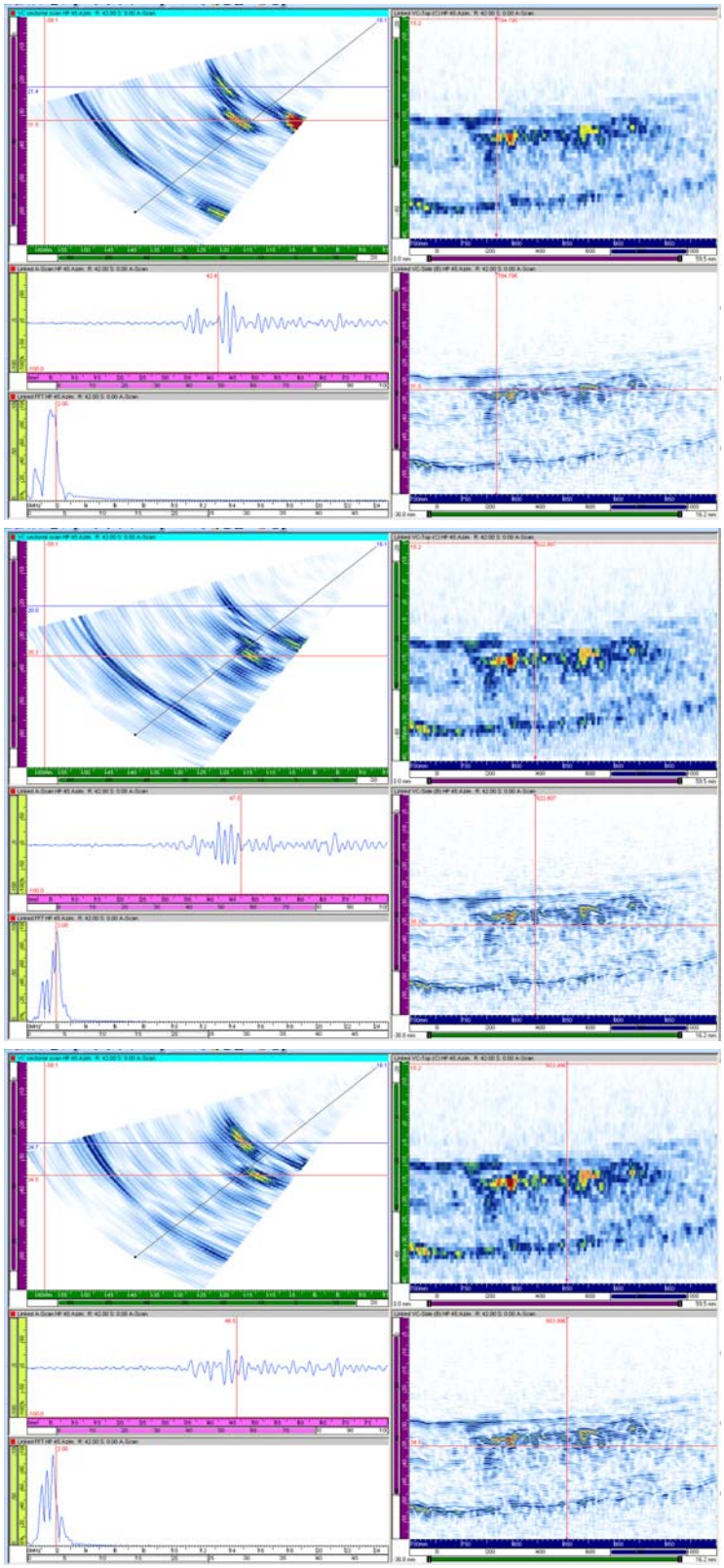


Figure D.16 2.0 MHz Data on Elbow Side of 7C-059, Flaw 4a, 4b, and 4c, Top to Bottom, for Depth Sizing

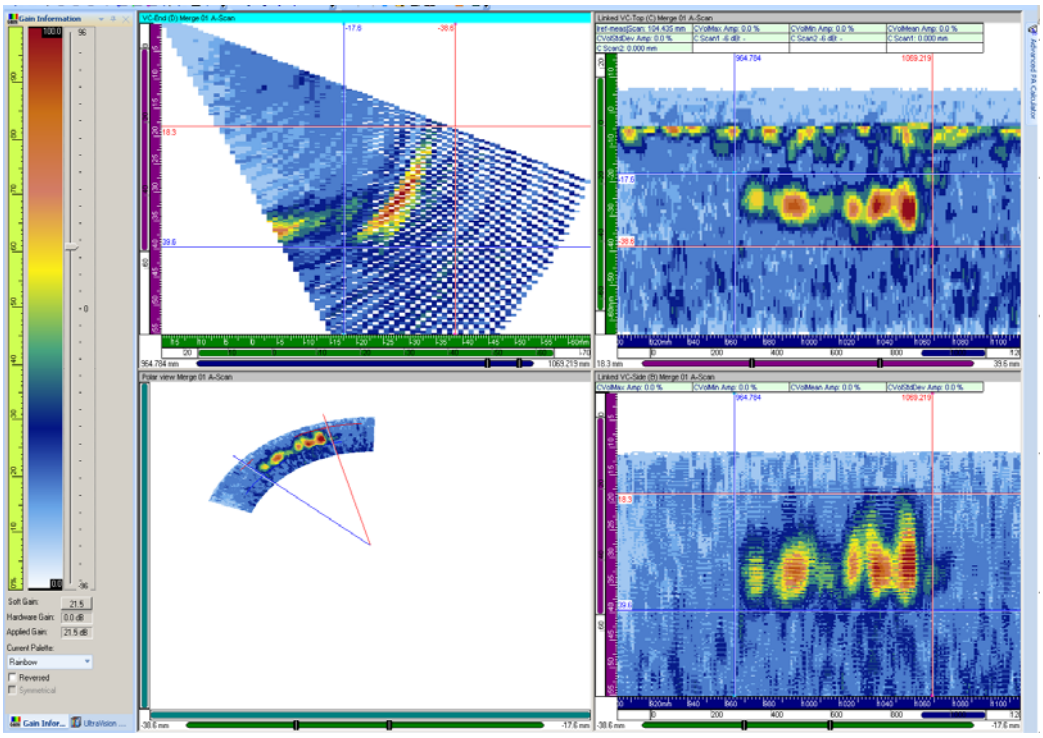


Figure D.17 2.0 MHz Data on Pipe Side of 9C-001, Flaw 1, Merged Image for Length Sizing

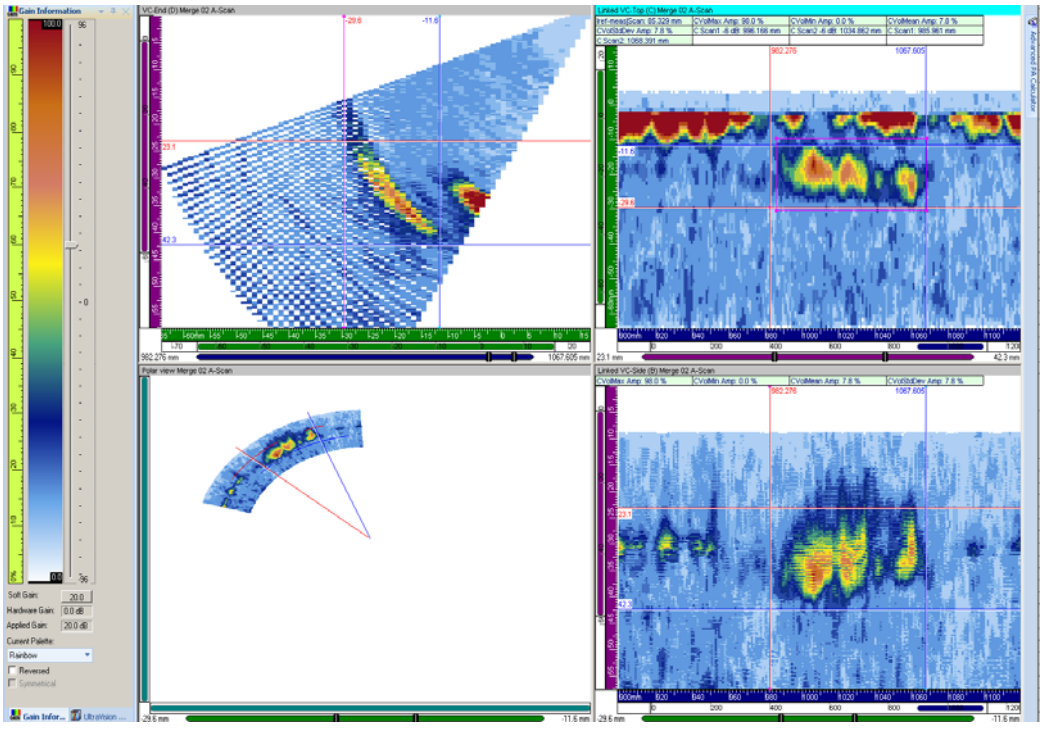


Figure D.18 2.0 MHz Data on Elbow Side of 9C-001, Flaw 1, Merged Image for Length Sizing

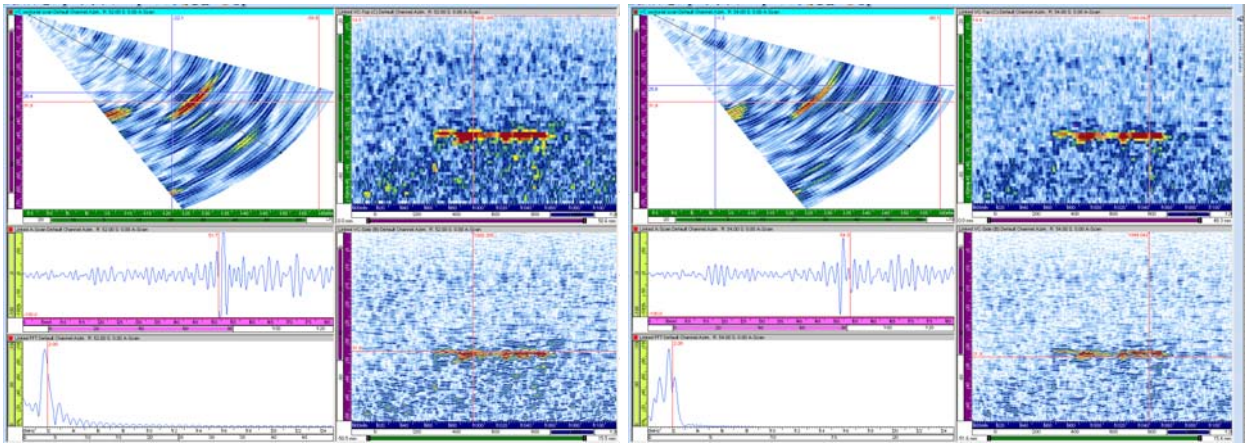


Figure D.19 2.0 MHz Data on Pipe Side of 9C-001, Flaw 1a and 1b, for Depth Sizing

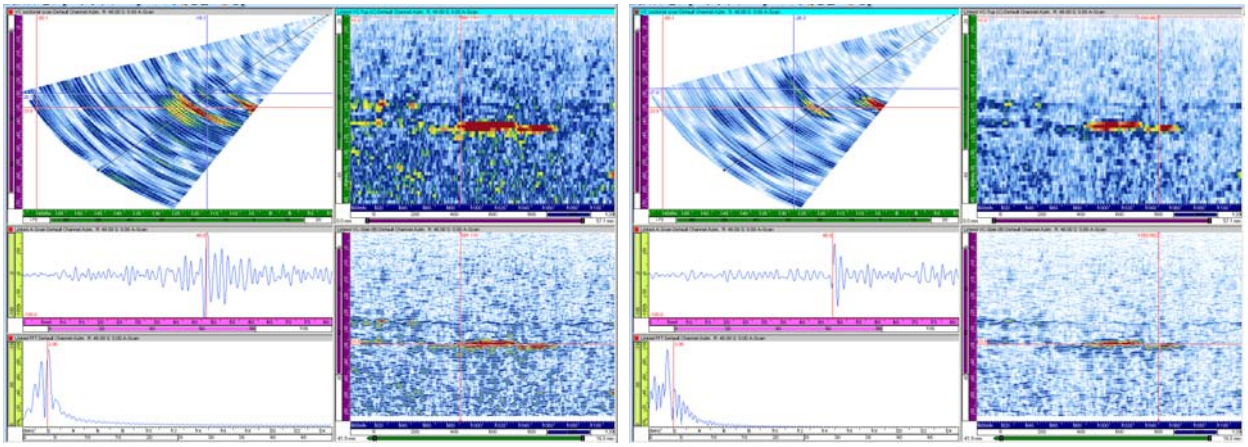


Figure D.20 2.0 MHz Data on Elbow Side of 9C-001, Flaw 1a and 1b, for Depth Sizing

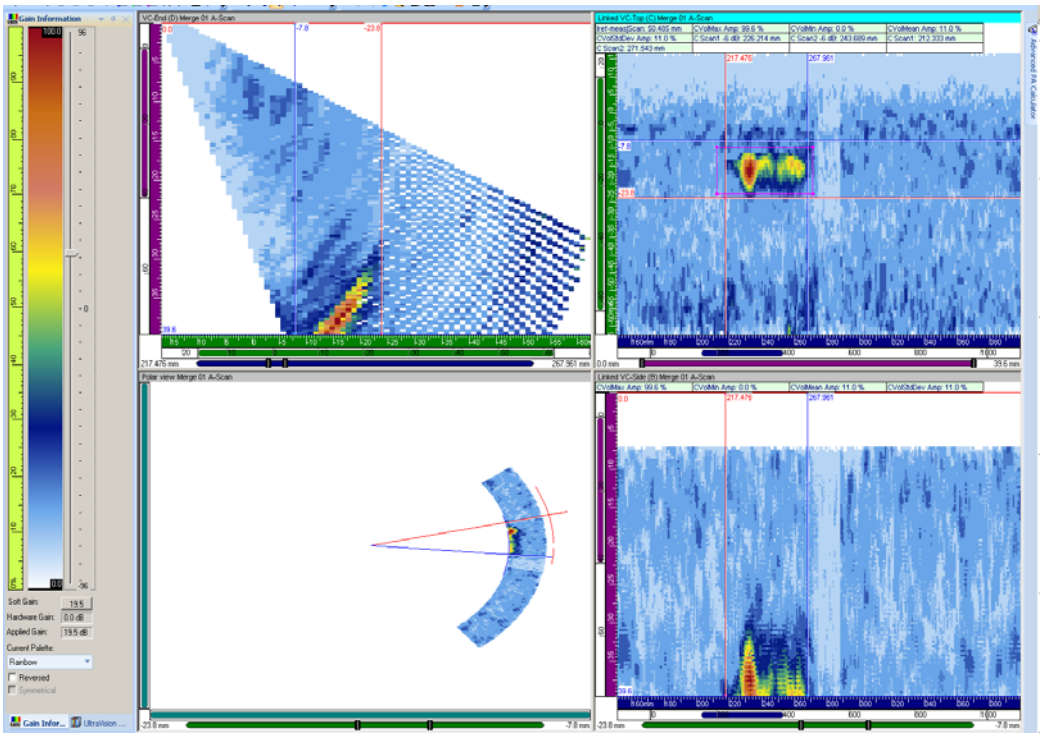


Figure D.21 2.0 MHz Data on Pipe Side of 9C-001, Flaw 2, Merged Image for Length Sizing

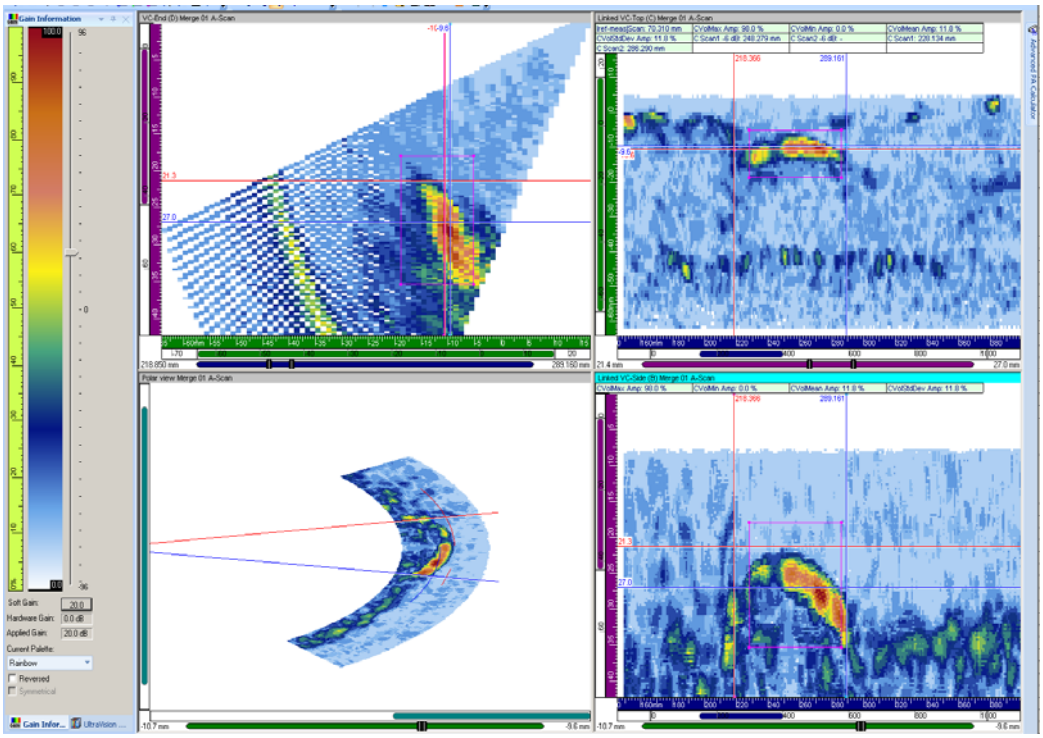


Figure D.22 2.0 MHz Data on Elbow Side of 9C-001, Flaw 2, Merged Image for Length Sizing

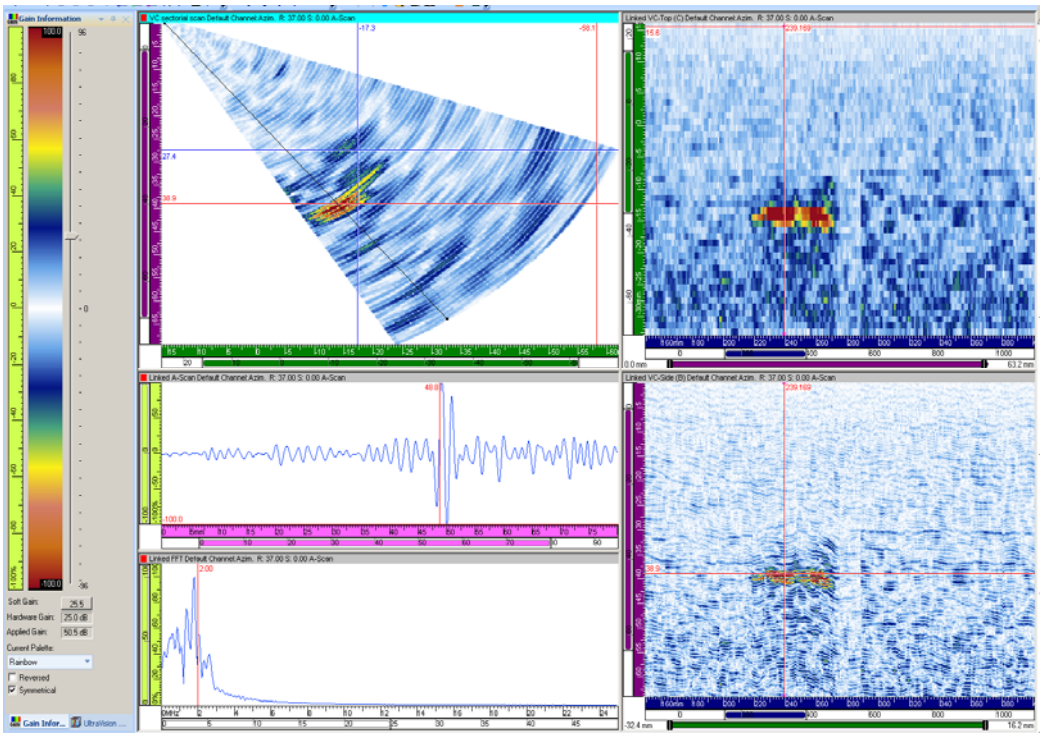


Figure D.23 2.0 MHz Data on Pipe Side of 9C-001, Flaw 2, for Depth Sizing

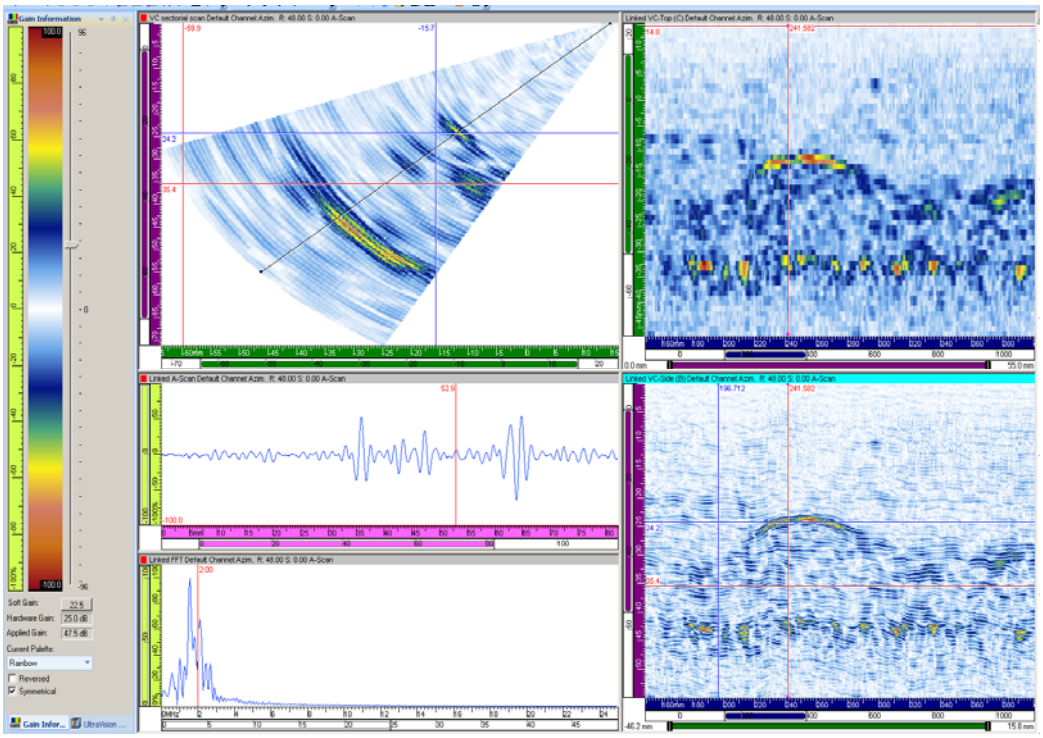


Figure D.24 2.0 MHz Data on Elbow Side of 9C-001, Flaw 2, for Depth Sizing

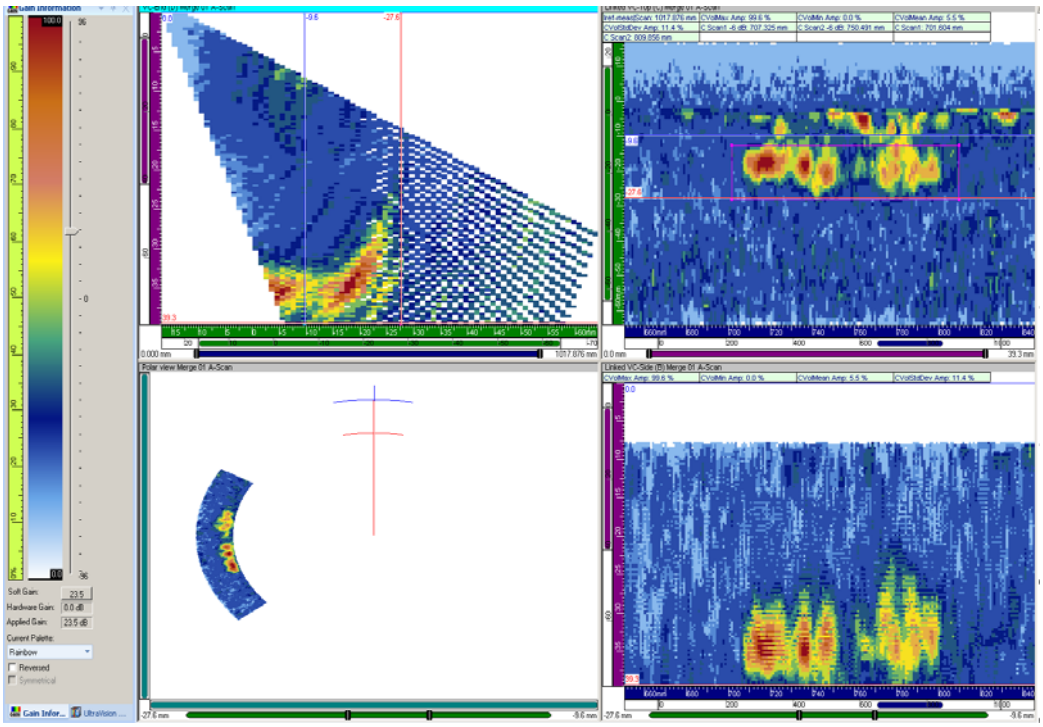


Figure D.25 2.0 MHz Data on Pipe Side of 9C-001, Flaw 3, Merged Image for Length Sizing

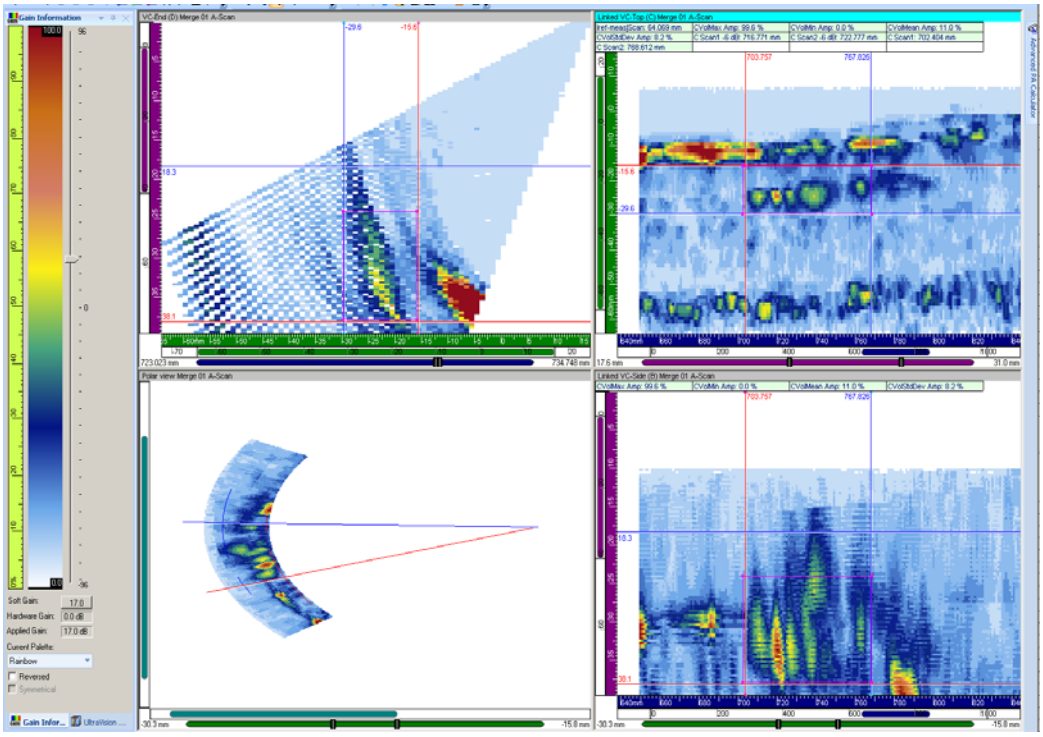


Figure D.26 2.0 MHz Data on Elbow Side of 9C-001, Flaw 3, Merged Image for Length Sizing

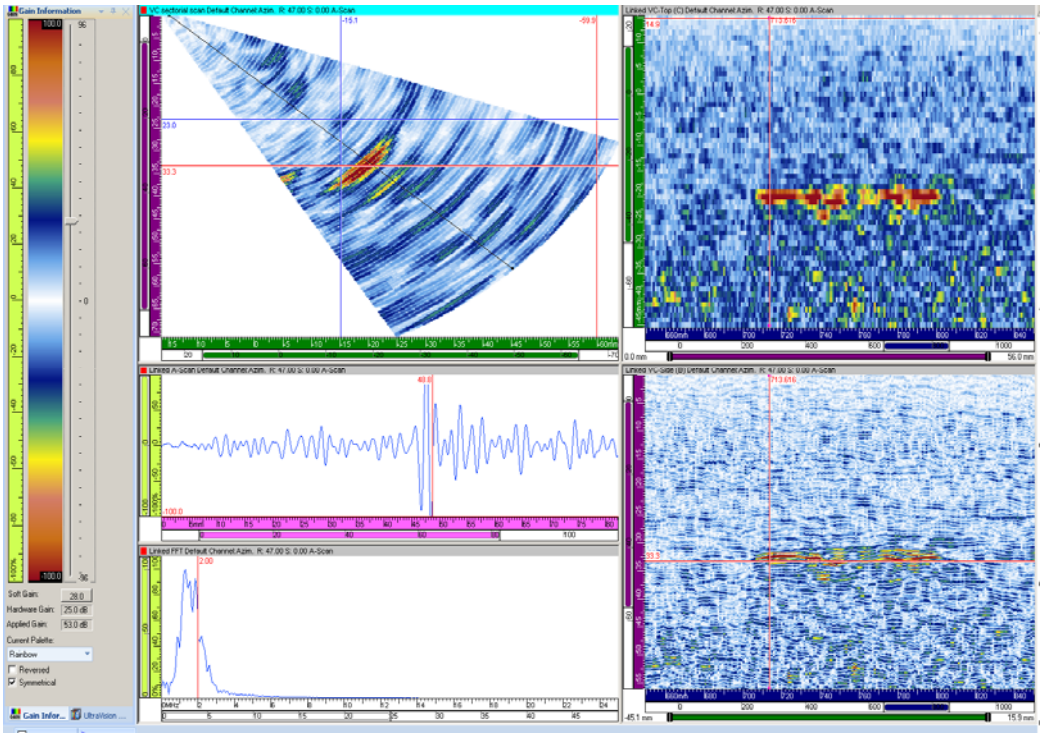


Figure D.27 2.0 MHz Data on Pipe Side of 9C-001, Flaw 3, for Depth Sizing

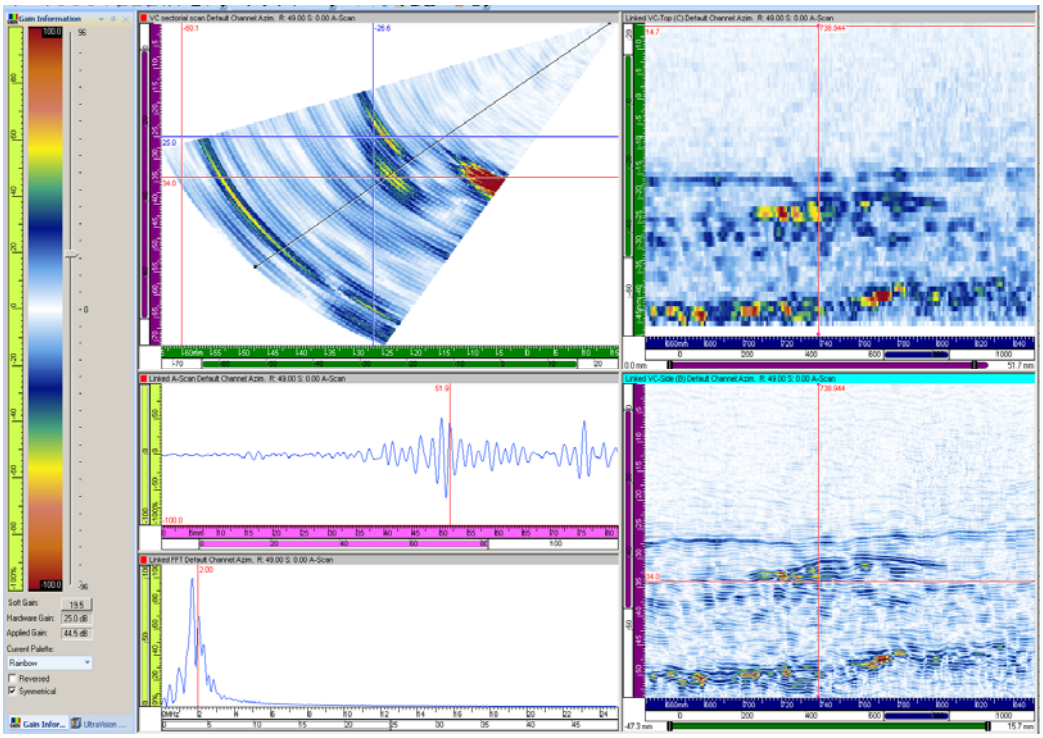


Figure D.28 2.0 MHz Data on Elbow Side of 9C-001, Flaw 3, for Depth Sizing

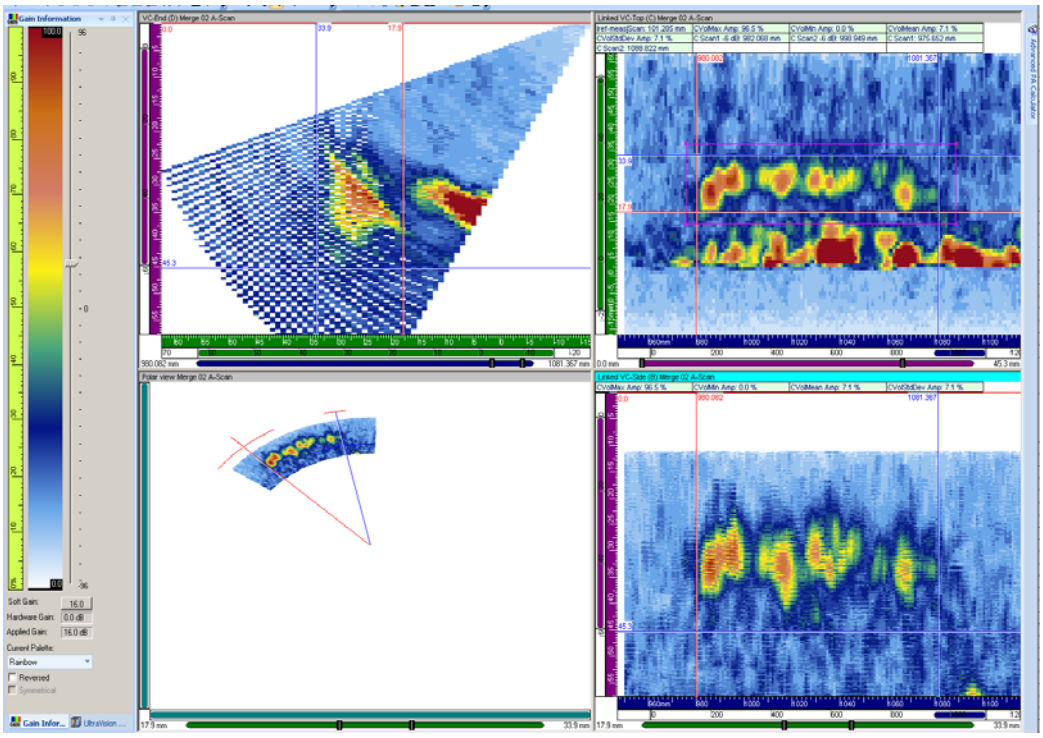


Figure D.29 2.0 MHz Data on Pipe Side of 9C-002, Flaw 1, Merged Image for Length Sizing

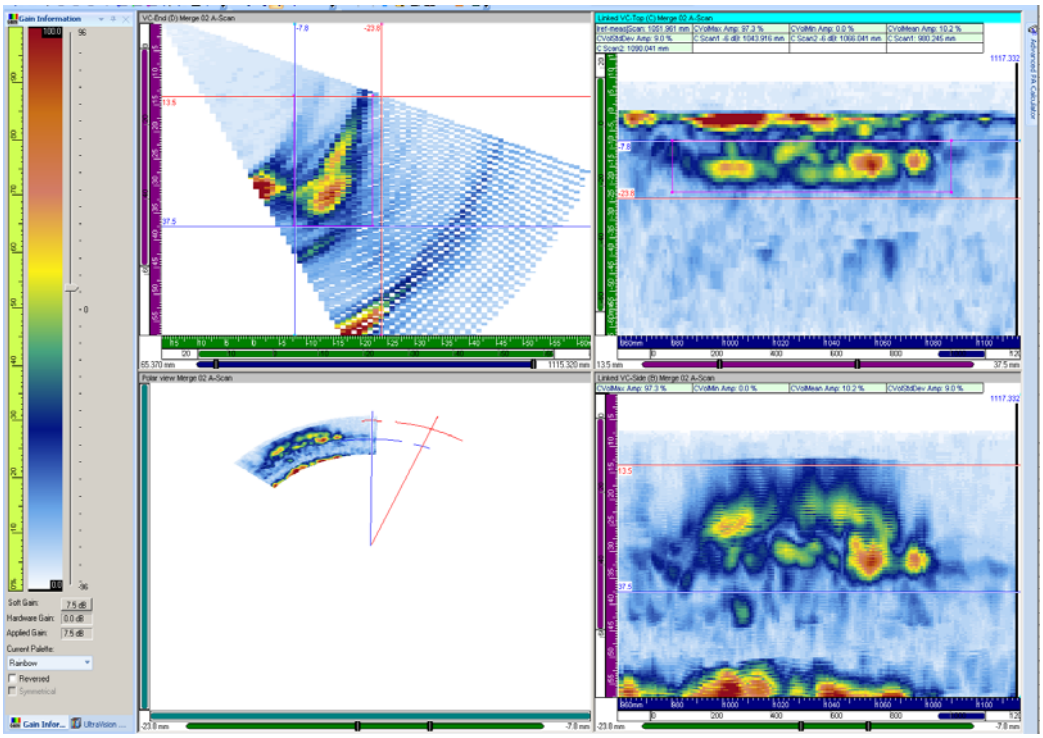


Figure D.30 2.0 MHz Data on Elbow Side of 9C-002, Flaw 1, Merged Image for Length Sizing

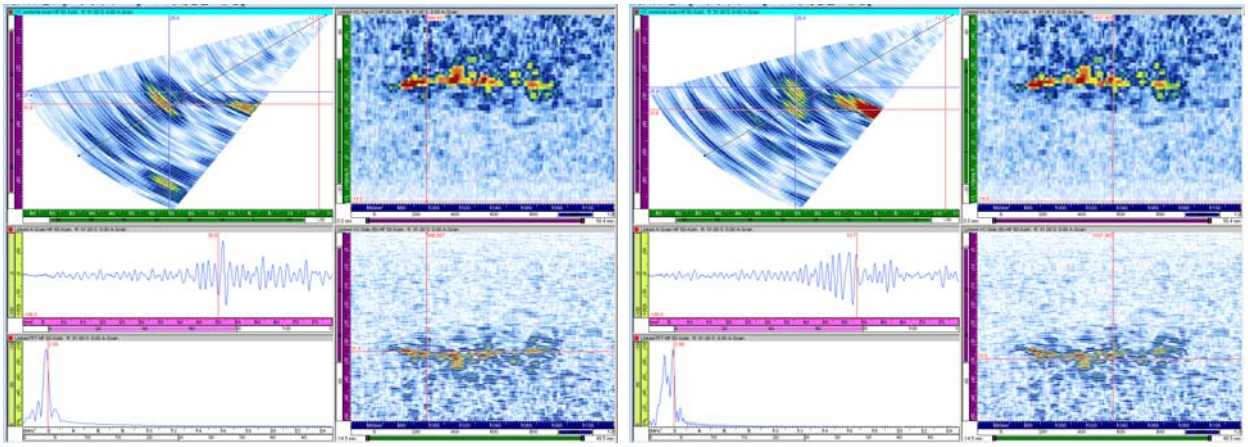


Figure D.31 2.0 MHz Data on Pipe Side of 9C-002, Flaw 1a and 1b, for Depth Sizing

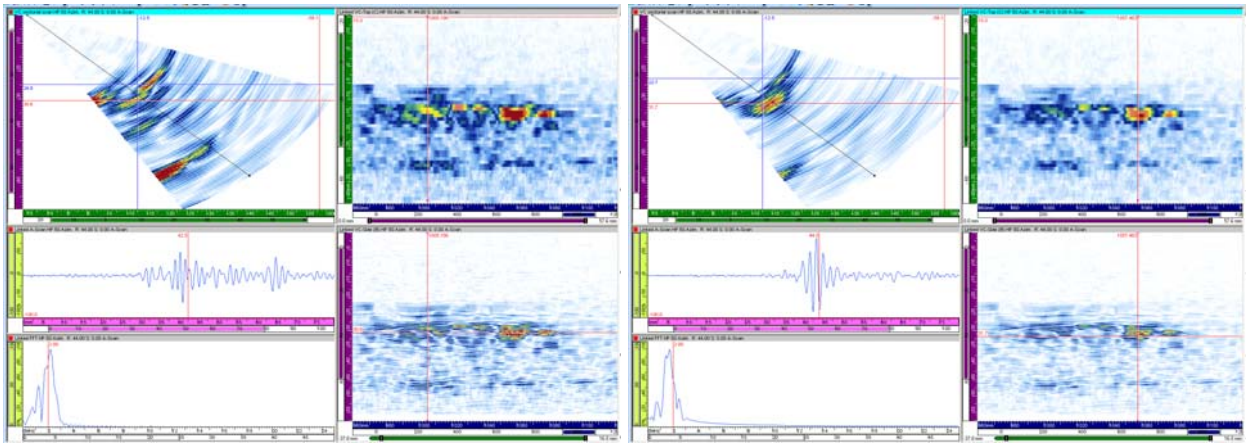


Figure D.32 2.0 MHz Data on Elbow Side of 9C-002, Flaw 1a and 1b, for Depth Sizing.

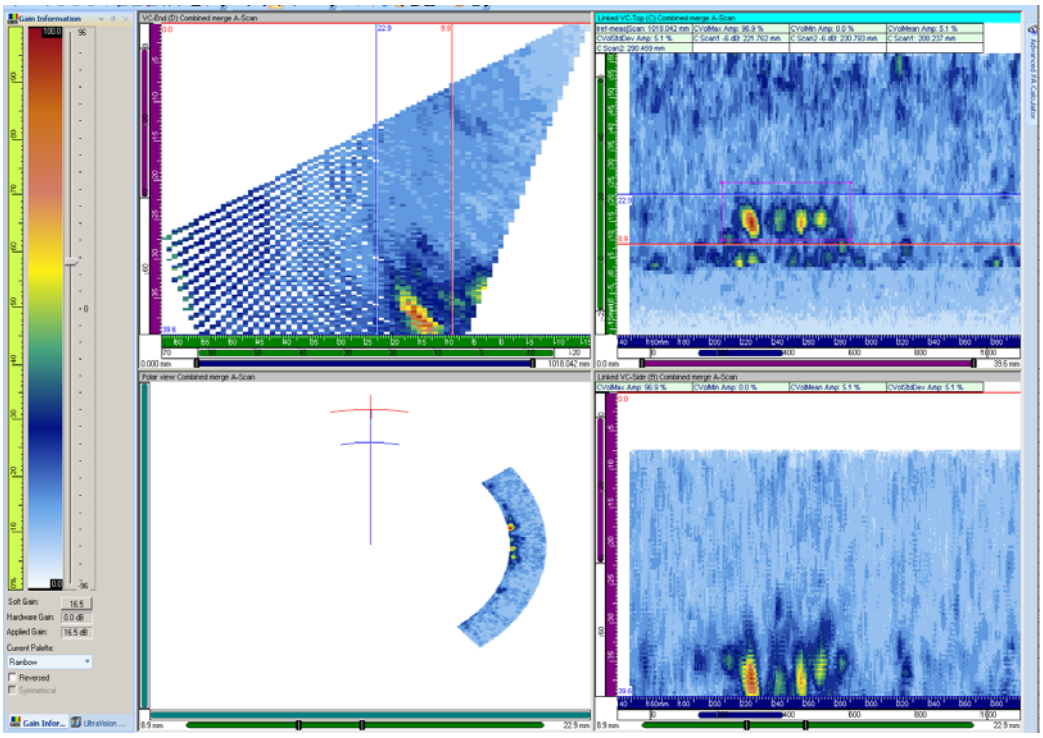


Figure D.33 2.0 MHz Data on Pipe Side of 9C-002, Flaw 2, Merged Image for Length Sizing

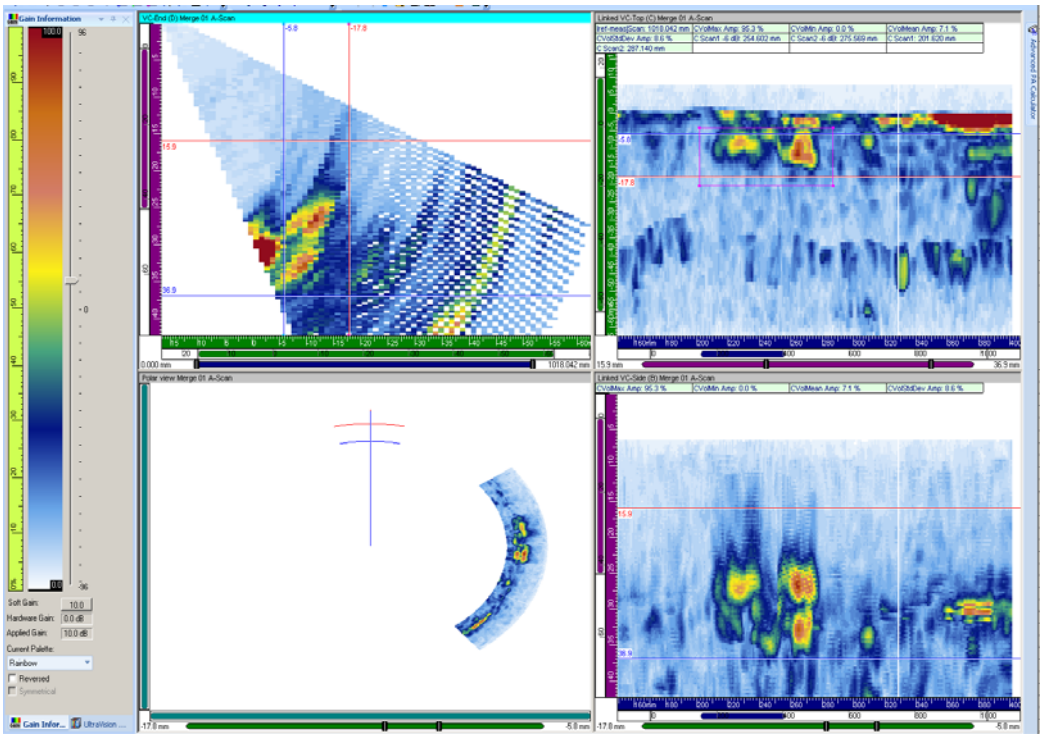


Figure D.34 2.0 MHz Data on Elbow Side of 9C-002, Flaw 2, Merged Image for Length Sizing

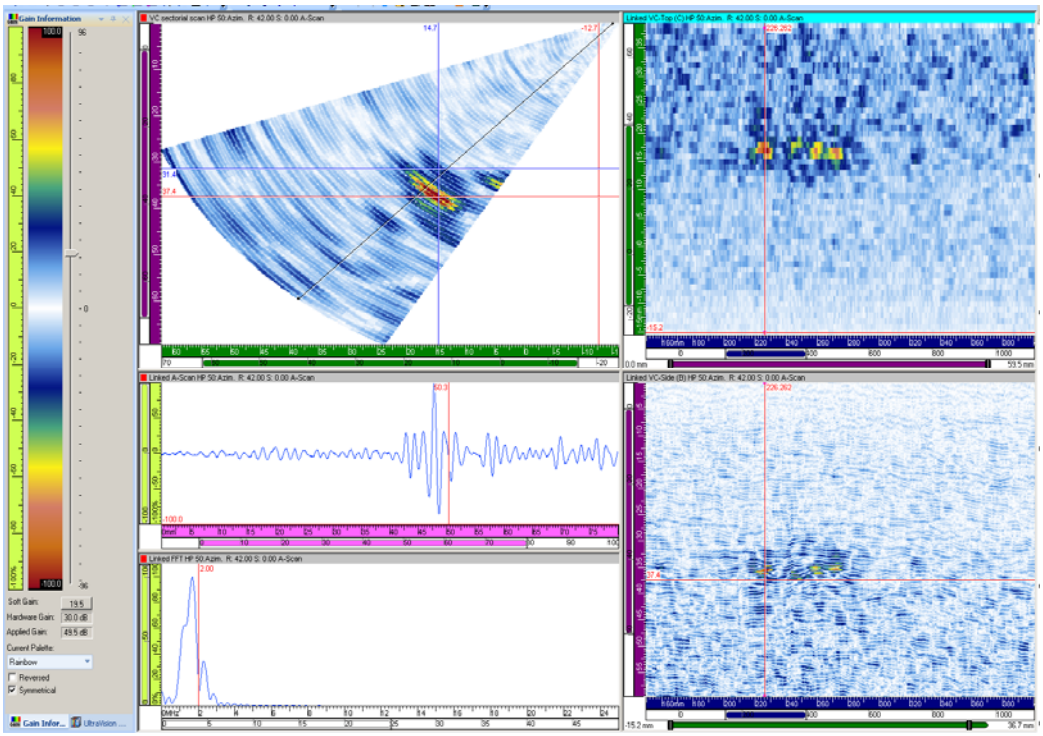


Figure D.35 2.0 MHz Data on Pipe Side of 9C-002, Flaw 2, for Depth Sizing

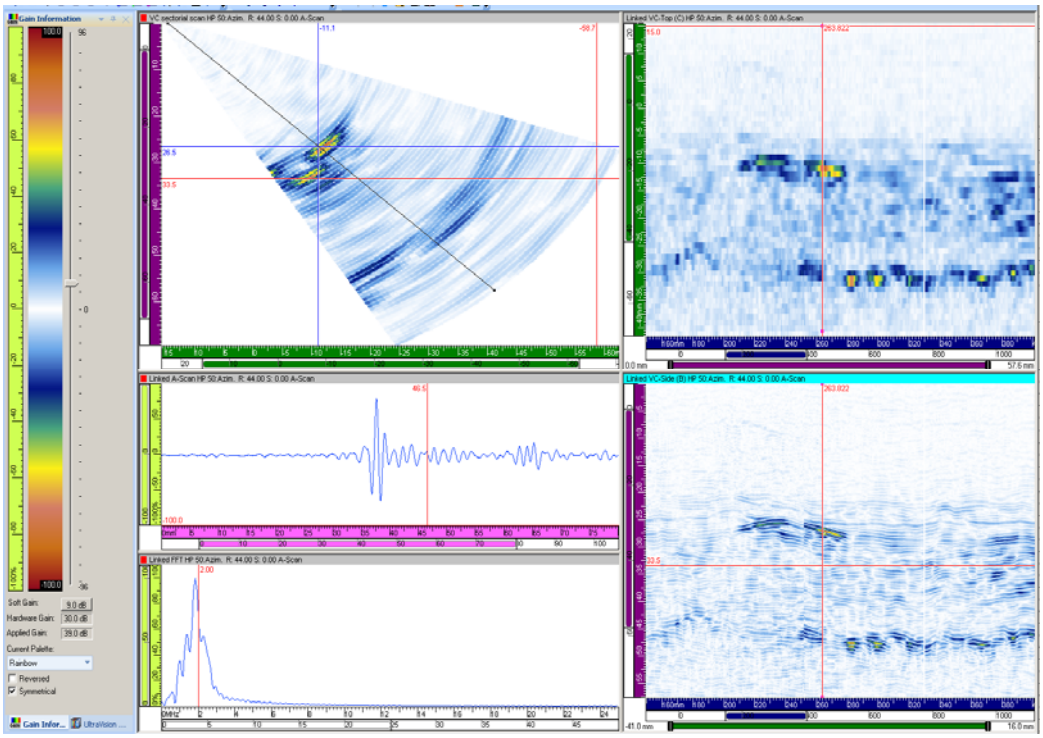


Figure D.36 2.0 MHz Data on Elbow Side of 9C-002, Flaw 2, for Depth Sizing

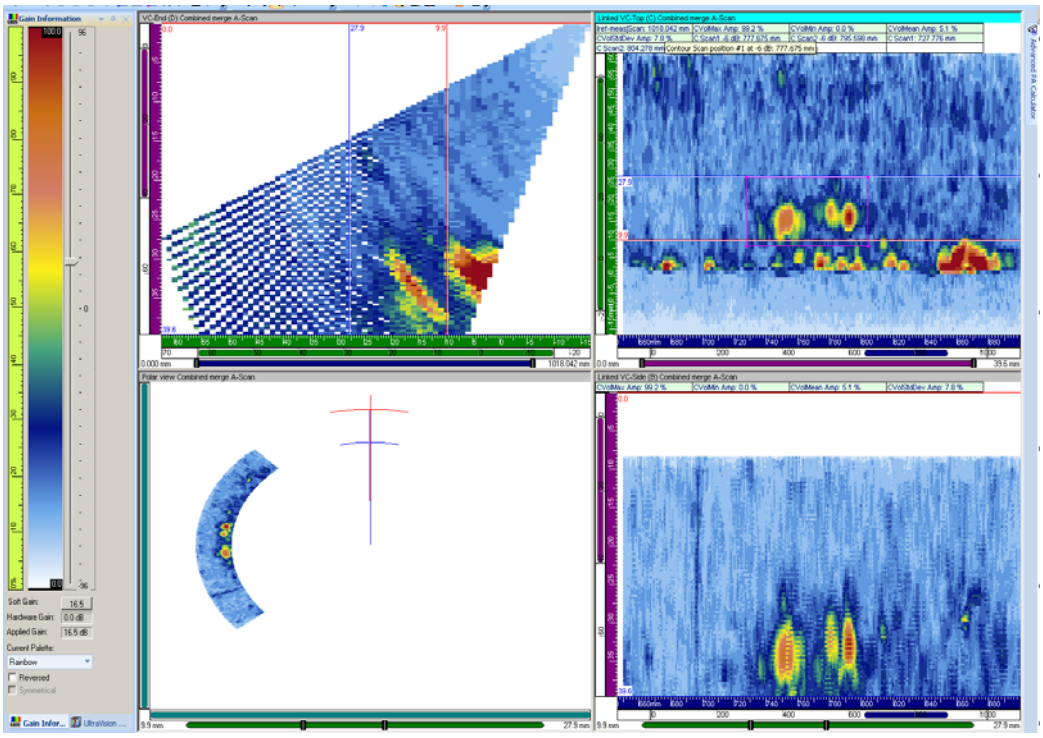


Figure D.37 2.0 MHz Data on Pipe Side of 9C-002, Flaw 3, Merged Image for Length Sizing

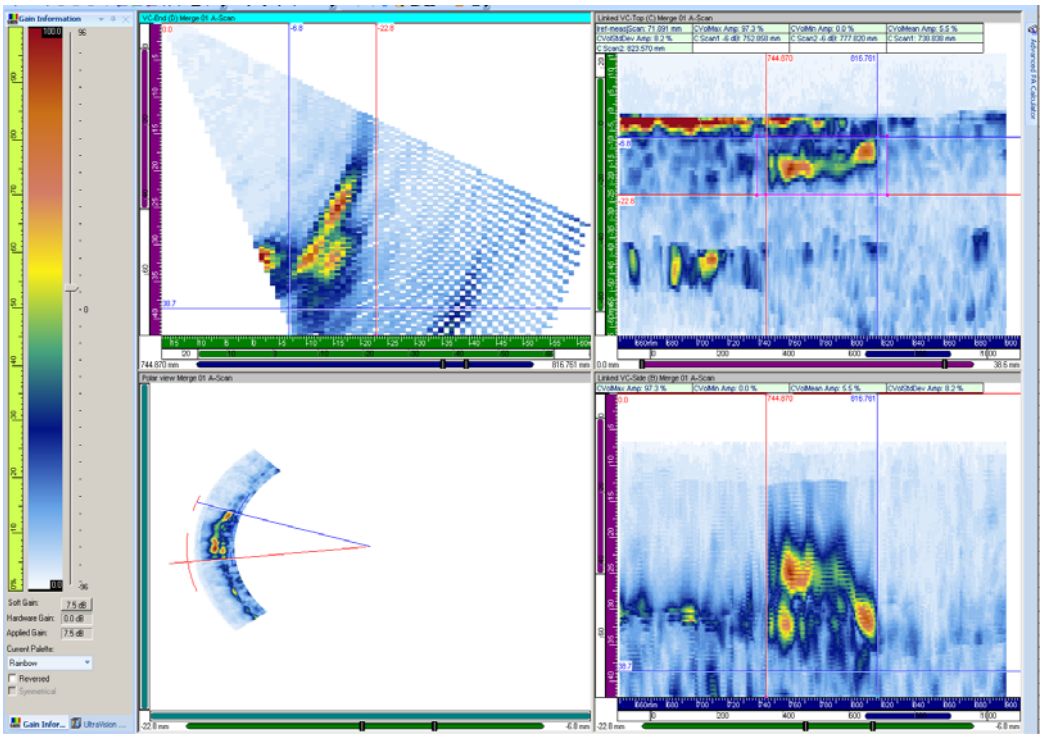


Figure D.38 2.0 MHz Data on Elbow Side of 9C-002, Flaw 3, Merged Image for Length Sizing

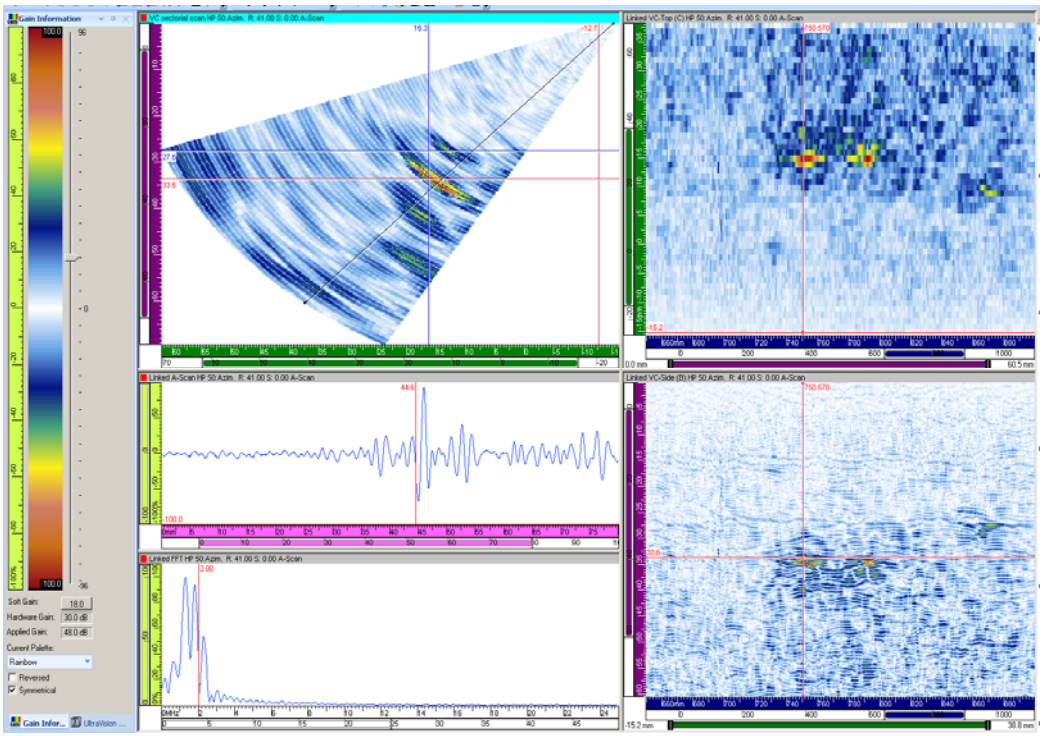


Figure D.39 2.0 MHz Data on Pipe Side of 9C-002, Flaw 3, for Depth Sizing

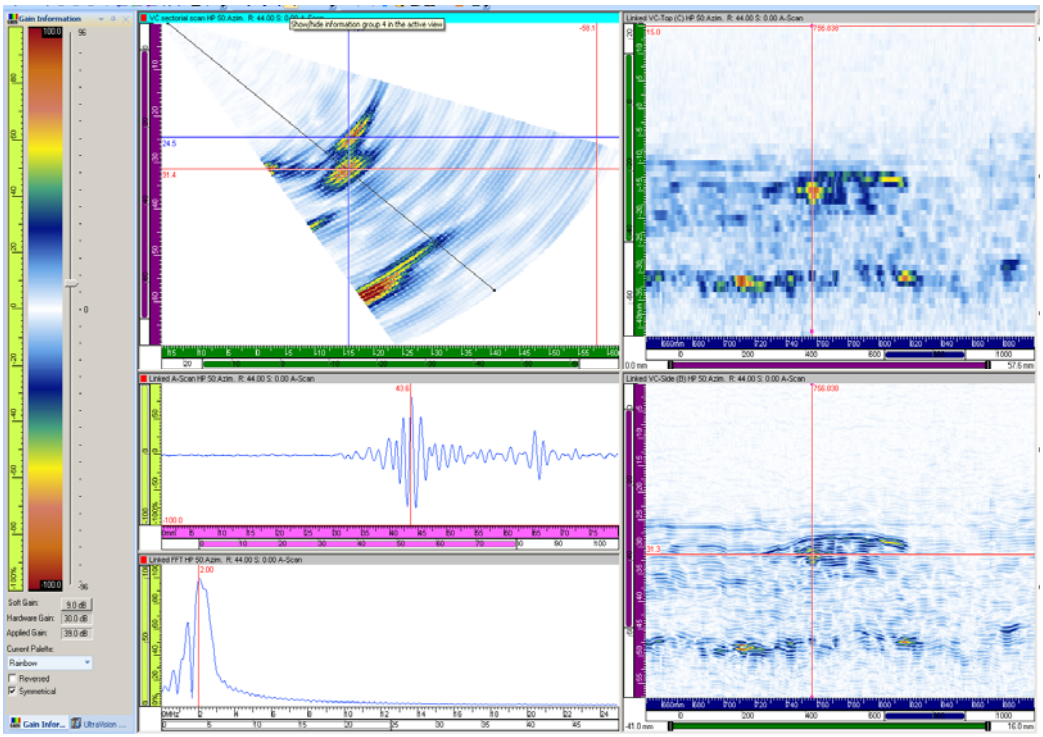


Figure D.40 2.0 MHz Data on Elbow Side of 9C-002, Flaw 3, for Depth Sizing

APPENDIX E

PNNL PHASED-ARRAY DATA ON IN-SITU FLAWS IN THE VALIDATION AND 9C-002 PRESSURIZER SURGE LINE SPECIMENS

APPENDIX E

PNNL PHASED-ARRAY DATA ON IN-SITU FLAWS IN THE VALIDATION AND 9C-002 PRESSURIZER SURGE LINE SPECIMENS

(all scales are in mm)

Figures E.1 through E.30 represent line scan data on flaws 1087, 1089, 1100, 1102, and 1110 at probe frequencies of 0.8, 1.5, and 2.0 MHz.

Merged images for length display:

Top Left:	C-scan top view
Bottom Left:	D-scan end view
Top Right:	Polar view
Bottom Right:	Sector view (B-scan side view)

Figures E.31–E.45 represent raster scan data on flaws 1087, 1089, 1100, 1102, and 1110 at probe frequencies of 0.8, 1.5, and 2.0 MHz.

Images display

Top Left:	Sector view
Bottom Left:	D-scan end view
Top Right:	C-Scan top view
Bottom Right:	B-scan side view

Or

Left:	D-scan end view
Top Right:	C-Scan top view
Bottom Right:	B-scan side view

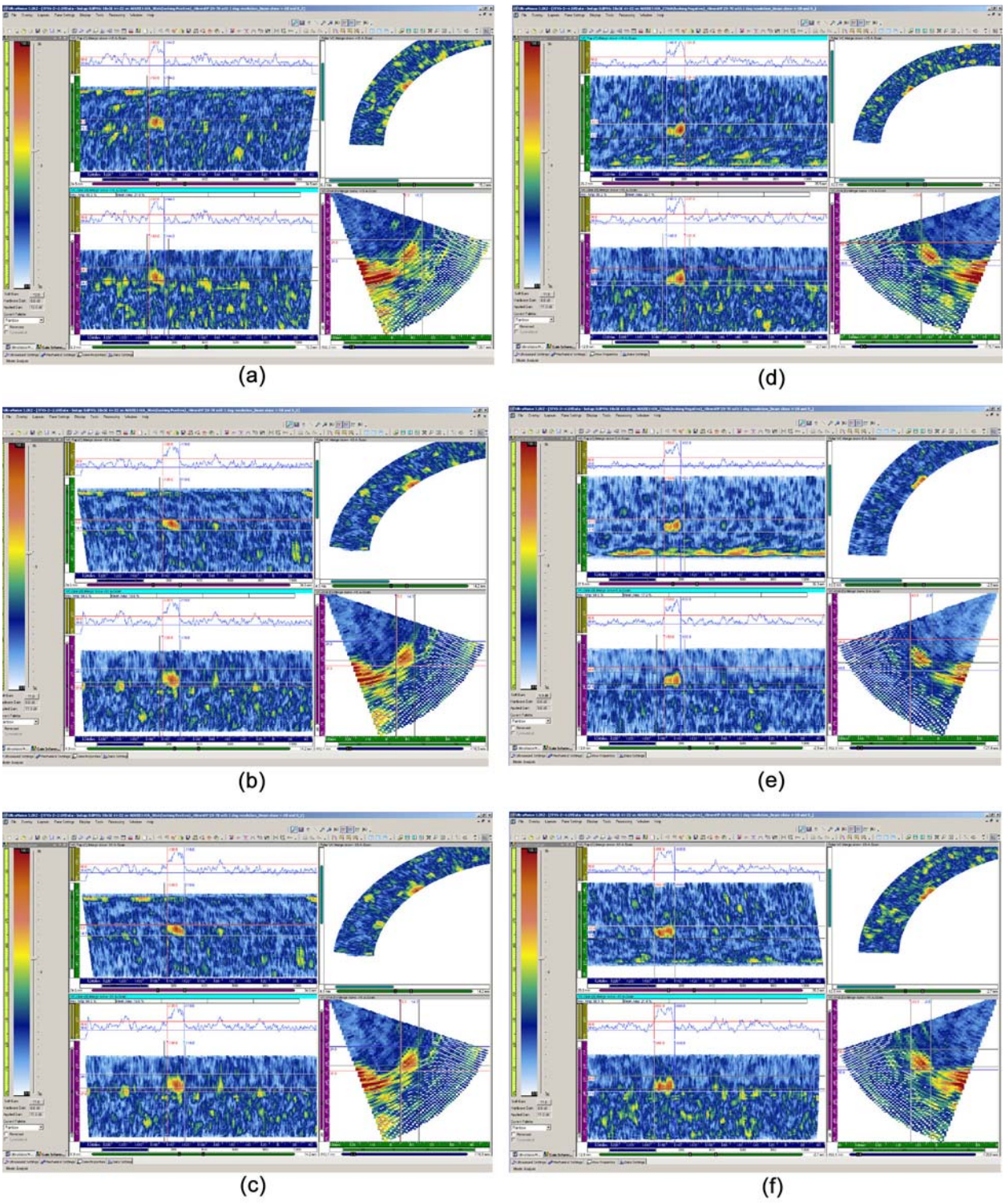


Figure E.1 0.8 MHz on Validation Specimen, Flaw 1087 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

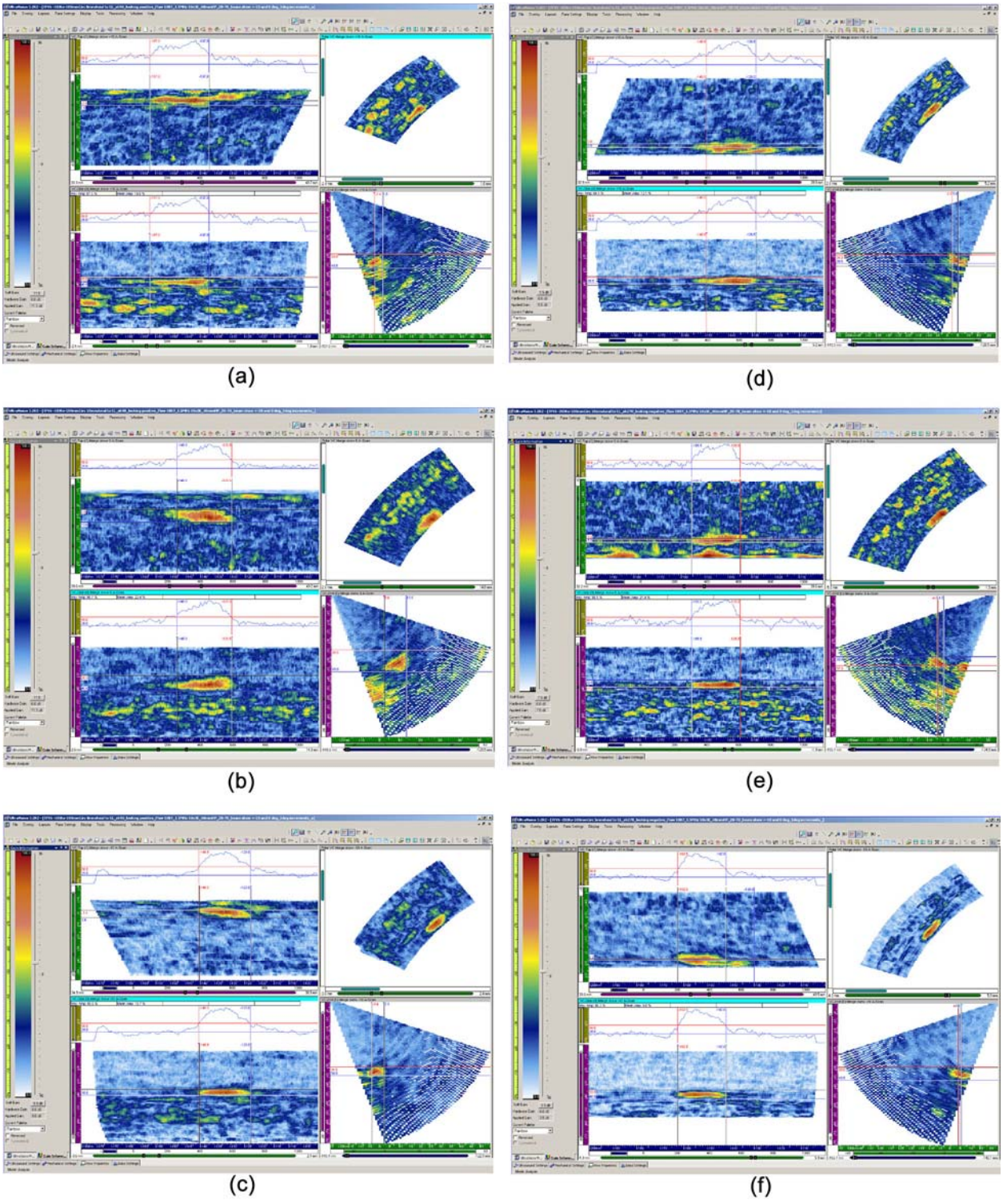


Figure E.2 1.5 MHz on Validation Specimen, Flaw 1087 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

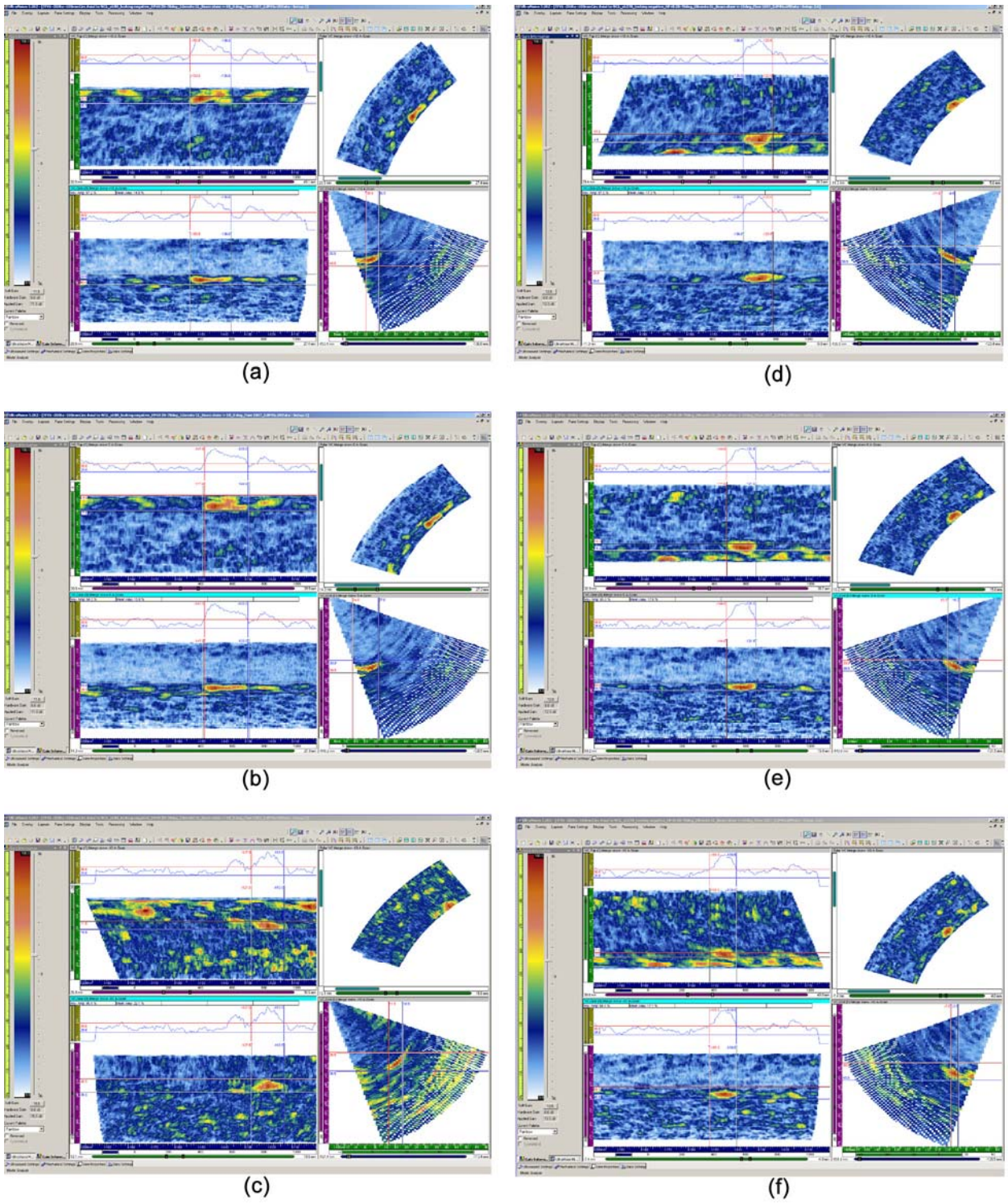
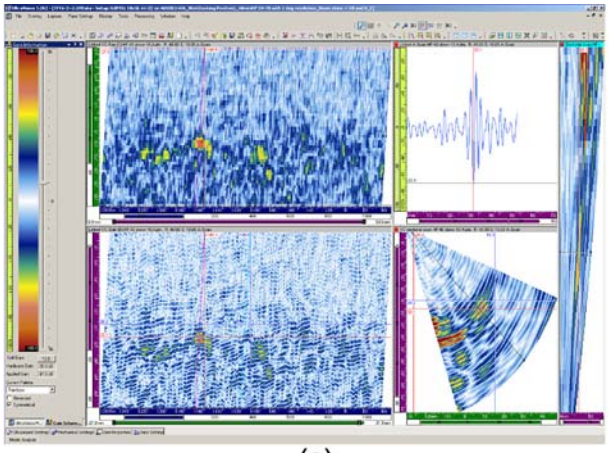
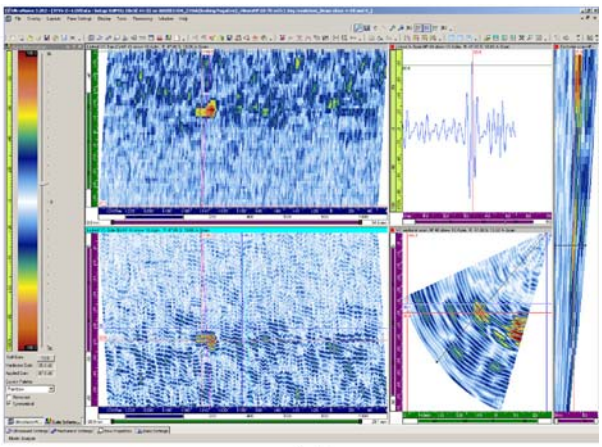


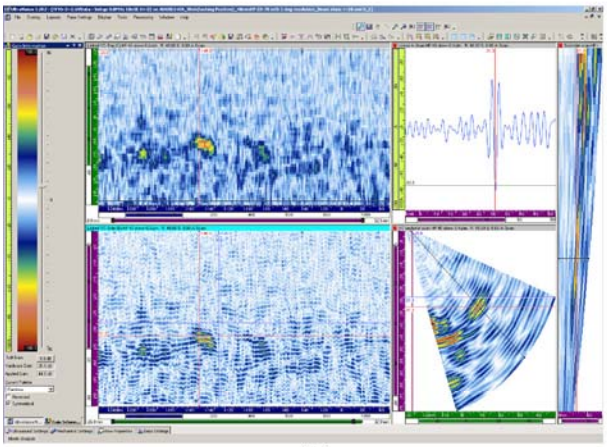
Figure E.3 2.0 MHz on Validation Specimen, Flaw 1087 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10



(a)



(d)



(b)

No Tip Detected for Skew 0

(e)

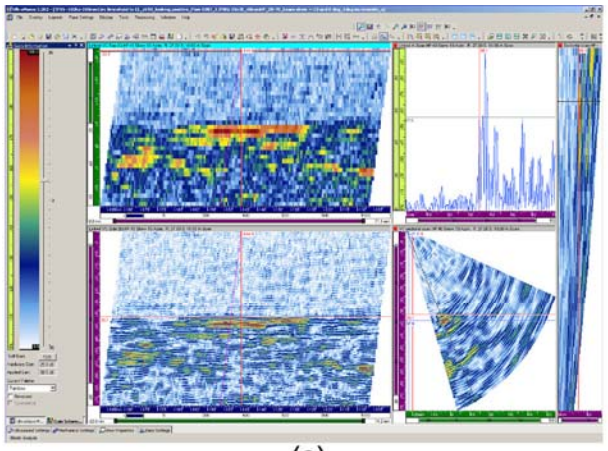
No Tip Detected for Skew -10

(c)

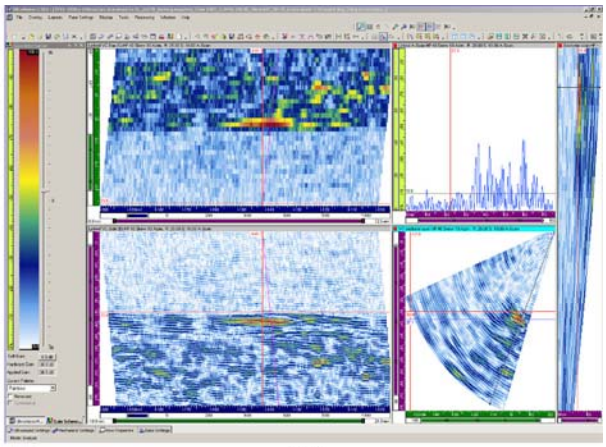
No Tip Detected for Skew -10

(f)

Figure E.4 0.8 MHz on Validation Specimen, Flaw 1087 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10



(a)



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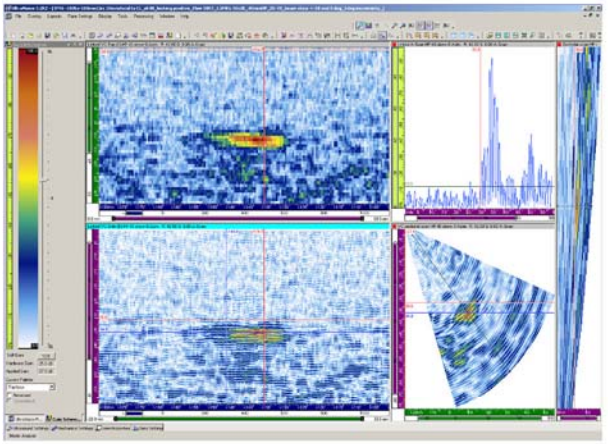
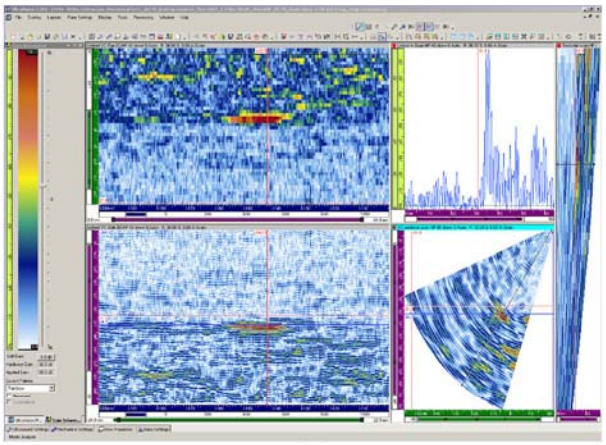
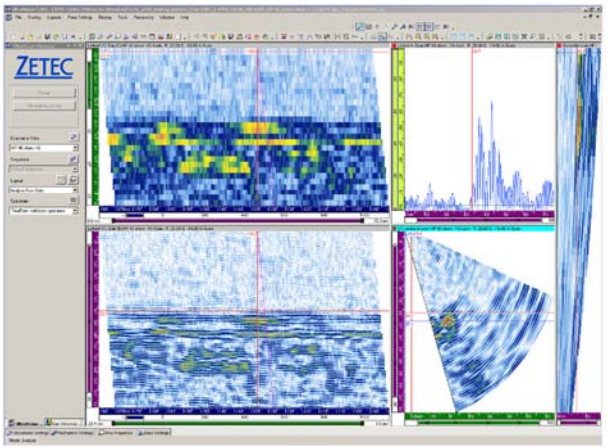


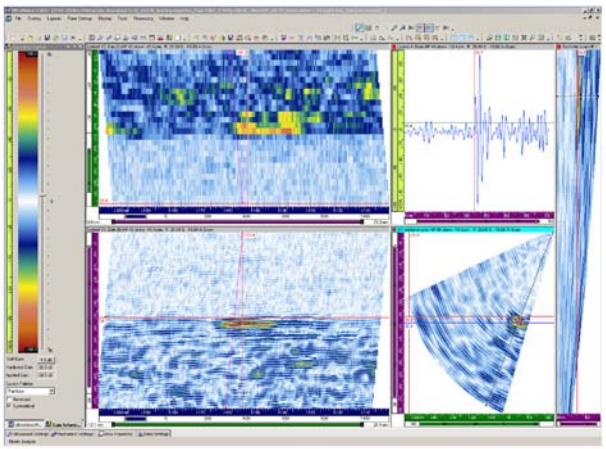
(b)



(e)



(c)



(f)

Figure E.5 1.5 MHz on Validation Specimen, Flaw 1087 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

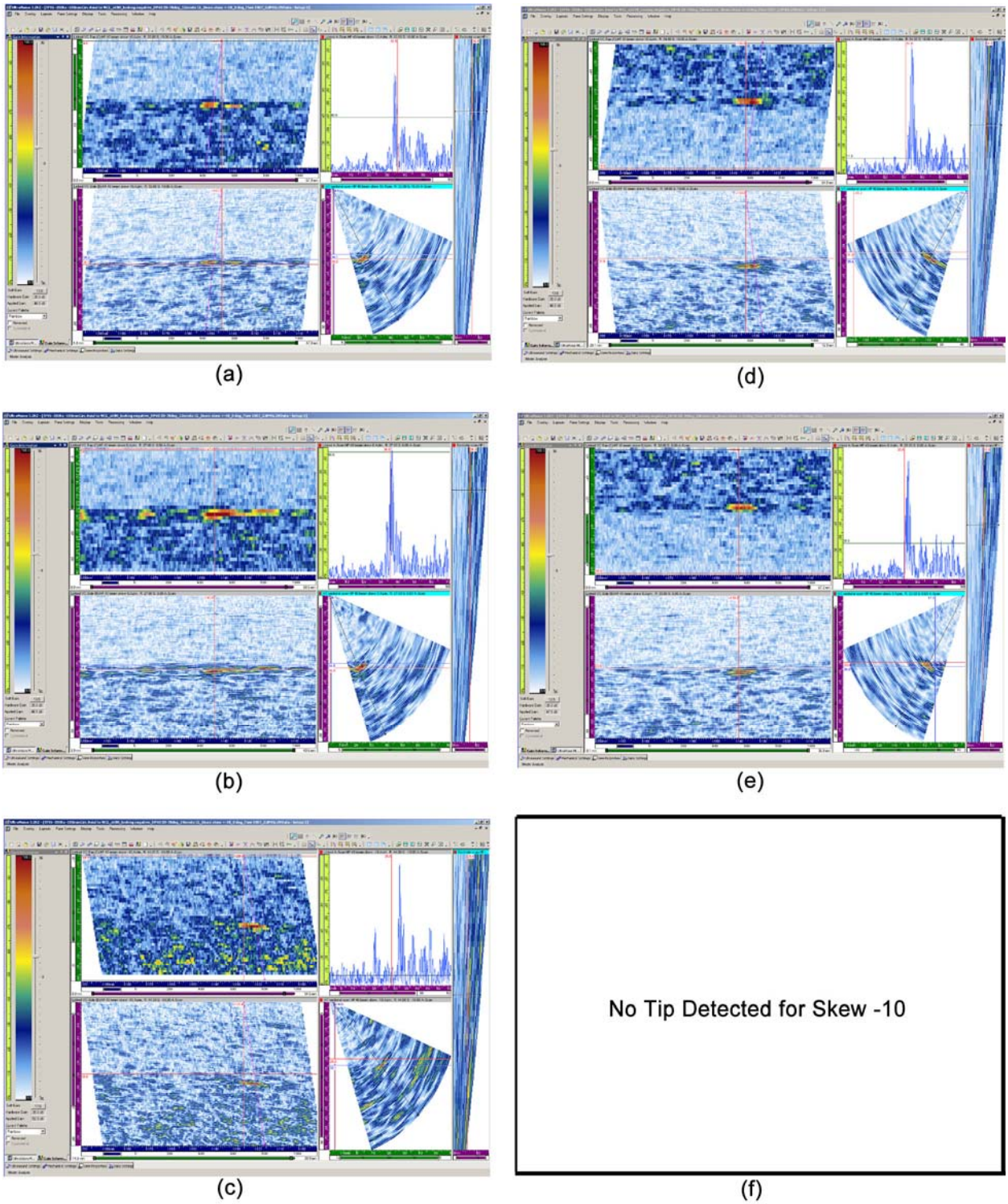


Figure E.6 2.0 MHz on Validation Specimen, Flaw 1087 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

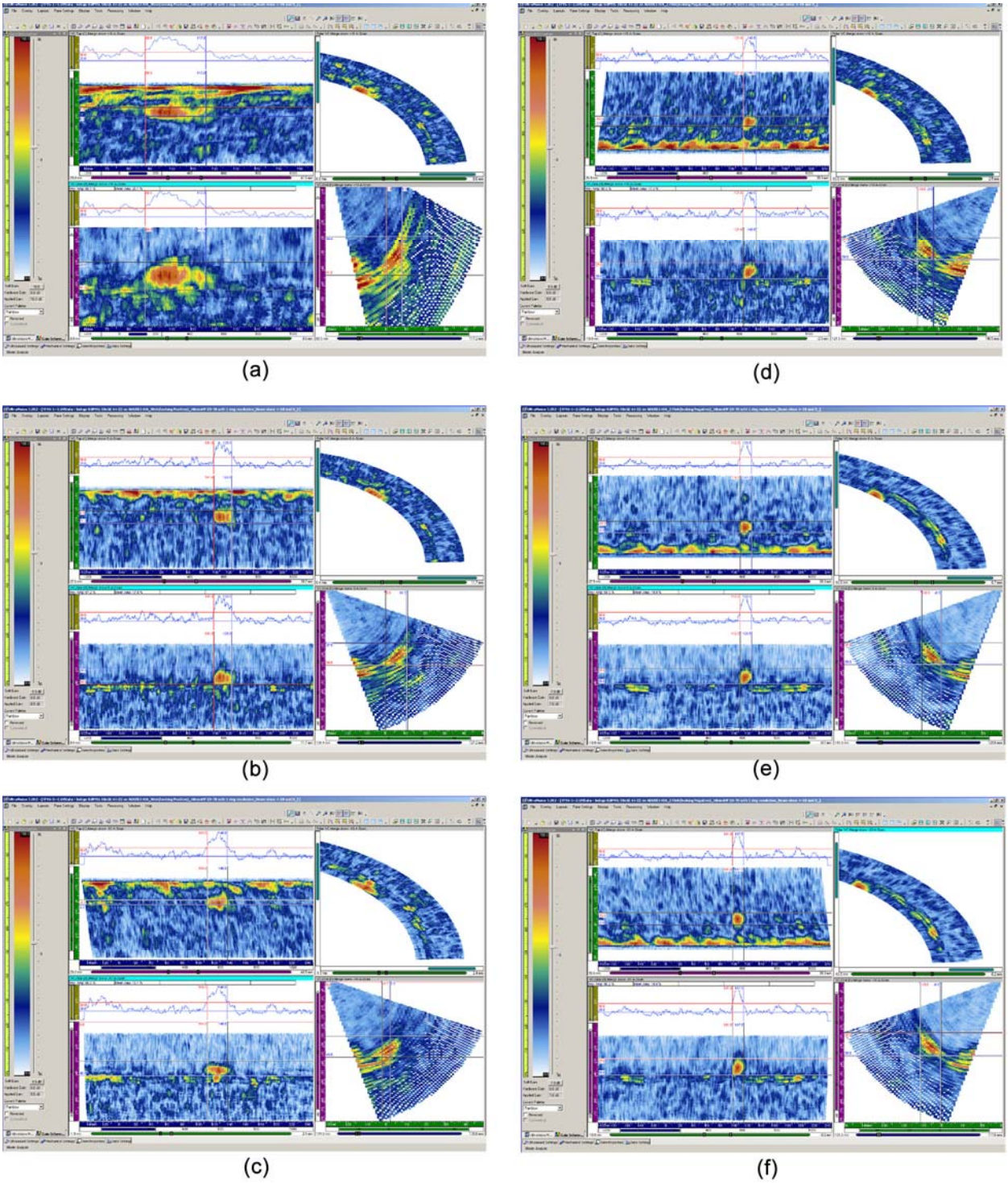


Figure E.7 0.8 MHz on Validation Specimen, Flaw 1089 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

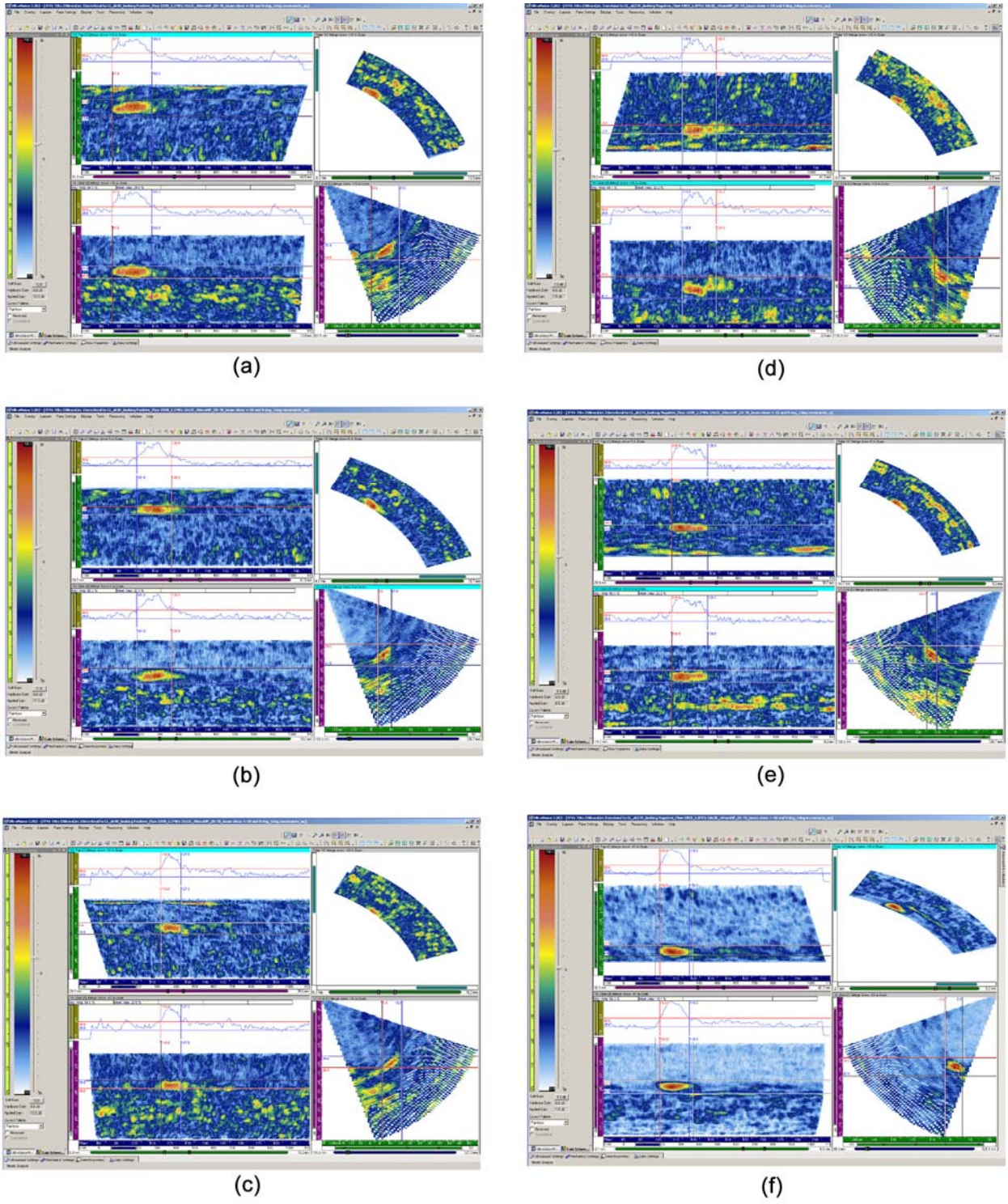


Figure E.8 1.5 MHz on Validation Specimen, Flaw 1089 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

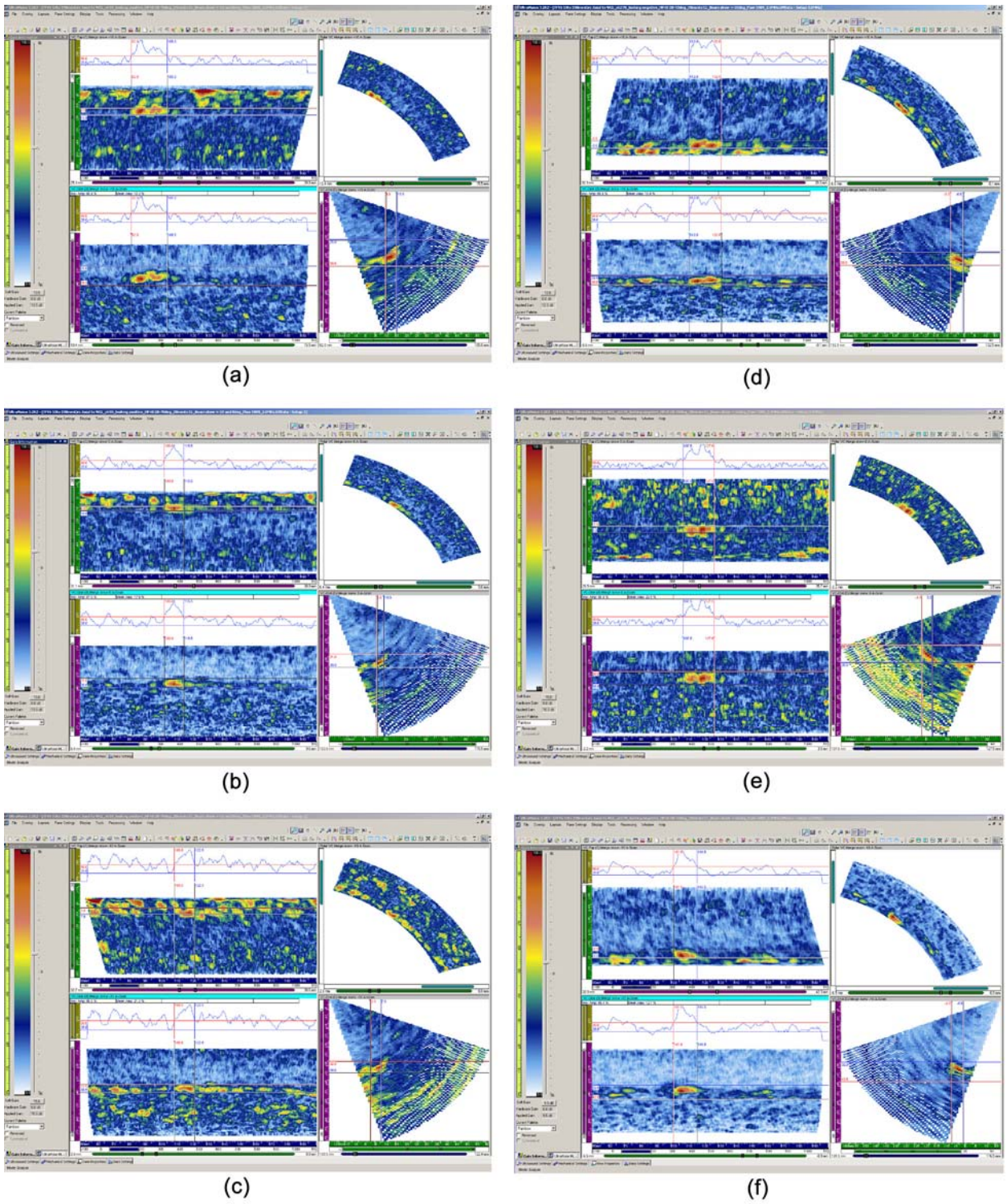
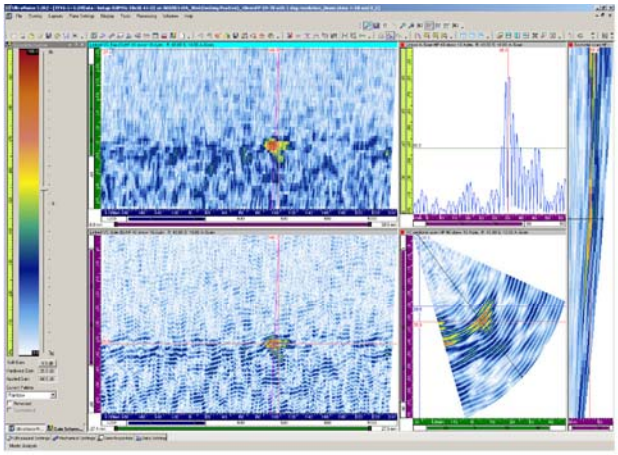
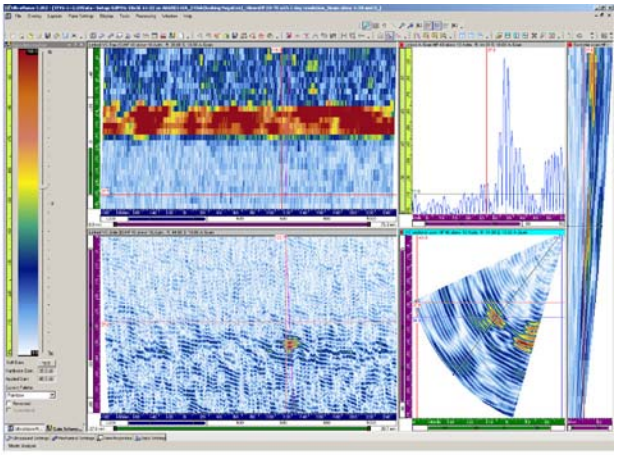


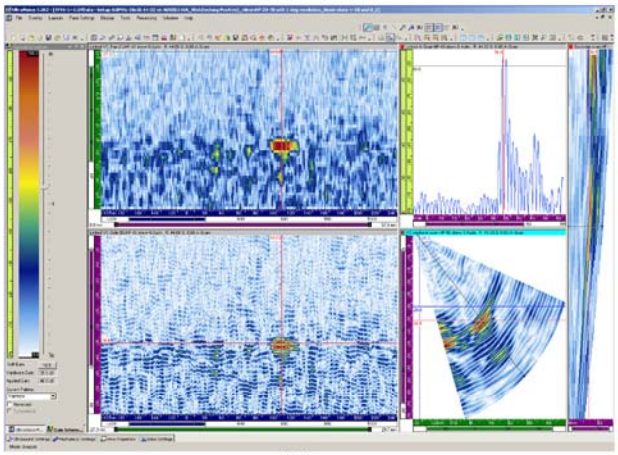
Figure E.9 2.0 MHz on Validation Specimen, Flaw 1089 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10



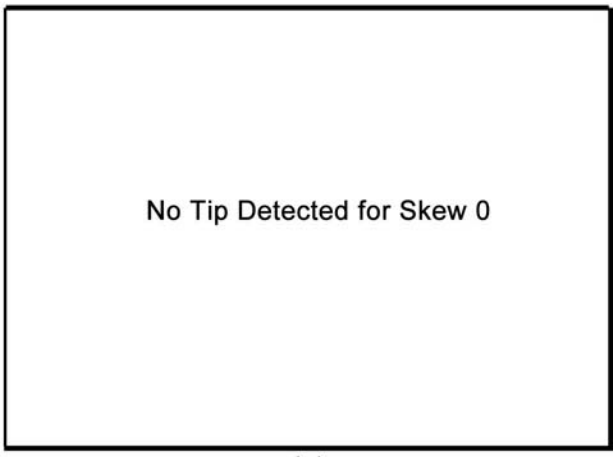
(a)



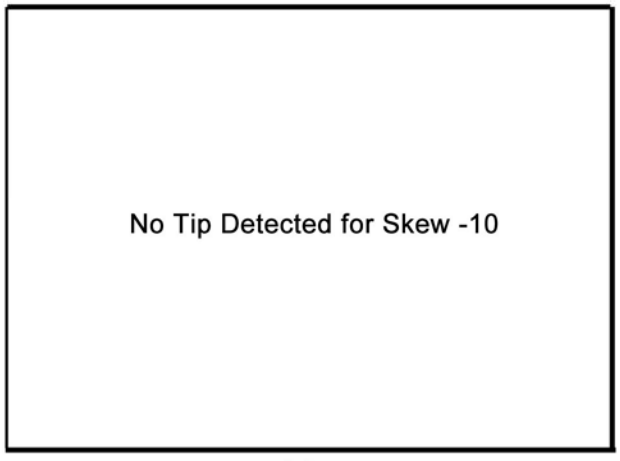
(d)



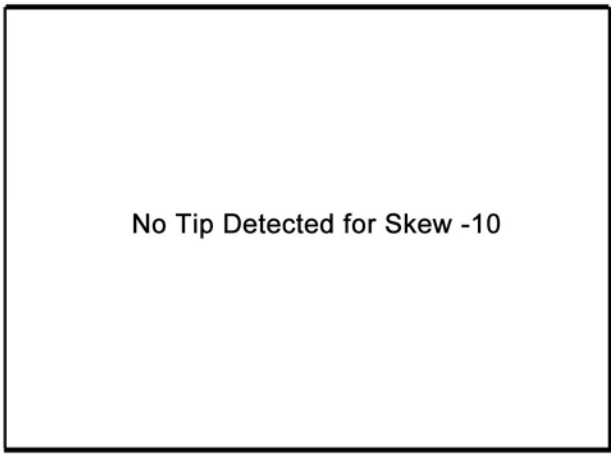
(b)



(e)

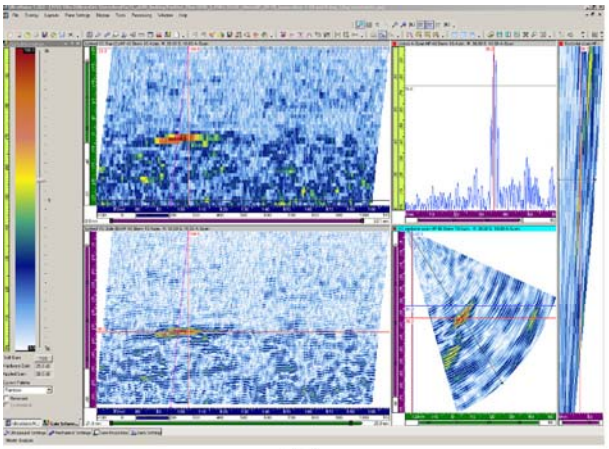


(c)

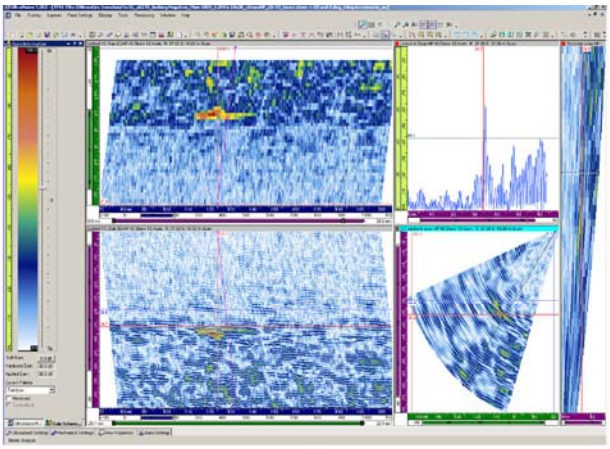


(f)

Figure E.10 0.8 MHz on Validation Specimen, Flaw 1089 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10



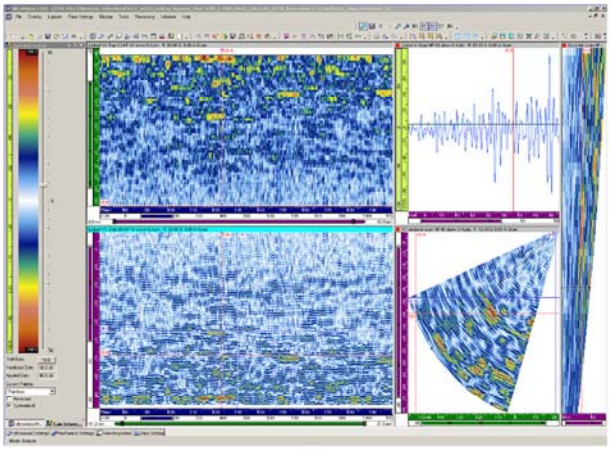
(a)



(d)

No Tip Detected for Skew 0

(b)



(e)

No Tip Detected for Skew -10

(c)

No Tip Detected for Skew -10

(f)

Figure E.11 1.5 MHz on Validation Specimen, Flaw 1089 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

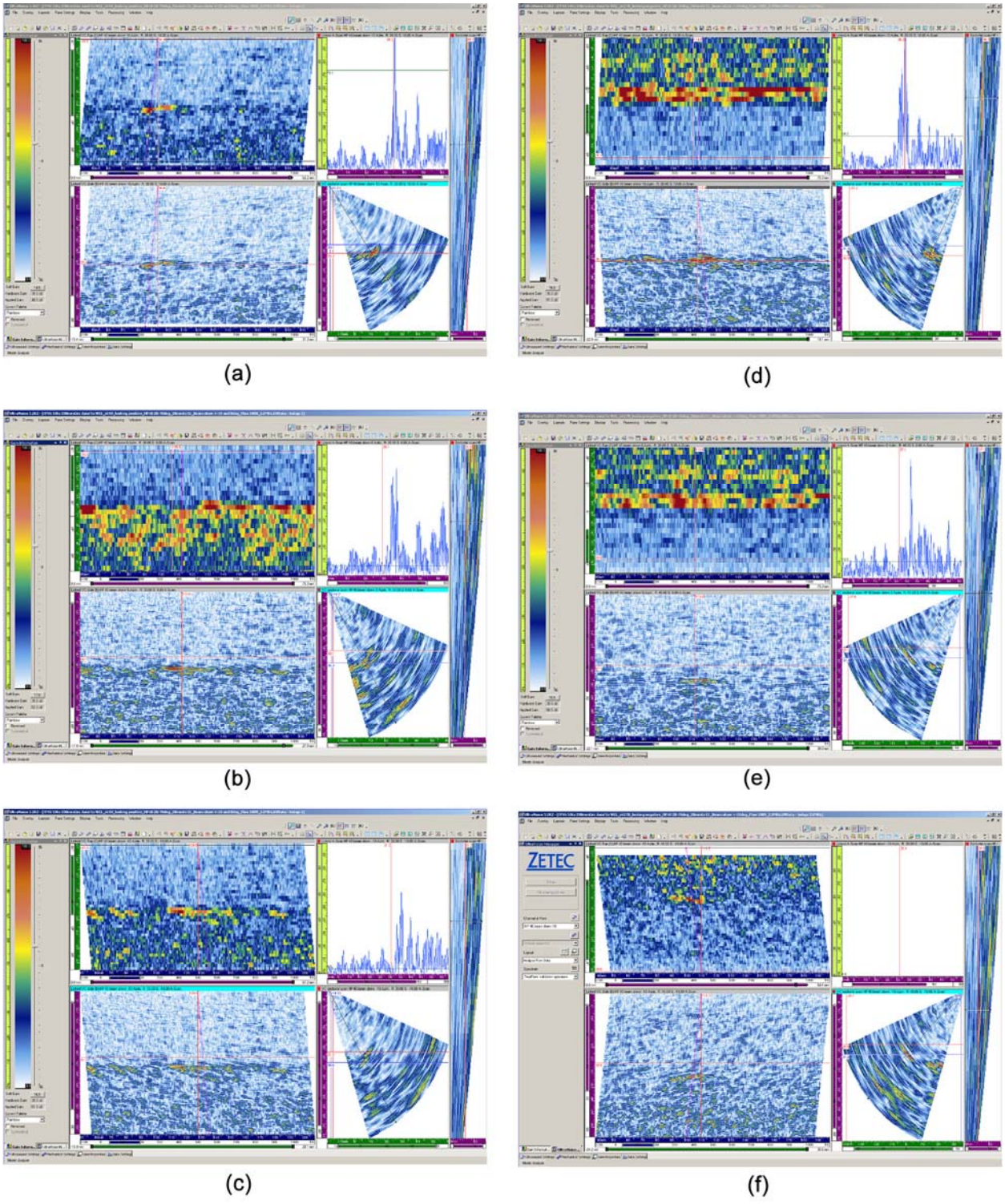


Figure E.12 2.0 MHz on Validation Specimen, Flaw 1089 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

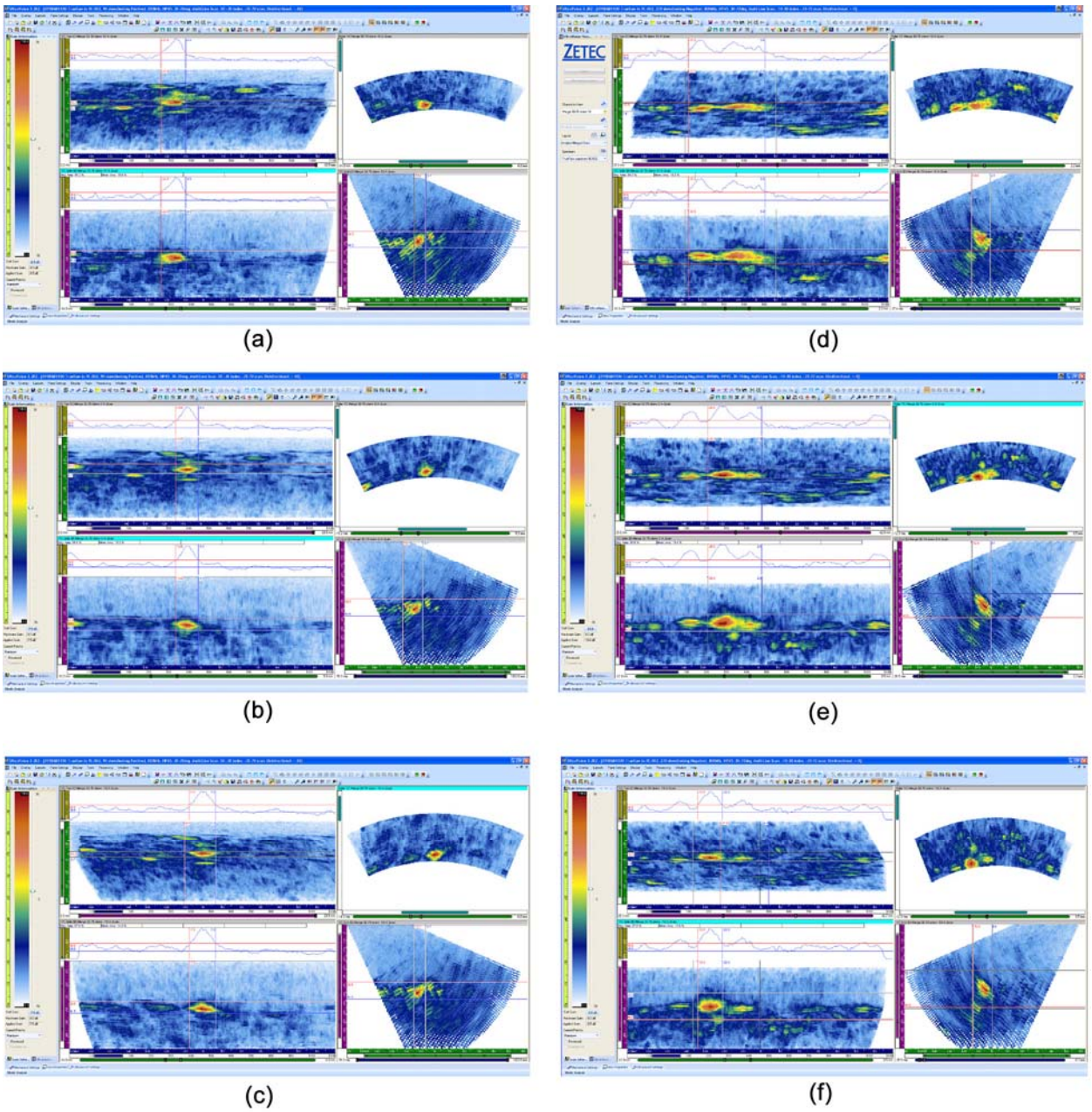


Figure E.13 0.8 MHz on 9C-002, Flaw 1100 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

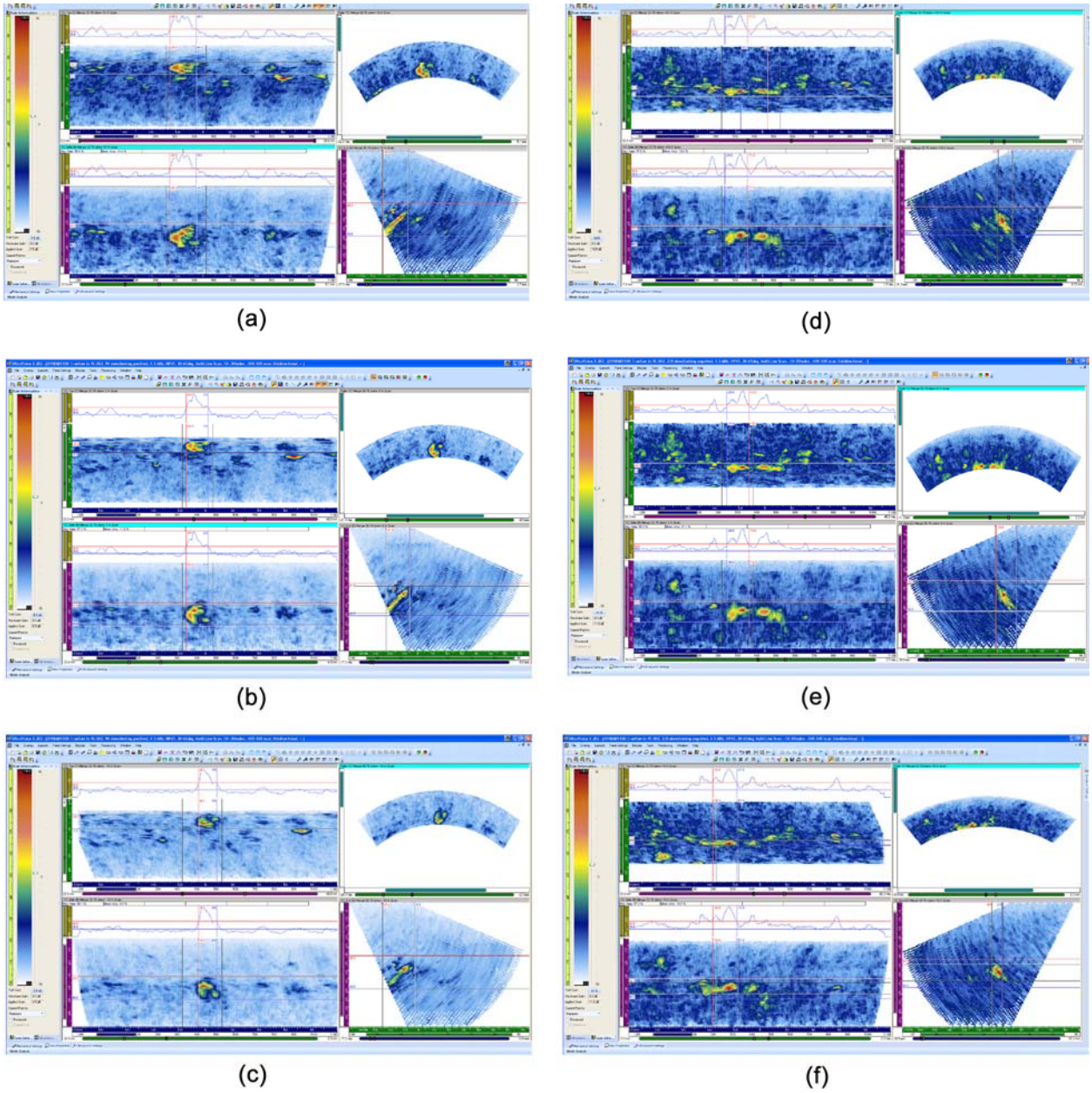


Figure E.14 1.5 MHz on 9C-002, Flaw 1100 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

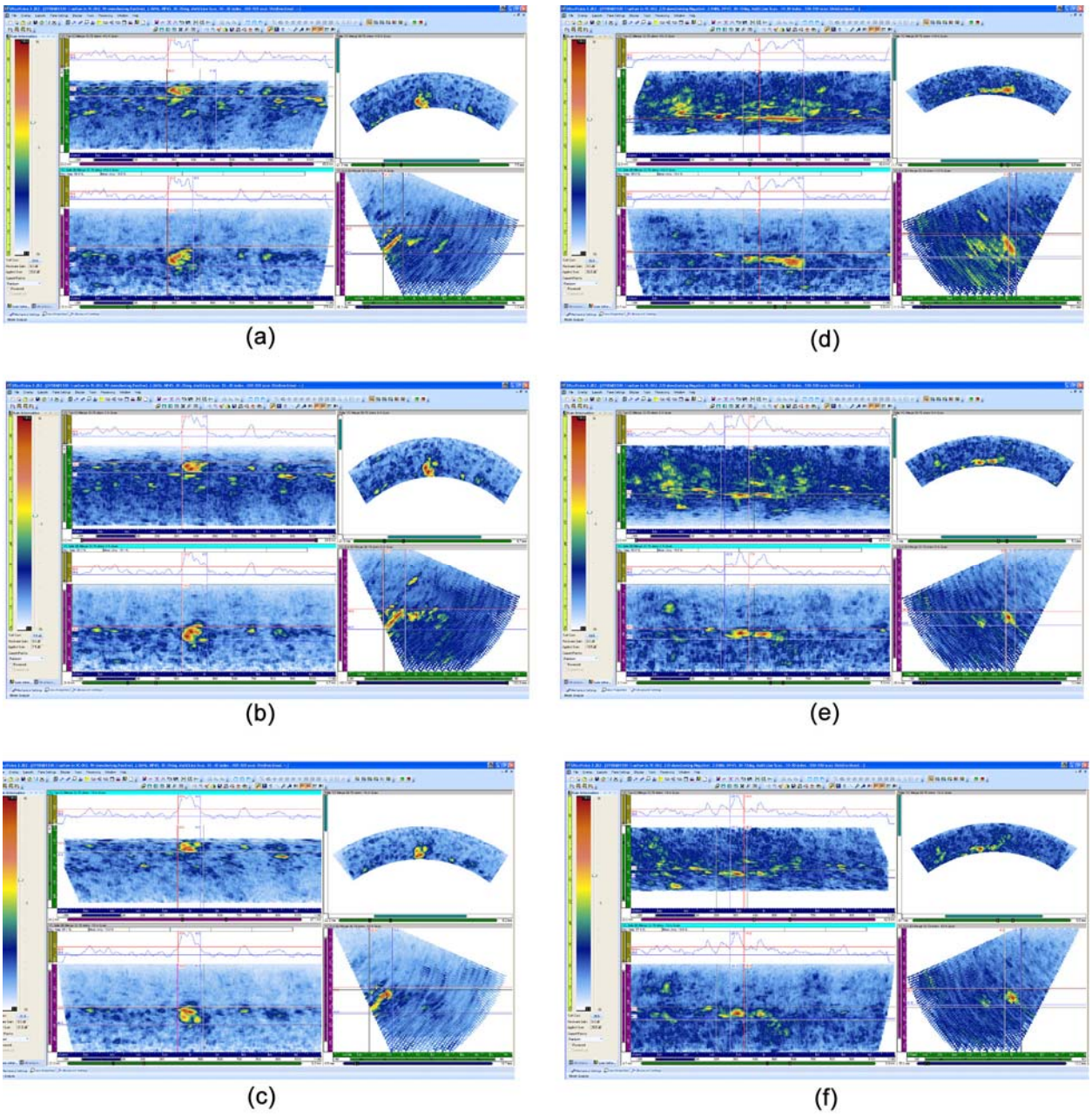


Figure E.15 2.0 MHz on 9C-002, Flaw 1100 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative, (d) Skew +10, (e) Skew 0, (f) Skew −10

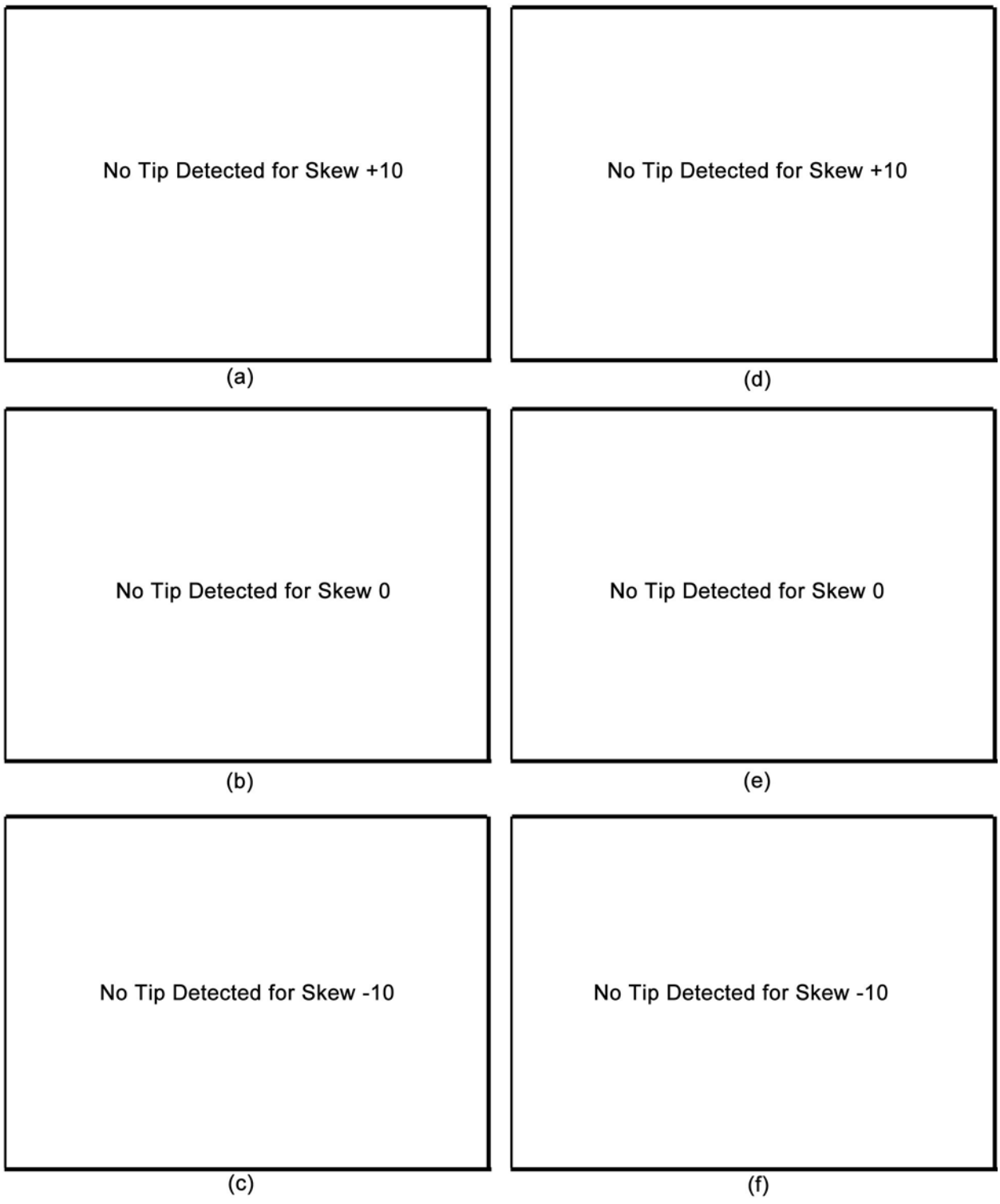


Figure E.16 0.8 MHz on 9C-002, Flaw 1100 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

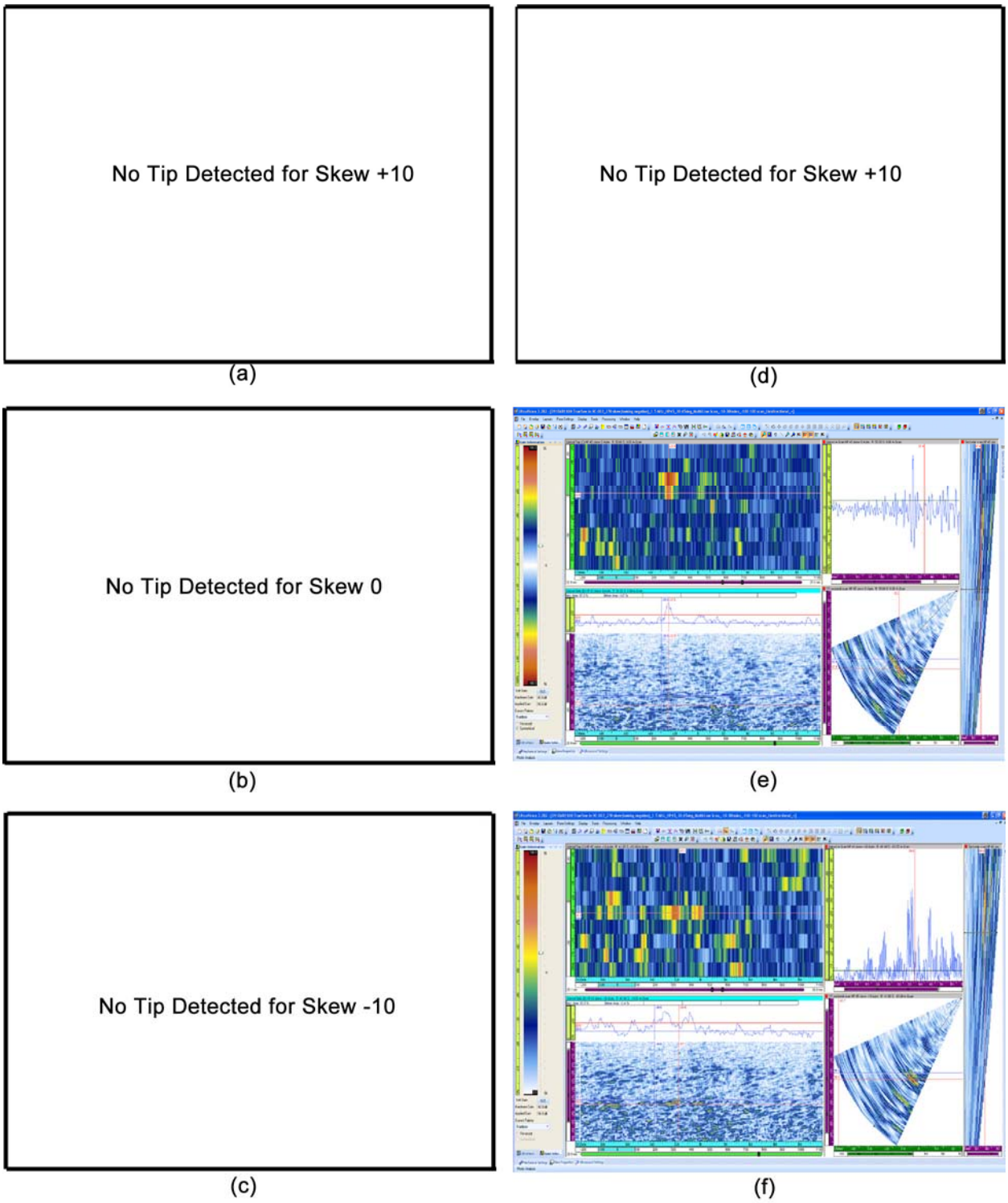


Figure E.17 1.5 MHz on 9C-002, Flaw 1100 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

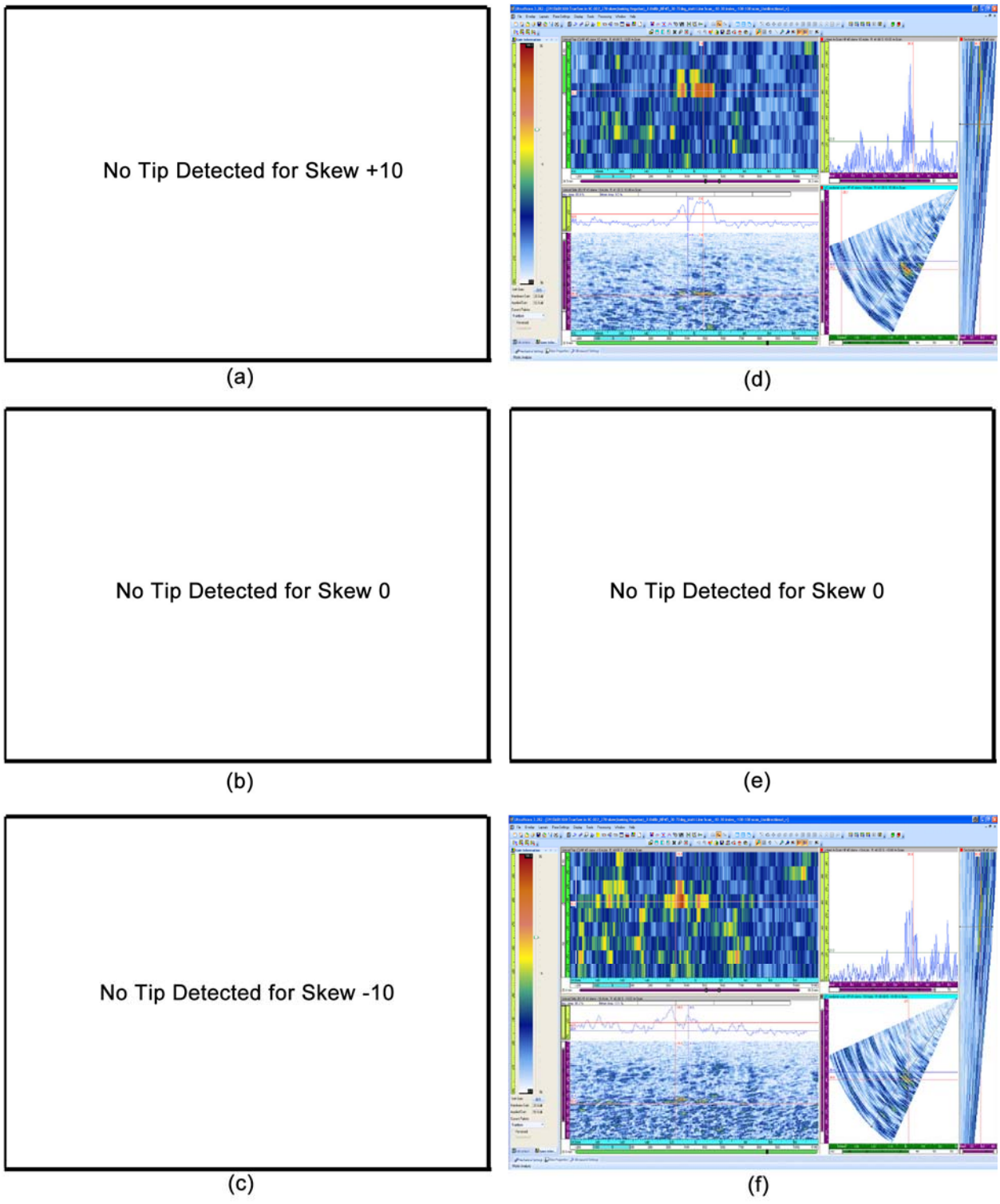


Figure E.18 2.0 MHz on 9C-002, Flaw 1100 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

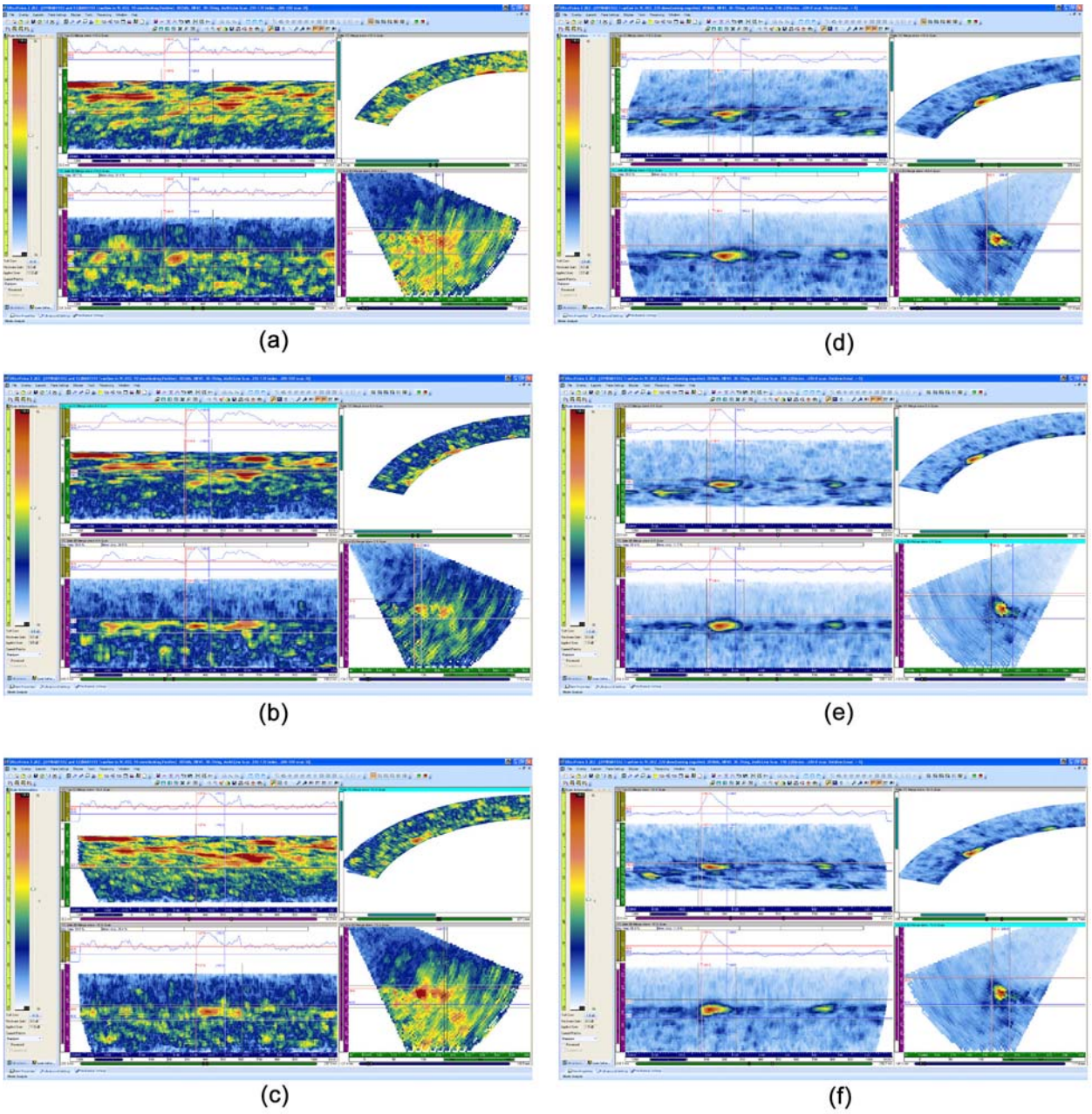


Figure E.19 0.8 MHz on 9C-002, Flaw 1102 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

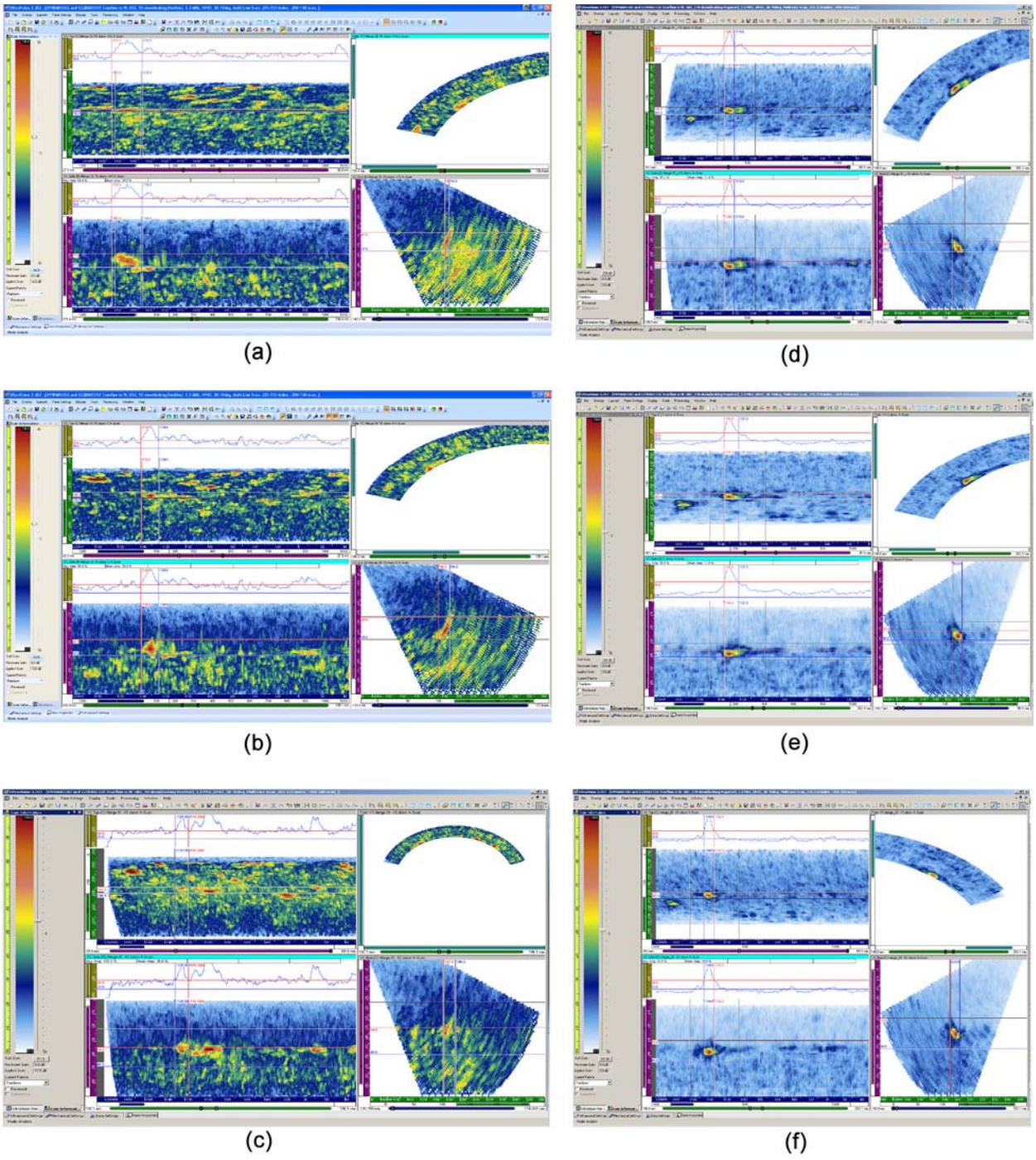


Figure E.20 1.5 MHz on 9C-002, Flaw 1102 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

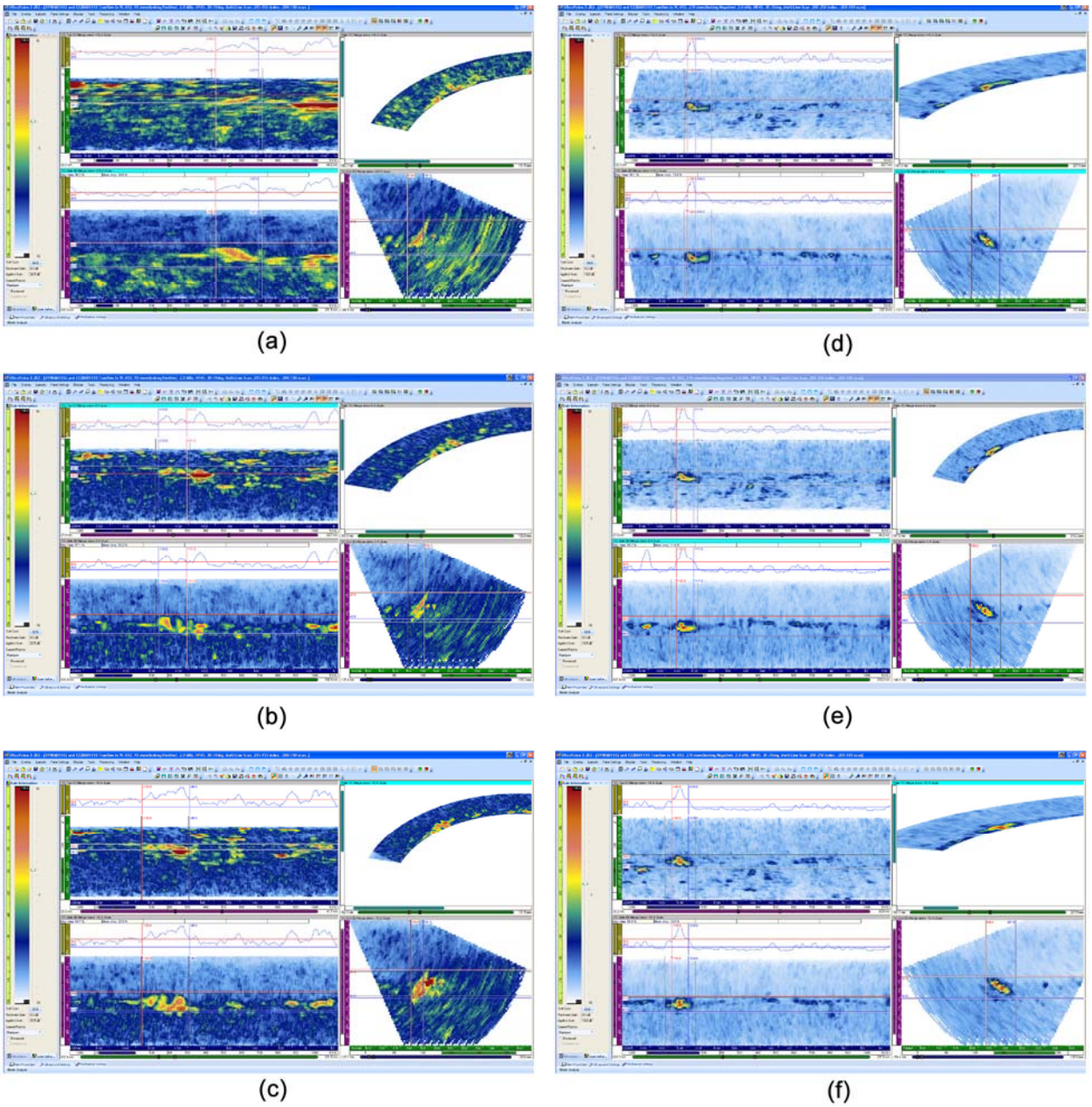


Figure E.21 2.0 MHz on 9C-002, Flaw 1102 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

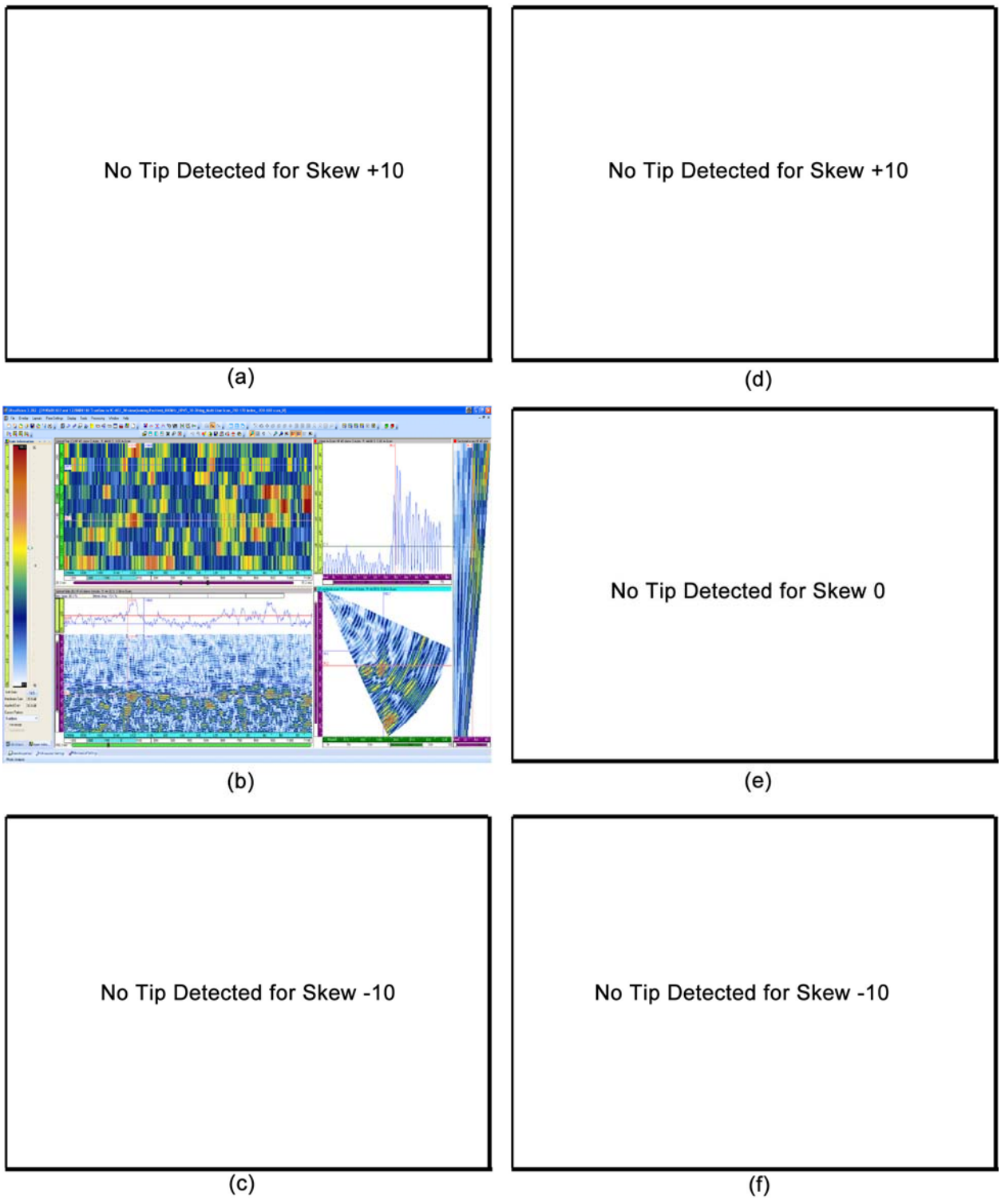


Figure E.22 0.8 MHz on 9C-002, Flaw 1102 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

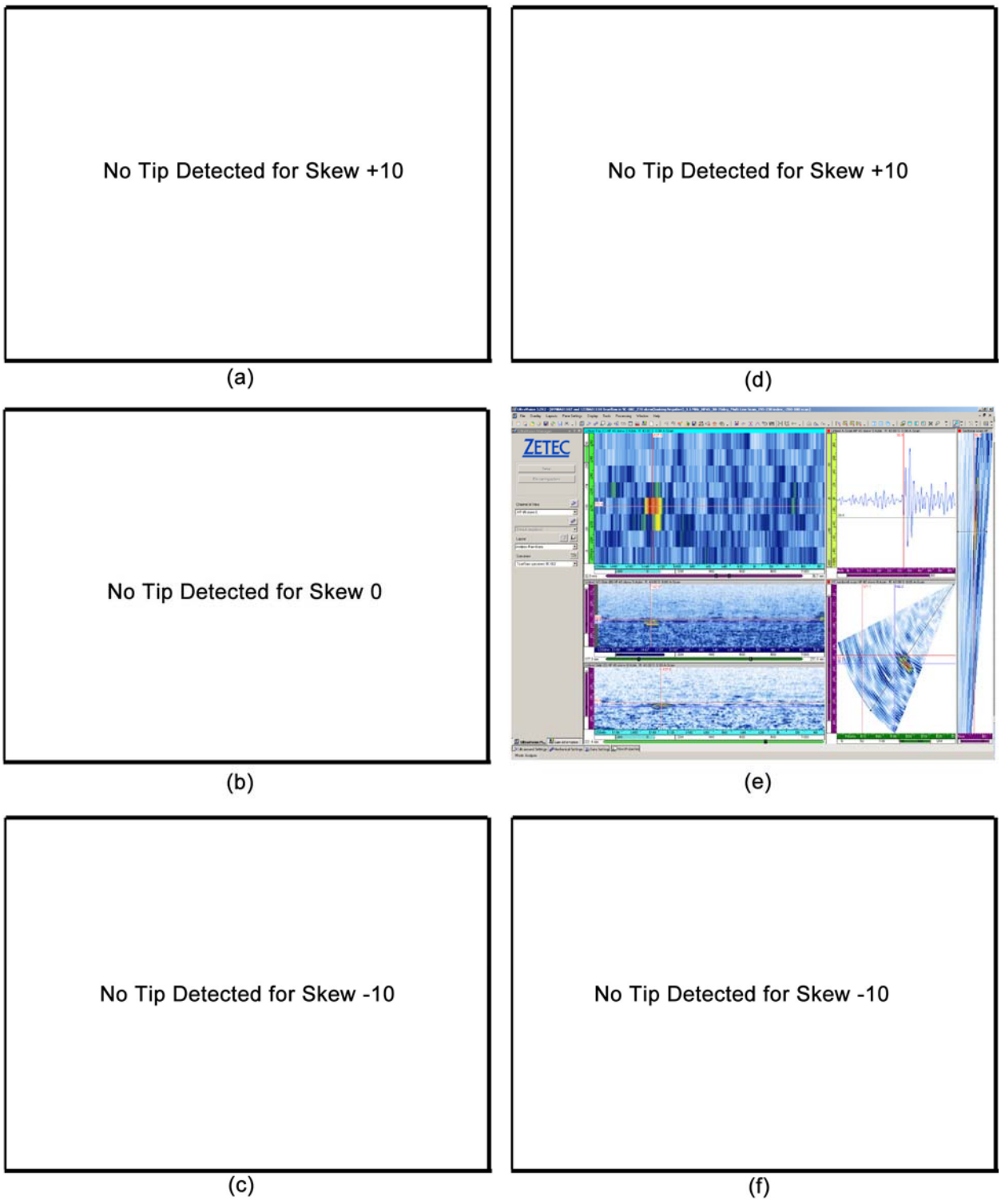


Figure E.23 1.5 MHz on 9C-002, Flaw 1102 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

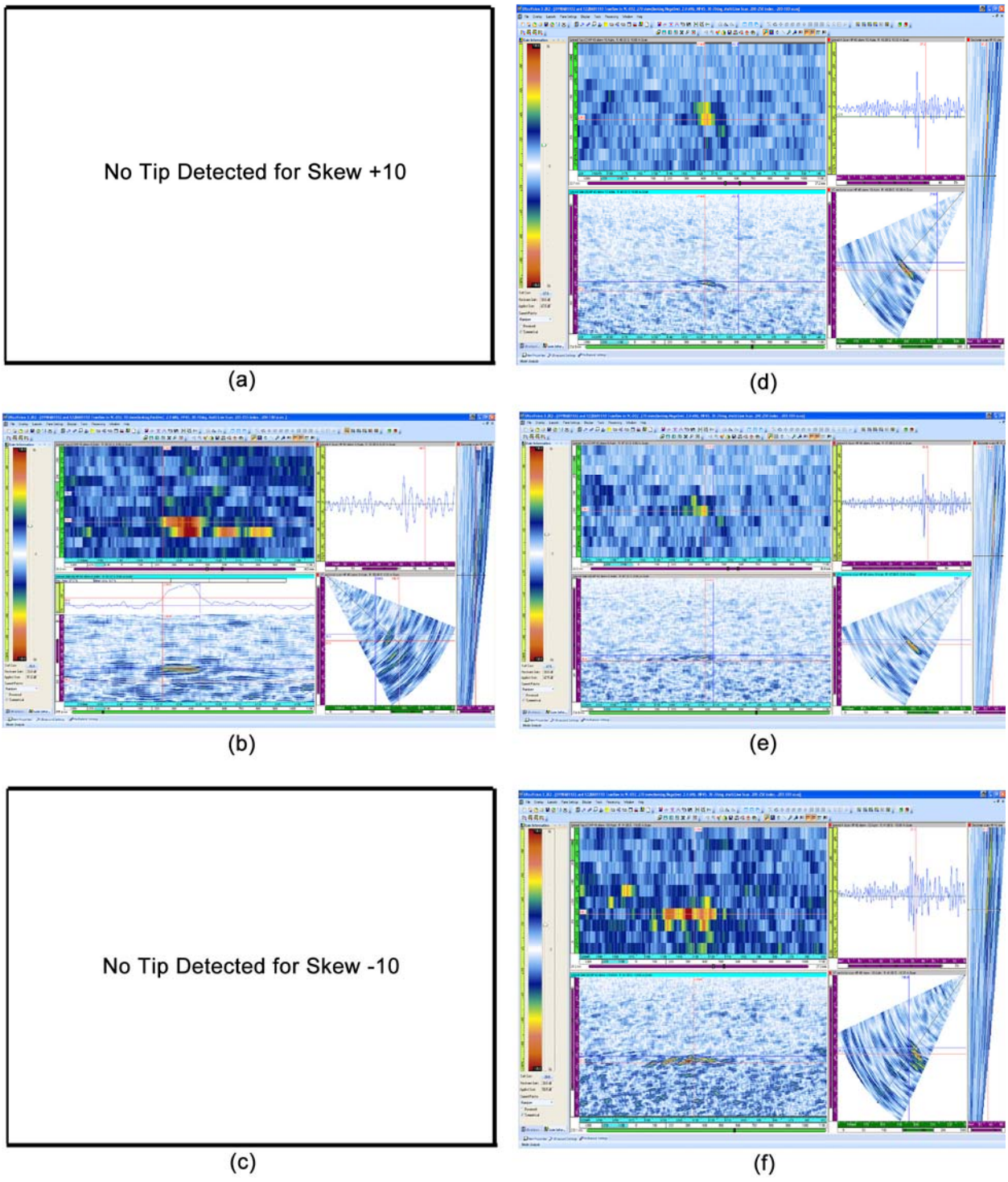


Figure E.24 2.0 MHz on 9C-002, Flaw 1102 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

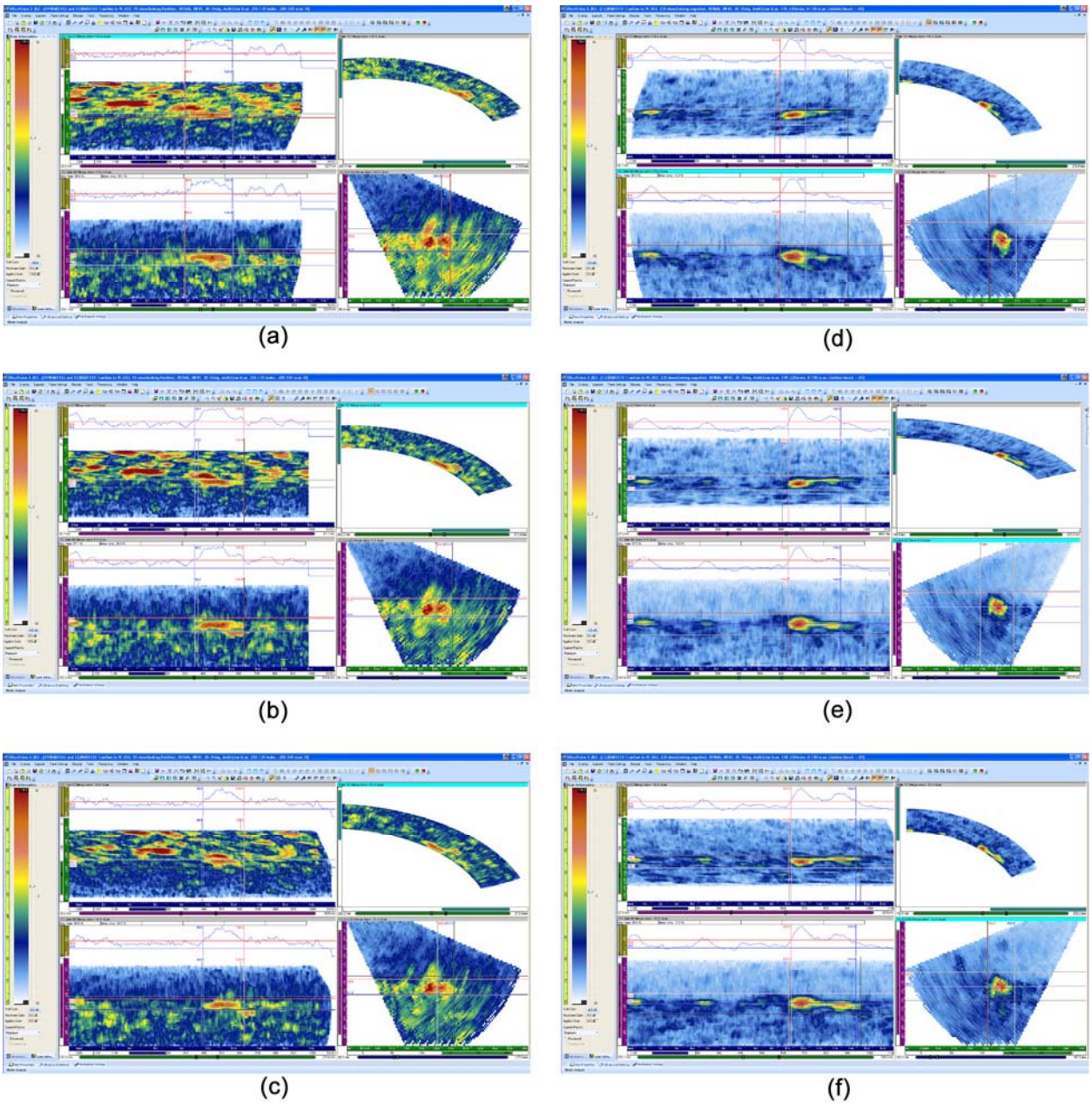


Figure E.25 0.8 MHz on 9C-002, Flaw 1110 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

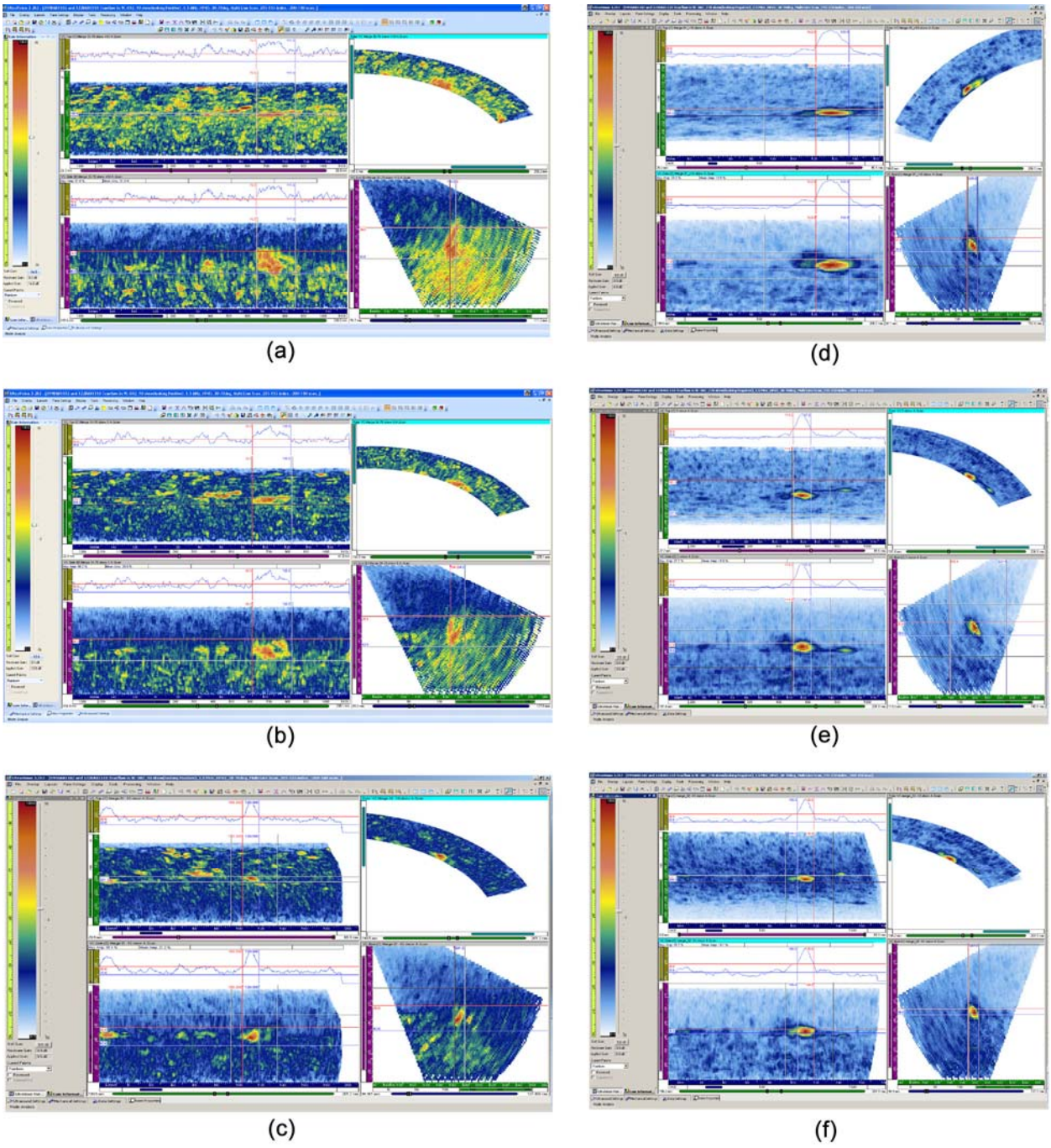


Figure E.26 1.5 MHz on 9C-002, Flaw 1110 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

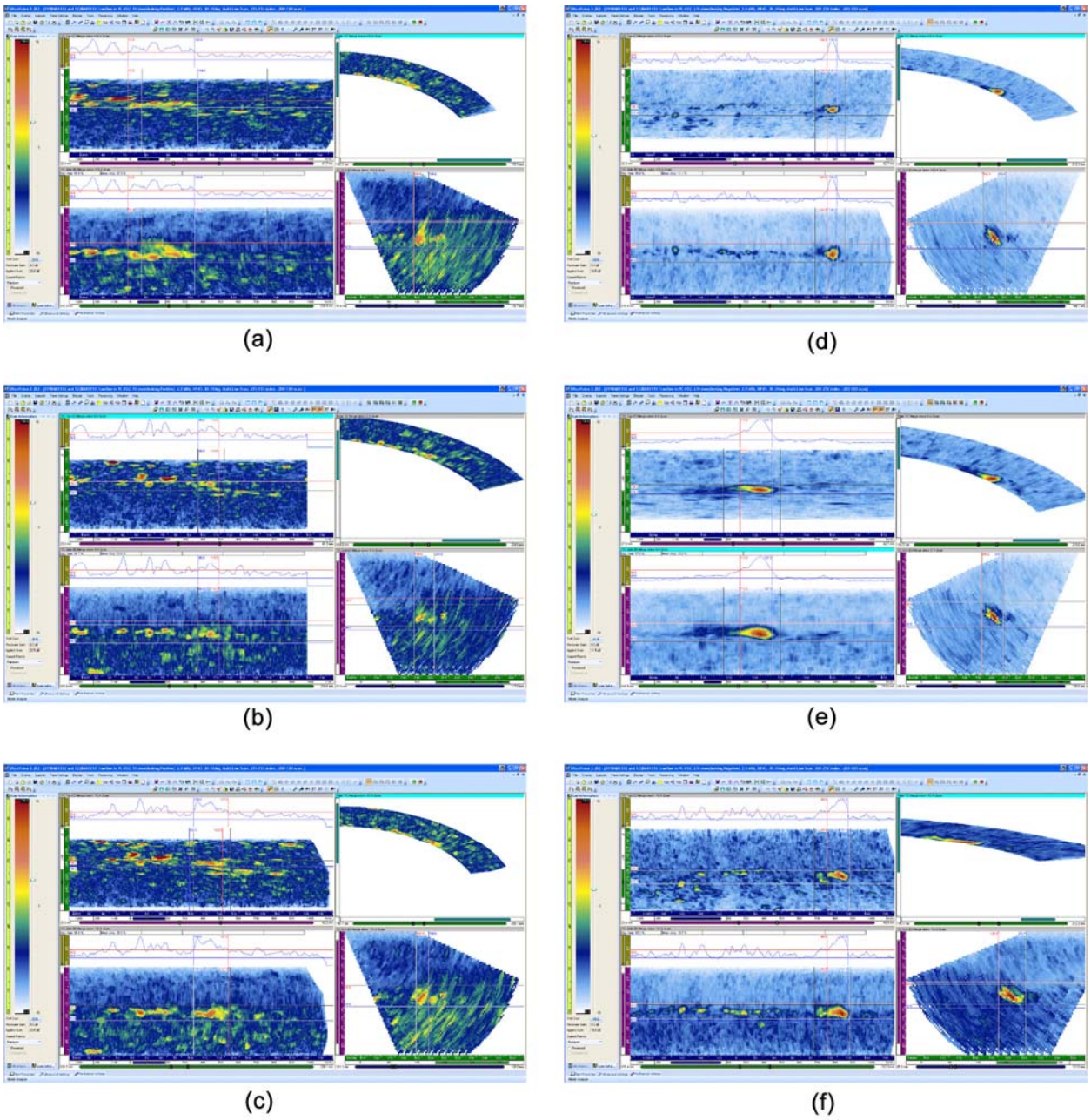


Figure E.27 2.0 MHz on 9C-002, Flaw 1110 Merged Image for Length Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

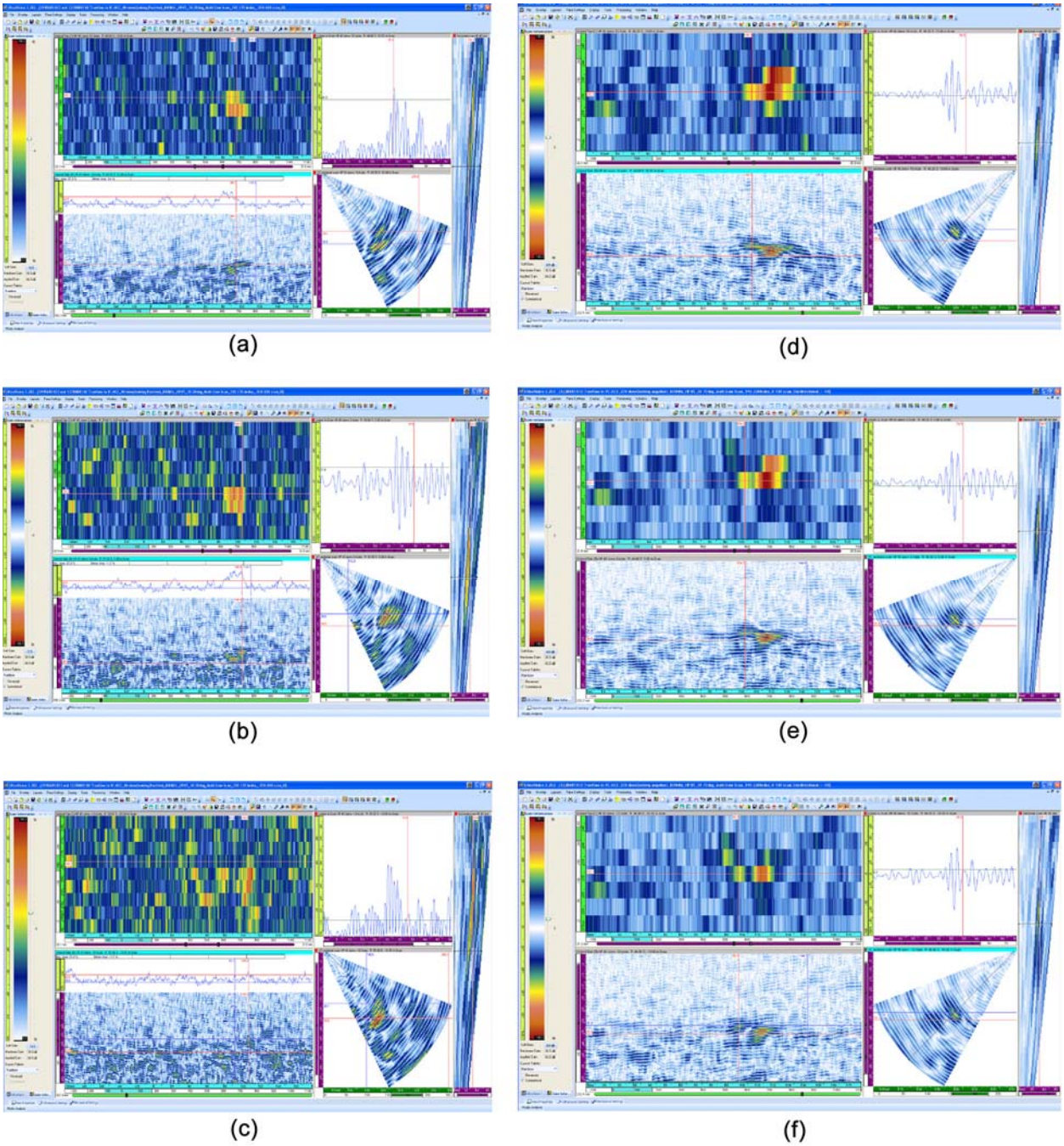


Figure E.28 0.8 MHz on 9C-002, Flaw 1110 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

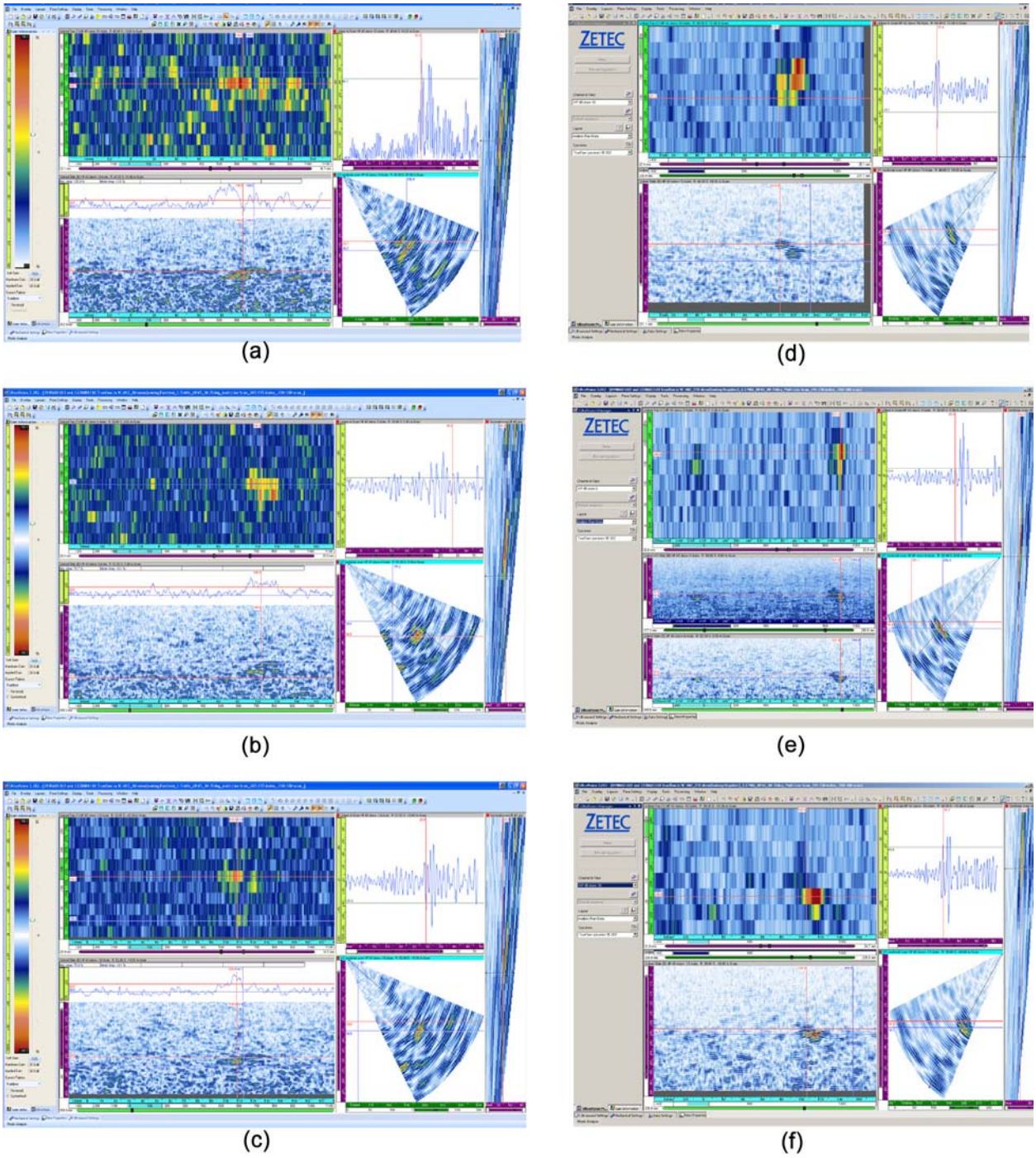


Figure E.29 1.5 MHz on 9C-002, Flaw 1110 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

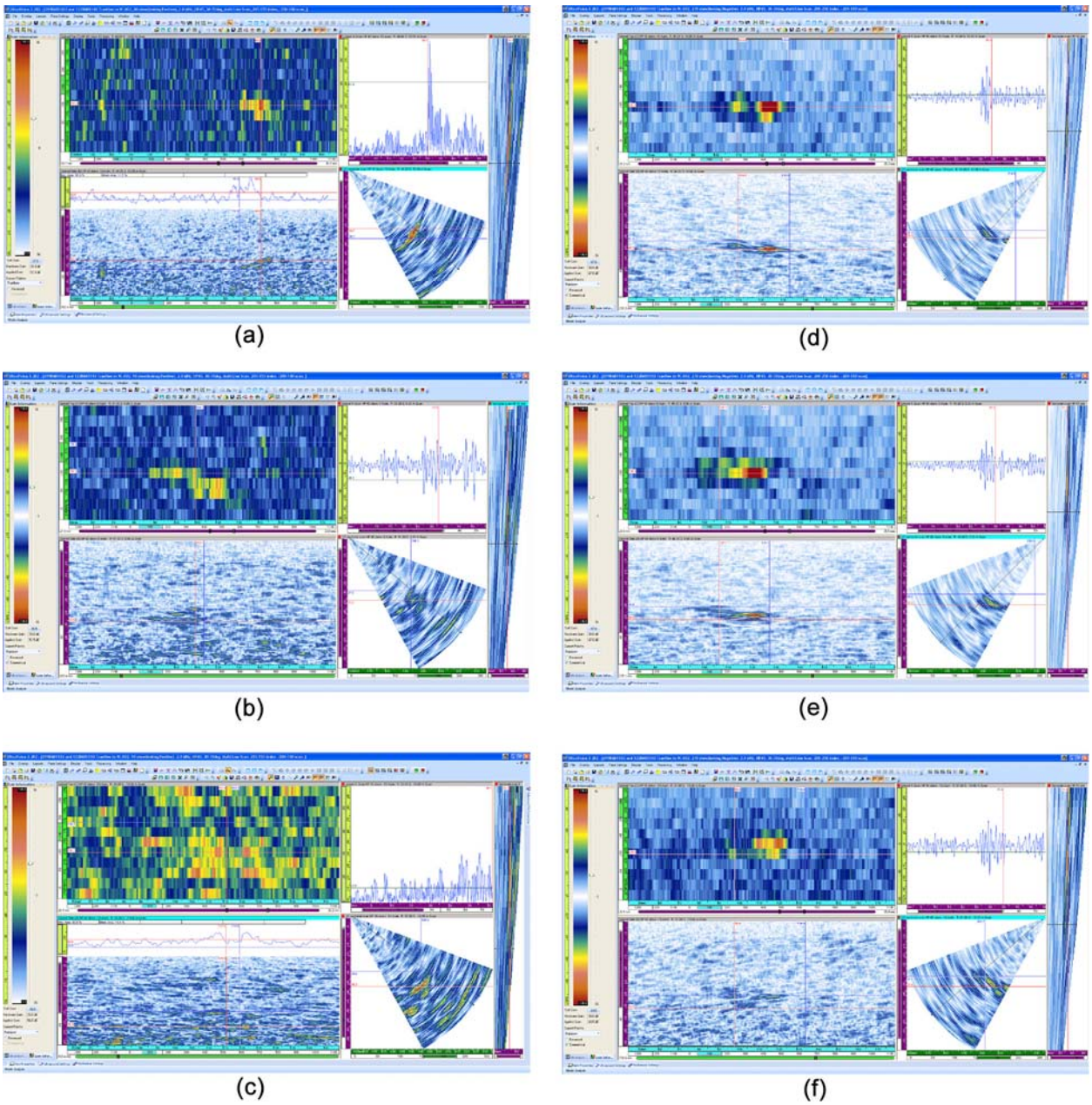


Figure E.30 2.0 MHz on 9C-002, Flaw 1110 for Depth Sizing, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

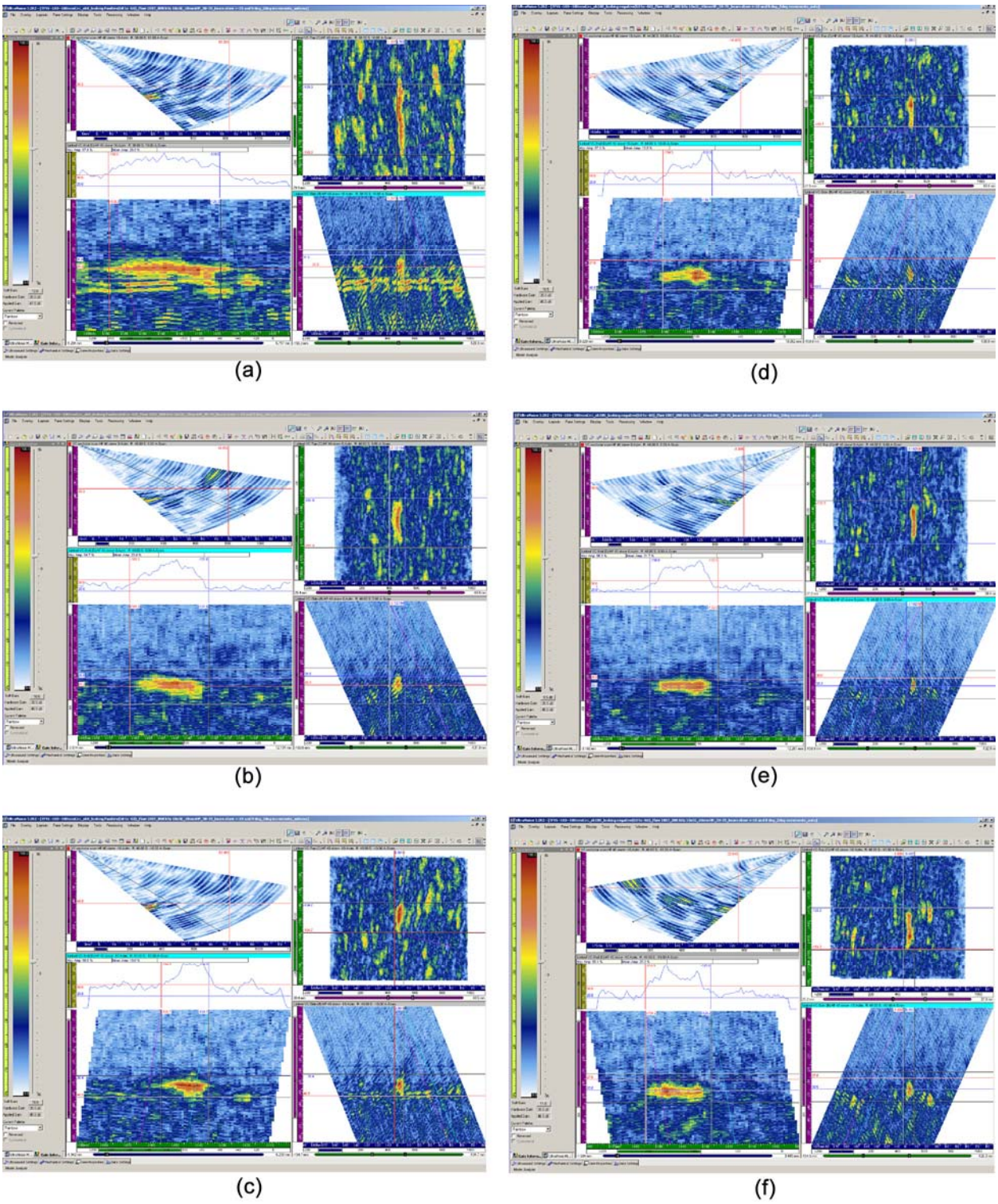
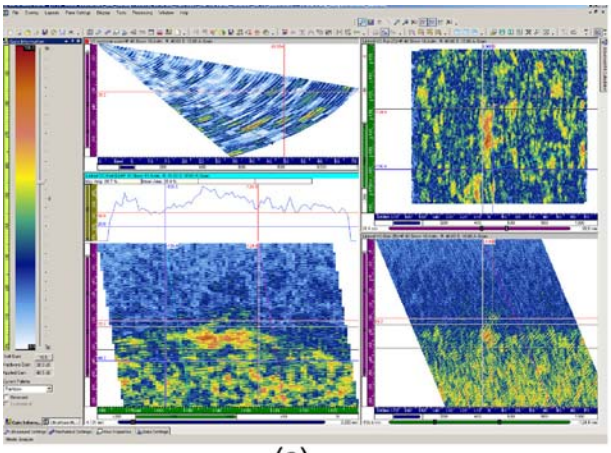
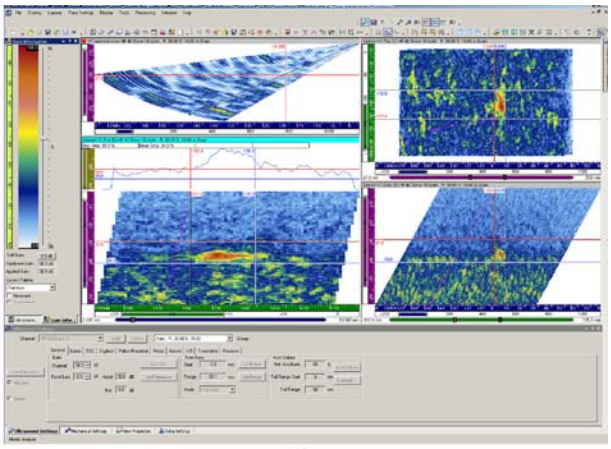


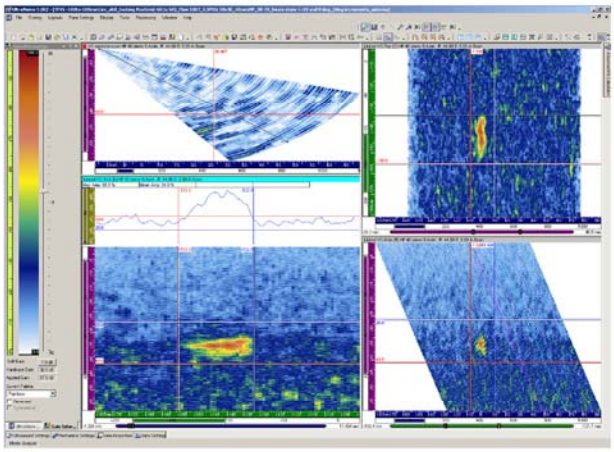
Figure E.31 Raster Data at 0.8 MHz on Validation Specimen, Flaw 1087, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10



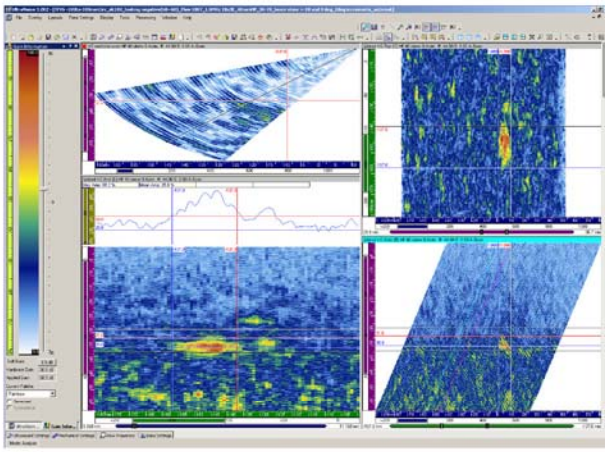
(a)



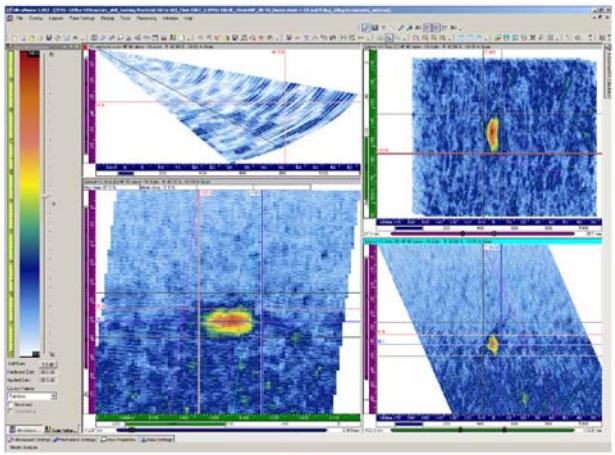
(d)



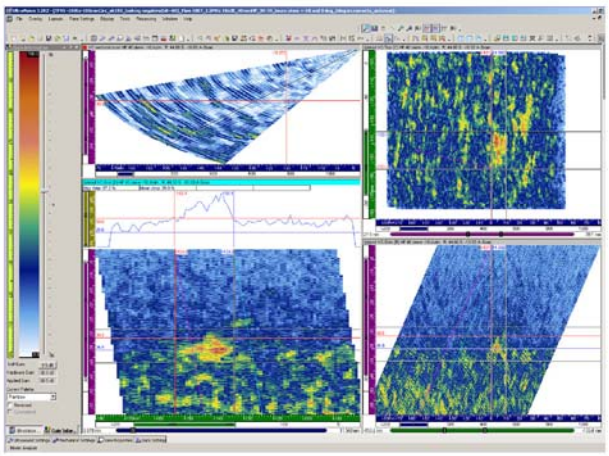
(b)



(e)

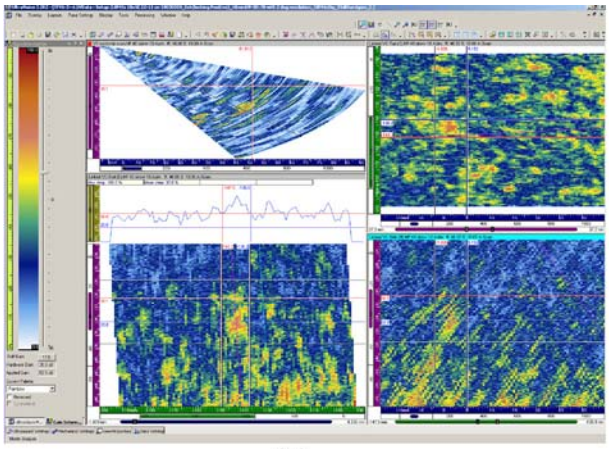


(c)

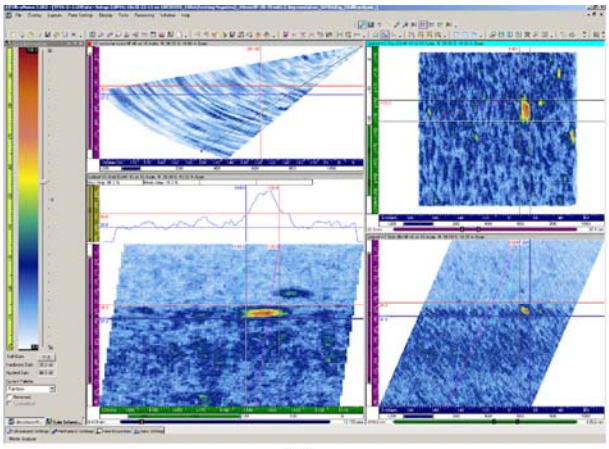


(f)

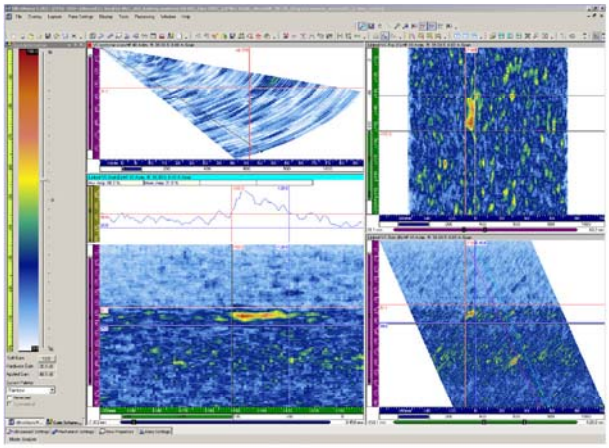
Figure E.32 Raster Data at 1.5 MHz on Validation Specimen, Flaw 1087, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10



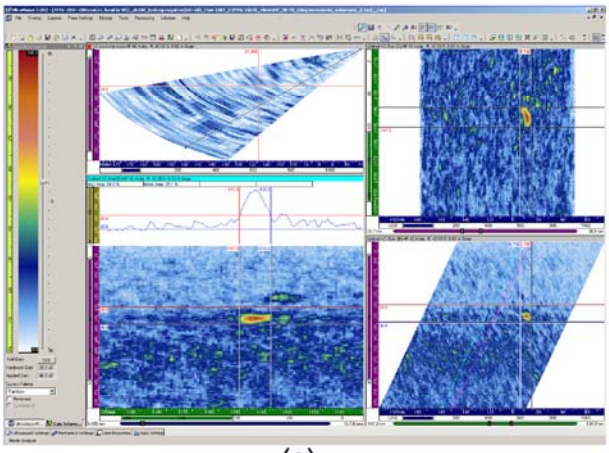
(a)



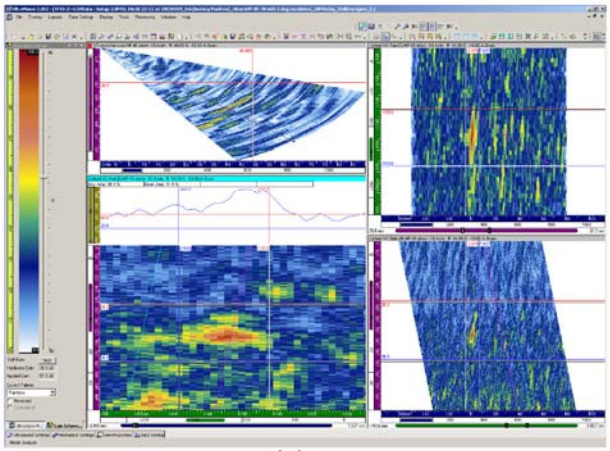
(d)



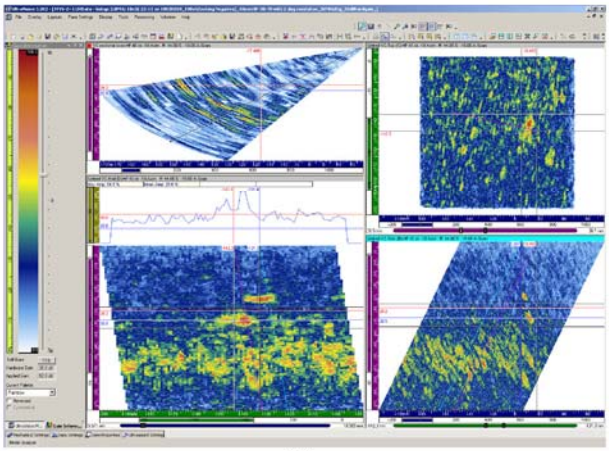
(b)



(e)

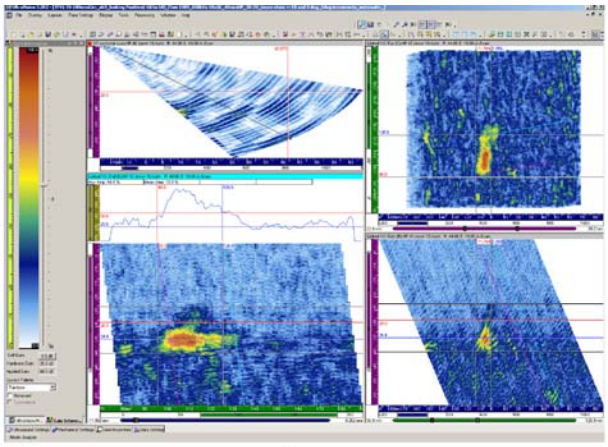


(c)

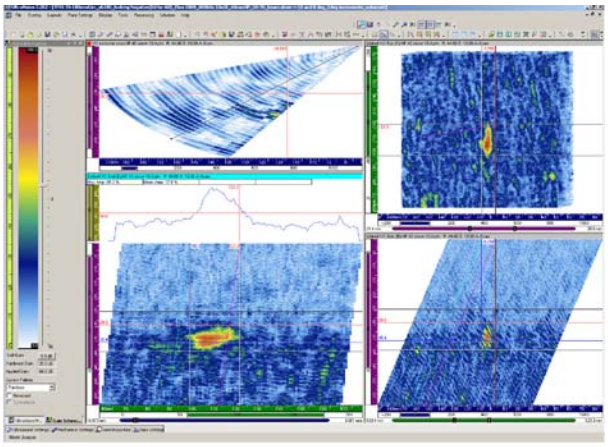


(f)

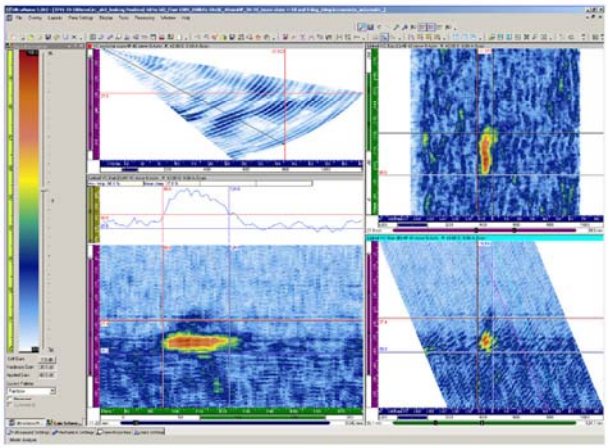
Figure E.33 Raster Data at 2.0 MHz on Validation Specimen, Flaw 1087, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10



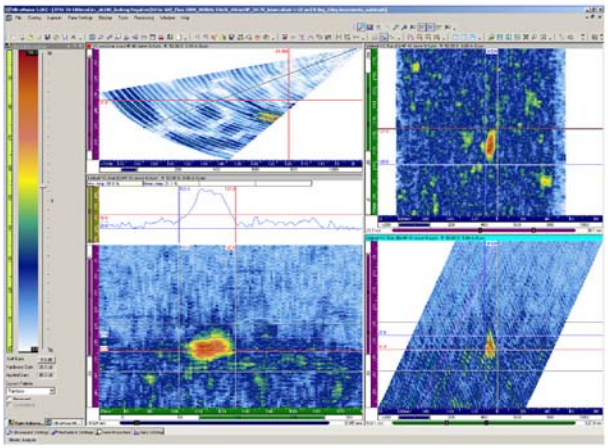
(a)



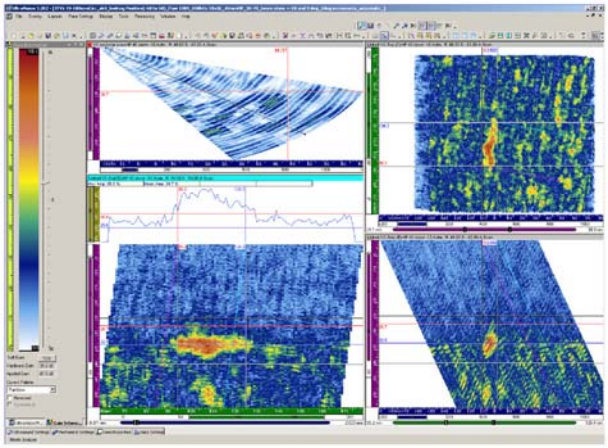
(d)



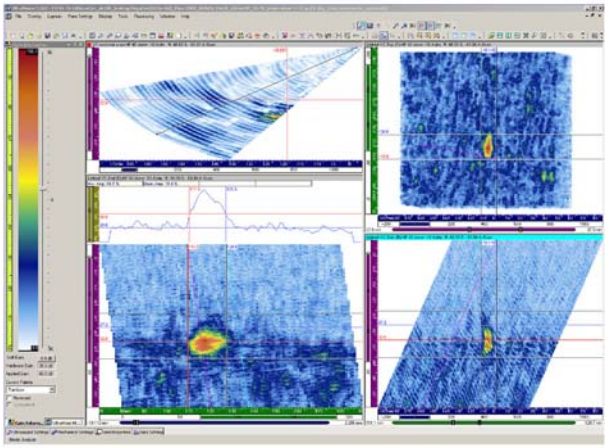
(b)



(e)



(c)



(f)

Figure E.34 Raster Data at 0.8 MHz on Validation Specimen, Flaw 1089, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

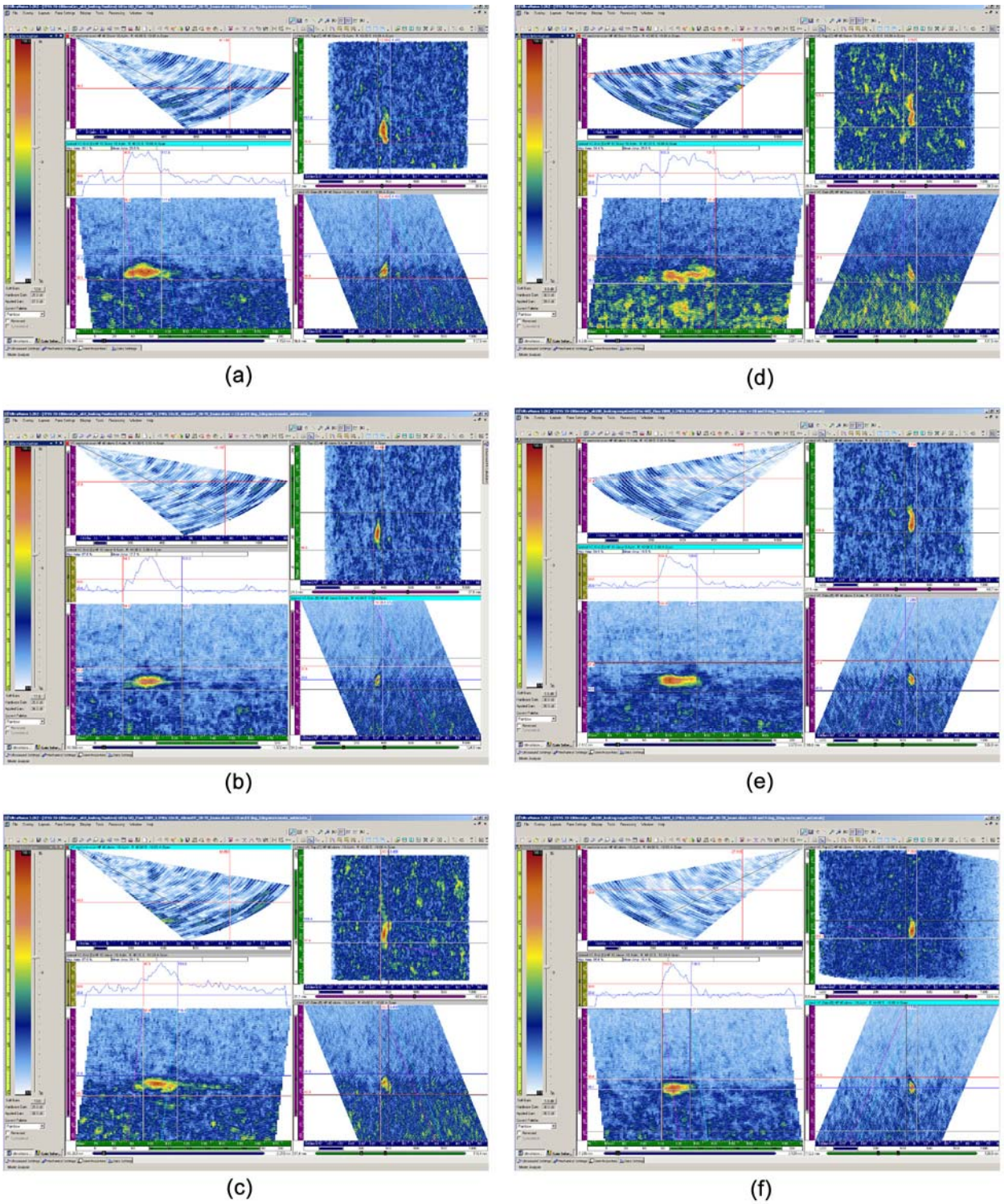
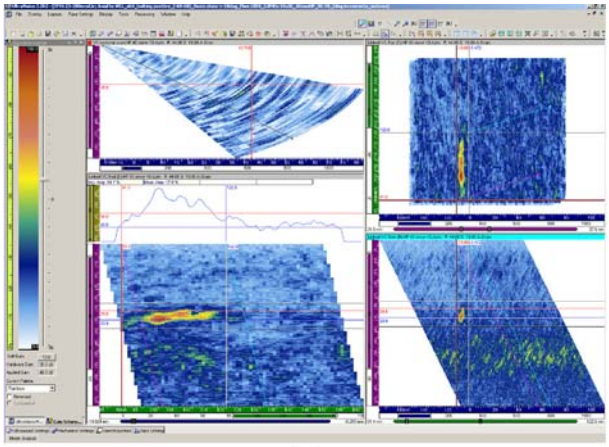
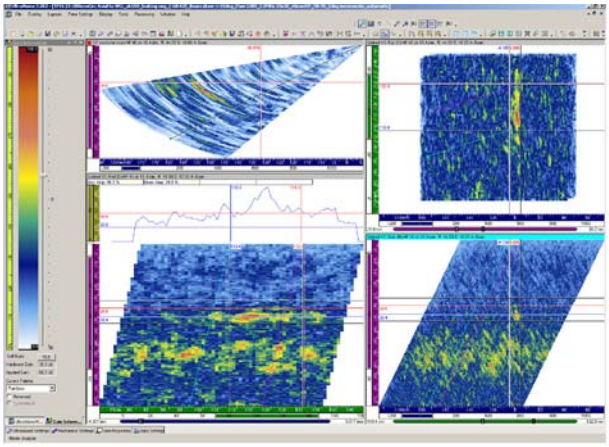


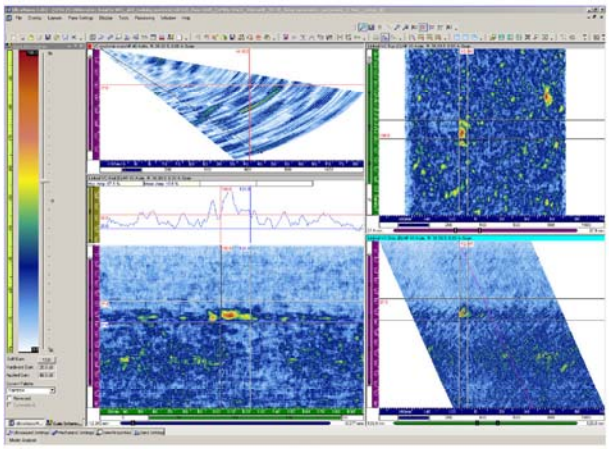
Figure E.35 Raster Data at 1.5 MHz on Validation Specimen, Flaw 1089, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10



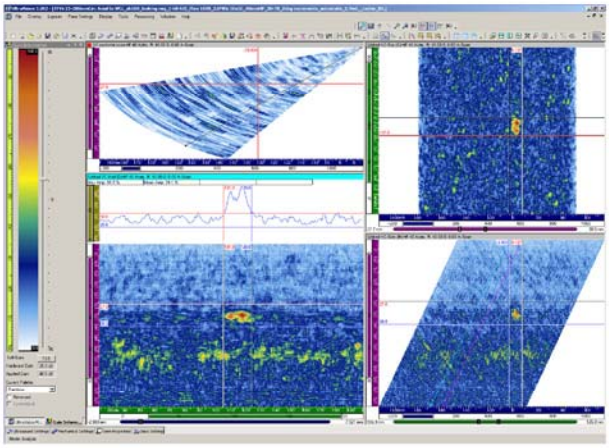
(a)



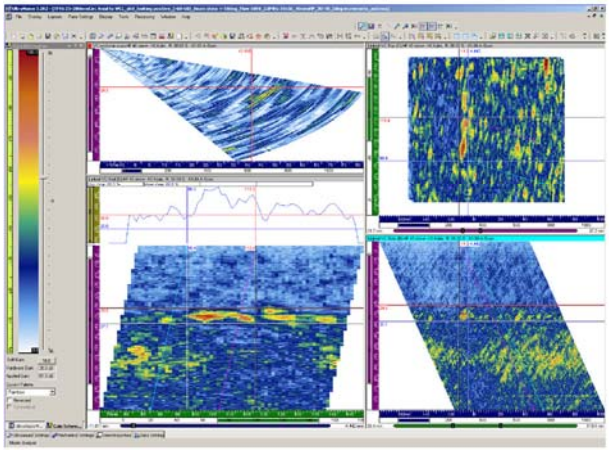
(d)



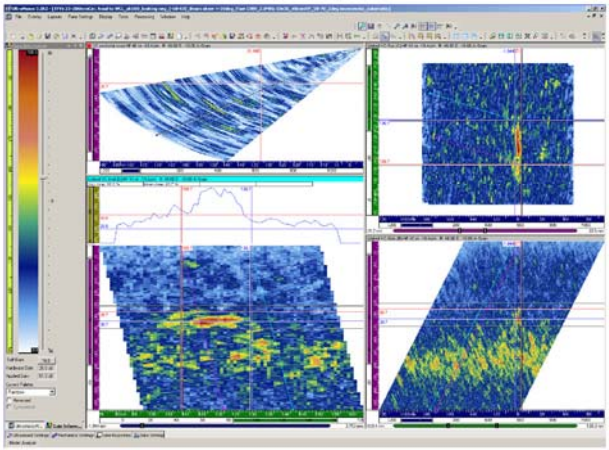
(b)



(e)



(c)



(f)

Figure E.36 Raster Data at 2.0 MHz on Validation Specimen, Flaw 1089, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

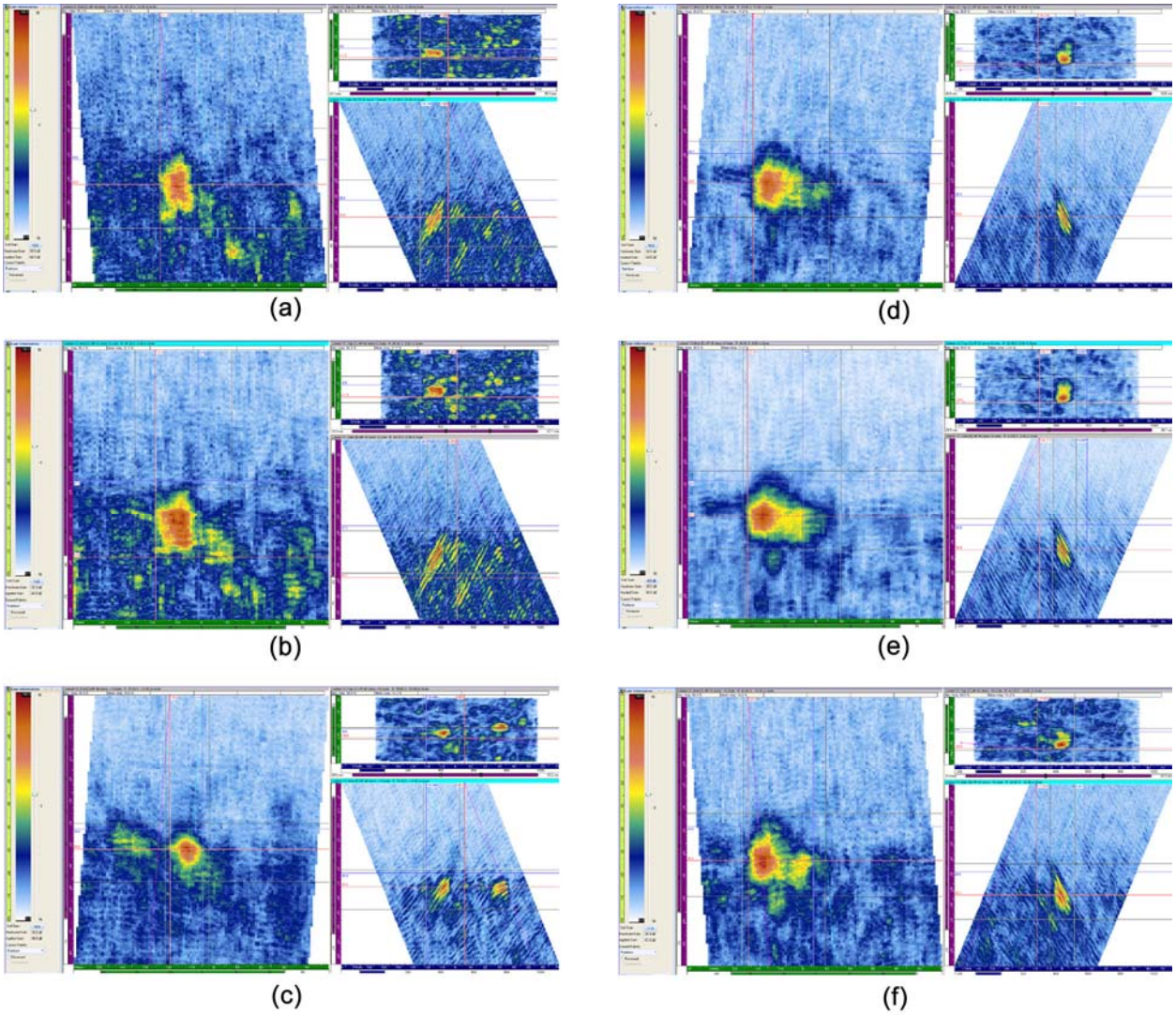


Figure E.37 Raster Data at 0.8 MHz on 9C-002, Flaw 1100, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

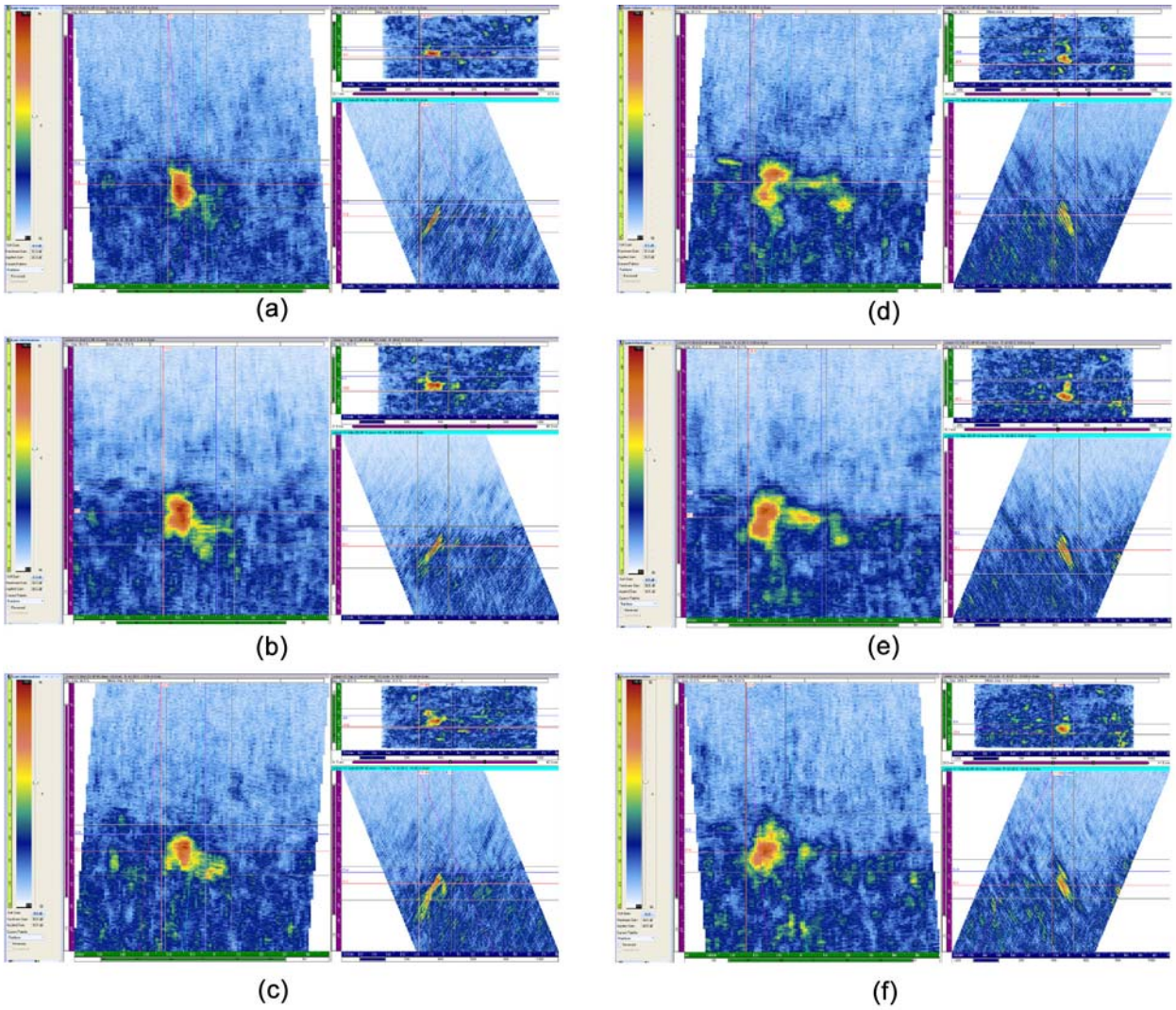


Figure E.38 Raster Data at 1.5 MHz on 9C-002, Flaw 1100, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

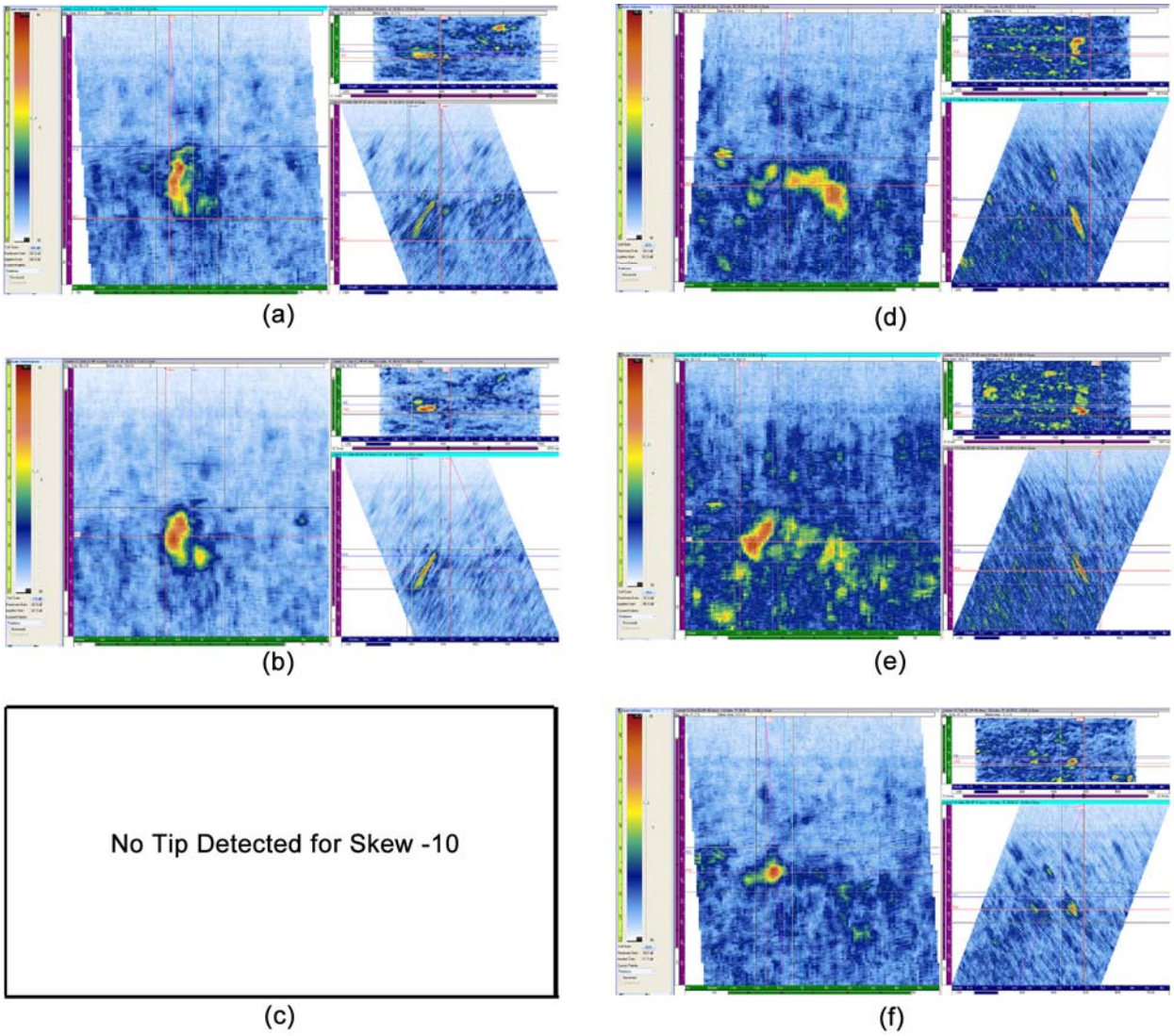


Figure E.39 Raster Data at 2.0 MHz on 9C-002, Flaw 1100, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

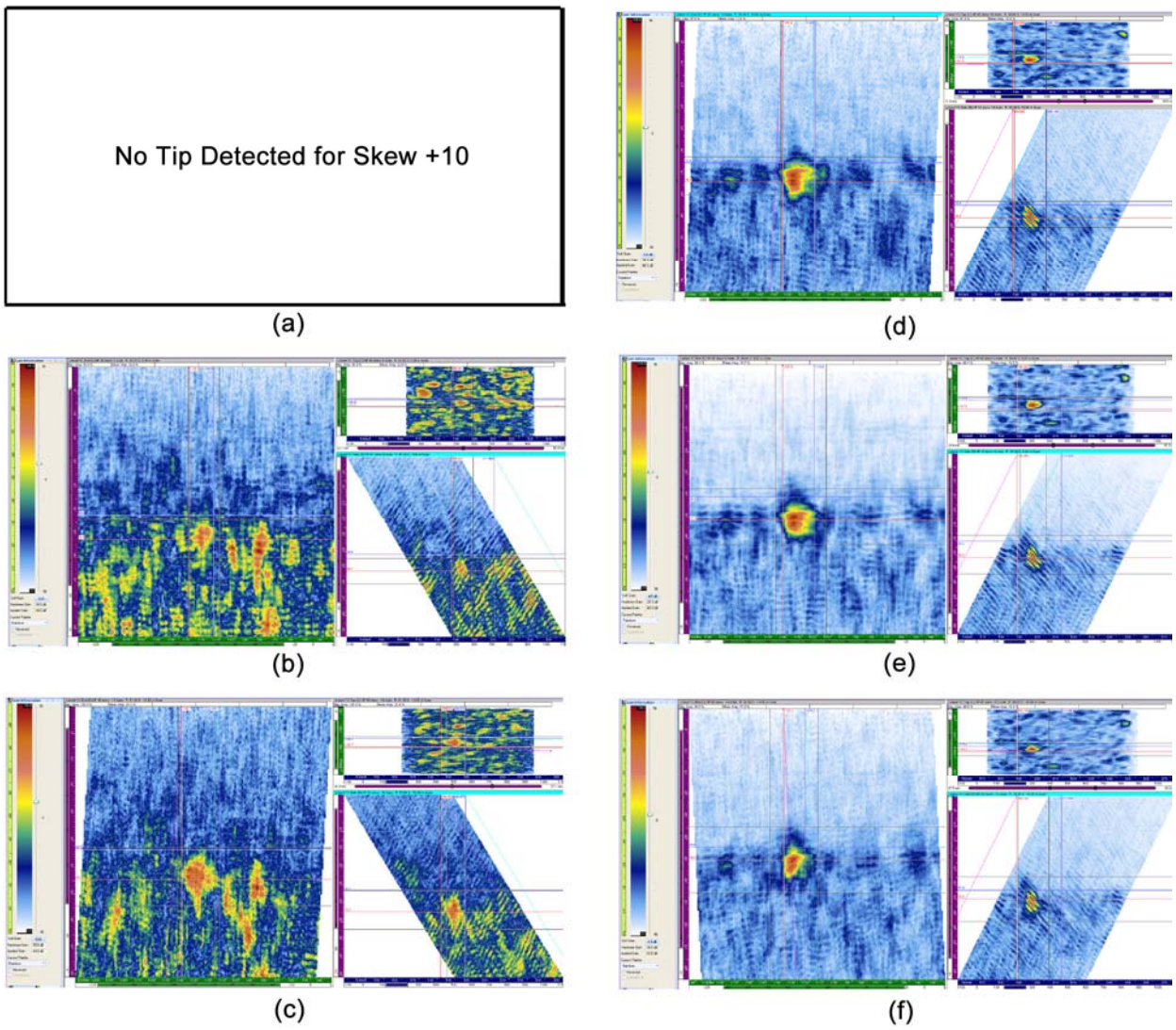


Figure E.40 Raster Data at 0.8 MHz on 9C-002, Flaw 1102, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

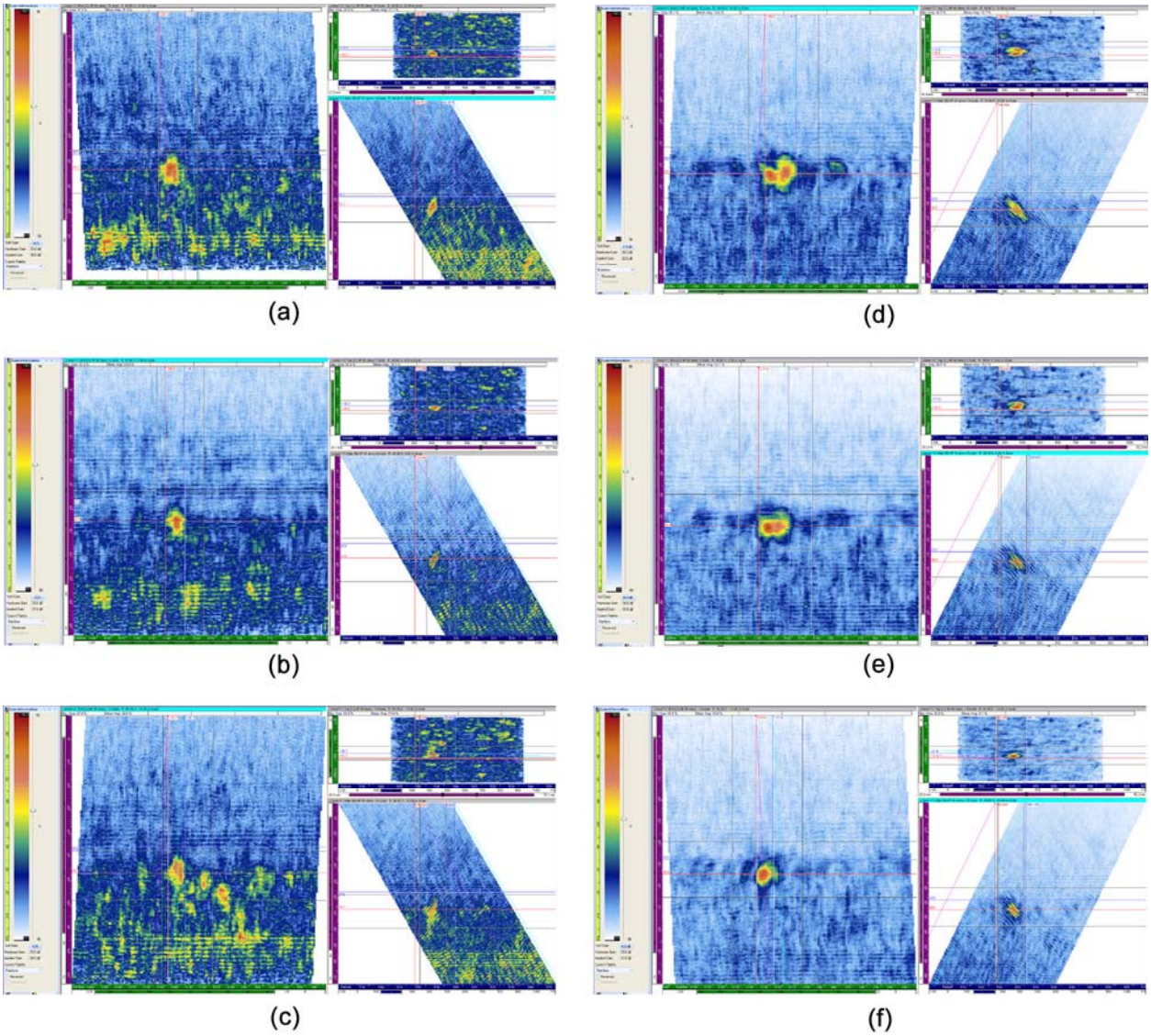


Figure E.41 Raster Data at 1.5 MHz on 9C-002, Flaw 1102, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

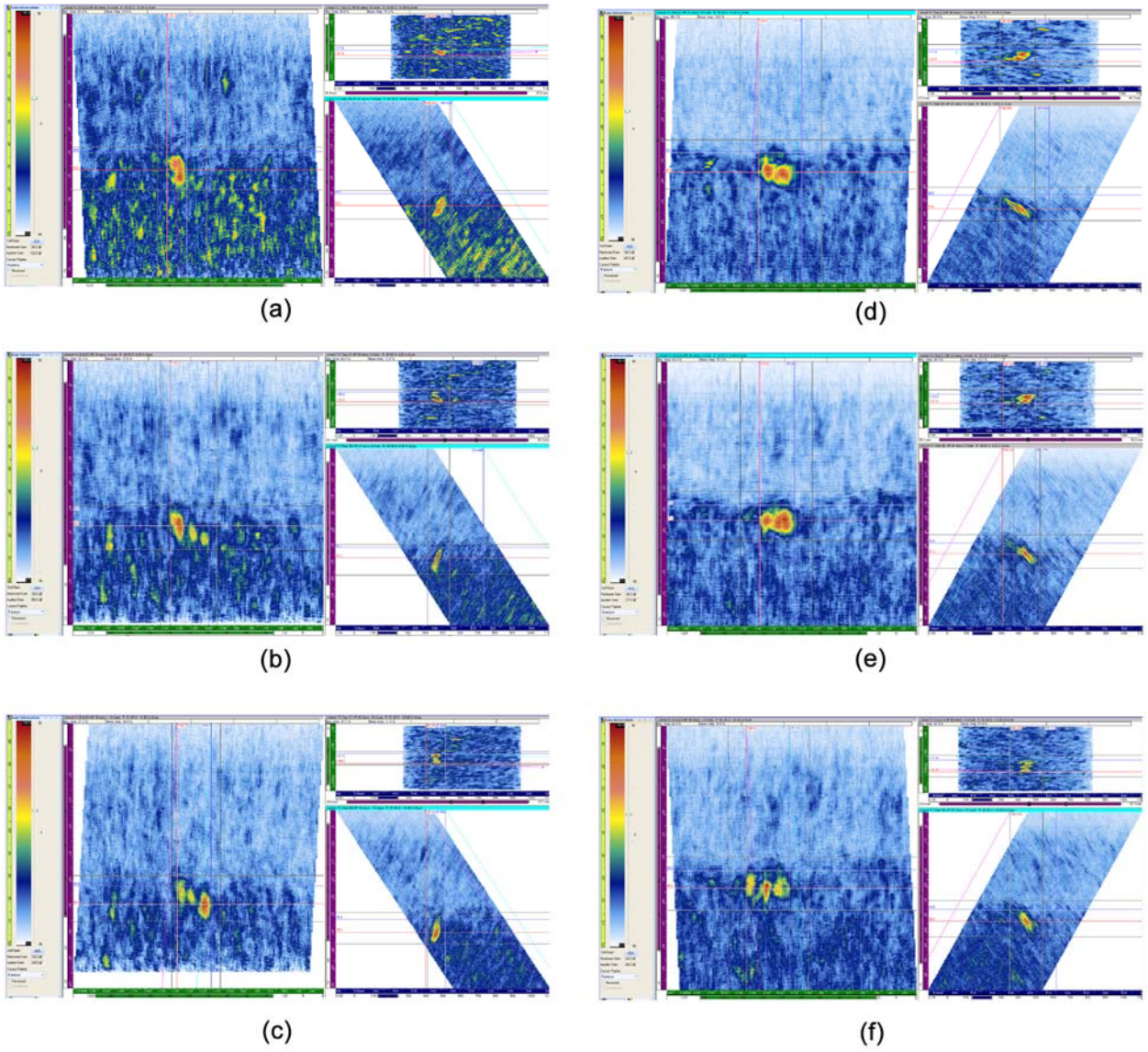


Figure E.42 Raster Data at 2.0 MHz on 9C-002, Flaw 1102, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

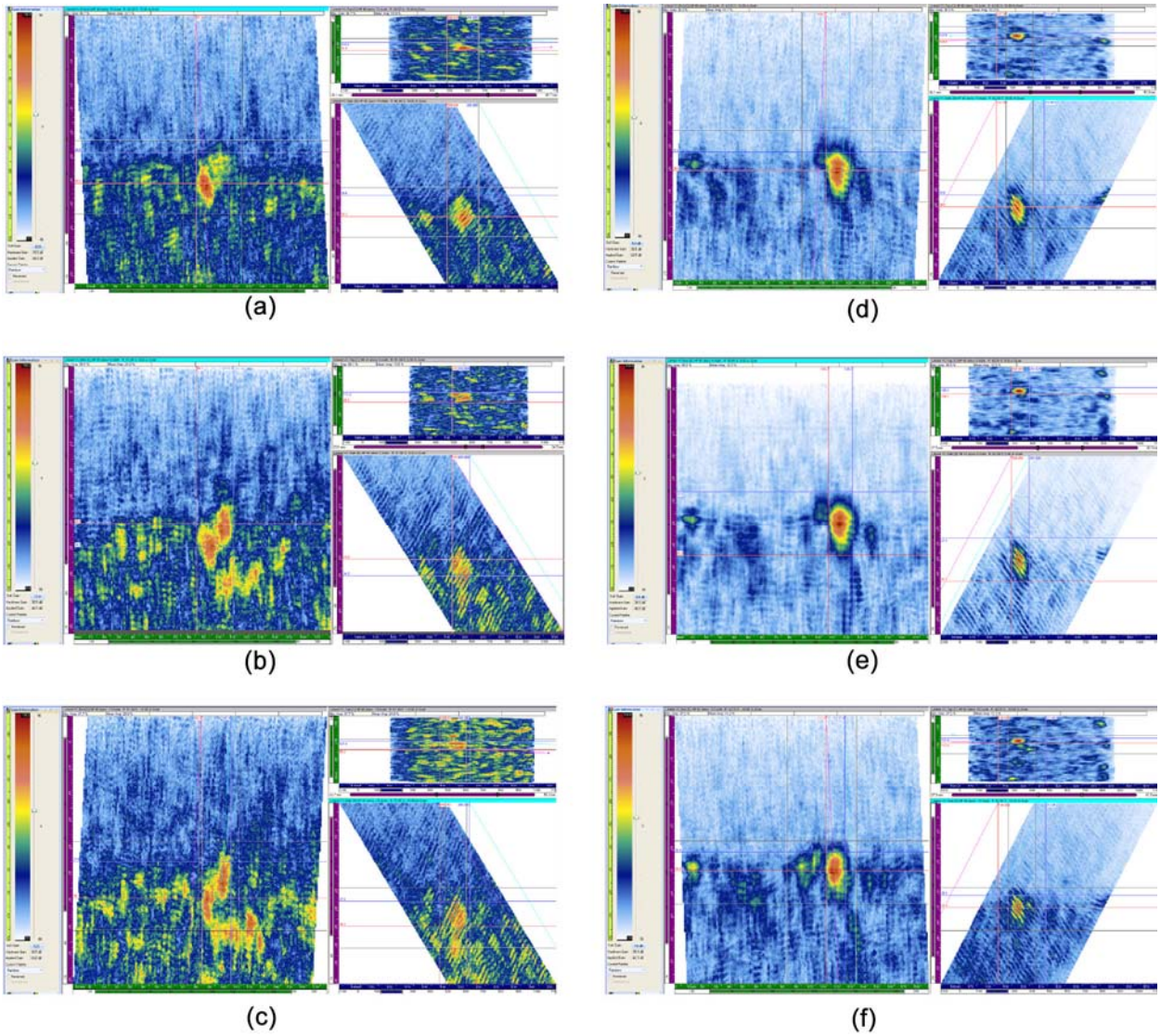


Figure E.43 Raster Data at 0.8 MHz on 9C-002, Flaw 1110, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

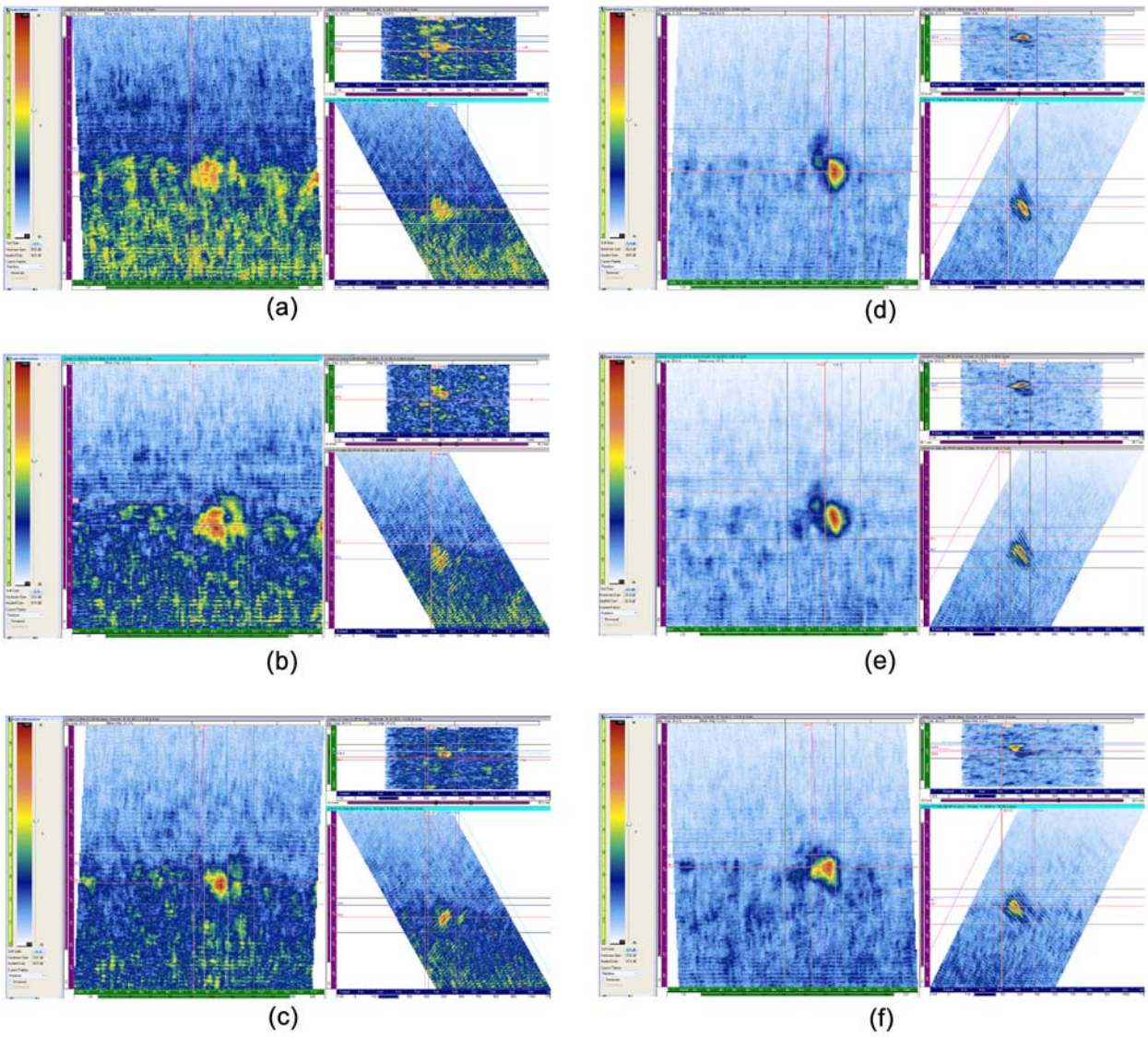


Figure E.44 Raster Data at 1.5 MHz on 9C-002, Flaw 1110, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

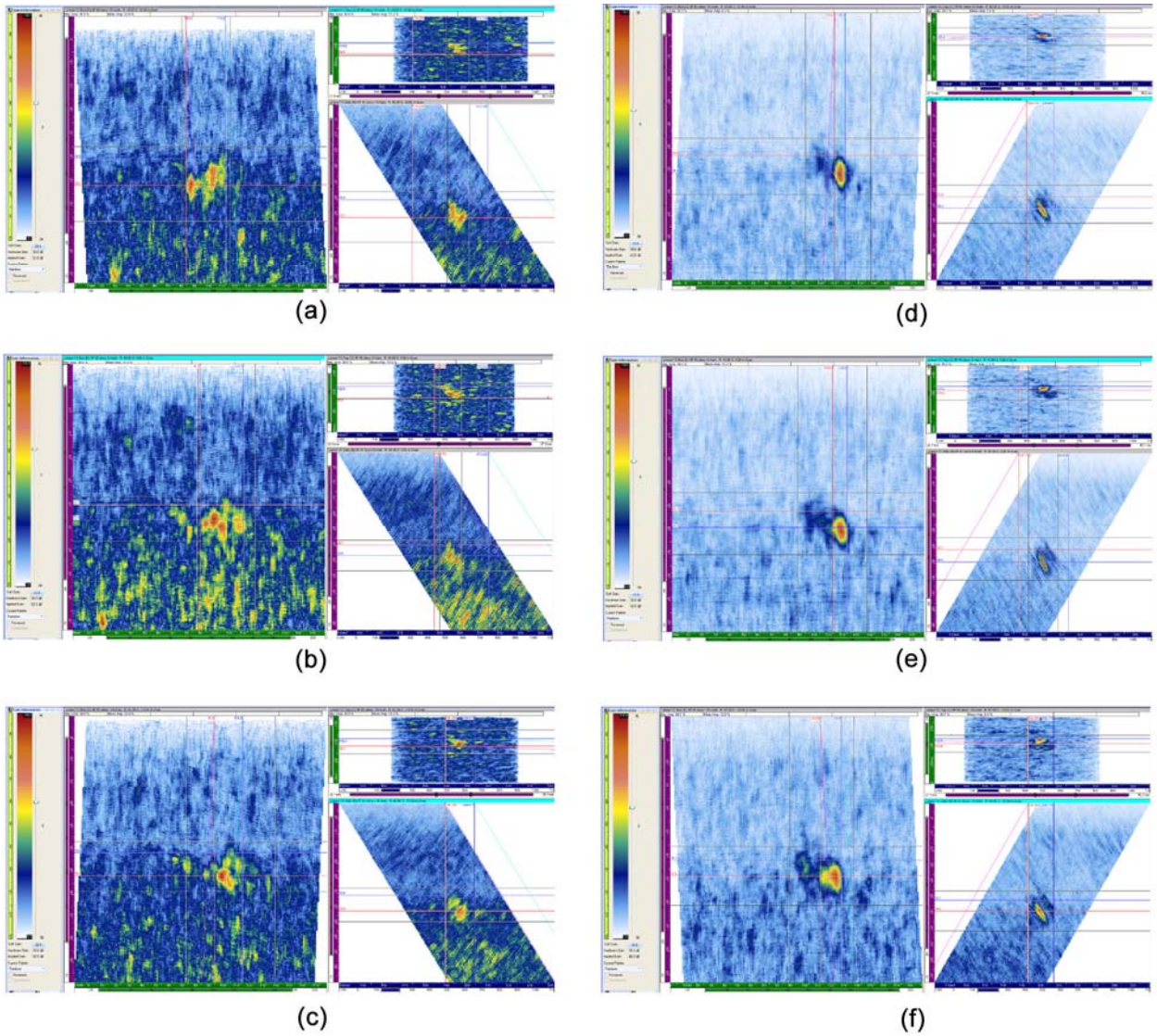


Figure E.45 Raster Data at 2.0 MHz on 9C-002, Flaw 1110, Looking Positive (a) Beam Skew +10, (b) Skew 0, (c) Skew −10, and Looking Negative (d) Skew +10, (e) Skew 0, (f) Skew −10

APPENDIX F

ISI VENDOR PHASED-ARRAY DATA ON SPECIMENS 9C-001 AND 9C-002

APPENDIX F

ISI VENDOR PHASED-ARRAY DATA ON SPECIMENS 9C-001 AND 9C-002

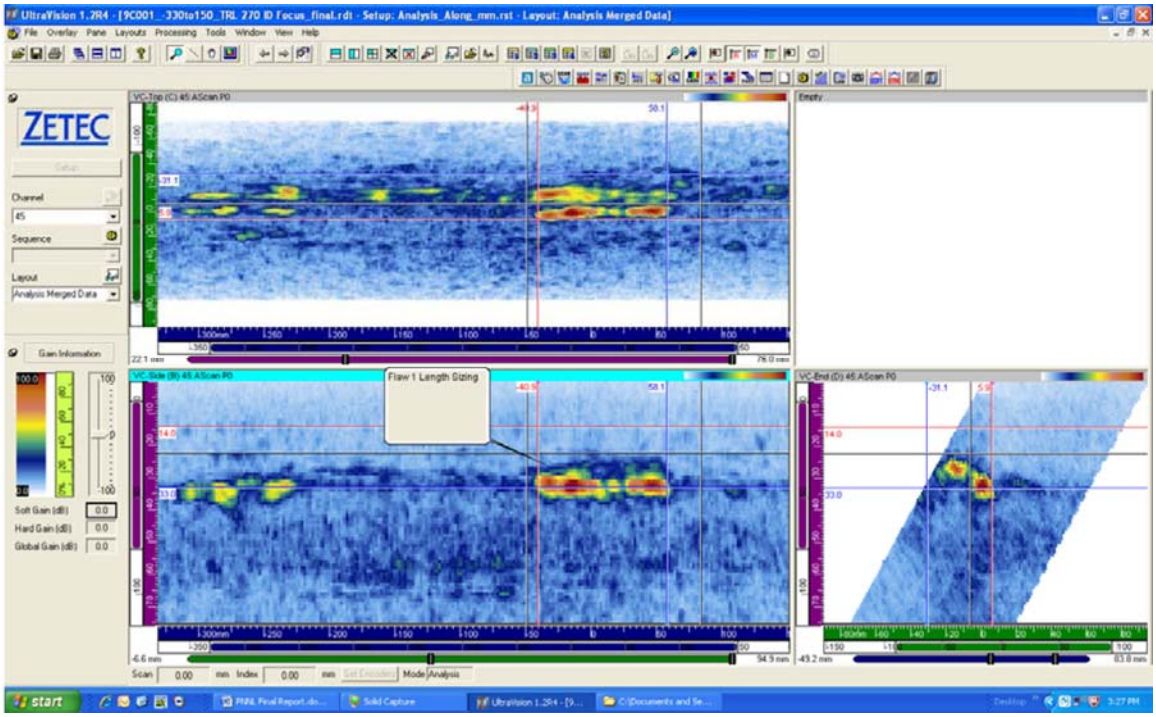


Figure F.1 9C-001 Implanted Flaw 1 from the CCSS Pipe Side for Length Sizing

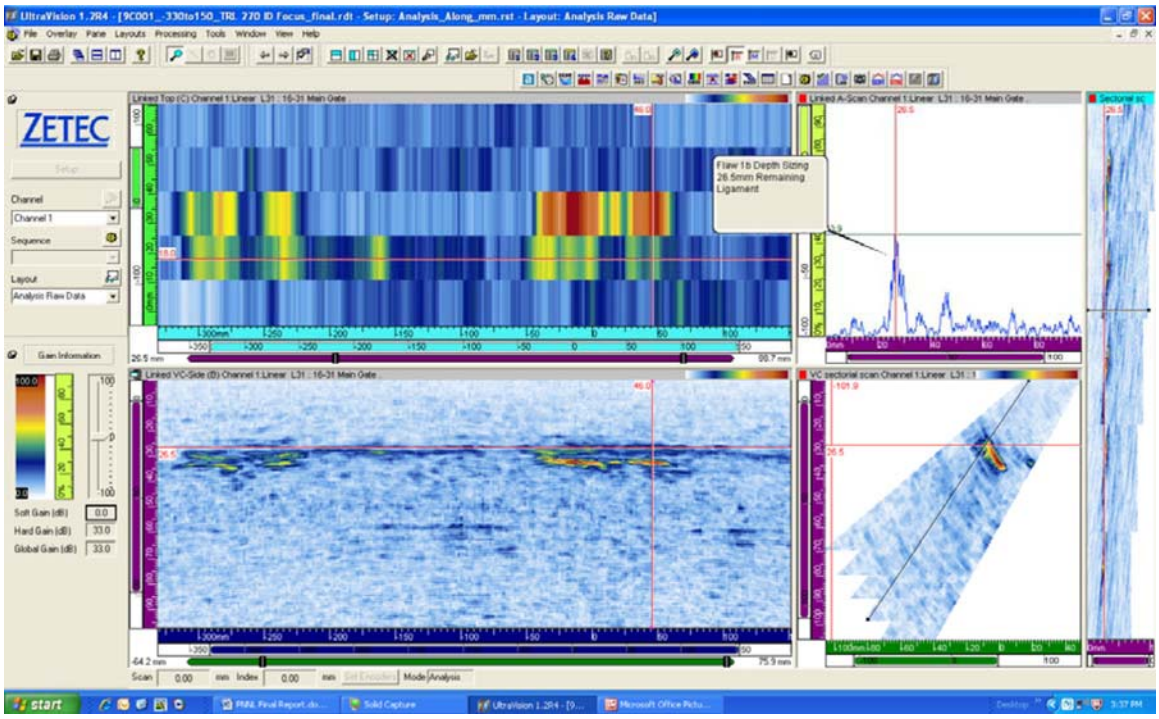


Figure F.2 9C-001 Implanted Flaw 1 from the CCSS Pipe Side for Depth Sizing

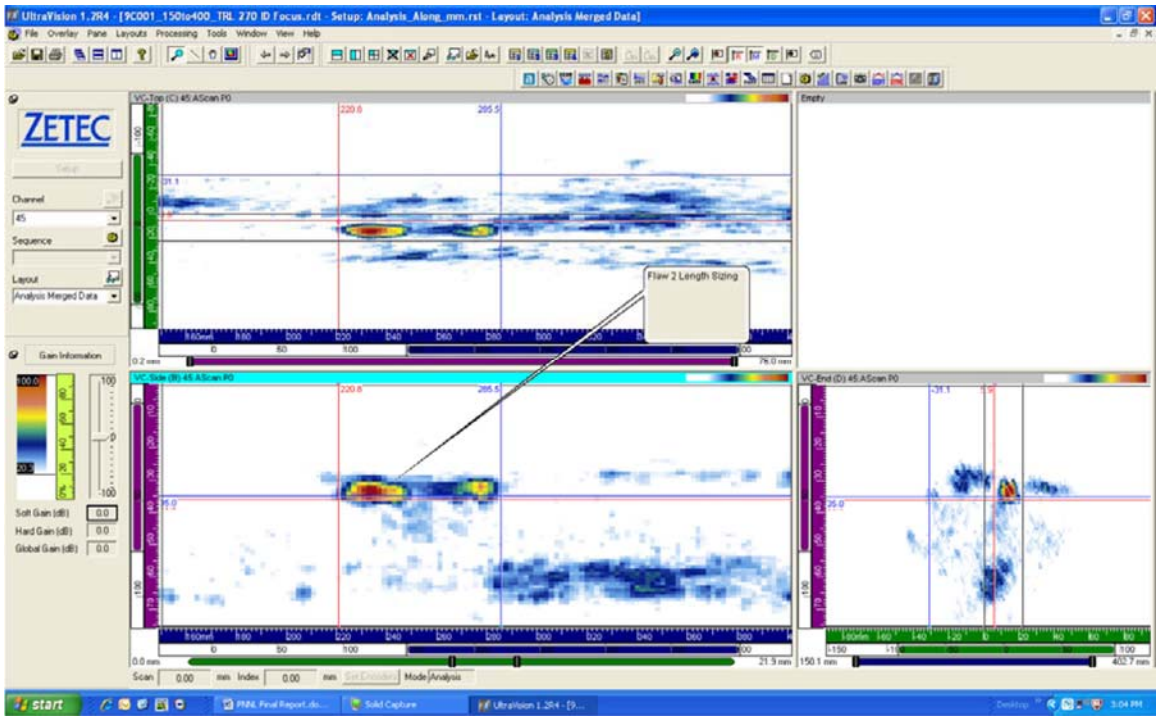


Figure F.3 9C-001 Implanted Flaw 2 from the CCSS Pipe Side for Length Sizing

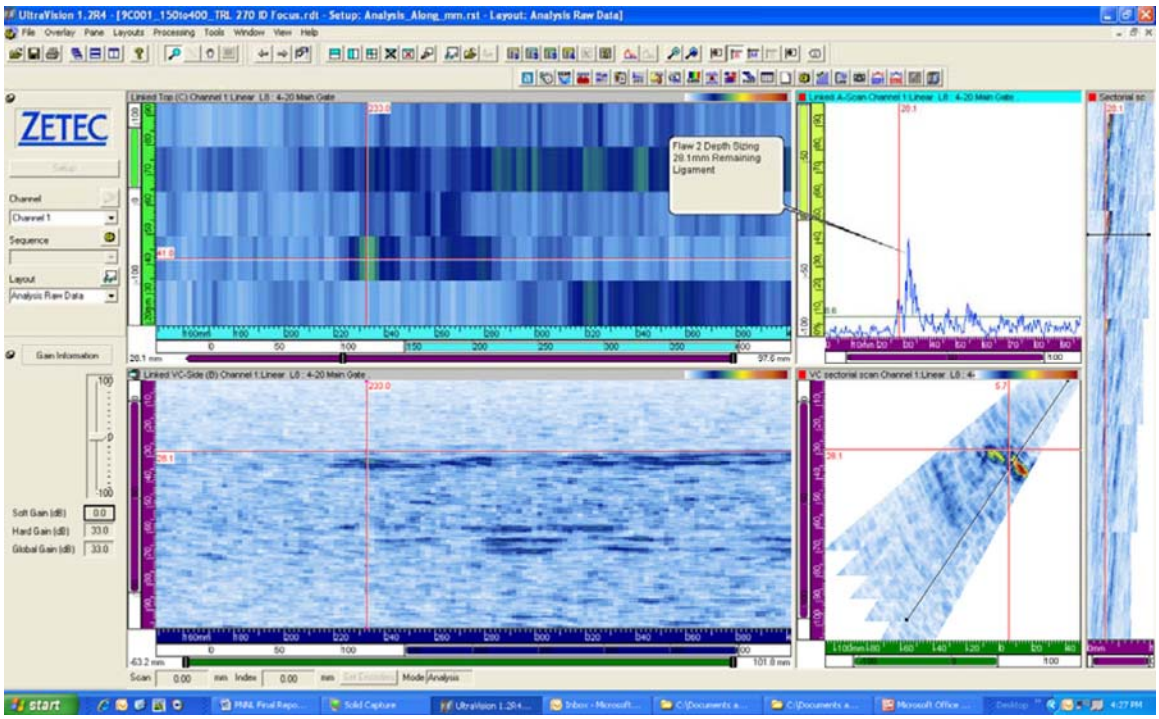


Figure F.4 9C-001 Implanted Flaw 2 from the CCSS Pipe Side for Depth Sizing

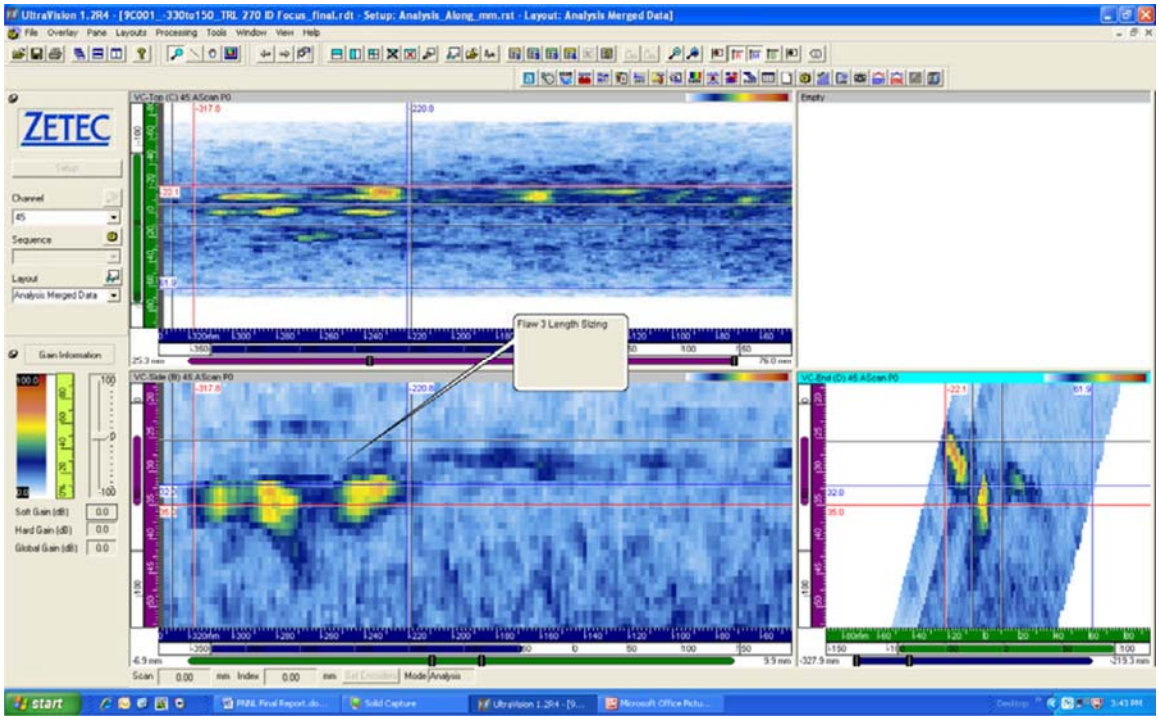


Figure F.5 9C-001 Implanted Flaw 3 from the CCSS Pipe Side for Length Sizing

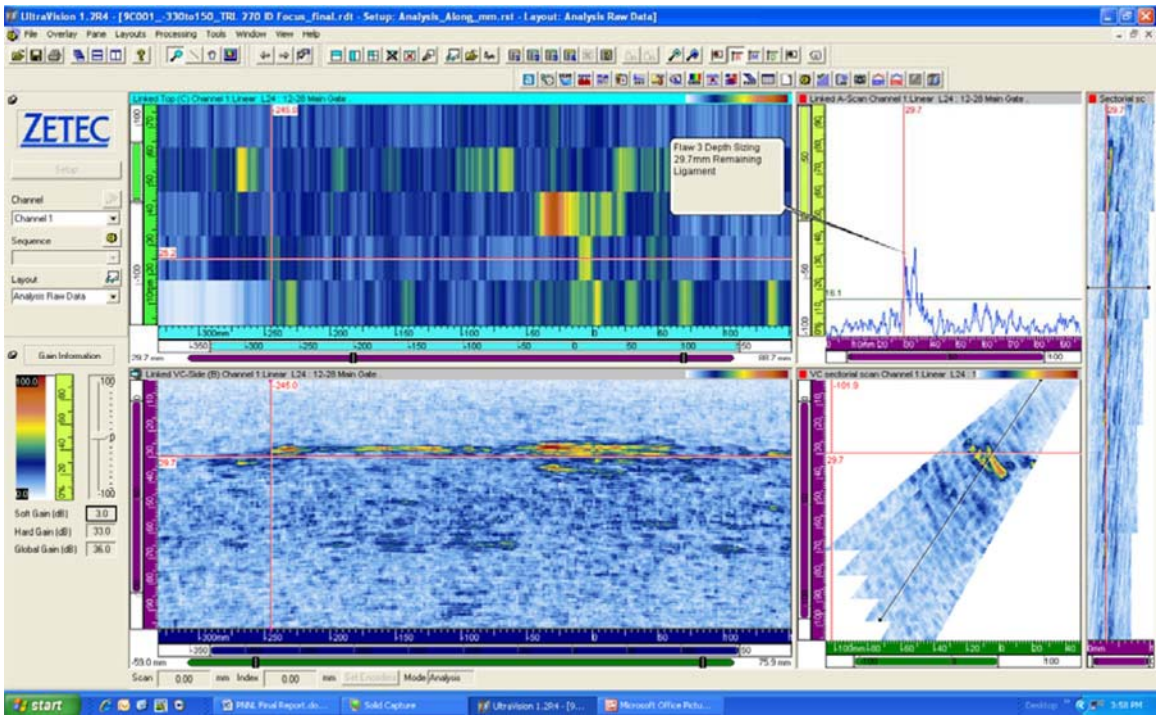


Figure F.6 9C-001 Implanted Flaw 3 from the CCSS Pipe Side for Depth Sizing

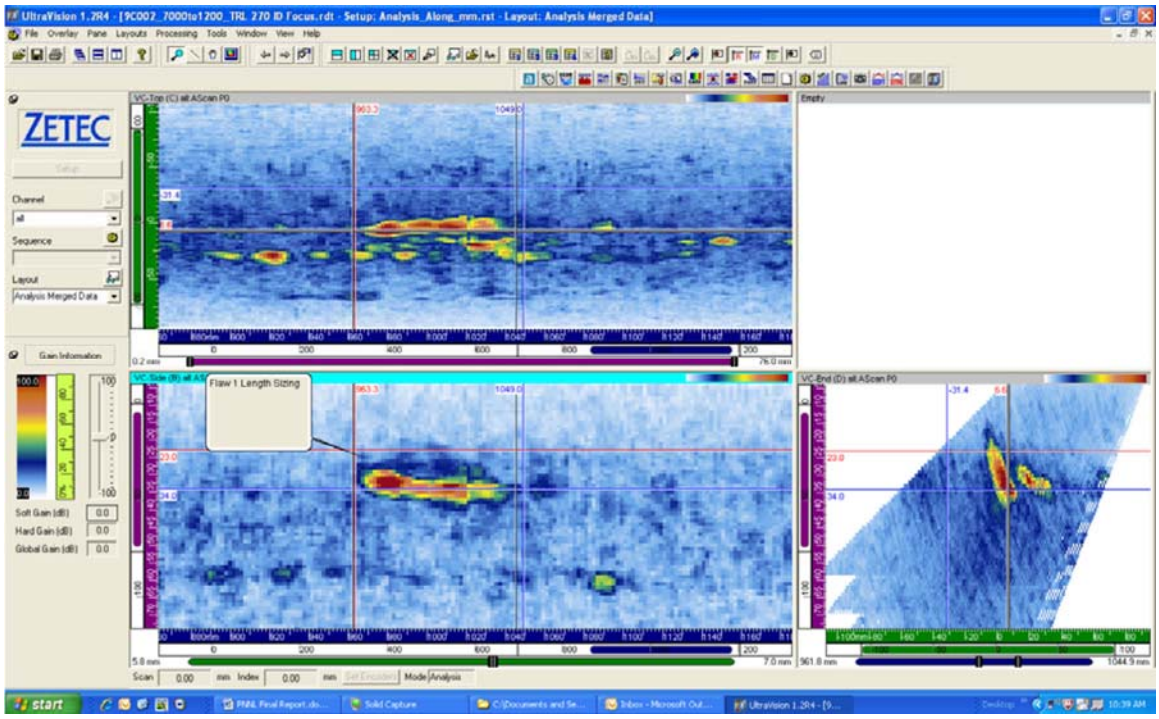


Figure F.7 9C-002 Implanted Flaw 1 from the CCSS Pipe Side for Length Sizing

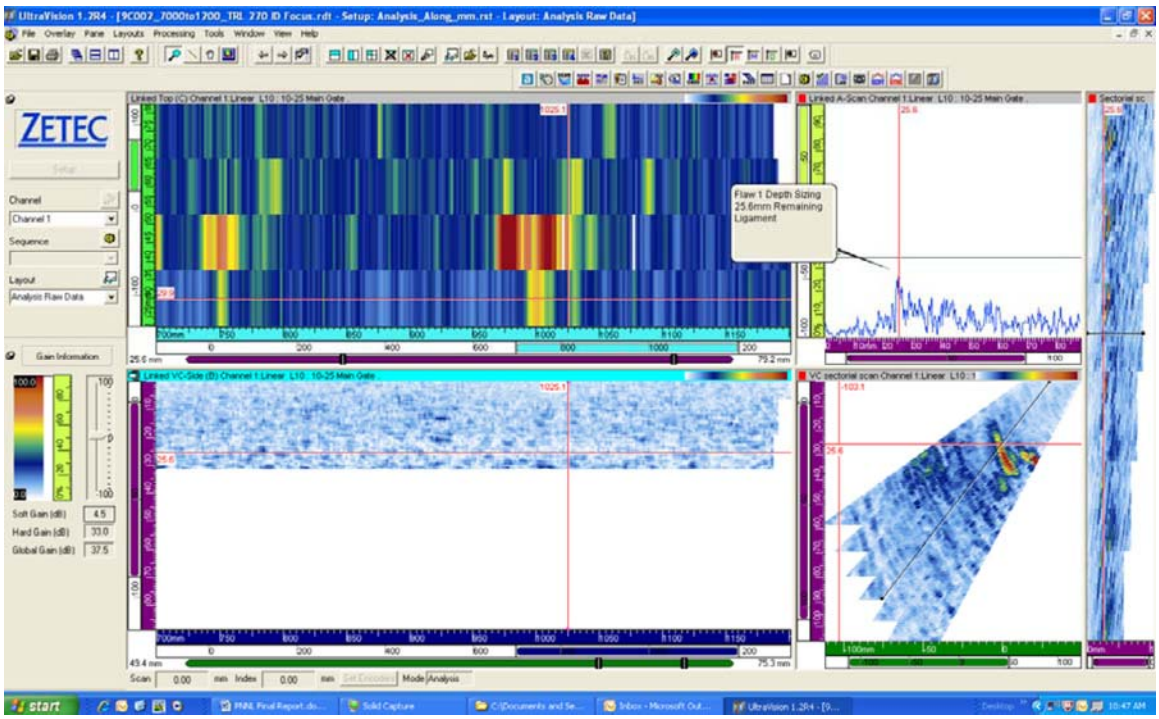


Figure F.8 9C-002 Implanted Flaw 1 from the CCSS Pipe Side for Depth Sizing

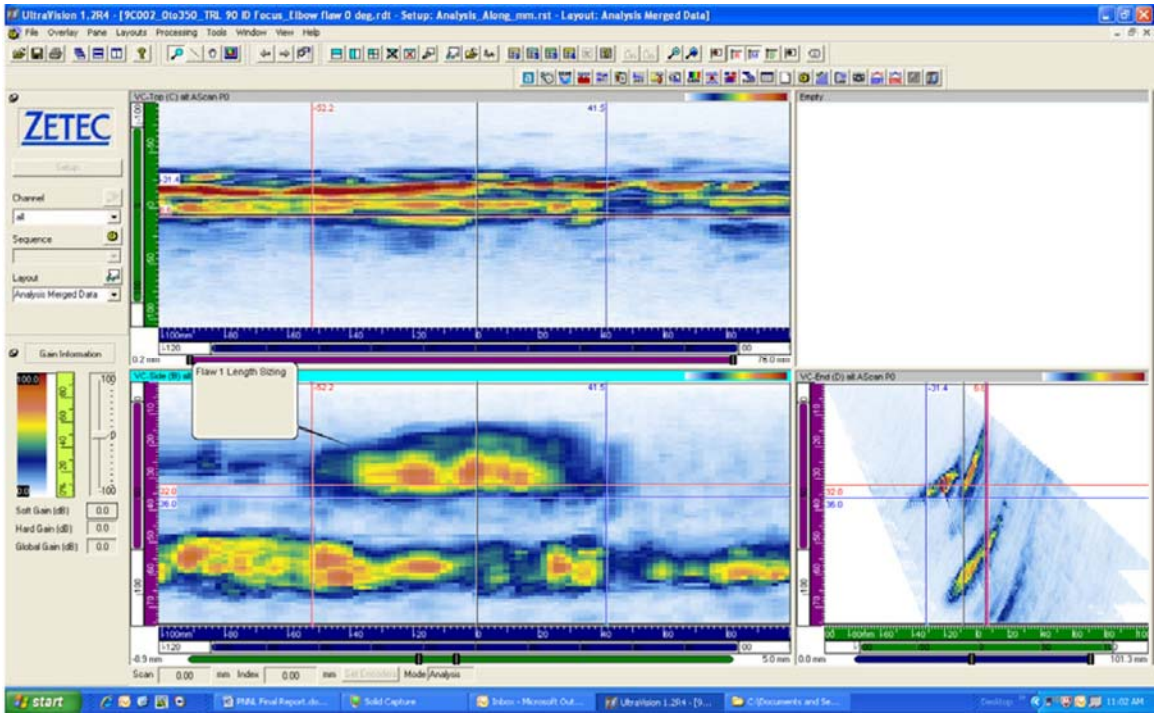


Figure F.9 9C-002 Implanted Flaw 1 from the SCSS Elbow Side for Length Sizing

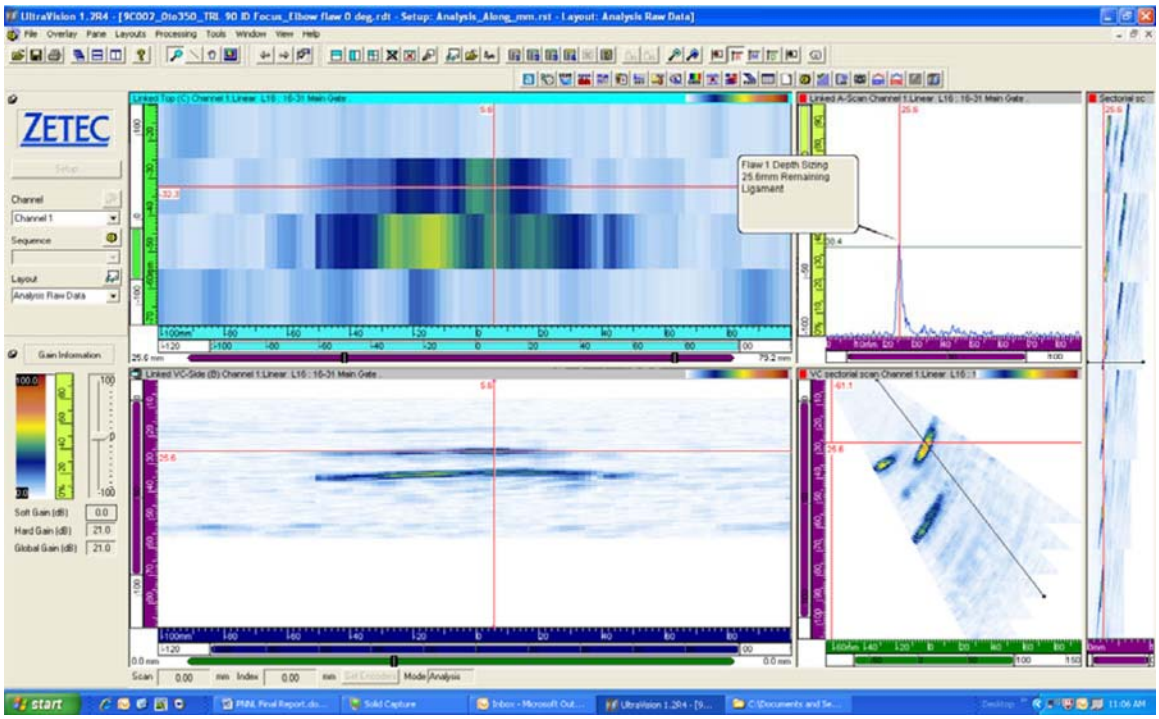


Figure F.10 9C-002 Implanted Flaw 1 from the SCSS Elbow Side for Depth Sizing

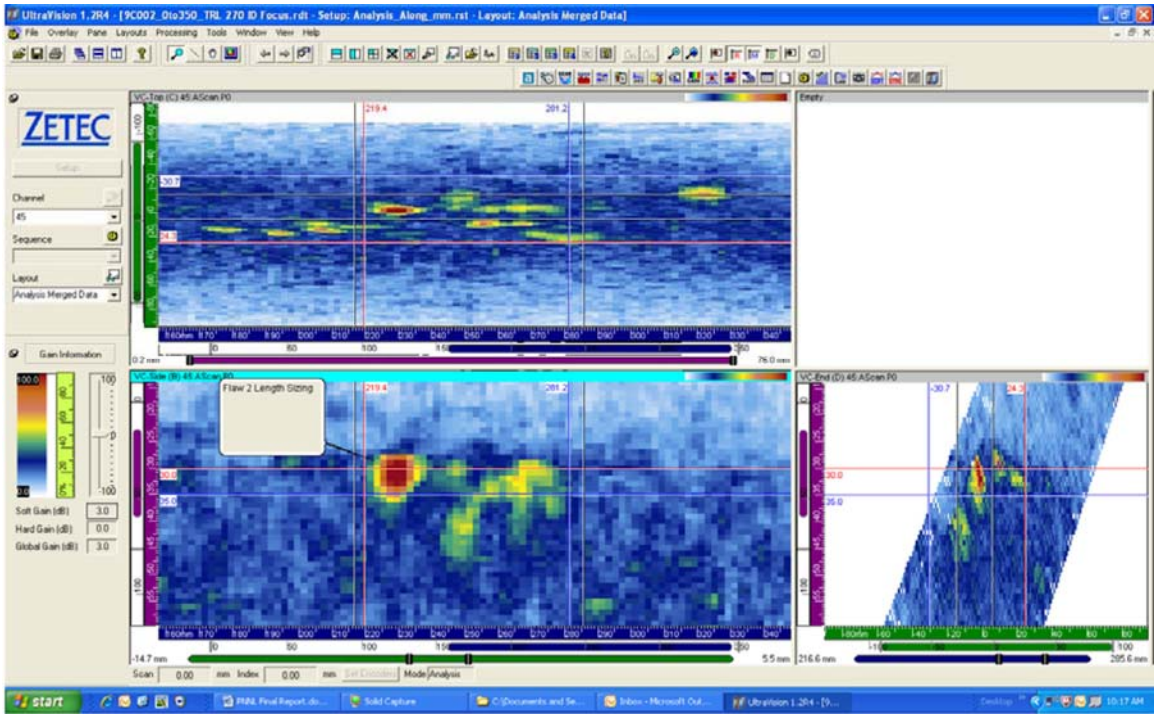


Figure F.11 9C-002 Implanted Flaw 2 from the CCSS Pipe Side for Length Sizing

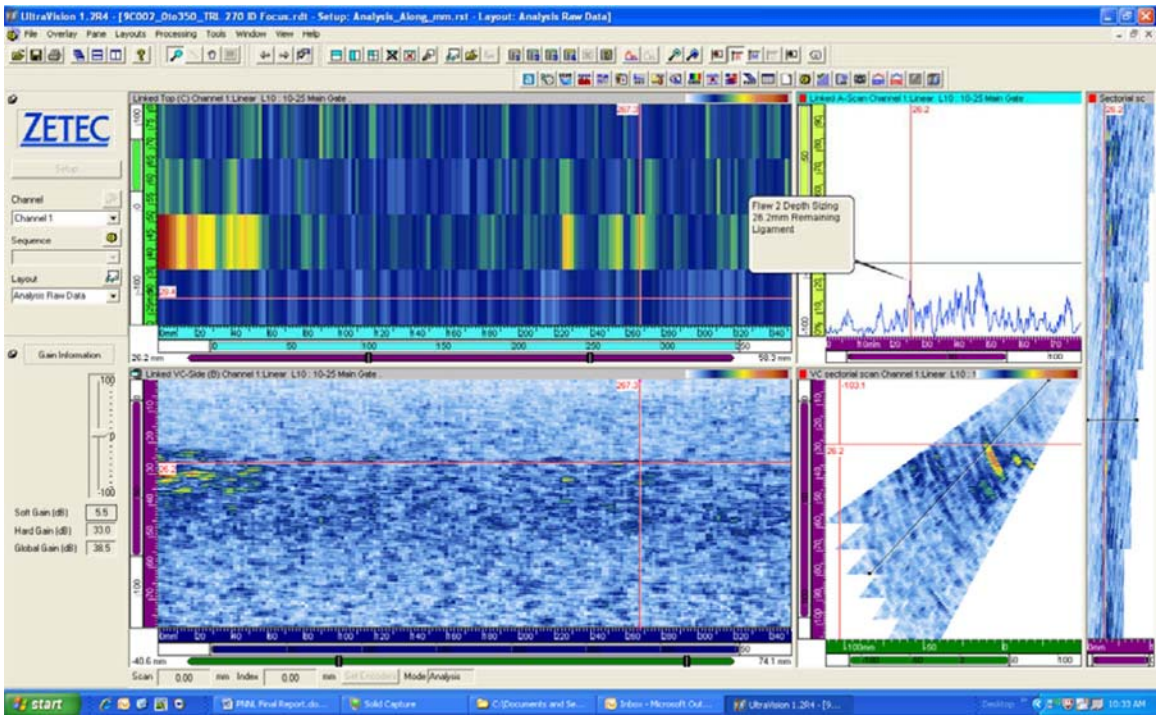


Figure F.12 9C-002 Implanted Flaw 2 from the CCSS Pipe Side for Depth Sizing

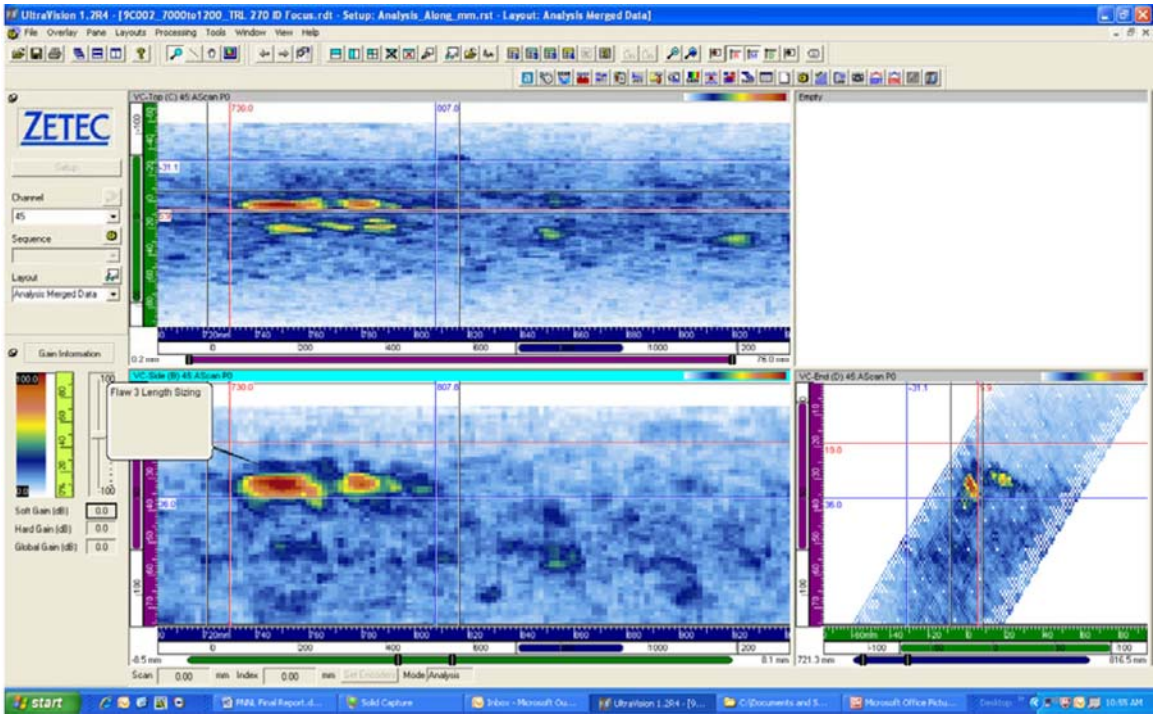


Figure F.13 9C-002 Implanted Flaw 3 from the CCSS Pipe Side for Length Sizing

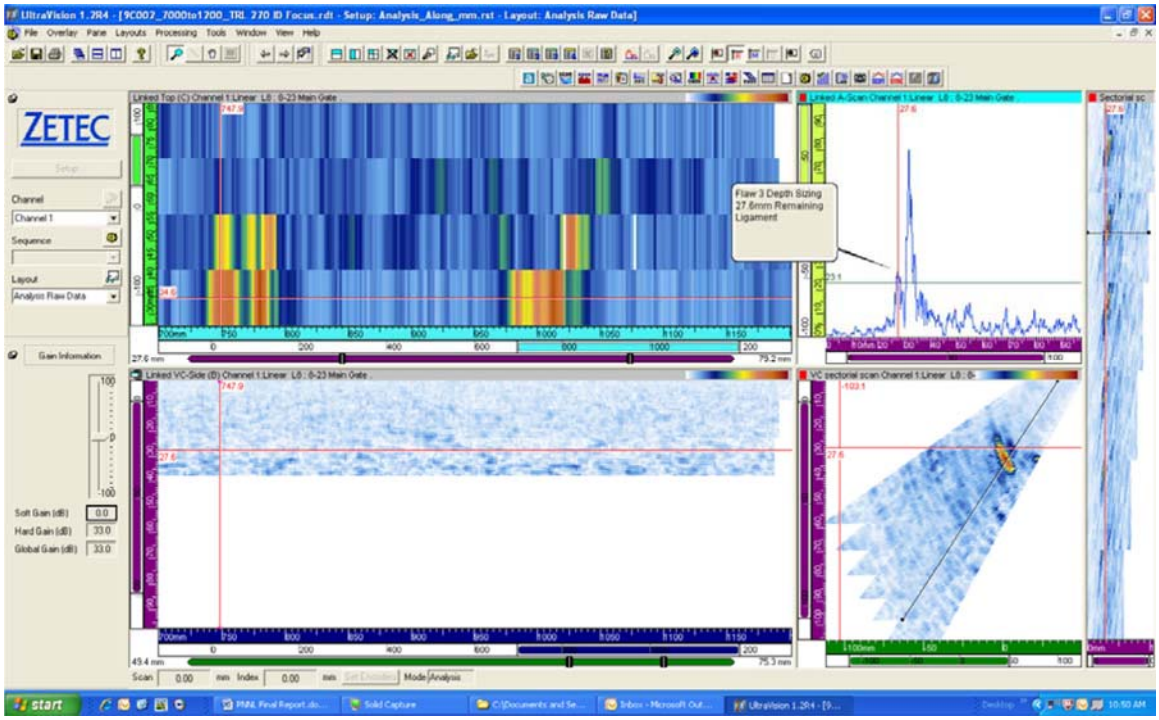


Figure F.14 9C-002 Implanted Flaw 3 from the CCSS Pipe Side for Depth Sizing

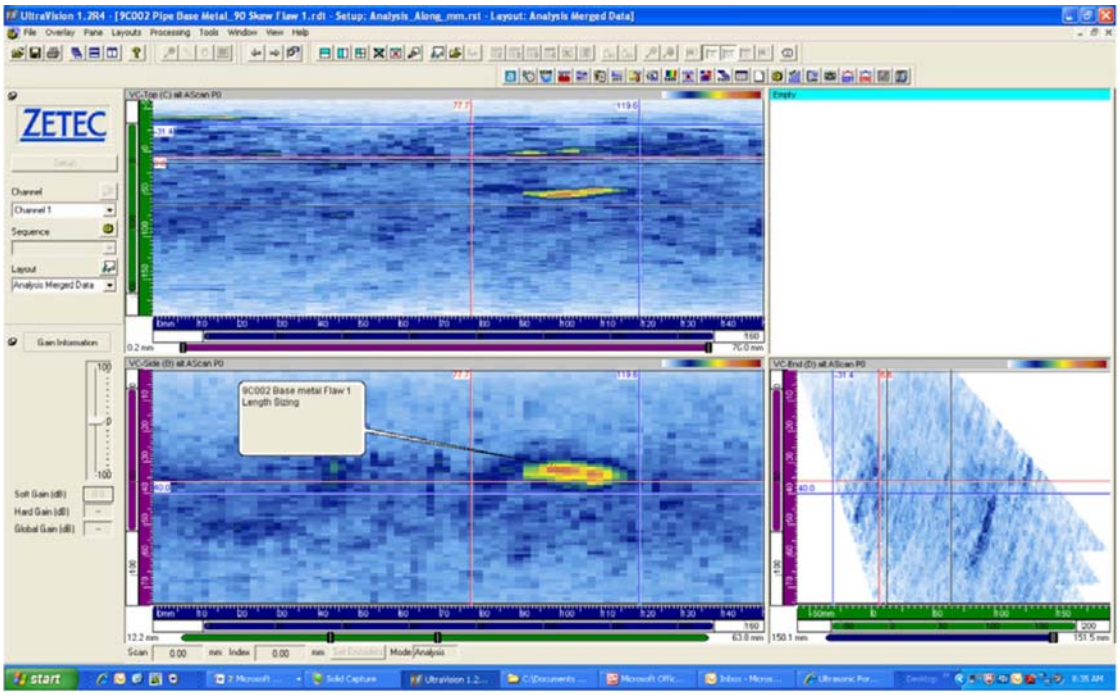


Figure F.15 9C-002 In-situ Grown Flaw 1110 from the Side Closest to the Elbow for Length Sizing

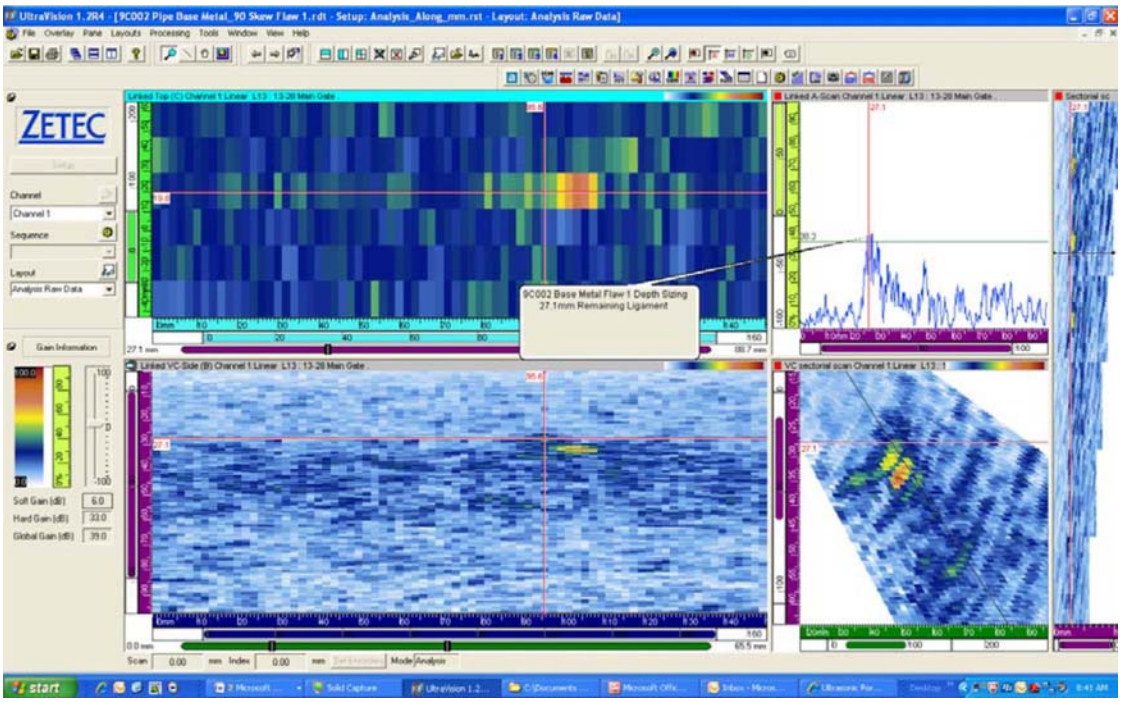


Figure F.16 9C-002 In-situ Grown Flaw 1110 from the Side Closest to the Elbow for Depth Sizing

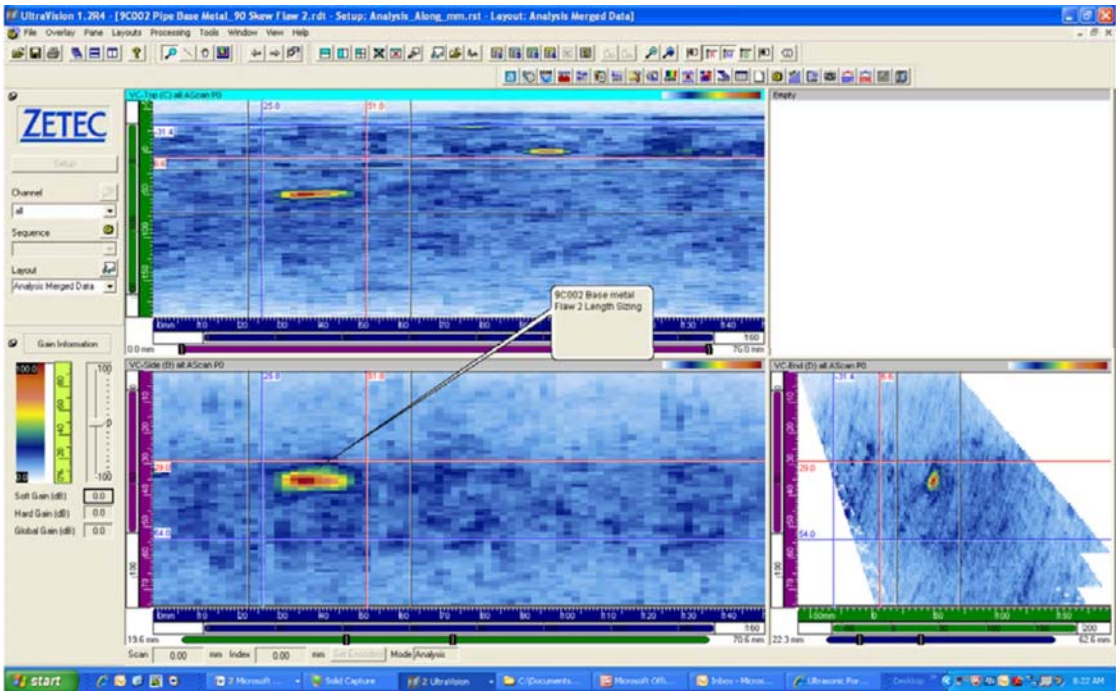


Figure F.17 9C-002 In-situ Grown Flaw 1102 from the Side Closest to the Elbow for Length Sizing

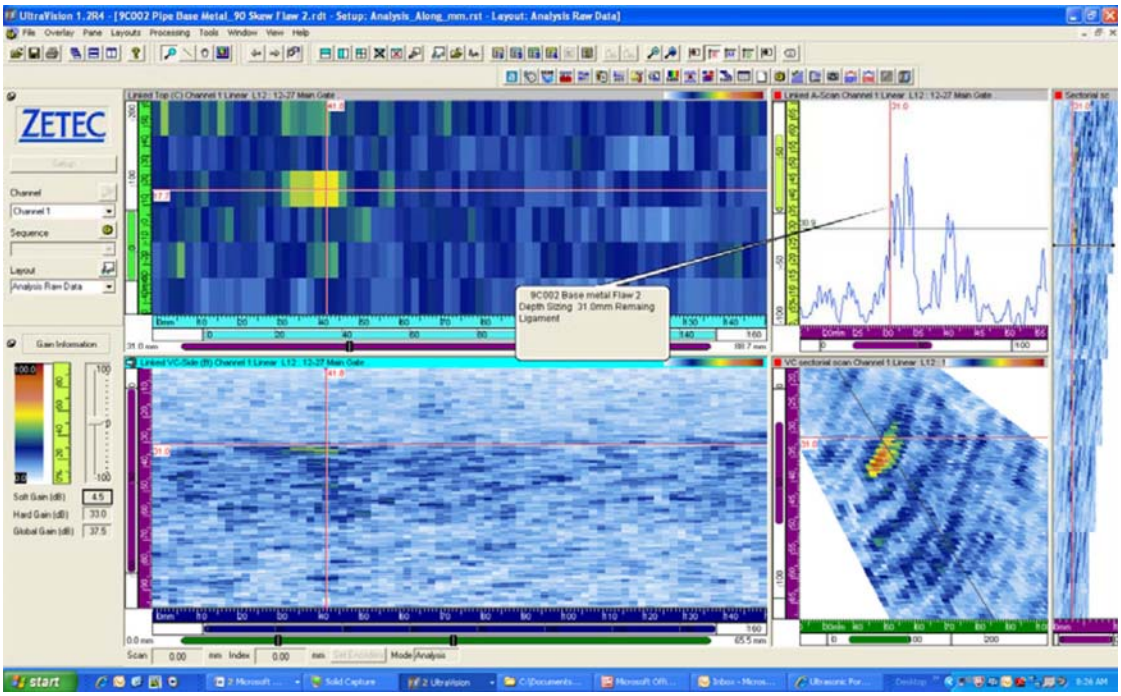


Figure F.18 9C-002 In-situ Grown Flaw 1102 from the Side Closest to the Elbow for Depth Sizing

NRC FORM 335
(9-2004)
NRCMD 3.7

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

(See instructions on the reverse)

1. REPORT NUMBER
(Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.)

NUREG/CR-7122

2. TITLE AND SUBTITLE

An Evaluation of Ultrasonic Phased Array Testing for Cast Austenitic Stainless Steel Pressurizer Surge Line Piping Welds

3. DATE REPORT PUBLISHED

MONTH	YEAR
March	2012

4. FIN OR GRANT NUMBER

N6398

5. AUTHOR(S)

A. A. Diaz, A. D. Cinson, S. L. Crawford, R. A. Mathews, T. L. Moran, M. S. Prowant and M. T. Anderson

6. TYPE OF REPORT

Technical

7. PERIOD COVERED *(Inclusive Dates)*

8. PERFORMING ORGANIZATION - NAME AND ADDRESS *(If NRC, provide Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address; if contractor, provide name and mailing address.)*

Pacific Northwest National Laboratory
P.O. Box 999
Richland, Washington 99352

9. SPONSORING ORGANIZATION - NAME AND ADDRESS *(If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)*

Division of Engineering
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

Confirmatory research is being conducted for the U.S. NRC at PNNL to assess effectiveness and reliability of advanced NDE methods for the inspection of primary system pressure boundary components/materials in LWRs. The work reported here provides a technical evaluation to assess the capabilities of phased-array ultrasonic testing methods as applied to the inspection of welds in CASS pressurizer (PZR) surge line piping. A set of thermal fatigue cracks (TFCs) were implanted into CASS PZR surge-line specimens salvaged from cancelled NPPs that were fabricated of vintage materials formed in the 1970s. Flaw responses from these cracks were used to evaluate detection and sizing performance of the PA-UT methods applied. The results reported here show that longitudinal mode, transmit-receive matrix phased-array probes, over the applied frequency range, provides effective sound fields for detection and characterization of TFCs in CASS PZR surge line components. PA-UT results were compared against true-state data for all flaws, and root mean square error was computed as a metric for both length- and depth-sizing of flaws. Signal-to-noise ratio measurements were documented and analyses made to quantify the potential impact of material-induced attenuation and redirection of the sound fields on flaw detection and localization.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

phased array
inservice inspection
ultrasonic testing
cast austenitic stainless steel

13. AVAILABILITY STATEMENT

unlimited

14. SECURITY CLASSIFICATION

(This Page)
unclassified

(This Report)
unclassified

15. NUMBER OF PAGES

16. PRICE

PRINTED ON RECYCLED PAPER

Federal Recycling Program

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

OFFICIAL BUSINESS

NUREG/CR-7122

An Evaluation of Ultrasonic Phased Array Testing for Cast Austenitic Stainless Steel Pressurizer Surge Line Piping Welds

March 2012