



Ultrasonic Phased Array Weld Inspection Course Outline

1.0 Introduction and course objectives

- 1.1 Brief history of phased array
- 1.2 Capabilities / advantages of phased array
- 1.3 Course objectives

2.0 Ultrasonic phased array digitization principles

- 2.1 Advantages of digital recording
- 2.2 Digital amplitude
- 2.3 Sampling rate
- 2.4 Time for one wavelength
- 2.5 Minimum sampling
- 2.6 Ideal sampling
- 2.7 Pulse shape
- 2.8 Pulse width
- 2.9 Signal averaging
- 2.10 Element excitation
- 2.11 Number of A scans
- 2.12 PRF / Scan speed relationship
- 2.13 Effect of averaging on scan speed
- 2.14 PRF issues
- 2.15 Probe frequency spectrum
- 2.16 Bandwidth
- 2.17 Bandpass filters
- 2.18 Video smoothing filters
- 2.19 Gray scale palette
- 2.20 Color scale palette
- 2.21 Swept angle imaging
- 2.22 Data collection rate
- 2.23 OmniScan display options
- 2.24 A scan
- 2.25 B scan
- 2.26 C scan (Double image)
- 2.27 S scan true depth
- 2.28 S scan half path

3.0 Introduction to phased array principles

- 3.1 What are phased arrays
- 3.2 Why use phased arrays
- 3.3 Phased array terminology
- 3.4 Probe parameters
- 3.5 Probe manufacturing, composite crystal technology
- 3.6 Linear 1D probes
- 3.7 Phased array probe design
- 3.8 Wedge parameters
- 3.9 Common probe geometries
- 3.10 Comparison with conventional vs phased array wave forming technology
- 3.11 Beam forming using phased array principles
- 3.12 Transmitting delays
- 3.13 Receiving delays
- 3.14 Focal law generation
- 3.15 Focal law calculation
- 3.16 Beam focusing
- 3.17 Dynamic Depth Focusing (DDF)
- 3.18 Beam steering
- 3.19 Sectorial scanning
- 3.20 Element size effects on beam steering
- 3.21 Electronic scanning
- 3.22 Summary of scan types
- 3.23 Array selection
- 3.24 Frequency and aperture type
- 3.25 Element size summary
- 3.26 How many elements to use
- 3.27 Power of the elements
- 3.28 Design compromise
- 3.29 Choosing the pitch and aperture size
- 3.30 Array lobes

4.0 OmniScan orientation and basic operating instructions

- 4.1 Available modules
- 4.2 Module specifications
- 4.3 Software screen

- 4.4 User interface options
 - 4.5 Direct access buttons
 - 4.6 Main menu
 - 4.7 File menu
 - 4.8 Reading menu
 - 4.9 Utilities menu
 - 4.10 UT
 - 4.11 Scan
 - 4.12 Display
 - 4.13 Probe / Part
 - 4.14 PGM Probe
 - 4.15 Gate / Alarms
 - 4.16 Calibration User
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- 5.0 Certification requirements for phased array inspectors**
 - 6.0 Code requirements for phased array inspection**
 - 7.0 Review of welding processes**
 - 8.0 Review of angle beam theory**
 - 8.1 Mathematical calculations used for angle beam theory
 - 8.2 Beam index point(s) determination
 - 8.3 Establishing weld scanning datum's
 - 9.0 Programming and process control procedures for the OmniScan.**
(Group practical session following Instructors presentation).
 - 9.1 General user information
 - 9.2 Basic connections and powering up
 - 9.3 Probe / Part calibration
 - 9.4 PGM probe calibration
 - 9.5 UT calibration
 - 9.6 Display selection
 - 9.7 Probe array dead element check
 - 9.8 Element sensitivity calibration procedure
 - 9.9 Wedge delay calibration procedure
 - 9.10 TCG (Time Corrected Gain) calibration procedure
 - 9.11 Sound velocity calibration procedure
 - 9.12 Encoder calibration procedure
 - 9.13 Flaw sizing procedure



- 9.14 Creating a report
- 9.15 Storing the set up file
- 9.16 Creating a defect table

10.0 Conclusions

Practical exercises

Appendix 1 Glossary of terms

Appendix 2 Acoustic Properties Table

Appendix 3 Direct access "Function Key" definitions

Appendix 4 Listing of available Olympus UT PA probe properties

Homework Quizzes

TEST NDT does not have any pre-requisites for attending any of our courses, it is entirely up to the attendee to determine whether the course is suitable for their needs and whether they are capable of achieving the standards. Please study the applicable course outline and decide if the course is suitable for your needs before enrolling, if in doubt, please contact us to discuss. For employer funded attendees, please discuss the suitability of any of the courses with your employers responsible NDT level 3 before enrolling.