

M 2 M

GEKKO

PORTABLE PHASED-ARRAY ULTRASOUND



USER-FRIENDLY

FULL-FEATURED SYSTEM

ADVANCED PHASED-ARRAY

APPLICATIONS

SPECIFICATIONS



GEKKO

GEKKO not only offers the features of standard phased-array portable systems (angular scanning, electronic scanning, TOFD, etc.), new advanced techniques have also been implemented such as real-time TFM (Total Focusing Method) and management of matrix arrays. These techniques offer 3D hyper focalization, defect characterization for more precise and faster inspections dedicated to field use.

GEKKO's user interface was developed to ease the work of operators. Thanks to wizards and a streamlined interface, reliable and precise inspections are achieved while keeping the experience easy to carry out.



GEKKO is dedicated to NDT operators from level 1 technicians to experts. Thanks to the application mode, an operator can directly access preset configurations to perform inspections. He can also choose to create a new application from scratch, guided by wizards and assistants.

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A CLEAR AND LOGICAL CONFIGURATION

GEKKO is designed with several step-by-step panels. For each panel (Equipment/ Settings/ Configuration), the operator sets the relevant parameters. Alert-indicators tell the operator of any inconsistencies (background color).

STEPS OF THE EQUIPMENT PANEL



SIMPLE AND CLEAR OPERATION MODES

GEKKO provides three module interfaces: **Wizards** are models of configuration files that allow the operator to create new applications with specific parameters. **Applications** are dedicated configuration files presenting step-by-step guidelines to the operator. **Inspections** files contain inspection data and report. Examine them further using analysis tools.

HOW BEST TO REDUCE OPERATOR ERROR?

GEKKO provides a simple and efficient operation mode for every NDT operator levels. Application interface, clear buttons, step-by-step parameters, quick calibration tools are there to reduce the possibilities of error.

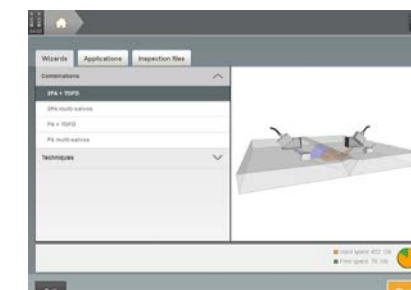
QUICK AND EASY CALIBRATION TOOLS

GEKKO provides fast and accurate calibration tools to set up the configuration: Material and wedge velocity calibration, Amplitude balancing, TCG & ACG calibration, TOFD calibration and more.

USER-FRIENDLY

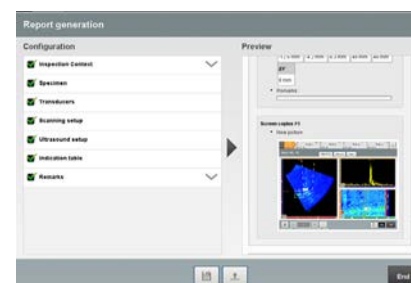
WIZARDS

Operators can select an application from a list of techniques (linear or matrix array inspections, TOFD, TFM or a combination of them). GEKKO prepares all the panels associated to the type of the selected application. The operator just needs to specify the parameters of the inspection.



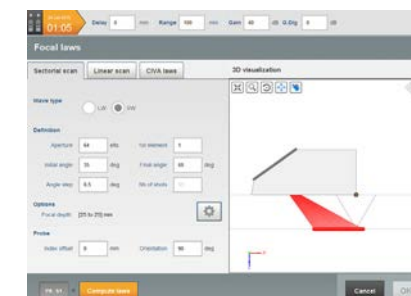
DATA ANALYSIS / REPORTING

The data-analysis tool allows an operator to point out and analyse the anomalies detected during an inspection. These indications can be exported into a report, along with all the parameters of the inspection (equipment, specimen, UT parameters for example) for further analysis by experts.

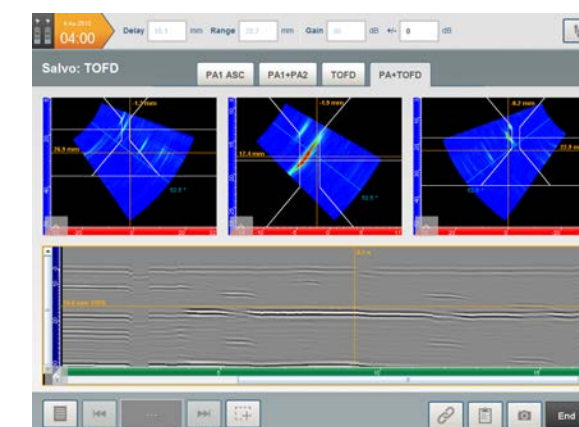


UT PARAMETER PANEL

Focal laws is one of the panels associated with an inspection. The operator can choose the type of scan, either sectorial or linear, the aperture, and the focal depth. Thanks to the CIVA-powered delay-law calculator, GEKKO can handle a wide range of delay laws.



MULTIGROUP CONFIGURATION



Multigroup with 2 phased-array and one TOFD results.

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Standard phased-array functions are natively implemented into GEKKO. Linear scan, 2D mapping, sector scan, electronic scanning, TOFD, pulse-echo, are all provided with step-by-step guidelines and assistants. The operator is helped starting with the calibration process through the data acquisition and analysis stages.

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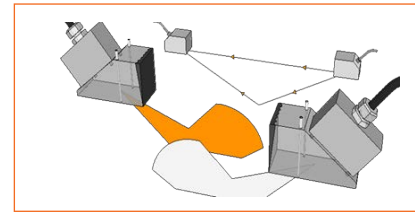
FULL-FEATURED

ADVANTAGE OF 64 PARALLEL CHANNELS

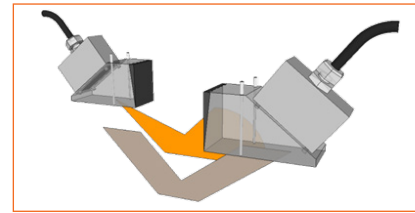
To meet numerous industrial applications, GEKKO is fueled with 64-parallel transmit/receive channels. This architecture makes some of the most advanced detection, characterization and imaging techniques possible.

HANDLING MULTIPLE SCANNING MODES

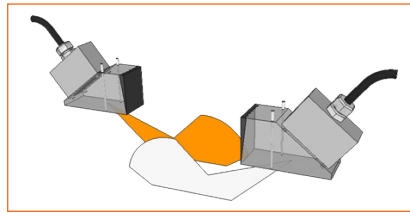
GEKKO manages various scanning methods to meet different inspection requirements. Some modes can also be used in combination, illustrated below.



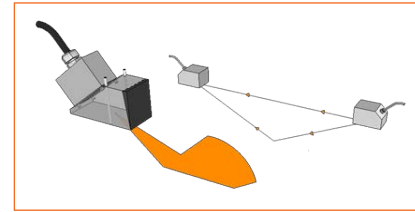
2x Sector scan + TOFD



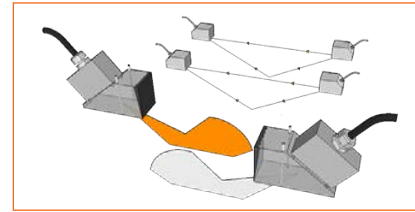
Sector scan + Electronic scanning



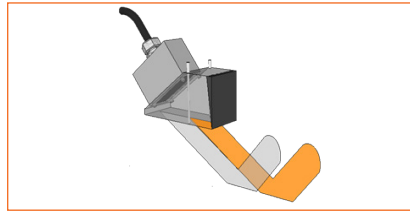
2x Sector scan



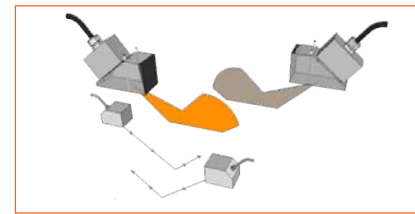
Sector scan + TOFD



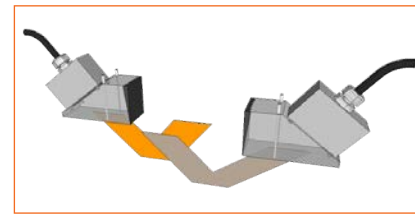
2x Sector scan + 2x TOFD



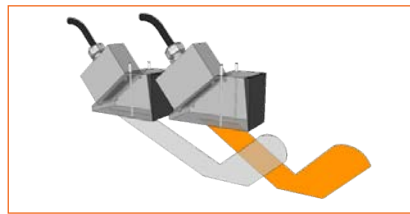
Multisalvoes



2x Sector scan + 2xPE



2x Electronic scanning



Tandem

PACKAGED SOLUTION

M2M works with scanner and probe manufacturers, as well as integrators, to offer packaged solutions worldwide. Most commonly-used phased-array probes and scanners in the NDT community are already preloaded in GEKKO.

SCANNERS



MagMan scanner



TOFD scanner



Tracer



C-Clamp encoder



Multisalvo

PROBES AND WEDGES



Flexible wedge



TOFD Configuration



Curved wedge with linear probe
*The GEKKO takes into account the curvature for delay law calculation



Angled wedge with matrix probe



GEKKO is implemented with new advanced techniques, such as real-time TFM (Total Focusing Method) and management of matrix arrays. These techniques offer 3D hyper focalization, defect characterization for more precise and faster inspections dedicated to field use.

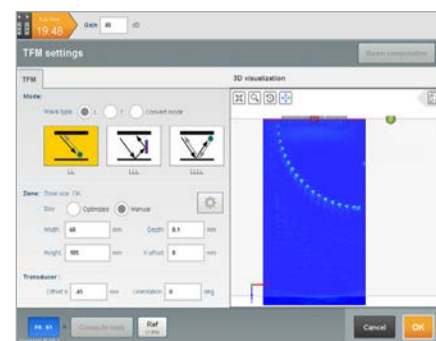
ADVANCED PHASED-ARRAY FOR EASIER INSPECTION

TOTAL FOCUSING METHOD FOR UNPARALLELED RESOLUTION DETECTION & CHARACTERIZATION

Total Focusing Method (TFM) imaging is one of the main axis of research and development at M2M. This powerful technique enables full focalization in the volume of specimens undergoing inspection for accurate defect characterization & high-resolution imaging. TFM uses the Full Matrix Capture method (FMC) for data acquisition and TFM algorithm for image reconstruction. TFM can be used with complex modes such as TTT for better characterization of vertical cracks or converted mode for misoriented defects.



ASME steel block inspection, using 5 MHz LO° phased-array probe with 64 elements

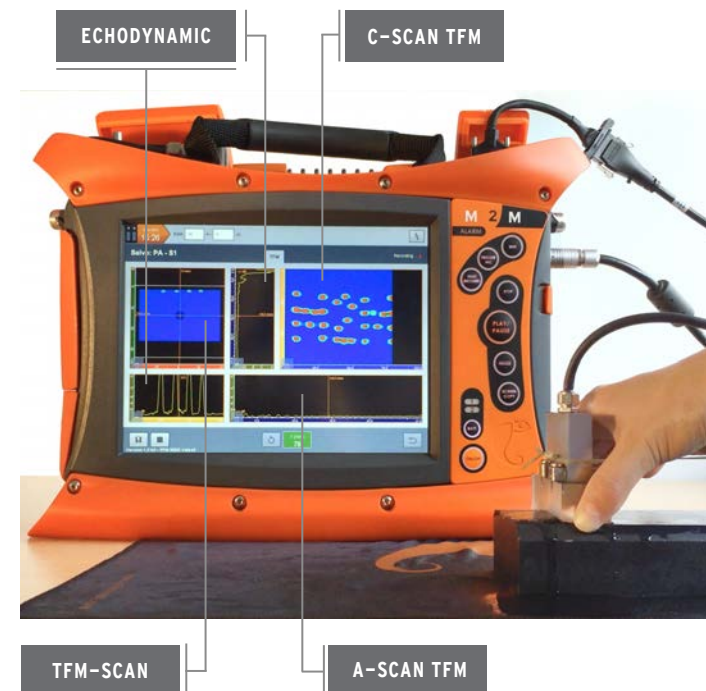


REAL-TIME TFM

Real-time imaging with speed of up to 30 frames per second can be achieved, for clear image and precise defect contour. The TFM image has a 256x256 pixels resolution: 1 pixel = 1 focused point.

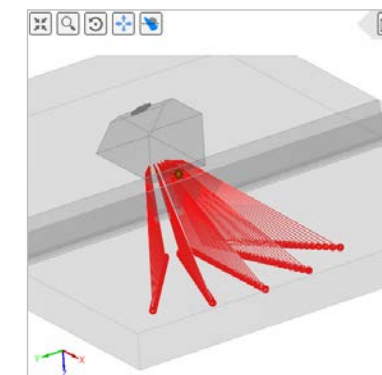
EXTENDED TFM IMAGES

In addition to the full imaging system (A-B-S-C Scan + 3D view) GEKKO offers extended TFM images during Acquisition and Analysis: C-SCAN, Echodynamics curves, A-scan, and 3D view.



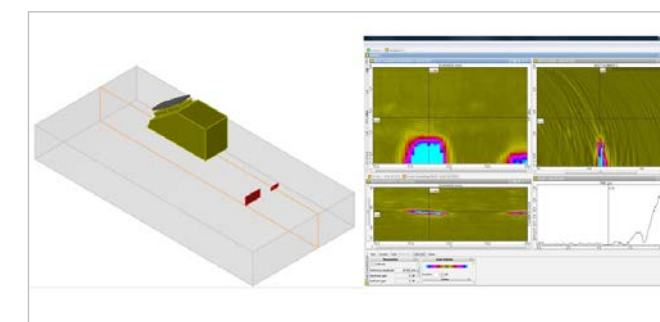
MATRIX PROBE

For better expertise, GEKKO handles matrix probes. Ideal for out-of-plane focusing and beam steering, the operator may choose this technique when access is limited and resolution needed in a specific area.



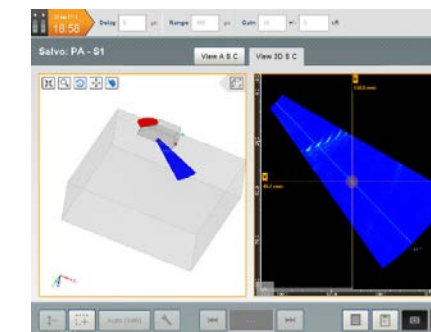
CIVA COMPATIBLE

GEKKO is fueled by CIVA, the leading simulation software on the NDT market. The operator can customize its interface. With the CIVA engine inside, GEKKO can be used to compute most focusing laws specified by the operator. GEKKO data files can be read and analyzed further in any CIVA packages.



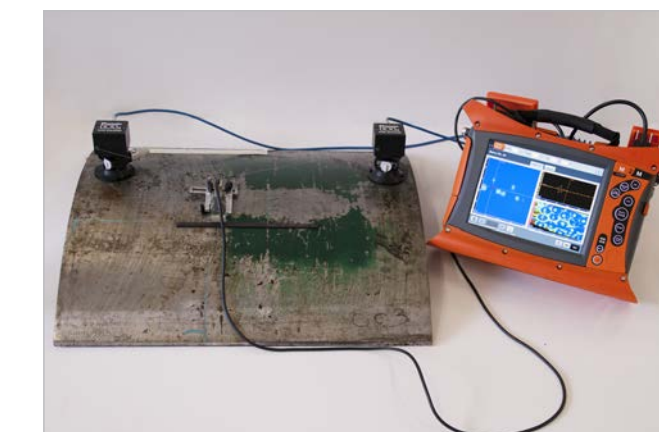
3D IMAGING

GEKKO is the only system on the market combining phased-array techniques with high-end 3D imaging techniques. This type of display helps the operator locate the sector-scan within the specimen undergoing inspection in 3D.



2D MAPPING

The GEKKO handles two-axis mapping.



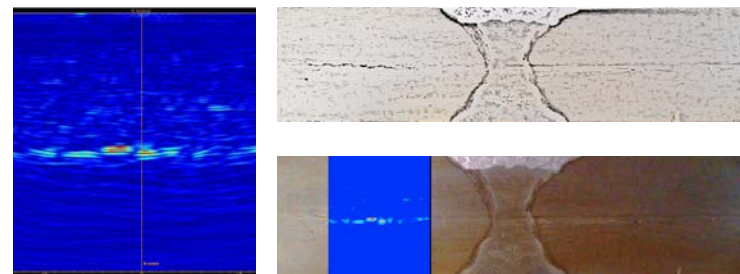


Intended for industries such as aerospace, metallurgy, oil & gas, power generation and automotive, GEKKO covers a wide range of applications from corrosion mapping to crack detection and characterization in welded pipes and plates. Thanks to its advanced features, GEKKO can handle thick components, detect and characterize misoriented defects. Superimposition of CAD files to ultrasonic data helps the operators interpret measurements and lowers the rate of false alarms.

IMPROVE DETECTION

HIGH TEMPERATURE HYDROGEN ATTACK (HTHA) DETECTION

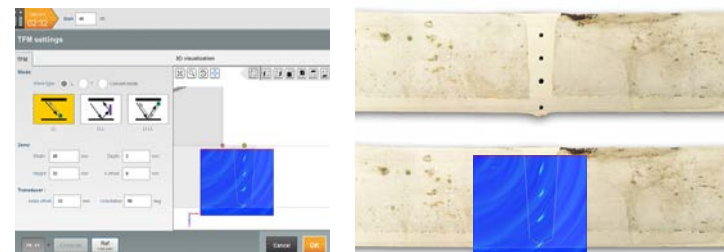
Carbon-steel specimen inspection with TFM technique.



Courtesy of Comex

EXTENDED VIZUALISATION AREA

Inconel weld-inspection with TFM technique. Defects are detected close to the top and bottom surfaces.

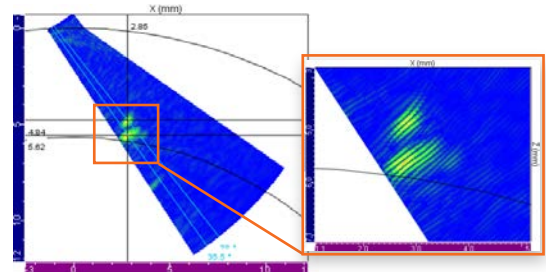


Courtesy of Karl Deutsch

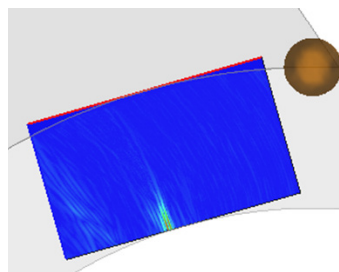
CYLINDRICAL RECONSTRUCTION

DEFECT SIZING

Small diameter pipe inspection using sizing with corner effect mode (TTT). Both TFM technique and sectorial scan are illustrated. For outside diameter defects, both modes account for the rebound off the inner curved-surface to display a scaled image.



S-scan for a 1 mm defect



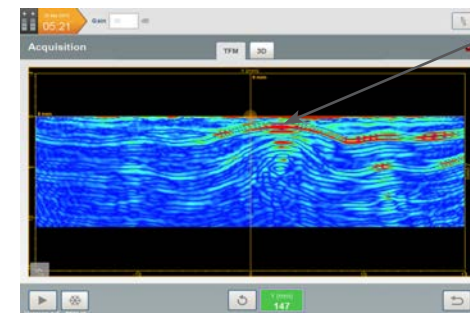
TFM reconstruction for a 1mm defect



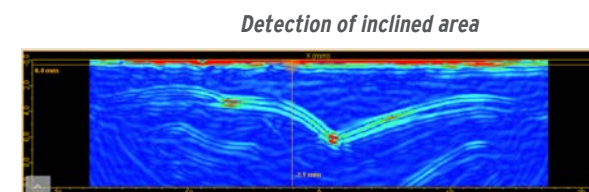
CORROSION

MAPPING IMPROVEMENT WITH TFM

Reduced dead zone: corrosion detection till 1mm under the surface. Full description of the corroded profile for more accurate measurements.



Corrosion till 1 mm under the surface



Detection of inclined area

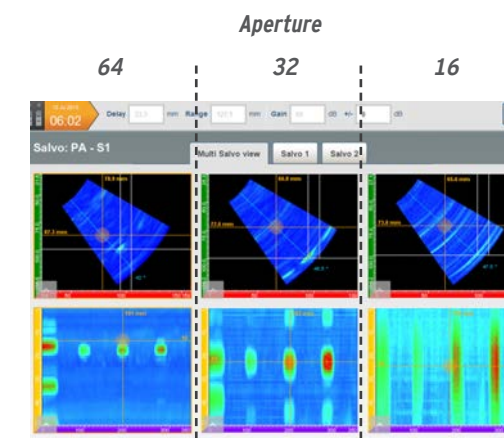
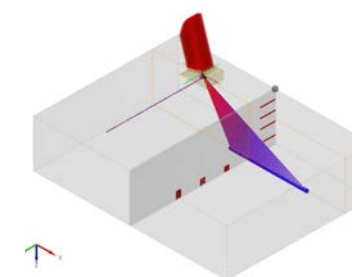
Courtesy of Insitut de Soudure



INSPECTION OF THICK COMPONENT

SUBSTANTIAL IMPROVEMENT WITH 64-ELEMENT APERTURE

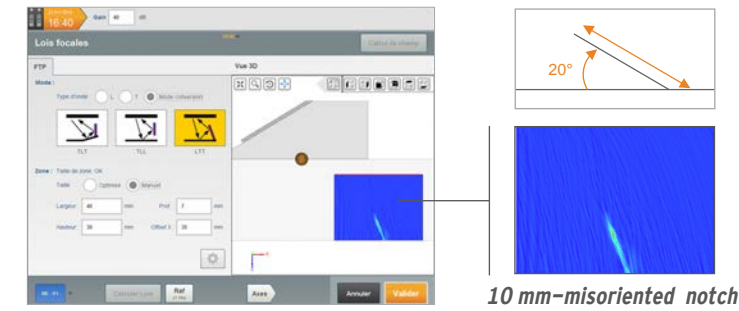
100-mm thick stainless steel weld inspection with a 64-element aperture shows better spatial resolution compared to 16 and 32-element apertures
 Probe: 3,5 MHz, 64 elements
 Pitch: 0,6mm
 Wedge: L



DEFECT CHARACTERIZATION

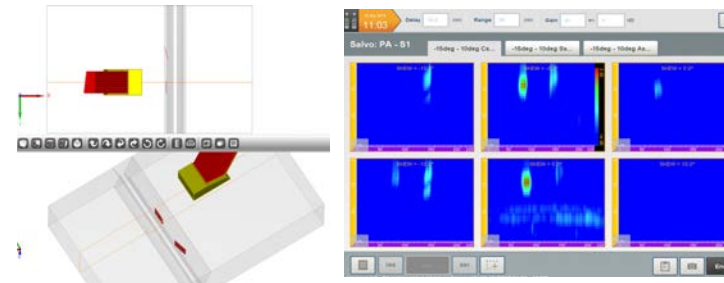
CHARACTERIZATION OF MISORIENTED DEFECT

Tilted defect reconstruction with TFM technique and mode conversion.
 Probe: 5 Mhz, 64 elements
 Wedge: S



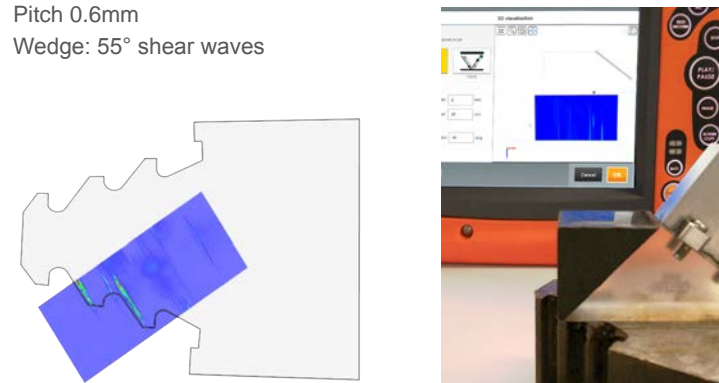
SKEWED DEFECT DETECTION

Use of matrix probe with sectorial scanning along various planes perfect for the detection of skewed defects



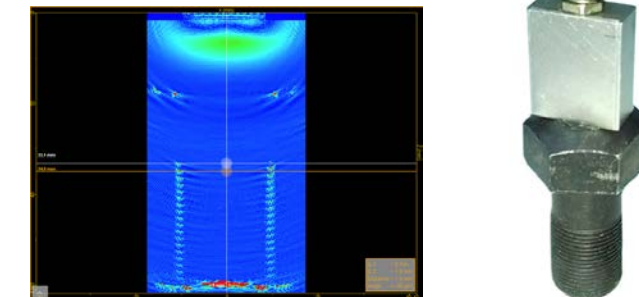
BLADE INSPECTION WITH HALF-SKIP TFM

TFM and superimposition of a CAD file to ease the inspection diagnostic
 Probe: 5 MHz, 64 elements
 Pitch 0.6mm
 Wedge: 55° shear waves



SCREW THREAD INSPECTION

27-mm long screw thread inspection with TFM technique, optimal resolution is obtained along the thread.
 Probe: PA, 5 MHz, 64 elements
 Pitch 1.8mm

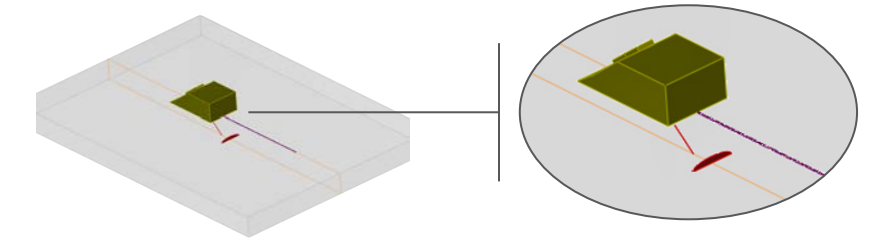


Courtesy of Karl Deusch

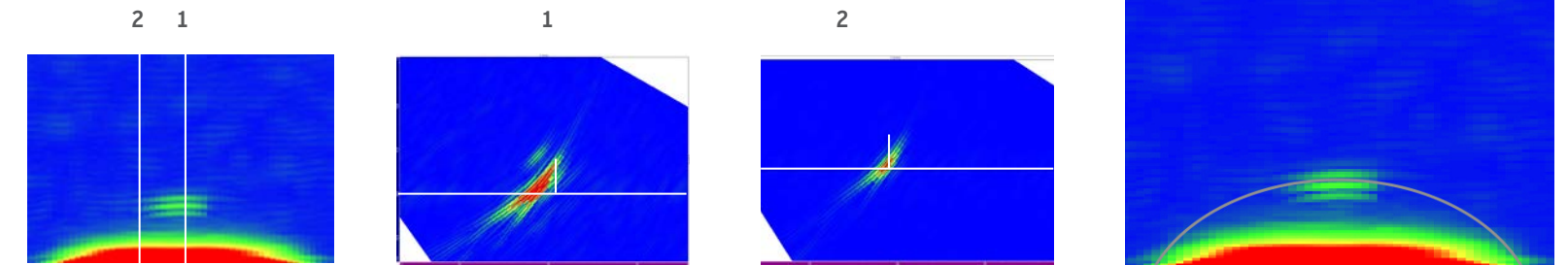
DEFECT CHARACTERIZATION

2-MM ELLIPTICAL CRACK

Characterization of the defect possible, even without a diffraction signal. The full shape of the defect is reconstructed with TFM technique.



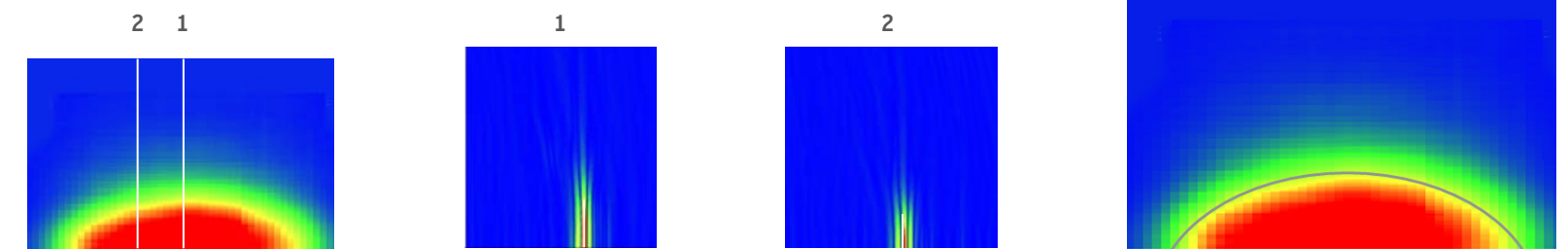
Sector scan



D-scan

Superimposition of the true profile of the crack with the DSCAN

Half skip reconstruction (TFM)



D-scan



Software

All-level operators, application wizards, analysis, reporting
 Real-time imaging A-Scan, B-Scan, S-Scan, C-Scan
 Total Focusing Methods (TFM), images & 3D display
 Inspection modes: pulse-echo, TOFD
 CIVA fueled phased-array calculator, compatibility with CIVA

Phased-array

Matrix and linear arrays
 Linear scanning, sectorial scanning
 Up to 1200 delay-laws - Up to 6 salvoes

Pulsers

64 phased array channels:
 Negative square pulse, width: 30ns to 1250ns
 12V to 100V with 1V step
 Max. PRF: 10kHz

4 conventional UT channels:
 Negative square pulse, width: 30ns to 1250ns
 12V to 200V with 1V step
 Max. PRF: 10kHz

Receivers

64 phased array channels:
 Input impedance: 50 Ω
 Frequency range: 0.4 to 20MHz
 Max. input signal: 1.2 Vpp
 TCG – ACG calibration wizard
 Gain: up to 120 dB (0.1dB step)
 Cross-talk between two channels < 50 dB

4 conventional UT channels:
 Input impedance: 50 Ω
 Frequency range: 0.4 to 25MHz
 Max. input signal: 1.4 Vpp
 TCG – DAC calibration wizard
 Gain: up to 120 dB (0.1dB step)

Digitizer

Digitizing and real-time summation on 64 channels
 FIR filters
 Averaging up to 1:32
 Resolution: 12bits, processing: 16bits
 Max. sampling frequency: 100 MHz
 Digitizing depth up to 65000 samples

Acquisition

Hardware acquisition gates, synchronization of gates
 Maximum number of acquisition gates : 6
 A-Scans/Peaks data recording
 Max. data flow 50 MB/s on a 128Go SSD (extensible up to 1 To)
 Inspection data file size: up to 10Go
 Acquisition trigger on event (encoder)

Hardware

FPGA and CPU boards
 3.5h batteries, hot swap
 10.4" touch screen – Resolution 1024x768

I-O

1 IPEX connector for phased array
 3 encoders input
 VGA output
 3 USB2
 4 LEMO 00 connectors for conventional UT
 1 external trigger* - Ethernet* - 16 analog input*

General

L x W x H: 410mm x 268mm x 124mm
 Operating temperature range: from 0 to 40°C
 Storage temperature range: -10 to 60°C with battery
 Weight: 6,5kg (without battery); 0,480g /battery
 IP54

*Indicated values may change without notice. *non-handled by the software in V1.3*

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