

# Wind Turbine Inspection Solutions

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2016



# Turbine failures

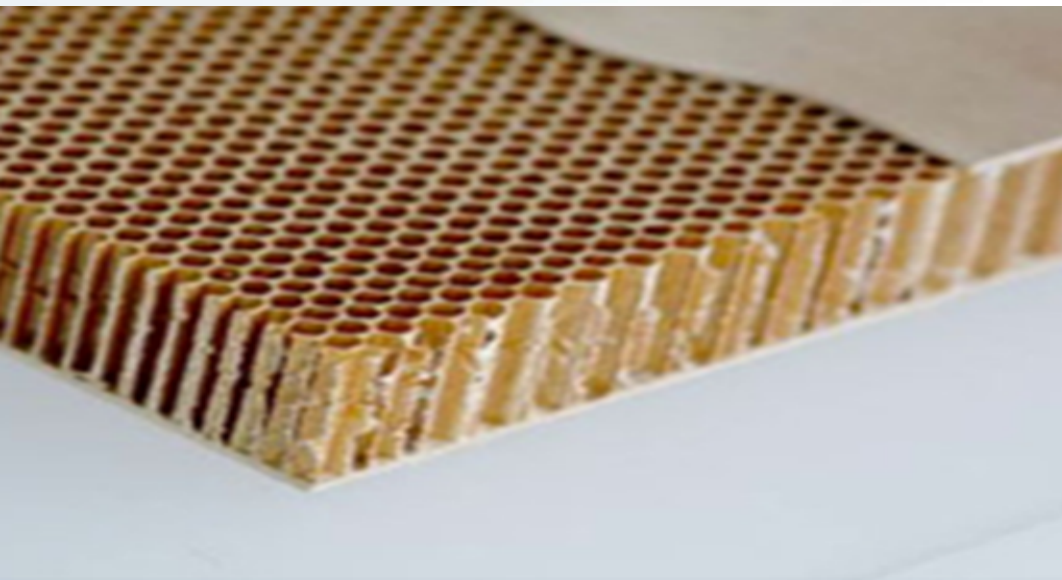




We can differentiate two main type of structures:

## Honeycomb

- Sandwich configuration composed of:
  - Honeycomb core
  - Top and bottom thin skin layers



## CFRP

- Multiple layers of carbon sheets



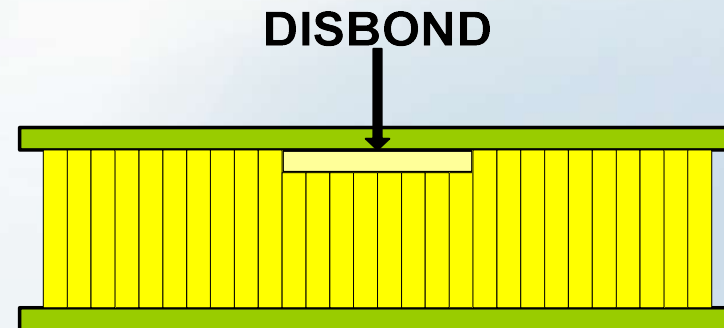
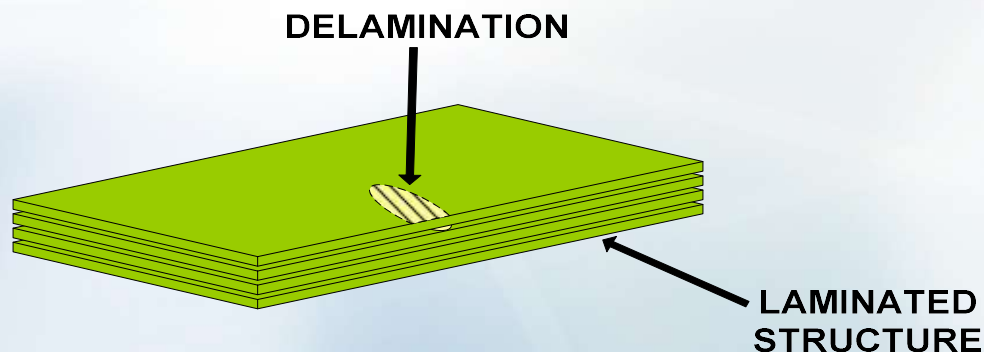
## Defects found in Honeycomb Structures

- **Types:**

- Disbond
- Delamination
- Repaired areas (putty)

- **Challenges:**

- Honeycomb core attenuation limits the use of Ultrasound for disbond detection
- Disbond can be on the near side or on the far side of the part
- Delamination are usually very close to the surface



# Bond Testing C-Scan

## Features

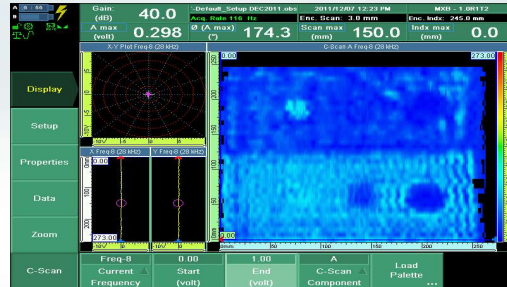
- 8 frequencies test
- Sizing estimation
- Color imagery (C-scan)
- Two encoded axis capability
- Amplitude or Phase displays
- Analysis mode
- Data archiving and reporting
- User-friendly interface



# Bond Testing C-Scan



**OmniScan MX and  
ECA/ECT Module**



**NEW**

**MXB Software**



**NEW**

**BondMaster Probe Adapter  
for OmniScan**



**Standard BondMaster  
Probe and Cable**



**Appropriate Yokes and  
Probe Holder**



**XY Scanner**



## Hand Scanner

**NEW**

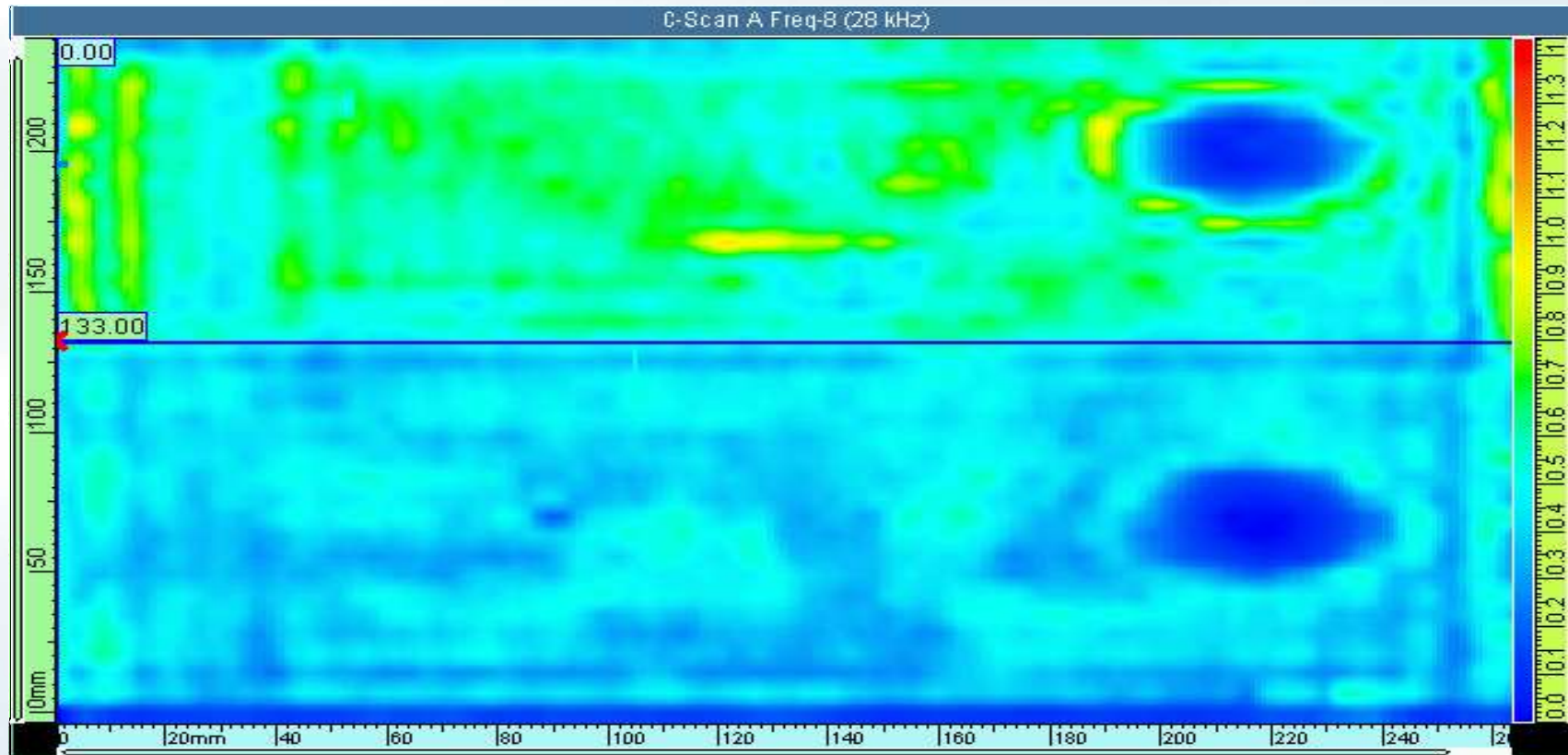
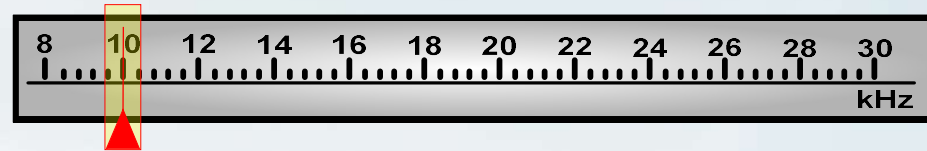




# Bond Testing C-Scan

## Sample results Amplitude

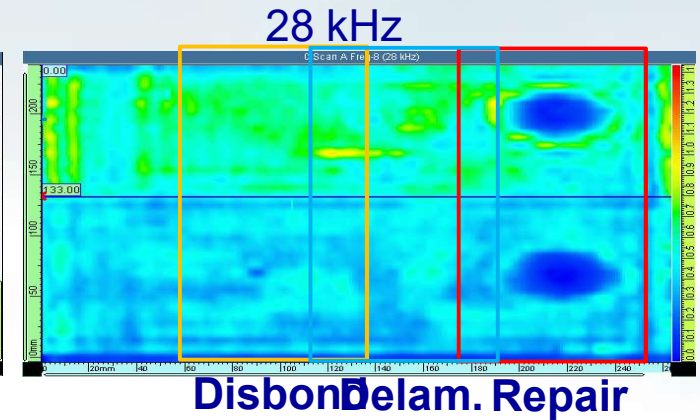
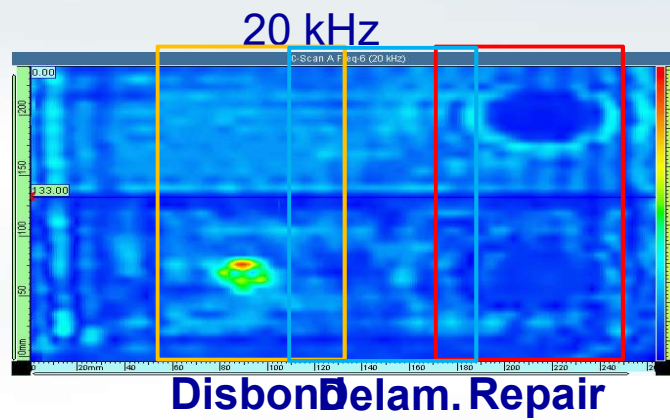
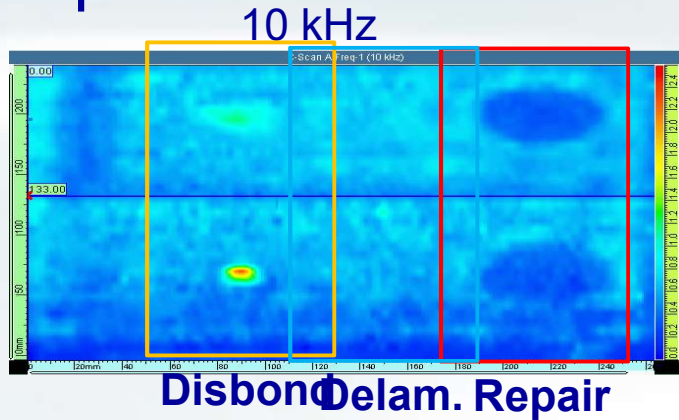
Near side, Amplitude Display



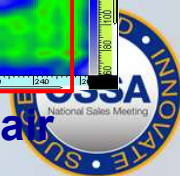
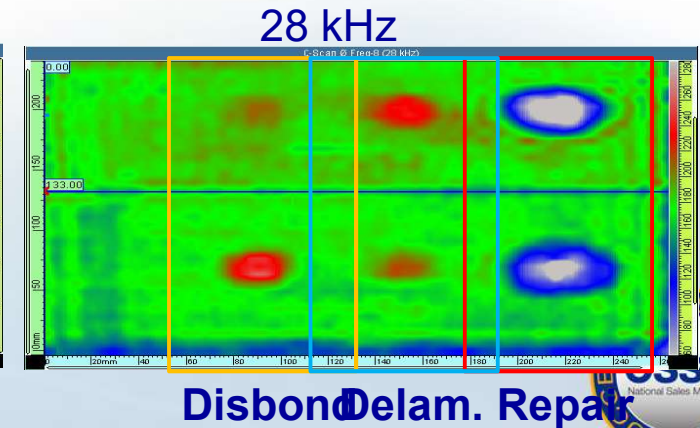
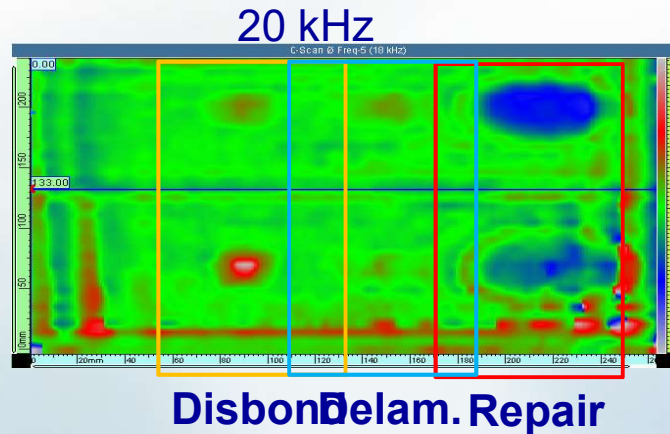
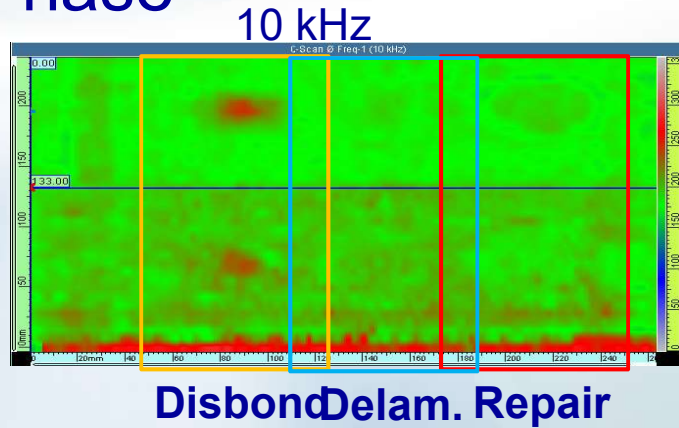
# Bond Testing C-Scan

## Sample results Amplitude VS Phase

### Amplitude



### Phase



# Phased Array Solution



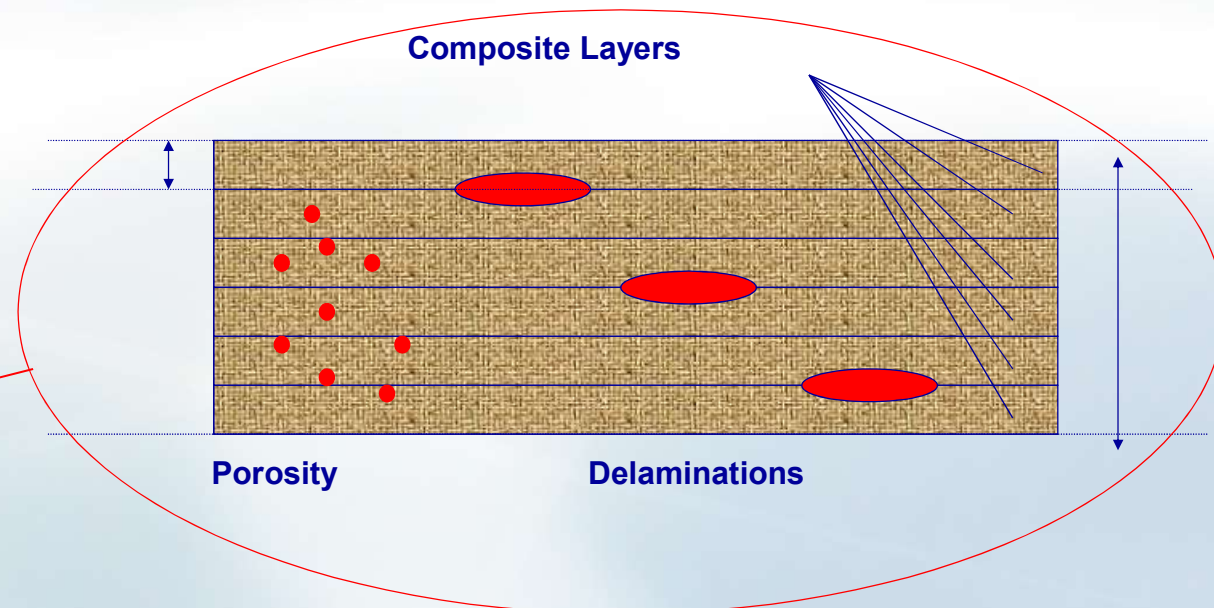
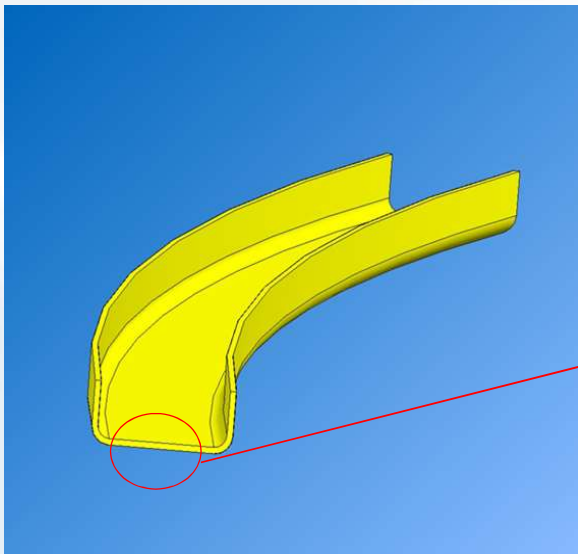
## Defects found in Multi-Ply Fiber Glass Structures

### Defect Types:

- Delamination
- Porosity

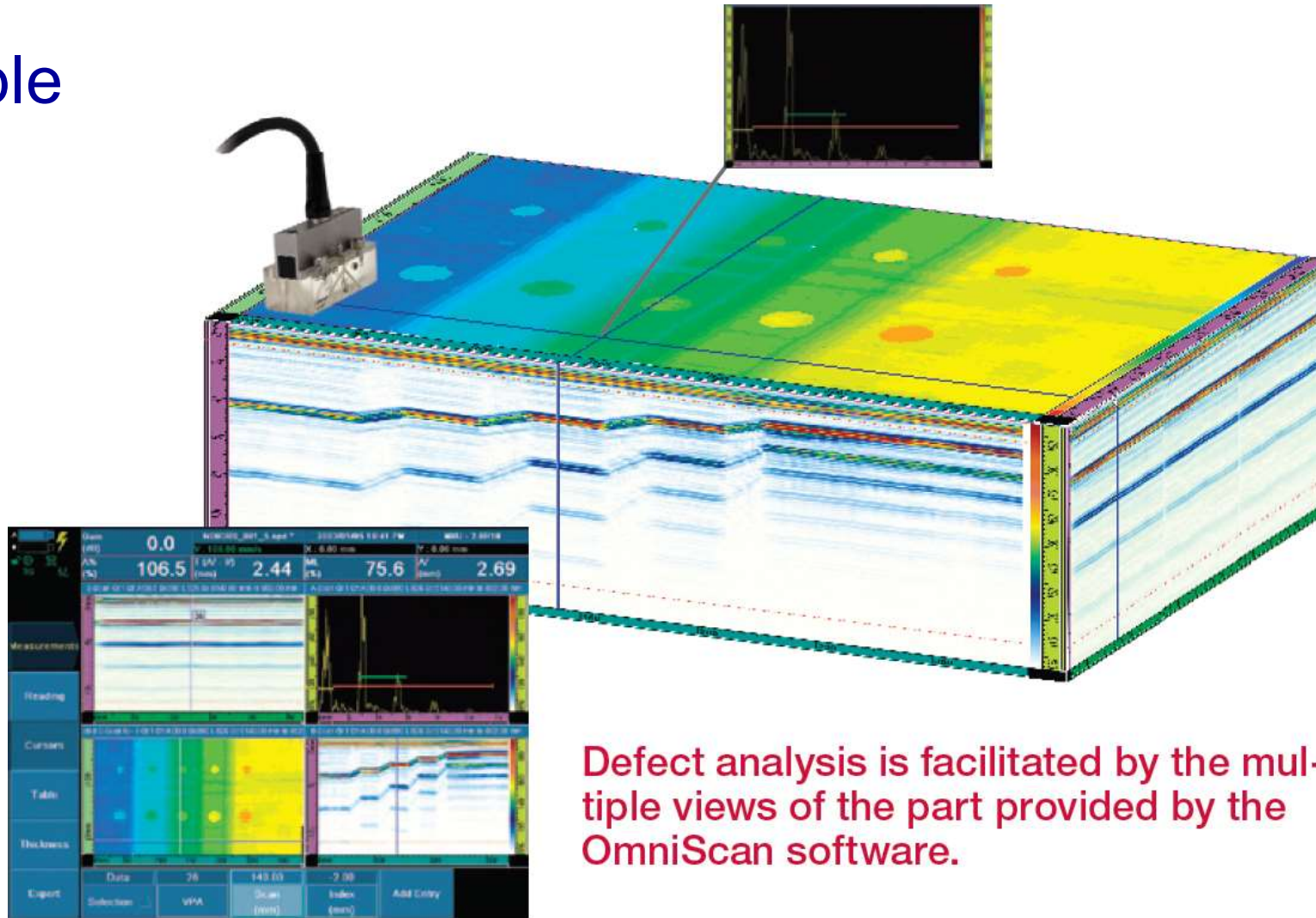
### Challenges:

- Thick attenuating material
- Porosity are not good reflectors



# Phased Array

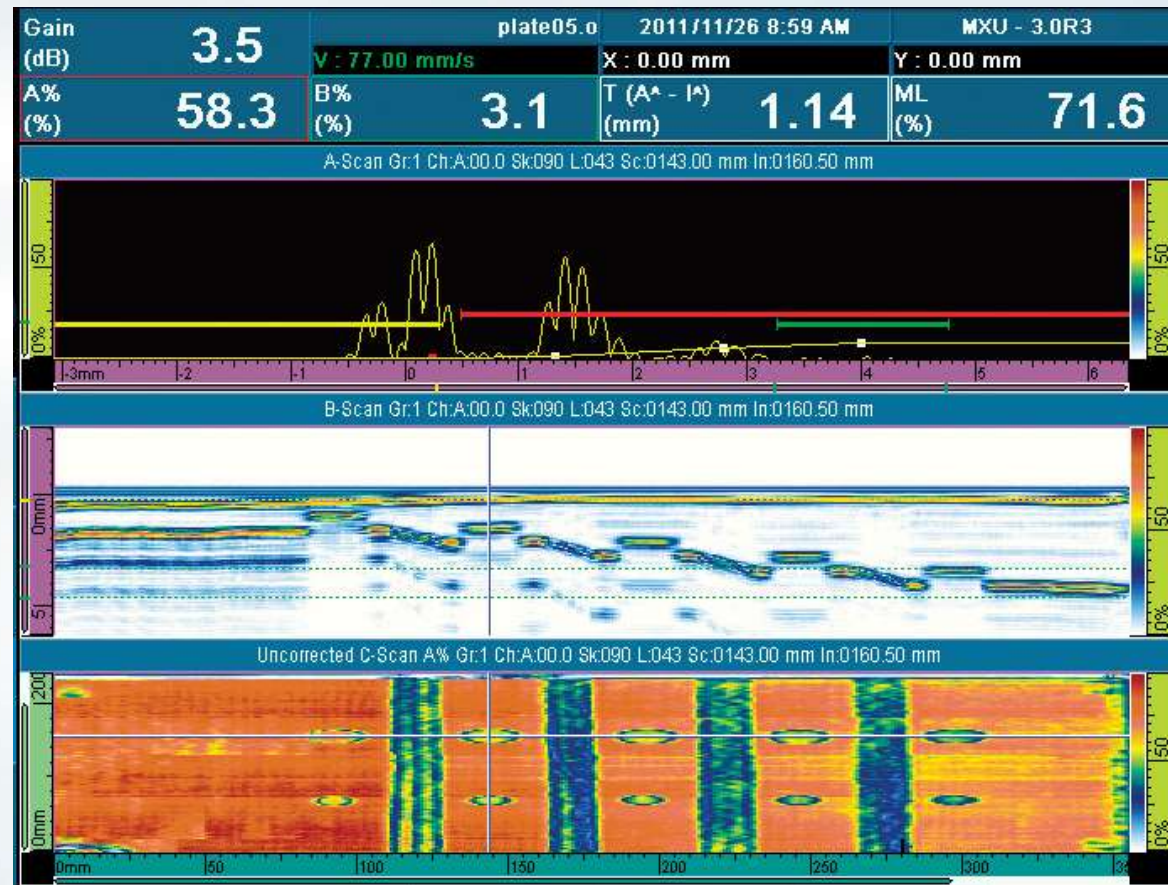
## Principle



# Phased Array

## Advantages

- Good penetration (up to 50mm thick)
- Large coverage
- Fast inspection
- Two encoded axis C-Scan imagery
- Precise Sizing and Depth measurement
- Data recording and reporting



# Phased Array

## Fiber Glass Inspection Solution

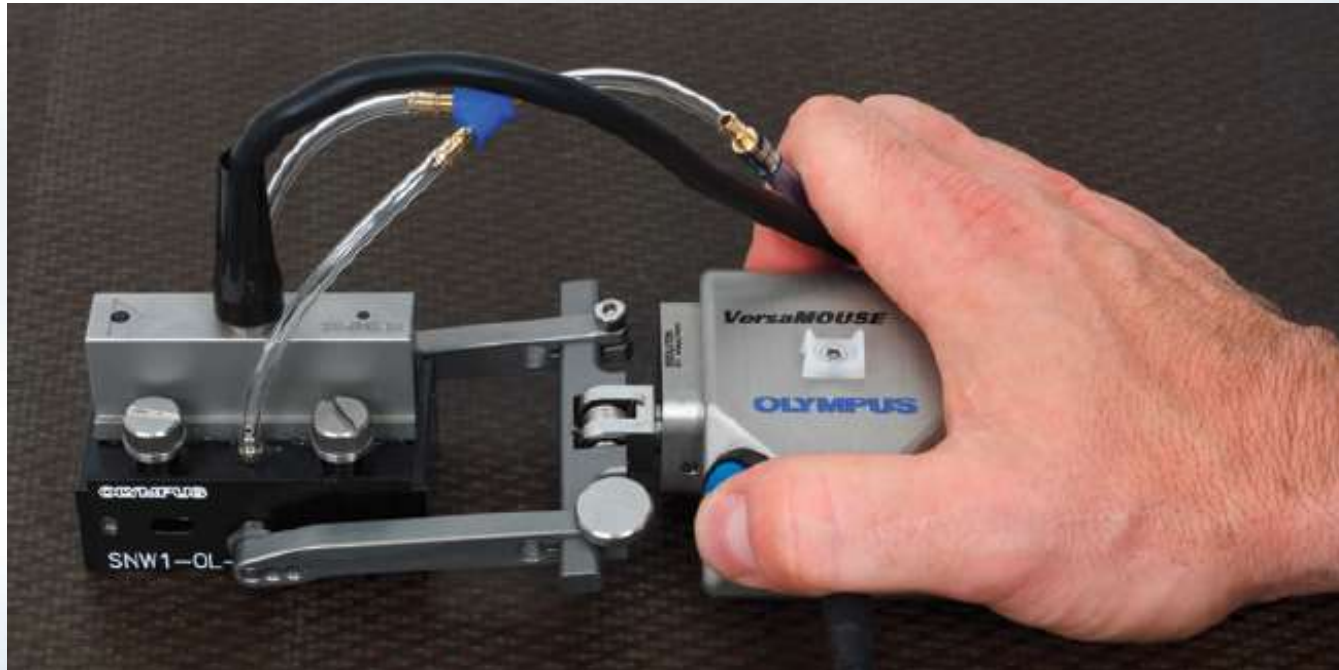
### Based on:

- OmniScan PA flaw detectors
- Glider/Wing/VersaMOUSE Scanners
- NW Aqualene Wedges and PA probes
- New RollerFORM Wheel Probe



# Phased Array

## Manual One-Line Inspection with Indexer VersaMOUSE – Affordable Inspection of Flat Surfaces



When limited space is a factor, the VersaMOUSE is an economical complimentary scanning tool to the GLIDER for 2-D mapping.



# Phased Array

## Manual One-Line Inspection with Indexer

RollerFORM – Ergonomic Inspection of Flat or Curved Surfaces

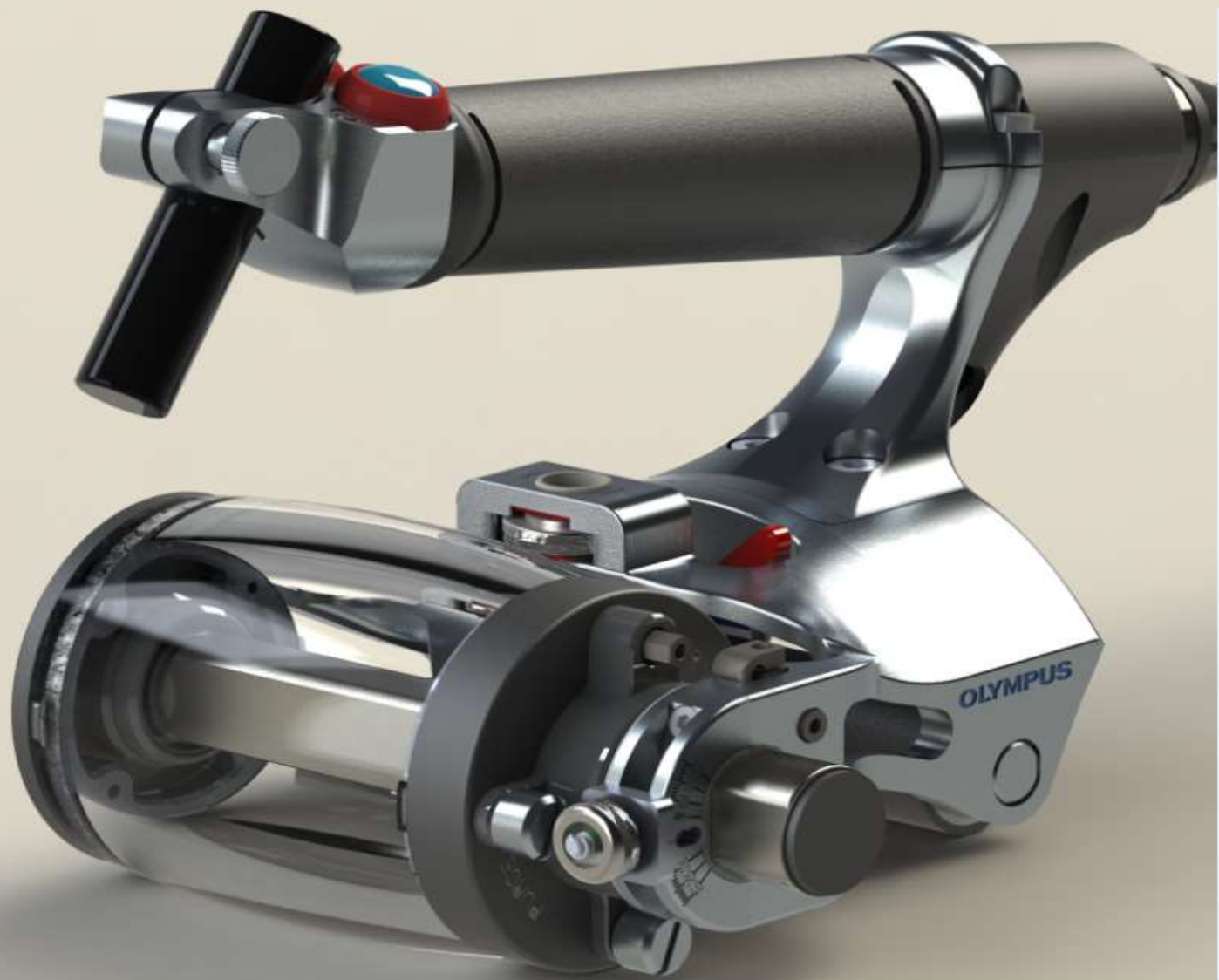


Immersion-like acoustic without the need to manage a water delay line



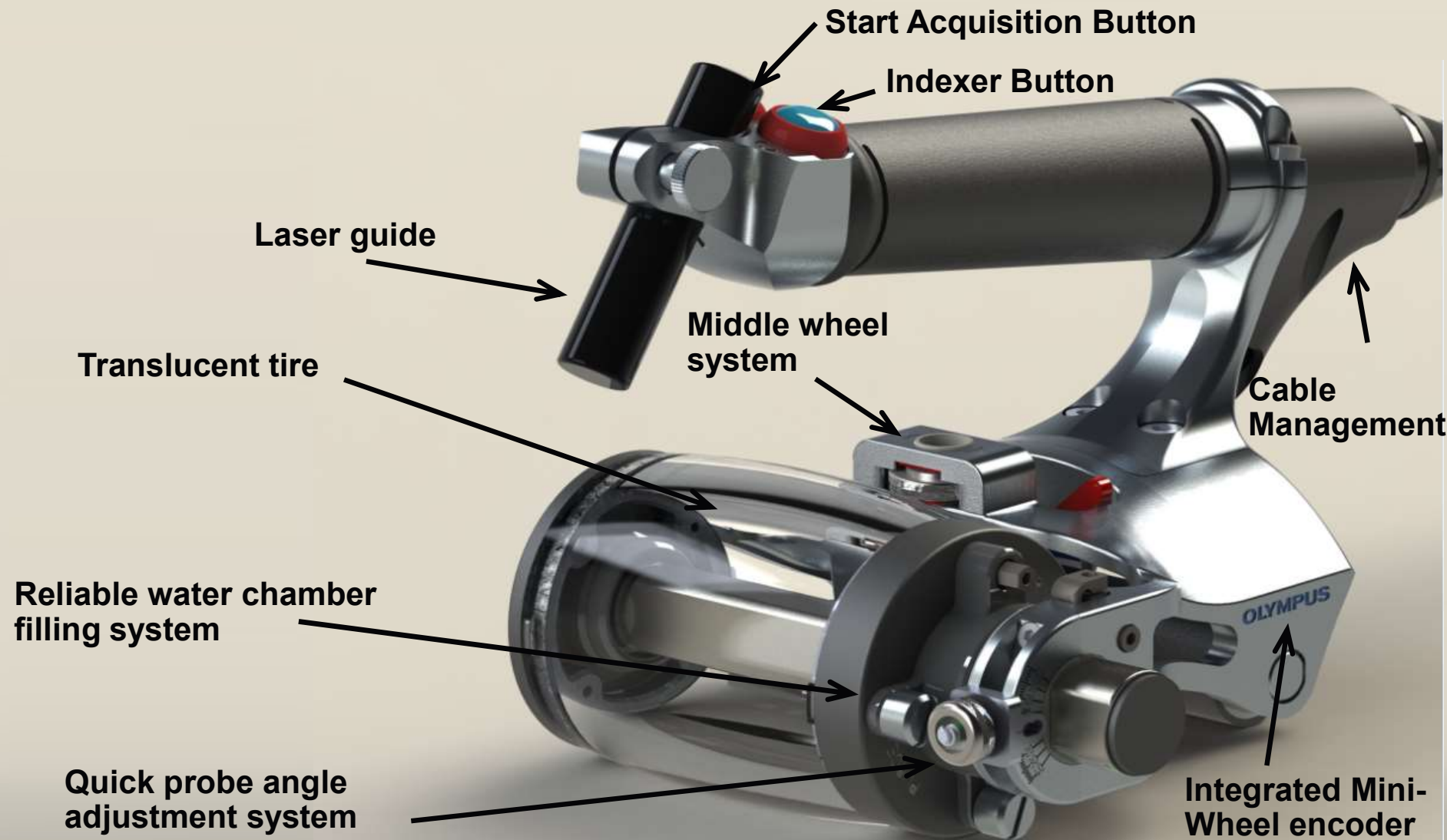
# Phased Array

**OLYMPUS**  
Your Vision, Our Future



***RollerFORM***

# Phased Array



# Phased Array

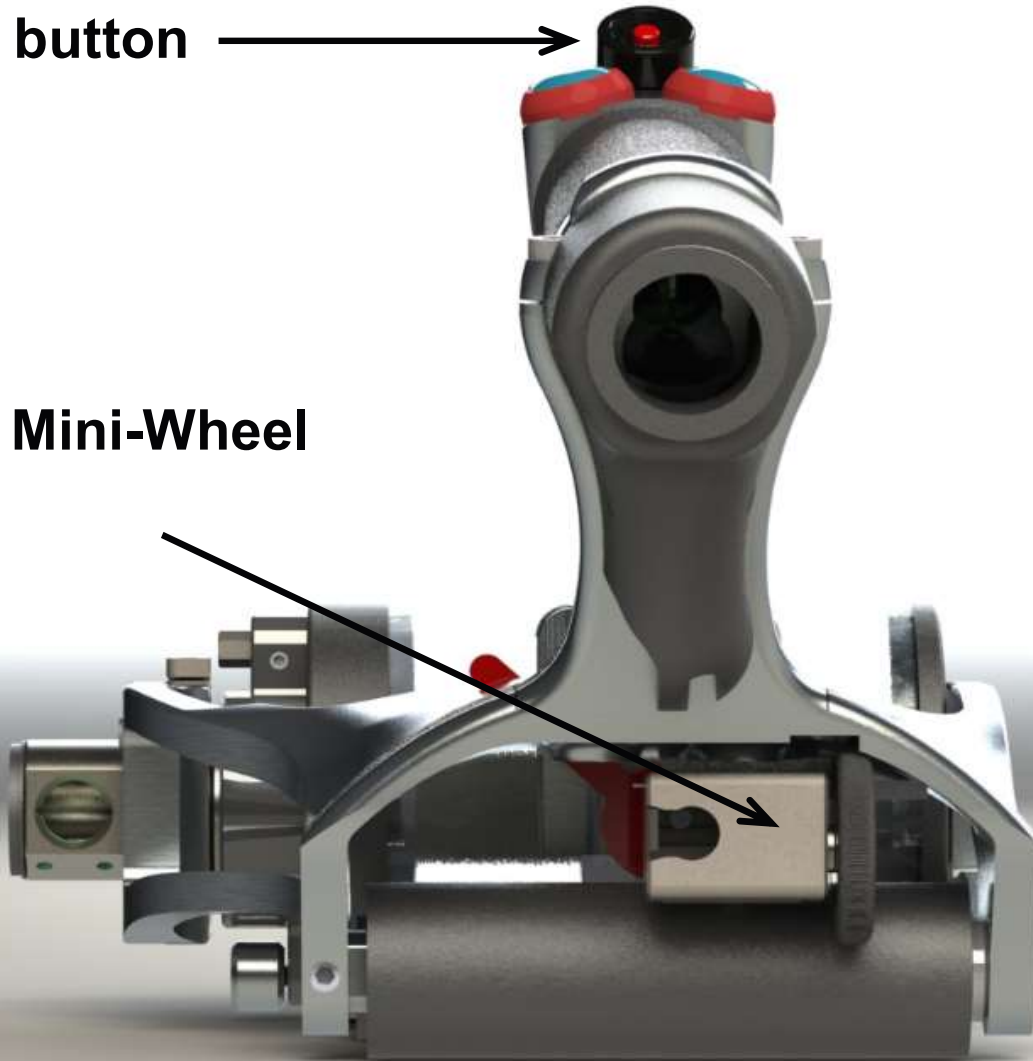
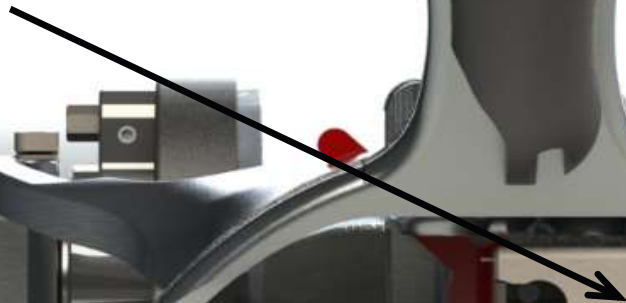


# Phased Array

**On/Off laser button**



**Integrated Mini-Wheel  
encoder**



# Phased Array

## Key benefits

- Multiple tools for different part configurations
- Portable and user-friendly
- XY Encoded scans, easy archiving of data
- C-scan Color Imagery
- Fast inspection
- Sizing and depth measurement accuracy
- Data recording and reporting



# Wind Turbine Inspection Solutions

- ◆ Conventional UT for Structural Members
- ◆ 38DL Plus for general thickness gauging of corrosion.



# Wind Turbine Inspection Solutions

◆ Conventional UT for flaw detection in welds  
And Hold down bolts.





# Wind Turbine Inspection

## ◆ Phased Array Inspection of Gearbox



Slice section view.



# Wind Turbine RVI Inspection

- ◆ Remote Visual Inspection of Internal components, ie gear box, generator



# Wind Turbine Inspection



# Thank You

