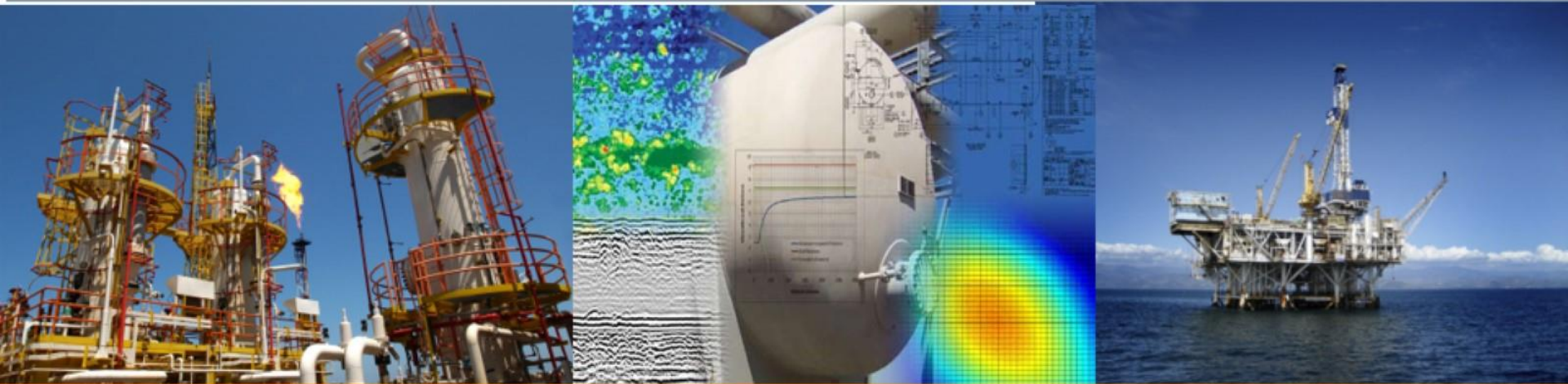# Inspection for Corrosion Under Pipe Supports (CUPS)
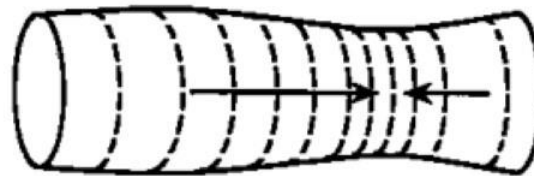
Pipe Supports

- No direct access, perpendicular UT not applicable
- Medium and/or long range NDT techniques required to provide assurance
  - LRUT (GW)
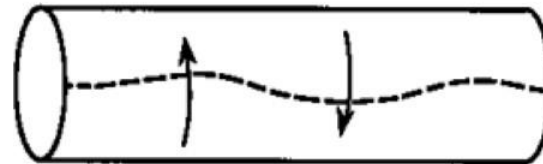 - SH-EMAT
  - CHIME
  - Multiskip

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Long Range Guided Wave

- Low frequency Ultrasound (20-100kHz)
- Diameters 1.5" to 48" (up to 78")
- 100% Coverage
- Test Range - Typical ±30m
  - Depends on pipework geometry

Longitudinal

Torsional

Flexural
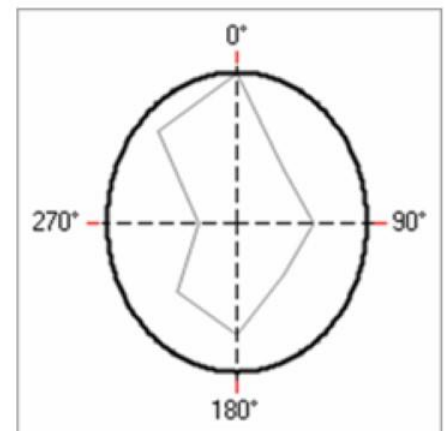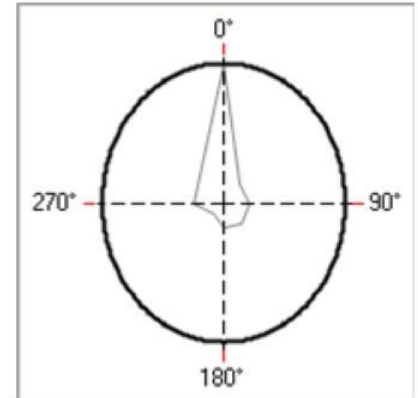
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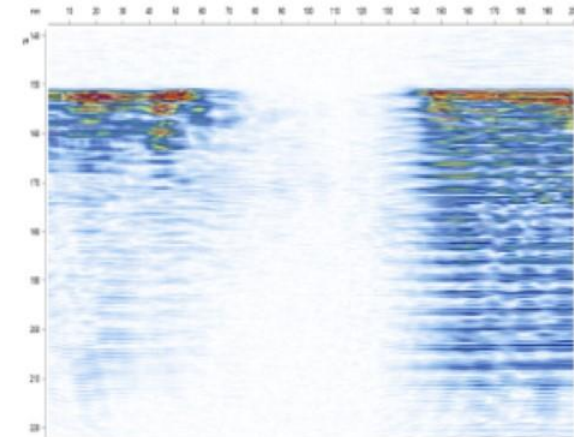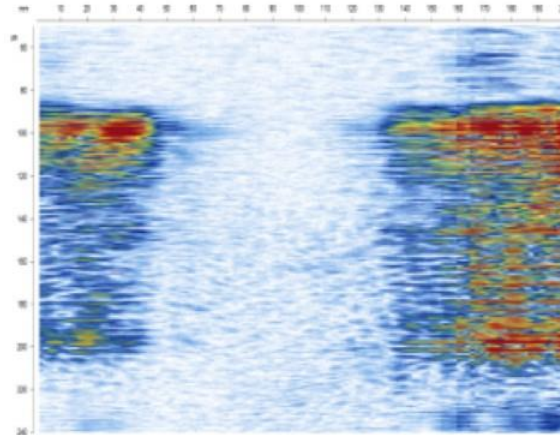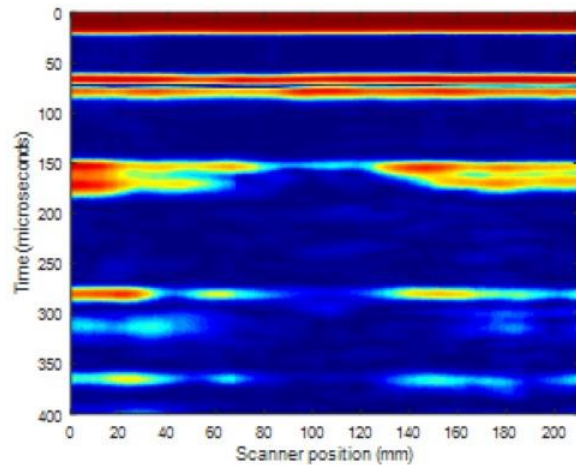# Example of LRUT Pipe Support Results

Long Range Guided Wave

- Amplitude response based on cross-sectional area of defect

- Prioritisation depends on amplitude and circumferential extent

- Screening technique – requires secondary NDT technique to quantify

- Prioritises pipe supports for follow-up actions

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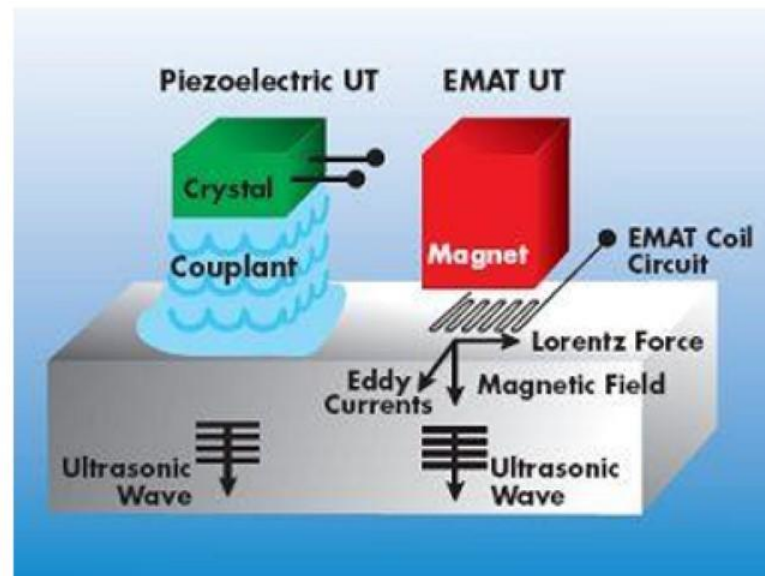
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Medium Range Techniques

- Sonomatic have developed three techniques for the detection of degradation under pipe supports:

  - Shear horizontal electromagnetic acoustic transducers (SH-EMAT)

  - Creeping head wave inspection method (CHIME)

  - Multiskip

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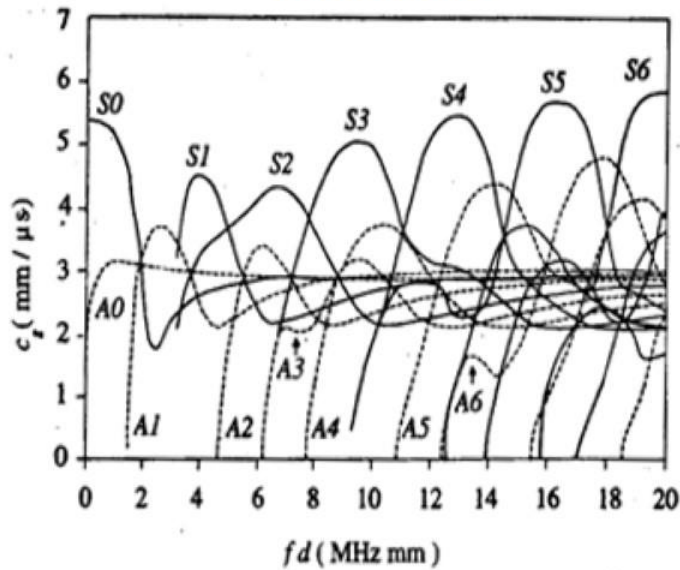
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EMAT - Introduction

- EMATs are non-contact ultrasonic probes.

- The probe consists of a magnet and an electric coil.

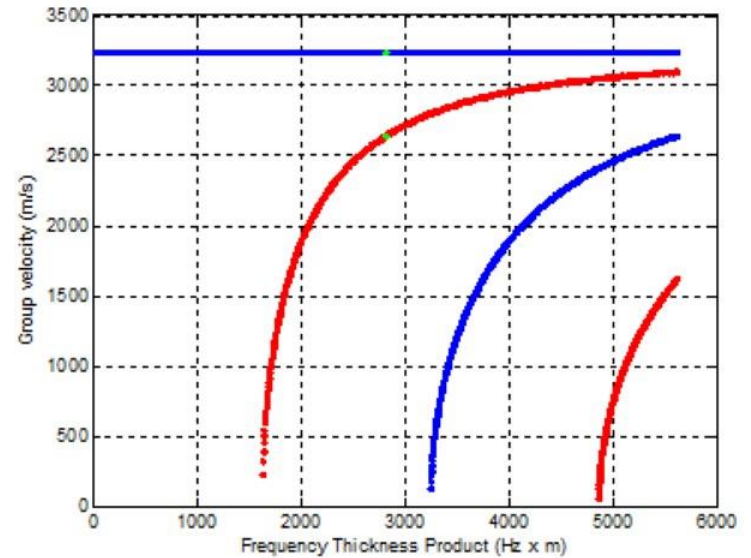- Suitable for samples with a thickness less than or equal to 15 mm.
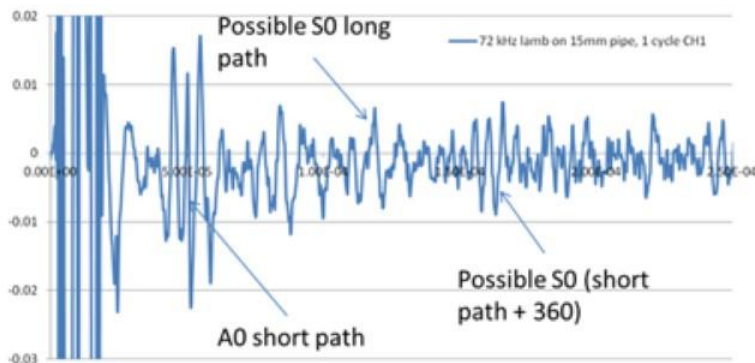
EMAT - Dispersion curves

Lamb wave

SH wave

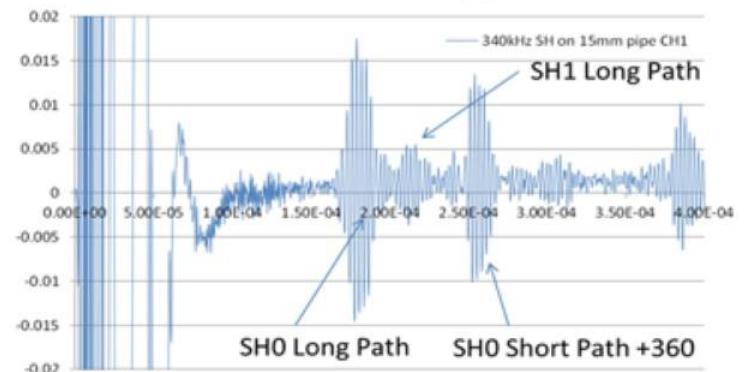
72 kHz lamb on 15mm pipe, 1 cycle CH1

Possible S0 long path

Possible S0 (short path + 360)

A0 short path

340kHz SH on 15mm pipe CH1

SH1 Long Path

SH0 Long Path

SH0 Short Path +360

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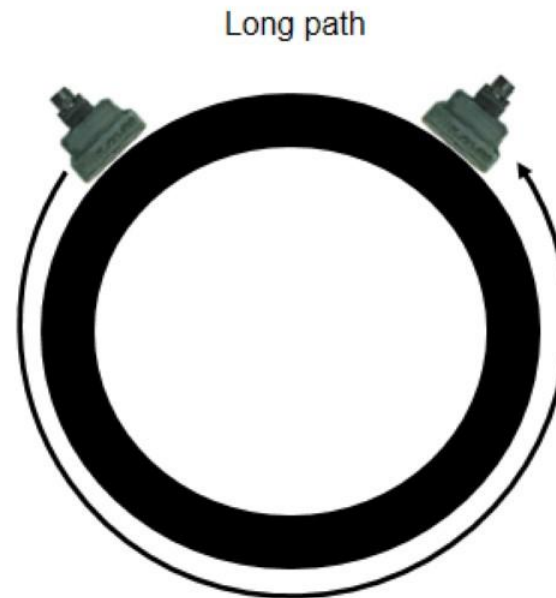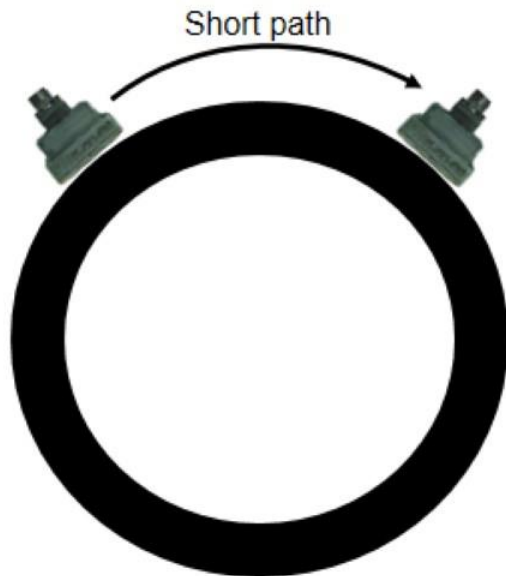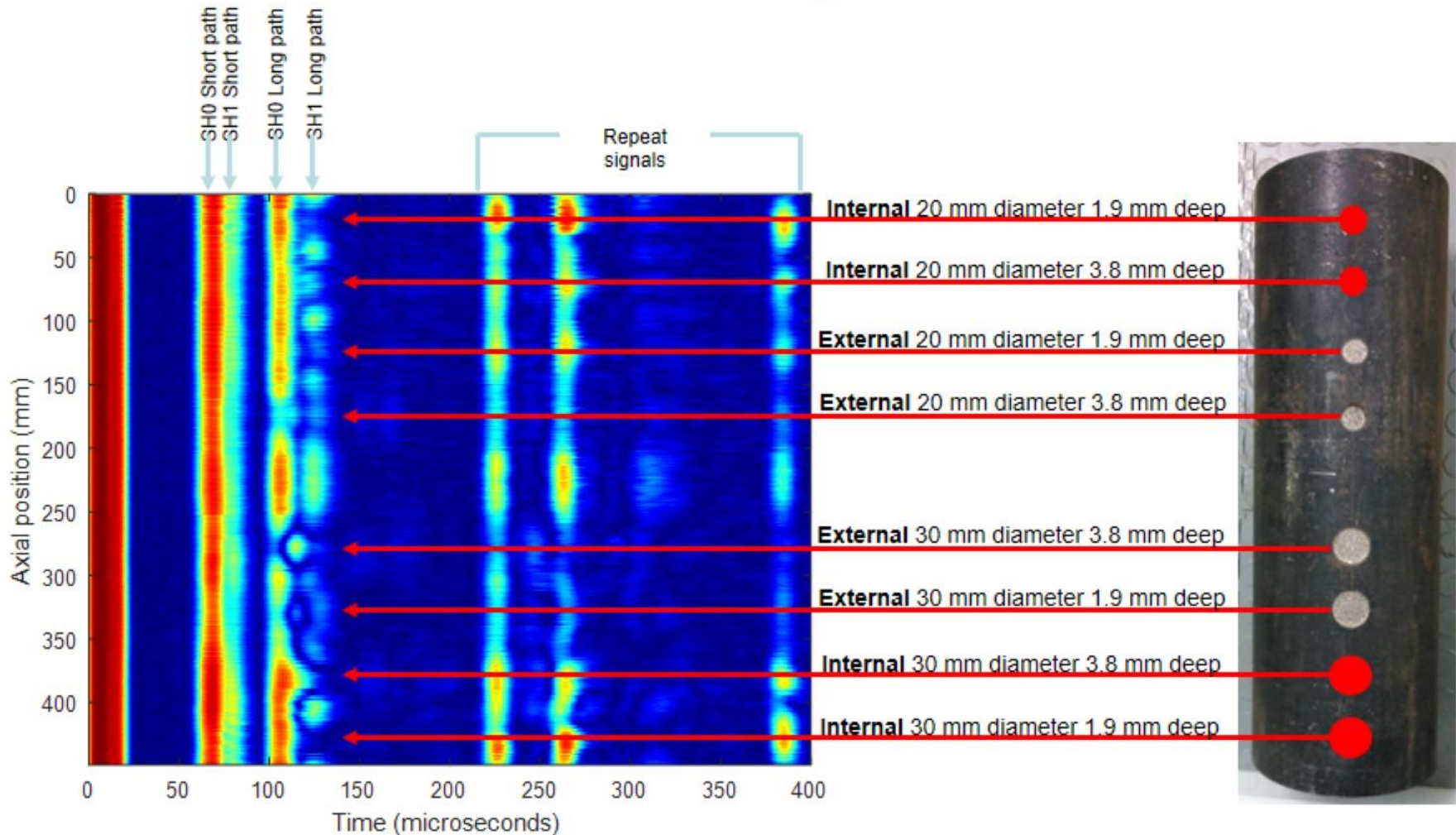
EMAT - Probe setup

- Typically, probes are separated circumferentially and scanned axially over the pipe support.
  - Can also be used axially along pipe
- The signals produced cover the full circumference of the pipe
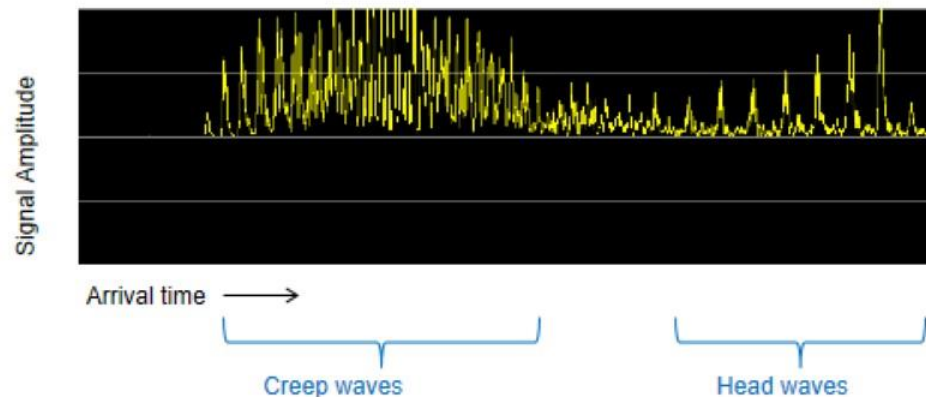- Any degradation is indicated by a change in the signals.

Short path

Long path

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EMAT – Example Results
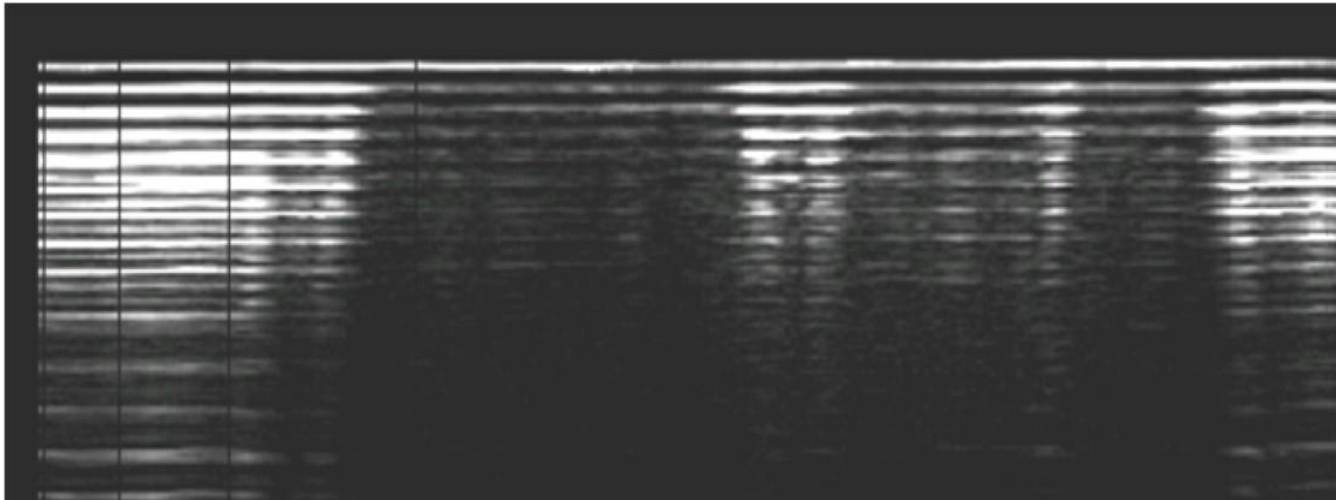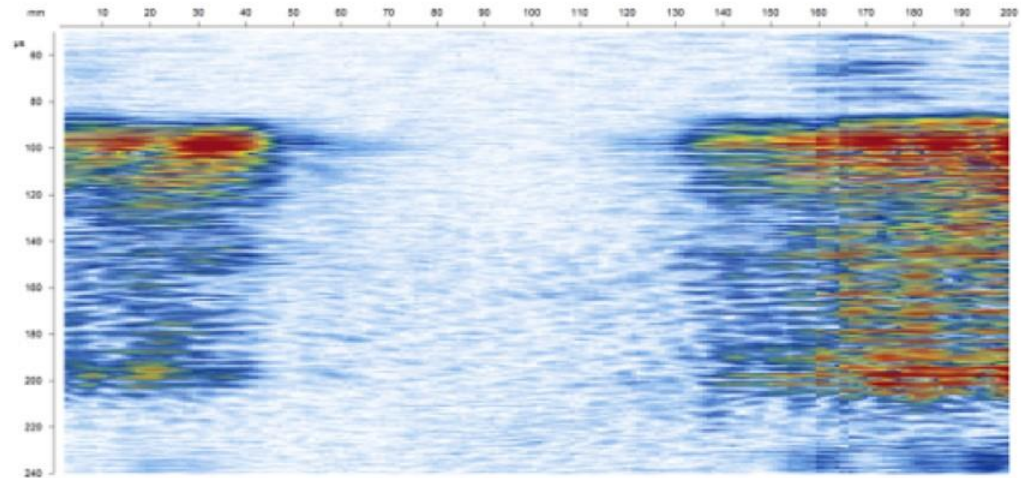

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CHIME - Introduction

- Transmitter fires pulse at critical angle – sets up regenerating creeping waves and head waves.

- A-scan at receiver shows a characteristic pattern that is a function of material thickness and profile between the probes.

- Suitable for samples with a thickness between 5 mm and 80 mm.

Signal Amplitude

Arrival time ⟶

Creep waves   Head waves

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CHIME - Classification

- Type A – up to 10% of wall loss.
- Type B – between 10% and 40% of wall loss.
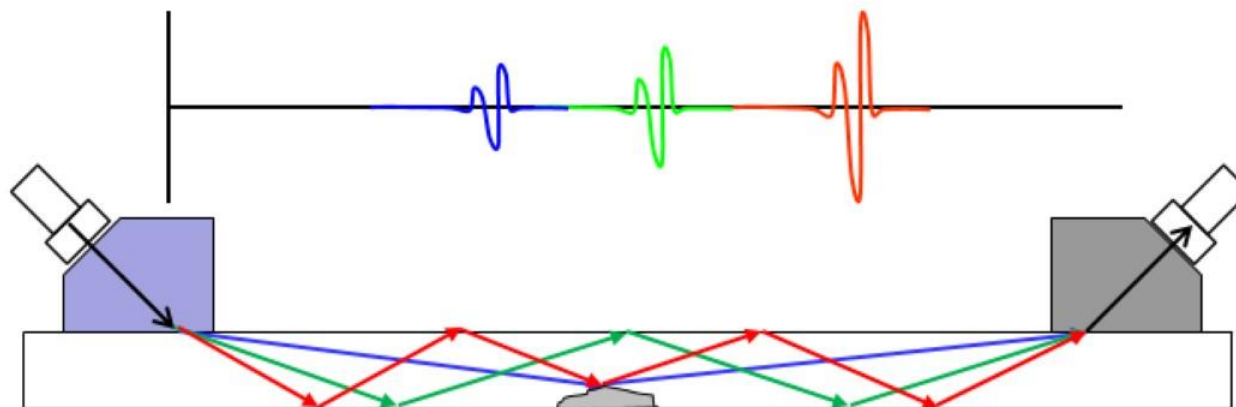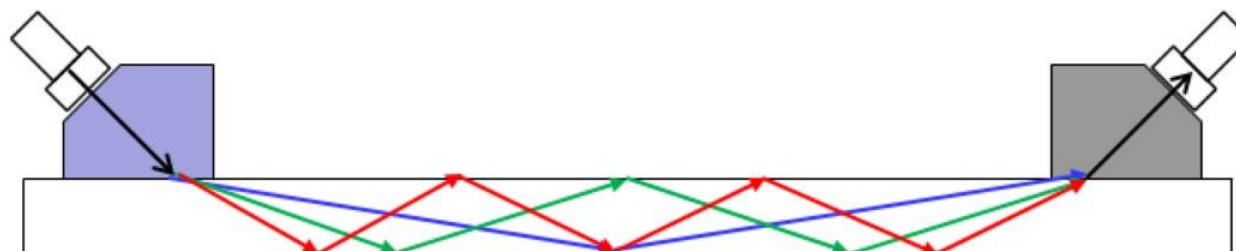- Type C – greater than 40% of wall loss.

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CHIME - Setups

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Multiskip - Introduction

- Probes separation up to 2 m, NWT >10 mm, internal and external defects
- Different skip signals due to beam spread.
- Depth, location and extent of defects have different effect on arrival times of different skip signals
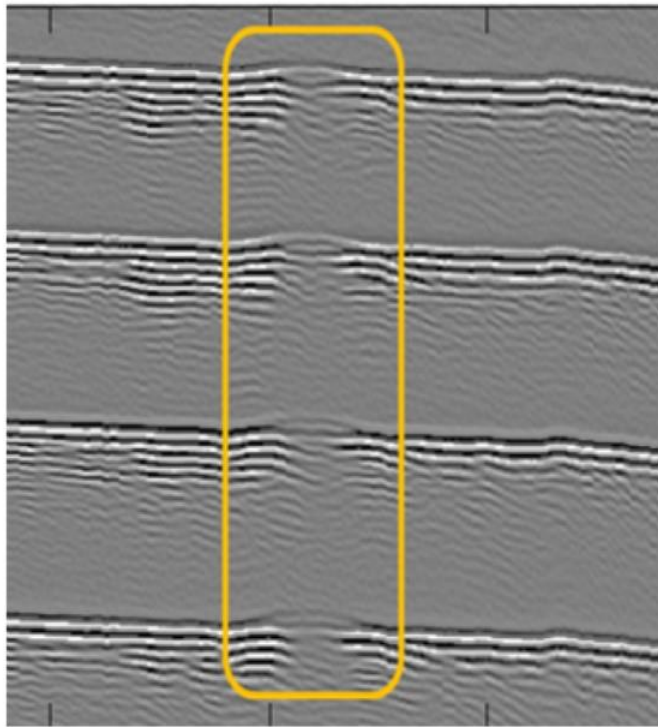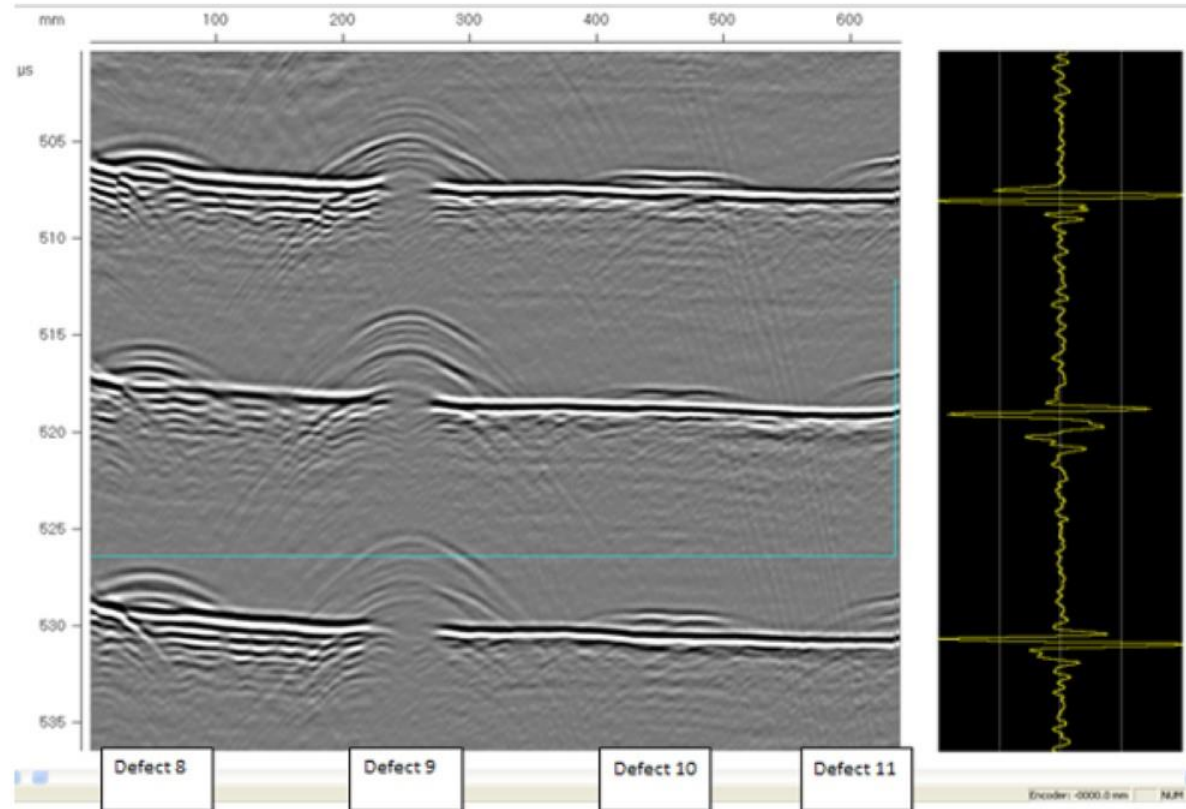
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Multiskip - Inspection Capability

- Very accurate sizing of average thickness when there is no degradation (sizing typically better than 1 mm).

- Very accurate depth sizing of localised degradation (for example, sizing of a single pit typically to within 1 mm).
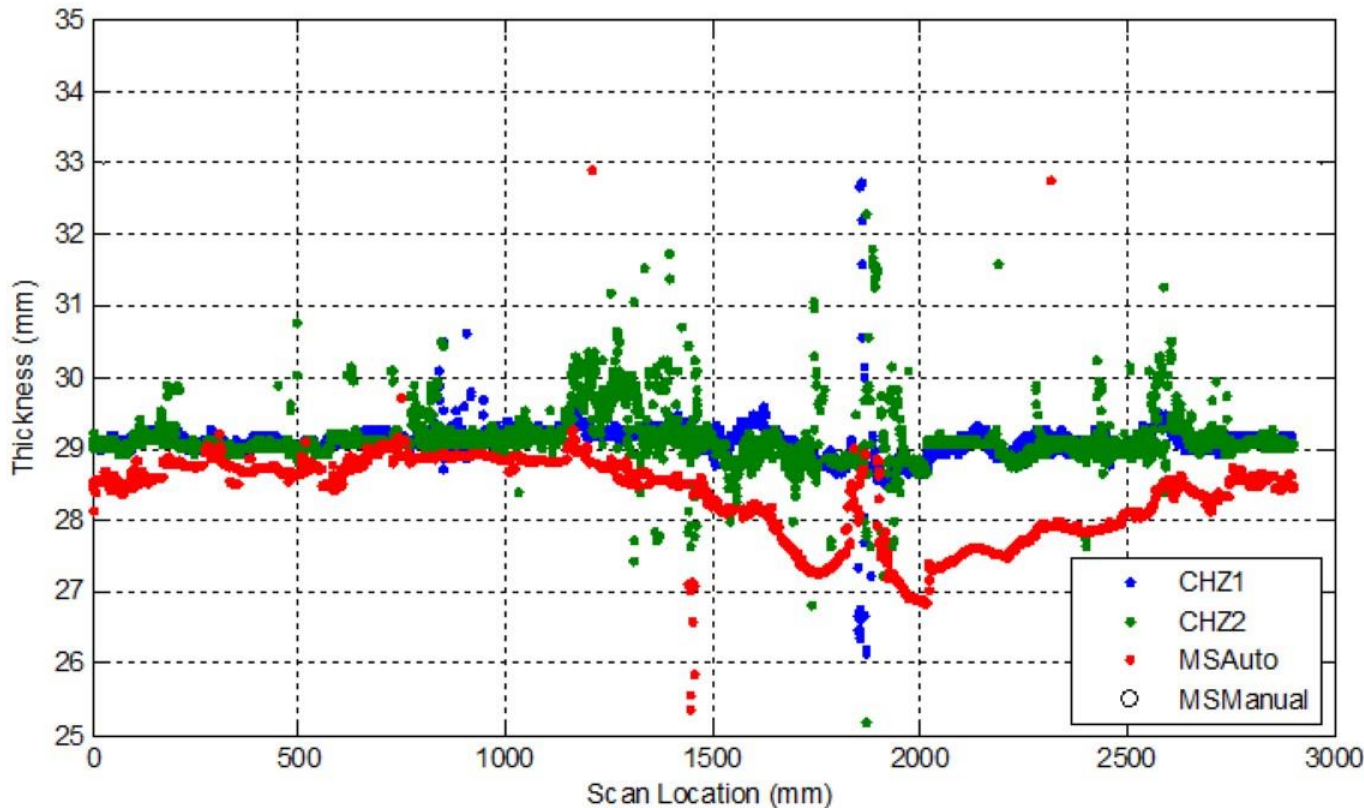
Inspection Capability

Multiskip Sizing – current status

- Reasonable capability when degradation is very general, i.e. small variation in thickness across the support. An average thickness is obtained.

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