



Ongoing Pipeline/Casing Integrity Assessment Projects at GTI

- > DOT/PHMSA
Cased Pipeline Integrity Management
Assessment Workshop – R&D Panel

July 15, 2008 - Rosemont, Illinois

by Daniel Ersoy, GTI

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Some Ongoing Projects Related to Pipeline/Casing Integrity Assessments

- > Guided Wave Use and Validation for Assessment of Casings, Bare Pipe, and City Gate Stations (*PHMSA and Industry Sponsored*)
- > GWUT Equivalency to a Hydrotest Validation (*OTD Sponsored*)
- > Phase Sensitive Methods to Detect Cathodic Disbondment (*PHMSA and SMP Sponsored*)



Challenging Assessment Situations – Casings, Bare Pipe, and City Gate Stations

> Sponsorship:

- [DOT/PHMSA](#) Project #195 (DTRS56-06-T-0001) - DOT Contact – Mr. Steve Nanney, DOT COTR.
 - > <http://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=195>
- [Local Distribution Companies](#), i.e. LDC Consortium.

> GTI Technical Contact:

Daniel Ersoy: daniel.ersoy@gastechnology.org



Challenging Assessment Situations

> Objectives:

- Improving the assessment of situations such as:
 - > Cased and non-cased crossings
 - > Pipe with no coatings (bare) or shielded/disbonded coatings
 - > Segments with interferences from multiple pipes in right of ways with a focus on city gate stations.
- This project includes the identification and demonstration of specific technologies to assess demanding pipeline situations with emphasis being placed on the latest generations of guided wave ultrasonic inspection technology.



Challenging Assessment Situations

- > This project includes support from over 20 gas companies. Five have contributed transmission pipeline segments for assessment, pipe inspection resources, and excavation and examination costs.
- > Field sites/studies have demonstrated the GWUT technologies: Pulse-echo; pitch-catch; C-Scan/focusing technology, as well as magnetic tomography, etc.
- > The results will include (a) expected reliability numbers for defect identification for the particular situations, and (b) a detailed protocol for implementation/use of GWUT under these situations [see *Draft Protocol Handout*].
- > These results and recommendations will be summarized and turned over to the appropriate committees associated with the applicable industry standards and recommended practices (e.g., ASME and NACE).

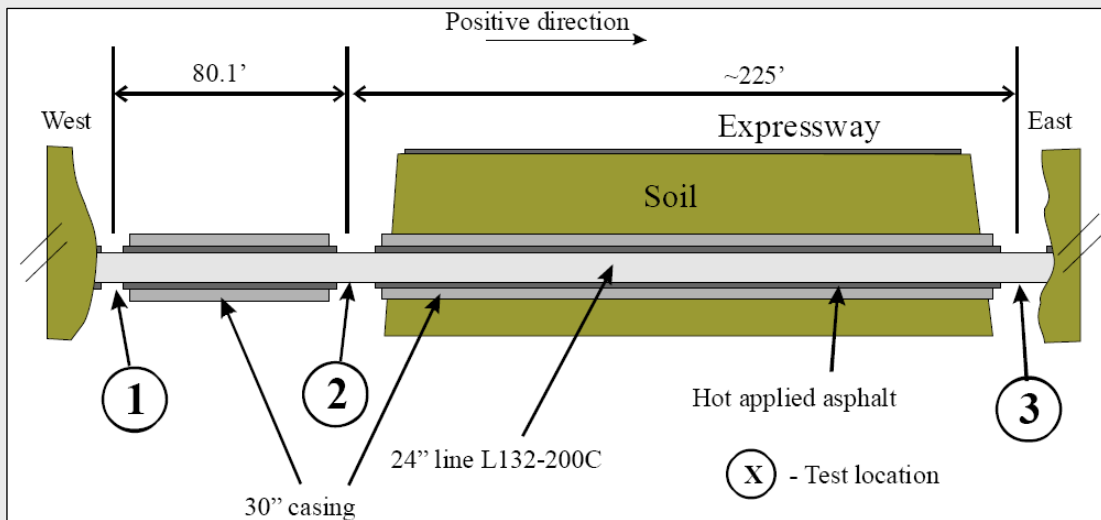
Bare Pipe Assessment Situation

- > Bare Pipe: Pitch-Catch UT; Magnetic Tomography; and Direct Exams.
- > Initial results of GWUT indicate good correlation with direct exams but limited range of effectiveness due to attenuation of signals on rough pipe in clay soils.
- > Magnetic Tomography performance results are currently mixed.

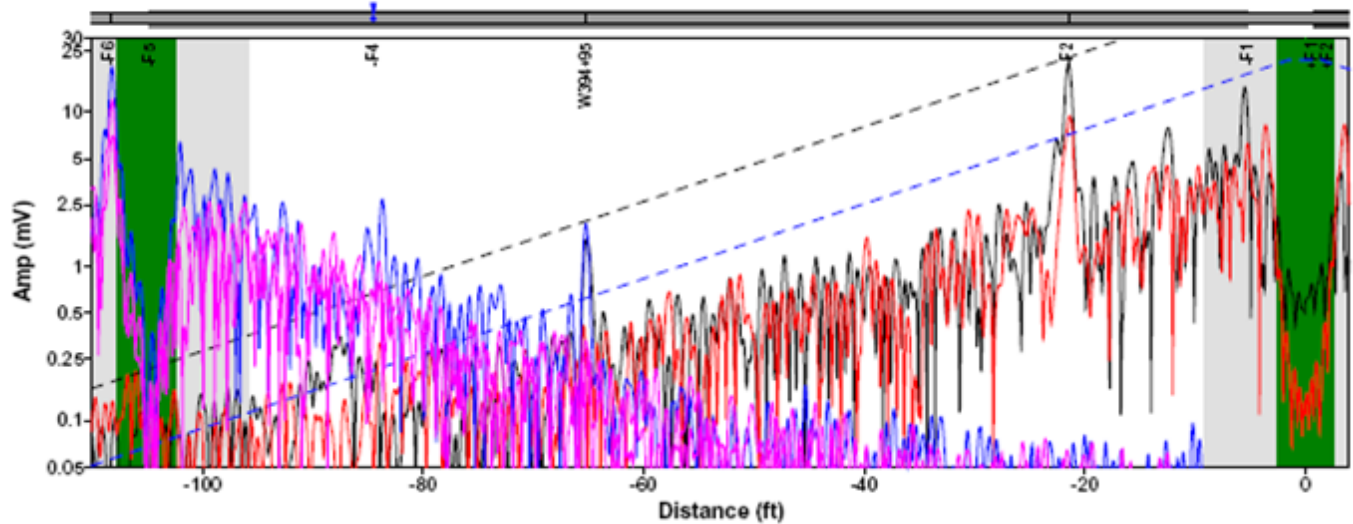
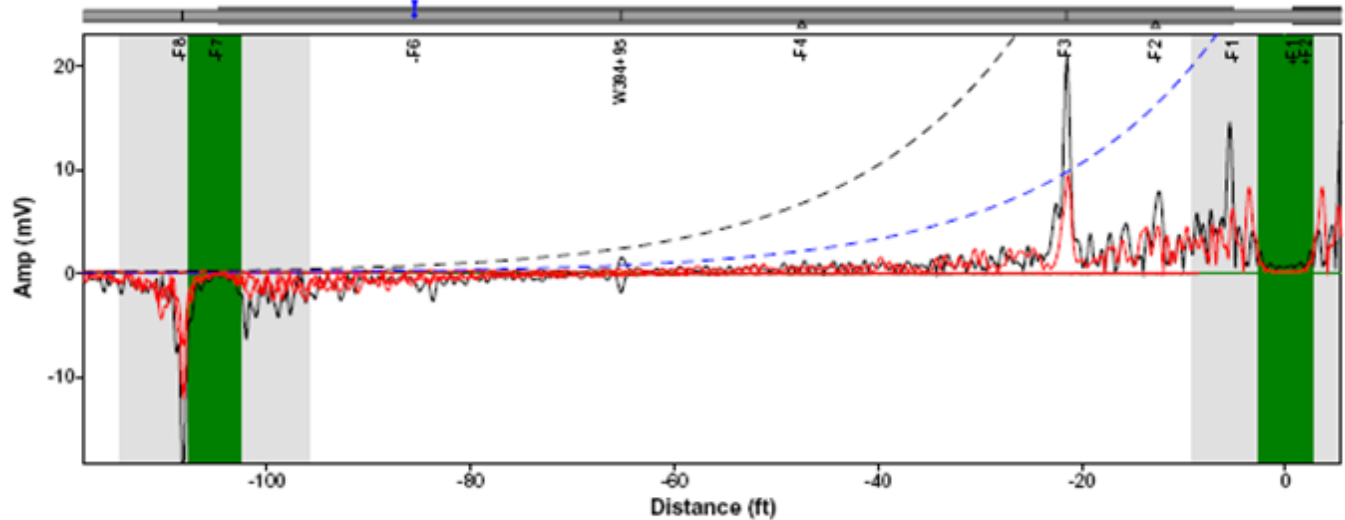


Casing Assessment Situations

- > Continues to be a challenging situation based on range, signal strength, sensitivity, etc.



Example Overlaid Scans from Both Casing Ends

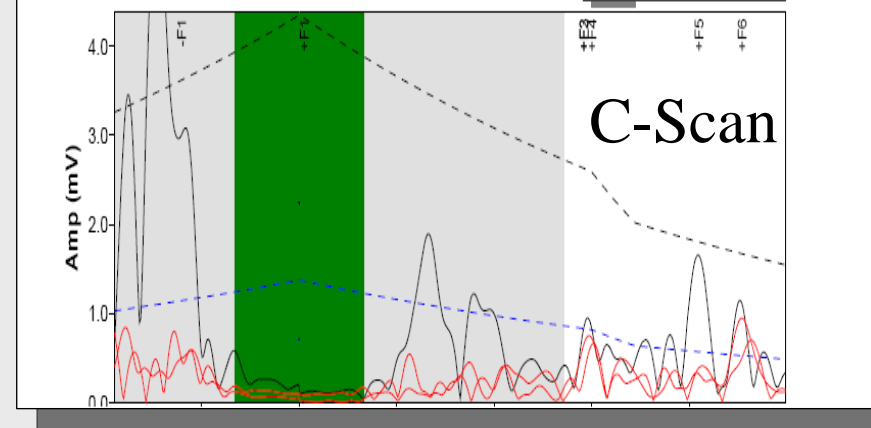
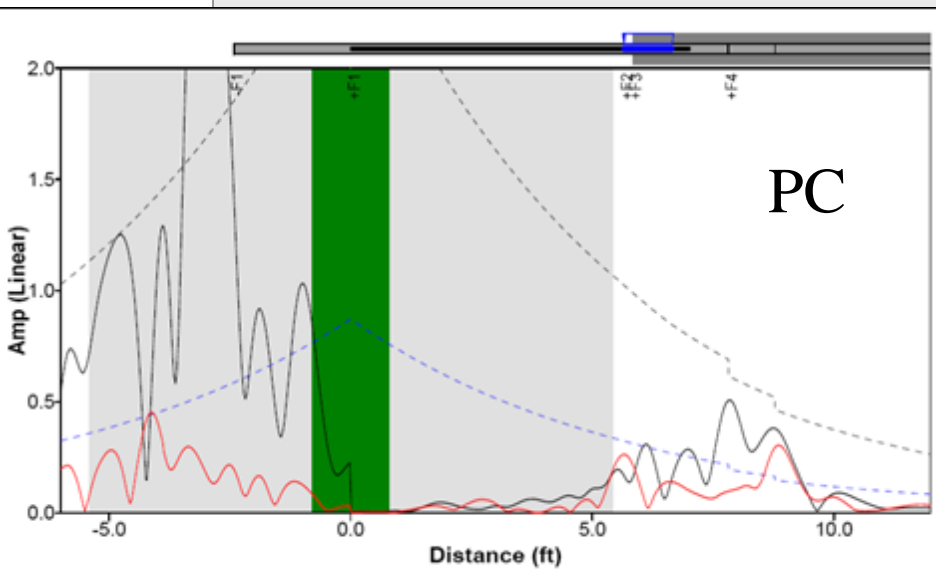
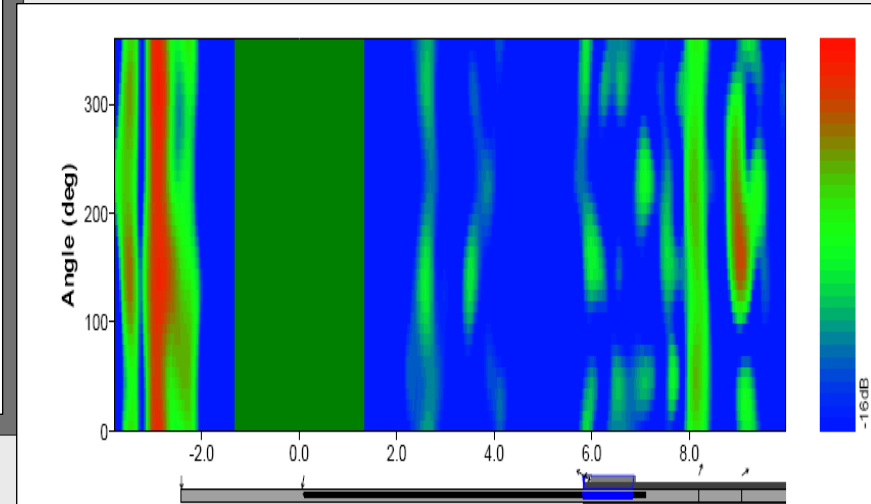
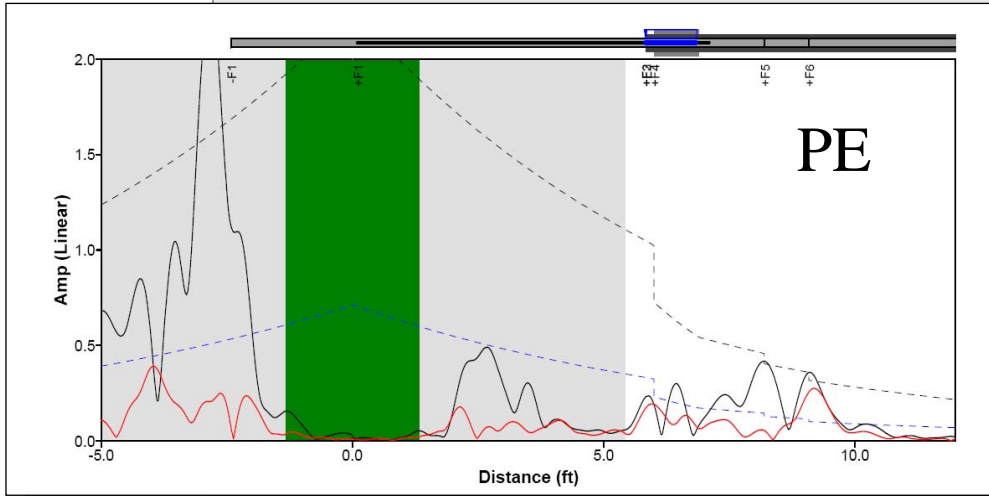


Crowded Areas - City Gate (Meter/Regulator) Stations [including vaults with wall casings]



- > City Gate Station – Recently used pitch-catch across tee's and wall penetrations with good success. Initial comparison against radiography, magnetic particle inspection, and portable/direct contact beta scan (UT) have confirmed inspection results.

City Gate Station Regulator Run with Wall Casing



Summary Direct Exam of Same Area

- > There was a localized reflection from the link seal. The predicted severity is in the range 20-40% at the bottom area of the pipe (at the 6 o'clock position).
- > The actual wall loss (after coating removal and measurement with a pit gauge) was 26-35% of the wall at the most severe locations. ASME B-31-G mod. was performed and indicted the piping safe to remain in place.
- > Data obtained from defect assessment on the basement side as discussed in the previous bullets was used to provide calibration of GWUT unit allowing evaluation of waveforms within the casing.
- > Corrosion in the casing through the concrete wall was no more severe than that found in the regulator building and the piping was safe to remain in place.



Guided Wave \leftrightarrow Hydro Equivalency Validation

> **Sponsorship:**

- [Operations Technology Development.](#)

OTD Contact – Ms. Maureen Droessler (847-768-7608).

> **GTI Technical Contact:**

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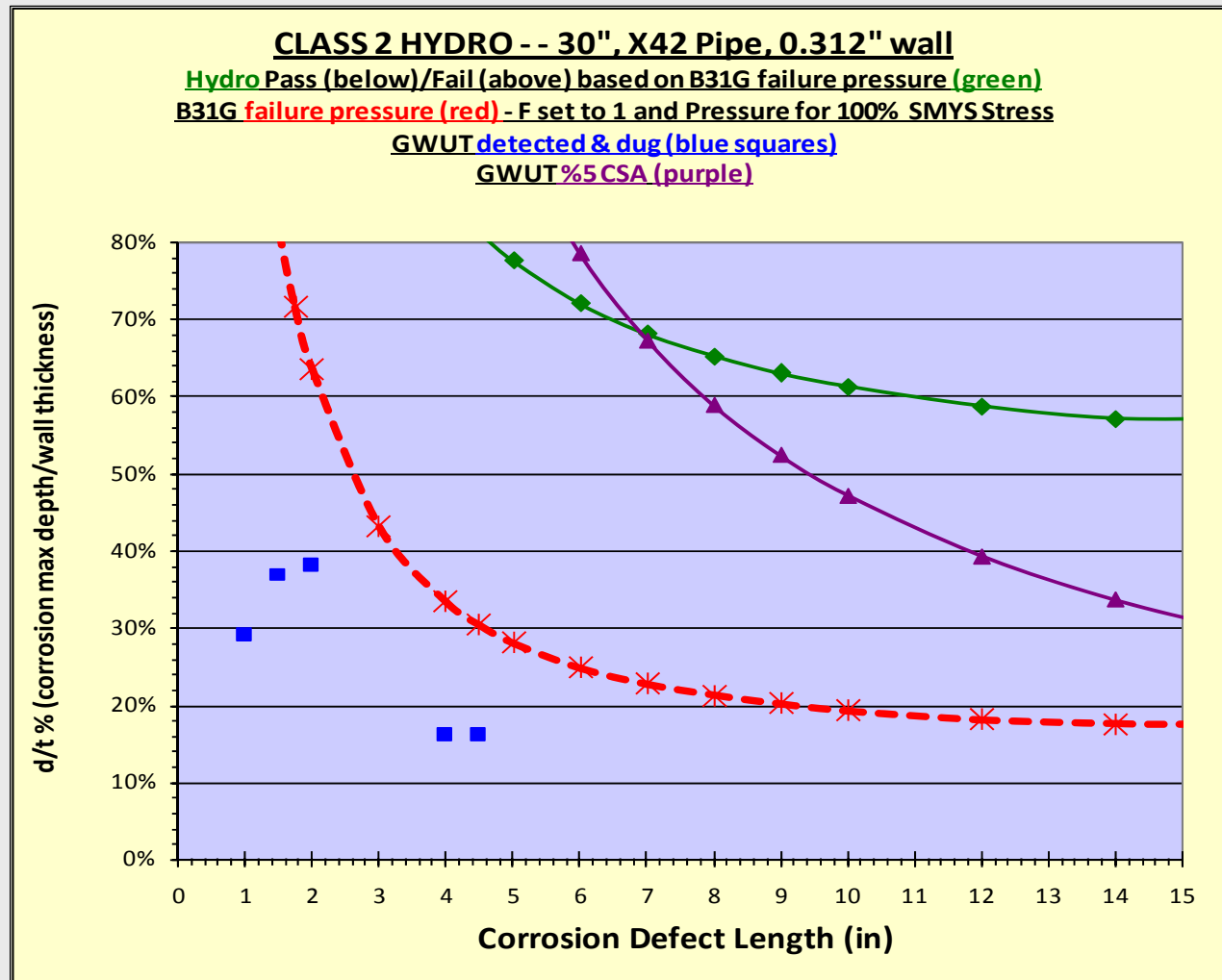
- ## > **Objective:** Perform a validation effort to determine if GW can be equated to a hydrotest - by demonstrating the ability of GWUT to detect (at a minimum) flaws that would fail a hydrotest.



Guided Wave↔Hydro Equivalency Validation

- > Form a Working Committee (Operators, AGA, INGAA, PHMSA, Manufacturers, etc.)
- > Assemble and summarize all of the defects found in GWUT inspections by volunteer companies/operators and R&D organizations (defects must be validated by direct measurements from excavations or high resolution ILI).
- > Calculate the pressure ratio of these defects to demonstrate that GWUT finds defects that (are small enough to) pass a hydrotest and therefore is capable of finding all the larger defects that would fail a hydrotest and could further deteriorate into a failure.
- > Draft a validated methodology (as the foundation) for a new standard. This would be housed in an ANSI accredited Standards Development Organization such as NACE, ASNT, API, etc.

Guided Wave \leftrightarrow Hydro Equivalency Validation



- > Example of GTI developed comparative plot of GW indications (features), failure pressure, hydro pass/fail B31G criteria, and constant CSA plot.

Phase Sensitive Methods to Detect Cathodic Disbondment

> **Objective:** To investigate above ground survey techniques (e.g. similar to PCM/AC Survey) using both *magnitude* and *phase* to detect disbonded coatings on buried steel pipes.

> **Sponsorship:**

– [DOT/PHMSA](#) Project #211 (DTPH56-06-T-000020) - DOT Contact – Mr. Allan Beshore, DOT COTR.

> <http://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=211>

– GTI [Sustaining Membership Program](#) - SMP Contact Greg Maxfield (847-768-0515).

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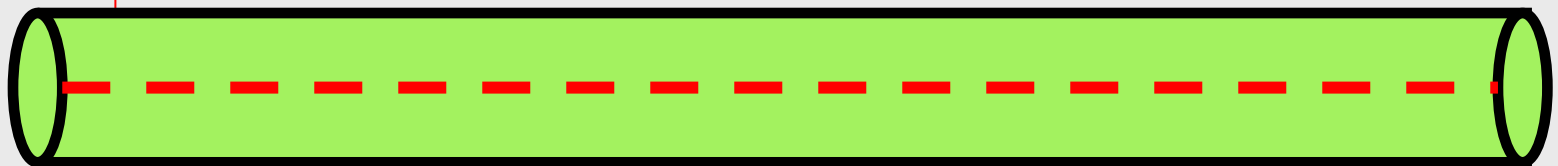
Cathodic Disbondment Detector

- > Two components synchronized by a wireless link
 - A signal injector connected to pipe
 - A hand carried detector

Signal
Injector



Hand-held
detector



Cathodic Disbondment Detector

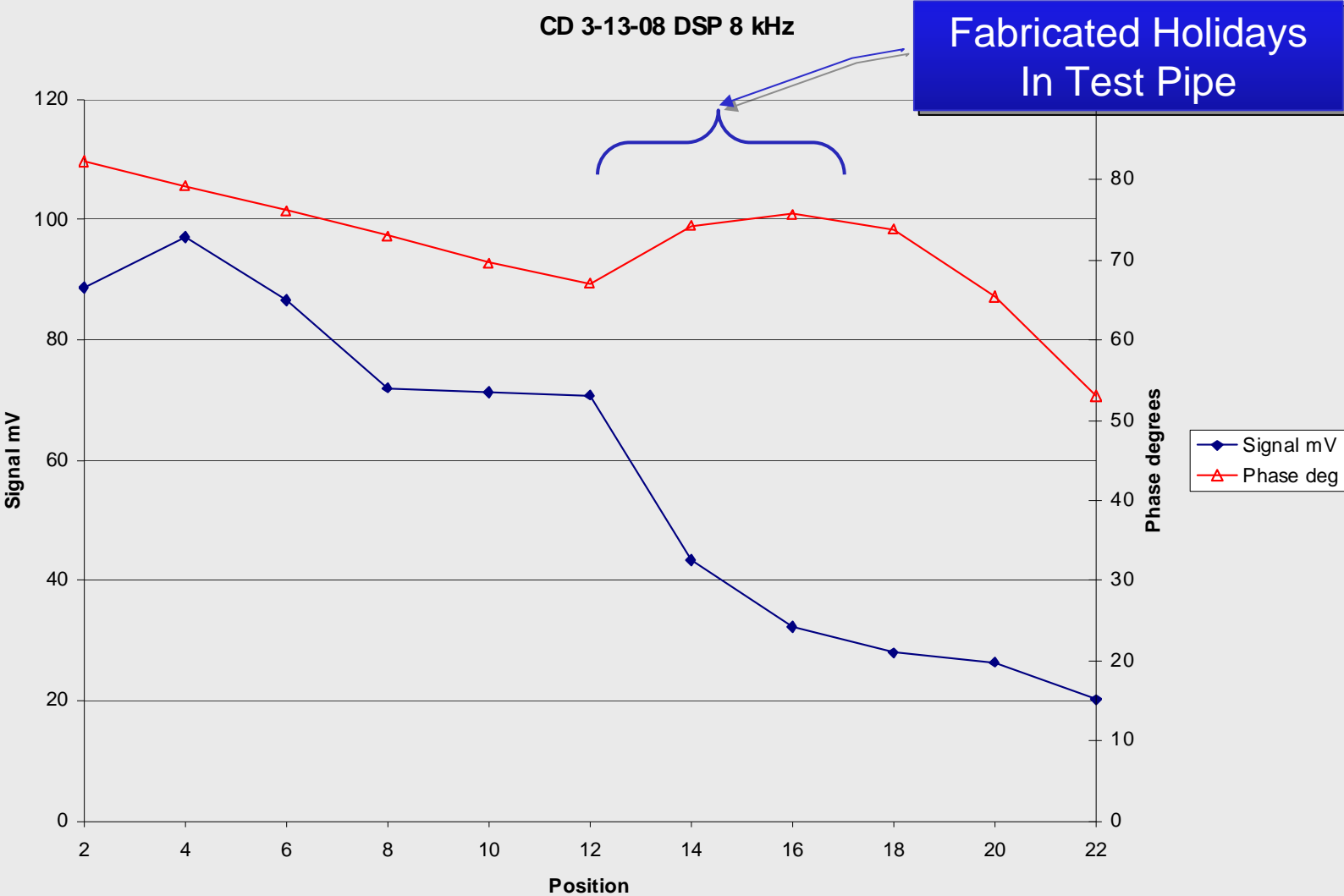


Bench Top
Equipment

Test Bed



Cathodic Disbondment Detector



Cathodic Disbondment Detector

- > **Status:** Measurements have been carried out on pipe available (with holidays) at GTI using laboratory grade equipment. Data collection software is functioning. GTI has initiated fabrication of specific defects (shielded disbondments) on pipes for burial this summer.
- > **Next Steps:** Need to carry out measurements on a broader population of pipelines. A local utility has volunteered to host a field test.

Cathodic Disbondment Detector

> Deliverables:

- Proof of concept that the addition of phase information to AC survey techniques provide additional information on the state of pipeline coatings, especially shielded disbondment.
- A working prototype apparatus will be tested on fabricated disbondments and on live pipelines.

Cathodic Disbondment Detector

> **Potential for Casing Assessment:**

- Technique has the possibility to distinguish between properly isolated, point shorts, and electrolytic shorts between casings and carrier pipe from above ground (only need to connect to the carrier pipe).

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> QUESTIONS ?





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