

Pipeline Research Council International

TC Energy Hard Spot Field Investigation

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TC Energy

2024 Fall I&I Meetings



LEADING PIPELINE RESEARCH

Speaker Introduction

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- **Patrick Adamski**
- **Pipeline Integrity Engineer @ TC Energy**
- **Qualification/validation of new NDE technologies**
- **Help manage the TCE Airdrie Research Facility**





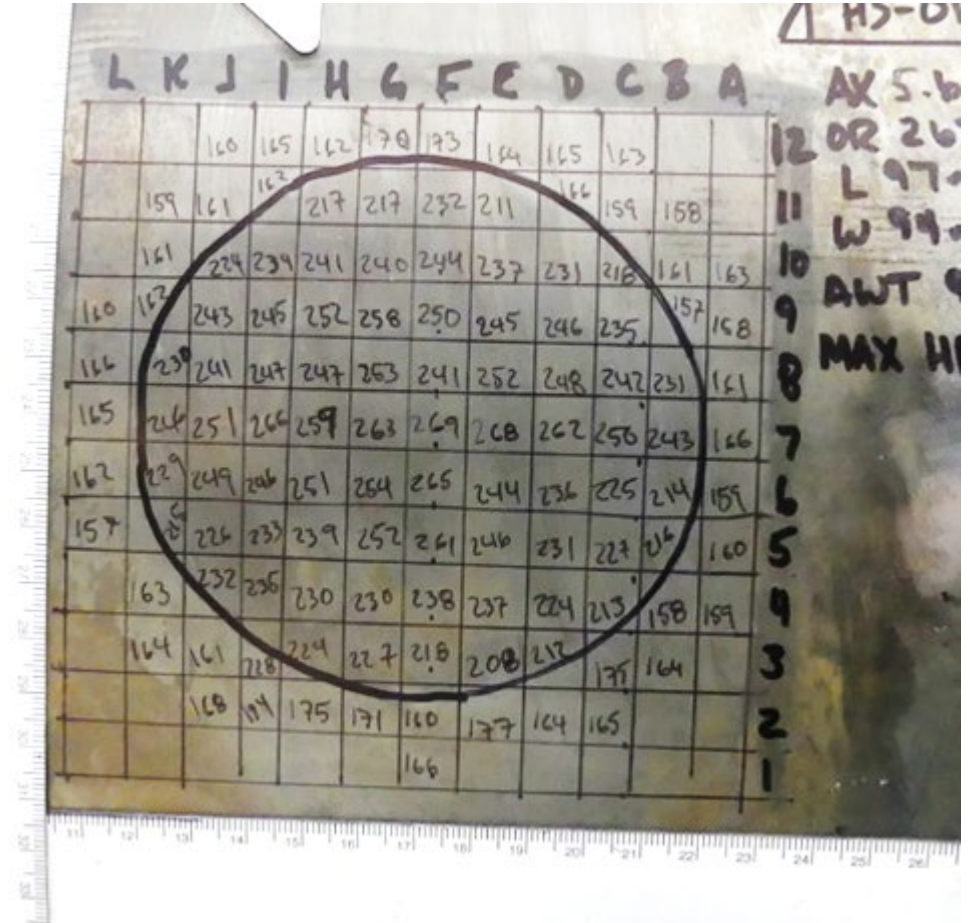
Agenda

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- **Current Field Approach**
- **Incorporation of ECA technology**
- **MAT-7-2A Learnings**
- **Canada Gas Hard Spot Analysis**

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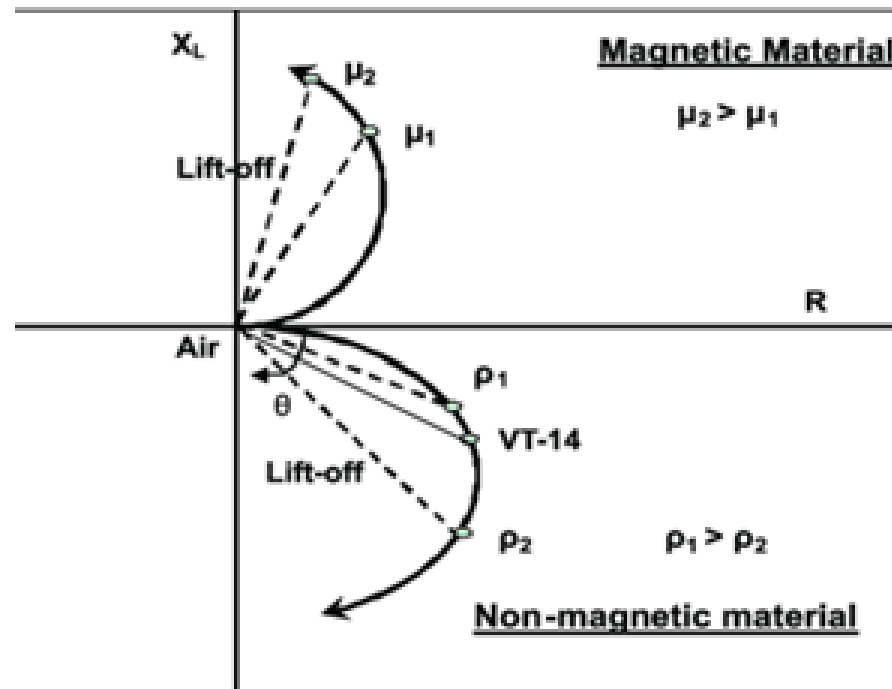
- Time consuming if difficult to locate hard spot within ILI tool call
- Rely only on ILI tool for finding locations of hardness



Eddy Current Array (ECA) Technology Addition

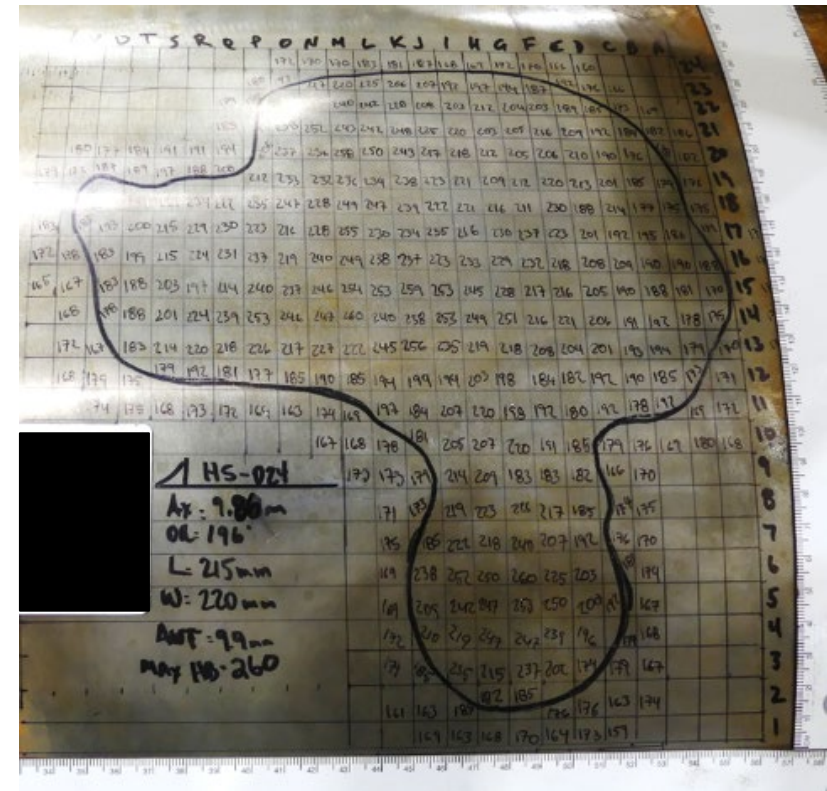
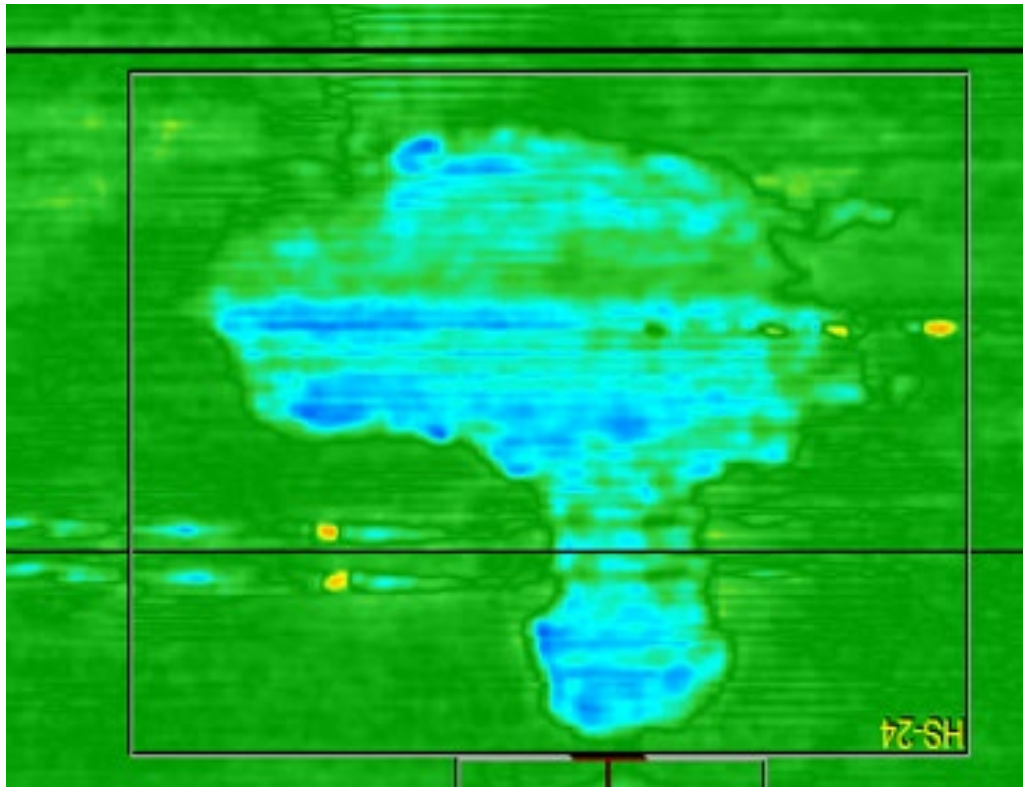
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- Carbon steel (magnetic material) has baseline material properties (permeability/conductivity)
- Magnetic properties of steel are altered in an area of hardness (as compared to baseline properties)
- Amplitude drop measured by ECA probe and displayed to user



ECA output compared to Etch and Hardness Grid

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Why incorporate ECA?

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ECA Mapping on Pipe Extent

- Increased NDE efficiency
- Locating additional areas of elevated hardness that can be investigated and used for further ILI correlations

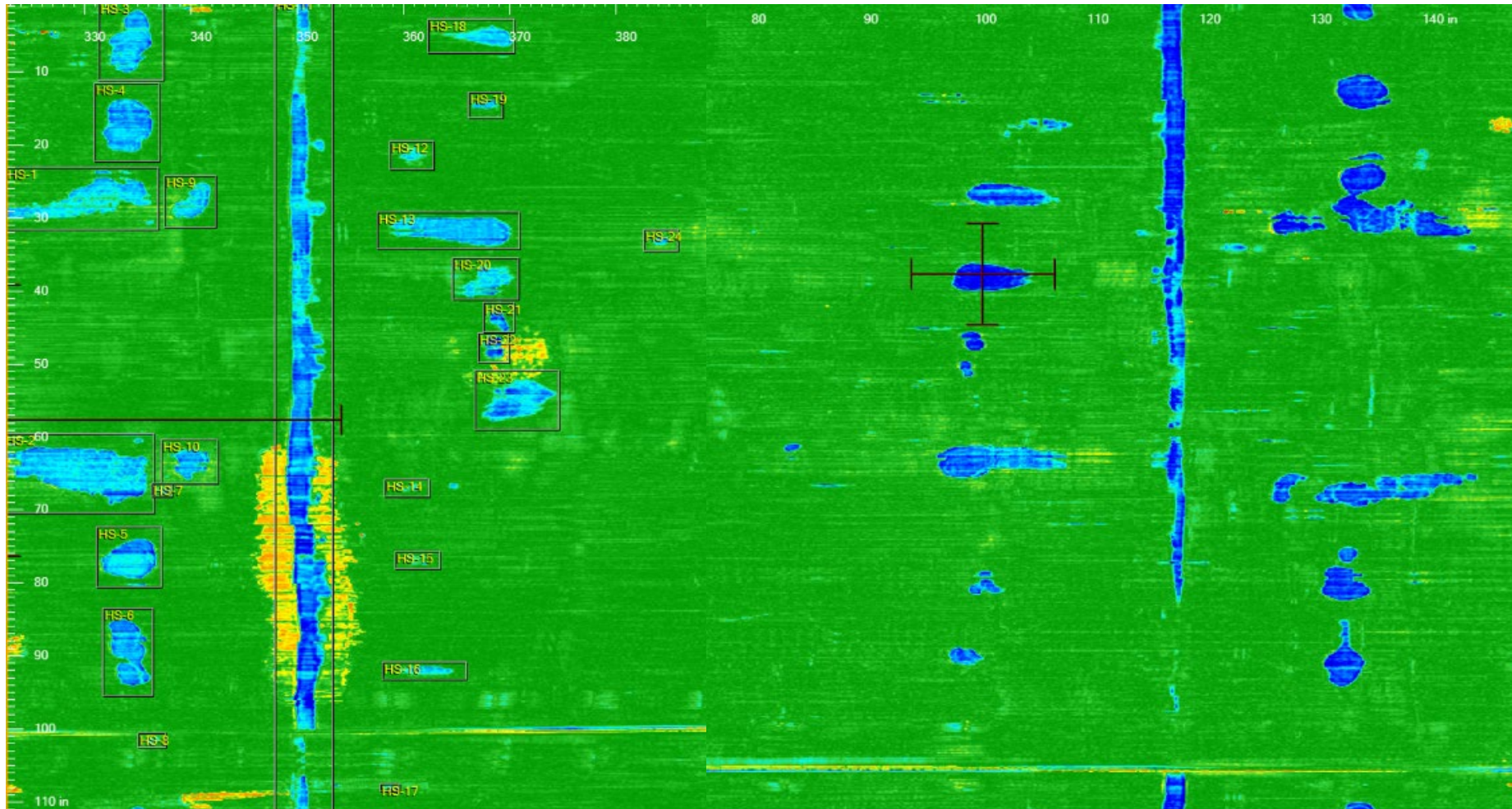
**Near-mirror finish,
5% nital or 10% ammonium
persulphate etching solution**

0.5" X 0.5" grid, Equitip & UCI

Risk – More ECA findings than bargained for!

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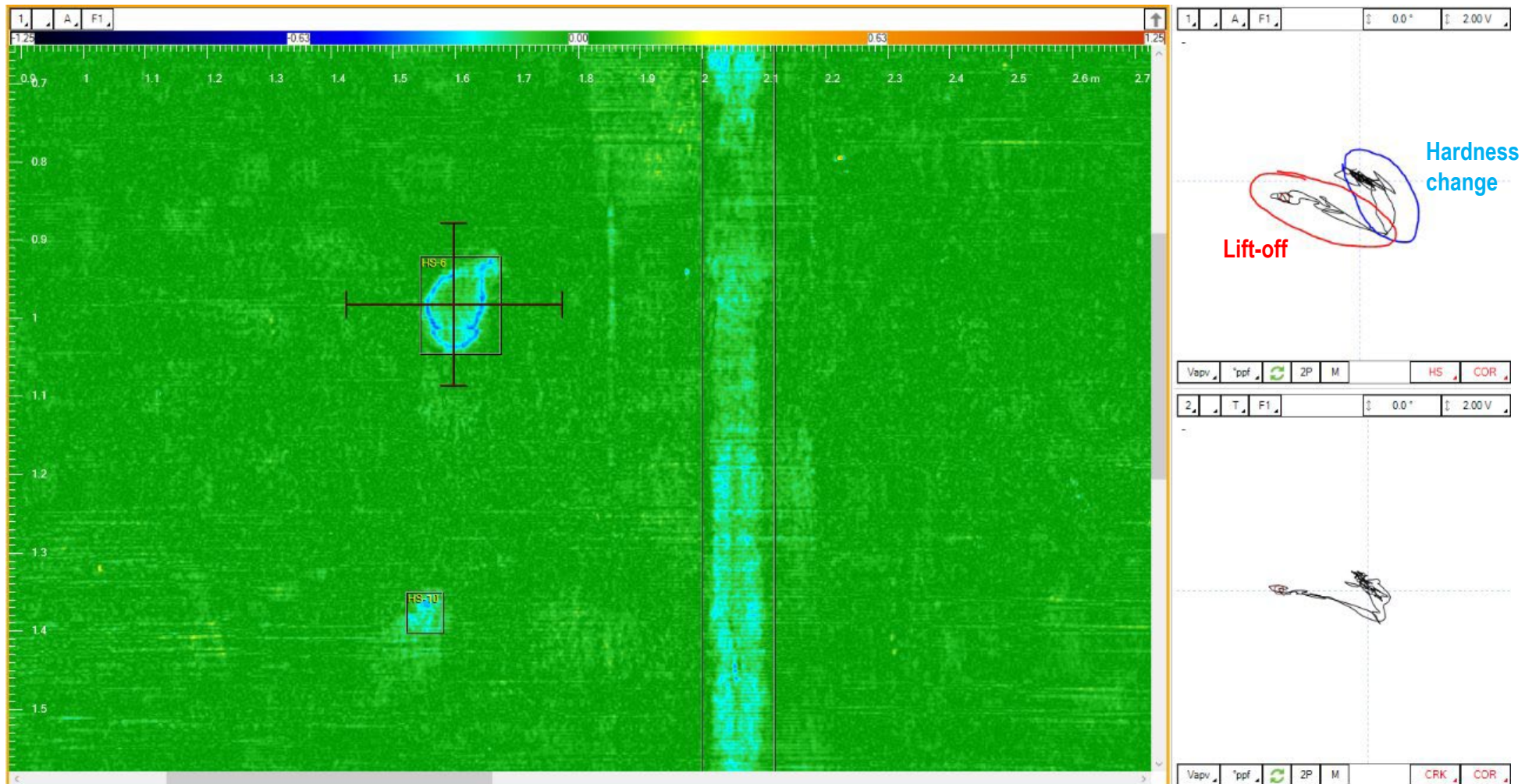
Is it possible to correlate the eddy current voltage response to a hardness value?



MAT-7-2A Project Learnings

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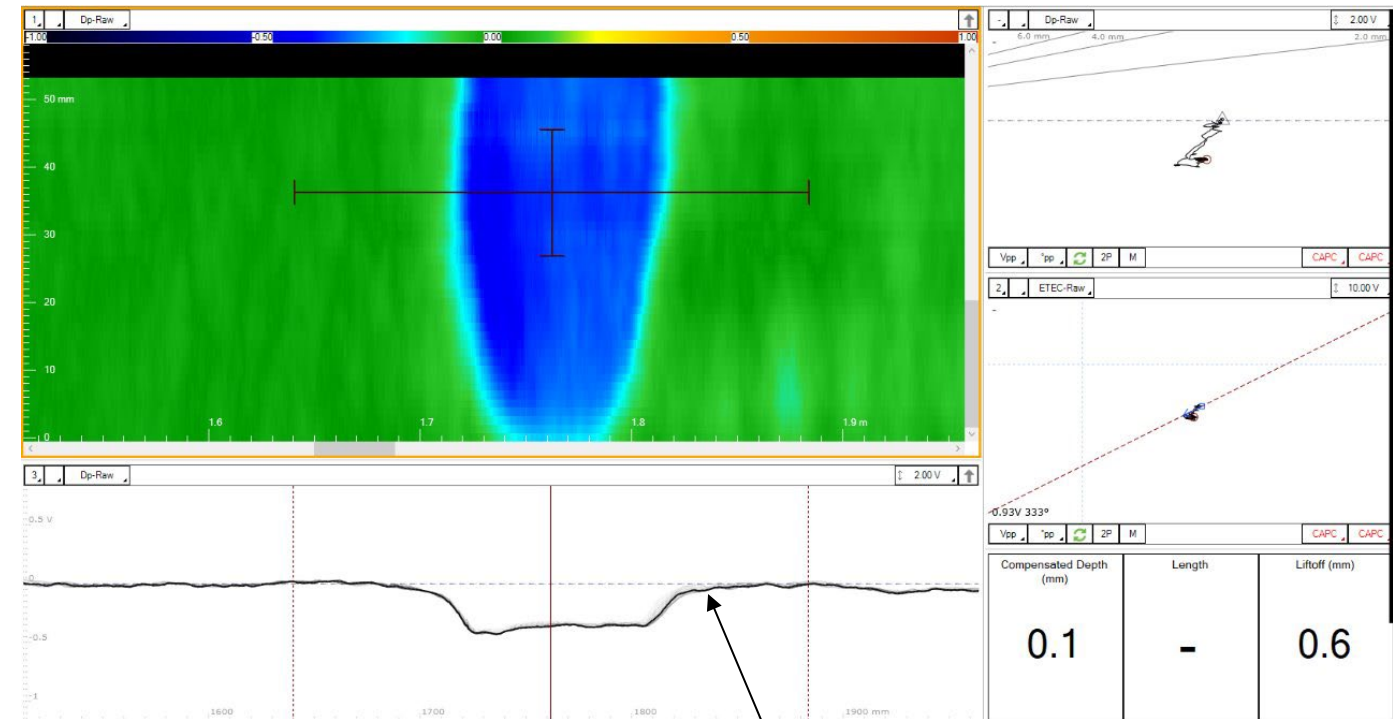
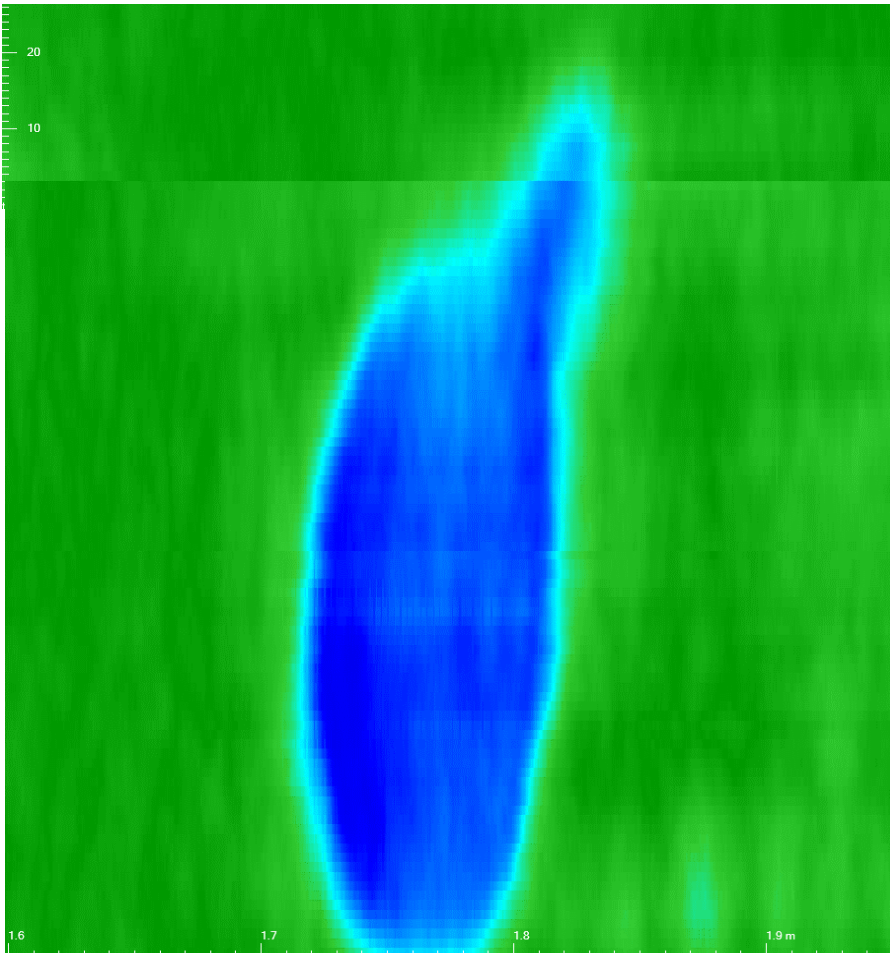
- Lift-off plays an important role in correlating to hardness values



MAT-7-2A Project Learnings

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- Scanning with flexible ECA probes can assist with lift-off variations

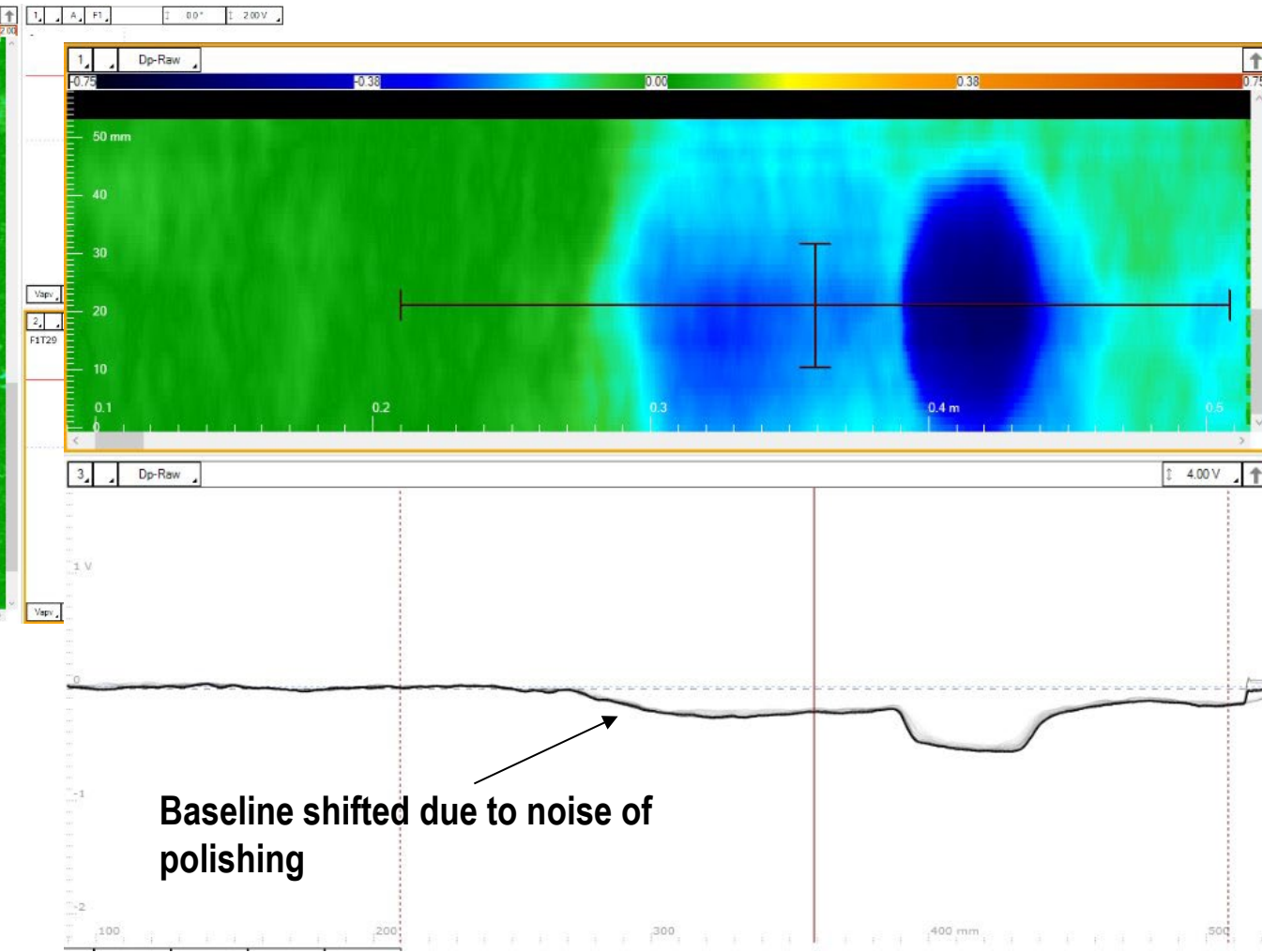
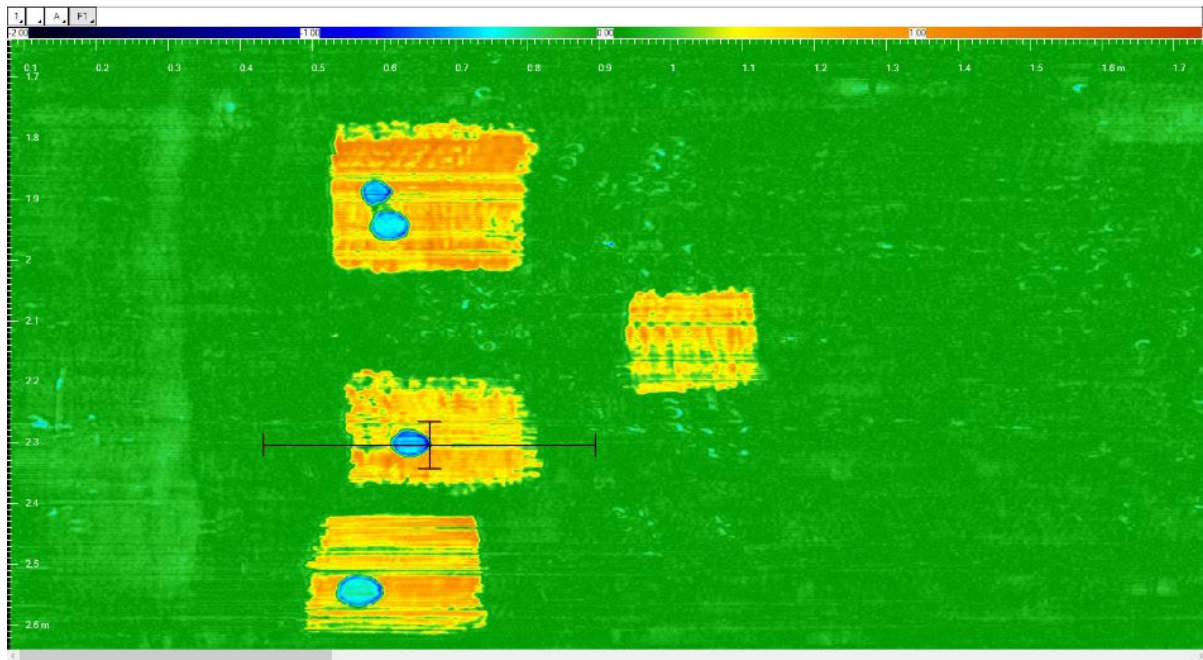


Constant amplitude – no lift off!

MAT-7-2A Project Learnings

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- Scanning hard spot areas using ECA after etching produces noise in the data

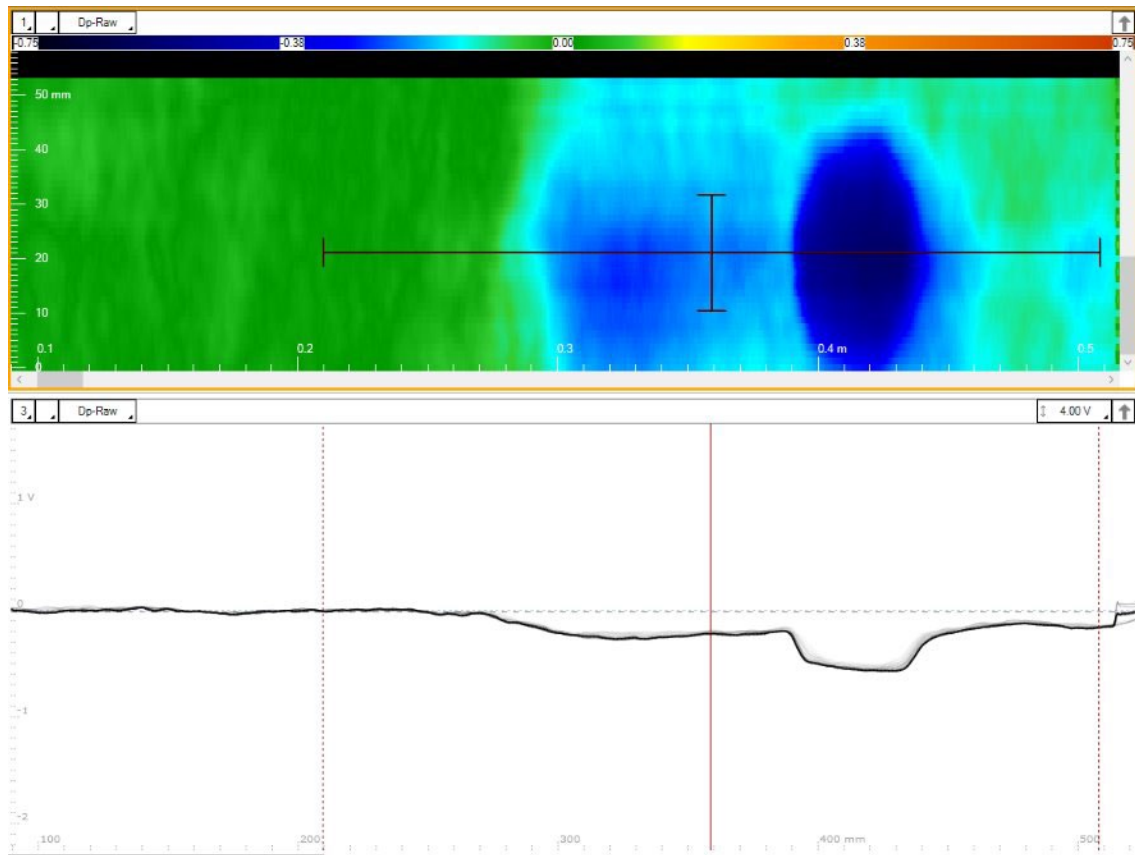


MAT-7-2A Project Learnings

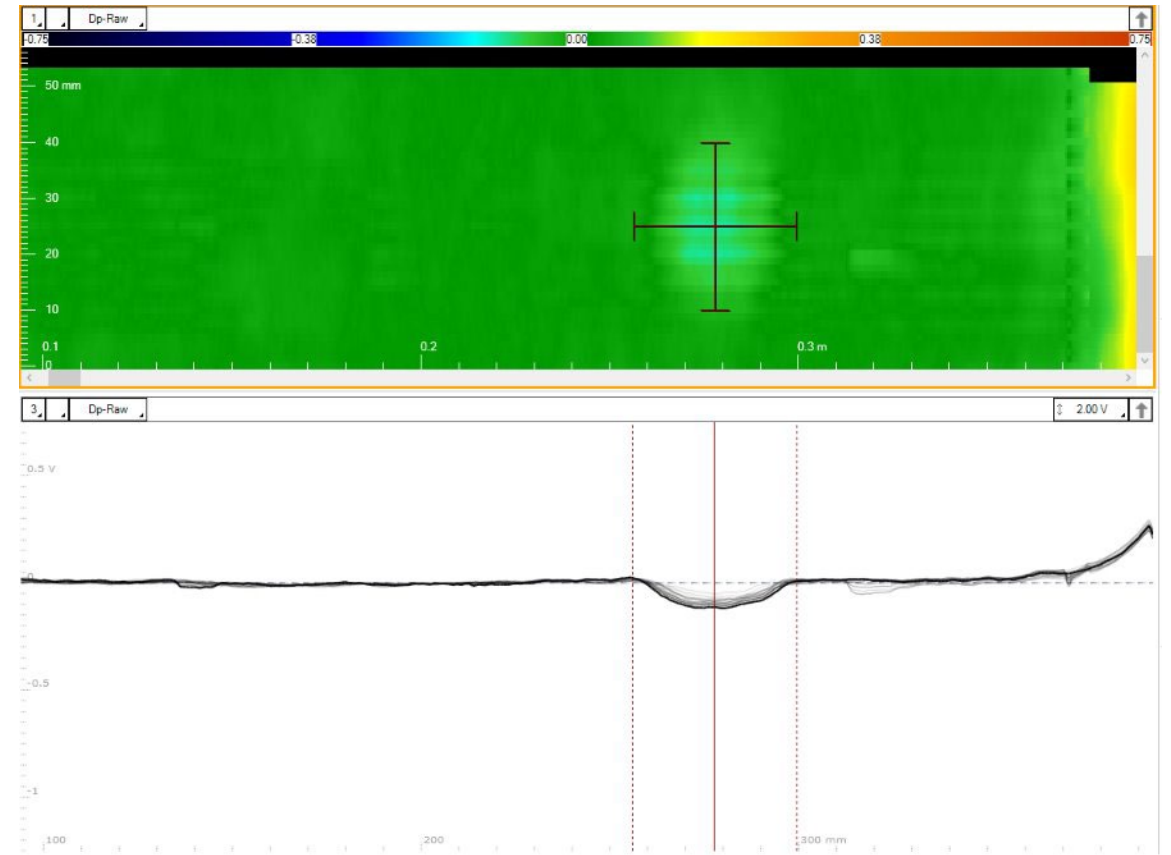
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- Able to use ECA for through-wall hard spots on the ID of pipe

Pipe OD



Pipe ID



Canada Gas Hard Spot Cut-Outs

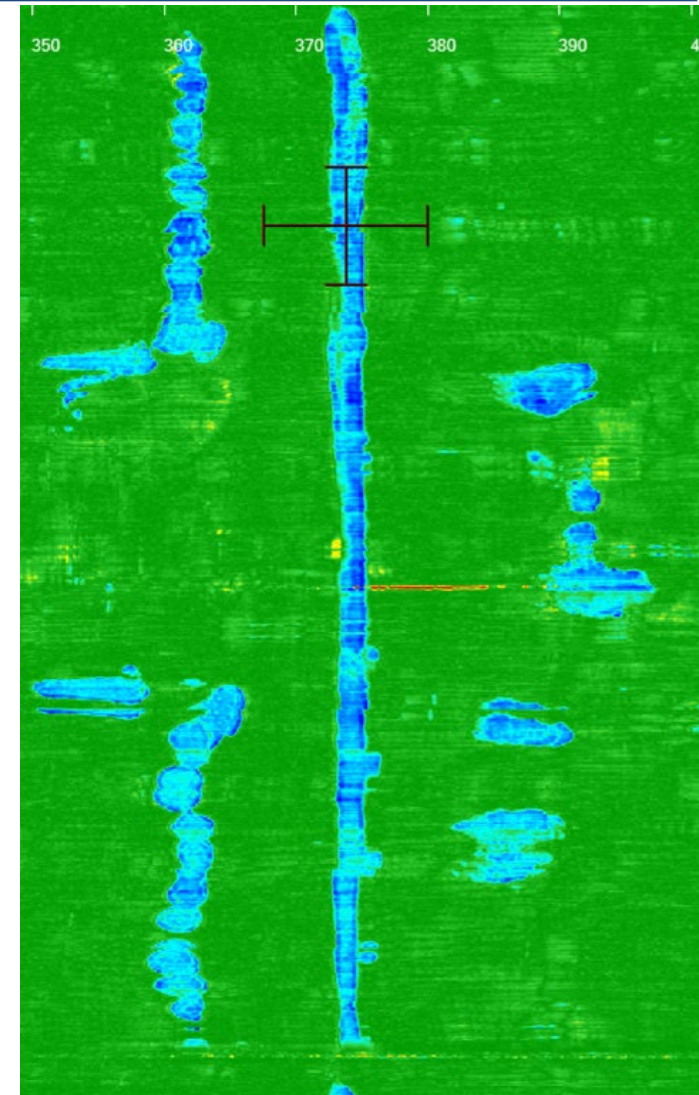
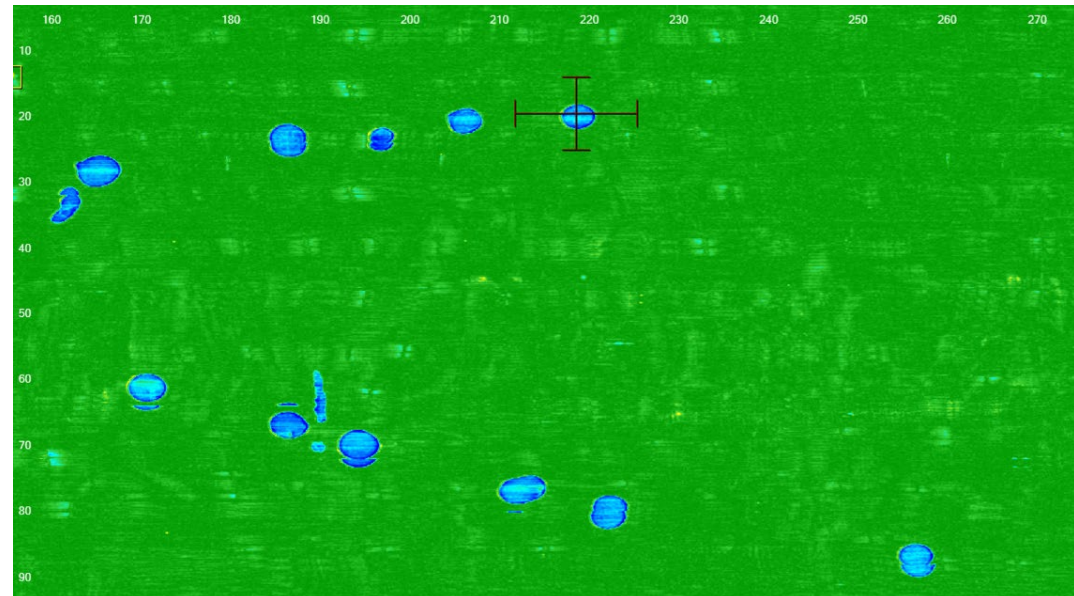
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3 joints cut-out during assessment

- NPS 30
- 1958 vintage
- X52
- AO Smith

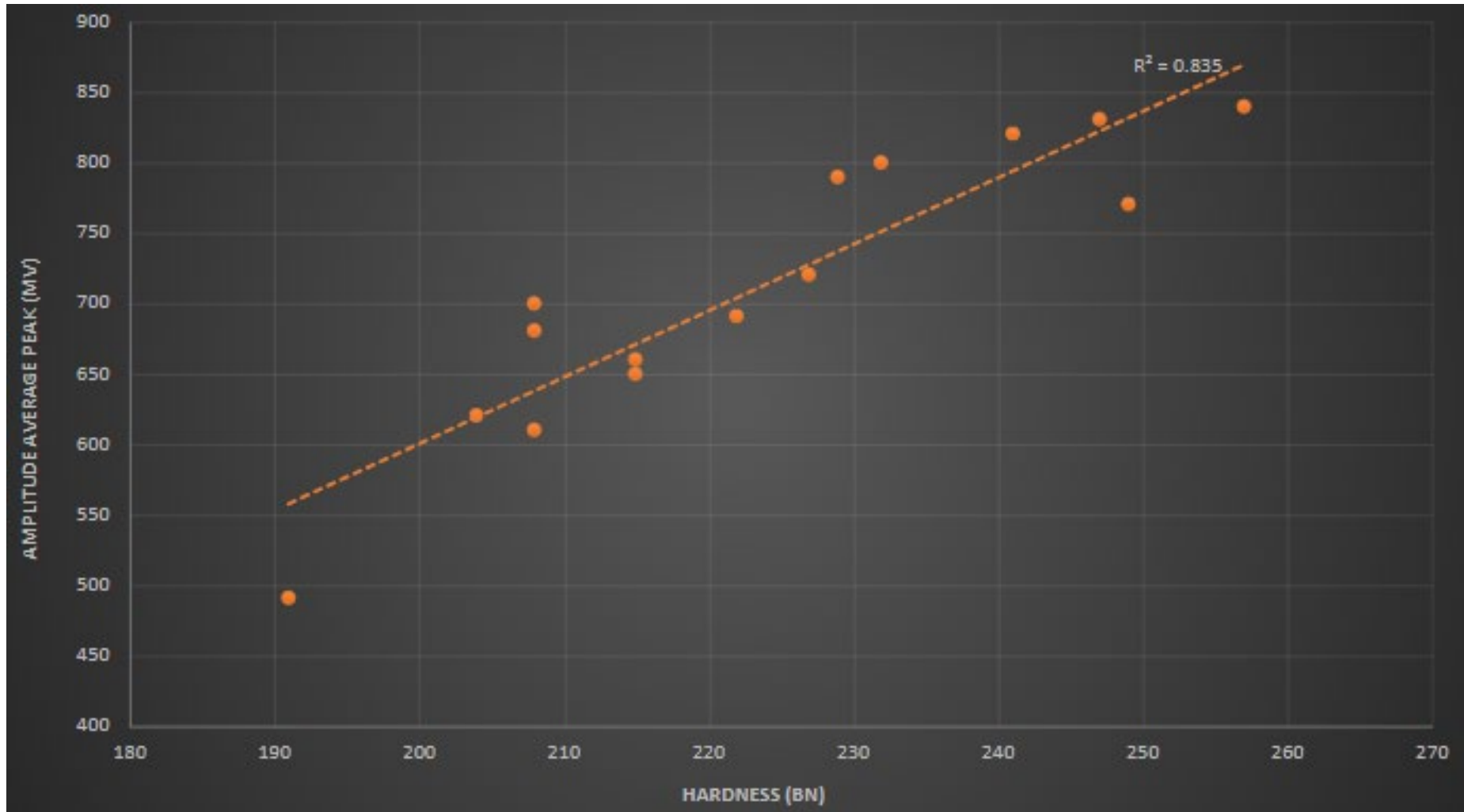
- Max hardness on each joint correlated to ILI calls
- Max hardness found: 325 HB
- Non-ILI called features ranging from ~160 – 290 HB

Each joint had 2-3 HS ILI calls...in total ~75 features identified by ECA probe



ECA Amplitude vs. Hardness – Preliminary Results

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Thank You!

