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of Engineers

Engineering and Support
Center, Huntsville

Evaluating and Understanding the EM61

ETS 2005

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Outline

- Introduce the projects that contributed to this presentation
- Quick look at what the field work looked like
- What we learned
- How our findings fit into the bigger picture

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Projects

EM61 MK1 Coil Evaluation Phase 1, 2002

EM61 MK1 Coil Evaluation Phase 2, 2003

EM61 MK2 Noise and Speed Study, 2004

EM61 MK2 Height and Clutter Tests, 2004

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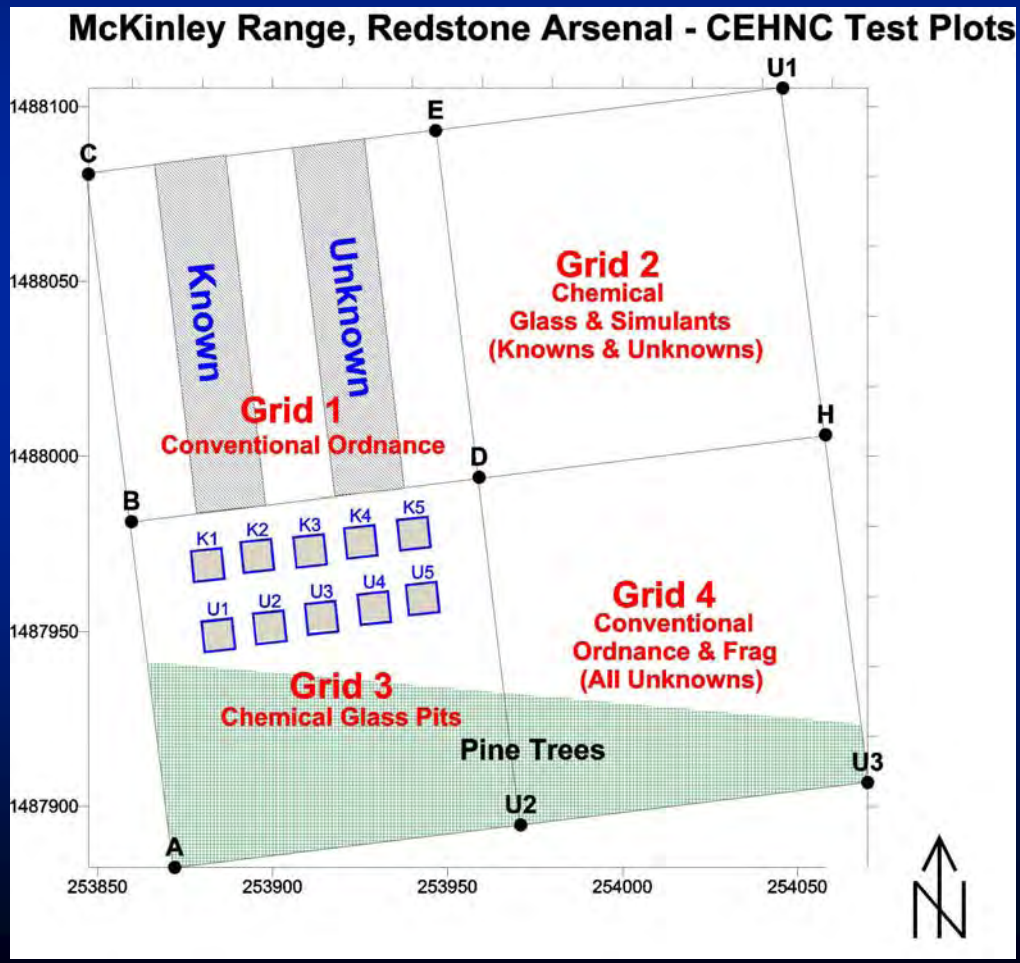
Project Location



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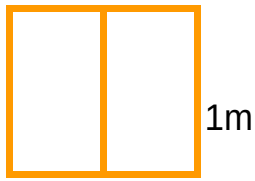
Coil Configuration Evaluations

Configuration #1

Configuration #2



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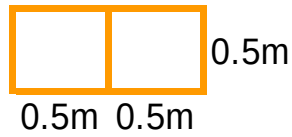

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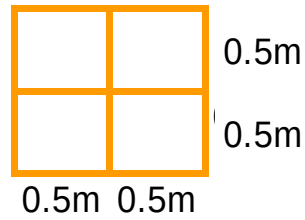

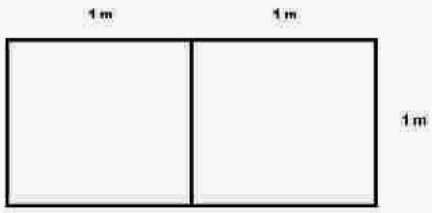

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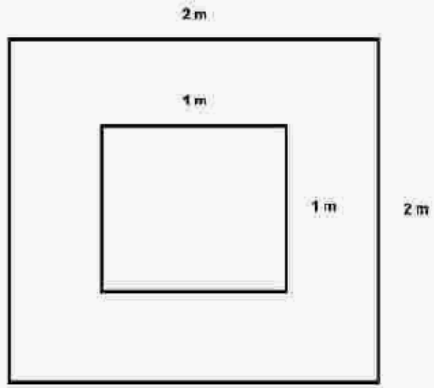

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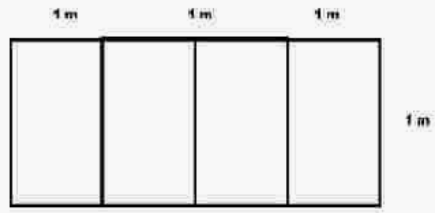

Configuration #7

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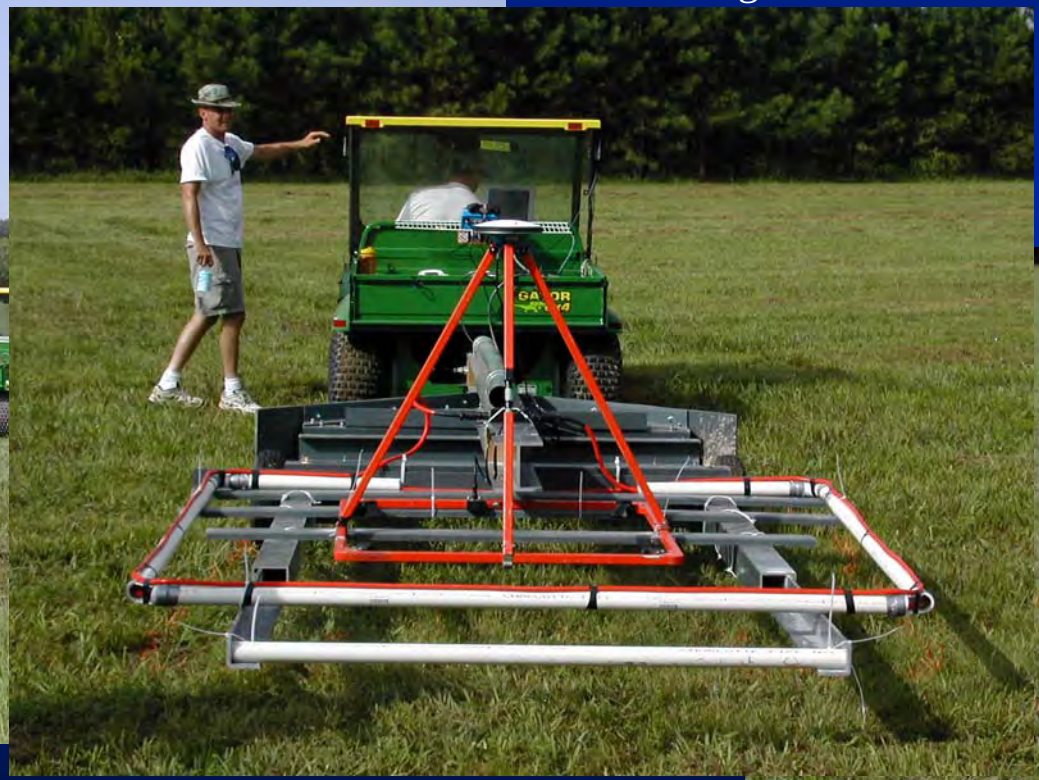
Coil Configuration Evaluations

Configuration #5

Configuration #6



Configuration #7

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Noise & Speed Tests

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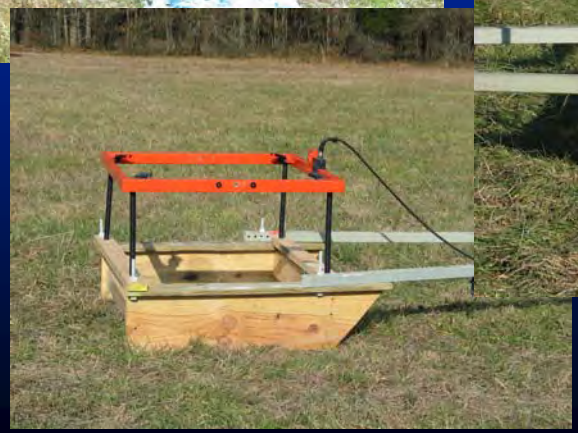
Height Tests



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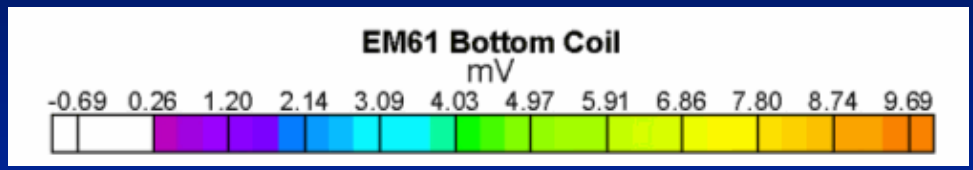
What We've Learned: Different Coils → Different Detection



C1 C2 C4 C5 C6 C7

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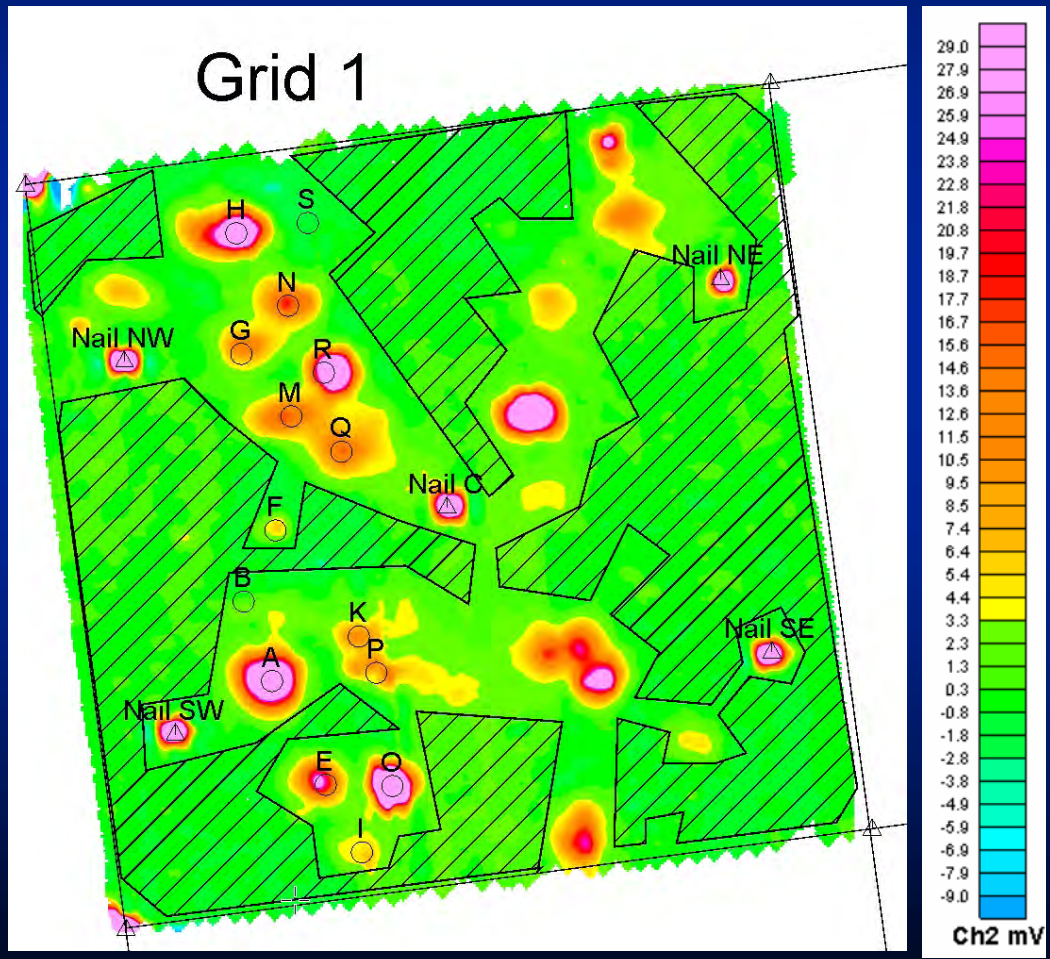
What We've Learned: How to look at noise



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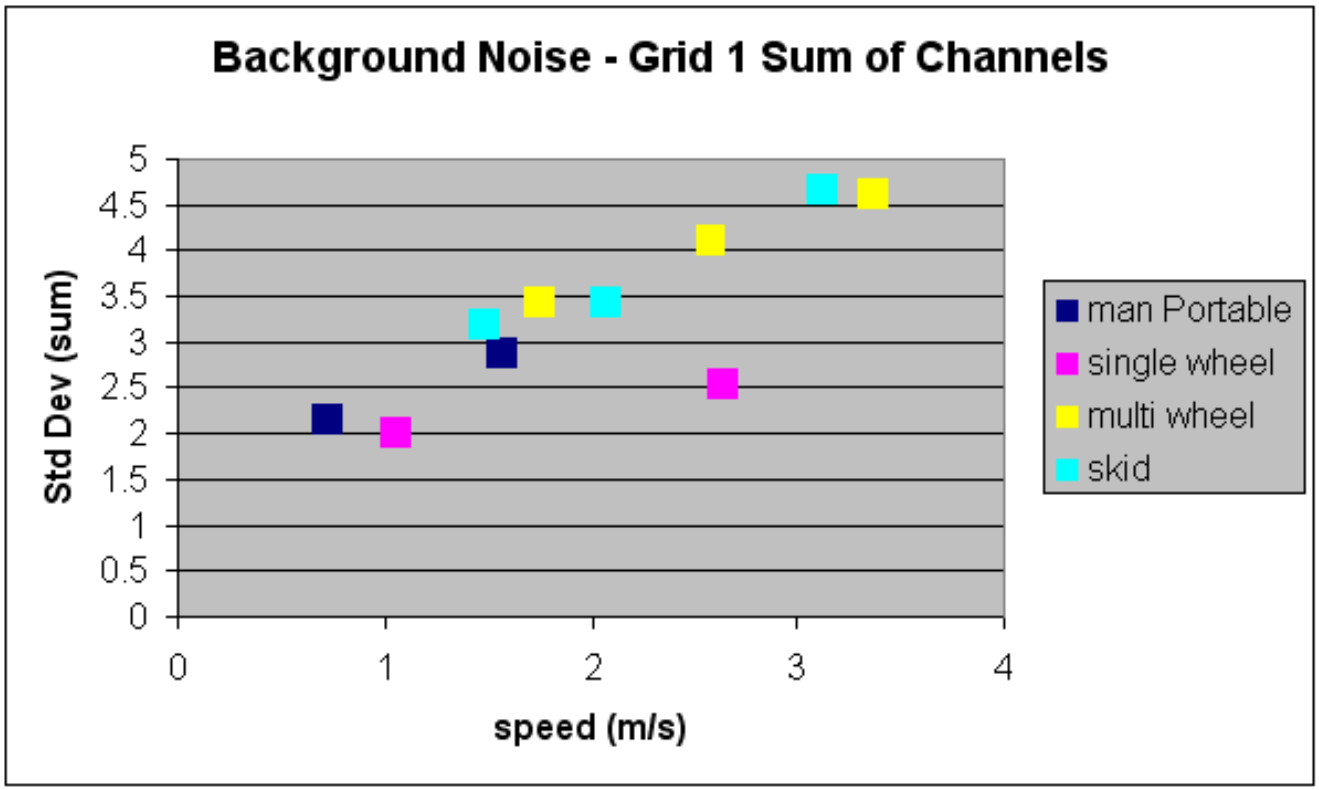
What We've Learned: Different Speeds → Different noise

Figure 4-2: Background Noise, Sum of all Channels



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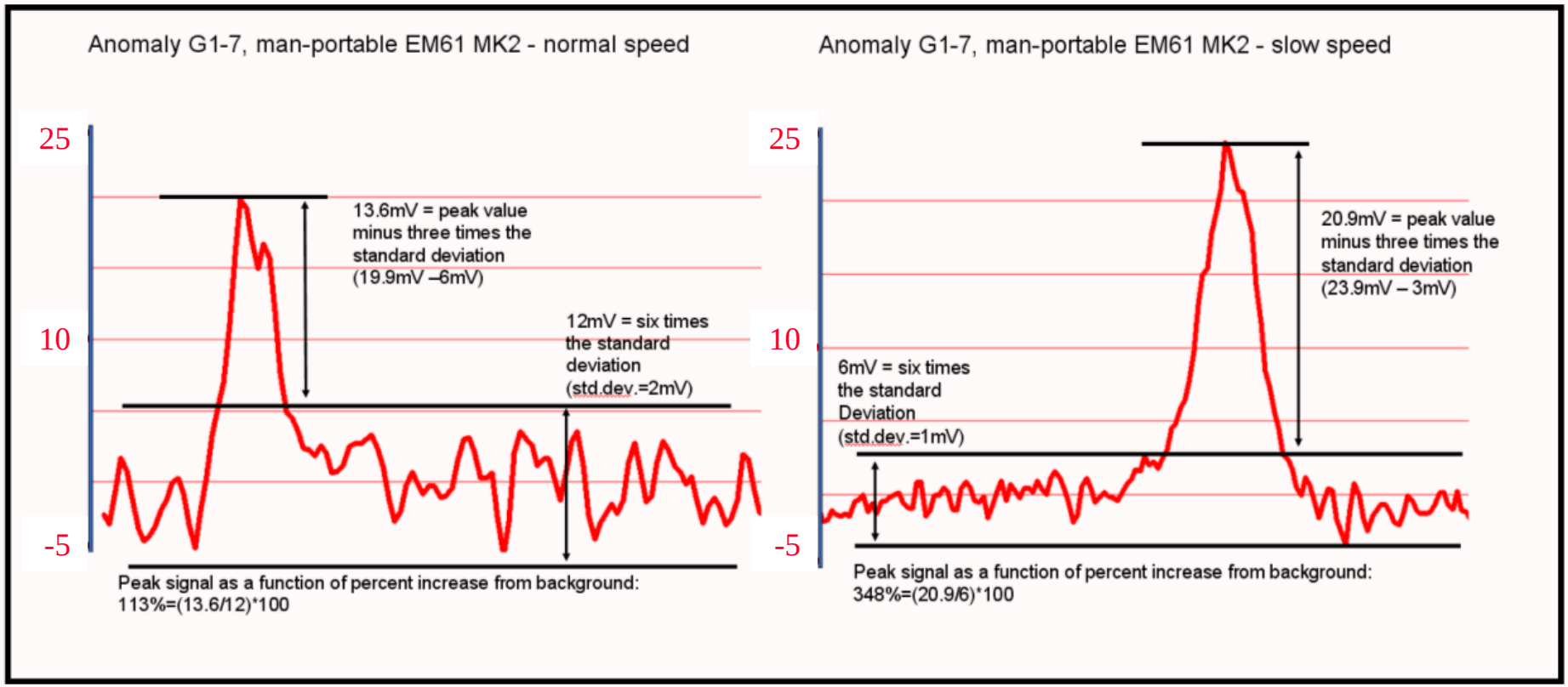
What We've Learned: Different Speeds → Different Signal Response (But not in direct proportion to SNR)

Figure 4-4: Example Calculation of Percentage Increase Above Background



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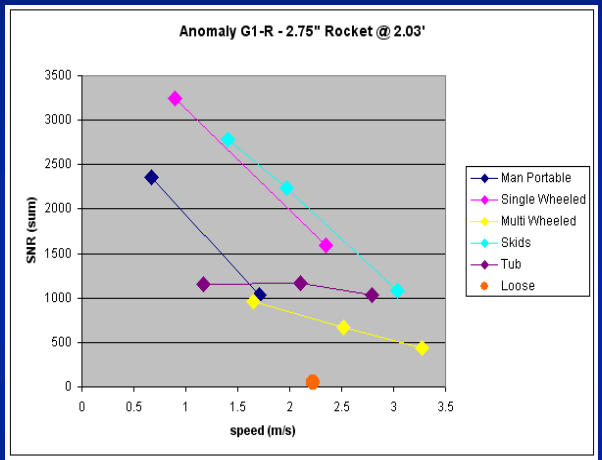
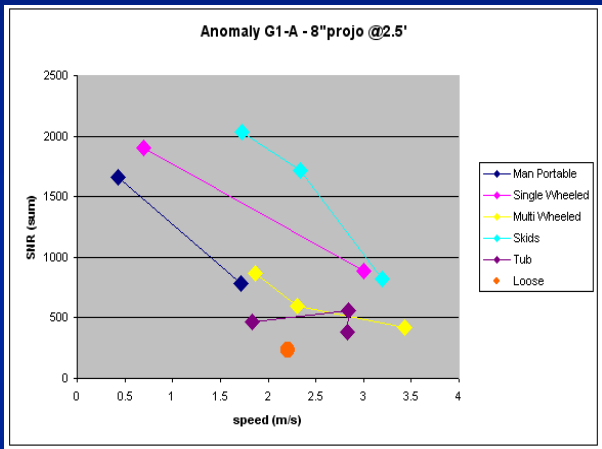
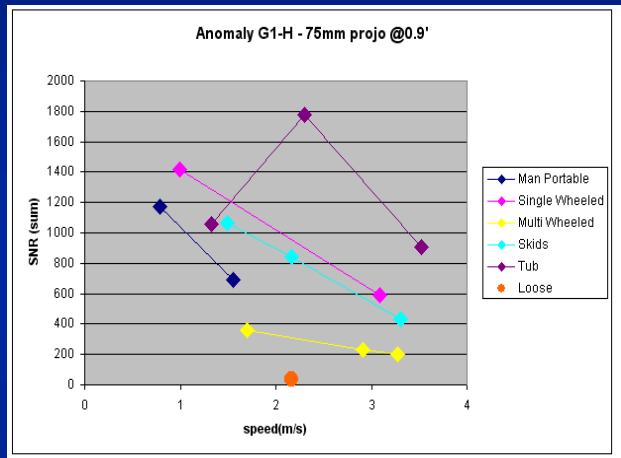
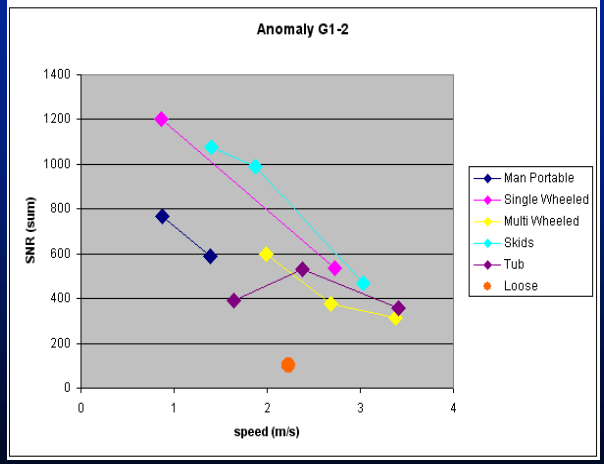
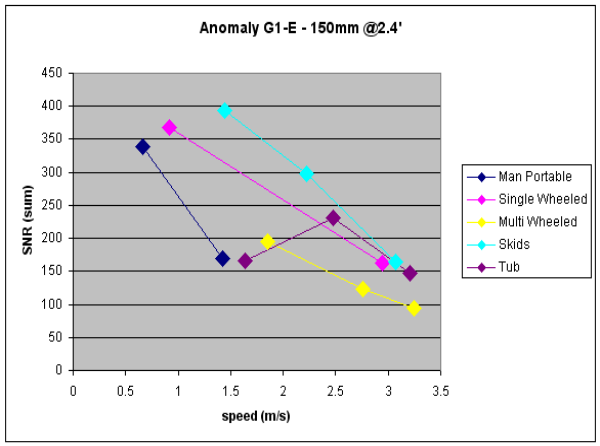
What We've Learned: Different Speeds → Very Different SNR

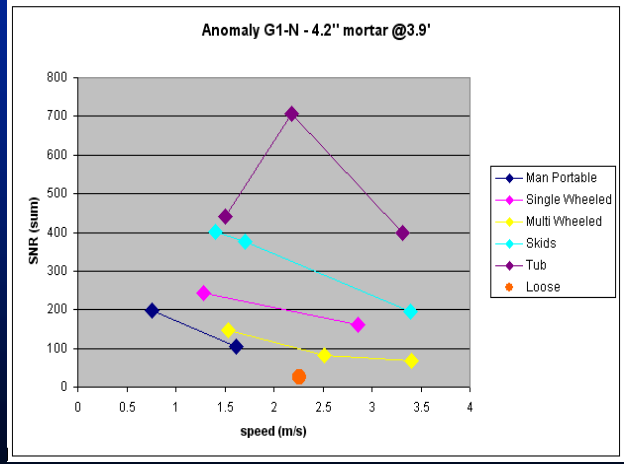












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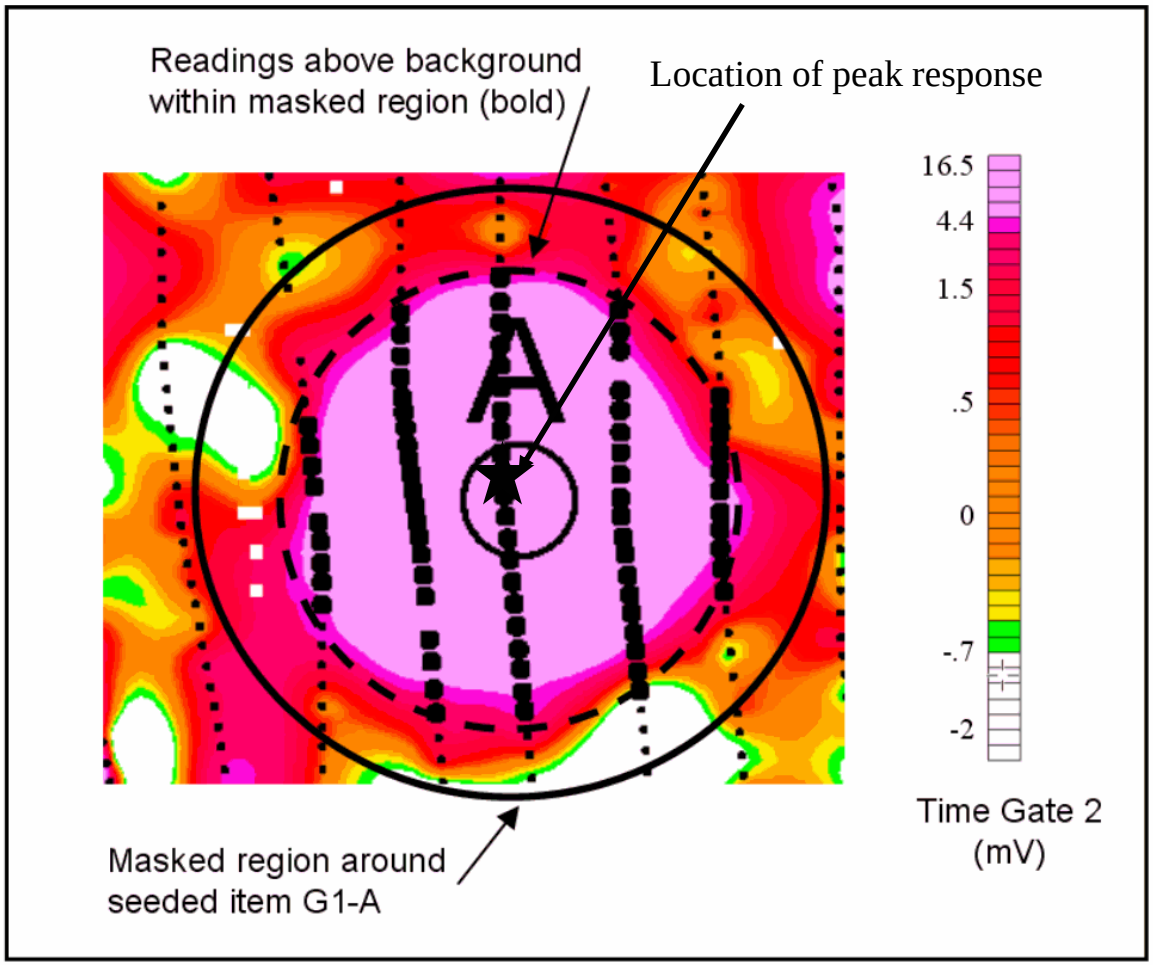
What We've Learned: Automating signal and noise estimates

Figure 4-6: Example of readings associated with SNR analyses



Link

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What We've Learned: Different Speeds → Different Anomaly Shapes

Figure 4-9: Anomaly Size Example 2

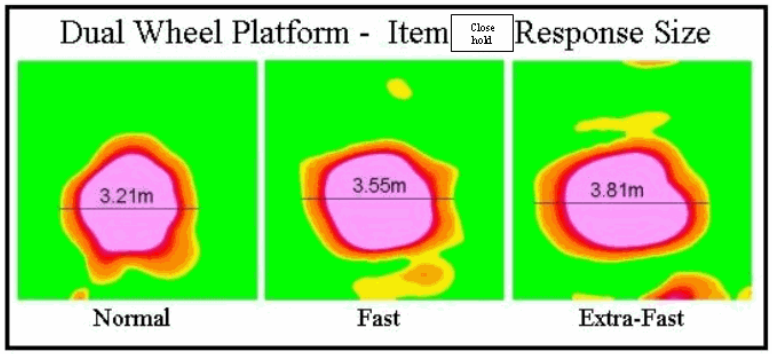
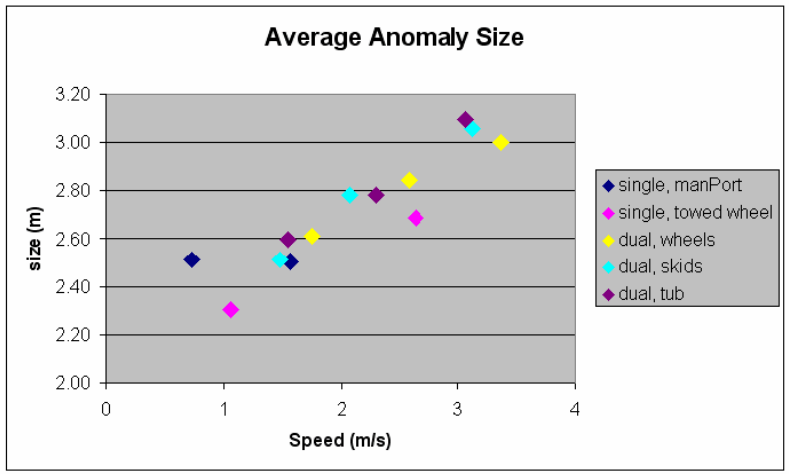


Figure 4-10: Average Anomaly Size vs. Speed



What We've Learned:
Keep the sensors close to the ground

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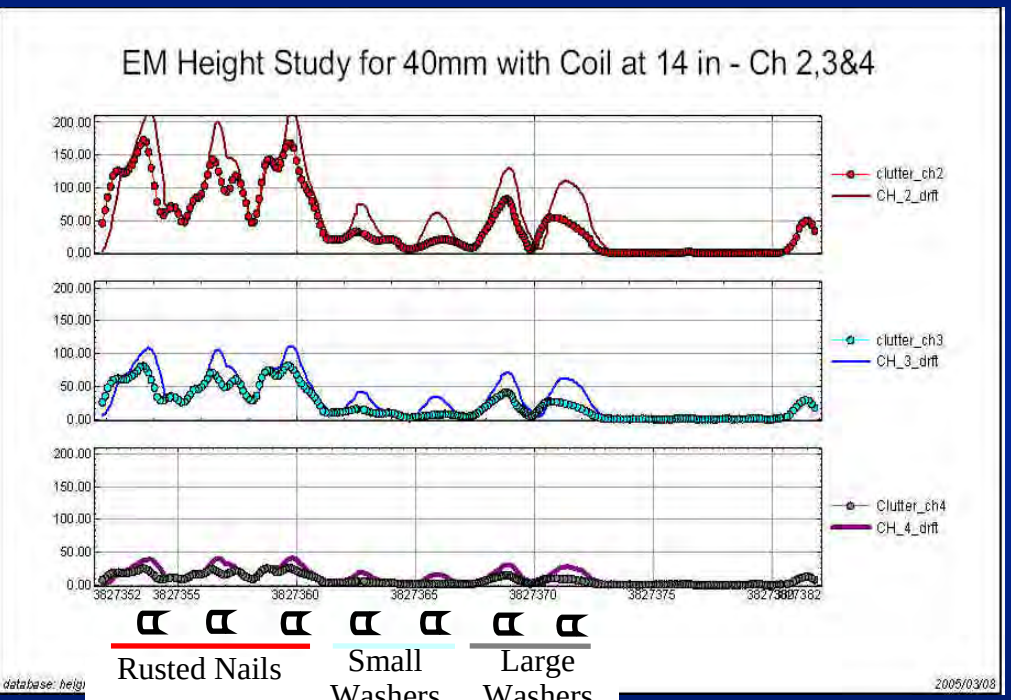

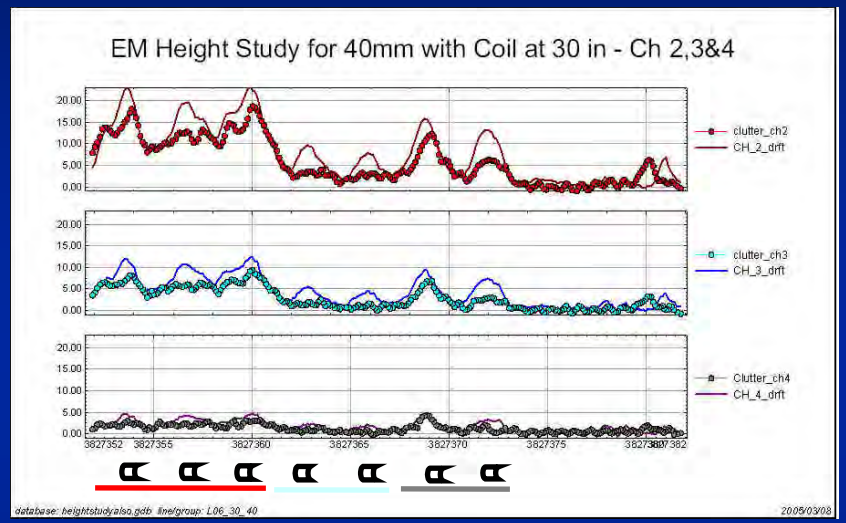

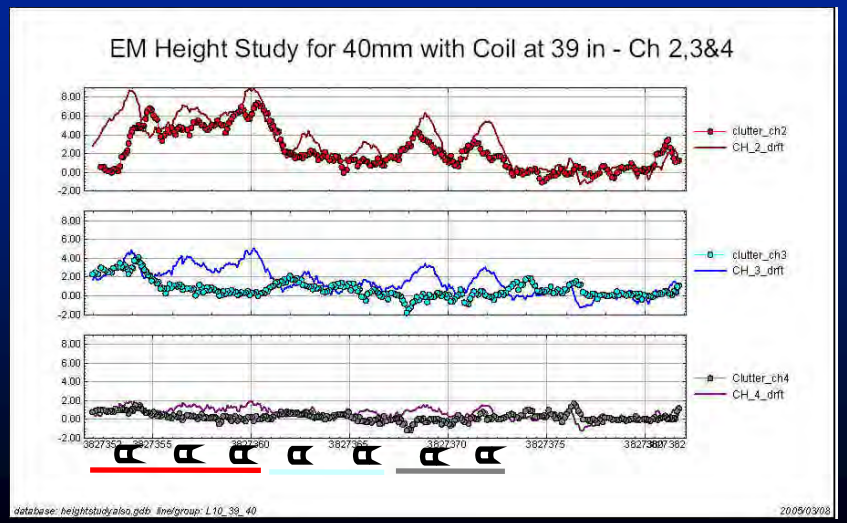

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In Summary

COIL CONFIGURATIONS

- No appreciable differences in anomaly detections at our site
- Smaller loops do increase "resolution"
- Larger loops detect larger items deeper
- Larger loops not as good as smaller loops at detecting smaller items

SURVEY SPEEDS & PLATFORM STABILITY

- Higher speeds yield lower SNR
- SNR decreases at a rate that is proportionally greater than the increase in noise alone
- Platform Flexure seems to contribute a significant degree of noise
- Noise and signal responses increased the closer the coils are to the ground—suspect flexure
- Anomaly size will change with changes in speed

SENSOR HEIGHTS & CLUTTER

- No appreciable differences in noise levels
- Signal responses change proportionally with clutter responses
- The size and characteristics of the clutter affect the measured response
- Discrimination may be feasible under some circumstances

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What it all means…

To the Client

- Contracting: identifying "definable features of work"
- QA: Learned to recognize where to start looking
- Agree up-front on data needs
- Basis for accepting Selection Criteria

To the Contractor's

- Proposals: coil selection, speed, production consistency
- Data Needs & QC: speed, flexure, height, anomaly selections
- Document discrimination decisions
- Continuous checking of decisions