MIR Demonstration for Pipe/Facilities Locator

Prepared for the:

Natural Gas Infrastructure Reliability Industry Forums

Morgantown, West Virginia

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Presented by:

Carlos Romero

romero29@llnl.gov

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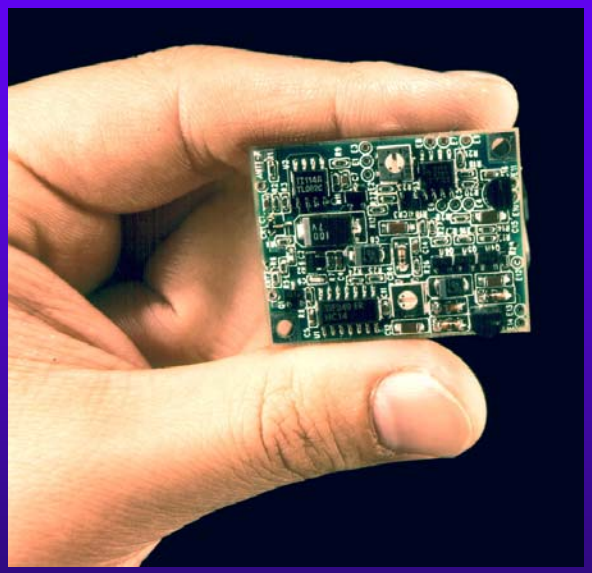
MIR Overview

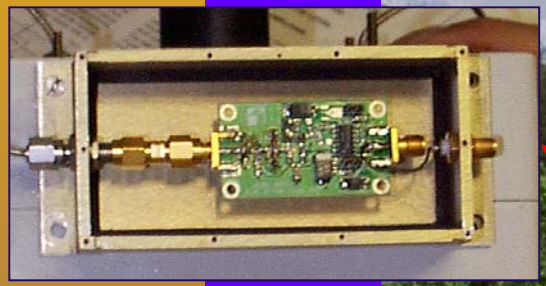
Based on pulse generation technology originally developed for Laser Fusion at LLNL

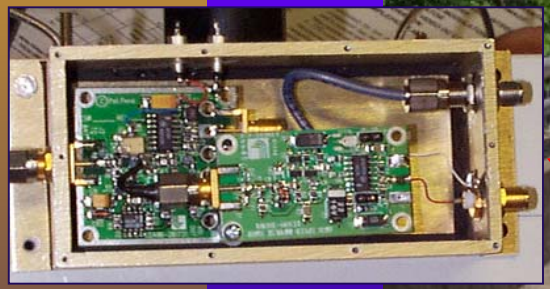


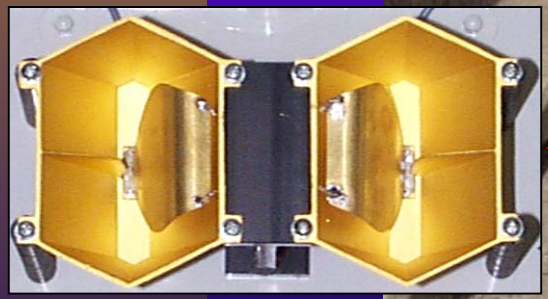
Complete MIR motion sensor (minus battery and antenna)

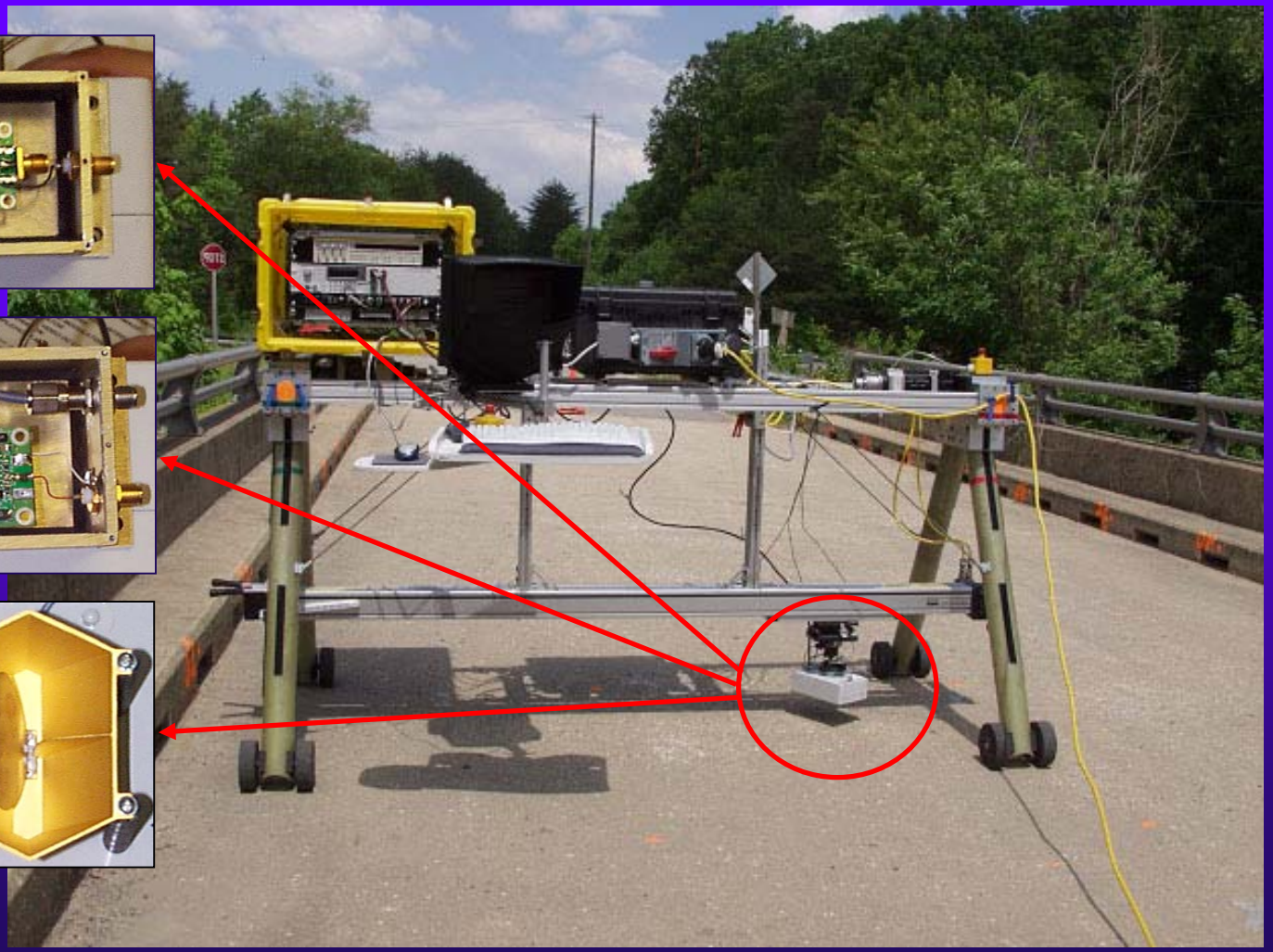
- Unique, patented technology
  - Compact
  - Inexpensive
  - Wideband pulsed radar
  - Low power
- Applications in:
  - Short-range motion sensing
  - Distance/light measurements
  - High-resolution Imaging
- On-going government programs in:
  - Aircraft safety
  - Bridge inspection
  - Mine detection
  - Security
  - Explosives diagnostics

PERES Cart

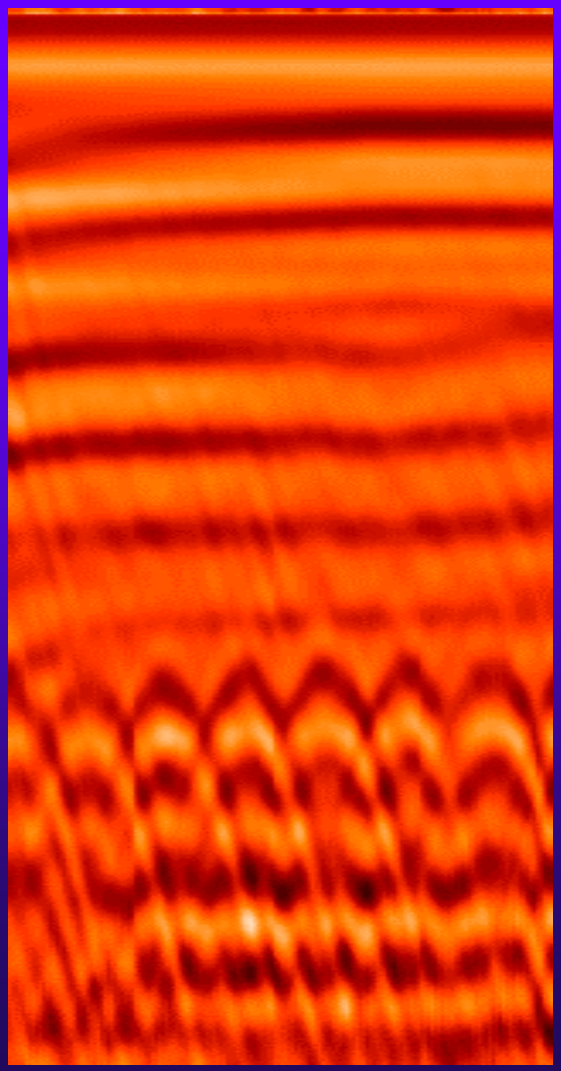


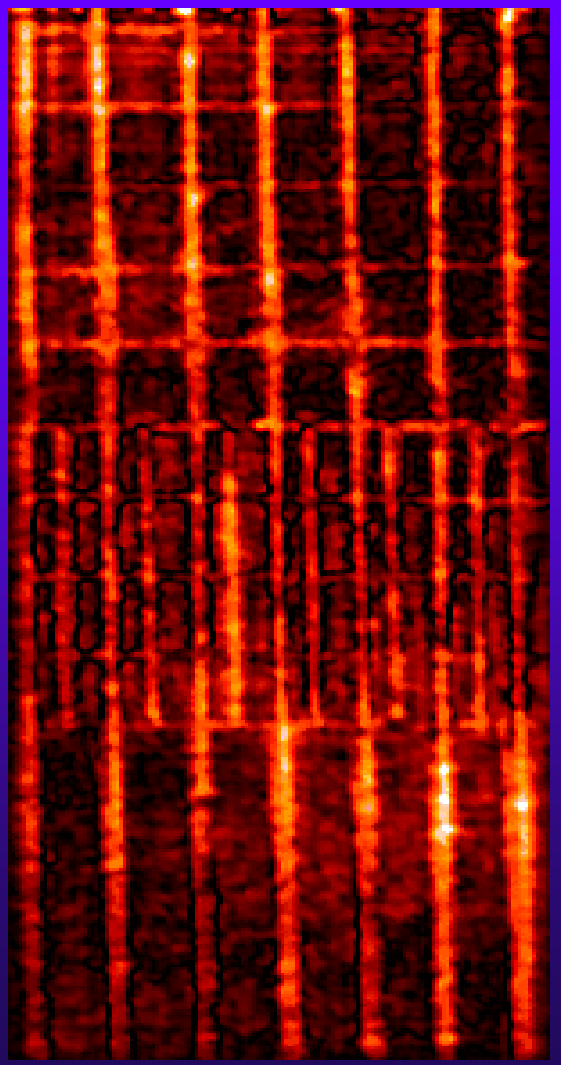






Bridge Inspection

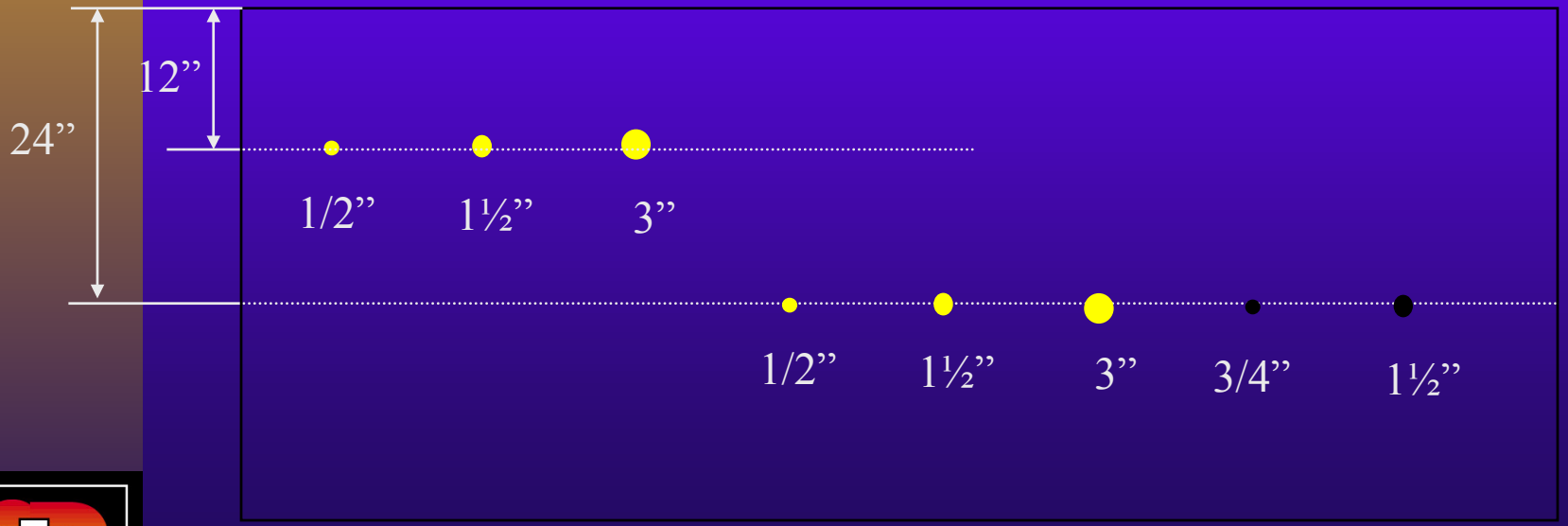




Initial Testing at LLNL

metal plastic (PE)

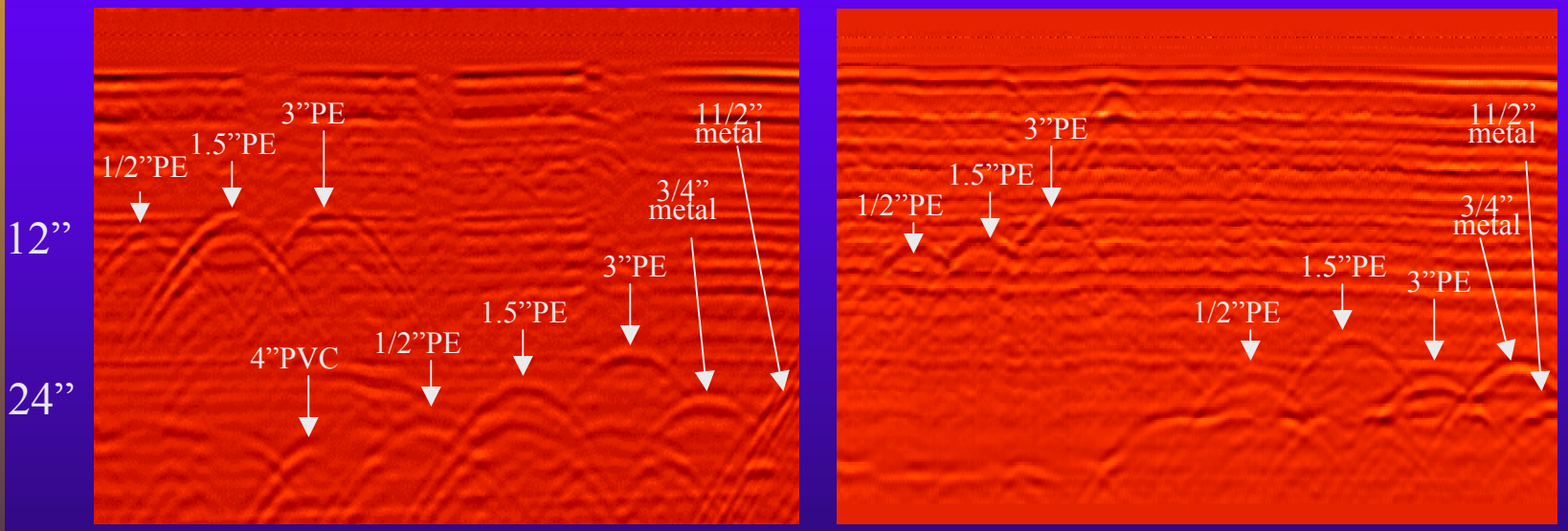
Results for dry sand & pea gravel



Results for dry sand & pea gravel

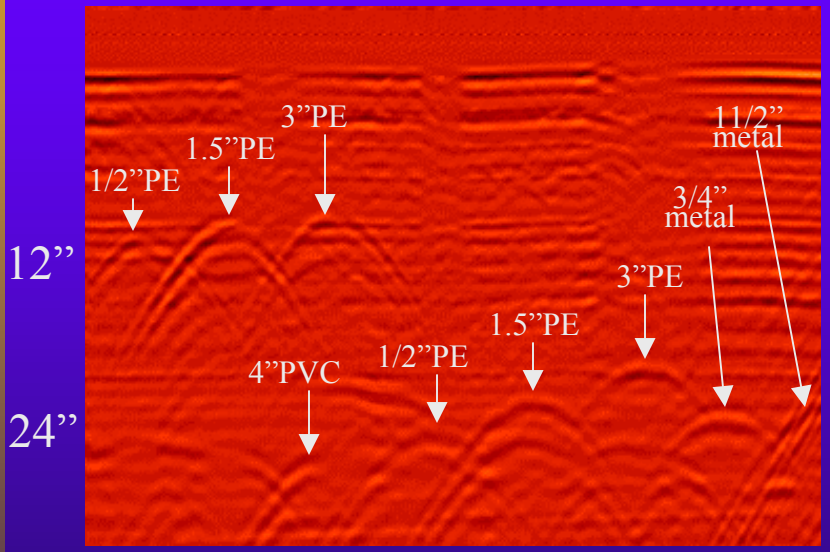
sand pit

gravel pit

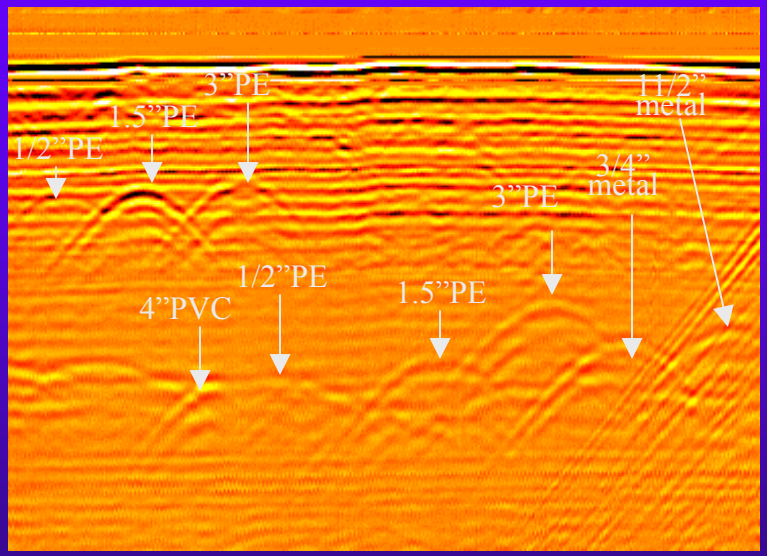


Results for dry sand vs. wet sand

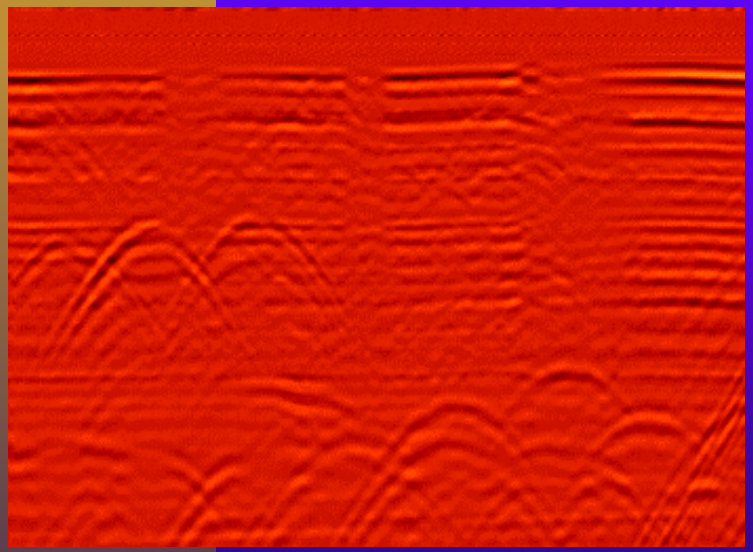
dry sand

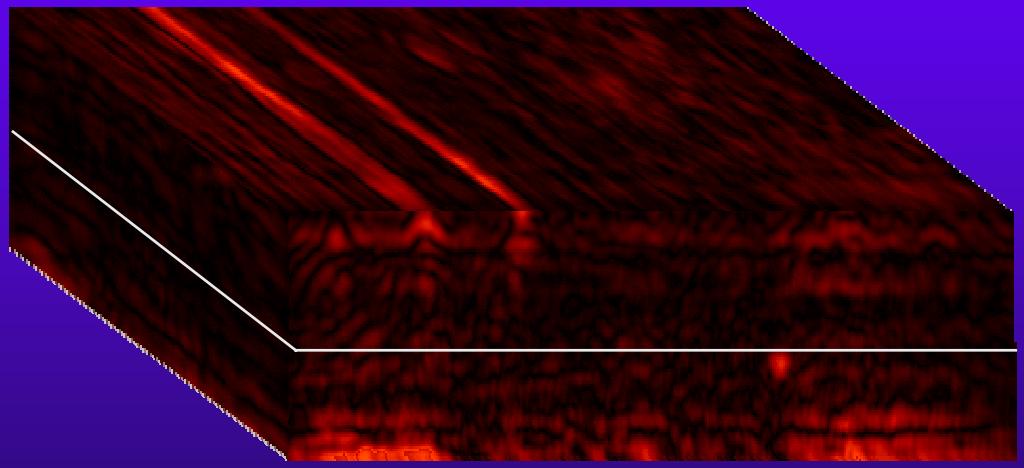


wet sand

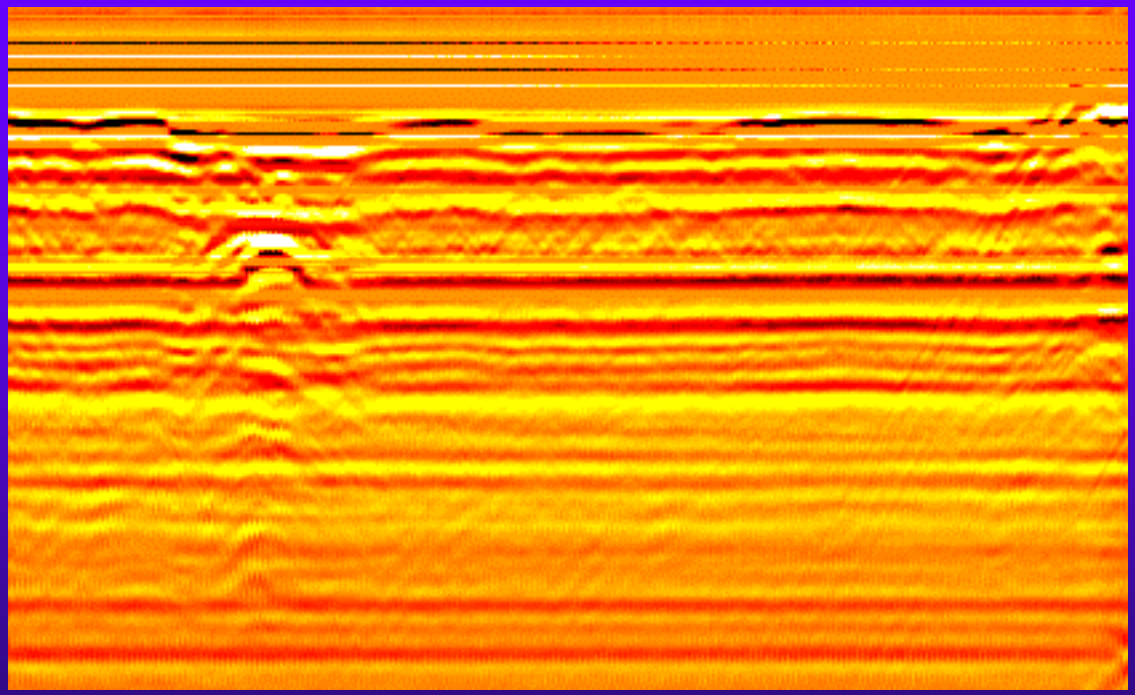


Reconstruction for dry sand pit

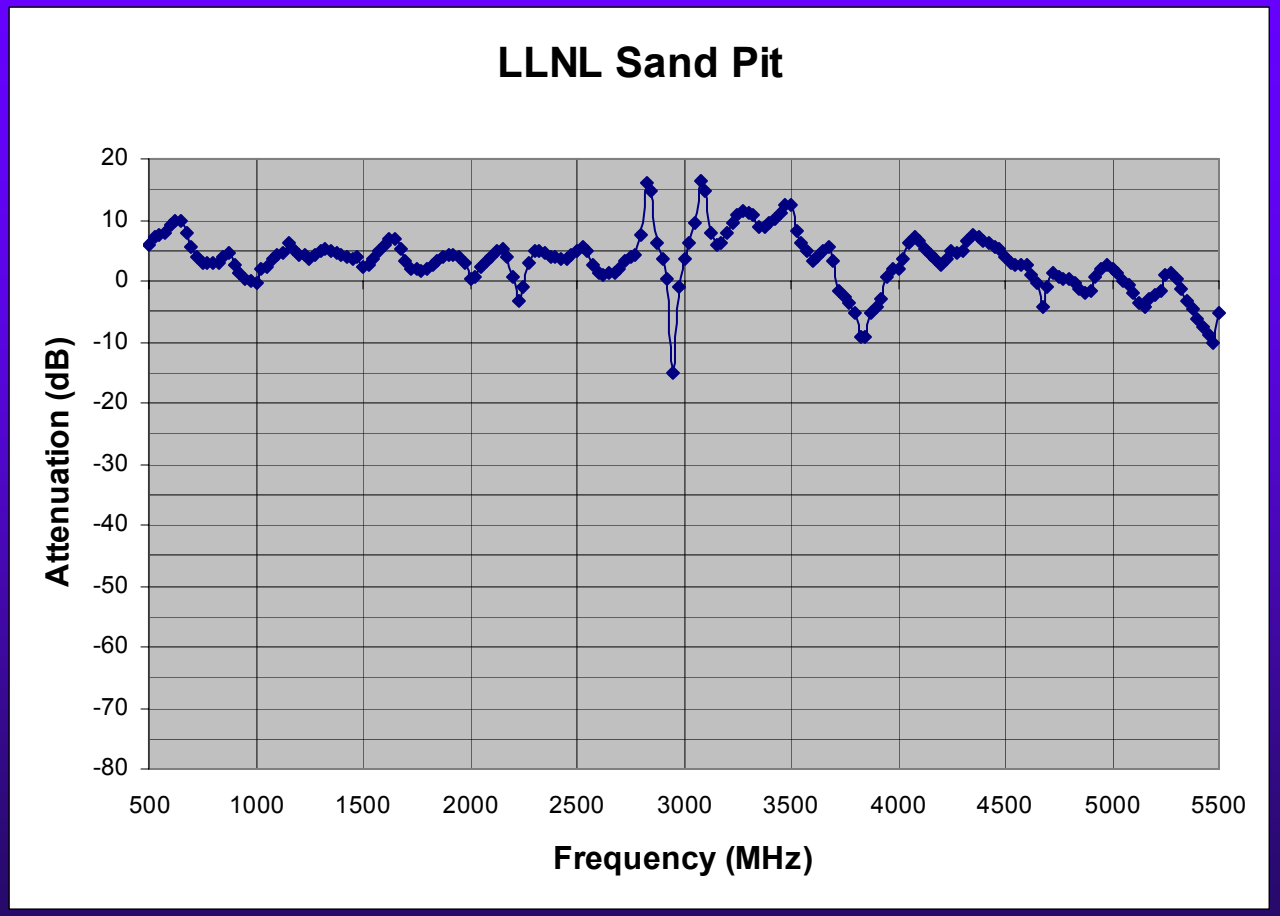




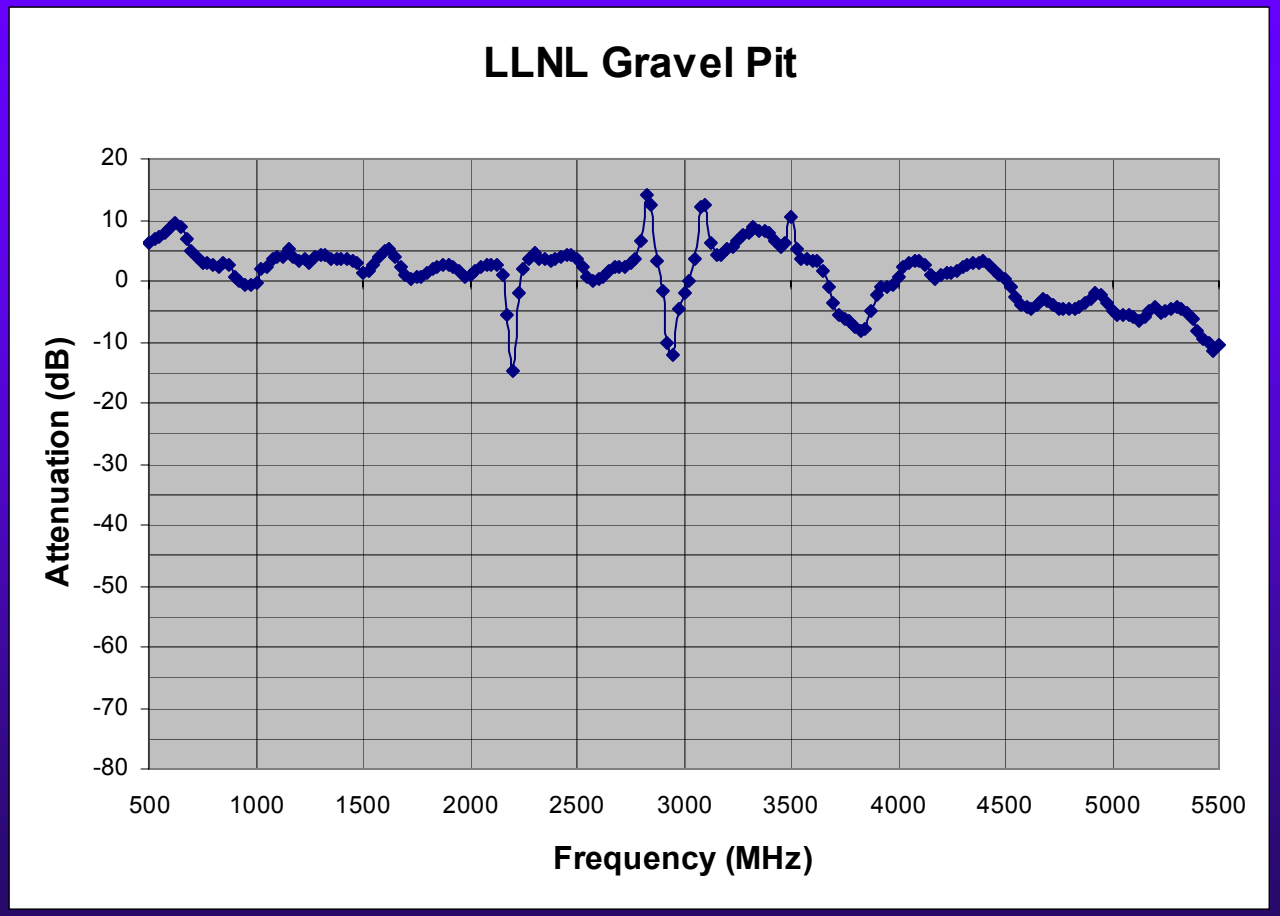
Results for dirt pit



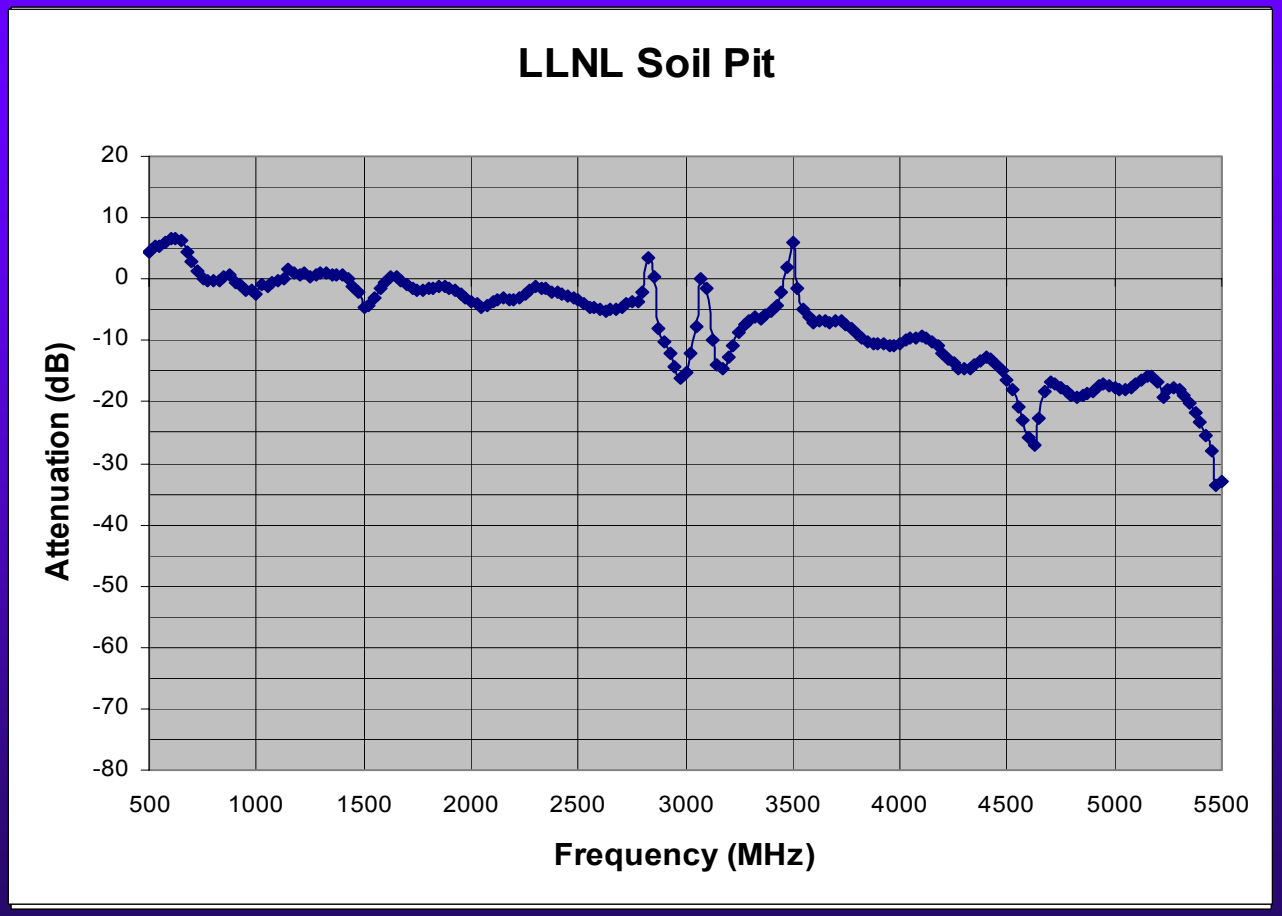
Attenuation Curves for Sand Pit



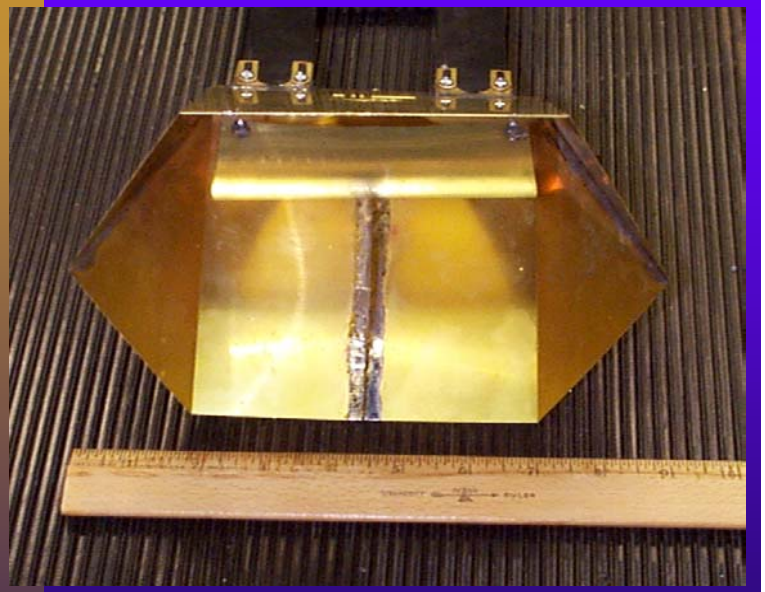
Attenuation Curves for Gravel Pit

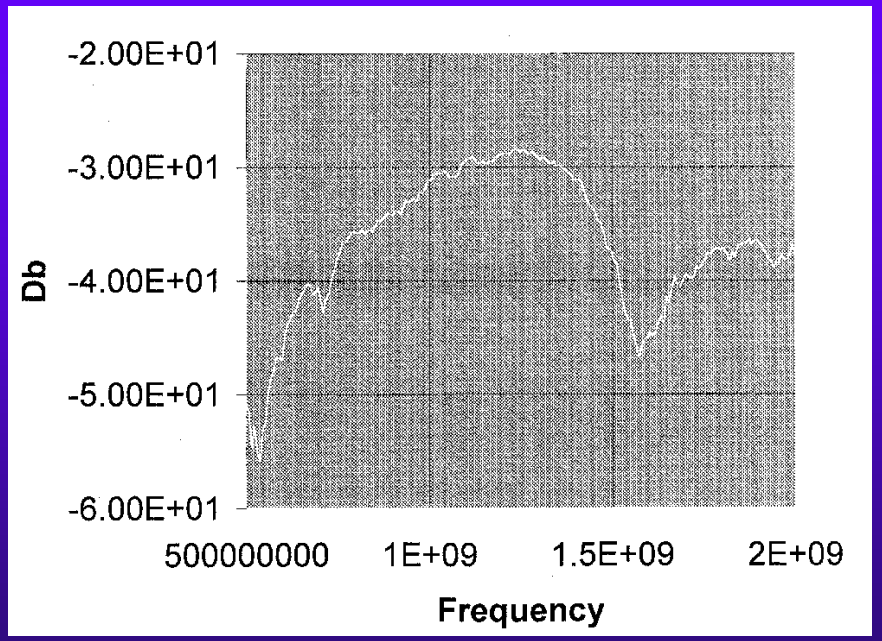


Attenuation Curves for Soil Pit



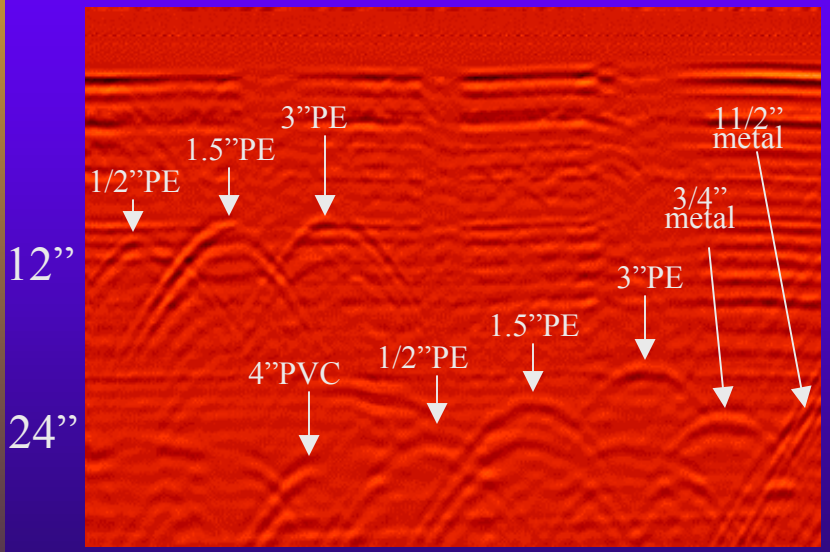
New 900MHz antenna



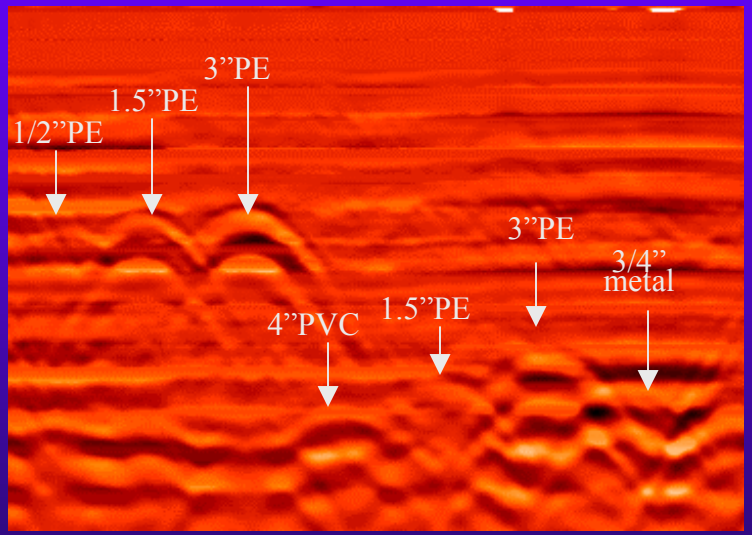


Results for 1.5GHz antenna vs. 900MHz

1.5 GHz



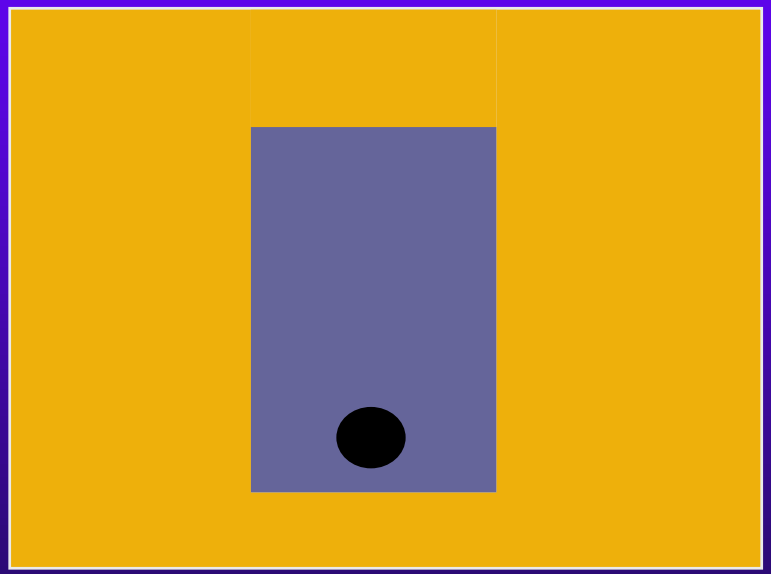
900 MHz



Testing at Chicago Pipe Farm

1. 2” PE at 60” Depth
2. 0.5” Cable at 24” Depth
3. Empty 24” Trench
4. 1” Steel at 18” Depth
5. 4” PE at 36” Depth

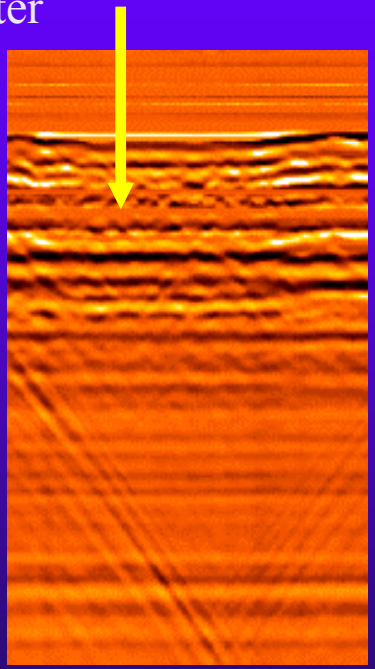
Testing at Chicago Pipe Farm

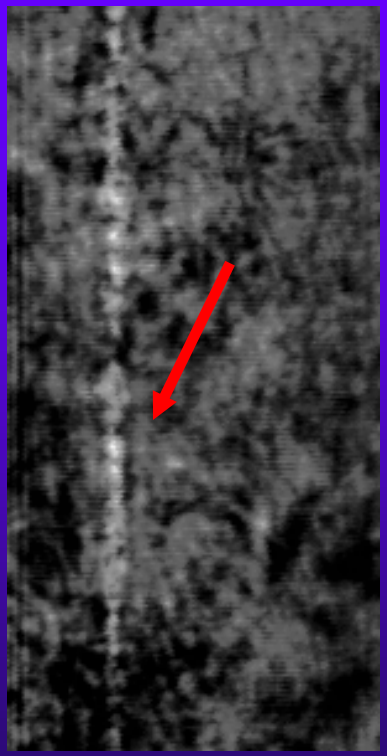


1. Dug 18” wide trench
2. Buried pipe
3. Backfilled the first half of the length of the trench with a 50/50 sand/soil mix, the other half with sand
4. Topped off with 4-6” of soil

Trench #4: 1” Steel at 18” Depth

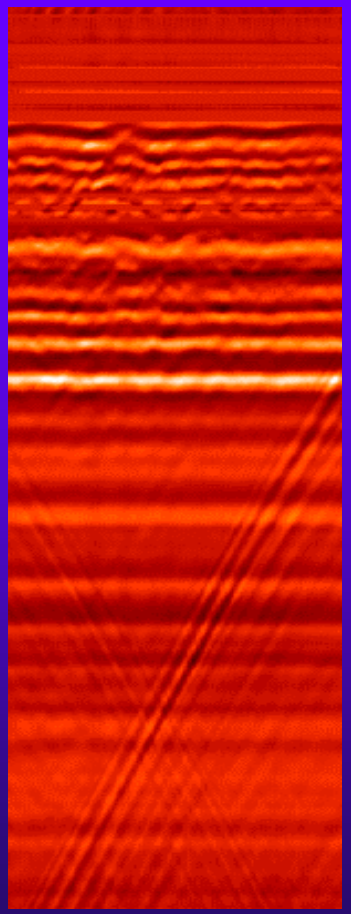
Vertical cross-section of raw data. Pipe should be visible, but is lost in surface clutter





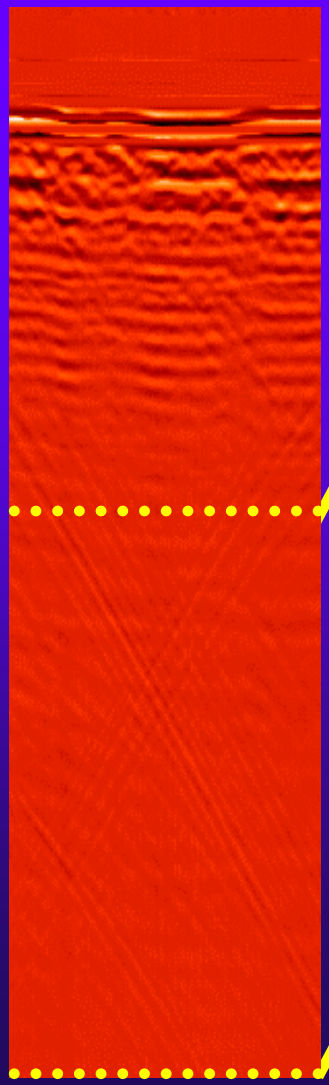
Horizontal cross-section of reconstruction at 18” depth

Trench #2: 0.5” Steel at 24” Depth

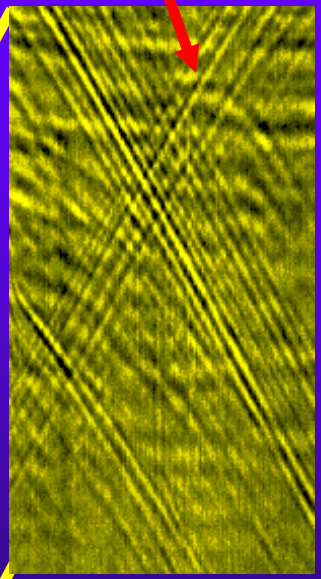


Vertical cross-sections of raw data. The cable only becomes apparent after removal of surface ringing

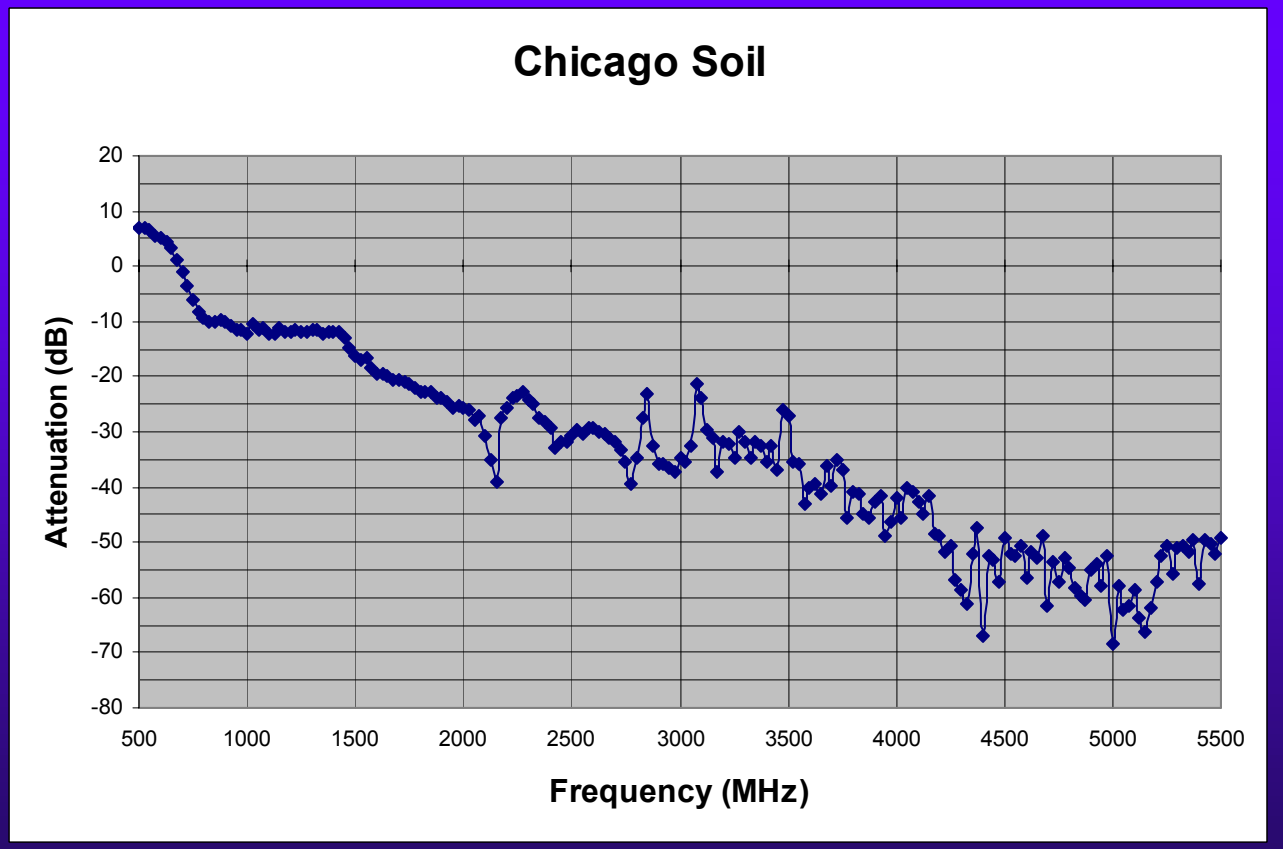
Trench #5: 4” PE at 36” Depth



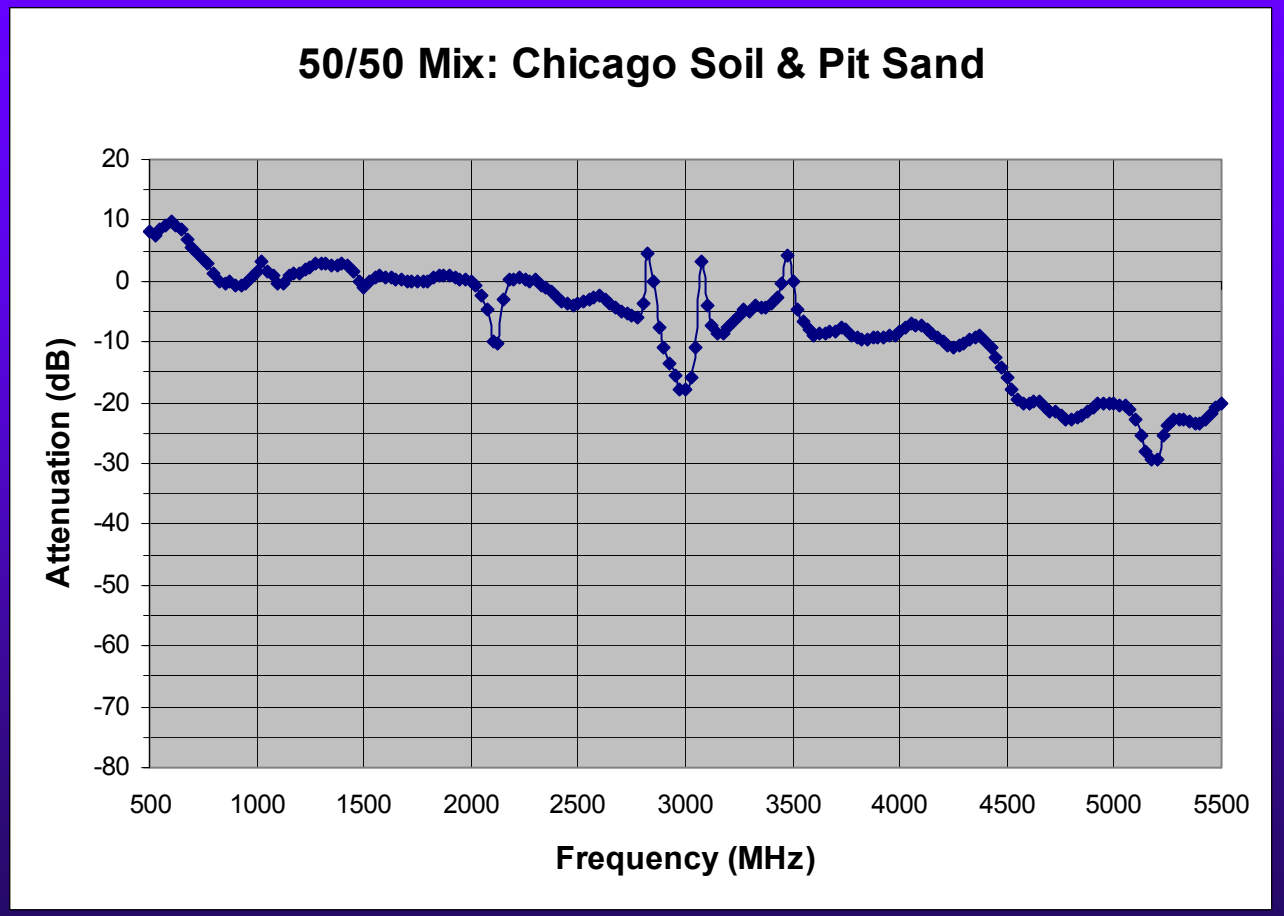
Returns from pipe are visible in raw data



Attenuation curves for Chicago soil



Attenuation curves for Chicago soil



Sample	Dielectric Constant	Loss/ft (dB)
Sand pit	3.2	2
Gravel pit	3.5	4
Soil pit	3.4	10
Top soil	4.6	16
Dry soil	4.8	14
Chicago	11.6	34
50/50 mix	4.4	9

Thank you!

Email: romero29@llnl.gov
Phone: (925)423-2830
Fax: (925)422-3358
URL: http://mir.llnl.gov