

Mn/DOT Ground Penetrating Radar: Applications in Pavements

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Mn/DOT

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Mn/DOT Equipment

- Air-coupled: 1.0 GHz and 2.0 GHz
 - ◆ GPR van can travel at highway speed.
 - ◆ Near surface applications: HMA thickness profile



Approximate penetration:

1 GHz: 3 ft

2 GHz: 2 ft



- **Ground-coupled: 1.5 GHz, 400 MHz and 100 MHz**

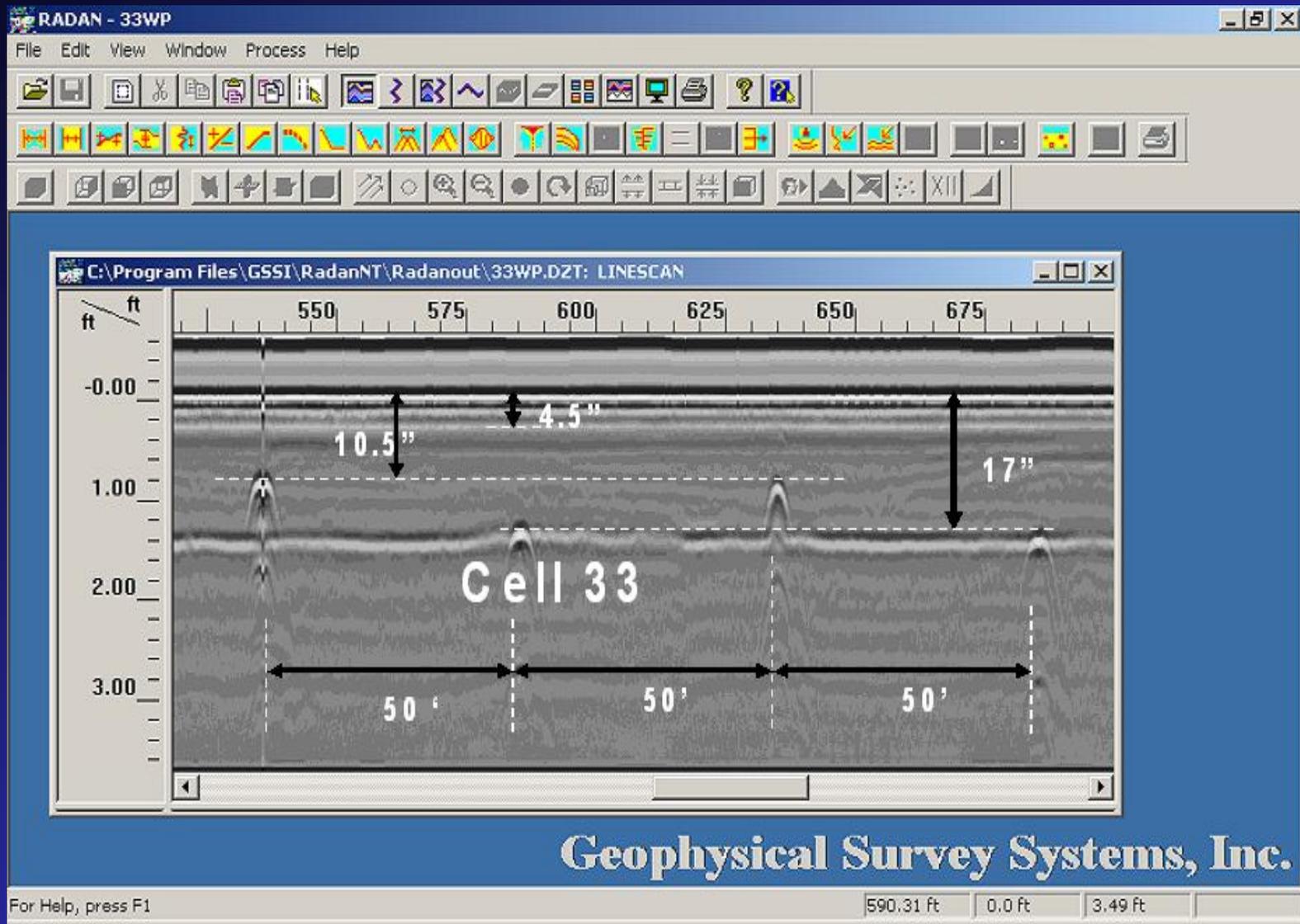
- ◆ **Walking speed**
- ◆ **Locate underground objects**
- ◆ **Approximate penetration depth:**
 - 1.5 GHz: 1.5 ft**
 - 400 MHz: 7 ft**
 - 100 MHz: 40 ft**



Field Calibration

- ◆ Field Calibration (Cell 33 @ MnROAD)
 - ☞ 2 Metal Plates @ 10" Depth @ 100' spacing
 - ☞ 2 Metal Plates @ 16" Depth @ 100' spacing
- ◆ Layer Thickness
 - ☞ Asphalt = 4"
 - ☞ Class 5 Base = 12"





Geophysical Survey Systems, Inc.

For Help, press F1

590.31 ft | 0.0 ft | 3.49 ft



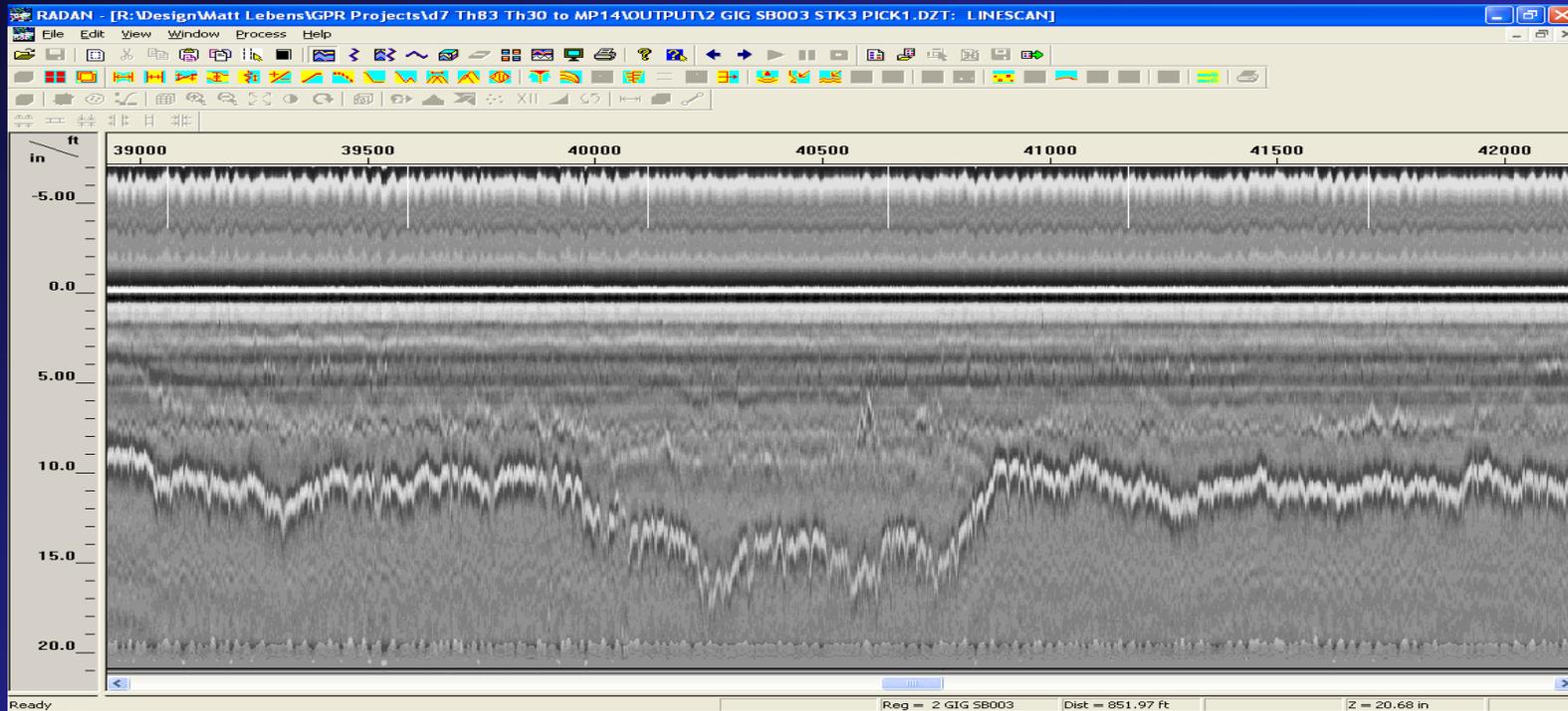
GPR Applications

- Pavement layer thickness profile
- Special Applications
 - ◆ Unmixed concrete
 - ◆ Missing tie bars



■ TH 83 (D7)

◆ Pavement thickness



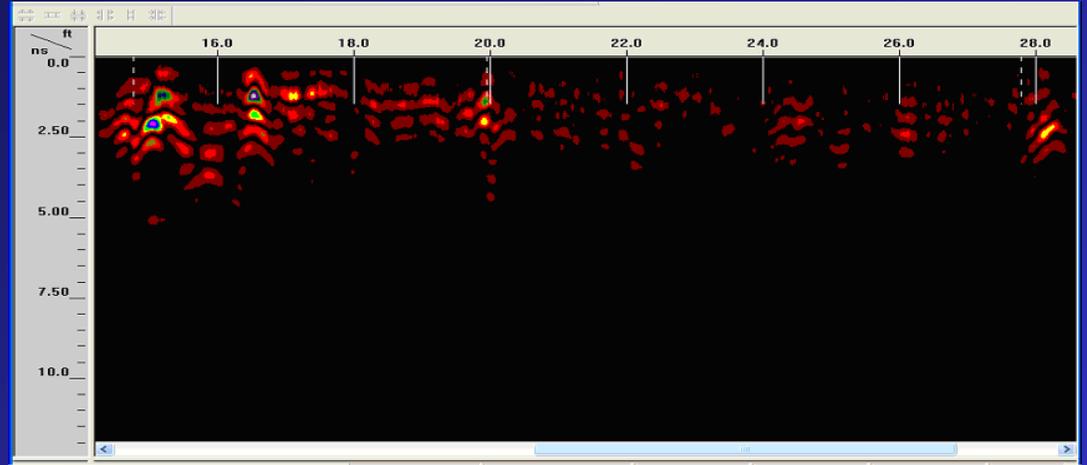
- **Good “screening” tool – give guidance on where to take cores**
 - ◆ Still need cores to verify / calibrate GPR
 - ◆ Minimize number of cores

- **Recommend GPR first for core locations**



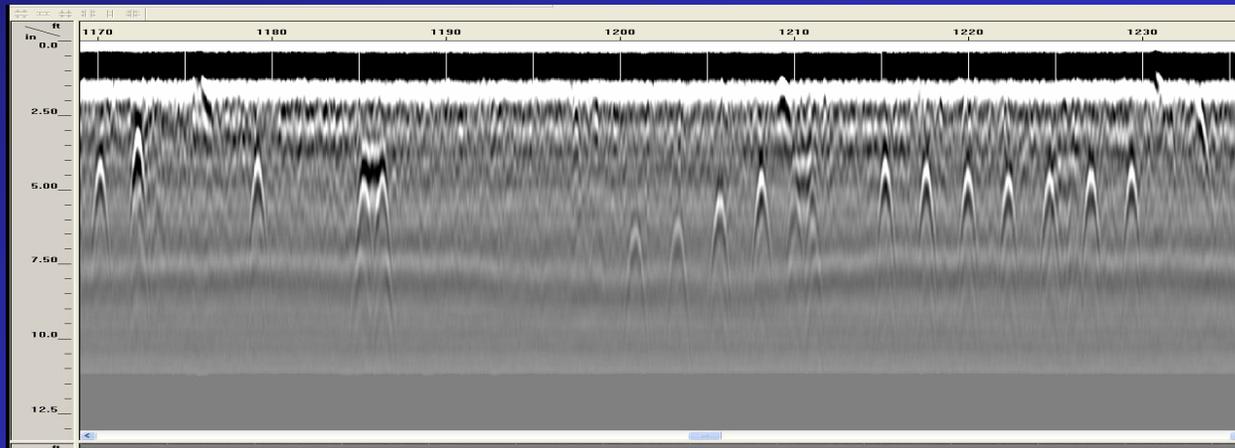
■ Special Applications

◆ Unmixed concrete on TH.7



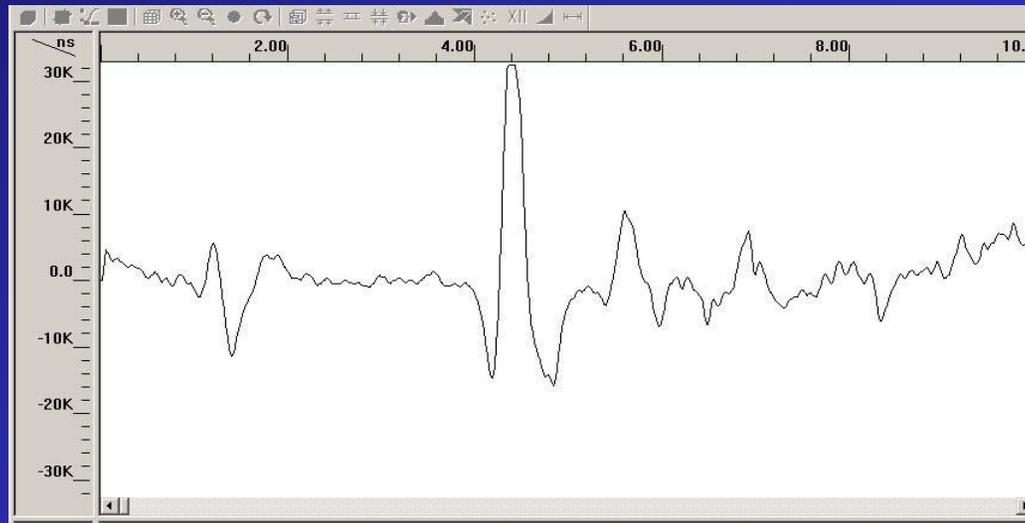
◆ Tie Bar Detection

☞ Missing tie bars and locations



Research Needs

- More accurately determine pavement layer thickness without lane closure
 - ◆ Limitation: must know dielectric or H.
 - ◆ Dielectric changes by location
 - ◆ Using time histories to determine both – University of Minnesota



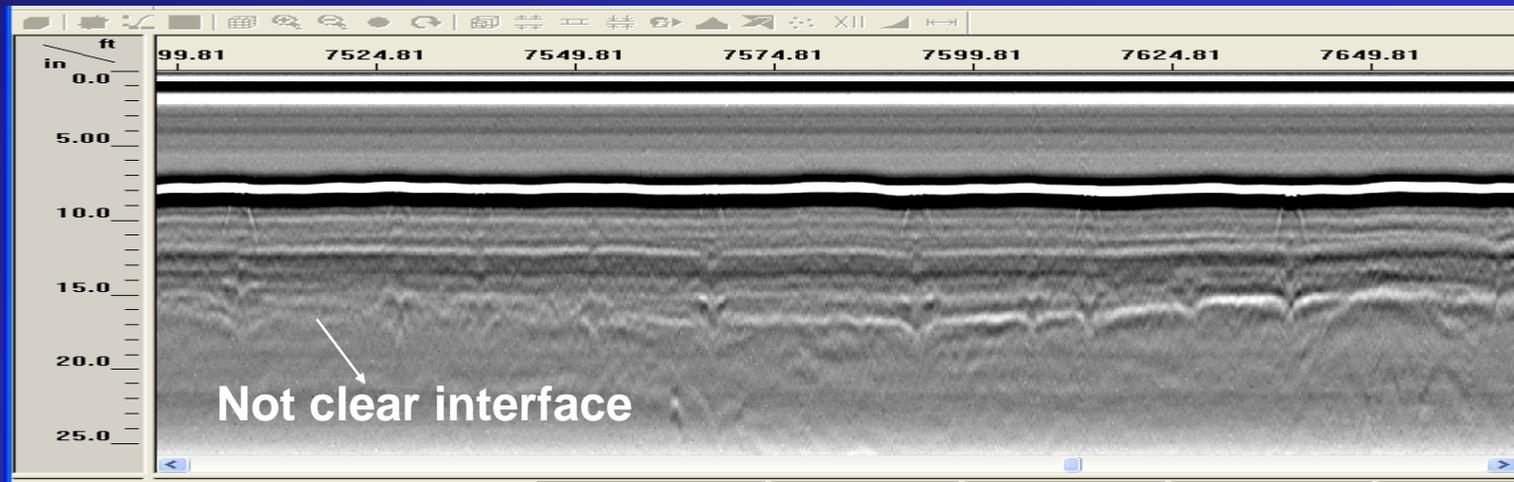
◆ 3D-GPR --- FHWA

☞ Multiple Antenna



■ Pavement Condition Determination

◆ Stripping Severity



■ HMA density

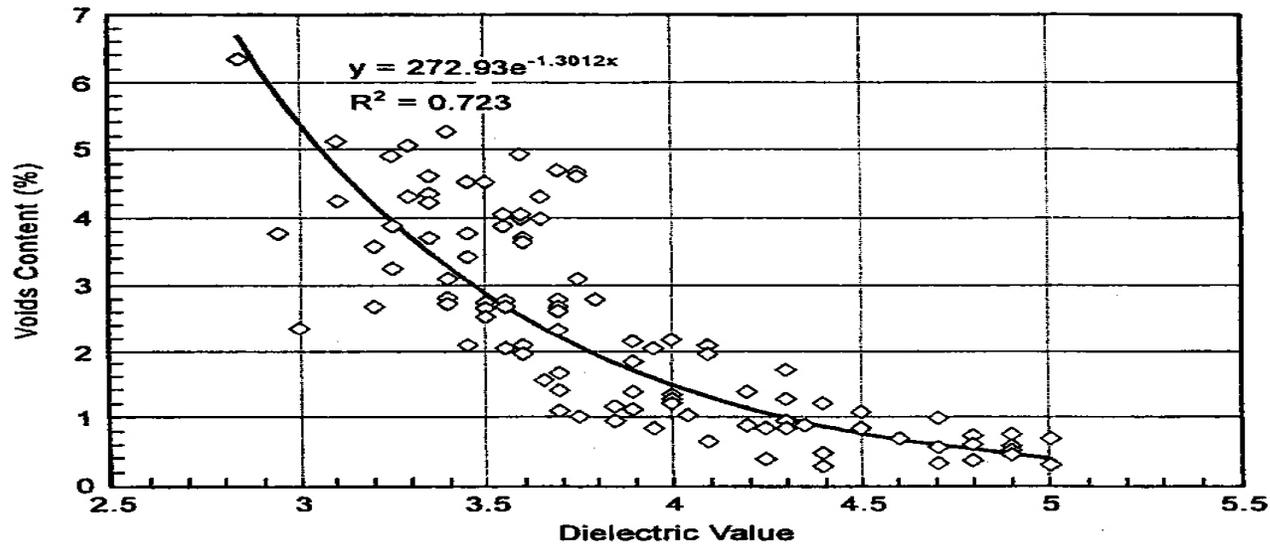


Figure 4. Laboratory Test Results Relating HMA Air Void Content to Measured Dielectric Values (Saarenketo, 1996).

