



TEXAS DEPARTMENT OF TRANSPORTATION

3D Technology for Pavement Preservation

Technical Discussion for WASHTO 2015

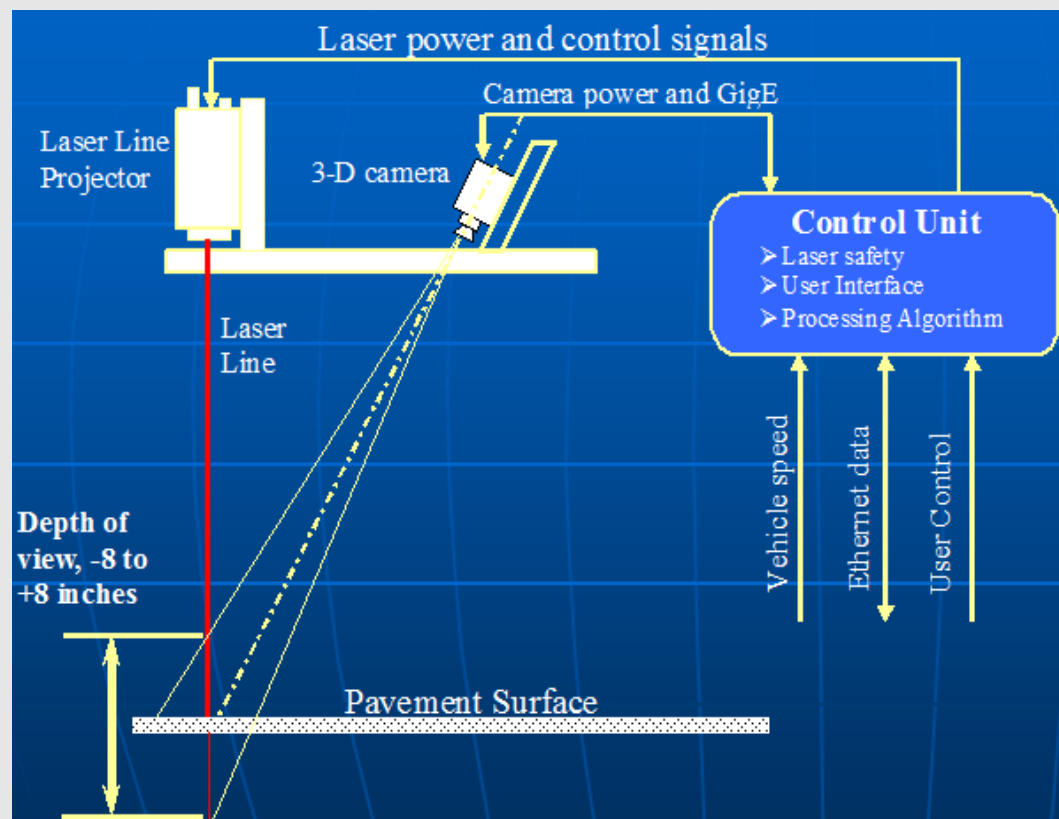
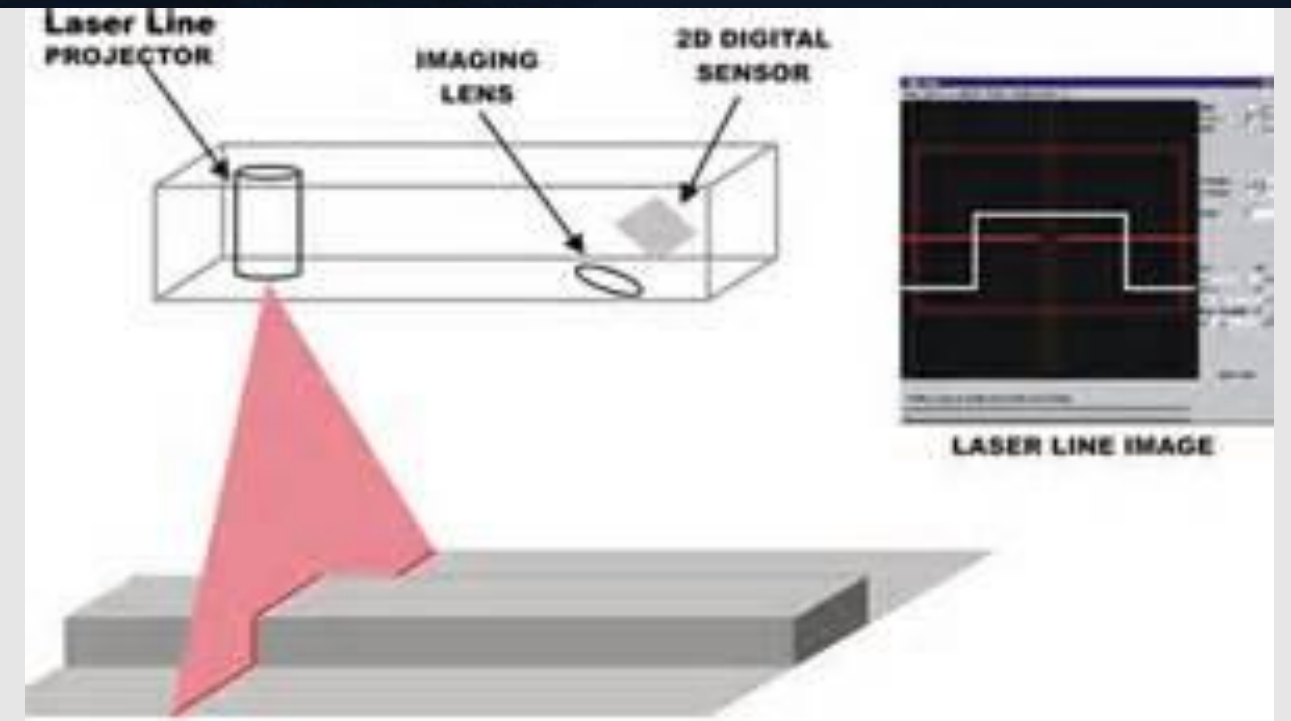
MNT, Pavements Preservation

Robin Huang; Magdy Mikhail; Todd Copenhaver

Capabilities of 3D Technology for Pavement Preservation

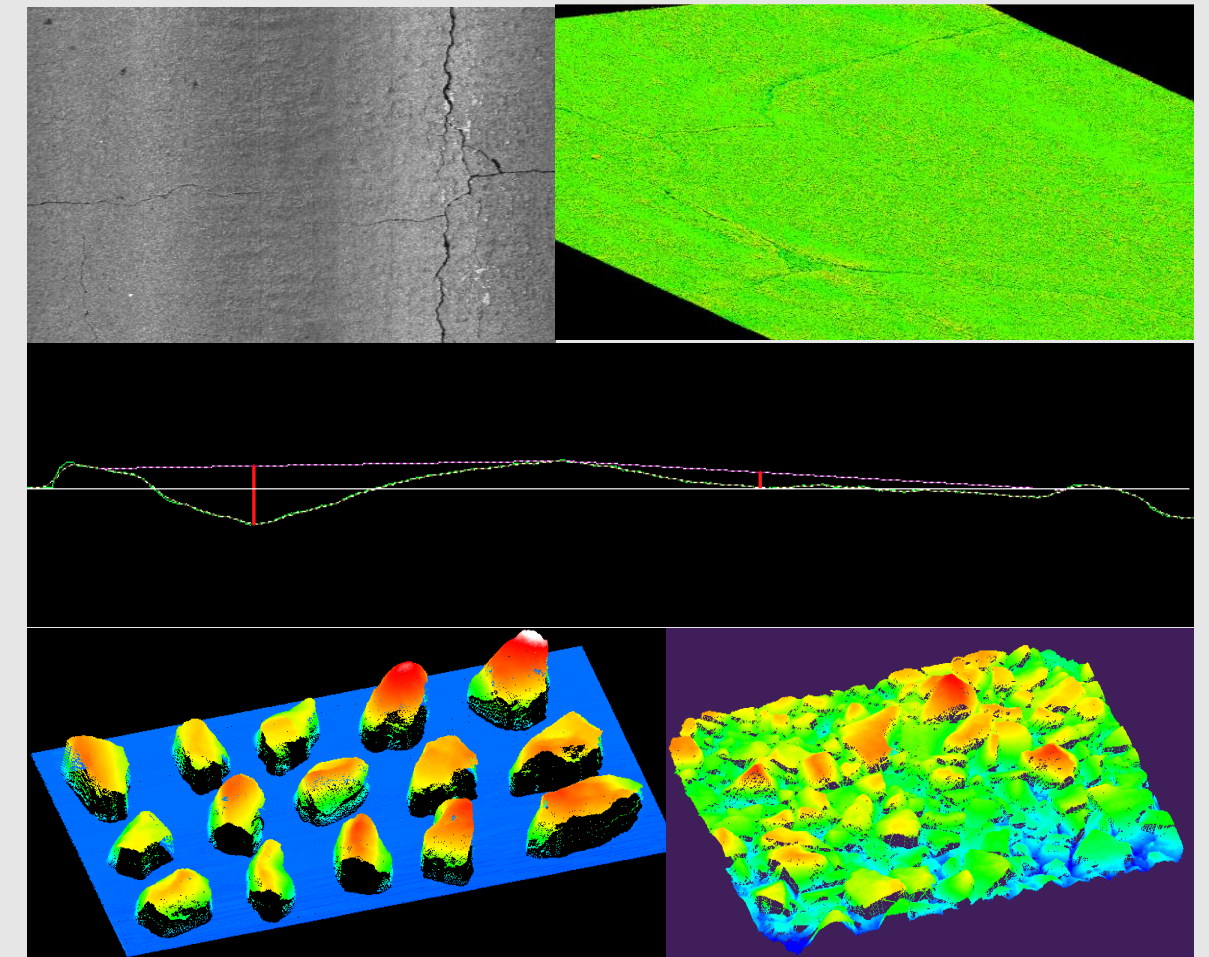
How a 3D scan works:

- Project a laser line on the surface
- A 2D digital camera looks the laser line from an angle
- Laser line will be distorted by the surface profile
- A special algorithm converts the distortion into height



Pavement Applications

- Surface Distress
- Rutting
- Texture
- Sealcoat Q&A



3D Tech Application: Seal Coat Operation Q&A

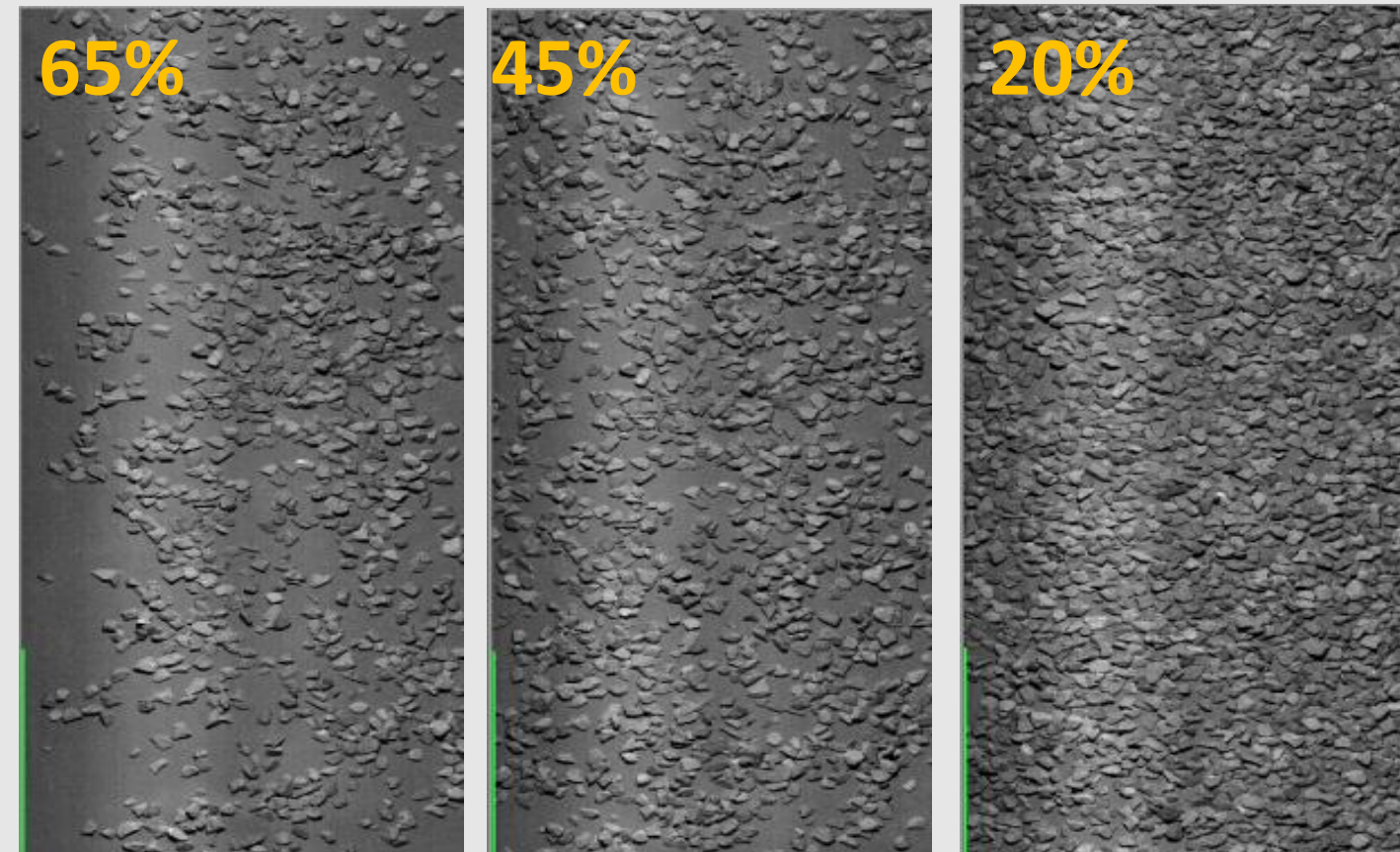
TxDOT SealCoat Tool

- Based on high resolution 3D technology
- Multi-function for sealcoat operation
- Aggregate property, digital board test
- Road Texture, embedment test



Digital Board Test

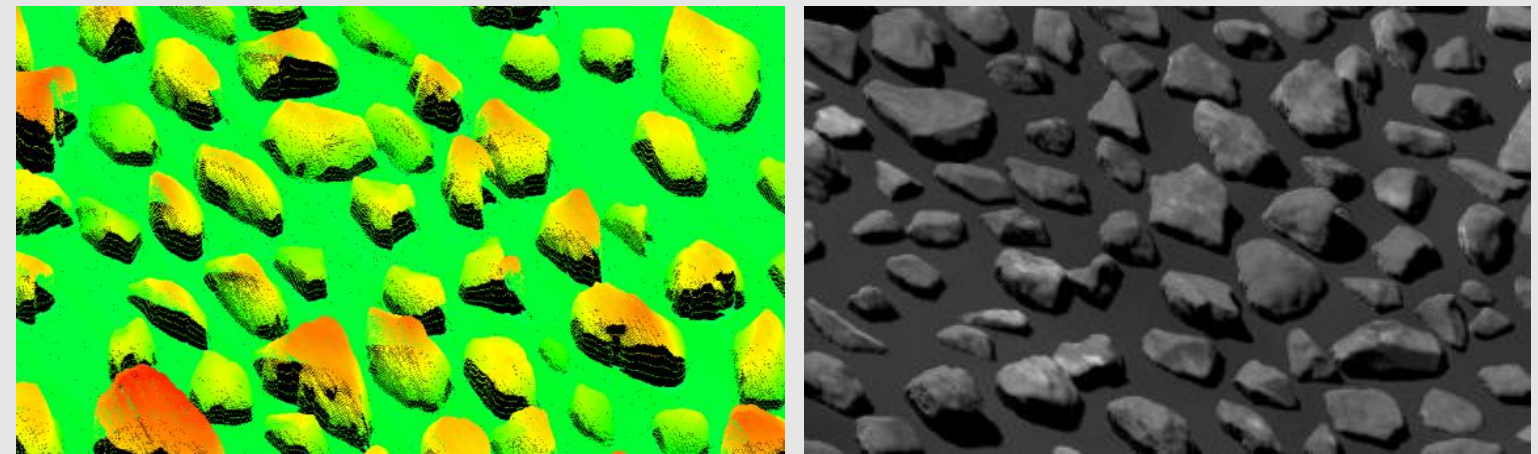
- Objective measure of board test
- True value of aggregate to void ration
- Reference to operator



3D Tech Application: Seal Coat Operation Q&A

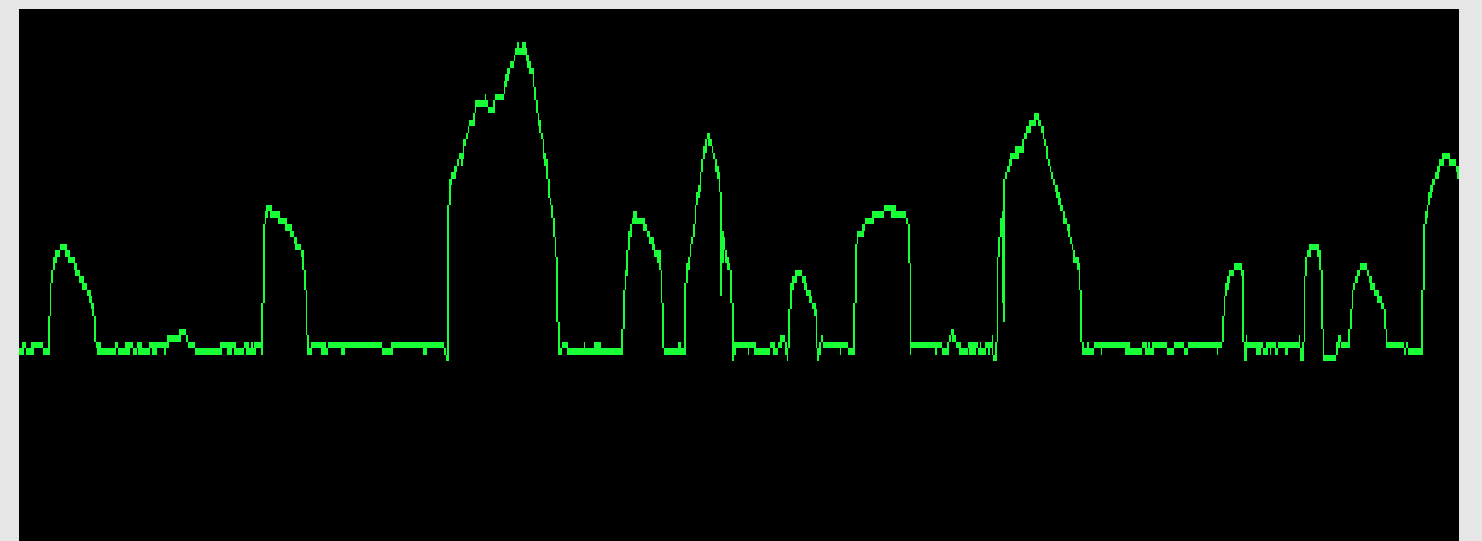
Aggregate Test

- Measure hundreds of stones in a scan
- True 3D aggregate modules
- Accurate measurement of aggregate
- Quick and simple operation



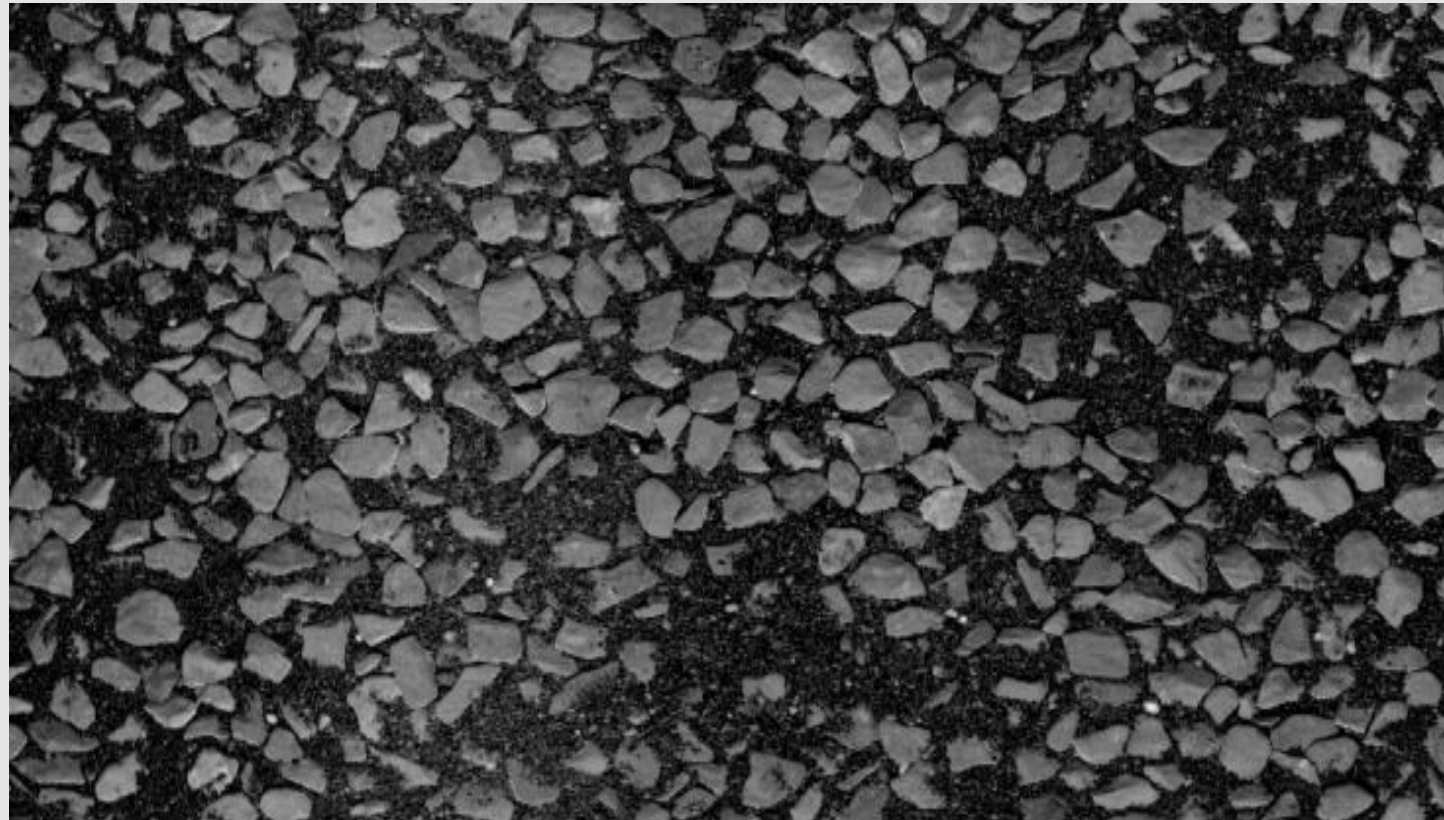
Embedment Depth Field Test

- Field test of embedment depth
- Base on true elevation measurement
- Continue operation for long coverage



Road Texture Measurement

- Pre-scan job site for macro texture
- Continue measure for the entire section



Field Application Ration

- Scan after the spreader
- Estimate application ratio
- Compare to the design requirement

3D Tech Application: Seal Coat Operation Q&A

TxDOT reference device specs

Profile point: 2048 data point
Range: 50.8 mm (2 inches, ± 1.0 inch)
Scan width: 254 mm (10 inches)
Scan speed: 2700 profile/second
Resolution: x: 0.125 mm (0.005 inch);
y: 0.075 mm (0.003 inch);
z: 0.01 mm (0.0016 inch)

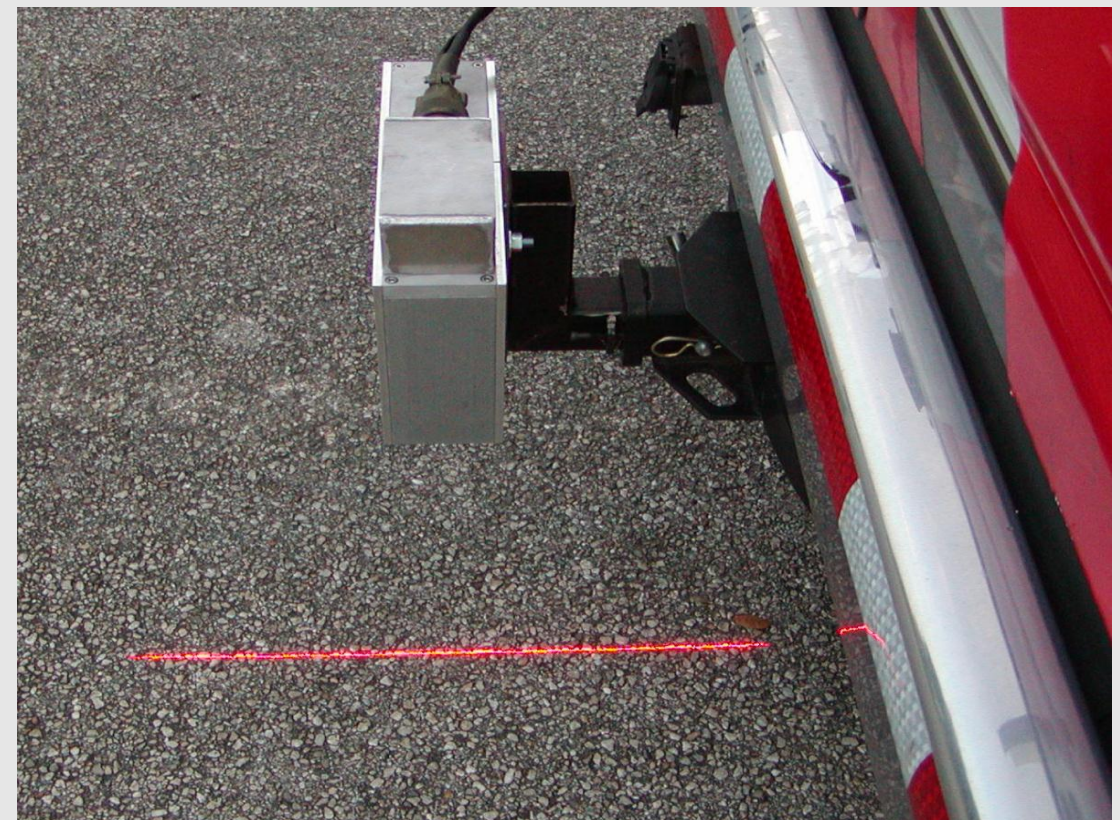
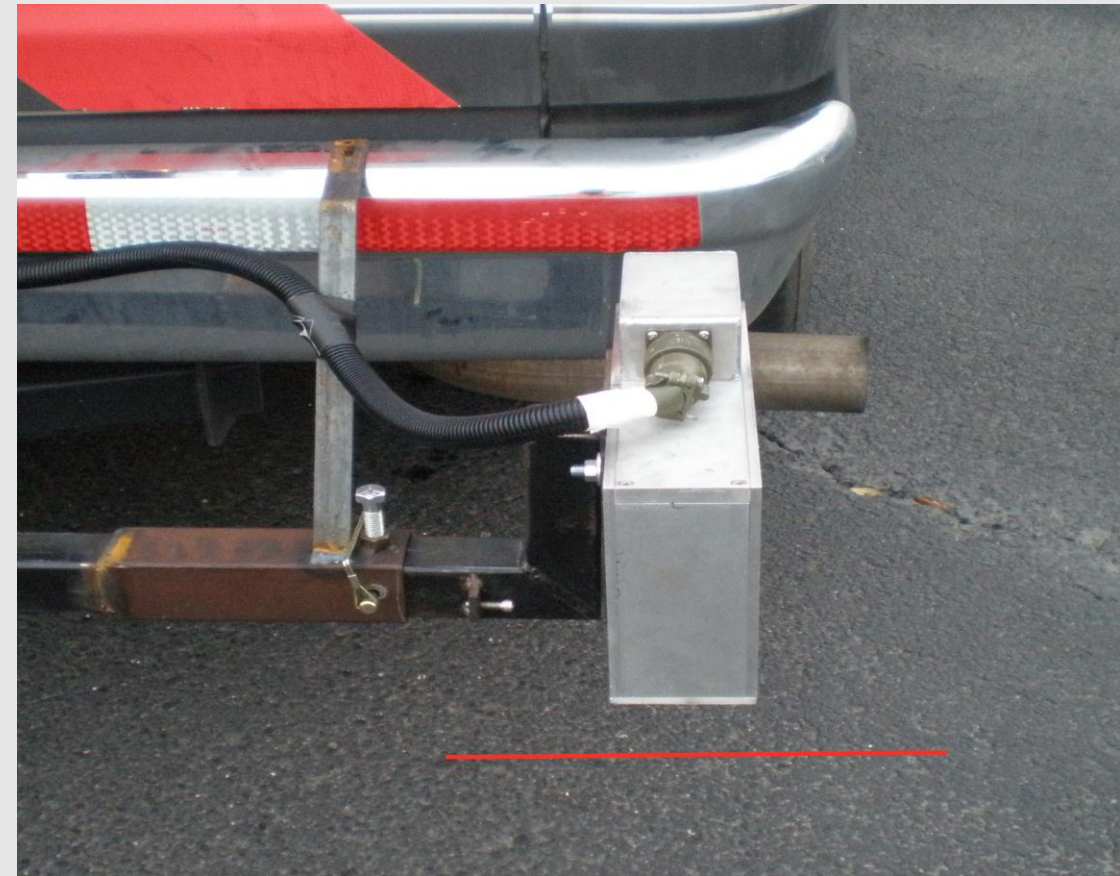
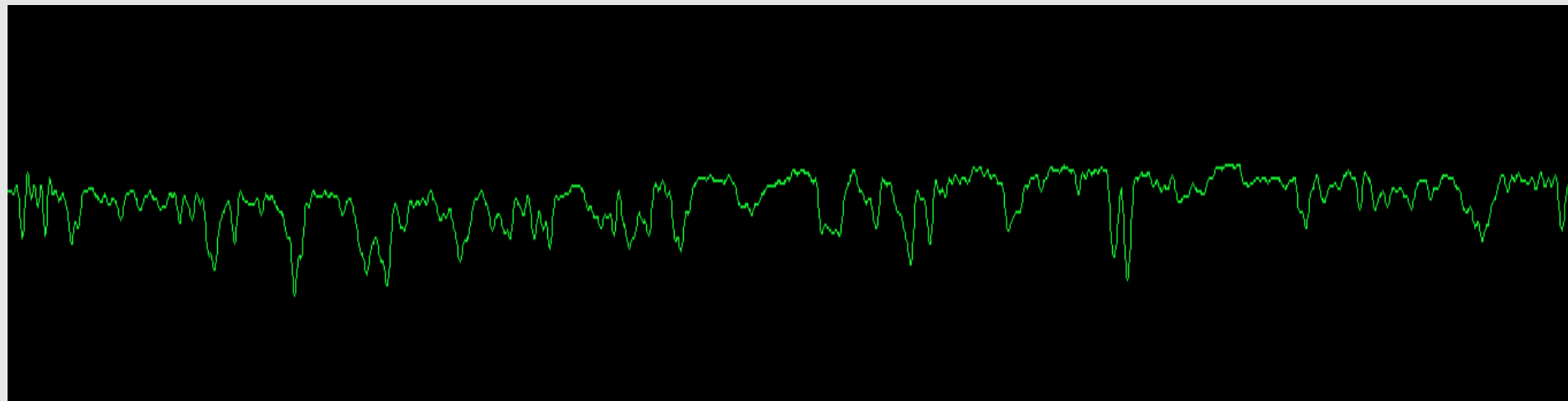
Battery operated, controlled by a laptop computer



3D Tech Application: High Speed Texture Measurement: VTexture

VTexture Capabilities

- Speed up to 75 mph
- True 3D profile covers 12" segment
- Better than 10 μm resolution
- Continues MPD at every 2" of travel
- Mount either longitudinal or transverse
- Speed independent, reliable result
- Works on both Asphalt and Concrete Surface

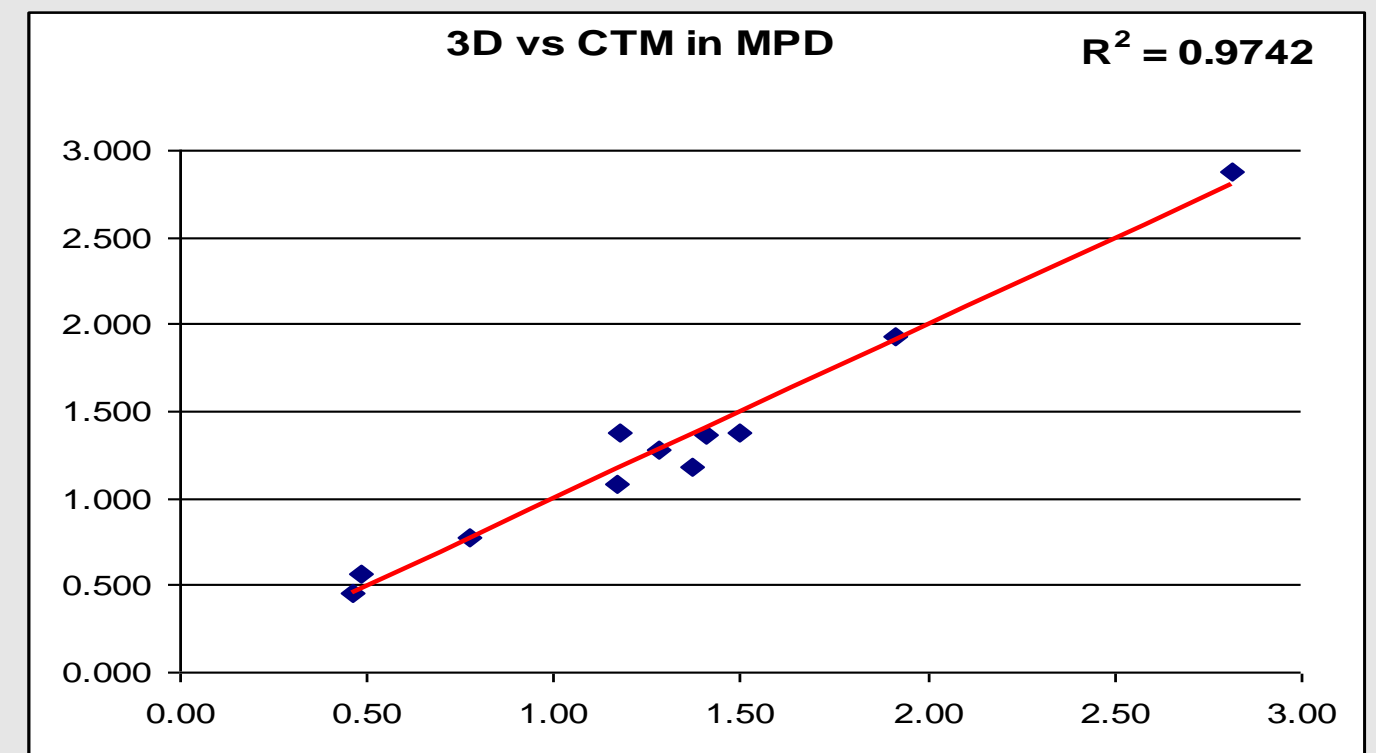
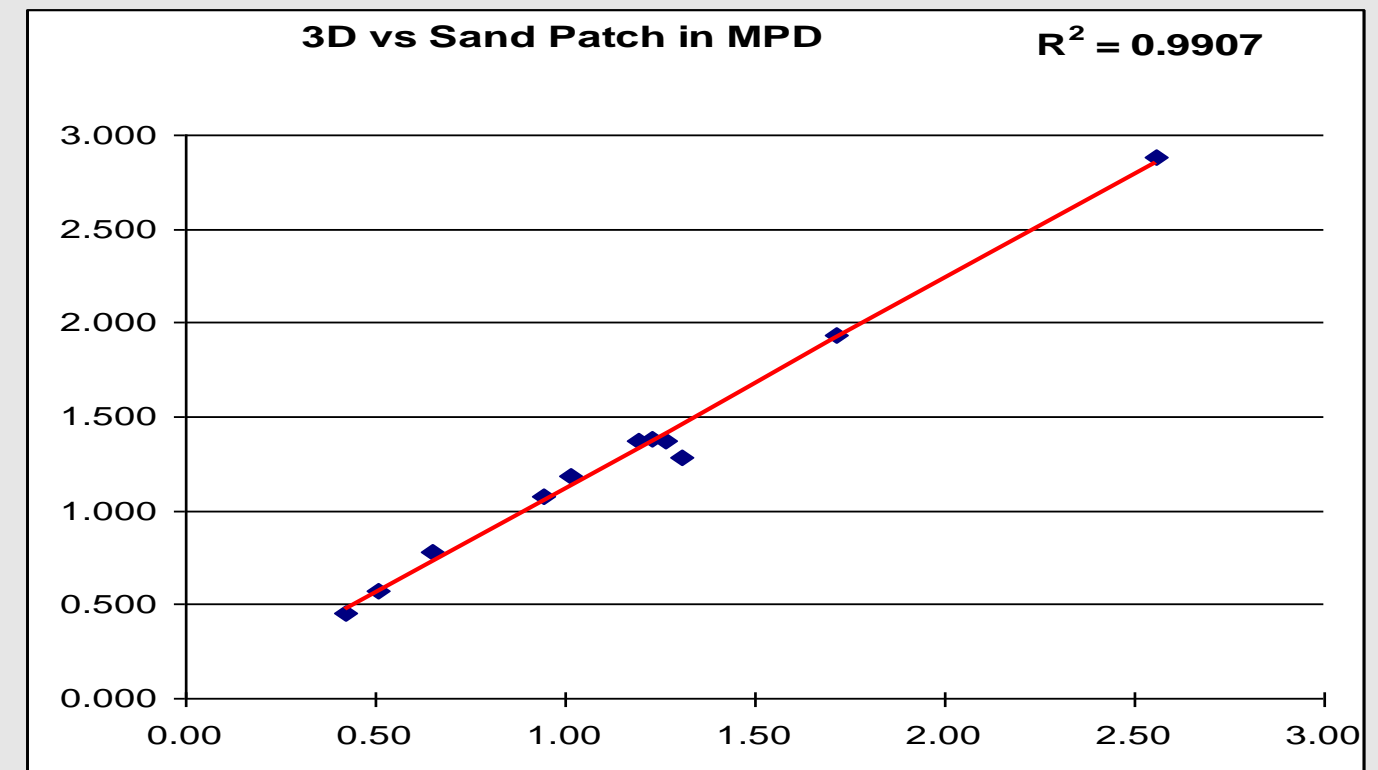


3D Tech Application: High Speed Texture Measurement: VTexture

Comparison to other Texture Methods

Section	Sand Patch	CTM	3D
A	1.31	1.28	1.284
B	1.26	1.40	1.367
C	1.71	1.91	1.936
D	1.23	1.18	1.380
E	0.51	0.48	0.570
F	0.65	0.77	0.779
G	2.56	2.81	2.883
H	0.42	0.46	0.455
I	0.94	1.17	1.078
J	1.19	1.50	1.371
K	1.02	1.37	1.181

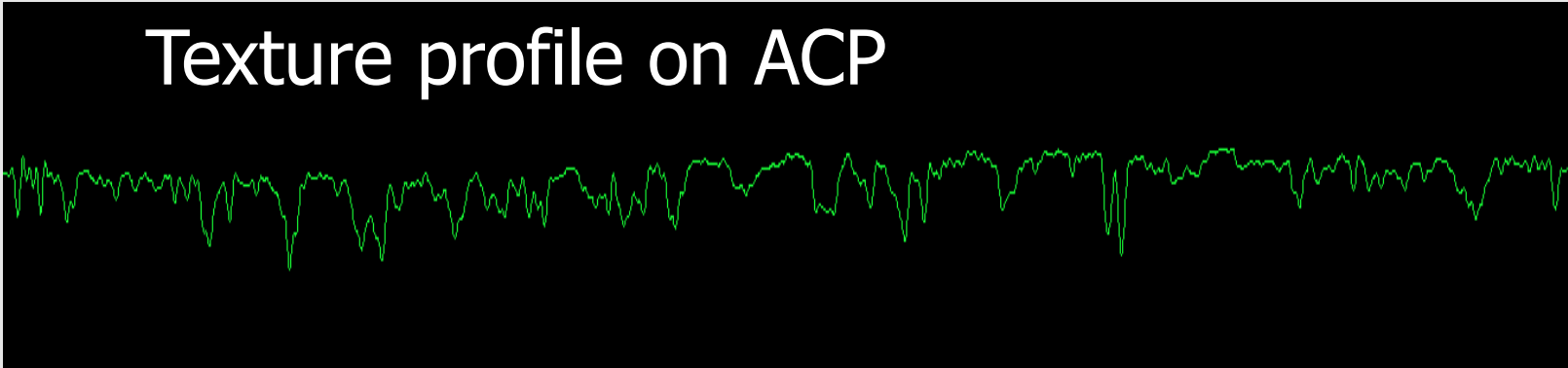
- Tested on 11 different pavement surface
- VTexture shows very high correlations to sand patch and CTM data
- VTexture works on concrete surface



3D Tech Application: High Speed Texture Measurement: VTexture

Continue MPD test on a project section

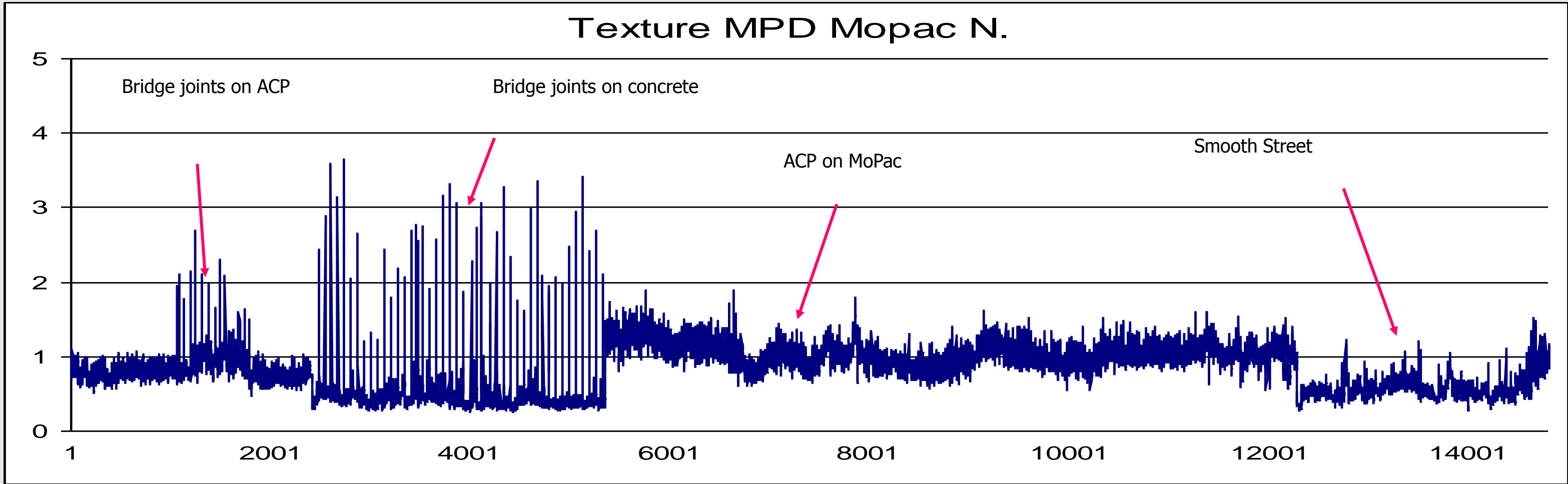
Texture profile on ACP



Texture Profile on tined con



Texture MPD Mopac N.



3D Tech Application: High Speed Rut Measurement: VRut



TxDOT 3D Rut Measurement System

- Highway speed up to 70 mph.
- Fully automated, with different rut algorithm
- Real time processing, no operator intervention

Profile point: 2048 data point

range: 12 inches, ± 6.0 inch

Scan width: 14 feet

Scan speed: 5000 profile/second

Resolution: x: 2.08 mm (0.08 inch)

y: 6.25 mm (0.246 inch)

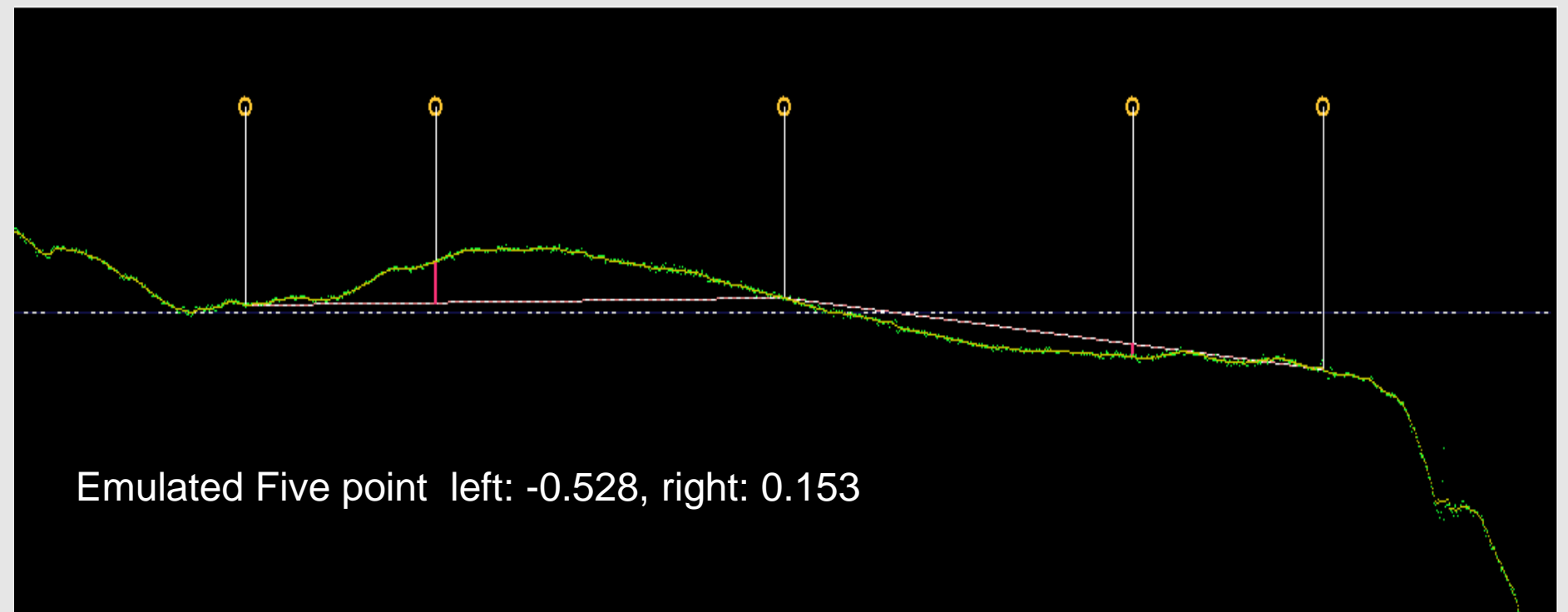
z: 0.65 mm (0.025 inch)

3D Tech Application: High Speed Rut Measurement: VRut

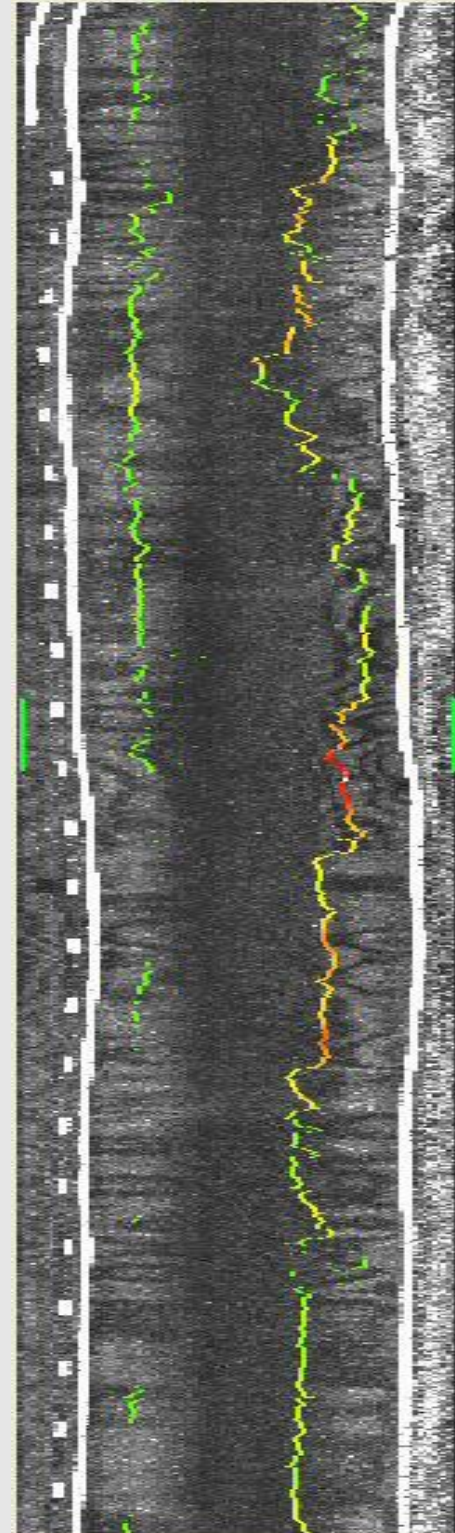
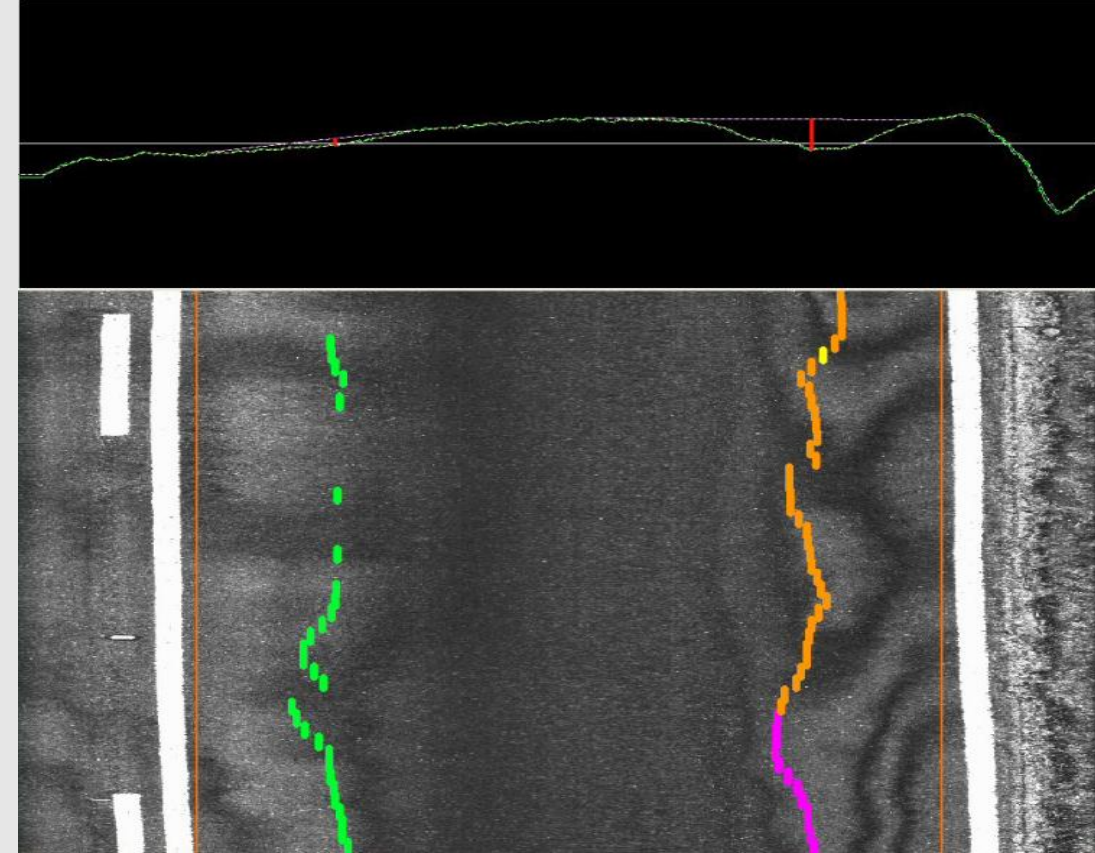
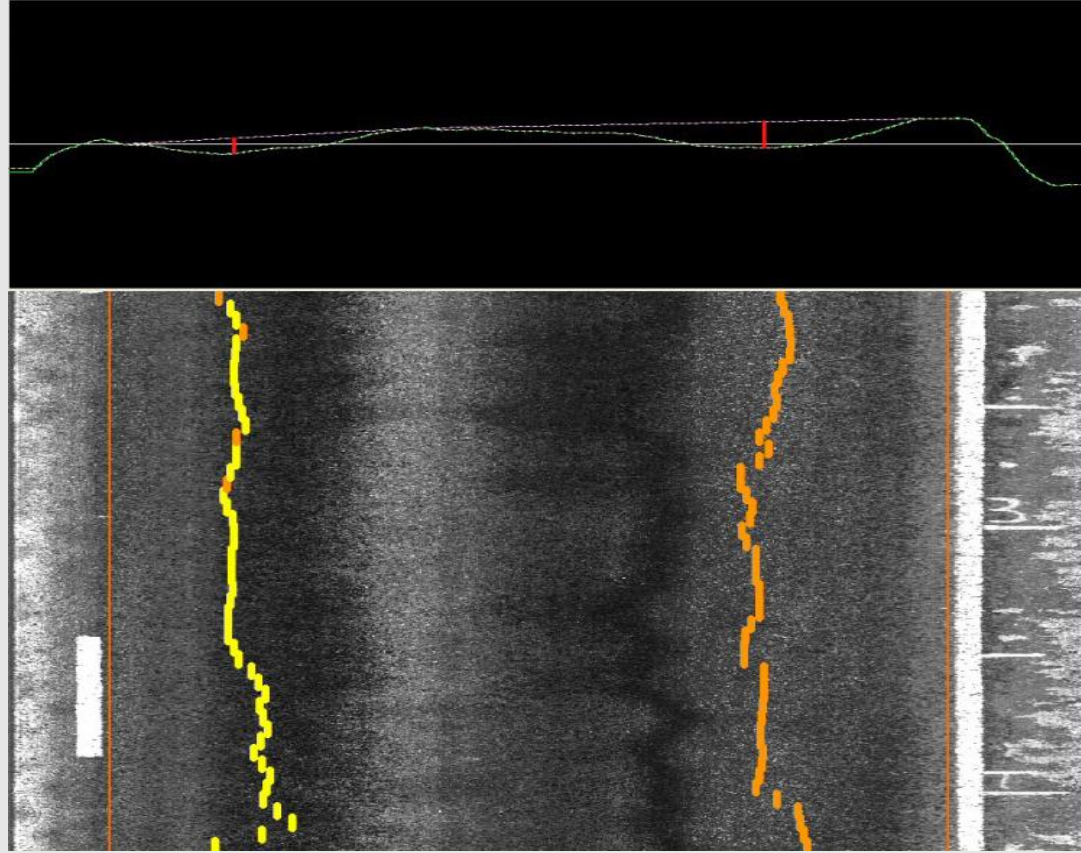
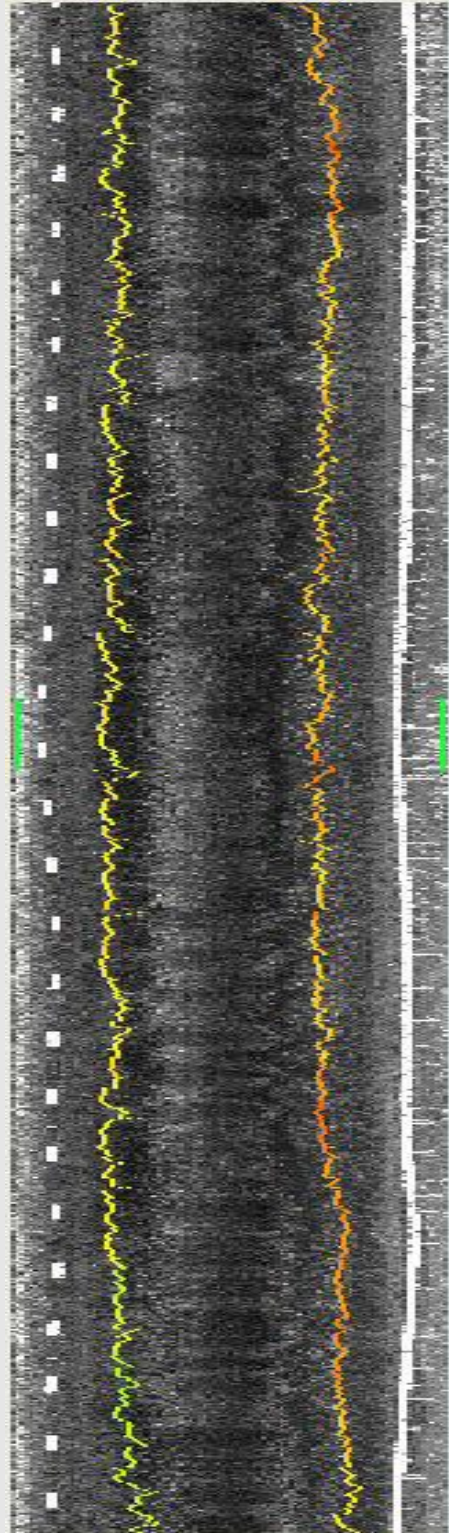
Rut Algorithm

- Digital Straight Edge
- Digital String Line
- Digital Five Point

Digital straight edge and digital string line give high accurate rut measurements over the traditional five or seven point method!



Rut Location and Spacing



US0183 major highway

FM2239 county road

- Only measured rut deeper than 1/8" are shown on maps
- Rut spacing is calculated only when left and right rut is measured
- Rut trace changes with distance
- Rut space changes with different traffic patterns



TEXAS DEPARTMENT OF TRANSPORTATION

Any Questions?

Thank You !

Maintenance Division, Pavement Preservation Branch

Robin Huang: robin.huang@txdot.gov, 512-832-7309

Magdy Mikhail: magdy.mikhail@txdot.gov, 512-832-7210

Todd Copenhaver: todd.copenhaver@txdot.gov, 512-832-7303