



U.S. Department of Transportation
Federal Highway Administration

MATC
MOBILE ASPHALT TECHNOLOGY CENTER

Dielectric Profiling Systems (DPS)

MATC Equipment Loan Program Update

DPS Virtual User Group Peer Exchange

November 9, 2021

Unless otherwise noted, FHWA is the source for all images in this presentation.



Disclaimer

- ▶ Except for any statutes or regulations cited, the contents of this presentation do not have the force and effect of law and are not meant to bind the public in any way. This presentation is intended only to provide information regarding existing requirements under the law or agency policies.

Acronyms

DOT: Department of Transportation

DPS: Dielectric Profiling System

FAQ: Frequently Asked Questions

FHWA: Federal Highway Administration

GPR: Ground Penetrating Radar

GPS: Global Positioning System

MATC: Mobile Asphalt Technology Center

Q&A: Questions and Answers

DPS Support Program through FHWA MATC

- ▶ Provide technical assistance, training sessions, and field demonstrations
- ▶ Develop briefing reports documenting the loan experience
- ▶ Develop DPS “Quick Guide” to accompany each equipment loan
- ▶ Provide support and outreach to asphalt pavement stakeholders



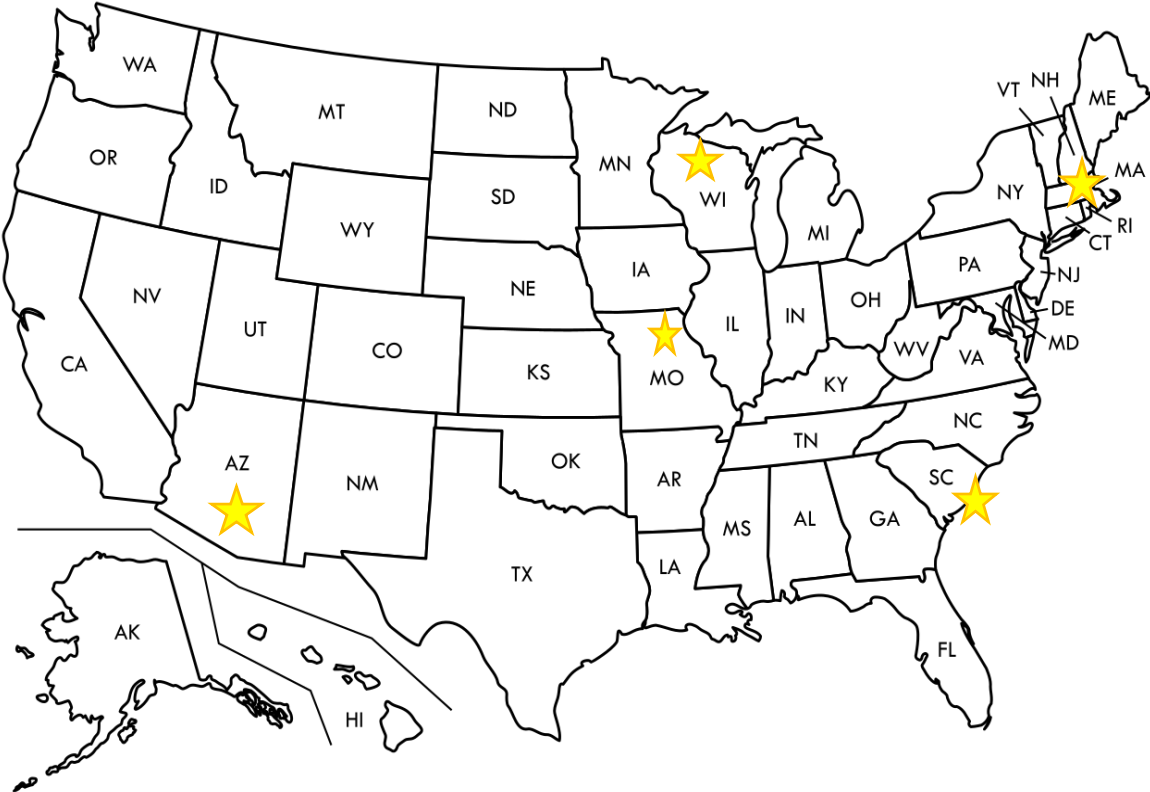
DPS Demonstration and Loan Support Team

▶ FHWA:

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DPS Demonstrations: Participating Agencies

- ▶ South Carolina DOT (virtual) – Feb 2021
- ▶ Missouri DOT (virtual) – Mar 2021
- ▶ Massachusetts DOT (in-person) – Jun 2021
- ▶ Wisconsin DOT (in-person) – July 2021
- ▶ Arizona DOT (in-person) – Sept 2021



In-person events included virtual access for remote participation

Pre-Training Check-in

- ▶ Equipment receipt & condition check
- ▶ Review basic assembly
- ▶ Confirm DPS functionality
- ▶ Review training agenda and special concerns/needs

DPS Pre-Training Guide

Components and Assembly
Before the training session, confirm that you have received all the components listed below and shown in Figures 1 and 2.

- Wheel cart base and handle
- Sensor cables; DMI cable; ToughPad connection cable
- Blue bag containing metal plate and HDPE block
- Velcro strips for cable management
- Puck Kit (Sensor stand, metal plate, HDPE puck, 2 Delrin blocks)

Assemble the DPS following the instructions in the Quick Guide
Once the DPS is assembled, insert two batteries into the slots on top of the concentrator box, close the lid, and press the button on the top of the concentrator box. A blue light will turn on. Next, turn on the ToughPad by holding power button until green light turns on. Once the OS loads, the PaveScan RDM 2.0 application should open automatically. If it does not, double click the PaveScan RDM 2.0 shortcut.




Figure 1. DPS cart with pelican case and blue storage bag

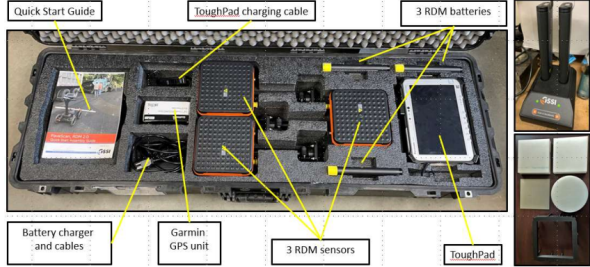


Figure 2. Components stored in pelican case; Batter charger (top right); Puck kit components (lower right)

Software and Firmware Versions
Confirm that the ToughPad has up-to-date software and firmware currently downloaded:

1. From the PaveScan Main Menu
2. Click "Version Info" on the user interface
3. Compare the listed version to the current version at <https://www.geophysical.com>
4. If needed, download the latest software and firmware

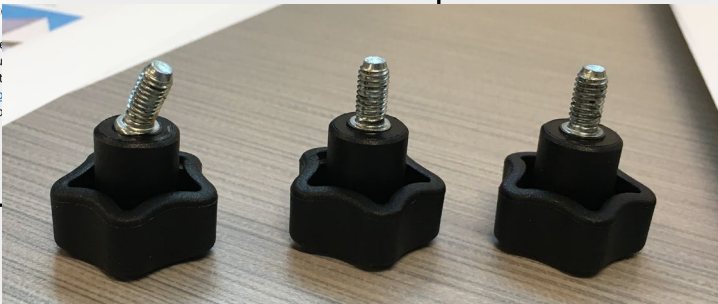


Image Credit: American Engineering Testing

DPS Training

- ▶ DPS Basics
- ▶ Equipment setup, calibration and validation
- ▶ Mix calibration
- ▶ Field data collection procedures
- ▶ On-site equipment operation
- ▶ Q&A Session



Image Credit: American Engineering Testing



Image Credit: Applied Pavement Technology

Field Demo – DPS in Action!



Image Credit: South Carolina DOT

South Carolina DOT



Image Credit: Applied Pavement Technology

Wisconsin DOT



Image Credit: Applied Pavement Technology

Massachusetts DOT



Image Credit: American Engineering Testing

Arizona DOT

Initial Lessons Learned from Demonstrations:

Equipment Operation and Field Testing Considerations

- ▶ Nighttime testing can be a challenge
- ▶ DPS Testing is initially a two-person operation
- ▶ Typically, quick learning curve for field testing
- ▶ Typically use DPS on low-traffic-volume project to become familiar with testing process before using it on larger, time-sensitive projects
- ▶ Plan testing details ahead of time based on work zone setup and time available on site (testing pattern, software setup)
- ▶ More training is needed to understand DPS software configurations
- ▶ More information needed on testing after rain events
- ▶ High accuracy GPS unit is a necessity for most agencies

Initial Lessons Learned from Demonstrations:

Mix Calibrations

- ▶ Puck calibration is in development, but some agencies will rely on field cores to assess dielectric-density relationship
- ▶ Robust modeling of density from dielectric uses dataset whose samples have a wide range of air void contents
- ▶ Fabricating gyratory pucks for asphalt rubber mixes with high air void content can be a challenge
- ▶ Uniqueness of the Stone Matrix Asphalt (SMA) mixture did not pose any issues associated with obtaining dielectric measurements

Initial Lessons Learned from Demonstrations:

Overall Agency Experience

- ▶ Overall comparative agreement between data from electrical gauge measurements and DPS (based on South Carolina DOT demo)
- ▶ Many State agencies interested in using DPS
 - Cost of device noted as a barrier
 - Vehicle mount for device would improve implementation chances

Would You Like to Borrow a DPS from FHWA?

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**SPREADING ASPHALT PAVEMENT
TECHNOLOGY INNOVATION**

<https://www.fhwa.dot.gov/pavement/asphalt/trailer/>

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