Lessons Learned from Florida's Profiler Certification Track

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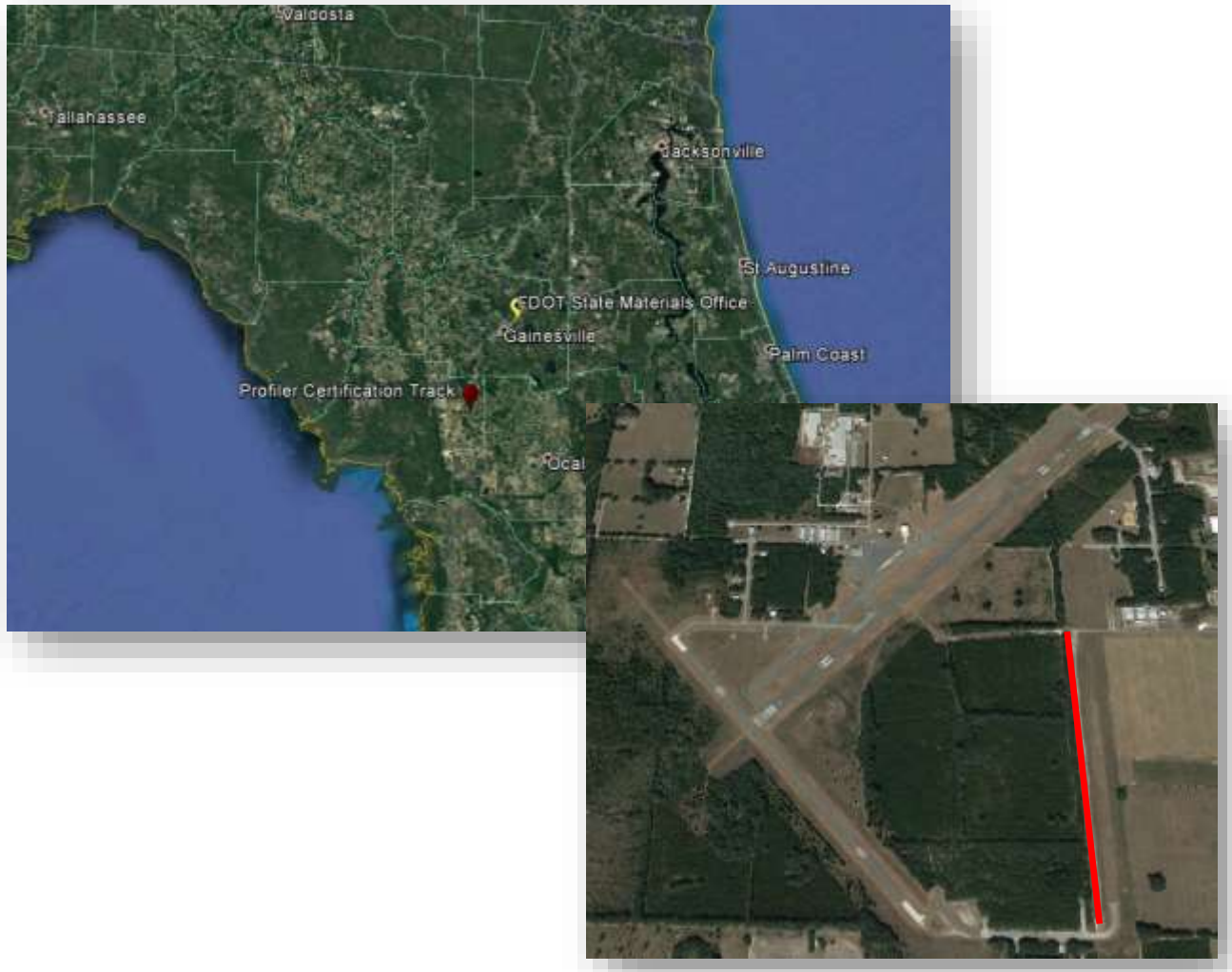
RPUG Road Profile Users' Group

Outline

- Background
- Construction
- 2018 Smoothness Rodeo
- Accuracy/repeatability requirements
- Testing requirements
- Summary

FDOT Profiler Certification Track

- Establish a standardized process to verify profilers are reliable and accurate
- Williston Municipal Airport, Levy County



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FDOT Profiler Certification Track

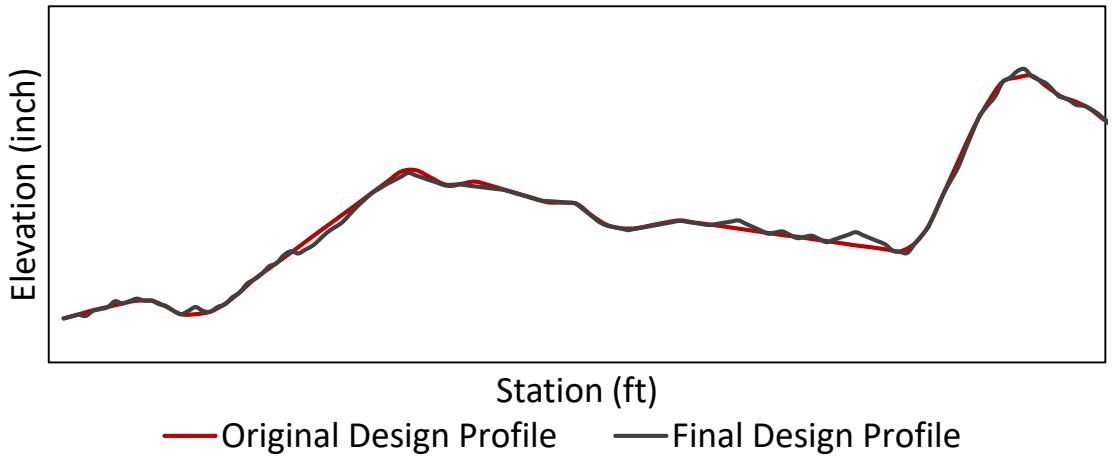
- 3700 ft. long x 14 ft. wide
- Open & dense-graded surfaces
- IRI ranges from 34 in/mile to 105 in/mile

FDOT Profiler Certification Track

- All FDOT profilers certified prior to start of annual network survey
- New profilers must pass certification
- Troubleshooting & research

Controlling Roughness in Paving

1. Altered base elevation based on profile simulation.
2. Adjusted paver tow arm based on profile simulation.
3. Measured smoothness.
4. Repeat 2 & 3 for each AC lift.



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Stabilized Subgrade

Base & 1st Asphalt Lift

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2nd Asphalt Lift & Friction Course

Construction Issues

- Cold joint in open-graded friction course due to contractor running out of material.
- FC-5 & FC-12.5 smooth sections were both rougher than desired.
- Decision made to mill & resurface both smooth sections.

Construction Lessons Learned

- There are many ways to target roughness
- Treat as a research project
- Coordination is critical

2018 Smoothness Rodeo

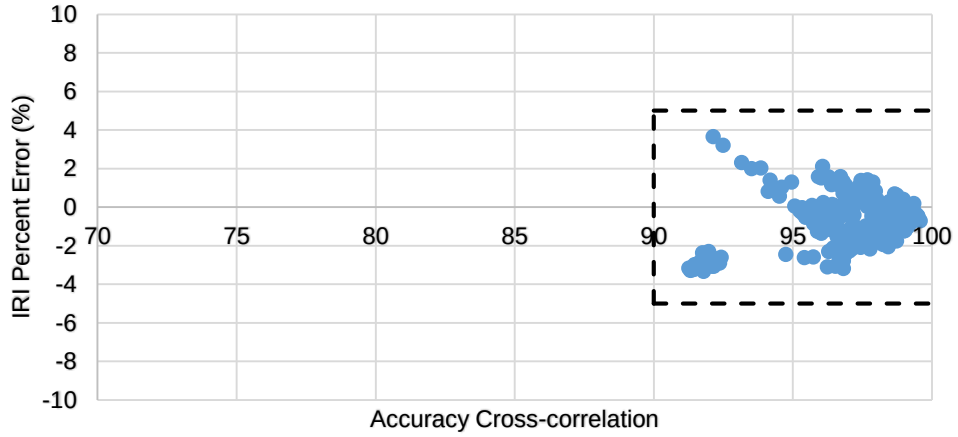
- 13 profilers from four manufactures representing eight organizations participated
- Testing done on four 0.1 mile sections:
  - Dense Smooth (IRI=39 in/mile)
  - Dense Medium-Smooth (IRI=83 in/mile)
  - Open Smooth (IRI=41 in/mile)
  - Open Medium-Smooth (IRI=96 in/mile)
- Test speeds of 30 & 45 mph

AASHTO R-56 Performance

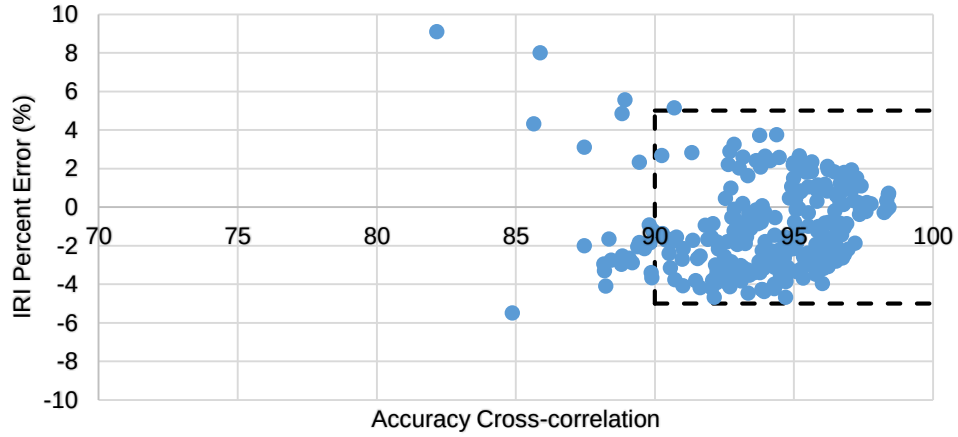
Test Section	Fraction of Tested Profilers Meeting AASHTO R 56 Criteria		
	Repeatability	Accuracy	Both
Dense smooth	12 / 13	12 / 13	11 / 13
Dense medium-smooth	13 / 13	13 / 13	13 / 13
Open smooth	8 /13	0 / 13	0 / 13
Open medium-smooth	13 / 13	12 / 13	12 /13

Accuracy cross-correlation conducted using ProVAL with SurPRO as reference device

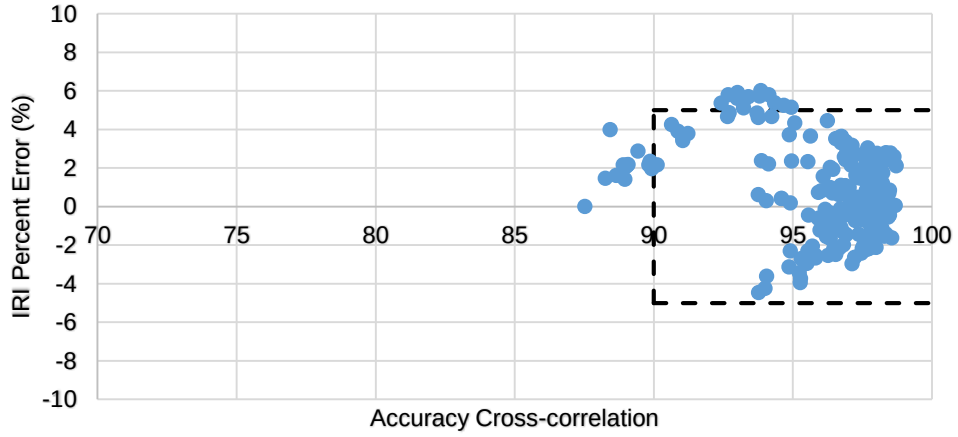
Accuracy Cross-Correlation vs. IRI %Error



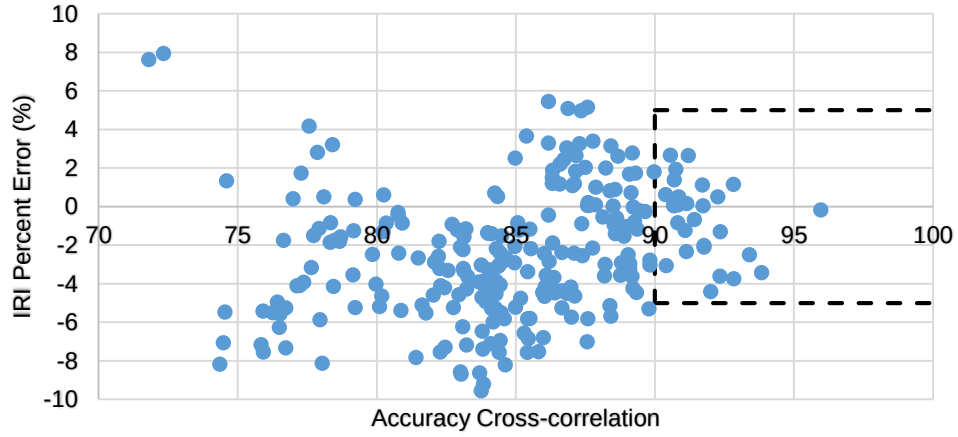
Dense-grade Medium-smooth



Dense-grade Smooth



Open-grade Medium-smooth



Open-grade Smooth

IRI Statistic Based Criteria

Test Section	Fraction of Tested Profilers Meeting AASHTO R 56 Criteria		
	Repeatability	Accuracy	Both
Dense smooth	12 / 13	12 / 13	11 / 13
Dense medium-smooth	13 / 13	13 / 13	13 / 13
Open smooth	13 /13	9 / 13	9 / 13
Open medium-smooth	13 / 13	13 / 13	13 /13

Nine of thirteen tested profilers would pass certification under the proposed criteria

Choosing Certification Criteria

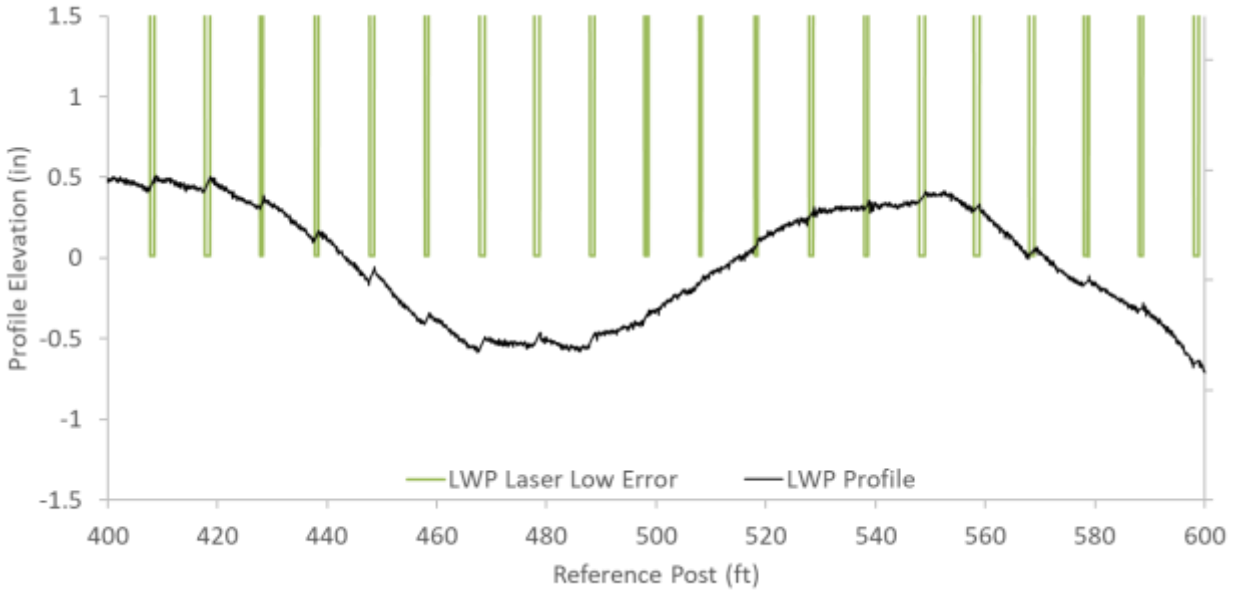
- Accuracy cross-correlation struggles on smooth open-grade surfaces
- Proposed criteria for smooth open-grade accuracy requirement

  The candidate profiler must produce ten-run average profiler IRI within 5 percent of the SurPRO for each wheel path
- Proposed criteria for smooth open-grade repeatability requirement

  The candidate profiler must have a ten-run coefficient of variation less than 5 percent for each wheel path

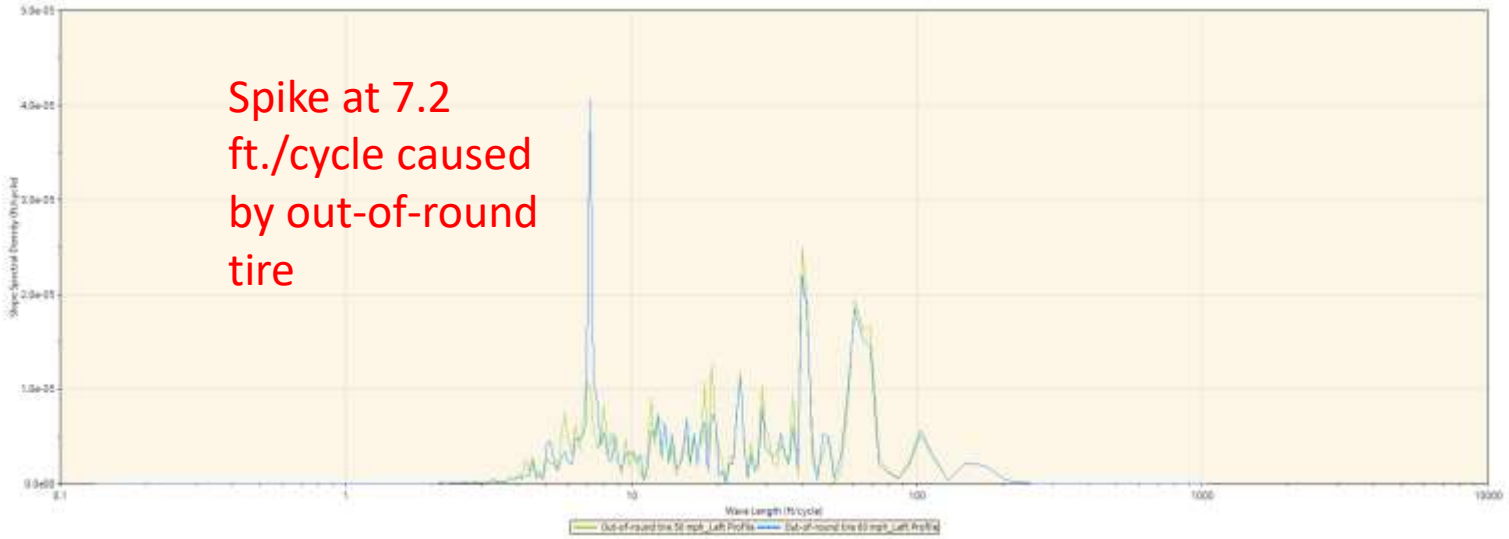
Surface Type Example

- Gocator line laser on the open-graded surface showed several low errors.
- These errors were not evident on the dense-graded surface.
- Upgraded laser firmware eliminated low errors on the open-graded surface.



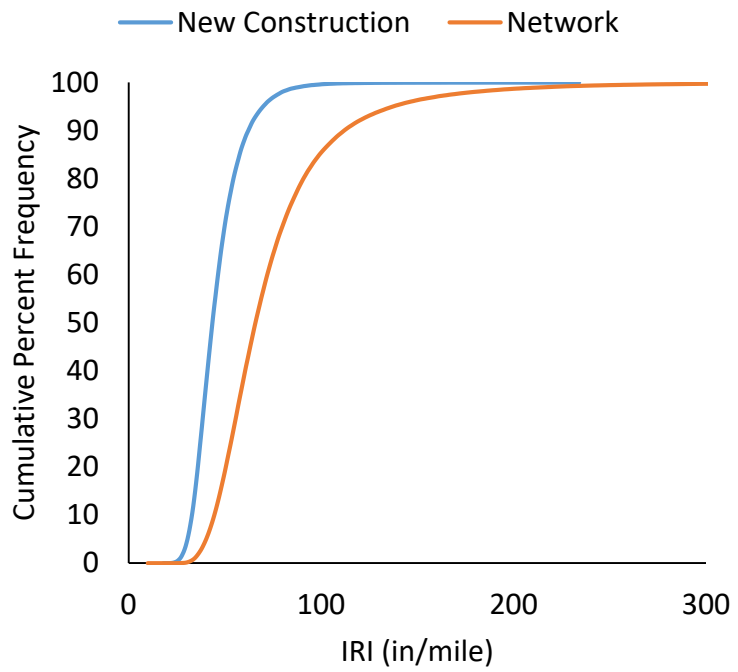
Test Speed Example

- Profiler with slightly out-of-round tire was shown to increase IRI by 7%. This was only apparent when the vehicle was tested at higher speeds (55 to 60 mph).
- Diagnosed using ProVAL spectral density.



Florida Smoothness Stats

- New Construction Avg. IRI = 44 in/mile
- Network Avg. IRI = 66 in/mile
- Approximately 70% of miles tested at 50 mph or greater



Percentile	New Construction IRI	Network IRI
25%	38	54
50%	44	66
75%	52	85

Summary of Lessons Learned

- Construction
  - Targeted pavement roughness can be achieved by adjusting paver toe arm & measuring profile between lifts.
  - Good communication with paving contractor is critical. Treat track as a research project.
- Test surfaces & speed should reflect actual conditions. Make sure test track is long enough to test at highest speeds.
- Accuracy cross-correlation is difficult for smooth open-graded surfaces.
- Test track is a valuable part of the overall data quality management, profiler diagnostic tool, and research.