

The Auto Rod and Level as a Reference Profiler

Mike Freeman
Michael Gerardi
APR Consultants, Inc.



What is the Auto Rod and Level (AR&L)?

- Rotating Construction Lasers
- Trimble Laser Receiving Mast
- Optical Distance Encoder
- Data Acquisition Box
- Laptop Computer



The Prototype AR&L



Modern AR&L Before Modifications



The Requirements

- Tire Footprint
- 2.5 inch Increments
- Very High Correlation Requirements

“Critical Profiler
Accuracy
Requirements”

Original AR&L Limitations

- Mast mounted on Cart - elevation is average height of cart.
- Occasional switch failures
- External laser accuracy (repeatability)



Proposed Solutions

- Tire Footprint - Mount the mast on its own wheel; use an actual tire as a bridging filter!
- Collection Frequency - use an optical distance encoder.
- Correlation - test laser configurations, limit cart dynamics.

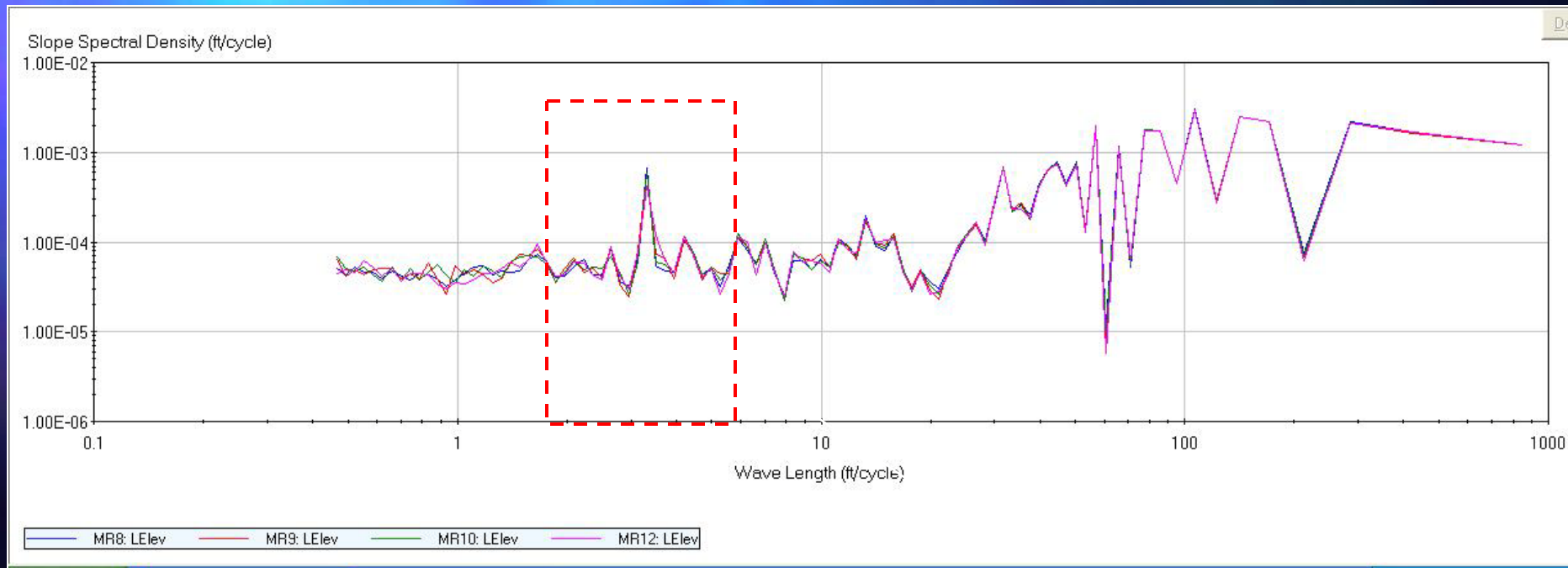
Single Point of Contact



Early Issues

- Mast support wheel not perfectly round: PSD problems
- Laser Set-ups: poor correlation between runs.

Early PSD Results



Tire Truing



Laser Setups

- Lasers have error built in to the "auto-level."
- Each time a new laser is used, the plane is slightly different.
- The same laser(s) must not be re-leveled during repeat runs.
- Limit distances to 100 feet from laser



Making a Reference Profile

- Calibrate distance using the built in feature of the software.
- Set up lasers at 100, 300, and 500 feet, level, and turn on. Cover two lasers.
- Start measurement on a chalk line, change lasers using the built-in set up feature.
- Save file at the end, repeat.

October Experiment

- Approximately 20 minutes per run.
- Three lasers on most test sections.
- Smoother, flatter sections were more difficult.
- Chip Seal, open graded, longitudinal tinning were not as much of a factor.



Investment

- Cart (Mast, data acquisition box, encoder)
- Tripod with Laser (2 each)
- Laptop Computer with preloaded measurement software
- User's Guide
- Technical Support
- \$41,000

The Auto Rod and Level

