

# Multi-Layer Paint Coating Thickness Measurement on Metallic Substrates

## Terahertz Technology for Primer, Base Coat, Clear Coat or Top Coat DFT Measurements

Car paint shops handle high production volumes, multiple paint colors, large metallic body panels and a mix of automated and manual coating operations. TeraNIM-Auto helps measure multi-layer paint coating thickness non-destructively, enabling production teams to reduce destructive cross-section checks and build a digital DFT control workflow for metallic parts such as **doors, fenders, bonnets, roofs, hoods, pillars and body panels**.



# Why Paint Coatings Need Non-Contact Thickness Measurement?

- Multi-layer coating systems with primer, base coat and clear coat interfaces
- Coating thickness variation across complex, curved and contoured plastic parts
- Thin or uneven paint layers affecting appearance, adhesion and performance
- Non-uniform coating caused by spray application, part geometry and process variation
- Non-contact measurement required for finished plastic components without surface damage

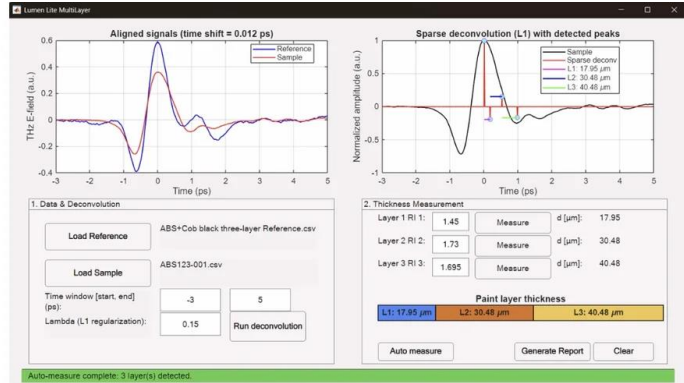
## Conventional Automotive Paint Thickness Measurement Challenges

- **Steel body panels: Magnetic Induction**
- **Aluminium body panels : Eddy Current**
- **Plastic / Composite parts : Ultrasonic Testing**
- **Manual**  
**Contact-based**
- **Substrate-specific**
- **Limited to total coating thickness**
- **Individual-layer measurements require scratching and maskin**

## How Terahertz Technology work for Paint Coating Assessment

TeraLumen's patented Terahertz Technology System generated THz waves from 0.1 to 5THz bandwidth. The THz waves refract and reflect at every coating layer interface. When sufficient dielectric contrast is >10% between coating layers. The time separation between interface reflections contains information about the optical thickness of each coating layer.

**Air → Clearcoat → Basecoat → Primer → Substrate**



## TeraNIM Automotive Inspection Workflow

### STEP 1 — Define the Inspection Requirement

The coating inspection requirement is defined based on:

- Component substrate - Metallic, plastic or composite substrate
- Coating Stack – Primer, Base Coat and Top Coat
- Reference measurement method

### STEP 2 — THz Measurement Setup

The coating stack is evaluated with following information:

- THz Calibration setup
- Define Locations
- Set Tolerance Limits and alarms

The measurement setup is then optimized for the specific automotive part.

### STEP 3 — Measure & Report

At each defined measurement location, THz sensor placed perpendicular to measuring area and analyses the coating layers. The THz system measures and records:

- Measurement Location
- THz Waveform
- Individual Layer Thickness
- Total Thickness
- Pass / Fail Result
- Operator Remarks

Results can be stored digitally for comparison, reporting and paint-process analysis.

## Key Advantages to Automotive OEM's

- **Scrap Reduction** – Not damaging the surface to do the inspection.
- **Real-time Inspection** – Enables to inspect every component.
- **Reduce Rejections/Rework** – Insights on coating deviations.
- **Industry 4.0** – Reduction in human errors, digital transformation of manufacturing and industrial processes.

## Automotive Paint Quality Control with TeraNIM™

TeraNIM™ provides a non-contact approach for evaluating individual layers within validated automotive paint systems. By combining THz reflection measurement, coating-specific calibration and digital analysis, the system can support automotive paint quality control, coating-process development, OEM specification verification and automated production inspection.