

Pharmaceutical Tablet Quality Inspection

Terahertz Technology for Non-Contact Tablet Coating Thickness, Porosity and Internal Structure Analysis

Pharmaceutical tablet quality depends on critical physical attributes such as **film-coating thickness, coating uniformity, tablet thickness, porosity and internal density**. Variations in these properties can influence tablet mechanical behaviour, disintegration, dissolution and the performance of functional or controlled-release coatings.

TeraXplor™ uses Terahertz Time-Domain Spectroscopy (THz-TDS) for non-contact and non-destructive tablet analysis, enabling pharmaceutical manufacturers and research teams to evaluate **coating thickness, coating uniformity, tablet porosity, internal density and layer-specific structure** without cutting or physically sectioning the tablet.



Why Pharmaceutical Tablets Need Non-Contact Quality Inspection?

- Coating thickness can vary across individual tablets and between tablets in the same batch
- Coating uniformity can influence functional coating and drug-release performance
- Tablet porosity and internal density can vary with compression and formulation conditions
- Conventional laboratory tests often provide delayed or sample-based feedback
- Non-contact measurement supports faster at-line and automated pharmaceutical quality control

Conventional Pharmaceutical Tablet Quality Challenges

- **Cross-Section Microscopy: Destructive Inspection**
- **Offline / Batch Quality Testing: Sample-Based Inspection**
- **Pharmaceutical Tablet: Quality Inspection Challenge**

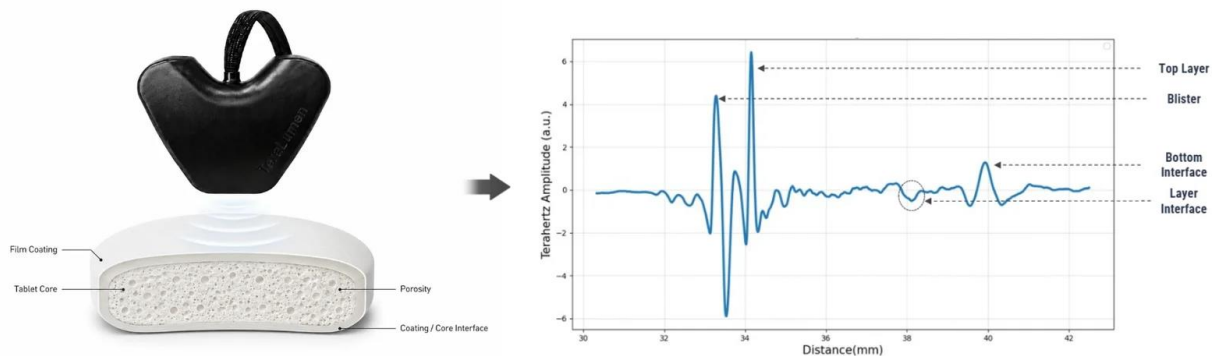
⚠ Coating-thickness variation

⚠ Porosity / density variation

⚠ Multilayer tablet structures

⚠ Curved tablet geometry

⚠ Need for rapid non-contact inspection



How Terahertz Technology Works for Tablet Quality Inspection

TeraXplor™ directs a THz pulse toward or through the tablet and analyses the interaction of the THz signal with the coating and tablet core.

For a coated tablet:

Air → Film Coating → Tablet Core

TeraXplor Pharmaceutical Tablet Inspection Workflow

SCAN

Direct a THz pulse onto or through the pharmaceutical tablet and acquire the THz signal using the configured reflection or transmission measurement mode.

DETECT

Analyse the THz response from the tablet coating, core and internal interfaces to evaluate coating thickness, tablet thickness, porosity and internal density.

ANALYSE & REPORT

- Calculate coating thickness, coating uniformity, tablet thickness, porosity and internal density, then generate the measurement result and digital QC record.

Key Advantages for Pharmaceutical Manufacturers & Research Organisations

- **Non-Contact Inspection:** Tablet quality attributes can be evaluated without physical probe contact.
- **Non-Destructive Measurement:** The tablet remains intact and can be retained for further testing where required.
- **Direct Coating Thickness Measurement:** THz reflections can provide direct information about film-coating thickness on suitable coated tablets.
- **Porosity & Internal Density Analysis:** THz propagation through the tablet provides information related to effective refractive index, which can be used for quantitative porosity analysis.
- **Coating Uniformity Mapping:** Multiple measurement locations can show spatial coating-thickness variation across the tablet surface.
- **Automation Ready:** THz measurement can be integrated with automated tablet handling and Process Analytical Technology workflows for faster manufacturing feedback. Research groups have demonstrated production-scale in-line coating measurements and automated pharmaceutical THz sensing.

Pharmaceutical Tablet Quality Control with TeraXplor™

TeraXplor™ provides a non-contact and non-destructive approach for evaluating critical physical attributes of pharmaceutical tablets.

By combining **THz reflection/transmission measurement, signal processing and digital analysis**, the system can support **tablet thickness measurement, film-coating thickness and uniformity analysis, porosity assessment, internal-density evaluation and multilayer tablet characterization**.