

GFRP Composite Inspection

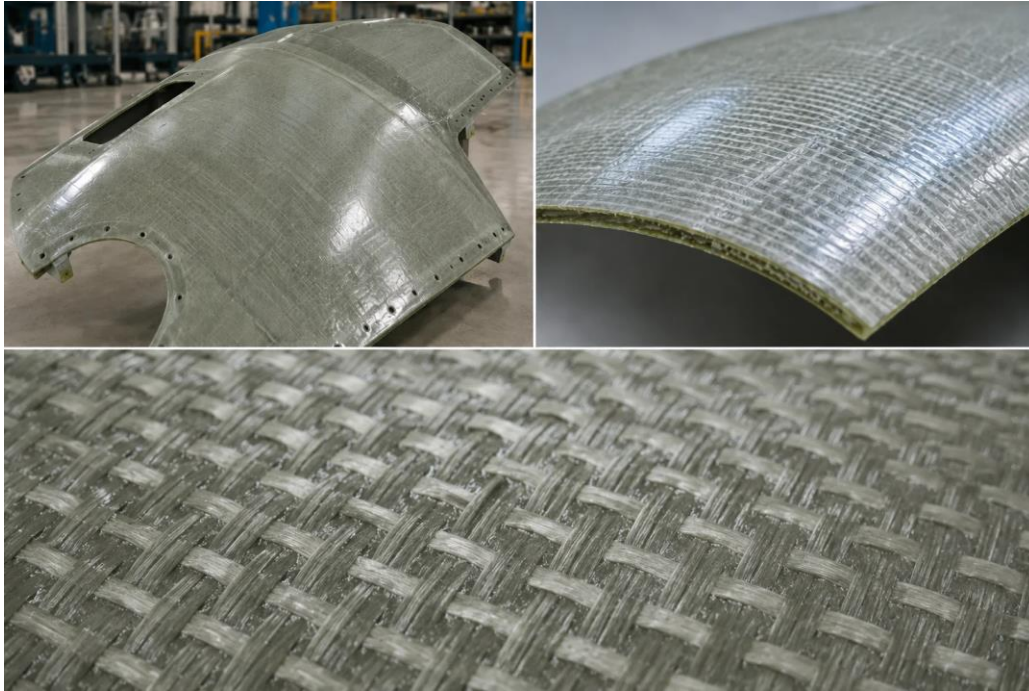
Terahertz NDT for Non-Contact GFRP Thickness Measurement and Internal Defect Detection

Glass Fibre Reinforced Plastic (GFRP) inspection is important for aerospace components where lightweight construction, corrosion resistance and structural reliability are critical. During manufacturing and service, hidden defects such as delamination, voids, inclusions and layer-thickness variations can develop inside the laminate.

TeraNIM-Aero uses Terahertz Time-Domain Spectroscopy (THz-TDS) for non-contact, non-destructive GFRP inspection, enabling evaluation of material thickness, internal interfaces and subsurface defects without cutting the component or using liquid couplants, for **aerospace parts such as radomes, fairings, fins, rudders, leading-edge structures and access panels.**

Why GFRP Needs Non-Contact Inspection?

- Layered dielectric structure with many internal interfaces
- Delamination hidden at unknown depth in the stack
- Voids, air gaps and foreign inclusions from layup and cure
- Thickness variation across large or curved panels
- Single-sided access on assembled aerospace structures



Conventional GFRP Inspection Challenges

Ultrasonic Testing: Contact-Based Inspection

X-Ray / C: Controlled Inspection

GFRP Composite: Inspection Challenge

- ⚠ Layered non-metallic structure
- ⚠ Hidden delamination
- ⚠ Voids and inclusions
- ⚠ Thickness variation
- ⚠ Need for non-contact inspection

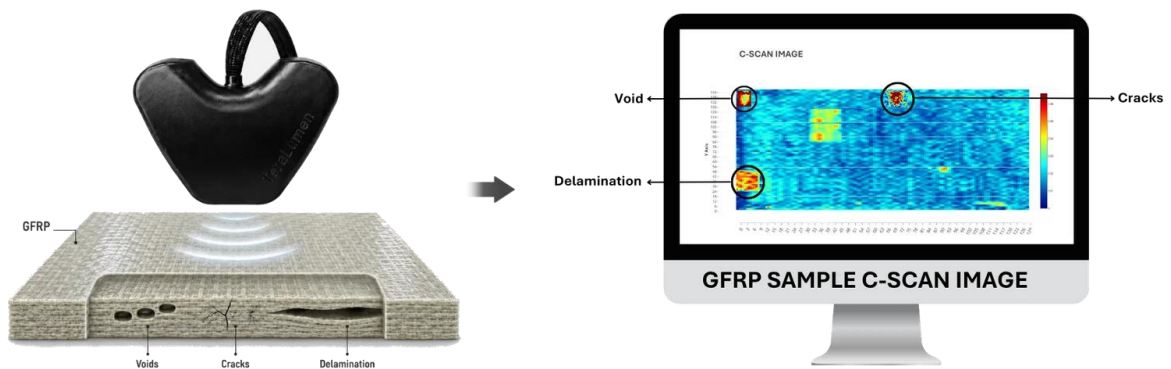
How Terahertz Technology Works for GFRP Inspection

TeraNIM-Aero directs a THz pulse into the GFRP laminate and analyses reflections generated from the surface, internal interfaces and discontinuities within the material.

A simplified inspection path is:

Air → GFRP Surface → Internal Laminate Interfaces → Back Surface

A delamination or air gap introduces an additional electromagnetic interface and can alter the reflected THz signal.



TeraNIM Aerospace GFRP Inspection Workflow

SCAN

Position the TeraNIM-Aero probe above the GFRP component and acquire reflected THz signals at defined inspection locations.

- Non-contact inspection
- Single-sided access
- Point or automated scanning

GFRP Component → THz Scan

DETECT

Analyse the reflected waveform to identify changes associated with internal GFRP structure.

Typical indications can include:

- Delamination
- Voids / air gaps
- Foreign inclusions
- Internal interfaces
- Thickness variation

Surface Reflection → Internal Response → Defect Indication

ANALYSE & REPORT

Process the acquired THz data to generate useful inspection results.

Outputs can include:

- GFRP Thickness
- Defect Location
- Delamination Indication
- Thickness Variation
- 2D Inspection Map
- Pass / Fail Result
- Digital Inspection Record

THz Signal → Inspection Result → QC Report

Key Advantages to Aerospace OEMs & Research Organisations

Non-Contact Inspection

THz measurement does not require physical probe contact with the GFRP surface.

Non-Destructive Testing

Inspect suitable GFRP components without cutting or sectioning the laminate.

Delamination Detection

Internal delamination can produce detectable changes in the reflected THz signal in suitable GFRP structures.

Thickness & Defect Mapping

Scanning multiple locations can provide material-thickness information and spatial maps of internal indications.

Automation Ready

TeraNIM-Aero can be integrated with scanners, robots or cobots for repeatable inspection of larger and curved GFRP structures.

Aerospace GFRP Quality Control with TeraNIM™

TeraNIM-Aero provides a non-contact and non-destructive approach for inspecting validated GFRP aerospace components.

By combining **THz reflection measurement, signal processing and scanning**, the system can support **GFRP thickness measurement, delamination detection, void and inclusion assessment, defect mapping and automated aerospace inspection.**