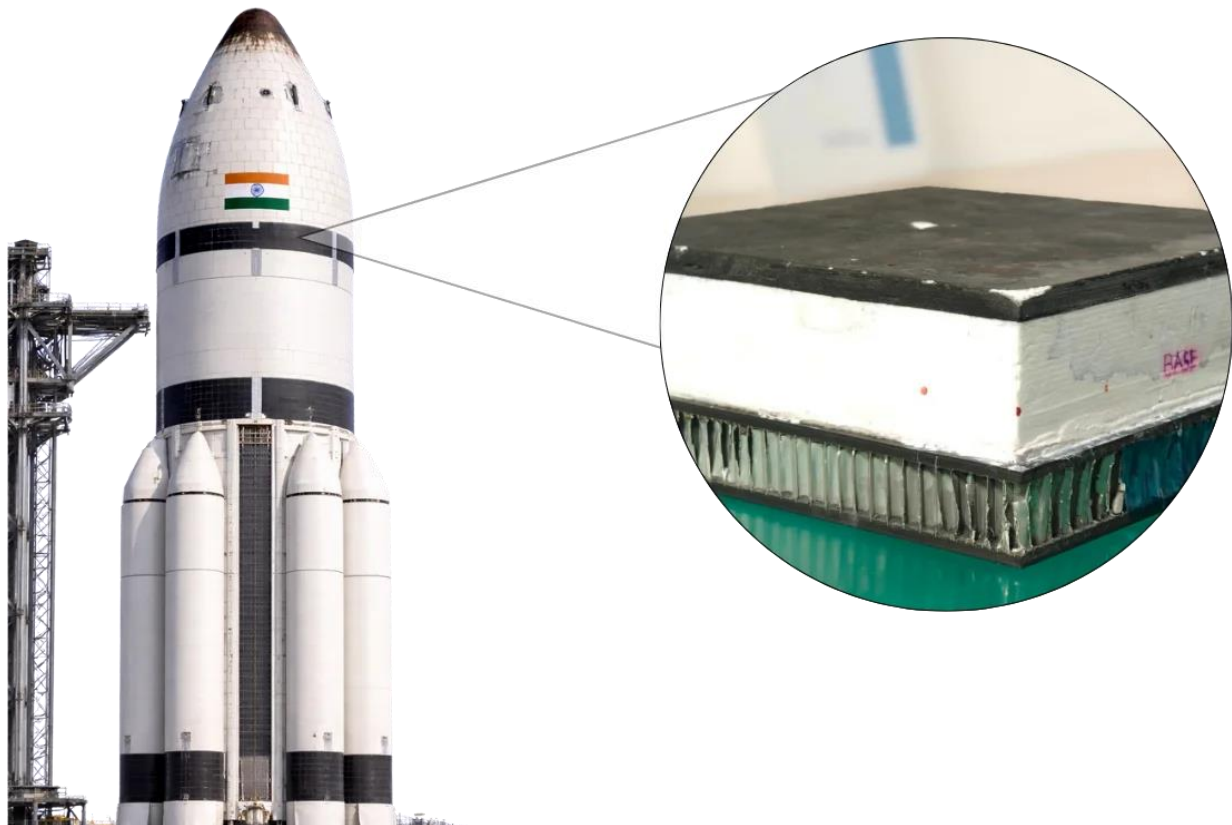


Silica Tiles Inspection in Aerospace

Terahertz NDT for Non-Contact Silica Tile Thickness, Internal Defect and Bond Inspection

Silica tiles are used in aerospace thermal-protection structures where **low weight, thermal resistance and structural integrity** are critical. During manufacturing, installation and service, hidden defects such as **cracks, voids, porosity variation, bond-line defects and debonding** can develop within the tile or at the bonded interface.

TeraNIM-Aero helps inspect silica tiles non-destructively and without physical contact, enabling aerospace teams to evaluate **tile thickness, internal defects and bonding interfaces** without cutting the component or using liquid couplant.



Why Silica Tiles Need Non-Contact Inspection?

- Highly porous internal structure can contain hidden defects
- Internal cracks may not be visible from the tile surface

- Voids and local material variations can develop within the tile
- Bonded interfaces may develop air gaps or debonding
- Non-contact inspection helps protect delicate low-density tile surfaces

Conventional Silica Tile Inspection Challenges

- **Visual Inspection**
- **Surface-Based Inspection**
- **Tap Testing**
- **Contact-Based Inspection**
- **Silica Tile**
- **Inspection Challenge**

⚠ Highly porous structure

⚠ Hidden cracks and voids

⚠ Bond-line defects

⚠ Debonding beneath the tile

⚠ Need for non-contact inspection

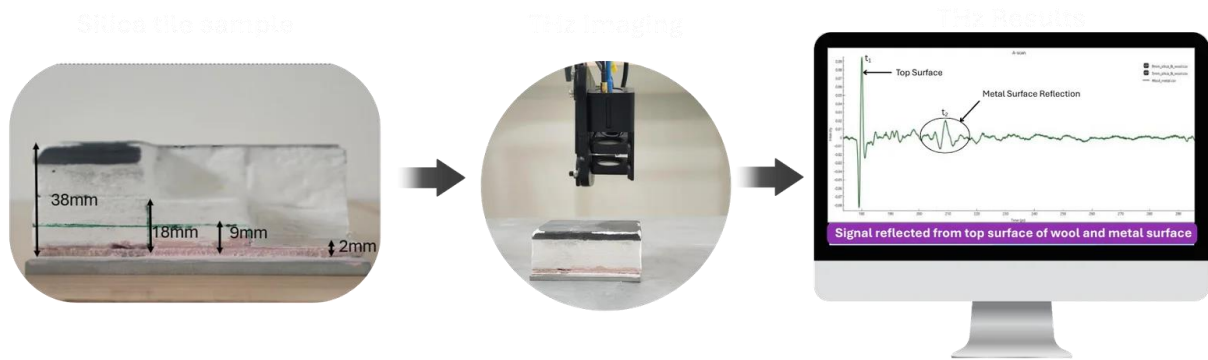
How Terahertz Technology Works for Silica Tile Inspection

TeraNIM-Aero directs a THz pulse into the silica tile and analyses reflections generated from the tile surfaces, internal discontinuities and bonding interfaces.

A simplified inspection path is:

Air → Silica Tile Surface → Silica Tile → Felt / Bond Layer → Substrate

Changes in the reflected THz signal can provide information about **tile thickness, internal cracks, voids and bond-interface condition.**



TeraNIM Silica Tile Inspection Workflow

SCAN

Direct a THz pulse onto the **silica tile surface** and acquire the reflected signal using **single-side, non-contact access**.

DETECT

Capture reflections from the **tile structure, bond layer and internal discontinuities** such as cracks, voids or debonding.

ANALYSE & REPORT

Extract reflected-signal features to determine **tile thickness, interface condition and defect indications**, then generate the inspection result.

Key Advantages for Aerospace OEMs & Research Organisations

- **Non-Contact Inspection:** No physical probe contact with the silica tile surface.
- **Non-Destructive Testing:** Inspect the tile without cutting or sectioning the component.
- **Thickness Measurement:** THz time-delay information can be used to determine calibrated silica tile thickness.
- **Internal Defect Detection:** Cracks, voids and other internal discontinuities can alter the reflected THz signal.
- **Bond & Defect Mapping:** Scanning multiple locations enables visualization of tile thickness variation and bond-interface anomalies.
- **Automation Ready:** TeraNIM-Aero can be integrated with scanners and automated positioning systems for repeatable inspection.

Silica Tile Quality Control with TeraNIM™

TeraNIM-Aero provides a non-contact and non-destructive approach for inspecting suitable aerospace silica tile structures.

By combining **THz reflection measurement, calibrated thickness analysis, interface evaluation and automated scanning**, the system can support **silica tile thickness measurement, crack and void detection, bond-integrity assessment, debonding detection, defect mapping and digital aerospace quality control**.