



Technical report

# Sub-terahertz detection for moisture and corrosion under insulation

2022

Independent technology  
assessment conducted by



## As an asset integrity leader, you know how valuable early warnings are.

For example, if you detect moisture within your pipework's insulation or cladding, you know that you will need to act to prevent the damaging effects of advanced corrosion.

However, if you can only detect moisture when it's already in contact with the cladding, you will have far less time to make decisions that protect people and prevent the painful costs of downtime.

That's why the global energy, chemical and processing industries need screening technology that detects moisture and corrosion under insulation (CUI) far more easily than conventional methods.

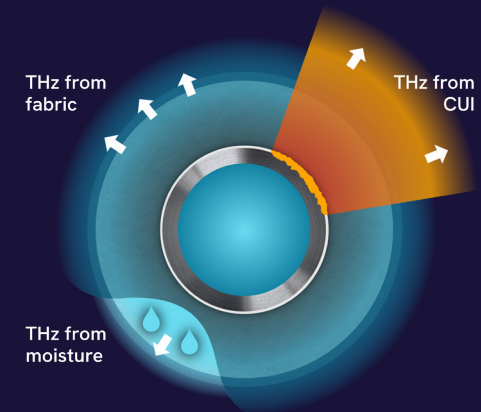
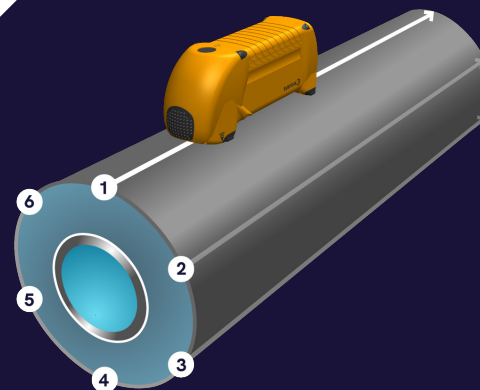
**Subtera commissioned ESR Technology to independently test its passive terahertz camera technology to detect CUI and the moisture that causes it.**

## What is sub-terahertz imaging?

Terahertz light (THz) is radiated by corroded metal, predominantly reflected by uncorroded metal, and heavily absorbed by moisture.

**Why does this matter?** Sub-terahertz cameras passively detect these differences in radiated terahertz light through paint, coatings, insulation and polymeric cladding around operational pipework and vessels – informing operators exactly where traces of moisture and CUI are present in pipework.

Moisture no longer needs to be directly in contact with cladding to be detected – and you don't need to stop your operations to locate it.



## Test Conditions

The methodology simulated conditions commonly found in the process industries, using industrial insulation and cladding:

Insulation: **Rockwool ProRox (30mm)**

Cladding: **ULVASHield CSPE Sheet**

Coating: **Intertherm 228**

Pipe temperature: **80°C**



## Test 1:

### Does Subtera's technology detect CUI?

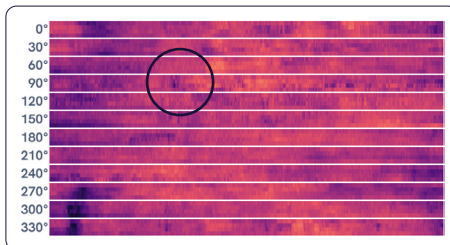
#### In a blind test...

- ③ The 1m long pipe section was insulated with mineral wool and the polymeric cladding was fitted.
- ③ The pipe temperature was raised to 80°C using an electrical heating cable, to simulate a typical process condition.
- ③ A saline solution was dripped onto an uncoated area of the pipe (Ø 40mm), forming a corrosion scab in an unspecified location.
- ③ Subtera's prototype Pi device was used to screen the pipe at regular intervals over a 3 month period.
- ③ During each visit to ESR Technology's test facility, the pipe was screened from all angles, enabling a detailed 360° analysis.

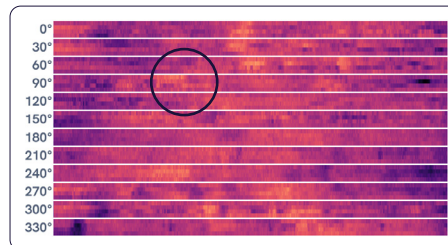
#### Result:

- ③ In Week 7 CUI was detected using the scan image data.

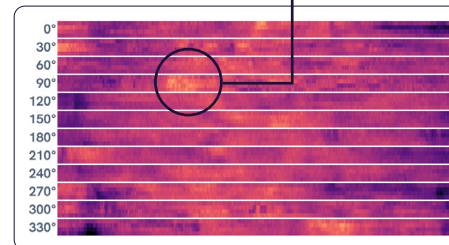
Week 1 scan data



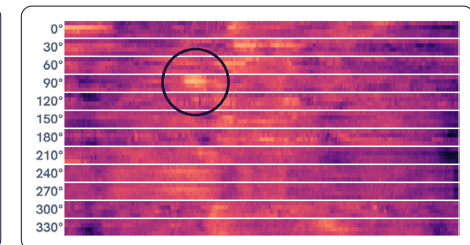
Week 4 scan data



Week 7 scan data



Week 10 scan data



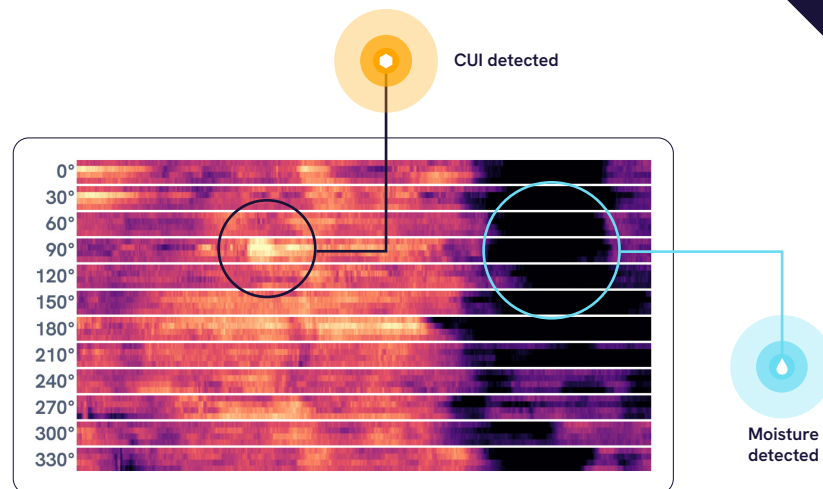
## Test 2:

### Does Subtera's technology detect moisture?

- ③ With the pipe temperature maintained at approx. 80°C, 50ml of water was injected (at a known location) directly into the mineral wool insulation.
- ③ The polymeric cladding was reapplied.
- ③ After 30 minutes, and after 20 hours, Subtera's prototype device was used to record 360° scan data of the pipe.

#### Result:

- ③ In both sets of scan data, Subtera's prototype detected the moisture.
- ③ This final test proved the ability for Subtera's passive THz imaging technology to accurately detect both CUI and moisture in a single scan.



# The next step in asset integrity management

ESR Technology's independent testing proved that Subtera's passive THz technology detects both moisture and corrosion under insulation.

#### For asset integrity managers, Subtera is a force for change.

Inspecting assets for CUI and corrosion-inducing moisture, while simultaneously assessing the condition of your insulation, is now a reality. Asset awareness is increased before the need to remove cladding or insulation arises. In short, Subtera empowers asset integrity managers to save untold cost, make smarter decisions, and deliver safe, energy-efficient operations.

To learn more about  
integrating Pi360 into your  
asset integrity programme,  
visit [subtera.tech](https://subtera.tech)