ENITT Co., Ltd.

Collecting temperature data using Raman scattered light

Distributed Temperature Sensing

e-DTS (Distributed Temperature Sensing) is a temperature data collection technology utilizing Raman scattered light, providing the following main functions:

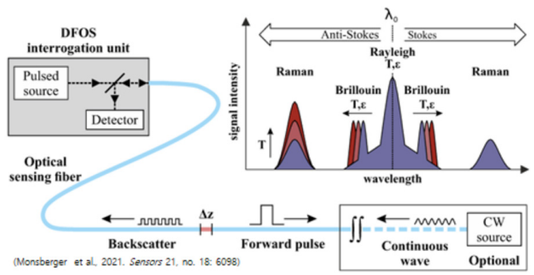
Raman Scattering-Based Detection : By injecting laser light into an optical fiber, the system can detect Raman scattered light generated by physical temperature changes. This scattered light is analyzed to collect detailed data on temperature.

Distributed Temperature Sensing : The optical fiber itself acts as a sensor, allowing continuous monitoring of temperature information at multiple points, and it can monitor a wide range of up to hundreds of kilometer in real-time. This enables comprehensive temperature monitoring in various fields such as large-scale infrastructure, industrial facilities, and underground spaces.

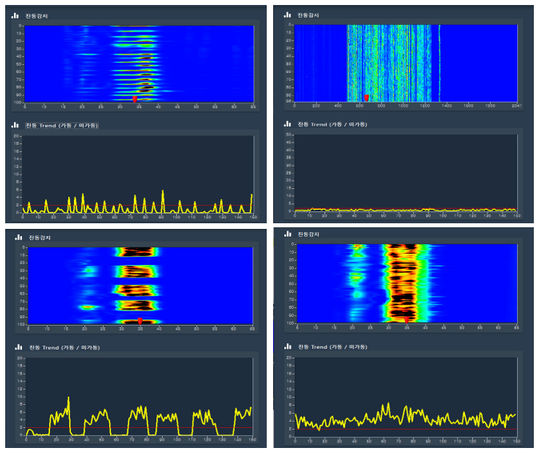
High-Resolution and Real-Time Monitoring : The e-DTS system processes high-resolution data in real-time, allowing for the quick detection of temperature changes in structures. This is highly useful for monitoring the condition of facilities and for early detection of thermal anomalies.

Wide Area Coverage : The e-DTS system monitors temperature data over large areas without additional sensors, making it effective in hard-to-reach locations. This is vital for infrastructure like pipelines and power lines. Using a single fiber-optic cable, it provides continuous temperature profiling, enabling early detection of fluctuations and potential issues.

The e-DTS system maximizes the advantages of collecting temperature data using Raman scattered light, playing a crucial role in various fields such as structural condition monitoring, underground space management, and industrial safety management.



(Monsberger et al., 2021, *Sensors* 21, no. 18: 6098)



Application

- Pipeline
- Underground Utility Tunnel
- Road/Tunnel
- Bridge
- Harbor
- Railway line
- Facilities
- Building

Product Features

Measurement of scattering signals due to lattice vibration

Measuring changes in physical quantities by scattering (Raman scattering) caused by lattice vibrations of molecules in optical fibers

Detecting structural abnormalities due to temperature changes

Real-time structural abnormality monitoring by distance/section using temperature change data

Accurate location confirmation with high spatial resolution

Supports 1m spatial resolution

Supports up to 8ch

Supports up to 8 channels per instrument (e-DTS standard)

No installation restrictions

EMI (electromagnetic interference) immunity, communication restrictions, and zero impact from dust, humidity, etc.

Reduce initial construction costs by using existing optical cables

Reduce initial construction costs by using optical fiber cables for communications as sensors (can be changed according to field conditions)

Product Specifications

Maximum measurement distance	16km_MMF(10mile), 30km_SMF(18mile)	Spatial resolution	0.5m
Measurement temperature range	-50 to 150°C	Measurement temperature accuracy	±1°C
Channels	1ch, 4ch, 8ch	Data transfer speed	10sec

Input/output connection

Optical cable terminal	FC/APC
Ethernet	-
USB	-
RS232(DB9)	-
Display	-

Device and operating environment

Size	435 × 535 × 129mm
weight	7.39kg(16.2lb)
Operating temperature	0 to 50°C
Operating humidity	10 to 90%, Non-condensing
Storage temperature	-40 to 80°C

Standards and Safety

Laser Safety Classification	Class 1
Product Certification	KC, FCC
-	-

Electrical characteristics

Operating voltage	100 to 230 VAC
Operating voltage frequency	50 to 60 Hz
Power consumption	-

Operating System Configuration

Rack	19" Rack 42U	Visualization Server	Visualizing DAS Analysis Information
DAQ Unit	DAS signal data collection, analysis and processing	UPS	Uninterruptible power supply
Storage	DAS signal data storage	L2 Switch	L2 network switch
Analysis Server	DAS signal data deep learning analysis	KVM	KVM for Servers

* System configuration may vary depending on purpose and environment.

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