sylex® FIBER OPTICS

AUTOMATED MONITORING SYSTEMS
- FIBER OPTIC
- FBG TECHNOLOGY

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SYLEX, s.r.o.
Slovak Republic

www.sylex.sk

SYLEX --- Fiber Optics

- Fiber optic technology is the DNA of Sylex
- Production and development of new products

2019	Family owned company with 260 employees
2011	Introduction of FBG sensing and monitoring solutions
1995	Sylex foundation

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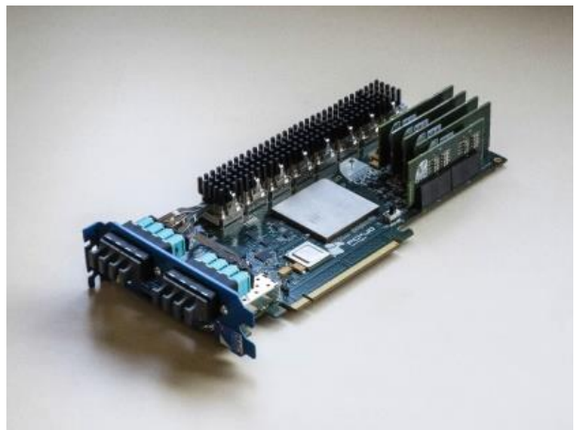
Real life application examples

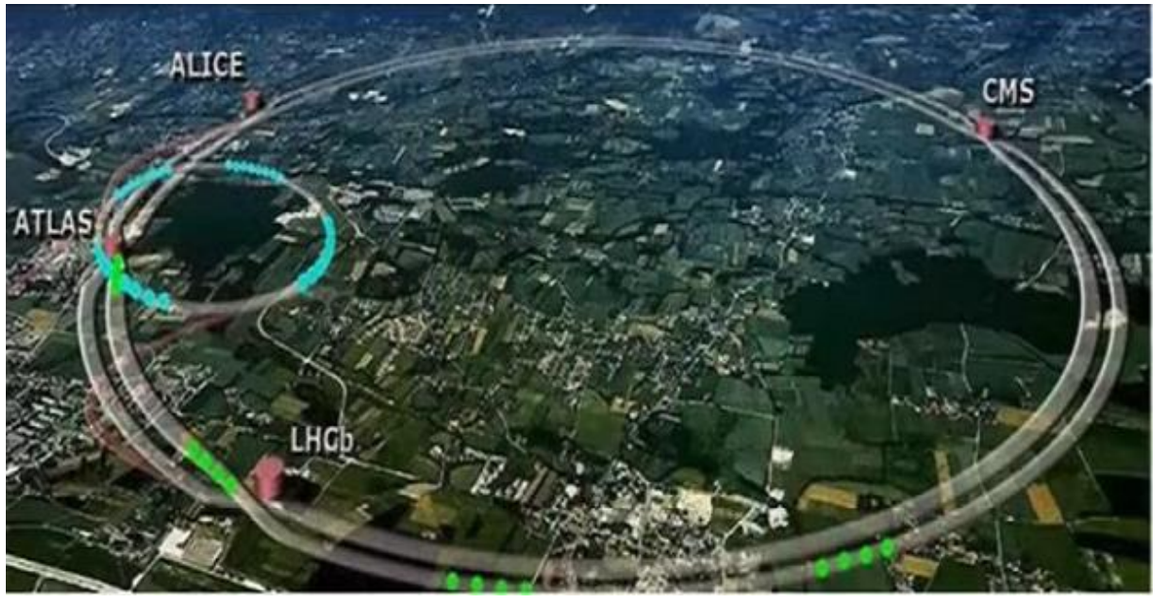
Interconnections

Fiber optics - CERN projects

ALICE

- In cooperation with Centre de physique des particules de Marseille
- Data center application

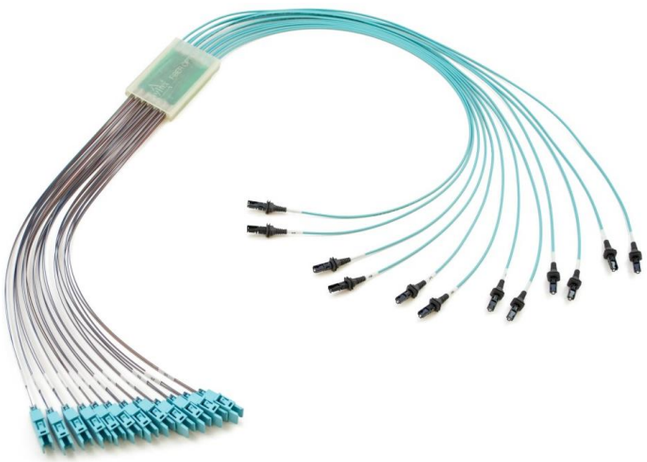


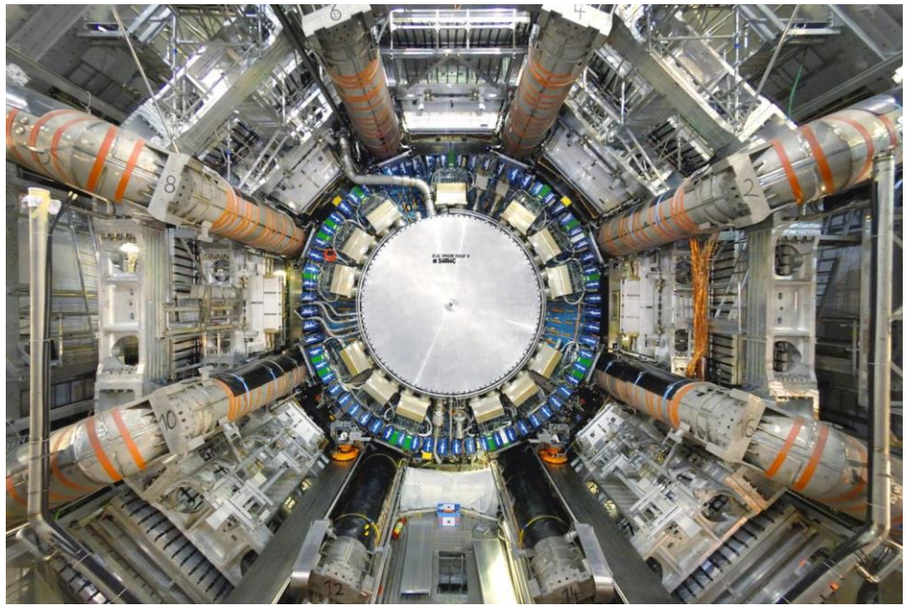


ATLAS, CMS

- In cooperation with Michigan State University

ndividual stations





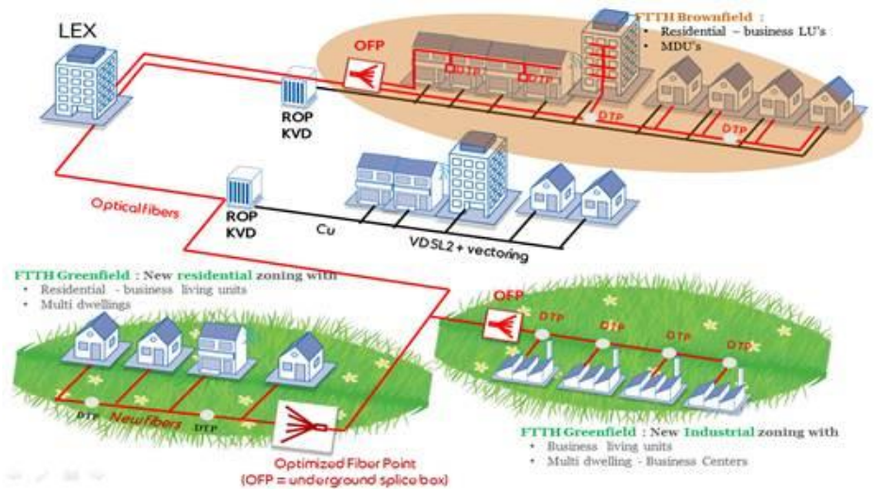
Further examples

Novartis, data center, Switzerland

- Co-development and supply of interconnect solution for data centers
- Data processing during pharmaceutical development

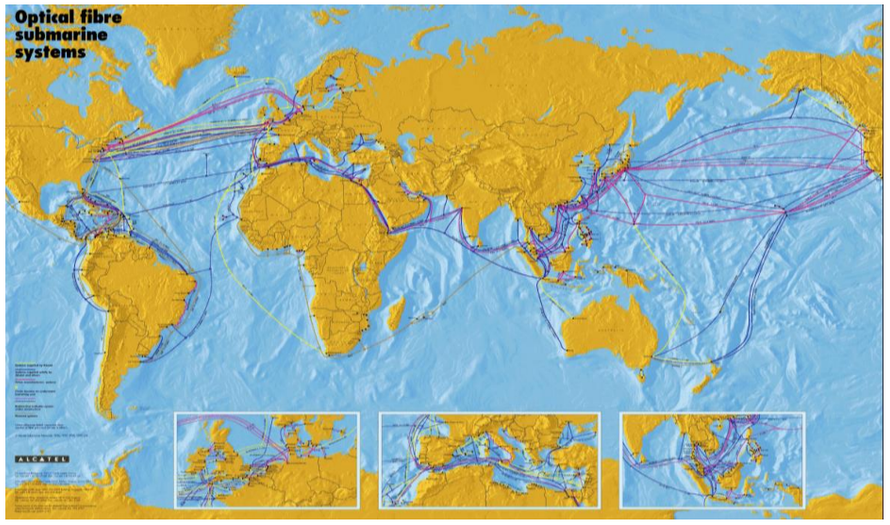
FTTh, Belgian telecom

- Complex fiber optic infrastructure for Fiber-to-the-home
- Turn key solution co-development and supply



Alcatel Submarine

- Sub-sea cables interconnect solutions for base stations
- Turn key solution co-development and supply



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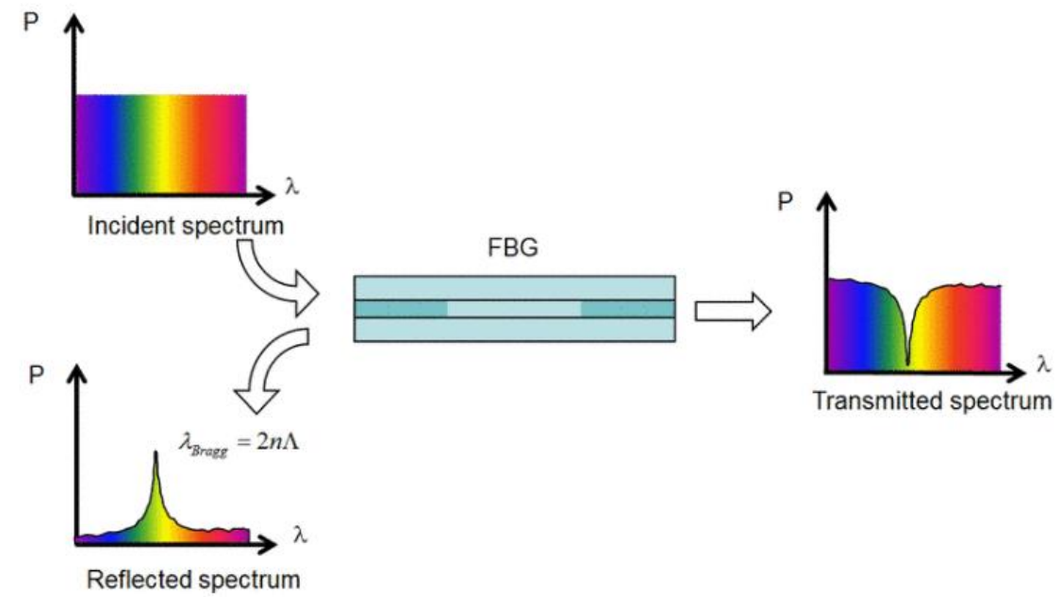
FBG technology

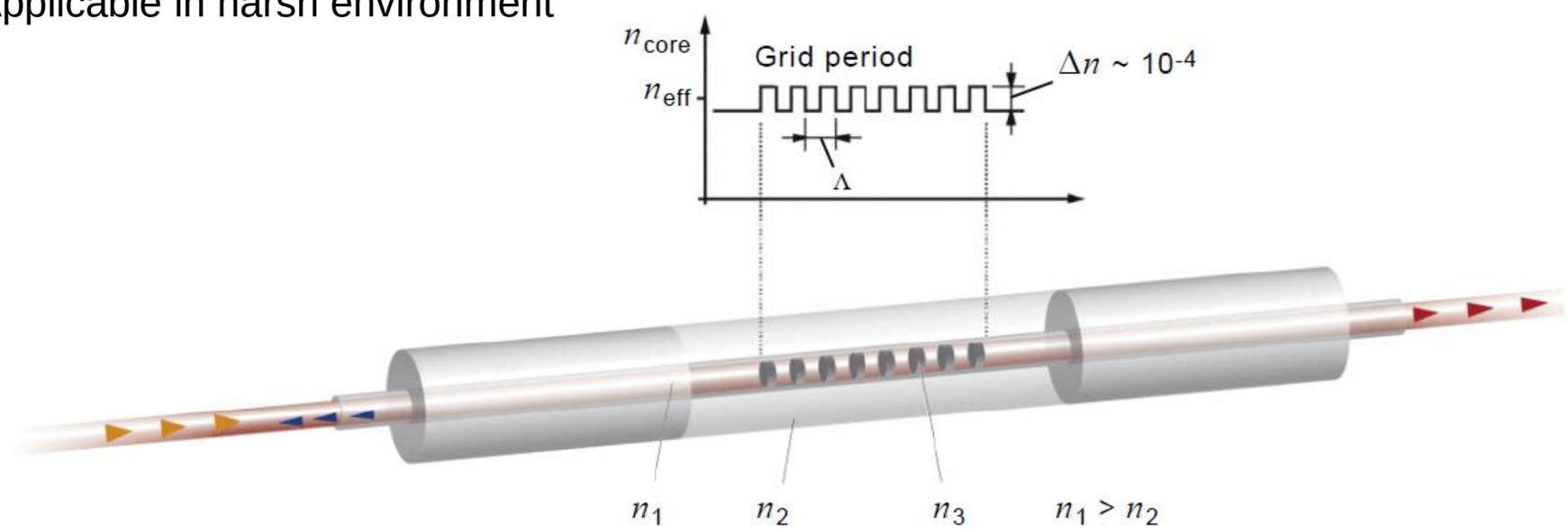
Sensors & Sensing systems

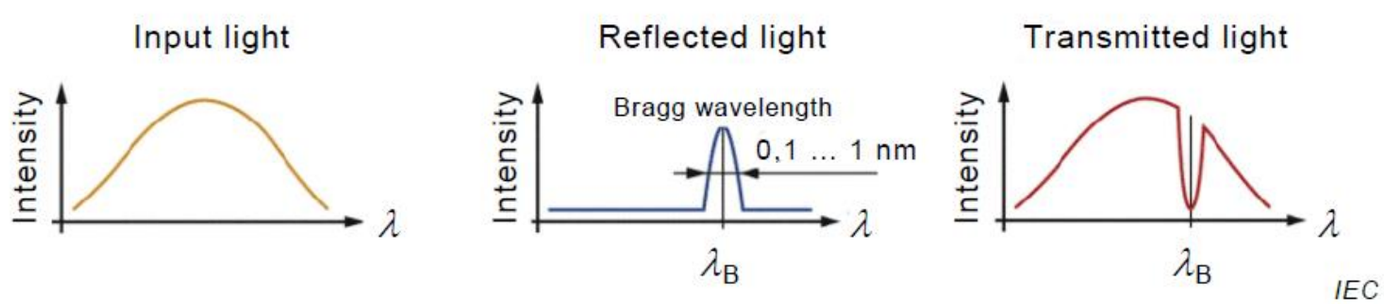
FBG technology – Introduction

- Light serves as the signal carrier
- Market proven solution

- Technology advantages
  - System cost
  - All advantages from Fiber Optic
  - Plug&Play design
  - Applicable in harsh environment







FBG technology – Components of monitoring systems

SYSTEM SOLUTIONS

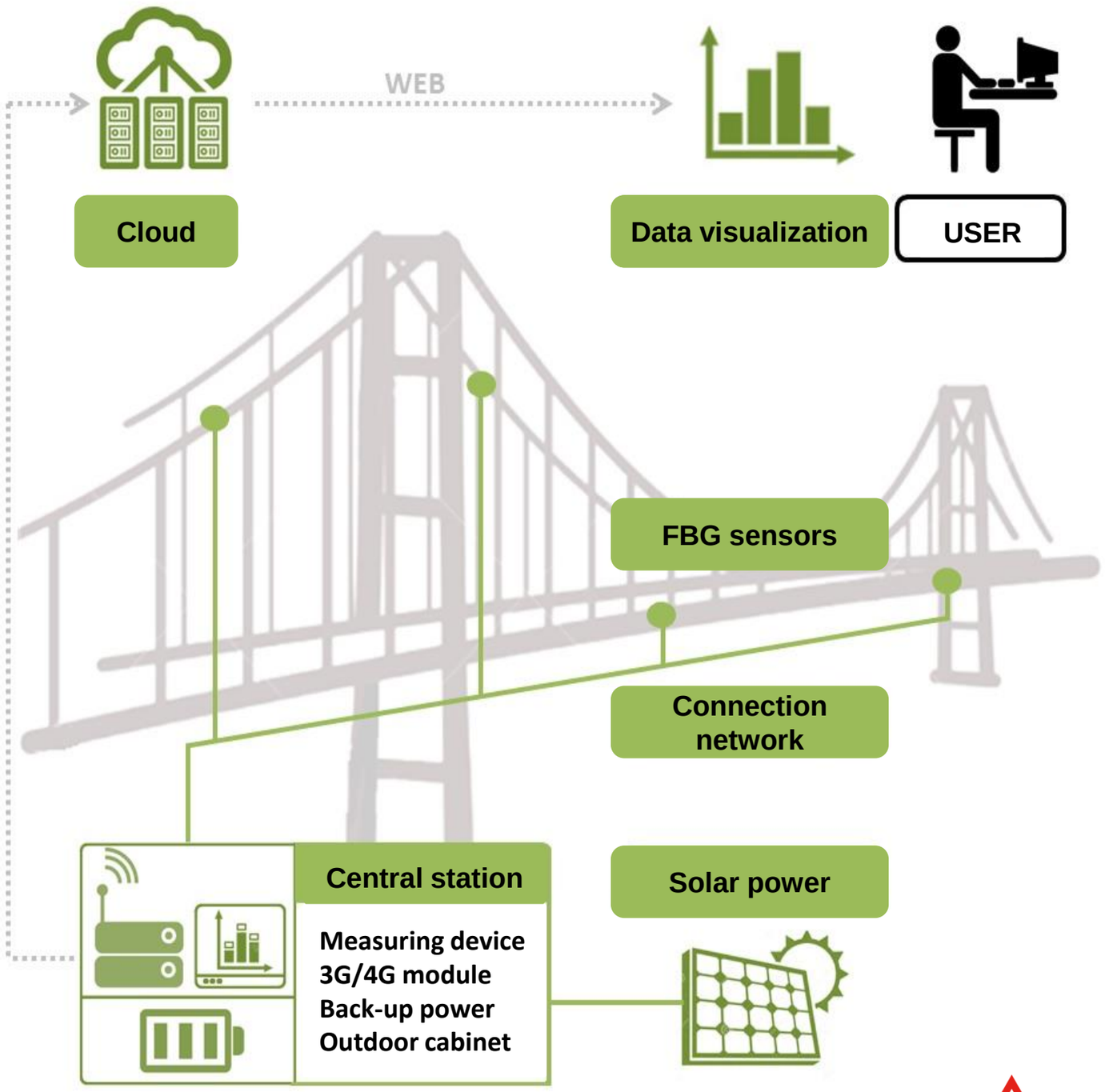
- Automated monitoring systems
- Tailored measuring systems

PRODUCTS

- Sensors
  - Strain / Stress / Deformation
  - Temperature
  - Displacement
  - Tilt
  - Vibrations
  - Pressure
- Data loggers (interrogators)
- Connection cables
- Analysis and Visualization SW

SERVICES

- Monitoring services (local and remote)
- Installation services
- Online data visualization
- Rental of instruments



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Real life application examples

Sensors & Sensing systems

Tunnel monitoring (Project 1)

Real time monitoring of deformations of the **sub-sea tunnel**

Built almost 30 years ago

More than 50km long, part of the structure undersea

Deepest point, almost 100m below sea bed

Total construction cost several billions

Constantly challenged structure

Changes in environment conditions

Movement of the sea bed or underlay

Increase in the background electromagnetic interference

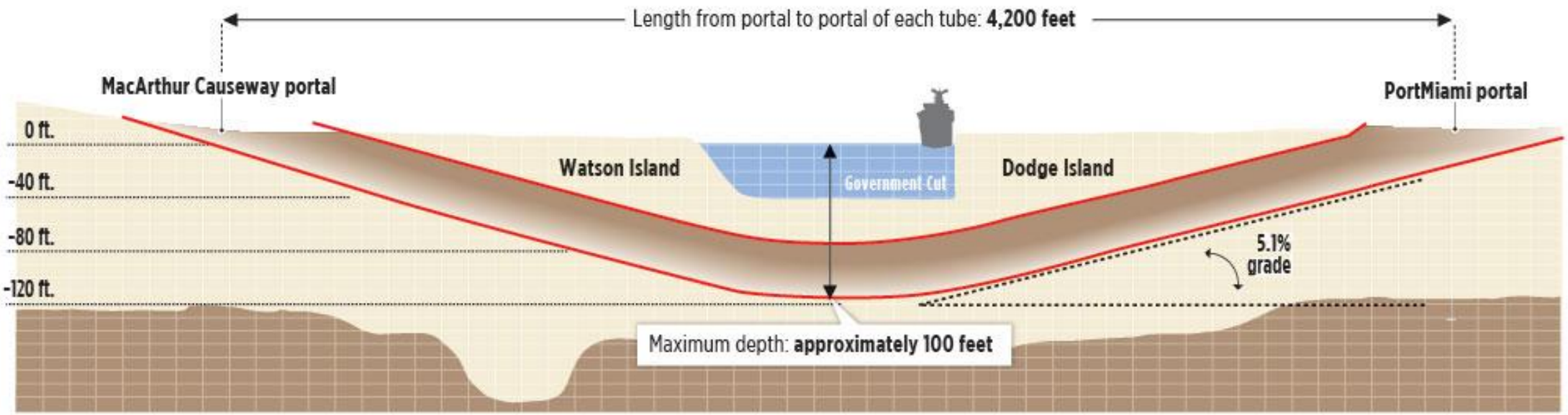


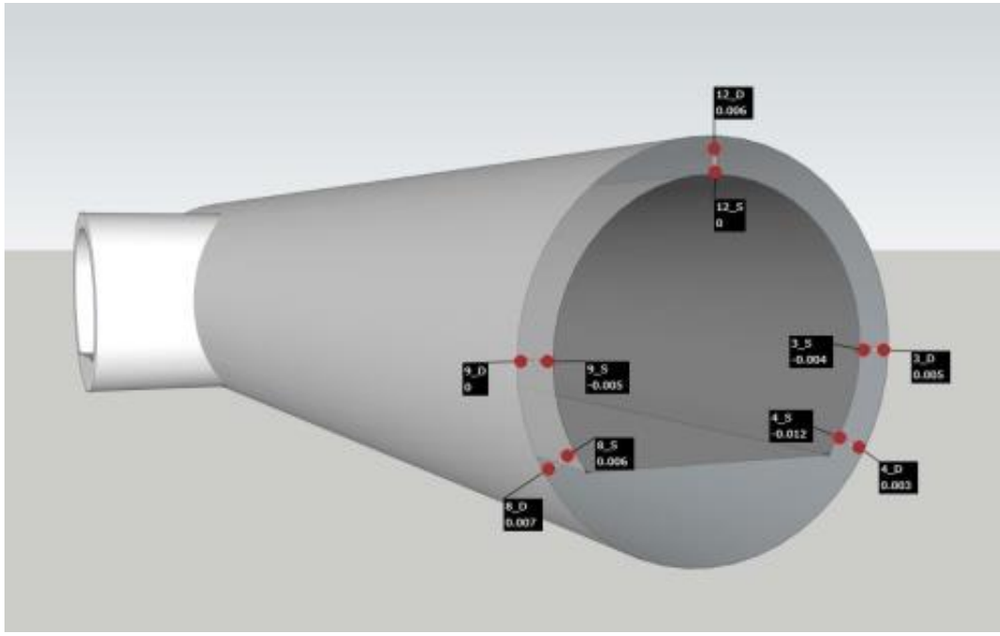
Illustration image

Tunnel monitoring

Real time monitoring of deformations of the sub-sea tunnel construction

Characteristics:

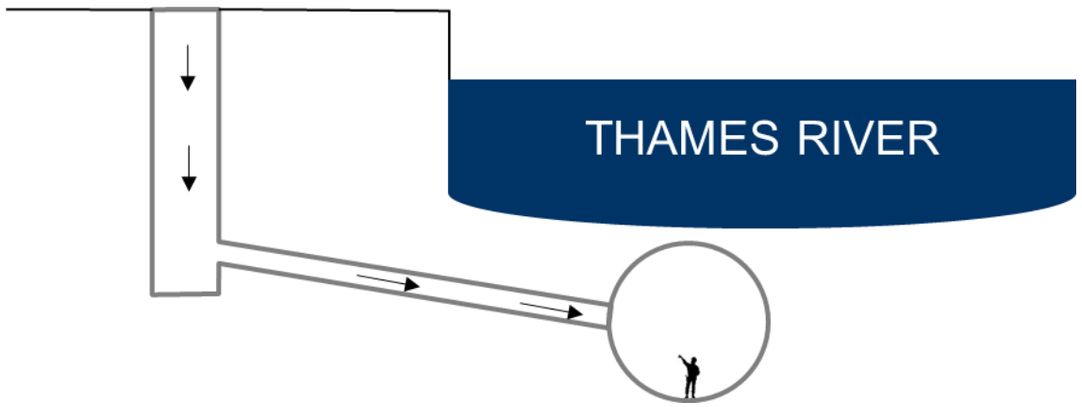
- Simple and quick-to-install
- Scalable for further extensions
- EMI immune
- On-line monitoring with early warning for critical events



Sewer monitoring (Project 2)

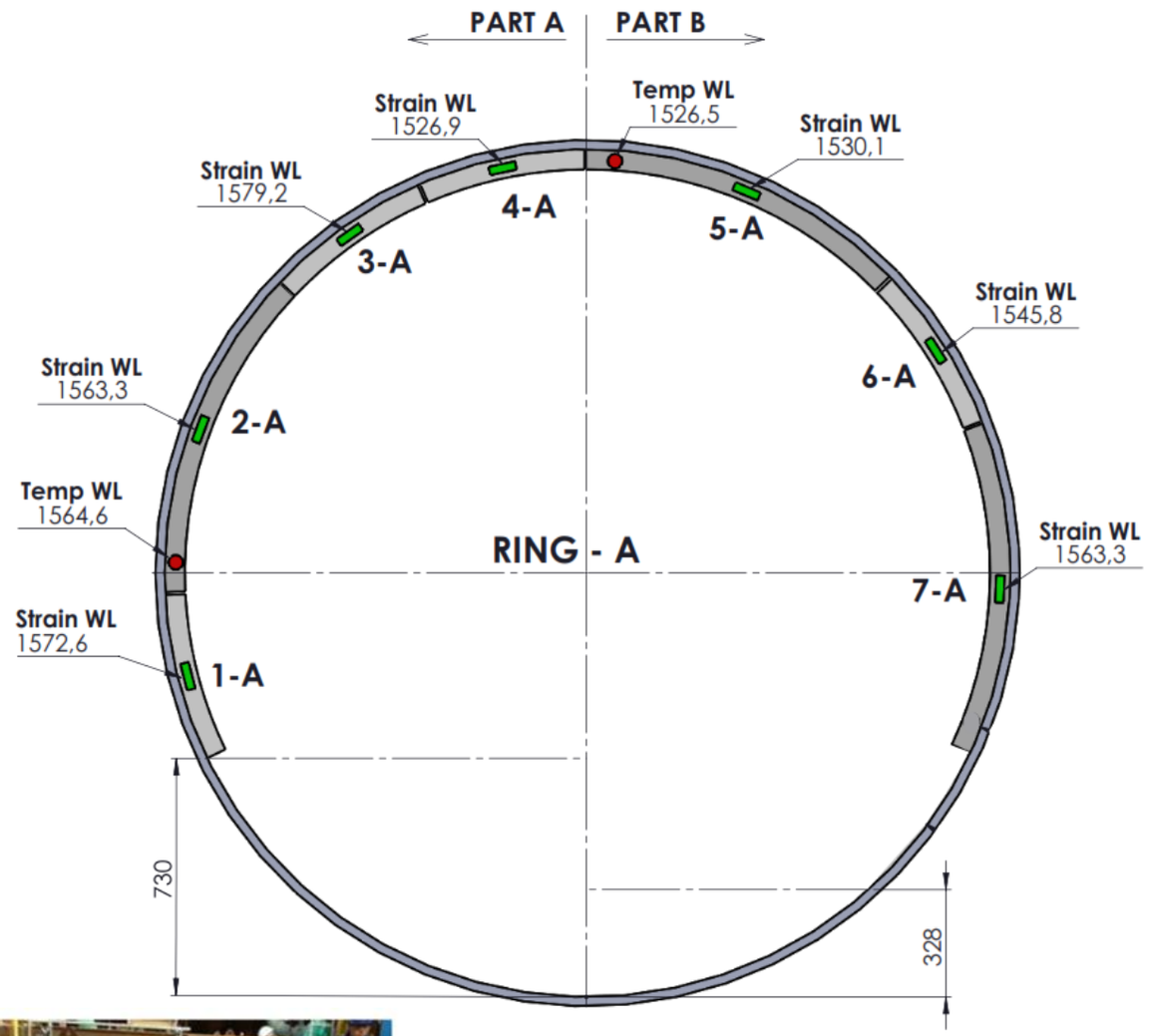
- Development impulse – Sewer monitoring in London
- Existing sewers need to be instrumented while new tunnels are being dug
- Those old sewers date back hundreds of years
- All equipment needs to be ATEX rated

- The Tideway project is a “super-sewer” that is:
- 25km long
- 7.2m in diameter
- Running from Acton down to Abbey Mills
- A construction project valued at £4.2 billion

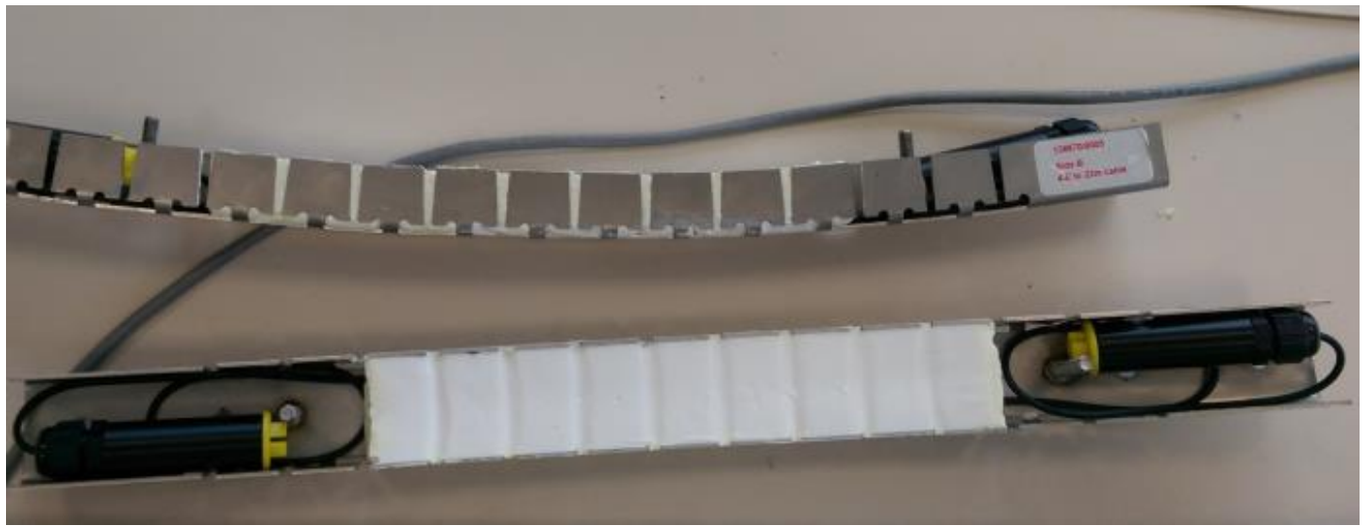


Sewer monitoring (Project 2)

- A cofferdam will be built directly opposite the sewer
- Such works are likely to cause displacements
- FEA analysis have been conducted
- 5 cross sections – each with 8 strain segments
- Simplified segment replacement
- 24/7 online data access

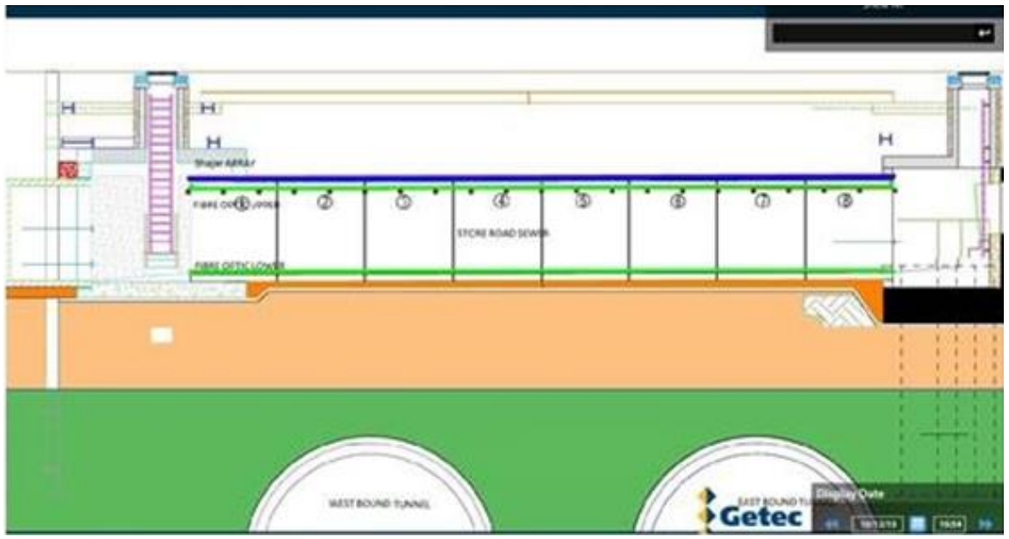


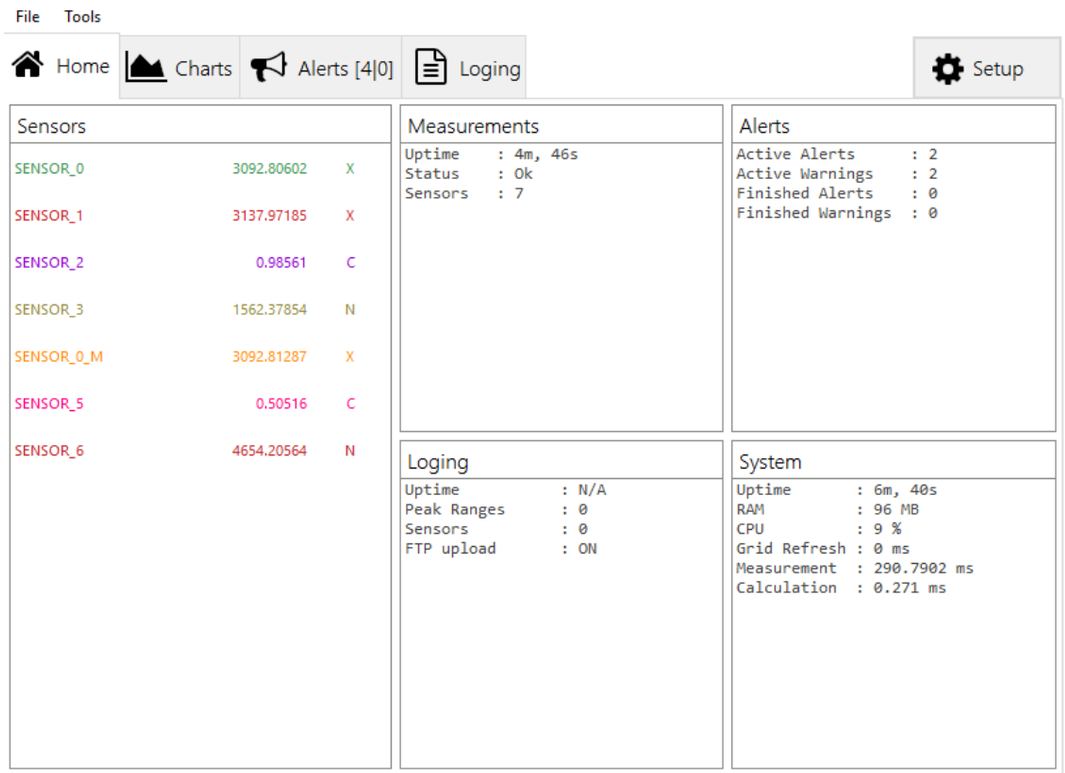
Sewer monitoring (Project 2)

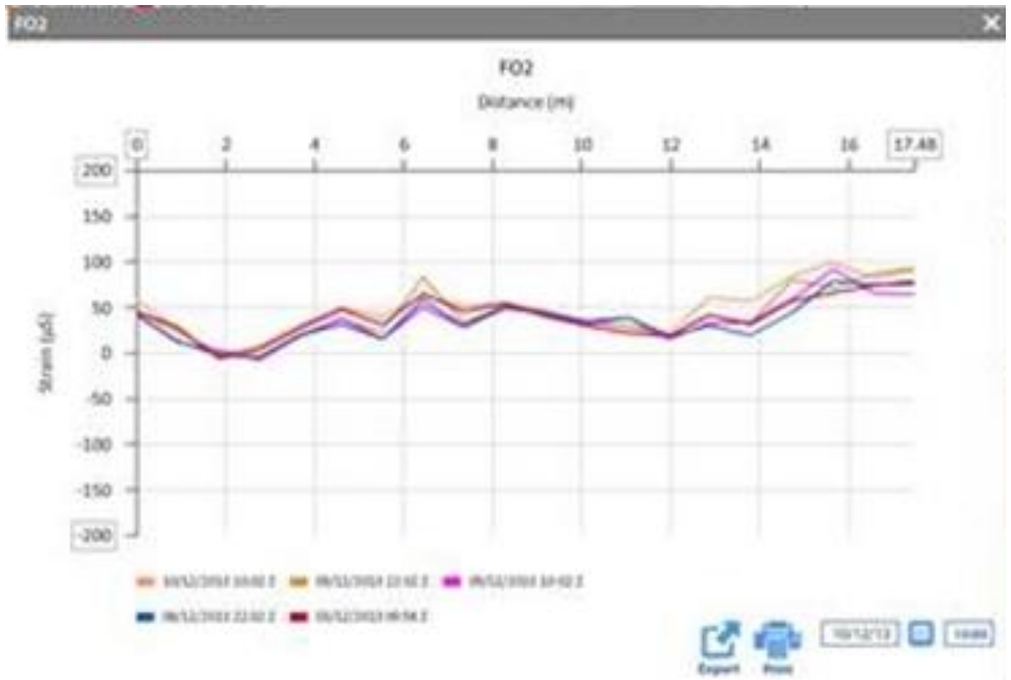


Sewer monitoring (Project 2)

Monitoring of existing sewer system while parallel tunnel construction in progress





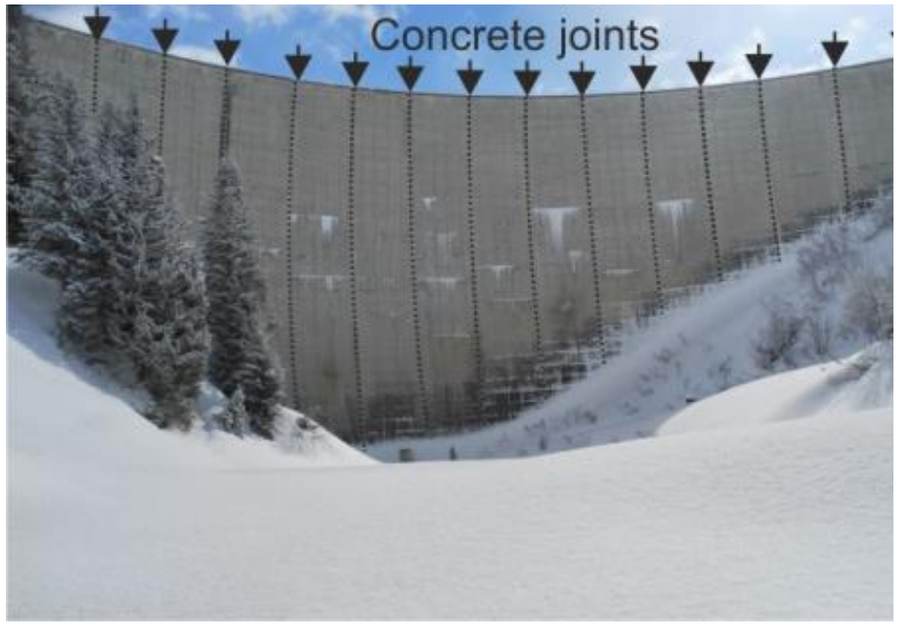


Water dam, Alps, Austria

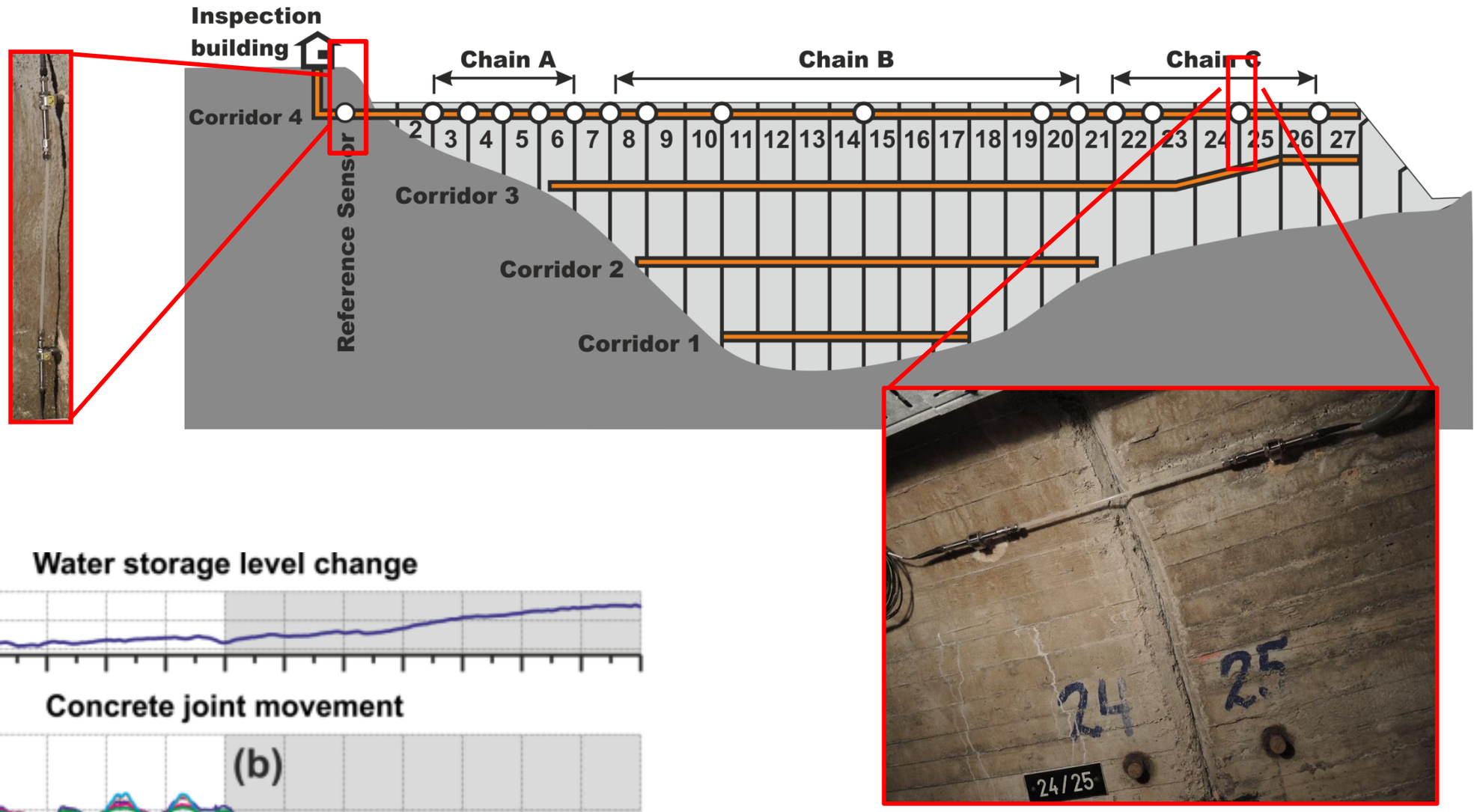
- TU Graz
- Long gauge sensors: SC-01

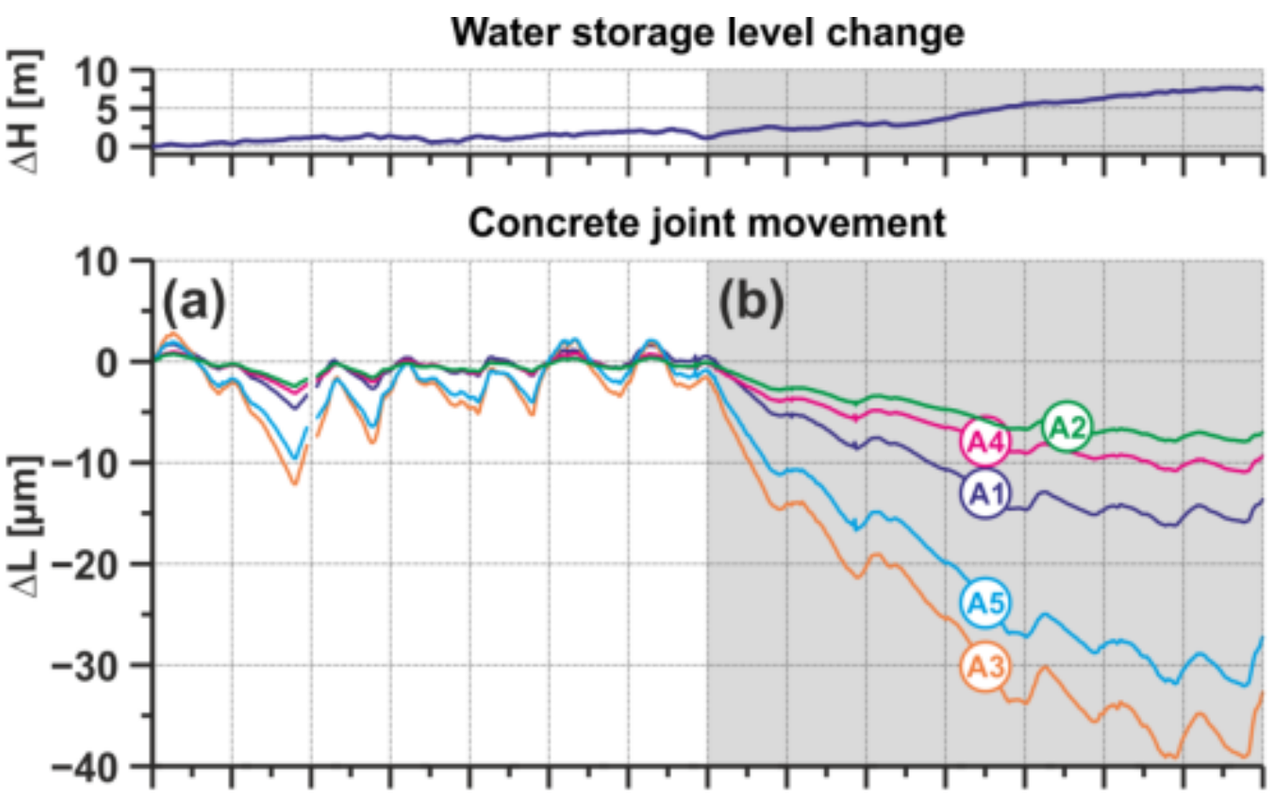
Requirements:

- High sensitivity of strain measurements
- Long term stability over several years
- Chain-able configuration of sensors



Water dam, Alps, Austria





Pipeline monitoring, Cantiere Pedaso - Italy

Monitoring of a gas pipeline integrity

Requirements:

- Electrically passive monitoring system
- Fast and quick installation
- On-line access to measured data
- Modular system

Sea port, pier monitoring, Kazakhstan

Monitoring of pier integrity

Requirements:

- Robust sensor and cable design
- Extensometers with 1mtr gauge lengths
- Temperature compensated (integrated in sensor)
- Variable pre-strain setup during installation

Sea port, pier monitoring, Kazachstan

Dynamic analysis, vibration diagnostics

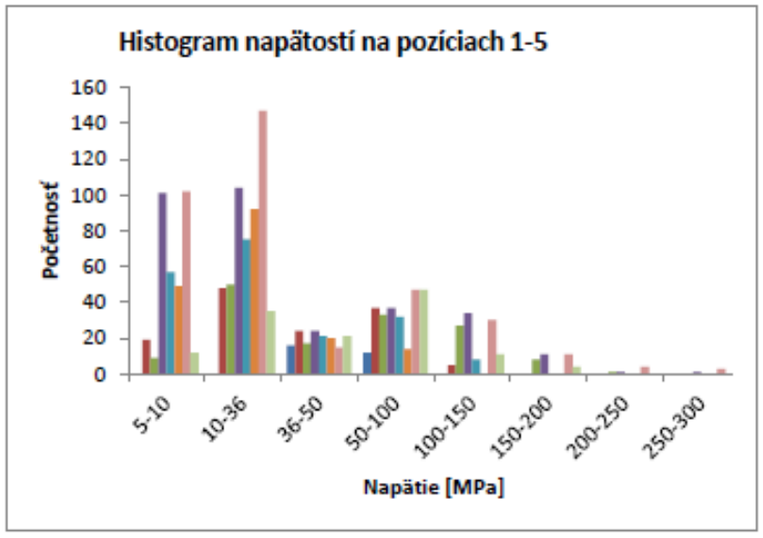
- 8 kHz sampling through all sensors
- 50 fm measurement repeatability
- Synchronous data acquisition from multiple instruments

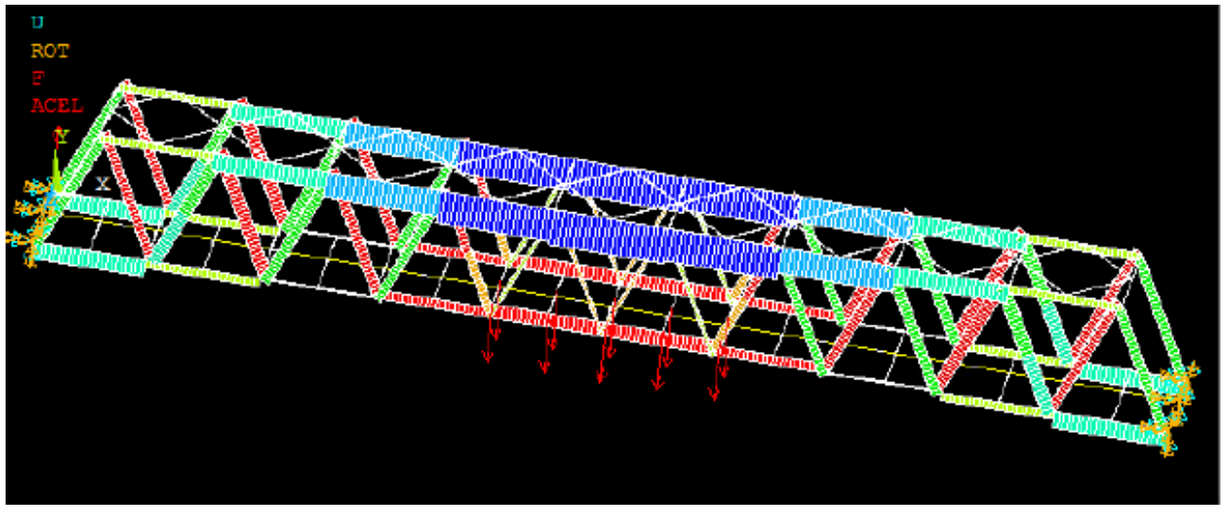
Bridge “Podbiel”, Slovakia

Monitoring of temporary bridge – steel construction

Requirements:

- Autonomous system
- Installation during the traffic on
- Re usable sensors
- On-line access to measured data



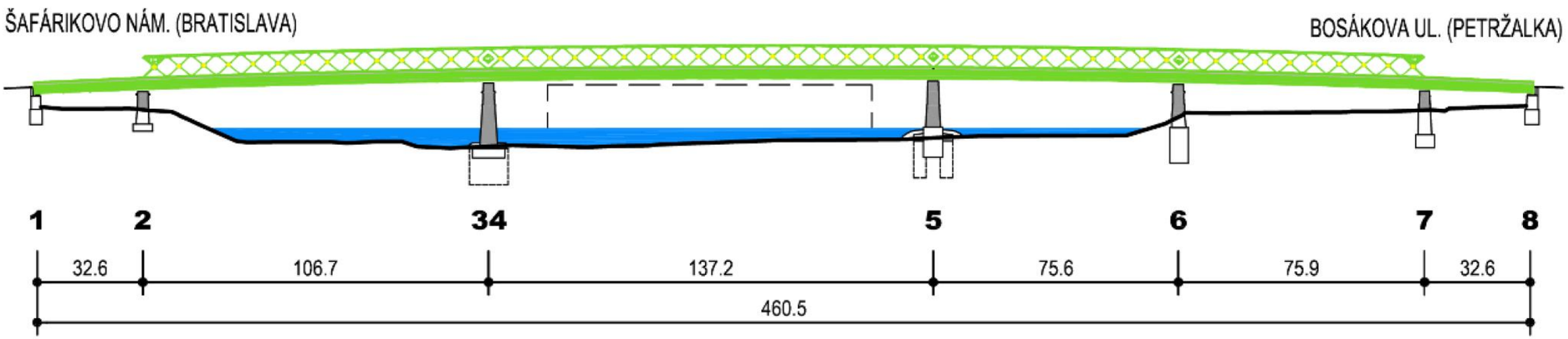


Bridge “Starý most”, Bratislava

Long term monitoring of the bridge in use and during the build up

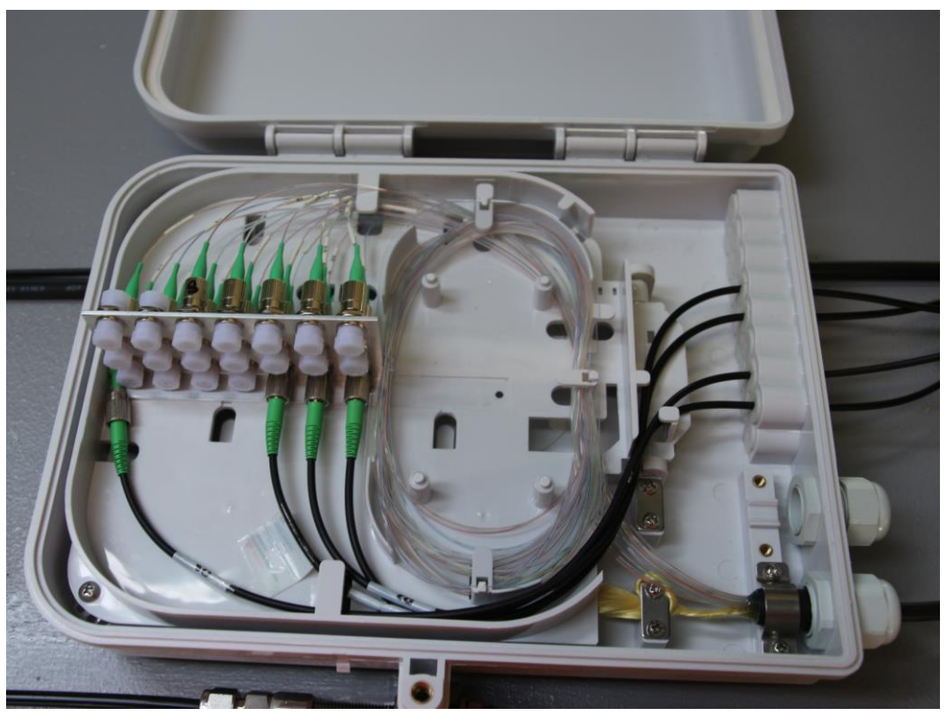
Requirements:

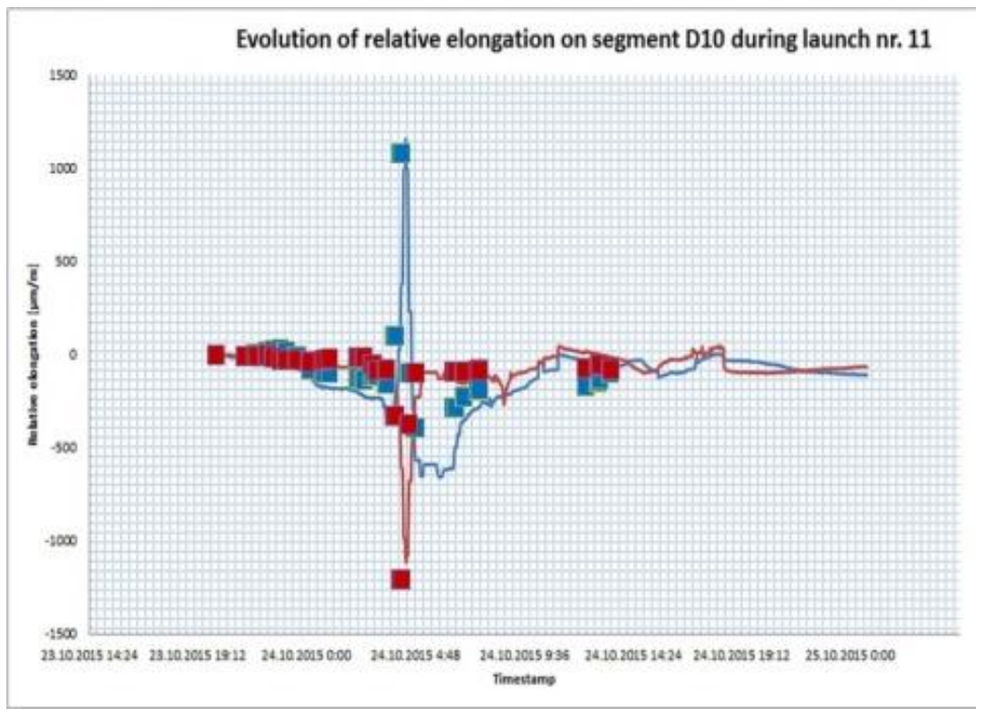
- Modular system continuously growing with the bridge under construction
- On-line access to measured data
- Early warning



Bridge “Starý most”, Bratislava

Bridge “Starý most”, Bratislava



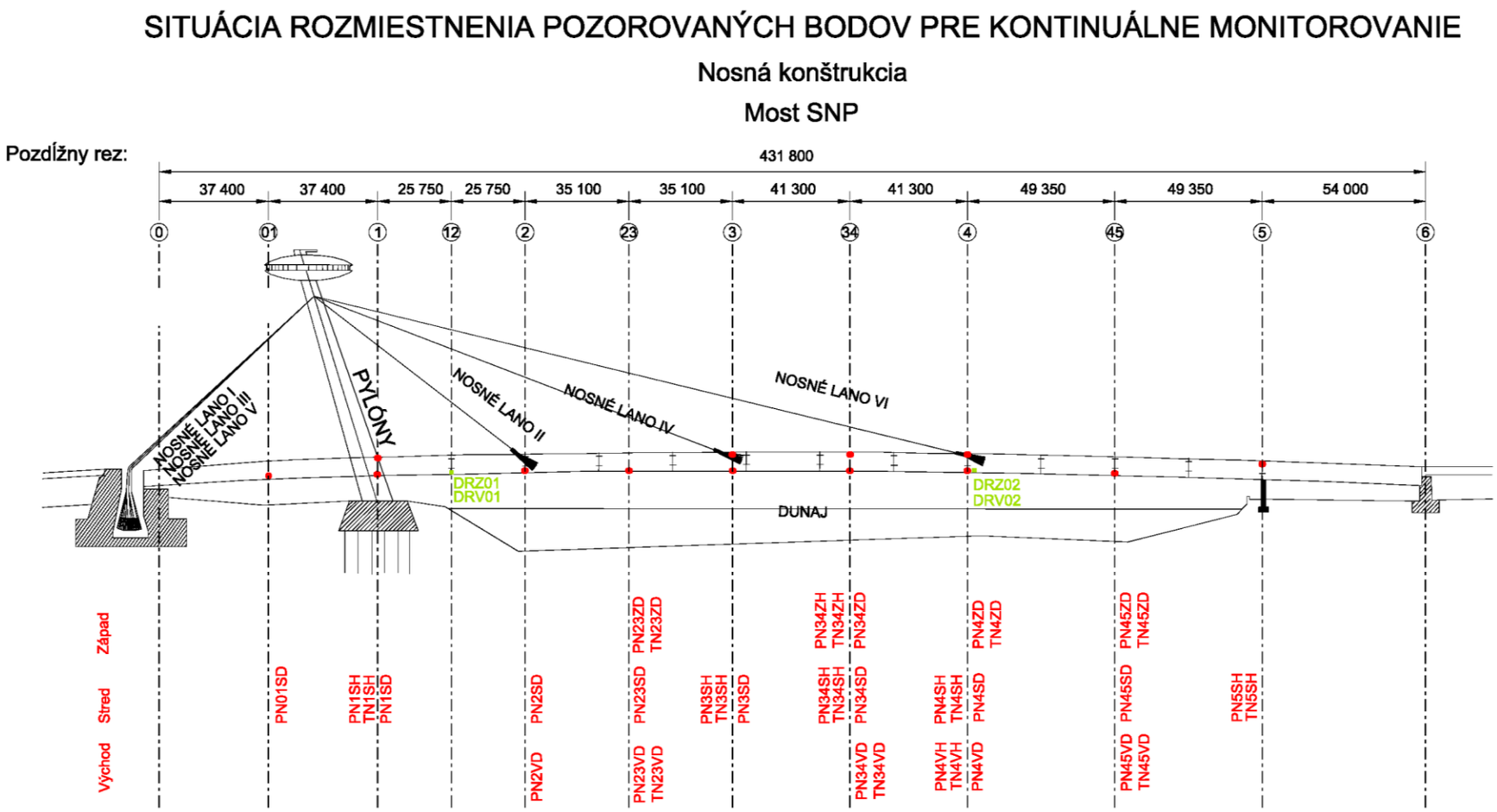


Bridge SNP, Bratislava

Real-time long time bridge deck monitoring

Requirements:

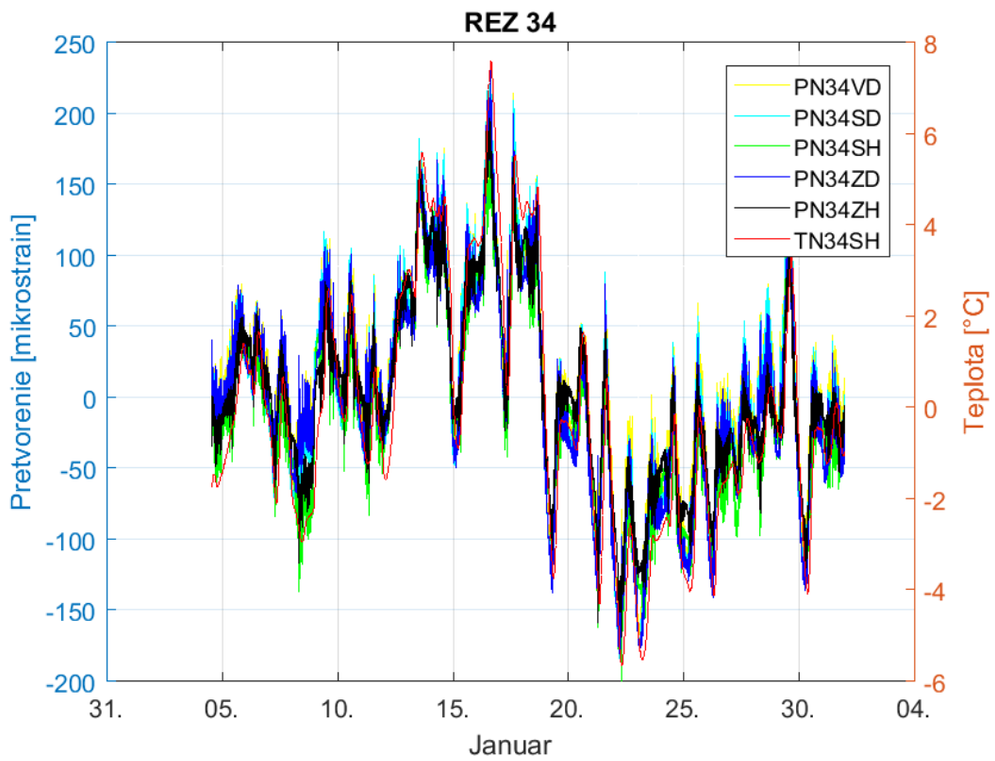
- Scalability – expandable with new measuring points
- Remote measurement system administration
- Critical values early warning



Bridge SNP, Bratislava

Benefits:

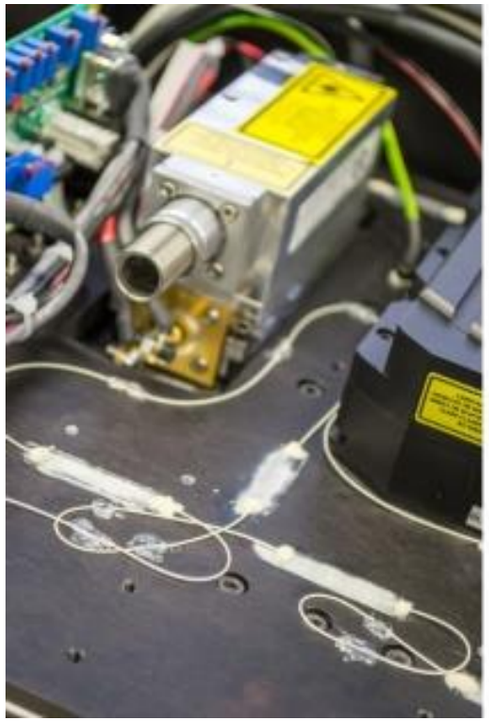
- Real time information on bridge beams condition
- Ability to identify temperature, traffic and parcially weather impacts
- Early warning for exceeded critical values

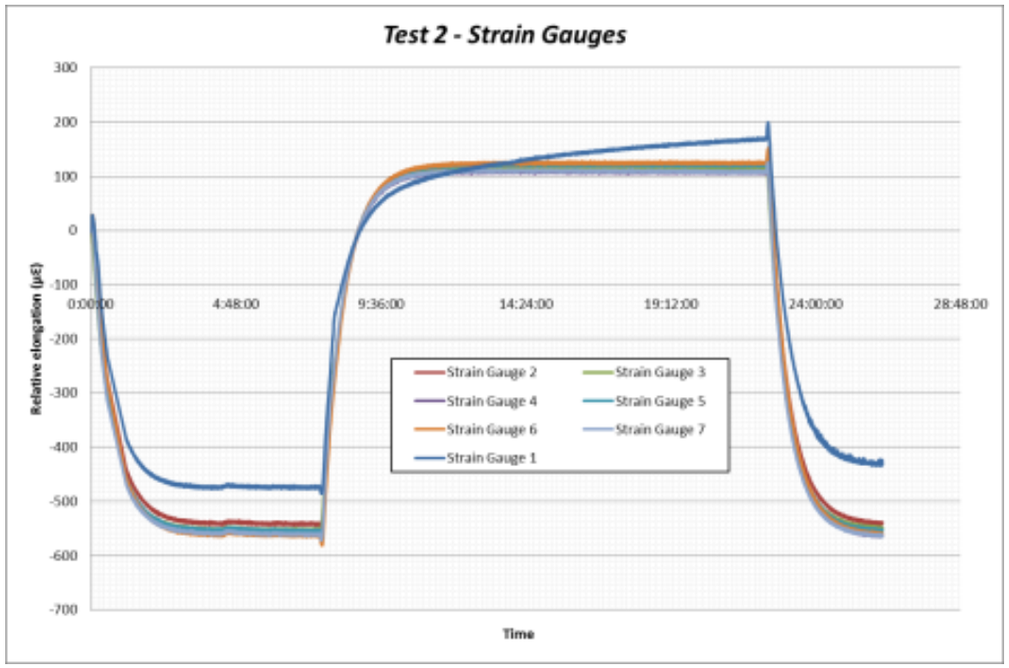


Structural analysis of industrial instrument

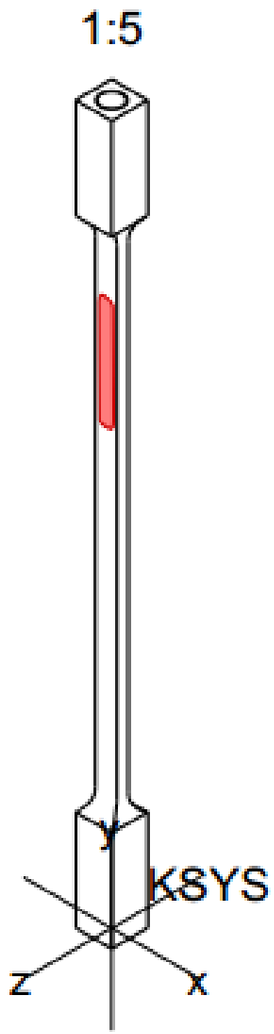
- Measurement of stability of the carrier holding the laser sources
- Experimental analysis focused on identifying possible causes of small inaccuracies of the laser system
- Measurement of two axial strain and temperature

Structural analysis of industrial instrument





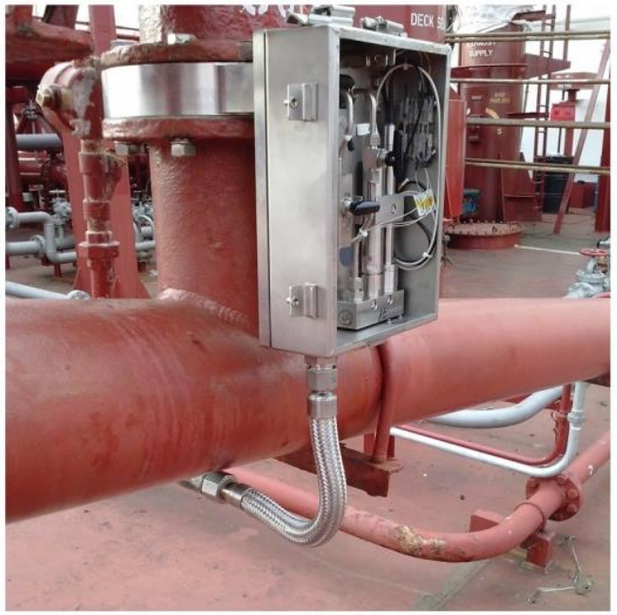
Mechanical girder load test, Slovakia



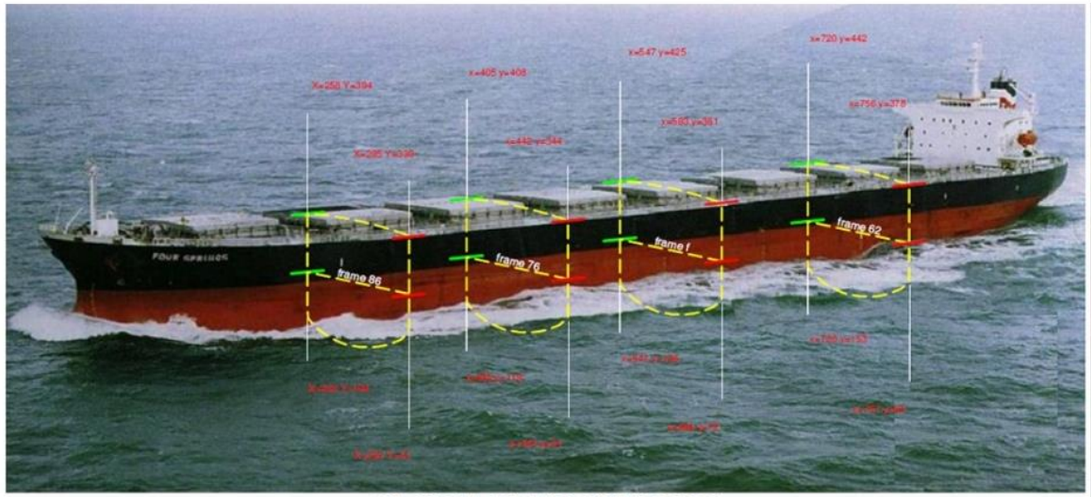
Girder was loaded constantly and exposed to high corrosive environment. The aim of this testing was to verify which of actually available monitoring technologies will provide long term stable measuring results in this environment.

Our FBG based sensors (FFA-01) succeeded to survive this harsh environment for the entire length of testing with very stable measuring results confirming the suitability of fiber-optic technology for such long term monitoring projects in any industry.

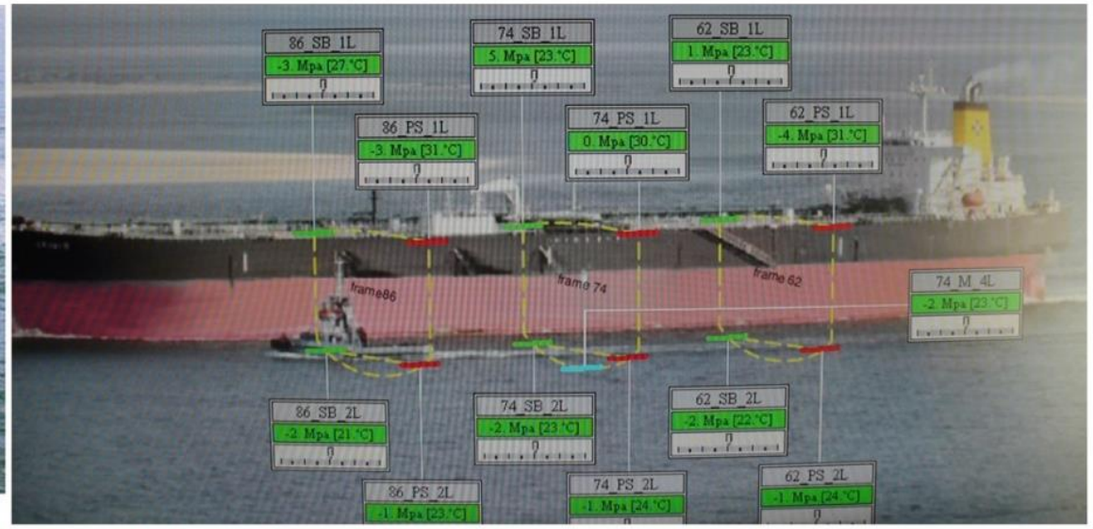
Ship monitoring, Turkey

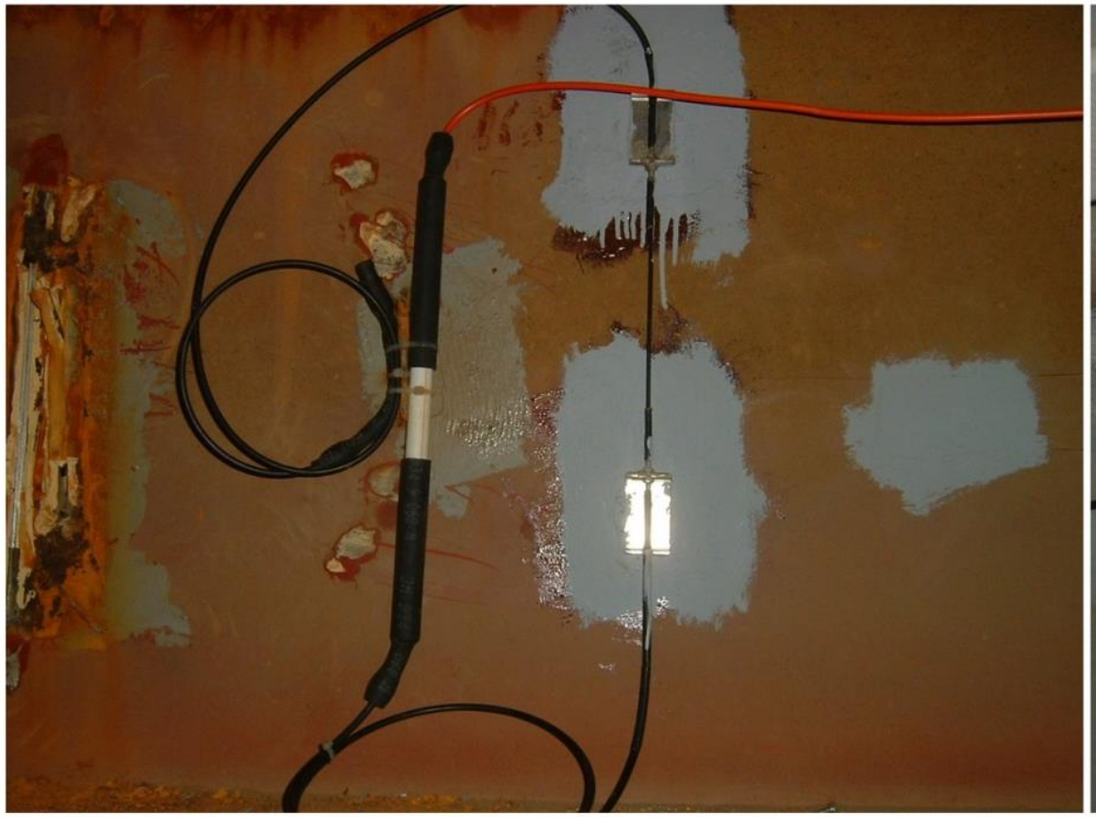


Ship monitoring, Italy



GLOBAL BEND SENSORS





Project originally supplied by FOS&S

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Thank you for your attention

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