

Optimizing structural health monitoring

USING OPTICAL TECHNOLOGY

Cristina Barbosa



HBK:PUBLIC

Introductions – Cristina Barbosa

- Product Manager, Optical Business
- Degree in Civil Engineering
- 15 years of experience in optical measurement solutions within HBM FiberSensing

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Challenges of SHM

WHERE OPTICAL TECHNOLOGY CAN HELP



#DURABILITY

#STABILITY

#RELIABILITY

Challenges of SHM

- Long periods of operation

OPTICAL TECHNOLOGY



Silica



Resistant

#DURABILITY

#STABILITY

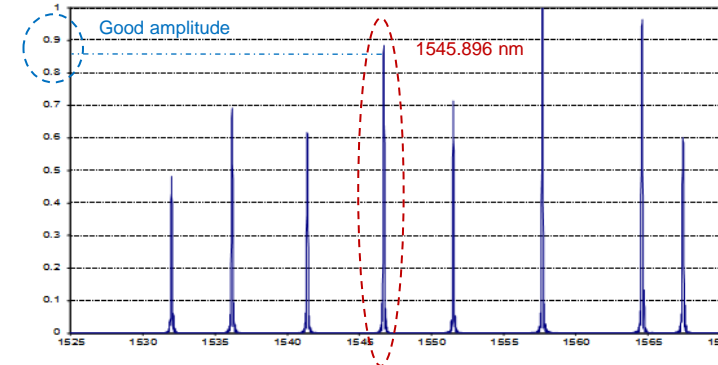
#RELIABILITY

Challenges of SHM

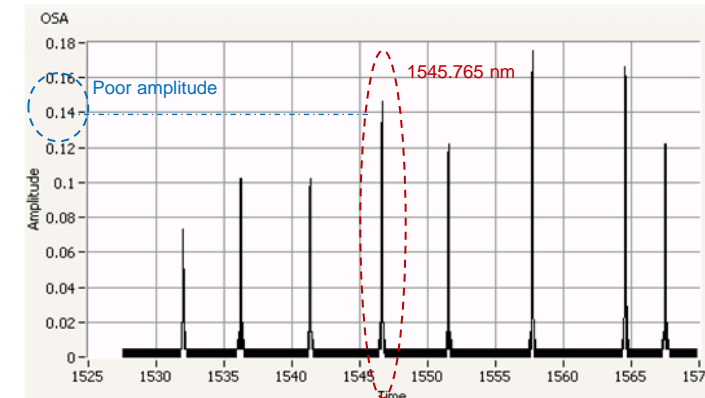
Long periods of operation

OPTICAL TECHNOLOGY

OC63 - S59 @ 2008.02.15



OC63 - S59 @ 2013.11.21



Wavelength



Insensitive to losses

#DURABILITY

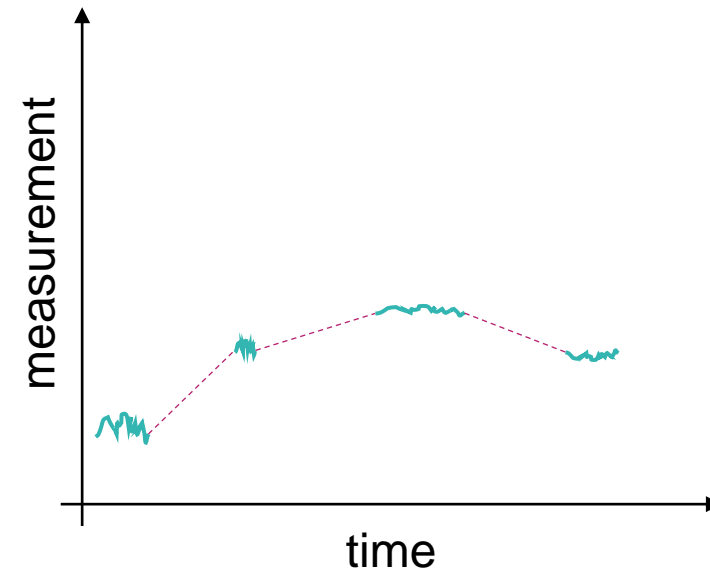
#STABILITY

#RELIABILITY

Challenges of SHM

Referenced measurements

OPTICAL TECHNOLOGY



Wavelength



Absolute

#DURABILITY

#STABILITY

#RELIABILITY

Challenges of SHM

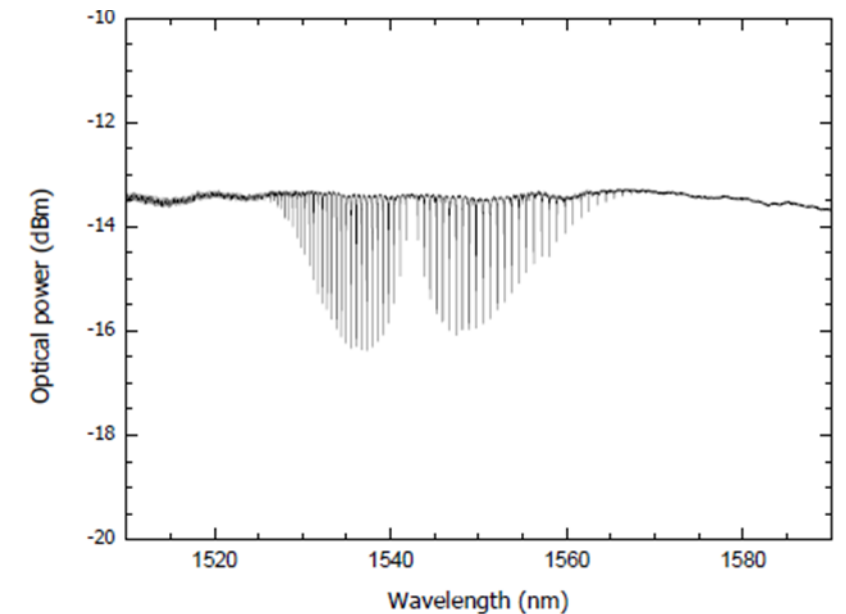
- Trusted measurements

OPTICAL TECHNOLOGY

Interrogators with
built-in reference



No Drift



Challenges of SHM

▲ Harsh Environments

Water

EMI/RFI

Salt

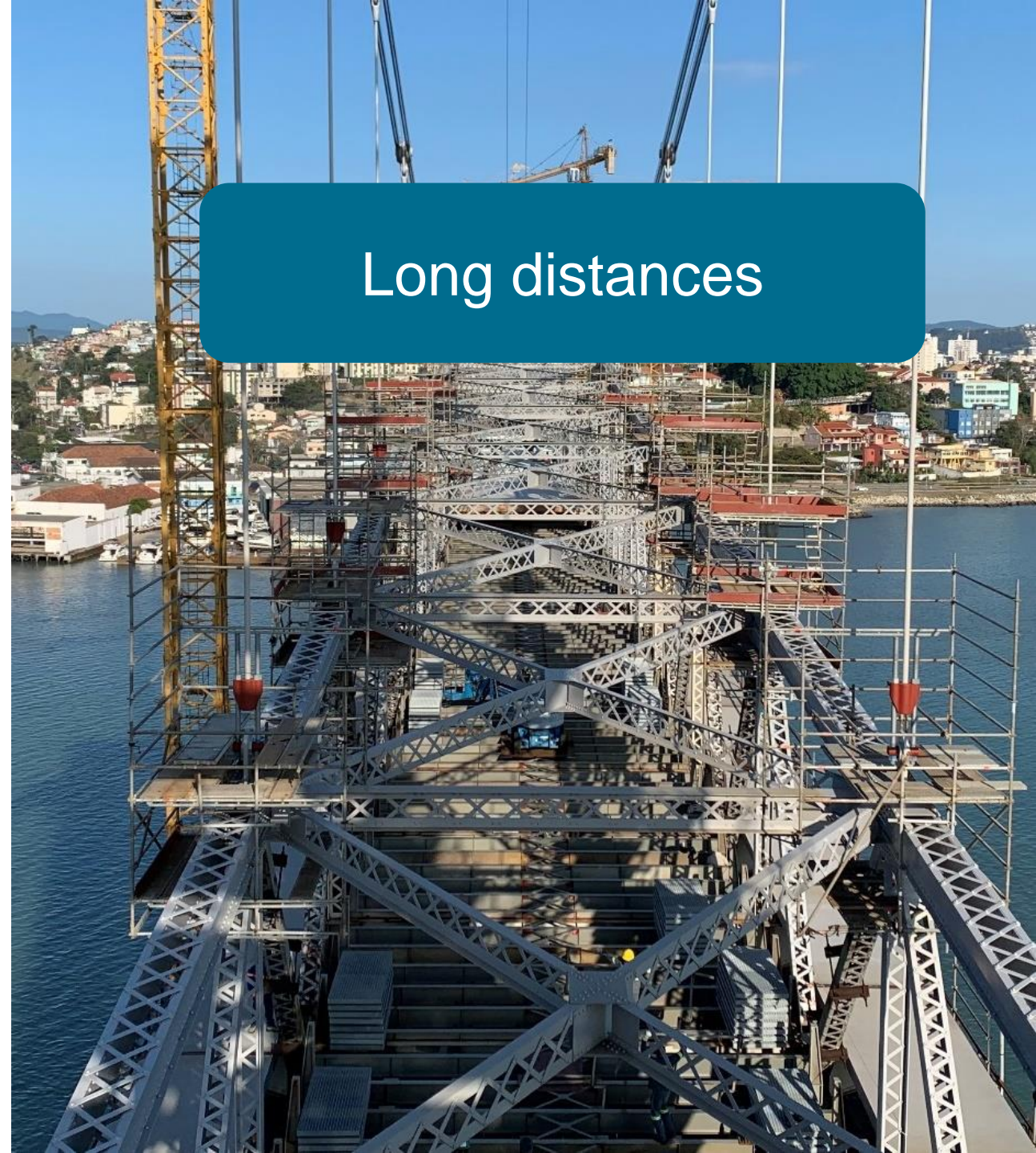
ATEX

Challenges of SHM

- Signal transmission

OPTICAL TECHNOLOGY

Data acquisition system installed far from sensors

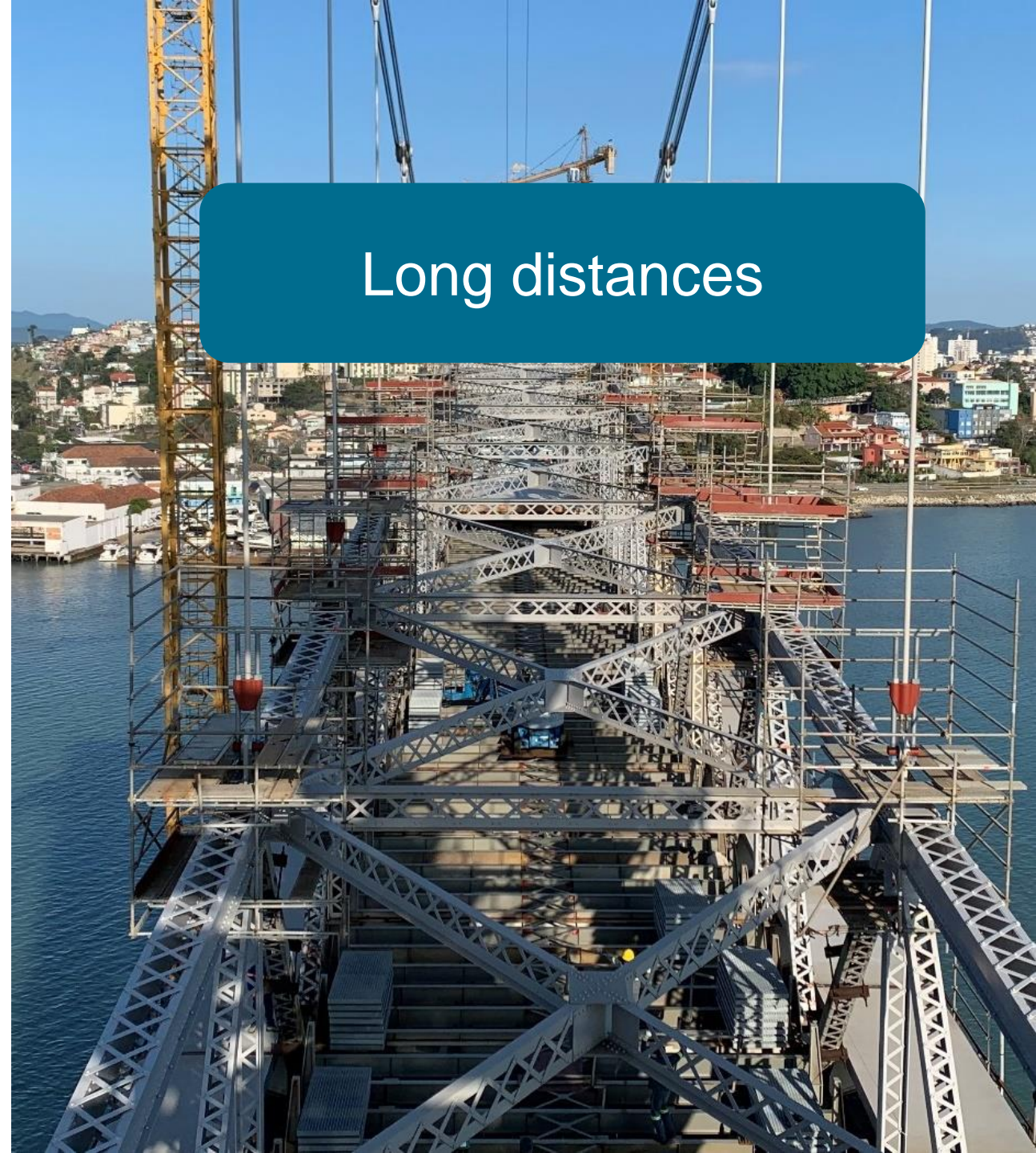


Challenges of SHM

Signal transmission

OPTICAL TECHNOLOGY

Low attenuation of the optical fibers



Long distances



Replicated sections

Challenges of SHM

Large sensor count

OPTICAL TECHNOLOGY



Multiplexing

Multifunctionality

32

Conventional
sensors

128

Wires

45

FBG sensors

4

Wires

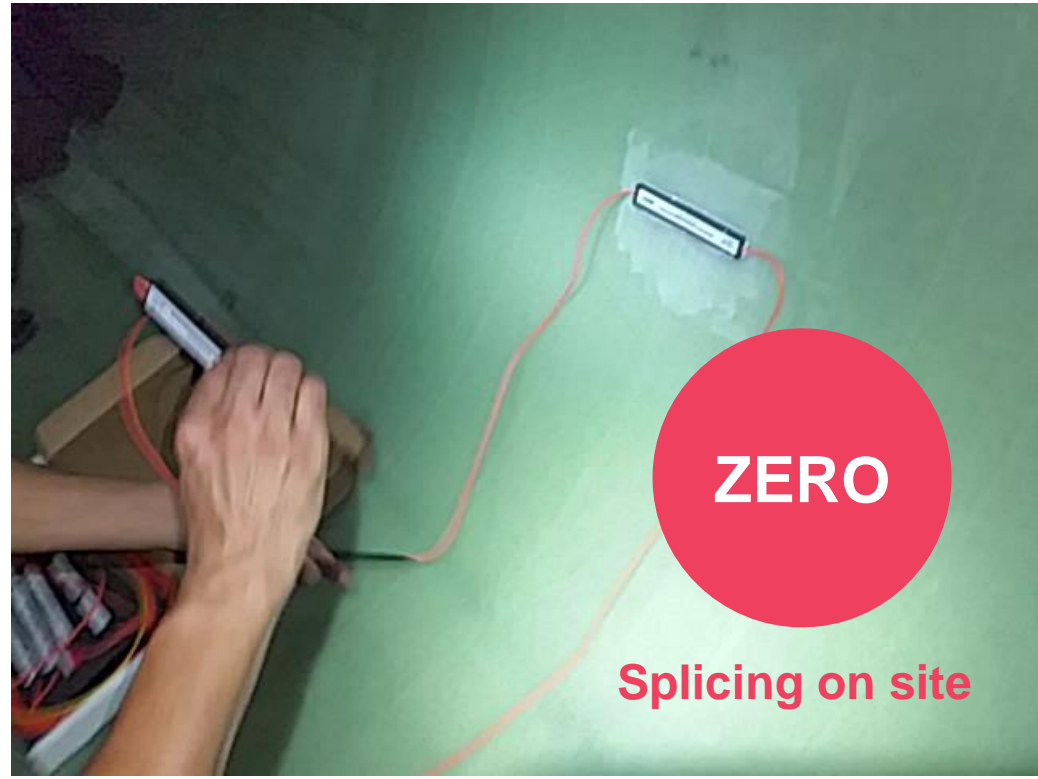




Challenges of SHM

Installation efficiency
OPTICAL TECHNOLOGY

Preassembled
arrays of sensors

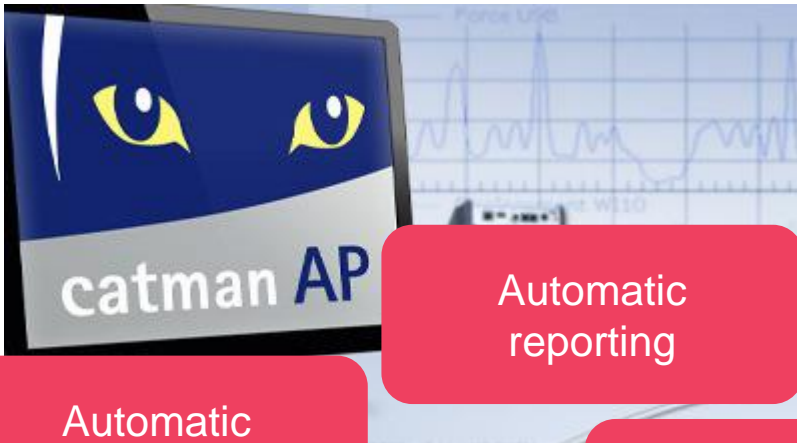


Challenges of SHM

▲ Data management

OPTICAL TECHNOLOGY

Catman software



Automatic reporting

Automatic processing

Alarming

Cloud

Data centers



Challenges of SHM

▲ Cost Effective

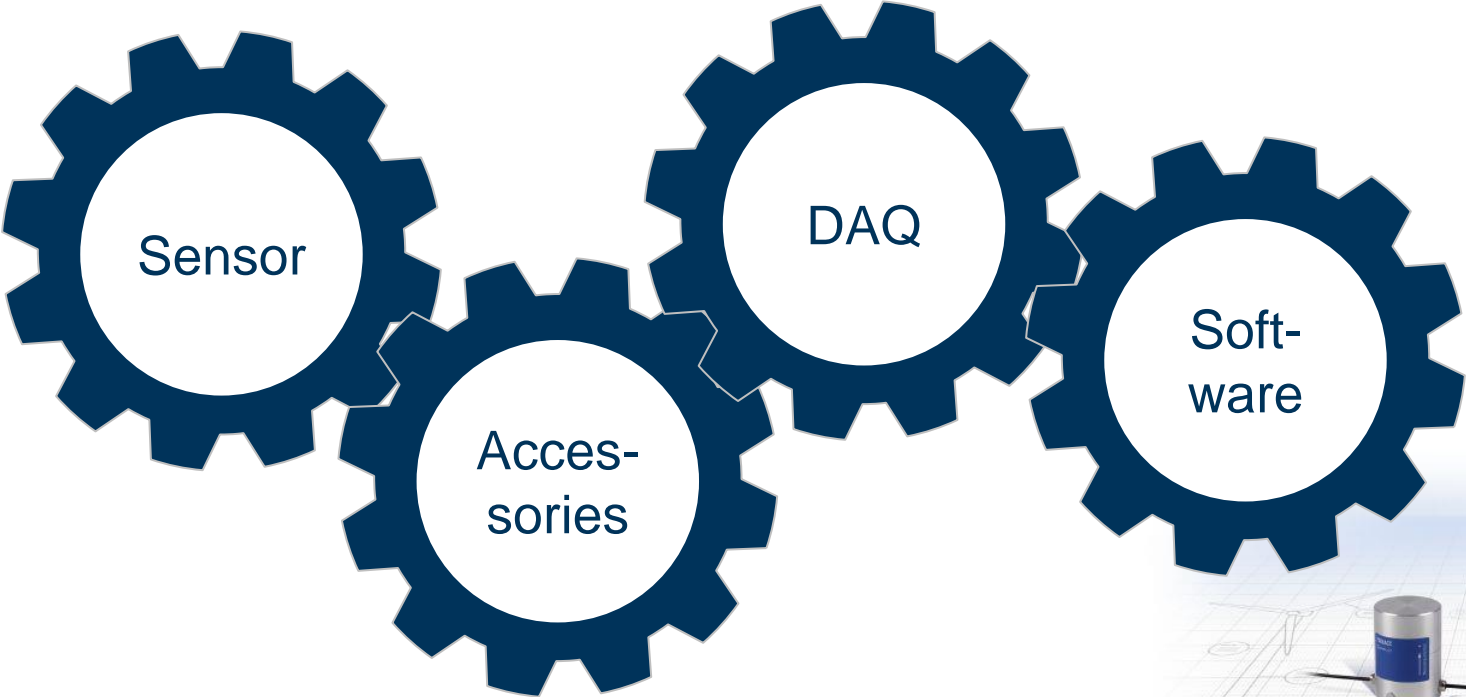
DURABLE

STABLE

RELIABLE

Challenges of SHM

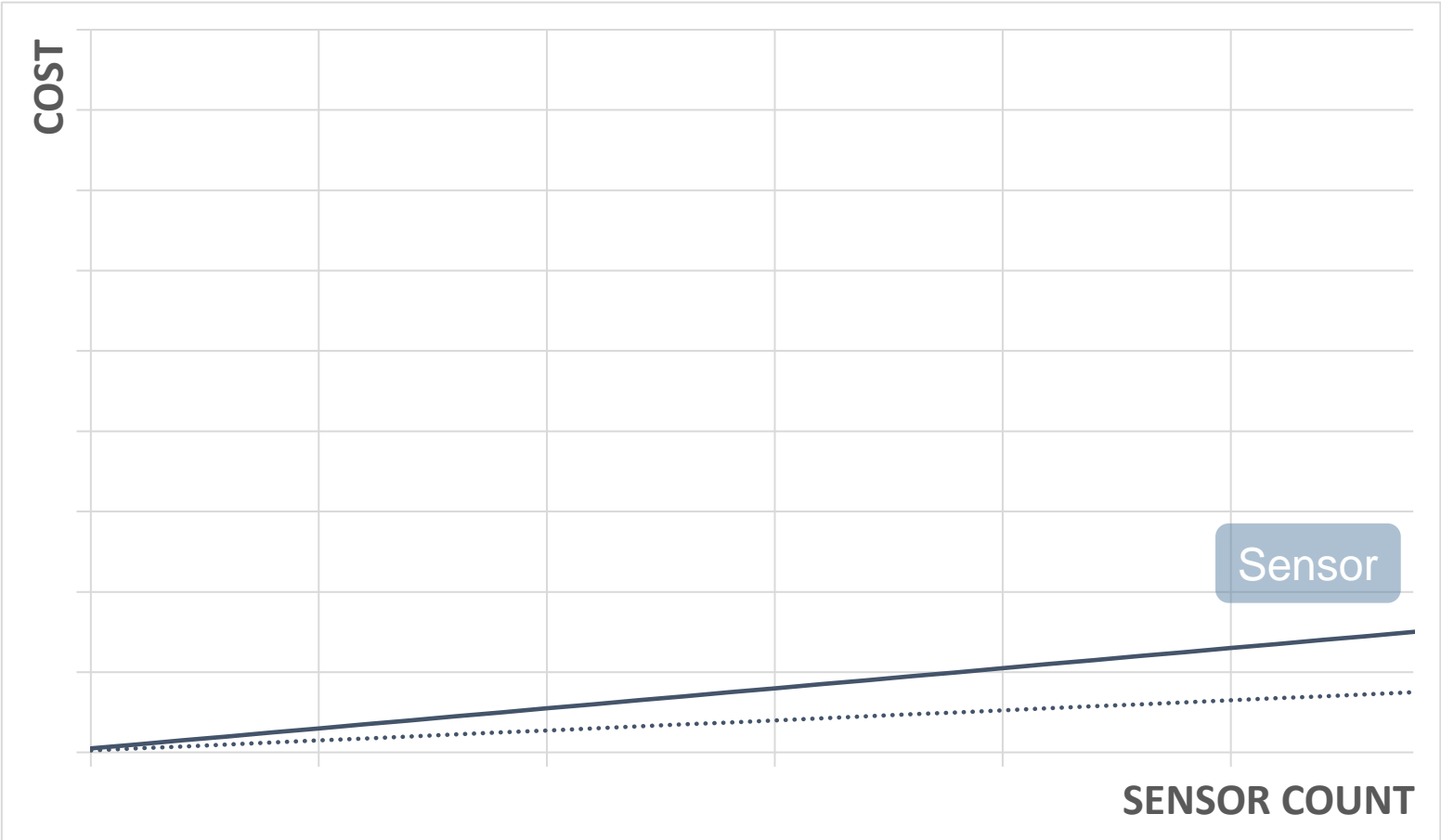
▲ Cost Effective



FULL MEASUREMENT CHAIN

Challenges of SHM

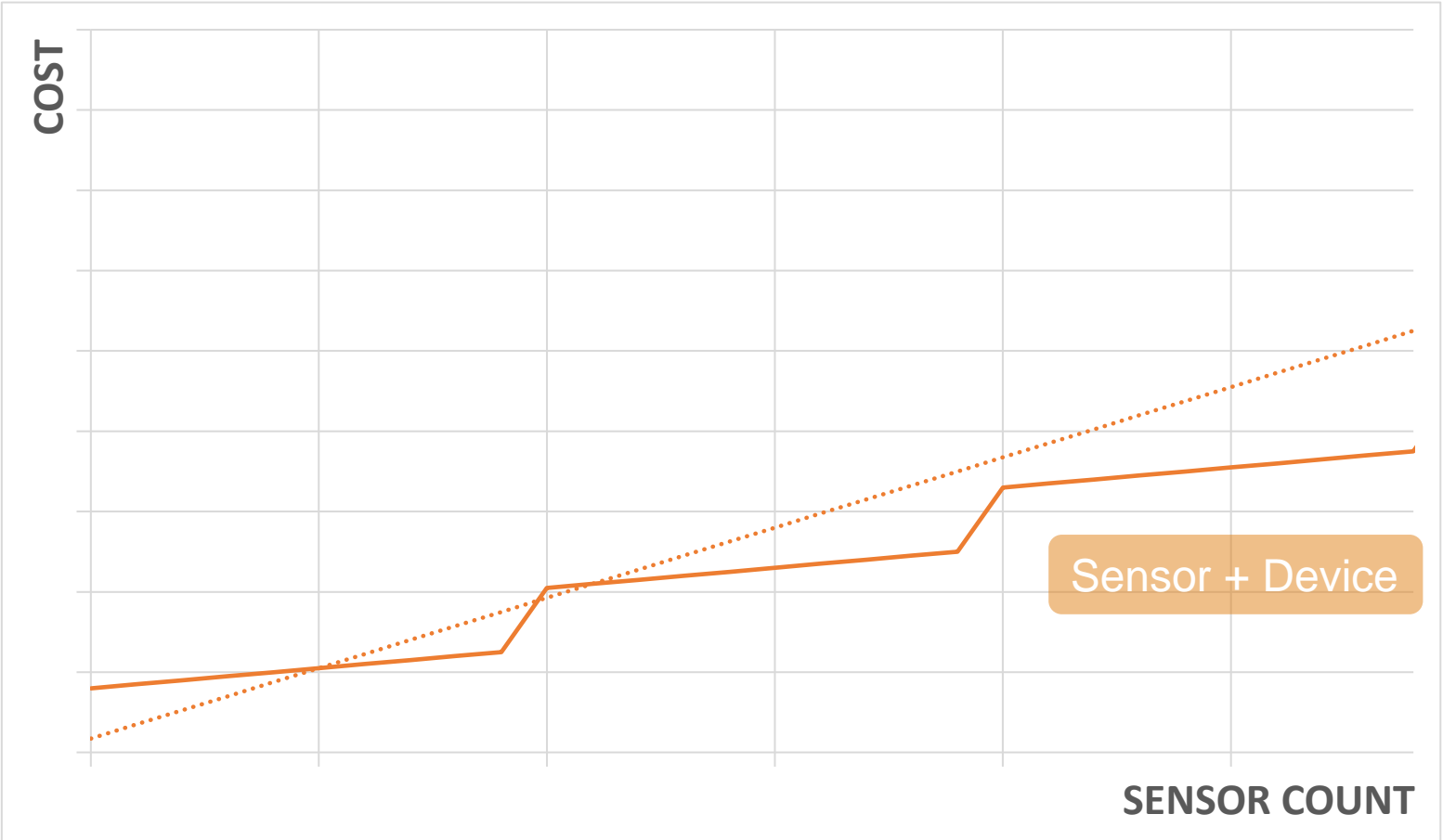
▲ Cost Effective



TECHNOLOGY:
..... Conventional
——— Optical

Challenges of SHM

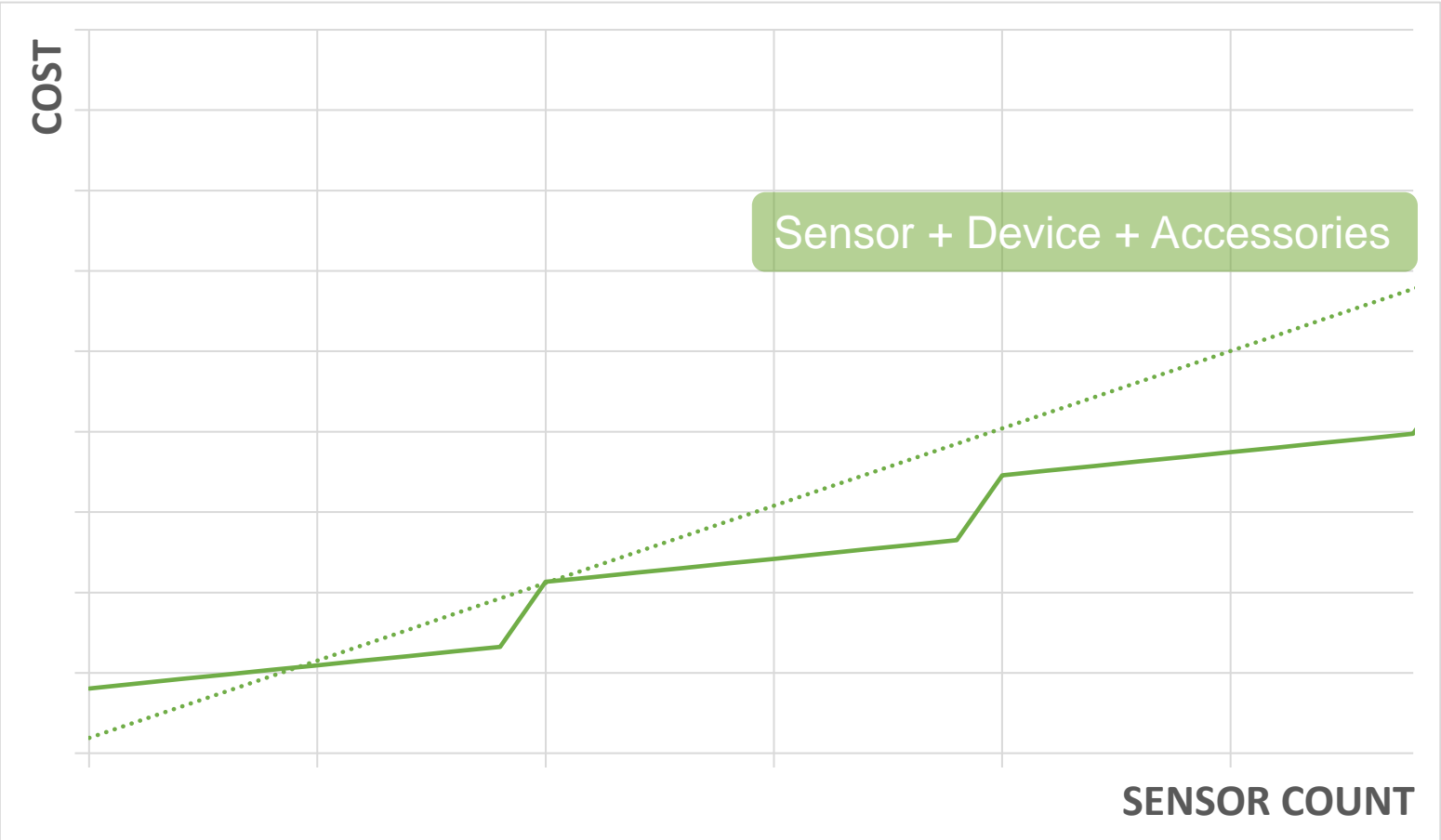
▲ Cost Effective



TECHNOLOGY:
..... Conventional
—— Optical

Challenges of SHM

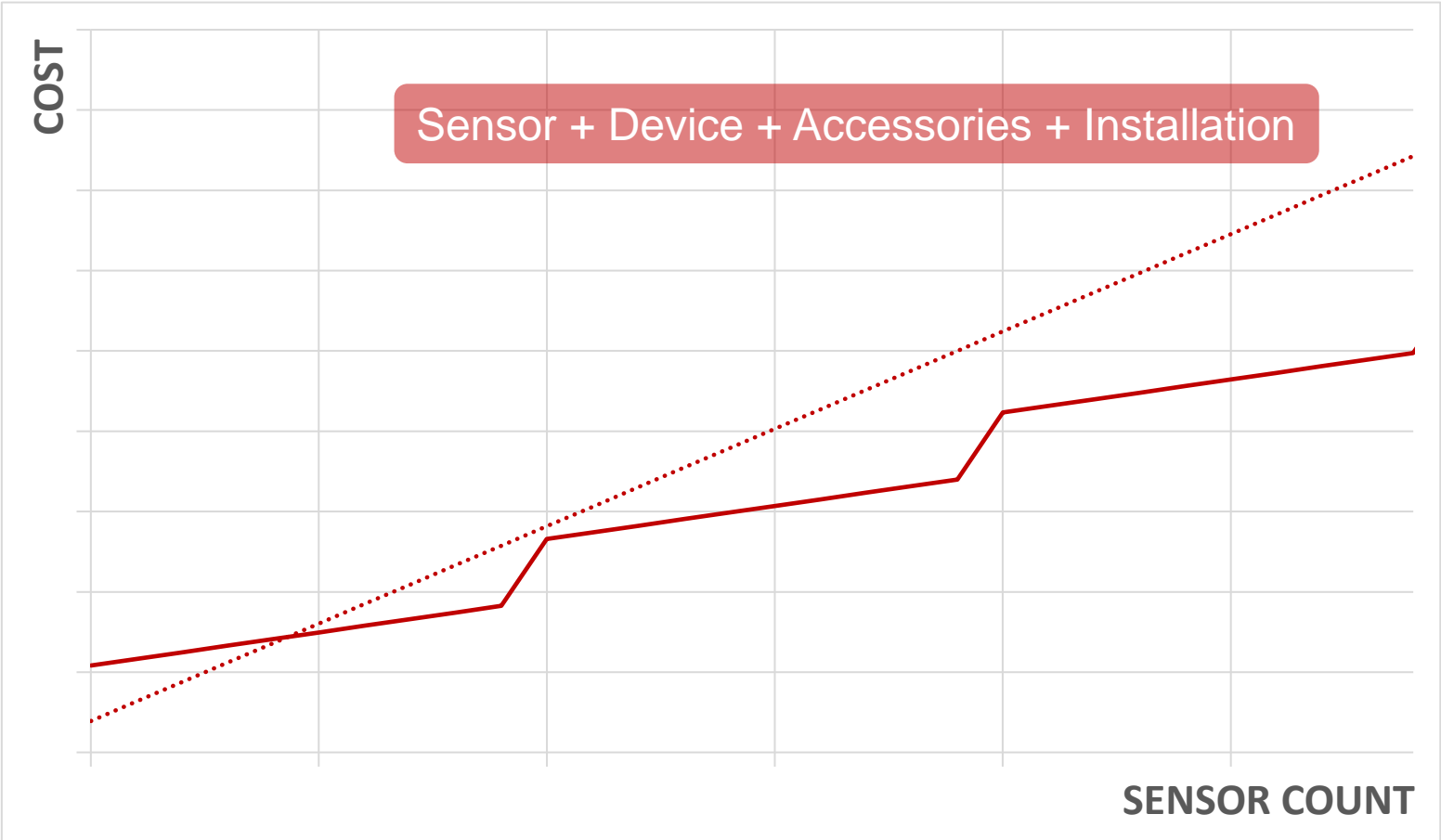
▲ Cost Effective



TECHNOLOGY:
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Challenges of SHM

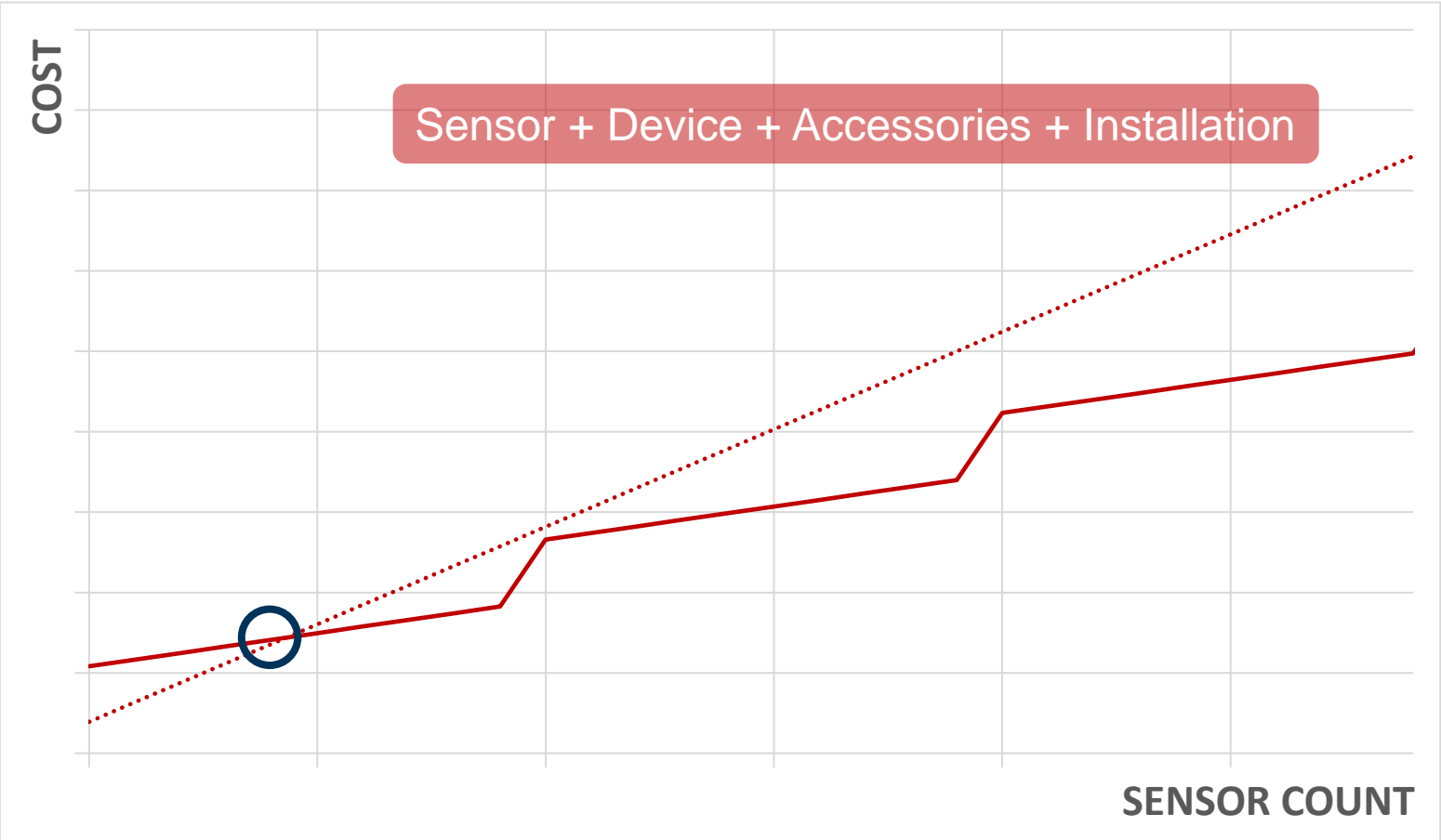
▲ Cost Effective



TECHNOLOGY:
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Challenges of SHM

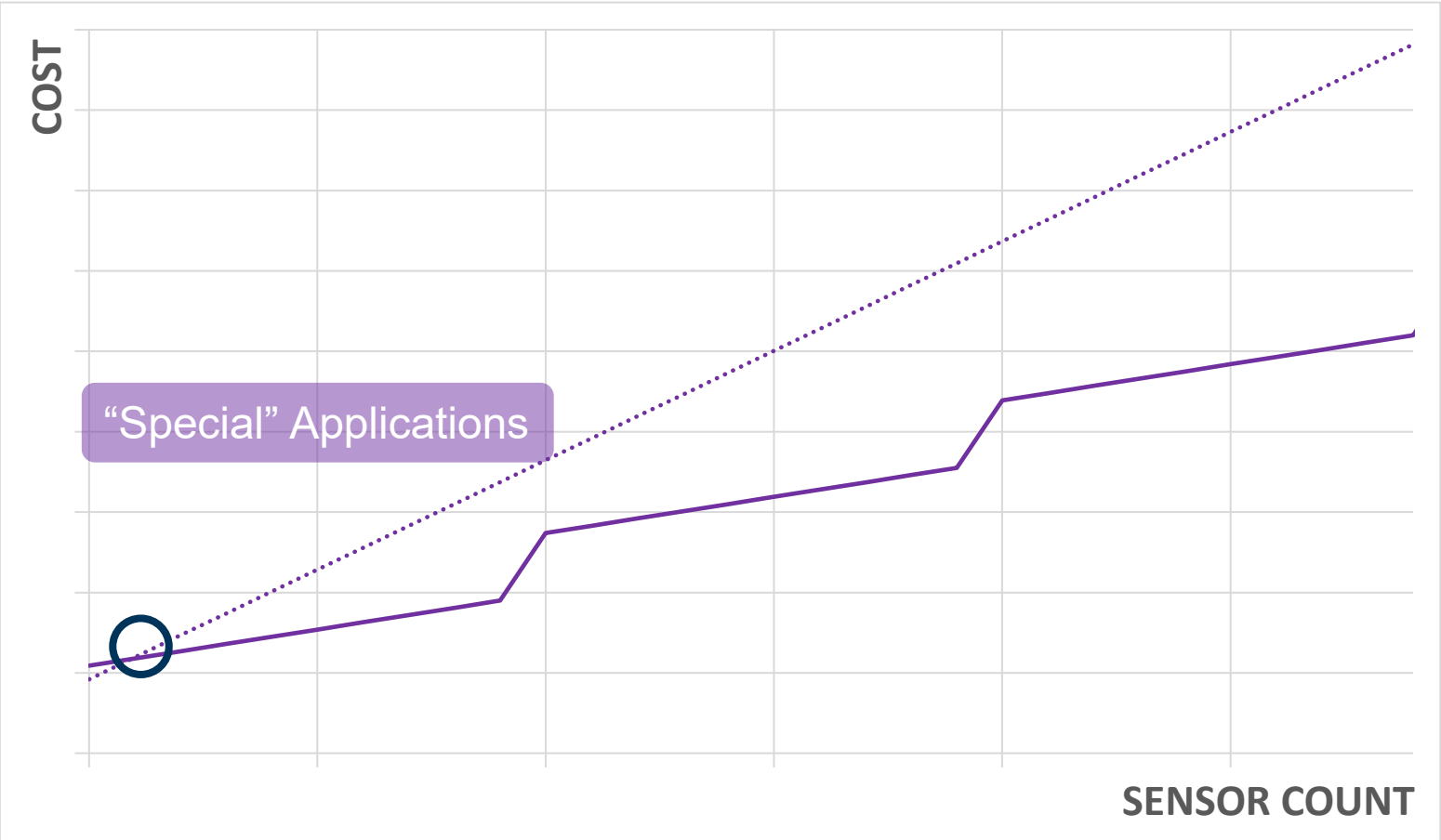
▲ Cost Effective



TECHNOLOGY:
..... Conventional
——— Optical

Challenges of SHM

▲ Cost Effective



TECHNOLOGY:
..... Conventional
——— Optical

Hybrid concept

THE BEST OF BOTH WORLDS



Hybrid concept

- ▲ Using conventional and optical technology combined



Optical



Electrical

Hybrid concept

- Using conventional and optical technology combined



Under the same interface



Hybrid concept

- ▲ Using conventional and optical technology combined

All data collected simultaneously

Best available solution for each measurement

Synchronized equipment

The new MXFS

The new MXFS

▲ BraggMETER

- 100 nm wavelength range
- 8 optical connectors; 16 channels per connector

128
Sensors

- Two sample rate modes

100S/s

2000S/s

- Smart Peak Detection

SPD



The new MXFS

QuantumX

- Reduced size and weight

2 Kg

174 x 88 x
135 mm

- Scalable

Ethernet

FireWire

Backplane

Analog

CAN

- Synchronization

NTP

PTPv2



The new MXFS

Catman Software

The screenshot displays the Catman AP V3.4.1 software interface. The main window shows a list of channels with their respective readings. A dialog box titled 'Configure wavelength range for MXFS8D1/FC' is open, showing an optical spectrum plot with several peaks. Below the plot is a table of channel parameters.

Channel	Band min [nm]	Band max [nm]	Reference [nm]
CH1	1589,00	1594,00	1590,783
CH2	1517,00	1523,50	1520,745
CH3	1527,82	1532,82	1530,803
CH4	1537,82	1542,82	1540,721
CH5	1547,81	1552,81	1550,664
CH6	1557,86	1562,86	1560,658
CH7	1568,60	1573,60	1571,100
CH8	1578,58	1583,58	1580,740
CH9	1506,75	1514,25	0,000
CH10	-	-	-
CH11	-	-	-
CH12	-	-	-



The new MXFS

Precise

Stable

Integrable



For Successful
Structural Health Monitoring
Projects

Thank You

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