
## Final Conference

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# Printed Sensors: Exploring New Opportunities for Structural Health Monitoring

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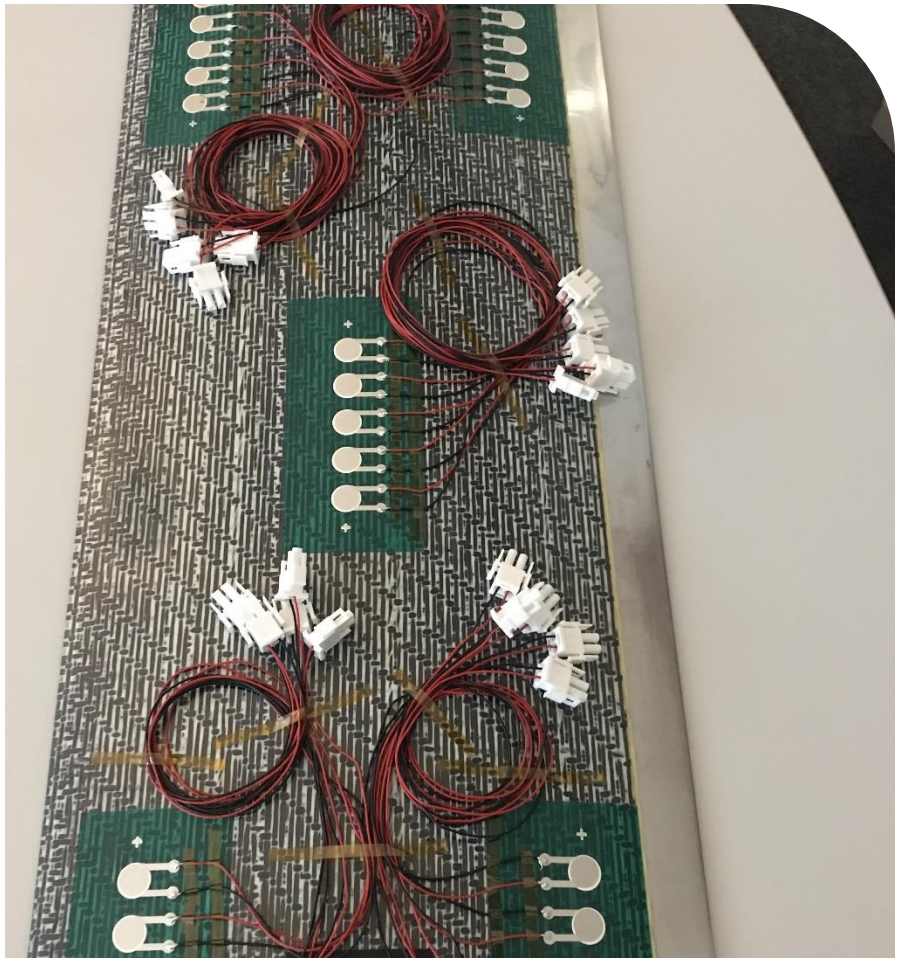


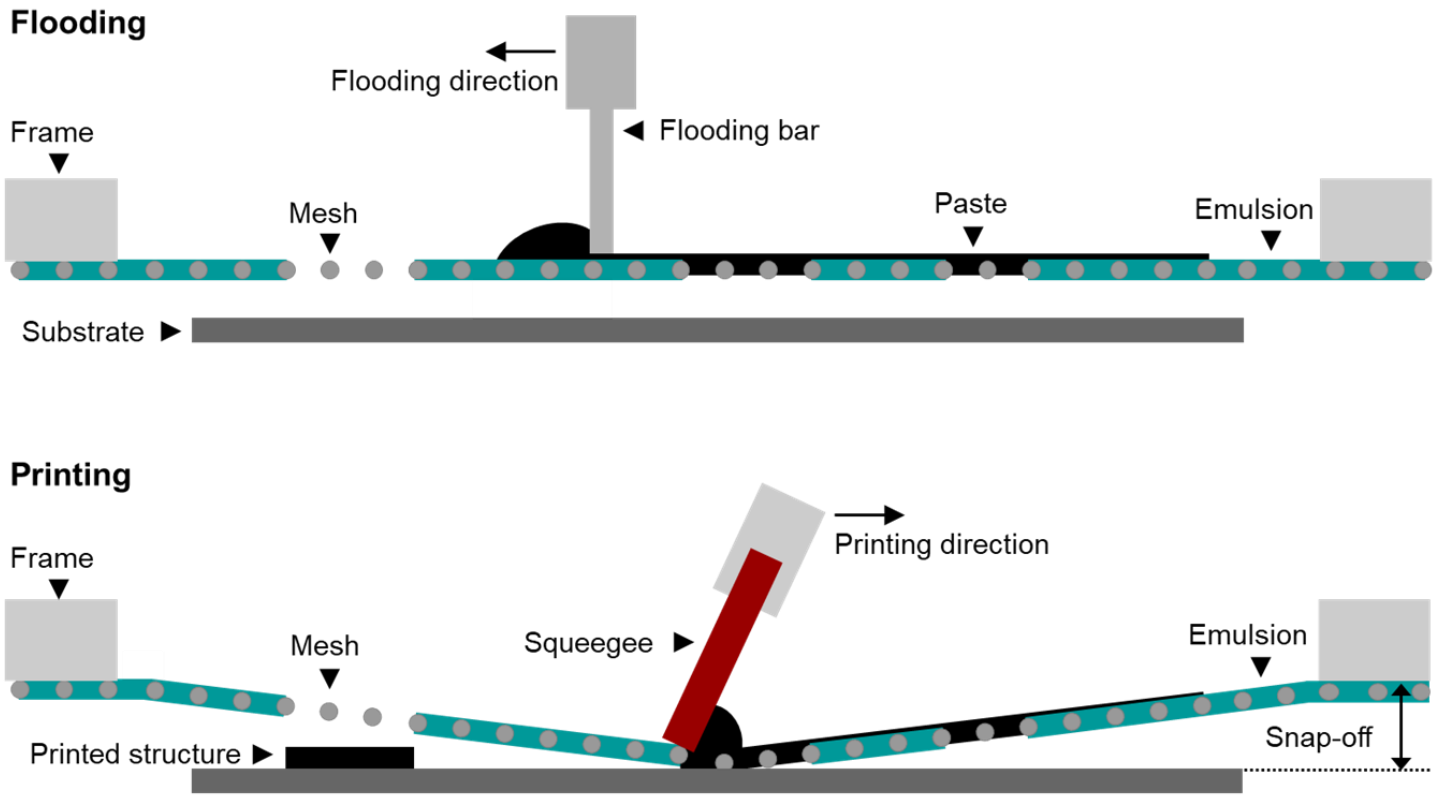
# Printed piezoelectric sensors

- Printed piezoelectric sensors for integration in composite structures without influence of structure properties and behaviour of the component
- Sensors for detection of structural deformation, damage or fatigue in aircraft to ensure aircraft safety and reliability

# Printed piezoelectric sensors

## Screen printing process

- Paste transport via squeegee
- Linear contact
- Open mesh = printing area
- Mesh covered with emulsion = non-printing area



# Printed piezoelectric sensors

## Screen printing process

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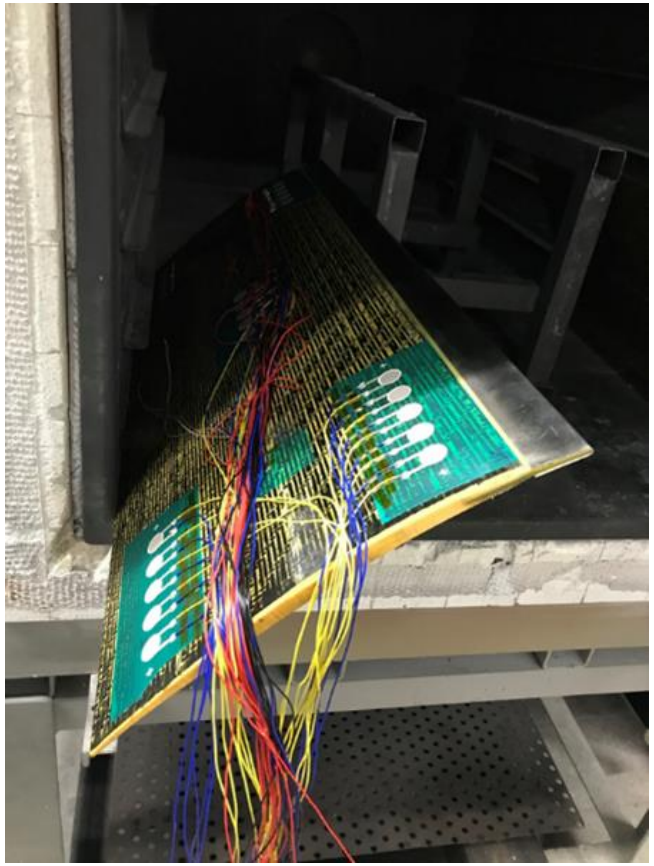
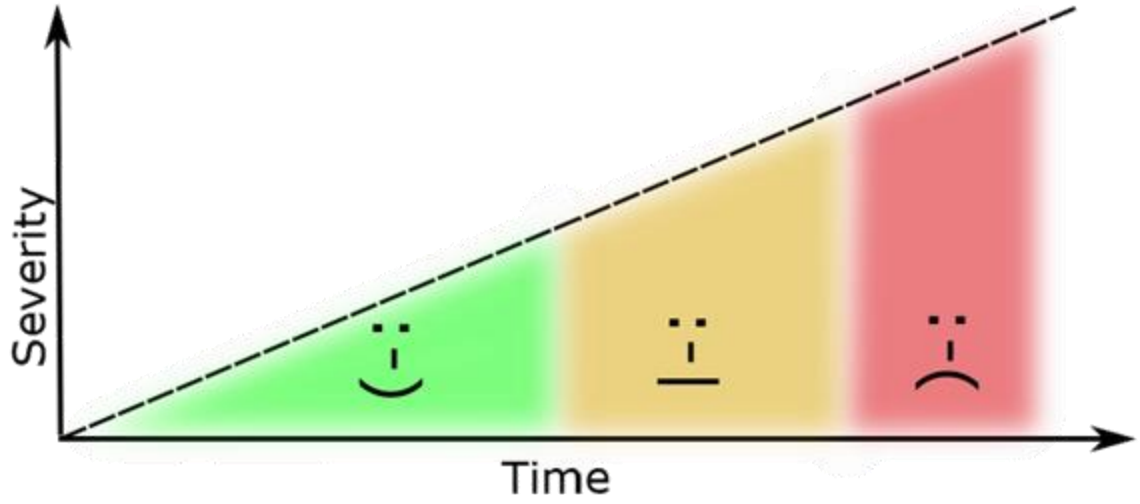
# Printed piezoelectric sensors

## Polarization of PZT sensors

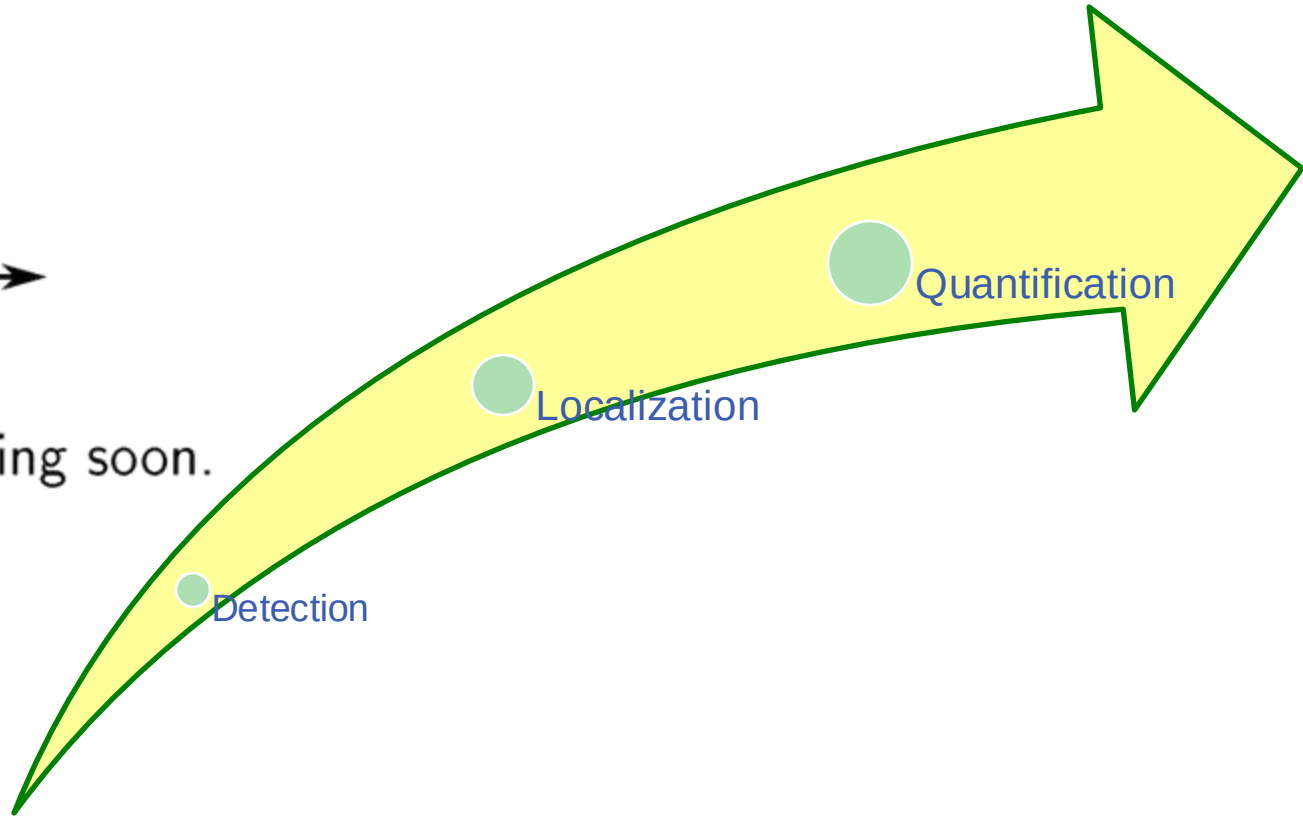
- Orientation of dipols using an electromagnetic field
- U = 350 V
- T = 100 °C
- t = 30 min



# Structural Health Monitoring principle




- :-) **Too early** → Wasted time and money.
- :-| **Best moment** → No real damage, but coming soon.
- :-( **Too late** → Failure already happened...

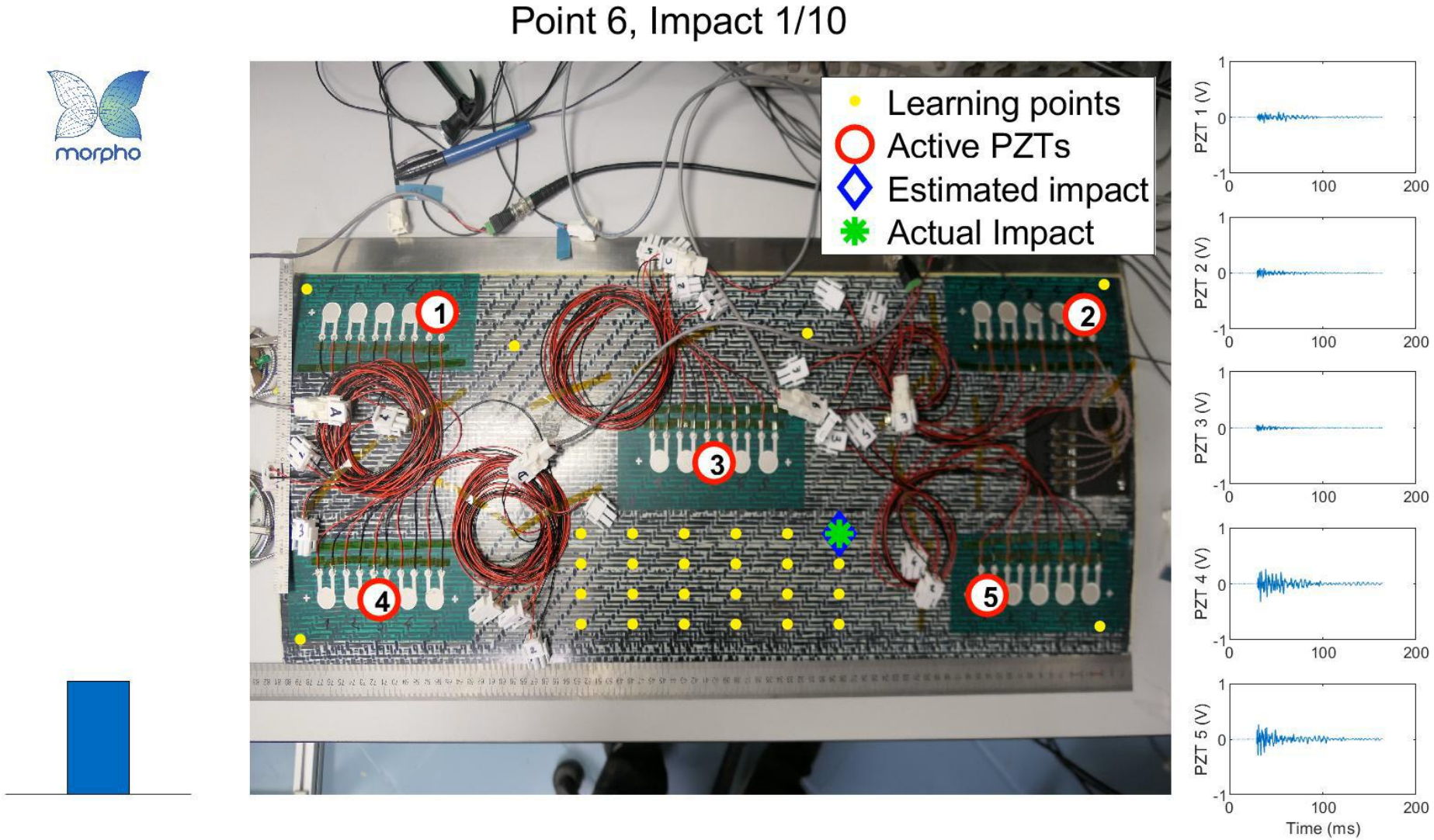


# Expectations related with printed PZTs

- Electromechanical Impedance
- Impact measurements
- Acoustic Emission
- Lamb waves interrogation

***One single sensor technology can handle several functionalities***

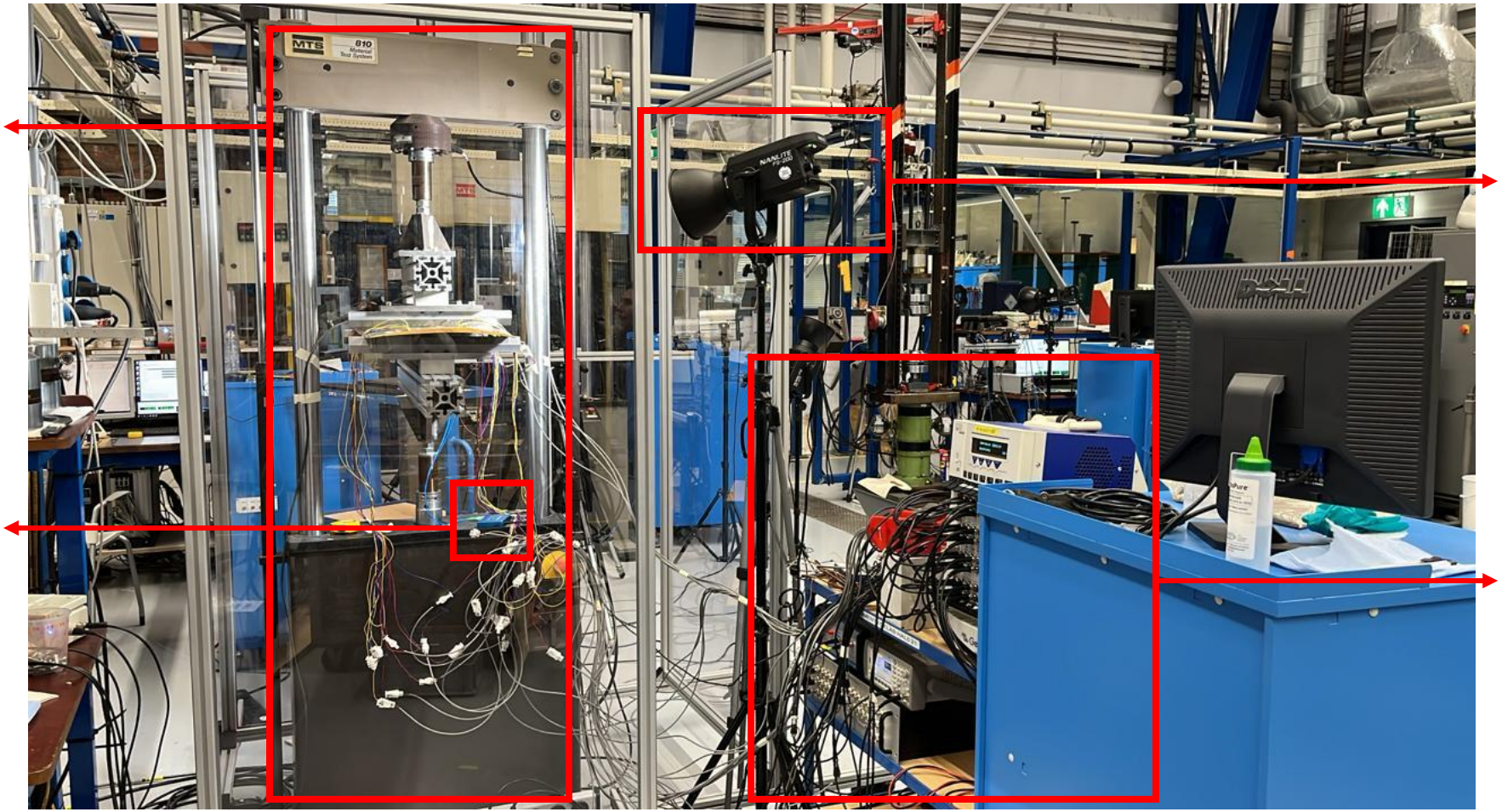
# Impact events detection & localization



# Experimental setup

MTS 810
Hydraulic
Machine

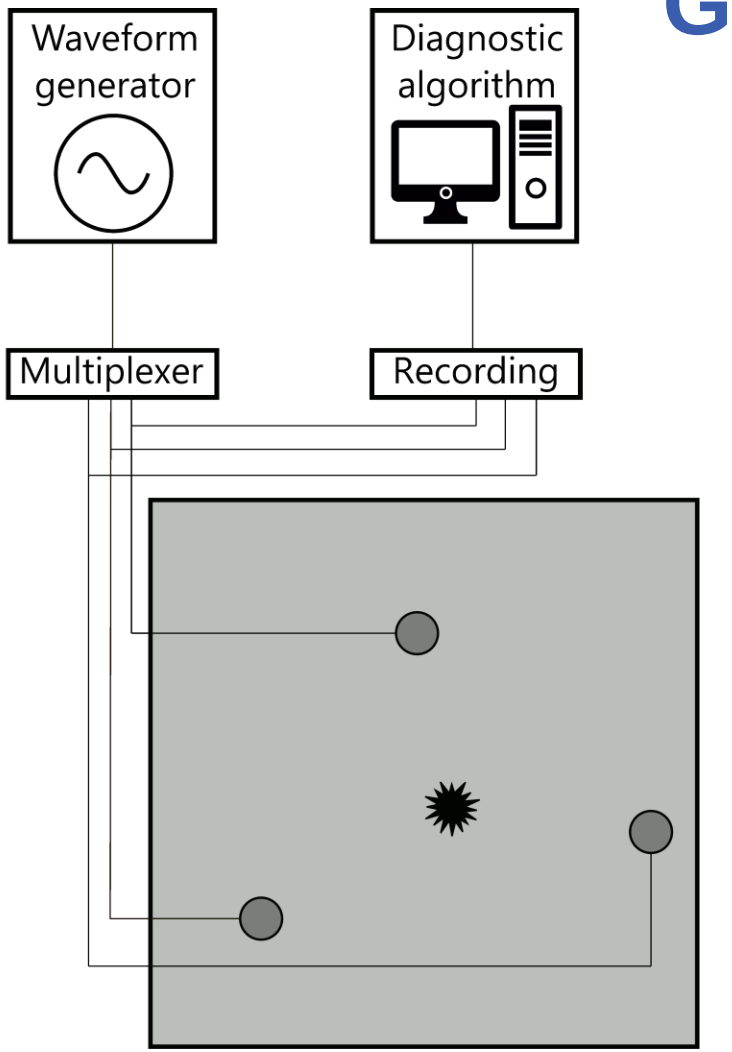
Interrogator
for FBGs

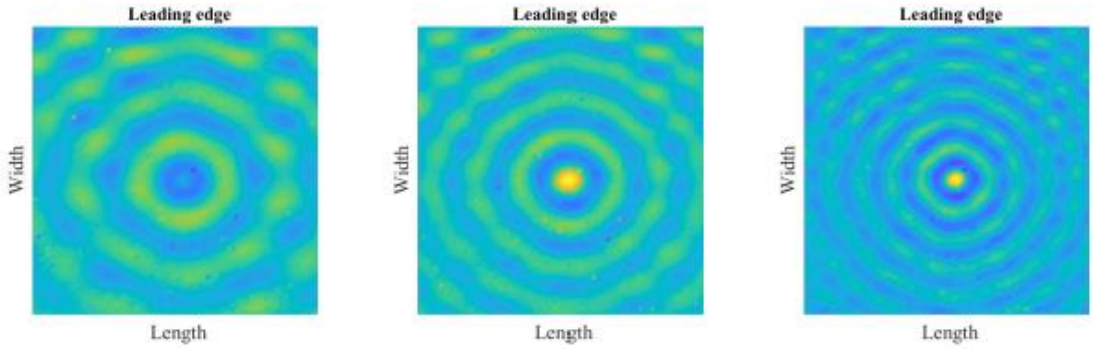



Camera

Data Acquisition
System for PZTs

# Guided waves interrogation principle

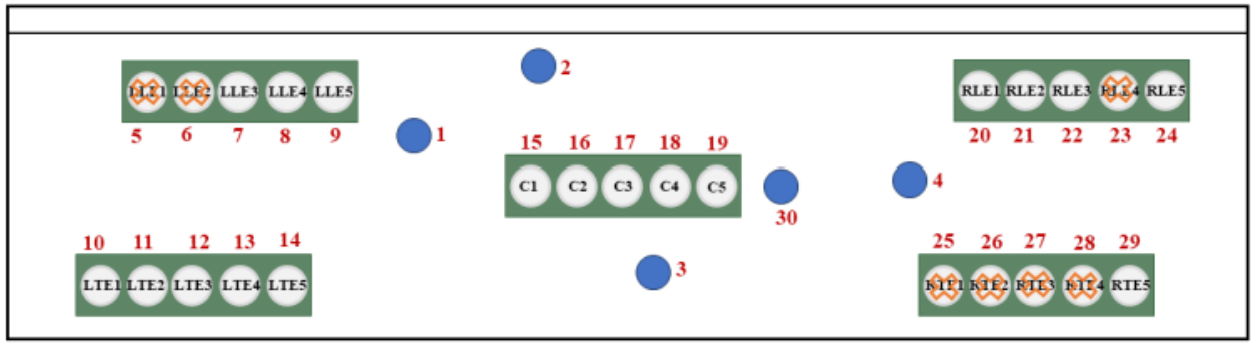


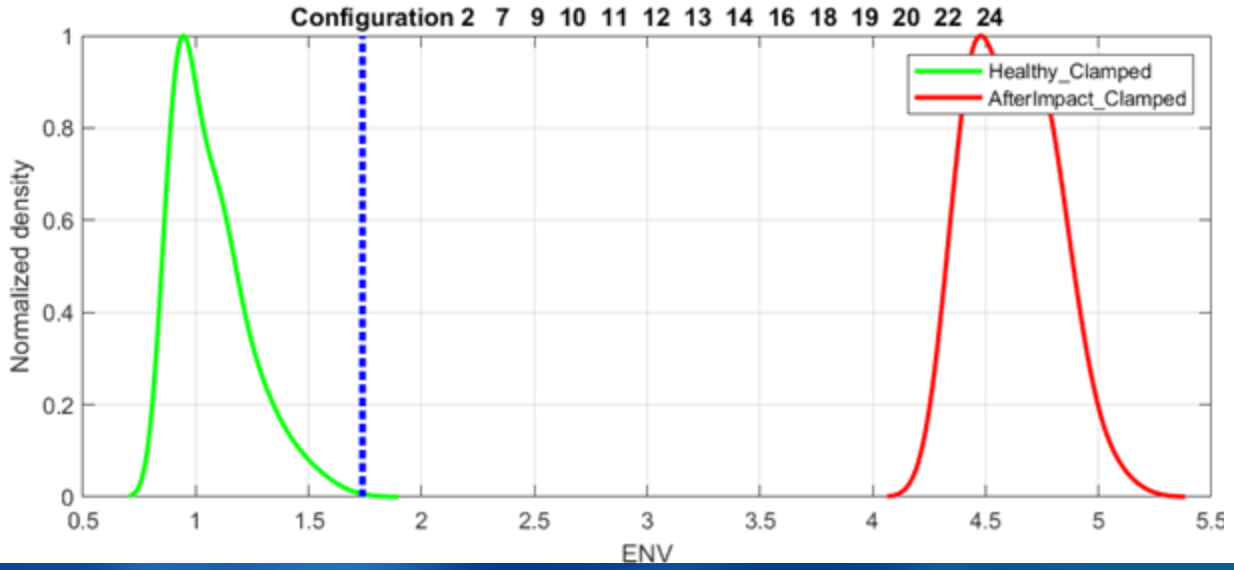

(a) 34.5 kHz (b) 49.5 kHz (c) 74.5 kHz

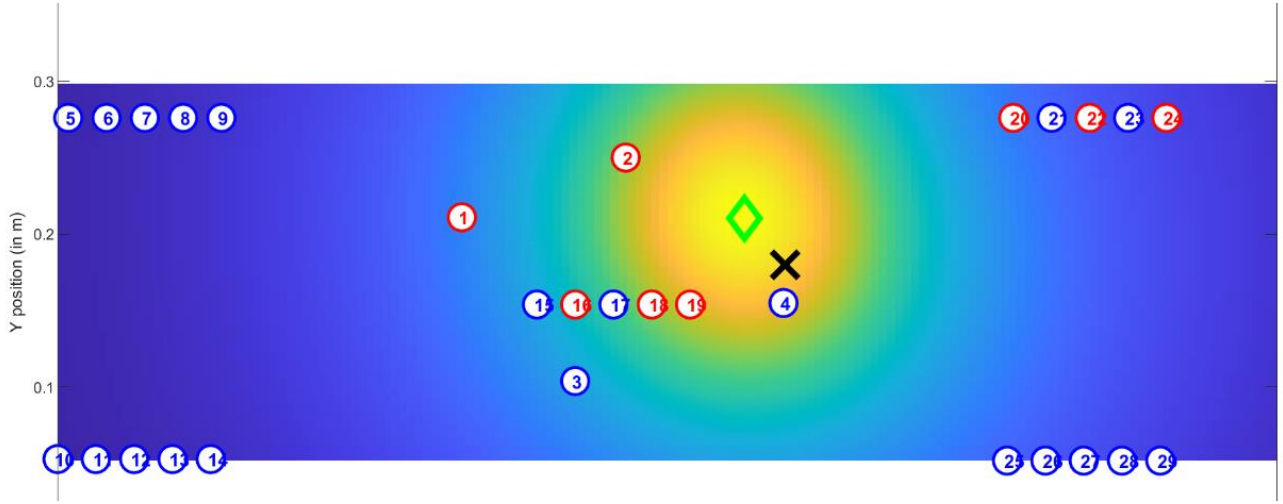
***Printed PZTs can emit and sense guided waves***

# Guided waves based SHM using printed PZTs



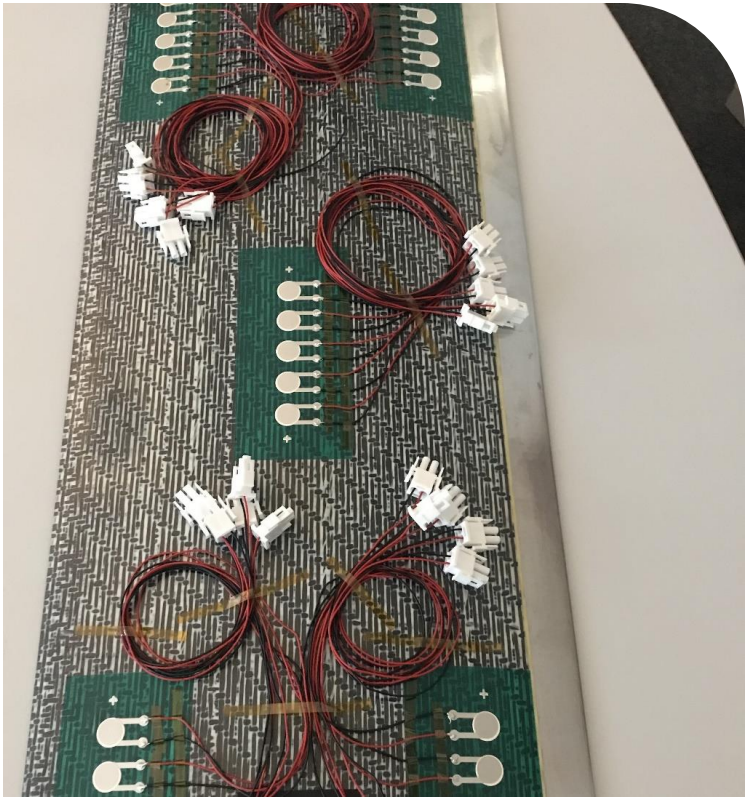

- Damage **detection** possible using printed piezoelectric elements
- Damage **localization** possible using printed piezoelectric elements



# Printed PZTs are a promising technology for SHM purposes

- Electromechanical Impedance
- Impact measurements
- Acoustic Emission
- Lamb waves interrogation



***One single sensor technology can handle several functionalities!***

# THANKS

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