

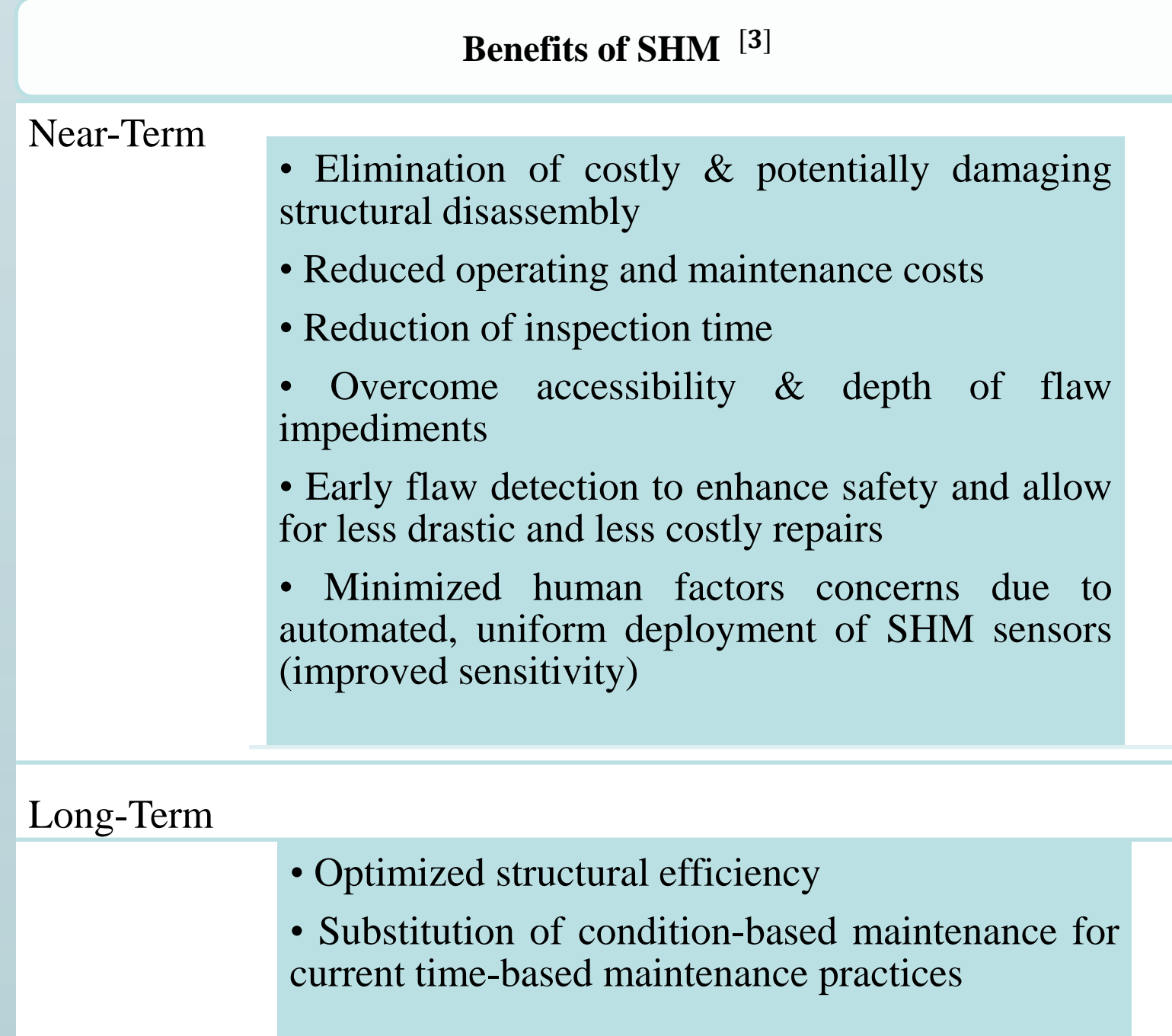
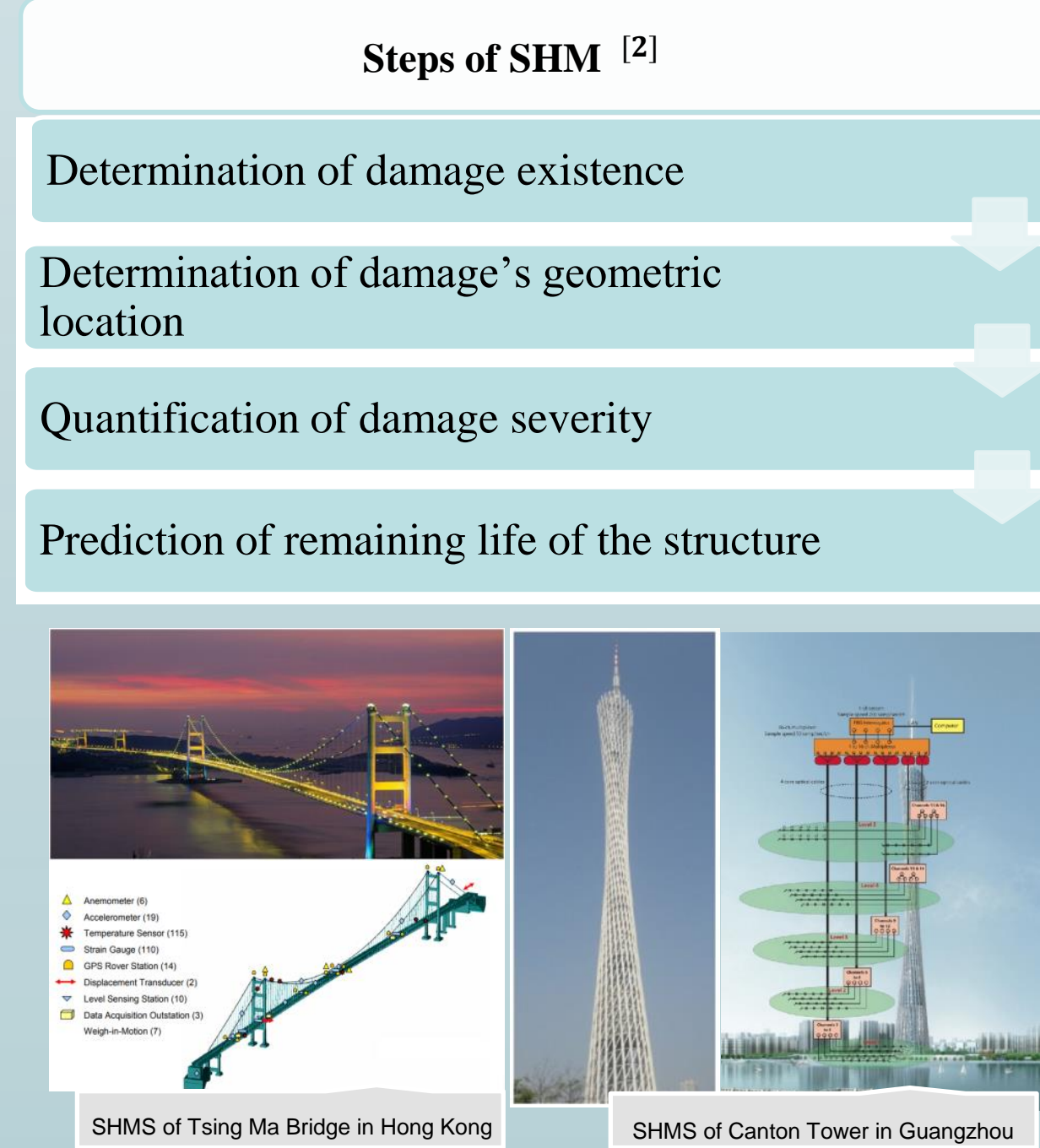
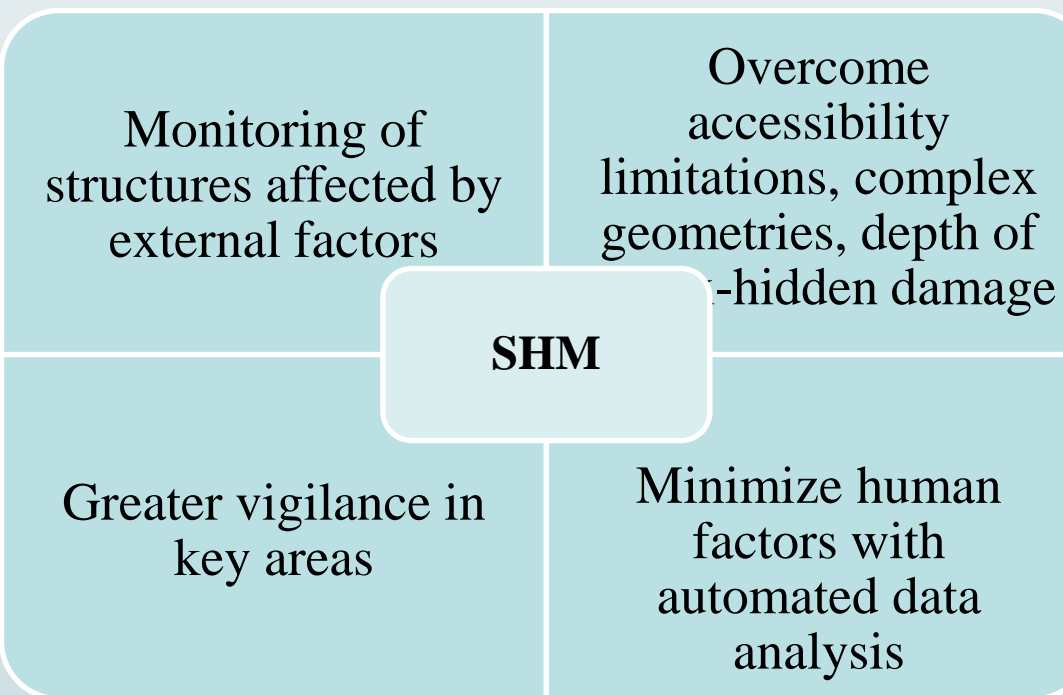
Reflectometry for the SHM of existing 2D and 3D structures

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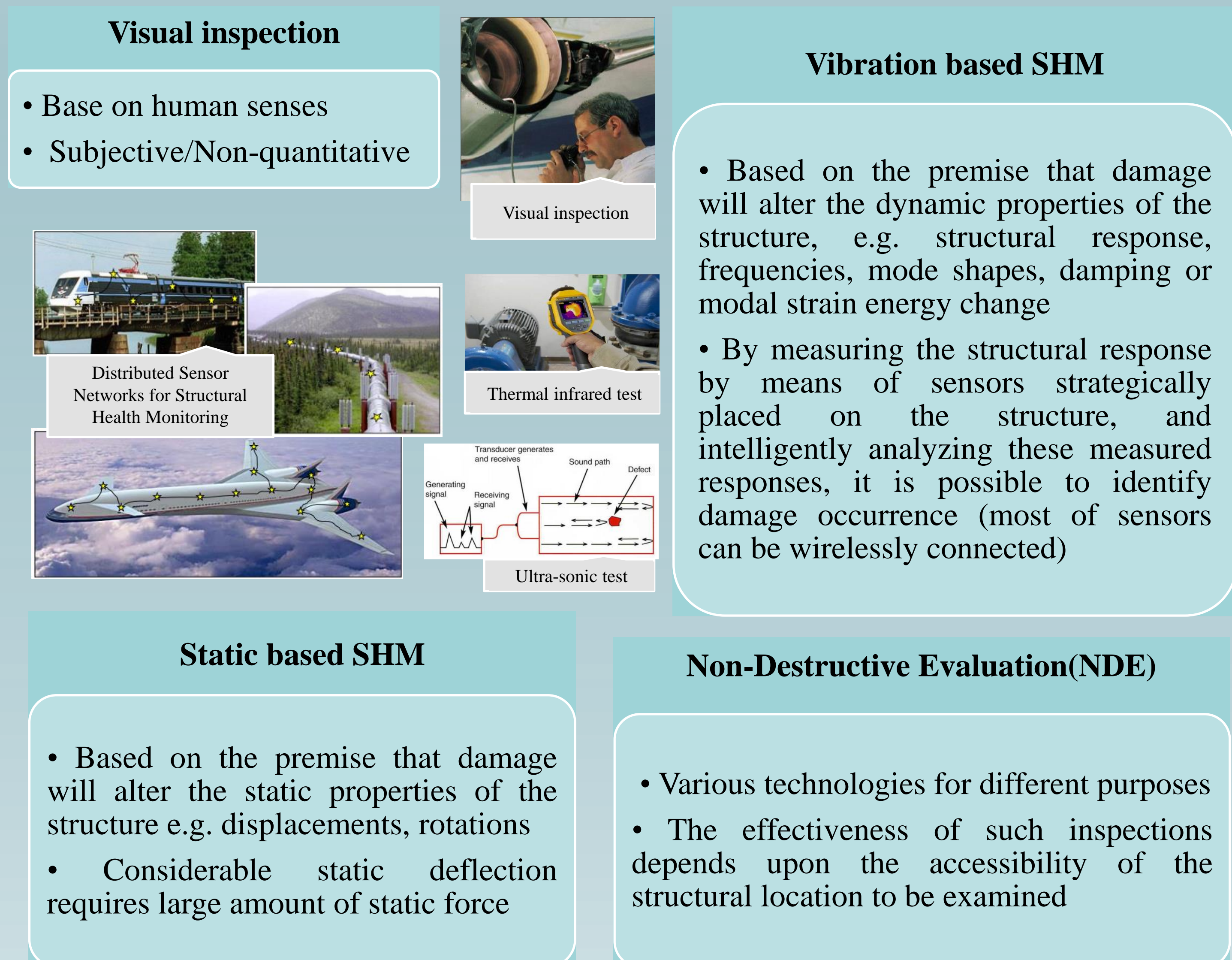
Introduction

Structural health monitoring (SHM) is the process of implementing a damage detection and characterization strategy for engineering structures^[1].

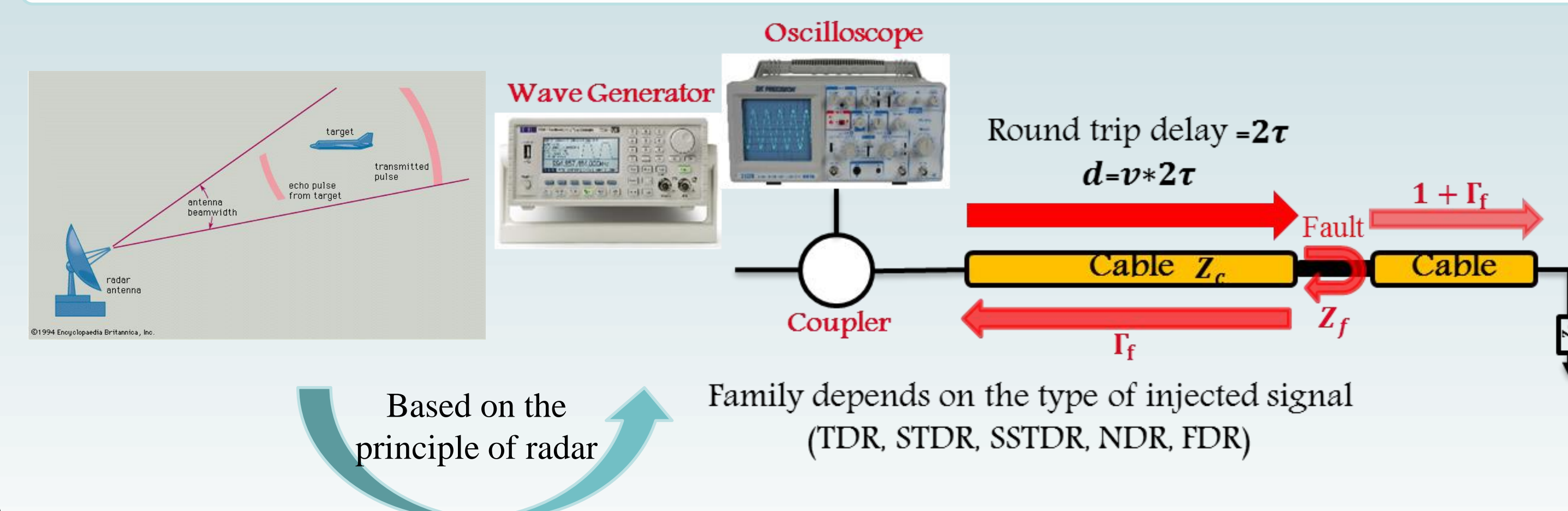


Methods

How to do SHM in practice ? ^[4]



Reflectometry methods



Advantages of reflectometry

- Good performance : detection, localization and characterization
- Easy integration

Disadvantages of reflectometry

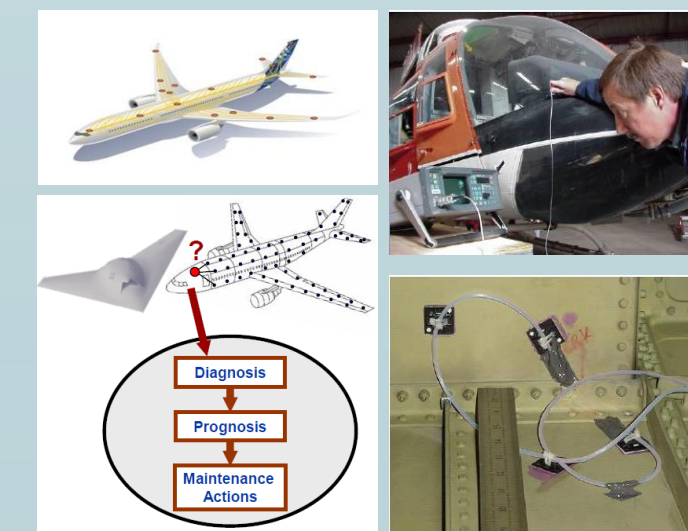
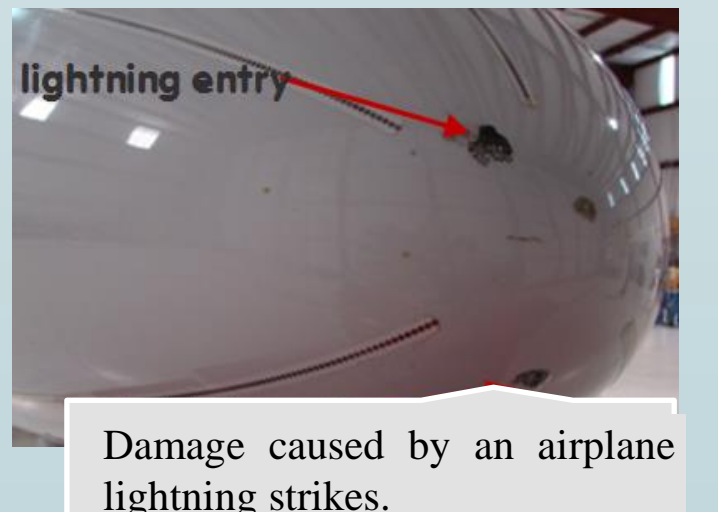
- In some methods an expensive directional coupler must be used to separate the incident and reflected signals
- The types of the faults cannot be exactly distinguished

Problematic



- Existing SHM approaches tend to be highly labor intensive and costly
- Efficient results were obtained by Applying the reflectometry to structures in 1D (complex wire networks)
- Reflectometry was recently limitedly applied to higher order structures (2D and 3D)
- In other methods we need access to the whole structure

The idea is to be able to diagnose a defect when it appears or, better still, predict the appearance of it at the first warning signs.



The development of new signal processing algorithms

The optimization of frequencies and/or waveforms

Stages of our work

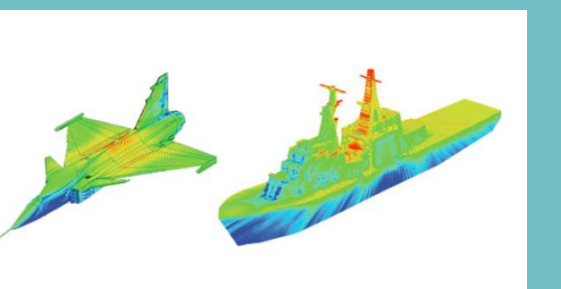
State of the Art: Bibliographic study

Review and test reflectometry on 1D (wire network) structure (*)

Modeling in search of a case that interests the industry : Using CST, create and test 2D and 3D structures (airplanes, pipes..) using several methods

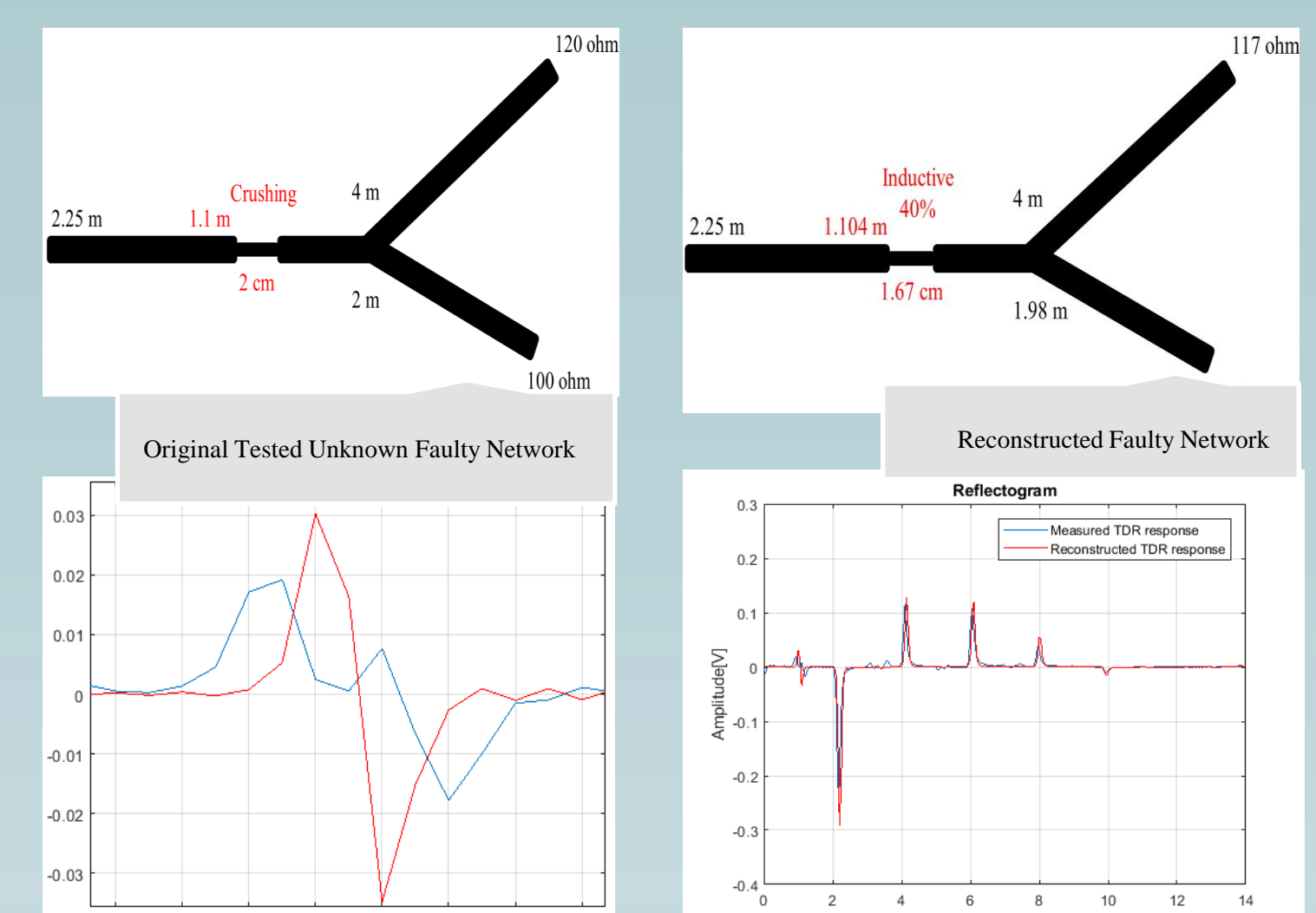
Adapt Reflectometry from 1D to 2D study and establish numerical module

Validate the research part and do the experimental part



Results

(*) Accepted International conference paper
M. KAFAL, F. MUSTAPHA, J. BENOIT, W. BEN HASSEN, «A Non Destructive Reflectometry Based Method for the Location and Characterization of Incipient Faults in Complex Unknown Wire Networks », IEEE AUTOTESTCON 2018.



Soft defect detection , location and characterization by solving the inverse problem of the measured reflectometry response by using optimization algorithms

Bibliography

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