

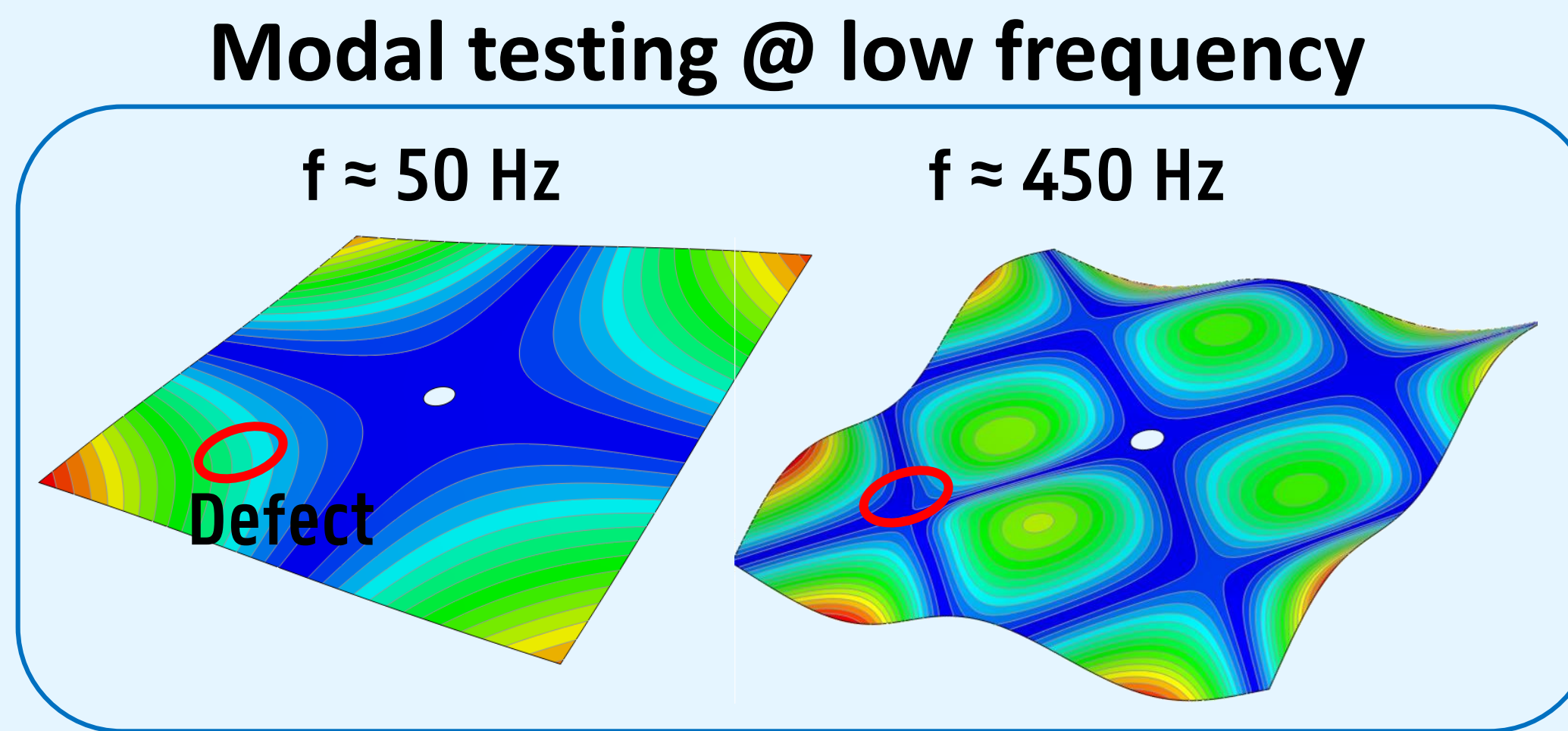
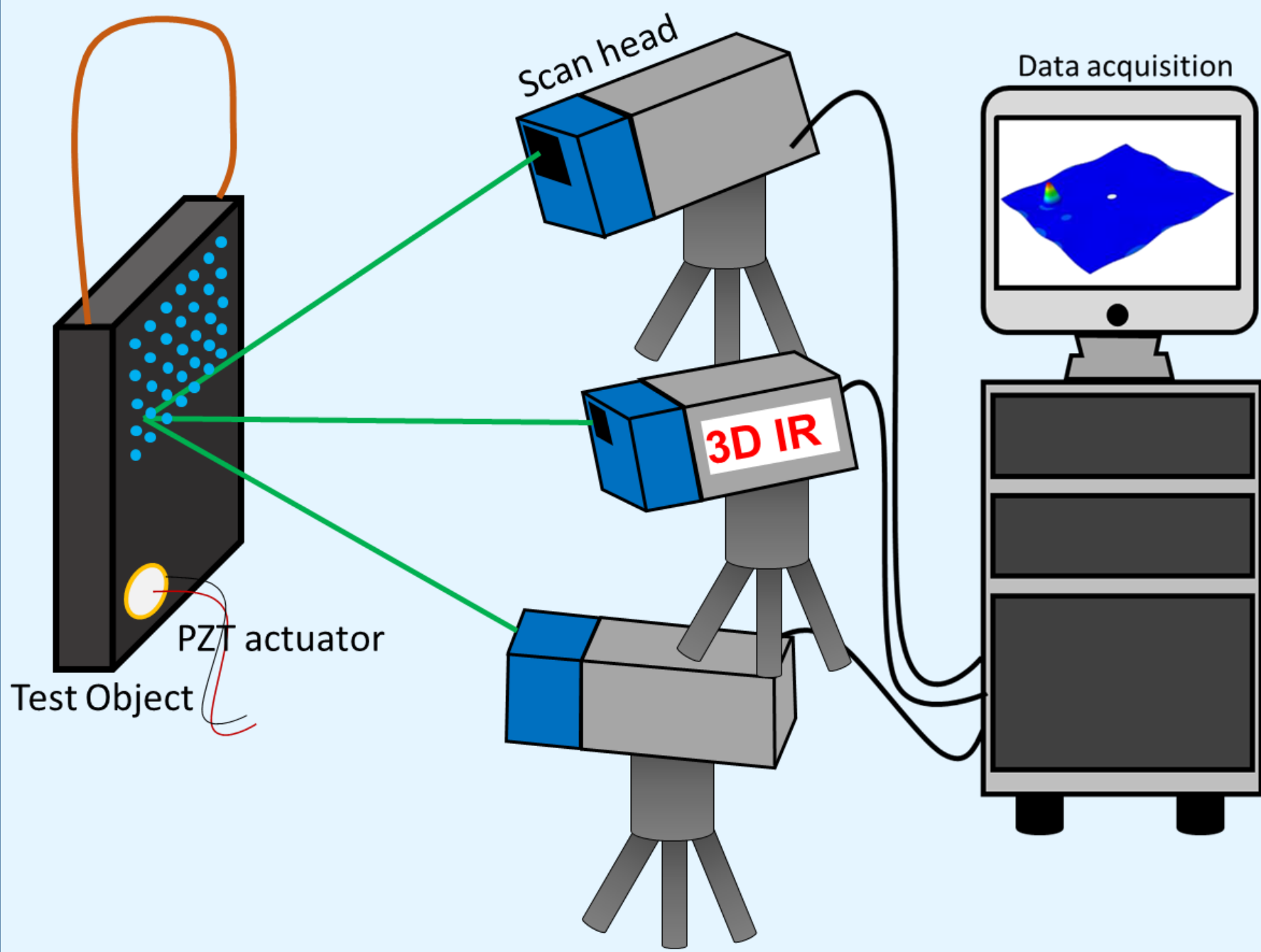
# Local Defect Resonance for NDT of Composites

Joost Segers<sup>1</sup>, Mathias Kersemans<sup>1</sup>, Saeid Hedayatrasa<sup>1,2</sup>, Gaétan Poelman<sup>1</sup>, Wim Van Paepegem<sup>1</sup>  
<sup>1</sup>Mechanics of Materials and Structures (MMS), Ghent University, Technologiepark 46, B-9052 Zwijnaarde, Belgium.  
<sup>2</sup>SIM M3 program, Technologiepark 48, B-9052 Zwijnaarde, Belgium.

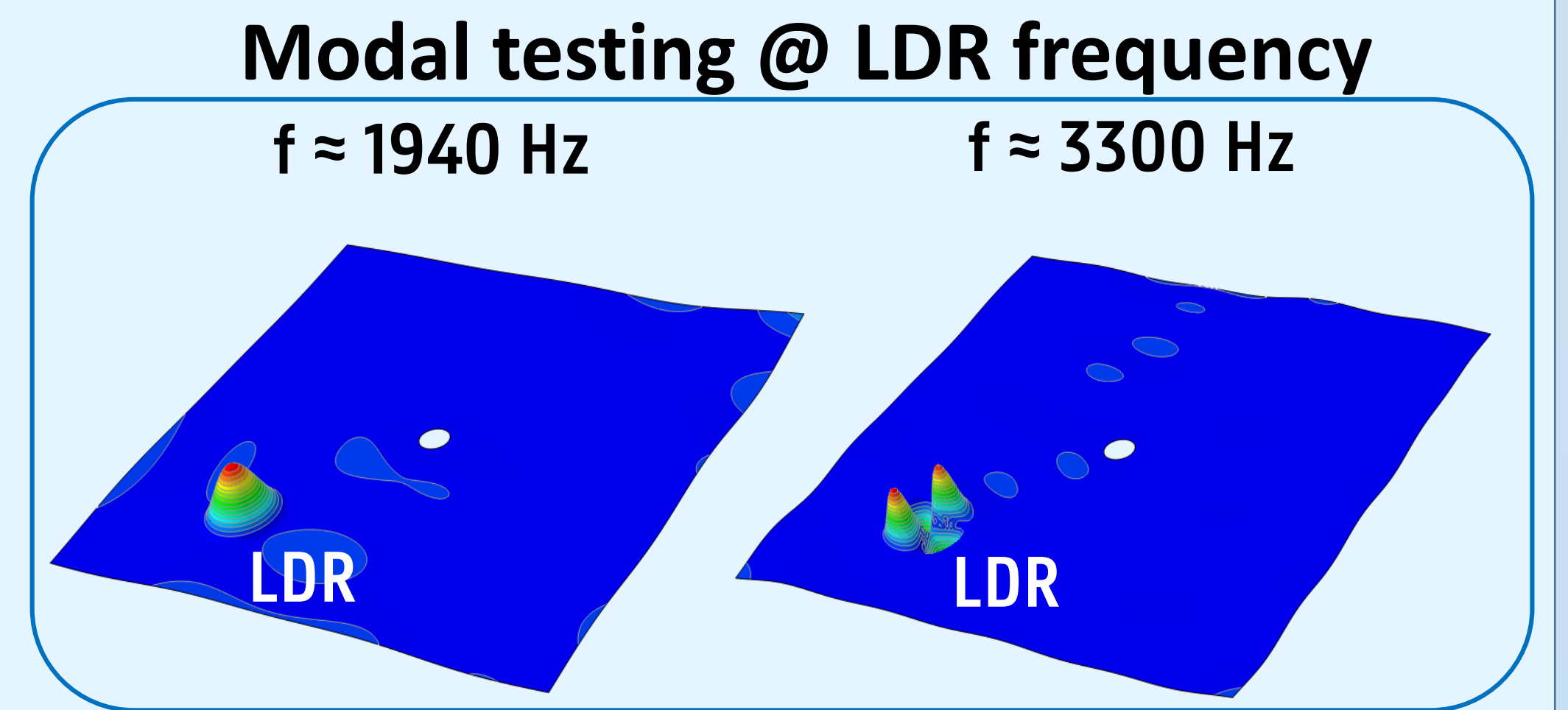
Local defect resonance (LDR) makes use of high frequency vibrations to get a localized resonant activation of the damaged region. First, a 3D scanning laser Doppler vibrometer (SLDV) is used to record the broadband vibrational response of CFRP components. The LDR behavior of the damages is visible in the operational deflection shapes. Next, a sensitive IR camera is used to detect the efficient local heating of damages under LDR.

## I. Local Defect Resonance (LDR)

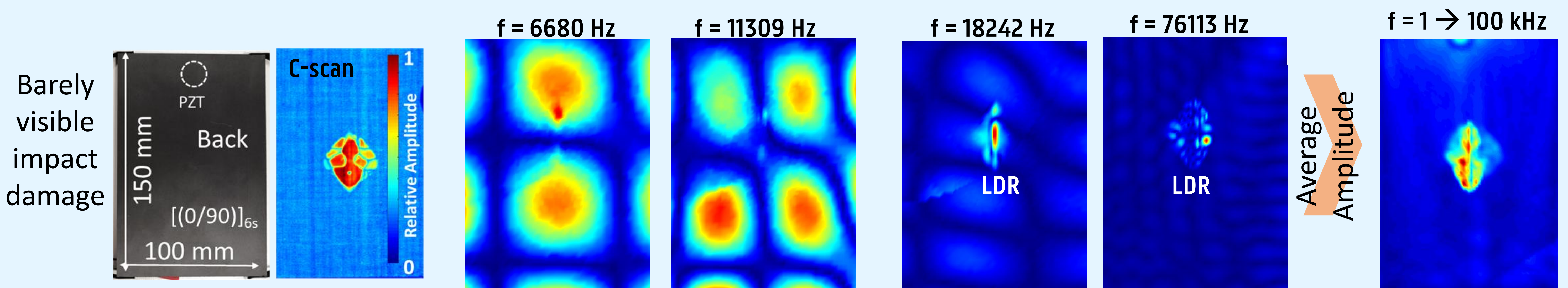
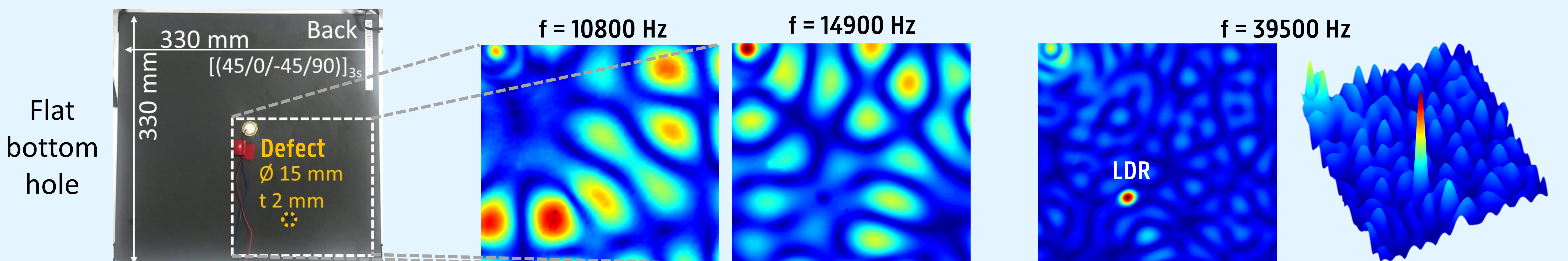
Local defect resonance can be seen as the extension of classical modal testing to high frequency excitations. These high frequencies are used to get a localized resonant activation of the defected zones and result in a superior sensitivity to damage.



- Resonate the sample
- Low sensitivity to damage

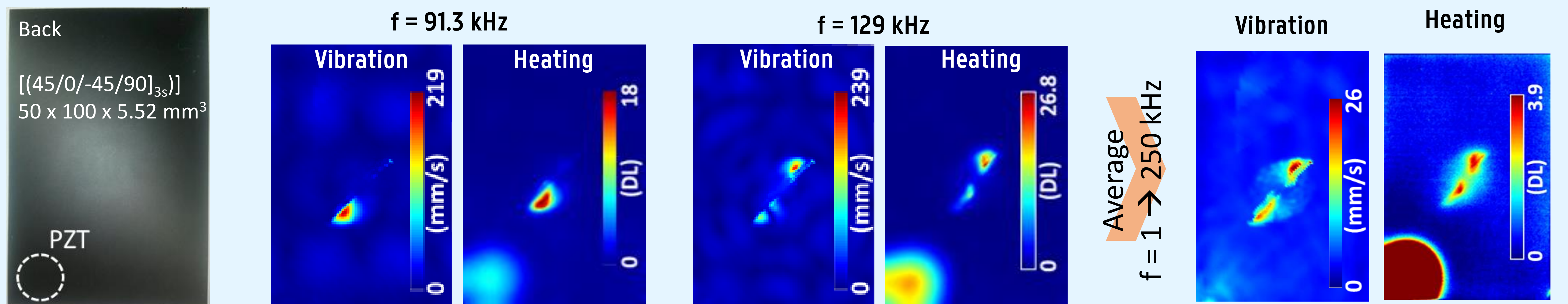


- Resonate the defect
- High sensitivity to damage



## II. LDR for efficient vibrothermography

The high vibrational activation of a defect under local defect resonance results in an efficient local heat generation. This is in particular the case when the LDR has a dominant in-plane character. As such, damages can be detected by exciting the test piece with a broadband, low power, sweep excitation while inspecting it with an IR camera.



## Conclusions

- The concept of LDR can be used to detect artificial and impact damages.
- Damages can be found by detecting the local heat generation of a defect under LDR.

## Acknowledgement

The work leading to this poster has been funded by the SBO project "M3DETECT-IV" (Grant no. 160455), which fits in the SIM research program MacroModelMat (M3) coordinated by Siemens (Siemens PLM software, Belgium) and funded by SIM (Strategic Initiative Materials in Flanders) and VLAIO (Flemish government agency Flanders Innovation & Entrepreneurship).