

## 1. Research Challenge

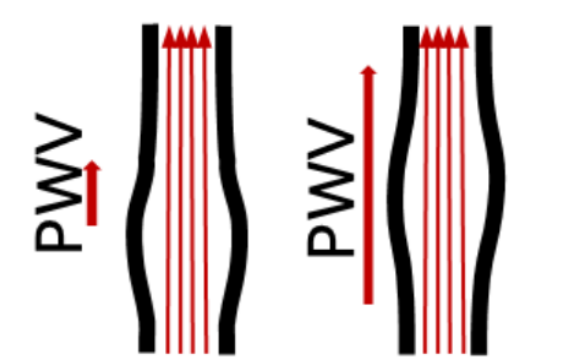
- Cardiovascular diseases (CVDs) are the number one cause of death globally, associated with **almost 18 million deaths annually** [1].



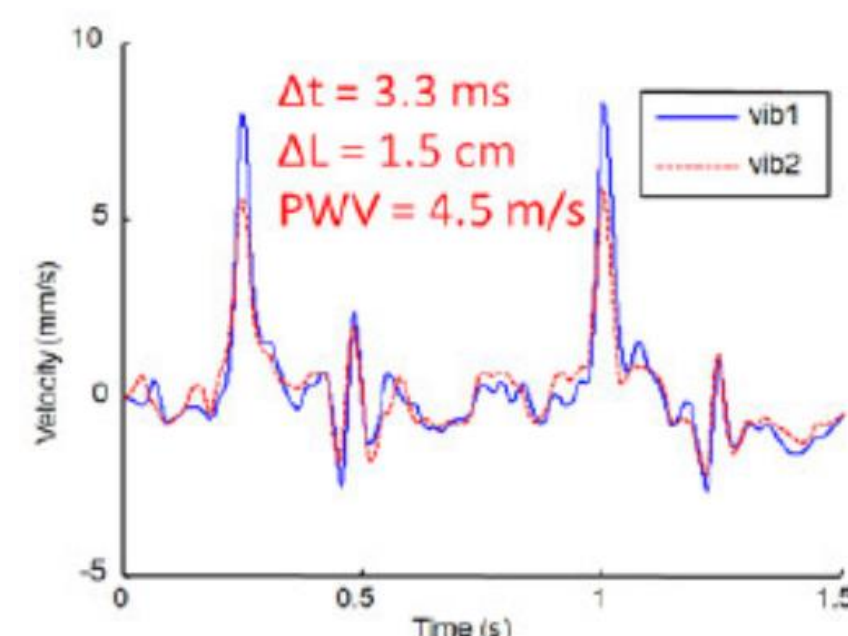
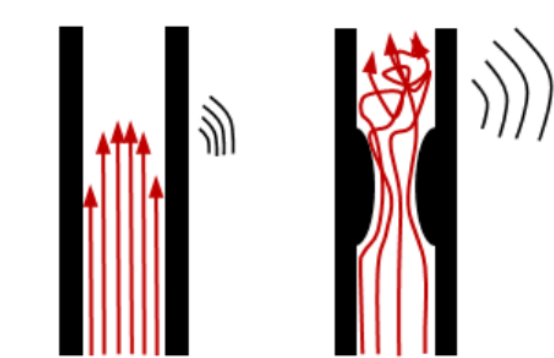
- Early diagnosis and intervention can save lives.

- Changes in blood flow can be indicative of abnormalities in the way the heart contracts to pump blood as well as of changes in arterial diameter or elasticity, all harbingers of CVD.

### Arterial Stiffness



### Arterial stenosis



- The EU-funded project 'InSiDe' [2] is developing a handheld laser Doppler vibrometer using silicon photonics and efficient algorithms to deliver **real-time signal analysis** of selected cardiovascular parameters.

## The H2020 'InSiDe' Project Consortium:



## 2. Objectives

- Building on previous work from the H2020 CARDIS project [3], InSiDe is developing a handheld, battery-operated, split diagnostic device, that can be operated as one unit as well as two separate units.

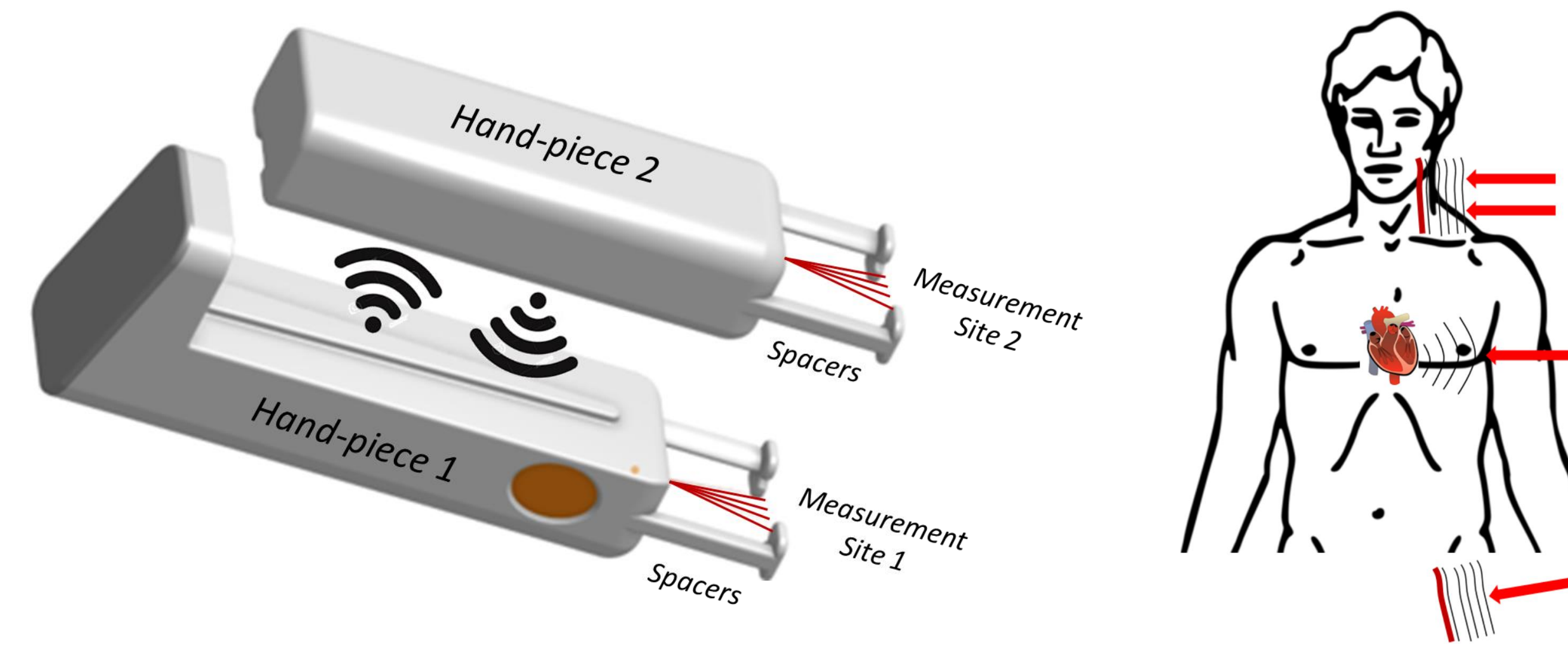


Figure 1: Early Concept of the InSiDe Diagnostic Device

- The device is based on a silicon photonics 4-beam laser Doppler vibrometer (LDV) comprised of a multi-branch interferometer in each hand piece.

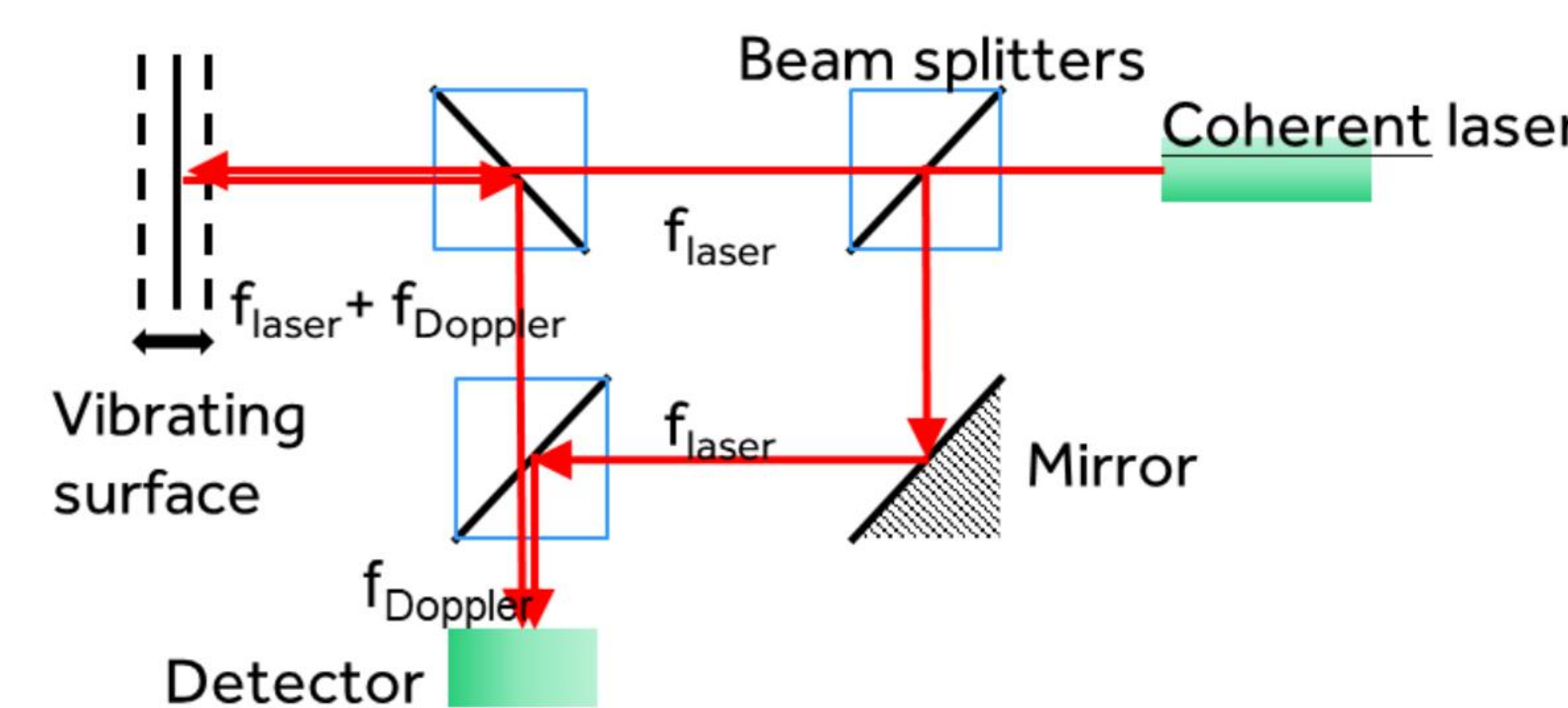


Figure 2: Homodyne Laser Doppler Vibrometer (LDV)

Cardi

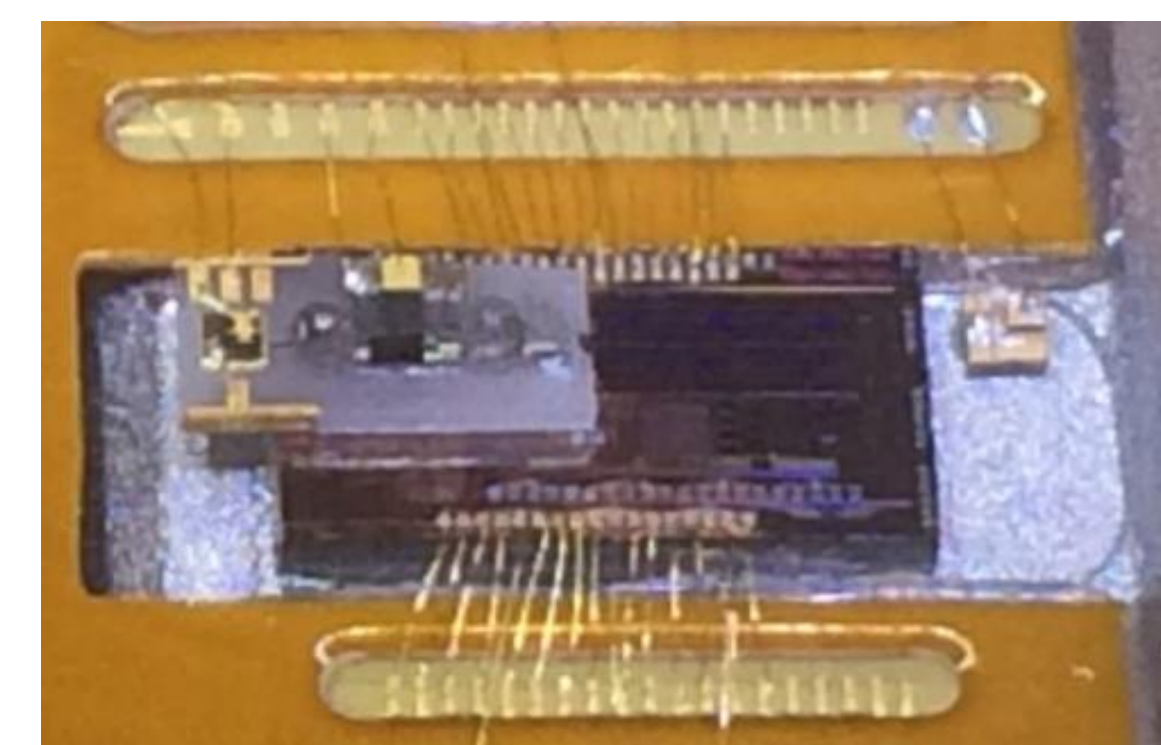


Figure 3: Hybrid Integration of a Laser Diode with a Silicon Photonics LDV Chip from the H2020 CARDIS Project [3]

## 3. Photonic Integration and Packaging

- 4-beam LDV silicon photonics chip.
- Hybrid-integration of a 1310nm laser diode.
- Aligned optical beam delivery system.

All Designs to be Compatible with Volume Assembly Processes

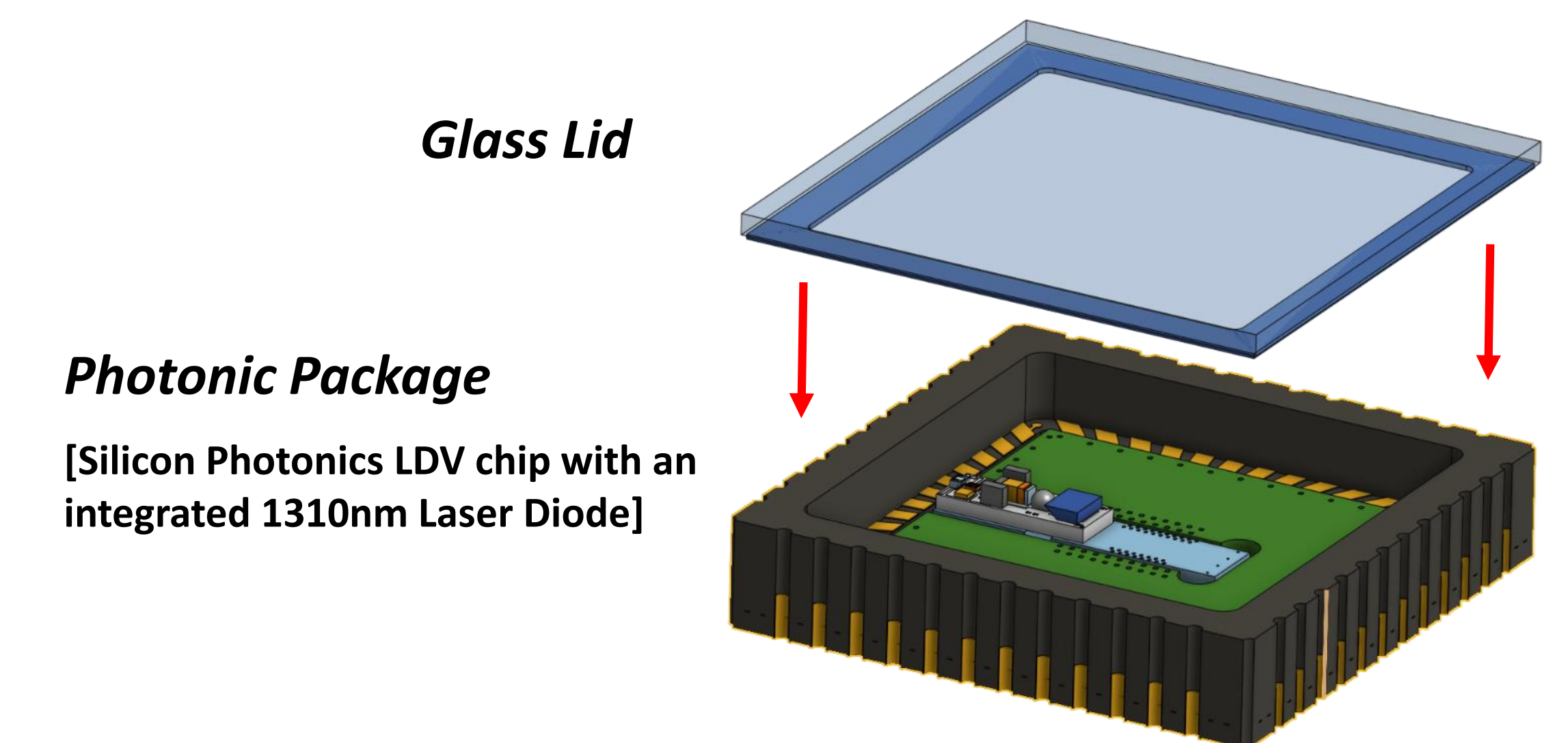


Figure 4: InSiDe - Photonic Integration and Packaging Concept

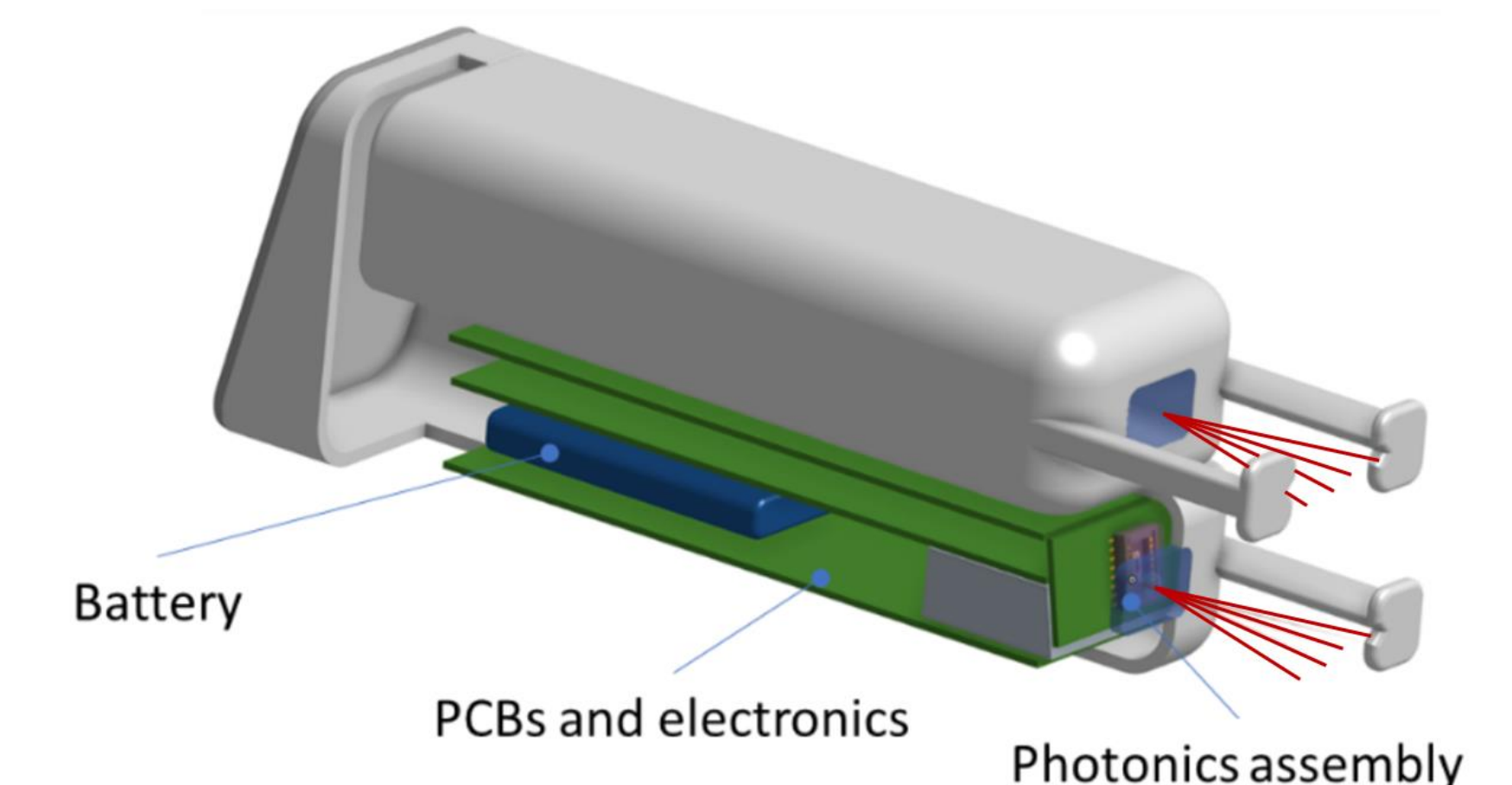


Figure 5: Core Elements of the InSiDe Diagnostic Device

## 5. References

- World Health Organisation – Cardiovascular Diseases: [https://www.who.int/health-topics/cardiovascular-diseases#tab=tab\\_1](https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1)
- InSiDe Project Website: <http://www.inside-h2020.eu/>
- H2020 CARDIS Project: <https://cordis.europa.eu/project/id/644798>

