# Swine diseases field diagnostics toolbox

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## INTRODUCTION

- The modern practices of intensive pig farming facilitate the exponential spread of diseases, with consequent economic loss for the pork industry. Early diagnosis of possible infectious disease outbreaks is essential to limit biophysical and socio-economic consequences.

## OBJECTIVES

- EU H2020 consortium aims to develop of a POC device to detect selected pig viruses:

| Targeted viruses | SWINOSTICS samples |
|---|---|
| ✓African swine fever (ASF) | Oral fluid in live animals, blood serum postmortem |
| ✓Porcine reproductive and respiratory syndrome (PRRS) | Oral fluid and blood serum |
| ✓Swine influenza A (SIV) | Oral fluid and nasal swabs |
| ✓Porcine Parvovirus (PPV) | Oral fluid and faeces |
| ✓Porcine Circovirus 2 (PCV2) | Oral fluid and blood serum |
| ✓Classical Swine Fever (CSF) | Oral fluid in live animals, blood serum post mortem |

- The device will be portable and will analyse up to 4 samples simultaneously at a reasonable cost, making it highly suitable for use in the field

## CONCEPTUAL DESIGN

- Advanced, reusable, silicon based Photonic Integrated Circuits depending on antibody-antigen bond (**Figure 1**)
- Commercially available monoclonal/policlonal antibodies will be used, for reliability and specificity, making the toolbox flexible
- Desired sample processing time and result within 30 minutes

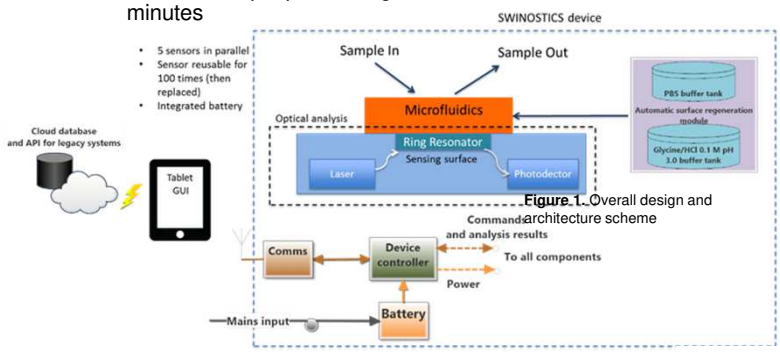


Figure 1. Overall design and architecture scheme

## FUNCTIONAL MODULES

### 1. SWINOSTICS BIOSENSOR

**a) Microfluidic subsystem** – delivery of the sample and buffer fluids to the sensor

**b) Photonic transducer** (**Figure 2, 3a**) – antibodies immobilized on silicon nitride based nano-ring resonators

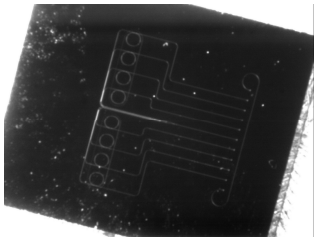

**Figure 2.** Nano-ring resonators functionalized with the antibodies immobilized on their surface

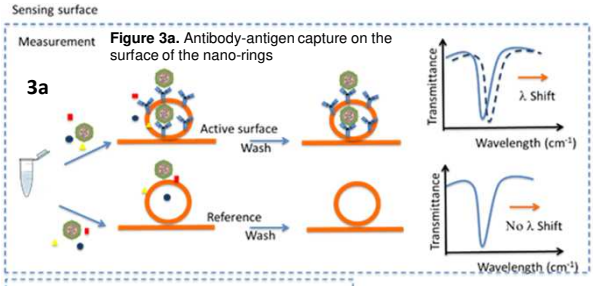


**Figure 3a.** Antibody-antigen capture on the surface of the nano-rings

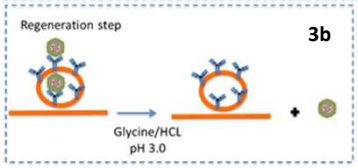


**Figure 3b.** Surface regeneration


**c) Optical analysis module** (**Figure 4**) – positive reaction (antigen capture) changes the refractive index, measured as power and wavelength shift of the laser signal

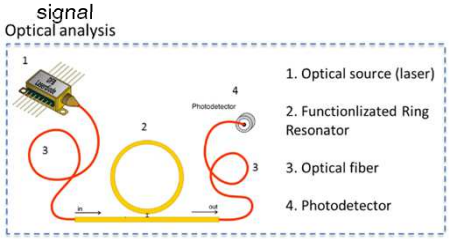


**Figure 4.** Structure of optical sensing module

### 2. TEMPERATURE CONDITIONING MODULE

- Providing stable temperature during analysis and storage

### 3. SURFACE REGENERATION (**Figure 3b**)

- Washing process to remove the antigen from the surface – reusable at least 50 times

### 4. PROCESSING, CONTROL AND COMMUNICATION MODULE

- Communication with tablets, smart phones (Bluetooth, WiFi), cloud based data storage

**Website**: www.swinostics.eu
**Facebook:** www.facebook.com/swinostics/
**LinkedIn**: www.linkedin.com/company/18392774
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