Small Form Factor Readout Platform for PICs, design, accuracy and validation.

Gerald Ebberink (NanoPhysics Saxion)
Overview

• Introduction

• Platform

• Demonstrators

• Results

• Outlook
Introduction
• Research group within Saxion

• Chip based sensors.
  – photonics
  – fluidics
  – MEMS
  – electronics
  – packaging
Nano Physics Interface

• Several Projects in Photonics and BioSensing
  – EU
  – Tech For Future
  – SiA
  – Private companies
Chip in a lab, not lab on a chip.
Chip in a lab, not lab on a chip.

Auxiliary Lasers

Fluidics

Alignment

PC

Readout

2018-12-11
The platform
- Photonic Integrated Chip
- Portable Electronics
- specialised software
The Platform

• Photonic Integrated Chip

• Multiple users

• Generic chip

• Conflicting specifications
The Platform

- Photonic Integrated Chip
- 10 x 10 mm
- 7+1 microring resonators
- 1 alignment structure
The Platform

• Portable Electronics

• Noise challenges

• Portable and lower cost

• High amplification 500k – 5M
The Platform

• Portable Electronics

• 1 laser output

• 8 Photodiodes

• Wireless communication
The Platform

- Specialized software
- Onboard shift calculations
- Bluetooth to smart device or WiFi to cloud.

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The Platform

- Specialized software
- New shift algorithm
  - Faster
  - Same accuracy
Demonstrators
Demonstrators

Desktop Demonstrator
• Measures in liquids (serum)
• Pumps and valves
• CrP measurement
• Antibodies

Wearable Demonstrator
• Measures gasses
• Equilibrium
• Skin emanating VOC detection
• Polymer coating
Demonstrators

Desktop Demonstrator

Wearable Demonstrator

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Results
First measurements:

Quantization $< 10^{-6}$ RIU

Comparable to current systems

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100 ppm sucrose/DI
Outlook

• New software optimized for aMZI sensors
• Measurement speed increase

• Smaller form factor

• Delivery of demonstrators to other projects
  – Label Free sensing of insulin
  – Several proposals have been made
  – Further development through SMEs
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