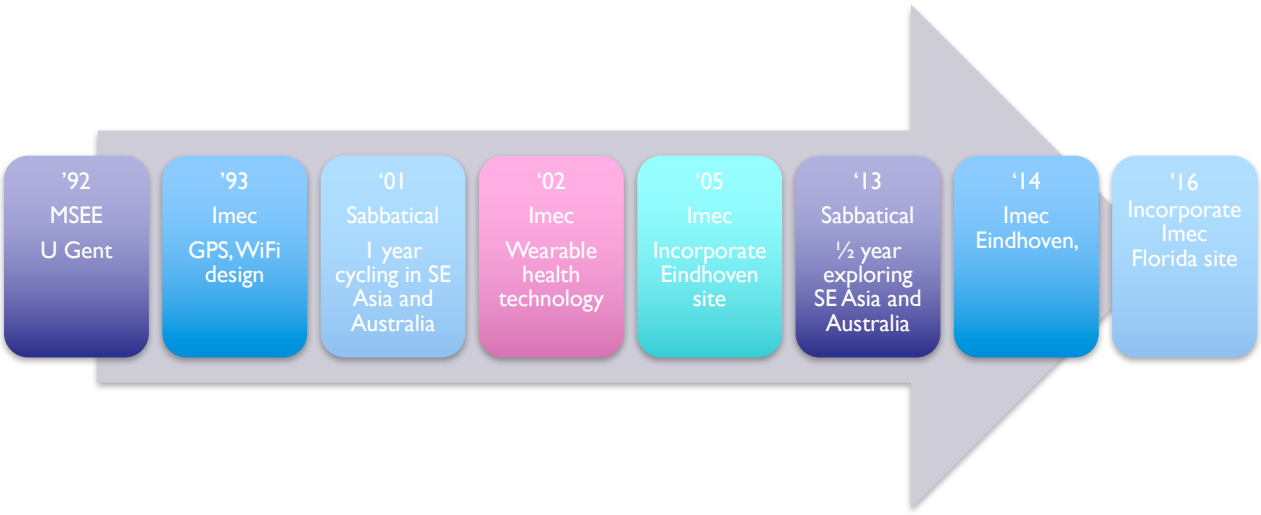
PHOTONICS IN THE MAGIC KINGDOM
FAIRY TALES AND TALENT FAIRS

BERT GYSELINCKX
IMEC USA

BERT GYSELINCKX



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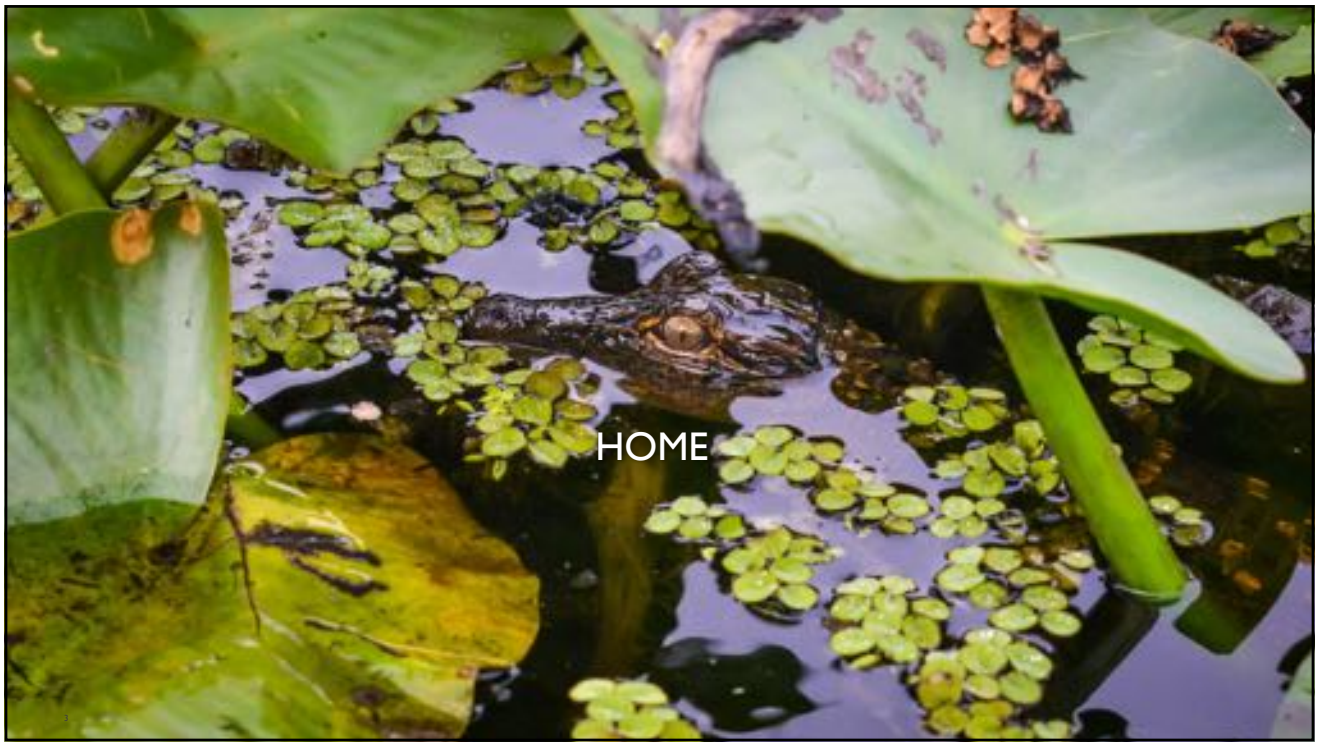
HOME


THE HAPPIEST PLACE ON EARTH

IMEC

NANO-ELECTRONICS R&D ORGANIZATION

- Founded in 1984
- Not for profit
- 3000 researchers – 600 students in PhD programs
- $100M public funding
- $500M contract R&D with industry

IMEC ECO SYSTEM

APPLICATION PARTNERS

FABLESS & FABLITE

IDMS & FOUNDRIES

SUPPLIERS

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IMEC ECO SYSTEM

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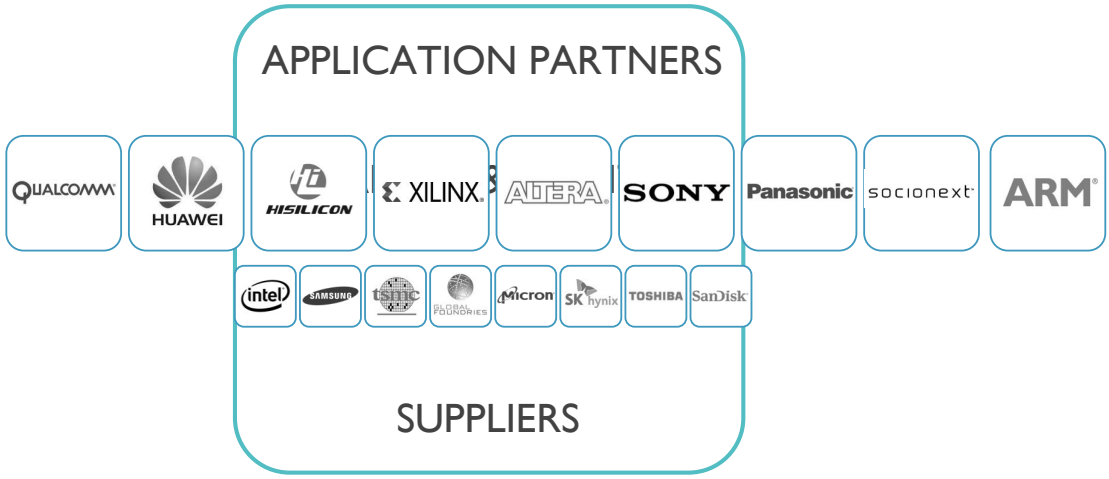
IMEC ECO SYSTEM



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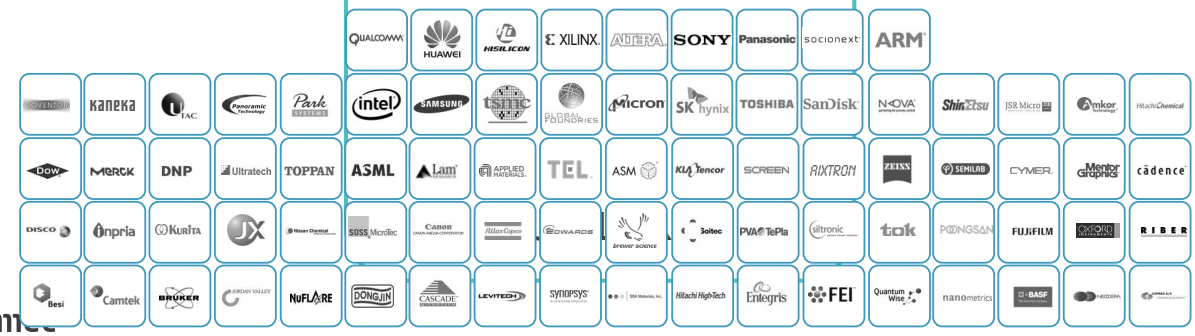
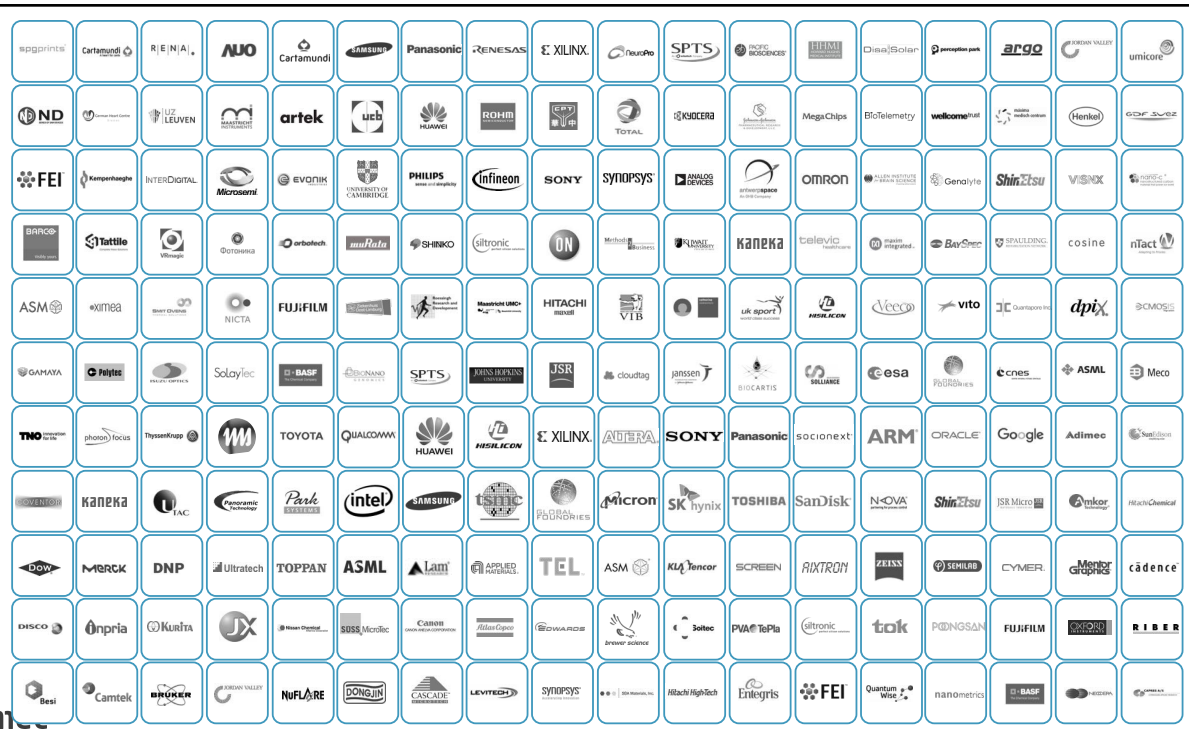
IMEC ECO SYSTEM

APPLICATION PARTNERS






IMEC AND BRIDG
HAVE ESTABLISHED
A DESIGN CENTER AND CLEANROOM
AT NEOCITY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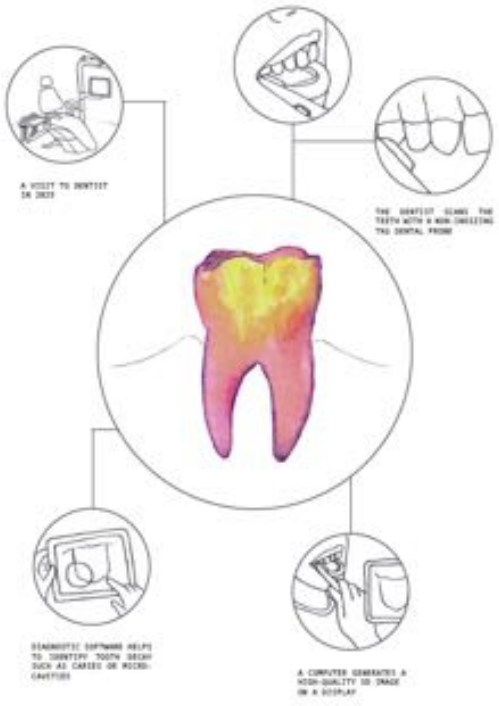
DESIGN CENTER
FOR
HIGH FREQUENCY ELECTRONICS AND **PHOTONICS**

THz DENTAL IMAGING PROBE

PART OF THE DENTAL INSTRUMENT SET, COMPLETING VISUAL INSPECTION

- Fully integrated handheld THz probe
- Targets early detection of tooth decay
- Non-ionizing imaging technique
  Safe for regular use
- Generates a 3D high-quality image
- Characterizes material composition of tooth or decay



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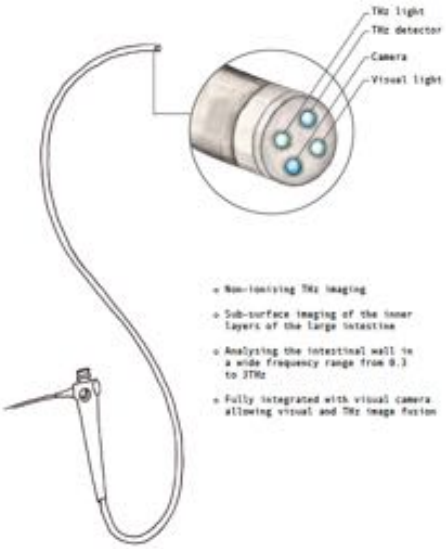
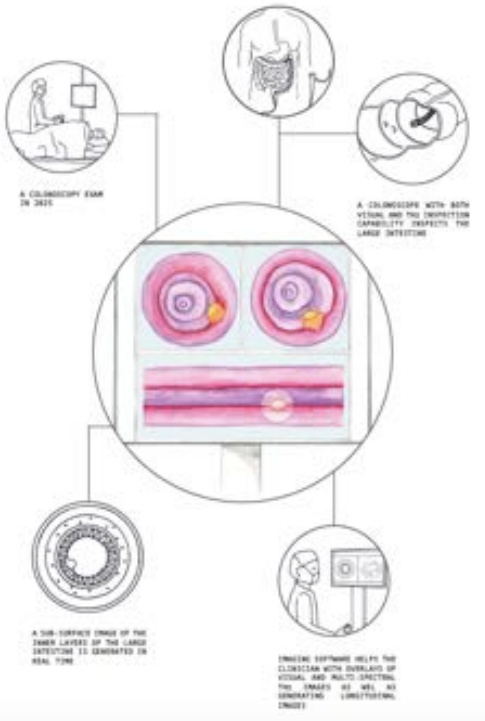
MULTI-SPECTRAL THz COLONOSCOPY

A FIBER INTEGRATED THz SCANNER FOR INSPECTION OF THE LARGE INTESTINE



- Non-ionizing THz imaging
- Sub-surface imaging of the inner layers of the large intestine
- Analysing the intestinal wall in a wide frequency range from 0.3 to 3THz
- Fully integrated with visual camera allowing visual and THz image fusion



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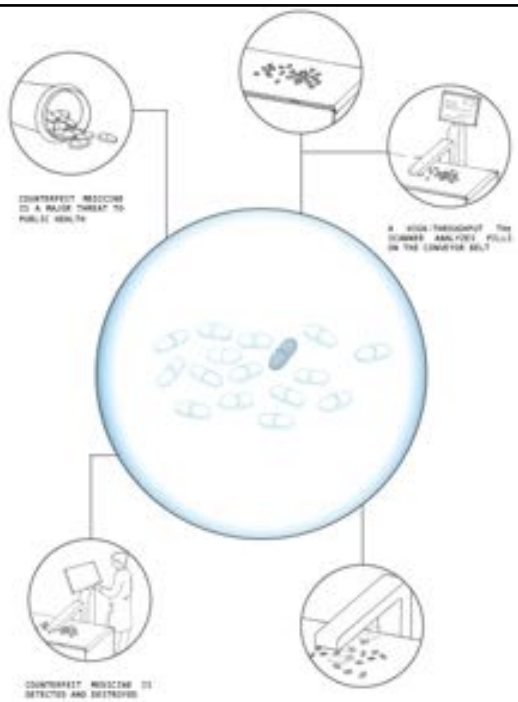
PHARMACEUTICAL COUNTERFEIT DETECTION

A THz SCANNER FOR INLINE INSPECTION OF PHARMACEUTICAL PRODUCTS

- Powerful but non-ionising THz source
- Linear THz detector array that is able to support high speed throughput
- Analysing the sample in a wide frequency range from 0.3 to 3THz
- Affordable system thanks to newest semiconductor technology.



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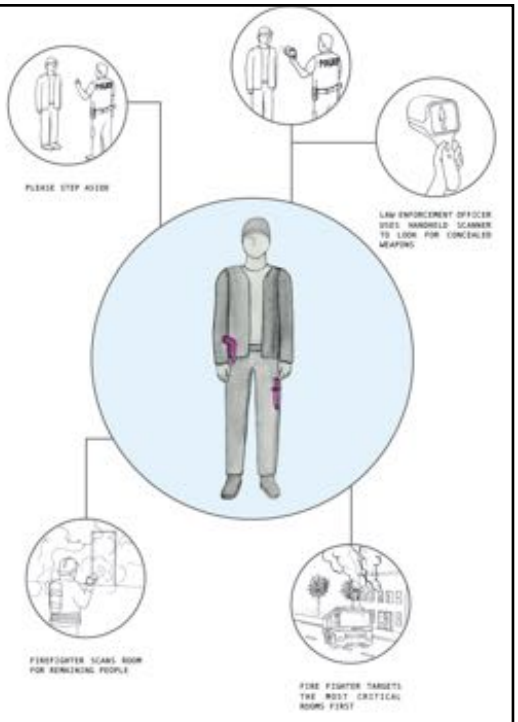
STANDOFF DETECTION

HANDHELD STANDOFF DETECTOR FOR FIRST RESPONDERS AND LAW ENFORCEMENT

- Fully integrated handheld scanner
- Targets detection of hidden objects below clothes or behind walls
- Uses mm and THz waves
- Generates a basic image with sufficient resolution for detecting objects of interest



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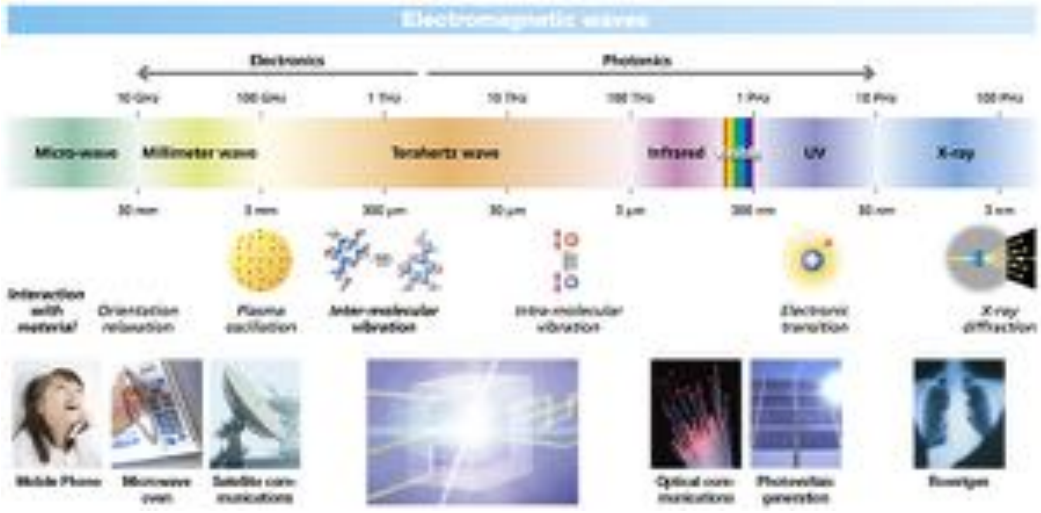
THz
PHOTONIC INTEGRATED CIRCUITS

THE TERAHERTZ DOMAIN
AT THE JUNCTION BETWEEN ELECTRONICS AND PHOTONICS



Source: Advantest

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ADVANTEST 7500TS

THz WAVE SPECTROSCOPY AND IMAGING ANALYSIS PLATFORM

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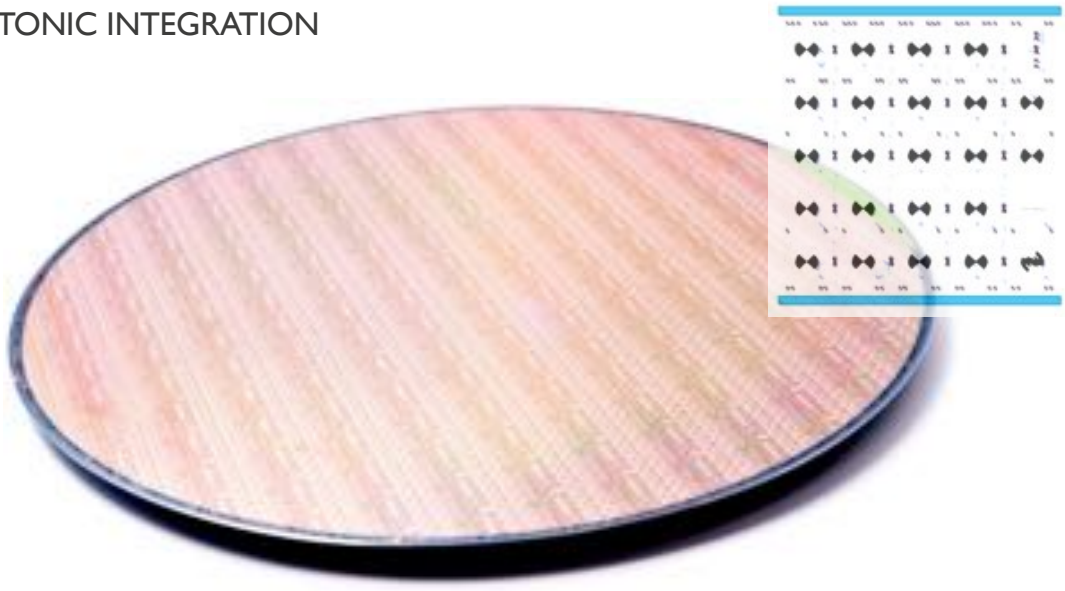
IMEC APPROACH

PHOTONIC INTEGRATION



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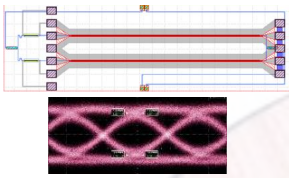
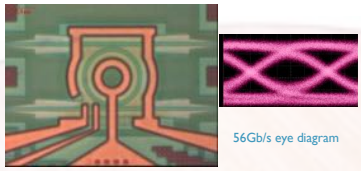
IMEC'S Si PHOTONICS PLATFORM

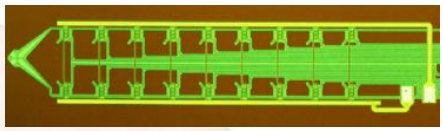
56G Silicon Mach-Zehnder Modulator



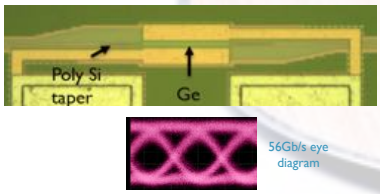
56G Silicon Ring Modulator



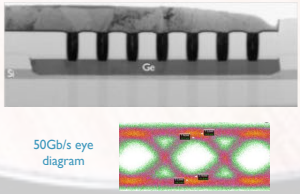
8+1-channel DWDM (De-)Multiplexing Filter



56G GeSi Electro-Absorption Modulator



50G Ge Photodetector



Grating Coupler

Edge Coupler

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Philippe Absil et al. *Optics Express 2015*, *23*(7), 9369–78.

STATUS

IMEC THZ IMAGING TECHNOLOGY

First scanned THz Image with imec emitter and Toptica detector

Scanning stage and optics

Two Toptica lasers

PCB + Batop silicon lens assembly

First single pixel photoconductive antennas on chip
Second tape out with small 2D arrays in processing (June)

Imec Si Photonics with Ge option

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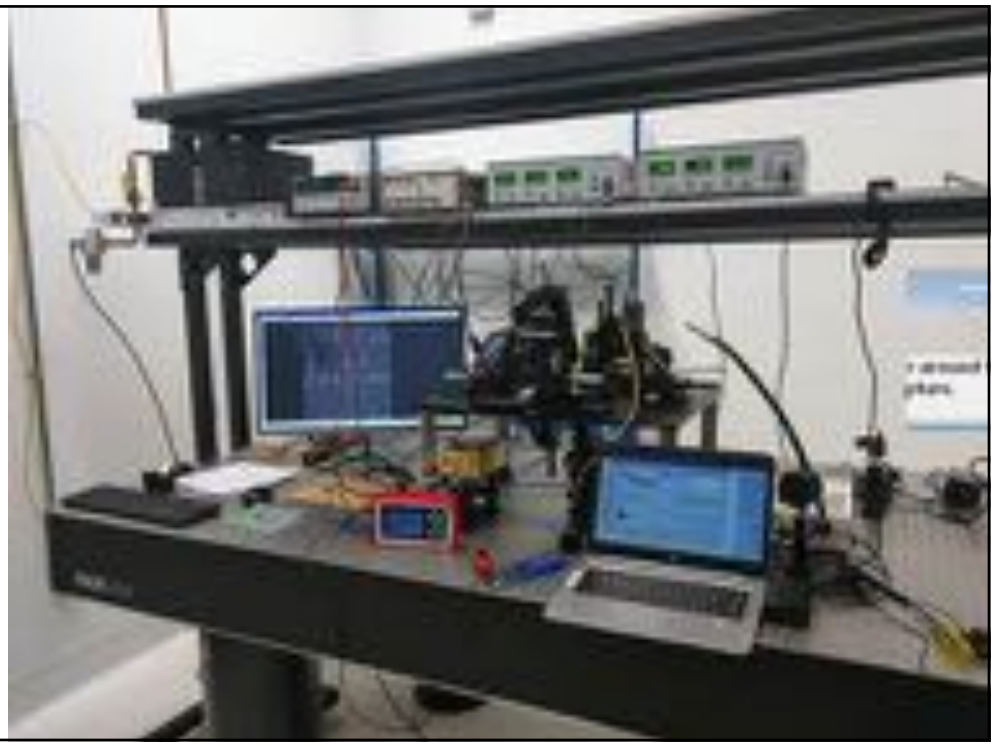
STATUS
OPERATIONAL LAB



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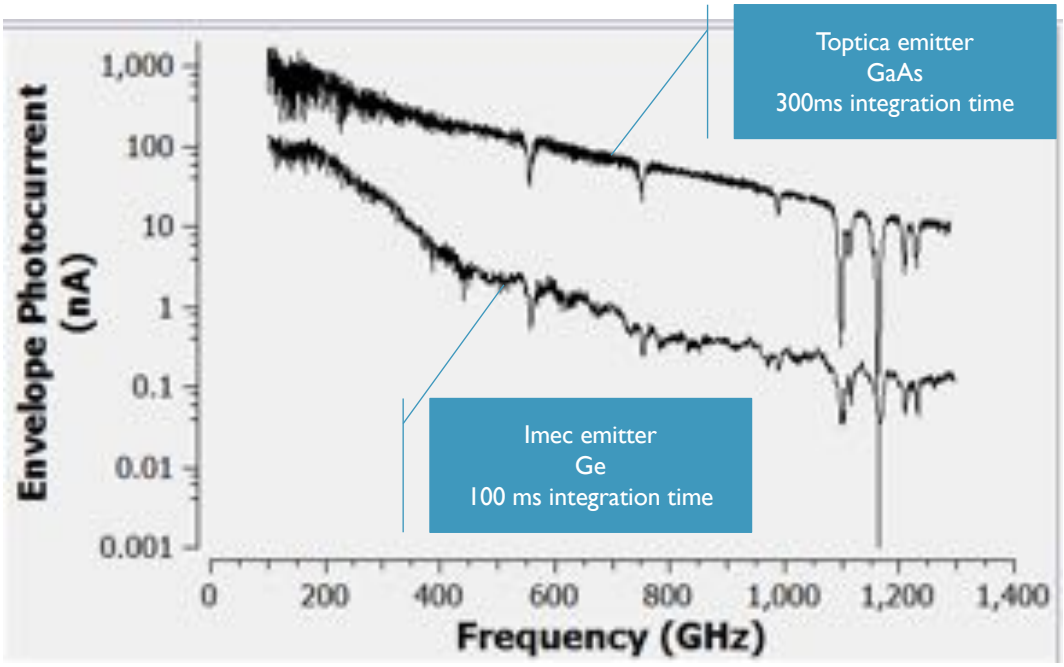
STATUS
EMITTER



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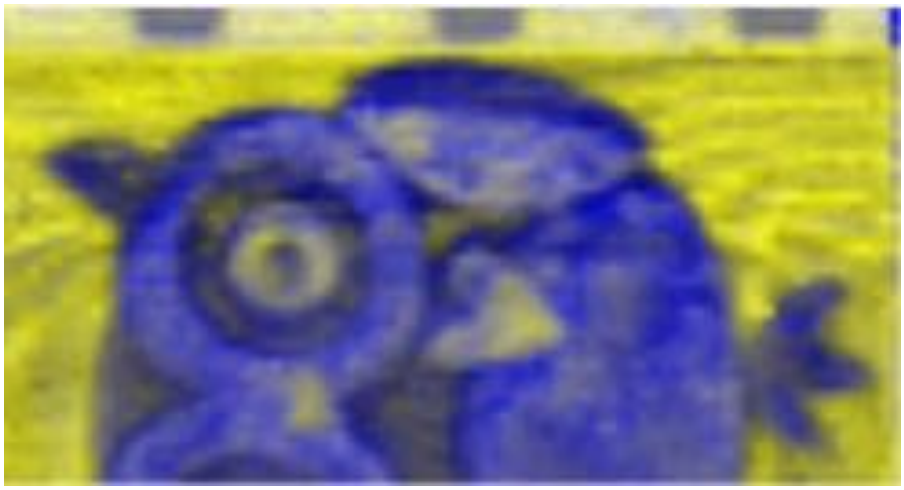
STATUS

THZ IMAGE WITH IMEC EMITTER AND TOPTICA DETECTOR



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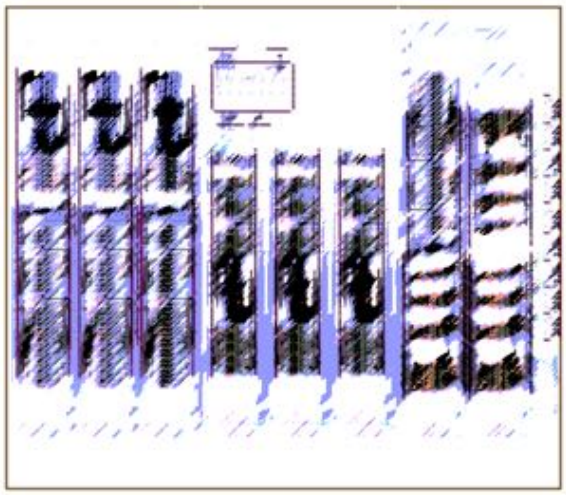
NEXT STEPS

1. ARRAY ON PIC – EXPECTED SUMMER 2018



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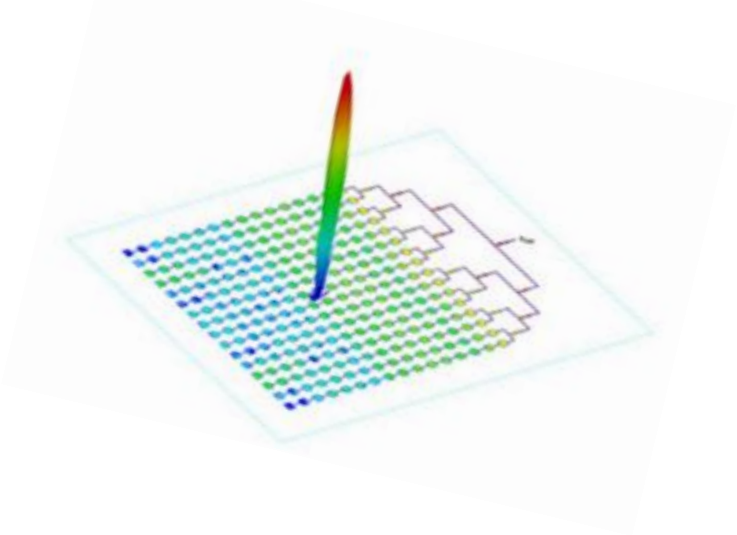
NEXT STEPS

2. BEAMFORMING THROUGH COUPLED PHOTOMIXERS



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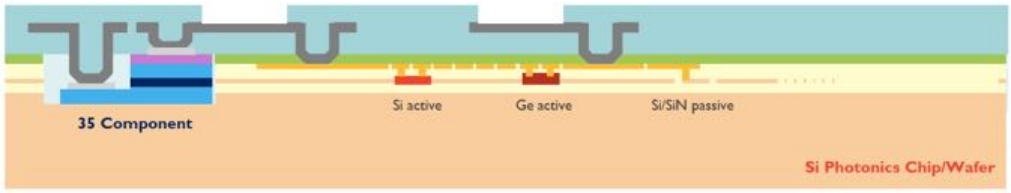
NEXT STEPS

3. LASER AND PIC INTEGRATION



- PostDoc Alex Liles
- Collaboration with U Gent.

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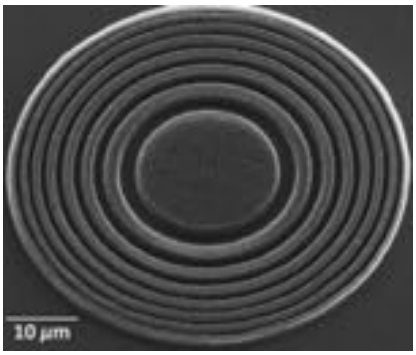
NEXT STEPS

4. FRESNEL LENS ON CHIP



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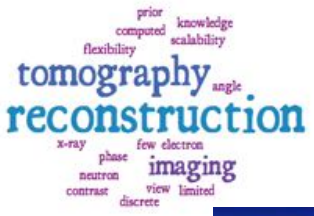
NEXT STEPS

5. THZ TOMOGRAPHY WITH U ANTWERPEN

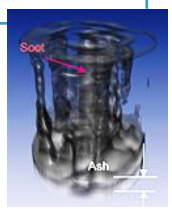
- **Goal**: Develop algorithms for 5D (3D volume + frequency + phase) terahertz tomography to enable imaging applications with imec hardware

ASTRA Toolbox



imec spectrally coherent THz imager

- Steerable emitter array (fast scanning
- Detector array: coherent, high SNR + phase information
- Integrated laser diodes: coherent excitation of emitter / detector



E.g. Non-Destructive Analysis of Ceramic Diesel Particulate Filters (Advantest)

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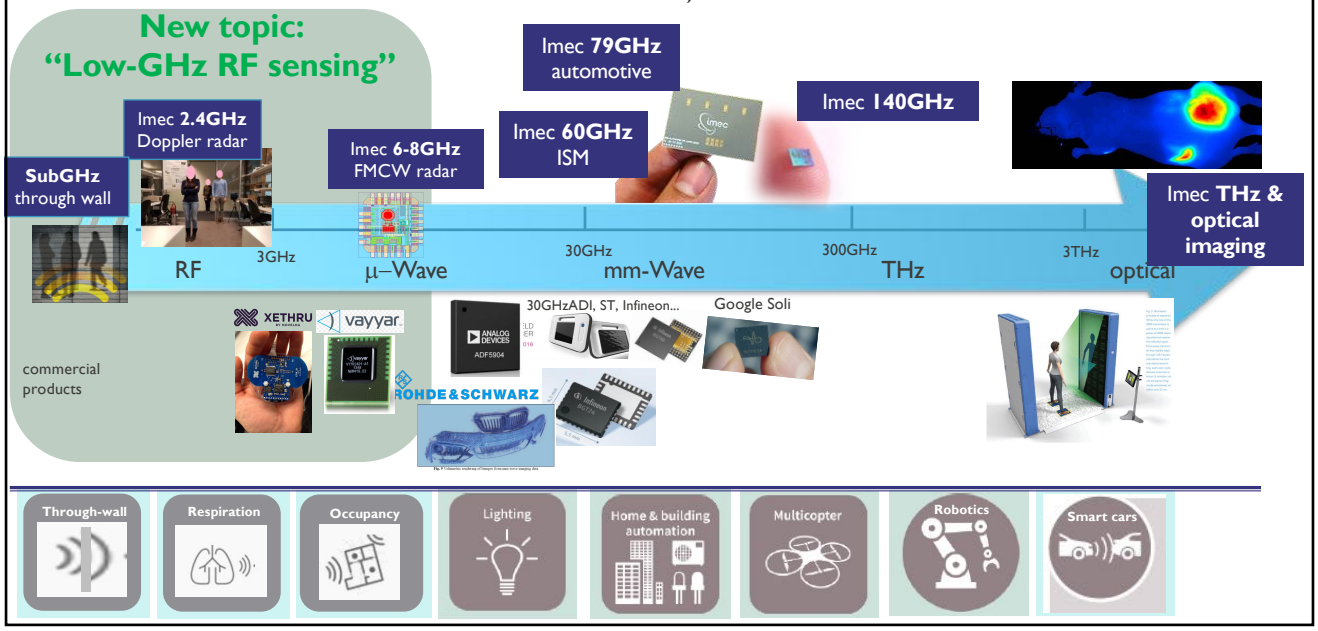
RF sensing and imaging

mm-WAVE

IMEC'S RADAR AND RF SENSING

ONE-STOP SHOP INCLUDING DATA FUSION, AND APPLICATION DEMOS

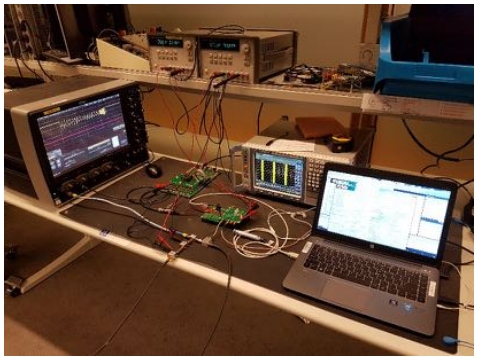


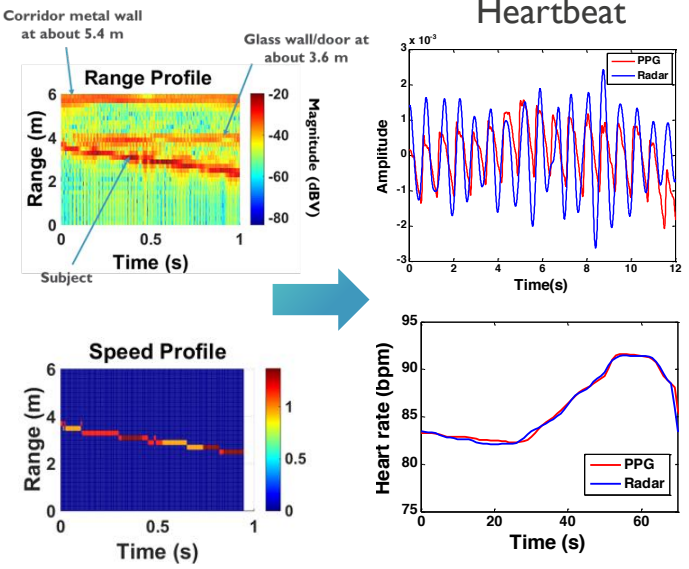
LOW-GHz RF SENSING

MEASURE HEART AND BREATHING RATE

Low-GHz radar prototypes

- 2.4GHz / 5GHz Doppler
- 7GHz FMCW





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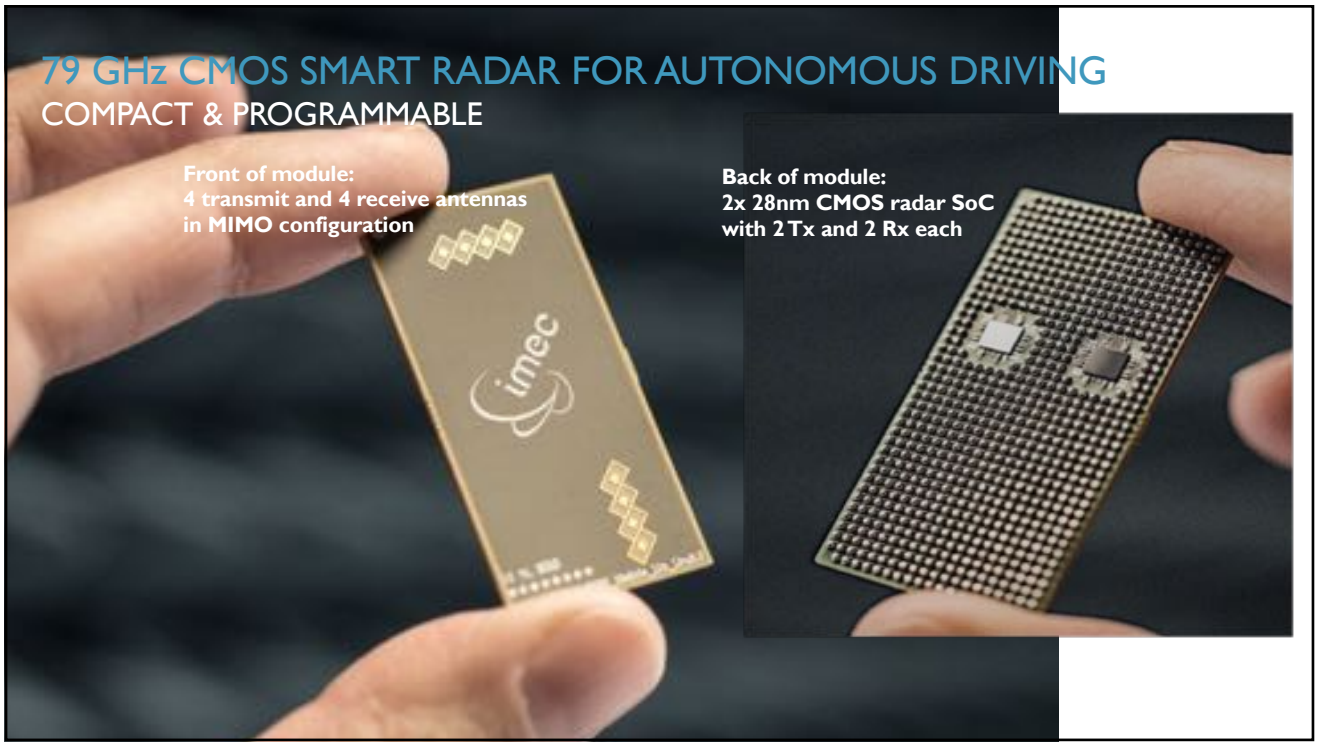
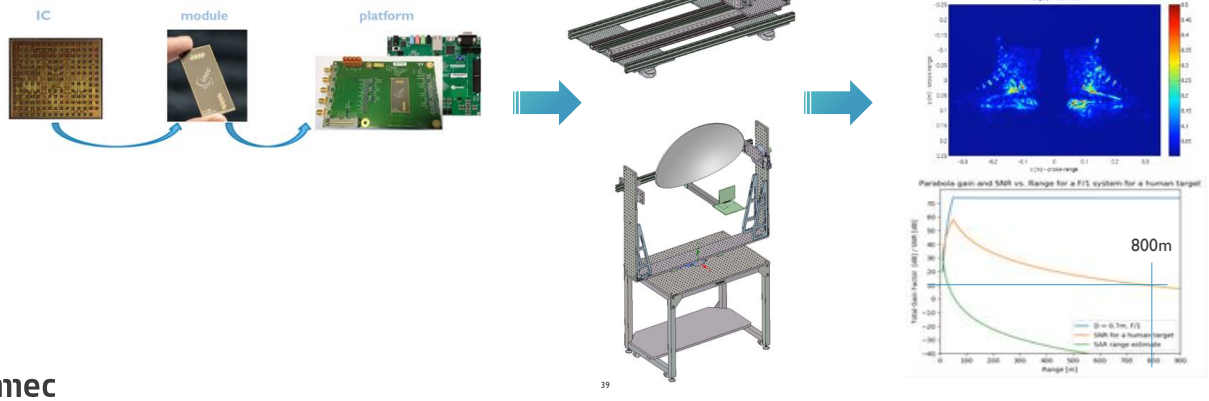
79 GHz CMOS SMART RADAR FOR AUTONOMOUS DRIVING

COMPACT & PROGRAMMABLE



mm-WAVE IMAGING TEST BEDS



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VENTURING

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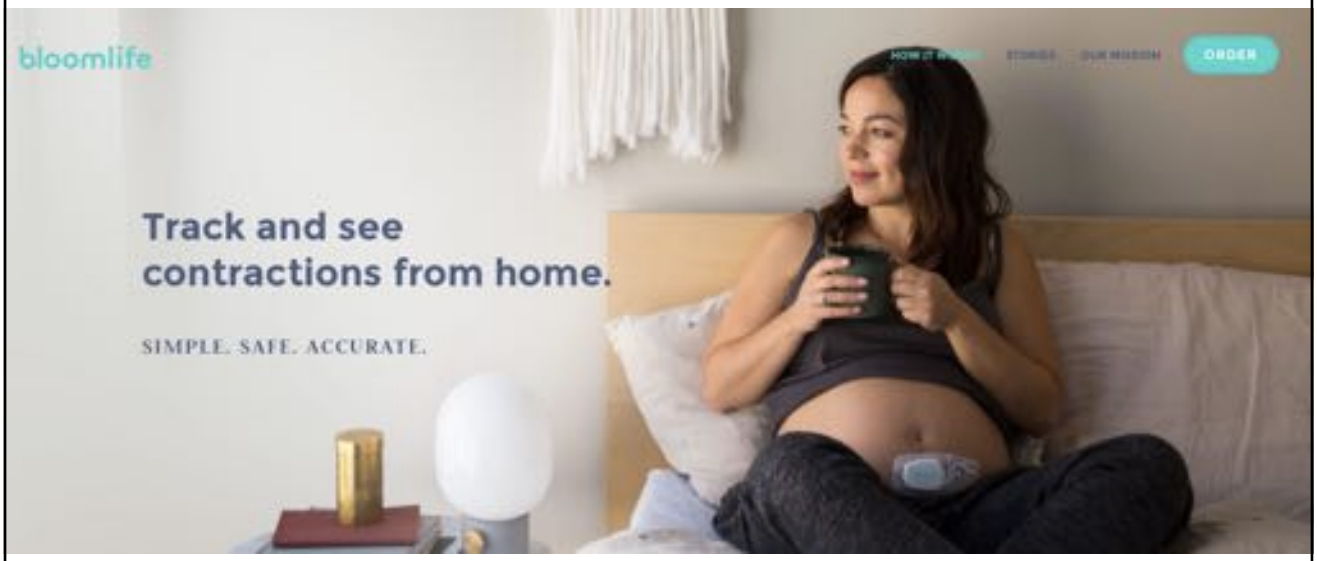
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Track and see
contractions from home.
SIMPLE. SAFE. ACCURATE.

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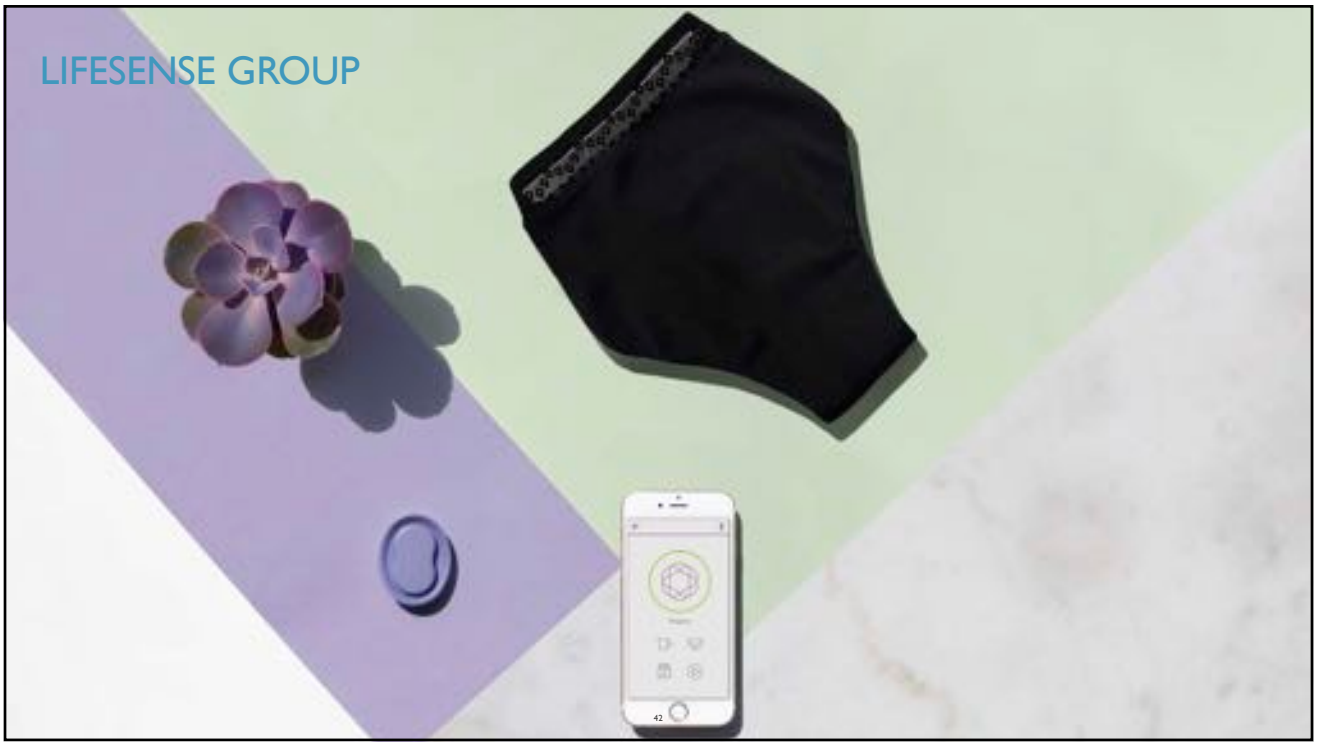
LIFESENSE GROUP
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WE ARE HIRING!

Payroll – PostDoc - PhD – internship


Computational imaging


Photonics design


Analog design


Digital design


Optical design

JOIN THE FORWARD THINKERS

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PROSTHETICS INTERFACES

POSTDOC MICROFABRICATION – POLYMER CHEMISTRY

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embracing a better life

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