



# European Sensor Systems Cluster – ESSC

**“Renaissance of chemical and biological sensors”**

**WG 3 - Health Monitoring and Comfort Sensors**

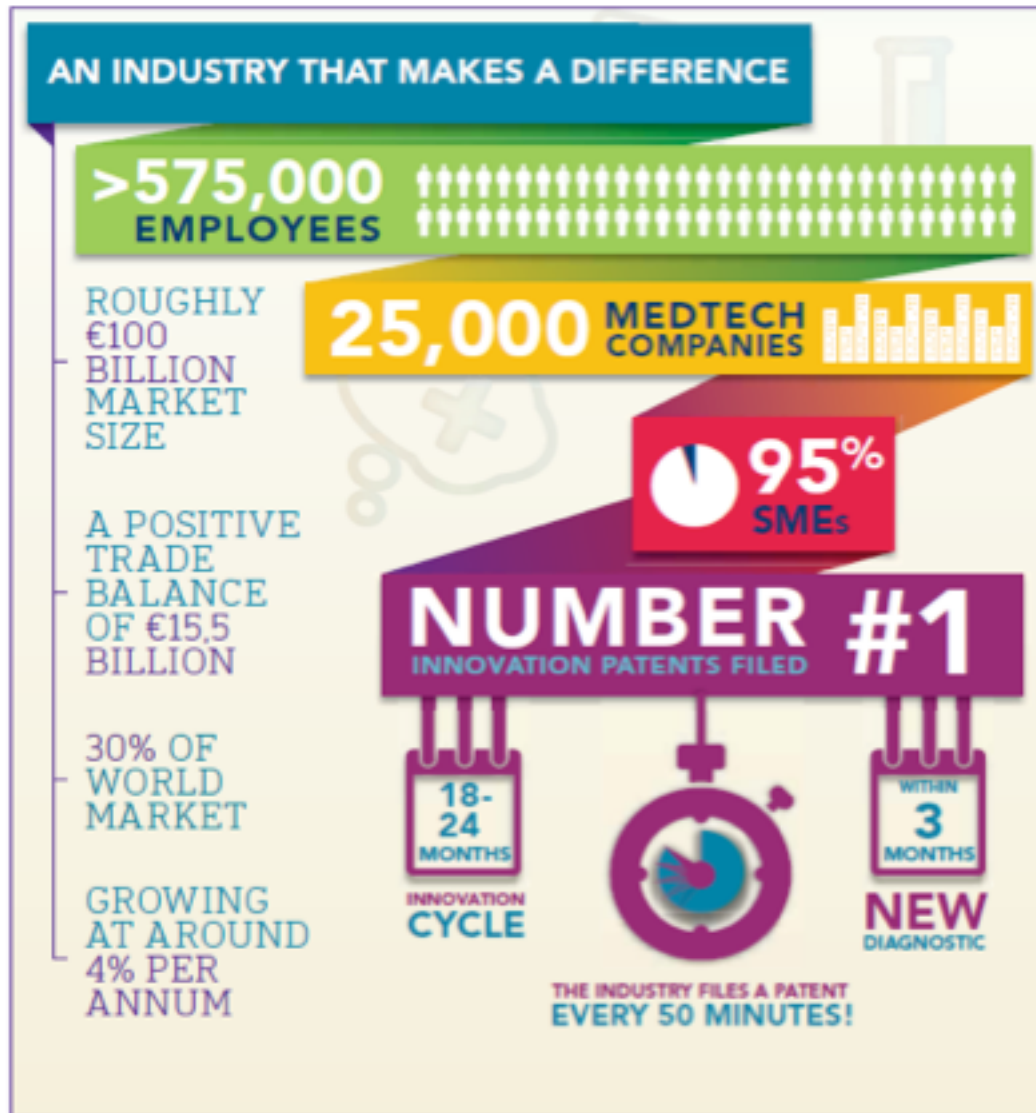
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# European Medtech Industry

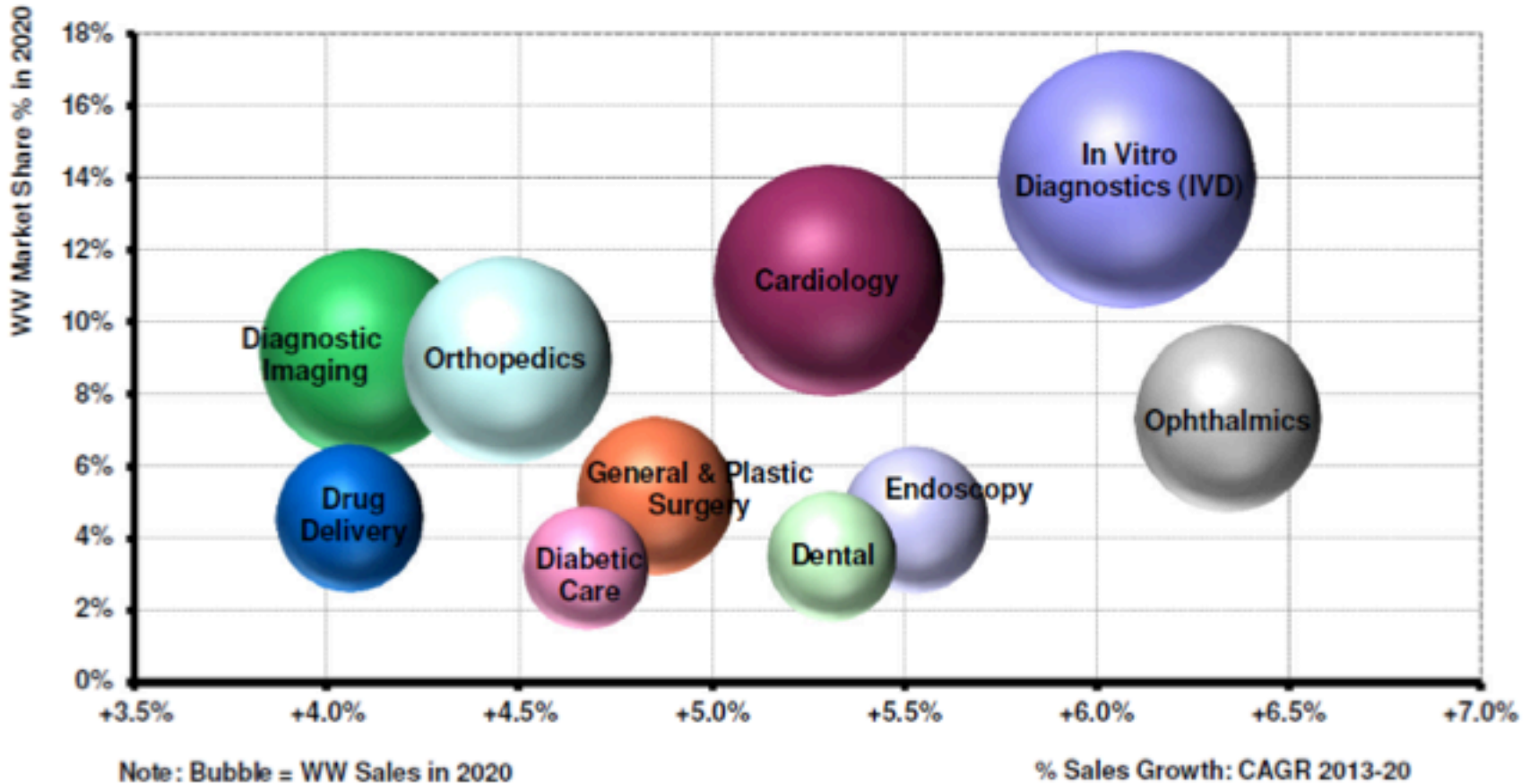


Ref: [www.eucomed.org](http://www.eucomed.org)

EU Member States spend 10.4% of their GDP on healthcare; on average, medical technology accounts for only ~7.5% of total healthcare expenditure – less than 1% of GDP;<sup>1</sup>

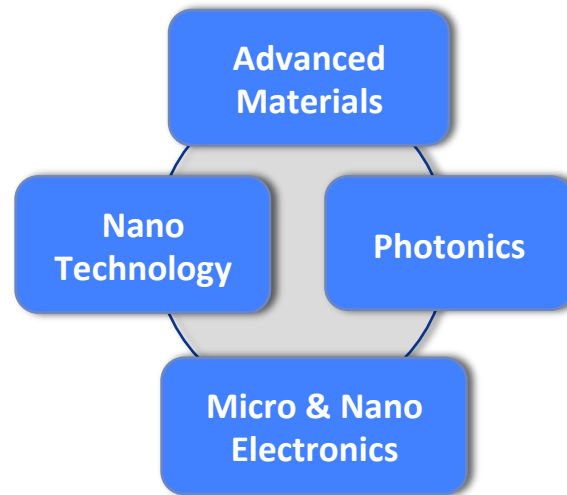
# Global Analysis of top 10 device areas in 2020

Analysis on Top 10 Device Areas in 2020, Market Share & Sales Growth (2013-20)  
Source: EvaluateMedTech® (18 SEP 2014)



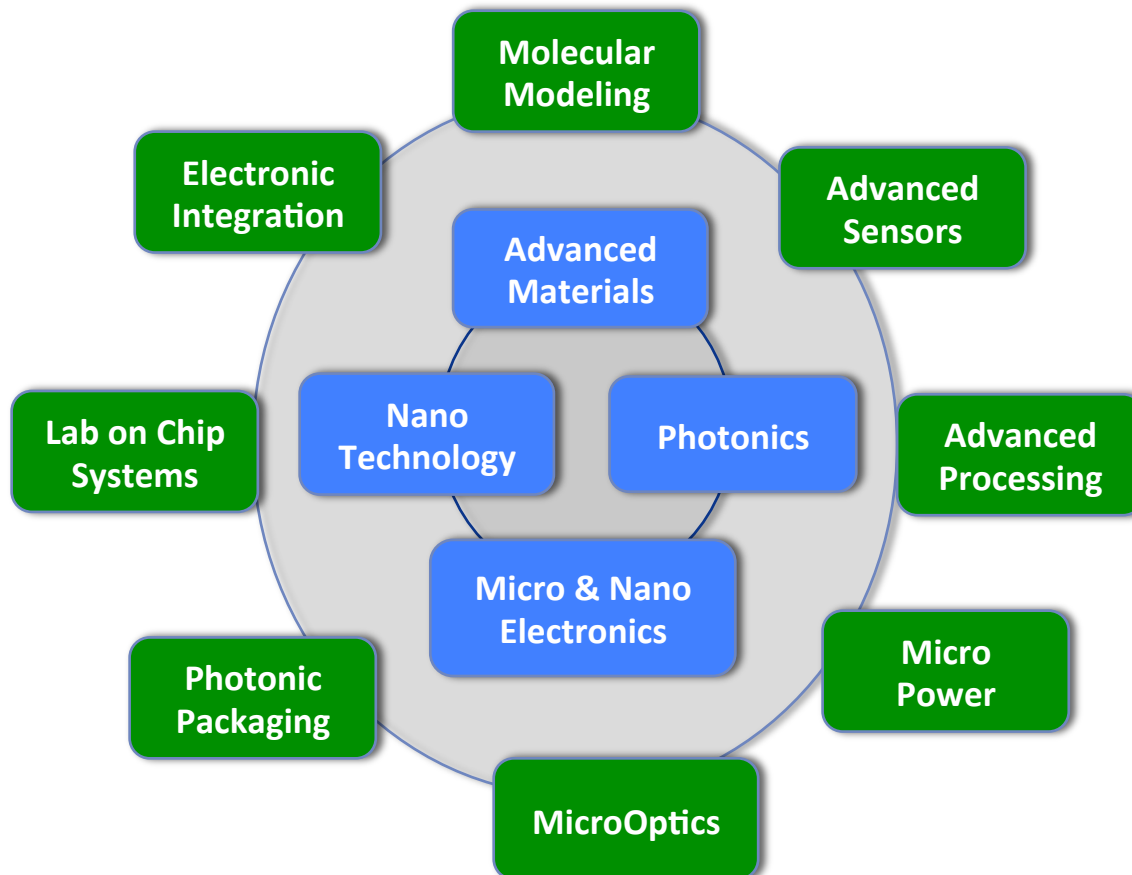
# KETs underpinning innovation in Health Monitoring and Comfort

Key Enabling Technologies



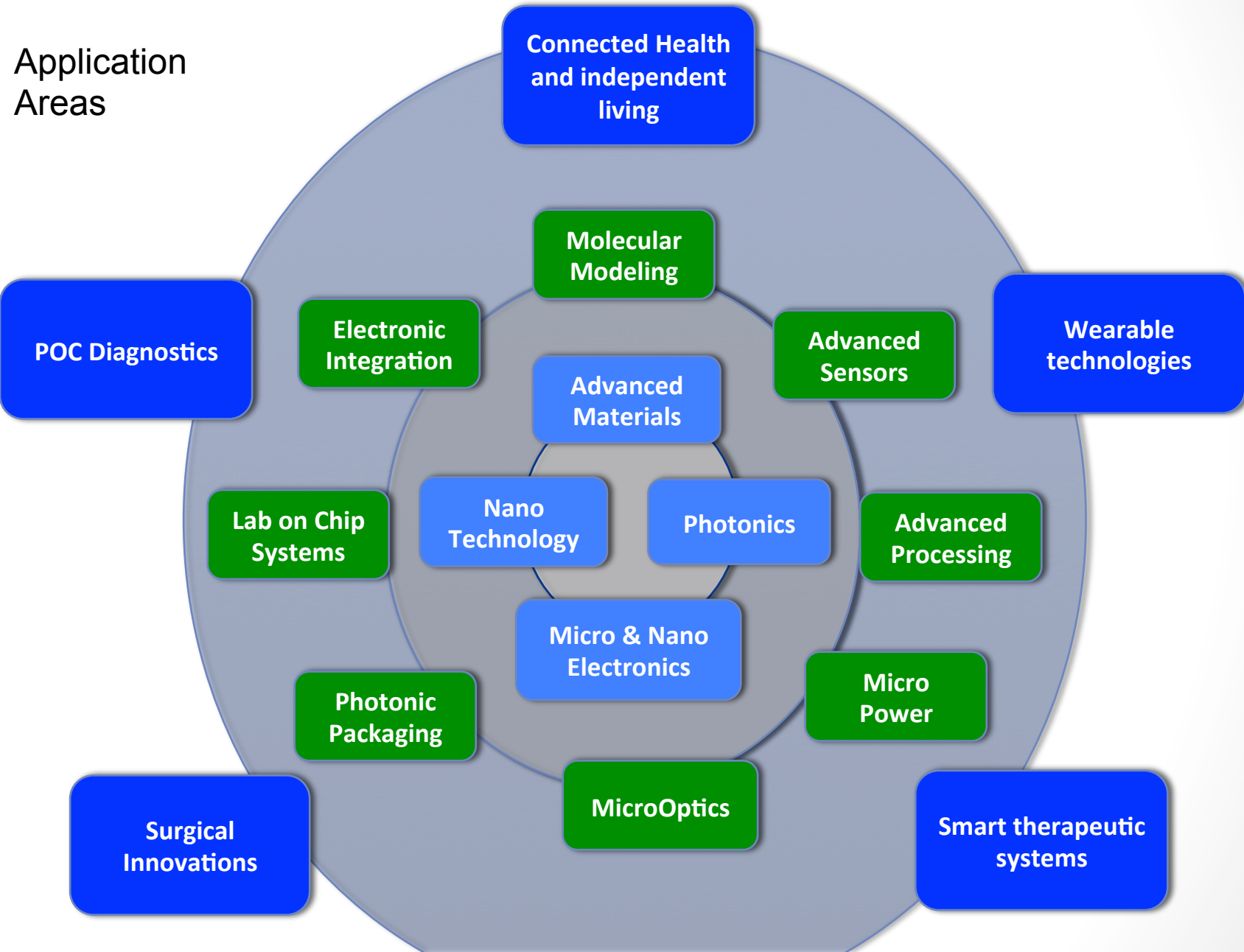
# KETs underpinning innovation in Health Monitoring and Comfort

Technology  
Platforms

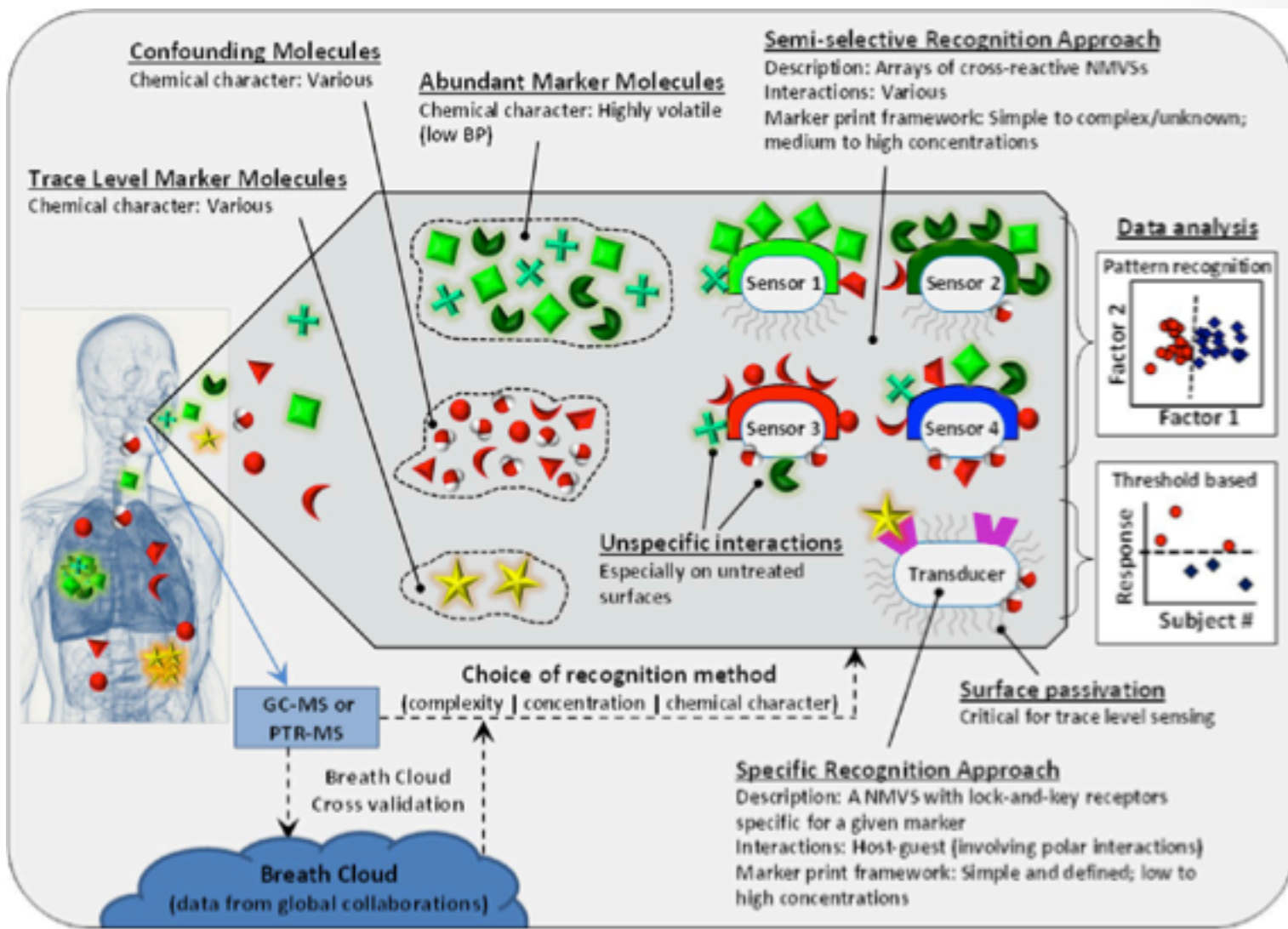


# KETs underpinning innovation in Health Monitoring and Comfort

Application Areas



# Sensors for detection and quantification of VOCs



From: G. Konvalina and H. Haick (2014), *Sensors for Breath Testing: From Nanomaterials to Comprehensive Disease Detection*, *Accounts of Chemical Research* 47(1) 66-76.

# Sensors for detection and quantification of VOCs

Disease	VOC Name	CAS No.	BP (K)	Ref	Controls (ppb <sub>v</sub> )	Diseased (ppb <sub>v</sub> )	Increase/Decrease (I/O)
Chronic obstructive pulmonary disease (COPD)	Carbon monoxide	630-08-0	82	<sup>1</sup>	2800	5960	1
	Nitric oxide	10102-43-9	121	<sup>2</sup>	2	4	1
				<sup>3</sup>	1.5	12.0	1
				<sup>1</sup>	6.8	11.9	1
	Ethane	74-84-0	184	<sup>1</sup>	0.9	2.8	1
	Isoprene	78-79-5	307	<sup>4</sup>	147.40	42.90	0
	Pentane	109-66-0	309	<sup>4</sup>	6.54	11.66	1
	2-Methylpentane (isohexane)	107-83-5	333	<sup>4</sup>	0.68	1.09	1
	Heptane	142-82-5	372	<sup>4</sup>	0.20	1.15	1
	Octane	111-65-9	398	<sup>4</sup>	0.49	1.28	1
	Ethylbenzene	100-41-4	409	<sup>4</sup>	0.33	1.25	1
	Xylenes	1330-20-7	412	<sup>4</sup>	0.76	2.31	1
	Styrene	100-42-5	418	<sup>4</sup>	0.30	2.14	1
	1,2,4-Trimethylbenzene	95-63-6	443	<sup>4</sup>	0.15	0.45	1
Decane	124-18-5	447	<sup>4</sup>	5.09	17.99	1	

From: G. Konvalina and H. Haick (2014), *Sensors for Breath Testing: From Nanomaterials to Comprehensive Disease Detection*, *Accounts of Chemical Research* 47(1) 66-76.



# Topic: Sensors for detection and quantification of volatile organic compounds (VOCs)

**Call timing:** 2018-2019

**Instrument:** RIA

**Challenge description:** VOCs provide opportunities to identify unique chemical signatures, which are diagnostic for specific diseases. Realtime analysis of VOCs (such as from breath, wounds, etc) could provide the basis for the ultimate point-of-care diagnostic system. Disease-specific VOC signatures require many different compounds to be analysed realtime, in parallel and in miniaturised sensor systems to fully characterize specific VOCs.

**Possible solutions:** The solution is likely to be an array of optical or electrochemical sensors (or some combination of the two), enabling the capture of VOCs into the appropriate media for analysis using highly sensitive (nanosensor) platforms

**EU positioning:** If successful, VOC diagnostic systems could revolutionise healthcare systems, based on their user friendliness, compatibility with use in the home, in primary healthcare settings, and integrated into wearables, which should support many new companies addressing various market segments, including both clinical and consumer markets.

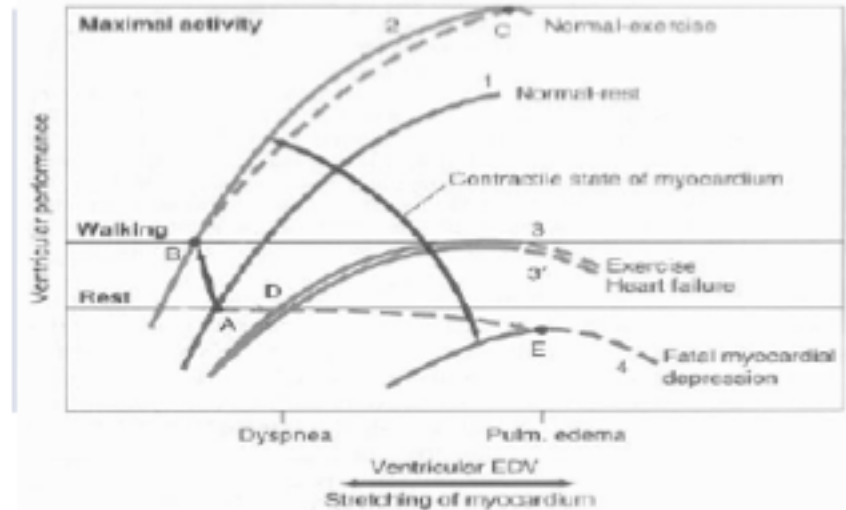
**Companies interested:** medtech, biopharma, smartphone and smart wearable, military

# Ultrawideband Pulse Radar

Research Highlights

## The Next Generation of Medical Diagnostic Devices

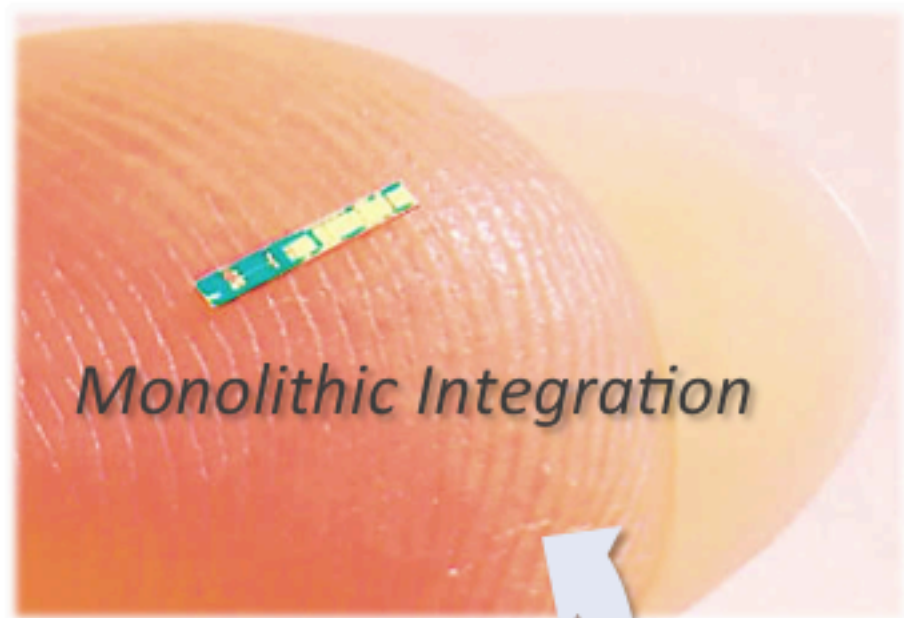
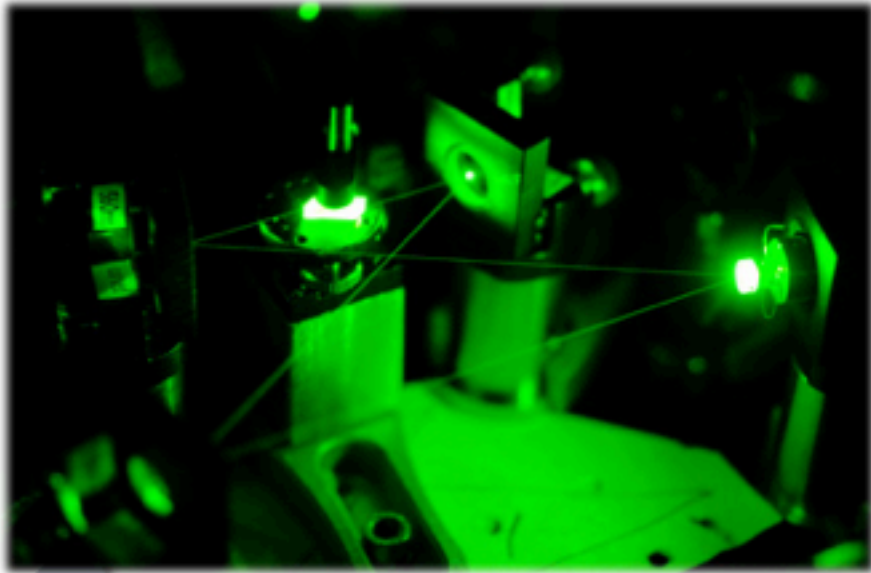
As search and rescue teams sweep the rubble of fallen buildings, they have several goals in mind—locate the survivors, determine and stabilize their injuries, remove



From: Lawrence Livermore National Laboratory (USA) Science and Technology Review , Aug 11, 2009

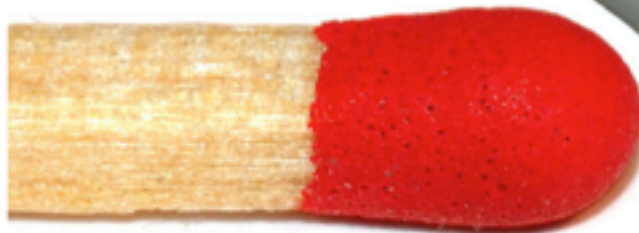
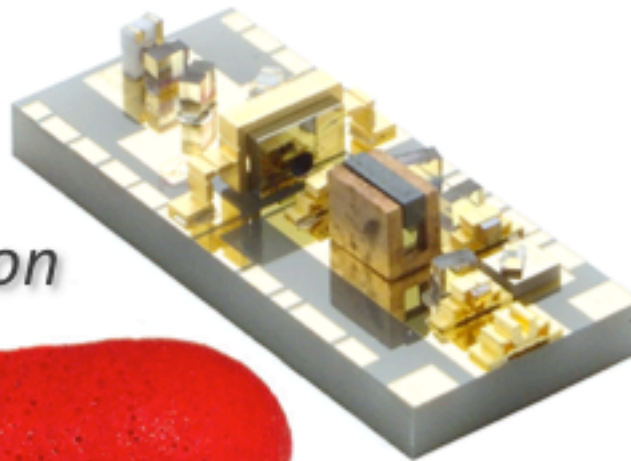
Zito D., et al, "A 90nm CMOS SoC UWB pulse radar for respiratory rate monitoring", IEEE International Solid State Circuits Conference (ISSCC), 2011

# Integrated Miniaturised Systems



*Monolithic Integration*

*Hybrid Integration*



# Topic: **Non-invasive sensing platforms for health monitoring**

**Call timing: 2018-2019**

**Instrument: RIA**

**Challenge description:** Sensor systems capable of remote monitoring of physiological parameters are needed which can rapidly and non-invasively provide the clinical data needed to support independent living, rapid identification of persons suffering from pathogens in the event of an epidemic, or continuous monitoring of patients from admission to discharge within the hospital context.

**Possible solutions:** With the advent of IOT-enabled smart environments, the potential exists to integrate non-contact sensing platforms into homes, cars, hospitals, and wearable systems for health monitoring. These could be based on sensors such as multispectral biophotonic techniques, ultrawideband radar, or other nano/ICT-enabled sensor platforms as applicable.

**EU positioning:** Europe which has more than 25,000 medtech companies with a market worth over €100bn, needs to position itself as a leader in the development and manufacture of smart medtech, leveraging the convergence of pharma, medical and ICT industries.

**Companies interested:** medtech, biopharma, smartphone and smart wearable, military

Thank You