



From Silicon to Solutions: The Role of Chiptech in Modern Medicine

Ronald Dekker, Phillips



The MEMS ultrasound revolution

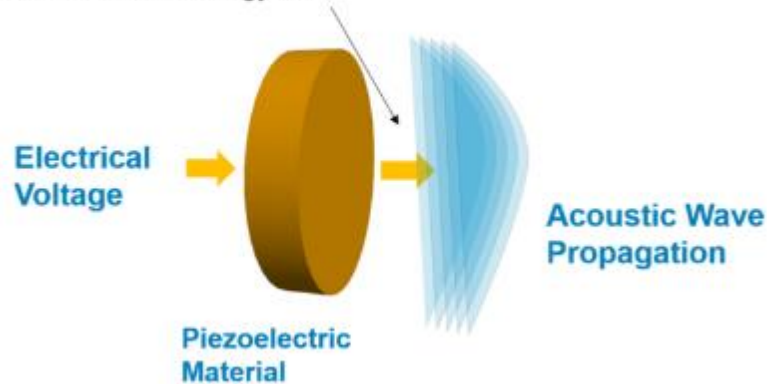
Ronald Dekker



// PZT will (have to) become MEMS

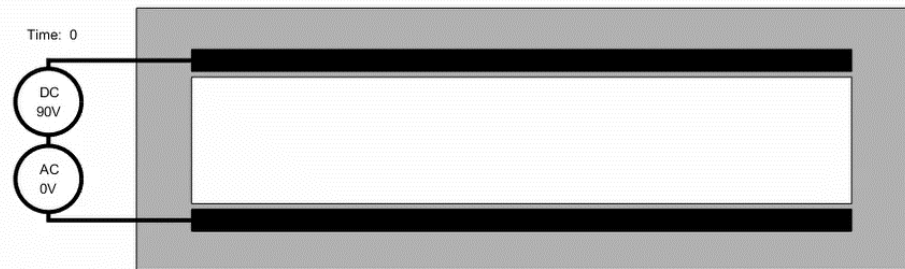
Traditional piezo-ceramic

Electric energy is converted into mechanical energy here



- 30 years proven technology
- Manual assembly
- Not scalable
- Expensive
- Not suitable for 2D arrays
- Narrow bandwidth

MEMS ultrasound transducer

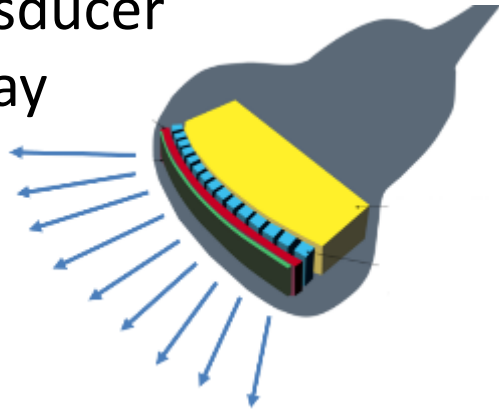


- Maturing fast
- Scalable to high volumes
- On ASIC → 2D arrays
- Wide bandwidth
- Tuneable

A huge opportunity for newcomers
A huge challenge for established players!

// 2D → 3D ultrasound

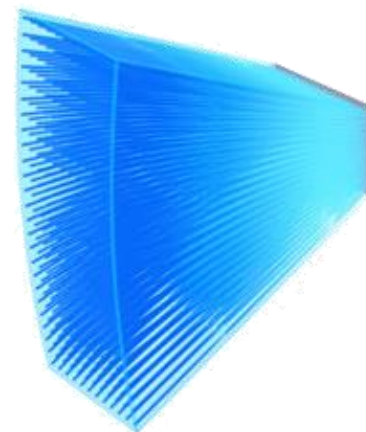
1D transducer array



2D ultrasound



3D ultrasound



2D transducer array

plane scan → volumetric data acquisition

// The MEMS US revolution

A paradigm shift in ultrasound imaging

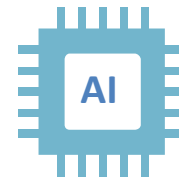


3D volumetric data



Validated models

+



Artificial intelligence

+



Deep clinical knowledge



portable ultrasound for semiprofessionals and even consumers

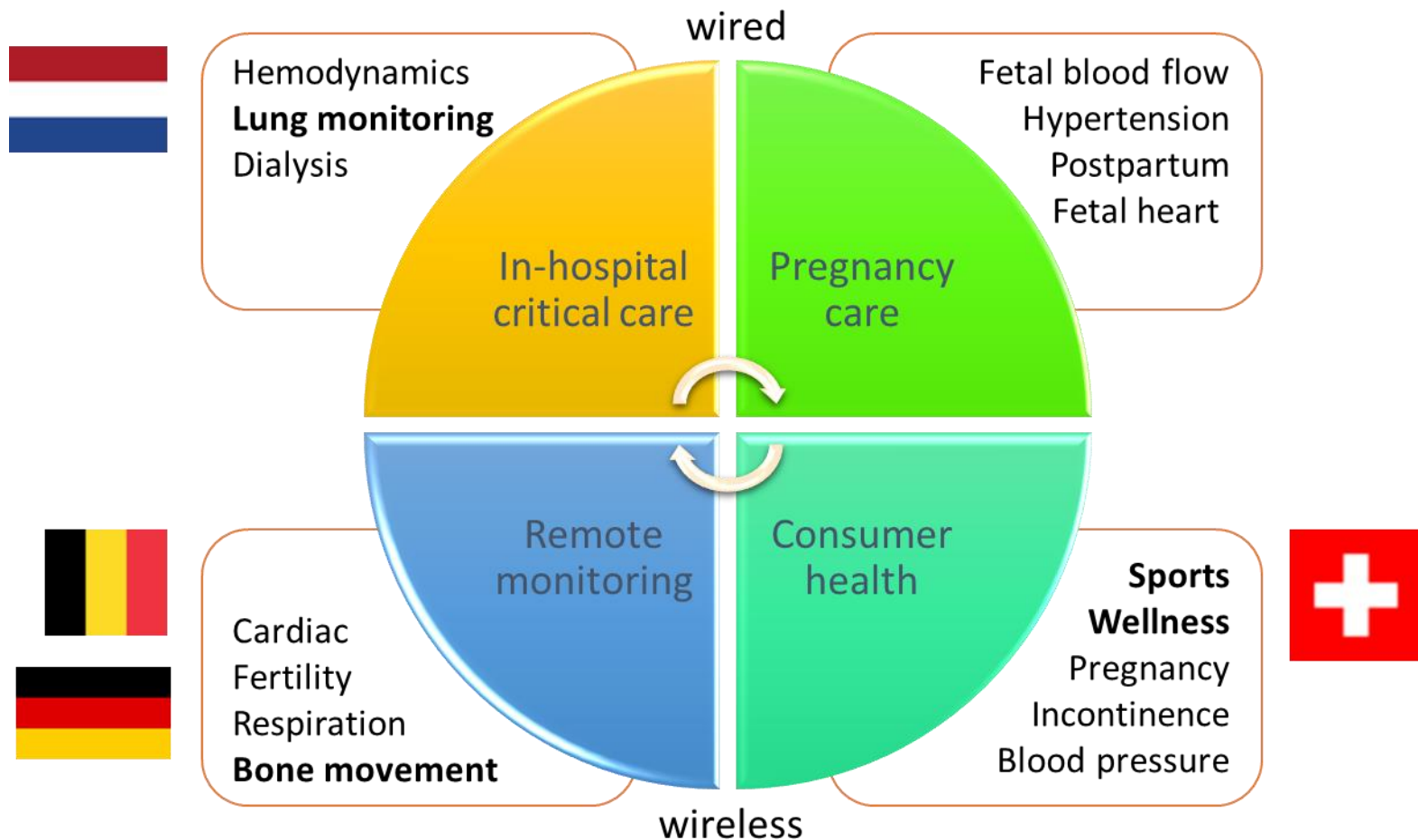


// New ultrasound markets

Market descriptor	Global device market size (B\$)	Market phase	Benefits MEMS	Application opportunities	Market start (est)
Interventional Ultrasound	2.5-3.0 ¹	Mature-growing	Miniaturization, performance, volume manufacturability, cost, performance	IVUS/FFR/ICE/TEE/EUS/EBUS-TBNA/Laparoscopes	1990-2000
POC out-of-hospital to in-hospital	1.5-2.0 ² 6-8 ³	Developing-growing	Cost, volume manufacturability, Ease of use (3D for UI), performance, ROHS compliant	UltraPortable Ultrasound	2018-2025
Wearable Ultrasound	12-18 ⁴ 30-40 ⁵	Strong venture/PPP investment pull	Cost, (flat) form factor, volume manufacturability, ease of placement, autonomous (3D for UI) use, performance, ROHS compliant	Lung monitoring, Fetal monitoring, Musculoskeletal monitoring, OB screening, Cardiac output, Dialysis, Cerebral perfusion, Bladder monitoring ...	2027-2032
Consumer Ultrasound	600-800 ⁶	Pre-Embryonic	Cost, volume manufacturability, autonomous use (3D for UI), ROHS compliant	Smartphone add-on: Pregnancy, bladder, body-fat, muscle, vascular, wrist (ID) heart-beat, skin, microvasculature	2030-2040

1. Global market size today growing at ~8-11 % CAGR. Data derived from Clarivate DRG overviews
2. Philips internal market evaluation.
3. Butterfly 2021 estimate 40 M potential users at 50 % adoption and 5 year lifetime gives ~4 M handhelds sold annually at ~1.5 keuro per device.
4. 1st order estimate: Patch connected to Lumify based back-end. Philips re-usable estimates 30-50 M re-usable patches for 1 M back-end devices annually at 300 \$ per patch and 3 keuro per device
5. Butterfly 2021 estimate (>>) 100M patches each year and 10 M devices at 200 \$ per patch and 1 keuro per device
6. 1.8 B Smartphones sold each year estimated at ~\$300-400 average price. Small CMUT components 1 per device at 1\$ component revenue.

// Wearable ultrasound applications



Bold: use cases addressed in Xecs project SonoSkin

// Questions

