IOTSHOW.IN
PROFIT FROM IOT

VIJAY MISHRA

SENSORS FOR IOT

www.vijaymishra.org

What are expected of IoT Sensors ?

Compact

Ruggedized

Low power/self-powered

Smart

Networked

Self-calibrated

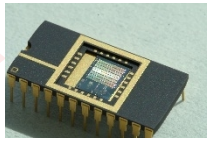
Low cost

Click to add text

What is already available ? In what form and shape ?

Water Quality Probes
https://www.waterprobes.com/

Massive Devices Huge Prices , Scalability ??

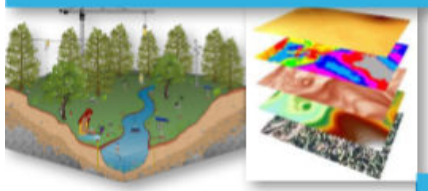


WORLD OF SENSORS

Predictive Maintenance

Energy Saving Smart Grid

Intelligent Buildings



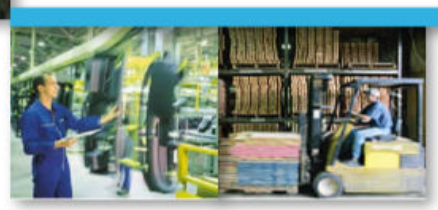
Enable New Knowledge

Improve Food and H^2O

Smart Home S+CC

High-Confidence Transport and Asset Tracking

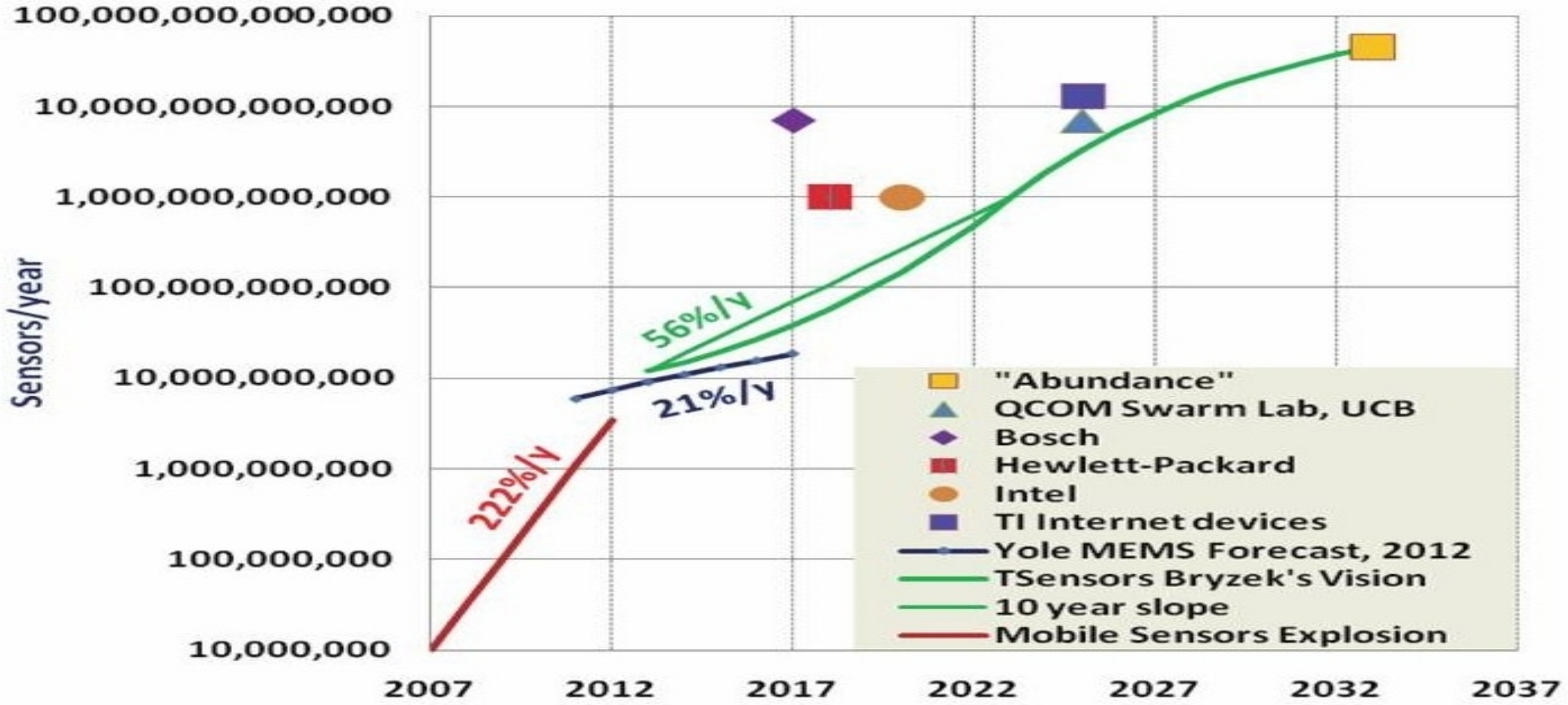
Enhanced Safety & Security



Improve Productivity

Healthcare

THE TRILLION SENSOR VISION BY 2030



DRIVERS FOR SENSORS MARKET

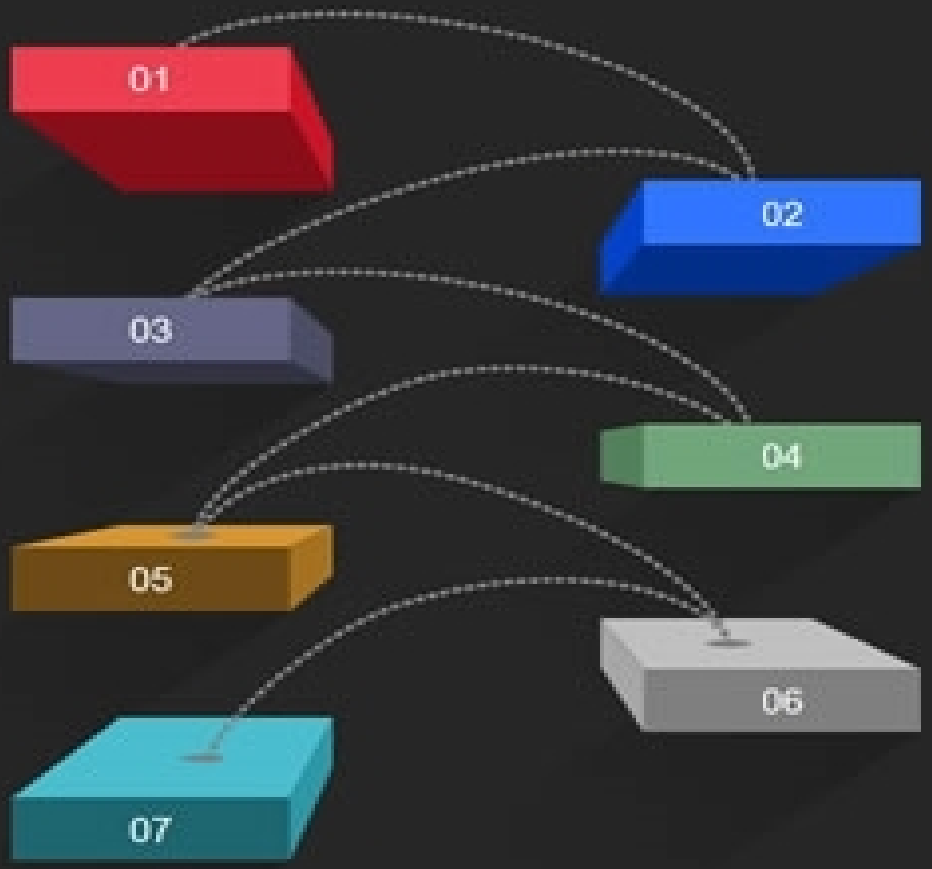
(no particular order)

IoT
Growing adoption of the Internet of Things (IoT)

SENSORS
Advances in sensors themselves

AUTOMATION
Strong demand in the automation industry

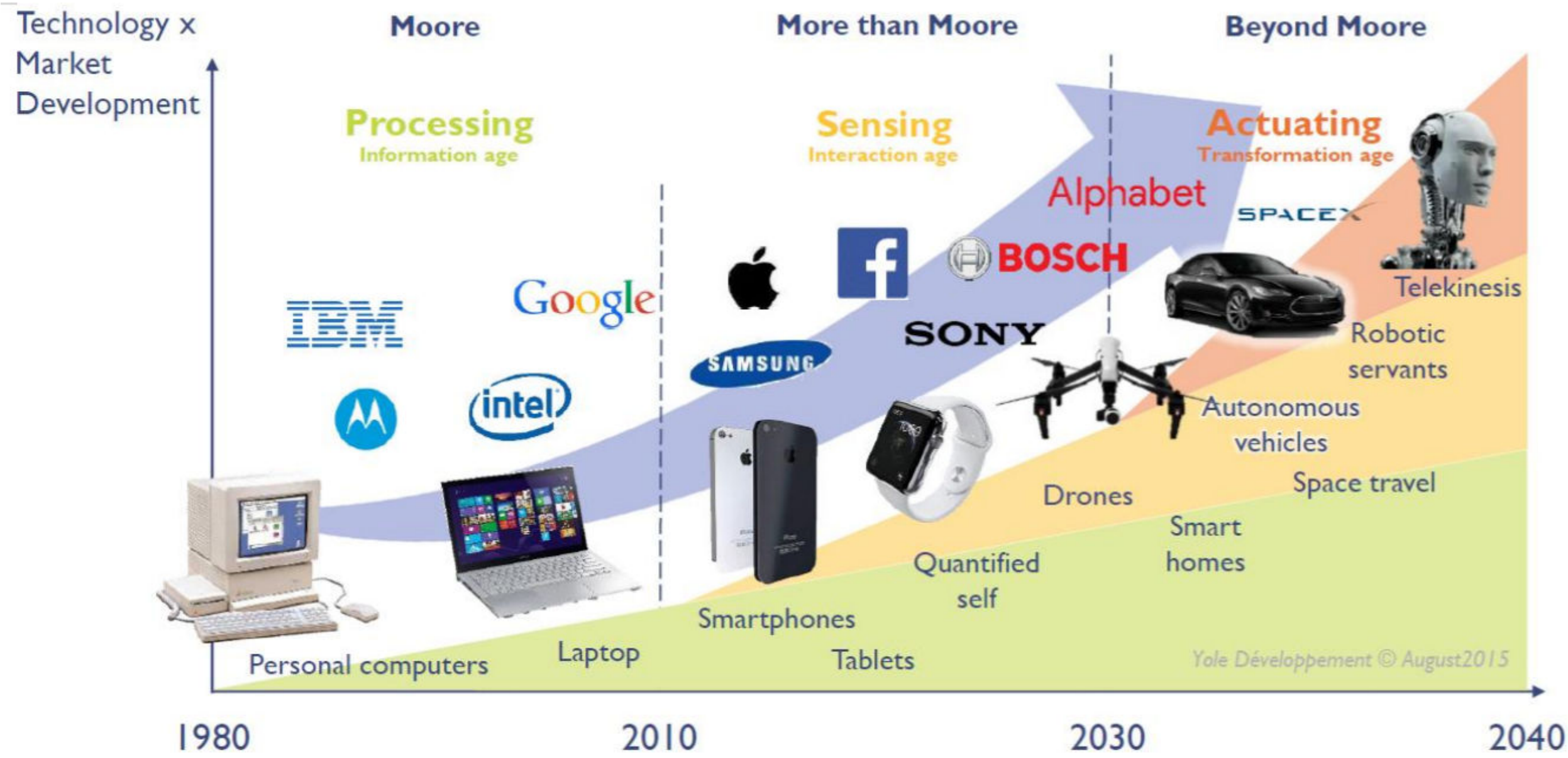
WEARABLES
Increasing demand for wearables

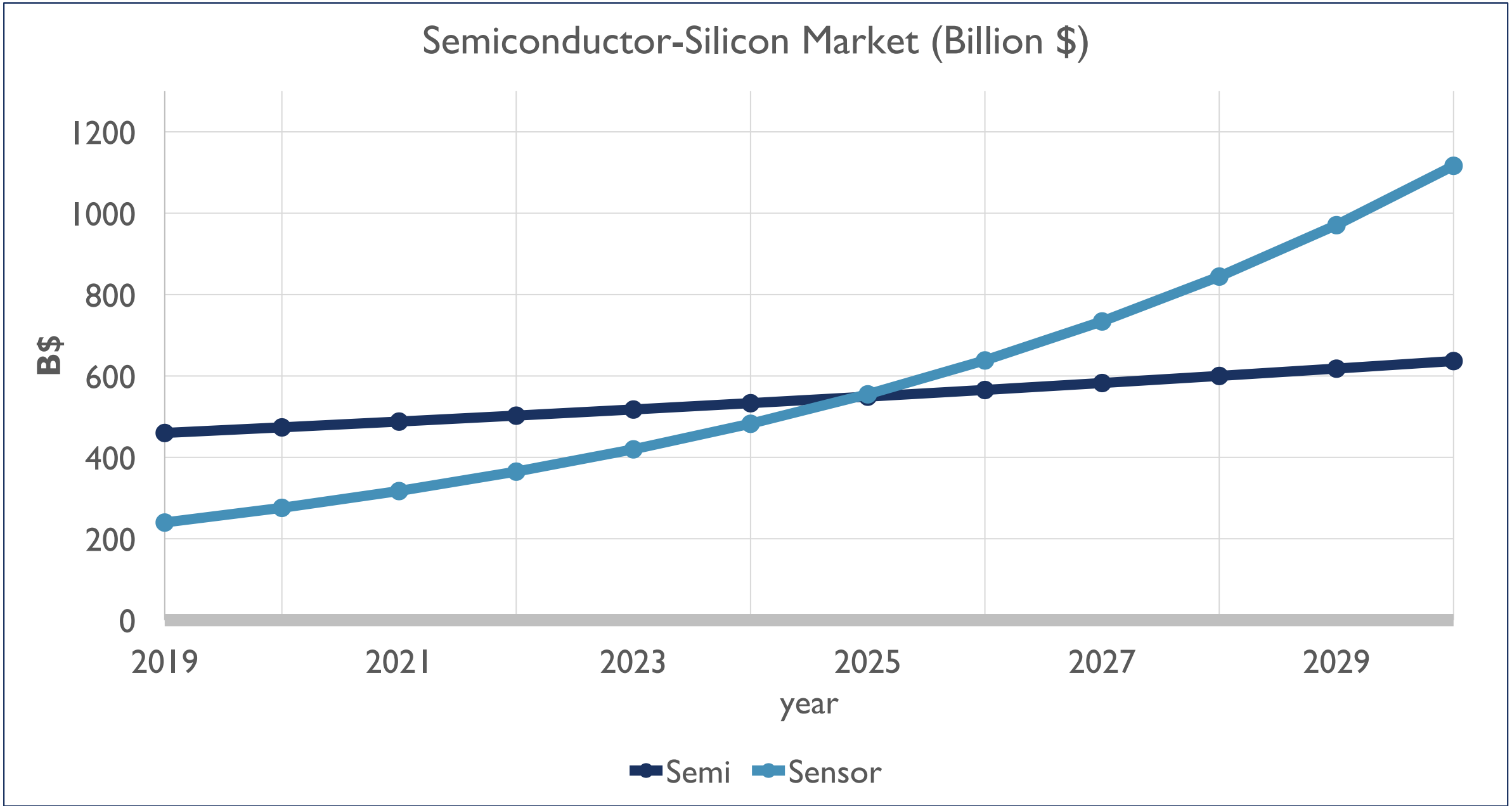


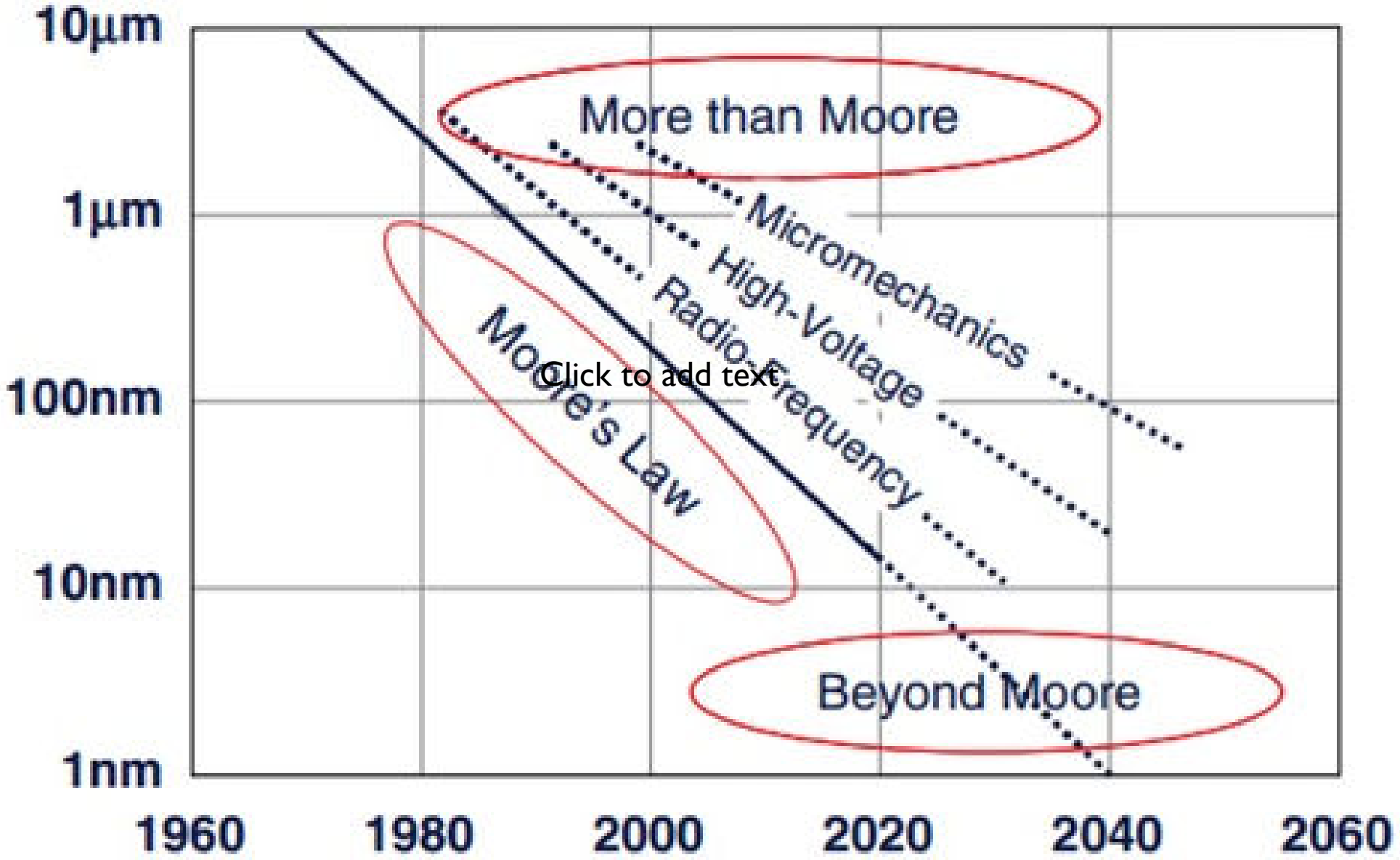
CE
Advances in consumer electronic products.

SMARTPHONE
The growing usage of all sorts of sensors in smartphones

AUTOMOTIVE
Growth in the automative industry

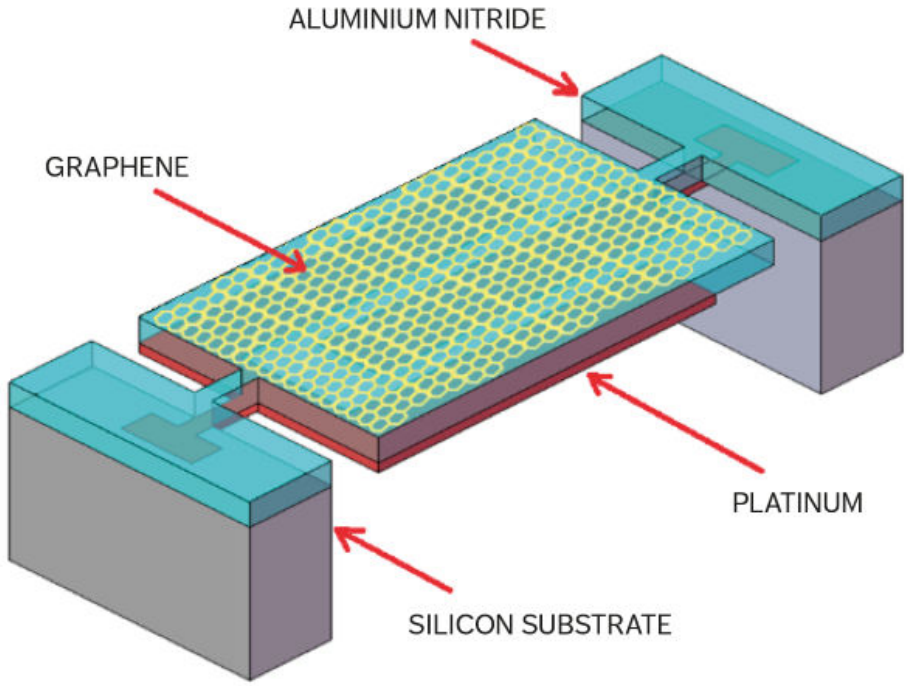

Technology x
Market
Development
Moore
More than Moore
Beyond Moore
Processing
Information age
Sensing
Interaction age
Actuating
Transformation age
Alphabet
SPACEX
BOSCH
IBM
Google
SONY
SAMSUNG
intel
Telekinesis
Robotic
servants
Autonomous
vehicles
Space travel
Drones
Smart
homes
Quantified
self
Smartphones
Tablets
Laptop
Personal computers
Yole Développement © August2015
1980
2010
2030
2040


Semiconductor-Silicon Market (Billion $)
1200
1000
800
600
400
200
0
B$
2019
2021
2023
2025
2027
2029
year
Semi
Sensor



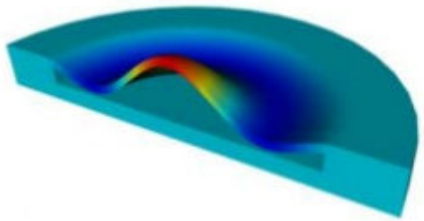
Click to add text

TRENDS IN MORE THAN MOORE DEVICES



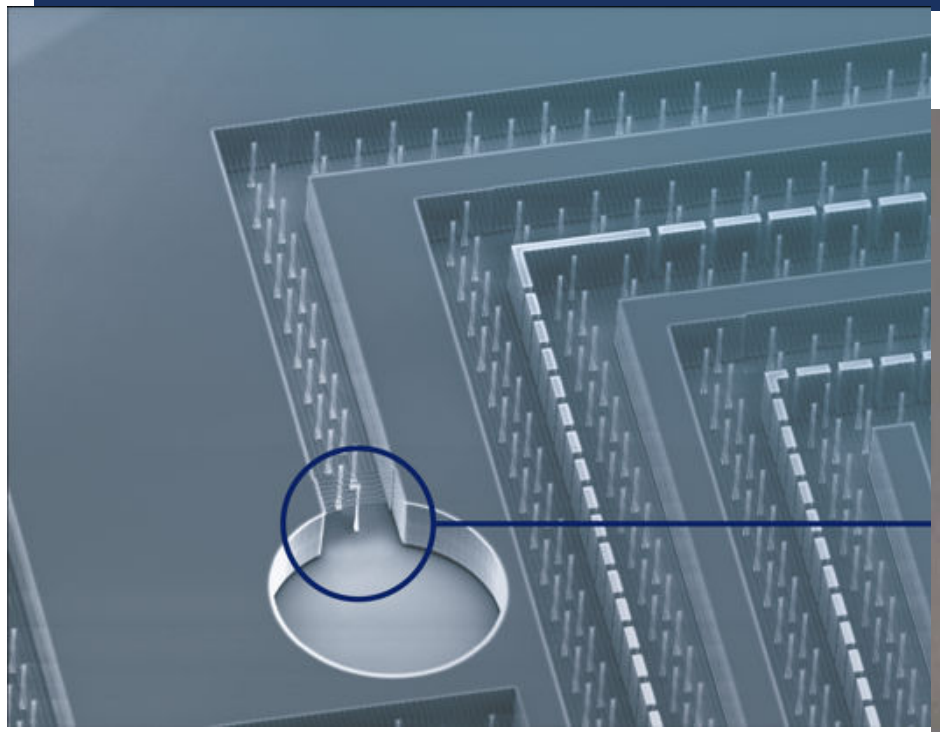
pMUTs

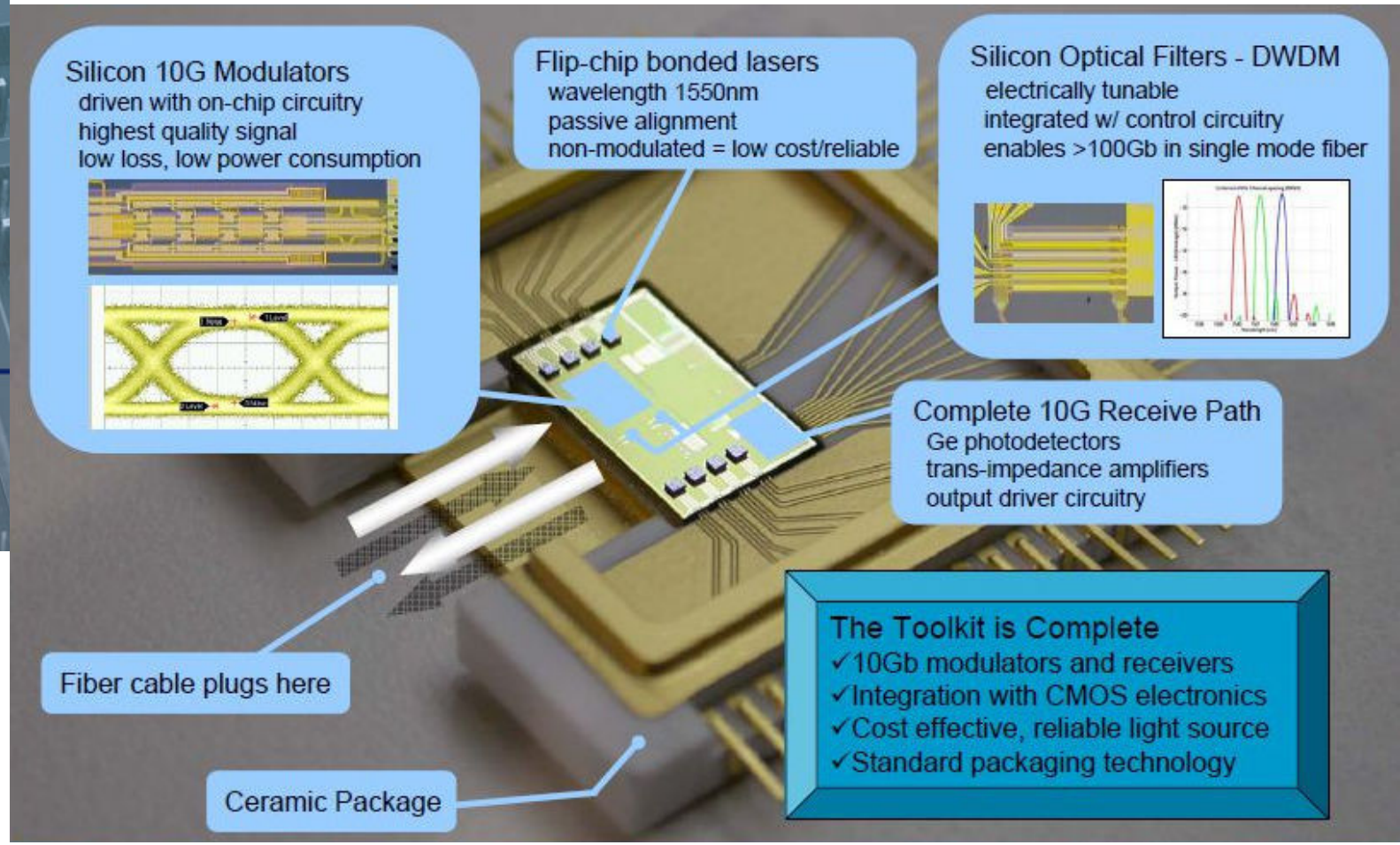
- Piezoelectric micromachined ultrasonic transducers
- Thin diaphragm typically formed on silicon substrates
- Suitable for a range of broadband sensing applications
- Microfabrication techniques make on-chip integration possible
- Unlike cMUTs - no high voltage biasing is required for operation
- Closer mechanical impedance to fluids enhances device efficiency
- Capable of High Frequency operation over a wide bandwidth

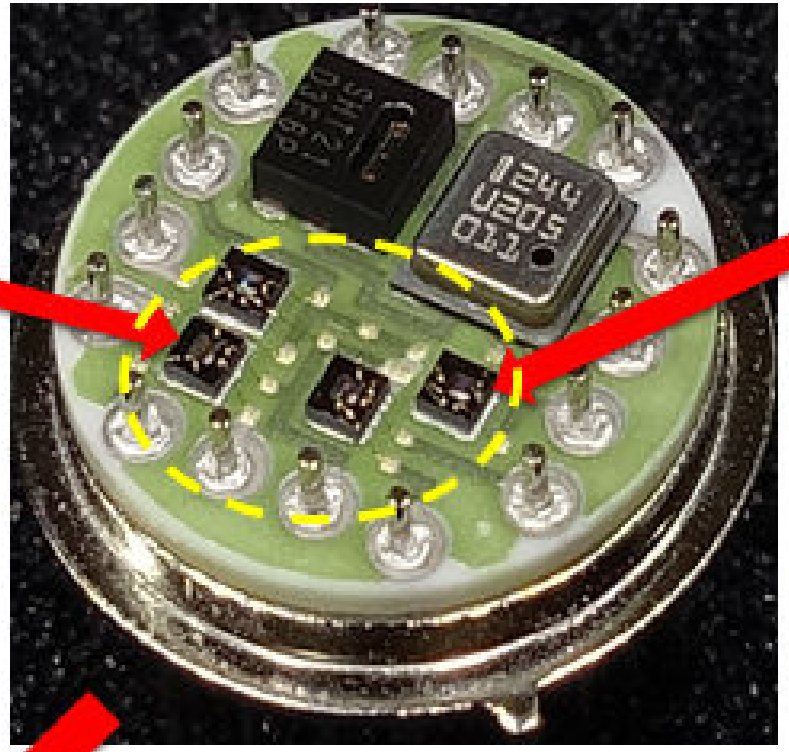


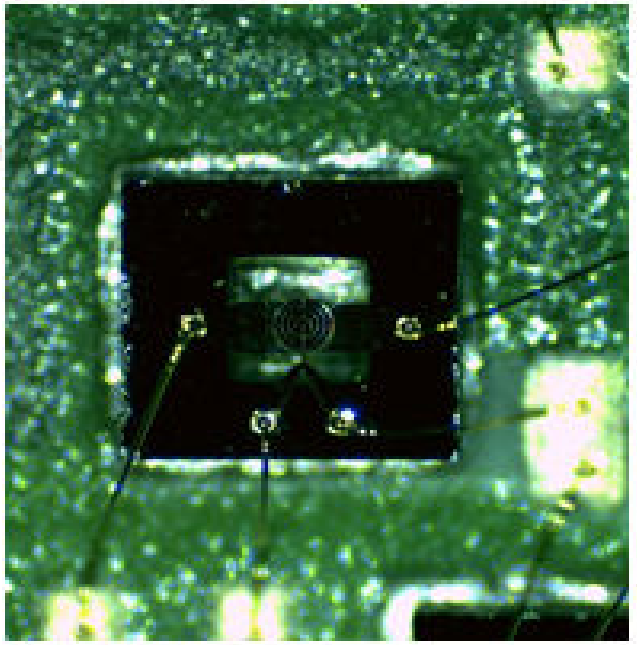
2nd order vibrational mode of a circular pMUT element

TRENDS IN MORE THAN MOORE DEVICES…. CONTINUED





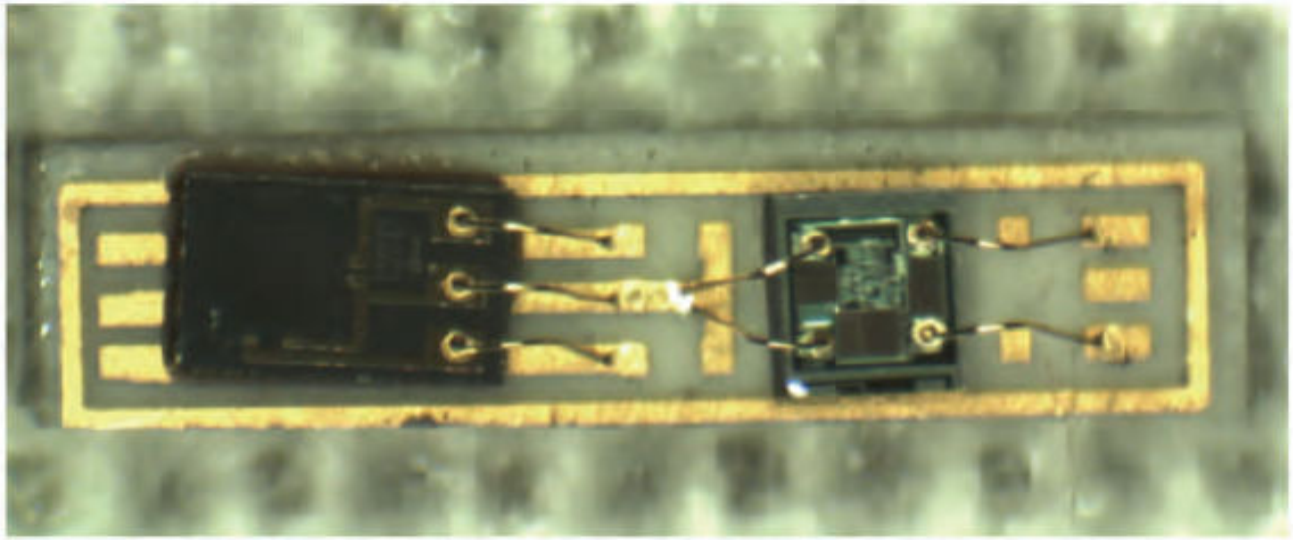


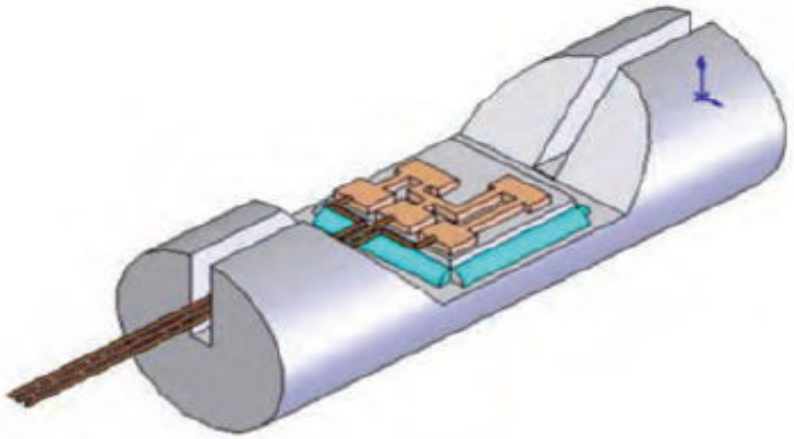


Packaged Sensor

Intracranial Pressure Sensor

CeNSE has developed pressure sensor and biocompatible advanced packaging to build solution for intracranial pressure monitoring for bio medical applications related to head injuries.

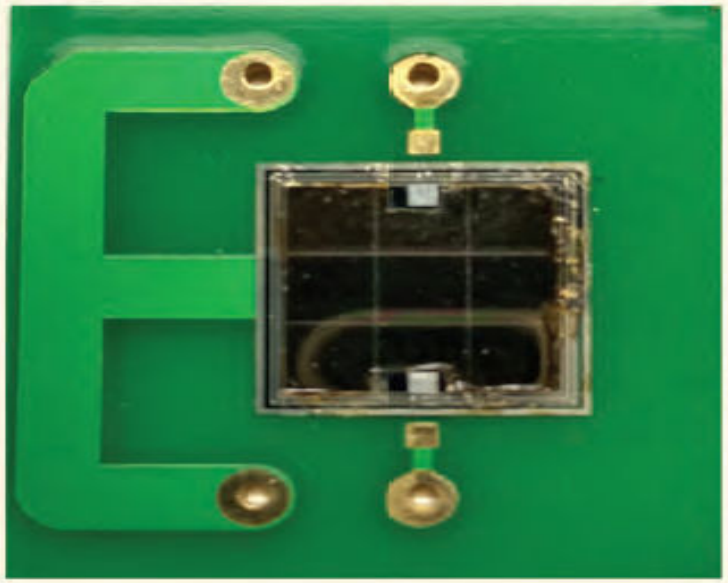


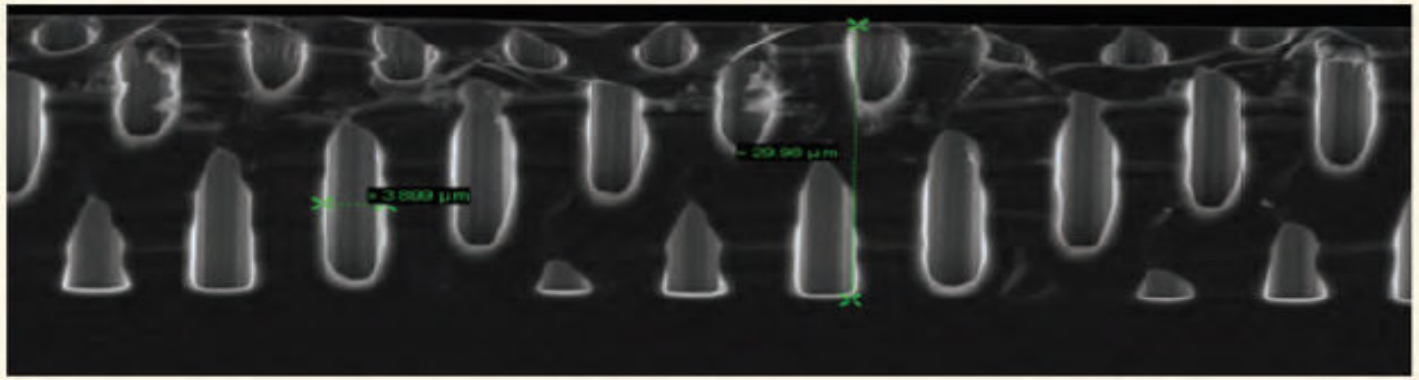


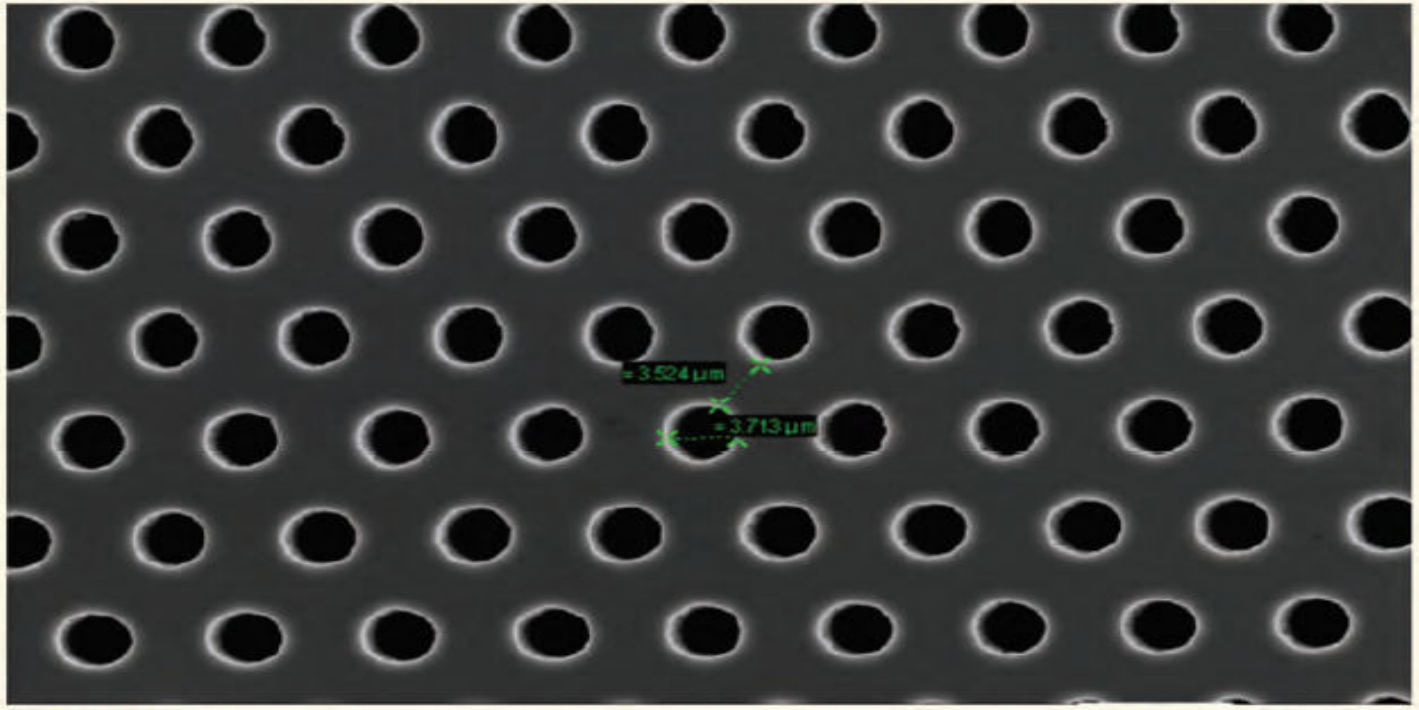
- Material: Gold plated Ceramic substrate with 0.6mm thickness.
- Dimension:
  - > Single sided: 0.8mm x 4.0mm
  - > Double sided: 0.8mm x 3.5mm
- Die-attach: GE P161 and ADTMP36 should be die-attached using H74 Non-conductive epoxy
- Wire bonding: 1mil ball to wedge bonding.
- Sensor output connection:
- 0.8mm O.D PTFE, Enamelled copper wire with five different colours as follows; clear, blue, red, black, green
- Cut to length: 1.5m

Neutron Sensors for strategic applications

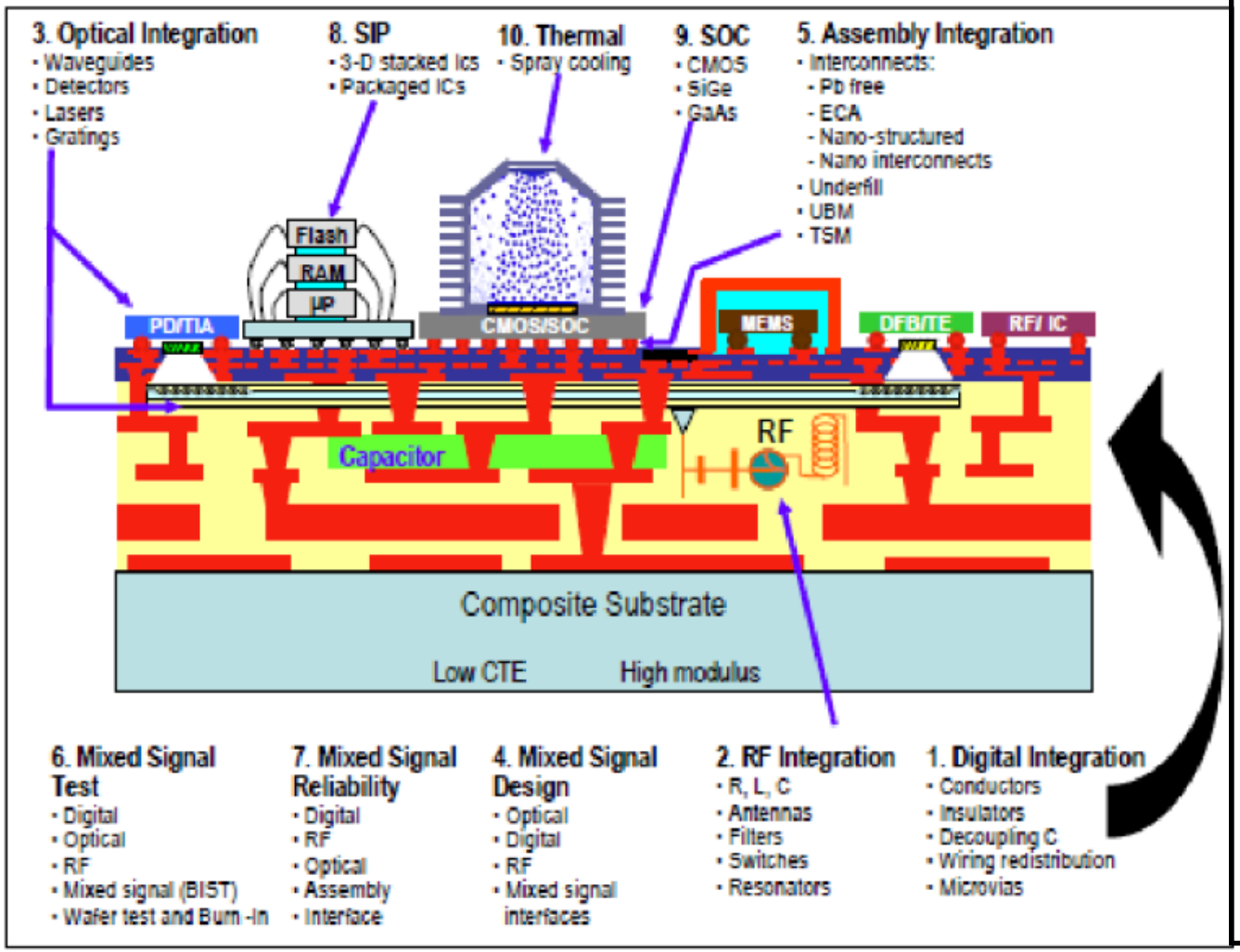
CeNSE has manufactured neutron sensors for applications in nuclear security. These sensors are solid state batch processed silicon technology based and utilize novel converter material growth using nanotechnology.







SENSOR SYSTEMS USING 3D SYSTEMS SCALING



Advantages of 3D systems Scaling

Latency of SOC is handled well in SOP

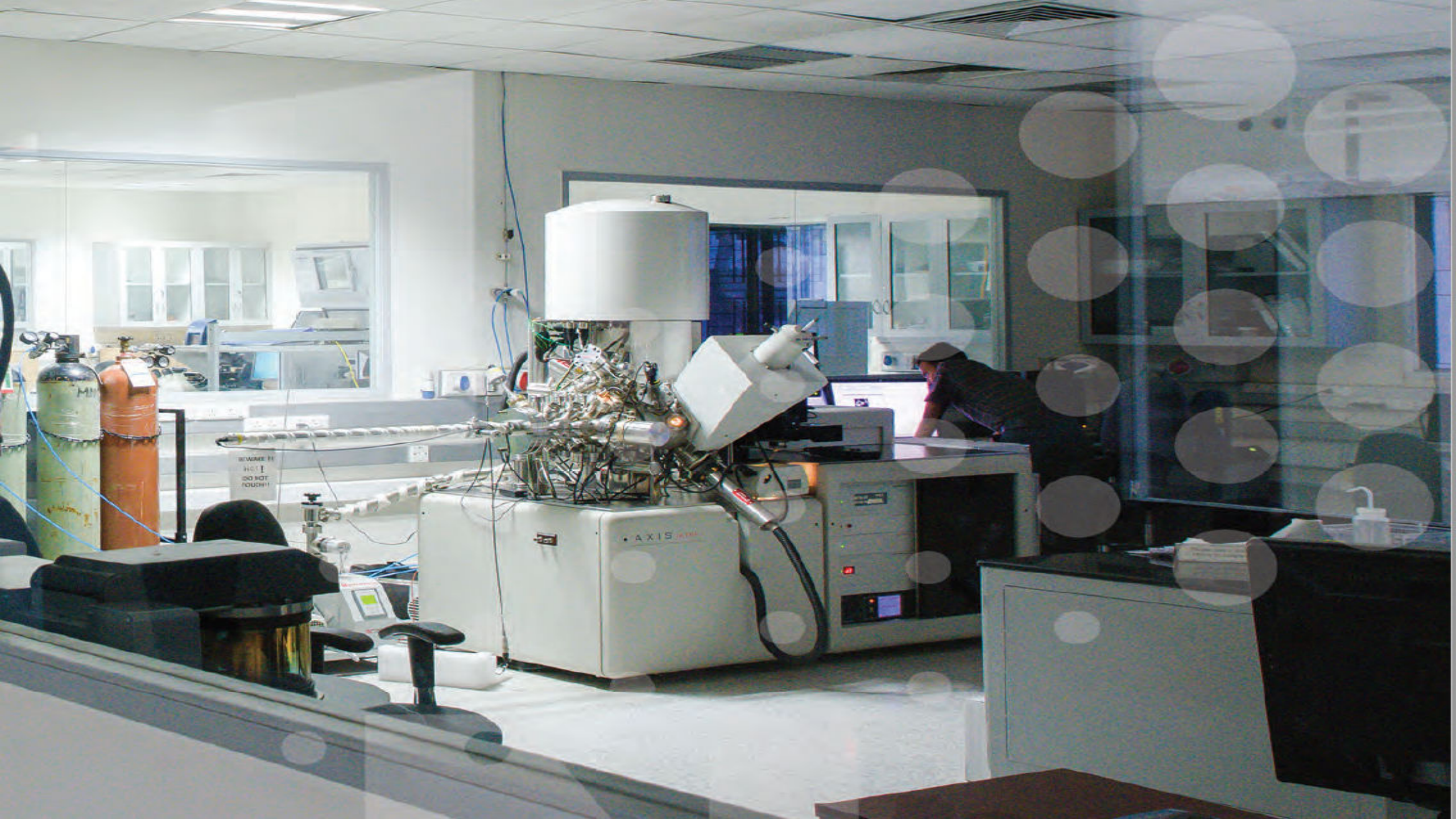
RF Limitations of SOC-integrating Antennas, Capacitors &Inductors with high Q, Filters, Switches

Heterogeneous Integration of technologies

Integrating Thin Film & Power Components.

CLEAM ROOM : FACILITY FOR MORE THAN MOORE

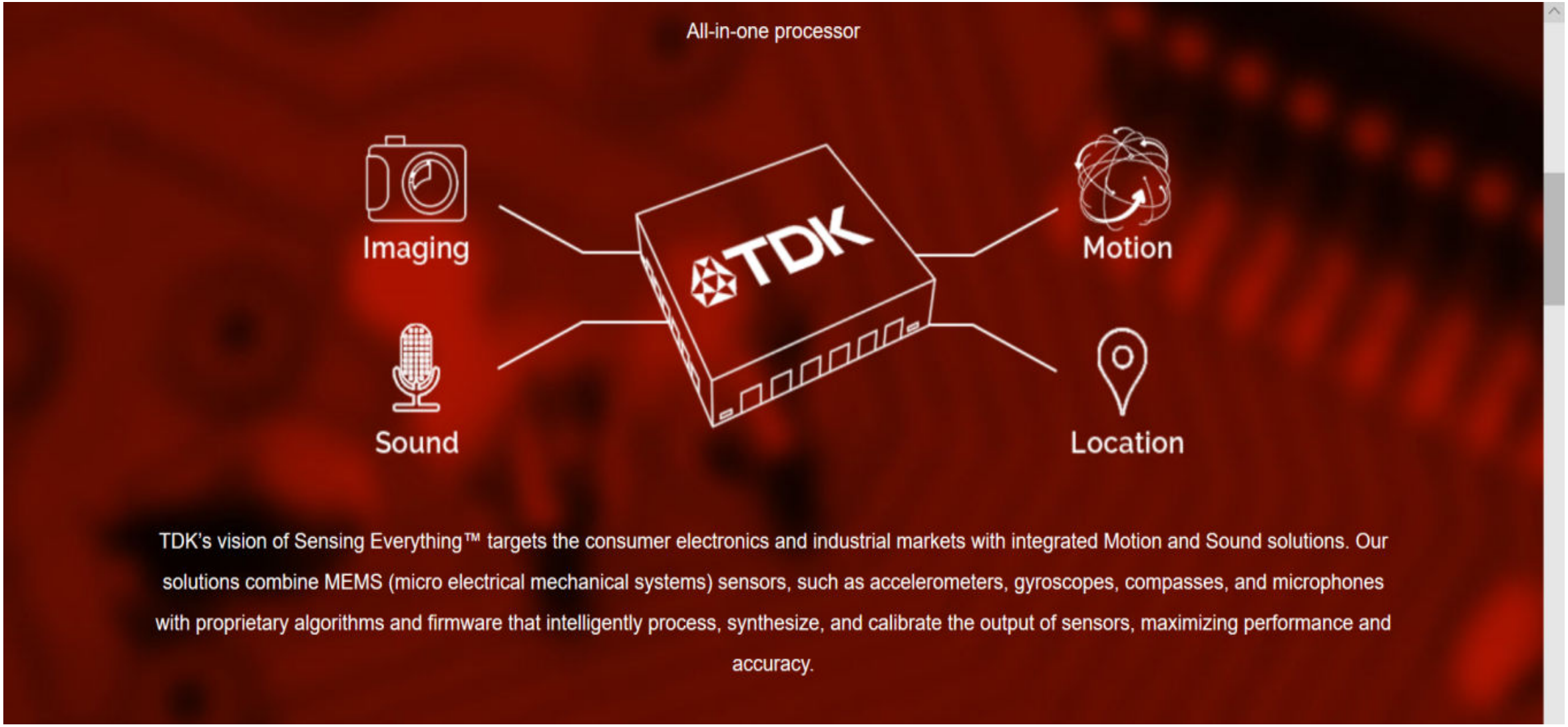

43
9


AXIS

List of MtM Fabs

- XFAB
- IMEC
- SCL
- CeNSE and Indian Educational Institutes
- Large fabs transforming into more than moore fabs or sensors fabs

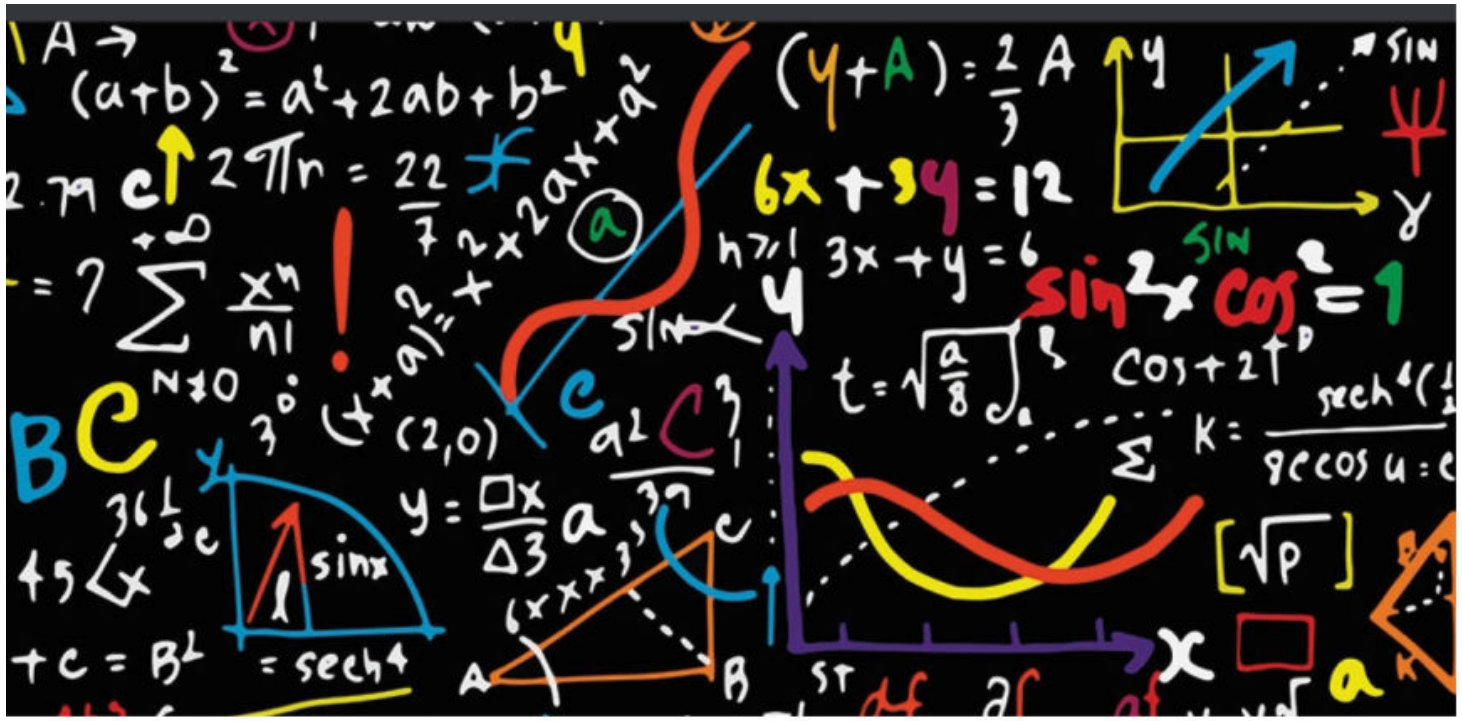
Sensor Manufacturing Organizations



NAVSON TECHNOLOGIES

Research meets industry

Comprehensive Solution for Sensor Fabrication Technologies and Training



Motion Imager

Conclusions

- Exponential demand for sensors
- Industry 4.0 , Cognitive Machines,
- Smart Homes, Cities, Wearables
- Bio Cyber Physical Systems
- Global Ecosystem of sensor market evolving fast