

2014 ECTC Special Session

Flexible Electronics – Packaging Technology and Application Trends



EMFT
- Sensors & Actuators –

Christoph Kutter

The German Government defined 5 Focus Fields in its High Tech Strategy 2020

Global Challenges -> 5 Focus Fields

Energy
Climate

Health
Nutrition

Mobility

Safety
Security

Communi-
cation

Key Technologies: Electronics, Sensors, ...

Internet Address Space

Internet IPv4:

4.294.967.296

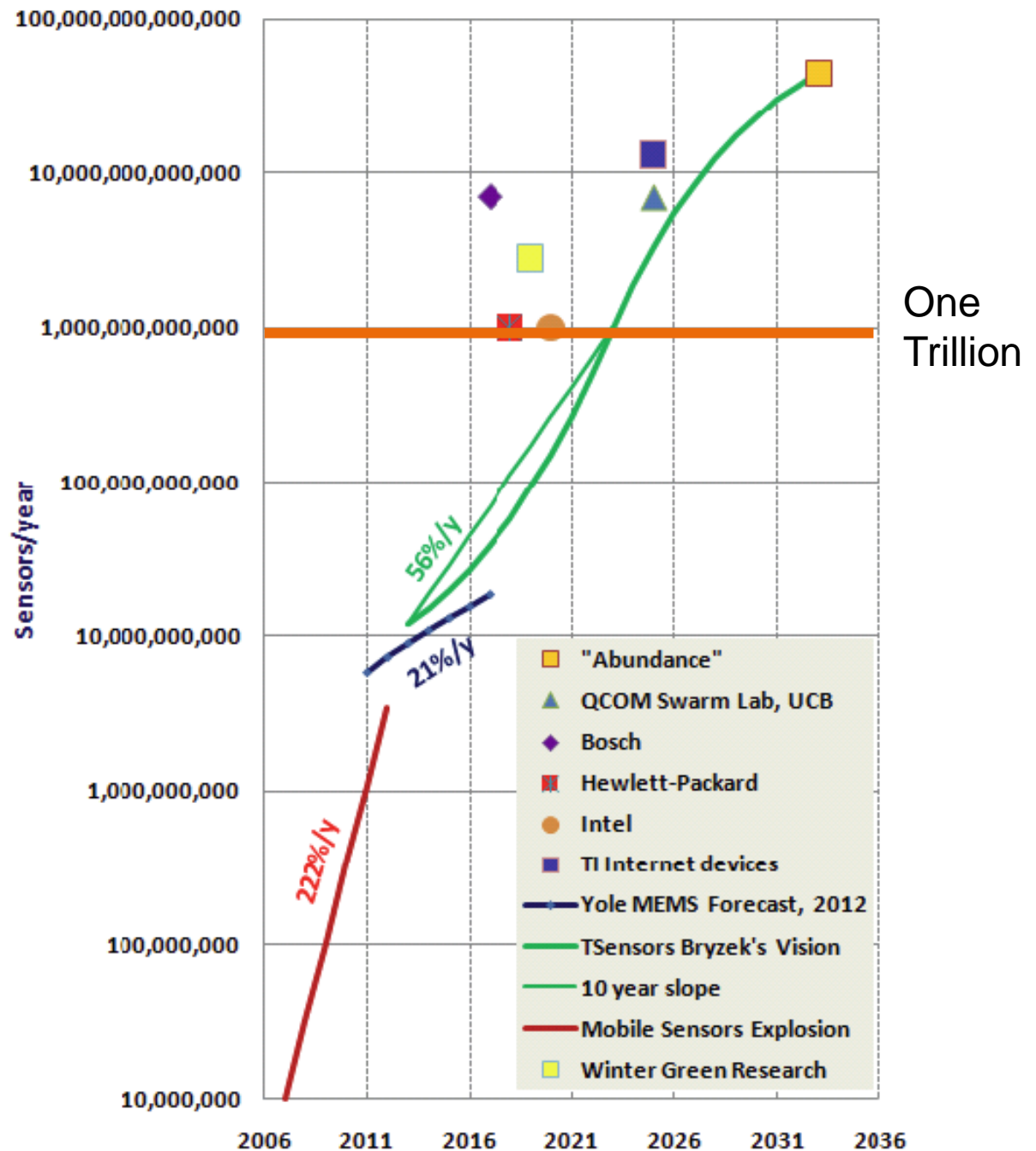
Internet IPv6:

340.282.366.920.938.463.463.374.607.431.768.211.456

The Trillion Sensor Vision



Source: Dr. Janusz Bryzek,
Chair, TSensors Summit,
Vice President, MEMS and
Sensing Solutions,
Fairchild Semiconductor



T SENSORS SUMMIT™ FOR TRILLION SENSOR ROADMAP

September 15 & 16, 2014
Munich, Germany



INTERFLEX Project

How to bring flexible electronic devices into high volume applications?

What is especially needed?

....and what about foil stacking?

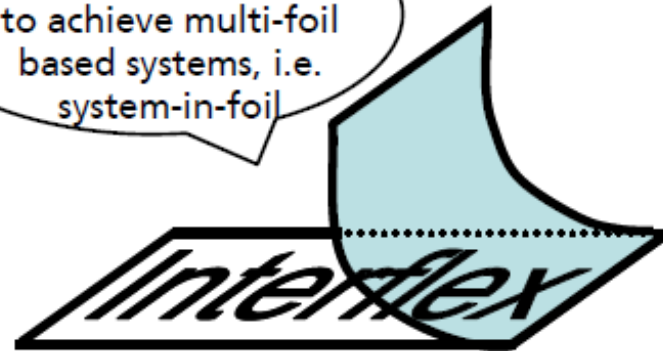
By the development of reliable assembly and interconnection technologies

Interconnection technologies between flexible components and flexible foils as well as between functional foils

3D functional foil integration is essential to achieve multi-foil based systems, i.e. system-in-foil



www.project-interflex.eu



INFOTECH
automation



BOSCH
Invented for life

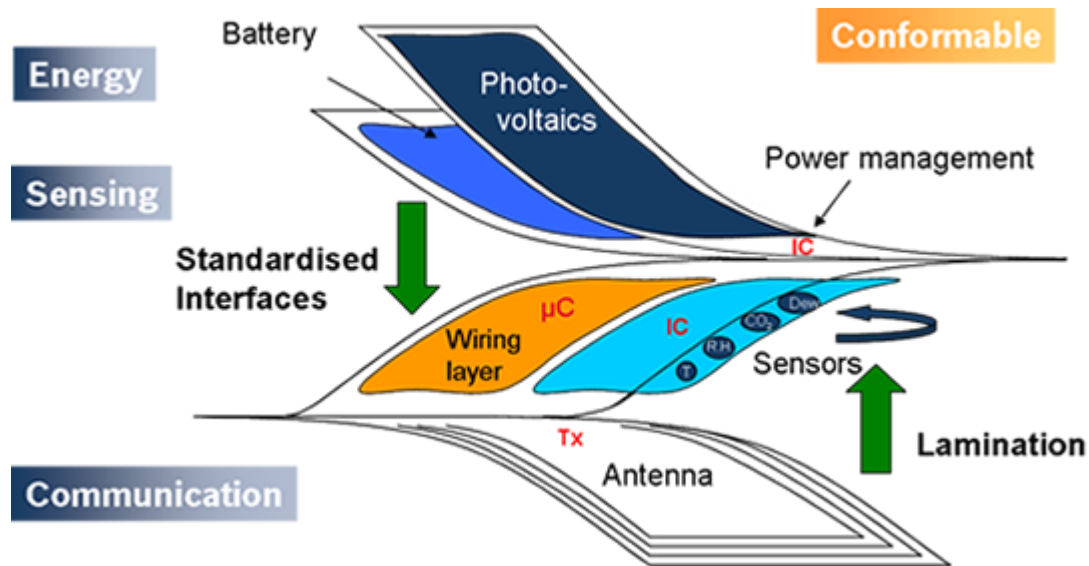
 **Fraunhofer**
EMFT

INTERFLEX Project

Vision and initial concept of the Interflex demonstrator

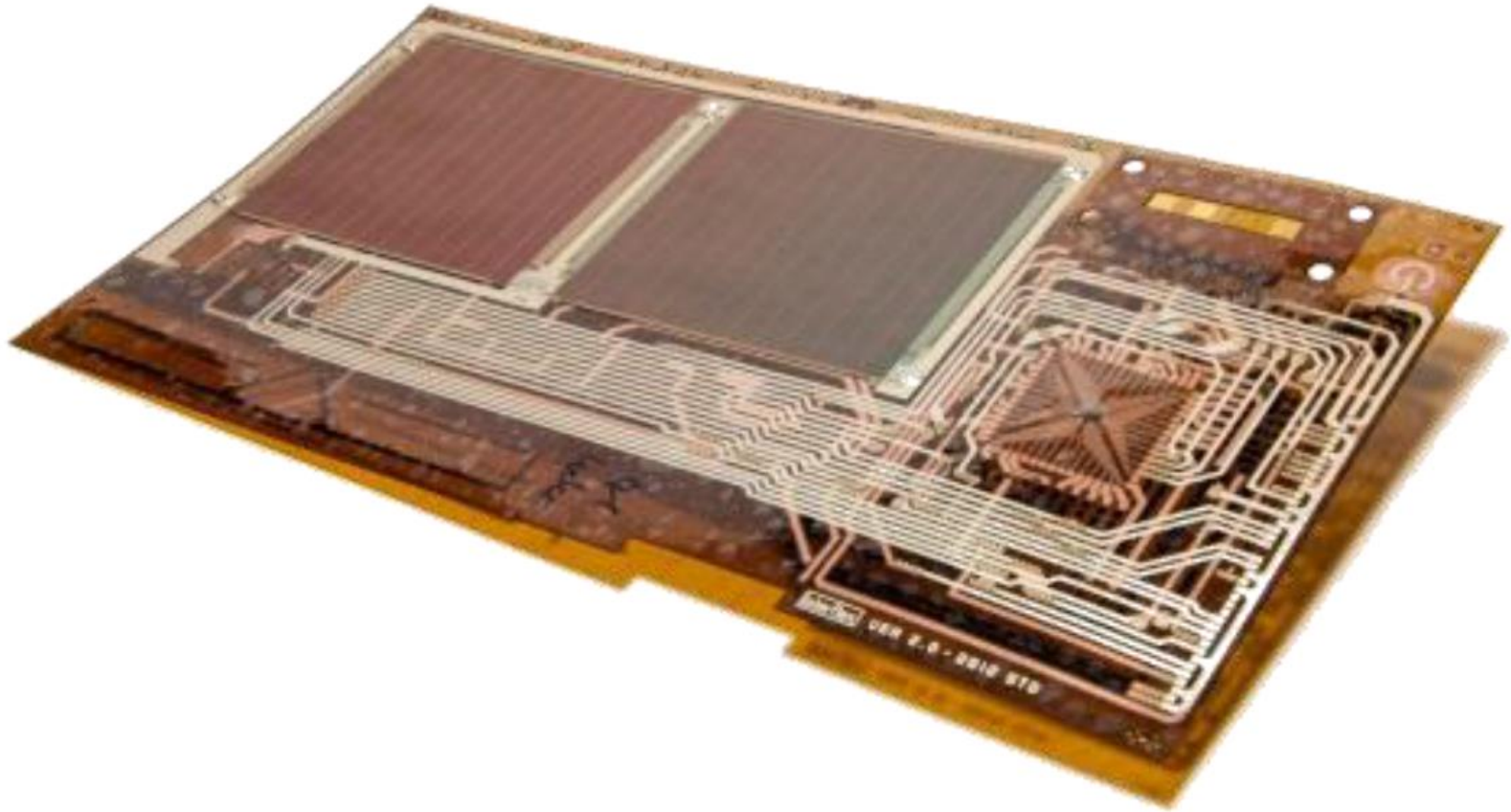
Basic elements and features

- wiring
- passives
- energy supply
- data exchange
- logic
- energy storage
- sensorics



INTERFLEX Project

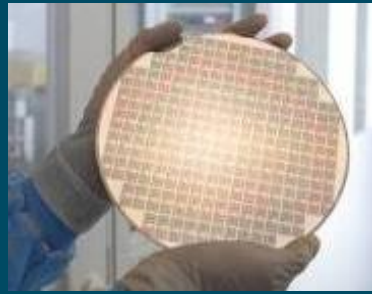
Interflex: multilayer system-in-foil



Fraunhofer EMFT Core Competencies



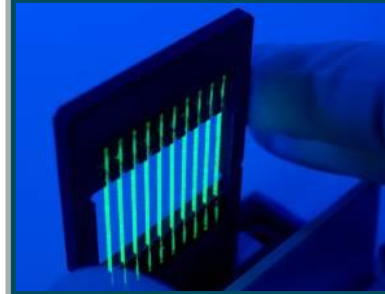
Functional molecules and surfaces



Silicon processes, device- and 3D-integration



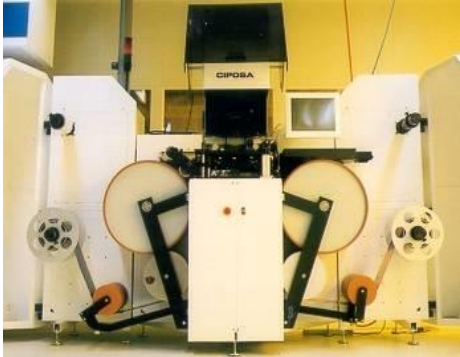
Heterointegration and foil technologies



Systems and prototypes



Reel-to-Reel Application Center



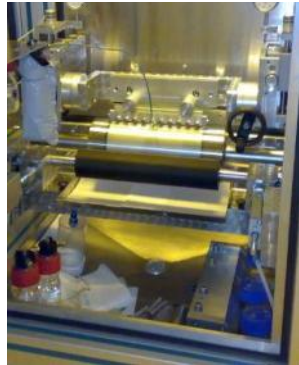
Fine-line patterning of metallized plastic films



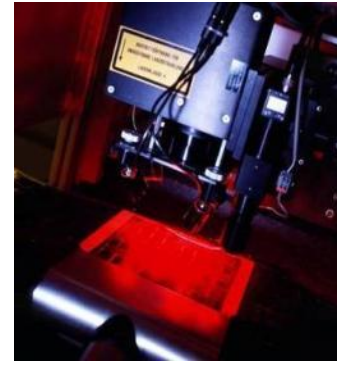
Thick-film screen printing on sheets and rolls



Sputter deposition Web coating



Foil lamination

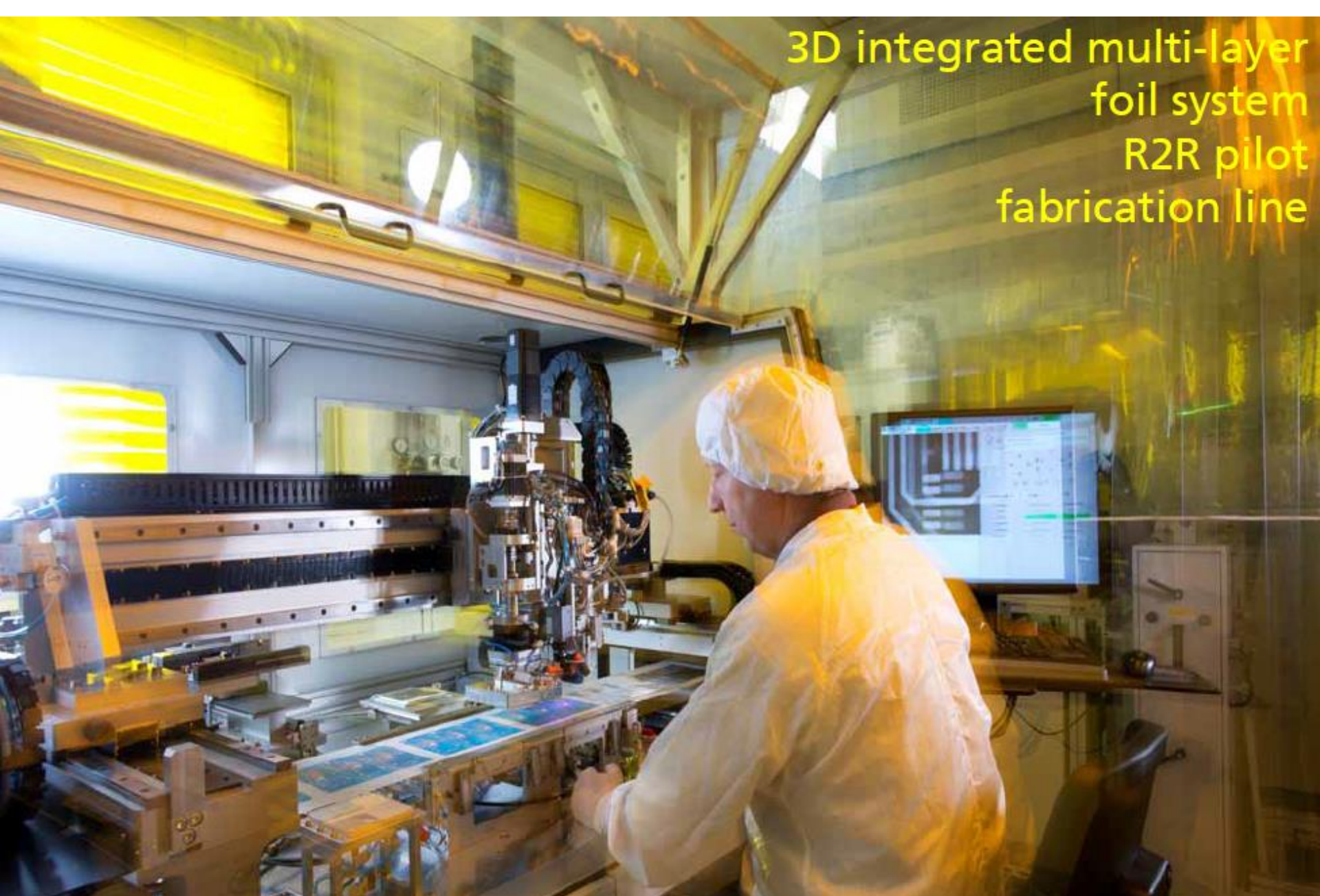


Laser processing

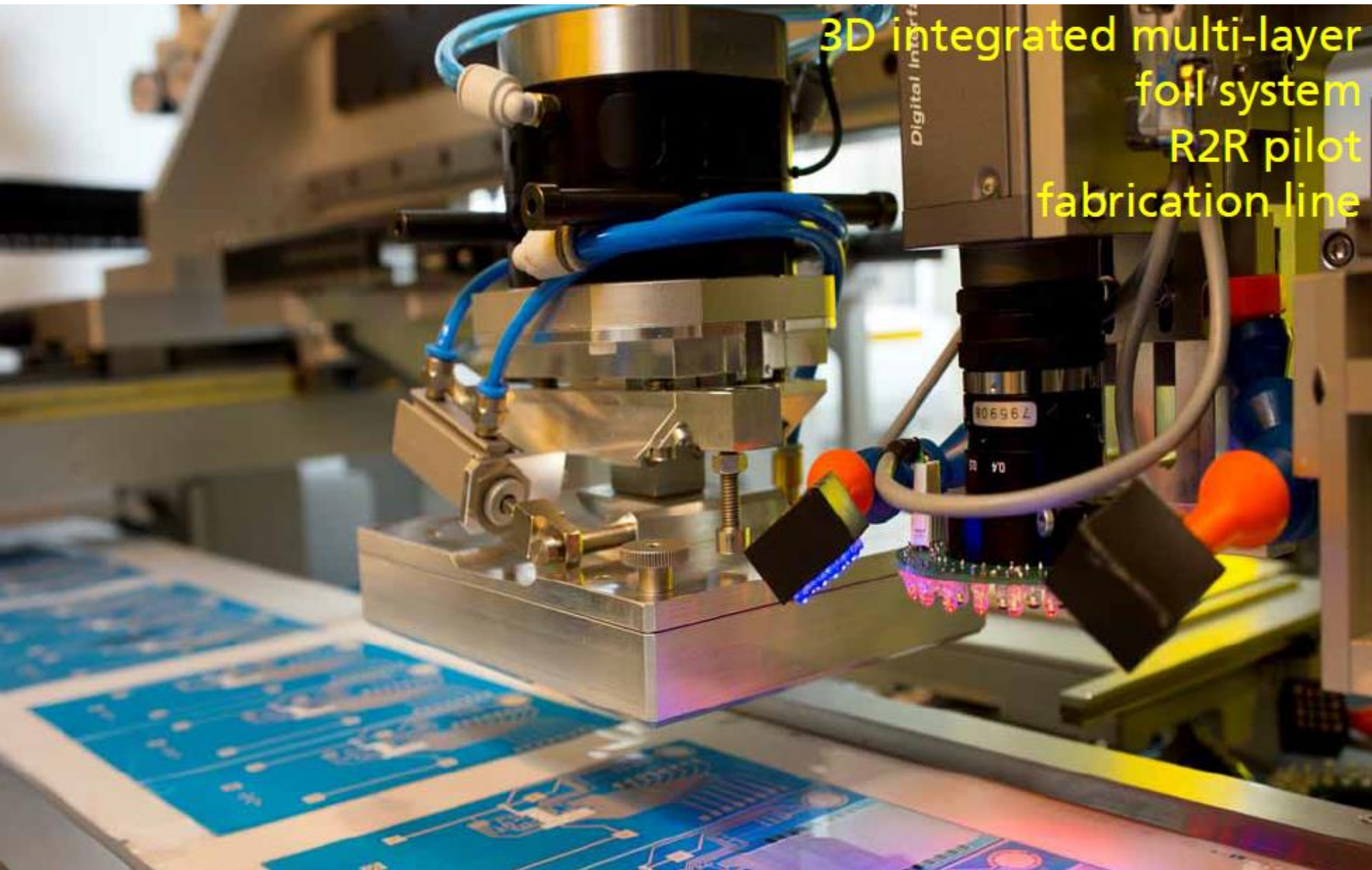


Electrical testing

3D integrated multi-layer
foil system
R2R pilot
fabrication line

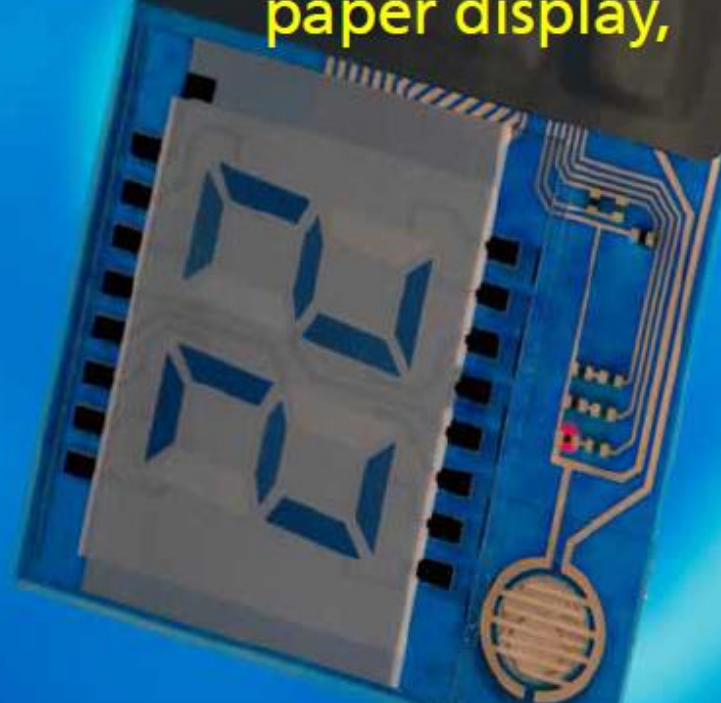
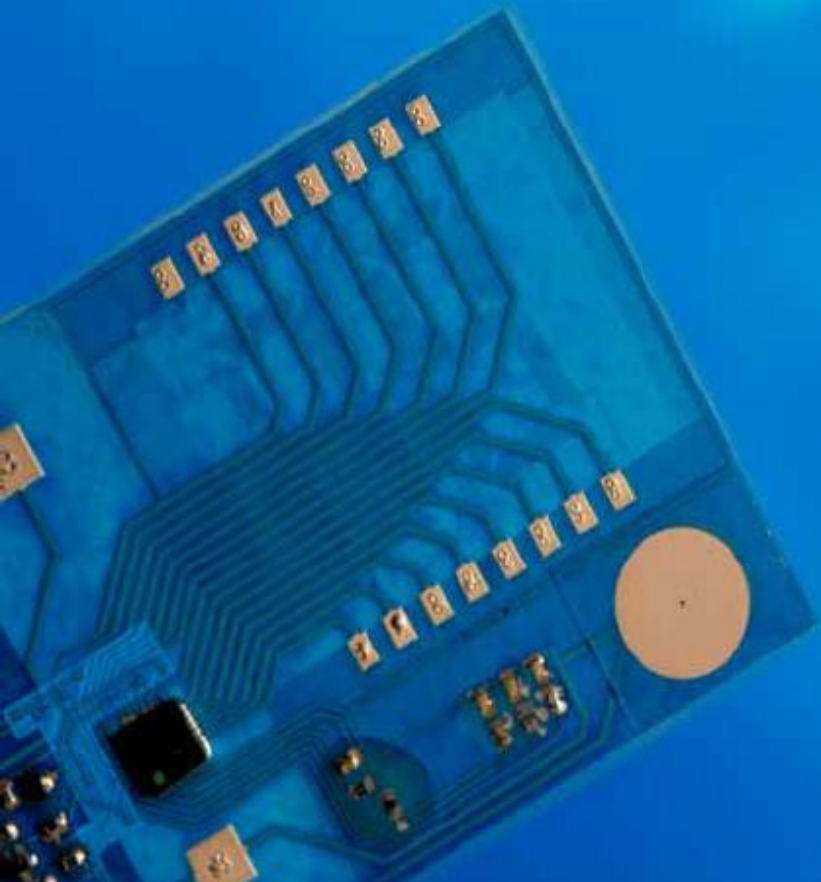



3D integrated multi-layer
foil system
R2R pilot
fabrication line



Temperature Tag / Logger in Foil

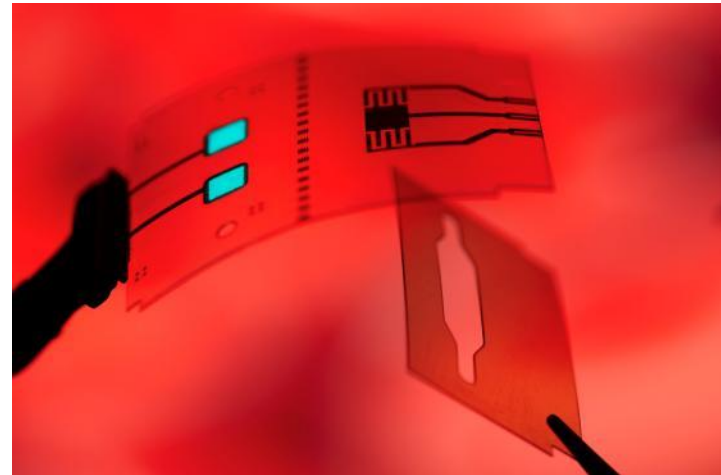
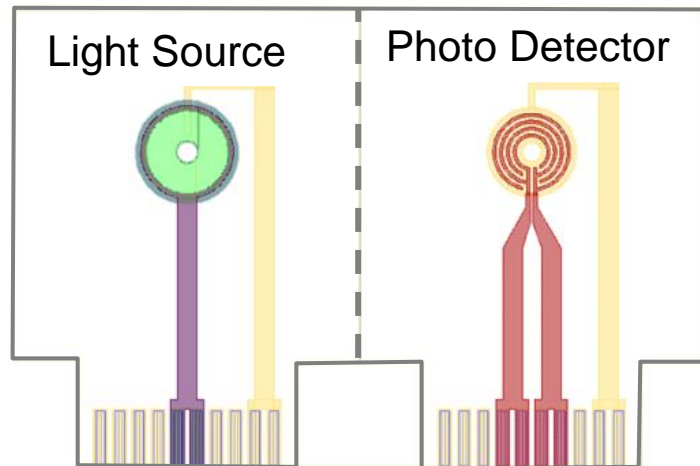
3D integrated
multi-layer foil system
with printed wiring,
thin batteries,
thin flexible
paper display,





DNA diagnostic array in foil
with square heater
for melt curve analysis (MCA)
single polymorphism detectable
point of care (POC) systems for
personalized medicine,
roll to roll foil processes (μ TAS-
2013)

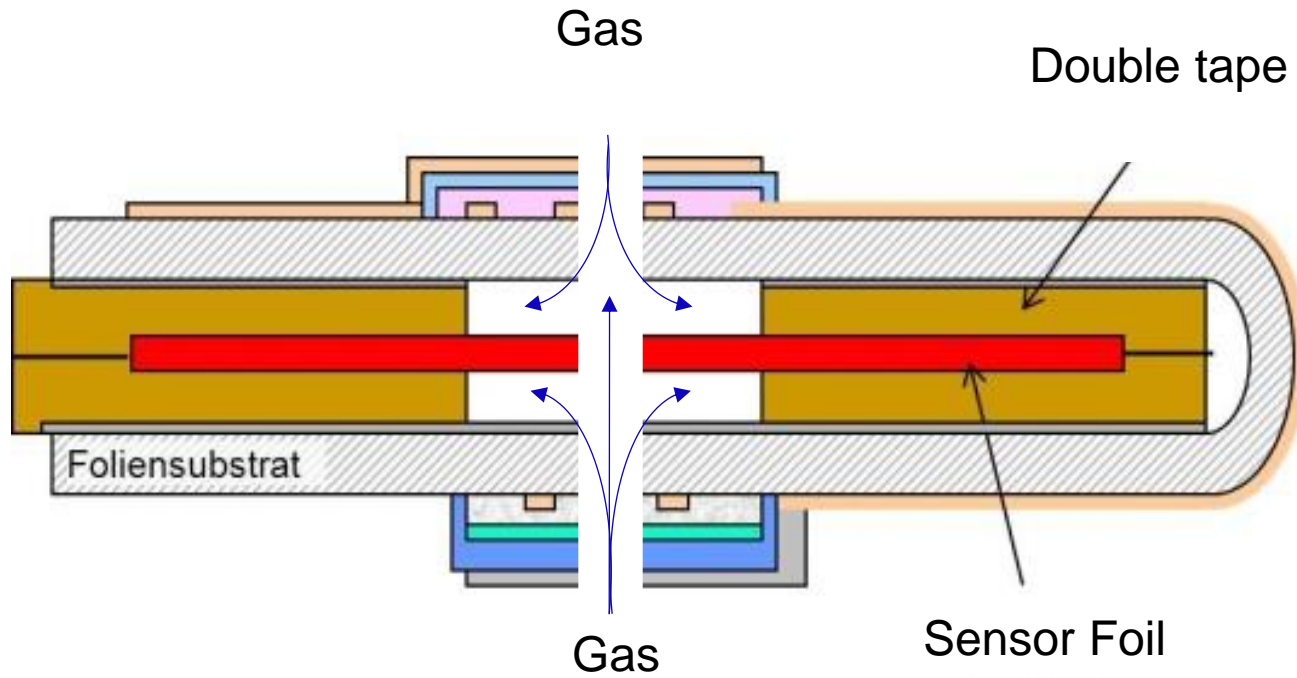
Polyopto Concept for Gas Sensor



- Combination of several functions on foil:
 - Light source
 - Photo detector
 - Chromophore sensor material
 - Microfluidic

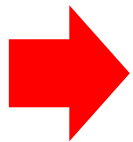
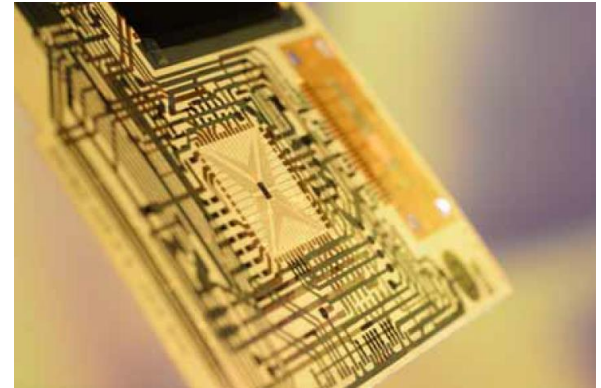
BMBF Projekt Polyopto / Best Paper Award @ SPIE Symposium San Diego, August 2012

Polyopto Concept for Gas Sensor



Conclusions

- The Internet of Things Drives the need for sensors
- Low cost sensor nodes with new functionality can be realised with printed, flexible electronics
- The INTERFLEX project provided 2D-integration and 3D-integration technologies on foil



Wiring foil technology in combination with adhesive based assembly becomes more and more an interesting alternative to flex PCB technology and soldering.

Fraunhofer EMFT - Your partner for sensor and actuator development



Thank you for
your attention!

Questions?

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