



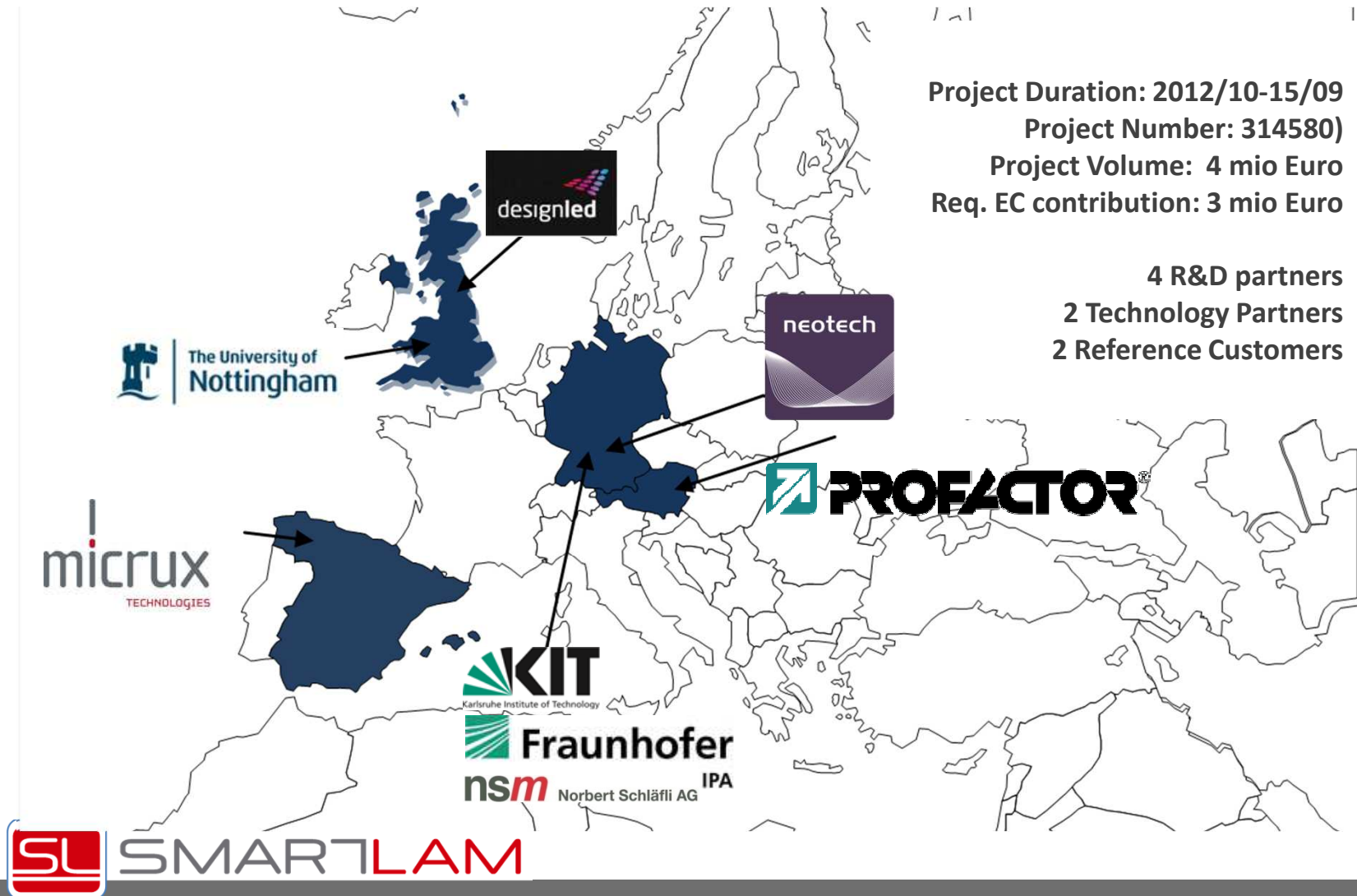
SMARTLAM

Scalable manufacturing equipment for production of mechatronic microsystems based on polymer film, laser milling and e-ink printing

Coordinator: Markus Dickerhof, Karlsruhe Institute of Technology



Smartlam Consortium



SMARTLAM ...

- ... is about combining already existing rapid prototyping-, structuring- additive manufacturing technologies as well as assembly and production knowledge for system integration
- ...highly flexible, scalable cost efficient manufacturing environment for production of complete micro components in small medium series in one machine



... there's still a lot to do produce complete micro systems in a „Star-trek“-like manner

Small- medium volume manufacturing of miniaturized 3D-Parts using Rapid Prototyping technologies

→ Industrial use of rapid prototyping technologies for **single and small volume production** has reached the industrial and consumer market introduction.

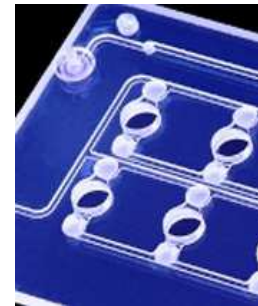
Technologies:

- **Laminated Objects modeling (LOM)**
- Selective (Laser) Melting
- 3D Printing (e.g. Fused deposition Modelling, FDM)
- (Laser-)Sintering
- Sterolithography modelling (SLM)

„low cost tool
Replicator 2“ with
double extruder
from Makerbot (ca.
80-100µm res.)



LOM: Volume production of Bioanalytical 2.5D-disposable with channel width <math><50\mu\text{m}</math>
Source: AlineInc.



3D- Manufacturing prototpye of complex **mechanical** systems e.g. using FDM (Source: Stratasys)

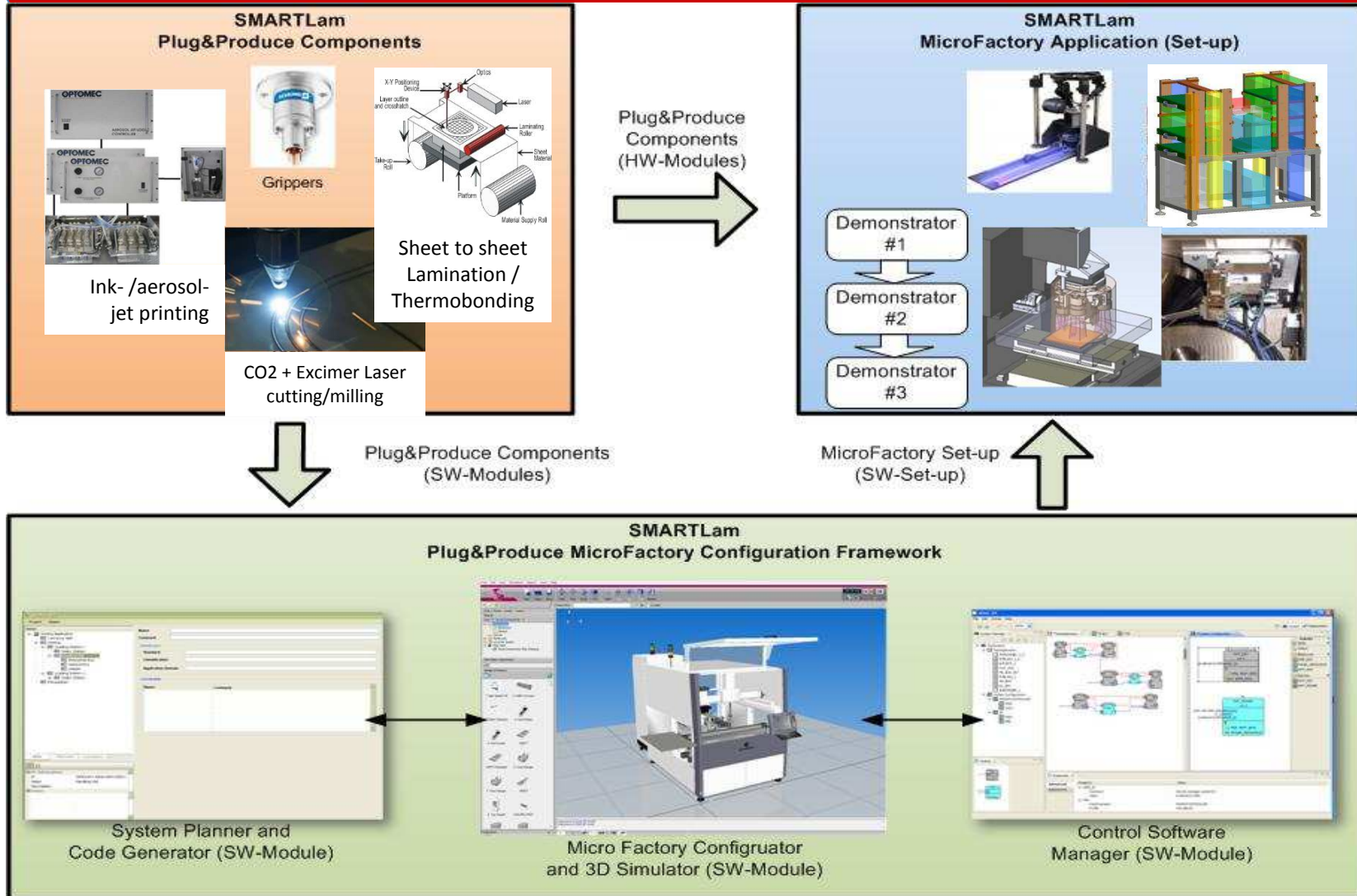


Testing of 3D metal printing system for **production of spare parts** for the ISS – the NASA electron beam freeform fabrication (EBF3)

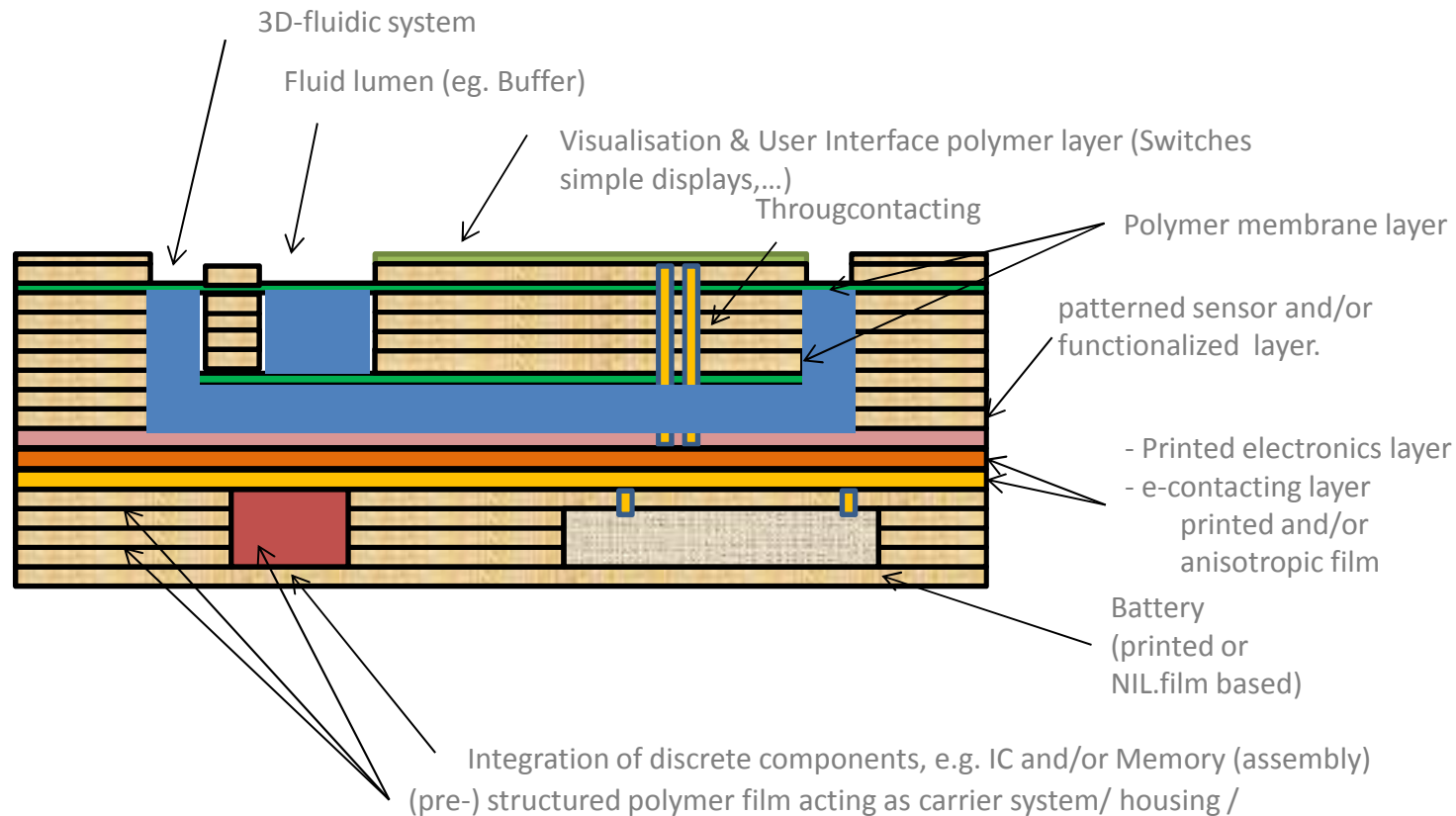
Small/medium volume manufacturing of miniaturized 3D-Parts using Rapid Prototyping technologies

- Systems are focussing solely on manufacturing of parts with mechanic functionality
- Many of them are still not precise enough
- ➔ A setup, allowing to produce more complex, mechatronic systems by use of rapid prototyping and additive manufacturing technologies in a cost efficient way is still missing

SmartLAM 3D-I – Modular Hardware Concept and flexible Re-Configuration



SMARTLAM – An Example...

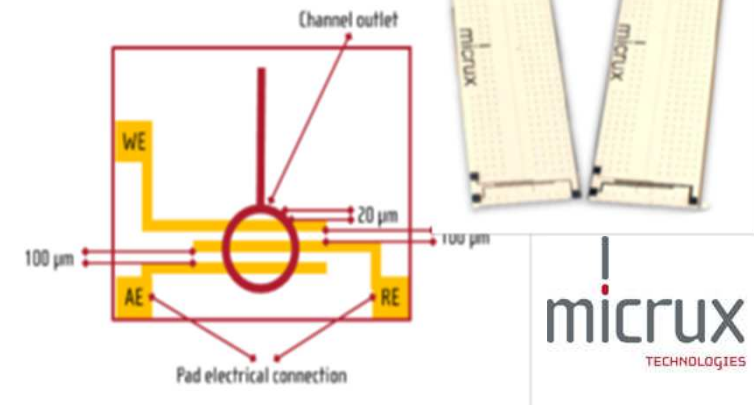


An Opportunity to create Business in Emerging Markets

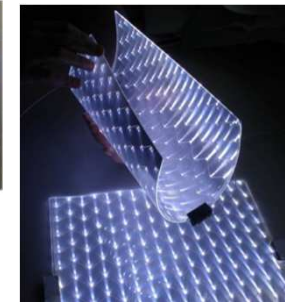
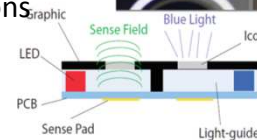
2 industrial demonstrators + 6 associated partners:

- Electrophoresis chip for bioanalytical testing
- Customized LED for illumination

» Electrodes: 50/150 nm chromium/gold thin-fil



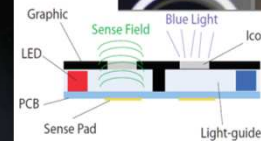
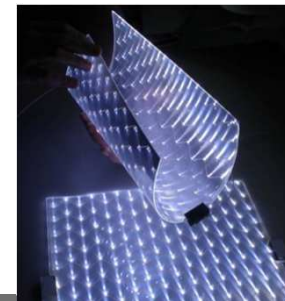
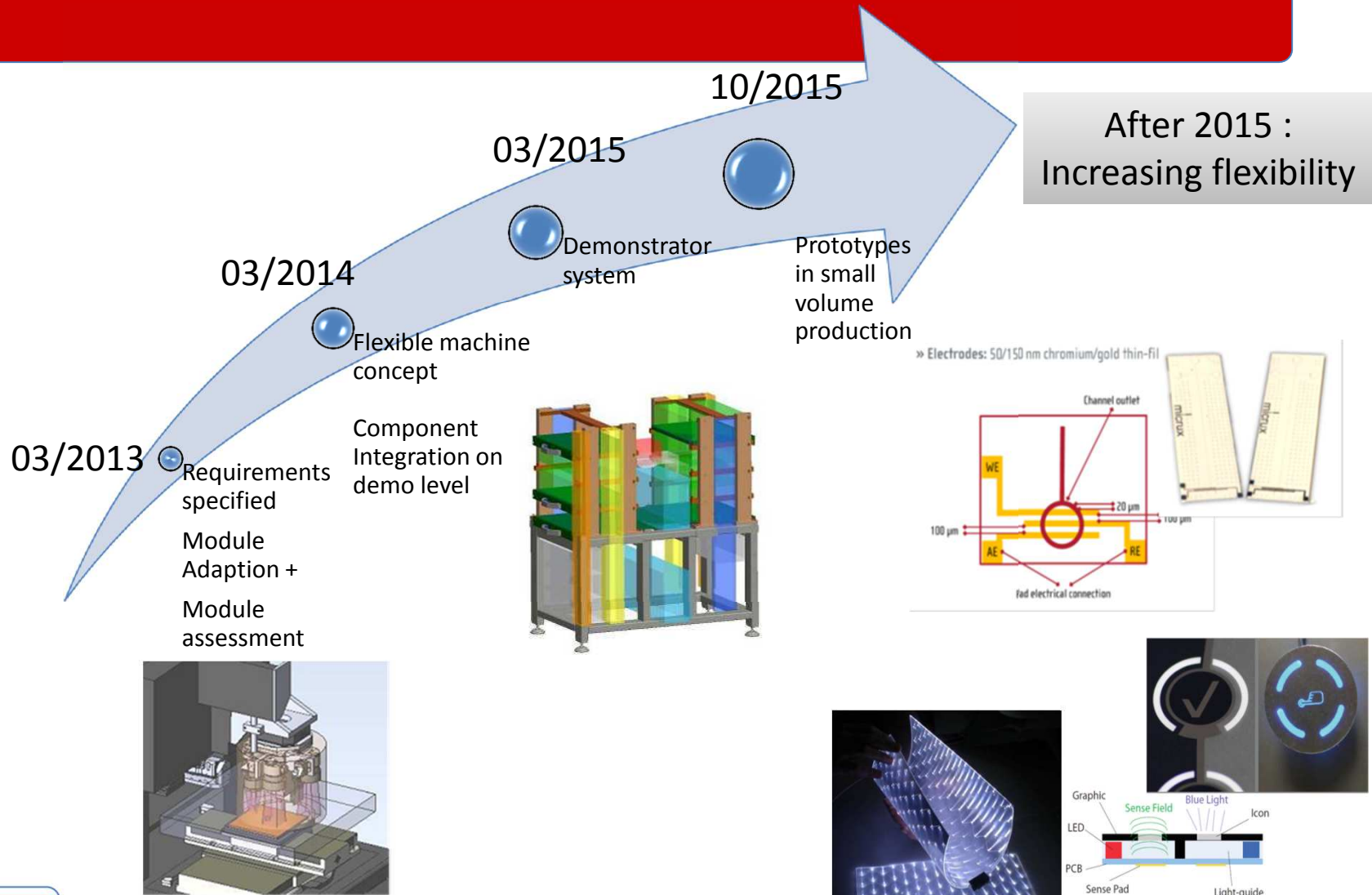
DesignLED – Customized high-end LED applications



SMARTLAM addicted a complete work package to the validation of the economic aspects



SmartLAM project: Timeline





Thank you for listening!

www.smartlam.eu

markus.dickerhof@kit.edu

