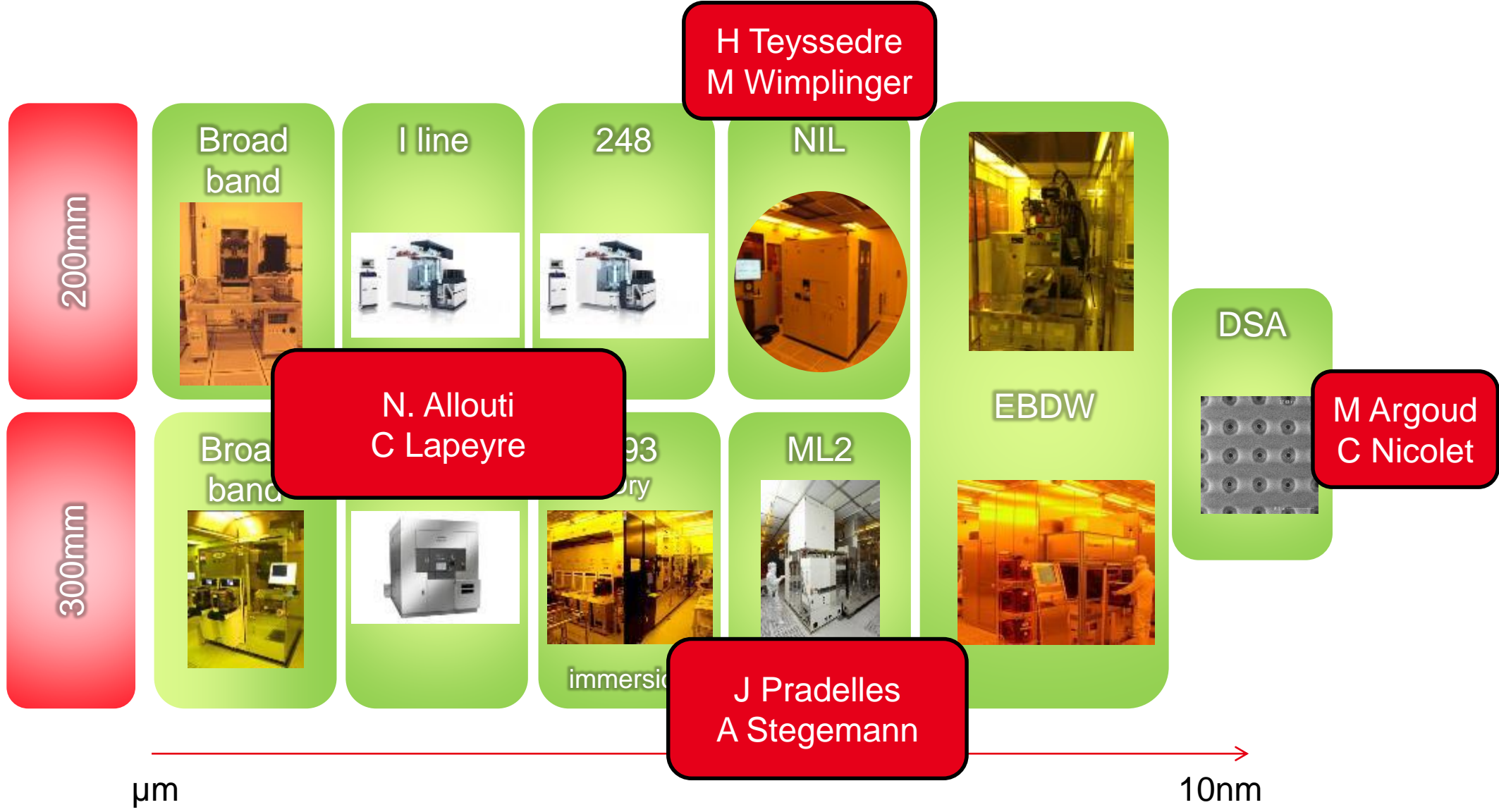


# WELCOME & INTRODUCTION

Leti litho workshop | PAIN Laurent | 6 July 2018

# LITHOGRAPHY CAPABILITY MAPPING





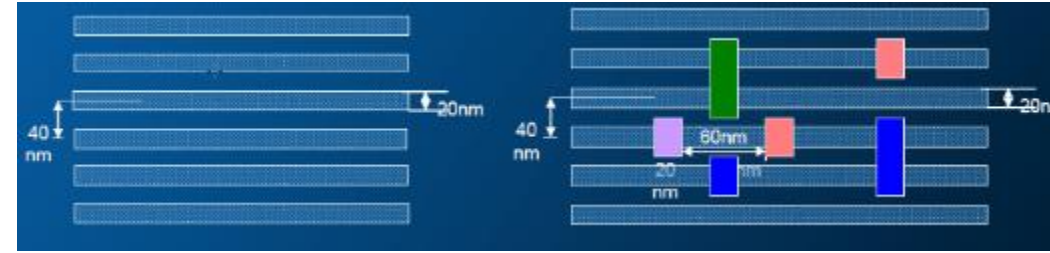
# THE LETI LITHO CLUSTER KEY TAKEAWAYS

Leti litho workshop | PAIN Laurent | 6 July 2018

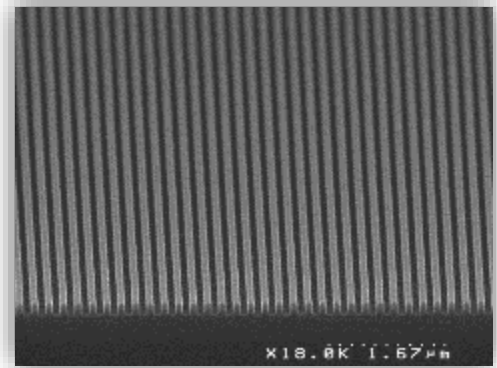
## OUTLINE

- The LETI platform capability
- The LETI platform versatility
- Conclusions

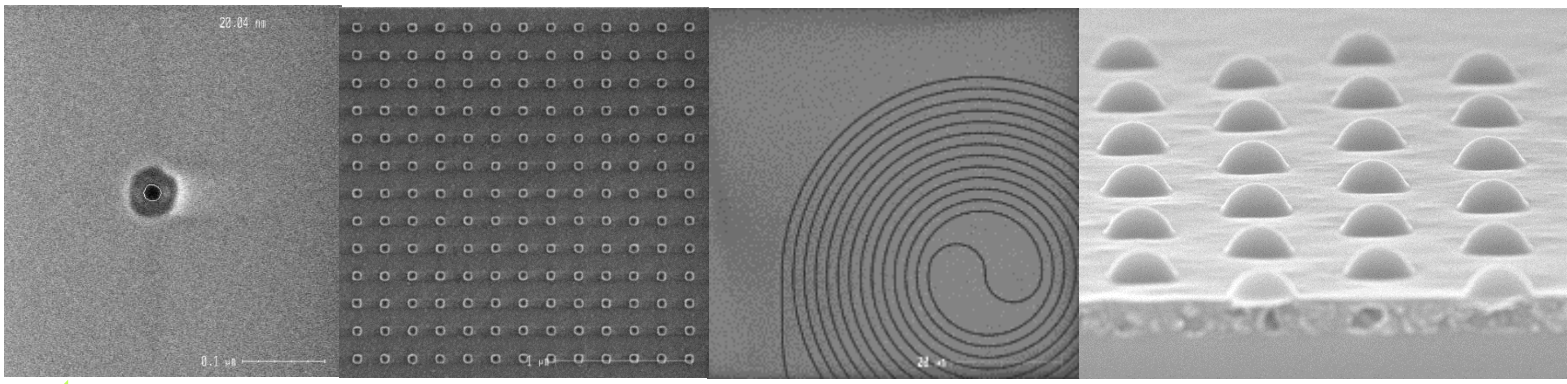
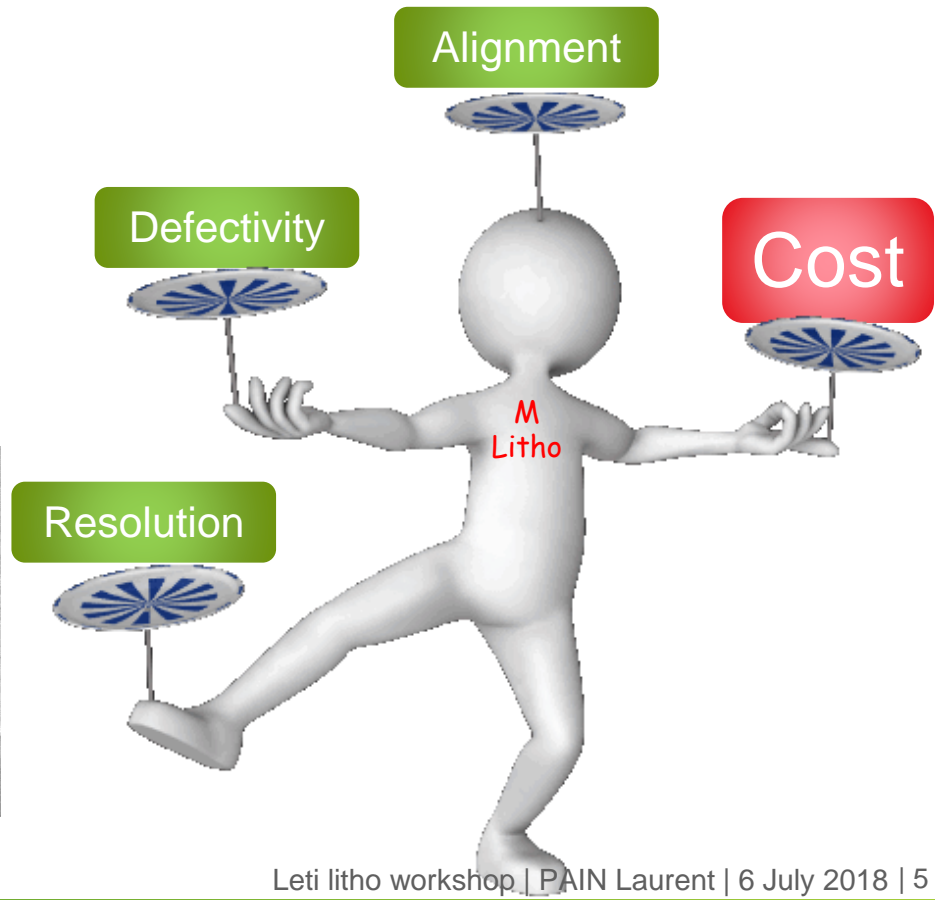
# LITHOGRAPHY/PATTERNING CHALLENGES



← No constraint → Single nm




← Non critical → « 0 »




← nm → μm

# AIM OF THE LETI LITHOGRAPHY ECOSYSTEM ... PROVIDE FAIR & CLEAR GUIDELINES


Optical



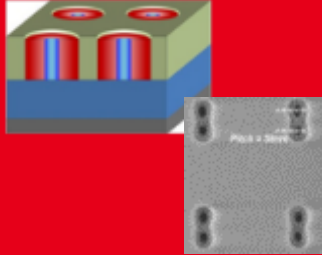
E-Beam



NIL



DSA

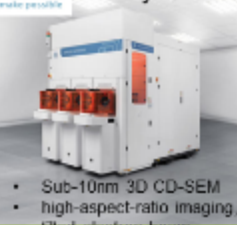




Top view CD-SEM

APPLIED MATERIALS make possible


VeritySEM 4i



- Sub-10nm 3D CD-SEM
- high-aspect-ratio imaging, tilted electron beam

HITACHI Inspire the Next


HCG4000



- 32nm node dedicated CD-SEM
- + Design Gauge for OPC

Overlay

KLA Tencor



Archer 600

- Optical overlay metrology for advanced patterning processes at the 1Xnm design nodes (sub-10nm)

Patterned wafer defect inspection & review

- defect capture on 2Xnm<sup>2</sup>1Xnm memory and logic devices
- scanner defectivity monitoring (PCM)
- Litho PW centering
- Defect capture on 3D & transparent substrate


target 2 tools  
Optical inspection + SEMreview

Consultation under progress

SP2 surfscan

Scanner baseline

ASML




YieldStar S375

- Scanner monitoring (Focus baseline & Overlay baseline)
- on-product overlay and focus using diffraction based overlay (uDBO) and diffraction based focus (DBF) techniques

Scatterometry

NOVA T600  
NOVA

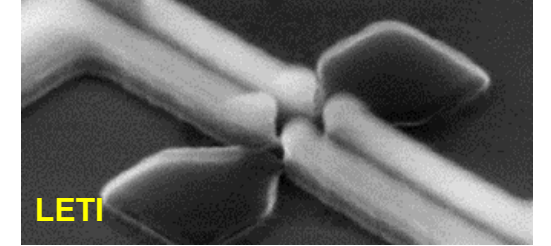
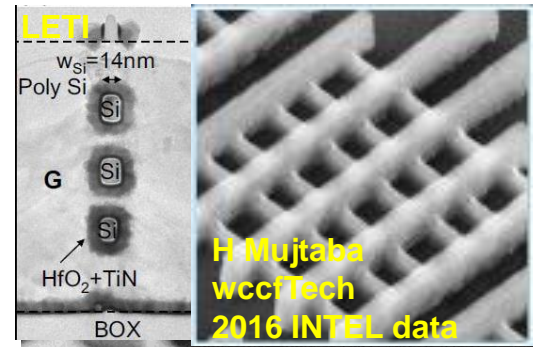
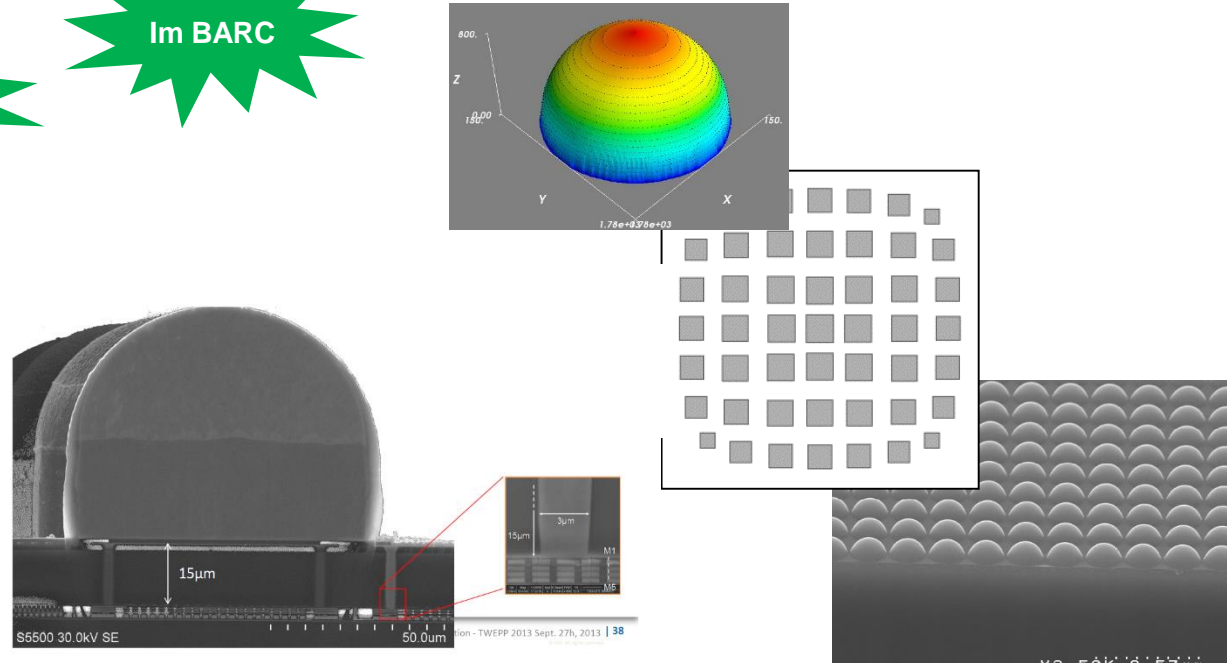
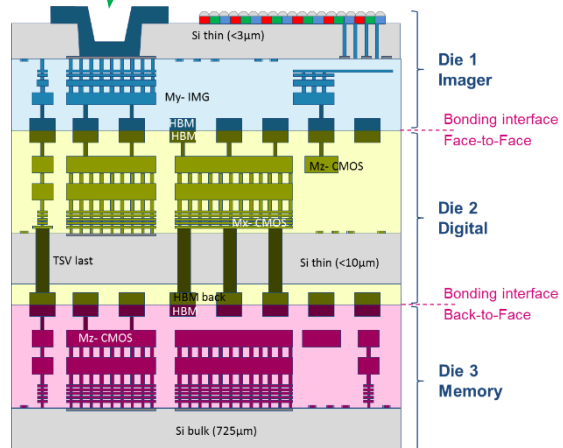
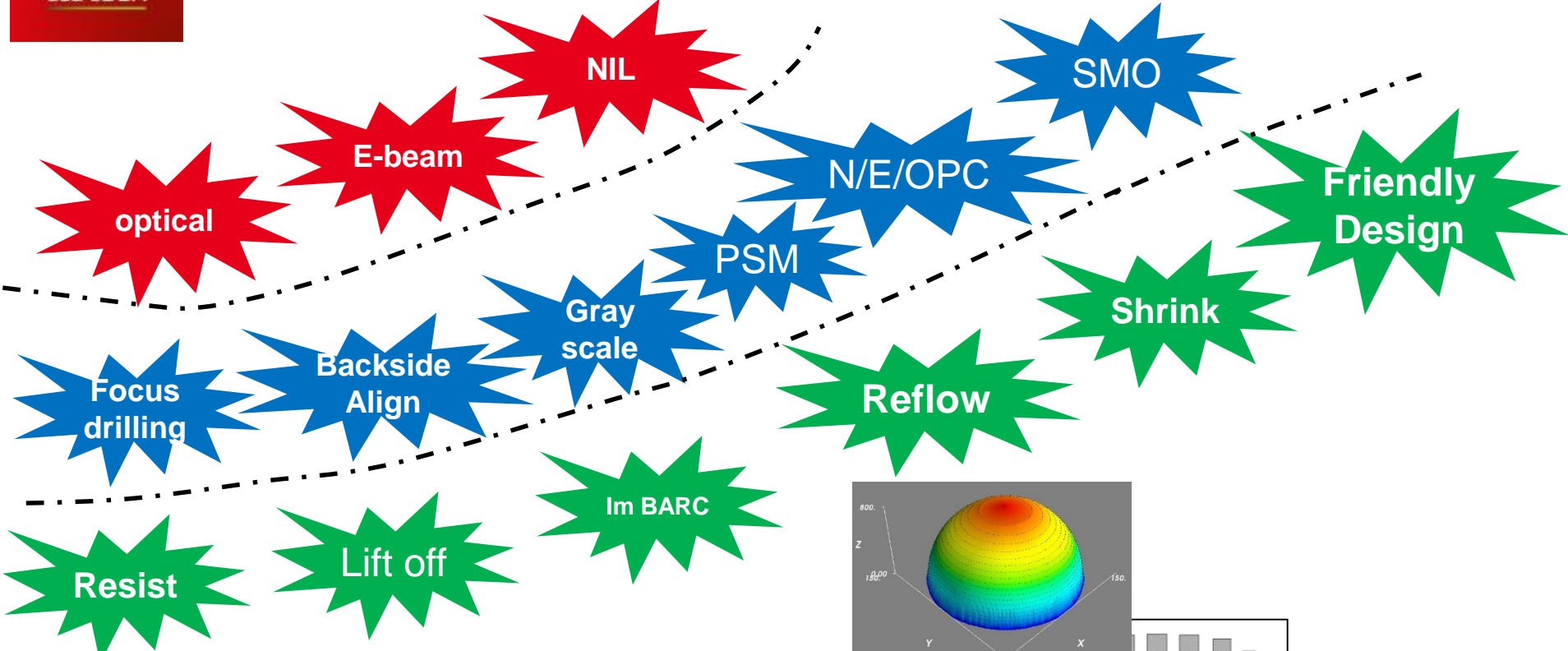


- 3D measurement
- CD measurement

# LITHOGRAPHY CAPABILITY MAPPING



# A COMPLETE TOOLBOX & INFRASTRUCTURE





## OUTLINE

- The LETI platform capability
- The LETI platform versatility
- Conclusions

# ABILITY TO DEFINE & DEVELOP BEST-IN-CLASS LITHOGRAPHY OPTION

### Cybersecurity

### Memory

### Imaging

?  
Best lithography  
option  
?

### Quantum

### 3D

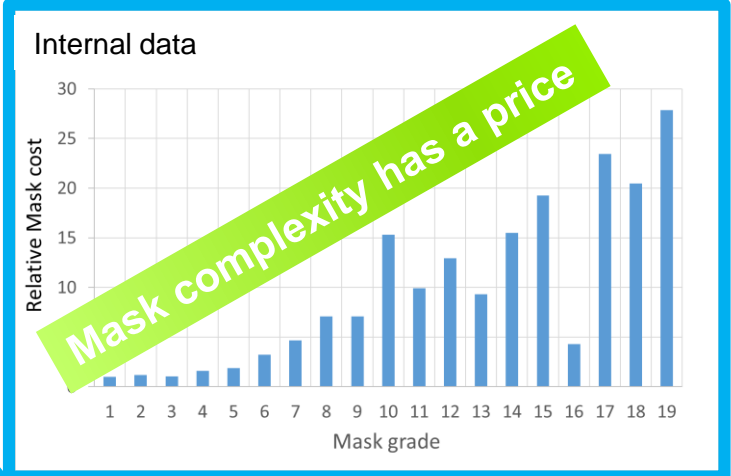
### FDSOI

### Other

Biochips  
Mastering

# OPTICAL LITHOGRAPHY : THE REFERENCE TECHNOLOGY

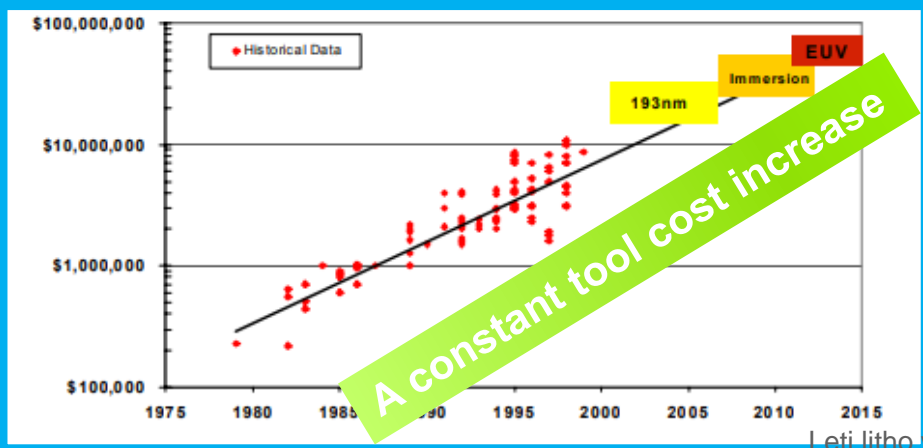
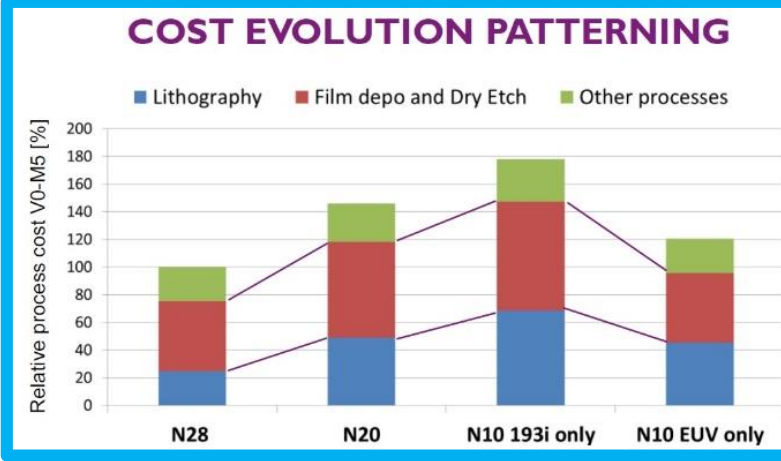
THE INDUSTRY REFERENCE



« The devil is in the mask »  
BJ Lin – Proc SPIE 2007

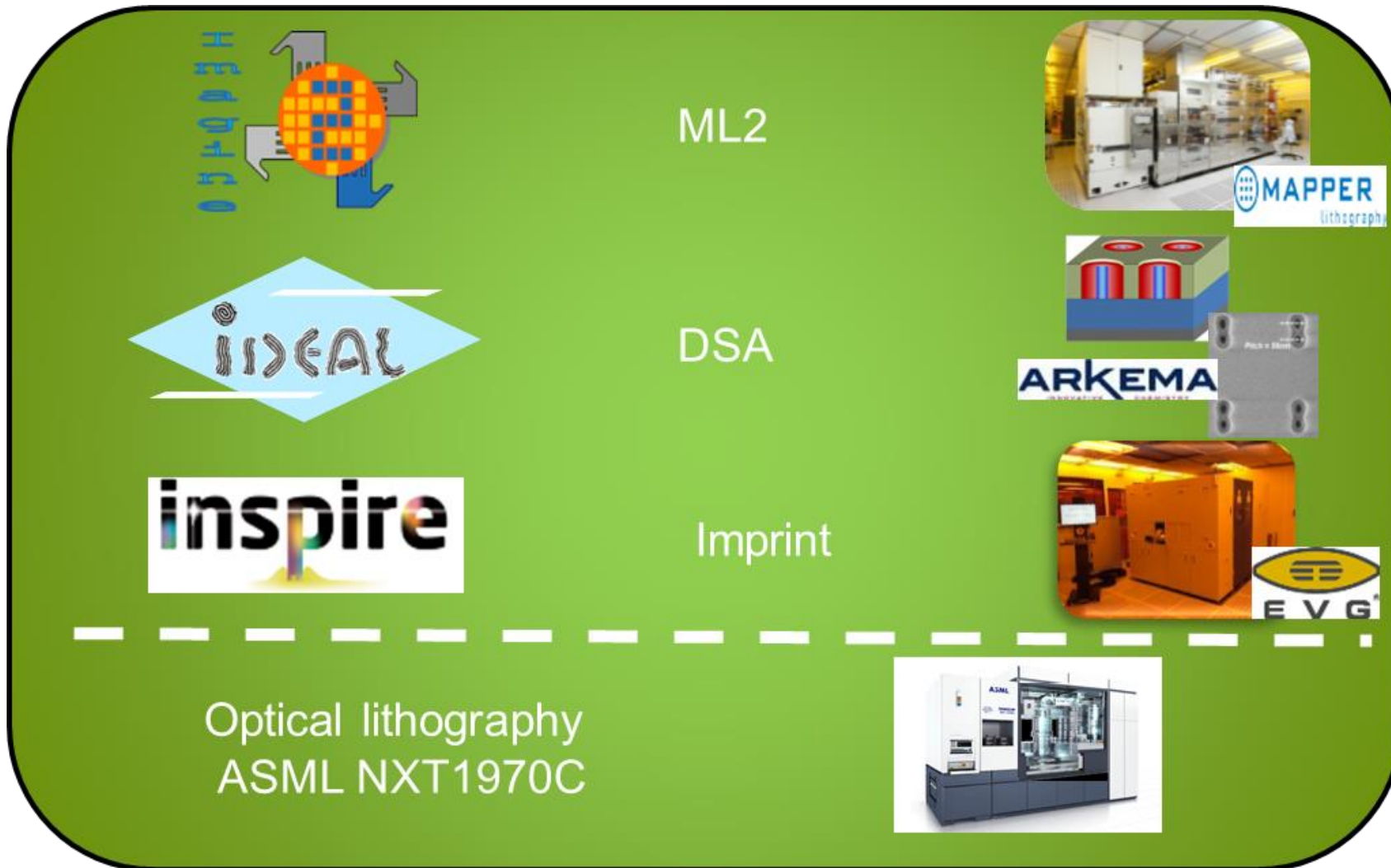
CoO & maturity will be the final key decision drivers

D Bursky – Chip design manufacturing 2017

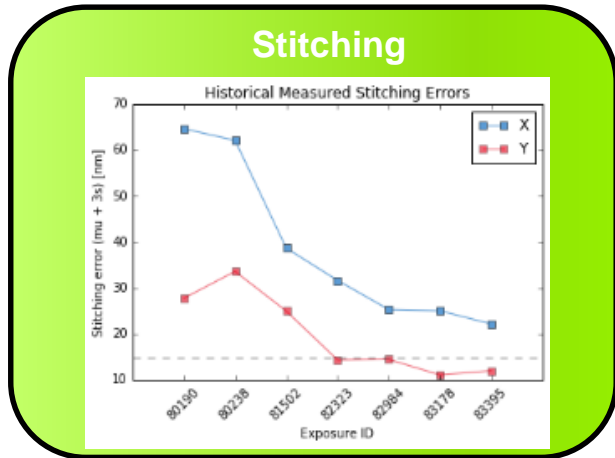
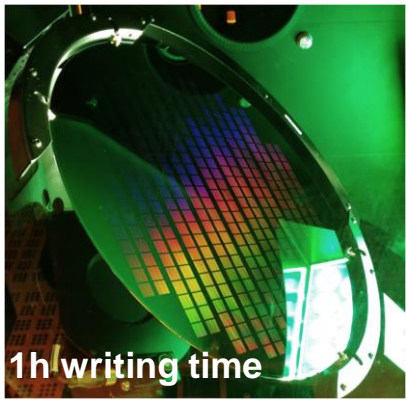
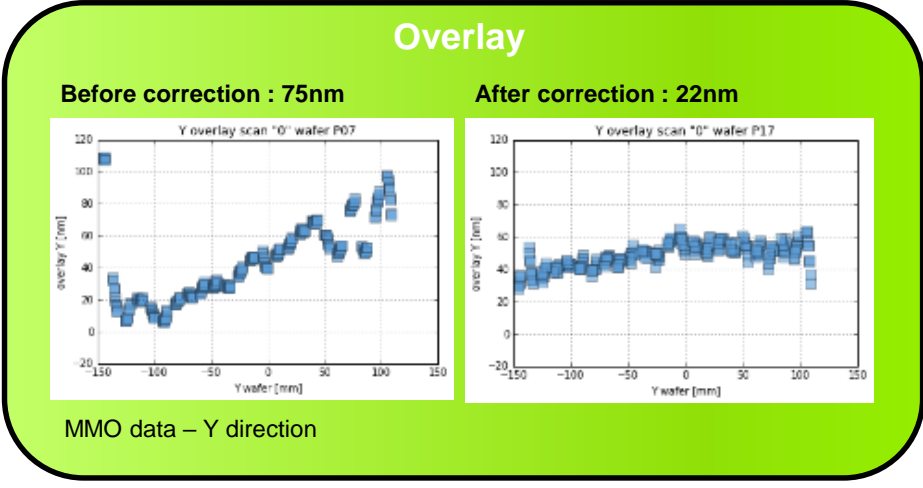
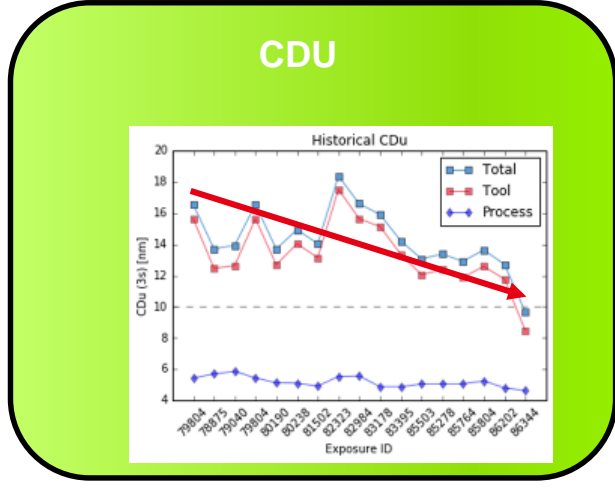
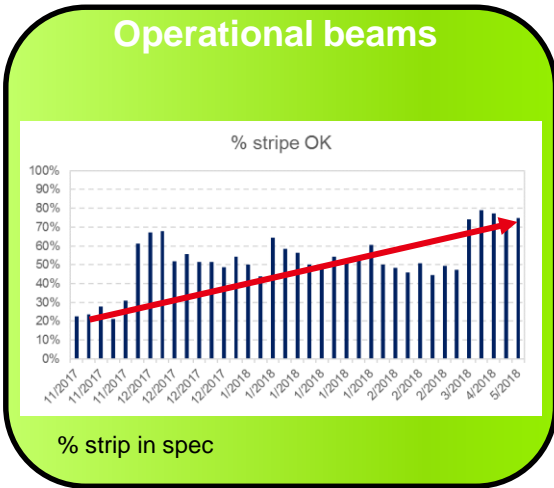


Proc SPIE 2017 - CANON

# ADVANCED LETI LITHOGRAPHY PLATFORM

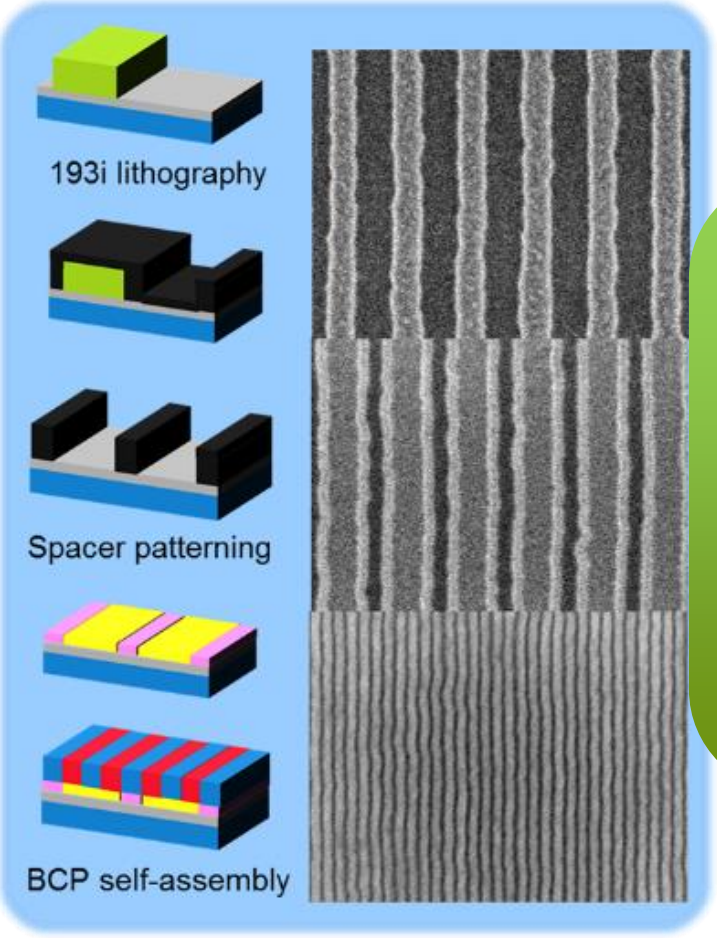


# MAPPER HIGHLIGHTS

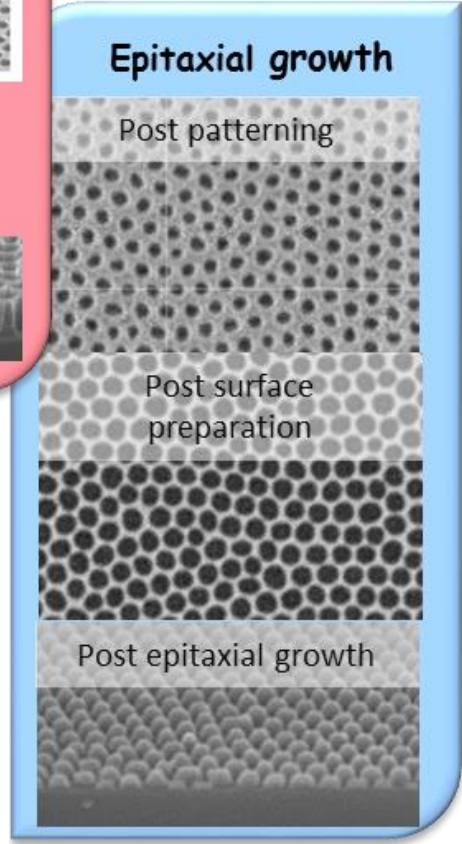
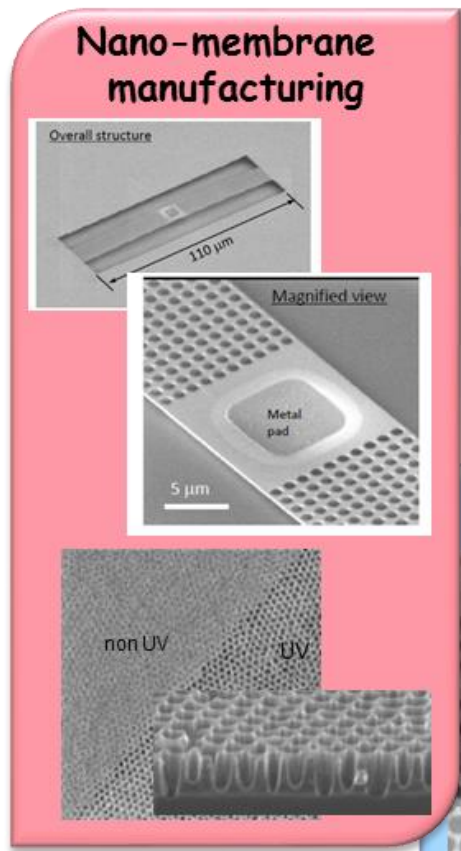


### Integration (Security program)

**FIB-TEM image**

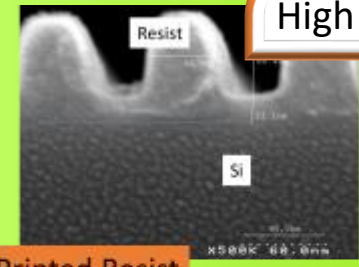


- ## Key advantages
- Reduce multi-patterning scheme (EUV & 193nm immersion)
  - Support EUV insertion
    - Mitigate LER
    - Relax masks issues for clear field levels

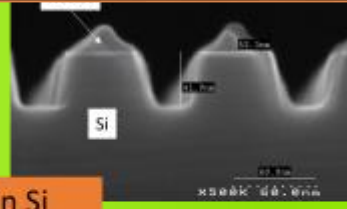


**R&D demonstration**

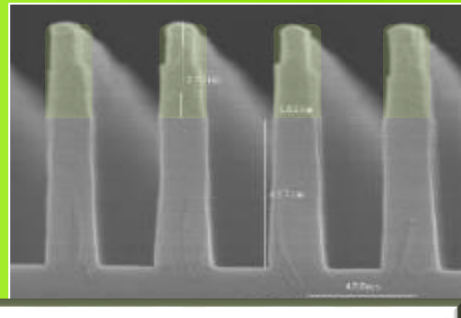
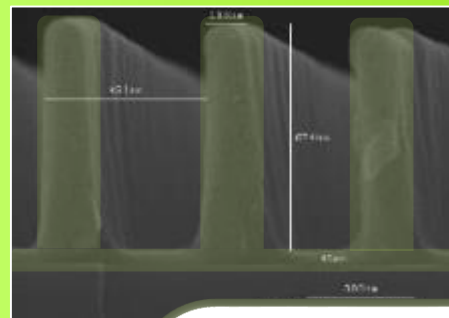
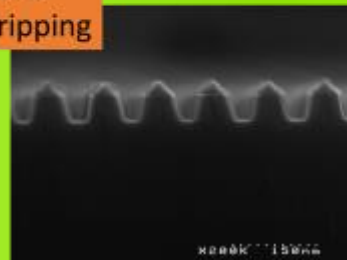
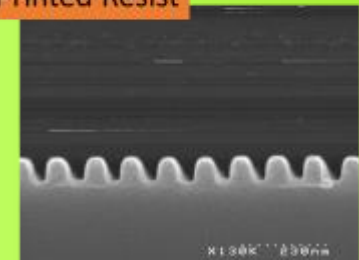
High resolution (50 nm) - polarizer



Printed Resist

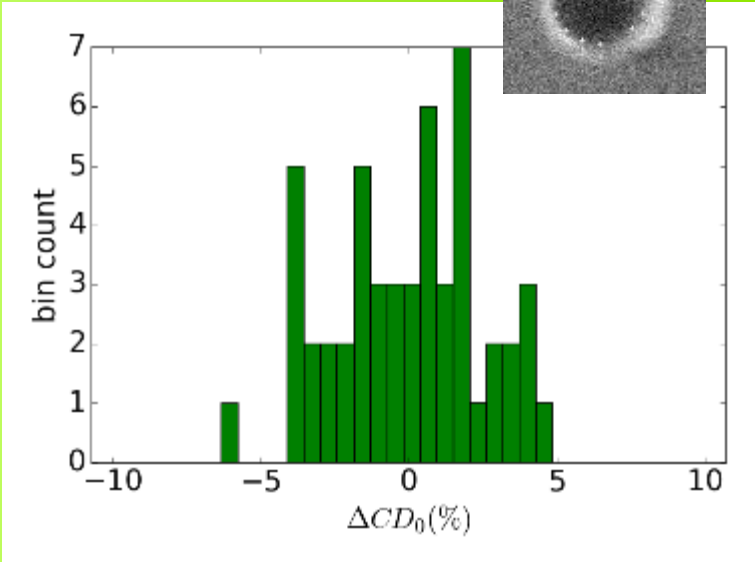
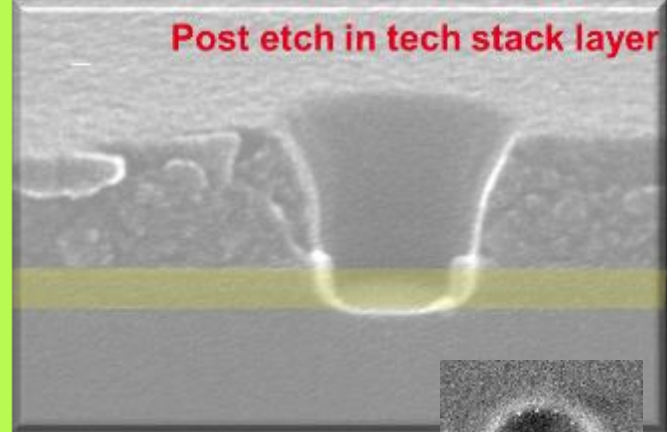


Etch in Si  
No stripping



High Aspect ratio (>5) - 100 nm resolution  
Optical Structures

**Customer demonstration**



## OUTLINE

- The LETI platform capability
- The LETI platform versatility
- Conclusions



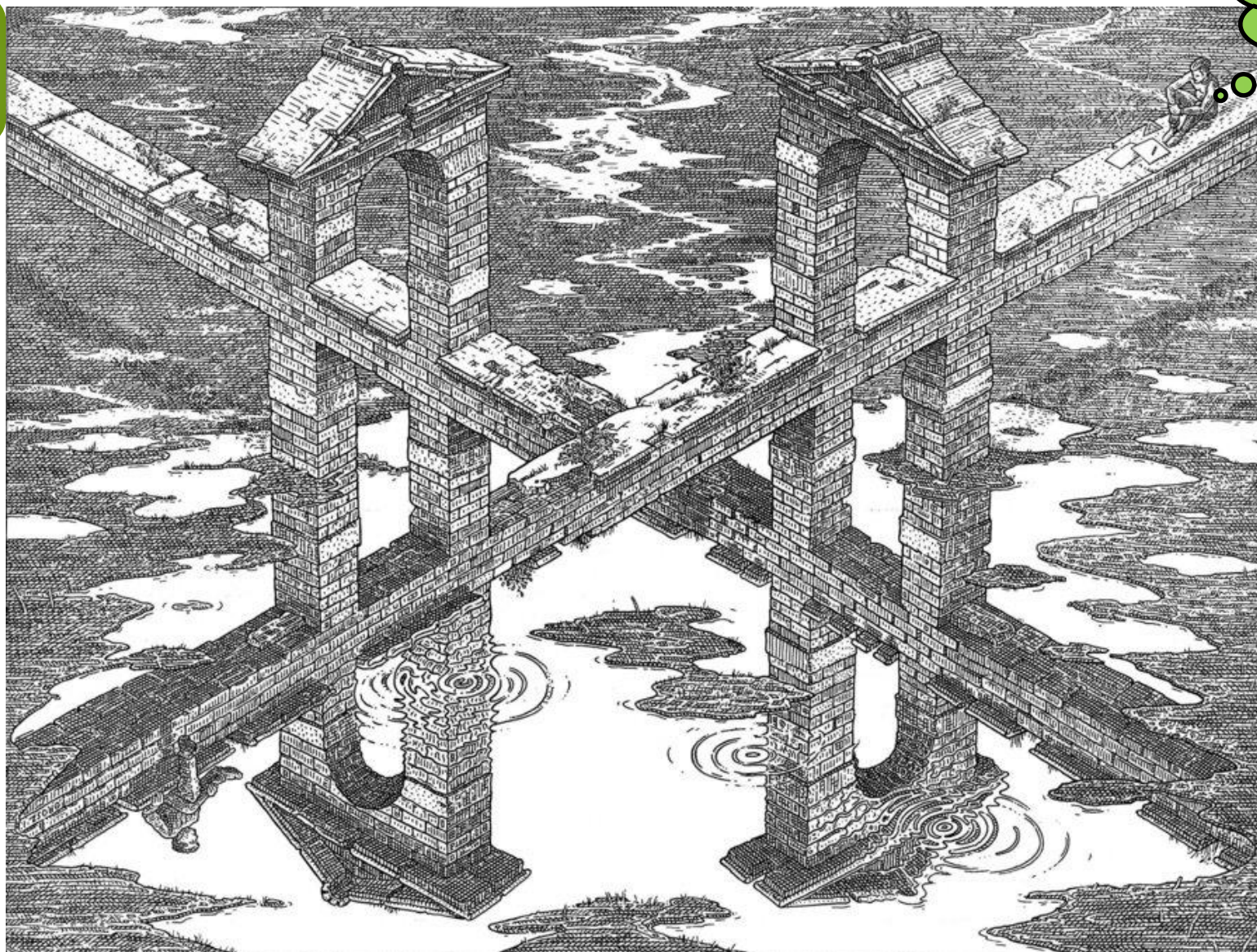
# THE OPPORTUNITY OF LETI ENVIRONMENT

R&D  
Pilot line

Litho  
alternatives

Application ?

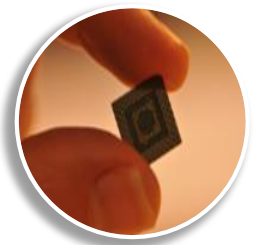
Innovative  
patterning



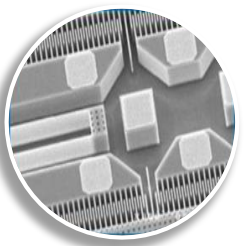
# LETI ENVIRONMENT : ACCESS & OPPORTUNITIES



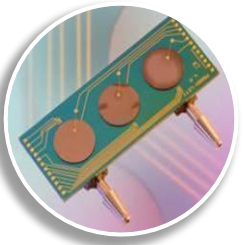
**DSIS**  
Systems & Solutions  
Integration



**DCOS**  
Silicon Component



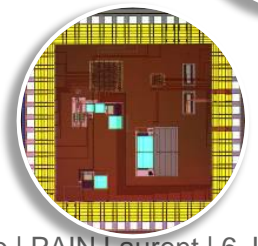
**DTBS**  
 $\mu$ Technologies for  
Biology and Health



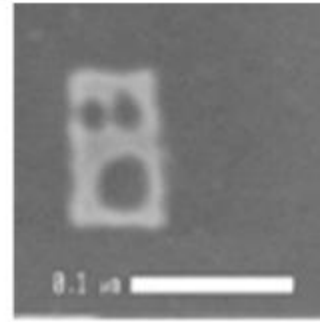
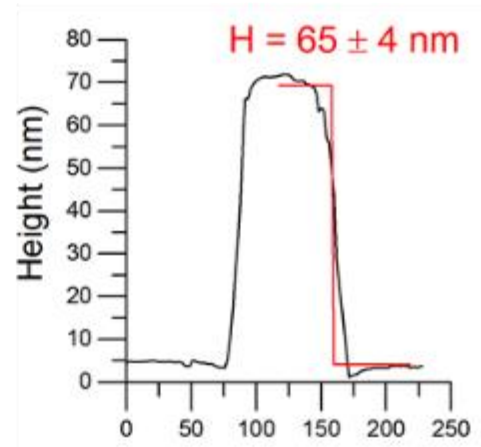
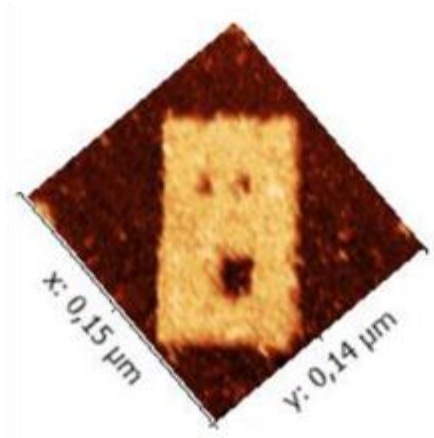
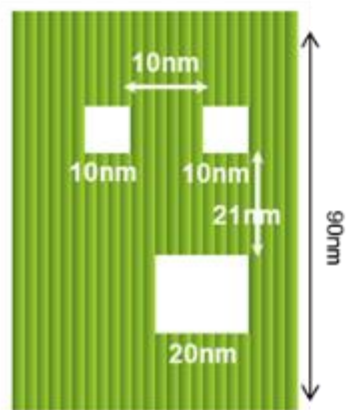
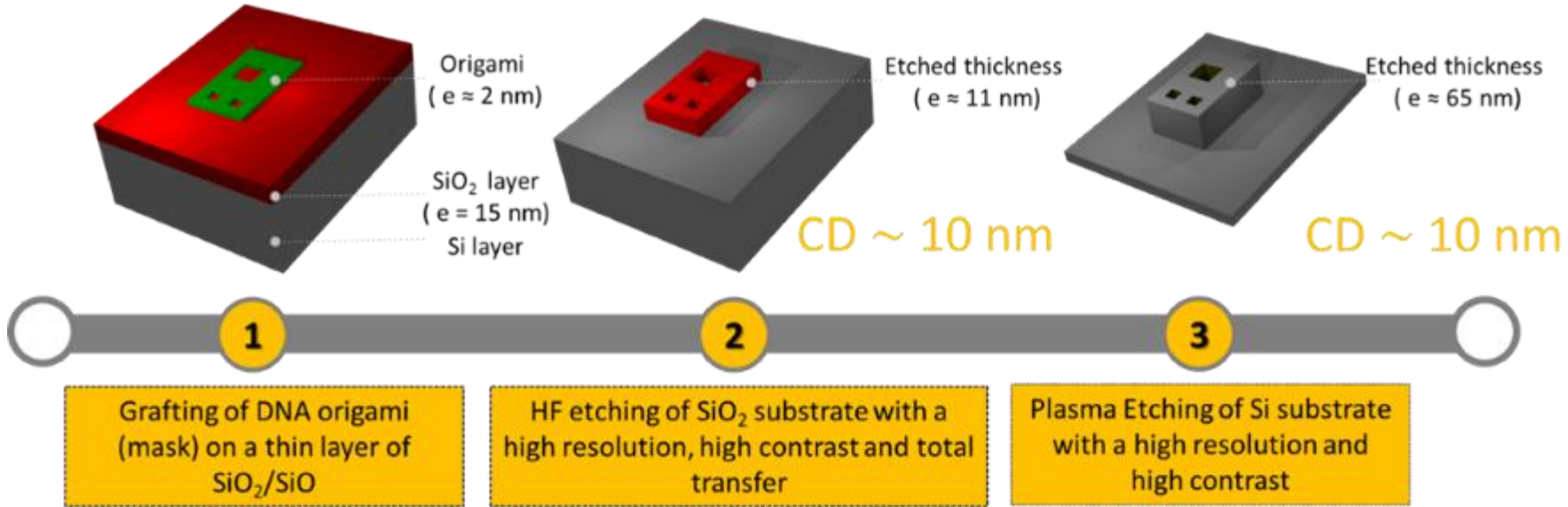
**DOPT**  
Optics & Photonics



**DACLE**  
Architecture, IC Design &  
Embedded Software



# AND AFTER TOMORROW???



CD-SEM image

R. Tiron et al, to be published