CAPITAL MARKETS DAY 2020

INSIGHTS PHOTOMASK EQUIPMENT

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PHOTOMASK TECHNOLOGY TREND

- All three frontend lithography choices (193i, EUV and NIL) remain under consideration - **Fig1**
- Comparing to 193i, EUV will reduce lithography steps by a factor of 4, aiming to improve manufacturing cost, reduce process complexity, and increase device yield. But still many challenges… - **Fig2**
- Multi-beam writing tools are expected to shorten the mask writing time against conventional single-beam writing tools - **Fig3**
- Increasing use of maching learning – **Fig4**

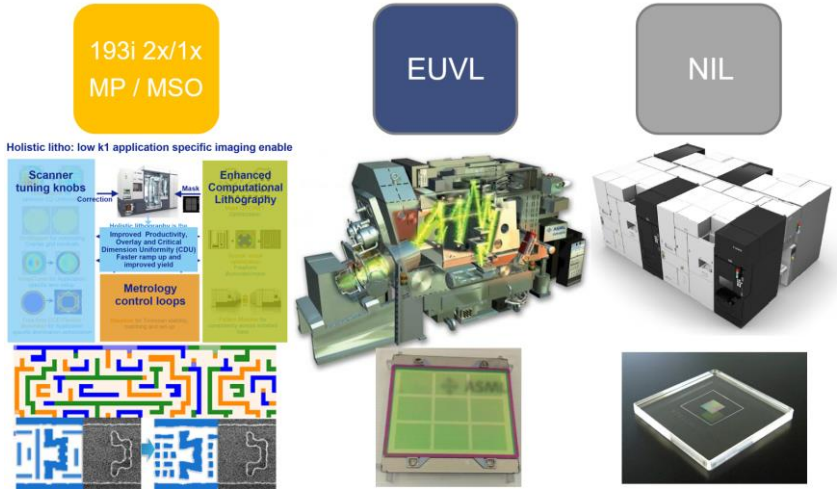


Fig1: Frontend Lithography Choices

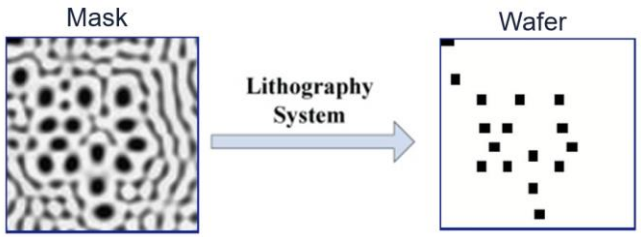


Fig4: AI based hot spot correction

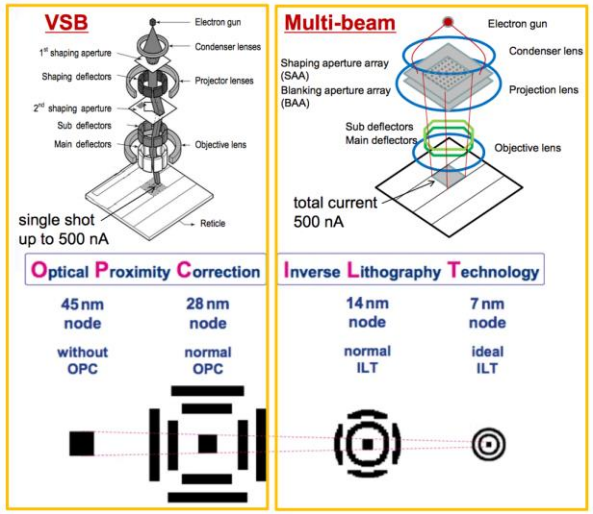
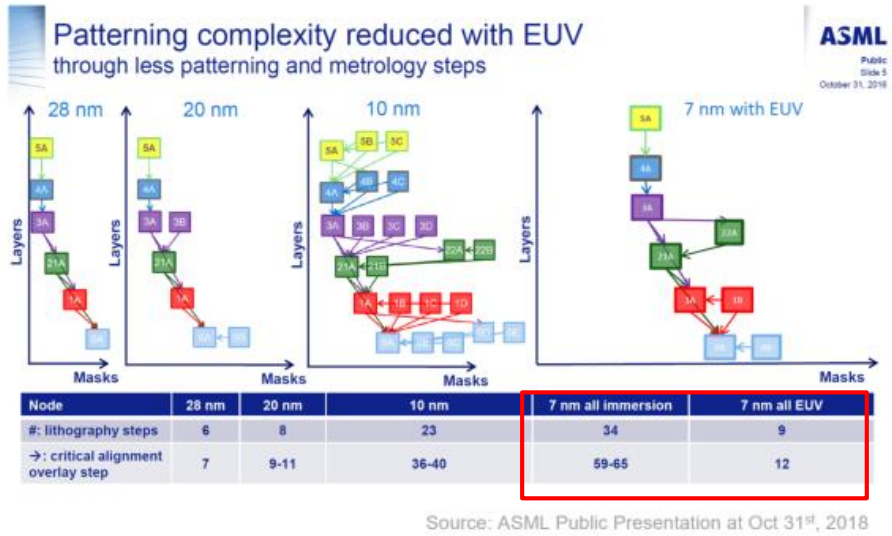


Fig3: Photomask Writing Choices



Node	28 nm	20 nm	10 nm	7 nm all immersion	7 nm all EUV
#: lithography steps	6	8	23	34	9
→: critical alignment overlay step	7	9-11	36-40	59-65	12

Source: ASML Public Presentation at Oct 31st, 2018

Fig2: Lithography Steps Comparison:193i vs EUV

MOORE'S LAW MARKET TREND

- Industrial computing power (standard PCs) and mobile devices (cellphones) are the main drivers today – **Fig5**
- High NA (0.55) EUV scanner will be launched after 2021 – **Fig6**
- 26 EUV scanners (NXE3400 series) will be shipped in 2020
- Many leading customers are preparing for capacity extension: Samsung, SK Hynix, TSMC and Intel – **Fig7**
- Equipment market forecasted at ~5% CAGR (2018-25)

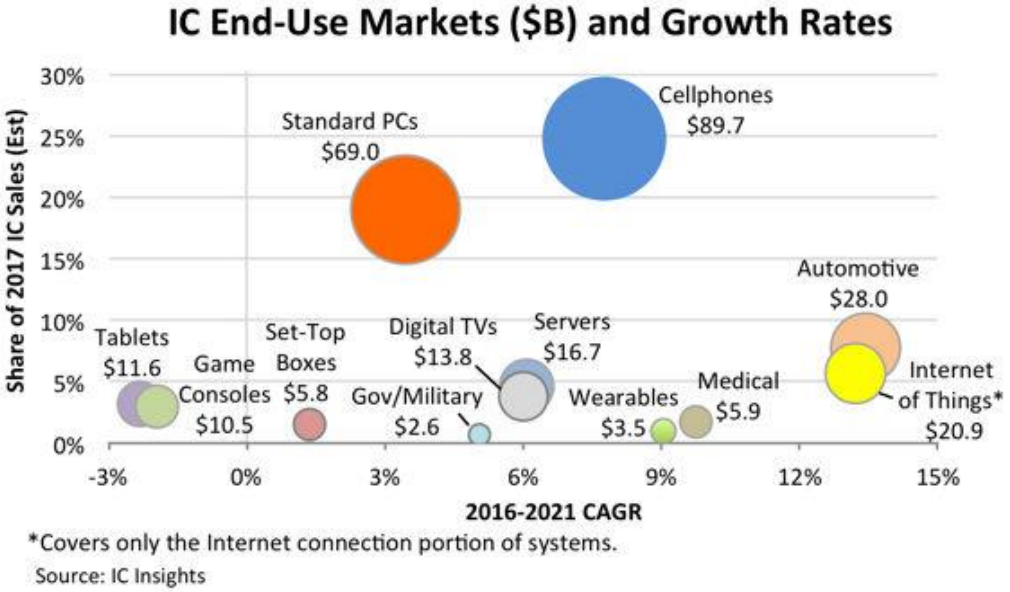


Fig5: Growth potential Market Trend

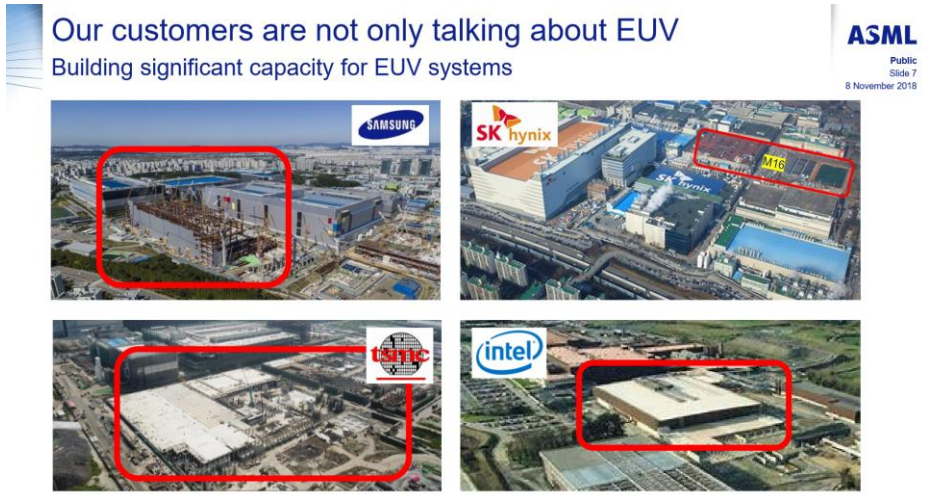


Fig7: Capacity Demands

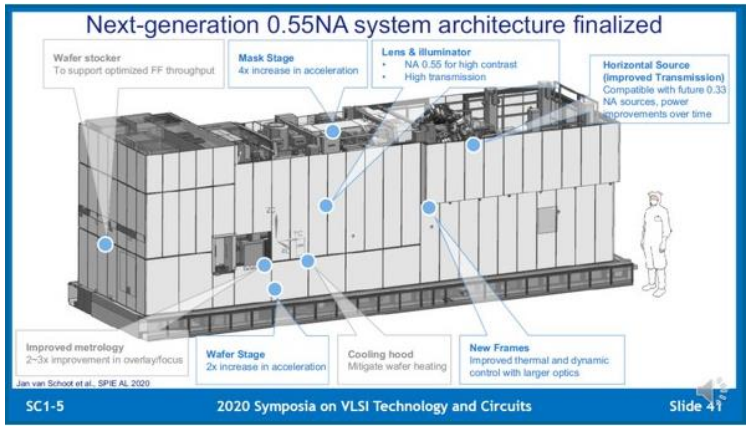


Fig6: ASML Next Generation EUV Scanner

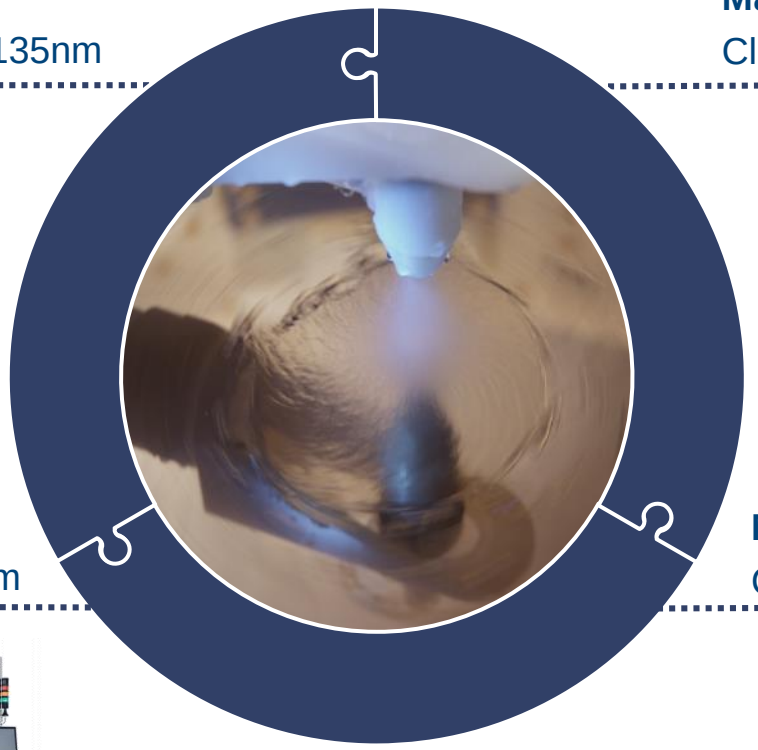
PRODUCT PORTFOLIO

HMx

Cleaning structure sizes > 135nm

MaskTrack X

Cleaning structure sizes < 14 nm



ASx

Cleaning structure sizes 90 - 135nm

MaskTrack Pro

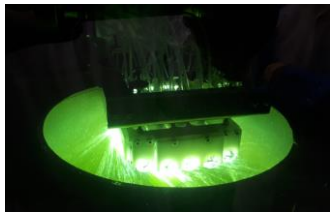
Cleaning structure sizes 14 - 90nm

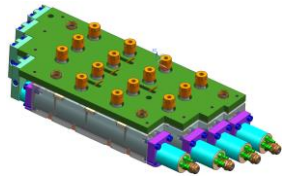
CORE COMPETENCE

+ ***SUSS Core Competence:***
  - **30+ years** photomask-specific experience
  - **> 600** worldwide installed base
  - More than **85% market share** in EUV mask cleaning
  - Technical **cooperation** with many customers
  - **Minimal pattern damage** to extend photomask lifetime
  - **Green technologies** to improve safety and reduce cost

MEMS WAFER CLEANING

Insitu-UV (ISUV)





CrustBuster (CB)

- **Target Application**: MEMS process
- **Applications:**
  - Polymer strip (resist, polyimide, other)
  - Final clean
- **Motivations:**
  - CrustBuster technology vs aggressive solvent (e.g. NMP)
  - Fast time to market leveraging existing Japanese outsource supplier's low cost platform


Thank you!