ASML

Augmented Reality at ASML

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AR/VR Subject Matter Expert & Solution Architect

2021-2-2 (online) ESI SASG Talk

- Introduction of ASML

- The role of the COVID-19 Pandemic

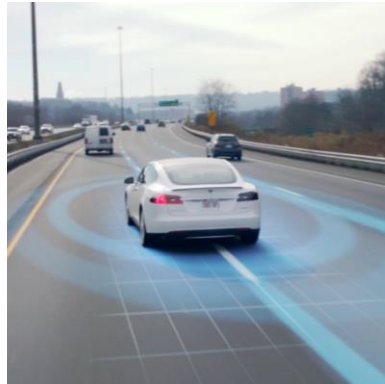 - 'Over The Shoulder' Support Solution

- What Potential do we see?

Credits:

Slides were made with inputs from the
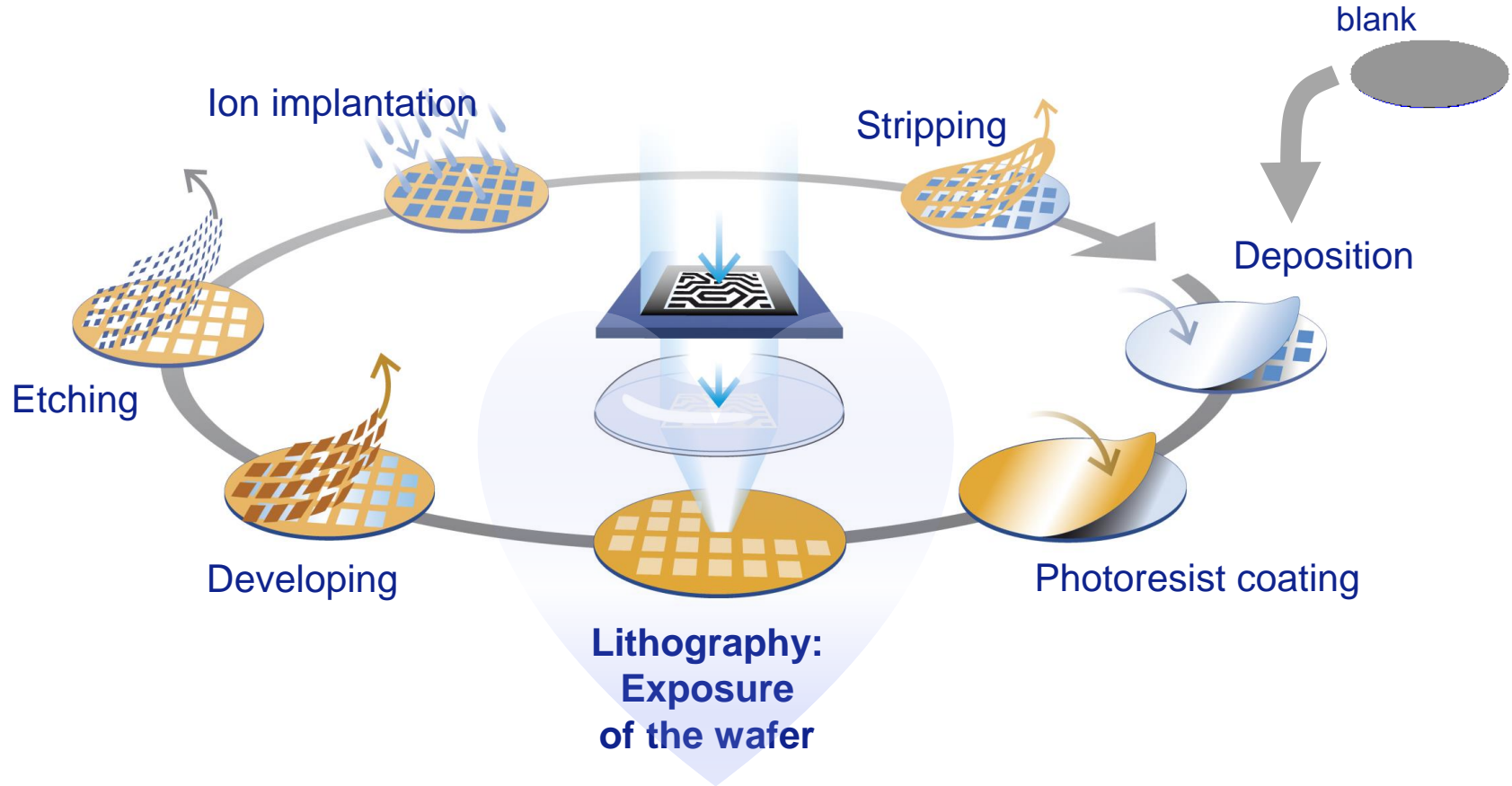entire ARES (ASML Remote Expert Support) team

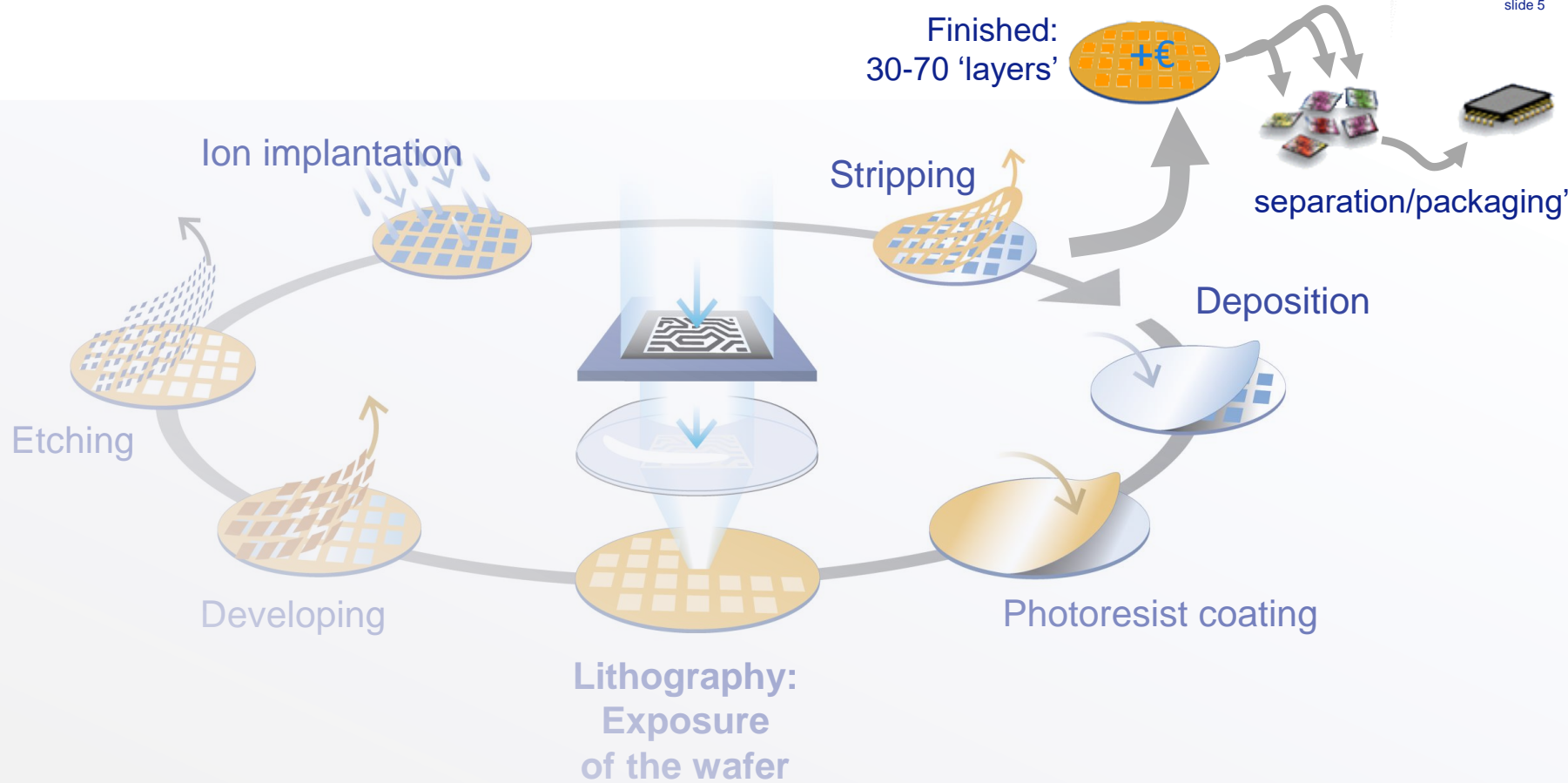# It's hard to imagine a world without chips

>600 billion integrated circuit chips produced in 2018 alone
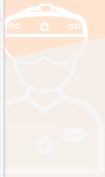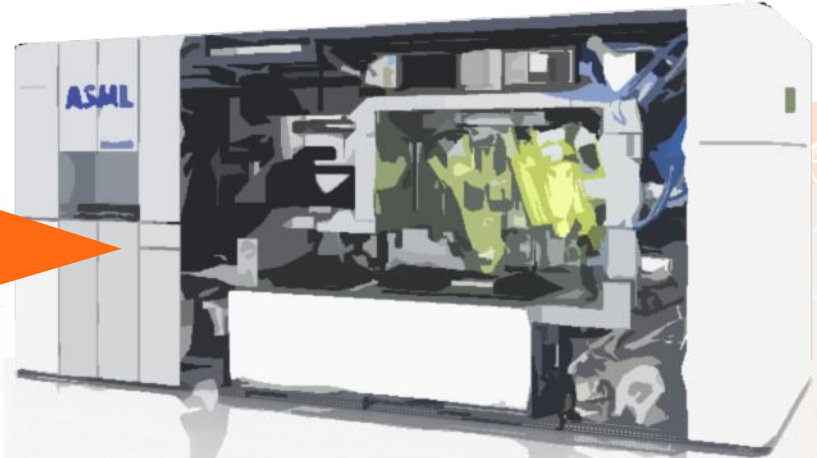
Lithography is at the heart of chip manufacturing

blank

Ion implantation

Stripping

Deposition

Etching

Developing

Photoresist coating

**Lithography:
Exposure
of the wafer**

Lithography is at the heart of chip manufacturing

Finished:
30-70 'layers'

+€

separation/packaging'

Ion implantation

Stripping

Deposition

Etching

Photoresist coating

Developing

Lithography:
Exposure
of the wafer

Keeping up with Moore's Law

Structure in a chip:
6 nanometer detail
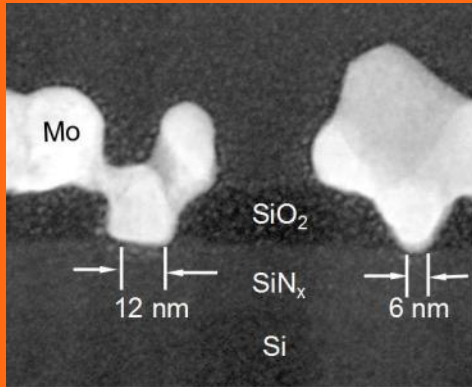
Mo

SiO$_2$

SiN$_x$

12 nm

6 nm

Si

ASML
Remote
Expert
Support

1984

PAS 2000

ASML's first stepper

2015

TWINSCAN NXT:1980Di

Our most advanced
immersion system

2018

TWINSCAN NXE:3400B

High volume
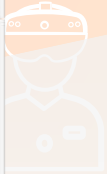EUV system

Keeping up with Moore's Law

Wavelength:
13.5 nanometers

Resolution:
≤ 22 nanometers

Overlay:
1.0 nanometers

Wafer size:
300 mm

Productivity:
125 wafers per hour

ASML
Remote
Expert
Support

1984
PAS 2000
ASML's first stepper

2015
TWINSCAN NXT:1980Di
Our most advanced
immersion system

2018
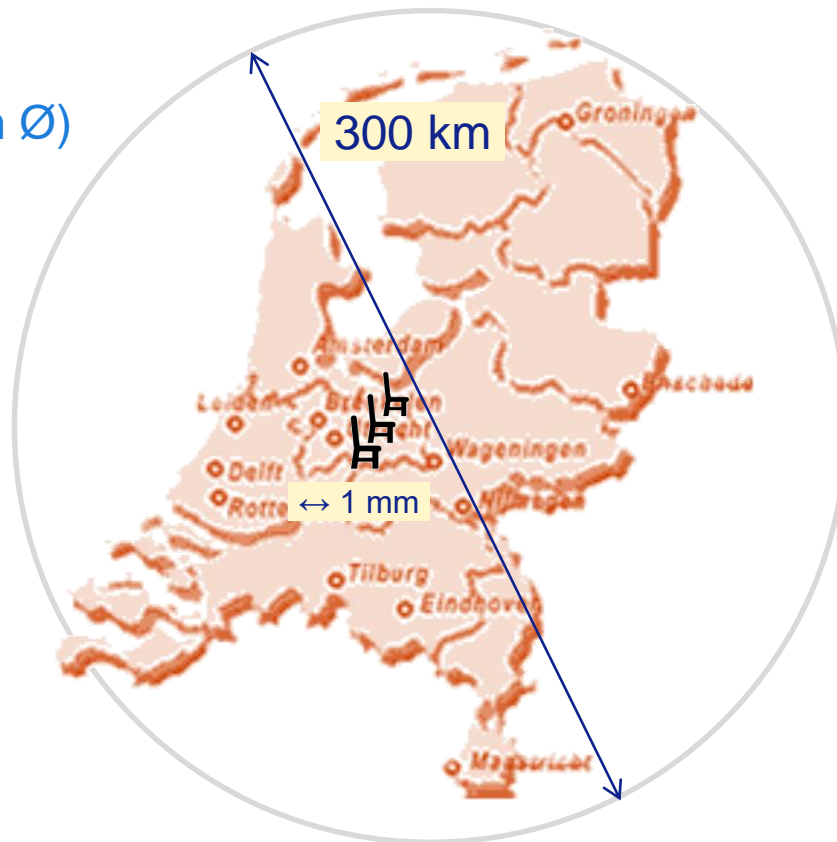**TWINSCAN NXE:3400B**
High volume
EUV system

Control at nm level is really fine-grained

1 mm motion

on scale of The Netherlands (300 km Ø)

1:300,000,000

1 nm motion

on scale of wafer (300 mm Ø)

1:300,000,000

300 km

↔ 1 mm

ASML
Remote
Expert
Support

Founded in 1984 as a spin-off from Philips

All major chipmakers are our customers

Company	Segment	2018 capex (est., $B)
SAMSUNG	Foundry + Memory	24.0
intel	Integrated Devices	14.0
tsmc	Foundry	11.0
SK hynix	Memory	11.0
Micron	Memory	8.5
TOSHIBA / WD Western Digital	Memory	7.3
GLOBALFOUNDRIES	Foundry	4.5
SMIC	Foundry	1.9
UMC	Foundry	1.1
SONY	Others	1.0
Others		30.7
Total		**115.0**

Public

Our key locations

San Diego(CA)

Wilton (CT)

Korea

Chandler (AZ)

Veldhoven

Taiwan

A global presence with ~25,000 employees

All this of-course, is very nice…
But then COVID-19 came,

which made everybody stuck

behind a monitor in the basement…

5,400 employees   **13,700 employees**   **5,700 employees**

Offices in over 60 cities in 16 countries worldwide

Any Augmented Reality at ASML, *before* COVID-19 hit us?

- Virtual Reality (VR) is already in use for training and design reviews

- AR identified as potential solution for *internal* use

But for use at our customers:

- AR requires a multimedia (Audio, Video) stream out of customer factories

- Security Concerns from customers was considered a *Stumble Block:*

  Video may contain sensitive information (billions of € in IP at risk)

What was the impact of the COVID-19 Lock-Down?

- Given the complexity of the ASML systems, normally:

    - Experts fly to customers for system installs and complex diagnostics

- Due to travel restrictions, this traveling stopped almost completely.

    - For our customers, this obviously has a huge impact.

- This triggered: "Can Augmented Reality be a solution to keep things going"?

    - This was possible due to the high level of *trust* between ASML and our customers.

The First AR Solution is now in place

- A very small team started to look into AR for "Remote Support"

- No real competence or experience in AR readily available (so far only VR)

- Just in case, in the first meeting we bought some (totally useless) hardware…

- In no time, we had a team in place:

  - A Cross-Sector team, from Customer Support, Training, Operations, Development, Research, IT Infra, IT Security, …

- By now a first solution for "Over The Shoulder" Support is available

Current Project Status

Customer FAB · EPS · ASML Global Support Center · Remote Expert workplace · E-center · VIEW · STOP · Customer oversight · Remote Over-the-Shoulder Support (OTS)
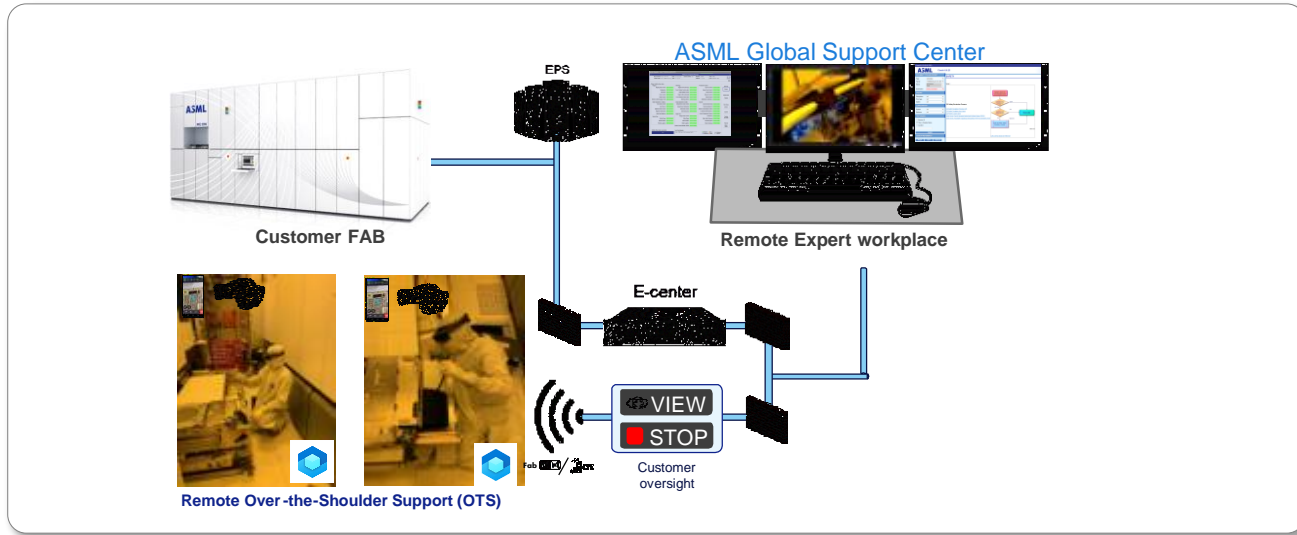
- ✓ Used standard hardware (HoloLens) and software (Remote Assist)

- ✓ HoloLens Head-sets available at every major customer

- ✓ Industrialization of IT and CS processes in progress

- ✓ Driving towards a singular solution for a Semiconductor Industry remote support standard

AR has potential beyond "Over the Shoulder" support
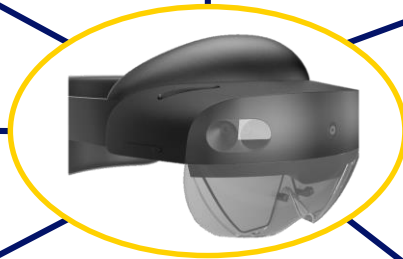
ASML Remote Expert Support

Challenges and Opportunities:

- Communication *out of* customer FAB → Customer IP Concerns

- Communication *into* customer FAB → ASML IP Concerns

- Current Solution is based on mutual trust & agreements

    – Can we envision technical solutions
      to support/enforce trust in a non-invasive way?

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