

Photomask Ecosystem : Current Status and Issues

DNP

未来のあたりまえをつくる。

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1. Background : Is it another “Gold Rush” in AI era?
2. Ecosystem of Photomask : Status and Issues
3. Summary

“Gold Rush” in 19th Century

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The Gold Rush:
Those who sold the pickaxes
often made more than those
who dug for gold.

*Courtesy of ChatGPT

- In the Gold Rush, the picks played an important and profitable role

“Gold Rush” in AI era

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*Courtesy of ChatGPT

- In the AI Gold Rush, who will play that role?

Who is really selling the picks and shovels of the AI “Gold Rush”?

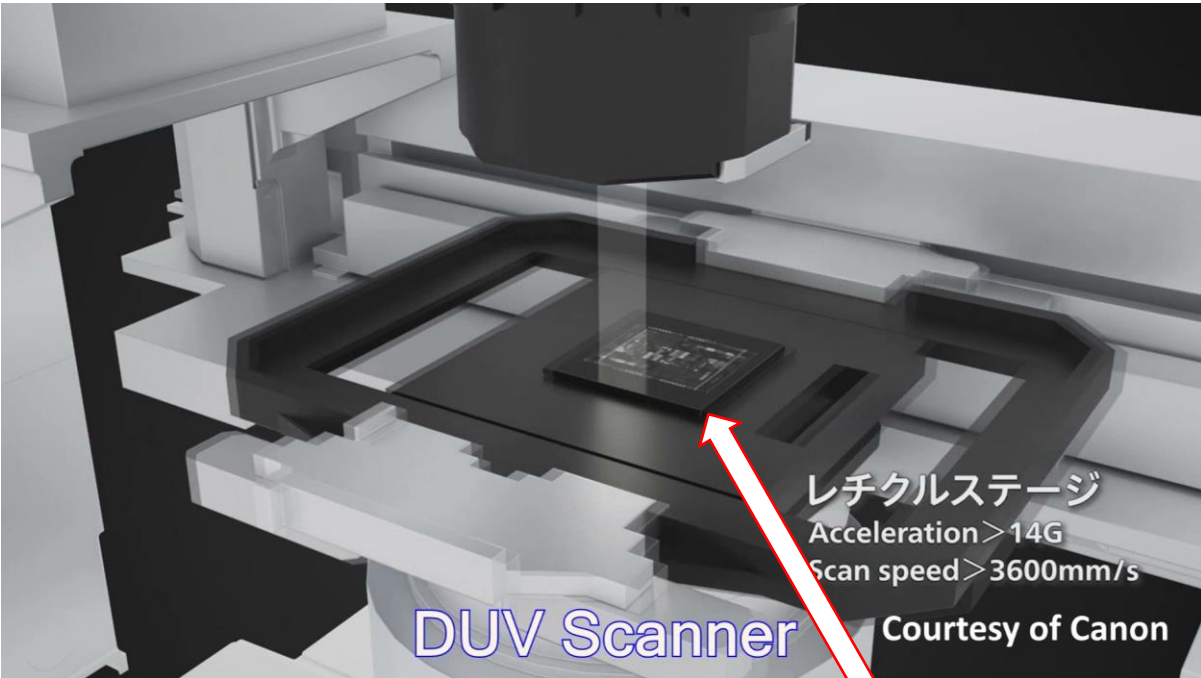
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*Courtesy of ChatGPT

How to Make the Chips with Those Tools?

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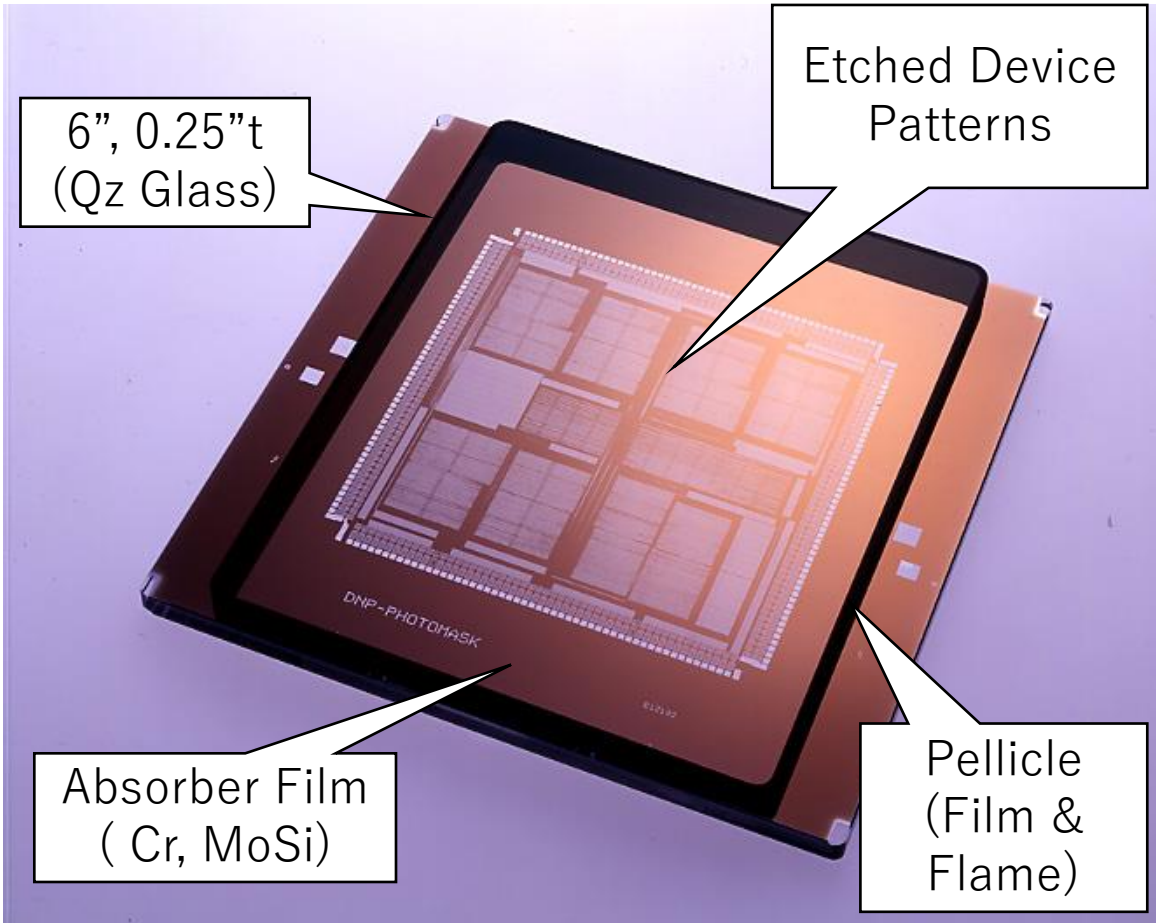


- Photomask!!!

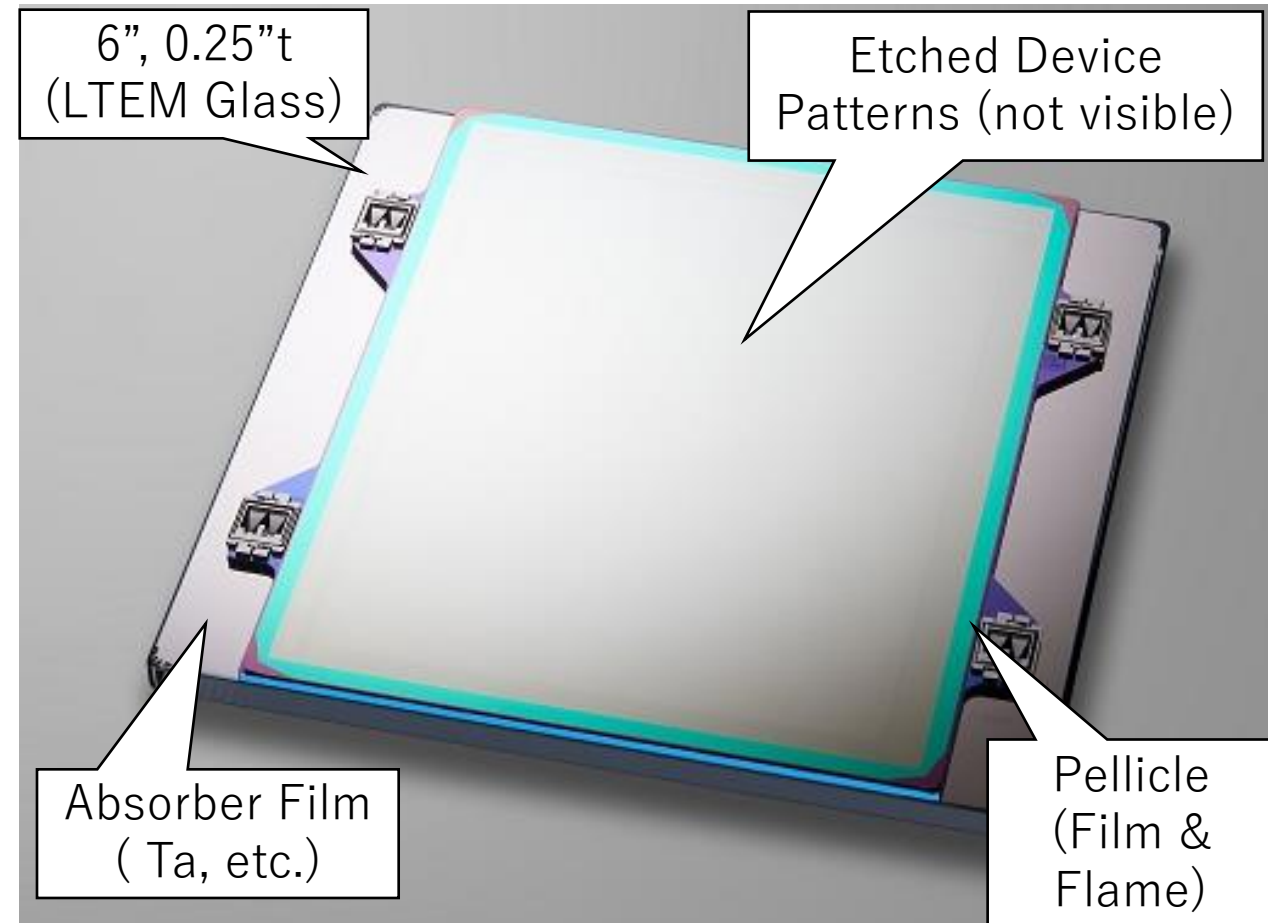
Photomask : What it looks like?

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Photomask for Optical Lithography



Photomask for EUV Lithography



Market Trend of Semiconductor & Photomask

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Semi (M\$)

Mask (M\$)

600,000
500,000
400,000
300,000
200,000
100,000
0

1,500,000 M\$ @2026

793,000 M\$ @2025

627,600 M\$ @2024

6,500~7,800 M\$@2026

5,280 M\$@2025

5,000 M\$@2024

2,000
1,000
0

1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

Americas Europe Japan Asia Pacific WW Photomask

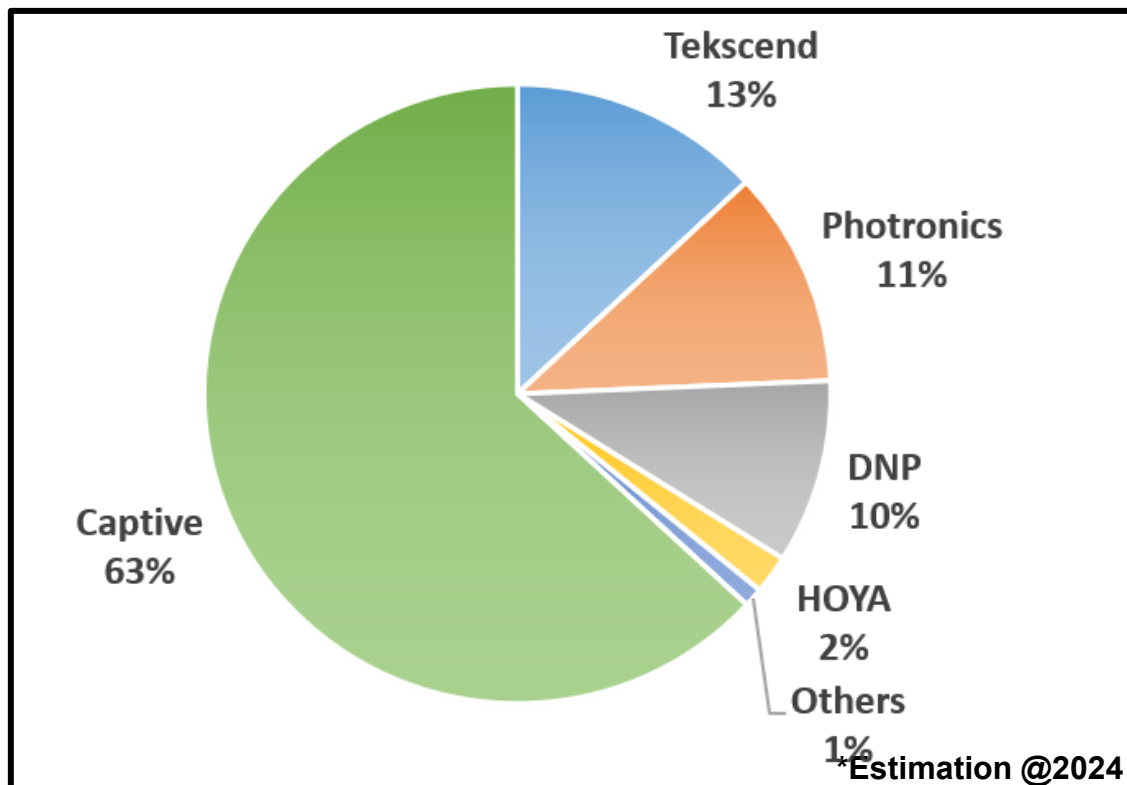
* DNP estimation

■ Semiconductor : Increasing 10x in last 30 years. > 1 T\$ four years earlier than expected !
■ Photomask : Following semiconductor market with about 1% of size, 5x in last 30 years.

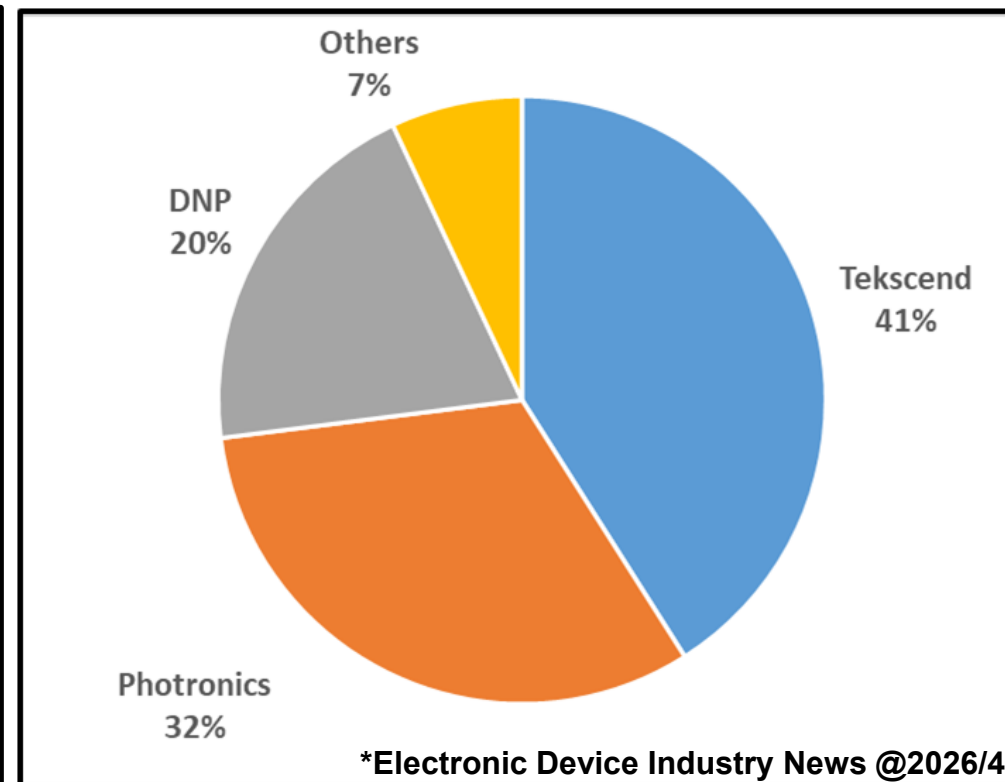
Photomask Market Share

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Worldwide



Merchant market



- Worldwide : Captive takes 60~70% of share with mostly advanced nodes.
- Merchant : 30~40% of share with mostly mature nodes, ~60% from Japanese companies.

1. Is it another “Gold Rush” in AI system?
- 2. Ecosystem of Photomask : Status and Issues**
3. Summary

Photomask Manufacturing Flow & Players

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Steps from Design

Processes

Major Players

Conversion to Writing Data

Data Conversion & Correction

Synopsys, D2S, NCS, ASML

Preparation of Mask Blanks

Mask Blank Materials

HOYA, Shinetsu, AGC, S&S

Resist Materials

FujiFilm, Shinetsu, JSR, TOK

Resist Coating

TEL, Suss MicroTec, AMAT

Pattern Writing

Electron & Laser Beam Writing

NuFlare, IMS, JEOL, Vistec(EB)

AMAT, Mycronic (Laser)

Development

Development of Exposed Blanks

TEL, Suss MicroTec, AMAT

Etching

Wet or Dry Etching of Metals

Suss MicroTec, AMAT (Wet)

AMAT, Plasma Therm,
Shibaura (Dry)

Strip & Clean

Resist Strip & Mask Cleaning

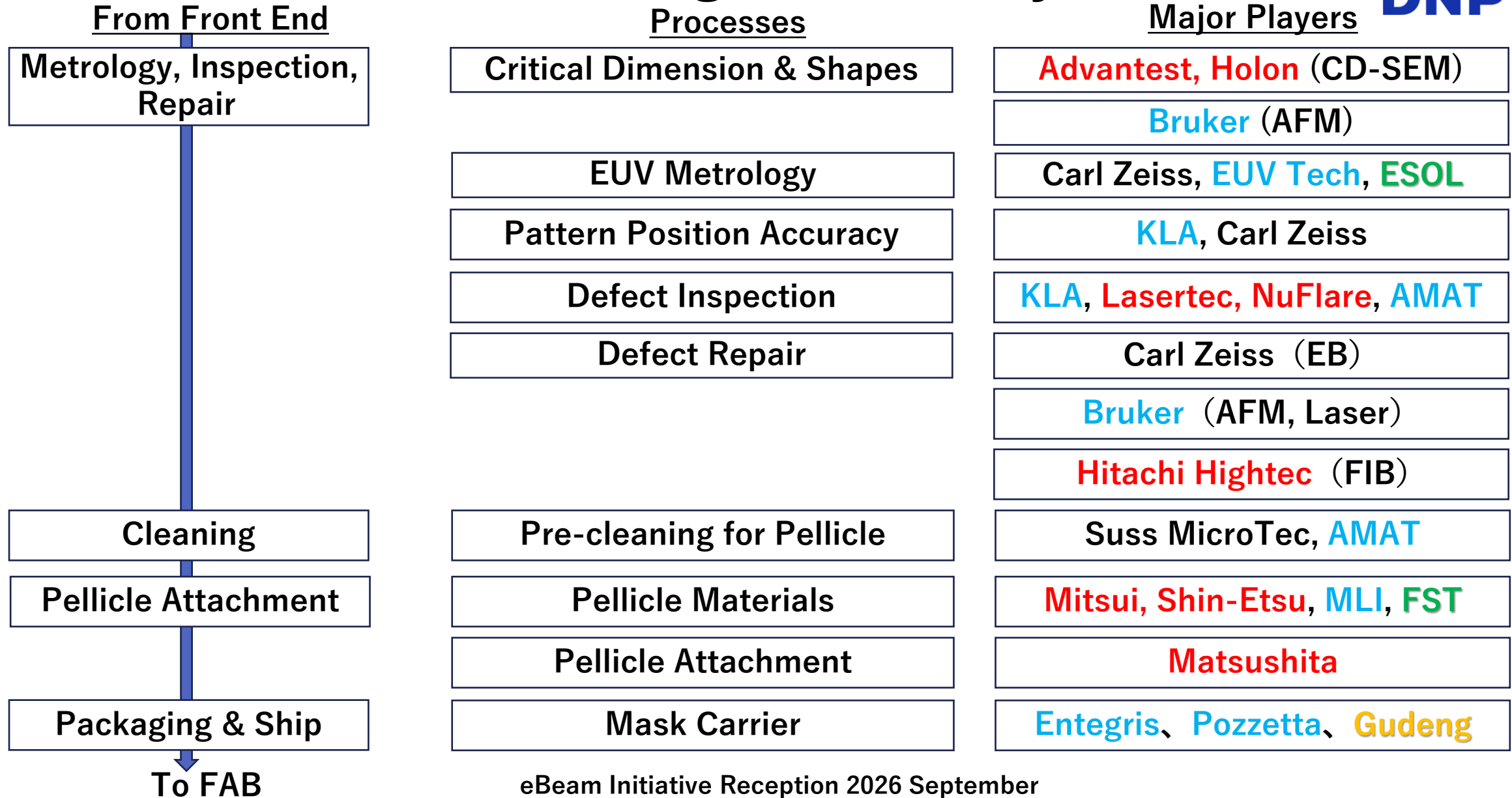
Suss MicroTec, AMAT

To Backend

eBeam Initiative Reception 2026 September

Photomask Manufacturing Flow & Players

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- ◆ Photomask and related industry are very important and expect rapidly growing demand in near future.
- ◆ On the other hand, dependence on a few key players in each category and limited capacity raise some concerns.
- ◆ Geopolitical perspective shows necessity of strong ecosystem.
- ◆ Should think about sustainable supply chain and industry wide support.

No Beam, No Mask!!

No Mask, No Device!!

No Device, No Life!!

Thank You !