

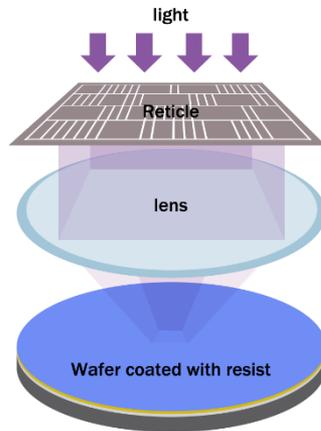


NAR Labs National Applied Research Laboratories
Taiwan Semiconductor Research Institute

L22 高速量產型光學曝光系統 儀器簡介 (248 Scanner Introduction)

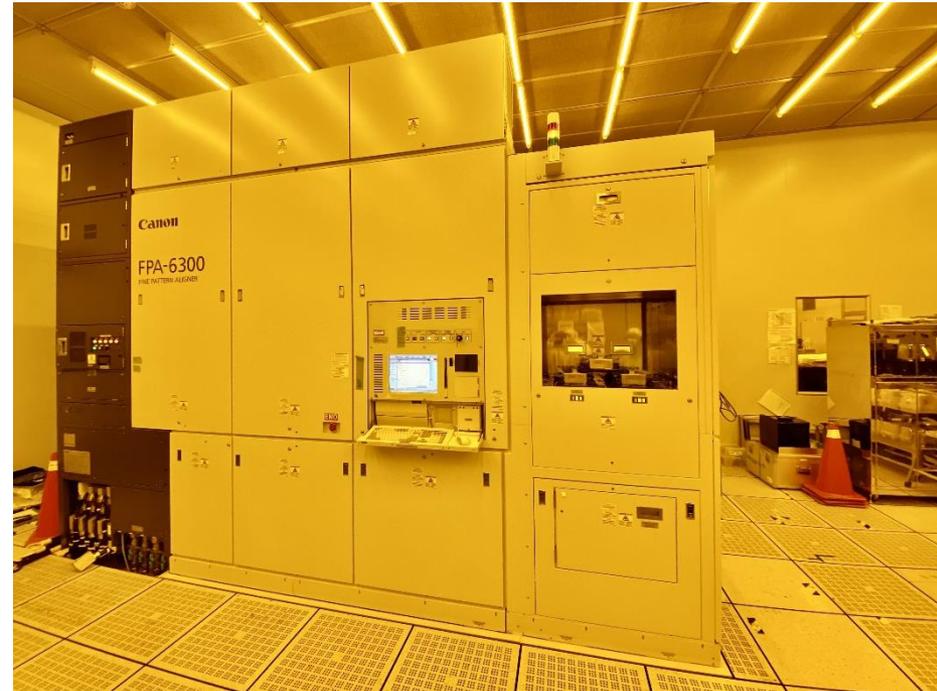
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The Lithography Process



- 電路圖形利用曝光機從光罩轉印到晶圓上
- 解析度越好的曝光設備，能將越小線寬的電路轉印到晶圓上。如此一來，單位面積的晶圓上，便能放入更多的元件，這使得單一晶片的功能越來越多，效能也會越好。
- TSRI 引進的 **Canon FPA-6300ES6a**，使用複雜的載台控制技術、改良的對準系統以及更先進的溫度及形變控制系統，可以將曝光偏移量控制更精準。而高達 **0.86 NA** (數值孔徑, Numerical Aperture) 的光學投影系統能提供良好的解析能力，能曝出更小的線寬 (110 nm)。

The KrF (248 nm) DUV Scanner in TSRI: FPA-6300ES6a

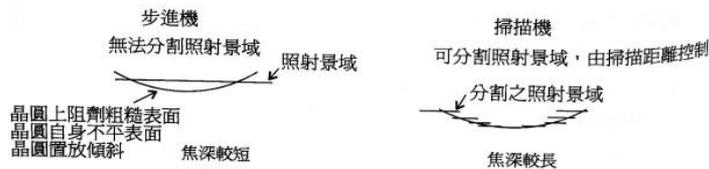
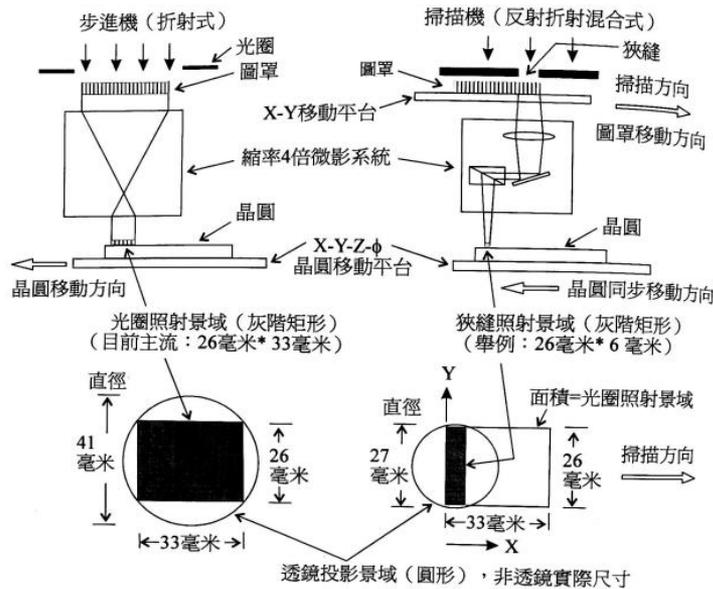


| Specifications | |
|-------------------------|--------------------------|
| Model Type | KrF (248 nm) DUV Scanner |
| Wafer Size | 200 mm |
| Numerical Aperture (NA) | 0.50 ~ 0.86 |
| Resolution | ≤ 110 nm |

Scanner vs Stepper

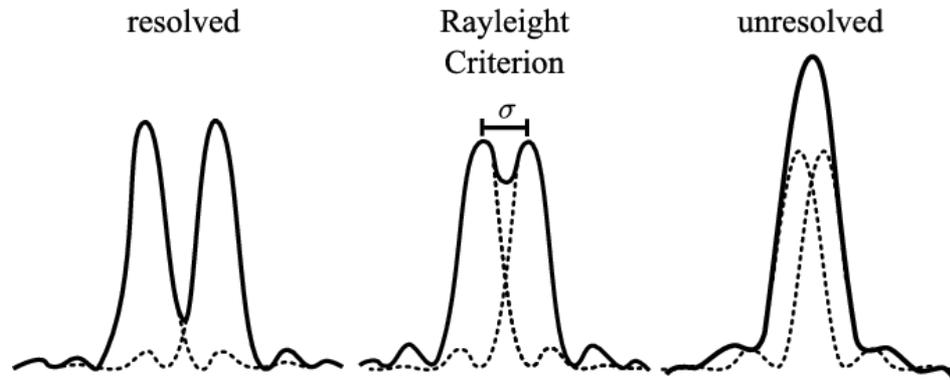
i-Line Stepper

248 Scanner



- ✓ 優點:
- 1. Scanner 所需的透鏡較小，較好製作，透鏡良率較高，成像像差較小。
- 2. Scanner 可以一邊曝光一邊調整聚焦位置，所以製程景深較大。

248 (DUV, KrF) vs 365 (i-line)



- ✓ 248 nm 相較於 i-line 的 365 nm，DUV KrF 使用 248 nm 較短波長有較佳的解析能力。

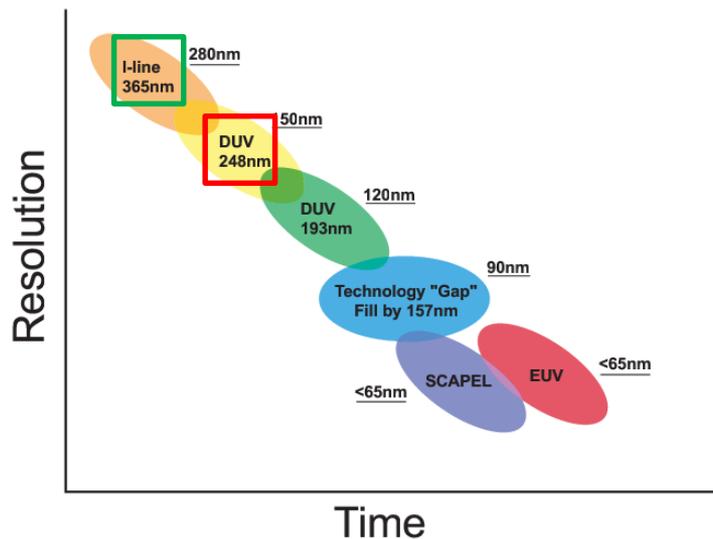
$$R (\text{resolution}) = K_1 \lambda / \text{NA}$$

K1: 製程綜合參數

λ : 波長

NA: 數值孔徑

Technology Roadmap

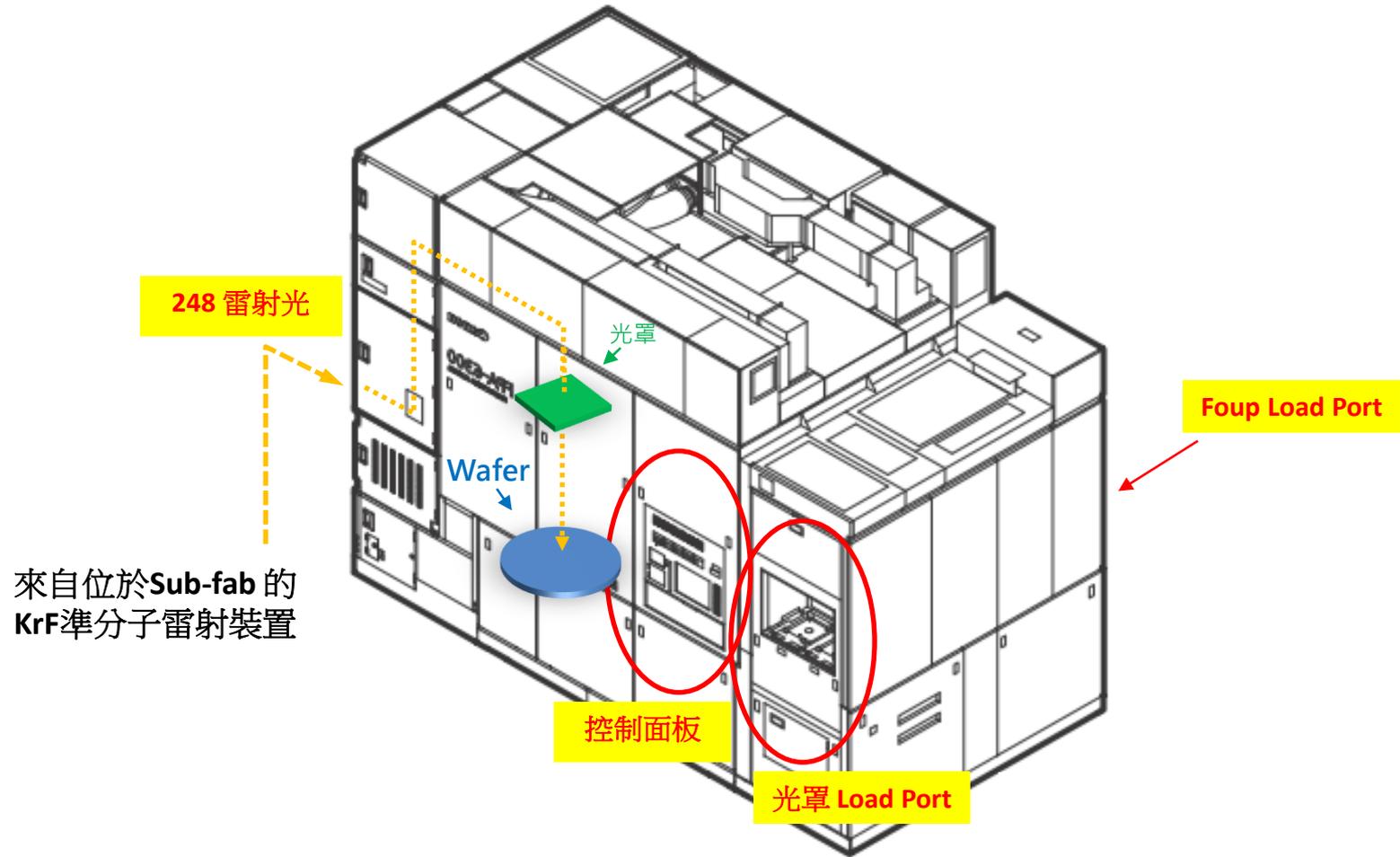


- ✓ 248 nm 波長光源是由氟氬(KrF)準分子雷射產生，所以有時會稱 248 為 KrF。

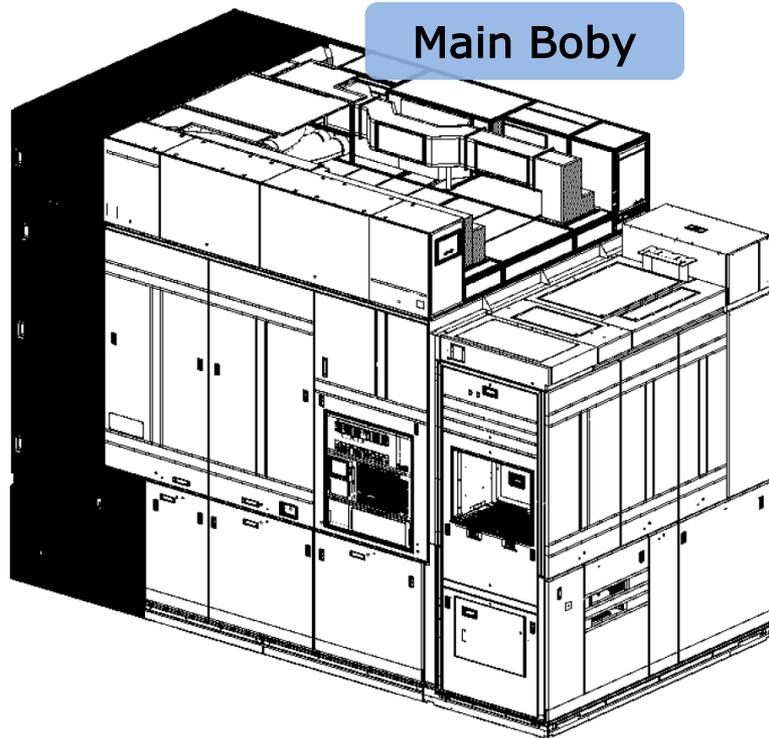
248 Scanner (L22) 位置



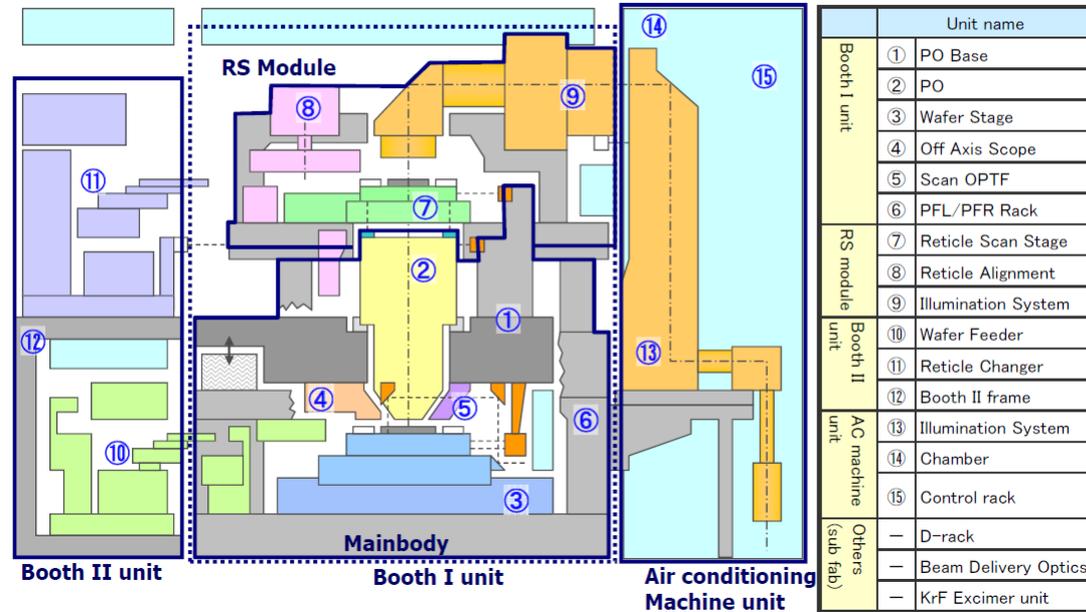
248 Scanner (L22) 外觀簡介



248 Scanner (L22) 細部介紹(Main Fab) **NAR Labs**



Unit Configuration



| Equipment | Width [mm] | Depth [mm] | Height [mm] | Weight [kg] | Remarks |
|--|------------|------------|-------------|-------------|--|
| Main-floor section (main body) *1 | 2300 | 4500 | 3350 | 21300 | |
| Booth1 | 2300 | 2680 | 3350 | 16980 | Main body area |
| Booth2 | 2300 | 1050 | 2882 | 2500 | Feeding system area |
| Air-conditioning machine | 2300 | 1120 | 3350 | 1820 | Air-conditioning system |
| Sub-floor section | | | | | |
| CPSU*2 | 2500 | 1350 | 1957 | 1775 | |
| D-Rack (Driver Rack) *3 | 3245 | 900 | 2139 | 2050 | Including the waterproof unit |
| Excimer laser *4 (GIGAPHOTON/4kHz) | 2053 | 879 | 2176*6 | 1580 | Laser main body (including the signal tower) |

248 Scanner (L22) 細部介紹(Sub Fab) **NARLabs**

Giga Laser



CPSU



D-Rack

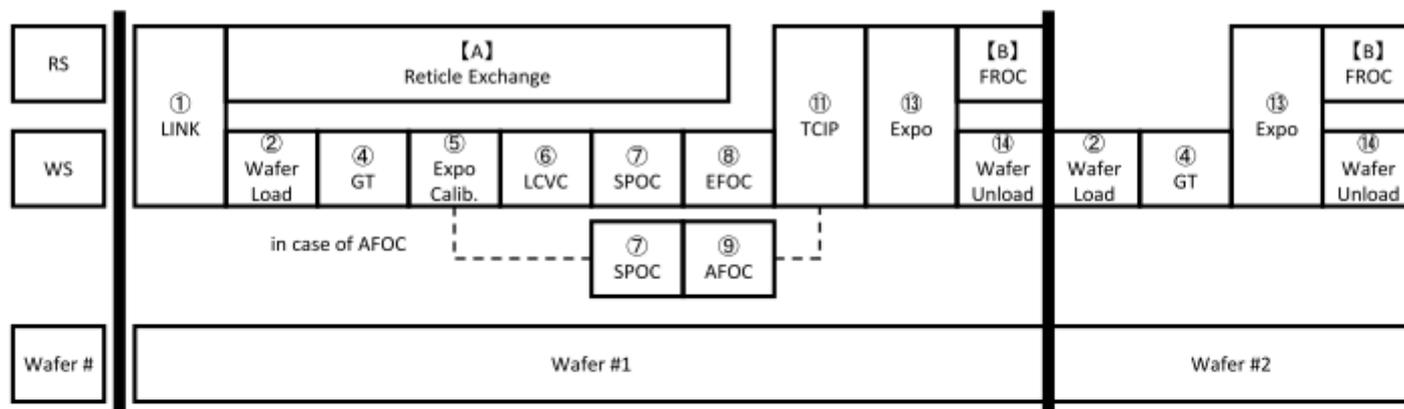


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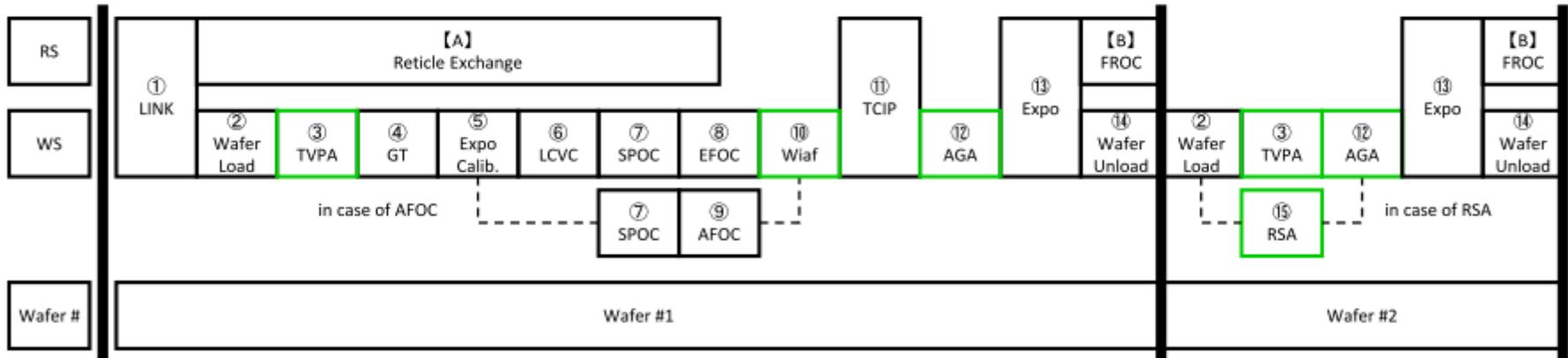
2. Seq. Mode(1st Mode)

- 1st Mode
- “1st Mode” is chosen when the equipment expose the non-exposure wafers which have no patterns.
- “1st Mode” Job Sequence is given below.



2. Seq. Mode(OAS-AGA Mode)

- OAS-AGA Mode
- “OAS-AGA Mode” is chosen when the equipment expose the exposed wafers which have some patterns already.
- “OAS-AGA Mode” Job Sequence is given below.
- The **Alignment** functions are added to “1st Mode” Job Sequence.





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End