06/03/2025
No.5770

Business Introduction

「*Ion and Electron Irradiation on Semiconductors for device characteristic improvement*」

SHI-ATEX Co., Ltd.

We would like to inform that “S.H.I. Examination & Inspection, Co.,Ltd. (SHIEI) ” will merger with “Japan Electron Beam Irradiation Service Co., Ltd. (EBIS)” and be named to “***SHI-ATEX Co., Ltd.***” from April 1, 2017.
In the same way as SHIEI and EBIS, we will continue the Ion and Electron beam irradiation service business in NEW COMPANY.

Location of SHI-ATEX

住重アテックス株式会社

Ion Head office Factory (Ehime)

Ion Okayama Center (Okayama)

EB Tsukuba Center (Ibaraki)

EB Kansai Center (Osaka)

Main accelerators

Ion

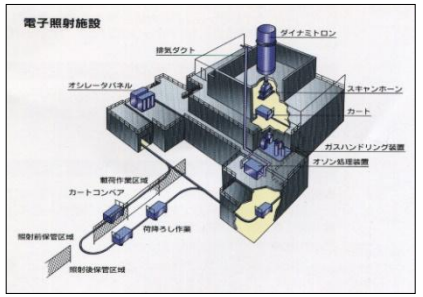
・Manufactured by Sumitomo Heavy Industry
Cyclotron 4Unit（Ehime）
Cyclotron 2Unit（Okayama）

Ion

・Manufactured by High Voltage Engineering
Van de Graaff 1Unit（Ehime）
Tandem 1Unit（Okayama）

EB

・Manufactured by RDI
Dynamitron 1 Unit （Osaka）
Dynamitron 1 Unit （Ibaraki ）



Ion Beam Irradiation by Cyclotrons

Wafer handling device (Ion beam irradiation)

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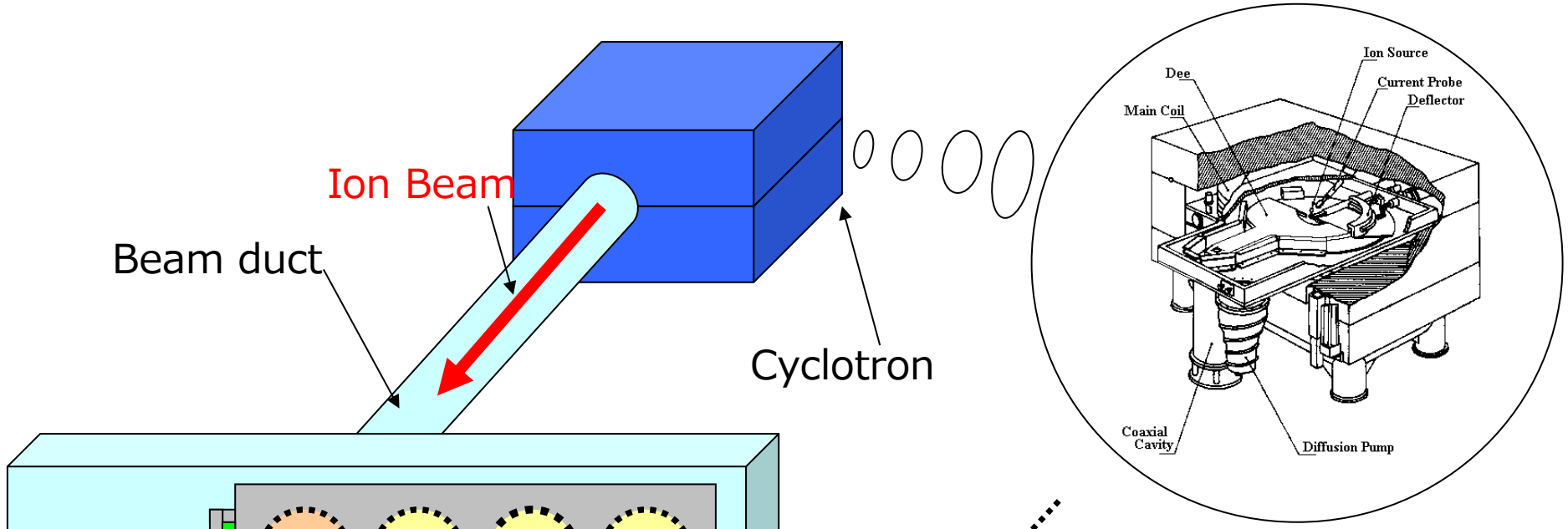

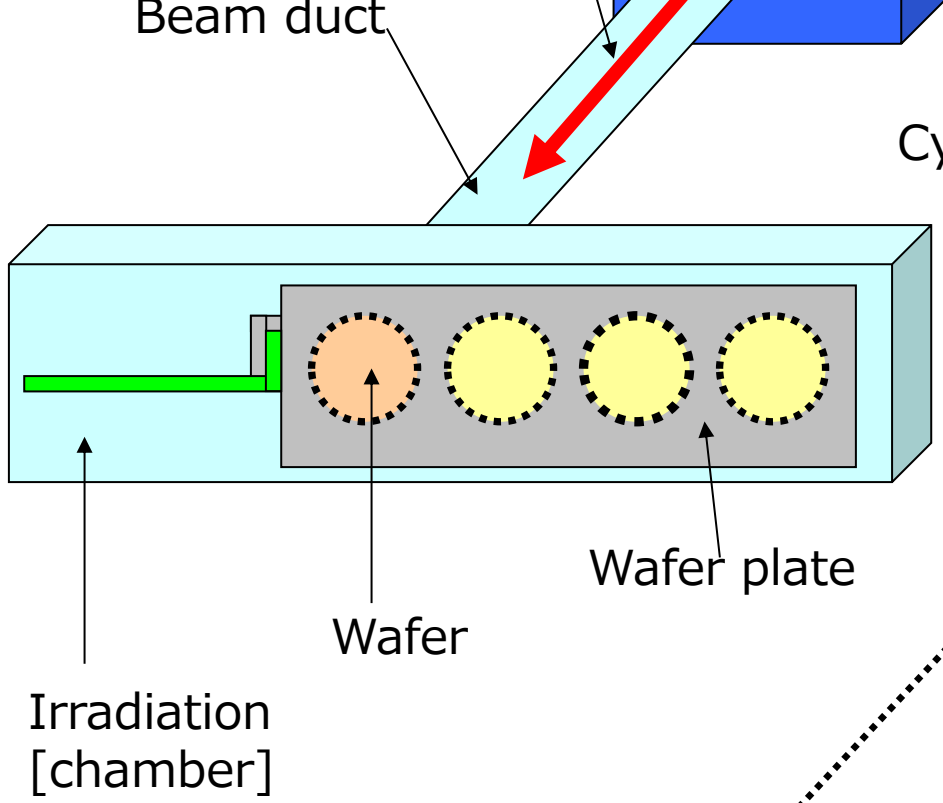

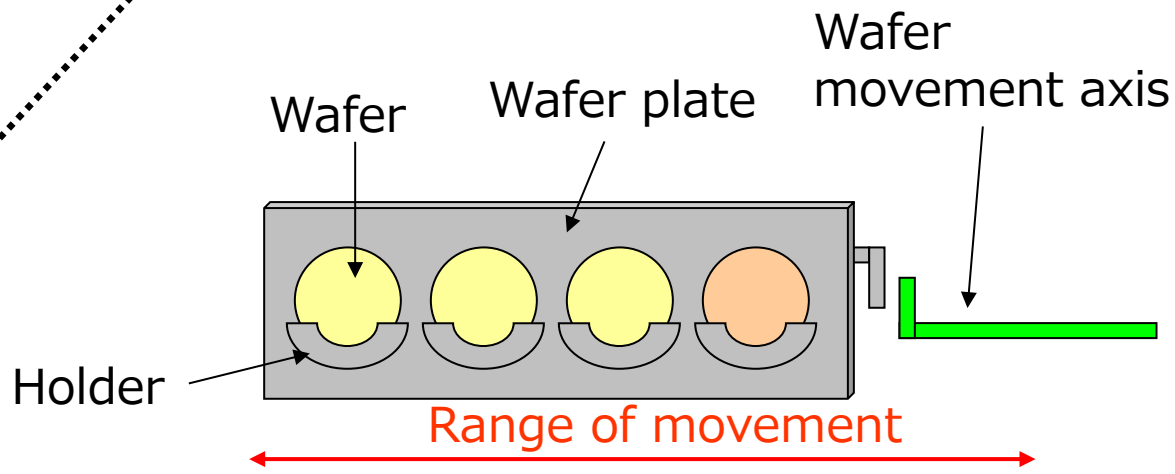

Wafer loading plate (Ion beam irradiation)

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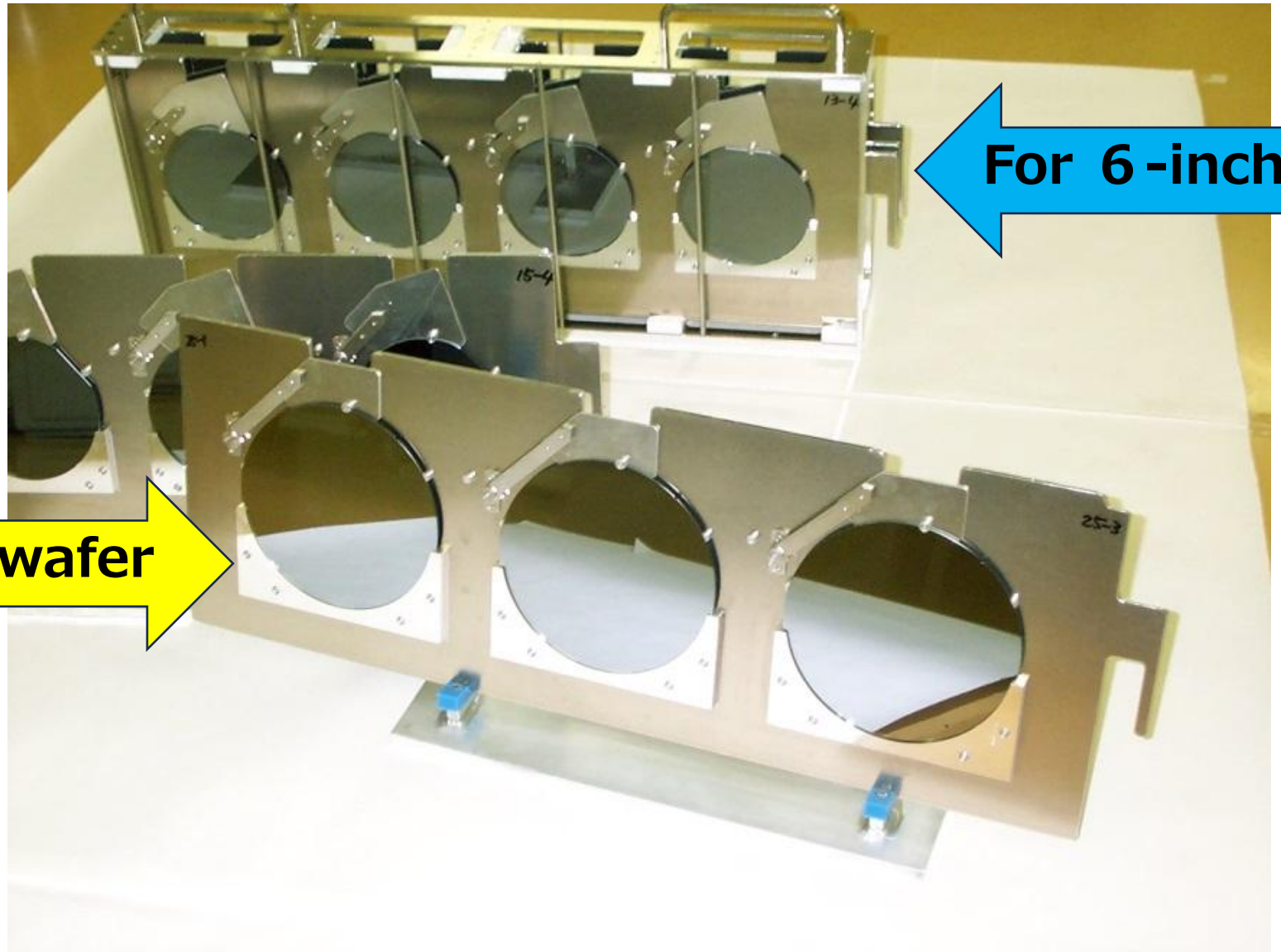

Wafer handling device (Ion beam irradiation)

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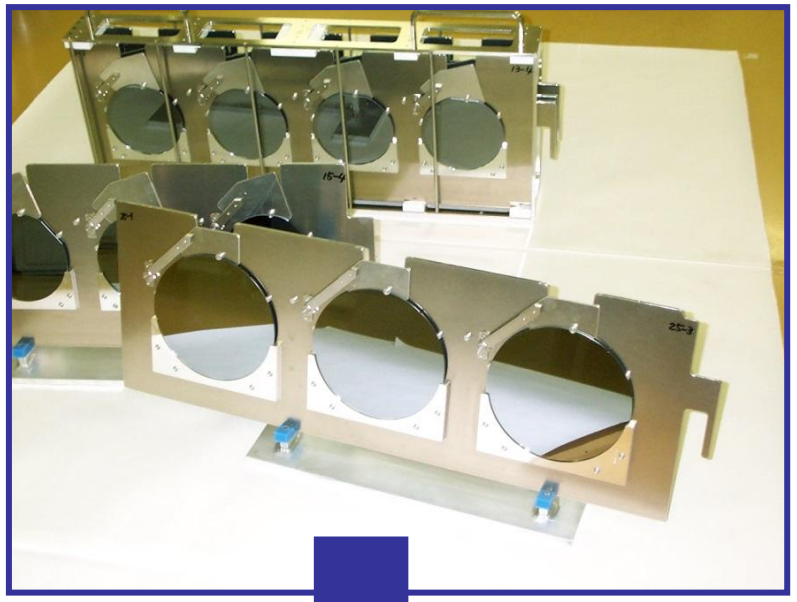
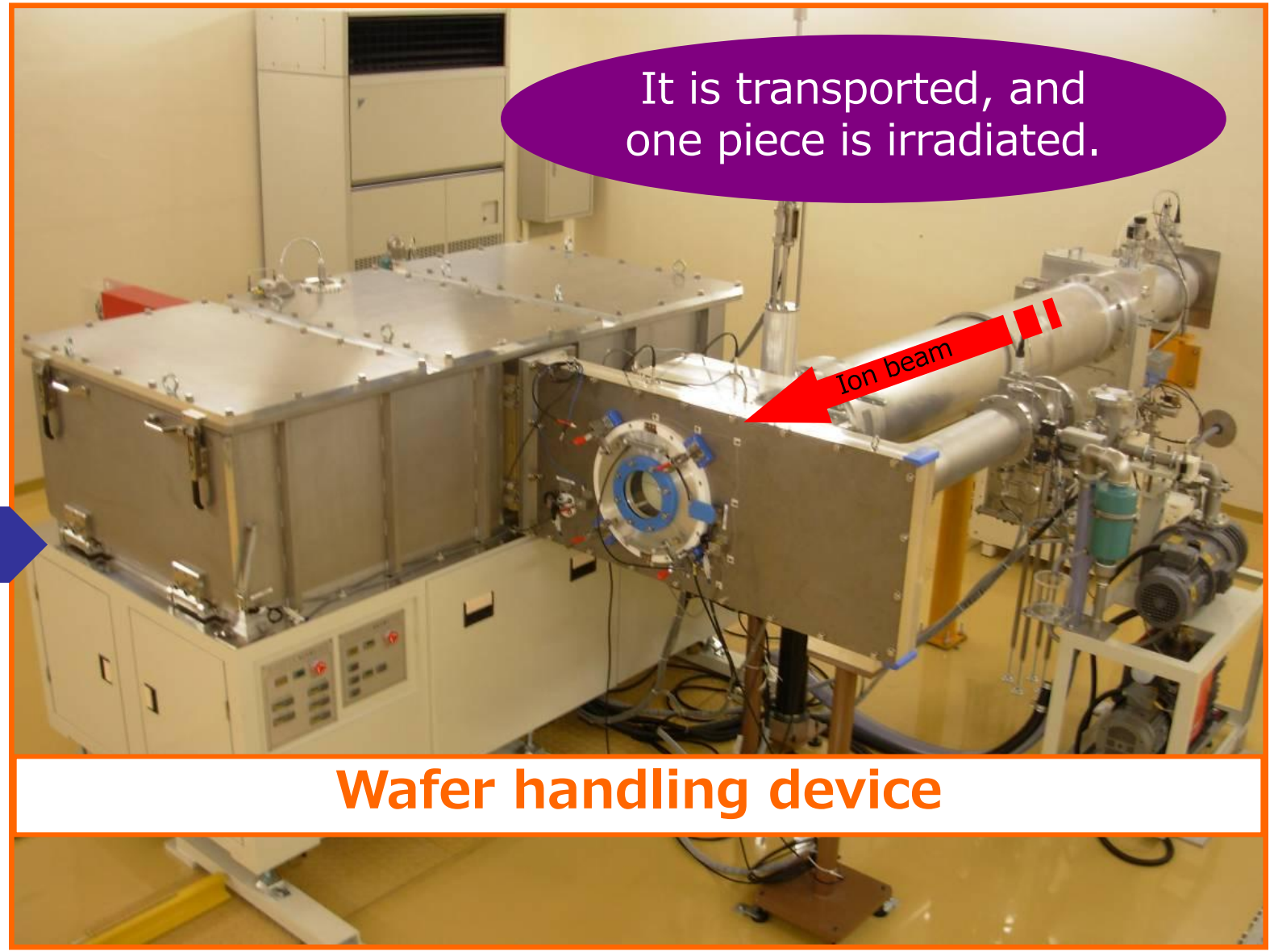


into the chamber

The wafer is an automatic operation.



Ion Beam Irradiation by Tandem

Tandem： Clean Equipment Overview

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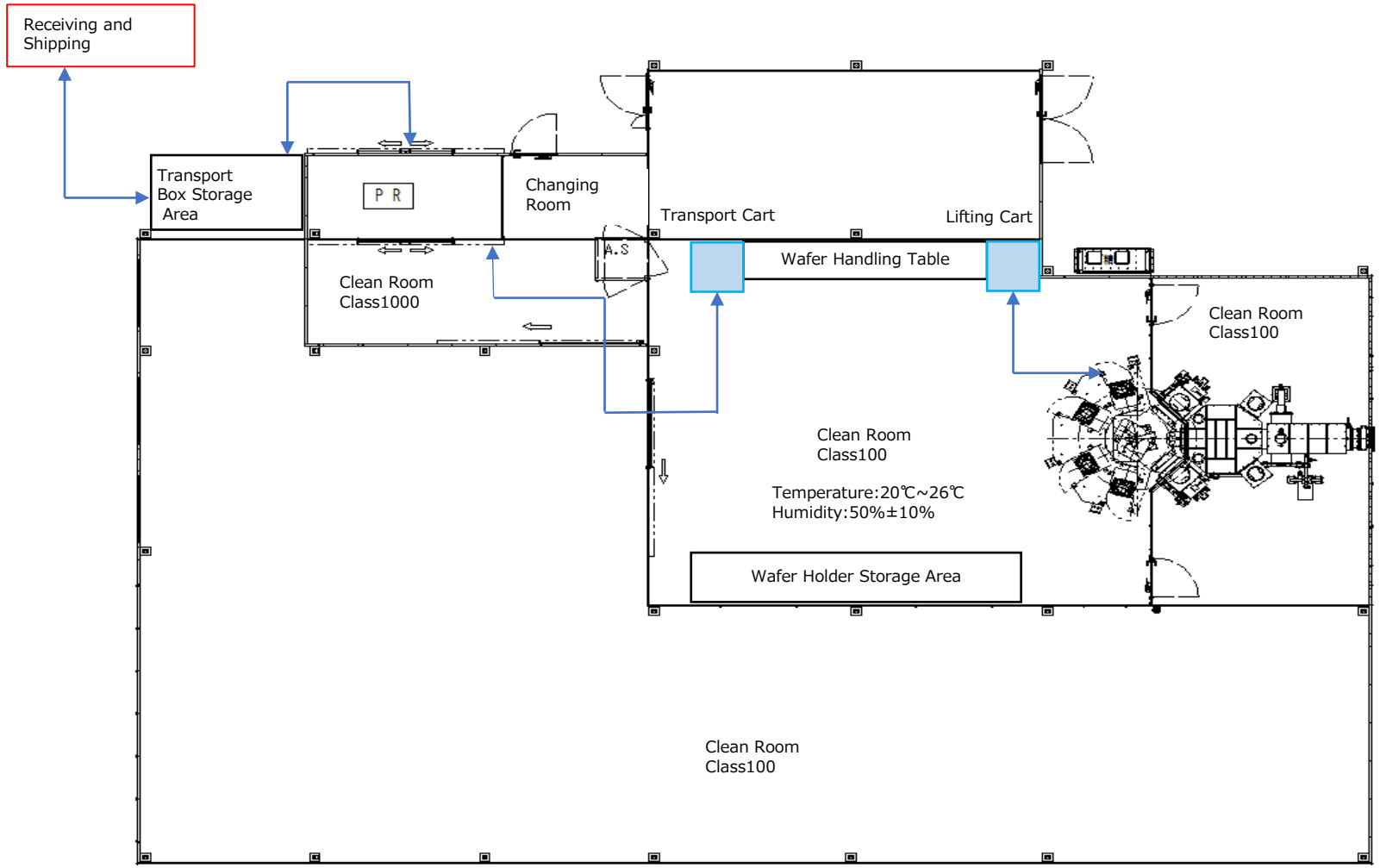
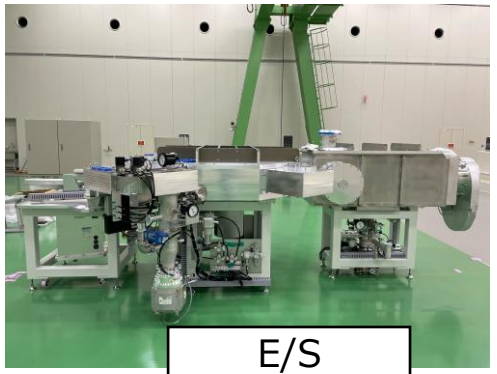
Equipment Specifications

・Work Area Cleanliness　: Class100
・Target Wafer　: 6,8,12inch




E/S


Cassette Stand


Transport Cart

Specifications of Wafer Transfer System (Okayama Center)

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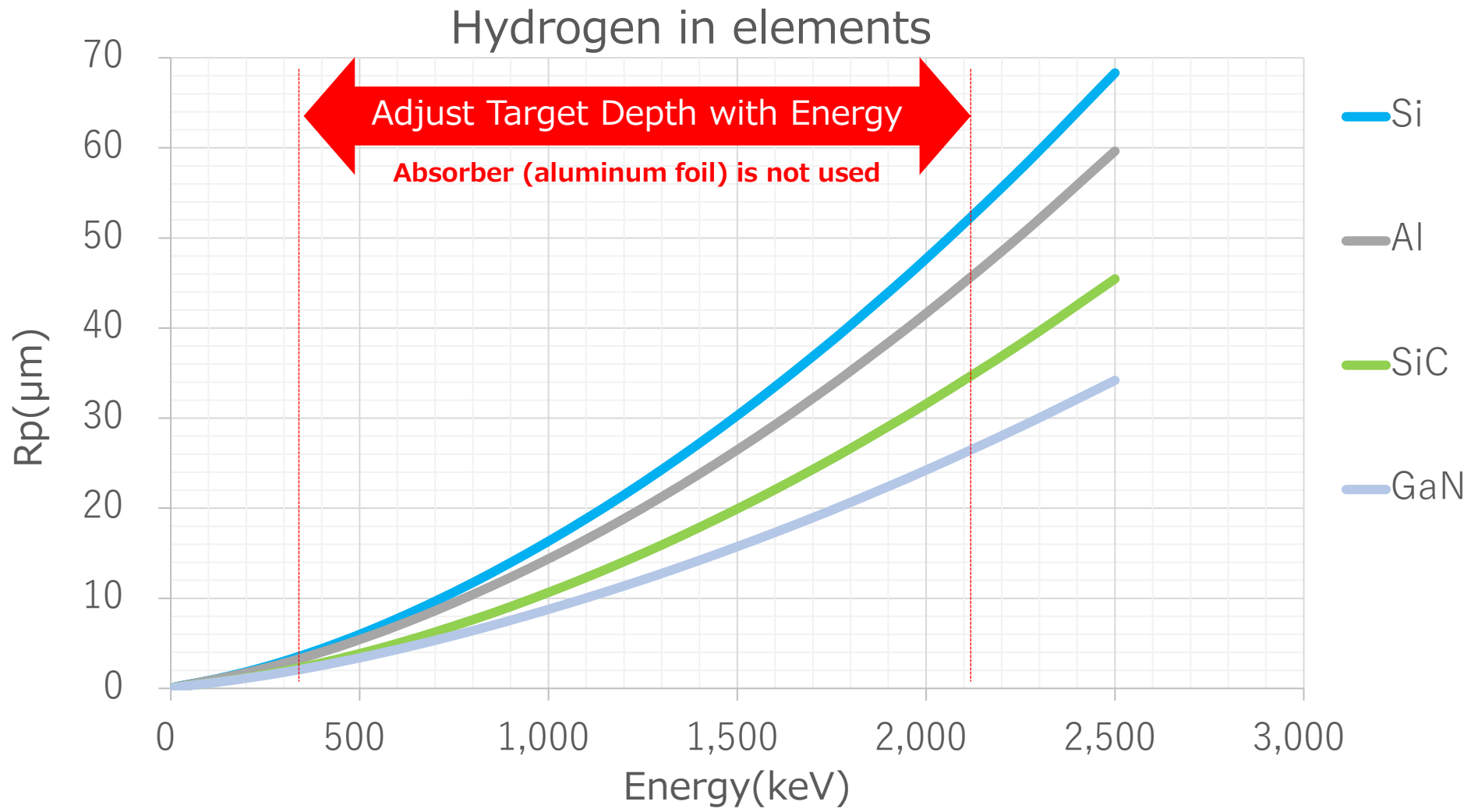
Item		Specification	
Accelerator	Accelerated Ion	Proton	Helium
	Acceleration Energy	260keV～2400keV	
Wafer Transfer System	Target Wafer	6,8,12inch	
	Irradiation Angle	0°～45°	
	Wafer Transfer	The Al plate with the mounted wafer is transferred by a robot	
	Maximum wafer capacity	60wafers	
	Effective wafer irradiation area	8-inch wafer: Φ190	

Relationship Between Target Depth and Energy (Proton)



Explanation Document for Tandem Wafer Transfer Method

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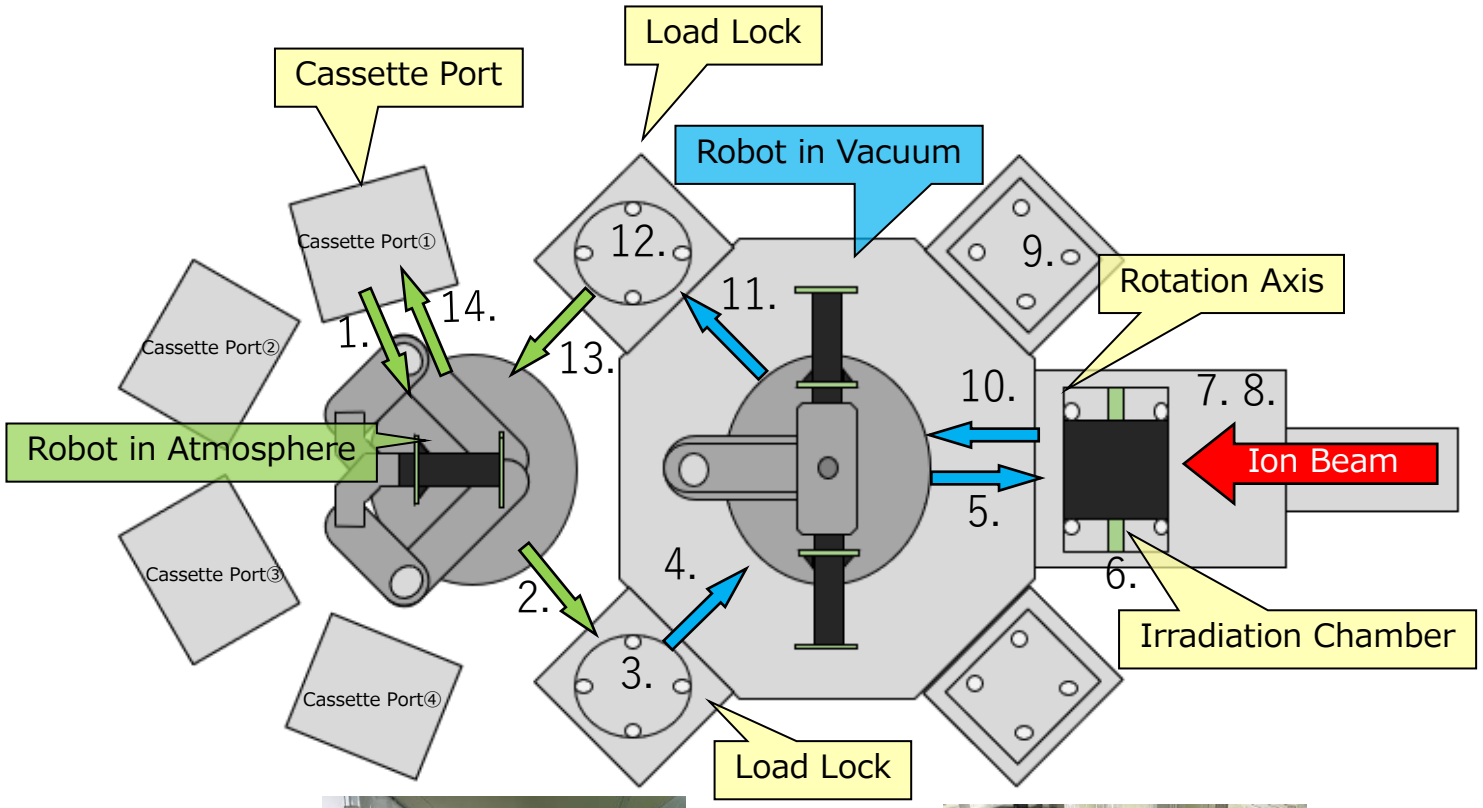
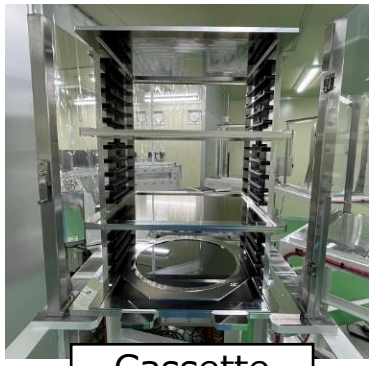
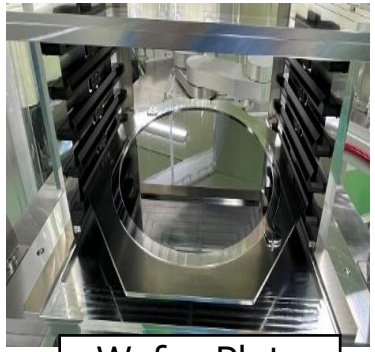




Cassette

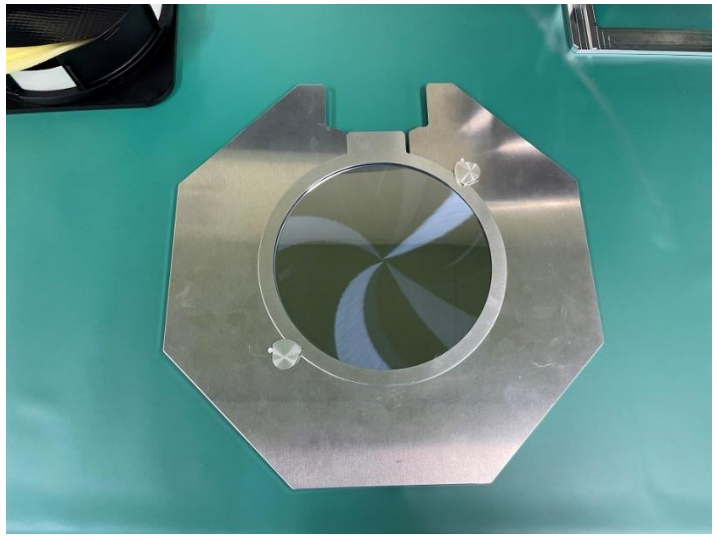


Wafer Plate

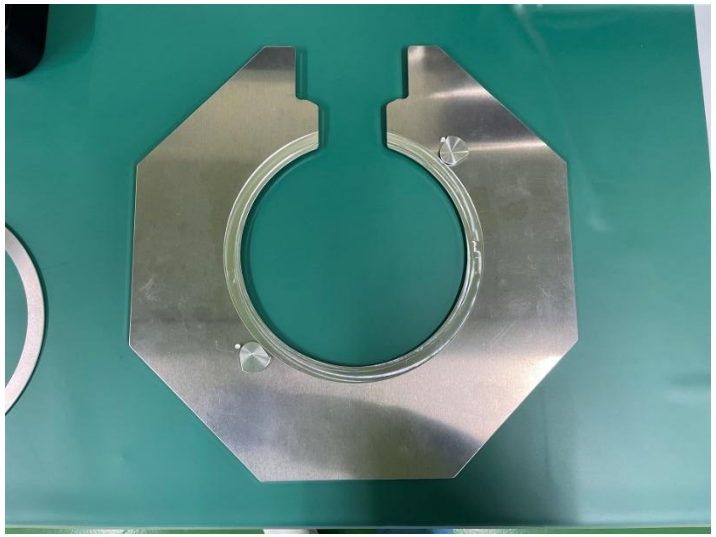
Wafer Transfer Process

1. Unload Wafer Plate from Cassette
2. Transfer into Load Lock
3. Vacuum Evacuation in Load Lock
4. Transfer Out from Load Lock
5. Transfer into Irradiation Chamber
6. Rotate Wafer to Irradiation Angle
7. Start Irradiation
8. Irradiation Complete
9. Rotate Wafer Horizontally
10. Transfer Out from Irradiation Chamber
11. Transfer into Load Lock
12. Vacuum Release in Load Lock
13. Transfer Out from Load Lock
14. Return Wafer Plate to Cassette

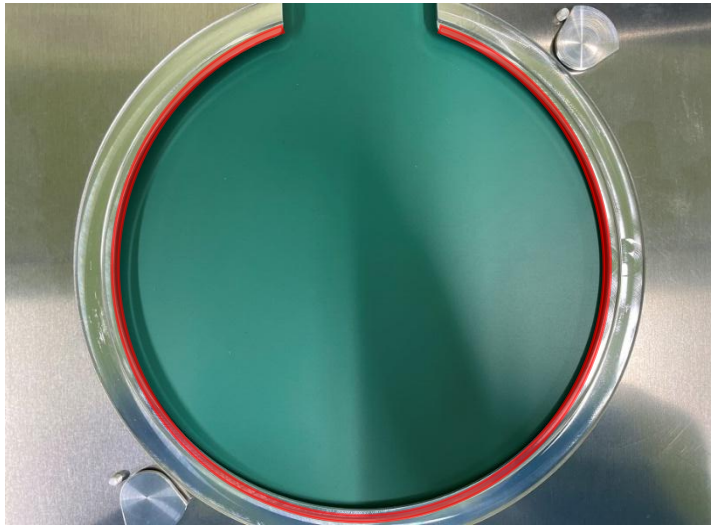
Wafer Contact Points



※Figure 1: Wafer Transfer state



※ Figure 2: Overall View of the Plate



※ Figure 3 : Wafer Contact Points

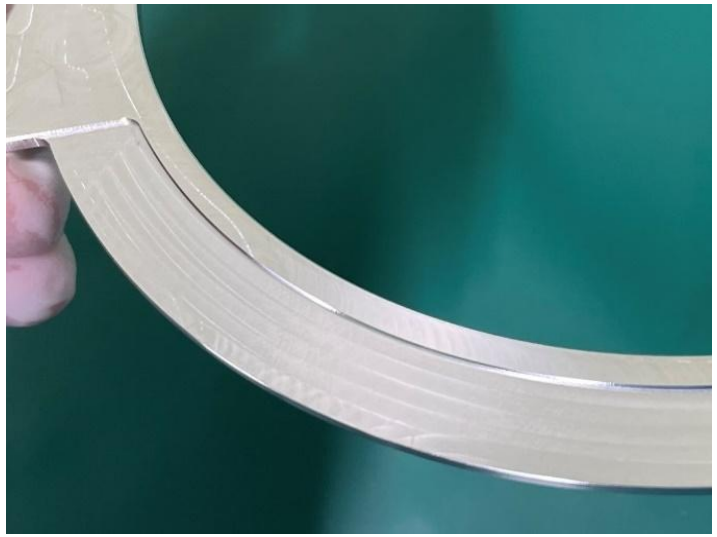
・Figure 3 ：Red Line
⇒ Wafer Contact Points on the Plate

Wafer Contact Points

※ Figure 1: Spacer Front Side

※ Figure 2 : Spacer Back Side Wafer Contact Points

・ Figure 2 : Red Line
⇒Wafer Contact Points on the Plate



※Figure 3 : Enlarged View of Wafer Contact Area

Electron Beam Irradiation by Dynamitron

Electron beam Irradiation facility

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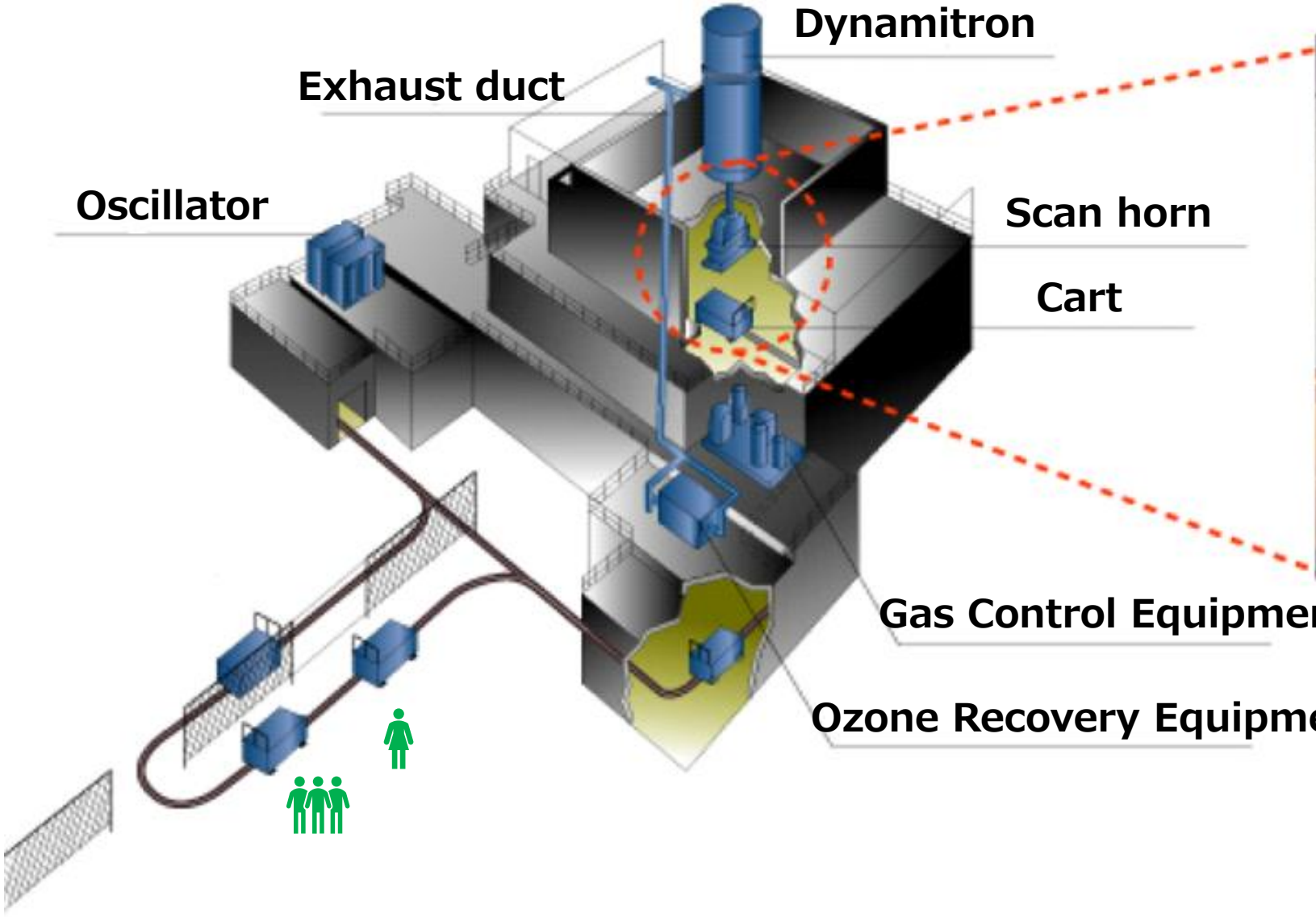
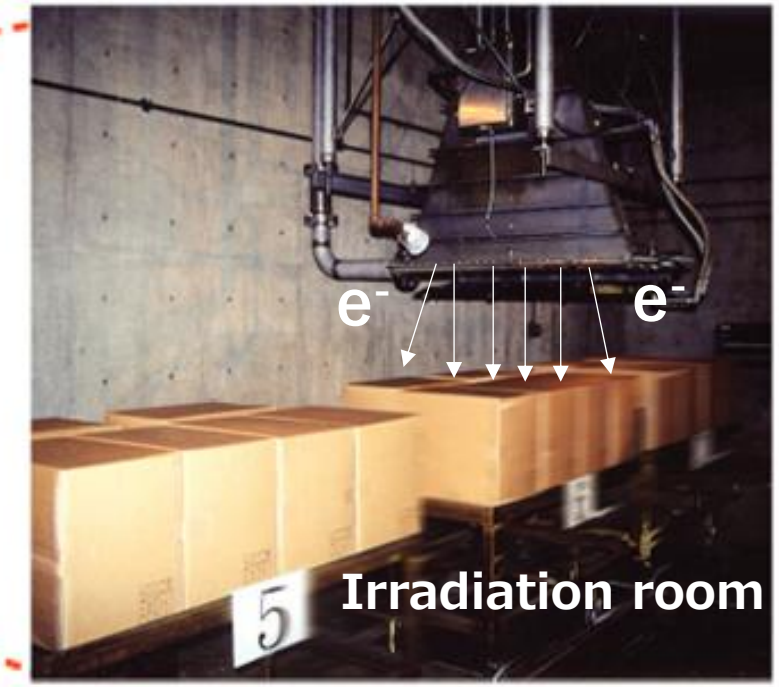
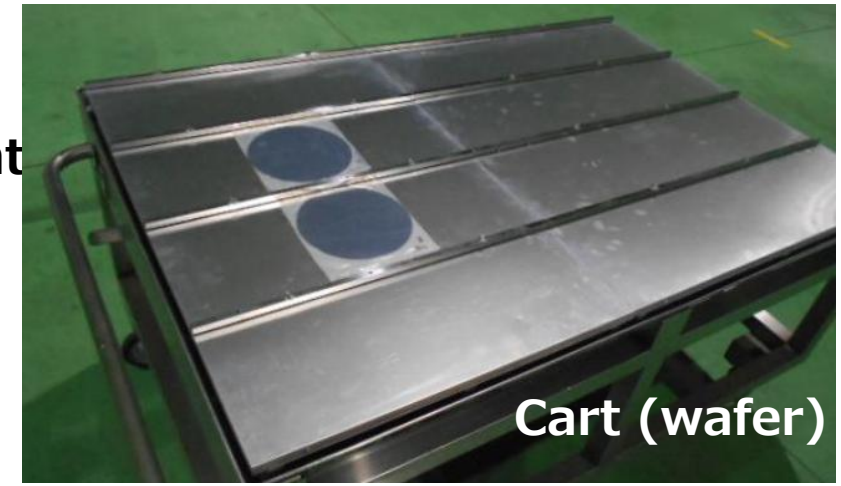
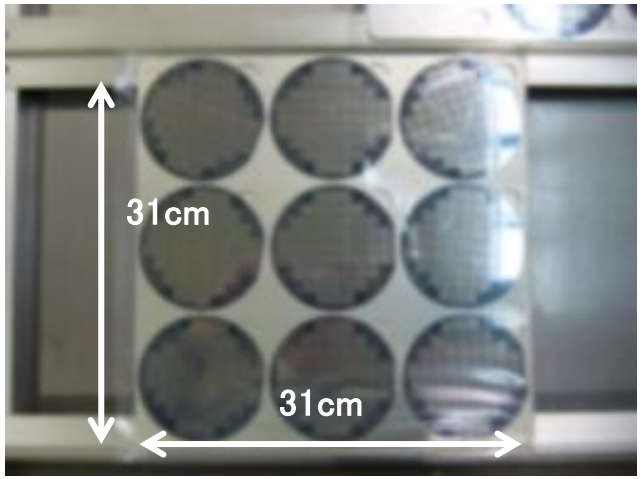


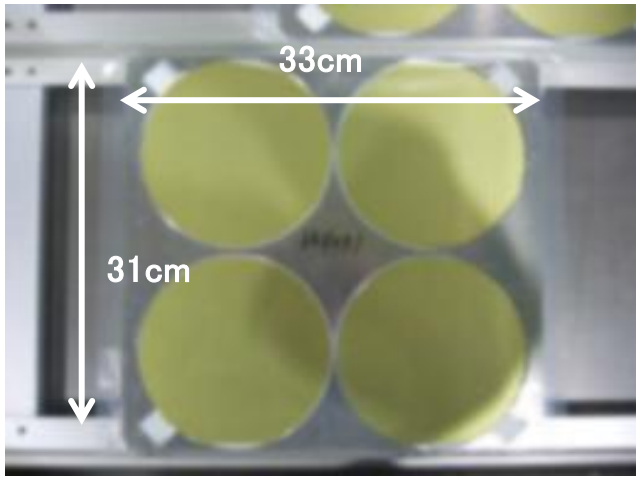




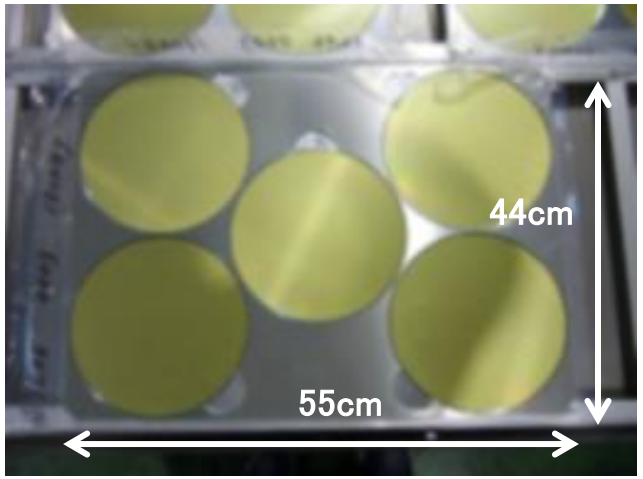
Wafer Set (Electron beam Irradiation)



4 i n c h wafer in （MAX 9sls）



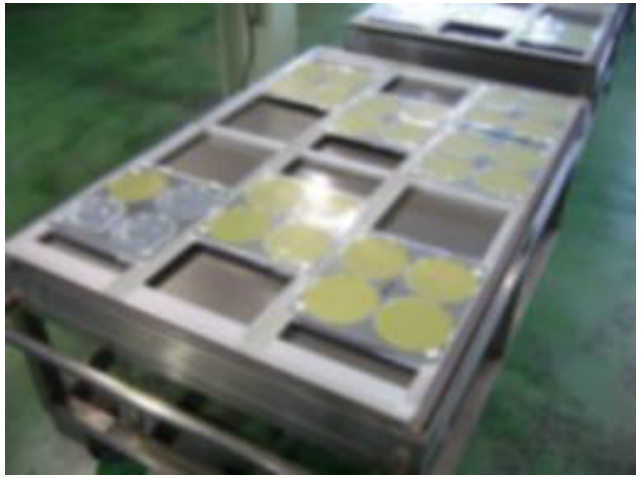
6 i n c h wafer（MAX 4sls）



8 i n c h wafer（MAX 5sls）

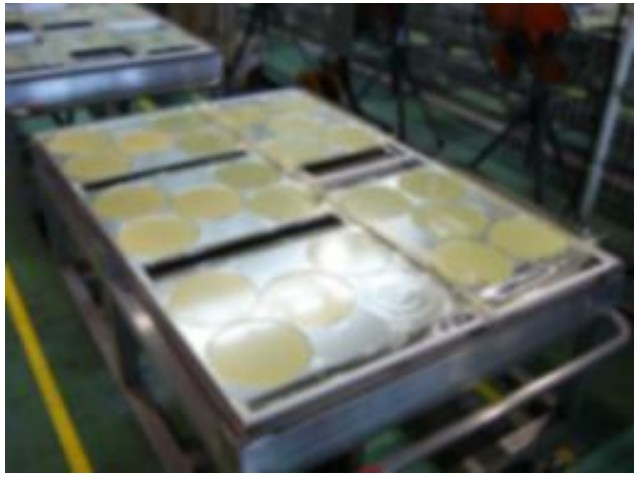
Tray Setting for 4inch wafer

(MAX 10 tray)



Tray Setting for 6inch wafer

(MAX 12 tray)



Tray Setting for 8inch wafer

(MAX 5 tray)

Outline of Ion and Electron irradiation technology for power semiconductors

Comparison of defect distribution (Thickness direction)

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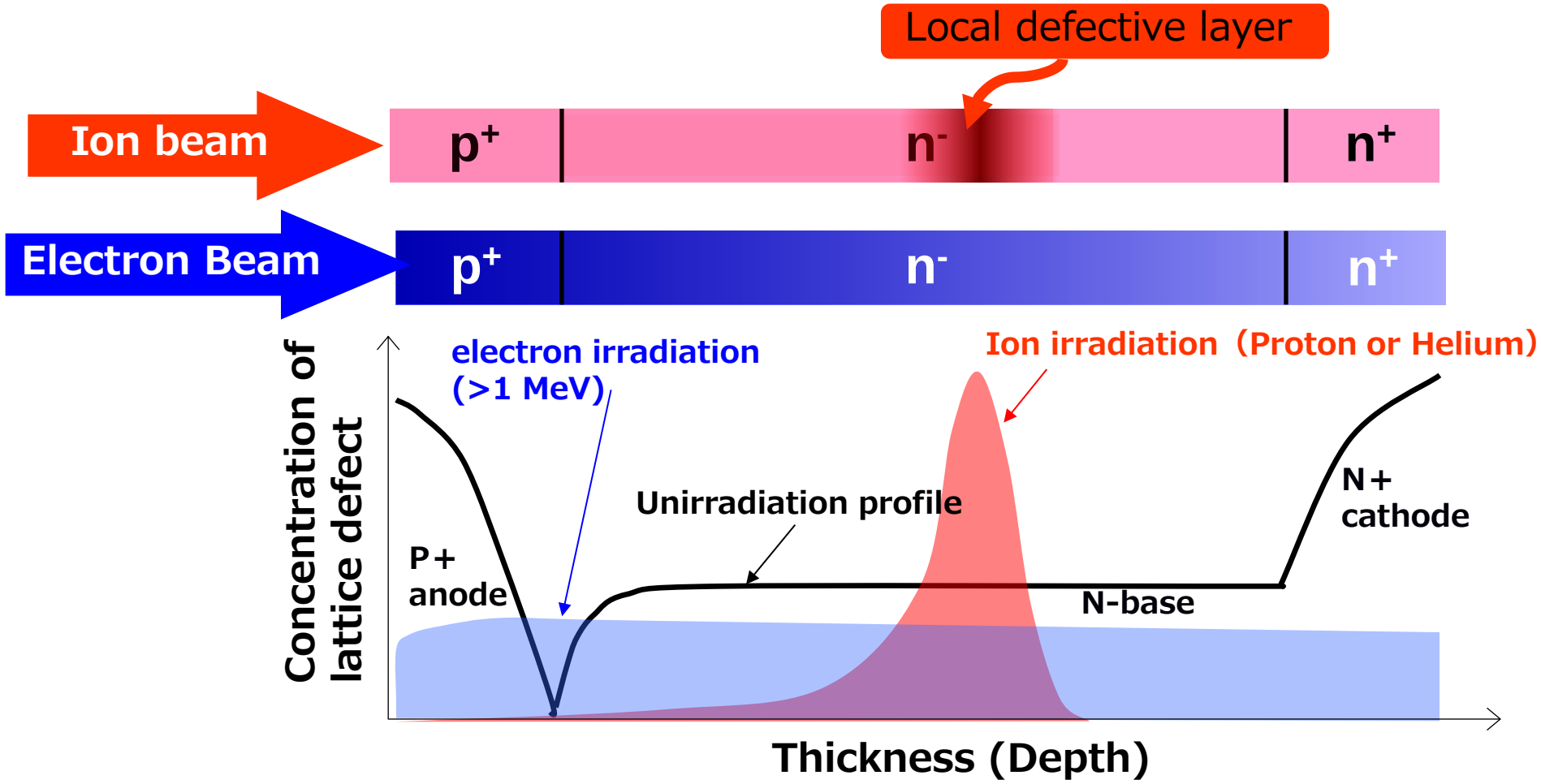
Ion or electron irradiation service produce lattice defects in silicon wafer as carrier of lifetime control. Particularly, ion beam irradiation form a local defective layer.



Plasma Treatment Service （PTS）

Manufactured by SHI-ATEX　AW800H-X18587

item	AW800H-X18587
Wafer Size	8inch
Power	2.5～ 7.5kw
Frequency	60kHz
Hot Plate Temp.	Max 400℃
Gas	H_2 , N_2
Gas Flow Rate	Max 600L/min
Transport Speed	0.4～25mm/sec

Target : Power Semiconductors,etc
Correspondence : Preproduction・Mass production
Processing power : 150wafer/8hr、13,500wafer/month（Depends on conditions）
Work Area Cleanliness ：Class 1000　（Temperature control management）

Measurement results by SRP（Carrier concentration）

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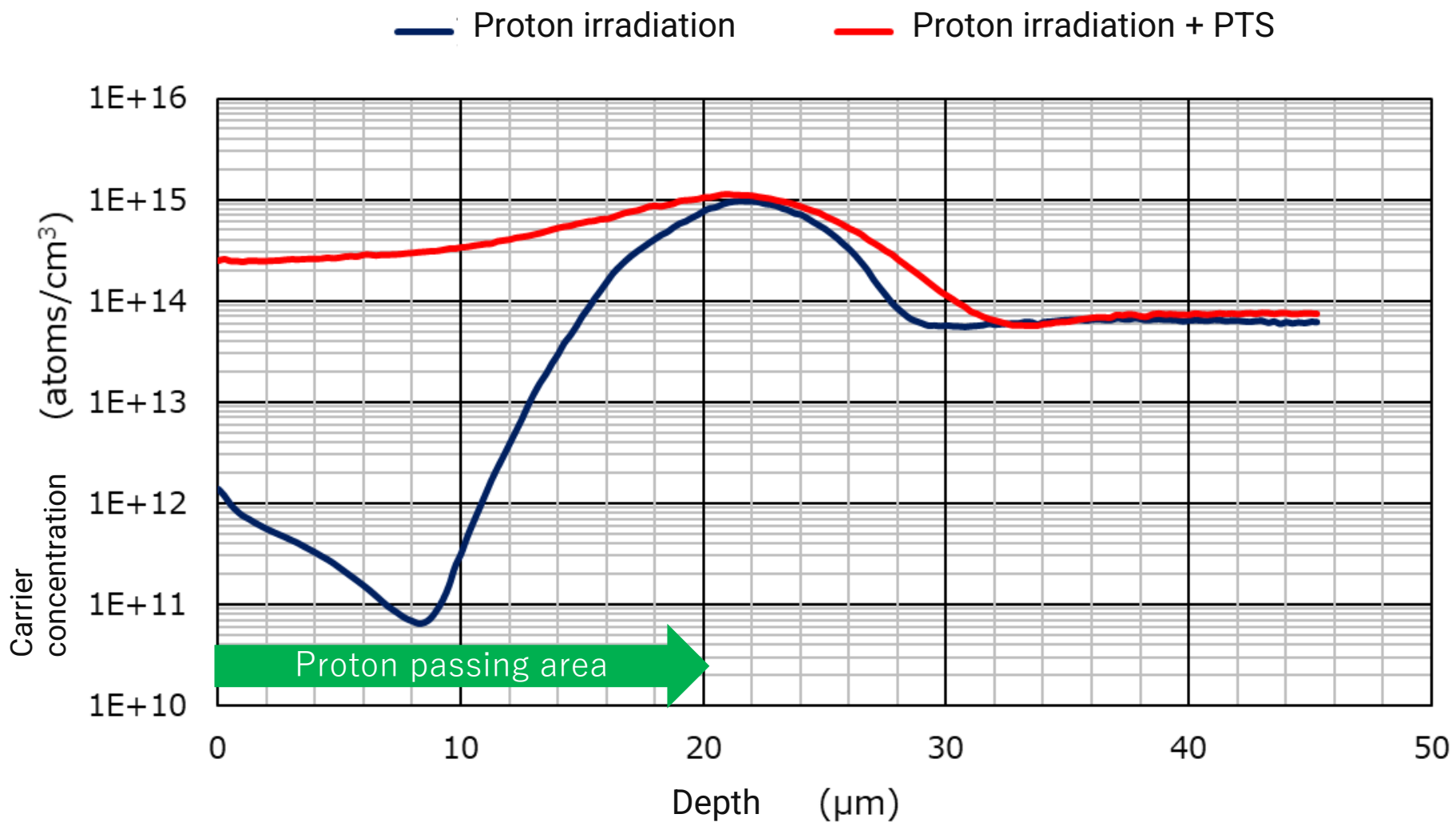
※SRP：Spreading Resistance Profiling



Laser Annealing Service（LAS）

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Made by Sumitomo Heavy Industries
SWA-90GDA

Item	SWA-90GDA
Wafer Size	6＆8inch
Laser Power	Gr : 75W×2　/ IR : 500W
Frequency	3kHz @25mJ
Annealing Time	1～30us
Delay	Gr : 0～1,000nsec
Delay Fluctuation	Gr : 20nsec or less
Beam Size (FWHM)	Gr : 0.3mm×2.5mm IR : 0.24mm×4.2mm
Process Atmosphere	Air or N2
Energy Density	Gr : max 2.0J/cm2×2 IR : max 8.0J/cm2

subject ：Power semiconductors, optical image sensors, etc.
support ： Prototype and mass production support
throughput ：100wafer/8hr、9,000wafer/month（ Depends on processing conditions ）
Work Area Cleanliness ：Class 1000（Temperature control management）