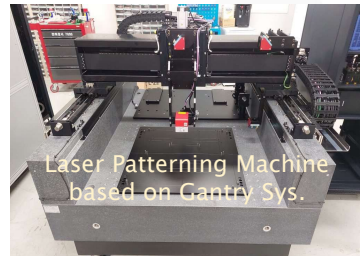


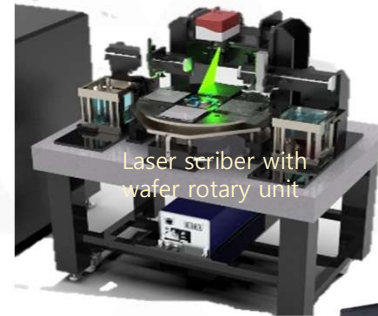
u-Lab1



u-Lab-S2



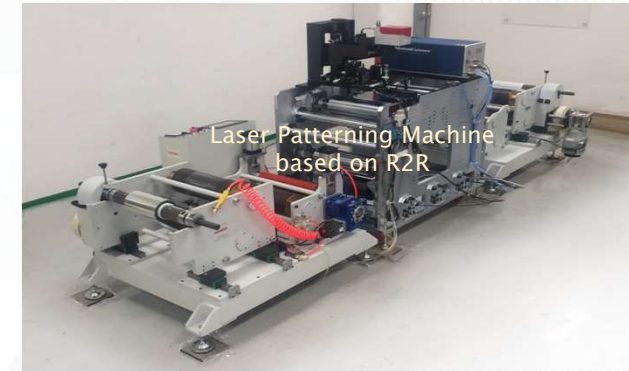
Laser Patterning Machine based on Gantry Sys.



Laser scriber with wafer rotary unit



u-Fab-D2



Laser Patterning Machine based on R2R

Established in 1999
(주)코셈사이언스
 AI Deep Learning

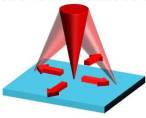
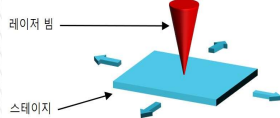
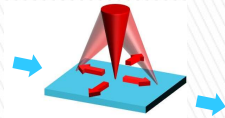
레이저 Patterning 장비 소개



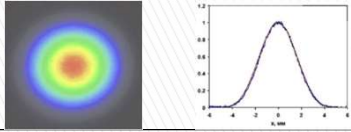
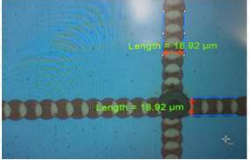
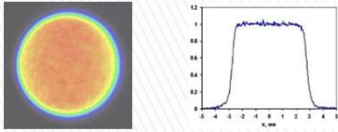

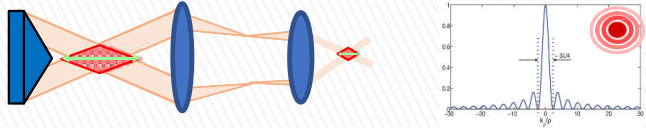
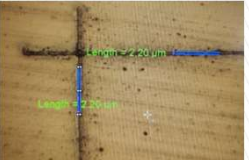
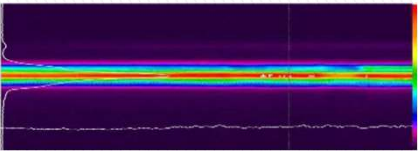
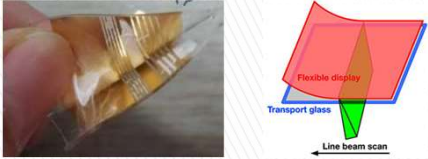

KORTherm Science. Co., Ltd

[연구소] 인천광역시 서구 로봇랜드로 155-11 로봇타워 1001호
 [본사] 인천광역시 부평구 청천동 425 우리라이온스밸리 C동 1203B호
 TEL. 032)623-6320~4 FAX. 032)623-6325 e-mail : sales1@kortherm.co.kr

※ Operation Mode

작동 방식	Dual Mode		IFOV	R2R	Remark	
	Scan Mode	Direct Writing(Fixed Optics)		MOTF		
		Objaction Lens+ Motion Stage				Scanner + Motion Stage
Model	μ-Lab, μ-Fab	μ-Fab		μ-R2R		
개념도						
Laser	355nm, 532nm	355nm, 532nm, 1064nm		355nm, 532nm, 1064nm(1 selection)		
특징	레이저 빔 이동(거울이용) 가공물(stage) 고정	레이저 고정 가공물(stage) 이동		레이저 빔 이동 가공물(stage) 한축(x축) 이동		
Travel range	≤ 200mm X 200 mm (小)	≤ 300x500mm (中)		Web width (200~300mm)		
가공속도	5~7m/s 까지 가능	1~ 1.5 m/s 이하		3M / min		
곡선	○	△		△		
직선	○	○		○		
동영상	www.kortherm.com					
Applications	Glass / Polymer / Wafer / Thin metal/ Film / Silicon wafer DISPLAY (FPD, AMLCD) / Solar Cell (Perovskite, OPV, CIGS등) / Bio sensor					
Option	<ul style="list-style-type: none"> - Beam Profile(Tophap, Bessel Beam) - IFOV 					

Beam profile

<p>Gaussian Beam</p>	<ul style="list-style-type: none"> • Typical shape of Laser Beam • Energy is concentrated in center 	 <p>Gaussian Beam Shape and Energy distribution</p>	 <p>Wavelength : 532nm</p>
<p>Tophat (Flat top Laser Beam)</p>	<ul style="list-style-type: none"> • Modulated Beam of Gaussian • It have constant energy density • It make uniform Laser Processing result • Power is lower than Gaussian 	 <p>Top-Hat Beam Shape and Energy distribution</p>	
<p>Bessel Beam</p>	<ul style="list-style-type: none"> • Beam have long focus position • It use process of Transparent material like glass, sapphire, quartz. 	 <p>Bessel Beam Diameter $2-3\mu\text{m}$ by Axicon Lens</p> <p>Energy distribution of Bessel Beam</p>	 <p>Wavelength : 1064nm</p>
<p>Line Beam</p>	<ul style="list-style-type: none"> • Modulated Beam of Gaussian to narrow line • It use lower power, make same power density in a thin line by lower cost. 		 <p>Flexible display</p> <p>Transport glass</p> <p>Line beam scan</p>
<p>Maskless Beam by SLM</p>	<ul style="list-style-type: none"> • Light transmitted by SLM can be reshaped to desired shape • It make single laser beam to split multi beam 		



01

μ -Lab1 / μ -Lab-S2

02

μ -Fab-D2

03

μ -Fab-I

04

μ -Gan

05

μ -WTU

06

μ -R2R

07

μ -Slot Die

08

주요 기능 소개

09

고객 리스트

10

ZEUS(장비 활용 종합 포털)

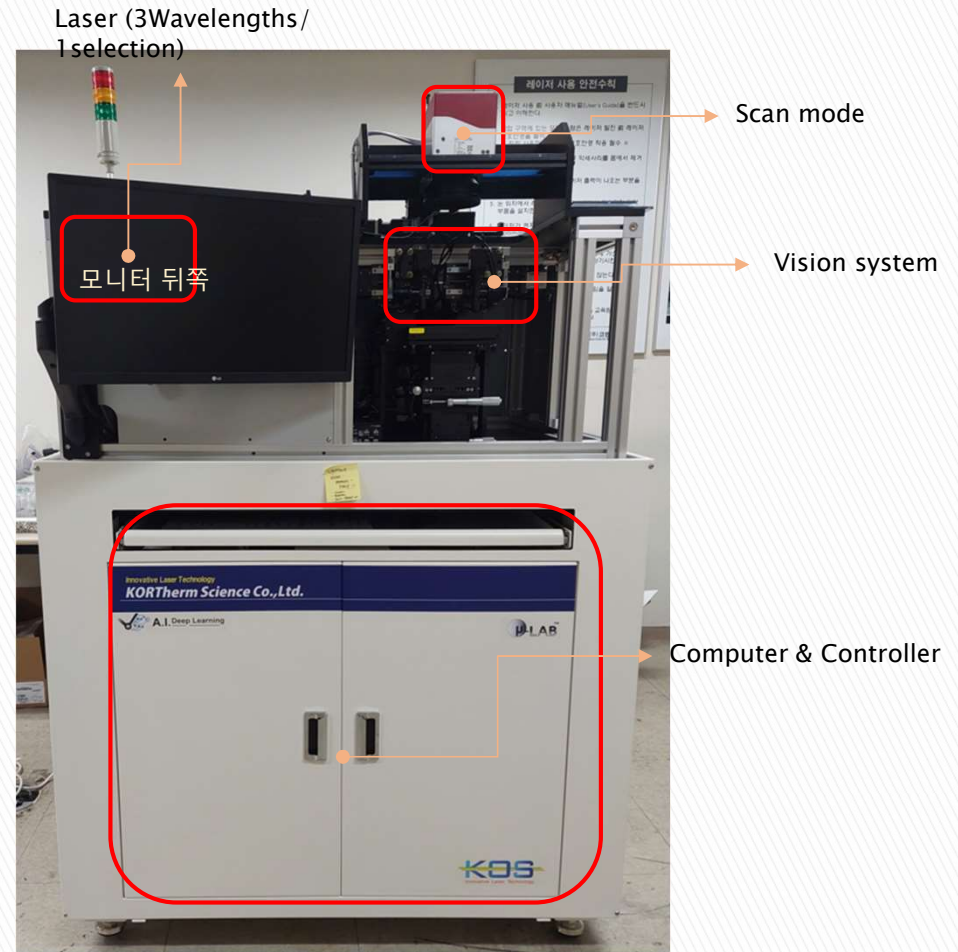
1. μ -Lab1

❖ Specification

Laser pulse width	NANO / PICO / FEMTO
Wavelength	355nm(UV)/ 532nm(Green)/ 1064nm(IR) : 1 Wavelength
Operating mode	Scan mode
Traveling range	200mm x 200mm
Dimension (W/D/H)	1,600mm x 1,200mm x 1900mm
Accuracy	$\leq \pm 0.5\mu\text{m}$
Reliability	$\leq \pm 0.5\mu\text{m}$
Working type	Patterning / Scribing / Cutting / Drilling
Application	Glass / Polymer / Wafer / Thin metal/ Film / Silicon wafer
	DISPLAY (FPD, AMLCD) / Solar Cell (Perovskite, OPV, CIGS 등)
	Bio sensor

* 핵심 기술 :

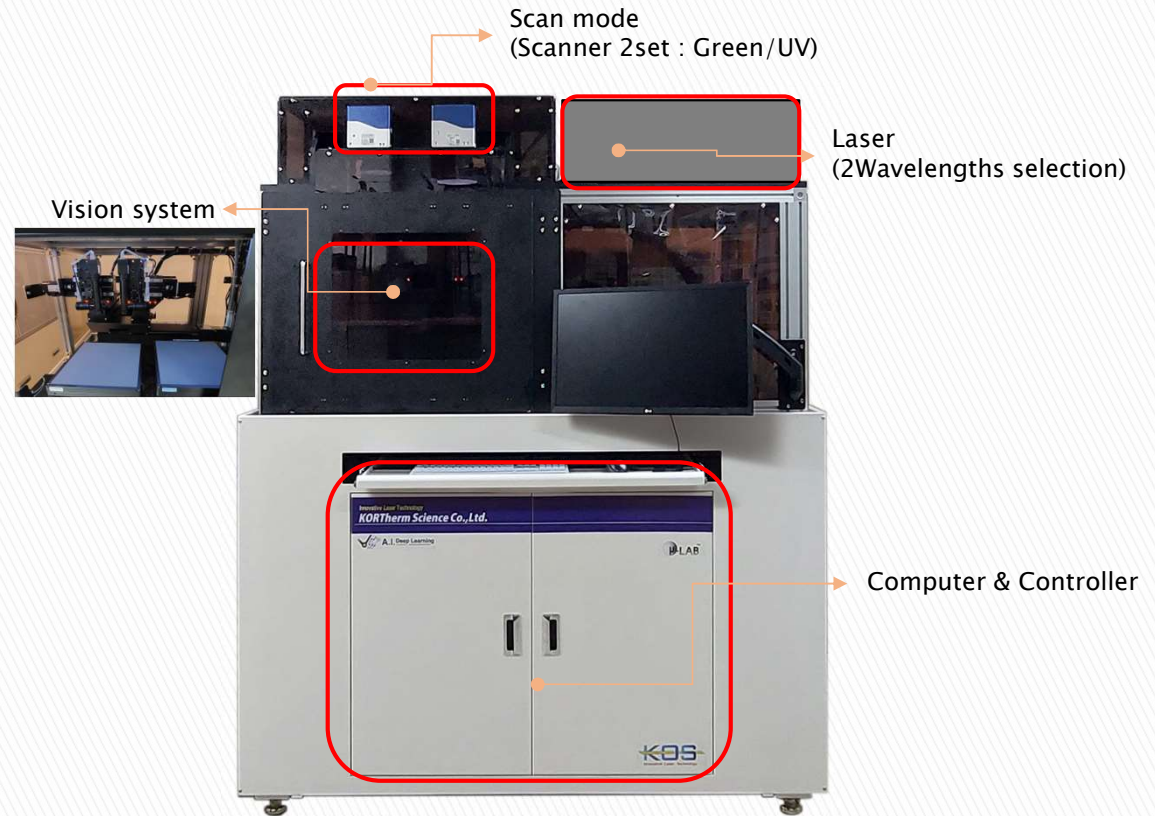
- 1) Vision Alignment 를 통한 패턴 인식 및 정렬
- 2) Multi 기능이 가능한 강력한 소프트웨어 구성
 - Measure Function
 - Laser Spot Overlap & Fluence Calculation
 - Control Laser Parameter
 - A.I adoption



1. μ -Lab-S2

❖ Specification

Laser pulse width	NANO / PICO / FEMTO
Wavelength	355nm(UV)/ 532nm(Green)/ 1064nm(IR) : 2 Wavelengths
Operating mode	Scan mode (Scanner 2set : Green / UV)
Traveling range	200mm x 200mm
Dimension (W/D/H)	1,600mm x 1,200mm x 1900mm
Accuracy	$\leq \pm 0.5\mu\text{m}$
Reliability	$\leq \pm 0.5\mu\text{m}$
Working type	Patterning / Scribing / Cutting / Drilling
Application	Glass / Polymer / Wafer / Thin metal/ Film / Silicon wafer DISPLAY (FPD, AMLCD) / Solar Cell (Perovskite, OPV, CIGS 등)



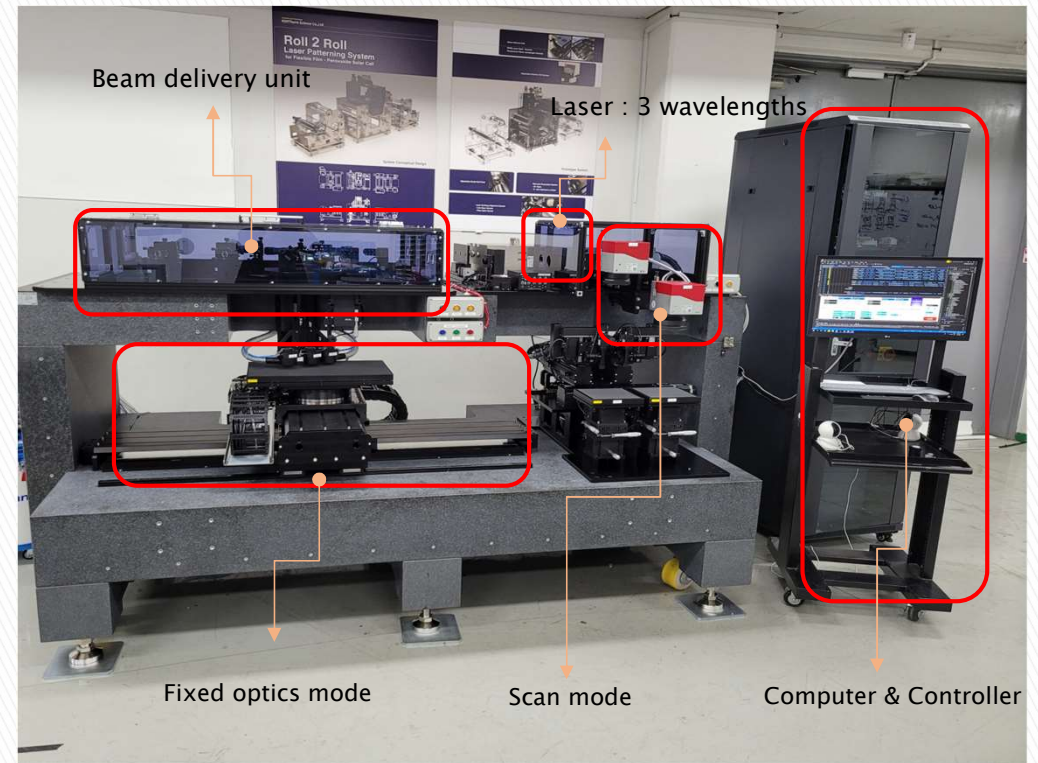
2. μ -Fab-D2 (Dual Mode : Fixed Optics / Scan)

❖ 주요 구성품

Laser	355nm(UV)/ 532nm(Green)/ 1064nm(IR) : 3 Wavelengths
Fixed optic mode	355nm, 532m, 1064 nm 사용 가능
Scan mode	2 set (355nm, 532nm 사용 가능)
Option	Bessel beam, Tophap beam

❖ 주요 spec.

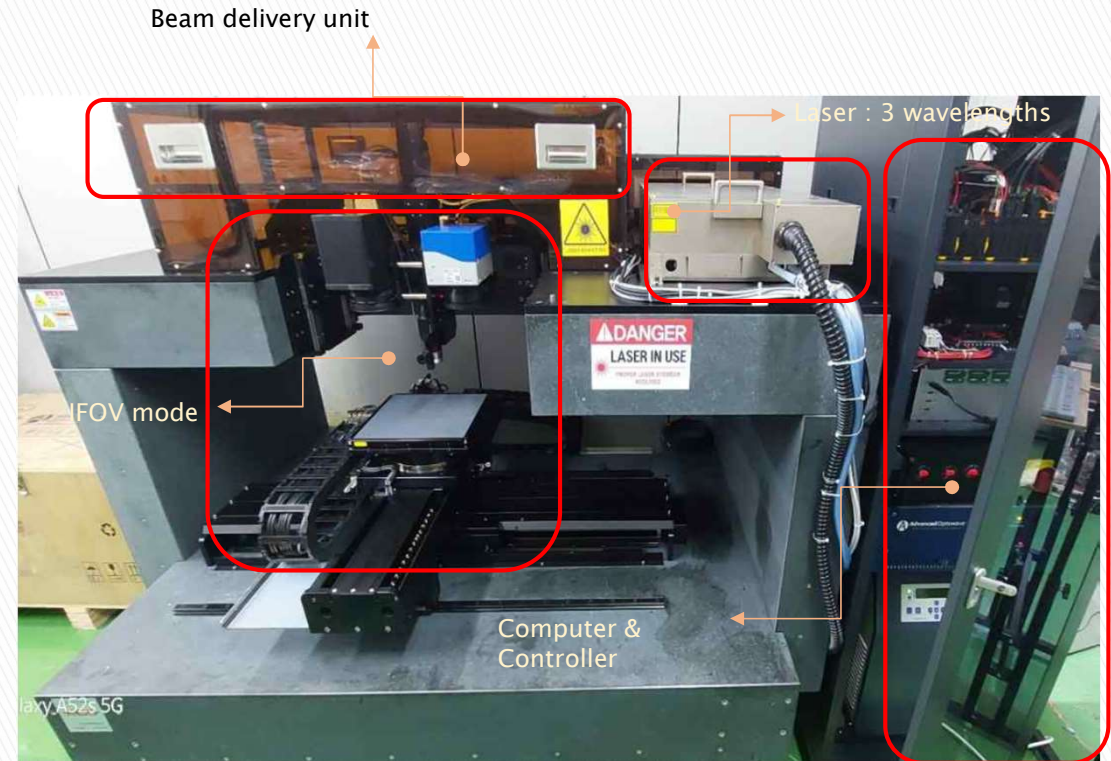
Laser	40W(1064nm)/ 20W(532nm)/ 10W (355nm) Repetition rate : 0.2 ~ 1MHz
spot size	$\leq 25\mu\text{m}$ (1064nm), $15\mu\text{m}$ (532nm), $12\mu\text{m}$ (355nm)
Substrate size	Motion stage : $\leq 500\text{X}300\text{mm}$ Scanner : $\leq 180\text{X}180\text{mm}$
Speed	Fixed optics mode : $\leq 1.5 \text{ m/s}$ Scan mode : $\leq 7 \text{ m/s}$
Accuracy	$\leq \pm 0.5\mu\text{m}$
Reliability	$\leq \pm 0.5\mu\text{m}$
Dimension(W/D/H)	2700X1500X2100mm



3. μ -Fab-I [IFOV (Synchronization)]

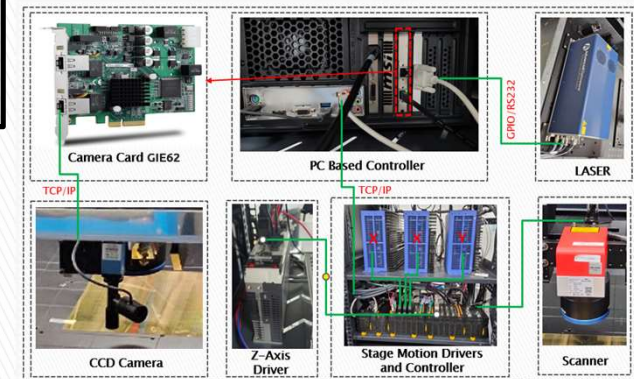
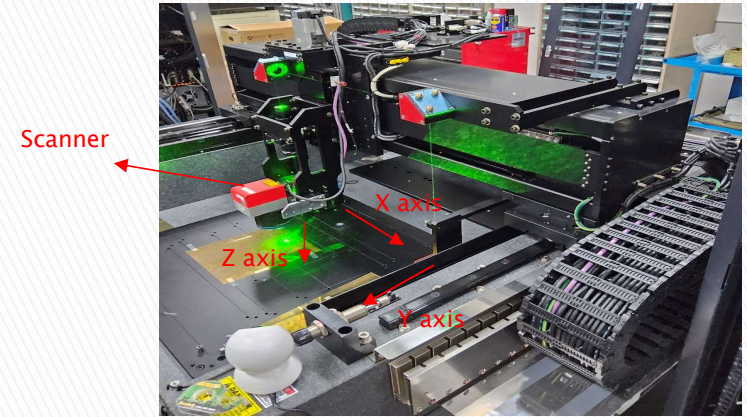
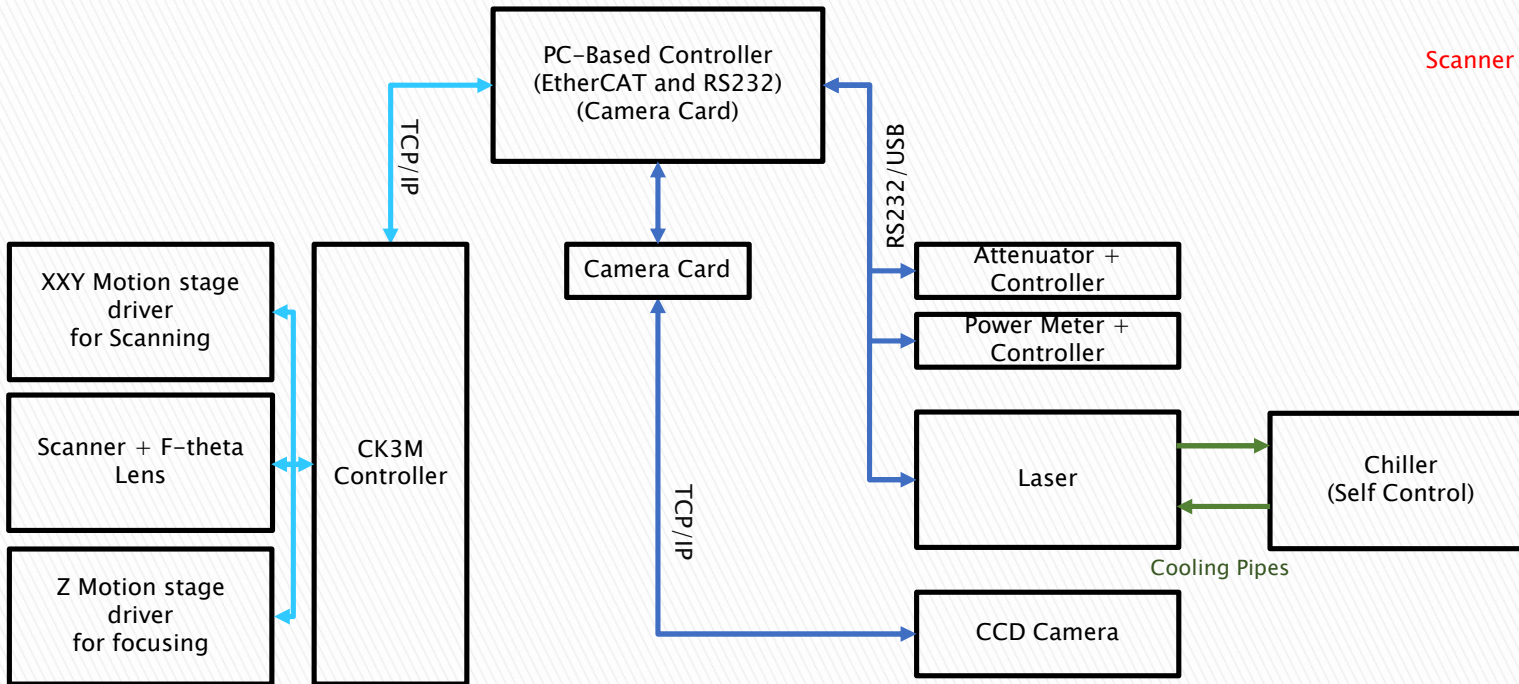
❖ 주요 spec.

Laser pulse width	Nano / Pico / Femto
Wavelength	355nm(UV)/532nm(Green)/1064nm(IR) / 2 Wavelengths
Operating mode	Dual mode (Fixed Optics / Scan) IFOV (Synchronization : Scan + Fixed Optics)
Traveling range	Max 600mm x 600mm
Working type	Patterning / Scribing / Cutting / Drilling
Application	Glass / Polymer / Wafer / Thin metal/ Film / Silicon wafer DISPLAY (FPD, AMLCD) / Solar Cell (Perovskite, OPV, CIGS 등)



※ IFOV : Infinite Field Of View

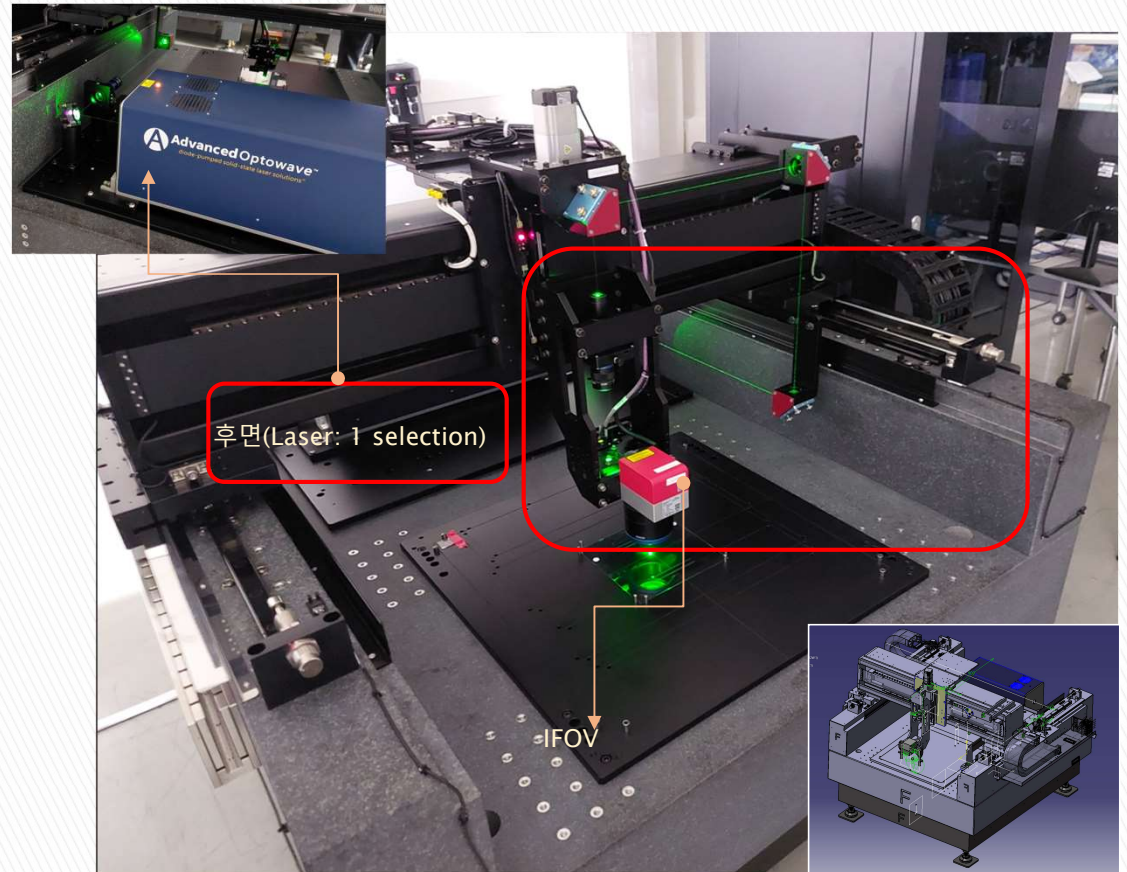
3. μ -Fab-I [IFOV (Synchronization)]



4. μ -Gan (Laser Patterning Machine based on Gantry System)

❖ 주요 spec.

Laser pulse width	Nano / Pico / Femto
Wavelength	355nm(UV)/532nm(Green)/1064nm(IR) / 1 Wavelength
Operating mode	Fixed Optics mode / IFOV
Traveling range	1cm X 1cm ~ 1m X 1m
Working type	Patterning / Scribing / Cutting / Drilling
Application	Glass, Polymer / Wafer / Thin metal / DISPLAY (FPD, AMLCD) / Solar Cell (Perovskite, CIGS 등)



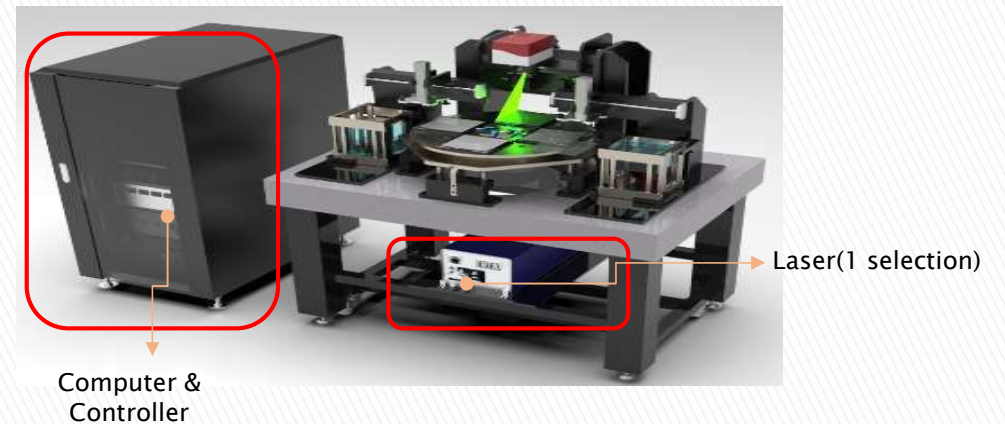
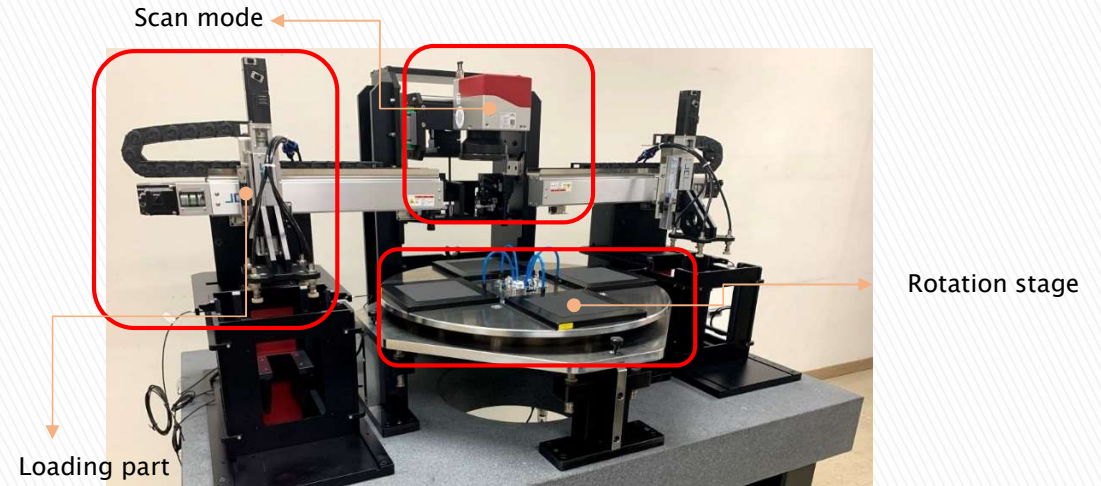
5. μ -WTU (Laser Scriber with Wafer Rotary Unit)

❖ 주요 구성품

Wavelength	355nm(UV)/532nm(Green)/1064nm (IR) / 선택 가능
Scanner	180mm X 180mm
Rotation stage	Wafer 4개 장착
Loading/unloading Part	Cassette (공정 ~이송)

❖ 주요 spec.

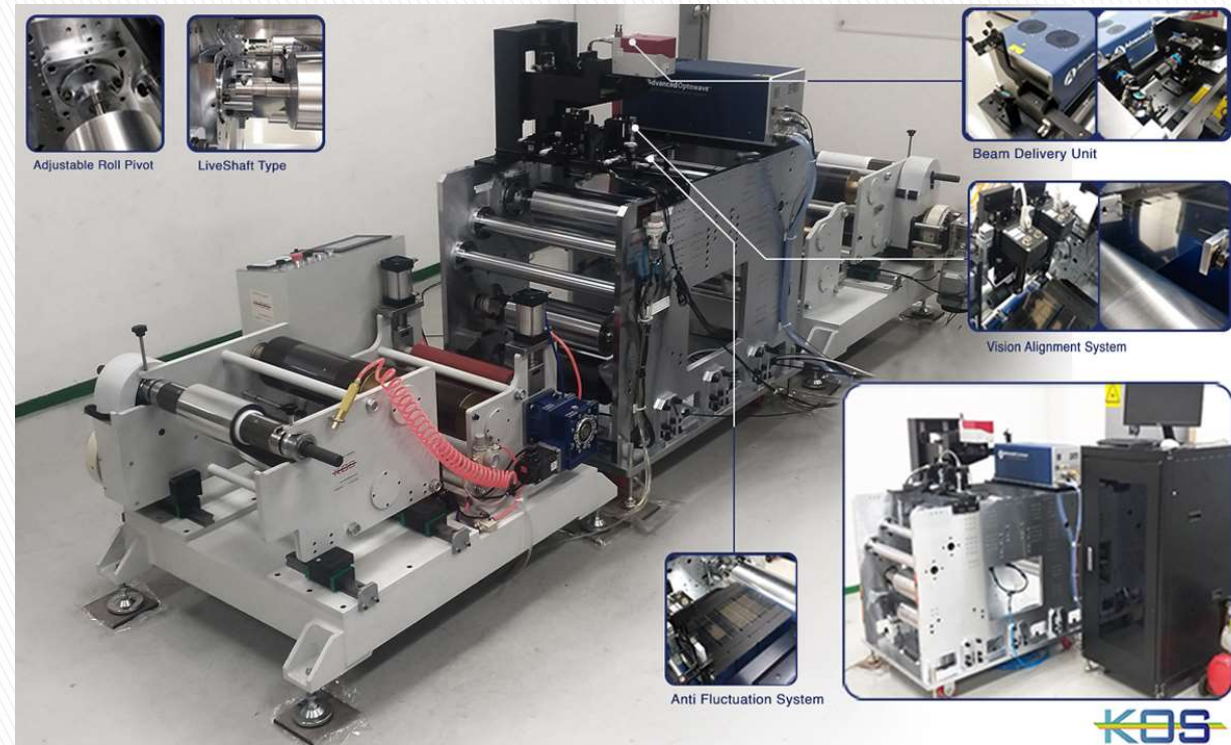
Laser	10W (532nm) Repetition rate : 0.2 ~ 1MHz
Substrate size	≤ 200X200mm(변경 가능)
Substrate thickness	0.05 ~ 3t (mm)
Speed	7 m/s
선폭	≤ 15 μ m
Accuracy	≤ ±0.5 μ m
Dimension(W/D/H)	3000 X 1500 X 1700 mm
Throughput	-



6. μ -R2R (Laser Patterning Machine based on Roll to Roll)

❖ 주요 spec.

Laser pulse width	Nano / Pico / Femto
Wavelength	355nm(UV) / 532nm(Green) / 1064nm(IR) / Single only
Operating mode	MOTF
Traveling range	200mm / 공정속도 Minimum 3M / min
선폭정밀도	2 μ m 이하
위치정밀도	$\leq \pm 50\mu$ m at 3M/Min
Application	Pevrovskite Composite / Film 등 유연 소재 Printed Electronics(인쇄 전자)
Dimension(W/D/H)	4500 X 2000 X 2000 mm



※ MOTF : Marking On the Fly

7. μ -Slot Die (Slot die Coating system)

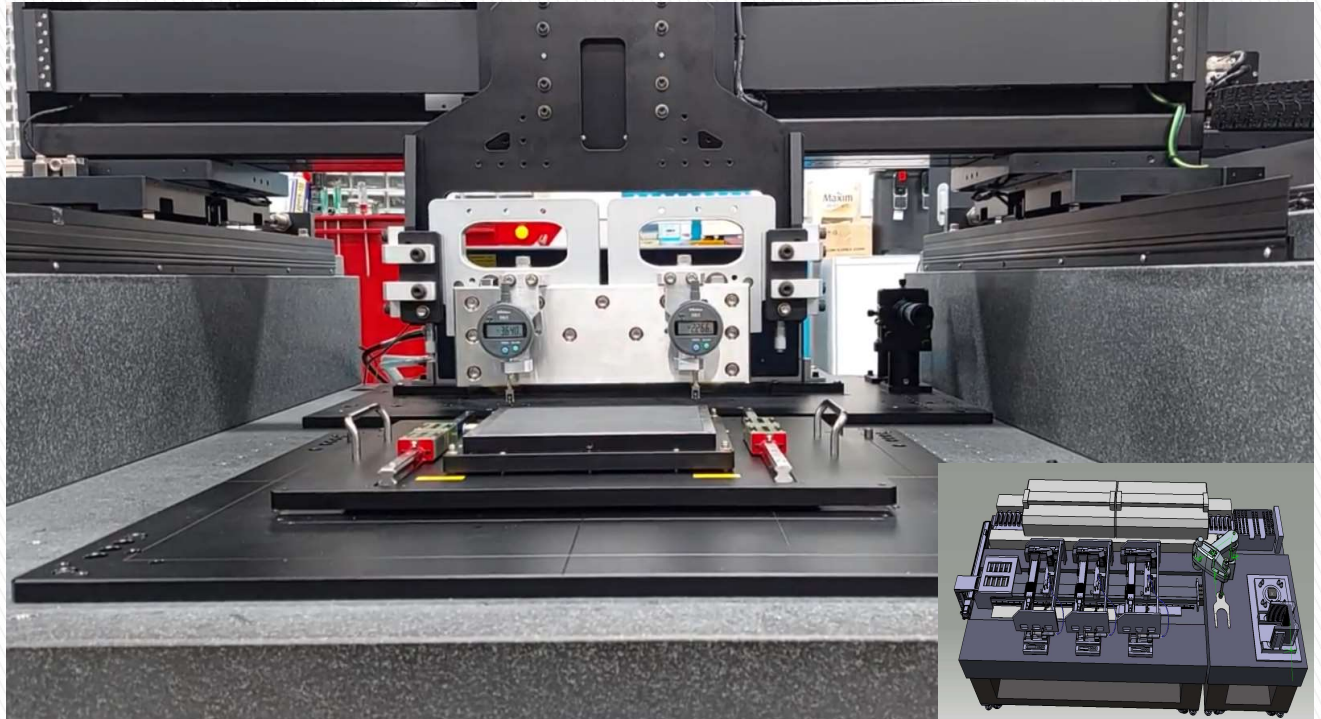
❖ 주요 구성품

Slot die coater	3 set (lip cleaner 3set 포함)
Syringe pump	3 set (사용량에 따라 변경 가능)
Semi dry zone	Air knife dryer
IR dryer	Convey 기능 포함
Automation system	Wafer Cartridge 10 sheet Loading / unloading Robot Transfer stage (Coating -> Dryer)

❖ 주요 spec.

Substrate size	200X200mm Glass(0.7~ 3mm)
Coating area	~ 160x160mm
Coating Speed	1~ 200mm/s
IR zone	2mm ($\leq 150^{\circ}\text{C}$)
Outline Dimension	3,500 X 1,750 X 1600 mm

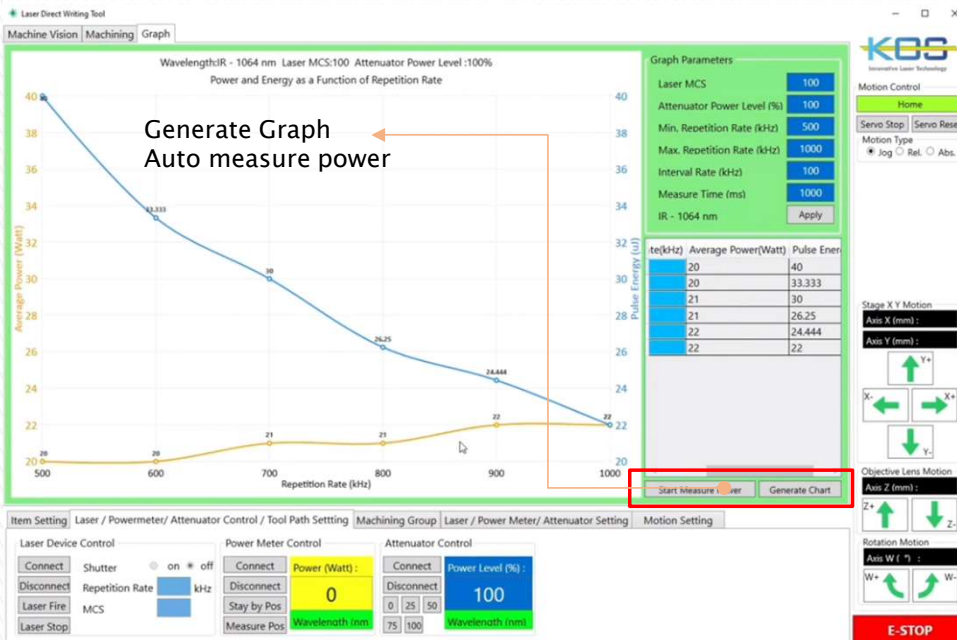
※ 고객 요청에 따라 spec. 및 구성 변경 가능



8. 주요 기능 소개

❖ Auto measure power / Generate Graph

- Repetition rate 에 따른 Power와 Pulse Energy 를 자동으로 계산 및 그래프 생성 가능



❖ Control Laser Parameter 기능

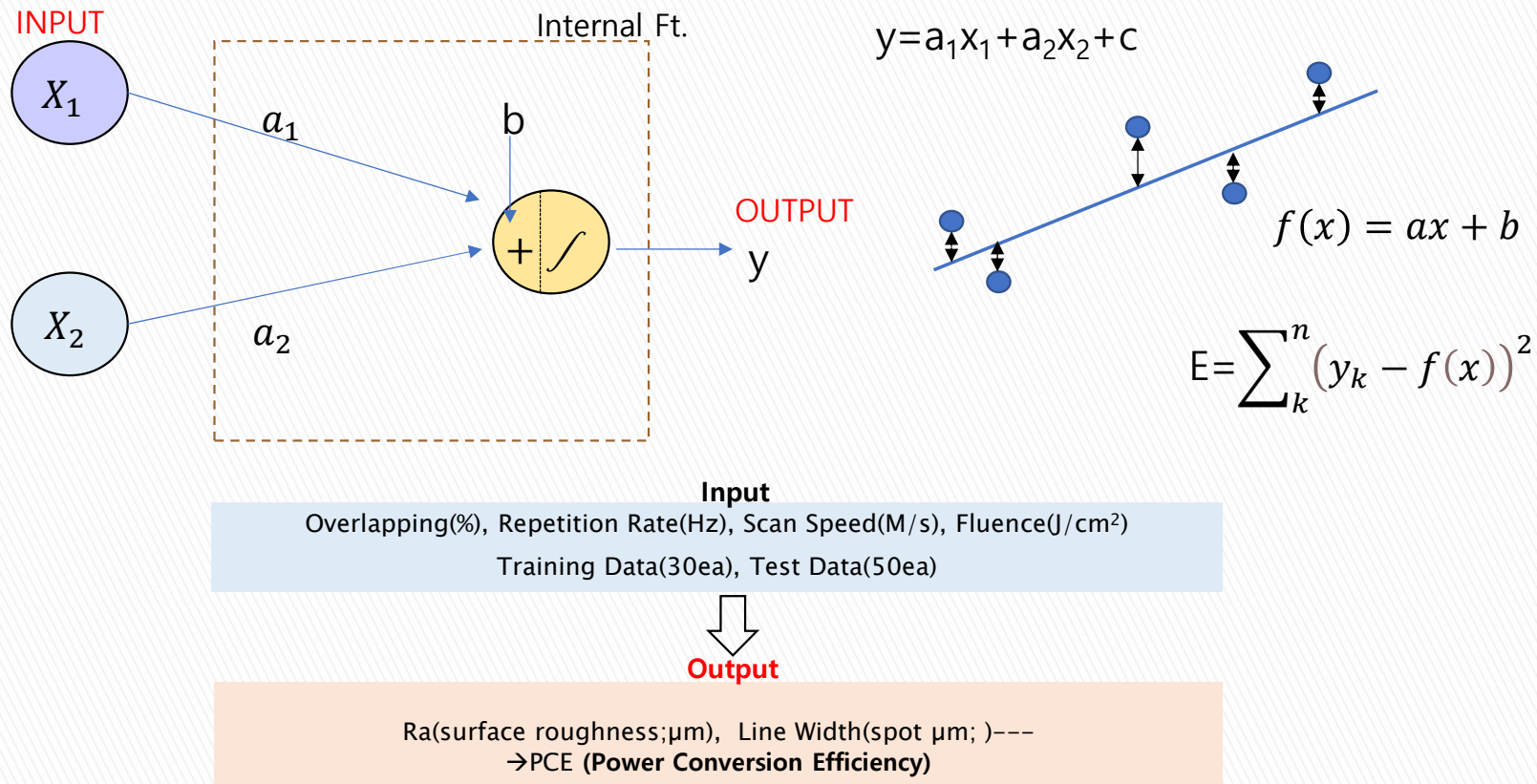
- 사용자가 최적의 공정 Parameter를 찾기 위하여 여러 번 반복 테스트를 진행 시, 한 번에 서로 다른 여러 Parameter 값을 가공 샘플에 적용하여 작업 효율을 높이는 기능

※ 주요 조정 Parameter: Power, Rep.Rate, Scan Speed, Pass(Repeat), Overlap(%)

Power Level	Spot Dia.(um)	LSO(%)	Power (Watt)	Fluence(J/cm ²)	Attenuator Power Level(%)	Machining Z Offset (mm)	Pass #	Group Delay (s)	Group Note
100	20	99	10	6.36619772367581	60	-1	1	1	
300	20	99	10	6.36619772367581	100	-2	1	1	
300	20	99	10	6.36619772367581	100	0.5	1	1	
300	20	99	10	6.36619772367581	100	-1.56	1	1	
300	20	99	10	6.36619772367581	100	1.56	1	1	

8. 주요 기능 소개

❖ AI adoption을 통한 공정 Parameter 최적화 기능



8. 주요 기능 소개

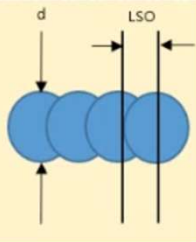
❖ Laser Spot Overlap – LSO(%)

- 3 개 변수(v,f,d)에 따라 LSO 값 결정
- 70%이상 설정으로 가공 품질 향상 가능
- LSO 공식

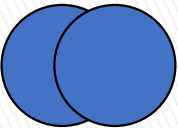
Laser Spot Overlap

$$LSO (\%) = \left(1 - \frac{v}{f \times d} \right) \times 100\%$$

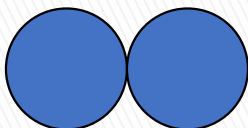
LSO = Laser Spot Overlap
 v = processing speed (mm/s)
 f = repetition frequency (kHz)
 d = beam spot diameter (um)



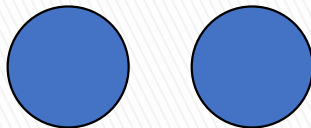
LSO = 50%



LSO = 0%



LSO = -50%



Input

Input

Input

Output

no.	Processing Speed (mm/s)	PRF (kHz)	Power Level	Spot Dia.(um)	LSO(%)
1	9600	400	300	20	-20

❖ Fluence

- 단위 면적당 레이저 에너지 (J/cm²)
- 3개 변수(p,f,d)에 따라 Fluence 값 결정
- Fluence 통해 최적 Parameter 선정 가능
- Fluence 공식

Fluence

Fluence = 5.427056 J/cm²

$$Fluence (J/cm^2) = p / f / (\pi * (d / 2)^2)$$

p = laser power (Watt) 13.32 Watt

f = repetition frequency (kHz) 500 kHz

d = beam spot diameter (um) 25 um

Calculate

Input

Input

Input

Output

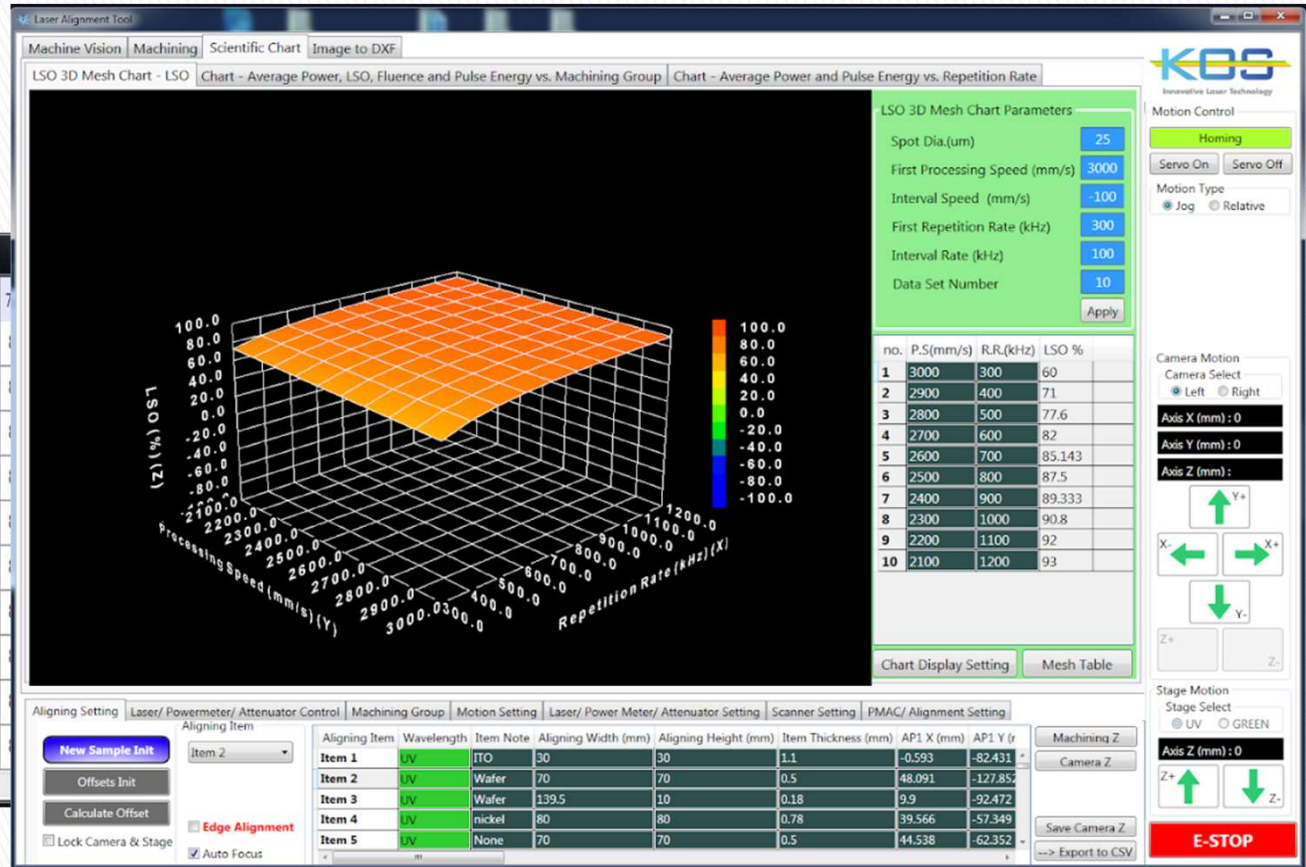
PRF (kHz)	Power Level	Spot Dia.(um)	LSO(%)	Power (Watt)	Fluence(J/cm ²)
400	300	20	-20	20	7.95774715459477

8. 주요 기능 소개

❖ LSO 3D Chart

- 2 개 변수(v,f)에 따라 LSO 값을 3D chart로 표현 가능

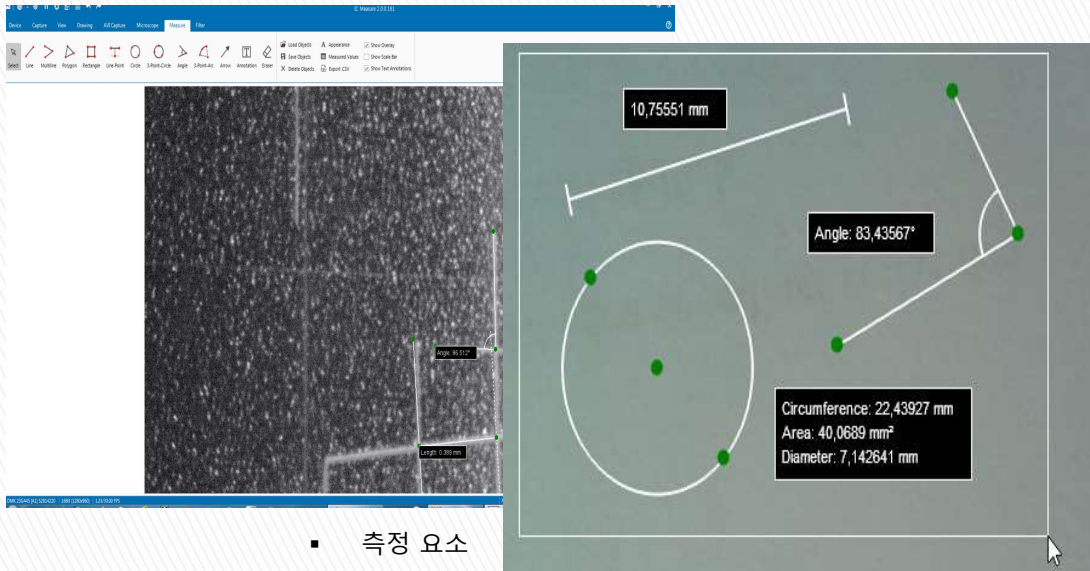
↓ P.S.(mm/s) /> LSO(%) for 25um /→ R.R.(kHz)	1200	1100	1000	900	800
2100	93	92.364	91.6	90.667	89.5
2200	92.667	92	91.2	90.222	89
2300	92.333	91.636	90.8	89.778	88.5
2400	92	91.273	90.4	89.333	88
2500	91.667	90.909	90	88.889	87.5
2600	91.333	90.545	89.6	88.444	87
2700	91	90.182	89.2	88	86.5
2800	90.667	89.818	88.8	87.556	86
2900	90.333	89.455	88.4	87.111	85.5
3000	90	89.091	88	86.667	85



8. 주요 기능 소개

❖ Measurement Function

- 최적화된 Vision system을 이용하여 미세 가공 데이터를 수치화 가능



- 측정 요소
 - Spot Size
 - Line width
 - Line to Line Space
 - Pattern Size

❖ Auto Focus

- 시료 Thickness에 적합한 가공 Z 위치 선정
- $\pm 5\text{mm}$ adjustable by motor

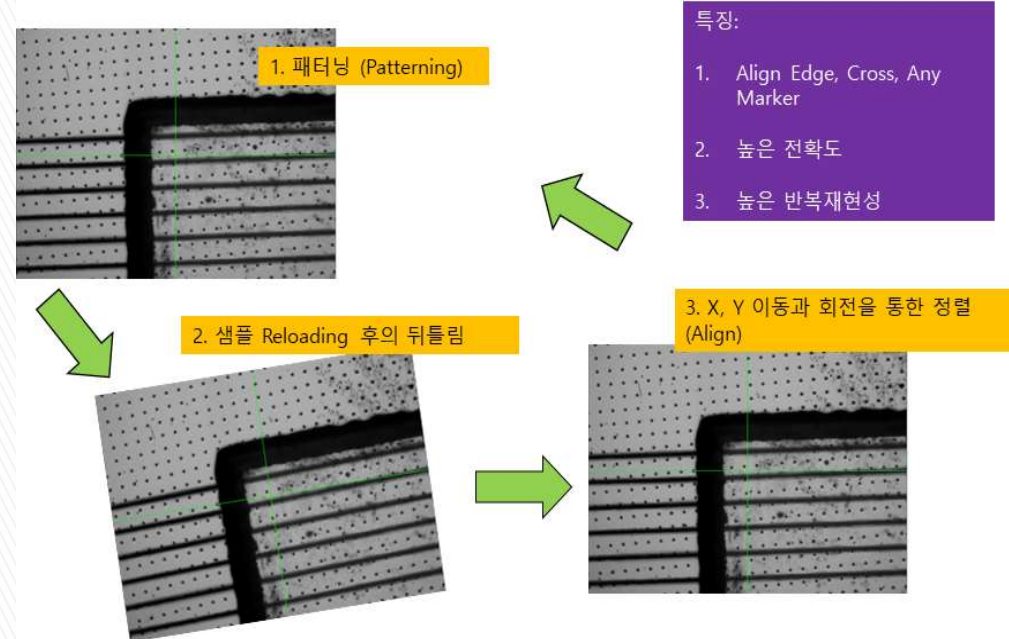
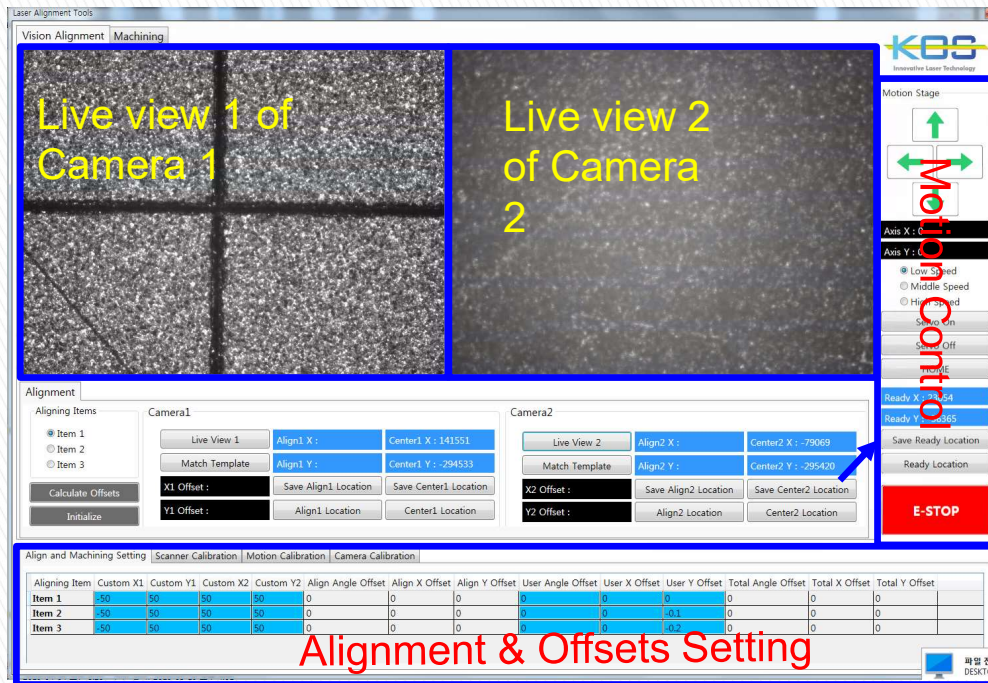
Aligning Item	Aligning Item	Wavelength	Item Note	Aligning Width	Aligning Height	Item Thickness
Item 2	UV	None	100	100	1	
Item 3	UV	None	65	50	0.05	
Item 4	UV	None	0	0	0	
Item 5	UV	None	0	0	0	

Auto Focus 클릭으로 적합한 가공 Z 위치 선정

8. 주요 기능 소개

❖ Auto Vision Align 기능

- 2대의 카메라를 이용한 Alignment
- 기판 크기 저장 가능(최대 50개)



Applications

1.Solar Cell
(PSC/OPV/CIGS)

2.Display
(Flat Panel Display)

3.Semiconductor
(MEMS/Bio Sensor)

4.Transparent
Materials
(Glass, Polymer,
4H SiC)

▶ 국내 기업



▶ 정부산하 연구센터

- KIST (한국과학기술연구원), 한국생산기술연구원, 대구 나노팩
- 한국재료연구원, KERI(한국전기연구원)
- ETRI(한국전자통신연구원), 한국화학연구원, 한국에너지기술원
- GIST(광주과학기술원), UNIST(울산과학기술원), DGIST(대구경북과학기술원)

▶ 국내대학 연구소

- 성균관대학교, 충남대학교, 연세대학교, 서울대학교, 고려대학교, 부산대학교

❖ 납품 장비 : u-Fab. System, u-Lab. System

10. ZEUS(장비 활용 종합 포털)

❖ ZEUS (장비 활용 종합 포털) <https://www.zeus.go.kr/main>

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통합검색

검색어 : 코썬사이언스 총 106건

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레이저 마이크로 가공기 예약 장비

장비설명 - 본 장비는 나노베이오센서 시작용 등의 제작을 위해서 설계된 도면을 이용하여 금속/비금속등을 레이저를 이용하여 마이크로 패턴을 가공 하는 핵심 장비임 (열손상 및 균열 등의 거의 발생하지 않아 초정밀 가공 가능)

기본정보 NFEC-2023-04-286994 | 모델명 : μ_Fab SYN2000 | 보유기관 : 나노·종합기술원 | 등록일자 : 2023-04-12 |

레이저 시스템 예약 장비

장비설명 ○ 디베이스의 효율이 고도화되고 복잡한 구조, 대면적화 및 다양한 종류의 기판에서의 연구가 필요함에 따라 레이저 식각장비의 활용을 통해 최적의 에칭 방법으로 접근할 수 없는 수준의 정밀한 디베이스의 제작 용도 ○ 짧은 Pulse를 이용한 피코초컨드(picosecond)이상의 레이저로 식각 중에 발생하는 열에너지를 의한 기관 및 에어의 손상을 최소화 할 수 있음. 기존 ...

기본정보 NFEC-2021-08-272696 | 모델명 : Pico-second laser system | 보유기관 : 울산과학기술원 | 등록일자 : 2021-08-25 |

레이저 스크라이버 예약 장비

장비설명 - 본 장비는 대면적 (180 mm X 180 mm) 태양전지의 모듈화 시 서브셀들을 직렬 연결화시키기 위한 공정 장비이다. - 레이저로 식각을 하여 최후 전극 부리 (P1 에칭), 하부 전극 노출 (P2 에칭), 상부전극 부리 (P3 에칭)의 세 단계를 거침으로써 서브셀들을 직렬로 연결하며, 정확한 위치조절, 피워조절, 속도조절이 필요하다.

기본정보 NFEC-2021-02-268062 | 모델명 : Pico-second laser system | 보유기관 : 광주과학기술원 | 등록일자 : 2021-02-18 |