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報告名稱:

赴美接受Canon FPA 3000 i5+I-line 步進機訓練報告

主辦機關:

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出國類別: 實習

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分類號/目: I5／化學與環境科學　I5／化學與環境科學

關鍵詞: 深次微米,微影製程

內容摘要: 目前I-line 步進機在深次微米微影製程中，扮演著重要的角色，主要是用來搭配先進曝光機台（如KrF、ArF、E-beam）做非關鍵層（non-critical layer）的曝光，稱作Mix-and-Match Lineup，用以平衡關鍵層曝光要求和整體產能和成本。目前國內的學術界並未具有此設備，毫微米實驗室在政府支持下引進此設備後，將能提昇本單位對於新製程的開發能力。特別是在本設備建立後配合尖端電子束曝光步進機(LEICA WEPRINT 200)之先進微影技術，以期能大幅提昇台灣學術界對於半導體製程之研發能力。另外本設備將來可對學界及產業界的半導體研究發展計劃提供合作或服務等業務，並可同時加強學生對先進微影製程之理論基礎與實務經驗，為未來半導體產業人才之培訓奠下紮實的根基。基於前述理由，此提案受到相關召集委員大力支持，故編列預算採購。參加本次訓練的目的在瞭解Canon公司I5+步進機台的操作原理和方法，此機台的相關操作相當複雜，例如圖罩的規格和製作、機台的參數設定與調校、軟體的操作、製程條件…等等。期瞭解上述相關資訊後，能在驗機程序上有足夠的相關知識審視規格。 另外，將相關的資料整理帶回實驗室，使其他同仁獲知該機台之相關規格，並能在NDL裝機及驗機前做好準備工作，例如實驗室空間的安排、底材與光阻材料的準備、驗機工具的安排、及其他必須搭配的事項等等。

本文電子檔已上傳至出國報告資訊網

行政院所屬各機關因公出國人員出國報告書

（出國類別：出國受訓）

赴美接受 Canon FPA 3000 i5+ I-line 步進機訓練報告

行政院研考會／省(市)研考會 編號欄

服務機關　：國家毫微米元件實驗室
出國人職稱：助理研究員
出國人姓名：陳俊淇
出國地點　：美國舊金山
出國時期　：90. 5. 14 － 90. 5. 27.
報告日期　：90. 8. 06

赴美接受 Canon FPA 3000 i5+ I-line 步進機訓練課程

前言

目前 I-line 步進機在深次微米微影製程中，扮演著重要的角色，主要是用來搭配先進曝光機台（如 KrF、ArF、E-beam）做非關鍵層（non-critical layer）的曝光，稱作 Mix-and-Match Lineup，用以平衡關鍵層曝光要求和整體產能和成本。

目前國內的學術界並未具有此設備，毫微米實驗室在政府支持下引進此設備後，將能提昇本單位對於新製程的開發能力。特別是在本設備建立後配合尖端電子束曝光步進機(LEICA WEPRINT 200)之先進微影技術，以期能大幅提昇台灣學術界對於半導體製程之研發能力。另外本設備將來可對學界及產業界的半導體研究發展計劃提供合作或服務等業務，並可同時加強學生對先進微影製程之理論基礎與實務經驗，為未來半導體產業人才之培訓奠下紮實的根基。基於前述理由，此提案受到相關召集委員大力支持，故編列預算採購。

一. 目的

參加本次訓練的目的在瞭解 Canon 公司 I5+步進機台的操作原理和方法，此機台的相關操作相當複雜，例如圖罩的規格和製作、機台的參數設定與調校、軟體的操作、製程條件...等等。期瞭解上述相關資訊後，能在驗機程序上有足夠的相關知識審視規格。

另外，將相關的資料整理帶回實驗室，使其他同仁獲知該機台之相關規格，並能在 NDL 裝機及驗機前做好準備工作，例如實驗室空間的安排、底材與光阻材料的準備、驗機工具的安排、及其他必須搭配的事項等等。

二. 出國日程

本次受訓日期是 90 年 5/13 至 5/26 止，共計兩個星期(十個工作天)。由 Canon 公司安排相關受訓課程如附件一，包括了：

1. Introduction and Safety
2. Daily Machine Readiness Checks
3. Wafer Flatness Test and Clean ABS Chuck
4. Best Focus, Uneven Focus, and ALFC Tests
5. AA Offset Test
6. Low Mag Offset and TVPA Matching Tests
7. Stage Accuracy and Matching Checks
8. Lens Mag Matching and Reticle Rotation Matching
9. Weekly Machine Readiness Checks
10. Lamp Replacement and Illumination Uniformity
11. E0 Matching Procedure
12. Quarterly Machine Readiness Checks
13. Reviews / Questions and Answer Session

受訓的地點為美國加州聖荷西市(CA, San Jose)，Canon公司的國際訓練中心，課程有 30% 時間在會議室中以投影片進行原理及概念解說，其餘時間則在無塵室中進行實際的操作和說明。

三. 訓練內容整理

以下就設備之操作訓練作整理報告:

(a) 機台規格簡介

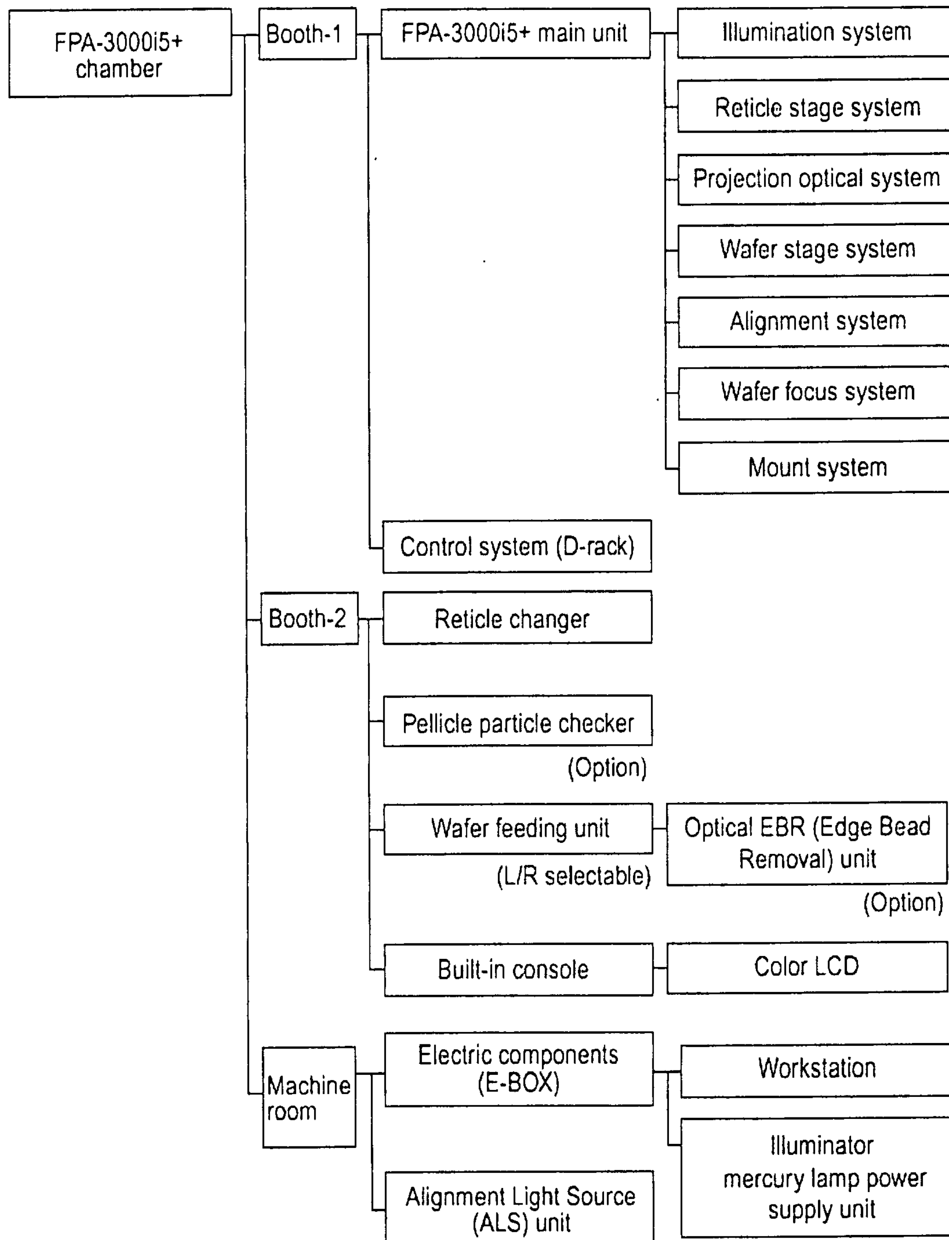
Key specifications of the Canon FPA-3000i5+ system are as shown:

Item	Specifications	Remarks
Reticle 1.1 □6-inch specifications (1) Size/thickness (2) Material (3) Film (4) Pellicle frame	 □6-inch, 0.25t Quartz Two-layer Cr, Three-layer Cr. Can be attached only on the pattern face, 6.3mm	
2. Wafer (1) Size	 ø6-inch, ø8-inch (Option: ø4-inch, ø5-inch)	
3. Projection optical system (1) Magnification (2) NA (3) Field size (4) Exposure light	 1/5x 0.63 to 0.45 (standard: 0.63) (Switched per 0.01) □6-inch Common size: □22mm (17.0 x 26mm) (ø31.11mm) □5-inch Without pellicle frame: □20mm (X: 22.6mm) With pellicle frame: □20mm (X: 20.6mm, ø28.28mm) i-line	 Automatic switching (set before shipping)
4. Illumination system (1) Light source (2) σ (normal illumination) (3) Exposure time control (4) Masking mechanism (5) Illumination mode	 2.7kW super-high-pressure mercury lamp 0.3 to 0.7 (standard: 0.65) Light integrator Four independent-controlled blades (□0.4mm to 26mm area on a wafer) Normal, SiA, SiB, SiA2	
5. Reticle alignment (1) Alignment light (2) Method	 i-line i-line illumination, Image-processing	
6. Wafer alignment (1) Alignment light (2) Alignment method (3) Mode	 1. He-Ne laser light 2. B² light 1. TTL OFF AXIS method with image-processing with He-Ne laser light 2. TTL OFF AXIS method with image-processing with B² light AGA	
7. Air bearing stage (high-speed X-Y stage) (1) Method (2) Others	 6-axis air bearing guide Controlled with 3-axis laser interferometer Wavelength compensation with a barometric monitor	

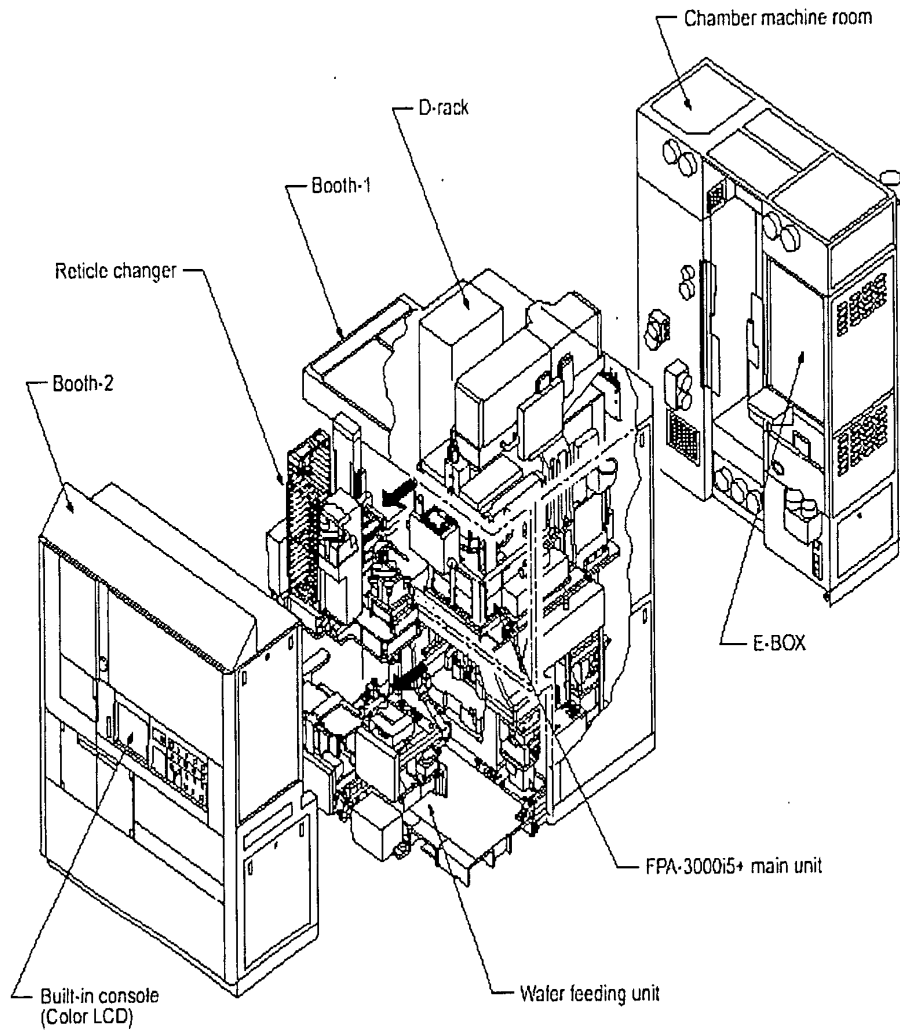
Item	Specifications	Remarks
8. Auto focus (1) Method (2) Others	 Optical auto focus and ALFC compensation Focus compensation for barometric pressure change Focus compensation for i-line illumination	
9. Wafer leveling (1) Method	 1. Global leveling 2. Die-by-die leveling	
10. Mechanical prealignment (1) Alignment method (2) Orientation flat position	 Peripheral non-contact method 1. 0° 2. 45°, -90°, 180° (selectable)	 Special-purpose chuck is used.
11. TV prealignment (1) Alignment method	 TV image-processing	
12. Wafer feeding unit (1) Method (Type VI) (2) Wafer carrier (3) Inline system	 Wafer surface/periphery non-contact method, wafer/IN-OUT method Double cassette type (SEMI standard Fluoroware) 1. Left-hand side inline system 2. Right-hand side inline system	 (No receive carrier is required.) 1 cassette: 25 wafers Inline system is available as an option.
13. Reticle changer (1) Number of reticles	 Standard: 14 With additional library: 29	 Additional library (stores 15 reticles) is available as an option.
14. Pellicle particle checker (1) Method (2) Inspection surfaces	Provided as an option: Scattered-light reception system with single laser beam radiation □6-inch reticle Two surfaces: Blank face, pellicle face, (with pattern)	
15. Chamber (1) Type (2) Temperature controller a. Air-cooling method Temperature controller b. Liquid-cooling method Temperature controller:	 CD-83 Built-in refrigerator and heater (Coolant: HCFC22) Booth (I, II) For stage For lens Built-in refrigerator and heater (Coolant: Galden HT110) For stage	

(b) 機台單元簡介

Canon FPA-3000i5+ system consists of the following units:

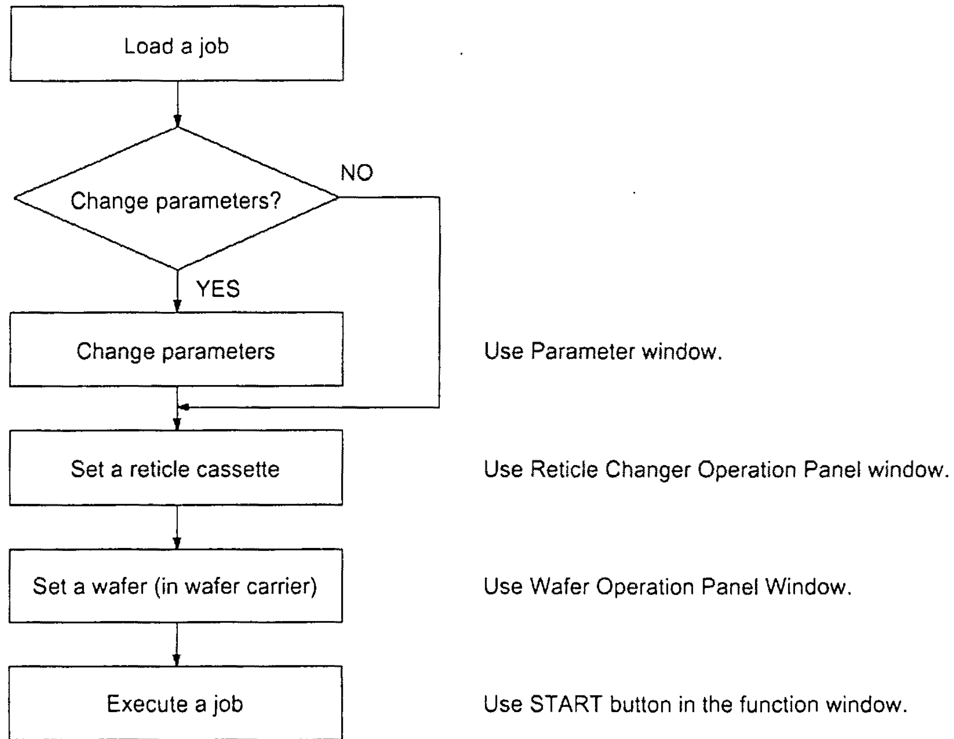


Names of the component units are shown in the following illustrations:



(c) 機台操作簡介

工作視窗 (Star Job)是用來執行工作、確認或改變機台參數的介面。工作視窗的操作流程如下圖：



CANON

START JOB

EDIT RETICLE

EDIT JOB

EDIT PARAM.

BACKUP AND RESTORE

LOGIN

SHUT DOWN

Operating Status Window

Shots Layout Window

Function Window

Error Maintenance Window

Parameter Window

WARNING

DECORATION

RETICLE

WAFER

STAGE

UNIT

HISTORY

Job Name

Reticle ID

Number of Wafer

Sequence Mode

Focus Offset

Alignment Mode

Exposure Dose

Guide:

JOB SAVE

LINK

SELECT PATCH

NEXT PANEL

START

RETICLE ALIGN

Joystick RA

COM-MAND

EXIT

Sequence:

Inline:

Wafer:

Warning:

Open Frame Command:

WARNING

DECORATION

diameter=200.00+-0.80mm

column

1 2

orientation flat = 57.50+-2.50mm
orientation flat angle = 0.00 degree

Expo GOOD | AGA GOOD | Row | START TIME
Expo FAIL | AGA FAIL | Column | END TIME
Skip Shot | AGA Warning | Number
Dummy Shot

RETICLE | WAFER | STAGE | UNIT | HISTORY

Status

Job:

Reticle:

Date/Time:

Online:

Waf. Door:

Ret. Door:

Login Name:

User Level:

Status Window

Operation

RETICLE | WAFER | STATUS

Operation Window

Current Job Editor

PARAM.

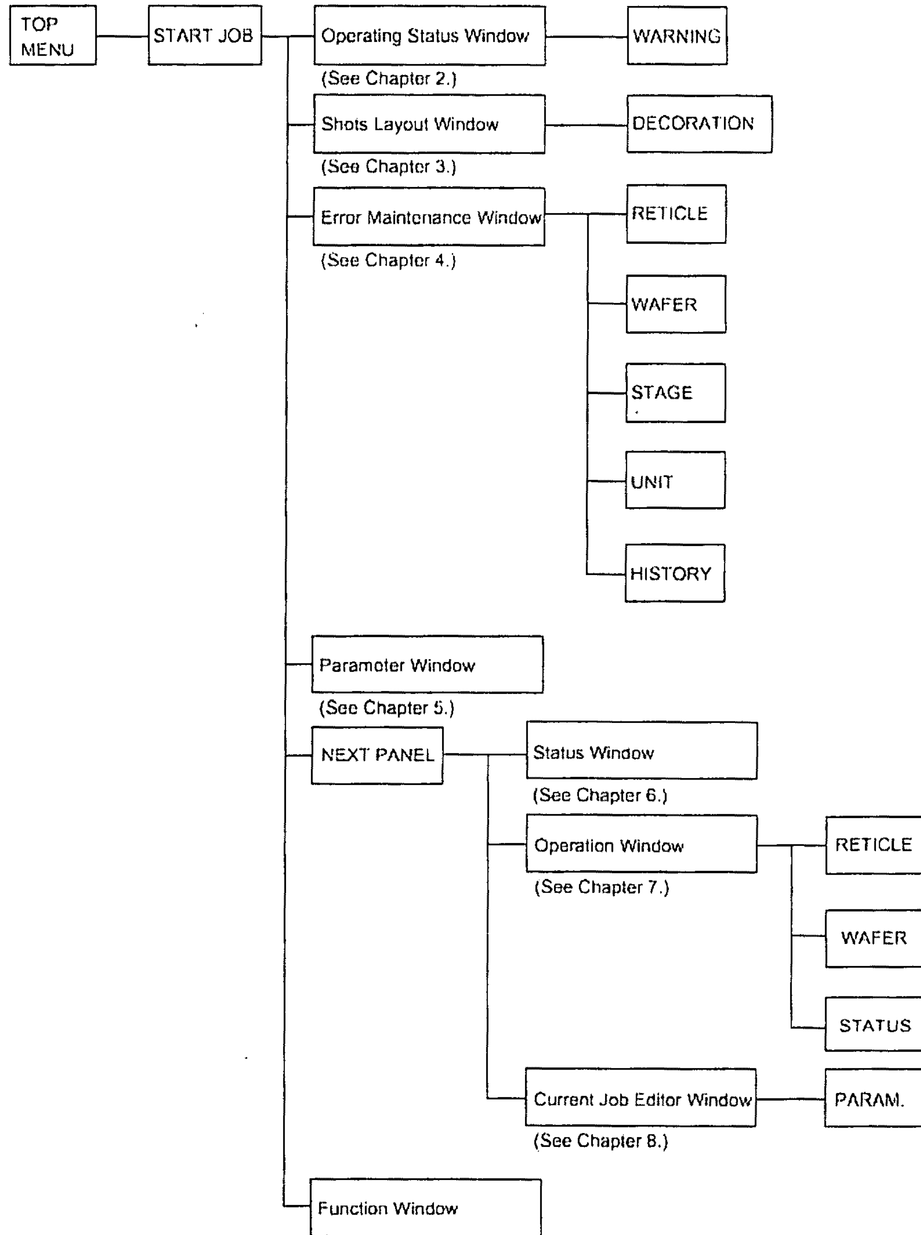
Current Job Editor Window

PREV PANEL

START | RETICLE ALIGN | Joystick RA | | | | | COM-MAND | EXIT

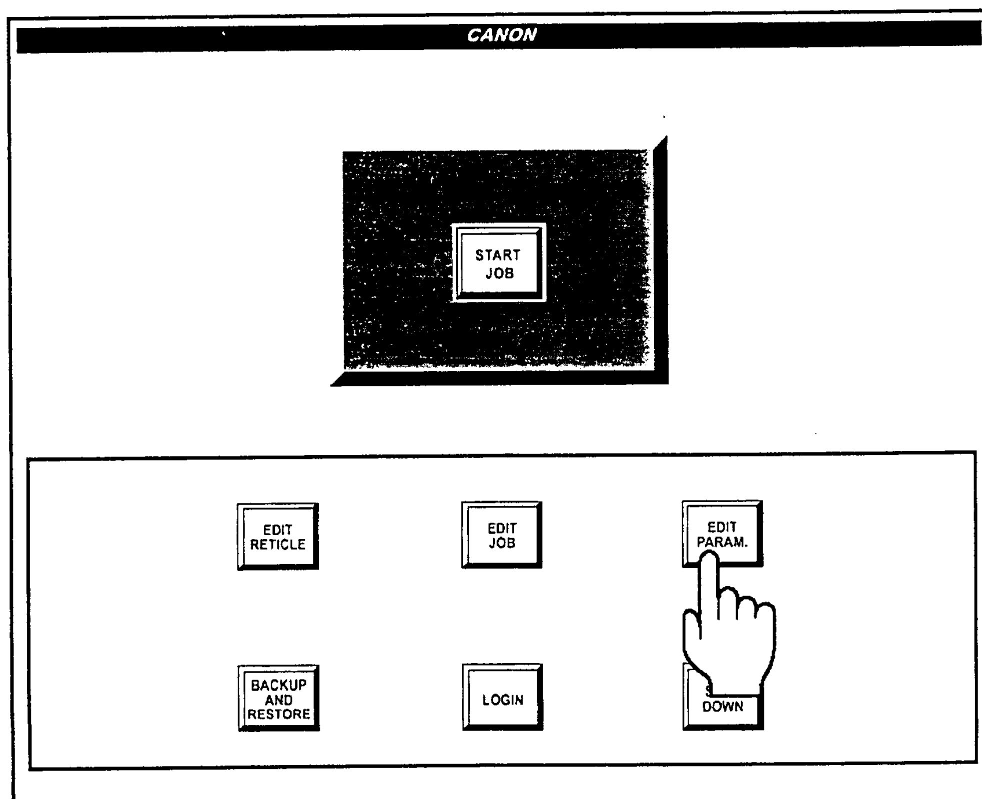
工作視窗其詳細功能選項如樹狀圖所示：

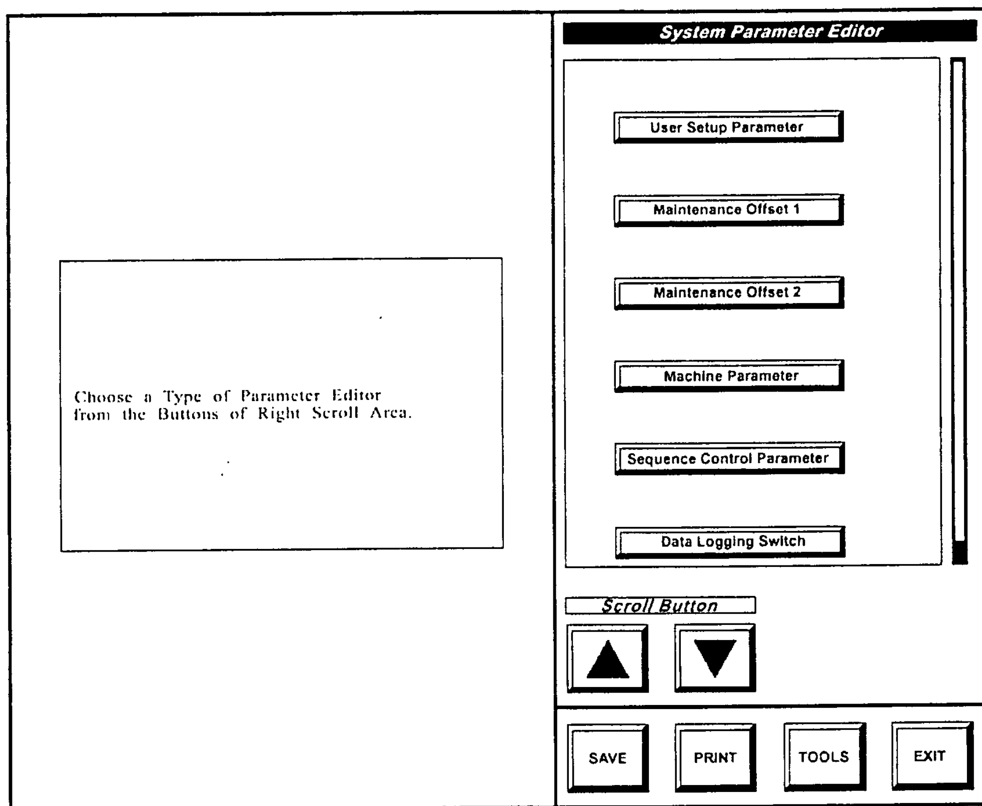
Tree structure of START JOB is shown here:



(d) 機台參數簡介

編輯參數視窗(EDIT PARAM.)是設計來設定機器狀況和工作程序的編輯器。其畫面及相關設定位置如下:



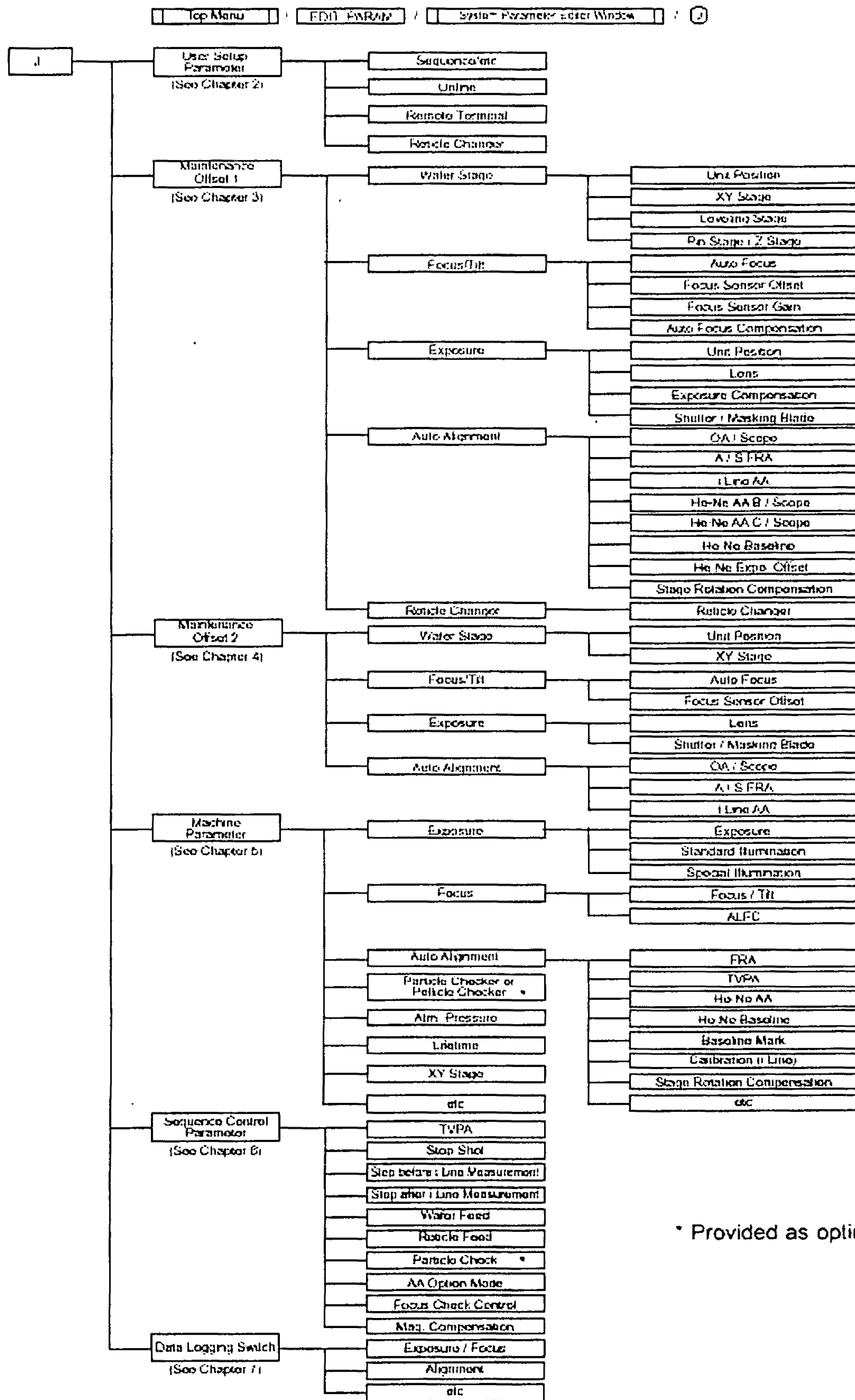


上圖為編輯參數視窗(EDIT PARAM.)下的螢幕，其中包含兩個子視窗。

(1) 系統參數編輯視窗(System Parameter Editor):用來檢查和更改系統參數檔案的數 值。

(2) 功能視窗(Function Windows):提供以下四項功能:儲存、列印、工具及退出。其中儲存為參數改變後的存檔，工具則提供更多的功能例如整個參數檔的複製、儲存。

參數編輯視窗詳細功能選項如下樹狀圖：



* Provided as options.

(e) 操作命令 (Command):

I5+除視窗式的操作介面外，另有許多額外的操作命令，大多是用以執行維修及檢查的工作，而平時操作的功能則是簡化為視窗示可觸控圖示。

下表為命令的功能簡介和執行名稱 ：

Alphabet (Command name)	Function category	Function outline
afoc	Measure Focus Pattern Ofs.	This command measures focus pattern offset and displays the measurement result in the display area. You can use this measurement result or input a specified focus pattern offset to compensate the focus measurement during exposure.
alfc	Measure Lens Focus Ofs.	This command executes the ALFC focus measurement and displays the measurement result in the display area. The measurement result can also be input into [ALFC Focus Offset] of [Machine Parameter] .
alrl	Unload all Wafer	Collects all the wafers inside the machine. Usually used when a trouble occurs during job execution or other special sequences to cause procedures (AA, exposure etc.) to halt.
asoc	Alignment Sensor ofs. check	This command measures the alignment offset of AA marks placed in the different positions on the display area. Generally, it is used to adjust the B and C-scopes by a Canon service engineer.
asxy	Move TTL Alignment Scope	This command measures the current position of alignment scope (iA scope) objective mirror and drives the objective mirror to a target position.
asz	Move TTL Alignment Scope-Z	This command measures the current focus position of alignment scope (iA scope) and drives the focus position to a target position.
auxaatune	AA TUNE	This command executes AGA measurement automatically on a wafer under the different conditions by changing the following parameters to optimize the alignment parameters used for wafer alignment. It also displays the measurement result in the display area.
auxfec	Obtain Optimum Expo. Condition	The optimum exposure condition which includes exposure dose and best focus position depends on manufacturing device, exposure process and machine environment. This command changes the exposure dose and focus offset of each shot to obtain the optimum exposure condition.
auxinc	Obtain Lens Property	The special sequence to evaluate lens performance. Changes conditions of wafer exposure on the shot-to-shot basis.

auxtct	Control Exposure with Timer	This command controls the exposure time by timer and runs the job.
auxwf	Measure Wafer Flatness	This command measures the wafer flatness on a specified position on the wafer by measuring the focus. The measurement result is displayed graphically.
auxxyp	Measure X-Y Stage Position	This command measures the stop position of the air bearing stage.
auxxysa	Measure Align. Ofs. 1Loop	This command executes AA measurement with the specified job and measures the deviation of each shot on the wafer. The measurement result is displayed graphically. Generally, this command is used to measure the magnification error and orthogonality error of the air bearing stage.
auxxysr	Measure Align. Ofs. 2Loops	This command executes the specified job two times on the same wafer. It executes AA measurement each time and measures the deviation of each shot on the wafer. The measurement result is displayed graphically. Generally, this command is used to measure the stepping repeatability of the air bearing stage.
bio	Display TV PA binary image	This command displays the binary image of the last TV prealignment measurement on the TV monitor screen.
blc	Measure Baseline Offset	This command measures the baseline offset and displays the measurement result in the display area. Generally, use this command to measure the deviated value of the relative position between the B-scope, C-scope reference marks and the reticle reference mark. You can input a measured offset into the HeNe Baseline offset of Machine Parameter.
cam	Chromatic Aberration Mesurement	The alignment modes 3 and 5 utilize the broad band light of the same alignment light source in different wavelength. The alignment offset is measured by these two alignment modes. The difference between the two modes is statistically processed and displayed in the display area. Generally, this command is used to adjust the B and C-scopes by a Canon service engineer.

cc	Move X-Y Stage to Chuck Clean.	This command drives the air bearing stage to the left inner side of the machine and moves the wafer chuck to the top of vacuum pins. Generally, use this command when cleaning the wafer chuck surface.
ddaf	Display Data Acq.File	This command displays the measurement data of [Exposure/Focus] or [Alignment] in the display area, when the output parameters of [Exposure/Focus] or [Alignment] are set to [ON] in [Data Logging Switch]. Use this command to check these measurement data.
eec	Check Exposure Parameter	The machine may not be able to control the exposure sequence as it is specified by the parameter, because of the status (deterioration) of the illumination mercury lamp. You can use this command to check each exposure paramter before starting the job.
gaus	Display Global Align.Data	This command displays the last global alignment (AGA) measurement result in the display area.
gow	Enter Global Align. Offset	You can input the global alignment (AGA) offset by this command.
gt	Meas Comp Global Tilt Offset	This commands starts the global tilt compensation drive. It also checks the global tilt offset by measuring the global tilt value. The global tilt measurement is based on the measurement sample shots specified in [PARAMETER] of job. The measurement result is displayed in the display area.
gtbp	Move X-Y Stage to Standard Mark	This command is used to display the origin position pattern of the stage reference mark on the TV monitor.
idf (This command is not available now.)	Image Data File Save	This command is used to file the latest image data obtained in the AA measurement of FRA, TV prealignment and AGA, on the magneto-optical disk (MO) or workstation hard disk. Generally, Canon service staff uses this command for image data analysis.
ihmr	Set Used Time to Illumi. Unit	Use this command to return the lamp used time or laser hour to the initial value after replacing the mercury lamp (Hg Lamp), helium neon laser head (HeNe laser) and halogen lamp (Halogen Lamp).
il	Obtain Optimum Il.Condition	This command has two functions to optimize the illumination uniformity and exposure dose in each illumination mode.

imsw	Switch Illumination Mode	This command drives the illumination system actuators to the specified illumination mode position. The stopper switching unit is driven to the specified stopper in each illumination mode.
iptaf	Measure Uneven Focus	This command measures the image uneven focus of the projection lens by measuring the best focus positions of TTLAF marks on several positions inside a shot. Generally, Canon service staff uses this command in machine adjustment.
iuc	Check Illumination Uniformity	This command measures the illumination uniformity of the illuminator mercury lamp and displays the measurement result graphically on the screen. Generally, use this command for the machine maintenance.
jsas	Joystick AS	You can drive the alignment scope (iA scope) manually by operating the joystick function buttons and objective focus buttons. When you operate the joystick function buttons and objective focus buttons, the current position of the alignment scope is automatically displayed in the display area.
jsma	Joystick MA	You can execute manual alignment for wafer AA marks by operating the joystick function buttons. When you operate the joystick function buttons, the current position of the air bearing stage is automatically displayed in the display area.
jspa	Joystick PA	You can execute manual TV prealignment by operating the joystick function buttons. When you operate the joystick function buttons, the current position of the air bearing stage is automatically displayed in the display area.
jsra	Joystick RA	You can execute manual reticle alignment by operating the joystick function buttons. When you operate the joystick function buttons, the current position of the reticle stage is automatically displayed in the display area.
lirc	Check Light Integ. Repeatability	This command measures the exposure dose by the light integrator and displays the result in the display area. Generally, use this command to check the measurement repeatability of the light integrator.

lpa	Lamp Position Adjustment	For adjusting the position of illumination system's mercury lamp. Measures illumination intensity in three illumination modes, the result of which is used to determine the lamp's best XY and Z positions. The result will be displayed in the display area.
mb	Move Masking Blade	This command measures the current masking blades (4 blades) positions and drives them to the target positions.
openf	Open Frame	Use this command to start jobs and sequence commands with no reticle on the reticle stage.
paop	TV/PA Optimize	This command automatically measures correlation by combination with all the measurement processing parameters and displays the result in the display area. During TV prealignment, if TV PA marks cannot be detected due to the wafer surface condition, use this command and search for the mark detectable parameter.
pen	Register TV PA Mark	This command registers the wafer TV prealignment mark in the main unit memory as the reference PA mark alignment data for matching pattern. Use this command when the PA mark cannot be detected normally because of any difference between actual PA mark and the standard data registered in the machine.
po	Measure Tilt Pattern Ofs.	This command measures the tilt pattern offset and renews [Tilt Pattern Offset] of [PARAMETER] with the measurement value. You can also input a specified tilt pattern offset into [Tilt Pattern Offset] of [PARAMETER].
ra	Reticle Auto Alignment	This command starts reticle auto alignment. Generally, use this command when reticle AA failed and the sequence stopped during job or command execution.
reexp	Retry Exposure	This command starts exposure from a specified shot.
rj	Reject Wafer	This command collects the exposed wafer from the wafer chuck and sends it to the wafer carrier on the wafer feeding unit. You can use this command only during inline feeding.

rl	Unload Wafer	This command collects the unexposed or being exposed wafer from the wafer chuck. Generally, use this command when you stop the processing (e.g. AA or exposure) because of some troubles during job or other special sequence execution.
roc	Measure Reticle Align. Offset	This command starts the reticle AA measurement and displays the result in the display area. When reticle AA fails, use this command to check the AA condition and execute manual reticle alignment.
rs1ch	Reset Other Small Units	This command resets (initializes) the 1-chip CPU in the machine. Generally, use this command to reset the unit when it fails.
rsrc	Reset Reticle Changer	This command resets (initializes) the reticle changer. Generally, use this command to reset the reticle changer when it fails.
rssf	Reset Stage and Focus Sys.	This command resets (initializes) the air bearing stage and focus system. Generally, use this command when the air bearing stage and focus system fail.
rstg	Move Reticle Stage	This command measures the current reticle stage position and drives the reticle stage to a target position.
rstv	Reset TV Alignment System	This command resets (initializes) the TVAA system. Generally, use this command to reset the TVAA system when the system fails.
rswf	Reset Wafer Feeder	This command resets (initialize) the wafer feeding unit. Generally, use this command to reset the wafer feeding unit when it fails.
rt	Measure Reticle Transmittance	This command measures the reticle transmittance (reticle throughout rate) and displays the result in the display area. Generally, the reticle transmittance is used to compensate the best focus which changes because of the exposure.
sf	Step Feed	This command drives the air bearing stage to a specified shot number position.
sh	Move Illumination Shutter	This command opens and closes the illuminator shutter.
siaf	Measure Image AF Ofs.(S-mark)	This command measures the best focus position of the stage reference mark and displays the measurement result in the display area.

src	Measure Stage Rot. Offset	This command measures the origin of the air bearing stage and displays the result in the display area. Generally, use this command to match the reticle coordinates and the X-direction running of the air bearing stage by the reference reticle. The reticle coordinates are the reference of the machine. After you have turned off the power to the machine and turned on it again, you must start this command to measure the air bearing stage origin. Also, to start this command, use the reference reticle which contains the baseline compensation mark.
stgm	Stage Maintenance	Enables adjustment of the Theta-Z tilt unit's bellofram regulator. After the Theta-Z tilt unit's servo is turned off, the Z position measured with the micro linear encoder (MLE) is used as a reference, which allows adjustment of bellofram as well as of a chronological change of bellofram itself.
tmpm	Control, Monitor Temperature	This command measures the temperature of all the chamber five channels and displays the measurement result in the display area. Generally, it is used to observe the temperature status of the chamber.
toc	Measure Wafer AA Offset	This command starts the wafer AA measurement and displays the measurement result in the display area. Generally, it is used to check the AA condition and perform manual wafer alignment when wafer AA fails.
tsdc	Compensate Tilt Offset	This command measures the die-by-die tilt offset and starts the compensation drive. The offset value and the measurement result will not be displayed. If you want to check the offset value, start the tsoc command after executing this command.
tsoc	Measure Focus/Tilt Offset	This command measures the auto focus and the die-by-die tilt offset. The measurement result is displayed in the display area. Generally, use this command during machine maintenance.

tva (This command is not available now.)	Display All-Zone TV Data	this command displays the TV AA measurement data of all zones in the display area. The measurement data is the image processing data.
tvo (This command is not available now.)	Display TV Data of Each-Zone	This command displays the TV AA measurement data of each zone in the display area. The measurement data can be displayed in waveform or in data obtained by image processing.
tvpa	Measure TV PA Offset	This command measures the TV prealignment and displays the measurement result in the display area. You can input the measurement result into [TV Pre Alignment Offset] of [Machine Parameter] and compensate TV prealignment. You can also input a specified TV prealignment offset and renew [TV Pre Alignment Offset] of [Machine Parameter].
wiaf	Measure Image AF Ofs.(Wafer)	This command measures the best focus position of wafer AA mark and displays the measurement result in the display area. Generally, use this command when setting [Image Auto Focus] offset parameter of Job.
winf	Display Wafer Carrier Info.	This command displays the wafer condition in the wafer carrier.
wl	Move Leveling Stage	This command measures the current position of the wafer tilt stage and drives the wafer tilt stage to a target position. You can specify the drive position by the drive point height (L,M,R) or by the gradient (X, Y-direction) and the height (Z).
wz	Move Wafer-Z Stage	This command measures the current position of the wafer Z stage and drives the wafer Z stage to a target position.
xyshot	Move X-Y Stage in Shot	This command measures the position of the AA mark as against the shot center and displays the measurement result in the display area. This command also drives the air bearing stage to a specified AA mark position.
xystg	Move X-Y Stage	This command measures the current position of the air bearing stage and drives the air bearing stage to a target position.
zd	Move Leveling Stage(Z)	This command drives the wafer Z stage vertically by a specified amount. The drive amount is specified as the distance from the current position.

以上為此次受訓整理而得一些機台基本的概念，其中還有許多維修的檢查和技巧，尚待整理。待機台到實驗室驗機完成後於驗機報告中詳述。

四.心得及建議

本次前往 Canon 公司國際訓練中心接受曝光機台相關訓練，其中台灣佳能半導體公司有製程應用工程師與設備維護工程師隨行，在訓練過程中受到許多照顧。國際訓練中心半導體儀器訓練部經理 Jason Ho 親自當講師，深感榮幸，其授課熱誠。本人回國後對儀器機台偶有困惑之處，常以電子郵件就教於 Jason，回覆均相當迅速、清楚。

此次受訓中得知驗機所需相關知識，發覺由於 NDL 無驗證多層疊對的儀器，將會在驗機上照成困擾，幸而 Canon 機台中內建一相似功能（Canon maps）唯此功能為較高階使用權限且較為耗時，Canon 方面也已答應使用本功能來做多層疊對驗機。

完成本文前，機台已於日本完成出貨前檢驗，其驗機報告如附件二. 預計於 8 月中旬進入本實驗室，9 月底前完成 On-site 驗機程序。

Course Objectives

Introduction
Welcome to Canon's FPA-3000i4/i5 Preventive Maintenance course.

Students will acquire information on the daily, weekly, monthly, and quarterly checks required for preventative maintenance. All preventative maintenance procedures will be performed to increase the students understanding of the maintenance requirements.

Duration
5 days

Class/Lab Time Split
30/70

Target Audience
Maintenance and Equipment Engineers who perform regular preventive maintenance on the Canon FPA-3000i4 and the Canon FPA-3000i5.

Student Prerequisites
The following are the prerequisites for taking this course:
- Complete the FPA-3000 i4/i5 Operation Training Course

Reference Material
The following manuals are provided in the classroom as reference material for this course:
- i4 and i5 Operation Manual 1/E Operation Guide
- i4 and i5 Operation Manual 2/E Parameter Guide 1
- i4 and i5 Operation Manual 3/E Parameter Guide 2
- i4 and i5 Operation Manual 4/E Command Guide
- i4 and i5 Operation Manual 5/E Reticle Design Guide
- i4 and i5 Service Manual E Maintenance Guide

Course Objectives (continued)

Before Class Begins:

Course Preparation Checklist

1. Class Roster
2. Student Name Tags
3. Certificates
4. Room Setup
5. Lab Equipment

a. Canon FPA-3000 i4 or i5 Stepper

b. Tools

c. Auxiliary Equipment

6. Reference Materials (Canon Manuals)
7. Student Guide Manuals
8. Instructor Guide Manual
9. Overhead Slides/Foils or software file equivalent

Lab Preparation Checklist

Before class begins, consider preparing the following:

(For detailed lab prep instructions, refer to the Lab Preparation Instructor Notes at the beginning of each section.)

1. 610 (or 365) Reticle 700 or 725, USA6-03
2. Reference Wafer for preventative matching procedures
3. Eight inch super flat wafers for testing
4. Chuck Removal and chuck cleaning tool
5. Cooling Oil and funnel for C-Oil procedure
6. Cleaning Cloth, Methanol and Isopropyl Alcohol
7. Hex Wrenches

Course Objectives (continued)

Signoff Sheet

Demonstrated Skill

Lab 1:	Daily Machine Readiness Checks
Lab 2:	Material Flow Subassembly Cleaning
Lab 3:	Daily Alignment System Checks
Lab 4:	Wafer Flatness Test and Clean ABS Chuck
Lab 5:	Best Focus, Uneven Focus and ALFC
Lab 6:	AA Offset Test
Lab 7:	Low Mag Offset and TVPA Matching
Lab 8:	Stage Accuracy and Matching Checks
Lab 9:	Lens Mag Matching and Reticle Rotation Matching
Lab 10:	Monthly Machine Readiness Checks
Lab 11:	Mercury & Halogen Lamp Change and Illumination Uniformity Check
Lab 12:	EO Matching
Lab 13:	Quarterly Machine Readiness Checks

Course Objectives (continued)

Performance Objectives

The students will achieve the following performance objectives:

1. Verify Temperature Controllers and Air Pressure and Vacuum Pressure Gauges Meet Machine Requirements.
2. Perform Air Bearing Stage Base and Wafer Feeder Vacuum Pads Cleaning.
3. Perform BLC, Baseline Compensation Procedure.
4. Perform SRC, Stage Rotation Compensation Procedure.
5. Perform Wafer Flatness Test, AUXWF and Clean ABS Chuck.
6. Perform Best Focus Check and Aux FEC.
7. Perform Uneven Focus Check.
8. Perform ALFC, Automatic Lens Focus Compensation Procedure.
9. Perform Auto Alignment Offset Check to Calibrate the He-Ne TV AA System.
10. Perform Low Mag Offset Matching and Pre-Alignment Matching.
11. Perform Stage Accuracy Testing and Magnification and Orthogonality Matching.
12. Perform Lens Magnification Matching and Reticle Rotation Matching.
13. Perform Chuck Removal and Chuck Clean.
14. Perform Cooling Level , Flow Check and Replenish Procedure.
15. Perform Halogen Lamp Change and Mercury Lamp Change.
16. Perform IUC and Lamp Z Positioning Procedure.
17. Perform Exposure Matching Procedure.
18. Perform Reticle Changer Subsystem Vacuum Pads Cleaning.

Course Objectives (continued)

Enabling Objectives

The students will demonstrate understanding of the following knowledge-building steps in pursuit of the performance objectives:

1. Understand the purpose of verifying temperature controllers and air pressure and vacuum pressure gauges meet machine requirements.
2. Understand procedure and purpose of air bearing stage base and wafer feeder vacuum pads cleaning.
3. Understand the process and procedure of the alignment system checks, SRC and BLC.
4. Understand purpose of wafer flatness test and procedures to perform the test.
5. Understand purpose and procedure of chuck cleaning.
6. Understand and perform best focus and exposure check.
7. Understand and perform uneven focus check.
8. Understand the process of alignment check ALFC.
9. Perform auto alignment offset check to calibrate the He-Ne TV AA system.
10. Understand purpose and procedure of Low Mag Offset Matching and Pre-Alignment Matching.
11. Understand purpose and procedure for stage accuracy and machine matching of scaling and orthogonality.
12. Understand purpose of Lens Magnification Matching and Reticle Rotation Matching and procedures to perform these tests.
13. Understand how to perform chuck removal and chuck clean.
14. Understand how to perform cooling level , flow check and replenish procedure.
15. Understand how to perform Halogen Lamp Change and Mercury Lamp Change.
16. Understand Lamp Z positioning and IUC check.
17. Understand purpose of exposure offset matching and procedures to perform the test.
18. Perform Reticle Changer Subsystem vacuum pads cleaning.

Course Objectives (continued)

Lab Exercises

This course is designed to maximize student on-machine training time. The student participates in the following lab exercises to complete the Canon FPA-3000 i4/i5 Preventative Maintenance Course.

Lab 1:	Daily Machine Readiness Checks
Lab 2:	Material Flow Subassembly Cleaning
Lab 3:	Daily Alignment System Checks
Lab 4:	Wafer Flatness Test and Clean ABS Chuck
Lab 5:	Best Focus, Uneven Focus Test, and ALFC.
Lab 6:	AA Offset Test
Lab 7:	Low Mag Offset and TVPA Matching
Lab 8:	Stage Accuracy and Matching Checks
Lab 9:	Lens Mag Matching and Reticle Rotation Matching
Lab 10:	Monthly Machine Readiness Checks
Lab 11:	Lamp Change and Illumination Uniformity Check
Lab 12:	E0 Matching Test
Lab 13:	Quarterly Machine Readiness Checks

Course Syllabus

Mon 9:00 A.M. **Welcome**

Instructor sits with the students and reviews each student's Data Sheet to learn their background, their stepper machine experience, and their objectives for the FPA-3000 i4/i5 Preventative Maintenance Course.

· Student Data Sheets

· Course Flow

· Expectations (lab work and outside reading)

Mon 9:30 A.M. **Section 1: Introduction and Safety**

See Section 1 for presentation material.
Review safety procedures for the FPA-3000 i4/i5 and review course outline as well as reference materials.

Daily Checks

Mon 10:00 A.M. **Section 2: Daily Machine Readiness Checks**

See Section 2 for presentation material.
Present enabling objective topics:

· Understand the purpose of verifying temperature controllers and air pressure and vacuum pressure gauges meet machine requirements.

· Understand procedure and purpose of air bearing stage base and wafer feeder vacuum pads cleaning.

Mon 11:00 A.M. **Break for 15 Minutes**

Mon 11:15 P.M. **Lab 1: Daily Machine Readiness Checks**

See Lab 1 for Lab Exercise Procedure

· Verify Temperature Controllers and Air Pressure and Vacuum Pressure Gauges Meet Machine Requirements.

· Perform Air Bearing Stage Base and Wafer Feeder Vacuum Pads Cleaning.

Mon 12:30 P.M. **Break 1 Hour for Lunch**

Mon 1:30 P.M. **Section 3: Daily Alignment System Checks**

See Section 3 for presentation material
Present enabling objective topics:

· Understand the process and procedure of the alignment system checks, SRC and BLC.

Mon 2:15 P.M. **Lab 2: Daily Alignment System Checks**

See Lab 2 for Lab Exercise Procedure

· Perform BLC, Baseline Compensation Procedure.

· Perform SRC, Stage Rotation Compensation Procedure.

Mon 3:30 P.M. **Break for 15 Minutes**

Weekly Checks

Mon 3:45 P.M. **Section 4: Wafer Flatness Test and Clean ABS Chuck**

See Section 4 for presentation material

Present enabling objective topics:

· Understand purpose of wafer flatness test and procedures to perform the test.

· Understand purpose of chuck cleaning.

Mon 4:30 P.M. **End of Day One**

Tue 9:00 A.M. **Lab 3: Wafer Flatness Test and Clean ABS Chuck**

See Lab 3 for Lab Exercise Procedure

· Perform Wafer Flatness Test, AUXWF and Clean ABS Chuck.

Tue 10:30 A.M. **Break for 15 Minutes**

Tue 10:45 A.M.	**Section 5: Best Focus, Uneven Focus, and ALFC Tests** See Section 5 for presentation material Present enabling objective topics: · Understand and perform best focus and exposure check. · Understand and perform uneven focus check. · Understand and perform ALFC command.
Tue 12:00 P.M.	**Break 1 Hour for Lunch**
Tue 1:00 P.M.	**Lab 4: Best Focus, Uneven Focus, and ALFC Tests** See Lab 4 for Lab Exercise Procedure · Perform Best Focus Check, Aux FEC · Perform Uneven Focus Check · Perform ALFC Check
Tue 3:00 P.M.	**Break for 15 Minutes**
Tue 3:15 P.M.	**Section 6: AA Offset Test** See Section 6 for presentation material Present enabling objective topics: · Perform auto alignment offset check to calibrate the He-Ne TV AA System.
Tue 3:45 P.M.	**Lab 5: AA Offset Test** See Lab 5 for Lab Exercise Procedure · Perform auto alignment offset check to calibrate the He-Ne TV AA System.
Tue 4:45 P.M.	**End of Day Two**

Wed 9:00 A.M. **Section 7: Low Mag Offset and TVPA Matching**

See Section 7 for presentation material

Present enabling objective topics:

· Understand purpose and procedure of Low Mag Offset Matching and Pre-Alignment Matching.

Wed 9:45 A.M. **Lab 6: Low Mag Offset and TVPA Matching Tests**

See Lab 6 for Lab Exercise Procedure

· Perform Low Mag Offset Matching.

· Perform TV Pre-Alignment Matching.

Wed 11:30 A.M. Break for 15 Minutes

Wed 11:45 A.M. Section 8: Stage Accuracy and Matching Checks

See Section 8 for presentation material

Present enabling objective topics:

· Understand purpose and procedure for stage accuracy and machine matching of scaling and orthogonality.

Wed 12:30 P.M. Break 1 Hour for Lunch

Wed 1:30 P.M. Lab 7: Stage Accuracy and Matching Checks

See Lab 7 for Lab Exercise Procedure

· Perform Stage Accuracy Testing and Magnification and Orthogonality Matching.

Wed 3:15 P.M. Break for 15 Minutes

Wed 3:30 P.M.	**Section 9: Lens Mag Matching and Reticle Rotation Matching** See Section 9 for presentation material Present enabling objective topics: · Understand purpose of Lens Mag Matching and Reticle Rotation Matching and procedures to perform these tests.
Wed 4:30 P.M.	**End of Day Three**
Thur 9:00 A.M.	**Lab 8: Lens Mag Matching and Reticle Rotation Matching** See Lab 8 for Lab Exercise Procedure · Perform Lens Magnification Matching and Reticle Rotation Matching.
Thur 11:00 A.M.	**Break for 15 Minutes**
Thur 11:15 A.M.	**Section 10: Weekly Machine Readiness Checks** See Section 10 for presentation material. Present enabling objective topics: · Understand how to perform cooling level flow check and replenish procedure · Understand how to perform chuck removal and chuck clean.
Thur 12:00 P.M.	**Break 1 Hour for Lunch**
Thur 1:00 P.M.	**Lab 9: Weekly Machine Readiness Checks** See Lab 9 for Lab Exercise Procedure Present enabling objective topics: · Perform Cooling Level Flow Check and Replenish Procedure. · Perform Chuck Removal and Chuck Clean.
Thur 2:30 P.M.	**Break for 15 Minutes**

Monthly Checks

Thur 2:45 P.M.	**Section 11: Lamp Replacement and Illumination Uniformity** Check and X-Terminal Clean See Section 10 for presentation material · Understand how to perform Halogen Lamp Change and Mercury Lamp Change. · Perform Illumination Uniformity Check and Adjustment after Lamp Change. · Understand how to clean the X-terminal.
Thur 3:30 P.M.	**Lab Section 10: Lamp Replacement and Illumination Uniformity** Check and X-Terminal Clean See Lab 10 for Lab Exercise Procedure · Perform Halogen Lamp Change and Mercury Lamp Change. · Perform Illumination Uniformity Adjustment, IUC. · Perform X-Terminal Clean.
Thur 5:00 P.M.	**End of Day Four**
Fri 9:00 A.M.	**Section 12: E0 Matching Procedure** See Section 12 for presentation material Present enabling objective topics: · Understand purpose of E0 Matching check.
Fri 10:00 A.M.	**Lab 11: E0 Matching Procedure** See Lab 11 for Lab Procedure · Perform E0 Matching Procedure (OPEN Frame)
Fri 11:15 A.M.	**Break for 15 Minutes**

Quarterly Checks

Fri 11:30 A.M.	**Section 13: Quarterly Machine Readiness Checks** See Section 13 for presentation material present enabling objective topics: · Perform Reticle Changer Subsystem vacuum pads cleaning and cassette cleaning.
Fri 12:30 P.M.	**Break 1 Hour for Lunch**
Fri 1:30 P.M.	**Lab 13: Quarterly Machine Readiness Checks** See lab 13 for lab exercise procedure · Perform Reticle Changer Subsystem vacuum pads cleaning and reticle cassette cleaning.
Fri 3:00 P.M.	**Break for 15 Minutes**
Fri 3:15 P.M.	**Review / Question and Answer Session**
Fri 4:30 P.M.	**End of Day Five**

附件二.

FPA-3000i5+

Fine Pattern Aligner

SHIPPING INSPECTION DATA1

For: National Nano Device Laboratories

Product Name	FPA-3000i5+
Serial No.	1062779
Product Code	0025T670
Inspection Date	29.Jun,2001

Manager	T. Ishii TERUO.ISHII
Assistant Manager	A. Ohzeki AKIRA.OHZEKI
Inspector	F. Koyama FUMIAKI.KOYAMA

Canon

Canon Inc. Optical Products Operations
20-2, Kiyohara-kogyo-danchi, Utsunomiya-shi,
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Phone : Utsunomiya(028)667-5711

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FPA-3000i5+ #2779 INSPECTION RESULT TABLE For National Nano Device Laboratories

Item	Condition		Specification	Result	Judge	Page

1. Projection Performance

	Item	Condition			Specification	Result	Judge	Page
1	Depth of Focus	NA0.63 σ 0.65	0.35 μ mL&S		Range≧1.2 μ m	1.511	ok	4~5
2	Image Field Deviation	NA0.63 σ 0.65	0.35 μ m ISO		Range≦0.35 μ m	0.285	ok	6~7
3	Astigmatism	NA0.63 σ 0.65	0.35 μ m ISO		≦0.20 μ m	0.191	ok	6~7
4	LR Difference	NA0.63 σ 0.65	0.35 μ m L&S	H	Range≦30 nm	13	ok	8
				V		13		
5	CD Uniformity	NA0.63 σ 0.65	0.35 μ m L&S		Range≦35 nm	21	ok	4~5
6	Distortion	NA0.63 σ 0.65	dX		≦±40 nm	24	ok	9
			dY			16		

2.Lens Heating Performance

	Item	Condition		Specification	Result	Judge	Page
1	Focus	NA0.63 σ 0.65	Initial	—	0.05	—	—
			After Exposure		0.10		
			After Cooling		0.00		
			Variation	Range≦0.3 μ m	0.10	ok	
2	Magnification	NA0.63 σ 0.65	Initial	—	2.404	—	10~12
			After Exposure		2.141		
			After Cooling		2.559		
			(After Exposure) - (Initial)	≦±2 ppm	-0.263	ok	
			(After Cooling) - (Initial)	≦±2 ppm	0.155	ok	

3.Illumination Performance

	Item	Condition		Specification	Result	Judge	Page
1	Illumination Intensity	NA0.63 σ 0.65	-	≧10000 W/m²	13034	ok	13
2	Illumination Uniformity	NA0.63 σ 0.65	-	≦±1.0 %	0.462	ok	13
3	Light Intergrator Accuracy	NA0.63 σ 0.65	-	≦±1.0 %	0.67	ok	—
4	Masking Blade Accuracy	NA0.63 σ 0.65	Bl	≦±100 μ m	25	ok	—
			Br		30		
			Bu		35		
			Bd		35		

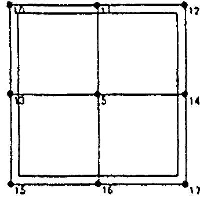
4.Alignment Performance

	Item	Condition		Specification	Result	Judge	Page
1	Reticle Rotation Accuracy	NA0.63 σ 0.65	-	≦±10 nm	-0.7	ok	—
2	Reticle Rotation Repeatability	NA0.63 σ 0.65	-	Range≦20 nm	3.3	ok	—
3	Auto Alignment Accracy	NA0.63 σ 0.65	X	Total |m|+3 σ	22	ok	14
		(He-Ne)	Y	≦50 nm	20		
		NA0.63 σ 0.65	X	Total |m|+3 σ	20	ok	15
		(B^2)	Y	≦50 nm	24		

	Item	Condition		Specification	Result	Judge	Page
5.Auto Focus Performance							
1	Auto Focus Repeatability	—	—	3σ≦100 nm	68	ok	—
2	Die-by-die Leveling Repeatability	—	X	3σ≦7 ppm	2.7	ok	—
			Y		3.6		
3	Chuck Flatness	—	□20mm	≦0.4 μm	0.32	ok	—
4	ALFC Measurement Repeatability	—	L	3σ≦100 nm	43	ok	—
			R		35		
6.X-Y Stage Perhormance							
1	Stepping Accuracy	NA0.63 σ0.65	X-X	3σ≦35 nm	14	ok	16~21
			X-Y	(→ meaning)	11		
			Y-X		15		
			Y-Y		14		
			X-X		12		
			X-Y		8		
			Y-X		11		
			Y-Y		14		
			X-X		12		
			X-Y		9		
			Y-X		12		
			Y-Y		15		
7.Prealignment Performance							
1	Mechanical Prealignment Accuracy	—	Xl	3σ≦30 μm	2.6	ok	22
			Xr		2.7		
			Yl		2.3		
			Yr		2.2		
2	TV Prealignment Accuracy	—	X	MAX≦3 μm	0.68	ok	—
			Y		0.59		
8.Throughput Performance							
1	Throughput 6"R	NA0.63 σ0.65	-	≧108 Wafers/Hour	118.8	ok	23
9.Reliablity							
1	Wafer Cycing	—	500Wafers	No Assist	No Assist	ok	—
2	Reticle Cycling	—	70Reticles	No Assist	No Assist	ok	—

INS.DATE	2001/ 6 / 1
Item	Depth of Focus CD Uniformity
Condition	NA0.63 σ 0.65 0.35 μ m L&S

X_Width= 20
Y_Width= 20



<<< 個別 CD >>>

ﾚﾝｽﾞ・本体No	::	#2779	測定日	::	2001/06/01
露光量	::	2240	処理日	::	2001/06/01
ショットNo	::	NO2/5	ﾌｧｲﾙ ﾈｰﾑ	::	HH779601
着目線幅	::	0.35	ｼﾞｮﾌﾞ ﾈｰﾑ	::	34-2

Axis-X :: -2.05 ～ 1.95
Axis-Y :: 0 ～ 0.7
(Vertical)—●— (Horizontal)—○—

INS.DATE	2001/ 6 / 1
Item	Depth of Focus CD Uniformity
Condition	NA0.63 σ 0.65 0.35 μ m L&S

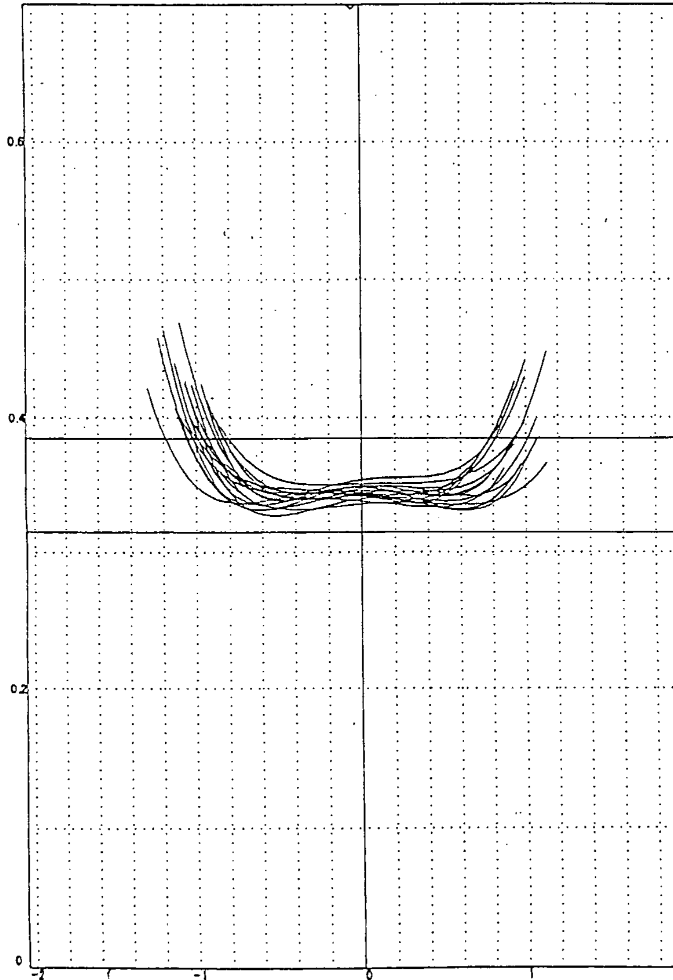
<<< 総合 CD (T/B片ボケ補正) >>>

ﾚﾝｽﾞ・本体No	::	#2779	測定日	::	2001/06/01
露光量	::	2240	処理日	::	2001/06/01
ショットNo	::	N02/5	ﾌｧｲﾙ ﾈｰﾑ	::	HH779601
着目線幅	::	0.35	ｼﾞｮﾌﾞ ﾈｰﾑ	::	34-2

スライス 0.385 / 0.315
最小値 0.328 <15>
ベストフォーカス -0.053 (-0.808 < 5>~ 0.703 <13>)
共通深度 ★1.511 (-0.808 < 5>~ 0.703 <13>)

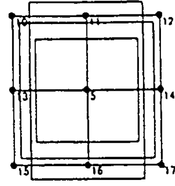
CD Uniformity = [BF]★0.021(0.336<12> ~ 0.357< 5>)

Axis-X :: -2.05 ~ 1.95
Axis-Y :: 0 ~ 0.7
(Vertical) (Horizontal)



INS.DATE	2001/ 6 / 9
Item	Image Field Deviation Astigmatism
Condition	NA0.63 σ 0.65 0.35 μm ISO

X_Width= 20
Y_Width= 20



<<< 個別 Isolate >>>

ﾚﾝｽﾞ・本体No	::	#2779	測定日	::	2001/06/09
露光量	::	2400	処理日	::	2001/06/09
ショットNo	::	N03/5	ﾌｧｲﾙ ﾈｰﾑ	::	HH779609
着目線幅	::	0.35	ｼﾞｮﾌﾞ ﾈｰﾑ	::	15-NDK01

Axis-X :: -2.03 ~ 1.97
Axis-Y :: 0 ~ 0.7
(Vertical)—●— (Horizontal)—○—

INS.DATE	2001/ 6 / 9
Item	Image Field Deviation Astigmatism
Condition	NA0.63 σ 0.65 0.35 μm ISO

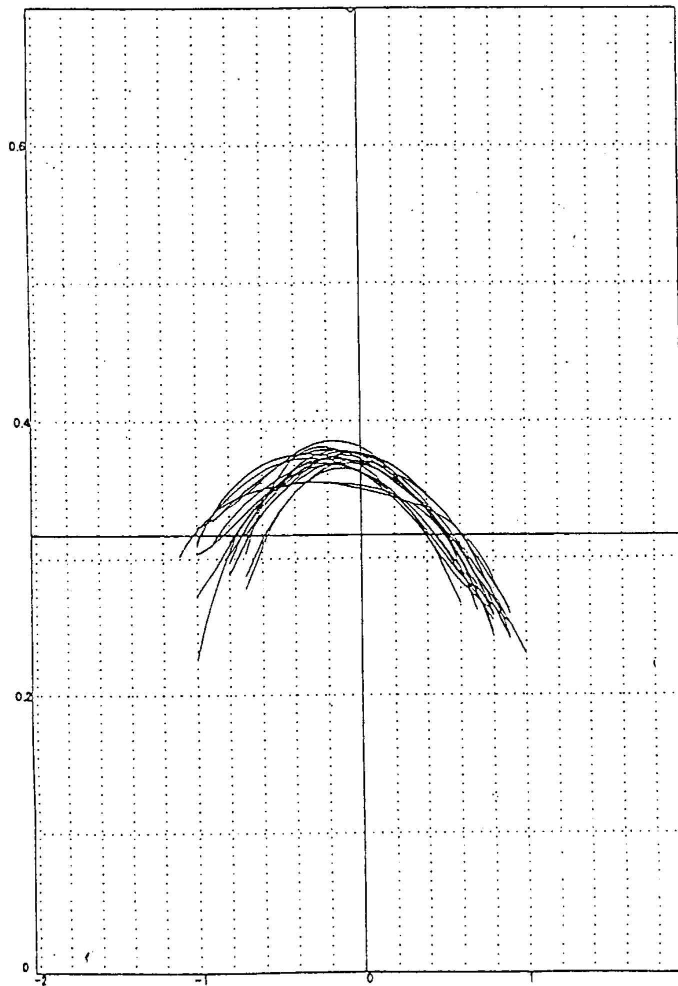
<<< 総合 Isolate >>>

ﾚﾝｽﾞ・本体No	::	#2779	測定日	::	2001/06/09
露光量	::	2400	処理日	::	2001/06/09
ショットNo	::	NO3/5	ﾌｧｲﾙ ﾈｰﾑ	::	HH779609
着目線幅	::	0.35	ｼﾞｮﾌﾞ ﾈｰﾑ	::	15-NDK01

スライス 0.316
最大値 0.386 <13>
ベストフォーカス -0.089 (-0.568 <12>~ 0.390 <14>)
共通深度 0.958 (-0.568 <12>~ 0.390 <14>)
像面幅(平面近似) ★0.285

非点 ★0.191 <17>

Axis-X :: -2.03 ~ 1.97
Axis-Y :: 0 ~ 0.7
(Vertical) (Horizontal)

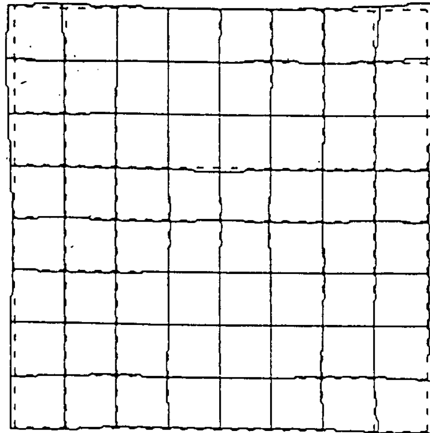


INS.DATE	2001/ 6 / 10
Item	LR Difference
Condition	NA0.63 σ 0.65 0.35 μm L&S

```
*** (L1-L5)  <<Vertical>> ***
              B F

  5         0.002
 10         0.013
 11         0.008
 12             0
 13        -0.005
 14         0.012
 15         0.006
 16         0.005
 17         0.002

 Min       -0.005
 Max     ★  0.013
 Ave        0.005

*** (L1-L5)  <<Horizontal>> ***
              B F

  5        -0.003
 10        -0.011
 11         0.009
 12        -0.007
 13             0
 14        -0.001
 15         0.003
 16        -0.013
 17         0.002

 Min     ★ -0.013
 Max        0.009
 Ave       -0.002
```

INS.DATE	2001/6/25
Item	Distortion
Condition	NA0.63 σ 0.65

<< FPA DISTORTION MAP >>



map .30 mic

Date	2001/06/25
Body No.	#2779
Pattern No.	
Reticle No.	
Wafer No.	
Filename.	M76P7791
ofs name.	N036701
Alignment	全点 参照
Row ピッチ	2.5
Clm ピッチ	2.5
符号反転	有り
処理日時	06/25/01

DISTORTION DATA

		X	Y	
MAXIMUM	=	★0.024	★0.016	(mic)
MINIMUM	=	-0.023	-0.011	(mic)

********** X DATA ***********

	1	2	3	4	5	6	7	8	9
1	-.018	-.011	-.002	+.002	+.005	+.004	+.005	+.016	+.024
2	-.023	-.006	+.001	+.003	+.002	+.003	+.004	+.008	+.020
3	-.018	-.004	-.004	-.001	+.001	+.001	+.007	+.005	+.011
4	-.009	-.006	-.007	+.003	+.002	+.000	+.002	+.005	+.005
5	-.007	-.007	-.007	+.006	+.006	-.005	-.002	+.007	+.005
6	-.005	-.006	-.007	+.002	+.001	-.002	+.003	+.004	+.003
7	-.009	-.003	-.008	-.002	-.001	+.003	+.001	+.001	+.007
8	-.010	-.004	-.003	-.004	-.000	+.001	-.003	+.002	+.015
9	-.012	-.008	-.003	-.001	+.001	-.002	+.000	+.009	+.017

********** Y DATA ***********

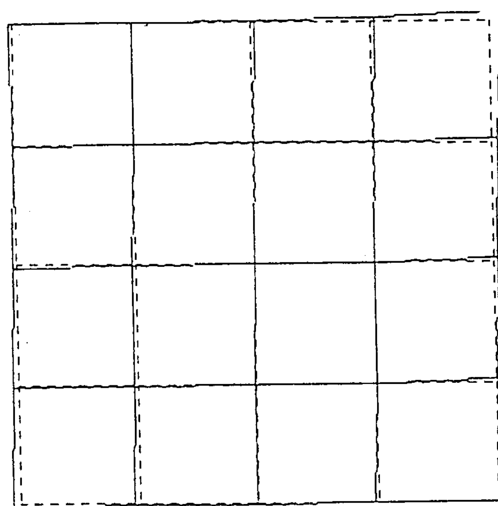
	1	2	3	4	5	6	7	8	9
1	+.007	+.013	+.005	+.002	+.002	+.002	+.006	+.014	+.016
2	+.006	-.002	-.003	-.002	+.002	+.003	+.001	+.004	+.013
3	-.004	-.006	-.001	+.001	-.002	-.002	+.003	+.000	+.002
4	-.007	-.006	-.005	-.009	-.011	-.009	-.003	-.004	-.004
5	-.003	-.002	-.004	-.003	-.003	-.004	-.003	-.002	-.003
6	-.000	-.004	-.004	+.002	+.001	+.001	-.003	+.000	-.001
7	-.000	+.000	-.001	-.001	-.001	-.002	-.002	+.003	+.002
8	-.003	+.003	+.005	+.002	-.000	+.001	+.005	+.003	-.005
9	-.005	-.003	+.005	+.003	+.005	+.007	+.003	-.004	-.008

INS.DATE	2001/ 6 / 8
Item	Magnification
Condition	NA0.63 σ 0.65 Initial

(ppm)

	Magnification	Variation
Initial	2.404	
After Exposure	2.141	★ -0.263
After Cooling	2.559	★ 0.155

Distortion Map（機種 = UL34-2 ）



Ver 4.2G-2 (MAP-K3.SEQ)

日付 2001/06/08

シリアルNo. #2779
データネーム M7F87794.DST
レチクルNo. 5X5-0
オフセットNo. NoOffset

モニター温度 23.0 (℃)
〃 気圧 1000.0 (hpa)
レンズセットオフセット 0.0 (hpa)
レンズ 気圧 1000.0 (hpa)

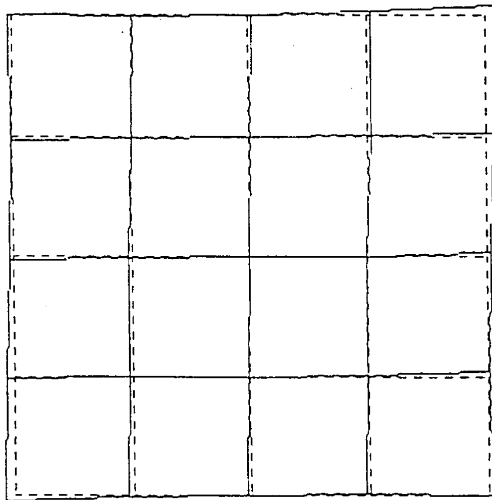
設置先標高 120 (m)

300nm

最小自乗倍率 2.404(ppm)

INS.DATE	2001/ 6 / 8
Item	Magnification
Condition	NA0.63 σ 0.65 After Exposure

Distortion Map（機種 = UL34-2 ）



300nm

Ver 4.2G-2 (MAP-K3.SEQ)

日付 2001/06/08

シリアルNo. #2779
データネーム M7F87795.DST
レチクルNo. 5X5-0
オフセットNo. NoOffset

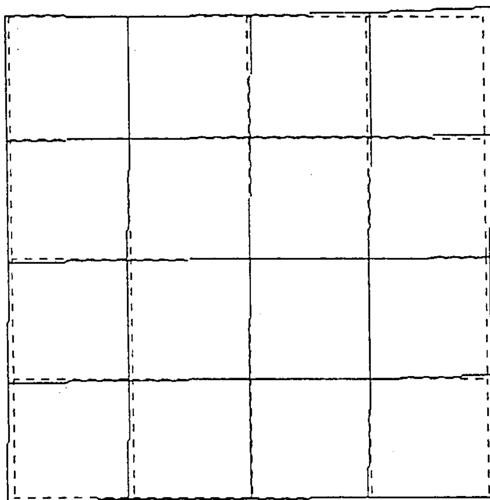
モニター温度 23.0 (℃)
〃 気圧 1000.0 (hpa)
レンズセットオフセット 0.0 (hpa)
レンズ 気圧 1000.0 (hpa)

設置先標高 120 (m)

最小自乗倍率 2.141(ppm)

INS.DATE	2001/ 6 / 8
Item	Magnification
Condition	NA0.63 σ 0.65 After Cooling

Distortion Map（機種 = UL34-2 ）



Ver 4.2G-2 (MAP-K3.SEQ)

日付 2001/06/08

シリアルNo. #2779
データネーム M7F87796.DST
レチクルNo. 5X5-0
オフセットNo. NoOffset

モニター温度 23.0 (℃)
〃 気圧 1000.0 (hpa)
レンズセットオフセット 0.0 (hpa)
レンズ 気圧 1000.0 (hpa)

設置先標高 120 (m)

300nm

最小自乗倍率 2.559(ppm)

INS.DATE	2001/ 6 / 11
Item	Illumination Intensity Illumination Uniformity
Condition	NA0.63 σ 0.65

Mon Jun 11 11:38:38 2001 Uniformity Check 0.63-0.65 Page 1-1

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
[1]	99.2#	99.3#	99.6	99.7	99.8	99.8	99.8	99.9	99.8	99.8	99.8	99.7	99.7
[2]	99.5#	99.6	99.7	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.8
[3]	99.7	99.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8
[4]	99.9	99.9	100.0	100.0	100.0	100.0	100.1	100.1	100.0	100.0	99.9	99.9	99.8
[5]	99.9	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.9	99.9	99.8	99.8
[6]	99.8	99.9	100.0	100.0	100.0	99.9	99.9	99.9	99.9	99.9	99.9	99.8	99.8
[7]	99.8	99.9	99.9	99.9	99.9	99.8	99.9	99.8	99.8	99.8	99.8	99.7	99.7
[8]	99.7	99.8	99.9	99.9	99.9	99.8	99.8	99.7	99.7	99.7	99.6	99.6	99.5
[9]	99.7	99.8	99.8	99.8	99.9	99.8	99.8	99.8	99.8	99.8	99.8	99.7	99.7
[10]	99.6	99.7	99.8	99.9	99.8	99.8	99.8	99.8	99.8	99.9	99.9	99.8	99.7
[11]	99.6	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.9	99.9	99.9	99.9	99.8
[12]	99.6	99.7	99.8	99.8	99.8	99.8	99.8	99.8	99.9	100.0	100.0	100.0	99.9
[13]	99.6	99.7	99.7	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.9	99.9	99.9
[14]	99.6	99.6	99.8	99.8	99.9	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.9
[15]	99.5	99.7	99.7	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.9	99.9
[16]	99.5	99.6	99.7	99.8	99.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
[17]	99.4	99.6	99.7	99.8	99.8	99.8	99.9	99.9	99.9	100.0	100.0	99.9	100.0
[18]	99.4	99.4	99.6	99.7	99.7	99.7	99.8	99.8	99.9	99.9	100.0	99.9	100.0
[19]	99.3	99.4	99.5	99.6	99.6	99.6	99.7	99.8	99.8	99.9	99.9	99.9	99.9
[20]	99.1#	99.3	99.4	99.5	99.5	99.5	99.6	99.7	99.8	99.8	99.9	99.9	99.9
[21]	98.9#	99.1#	99.1	99.2	99.2	99.3	99.4	99.5	99.6	99.7	99.7	99.7	99.7

Mon Jun 11 11:38:38 2001 Uniformity Check 0.63-0.65 Page 1-2

	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]
[1]	99.6	99.6	99.4	99.4	99.3	99.2	99.1#	99.0#
[2]	99.7	99.7	99.6	99.5	99.5	99.4	99.3	99.2#
[3]	99.8	99.8	99.7	99.6	99.6	99.6	99.5	99.3
[4]	99.8	99.8	99.8	99.7	99.7	99.6	99.6	99.4
[5]	99.8	99.7	99.8	99.7	99.7	99.7	99.6	99.5
[6]	99.8	99.7	99.7	99.7	99.7	99.6	99.6	99.5
[7]	99.7	99.7	99.7	99.7	99.7	99.7	99.6	99.5
[8]	99.5	99.6	99.7	99.7	99.7	99.7	99.6	99.5
[9]	99.6	99.6	99.6	99.6	99.7	99.7	99.6	99.5
[10]	99.6	99.6	99.6	99.6	99.7	99.7	99.6	99.6
[11]	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.6
[12]	99.8	99.8	99.8	99.8	99.7	99.8	99.7	99.6
[13]	99.9	99.8	99.8	99.8	99.8	99.8	99.8	99.7
[14]	99.9	99.9	99.9	99.9	99.9	99.8	99.8	99.7
[15]	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.8
[16]	100.0	99.9	99.9	100.0	99.9	99.9	99.9	99.9
[17]	99.9	99.9	100.0	100.0	100.0	99.9	99.9	99.8
[18]	99.9	99.9	100.0	100.0	99.9	99.9	99.8	99.8
[19]	99.9	99.9	100.0	100.0	99.9	99.9	99.7	99.6
[20]	99.8	99.9	99.9	99.8	99.8	99.7	99.6	99.5#
[21]	99.7	99.6	99.7	99.8	99.7	99.6	99.4#	99.2#

[file information]

file_name : 0.63-0.65
date : 2001/06/11
time : 10:29:03
Region x : 20.0000 (mm)
Region y : 22.6000 (mm)
Pitch x : 1.0000 (mm)
Pitch y : 1.1300 (mm)
IUC value ★ 0.462 (%)
UC0 ★ 13034.000

INS.DATE	2001/ 6 / 8
Item	Auto Alignment Accuracy
Condition	NA0.63 σ 0.65 (He-Ne)

```
Date (Print)    :: 2001/06/08
Wafer Pitch(mm)   X::  20.000  Y::  20.000
Chip  Pitch(mm)   X::   9.450  Y::   9.450
Shot (/Wafer)  :: 32
Measure Points :: 5
Calc    Points :: 5
File_Name
  No 1  :: v7687791
  No 2  :: v7687792
  No 3  :: v7687793
  No 4  :: v7687794
  No 5  :: v7687795
```

** Average **

	All [um] X	Y
No = 1	0.002	-0.003
No = 2	-0.002	-0.001
No = 3	-0.005	-0.001
No = 4	-0.006	-0.007
No = 5	-0.005	-0.001
Max	0.002	-0.001
Min	-0.006	-0.007
Range	0.008	0.006

** 3σ **

	All [um] X	Y
No = 1	0.016	0.017
No = 2	0.020	0.014
No = 3	0.018	0.021
No = 4	0.018	0.013
No = 5	0.013	0.014

** Total **

	All [um] X	Y
Ave	-0.003	-0.003
→ 3σ	0.019	0.017
|Ave|+3σ	★ 0.022	★ 0.020

INS:DATE	2001/ 6 / 8
Item	Auto Alignment Accuracy
Condition	NA0.63 σ 0.65 (B^2)

Date (Print) :: 2001/06/08
Wafer Pitch(mm) X:: 20.000 Y:: 20.000
Chip Pitch(mm) X:: 9.450 Y:: 9.450
Shot (/Wafer) :: 32
Measure Points :: 5
Calc Points :: 5
File_Name
No 1 :: v7687796
No 2 :: v7687797
No 3 :: v7687798
No 4 :: v7687799
No 5 :: v768779a

** Average **

	All [um] X	Y
No = 1	-0.008	-0.002
No = 2	-0.005	-0.009
No = 3	-0.002	-0.004
No = 4	-0.003	-0.006
No = 5	0.001	0.002
Max	0.001	0.002
Min	-0.008	-0.009
Range	0.009	0.011

** 3σ **

	All [um] X	Y
No = 1	0.016	0.016
No = 2	0.010	0.008
No = 3	0.013	0.012
No = 4	0.013	0.016
No = 5	0.016	0.026

** Total **

	All [um] X	Y
Ave	-0.0038	-0.004
3σ	0.016	0.020
|Ave|+3σ	★0.020	★0.024

184.96 258.96

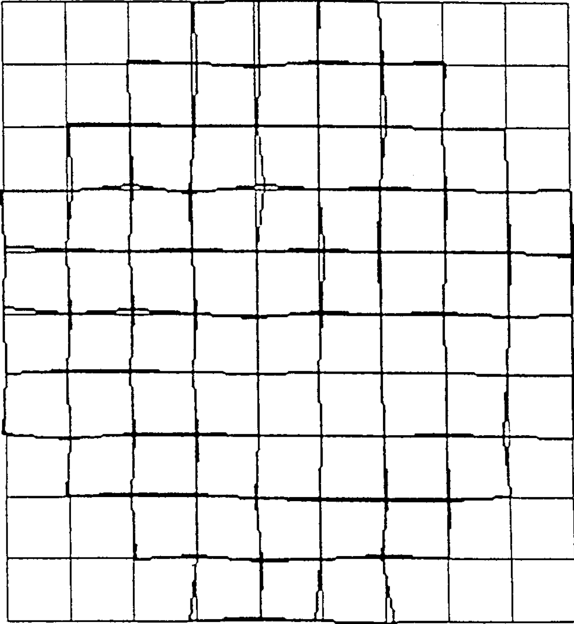
13.6 21.04 + 162
-84.96
-15.96
-15.96
21.04

INS.DATE	2001/ 6 /28
Item	Stepping Accuracy
Condition	NA0.63 σ 0.65

MT-50130
SEIKO-6W¥365-NSP 06/28/01 16:56 J76S7791.NSP

	X	Y	
max	+0.014	+0.011	[micron]
min	-0.013	-0.007	[micron]
Average	+0.000	+0.000	[micron]
3 sigma	★ +0.014	★ +0.011	[micron]
direction	-0.001	+0.001	[micron]

Map scale = .10 mic/div +

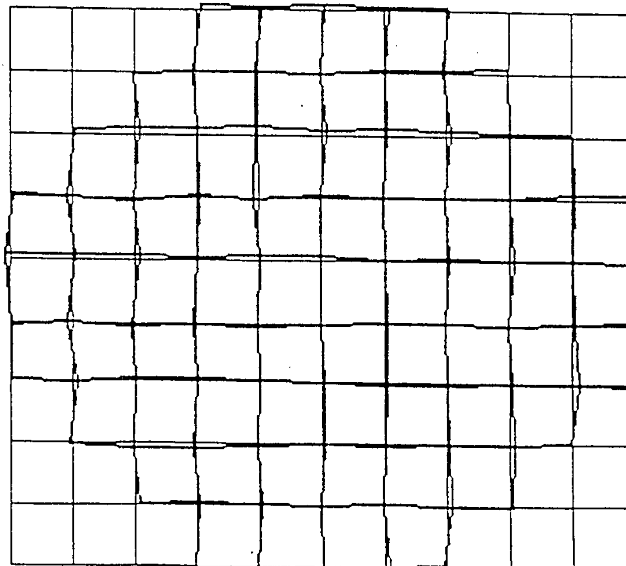


INS.DATE	2001/ 6 /28
Item	Stepping Accuracy
Condition	NA0.63 σ 0.65

MT-50130
SEIKO-6W¥365-NSP 06/28/01 16:56 N76S7791.NSP

	X	Y	
max	+0.012	+0.012	[micron]
min	-0.011	-0.010	[micron]
Average	+0.000	-0.000	[micron]
3 sigma	☆ +0.015	☆ +0.014	[micron]
direction	+0.003	-0.000	[micron]

Map scale = .10 mic/div

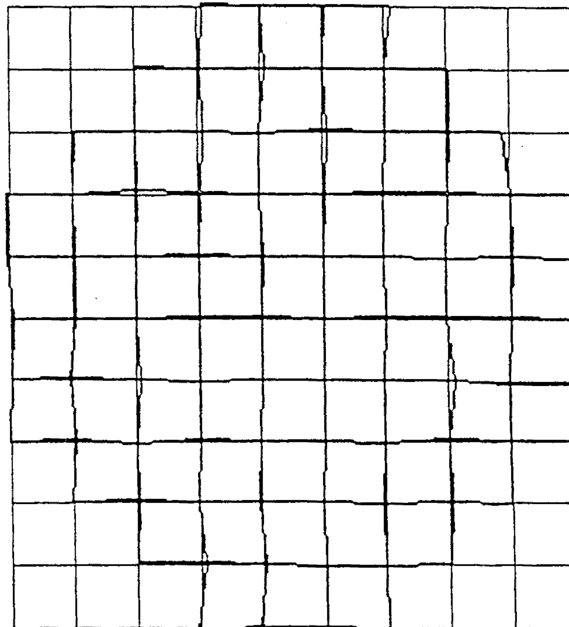


INS.DATE	2001/ 6 /28
Item	Stepping Accuracy
Condition	NA0.63 σ 0.65

MT-50130
SEIKO-6W¥365-NSP   06/28/01 16:56 J76S7792.NSP

	X	Y	
max	+0.010	+0.005	[micron]
min	-0.013	-0.008	[micron]
Average	+0.000	-0.000	[micron]
3 sigma	★ +0.012	★ +0.008	[micron]
direction	-0.000	-0.000	[micron]

Map scale = .10 mic/div

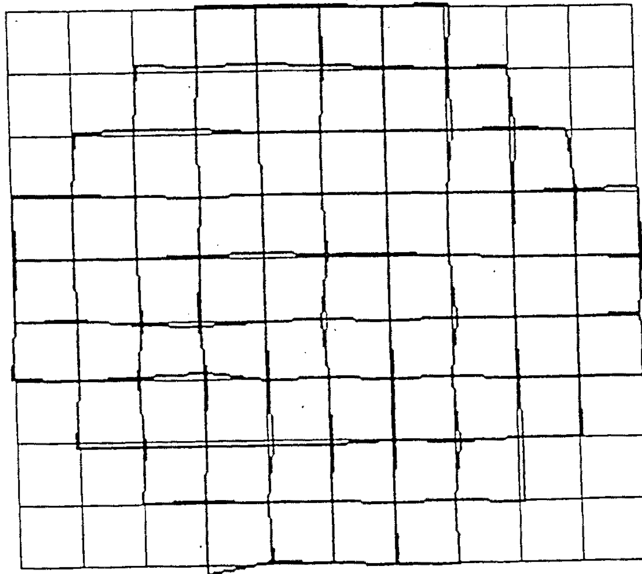


INS.DATE	2001/ 6 / 28
Item	Stepping Accuracy
Condition	NA0.63 σ 0.65

MT-50130
SEIKO-6W¥365-NSP 06/28/01 16:56 N76S7792.NSP

	X	Y	
max	+0.010	+0.010	[micron]
min	-0.009	-0.016	[micron]
Average	+0.000	-0.000	[micron]
3 sigma	★ +0.011	★ +0.014	[micron]
direction	-0.000	+0.000	[micron]

Map scale = .10 mic/div +

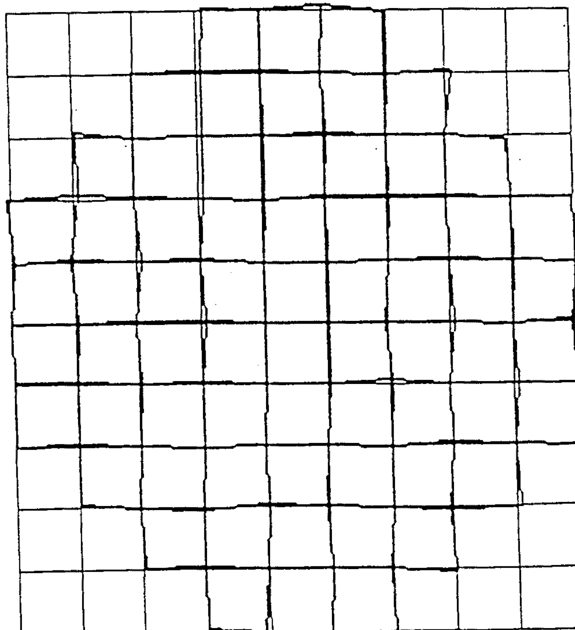


INS.DATE	2001/ 6 /28
Item	Stepping Accuracy
Condition	NA0.63 σ 0.65

MT-50130
SEIKO-6W¥365-NSP 06/28/01 16:56 J76S7793.NSP

	X	Y	
max	+0.009	+0.007	[micron]
min	-0.010	-0.006	[micron]
Average	-0.000	-0.000	[micron]
3 sigma	★ +0.012	★ +0.009	[micron]
direction	+0.000	-0.001	[micron]

Map scale = .10 mic/div



INS.DATE	2001/ 6 /28
Item	Stepping Accuracy
Condition	NA0.63 σ 0.65

MT-50130
SEIKO-6W¥365-NSP 06/28/01 16:56 N76S7793.NSP

	X	Y	
max	+0.010	+0.009	[micron]
min	-0.012	-0.011	[micron]
Average	+0.000	+0.000	[micron]
3 sigma	★ +0.012	★ +0.015	[micron]
direction	+0.000	+0.000	[micron]

Map scale = .10 mic/div

INS.DATE	2001/ 6 / 6
Item	Mechanical Prealignment Accuracy
Condition	————

```
i4hp_user[29] MpaHelp
======xl======
Sample count =    25
AVERAGE =     132.720 (nm)
3-SIGMA =  *2628.626 (nm)
======xr======
Sample count =    25
AVERAGE =     287.440
3-SIGMA =  *2736.126
======yl======
Sample count =    25
AVERAGE =      92.000
3-SIGMA =  *2342.457
======yr======
Sample count =    25
AVERAGE =  -1136.640
3-SIGMA =  *2185.762
======END=====
i4hp_user[30]
```

INS.DATE	2001/ 6 / 7
Item	Throughput 6"R
Condition	NA0.63 σ 0.65

```
i4)tpd -A
Date                          : Jun 7,'01 19:35:22
Machine                       : FPA-3000 i5
MAIN version                  :  maincpu = v13.06b
SF   version                  :  stgcpu  = BG5-2754:SFCPU:4.5+:2001.02.20:
                                 stgdsp  = BG5-2755:FLATDSP:4.5:2001.02.20:
                                 xypre   = BG5-0281:XYPRE:1.7:2000.01.06:1.7
                                 ofcd    = BG4-9027:FZANA-IF:1.2:1996.03.08:1.2
                                 stgcd   = BG3-5743:STGCD2:1.5:1998.06.22:1.5
WF   version                  :  wfcpu   =   V6.14F
RF   version                  :  rfcpu   =   v1.12a2
TV   version                  :  tvcpu   =   v1.18a [Aug 30 19:17 2000] - 1 -
CAP3 version                  :  cap3drv =   HRDhost: B  v4.30a [Feb 26 13:32 2001]
                                 cap3cpu =   HRDsub : B  v4.34a [Jun 05 09:33 2000]
Carrier System                : TYPE-6-R
Wafer Size                    : 6 inch ( 0.675) Wafer Type          : SEMI

Job Name                             : /canon/ND-SU-65-2nd.job
Tilt Compensation Mode               : Die by Die
Tilt Pattern Offset Mode             : Auto          Loop Mode      : Open Loop
Tilt Pattern Offset Sample Shots     : 16
Focus Pattern Offset Mode            : Bypass        Loop Mode      : Open Loop
Focus Pattern Offset Sample Shots    :  4            Wafer No.      : 999
Image Auto Focus                     : 1st wafer     Mark           : B and C
TVPA Measurement on Chuck            : Bypass        Loop Mode      : Open Loop
AGA Main                             :  4            AGA Sub        :  0
TVPA Measurement on Chuck            : Bypass        Loop Mode      : Open Loop
Auto Focus Mode                      : Smoothing AF  Performance    : Normal
Hot Line Interface(HLIF)             : Enable

wno - uload_wafer load_wafer tv_pre_align   aga    index [ms]   throughput[WPH]

 1,      4731,      32110,      2048,      45134,  100791,
 2,      4733,       4620,      1538,       4201,   30532,         117.9
 3,      4733,       4606,      1212,       4252,   30219,         119.1
 4,      4746,       4595,      1210,       4245,   30193,         119.2

<SUMMARY>
      uload_wafer load_wafer tv_pre_align   aga    index [ms]   throughput[WPH]

ave.     4737,       4607,      1320,       4232,   30314,       ★ 118.8

wno  1st-step   step   #####   #####   SF_posi  SF_focus  expo    shot [ms]

 2,    564  ,  223.6,   0.0,    0.0,    310.0,   20.8,   111.9,   335.5
 3,    564  ,  222.8,   0.0,    0.0,    309.8,   19.6,   112.1,   334.9
 4,    564  ,  222.4,   0.0,    0.0,    309.1,   20.3,   112.1,   334.5
ave.   564.0,  222.9,   0.0,    0.0,    309.7,   20.2,   112.0,   335.0
i4)
```

授權書
(出國報告書)

本授權書所授權之出國報告書名稱：赴美接受Canon FPA 3000i5+ I-Line 步進机訓練報告

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共同授權人均請親筆簽名：陳俊璞

日期：民國 90 年 08 月 06日

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