


JXA-8200 基本操作手冊



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1 開關機及升降電壓電流

1-1 開機

- a. 打開氮氣，壓力保持在 0.4~0.5Mpa (4~5kg/cm²)
- b. 打開冷卻水(兩部)
- c. 打開總電源(儀器背後)
- d. 轉動 POWER KEY 到 START 的位置後，自動回到 I 的位置
- e. 開 PR GAS
 - a. 如果使用 LaB₆ 燈絲必須等到 V3B 閥關閉，電子槍室只用 Ion pump 抽真空時，才可以開 PR GAS
 - b. PR GAS 必須流通超過 30 分鐘後才可以開啟 X-Ray counter (亦即表示，OPE PWR/OFF 需保持在 OFF)
 - c. PR GAS 流量控制在 6~7 l/min(1~2bubbles/sec)
- f. PR GAS 打開 30 分鐘過後，打開 OPE PWR/OFF 到 PWR
- g. 打開 SUN 以及 HP 兩台電腦，進入 Win XP 系統，並且連上 NFS(Network Filing System) ，所有使用者名稱均使用 jxl，而密碼為 jxljxl
- h. 執行桌面上 EPMA.rxc  程式，進到 server 系統，此時要求輸入帳號密碼同前
- i. 最後 EPMA Main Menu 會出現在螢幕左上方，此時可以開始操作。



1-2 升電壓電流

- a. 確定 HV ready 燈亮
- b. 按 ACCEL VOLTAGE ON (燈亮)
- c. 按影像控制畫面(左邊螢幕)左上方 HT (由藍色變為綠色)
- d. 設定電壓值
- e. EPMA Main MENU-> Initialize ->Auto Gun Startup

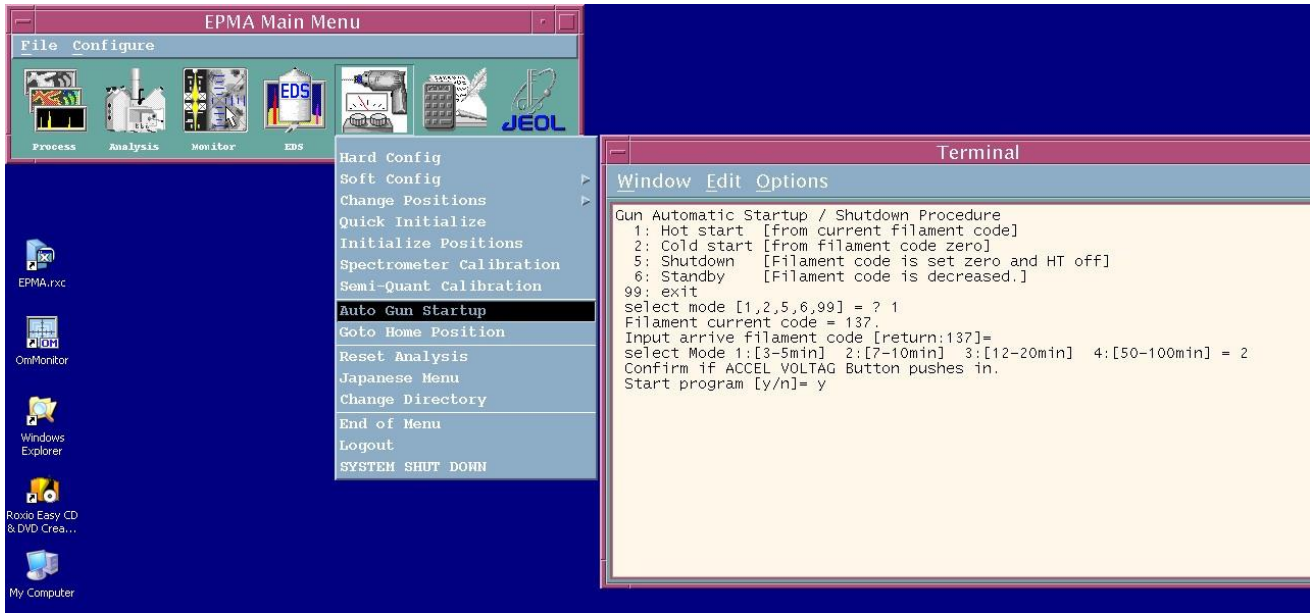
若此時 filament code=0 則選 2 COLD START

若此時 filament code=90 則選 1 HOT START

選完後依據所需輸入條件，例如最終 filament code=140，

升電流時間選 2. 7~10Min 或 3. 12~20Min

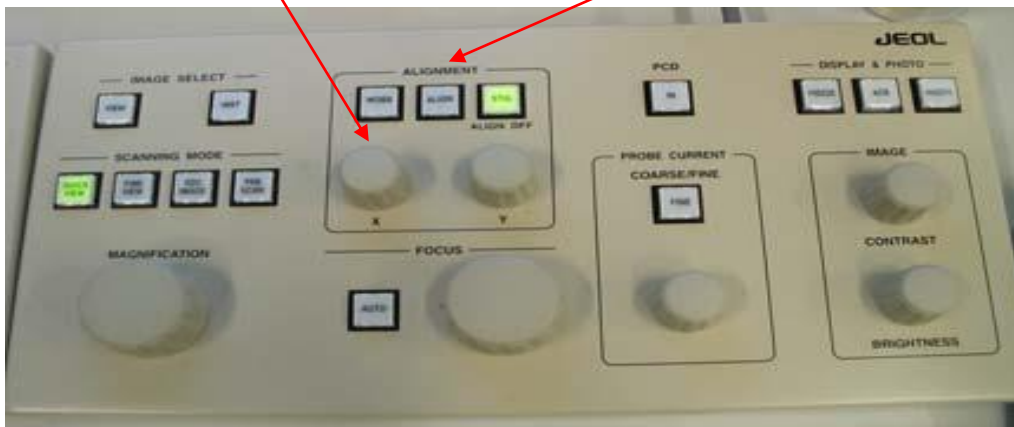
f.



g. 調整飽和電流，按影像控制畫面(左邊螢幕)右上方 EOS->將 Column mode 改為 EMP，此時可以觀察到模擬燈絲影像（此時注意 SEI Detector 必須開啟，必要時調整亮度對比，亮度及對比不可太高）->如果燈絲影像有缺角代表尚未飽和，請緩慢增加 Filament code 直到燈絲影像中心以及外圍顏色均勻，即代表燈絲已達飽和。

備註：燈絲使用久了，Filament code 需下降，才不會處於過飽和狀態，燈絲過飽和時，燈絲影像和飽和時一樣，此時降低 Filament code 直到影像中心以及外圍顏色開始變不均勻，即停止降低 Filament code。

h. Gun Tilt 及 Gun Shift 校正，燈絲飽和點調好後->按桌上影像調整控制器上 ALIGNMENT 之 ALIGN，此時在左邊螢幕左下角會出現 Alignment menu 的校正畫面->選 Gun Tilt Alignment->利用 X 及 Y 旋鈕將燈絲影像調到中心點->將 Column mode 改回 NORM->左邊螢幕左下角校正畫面選 Gun Shift Alignment->PCD ON(燈亮)->Probe Current 旋鈕順時鐘調到最大->開啟 MDA->利用 X 及 Y 旋鈕將 MDA 顯示之 Probe current 調到最大，如此重複數次即可完成校正。



1-3 降電壓電流

a. EPMA Main MENU-> Initialize ->Auto Gun Startup

選 5 SHUTDOWN 使 filament code 降到 0

備註：若只是每天下班時的關機則選 6 STANDBY 使 filament code=90，以下步驟亦不需執行

b. 將電壓值改為 0 kV

c. 按影像控制畫面(左邊螢幕)左上方 HT (由綠色變為藍色)

d. 關 ACCEL VOLTAGE ON (燈暗)

1-4 關機

a. 確定真空保持在 READY 狀態 (READY 燈亮)

b. 降電壓電流

c. 關閉所有 EPMA 程式 (視窗)

d. EPMA Main Menu->Initialize->System Shutdown，按 OK 後 server 關閉 (SUN 電腦關閉)

e. 關 PC (Win XP 系統)

f. 關 OPE PWR/OFF 到 OFF

g. POWER KEY 轉到 0

h. 關 PR GAS

i. 關氮氣

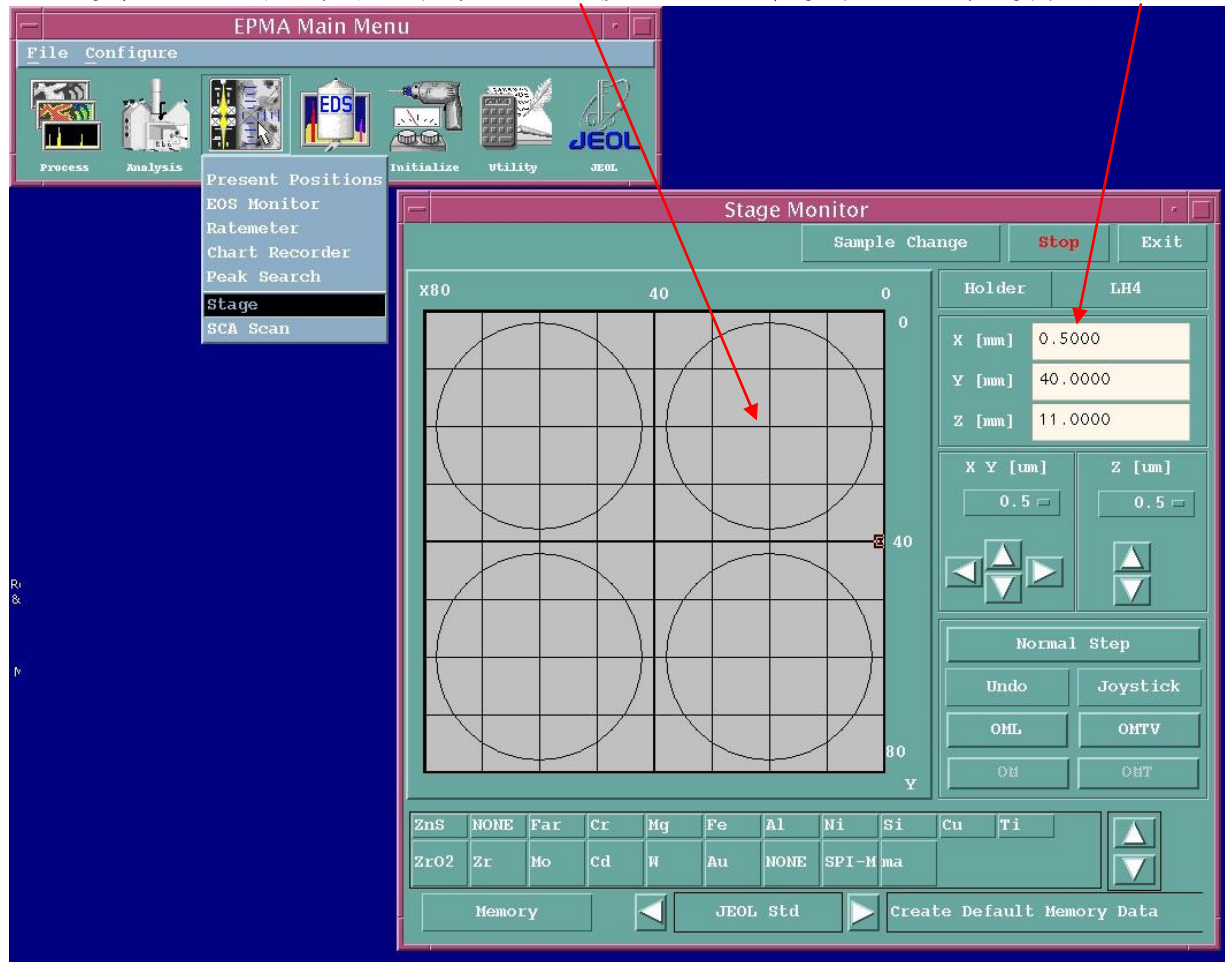
j. 過 5~10 分鐘後關冷卻水


備註：一般除非長時間不使用儀器否則真空系統和 server 都是保持開啟狀態，頂多降低電流或再進一步關 PC 及 OPE PWR/OFF 到 OFF

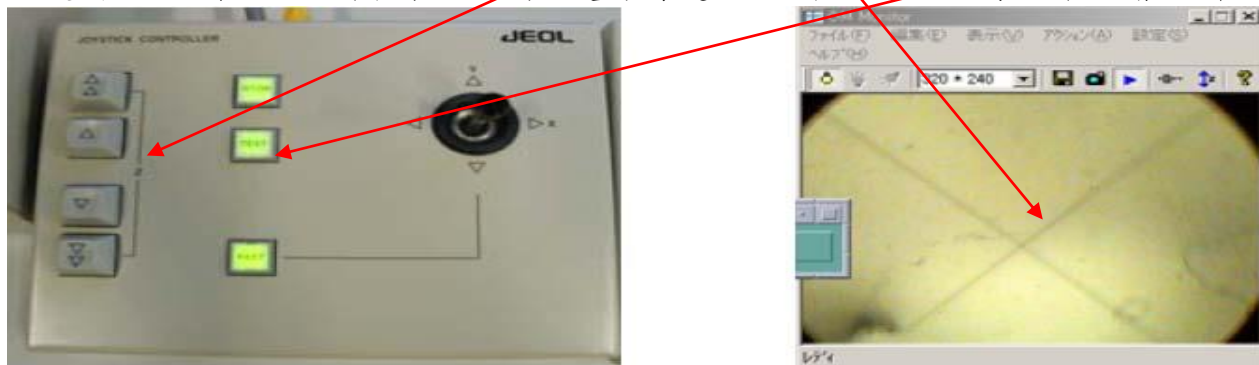
2 設定檢測位置及影像調整

2-1. 進入EPMA Main Menu -> Monitor ->Stage

2-2. 選擇 Holder 種類,再以滑鼠快點二下移動至欲分析處或於 X、Y 軸處輸入座標



2-3. 執行桌面上之OmMonitor  程式，開啟光學顯微鏡光源（必要時調整亮度對比），以JOYSTICK CONTROLLER 調整Z軸Focus(十字交叉線重疊)清楚，並按一下TEST 鍵後再調整Z軸Focus(十字交叉線重疊)清楚，直到按TEST鍵時焦聚不會跑掉

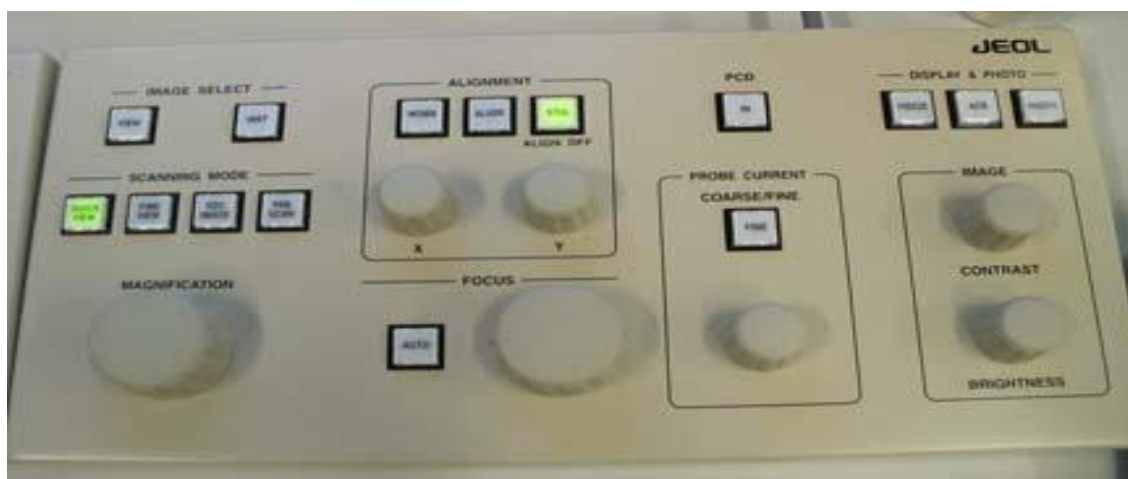


注意：調整SEM 的Stage 高度，並非是電子束的聚焦

2-4 成像

- A. PCD IN 調整適當之 Probe current
- B. 確定 SCAN SPEED (有四段)
- C. PCB SCAN 燈要亮
- D. ALIGNMENT 選 STIG
- E. PCD IN 關閉，燈要暗
- F. DISPLAY & PHOTO 之 FREEZE 要關閉，燈要暗
- G. 選 IMAGE 訊號 (用 IMAGE SELECT 之 VIEW 可循環選擇 SEI/COMPO/TOPO)
- H. 調整亮度對比
- I. 調整焦聚及散光

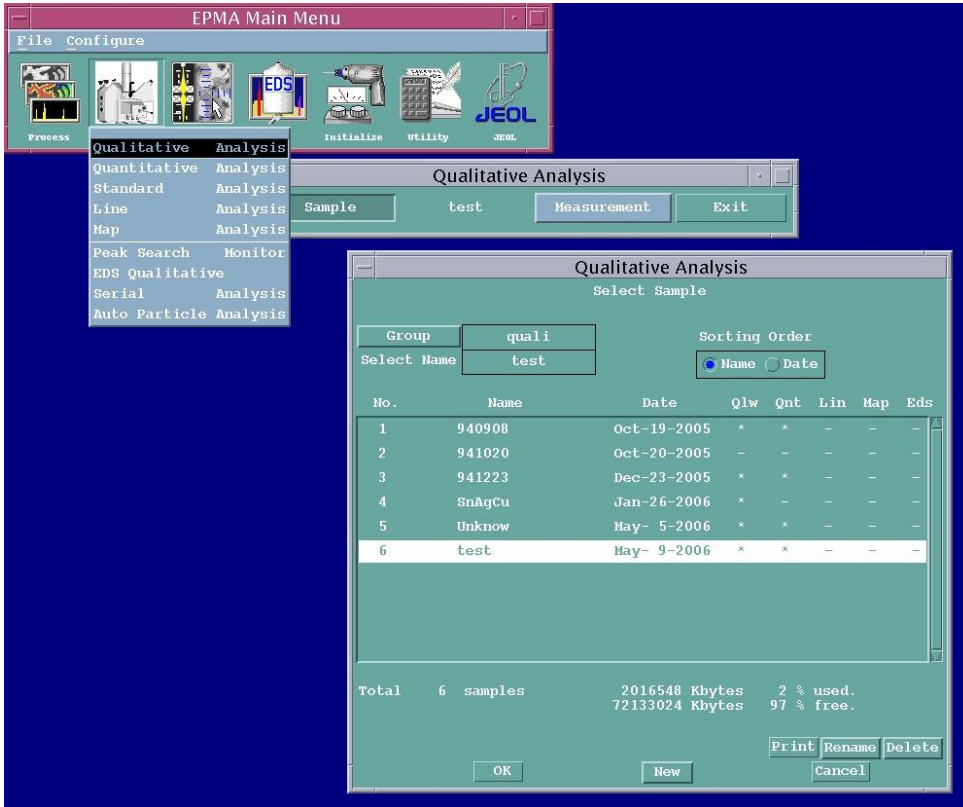
註：若選擇BEI 影像, 必須要關閉光學顯微鏡光源



3 定性分析

3-1. 移動到想要檢測的大概位置，並調整SEM 影像

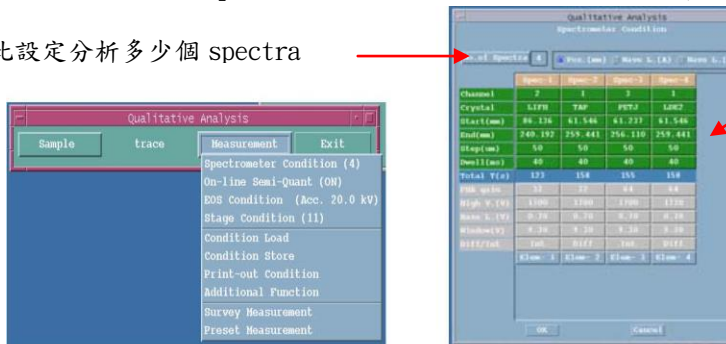
3-2. 進入EPMA Main Menu ->Analysis-> Qualitative Analysis ->Sample 設定存檔位置



3-3 選擇Measurement -> Spectrometer Condition 設定分析的參數

在此設定分析多少個 spectra

在此設定分析參數



設定 Channel

設定 crystal

設定分析範圍與 Dwell time



註1. 做定性分析時，須確認sample 含那些元素，否則須做全範圍的掃描

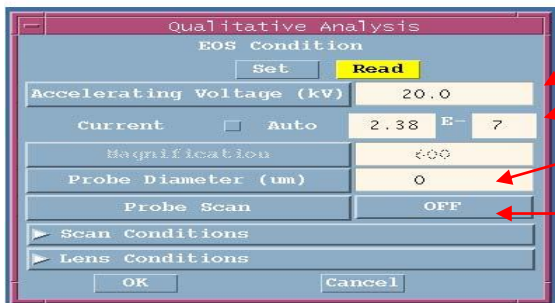
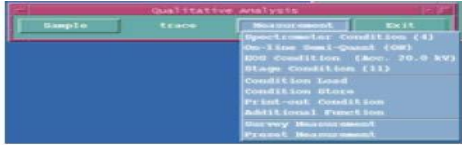
註2. 參數設定包含Channel. Crystal. Start. End. Step. 及Dwell

註3. 建議參數:Start--最小. End--最大. Step--50. Dwell--100~200ms

註4. Step 的設定值最好不可太大, 否則會影響判斷值.

通常設為50(crystal such as TAP. PET. LIF), 或者為100(in crystal STP. LDE2)

3-4 選擇Measurement->EOS Condition, 將加速電壓、Probe current、probe scan與否以及影像焦距等設定好後, 再輸入Probe diameter最後選擇Read完成設定, 或者在EOS Condition 中輸入欲分析之參數後, 選擇SET完成設定



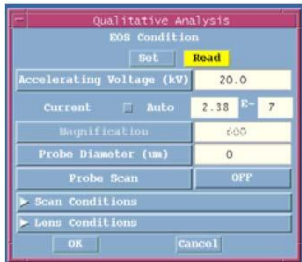
設定加速電壓

設定 Probe current

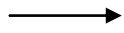
Probe diameter 0~200(最好在 30 以下)

選擇 OFF 代表不掃描, 打在正中心

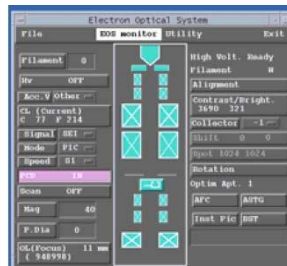
註: Set 及 Read 功用



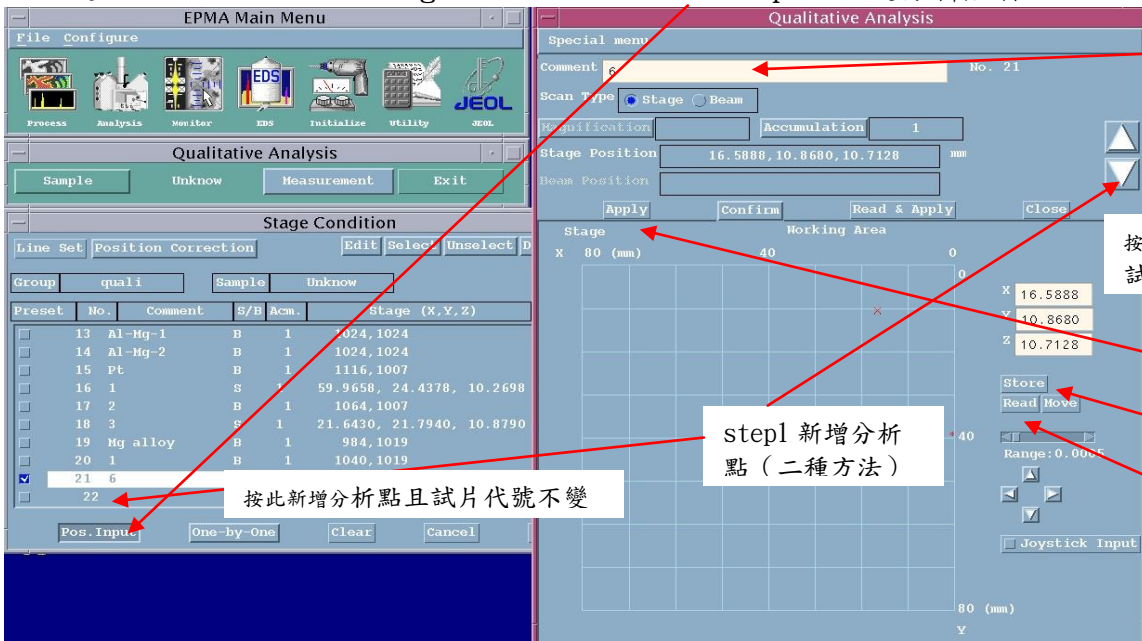
SET



READ



3-5 進入Measurement -> Stage Condition -> Pos Input 設定分析座標



step2 試片代號

按此新增分析點且試片代號會加 1

step5. apply

step4. store

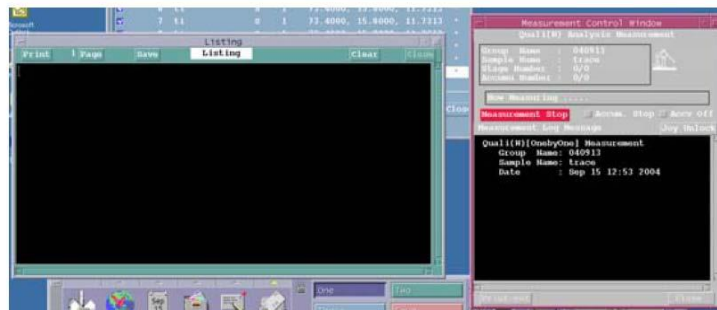
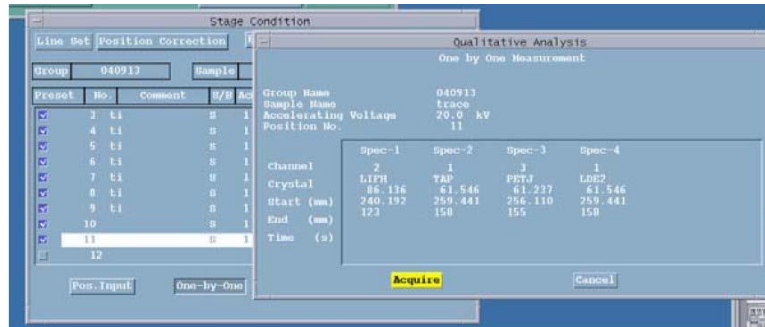
step1 新增分析點 (二種方法)

按此新增分析點且試片代號不變

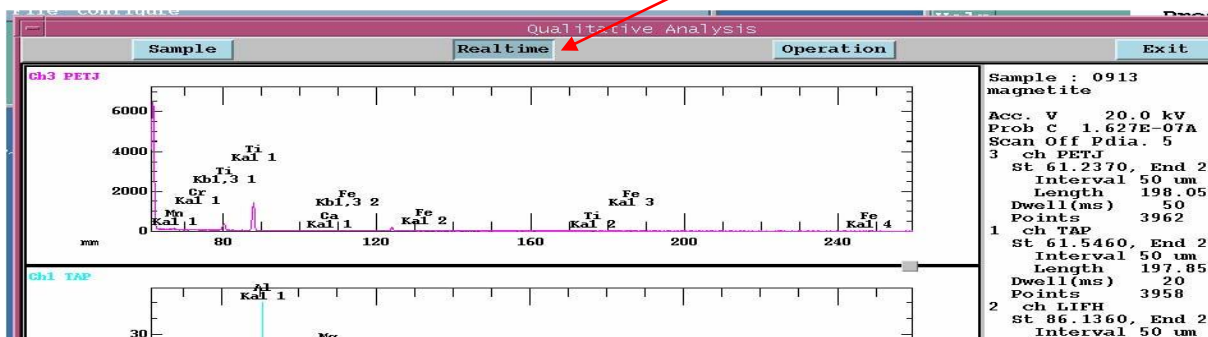
step3. 移到分析點後按 READ 讀取座標

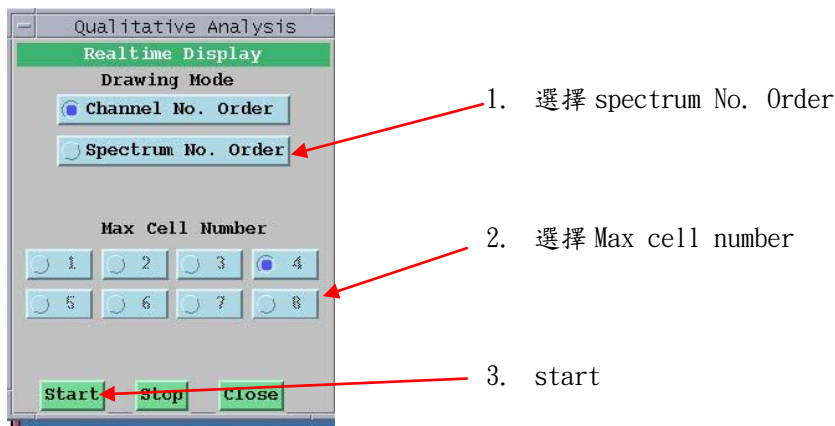
註1: Apply 與Read & Apply 的差異: $Read \& Apply = Read + Store + Apply$ ，因此步驟3~5可直接按Read & Apply取代

3-6 回到Stage Condition 視窗，選擇one-by-one 再按Acquire

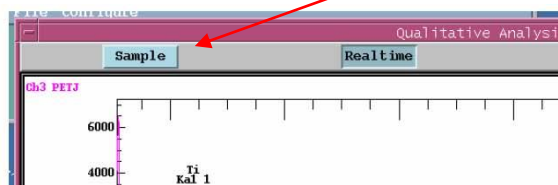


3-7 開啟EPMA Main Menu -> Process -> Qualitative Analysis -> Real time開啟及時分析模式





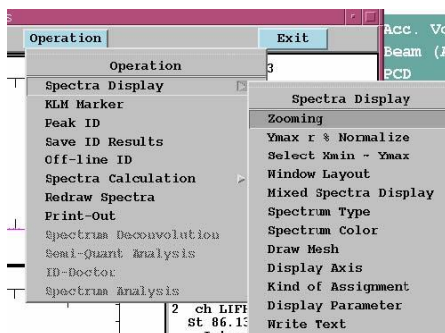
3-8 開啟EPMA Main Menu ->Process -> Qualitative Analysis-> sample 開啟Group 舊檔案



3-9 將圖譜放大, 確定是否有圖譜重疊或遺漏小peak

3-10 進入Qualitative Analysis ->Operation -> Spectra Display-> Zooming (或者按滑鼠右鍵. 開啟快捷列, 選擇Zooming)

3-11 用滑鼠左鍵拖曳放大圖譜



3-12 確定元素: 開啟Operation -> Peak ID (或者按滑鼠右鍵. 開啟快捷列, 選擇Peak ID)

3-12-1 點選想要分析的位置, 確定後按SET即可標定元素, 如果誤植標定元素可選定該處, 選取想要去除之元素然後選Delete

3-12-2 any length可計算二位置間距離

Qualitative Analysis

Peak ID

1 2 3 4 5 6 7 8

CH-2 LIFH

134.586 mm 1.935 A 6.4073 KeV
2164 cnt

X ray Name	Order	Diff.	Int.
Ir Lg2	2	-0.299	1
Th La2	2	0.040	10
Fe Ka1	1	0.060	100
Pb Lb3	2	0.212	6

Order: 8 Min Int.: 0

Prev ID Next ID
 Prev Delete
 Set Shift ID Any Length Close

1. 選圖譜
 2. 選標定元素
 3. set or deltdte

3-13 更改圖譜的座標顯示

Qualitative Analysis

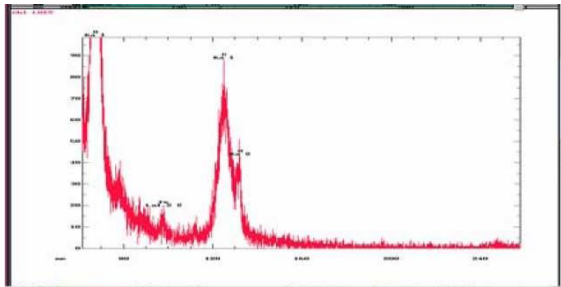
Display Axis

Position mm
 Wave length A
 Wave length nm
 Energy keV

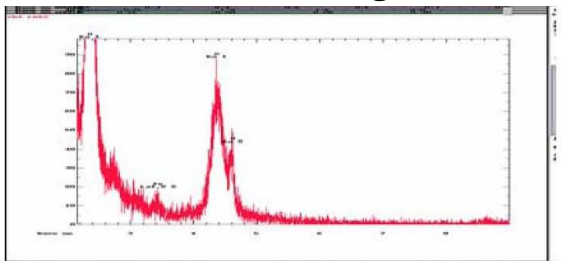
Wave order 1

OK Close

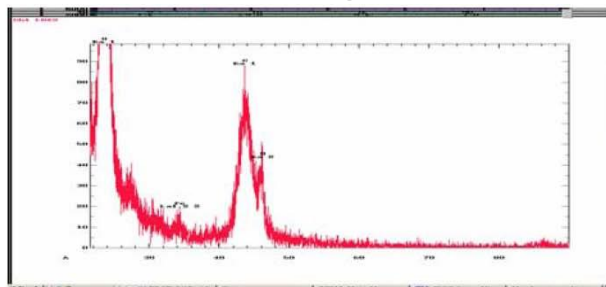
顯示position L(mm)



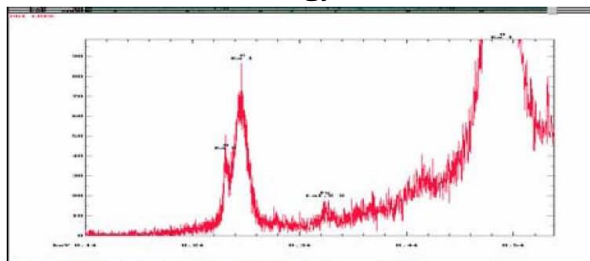
顯示Wave length(nm)



顯示Wave length(A)



顯示Energy(keV)



4 定量分析

4-1. 確認所有元素

4-1-1 在做定量前，必須確認全部的元素都存在，特別是微量的元素，一般做法會在確認時將SEM 加速電壓設在15~20kV

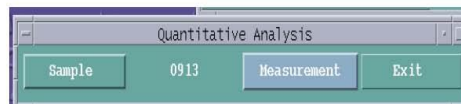
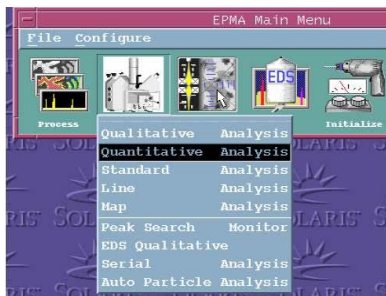
4-1-2. 除了確定元素成份外，還必須確定peak 不會overlap 以及確定Background 設定，可製做下列表格：

例：分析Si. Ti. Cr. Mn. Fe. Ni

(通常L 設定在5, 但可視情況做修正, 如下表Ni 設在+3)

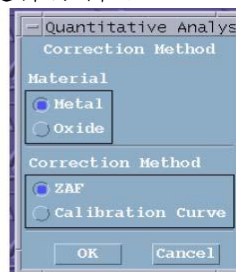
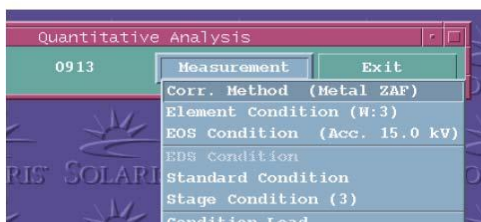
	Z	line	Crystal	Peak	L(+)	L(-)
Si	14	Ka	TAP	77	+5	-5
Ti	22	Ka	PET	88	+5	-5
Cr	24	Ka	LIF	159	+5	-5
Mn	25	Ka	LIF	146	+5	-5
Fe	26	Ka	LIF	135	+5	-5
Ni	28	Ka	LIF	115	+3	-5

4-2. 進入EPMA Main Menu 的Analysis -> Quantitative Analysis 開啟定量分析

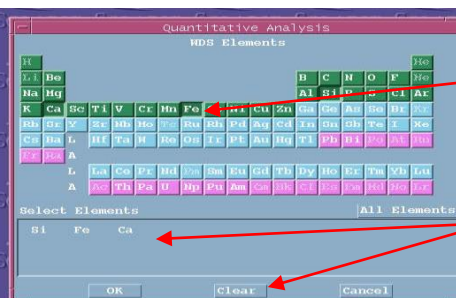
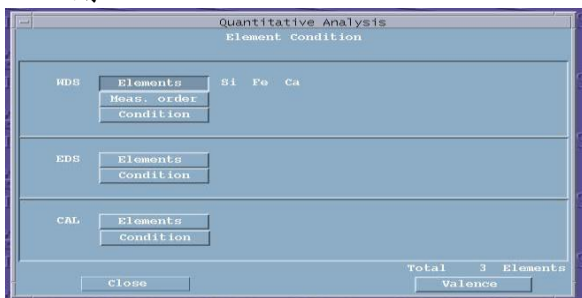


4-3. 設定存檔檔名及位置開啟Analysis -> Quantitative Analysis -> Sample

4-4. 開啟Measurement -> Corr. Method 選擇分析方法



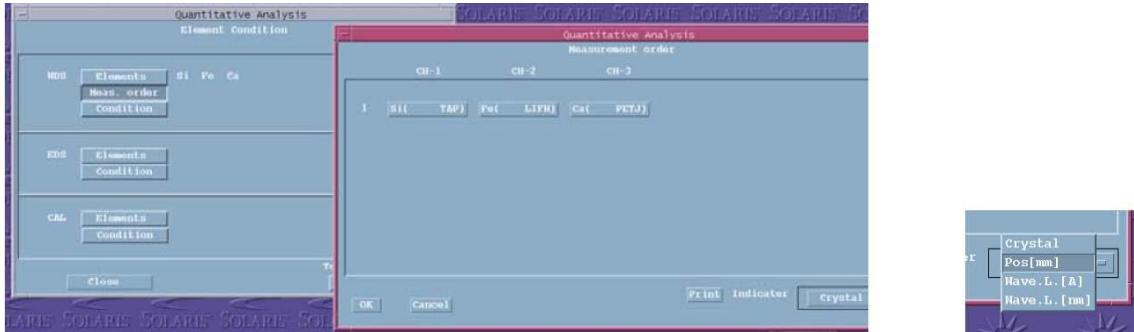
4-5. 開啟Measurement -> Element Condition -> WDS Element



直接點選週期表上元素新增分析元素

要取消分析元素，可以滑鼠左鍵拖曳反白後按 delete

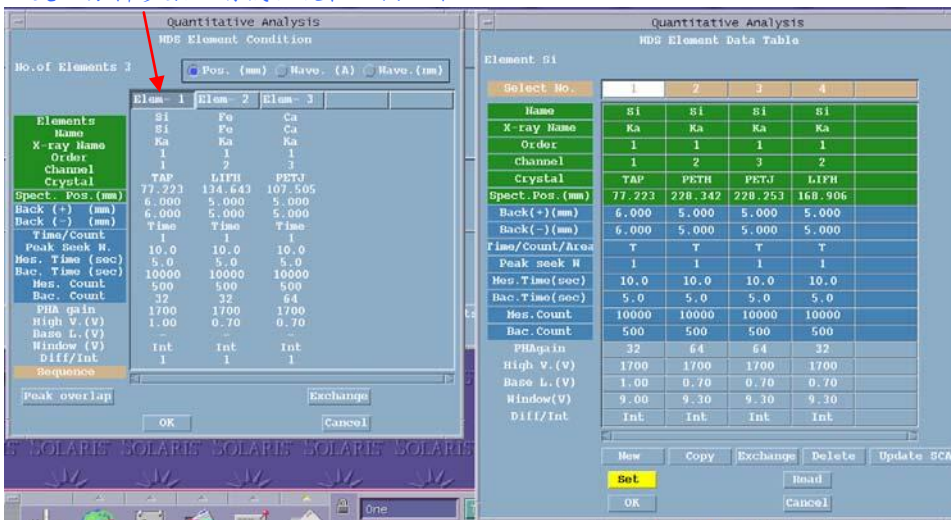
4-6. 確認Channel 分析何種元素開啟Measurement -> Element Condition -> WDS Mass. order



註:Channel 分配元素數量分析, 關係到分析的時間長短. 若過於集中在某一個channel 分析, 會讓增加分析的時間, 建議最好能平均分配

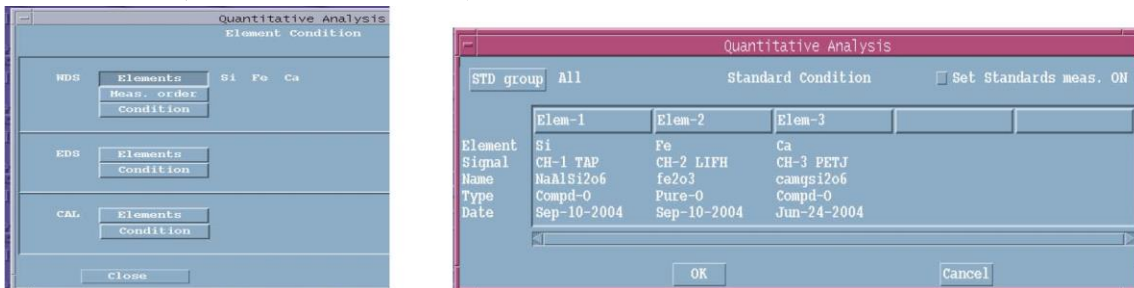
4-7. 設定分析參數開啟Measurement -> Element Condition -> WDS Condition

欲更改分析參數以滑鼠左鍵在此按一下



註:Back(+)及Back(-)設定. 一般是設為+5 及-5, 但若在做定量分析時, 發現有其它元素干擾, 此時就必須更換數值.(參閱4-1-2)

4-8 確認分析的元素都有建立標準值(Standard)



4-9. 選擇Measurement -> EOS Condition 設分析參數後(請參閱步驟3-4)

4-10. 進入Measurement -> Stage Condition -> Pos Input 設定分析座標 (參閱步驟3-5)

4-11 選擇 One by one後再按Acquire(參閱步驟3-6)

4-11. 數據處理

4-11-1 進入EPMA Main Menu 的Process -> Quantitative Analysis ->summary

4-11-2. Sample選取檔案

4-11-3. summary->clear all->some->選擇要輸出之點 (選擇後會打勾) ->選ROW及Spreadsheet->分別選Mass->type out、100%>type out、Atom->type out後在List中會出現所有數據

The screenshot shows the EPMA Main Menu interface. The 'Summary' window is active, displaying a table of data for 'quant' samples. The 'Listing' window is also open, showing a detailed table of elemental concentrations for Ag and Sb. The 'Listing' window has a menu bar with 'File', 'Edit', 'Page 1', and 'Exit'. The 'Edit' menu is open, showing 'Clipboard' and 'Clear' options. The 'Clipboard' option is highlighted. The 'Listing' window displays the following data:

No.	Sb	In	Ag	Total
1	97.831	0.865	0.084	98.78
2	94.021	0.695	0.000	94.71
3	93.325	0.712	0.097	94.13
4	51.252	49.316	0.000	100.56
5	49.067	49.453	0.045	98.56
Minimum	49.067	0.695	0.000	94.13
Maximum	97.831	49.453	0.097	100.56
Average	77.099	20.208	0.045	97.35
Sigma	24.664	26.634	0.045	2.79
"No. of data"	5			

4-11-4. 在List中選Edit->Clipboard

4-11-5. 開啟Execel->貼上數據->另存新檔即可

5 建立標準元素值(Standard)

有二種方式:

方法一:使用Calibration Curve

方法二: 不使用Calibration Curve (ZAF、Thin film ...)

註1:方法一較為準確, 但必須有不同濃度的已知樣品, 在實際上執行有困難(如鋼鐵材含有不同濃度carbon, 可使用此方法)

註2:方法二只須準備一個濃度的樣品, 是一般最常使用的方式

5-1 做Peak Search:

5-1-1 開啟EPMA Main Menu-> Monitor ->Peak Search 視窗

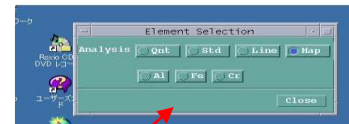
5-1-2 選擇元素及設定分析參數, 再執行Peak Search



step1: 選擇分析元素

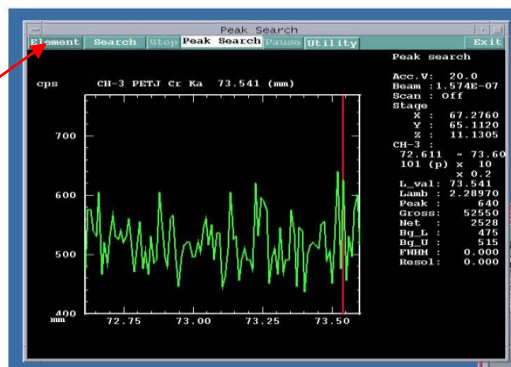
step2: 執行peak search

Step2 條件設定好了後執行 Peak search



先選 std 再選元素

Step1 選 element

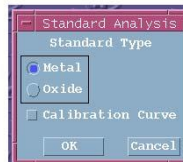
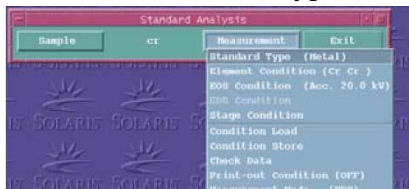


5-2 進入EPMA Main Menu 的Analysis -> Standard Analysis 開啟STD分析



5-3 設定存檔檔名及位置，開啟Analysis -> Quantitative Analysis -> Sample

5-4 設定Standard Type 的開啟Measurement -> Standard Type

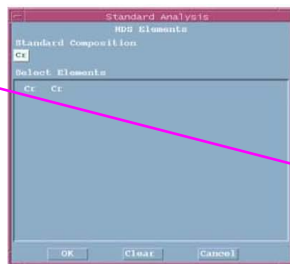
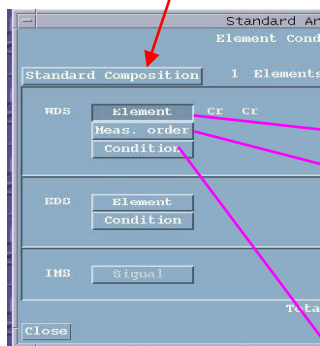


5-5. 選擇分析的元素及分析的參數(使用方法一及方法二的略有不同，分述如下)

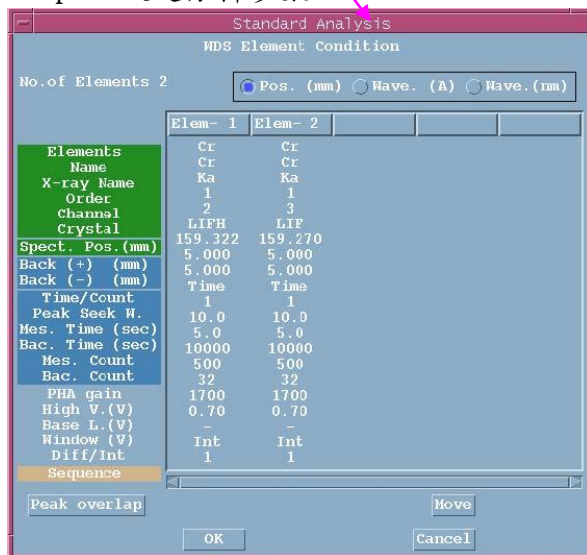
5-5-1: ZAF

Step1: 輸入標準試片之成分 Step2: 選擇分析元素

Step3: 選擇晶體及Channel

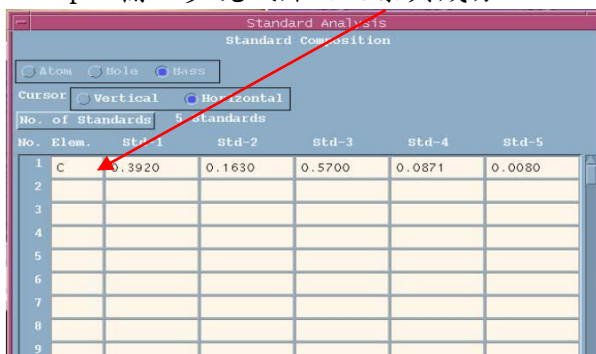


Step4: 設定分析參數

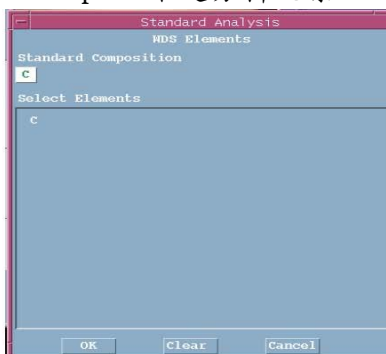


5-5-2 Calibration curve

Step1: 輸入多塊試片之元素與成分



Step2: 確定分析元素

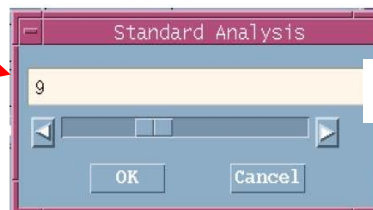
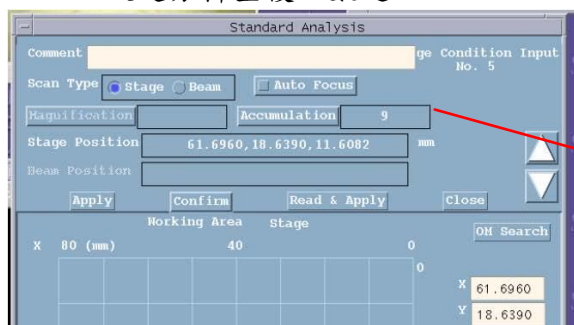


5-6. 設分析參數後: 選擇 Measurement -> EOS Condition 請參閱步驟3-4

5-7. 若使用方法二(ZAF). 請參閱步驟3-4~3-6

5-8. 若使用方法一與方法二在設定上會略有不同, 方法一通常會在不同濃度上. 多測幾點, 並取其平均值, 以求準確確性, 請參閱如下步驟

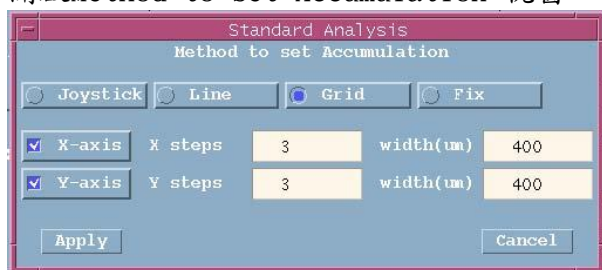
5-8-1 設定分析重複次數進入 Measurement -> Stage Condition -> Pos Input -> Accumulation



輸入分析點數

5-8-2. 設定測定點數及移動距離

開啟 Method to set Accumulation 視窗

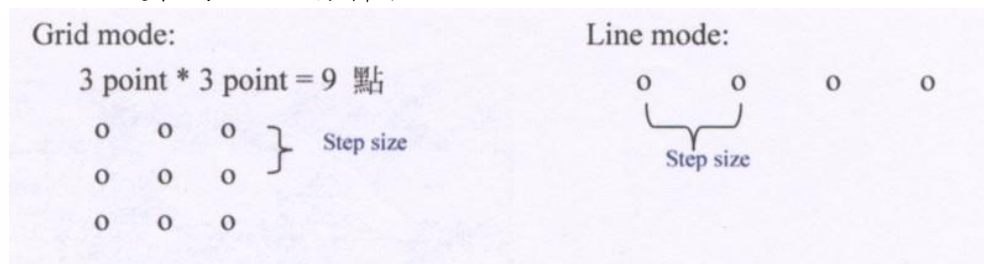


Joystick: 利用搖桿隨機取點

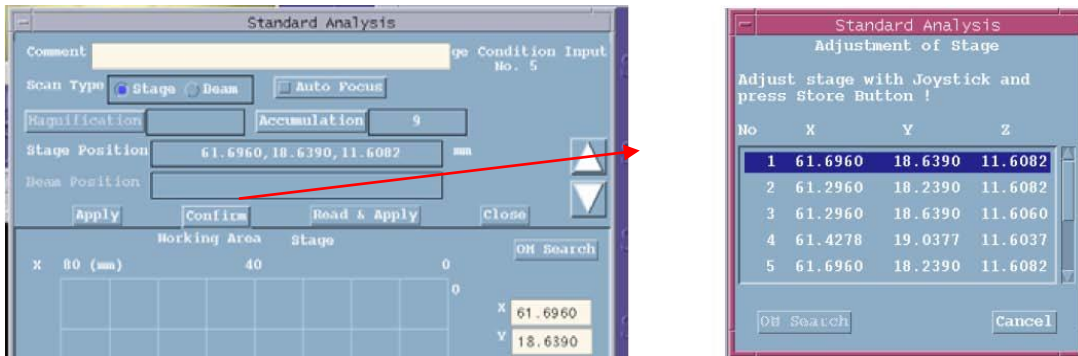
Line: 在一條線上等距取點

Grid: 在一範圍內設定X軸等距, Y軸等距的分析點

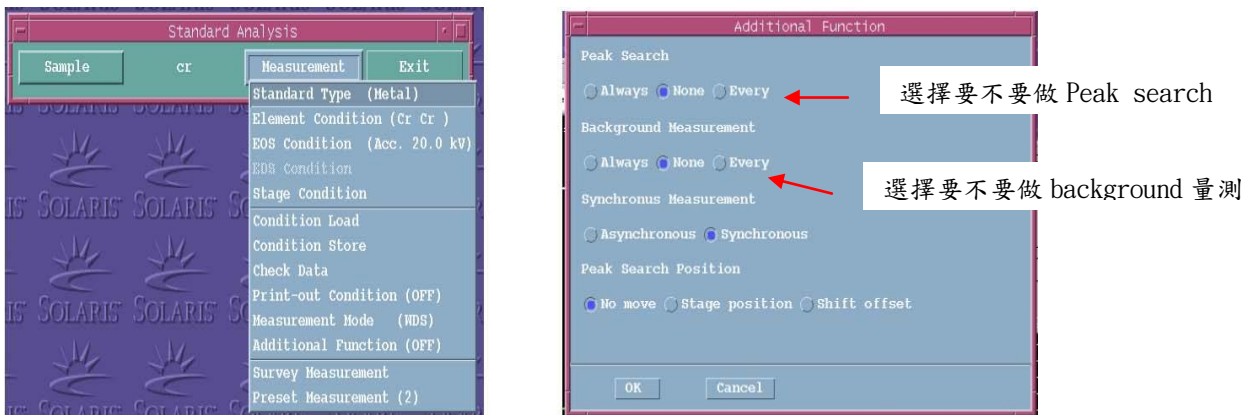
Fix: 固定在同一點上分析數次



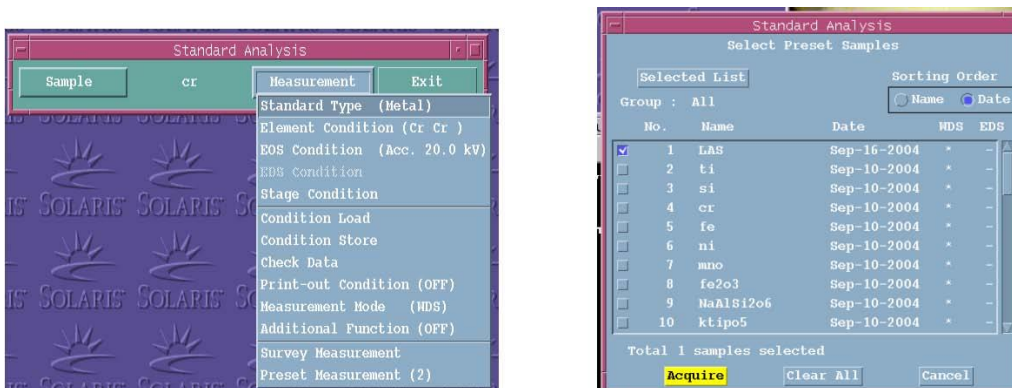
5-8-3 回到座標設定視窗，選擇Confirm，並開啟光學顯微鏡視窗，確認每一點的Z軸對焦都ok



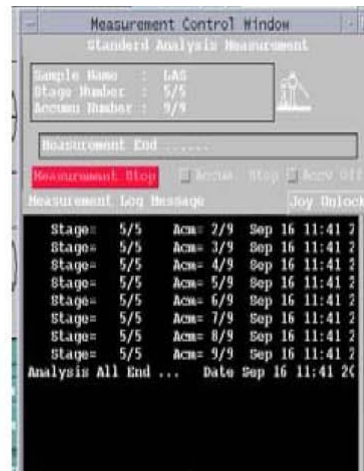
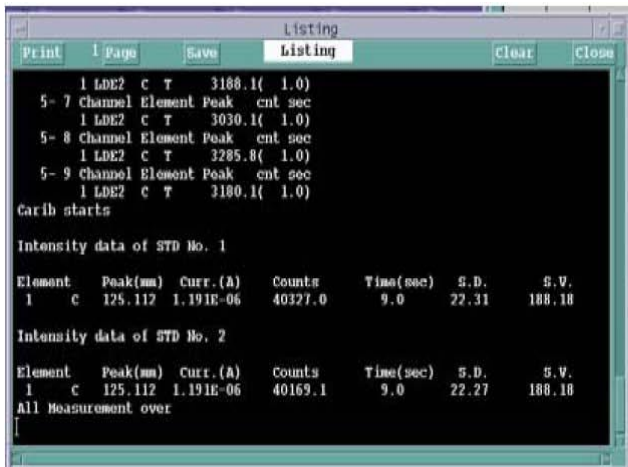
5-8-4 開啟Measurement -> Additional Function



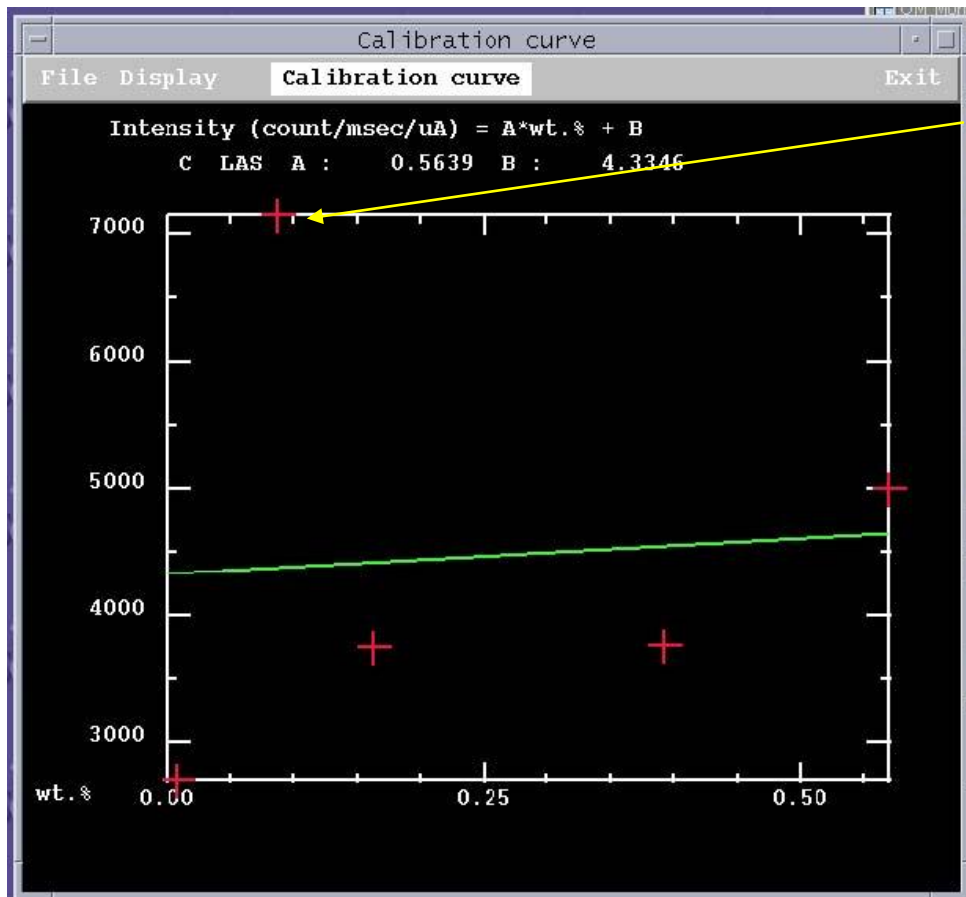
5-8-5 開啟Measurement -> Select Preset Samples 執行Acquire



5-8-6 選擇Acquire 後，機台自動執行偵測，會出下面視窗



5-6-7. 檢測曲線圖是否有問題（除了Calibration curve法外不會有此圖）



此點明顯不同，可能是
濃度輸入問題或試片
有問題

6. Map Analysis

6-1. 確認所有元素

6-2. 做Peak Search

6-3. 進入EPMA Main Menu 的Analysis -> Map 開啟Map Analysis分析視窗



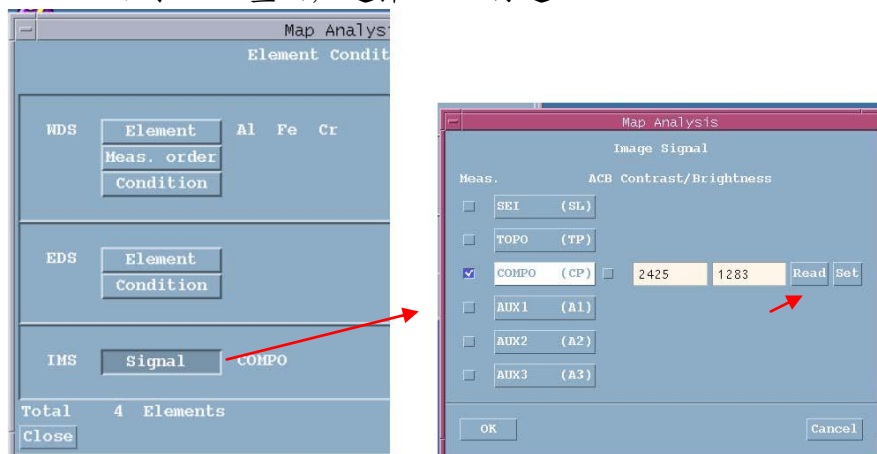
6-4. 設定檔存位置及分析參數(請參閱步驟4-3-4-9, Map 分析時, 建議Dwell time 至少設20 msec)

6-5. 選擇SEM 影像

6-5-1 進入Element Condition -> Signal

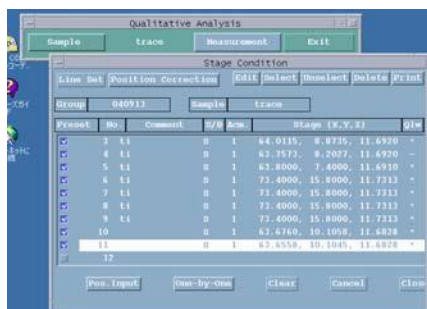
6-5-2 調整SEM影像

6-5-3 回到EPMA 畫面, 選擇Read 再選OK

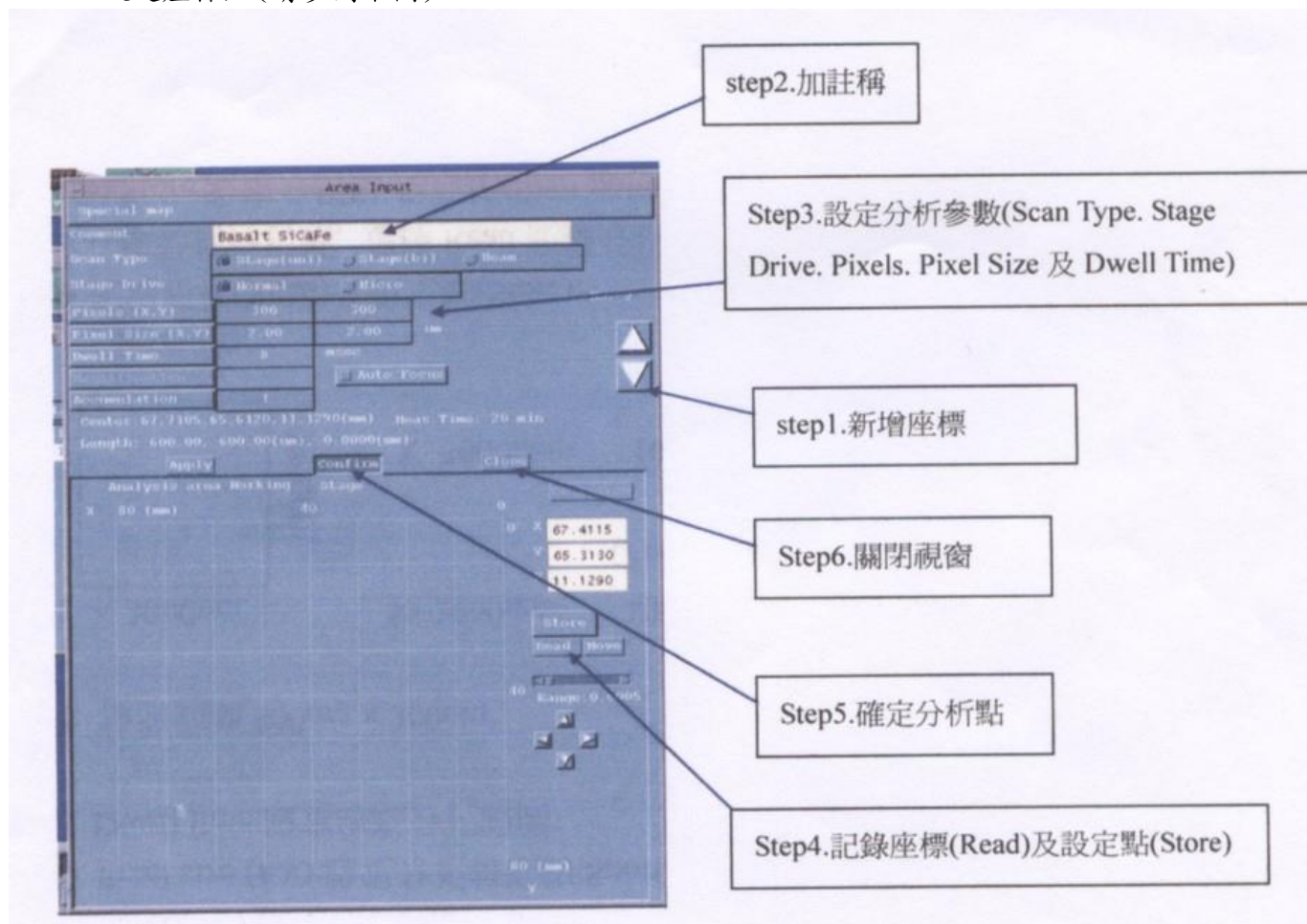


6-6. 確定分析的範圍

6-6-1. 進入Measurement -> Stage Condition -> Pos Input 設定分析座標



6-6-2. 設定座標點(請參閱下圖)



Step1: 新增座標

Step2: 加註稱

Step3: 設定分析參數

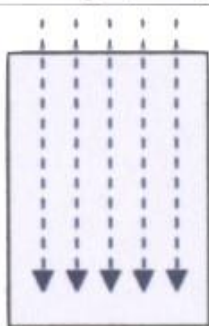
A. Scan Type: 共有三種掃描模式 Stage(uni)、Stage(bi)以及Beam

Stage uni: 為固定Beam, 移動Stage 固定由上往下掃描 (時間較久, 精確性較高)

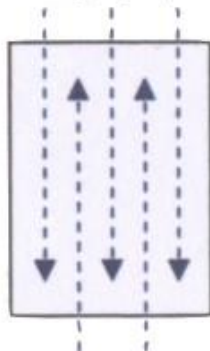
Stage bi: 為固定Beam, 移動Stage 由上下來回掃描 (時間快, 準確性差)

Beam: 為固定Stage, 移動Beam 固定由左而右掃描 (使用此模式, 倍率須在3000 倍以上)

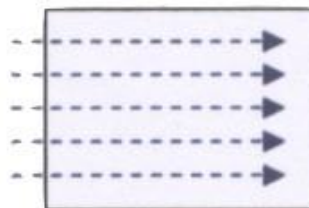
Stage(uni)



Stage(bi)



Beam



B. Stage Drive:

Normal step : 每個step最小0.5 um (速度較快)

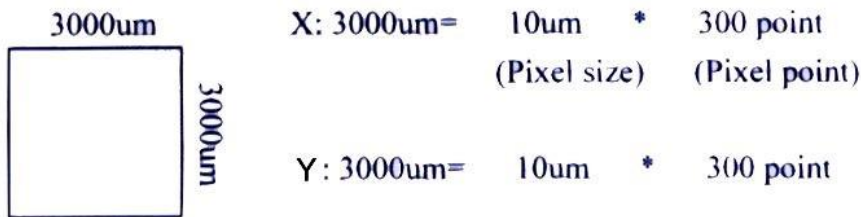
Micro Step : 每個step最小0.02 um

C. Pixel (x.y):設定分析點數

D. Pixel size (x.y): 設定分析每點的Spot Size

E. Dwell time: 設定每點分析時間

例: 檢測範圍 300um x 300um



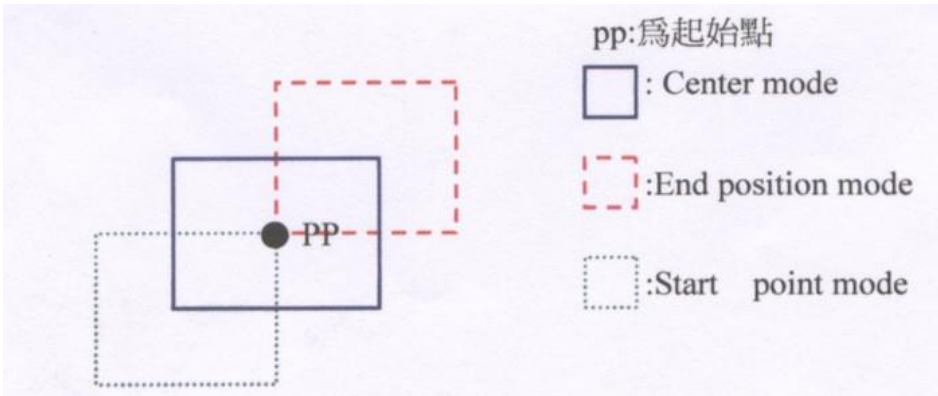
註: 分析時間長短由pixel以及Dwell time決定
Pixel最好選256 X 256以上或附近效果較好

Step4: 記錄座標(Read)及設定點(Store):

(a). 移動到分析點, 選擇Read 記錄分析點的座標 (目前位置的中心點)

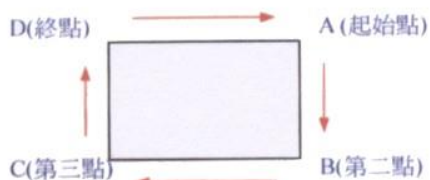
(b). Store 設定分析點, 有三種方式

1. store to start(Start point mode):代表將讀取到的座標當作本次實驗的起始點
2. store to center (center mode) :代表將讀取到的座標當作本次實驗的起中心點
3. store to end(END position mode) :代表將讀取到的座標當作本次實驗的終止點



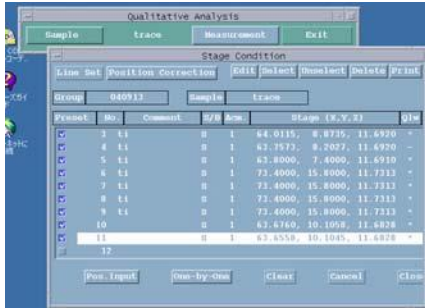
Step5: 確定分析: 點開啟光學顯微鏡, 確認Map 分析四邊對角的焦距

例: Store 設為 Start point mode 起始點



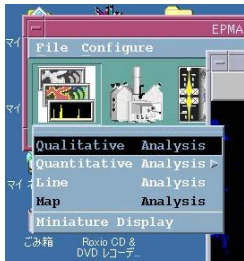
Step6: apply, 並關閉視窗

6-6-3: 回到Measurement -> Stage Condition -> One by one 開始分析



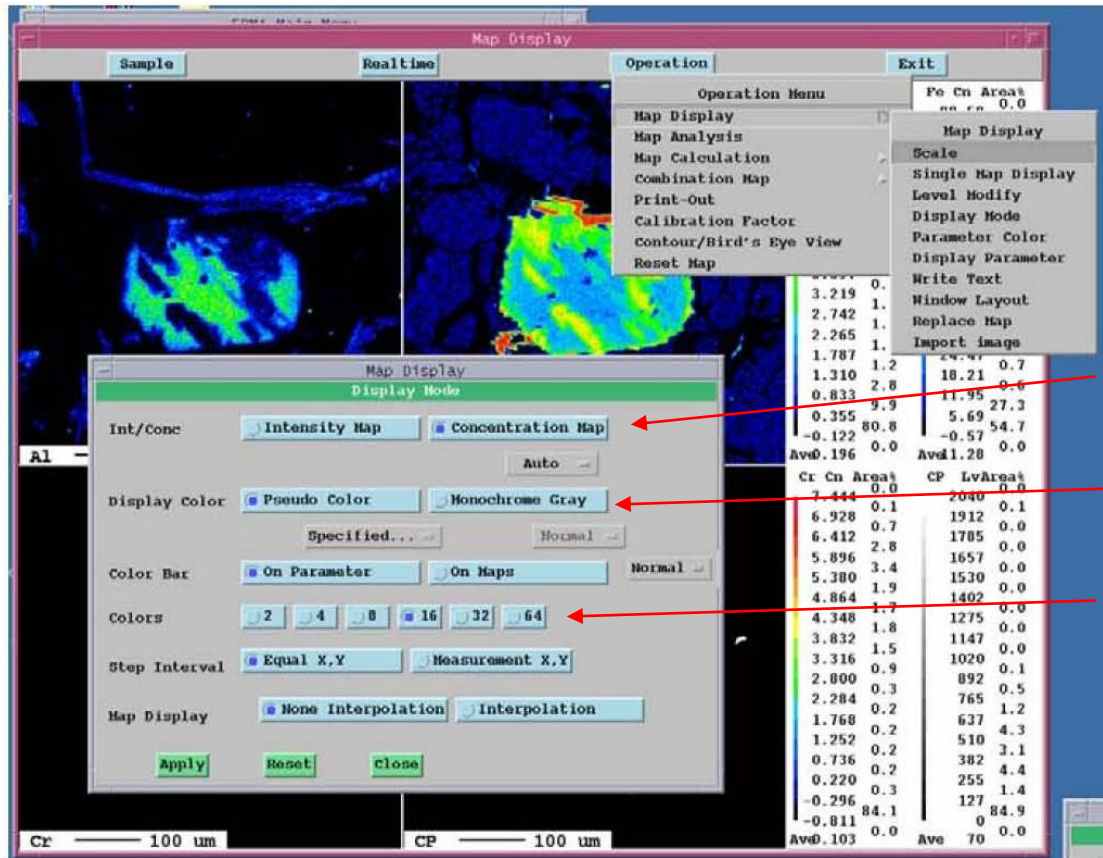
6-7. 觀測分析及時狀況:

開啟EPMA Main Menu -> Process -> Map Analysis 視窗, 選擇 Real time



6-8. Map analysis 數據分析

6-8-1 進入Map Analysis -> Operation-> map Display-> Display Mode

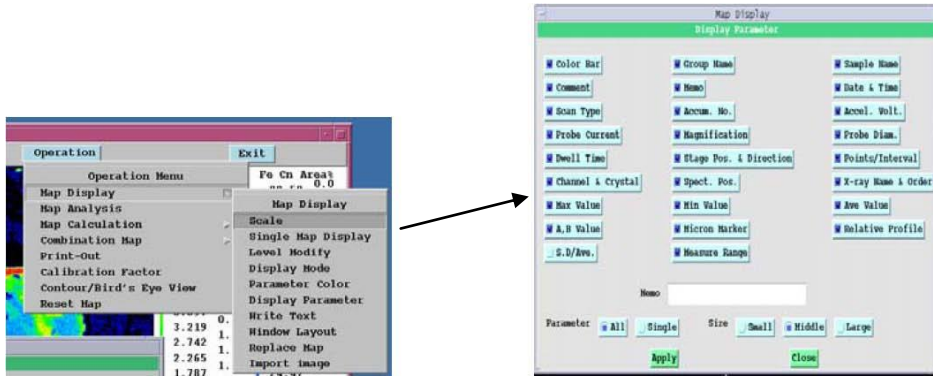


以強度或濃度顯示

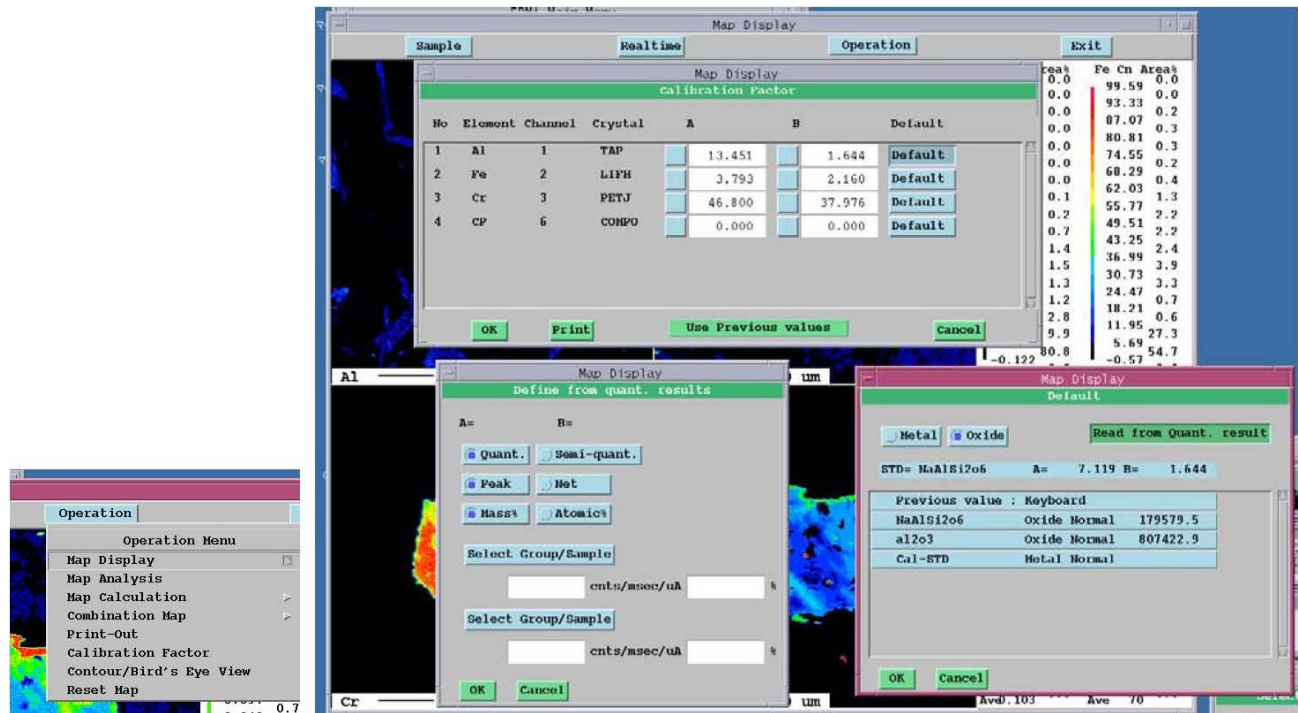
以彩色或灰階顯示

選擇幾種顏色顯示

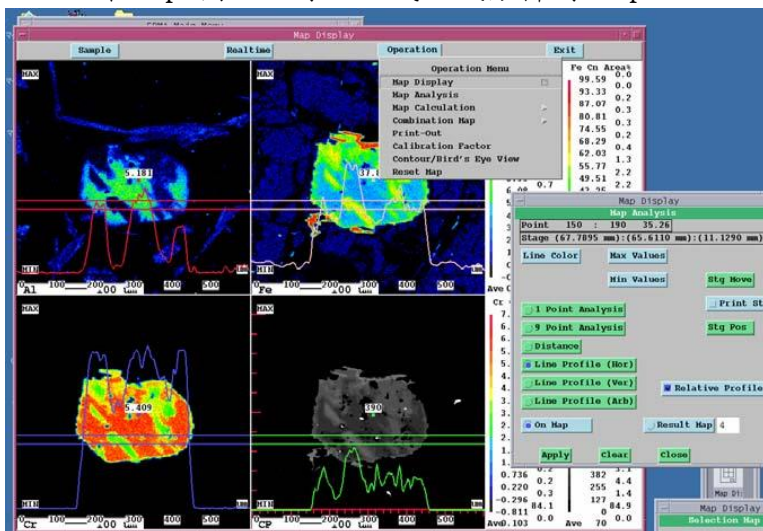
6-8-2 選擇顯示的參數開啟Operation -> Map Display -> Display Parameter



6-8-3 設定Calibration Factor



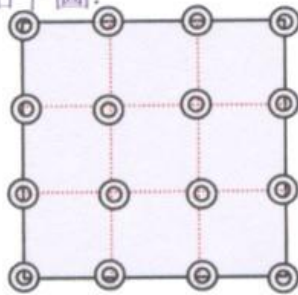
6-8-4 在Map 圖上做線. 點或區域分析開啟Operation -> Map Analysis 視窗



7. Guide Map

將Guide Map 分割分析區做預設.

例: 如下圖.



分割分析區域:

3 x 3 共九塊區域

分析點◎:

$(3+1) * (3+1) = 16$ point

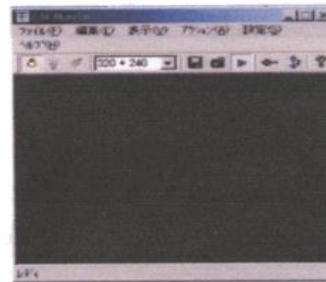
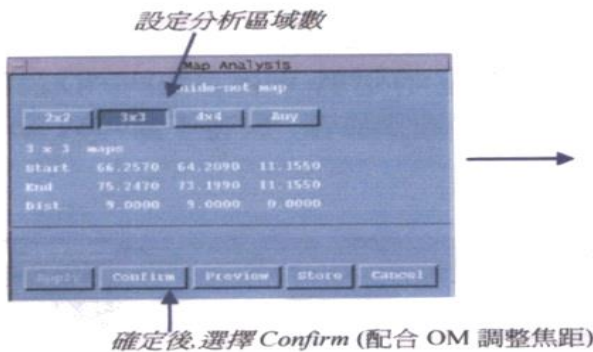
7-1. 執行步驟6-1~6-5

7-2. 進入Measurement -> Stage Condition 選擇 Pos Input 設定分析座標
7-3 開啟Area Input 視窗, 進入Special map -> Set Area 設定

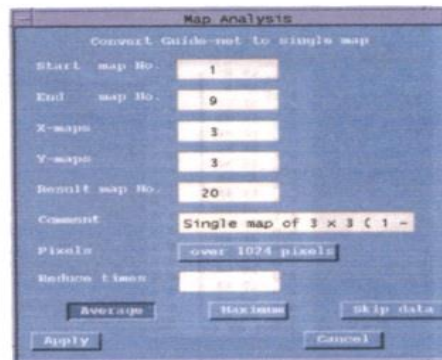
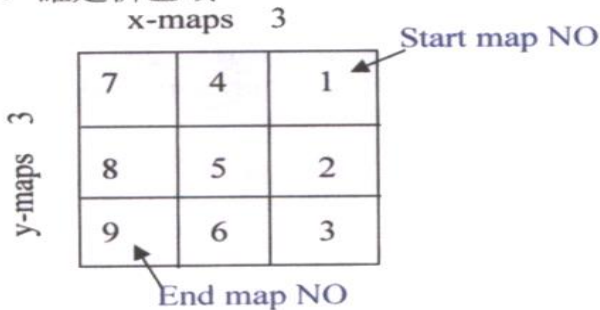
7-4 開啟Special map -> Guide-net map 設定



開啟 OM 確認每一個區域的焦距



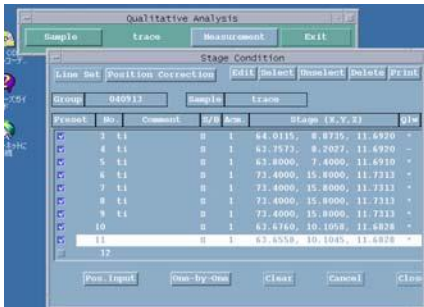
7-5 確定析區域



7-6. 設定座標後, 開始分析(請參閱步驟6-6-6~6-8)

7-7. 待分析完成後, 合併map 圖

7-7-1. 進入Measurement -> Stage Condition -> Pos Input 設定分析座標



7-7-2. 進入Special map -> Guide-net map 合併圖為單一(single)

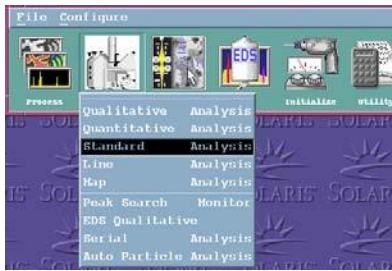


8. Line Analysis

8-1. 確認所有元素

8-2. 做Peak Search

8-3. 進入EPMA Main Menu 的Analysis -> Line 開啟Line Analysis分析視窗



8-4. 設定檔存位置及分析參數(請參閱步驟4-3-4-9)

8-5. 選擇SEM 影像

8-6. 確定分析的範圍

8-6-1. 進入Measurement -> Stage Condition -> Pos Input 設定分析座標



8-6-2. 設定座標點

Step1: 新增座標

Step2: 加註稱

Step3: 設定分析參數

A. Scan Type: 共有二種掃瞄模式 Stage(uni)以及Beam

Stage uni: 為固定Beam, 移動Stage

Beam: 為固定Stage, 移動Beam (使用此模式, 倍率須在3000 倍以上)

B. Stage Drive:

Normal step : 每個step最小0.5 um (速度較快)

Micro Step : 每個step最小0.02 um

C. Pixel (x.y):設定分析點數

D. Pixel size (x.y): 設定分析每點的Spot Size

E. Dwell time: 設定每點分析時間

Step4: 記錄座標(Read)及設定點(Store):

(a). 移動到分析點, 選擇Read 記錄分析點的座標 (目前位置的中心點)

(b). Store 設定分析點, 有三種方式

1. store to start(Start point mode):代表將讀取到的座標當作本次實驗的起始點

2. store to center (center mode) :代表將讀取到的座標當作本次實驗的起中心點

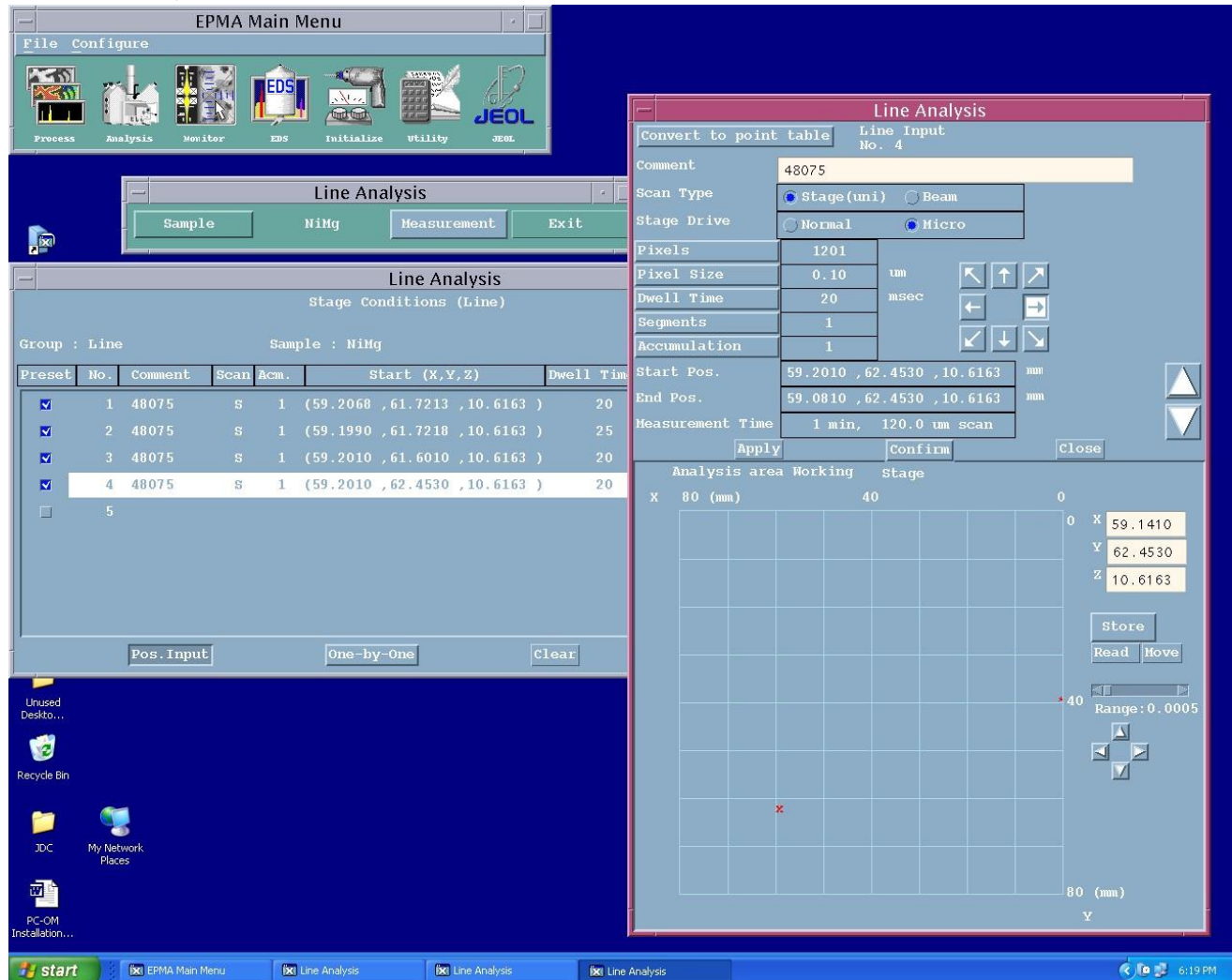
3. store to end(END position mode) :代表將讀取到的座標當作本次實驗的終止點

Step5:確定掃描方向 (或試片移動方向)

Step6: 確定分析：點開啟光學顯微鏡, 確認Map 分析四邊對角的焦距

例: Store 設為Start point mode 起始點

Step7: apply



8-6-3: 回到Measurement -> Stage Condition -> One by one ->Acquire開始分析

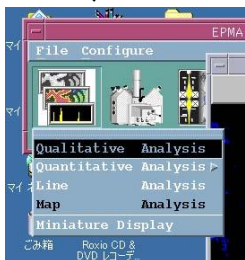


8-7. 觀測分析及時狀況:

開啟EPMA Main Menu -> Process -> Line Analysis 視窗, 選擇 Real time

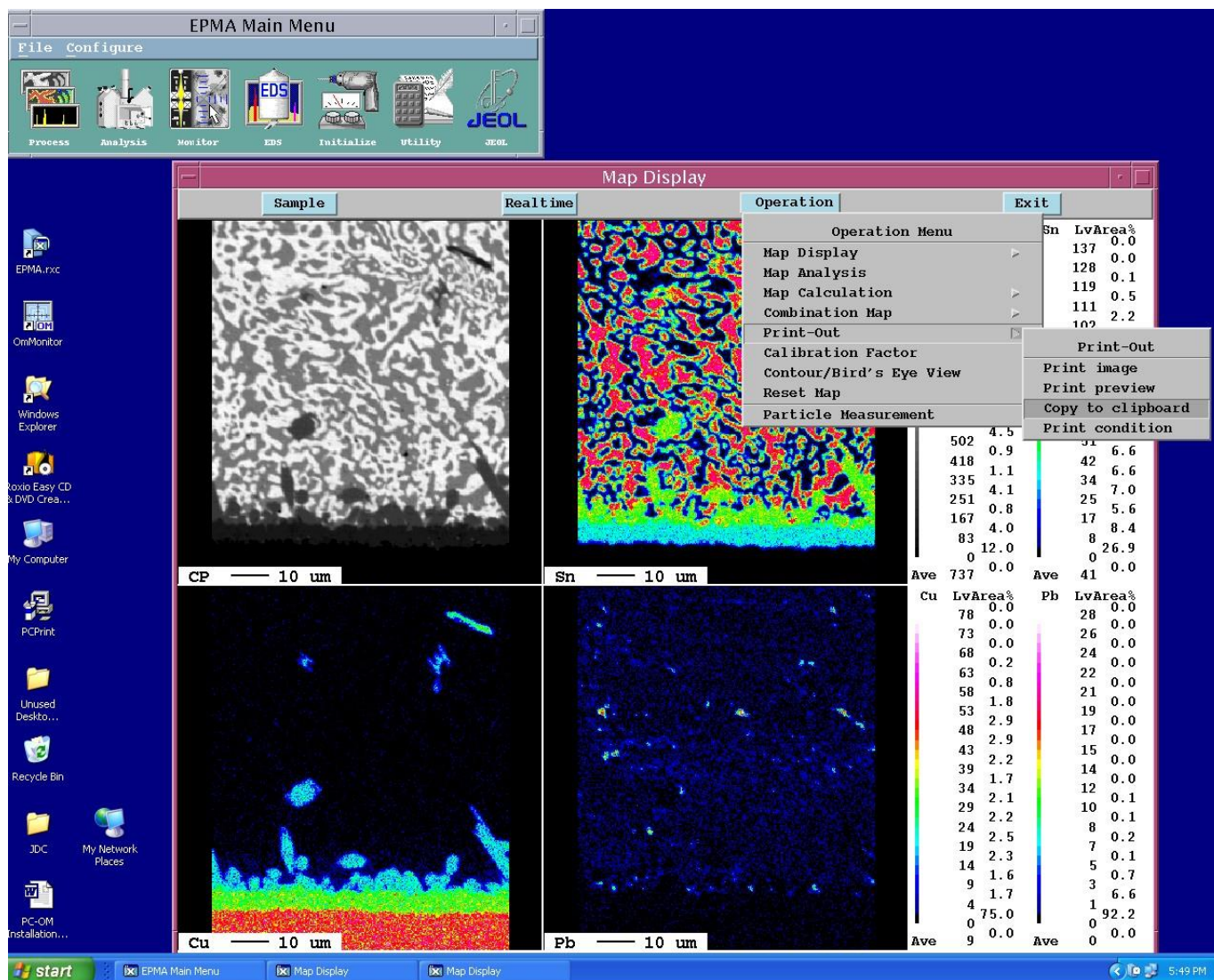
9. 定性、Line scan、Map圖片輸出

9-1. 開啟EPMA Main Menu -> Process -> Qualitative analysis、Line或Map

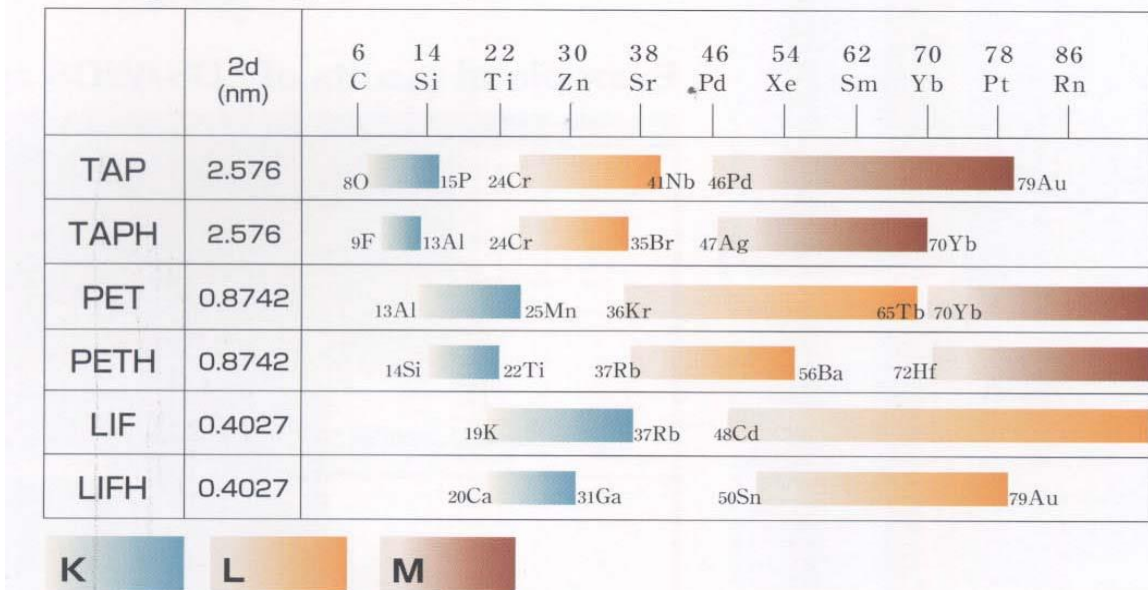


9-2. Sample: 開啟檔案，並設定好輸出格式

9-3. Operation-> print out->copy to clipboard ->開啟小畫家->貼上->另存新檔即可



附錄一、Analysis ranges of crystals



附錄二、Types of X-ray spectrometers element

X-ray spectrometer	Model name	Abbr.	Number of crystals	Crystal exchange	Features
XCE-type X-ray Spectrometer	XM-86010	XCE	2	At any position	High resolution in wavelength
TXE-type X-ray Spectrometer	XM-86020	TXE	2	At given position	For light-element chemical-shift analysis
H-type X-ray Spectrometer	XM-86030	H	2	90% of full range	High X-ray intensity
XCE-type Four Crystal Spectrometer	XM-86040	FCS	4	90% of full range	Four different crystals can be mounted. B to U can be analyzed

附錄三、List of crystals for the diction of very light element

	2d (nm)	Be	B	C	N	O	F
NSTE	Approx. 10		○	○	○	○	
LDE1	Approx. 6			△	◎	◎	◎
LDE2	Approx. 10		◎	◎	◎	○	
LDEB	Approx. 14.5	◎	○				
LDE1H	Approx. 6			△	◎	◎	
LDE2H	Approx. 10		◎	◎			
LDENH	Approx. 8			○	◎		
LDE3H	Approx. 20	◎	○				
LDE5H	Approx. 8			◎	◎		
LDEBH	Approx. 14.5	◎	◎				

18 BRIEF DESCRIPTION OF JXA-8100/8200 OPERATION

START UP

1. Turn on the flow of cooling water, nitrogen gas and PR gas.
2. Turn Main POWER (Key Switch) on.
3. Turn OPE POWER on.
4. Turn on the server, PC and peripherals.
5. Log in to the PC and NFS.
6. Log in to EPMA server.

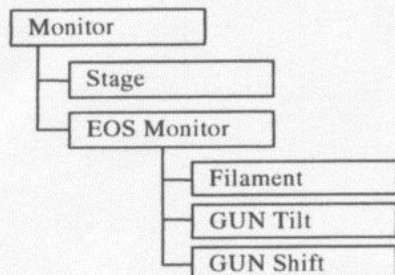
↓
EPMA Menu starts.

HV Ready

↓
Possible to operate

PREPARATIONS

1. ELECTRON COLUMN ALIGNMENT
Turn ACCEL VOLTAGE on.
Set or adjust the following in Monitor menu.



15–20 kV

Change specimen and set position.

Adjust filament heating current to get the saturation point.
Adjust to get the maximum probe current.

Adjust the feature image (SEI) to be stationary when probe current is changed in order of 10^{-9} – 10^{-7} A.

WOBB

Adjust the centering of the OL aperture to minimize the shift of the feature image.
(This can be done even just after GUN tilt adjustment.)

2. CONFIRMATION OF SEM IMAGE
Confirm the sharpness or the steadiness of the SEM image with a suitable specimen before analyzing of unknown specimens.

OBSERVATION OF SEM IMAGE

1. Set the specimen on the stage and focus the OM image.
2. Set the following

IMAGE SELECTOR	SEI
SCAN SPEED	1
PRB SCAN	ON
PCD	OUT
3. Adjust Contrast, Brightness. (It is easy to push the ACB button on operation panel.)
4. Increase the magnification of the SEM image and focus the image.
5. Decrease the probe current to the order of 10^{-11} – 10^{-10} A and select OL aperture according to the recommended number indicated on the Control window.
(If necessary, adjust Contrast, Brightness.)
6. Push the WOBB button and adjust the centering of the OL aperture to minimize the shift of the feature image.
7. Focus the image with STIGMATOR X, Y and FOCUS.

QUALITATIVE ANALYSIS

1. Analysis

Qualitative Analysis

Sample

Input Group name and Sample name.

Measurement

Spectrometer Condition

Input No. of Spectra, Channel, Crystal, Spect. Range, etc.
E.g.: No. of Spectra 4, Crystal LDE2, TAP, PET, LiF
Range 65–250 mm, Step 50 um, Dwell 50 msec

EOS Condition

Set EOS before start of analysis. Read here.
E.g.: 20 kV, 10^{-7} A

Stage Position (Stage Condition)

Pos. Input

Input X, Y, Z coordinates. Move

Set position to be analyzed with joystick

Read, Store, Apply (or Read & Apply)

(For Accumulation 1)

If set to two or more

Click on upper right ∇ mark.

One by one

For single measurement

Preset Measurement

For preset continuous measurements

2. Process

Qualitative Analysis

Realtime

Display data now being taken.

Specify No. of spectra, Order of Display. Start, Stop for end.

Sample

Display data taken previously.

Specify Group name, Sample name, No. of spectra, etc.

Operation

Spectra Display

Zooming

Zoom in on part of spectrum.

Mixed Spectra Display

Display 2 or more spectra superimposed.

:

KLM Marker

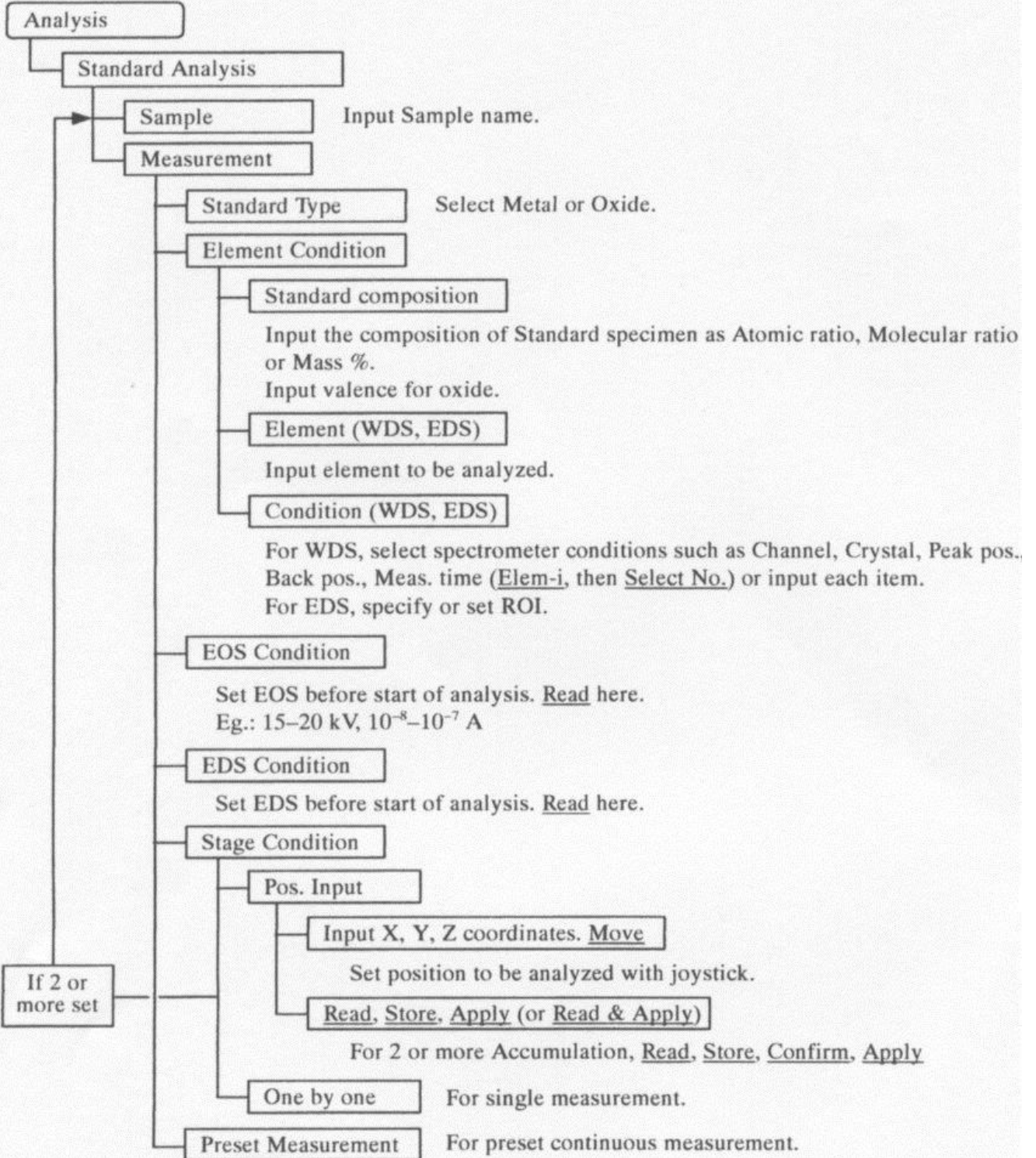
Display markers at the positions of characteristic X-rays of specified element.

Peak ID

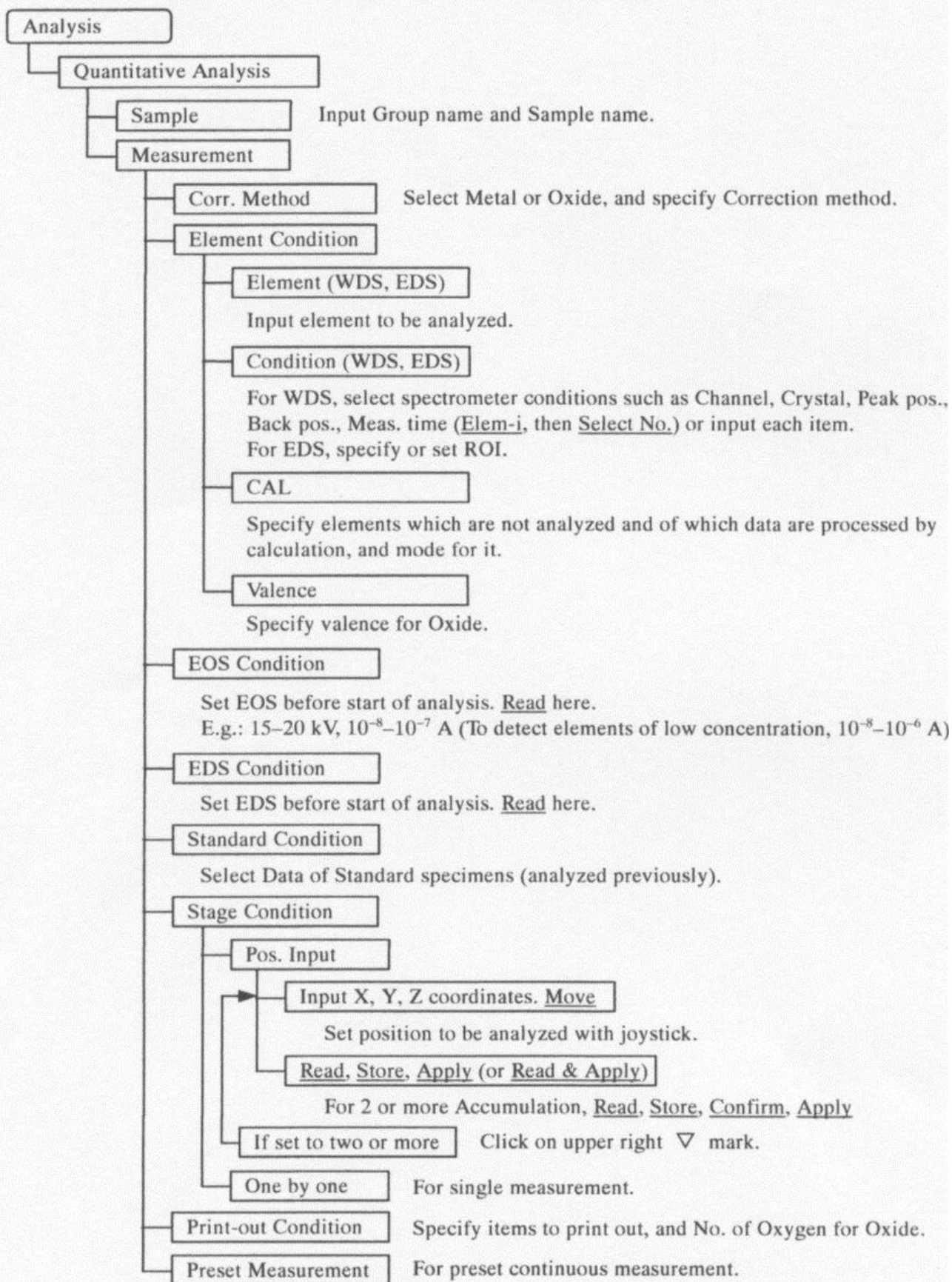
Display characteristic X-rays of the peak specified with cursor.

QUANTITATIVE ANALYSIS

1. Standard Analysis



2. Quantitative Analysis



COLOR MAP ANALYSIS

1. Analysis

Map Analysis

Sample

Input Group name and Sample name.

Measurement

Element Condition

(Same as Quantitative Analysis)

Element (WDS, EDS)

Input elements to be analyzed.

Condition (WDS, EDS)

For WDS, select spectrometer conditions such as Channel, Crystal, Peak pos., Back pos., Meas. time (Elem-i, then Select No.) or input each item.
For EDS, specify or set ROI.

IMS

Specify image signals to be measured.

EOS Condition

Set EOS before start of analysis. Read here.
E.g.: 15–20 kV, 10^{-7} – 10^{-6} A (depending on concentration)
Adjust CONTRAST, BRIGHTNESS of image signal.

EDS Condition

Set EDS before start of analysis. Read here.

Stage Condition

Area Input

Scan Type

Stage scan (Uni/Bi) / Beam scan

Stage Drive

Normal step (0.5 um/min.) / Micro step (0.02 um/min.)

Pixels

Usually 200–600, 1024 max.

Pixel Size

Set automatically in Beam scan.

Dwell time

Usually 10–50 msec.

Input X, Y, Z coordinates. Move

Set position to be analyzed with joystick.

Read, Store, (Center, Start, End), Apply

Confirm (Stage scan only)

Focus OMTV image and push STOR in joystick at 4 corners of area to be analyzed. Apply

If set to two or more

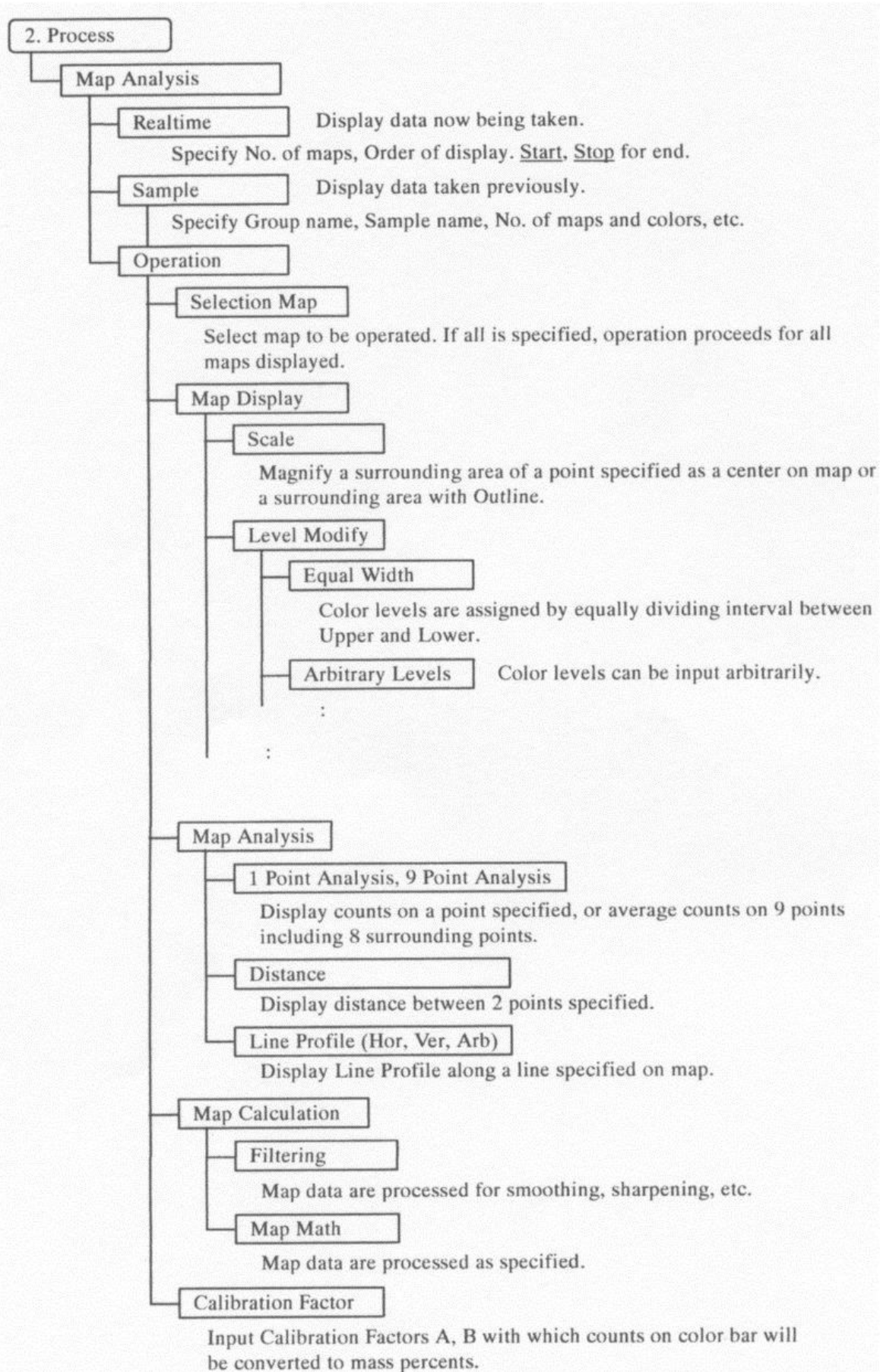
Click on upper right ∇ mark.

One by one

For single measurement.

Preset Measurement

For preset continuous measurement.



L-value Table

2d(nm)	
LDEB	14.5
LDE2	9.83
LDE1	5.99
TAP	2.5757
PET	0.8742
LIF	0.40267

Drive range (Approximately)

XCE, TXE : 61~260mm

H : 87~240mm

FCS : 71~260mm

$n\lambda = 2d\sin\theta$

$L = (R/d)n\lambda$

	3 Li	4 Be	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	5 B	6 C	7 N	8 O	9 F	10 Ne			
LDEBK α		220.14	97.08	88.03	80.19	73.34	67.32	62.01	124.40	115.28	107.12	99.79	93.18	87.20	81.77	76.82	72.30	68.15	130.54	124.66	88.13	65.87				LDEBK α	
LDE2K α			210.76	191.12	174.09	159.22	146.15	134.62	173.63	158.29	144.97	133.21	122.75	113.45	105.13	97.73	91.04	84.98	188.53	208.95	147.71	110.41	85.64	68.29		LDE2K α	
LDE1K α			91.15	79.73	70.51	63.24	58.29	54.97	49.22	46.97	44.97	43.21	42.75	41.45	40.13	39.73	39.04	38.98	208.95	256.77	199.15	158.82				LDE1K α	
TAP K α			107.57	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar		TAP K α	
PET K α			97.08	88.03	80.19	73.34	67.32	62.01	124.40	115.28	107.12	99.79	93.18	87.20	81.77	76.82	72.30	68.15	90.66	77.46	66.93					PET K α	
LIF K α			210.76	191.12	174.09	159.22	146.15	134.62	173.63	158.29	144.97	133.21	122.75	113.45	105.13	97.73	91.04	84.98	228.22	228.22	197.20	172.07	151.43	134.26		LIF K α	
TAP L α			91.15	79.73	70.51	63.24	58.29	54.97	49.22	46.97	44.97	43.21	42.75	41.45	40.13	39.73	39.04	38.98									TAP L α
LDE2 L α			107.57	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51									LDE2 L α
LIF L α			210.76	191.12	174.09	159.22	146.15	134.62	173.63	158.29	144.97	133.21	122.75	113.45	105.13	97.73	91.04	84.98	234.40	219.81	206.55	206.55	206.55	206.55	206.55		LIF L α
PET L α			91.15	79.73	70.51	63.24	58.29	54.97	49.22	46.97	44.97	43.21	42.75	41.45	40.13	39.73	39.04	38.98	79.56	74.60	70.10						PET L α
TAP L α			107.57	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51									TAP L α
LIF L α			210.76	191.12	174.09	159.22	146.15	134.62	173.63	158.29	144.97	133.21	122.75	113.45	105.13	97.73	91.04	84.98	201.13	193.03	185.36	185.36	185.36	185.36	185.36		LIF L α
PET L α			91.15	79.73	70.51	63.24	58.29	54.97	49.22	46.97	44.97	43.21	42.75	41.45	40.13	39.73	39.04	38.98	92.64	88.91	85.38						PET L α
TAP M α			107.57	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51	107.51									TAP M α
PET M α			210.76	191.12	174.09	159.22	146.15	134.62	173.63	158.29	144.97	133.21	122.75	113.45	105.13	97.73	91.04	84.98	161.76	161.76	161.76	161.76	161.76	161.76	161.76		PET M α
LIF L α			91.15	79.73	70.51	63.24	58.29	54.97	49.22	46.97	44.97	43.21	42.75	41.45	40.13	39.73	39.04	38.98	87 Fr	88 Ra	89 Ac						LIF L α
PET L α			210.76	191.12	174.09	159.22	146.15	134.62	173.63	158.29	144.97	133.21	122.75	113.45	105.13	97.73	91.04	84.98	71.66	69.86	68.14					PET L α	
TAP M α			91.15	79.73	70.51	63.24	58.29	54.97	49.22	46.97	44.97	43.21	42.75	41.45	40.13	39.73	39.04	38.98									TAP M α
PET M α			210.76	191.12	174.09	159.22	146.15	134.62	173.63	158.29	144.97	133.21	122.75	113.45	105.13	97.73	91.04	84.98									PET M α

	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
LIF L α	178.12	171.27	164.83	158.69	152.96	147.48	142.33	137.44	132.73	128.29	124.07	120.07	116.26	112.61	LIF L α
PET L α	82.04	78.89	75.92	73.10	70.46	67.93	65.56	63.31	61.14	59.01	56.98	54.95	52.92	50.89	PET L α
TAP M α	152.62	101.80	145.05	137.84	137.84	119.14	113.71	108.71	104.25	100.01	95.88	92.18	88.59	85.23	TAP M α
PET M α															PET M α

	90 Th	91 Pa	92 U	93 Np	95 Pu
LIF L α	66.48	64.87	63.32	61.83	
PET M α	132.54	128.82	125.23		