Tutorial of Laue Analysis

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$1 \ . \ Installation and boot of program$

1. 1 Installation of program

You need to decide a drive (Exp. C :) or a folder at witch Laue analysis is stored. And copy the Laue folder of CD-R at the place.



(1) exe folder

Following programs are stored.

- Laue.exe : Laue Analysis Program
- sptrn.exe: Laue Pattern and Stereographic Projection Simulation Program

(2) bmp folder

Following bmp files are stored. These are Laue pattern data.

• Tu_Ortho.bmp: This file is Laue pattern data of orthorhombic.

This is the simulation data which is made by

"Laue Pattern and Stereographic Projection Simulation Program"

(See chapter 3.)

• Tu_Hexa.bmp: This file is Laue pattern data of Hexagonal.

This is photographed by CCD under forward reflection.

• Tu_Cubic.bmp: This file is Laue pattern data of Cubic.

This is photographed by Polaroid film under back reflection.

- (3) Save folder
 - lue type file : This file has the result of Laue analysis. When Laue Analysis Program read this, the program can recover the result of analysis.
 - spt type file : This file has the operation content of

"Laue Pattern and Stereographic Projection Simulation Program" .

When the program read this, the program can recover the operation content.

1. 2 Boot of program

You can boot-up "Laue Analysis Program" by the double click of Laue.exe



- 2. Analysis of Laue pattern data
- 2. 1 Origin decision by "Film Frame"

Tu_Ortho.bmp is Laue pattern data of orthorhombic. This is the simulation data which is made by "Laue Pattern and Stereographic Projection Simulation Program" (See chapter 3.) This data is origin-decided by "Film Frame".

(1) Recovering analysis condition

Click "File" of main menu \rightarrow "Save File Open", and open "Tu_Ortho.lue" file of save folder.

(2) Reading bmp file

Click "File" of main menu \rightarrow "BMP File Open", and open "Tu_Ortho.bmp" file of bmp folder.

(3) Confirming Parameter Input

When you click "Parameter Input" of main menu, "Parameter Input" dialog is shown. After you confirm parameters, click "Close" button. Don't change the parameters.

Parameter Input			
Sample name : ort User name : Nte Lattice Constant (a : 1.000 b : 1.200 c : 1.400 Group2 Max Ref. Index :	horhombic eramae A) Alpha: Beta: Gamma: Group1 8	90.000 90.000 90.000 90.000	Origin Decide Cross Film Frame C Center (mm) (pixel) Height : 100.00 Width : 100.00 Camera Distance(mm) : 30.00 Main HKL : 0 0 1 Film Position Back Reflection C Free Back Position Forward Reflection C Free Forward Position
Digitize Points :	6		Film Rotate Position : deg
🥅 Ref. Restricti	on Ref. Type	e & Conditi	ion 🔽 Cylindorical Film Radius : 0.0 mm
Twin			Decide Close

(4) Reading Measure Data

When you click "Measure Read" of main menu, "Measure Data Read" dialog is shown. After you confirm the data, click "Measure Digitize" button.

"Measure Data Digitize" dialog is shown.



(5) Confirming Origin Point and Digitize Points

"Measure Data Digitize" dialog is shown.

When you click "Read" button of "Origin : ", you can confirm it. And when you click "Read" button of "Digitize Points : ", you can confirm these. When you click "Analysis" button, "Laue Analysis " dialog is shown.



(6) Searching candidates

When "Laue Analysis" dialog is shown, click "Candidate Search" button. After the search is done, "Select Num:" is set to 1. Don't change this. When you click "Display" button, "Pattern Display" dialog is shown. (The operation of "Calc. Result" button is similar.)

eserv	/e Ang	;le :	15.	0	de	eg.							С	andid	ate N	lum. : 30		Search	Time Limit :	60	sec
Analys	sis Ern	or :	1.0)	de	eg.	Cano	lidate	Sea	arch			1	Vext	Candi	date Disp	Car	mera Dist	ance Error :	5	%
um.	hkl															Error	Psi	Theta	Phi		
1	-1	0	2	-1	1	2	0	2	5	0	0	1	-1	-2	5	0.07	14.87	20.07	10.18		
2	1	0	2	1	-1	2	0	-2	5	0	0	1	1	2	5	0.07	14.87	20.07	-169.82		
3	1	0	2	1	-1	2	0	-3	7	0	0	1	1	2	5	0.45	13.56	20.12	-169.02		
4	-1	0	2	-1	1	2	0	3	7	0	0	1	-1	-2	5	0.45	13.56	20.12	10.98		
5	-1	-2	6	-1	0	3	0	2	7	1	0	5	1	-2	4	0.54	67.84	9.91	-79.46		
6	1	2	6	1	0	3	0	-2	7	-1	0	5	-1	2	4	0.54	67.84	9.91	100.54		
7	2	0	3	1	-1	3	0	0	1	1	2	6	2	2	3	0.59	74.22	28.64	166.30		
8	-2	0	3	-1	1	3	0	0	1	-1	-2	6	-2	-2	3	0.59	74.22	28.64	-13.70		
9	0	0	1	1	0	3	2	-3	5	0	-3	5	-1	-1	3	0.61	-144.67	15.97	-102.45		
10	0	0	1	-1	0	3	-2	3	5	0	3	5	1	1	3	0.61	-144.67	15.97	77.55		
	Se	elect	Nun	n : 1	_	-		Ca	alc. F	Result	1	[Displa	av				Sto	DD a	ose	

(7) Confirming Laue analysis

"Pattern Display " dialog is shown.



2. 2 Origin decision by "Center"

Tu_Hexa.bmp is Laue pattern data of hexagonal. This is photographed by CCD under forward reflection. This data is origin-decided by "Center".

(1) Recovering analysis condition

Click "File" of main menu \rightarrow "Save File Open", and open "Tu_ Hexa.lue" file of save folder.

(2) Reading bmp file

Click "File" of main menu \rightarrow "BMP File Open", and open "Tu_Hexa.bmp" file of bmp folder.

(3) Confirming Parameter Input

When you click "Parameter Input" of main menu, "Parameter Input" dialog is shown. After you confirm parameters, click "Close" button. Don't change the parameters.

Parameter Input			
Sample name : He User name : N.T Lattice Constant (a : 4.519 b : 4.519 c : 7.357	(agonal eramae A) Alpha: Beta: Gamma: 1	90.000 90.000 20.000	Origin Decide Cross C Film Frame Center (mm) (pixel) Height : 50.00 512 Width : 50.00 512 Camera Distance(mm) : 33.84 Main HKL : 5 1 2 Film Position
Max Ref. Index :		7	Forward Reflection Free Forward Position
Digitize Points :	6		Film Rotate Position : deg
🔲 Ref. Restricti	on Ref. Type	e & Conditi	on 🔲 Cylindorical Film Radius : 0.0 mm
Twin			Decide Close

(4) Reading Measure Data

When you click "Measure Read" of main menu, "Measure Data Read" dialog is shown. After you confirm the data, click "Measure Digitize" button.

"Measure Data Digitize" dialog is shown.



(5) Confirming Origin Point and Digitize Points

"Measure Data Digitize" dialog is shown.

When you click "Read" button of "Origin: ", you can confirm it.

And when you click "Read" button of "Digitize Points:", you can confirm these. When you click "Analysis" button, "Laue Analysis" dialog is shown.



(6) Searching candidates

When "Laue Analysis" dialog is shown, click "Candidate Search" button. After the search is done, "Select Num:" is set to 1. Don't change this. When you click "Display" button, "Pattern Display" dialog is shown. (The operation of "Calc. Result" button is similar.)

Reserv	e Ang	;le :	20.0	0	de	eg.							С	andid	late l	Num.	: 30		S	Search Tim	e Limit :	60 se
Analys	sis Ern	or :	1.5		de	g,	Cano	lidat	e Sea	arch			1	Vext	Cano	didate	Dis	p	Came	ra Distance	e Error :	5 %
Num.	hkl																		Error	Psi	Theta	Phi
1	0	-1	-5	0	0	-1	0	-1	2	0	-2	3	-1	2	0	-1	1	3	0.21	-12.71	158.36	84.01
2	0	1	-5	0	0	-1	0	1	2	0	2	3	1	-2	0	1	-1	3	0.21	-142.65	28.57	-129.92
3	1	-1	5	0	0	1	1	-1	-2	2	-2	-3	-1	2	0	0	1	-3	0.21	138.50	4.81	127.72
4	-1	1	5	0	0	1	-1	1	-2	-2	2	-3	1	-2	0	0	-1	-3	0.21	75.24	160.94	-11.71
5	0	1	-6	0	0	-1	0	1	2	0	2	3	1	-2	0	1	-1	3	0.75	-142.19	28.84	-129.89
6	-1	1	6	0	0	1	-1	1	-2	-2	2	-3	1	-2	0	0	-1	-3	0.76	74.71	160.83	-12.77
7	1	-1	6	0	0	1	1	-1	-2	2	-2	-3	-1	2	0	0	1	-3	0.77	141.68	4.71	125.06
8	0	-1	-6	0	0	-1	0	-1	2	0	-2	3	-1	2	0	-1	1	3	0.78	-11.49	158.27	84.75
9	0	0	-1	-1	1	-5	1	-1	1	3	-3	2	-2	1	1	-1	-1	6	0.99	-164.27	146.66	-97.46
10	0	0	1	-1	1	5	1	-1	-1	3	-3	-2	-1	2	-1	1	1	-6	0.99	-148.75	8.23	73.00
	Se	lect	: Num	. : <mark>1</mark>	-	•		С	alc. F	Result	:	[Displa	iy						Stop	Clos	e

(7) Confirming Laue analysis

"Pattern Display " dialog is shown.



2. 3 Origin decision by "Cross"

Tu_Cubic.bmp is Laue pattern data of cubic. This is photographed by Polaroid film under back reflection. This data is origin-decided by "Cross".

(1) Recovering analysis condition

Click "File" of main menu \rightarrow "Save File Open", and open "Tu_Cubic.lue" file of save folder.

(2) Reading bmp file

Click "File" of main menu \rightarrow "BMP File Open", and open "Tu_Cubic.bmp" file of bmp folder.

(3) Confirming Parameter Input

When you click "Parameter Input" of main menu, "Parameter Input" dialog is shown. After you confirm parameters, click "Close" button. Don't change the parameters.

Parameter Input			
Sample name : Out User name : Nte Lattice Constant (pic eramae A)	90.000	Origin Decide Cross C Film Frame C Center (mm) (pixel) Height : 25.40 Width : 25.40
a: 1.200 b: 1.200 c: 1.200	Alpha : Beta : Gamma :	90.000 90.000 90.000	Camera Distance(mm) : 32.00 Main HKL : 1 1 1
Group2 Max Ref. Index :	Group1 G	àroup2 7	Film Position Back Reflection
Digitize Points :	6		Film Rotate Position : deg
🔲 Ref. Restrictio	on Ref. Typ	e & Conditi	ion 🔽 Cylindorical Film Radius : 0.0 mm
Twin			Decide Close

(4) Reading Measure Data

When you click "Measure Read" of main menu, "Measure Data Read" dialog is shown. After you confirm the data, click "Measure Digitize" button.

"Measure Data Digitize" dialog is shown.



Caution: The photo is cut at this dialog.

So, the cut photo is zoomed at "Measure Data Digitize" dialog.

(5) Confirming Origin Point and Digitize Points

"Measure Data Digitize" dialog is shown.

When you click "Read" button of "Origin : ", you can confirm it. And when you click "Read" button of "Digitize Points : ", you can confirm these. When you click "Analysis" button, "Laue Analysis" dialog is shown.

Measure Data Digitize					
	•	Origin De Digitize	cide	BMP File Tu_Cubic.br	Name : np
	Origir	n Decide x	(pixel) v) Decide	Clear
	1	140.0	247.0	Upper	Upper
	2	194.0	191.0	Right	Right
\times $\frac{3}{2}$	3	249.0	246.0	Bottom	Bottom
	4	194.0	300.0	Left	Left
× 🕲 ×	Origin	194.0	246.	5	Origin :
× ×		Digiti	ze Poir	nt(mm)	Decide
	1	×	— r	4.08	Read
	2	-4.89	— 'i	20.86	🖲 Groupt
	3	22.60	— 'i	12.00	, 🔿 Group2
	4	11.42	— i	-10.83	Digitize Points :
	5	6.99	— î	-24.12	Decide
	6	-19.11	Ì —	-19.92	Read
	7	0.00		0.00	Input Num.
	8	0.00		0.00	
	9	0.00		0.00	All Clear
	10	0.00		0.00	Analysis
Measure points are read.]	Grening	er disp		Close

(6) Searching candidates

When "Laue Analysis" dialog is shown, click "Candidate Search" button. After the search is done, "Select Num:" is set to 1. Don't change this. When you click "Display" button, "Pattern Display" dialog is shown. (The operation of "Calc. Result" button is similar.)

eserv	e Ang	;le :	15.0		de	eg.							Ca	Indid	ate N	lum.	:18		S	earch Time	Limit :	60 se c
Analys	sis Ern	or : [1.0		de	eg.	Cand	idate	Sear	ch			N	ext (Candi	idate	Disp	1	Came	ra Distance	Error :	5 %
Jum.	hkl																		Error	Psi	Theta	Phi
1	1	1	0	3	2	1	1	1	1	1	2	1	1	3	1	1	2	0	0.18	27.70	19.28	160.55
2	0	1	1	1	3	2	1	1	1	1	1	2	1	1	3	0	1	2	0.18	27.70	19.28	40.55
3	1	0	1	2	1	3	1	1	1	2	1	1	3	1	1	2	0	1	0.18	27.70	19.28	-79.45
4	2	3	1	4	3	1	6	2	3	3	2	3	2	2	3	2	4	3	0.49	-91.44	8.46	-151.00
5	1	2	3	1	4	3	3	6	2	3	3	2	3	2	2	3	2	4	0.49	-91.44	8.46	89.00
6	3	1	2	3	1	4	2	3	6	2	3	3	2	3	2	4	3	2	0.49	-91.44	8.46	-31.00
7	3	1	4	2	U	5	U	1	б	1	3	б	1	3	4	3	3	4	0.65	-132.32	29.39	-1.04
8	4	3	1	5	2	0	6	0	1	6	1	3	4	1	3	4	3	3	0.65	-132.32	29.39	-121.04
9	1	4	3	0	5	2	1	6	0	3	6	1	3	4	1	3	4	3	0.65	-132.32	29.39	118.96
10	1	1	0	2	2	1	2	5	3	2	6	1	1	4	0	3	5	-1	0.70	74.17	28.35	148.17
	Se	lect	Num.	: 1		-		Ca	alc. Re	sult	1	D	lisplay	/						Stop	Clos	e

(7) Confirming Laue analysis

"Pattern Display " dialog is shown.



3 Making a simulation data of Laue pattern

(1) Boot of program

You can boot-up "Laue Pattern and Stereographic Projection Simulation Program" by the double click of sptrn.exe

💑 Laue Standard Pattern – sptrn	
<u>Eile E</u> dit <u>V</u> iew <u>H</u> elp SphereRef. LauePhoto StereoProjection OthersSet Option	
Laue Pattern and Stereographic Projection Simulation Program Version 6.0.0 (2010.Sep.) (Norm Co. Ltd.)	
Ready	

(2) Recovering analysis condition

Click "File" of main menu \rightarrow "Save File Open", and open "Tu_Ortho.spt" file of save folder.

(3) Making Sphere of Reflection

When you click "Sphere Ref." of main menu, "Sphere of Reflection" dialog is shown. After you confirm parameters, click "Close" button. Don't change the parameters.

Sphere of Ref	lection		
Lattice Cons	tant (A)		
a : 1.000	Alpha :	90.000	
b: 1.200	Beta :	90.000	
c: 1.400	Gamma :	90.000	
Ref. Restrictio None Ref. Type & Atom Name	on Condition & Position	Ref. Restriction	a
Max Ref. Index	: 8	Twin	
]	Calc.	Close	

(4) Confirming Laue Photo Parameter

When you click "Laue Photo" of main menu, "Laue Photo Parameter" dialog is shown. You can confirm these parameters.

When you click "Display" button, "Laue Pattern Display" dialog is shown.

Laue Photo Parame	ter		X
Laue Photo Width :	100.0	mm	
Height :	100.0	mm	
Camera Distance :	30.0	mm	
Film Position G Back Reflection C Forward Reflect	O Free I	Back Positic Forward Pos)n sition
Film Rotate I	Position :	de g.	
🔲 Cylindrical Film	Radius : 0.	.0 mm	
Direction H	К	L	
ND : 0.0000	0.0000	1.0000	
RD : 0.0000	1.0000	0.0000	
Phi Rotation Angle : 15.0	Theta	Phi 10.00	Clear
Direction after Rotatio H	n KL		
ND :			
TD :			
RD :			
Display ND,F	RD Set	Close	

($5\,)~$ Display of Laue pattern and Saving it

"Laue Pattern Display" dialog is shown.

When you click "Save Display" button, displayed Laue pattern is clipped at clipboard.



- (6) Making bmp file by "Paint" program (for reference)
 - When you click "start" of Windows → "All Programs" → "Accessories" → "Paint",
 "Paint" program is boot-upped.
 - When you click "Edit" of main menu \rightarrow "Paste", saved Laue pattern at (5) is pasted. Click "Select" button at tool box.

And you need make a less than 512×512 pixel area by mouse dragging.

After that, when you click "Edit" of main menu → "Copt To…", "Copy To" dialog is shown.
 You can save the cut Laue pattern to a bmp file at the dialog.