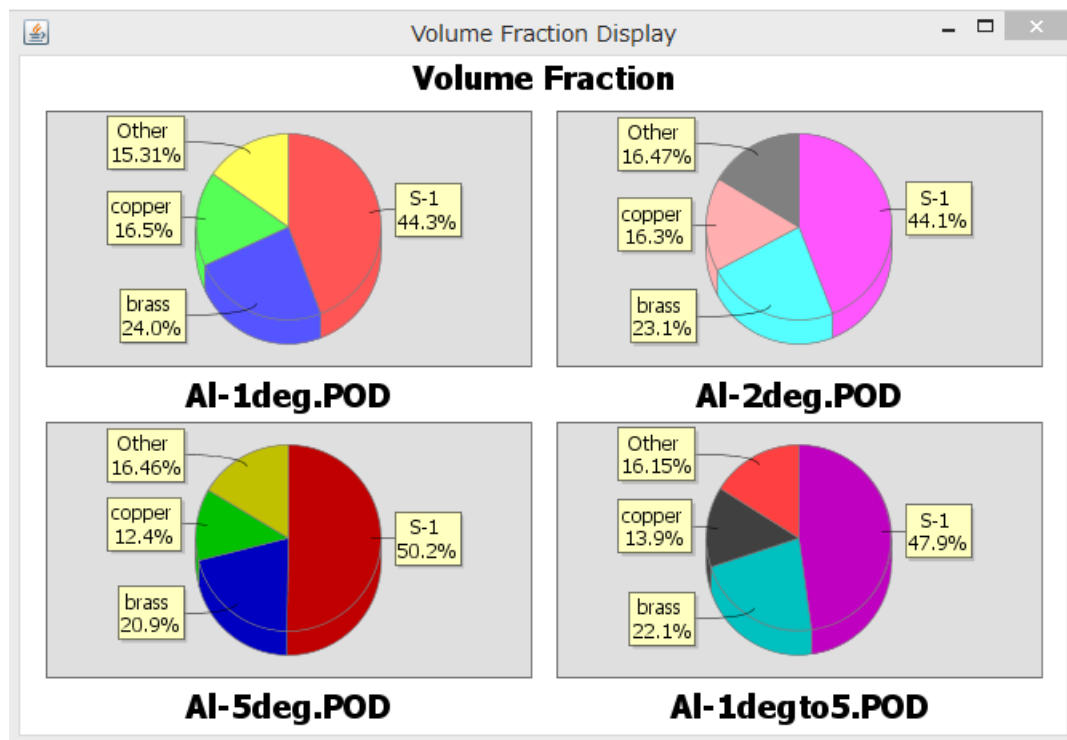


## 極点図測定間隔と結晶方位の定量値

[http://www.geocities.jp/y\\_craturasuper/index.html](http://www.geocities.jp/y_craturasuper/index.html)

他の記事は上記サイトで確認してください。

1度間隔で測定した極点図のデータ処理結果から1deg, 2deg, 5deg極点図を作成しそれぞれODF解析を行い、VolumeFraction（結晶方位の定量）を行って見ました。



1degが正しいとすると、2degでは、定量値が下がり始める。

5degでは、S方位が多くなり、brassとcopperが少なくなりバラツクデータ量が多いほど、バラツキが少ない結果が得られます。

2017年02月07日

*HelperTex Office*

## 概要

極点図の $\alpha$ 軸、 $\beta$ 軸の測定間隔は5度が一般的である。

最近、EBSDは2次元検出器の解析で5度ではなく1度データを扱う機会があり、気になったので以前測定したデータで検証を行ってみます。

## 評価に使用するデータ

材料：アルミニウム

装置： RINT2100 (Rigaku)

管球：Cu 40kV-40mA

スリット： 1/2 deg (DS) - 7mm (RS) - 7mm (SS)

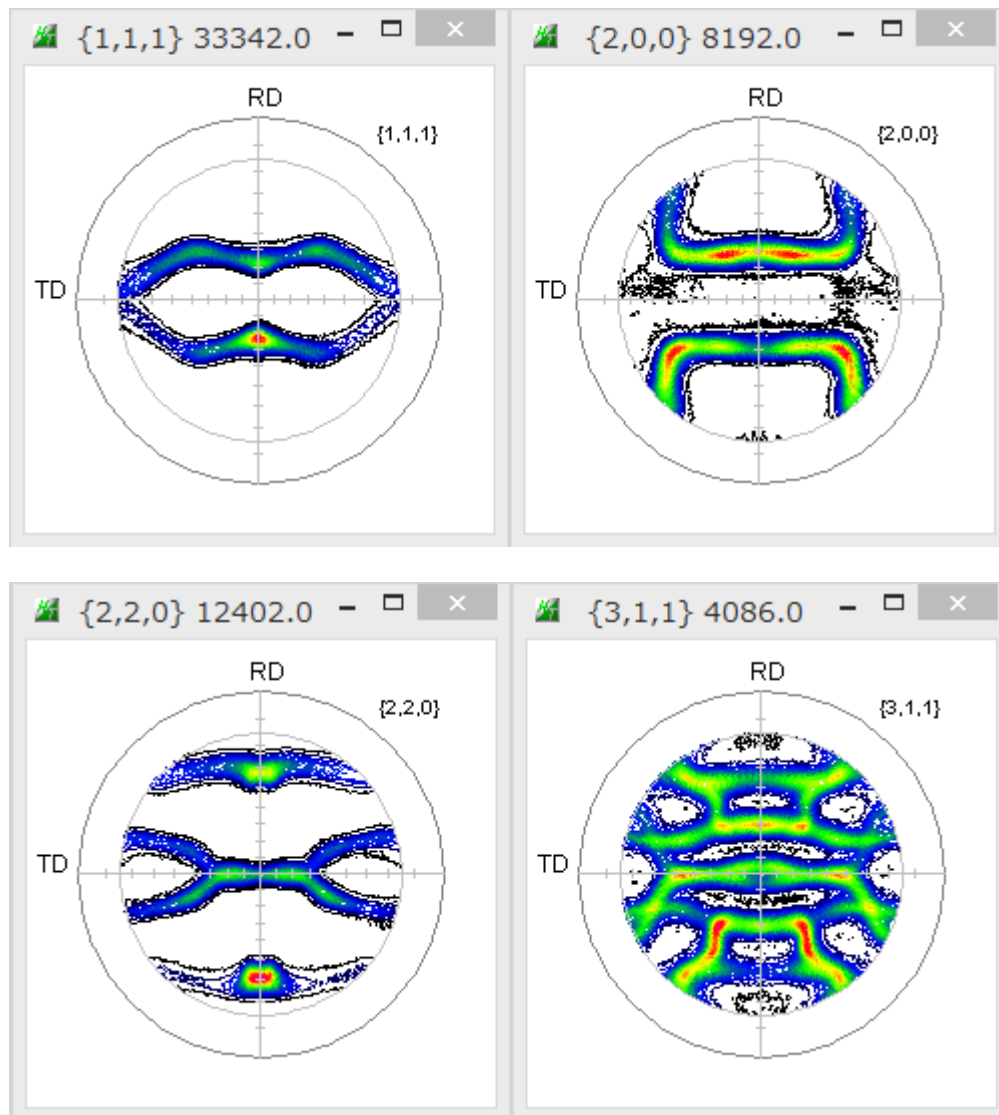
Schultzスリット：1mm

ゴニオ半径： 185mm

$\alpha$ 軸： 15度-90度、測定間隔 1deg

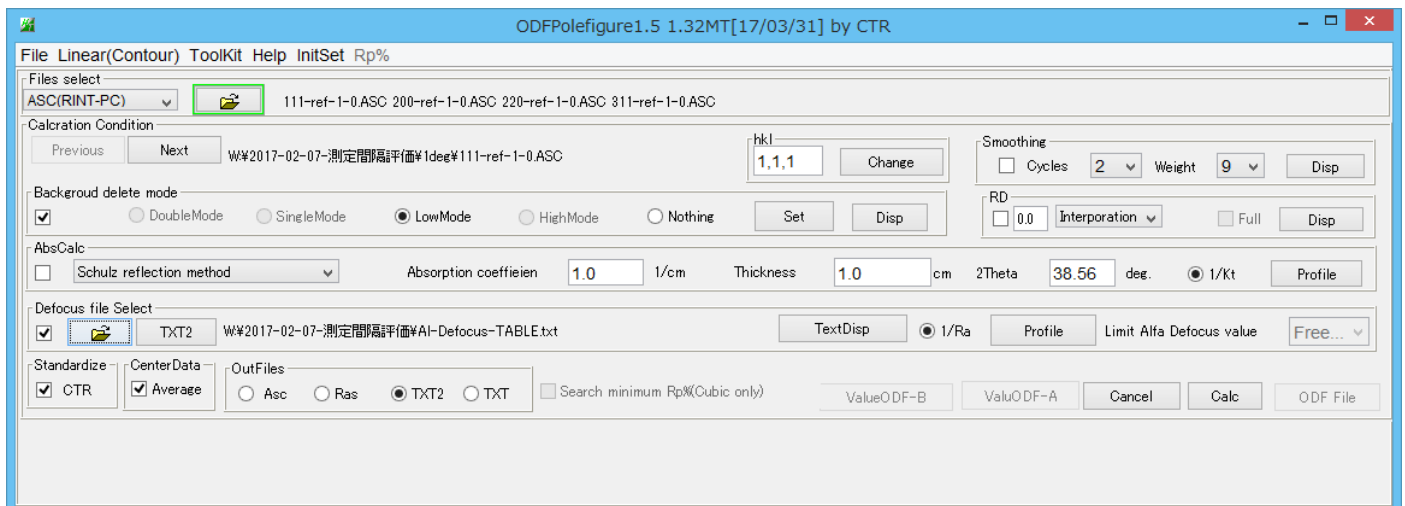
$\beta$ 軸： 0度-360度、測定間隔 1deg

$\beta$ スピード： 600 deg/min.

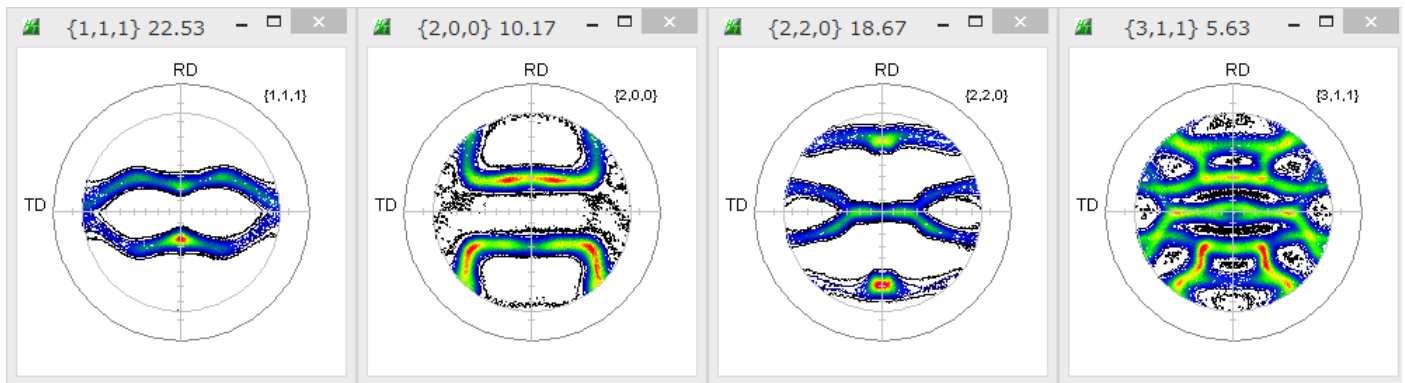


## データ処理

### BG削除とDefocus補正

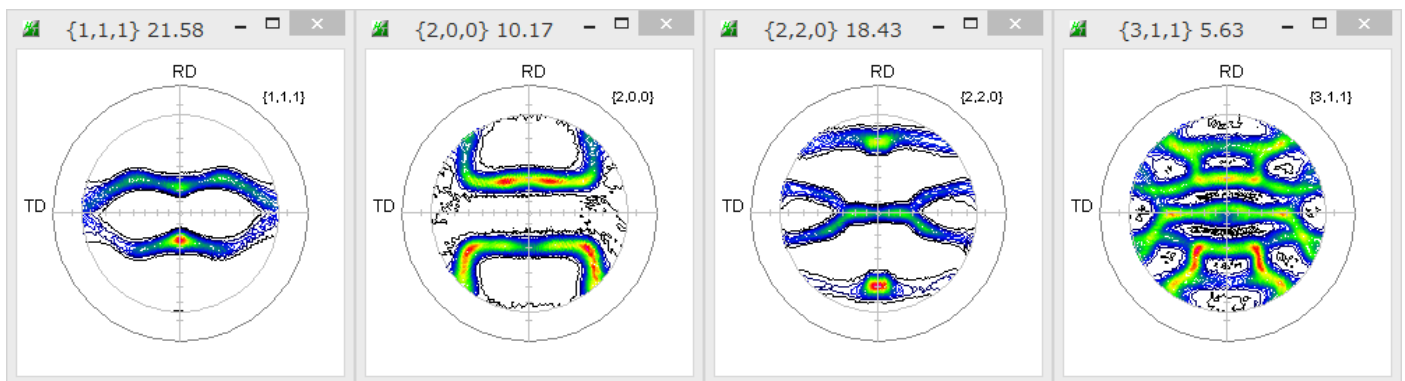


### 1deg

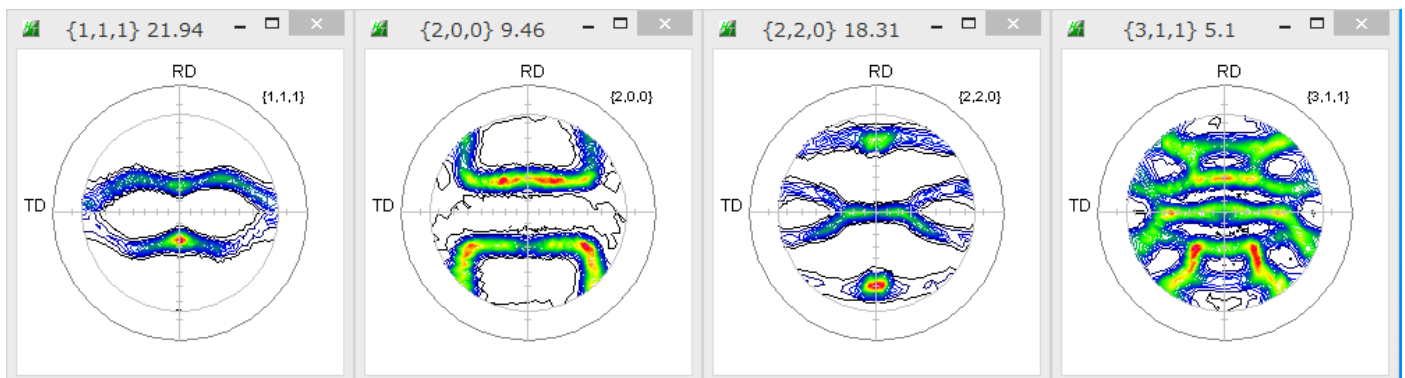


1deg 極点図から GPPoleDisplay で 2deg と 5deg 極点図を作成

### 2deg

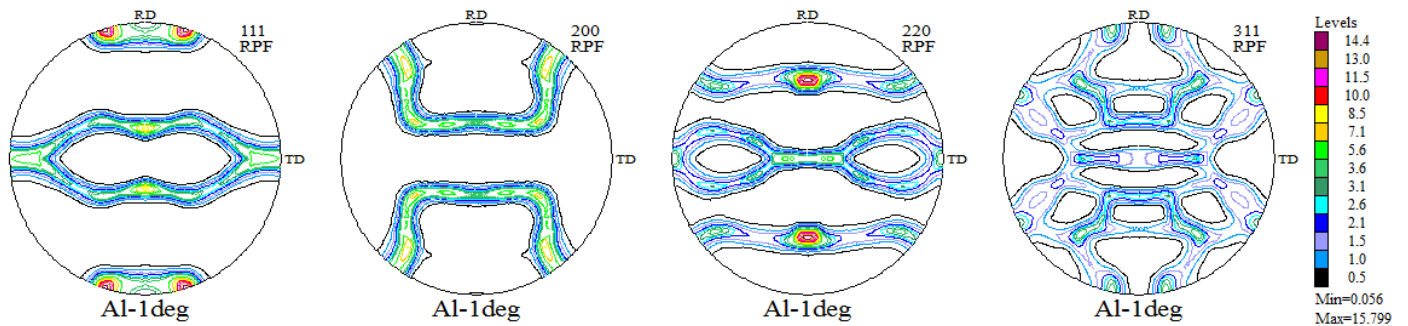


### 5deg

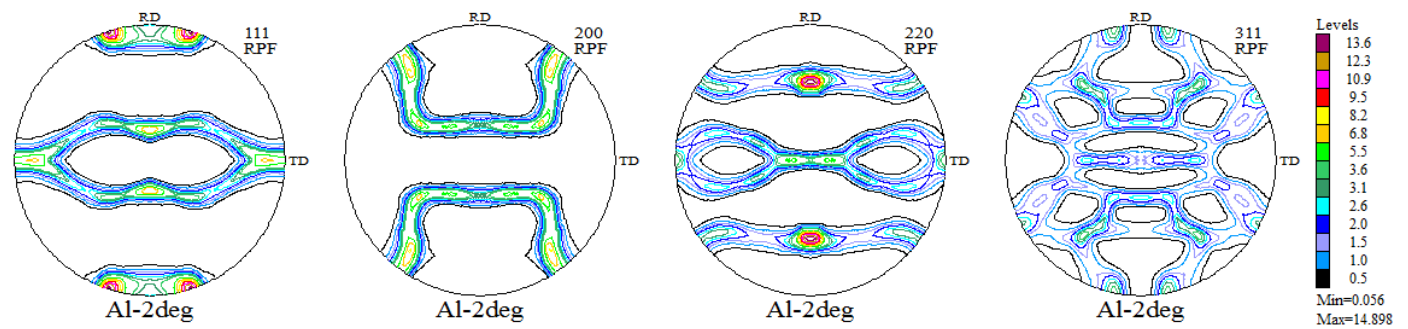


# ODF 解析後の極点図比較

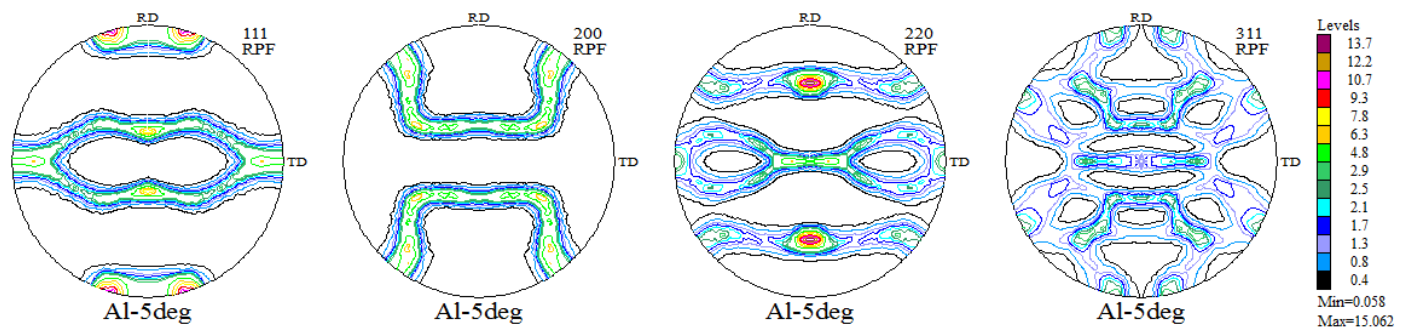
## 1deg



## 2deg



## 5deg



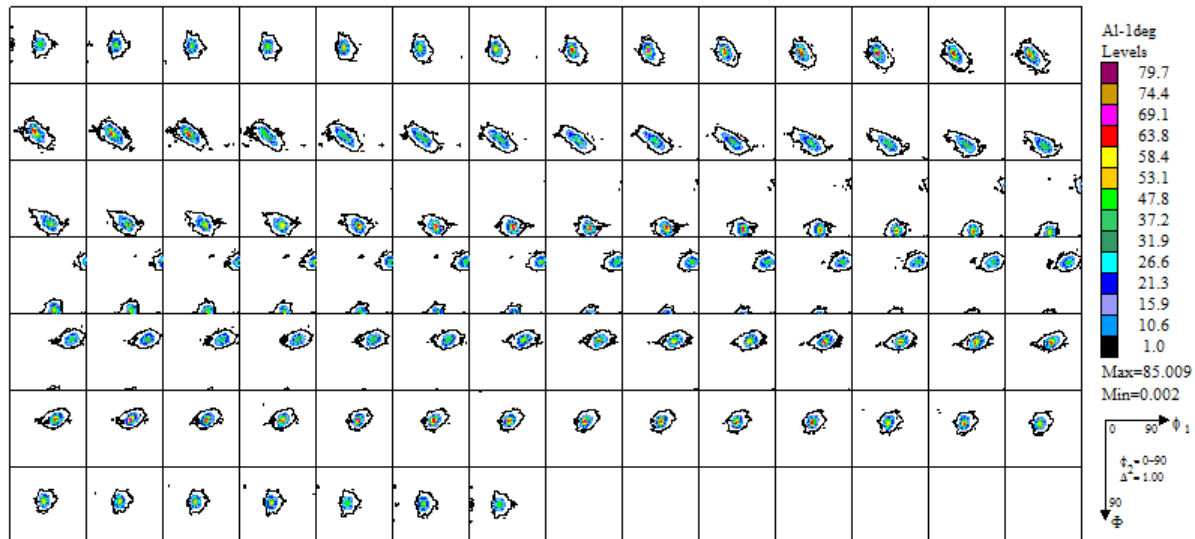
	{111}	{200}	{220}	{311}
1deg	15.799	8.619	15.361	4.207
2deg	14.699	8.279	14.898	4.170
5deg	12.037	7.583	15.062	3.407
1 deg to 2 deg	15.799	8.619	15.361	4.207
1 deg to 5 deg	15.799	8.619	15.361	4.207

LaboTex の内部で 1deg から 2deg や 5deg 変換しても再計算極点図は 1deg で計算されている。

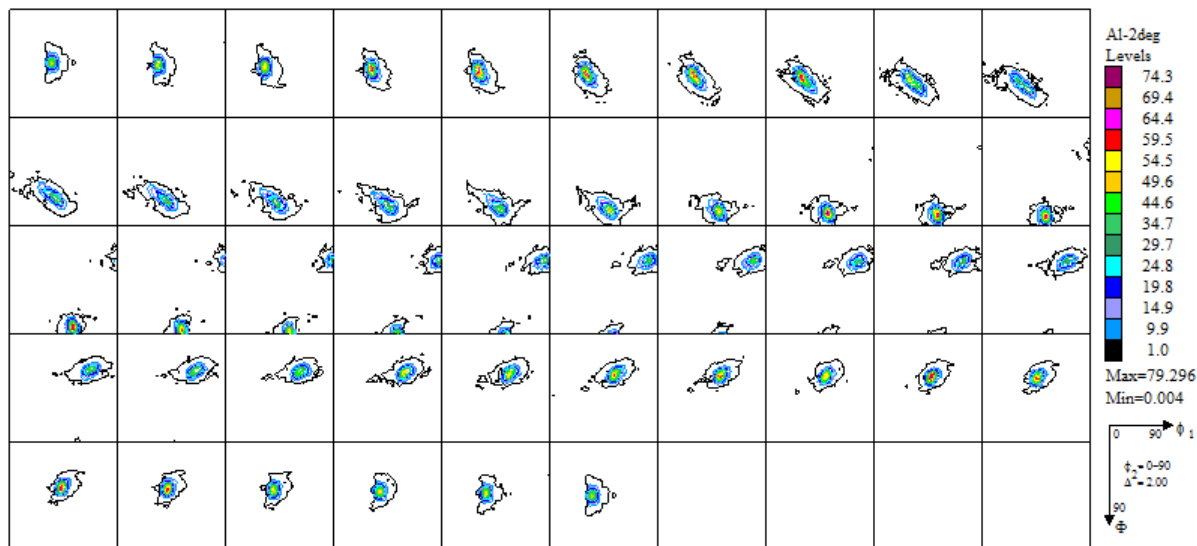
1 d e g , 2 d e g , 5 d e g で比較すると、5 d e g の { 2 2 0 } の挙動が異なる。

# ODF 図比較

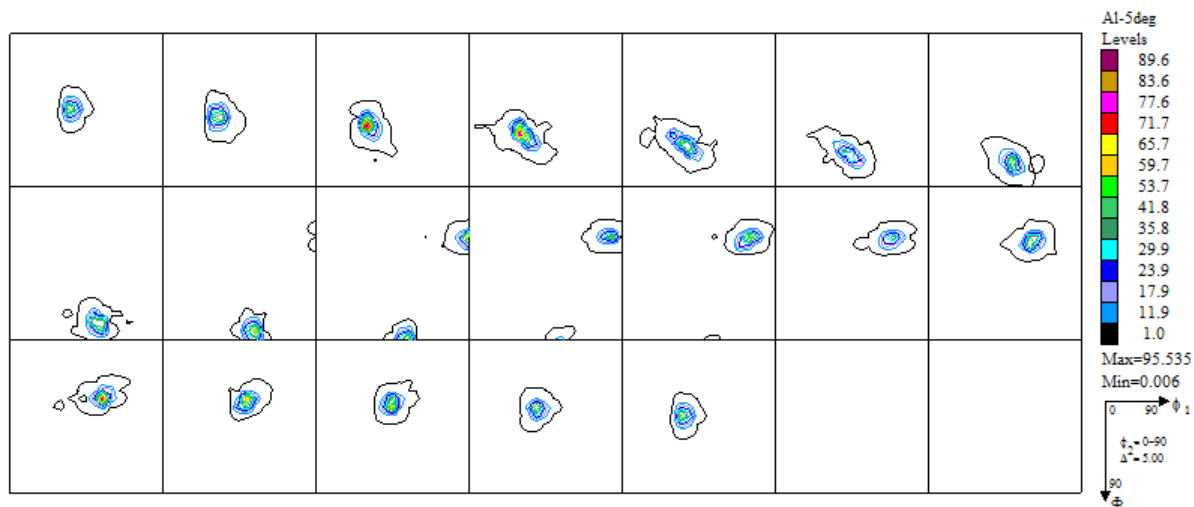
## 1deg



## 2deg



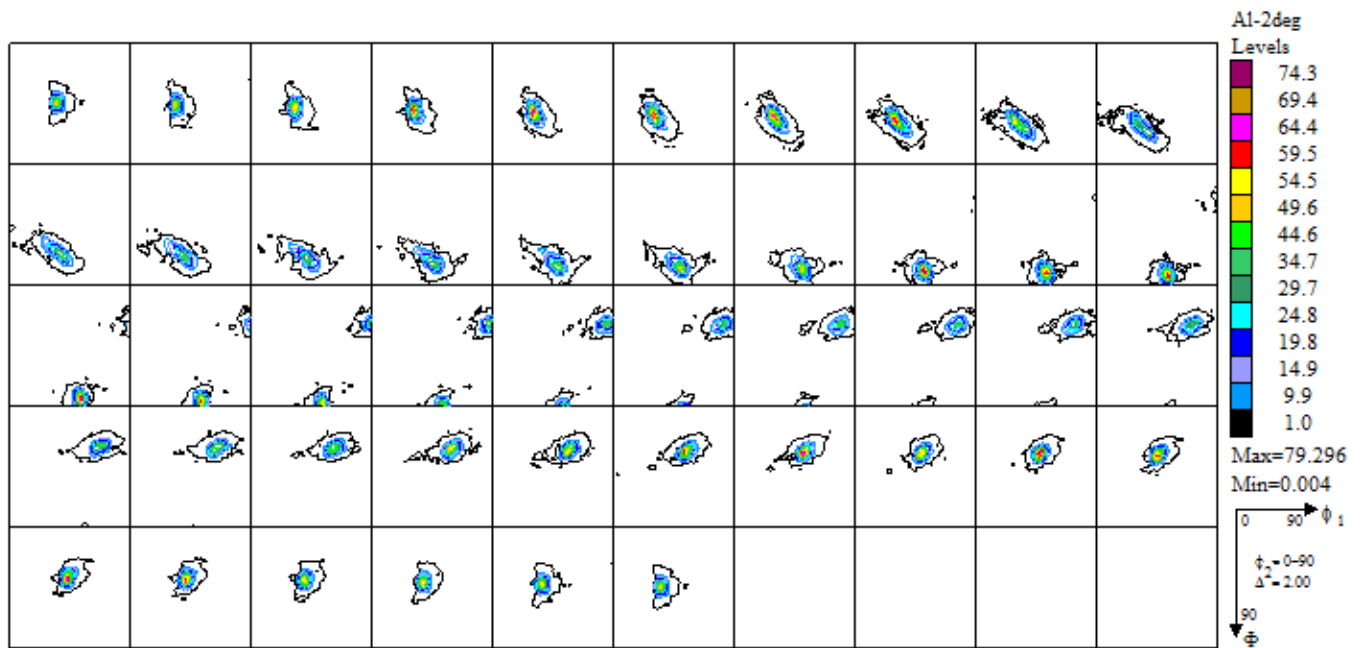
## 5deg



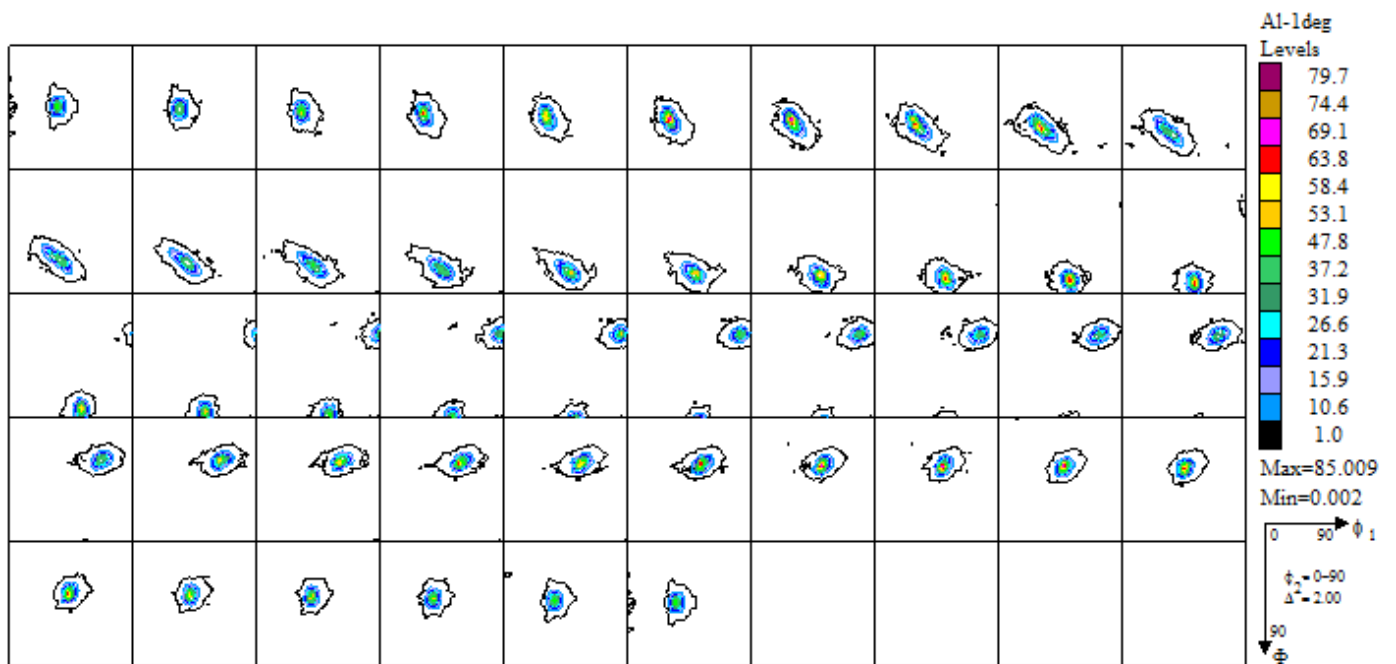
ODFの最大値では5degが最大になる。

1degODF 図から 2deg 極点図を作成し比較

2deg

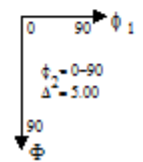
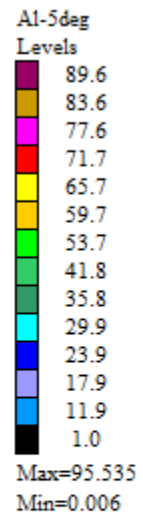
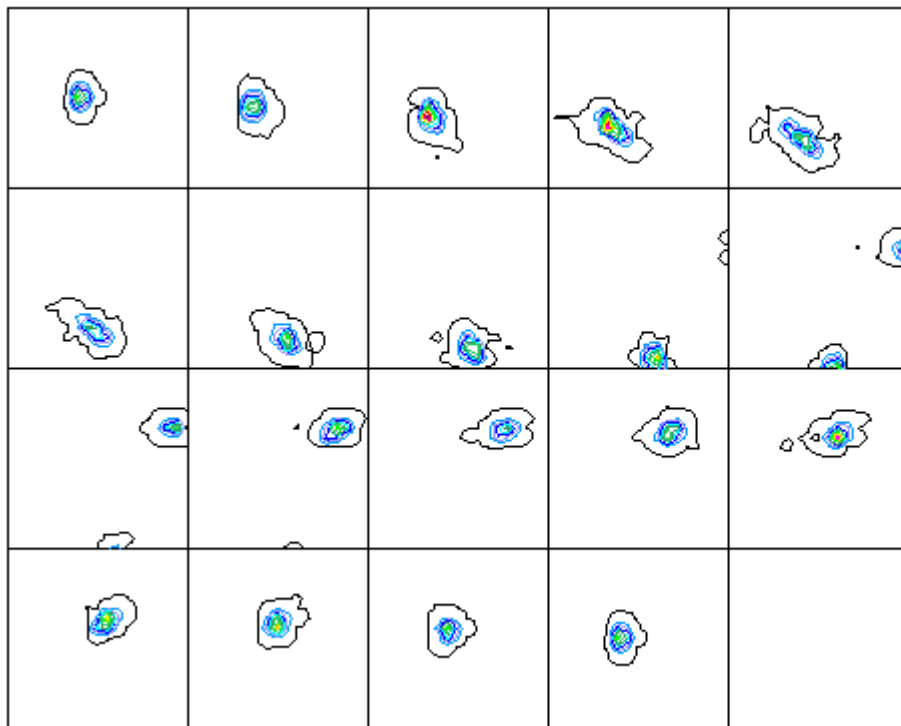


1deg->2deg

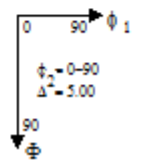
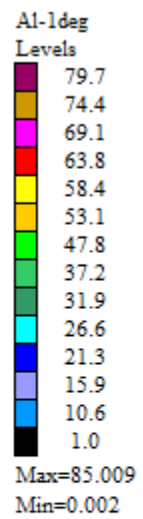
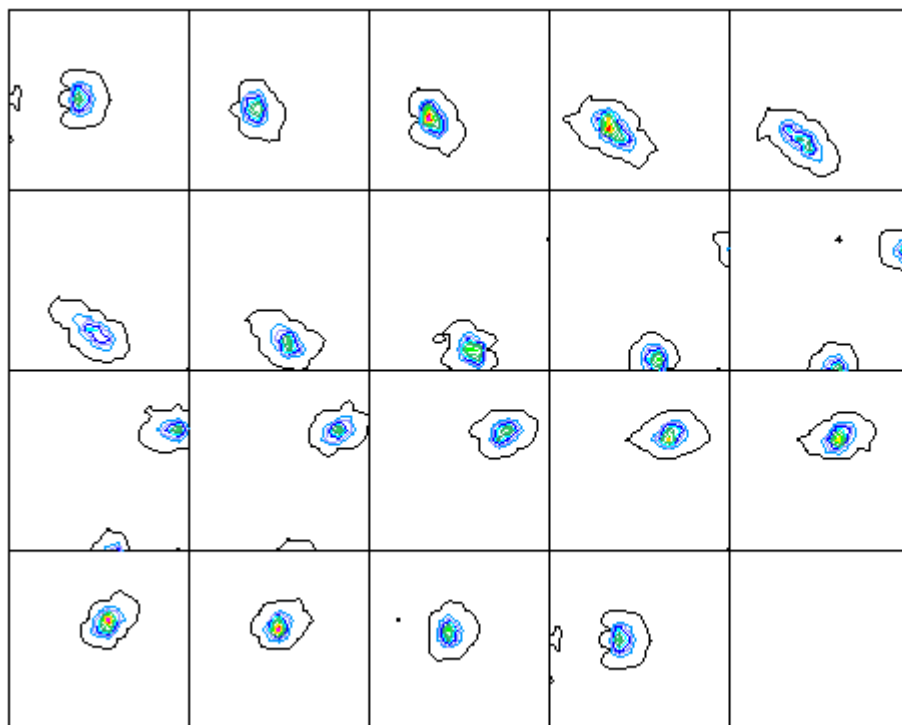


1degODF 図から 5deg 極点図を作成し比較

5deg



1deg->5deg



# VolumeFraction

1deg

Quantitative Analysis - Model Functions Method - Project: Demo Sample:Al-1deg Job:1

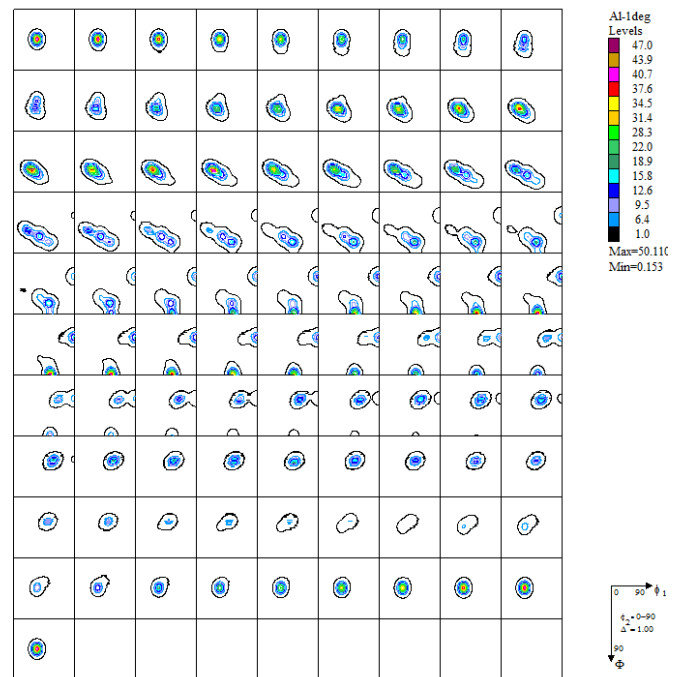
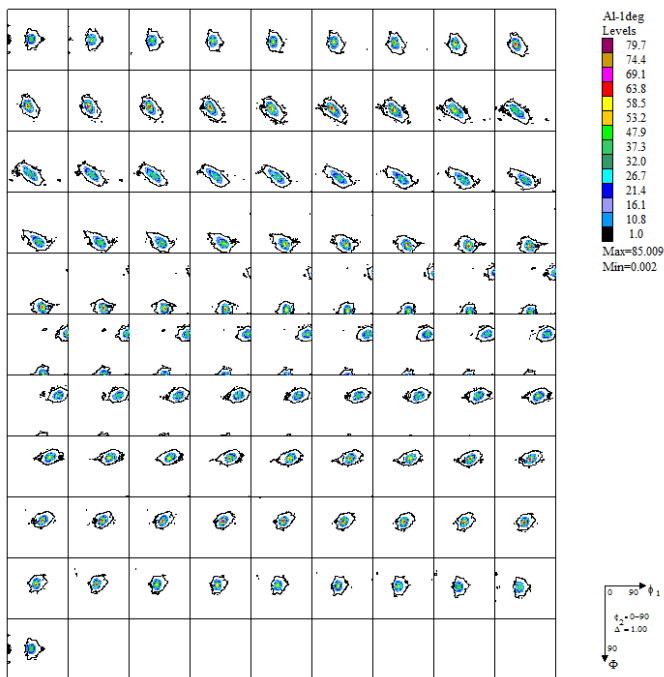
Crystal Symmetry: **Cubic** (Cubic) | Sample Symmetry: Orthorhombic | Grid Cells for Output ODF: 1.0\*1.0 | Step: 0.50 | Diagram Range +/-: 45.0

Centre of Orientation (Three plots showing 100.0% fit, with Misfit, Good, and Backgr. curves)

No	Texture Component	On	Distribution	FWHM $\rho_1$	FWHM $\Phi$	FWHM $\rho_2$	Volume Fraction	Show Sym. Eq.
1	{ 1 3 2 } < 6 -4 3 > S-1	<input checked="" type="checkbox"/>	Gauss	13.9	12.6	14.0	44 %	{ 1 3 2 } < 6 -4 3 > S-1
2	{ 1 1 0 } < 1 -1 2 > brass	<input checked="" type="checkbox"/>	Gauss	10.7	12.8	13.3	24 %	Calculation Mode <input checked="" type="radio"/> Automatic <input type="radio"/> Manual Max. Iteration Number: 1,000 Max. Fit Error % (*1000): 100 Iteration: 81 Fit Error% (*1000): 85414. Fit Calculation Progress:
3	{ 1 1 2 } < 1 1 -1 > copper	<input checked="" type="checkbox"/>	Gauss	12.6	14.2	18.4	16 %	
4	{ 2 1 3 } < -3 -6 4 > S-3	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	14 %	
5	{ 2 3 1 } < -3 4 -6 > S-4	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	18 %	
6	{ 1 1 2 } < 1 1 -1 > copper	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	17 %	
7	{ 1 1 0 } < 0 0 1 > goss	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	
8	{ 1 2 3 } < 4 1 -2 >	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	
9	{ 1 2 3 } < 4 1 -2 > R	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	
10	{ 1 1 0 } < 1 -1 1 >	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	

Max. Linearity | Orientation Set: Set from Database (sort by) | Save Current Set | Background: 16 %

Buttons: Change Initial Parameters | Start Volume Fraction Calculation | Exit | Exit and Show





# VolumeFraction

2deg

Quantitative Analysis - Model Functions Method - Project: Demo Sample:Al-2deg Job:1

Crystal Symmetry: **Cubic** (Cubic) | Sample Symmetry: Orthorhombic | Grid Cells for Output ODF: 2.0\*2.0 | Step: 0.50 | Diagram Range +/-: 45.0

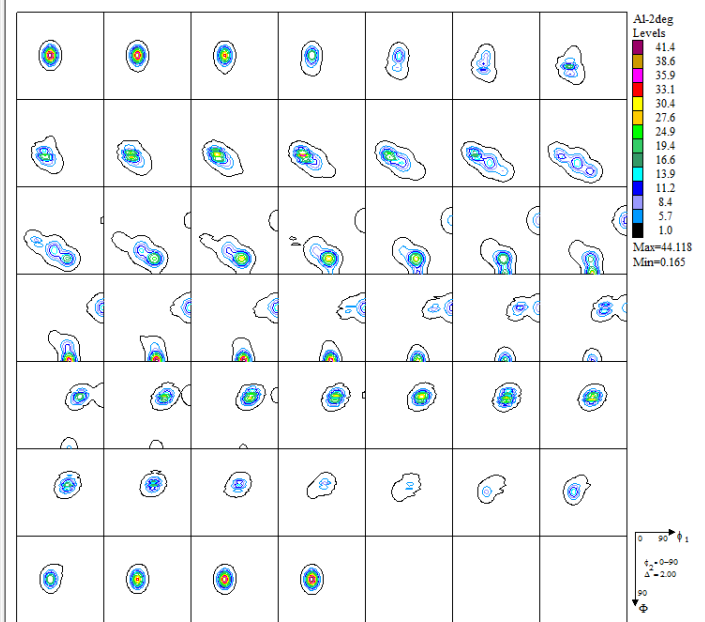
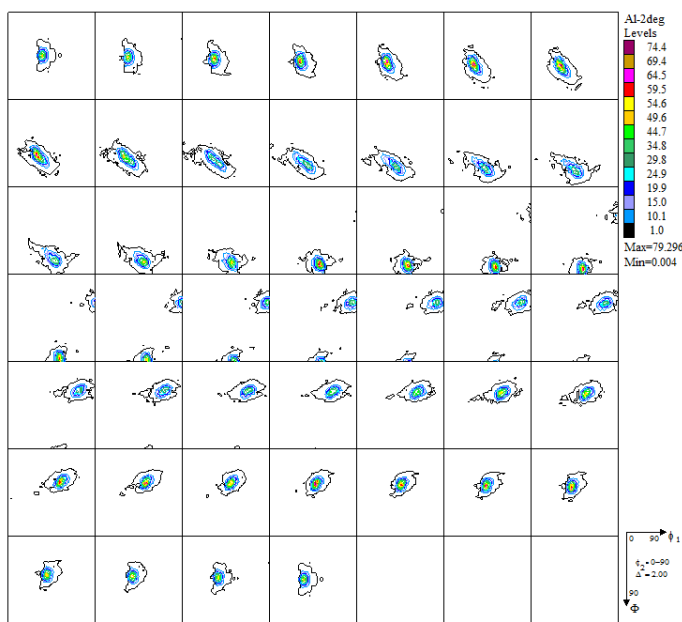
Centre of Orientation (100.0%) | Centre of Orientation (100.0%) | Centre of Orientation (100.0%)

Misfit (red), Good (blue), Backgr. (black), Diff. (grey)

No	Texture Component	On	Distribution	FWHM $\rho_1$	FWHM $\Phi$	FWHM $\rho_2$	Volume Fraction	Show Sym. Eq.
1	{ 1 3 2 } < 6 -4 3 > S-1	<input checked="" type="checkbox"/>	Gauss	12.2	11.5	13.5	44 %	{ 1 3 2 } < 6 -4 3 > S-1
2	{ 1 1 0 } < 1 -1 2 > brass	<input checked="" type="checkbox"/>	Gauss	9.6	12.9	12.9	23 %	Calculation Mode
3	{ 1 1 2 } < 1 1 -1 > copper	<input checked="" type="checkbox"/>	Gauss	12.6	15.2	16.9	16 %	<input checked="" type="radio"/> Automatic <input type="radio"/> Manual
4	{ 2 3 1 } < -3 4 -6 > S-4	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	14 %	Max. Iteration Number: 1,000
5	{ 2 1 3 } < -3 -6 4 > S-3	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	17 %	Max. Fit Error % (*1000): 100
6	{ 1 1 2 } < 1 1 -1 > copper	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	14 %	Iteration: 195
7	{ 1 2 3 } < 4 1 -2 >	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	Fit Error% (*1000): 86099.
8	{ 1 2 3 } < 4 1 -2 > R	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	Fit Calculation Progress
9	{ 1 1 0 } < 1 -1 1 >	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	
10	{ 1 1 0 } < 0 0 1 > goss	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	

Max. Linearity | Orientation Set: Set from Database (sort by) | Save Current Set | Background: 17 %

Change Initial Parameters | Start Volume Fraction Calculation | Exit | Exit and Show



# VolumeFraction

5deg

Quantitative Analysis - Model Functions Method - Project: Demo Sample:Al-5deg Job:1

Crystal Symmetry: **(Cubic)** Sample Symmetry: Orthorhombic Grid Cells for Output ODF: 5.0\*5.0 Step: 0.50 Diagram Range +/-: 45.0

Centre of Orientation (100.0%) Centre of Orientation (100.0%) Centre of Orientation (100.0%)

Misfit Good Backgr. Diff.

No	Texture Component	On	Distribution	FWHM $\rho_1$	FWHM $\Phi$	FWHM $\rho_2$	Volume Fraction	Show Sym. Eq.
1	{ 1 3 2 } < 6 -4 3 > S-1	<input checked="" type="checkbox"/>	Gauss	12.9	11.7	13.4	50	{ 1 3 2 } < 6 -4 3 > S-1
2	{ 1 1 0 } < 1 -1 2 > brass	<input checked="" type="checkbox"/>	Gauss	10.1	9.4	11.1	21	
3	{ 1 1 2 } < 1 1 -1 > copper	<input checked="" type="checkbox"/>	Gauss	12.1	15.2	11.0	12	
4	{ 2 3 1 } < 3 -4 6 > S-2	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	12	
5	{ 2 3 1 } < -3 4 -6 > S-4	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	14	
6	{ 2 1 3 } < -3 -6 4 > S-3	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	17	
7	{ 1 2 3 } < 4 1 -2 >	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10	
8	{ 1 2 3 } < 4 1 -2 > R	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10	
9	{ 1 1 0 } < 0 0 1 > goss	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10	
10	{ 3 2 3 } < 1 -3 1 >	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10	

Max. Linearity:  Orientation Set: Set from Database (sort by) Save Current Set Background: 17

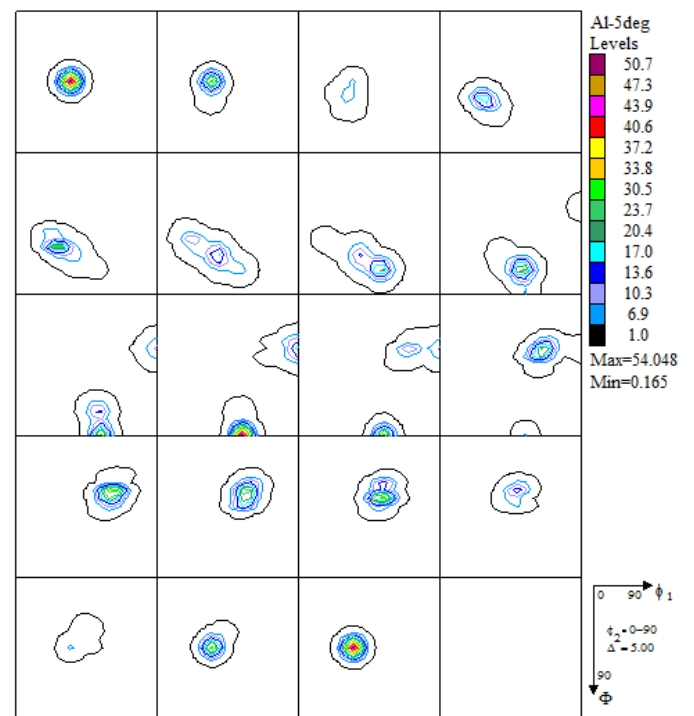
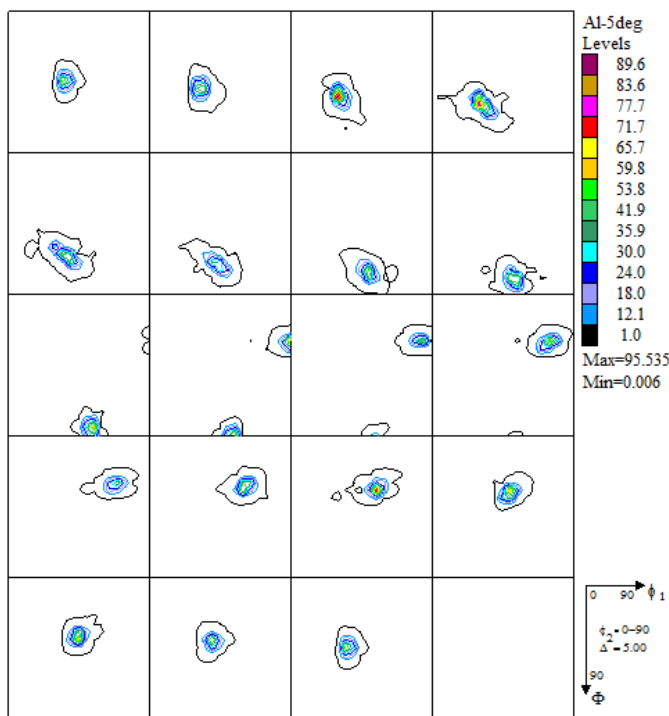
Calculation Mode:  Automatic  Manual

Max. Iteration Number: 1,000 Max. Fit Error % (\*1000): 100

Iteration: 183 Fit Error% (\*1000): 93708.

Fit Calculation Progress:

Buttons: Change Initial Parameters Start Volume Fraction Calculation Exit Exit and Show



# VolumeFraction

1deg->5deg

Quantitative Analysis - Model Functions Method - Project: Demo Sample:Al-1deg Job:3

Crystal Symmetry: **(Cubic)** | Sample Symmetry: Orthorhombic | Grid Cells for Output ODF: 5.0\*5.0 | Step: 0.50 | Diagram Range +/-: 45.0

Centre of Orientation (100.0%) | Centre of Orientation (100.0%) | Centre of Orientation (100.0%)

Misfit: █ | Good: █ | Backgr.: █ | Diff. █

No	Texture Component	On	Distribution	FWHM $\phi_1$	FWHM $\Phi$	FWHM $\phi_2$	Volume Fraction	Show Sym. Eq.
1	{ 1 3 2 } < 6 -4 3 > S-1	<input checked="" type="checkbox"/>	Gauss	13.6	12.5	13.2	48 %	{ 1 3 2 } < 6 -4 3 > S-1
2	{ 1 1 0 } < 1 -1 2 > brass	<input checked="" type="checkbox"/>	Gauss	10.1	12.2	12.0	22 %	
3	{ 1 1 2 } < 1 1 -1 > copper	<input checked="" type="checkbox"/>	Gauss	12.3	13.9	14.6	14 %	
4	{ 2 3 1 } < -3 4 -6 > S-4	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	14 %	
5	{ 2 1 3 } < -3 -6 4 > S-3	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	17 %	
6	{ 1 1 2 } < 1 1 -1 > copper	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	18 %	
7	{ 1 2 3 } < 4 1 -2 >	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	
8	{ 1 2 3 } < 4 1 -2 > R	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	
9	{ 1 1 0 } < 0 0 1 > goss	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	
10	{ 1 1 0 } < 1 -1 1 >	<input type="checkbox"/>	Gauss	10.0	10.0	10.0	10 %	

Max. Linearity:  | Orientation Set: Set from Database (sort by) | Save Current Set | Background: 16 %

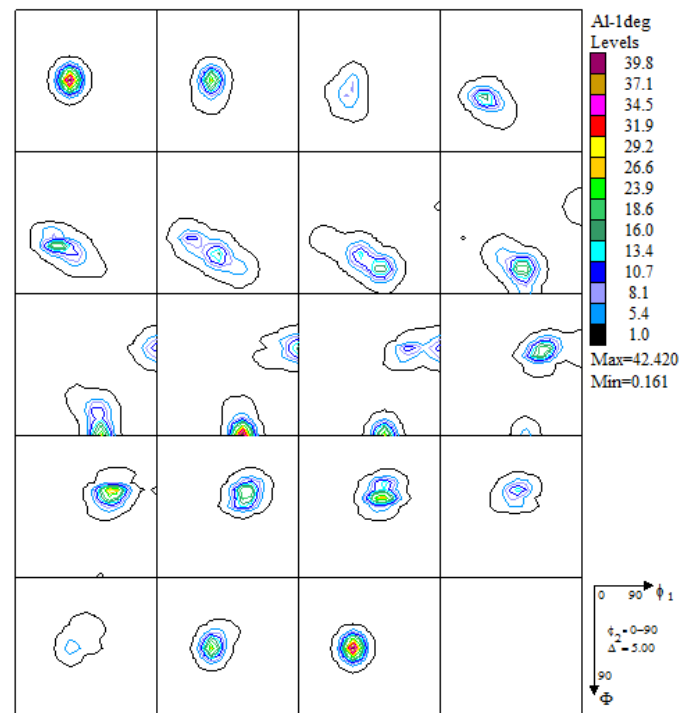
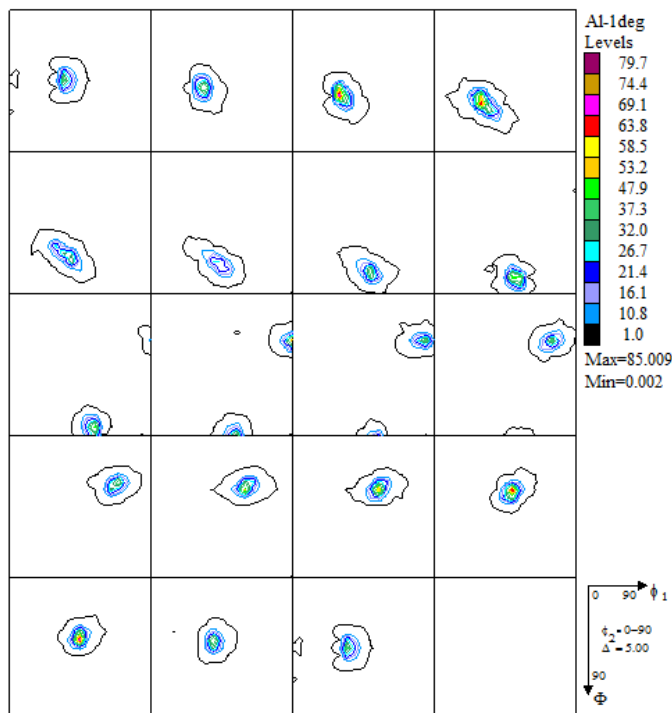
Calculation Mode:  Automatic  Manual

Max. Iteration Number: 1,000 | Max. Fit Error % (\*1000): 100

Iteration: 129 | Fit Error% (\*1000): 84121.

Fit Calculation Progress:

Buttons: Change Initial Parameters | Start Volume Fraction Calculation | Exit | Exit and Show



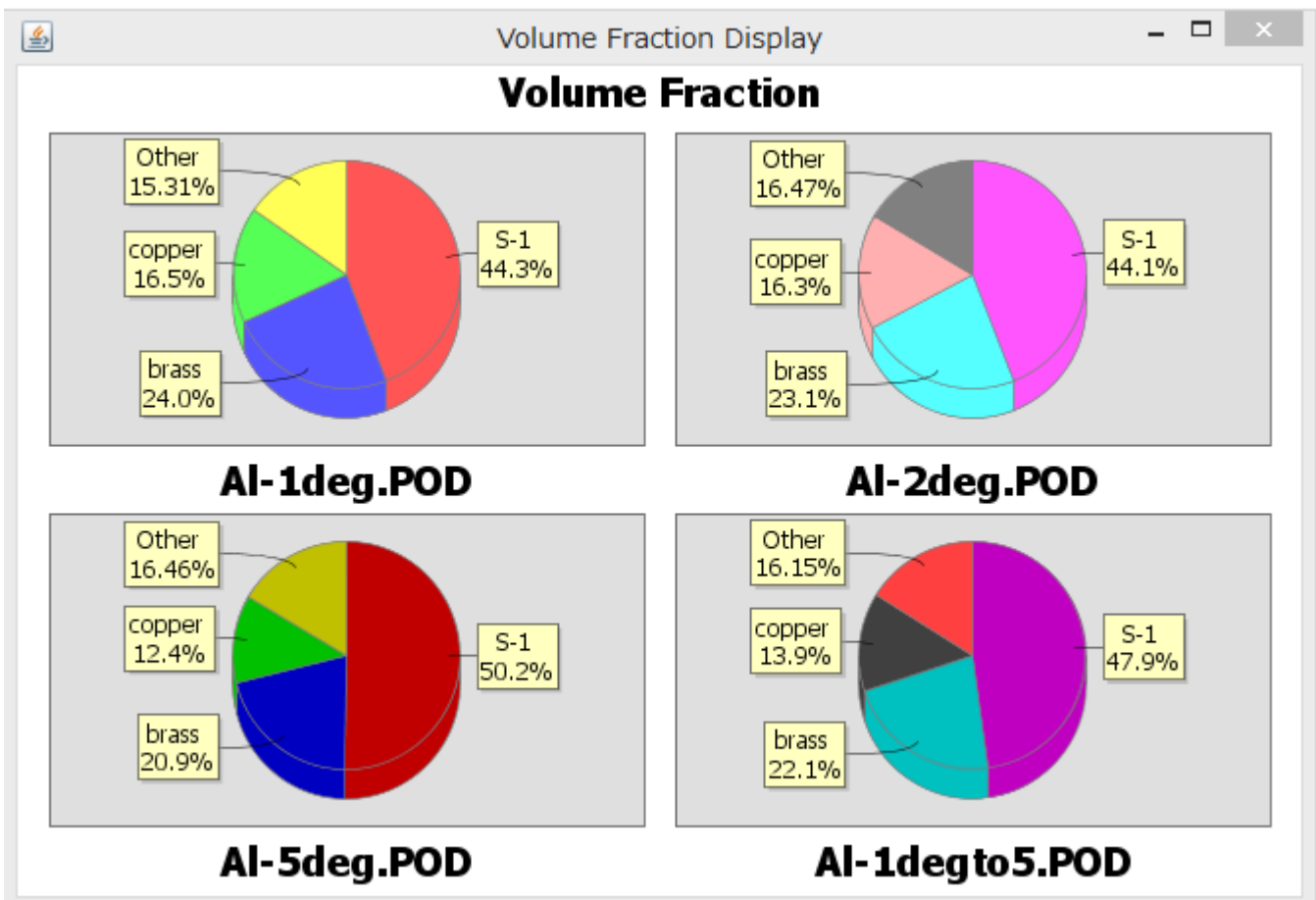
Volume Fraction比

Job	JOB4	Sample : Al-1deg	Project : Demo
No.	VF(%)	Phi1(FWHM)	Phi(FWHM)
1:	44.3	13.9	12.6
2:	24.0	10.7	12.8
3:	16.5	12.6	14.2
4:	15.31	Background Volume Fraction	
		Phi2(FWHM)	Orientation
		14.0	{ 1 3 2 } K 6 -4 3 > S-1
		13.3	{ 1 1 0 } K 1 -1 2 > brass
		18.4	{ 1 1 2 } K 1 1 -1 > copper

Job	JOB2	Sample : Al-2deg	Project : Demo
No.	VF(%)	Phi1(FWHM)	Phi(FWHM)
1:	44.1	12.2	11.5
2:	23.1	9.6	12.9
3:	16.3	12.6	15.2
4:	16.47	Background Volume Fraction	
		Phi2(FWHM)	Orientation
		13.5	{ 1 3 2 } K 6 -4 3 > S-1
		12.9	{ 1 1 0 } K 1 -1 2 > brass
		16.9	{ 1 1 2 } K 1 1 -1 > copper

Job	JOB3	Sample : Al-5deg	Project : Demo
No.	VF(%)	Phi1(FWHM)	Phi(FWHM)
1:	50.2	12.9	11.7
2:	20.9	10.1	9.4
3:	12.4	12.1	15.2
4:	16.46	Background Volume Fraction	
		Phi2(FWHM)	Orientation
		13.4	{ 1 3 2 } K 6 -4 3 > S-1
		11.1	{ 1 1 0 } K 1 -1 2 > brass
		11.0	{ 1 1 2 } K 1 1 -1 > copper

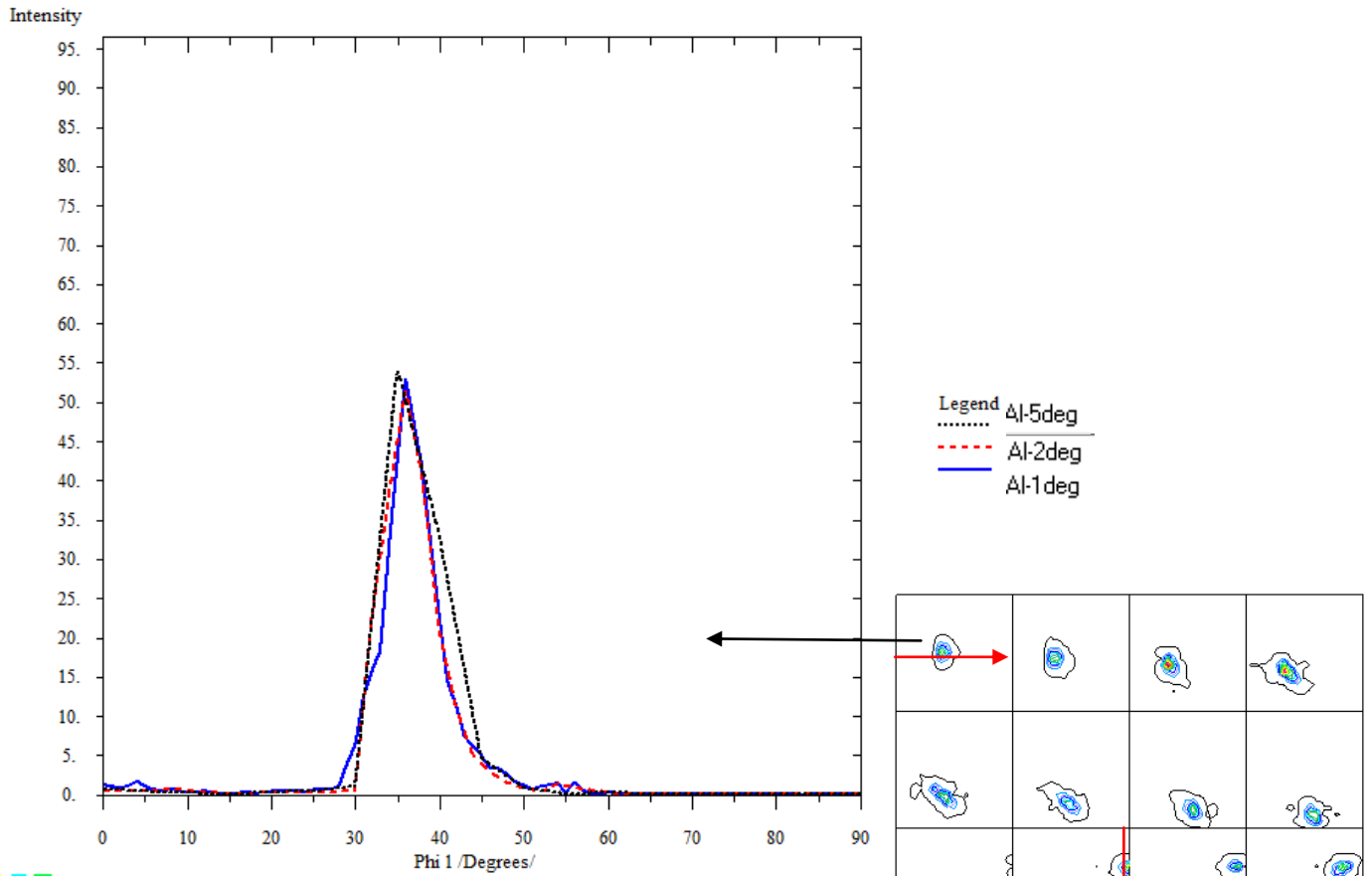
Job	JOB5	Sample : 1degto5deg	Project : Demo
No.	VF(%)	Phi1(FWHM)	Phi(FWHM)
1:	47.9	13.6	12.5
2:	22.1	10.1	12.2
3:	13.9	12.3	13.9
4:	16.15	Background Volume Fraction	
		Phi2(FWHM)	Orientation
		13.2	{ 1 3 2 } K 6 -4 3 > S-1
		12.0	{ 1 1 0 } K 1 -1 2 > brass
		14.6	{ 1 1 2 } K 1 1 -1 > copper



5degのS方位が特異と思われます。

2D 比較

FCC- $\alpha$ -fiber ( $\phi 10 = 0 \rightarrow 90$ 、 $\Phi = 4$ 、 $\phi 2 = 0$ )



Copper 確認 ( $\phi 1 = 90$ 、 $\Phi 0 \rightarrow 90$ 、 $\phi = 45$ )

