

立方晶BCC-Fiberの体積率計算法

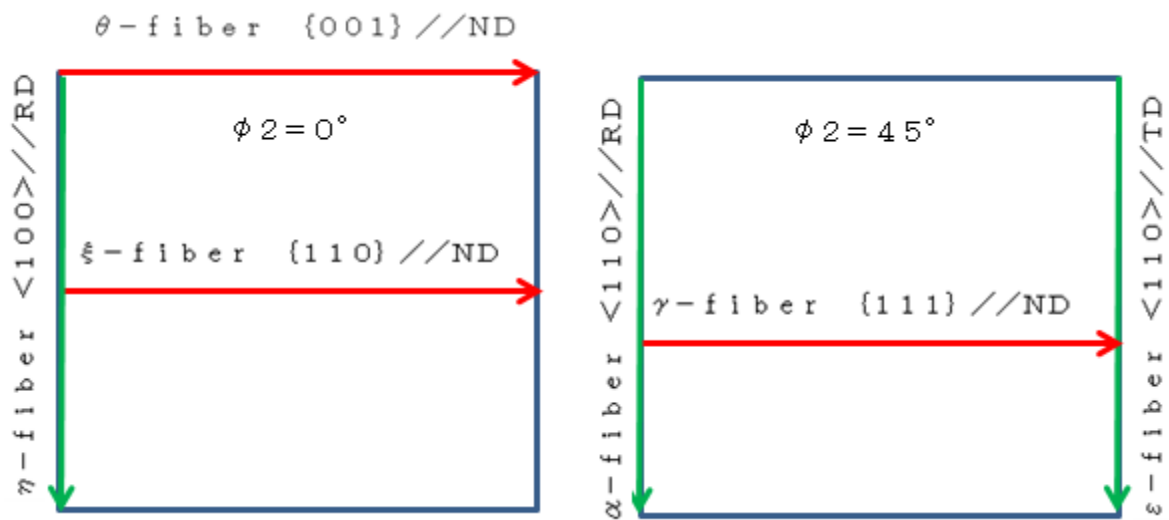
2022年08月01日

HelperTex Office

概要

α -Feなどを扱っていると $\langle h k l \rangle // ND$ 、 $// RD$ 、 $// TD$ などがあります。
 主なfiberは以下の6種類です。
 このfiberのODF図、極点図と、fiberを形成する方位を示し、
 LaboTexで体積率計算可能な $// ND$ に変換する方法を説明します。

α -fiber	$\langle 110 \rangle // RD$	$\phi 1 = 0^\circ$ 、 $\Phi = 0^\circ$ から 90° 、 $\phi 2 = 45^\circ$
γ -fiber	$\{111\} // ND$	$\phi 1 = 0^\circ$ から 90° 、 $\Phi = 55^\circ$ 、 $\phi 2 = 45^\circ$
ε -fiber	$\langle 110 \rangle // TD$	$\phi 1 = 90^\circ$ 、 $\Phi = 0^\circ$ から 90° 、 $\phi 2 = 45^\circ$
η -fiber	$\langle 100 \rangle // RD$	$\phi 1 = 0^\circ$ 、 $\Phi = 0^\circ$ から 90° 、 $\phi 2 = 0^\circ$
θ -fiber	$\{001\} // ND$	$\phi 1 = 0^\circ$ から 90° 、 $\Phi = 0^\circ$ 、 $\phi 2 = 0^\circ$
ξ -fiber	$\{110\} // ND$	$\phi 1 = 0^\circ$ から 90° 、 $\Phi = 45^\circ$ 、 $\phi 2 = 0^\circ$



主な方位

α -fiber	$\langle 110 \rangle // RD$	$(001)[1-10] (0.0,0.0,45.0)$ $(112)[1-10] (0.0,35.26,45.0)$ $(111)[1-10] (0.0,54.74,45.0)$
γ -fiber	$\{111\} // ND$	$(111)[1-10] (0.0,54.74,45.0)$ $(111)[1-21] (30.0,54.74,45.0)$ $(111)[-1-12] (90.0,54.74,45.0)$
ε -fiber	$\langle 110 \rangle // TD$	$(001)[-1-10] (90.0,0.0,45.0)$ $(112)[111] (90.0,35.26,45.0)$ $(111)[-1-12] (90.0,54.74,45.0)$
η -fiber	$\langle 100 \rangle // RD$	$(001)[100] (0.0,0.0,0.0)$ $(011)[100] (0.0,45.0,0.0)$ $(010)[100] (0.0,90.0,0.0)$
θ -fiber	$\{001\} // ND$	$(001)[100] (0.0,0.0,0.0)$ $(001)[1-10] (0.0,45.0,0.0)$
ξ -fiber	$\{110\} // ND$	$(011)[100] (0.0,45.0,0.0)$ $(011)[2-11] (35.26,45.0,0.0)$ $(011)[1-11] (54.74,45.0,0.0)$

以下方位をMTEXで作成し、CTRで表示を行う

Fiber方位作成

```
cs = crystalSymmetry('cubic')
```

```
ss = specimenSymmetry('triclinic')
```

```
odf = fibreODF(Miller(1,1,0,cs),xvector)
```

方位作成

```
psi = vonMisesFisherKernel('HALFWIDTH',5*degree)
```

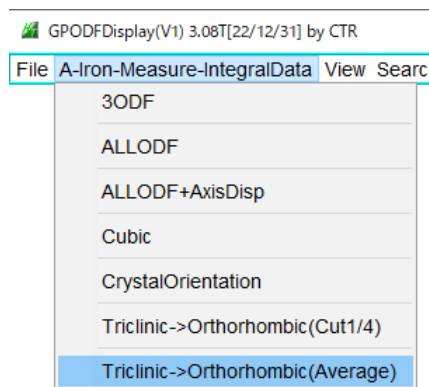
```
ori = orientation.byMiller([1,1,0],[0,0,1],cs,ss)
```

```
odf = unimodalODF(ori,psi)
```

```
h = { Miller(1,1,0,cs), Miller(2,0,0,cs), Miller(2,1,1,cs) }
```

```
rpf = calcPoleFigure(odf,h)
```

ODF図のTriclinic→Orthorhombic



極点図 MTEXフォーマット→TXT2

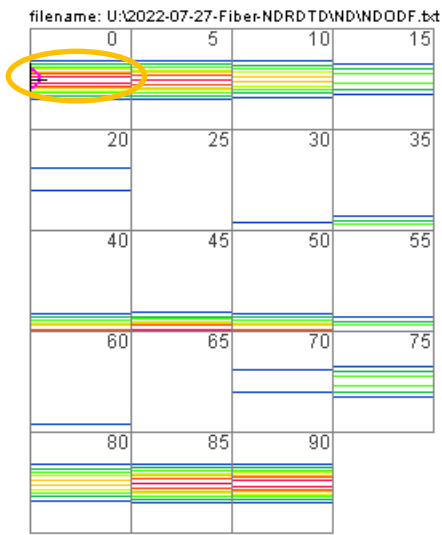
MakePoleFileで変換

極点図表示

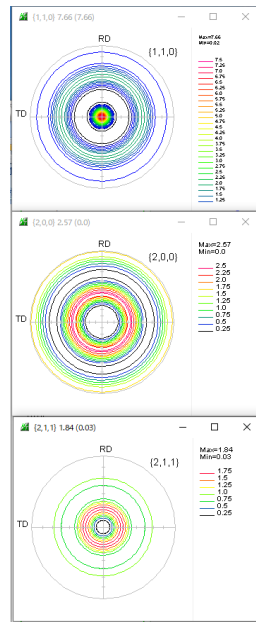
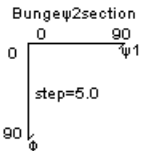
GPPOleDisplayでTXT2を表示

ξ - fiber $\{110\} // ND$

$\phi 1 = 0^\circ$ から 90° 、 $\Phi = 45^\circ$ 、 $\phi 2 = 0^\circ$



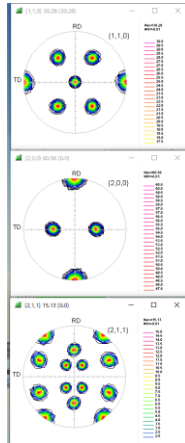
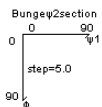
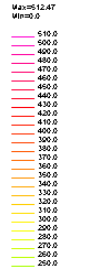
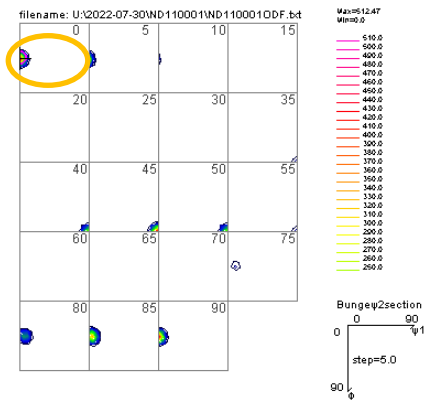
Max=7.66
Min=0.0



$(0,1,1)[1,0,0]f1=0.0, F=45.0, f2=0.0$ ODF=7.66

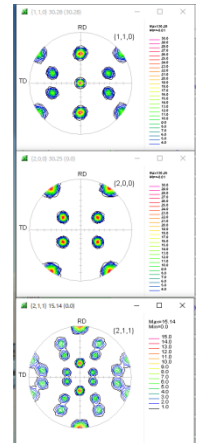
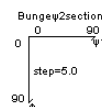
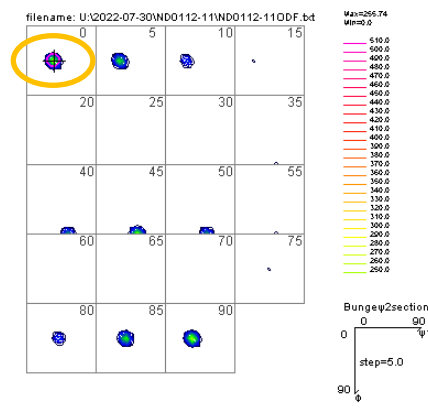
Fiber 上の主要な方位

$\{011\}\langle 100 \rangle$



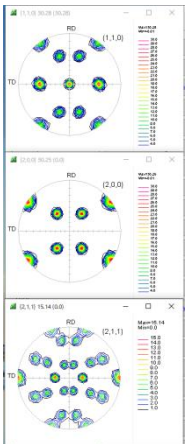
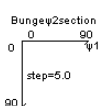
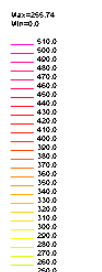
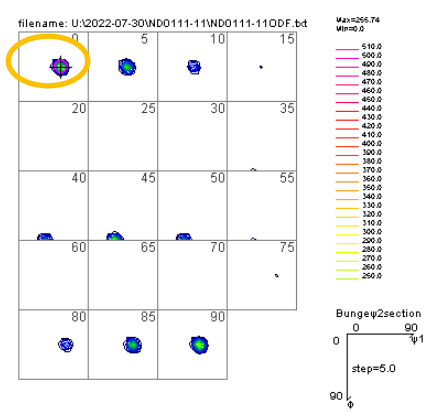
$(0,1,1)[1,0,0]f1=0.0, F=45.0, f2=0.0$ ODF=512.47

$\{011\}\langle 2-11 \rangle$



$(0,1,1)[2,-1,1]f1=35.3, F=45.0, f2=0.0$ ODF=255.74

$\{011\}\langle 1-11 \rangle$

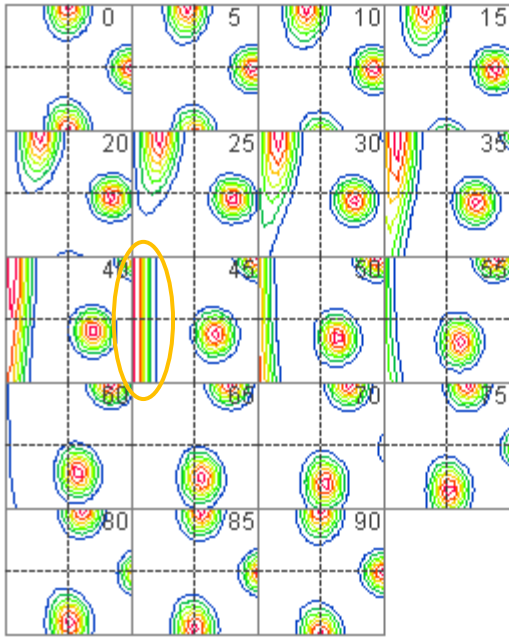


$(0,1,1)[1,-1,1]f1=54.7, F=45.0, f2=0.0$ ODF=255.74

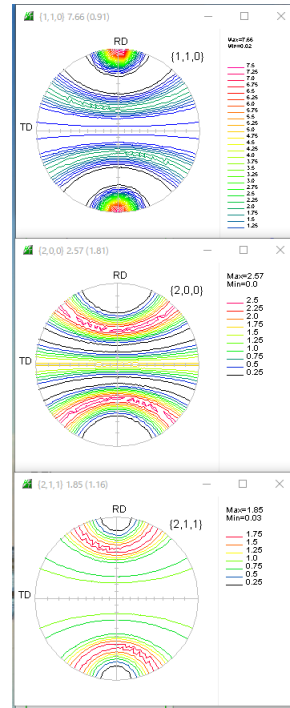
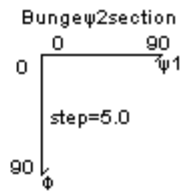
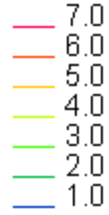
α -fiber $\langle 110 \rangle // RD$

$\phi 1 = 0^\circ$ 、 $\Phi = 0^\circ$ から 90° 、 $\phi 2 = 45^\circ$

filename: U:\2022-07-30\110RD.bt



Max=7.66
Min=0.0

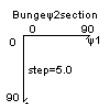
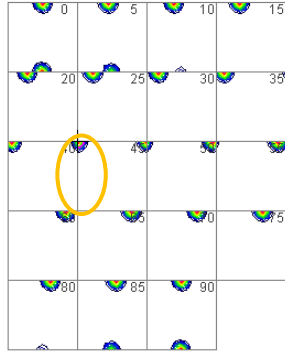


Fiber 上の主要な方位

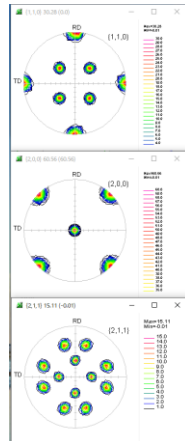
$\{001\}\langle 1-10 \rangle$

$\{112\}\langle 1-10 \rangle$

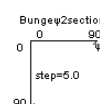
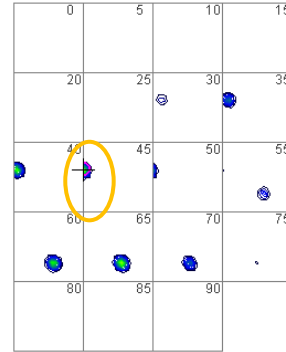
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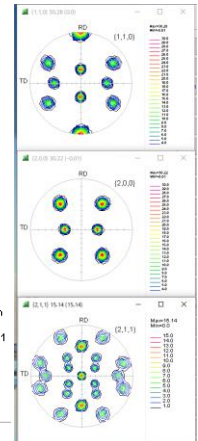
$(0,0,1)[1,-1,0]f1=0.0,F=0.0,f2=45.0$ ODF=512.47



filename: U:\2022-07-30\RD1121-10\RD1121-10ODF.bt

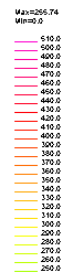
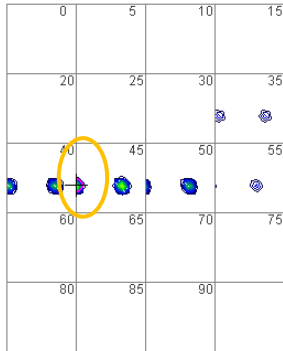


$(1,1,2)[1,-1,0]f1=0.0,F=35.3,f2=45.0$ ODF=255.74

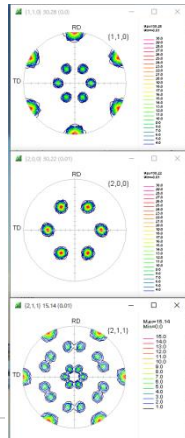


$\{111\}\langle 1-10 \rangle$

filename: U:\2022-07-30\RD1111-10\RD1111-10ODF.bt

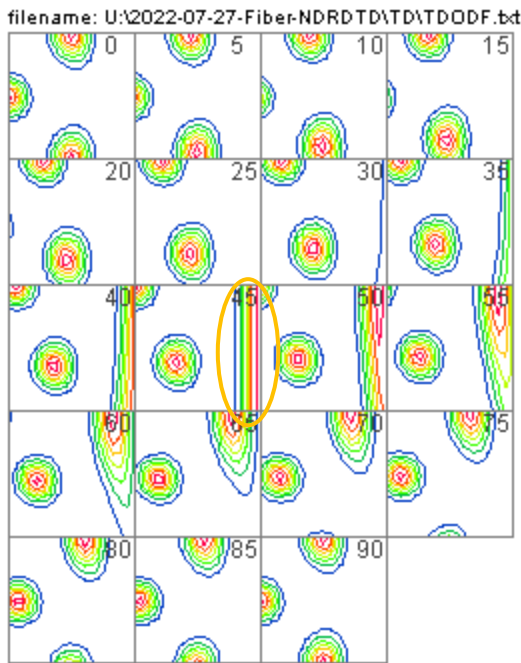


$(1,1,1)[1,-1,0]f1=0.0,F=54.7,f2=45.0$ ODF=255.74

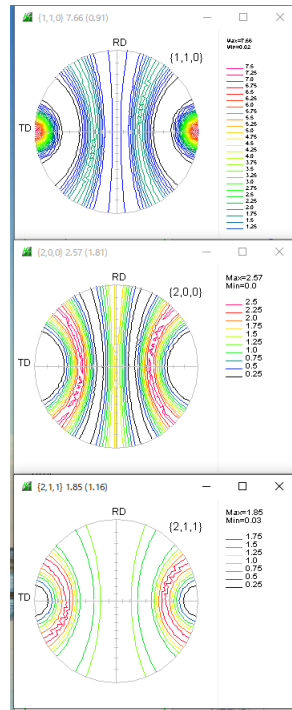
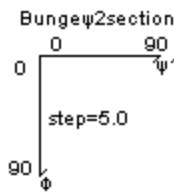


ϵ - fiber $\langle 110 \rangle // TD$

$\phi 1 = 90^\circ$ 、 $\Phi = 0^\circ$ から 90° 、 $\phi 2 = 45^\circ$



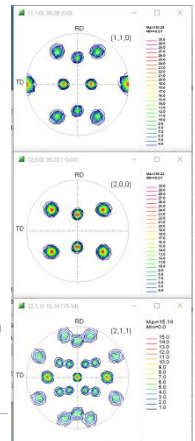
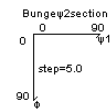
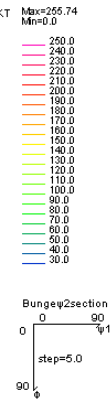
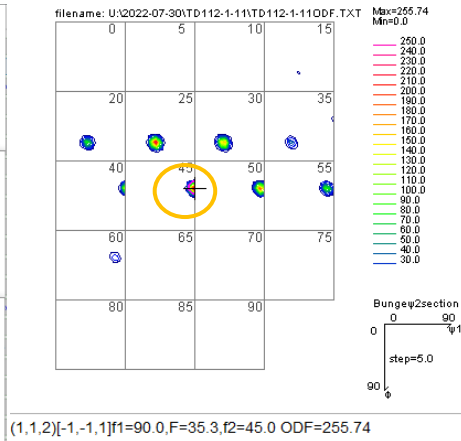
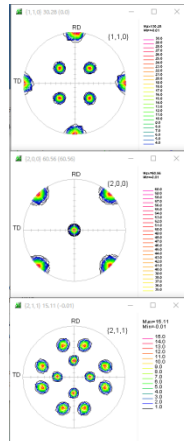
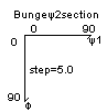
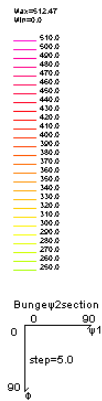
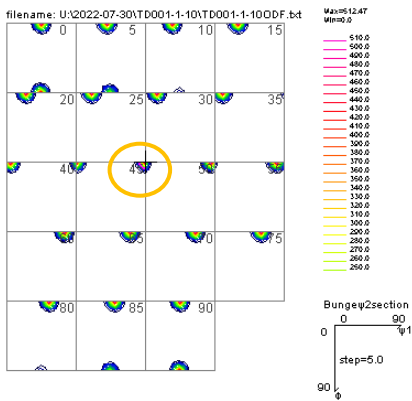
Max=7.66
Min=0.0



Fiber 上の主要な方位

$\{001\}\langle -1-10 \rangle$

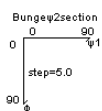
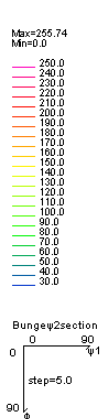
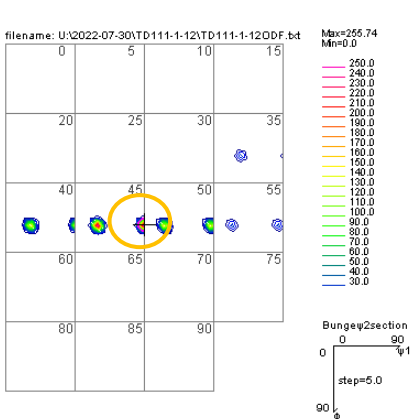
$\{112\}\langle -1-10 \rangle$



$(0,0,1)[-1,-1,0]f1=90.0,F=0.0,f2=45.0$ ODF=512.47

$(1,1,2)[-1,-1,1]f1=90.0,F=35.3,f2=45.0$ ODF=255.74

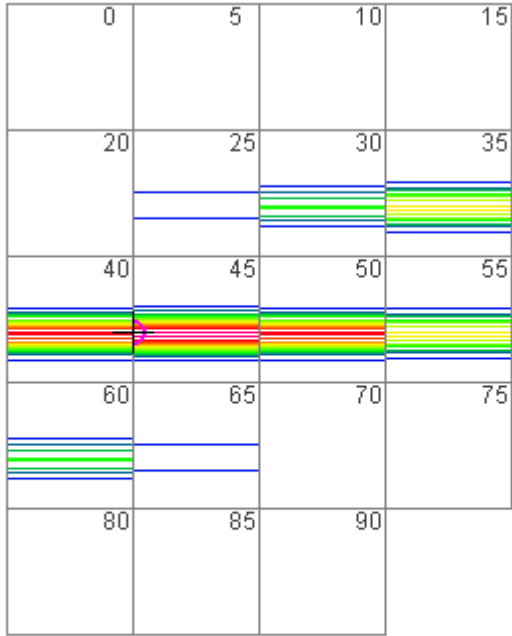
$\{111\}\langle -1-12 \rangle$



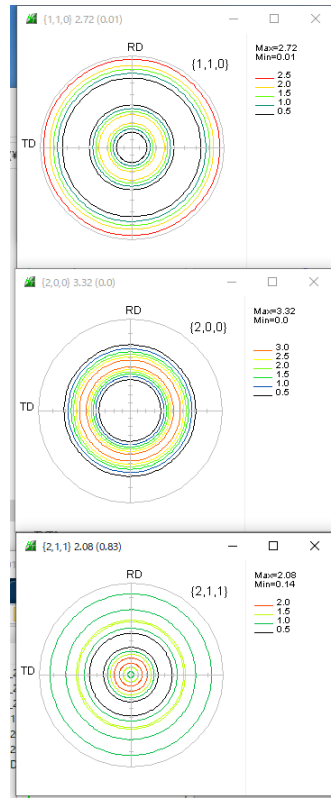
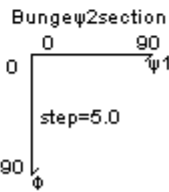
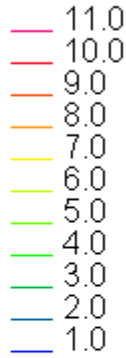
$(1,1,1)[-1,-1,2]f1=90.0,F=54.7,f2=45.0$ ODF=255.74

γ -fiber $\{111\} // ND$ $\phi 1 = 0^\circ$ から 90° 、 $\Phi = 55^\circ$ 、 $\phi 2 = 45^\circ$

filename: U:\2022-07-27-Fiber-NDRD\TD\ND111\ND111-FOC



Max=11.48
Min=0.0



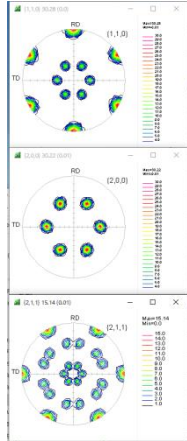
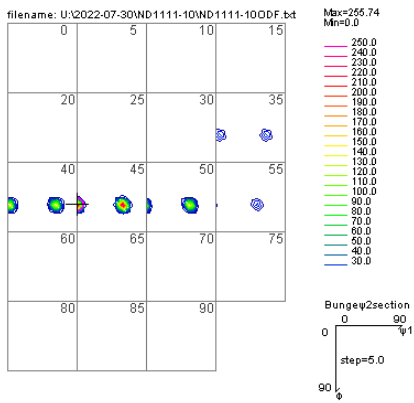
$(1,1,1)[1,-1,0]f1=0.0, F=54.7, f2=45.0$ ODF=11.48

四角形の部

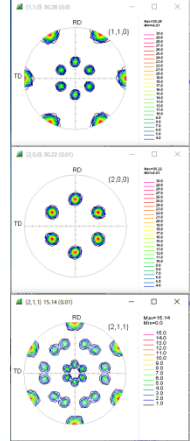
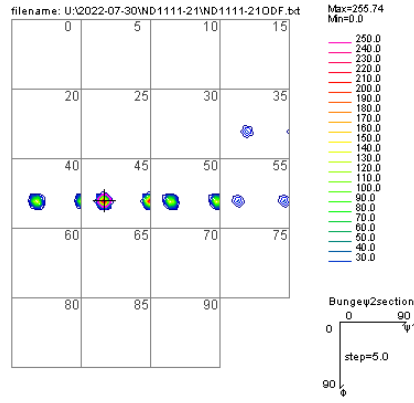
Fiber 上の主要な方位

$\{111\}\langle 1-10 \rangle$

$\{111\}\langle 1-21 \rangle$

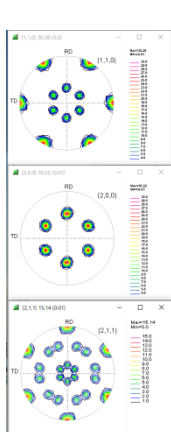
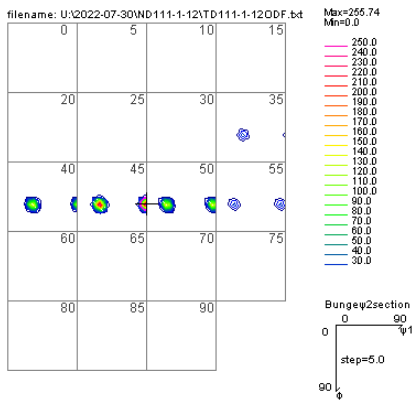


$(1,1,1)[1,-1,0]f1=0.0, F=54.7, f2=45.0$ ODF=255.74



$(1,1,1)[1,-2,1]f1=30.0, F=54.7, f2=45.0$ ODF=255.74

$\{111\}\langle -1-12 \rangle$

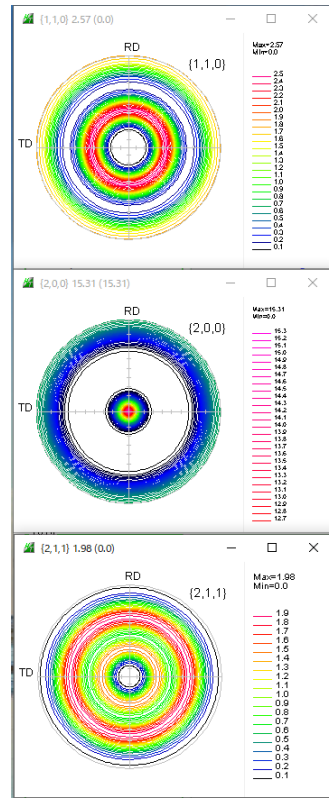
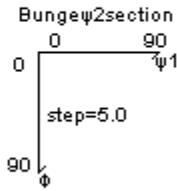
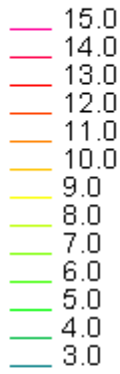


$(1,1,1)[1,-1,-2]f1=90.0, F=54.7, f2=45.0$ ODF=255.74

θ - fiber $\{001\} // ND$ $\phi 1 = 0^\circ$ から 90° 、 $\Phi = 0^\circ$ 、 $\phi 2 = 0^\circ$



Max=15.32
Min=0.0



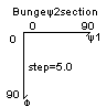
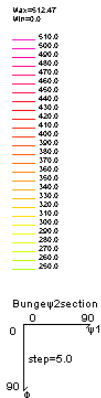
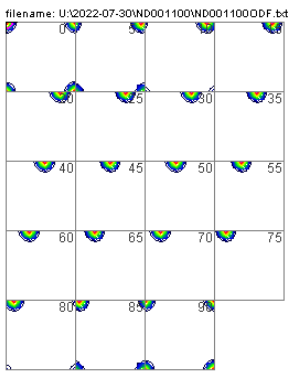
$\psi 1 = 0.0$ $\Phi = 1.4$ $\psi 2 = 0.0$ $ODF = 15.3 \rightarrow (0,0,1)[1,0,0]$ $\psi 1 = 0.0$ $\Phi = 0.0$

$(001)[100]$ $(0,0,0,0,0)$ $(001)[1-10]$ $(0,0,45,0,0)$

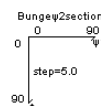
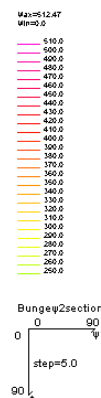
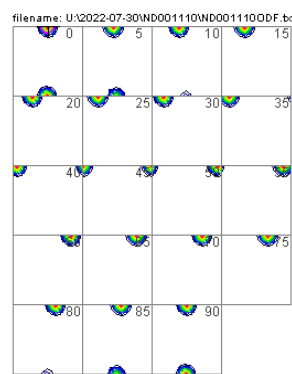
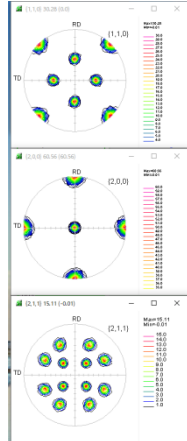
Fiber 上の主要な方位

$\{001\}\langle 100 \rangle$

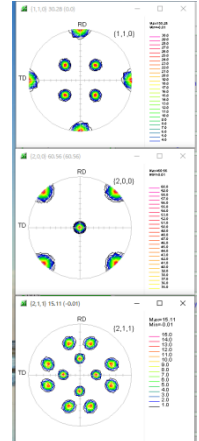
$\{001\}\langle 110 \rangle$



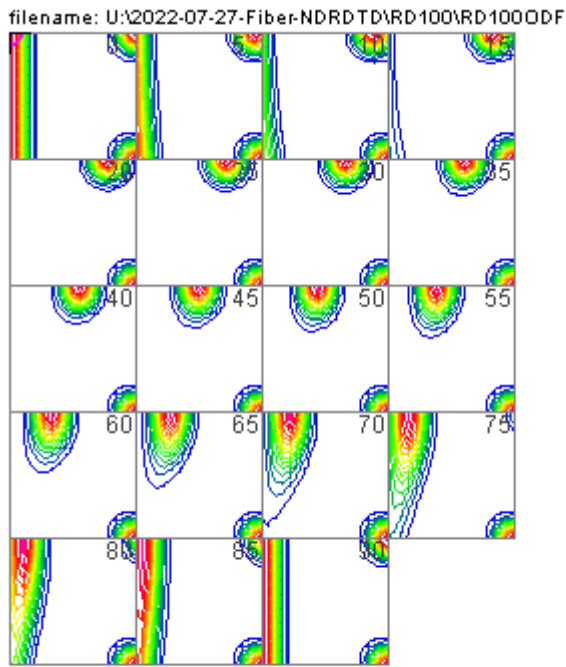
$(0,0,1)[1,0,0]f1=0.0,F=0.0,f2=0.0$ $ODF=512.47$



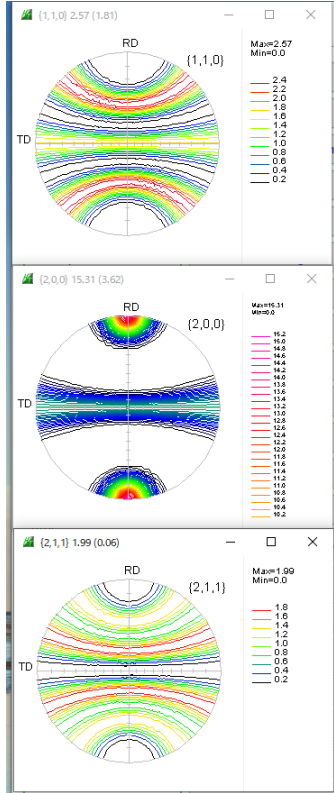
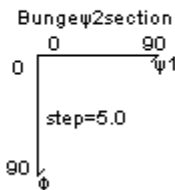
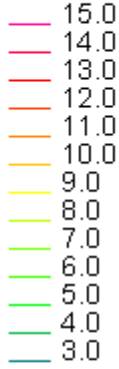
$(0,0,1)[1,-1,0]f1=45.0,F=0.0,f2=0.0$ $ODF=512.47$



η -fiber $\langle 100 \rangle // RD$ $\phi_1 = 0^\circ$ 、 $\Phi = 0^\circ$ から 90° 、 $\phi_2 = 0^\circ$
 $(001)[100] (0,0,0,0,0) (011)[100] (0,0,45,0,0) (010)[100] (0,0,90,0,0)$



Max=15.32
Min=0.0

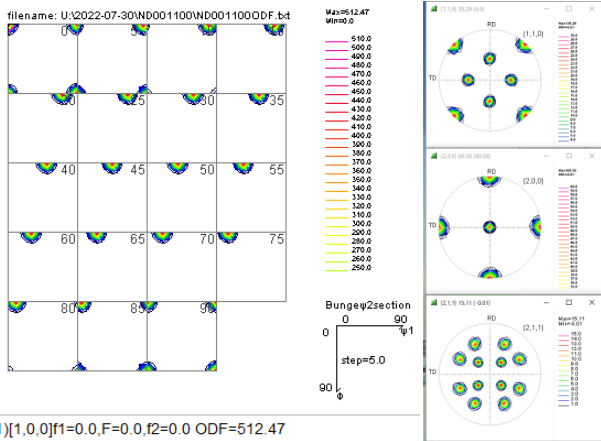


$(0,0,1)[1,0,0] f_1=0.0, F=0.0, f_2=0.0$ ODF=15.32

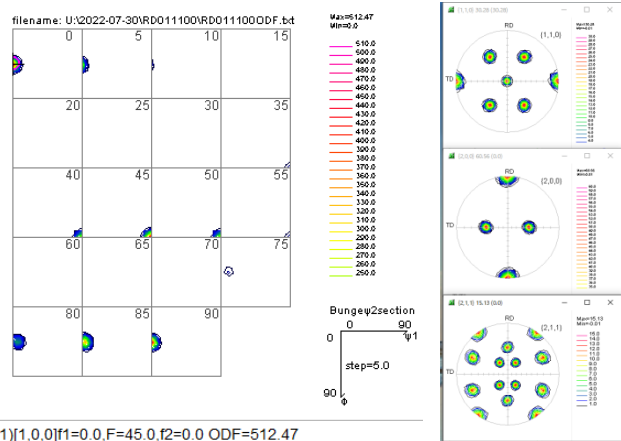
Fiber 上の主要な方位

$\{001\} \langle 100 \rangle$

$\{011\} \langle 100 \rangle$



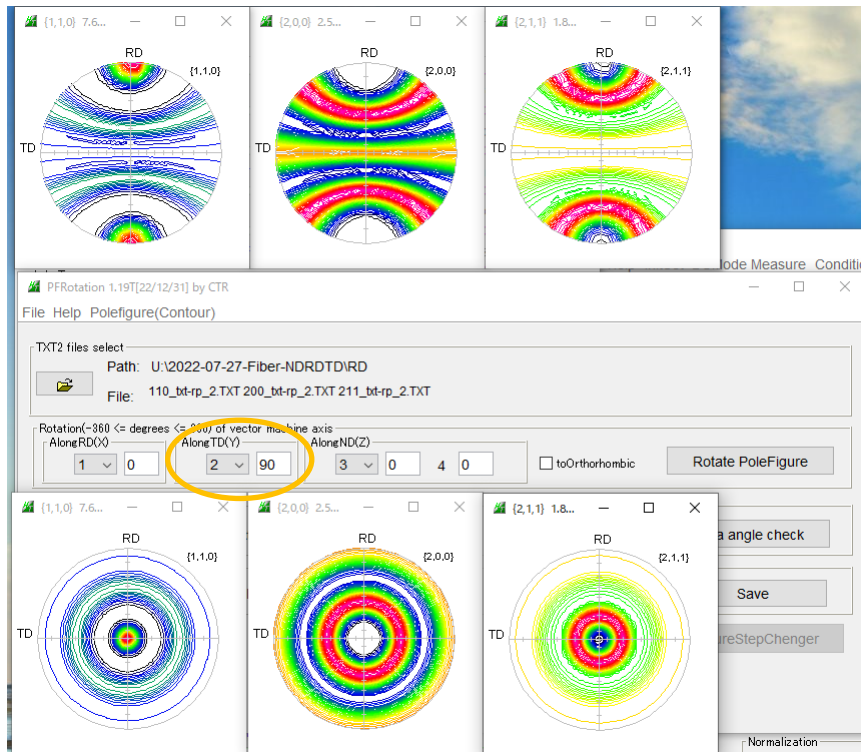
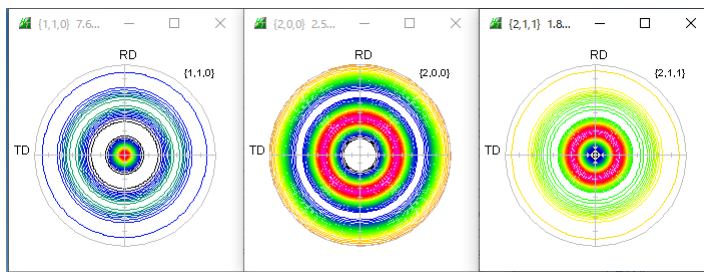
$(0,0,1)[1,0,0] f_1=0.0, F=0.0, f_2=0.0$ ODF=512.47



$(0,1,1)[1,0,0] f_1=0.0, F=45.0, f_2=0.0$ ODF=512.47

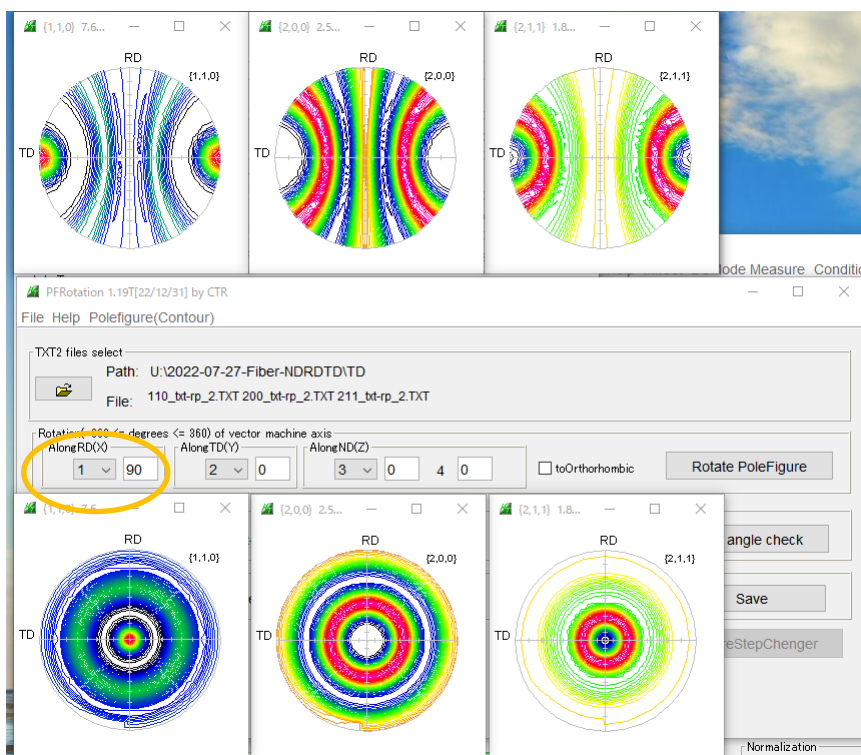
//RD, //TDを//NDに変換

{110}//ND



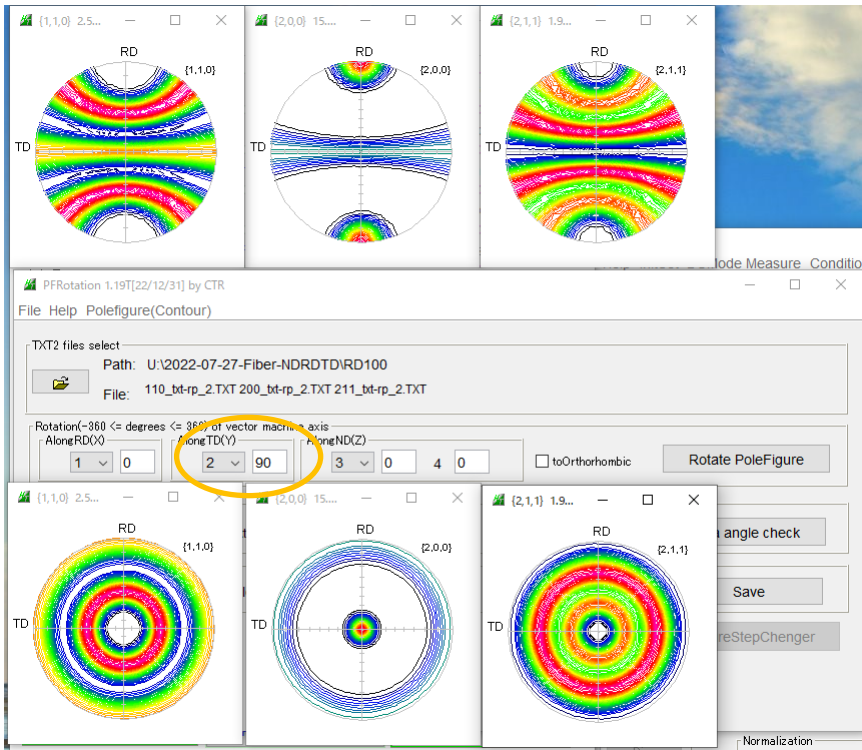
<110>//RD

TD-90度回転



<110>//TD

RD-90度回転



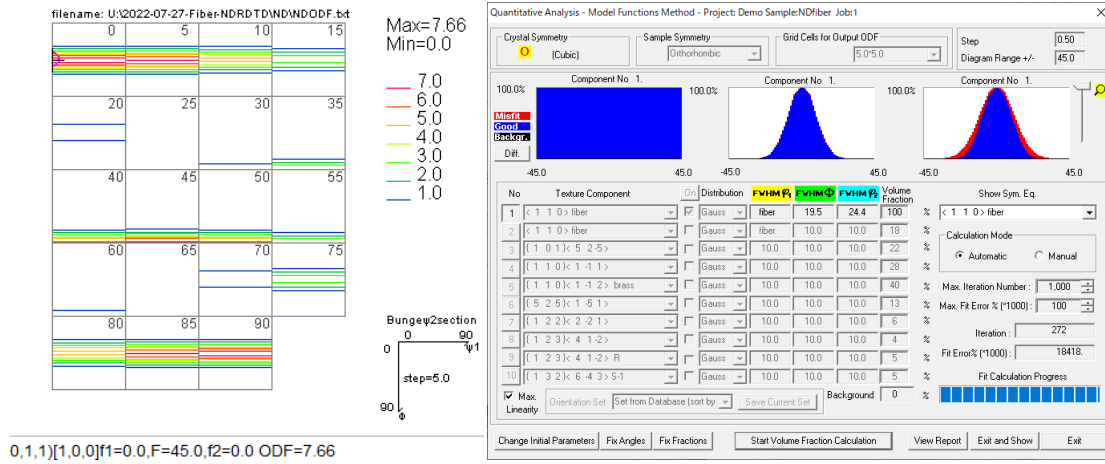
<100>//RD

RD->ND 变换

Fiberの体積率計算

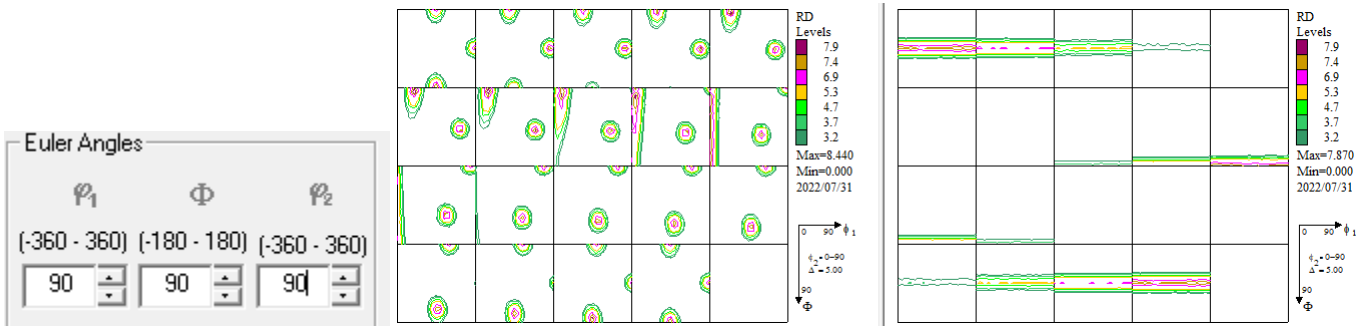
ξ -fiber $\{110\} // ND$

$\langle 110 \rangle$ -fiberで定量



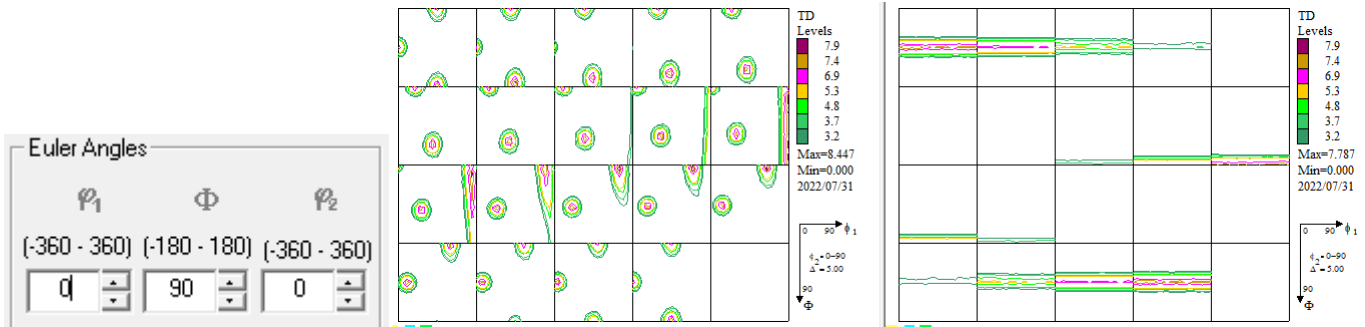
α -fiber $\langle 110 \rangle // RD$

RD->ND 変換で $\langle 110 \rangle$ -fiberとして定量



ε -fiber $\langle 110 \rangle // TD$

TD->ND 変換で $\langle 110 \rangle$ -fiberとして定量



η -fiber $\langle 100 \rangle // RD$

RD->ND 変換で $\langle 100 \rangle$ -fiberとして定量

