

$$\underline{\max 2\theta = 125^\circ!}$$

06.03.2013

Experiment SI 8142-1

move M4 y to -30 (focus on RASOR)

Moved Diffractometer  $2\theta = 40^\circ$

M4\_pitch 9160  $\leq 9250$

8640  $\rightarrow$

[CR:  $S_y = 2.12$      $S_z = -0.81$      $S_x = 20$ ]

beam in CR: M4 pitch =

$$S_y = -2.5$$

$$S_x = 19.5$$

$$\text{chamb-trans} = -5.5$$

$$\text{M4\_pitch} = 9050$$

fil not drifted (detector scan at peak @ 0)

$S_y$  scan: # 46040  $\rightarrow$  centre - 1.7

fil scan: # 46041  $\rightarrow$  pos fil - 1.4

repeat  $S_y$  scan - new  $S_y = 1.8$

$S_y = 1.65$  - sample

user1\_axis 4 - vertical for pitch

user1\_axis 5 - horizontal

scan user1\_axis 4 0 18 0.2 - # 46050  
46051  
46052

82 3 μm - 5 μm pin hole Co edge = [180 eV]

46076 0.010

46077 0.005

78 0.002

79 0.001

move energy to Fe L<sub>3</sub> edge = (707) eV.

~~80 0.005~~

~~81 0.002~~

~~82 0.001~~

pin moved to idls/i10/data/2013/s18142-1

enaged-data/pinhole

46075 0.005

76 0.002

77 0.001

didn't work. Probably, when the engineer change the "epics" settings the camera shutter change to "high to open", so the images

Move to off-res Fe L<sub>3</sub> = (698 eV)

are saturated. Hopefully we were

46078 0.005

79 0.002

80 0.001

8

at the smallest pinhole, so the camera looks fine

Move back to (780 eV), check

still ~~moving~~ getting beam through pin hole.

81 → still saturated.

checking can still see pin holes at 707 & 698 eV.

Moved 20 back to 90° (ie and/or 0°)

(698 eV)  $\phi = 5 \mu m$

460782 0.0015

51? eV

83 0.002

84 0.005

scan user1-axis 5 95 10 1 mac116 | #46053

user1-axis 5 = 14.680

scan user1-axis 4 0 18 0.2 mac116 |  
#46055

scan user1-axis 5 95 75 0.05 mac116 |  
- #46056

Edge - 64.7 (user1-axis 5)

pos user1-axis 5 65

1	70.5	70.8 ~ 70.2	70.3	g   → 50μm y
2	72.3		x	
3	78.5			
4	782.5?			

pinhole 1 (50 μm) - y = 8.5 mm  
(user1-axis 4)  
x = 70.3 mm  
(user1-axis 5)

pinhole 2 (20 μm) y = 8.5 mm  
(user1-axis 4)  
x = 74.3 mm  
(user1-axis 5)

pinhole 3 (~~10 μm~~ 10 μm) y = 8.5  
(user1-axis 4)  
x = 78.3 mm  
(user1-axis 5)

pinhole 4 (5 μm) → x = 82.3 y = 8.5

move  $E = (707) \text{ eV}$  (Fe L<sub>3</sub> edge)  $\phi = 5 \mu\text{m}$

6085	0.005
86	0.002
87	0.001

move to the next pinhole  $\phi = 10 \mu\text{m}$

$\phi = 10 \mu\text{m}$   $E = (707) \text{ eV}$

46088	0.0055
88	0.0025
90	0.0015

$\phi = 10 \mu\text{m}$   $E = (698) \text{ eV}$

46091	0.0055
92	0.0025
93	0.0015

$\phi = 10 \mu\text{m}$   $E = (780) \text{ eV}$

46094	0.005
95	0.002
96	0.001

move to pinhole  $\phi = 20 \mu\text{m}$

$\phi = 20 \mu\text{m}$   $E = (780) \text{ eV}$

46097	0.002
97	0.001

$\phi = 20 \mu\text{m}$   $E = (707) \text{ eV}$

46099	0.002
46100	0.001

$$\phi = 70 \mu\text{m}$$

$$E = (648) \text{ eV}$$

46104

$$0.002$$

102

$$0.004$$

103

$$0.001$$

move to pinhole  $\phi = 50 \mu\text{m}$

$$\phi = 50$$

$$E = 6$$

46104

check dark image

Moved back to the 10  $\mu\text{m}$  pin hole

$$205 \quad \text{V}_1 \quad \text{AS} = 78.3$$

105 test.

$$\text{Set } E = (707) \text{ eV}$$

106 0.0005 s

107 0.0001 s

108 0.00005 s

MOVING TO SAMPLE

$$\text{pos } \text{sy} = 1.65$$

$$\text{pos } \text{th} = 120$$

$$\text{pos } \text{th} = 1$$

109 0.002 s

110 1 s

111 10 s

$$\text{pos } \text{th} = 2$$

112

1 s

pos th = 6

113 1s

pos th = ~~20~~ 10

114 1s

pos th = 15

115 1s

Camera = -30°C

116

Move back to straight through beam...

117 0.001

Set idd - lin hor energy (690)  
pgm-energy (710)

118 0.001

119 0.01

120 0.1

} saturated

121 1.

122 0.005

123 0.008

124 0.02 ✓

125 0.05

} saturated

126 0.08

set idd - lin - hor - energy (680)

7 0.001  
8 0.005  
9 0.008  
10 0.01  
11 0.05  
12 0.08  
13 0.1

} forgot to move PGM -  
energy to (710).

→ saturated.

pos pgm - energy (710)

34 0.001  
35 0.005  
36 0.008  
37 0.1

Move to  $\phi = 20$  Um. pos v1 axis 743.

38 0.002 → no diffraction  
39 0.01  
40 0.1 → saturating

41 1  
~~42~~ pos idd - lin - hor - energy (710)

42 0.002.

Moved to 54 y gap = -3.000

43 0.002

54 y gap = -3.5

44 0.002

pos 01 - a5 82.3 (back to  $\phi$  5mm)

45 1  
46 0.1

sy gap = -3

47 1 } saturated  
48 0.1  
49 0.01

sy gap = -1

50 0.01

51 0.005

pos idel e = (780)

52 0.005

sy gap = -2

53 0.01

54 0.001

55 0.002

56 0.01

57 0.005

58 0.008

pos  $\theta_{th} = 120^\circ$

pos sy = 1.65

pos  $\theta_{th} = 10^\circ$



59 0.01s

60 5 s.

pos th ~~125~~ 125°

61 1

pos th 5

62 0.5

pos th 20

63 0.5

pos ul a5 78.3

64 1

pos s4 y gap -3

65 1

pos th = 5

66 1

pos th = 130

67 1.

pos s4 gap = -1

68 1

Try to ~~re~~ realign the sample.

pos tth, th = 0

pos user1-axis 5 50.

pos sy ~~1~~ -1 → check  $2\theta = 0$ .

change ANDOR HIGH TO OPEN so shutter is open.

169 scan tth -2 2 0.1 mac116 1.

Gain  $10^4$

170 repeat above

set tth = -0.89 to → 0.

~~171~~ cscan tth 2 0.2 mac116 1.

172 scan sy 0 4 0.1 mac116 1.

pos sy 1.79

pos tth 10 th 5

173 cscan th 2 0.1 mac116 1.

GAIN  $10^8$

174 cscan ~~300~~ th 15 0.02 mac116 1

~~175~~ cscan th

GAIN  $10^6$

175 ~~as above~~ scan th 4 5.5 0.02 mac116 1.

GAIN  $10^5$

pos odd-circ-pos, energy (708)

79 scan dia 90.2 → 92 0.1 maillb.

84 scan th 0 5 bragg peaks at  $\frac{th=10}{2.20}$   
3.01

pos v1-as ~~87.8~~ 78.3  
move sample out of beam  $\approx 2-d$   
pos sy -1

pos th 90°  
check diffraction through pin hole.

46190 check diff. rings from pin hole.

pos th 105°  
pos th 3

46191 is no sample!  
pos sy 1.79.

46192 is  
46193 0.01s.  
46194 0.001s

pos th 115

195 0.01s

pos v1-as 60 moving pin hole out of the way.

try to see spec peaks on 2D

196 0.01  
pos th 125

197 0.01

198  $t_h = 6$  0.01s

199  $t_h = 8$  0.01s

200  $t_h = 15$  0.01

201  $t_h = 20$  0.01

202  $t_h = 20$  0.5

pos  ~~$t_h = 130$~~

pos  $t_h = 15$

203 0.5

pos  $t_h = 20$

204 0.5

pos pin hole  $\phi = 10\mu\text{m}$  78.3

205 0.5

pos pin hole  $\phi = 50\mu\text{m}$  70.3

206 0.5

207 1

208 10

pos s4 y gap = -2.5

209 10

moved back s4 y gap = -1

210 1s

12 10s repeat

211 10s

Move slit to +2 then back to -1  
to see if intensity increases.

13 10s

pos user 1 axis 5 60 raise pinhole out  
to check intensity

14 10s

pos sy = 1.5<sup>91</sup>

15 10s

pos  $2\theta = 0$  → check straight through  
beam again

$$\theta = 0$$

$$sy = -1$$

GAIN  $10^4$

16

pos sy = 1.83

pos 54 y gap = -0.5

27 scan tth

pos 54 y gap = -1.5

28 repeat scan

sy y gap = -0.8

229 repeat scan.

sy y gap = -1

230 repeat → lost intensity from before

moved sy = -2 (completely out of the way)

234 repeat

low to OPEN th 130 th 20 , sy 1.83  
move pin hole  $\phi(\text{hole}) = 70.3$

239 10s exposure - camera @ 24°C.

rebooted camera, check if temp <sup>controller</sup> returns.

now sy = -2

Instead run <sup>pseudo</sup> phi scan just to measure intensity to see if it was decreasing.

At 8:40 was counts ~ 43000.  $\phi$

4650 scan th 2 0.1 mad16 1

move in 50mm slit ul-as = 70.3

251 scan th 2 0.1 mad16 → can't see anything!

move 2 $\theta$  = 30° → check pinhole on YAG.

8<sup>th</sup> / March / 2013

9:20 we find out that the position of the

beam has moved. ~~now~~ The new position of the

50 $\mu$ m pinhole is

$$x = 70.7, \quad y = 8.8$$

Moved sample fully out the way  
then taking an image to check if the

46255 is YAG PORT WAS OPEN.

$$y = 1.83, \quad \theta = 20$$

46286 is YAG PORT CLOSED.

$\theta = -20$ , trying to block direct beam

46257 is

pos  $\theta = 0$

Remove pin hole, check the "reflection"  
is coming from the pin hole holder

46258 is VALVE/RAISOR SHUT

~~the~~ Moving  $\theta = 30^\circ$  check straight  
through pin hole  $\rightarrow$  adjust the beam  
position to maintain the diffraction order  
is centre of rotation.

Moving w/  $a_s = 70.7$  ( $\phi 50\mu\text{m}$ )  
 $y = -2$  (sample out of way)

HIGH TO OPEN

LOW TO OPEN

$$ul - aS = 80.4 (\phi 5 \text{ Mm})$$

260

pos  $ul - aS = 82.3$

↑ this is not the position of the pin hole.

261

0.005

pos  $ul - aS = \boxed{82.4} \rightarrow$  new position

262

0.005

pos  $tth = 100^\circ$

263

0.005

pos  $tth = 110^\circ$

264

0.005

pos  $tth = 120^\circ$

265

0.005.

pos  $tth = 90^\circ$

pos  $ul - aS = 78.4$

266

0.002 ( $\phi 10 \text{ Mm}$ )

pos  $ul - aS = 74.4$

267

0.002 ( $\phi 20 \text{ Mm}$ )



check alignment of the sample now the beam position has been adjusted.

pos  $\theta_h = 0$ .

46267 cscan  $\theta_h$  2 0.1 mac11b 1

→ 71 with pin hole in.

move pin holes out  $ul-as = 60$

72 scan  $\theta_h$  3 -3 0.1 mac11b. 1 (pin hole reduce the intensity  $\times 10$ )

$I_{\text{peak}} \sim 43k$   $2\theta = 0 \checkmark$

73 scan  $\theta_y$  0 3 0.1 mac11b 1.

$\theta_y = 1.88$

pos  $\theta_h = 5$

(set camera to -20 while not using)

74 scan  $\theta_h$  -2 2 0.1 mac11b

75  $\theta_h$  1.8 4 0.1 mac11b.

76  $\theta_h$  1.73 2.73 0.01 mac11b 1.

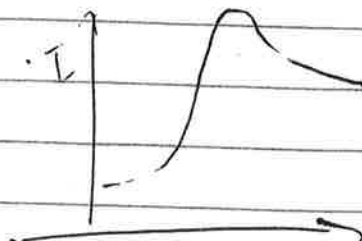
set  $camT = -10^\circ C$

pos  $\theta_h$  2.23 → set to 2.5°

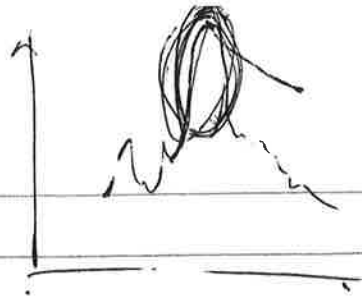
set  $\theta_h = 10$ ,  $\theta_h = 5$

77 cscan  $\theta_h$  2 0.1 mac11b 1. I

$ul-as = 50$



78 repeat scan see



increase GAIN  $10^6$

79 escan th 5 0.1 mac11b. 1.

pos th 5.24 , set th 5.0°

low to OPEN , move **th = 100°**

80 andor 0.01

~~pos ul-as = 74.4~~

81 andor 0.01

~~pos ul-as = 74.4~~

82 0.01

pos ul-as = 74.4

83 0.01

84 0.001

pos ul-as = 70.4

85 10.

86 0.01

87 0.01

closed down the <sup>SG</sup> 1 slits

pos sy = -2

pos th = 0

w/o cutting  
main beam

much better

than 86!!

light coming from  
somewhere else  
in the beamline

88 0.01

pos sy 1.88 , pos th 5.0 , pos ul-as 80.

89 0.01

diffraction w/o pin hole.

pos **th = 115°** , pos th = 8

90 0.01

pos ul-as = 70.4°

1 1s.

2 0.1s

3 0.2s

4 0.4s

5 0.6s

6 0.8s

pos ul-as = 74.4 ( $\phi 20mm$ )

7 1s

8 10s

pos ul-as = 78.4 ( $\phi 10mm$ )

1 10s

pos th = 10

0 10s

pos dia = 90.5° (90° before, trying to shift the beam horizontally across the camera).

01 10s.

pos th 4

02 1s

pos th 5

03 1s

pos  $EA = 15$

305 10s.

306 15S

change energy (690 eV)

307 15S

change energy (708) eV circ. pos

308 15S

change polarization (708 eV) circ. neg

309 15S

more user1-axis 82.4

310 15S → camera temp = -30°C

311 15S → camera temp = 0°C

312 15S → camera temp = -30°C

313 15S → -25°C

314 15S → -20°C

315 15S → -15°C

316 15S → -10°C

317 15S → ~~0°C~~ ?? No idea of the temp

318 15S → -5°C

pos ul aS = 78.4 (10Mm) time 1909  $p = 1.8 \times 10^{-6}$

319 10s  $Sx = 0.5$

camera = -30°C

pos ~~319~~ 0.245

320 10s  $Sx = 0.45$

321 10s  $Sx = 0.4$

change energy (690 eV) circ. neg.

322 10 s -30°C

change polarization (690 eV) circ. pos

323 10 s -30°C

change energy (650 eV) circ. pos

324 10 s -30°C

change polarization (650 eV) circ. neg

325 10 s -30°C

change energy (600 eV) circ. neg

326 10 s -30°C

change polarization (600 eV) circ. pos

327 10 s -30°C

move  $\theta_{th} = 110^\circ$

328

10 s

pos  $\theta_{th} = 12$

pos idd - circ - neg - energy = 708

329

10 s

neg

330

10 s

pos

pos  $\theta_h = 125^\circ$ , pos  $\theta_h = 18^\circ$

31 pos 10s  
32 neg 10s

We went mod comparing the intensities of the reflections off resonant and above the edge. However the exposure time was different. Now we will move back to  $E = (708) \text{ eV}$  and.

333 10s  $\rightarrow -10^\circ\text{C}$   $\rightarrow$  Discard

(334) 10s  $\rightarrow -30^\circ\text{C}$  (708eV neg

~~more~~ change polarity circ. pos

(335) 10s  $\rightarrow -30^\circ\text{C}$  (708eV pos

Running a long overnight scan to check the stability of the beam.

110-4338 and/or files scan phi 0 3000 1 and/or 10

camera =  $-30^\circ\text{C}$ ; u.l.a.s. = 78.4,  $\theta_h = 115$ ,  $\theta_h = 15$ , (708eV)

in the morning camera is still at  $-30^{\circ}\text{C}$

09/03/13

$$p = 8.3 \times 10^{-7}$$

At 0944 reached image 2235/3000

Stopped at 2250

check the energy scan

pos ~~th~~ =  $30^{\circ}$ , pos th =  $15^{\circ}$

~~pos th =  $25^{\circ}$~~

camera H:111 to OPEN  $-10^{\circ}\text{C}$

46341 t/s check camera is out of the way.

pos vl - 45 = 55

46342 t/s check camera again

46343

scan th 3 0.1 max 116

(check alignment)

GAIN  $10^8$

46344

→ camera repeat lost signal

45

GAIN  $10^4$

46

all just dark current

47

GAIN  $10^6$

48

repeat scan.

GAIN  $10^8$

49

repeat

pos sy = 0.5

50

scan sy = 0 4 0.1 max 116

pos th 0, th 0, sy - 1

51 scan th 2 0.1 mac116  
GAIN  $10^4$

52 repeat

53 scan sy 0 4 0.1 mac116.

54 scan th 3 0.1 ~~mac116~~ 1 - accident  
pos sy 1.88, pos th = 10, pos th = 5

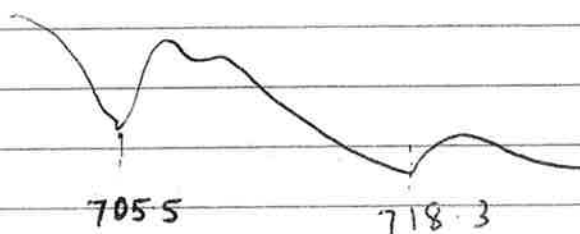
55 scan th 3 0.1 mac116 1.  
mid-gaussian changed gain to  $10^6$

56 scan th 4 6 0.01 mac116 1.  
pos th 4.8

57 - scan idd - circ - pos - energy 680 730 0.1 mac116 1

58 - scan idd - az - neg - energy 680 730 0.1 mac116 2

mac116 / mac120



59 rerunning neg - energy scan as the  
pos & neg don't match up & neg scan  
looked wrong sort of shape. (repeat 58)

60 rescanning pos - energy (repeat 57)



changed GAIN  $10^8$  ~~10^7~~

61 scan idd - circ - pos - energy 700 718 0.2 mac llb l.  
GAIN  $10^7$

62 repeat scan (back the other way) 718 700

63 scan neg 700 718 0.2 mac llb l.

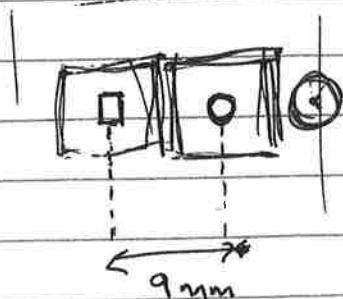
N.B. M1 PITCH  $15771^\circ$   
M3  $29.97^\circ$   $1201.82^\circ$   $\Rightarrow$  Moved to  $1230^\circ$   
M4  $9079.39^\circ$

changed the position of exit slits to

73 idd - ~~pos~~ <sup>neg</sup> - energy 700 720 0.5 mac llb

74 ~~neg~~ <sup>pos</sup> - energy 720 700 0.5 mac llb l.

Added penrose sample  $\phi$ ul7a



21:36 Samples change, realigning the equiv

46375  $\rightarrow$  direct beam  $2\theta$  saturated, reduce

gain to  $10^5$

376 → same than 375 →  $th = 0$

377 → scan sy 0 4 0.1 mac116 1 →  $sy = 1.5$

~~378~~ pos  $th = 10$ , pos  $th = 5$

378 → cscan th 5 0.1 mac116 1 → Fail (I didn't scan  
th, so scan from -5 to 5)

379 → cscan th 5 0.1 mac116 1

reset th.

We had found a job surge, not likely the  
pattern so we will scan sx to find it

pos  $sx + 1.5$

380 → cscan th 4 0.1 mac116 1

pos  $sx + 2.5$   
~~pos~~

381 → cscan th 4 0.1 mac116 1

pos  $sx + 3.5$

382 → cscan th 4 0.1 mac116 1

GAIN to  $10^8$

pos  $sx + 4.0$

383 → cscan th 4 0.1 mac116 1

pos  $sx 0$

384 → idem

(The same)

385 → cscan th  $\frac{5}{8}$  0.01 mac 116 1

pos  $\rightarrow z = -0.5$

386 → cscan th 5 0.1 mac 116 1.

387 → pos  $\rightarrow z = -1.5$  (using the shadow of  
an allen key on the  
cscan th 5 0.1 mac 116 1. window of camera)

388 → cscan th  $\frac{4}{8}$  0.01 mac 116 1

Camera cooled down. At the  
beginning it doesn't work. Sophie switch  
it off, unplugged the cables, correct them  
again, switch it on. Then the camera works

th 100

389 autor 1s

390 autor 0.01s

pos th = 115, th = 12

391 0.01s

pos th = 15

392 0.05s

393 1s

$$f_h = 10$$

394 ~~1.5~~ 1s

395 0.1s

$$\text{pos } s_x = -1.8$$

396 0.1s

$$\text{pos } s_x = -1.3$$

397 0.1s

$$\text{pos } s_x = -1.4$$

398 0.1s

$$\text{pos } s_x = -1.6$$

399 0.1s

$$\text{pos } s_x = -1.5$$

$$\text{pos } u1 - a5 = 70.4$$

400 1s

$$\text{pos } \theta_h = 11^\circ \quad \left\{ \text{move higher on array detector} \right\}$$

401 5s

$$\text{pos } \theta_h = 12^\circ$$

402 5s

$$\text{pos } \theta_h = 0, \quad \text{pos } s_y = -7, \quad \text{pos } \theta_h = 90$$

Trying to image the pin hole.

403 ~~1.5~~ 0.001s

$$\text{pos } u1 - a5 = 70.3$$

404

0.001s

pos ul - a5 = 78.3 (10  $\mu$ m)

405 1s.  $\rightarrow$  LOOKS VERY NICE - good symmetric ~~at~~ manhopper lots of orders

pos ul - a5 = 78.4

406 1s

78.4 is better  $\Rightarrow$  visibility/contrast better.

pos 82.3 (5  $\mu$ m)

407 1s

pos 74.3 (20  $\mu$ m)

408 0.005s

pos  $\theta_{th} = 115^\circ$ ,  $\theta_h = 10^\circ$ , pos sy = 1.5

409 10s nothing

pos ul - a5 = 55

410 0 1s good (not as nice as 417)

pos  $\theta_h = 12$

411 0.1s not enough sig.

412 1s too much light

pos  $\theta_{th} = 120$ ,  $\theta_h = 13$

413 1s overexposed - very blurred out (diffuse)

pos  $\theta_{th} = 105^\circ$ ,  $\theta_h = 8$

414 0.0005s } <sup>just enough</sup> diffraction is getting worse as you ~~do~~ increase  $\theta_h \therefore$  gone  
415 0.01s } <sup>light</sup> as very low angle

416 0.1s ~~very~~ blurred good  $\delta$  axis not as obvious as 17.  
pos  $\theta_h = 9^\circ$

417 0.1s oversat blurred pattern (no pinhole)  
pos  $\psi_1 - \alpha_5 = 70.3^\circ$   $\rightarrow$  can sort of see  
5 axis of symmetry

418 10s oversat.  
pos  $\theta_h = 7^\circ$

419 10s oversat (small marks)  
pos  $\theta_h = 108^\circ$

420 10s no diff.  
pos  $\theta_h = 6.0$

421 10s high but very faint

422 Diagnostic in 1s dark image

Gate valve closed - set camera temp =  $15^\circ\text{C}$   
system safe 1:02 am.

10/03/13

pos  $\theta_h$  80

$\delta x =$

~~422~~ ~~421~~ 8.3328 for the second sample  
(penrose 1400nm  $\delta$  cm 18b)

$\theta_h = 10$ ,  $\theta_h = 5$ ,  $\delta y = 1.5$ ,  $\delta x = 8.3328$   $\delta z = -0.2$

423 cscan  $\theta_h$  4 0 1 mac 1161.

pos  $\psi_1 - \alpha_5 = 60$

424

GATE VALVE WAS CLOSED!

425

repeat with open