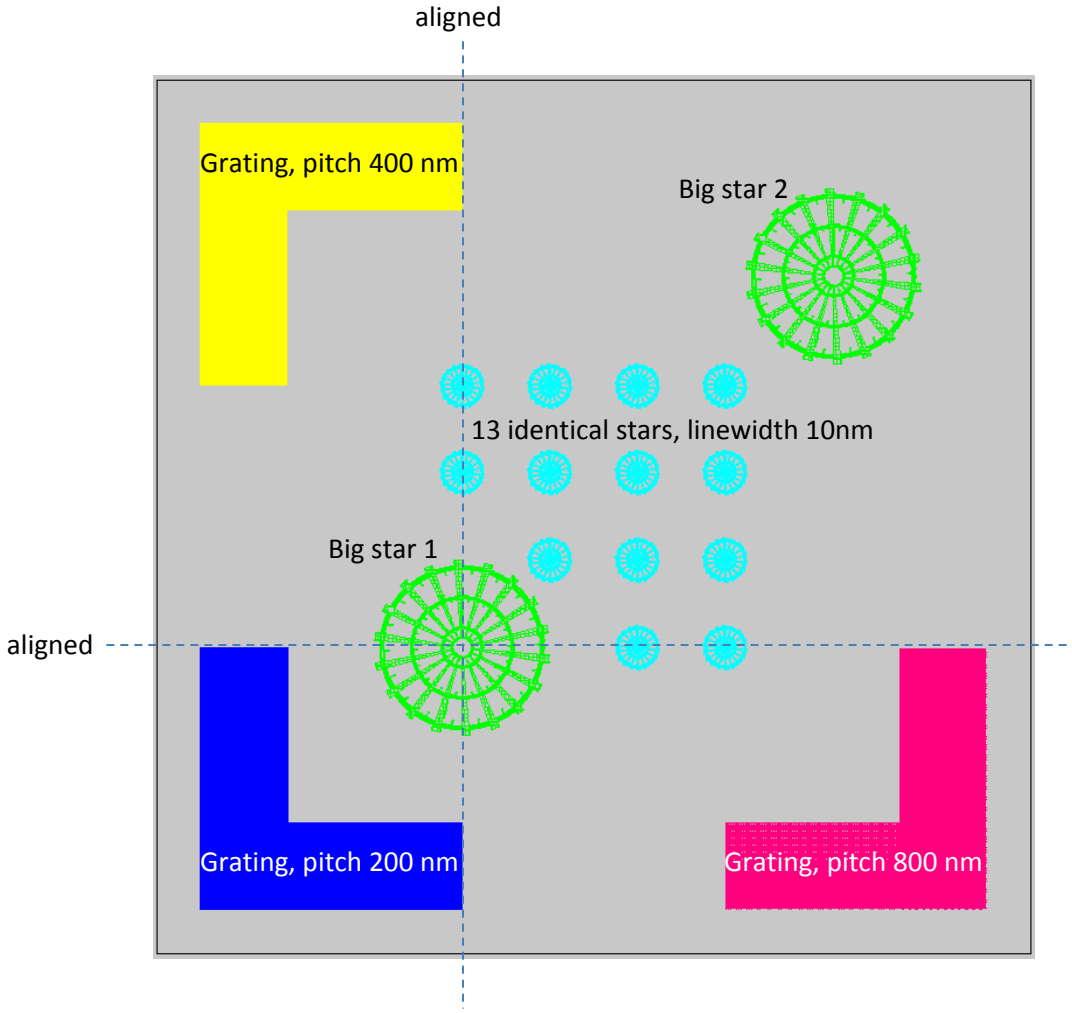
HR test objects – August 2018 – from Maxime Lebugle

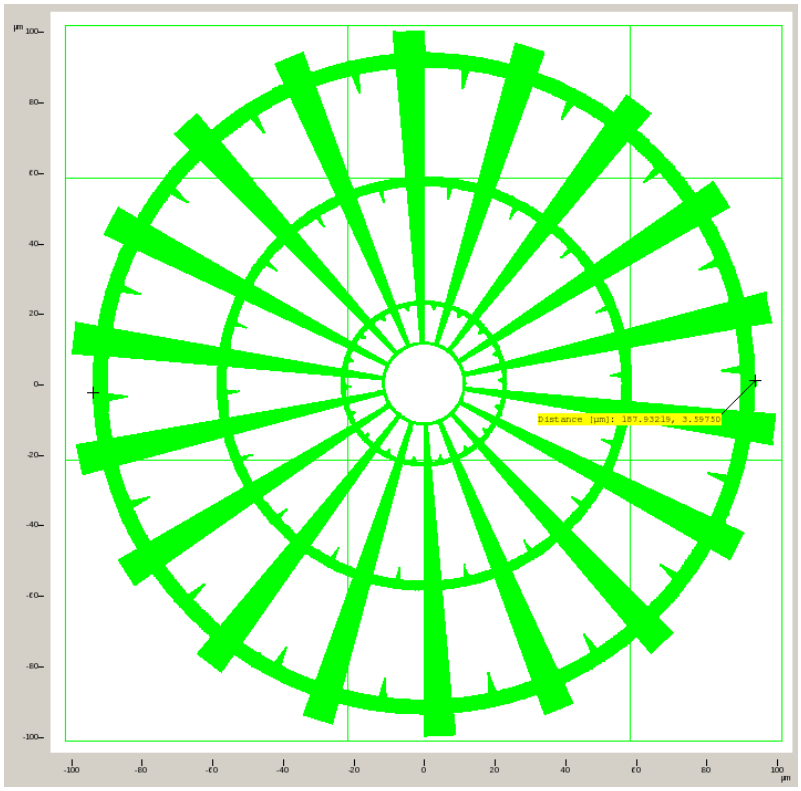
Si chips 3mm x 3mm. 300 um thickness. Window size 1mm x 1mm with Si3N4 250nm thick
HSQ Fox16 diluted in MIBK 1:1 spin-coated at 1300 RPM for 60s.
Resist thickness is about 250-300 nm, locally more.
Linewidth is down to 10 nm. 10 nm of Ir was conformal deposited (with ALD 275 cycles with 3x0.8 pulse recipe).



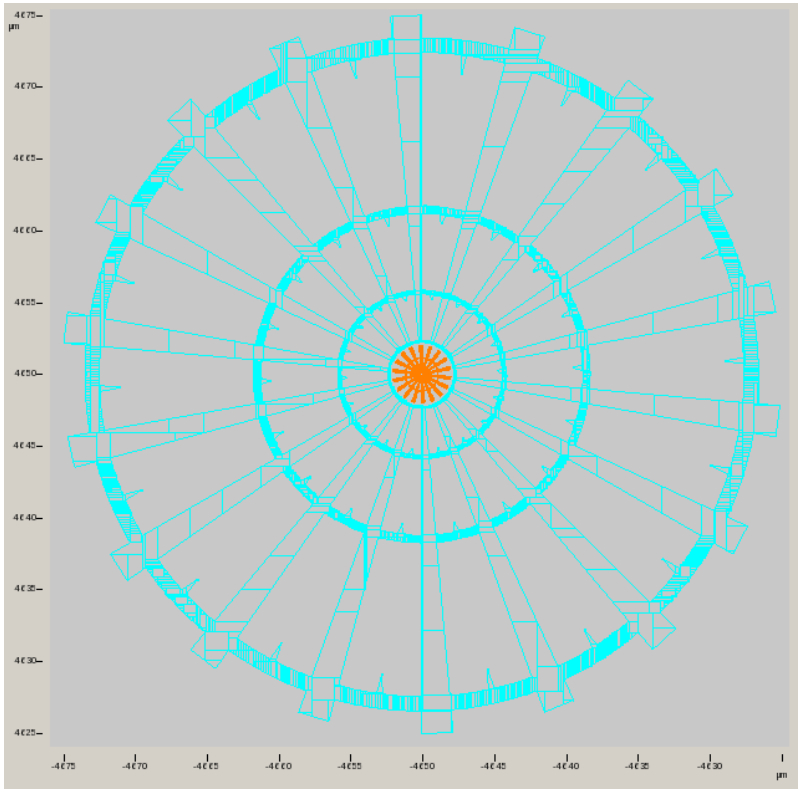
0,0 is the center of the membrane
Grating, pitch 200 nm (overlap in X and Y, length is 300 um): inner corner at -300,-300
Grating, pitch 400 nm (overlap in X and Y, length is 300 um): inner corner at -300,300
Grating, pitch 800 nm (overlap in X and Y, length is 300 um): inner corner at 300,-300
13 identical stars with 18 spokes, lw 10 nm: center at 0,0 with 100 um in between each star
Big star 1 with 18 spokes: -150,-150
Big star 2 with 18 spokes: 275,275

4 exposures, 10 samples in total:
LM180516a, LM180719b, LM180727a, all similar (no interruptions in gratings)
LM180813a, gratings have interruptions in the HSQ template with pitch of 1.2 um for 200-nm pitch, 2.4 um for 400-nm pitch, 4.8 um for 800-nm pitch.
Diffraction orders coming from the HSQ template are expected, which are exactly half-orders of the Ir one.

Big stars have a diameter of 200 um, a linewidth down to 1 um and rings with 500 nm, 1 um, 2.5 um, 4um width. They have arrows pointing inwards, as asked.

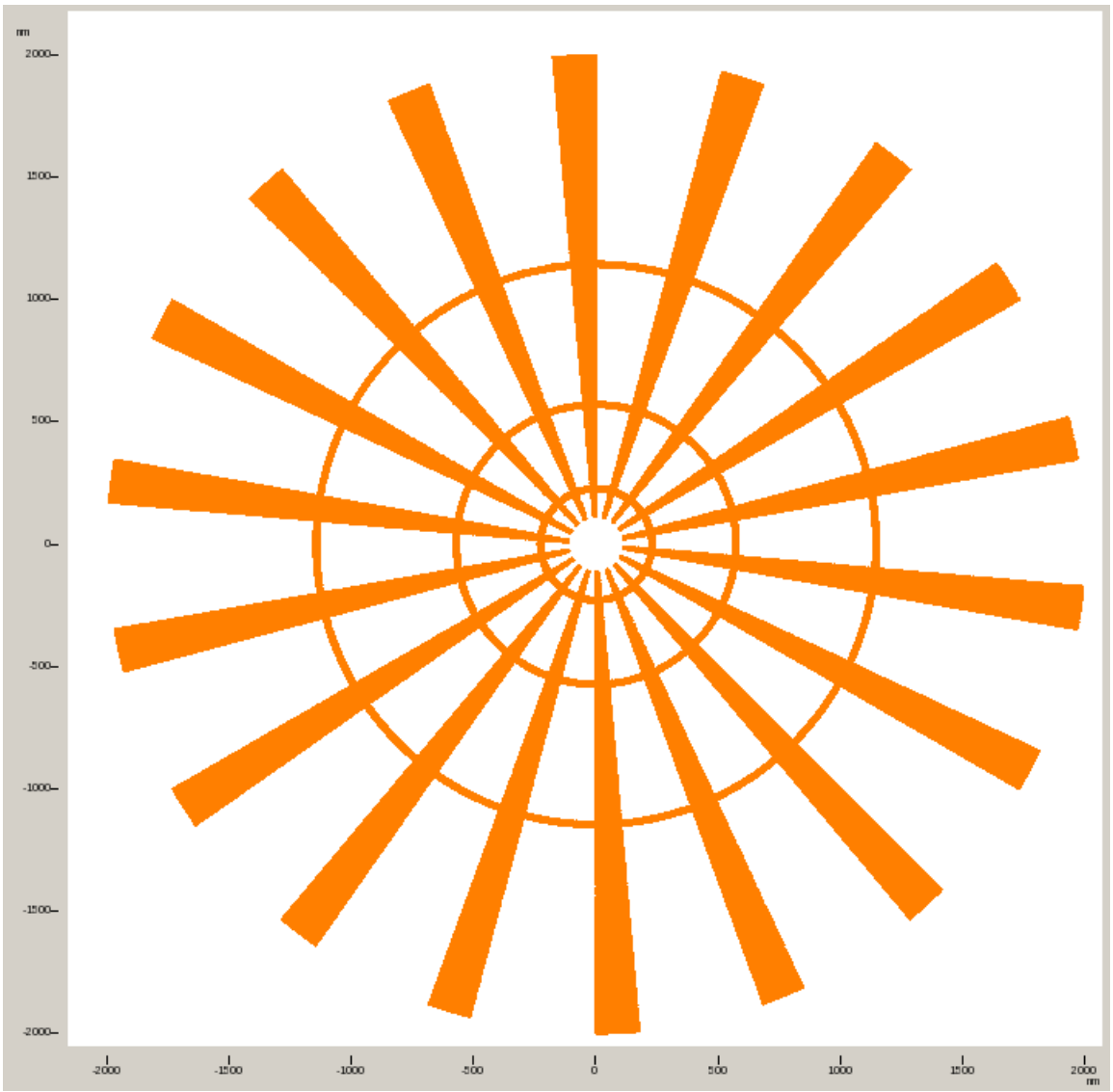


13 identical stars consist of a medium-size star (blue) with diameter 50 um, a linewidth down to 200 nm and rings with 100 nm, 250 nm, 500 nm, 1 um. They have arrows pointing inwards, as asked.

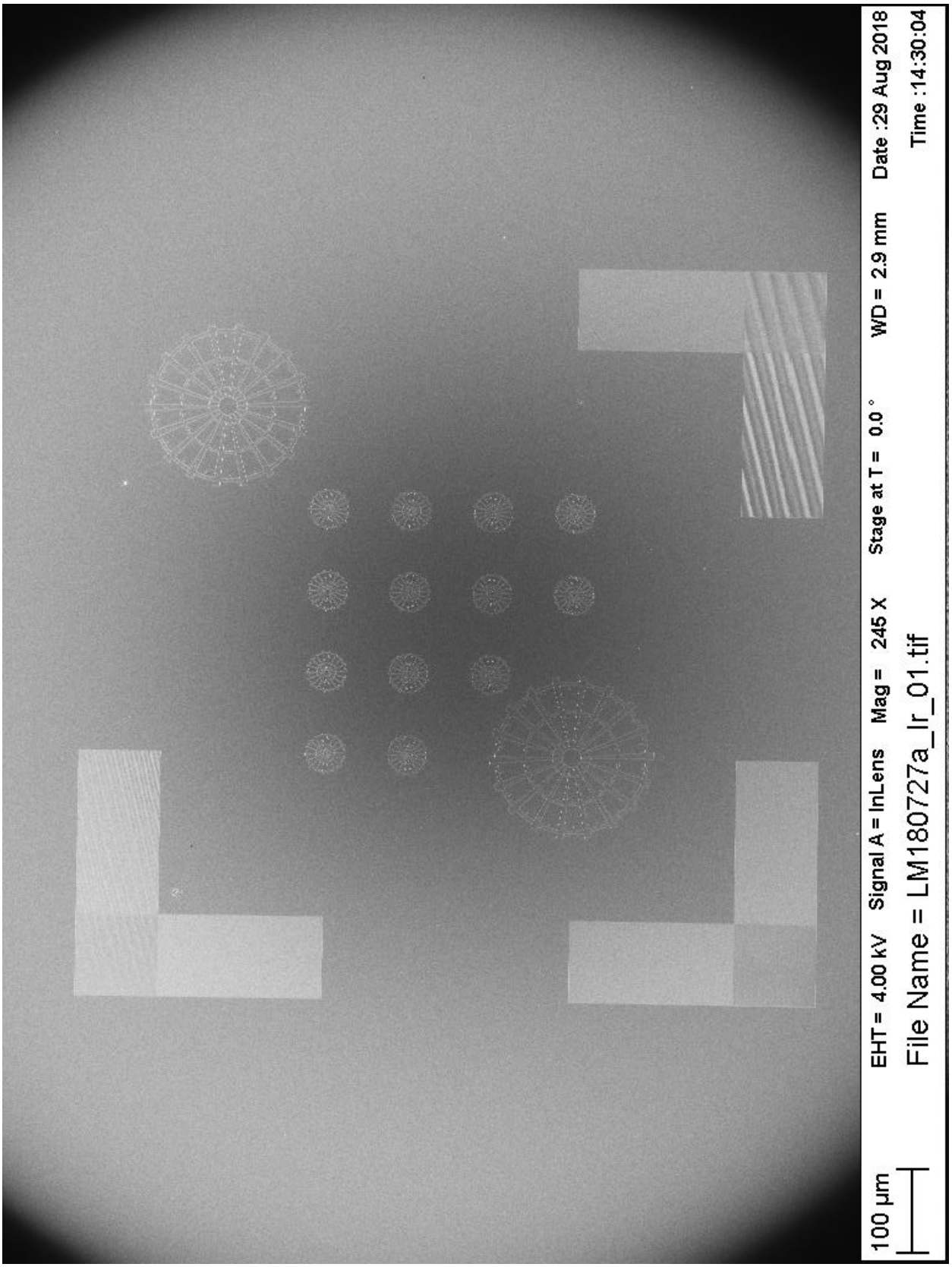


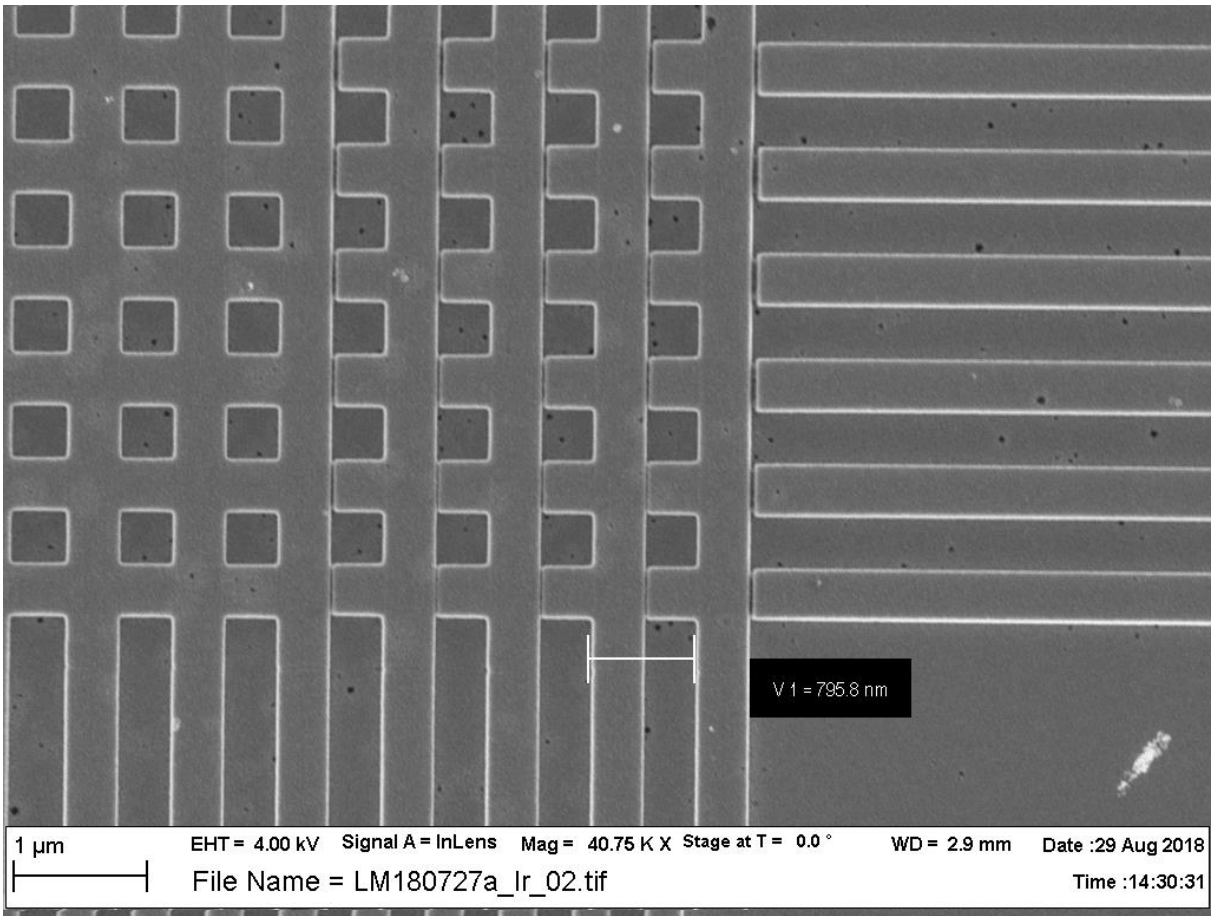
At the center of this star is found a smaller one with diameter 2 um, a linewidth down to 10 nm, and ring all with 18.75 nm.
All linewidth values given are theoretical and due to a biasing effect they cannot be perfectly equal to a measured value.
Moreoever some fracturing effects occur randomly (see image 8 as counted from the first). Some inner part of the ZPs did not come out nice, I would say about 33%, but it is also very hard to get good SEM pictures so we need an efficient X-ray tool to investigate that ☺.

Close view of the star inside:



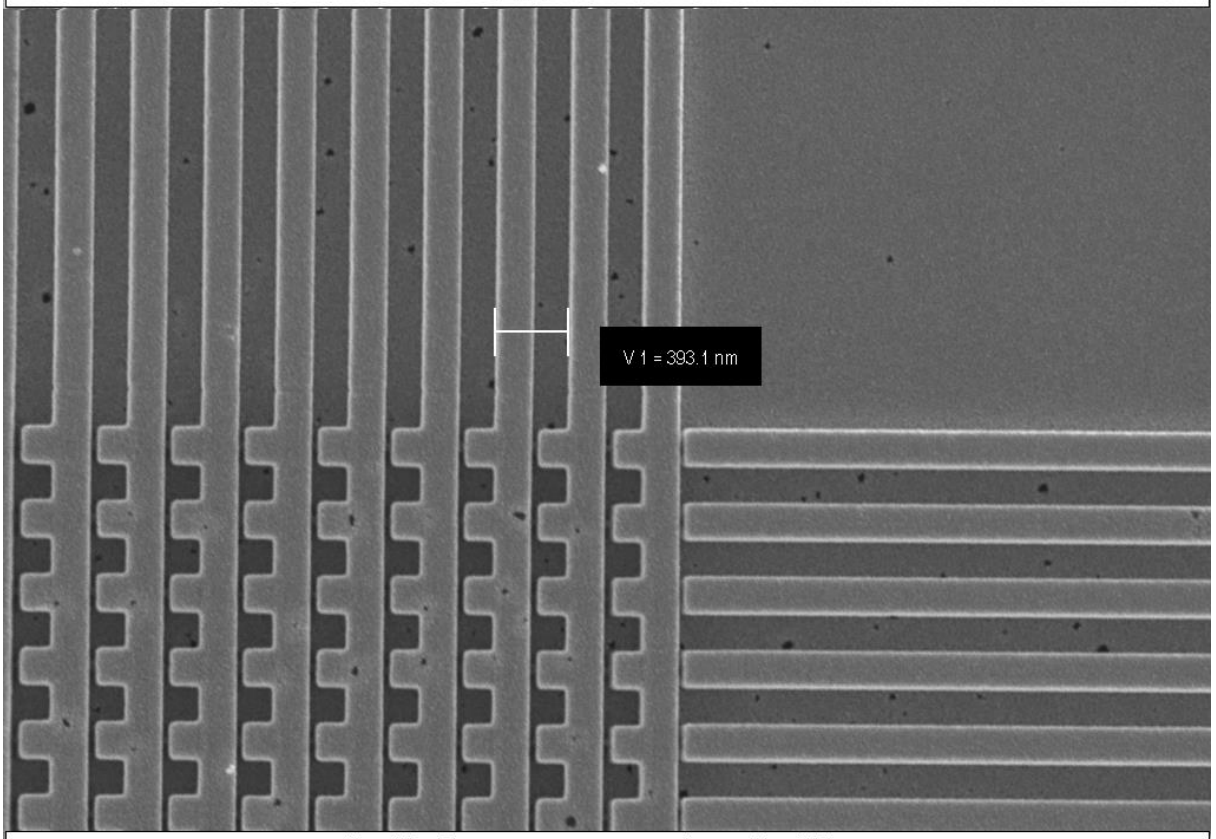
SEM images:


100 µm
EHT = 4.00 kV
Signal A = InLens
Mag = 245 X
Stage at T = 0.0 °
WD = 2.9 mm
Date :29 Aug 2018
Time :14:30:04
File Name = LM180727a_lr_01.tif



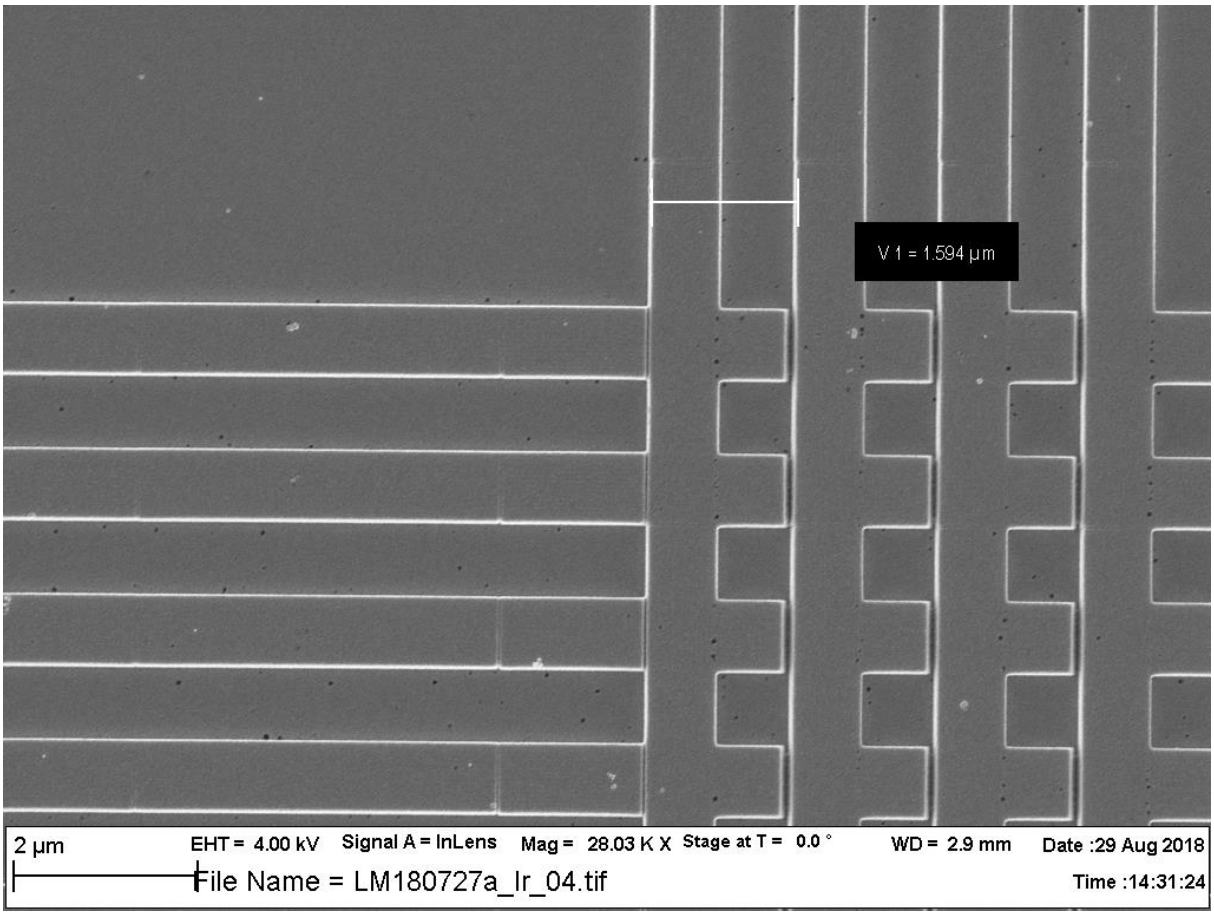
1 µm EHT = 4.00 kV Signal A = InLens Mag = 40.75 K X Stage at T = 0.0 ° WD = 2.9 mm Date :29 Aug 2018

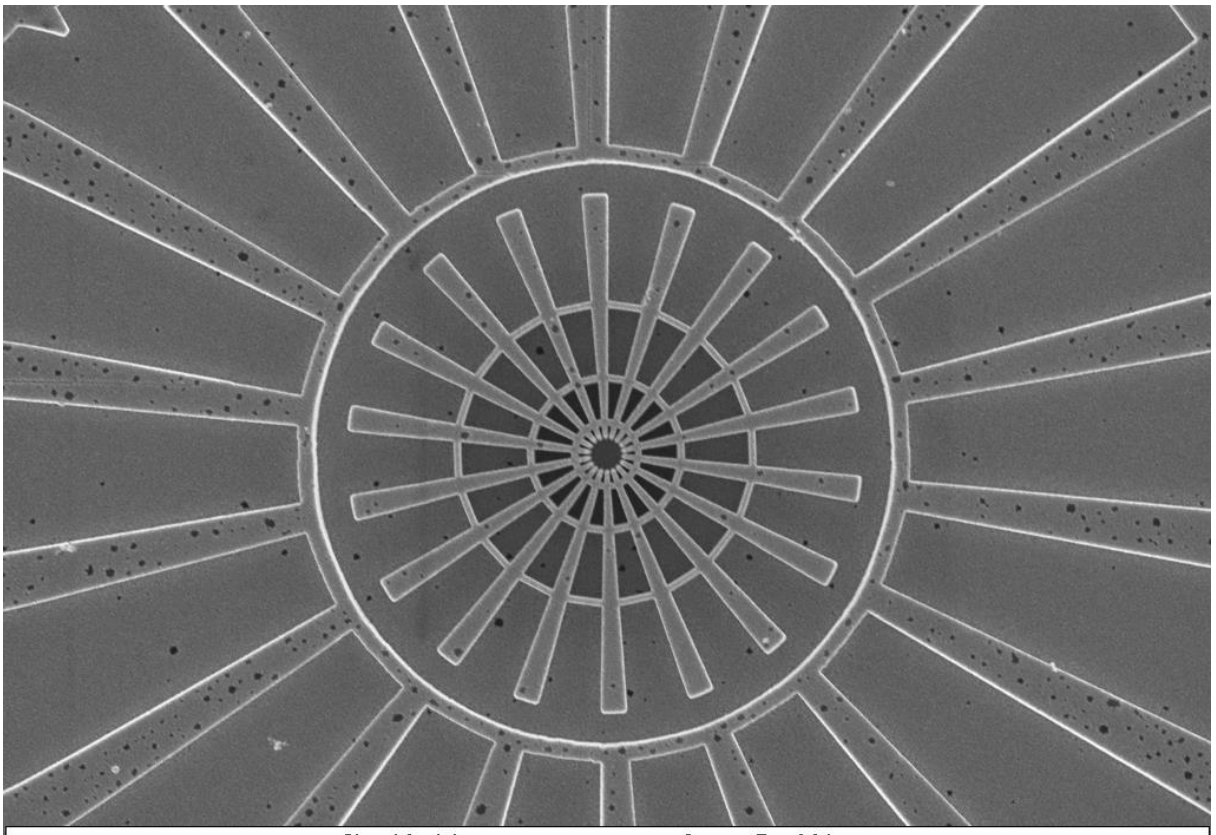
File Name = LM180727a_lr_02.tif Time :14:30:31

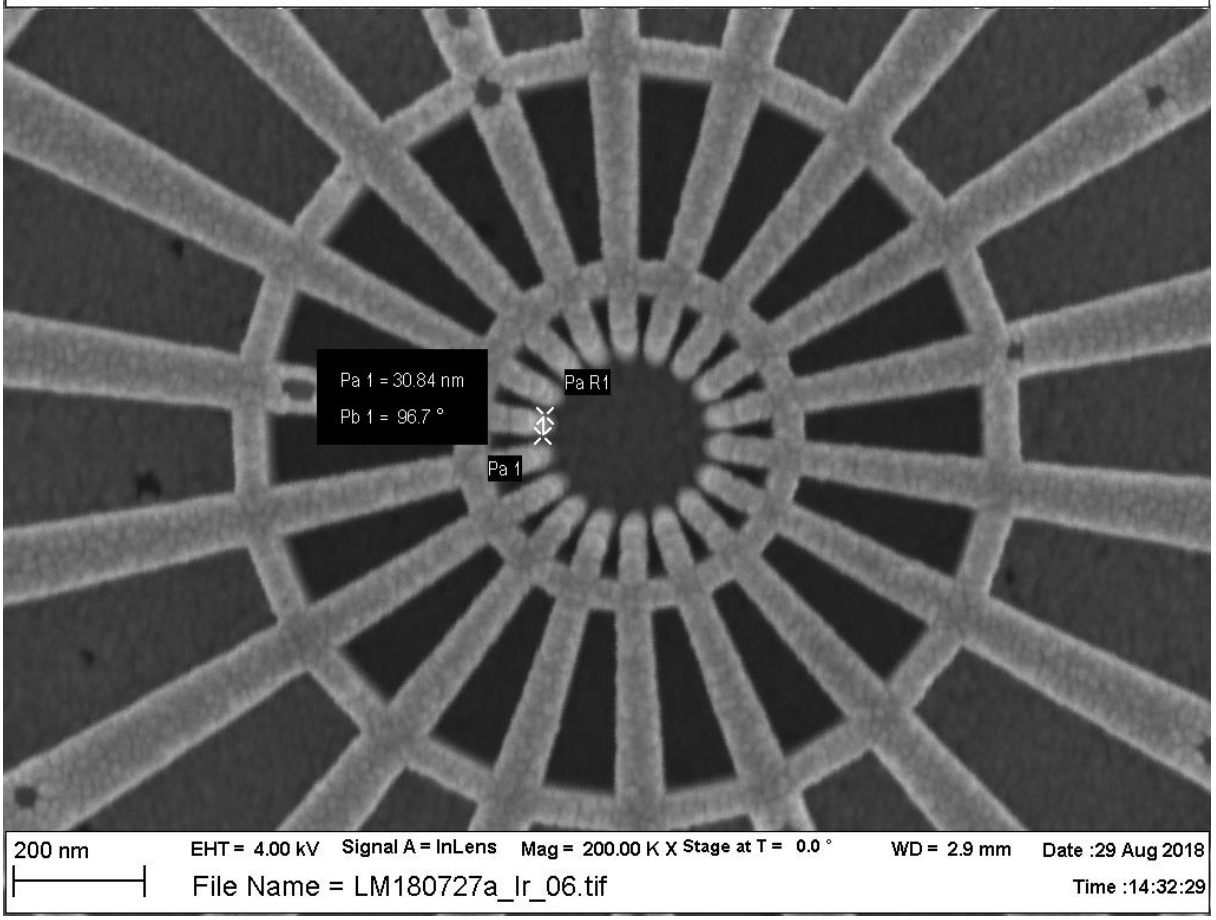


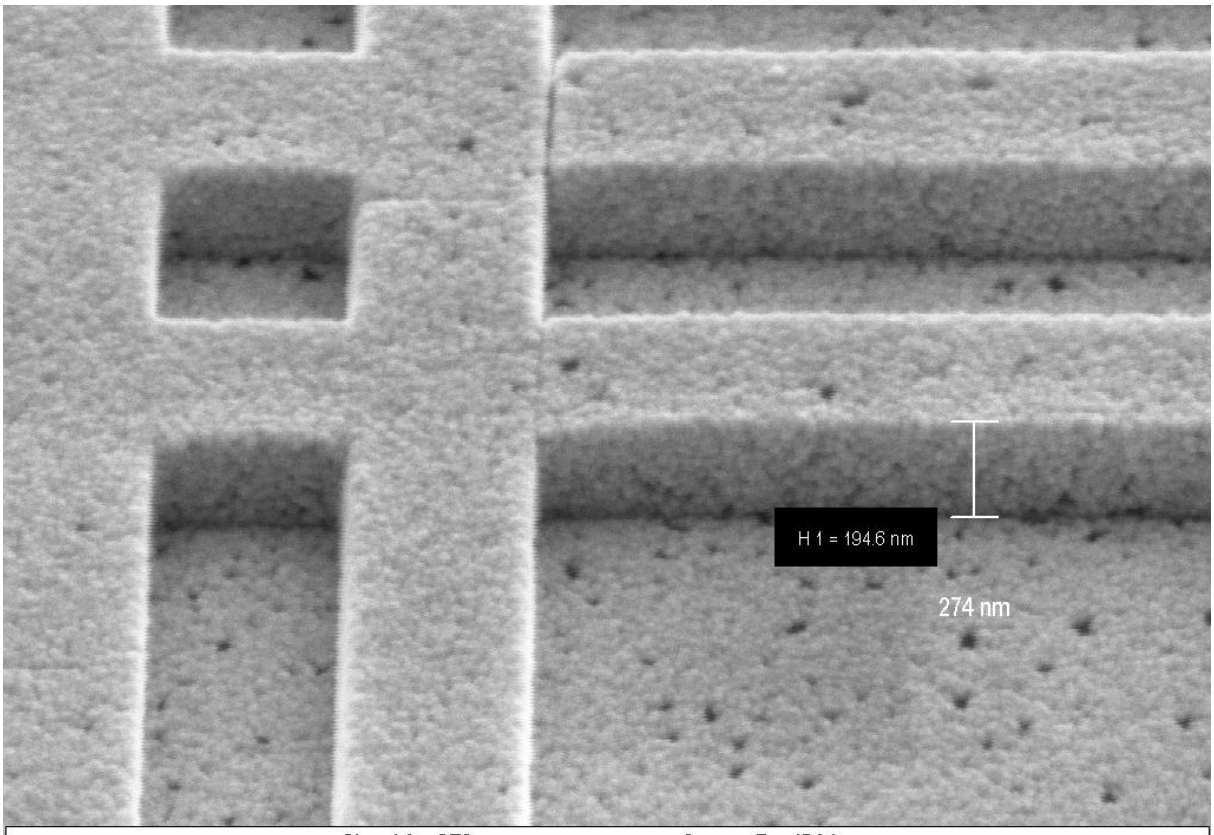
300 nm EHT = 4.00 kV Signal A = InLens Mag = 56.84 K X Stage at T = 0.0 ° WD = 2.9 mm Date :29 Aug 2018

File Name = LM180727a_lr_03.tif Time :14:31:04

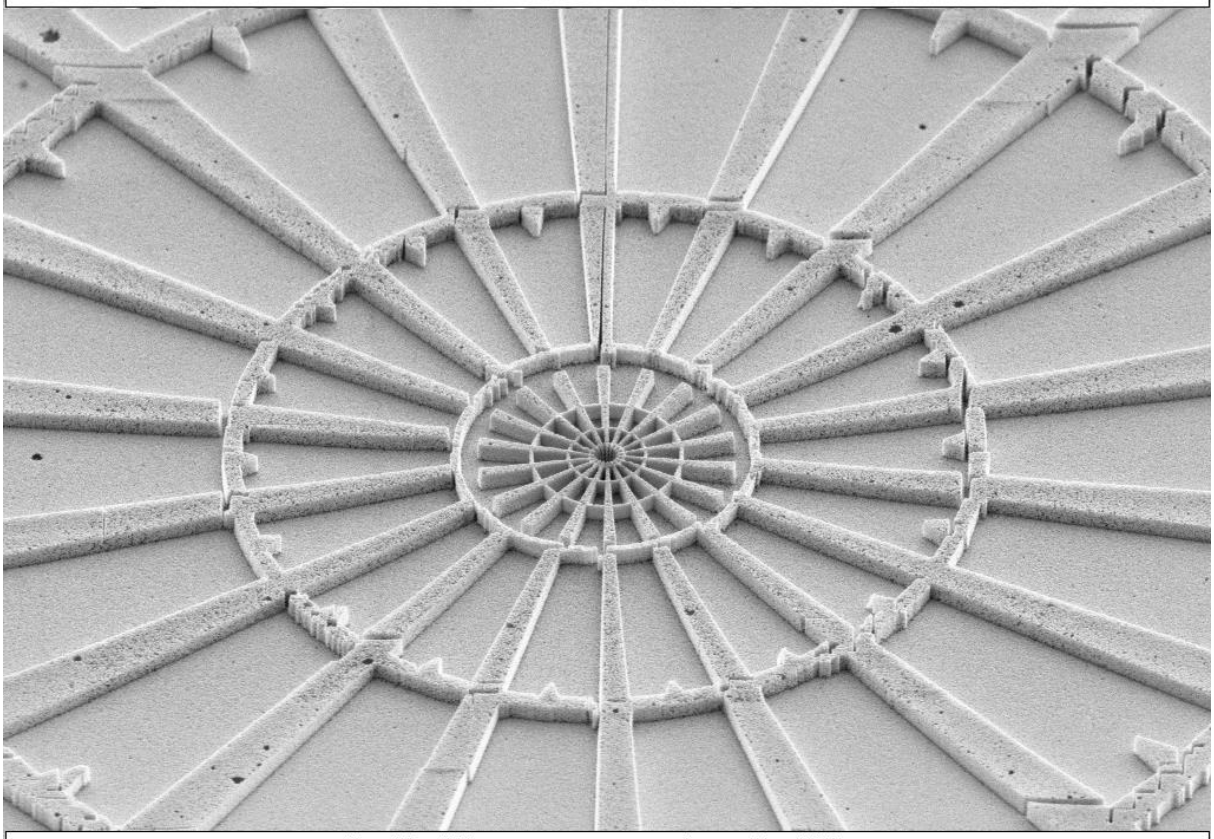

V 1 = 1.594 µm
2 µm
EHT = 4.00 kV
Signal A = InLens
Mag = 28.03 K X
Stage at T = 0.0 °
WD = 2.9 mm
Date :29 Aug 2018
File Name = LM180727a_lr_04.tif
Time :14:31:24


1 µm
EHT = 4.00 kV
Signal A = InLens
Mag = 40.00 K X
Stage at T = 0.0 °
WD = 2.9 mm
Date :29 Aug 2018
File Name = LM180727a_Ir_05.tif
Time :14:31:51

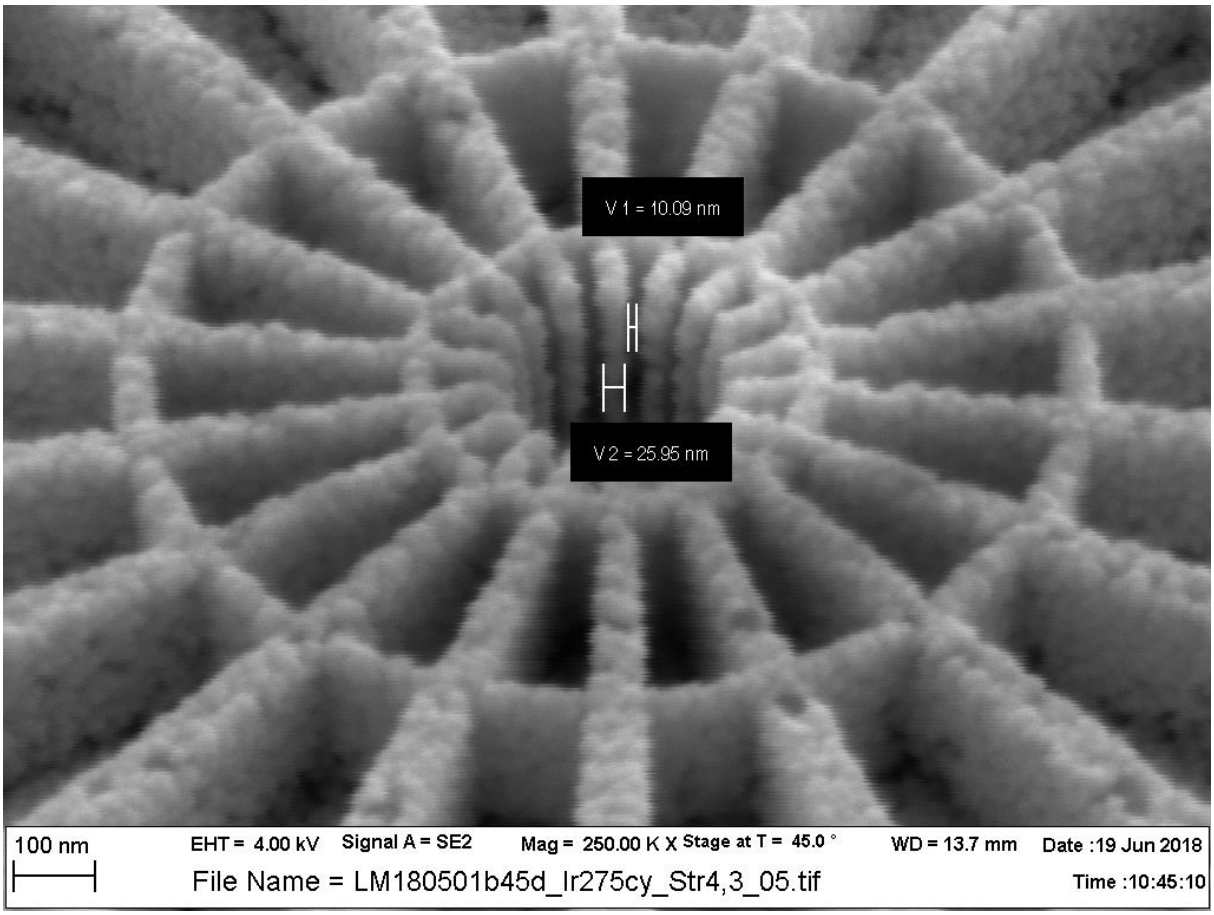

Pa 1 = 30.84 nm
Pb 1 = 96.7 °
Pa R1
Pa 1
200 nm
EHT = 4.00 kV
Signal A = InLens
Mag = 200.00 K X
Stage at T = 0.0 °
WD = 2.9 mm
Date :29 Aug 2018
File Name = LM180727a_Ir_06.tif
Time :14:32:29



200 nm EHT = 4.00 kV Signal A = SE2 Mag = 150.00 K X Stage at T = 45.0 ° WD = 13.7 mm Date :19 Jun 2018
File Name = LM180501b45d_Ir275cy_08.tif Time :10:47:21



1 µm EHT = 4.00 kV Signal A = SE2 Mag = 20.00 K X Stage at T = 45.0 ° WD = 13.7 mm Date :19 Jun 2018
File Name = LM180501b45d_Ir275cy_Str4,3_00.tif Time :10:34:36



More images on
XRO:\Maxime\2018.04 cSAXS_HR