SAND2016-9296PE

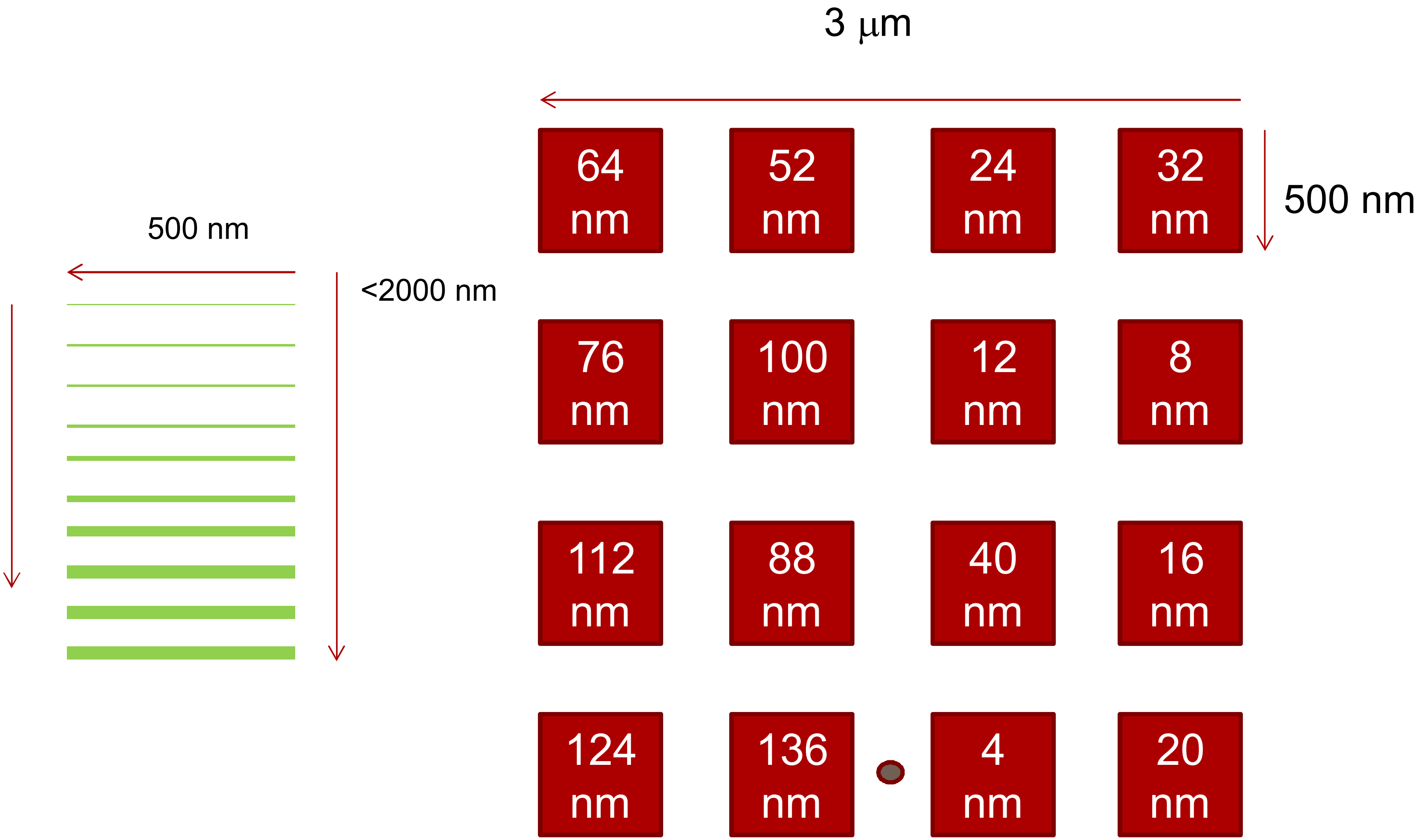
Exceptional service in the national interest

Sandia
National
Laboratories

sMIM resolution tester

H lithography- Chip S87

Pattern



500 nm

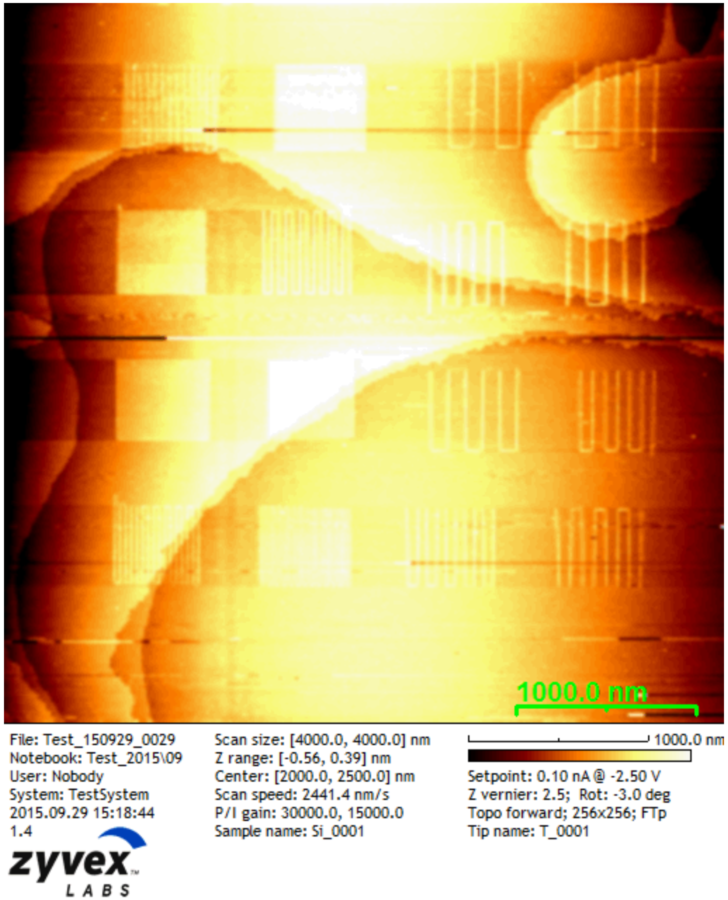
<2000 nm

3 µm

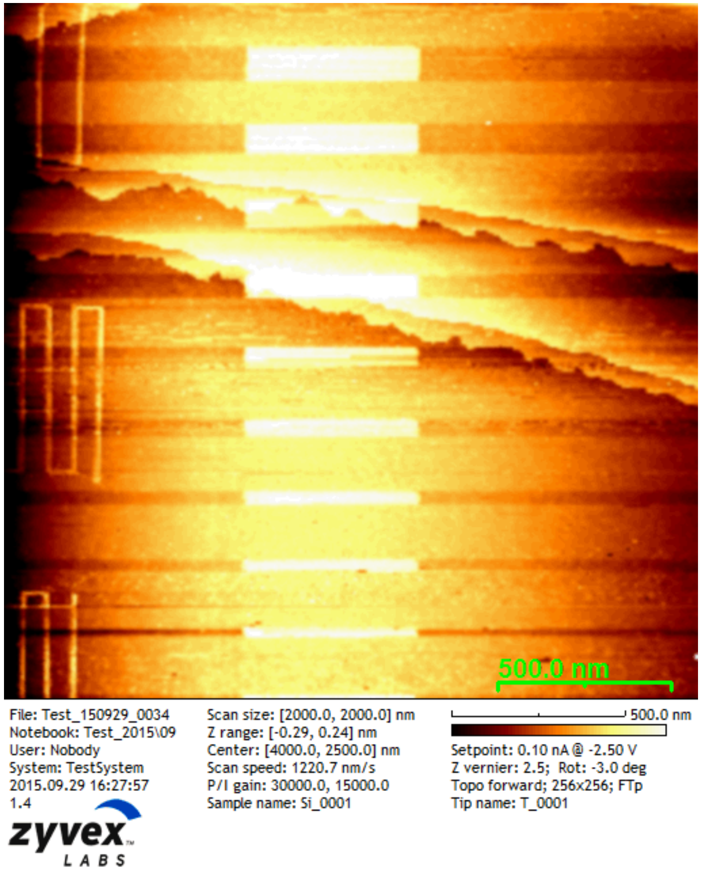
500 nm

64 nm	52 nm	24 nm	32 nm
76 nm	100 nm	12 nm	8 nm
112 nm	88 nm	40 nm	16 nm
124 nm	136 nm	4 nm	20 nm

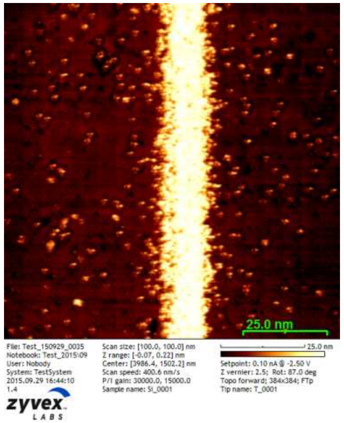
STM images



```
File: Test_150929_0029
Notebook: Test_2015\09
User: Nobody
System: TestSystem
2015.09.29 15:18:44
1.4

Scan size: [4000.0, 4000.0] nm
Z range: [-0.56, 0.39] nm
Center: [2000.0, 2500.0] nm
Scan speed: 2441.4 nm/s
P/I gain: 30000.0, 15000.0
Sample name: Si_0001

Setpoint: 0.10 nA @ -2.50 V
Z vernier: 2.5;  Rot: -3.0 deg
Topo forward; 256x256; FTp
Tip name: T_0001
```



```
File: Test_150929_0034
Notebook: Test_2015\09
User: Nobody
System: TestSystem
2015.09.29 16:27:57
1.4

Scan size: [2000.0, 2000.0] nm
Z range: [-0.29, 0.24] nm
Center: [4000.0, 2500.0] nm
Scan speed: 1220.7 nm/s
P/I gain: 30000.0, 15000.0
Sample name: Si_0001

Setpoint: 0.10 nA @ -2.50 V
Z vernier: 2.5;  Rot: -3.0 deg
Topo forward; 256x256; FTp
Tip name: T_0001
```



```
File: Test_150929_0035
Notebook: Test_2015\09
User: Nobody
System: TestSystem
2015.09.29 16:44:10
1.4

Scan size: [100.0, 100.0] nm
Z range: [-0.07, 0.22] nm
Center: [3986.4, 1502.2] nm
Scan speed: 400.6 nm/s
P/I gain: 30000.0, 15000.0
Sample name: Si_0001

Setpoint: 0.10 nA @ -2.50 V
Z vernier: 2.5;  Rot: 87.0 deg
Topo forward; 384x384; FTp
Tip name: T_0001
```

10 nm linewidth

sMIM images

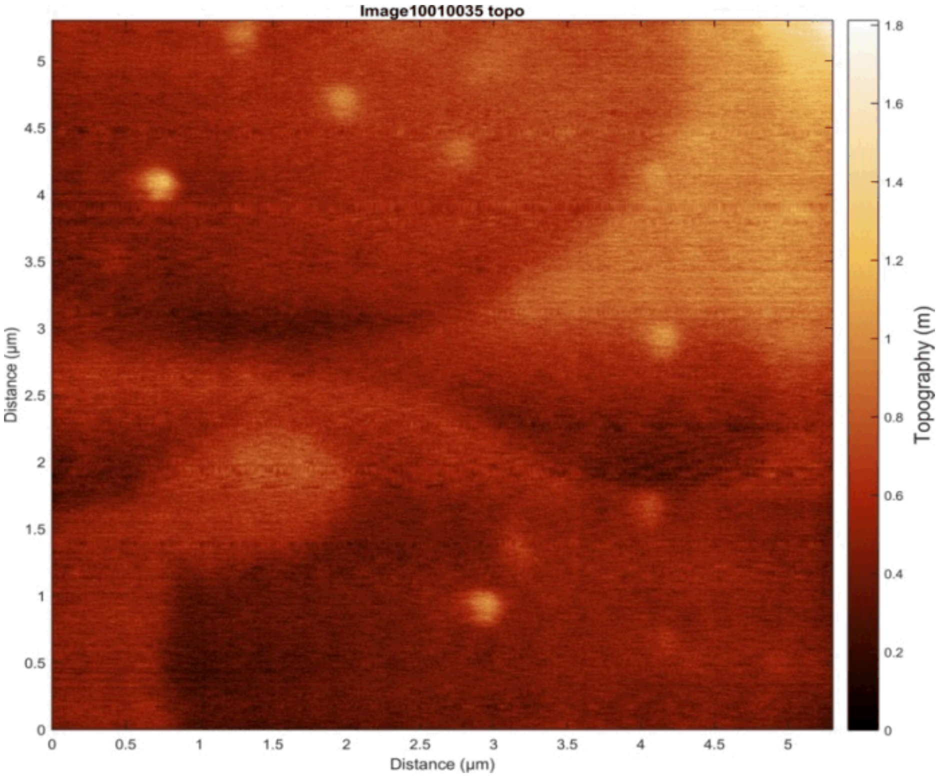


Image10010035 topo
Distance (µm)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Distance (µm)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Topography (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8

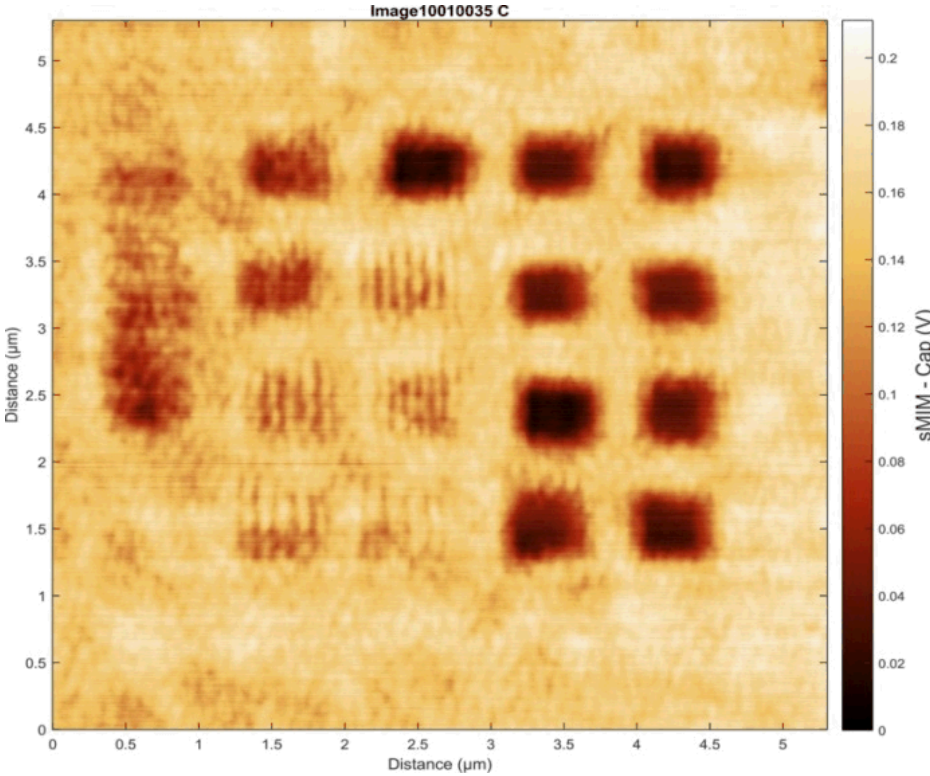


Image10010035 C
Distance (µm)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Distance (µm)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
sMIM - Cap (V)
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2