

100nm depth oxide HM (L50P100) Line & Space with 30A ALD TiN Coating navigation & results Oct 24, 2023

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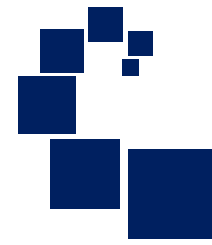
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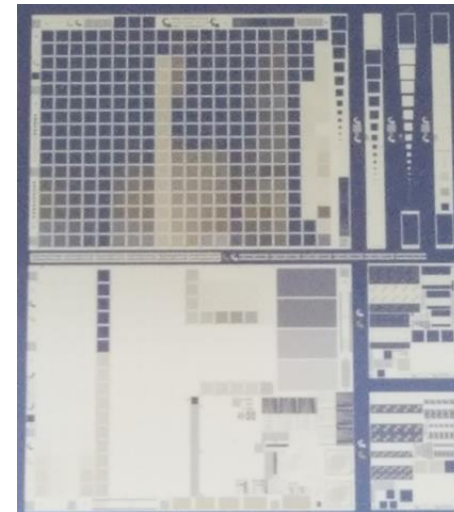
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AMAG7 CD metrology modules



- Full die repeat size is 27.000mm x 33.000mm (exactly).
- All panes of AMAG7 are included. Full Field.

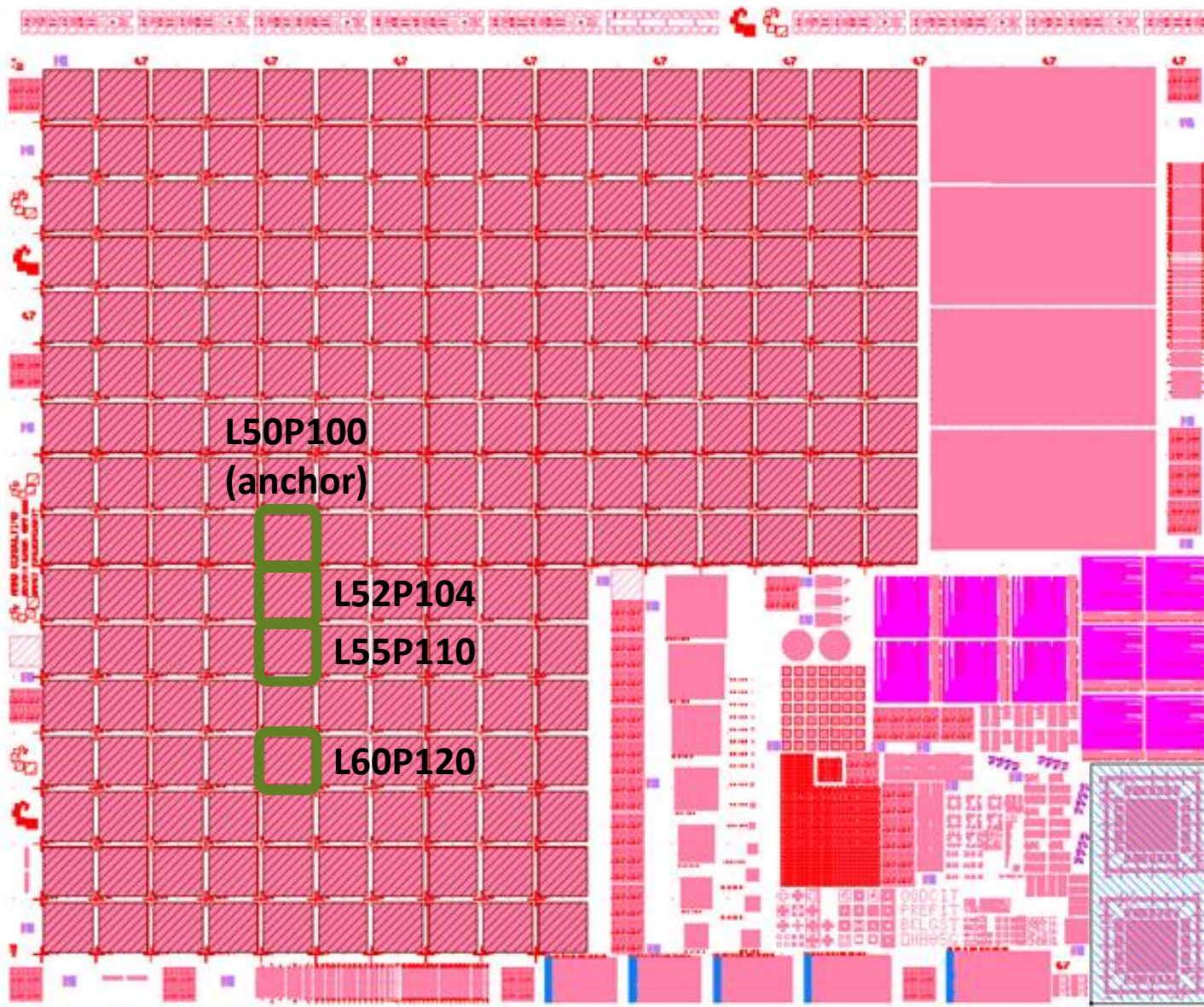
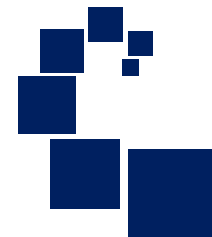


33.000 mm

27.000 mm

Photograph of Line & Space pattern

AMAG7B Pane CD metrology modules



L50P100
(anchor)

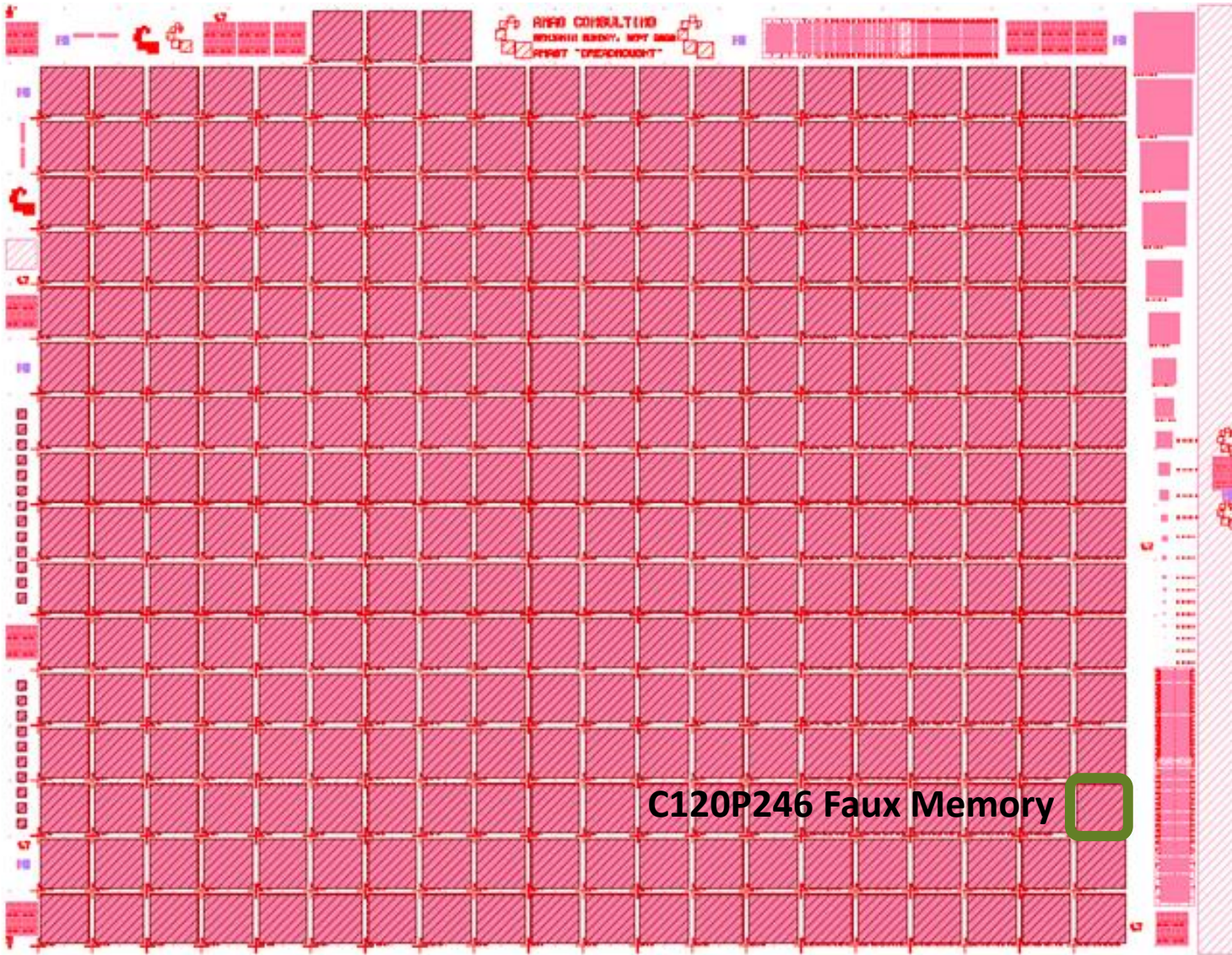
L52P104

L55P110

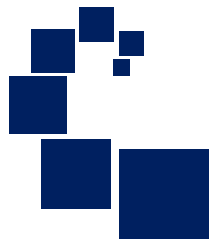
L60P120

AMAG7A Pane

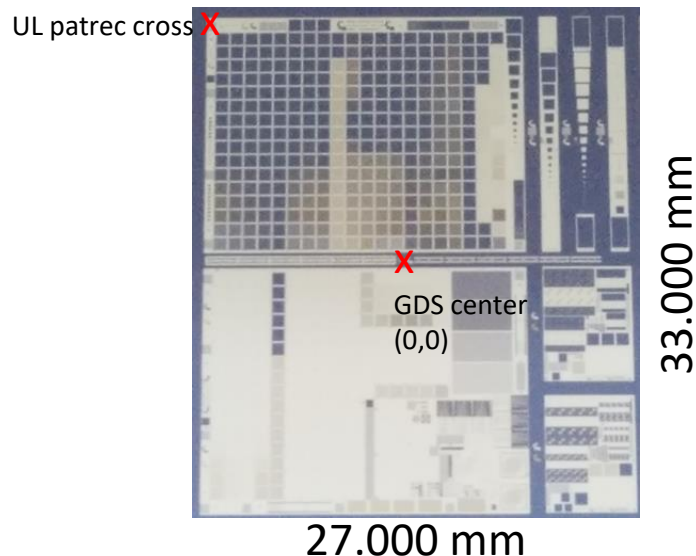
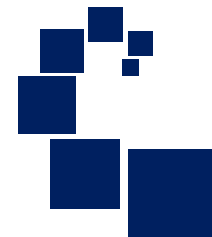
UL corner patrec mark



C120P246 Faux Memory

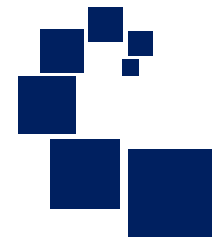


AMAG7 Full Field Pattern for Line&Space



Photograph of Line & Space pattern

Pattern	Wafer Type	x [um]	y [um]	Tile coordinates (each tile has location in GDS)
UL pattern rec cross--top left corner of die	100HM Line&Space	-12920	15938	left of A-00
AMAG7 L50P100 grating (anchor target, 800um pad)	100HM Line&Space	-8400	-8300	E-25
L52P104 grating (800um pad)	100HM Line&Space	-8400	-9200	E-26
L55P110 grating (800um pad)	100HM Line&Space	-8400	-10100	E-27
L60P120 grating (800um pad)	100HM Line&Space	-8400	-11900	E-29
C120P246 Faux Memory grating (800um pad)	100HM Line&Space	5100	2900	T-14
GDS center (cartesian coordinates)	no feature	0	0	~center of middle scribe lane



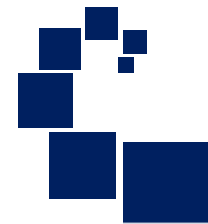
Line & Space 30A ALD TiN Coating HM100 wafer-level CD results

- This report shows the wafer-level averages and variation for each wafer of the first lot of the Line & Space product.
- Specific maps for each wafer including the average & 1sigma and SEM images of all-die of L50P100 and few sites of each of the secondary targets.
- CD values convey bottom CD of the lines.
 - For C120P246 Faux Memory, two values represent the holes nearest trench and holes further from trench.

Lot ID:

Purpose: AMAG7, Pane B (bladed), Line and space, 100nm oxide thickness, 30A ALD TiN coating. Anchor feature = L50 P100

Slot	Wfr ID	recipe = DNVM1FAMAG7XCDUA			recipe = DNVM1FAMAG7XCDUB			recipe = DNVM1FAMAG7XCDUC	
		L50 P100Hor (XLS) All die			L50 P100Ver (NHL) 11 die	L55 P110 (BCH) 11 die	L60 P120 (NVL) 11 die	C120 P246 MEM (ECH) CD1, 11 die	C120 P246 MEM (ECH2) CD2, 11 die
		CD	1-sigma	LWR	CD	CD	CD	CD	CD
1	46KDP051SJA1	49.9	1.19	2.99	50.1	56.4	60.7	100.5	99.9
2	46KDP025SJD5	50.9	1.31	2.99	51.3	57.6	62.1	99.1	98.6
3	46KDP024SJG6	50.5	1.33	2.98	50.8	57.2	61.5	99.7	99.0
4	46KDP023SJC4	50.8	1.40	3.00	50.9	57.5	61.8	99.0	98.6
5	46KDP0222SJF5	50.1	1.40	3.05	50.7	57.1	61.3	99.5	99.1
Lot	Averages	50.44	1.33	3.00	50.76	57.16	61.48	99.6	99.05



46KDP051SJA1 (2338EMEM001 slot 1) Reference Data

L50P100 Anchor Target

Oct 2023

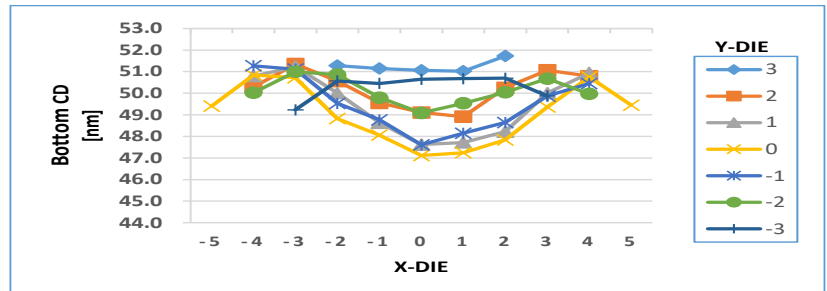
- All measurements in nm.
- Avg CD and 1sigma line-to-line variation for L50P100 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 8 lines sampled at each site, from images on next page.
- CD values convey bottom CD of the lines.

Full Wafer Avg CD:	49.86	nm
Full wafer 1sigma CD:	1.19	nm
Die-to-Die 1sigma		
Avg:	0.20	nm
RMS:	0.21	nm
LWR Line (Avg):	2.99	nm
FOV:	1000	nm

Average of all individual die CD averages (8 targets/die).
 Stdev of all die CD average of (8 targets/die), represents across wafer variation.
 Feature-to-feature variation within grating.
 Arithmetic average value of feature-to-feature variation.
 RMS average value of feature-to-feature variation.
 Average of 3Sigma LWR (Linewidth)
 Size of image (field-of-view).

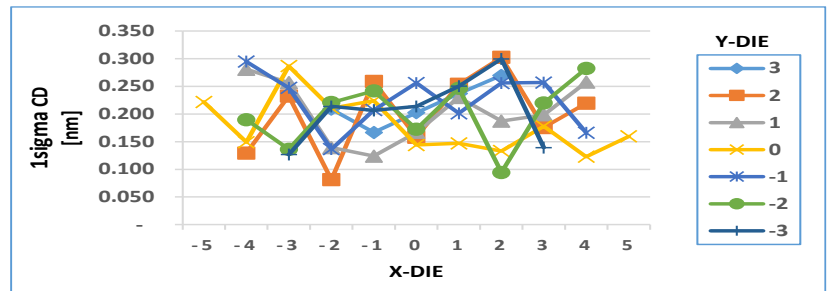
L50P100 Anchor Target Avg CD (line)

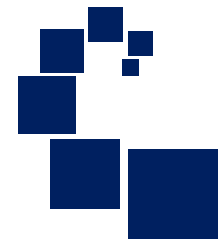
	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				51.28	51.15	51.07	51.02	51.72			
2		50.28	51.35	50.56	49.55	49.11	48.92	50.25	51.06	50.79	
1		50.80	51.23	50.01	48.63	47.62	47.72	48.22	50.00	50.94	
0	49.40	50.85	50.72	48.83	48.06	47.11	47.24	47.84	49.36	50.75	49.45
-1		51.27	51.12	49.53	48.77	47.61	48.15	48.64	49.87	50.45	
-2		50.03	50.99	50.87	49.80	49.09	49.54	50.04	50.68	49.97	
-3			49.23	50.57	50.45	50.65	50.68	50.70	49.88		



L50P100 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.209	0.167	0.202	0.237	0.270			
2		0.130	0.233	0.081	0.259	0.158	0.254	0.302	0.176	0.220	
1		0.281	0.257	0.139	0.124	0.167	0.230	0.187	0.199	0.258	
0	0.222	0.149	0.287	0.210	0.224	0.144	0.147	0.133	0.178	0.123	0.160
-1		0.295	0.247	0.137	0.207	0.256	0.201	0.256	0.257	0.166	
-2		0.190	0.136	0.221	0.242	0.173	0.247	0.094	0.220	0.282	
-3			0.127	0.214	0.206	0.214	0.250	0.300	0.139		





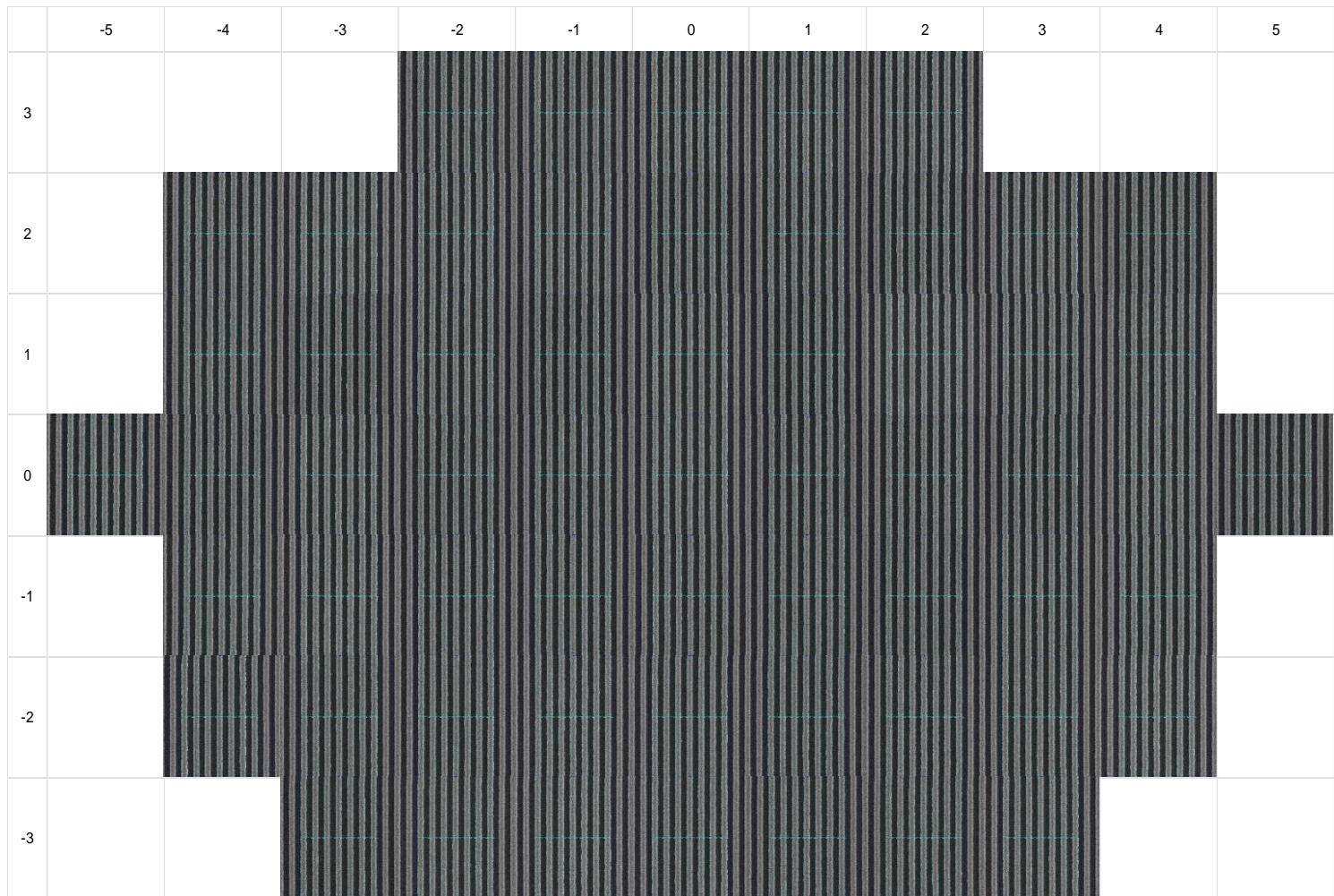
46KDP051SJA1 (2338EMEM001 slot 1) Reference Data

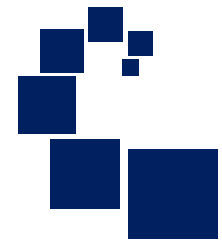
L50P100 Anchor Target

Oct 2023

L50P100 Anchor Target CD-SEM image wafer map

Full Wafer Avg CD:	49.86	nm
Full wafer 1sigma CD:	1.19	nm
Die-to-Die 1sigma		
Avg:	0.20	nm
RMS:	0.21	nm
LWR Line (Avg):	2.99	nm
FOV:	1000	nm





46KDP051SJA1 (2338EMEM001 slot 1) Reference Data

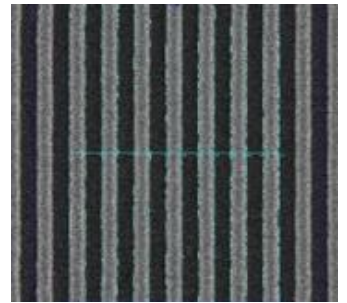
Anchor and Secondary Targets Summary

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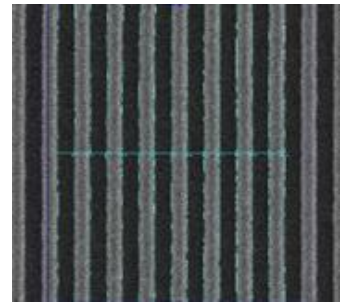
Anchor Target

L50P100 (XLS*)

L50P100 (NHL*)



Horizontal



Vertical

Full Wafer Avg CD:	49.86	nm
Full wafer 1sigma CD:	1.19	nm
Die-to-Die 1sigma		
Avg:	0.20	nm
RMS:	0.21	nm
LWR Line (Avg):	2.99	nm
FOV:	1000	nm

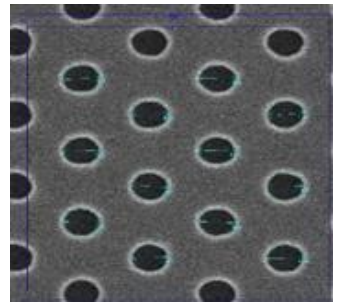
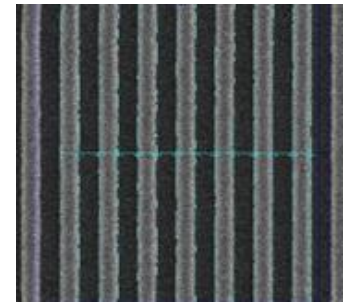
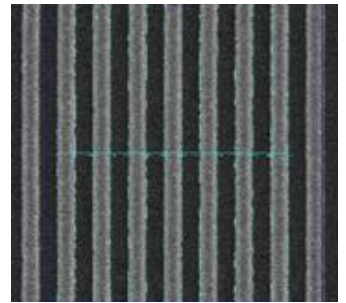
Full Wafer Avg CD:	50.11	nm
Full wafer 1sigma CD:	1.36	nm
Die-to-Die 1sigma		
Avg:	0.24	nm
RMS:	0.25	nm
LWR Line (Avg):	3.04	nm
FOV:	1000	nm

Secondary Targets

L55P110 (IHL*)

L60P120 (NVL*)

C120P246MEM (ECH*)

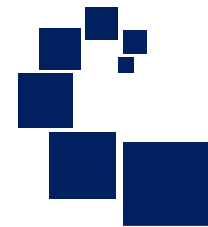


Full Wafer Avg CD:	56.41	nm
Full wafer 1sigma CD:	1.45	nm
Die-to-Die 1sigma		
Avg:	0.25	nm
RMS:	0.26	nm
LWR Line (Avg):	3.10	nm
FOV:	1000	nm

Full Wafer Avg CD:	60.72	nm
Full wafer 1sigma CD:	1.58	nm
Die-to-Die 1sigma		
Avg:	0.25	nm
RMS:	0.26	nm
LWR Line (Avg):	3.16	nm
FOV:	1000	nm

Full Wafer Avg CD:	100.46	nm
Full wafer 1sigma CD:	1.80	nm
Die-to-Die 1 sigma		
Avg:	2.12	nm
RMS:	2.23	nm
Ellipticity	1.24	nm
FOV:	1000	nm

* Coding labels for CD data results files



46KDP0251SJD5 (2338EMEM001 slot 2) Reference Data

L50P100 Anchor Target

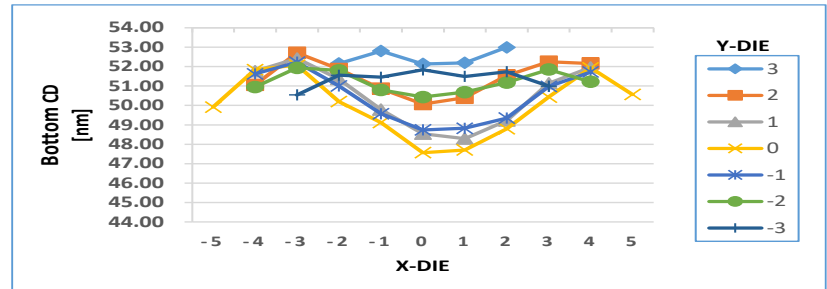
Oct 2023

- All measurements in nm.
- Avg CD and 1sigma line-to-line variation for L50P100 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 8 lines sampled at each site, from images on next page.
- CD values convey bottom CD of the lines.

Full Wafer Avg CD:	50.92	nm	Average of all individual die CD averages (8 targets/die).
Full wafer 1sigma CD:	1.31	nm	Stdev of all die CD average of (8 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	0.22	nm	Arithmetic average value of feature-to-feature variation.
RMS:	0.22	nm	RMS average value of feature-to-feature variation.
LWR Line (Avg):	2.99	nm	Average of 3Sigma LWR (Linewidth)
FOV:	1000	nm	Size of image (field-of-view).

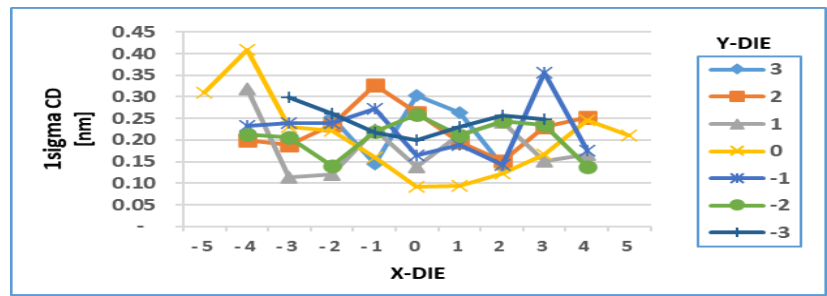
L50P100 Anchor Target Avg CD (line)

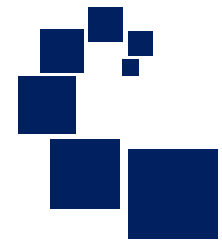
	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				52.16	52.80	52.13	52.19	52.99			
2		51.07	52.71	51.87	50.86	50.07	50.40	51.54	52.25	52.16	
1		51.76	52.42	51.36	49.78	48.55	48.29	49.22	51.14	51.96	
0	49.91	51.84	52.07	50.19	49.12	47.57	47.71	48.80	50.43	51.94	50.56
-1		51.62	52.23	51.00	49.57	48.74	48.83	49.35	50.98	51.72	
-2		50.95	51.94	51.81	50.80	50.43	50.69	51.18	51.85	51.22	
-3			50.54	51.56	51.45	51.83	51.49	51.74	51.00		



L50P100 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.25	0.15	0.30	0.26	0.14			
2		0.20	0.19	0.24	0.33	0.26	0.20	0.15	0.23	0.25	
1		0.32	0.11	0.12	0.23	0.14	0.21	0.24	0.15	0.17	
0	0.31	0.41	0.23	0.22	0.16	0.09	0.10	0.12	0.17	0.25	0.21
-1		0.23	0.24	0.24	0.27	0.16	0.19	0.14	0.36	0.18	
-2		0.21	0.21	0.14	0.22	0.26	0.21	0.24	0.24	0.14	
-3			0.30	0.26	0.22	0.20	0.23	0.26	0.25		





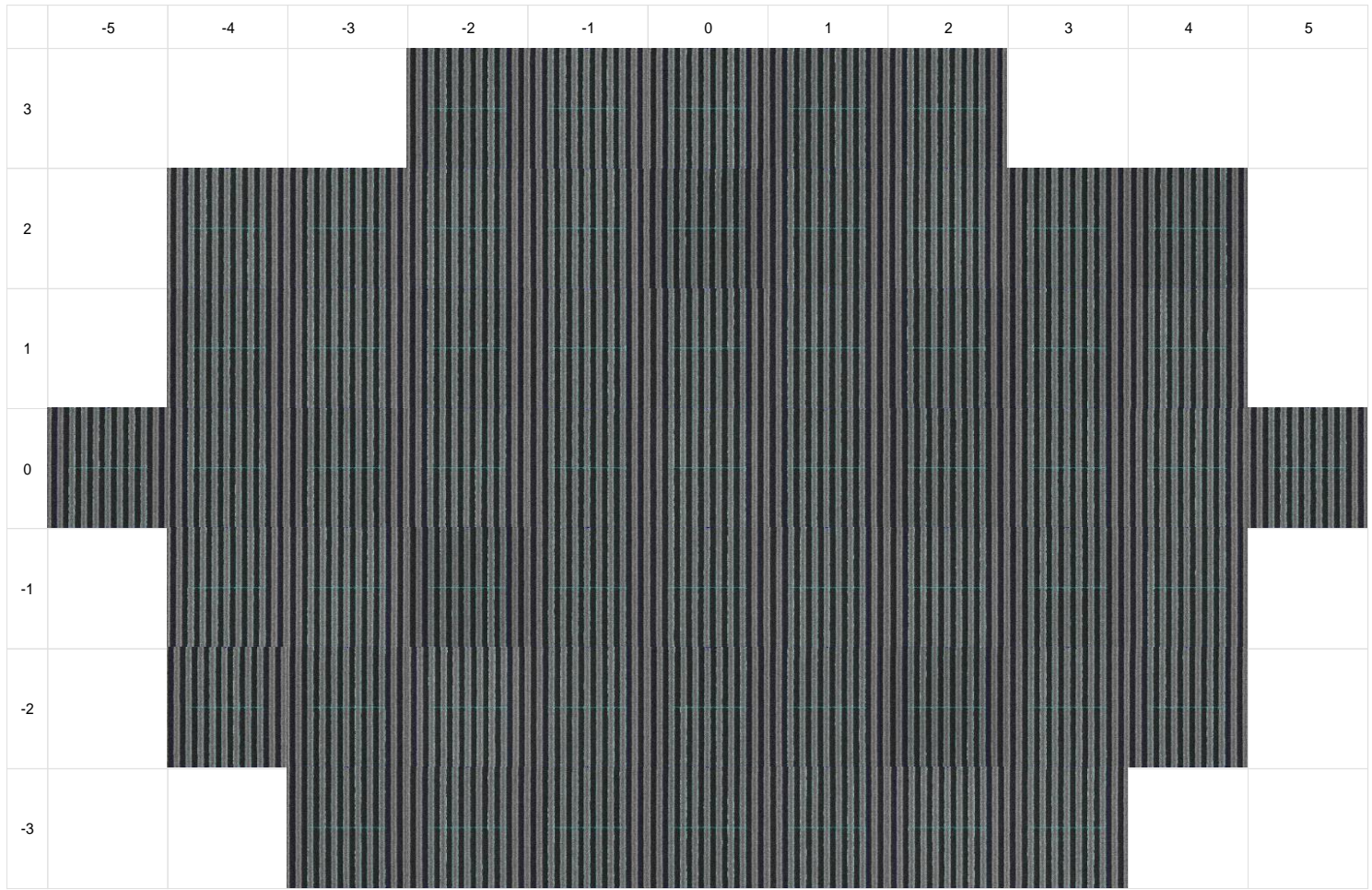
46KDP0251SJD5 (2338EMEM001 slot 2) Reference Data

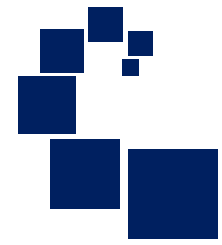
L50P100 Anchor Target

Oct 2023

L50P100 Anchor Target CD-SEM image wafer map

Full Wafer Avg CD:	50.92	nm
Full wafer 1sigma CD:	1.31	nm
Die-to-Die 1sigma		
Avg:	0.22	nm
RMS:	0.22	nm
LWR Line (Avg):	2.99	nm
FOV:	1000	nm





46KDP0251SJD5 (2338EMEM001 slot 2) Reference Data

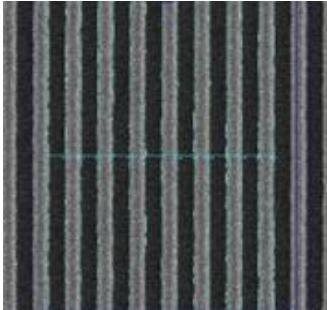
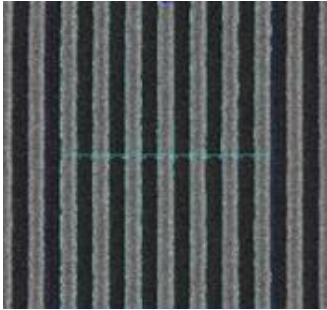
Anchor and Secondary Targets Summary

Oct 2023

Anchor Target

L50P100 (XLS*)

L50P100 (NHL*)



Horizontal

Vertical

Full Wafer Avg CD:	50.92	nm
Full wafer 1sigma CD:	1.31	nm
Die-to-Die 1sigma		
Avg:	0.22	nm
RMS:	0.22	nm
LWR Line (Avg):	2.99	nm
FOV:	1000	nm

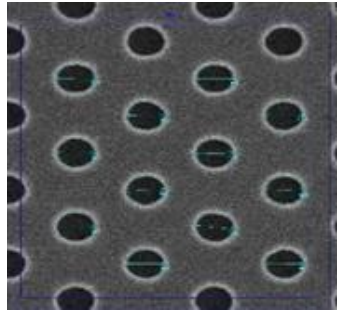
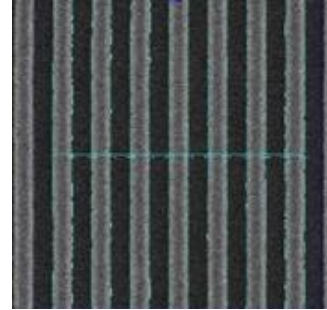
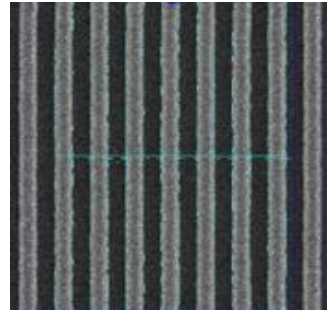
Full Wafer Avg CD:	51.3	nm
Full wafer 1sigma CD:	1.69	nm
Die-to-Die 1 sigma:		
Avg:	0.19	nm
RMS:	0.21	nm
LWR:	2.97	nm
FOV:	1000	nm

Secondary Targets

L55P110 (IHL*)

L60P120 (NVL*)

C120P246MEM (ECH*)

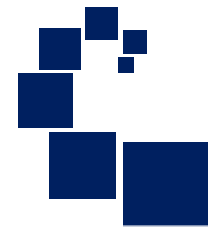


Full Wafer Avg CD:	57.6	nm
Full wafer 1sigma CD:	1.67	nm
Die-to-Die 1 sigma:		
Avg:	0.30	nm
RMS:	0.33	nm
LWR:	2.97	nm
FOV:	1000	nm

Full Wafer Avg CD:	62.1	nm
Full wafer 1sigma CD:	1.76	nm
Die-to-Die 1 sigma		
Avg:	0.21	nm
RMS:	0.23	nm
LWR:	3.09	nm
FOV:	1000	nm

Full Wafer Avg CD:	99.11	nm
Full wafer 1sigma CD:	2.16	nm
Die-to-Die 1 sigma		
Avg:	2.10	nm
RMS:	2.22	nm
Ellipticity	1.24	nm
FOV:	1000	nm

* Coding labels for CD data results files



46KDP0241SJG6 (2338EMEM001 slot 3) Reference Data

L50P100 Anchor Target

Oct 2023

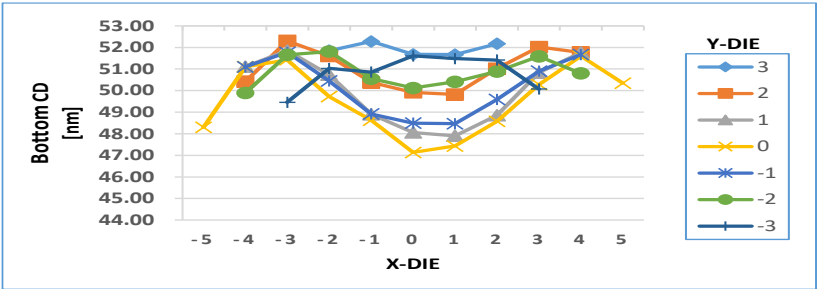
- All measurements in nm.
- Avg CD and 1sigma line-to-line variation for L50P100 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 8 lines sampled at each site, from images on next page.
- CD values convey bottom CD of the lines.

Full Wafer Avg CD:	50.48	nm
Full wafer 1sigma CD:	1.33	nm
Die-to-Die 1sigma		
Avg:	0.20	nm
RMS:	0.21	nm
LWR Line (Avg):	2.98	nm
FOV:	1000	nm

Average of all individual die CD averages (8 targets/die).
 Stdev of all die CD average of (8 targets/die), represents across wafer variation.
 Feature-to-feature variation within grating.
 Arithmetic average value of feature-to-feature variation.
 RMS average value of feature-to-feature variation.
 Average of 3Sigma LWR (Linewidth)
 Size of image (field-of-view).

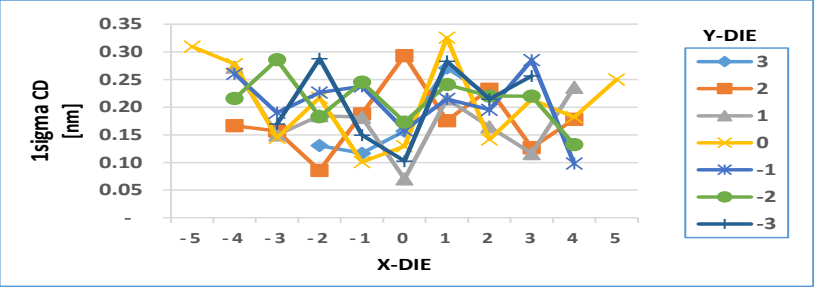
L50P100 Anchor Target Avg CD (line)

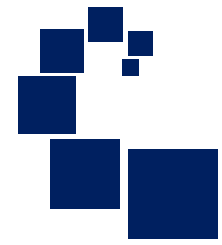
	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				51.85	52.28	51.68	51.67	52.17			
2		50.42	52.30	51.60	50.38	49.92	49.82	51.02	52.02	51.76	
1		51.11	51.85	50.73	48.90	48.06	47.91	48.86	50.83	51.76	
0	48.30	51.11	51.42	49.72	48.63	47.13	47.44	48.57	50.28	51.60	50.35
-1		51.10	51.77	50.45	48.91	48.49	48.47	49.59	50.90	51.67	
-2		49.89	51.66	51.81	50.55	50.12	50.41	50.88	51.59	50.80	
-3			49.46	51.03	50.86	51.60	51.48	51.42	50.07		



L50P100 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.13	0.12	0.16	0.27	0.22			
2		0.17	0.16	0.09	0.19	0.29	0.18	0.23	0.13	0.18	
1		0.27	0.15	0.18	0.18	0.07	0.21	0.16	0.12	0.24	
0	0.31	0.28	0.14	0.22	0.10	0.13	0.33	0.14	0.21	0.18	0.25
-1		0.26	0.19	0.23	0.24	0.16	0.21	0.20	0.29	0.10	
-2		0.22	0.29	0.18	0.25	0.17	0.24	0.22	0.22	0.13	
-3			0.17	0.29	0.15	0.10	0.28	0.21	0.26		





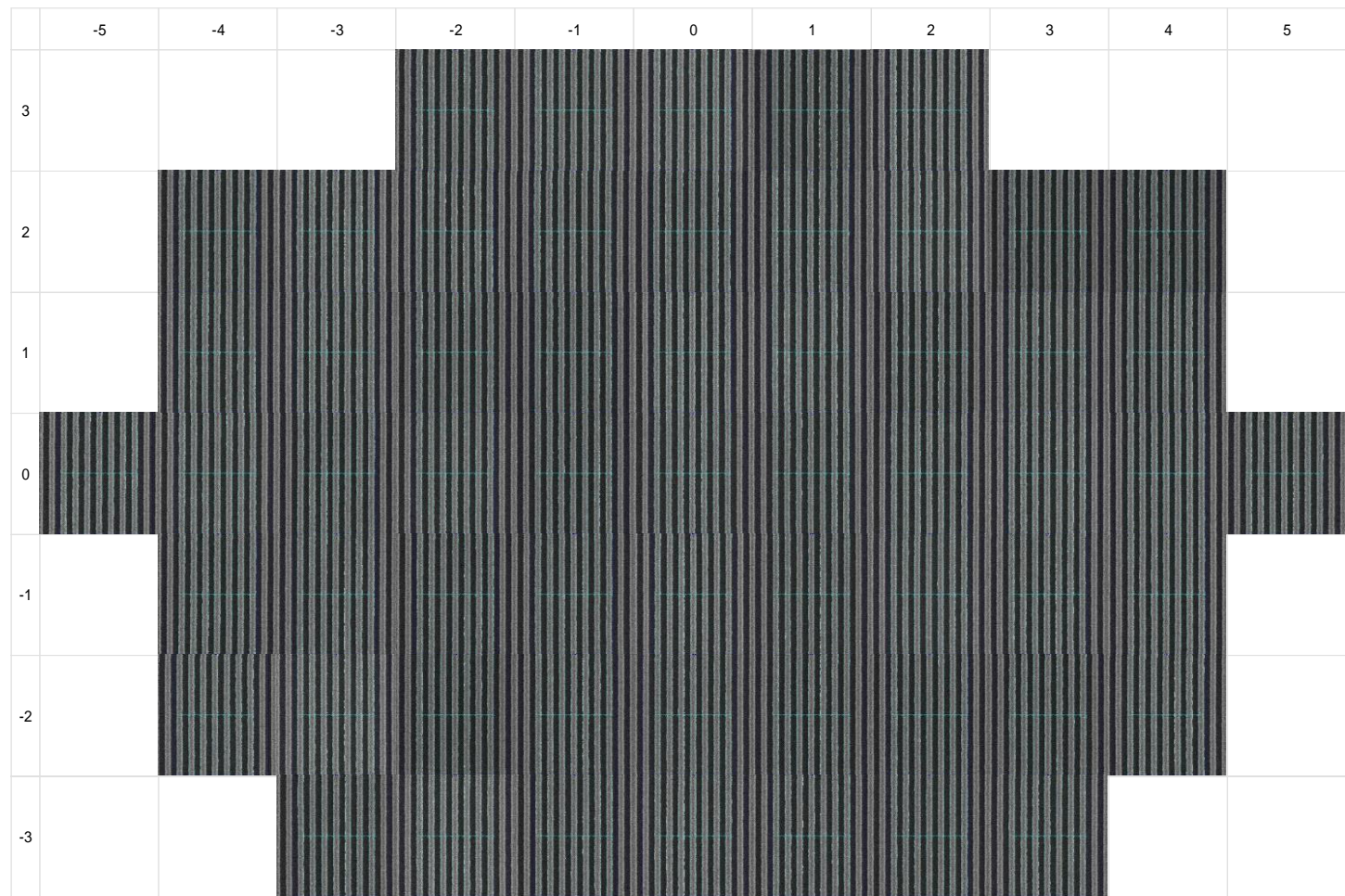
46KDP0241SJG6 (2338EMEM001 slot 3) Reference Data

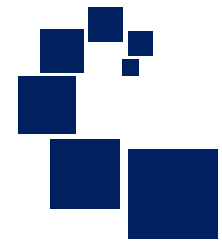
L50P100 Anchor Target

Oct 2022

L50P100 Anchor Target CD-SEM image wafer map

Full Wafer Avg CD:	50.48	nm
Full wafer 1sigma CD:	1.33	nm
Die-to-Die 1sigma		
Avg:	0.20	nm
RMS:	0.21	nm
LWR Line (Avg):	2.98	nm
FOV:	1000	nm





46KDP0241SJG6 (2338EMEM001 slot 3) Reference Data

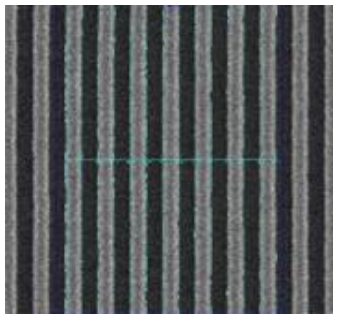
Anchor and Secondary Targets Summary

Oct 2023

Anchor Target

L50P100 (XLS*)

L50P100 (NHL*)



Horizontal

Vertical

Full Wafer Avg CD:	50.48	nm
Full wafer 1sigma CD:	1.33	nm
Die-to-Die 1sigma		
Avg:	0.20	nm
RMS:	0.21	nm
LWR Line (Avg):	2.98	nm
FOV:	1000	nm

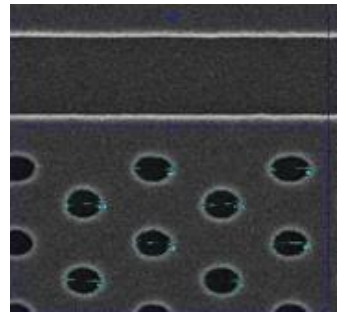
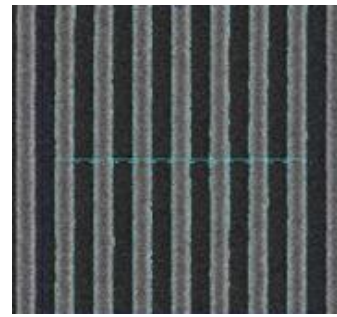
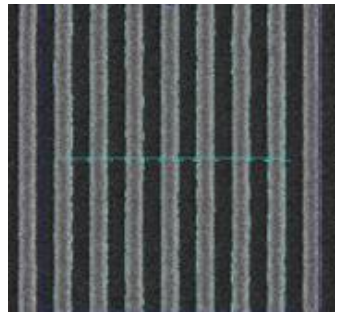
Full Wafer Avg CD:	50.8	nm
Full wafer 1sigma CD:	1.72	nm
Die-to-Die 1 sigma		
Avg:	0.21	nm
RMS:	0.22	nm
LWR:	2.92	nm
FOV:	1000	nm

Secondary Targets

L55P110 (IHL*)

L60P120 (NVL*)

C120P246MEM (ECH*)

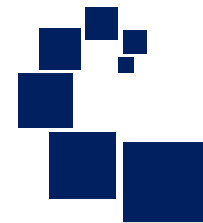


Full Wafer Avg CD:	57.2	nm
Full wafer 1sigma CD:	1.76	nm
Die-to-Die 1 sigma		
Avg:	0.27	nm
RMS:	0.30	nm
LWR:	2.89	nm
FOV:	1000	nm

Full Wafer Avg CD:	61.5	nm
Full wafer 1sigma CD:	1.82	nm
Die-to-Die 1 sigma		
Avg:	0.21	nm
RMS:	0.23	nm
LWR:	3.15	nm
FOV:	1000	nm

Full Wafer Avg CD:	99.70	nm
Full wafer 1sigma CD:	2.50	nm
Die-to-Die 1 sigma		
Avg:	2.19	nm
RMS:	2.34	nm
Ellipticity	1.24	nm
FOV:	1000	nm

* Coding labels for CD data results files



46KDP0231SJC4 (2338EMEM001 slot 4) Reference Data

L50P100 Anchor Target

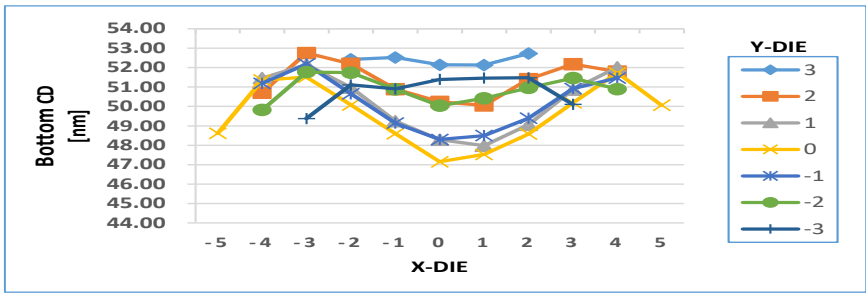
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- All measurements in nm.
- Avg CD and 1sigma line-to-line variation for L50P100 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 8 lines sampled at each site, from images on next page.
- CD values convey bottom CD of the lines.

Full Wafer Avg CD:	50.63	nm	Average of all individual die CD averages (8 targets/die).
Full wafer 1sigma CD:	1.40	nm	Stdev of all die CD average of (8 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	0.18	nm	Arithmetic average value of feature-to-feature variation.
RMS:	0.19	nm	RMS average value of feature-to-feature variation.
LWR Line (Avg):	3.00	nm	Average of 3Sigma LWR (Linewidth)
FOV:	1000	nm	Size of image (field-of-view).

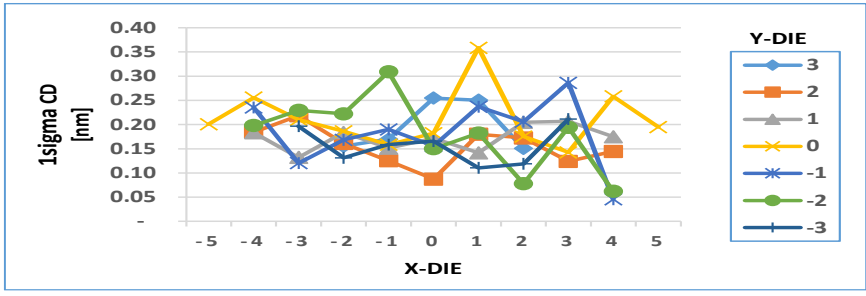
L50P100 Anchor Target Avg CD (line)

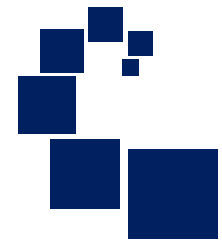
	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				52.42	52.52	52.14	52.13	52.72			
2		50.71	52.75	52.19	50.89	50.24	50.06	51.40	52.18	51.79	
1		51.46	52.15	50.97	49.24	48.29	47.97	49.05	50.87	52.02	
0	48.61	51.36	51.51	50.08	48.59	47.15	47.53	48.58	50.19	51.73	50.06
-1		51.19	52.18	50.65	49.14	48.30	48.50	49.39	50.92	51.46	
-2		49.82	51.77	51.74	50.88	50.04	50.42	50.95	51.46	50.89	
-3			49.38	51.11	50.90	51.39	51.46	51.48	50.10		



L50P100 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.16	0.17	0.25	0.25	0.15			
2		0.18	0.22	0.16	0.13	0.09	0.18	0.17	0.12	0.14	
1		0.18	0.13	0.18	0.15	0.17	0.14	0.20	0.21	0.17	
0	0.20	0.26	0.21	0.19	0.16	0.18	0.36	0.18	0.14	0.26	0.19
-1		0.24	0.12	0.17	0.19	0.16	0.24	0.21	0.29	0.05	
-2		0.20	0.23	0.22	0.31	0.15	0.18	0.08	0.19	0.06	
-3			0.20	0.13	0.16	0.17	0.11	0.12	0.21		





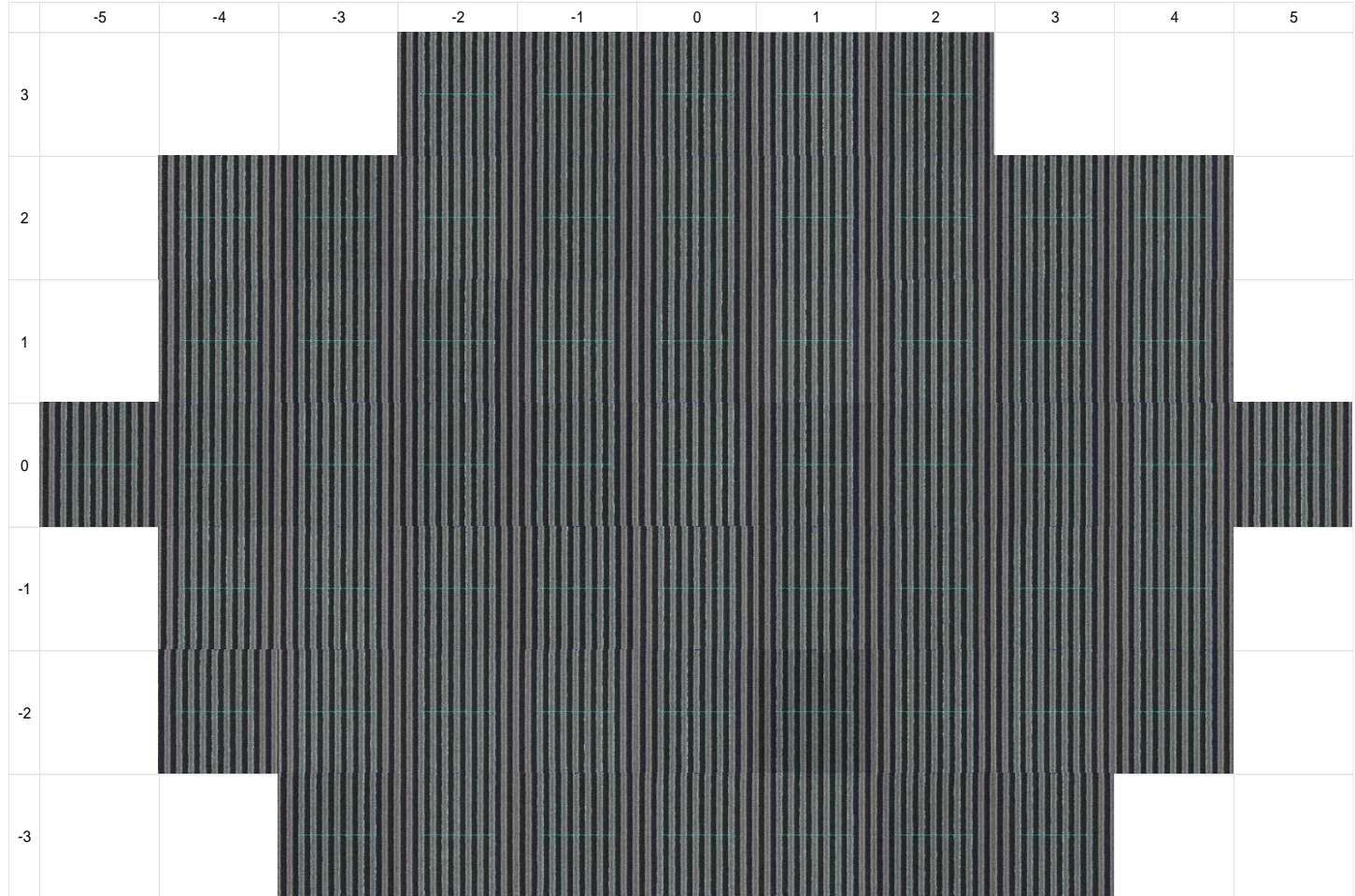
46KDP0231SJC4 (2338EMEM001 slot 4) Reference Data

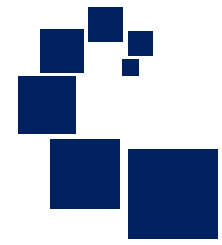
L50P100 Anchor Target

Oct 2022

L50P100 Anchor Target CD-SEM image wafer map

Full Wafer Avg CD:	50.63	nm
Full wafer 1sigma CD:	1.40	nm
Die-to-Die 1sigma		
Avg:	0.18	nm
RMS:	0.19	nm
LWR Line (Avg):	3.00	nm
FOV:	1000	nm





46KDP0231SJC4 (2338EMEM001 slot 4) Reference Data

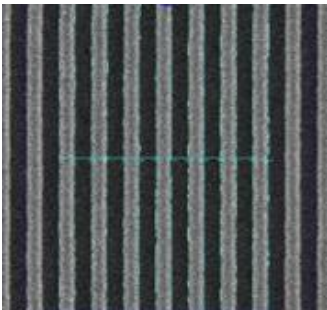
Anchor and Secondary Targets Summary

Oct 2023

Anchor Target

L50P100 (XLS*)

L50P100 (NHL*)



Horizontal

Vertical

Full Wafer Avg CD:	50.63	nm
Full wafer 1sigma CD:	1.40	nm
Die-to-Die 1 sigma		
Avg:	0.18	nm
RMS:	0.19	nm
LWR Line (Avg):	3.00	nm
FOV:	1000	nm

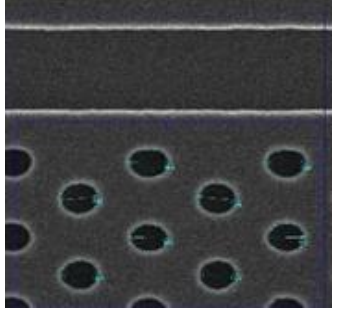
Full Wafer Avg CD:	50.9	nm
Full wafer 1sigma CD:	1.61	nm
Die-to-Die 1 sigma		
Avg:	0.24	nm
RMS:	0.26	nm
LWR:	3.03	nm
FOV:	1000	nm

Secondary Targets

L55P110 (IHL*)

L60P120 (NVL*)

C120P246MEM (ECH*)

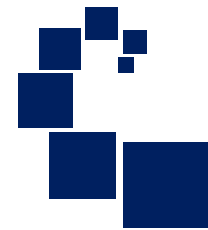


Full Wafer Avg CD:	57.5	nm
Full wafer 1sigma CD:	1.75	nm
Die-to-Die 1 sigma		
Avg:	0.28	nm
RMS:	0.31	nm
LWR:	2.95	nm
FOV:	1000	nm

Full Wafer Avg CD:	61.8	nm
Full wafer 1sigma CD:	1.82	nm
Die-to-Die 1 sigma		
Avg:	0.23	nm
RMS:	0.25	nm
LWR:	3.12	nm
FOV:	1000	nm

Full Wafer Avg CD:	99.00	nm
Full wafer 1sigma CD:	2.57	nm
Die-to-Die 1 sigma		
Avg:	1.85	nm
RMS:	1.96	nm
Ellipticity	1.24	nm
FOV:	1000	nm

* Coding labels for CD data results files



46KDP0221SJF5 (2338EMEM001 slot 5) Reference Data

L50P100 Anchor Target

Oct 2022

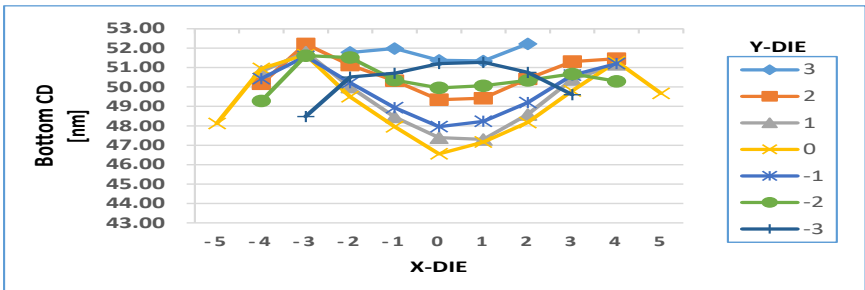
- All measurements in nm.
- Avg CD and 1sigma line-to-line variation for L50P100 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 8 lines sampled at each site, from images on next page.
- CD values convey bottom CD of the lines.

Full Wafer Avg CD:	50.10	nm
Full wafer 1sigma CD:	1.40	nm
Die-to-Die 1sigma		
Avg:	0.20	nm
RMS:	0.21	nm
LWR Line (Avg):	3.05	nm
FOV:	1000	nm

Average of all individual die CD averages (8 targets/die).
 Stdev of all die CD average of (8 targets/die), represents across wafer variation.
 Feature-to-feature variation within grating.
 Arithmetic average value of feature-to-feature variation.
 RMS average value of feature-to-feature variation.
 Average of 3Sigma LWR (Linewidth)
 Size of image (field-of-view).

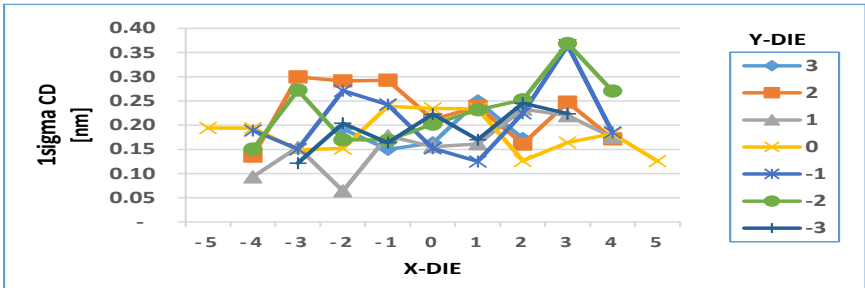
L50P100 Anchor Target Avg CD (line)

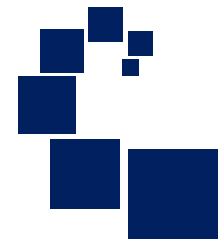
	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				51.78	51.98	51.37	51.34	52.22			
2		50.16	52.21	51.13	50.32	49.35	49.42	50.42	51.31	51.46	
1		50.80	51.79	50.00	48.45	47.39	47.30	48.58	50.38	51.16	
0	48.12	50.95	51.66	49.50	47.95	46.56	47.17	48.17	49.80	51.30	49.67
-1		50.43	51.58	50.22	48.93	47.95	48.23	49.20	50.61	51.20	
-2		49.28	51.61	51.52	50.35	49.95	50.06	50.34	50.67	50.29	
-3			48.48	50.51	50.71	51.21	51.27	50.75	49.60		



L50P100 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.19	0.15	0.16	0.25	0.17			
2		0.14	0.30	0.29	0.29	0.21	0.24	0.16	0.25	0.17	
1		0.09	0.15	0.06	0.18	0.16	0.16	0.23	0.22	0.18	
0	0.19	0.19	0.15	0.15	0.24	0.23	0.23	0.13	0.16	0.18	0.13
-1		0.19	0.15	0.27	0.24	0.15	0.12	0.22	0.37	0.18	
-2		0.15	0.27	0.17	0.17	0.20	0.23	0.25	0.37	0.27	
-3			0.12	0.20	0.16	0.22	0.17	0.25	0.22		





46KDP0221SJF5 (2338EMEM001 slot 5) Reference Data

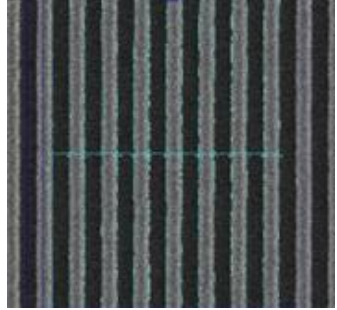
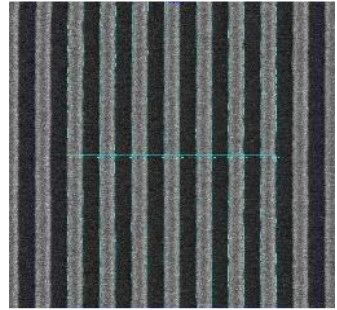
Anchor and Secondary Targets Summary

Oct 2023

Anchor Target

L50P100 (XLS*)

L50P100 (NHL*)



Horizontal

Vertical

Full Wafer Avg CD:	50.10	nm
Full wafer 1sigma CD:	1.40	nm
Die-to-Die 1 sigma		
Avg:	0.20	nm
RMS:	0.21	nm
LWR Line (Avg):	3.05	nm
FOV:	1000	nm

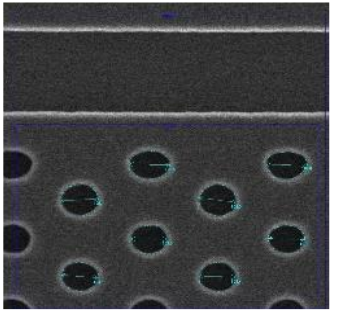
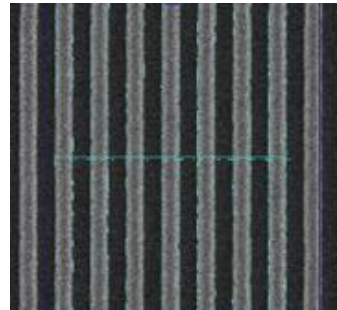
Full Wafer Avg CD:	50.7	nm
Full wafer 1sigma CD:	1.76	nm
Die-to-Die 1 sigma		
Avg:	0.19	nm
RMS:	0.21	nm
LWR:	3.03	nm
FOV:	1000	nm

Secondary Targets

L55P110 (IHL*)

L60P120 (NVL*)

C120P246MEM (ECH*)



Full Wafer Avg CD:	57.1	nm
Full wafer 1sigma CD:	1.76	nm
Die-to-Die 1 sigma		
Avg:	0.32	nm
RMS:	0.35	nm
LWR:	2.93	nm
FOV:	1000	nm

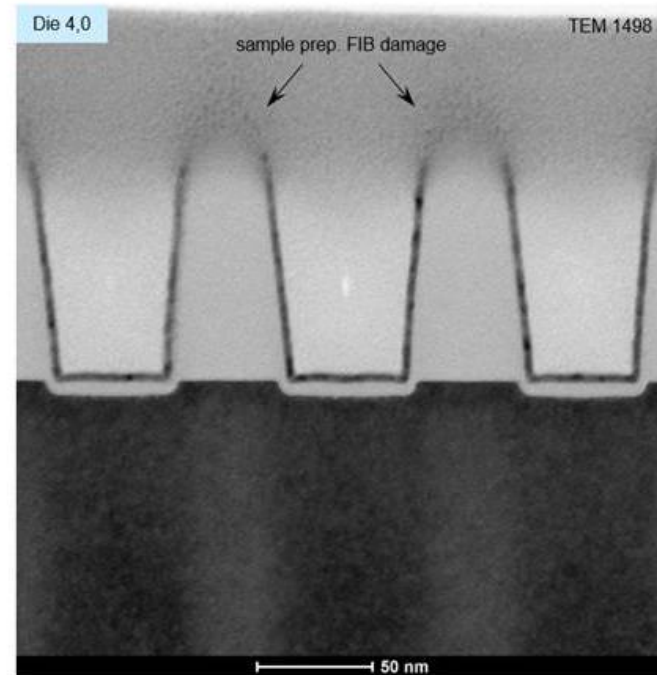
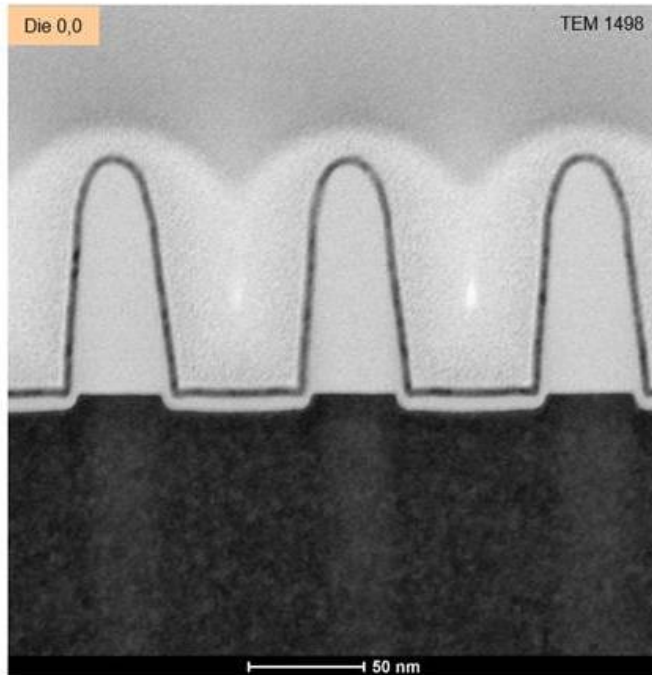
Full Wafer Avg CD:	61.3	nm
Full wafer 1sigma CD:	1.78	nm
Die-to-Die 1 sigma		
Avg:	0.21	nm
RMS:	0.23	nm
LWR:	3.15	nm
FOV:	1000	nm

Full Wafer Avg CD:	99.52	nm
Full wafer 1sigma CD:	2.49	nm
Die-to-Die 1 sigma		
Avg:	1.99	nm
RMS:	2.12	nm
Ellipticity	1.24	nm
FOV:	1000	nm

* Coding labels for CD data results files

AMAG7 Hardmask L-S w/30A ALD TiN

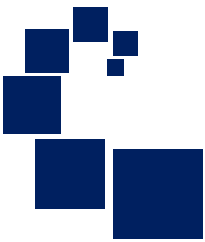
Oct 2023



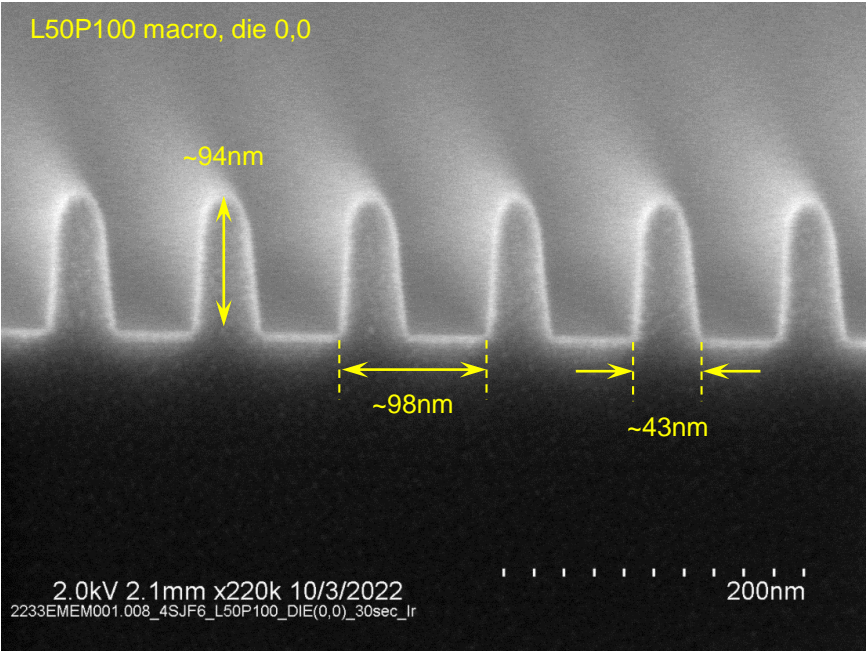
L50P100 Target XSEM Reference Data

Without ALD TiN

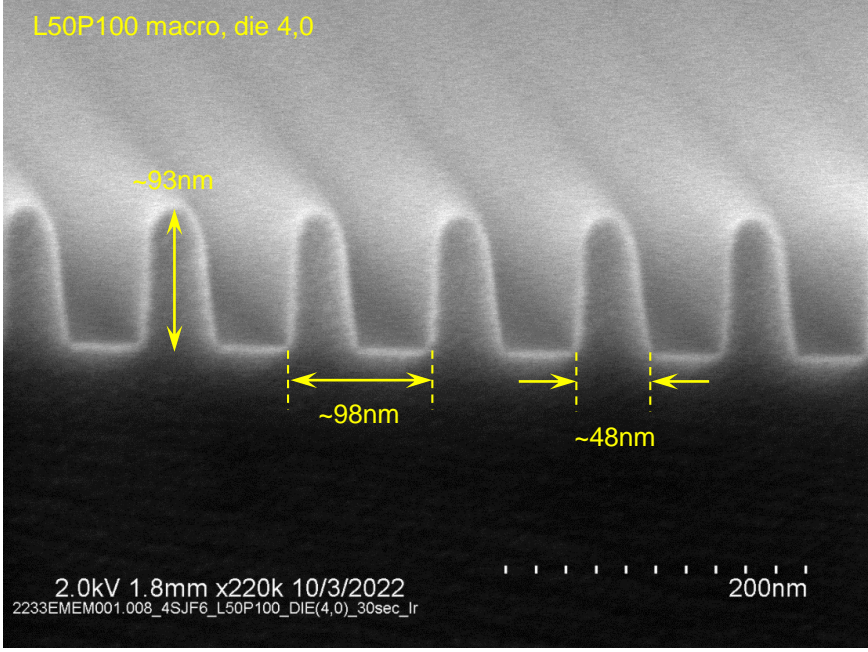
Oct 2023



Target XSEM images

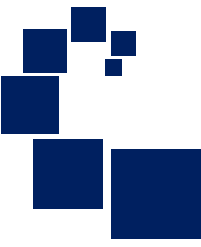


Center



Edge

Conclusions

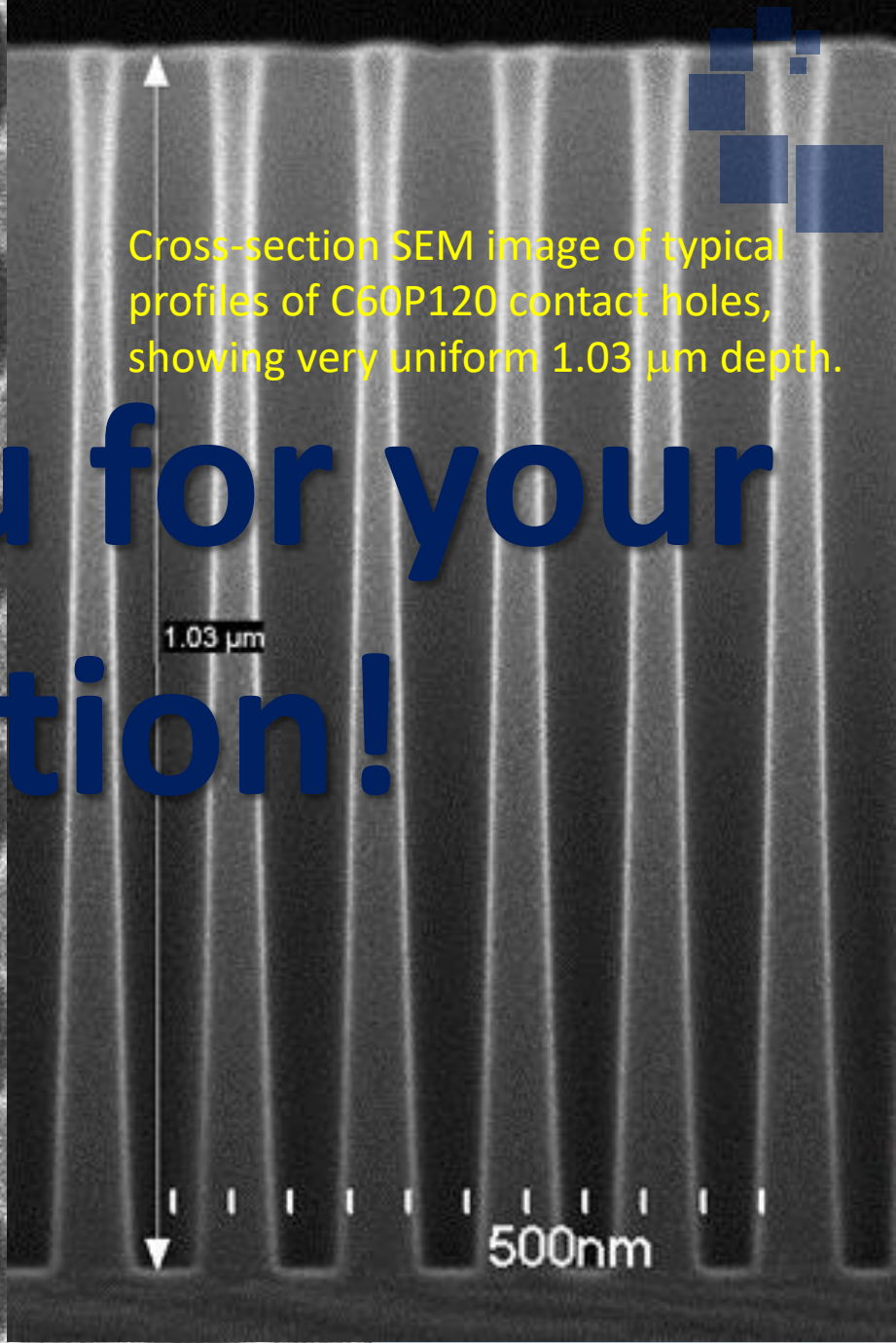


- Thank you for your purchase of AMAG wafers!
- We hope this guide of reference CD-SEM metrology adds significant value to the use of these wafers.
- This report represents the standard metrology AMAG nanometro provides for such wafers, and future lots and wafer types will have similar companion data sets.





Top down CD-SEM image of typical C60P120 grating. FOV = 660 nm.
Note image cropped on right.



Cross-section SEM image of typical profiles of C60P120 contact holes, showing very uniform 1.03 μm depth.

Thank you for your Attention!