

# HARhole (1um depth) navigation & results

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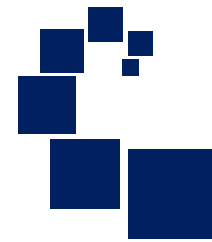
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# AMAG7A pane is pattern on HARhole wafers



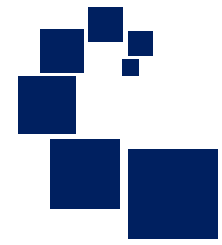
Pane  
AMAG7A:  
Darkfield  
content  
(hole,  
trench,  
variations)

- Full die repeat size is 26.000mm x 33.000mm (exactly).
- Pane A as shown is bladed to print the pattern leaving much empty space filling in ~60% area of die, important for etch loading control to achieve the etch.
- Only the pattern circled in orange to left is present, as that is the content with holes and trenches; the rest is for line/space which does not pattern at same conditions so is omitted for etch loading and defectivity reasons.

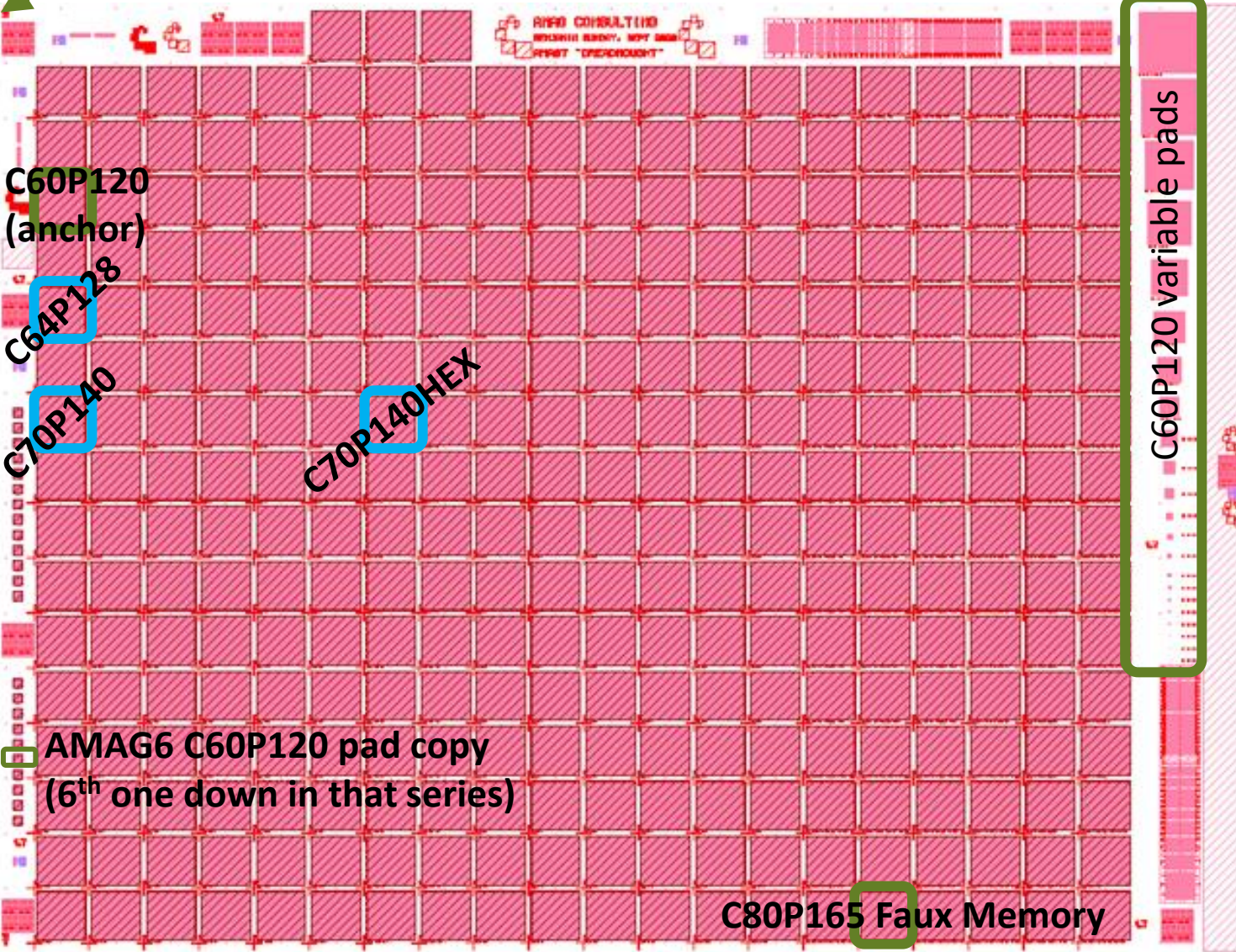




# AMAG7A pane is pattern on HARhole wafers, 1um depth



UL corner patrec mark



## Color Key:

**Green:** both 1.0um & 1.5um depth

**Cyan:** 1.0um depth

C60P120 variable pads

C60P120  
(anchor)

C64P128

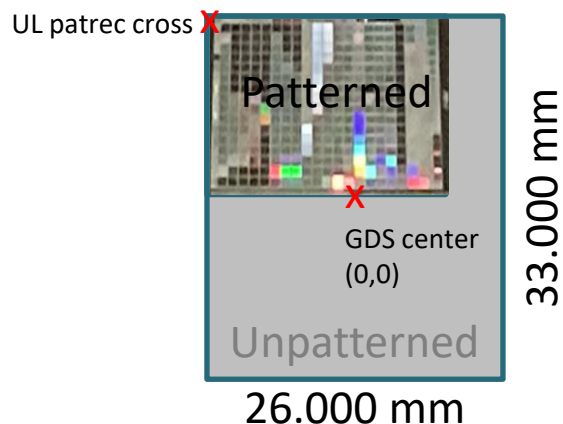
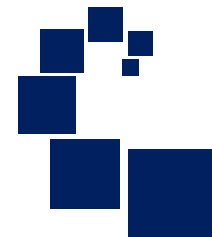
C70P140

C70P140HEX

AMAG6 C60P120 pad copy  
(6<sup>th</sup> one down in that series)

C80P165 Faux Memory

# AMAG7A pane is pattern on HARhole wafers

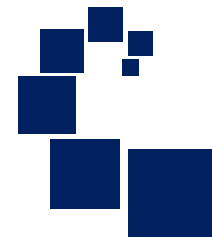


Photograph of HARhole pattern  
(rough pattern between die is just reflection off ceiling)

Pattern	Wafer Type	x [um]	y [um]	Tile coordinates (each tile has location in GDS)
UL pattern rec cross--top left corner of die	1.0 & 1.5um HAR	-12920.5	15930.7	left of A-00
AMAG7 C60P120 grating (anchor target, 800um pad)	1.0 & 1.5um HAR	-12040	12650	A-03
C64P128 grating (800um pad)	1.0um HAR	-12040	10900	A-05
C70P140 grating (800um pad)	1.0um HAR	-12040	9150	A-07
C70P140HEX grating (800um pad)	1.0um HAR	-6600	9150	G-07
C64P133 grating (800um pad)	1.5um HAR	-7500	10900	F-05
C70P145 grating (800um pad)	1.5um HAR	-7500	9150	F-07
C70P145HEX grating (800um pad)	1.5um HAR	-5690	9150	H-07
C80P165 Faux Memory grating (800um pad)	1.0 & 1.5um HAR	1473	1067	P-16
AMAG6 C60P120 grating (150um pad)	1.0 & 1.5um HAR	-12720	3633	left of A-13
GDS center (cartesian coordinates)	no feature	0	0	~center of bottom of patterned area



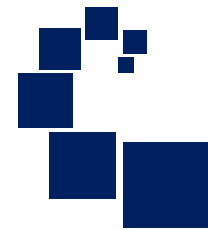
# HARhole 1.0um wafer-level CD results



- This report shows the wafer-level averages and variation for each wafer of the first lot of each HAR wafer depth.
- Specific maps for each wafer including the average & 1sigma and SEM images of all-die all-wafer of C60P120 anchor target and few sites of multiple secondary targets are collected as the standard data package with these wafers, making possible this full summary.
- CD values convey top CD of the holes.
  - For C80P165 Faux Memory, two values represent the hole nearest trench and holes further from trench.

		Final CDSEM measurements (nm)								
		recipe = DNVA1FAMAG7ACDU1			recipe = DNVA1FAMAG7ACDU2					
Slot	Wfr ID	Daughter Lot	C60 P120 (XCH) All Die	C60 P120 (1-sigma)	Daughter Lot	C64 P128 (ACH) 11 die	C70 P140 (BCH) 11 die	C70 P140 HEX (NCH) 11 die	C80 P165 MEM (CCH) CD1, 11 die	C80 P165 MEM (CCH) CD2, 11 die
1	46JTP061SJG4	.008	70.28	1.08	.008	84.6	100.4	83.2	104.3	102.3
2	46JTP060SJC2	.000	69.07	0.89	.000	84.6	99.9	82.1	102.5	104.2
3	46JTP059SJG4	.000	70.11	0.96	.000	85.7	100.1	82.9	103.9	102.3
4	46JTP058SJC2	.009	68.82	1.02	.009	85.5	99.3	81.5	100.8	102.0
5	46JTP057SJF3	.001	70.27	0.87	.001	84.5	100.2	82.8	102.4	105.0
6	46JTP056SJB1	.017	67.92	0.97	.001	85.1	98.7	81.2	101.2	103.6
7	46JTP055SJE2	.002	70.33	0.81	.002	85.5	100.2	82.8	102.0	102.0
8	46JTP054SJA0	.002	70.33	0.81	.002	84.6	100.7	82.9	100.8	103.4
9	46JTP053SJD1	.010	71.34	1.00	.010	84.5	100.9	83.8	101.1	103.8
10	46JTP052SJG2	.011	68.58	0.93	.011	85.7	99.1	81.7	101.4	102.7
11	46JTP051SJC0	.003	70.68	0.83	.003	85.5	100.1	83.4	101.1	102.4
12	46JTP100SJD7	.018	67.99	1.06	.003	85.3	98.8	81.2	103.8	102.5
13	46JTP099SJC3	.004	70.34	0.96	.004	85.9	100.2	83.0	100.9	104.3
14	46JTP098SJF4	.019	67.91	0.96	.004	84.9	98.6	81.0	99.2	102.2
15	46JTP097SJB2	.012	70.39	0.80	.012	84.2	100.9	83.3	100.9	104.9
16	46JTP096SJE3	.020	67.91	0.95	.005	84.7	98.5	80.9	101.4	102.5
17	46JTP095SJA1	.005	70.35	0.66	.005	84.3	100.2	83.1	102.8	103.3
18	46JTP094SJD2	.013	67.64	0.90	.013	84.5	98.4	81.3	100.2	101.0
19	46JTP093SJG3	.006	70.24	0.77	.006	84.3	100.1	83.0	101.8	103.8
20	46JTP092SJC1	.021	67.87	0.91	.006	84.8	98.4	81.0	102.7	101.9
21	46JTP091SJF2	.014	70.36	0.86	.014	86.0	100.2	83.2	103.3	102.5
22	46JTP090SJB0	.022	67.95	0.90	.007	84.7	98.7	81.4	102.2	102.0
23	46JTP089SJF2	.007	70.26	0.82	.007	84.5	100.1	83.4	102.1	103.4
24	46JTP088SJB0	.016	67.76	1.02	.015	84.8	98.7	81.0	101.7	103.4
25	46JTP087SJE1	.015	70.24	0.88	.015	85.5	100.2	83.1	101.0	104.7





# 46JTP061SJG4 (2225DNDN001 slot 1) Reference Data

## C60P120 Anchor Target

June 2022

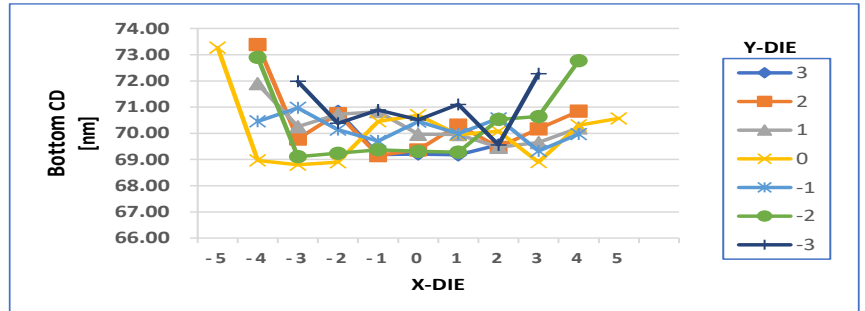
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.28	nm
Full wafer 1sigma CD:	1.08	nm
Die-to-Die 1sigma		
Avg:	1.74	nm
RMS:	1.82	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

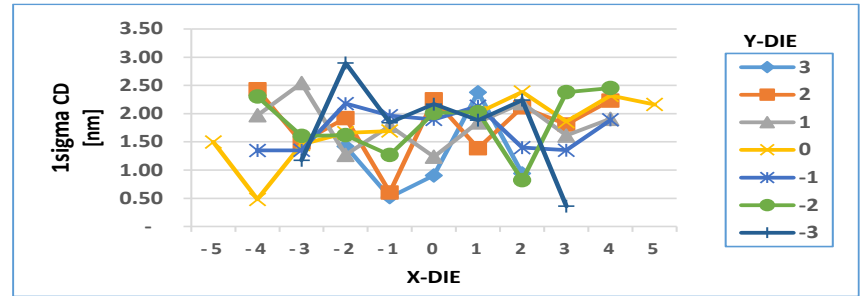
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				70.84	69.19	69.21	69.18	69.56			
2		73.39	69.79	70.75	69.15	69.37	70.32	69.47	70.18	70.85	
1		71.90	70.25	70.73	70.83	69.96	69.96	69.47	69.65	70.21	
0	73.28	68.97	68.80	68.90	70.46	70.69	69.95	70.08	68.90	70.31	70.57
-1		70.46	70.97	70.14	69.71	70.45	69.98	70.57	69.33	69.97	
-2		72.90	69.11	69.24	69.37	69.31	69.28	70.53	70.64	72.78	
-3			71.99	70.39	70.89	70.52	71.10	69.56	72.28		

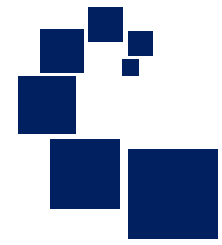


### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.42	0.52	0.90	2.38	0.94			
2		2.43	1.49	1.92	0.60	2.26	1.39	2.11	1.81	2.23	
1		1.97	2.54	1.27	1.78	1.24	1.84	2.19	1.61	1.91	
0	1.50	0.48	1.45	1.66	1.69	-	2.02	2.38	1.86	2.32	2.16
-1		1.35	1.35	2.18	1.96	1.90	2.13	1.40	1.35	1.89	
-2		2.30	1.61	1.62	1.27	2.01	2.03	0.82	2.38	2.45	
-3			1.17	2.90	1.84	2.17	1.88	2.24	0.36		







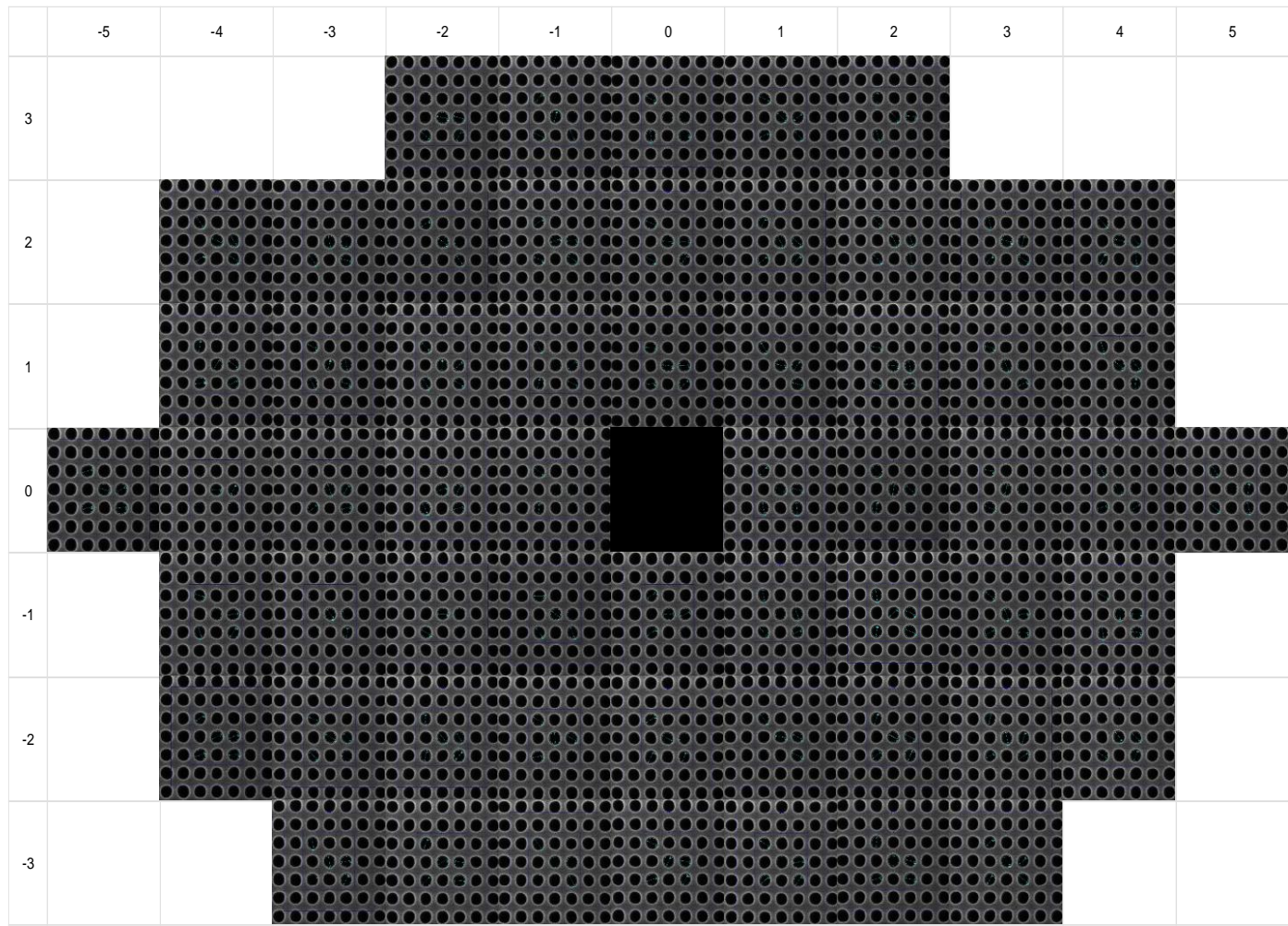
# 46JTP061SJG4 (2225DNDN001 slot 1) Reference Data

C60P120 Anchor Target

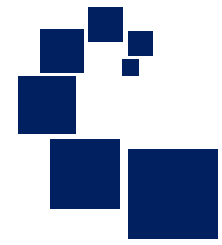
June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	70.28	nm
Full wafer 1sigma CD:	1.08	nm
Die-to-Die 1sigma		
Avg:	1.74	nm
RMS:	1.82	nm
Ellipticity Avg:	1.06	
FOV:	800	nm







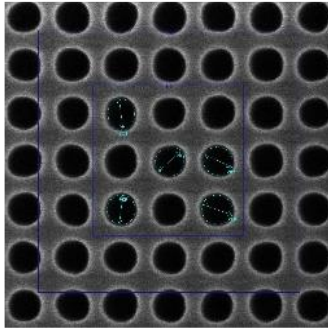
# 46JTP061SJG4 (2225DNDN001 slot 1) Reference Data

## Secondary Targets

June 2022

### Anchor Target

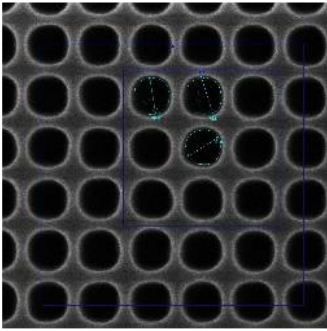
C60P120 (XCH\*)



Full Wafer Avg CD:	70.28	nm
Full wafer 1sigma CD:	1.08	nm
Die-to-Die 1 sigma		
Avg:	1.74	nm
RMS:	1.82	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

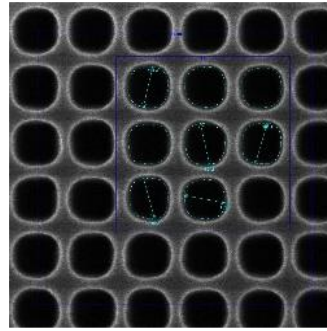
### Secondary Targets

C64P128 (ACH\*)



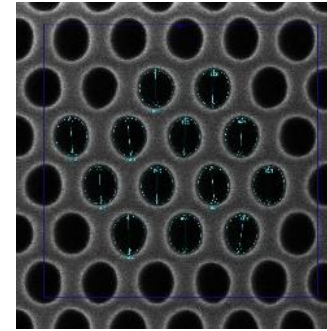
Full Wafer Avg CD:	84.6	nm
Full wafer 1sigma CD:	1.45	nm
Die-to-Die 1 sigma		
Avg:	3.97	nm
RMS:	4.40	nm
Ellipticity Avg:	1.15	
FOV:	800	nm

C70P140 (BCH\*)



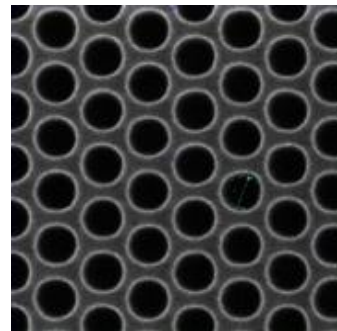
Full Wafer Avg CD:	100.4	nm
Full wafer 1sigma CD:	0.63	nm
Die-to-Die 1 sigma		
Avg:	0.65	nm
RMS:	0.67	nm
Ellipticity Avg:	1.04	
FOV:	800	nm

C70P140HEX (NCH\*)



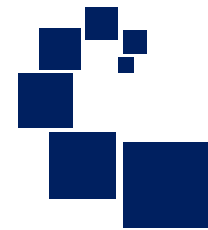
Full Wafer Avg CD:	83.15	nm
Full wafer 1sigma CD:	0.51	nm
Die-to-Die 1 sigma		
Avg:	1.24	nm
RMS:	1.28	nm
Ellipticity Avg:	1.20	
FOV:	800	nm

C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.3	nm
Full wafer 1sigma CD:	2.51	nm
Die-to-Die 1 sigma		
Avg:	3.61	nm
RMS:	4.63	nm
Ellipticity Avg:	1.15	
FOV:	1000	nm

\* Coding labels for CD data results files



# 46JTP060SJC2 (2225DNDN001 slot 2) Reference Data

## C60P120 Anchor Target

June 2022

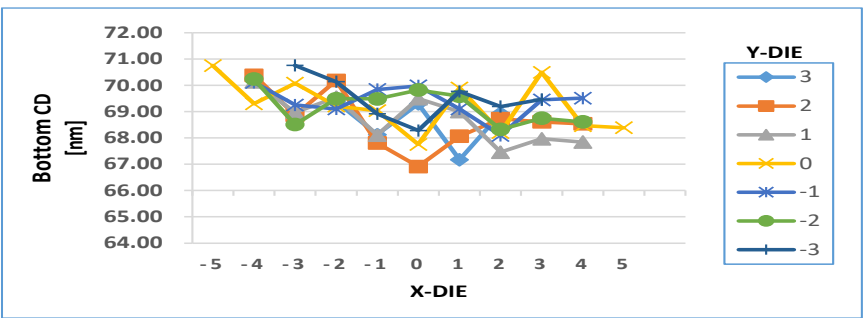
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	69.07	nm
Full wafer 1sigma CD:	0.89	nm
Die-to-Die 1sigma		
Avg:	1.58	nm
RMS:	1.67	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

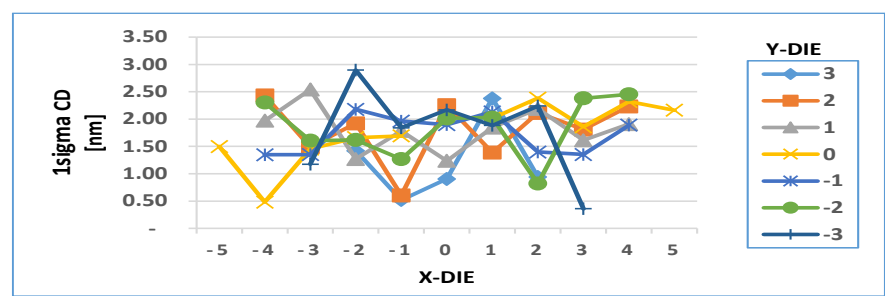
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				69.38	68.12	69.30	67.17	68.94			
2		70.38	68.87	70.19	67.81	66.91	68.07	68.73	68.61	68.54	
1		70.13	68.97	69.55	68.11	69.50	69.00	67.46	67.97	67.84	
0	70.75	69.30	70.08	69.21	69.04	67.76	69.90	68.21	70.50	68.47	68.39
-1		70.12	69.25	69.10	69.84	69.98	69.10	68.10	69.45	69.51	
-2		70.24	68.51	69.50	69.48	69.82	69.59	68.32	68.75	68.61	
-3			70.76	70.14	68.92	68.28	69.77	69.19	69.47		

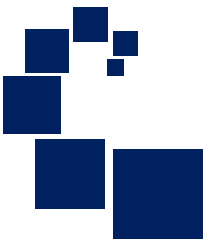


### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.30	1.64	1.35	1.91	1.59			
2		0.68	1.21	1.72	1.12	1.46	2.00	1.97	1.42	2.40	
1		1.42	0.36	1.71	1.30	1.12	1.84	1.67	1.48	1.64	
0	2.30	1.61	2.14	0.72	2.54	1.79	2.05	1.76	1.09	1.71	1.15
-1		0.56	1.67	1.42	1.62	1.26	2.66	1.92	1.28	1.69	
-2		2.65	3.10	1.48	1.12	1.98	2.16	1.06	1.53	1.49	
-3			1.78	0.96	1.94	1.74	0.94	1.40	0.92		







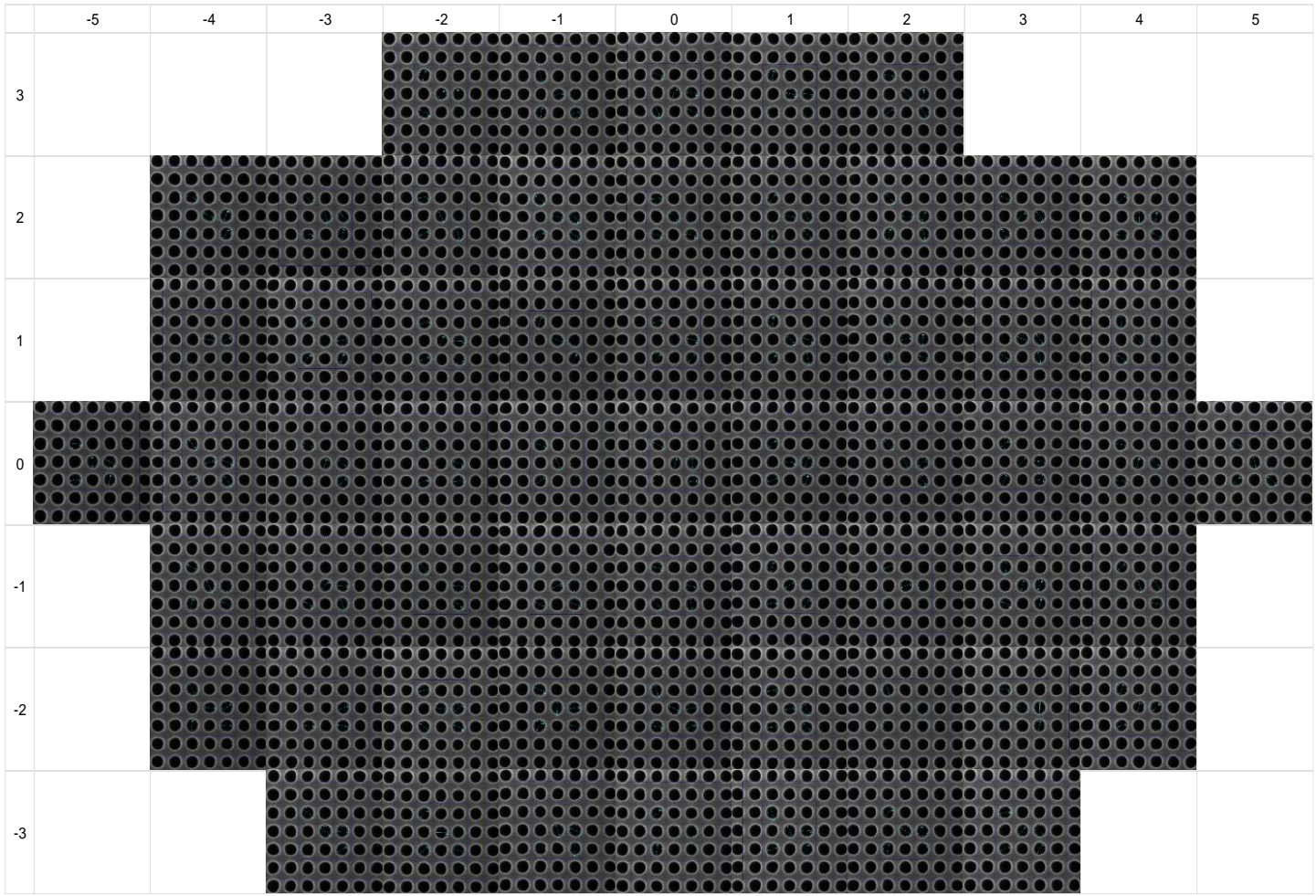
# 46JTP060SJC2 (2225DNDN001 slot 2) Reference Data

C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	69.07	nm
Full wafer 1sigma CD:	0.89	nm
Die-to-Die 1sigma		
Avg:	1.58	nm
RMS:	1.67	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





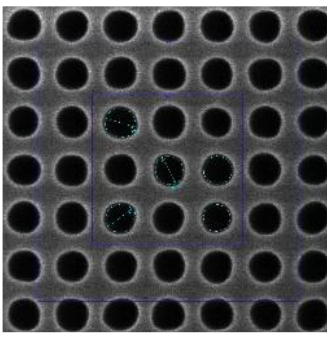
# 46JTP060SJC2 (2225DNDN001 slot 2) Reference Data

## Secondary Targets

June 2022

### Anchor Target

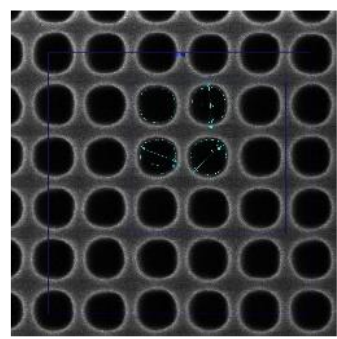
C60P120 (XCH\*)



Full Wafer Avg CD:	69.07	nm
Full wafer 1sigma CD:	0.89	nm
Die-to-Die 1sigma		
Avg:	1.58	nm
RMS:	1.67	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

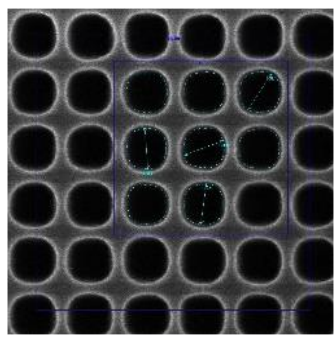
### Secondary Targets

C64P128 (ACH\*)



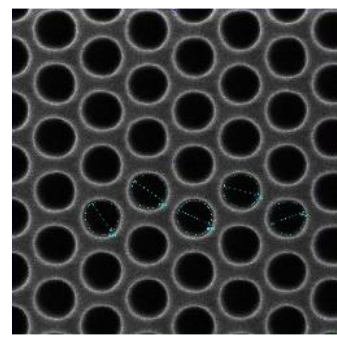
Full Wafer Avg CD:	84.6	nm
Full wafer 1sigma CD:	1.91	nm
Die-to-Die 1 sigma:		
Avg:	3.15	nm
RMS:	3.67	nm
Ellipticity Avg:	1.12	
FOV:	800	nm

C70P140 (BCH\*)



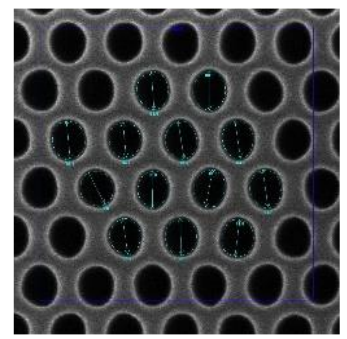
Full Wafer Avg CD:	99.9	nm
Full wafer 1sigma CD:	0.75	nm
Die-to-Die 1 sigma:		
Avg:	0.67	nm
RMS:	0.68	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	82.14	nm
Full wafer 1sigma CD:	0.77	nm
Die-to-Die 1 sigma:		
Avg:	1.31	nm
RMS:	1.33	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

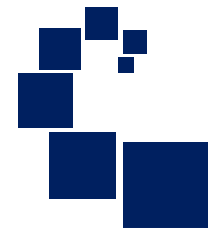
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	104.2	nm
Full wafer 1sigma CD:	1.30	nm
Die-to-Die 1 sigma:		
Avg:	0.83	nm
RMS:	1.38	nm
Ellipticity Avg:	1.06	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP059SJG4 (2225DNDN001 slot 3) Reference Data

## C60P120 Anchor Target

June 2022

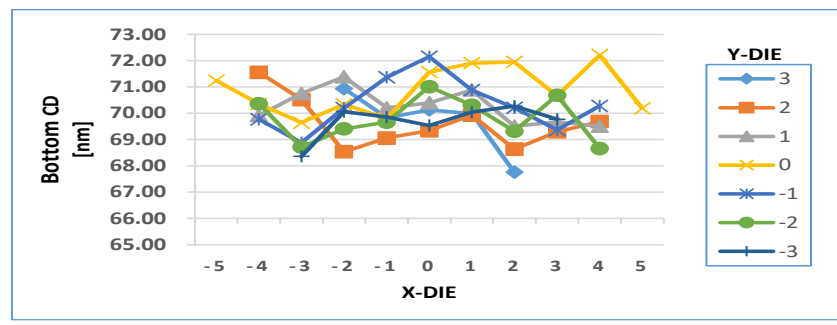
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.11	nm
Full wafer 1sigma CD:	0.96	nm
Die-to-Die 1sigma	Avg:	1.66 nm
	RMS:	1.78 nm
	Ellipticity Avg:	1.06
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

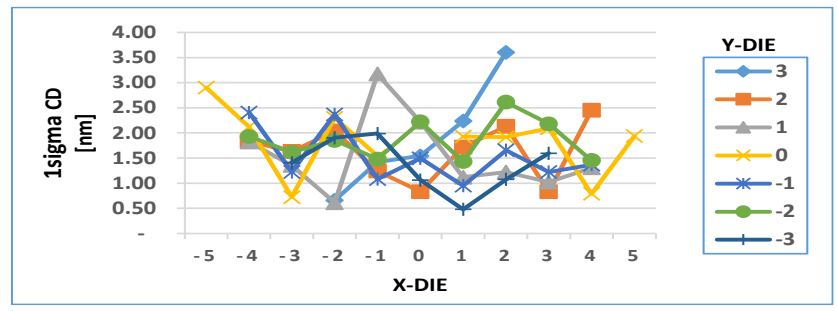
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				70.94	69.83	70.13	69.99	67.76			
2		71.56	70.52	68.54	69.06	69.34	69.93	68.64	69.30	69.69	
1		69.92	70.75	71.39	70.21	70.40	70.89	69.51	69.67	69.51	
0	71.25	70.36	69.65	70.34	69.80	71.57	71.91	71.95	70.67	72.21	70.19
-1		69.78	68.88	70.20	71.37	72.15	70.88	70.21	69.36	70.28	
-2		70.37	68.71	69.41	69.66	71.01	70.30	69.32	70.69	68.66	
-3			68.36	70.07	69.86	69.54	70.04	70.27	69.77		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.66	1.42	1.54	2.24	3.61			
2		1.83	1.63	2.04	1.24	0.83	1.72	2.13	0.83	2.45	
1		1.82	1.35	0.61	3.17	2.22	1.12	1.22	1.02	1.30	
0	2.90	2.12	0.72	2.30	1.54	0.98	1.93	1.92	2.09	0.79	1.94
-1		2.41	1.22	2.37	1.08	1.50	0.95	1.66	1.22	1.37	
-2		1.93	1.62	1.85	1.48	2.22	1.43	2.61	2.18	1.45	
-3			1.41	1.90	1.99	1.06	0.48	1.07	1.59		





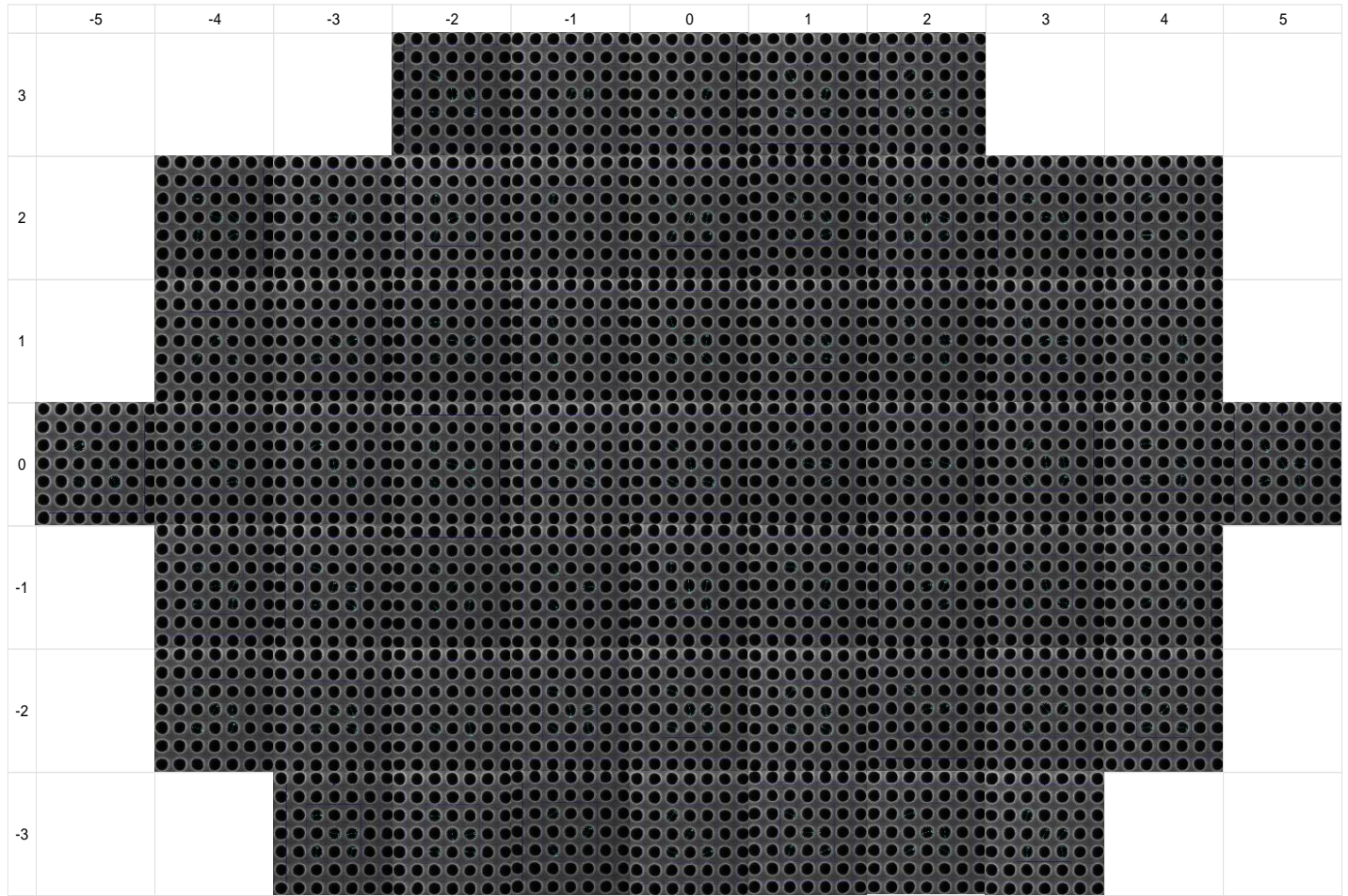
# 46JTP059SJG4 (2225DNDN001 slot 3) Reference Data

C60P120 Anchor Target

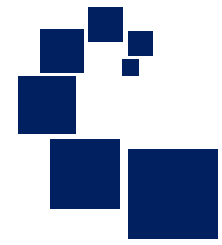
June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	70.11	nm
Full wafer 1sigma CD:	0.96	nm
Die-to-Die 1sigma		
Avg:	1.66	nm
RMS:	1.78	nm
Ellipticity Avg:	1.06	
FOV:	800	nm







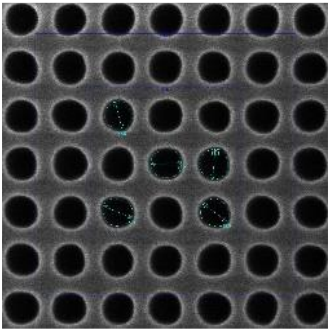
# 46JTP059SJG4 (2225DNDN001 slot 3) Reference Data

## Secondary Targets

June 2022

### Anchor Target

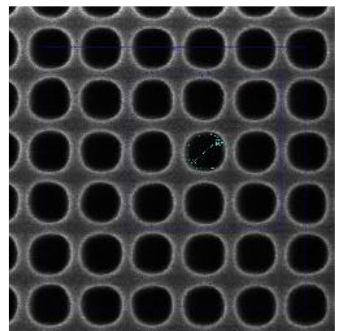
C60P120 (XCH\*)



Full Wafer Avg CD:	70.11	nm
Full wafer 1sigma CD:	0.96	nm
Die-to-Die 1sigma		
Avg:	1.66	nm
RMS:	1.78	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

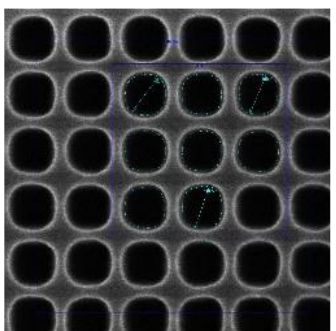
### Secondary Targets

C64P128 (ACH\*)



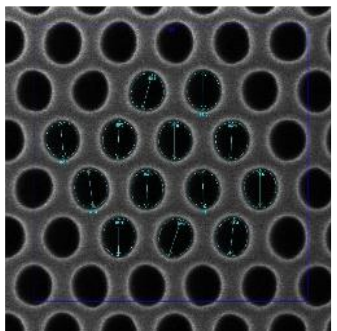
Full Wafer Avg CD:	85.7	nm
Full wafer 1sigma CD:	1.84	nm
Die-to-Die 1 sigma:		
Avg:	3.0	nm
RMS:	3.69	nm
Ellipticity Avg:	1.11	
FOV:	800	nm

C70P140 (BCH\*)



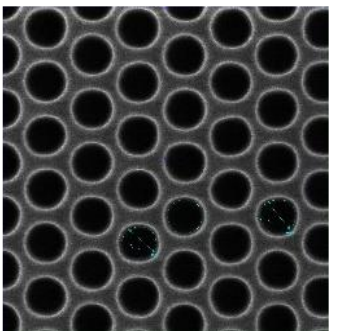
Full Wafer Avg CD:	100.1	nm
Full wafer 1sigma CD:	0.60	nm
Die-to-Die 1 sigma:		
Avg:	0.75	nm
RMS:	0.78	nm
Ellipticity Avg:	1.04	
FOV:	800	nm

C70P140HEX (NCH\*)



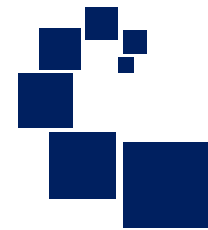
Full Wafer Avg CD:	82.91	nm
Full wafer 1sigma CD:	0.76	nm
Die-to-Die 1 sigma:		
Avg:	1.35	nm
RMS:	1.36	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.3	nm
Full wafer 1sigma CD:	2.14	nm
Die-to-Die 1 sigma:		
Avg:	2.58	nm
RMS:	4.12	nm
Ellipticity Avg:	1.13	
FOV:	1000	nm

\* Coding labels for CD data results files



# 46JTP058SJC2 (2225DNDN001 slot 4) Reference Data

## C60P120 Anchor Target

June 2022

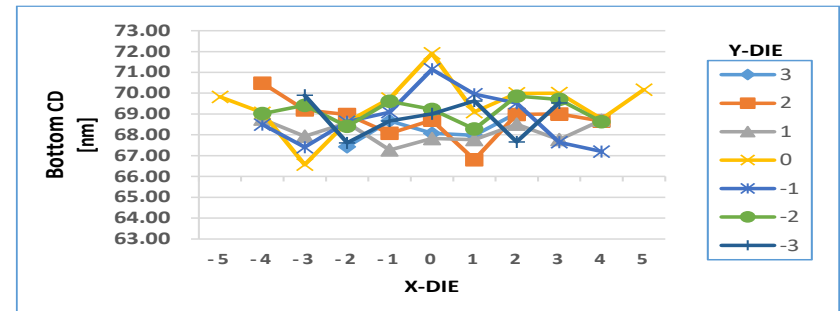
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	68.82	nm
Full wafer 1sigma CD:	1.02	nm
Die-to-Die 1sigma		
Avg:	1.74	nm
RMS:	1.84	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

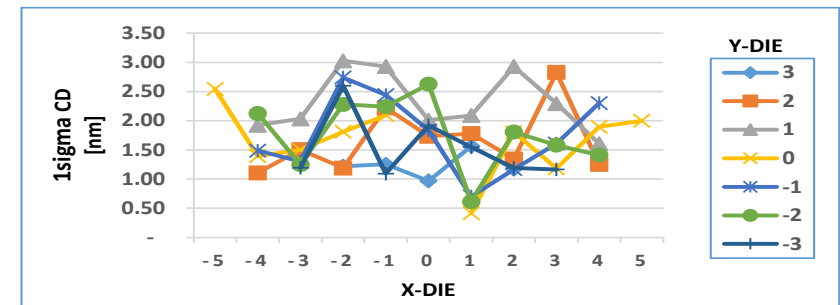
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				67.43	68.67	68.08	67.97	69.04			
2		70.48	69.20	68.97	68.07	68.71	66.80	68.98	69.00	68.66	
1		68.75	67.93	68.58	67.27	67.82	67.77	68.51	67.77	68.70	
0	69.82	69.06	66.57	68.62	69.74	71.91	69.09	69.99	70.00	68.76	70.17
-1		68.49	67.40	68.63	69.09	71.14	69.95	69.52	67.64	67.19	
-2		69.02	69.42	68.41	69.61	69.22	68.28	69.86	69.70	68.63	
-3			69.90	67.61	68.67	69.00	69.63	67.66	69.53		

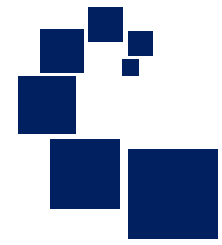


### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.22	1.25	0.97	1.56	1.17			
2		1.11	1.50	1.19	2.22	1.74	1.78	1.35	2.83	1.26	
1		1.92	2.03	3.03	2.93	2.01	2.09	2.93	2.29	1.61	
0	2.55	1.39	1.50	1.81	2.10	1.82	0.41	1.80	1.18	1.90	2.00
-1		1.49	1.30	2.74	2.44	1.84	0.70	1.17	1.61	2.30	
-2		2.13	1.25	2.28	2.24	2.63	0.61	1.81	1.58	1.41	
-3			1.19	2.60	1.09	1.92	1.55	1.19	1.16		







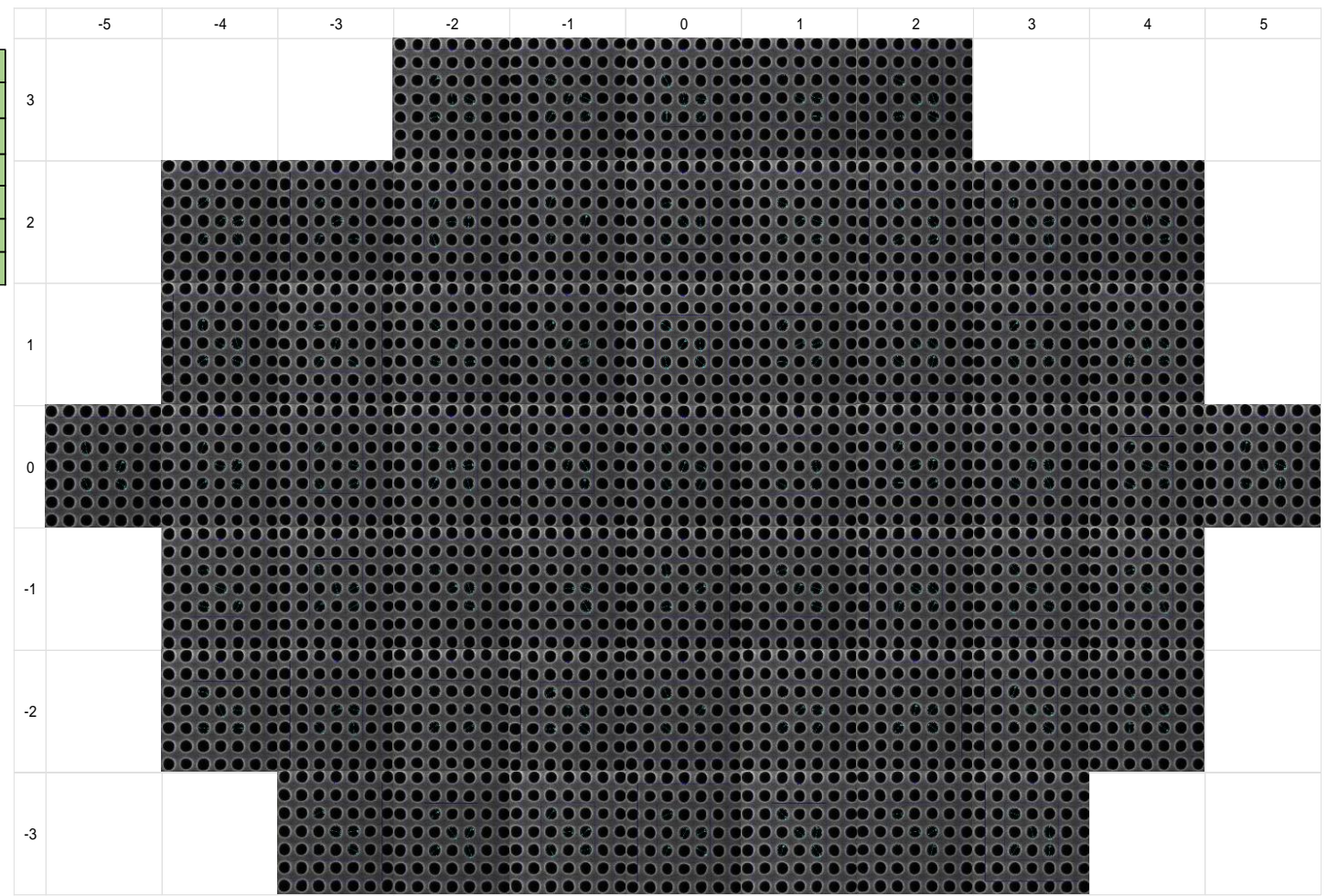
# 46JTP058SJC2 (2225DNDN001 slot 4) Reference Data

C60P120 Anchor Target

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C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	68.82	nm
Full wafer 1sigma CD:	1.02	nm
Die-to-Die 1sigma		
Avg:	1.74	nm
RMS:	1.84	nm
Ellipticity Avg:	1.07	
FOV:	800	nm





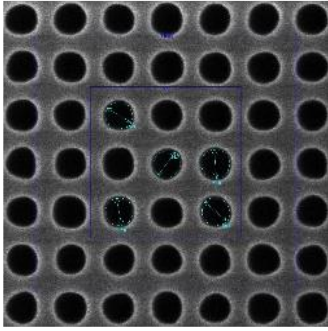
# 46JTP058SJC2 (2225DNDN001 slot 4) Reference Data

## Secondary Targets

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### Anchor Target

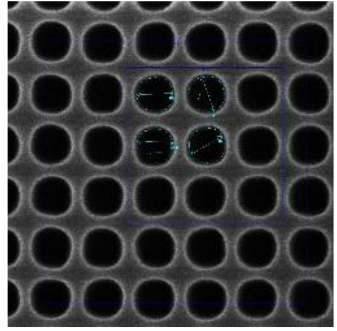
C60P120 (XCH\*)



Full Wafer Avg CD:	68.82	nm
Full wafer 1sigma CD:	1.02	nm
Die-to-Die 1sigma		
Avg:	1.74	nm
RMS:	1.84	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

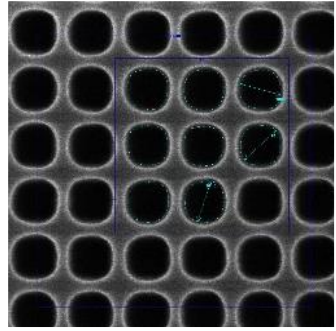
### Secondary Targets

C64P128 (ACH\*)



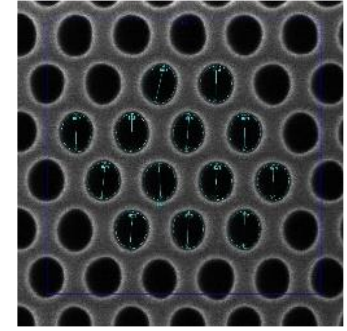
Full Wafer Avg CD:	85.5	nm
Full wafer 1sigma CD:	1.71	nm
Die-to-Die 1 sigma:		
Avg:	1.97	nm
RMS:	2.80	nm
Ellipticity Avg:	1.08	
FOV:	800	nm

C70P140 (BCH\*)



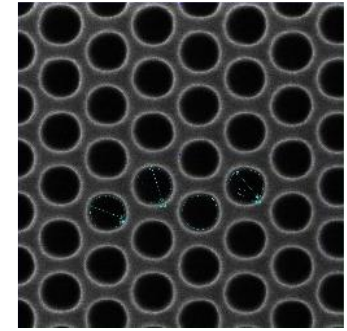
Full Wafer Avg CD:	99.3	nm
Full wafer 1sigma CD:	0.81	nm
Die-to-Die 1 sigma:		
Avg:	0.75	nm
RMS:	0.77	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	81.48	nm
Full wafer 1sigma CD:	0.53	nm
Die-to-Die 1 sigma		
Avg:	1.28	nm
RMS:	1.32	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

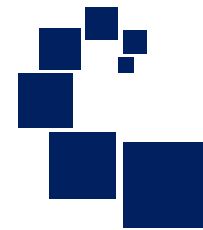
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.0	nm
Full wafer 1sigma CD:	2.57	nm
Die-to-Die 1 sigma		
Avg:	3.19	nm
RMS:	3.78	nm
Ellipticity Avg:	1.11	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP057SJF3 (2225DNDN001 slot 5) Reference Data

## C60P120 Anchor Target

June 2022

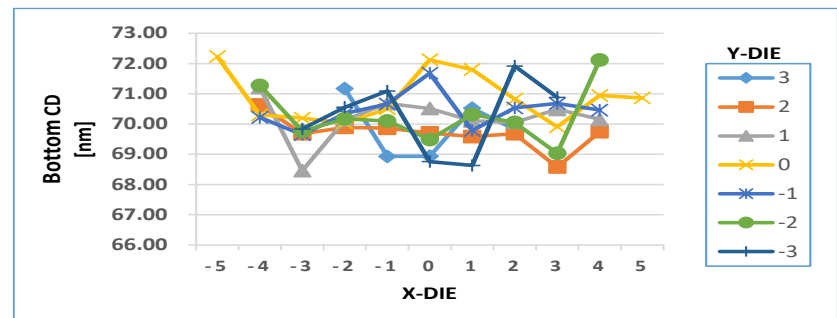
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.27	nm
Full wafer 1sigma CD:	0.87	nm
Die-to-Die 1sigma		
Avg:	1.71	nm
RMS:	1.82	nm
Ellipticity Avg:		
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

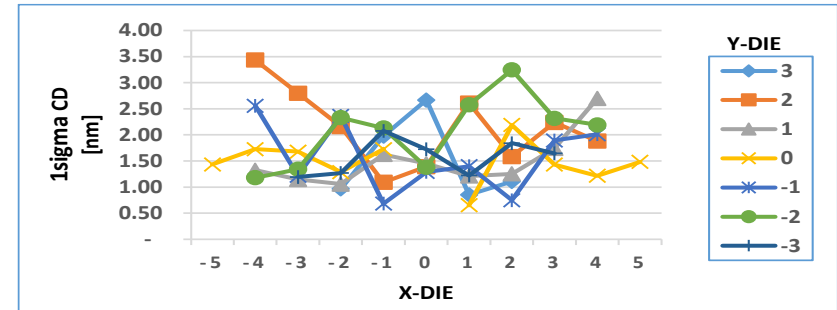
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				71.17	68.93	68.93	70.53	69.82			
2		70.63	69.68	69.89	69.86	69.70	69.58	69.68	68.58	69.75	
1		71.20	68.46	70.13	70.68	70.51	70.10	70.05	70.49	70.15	
0	72.23	70.30	70.19	70.04	70.51	72.12	71.80	70.82	69.91	70.94	70.86
-1		70.22	69.65	70.35	70.66	71.68	69.78	70.53	70.68	70.46	
-2		71.28	69.76	70.17	70.10	69.49	70.32	70.05	69.03	72.12	
-3			69.84	70.55	71.09	68.76	68.63	71.92	70.88		



### C60P120 Anchor Target 1sigma CD

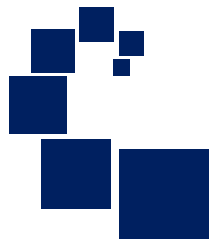
	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.96	1.98	2.67	0.85	1.11			
2		3.44	2.80	2.16	1.09	1.39	2.61	1.58	2.24	1.88	
1		1.32	1.14	1.06	1.62	1.45	1.21	1.25	1.74	2.70	
0	1.43	1.73	1.68	1.29	1.73	0.65	0.65	2.19	1.43	1.22	1.48
-1		2.56	1.22	2.37	0.68	1.29	1.40	0.75	1.89	2.01	
-2		1.18	1.34	2.33	2.13	1.38	2.58	3.25	2.32	2.19	
-3			1.19	1.27	2.08	1.72	1.22	1.84	1.65		



# 46JTP057SJF3 (2225DNDN001 slot 5) Reference Data

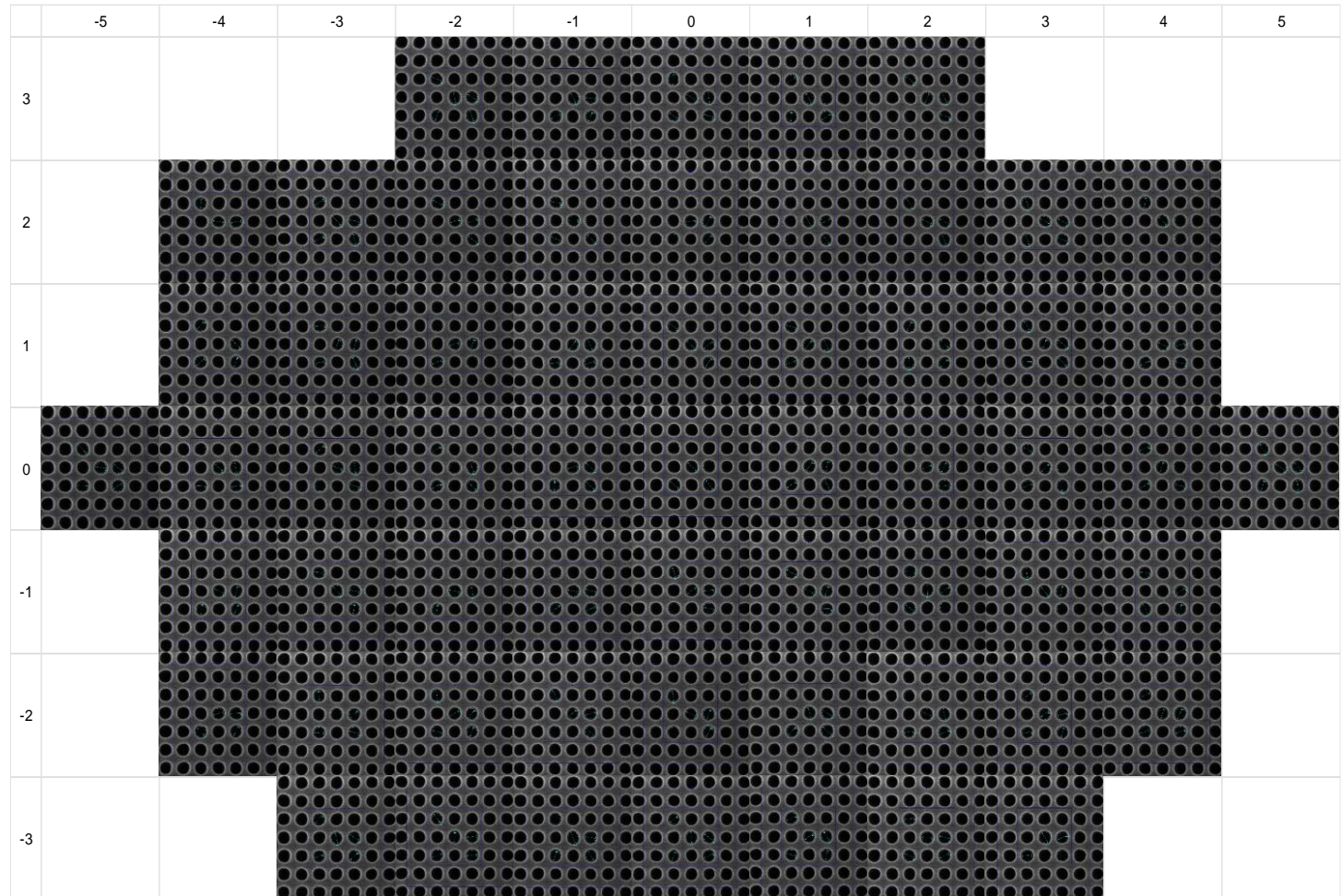
C60P120 Anchor Target

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## C60P120 Anchor Target CD-SEM image wafer map

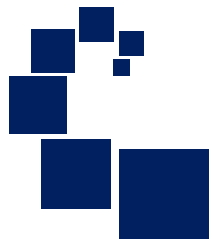
Full Wafer Avg CD:	70.27	nm
Full wafer 1sigma CD:	0.87	nm
Die-to-Die 1sigma		
Avg:	1.71	nm
RMS:	1.82	nm
Ellipticity Avg:		
FOV:	800	nm



# 46JTP057SJF3 (2225DNDN001 slot 5) Reference Data

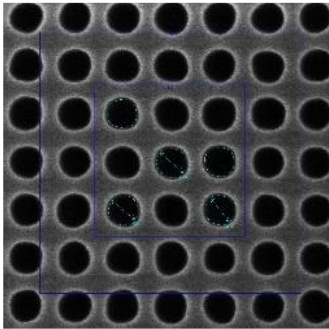
Secondary Targets

June 2022



## Anchor Target

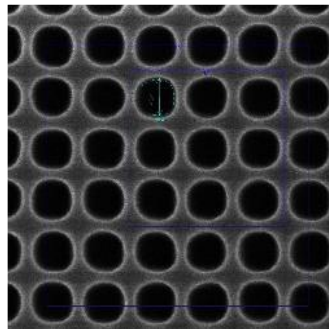
C60P120 (XCH\*)



Full Wafer Avg CD:	70.27	nm
Full wafer 1sigma CD:	0.87	nm
Die-to-Die 1 sigma		
Avg:	1.71	nm
RMS:	1.82	nm
Ellipticity Avg:		
FOV:	800	nm

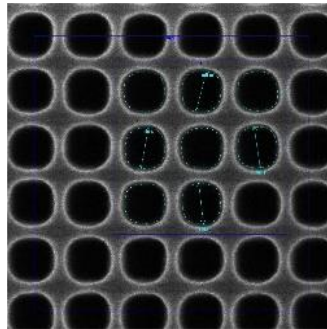
## Secondary Targets

C64P128 (ACH\*)



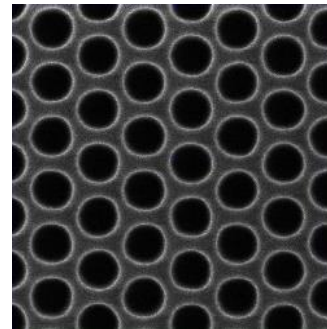
Full Wafer Avg CD:	84.5	nm
Full wafer 1sigma CD:	2.36	nm
Die-to-Die 1 sigma		
Avg:	3.22	nm
RMS:	3.78	nm
Ellipticity Avg:	1.15	
FOV:	800	nm

C70P140 (BCH\*)



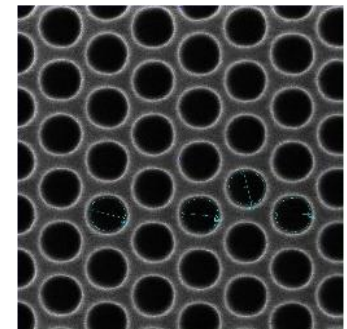
Full Wafer Avg CD:	100.2	nm
Full wafer 1sigma CD:	0.60	nm
Die-to-Die 1 sigma		
Avg:	0.62	nm
RMS:	0.64	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	82.96	nm
Full wafer 1sigma CD:	0.53	nm
Die-to-Die 1 sigma		
Avg:	1.39	nm
RMS:	1.40	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

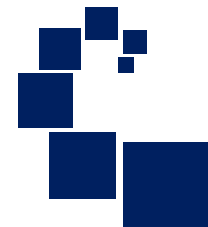
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	105.0	nm
Full wafer 1sigma CD:	2.12	nm
Die-to-Die 1 sigma		
Avg:	0.77	nm
RMS:	1.63	nm
Ellipticity Avg:	1.07	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP056SJB1 (2225DNDN001 slot 6) Reference Data

## C60P120 Anchor Target June 2022

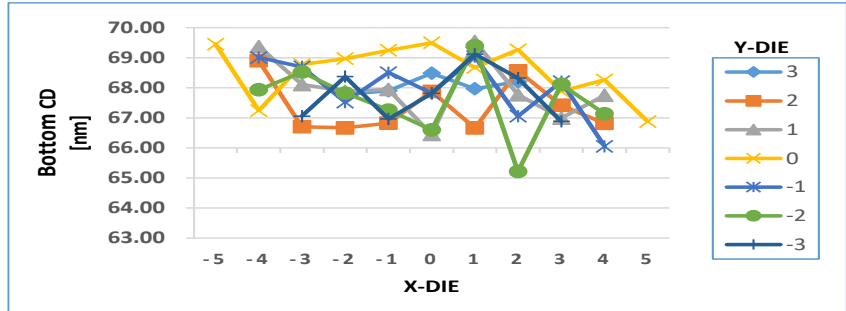
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	67.92	nm
Full wafer 1sigma CD:	0.97	nm
Die-to-Die 1sigma		
Avg:	1.71	nm
RMS:	1.79	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

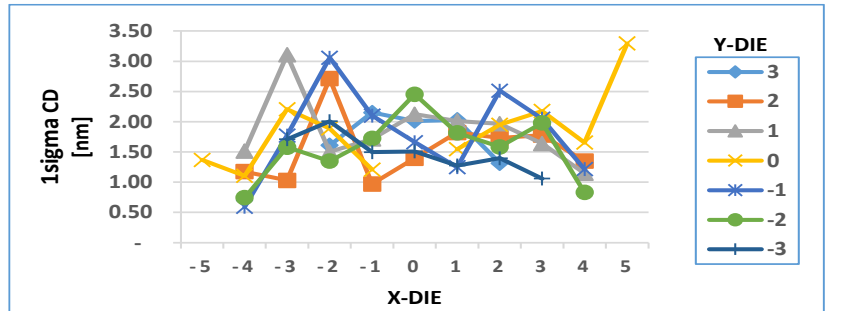
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				67.79	67.90	68.49	67.97	68.21			
2		68.90	66.70	66.67	66.83	67.88	66.66	68.56	67.41	66.82	
1		69.37	68.11	67.88	67.94	66.44	69.54	67.77	66.99	67.75	
0	69.45	67.24	68.77	68.97	69.24	69.49	68.67	69.27	67.88	68.26	66.88
-1		69.00	68.69	67.52	68.50	67.82	69.03	67.05	68.20	66.05	
-2		67.93	68.53	67.82	67.26	66.60	69.39	65.21	68.11	67.13	
-3			67.06	68.37	66.96	67.81	69.12	68.32	66.88		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.61	2.15	2.01	2.03	1.31			
2		1.17	1.03	2.71	0.97	1.40	1.82	1.73	1.78	1.35	
1		1.51	3.11	1.50	1.71	2.12	2.01	1.97	1.64	1.15	
0	1.37	1.10	2.21	1.89	1.21	2.15	1.55	1.95	2.18	1.66	3.29
-1		0.59	1.77	3.06	2.10	1.66	1.25	2.51	2.05	1.22	
-2		0.74	1.58	1.35	1.72	2.45	1.82	1.58	1.98	0.83	
-3			1.71	2.01	1.50	1.51	1.27	1.40	1.06		





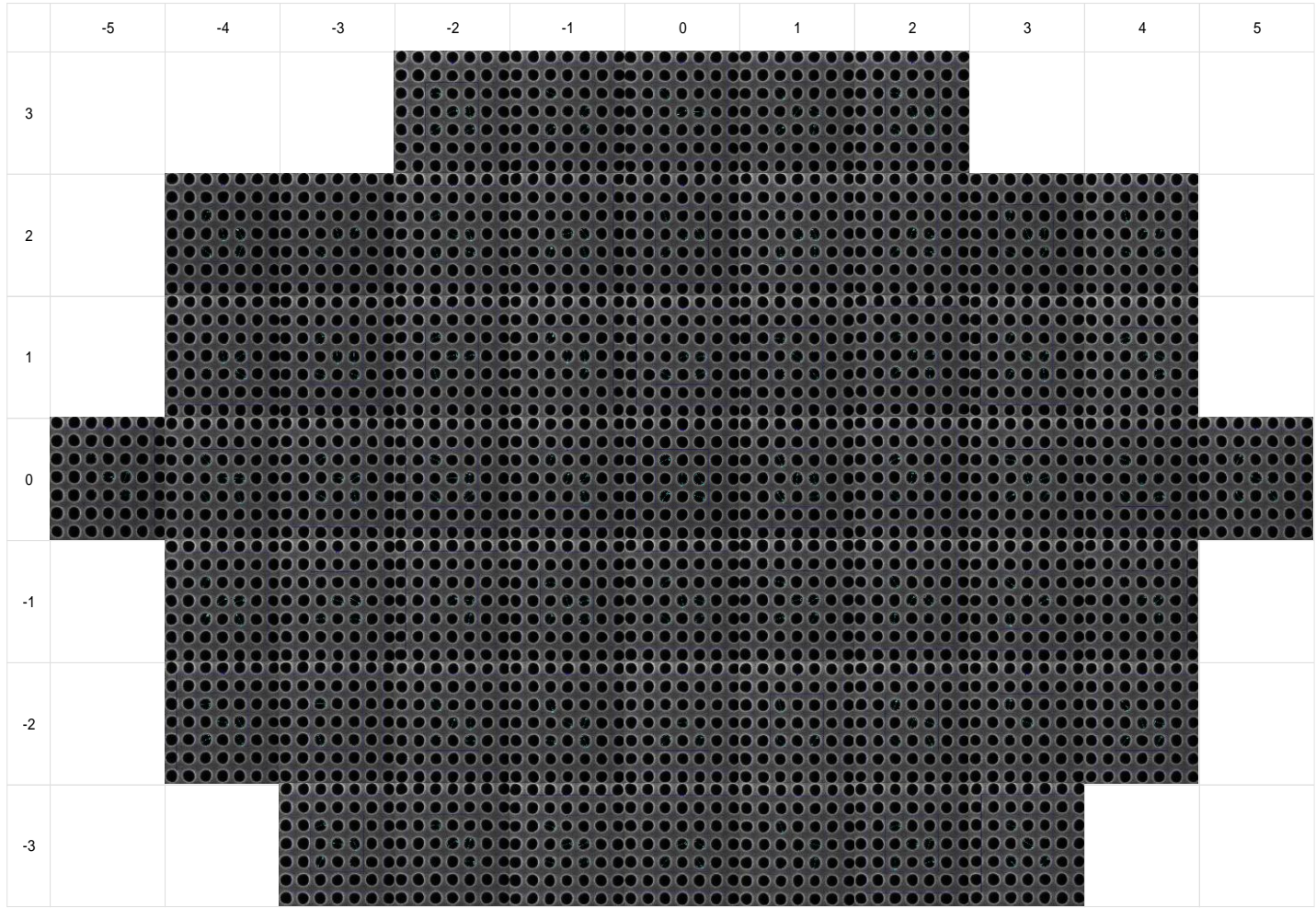
# 46JTP056SJB1 (2225DNDN001 slot 6) Reference Data

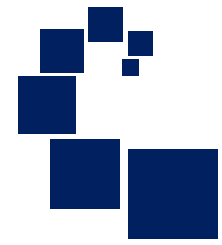
C60P120 Anchor Target

June 2022

## C60P120 Anchor Target CD-SEM image wafer map

Full Wafer Avg CD:	67.92	nm
Full wafer 1sigma CD:	0.97	nm
Die-to-Die 1sigma		
Avg:	1.71	nm
RMS:	1.79	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





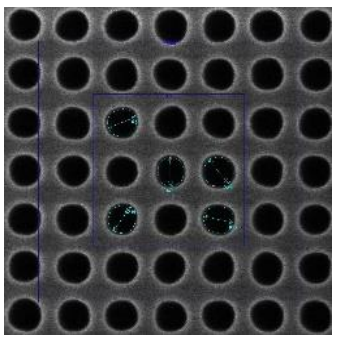
# 46JTP056SJB1 (2225DNDN001 slot 6) Reference Data

## Secondary Targets

June 2022

### Anchor Target

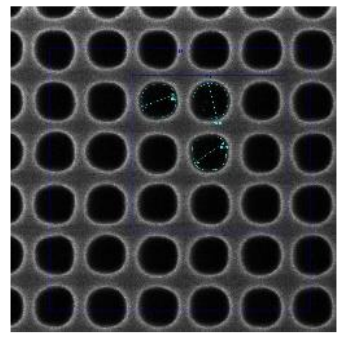
C60P120 (XCH\*)



Full Wafer Avg CD:	67.92	nm
Full wafer 1sigma CD:	0.97	nm
Die-to-Die 1sigma		
Avg:	1.71	nm
RMS:	1.79	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

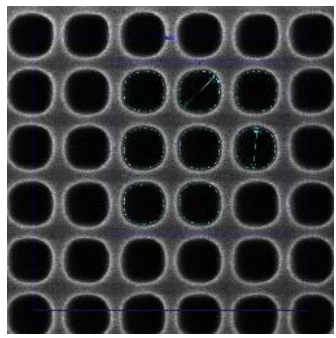
### Secondary Targets

C64P128 (ACH\*)



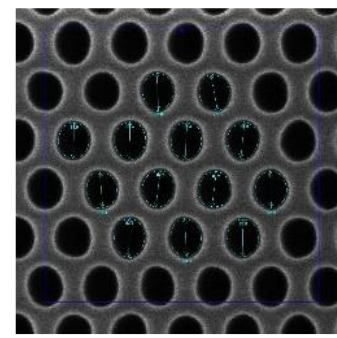
Full Wafer Avg CD:	85.1	nm
Full wafer 1sigma CD:	1.10	nm
Die-to-Die 1 sigma:		
Avg:	1.63	nm
RMS:	2.02	nm
Ellipticity Avg:	1.05	
FOV:	800	nm

C70P140 (BCH\*)



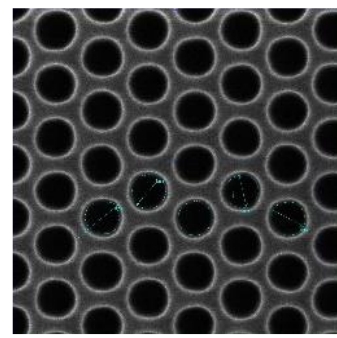
Full Wafer Avg CD:	98.7	nm
Full wafer 1sigma CD:	0.65	nm
Die-to-Die 1 sigma:		
Avg:	0.60	nm
RMS:	0.61	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	81.16	nm
Full wafer 1sigma CD:	0.76	nm
Die-to-Die 1 sigma:		
Avg:	1.41	nm
RMS:	1.43	nm
Ellipticity Avg:	1.02	
FOV:	800	nm

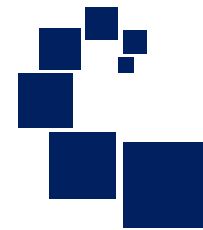
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	103.6	nm
Full wafer 1sigma CD:	0.78	nm
Die-to-Die 1 sigma:		
Avg:	0.89	nm
RMS:	1.55	nm
Ellipticity Avg:	1.09	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP055SJE2 (2225DNDN001 slot 7) Reference Data

## C60P120 Anchor Target

June 2022

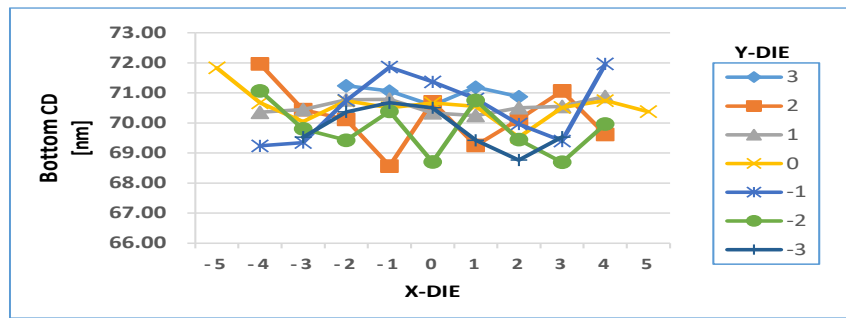
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.33	nm
Full wafer 1sigma CD:	0.81	nm
Die-to-Die 1sigma		
Avg:	1.67	nm
RMS:	1.79	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

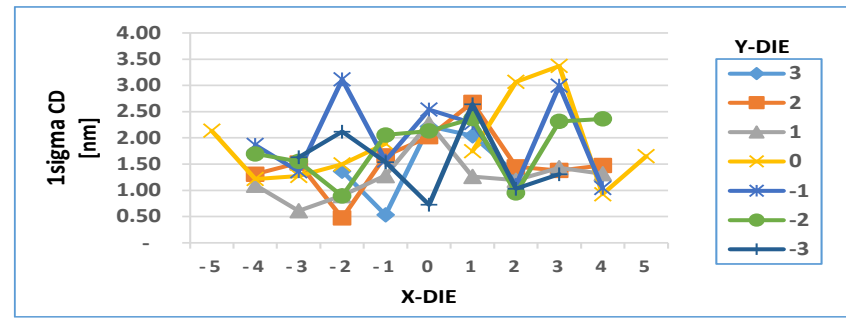
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				71.24	71.06	70.58	71.19	70.87			
2		71.96	70.44	70.12	68.56	70.70	69.25	70.12	71.06	69.62	
1		70.35	70.44	70.77	70.79	70.34	70.25	70.50	70.55	70.88	
0	71.83	70.67	70.04	70.74	70.50	70.66	70.55	69.53	70.51	70.75	70.38
-1		69.24	69.35	70.75	71.86	71.37	70.80	69.96	69.40	71.96	
-2		71.07	69.80	69.42	70.39	68.70	70.75	69.44	68.69	69.96	
-3			69.52	70.37	70.67	70.51	69.42	68.76	69.53		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.36	0.53	2.22	2.04	1.31			
2		1.31	1.52	0.47	1.66	2.02	2.68	1.45	1.38	1.47	
1		1.10	0.61	0.90	1.28	2.28	1.26	1.19	1.43	1.32	
0	2.14	1.22	1.27	1.50	1.89	1.87	1.75	3.07	3.37	0.93	1.65
-1		1.87	1.36	3.12	1.57	2.54	2.28	1.10	3.00	1.04	
-2		1.70	1.55	0.89	2.06	2.13	2.37	0.95	2.32	2.36	
-3			1.63	2.12	1.54	0.72	2.64	1.03	1.31		





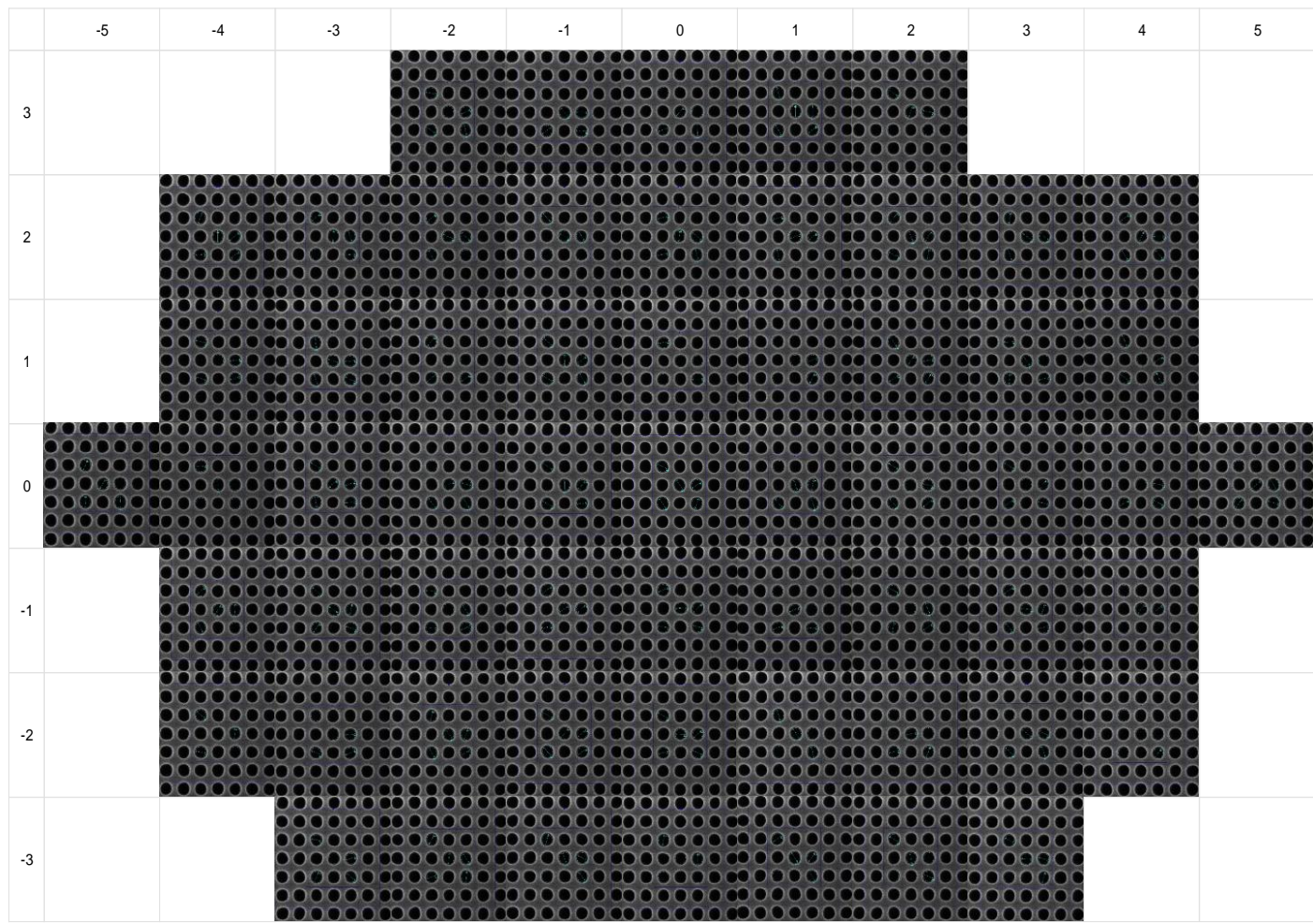
# 46JTP055SJE2 (2225DNDN001 slot 7) Reference Data

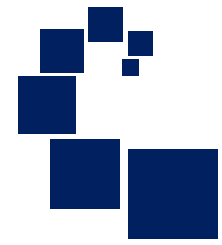
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	70.33	nm
Full wafer 1sigma CD:	0.81	nm
Die-to-Die 1sigma		
Avg:	1.67	nm
RMS:	1.79	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





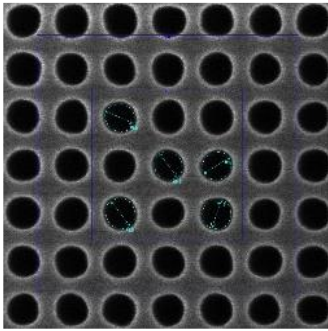
# 46JTP055SJE2 (2225DNDN001 slot 7) Reference Data

## Secondary Targets

June 2022

### Anchor Target

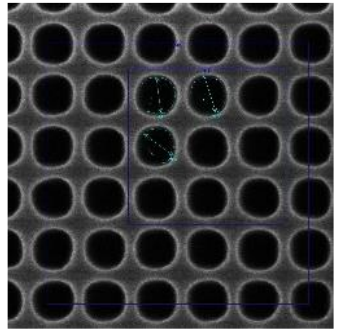
C60P120 (XCH\*)



Full Wafer Avg CD:	70.33	nm
Full wafer 1sigma CD:	0.81	nm
Die-to-Die 1 sigma		
Avg:	1.67	nm
RMS:	1.79	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

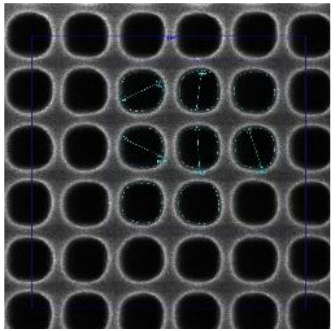
### Secondary Targets

C64P128 (ACH\*)



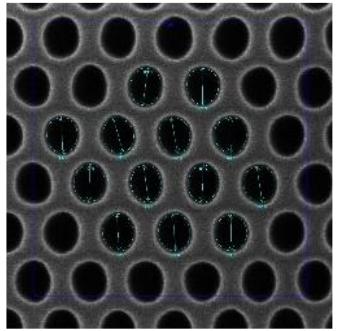
Full Wafer Avg CD:	85.5	nm
Full wafer 1sigma CD:	2.30	nm
Die-to-Die 1 sigma		
Avg:	2.58	nm
RMS:	3.22	nm
Ellipticity Avg:	1.10	
FOV:	800	nm

C70P140 (BCH\*)



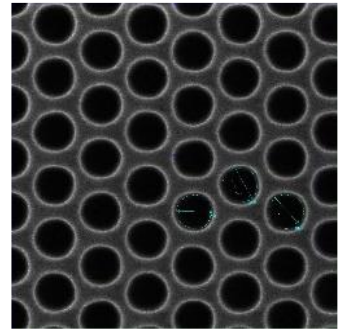
Full Wafer Avg CD:	100.2	nm
Full wafer 1sigma CD:	0.50	nm
Die-to-Die 1 sigma		
Avg:	0.77	nm
RMS:	0.79	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	82.75	nm
Full wafer 1sigma CD:	0.51	nm
Die-to-Die 1 sigma		
Avg:	1.19	nm
RMS:	1.22	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

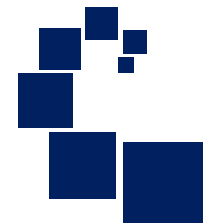
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.0	nm
Full wafer 1sigma CD:	2.63	nm
Die-to-Die 1 sigma		
Avg:	2.34	nm
RMS:	4.01	nm
Ellipticity Avg:	1.13	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP054SJA0 (2225DNDN001 slot 8) Reference Data

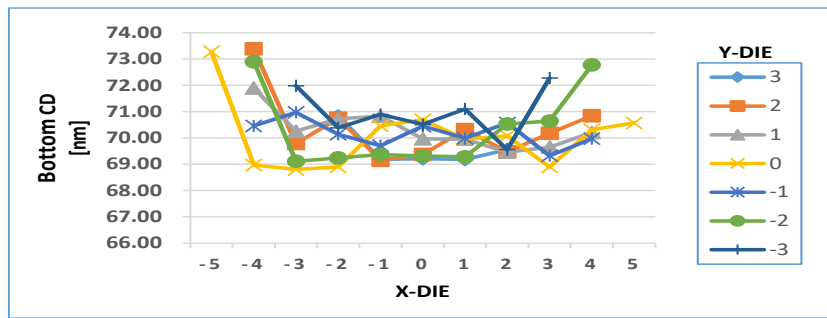
## C60P120 Anchor Target June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.28	nm	Average of all individual die CD averages (25 targets/die).
Full wafer 1sigma CD:	1.08	nm	Stdev of all die CD average of (25 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	1.66	nm	Arithmetic average value of feature-to-feature variation.
RMS:	1.78	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:	1.06		Average of ratio of major axis to minor axis.
FOV:	800	nm	Size of image (field-of-view).

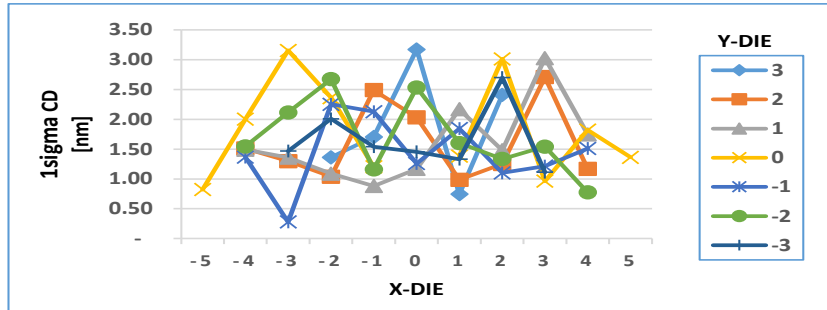
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				70.84	69.19	69.21	69.18	69.56			
2		73.39	69.79	70.75	69.15	69.37	70.32	69.47	70.18	70.85	
1		71.90	70.25	70.73	70.83	69.96	69.96	69.47	69.65	70.21	
0	73.28	68.97	68.80	68.90	70.46	70.69	69.95	70.08	68.90	70.31	70.57
-1		70.46	70.97	70.14	69.71	70.45	69.98	70.57	69.33	69.97	
-2		72.90	69.11	69.24	69.37	69.31	69.28	70.53	70.64	72.78	
-3			71.99	70.39	70.89	70.52	71.10	69.56	72.28		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.36	1.71	3.17	0.75	2.41			
2		1.51	1.30	1.04	2.49	2.03	0.99	1.25	2.71	1.17	
1		1.49	1.36	1.09	0.88	1.17	2.17	1.48	3.03	1.75	
0	0.82	2.00	3.16	2.36	1.20	1.16	1.39	3.01	0.96	1.82	1.36
-1		1.36	0.28	2.25	2.13	1.26	1.84	1.10	1.21	1.51	
-2		1.55	2.12	2.67	1.16	2.54	1.60	1.34	1.54	0.78	
-3			1.47	2.01	1.54	1.45	1.33	2.70	1.11		





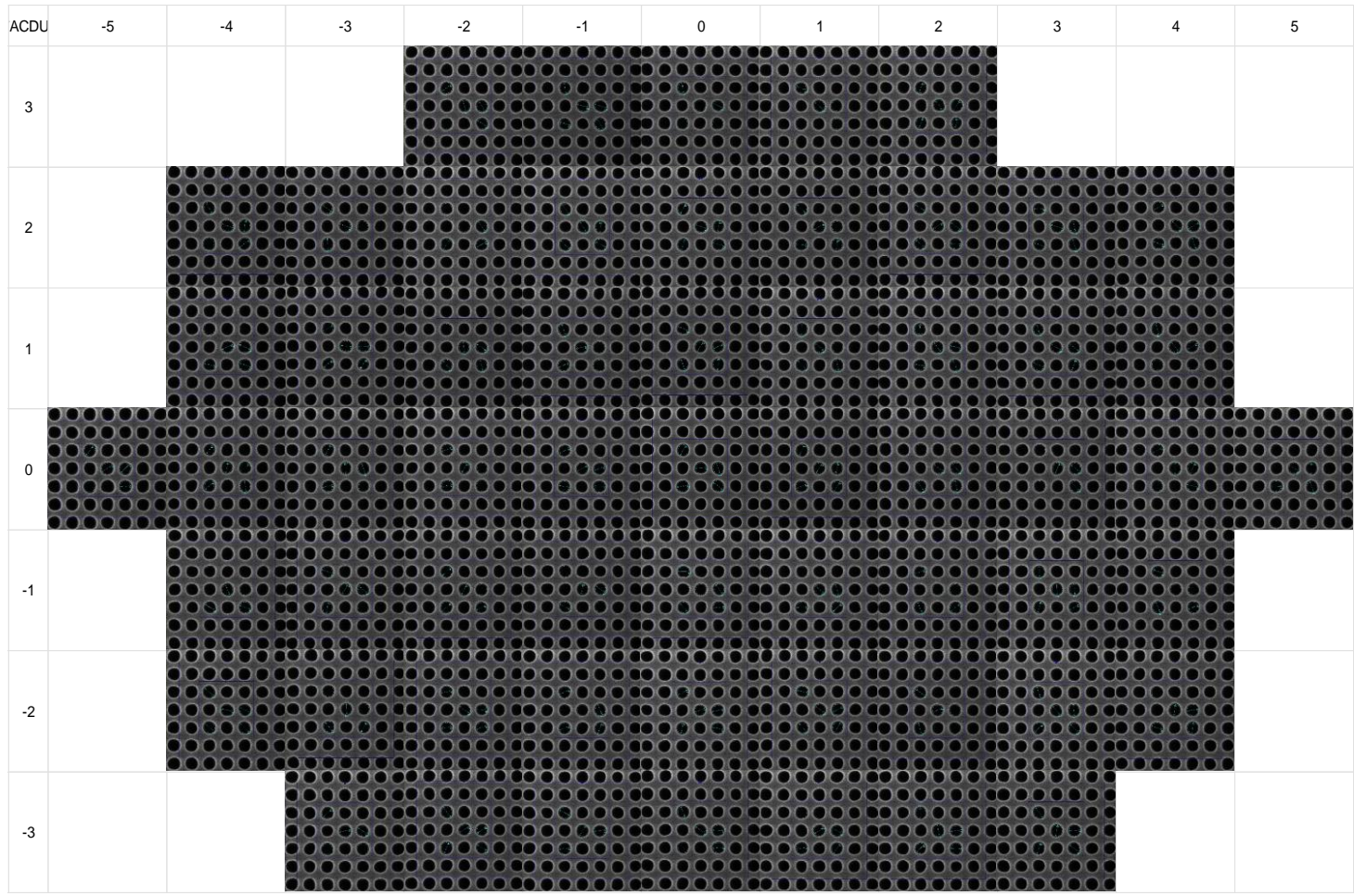
# 46JTP054SJA0 (2225DNDN001 slot 8) Reference Data

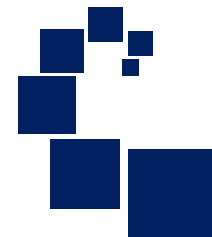
C60P120 Anchor Target

June 2022

## C60P120 Anchor Target CD-SEM image wafer map

Full Wafer Avg CD:	70.28	nm
Full wafer 1sigma CD:	1.08	nm
Die-to-Die 1sigma		
Avg:	1.66	nm
RMS:	1.78	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





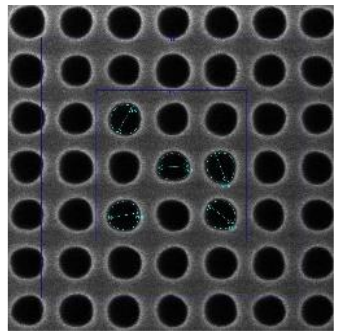
# 46JTP054SJA0 (2225DNDN001 slot 8) Reference Data

## Secondary Targets

June 2022

### Anchor Target

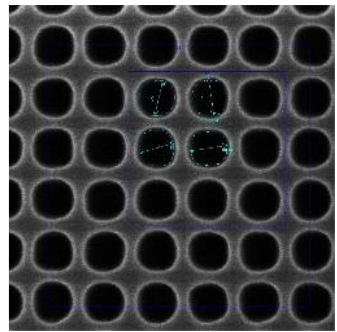
C60P120 (XCH\*)



Full Wafer Avg CD:	70.33	nm
Full wafer 1sigma CD:	0.81	nm
Die-to-Die 1 sigma		
Avg:	1.67	nm
RMS:	1.79	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

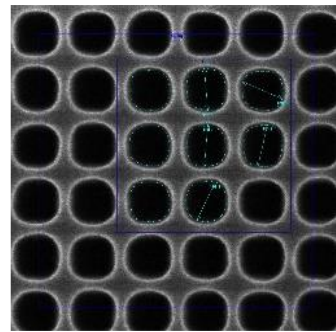
### Secondary Targets

C64P128 (ACH\*)



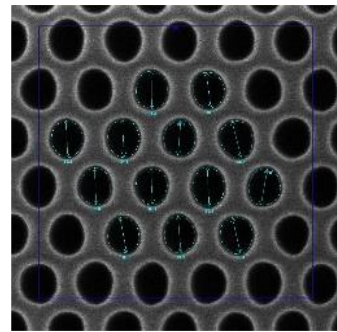
Full Wafer Avg CD:	84.6	nm
Full wafer 1sigma CD:	2.43	nm
Die-to-Die 1 sigma		
Avg:	3.44	nm
RMS:	4.62	nm
Ellipticity Avg:	1.16	
FOV:	800	nm

C70P140 (BCH\*)



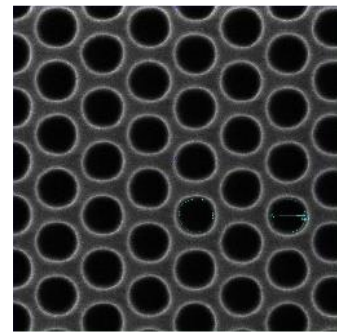
Full Wafer Avg CD:	100.7	nm
Full wafer 1sigma CD:	0.92	nm
Die-to-Die 1 sigma		
Avg:	0.69	nm
RMS:	0.74	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	82.94	nm
Full wafer 1sigma CD:	0.79	nm
Die-to-Die 1 sigma		
Avg:	1.22	nm
RMS:	1.23	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

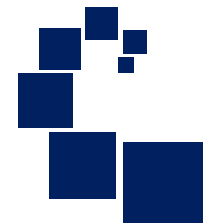
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	103.4	nm
Full wafer 1sigma CD:	1.77	nm
Die-to-Die 1 sigma		
Avg:	1.82	nm
RMS:	3.35	nm
Ellipticity Avg:	1.10	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP053SJD1 (2225DNDN001 slot 9) Reference Data

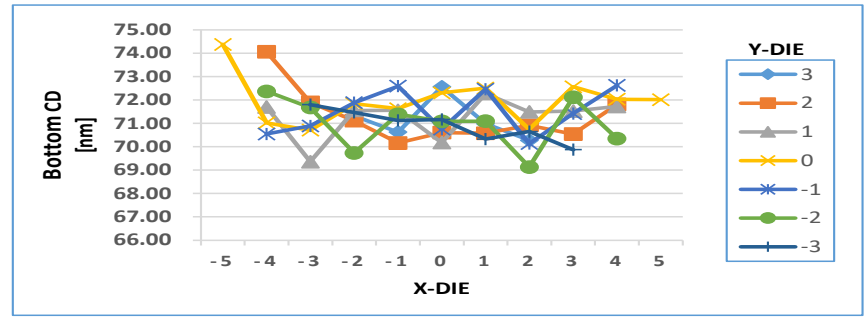
## C60P120 Anchor Target June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	71.34	nm	Average of all individual die CD averages (25 targets/die).
Full wafer 1sigma CD:	1.00	nm	Stdev of all die CD average of (25 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	1.55	nm	Arithmetic average value of feature-to-feature variation.
RMS:	1.66	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:	1.06		Average of ratio of major axis to minor axis.
FOV:	800	nm	Size of image (field-of-view).

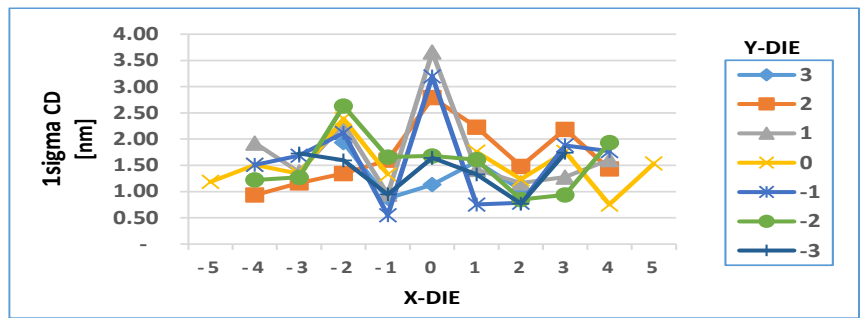
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				71.32	70.63	72.56	70.99	70.27			
2		74.06	71.90	71.12	70.16	70.60	70.58	70.92	70.54	71.81	
1		71.70	69.36	71.55	71.56	70.18	72.28	71.49	71.52	71.73	
0	74.38	71.02	70.71	71.84	71.63	72.31	72.51	70.75	72.56	72.03	72.02
-1		70.55	70.89	71.89	72.59	70.75	72.46	70.14	71.42	72.62	
-2		72.37	71.68	69.73	71.39	71.09	71.10	69.13	72.12	70.35	
-3			71.80	71.47	71.12	71.17	70.33	70.65	69.88		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.93	0.87	1.13	1.57	1.03			
2		0.93	1.16	1.34	1.60	2.79	2.23	1.48	2.19	1.43	
1		1.92	1.37	2.29	0.95	3.66	1.42	1.16	1.28	1.61	
0	1.19	1.51	1.34	2.39	1.33	2.47	1.76	1.23	1.76	0.75	1.54
-1		1.51	1.68	2.12	0.55	3.20	0.75	0.79	1.88	1.77	
-2		1.22	1.27	2.63	1.66	1.68	1.61	0.85	0.94	1.94	
-3			1.73	1.59	0.94	1.64	1.33	0.77	1.74		





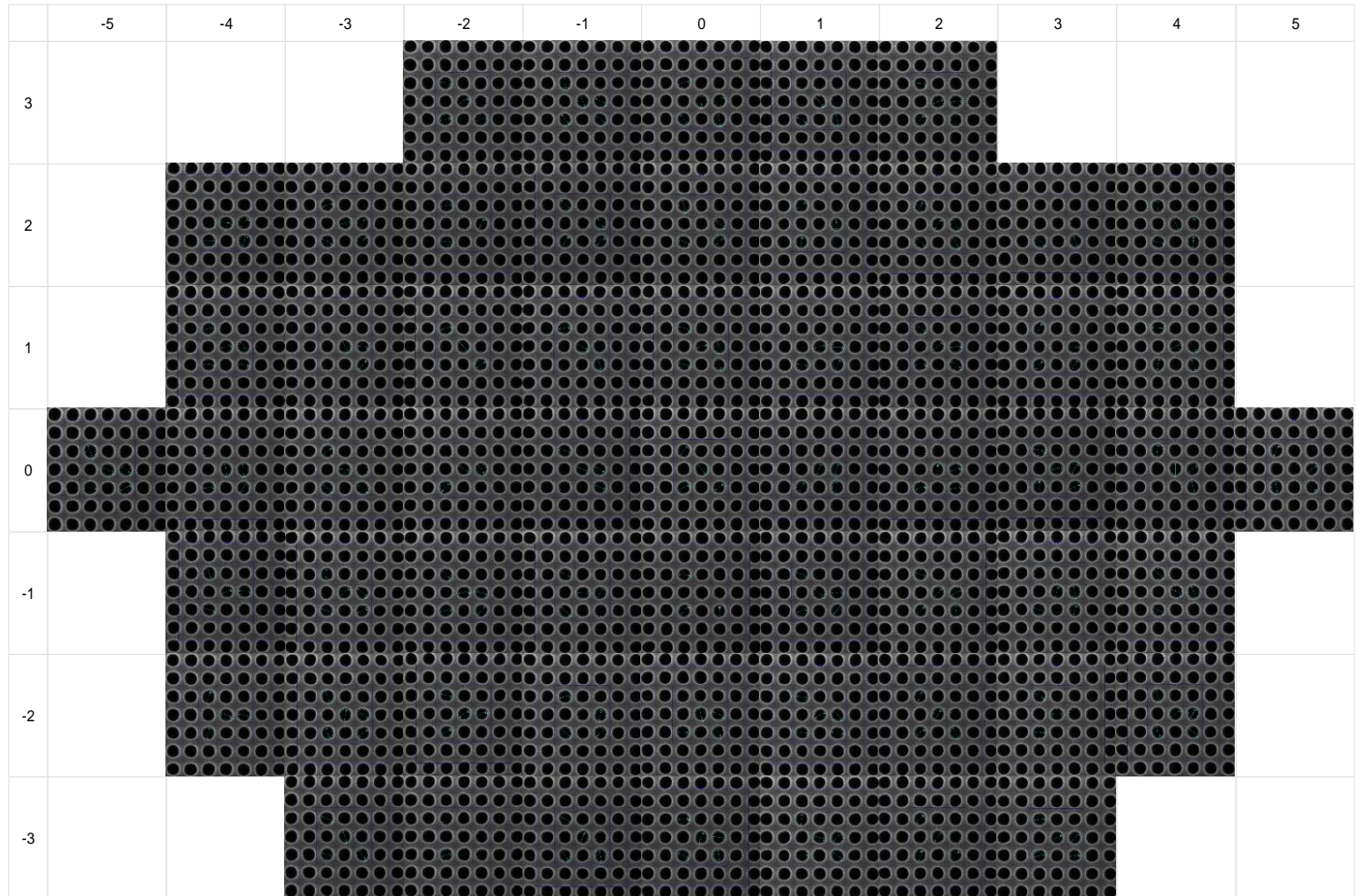
# 46JTP053SJD1 (2225DNDN001 slot 9) Reference Data

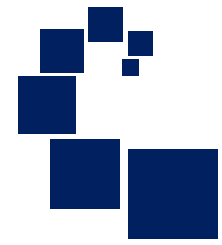
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	71.34	nm
Full wafer 1sigma CD:	1.00	nm
Die-to-Die 1sigma		
Avg:	1.55	nm
RMS:	1.66	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





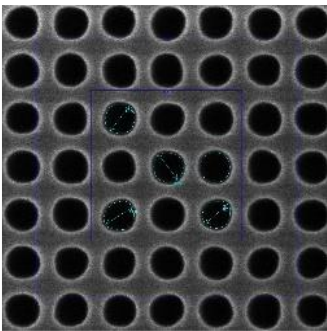
# 46JTP053SJD1 (2225DNDN001 slot 9) Reference Data

## Secondary Targets

June 2022

### Anchor Target

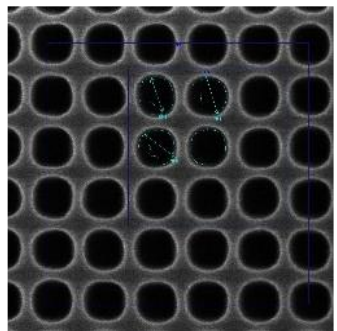
C60P120 (XCH\*)



Full Wafer Avg CD:	71.34	nm
Full wafer 1sigma CD:	1.00	nm
Die-to-Die 1sigma		
Avg:	1.55	nm
RMS:	1.66	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

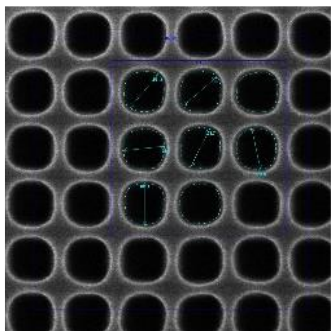
### Secondary Targets

C64P128 (ACH\*)



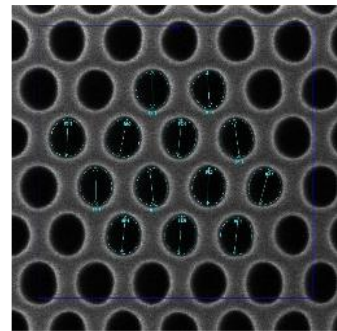
Full Wafer Avg CD:	84.5	nm
Full wafer 1sigma CD:	1.85	nm
Die-to-Die 1 sigma:		
Avg:	4.36	nm
RMS:	4.54	nm
Ellipticity Avg:	1.17	
FOV:	800	nm

C70P140 (BCH\*)



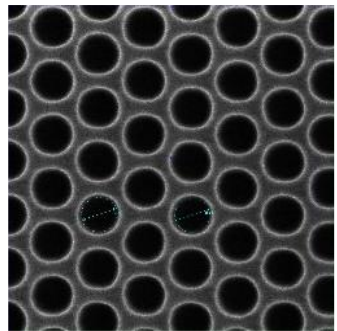
Full Wafer Avg CD:	100.9	nm
Full wafer 1sigma CD:	0.61	nm
Die-to-Die 1 sigma:		
Avg:	0.58	nm
RMS:	0.59	nm
Ellipticity Avg:	1.04	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	83.80	nm
Full wafer 1sigma CD:	0.74	nm
Die-to-Die 1 sigma		
Avg:	1.54	nm
RMS:	1.60	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

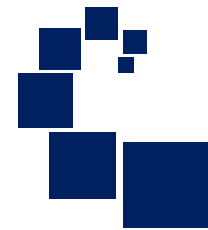
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	103.8	nm
Full wafer 1sigma CD:	1.97	nm
Die-to-Die 1 sigma		
Avg:	4.64	nm
RMS:	5.47	nm
Ellipticity Avg:	1.09	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP052SJG2 (2225DNDN001 slot 10) Reference Data

## C60P120 Anchor Target

June 2022

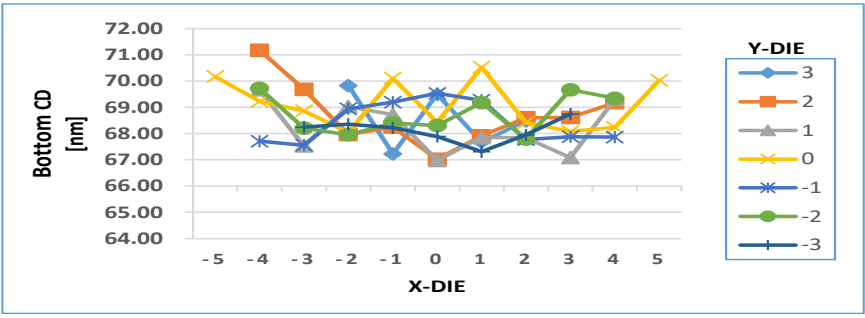
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	68.58	nm
Full wafer 1sigma CD:	0.93	nm
Die-to-Die 1sigma	Avg:	1.70 nm
	RMS:	1.83 nm
	Ellipticity Avg:	1.06
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

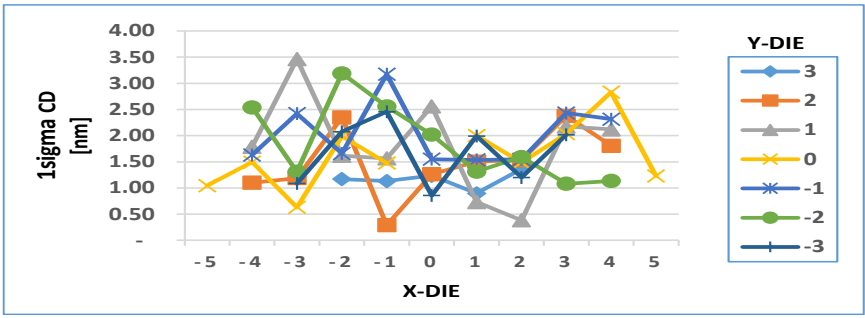
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				69.83	67.23	69.50	67.68	68.48			
2		71.18	69.69	67.96	68.25	67.02	67.91	68.60	68.62	69.18	
1		69.67	67.53	69.03	68.72	66.98	67.86	67.84	67.08	69.31	
0	70.18	69.23	68.87	68.03	70.11	68.43	70.53	68.42	68.08	68.24	70.03
-1		67.71	67.55	68.95	69.20	69.53	69.27	67.77	67.88	67.86	
-2		69.72	68.21	67.95	68.41	68.31	69.18	67.79	69.67	69.35	
-3			68.24	68.36	68.22	67.89	67.31	67.95	68.74		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.17	1.13	1.24	0.90	1.36			
2		1.10	1.19	2.35	0.29	1.26	1.51	1.54	2.38	1.81	
1		1.79	3.47	1.62	1.56	2.56	0.73	0.38	2.17	2.12	
0	1.04	1.49	0.63	1.99	1.48	1.68	2.00	1.49	2.04	2.83	1.23
-1		1.63	2.42	1.66	3.17	1.55	1.54	1.55	2.43	2.32	
-2		2.54	1.31	3.19	2.56	2.02	1.31	1.59	1.08	1.14	
-3			1.09	2.08	2.46	0.86	1.99	1.20	2.02		





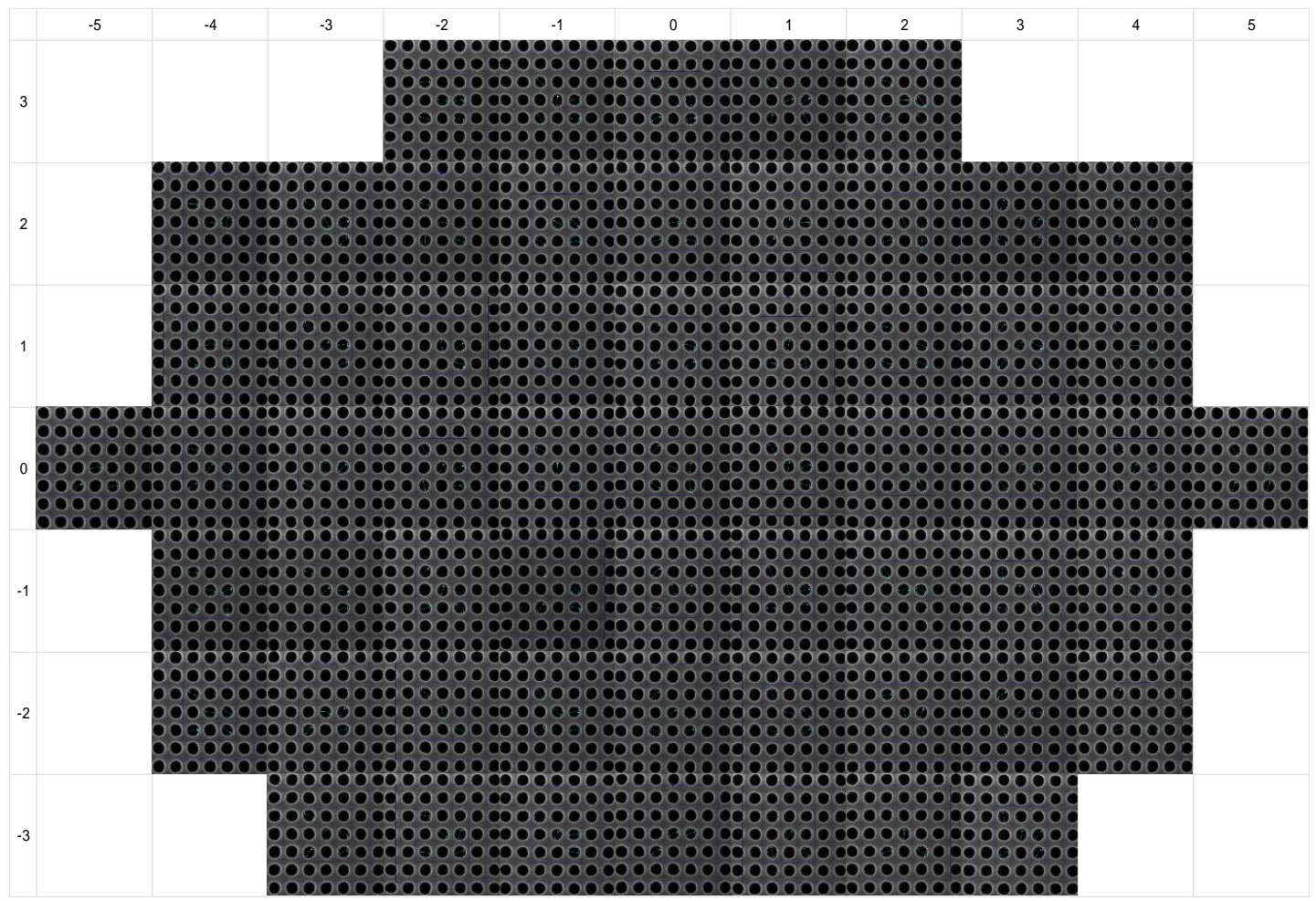
# 46JTP052SJG2 (2225DNDN001 slot 10) Reference Data

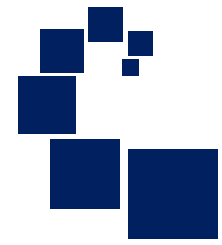
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	68.58	nm
Full wafer 1sigma CD:	0.93	nm
Die-to-Die 1sigma		
Avg:	1.70	nm
RMS:	1.83	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





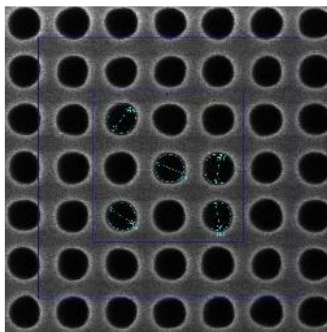
# 46JTP052SJG2 (2225DNDN001 slot 10) Reference Data

## Secondary Targets

June 2022

### Anchor Target

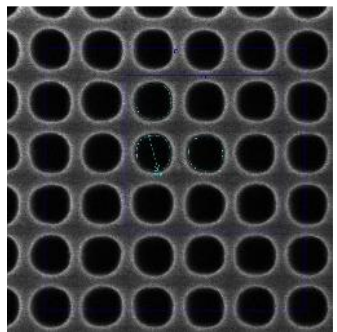
C60P120 (XCH\*)



Full Wafer Avg CD:	68.58	nm
Full wafer 1sigma CD:	0.93	nm
Die-to-Die 1sigma		
Avg:	1.70	nm
RMS:	1.83	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

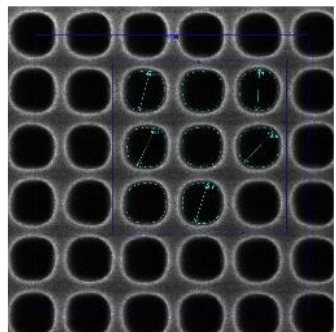
### Secondary Targets

C64P128 (ACH\*)



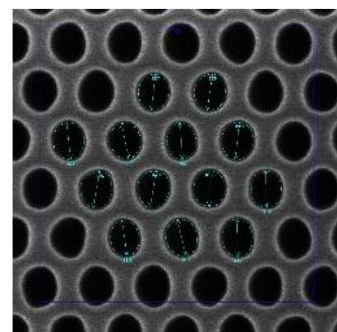
Full Wafer Avg CD:	85.7	nm
Full wafer 1sigma CD:	1.00	nm
Die-to-Die 1 sigma:		
Avg:	1.69	nm
RMS:	2.20	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

C70P140 (BCH\*)



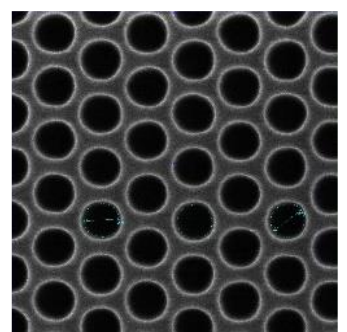
Full Wafer Avg CD:	99.1	nm
Full wafer 1sigma CD:	0.69	nm
Die-to-Die 1 sigma:		
Avg:	0.79	nm
RMS:	0.82	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	81.68	nm
Full wafer 1sigma CD:	0.65	nm
Die-to-Die 1 sigma:		
Avg:	1.43	nm
RMS:	1.45	nm
Ellipticity Avg:	1.20	
FOV:	800	nm

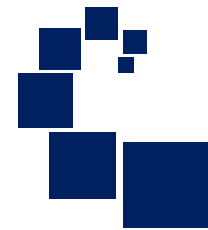
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.7	nm
Full wafer 1sigma CD:	2.69	nm
Die-to-Die 1 sigma:		
Avg:	2.77	nm
RMS:	3.51	nm
Ellipticity Avg:	1.08	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP051SJC0 (2225DNDN001 slot 11) Reference Data

## C60P120 Anchor Target

June 2022

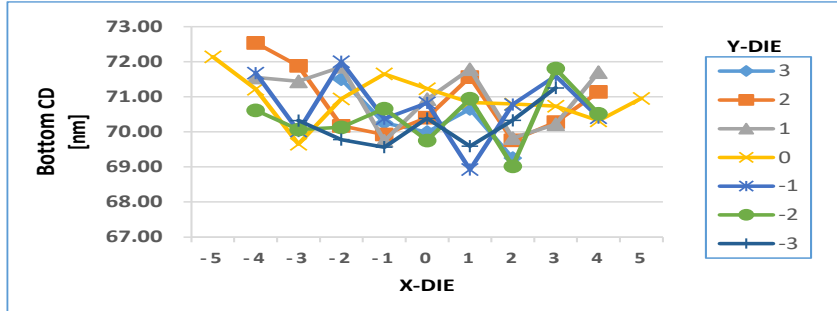
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.68	nm
Full wafer 1sigma CD:	0.83	nm
Die-to-Die 1sigma		
Avg:	1.67	nm
RMS:	1.80	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

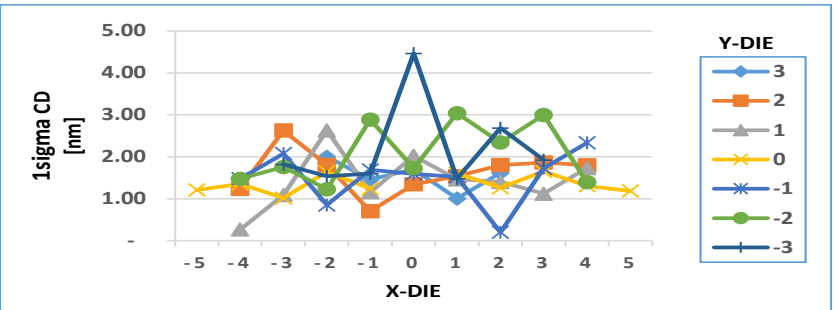
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				71.50	70.26	69.99	70.65	69.25			
2		72.54	71.88	70.17	69.92	70.41	71.56	69.76	70.28	71.14	
1		71.55	71.44	71.85	69.74	70.93	71.79	69.82	70.22	71.71	
0	72.14	71.22	69.65	70.94	71.65	71.23	70.84	70.80	70.73	70.32	70.95
-1		71.67	70.02	72.00	70.38	70.83	68.92	70.78	71.60	70.41	
-2		70.62	70.07	70.13	70.66	69.75	70.94	69.02	71.80	70.52	
-3			70.32	69.78	69.56	70.39	69.59	70.33	71.25		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				2.00	1.46	1.71	1.00	1.62			
2		1.24	2.63	1.81	0.70	1.35	1.54	1.80	1.86	1.80	
1		0.27	1.09	2.63	1.15	2.02	1.46	1.40	1.12	1.73	
0	1.21	1.35	1.02	1.65	1.24	0.84	1.61	1.26	1.65	1.31	1.19
-1		1.48	2.08	0.85	1.69	1.59	1.52	0.20	1.73	2.34	
-2		1.48	1.76	1.23	2.89	1.73	3.04	2.34	3.00	1.39	
-3			1.82	1.54	1.60	4.46	1.48	2.69	1.92		





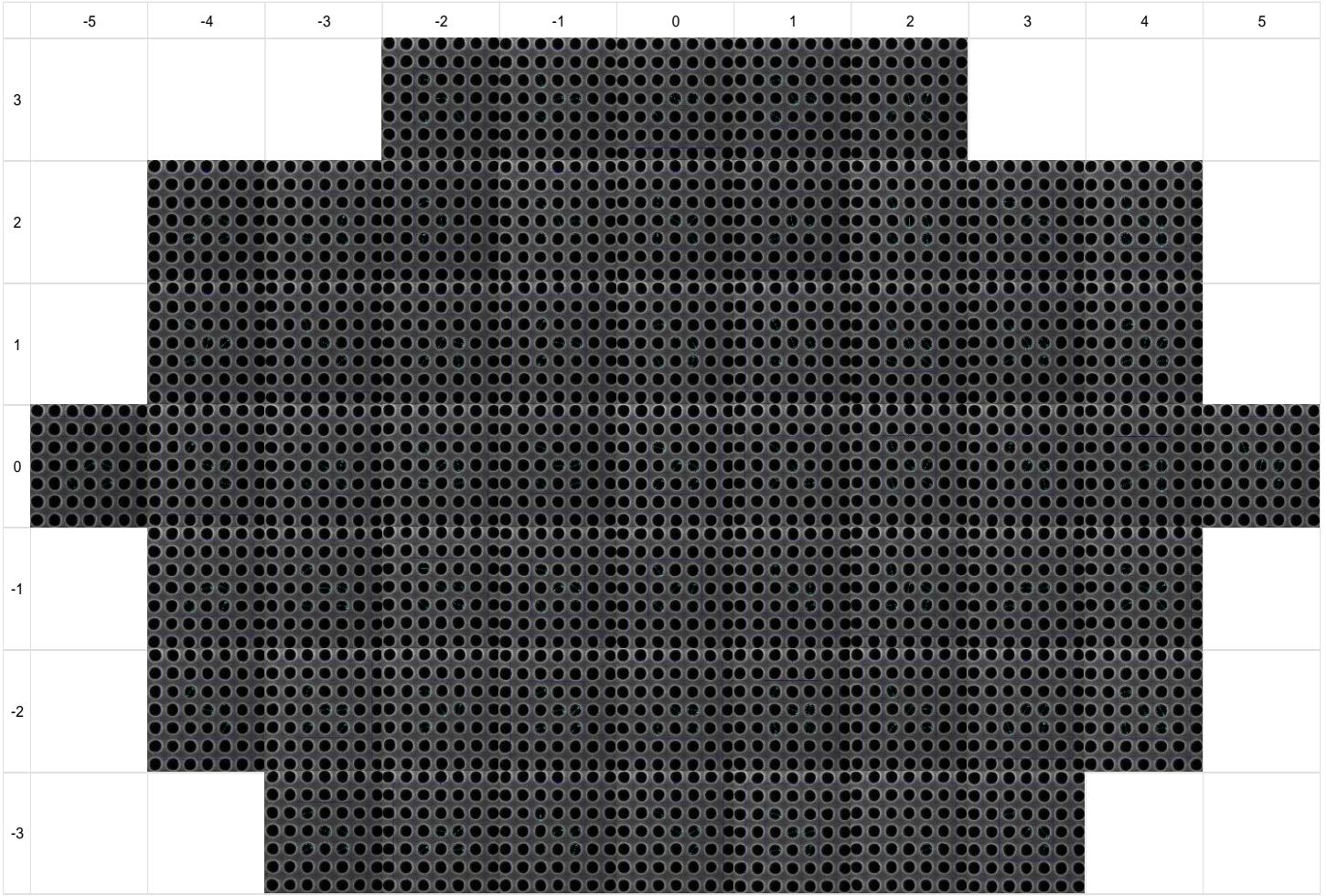
# 46JTP051SJC0 (2225DNDN001 slot 11) Reference Data

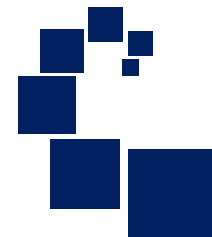
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	70.68	nm
Full wafer 1sigma CD:	0.83	nm
Die-to-Die 1sigma		
Avg:	1.67	nm
RMS:	1.80	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





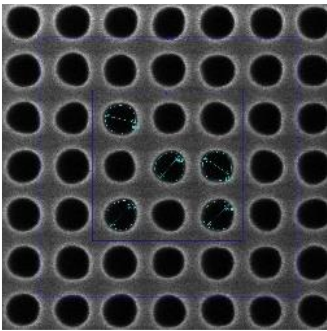
# 46JTP051SJC0 (2225DNDN001 slot 11) Reference Data

## Secondary Targets

June 2022

### Anchor Target

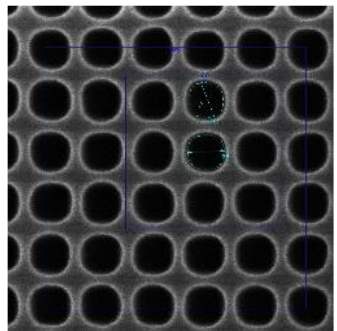
C60P120 (XCH\*)



Full Wafer Avg CD:	70.68	nm
Full wafer 1sigma CD:	0.83	nm
Die-to-Die 1sigma		
Avg:	1.67	nm
RMS:	1.80	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

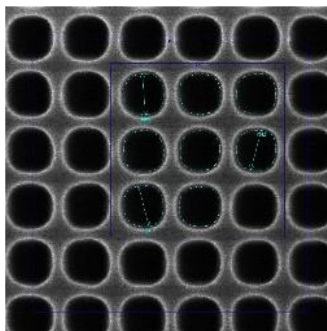
### Secondary Targets

C64P128 (ACH\*)



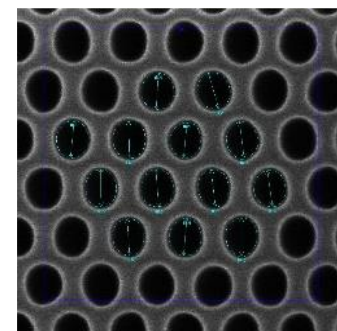
Full Wafer Avg CD:	85.5	nm
Full wafer 1sigma CD:	2.20	nm
Die-to-Die 1 sigma:		
Avg:	2.68	nm
RMS:	3.53	nm
Ellipticity Avg:	1.09	
FOV:	800	nm

C70P140 (BCH\*)



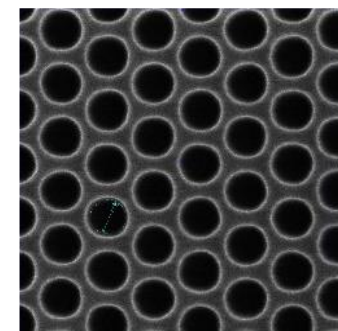
Full Wafer Avg CD:	100.1	nm
Full wafer 1sigma CD:	0.52	nm
Die-to-Die 1 sigma:		
Avg:	0.70	nm
RMS:	0.72	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	83.41	nm
Full wafer 1sigma CD:	0.61	nm
Die-to-Die 1 sigma:		
Avg:	1.24	nm
RMS:	1.26	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

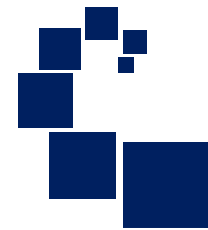
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.4	nm
Full wafer 1sigma CD:	2.78	nm
Die-to-Die 1 sigma:		
Avg:	2.81	nm
RMS:	4.13	nm
Ellipticity Avg:	1.10	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP100SJD7 (2225DNDN001 slot 12) Reference Data

## C60P120 Anchor Target

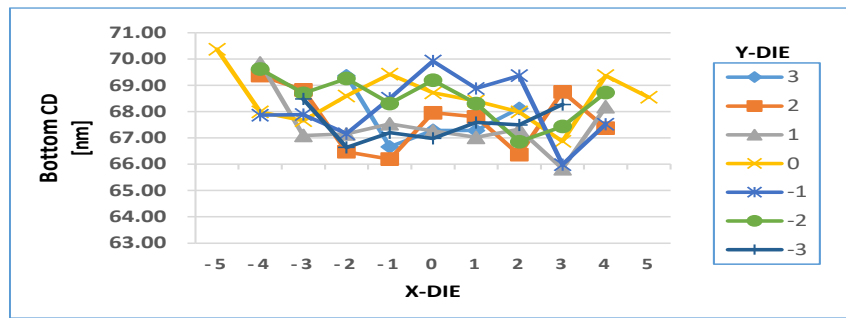
June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	67.99	nm	Average of all individual die CD averages (25 targets/die).
Full wafer 1sigma CD:	1.06	nm	Stdev of all die CD average of (25 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	1.73	nm	Arithmetic average value of feature-to-feature variation.
RMS:	1.83	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:	1.07		Average of ratio of major axis to minor axis.
FOV:	800	nm	Size of image (field-of-view).

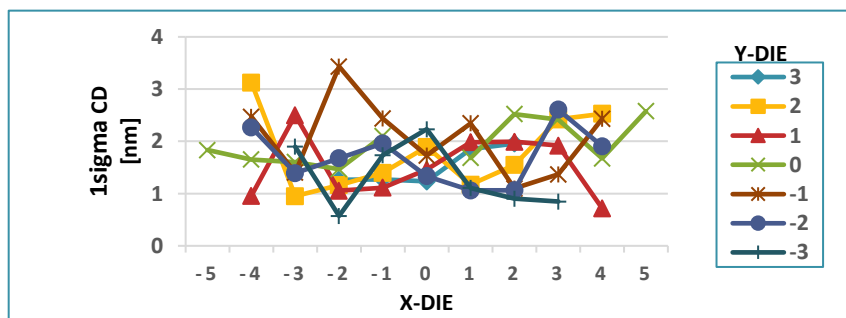
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				69.37	66.66	67.29	67.28	68.12			
2		69.37	68.83	66.47	66.19	67.96	67.80	66.36	68.75	67.38	
1		69.85	67.09	67.16	67.54	67.27	67.02	67.33	65.83	68.19	
0	70.38	67.99	67.66	68.60	69.43	68.72	68.41	67.99	66.87	69.37	68.55
-1		67.87	67.89	67.16	68.51	69.93	68.88	69.37	65.99	67.52	
-2		69.62	68.70	69.26	68.31	69.19	68.31	66.86	67.44	68.73	
-3			68.48	66.64	67.20	66.98	67.59	67.49	68.27		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.26	1.27	1.23	1.85	1.96			
2		3.12	0.95	1.16	1.40	1.89	1.17	1.55	2.42	2.53	
1		0.96	2.50	1.06	1.11	1.46	1.98	1.99	1.92	0.72	
0	1.83	1.65	1.60	1.47	2.10	2.03	1.68	2.52	2.42	1.67	2.58
-1		2.47	1.40	3.43	2.43	1.73	2.34	1.10	1.37	2.43	
-2		2.27	1.39	1.68	1.96	1.33	1.06	1.06	2.61	1.91	
-3			1.90	0.57	1.74	2.23	1.11	0.90	0.85		





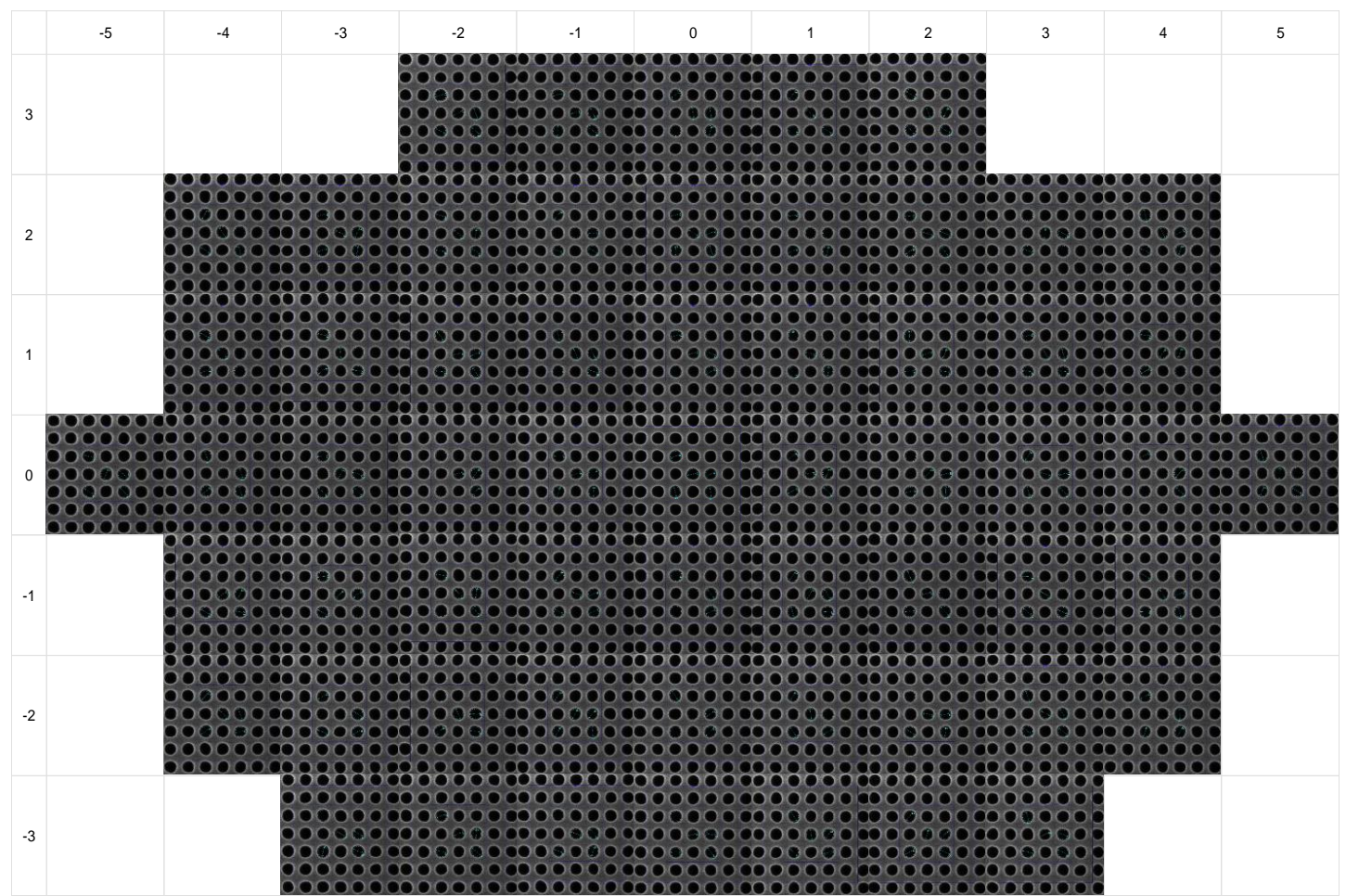
# 46JTP100SJD7 (2225DNDN001 slot 12) Reference Data

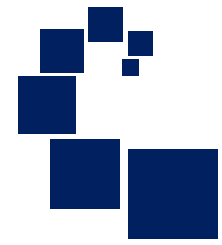
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	67.99	nm
Full wafer 1sigma CD:	1.06	nm
Die-to-Die 1sigma		
Avg:	1.73	nm
RMS:	1.83	nm
Ellipticity Avg:	1.07	
FOV:	800	nm





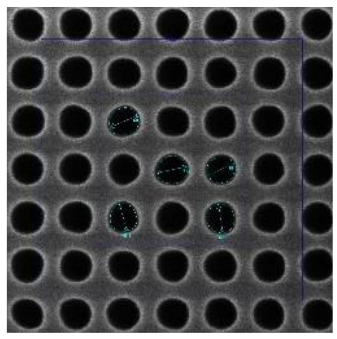
# 46JTP100SJD7 (2225DNDN001 slot 12) Reference Data

## Secondary Targets

June 2022

### Anchor Target

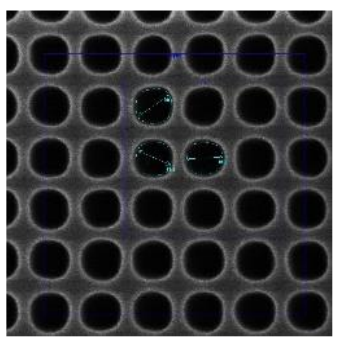
C60P120 (XCH\*)



Full Wafer Avg CD:	67.99	nm
Full wafer 1sigma CD:	1.06	nm
Die-to-Die 1sigma		
Avg:	1.73	nm
RMS:	1.83	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

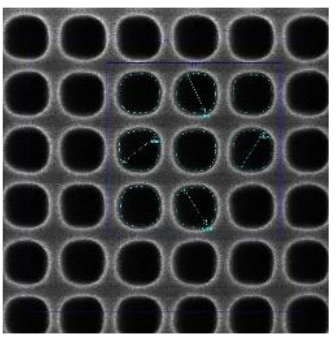
### Secondary Targets

C64P128 (ACH\*)



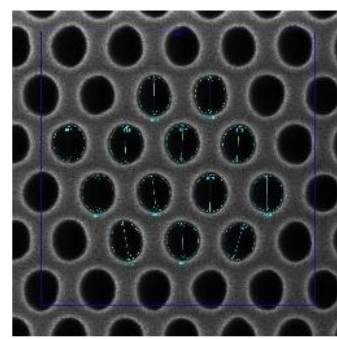
Full Wafer Avg CD:	85.3	nm
Full wafer 1sigma CD:	1.09	nm
Die-to-Die 1 sigma:		
Avg:	1.72	nm
RMS:	2.25	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

C70P140 (BCH\*)



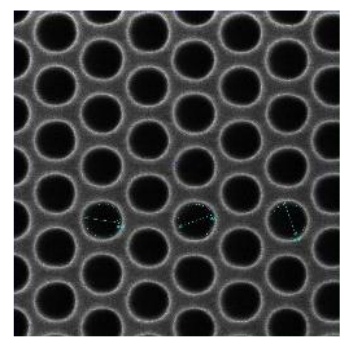
Full Wafer Avg CD:	98.8	nm
Full wafer 1sigma CD:	0.71	nm
Die-to-Die 1 sigma:		
Avg:	0.72	nm
RMS:	0.73	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	81.16	nm
Full wafer 1sigma CD:	0.69	nm
Die-to-Die 1 sigma:		
Avg:	1.19	nm
RMS:	1.22	nm
Ellipticity Avg:	1.20	
FOV:	800	nm

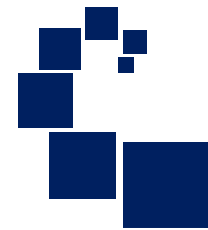
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.5	nm
Full wafer 1sigma CD:	1.37	nm
Die-to-Die 1 sigma:		
Avg:	2.67	nm
RMS:	3.91	nm
Ellipticity Avg:	1.07	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP099SJC3 (2225DNDN001 slot 13) Reference Data

## C60P120 Anchor Target

June 2022

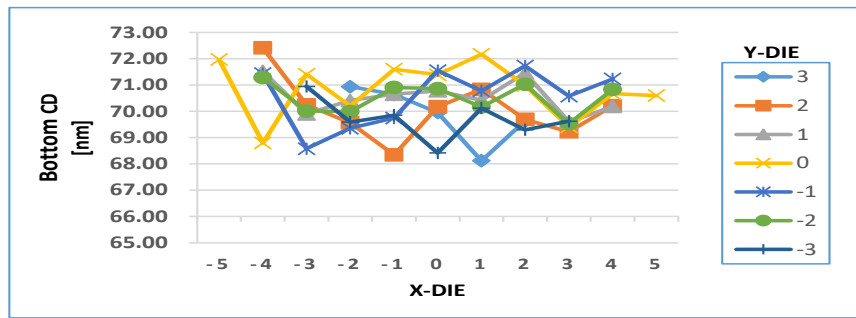
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.37	nm
Full wafer 1sigma CD:	0.96	nm
Die-to-Die 1sigma		
Avg:	1.67	nm
RMS:	1.80	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

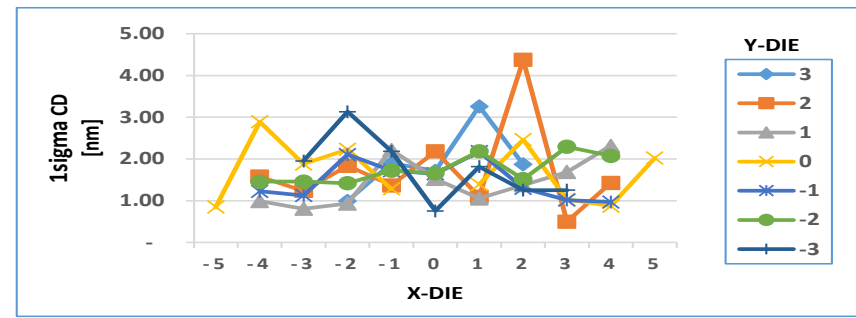
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				70.94	70.64	69.95	68.12	69.64			
2		72.42	70.25	69.57	68.34	70.17	70.84	69.69	69.22	70.21	
1		71.52	69.90	70.41	70.65	70.78	70.42	71.46	69.60	70.18	
0	71.97	68.80	71.41	70.20	71.60	71.39	72.17	70.98	69.41	70.67	70.60
-1		71.43	68.58	69.36	69.75	71.55	70.78	71.73	70.58	71.23	
-2		71.29	70.02	69.99	70.91	70.86	70.17	71.03	69.53	70.84	
-3			70.95	69.59	69.85	68.42	70.12	69.30	69.63		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.99	1.90	1.71	3.26	1.87			
2		1.58	1.24	1.84	1.37	2.18	1.10	4.38	0.50	1.43	
1		0.99	0.81	0.93	2.22	1.52	1.05	1.37	1.69	2.31	
0	0.85	2.89	1.88	2.23	1.28	1.29	1.39	2.46	1.03	0.87	2.02
-1		1.22	1.13	2.11	1.72	1.65	2.18	1.30	1.02	0.97	
-2		1.46	1.46	1.42	1.72	1.66	2.19	1.52	2.29	2.08	
-3			1.95	3.13	2.19	0.76	1.81	1.25	1.25		





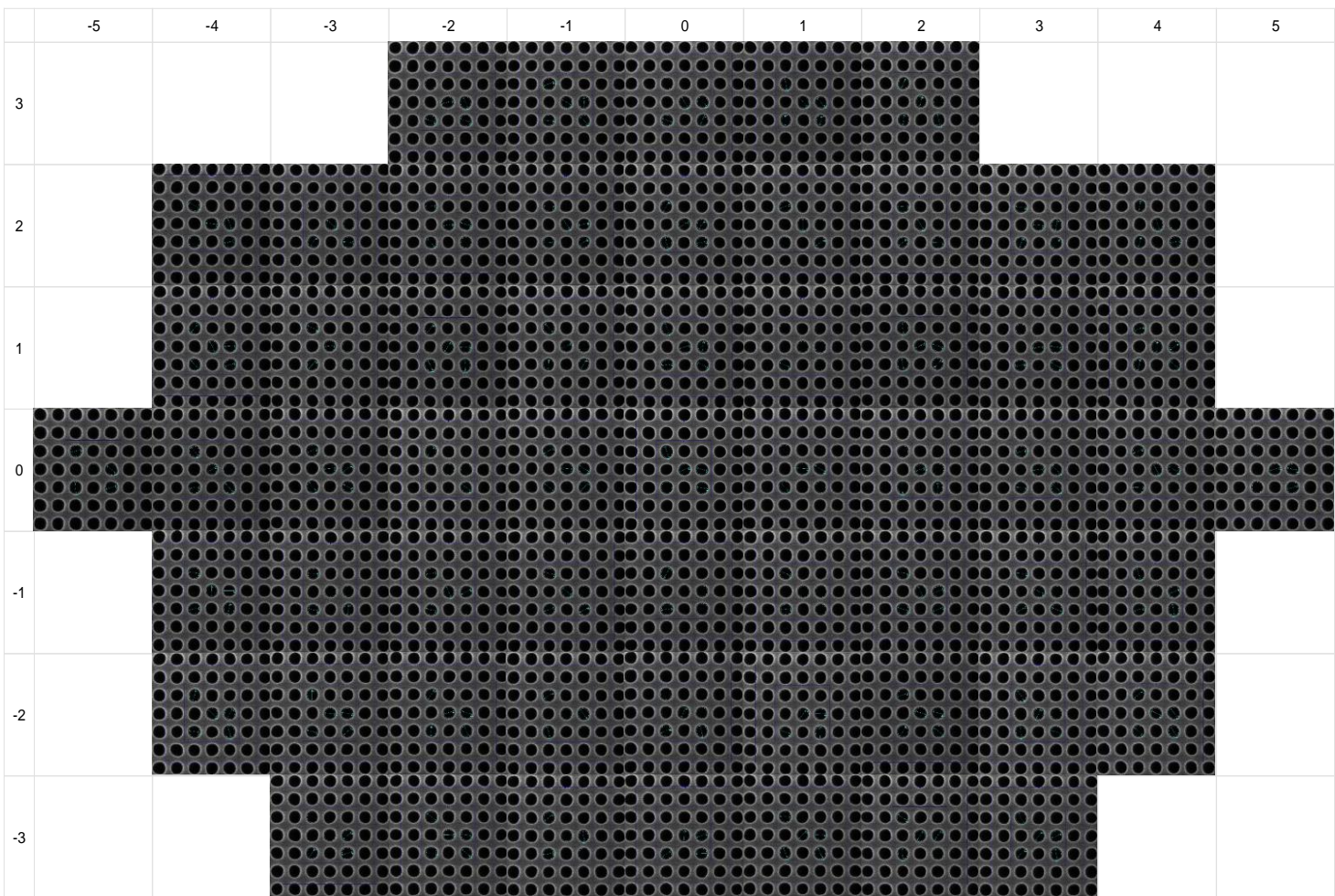
# 46JTP099SJC3 (2225DNDN001 slot 13) Reference Data

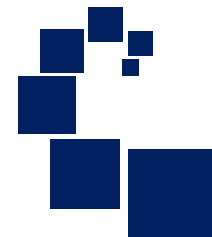
C60P120 Anchor Target

June 2022

## C60P120 Anchor Target CD-SEM image wafer map

Full Wafer Avg CD:	70.37	nm
Full wafer 1sigma CD:	0.96	nm
Die-to-Die 1sigma		
	Avg:	1.67 nm
	RMS:	1.80 nm
Ellipticity Avg:	1.06	
FOV:	800	nm





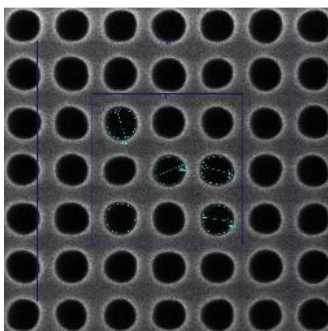
# 46JTP099SJC3 (2225DNDN001 slot 13) Reference Data

## Secondary Targets

June 2022

### Anchor Target

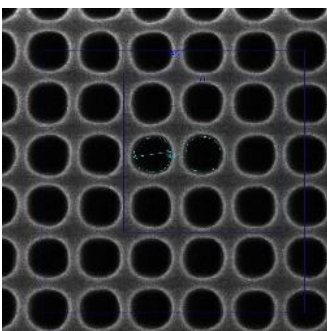
C60P120 (XCH\*)



Full Wafer Avg CD:	70.37	nm
Full wafer 1sigma CD:	0.96	nm
Die-to-Die 1sigma		
Avg:	1.67	nm
RMS:	1.80	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

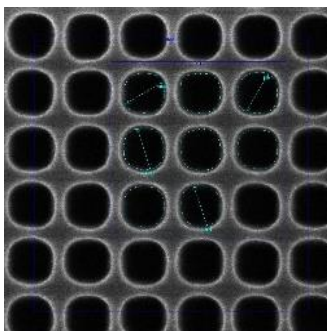
### Secondary Targets

C64P128 (ACH\*)



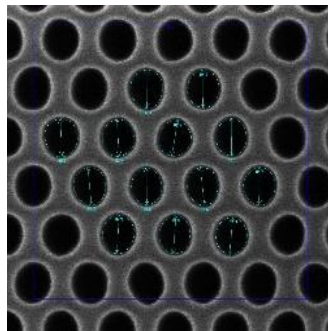
Full Wafer Avg CD:	85.9	nm
Full wafer 1sigma CD:	2.13	nm
Die-to-Die 1 sigma:		
Avg:	2.65	nm
RMS:	3.25	nm
Ellipticity Avg:	1.09	
FOV:	800	nm

C70P140 (BCH\*)



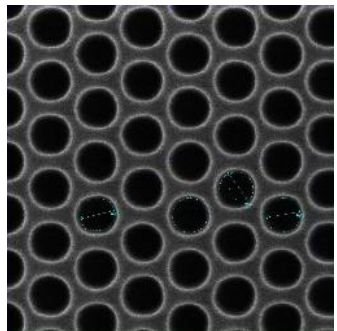
Full Wafer Avg CD:	100.2	nm
Full wafer 1sigma CD:	0.63	nm
Die-to-Die 1 sigma:		
Avg:	0.63	nm
RMS:	0.67	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	83.03	nm
Full wafer 1sigma CD:	0.49	nm
Die-to-Die 1 sigma		
Avg:	1.43	nm
RMS:	1.45	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

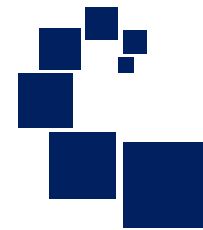
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	104.3	nm
Full wafer 1sigma CD:	1.53	nm
Die-to-Die 1 sigma		
Avg:	3.11	nm
RMS:	3.77	nm
Ellipticity Avg:	1.08	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP098SJF4 (2225DNDN001 slot 14) Reference Data

## C60P120 Anchor Target

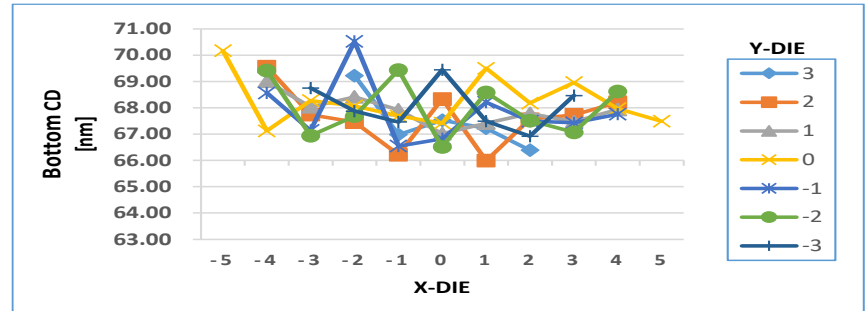
June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	67.91	nm	Average of all individual die CD averages (25 targets/die).
Full wafer 1sigma CD:	0.96	nm	Stddev of all die CD average of (25 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	1.81	nm	Arithmetic average value of feature-to-feature variation.
RMS:	1.93	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:	1.06		Average of ratio of major axis to minor axis.
FOV:	800	nm	Size of image (field-of-view).

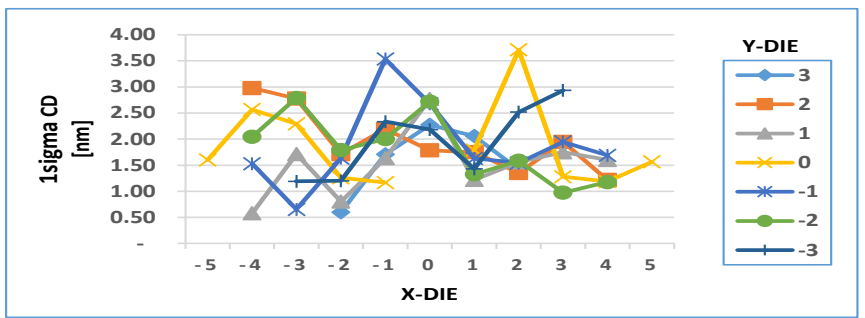
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				69.23	66.98	67.53	67.22	66.39			
2		69.56	67.74	67.46	66.22	68.34	65.99	67.57	67.73	68.21	
1		69.01	68.04	68.41	67.93	67.02	67.42	67.79	67.47	67.94	
0	70.18	67.13	68.28	68.07	67.69	67.42	69.50	68.18	68.96	67.97	67.49
-1		68.57	67.14	70.52	66.55	66.82	68.21	67.49	67.43	67.76	
-2		69.42	66.94	67.68	69.44	66.52	68.59	67.51	67.07	68.62	
-3			68.76	67.88	67.46	69.45	67.49	66.92	68.47		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.60	1.71	2.27	2.06	1.42			
2		2.98	2.78	1.71	2.19	1.79	1.75	1.35	1.95	1.22	
1		0.58	1.71	0.80	1.63	2.77	1.22	1.56	1.75	1.60	
0	1.60	2.57	2.29	1.26	1.17	1.07	1.79	3.71	1.28	1.19	1.57
-1		1.53	0.65	1.64	3.53	2.68	1.63	1.54	1.95	1.69	
-2		2.04	2.79	1.79	2.00	2.72	1.33	1.59	0.97	1.18	
-3			1.19	1.20	2.33	2.18	1.43	2.52	2.93		





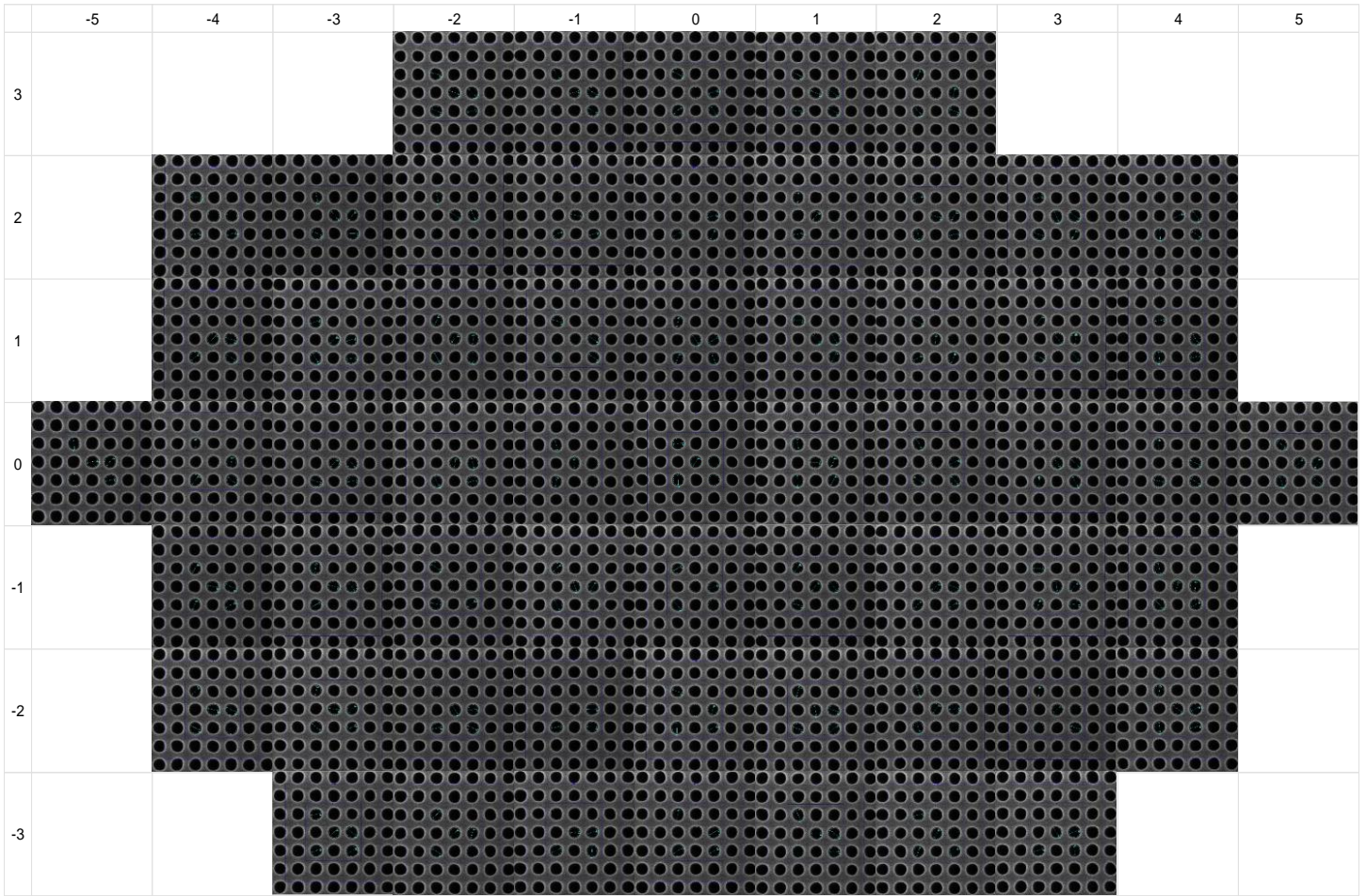
# 46JTP098SJF4 (2225DNDN001 slot 14) Reference Data

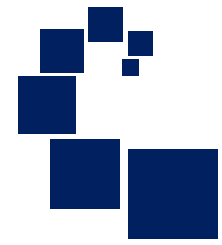
C60P120 Anchor Target

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C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	67.91	nm
Full wafer 1sigma CD:	0.96	nm
Die-to-Die 1sigma		
Avg:	1.81	nm
RMS:	1.93	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





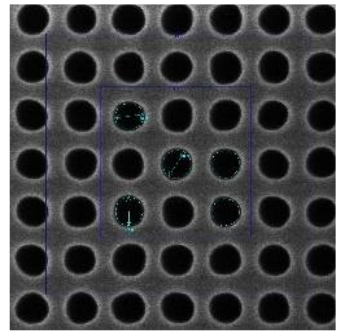
# 46JTP098SJF4 (2225DNDN001 slot 14) Reference Data

## Secondary Targets

June 2022

### Anchor Target

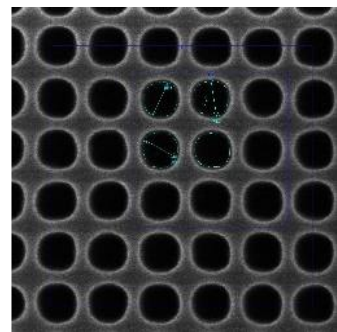
C60P120 (XCH\*)



Full Wafer Avg CD:	67.91	nm
Full wafer 1sigma CD:	0.96	nm
Die-to-Die 1sigma		
Avg:	1.81	nm
RMS:	1.93	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

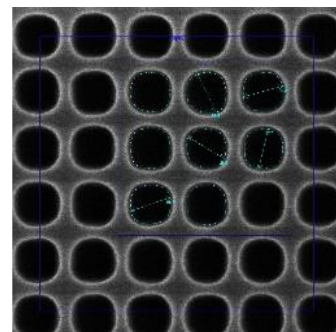
### Secondary Targets

C64P128 (ACH\*)



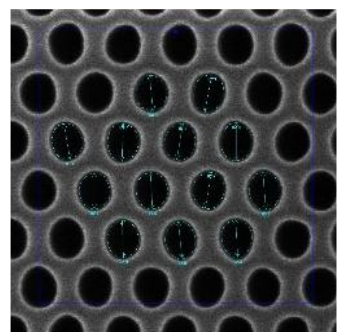
Full Wafer Avg CD:	84.9	nm
Full wafer 1sigma CD:	1.02	nm
Die-to-Die 1 sigma:		
Avg:	1.56	nm
RMS:	2.19	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

C70P140 (BCH\*)



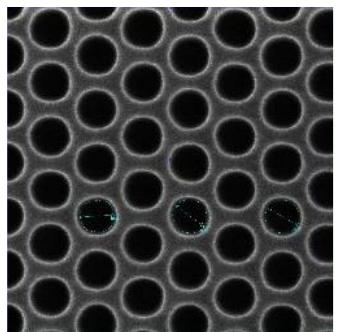
Full Wafer Avg CD:	98.6	nm
Full wafer 1sigma CD:	0.65	nm
Die-to-Die 1 sigma:		
Avg:	0.76	nm
RMS:	0.79	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	80.95	nm
Full wafer 1sigma CD:	0.66	nm
Die-to-Die 1 sigma		
Avg:	1.48	nm
RMS:	1.51	nm
Ellipticity Avg:	1.20	
FOV:	800	nm

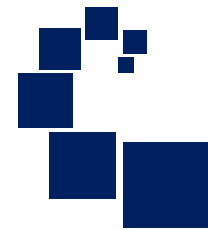
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.2	nm
Full wafer 1sigma CD:	1.44	nm
Die-to-Die 1 sigma		
Avg:	3.58	nm
RMS:	4.31	nm
Ellipticity Avg:	1.08	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP097SJB2 (2225DNDN001 slot 15) Reference Data

## C60P120 Anchor Target

June 2022

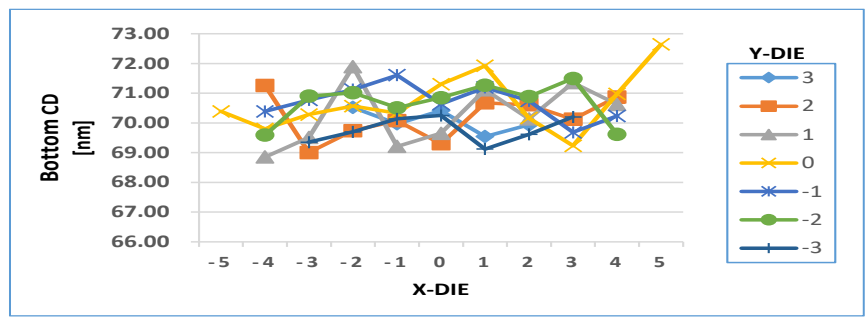
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.39	nm
Full wafer 1sigma CD:	0.80	nm
Die-to-Die 1sigma		
Avg:	1.58	nm
RMS:	1.68	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

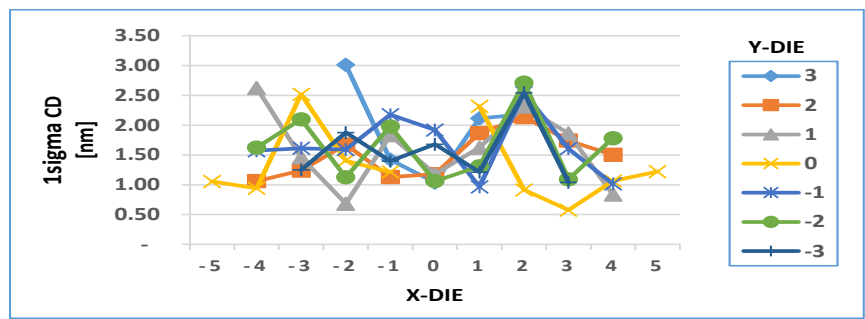
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				70.52	69.97	70.42	69.54	69.94			
2		71.26	69.00	69.74	70.08	69.30	70.68	70.61	70.13	70.87	
1		68.85	69.51	71.89	69.21	69.65	71.12	70.13	71.35	70.62	
0	70.39	69.79	70.28	70.56	70.33	71.30	71.92	70.16	69.23	70.98	72.64
-1		70.39	70.77	71.12	71.61	70.64	71.19	70.74	69.68	70.23	
-2		69.59	70.90	71.02	70.51	70.85	71.27	70.88	71.50	69.61	
-3			69.35	69.70	70.14	70.25	69.12	69.61	70.20		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				3.01	1.42	1.04	2.11	2.18			
2		1.06	1.24	1.67	1.13	1.18	1.86	2.14	1.74	1.50	
1		2.62	1.46	0.68	1.83	1.18	1.62	2.31	1.86	0.84	
0	1.06	0.94	2.52	1.40	1.22	0.33	2.32	0.91	0.58	1.06	1.22
-1		1.57	1.61	1.59	2.18	1.92	0.97	2.55	1.60	1.01	
-2		1.62	2.10	1.12	1.98	1.06	1.31	2.72	1.09	1.78	
-3			1.25	1.88	1.40	1.68	1.21	2.54	1.04		





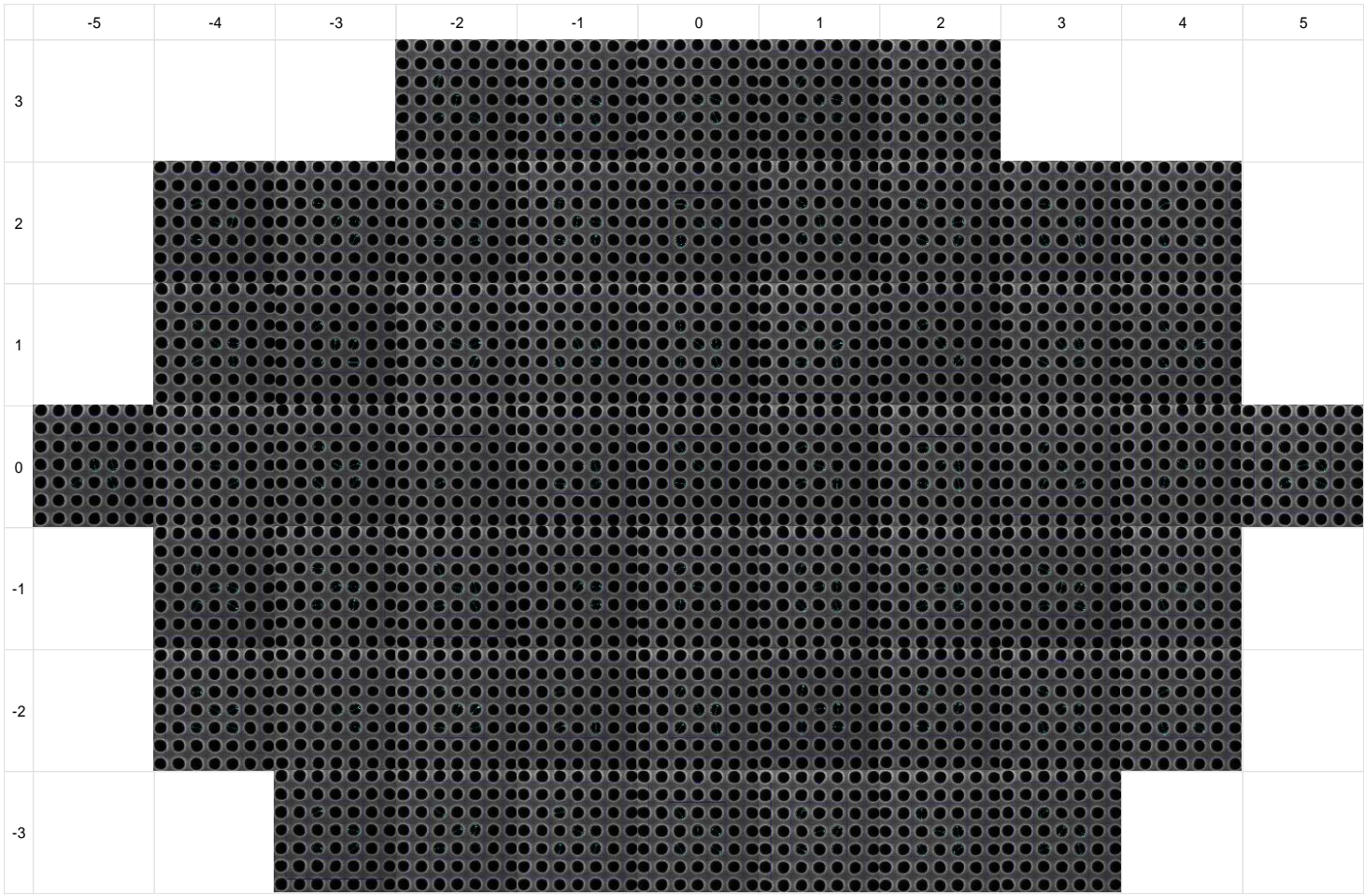
# 46JTP097SJB2 (2225DNDN001 slot 15) Reference Data

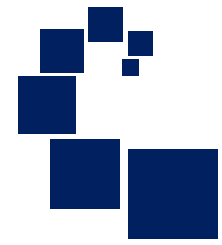
C60P120 Anchor Target

June 2022

## C60P120 Anchor Target CD-SEM image wafer map

Full Wafer Avg CD:	70.39	nm
Full wafer 1sigma CD:	0.80	nm
Die-to-Die 1sigma		
Avg:	1.58	nm
RMS:	1.68	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





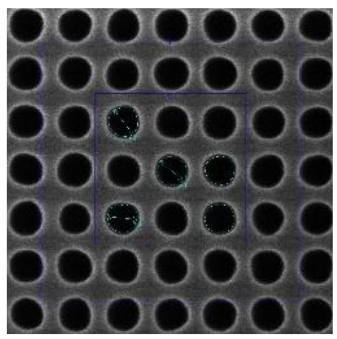
# 46JTP097SJB2 (2225DNDN001 slot 15) Reference Data

## Secondary Targets

June 2022

### Anchor Target

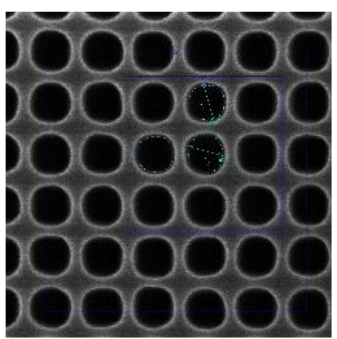
C60P120 (XCH\*)



Full Wafer Avg CD:	70.39	nm
Full wafer 1sigma CD:	0.80	nm
Die-to-Die 1sigma		
Avg:	1.58	nm
RMS:	1.68	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

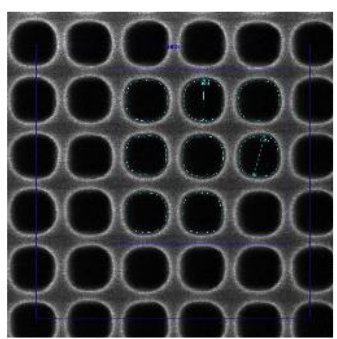
### Secondary Targets

C64P128 (ACH\*)



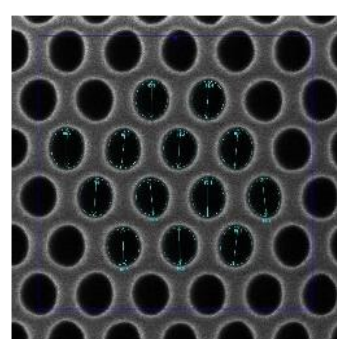
Full Wafer Avg CD:	84.2	nm
Full wafer 1sigma CD:	2.11	nm
Die-to-Die 1 sigma:		
Avg:	3.94	nm
RMS:	4.28	nm
Ellipticity Avg:	1.15	
FOV:	800	nm

C70P140 (BCH\*)



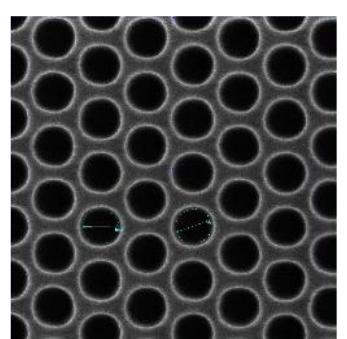
Full Wafer Avg CD:	100.9	nm
Full wafer 1sigma CD:	5.88	nm
Die-to-Die 1 sigma:		
Avg:	0.65	nm
RMS:	0.67	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	83.29	nm
Full wafer 1sigma CD:	0.70	nm
Die-to-Die 1 sigma		
Avg:	1.31	nm
RMS:	1.35	nm
Ellipticity Avg:	1.20	
FOV:	800	nm

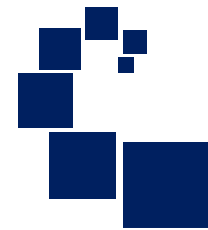
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	104.9	nm
Full wafer 1sigma CD:	2.11	nm
Die-to-Die 1 sigma		
Avg:	2.32	nm
RMS:	3.24	nm
Ellipticity Avg:	1.07	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP096SJE3 (2225DNDN001 slot 16) Reference Data

## C60P120 Anchor Target

June 2022

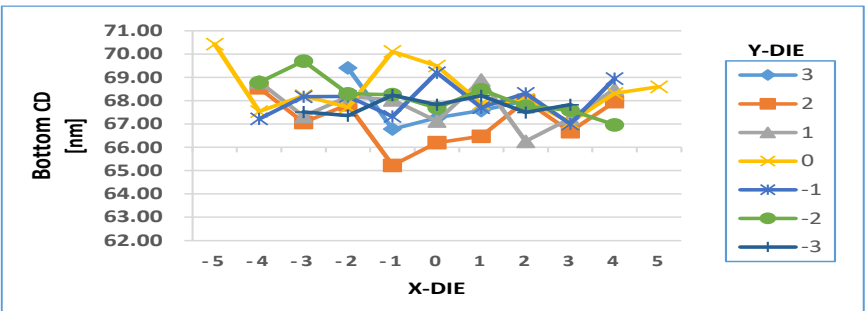
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	67.91	nm
Full wafer 1sigma CD:	0.95	nm
Die-to-Die 1sigma		
Avg:	1.66	nm
RMS:	1.78	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

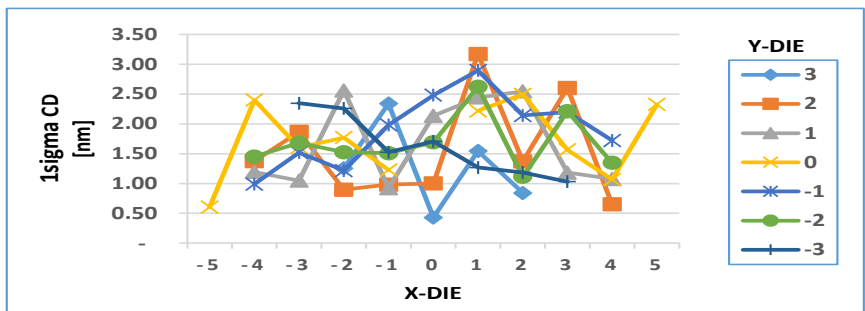
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				69.40	66.78	67.27	67.58	67.99			
2		68.55	67.07	67.83	65.22	66.20	66.47	68.00	66.67	67.96	
1		68.81	67.33	68.17	68.04	67.13	68.89	66.26	67.24	68.49	
0	70.43	67.54	68.22	67.72	70.11	69.50	67.88	68.06	67.07	68.32	68.60
-1		67.22	68.17	68.19	67.32	69.20	67.71	68.32	67.01	68.95	
-2		68.79	69.70	68.29	68.26	67.69	68.47	67.76	67.59	66.96	
-3			67.51	67.36	68.24	67.83	68.21	67.49	67.83		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.26	2.34	0.43	1.55	0.84			
2		1.38	1.87	0.90	0.98	1.00	3.17	1.37	2.60	0.65	
1		1.20	1.05	2.56	0.92	2.14	2.44	2.55	1.18	1.08	
0	0.60	2.40	1.61	1.77	1.23	1.71	2.22	2.50	1.57	1.07	2.33
-1		0.99	1.52	1.22	1.98	2.48	2.90	2.14	2.20	1.72	
-2		1.45	1.68	1.53	1.51	1.69	2.62	1.11	2.21	1.35	
-3			2.35	2.26	1.53	1.71	1.27	1.19	1.03		





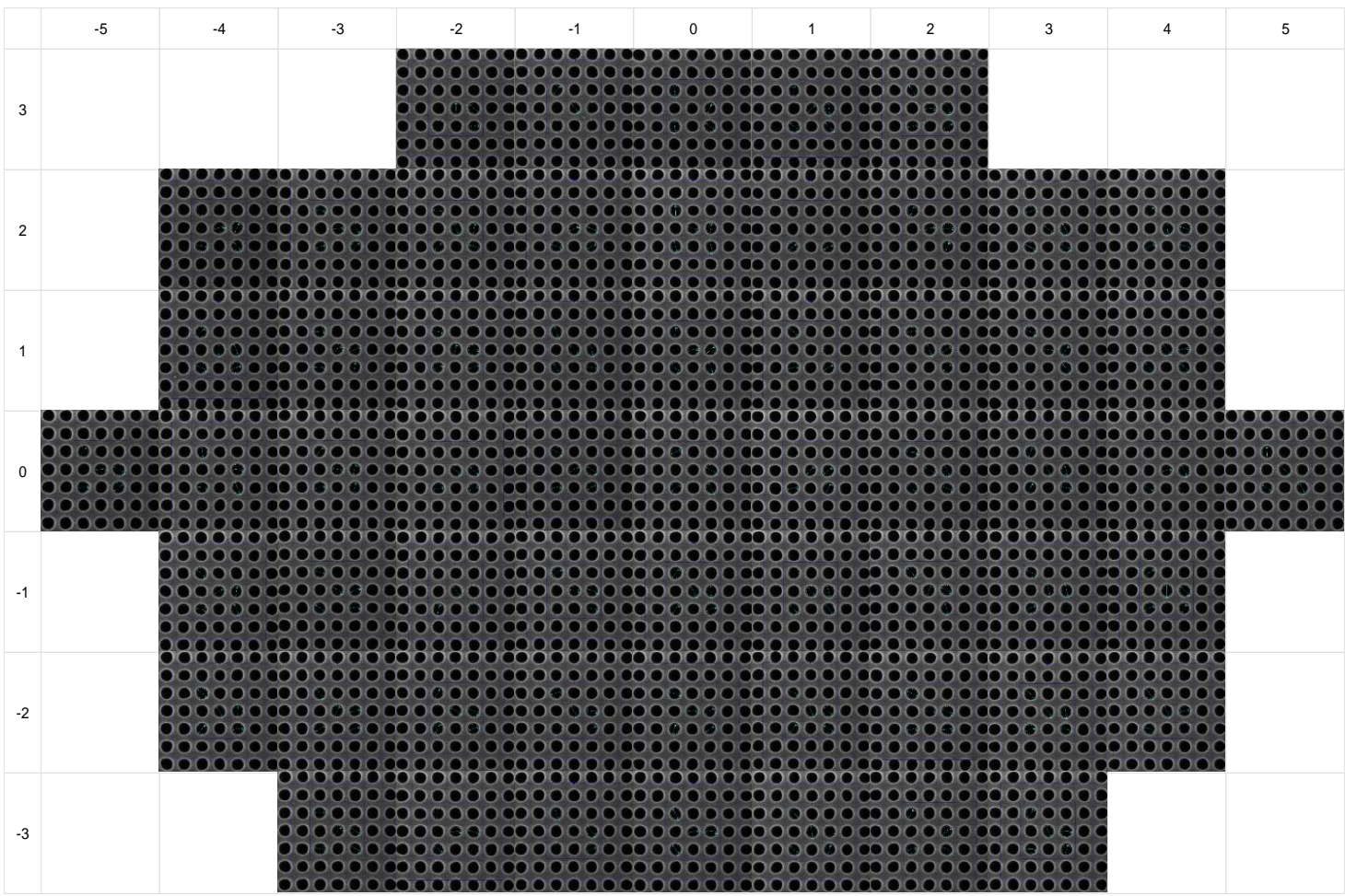
# 46JTP096SJE3 (2225DNDN001 slot 16) Reference Data

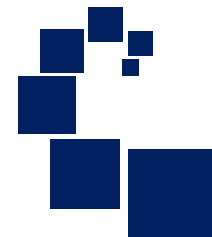
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	67.91	nm
Full wafer 1sigma CD:	0.95	nm
Die-to-Die 1sigma		
Avg:	1.66	nm
RMS:	1.78	nm
Ellipticity Avg:	1.07	
FOV:	800	nm



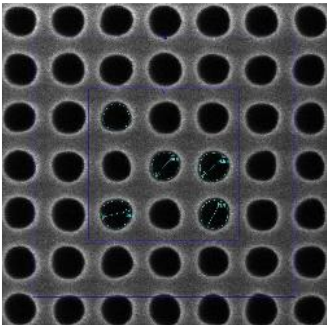


# 46JTP096SJE3 (2225DNDN001 slot 16) Reference Data

Secondary Targets  
June 2022

## Anchor Target

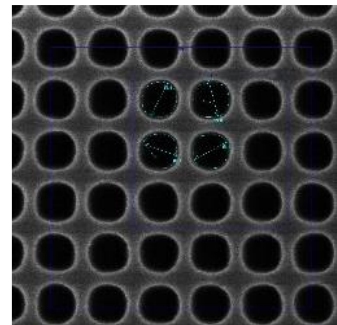
C60P120 (XCH\*)



Full Wafer Avg CD:	67.91	nm
Full wafer 1sigma CD:	0.95	nm
Die-to-Die 1sigma		
Avg:	1.66	nm
RMS:	1.78	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

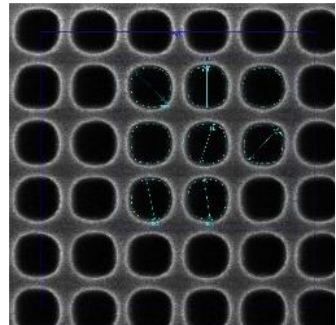
## Secondary Targets

C64P128 (ACH\*)



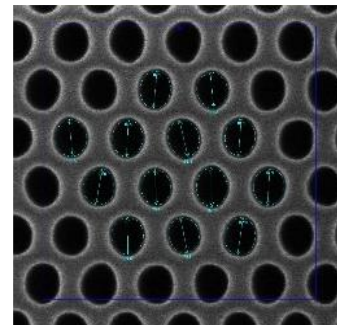
Full Wafer Avg CD:	84.7	nm
Full wafer 1sigma CD:	0.95	nm
Die-to-Die 1 sigma:		
Avg:	2.03	nm
RMS:	2.30	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

C70P140 (BCH\*)



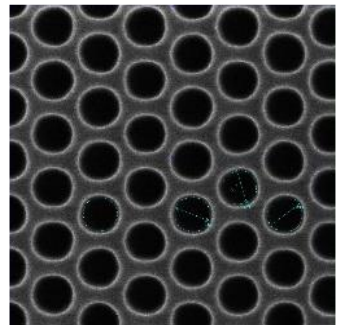
Full Wafer Avg CD:	98.5	nm
Full wafer 1sigma CD:	0.66	nm
Die-to-Die 1 sigma:		
Avg:	0.78	nm
RMS:	0.83	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	80.87	nm
Full wafer 1sigma CD:	0.65	nm
Die-to-Die 1 sigma		
Avg:	1.28	nm
RMS:	1.30	nm
Ellipticity Avg:	1.20	
FOV:	800	nm

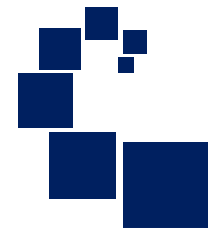
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.5	nm
Full wafer 1sigma CD:	1.26	nm
Die-to-Die 1 sigma		
Avg:	3.21	nm
RMS:	4.03	nm
Ellipticity Avg:	1.07	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP095SJA1 (2225DNDN001 slot 17) Reference Data

## C60P120 Anchor Target

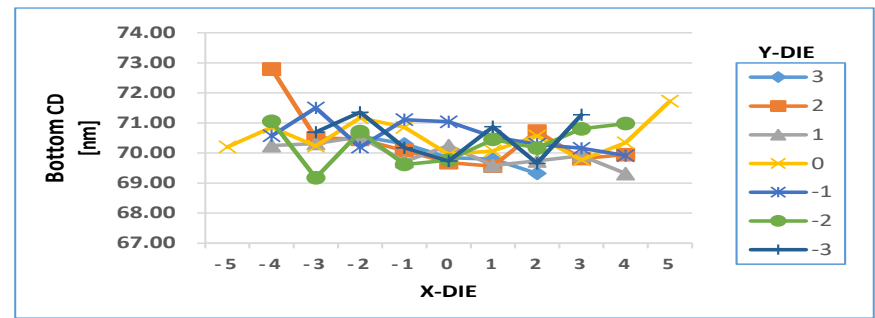
June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.35	nm	Average of all individual die CD averages (25 targets/die).
Full wafer 1sigma CD:	0.66	nm	Stdev of all die CD average of (25 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	1.53	nm	Arithmetic average value of feature-to-feature variation.
RMS:	1.62	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:	1.06		Average of ratio of major axis to minor axis.
FOV:	800	nm	Size of image (field-of-view).

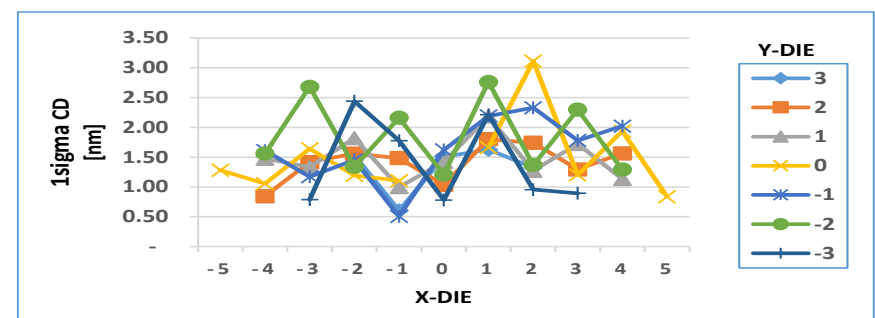
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				70.56	70.30	69.84	69.79	69.32			
2		72.80	70.50	70.46	70.08	69.68	69.56	70.73	69.81	69.95	
1		70.25	70.31	70.54	69.71	70.24	69.58	69.74	69.91	69.31	
0	70.20	70.85	70.23	71.17	70.85	69.95	70.07	70.57	69.77	70.34	71.72
-1		70.57	71.50	70.19	71.11	71.04	70.54	70.29	70.16	69.91	
-2		71.05	69.17	70.71	69.62	69.76	70.45	70.17	70.80	70.98	
-3			70.69	71.36	70.17	69.73	70.87	69.65	71.27		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.53	0.60	1.50	1.63	1.33			
2		0.85	1.42	1.56	1.49	1.04	1.80	1.74	1.30	1.56	
1		1.47	1.33	1.82	1.00	1.42	2.18	1.27	1.72	1.13	
0	1.28	1.05	1.64	1.19	1.11	0.49	1.66	3.11	1.20	1.94	0.84
-1		1.61	1.17	1.46	0.51	1.62	2.19	2.33	1.78	2.02	
-2		1.56	2.68	1.34	2.16	1.21	2.76	1.37	2.30	1.29	
-3			0.79	2.44	1.78	0.78	2.21	0.96	0.90		





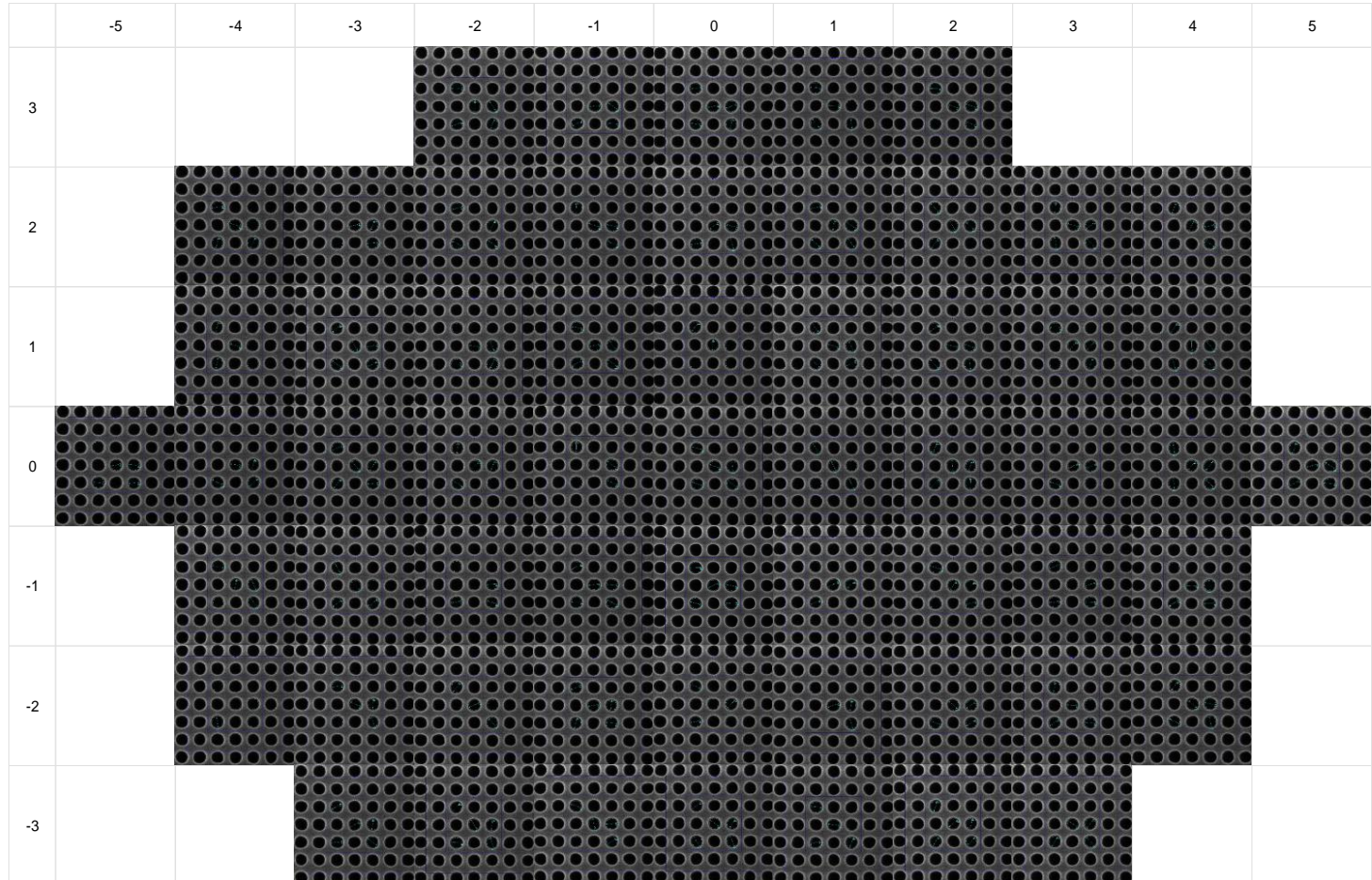
# 46JTP095SJA1 (2225DNDN001 slot 17) Reference Data

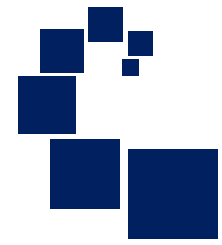
C60P120 Anchor Target

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C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	70.35	nm
Full wafer 1sigma CD:	0.66	nm
Die-to-Die 1sigma		
Avg:	1.53	nm
RMS:	1.62	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





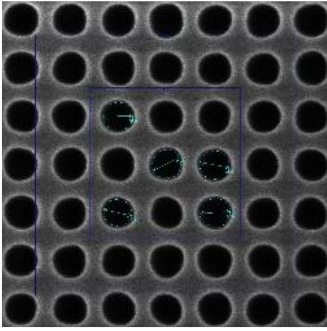
# 46JTP095SJA1 (2225DNDN001 slot 17) Reference Data

## Secondary Targets

June 2022

### Anchor Target

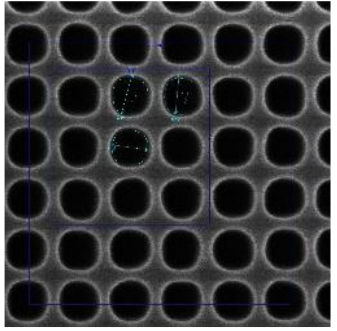
C60P120 (XCH\*)



Full Wafer Avg CD:	70.35	nm
Full wafer 1sigma CD:	0.66	nm
Die-to-Die 1 sigma		
Avg:	1.53	nm
RMS:	1.62	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

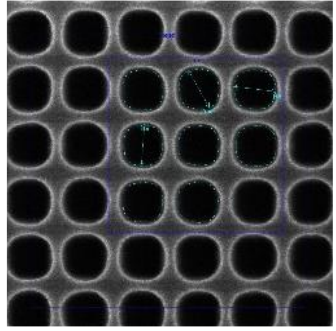
### Secondary Targets

C64P128 (ACH\*)



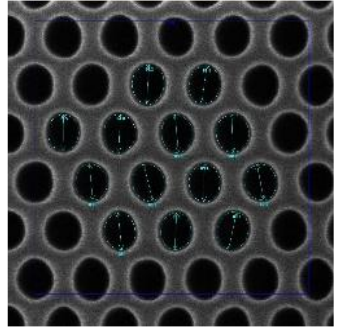
Full Wafer Avg CD:	84.3	nm
Full wafer 1sigma CD:	2.15	nm
Die-to-Die 1 sigma		
Avg:	3.96	nm
RMS:	4.33	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

C70P140 (BCH\*)



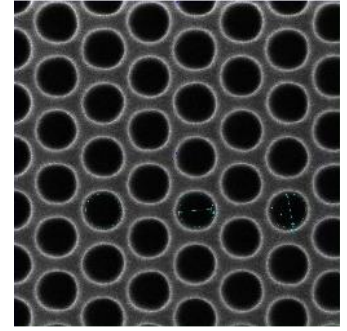
Full Wafer Avg CD:	100.2	nm
Full wafer 1sigma CD:	0.45	nm
Die-to-Die 1 sigma		
Avg:	0.71	nm
RMS:	0.75	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	83.05	nm
Full wafer 1sigma CD:	0.60	nm
Die-to-Die 1 sigma		
Avg:	1.48	nm
RMS:	1.50	nm
Ellipticity Avg:	1.20	
FOV:	800	nm

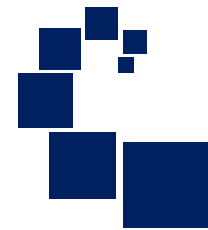
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	103.3	nm
Full wafer 1sigma CD:	1.37	nm
Die-to-Die 1 sigma		
Avg:	4.42	nm
RMS:	4.78	nm
Ellipticity Avg:	1.09	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP094SJD2 (2225DNDN001 slot 18) Reference Data

## C60P120 Anchor Target

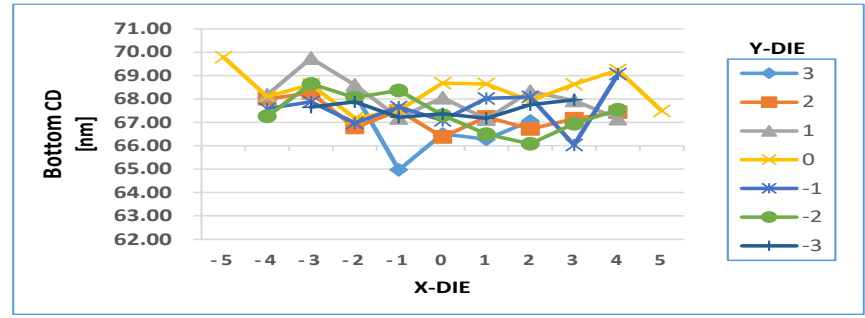
June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	67.64	nm	Average of all individual die CD averages (25 targets/die).
Full wafer 1sigma CD:	0.90	nm	Stdev of all die CD average of (25 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	1.59	nm	Arithmetic average value of feature-to-feature variation.
RMS:	1.74	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:	1.07		Average of ratio of major axis to minor axis.
FOV:	800	nm	Size of image (field-of-view).

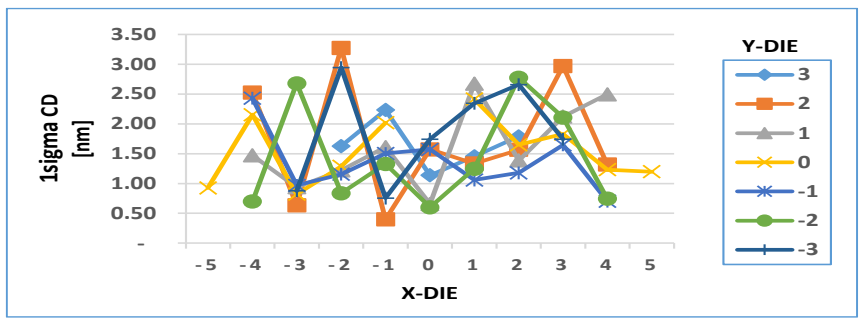
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				68.23	64.97	66.50	66.28	67.06			
2		68.01	68.26	66.78	67.51	66.37	67.23	66.72	67.16	67.44	
1		68.18	69.75	68.61	67.19	68.06	67.14	68.33	67.94	67.16	
0	69.79	68.10	68.62	67.18	67.51	68.68	68.65	67.92	68.63	69.24	67.49
-1		67.59	67.88	66.97	67.65	67.09	68.03	68.09	66.03	69.07	
-2		67.26	68.65	68.06	68.37	67.31	66.50	66.08	66.94	67.54	
-3			67.65	67.88	67.22	67.37	67.18	67.76	67.97		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.63	2.23	1.14	1.45	1.79			
2		2.52	0.63	3.28	0.40	1.57	1.34	1.57	2.97	1.32	
1		1.47	0.94	1.22	1.61	0.66	2.67	1.39	2.12	2.50	
0	0.93	2.15	0.82	1.29	2.02	1.03	2.42	1.65	1.83	1.23	1.20
-1		2.43	0.97	1.16	1.50	1.57	1.06	1.18	1.65	0.70	
-2		0.70	2.68	0.84	1.33	0.60	1.25	2.78	2.11	0.75	
-3			0.88	2.95	0.76	1.74	2.34	2.66	1.74		





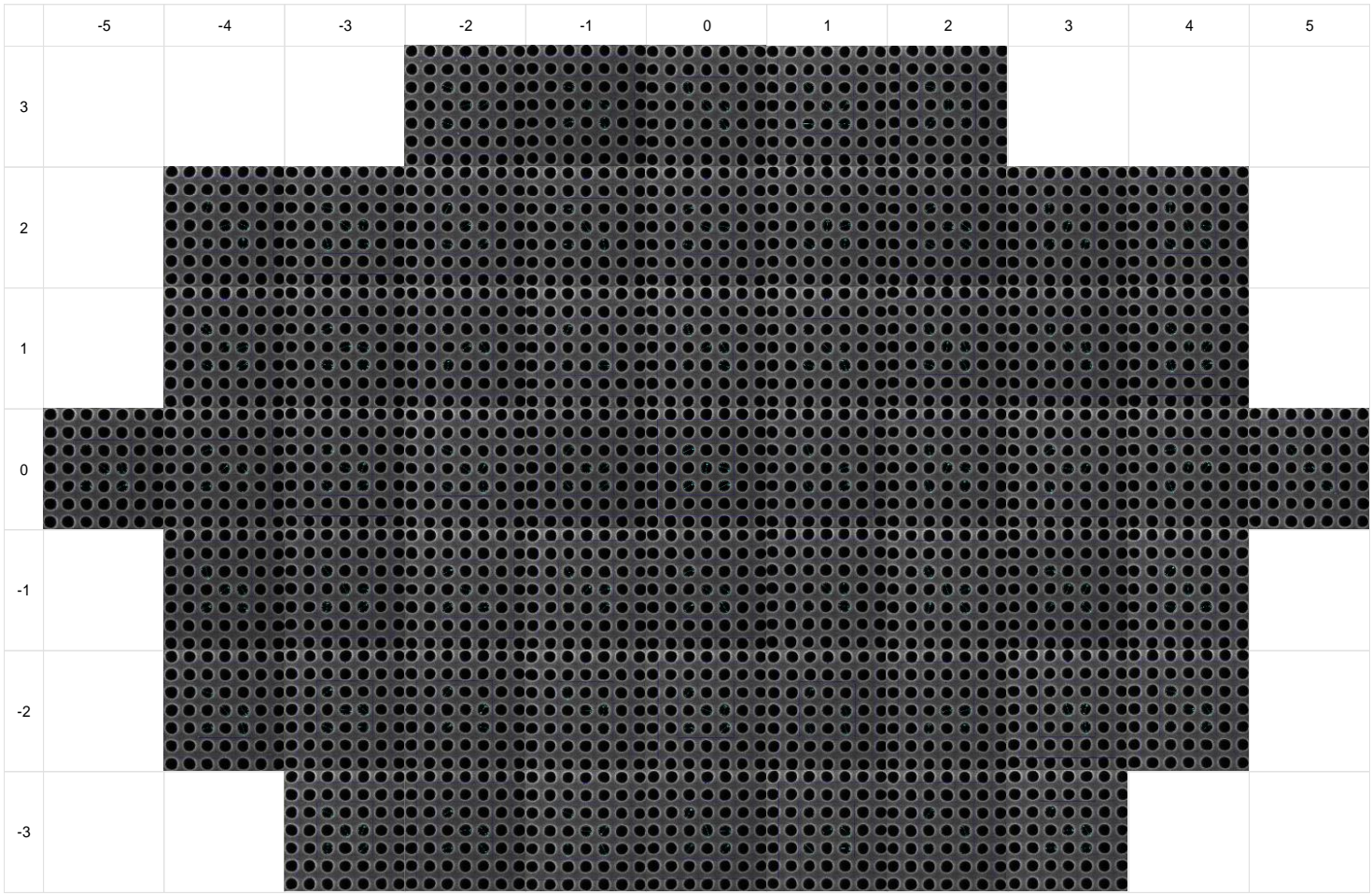
# 46JTP094SJD2 (2225DNDN001 slot 18) Reference Data

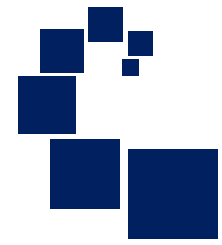
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	67.64	nm
Full wafer 1sigma CD:	0.90	nm
Die-to-Die 1sigma		
Avg:	1.59	nm
RMS:	1.74	nm
Ellipticity Avg:	1.07	
FOV:	800	nm





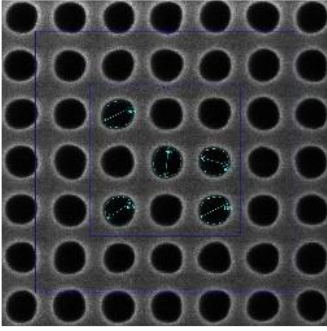
# 46JTP094SJD2 (2225DNDN001 slot 18) Reference Data

## Secondary Targets

June 2022

### Anchor Target

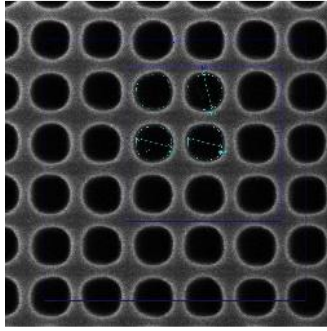
C60P120 (XCH\*)



Full Wafer Avg CD:	67.64	nm
Full wafer 1sigma CD:	0.90	nm
Die-to-Die 1sigma		
Avg:	1.59	nm
RMS:	1.74	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

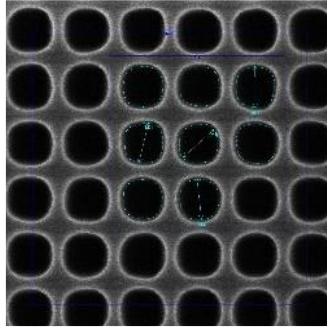
### Secondary Targets

C64P128 (ACH\*)



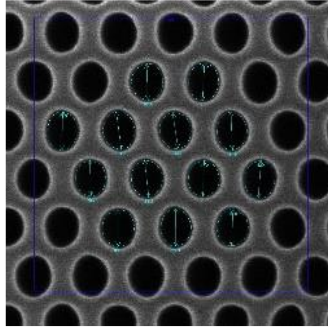
Full Wafer Avg CD:	84.5	nm
Full wafer 1sigma CD:	1.48	nm
Die-to-Die 1 sigma:		
Avg:	2.24	nm
RMS:	2.84	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

C70P140 (BCH\*)



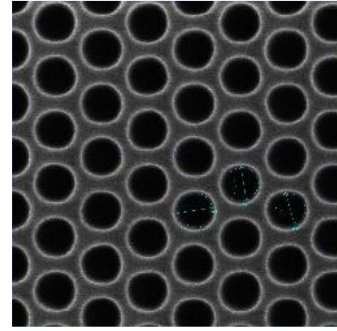
Full Wafer Avg CD:	98.4	nm
Full wafer 1sigma CD:	0.67	nm
Die-to-Die 1 sigma:		
Avg:	0.68	nm
RMS:	0.70	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	81.27	nm
Full wafer 1sigma CD:	0.68	nm
Die-to-Die 1 sigma:		
Avg:	1.41	nm
RMS:	1.46	nm
Ellipticity Avg:	1.21	
FOV:	800	nm

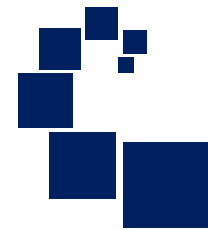
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	101.0	nm
Full wafer 1sigma CD:	2.47	nm
Die-to-Die 1 sigma:		
Avg:	4.09	nm
RMS:	4.87	nm
Ellipticity Avg:	1.11	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP093SJG3 (2225DNDN001 slot 19) Reference Data

## C60P120 Anchor Target

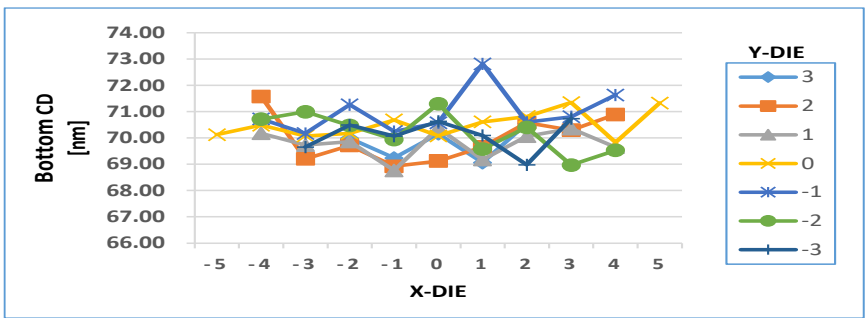
June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.24	nm	Average of all individual die CD averages (25 targets/die).	
Full wafer 1sigma CD:	0.77	nm	Stdev of all die CD average of (25 targets/die), represents across wafer variation.	
Die-to-Die 1sigma			Feature-to-feature variation within grating.	
Avg:		1.53	nm	Arithmetic average value of feature-to-feature variation.
RMS:		1.63	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:		1.06		Average of ratio of major axis to minor axis.
FOV:		800	nm	Size of image (field-of-view).

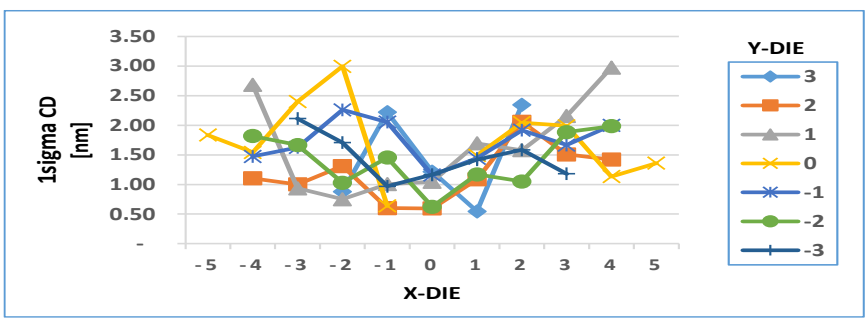
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				69.98	69.24	70.16	69.06	70.56			
2		71.58	69.21	69.71	68.92	69.12	69.66	70.59	70.30	70.89	
1		70.18	69.73	69.86	68.77	70.38	69.18	70.07	70.36	69.65	
0	70.13	70.49	70.07	70.18	70.69	70.08	70.61	70.81	71.35	69.83	71.33
-1		70.72	70.17	71.26	70.24	70.58	72.82	70.60	70.81	71.63	
-2		70.71	71.00	70.47	69.94	71.30	69.58	70.40	68.97	69.53	
-3			69.65	70.49	70.07	70.63	70.09	68.98	70.73		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				0.88	2.22	1.22	0.55	2.35			
2		1.10	1.00	1.31	0.60	0.60	1.09	2.06	1.51	1.42	
1		2.68	0.94	0.75	1.01	1.05	1.69	1.58	2.16	2.98	
0	1.84	1.54	2.40	3.00	0.64	1.04	1.49	2.05	1.99	1.14	1.36
-1		1.47	1.63	2.26	2.05	1.16	1.44	1.92	1.67	2.00	
-2		1.82	1.67	1.03	1.45	0.62	1.17	1.05	1.88	1.99	
-3			2.11	1.71	0.97	1.17	1.42	1.59	1.18		





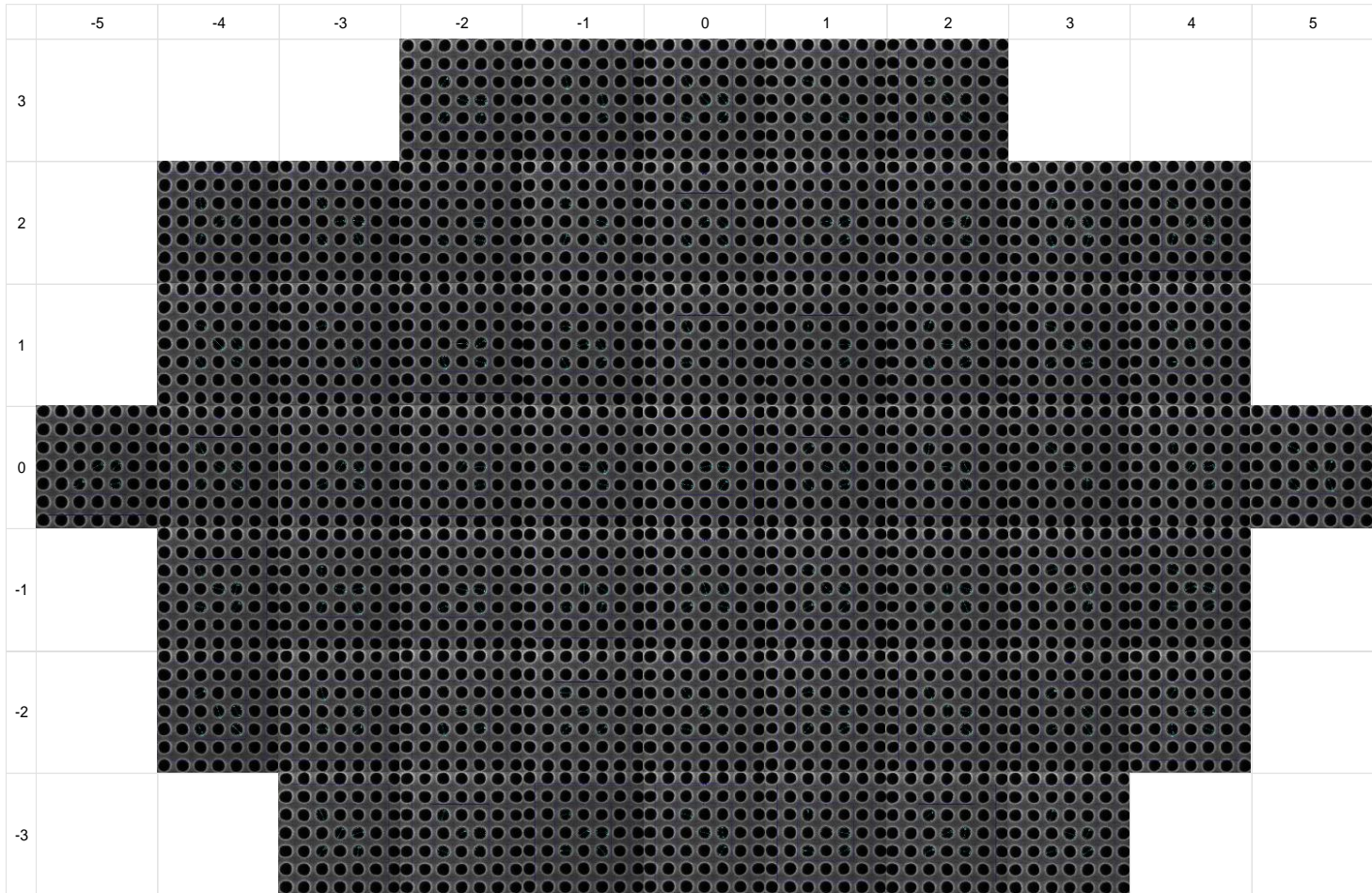
# 46JTP093SJG3 (2225DNDN001 slot 19) Reference Data

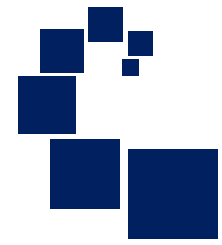
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	70.24	nm
Full wafer 1sigma CD:	0.77	nm
Die-to-Die 1sigma		
Avg:	1.53	nm
RMS:	1.63	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





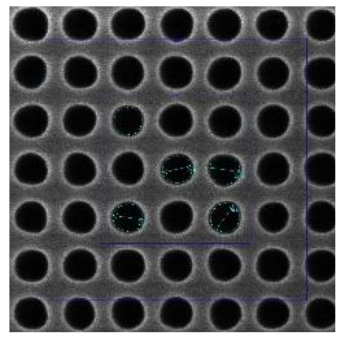
# 46JTP093SJG3 (2225DNDN001 slot 19) Reference Data

## Secondary Targets

June 2022

### Anchor Target

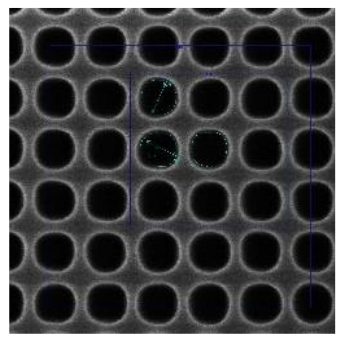
C60P120 (XCH\*)



Full Wafer Avg CD:	70.24	nm
Full wafer 1sigma CD:	0.77	nm
Die-to-Die 1sigma		
Avg:	1.53	nm
RMS:	1.63	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

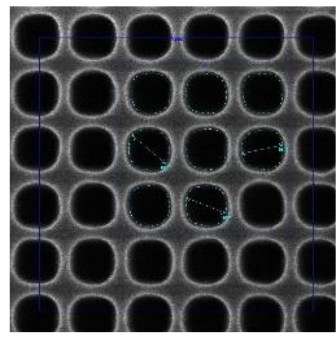
### Secondary Targets

C64P128 (ACH\*)



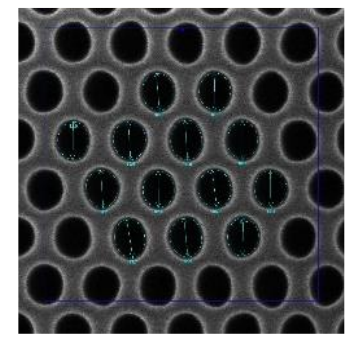
Full Wafer Avg CD:	84.3	nm
Full wafer 1sigma CD:	1.95	nm
Die-to-Die 1 sigma:		
Avg:	3.86	nm
RMS:	4.14	nm
Ellipticity Avg:	1.15	
FOV:	800	nm

C70P140 (BCH\*)



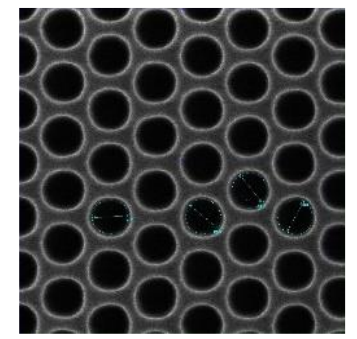
Full Wafer Avg CD:	100.1	nm
Full wafer 1sigma CD:	0.55	nm
Die-to-Die 1 sigma:		
Avg:	0.67	nm
RMS:	0.70	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	83.03	nm
Full wafer 1sigma CD:	0.68	nm
Die-to-Die 1 sigma		
Avg:	1.26	nm
RMS:	1.30	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

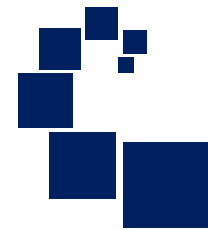
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	103.8	nm
Full wafer 1sigma CD:	1.39	nm
Die-to-Die 1 sigma		
Avg:	4.35	nm
RMS:	5.20	nm
Ellipticity Avg:	1.11	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP092SJC1 (2225DNDN001 slot 20) Reference Data

## C60P120 Anchor Target

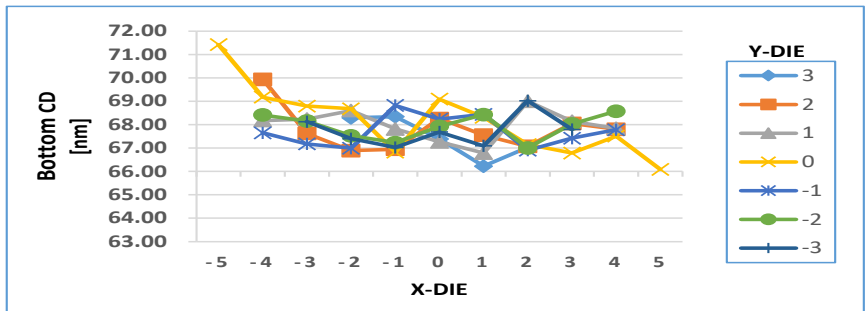
June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	67.87	nm	Average of all individual die CD averages (25 targets/die).
Full wafer 1sigma CD:	0.91	nm	Stddev of all die CD average of (25 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	1.77	nm	Arithmetic average value of feature-to-feature variation.
RMS:	1.89	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:	1.07		Average of ratio of major axis to minor axis.
FOV:	800	nm	Size of image (field-of-view).

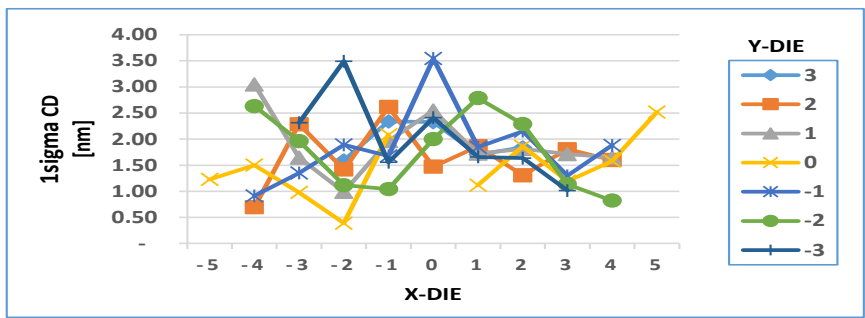
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				68.30	68.34	67.39	66.23	67.03			
2		69.94	67.63	66.89	66.95	68.27	67.55	67.07	68.05	67.81	
1		68.18	68.24	68.60	67.82	67.26	66.79	69.01	68.15	67.85	
0	71.43	69.18	68.80	68.68	66.82	69.09	68.32	67.15	66.79	67.51	66.09
-1		67.65	67.18	66.99	68.82	68.24	68.44	66.91	67.42	67.78	
-2		68.42	68.15	67.53	67.24	67.93	68.43	67.01	68.03	68.58	
-3			68.13	67.40	67.03	67.69	67.09	69.03	67.80		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.59	2.34	2.33	1.70	1.84			
2		0.70	2.29	1.42	2.62	1.47	1.86	1.31	1.81	1.60	
1		3.05	1.64	0.99	1.96	2.55	1.72	1.81	1.72	1.65	
0	1.23	1.50	0.98	0.39	2.09	1.28	1.12	1.86	1.19	1.58	2.52
-1		0.91	1.35	1.89	1.68	3.55	1.85	2.15	1.30	1.88	
-2		2.63	1.96	1.12	1.04	2.00	2.79	2.29	1.13	0.82	
-3			2.31	3.49	1.56	2.41	1.66	1.64	1.01		





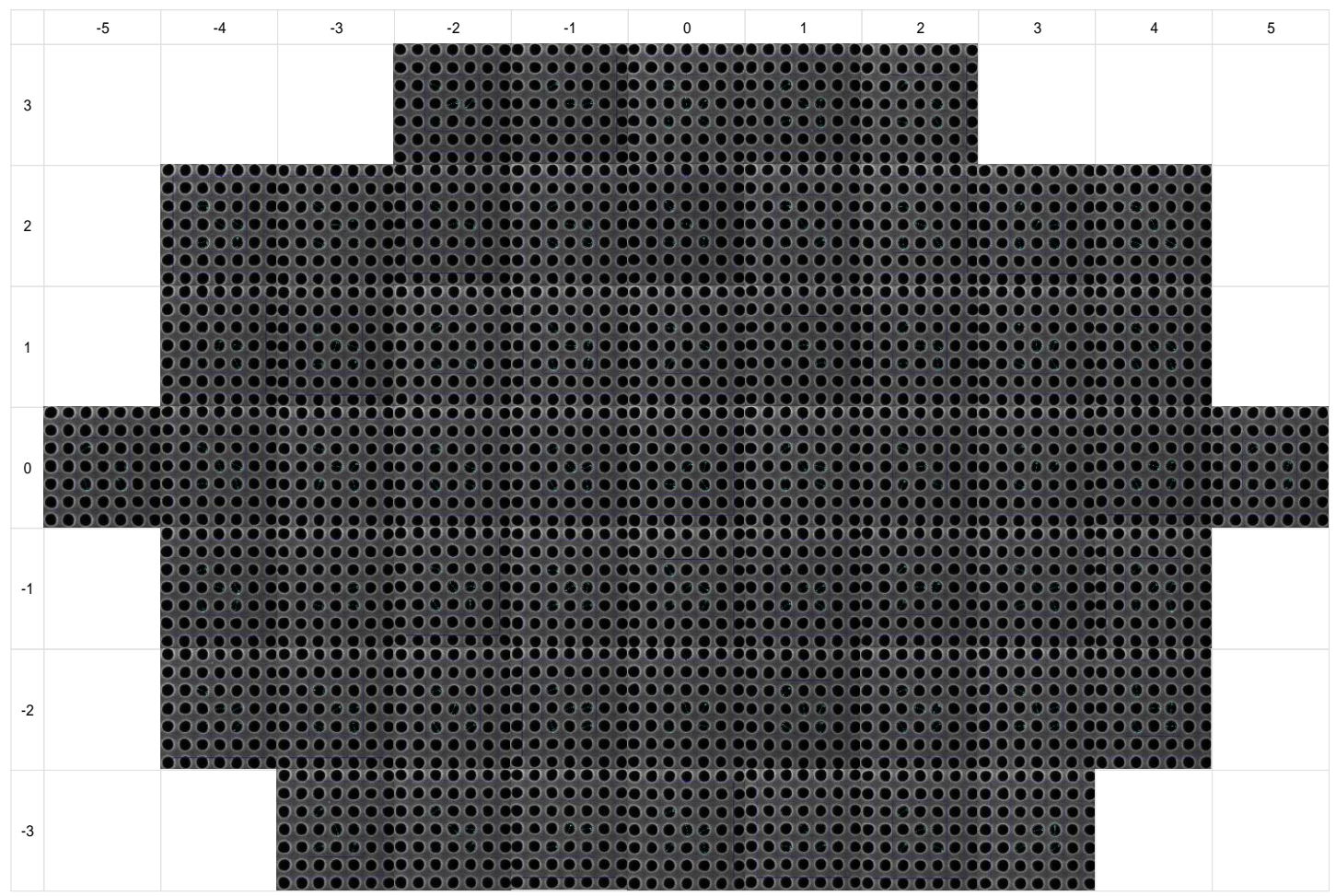
# 46JTP092SJC1 (2225DNDN001 slot 20) Reference Data

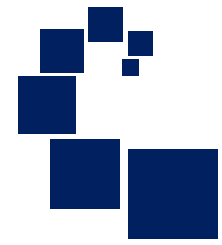
C60P120 Anchor Target

June 2022

## C60P120 Anchor Target CD-SEM image wafer map

Full Wafer Avg CD:	67.87	nm
Full wafer 1sigma CD:	0.91	nm
Die-to-Die 1sigma		
	Avg:	1.77 nm
	RMS:	1.89 nm
Ellipticity Avg:	1.07	
FOV:	800	nm





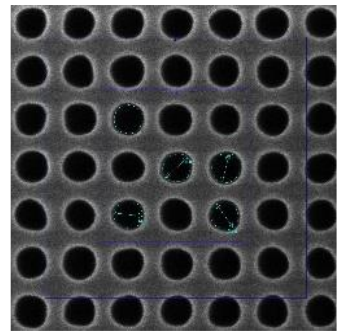
# 46JTP092SJC1 (2225DNDN001 slot 20) Reference Data

## Secondary Targets

June 2022

### Anchor Target

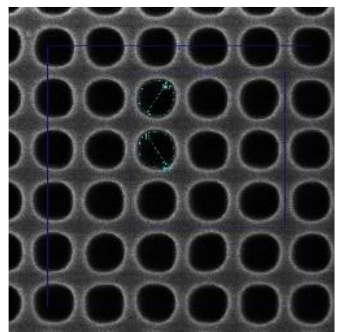
C60P120 (XCH\*)



Full Wafer Avg CD:	67.87	nm
Full wafer 1sigma CD:	0.91	nm
Die-to-Die 1 sigma		
Avg:	1.77	nm
RMS:	1.89	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

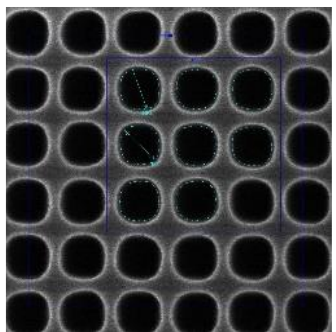
### Secondary Targets

C64P128 (ACH\*)



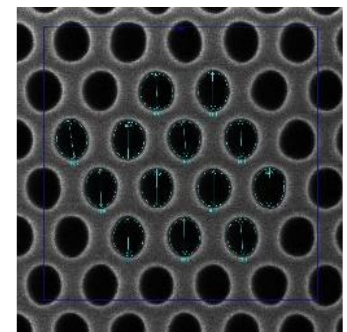
Full Wafer Avg CD:	84.8	nm
Full wafer 1sigma CD:	1.22	nm
Die-to-Die 1 sigma		
Avg:	1.64	nm
RMS:	2.11	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

C70P140 (BCH\*)



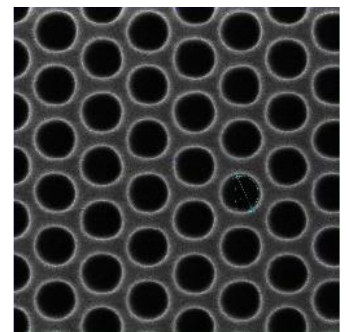
Full Wafer Avg CD:	98.4	nm
Full wafer 1sigma CD:	0.69	nm
Die-to-Die 1 sigma		
Avg:	0.73	nm
RMS:	0.76	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	80.96	nm
Full wafer 1sigma CD:	0.68	nm
Die-to-Die 1 sigma		
Avg:	1.21	nm
RMS:	1.23	nm
Ellipticity Avg:	1.20	
FOV:	800	nm

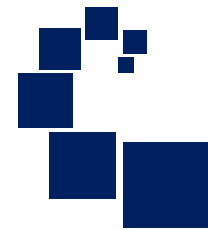
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	101.9	nm
Full wafer 1sigma CD:	3.51	nm
Die-to-Die 1 sigma		
Avg:	2.21	nm
RMS:	2.68	nm
Ellipticity Avg:	1.09	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP091SJF2 (2225DNDN001 slot 21) Reference Data

## C60P120 Anchor Target

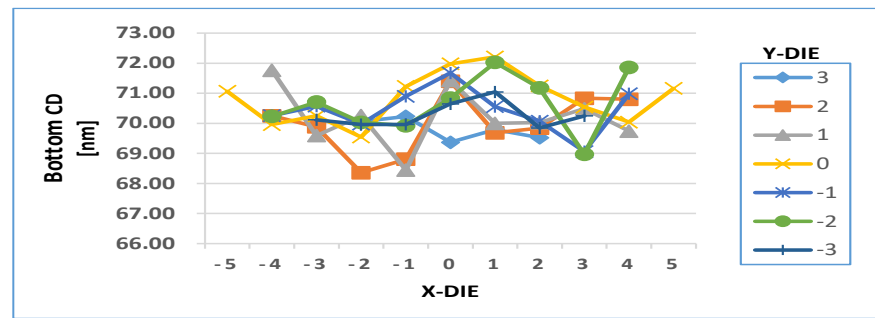
June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.36	nm	Average of all individual die CD averages (25 targets/die).
Full wafer 1sigma CD:	0.86	nm	Stddev of all die CD average of (25 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	1.63	nm	Arithmetic average value of feature-to-feature variation.
RMS:	1.72	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:	1.06		Average of ratio of major axis to minor axis.
FOV:	800	nm	Size of image (field-of-view).

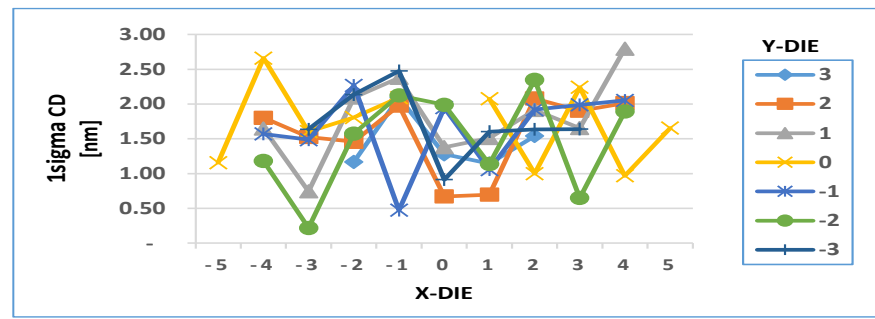
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				70.05	70.23	69.37	69.79	69.52			
2		70.25	69.88	68.35	68.80	71.40	69.68	69.84	70.83	70.80	
1		71.76	69.59	70.26	68.44	71.42	70.00	70.02	70.49	69.74	
0	71.07	69.96	70.25	69.54	71.23	71.98	72.21	71.24	70.54	70.04	71.16
-1		70.25	70.57	69.98	70.90	71.67	70.55	70.07	69.06	70.98	
-2		70.23	70.71	70.03	69.92	70.84	72.03	71.18	68.96	71.86	
-3			70.12	69.96	69.96	70.65	71.04	69.84	70.25		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.17	2.09	1.28	1.14	1.54			
2		1.80	1.53	1.46	1.98	0.67	0.70	2.08	1.90	2.01	
1		1.65	0.74	2.09	2.38	1.38	1.51	1.92	1.65	2.80	
0	1.16	2.66	1.60	1.81	2.09	1.44	2.08	1.00	2.24	0.97	1.65
-1		1.57	1.49	2.27	0.47	1.95	1.06	1.92	1.99	2.05	
-2		1.18	0.22	1.58	2.12	1.99	1.14	2.35	0.65	1.89	
-3			1.64	2.14	2.48	0.91	1.60	1.63	1.64		





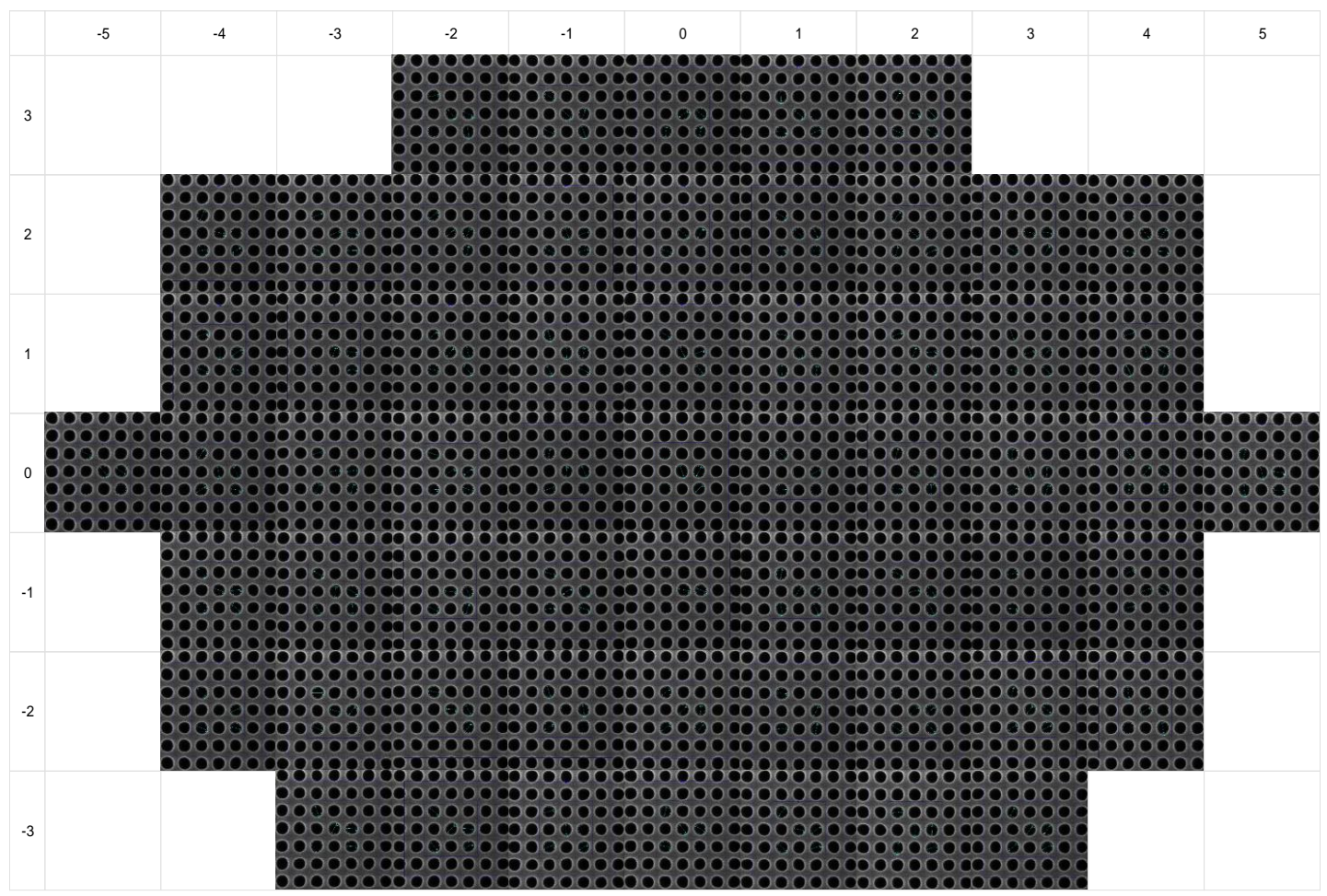
# 46JTP091SJF2 (2225DNDN001 slot 21) Reference Data

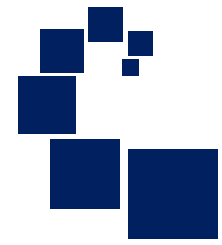
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	70.36	nm
Full wafer 1sigma CD:	0.86	nm
Die-to-Die 1sigma		
Avg:	1.63	nm
RMS:	1.72	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





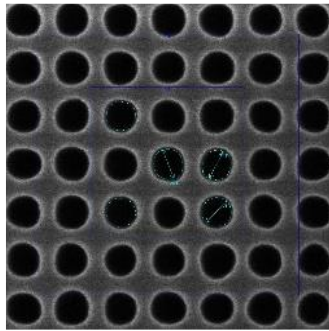
# 46JTP091SJF2 (2225DNDN001 slot 21) Reference Data

## Secondary Targets

June 2022

### Anchor Target

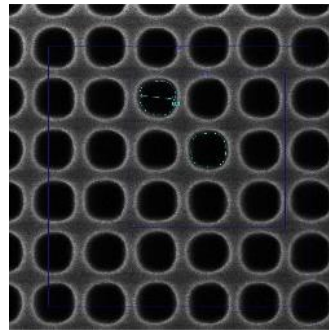
C60P120 (XCH\*)



Full Wafer Avg CD:	70.36	nm
Full wafer 1sigma CD:	0.86	nm
Die-to-Die 1 sigma		
Avg:	1.63	nm
RMS:	1.72	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

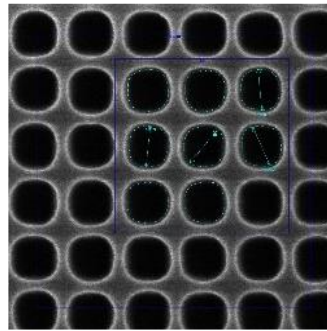
### Secondary Targets

C64P128 (ACH\*)



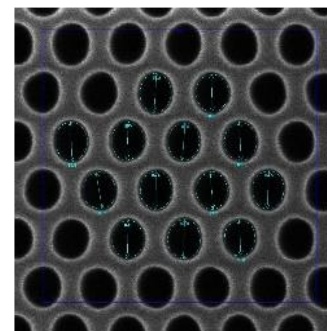
Full Wafer Avg CD:	86.0	nm
Full wafer 1sigma CD:	1.69	nm
Die-to-Die 1 sigma		
Avg:	2.52	nm
RMS:	3.25	nm
Ellipticity Avg:	1.09	
FOV:	800	nm

C70P140 (BCH\*)



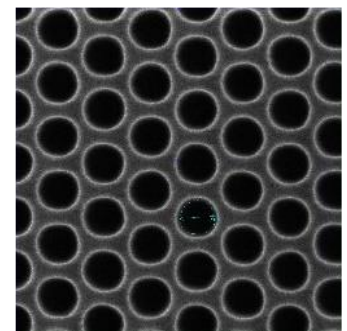
Full Wafer Avg CD:	100.2	nm
Full wafer 1sigma CD:	0.67	nm
Die-to-Die 1 sigma		
Avg:	0.72	nm
RMS:	0.74	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	83.23	nm
Full wafer 1sigma CD:	0.77	nm
Die-to-Die 1 sigma		
Avg:	1.40	nm
RMS:	1.41	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

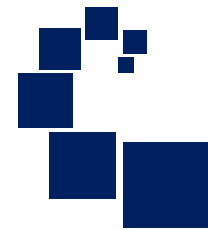
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.5	nm
Full wafer 1sigma CD:	3.44	nm
Die-to-Die 1 sigma		
Avg:	4.50	nm
RMS:	5.88	nm
Ellipticity Avg:	1.10	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP090SJB0 (2225DNDN001 slot 22) Reference Data

## C60P120 Anchor Target

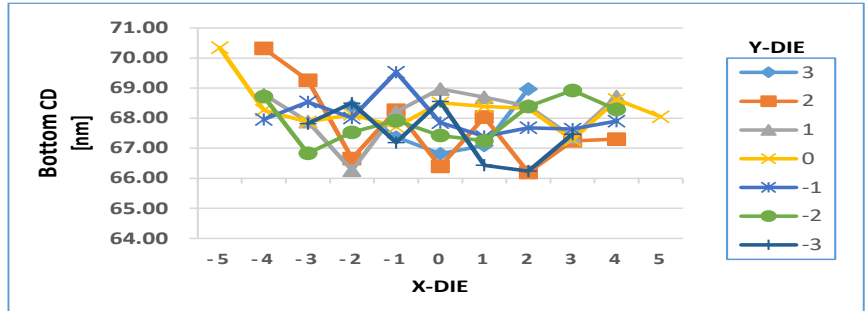
June 2022

- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	67.95	nm	Average of all individual die CD averages (25 targets/die).
Full wafer 1sigma CD:	0.90	nm	Stdev of all die CD average of (25 targets/die), represents across wafer variation.
Die-to-Die 1sigma			Feature-to-feature variation within grating.
Avg:	1.68	nm	Arithmetic average value of feature-to-feature variation.
RMS:	1.77	nm	RMS average value of feature-to-feature variation.
Ellipticity Avg:	1.07		Average of ratio of major axis to minor axis.
FOV:	800	nm	Size of image (field-of-view).

### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				68.40	67.37	66.81	67.09	68.97			
2		70.32	69.26	66.66	68.27	66.39	68.03	66.19	67.24	67.30	
1		68.79	67.88	66.26	68.21	68.97	68.69	68.40	67.37	68.72	
0	70.34	68.26	67.87	68.12	67.71	68.51	68.39	68.33	67.28	68.62	68.05
-1		67.96	68.54	68.01	69.53	67.85	67.39	67.68	67.63	67.90	
-2		68.72	66.83	67.53	67.92	67.42	67.25	68.39	68.92	68.28	
-3			67.82	68.50	67.19	68.56	66.43	66.24	67.47		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.59	1.90	1.43	0.39	2.20			
2		1.30	1.43	2.31	1.67	1.31	1.86	2.24	1.33	0.35	
1		1.57	0.97	2.48	2.70	1.52	1.92	1.47	2.17	1.70	
0	1.83	1.62	1.33	2.21	1.95	2.29	1.91	1.35	1.16	1.79	1.20
-1		0.54	1.35	1.84	2.12	1.10	1.34	1.25	2.04	2.27	
-2		1.31	2.55	2.20	1.25	2.91	1.82	1.71	1.55	1.57	
-3			2.84	2.08	2.25	0.82	1.97	0.78	1.79		





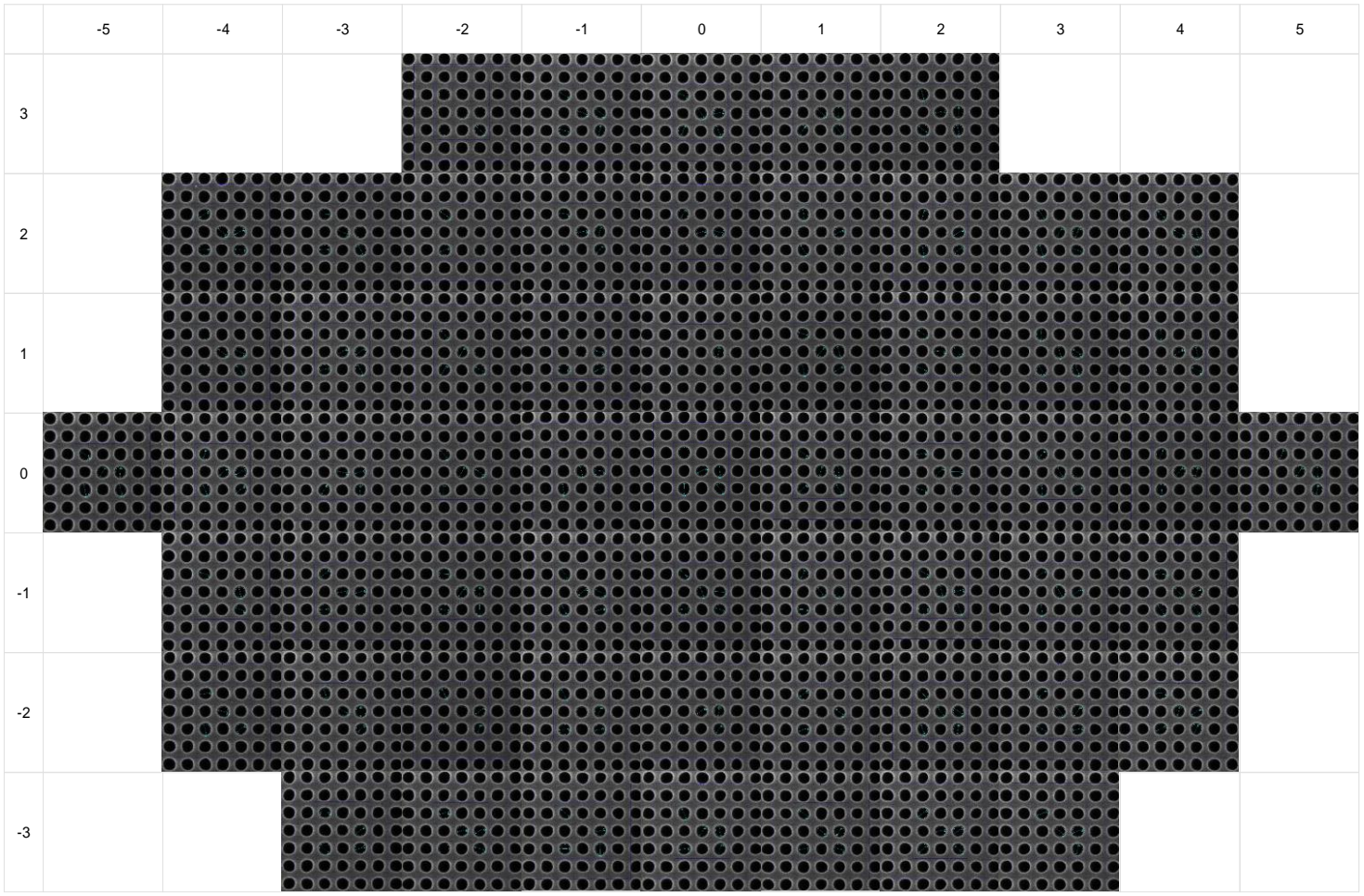
# 46JTP090SJB0 (2225DNDN001 slot 22) Reference Data

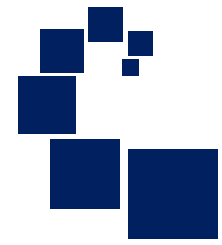
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	67.95	nm
Full wafer 1sigma CD:	0.90	nm
Die-to-Die 1sigma		
Avg:	1.68	nm
RMS:	1.77	nm
Ellipticity Avg:	1.07	
FOV:	800	nm





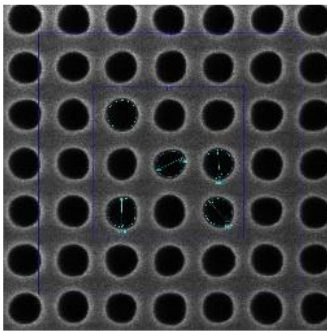
# 46JTP090SJB0 (2225DNDN001 slot 22) Reference Data

## Secondary Targets

June 2022

### Anchor Target

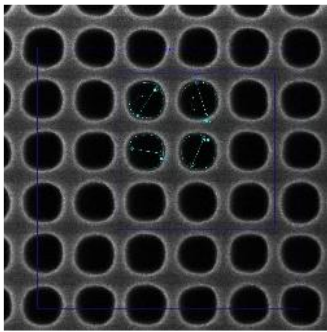
C60P120 (XCH\*)



Full Wafer Avg CD:	67.95	nm
Full wafer 1sigma CD:	0.90	nm
Die-to-Die 1sigma		
Avg:	1.68	nm
RMS:	1.77	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

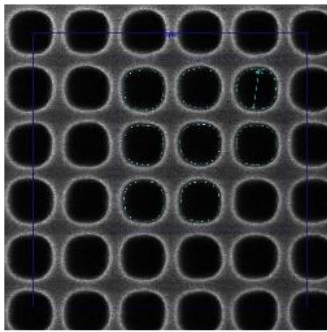
### Secondary Targets

C64P128 (ACH\*)



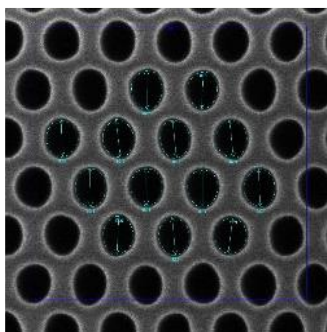
Full Wafer Avg CD:	84.7	nm
Full wafer 1sigma CD:	1.80	nm
Die-to-Die 1 sigma:		
Avg:	1.82	nm
RMS:	2.39	nm
Ellipticity Avg:	1.08	
FOV:	800	nm

C70P140 (BCH\*)



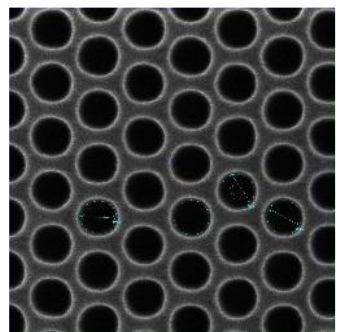
Full Wafer Avg CD:	98.7	nm
Full wafer 1sigma CD:	0.62	nm
Die-to-Die 1 sigma:		
Avg:	0.73	nm
RMS:	0.74	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	81.39	nm
Full wafer 1sigma CD:	0.69	nm
Die-to-Die 1 sigma		
Avg:	1.25	nm
RMS:	1.27	nm
Ellipticity Avg:	1.21	
FOV:	800	nm

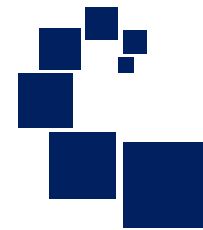
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	102.0	nm
Full wafer 1sigma CD:	1.60	nm
Die-to-Die 1 sigma		
Avg:	4.10	nm
RMS:	4.91	nm
Ellipticity Avg:	1.10	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP089SJF2 (2225DNDN001 slot 23) Reference Data

## C60P120 Anchor Target

June 2022

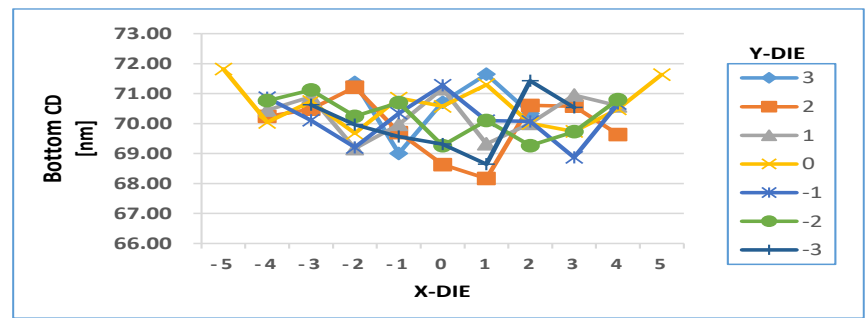
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.26	nm
Full wafer 1sigma CD:	0.82	nm
Die-to-Die 1sigma		
Avg:	1.65	nm
RMS:	1.74	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

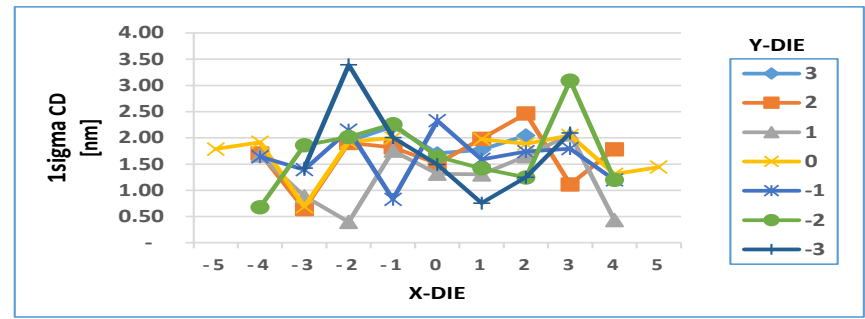
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				71.38	69.00	70.71	71.65	70.34			
2		70.24	70.48	71.21	69.70	68.63	68.16	70.61	70.58	69.63	
1		70.45	70.89	69.16	69.97	71.16	69.32	70.00	70.95	70.59	
0	71.82	70.04	70.74	69.67	70.85	70.57	71.30	70.00	69.74	70.49	71.63
-1		70.86	70.11	69.20	70.34	71.27	70.10	70.07	68.87	70.67	
-2		70.77	71.12	70.24	70.70	69.26	70.10	69.26	69.73	70.80	
-3			70.63	69.96	69.57	69.32	68.64	71.43	70.54		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.94	2.22	1.70	1.77	2.05			
2		1.70	0.64	1.91	1.82	1.51	1.98	2.46	1.11	1.78	
1		1.67	0.89	0.40	1.75	1.31	1.30	1.65	2.07	0.43	
0	1.79	1.92	0.69	1.92	2.00	2.20	1.98	1.89	2.05	1.31	1.44
-1		1.64	1.39	2.15	0.83	2.33	1.59	1.74	1.79	1.20	
-2		0.68	1.86	2.02	2.26	1.64	1.42	1.25	3.09	1.20	
-3			1.42	3.39	2.01	1.49	0.76	1.25	2.10		





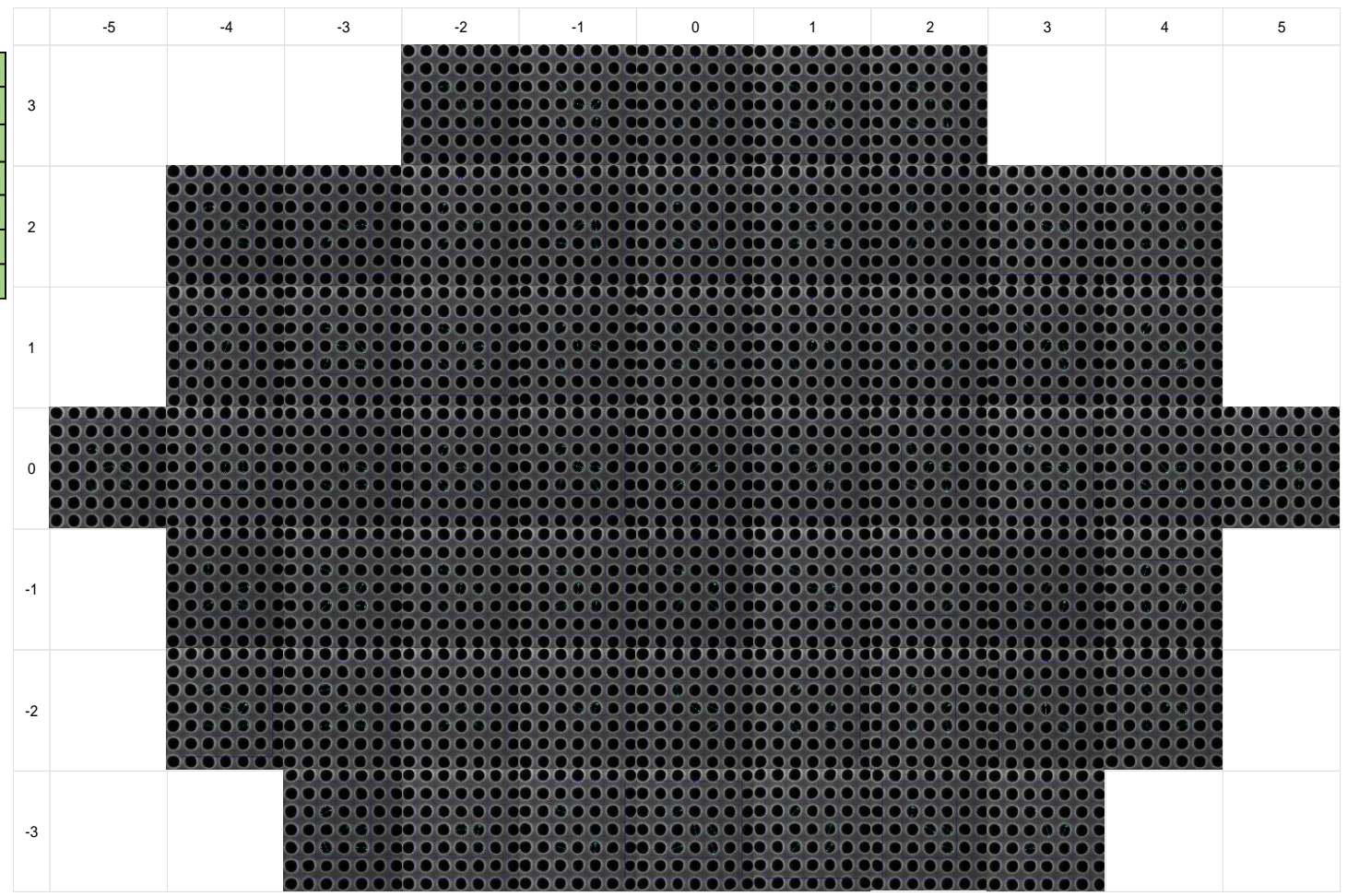
# 46JTP089SJF2 (2225DNDN001 slot 23) Reference Data

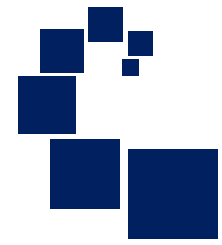
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	70.26	nm
Full wafer 1sigma CD:	0.82	nm
Die-to-Die 1sigma	Avg:	1.65 nm
	RMS:	1.74 nm
Ellipticity Avg:	1.06	
FOV:	800	nm





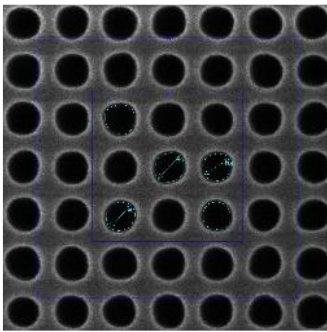
# 46JTP089SJF2 (2225DNDN001 slot 23) Reference Data

## Secondary Targets

June 2022

### Anchor Target

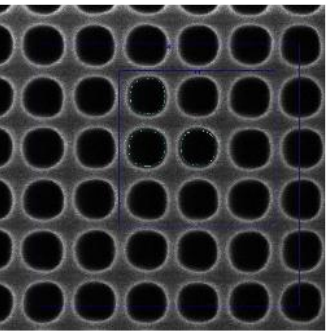
C60P120 (XCH\*)



Full Wafer Avg CD:	70.26	nm
Full wafer 1sigma CD:	0.82	nm
Die-to-Die 1sigma		
Avg:	1.65	nm
RMS:	1.74	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

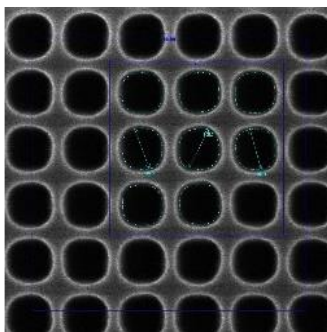
### Secondary Targets

C64P128 (ACH\*)



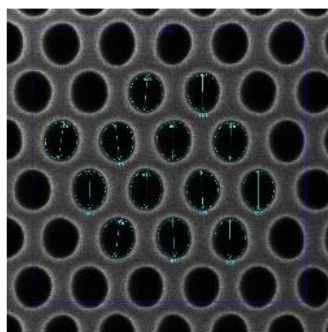
Full Wafer Avg CD:	84.5	nm
Full wafer 1sigma CD:	2.58	nm
Die-to-Die 1 sigma:		
Avg:	3.44	nm
RMS:	3.99	nm
Ellipticity Avg:	1.80	
FOV:	800	nm

C70P140 (BCH\*)



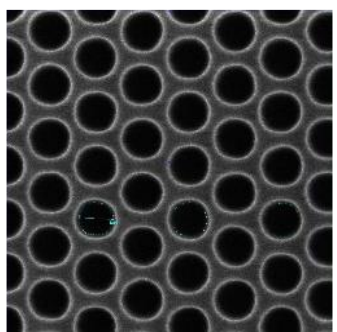
Full Wafer Avg CD:	100.1	nm
Full wafer 1sigma CD:	0.72	nm
Die-to-Die 1 sigma:		
Avg:	0.59	nm
RMS:	0.61	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	83.38	nm
Full wafer 1sigma CD:	0.66	nm
Die-to-Die 1 sigma:		
Avg:	1.24	nm
RMS:	1.25	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

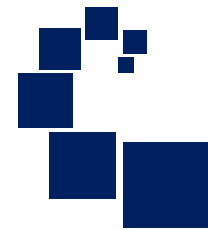
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	103.4	nm
Full wafer 1sigma CD:	2.05	nm
Die-to-Die 1 sigma:		
Avg:	3.63	nm
RMS:	4.12	nm
Ellipticity Avg:	1.08	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP088SJB0 (2225DNDN001 slot 24) Reference Data

## C60P120 Anchor Target

June 2022

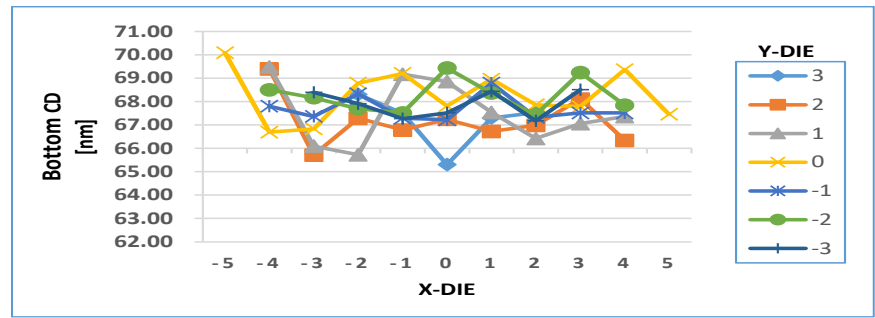
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	67.76	nm
Full wafer 1sigma CD:	1.02	nm
Die-to-Die 1sigma		
Avg:	1.77	nm
RMS:	1.86	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

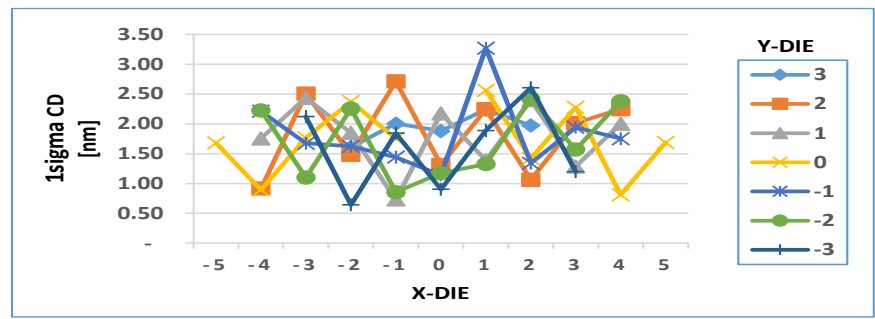
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				68.31	67.50	65.30	67.30	67.53			
2		69.40	65.71	67.29	66.78	67.24	66.73	66.99	68.11	66.34	
1		69.48	66.09	65.73	69.17	68.85	67.54	66.42	67.06	67.36	
0	70.09	66.69	66.84	68.79	69.21	67.81	68.96	67.86	67.79	69.37	67.46
-1		67.80	67.36	68.33	67.29	67.22	68.79	67.33	67.52	67.51	
-2		68.51	68.17	67.70	67.52	69.44	68.37	67.44	69.24	67.84	
-3			68.40	67.91	67.27	67.52	68.44	67.18	68.51		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				1.61	2.01	1.88	2.24	1.97			
2		0.91	2.51	1.48	2.71	1.31	2.25	1.06	2.01	2.25	
1		1.76	2.44	1.85	0.73	2.18	1.39	2.40	1.29	2.00	
0	1.68	0.90	1.76	2.37	1.75	1.24	2.56	1.42	2.28	0.81	1.69
-1		2.21	1.68	1.62	1.44	1.14	3.27	1.34	1.94	1.75	
-2		2.23	1.10	2.26	0.85	1.17	1.33	2.42	1.57	2.38	
-3			2.12	0.64	1.85	0.90	1.89	2.61	1.20		





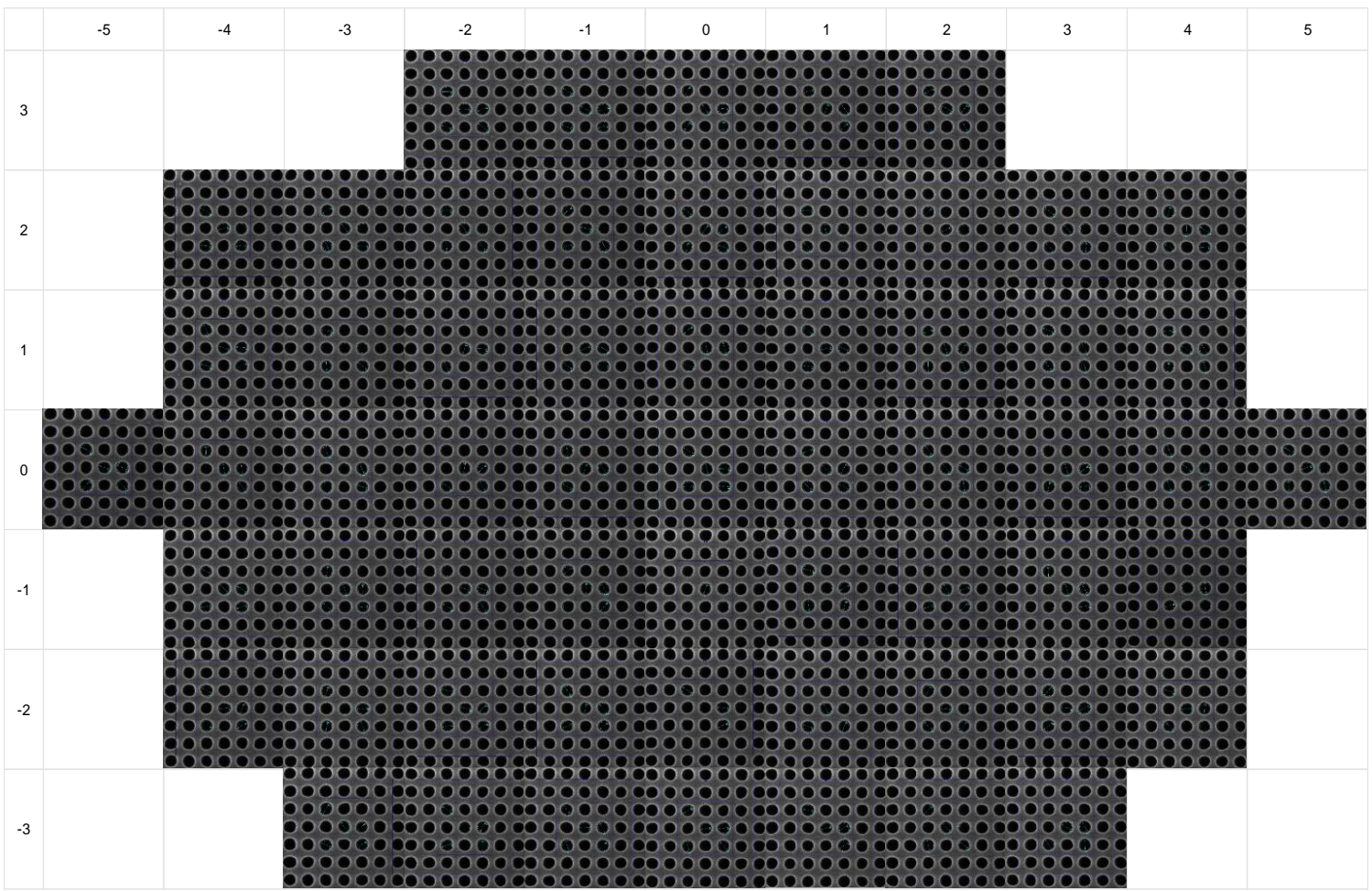
# 46JTP088SJB0 (2225DNDN001 slot 24) Reference Data

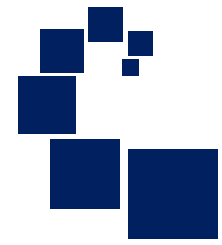
C60P120 Anchor Target

June 2022

C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	67.76	nm
Full wafer 1sigma CD:	1.02	nm
Die-to-Die 1sigma		
Avg:	1.77	nm
RMS:	1.86	nm
Ellipticity Avg:	1.07	
FOV:	800	nm





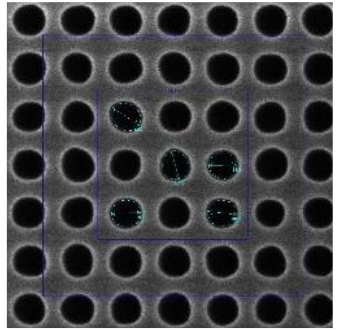
# 46JTP088SJB0 (2225DNDN001 slot 24) Reference Data

## Secondary Targets

June 2022

### Anchor Target

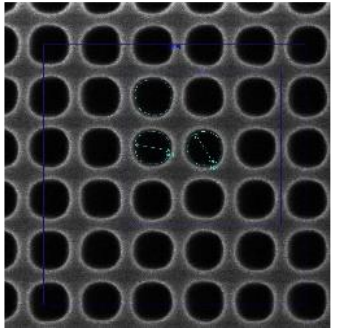
C60P120 (XCH\*)



Full Wafer Avg CD:	67.76	nm
Full wafer 1sigma CD:	1.02	nm
Die-to-Die 1sigma		
Avg:	1.77	nm
RMS:	1.86	nm
Ellipticity Avg:	1.07	
FOV:	800	nm

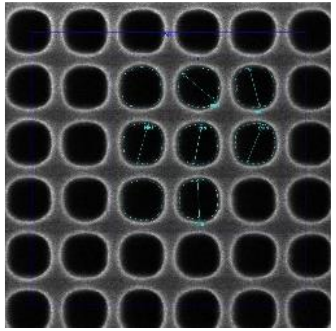
### Secondary Targets

C64P128 (ACH\*)



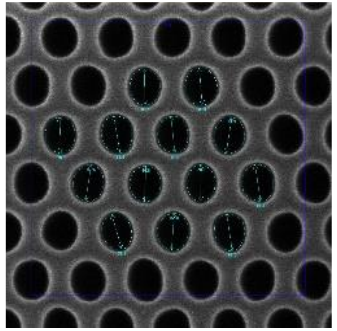
Full Wafer Avg CD:	84.8	nm
Full wafer 1sigma CD:	1.11	nm
Die-to-Die 1 sigma:		
Avg:	1.85	nm
RMS:	2.50	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

C70P140 (BCH\*)



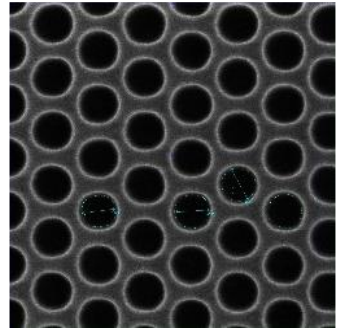
Full Wafer Avg CD:	98.7	nm
Full wafer 1sigma CD:	0.72	nm
Die-to-Die 1 sigma:		
Avg:	0.81	nm
RMS:	0.84	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	80.98	nm
Full wafer 1sigma CD:	0.55	nm
Die-to-Die 1 sigma		
Avg:	1.41	nm
RMS:	1.45	nm
Ellipticity Avg:	1.20	
FOV:	800	nm

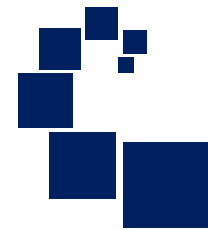
C80P165MEM (CCH2\*)



Full Wafer Avg CD:	103.4	nm
Full wafer 1sigma CD:	1.56	nm
Die-to-Die 1 sigma		
Avg:	2.90	nm
RMS:	3.72	nm
Ellipticity Avg:	1.07	
FOV:	1000	nm

\* Coding labels for CD data results files





# 46JTP087SJE1 (2225DNDN001 slot 25) Reference Data

## C60P120 Anchor Target

June 2022

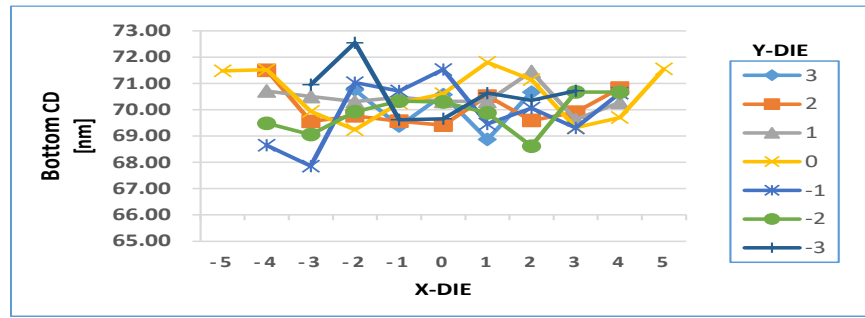
- All measurements in nm.
- Avg CD and 1sigma hole-to-hole variation for C60P120 anchor target for each die, reported for each die in wafer map format, and plotted to right.
- Average and 1sigma values are of 25 holes sampled at each site, from images on next page.
- Values reported by CD-SEM as hole “Bottom CD” correspond well to the CD of top opening of the HAR holes.

Full Wafer Avg CD:	70.24	nm
Full wafer 1sigma CD:	0.88	nm
Die-to-Die 1sigma		
Avg:	1.70	nm
RMS:	1.78	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

Average of all individual die CD averages (25 targets/die).  
 Stdev of all die CD average of (25 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 ratio of major axis to minor axis.  
 Size of image (field-of-view).

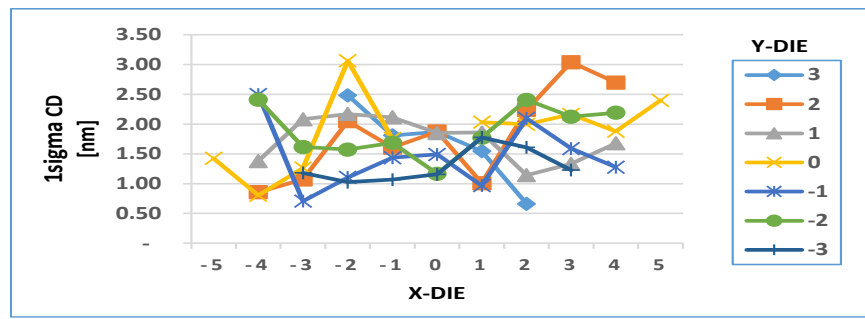
### C60P120 Anchor Target Avg CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				70.76	69.38	70.57	68.87	70.67			
2		71.50	69.56	69.77	69.56	69.42	70.52	69.59	69.91	70.82	
1		70.71	70.50	70.31	70.48	70.32	70.32	71.45	69.62	70.28	
0	71.48	71.52	69.94	69.24	70.26	70.61	71.80	71.15	69.32	69.71	71.56
-1		68.65	67.86	71.03	70.71	71.53	69.46	70.07	69.31	70.63	
-2		69.49	69.06	69.92	70.33	70.30	69.88	68.62	70.67	70.67	
-3			70.95	72.55	69.62	69.66	70.63	70.36	70.72		



### C60P120 Anchor Target 1sigma CD

	-5	-4	-3	-2	-1	0	1	2	3	4	5
3				2.48	1.81	1.87	1.54	0.66			
2		0.86	1.07	2.05	1.61	1.87	1.01	2.24	3.04	2.70	
1		1.38	2.08	2.17	2.11	1.85	1.86	1.14	1.33	1.68	
0	1.43	0.80	1.26	3.06	1.76	1.81	2.03	2.00	2.16	1.88	2.40
-1		2.50	0.71	1.11	1.44	1.49	0.97	2.10	1.59	1.28	
-2		2.41	1.62	1.57	1.69	1.17	1.77	2.41	2.12	2.19	
-3			1.18	1.03	1.07	1.16	1.78	1.61	1.23		





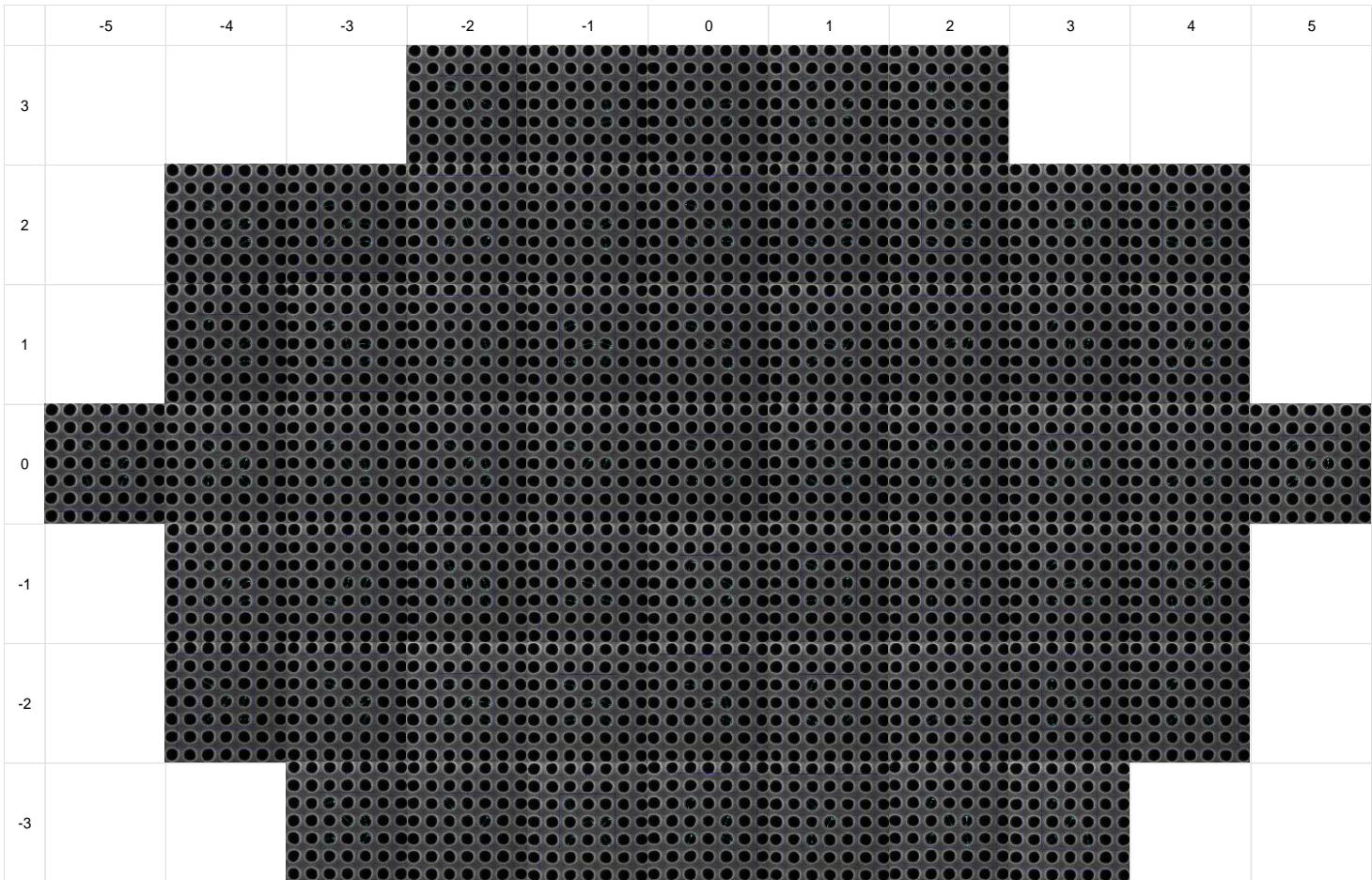
# 46JTP087SJE1 (2225DNDN001 slot 25) Reference Data

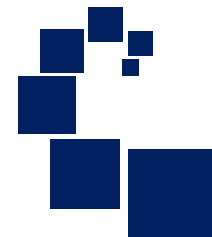
C60P120 Anchor Target

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C60P120 Anchor Target  
CD-SEM image wafer map

Full Wafer Avg CD:	70.24	nm
Full wafer 1sigma CD:	0.88	nm
Die-to-Die 1sigma		
Avg:	1.70	nm
RMS:	1.78	nm
Ellipticity Avg:	1.06	
FOV:	800	nm





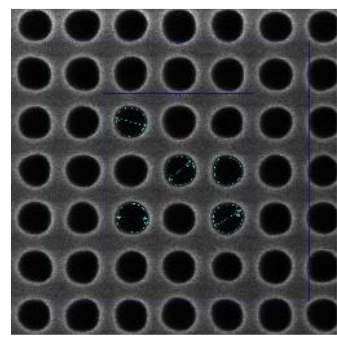
# 46JTP087SJE1 (2225DNDN001 slot 25) Reference Data

## Secondary Targets

June 2022

### Anchor Target

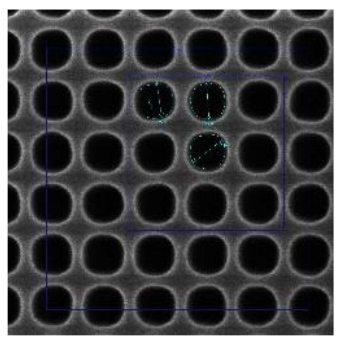
C60P120 (XCH\*)



Full Wafer Avg CD:	70.24	nm
Full wafer 1sigma CD:	0.88	nm
Die-to-Die 1sigma		
Avg:	1.70	nm
RMS:	1.78	nm
Ellipticity Avg:	1.06	
FOV:	800	nm

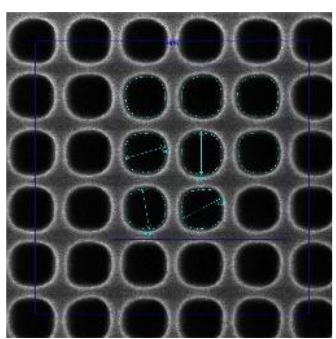
### Secondary Targets

C64P128 (ACH\*)



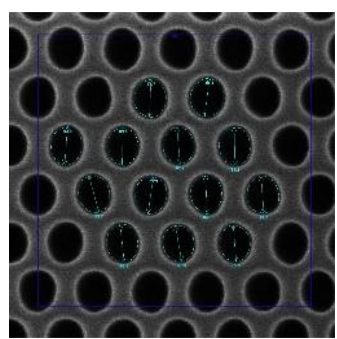
Full Wafer Avg CD:	85.5	nm
Full wafer 1sigma CD:	1.80	nm
Die-to-Die 1 sigma:		
Avg:	3.45	nm
RMS:	3.94	nm
Ellipticity Avg:	1.10	
FOV:	800	nm

C70P140 (BCH\*)



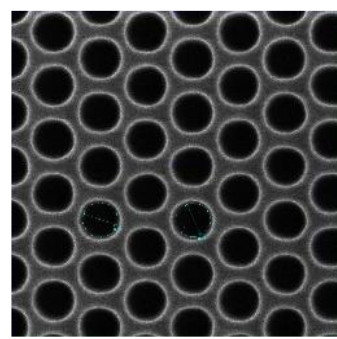
Full Wafer Avg CD:	100.2	nm
Full wafer 1sigma CD:	0.60	nm
Die-to-Die 1 sigma:		
Avg:	0.72	nm
RMS:	0.73	nm
Ellipticity Avg:	1.03	
FOV:	800	nm

C70P140HEX (NCH\*)



Full Wafer Avg CD:	83.10	nm
Full wafer 1sigma CD:	0.35	nm
Die-to-Die 1 sigma		
Avg:	1.45	nm
RMS:	1.48	nm
Ellipticity Avg:	1.19	
FOV:	800	nm

C80P165MEM (CCH2\*)

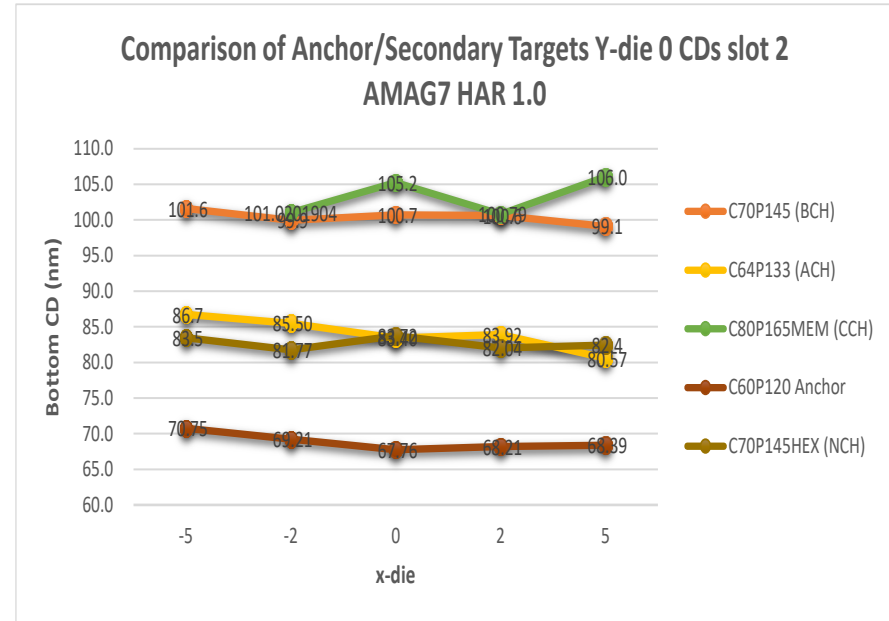
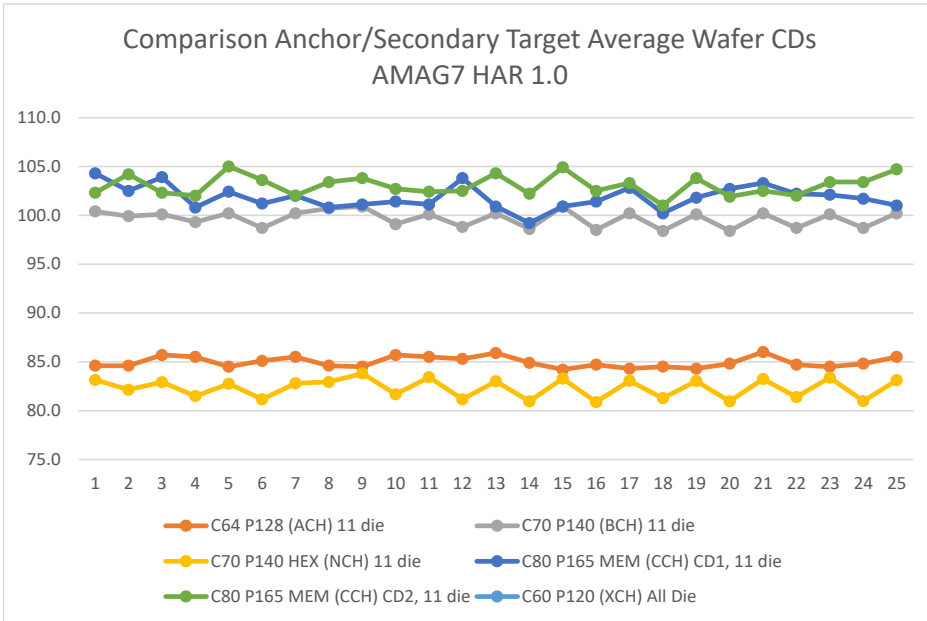


Full Wafer Avg CD:	104.7	nm
Full wafer 1sigma CD:	1.14	nm
Die-to-Die 1 sigma		
Avg:	3.11	nm
RMS:	4.26	nm
Ellipticity Avg:	1.08	
FOV:	1000	nm

\* Coding labels for CD data results files

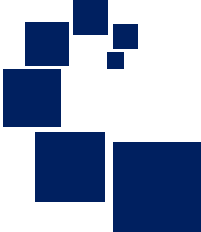


# Comparison CDs- Anchor to Secondary Targets

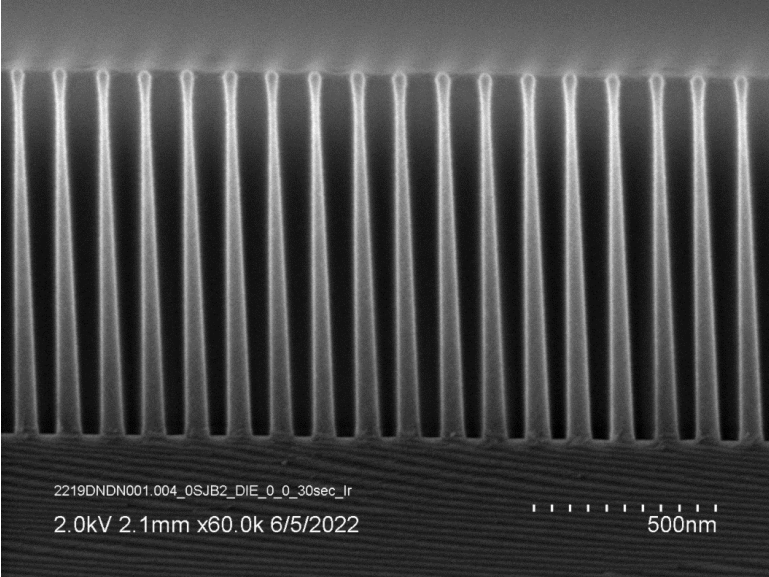


# C60P120 Anchor Target XSEM Reference Data

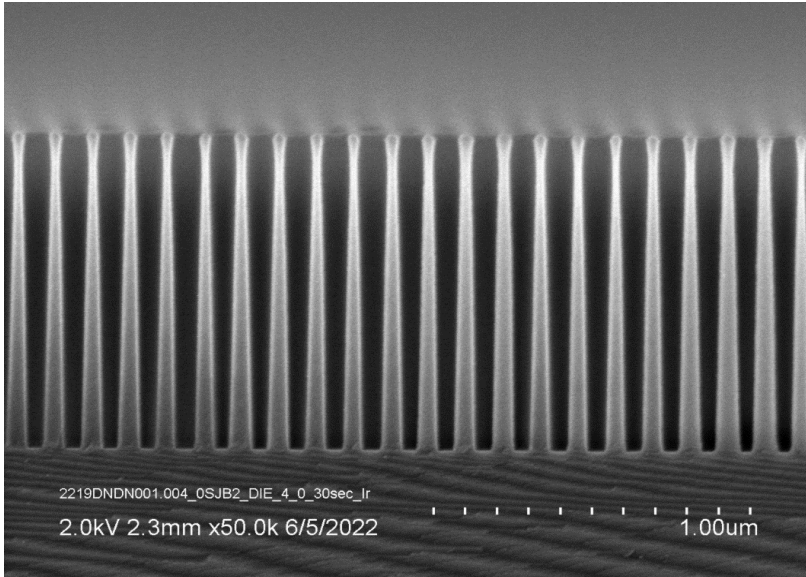
June 2022



## C60P120 Anchor Target XSEM images



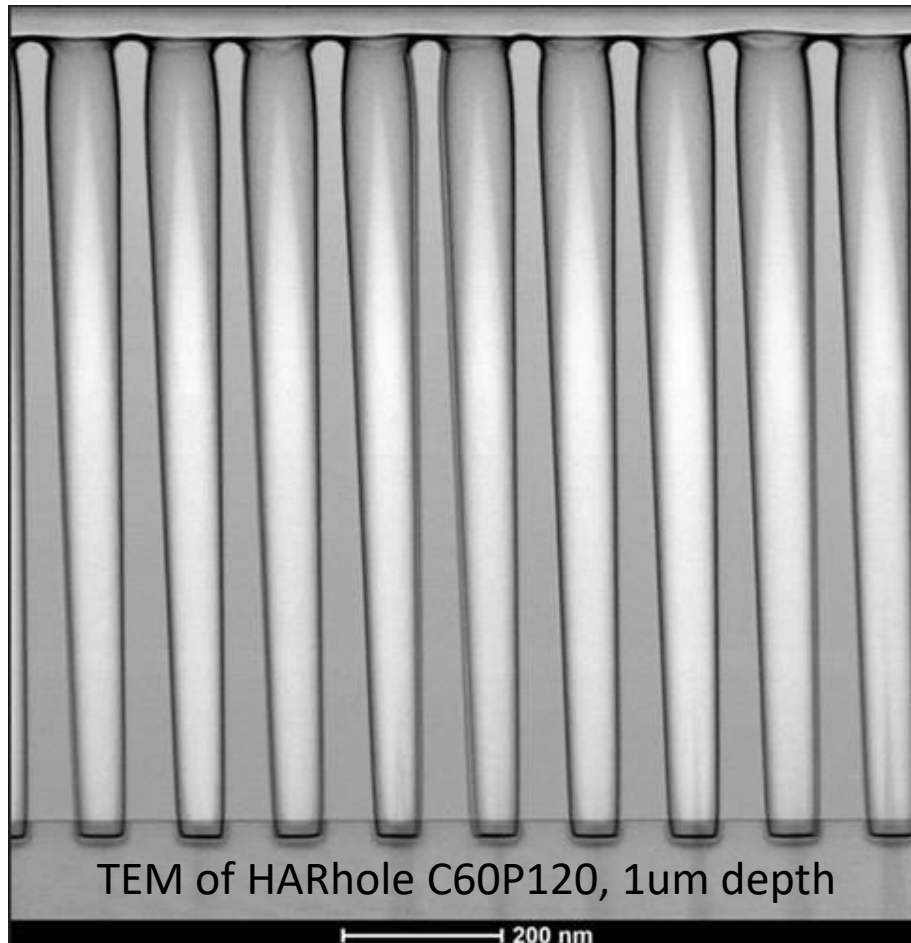
Center



Edge

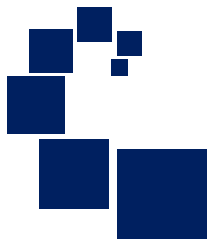
# 20Å HfO<sub>2</sub> coating, 1um HARhole wafer, great coverage, LR-TEM

- Multiple X-ray tool suppliers have requested HfO<sub>2</sub> coatings to improve X-ray scattering, this TEM demonstrates the first attempt of 20Å ALD deposition on a 1um HARhole wafer, and demonstrates this film addition is successful and now ready to order as an add-on line item for any purchased HARhole wafer.
- Also this is a low resolution TEM of the full profile.





# Conclusions

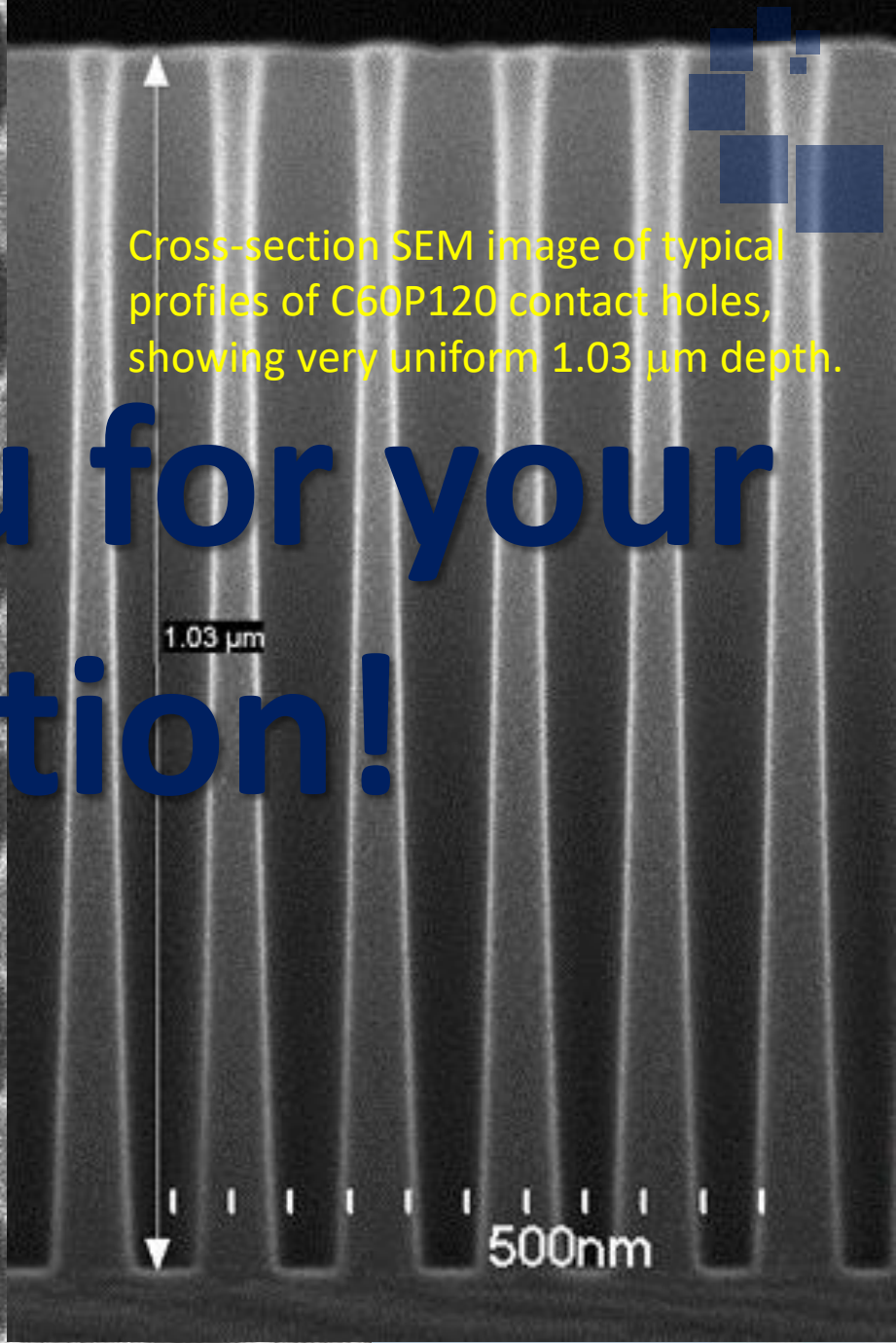


- Thank you for your purchase of AMAG HAR wafers!
- We hope this guide of reference CD-SEM metrology adds significant value to the use of these wafers.
- This report represents the standard metrology AMAG nanometro provides for such wafers, and future lots and wafer types will have similar companion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