



**AZ Electronic Materials**



# AZ 9260 Photoresist

## Data Package at 12um FT & 24um FT

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# AZ's Thick Film Photoresist Roadmap [as of 11/2007]

Lift-off FT: 2-7 $\mu\text{m}$	Deep Implant / Metal Etch FT: 3-10 $\mu\text{m}$	Copper Plating FT: 5-30 $\mu\text{m}$	Gold Plating FT: 10-30 $\mu\text{m}$	Solder / Metal Plating FT: >30 $\mu\text{m}$	MEMS / Ink Jet FT: >30 $\mu\text{m}$	DUV TFRH/Implant FT: 3 - 8 $\mu\text{m}$
Commercialized materials  <b>AZ nLOF Series</b>	AZ MIR 900 <b>AZ N4000</b> <b>AZ N6000</b>	AZ 10XT AZ 33XT	AZ PLP30/40	←-----AZ 50XT-----→		
	←-----AZ 9200-----→	←-----P4000 (P4620)-----→		(Multicoat)-----→		
Materials in sampling (all EXP products)	AZ 5XT <b>AZ 5nXT</b> <b>AZ 3nXT-HR</b>	AZ 12XT-20P		AZ 40XT-A1	AZ 40XT-11	AZ TX 1311 VS-01HJ
Materials under development		←-----AZ EXP 100-----→				AZ LExp 500

# AZ Electronic Materials

## Thick Photoresist Product Summary

Thick Film Product	Platform	$\lambda$	FT Range (um)	Maximum Single coat	Aspect Ratio	Application	Developer Compatibility
P4000	DNQ	g-h	2 - 55	25	2:1	Solder, Cu, Au	<b>400K</b> / TMAH
4500	DNQ	g-h	2 - 55	25	2:1	Solder, Cu, Au	<b>400K</b> / TMAH
9200	DNQ	<b>g-h-i</b>	3 - 50	25	3:1	Solder, Cu	<b>400K</b> / TMAH
10XT	DNQ	<b>g-h-i</b>	4 - 50	25	3:1	Solder, Cu, Au	<b>400K</b> / TMAH
33XT	DNQ	g-h-i	5 - 25	25	5:1	Solder, Cu	<b>TMAH</b> / 400K
50XT	DNQ	g-h	15 - 65	65	3:1	Solder, Cu	400K
PLP-30	DNQ	g-h	6 - 25	25	2:1	Au, Cu	303N
PLP-40	DNQ	g-h	20 - 30	30	2:1	Au, Cu	303N
EXP 12XT-20P	CA	g-h- <b>i</b>	5 - 20	20	3:1	Cu	TMAH
EXP 5XT	CA	g-h- <b>i</b>	3 - 5	5	2:1	Si, Implant, Etch	TMAH
EXP 40XT	CA	g-h- <b>i</b>	20 - 100	60	4:1	Etch, Solder, Cu	<b>TMAH</b> / 400K
EXP 125nXT	PP	g-h- <b>i</b>	20 - 120	120	5:1	Cu, Au, Solder	<b>TMAH</b> / 303N
EXP 3nXT-HR	CA	g-h- <b>i</b>	3 - 5	5	5:1	Cu, NiFe, Si	TMAH
EXP 5nXT	CA	g-h- <b>i</b>	5 - 15	15	3:1	Cu, NiFe, Si	TMAH
TX 1311	CA	DUV	3 - 5	5	15:1	Cu, NiFe, Si	TMAH

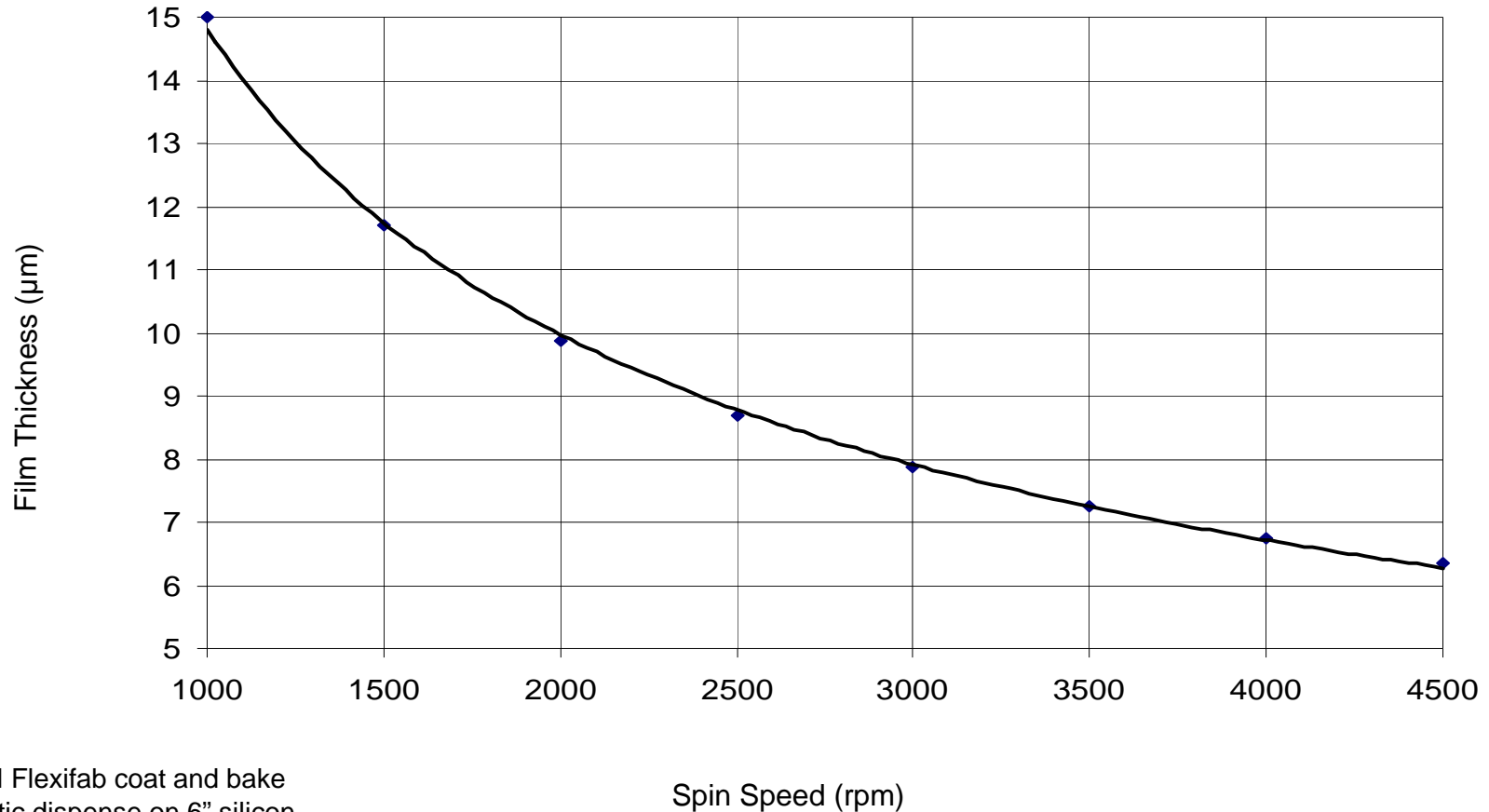
➤ Platform: **DNQ** = Novolak, **CA** = Chemically Amplified, **PP** = Photopolymer

➤ Wavelength: Red font indicates better performance.

➤ Developer Compatibility: **Bold font** indicates most compatible developer, resulting in shorter develop times and lower exposure energies.

# AZ 9260 Photoresist on Silicon

## Film Thickness vs. Spin Speed



MTI Flexifab coat and bake  
Static dispense on 6" silicon  
30 sec spin @ indicated rpm  
SB: 110°C in proximity  
10 sec @ 0.050", 180 sec @ 0.002"

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- ▶ 24 $\mu$ m FT Process & Performance Results      Pages 53 – 65  
Suss MA200 with AZ 300 MIF developer

# **AZ 9260 Photoresist**

**Lithographic Evaluation  
by Ultratech 1500 Stepper**

**with AZ 300 MIF Developer  
12 $\mu$ m FT Process**

# AZ 9260 Photoresist

## Process Conditions:

Substrate:	Bare Silicon
Coat:	Optitrac Static dispense
Target FT:	12 $\mu\text{m}$
Softbake:	110°C hotplate/ 180 sec. full contact
Exposure:	Ultratech 1500 gh line Stepper
FEM:	1200 mJ/cm <sup>2</sup> with increments of 75 mJ/cm <sup>2</sup> Nominal Focus of -2 $\mu\text{m}$ in increments of 2 $\mu\text{m}$ in both directions
Develop:	<b>AZ 300MIF (2.38% TMAH)</b> continuous spray for 400 sec. @ 23°C
<b>Analysis:</b>	Amray SEM

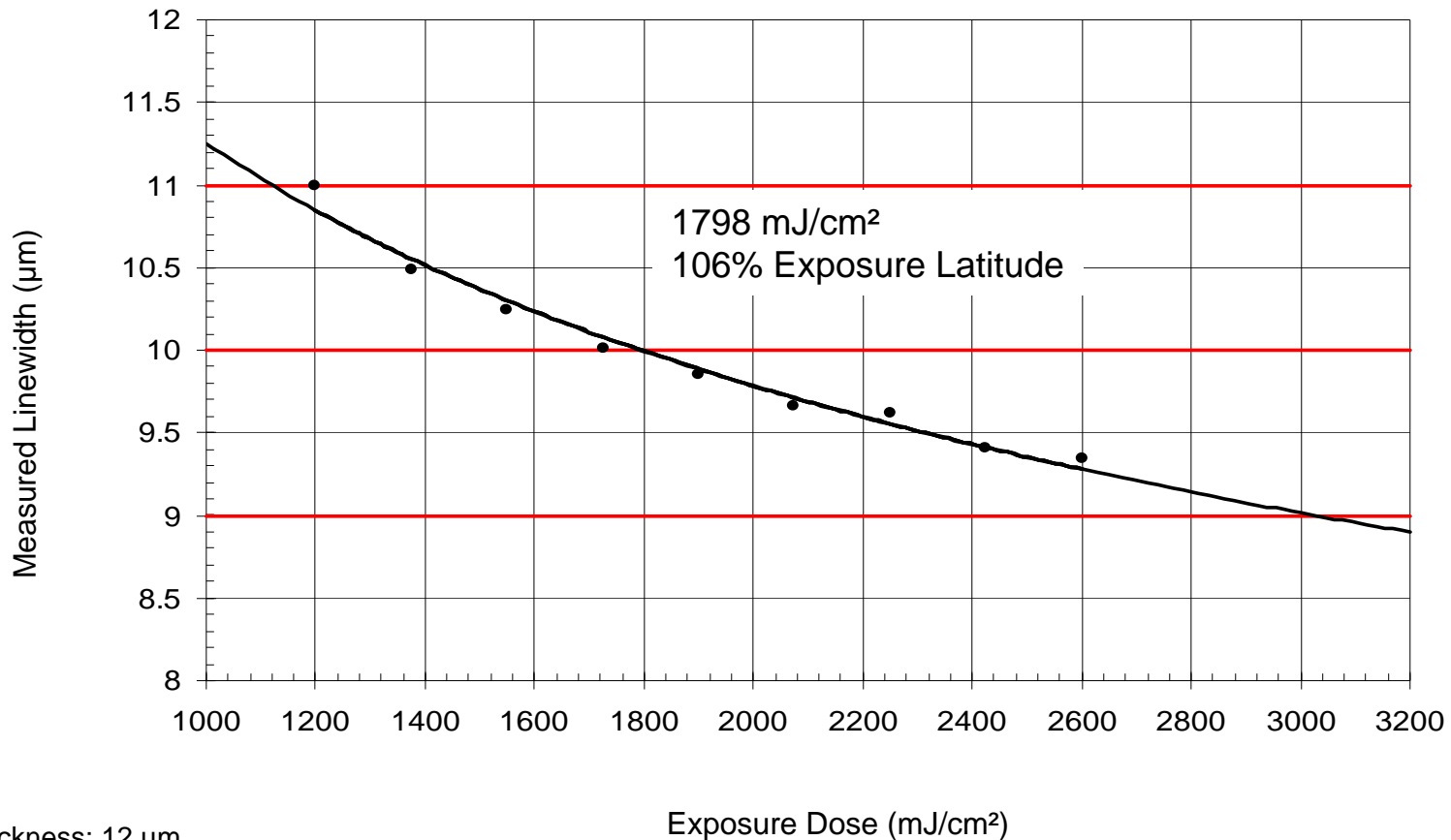
# AZ 9260 Photoresist

## Summary of Results:

Features (1:1)	Film Thickness ( $\mu\text{m}$ )	DTP 10 $\mu\text{m}$ ( $\text{mJ}/\text{cm}^2$ )	Exposure Latitude 10 $\mu\text{m}$ (%)	DOF 10 $\mu\text{m}$ ( $\mu\text{m}$ )	Linearity ( $\mu\text{m}$ )
Dense Lines	12	1798	106	16.0	4.0
Contact Holes	12	1539	90	>8	<10



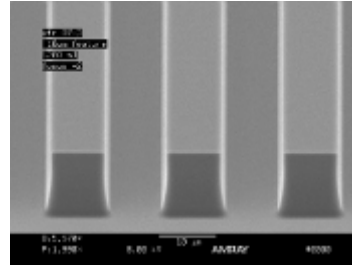
# AZ 9260 Photoresist, FT=12 $\mu\text{m}$ Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ L/S



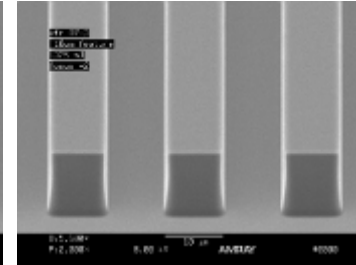
Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Develop  
SB: 110°C/ 180 sec  
Ultratech 1500 gh line Stepper  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$ Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ L/S

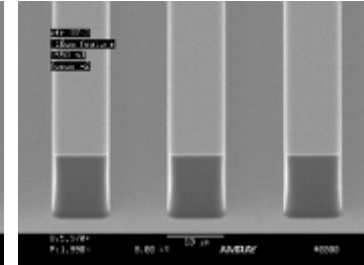
1200 mJ/cm<sup>2</sup>



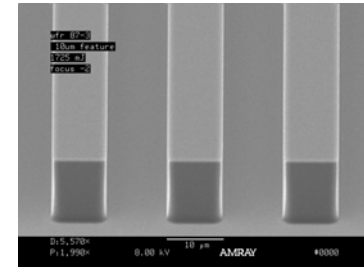
1375mJ/cm<sup>2</sup>



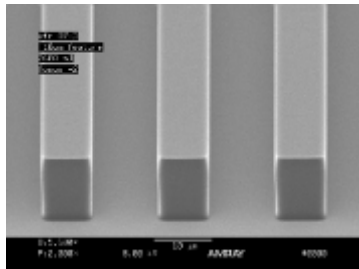
1550 mJ/cm<sup>2</sup>



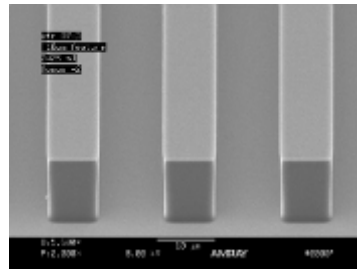
1725 mJ/cm<sup>2</sup>



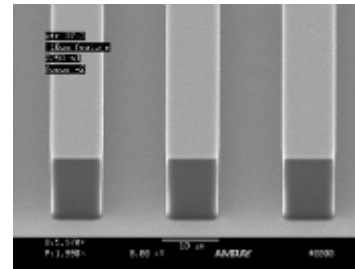
Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Develop  
SB: 110°C/ 180 sec  
Ultratech 1500 gh line Stepper  
AZ 300 MIF, 400 sec continuous spray @ 23 °C



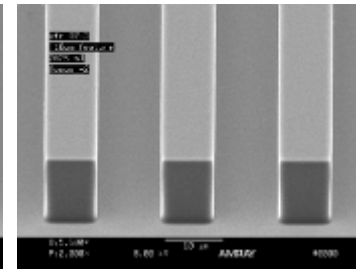
2600 mJ/cm<sup>2</sup>



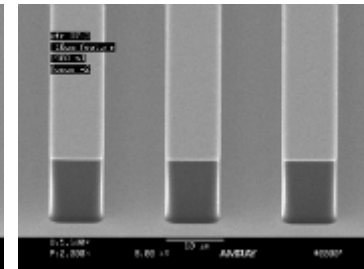
2425 mJ/cm<sup>2</sup>



2250 mJ/cm<sup>2</sup>



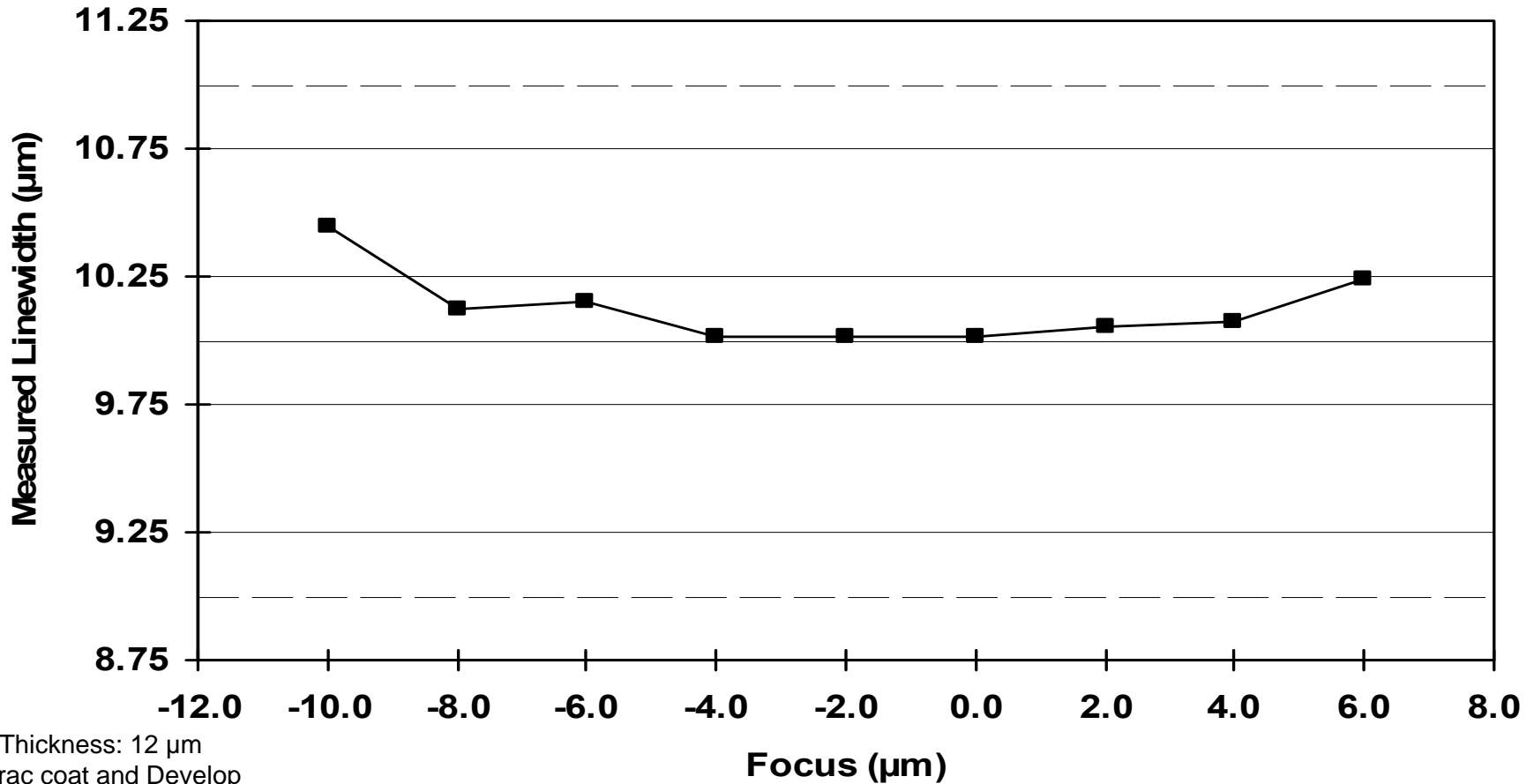
2075 mJ/cm<sup>2</sup>



1900 mJ/cm<sup>2</sup>

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

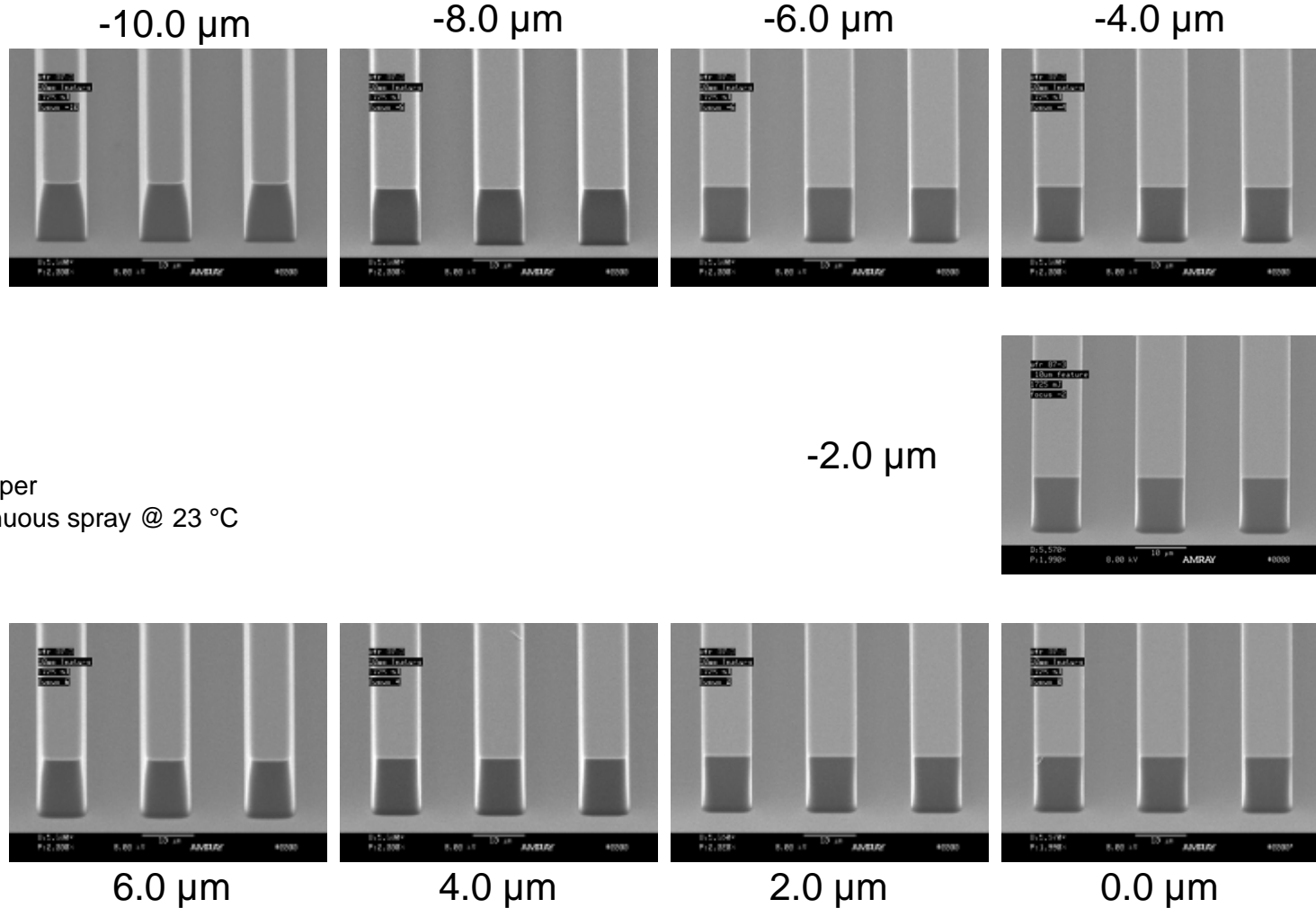
## Depth of Focus @ 1725 $\text{mJ}/\text{cm}^2$ , 10.0 $\mu\text{m}$ L/S



Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Develop  
SB: 110°C/ 180 sec  
Ultratech 1500 gh line Stepper  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

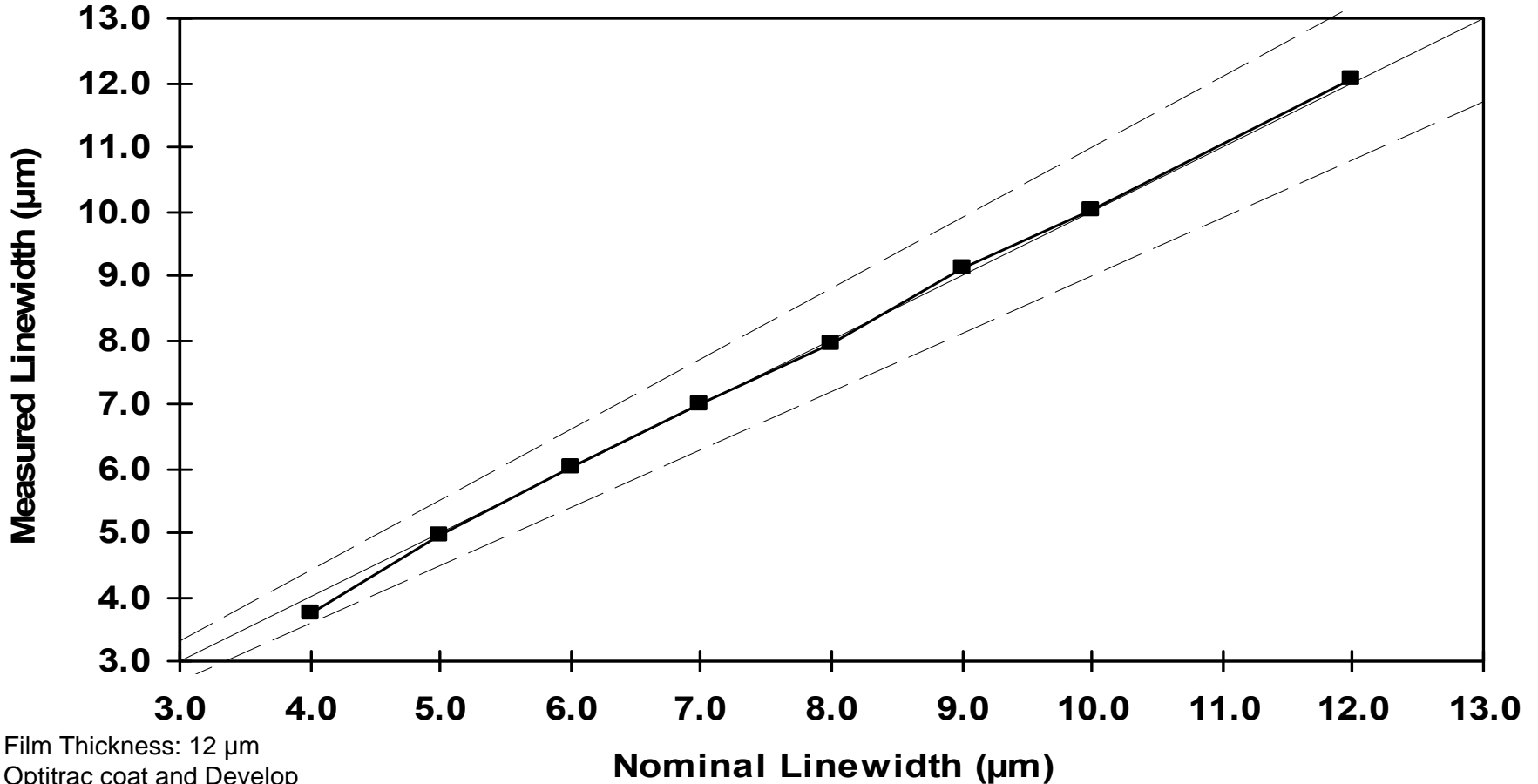
## Depth of Focus @ 1725 mJ/cm<sup>2</sup>, 10.0 $\mu\text{m}$ L/S



Film Thickness: 12  $\mu\text{m}$   
 Optitrac coat and Develop  
 SB: 110°C/ 180 sec  
 Ultratech 1500 gh line Stepper  
 AZ 300 MIF, 400 sec continuous spray @ 23 °C

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

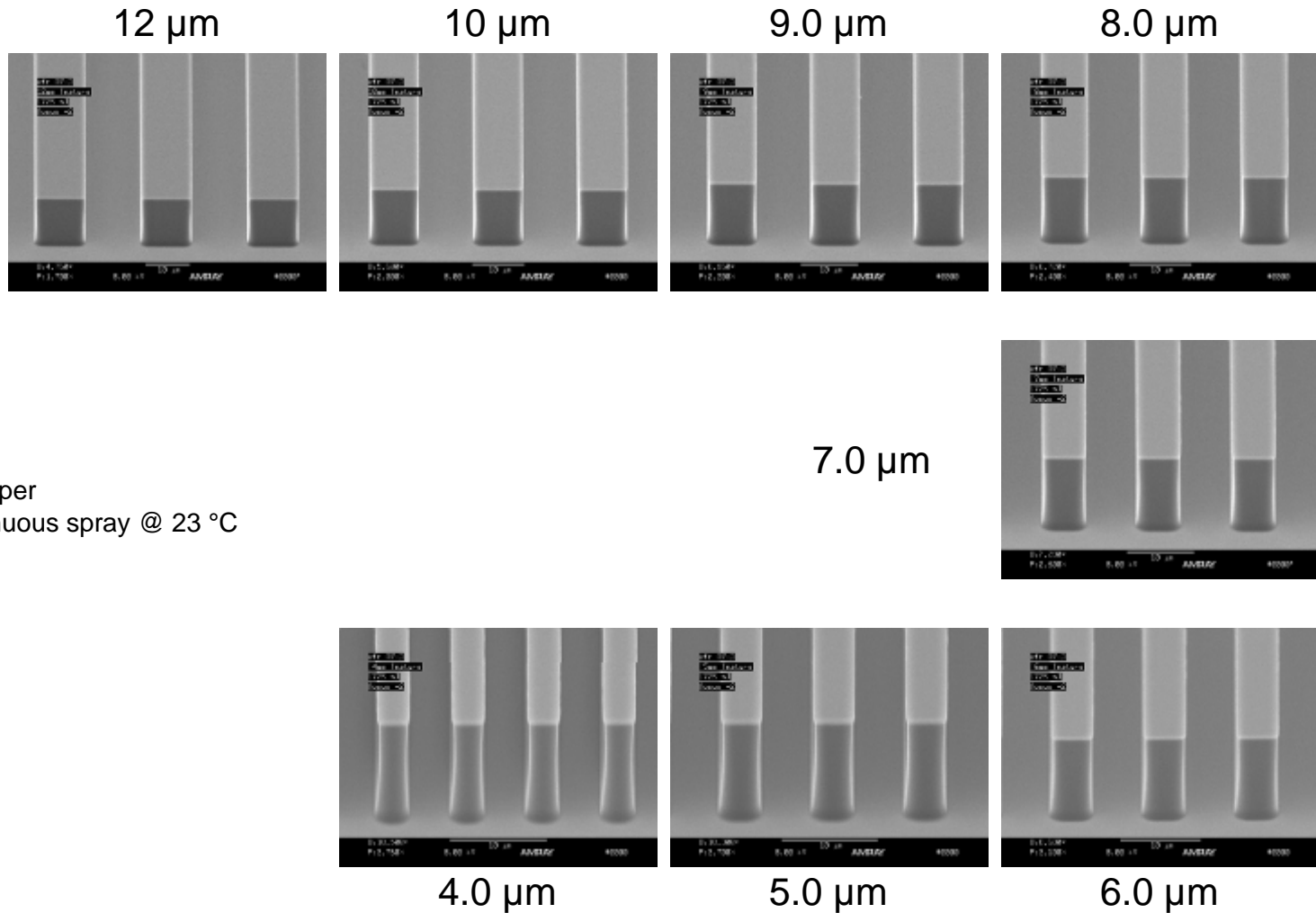
## Linearity on Silicon @ 1725 $\text{mJ}/\text{cm}^2$



Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Develop  
SB: 110°C/ 180 sec  
Ultratech 1500 gh line Stepper  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

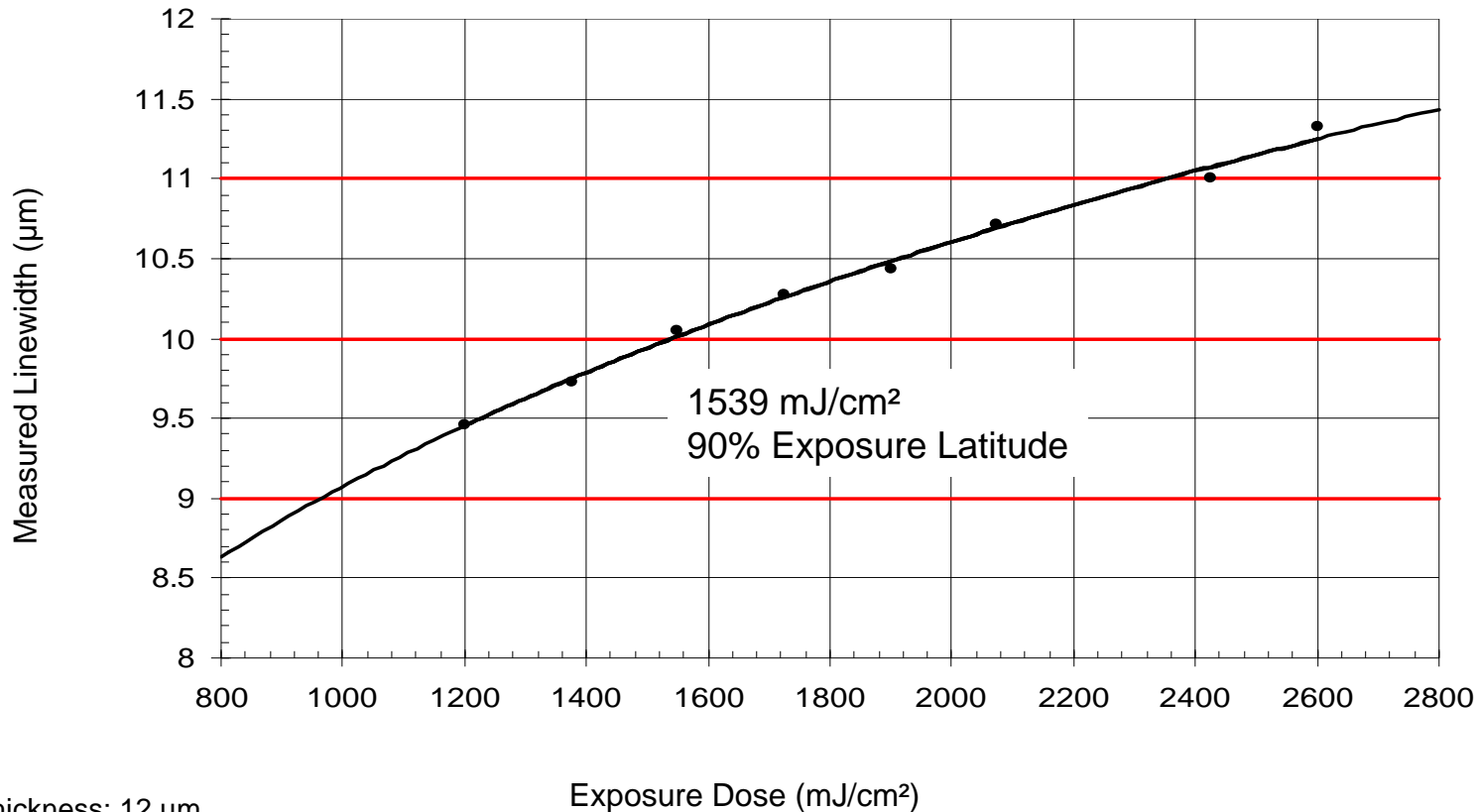
## Linearity on Silicon @ 1725 $\text{mJ}/\text{cm}^2$



Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Develop  
SB: 110°C/ 180 sec  
Ultratech 1500 gh line Stepper  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

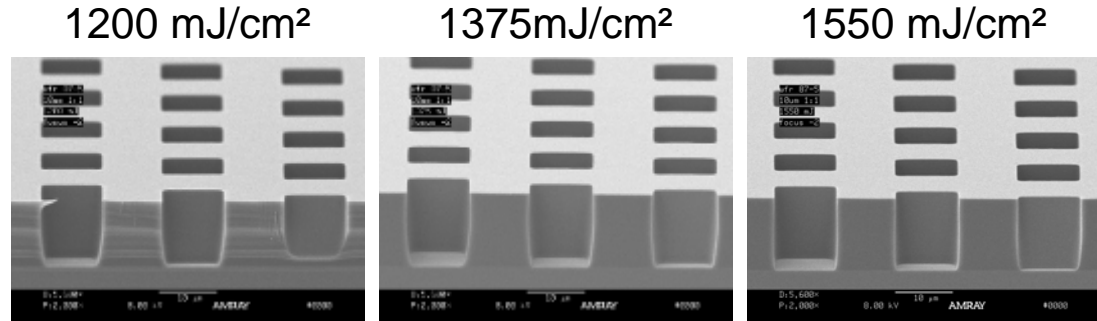
## Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ CH, 1:1 Pitch



Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Develop  
SB: 110°C/ 180 sec  
Ultratech 1500 gh line Stepper  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

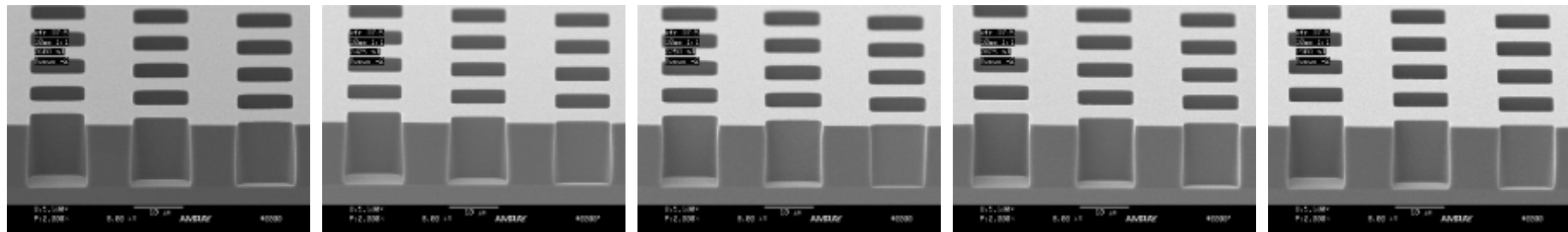
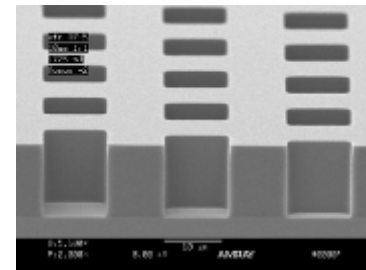
# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ CH, 1:1 Pitch



Film Thickness: 12  $\mu\text{m}$   
 Optitrac coat and Develop  
 SB: 110°C/ 180 sec  
 Ultratech 1500 gh line Stepper  
 AZ 300 MIF, 400 sec continuous spray @ 23 °C

1725 mJ/cm<sup>2</sup>



2600 mJ/cm<sup>2</sup>

2425 mJ/cm<sup>2</sup>

2250 mJ/cm<sup>2</sup>

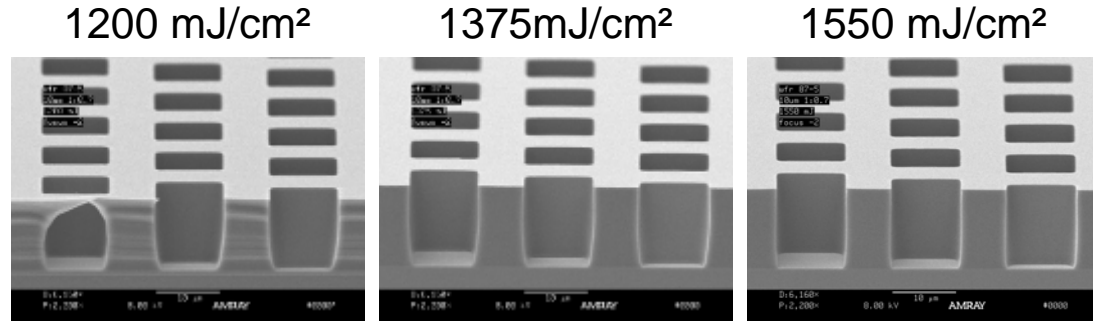
2075 mJ/cm<sup>2</sup>

1900 mJ/cm<sup>2</sup>



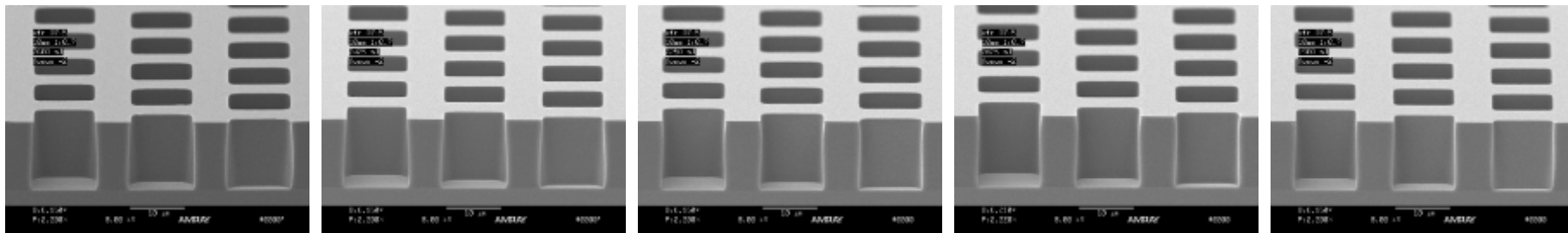
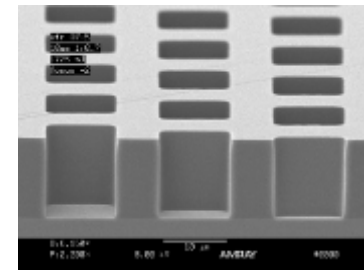
# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ CH, 1:0.7 Pitch



Film Thickness: 12  $\mu\text{m}$   
 Optitrac coat and Develop  
 SB: 110°C/ 180 sec  
 Ultratech 1500 gh line Stepper  
 AZ 300 MIF, 400 sec continuous spray @ 23 °C

1725 mJ/cm<sup>2</sup>



2600 mJ/cm<sup>2</sup>

2425 mJ/cm<sup>2</sup>

2250 mJ/cm<sup>2</sup>

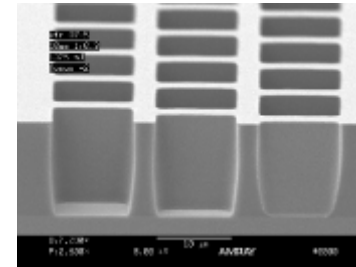
2075 mJ/cm<sup>2</sup>

1900 mJ/cm<sup>2</sup>

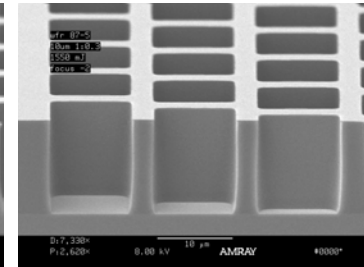
# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

Exposure Latitude on Silicon, 10.0  $\mu\text{m}$  CH, 1:0.3 Pitch

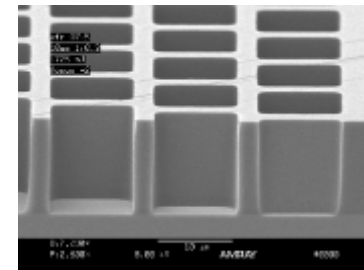
1375mJ/cm<sup>2</sup>



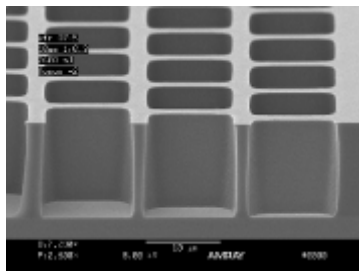
1550 mJ/cm<sup>2</sup>



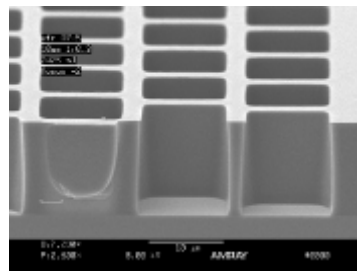
1725 mJ/cm<sup>2</sup>



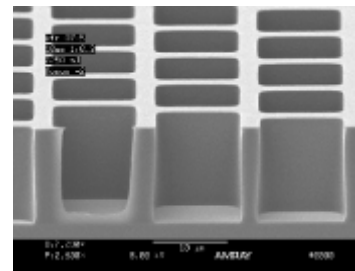
Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Develop  
SB: 110°C/ 180 sec  
Ultratech 1500 gh line Stepper  
AZ 300 MIF, 400 sec continuous spray @ 23 °C



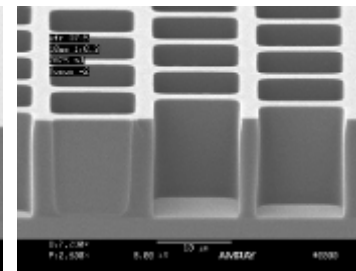
2600 mJ/cm<sup>2</sup>



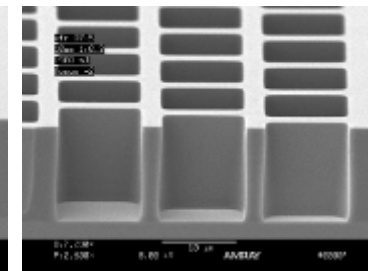
2425 mJ/cm<sup>2</sup>



2250 mJ/cm<sup>2</sup>



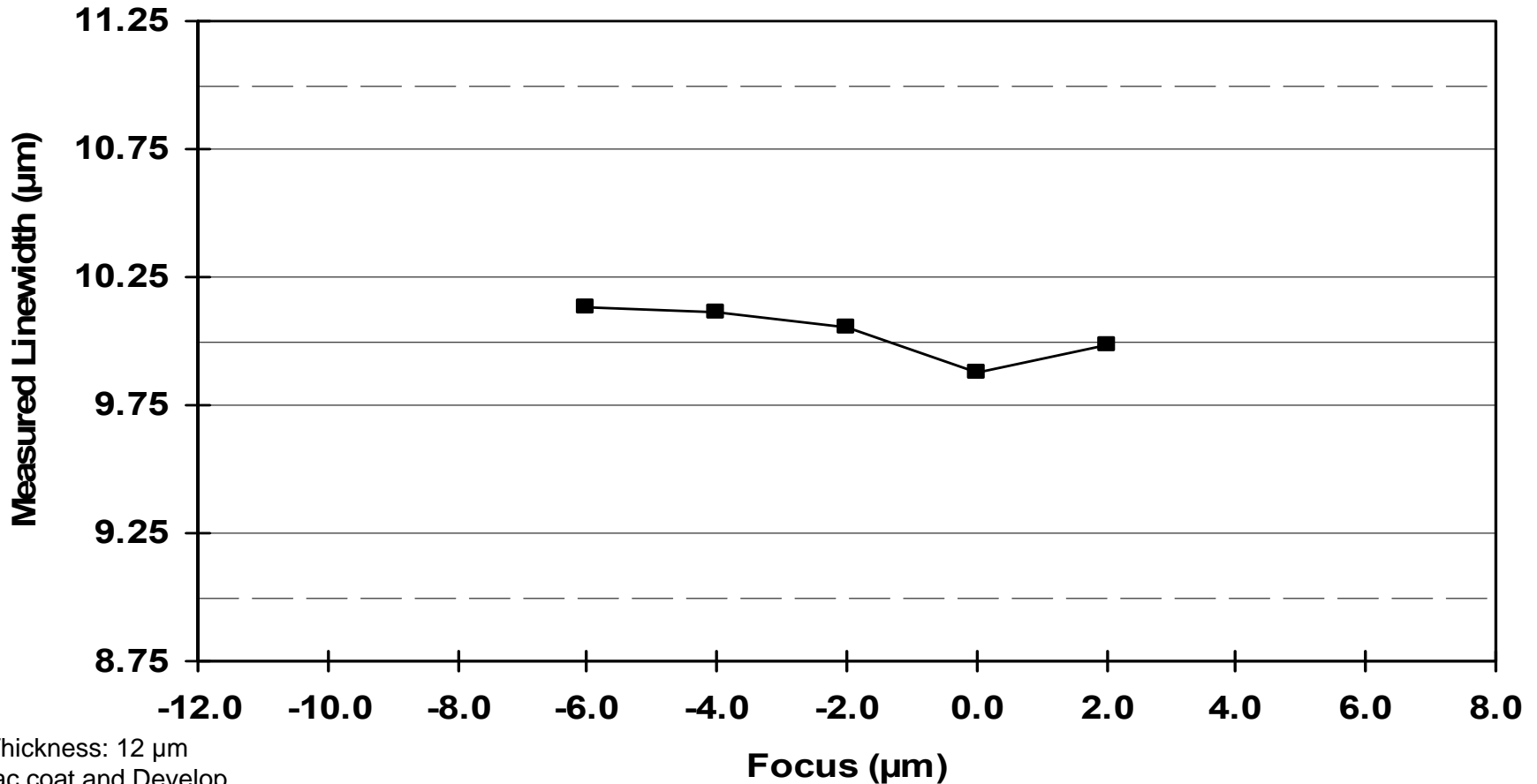
2075 mJ/cm<sup>2</sup>



1900 mJ/cm<sup>2</sup>

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

Depth of Focus @ 1550mJ/cm<sup>2</sup>, 10.0  $\mu\text{m}$  CH, 1:1 Pitch

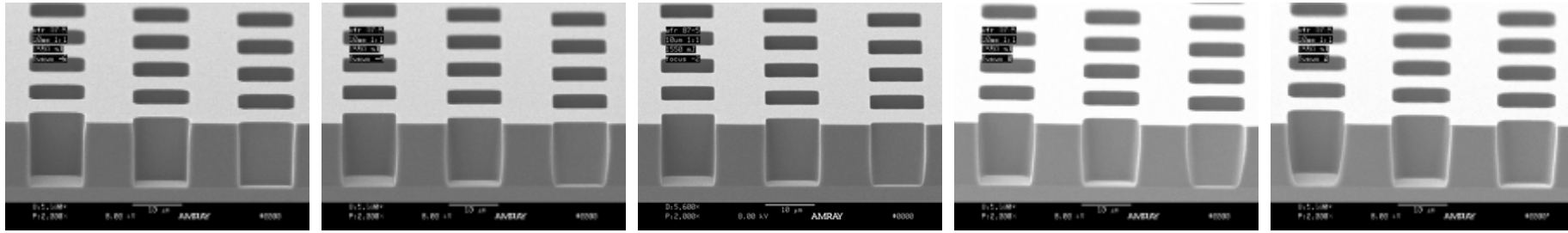


Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Develop  
SB: 110°C/ 180 sec  
Ultratech 1500 gh line Stepper  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

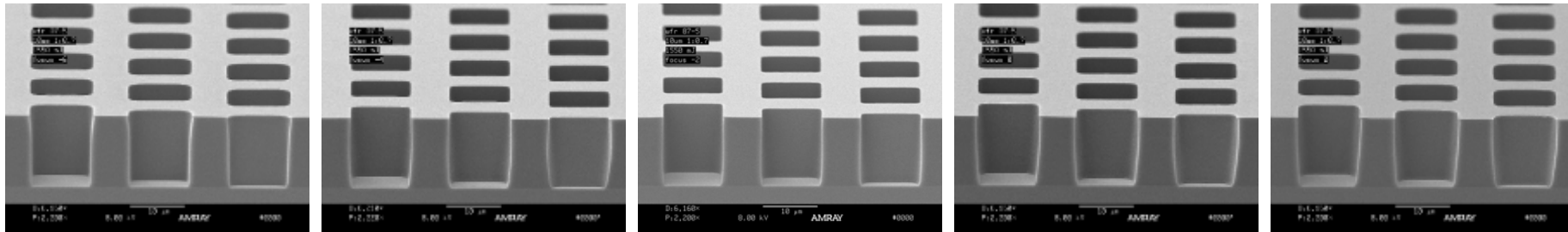
# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

Depth of Focus @ 1550mJ/cm<sup>2</sup>, 10.0  $\mu\text{m}$  CH, Various Pitch

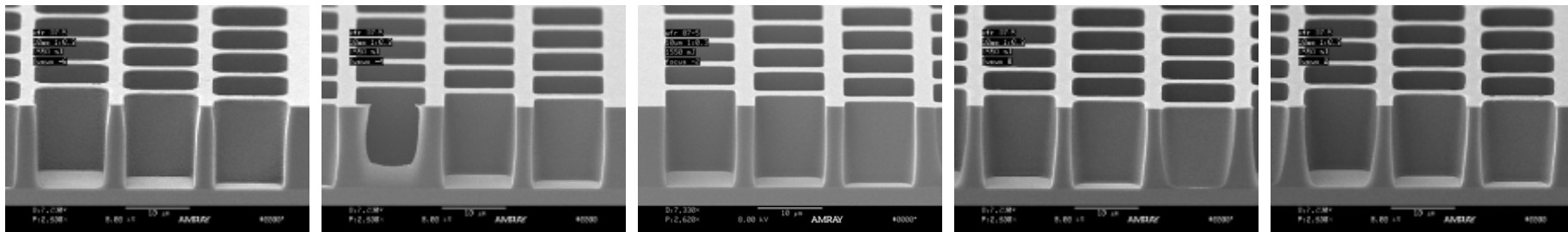
1:1



1:0.7



1:0.3



-6.0  $\mu\text{m}$

-4.0  $\mu\text{m}$

-2.0  $\mu\text{m}$

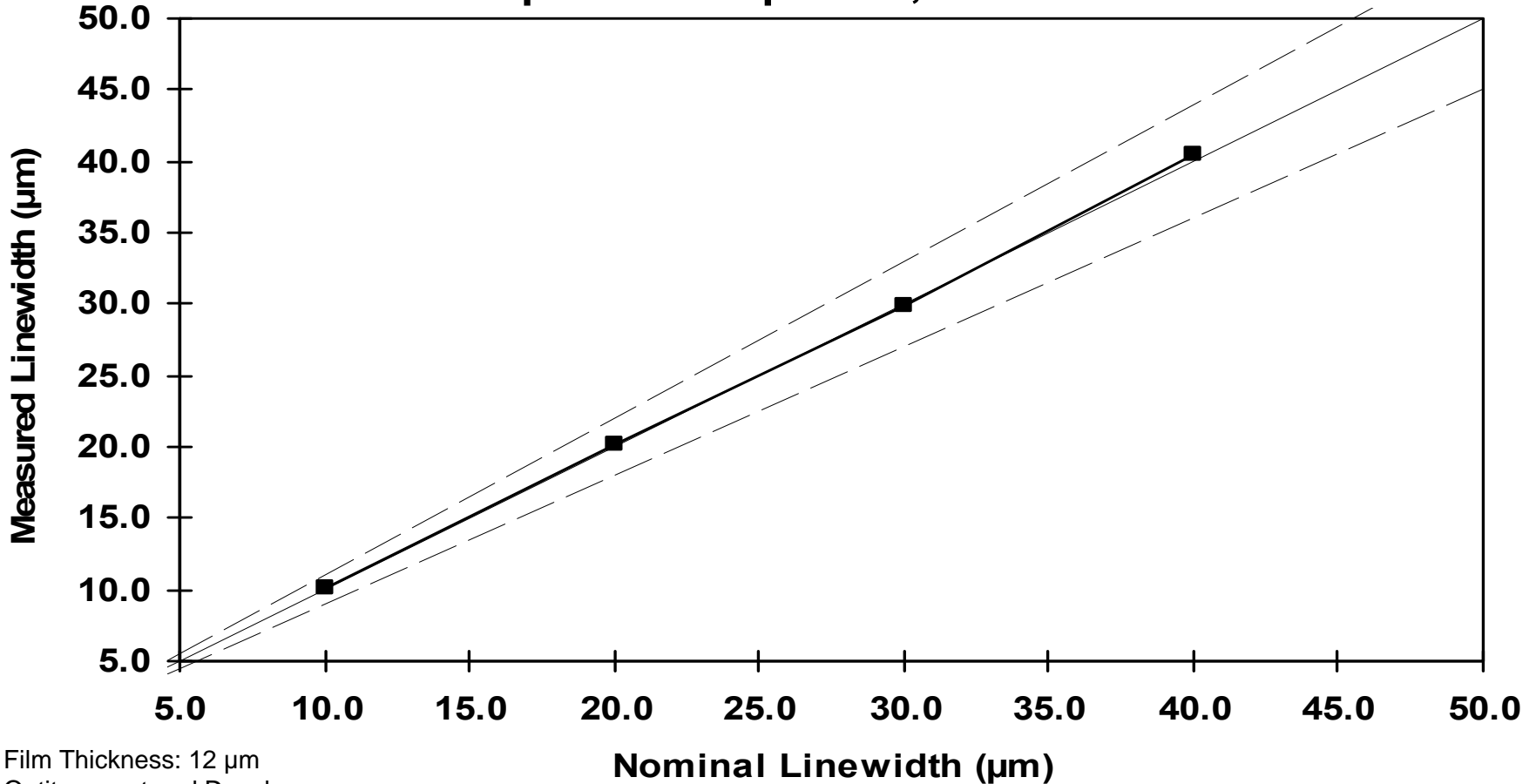
0.0  $\mu\text{m}$

2.0  $\mu\text{m}$

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

Linearity on Silicon @ 1550  $\text{mJ}/\text{cm}^2$

40.0  $\mu\text{m}$  to 10.0  $\mu\text{m}$  CH, 1:1 Pitch

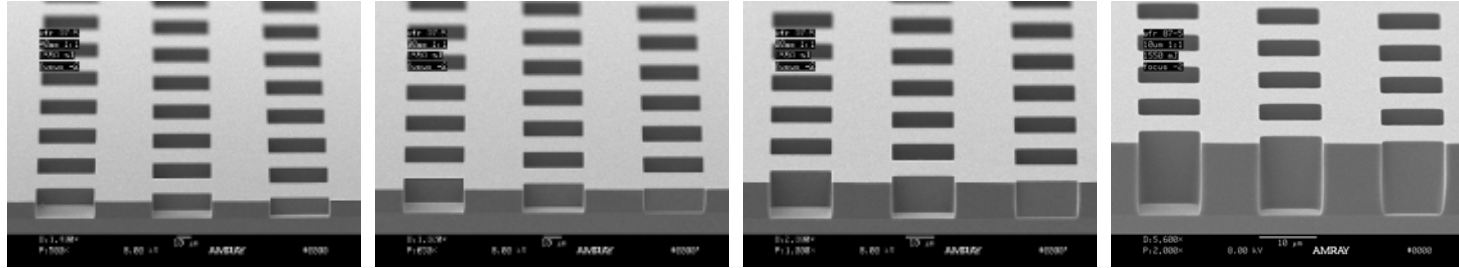


Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Develop  
SB: 110°C/ 180 sec  
Ultratech 1500 gh line Stepper  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

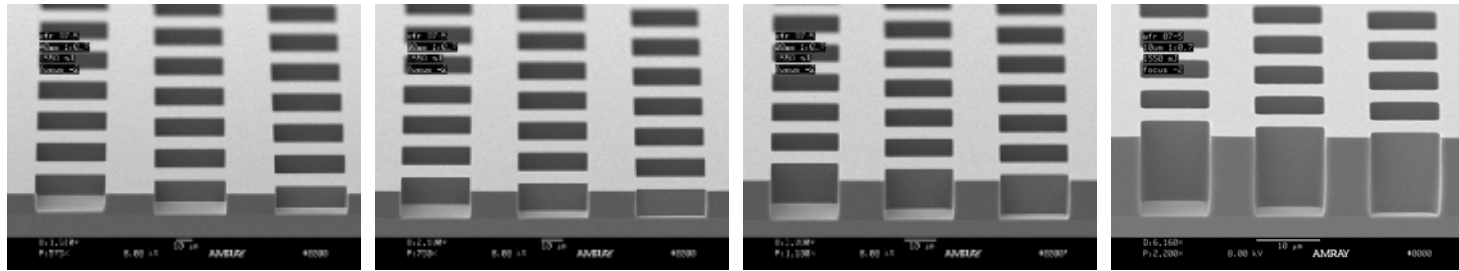
# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

Linearity on Silicon @ 1550  $\text{mJ}/\text{cm}^2$   
40.0  $\mu\text{m}$  to 10.0  $\mu\text{m}$  CH, Various Pitch

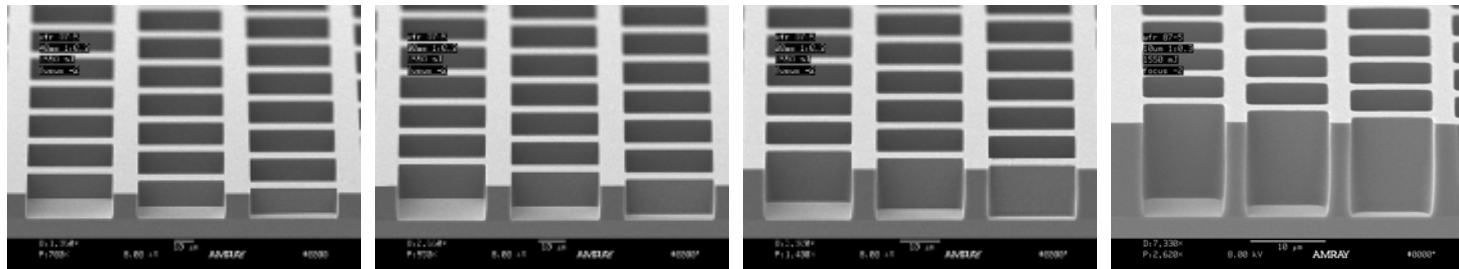
1:1



1:0.7



1:0.3



40  $\mu\text{m}$

30  $\mu\text{m}$

20  $\mu\text{m}$

10  $\mu\text{m}$



# **AZ 9260 Photoresist**

**Lithographic Evaluation  
by Suss MA200 Mask Aligner**

**with AZ 300 MIF Developer  
12 $\mu$ m FT Process**

# AZ 9260 Photoresist

## Process Conditions:

Substrate: Bare Silicon  
Coat: Optitrac Static dispense  
Target FT: 12  $\mu\text{m}$   
Softbake: 110°C hotplate/ 180 sec. full contact  
Exposure: Suss MA200 CC Mask Aligner with 20  $\mu\text{m}$  proximity gap  
FEM: 960  $\text{mJ}/\text{cm}^2$  with increments of 80  $\text{mJ}/\text{cm}^2$   
Develop: **AZ 300MIF (2.38% TMAH)** continuous spray for 400 sec. @ 23°C

**Analysis:** Amray SEM



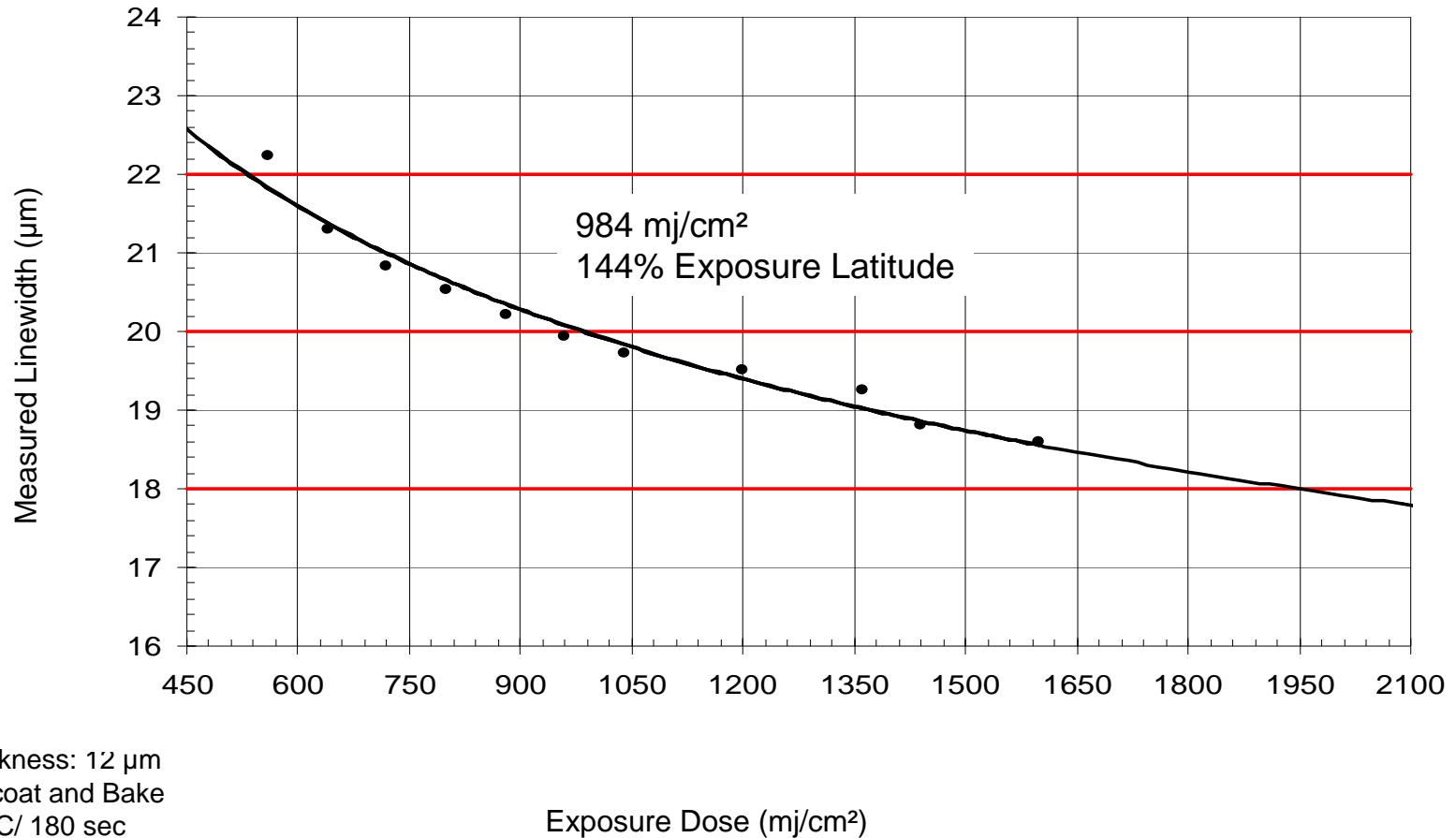
# AZ 9260 Photoresist

## Summary of Results:

<b>Features (1:1)</b>	<b>Film Thickness (<math>\mu\text{m}</math>)</b>	<b>DTP 20 <math>\mu\text{m}</math> (<math>\text{mJ}/\text{cm}^2</math>)</b>	<b>Exposure Latitude 20 <math>\mu\text{m}</math> (%)</b>	<b>Linearity (<math>\mu\text{m}</math>)</b>
Dense Lines	12	984	144	10
Contact Holes	12	792	137	10

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Exposure Latitude on Silicon, 20.0 $\mu\text{m}$ L/S

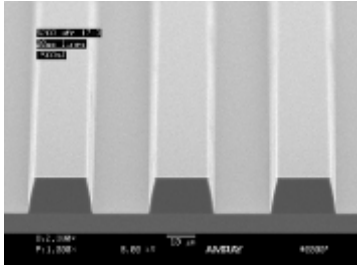


Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 110°C/ 180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

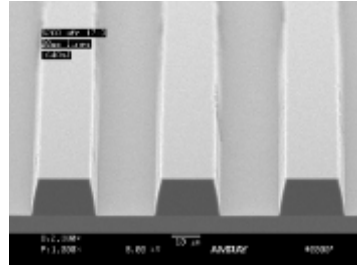
Exposure Dose ( $\text{mj}/\text{cm}^2$ )

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$ Exposure Latitude on Silicon, 20.0 $\mu\text{m}$ L/S

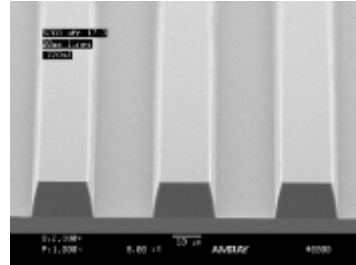
560 mJ/cm<sup>2</sup>



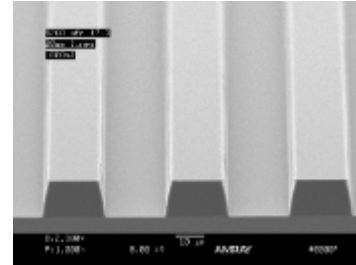
640 mJ/cm<sup>2</sup>



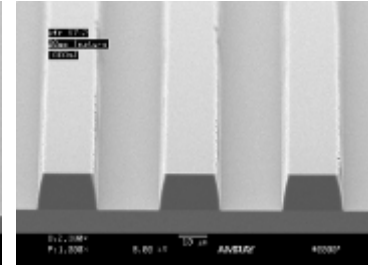
720 mJ/cm<sup>2</sup>



800mJ/cm<sup>2</sup>

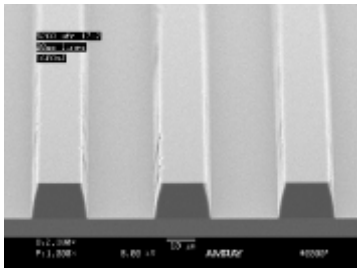
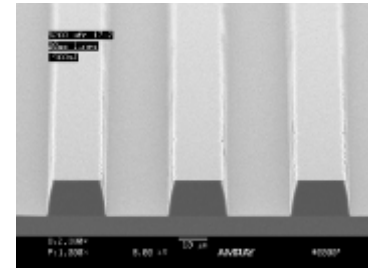


880 mJ/cm<sup>2</sup>

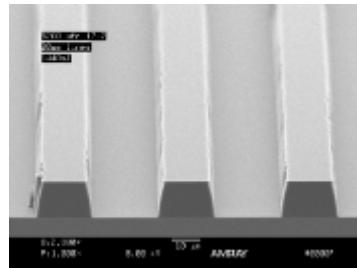


Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 110°C/ 180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

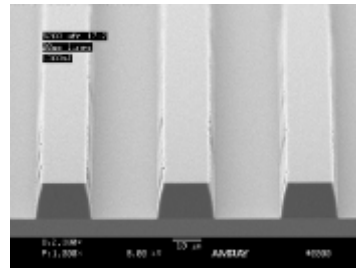
960 mJ/cm<sup>2</sup>



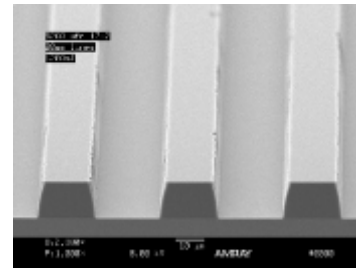
1600 mJ/cm<sup>2</sup>



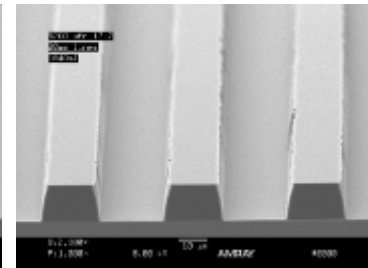
1440 mJ/cm<sup>2</sup>



1360 mJ/cm<sup>2</sup>



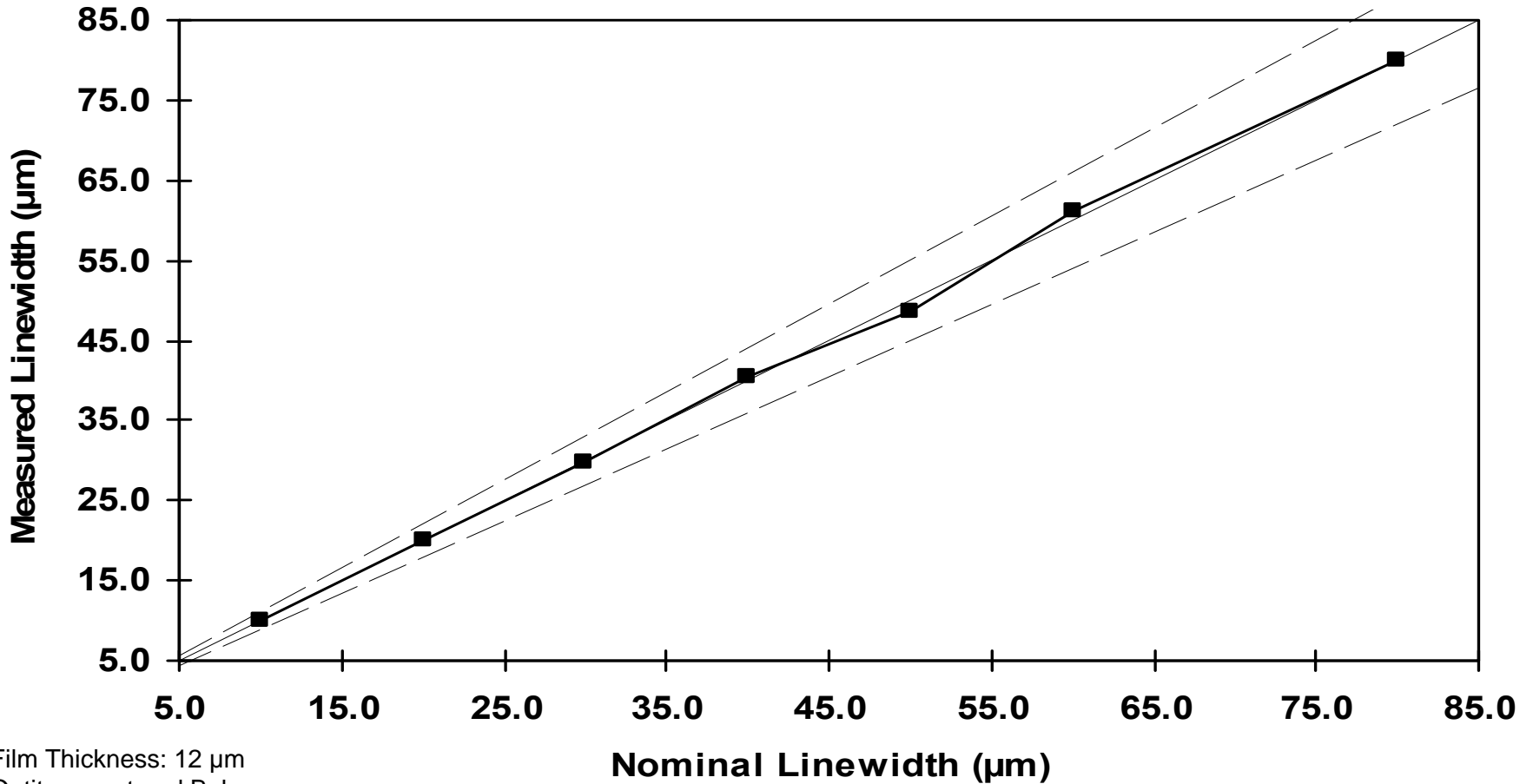
1200 mJ/cm<sup>2</sup>



1040 mJ/cm<sup>2</sup>

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Linearity on Silicon @ 960 $\text{mJ}/\text{cm}^2$

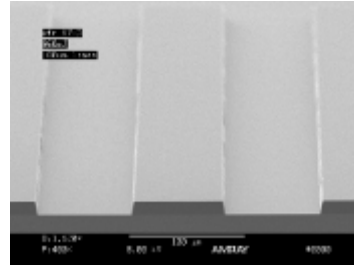


Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 110°C/ 180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

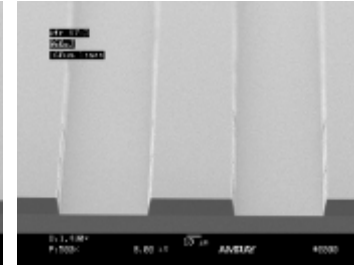
# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Linearity on Silicon @ 960 $\text{mJ}/\text{cm}^2$

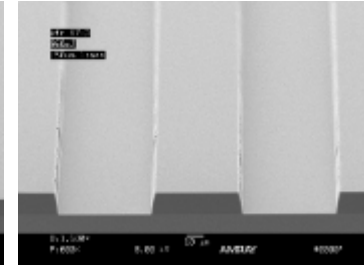
80  $\mu\text{m}$



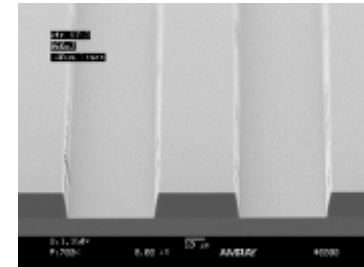
60  $\mu\text{m}$



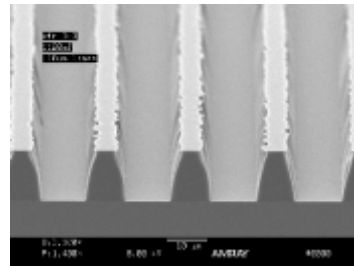
50  $\mu\text{m}$



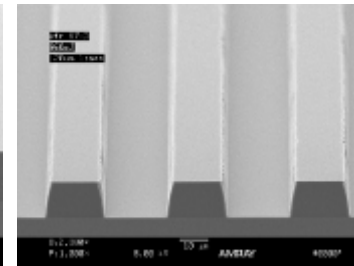
40  $\mu\text{m}$



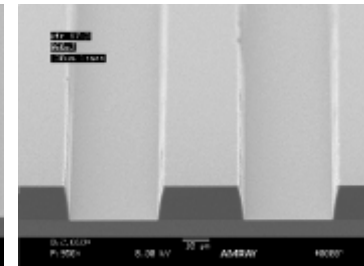
Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 110°C/ 180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 400 sec continuous spray @ 23 °C



10  $\mu\text{m}$



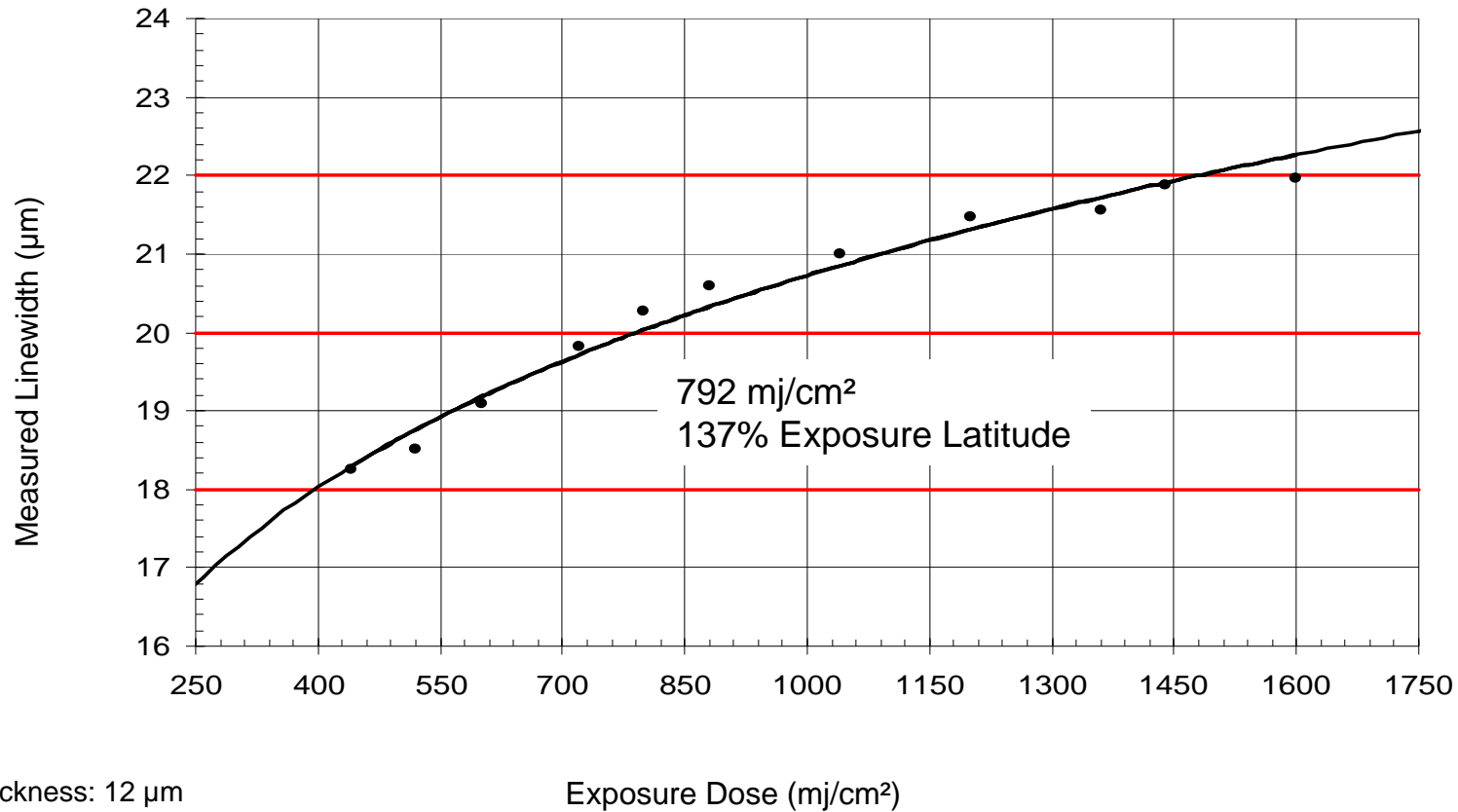
20  $\mu\text{m}$



30  $\mu\text{m}$

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Exposure Latitude on Silicon, 20.0 $\mu\text{m}$ CH, 1:1 Pitch



Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 110°C/ 180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Exposure Latitude on Silicon, 20.0 $\mu\text{m}$ CH, 1:1 Pitch

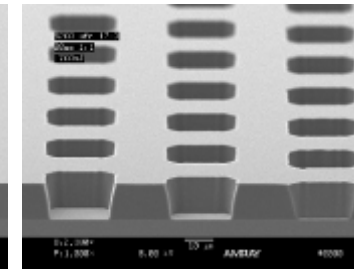
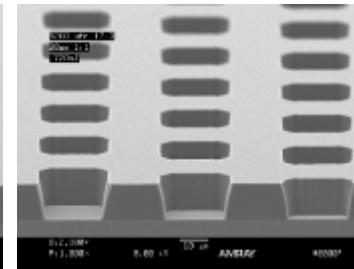
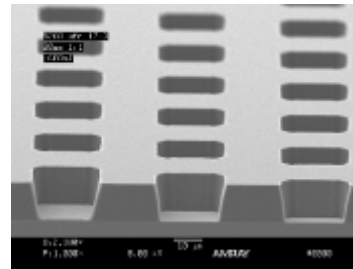
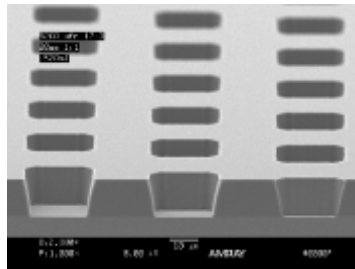
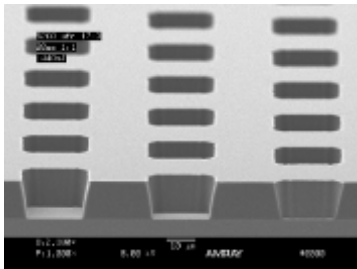
440 mJ/cm<sup>2</sup>

520 mJ/cm<sup>2</sup>

600 mJ/cm<sup>2</sup>

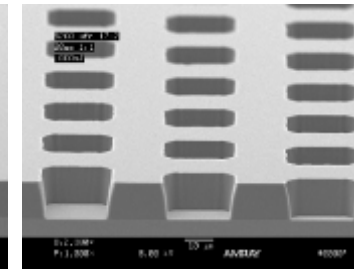
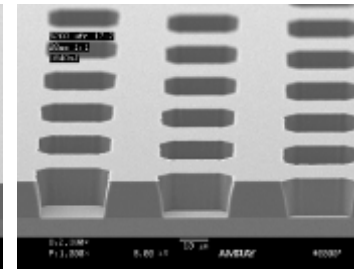
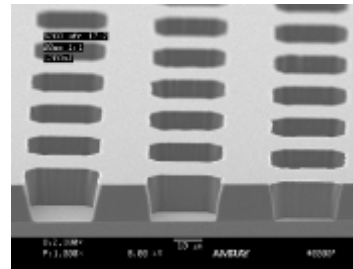
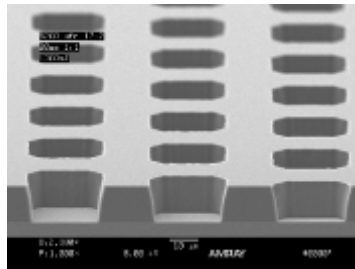
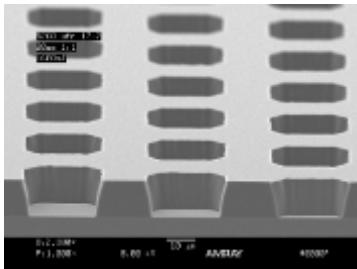
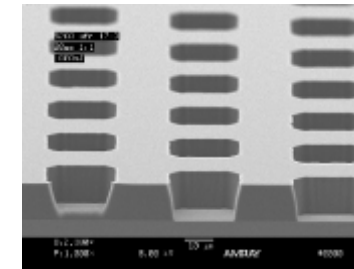
720mJ/cm<sup>2</sup>

760 mJ/cm<sup>2</sup>



Film Thickness: 12  $\mu\text{m}$   
 Optitrac coat and Bake  
 SB: 110°C/ 180 sec  
 Suss MA200 CC Mask Aligner  
 20  $\mu\text{m}$  proximity gap  
 AZ 300 MIF, 400 sec continuous spray @ 23 °C

800 mJ/cm<sup>2</sup>



1600 mJ/cm<sup>2</sup>

1360 mJ/cm<sup>2</sup>

1200 mJ/cm<sup>2</sup>

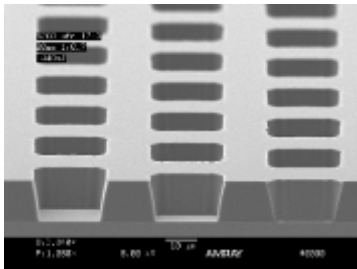
1040 mJ/cm<sup>2</sup>

880 mJ/cm<sup>2</sup>

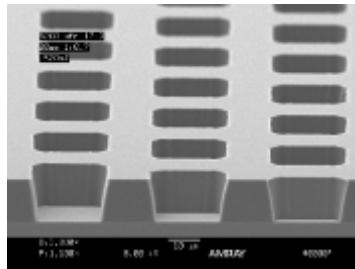
# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Exposure Latitude on Silicon, 20.0 $\mu\text{m}$ CH, 1:0.7 Pitch

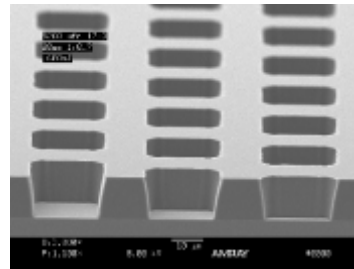
440 mJ/cm<sup>2</sup>



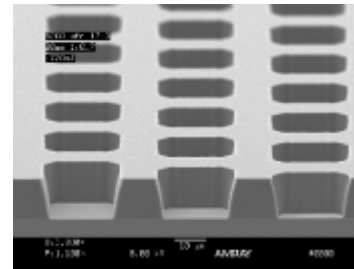
520 mJ/cm<sup>2</sup>



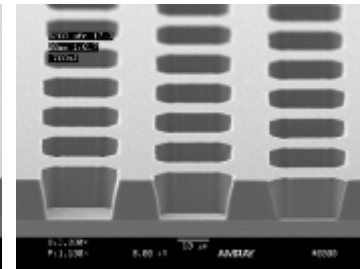
600 mJ/cm<sup>2</sup>



720 mJ/cm<sup>2</sup>

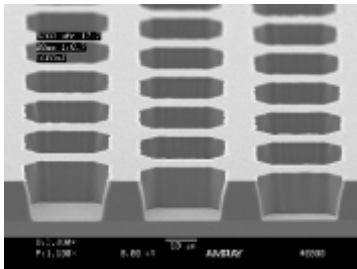
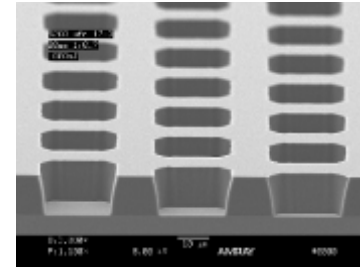


760 mJ/cm<sup>2</sup>

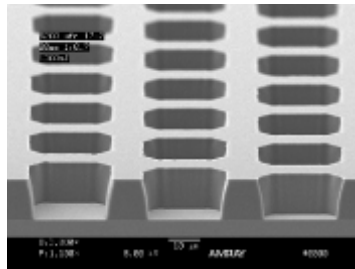


Film Thickness: 12  $\mu\text{m}$   
 Optitrac coat and Bake  
 SB: 110°C/ 180 sec  
 Suss MA200 CC Mask Aligner  
 20  $\mu\text{m}$  proximity gap  
 AZ 300 MIF, 400 sec continuous spray @ 23 °C

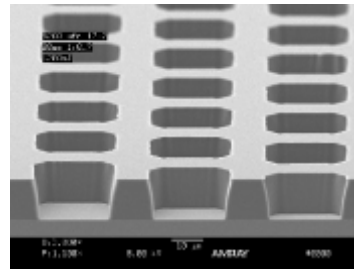
800 mJ/cm<sup>2</sup>



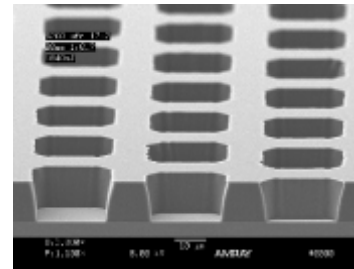
1600 mJ/cm<sup>2</sup>



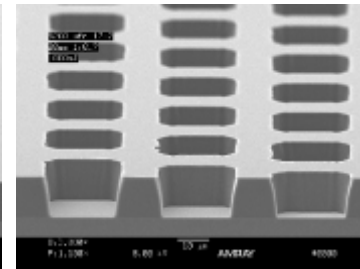
1360 mJ/cm<sup>2</sup>



1200 mJ/cm<sup>2</sup>



1040 mJ/cm<sup>2</sup>

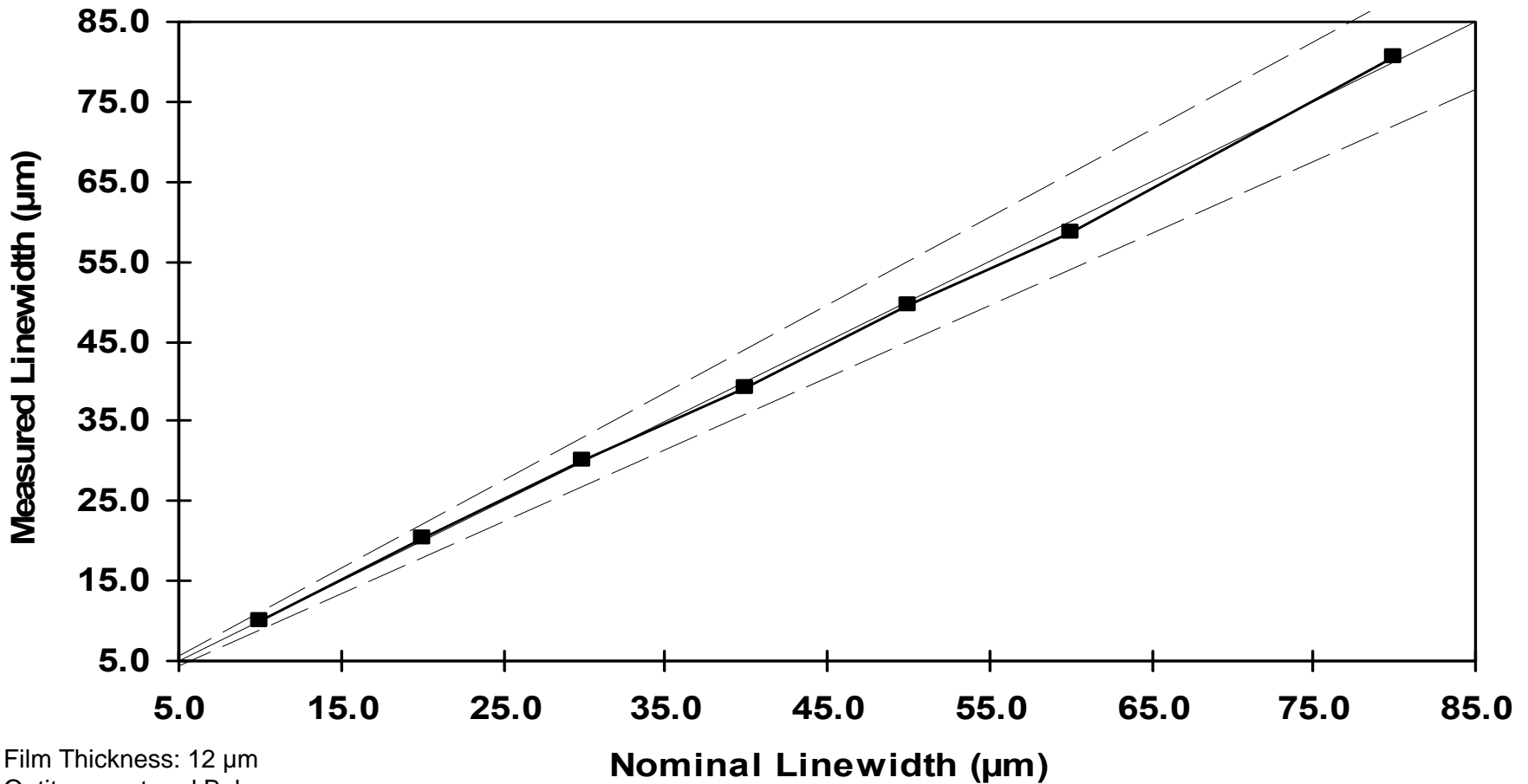


880 mJ/cm<sup>2</sup>



# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

Linearity on Silicon @ 800  $\text{mJ}/\text{cm}^2$ , Contact Holes, 1:1 Pitch

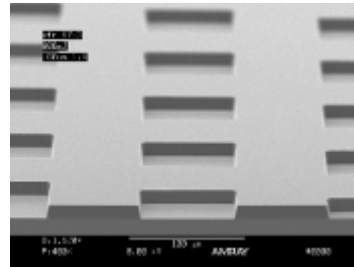


Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 110°C/ 180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

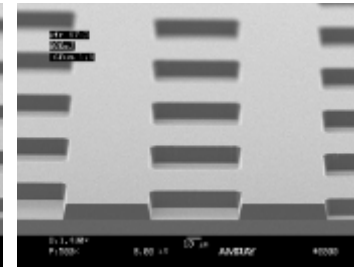
# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Linearity on Silicon @ 800 $\text{mJ}/\text{cm}^2$ , Contact Holes, 1:1 Pitch

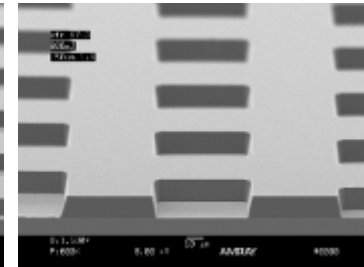
80  $\mu\text{m}$



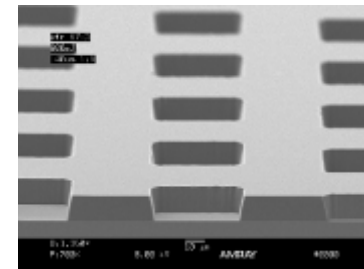
60  $\mu\text{m}$



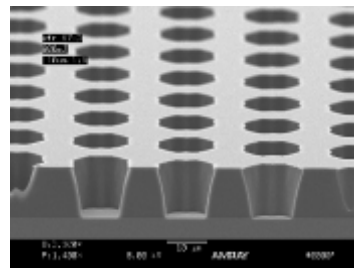
50  $\mu\text{m}$



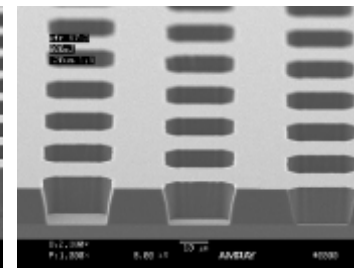
40  $\mu\text{m}$



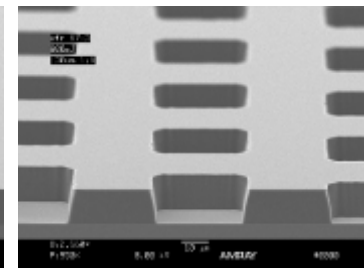
Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 110°C/ 180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 400 sec continuous spray @ 23 °C



10  $\mu\text{m}$



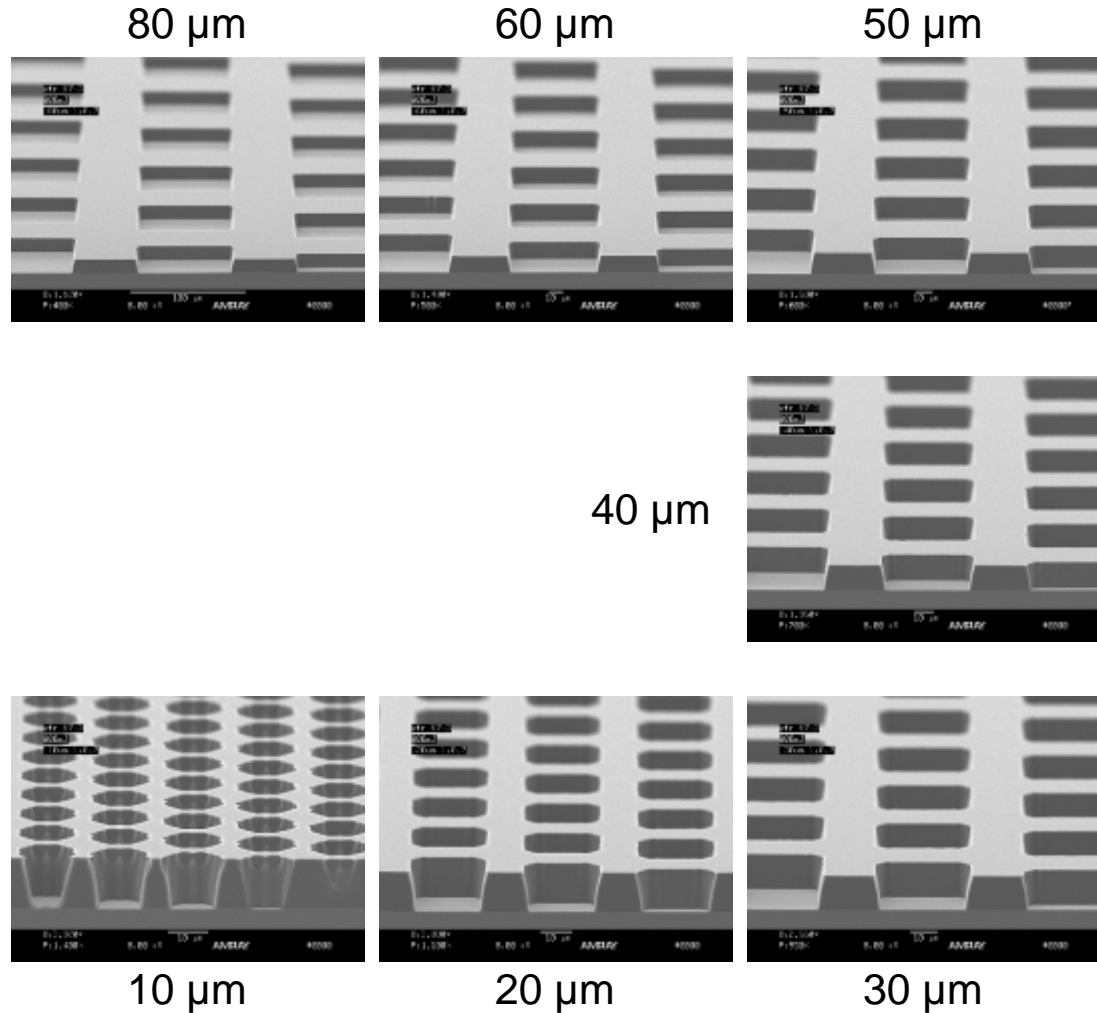
20  $\mu\text{m}$



30  $\mu\text{m}$

# AZ 9260 Photoresist, FT=12 $\mu\text{m}$

## Linearity on Silicon @ 800 $\text{mJ}/\text{cm}^2$ , Contact Holes, 1:0.7 Pitch



Film Thickness: 12  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 110°C/ 180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 400 sec continuous spray @ 23 °C

# **AZ 9260 Photoresist**

**Lithographic Evaluation  
by Ultratech 1500 Stepper**

**with AZ 400K 1:4 Developer  
24 $\mu$ m FT Process**

# AZ 9260 Photoresist

## Process Conditions:

Substrate:	Bare Silicon
Coat:	Optitrac Static dispense
Target FT:	24 $\mu\text{m}$
Softbake:	1st layer 110°C hotplate/ 80 sec. full contact 2nd layer 115°C hotplate/ 180 sec. full contact
Exposure:	Ultratech 1500 gh line Stepper
FEM:	1900 mJ/cm <sup>2</sup> with increments of 75 mJ/cm <sup>2</sup> Nominal Focus of -6 $\mu\text{m}$ in increments of 2 $\mu\text{m}$ in both directions
Develop:	<b>AZ 400K 1:4</b> , continuous spray for 600 sec. @ 27°C

**Analysis:** Amray SEM

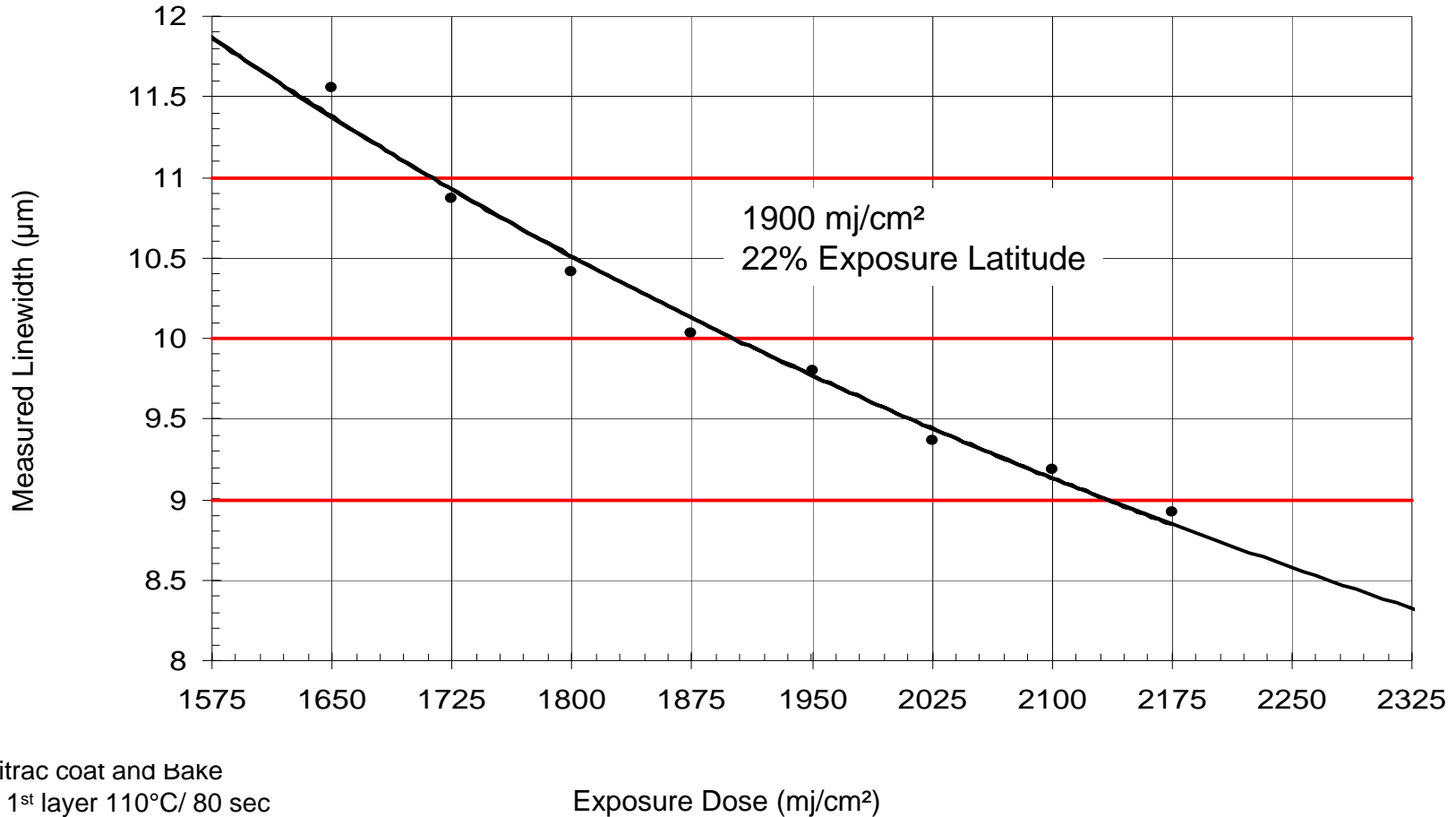
# AZ 9260 Photoresist

## Summary of Results:

Features (1:1)	Film Thickness ( $\mu\text{m}$ )	DTP 10 $\mu\text{m}$ ( $\text{mJ}/\text{cm}^2$ )	Exposure Latitude 10 $\mu\text{m}$ (%)	DOF 10 $\mu\text{m}$ ( $\mu\text{m}$ )	Linearity ( $\mu\text{m}$ )
Dense Lines	24	1900	22	16	4
Contact Holes	24	1805	30	>8	<10

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ L/S



Optitrac coat and Bake

SB: 1<sup>st</sup> layer 110°C/ 80 sec

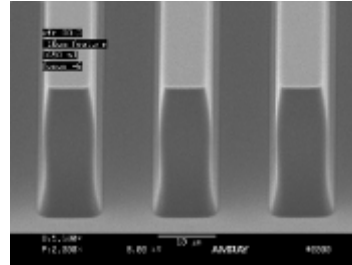
2<sup>nd</sup> layer 115°C/180 sec

Ultratech 1500 gh line Stepper

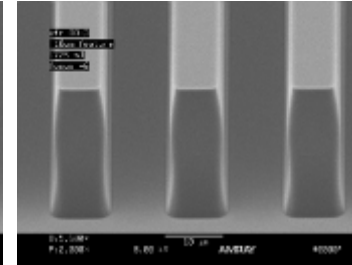
AZ 400K 1:4, 600 sec continuous spray @ 27 °C

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$ Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ L/S

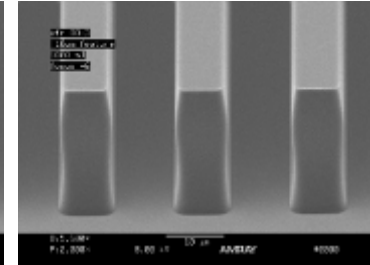
1650 mJ/cm<sup>2</sup>



1725 mJ/cm<sup>2</sup>



1800 mJ/cm<sup>2</sup>



Optitrac coat and Bake

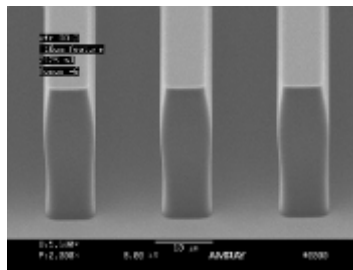
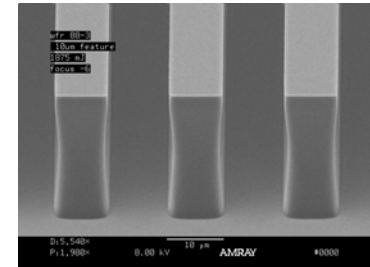
SB: 1<sup>st</sup> layer 110°C/ 80 sec

2<sup>nd</sup> layer 115°C/180 sec

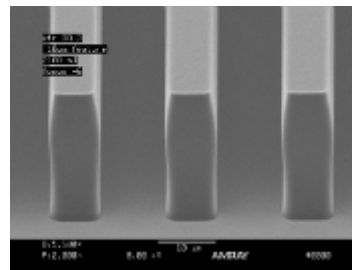
Ultratech 1500 gh line Stepper

AZ 400K 1:4, 600 sec continuous spray @ 27 °C

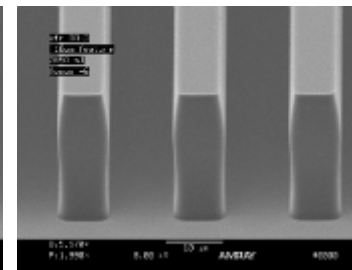
1875 mJ/cm<sup>2</sup>



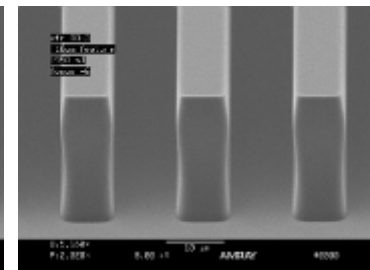
2175 mJ/cm<sup>2</sup>



2100 mJ/cm<sup>2</sup>



2025 mJ/cm<sup>2</sup>

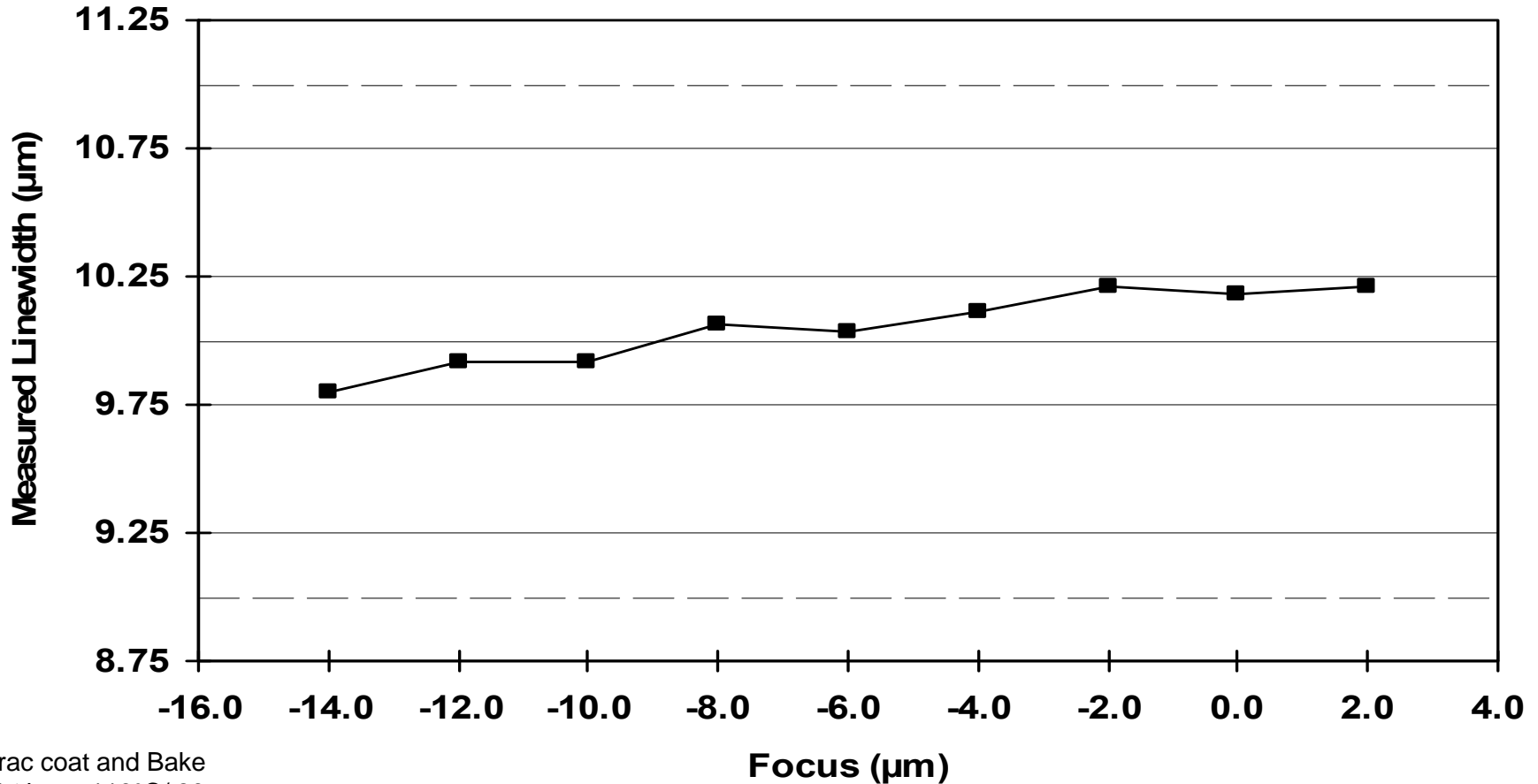


1950 mJ/cm<sup>2</sup>



# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

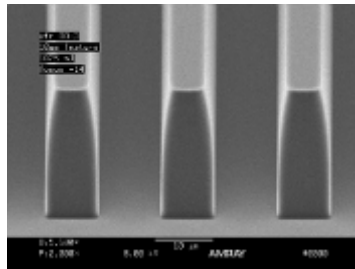
## Depth of Focus @ 1875 mJ/cm<sup>2</sup>, 10.0 $\mu\text{m}$ L/S



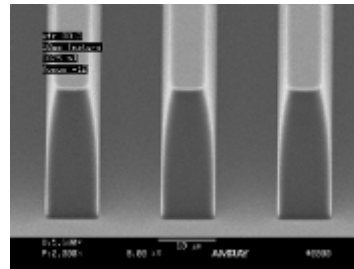
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Ultratech 1500 gh line Stepper  
AZ 400K 1:4, 600 sec continuous spray @ 27 °C

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$ Depth of Focus @ 1875 $\text{mJ}/\text{cm}^2$ , 10.0 $\mu\text{m}$ L/S

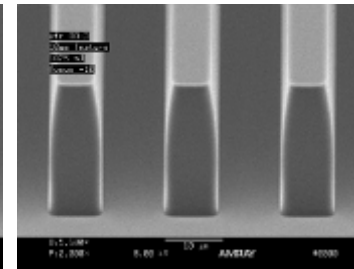
-14.0  $\mu\text{m}$



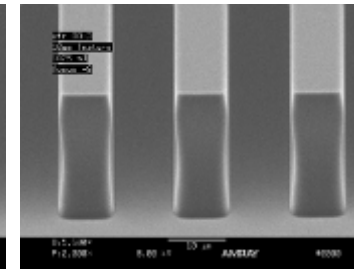
-12.0  $\mu\text{m}$



-10.0  $\mu\text{m}$



-8.0  $\mu\text{m}$



Optitrac coat and Bake

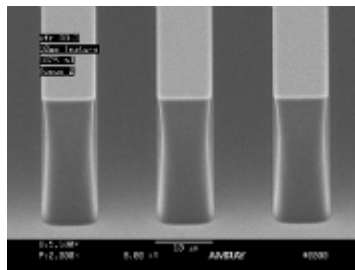
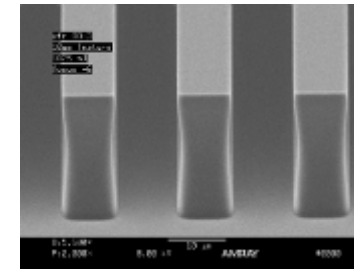
SB: 1<sup>st</sup> layer 110°C/ 80 sec

2<sup>nd</sup> layer 115°C/180 sec

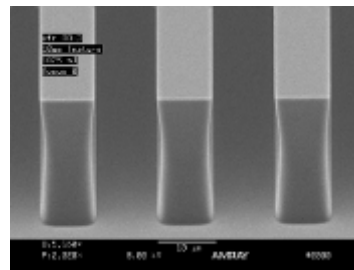
Ultratech 1500 gh line Stepper

AZ 400K 1:4, 600 sec continuous spray @ 27 °C

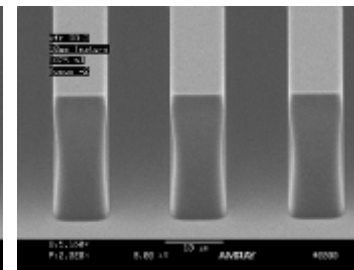
-6.0  $\mu\text{m}$



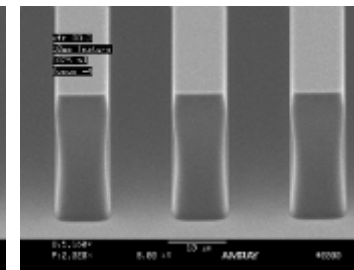
2.0  $\mu\text{m}$



0.0  $\mu\text{m}$



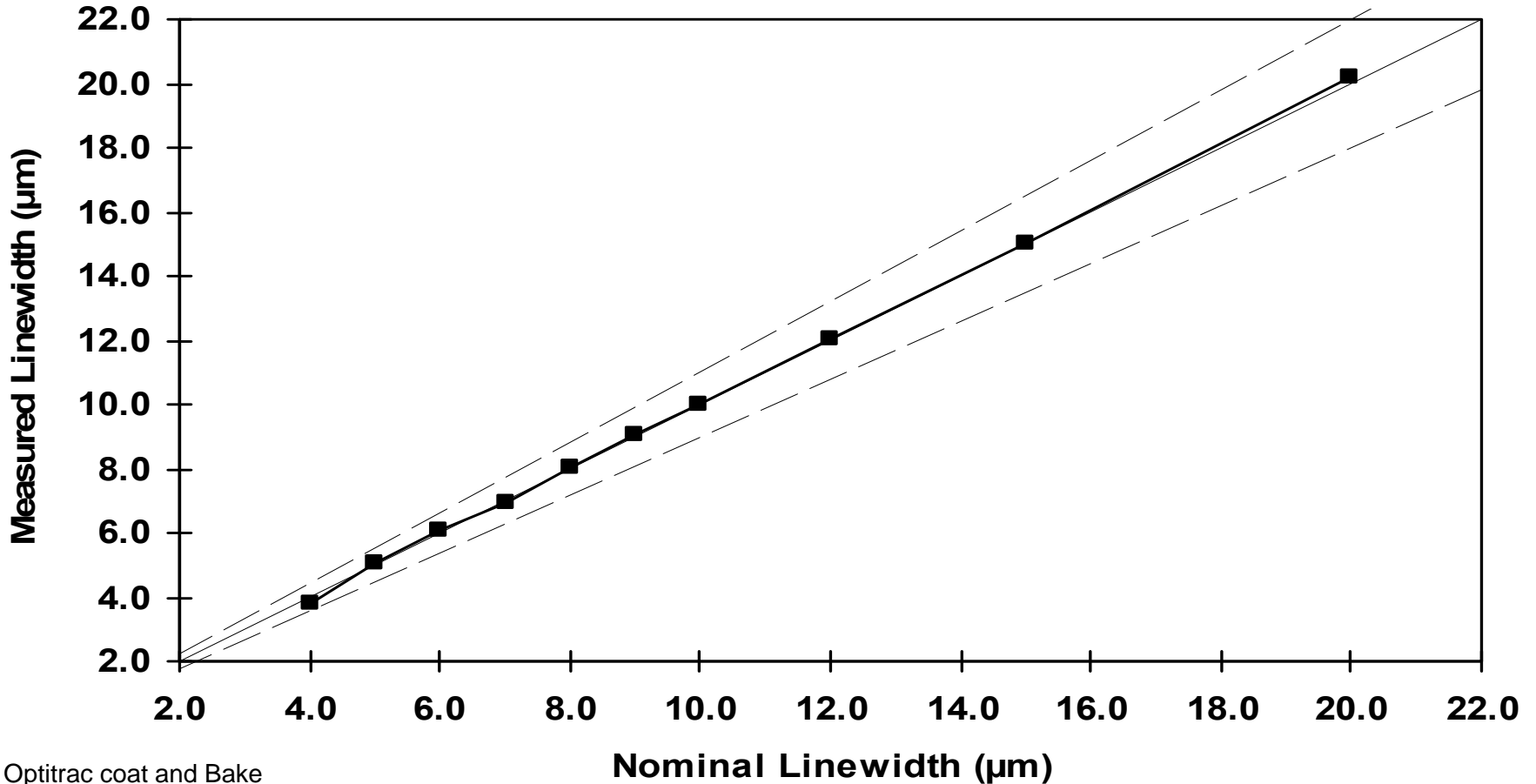
-2.0  $\mu\text{m}$



-4.0  $\mu\text{m}$

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Linearity on Silicon @ 1875 $\text{mJ}/\text{cm}^2$

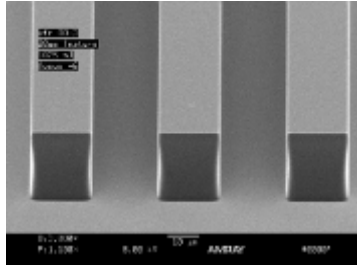


Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Ultratech 1500 gh line Stepper  
AZ 400K 1:4, 600 sec continuous spray @ 27 °C

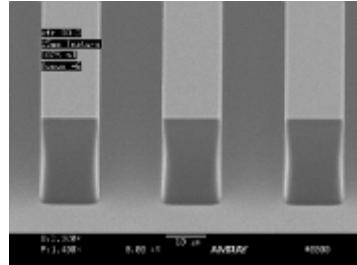
# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Linearity on Silicon @ 1875 $\text{mJ}/\text{cm}^2$

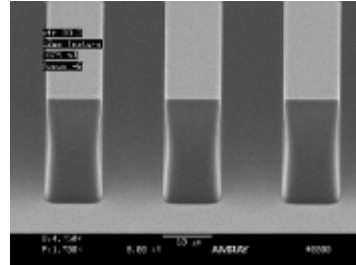
20  $\mu\text{m}$



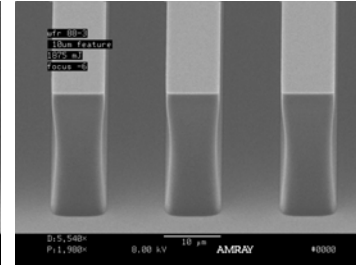
15  $\mu\text{m}$



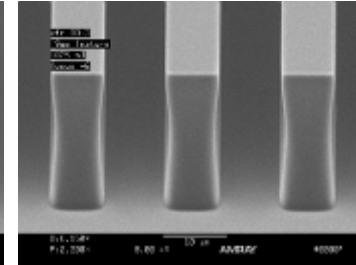
12  $\mu\text{m}$



10.0  $\mu\text{m}$



9.0  $\mu\text{m}$



Optitrac coat and Bake

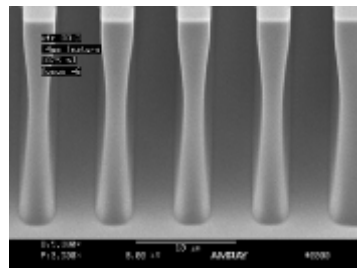
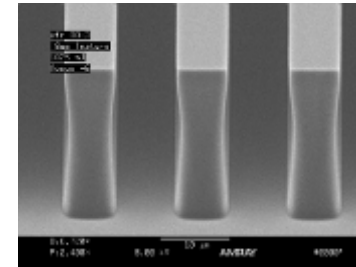
SB: 1<sup>st</sup> layer 110°C/ 80 sec

2<sup>nd</sup> layer 115°C/180 sec

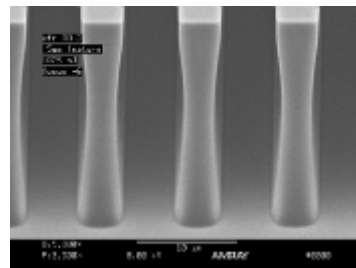
Ultratech 1500 gh line Stepper

AZ 400K 1:4, 600 sec continuous spray @ 27 °C

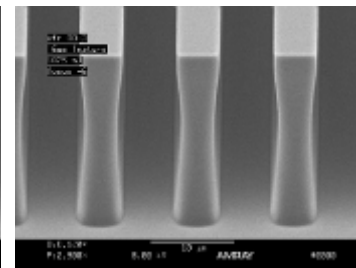
8.0  $\mu\text{m}$



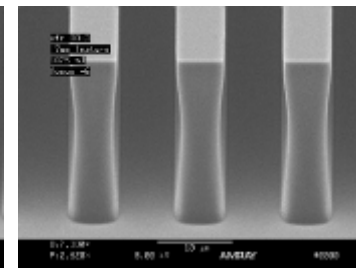
4.0  $\mu\text{m}$



5.0  $\mu\text{m}$



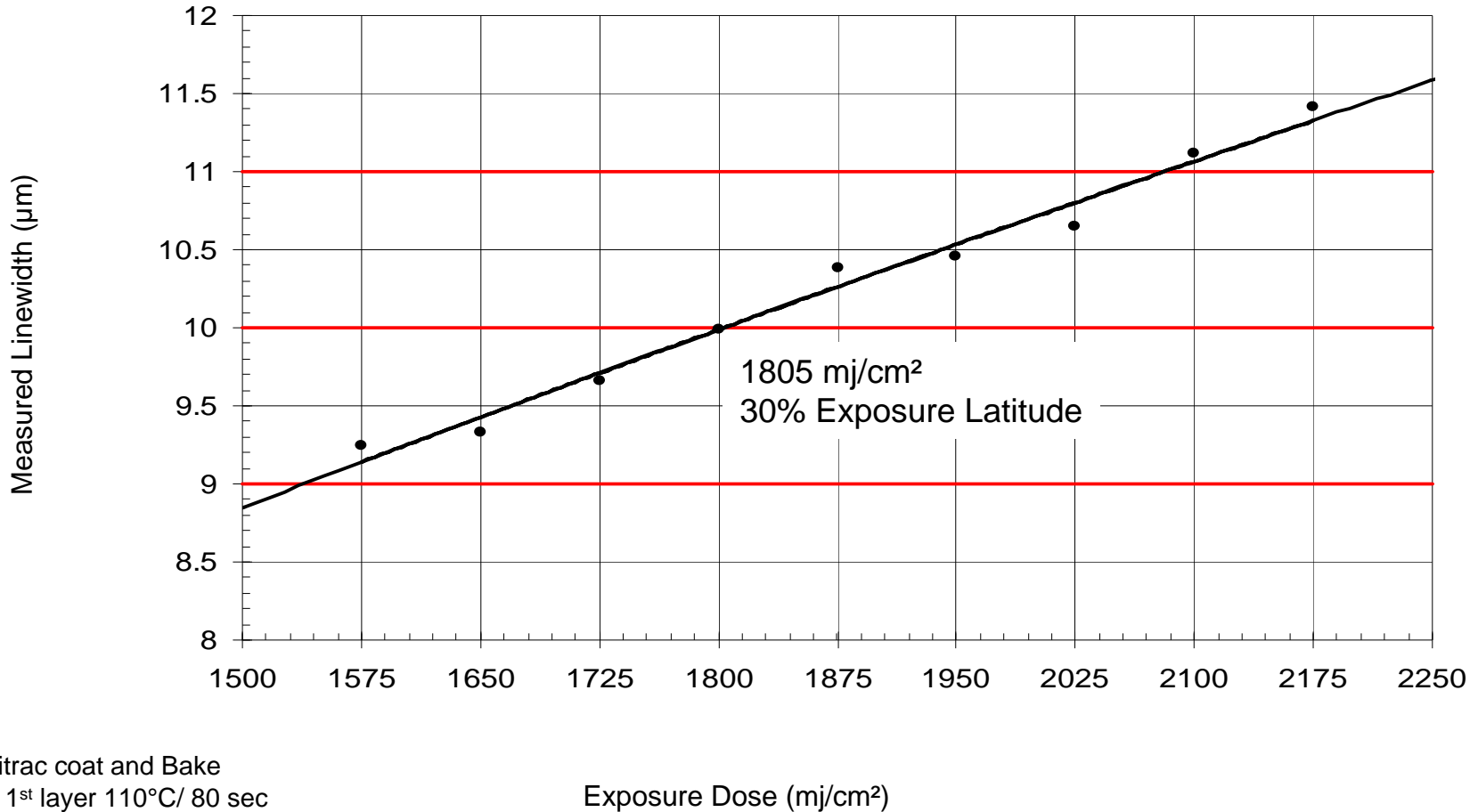
6.0  $\mu\text{m}$



7.0  $\mu\text{m}$

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ CH, 1:1 Pitch

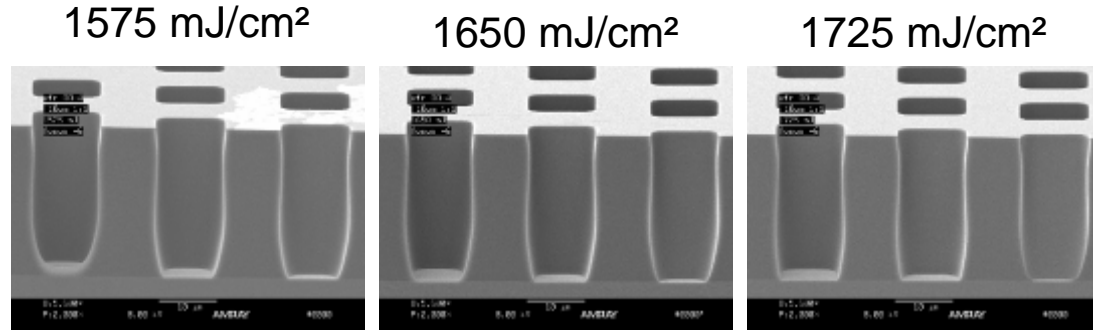


Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Ultratech 1500 gh line Stepper  
AZ 400K 1:4, 600 sec continuous spray @ 27 °C

Exposure Dose ( $\text{mj}/\text{cm}^2$ )

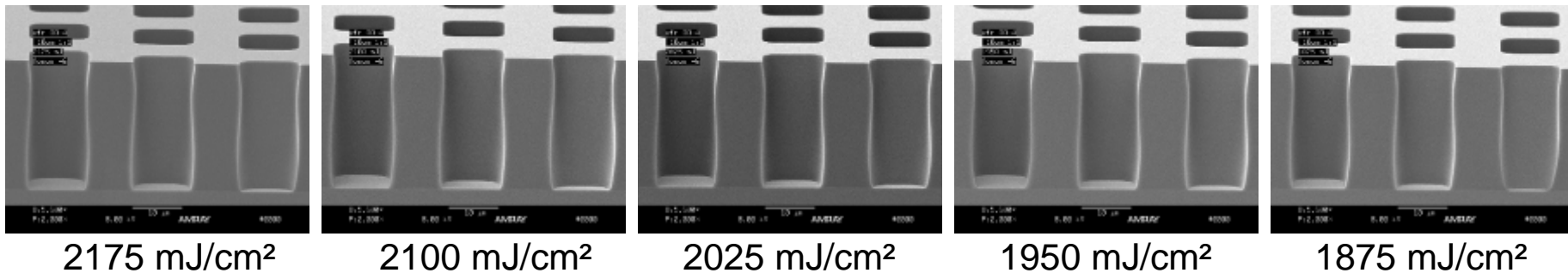
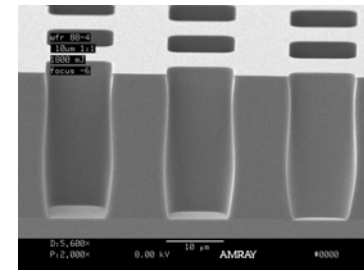
# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ CH, 1:1 Pitch



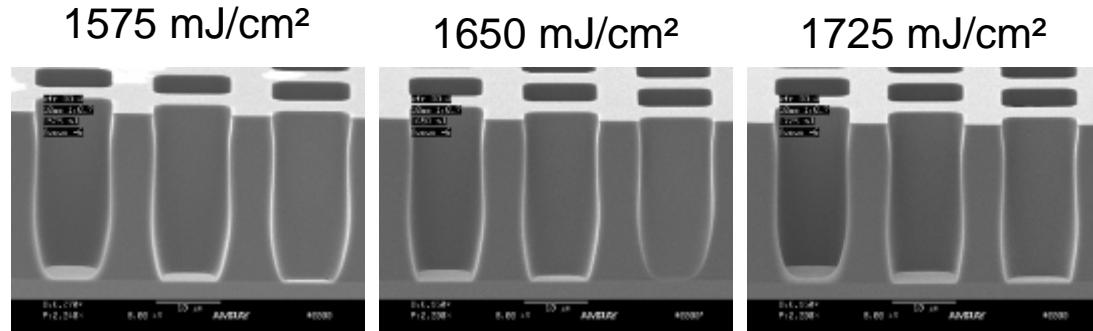
Optitrac coat and Bake  
 SB: 1<sup>st</sup> layer 110°C/ 80 sec  
     2<sup>nd</sup> layer 115°C/180 sec  
 Ultratech 1500 gh line Stepper  
 AZ 400K 1:4, 600 sec continuous spray @ 27 °C

1800 mJ/cm<sup>2</sup>



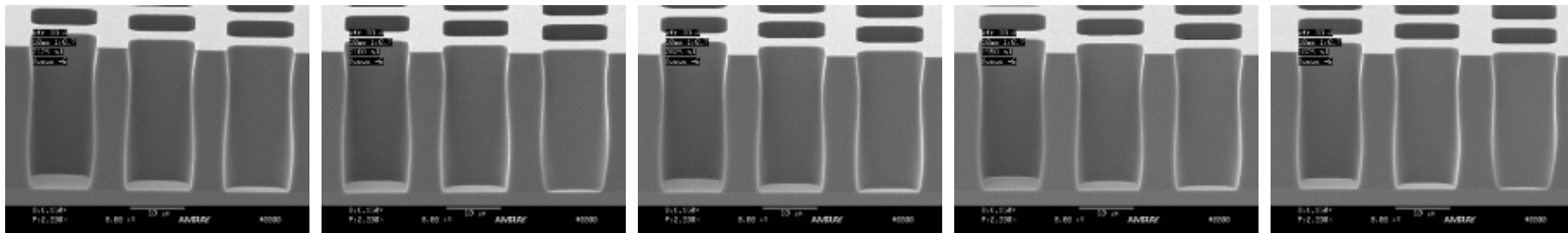
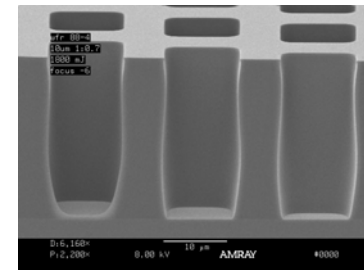
# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ CH, 1:0.7 Pitch



Optitrac coat and Bake  
 SB: 1<sup>st</sup> layer 110°C/ 80 sec  
     2<sup>nd</sup> layer 115°C/180 sec  
 Ultratech 1500 gh line Stepper  
 AZ 400K 1:4, 600 sec continuous spray @ 27 °C

1800 mJ/cm<sup>2</sup>



2175 mJ/cm<sup>2</sup>

2100 mJ/cm<sup>2</sup>

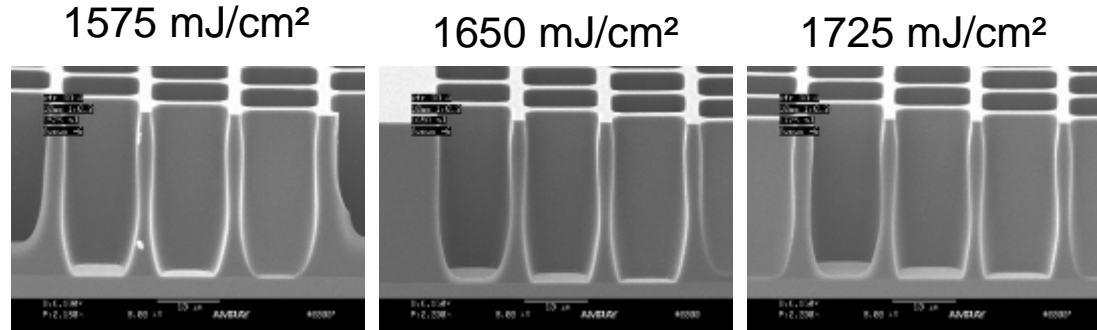
2025 mJ/cm<sup>2</sup>

1950 mJ/cm<sup>2</sup>

1875 mJ/cm<sup>2</sup>

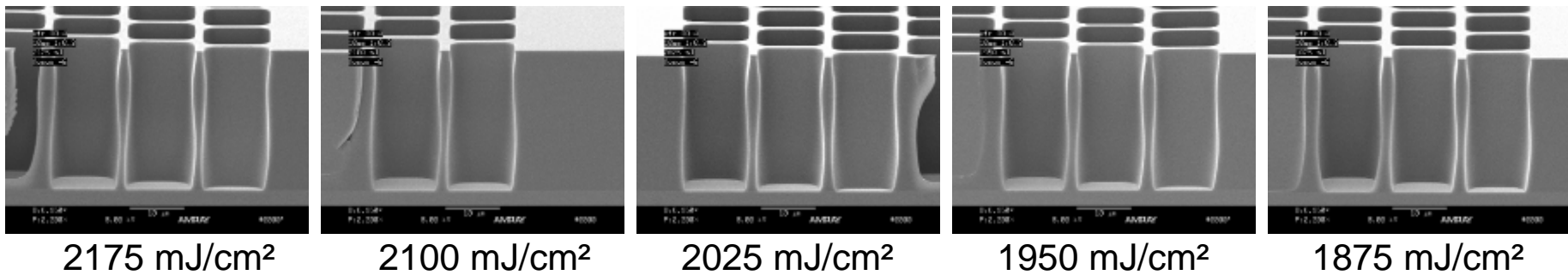
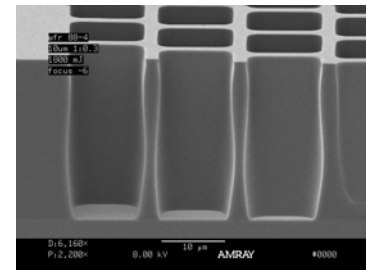
# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Exposure Latitude on Silicon, 10.0 $\mu\text{m}$ CH, 1:0.3 Pitch



Optitrac coat and Bake  
 SB: 1<sup>st</sup> layer 110°C/ 80 sec  
     2<sup>nd</sup> layer 115°C/180 sec  
 Ultratech 1500 gh line Stepper  
 AZ 400K 1:4, 600 sec continuous spray @ 27 °C

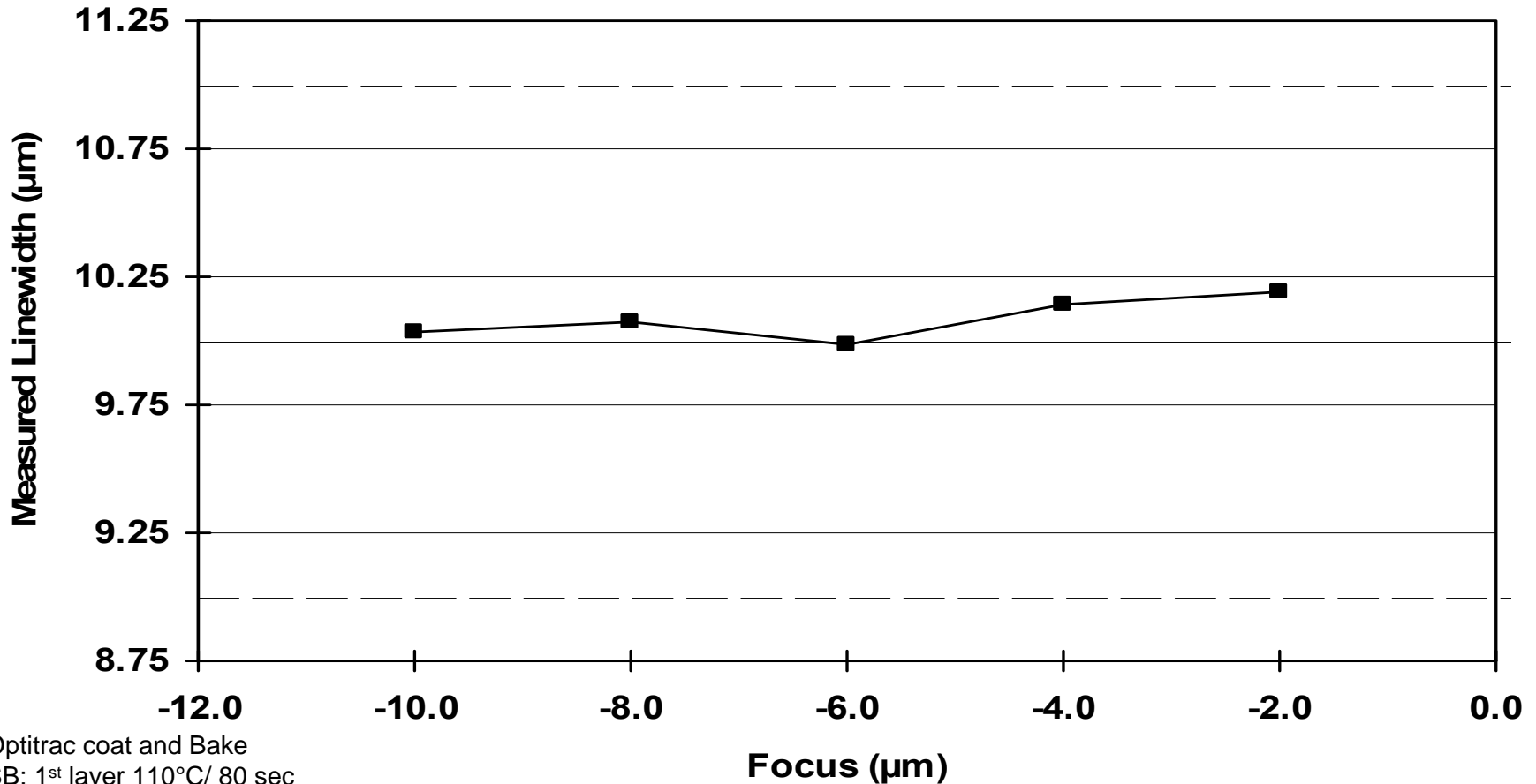
1800 mJ/cm<sup>2</sup>





# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

Depth of Focus @ 1800 mJ/cm<sup>2</sup>, 10.0  $\mu\text{m}$  CH, 1:1 Pitch

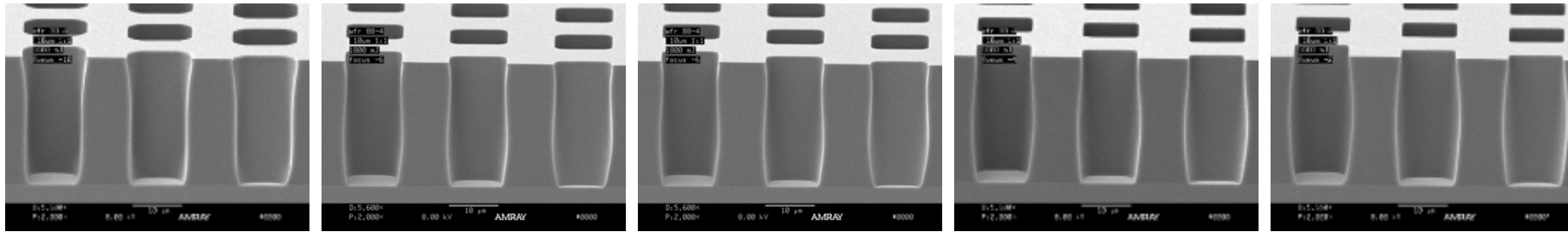


Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Ultratech 1500 gh line Stepper  
AZ 400K 1:4, 600 sec continuous spray @ 27 °C

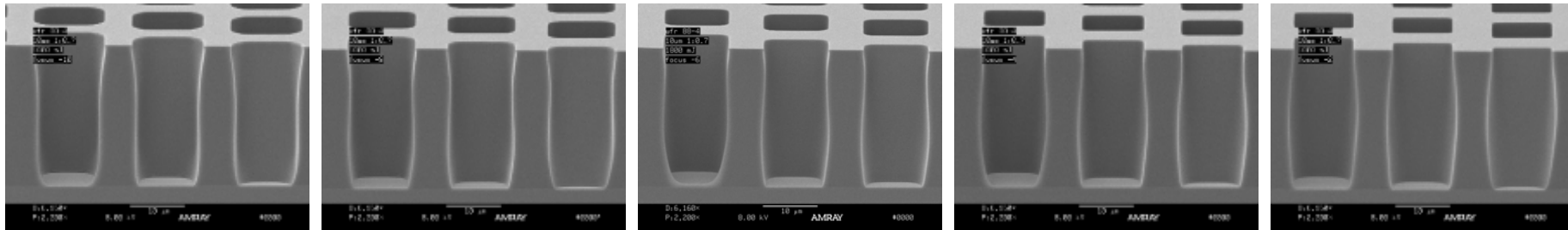
# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

Depth of Focus @ 1800  $\text{mJ}/\text{cm}^2$ , 10.0  $\mu\text{m}$  CH, Various Pitch

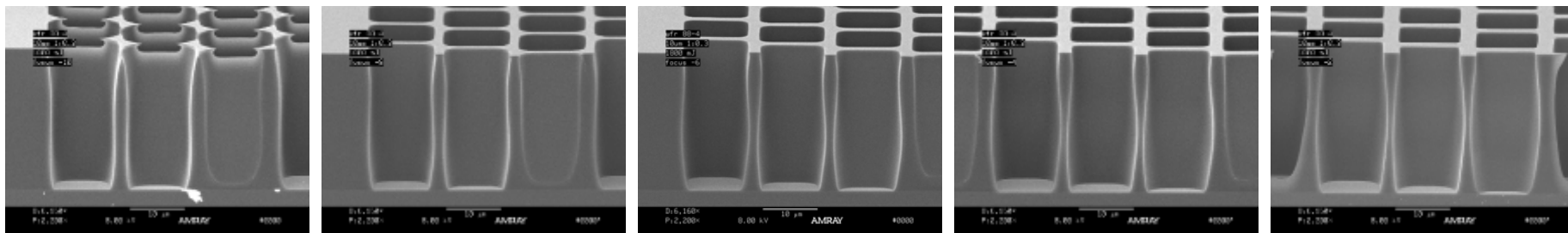
1:1



1:0.7



1:0.3



-10.0  $\mu\text{m}$

-8.0  $\mu\text{m}$

-6.0  $\mu\text{m}$

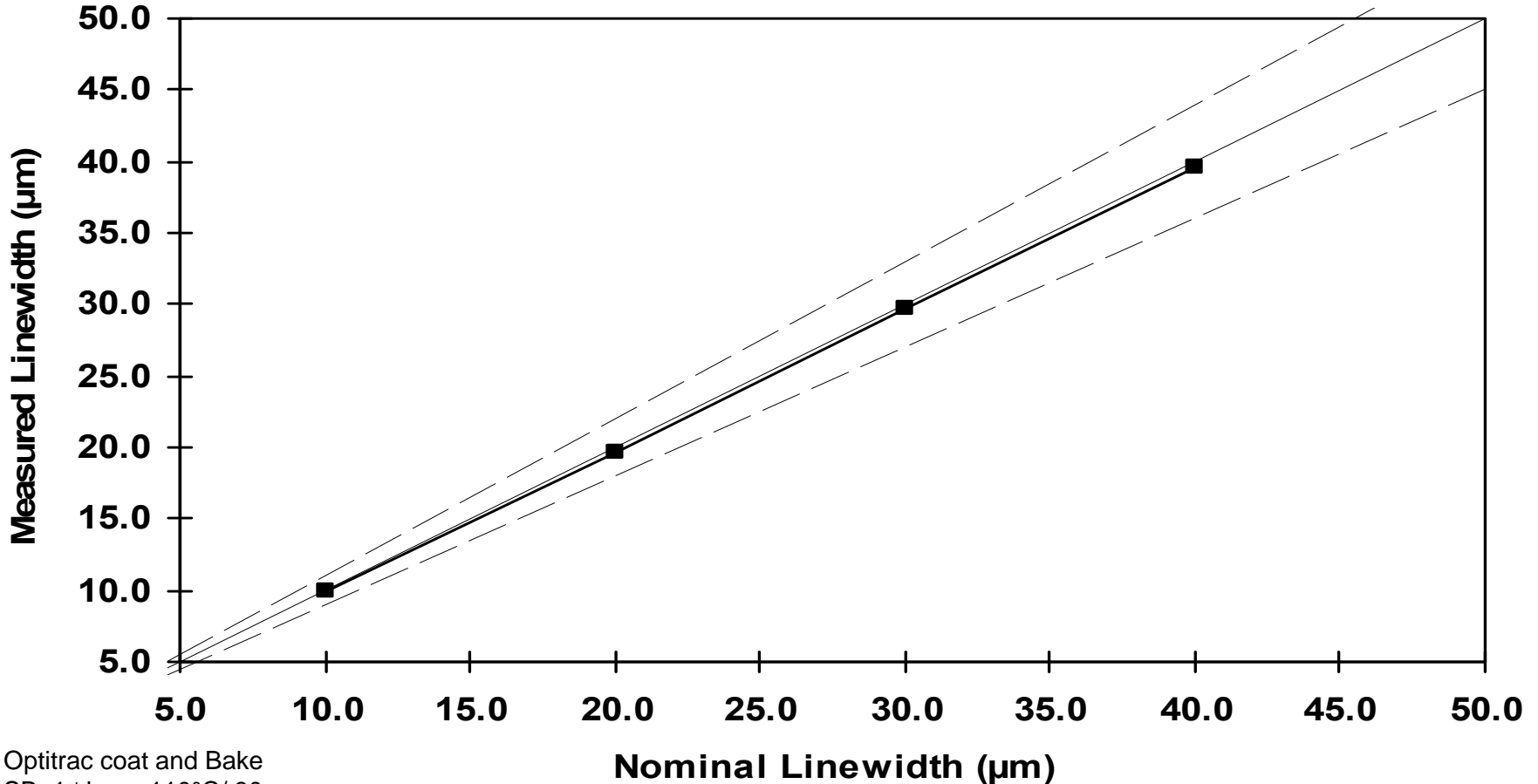
-4.0  $\mu\text{m}$

-2.0  $\mu\text{m}$

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

Linearity on Silicon @ 1800  $\text{mJ}/\text{cm}^2$

40.0  $\mu\text{m}$  to 10.0  $\mu\text{m}$  Contact Holes, 1:1 Pitch



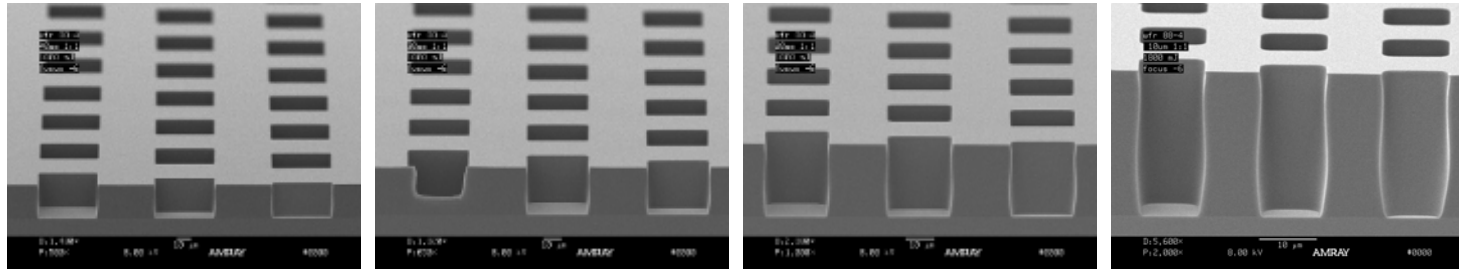
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Ultratech 1500 gh line Stepper  
AZ 400K 1:4, 600 sec continuous spray @ 27 °C

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

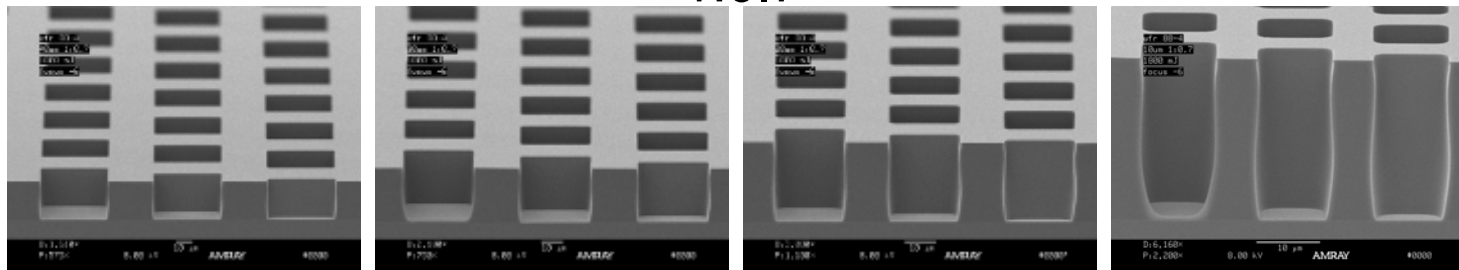
Linearity on Silicon @ 1800  $\text{mJ}/\text{cm}^2$

40.0  $\mu\text{m}$  to 10.0  $\mu\text{m}$  Contact Holes, Various Pitch

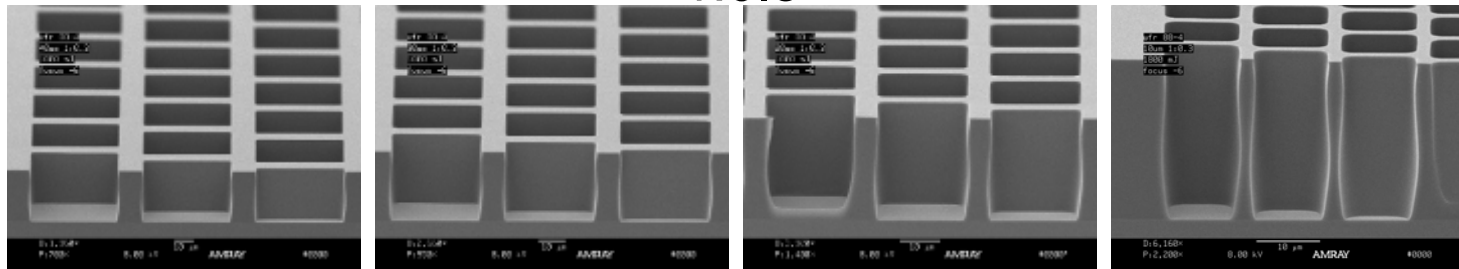
1:1



1:0.7



1:0.3



40  $\mu\text{m}$

30  $\mu\text{m}$

20  $\mu\text{m}$

10  $\mu\text{m}$



# **AZ 9260 Photoresist**

## **Lithographic Evaluation**

### **by Suss MA200 Mask Aligner**

#### **with AZ 300 MIF Developer**

#### **24 $\mu$ m FT Process**

# AZ 9260 Photoresist

## Process Conditions:

Substrate:	Bare Silicon
Coat:	Optitrac Static dispense
Target FT:	24 $\mu\text{m}$
Softbake:	1st layer 110°C hotplate/ 80 sec. full contact 2nd layer 115°C hotplate/ 180 sec. full contact
Exposure:	Suss MA200 CC Mask Aligner with 20 $\mu\text{m}$ proximity gap
FEM:	2200 $\text{mJ}/\text{cm}^2$ with increments of 200 $\text{mJ}/\text{cm}^2$
Develop:	<b>AZ 300 MIF (2.38% TMAH)</b> continuous spray for 720 sec. @ 23°C
<b>Analysis:</b>	Amray SEM

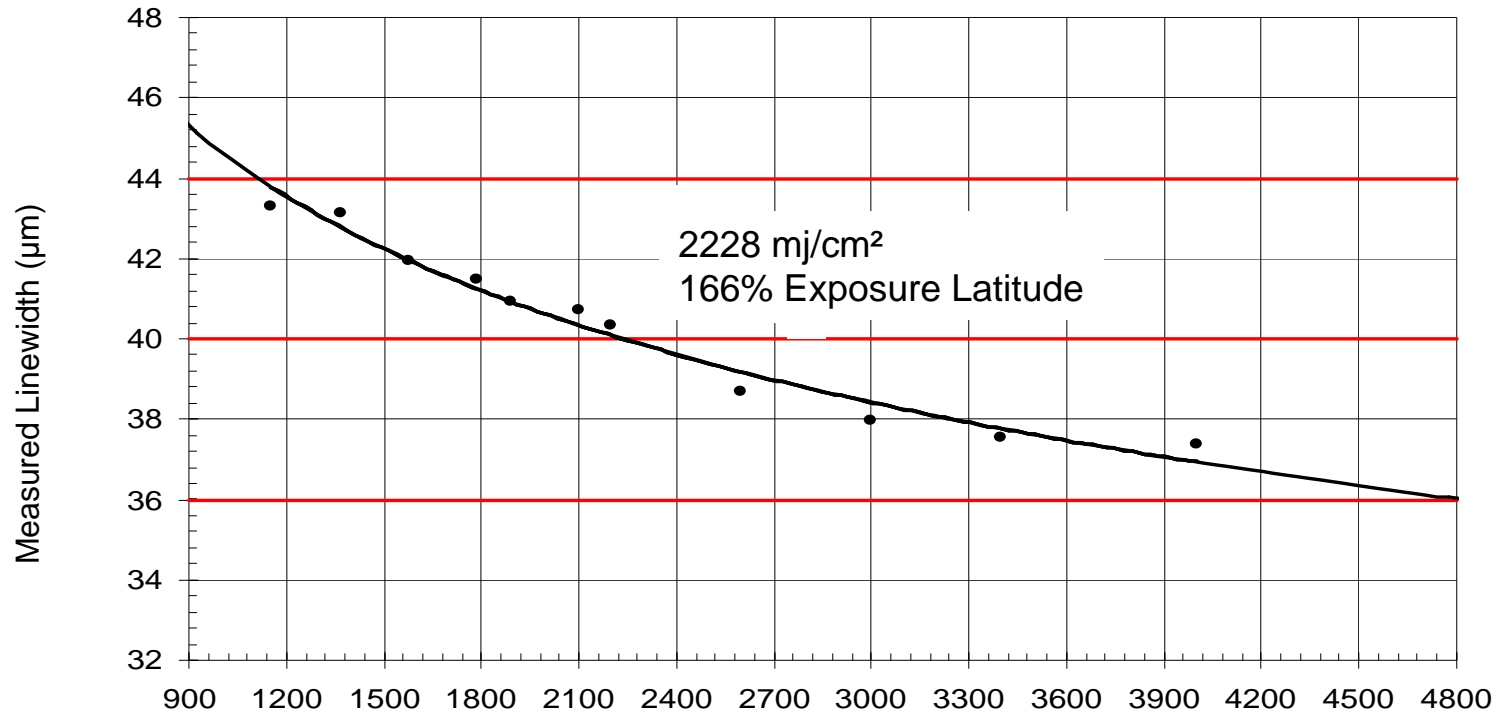
# AZ 9260 Photoresist

## Summary of Results:

Features (1:1)	Film Thickness ( $\mu\text{m}$ )	DTP 40 $\mu\text{m}$ ( $\text{mJ}/\text{cm}^2$ )	Exposure Latitude 40 $\mu\text{m}$ (%)	Linearity ( $\mu\text{m}$ )
Dense Lines	24	2228	166	10
Contact Holes	24	1674	217	10

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Exposure Latitude on Silicon, 40 $\mu\text{m}$ L/S



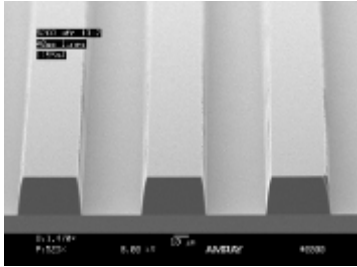
Film Thickness: 24  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 720 sec continuous spray @ 23 °C

Exposure Dose ( $\text{mj}/\text{cm}^2$ )

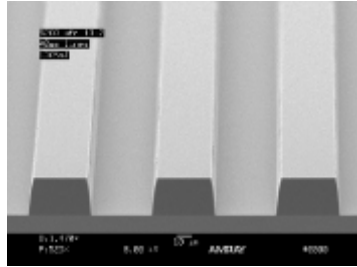


# AZ 9260 Photoresist, FT=24 $\mu\text{m}$ Exposure Latitude on Silicon, 40 $\mu\text{m}$ L/S

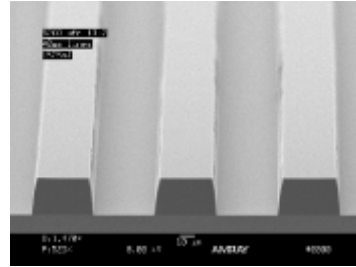
1155 mJ/cm<sup>2</sup>



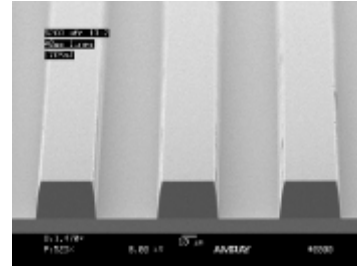
1365 mJ/cm<sup>2</sup>



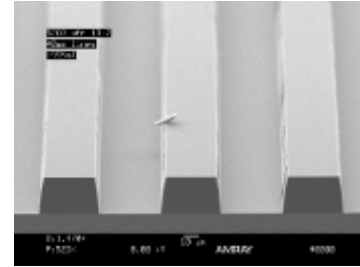
1575 mJ/cm<sup>2</sup>



1785 mJ/cm<sup>2</sup>

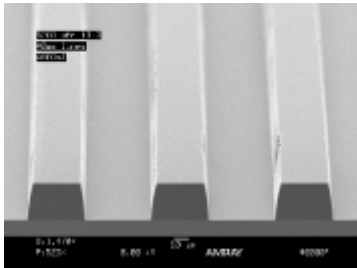
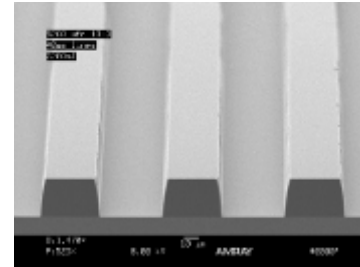


1995 mJ/cm<sup>2</sup>

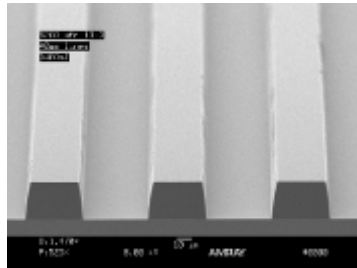


Film Thickness: 24  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 720 sec continuous spray @ 23 °C

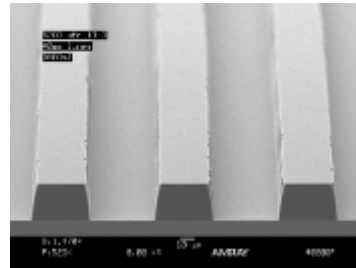
2200 mJ/cm<sup>2</sup>



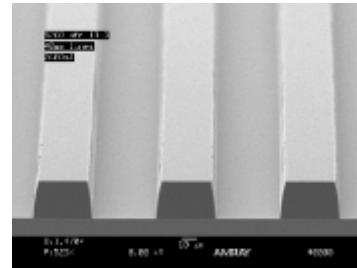
4000 mJ/cm<sup>2</sup>



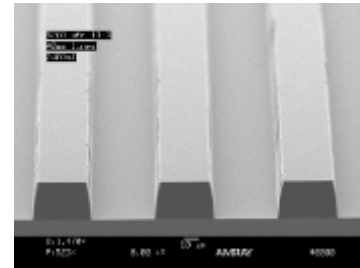
3400 mJ/cm<sup>2</sup>



3000 mJ/cm<sup>2</sup>



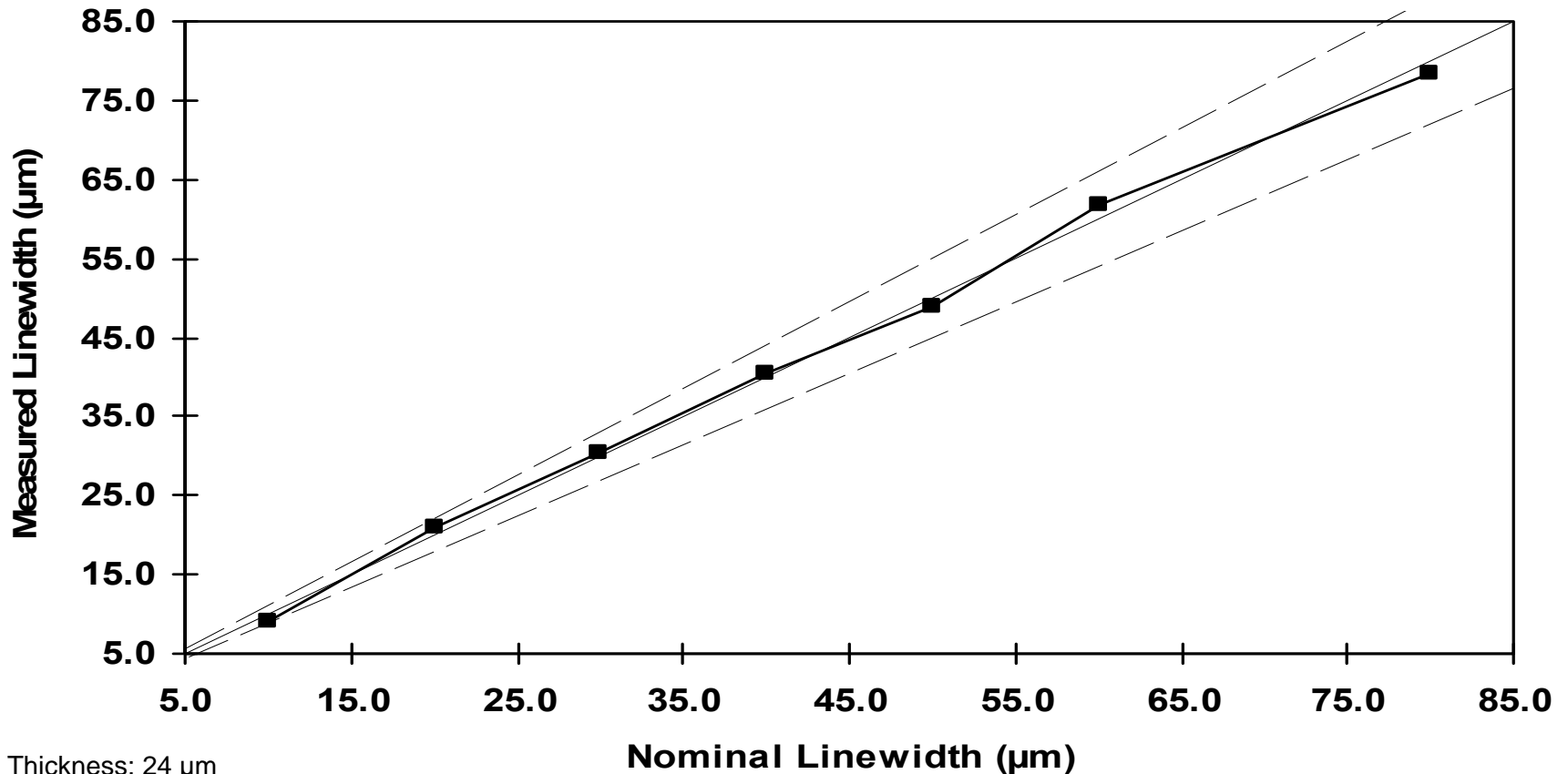
2600 mJ/cm<sup>2</sup>



2400 mJ/cm<sup>2</sup>

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Linearity on Silicon @ 2200 $\text{mJ}/\text{cm}^2$

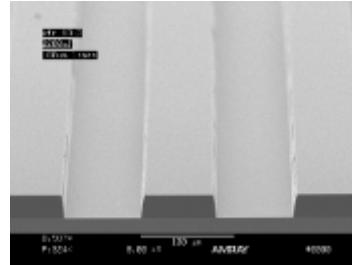


Film Thickness: 24  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
    2<sup>nd</sup> layer 115°C/180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 720 sec continuous spray @ 23 °C

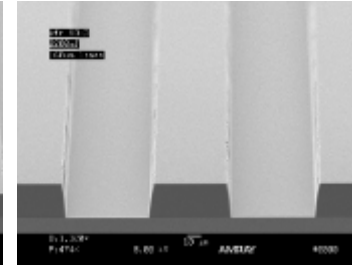
# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Linearity on Silicon @ 2200 $\text{mJ}/\text{cm}^2$

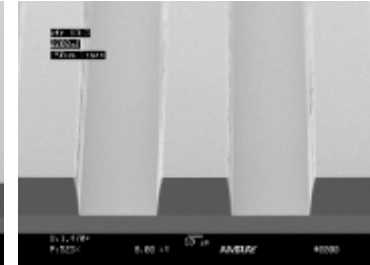
80  $\mu\text{m}$



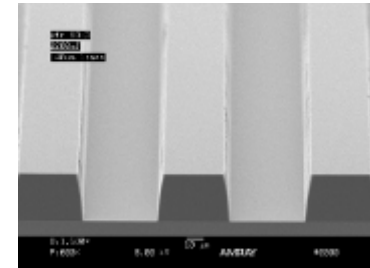
60  $\mu\text{m}$



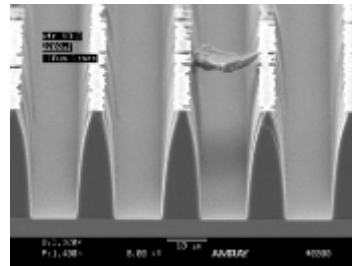
50  $\mu\text{m}$



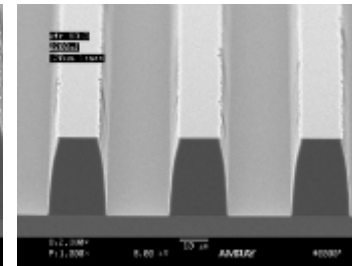
40  $\mu\text{m}$



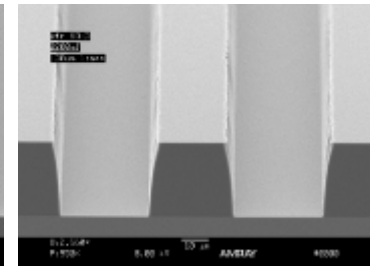
Film Thickness: 24  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 720 sec continuous spray @ 23 °C



10  $\mu\text{m}$



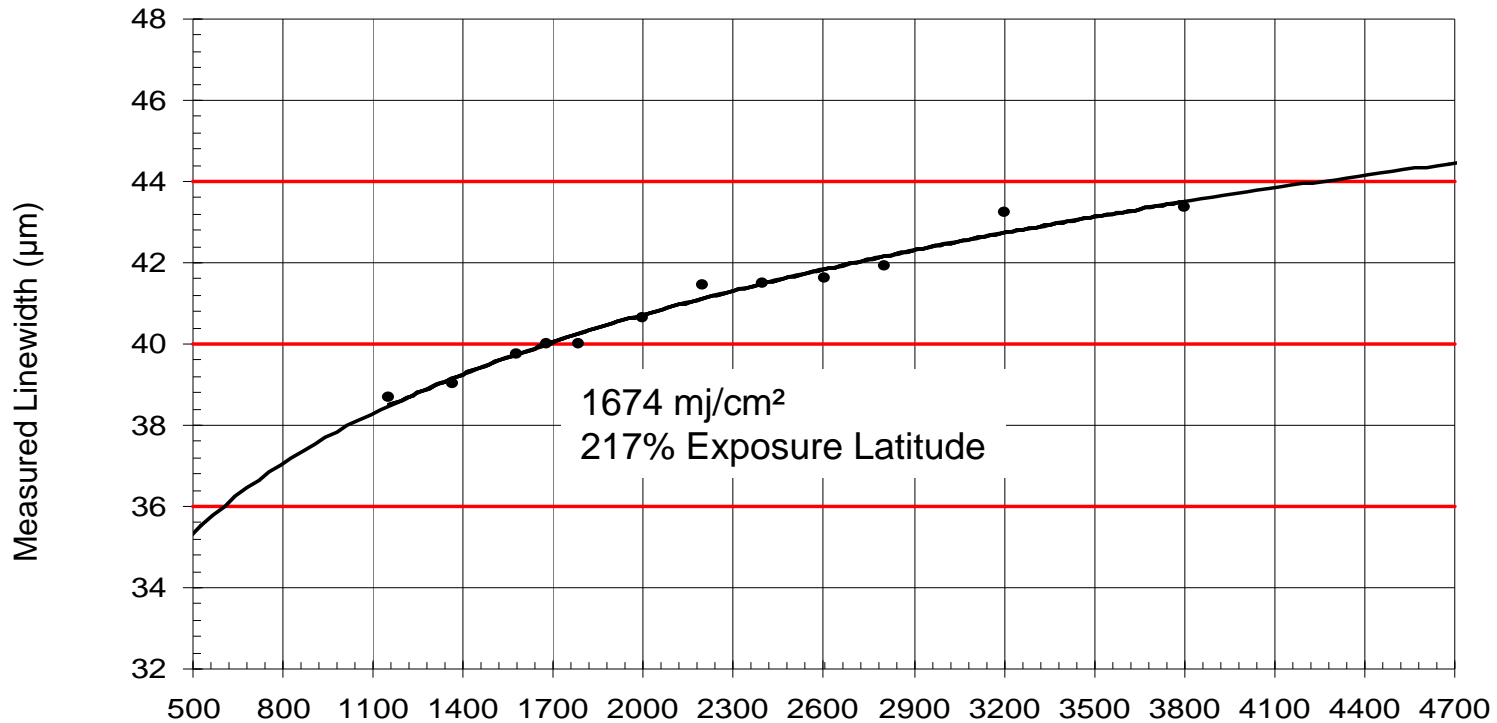
20  $\mu\text{m}$



30  $\mu\text{m}$

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Exposure Latitude on Silicon, 40 $\mu\text{m}$ Contact Holes, 1:1 Pitch



Film Thickness:  
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 720 sec continuous spray @ 23 °C

Exposure Dose ( $\text{mj}/\text{cm}^2$ )

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Exposure Latitude on Silicon, 40 $\mu\text{m}$ Contact Holes, 1:1 Pitch

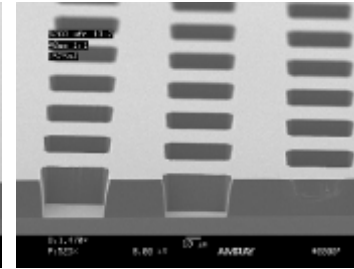
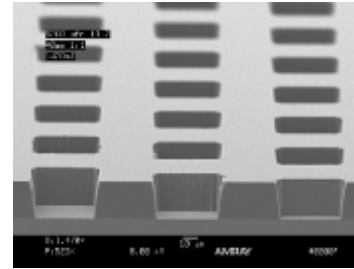
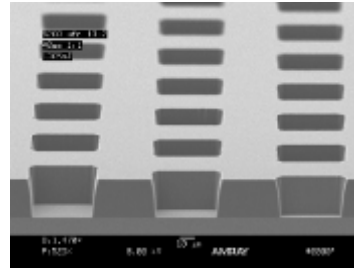
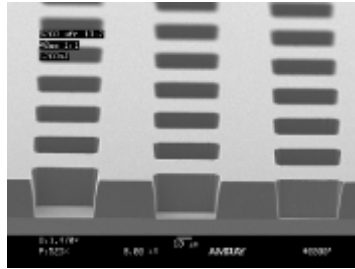
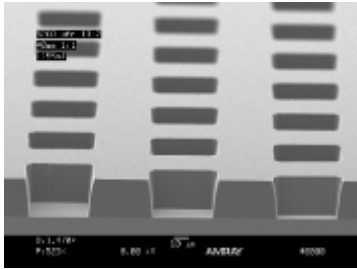
1155 mJ/cm<sup>2</sup>

1260 mJ/cm<sup>2</sup>

1365 mJ/cm<sup>2</sup>

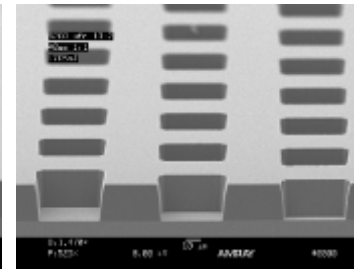
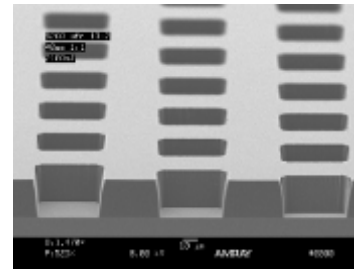
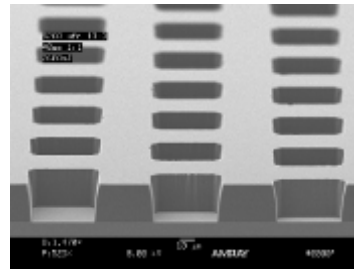
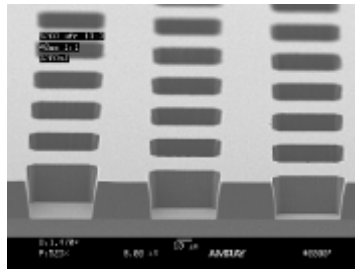
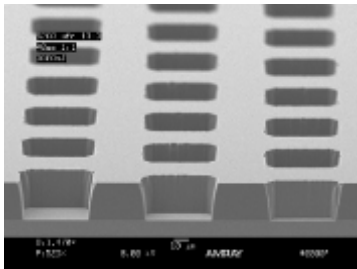
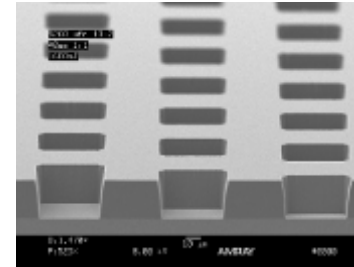
1470 mJ/cm<sup>2</sup>

1575 mJ/cm<sup>2</sup>



Film Thickness: 24  $\mu\text{m}$   
 Optitrac coat and Bake  
 SB: 1<sup>st</sup> layer 110°C/ 80 sec  
     2<sup>nd</sup> layer 115°C/180 sec  
 Suss MA200 CC Mask Aligner  
 20  $\mu\text{m}$  proximity gap  
 AZ 300 MIF, 720 sec continuous spray @ 23 °C

1680 mJ/cm<sup>2</sup>



3800 mJ/cm<sup>2</sup>

3200 mJ/cm<sup>2</sup>

2600 mJ/cm<sup>2</sup>

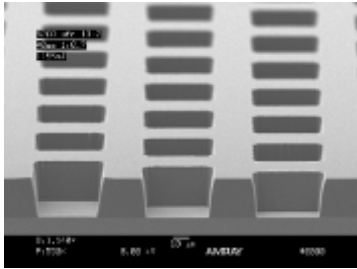
2100 mJ/cm<sup>2</sup>

1785 mJ/cm<sup>2</sup>

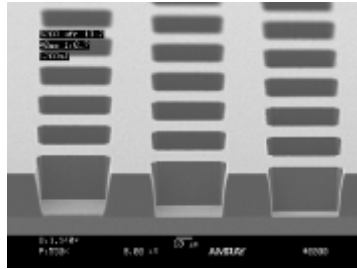
# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Exposure Latitude on Silicon, 40 $\mu\text{m}$ Contact Holes, 1:0.7 Pitch

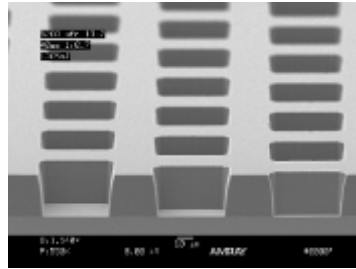
1155 mJ/cm<sup>2</sup>



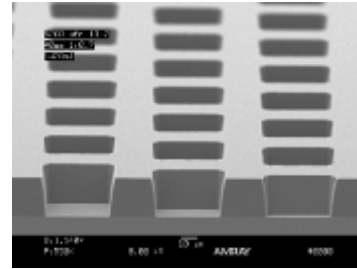
1260 mJ/cm<sup>2</sup>



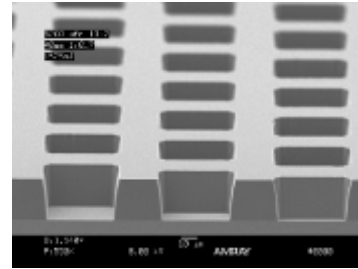
1365 mJ/cm<sup>2</sup>



1470 mJ/cm<sup>2</sup>

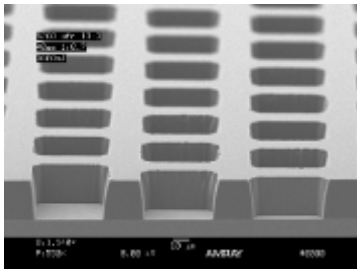
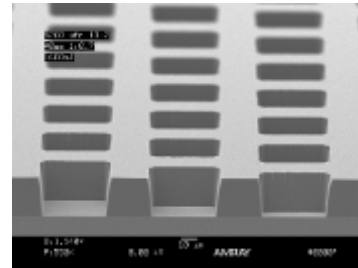


1575 mJ/cm<sup>2</sup>

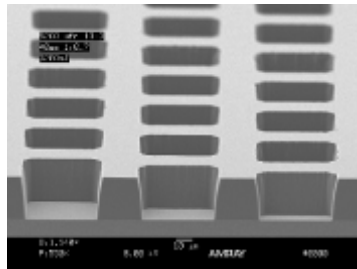


Film Thickness: 24  $\mu\text{m}$   
 Optitrac coat and Bake  
 SB: 1<sup>st</sup> layer 110°C/ 80 sec  
       2<sup>nd</sup> layer 115°C/180 sec  
 Suss MA200 CC Mask Aligner  
 20  $\mu\text{m}$  proximity gap  
 AZ 300 MIF, 720 sec continuous spray @ 23 °C

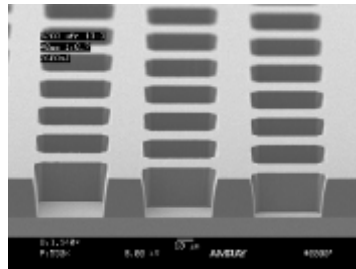
1680 mJ/cm<sup>2</sup>



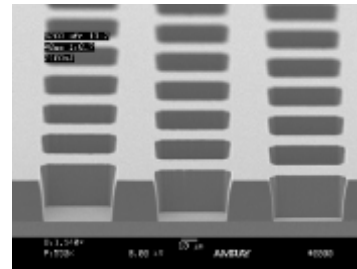
3800 mJ/cm<sup>2</sup>



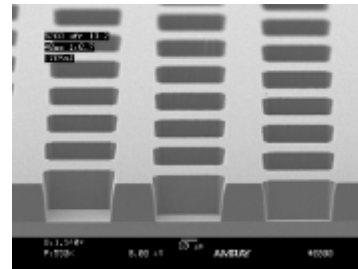
3200 mJ/cm<sup>2</sup>



2600 mJ/cm<sup>2</sup>



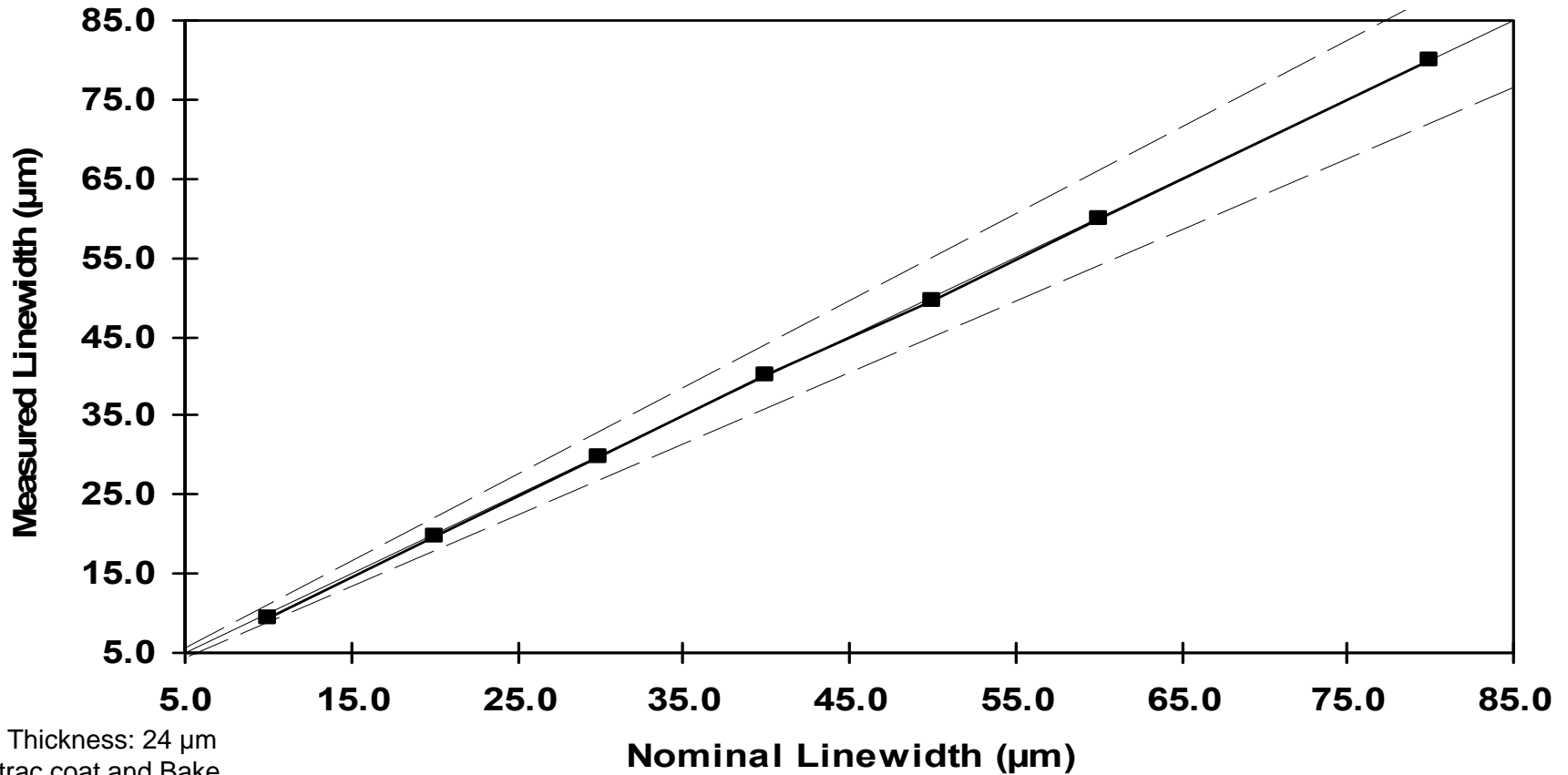
2100 mJ/cm<sup>2</sup>



1785 mJ/cm<sup>2</sup>

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

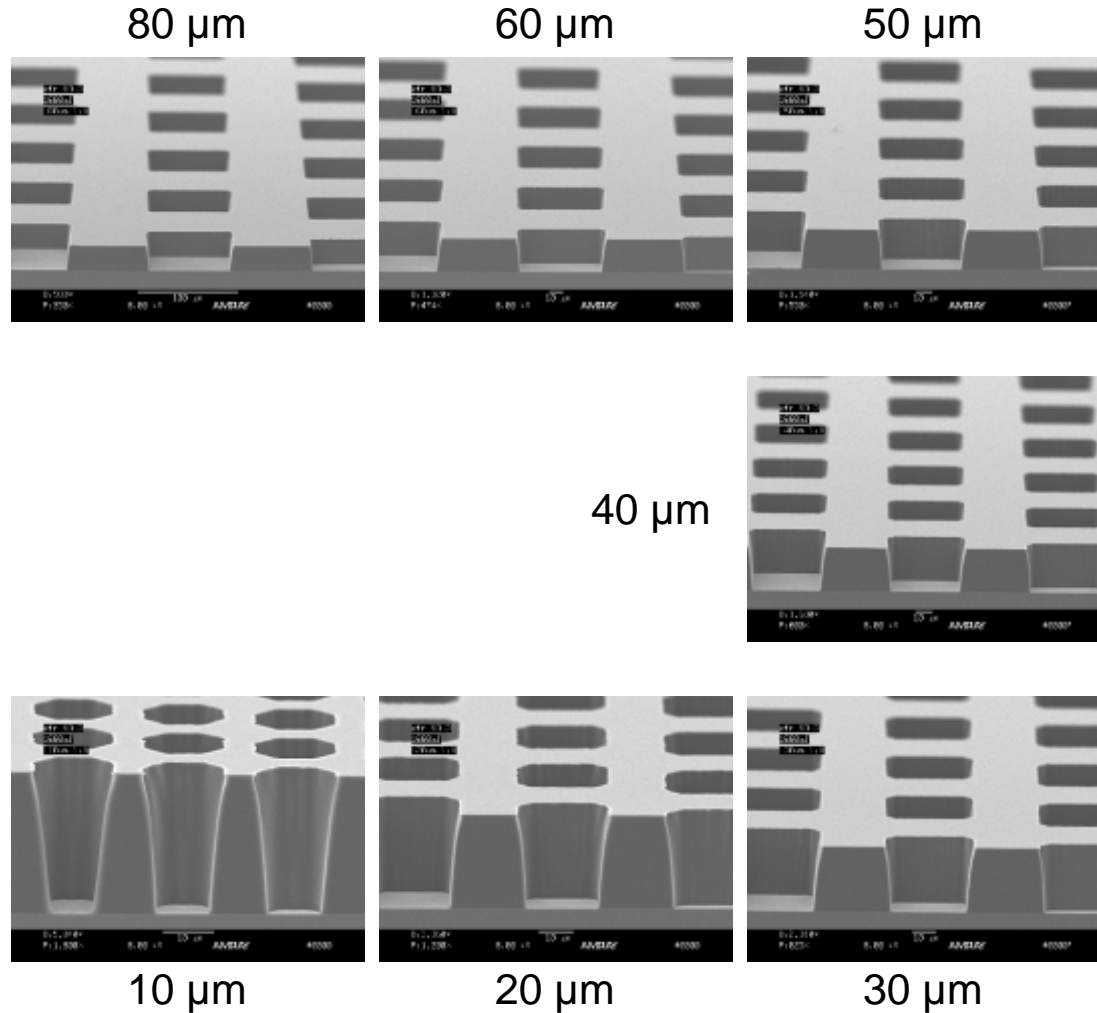
## Linearity on Silicon @ 1680 $\text{mJ}/\text{cm}^2$ , Contact Holes, 1:1 Pitch



Film Thickness: 24  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
2<sup>nd</sup> layer 115°C/180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 720 sec continuous spray @ 23 °C

# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Linearity on Silicon @ 1680 $\text{mJ}/\text{cm}^2$ , Contact Holes, 1:1 Pitch

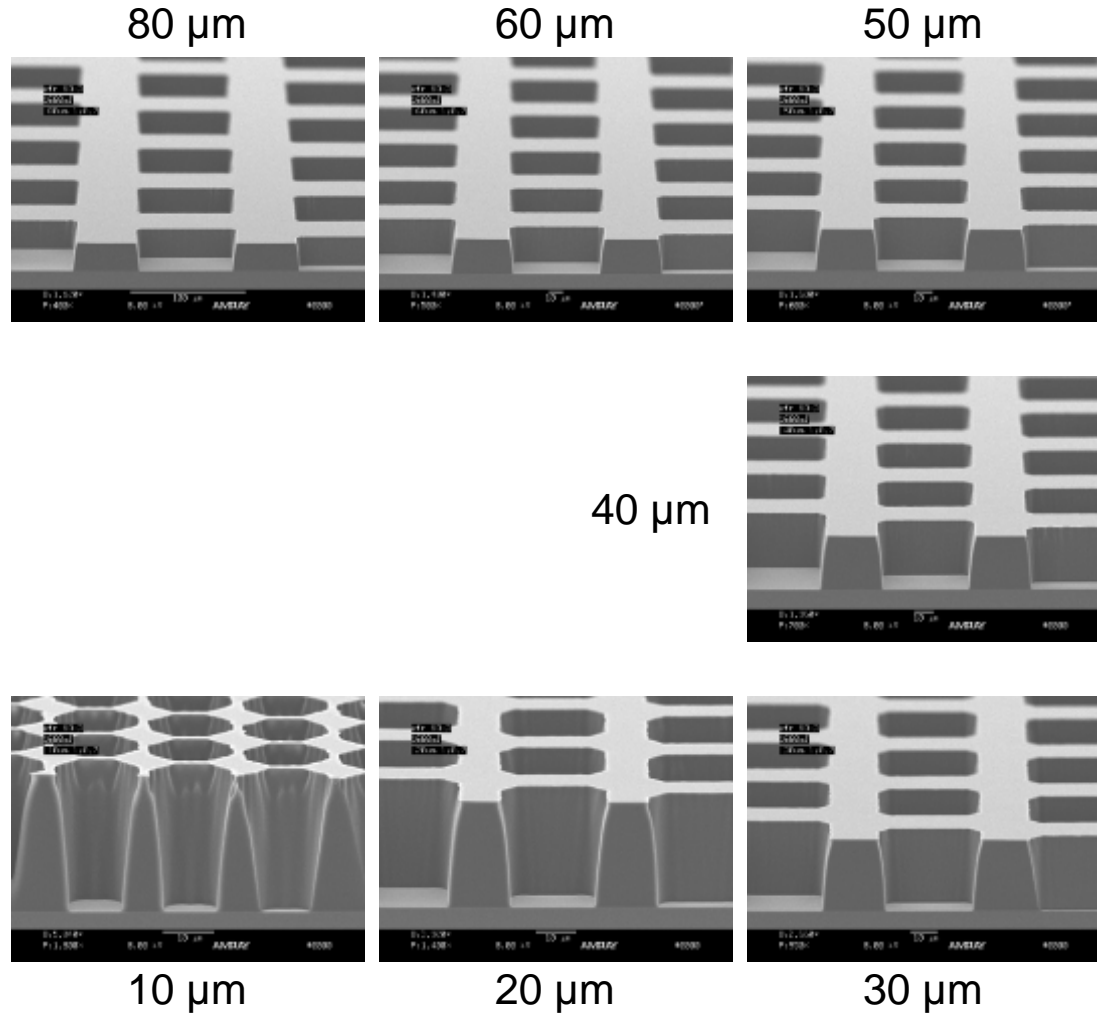


Film Thickness: 24  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
    2<sup>nd</sup> layer 115°C/180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 720 sec continuous spray @ 23 °C



# AZ 9260 Photoresist, FT=24 $\mu\text{m}$

## Linearity on Silicon @ 1680 $\text{mJ}/\text{cm}^2$ , Contact Holes, 1:0.7 Pitch



Film Thickness: 24  $\mu\text{m}$   
Optitrac coat and Bake  
SB: 1<sup>st</sup> layer 110°C/ 80 sec  
    2<sup>nd</sup> layer 115°C/180 sec  
Suss MA200 CC Mask Aligner  
20  $\mu\text{m}$  proximity gap  
AZ 300 MIF, 720 sec continuous spray @ 23 °C