

Overall Prober/ Probe Card Accuracy

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Electroglas

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Accuracy

- Outline
 - Probe Mark Analysis Algorithm
 - Prober accuracy
 - Die to die stepping
 - Wafer to wafer
 - Probe to pad alignment
 - Total accuracy

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Accuracy

- Prober accuracy
 - Probe card accuracy
 - pad to pad
 - Thermal effect on accuracy
 - Prober features
 - Ways to enhance accuracy through pad data, pin data ...

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Accuracy

- Probe Mark Analysis
 - Why probe marks
 - Probe card alignment signature
 - Prober stepping signature
 - Probe to pad alignment goodness
 - Quantitative analysis on what operator and Engineers have been doing qualitatively

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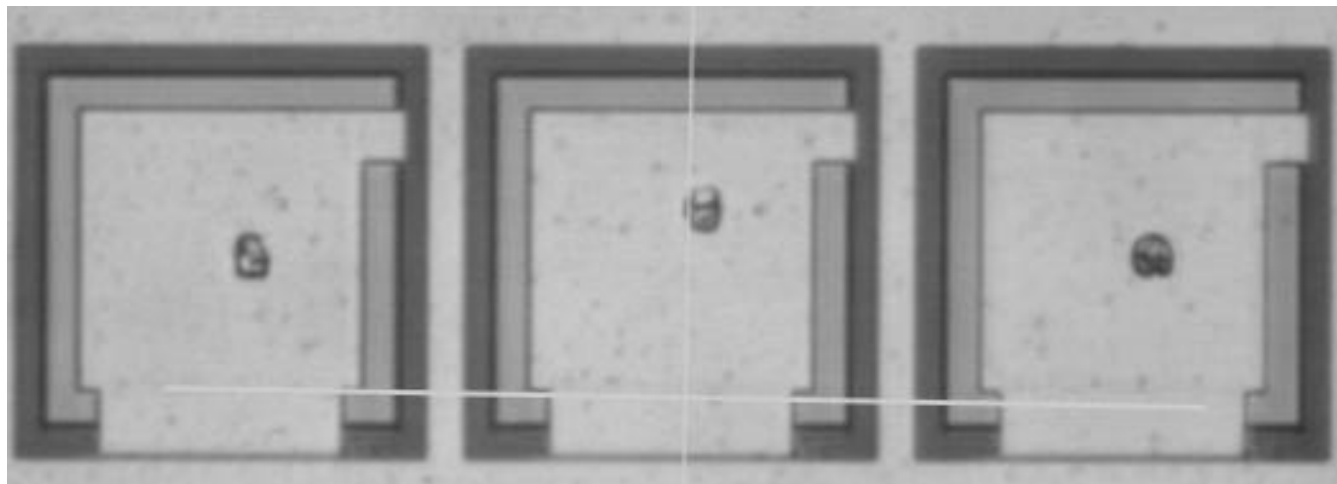
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Accuracy

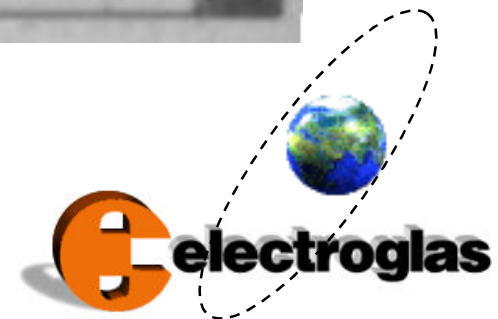
- Probe Mark Analysis
 - Probe card signature:



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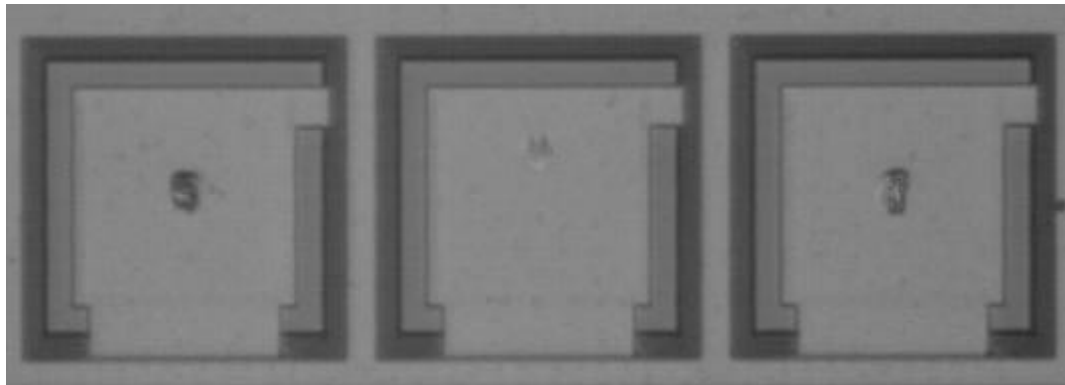
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Accuracy

- Probe Mark Analysis
 - Probe card signature:



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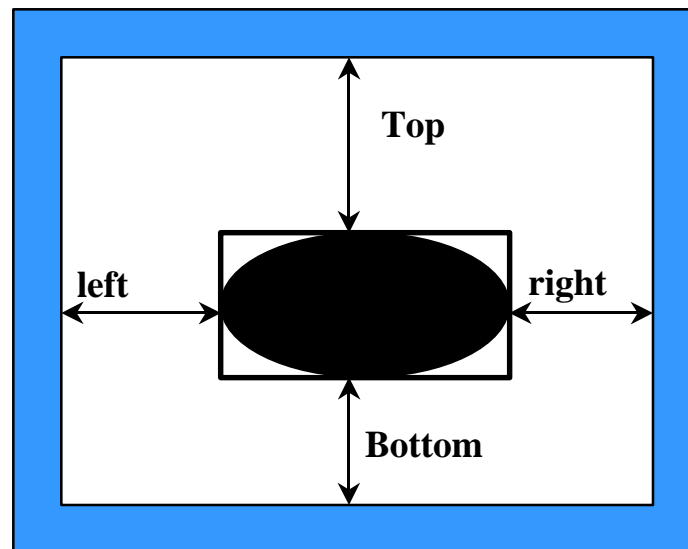
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Accuracy

- Probe Mark Analysis
 - Method:



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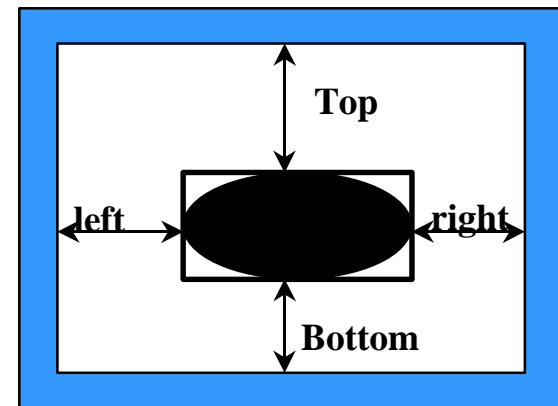
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Accuracy

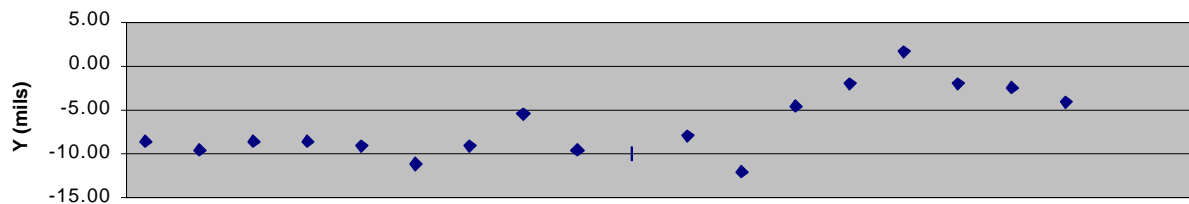
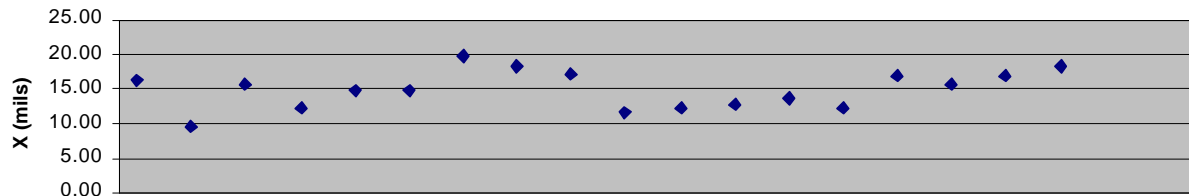
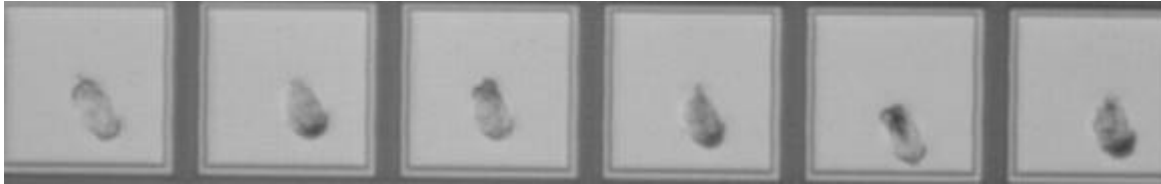
- Probe Mark Analysis - method
 - Pad offset:

- $X_{\text{offset}} = (\text{Left} - \text{Right})/2$
- $Y_{\text{offset}} = (\text{Bottom} - \text{Top})/2$



Accuracy

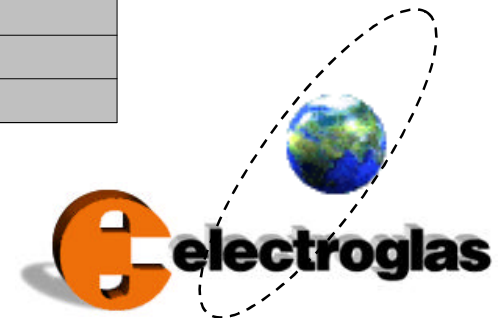
- Probe Mark Analysis - method
 - Pad to pad variation
 - Probe card alignment error



1st touchdown

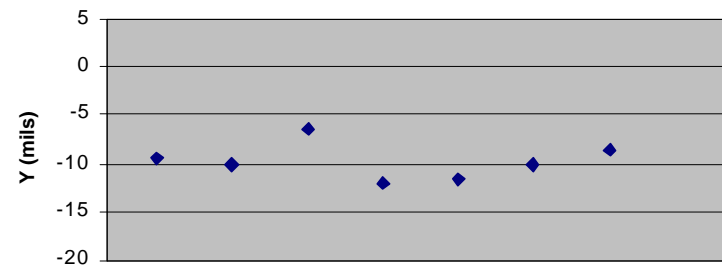
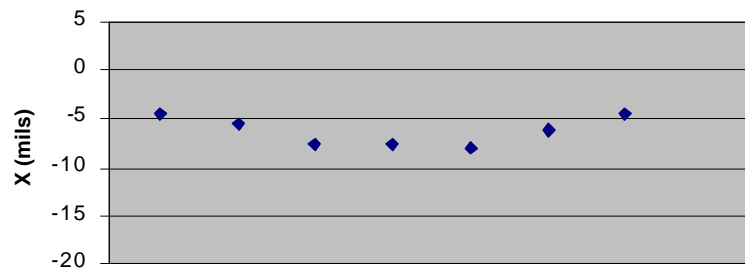
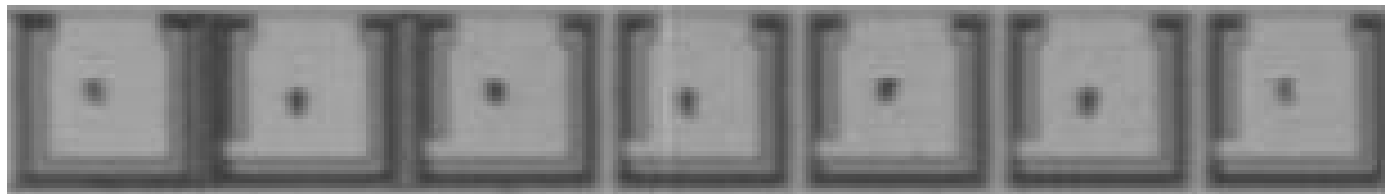
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Accuracy

- Probe Mark Analysis - method
 - Pad to pad variation
 - Systematic error at 90° C



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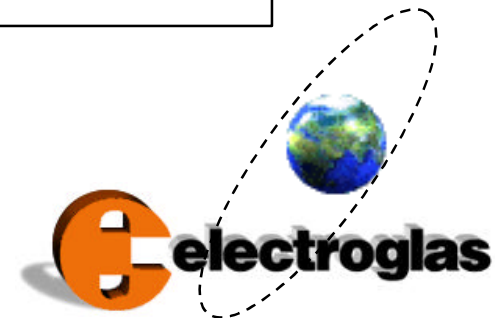
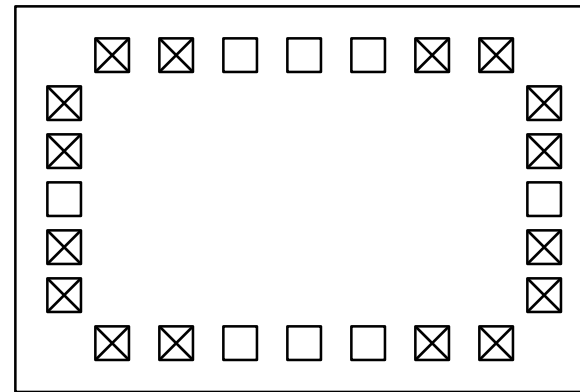
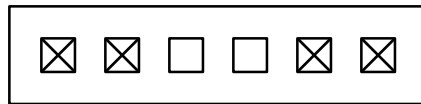
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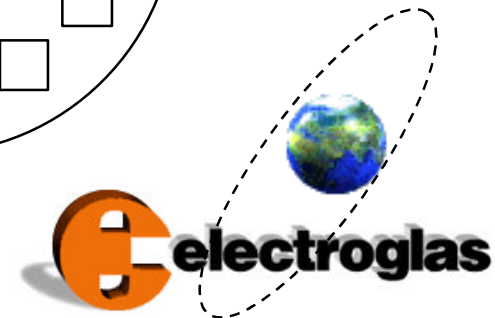
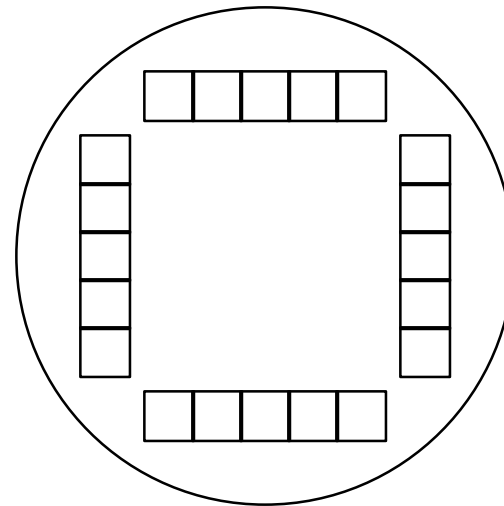
Accuracy

- Probe Mark Analysis - method
 - Die to die stepping error
 - $X_{\text{die}} = \sum_i (x_{\text{off}})_i / i$
 - $Y_{\text{die}} = \sum_i (y_{\text{off}})_i / i$



Accuracy

- Probe Mark Analysis - method
 - Wafer
 - $X_{\text{wafer}} = \sum_j (x_{\text{die}})_j / j$
 - $Y_{\text{wafer}} = \sum_j (y_{\text{die}})_j / j$



Setup -

$$X_{\text{setup}} = \sum_k X_{\text{wafer}}/k$$

$$Y_{\text{setup}} = \sum_k Y_{\text{wafer}}/k$$

Probe 15 wafers, probe to pad alignment every 5th wafer

$$\text{Die to die stepping error} = \sigma_{x,\text{die}} = \text{stdev}(X'_{\text{die}})$$

$$X'_{\text{die}} = X_{\text{die}} - X_{\text{wafer}}$$

$$\text{Wafer to wafer} = \sigma_{x,\text{wafer}} = \text{stdev}(X'_{\text{wafer}})$$

$$X'_{\text{wafer}} = X_{\text{wafer}} - X_{\text{setup}}$$

$$\text{Total error} = \sigma_{x,\text{total}} = \text{stdev}(X_{\text{offset}})$$

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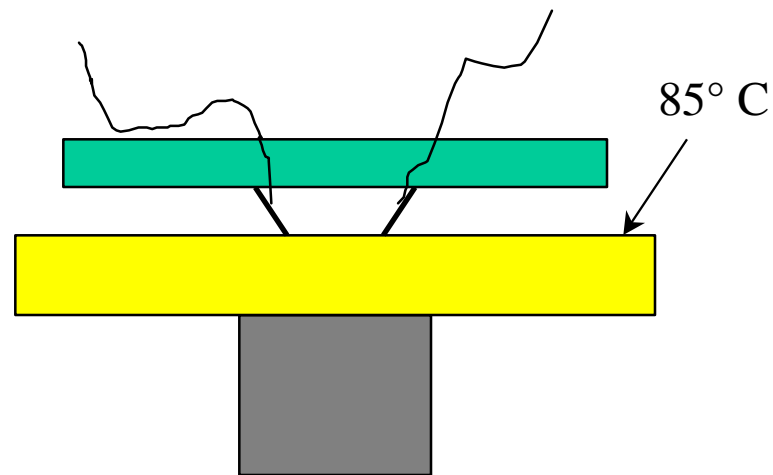
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Accuracy

- Thermal effect
 - Probe tip temperature

Probe card with thermocouple



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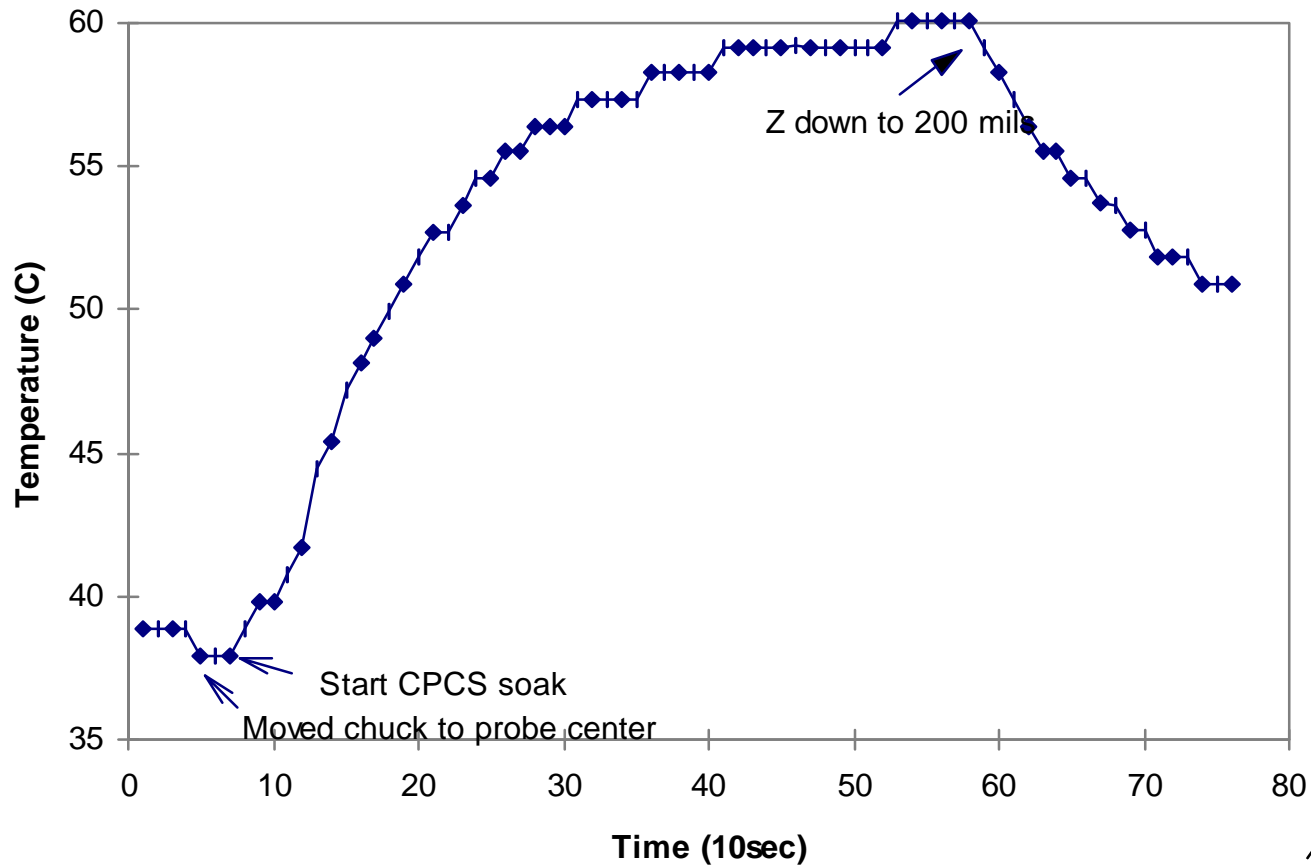
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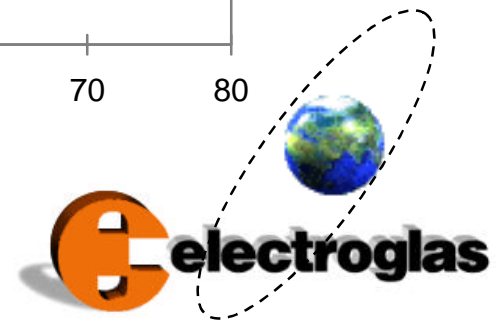
Accuracy

Probe Tips Temperature Profile. This graph shows that it takes about 300sec for the probe tip temperature to reach equilibrium



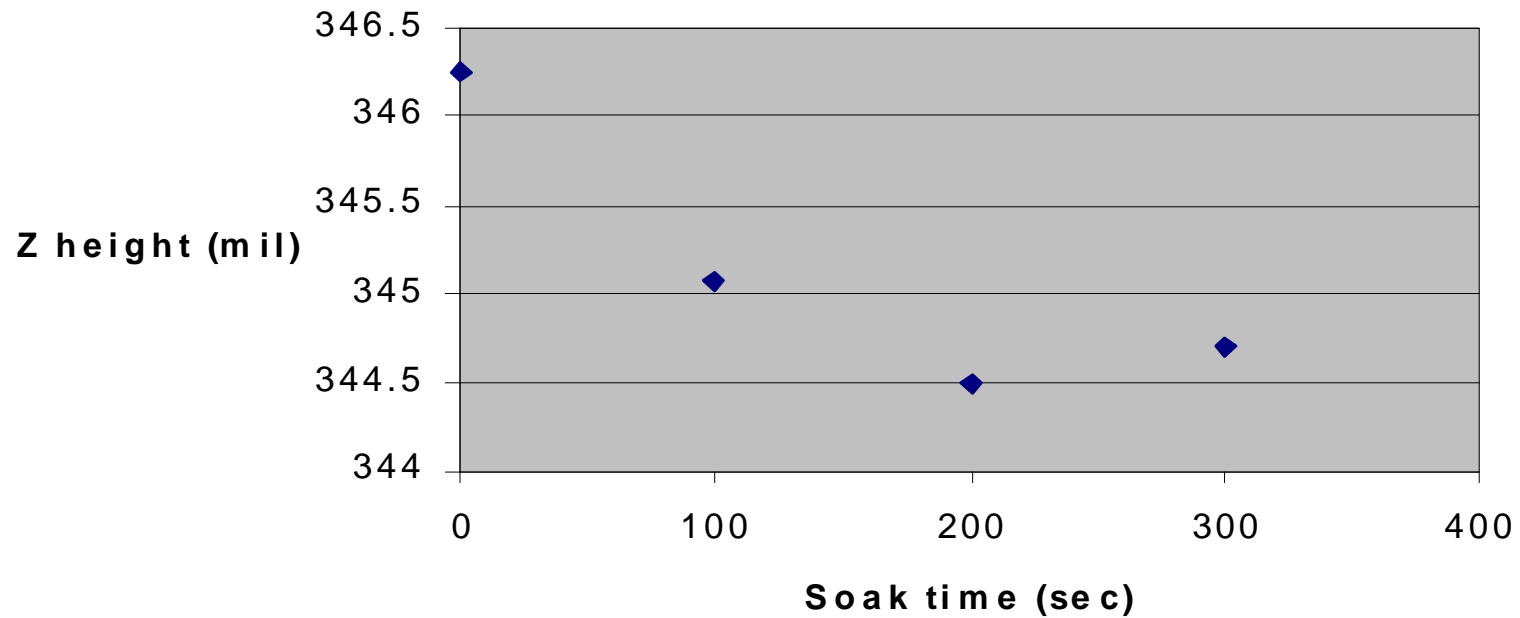
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Accuracy

Probe card Z height



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Accuracy

- Prober features
 - Soak
 - CPCS soak
 - 1st wafer soak
 - WSSC

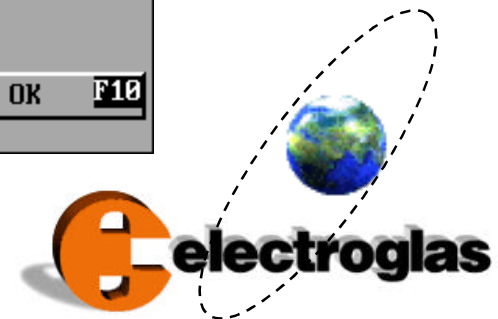
WSSC Manual Results		
Detected Scale (X,Y)	1.000000	0.999976
Current Correction Choice	Stepping	
Save Product to File:	No	
Step Correction would be (x,y) :	255.908	255.902
Temp Expansion Coeffs would be (x,y) :	2.50	0.12
Detected Skew (.001 deg)	0.000	
Detected Rotation (.001 deg)	0.000	
Detected Offset (x,y)	-0.162	-0.029

Cancel **ESC** Change **F9** OK **F10**

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Accuracy

- Prober features
 - HC
 - HC temp. tolerance
 - HC early recovery
 - HC recovery time
 - delay after load

Chuck Setup Menu	
Chuck Model:	EG Hot
Chuck size:	8 Inch
Set temperature (Celsius):	30
HC Early Recovery:	Disable
HC Recovery time (seconds):	5
HC temperature tolerance (+/-):	20
Delay after load (seconds):	0

Soak **K** Change **F9** Save **S** OK **F10**

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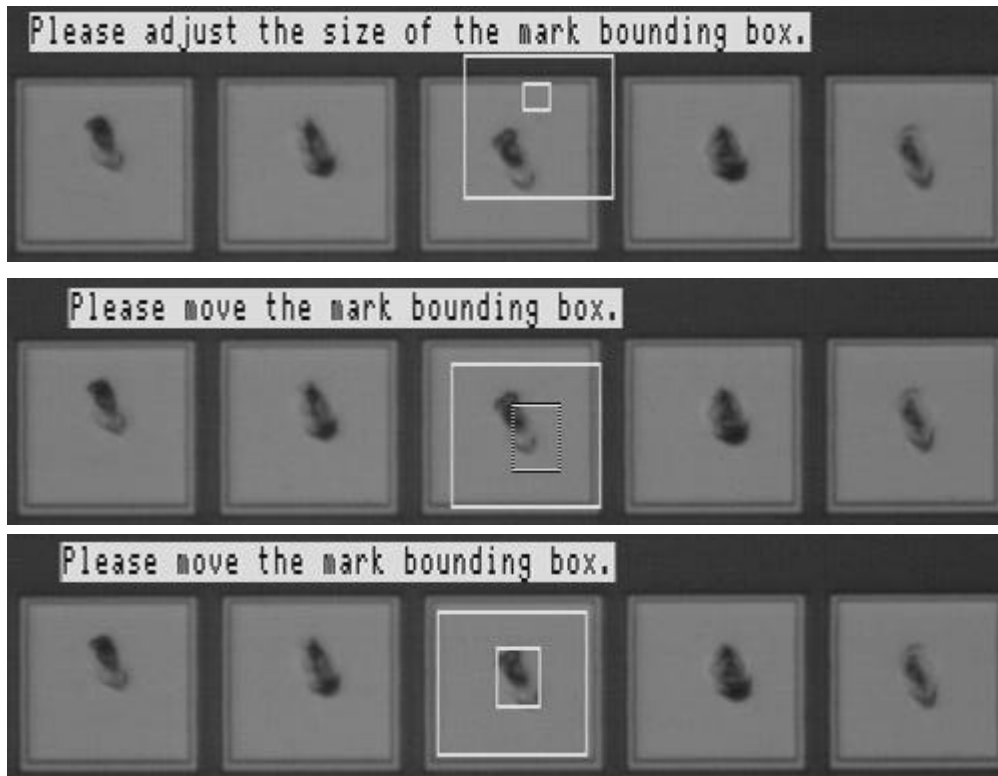
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Accuracy

- Prober features
 - PC update
 - PTPO



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