STEPPER 1 st1

MIETEC
ALCATEL

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From: D.Laidler

Subject: Canon 2000i1 #268 Pre-Acceptance Report

Canon 2000i1 #268 Pre-Acceptance Report

Introduction and Summary

The pre-acceptance of the first Canon 2000i1 stepper for Mietec-Alcatel Fab 2 was performed over three weeks starting on the 12th October and ending on the 30th October, 92. The serial number of the machine is #268 and as at the factory acceptance all criteria were succesfully passed with the exception of the alignment specification.

The following problems still need to be resolved following the completion of the pre-acceptance tests and prior to final acceptance:

1.) Asymmetric resist profile.

2.) Replacement of B-Scope camera and repeat of AGA test.

3.) TTLAF repeatability.

Method and Results

On the following pages the results of the pre-acceptance tests are presented along with brief details of the methods used and a discussion of the results. A summary of the results can be seen in Appendix 5.

The photoresist used for all of the pre-acceptance tests was UCB-JSR IX500EL (Japanese manufacture) as had been used at the factory. The process used for the UCB-JSR IX500EL photoresist was basically the same as that used at the factory which is the process recommended by UCB. The only differences were that the resist thickness was 1.19μ instead of 1.20μ, the bakes were by proximity instead of by contact and development was by puddle in TMA238WA developer instead of by immersion in PD523 developer. The difference between the developers being that the TMA238WA developer contains surfactant for helping to form a stable puddle on a 6" wafer.

The resist thickness of 1.19μ is a point of minimum incoupling, the softbake was 100°C for 60 seconds, the PEB was 120°C for 60 seconds and development was by a 60 second puddle. All processing was eventually performed on the TEL Clean Track Mark V.

1. ILLUMINATOR

1a. Illumination Intensity

Illumination Intensity:	Specification: ≥ 600mW/cm2
(After 355 hours)	**Result: 855mW/cm2**

1b. Illumination Uniformity

Illumination Uniformity:	Specification: ≤ 1.2%
	Result: 0.7%

1c. Light Integrator Accuracy

Total accuracy:	Specification: ≤ 1.2%
	Result: 0.625%

1f. Masking Blade Accuracy

Masking Blade accuracy:	Specification: ≤ ±100μ
	Result: Max +40μ

1g. Reticle Change Time

Reticle change time:	Specification: ≤ 25 seconds
	Result: 50 seconds

Technically this test fails the specification, but there is not a problem with the stepper, it is purely a question of a misunderstanding over the definition used. Canon normally specify reticle exchange time not including FRA and for this the measured time was 18 seconds and is within the specification of 25 seconds. However, Mietec had specified reticle exchange time including FRA and for this the measured time was 50 seconds and Canon do not normally have a specification for this.

2. EXPOSURE PERFORMANCE

2a. Resolution

0.5μ, 0.8μ and 1.0μ linewidths were resolved in both the Vertical and Horizontal directions at all nine points within the 20x20mm image field.

2b. UDoF

A Focus Matrix was exposed on a wafer ranging from -2.7μ to +2.7μ in increments of 0.15μ and using the reticle 325-01 which has resolution structures at nine points in the field. The Focus Matrix was exposed at four different positions on the wafer each at a different exposure dose in order that the optimum exposure could be selected following development. The wafer used was an ultraflat with a local flatness specification of ≤ 0.5μ in any 20x20mm area.

For the pre-acceptance test the UDoF is specified for 0.5μ, 0.8μ and 1.0μ linewidths whereas at the factory acceptance the UDoF was only specified for the 0.5μ linewidth. Initially the exposure was targetted to obtain 1:1 exposure for the 0.5μ linewidth and it was intended to measure the UDoF at this fixed exposure dose for all of the linewidths. However, the UDoF was measured for the nine points in the field at the 1:1 exposure for the 0.5μ linewidth, which was found to be 210mJ/cm2 and the result of 0.90μ failed the specification of UDoF ≥ 1.2μ and it could clearly be seen that the exposure was below the Isofocal exposure dose. Therefore the measurement was repeated for an exposure of 230mJ/cm2 and the result of 1.50μ passed the specification.

At this point FEM's were measured for the 0.5μ, 0.8μ and 1.0μ linewidths in order to exactly establish the Isofocal exposure dose. This was found to be 250mJ/cm2 for the 0.5μ linewidth, 200mJ/cm2 for the 0.8μ linewidth and 190mJ/cm2 for the 1.0μ linewidth and the data can be seen in Appendix 1. The UDoF measurement for the 0.5μ linewidth was therefore repeated once more for an exposure dose of 250mJ/cm2 which resulted in a linewidth of approximately 0.45μ for the nominal 0.50μ linewidth in the centre of the lens. The actual 0.50μ linewidth on the reticle in the centre of the field being 0.48μ. Hence the overexposure from nominal being 0.04μ whereas at the factory it had been 0.02μ. The result for the exposure of 250mJ/cm2 was 1.50μ, the same as for the exposure of 230mJ/cm2.

All CD measurements were made on the Hitachi S6200 SEM with an accelerating voltage of 800V and a beam current of 2.0μA. Both the bottom and the top of the resist were measured at each of the focus positions using the Hitachi line profile programs, cursors moving inwards for the bottom of the resist and outwards for the top of the resist.

The Mietec specification for UDoF combines the CD data with Sidewall Angle and the specification is ≤ ± 10% CD together with a Sidewall Angle ≥ 80°. The specification and results for the 0.5μ linewidth at an exposure of 250mJ/cm2 were as follows and the graphs produced for CD, Sidewall Angle and Top/Base Ratio can be seen in Appendix 2.

0.5μ UDoF: Specification: ≥ 1.2μ **Result:** **1.50**μ

With reference to the factory acceptance report it was stated that the UDoF for the 0.5μ linewidth as per the Mietec specification was 1.95μ. This was an error and the UDoF for the Mietec specification should have been stated as ≥ **1.35**μ.

The Isofocal exposure dose for the 0.8μ linewidth was found to be 200mJ/cm2 which resulted in a linewidth of approximately 0.85μ in the centre of the lens. The specification and results were as follows and the graphs produced for CD, Sidewall Angle and Top/Base Ratio can be seen in Appendix 2.

0.8μ UDoF: Specification: ≥ 2.8μ **Result:** **2.80**μ

The Isofocal exposure dose for the 1.0μ linewidth was found to be 190mJ/cm2 which resulted in a linewidth of approximately 1.10μ in the centre of the lens. However when the UDoF was measured at this exposure the specification was not met and it appeared that the exposure was slightly below the Isofocal exposure dose. Hence the measurements were repeated for an exposure dose of 200mJ/cm2. The specification and results for the 1.0μ linewidth for an exposure of 200mJ/cm2 were as follows and the graphs produced for CD, Sidewall Angle and Top/Base Ratio can be seen in Appendix 2.

1.0μ UDoF: Specification: ≥ 3.8μ **Result:** **3.80**μ

From the FEM's and Linearity plots in Appendix 1, it can be seen that a different optimum bias is required for each of the linewidths and this is clearly not an optimum situation. Of particular interest is that a negative bias is required for the 0.8μ and 1.0μ linewidths. In addition the resist can be seen to apparently have a cap and based on discussions with UCB this is said to be due to the surfactant containing developer TMA238WA. Cross-sections will be made to verify whether or not the resist does infact have a cap and if it does, it will need to be evaluated whether or not the non-surfactant PD523 developer could be used.

It was observed while making all of the UDoF measurements that as the lens moves out of focus in the negative direction the resist profile is not symmetric and that the sidewall angle on the left is much geater than that on the right and this is the same for all nine points within the field. This only occurs for the Vertical lines and not for the Horizontal lines. Canon have an internal specification for asymmetry in the resist profile and this specification defines the difference in sidewall angle for a focus offset of - 0.6μ to be ≤ 5°.

At the factory this value was 0.9°, but now it is 4.8° which is marginally within the Canon internal specification and based on discussions with Canon at the limit of their ability to adjust. The adjustment is made by means of a glass plate at the bottom of the lens. Mietec does not have a specification with Canon for this item. Canon if asked will attempt to improve the asymmetry, but this will take three days and the only guarantee that they can give is that it will not be worse.

2c. Linewidth Repeatability Within Field

For the linewidth repeatability within the field a wafer was exposed at 230mJ/cm2 using the 365-01 reticle and the linewidth measured at nine points within a field at two locations on the wafer and the results were as follows:

0.5μ Linewidth Repeatability Within Field:	Specification: ≤ 0.05μ
	Result: 0.042μ
0.8μ Linewidth Repeatability Within Field:	Specification: ≤ 0.08μ
	Result: 0.039μ
1.0μ Linewidth Repeatability Within Field:	Specification: ≤ 0.10μ
	Result: 0.046μ

To put the above figures in perspective, for the 0.5μ linewidth the actual linewidth variation across the field due to the reticle itself was 0.028μ.

2d. Linewidth Repeatability Within Wafer

For the linewidth repeatability within a wafer the same wafer was used and the linewidth at the centre of the lens measured at ten locations on the wafer. The results were as follows:

0.5μ Linewidth Repeatability Within Wafer:	Specification: ≤ 0.05μ
	Result: 0.008μ

0.8μ Linewidth Repeatability Within Wafer:	Specification: ≤ 0.08μ		
	Result:	**0.031μ**	
1.0μ Linewidth Repeatability Within Wafer:	Specification: ≤ 0.10μ		
	Result:	**0.040μ**	

2e. Distortion (Deviation from Ideal Cartesian Grid)

For this test the lens distortion is referenced to the XY stage by exposing four shots on the wafer at the full field size of 20x20mm and then exposing only the centre of the reticle at a small step size across the already exposed full fields with an appropriate offset shift. The maximum values for X and Y distortion are then obtained by measuring the box in a box structures using both the Canomap metrology sofware and the IVS. A criteria for the test is that the stage Scaling and Orthogonality errors must be ≤ 1ppm and this was checked prior to the test on a quartz reference wafer and found to be within specification. For both Canomap and the IVS 25 points were measured within the field. The Monolith plots produced from the IVS data can be seen in Appendix 4. The specifications and results were as follows and the test was performed twice:

CANOMAP #1

Distortion Max X:	Specification: ≤ 0.07μ	**Result:**	**-0.033μ**
Distortion Max Y:	Specification: ≤ 0.07μ	**Result:**	**-0.046μ**

CANOMAP #2

Distortion Max X:	Specification: ≤ 0.07μ	**Result:**	**0.044μ**
Distortion Max Y:	Specification: ≤ 0.07μ	**Result:**	**-0.027μ**

IVS #1

Distortion Max X:	Specification: ≤ 0.07μ	**Result:**	**0.029μ**
Distortion Max Y:	Specification: ≤ 0.07μ	**Result:**	**0.030μ**

IVS #2

Distortion Max X:	Specification: ≤ 0.07μ	**Result:**	**0.030μ**
Distortion Max Y:	Specification: ≤ 0.07μ	**Result:**	**-0.028μ**

3. AUTO FOCUS ACCURACY

3a. Auto Focus Repeatability and Stability

For the repeatability test, for 45 shots the focus offset is measured, the focus adjusted and the remaining focus offset measured:

Auto Focus Repeatability: Specification: 3s ≤ 0.15μ

Result: 0.095μ

For the stability test the focus of one shot is measured twenty five times repeatedly with a 3msec delay between measurements.

Auto Focus Stability: Specification: 3s ≤ 0.15μ

Result: 0.043μ

3b. Auto Focus Stability (5 Days)

Read by optical microscope using Canon's standard method.

Stability (5 Days): Specification: range ≤ 0.30μ

Result: 0.15μ

3c. Maximum Deviation of Best Focus Position

This test requires blank Nitride, Polysilicon and Metal wafers and at the time of the pre-acceptance test these wafers were not available. Hence this test will be performed prior to final acceptance.

3d. Global Levelling Repeatability

Global levelling Repeatability: Specification: 3s ≤ 10ppm

Result X: 4.6ppm

Result Y: 5.1ppm

3e. Die by Die Levelling Repeatability and Stability

For the repeatability test, for 45 shots the die by die tilt is measured, the tilt adjusted and the remaining tilt measured:

Auto Focus Repeatability: Specification: 3s ≤ 10ppm

Result X: 4.6ppm

Result Y: 4.0ppm

For the stability test the tilt of one shot is measured twenty five times repeatedly with a 3msec delay between measurements.

Auto Focus Stability: Specification: 3s ≤ 10ppm

Result X: 2.44ppm

Result Y: 3.96ppm

The above focus and die by die levelling tests were performed on blank resist coated wafers.

4. AUTO ALIGNMENT ACCURACY

4a. Reticle Rotation Accuracy and Repeatability

This test involves exposing five rows with overlapping shots and for each row resetting the reticle. The Y difference for each shot is then measured using box in a box structures using the Canomap metrology software and the IVS. From this data the reticle rotation accuracy and repeatability is calculated. The specifications and results obtained were as follows and the test was performed twice:

CANOMAP #1

Reticle Rotation Accuracy:	Specification: ≤ ± 0.02μ
	Result: 0.000μ
Reticle Rotation Repeatability:	Specification: ≤ 0.03μ
	Result: 0.015μ

CANOMAP #2

Reticle Rotation Accuracy:	Specification: ≤ ± 0.02μ
	Result: 0.001μ
Reticle Rotation Repeatability:	Specification: ≤ 0.03μ
	Result: 0.011μ

IVS #1

Reticle Rotation Accuracy:	Specification: ≤ ± 0.02μ
	Result: -0.0064μ
Reticle Rotation Repeatability:	Specification: ≤ 0.03μ
	Result: 0.0022μ

IVS #2

Reticle Rotation Accuracy:	Specification: ≤ ± 0.02μ
	Result: -0.0057μ
Reticle Rotation Repeatability:	Specification: ≤ 0.03μ
	Result: 0.0021μ

4b. AGA Accuracy (Single Machine) HeNe and B2

This test involves exposing a first layer in resist and developing the wafer and then aligning to this wafer, exposing the second layer with an origin shift and then after developing the wafer reading the overlay accuracy by means of box in a box structures using both the Canomap metrology software and the IVS. The layout of the wafer is 32 shots with an X and Y step size of 20mm and for the AGA sampling a Sub loop of 4 shots and a Main loop of 8 shots. The Canomap is only able to measure very specific circuit layouts so for the Canomap measurements only 24 shots were measured. On the IVS all 32 shots were measured. The alignment mark used was the 20P-4F Multimark.

The test was performed over three days and on the first day thirty wafers were exposed and developed. Then for the next three days five wafers were aligned and exposed for each of the alignment modes, HeNe and Broadband (B2). The overlay accuracy was then measured. Prior to exposing the wafers each day the Baseline check was performed using the BLCR command. The results can be seen in Appendix 4 and it can be seen that for the Canomap measurements two wafers marginally fail the specification of $|m| + 3s \leq 0.12\mu$, but that for the IVS measurements five wafers fail the specification, with the largest value for $|m| + 3s$ being **0.158μ**. In the case of the Canomap data it is two HeNe wafers on the second day that are out of specification in the X direction. In the case of the IVS data four HeNe wafers are out of specification, one on the first day, one on the second day and two on the third day and one B2 wafer is out of specification on the third day, all in the Y direction.

There is a difference in mean offset between the Canomap and IVS data and it can be seen from the Canomap data that the mean offset over the three days in the X direction is consistently -0.05μ. Hence if the alignment offset had been better optimised on the first day, all of the Canomap data for both alignment modes would have been within specification. The X alignment is performed using the C-Scope and the Y alignment is performed using the B-Scope and the measurement repeatability of the B-Scope in HeNe mode was later found to be very poor, hence this would provide a reason for the Y direction being out of specification. Canon have agreed to replace the B-Scope camera which they believe to be the cause of the problem and then the AGA test will be repeated. This will be performed in Week 49.

The difference in mean offset between the Canomap and the IVS data has been found to be due to Tool Induced Shift on the stepper. When calibrating the IVS a wafer is measured both in the normal orientation and at 180° and therefore any TIS is taken into account. For the Canomap this calibration had not been performed and hence the data contains TIS. This has now been measured for Canomap and if it is taken into account the mean offset of the Canomap data agrees very well with that obtained from the IVS.

Currently Canon are recalculating the Canomap data to take into account the TIS and with this taken into account all Canomap data will probably be within specification. The Canomap calibration offset will be input to the stepper prior to repeating the AGA test in Week 49.

The AGA wafers were also measured on the IVS in the centre of the field and the data for each group of five wafers as analysed by Monolith can be seen in Appendix 3.

5. XY STAGE ACCURACY

A 7 x 7 matrix is exposed so that in both X and Y directions the shots are overlapped. The resulting stepping accuracy is then measured using box in a box structures using both the Canomap metrology software and the IVS. The results obtained were as follows and the test was performed twice:

CANOMAP #1

XY Stage Stepping Accuracy: Specification: 3s ≤ 0.07μ

Result X: 0.034μ

Result Y: 0.027μ

CANOMAP #2

XY Stage Stepping Accuracy: Specification: 3s ≤ 0.07μ

Result X: 0.026μ

Result Y: 0.040μ

IVS #1

XY Stage Stepping Accuracy: Specification: 3s ≤ 0.07μ

Result X: 0.018μ

Result Y: 0.017μ

IVS #2

XY Stage Stepping Accuracy: Specification: 3s ≤ 0.07μ

Result X: 0.018μ

Result Y: 0.021μ

6. MECHANICAL PREALIGNMENT ACCURACY

Specification: 3s ≤ 40μ

Result X: 23μ

Result Yl: 17μ

Result Yr: 24μ

7. CONTAMINATION

The contamination test was performed by measuring ten wafers on the Surfscan before and after processing through the stepper. The measurements were split into four categories: 0.2 to 0.3μ, 0.3 to 0.5μ, 0.5 to 1.0μ and 1.0 to 1.6μ and averaged over the ten wafers. The results were as follows:

Specification: ≤ 10 particles/wafer ≥ 0.3μ

≤ 3 particles/wafer ≥ 0.5μ

Result:	0.2 to 0.3μ	+0.6 particles/wafer
	0.3 to 0.5μ	+0.3 particles/wafer
	0.5 to 1.0μ	-0.1 particles/wafer
	1.0 to 1.6μ	0 particles/wafer

8. RELIABILITY

The first test aims to test the reliability of the reticle changer and involves exposing twenty five wafers with AGA, 45 exposures per wafer, a step size of 20mm, an exposure of 150 msecs and 14 reticle changes per wafer.

Specification: No Error or Assist **Result: Pass**

The second test aims to test the reliability of the wafer handling and involves exposing five hundred wafers with AGA, 45 exposures per wafer, a step size of 20mm and an exposure of 150 msecs.

Specification: No Error or Assist **Result: Pass**

9. THROUGHPUT

The throughput is measured for 45 shots with a step size in X and Y of 20mm, HeNe AGA using the 20P-4F multimark with a Sub loop of 4 shots and a Main loop of 8 shots with chip rotation compensation OFF and an exposure time of 150 msecs. The specifications and results were as follows:

Throughput D by D Tilt OFF:	Specification: $\geq$ 57 w/hr
	Result: 64 w/hr
Throughput D by D Tilt ON:	Specification: $\geq$ 51 w/hr
	Result: 63 w/hr

Conclusion and Further Actions

The Canon 2000i1 #268 should be pre-accepted by Mietec with the condition that the following three points are successfully resolved prior to the final acceptance of the stepper.

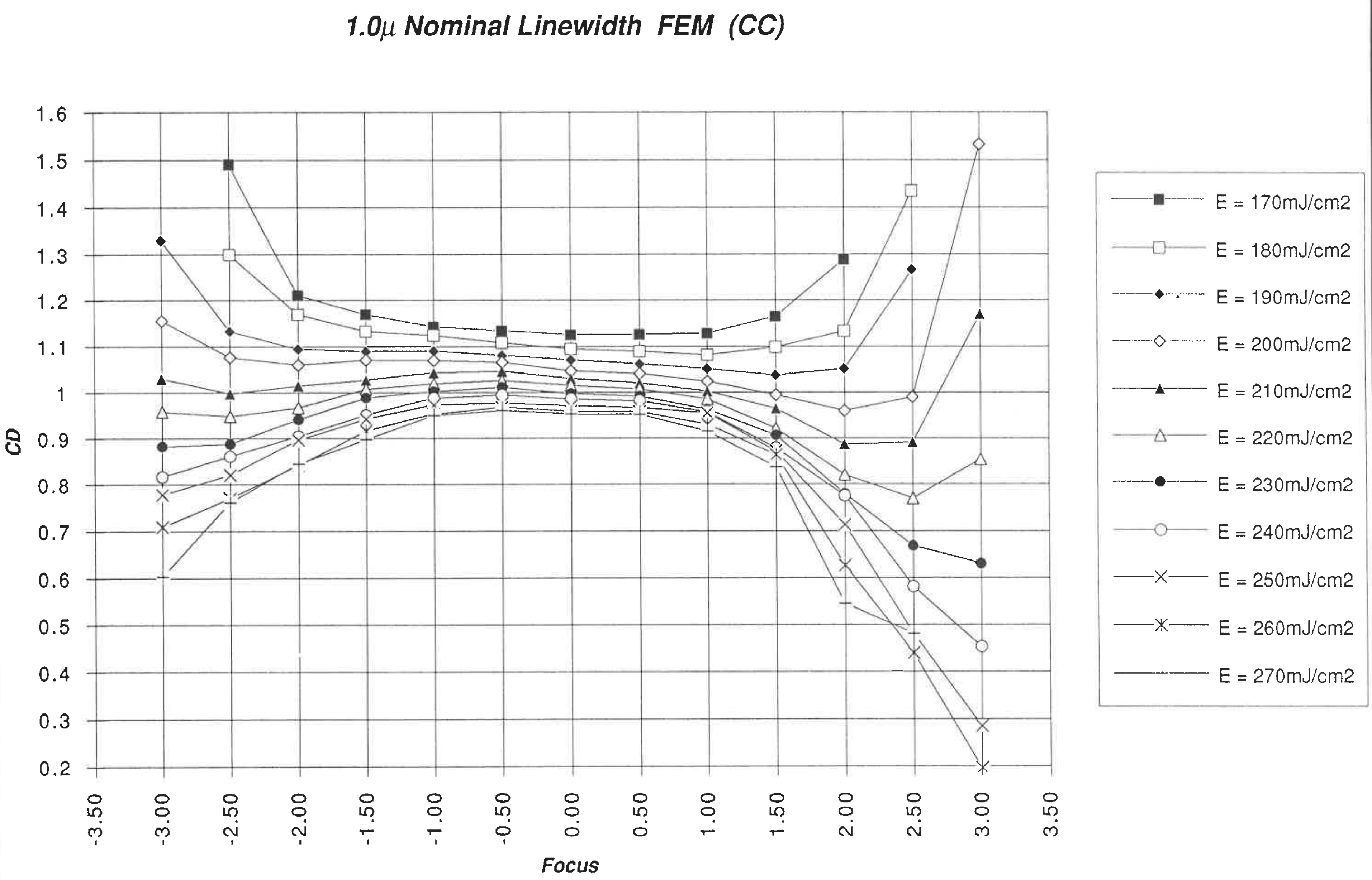
1. The recommendation from Canon with regard to the asymmetric resist profile is to NOT make an adjustment as the value of 4.8° is within their internal specification. However if Mietec request the adjustment Canon are willing to make it. In my opinion following discussion with Canon we should NOT ask for the adjustment to be made but should obtain from Canon an undertaking that they will make the adjustment at any time in the future free of charge at the request of Mietec. We will then be in a position to wait and see if the phenomena is present on the second and third steppers delivered to Mietec before asking for the adjustment to be made.

2. The B-Scope camera is scheduled for replacement in Week 49 and after this has been completed the three day AGA test will be repeated.

3. The TTLAF repeatability should be $\leq 0.1\mu$ 3s and currently this is not the case and the cause has been found to be due to a bad connector which will be replaced in Week 49.

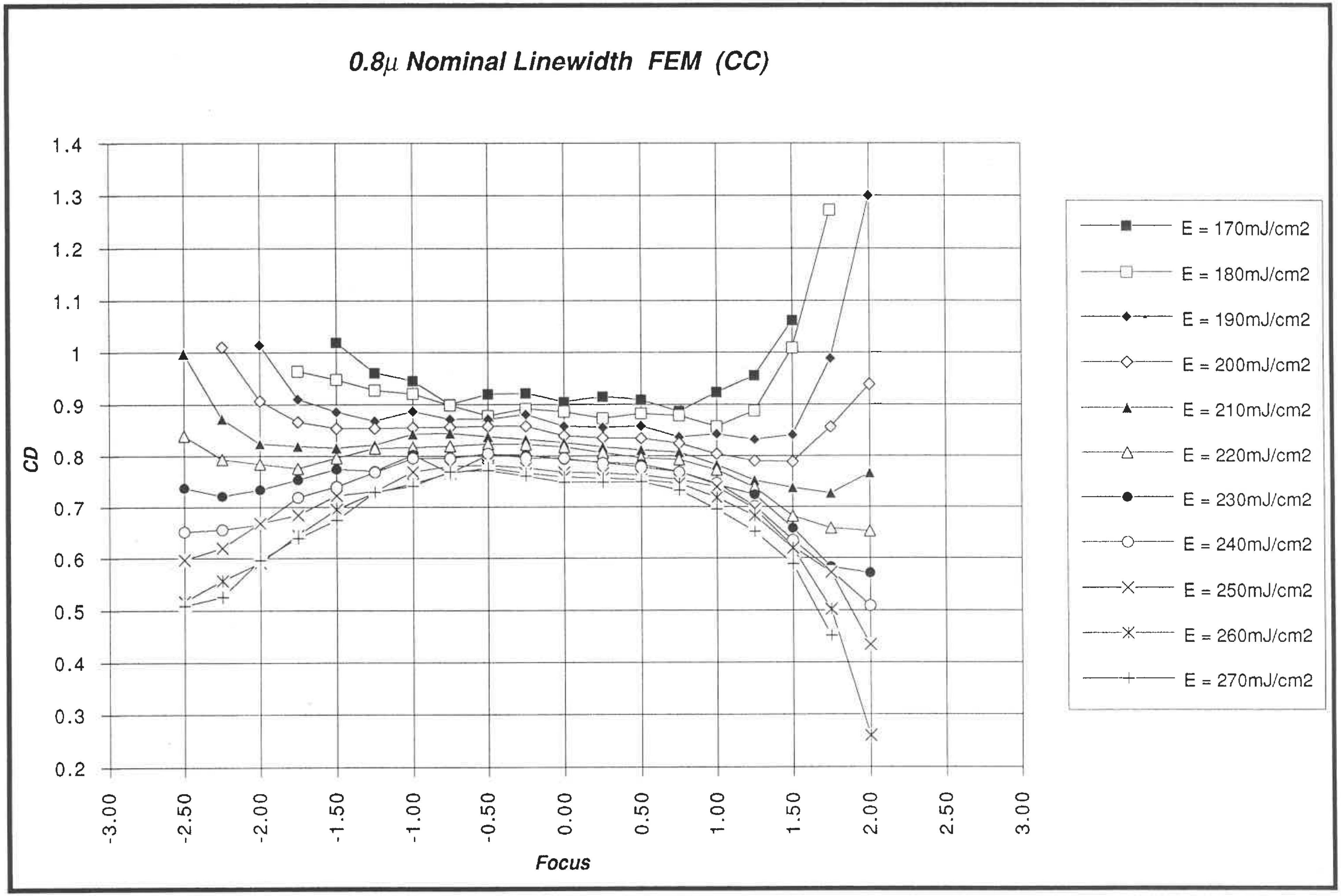
Appendix 1 - FEM and Linearity Data

Canon 2 0i1 #268 (Pre-Acceptance Data) UCB-JSR I. 00EL



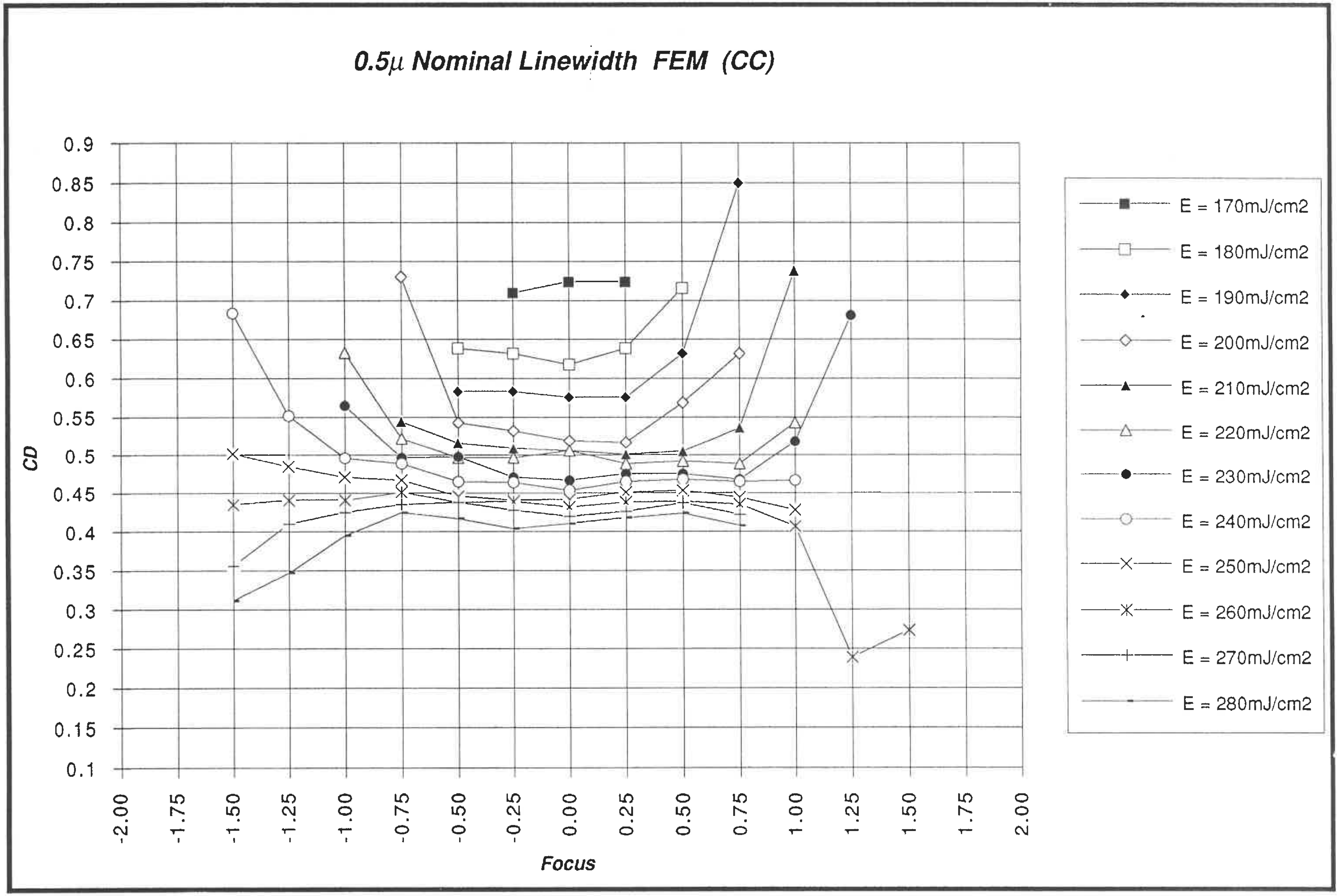
D.Laidler 30th October, 1992.

Canon 2..0i1 #268 (Pre-Acceptance Data) UCB-JSR I..00EL



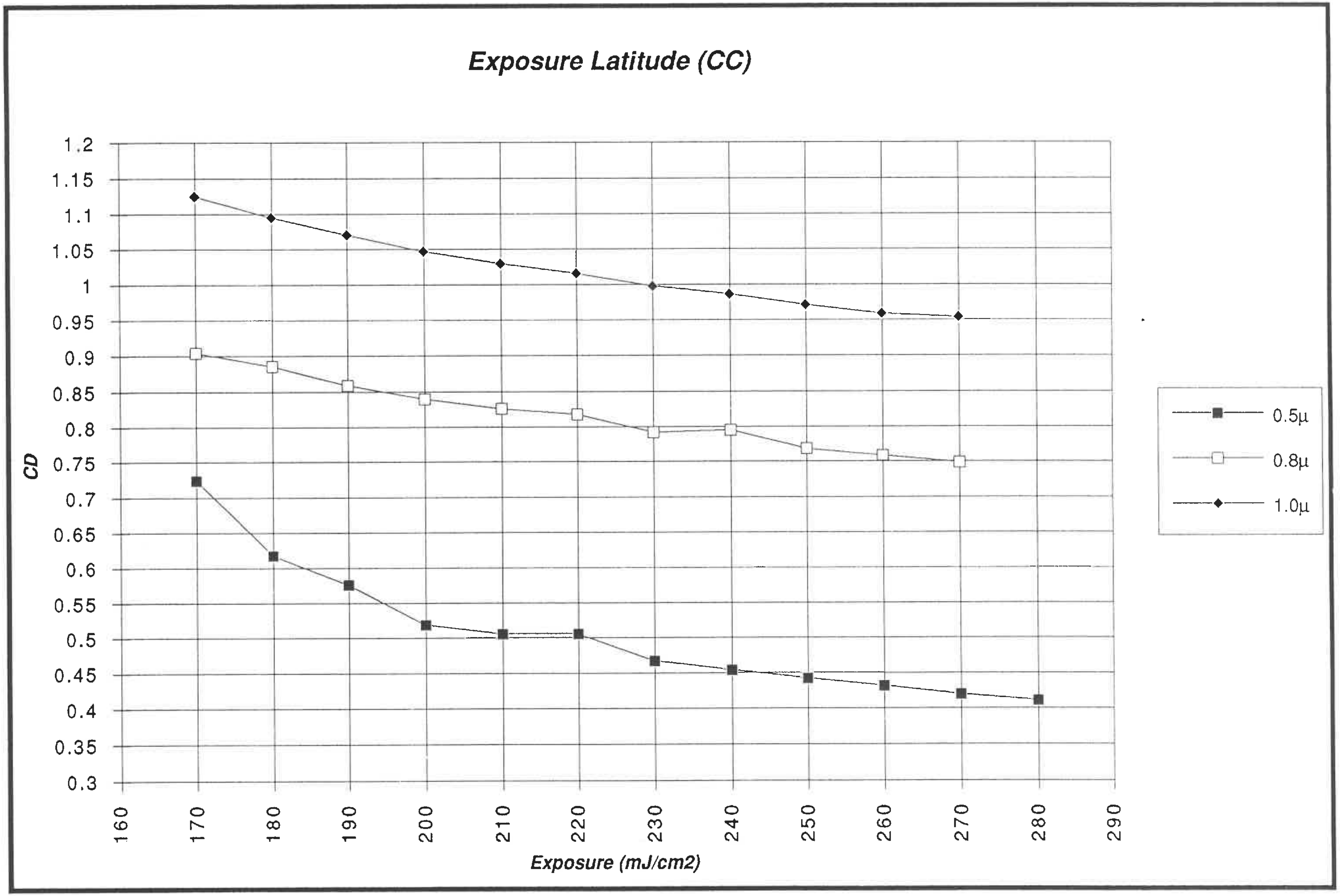
D.Laidler 30th October, 1992.

Canon . 0i1 #268 (Pre-Acceptance Data) UCB-JSR : 00EL

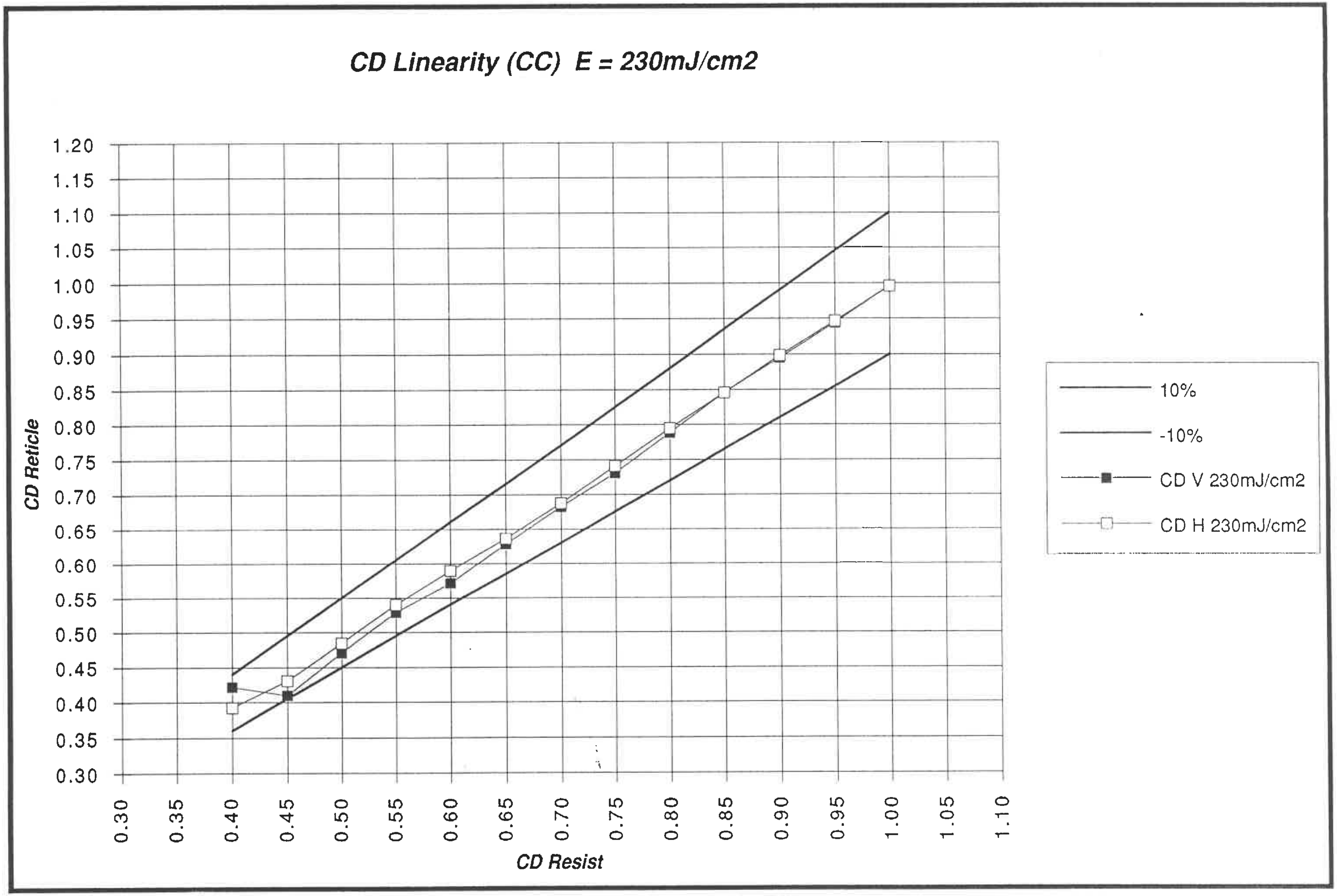


D.Laidler 30th October, 1992.

Canon 2 0i1 #268 (Pre-Acceptance Data) UCB-JSR I. 0EL

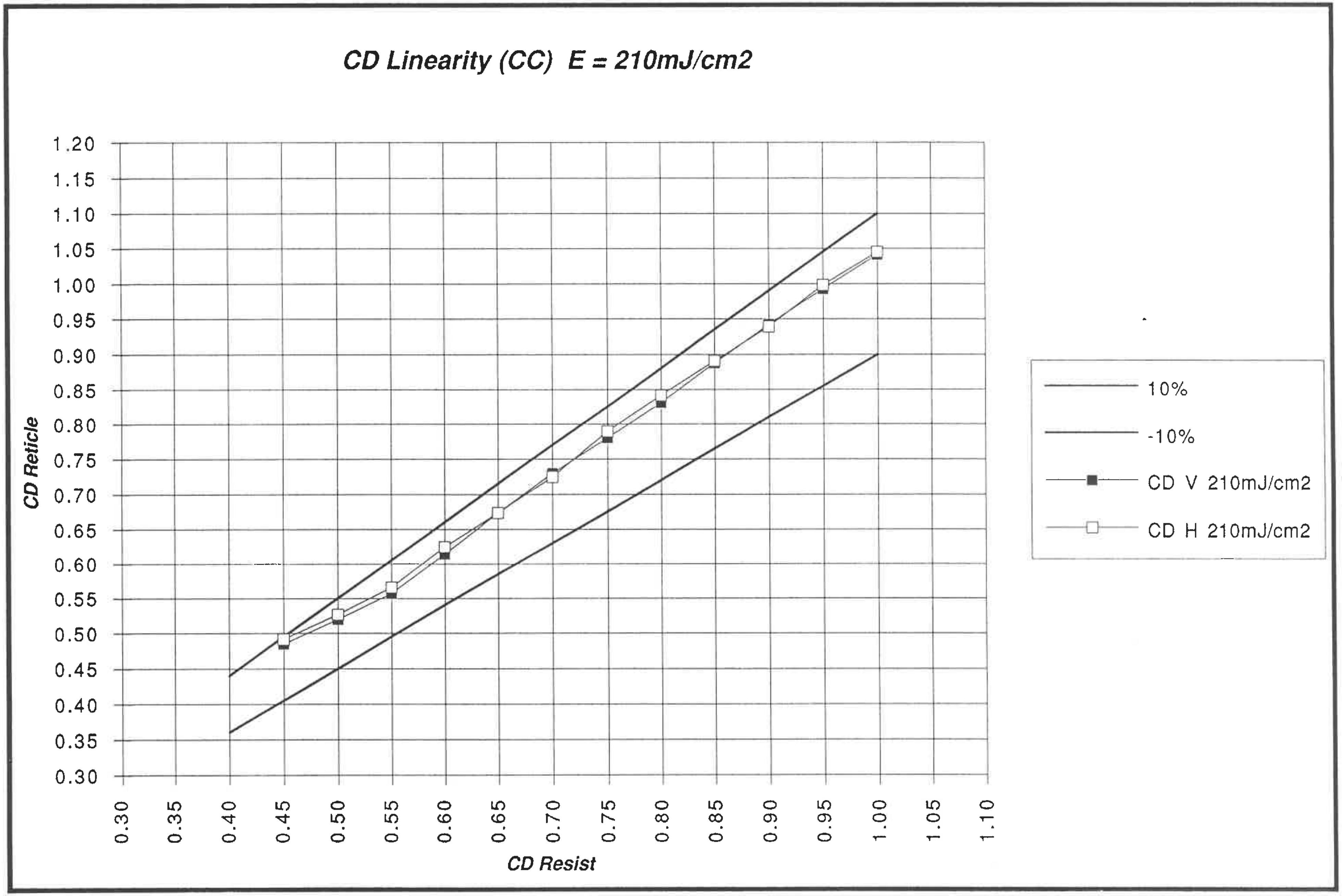


D.Laidler 31st October, 1992.



D.Laidler 28th October, 1992.

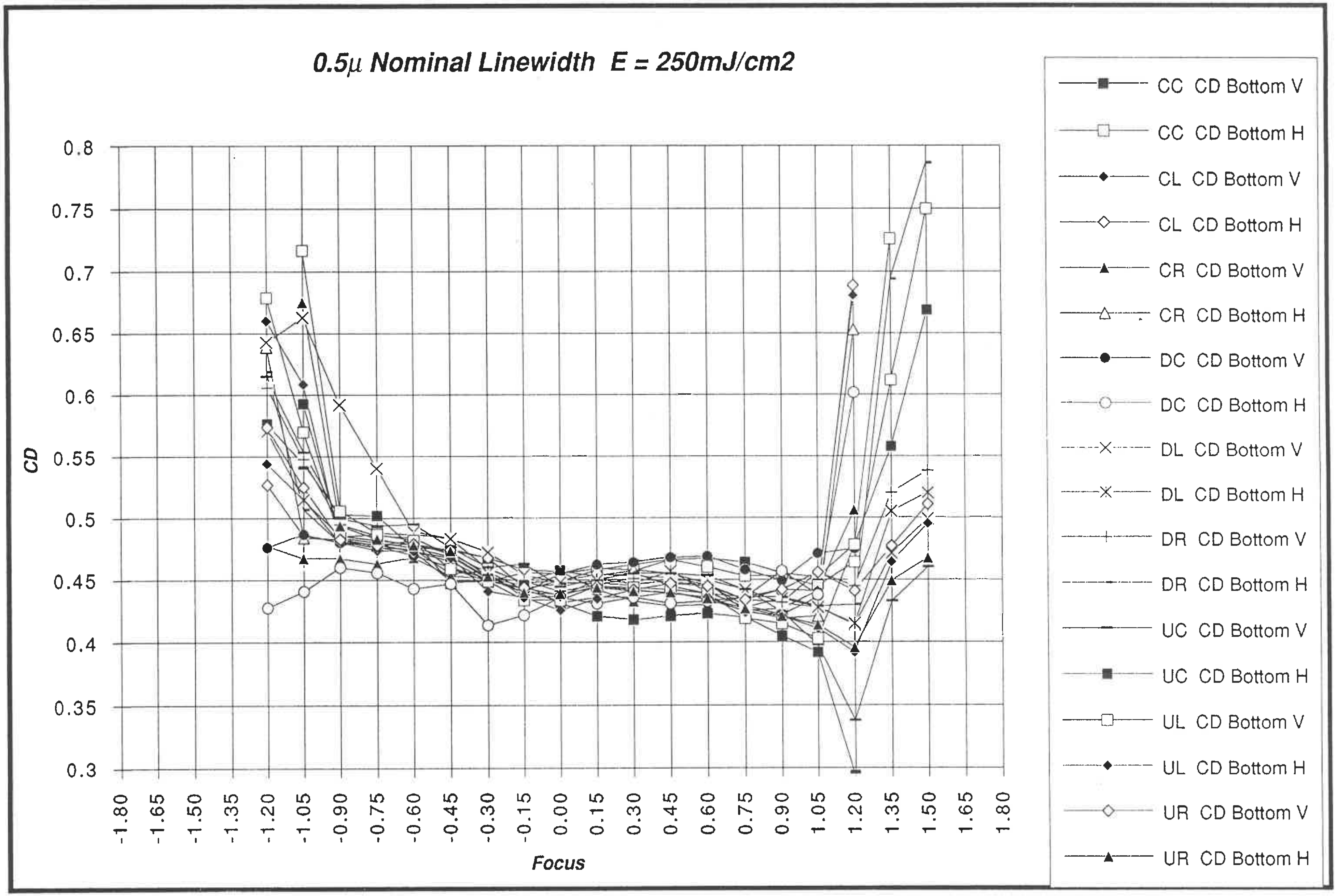
Canon 2 0i1 #268 (Pre-Acceptance Data) UCB-JSR 00EL



D.Laidler 28th October, 1992.

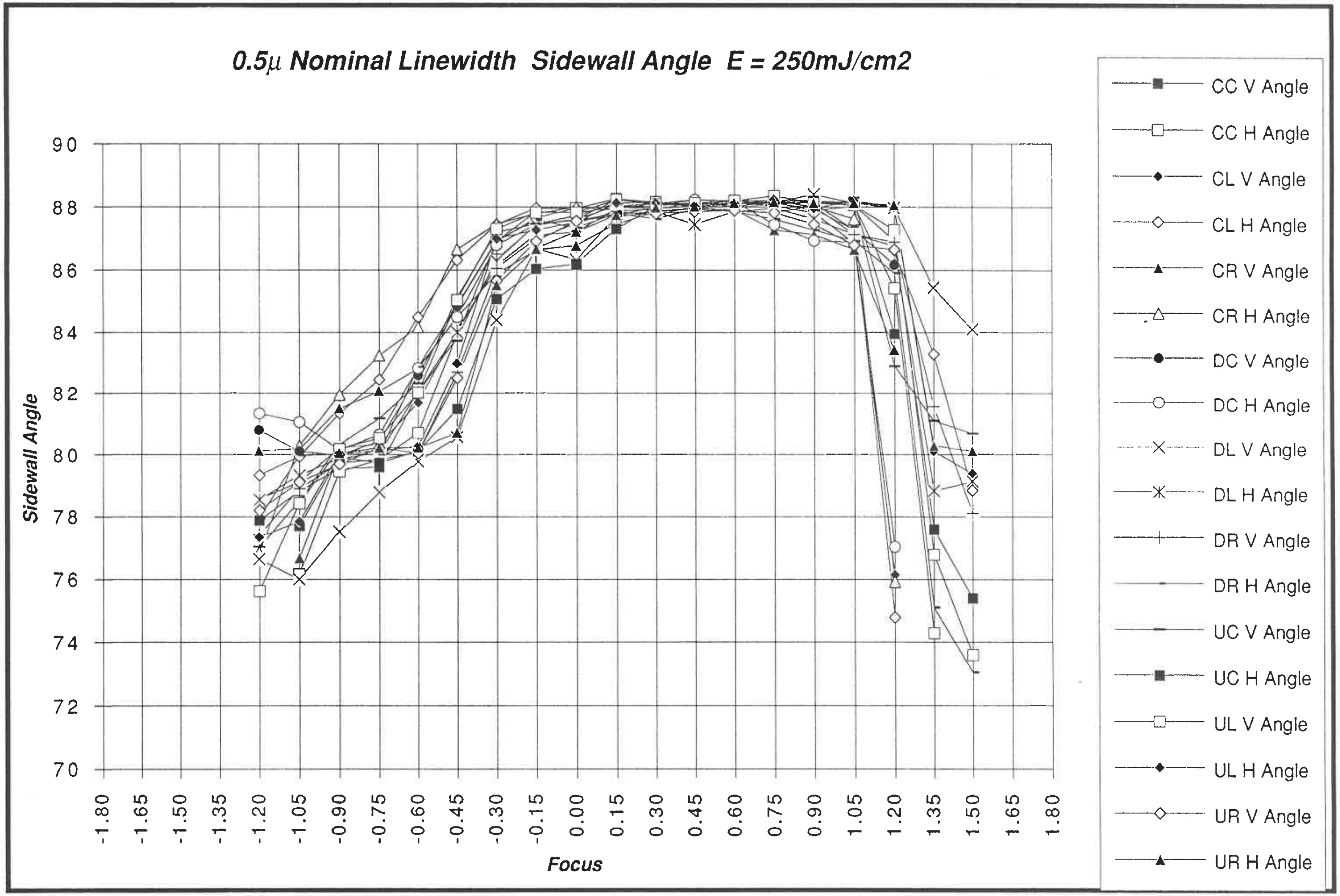
Appendix 2 - UDoF Data

Canon 2000i1 #2ʟ 20x20mm 9 Points (Pre-Acceptance Data) (3-JSR IX500EL



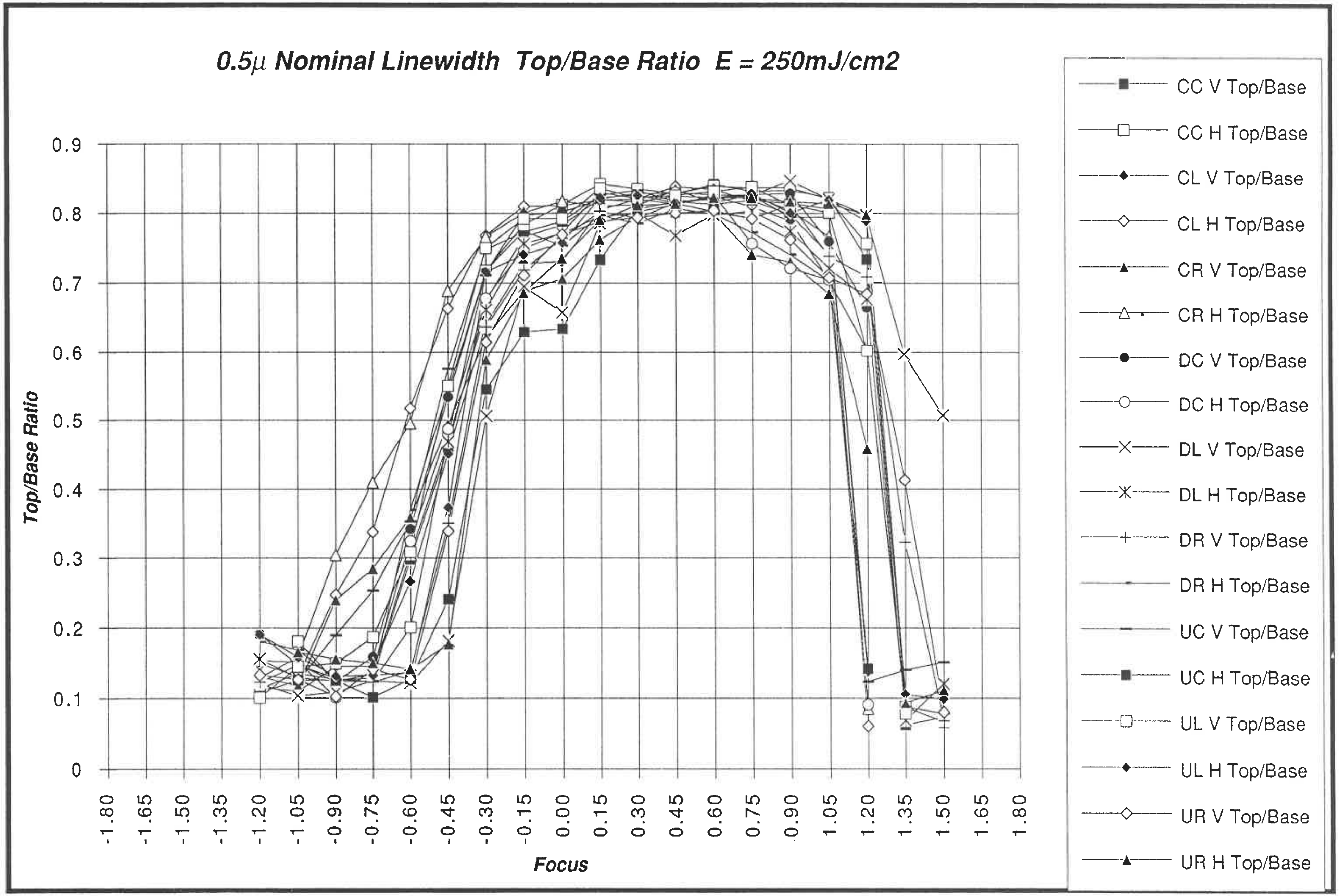
D.Laidler 28th October, 1992.

Canon 2000i1 #2(20x20mm 9 Points (Pre-Acceptance Data) (3-JSR IX500EL



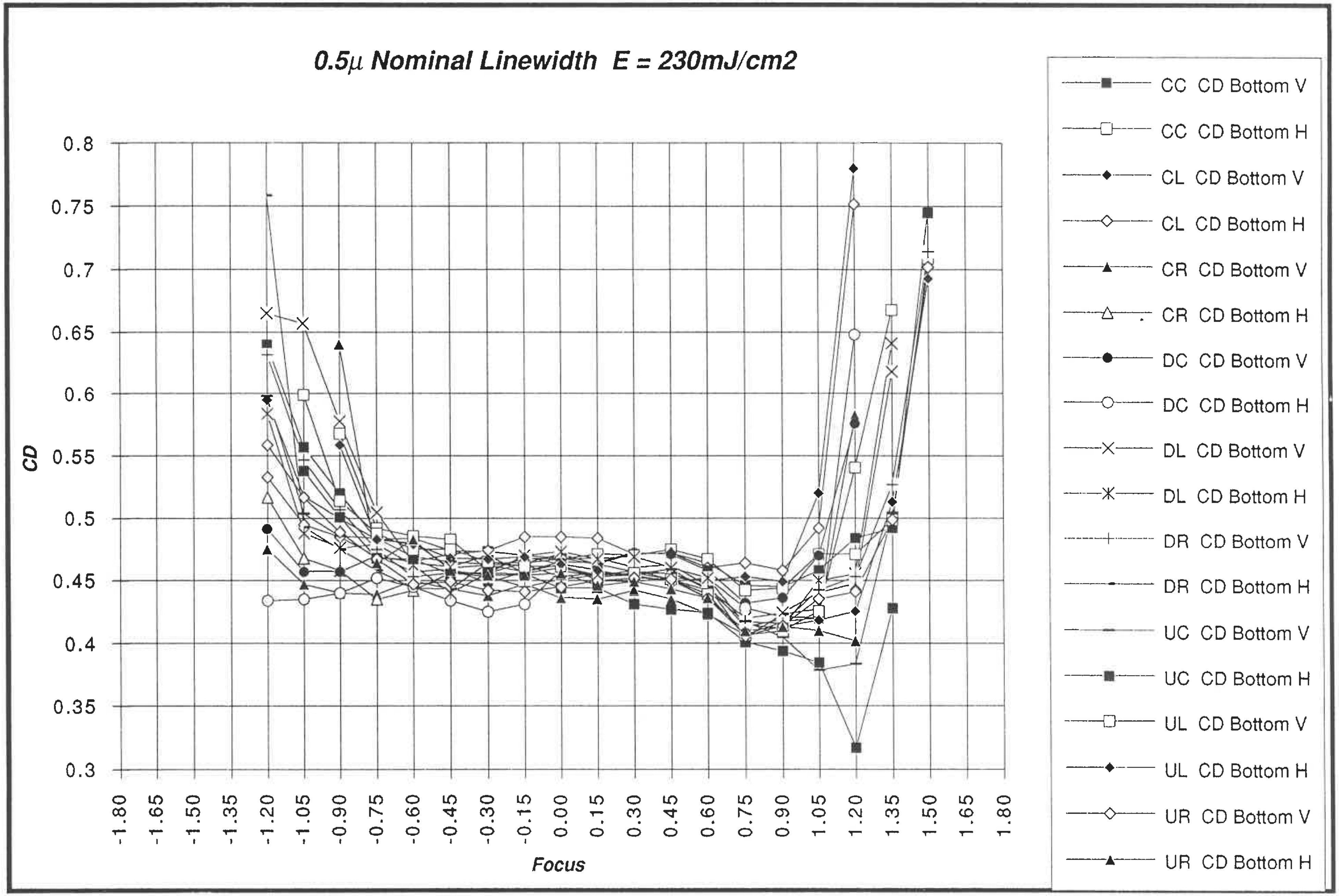
D.Laidler 28th October, 1992.

Canon 2000i1 #2ι 20x20mm 9 Points (Pre-Acceptance Data) ι 3-JSR IX500EL



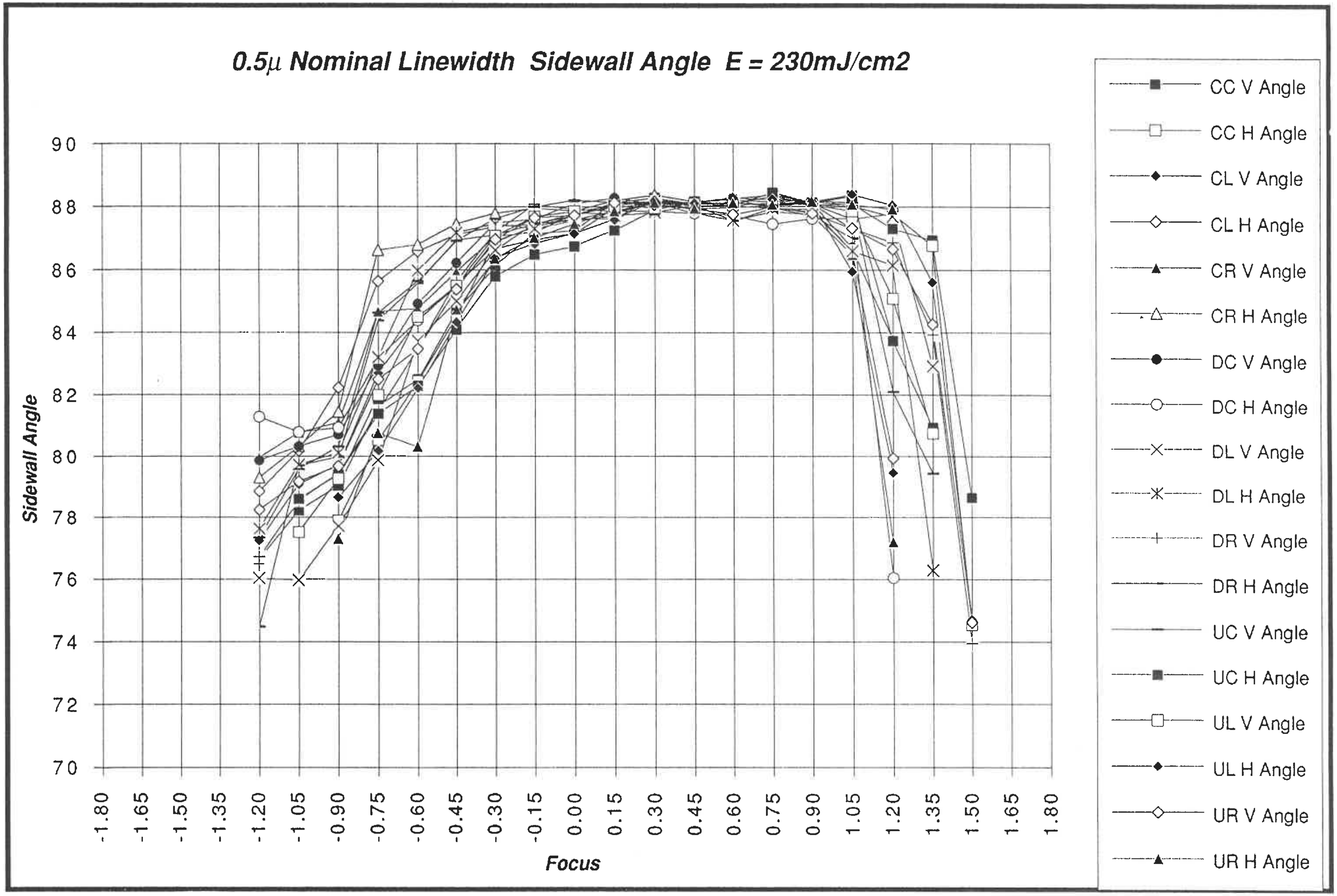
D.Laidler 28th October, 1992.

Canon 2000i1 #2 20x20mm 9 Points (Pre-Acceptance Data) 3-JSR IX500EL



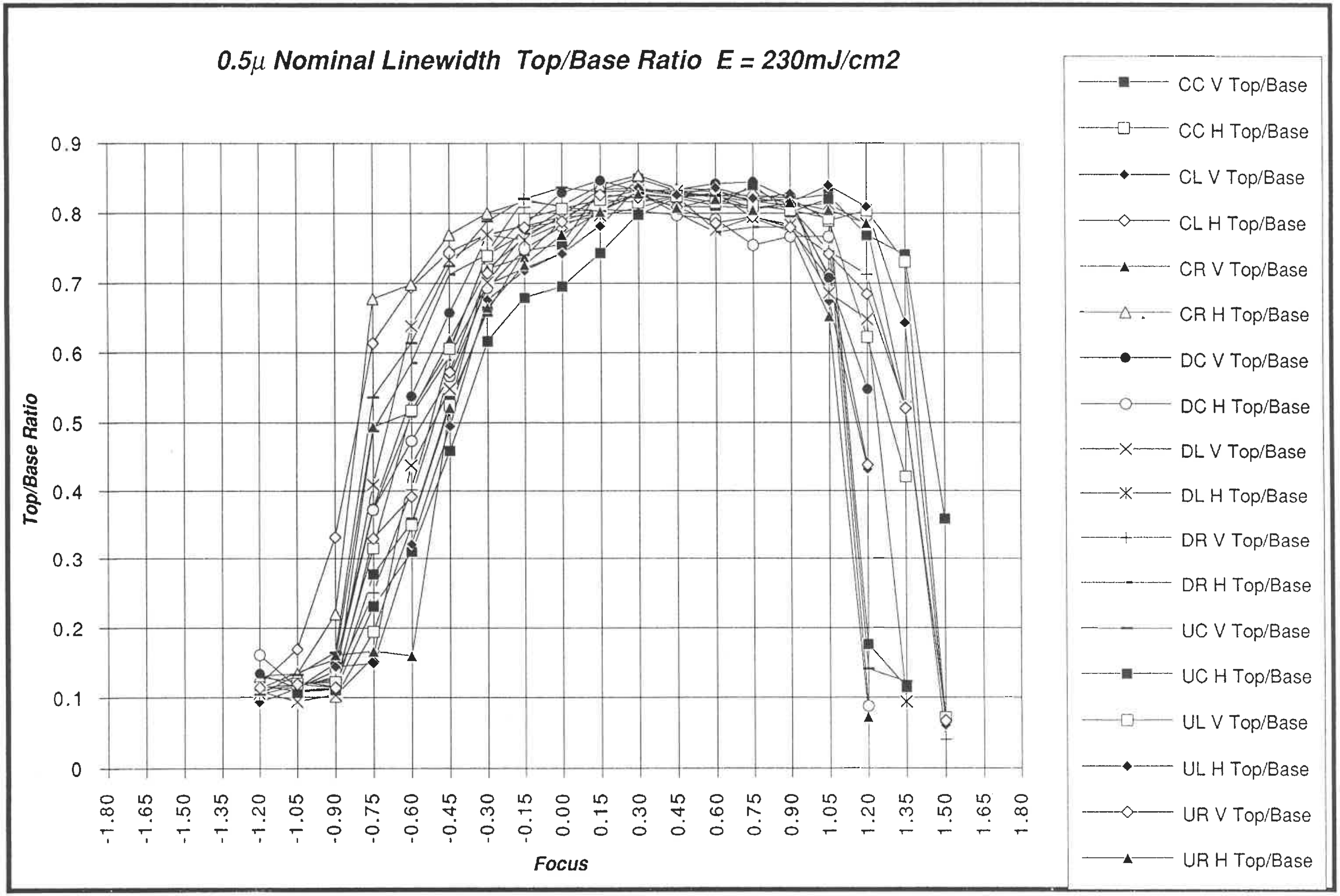
D.Laidler 28th October, 1992.

Canon 2000i1 #2ı. 20x20mm 9 Points (Pre-Acceptance Data) ı -B-JSR IX500EL



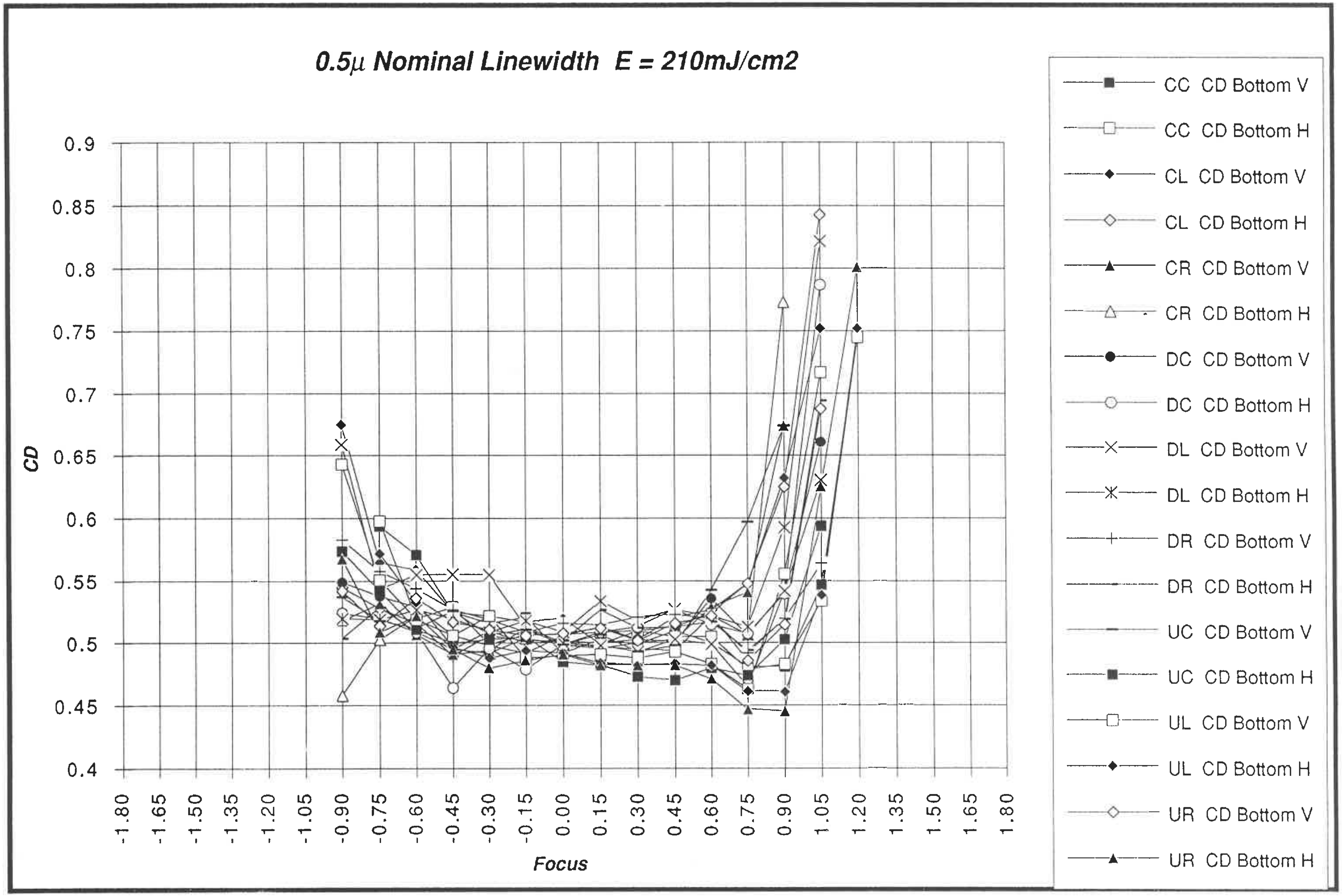
D.Laidler 28th October, 1992.

Canon 2000i1 #2(20x20mm 9 Points (Pre-Acceptance Data) (3-JSR IX500EL



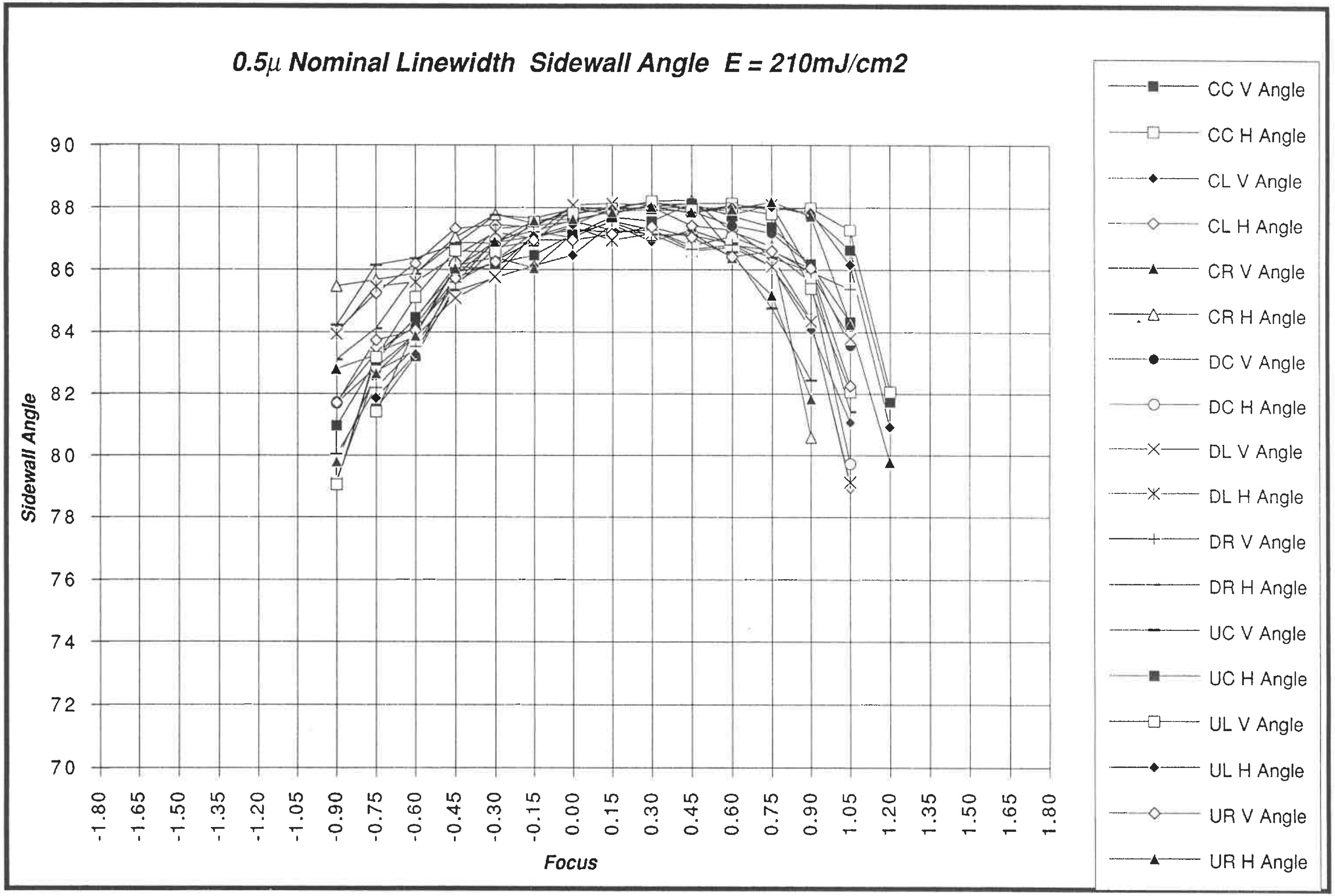
D.Laidler 28th October, 1992.

Canon 2000i1 #2(20x20mm 9 Points (Pre-Acceptance Data) (3-JSR IX500EL

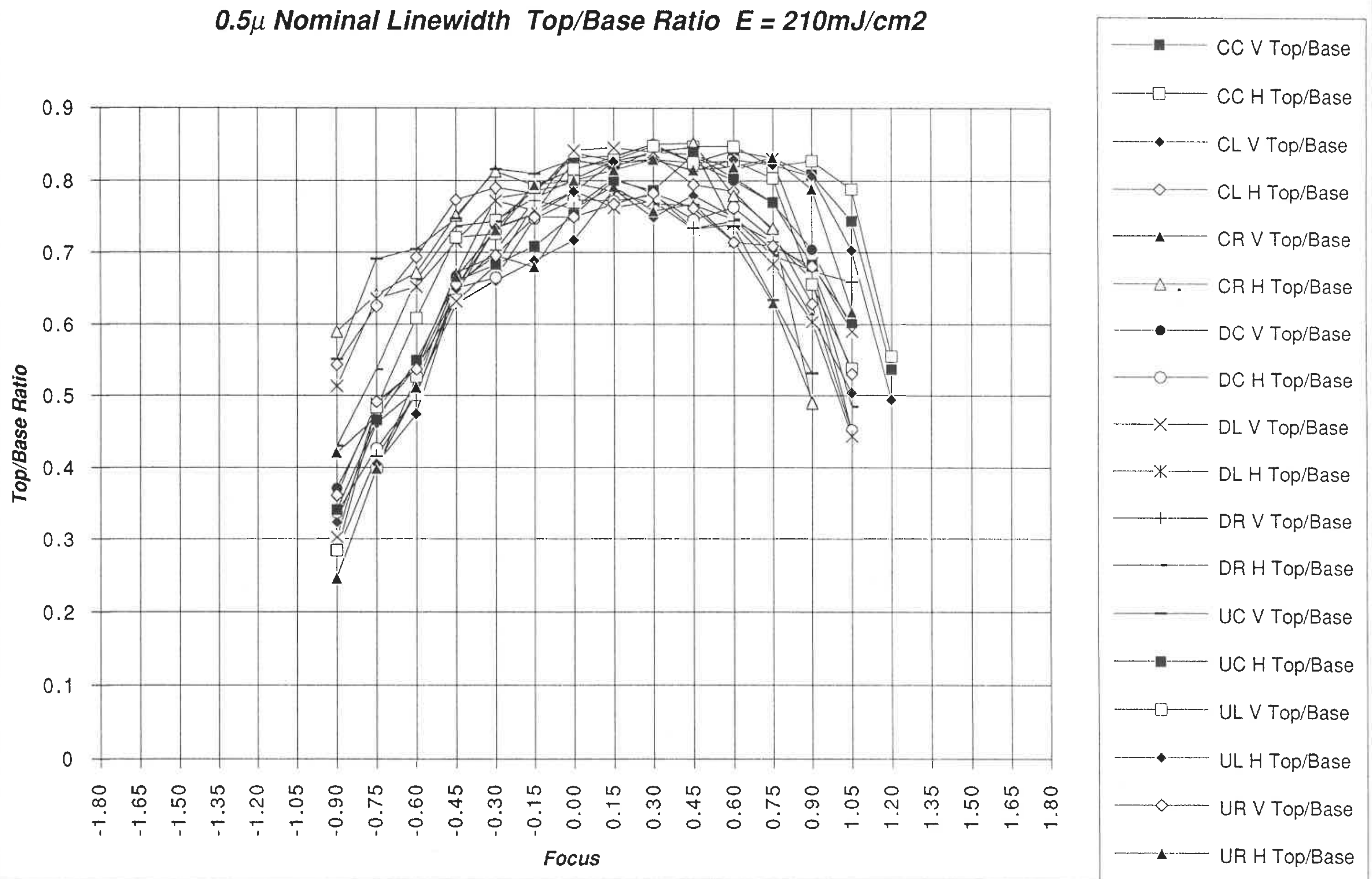


D.Laidler 28th October, 1992.

Canon 2000i1 #2 20x20mm 9 Points (Pre-Acceptance Data) 3-JSR IX500EL

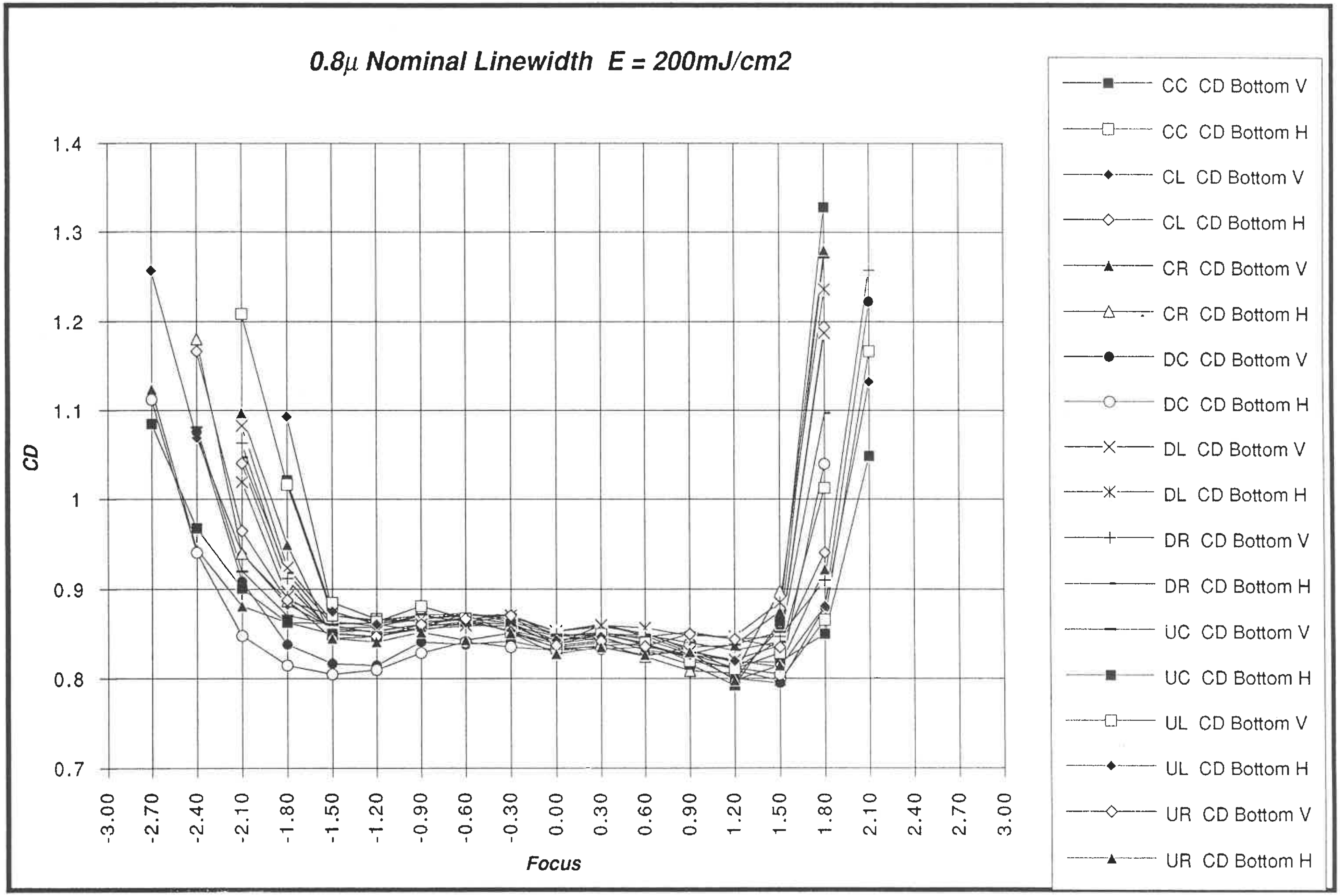


D.Laidler 28th October, 1992.



D.Laidler 28th October, 1992.

Canon 2000i1 #2(20x20mm 9 Points (Pre-Acceptance Data) 3-JSR IX500EL



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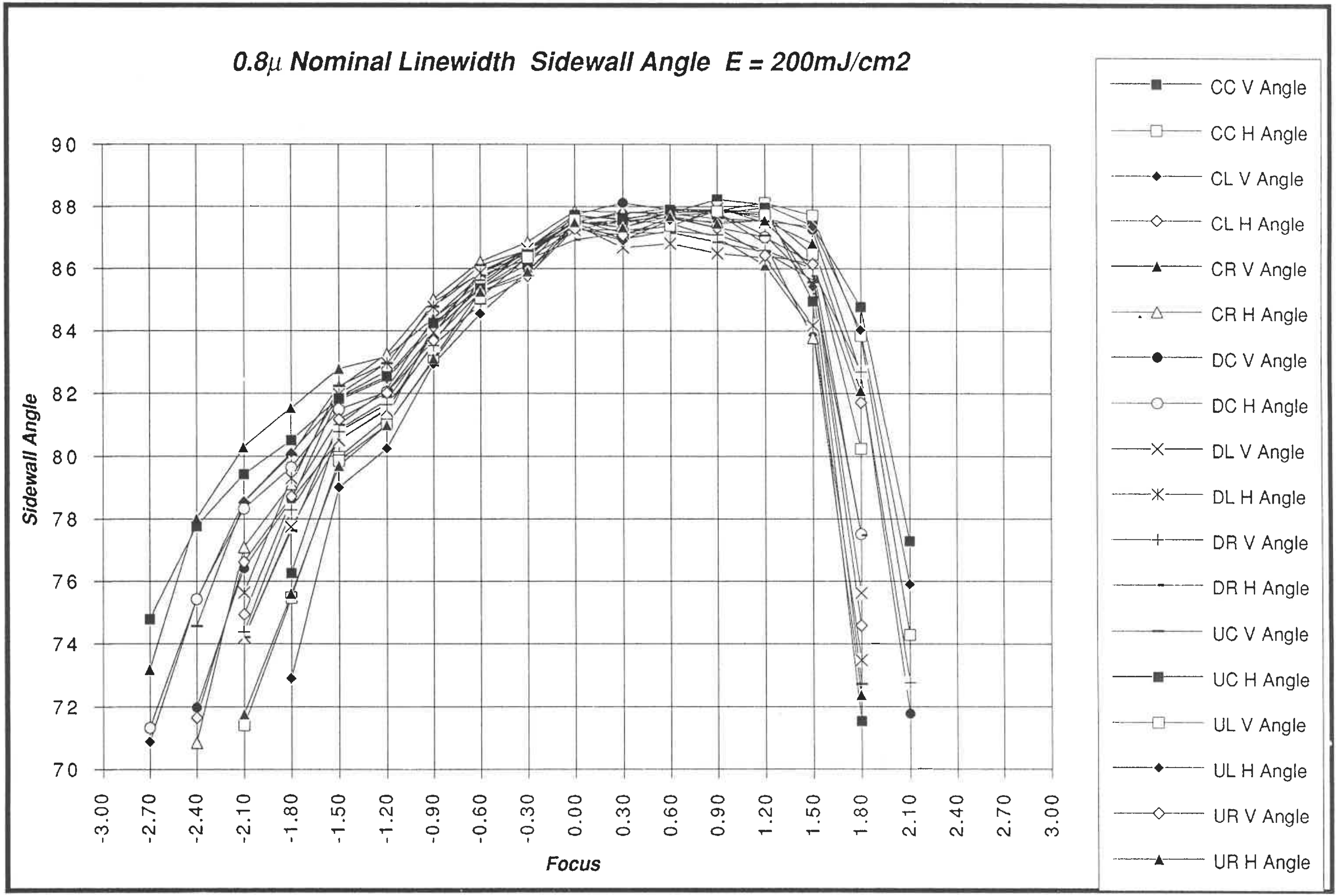
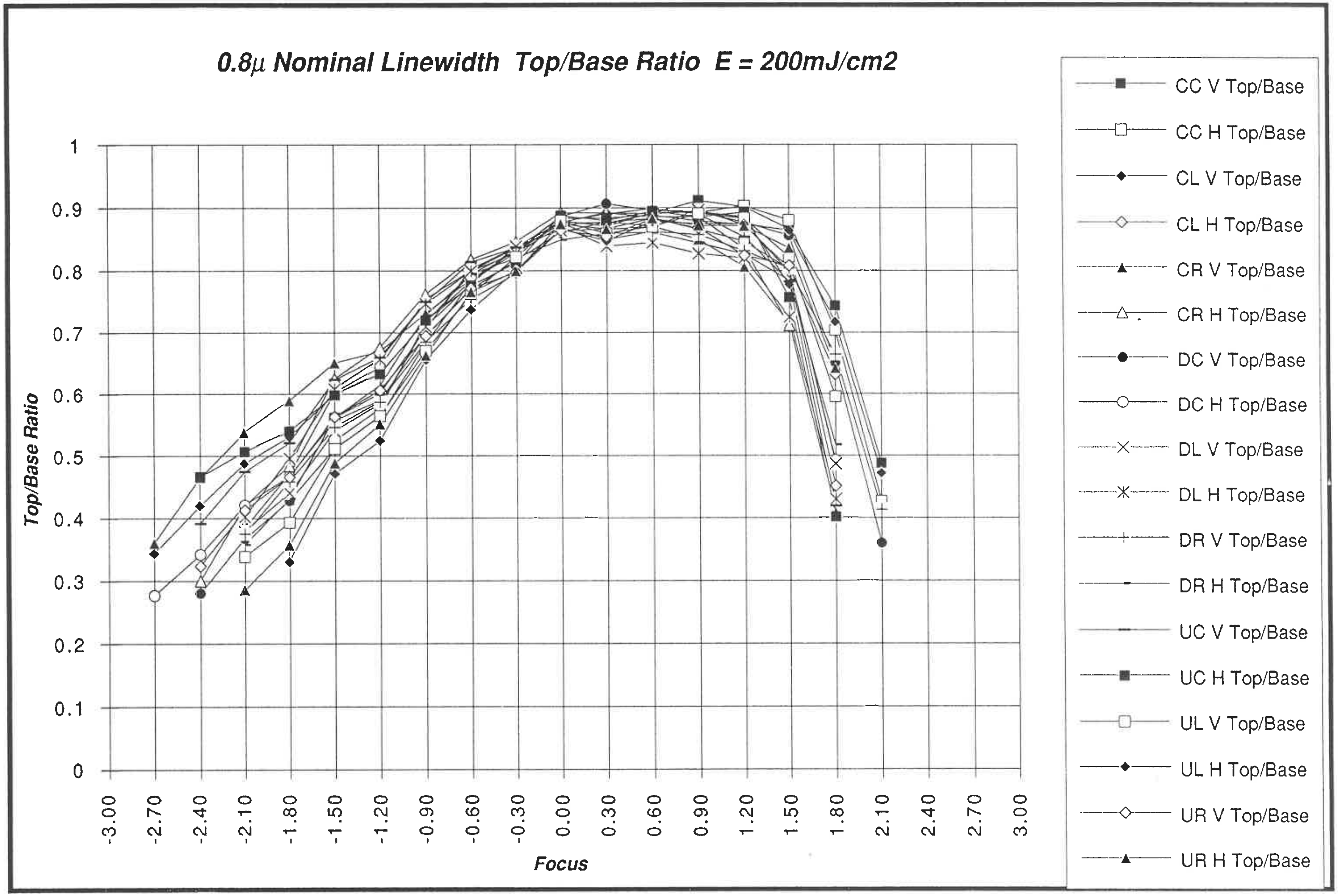
Canon 2000i1 #2 20x20mm 9 Points (Pre-Acceptance Data) 3-JSR IX500EL



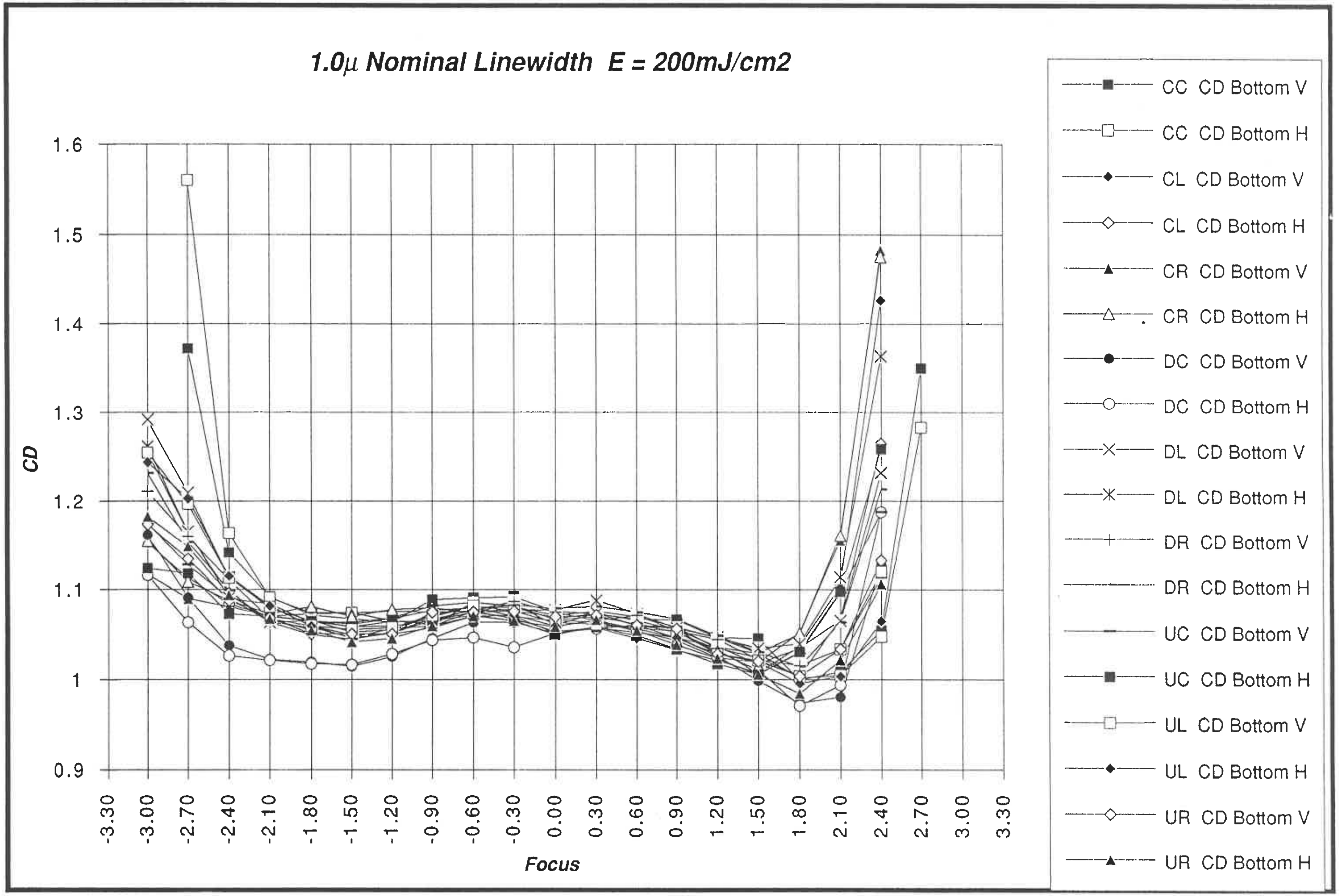
D.Laidler 28th October, 1992.

Canon 2000i1 #2 20x20mm 9 Points (Pre-Acceptance Data) 3-JSR IX500EL



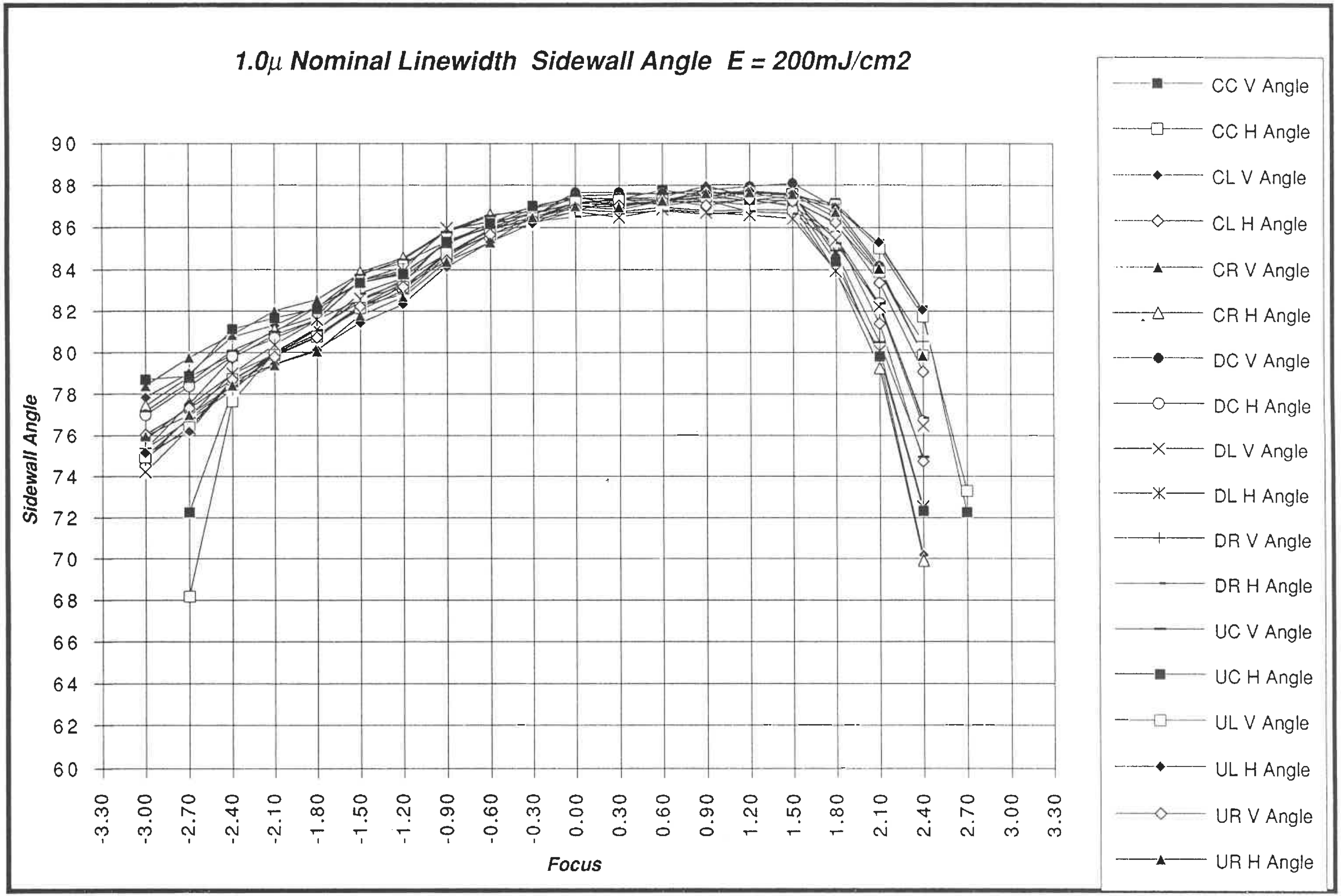
D.Laidler 28th October, 1992.

Canon 2000i1 #2… 20x20mm 9 Points (Pre-Acceptance Data) …3-JSR IX500EL



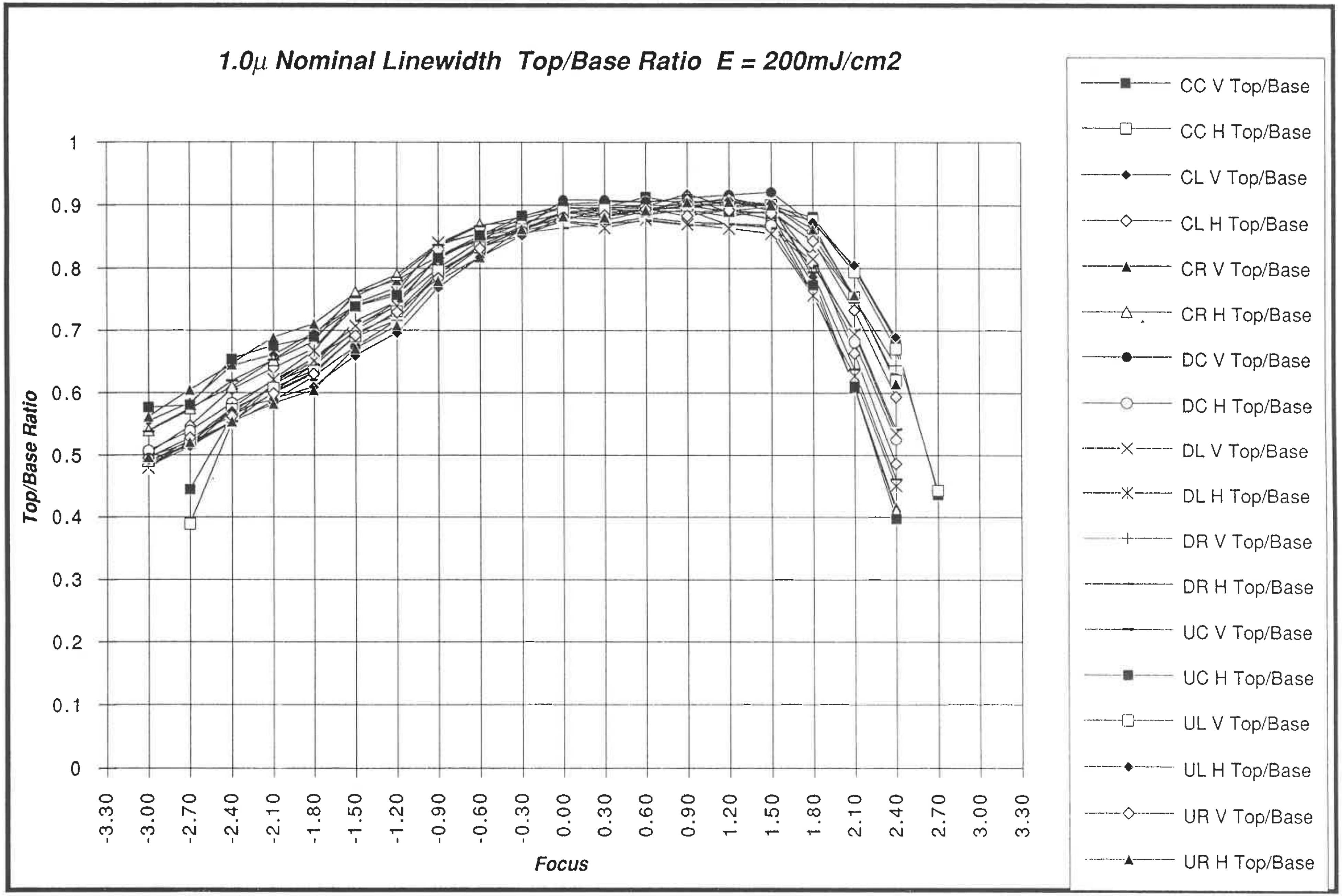
D.Laidler 30th October, 1992.

Canon 2000i1 #2(20x20mm 9 Points (Pre-Acceptance Data) 3-JSR IX500EL



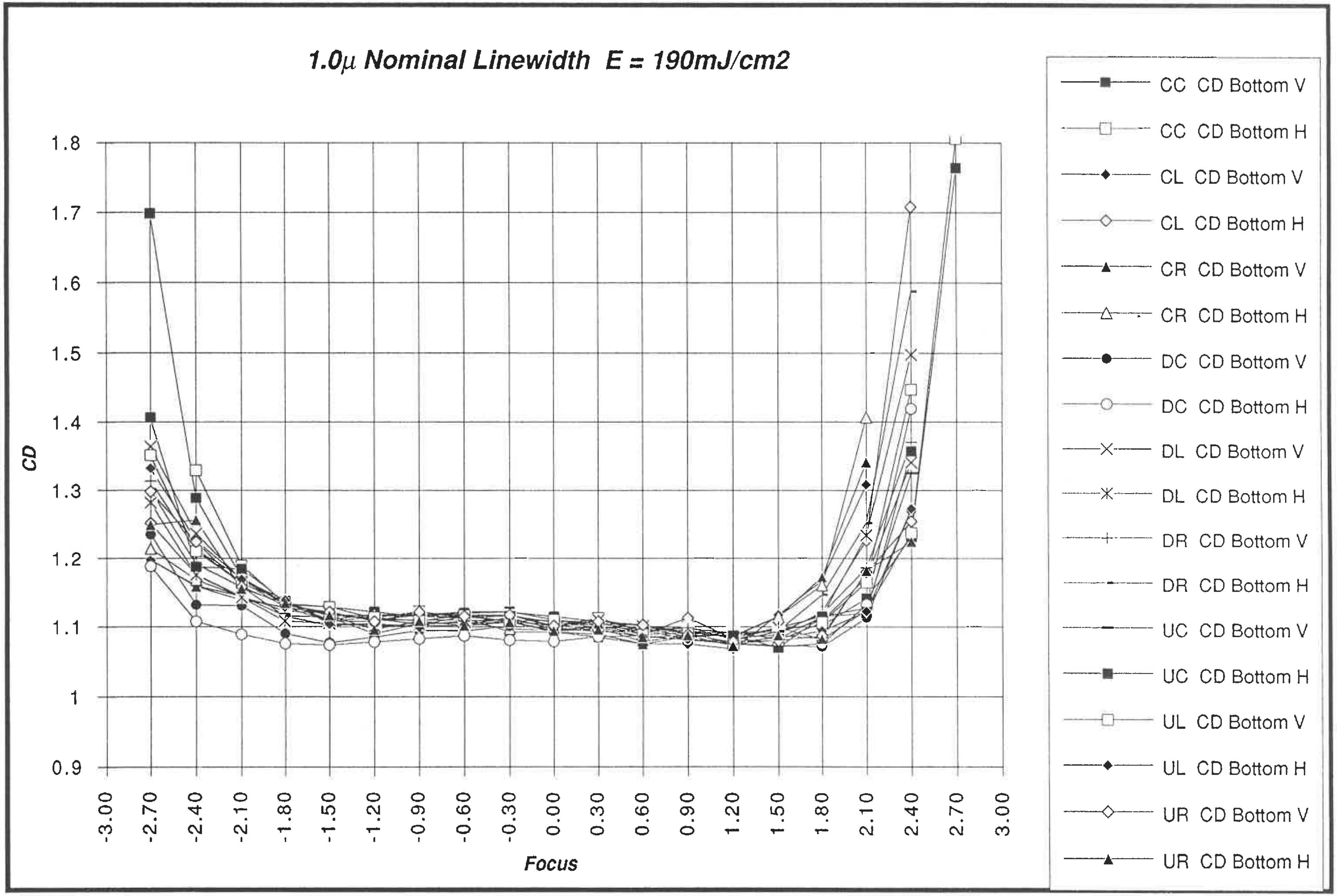
D.Laidler 30th October, 1992.

Canon 2000i1 #2 20x20mm 9 Points (Pre-Acceptance Data) B-JSR IX500EL



D.Laidler 30th October, 1992.

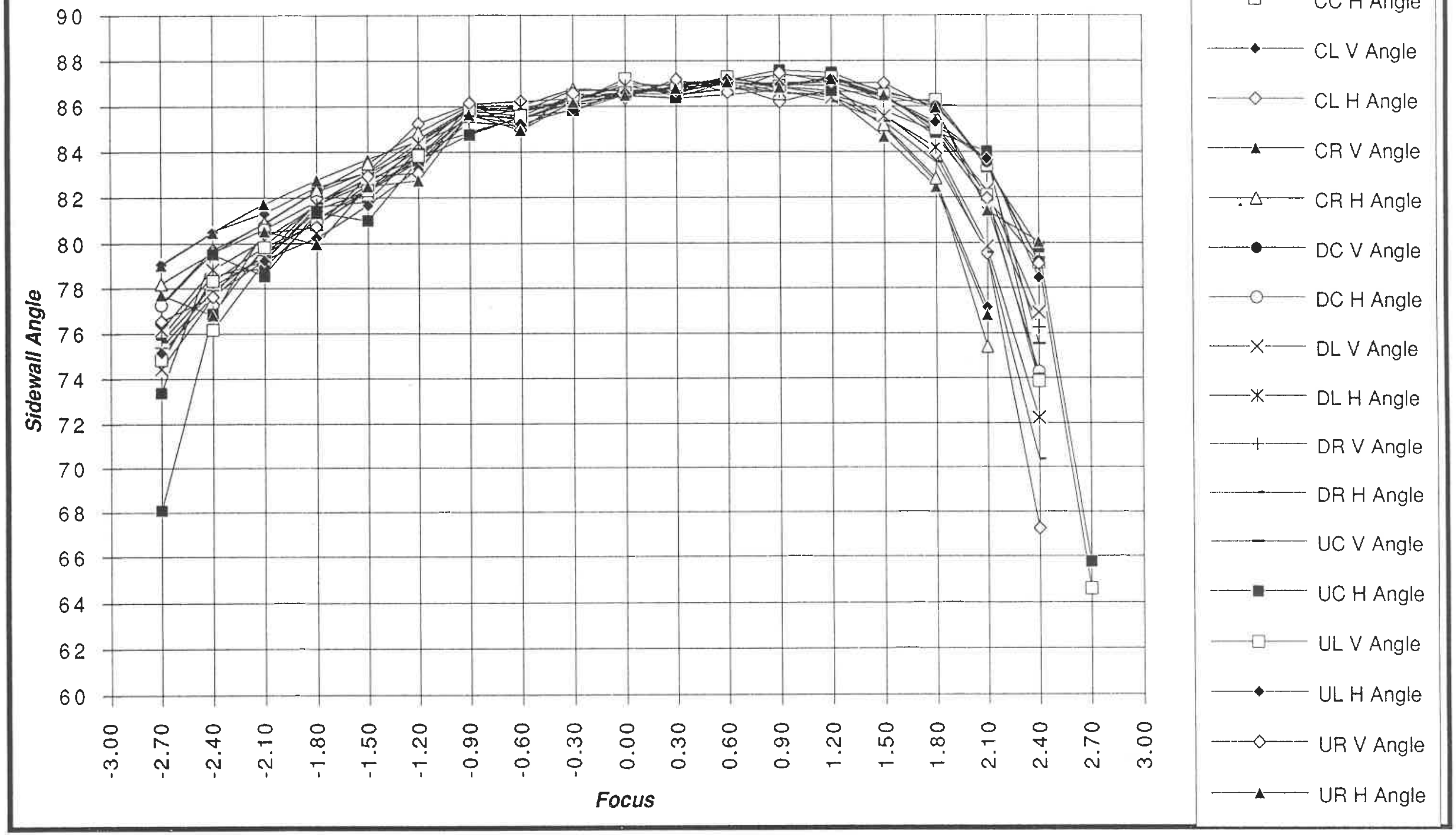
Canon 2000i1 #2 20x20mm 9 Points (Pre-Acceptance Data) 3-JSR IX500EL



D.Laidler 28th October, 1992.

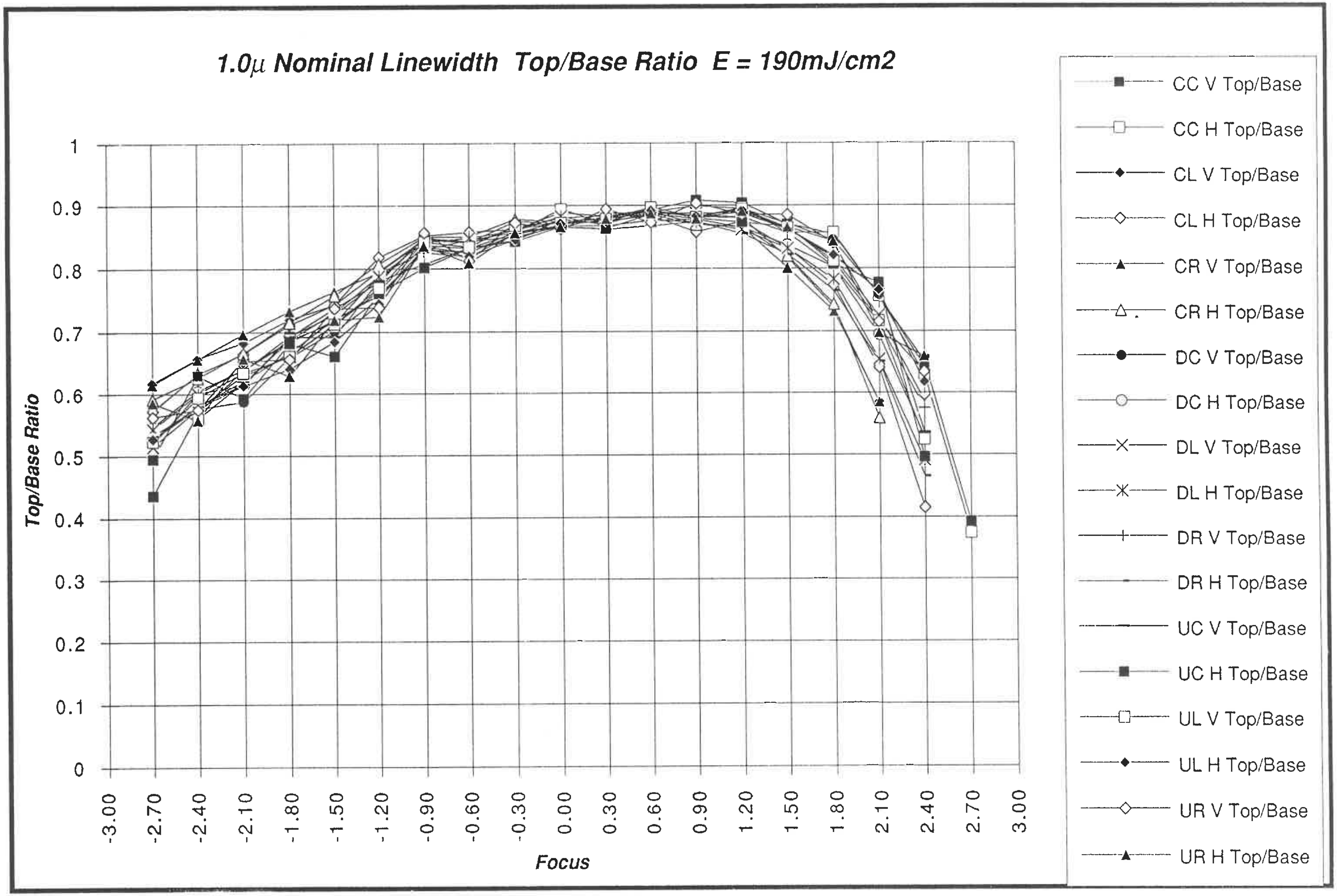
Canon 2000i1 #2t 20x20mm 9 Points (Pre-Acceptance Data) 3-JSR IX500EL

1.0μ Nominal Linewidth Sidewall Angle E = 190mJ/cm2



D.Laidler 28th October, 1992.

Canon 2000i1 #2(20x20mm 9 Points (Pre-Acceptance Data) 3-JSR IX500EL



D.Laidler 28th October, 1992.

Appendix 3 - AGA Data

Canon 2000i1 #268 AGA 15/10/92 Day 1 IVS (Pre-Acceptance Data)

		(Xl+Xr)/2	Yl	Yr
15/10/92 Mode 1 #1	|m| 3's |m| + 3s	0.0202 0.0417 0.0618	0.0248 0.0607 0.0854	0.0083 0.0467 0.0550
15/10/92 Mode 1 #2	|m| 3s |m| + 3s	0.0066 0.0588 0.0655	0.0296 0.0870 0.1166	0.0150 0.0697 0.0847
15/10/92 Mode 1 #3	|m| 3s |m| + 3s	0.0115 0.0564 0.0678	0.0024 0.0624 0.0647	0.0164 0.0535 0.0699
15/10/92 Mode 1 #4	|m| 3s |m| + 3s	0.0155 0.0770 0.0925	0.0397 0.0869 **0.1265**	0.0271 0.0753 0.1023
15/10/92 Mode 1 #5	|m| 3s |m| + 3s	0.0224 0.0500 0.0725	0.0022 0.0419 0.0441	0.0100 0.0370 0.0470
15/10/92 Mode 1 #1 - 5	|m| 3s |m| + 3s	0.0153 0.0605 0.0757	0.0188 0.0850 0.1038	0.0153 0.0615 0.0768

		(Xl+Xr)/2	Yl	Yr
15/10/92 Mode 4 #1	|m| 3s |m| + 3s	0.0166 0.0522 0.0688	0.0349 0.0586 0.0935	0.0157 0.0590 0.0747
15/10/92 Mode 4 #2	|m| 3s |m| + 3s	0.0235 0.0522 0.0757	0.0408 0.0433 0.0840	0.0455 0.0315 0.0770
15/10/92 Mode 4 #3	|m| 3s |m| + 3s	0.0083 0.0364 0.0447	0.0355 0.0230 0.0585	0.0470 0.0267 0.0737
15/10/92 Mode 4 #4	|m| 3s |m| + 3s	0.0031 0.0396 0.0426	0.0251 0.0284 0.0536	0.0368 0.0217 0.0586
15/10/92 Mode 4 #5	|m| 3s |m| + 3s	0.0207 0.0425 0.0632	0.0499 0.0373 0.0873	0.0431 0.0298 0.0729
15/10/92 Mode 4 #1 - 5	|m| 3s |m| + 3s	0.0132 0.0535 0.0667	0.0373 0.0469 0.0841	0.0376 0.0500 0.0876

Canon 2000i1 #268 AGA 16/10/92 Day 2 IVS (Pre-Acceptance Data)

		(Xl+Xr)/2	Yl	Yr
16/10/92 Mode 1 #1	|m| 3s |m|+3s	0.0365 0.0589 0.0954	0.0202 0.0691 0.0893	0.0143 0.0580 0.0723
16/10/92 Mode 1 #2	|m| 3s |m|+3s	0.0247 0.0686 0.0933	0.0445 0.1030 **0.1475**	0.0381 0.0855 **0.1236**
16/10/92 Mode 1 #3	|m| 3s |m|+3s	0.0337 0.0605 0.0942	0.0237 0.0847 0.1084	0.0046 0.0613 0.0659
16/10/92 Mode 1 #4	|m| 3s |m|+3s	0.0195 0.0695 0.0890	0.0248 0.0597 0.0845	0.0287 0.0696 0.0983
16/10/92 Mode 1 #5	|m| 3s |m|+3s	0.0340 0.0605 0.0946	0.0216 0.0812 0.1028	0.0246 0.0644 0.0890
16/10/92 Mode 1 #1 - 5	|m| 3s |m| + 3s	0.0297 0.0666 0.0963	0.0270 0.0852 0.1121	0.0220 0.0768 0.0989

		(Xl+Xr)/2	Yl	Yr
16/10/92 Mode 4 #1	|m| 3s |m|+3s	0.0064 0.0494 0.0558	0.0392 0.0412 0.0804	0.0361 0.0365 0.0726
16/10/92 Mode 4 #2	|m| 3s |m|+3s	0.0062 0.0439 0.0502	0.0374 0.0379 0.0753	0.0351 0.0433 0.0784
16/10/92 Mode 4 #3	|m| 3s |m|+3s	0.0006 0.0454 0.0460	0.0582 0.0507 0.1089	0.0390 0.0455 0.0845
16/10/92 Mode 4 #4	|m| 3s |m|+3s	0.0148 0.0413 0.0562	0.0393 0.0262 0.0656	0.0423 0.0345 0.0768
16/10/92 Mode 4 #5	|m| 3s |m|+3s	0.0128 0.0414 0.0541	0.0471 0.0487 0.0958	0.0463 0.0525 0.0988
16/10/92 Mode 4 #1 - 5	|m| 3s |m| + 3s	0.0057 0.0501 0.0558	0.0443 0.0479 0.0921	0.0398 0.0447 0.0844

D.Laidler 16th November, 1992.

Canon 2000i1 #268 AGA 19/10/92 Day 3 IVS (Pre-Acceptance Data)

		(Xl+Xr)/2	Yl	Yr
19/10/92	|m|	0.0157	0.0500	0.0349
Mode 1	3s	0.0424	0.0363	0.0330
#1	|m|+3s	0.0581	0.0863	0.0679
19/10/92	|m|	0.0119	0.0465	0.0359
Mode 1	3s	0.0645	0.0721	0.0653
#2	|m|+3s	0.0764	0.1186	0.1012
19/10/92	|m|	0.0252	0.0540	0.0530
Mode 1	3s	0.0522	0.0580	0.0540
#3	|m|+3s	0.0774	0.1120	0.1070
19/10/92	|m|	0.0279	0.0578	0.0614
Mode 1	3s	0.0670	0.0746	0.0453
#4	|m|+3s	0.0949	**0.1324**	0.1068
19/10/92	|m|	0.0172	0.0630	0.0479
Mode 1	3s	0.0496	0.0954	0.0582
#5	|m|+3s	0.0667	**0.1584**	0.1061
19/10/92	|m|	0.0196	0.0542	0.0466
Mode 1	3s	0.0588	0.0722	0.0605
#1 - 5	|m| + 3s	0.0783	**0.1264**	0.1072

		(Xl+Xr)/2	Yl	Yr
19/10/92	|m|	0.0053	0.0520	0.0336
Mode 4	3s	0.0382	0.0426	0.1194
#1	|m|+3s	0.0434	0.0946	**0.1530**
19/10/92	|m|	0.0047	0.0633	0.0489
Mode 4	3s	0.0503	0.0423	0.0278
#2	|m|+3s	0.0551	0.1057	0.0767
19/10/92	|m|	0.0101	0.0693	0.0440
Mode 4	3s	0.0529	0.0307	0.0273
#3	|m|+3s	0.0630	0.1000	0.0713
19/10/92	|m|	0.0030	0.0505	0.0463
Mode 4	3s	0.0479	0.0481	0.0336
#4	|m|+3s	0.0509	0.0986	0.0798
19/10/92	|m|	0.0007	0.0574	0.0612
Mode 4	3s	0.0496	0.0396	0.0375
#5	|m|+3s	0.0503	0.0971	0.0987
19/10/92	|m|	0.0036	0.0585	0.0468
Mode 4	3s	0.0499	0.0462	0.0661
#1 - 5	|m| + 3s	0.0534	0.1047	0.1129

D.Laidler 16th November, 1992.

AGA Alignment Accuracy

15/10/'92

		(Xl+Xr)/2	Yl	Yr
HeNe 1	mean	-0.050	0.004	0.018
	3s	0.037	0.051	0.040
	|m|+3s	0.087	0.055	0.058
HeNe 2	mean	-0.035	-0.003	0.010
	3s	0.059	0.077	0.066
	|m|+3s	0.094	0.080	0.076
HeNe 3	mean	-0.041	0.018	0.014
	3s	0.047	0.048	0.066
	|m|+3s	0.088	0.066	0.080
HeNe 4	mean	-0.051	-0.004	0.006
	3s	0.069	0.074	0.072
	|m|+3s	0.120	0.078	0.078
HeNe 5	mean	-0.054	0.023	0.013
	3s	0.044	0.048	0.049
	|m|+3s	0.098	0.071	0.062
TOTAL	mean	-0.046	0.007	0.012
	3s	0.056	0.068	0.060
	|m|+3s	0.102	0.075	0.072

		(Xl+Xr)/2	Yl	Yr
BB 1	mean	-0.053	-0.006	0.009
	3s	0.046	0.057	0.045
	|m|+3s	0.099	0.063	0.054
BB 2	mean	-0.059	-0.004	-0.019
	3s	0.043	0.039	0.037
	|m|+3s	0.102	0.043	0.056
BB 3	mean	-0.042	-0.005	-0.018
	3s	0.038	0.032	0.041
	|m|+3s	0.080	0.037	0.059
BB 4	mean	-0.032	0.008	-0.006
	3s	0.039	0.034	0.037
	|m|+3s	0.071	0.042	0.043
BB 5	mean	-0.056	-0.018	-0.013
	3s	0.034	0.044	0.036
	mean	0.090	0.062	0.049
TOTAL	mean	-0.048	-0.005	-0.009
	3s	0.049	0.048	0.049
	|m|+3s	0.097	0.053	0.058

AGA Alignment Accuracy

16/10/'92

		(Xl+Xr)/2	Yl	Yr
HeNe 1	mean	-0.066	0.008	0.008
	3s	0.044	0.053	0.041
	|m|+3s	0.110	0.061	0.049
HeNe 2	mean	-0.054	-0.016	-0.009
	3s	0.071	0.099	0.071
	|m|+3s	0.125	0.115	0.080
HeNe 3	mean	-0.065	0.003	0.019
	3s	0.057	0.080	0.064
	|m|+3s	0.122	0.083	0.083
HeNe 4	mean	-0.046	0.005	-0.002
	3s	0.060	0.061	0.062
	|m|+3s	0.106	0.066	0.064
HeNe 5	mean	-0.061	0.001	-0.001
	3s	0.040	0.080	0.062
	|m|+3s	0.101	0.081	0.063
TOTAL	mean	-0.058	0.000	0.003
	3s	0.059	0.079	0.066
	|m|+3s	0.117	0.079	0.069

		(Xl+Xr)/2	Yl	Yr
BB 1	mean	-0.041	-0.018	-0.019
	3s	0.019	0.042	0.046
	|m|+3s	0.060	0.060	0.065
BB 2	mean	-0.049	-0.010	-0.015
	3s	0.030	0.031	0.037
	|m|+3s	0.079	0.041	0.052
BB 3	mean	-0.033	-0.031	-0.012
	3s	0.034	0.048	0.039
	|m|+3s	0.067	0.079	0.051
BB 4	mean	-0.024	-0.009	-0.007
	3s	0.027	0.042	0.036
	|m|+3s	0.051	0.051	0.043
BB 5	mean	-0.035	-0.008	-0.013
	3s	0.041	0.040	0.037
	mean	0.076	0.048	0.050
TOTAL	mean	-0.036	-0.015	-0.013
	3s	0.040	0.047	0.040
	|m|+3s	0.076	0.062	0.053

AGA Alignment Accuracy

19/10/'92

		(Xl+Xr)/2'	Yl	Yr
HeNe 1	mean	-0.045	-0.016	-0.013
	3s	0.048	0.030	0.034
	|m|+3s	0.093	0.046	0.047
HeNe 2	mean	-0.037	-0.014	-0.008
	3s	0.062	0.069	0.059
	|m|+3s	0.099	0.083	0.067
HeNe 3	mean	-0.055	-0.023	-0.030
	3s	0.054	0.065	0.062
	|m|+3s	0.109	0.088	0.092
HeNe 4	mean	-0.057	-0.024	-0.036
	3s	0.062	0.045	0.044
	|m|+3s	0.119	0.069	0.080
HeNe 5	mean	-0.040	-0.029	-0.021
	3s	0.046	0.073	0.053
	|m|+3s	0.086	0.102	0.074
TOTAL	mean	-0.047	-0.021	-0.021
	3s	0.059	0.060	0.059
	|m|+3s	0.106	0.081	0.080

		(Xl+Xr)/2	Yl	Yr
BB 1	mean	-0.035	-0.021	-0.008
	3s	0.034	0.029	0.036
	|m|+3s	0.069	0.050	0.044
BB 2	mean	-0.030	-0.033	-0.020
	3s	0.051	0.058	0.038
	|m|+3s	0.081	0.091	0.058
BB 3	mean	-0.041	-0.043	-0.019
	3s	0.046	0.043	0.030
	|m|+3s	0.087	0.086	0.049
BB 4	mean	-0.020	-0.016	-0.016
	3s	0.053	0.060	0.040
	|m|+3s	0.073	0.076	0.056
BB 5	mean	-0.033	-0.024	-0.034
	3s	0.049	0.043	0.046
	mean	0.082	0.067	0.080
TOTAL	mean	-0.032	-0.028	-0.019
	3s	0.051	0.055	0.046
	|m|+3s	0.083	0.083	0.065

MONO-LITH® ANALYSIS

GRID

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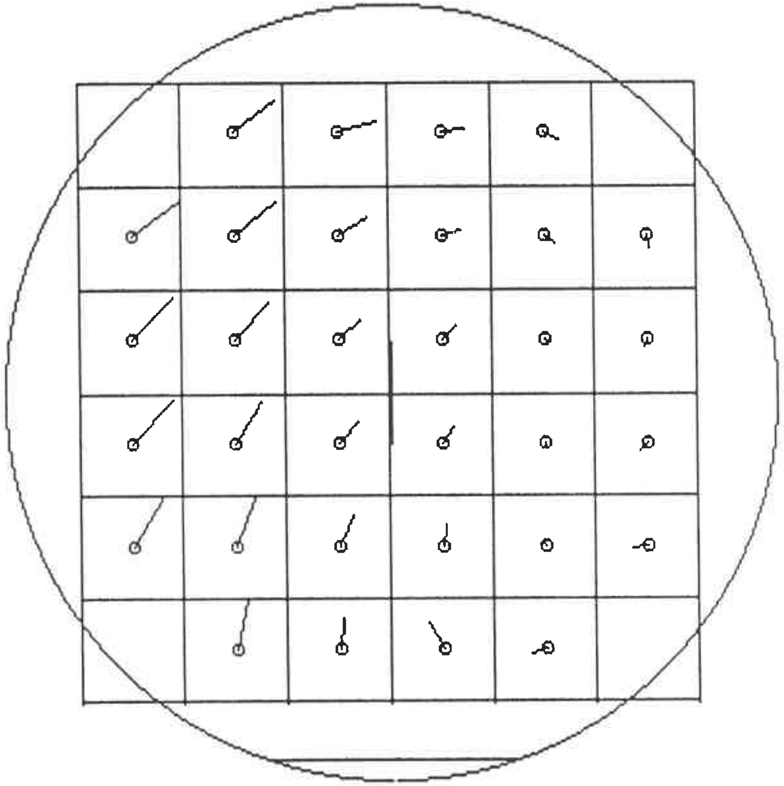
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\1-5.REG3G

DATE: OCT-24-92

VECTOR MAP

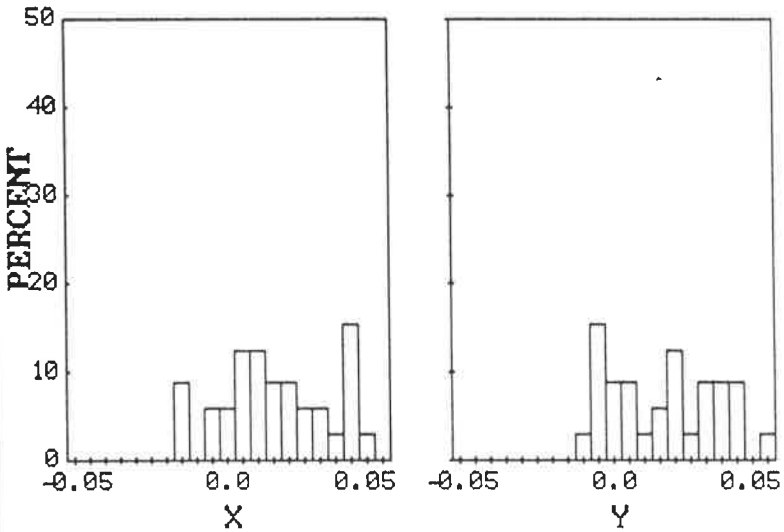
—— 1-5 CANON/PREACCEP/(01A) MEA



SCALE: |—| 0.05 um.

HISTOGRAM

1-5 CANON/PREACCEP/(01A) MEA



	X		Y
MAX:	0.045	MAX:	0.048
AVG:	0.015	AVG:	0.016
MIN:	-0.015	MIN:	-0.011
S.D:	0.017	S.D:	0.018
OUT:	0	OUT:	2
SIZE:	32	SIZE:	32

MONO-LITH® ANALYSIS

GRID

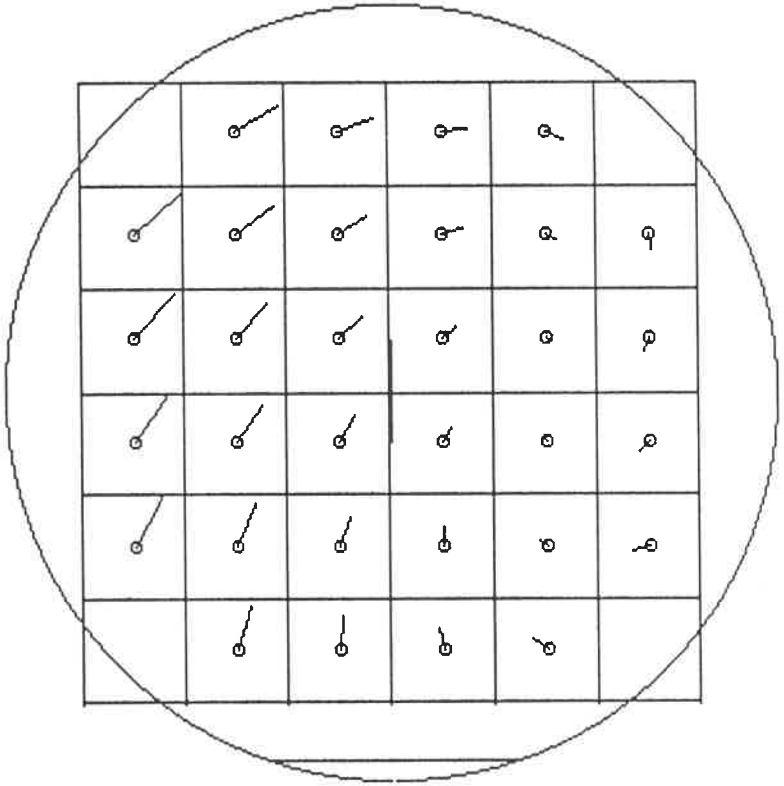
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\1-5.REG ΞG

DATE: OCT-24-92

VECTOR MAP

—— 1-5 CANON/PREACCEP/(01A) MOD



SCALE: |—| 0.05 um.

COEFFICIENTS

1-5 CANON/PREACCEP/(01A)

TRANSLATION	X	15 nm.
	Y	18 nm.
ROTATION		-0.56 nm/mm
SCALE	X	-0.44 nm/mm
	Y	-0.18 nm/mm
ORTHOGONALITY		0.25 nm/mm
RESIDUAL (rms)	X	3 nm.
	Y	5 nm.

MONO-LITH® ANALYSIS | GRID

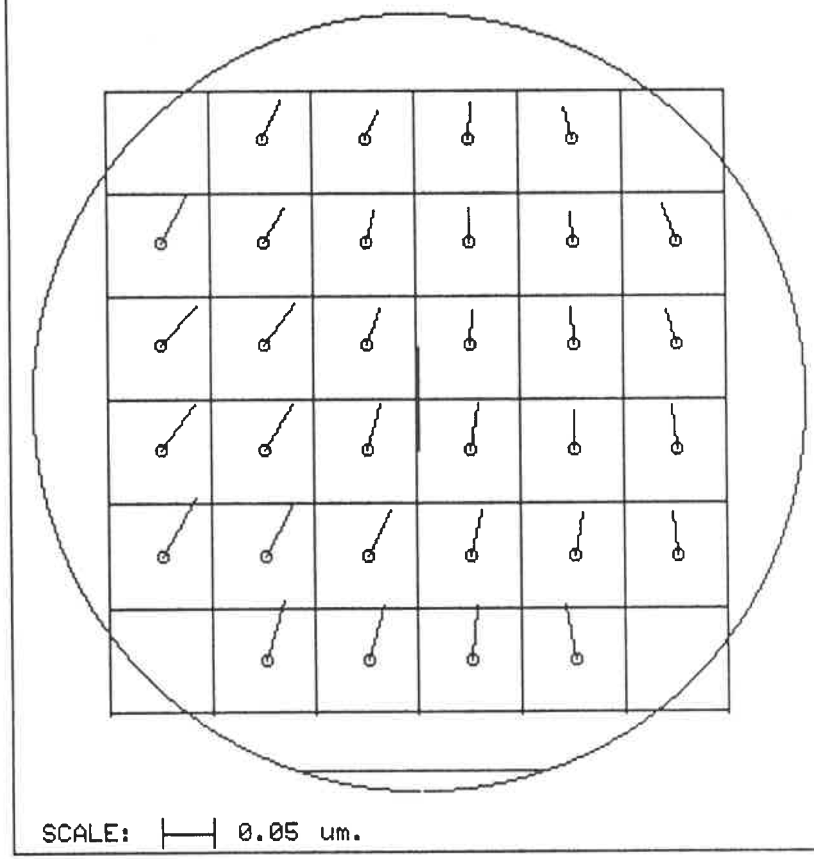
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\6-10.REGG

DATE: OCT-24-92

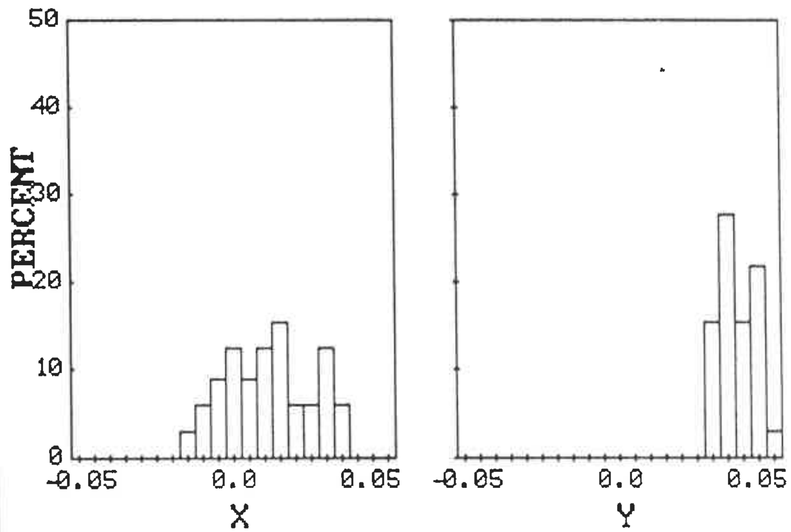
VECTOR MAP

——6-10 CANON/PREACCEP/(10A) MEA



HISTOGRAM

6-10 CANON/PREACCEP/(10A) MEA



	X	Y
MAX:	0.037	0.050
AVG:	0.011	0.038
MIN:	-0.013	0.029
S.D:	0.014	0.006
OUT:	0	5
SIZE:	32	32

MONO-LITH® ANALYSIS

GRID

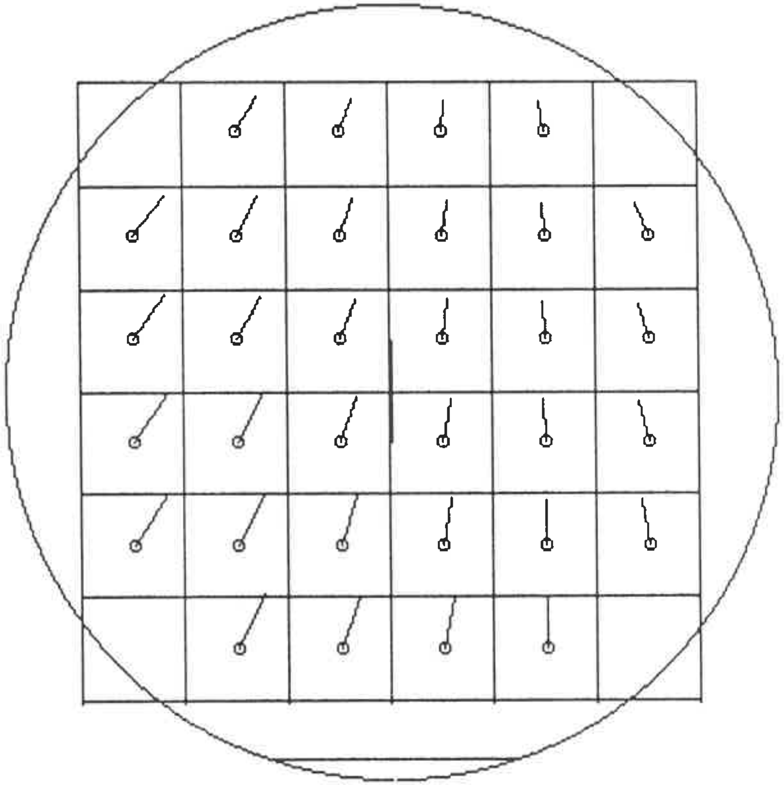
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\6-10.REGG

DATE: OCT-24-92

VECTOR MAP

——6-10 CANON/PREACCEP/(10A) MOD



SCALE: |—| 0.05 um.

COEFFICIENTS

6-10 CANON/PREACCEP/(10A)

TRANSLATION	X	11 nm.
	Y	41 nm.
ROTATION		-0.09 nm/mm
SCALE	X	-0.41 nm/mm
	Y	-0.21 nm/mm
ORTHOGONALITY		0.15 nm/mm
RESIDUAL (rms)	X	4 nm.
	Y	4 nm.

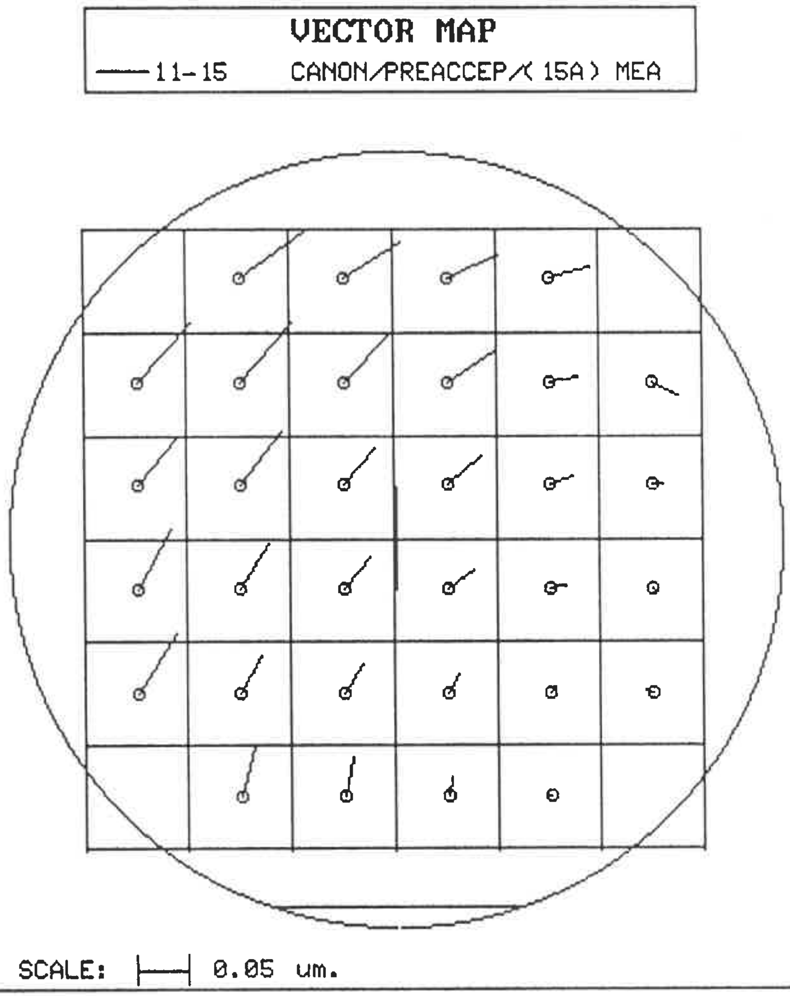
MONO-LITH® ANALYSIS

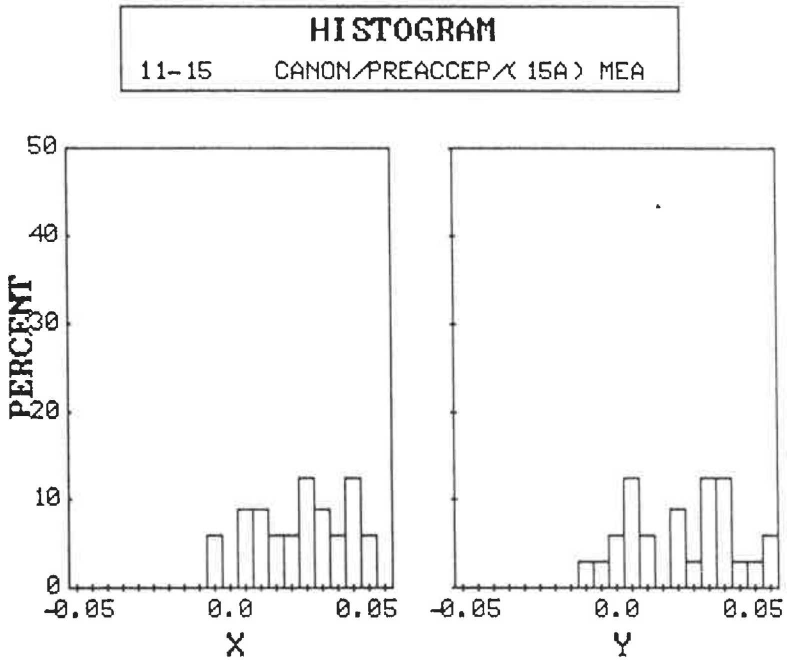
GRID

V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\11-15.REG

DATE: OCT-24-92





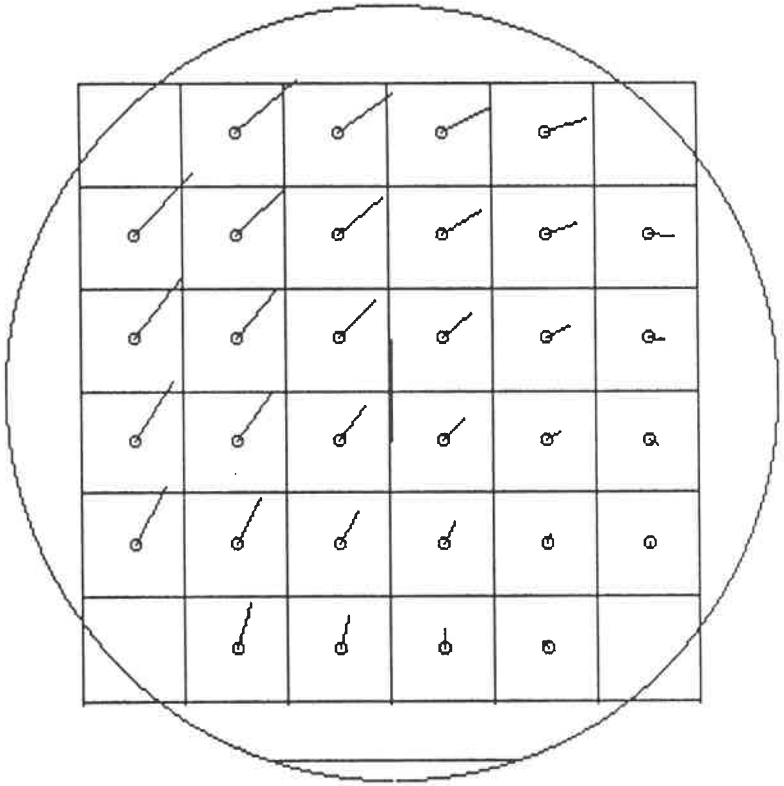
	X		Y
MAX:	0.046	MAX:	0.049
AVG:	0.023	AVG:	0.021
MIN:	-0.007	MIN:	-0.010
S.D:	0.015	S.D:	0.017
OUT:	5	OUT:	6
SIZE:	32	SIZE:	32

MONO-LITH® ANALYSIS | GRID | V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\11-15.REG DATE: OCT-24-92

VECTOR MAP

—— 11-15 CANON/PREACCEP/(15A) MOD



SCALE: 0.05 um.

COEFFICIENTS

11-15 CANON/PREACCEP/(15A)

TRANSLATION	X	28	nm.
	Y	28	nm.
ROTATION		-0.62	nm/mm
SCALE	X	-0.32	nm/mm
	Y	0.07	nm/mm
ORTHOGONALITY		0.17	nm/mm
RESIDUAL (rms)	X	4	nm.
	Y	6	nm.

MONO-LITH® ANALYSIS | GRID |

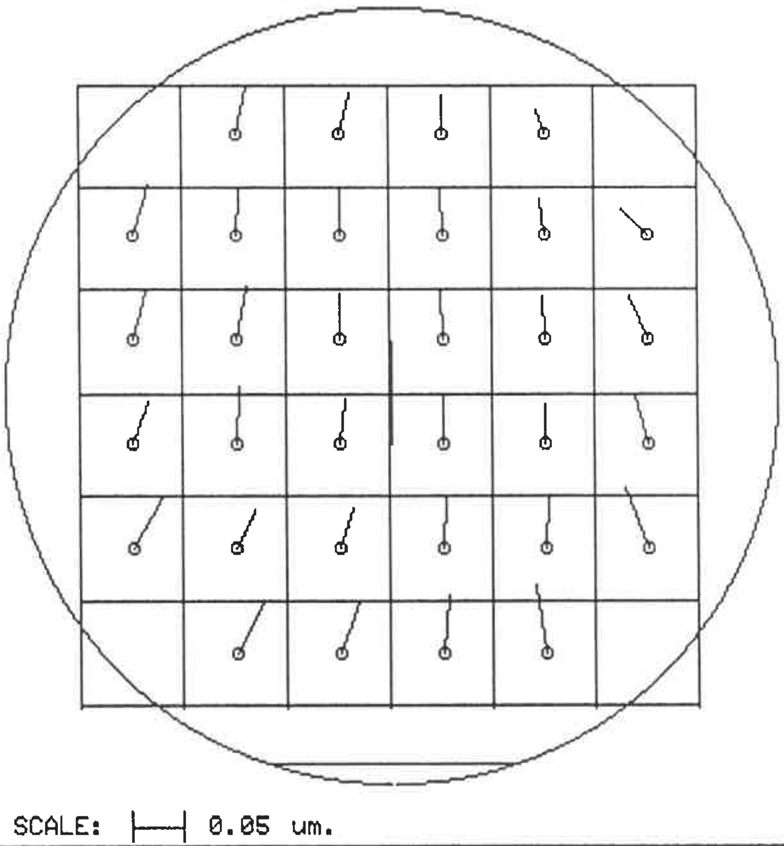
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\16-20.REG

DATE: OCT-24-92

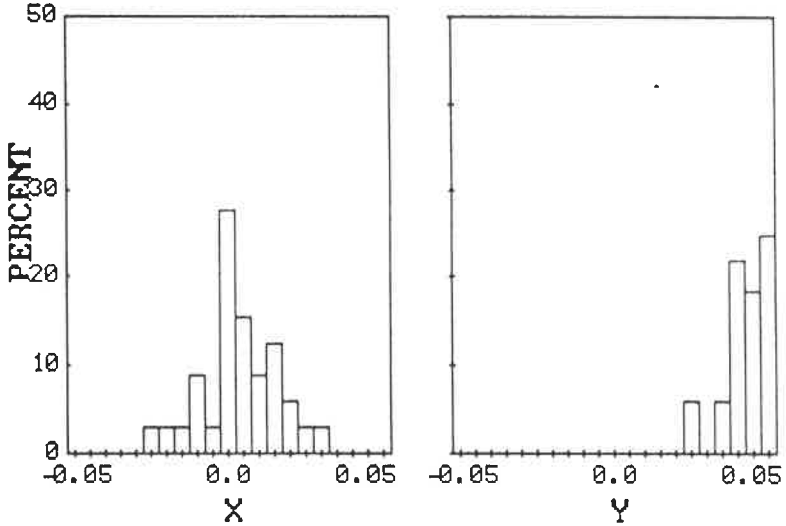
VECTOR MAP

—— 16-20 CANON/PREACCEP/(05A) MEA



HISTOGRAM

16-20 CANON/PREACCEP/(05A) MEA



	X		Y
MAX:	0.028	MAX:	0.050
AVG:	0.003	AVG:	0.043
MIN:	-0.024	MIN:	0.023
S.D:	0.012	S.D:	0.007
OUT:	0	OUT:	7
SIZE:	32	SIZE:	32

MONO-LITH® ANALYSIS | GRID

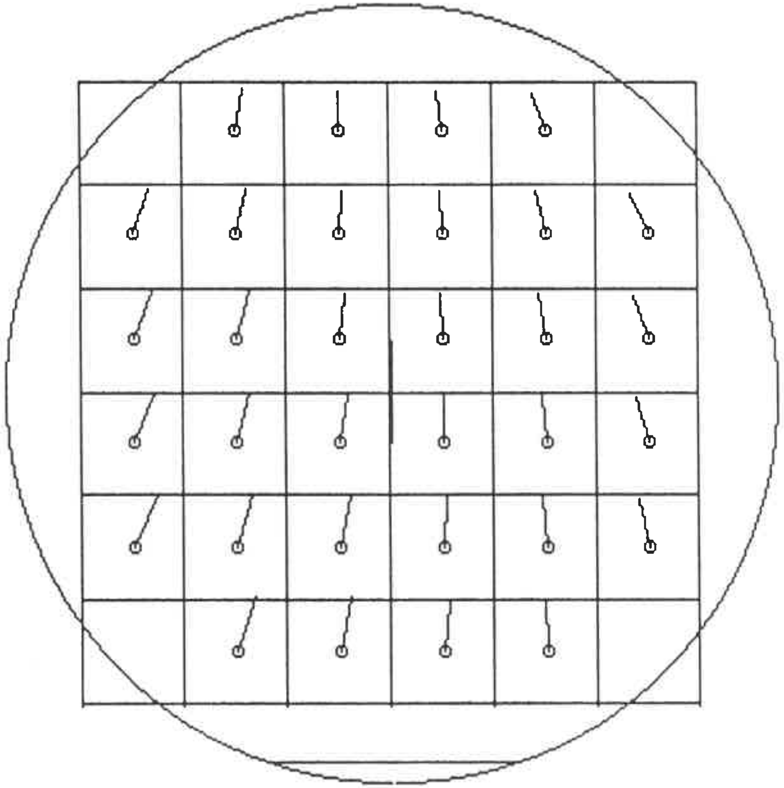
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\16-20.REG

DATE: OCT-24-92

VECTOR MAP

—— 16-20 CANON/PREACCEP/(05A) MOD



SCALE: |—| 0.05 um.

COEFFICIENTS

16-20 CANON/PREACCEP/(05A)

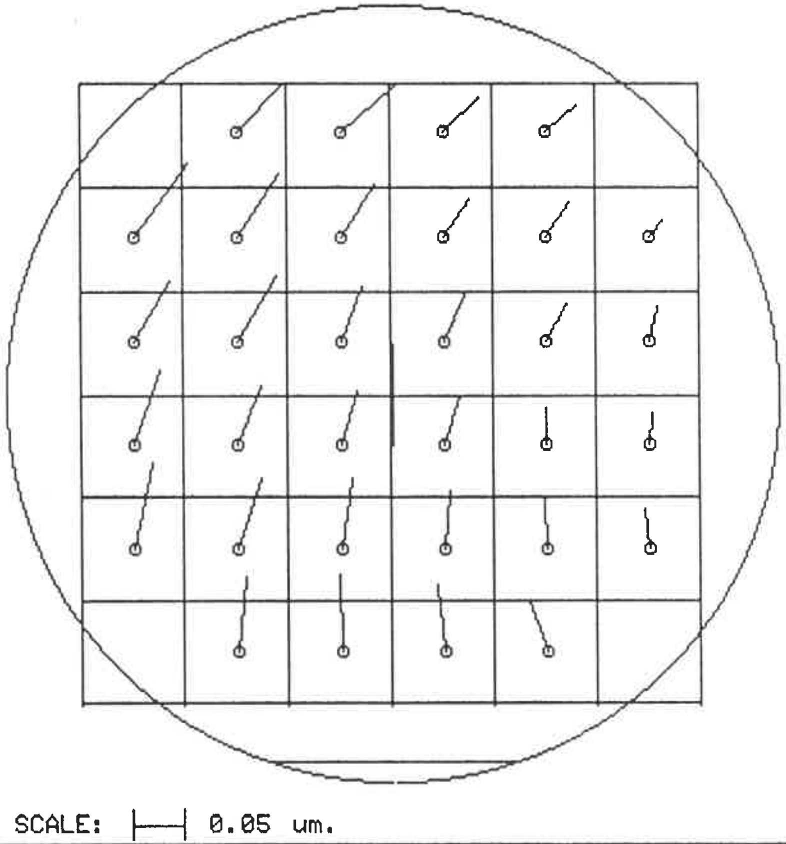
TRANSLATION	X	3 nm.
	Y	45 nm.
ROTATION		-0.05 nm/mm
SCALE	X	-0.32 nm/mm
	Y	-0.13 nm/mm
ORTHOGONALITY		0.15 nm/mm
RESIDUAL (rms)	X	6 nm.
	Y	7 nm.

MONO-LITH® ANALYSIS | GRID |
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\21-25.REG DATE: OCT-24-92

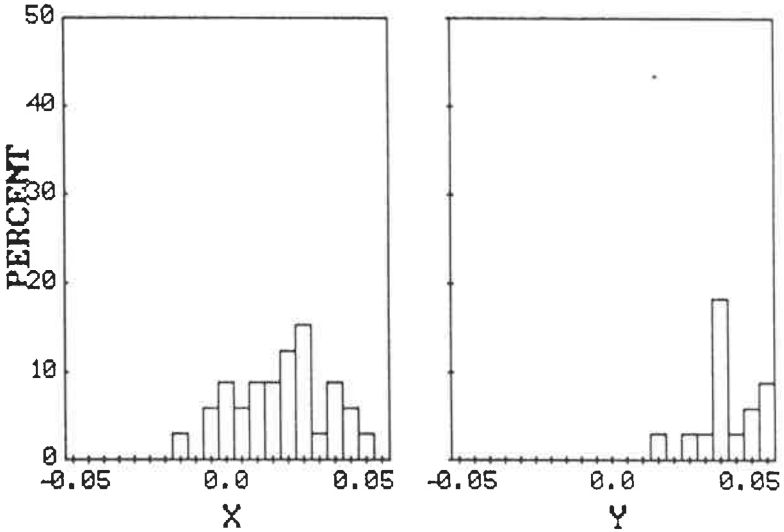
VECTOR MAP

——21-25 CANON/PREACCEP/(10A) MEA



HISTOGRAM

21-25 CANON/PREACCEP/(10A) MEA



X		Y	
MAX:	0.047	MAX:	0.049
AVG:	0.017	AVG:	0.037
MIN:	-0.017	MIN:	0.016
S.D:	0.015	S.D:	0.009
OUT:	2	OUT:	17
SIZE:	32	SIZE:	32

MONO-LITH® ANALYSIS

GRID

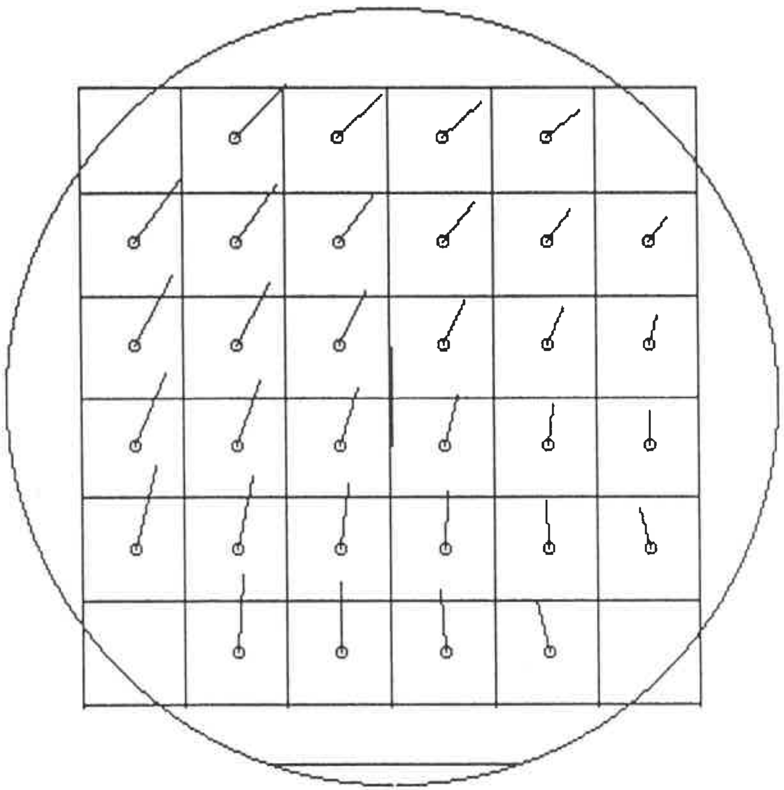
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\21-25.REG

DATE: OCT-24-92

VECTOR MAP

——21-25 CANON/PREACCEP/(10A) MOD



SCALE: |—| 0.05 um.

COEFFICIENTS

21-25 CANON/PREACCEP/(10A)

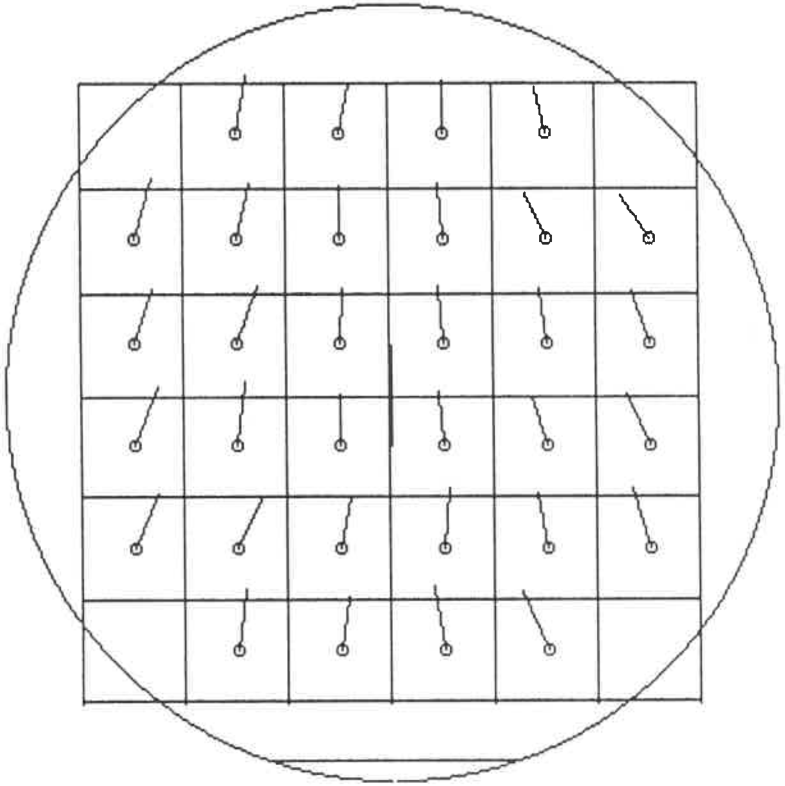
TRANSLATION	X	19 nm.
	Y	51 nm.
ROTATION		-0.41 nm/mm
SCALE	X	-0.30 nm/mm
	Y	-0.26 nm/mm
ORTHOGONALITY		-0.02 nm/mm
RESIDUAL (rms)	X	4 nm.
	Y	4 nm.

MONO-LITH® ANALYSIS | GRID | V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\26-30.REG | DATE: OCT-24-92

VECTOR MAP

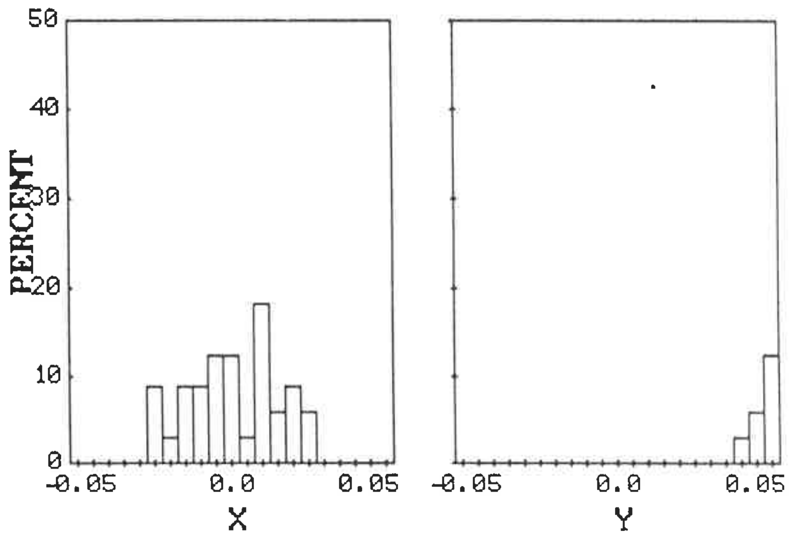
—— 26-30 CANON/PREACCEP/(15A) MEA



SCALE: |—| 0.05 um.

HISTOGRAM

26-30 CANON/PREACCEP/(15A) MEA



	X		Y
MAX:	0.023	MAX:	0.050
AVG:	0.001	AVG:	0.046
MIN:	-0.027	MIN:	0.040
S.D:	0.014	S.D:	0.003
OUT:	0	OUT:	25
SIZE:	32	SIZE:	32

MONO-LITH® ANALYSIS | GRID |

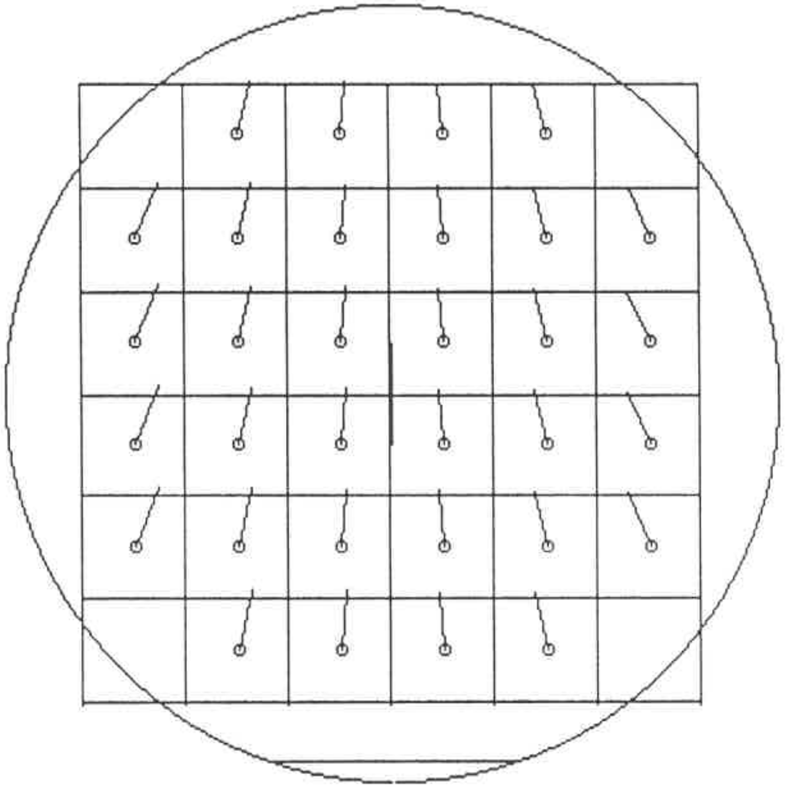
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\GRIDMATC\26-30.REG

DATE: OCT-24-92

VECTOR MAP

——26-30 CANON/PREACCEP/(15A) MOD



SCALE: ├─┤ 0.05 um.

COEFFICIENTS

26-30 CANON/PREACCEP/(15A)

TRANSLATION	X	1	nm.
	Y	53	nm.
ROTATION		-0.06	nm/mm
SCALE	X	-0.43	nm/mm
	Y	-0.08	nm/mm
ORTHOGONALITY		0.06	nm/mm
RESIDUAL (rms)	X	5	nm.
	Y	4	nm.

Appendix 4 - IVS Lens Distortion Data (Monolith)

MONO-LITH® ANALYSIS

INTRAFIELD

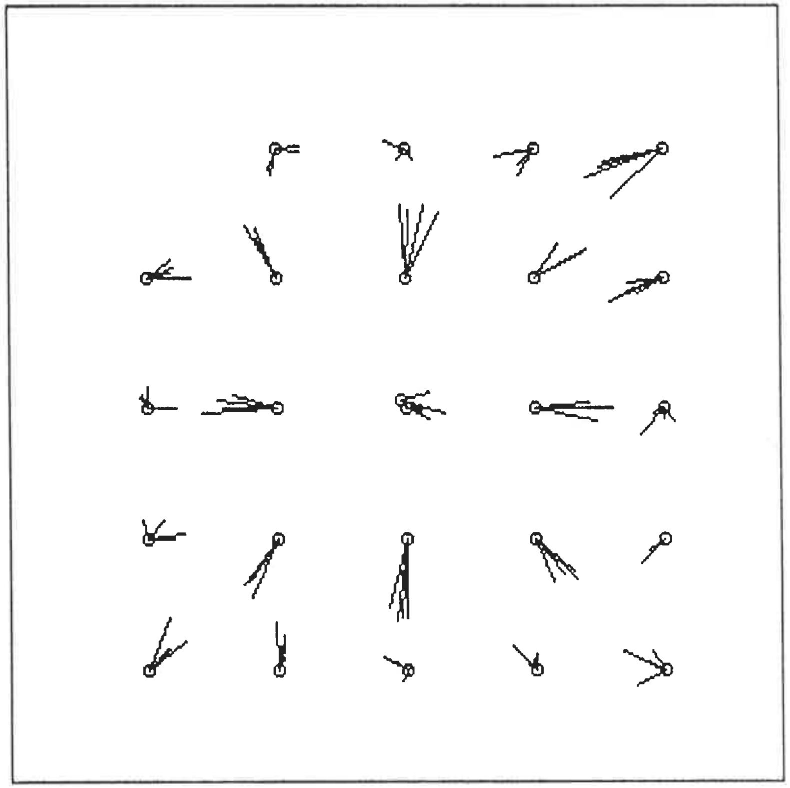
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\INTRAFLD\W1310921.REG

DATE: OCT-13-92

VECTOR MAP

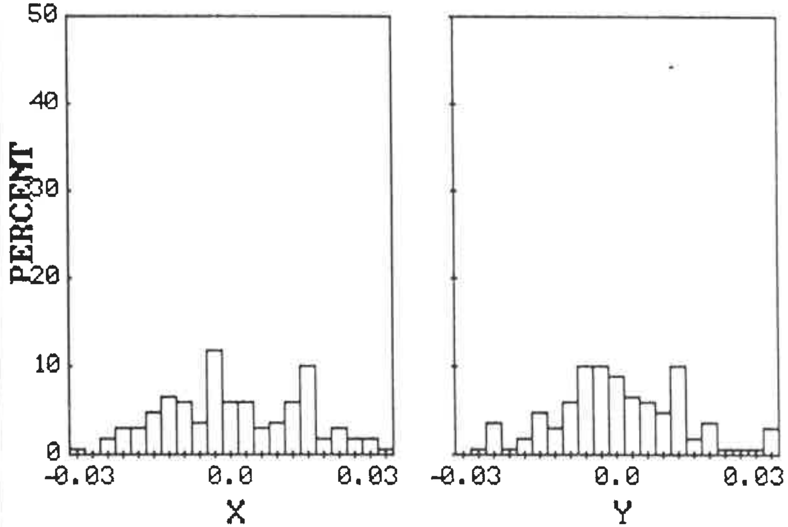
—— W1310921 CANON/PREACCEP/(01A) MEA



SCALE: ⊢⊣ 0.03 um.

HISTOGRAM

W1310921 CANON/PREACCEP/(01A) MEA



	X		Y
MAX:	0.029	MAX:	0.030
AVG:	0.001	AVG:	0.001
MIN:	-0.029	MIN:	-0.028
S.D:	0.013	S.D:	0.013
OUT:	12	OUT:	9
SIZE:	100	SIZE:	100

MONO-LITH® ANALYSIS

INTRAFIELD

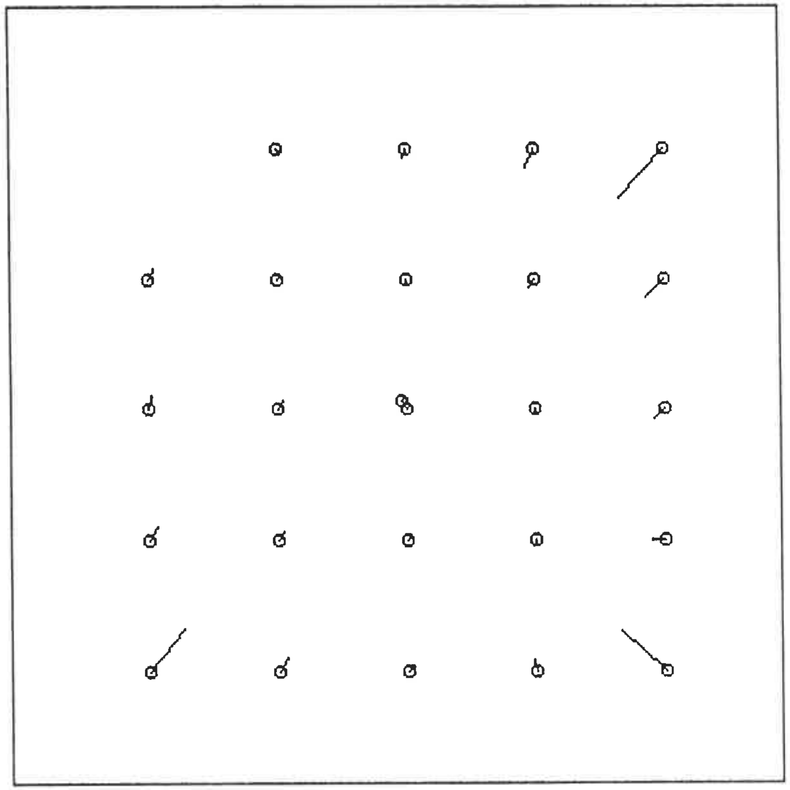
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\INTRAFLD\W1310921.REG

DATE: OCT-13-92

VECTOR MAP

——W1310921 CANON/PREACCEP/(01A) MOD



SCALE: ├─┤ 0.03 um.

COEFFICIENTS

W1310921 CANON/PREACCEP/(01A)

TRANSLATION	X	2	nm.
	Y	1	nm.
ROTATION		-0.2	nm/mm
REDUCTION		-0.3	nm/mm
TRAPEZOID	1	-0.03	nm/mm^2
	2	-0.02	nm/mm^2
ANAMORPHISM	1	-0.4	nm/mm
	2	-0.4	nm/mm
DISTORTION	3rd	0.014	nm/mm^3
	5th	-0.00012	nm/mm^5
RESIDUAL (rms)	X	16	nm.
	Y	17	nm.

MONO-LITH® ANALYSIS

INTRAFIELD

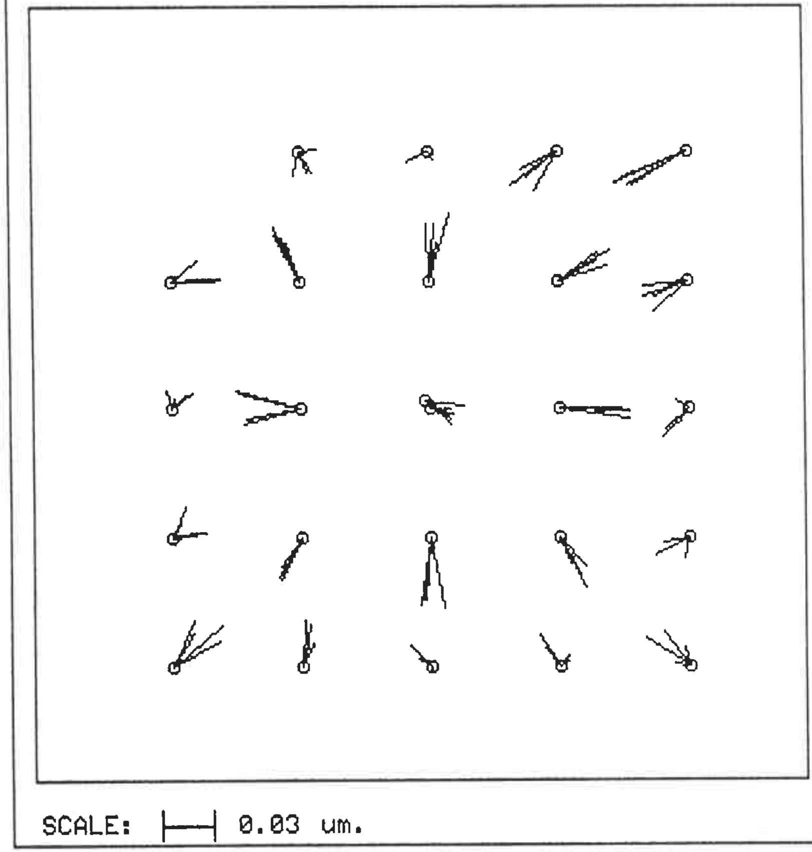
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\INTRAFLD\W1310922.REG

DATE: OCT-13-92

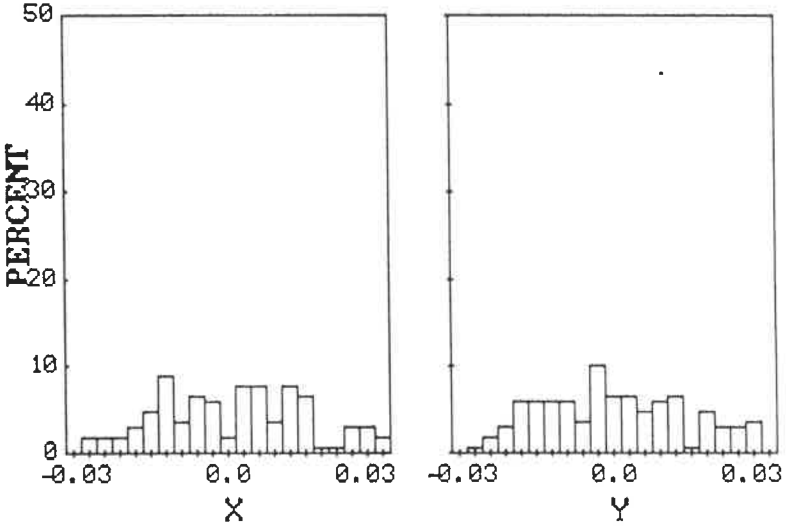
VECTOR MAP

—— W1310922 CANON/PREACCEP/(02A) MEA



HISTOGRAM

W1310922 CANON/PREACCEP/(02A) MEA

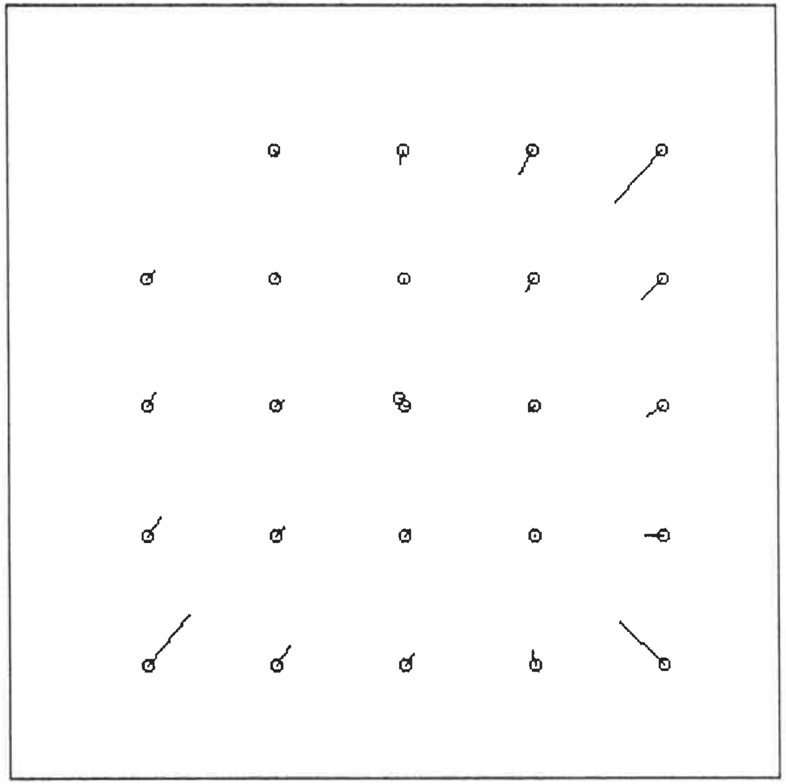


	X	Y
MAX:	0.030	0.027
AVG:	0.001	0.000
MIN:	-0.026	-0.028
S.D:	0.014	0.014
OUT:	13	8
SIZE:	100	100

MONO-LITH® ANALYSIS | INTRAFIELD |
V2.08 S/N 121

FILE: C:\DATA\CANPRACC\INTRAFLD\W1310922.REG | DATE: OCT-13-92

VECTOR MAP
—— W1310922 CANON/PREACCEP/(02A) MOD



SCALE: |—| 0.03 um.

COEFFICIENTS
W1310922 CANON/PREACCEP/(02A)

TRANSLATION	X	2	nm.
	Y	0	nm.
ROTATION		-0.2	nm/mm
REDUCTION		-0.6	nm/mm
TRAPEZOID	1	-0.03	nm/mm^2
	2	-0.02	nm/mm^2
ANAMORPHISM	1	-0.3	nm/mm
	2	-0.5	nm/mm
DISTORTION	3rd	0.014	nm/mm^3
	5th	-0.00012	nm/mm^5
RESIDUAL (rms)	X	16	nm.
	Y	16	nm.

Appendix 5 - Pre-Acceptance Results Summary

non 2000i1 #268 Pre-Acceptance Results (UCB-JSR IX500EL)

		SPECIFICATION	RESULT	
1. ILLUMINATOR	Intensity	≥ 600mW/cm2	855mW/cm2	Pass
	Image Surface Uniformity	≤ ±1.2%	0.70%	Pass
	Integrated Exposure Control Accuracy	≤ ±1.2%	0.625%	Pass
	Masking Blade Accuracy (Wafer level)	≤ ± 100 μ	Max + 40μ	Pass
	Reticle Change Time (Including Alignment)	≤ 25 secs	50 secs	Fail
2. EXPOSURE PERFORMANCE	UDoF (Useable Depth of Focus)			Pass
	0.5μ lines/spaces	≥ 1.2μ range	1.50μ	
	0.8μ lines/spaces	≥ 2.8μ range	2.80μ	
	1.0μ lines/spaces	≥ 3.8μ range	3.80μ	
	Linewidth Repeatability Within Field			Pass
	0.5μ lines/spaces	≤ 0.05μ range	Mean = 0.500μ, Range = 0.042μ	
	0.8μ lines/spaces	≤ 0.08μ range	Mean = 0.820μ, Range = 0.039μ	
	1.0μ lines/spaces	≤ 0.10μ range	Mean = 1.031μ, Range = 0.046μ	
	Linewidth Repeatability Within Wafer			Pass
	0.5μ lines/spaces	≤ 0.05μ range	Mean = 0.501μ, Range = 0.008μ	
	0.8μ lines/spaces	≤ 0.08μ range	Mean = 0.832μ, Range = 0.031μ	
	1.0μ lines/spaces	≤ 0.10μ range	Mean = 1.037μ, Range = 0.040μ	
	Distortion (Deviation from Ideal Cartesian Grid)	≤ ± 0.07μ	CANOMAP #1. Max X = -0.033μ, Max Y = -0.046μ	Pass
			#2. Max X = 0.044μ, Max Y = -0.027μ	
			IVS #1. Max X = 0.029μ, Max Y = 0.030μ	Pass
			#2. Max X = 0.030μ, Max Y = -0.028μ	
3. AUTO FOCUS ACCURACY	Repeatability	≤ 0.15μ 3s	0.095μ	Pass
	Stability over 5 days	≤ 0.3μ range	0.15μ	Pass
	Maximum Deviation of Best Focus for Silicon, Nitride, Polysilicon and Metal Wafers	≤ 0.3μ range	-	
	Global Levelling	≤ 10ppm	X = 4.6ppm, Y = 5.1ppm	Pass
	Die By Die Levelling	≤ 10ppm	X = 4.6ppm, Y = 4.0ppm	Pass
4. AUTO ALIGNMENT ACCURACY	Reticle Rotation Accuracy	≤ ± 0.02μ	CANOMAP #1. 0.000μ	Pass
			#2. 0.001μ	
			IVS #1. -0.0064μ	Pass
			#2. -0.0057μ	
	Reticle Rotation Repeatability	≤ 0.03μ range	CANOMAP #1. 0.015μ	Pass
			#2. 0.011μ	
			IVS #1. 0.0022μ	Pass
			#2. 0.0021μ	

D.Laidler 11th November, 1992.

Test	Conditions	Specification	CANOMAP	(Xl+Xr)/2	Yl	Yr	Result
4. AUTO ALIGNMENT ACCURACY (Contd.)	Single Machine (Resist to Resist)	≤ 0.12μ |m| + 3s					Fail
		CANOMAP	1	0.087	0.055	0.058	
			2	0.094	0.080	0.076	
		24 Shots per wafer	3	0.088	0.066	0.080	
			4	0.120	0.078	0.078	
			5	0.098	0.071	0.062	
			6	0.099	0.063	0.054	
			7	0.102	0.043	0.056	
			8	0.080	0.037	0.059	
			9	0.071	0.042	0.043	
			10	0.090	0.062	0.049	
			11	0.110	0.061	0.049	
			12	**0.125**	**0.115**	**0.080**	
			13	**0.122**	**0.083**	**0.083**	
			14	0.106	0.066	0.064	
			15	0.101	0.081	0.063	
			16	0.060	0.060	0.065	
			17	0.079	0.041	0.052	
			18	0.067	0.079	0.051	
			19	0.051	0.051	0.043	
			20	0.076	0.048	0.050	
			21	0.093	0.046	0.047	
			22	0.099	0.083	0.067	
			23	0.109	0.088	0.092	
			24	0.119	0.069	0.080	
			25	0.086	0.102	0.074	
			26	0.060	0.060	0.065	
			27	0.079	0.041	0.052	
			28	0.067	0.079	0.051	
			29	0.051	0.051	0.043	
			30	0.076	0.048	0.050	

Test	Condition	Specification	IVS	(Xl+Xr)/2	Yl	Yr	Result
4. AUTO ALIGNMENT ACCURACY (Contd.)	Single Machine (Resist to Resist)	≤ 0.12µ |m| + 3s IVS 32 Shots per wafer	1	0.062	0.085	0.055	Fail
			2	0.066	0.117	0.085	
			3	0.068	0.065	0.070	
			4	**0.093**	**0.127**	**0.102**	
			5	0.073	0.044	0.047	
			6	0.069	0.094	0.075	
			7	0.076	0.084	0.077	
			8	0.045	0.059	0.074	
			9	0.043	0.054	0.059	
			10	0.063	0.087	0.073	
			11	0.095	0.089	0.072	
			12	**0.093**	**0.148**	**0.124**	
			13	0.094	0.108	0.066	
			14	0.089	0.085	0.098	
			15	0.095	0.103	0.089	
			16	0.056	0.080	0.073	
			17	0.050	0.075	0.078	
			18	0.046	0.109	0.085	
			19	0.056	0.066	0.077	
			20	0.054	0.096	0.099	
			21	0.058	0.086	0.068	
			22	0.076	0.119	0.101	
			23	0.077	0.112	0.107	
			24	**0.095**	**0.132**	**0.107**	
			25	**0.067**	**0.158**	**0.106**	
			26	**0.043**	**0.095**	**0.153**	
			27	0.055	0.106	0.077	
			28	0.063	0.100	0.071	
			29	0.051	0.099	0.080	
			30	0.050	0.097	0.099	

5. X-Y STAGE	Stepping Accuracy	≤ 0.07µ 3s	CANOMAP #1. X = 0.034µ, Y = 0.027µ #2. X = 0.026µ, Y = 0.040µ IVS #1. X = 0.018 µ, Y = 0.017µ #2. X = 0.018 µ, Y = 0.021µ	Pass Pass
6. PRE-ALIGNMENT ACCURACY	Mechanical Prealignment Accuracy	≤ 40µ 3s	X = 23µ, Yl = 17µ, Yr = 24µ	Pass
7. CONTAMINATION	Particles ≥ 0.3µ Added Per 150mm Wafer Per Pass Particles ≥ 0.5µ Added Per 150mm Wafer Per Pass	≤ 10 ≤ 3	0.2 to 0.3µ +0.6/Wafer 0.3 to 0.5µ +0.3/Wafer 0.5 to 1.0µ -0.1/Wafer 1.0 to 1.6µ 0/Wafer	Pass Pass
8. RELIABILITY	Cycled Wafers Through Coat, Expose and Develop Without Error or Assist: Test i) Test ii)	25 500	- -	Pass Pass
9. THROUGHPUT	150mm Wafers Per Hour With AGA, Multimark, 45 Shots Per Wafer, 20mmx20mm and 0.15secs Exposure Die By Die Levelling ON Die By Die Levelling OFF	≥ 51 ≥ 57	63 64	Pass Pass
10. COMPACT CHAMBER	Booth Temperature Stage Temperature Lens Temperature	21°C ± 0.1°C 23°C ± 0.1°C 23°C ± 0.1°C	- - -	Pass

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