

Sidet Facilities

- A snap shot of space and equipment at Sidet and their current use
- Projected future uses and upgrades

Major Sidet Work Areas

<u>Location</u>	<u>Size(Sqf)</u>	<u>Designed Class</u>	<u>No. Volume changes/hour</u>
Lab C north	1750	10,000	15
Lab C south	1600	10,000	15
Lab D	2350	10,000	30
Bonding room	720	--	--
Repair stations	300	--	--
C-D cross connect	2000	--	--
A-B bridge east	500	--	--
A-B bridge west	780	--	--

Temperature Uniformity Study (Winter '06)

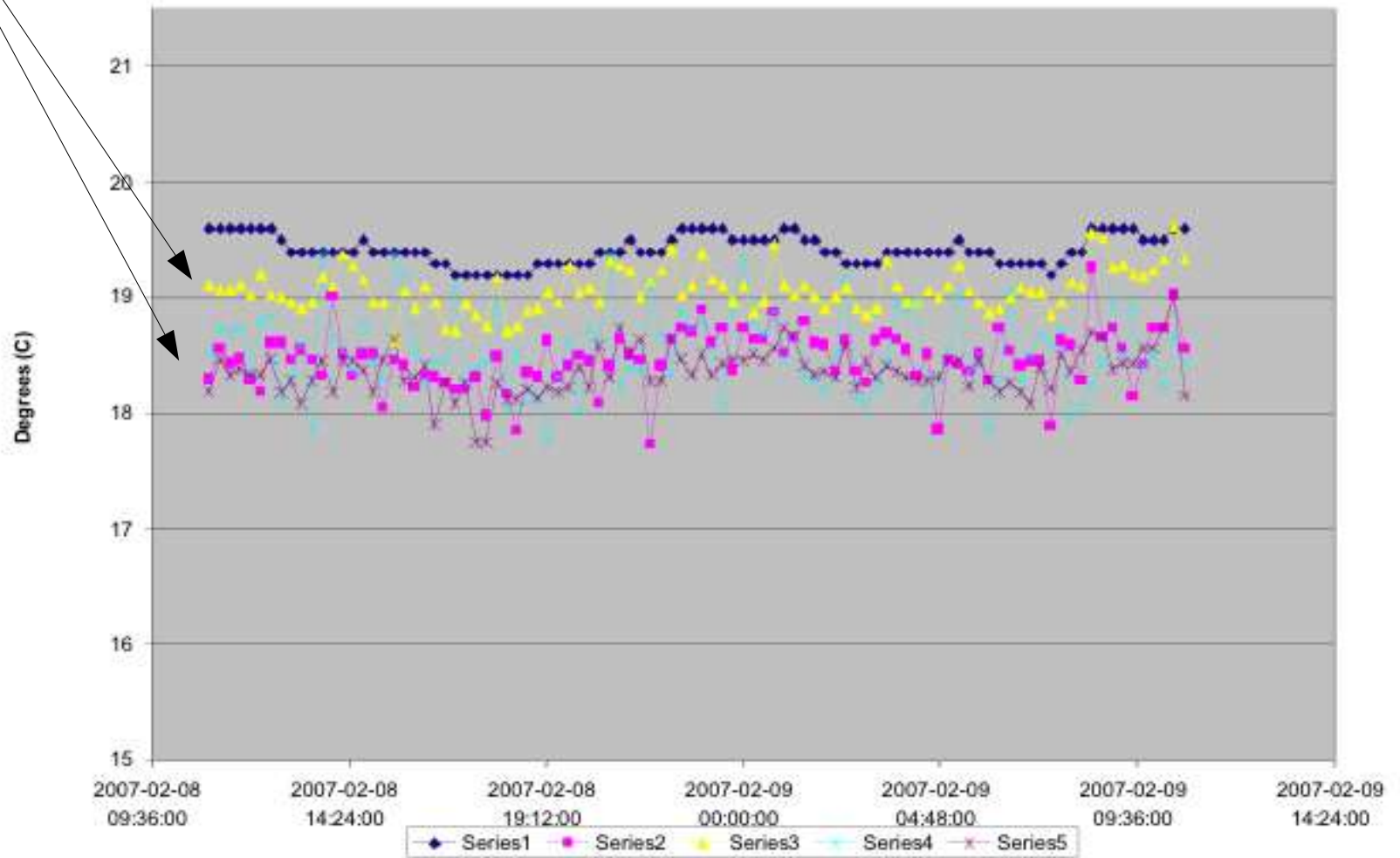
Preliminary !

<u>Area</u>	Variations (Celcius)		
	<u>Daily</u>	<u>Horizontal</u>	<u>Vertical</u>
Lab C North	1-2	1	1-2
Lab C South	1-2	1	1-2
Lab D	1-2	1	2-3

Preliminary !

Vertical span of 8'

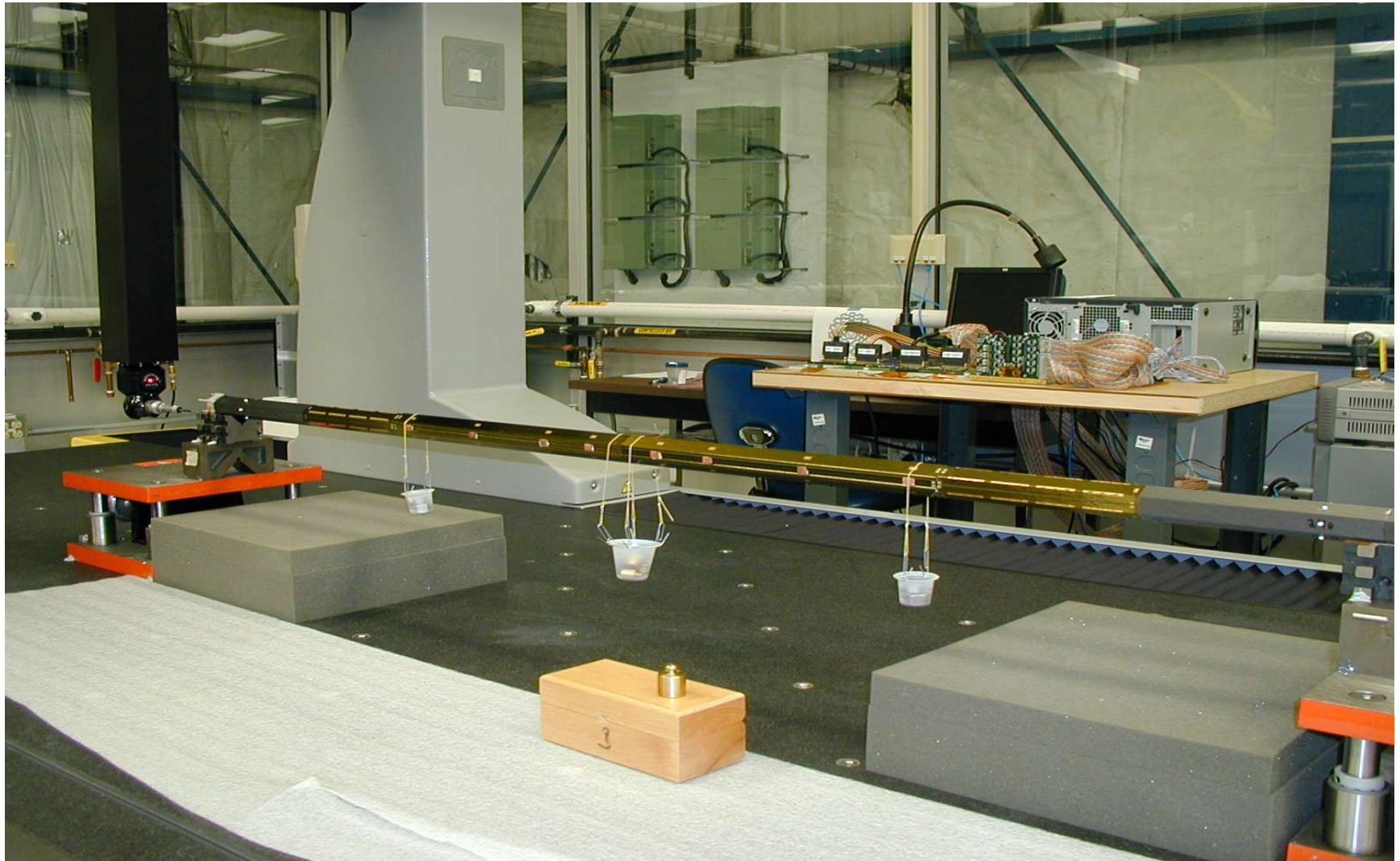
Temperature Uniformity Near Brown&Sharp CMM in Lab C South



CMM INFORMATION

	Machine	Location	Measuring Range XYZ (mm)	Machine Weight (lb)	Overall Dimensions W x L x H (mm)	Table Height(in)	CTE of scales PPM/degree C
<u>Cordax</u>	1808-MH	Lab D	1500x625x500	4900	2134x1293x2660		
	1808-MEA-1	Lab D	750x625x500	3200	1372x1293x2660		
	1808-MEA-2	Lab D	750x625x500	3200	1372x1293x2660		
LK	LK G80C	Lab C	2000x1000x800	17257	1821x2896x3091	28	X(10),Y(10),Z(10)
	LK HC90	Lab 3	4000x1600x1600	14868		NA	X(10),Y(10),Z(10)
Zeiss	UMM500-1 (500-3)	Lab D SE	500x200x300	3219			
	UMM500-2	Lab D NW	500x200x300	3219			
	UMM500-3	Lab A	500x200x300	3219			
	UMM500-4	Lab D SW	500x200x300	3219			
	UMC850-5	Lab C	850x1200x600	8377		36	
	UPMC850-6	Lab D	850x700x600	7385		36	
	UMM500-7	Lab C	500x200x300	3219			
	UMM500-8	Lab D NE	500x200x300	3219			
<u>BnS</u>	Global Image 12-30-10	Lab C	1200x3000x1000	16285	1811x4445x3330	24	X(10),Y(10),Z(10)
	Global Image 9-15-8	Lab C	900x1500x800	5218	1509x2794x3066	28	X(10),Y(10),Z(10)
	XCEL UHA 12-30-10	Lab C	1200x3000x1000	27500	2040x4225x3738	39	X(8.6),Y(7.8),Z(8.6)
	XCEL 9-15-9	Lab C	900x1500x900	10400	1735x2625x3170	30	X(8.6),Y(7.8),Z(8.6)
OGP	Avant 600	Lab D	610x450x150	3340	1020x1320x1730		X(9.4),Y(9.4),Z(9.4)

Brown & Sharp Global Image CMM with Touch Probe 200



Touch Probe 200 Force = 2-10 grams
Feather Probe Force < 10 mgrams (not shown)

ACCURACY SPECIFICATIONS

	Machine	Lin. Acc. B89 mm / mm	Lin. Acc. VDI L = length in mm result is in um	Vol. Acc B89 mm / mm	Vol. Acc. VDI L = length in mm result is in um	Planar Acc. VDI L = length in mm result is in um
CORDAX	1808-MH	.010 / 1500		.017 / 400		
	1808-MEA-1	.007 / 750		.016 / 400		
	1808-MEA-2	.007 / 750		.016 / 400		
LK	LK G80C			.013 / 400		
	LK HC90					
ZEISS	UMM500-1		0.5 + L/700	.008 / 450		
	UMM500-2		0.5 + L/700	.008 / 450		
	UMM500-3		0.5 + L/700	.008 / 450		
	UMM500-4		0.5 + L/700	.008 / 450		
	UMC850-5		1.9 + L/300		3.0 + L/200	
	▶ UPMC850-6		0.5 + L/900		0.8 + L/600	
	UMM500-7		0.5 + L/700	.008 / 450		
	UMM500-8		0.5 + L/700	.008 / 450		
BNS	Global Image 12-30-10	.006 / 3000		.008 / 900	1.9 + L/333	
	Global Image 9-15-8	.006 / 1500		.007/ 750	2.5 + L/333	
	XCEL UHA 12-30-10	.010 / 3000	3.6 + L/322	.011 / 900	3.9 + L/303	
	XCEL 9-15-9	.007 /1500	4.0 + L/244	.010 / 750	4.4 + L/233	
OGP	Avant 600					4.0 + L/150

Best overall Machine

Other Major Equipment

Generic Equipment

- Wire bonders
- Dicing Saw
- Vacuum Ovens and Clean Benches
- Encapsulation machines (manual and automatic)
- Alcatel Leak checker
- Inspections Stations
- Probe stations
- Electronics Modules (e.g. Keithley 237's)
- Chillers
- Vacuum pumps
- Plasma Cleaner (needs to be recommissioned)
- Flip-Chip Bonder (on arrival)

Project Specific Equipment

- SVX readout infrastructure
- Burnin Boxes

Vacuum Oven and Clean Bench Workstation in Lab D



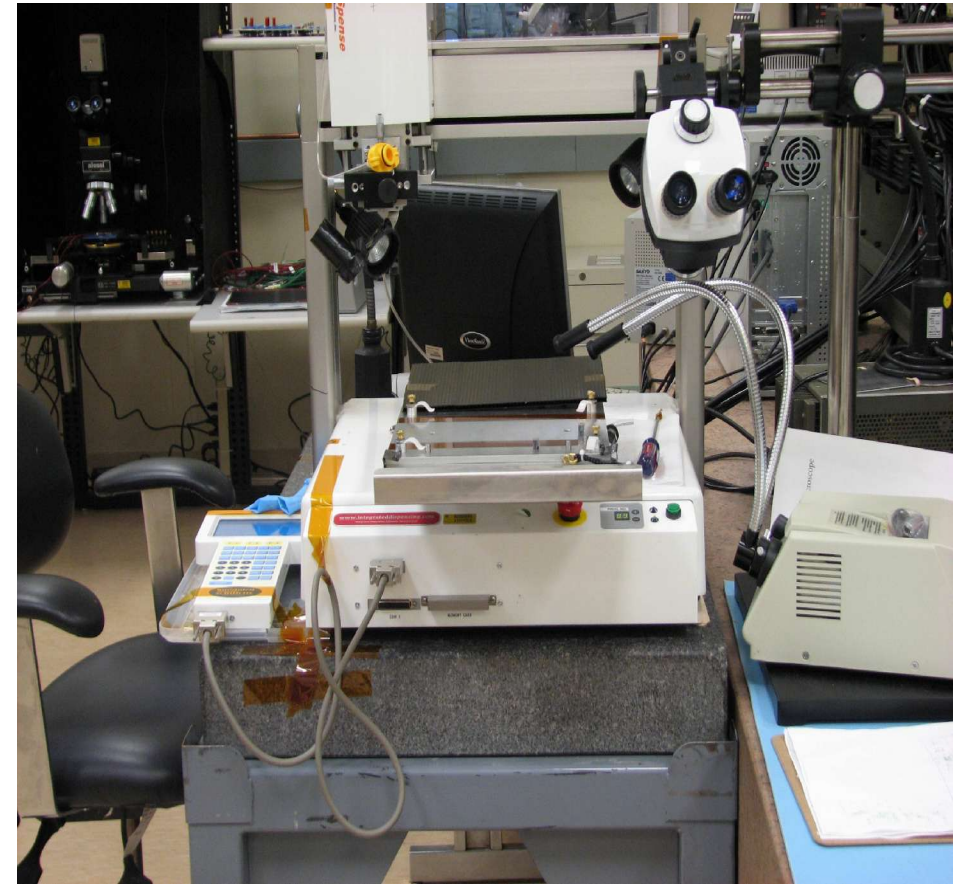
Currently used by CMS-FPIX for lamination



Kullick & Soffa 8090 Wirebonders

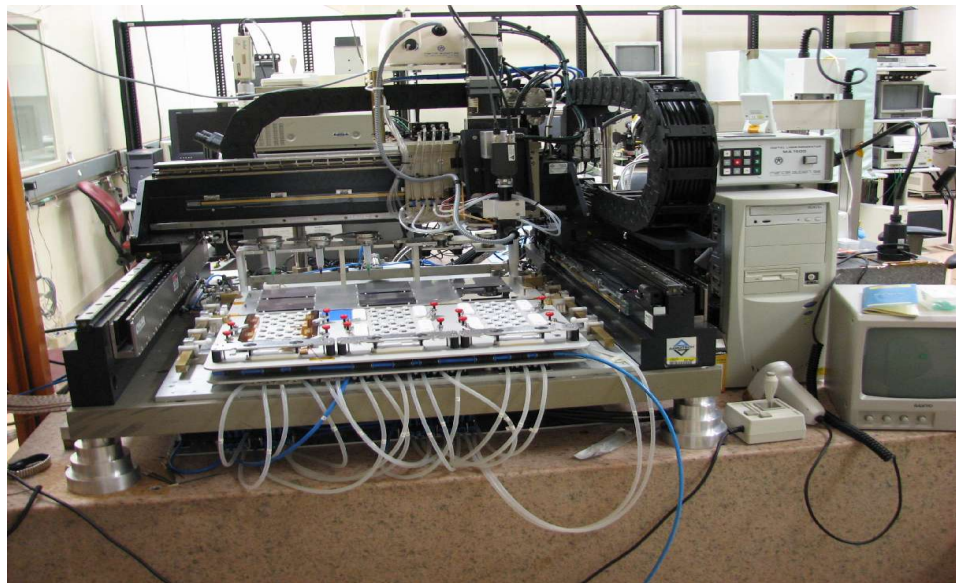
We will be receiving a flip-chip bonder in the summer.

We are exploring upgrading to a deep-head bonder.



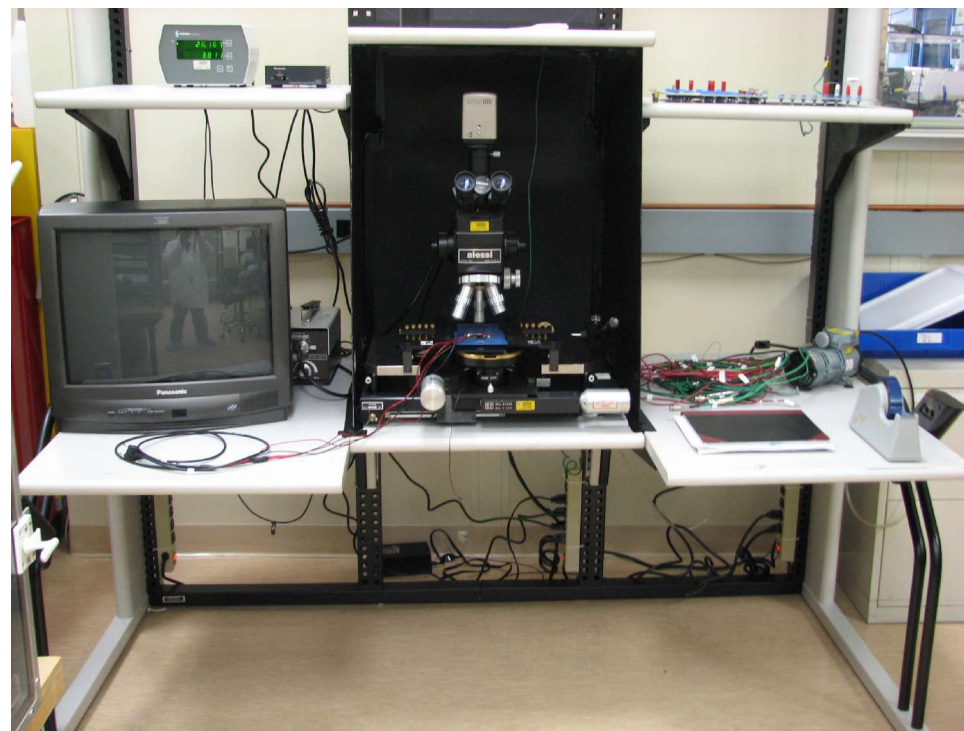
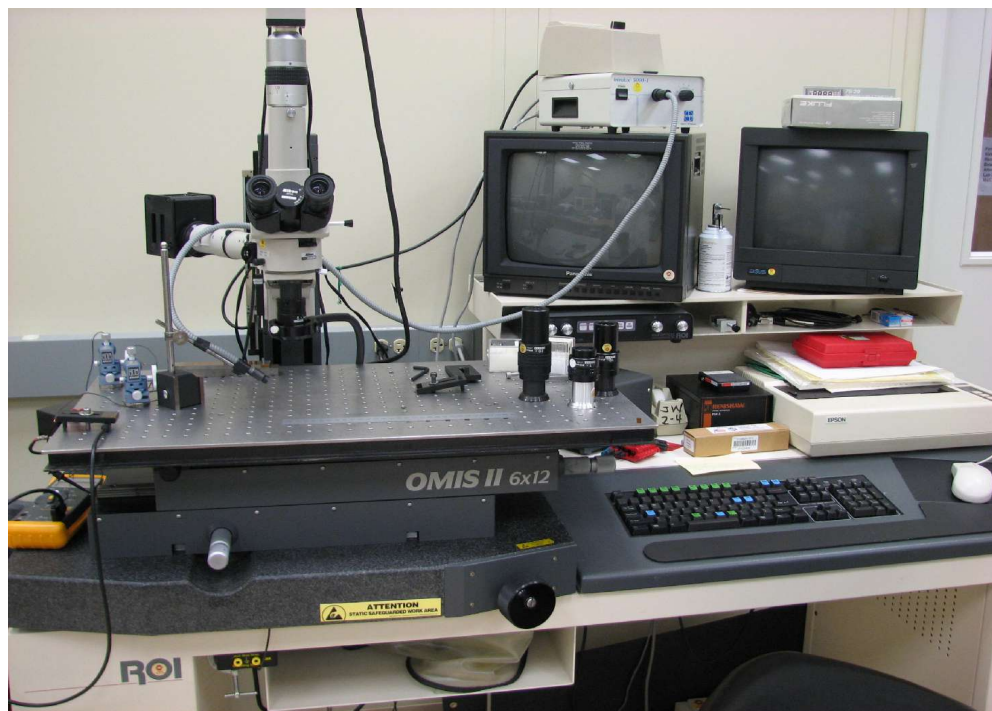
Encapsulation Robot in Lab D

Omni-II X-Y inspection stations
(~4 total)



Aerotech Gantry
(Specific to CMS-TOB)

Probe stations
(~4 total)



Inspection Optics and CCD camera

<u>Device</u>	<u>Magnification</u>	<u>Pixel resolution</u>	<u>Field of View</u>
Ram	2x	0.6 microns	0.46 mm x 0.46 mm
OGP	5x	0.5 microns	0.45 mm x 0.45 mm
Nikon	20x	-	0.15 mm x 0.15 mm
AEI	450x	-	0.7 mm x 0.7 mm

Typical working distance of 30 mm

Chillers (all currently in use)

4 small Neslab bath chillers.	-5C.	Low wattage
2 medium glycol chiller	-5C.	10 watts
1 medium glycol-PF50 chiller with heat-exchanger	X	X
1 large glycol chiller	-20C.	20 Watts
1 FTS PF50 chiller	X	large
1 FTS PF50 chiller (Univ of Rochester)	X	large

Space and Equipment Usage

<u>Projects (Other than ILC Silicon R&D)</u>	<u>Space Usage</u>
CMS-FPIX	Lab C North, Lab D C-D cross connect
DES/SNAP	Lab C South, Lab A
RD50	Lab C South (Small)
ILC SiliconPM R&D	A-B bridge test area
LANL-Phenix Forward Planar Pixel	Lab D (small) and A-B brige test area
BNL-Phenix Layer3-4 Wirebonding and Encapsulation	Lab D (small) and A-B bridge test area
Silicon Pixel Testbeam Support	Lab D (small) and A-B bridge test area
Super CDMS	Lab D (small)
COUPP	Lab D (small)
Other Projects (in discussion)	-----

Space Usage Forecast

DES/SNAP will occupy Lab C South for long term.

CMS-FPIX Panel Assembly concludes in Summer 2007. Significantly more space and equipment in Lab D and C-D cross connect will be available.

CMS-FPIX Full Detector Assembly concludes in Fall-Winter 2007. Significantly more space and equipment in Lab C North will be available.

We do not know yet the impact of other projects that are in discussion: SLHC upgrade, and other DOE silicon projects based elsewhere.

I expect that priority will be given to ILC Silicon R&D in lab D.

Clean room space is also available at Lab 3, in the village (5 minutes drive from Sidet).

Rated at class 10,000.

Size comparable to Lab C.

This space would have to be shared with SuperCDMS, COUPP.

Manufacturer Specifications

	Global Image 12-30-10	XCEL 9-15-9	OGP
B89 Linear Accuracy (mm/mm)	.006 / 3000	.007 / 1500	
VDI/VDE Linear Accuracy (um)		4.0 + L/244	
B89 Volumetric Accuracy (mm/mm)	.008 / 900	.010 / 750	
VDI/VDE Volumetric Accuracy (um)	1.9 + L/333	4.4 + L/233	
B89 Repeatability (um)	0.002	0.002	
XY Planar Accuracy (um)			4.0 + L/150
Z Linear Accuracy (um)			4.0 + L/150

L = length in mm

VDI/VDE - European standard for CMM performance evaluations

B89 - U.S. standard for CMM performance evaluations

B89 Repeatability - range of center coordinates of a sphere determined by 10 successive sphere measurements

B89 Linear Accuracy - conformance of the CMM scales to the international standards - designated as range of all measured deviations

B89 Volumetric Accuracy - assessment of total geometry of CMM structure - designated as range of all measured deviations

Video Probe Repeatability and Working Distance

	Ram	Nikon	OGP
Working Distance (mm)	38	47.5	35
X Repeatability (um)	2	2	1
Y Repeatability (um)	1	1	3
Z Repeatability (um)	23	9	5
Z Repeatability Stdev (um)	7.0	2.7	1.6

Repeatability - range of center coordinates of a sensor target determined by 25 successive measurements

Estimated Video Probe Reference Accuracy and Drift

	Ram	Nikon	OGP
Video to Touch Probe Reference Accuracy XY (um)	3	3	2
Video to Touch Probe Reference Accuracy Z (um)	10	5	3
Video Probe Drift XY (um)	10	10	2
Video Probe Drift Z (um)	10	10	2

Drift - changes in measured values due to environmental factors such as temperature variation

All estimates of video probe reference accuracy and drift are based on experience.

Official tests to evaluate video probe measurement uncertainty have not been conducted but are being planned