



Certification Date: 05-May-2014

In compliance with ISO/IEC 17025

Recertification Due:

CERTIFICATION OF MEASUREMENT

MRS4-XY R24-135

	X-Traversal		Y-Traversal			X-Traversal		Y-Traversal	
	Left	Right	Top	Bottom		Left	Right	Top	Bottom
500µm pitch					1µm pitch				
1	499.82	499.88	499.92	499.99	1	0.984	1.000	1.006	1.007
2	499.88	499.99	499.72	499.90	2	0.994	0.996	0.996	0.990
3	499.85	499.97	499.71	500.07	3	1.005	0.995	0.988	0.990
4	499.78	499.87	499.88	499.75	4	1.001	1.007	1.019	1.014
5	499.79	499.83	500.02	499.86	5	0.988	0.988	0.994	0.991
6	<u>499.72</u>	<u>499.90</u>	<u>499.85</u>	<u>499.86</u>	6	1.001	1.011	0.967	1.002
Average	499.81	499.91	499.85	499.91	7	1.012	0.988	0.997	0.988
2-Sigma	0.12	0.12	0.24	0.23	8	<u>0.981</u>	<u>0.988</u>	<u>1.007</u>	<u>0.995</u>
50µm pitch					Average	0.996	0.997	0.997	0.997
1	50.02	50.01	49.99	50.08	2-Sigma	0.022	0.017	0.031	0.019
2	49.96	49.95	49.94	50.08					
3	50.22	49.86	49.96	49.88	0.50µm pitch				
4	49.92	50.03	50.03	49.88	1	0.504	0.500	0.507	0.504
5	49.87	49.99	50.17	49.91	2	0.489	0.489	0.483	0.501
6	49.80	49.83	49.89	49.91	3	0.507	0.509	0.500	0.492
7	50.05	49.83	50.00	49.91	4	0.510	0.509	0.501	0.513
8	<u>49.93</u>	<u>49.91</u>	<u>49.90</u>	<u>49.93</u>	5	0.493	0.491	0.491	0.486
Average	49.97	49.93	49.98	49.95	6	0.467	0.469	0.502	0.495
2-Sigma	0.26	0.17	0.18	0.17	7	0.529	0.528	0.498	0.502
2µm pitch					8	0.494	0.493	0.494	0.497
1	1.997	2.002	1.998	2.005	9	0.498	0.500	0.518	0.492
2	1.985	2.002	1.992	2.001	10	<u>0.500</u>	<u>0.499</u>	<u>0.499</u>	<u>0.504</u>
3	2.000	2.007	1.999	1.991	Average	0.499	0.499	0.499	0.499
4	1.999	1.997	1.995	2.005	2-Sigma	0.032	0.031	0.019	0.016
5	2.014	1.996	1.998	1.987					
6	1.991	2.002	2.003	1.993					
7	2.002	1.980	2.005	1.988					
8	<u>1.998</u>	<u>2.013</u>	<u>2.001</u>	<u>1.998</u>					
Average	1.998	2.000	1.999	1.996					
2-Sigma	0.016	0.020	0.008	0.014					

Pitch	Uncertainty(k=2)	Traceable to:
500µm	±0.25µm	MRS-4 S/N R23-169
50µ	±0.104µm	MRS-4 S/N R23-169
2µm	±0.031µm	MRS-4 S/N R23-169

Pitch	Uncertainty	Traceable to:
1µm	±0.03µm	MRS-4 S/N R23-169
1/2µm	±0.038µm	MRS-4 S/N R23-169

XY Working Standard: MRS-4 S/N R24-171

Minghua Liu, Ph. D.
Research Scientist