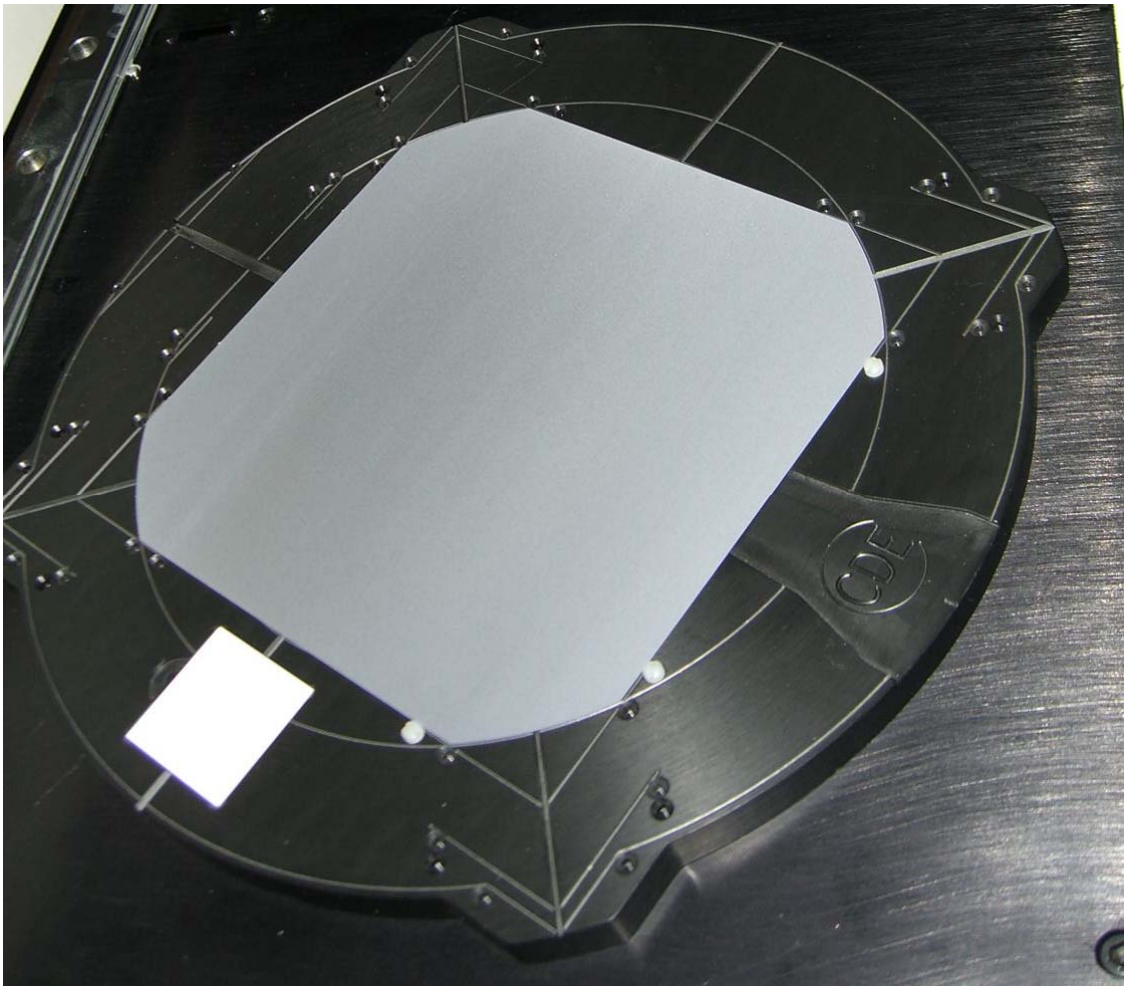
125mm x 125mm Square
Solar Cell Demo using CDE ResMap 178

1. Data Summary:

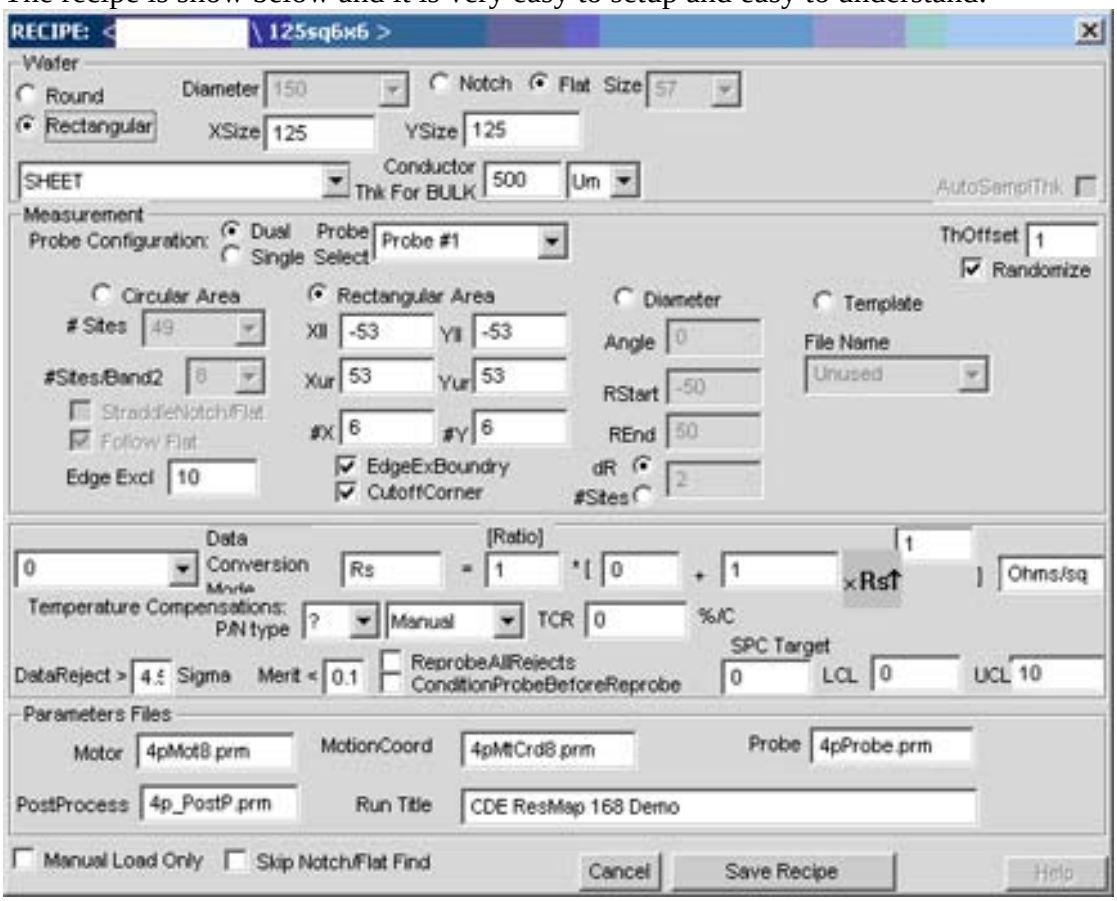
We received 10x 125mm x 125mm thin solar cell samples to be measured on a CDE ResMap 178. All the data below are measured with a Jandel type EH probe [1.6mm pin spacing, 40μm tip radius, 200 gram force].

The photo below shows the CDE ResMap with a chuck that can handle 156mm x 156mm, 150mm x 150mm, 125mm x 125mm, 100mm x 100mm, 75mm x 75mm, 50mm x 50mm and 25mm x 25mm samples. Off course, any rectangles with any pair of the above dimensions, such as 100mm x 156mm, etc. plus all the circular wafers from 2" diameter to 200mm can be handled by this chuck. On the lower left side of the chuck there is a built in ceramic plate for automatic probe conditioning.

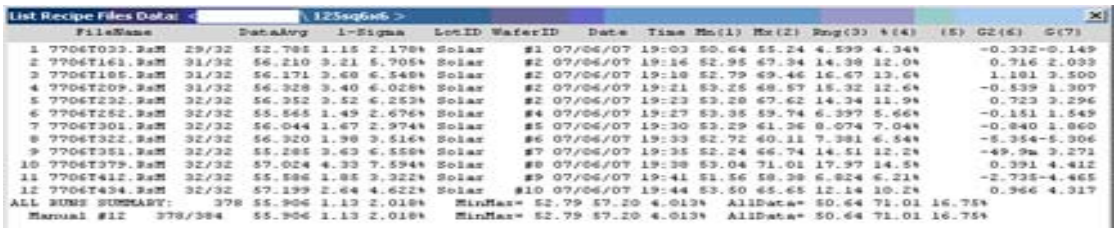


We measured all these samples using a 6 x 6 grid pattern with 10mm edge exclusion. Since the edges of these samples are rounded, the 4 corner sites are outside the 10mm edge exclusion and re automatically removed by the pattern generator.

The recipe is show below and it is very easy to setup and easy to understand:



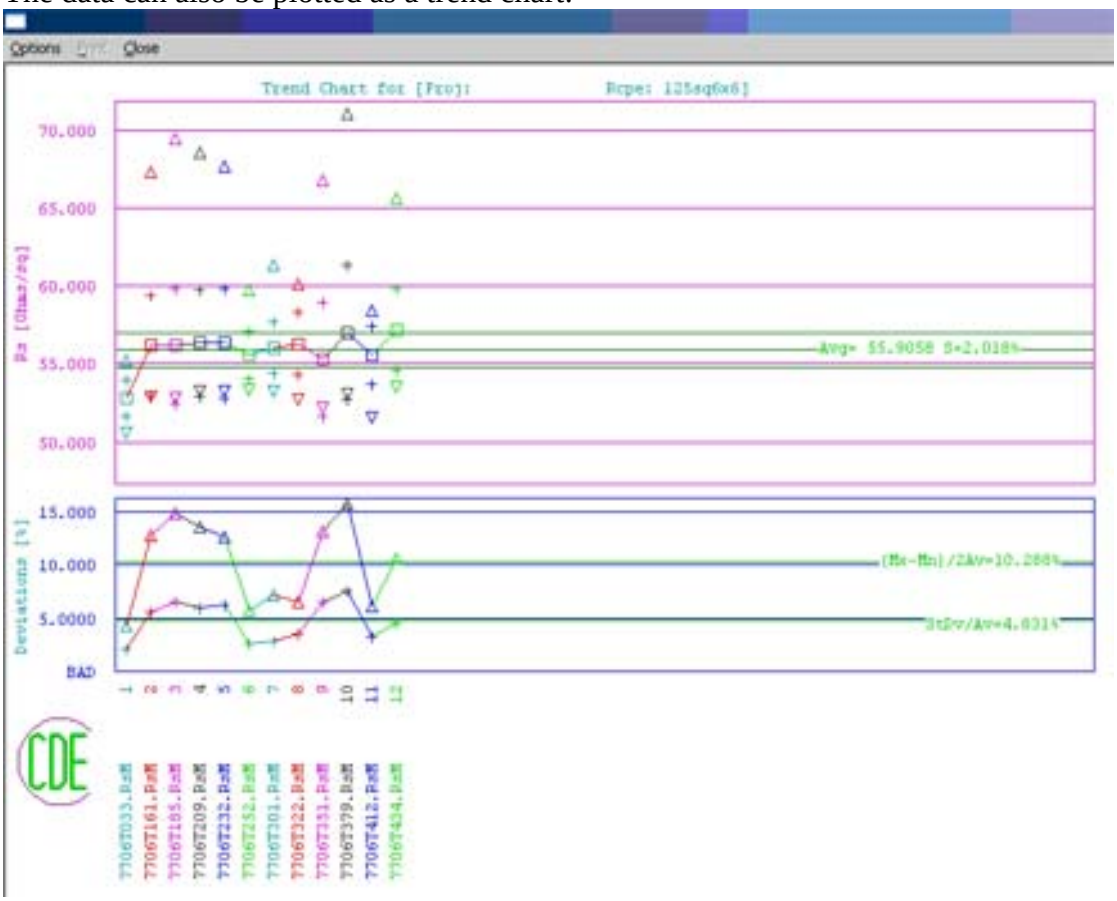
Below is the data summary screen: We map each samples once (see WaferID column), except, we map sample #2 4 times to check wafer-to-wafer repeatability, wafer #3 wafer broken when we got it, so we did not measure it:



List Recipe Files Data: < \ 125sq6x6 >

	FileName		DataAvg	1-Sigma		LotID	WaferID	Date	Time	Mn(1)	Mx(2)	Rng(3)	%(4)	(5)	G2(6)	G(7)
1	7706T033.3sM	29/32	52.705	1.15	2.178%	Solar	#1	07/06/07	19:03	50.64	55.24	4.599	4.34%		-0.332	-0.149
2	7706T161.3sM	31/32	56.210	3.21	5.705%	Solar	#2	07/06/07	19:16	52.95	67.34	14.38	12.0%		0.716	2.033
3	7706T185.3sM	31/32	56.171	3.68	6.548%	Solar	#2	07/06/07	19:18	52.79	69.46	16.67	13.6%		1.101	3.500
4	7706T209.3sM	31/32	56.328	3.40	6.028%	Solar	#2	07/06/07	19:21	53.25	68.57	15.32	12.6%		-0.539	1.307
5	7706T232.3sM	32/32	56.352	3.52	6.253%	Solar	#2	07/06/07	19:23	53.20	67.62	14.34	11.9%		0.723	3.296
6	7706T252.3sM	32/32	55.565	1.49	2.676%	Solar	#4	07/06/07	19:27	53.35	59.74	6.397	5.66%		-0.151	1.549
7	7706T301.3sM	32/32	56.044	1.67	2.974%	Solar	#5	07/06/07	19:30	53.29	61.36	8.074	7.04%		-0.840	1.060
8	7706T322.3sM	32/32	56.320	1.98	3.516%	Solar	#6	07/06/07	19:33	52.72	60.11	7.381	6.54%		-5.354	-5.306
9	7706T351.3sM	32/32	55.285	3.63	6.559%	Solar	#7	07/06/07	19:35	52.24	66.74	14.51	12.2%		-49.9m	3.271
10	7706T379.3sM	32/32	57.024	4.33	7.594%	Solar	#8	07/06/07	19:38	53.04	71.01	17.97	14.5%		0.391	4.412
11	7706T412.3sM	32/32	55.586	1.85	3.322%	Solar	#9	07/06/07	19:41	51.56	58.38	6.824	6.21%		-2.735	-4.465
12	7706T434.3sM	32/32	57.199	2.64	4.622%	Solar	#10	07/06/07	19:44	53.50	65.65	12.14	10.2%		0.966	4.317
ALL RUNS SUMMARY:		378	55.906	1.13	2.018%		MinMax=	52.79	57.20	4.013%		AllData=	50.64	71.01	16.75%	
Manual #12		378/384	55.906	1.13	2.018%		MinMax=	52.79	57.20	4.013%		AllData=	50.64	71.01	16.75%	

The data can also be plotted as a trend chart:



We port the data summary file to EXCEL and got the repeatability data for sample #2.

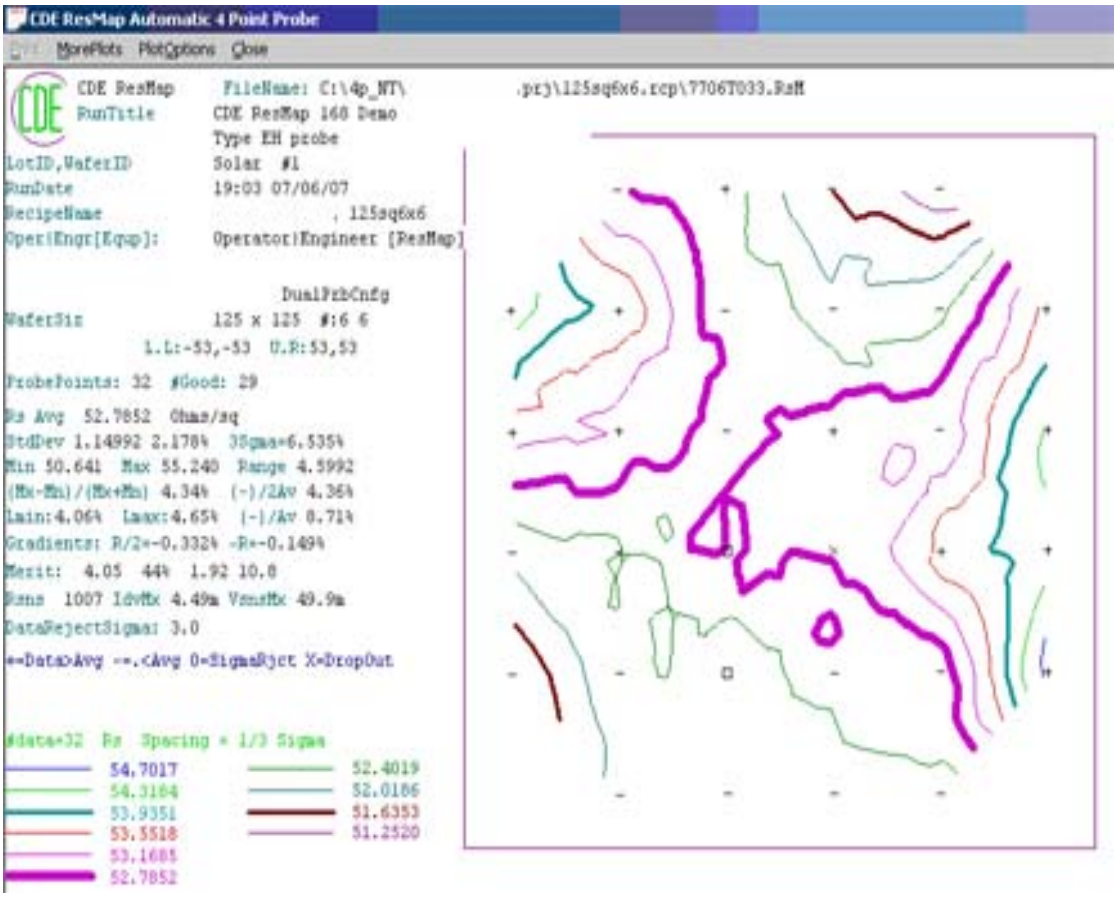
	Within Wafer		
	Average	**Stdev**	**%**
Run 1	56.21	3.21	5.70%
Run 2	56.17	3.68	6.55%
Run 3	56.33	3.40	6.03%
Run 4	56.35	3.52	6.25%
Wafer-to-wafer			
Average=	56.27		
Stdev=	0.09		
%=	**0.157%**		

Repeatability for Sample #2

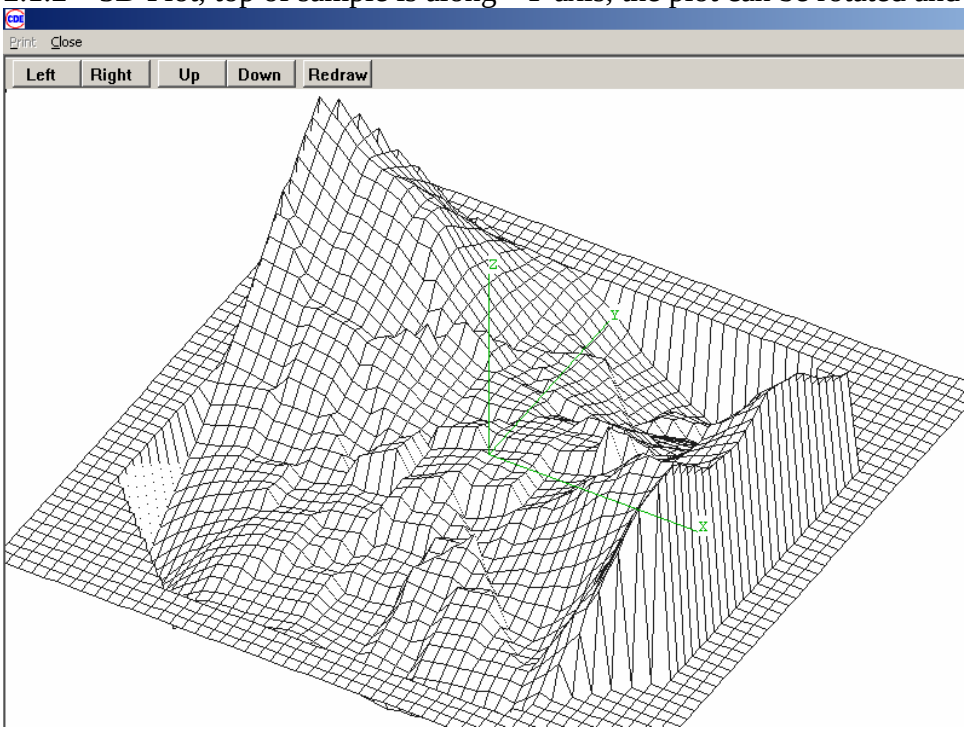
2. Data in Detail: Demonstrates various plots.

Although the average Rs for these samples are all similar, however, the data distribution looks very different! We will present contour maps for all samples, plus all the other plots for sample #1 to illustrate our software utilities.

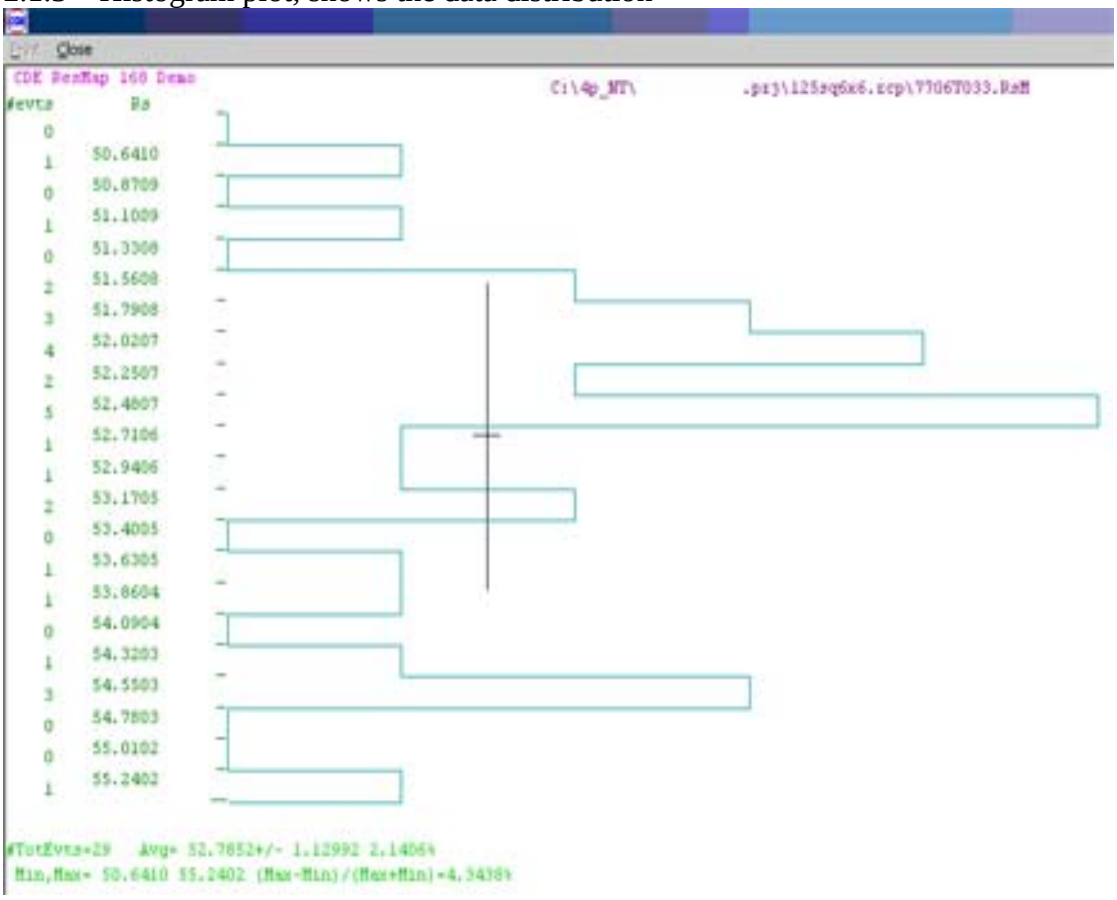
2.1 Sample #1,
2.1.1 contour map:



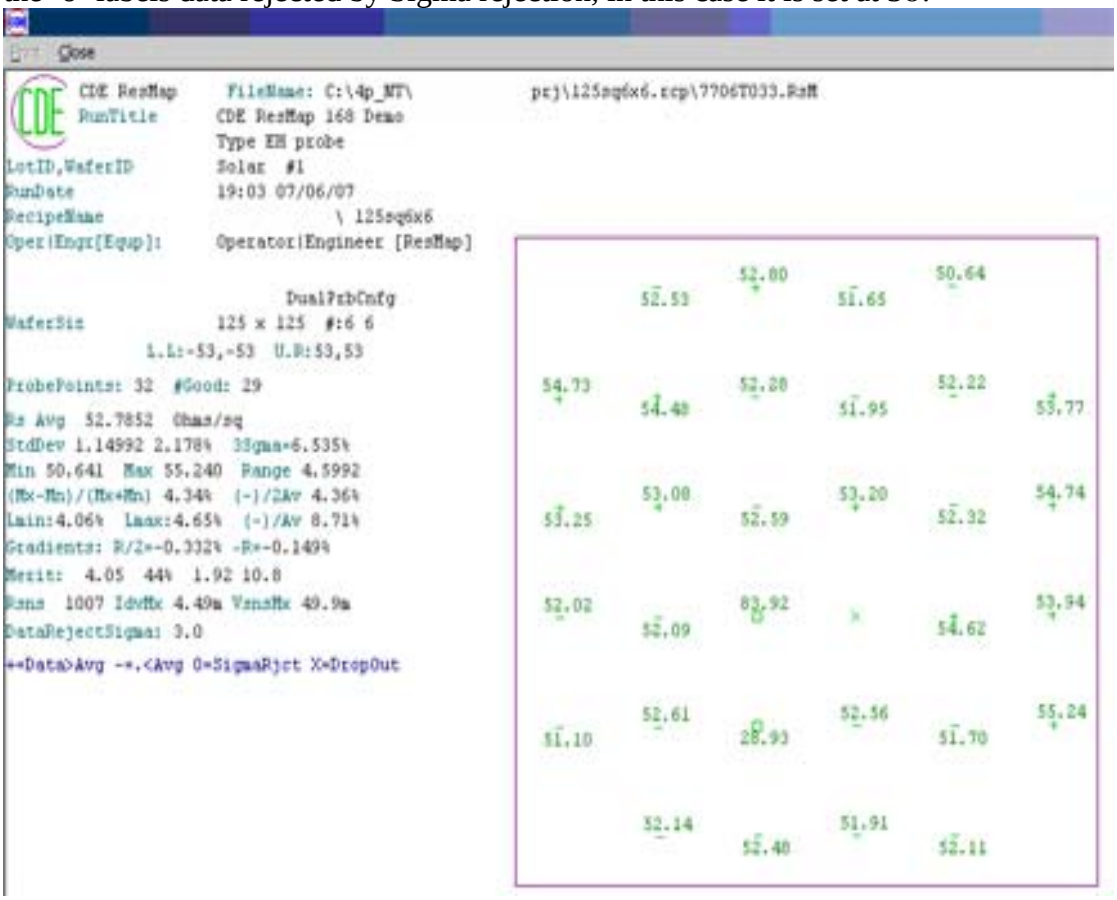
2.1.2 3D Plot, top of sample is along +Y axis, the plot can be rotated and tilted.



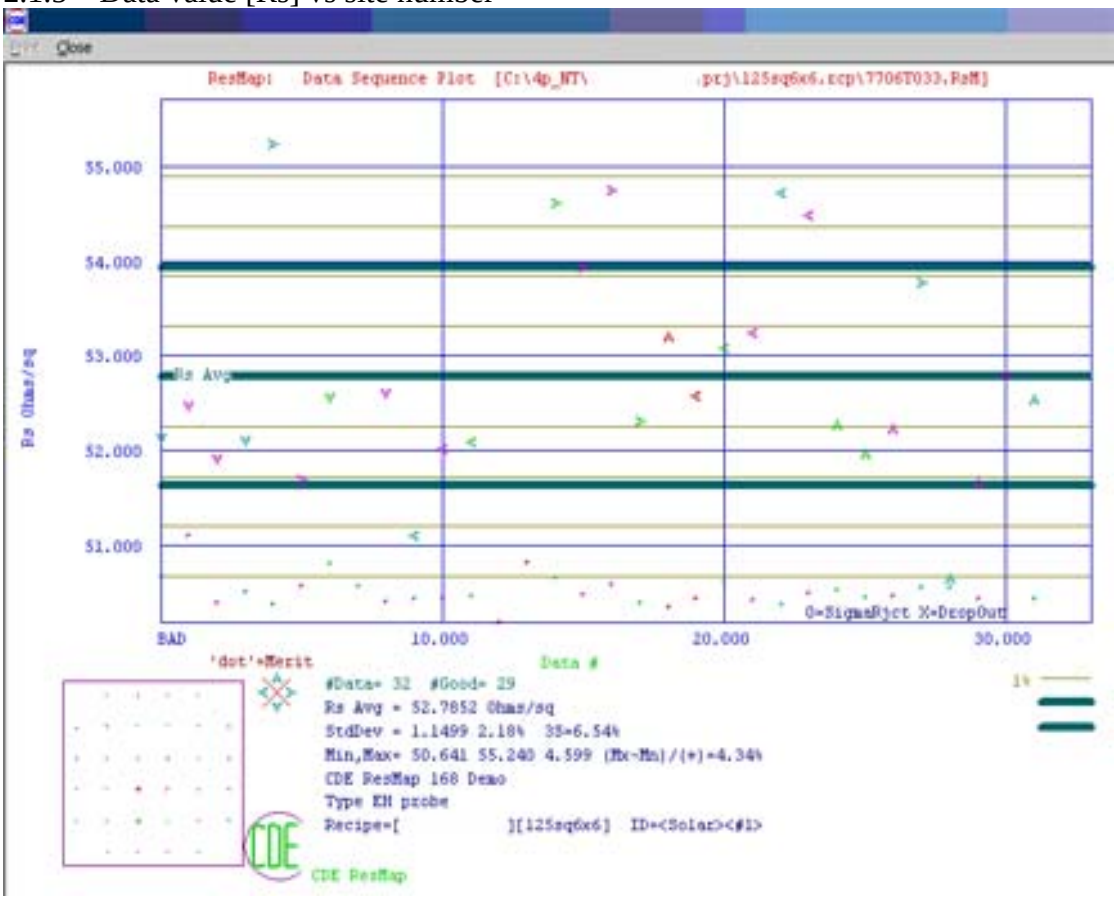
2.1.3 Histogram plot, shows the data distribution



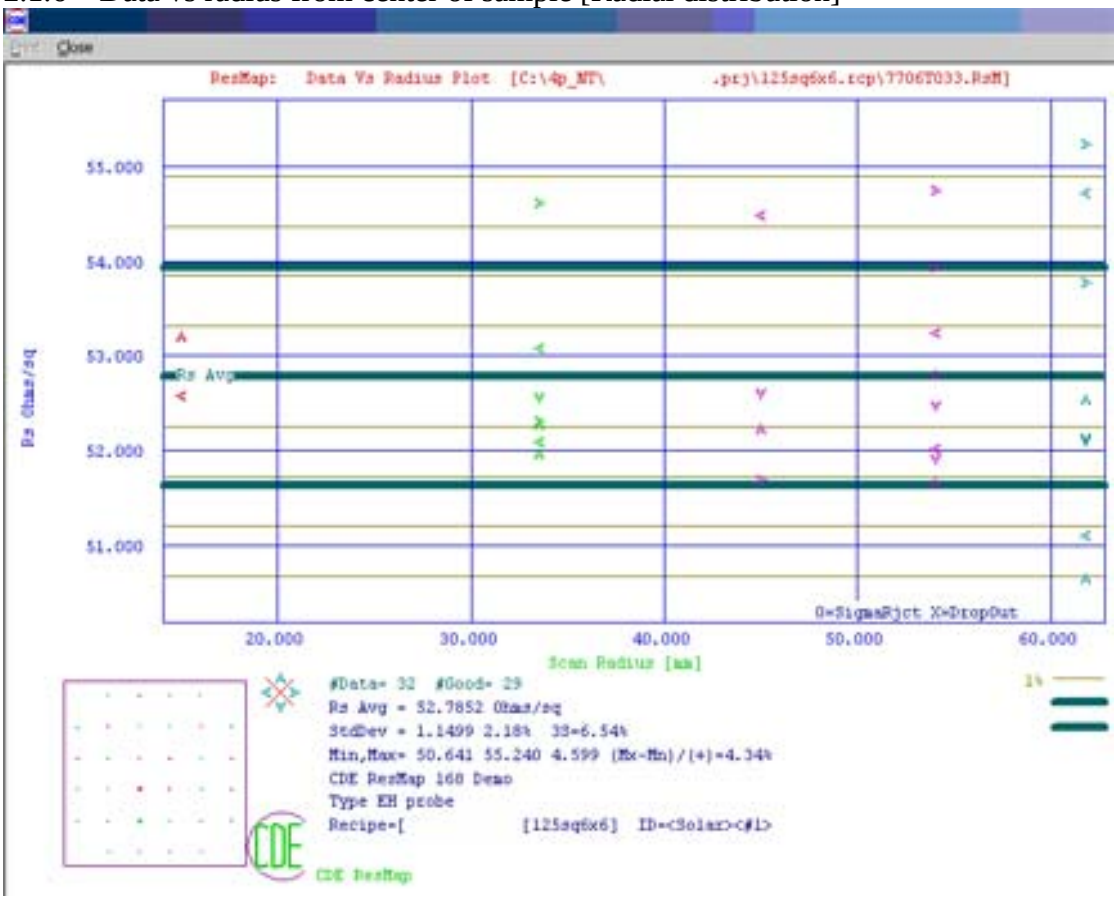
2.1.4 Wafer data plot, labels the data value on each site. The '+' labels data with values above the average; the '–' labels data with values below the average; the 'x' labels bad and immeasurable data; and the 'o' labels data rejected by Sigma rejection, in this case it is set at 3σ.



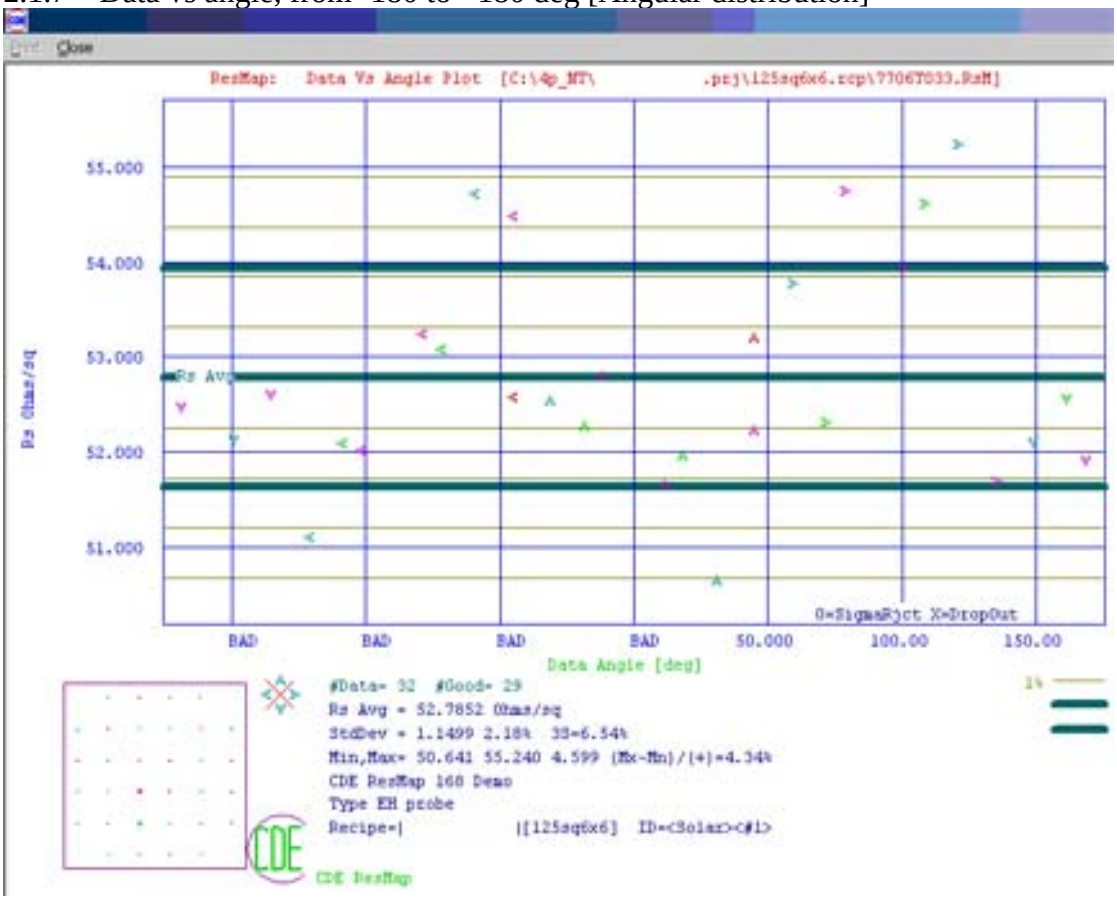
2.1.5 Data value [Rs] vs site number



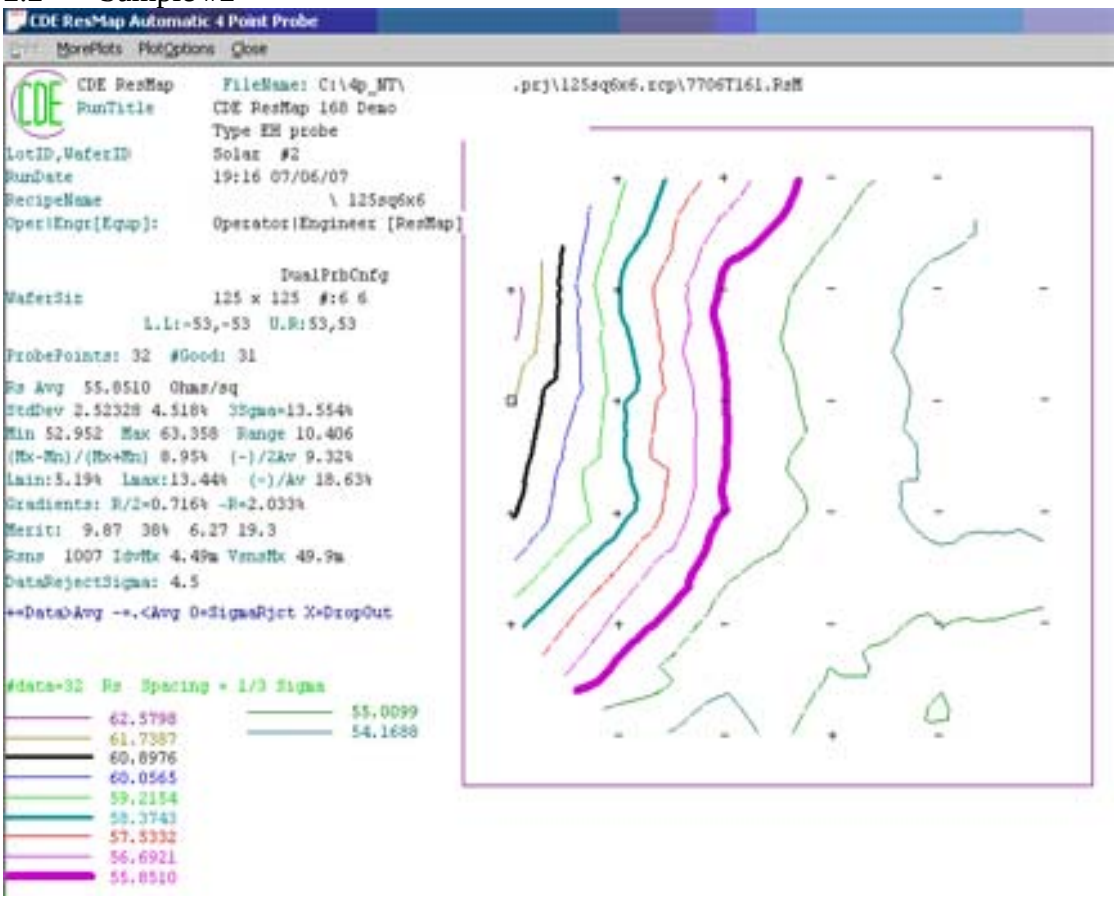
2.1.6 Data vs radius from center of sample [Radial distribution]



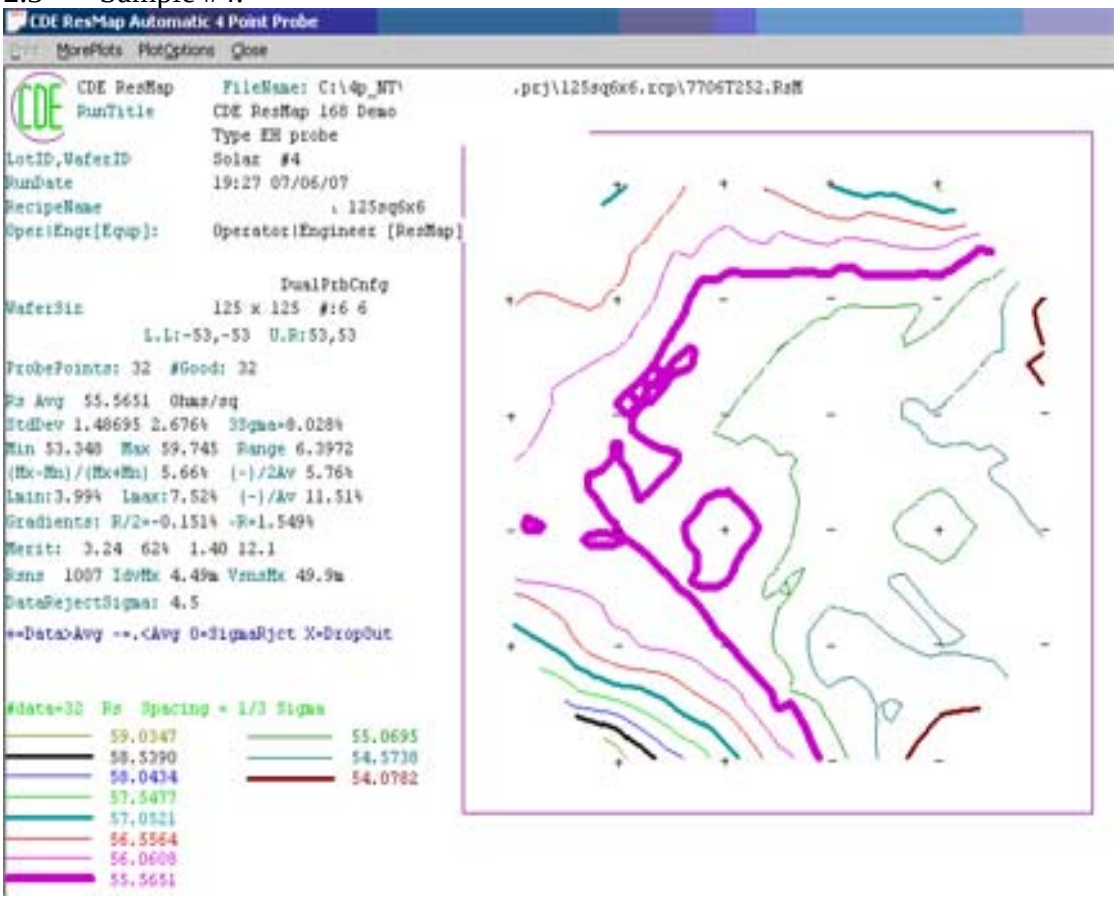
2.1.7 Data vs angle, from -180 to +180 deg [Angular distribution]



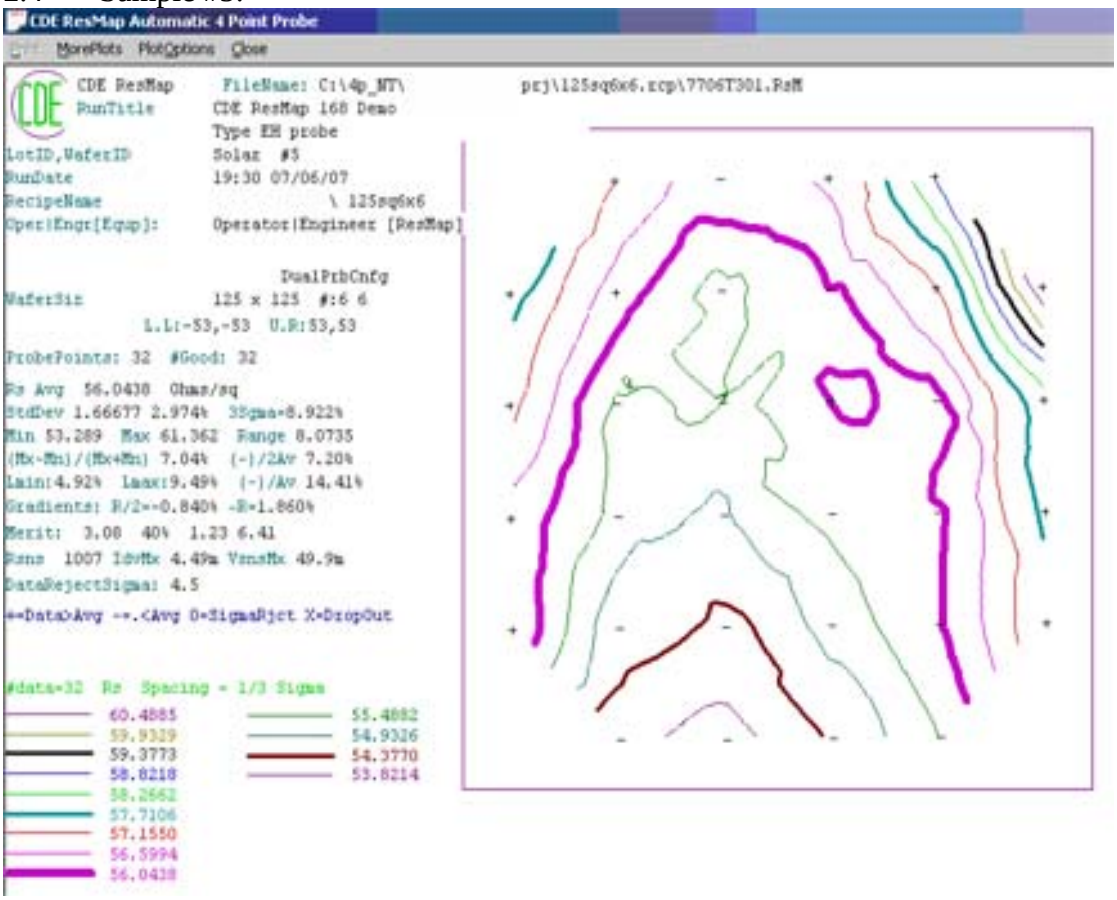
2.2 Sample #2



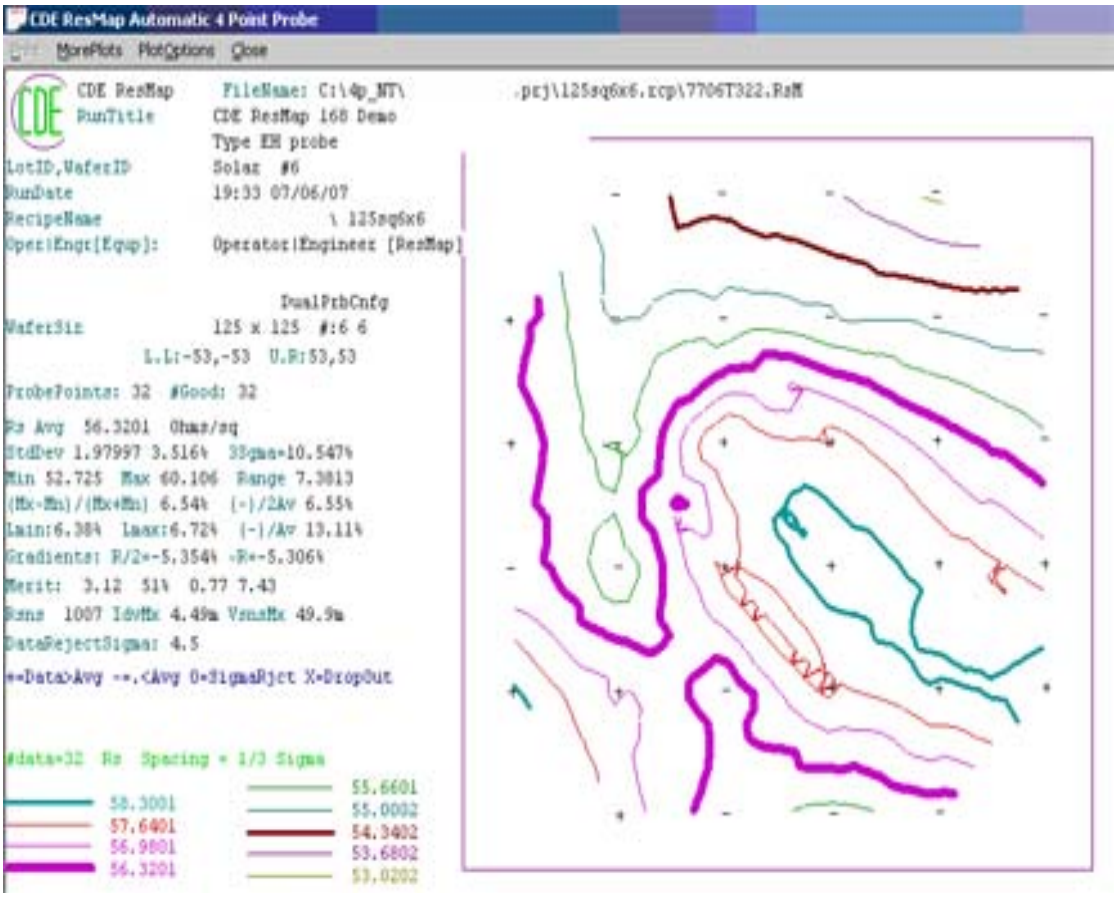
2.3 Sample #4:



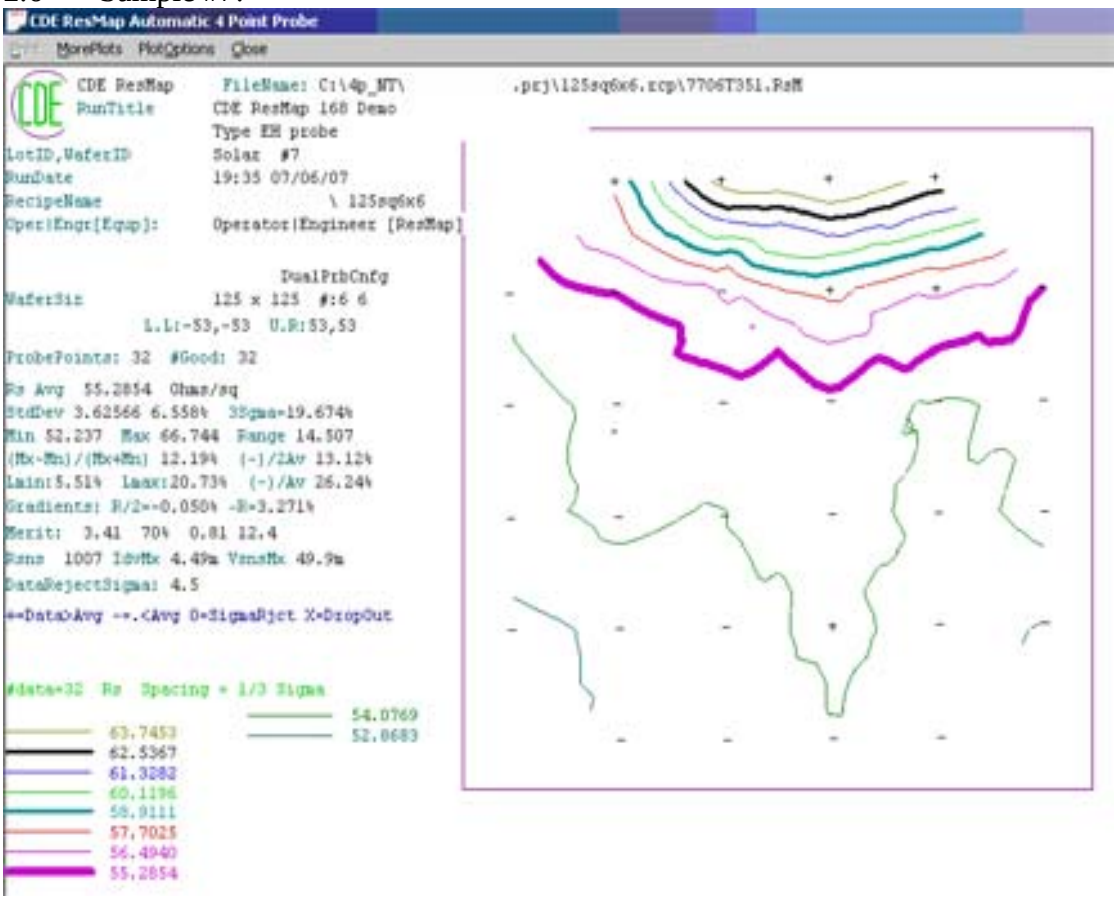
2.4 Sample #5:



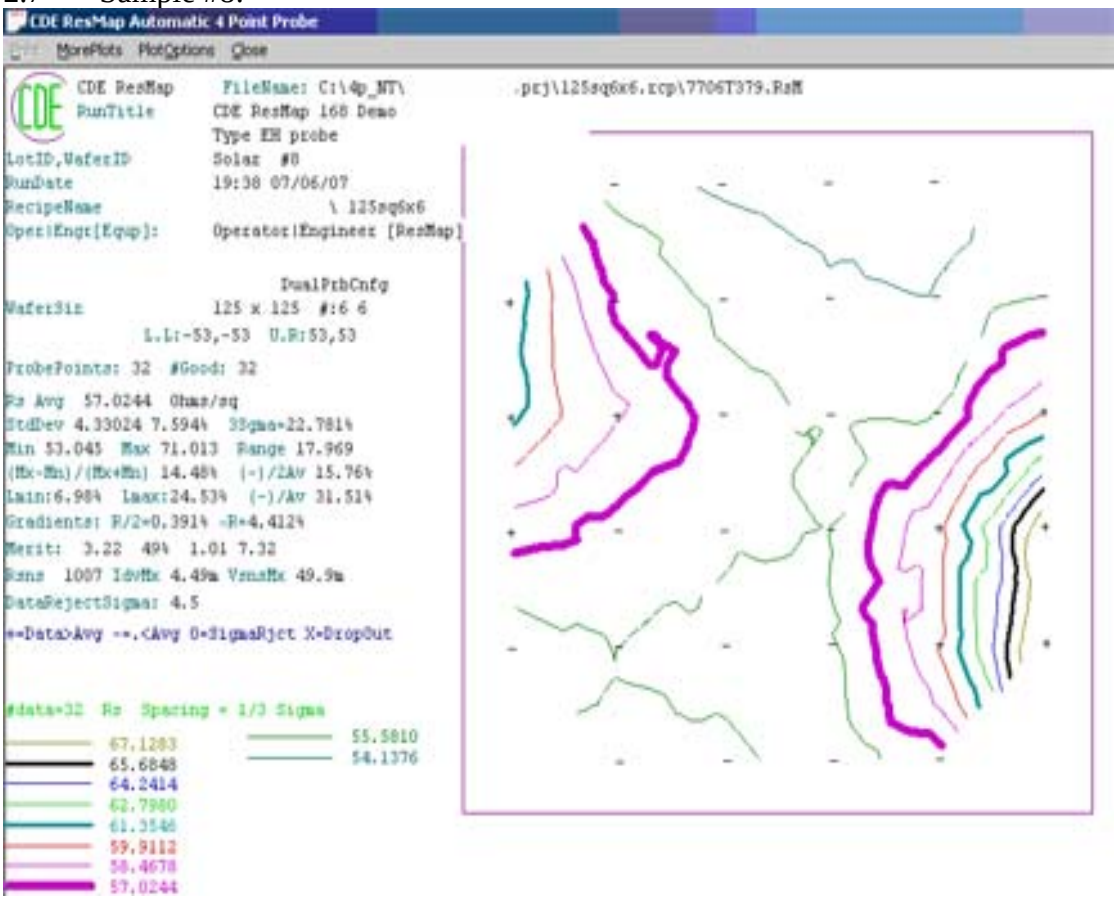
2.5 Sample #6:



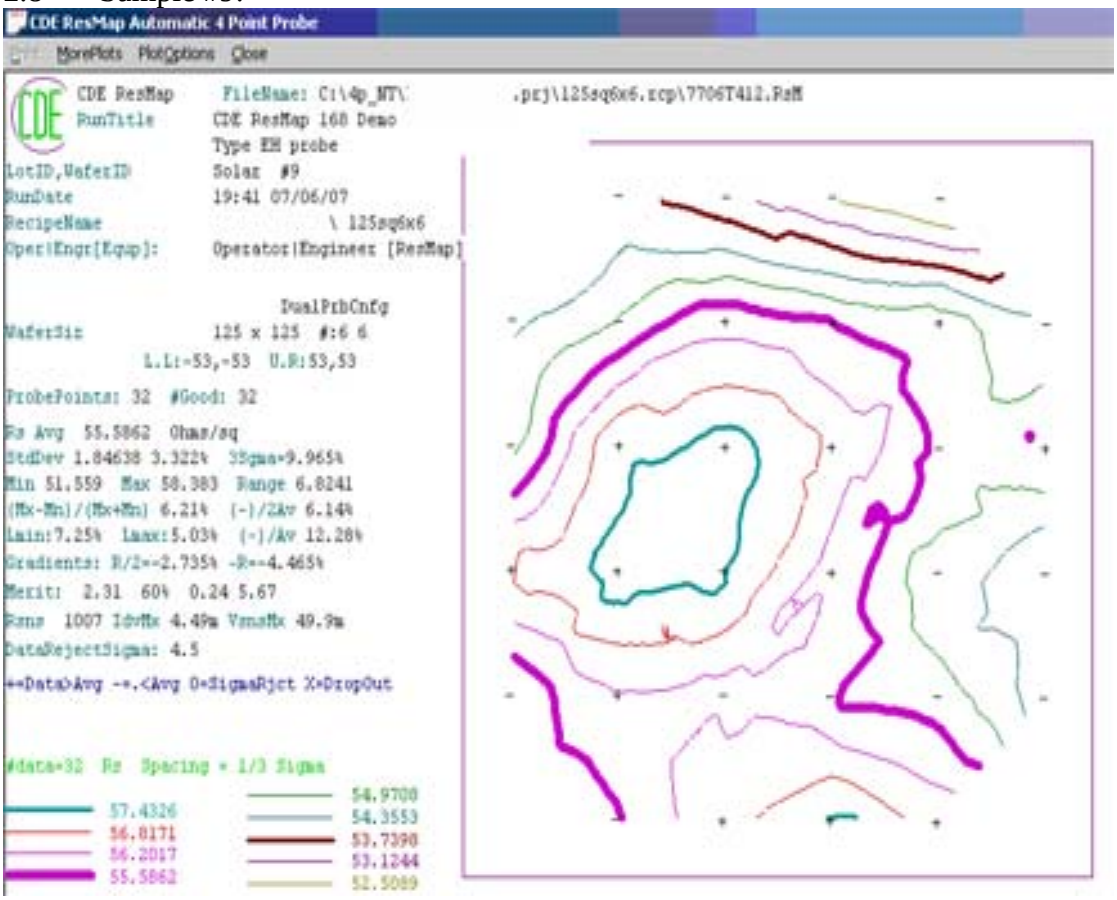
2.6 Sample #7:



2.7 Sample #8:



2.8 Sample #9:



2.9 Sample #10: