

Cigarette Box

Executive Summary

Optimet's MK10 with a 25 mm focal lens was used in cigarette box inspection. The main industrial inspection application is related to the boxes' folding line. The following parameters were measured in six types of samples (type 1 includes two samples and type 5 includes seven samples):

- Radius of folding line
- Width of folding line
- Height of folding line
- Plane's angle around folding line

We obtained optimal results for every sample.

1. Optimet's Advantages over Other Technologies:

1. Unique collinear technology
2. Capability to measure sharp angles in minimum clearance.
3. High sampling rate
4. High lateral resolution

2. Application Description

Scanning of six different cigarettes box samples using Optimet's MK10 with a 25 mm focal lens.



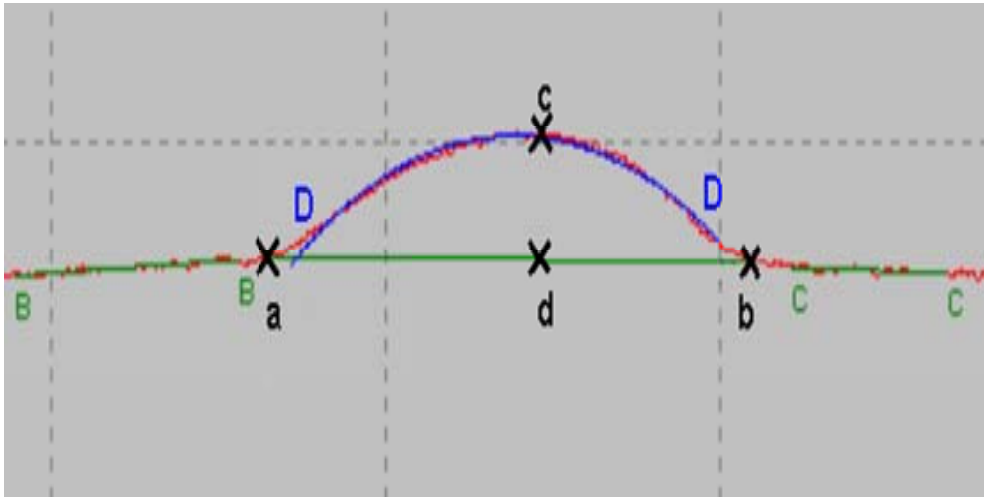
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3. Results and Observations

General



Note (fig.2):

We assigned the following names:

L1 – line **B-B**

L2 – line **C-C**

Delta angle – angle between lines **B-B** and **C-C**

Width – distance between points **a** and **b**

Height - distance between points **c** and **d**

Radius – circle **D-D**

Figure 1 – Folding line profile

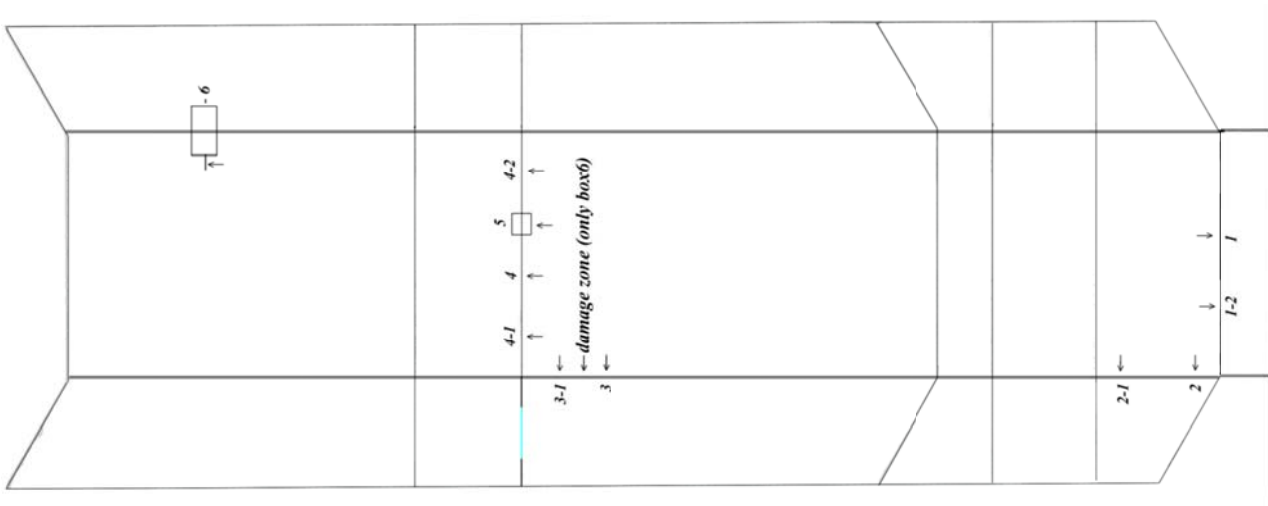


Figure 2 – Measurement zones on each box

Box Number 1A

BOX 1a		MEASUREMENT					RADIUS(avrg) mm
		ANGLE °(L1-left)	ANGLE °(L2)	Delta ANGLE °	WIDTH mm	HEIGHTmm	
SINGLE PROFILE	1	1.5447	179.12	177.58	1.535	0.2333	1.15
	1_2	1.9464	179.16	177.22	1.4252	0.233	1.1555
	2	0.36	179.68	179.32	1.52	0.1754	1.2757
	2_1	0.7624	0.5109	0.2515	1.385	0.1761	1.3169
	3	0.0894	179.52	179.43	1.2454	0.0981	2.6727
	3_1	0.2987	179.91	179.61	1.365	0.1032	2.4995
	4	3.1604	179.38	176.22	1.2851	0.1639	1.3361
	4_1	2.4749	179.94	177.46	1.335	0.15	1.72
3D PROFILE	4_2	2.3995	179.83	177.43	1.3353	0.1741	1.3676
	5(y=1mm)	1.7405	178.77	177.03	1.42	0.172	1.41
	5(y=2.5mm)	2.0983	178.72	176.62	1.38	0.1742	1.3435
	5(y=4mm)	2.2447	178.73	176.48	1.47	0.1704	1.496
	6(y=1mm)	0.4155	0.5017	0.0862	1.51	0.175	1.48
	6(y=2.5mm)	0.4963	0.444	0.0523	1.55	0.1958	1.3998
	6(y=4mm)	0.7395	0.2995	0.44	1.5	0.1995	1.382

Table 1 – Scanning results

Box number 2

Box2		MEASUREMENT					RADIUS(avrg) mm
		ANGLE °(L1-left)	ANGLE °(L2)	Delta ANGLE °	WIDTH mm	HEIGHTmm	
SINGLE PROFILE	1	179.84	0.9708	178.865	1.44	0.1008	2.9093
	1_2	0.726	179.52	178.797	1.39	0.0928	2.8251
	2	179.38	179.95	0.5674	1.4052	0.0873	3.0244
	2_1	0.0016	179.79	179.791	1.4	0.0797	3.1754
	3	0.1625	179.73	179.564	1.36	0.0508	4.7857
	3_1	0.2227	179.85	179.631	1.3752	0.0562	4.3308
	4	0.8923	179.37	178.475	1.585	0.1126	2.5962
	4_1	0.6679	179.21	178.54	1.5	0.1046	2.6088
3D PROFILE	4_2	0.5298	179.31	178.782	1.5	0.117	2.6272
	5(y=1mm)	0.7158	179.11	178.395	1.56	0.1151	2.7695
	5(y=2.5mm)	0.5909	178.66	178.064	1.4	0.1074	2.5589
	5(y=4mm)	0.9333	179.21	178.273	1.4001	0.1061	2.5778
	6(y=1mm)	179.83	0.1242	179.704	1.4701	0.0593	4.6297
	6(y=2.5mm)	179.78	0.1259	179.656	1.45	0.0663	3.7965
	6(y=4mm)	179.7	0.1789	179.521	1.45	0.0694	3.8841

Table 2 – Scanning results

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Box number 3

Box3		MEASUREMENT					RADIUS(avrg) mm
		ANGLE °(L1-left)	ANGLE °(L2)	Delta ANGLE °	WIDTH mm	HEIGHTmm	
SINGLE PROFILE	1	0.4722	179.53	179.062	1.465	0.067	3.7742
	1_2	1.0403	178.84	177.803	1.35	0.0514	4.4253
	2	0.5024	179.28	179.479	1.38	0.039	6.3436
	2_1	0.5176	0.2767	0.2408	1.4	0.0418	5.8192
	3	0.2195	179.4	179.179	1.2651	0.421	5.1959
	3_1	0.0393	179.62	179.577	1.55	0.0515	5.4309
	4	0.6421	179.62	179.975	1.5	0.0633	4.3078
	4_1	0.6571	179.43	178.777	1.49	0.0623	3.963
	4_2	1.0216	179.46	178.441	1.4	0.0569	4.1335
3D PROFILE	5(y=1mm)	0.7906	178.67	177.876	1.4351	0.0616	4.1951
	5(y=2.5mm)	0.7155	178.97	178.25	1.49	0.0548	4.7378
	5(y=4mm)	0.4494	179.03	178.576	1.51	0.0589	4.3184
	6(y=1mm)	0.2629	179.51	179.25	1.49	0.0415	6.3063
	6(y=2.5mm)	179.99	179.46	0.5298	1.37	0.0366	7.113
	6(y=4mm)	179.79	179.57	0.2181	1.46	0.0431	6.1118

Table 3 – Scanning results**Box number 4**

Box4		MEASUREMENT					RADIUS(avrg) mm
		ANGLE °(L1-left)	ANGLE °(L2)	Delta ANGLE °	WIDTH mm	HEIGHTmm	
SINGLE PROFILE	1	0.0865	179.8	179.709	1.385	0.0518	5.1528
	1_2	0.099	179.88	179.78	1.41	0.0447	5.8217
	2	0.5289	179.92	179.387	1.44	0.0877	3.1769
	2_1	0.6333	179.46	178.825	1.35	0.0855	3.0039
	3	179.59	178.98	0.6044	1.2702	0.0706	3.1507
	3_1	179.93	179.4	0.5378	1.3154	0.092	2.7839
	4	0.7335	179.81	179.074	1.29	0.0592	4.0872
	4_1	0.3438	179.69	179.348	1.425	0.0617	4.1413
	4_2	0.0458	0.0431	0.0026	1.6352	0.0781	4.8259
3D PROFILE	5(y=1mm)	0.2984	0.1114	0.1869	1.3	0.0544	4.1722
	5(y=2.5mm)	180	0.1136	179.886	1.33	0.0517	4.3232
	5(y=4mm)	0.3043	179.85	179.543	1.4201	0.0549	4.6933
	6(y=1mm)	0.181	179.45	179.271	1.28	0.0744	2.8336
	6(y=2.5mm)	0.3828	179.39	179.004	1.3501	0.0877	2.709
	6(y=4mm)	0.2088	179.15	178.943	1.31	0.085	2.8616

Table 4 – Scanning results

Box number 5a

Box5a		MEASUREMENT					
		ANGLE °(L1-left)	ANGLE °(L2)	Delta ANGLE °	WIDTH mm	HEIGHTmm	RADIUS(avrg) mm
SINGLE PROFILE	1	0.3833	179.77	179.387	1.2651	0.1374	1.5035
	1_2	0.901	0.0331	0.8669	1.345	0.1487	1.5228
	2	179.47	0.1351	179.34	1.2405	0.0981	2.0446
	2_1	179.84	0.3807	179.461	1.2355	0.0971	1.9107
	3	179.83	179.74	0.0892	1.2751	0.0705	3.0211
	3_1	179.49	179.92	0.4312	1.2502	0.0849	2.2375
	4	0.1853	179.63	179.441	1.205	0.1127	1.6188
	4_1	179.92	179.36	0.5608	1.26	0.1064	1.9381
	4_2	0.1312	0.139	0.0078	1.22	0.1058	1.9543
3D PROFILE	5(y=1mm)	0.6281	179.85	179.225	1.26	0.1101	1.928
	5(y=2.5mm)	0.507	179.72	179.213	1.26	0.1058	1.8533
	5(y=4mm)	0.2801	179.77	179.492	1.29	0.1169	1.7726
	6(y=1mm)	0.1016	179.86	179.761	1.35	0.0889	2.7527
	6(y=2.5mm)	179.89	0.1652	179.628	1.3201	0.0853	2.6363
	6(y=4mm)	0.2398	179.75	179.506	1.32	0.0984	2.225

Table 5 – Scanning results

Box number 5f

Box 5f		MEASUREMENT					
		ANGLE °(L1-left)	ANGLE °(L2)	Delta ANGLE °	WIDTH mm	HEIGHTmm	RADIUS(avrg) mm
SINGLE PROFILE	1	1.0909	179.85	178.763	1.2956	0.1551	1.4386
	1_2	0.5877	179.62	179.034	1.2954	0.157	1.4004
	2	179.94	0.1645	179.571	1.3752	0.0829	2.6585
	2_1	179.97	0.108	179.861	1.2553	0.1018	2.1046
	3	179.87	0.083	179.783	1.3052	0.0624	3.3881
	3_1	179.99	179.85	0.14	1.3052	0.0934	2.2624
	4	0.502	179.73	179.226	1.2301	0.1068	1.92
	4_1	0.1664	179.42	179.25	1.245	0.112	1.8895
	4_2	0.5838	179.72	179.137	1.2402	0.1106	1.8261
3D PROFILE	5(y=1mm)	0.5409	179.75	179.213	1.2701	0.0985	1.9686
	5(y=2.5mm)	0.5726	179.76	179.184	1.33	0.1055	1.9429
	5(y=4mm)	0.4435	179.63	179.186	1.26	0.1023	2.006
	6(y=1mm)	0.6825	0.6485	0.0339	1.3101	0.0836	2.6327
	6(y=2.5mm)	0.6147	0.5382	0.0764	1.34	0.087	2.5375
	6(y=4mm)	0.5854	0.2978	0.2876	1.2702	0.0775	2.4254

Table 6 – Scanning results



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Box number 6

Box6		MEASUREMENT							
		ANGLE °(L1-left)	ANGLE °(L2)	Delta ANGLE °	WIDTH mm	HEIGHTmm	RADIUS(avrg) mm		
SINGLE PROFILE	1	0.4187	179.16	178.74	1.2201	0.0757	2.6372		
	1_2	0.1063	179.44	179.337	1.22	0.0695	2.8429		
	2	179.99	179.81	0.179	1.2051	0.0421	5.2103		
	2_1	0.3144	179.98	179.644	1.1	0.0485	3.3396		
	3	178.04	0.9842	177.056	0.915	0.1171	0.9757		
	3_1	177.79	0.8206	176.97	1.14	0.1221	1.3564		
	4	179.93	179.12	0.806	1.2101	0.0659	2.7617		
	4_1	179.81	179.16	0.655	1.245	0.058	3.6388		
	4_2	0.3008	179.23	178.929	1.07	0.0612	2.9519		
3D PROFILE	damaged zone(y=1.25mm)	178.79		1.051		177.74	0.9	0.1124	0.9753
	5(y=1mm)	0.3147		178.74		178.424	1.3	0.0517	3.9445
	5(y=2.5mm)	179.95		178.97		0.9862	1.26	0.0502	3.7327
	5(y=4mm)	179.97		179.25		0.7183	1.22	0.0542	3.5475
	6(y=1mm)	0.7437		0.0388		0.7048	1.31	0.0586	3.9113
	6(y=2.5mm)	0.5265		0.0008		0.5256	1.28	0.0529	3.6518
	6(y=4mm)	0.5921		179.8		179.21	1.29	0.0468	4.1653

Table 7 – Scanning results

Note: We did not include scanning results for Box1b, Box5b, Box5c, Box5d, Box5e and Box5g in this report.



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Profile Scanning – Box 5F

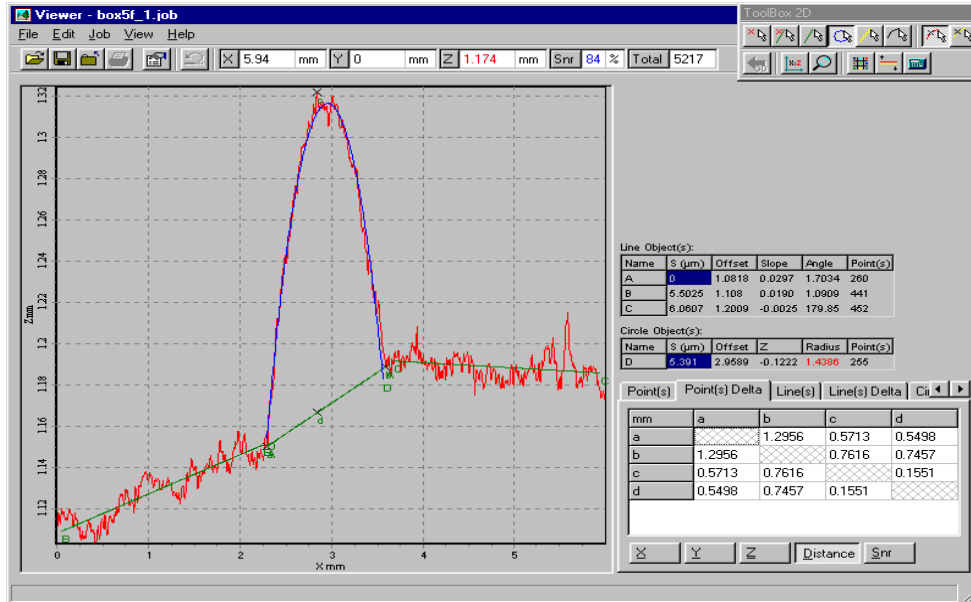


Figure 4 – Profile 1 – 2

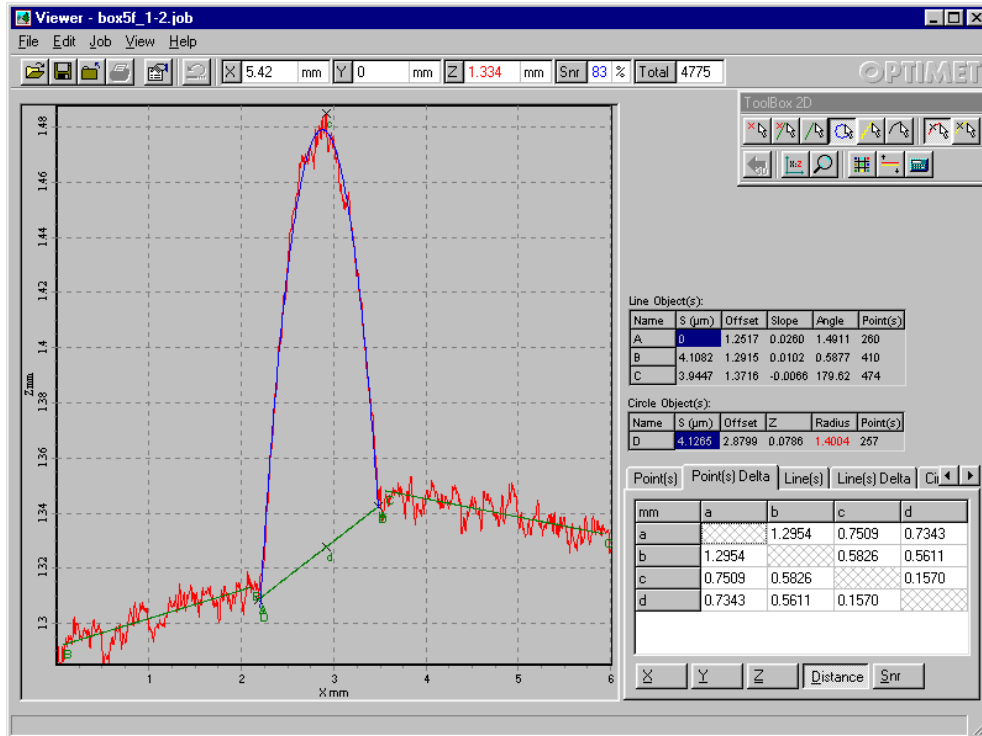


Figure 5 – Profile 1 – 2



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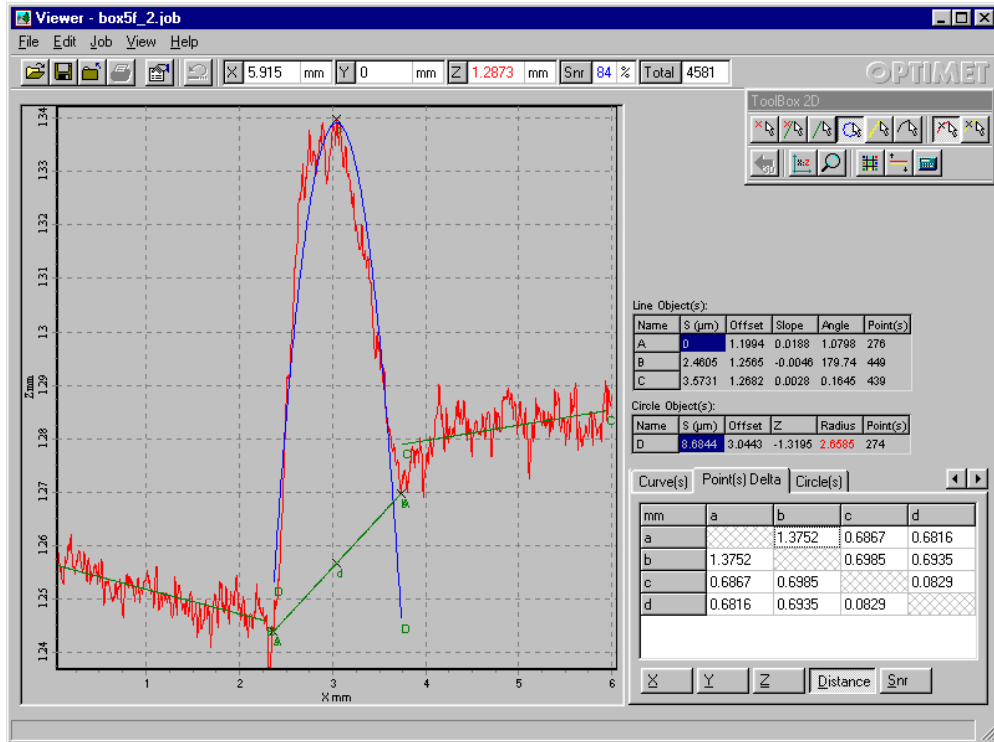


Figure 6 – Profile 2 – 1

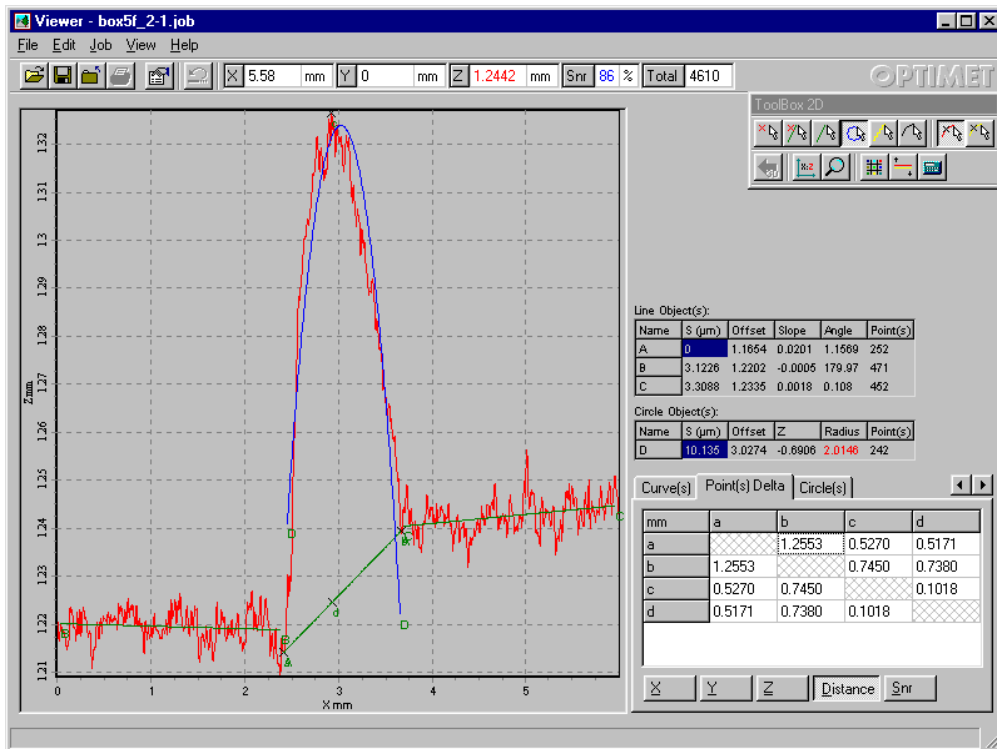


Figure 7 – Profile 2 – 2



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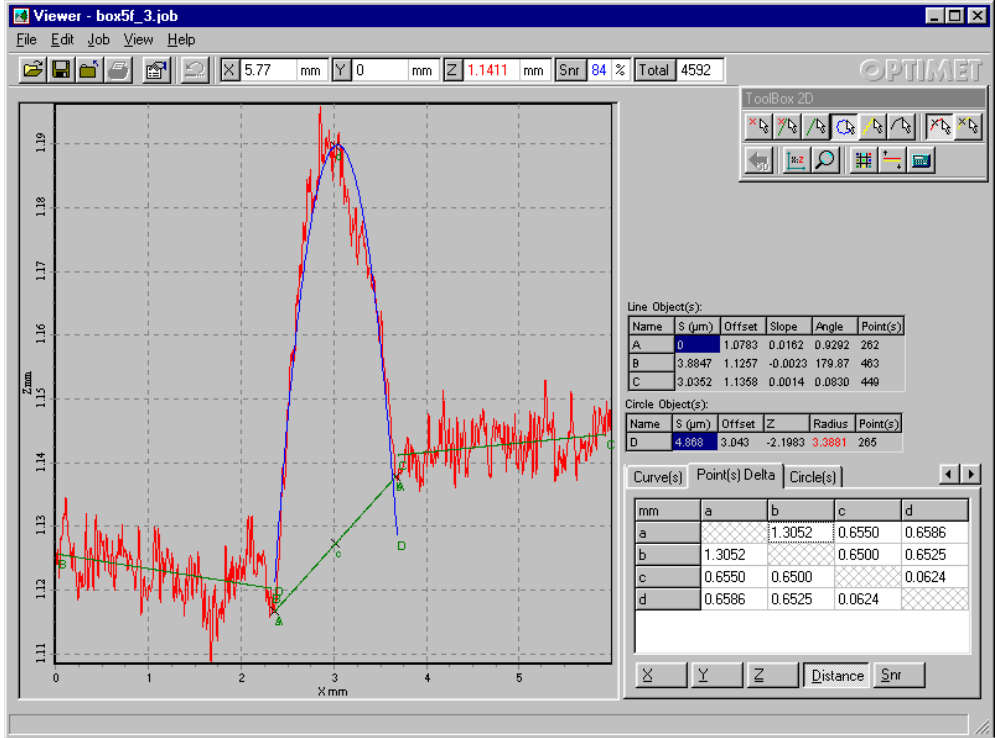


Figure 8 – Profile 3 – 1

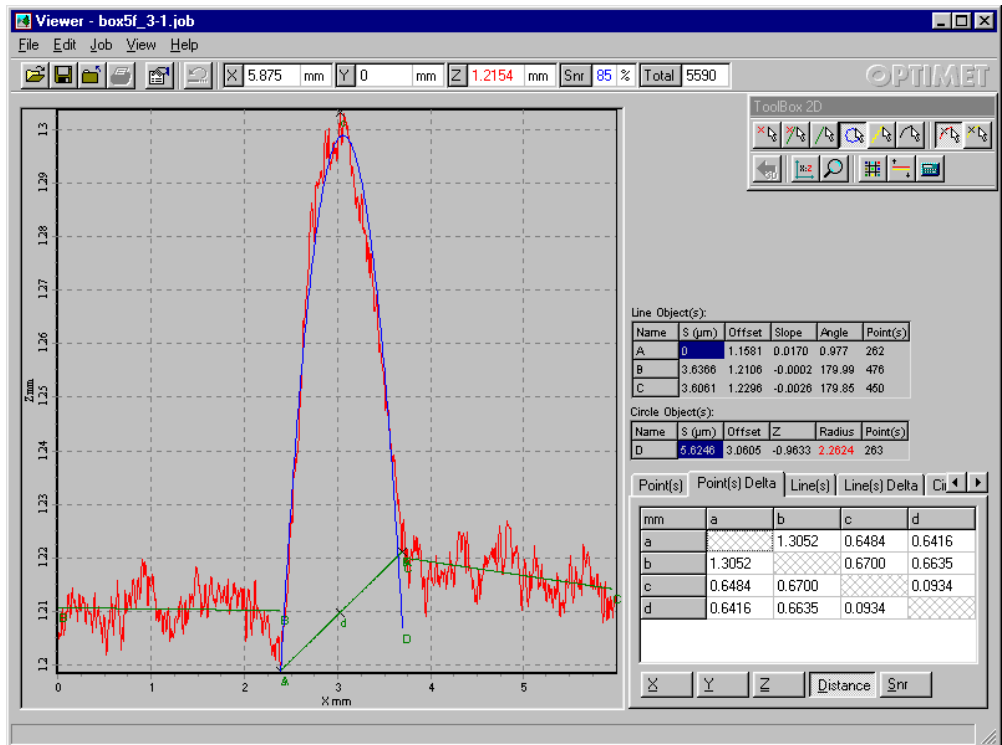


Figure 9 – Profile 3 – 2



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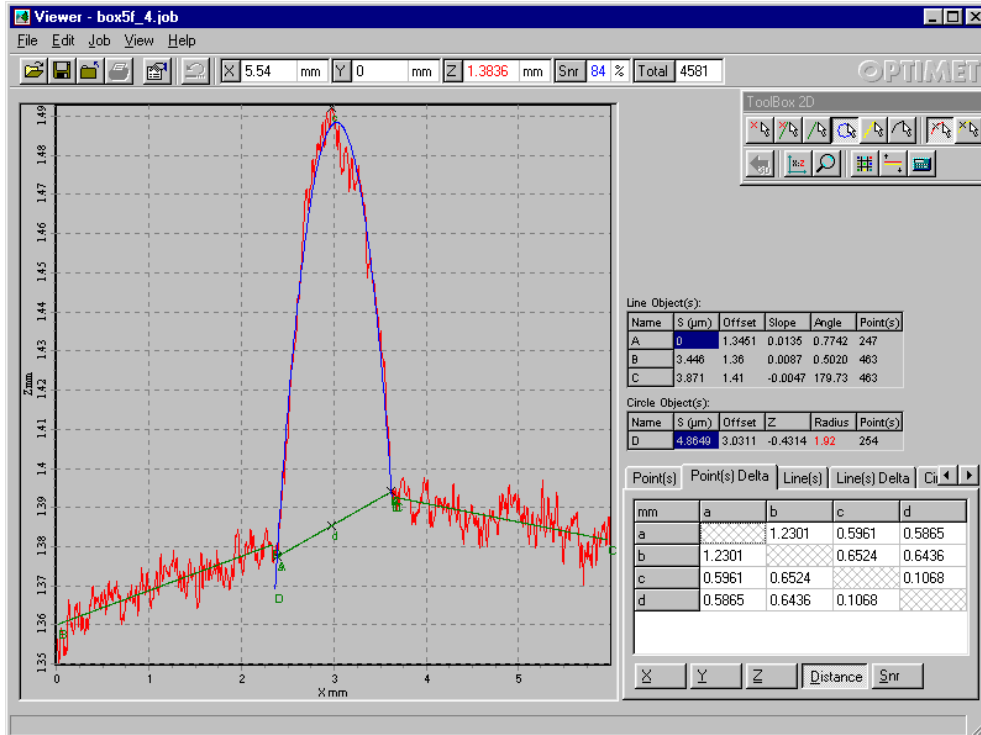


Figure 10 – Profile 4 – 1

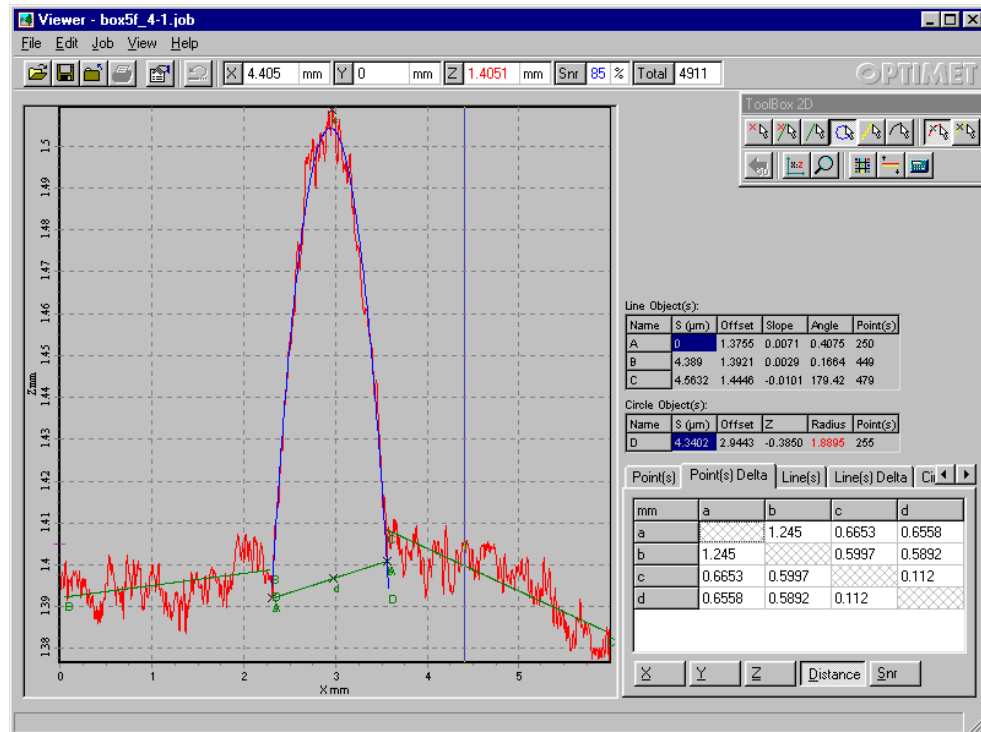


Figure 11 – Profile 4 – 2



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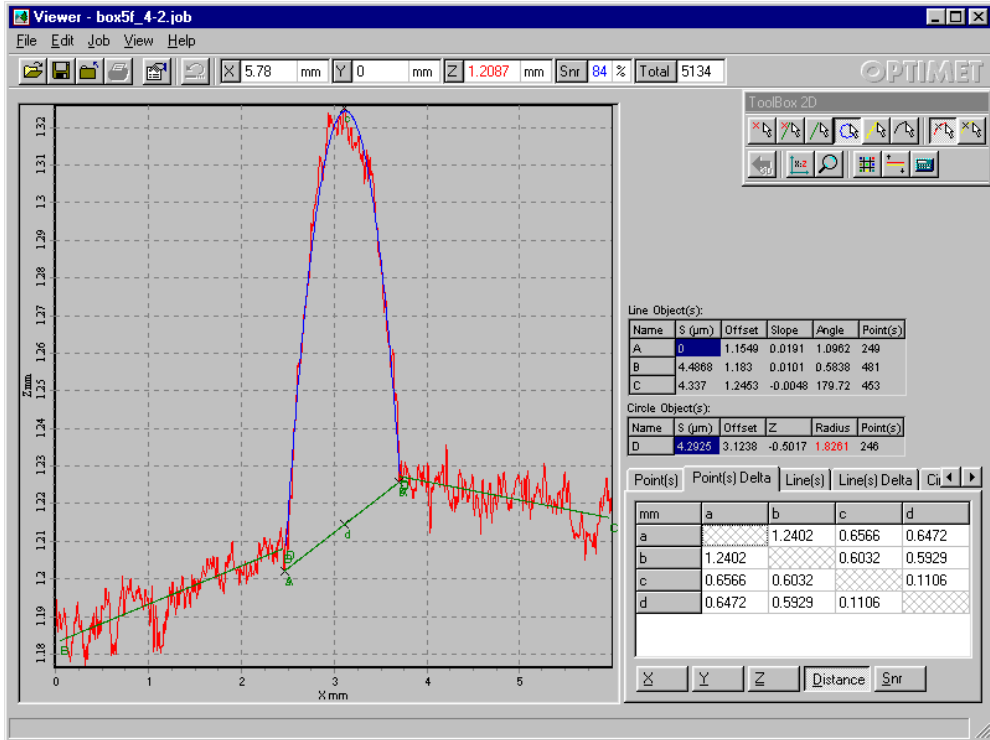


Figure 12 – Profile 4 – 3

Tridimensional Scanning – Box 5F

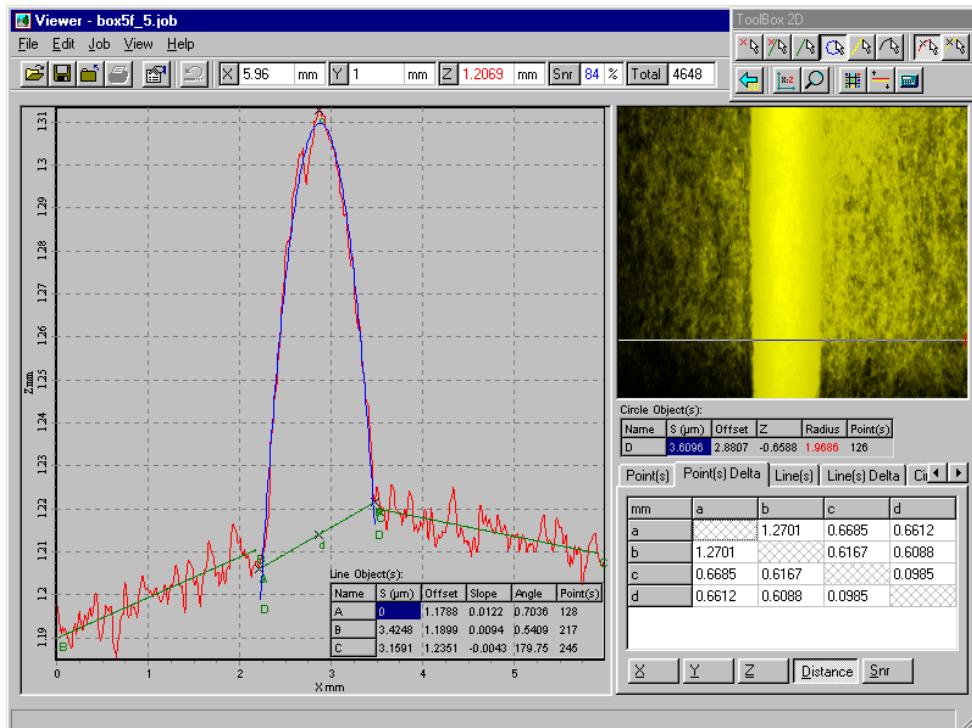


Figure 13 – Profile 5 (y=1mm)



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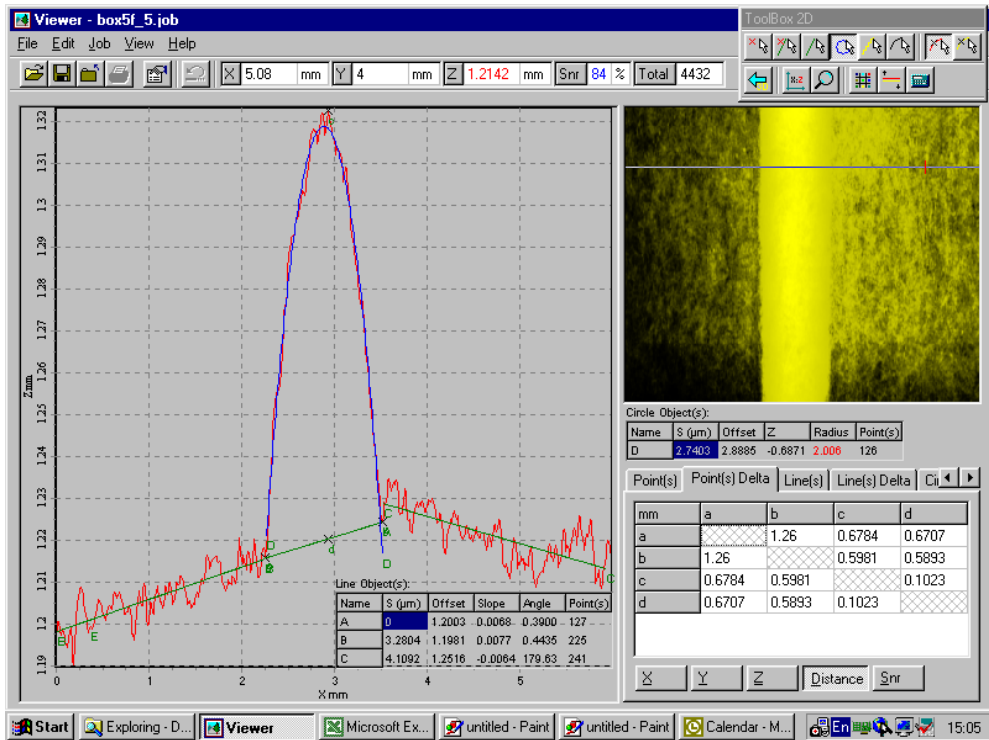


Figure 14 – Profile 5 (y=2.5mm)

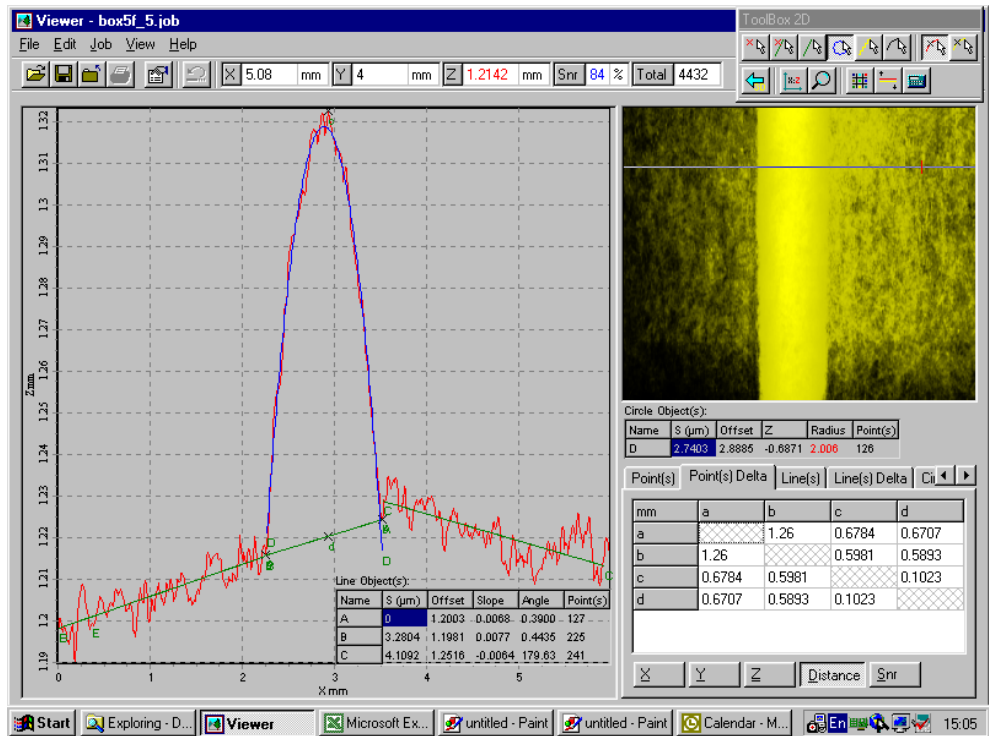


Figure 15 – Profile 5 (y=4mm)



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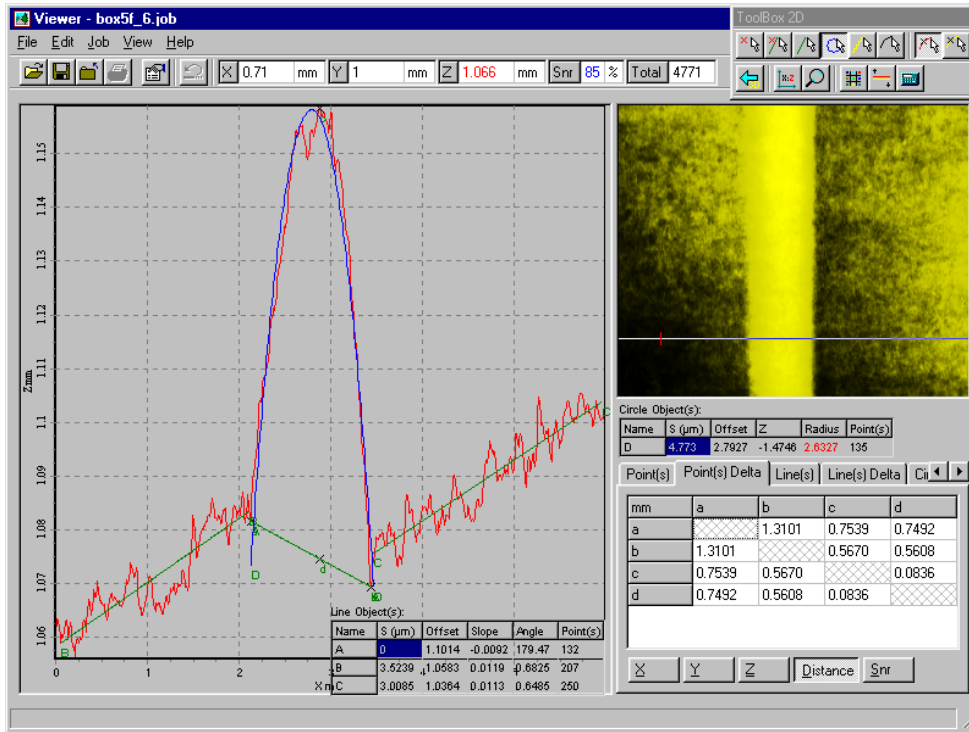


Figure 16 – Profile 6 (y=1mm)

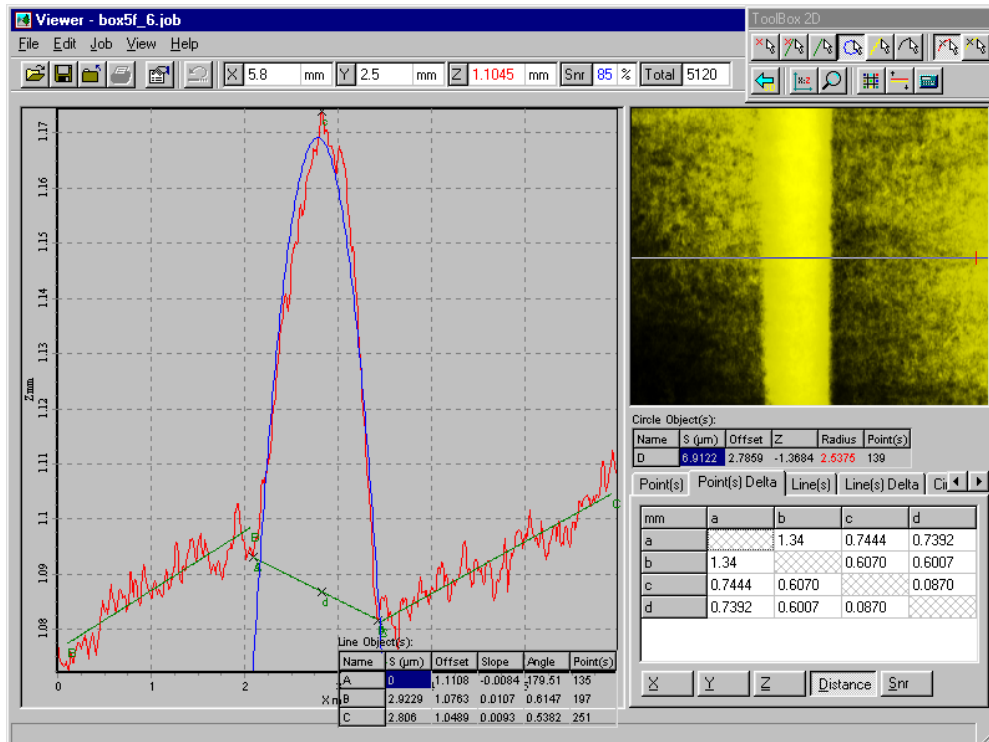


Figure 17 – Profile 6 (y=2.5mm)



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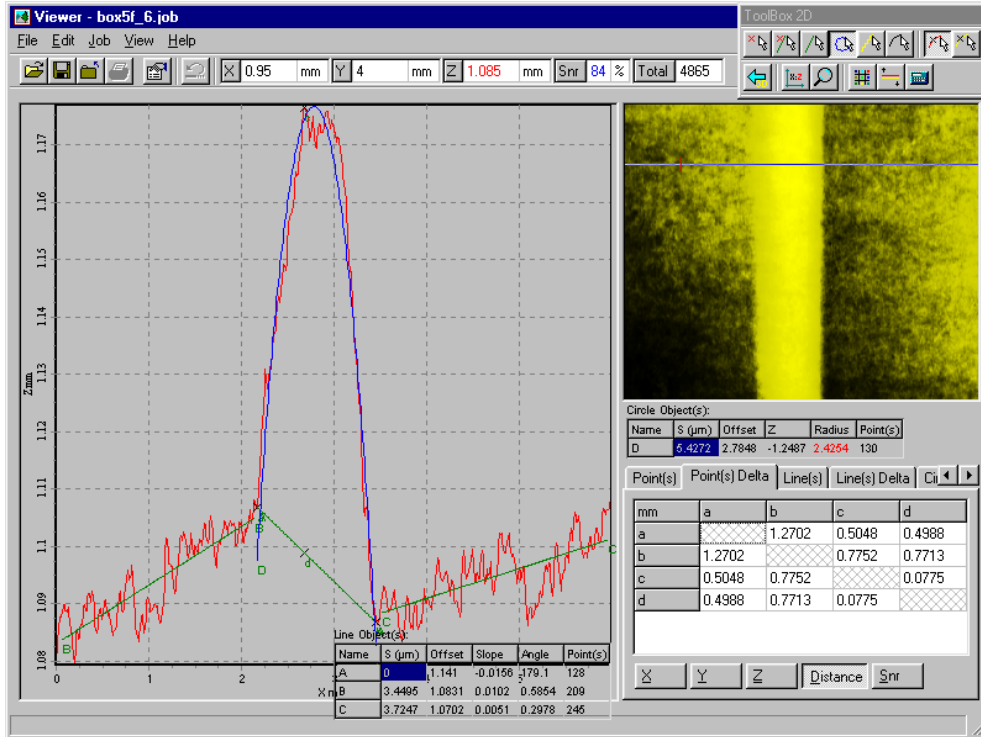


Figure 18 – Profile 6 (y=4mm)

4. Data:

Parameter	Value
Reflective/Diffusive/Transparent/Translucent	Diffusive
Working Range (mm)	1.8
Precision (µm)	3
Stand Off (mm)	15
Max. Data Rate (Hz)	9KHz
Lateral Resolution(µm)	12
Z Resolution	-
Application Category	-