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**APPENDIX A**  
**THE Q/M VALUES OF VARIOUS DEVELOPERS EVALUATED**  
**BY A BLOW OFF MEASUREMENT UNIT**

Developer                      KT-16a toner and F-200 carrier  
 Concentration                1, 2, 3, 5, 7, 10 wt%  
 Speed                            600 rpm.

Table A-1 : q/m values of developer, KT-16a and F-200, at 600 rpm.  
 by MS1 Minishaker at 55±3 %RH and 26±2°C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (-μC/g)
1 wt%	30	0.23	0.0013	4.25
	60	1.17	0.0029	9.68
	120	1.04	0.0025	9.98
	240	0.78	0.0018	10.40
	360	0.49	0.0012	9.80
	720	0.87	0.0024	8.70
2 wt%	30	0.72	0.0040	4.32
	60	1.21	0.0056	5.19
	120	1.42	0.0046	7.41
	240	1.18	0.0032	8.85
	360	1.76	0.0048	8.80
	720	1.21	0.0034	8.54
3 wt%	30	2.76	0.0162	4.09
	60	0.96	0.0041	5.62
	120	3.10	0.0105	7.09
	240	2.08	0.0068	7.34
	360	2.04	0.0063	7.77
	720	2.00	0.0061	7.87
5 wt%	30	2.37	0.0301	1.89
	60	2.12	0.0107	4.76
	120	2.29	0.0084	6.54
	240	4.13	0.0139	7.13
	360	2.19	0.0073	7.20
	720	4.18	0.0139	7.22
7 wt%	30	0.90	0.0317	0.68
	60	11.31	0.0644	4.21
	120	4.24	0.0168	6.06
	240	5.92	0.0214	6.64
	360	1.59	0.0055	6.94
	720	1.99	0.0067	7.13
10 wt%	30	0.88	0.0536	0.39
	60	3.33	0.0330	2.42
	120	7.54	0.0401	4.51
	240	5.95	0.0255	5.60
	360	3.67	0.0152	5.79
	720	4.66	0.0185	6.05

Developer KT-16a toner and F-200 carrier  
 Concentration 1, 2, 3, 5, 7, 10 wt%  
 Speed 800 rpm.

Table A-2 : q/m values of developer, KT-16a and F-200, at 800 rpm.  
 by MS1 Minishaker at  $55 \pm 3$  %RH and  $26 \pm 2$  °C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
1 wt%	30	0.61	0.0023	6.37
	60	0.80	0.0019	10.11
	120	0.55	0.0013	10.15
	240	0.69	0.0019	8.71
	360	0.87	0.0027	7.73
	720	0.59	0.0020	7.08
2 wt%	30	2.24	0.0096	5.60
	60	1.96	0.0063	6.44
	120	1.49	0.0044	8.13
	240	1.15	0.0031	8.90
	360	1.82	0.0049	8.91
	720	1.87	0.0049	9.16
3 wt%	30	0.94	0.0042	5.37
	60	2.72	0.0102	6.40
	120	1.65	0.0052	7.62
	240	2.05	0.0058	8.48
	360	2.36	0.0063	8.99
	720	2.16	0.0056	9.26
5 wt%	30	3.40	0.0287	2.84
	60	2.45	0.0103	5.66
	120	1.18	0.0043	6.59
	240	1.99	0.0062	7.70
	360	2.99	0.0084	8.54
	720	2.74	0.0075	8.77
7 wt%	30	1.23	0.0077	3.83
	60	3.26	0.0152	5.15
	120	2.99	0.0117	6.13
	240	2.43	0.0082	7.11
	360	4.46	0.0135	7.93
	720	4.80	0.0138	8.35
10 wt%	30	2.79	0.0344	1.95
	60	2.20	0.0161	3.28
	120	3.37	0.0166	4.87
	240	5.09	0.0172	7.10
	360	4.03	0.0134	7.22
	720	3.45	0.0114	7.26

Developer                      KT-16a toner and F-200 carrier  
 Concentration                1, 2, 3, 5, 7, 10 wt%  
 Speed                            1000 rpm.

Table A-3 : q/m values of developer, KT-16a and F-200, at 1000 rpm.  
 by MS1 Minishaker at  $55 \pm 3$  %RH and  $26 \pm 2$  °C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
1 wt%	30	0.59	0.0013	10.89
	60	0.67	0.0013	12.37
	120	0.57	0.0009	15.20
	240	1.01	0.0025	9.70
	360	0.91	0.0021	10.40
	720	0.67	0.0017	9.46
2 wt%	30	1.19	0.0032	8.93
	60	1.23	0.0028	10.54
	120	1.25	0.0028	10.71
	240	1.38	0.0031	10.68
	360	1.14	0.0025	10.94
	720	1.43	0.0027	12.71
3 wt%	30	0.68	0.0022	7.42
	60	1.67	0.0043	9.32
	120	0.97	0.0023	10.12
	240	1.58	0.0036	10.53
	360	1.39	0.0031	10.76
	720	1.20	0.0026	11.07
5 wt%	30	2.98	0.0098	7.30
	60	3.80	0.0105	8.69
	120	2.09	0.0057	8.80
	240	2.08	0.0053	9.42
	360	1.65	0.0040	9.90
	720	1.44	0.0034	10.16
7 wt%	30	4.55	0.0162	6.74
	60	3.31	0.0117	6.79
	120	2.40	0.0064	9.00
	240	1.41	0.0038	8.91
	360	2.91	0.0074	9.44
	720	3.82	0.0096	9.55
10 wt%	30	4.85	0.0187	6.22
	60	4.39	0.0155	6.80
	120	3.99	0.0119	8.05
	240	2.66	0.0087	7.34
	360	1.07	0.0098	2.62
	720	5.69	0.0171	7.99



Developer KT-16a toner and F-200 carrier  
 Concentration 3 wt%  
 Speed 400 rpm.

Table A-4 : q/m values of developer, KT-16a and F-200, at 400 rpm.  
 by MS1 Minishaker at  $55 \pm 3$  %RH and  $26 \pm 2$  °C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
3 wt%	30	0.11	0.0263	0.10
	60	0.54	0.0481	0.27
	120	1.21	0.0098	2.96
	240	1.18	0.0068	4.16
	360	2.01	0.0106	4.55
	720	0.93	0.0035	6.38

Developer KT-16a toner and F-200 carrier  
 Concentration 3 wt%  
 Speed 1200 rpm.

Table A-5 : q/m values of developer, KT-16a and F-200, at 1200 rpm.  
 by MS1 Minishaker at  $55 \pm 3$  %RH and  $26 \pm 2$  °C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
3 wt%	30	0.93	0.0027	8.27
	60	1.55	0.0039	9.54
	120	1.19	0.0024	11.90
	240	1.28	0.0025	12.29
	360	2.54	0.0050	12.19
	720	1.00	0.0020	12.00

Developer KT-16a toner and F-200 carrier  
 Concentration 3 wt%  
 Speed 1400 rpm.

Table A-6 : q/m values of developer, KT-16a and F-200, at 1400 rpm.  
 by MS1 Minishaker at  $55 \pm 3$  %RH and  $26 \pm 2$  °C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
3 wt%	30	1.63	0.0042	9.31
	60	1.50	0.0034	10.59
	120	0.68	0.0013	12.55
	240	0.54	0.0009	14.40
	360	0.52	0.0011	11.35
	720	0.64	0.0014	10.97

Developer                   KT-16a toner and TSV-200 (17  $\mu$ A) carrier  
 Concentration            1, 2, 3, 5, 7, 10 wt%  
 Speed                       600 rpm.

Table A-7 : q/m values of developer, KT-16a and TSV-200 (17  $\mu$ A),  
 at 600 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 26 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu$ C/g)
1 wt%	30	0.36	0.0014	6.17
	60	0.22	0.0005	10.56
	120	0.32	0.0005	12.80
	240	0.59	0.0009	15.73
	360	0.62	0.0010	14.88
	720	0.53	0.0009	14.13
2 wt%	30	0.87	0.0021	9.94
	60	0.60	0.0014	10.29
	120	0.64	0.0012	12.80
	240	0.56	0.0009	14.93
	360	0.69	0.0011	15.05
	720	0.69	0.0011	15.05
3 wt%	30	1.63	0.0076	5.15
	60	2.15	0.0070	7.37
	120	1.31	0.0030	10.48
	240	1.08	0.0020	12.96
	360	0.71	0.0013	13.11
	720	0.50	0.0009	13.33
5 wt%	30	6.03	0.0492	2.94
	60	2.67	0.0088	7.28
	120	2.18	0.0051	10.26
	240	2.86	0.0059	11.63
	360	1.77	0.0037	11.48
	720	1.14	0.0023	11.90
7 wt%	30	4.54	0.0516	2.11
	60	6.97	0.0034	4.92
	120	3.39	0.0103	7.90
	240	1.89	0.0055	8.25
	360	1.76	0.0050	8.45
	720	2.77	0.0074	8.98
10 wt%	30	2.39	0.1371	0.42
	60	3.53	0.0284	2.98
	120	14.68	0.0729	4.83
	240	4.64	0.0187	6.34
	360	1.35	0.0069	4.70
	720	2.87	0.0125	5.51



Developer KT-16a toner and TSV-200 (17  $\mu$ A) carrier  
 Concentration 1, 2, 3, 5, 7, 10 wt%  
 Speed 800 rpm.

Table A-8 : q/m values of developer, KT-16a and TSV-200 (17  $\mu$ A),  
 at 800 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 26 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu$ C/g)
1 wt%	30	0.01	0.0006	0.40
	60	0.06	0.0006	2.40
	120	0.46	0.0013	8.49
	240	0.76	0.0015	12.16
	360	0.35	0.0009	9.33
	720	0.16	0.0012	3.20
2 wt%	30	0.67	0.0015	10.72
	60	0.33	0.0006	13.20
	120	0.54	0.0009	14.40
	240	0.60	0.0009	16.00
	360	0.27	0.0004	16.20
	720	0.62	0.0009	16.53
3 wt%	30	1.20	0.0041	7.02
	60	0.68	0.0020	8.16
	120	0.97	0.0019	12.25
	240	0.75	0.0013	13.85
	360	0.58	0.0010	13.92
	720	0.58	0.0010	13.92
5 wt%	30	1.68	0.0058	6.95
	60	3.19	0.0099	7.73
	120	1.99	0.0046	10.38
	240	2.11	0.0043	11.78
	360	1.04	0.0020	12.48
	720	1.64	0.0031	12.69
7 wt%	30	3.25	0.0145	5.38
	60	3.09	0.0110	6.74
	120	1.95	0.0058	8.07
	240	2.73	0.0076	8.62
	360	2.34	0.0058	9.68
	720	3.17	0.0085	10.48
10 wt%	30	4.24	0.0261	3.90
	60	3.44	0.0210	3.93
	120	2.28	0.0080	6.84
	240	2.46	0.0082	7.20
	360	4.06	0.0139	7.01
	720	1.97	0.0070	6.75

Developer KT-16a toner and TSV-200 (17  $\mu$ A) carrier  
 Concentration 1, 2, 3, 5, 7, 10 wt%  
 Speed 1000 rpm.

Table A-9 : q/m values of developer, KT-16a and TSV-200 (17  $\mu$ A),  
 at 1000 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 26 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu$ C/g)
1 wt%	30	0.37	0.0006	14.80
	60	0.53	0.0008	15.90
	120	0.41	0.0006	16.40
	240	0.39	0.0004	23.40
	360	0.61	0.0008	18.30
	720	0.67	0.0009	17.87
2 wt%	30	0.45	0.0008	13.50
	60	0.33	0.0005	15.84
	120	0.62	0.0008	18.60
	240	0.49	0.0006	19.60
	360	0.52	0.0006	20.80
	720	0.58	0.0007	19.89
3 wt%	30	0.53	0.0010	12.72
	60	0.41	0.0007	14.06
	120	0.43	0.0006	17.20
	240	0.68	0.0009	18.13
	360	0.63	0.0008	18.90
	720	0.56	0.0007	19.20
5 wt%	30	0.75	0.0015	12.00
	60	1.08	0.0018	14.40
	120	1.30	0.0021	14.86
	240	0.83	0.0014	14.22
	360	1.15	0.0019	14.53
	720	1.15	0.0022	12.54
7 wt%	30	2.54	0.0059	10.32
	60	1.34	0.0030	10.72
	120	2.73	0.0063	10.40
	240	2.07	0.0051	9.74
	360	2.00	0.0050	9.60
	720	1.15	0.0036	7.67
10 wt%	30	1.29	0.0051	6.07
	60	3.03	0.0112	6.49
	120	2.88	0.0110	6.28
	240	2.78	0.0103	6.48
	360	2.96	0.0103	6.89
	720	1.66	0.0077	5.17

Developer KT-16a toner and TSV-200 (17  $\mu\text{A}$ ) carrier  
 Concentration 3 wt%  
 Speed 400 rpm.

Table A-10 : q/m values of developer, KT-16a and TSV-200 (17  $\mu\text{A}$ ),  
 at 400 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 26 $\pm$ 2 $^{\circ}\text{C}$

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu\text{C/g}$ )
3 wt%	30	0.81	0.0850	0.23
	60	4.47	0.0614	1.75
	120	1.44	0.0056	6.17
	240	1.89	0.0052	8.72
	360	1.64	0.0044	8.95
	720	1.05	0.0028	9.00

Developer KT-16a toner and TSV-200 (17  $\mu\text{A}$ ) carrier  
 Concentration 3 wt%  
 Speed 1200 rpm.

Table A-11 : q/m values of developer, KT-16a and TSV-200 (17  $\mu\text{A}$ ),  
 at 1200 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 26 $\pm$ 2 $^{\circ}\text{C}$

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu\text{C/g}$ )
3 wt%	30	0.67	0.0010	16.08
	60	0.74	0.0010	17.76
	120	0.80	0.0010	19.20
	240	0.80	0.0011	17.45
	360	0.64	0.0009	17.07
	720	0.56	0.0009	14.93

Developer KT-16a toner and TSV-200 (17  $\mu\text{A}$ ) carrier  
 Concentration 3 wt%  
 Speed 1400 rpm.

Table A-12 : q/m values of developer, KT-16a and TSV-200 (17  $\mu\text{A}$ ),  
 at 1400 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 26 $\pm$ 2 $^{\circ}\text{C}$

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu\text{C/g}$ )
3 wt%	30	0.67	0.0010	16.08
	60	0.77	0.0010	18.48
	120	0.56	0.0008	16.80
	240	0.78	0.0012	15.60
	360	0.51	0.0009	13.60
	720	0.62	0.0012	12.40

Developer N-09S toner and TSV-200 (17  $\mu$ A) carrier  
 Concentration 5 wt%  
 Speed 400 rpm.

Table A-13 : q/m values of developer, N-09S and TSV-200 (17  $\mu$ A),  
 at 400 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 27 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
5 wt%	30	0.59	0.0987	0.14
	60	1.90	0.1903	0.24
	120	2.01	0.0390	1.24
	240	0.52	0.0023	5.43
	360	0.50	0.0010	12.00
	720	0.78	0.0011	17.02

Developer N-09S toner and TSV-200 (17  $\mu$ A) carrier  
 Concentration 5 wt%  
 Speed 600 rpm.

Table A-14 : q/m values of developer, N-09S and TSV-200 (17  $\mu$ A),  
 at 600 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 27 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
5 wt%	30	2.77	0.0177	3.76
	60	0.79	0.0021	9.03
	120	0.92	0.0018	12.27
	240	0.54	0.0008	16.20
	360	0.24	0.0003	19.20
	720	0.51	0.0006	20.40

Developer N-09S toner and TSV-200 (17  $\mu$ A) carrier  
 Concentration 5 wt%  
 Speed 800 rpm.

Table A-15 : q/m values of developer, N-09S and TSV-200 (17  $\mu$ A),  
 at 800 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 27 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
5 wt%	30	0.89	0.0013	16.43
	60	0.25	0.0003	20.00
	120	0.39	0.0004	23.40
	240	0.62	0.0006	24.80
	360	0.74	0.0007	25.37
	720	0.56	0.0005	26.88

Developer N-09S toner and TSV-200 (17  $\mu$ A) carrier  
 Concentration 5 wt%  
 Speed 1000 rpm.

Table A-16 : q/m values of developer, N-09S and TSV-200 (17  $\mu$ A),  
 at 1000 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 27 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu$ C/g)
5 wt%	30	0.31	0.0004	18.60
	60	0.61	0.0007	20.91
	120	0.53	0.0005	25.44
	240	0.36	0.0003	28.80
	360	0.24	0.0002	28.80
	720	0.71	0.0006	28.40

Developer N-09S toner and TSV-200 (17  $\mu$ A) carrier  
 Concentration 5 wt%  
 Speed 1200 rpm.

Table A-17 : q/m values of developer, N-09S and TSV-200 (17  $\mu$ A),  
 at 1200 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 27 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu$ C/g)
5 wt%	30	0.74	0.0007	25.37
	60	0.79	0.0007	27.09
	120	0.74	0.0007	25.37
	240	0.70	0.0010	16.80
	360	0.46	0.0008	13.80
	720	0.27	0.0006	10.80

Developer N-09S toner and TSV-200 (17  $\mu$ A) carrier  
 Concentration 5 wt%  
 Speed 1400 rpm.

Table A-18 : q/m values of developer, N-09S and TSV-200 (17  $\mu$ A),  
 at 1400 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 27 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu$ C/g)
5 wt%	30	0.66	0.0006	26.40
	60	0.65	0.0005	31.20
	120	0.85	0.0008	25.50
	240	0.92	0.0010	22.08
	360	0.84	0.0010	20.16
	720	0.41	0.0006	16.40

Developer N-09S toner and F-200 carrier  
 Concentration 5 wt%  
 Speed 400 rpm.

Table A-19 : q/m values of developer, N-09S and F-200, at 400 rpm.  
 by MS1 Minishaker at  $55\pm 3$  %RH and  $27\pm 2$ °C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
5 wt%	30	0.79	0.1174	0.16
	60	1.15	0.1045	0.26
	120	2.50	0.1247	0.48
	240	2.44	0.0568	1.03
	360	6.17	0.0150	9.87
	720	2.36	0.0033	17.16

Developer N-09S toner and F-200 carrier  
 Concentration 5 wt%  
 Speed 600 rpm.

Table A-20 : q/m values of developer, N-09S and F-200, at 600 rpm.  
 by MS1 Minishaker at  $55\pm 3$  %RH and  $27\pm 2$ °C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
5 wt%	30	0.96	0.0119	1.94
	60	1.17	0.0042	6.69
	120	0.35	0.0009	9.33
	240	0.35	0.0006	14.00
	360	0.36	0.0005	17.28
	720	0.47	0.0006	18.80

Developer N-09S toner and F-200 carrier  
 Concentration 5 wt%  
 Speed 800 rpm.

Table A-21 : q/m values of developer, N-09S and F-200, at 800 rpm.  
 by MS1 Minishaker at  $55\pm 3$  %RH and  $27\pm 2$ °C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m (- $\mu$ C/g)
5 wt%	30	3.05	0.0052	14.08
	60	1.52	0.0018	20.27
	120	1.20	0.0013	22.15
	240	1.21	0.0012	24.20
	360	1.48	0.0014	25.37
	720	1.05	0.0010	25.20



Developer N-09S toner and F-200 carrier  
 Concentration 5 wt%  
 Speed 1000 rpm.

Table A-22 : q/m values of developer, N-09S and F-200, at 1000 rpm.  
 by MS1 Minishaker at  $55 \pm 3$  %RH and  $27 \pm 2^\circ\text{C}$

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu\text{C/g}$ )
5 wt%	30	1.17	0.0017	16.52
	60	1.22	0.0014	20.91
	120	1.20	0.0012	24.00
	240	0.73	0.0007	25.03
	360	3.16	0.0029	26.15
	720	1.74	0.0016	26.10

Developer N-09S toner and F-200 carrier  
 Concentration 5 wt%  
 Speed 1200 rpm.

Table A-23 : q/m values of developer, N-09S and F-200, at 1200 rpm.  
 by MS1 Minishaker at  $55 \pm 3$  %RH and  $27 \pm 2^\circ\text{C}$

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu\text{C/g}$ )
5 wt%	30	1.41	0.0014	24.17
	60	0.95	0.0009	25.33
	120	0.86	0.0008	25.80
	240	1.06	0.0011	23.13
	360	1.12	0.0013	20.68
	720	0.48	0.0006	19.20

Developer N-09S toner and F-200 carrier  
 Concentration 5 wt%  
 Speed 1400 rpm.

Table A-24 : q/m values of developer, N-09S and F-200, at 1400 rpm.  
 by MS1 Minishaker at  $55 \pm 3$  %RH and  $27 \pm 2^\circ\text{C}$

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu\text{C/g}$ )
5 wt%	30	2.37	0.0022	25.85
	60	0.89	0.0008	26.70
	120	1.95	0.0017	27.53
	240	1.00	0.0009	26.67
	360	0.65	0.0007	22.29
	720	0.49	0.0006	19.60

Developer KT-16a toner and TSV-200 (31  $\mu$ A) carrier  
 Concentration 5 wt%  
 Speed 600 rpm.

Table A-25 : q/m values of developer, KT-16a and TSV-200 (31  $\mu$ A),  
 at 600 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 27 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu$ C/g)
5 wt%	30	1.10	0.0050	5.28
	60	1.29	0.0040	7.74
	120	0.79	0.0017	11.15
	240	1.08	0.0020	12.96
	360	1.14	0.0021	13.02
	720	0.73	0.0013	13.48

Developer KT-16a toner and TSV-200 (76  $\mu$ A) carrier  
 Concentration 5 wt%  
 Speed 600 rpm.

Table A-26 : q/m values of developer, KT-16a and TSV-200 (76  $\mu$ A),  
 at 600 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 27 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu$ C/g)
5 wt%	30	1.99	0.0092	5.19
	60	0.89	0.0025	8.54
	120	0.96	0.0020	11.52
	240	0.41	0.0007	14.06
	360	0.67	0.0011	14.62
	720	0.70	0.0011	15.27

Developer KT-16a toner and TSV-200 (182  $\mu$ A) carrier  
 Concentration 5 wt%  
 Speed 600 rpm.

Table A-27 : q/m values of developer, KT-16a and TSV-200 (182  $\mu$ A),  
 at 600 rpm. by MS1 Minishaker at 55 $\pm$ 3 %RH and 27 $\pm$ 2 $^{\circ}$ C

Conc. (wt%)	Time (sec)	Volt (V)	Toner weight (g)	q/m ( $-\mu$ C/g)
5 wt%	30	2.25	0.0098	5.51
	60	0.74	0.0020	8.88
	120	0.86	0.0017	12.14
	240	0.67	0.0011	14.61
	360	0.81	0.0013	14.95
	720	0.87	0.0013	16.08

**APPENDIX B**  
**THE Q/M VALUES OF VARIOUS DEVELOPERS EVALUATED**  
**BY E-SPART ANALYZER**

Table B-1 : Charge-to-mass ratio (q/m) of developers by E-SPART analyzer

Developer	Type of Component	Name of the Component	Weight (g)	Rotating Speed (rpm)	Q/m value ( $\mu\text{C/g}$ )
D1	Toner	KT-16a	0.6	800	-7.57
	Carrier	F-200	19.4		
D2	Toner	KT-16a	0.6	800	-12.41
	Carrier	TSV-200 (17 $\mu\text{A}$ )	19.4		
D3	Toner	N-09S	1	800	-18.61
	Carrier	TSV-200 (17 $\mu\text{A}$ )	19		
D4	Toner	N-09S	1	1200	-15.95
	Carrier	TSV-200 (17 $\mu\text{A}$ )	19		
D5	Toner	N-09S	0.6	1400	-9.32
	Carrier	TSV-200 (17 $\mu\text{A}$ )	19.4		

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Developer KT-16a toner and F-200 carrier  
 Concentration 3 wt%  
 Speed 800 rpm

date :  
 data file name : 16FC  
 sample name :  
 measuring time (sec) = 113.5  
 field voltage applied (V) = 100  
 particle density (g/cm<sup>3</sup>) = 1

max charge range (femt C) = +- 42.6613  
 max particle charge (neg) (femt C) = -13.373  
 max particle charge (pos) (femt C) = 17.4058

No.	ave. dia. ( $\mu\text{m}$ )	(-)	negative		positive		total	
			(femt C)	(-)	(femt C)	(-)	(femt C)	
1	1.9	2	-1.18(0.276)	2	3.09(0.724)	4	1.91	
2	2.2	2	-0.98(0.680)	2	0.46(0.320)	4	-0.52	
3	2.5	4	-1.88(0.983)	1	0.03(0.017)	5	-1.85	
4	2.9	2	-1.01(0.684)	2	0.46(0.316)	4	-0.54	
5	3.3	4	-4.13(0.989)	1	0.04(0.011)	5	-4.08	
6	3.7	13	-7.96(0.909)	2	0.80(0.091)	15	-7.16	
7	4.2	30	-32.69(0.901)	5	3.59(0.099)	35	-29.10	
8	4.7	72	-89.40(0.830)	12	18.35(0.170)	84	-71.06	
9	5.3	178	-276.04(0.891)	18	33.63(0.109)	196	-242.41	
10	6.0	368	-621.94(0.979)	19	13.56(0.021)	387	-608.38	
11	6.7	443	-908.41(0.976)	27	22.21(0.024)	470	-886.20	
12	7.5	439	-1030.09(0.941)	23	64.83(0.059)	462	-965.26	
13	8.4	495	-1398.79(0.965)	17	50.53(0.035)	512	-1348.26	
14	9.3	410	-1294.08(0.972)	15	37.62(0.028)	425	-1256.45	
15	10.5	171	-515.82(0.961)	8	24.92(0.039)	179	-590.90	
16	11.8	53	-205.21(0.922)	7	17.33(0.078)	60	-187.88	
17	13.3	17	-75.36(1.000)	0	0.00(0.000)	17	-75.36	
18	14.9	7	-43.79(0.963)	2	1.68(0.037)	9	-42.11	
19	16.7	9	-54.63(0.876)	1	7.74(0.124)	10	-46.89	
20	18.8	1	-5.56(1.000)	0	0.00(0.000)	1	-5.56	
21	21.3	1	-1.50(1.000)	0	0.00(0.000)	1	-1.50	
22	24.2	4	-23.89(0.579)	1	17.41(0.421)	5	-6.48	

average diameter : d50 (count) = 7.47( $\mu\text{m}$ ) d50 (volume) = 8.98( $\mu\text{m}$ )

	negative	positive	total
count (-)	2725 (0.943)	165 (0.057)	2890
mass (nano gram)	792.7 (0.941)	49.5 (0.059)	842.2
charge (femt C)	-6694.33 (0.955)	318.29 (0.045)	-6376.04
q/m (micro C/g)	-8.44	6.43	-7.57

Developer KT-16a toner and TSV-200 carrier  
 Concentration 3 wt%  
 Speed 800 rpm

date :  
 data file name : 16TSVC  
 sample name :  
 measuring time (sec) = 359.75  
 field voltage applied (V) = 100  
 particle density (g/cm<sup>3</sup>) = 1

max charge range (femt C) = +- 42.6613  
 max particle charge (neg) (femt C) = -29.6922  
 max particle charge (pos) (femt C) = 17.7376

No.	ave. dia.		negative		positive		total	
	( $\mu\text{m}$ )	(-)	(femt C)	(-)	(femt C)	(-)	(femt C)	
1	1.9	1	-0.47(0.792)	1	0.12(0.208)	2	-0.34	
2	2.2	0	0.00(0.000)	0	0.00(0.000)	0	0.00	
3	2.5	1	-0.30(0.450)	1	0.37(0.550)	2	0.07	
4	2.9	6	-5.65(0.685)	1	2.59(0.315)	7	-3.06	
5	3.3	6	-5.18(1.000)	0	0.00(0.000)	6	-5.18	
6	3.7	9	-9.56(0.707)	3	3.95(0.293)	12	-5.61	
7	4.2	14	-14.69(0.667)	3	7.35(0.333)	17	-7.35	
8	4.7	33	-54.07(0.792)	10	14.21(0.208)	43	-39.86	
9	5.3	110	-242.27(0.960)	7	10.16(0.040)	117	-232.10	
10	6.0	219	-550.53(0.962)	11	21.78(0.038)	230	-528.75	
11	6.7	401	-1254.46(0.958)	23	54.85(0.042)	424	-1199.61	
12	7.5	517	-1980.43(0.989)	6	22.82(0.011)	523	-1957.61	
13	8.4	597	-2618.13(0.995)	10	12.55(0.005)	607	-2605.58	
14	9.3	481	-2614.35(0.985)	14	40.36(0.015)	495	-2573.99	
15	10.5	293	-1758.64(0.970)	9	54.97(0.030)	302	-1703.67	
16	11.8	97	-674.09(0.555)	1	3.47(0.005)	98	-670.62	
17	13.3	28	-221.43(1.000)	0	0.00(0.000)	28	-221.43	
18	14.9	1	-3.56(0.944)	1	0.21(0.056)	2	-3.35	
19	16.7	1	-10.08(1.000)	0	0.00(0.000)	1	-10.08	
20	18.8	2	-33.88(0.848)	1	6.09(0.152)	3	-27.79	
21	21.3	2	-27.57(1.000)	0	0.00(0.000)	2	-27.57	
22	24.2	2	-52.56(1.000)	0	0.00(0.000)	2	-52.56	

average diameter : d50 (count) = 8.03( $\mu\text{m}$ ) d50 (volume) = 9.20( $\mu\text{m}$ )

	negative		positive		total
count (-)	2821	(0.965)	102	(0.035)	2923
mass (nano gram)	928.9	(0.971)	28.0	(0.029)	956.9
charge (femt C)	-12131.90	(0.979)	255.84	(0.021)	-11876.10
q/m (micro C/g)	-13.06		9.15		-12.41

Developer N-O9S toner and TSV-200 carrier  
 Concentration 5 wt%  
 Speed 800 rpm

date : 97/07/07  
 data file name : 7-5-3C  
 sample name :  
 measuring time (sec) = 178.75  
 field voltage applied (V) = 100  
 particle density (g/cm<sup>3</sup>) = 1

max charge range (femt C) = +- 38.783  
 max particle charge (neg) (femt C) = -1.9341  
 max particle charge (pos) (femt C) = 9.1896

No.	ave. dia. ( $\mu\text{m}$ )	negative		positive		total	
		(-)	(femt C)	(-)	(femt C)	(-)	(femt C)
1	1.9	0	0.00(0.000)	3	0.56(1.000)	3	0.56
2	2.2	2	-1.79(0.932)	1	0.13(0.068)	3	-1.66
3	2.5	4	-2.81(1.000)	0	0.00(0.000)	4	-2.81
4	2.9	4	-3.80(0.735)	3	1.37(0.265)	7	-2.43
5	3.3	5	-2.75(0.633)	2	1.60(0.367)	7	-1.16
6	3.7	5	-3.41(0.641)	4	1.91(0.359)	9	-1.50
7	4.2	20	-21.54(0.717)	10	8.49(0.283)	30	-13.05
8	4.7	102	-181.35(0.967)	11	6.28(0.033)	113	-175.07
9	5.3	365	-731.50(0.988)	24	9.04(0.012)	389	-722.46
10	6.0	731	-1917.58(0.981)	37	36.38(0.019)	768	-1881.20
11	6.7	709	-2412.14(0.981)	34	46.76(0.019)	743	-2365.38
12	7.5	590	-2518.46(0.993)	28	18.10(0.007)	618	-2500.36
13	8.4	192	-852.90(0.992)	15	7.08(0.008)	207	-845.83
14	9.3	32	-144.63(0.990)	4	1.42(0.010)	36	-143.21
15	10.5	12	-40.51(0.984)	3	0.67(0.016)	15	-39.85
16	11.8	4	-8.40(0.554)	1	6.75(0.446)	5	-1.65
17	13.3	0	0.00(0.000)	0	0.00(0.000)	0	0.00
18	14.9	0	0.00(0.000)	0	0.00(0.000)	0	0.00
19	16.7	0	0.00(0.000)	1	0.64(1.000)	1	0.64
20	18.8	0	0.00(0.000)	0	0.00(0.000)	0	0.00
21	21.3	0	0.00(0.000)	0	0.00(0.000)	0	0.00
22	24.2	0	0.00(0.000)	0	0.00(0.000)	0	0.00

average diameter : d50 (count) = 6.43( $\mu\text{m}$ ) d50 (volume) = 7.02( $\mu\text{m}$ )

	negative	positive	total
count (-)	2777 (0.939)	181 (0.061)	2958
mass (nano gram)	437.4 (0.936)	29.9 (0.064)	467.3
charge (femt C)	-8843.58 (0.984)	147.18 (0.016)	-8696.41
q/m (micro C/g)	-20.22	4.92	-18.61



Developer N-O9S toner and TSV-200 carrier  
 Concentration 5 wt%  
 Speed 1200 rpm

date : 97/07/07  
 data file name : 7-5-1C  
 sample name :  
 measuring time (sec) = 138.25  
 field voltage applied (V) = 100  
 particle density (g/cm<sup>3</sup>) = 1

max charge range (femt C) - + 38.783  
 max particle charge (neg) (femt C) = -14.5824  
 max particle charge (pos) (femt C) = 18.5438

No.	ave. dia. ( $\mu\text{m}$ )	negative		positive		total	
		(-)	(femt C)	(-)	(femt C)	(-)	(femt C)
1	1.9	0	0.00(0.000)	0	0.00(0.000)	0	0.00
2	2.2	0	0.00(0.000)	0	0.00(0.000)	0	0.00
3	2.5	1	-0.70(0.164)	1	3.57(0.836)	2	2.87
4	2.9	2	-2.39(0.883)	1	0.32(0.117)	3	-2.07
5	3.3	5	-5.55(1.000)	0	0.00(0.000)	5	-5.55
6	3.7	3	-3.32(0.619)	3	2.05(0.381)	6	-1.27
7	4.2	16	-21.75(0.925)	2	1.76(0.075)	18	-19.99
8	4.7	91	-143.47(0.959)	10	6.11(0.041)	101	-137.36
9	5.3	308	-614.60(0.963)	34	23.39(0.037)	342	-591.21
10	6.0	639	-1637.27(0.970)	44	50.05(0.030)	683	-1587.21
11	6.7	726	-2300.77(0.989)	31	24.72(0.011)	757	-2276.05
12	7.5	698	-2544.10(0.982)	34	45.83(0.018)	732	-2498.28
13	8.4	207	-721.21(0.988)	14	8.87(0.012)	221	-712.33
14	9.3	42	-135.87(0.936)	4	9.23(0.064)	46	-126.64
15	10.5	14	-39.98(1.000)	0	0.00(0.000)	14	-39.98
16	11.8	3	-7.95(0.757)	3	2.55(0.243)	6	-5.40
17	13.3	2	-8.46(0.943)	1	0.51(0.057)	3	-7.95
18	14.9	1	-8.95(0.351)	1	16.57(0.649)	2	7.62
19	16.7	1	-10.87(1.000)	0	0.00(0.000)	1	-10.87
20	18.8	1	-11.31(0.839)	1	2.17(0.161)	2	-9.14
21	21.3	0	0.00(0.000)	0	0.00(0.000)	0	0.00
22	24.2	0	0.00(0.000)	0	0.00(0.000)	0	0.00

average diameter : d50 (count) = 6.59( $\mu\text{m}$ ) d50 (volume) = 7.19( $\mu\text{m}$ )

	negative		positive		total
count (-)	2760	(0.938)	184	(0.063)	2944
mass (nano gram)	467.4	(0.929)	35.5	(0.071)	502.9
charge (femt C)	-8218.51	(0.977)	197.69	(0.023)	-8020.82
q/m (micro C/g)	-17.58		5.57		-15.95

Developer KT-16a toner and TSV-200 carrier  
 Concentration 3 wt%  
 Speed 1400 rpm

date : 97/07/07  
 data file name : 7-5-2C  
 sample name :  
 measuring time (sec) = 372  
 field voltage applied (V) = 100  
 particle density (g/cm<sup>3</sup>) = 1

max charge range (femt C) = ← 38.783  
 max particle charge (neg) (femt C) = -12.7576  
 max particle charge (pos) (femt C) = 23.2698

No.	ave. dia. ( $\mu\text{m}$ )	negative		positive		total	
		(-)	(femt C)	(-)	(femt C)	(-)	(femt C)
1	1.9	0	0.00(0.000)	0	0.00(0.000)	0	0.00
2	2.2	1	-1.13(1.000)	0	0.00(0.000)	1	-1.13
3	2.5	3	-2.96(1.000)	0	0.00(0.000)	3	-2.96
4	2.9	1	-0.95(1.000)	0	0.00(0.000)	1	-0.95
5	3.3	3	-3.39(0.411)	2	4.87(0.589)	5	1.48
6	3.7	4	-3.00(0.985)	1	0.05(0.015)	5	-2.96
7	4.2	11	-11.96(0.791)	3	3.16(0.209)	14	-8.80
8	4.7	15	-18.73(0.970)	2	0.59(0.030)	17	-18.15
9	5.3	67	-105.73(0.974)	2	2.79(0.026)	69	-102.94
10	6.0	218	-415.38(0.978)	10	9.26(0.022)	228	-406.12
11	6.7	429	-932.07(0.988)	10	11.73(0.012)	439	-920.34
12	7.5	587	-1559.55(0.979)	15	32.72(0.021)	602	-1526.83
13	8.4	644	-2139.22(0.991)	14	20.07(0.009)	658	-2119.15
14	9.3	510	-1953.31(0.986)	9	27.58(0.014)	519	-1925.74
15	10.5	239	-1030.79(0.975)	6	26.92(0.025)	245	-1003.87
16	11.8	74	-394.43(0.970)	3	12.16(0.030)	77	-382.27
17	13.3	13	-69.52(1.000)	0	0.00(0.000)	13	-69.52
18	14.9	2	-11.43(1.000)	0	0.00(0.000)	2	-11.43
19	16.7	3	-24.51(1.000)	0	0.00(0.000)	3	-24.51
20	18.8	2	-11.07(1.000)	0	0.00(0.000)	2	-11.07
21	21.3	0	0.00(0.000)	0	0.00(0.000)	0	0.00
22	24.2	2	-9.93(1.000)	0	0.00(0.000)	2	-9.93

average diameter : d50 (count) = 8.01( $\mu\text{m}$ ) d50 (volume) = 8.94( $\mu\text{m}$ )

	negative	positive	total
count (-)	2828 (0.973)	77 (0.027)	2905
mass (nano gram)	896.1 (0.977)	20.7 (0.023)	916.8
charge (femt C)	-8699.07 (0.983)	151.89 (0.017)	-8547.19
q/m (micro C/g)	-9.71	7.34	-9.32

**APPENDIX C**  
**THE Q/M VALUES OF VARIOUS TONERS EVALUATED**  
**BY OKI PRINTER**

Printer OKI 400 micro line CL  
 Toner KT-16a

Table C-1 : q/m values of KT-16a toner in OKI 400 micro line CL Printer

Exposure (%)	Condition (Transfer on PC)	Volt (V)	Gram (g)	q/m (- $\mu$ C/g)	average q/m (- $\mu$ C/g)	
100	Before	0.83	0.0016	12.50	13.00	
		0.79	0.0016	11.90		
		0.61	0.0010	14.60		
	After Photoconductor	-	-	-		-
		1.46	0.0024	14.60		16.43
		1.97	0.0025	18.90		
		1.51	0.0023	15.80		
60	Before	0.84	0.0020	10.10	11.60	
		1.03	0.0023	10.70		
		1.05	0.0018	14.00		
	After Photoconductor	-	-	-		-
		1.06	0.0017	15.00		16.2
		1.99	0.0028	17.10		
		1.93	0.0028	16.50		
40	Before	1.08	0.0018	14.40	12.37	
		1.09	0.0024	10.90		
		0.54	0.0011	11.80		
	After	0.96	0.0018	12.80		16.67
		0.27	0.0004	16.20		
		0.18	0.0002	21.00		
	Photoconductor	0.76	0.0016	11.40		11.80
		1.14	0.0018	15.20		
		0.79	0.0021	9.03		
0	Before	1.22	0.0014	20.90	17.43	
		1.16	0.0017	16.40		
		1.19	0.0019	15.00		
	After	0.94	0.0008	28.20		18.57
		0.86	0.0015	13.70		
		0.92	0.0016	13.80		
	Photoconductor	-	-	-	-	

Printer OKI 400 micro line CL  
Toner N-O9S

Table C-2 : q/m values of N-O9S toner in the OKI 400 micro line CL Printer

Exposure (%)	Condition (Transfer on PC)	Volt (V)	Gram (g)	q/m (- $\mu$ C/g)	average q/m (- $\mu$ C/g)
100	Before	2.81	0.0018	37.50	31.40
		4.05	0.0038	25.60	
	After	2.74	0.0021	31.30	34.00
		1.38	0.0011	30.10	
		1.58	0.0010	37.90	
	Photoconductor	1.25	0.0016	18.80	36.93
		3.47	0.0023	36.20	
		3.11	0.0020	37.30	
		3.73	0.0024	37.30	
	60	Before	5.94	0.0060	23.80
5.12			0.0041	30.00	
After		3.59	0.0012	26.90	33.60
		2.48	0.0016	37.20	
		2.79	0.0023	29.10	
Photoconductor		1.87	0.0013	34.50	30.30
		4.30	0.0033	31.30	
		5.48	0.0038	27.40	
		4.43	0.0033	32.20	
40	Before	4.08	0.0039	25.10	27.27
		1.09	0.0009	29.10	
	After	4.60	0.0040	27.60	25.63
		2.66	0.0027	23.60	
		3.16	0.0029	26.20	
	Photoconductor	2.26	0.0020	27.10	32.70
		2.52	0.0017	35.60	
		2.70	0.0020	32.40	
		2.63	0.0021	30.10	
0	Before	4.21	0.0040	25.30	25.10
		5.77	0.0054	25.60	
	After	5.28	0.0052	24.40	24.30
		5.46	0.0054	24.30	
		4.18	0.0040	25.10	
	Photoconductor	3.13	0.0032	23.50	-
		-	-	-	
		-	-	-	

**APPENDIX D**  
**MEASUREMENT ON PRINT QUALITY**

Toner     KT-16a  
Density   Solid density

**Table D-1 : The Measurement of Solid density for KT-16a toner by densitometer**

Paper Position	Paper														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.48	1.48	1.49	1.49	1.49	1.48	1.48	1.48	1.48	1.48	1.49	1.48	1.49	1.49	1.49
2	1.48	1.48	1.49	1.49	1.49	1.49	1.49	1.48	1.48	1.47	1.49	1.49	1.49	1.49	1.48
3	1.48	1.48	1.48	1.49	1.49	1.48	1.48	1.48	1.48	1.48	1.49	1.48	1.49	1.48	1.48
4	1.47	1.48	1.48	1.48	1.49	1.48	1.49	1.48	1.48	1.47	1.49	1.48	1.49	1.48	1.48
5	1.47	1.48	1.47	1.48	1.48	1.48	1.48	1.47	1.48	1.47	1.48	1.48	1.49	1.48	1.48
6	1.47	1.48	1.46	1.47	1.48	1.48	1.48	1.48	1.48	1.47	1.47	1.48	1.48	1.47	1.48
7	1.47	1.47	1.46	1.48	1.48	1.46	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47
8	1.47	1.48	1.45	1.47	1.47	1.47	1.48	1.47	1.48	1.47	1.47	1.48	1.47	1.47	1.47
9	1.46	1.46	1.45	1.47	1.47	1.46	1.47	1.46	1.48	1.47	1.46	1.47	1.47	1.47	1.47
10	1.46	1.47	1.46	1.47	1.48	1.47	1.47	1.48	1.48	1.47	1.48	1.48	1.48	1.47	1.47
11	1.46	1.46	1.46	1.47	1.48	1.47	1.48	1.48	1.48	1.47	1.47	1.47	1.48	1.48	1.47
12	1.47	1.47	1.46	1.47	1.48	1.47	1.48	1.47	1.47	1.47	1.47	1.48	1.48	1.47	1.47
13	1.47	1.46	1.47	1.46	1.49	1.46	1.49	1.46	1.47	1.46	1.48	1.48	1.48	1.47	1.47
14	1.47	1.47	1.45	1.48	1.49	1.48	1.49	1.49	1.47	1.47	1.49	1.50	1.50	1.50	1.49
15	1.47	1.47	1.48	1.47	1.48	1.49	1.48	1.49	1.48	1.49	1.50	1.50	1.50	1.47	1.47
16	1.47	1.47	1.47	1.48	1.48	1.48	1.50	1.49	1.48	1.48	1.50	1.50	1.50	1.50	1.50
17	1.48	1.47	1.49	1.48	1.49	1.48	1.49	1.50	1.49	1.48	1.50	1.50	1.50	1.48	1.49
18	1.49	1.49	1.48	1.49	1.48	1.49	1.50	1.50	1.49	1.49	1.49	1.50	1.50	1.50	1.50
19	1.48	1.48	1.48	1.47	1.48	1.48	1.48	1.49	1.47	1.48	1.49	1.48	1.49	1.49	1.50
20	1.48	1.48	1.48	1.47	1.49	1.48	1.48	1.50	1.49	1.49	1.49	1.49	1.49	1.50	1.49
21	1.47	1.48	1.49	1.47	1.48	1.48	1.48	1.49	1.49	1.48	1.49	1.49	1.48	1.49	1.49
22	1.47	1.48	1.47	1.47	1.48	1.46	1.47	1.48	1.48	1.48	1.47	1.48	1.47	1.48	1.47
23	1.47	1.47	1.47	1.47	1.48	1.46	1.47	1.48	1.47	1.46	1.47	1.47	1.46	1.49	1.47
24	1.48	1.48	1.48	1.47	1.48	1.47	1.47	1.47	1.48	1.47	1.47	1.48	1.47	1.48	1.48
Average	1.47	1.47	1.47	1.48	1.48	1.47	1.48	1.48	1.48	1.47	1.48	1.48	1.48	1.48	1.48

Toner KT-16a  
Density 60% halftone

Table D-2 : The Measurement of Density at 60% halftone for KT-16a toner by densitometer

Paper Position	Paper														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.83	0.82	0.81	0.82	0.80	0.80	0.81	0.80	0.80	0.79	0.79	0.78	0.79	0.79	0.79
2	0.82	0.82	0.80	0.81	0.79	0.79	0.81	0.80	0.80	0.78	0.77	0.79	0.79	0.79	0.79
3	0.83	0.81	0.80	0.80	0.79	0.81	0.81	0.79	0.80	0.79	0.79	0.77	0.79	0.79	0.79
4	0.81	0.82	0.80	0.82	0.79	0.79	0.80	0.79	0.81	0.79	0.77	0.78	0.78	0.80	0.79
5	0.82	0.82	0.80	0.80	0.81	0.81	0.81	0.81	0.80	0.79	0.78	0.79	0.78	0.81	0.78
6	0.79	0.80	0.80	0.81	0.81	0.80	0.80	0.79	0.79	0.80	0.77	0.77	0.77	0.79	0.78
7	0.80	0.80	0.79	0.80	0.81	0.79	0.79	0.79	0.79	0.79	0.77	0.77	0.77	0.78	0.78
8	0.80	0.80	0.80	0.81	0.81	0.80	0.80	0.80	0.81	0.78	0.77	0.78	0.78	0.81	0.81
9	0.80	0.80	0.80	0.81	0.80	0.80	0.80	0.81	0.79	0.78	0.78	0.79	0.77	0.80	0.79
10	0.81	0.81	0.80	0.82	0.80	0.81	0.81	0.81	0.79	0.78	0.78	0.79	0.79	0.81	0.80
11	0.82	0.79	0.82	0.82	0.81	0.81	0.82	0.81	0.81	0.79	0.79	0.80	0.80	0.81	0.80
12	0.80	0.80	0.80	0.82	0.81	0.79	0.81	0.80	0.80	0.79	0.78	0.79	0.80	0.82	0.81
13	0.80	0.82	0.80	0.81	0.79	0.80	0.80	0.79	0.79	0.78	0.79	0.79	0.81	0.82	0.80
14	0.79	0.81	0.81	0.81	0.80	0.79	0.80	0.79	0.79	0.79	0.77	0.78	0.79	0.80	0.80
15	0.83	0.82	0.82	0.82	0.80	0.81	0.81	0.80	0.79	0.81	0.78	0.82	0.80	0.82	0.81
16	0.82	0.82	0.82	0.80	0.82	0.81	0.83	0.81	0.81	0.79	0.78	0.80	0.81	0.79	0.82
17	0.82	0.82	0.82	0.82	0.81	0.82	0.83	0.81	0.81	0.81	0.80	0.81	0.81	0.81	0.82
18	0.80	0.81	0.81	0.82	0.80	0.79	0.82	0.80	0.79	0.79	0.77	0.79	0.79	0.82	0.80
19	0.81	0.81	0.81	0.81	0.79	0.81	0.83	0.79	0.80	0.79	0.78	0.81	0.79	0.81	0.81
20	0.80	0.80	0.82	0.81	0.79	0.79	0.81	0.79	0.79	0.80	0.77	0.78	0.79	0.82	0.80
21	0.81	0.80	0.81	0.81	0.81	0.82	0.82	0.80	0.79	0.81	0.78	0.82	0.81	0.82	0.81
22	0.82	0.82	0.82	0.82	0.79	0.82	0.83	0.81	0.81	0.81	0.79	0.82	0.81	0.82	0.82
23	0.79	0.79	0.80	0.81	0.80	0.81	0.81	0.79	0.80	0.81	0.79	0.81	0.80	0.81	0.82
24	0.80	0.79	0.82	0.81	0.80	0.80	0.81	0.79	0.80	0.80	0.79	0.79	0.80	0.81	0.82
Average	0.81	0.81	0.81	0.81	0.80	0.80	0.81	0.80	0.80	0.79	0.78	0.79	0.79	0.81	0.80

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Toner KT-16a  
Density 40% halftone

Table D-3 : The Measurement of Density at 40% halftone for KT-16a toner by densitometer

Paper \ Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.53	0.53	0.50	0.52	0.52	0.51	0.50	0.50	0.50	0.51	0.52	0.52	0.51	0.52	0.52
2	0.53	0.51	0.48	0.50	0.49	0.49	0.51	0.51	0.51	0.49	0.52	0.52	0.52	0.53	0.52
3	0.51	0.53	0.50	0.52	0.49	0.51	0.49	0.50	0.50	0.50	0.52	0.52	0.52	0.52	0.52
4	0.52	0.51	0.49	0.52	0.50	0.50	0.50	0.50	0.50	0.49	0.51	0.52	0.52	0.52	0.52
5	0.51	0.52	0.48	0.50	0.49	0.50	0.49	0.50	0.50	0.49	0.50	0.51	0.52	0.53	0.52
6	0.50	0.52	0.48	0.49	0.48	0.49	0.48	0.48	0.49	0.49	0.50	0.50	0.50	0.51	0.51
7	0.50	0.50	0.48	0.50	0.48	0.48	0.48	0.48	0.48	0.48	0.49	0.50	0.50	0.51	0.51
8	0.51	0.51	0.48	0.49	0.48	0.48	0.48	0.50	0.49	0.49	0.49	0.51	0.52	0.52	0.52
9	0.50	0.52	0.50	0.51	0.49	0.50	0.49	0.49	0.49	0.49	0.50	0.52	0.51	0.52	0.52
10	0.52	0.52	0.50	0.52	0.50	0.51	0.50	0.52	0.52	0.50	0.52	0.52	0.52	0.53	0.53
11	0.53	0.52	0.49	0.51	0.51	0.51	0.51	0.52	0.51	0.52	0.50	0.52	0.52	0.53	0.52
12	0.52	0.52	0.51	0.51	0.51	0.51	0.49	0.52	0.51	0.51	0.52	0.53	0.53	0.53	0.53
13	0.53	0.53	0.51	0.52	0.51	0.52	0.51	0.50	0.52	0.50	0.52	0.52	0.52	0.52	0.53
14	0.52	0.51	0.49	0.50	0.50	0.50	0.51	0.49	0.52	0.50	0.50	0.52	0.52	0.52	0.52
15	0.53	0.52	0.50	0.51	0.52	0.52	0.51	0.52	0.53	0.50	0.51	0.52	0.52	0.53	0.52
16	0.53	0.52	0.50	0.53	0.52	0.53	0.51	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.53
17	0.51	0.52	0.50	0.52	0.52	0.51	0.50	0.52	0.52	0.49	0.50	0.52	0.52	0.53	0.53
18	0.50	0.51	0.49	0.52	0.50	0.51	0.52	0.53	0.51	0.49	0.52	0.52	0.52	0.53	0.52
19	0.52	0.50	0.48	0.52	0.50	0.49	0.49	0.52	0.50	0.49	0.50	0.52	0.53	0.52	0.52
20	0.50	0.51	0.48	0.49	0.50	0.49	0.49	0.50	0.49	0.49	0.49	0.50	0.52	0.52	0.52
21	0.52	0.51	0.49	0.50	0.51	0.49	0.50	0.52	0.52	0.51	0.50	0.51	0.53	0.53	0.52
22	0.53	0.53	0.50	0.52	0.52	0.49	0.51	0.53	0.51	0.52	0.51	0.52	0.52	0.53	0.53
23	0.53	0.52	0.49	0.52	0.51	0.50	0.49	0.53	0.52	0.50	0.50	0.51	0.52	0.53	0.52
24	0.52	0.50	0.49	0.52	0.51	0.49	0.50	0.52	0.52	0.50	0.50	0.52	0.53	0.53	0.52
Average	0.52	0.52	0.49	0.51	0.50	0.50	0.50	0.51	0.51	0.50	0.51	0.52	0.52	0.52	0.52



Toner N-09S  
Density Solid density

Table D-5 : The Measurement of Solid density for N-09S toner  
by densitometer

Paper Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.46	1.47	1.47	1.48	1.46	1.47	1.46	1.47	1.48	1.47	1.48	1.47	1.47	1.47	1.47
2	1.47	1.47	1.48	1.47	1.48	1.48	1.47	1.48	1.49	1.48	1.50	1.46	1.48	1.48	1.48
3	1.47	1.47	1.47	1.47	1.47	1.48	1.47	1.48	1.49	1.48	1.49	1.47	1.47	1.49	1.48
4	1.46	1.47	1.48	1.47	1.48	1.48	1.46	1.48	1.49	1.48	1.50	1.46	1.48	1.48	1.48
5	1.46	1.46	1.48	1.47	1.47	1.48	1.46	1.48	1.49	1.48	1.49	1.46	1.47	1.48	1.48
6	1.46	1.47	1.48	1.47	1.48	1.48	1.46	1.48	1.50	1.48	1.50	1.46	1.48	1.48	1.48
7	1.46	1.47	1.47	1.48	1.49	1.49	1.46	1.48	1.49	1.49	1.50	1.46	1.48	1.49	1.49
8	1.46	1.48	1.49	1.47	1.49	1.48	1.47	1.49	1.50	1.49	1.50	1.46	1.49	1.49	1.49
9	1.47	1.48	1.49	1.47	1.48	1.49	1.47	1.49	1.50	1.49	1.51	1.47	1.49	1.50	1.50
10	1.47	1.48	1.49	1.48	1.48	1.49	1.47	1.49	1.50	1.48	1.51	1.47	1.48	1.50	1.49
11	1.47	1.48	1.49	1.47	1.49	1.50	1.48	1.50	1.50	1.49	1.51	1.48	1.49	1.50	1.50
12	1.47	1.48	1.48	1.48	1.49	1.49	1.47	1.50	1.50	1.49	1.51	1.47	1.49	1.50	1.50
13	1.48	1.48	1.49	1.48	1.49	1.50	1.49	1.50	1.49	1.49	1.51	1.48	1.50	1.50	1.50
14	1.48	1.48	1.49	1.48	1.49	1.49	1.48	1.50	1.50	1.49	1.51	1.49	1.49	1.50	1.50
15	1.48	1.48	1.49	1.48	1.48	1.48	1.48	1.50	1.50	1.49	1.51	1.49	1.49	1.50	1.50
16	1.48	1.48	1.49	1.47	1.48	1.47	1.49	1.48	1.50	1.48	1.50	1.49	1.50	1.50	1.49
17	1.47	1.48	1.48	1.47	1.48	1.48	1.48	1.49	1.50	1.48	1.50	1.48	1.49	1.49	1.49
18	1.47	1.47	1.48	1.47	1.47	1.48	1.47	1.48	1.49	1.47	1.49	1.48	1.48	1.48	1.48
19	1.46	1.46	1.47	1.46	1.46	1.46	1.46	1.48	1.49	1.47	1.49	1.46	1.48	1.47	1.49
20	1.45	1.46	1.45	1.45	1.46	1.46	1.46	1.47	1.48	1.47	1.48	1.47	1.47	1.47	1.48
21	1.45	1.45	1.45	1.46	1.45	1.45	1.45	1.46	1.47	1.45	1.47	1.46	1.47	1.47	1.47
22	1.45	1.46	1.46	1.46	1.45	1.45	1.46	1.46	1.48	1.46	1.47	1.46	1.47	1.47	1.47
23	1.46	1.46	1.46	1.45	1.45	1.46	1.45	1.46	1.47	1.46	1.47	1.47	1.47	1.46	1.46
24	1.46	1.46	1.46	1.47	1.46	1.46	1.46	1.46	1.47	1.47	1.47	1.47	1.47	1.47	1.46
Average	1.47	1.47	1.48	1.47	1.47	1.48	1.47	1.48	1.49	1.48	1.49	1.47	1.48	1.49	1.48

Toner N-09S  
Density 60% halftone

Table D-6 : The Measurement of Density at 60% halftone for N-09S toner by densitometer

Paper \ Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.95	0.93	0.93	0.94	0.93	0.93	0.96	0.95	0.95	0.96	0.95	0.96	0.96	0.96	0.96
2	0.94	0.94	0.94	0.94	0.92	0.93	0.97	0.97	0.97	0.97	0.95	0.97	0.98	0.98	0.97
3	0.94	0.93	0.93	0.93	0.94	0.93	0.95	0.97	0.97	0.97	0.95	0.97	0.97	0.97	0.97
4	0.94	0.93	0.92	0.92	0.93	0.93	0.97	0.98	0.98	0.98	0.97	0.97	0.96	0.97	0.97
5	0.94	0.92	0.92	0.92	0.94	0.93	0.97	0.97	0.98	0.98	0.96	0.97	0.97	0.97	0.97
6	0.95	0.92	0.93	0.93	0.92	0.92	0.96	0.97	0.96	0.96	0.97	0.96	0.96	0.97	0.97
7	0.95	0.93	0.93	0.94	0.93	0.92	0.96	0.97	0.96	0.96	0.96	0.97	0.97	0.96	0.98
8	0.95	0.93	0.95	0.94	0.93	0.92	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.98	0.96
9	0.95	0.92	0.95	0.95	0.94	0.92	0.96	0.98	0.97	0.96	0.97	0.97	0.96	0.96	0.97
10	0.97	0.95	0.96	0.96	0.94	0.93	0.97	0.98	0.98	0.96	0.97	0.97	0.97	0.97	0.97
11	0.95	0.93	0.95	0.92	0.95	0.94	0.97	0.98	0.96	0.96	0.97	0.96	0.96	0.97	0.97
12	0.95	0.94	0.94	0.94	0.94	0.93	0.98	0.97	0.96	0.97	0.97	0.95	0.97	0.97	0.98
13	0.95	0.95	0.96	0.94	0.97	0.95	0.98	0.97	0.98	0.98	0.96	0.97	0.96	0.98	0.98
14	0.95	0.94	0.96	0.96	0.97	0.95	0.97	0.98	0.96	0.98	0.96	0.96	0.96	0.98	0.98
15	0.97	0.96	0.97	0.96	0.97	0.96	0.97	0.98	0.98	0.98	0.96	0.97	0.98	0.98	0.98
16	0.97	0.97	0.94	0.96	0.97	0.93	0.98	0.98	0.98	0.97	0.96	0.98	0.97	0.97	0.97
17	0.97	0.97	0.97	0.96	0.97	0.96	0.97	0.98	0.98	0.98	0.97	0.98	0.98	0.97	0.97
18	0.96	0.95	0.95	0.94	0.96	0.93	0.97	0.98	0.97	0.97	0.96	0.98	0.97	0.97	0.97
19	0.97	0.96	0.95	0.96	0.97	0.95	0.97	0.97	0.97	0.98	0.97	0.98	0.98	0.97	0.97
20	0.97	0.95	0.94	0.94	0.95	0.94	0.97	0.97	0.97	0.97	0.96	0.97	0.98	0.97	0.97
21	0.96	0.96	0.94	0.95	0.96	0.95	0.96	0.96	0.95	0.97	0.96	0.98	0.97	0.96	0.97
22	0.96	0.96	0.94	0.95	0.95	0.93	0.98	0.97	0.96	0.96	0.96	0.98	0.98	0.97	0.98
23	0.94	0.96	0.94	0.96	0.96	0.94	0.95	0.94	0.95	0.96	0.96	0.95	0.96	0.95	0.96
24	0.95	0.96	0.94	0.95	0.94	0.94	0.96	0.96	0.95	0.96	0.96	0.96	0.96	0.95	0.95
Average	0.95	0.94	0.94	0.94	0.95	0.94	0.97	0.97	0.97	0.97	0.96	0.97	0.97	0.97	0.97

Toner N-O9S  
Density 40% halftone

Table D-7 : The Measurement of Density at 40% halftone for N-O9S toner by densitometer

Paper Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.71	0.72	0.70	0.71	0.70	0.71	0.71	0.72	0.70	0.70	0.68	0.71	0.70	0.69	0.71
2	0.72	0.73	0.70	0.70	0.70	0.72	0.71	0.72	0.68	0.69	0.67	0.72	0.69	0.68	0.68
3	0.72	0.72	0.70	0.71	0.69	0.71	0.70	0.70	0.68	0.69	0.68	0.71	0.71	0.70	0.69
4	0.71	0.72	0.68	0.69	0.69	0.72	0.70	0.70	0.68	0.69	0.67	0.71	0.71	0.70	0.69
5	0.70	0.71	0.69	0.69	0.68	0.70	0.69	0.69	0.68	0.67	0.68	0.70	0.69	0.69	0.69
6	0.70	0.71	0.67	0.67	0.71	0.69	0.70	0.68	0.67	0.67	0.68	0.69	0.67	0.71	0.67
7	0.69	0.70	0.67	0.68	0.70	0.69	0.69	0.69	0.68	0.67	0.67	0.70	0.68	0.71	0.68
8	0.70	0.72	0.67	0.68	0.70	0.70	0.70	0.69	0.69	0.68	0.68	0.71	0.67	0.69	0.68
9	0.70	0.72	0.67	0.69	0.70	0.70	0.70	0.68	0.68	0.69	0.67	0.70	0.68	0.70	0.68
10	0.72	0.73	0.70	0.69	0.71	0.72	0.72	0.70	0.67	0.69	0.67	0.70	0.69	0.69	0.71
11	0.72	0.72	0.67	0.70	0.70	0.72	0.72	0.68	0.68	0.70	0.67	0.72	0.71	0.70	0.69
12	0.71	0.73	0.67	0.69	0.71	0.70	0.71	0.68	0.68	0.68	0.69	0.72	0.69	0.71	0.68
13	0.72	0.72	0.70	0.69	0.71	0.71	0.72	0.70	0.68	0.71	0.68	0.73	0.71	0.71	0.72
14	0.73	0.73	0.69	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.69	0.71	0.70	0.70	0.68
15	0.72	0.72	0.70	0.70	0.71	0.71	0.72	0.72	0.68	0.71	0.68	0.72	0.70	0.72	0.71
16	0.73	0.73	0.68	0.71	0.71	0.72	0.72	0.72	0.69	0.70	0.68	0.73	0.71	0.71	0.70
17	0.72	0.73	0.69	0.70	0.71	0.72	0.72	0.72	0.69	0.70	0.69	0.73	0.70	0.69	0.70
18	0.71	0.73	0.68	0.71	0.70	0.70	0.72	0.71	0.71	0.68	0.68	0.72	0.71	0.68	0.69
19	0.72	0.73	0.69	0.69	0.70	0.71	0.72	0.72	0.70	0.69	0.68	0.73	0.68	0.72	0.71
20	0.72	0.73	0.67	0.70	0.69	0.71	0.71	0.70	0.70	0.68	0.67	0.72	0.68	0.71	0.70
21	0.71	0.72	0.67	0.69	0.68	0.70	0.71	0.72	0.69	0.68	0.68	0.72	0.68	0.70	0.70
22	0.72	0.72	0.68	0.71	0.71	0.71	0.72	0.72	0.71	0.67	0.67	0.72	0.70	0.71	0.71
23	0.70	0.72	0.69	0.69	0.68	0.69	0.71	0.70	0.68	0.68	0.67	0.73	0.69	0.69	0.69
24	0.71	0.72	0.68	0.68	0.68	0.69	0.71	0.71	0.70	0.68	0.67	0.73	0.68	0.71	0.70
Average	0.71	0.72	0.68	0.69	0.70	0.71	0.71	0.70	0.69	0.69	0.68	0.72	0.69	0.70	0.69



Toner N-09S  
Density Background density

Table D-8 : The Measurement of Background density for N-09S toner by densitometer

Paper Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.02
2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02
4	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.02
5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.02
6	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02
7	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.02
8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01
9	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.02
10	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.02
11	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
12	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.02
13	0.03	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.02	0.01	0.03	0.03	0.03
14	0.03	0.02	0.03	0.03	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.01	0.02	0.03	0.03
15	0.03	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.03	0.02	0.03
16	0.03	0.01	0.03	0.03	0.01	0.02	0.01	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.03
17	0.03	0.01	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03
18	0.03	0.03	0.04	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.01	0.02	0.03	0.03	0.03
19	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.03	0.03	0.03
20	0.03	0.03	0.03	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.03	0.01	0.03
21	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03
22	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.02	0.03
23	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03
24	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
Average	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.02



## VITA

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