

# Wood Pattern Reproduction

Offset Proof 2008-2

Ink jet Print 2008-3-11

Ink Jet drupa 2008-6-20

Measured 2008-8-26, 9-9

Meeting 2008-9-18

# Wood Pattern



2008-9-25 IGU AK

# The characteristics of printing processes for printed electronics

## Dimensions for good printing results

Printing method	Viscosity	Thickness	Feature Size	Registration	Throughput
Gravure	0.01-0.2	<0.1-8	75	>20	3-60
Flexo	0.05-0.5	0.04-2.5	80	<200	3 30
Offset	5-100	0.5-2	10-50	>10	3 30
Screen	0.5-50	0.015-100	20-100	>25	2 3
Ink Jet	0.001-0.04	0.05-20	20-50	5 ~ 20	0.01 0.5
	(Pas)	( $\mu\text{m}$ )	( $\mu\text{m}$ )	( $\mu\text{m}$ )	( $\text{m}^2/\text{s}$ )

# Experiments

- 1、Original( Neutral~ Soft White)
- 2、Scanner
- 3、CTP
- 4、Proof
- 5、Ink Jet Print
- 6、Evaluation
- 7、2<sup>nd</sup> Experiment

a Original	a Original	b=Offset Proof
1,neutral	5,Caramelmoka	c= Ink Jet
a	a	
Ave	Ave	
2,Essen	6,HiteaBrown	
a	a	
Ave	Ave	
3,Gerata	7,Casual	
a	a	
Ave	Ave	
4,Chocolade	8,SofreWhite	
a	a	
Ave	Ave	

# Ink Jet Performance

Items	Ink Jet	Chracteristics	
	UV	Aqueous	Solvent
Image quality			
Productivity			
Drying		x	
Smell			x
Outside Test			
Media		x	

# Luxel Jet UV 250 GT



# Luxel Jet & Original

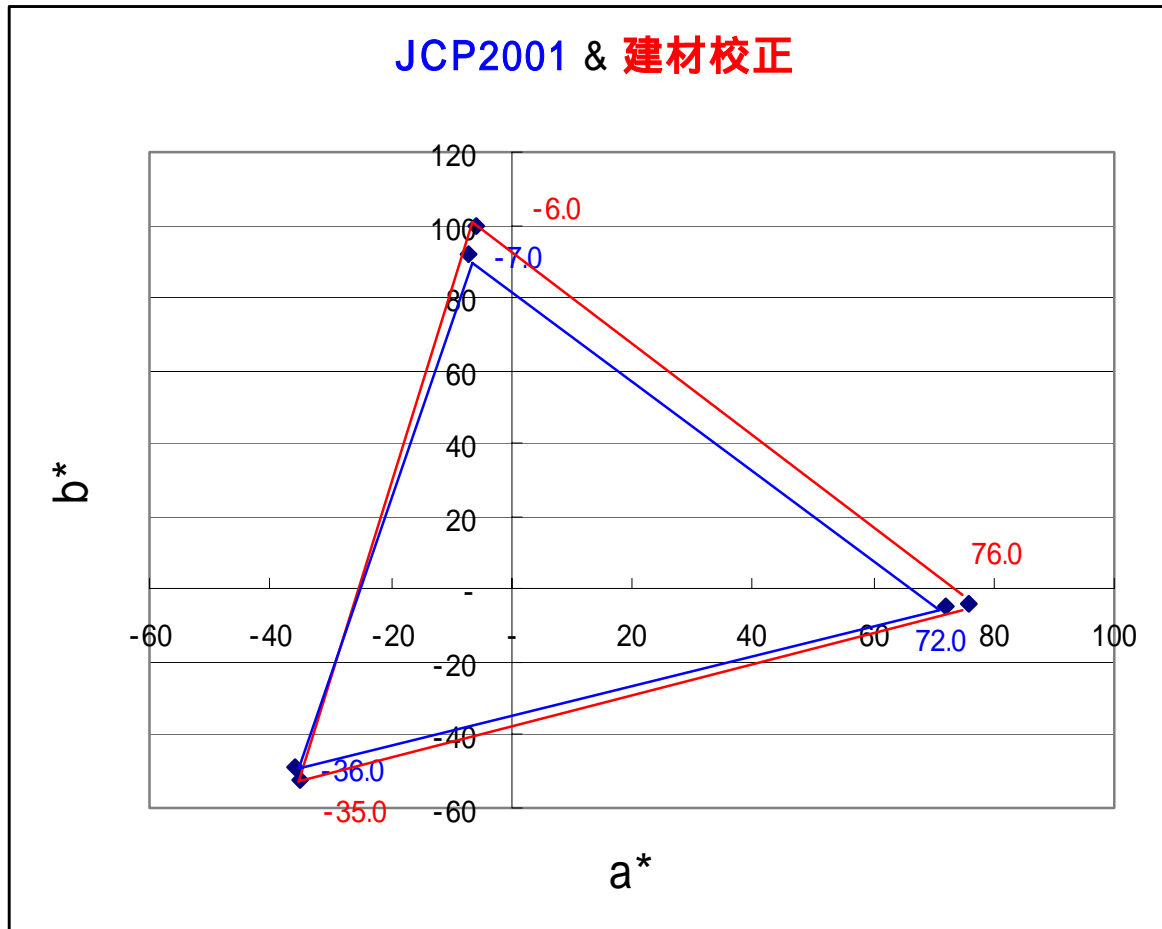


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# Proof & JCP2001



# JCP2001 & Wood Pattern

JCP2001	L*	c *	建材	L*	c *	$\Delta E$
C	54.0	60.8	C	52.0	62.7	3.7
M	45.0	72.2	M	48.0	76.1	5.1
Y	86.0	92.3	Y	89.0	100.2	8.6

# Reproduction of Original (Gravure) & Proof (Offset) in Wood Pattern

# Wood Pattern (No1) ~ (No8)

## モダンカラー N01~4



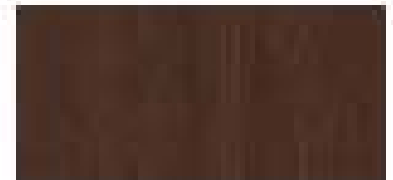
ニュートラル



エッセン



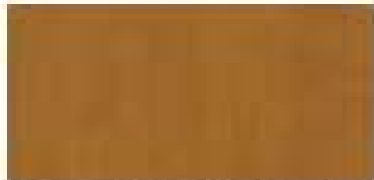
ジェラータ



ショコラーデ

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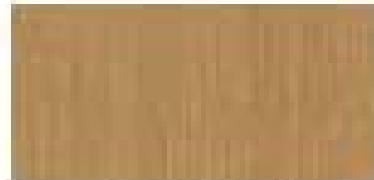
## クラシックカラー No5~8



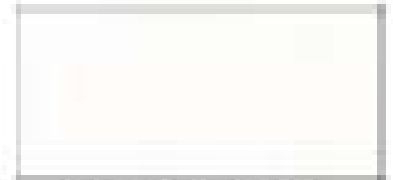
キャラメルモカ



ハーティーブラウン



カジュアル



リフレホホワイト

## a.Original

<b>a</b>	<b>D</b>	<b>L*</b>	<b>a*</b>	<b>b*</b>	<b>c*</b>	<b>HA</b>
1,neutral a	0.94	58.43	15.1	32.52	35.85	65.13
	0.9	60.01	14.34	32.8	35.80	66.42
	0.89	60.61	13.98	32.94	35.78	67.04
	0.98	56.76	15.65	33.38	36.87	64.91
<b>Ave</b>	<b>0.93</b>	<b>58.95</b>	<b>14.77</b>	<b>32.91</b>	<b>36.08</b>	<b>65.87</b>
2,Essen a	0.68	69.63	12.09	30.87	33.15	68.65
	0.66	70.67	11.58	30.56	32.68	69.28
	0.64	71.42	11.07	29.79	31.78	69.65
<b>Ave</b>	<b>0.66</b>	<b>70.57</b>	<b>11.58</b>	<b>30.41</b>	<b>32.54</b>	<b>69.19</b>
3,Gerata a	0.34	81.42	4.34	14.79	15.41	73.68
	0.32	82.45	3.4	13.89	14.30	76.28
	0.3	83.2	3.31	13.39	13.79	76.15
<b>Ave</b>	<b>0.32</b>	<b>82.36</b>	<b>3.68</b>	<b>14.02</b>	<b>14.50</b>	<b>75.32</b>
4,Chocolade a	1.8	18.24	7.89	8.92	11.91	48.53
	1.77	20.68	9.53	12.2	15.48	52.03
	1.74	18.39	6.73	6.79	9.56	45.28
<b>Ave</b>	<b>1.77</b>	<b>19.10</b>	<b>8.05</b>	<b>9.30</b>	<b>12.32</b>	<b>49.16</b>
5,Caramelmok a	1.44	41.75	21.04	34.49	40.40	58.65
	1.41	43.65	21.4	36.38	42.21	59.56
	1.37	45.4	21.62	37.58	43.36	60.12
<b>Ave</b>	<b>1.41</b>	<b>43.60</b>	<b>21.35</b>	<b>36.15</b>	<b>41.99</b>	<b>59.46</b>
6,HiteaBrown a	1.69	27.94	12.04	22.21	25.26	61.57
	1.66	29.47	12.12	23.54	26.48	62.79
	1.64	30.32	12.26	24.27	27.19	63.23
<b>Ave</b>	<b>1.66</b>	<b>29.24</b>	<b>12.14</b>	<b>23.34</b>	<b>26.31</b>	<b>62.55</b>
7,Casual a	1.17	47.37	13.54	29.47	32.43	65.36
	1.07	52.14	12.15	30.91	33.21	68.58
	1	54.25	11.58	29.77	31.94	68.78
<b>Ave</b>	<b>1.08</b>	<b>51.25</b>	<b>12.42</b>	<b>30.05</b>	<b>32.53</b>	<b>67.57</b>
8,SofreWhite a	0.16	88.83	-0.24	3.13	3.14	94.34
	0.15	89.33	-0.3	2.99	3.01	95.69
	0.14	89.66	-0.3	2.89	2.91	95.88
<b>Ave</b>	<b>0.15</b>	<b>89.27</b>	<b>-0.28</b>	<b>3.00</b>	<b>3.02</b>	<b>95.28</b>

## b.Proof

<b>b</b>	<b>D</b>	<b>L*</b>	<b>a*</b>	<b>b*</b>	<b>c*</b>	<b>HA</b>
1,neutral b	0.96	57.66	14.96	34.12	37.26	66.36
	0.94	58.31	14.71	33.57	36.65	66.37
	<b>0.95</b>	<b>57.99</b>	<b>14.84</b>	<b>33.85</b>	<b>36.95</b>	<b>66.36</b>
2,Essen b	0.66	70.49	11.8	30.15	32.38	68.66
	0.64	71.98	11.59	30.72	32.83	69.36
	0.62	72.26	11.09	29.31	31.34	69.31
	<b>0.64</b>	<b>71.58</b>	<b>11.49</b>	<b>30.06</b>	<b>32.18</b>	<b>69.11</b>
3,Gerata b	0.33	82	5.51	13.9	14.95	68.41
	0.32	82.08	5.12	13.48	14.42	69.24
	0.31	82.79	5	13.02	13.95	69.03
	<b>0.32</b>	<b>82.29</b>	<b>5.21</b>	<b>13.47</b>	<b>14.44</b>	<b>68.88</b>
4,Chocolade b	1.58	22.5	9.04	9.23	12.92	45.62
	1.57	22.84	10.11	8.99	13.53	41.67
	1.56	22.66	8.85	8.44	12.23	43.66
	<b>1.57</b>	<b>22.67</b>	<b>9.33</b>	<b>8.89</b>	<b>12.89</b>	<b>43.62</b>
5,Caramelmoka b	1.42	41.45	24.76	34.79	42.70	54.59
	1.39	41.96	25.26	34.45	42.72	53.78
	1.35	45.06	25.31	37.32	45.09	55.88
	<b>1.39</b>	<b>42.82</b>	<b>25.11</b>	<b>35.52</b>	<b>43.50</b>	<b>54.77</b>
6,HiteaBrown b	1.45	34.78	16.52	24.18	29.28	55.69
	1.42	37.45	18.26	28.15	33.55	57.06
	1.4	39.06	18	29.54	34.59	58.67
	<b>1.42</b>	<b>37.10</b>	<b>17.59</b>	<b>27.29</b>	<b>32.48</b>	<b>57.22</b>
7,Casual b	1.1	48.27	15.98	27.16	31.51	59.56
	1.07	49.25	15.53	27.13	31.26	60.24
	1.02	51.46	15.41	26.76	30.88	60.09
	<b>1.06</b>	<b>49.66</b>	<b>15.64</b>	<b>27.02</b>	<b>31.22</b>	<b>59.96</b>
8,SofreWhite b	0.14	89.26	0.24	1.39	1.41	80.24
	0.13	89.51	0.2	1.1	1.12	79.74
	0.12	90.07	0.1	0.62	0.63	80.88
	<b>0.13</b>	<b>89.61</b>	<b>0.18</b>	<b>1.04</b>	<b>1.05</b>	<b>80.19</b>

Calculated values

E	c*(a-b)	HA(a-b)	D(a-b)
1.78	-1.40	-1.23	-0.02
1.90	-0.85	0.05	-0.04
1.84	-1.13	-0.50	-0.02
1.16	0.78	-0.01	0.02
1.32	-0.15	-0.08	0.02
0.97	0.44	0.34	0.02
1.15	0.36	0.08	0.02
1.58	0.46	5.27	0.01
1.81	-0.12	7.05	0.00
1.78	-0.15	7.13	-0.01
1.72	0.06	6.44	0.00
4.42	-1.01	2.91	0.22
3.91	1.95	10.37	0.20
5.04	-2.67	1.61	0.18
4.46	-0.58	5.54	0.20
3.74	-2.30	4.06	0.02
4.63	-0.51	5.79	0.02
3.71	-1.74	4.23	0.02
4.03	-1.52	4.69	0.02
8.41	-4.02	5.88	0.24
11.07	-7.08	5.73	0.24
11.71	-7.40	4.56	0.24
10.40	-6.17	5.33	0.24
3.48	0.92	5.80	0.07
5.84	1.95	8.33	0.00
5.61	1.06	8.69	-0.02
4.98	1.31	7.61	0.02
1.86	1.73	14.10	0.02
1.96	1.89	15.95	0.02
2.34	2.28	15.01	0.02
2.05	1.96	15.09	0.02

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# a, Original c\*, HA

a	D	L*	a*	b*	c*	HA
1,Ave	0.93	58.95	14.77	32.91	36.08	65.87
2,Ave	0.66	70.57	11.58	30.41	32.54	69.19
3,Ave	0.32	82.36	3.68	14.02	14.50	75.32
4,Ave	1.77	19.10	8.05	9.30	12.32	49.16
5,Ave	1.41	43.60	21.35	36.15	41.99	59.46
6,Ave	1.66	29.24	12.14	23.34	26.31	62.55
7,Ave	1.08	51.25	12.42	30.05	32.53	67.57
8,Ave	0.15	89.27	-0.28	3.00	3.02	95.28

## b, offset proof c\*, HA

b	D	L*	a*	b*	c*	HA
1,Ave	0.95	57.99	14.84	33.85	36.95	66.36
2,Ave	0.64	71.58	11.49	30.06	32.18	69.11
3,Ave	0.32	82.29	5.21	13.47	14.44	68.88
4,Ave	1.57	22.67	9.33	8.89	12.89	43.62
5,Ave	1.39	42.82	25.11	35.52	43.50	54.77
6,Ave	1.42	37.10	17.59	27.29	32.48	57.22
7,Ave	1.06	49.66	15.64	27.02	31.22	59.96
8,Ave	0.13	89.61	0.18	1.04	1.05	80.19

# a, original & b, proof      E

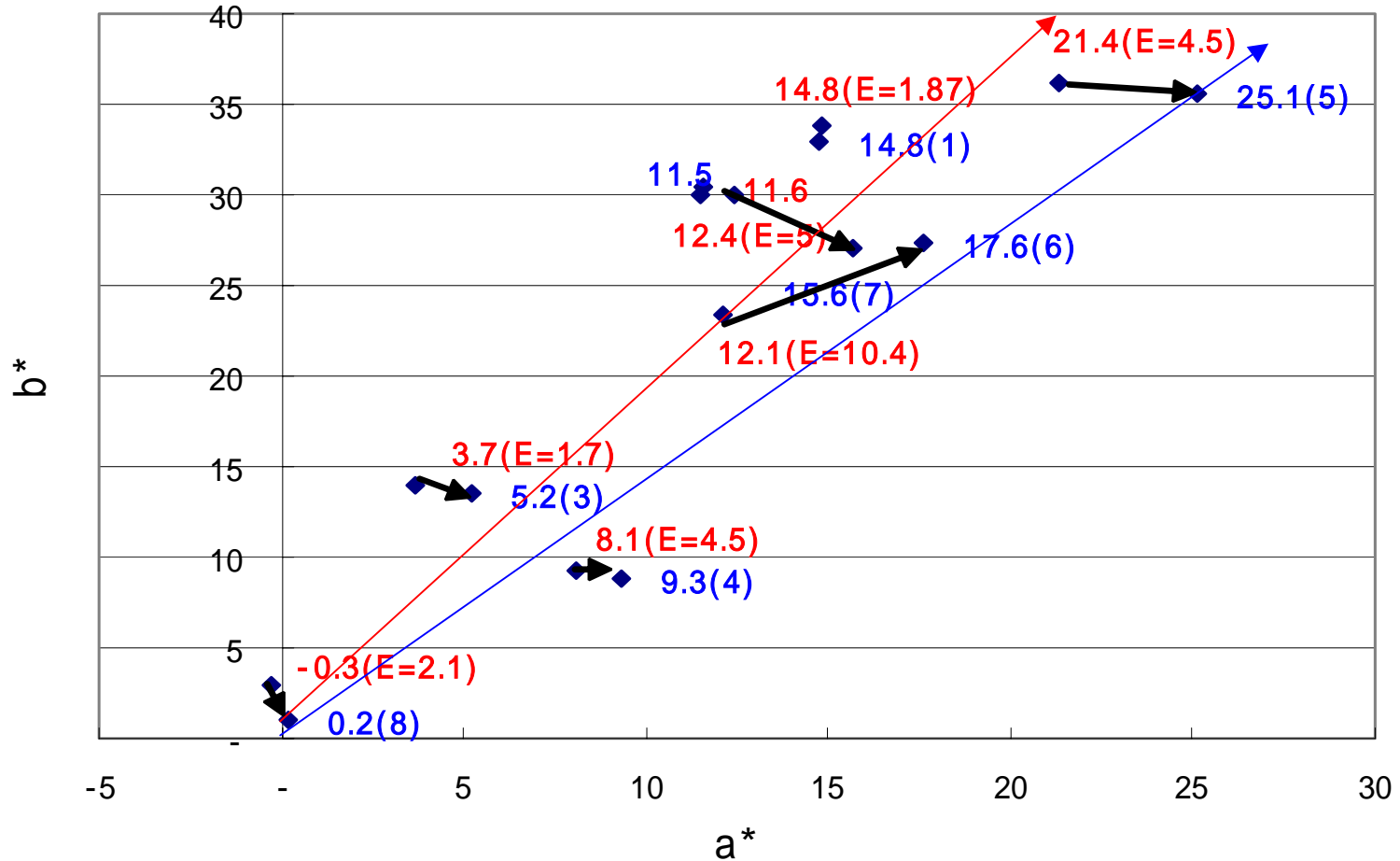
b	D	L*	a*	b*	c*	HA	E	c*(a-b)	HA(a-b)	D(a-b)
1,Ave	0.95	57.99	14.84	33.85	36.95	66.36	1.84	-1.13	-0.50	-0.02
2,Ave	0.64	71.58	11.49	30.06	32.18	69.11	1.15	0.36	0.08	0.02
3,Ave	0.32	82.29	5.21	13.47	14.44	68.88	1.72	0.06	6.44	0.00
4,Ave	1.57	22.67	9.33	8.89	12.89	43.62	4.46	-0.58	5.54	0.20
5,Ave	1.39	42.82	25.11	35.52	43.50	54.77	4.03	-1.52	4.69	0.02
6,Ave	1.42	37.10	17.59	27.29	32.48	57.22	10.40	-6.17	5.33	0.24
7,Ave	1.06	49.66	15.64	27.02	31.22	59.96	4.98	1.31	7.61	0.02
8,Ave	0.13	89.61	0.18	1.04	1.05	80.19	2.05	1.96	15.09	0.02
								-0.7976	0.0845	0.8022

a, original & b, proof E &  
 $c * (a-b)$ , HA(a-b)

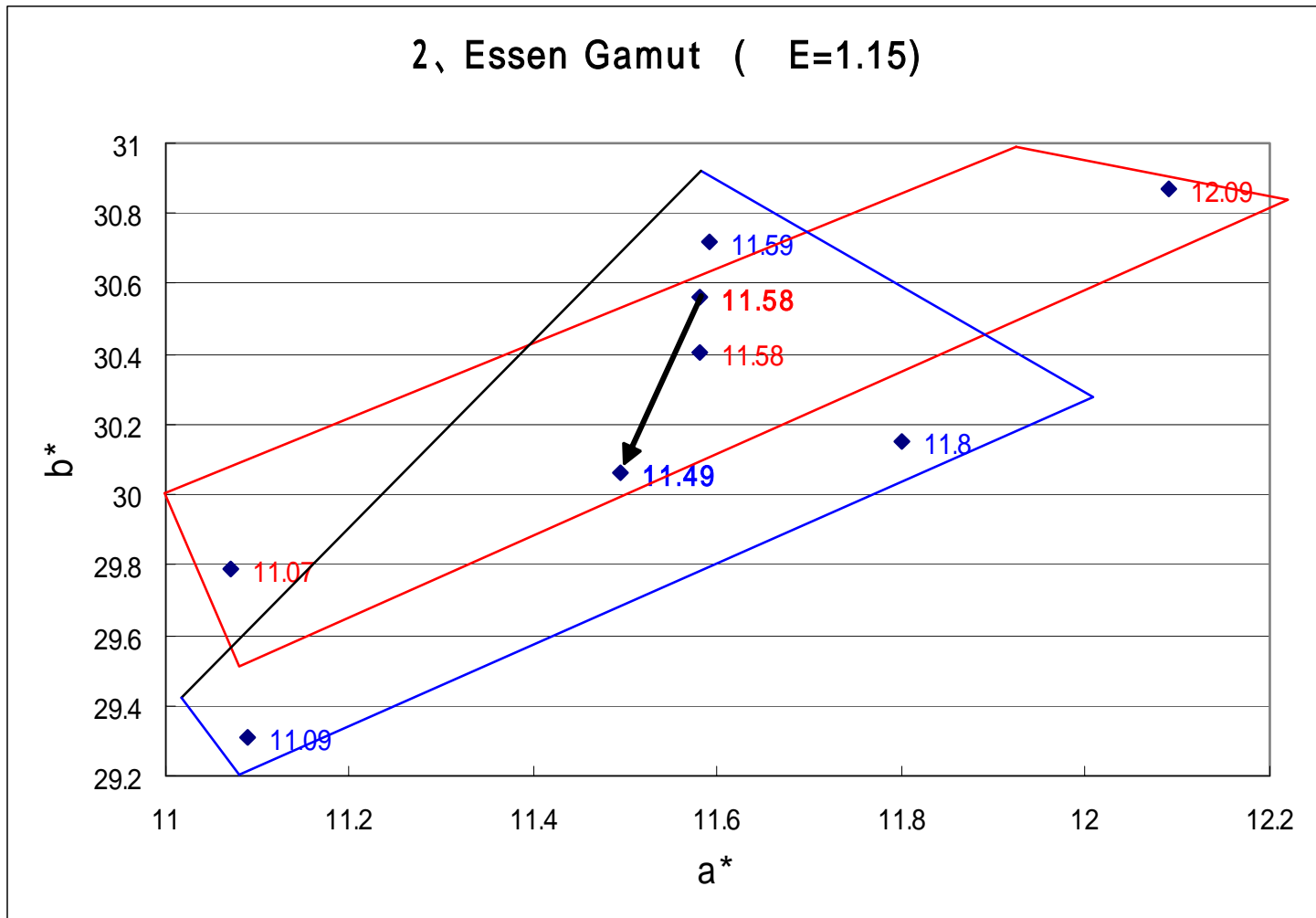
E	$c * (a-b)$	HA(a-b)	D(a-b)
1.84	-1.13	-0.50	-0.02
1.15	0.36	0.08	0.02
1.72	0.06	6.44	0.00
4.46	-0.58	5.54	0.20
4.03	-1.52	4.69	0.02
10.40	-6.17	5.33	0.24
4.98	1.31	7.61	0.02
2.05	1.96	15.09	0.02
	-0.7976	0.0845	0.8022

# a, b, Gamut

8 ave. Gamut red=original, blue=Proof

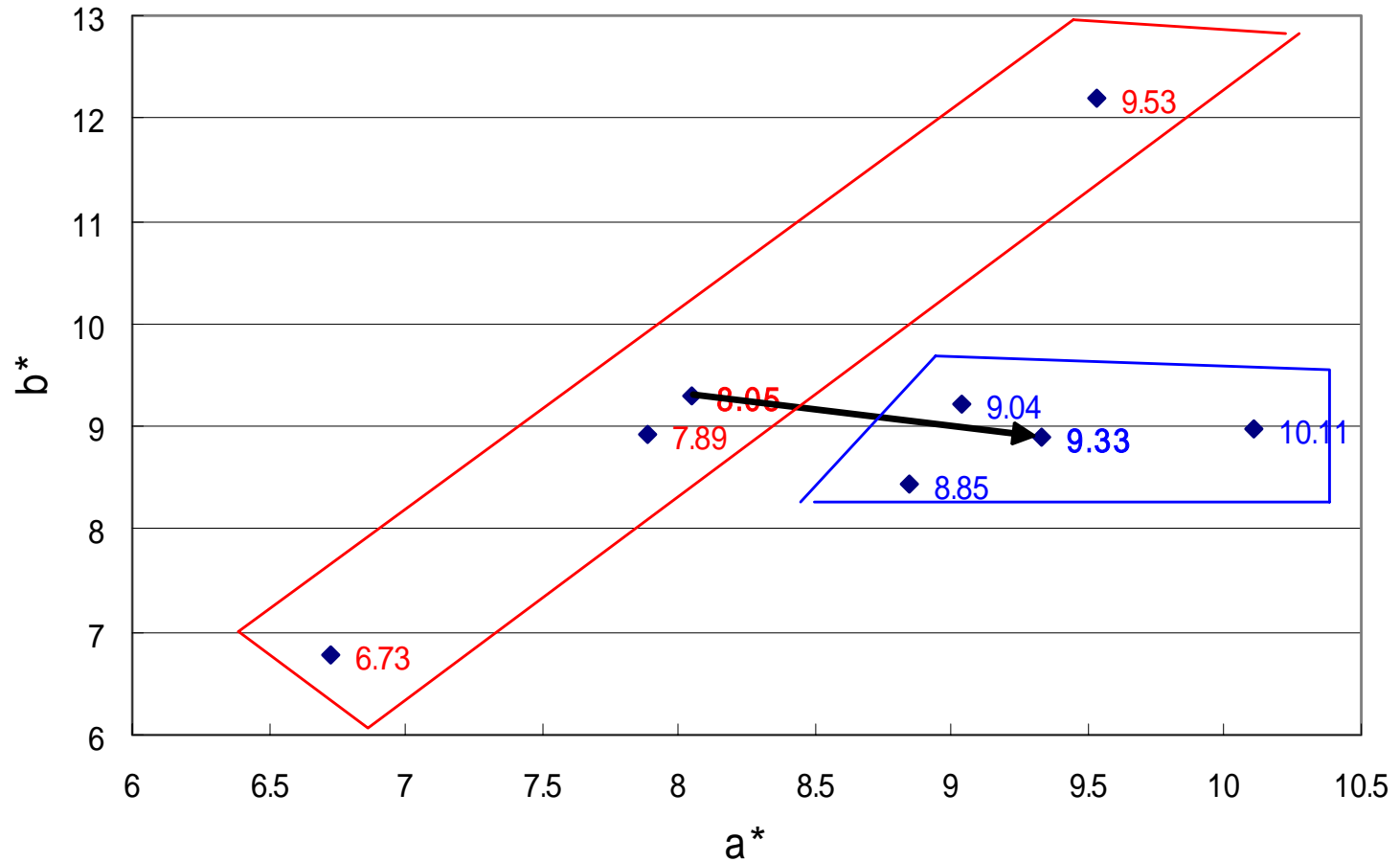


# No2 Sample Gamut

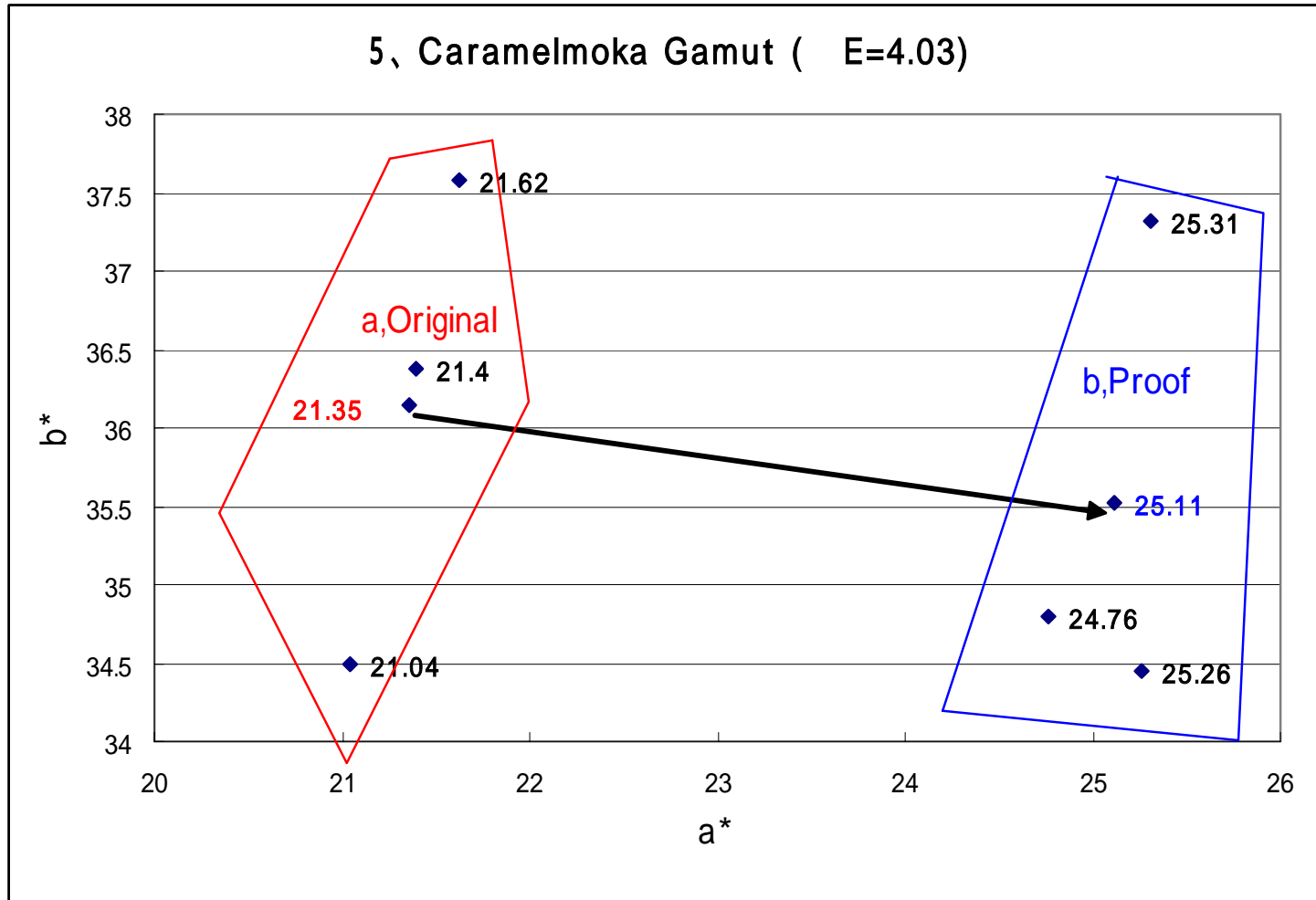


# No4 Sample Gamut

4、Chocolate Gamut( E=4.46 )



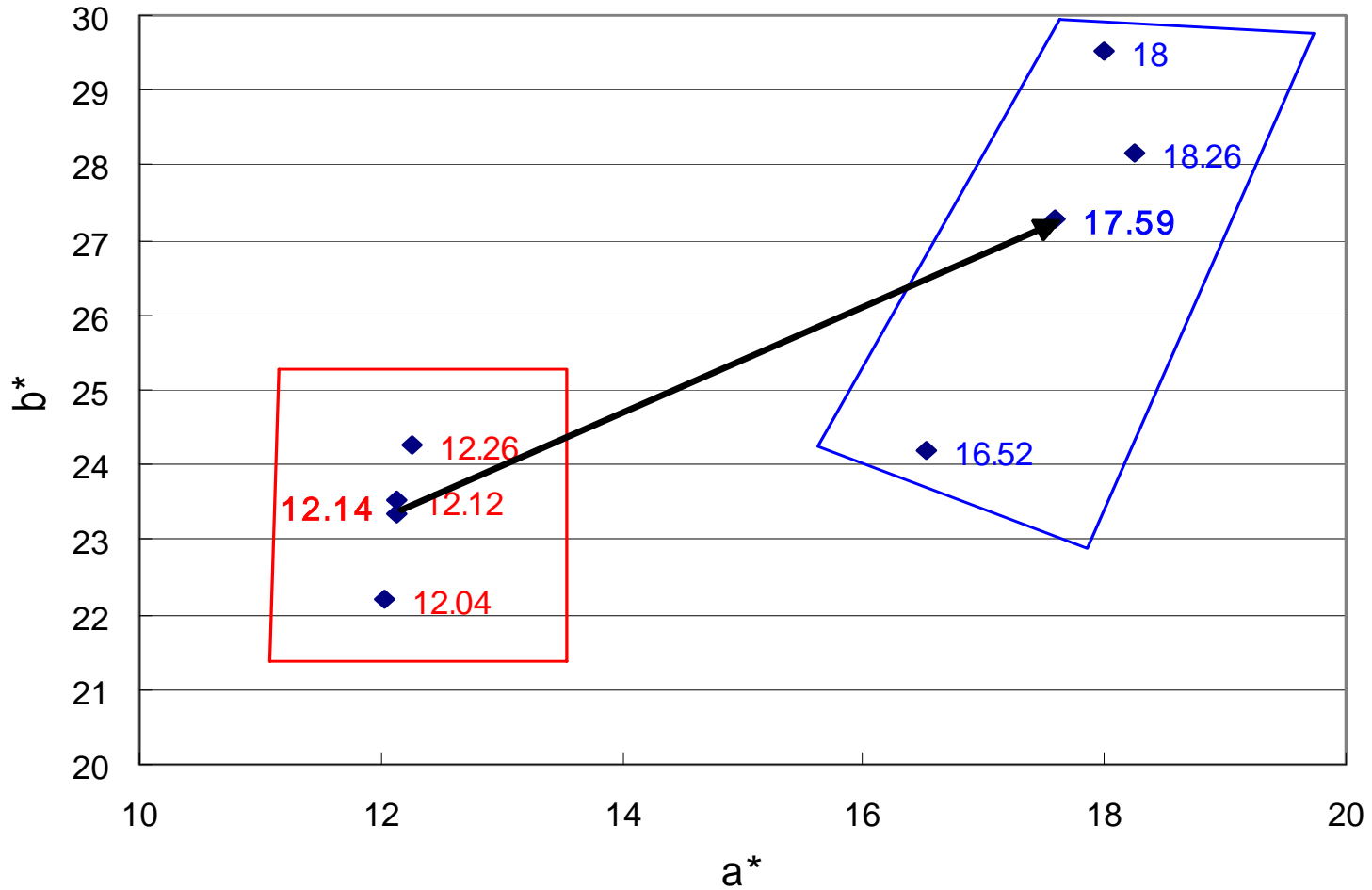
# No5 Sample Gamut





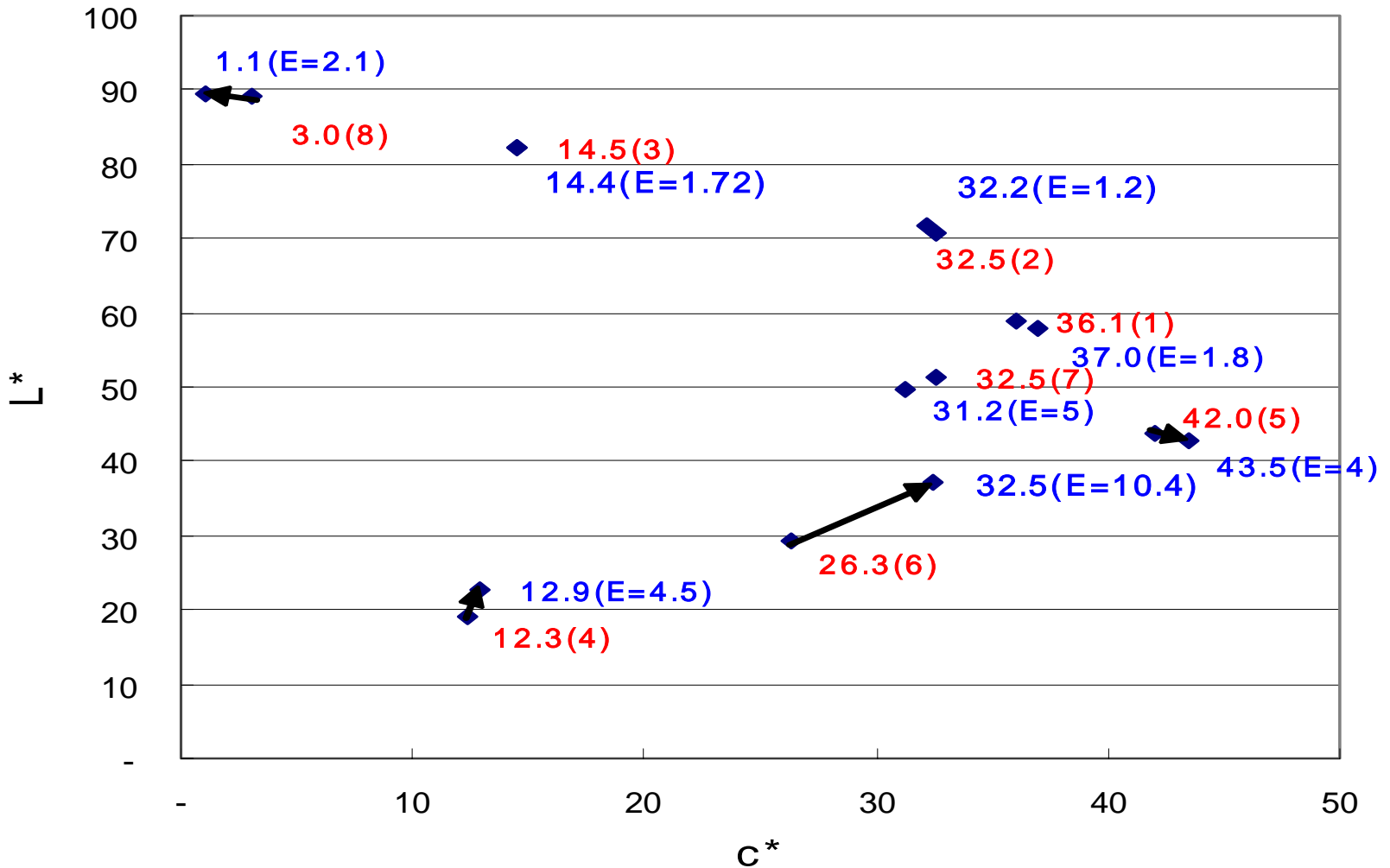
# No6 Sample Gamut

6、Hitea Brown Gamut( E=10.4)



# $C^*$ - $L^*$ Original & Proof

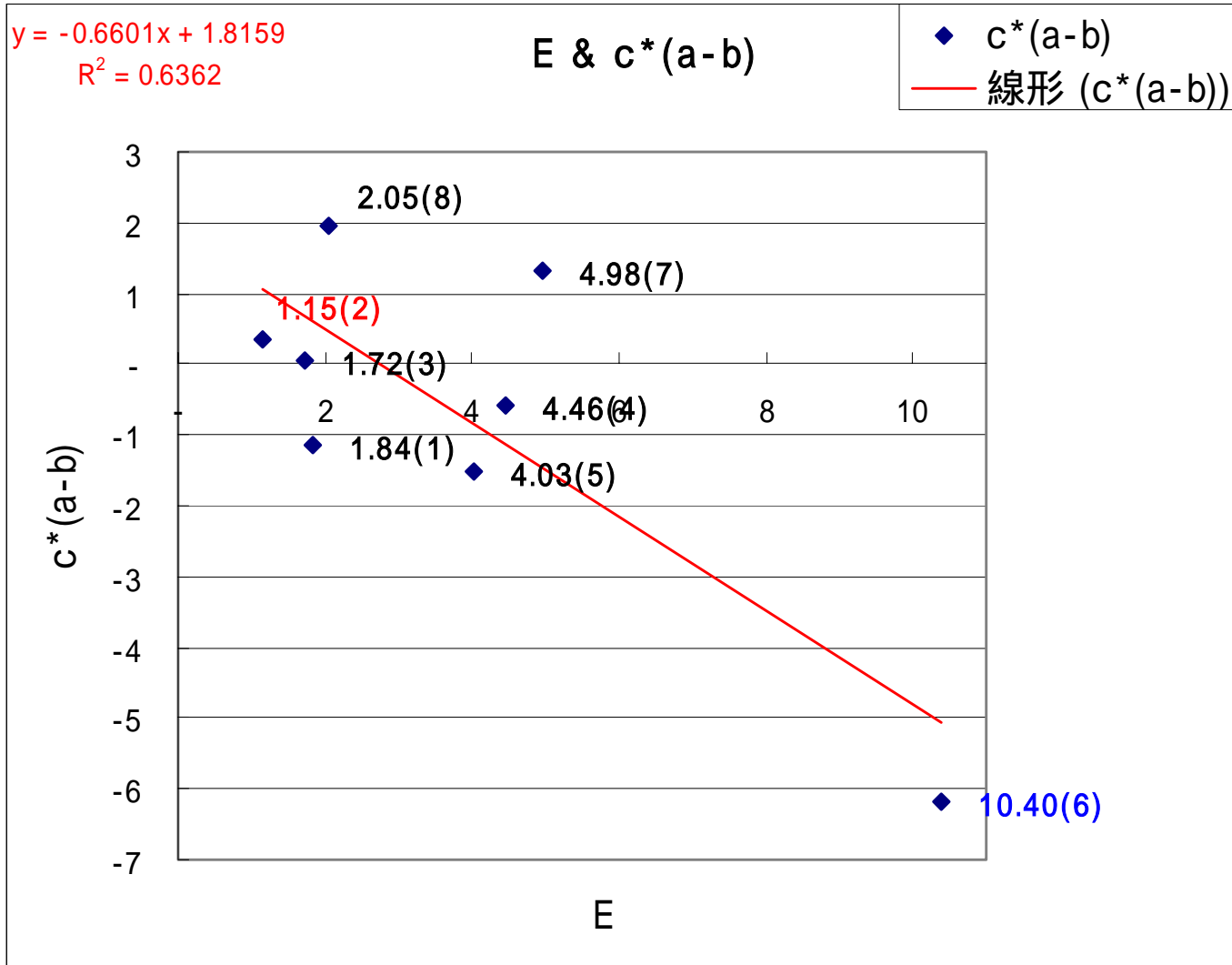
$C^*$  -  $L^*$  original proof (1-8)



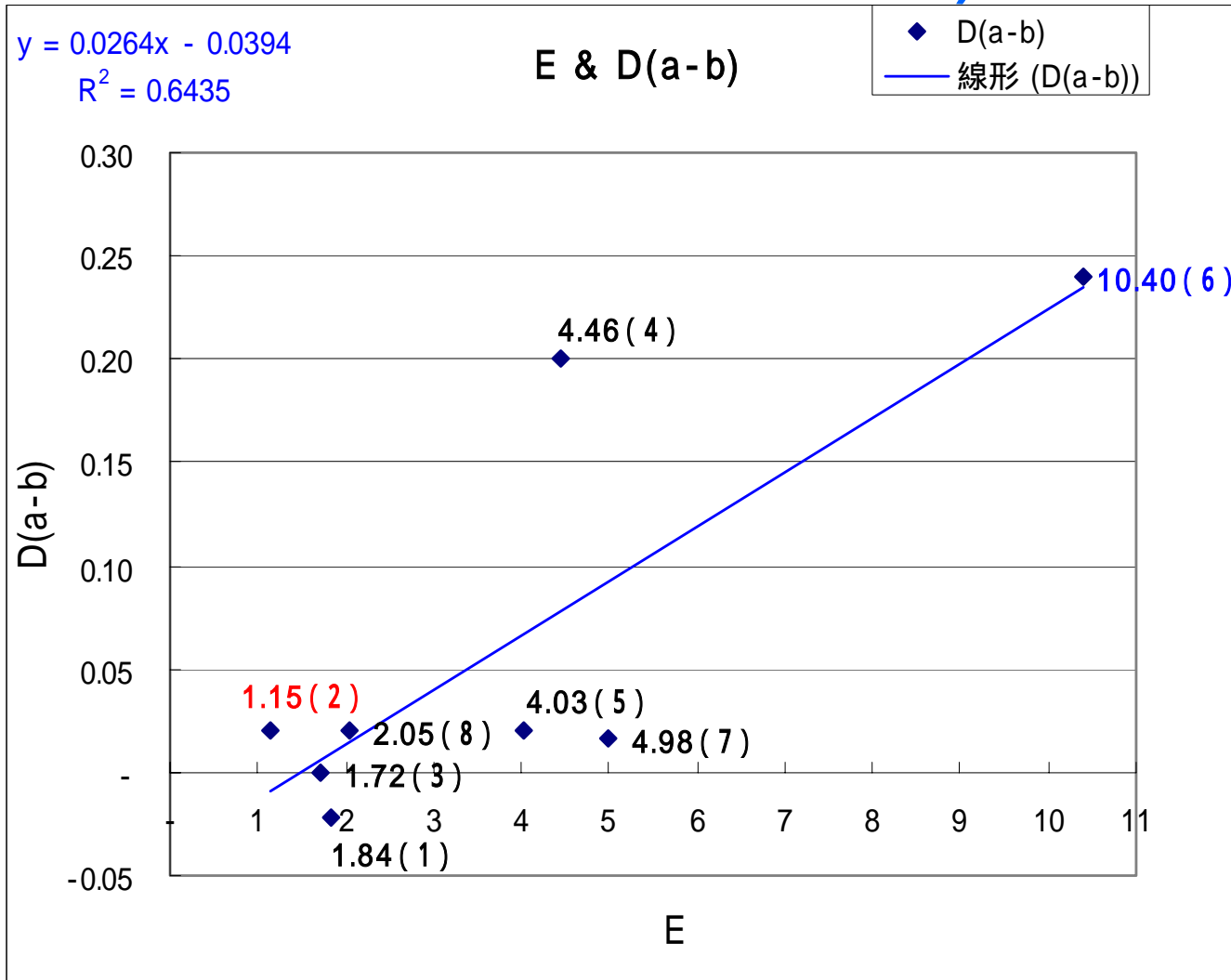
## E & Difference of $c^*$ , HA, D

Sample	E	$c^*(a-b)$	HA(a-b)	D(a-b)
2	1.15	0.36	0.08	0.020
3	1.72	0.06	6.44	0.000
1	1.84	-1.13	-0.50	-0.023
8	2.05	1.96	15.09	0.020
5	4.03	-1.52	4.69	0.020
4	4.46	-0.58	5.54	0.200
7	4.98	1.31	7.61	0.017
6	10.40	-6.17	5.33	0.240
		-0.798	0.085	0.802

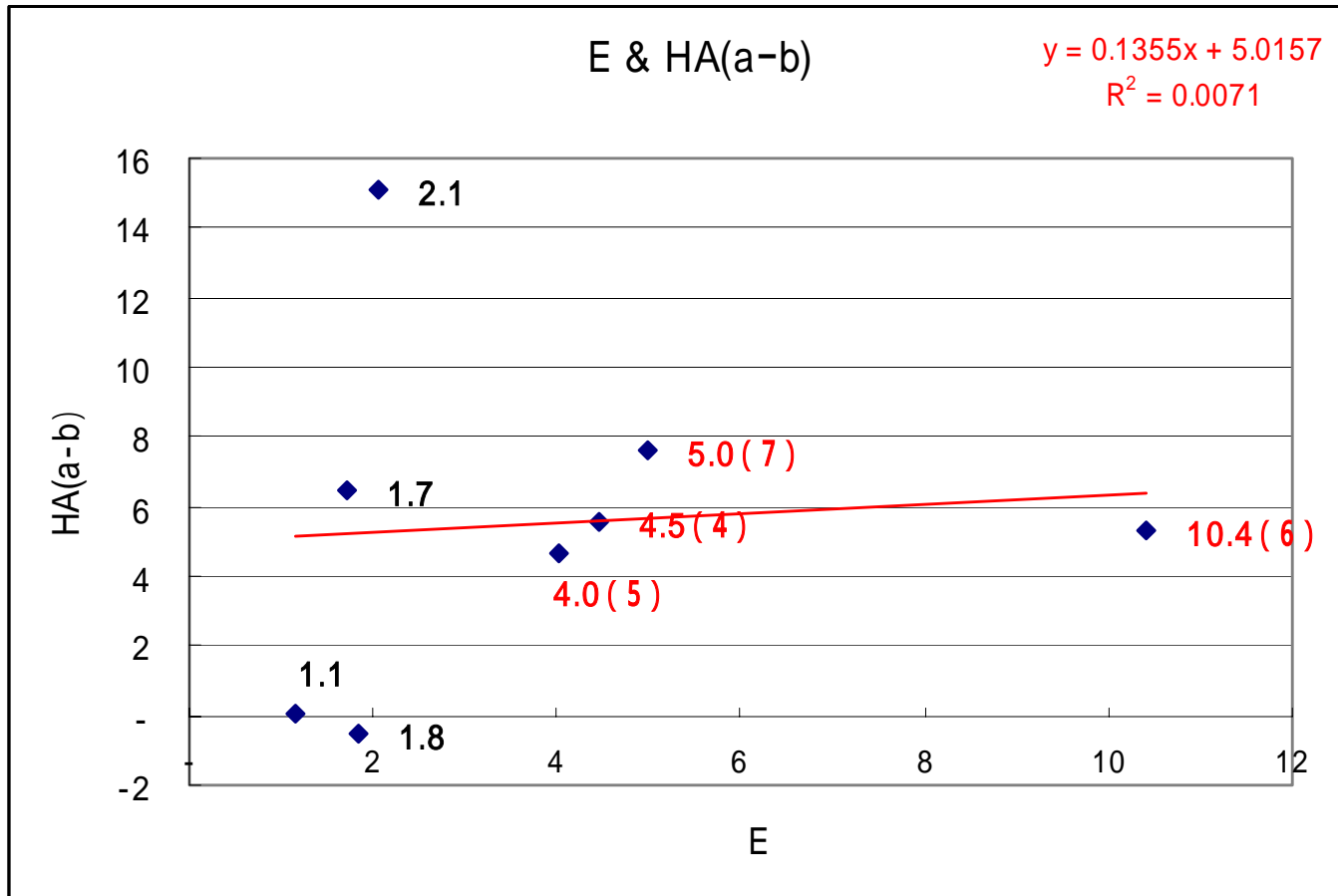
# E & c \* (a-b)



# E & D(a-b)



# E & HA(a-b)

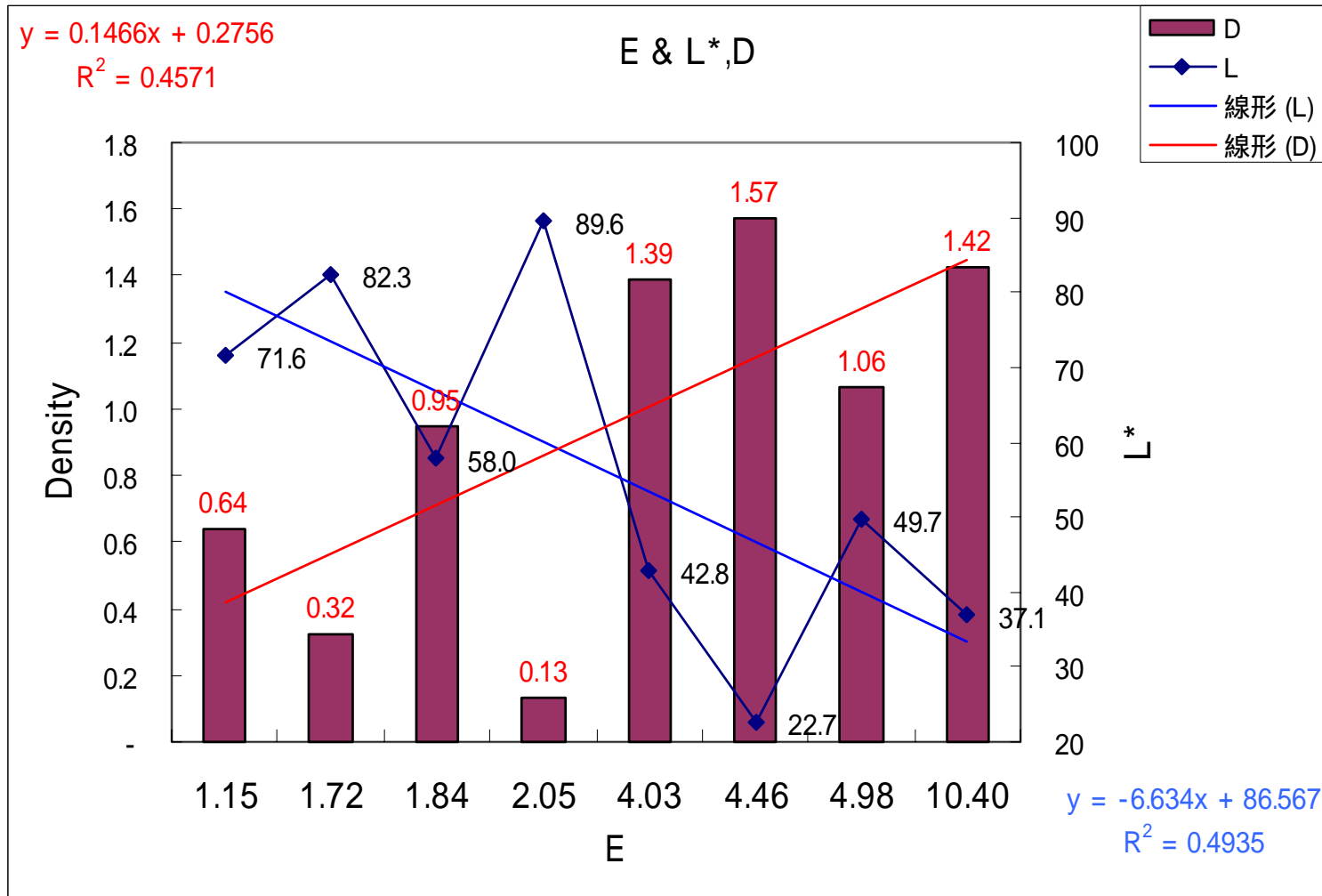


# Ave Data D,L, E in Proof (b)

## Ave Data

Sample	D	L	E
2	0.64	71.58	1.15
3	0.32	82.29	1.72
1	0.95	57.99	1.84
8	0.13	89.61	2.05
5	1.39	42.82	4.03
4	1.57	22.67	4.46
7	1.06	49.66	4.98
6	1.42	37.10	10.40

# Graph of Ave Data D,L, E in proof





# Evaluation of Wood Pattern by Ink Jet Print

E &  
C \*

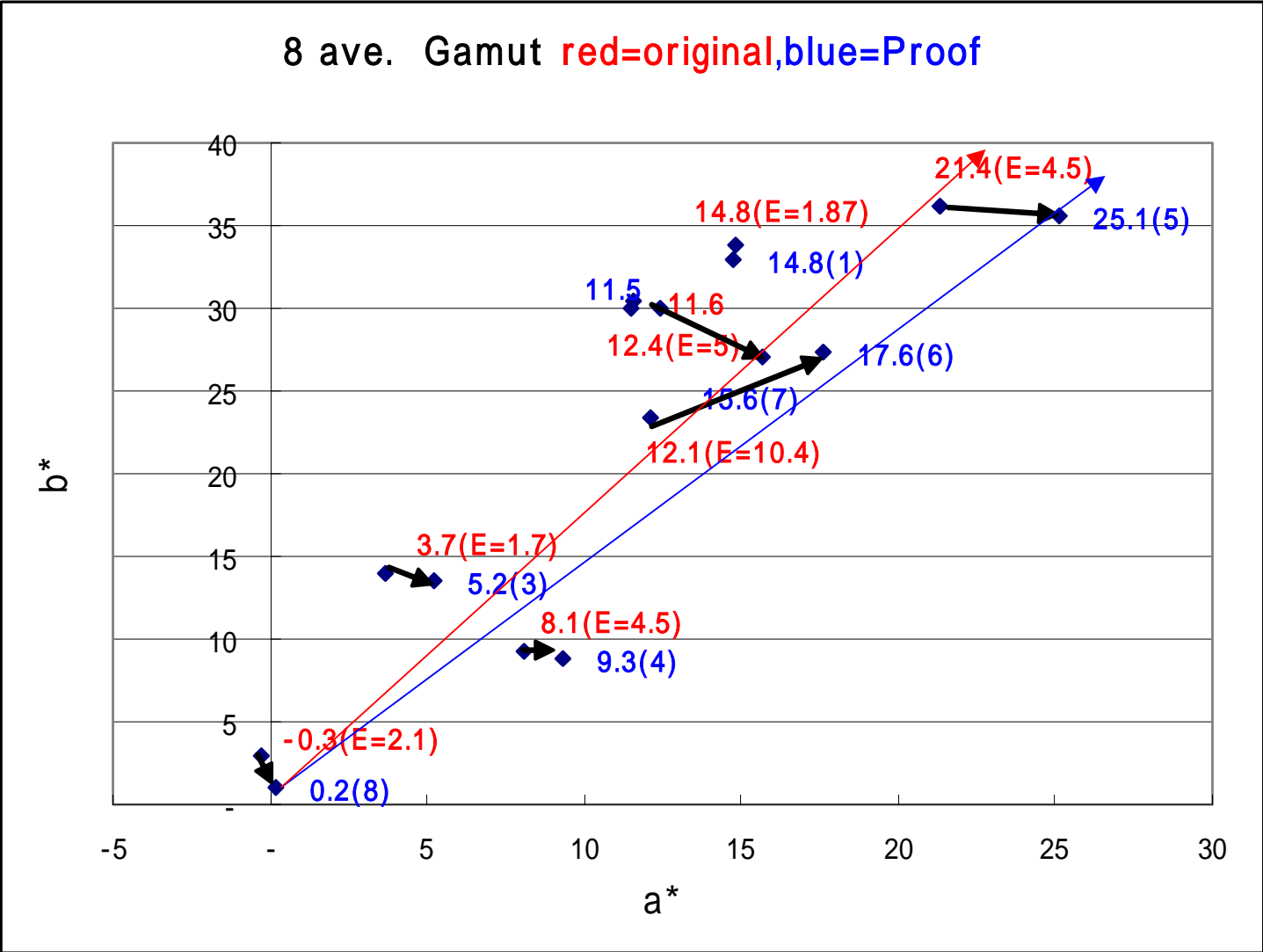
a Original	E(a-b)	E(b-c)	E(a-c)	c*(a-b)	c*(b-c)	c*(a-c)
1,neutral a	1.78	7.18	6.99	-1.40	0.22	-1.18
	1.90	6.80	7.72	-0.85	0.06	-0.79
			6.53			-0.82
			5.04		0.14	
<b>Ave</b>	<b>1.84</b>			<b>-1.13</b>		
2,Essen a	1.16	7.30	7.06	0.78	-3.77	-2.99
	1.32	5.97	6.03	-0.15	-2.25	-2.40
	0.97	6.82	7.30	0.44	-2.28	-1.84
	<b>Ave</b>	<b>1.15</b>	<b>6.50</b>	<b>6.65</b>	<b>0.36</b>	<b>-2.76</b>
3,Gerata a	1.58	4.15	4.62	0.46	-2.73	-2.26
	1.81	4.51	4.52	-0.12	-1.47	-1.59
	1.78	5.04	4.56	-0.15	-0.46	-0.61
	<b>Ave</b>	<b>1.72</b>	<b>4.39</b>	<b>4.48</b>	<b>0.06</b>	<b>-1.54</b>
4,Chocolade a	4.42	5.59	5.71	-1.01	0.90	-0.11
	3.91	4.43	7.03	1.95	-1.08	0.87
	5.04	3.97	6.64	-2.67	-1.81	-4.48
	<b>Ave</b>	<b>4.46</b>	<b>4.47</b>	<b>5.78</b>	<b>-0.58</b>	<b>-0.65</b>
5,Caramelmok a	3.74	7.71	10.07	-2.30	2.07	-0.23
	4.63	6.56	10.97	-0.51	0.90	0.39
	3.71	8.04	10.80	-1.74	2.06	0.32
	<b>Ave</b>	<b>4.03</b>	<b>7.42</b>	<b>10.61</b>	<b>-1.52</b>	<b>1.68</b>
6,HiteaBrown a	8.41	7.92	9.44	-4.02	2.02	-2.00
	11.07	11.89	9.73	-7.08	6.62	-0.46
	11.71	8.39	10.87	-7.40	2.62	-4.78
	<b>Ave</b>	<b>10.40</b>	<b>9.27</b>	<b>9.76</b>	<b>-6.17</b>	<b>3.77</b>
7,Casual a	3.48	4.90	8.20	0.92	1.18	2.10
	5.84	4.86	10.16	1.95	3.19	5.14
	5.61	4.02	8.94	1.06	1.19	2.25
	<b>Ave</b>	<b>4.98</b>	<b>4.44</b>	<b>8.94</b>	<b>1.31</b>	<b>1.86</b>
8,SofreWhite a	1.86	3.94	4.87	1.73	0.28	2.01
	1.96	4.29	4.94	1.89	0.08	1.97
	2.34	4.19	5.03	2.28	-0.27	2.00
	<b>Ave</b>	<b>2.05</b>	<b>4.13</b>	<b>4.95</b>	<b>1.96</b>	<b>0.03</b>

08-9-25 4:29 AK

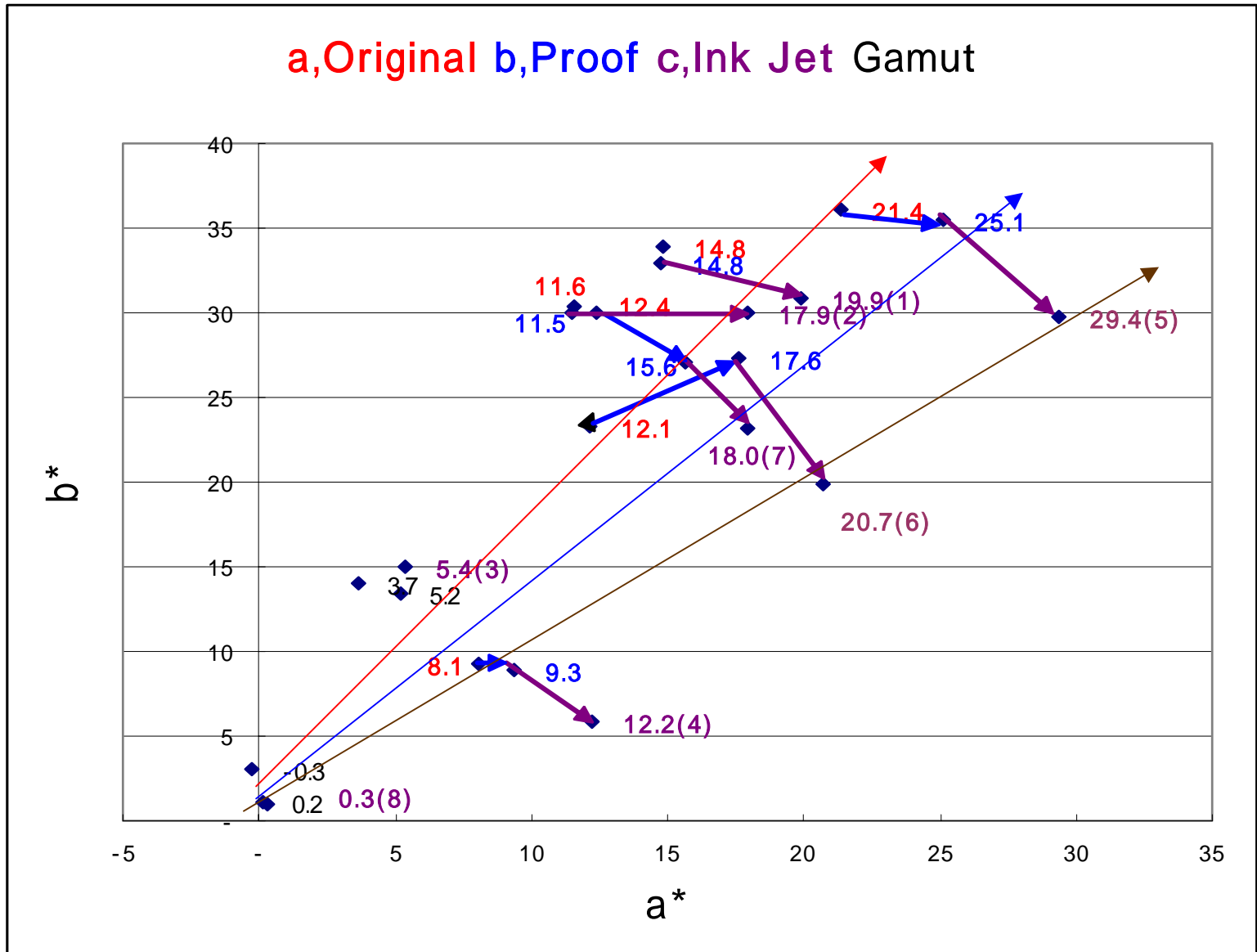
E &  
HA

a Original	E(a-b)	E(b-c)	E(a-c)	HA(a-b)	HA(b-c)	HA(a-c)
1,neutral a	1.78	7.18	6.99	-1.23	9.53	8.30
	1.90	6.80	7.72	0.05	9.55	9.60
			6.53			
			5.04		9.54	7.61
<b>Ave</b>	<b>1.84</b>			<b>-0.50</b>		
2,Essen a	1.16	7.30	7.06	-0.01	10.49	10.48
	1.32	5.97	6.03	-0.08	9.33	9.25
	0.97	6.82	7.30	0.34	9.97	10.31
	<b>Ave</b>	<b>1.15</b>	<b>6.50</b>	<b>6.65</b>	<b>0.08</b>	<b>9.94</b>
3,Gerata a	1.58	4.15	4.62	5.27	0.12	5.40
	1.81	4.51	4.52	7.05	-0.74	6.30
	1.78	5.04	4.56	7.13	-4.64	2.49
	<b>Ave</b>	<b>1.72</b>	<b>4.39</b>	<b>4.48</b>	<b>6.44</b>	<b>-1.58</b>
4,Chocolad a	4.42	5.59	5.71	2.91	23.10	26.01
	3.91	4.43	7.03	10.37	16.37	26.73
	5.04	3.97	6.64	1.61	15.19	16.80
	<b>Ave</b>	<b>4.46</b>	<b>4.47</b>	<b>5.78</b>	<b>5.54</b>	<b>18.04</b>
5,Carameln a	3.74	7.71	10.07	4.06	9.75	13.80
	4.63	6.56	10.97	5.79	8.66	14.44
	3.71	8.04	10.80	4.23	9.72	13.96
	<b>Ave</b>	<b>4.03</b>	<b>7.42</b>	<b>10.61</b>	<b>4.69</b>	<b>9.38</b>
6,HiteaBro a	8.41	7.92	9.44	5.88	13.34	19.22
	11.07	11.89	9.73	5.73	14.85	20.58
	11.71	8.39	10.87	4.56	12.00	16.56
	<b>Ave</b>	<b>10.40</b>	<b>9.27</b>	<b>9.76</b>	<b>5.33</b>	<b>13.31</b>
7,Casual a	3.48	4.90	8.20	5.80	8.73	14.52
	5.84	4.86	10.16	8.33	7.08	15.41
	5.61	4.02	8.94	8.69	7.07	15.76
	<b>Ave</b>	<b>4.98</b>	<b>4.44</b>	<b>8.94</b>	<b>7.61</b>	<b>7.65</b>
8,SofreWh a	1.86	3.94	4.87	14.10	13.14	27.24
	1.96	20.25	4.94	15.95	8.31	24.26
	2.34	4.19	5.03	15.01	0.40	15.41
	<b>Ave</b>	<b>2.05</b>	<b>4.13</b>	<b>4.95</b>	<b>15.09</b>	<b>7.70</b>

# Gamut of Original & Proof



# Gamut of Proof & Ink Jet Print



# Fundamental statistics of Original & Ink Jet Print

a-c E		a-cHA	
E	Statistics	E	Statistics
Ave	7.49	Ave	14.91
Stad.Dev	2.25	Stad.Dev	6.83
Range	<b>6.45</b>	Range	<b>24.75</b>
Min	4.52	Min	2.49
Max	10.97	Max	27.24
Total	172.19	Total	342.84
Samples	<b>23</b>	Samples	<b>23</b>

# Selection of Samples(4,5,6,7)

a - b	E(a-b)	c*(a-b)	L(a-b)	HA(a-b)	D(a-b)
4, Ave	4.46	-0.58	-3.56	5.54	0.20
5, Ave	4.03	-1.52	0.78	4.69	0.02
6, Ave	10.40	-6.17	-7.85	5.33	0.24
7, Ave	4.98	1.31	1.59	7.61	0.02
		-0.874	0.858	0.397	-0.344

b - c	E(b-c)	c*(b-c)	L*(b-c)	HA(b-c)	D(b-c)
4, Ave	4.47	-0.65	1.55	18.04	-0.04
5, Ave	7.42	1.68	1.91	9.38	0.05
6, Ave	9.27	3.77	4.65	13.31	-0.01
7, Ave	4.44	1.86	0.03	7.65	0.07
		0.789	0.598	0.358	-0.978

a - c	E(a-c)	c*(a-c)	L*(a-c)	HA(a-c)	D(a-c)
4, Ave	5.78	-1.23	-2.01	23.58	0.16
5, Ave	10.61	0.16	2.68	14.07	0.07
6, Ave	9.76	-2.40	-3.20	18.64	0.23
7, Ave	8.94	3.17	1.63	15.26	0.08
		0.140	0.770	-0.787	0.647

# Original & Ink Jet in $E, HA, c^*, L^* & D$

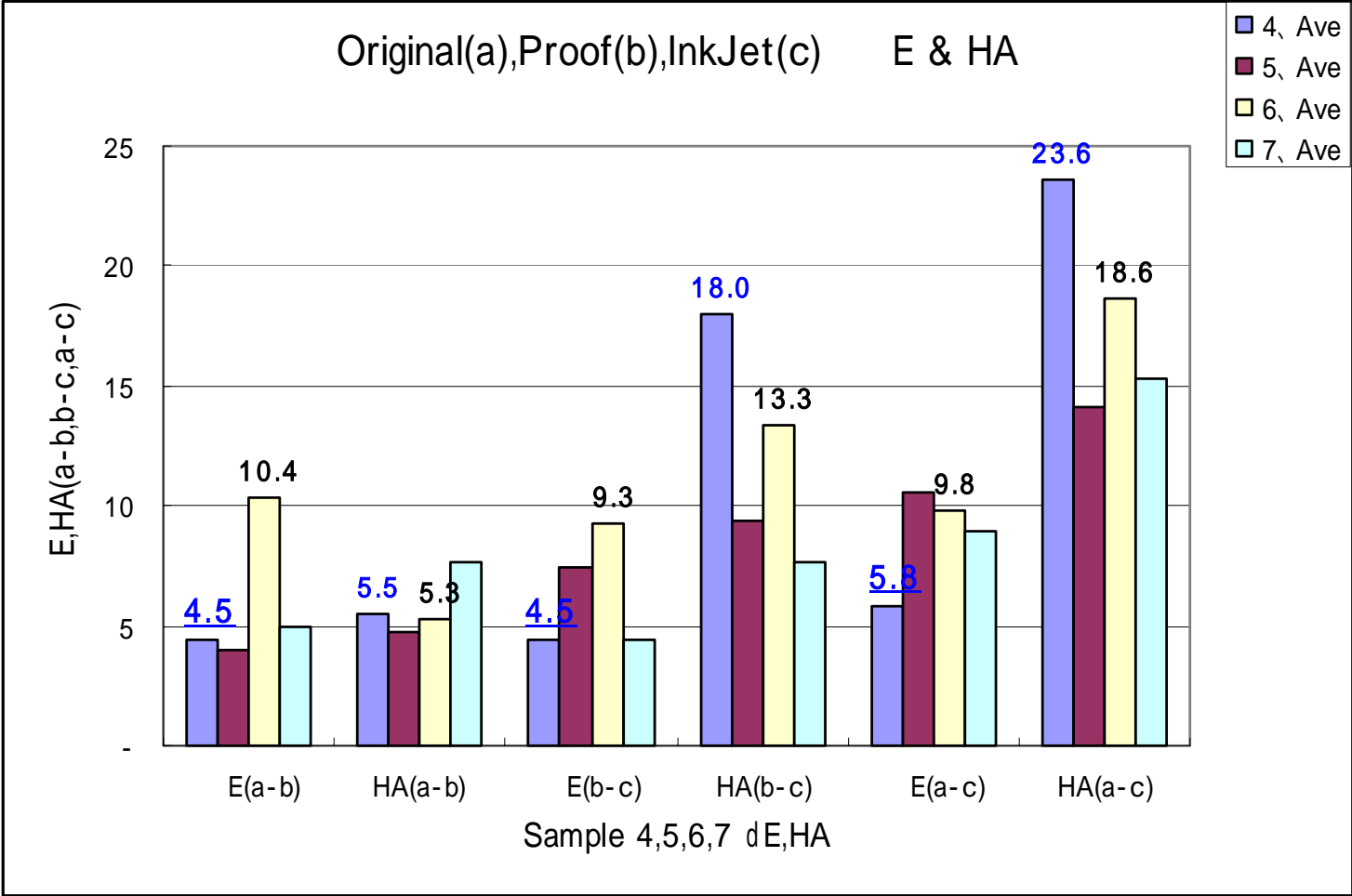
a-c	4, Ave	7, Ave	6, Ave	5, Ave
$E(a-c)$	5.78	8.94	9.76	10.61
$HA(a-c)$	23.58	15.26	18.64	14.07
$c^*(a-c)$	-1.23	3.17	-2.40	0.16
$L^*(a-c)$	-2.01	1.63	-3.20	2.68
$D(a-c)$	0.16	0.08	0.23	0.07



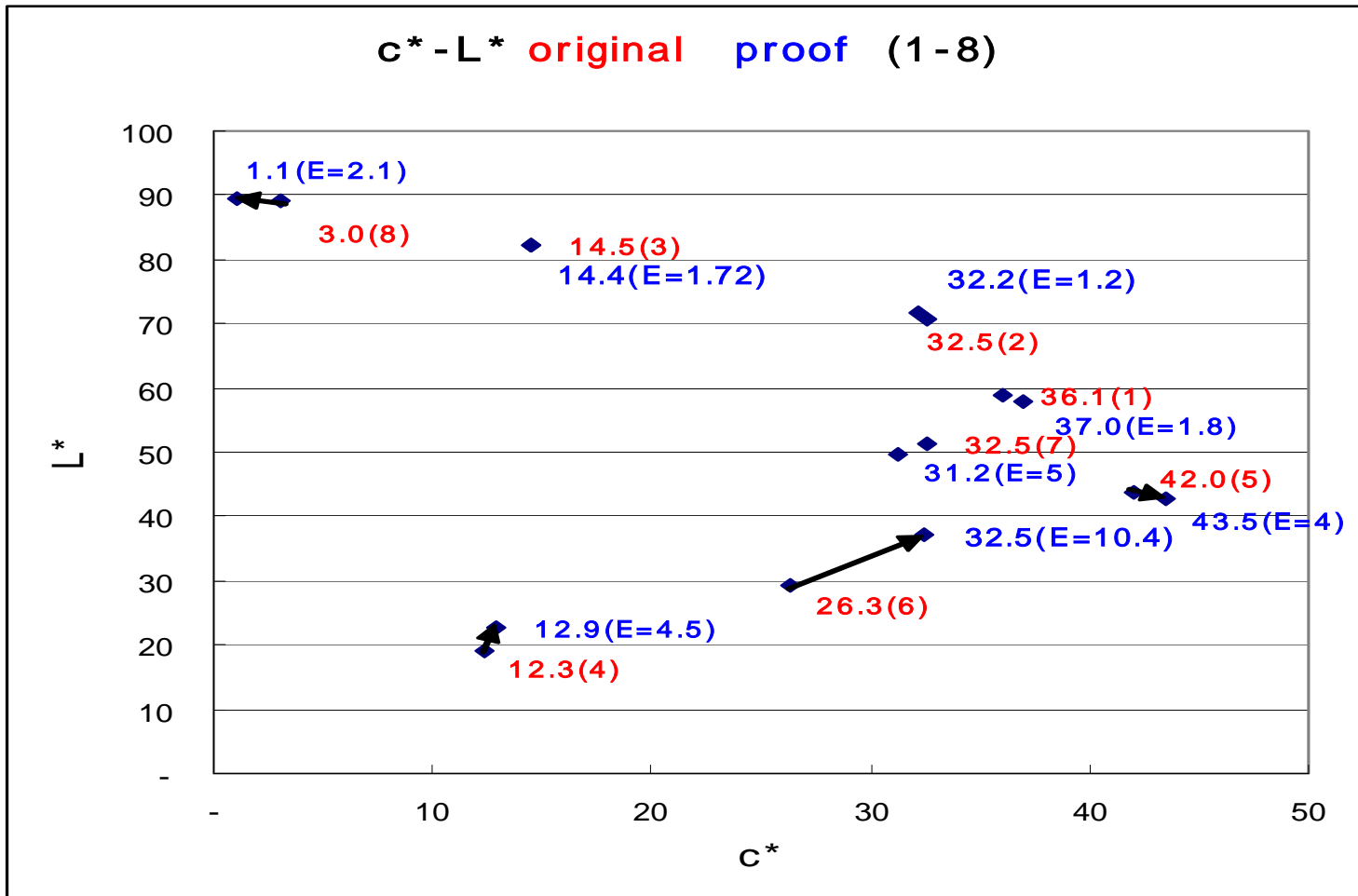
# E & HA in a-b,b-c,a-c

a,b,c	E(a-b)	E(b-c)	E(a-c)	HA(a-b)	HA(b-c)	HA(a-c)
4, Ave	4.46	4.47	5.78	5.54	18.04	23.58
5, Ave	4.03	7.42	10.61	4.69	9.38	14.07
6, Ave	10.40	9.27	9.76	5.33	13.31	18.64
7, Ave	4.98	4.44	8.94	7.61	7.65	15.26

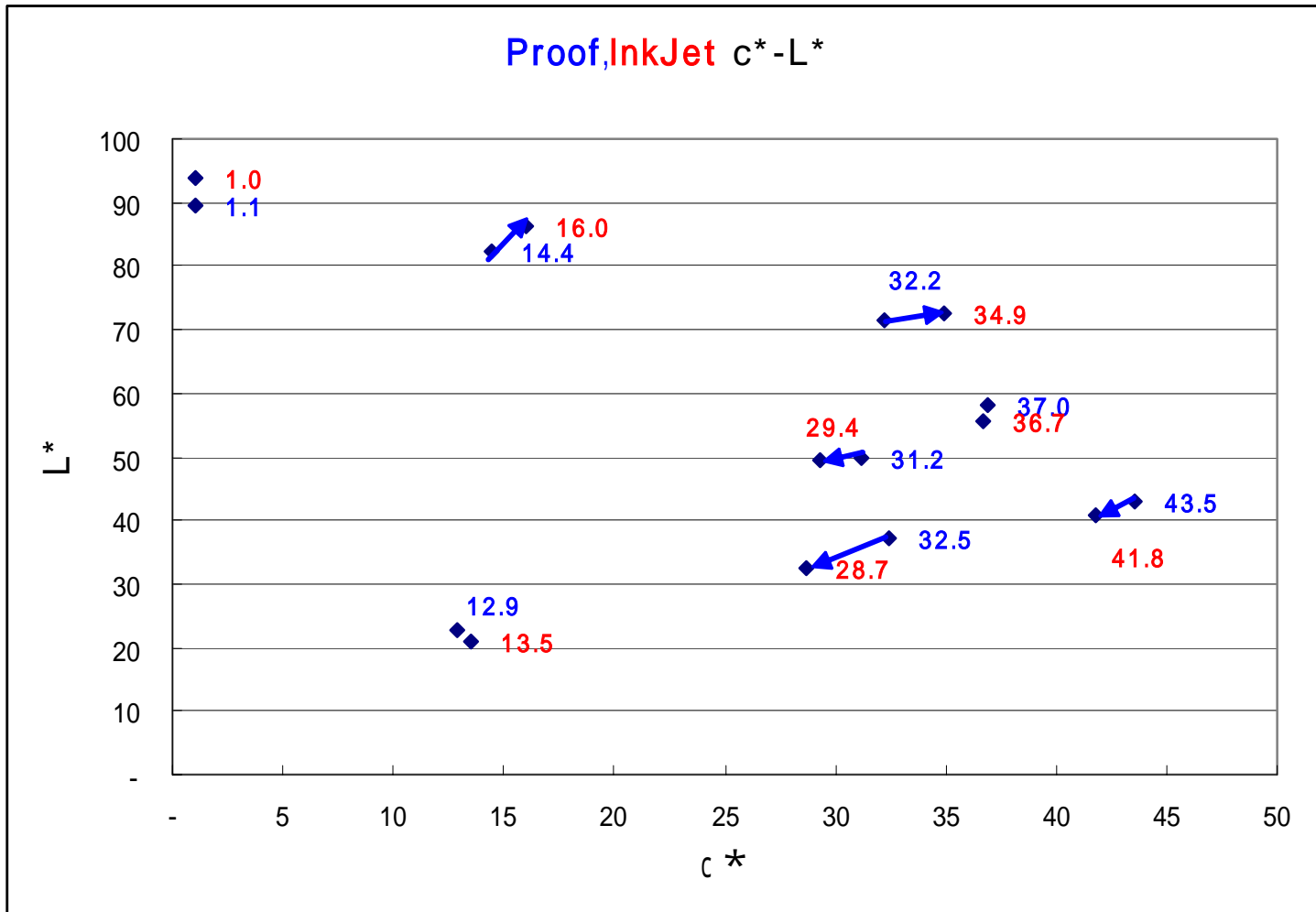
# Graph of E & HA in a-b,b-c,a-c



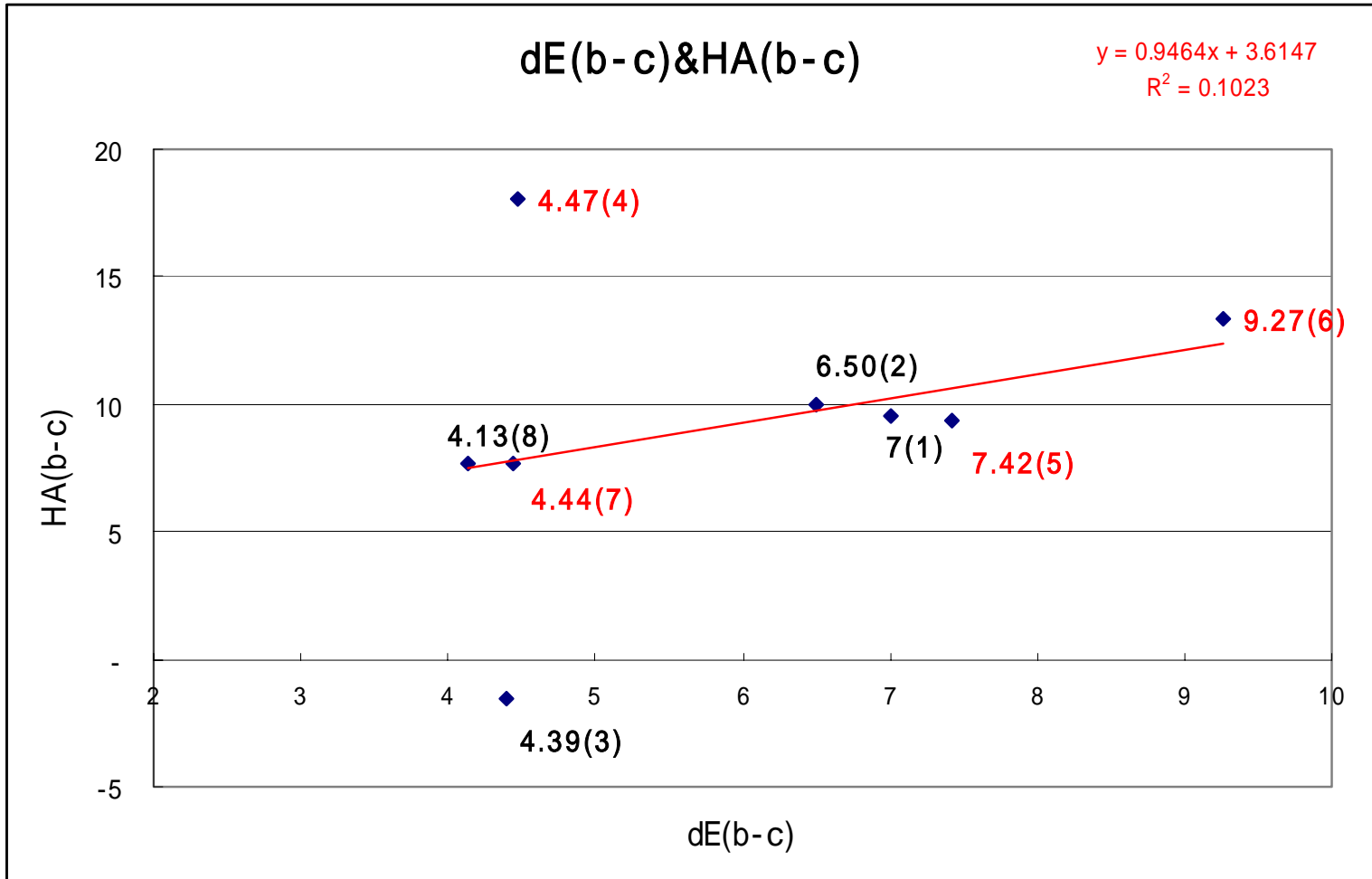
# $C^*$ - $L^*$ Original & Proof



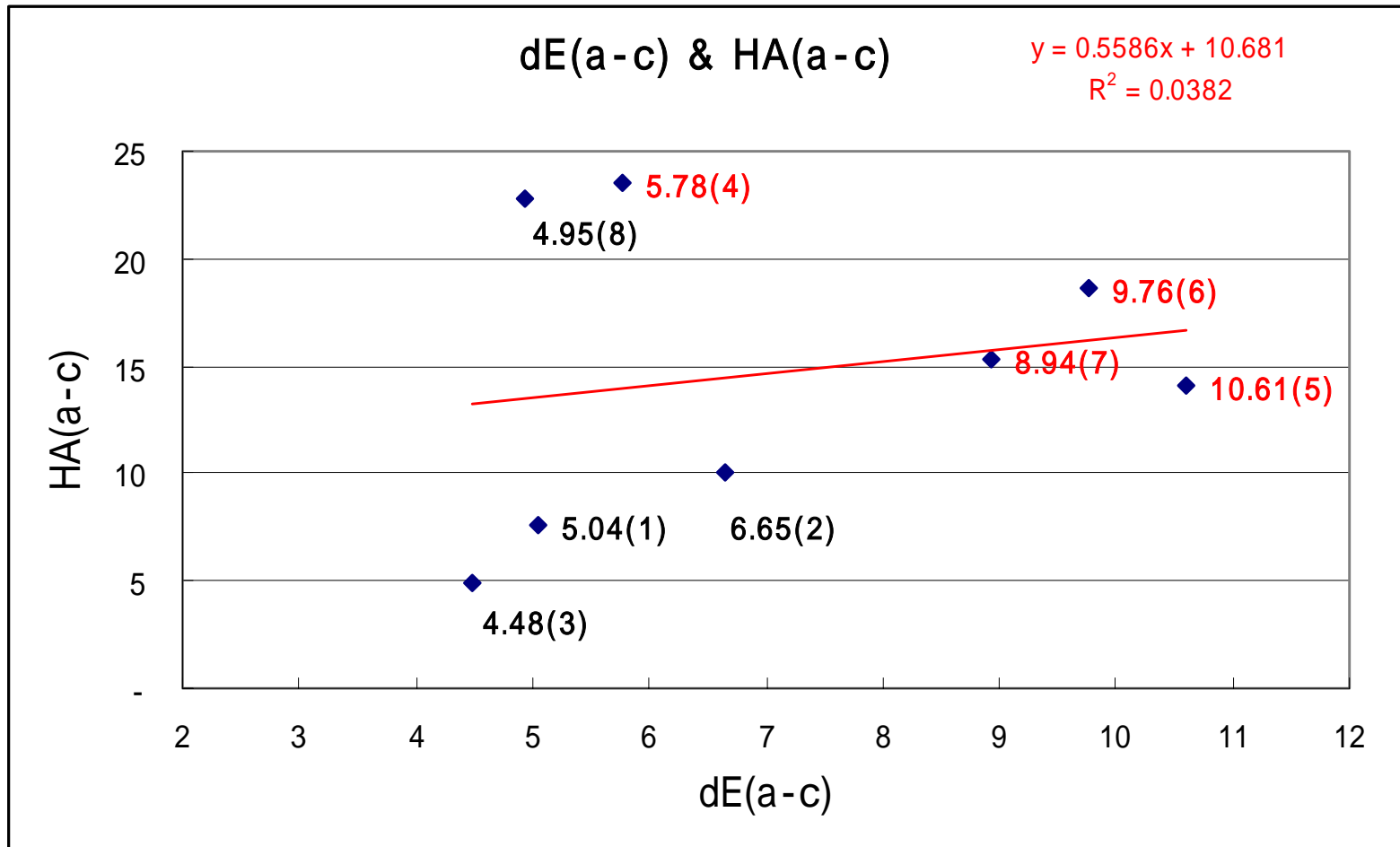
# $c^* - L^*$ Proof & Ink Jet



# E & HA (b-c)



# E & HA (a-c)



# Summary

- 1, The **color difference more increased** according to the output to the ink-jet & to proof from original of **the wood pattern in eight kinds of samples.**
- 2, There was **decrease of the HA**, and the factor moved **from Red to Magenta.**
- 3, The **chroma and the density change** of the ink-jet print were **not accepted** very much in each samples.
- 4, It seems that **an ink characteristic** of the ink-jet participate greatly from these results.

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