

To: XXXX Co., Ltd.

PaPaLaB Co., Ltd.
Engineering Department, XX

Outsourced Test Results Report (Summary)

We hope this message finds you well.

Thank you very much for your continued support. We have completed the measurement tests for the samples you provided, and we report the results as follows.

<Objective>

Evaluate the introduction of a 2D colorimeter.

<Test Scope>

- (1) Pre-validation (verification of the reproducibility of 2D colorimeter measurements)
- (2) Measurement
- (3) Analysis
 - A. Comparison of visual evaluation and $L^*a^*b^*$ values
 - B. Correlation between visual evaluation and ΔE

<Results>

- (1) Pre-validation

From six measurements at the same location, the coefficients of variation (CV), calculated from the mean values and standard deviations of L^* , a^* , and b^* , were all below 0.3%, indicating highly stable measurement performance.
- (2) Measurement

See the Outsourced Test Results Report (from p. 2 onward).
- (3) Analysis
 - A. Comparison of visual evaluation and $L^*a^*b^*$ values

When compared with the visual evaluation, we confirmed samples for which the measured values showed **a similar trend** to the visual evaluation, while for some samples the **trend did not match**. This suggests that although there is a certain level of correlation between the measurement results and the visual evaluation, a perfect match was not obtained for all samples.
 - B. Correlation between visual evaluation and ΔE

As a result of analyzing the correlation between the visual evaluation results and the measured values (ΔE), **a negative correlation** was observed. This indicates that samples with higher visual evaluation scores (= judged to be better) tend to have smaller ΔE values (= smaller color difference).

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PaPaLaB®

2025/05/01

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Engineering Department, XX

Outsourced Test Results Report

1. Objective

Evaluate the introduction of a 2D colorimeter.

2. Test Scope

2-1. Test samples

Metal-plated plates (6 types)

PRD-01	PRD-02	PRD-03	PRD-04	PRD-05	PRD-06
					

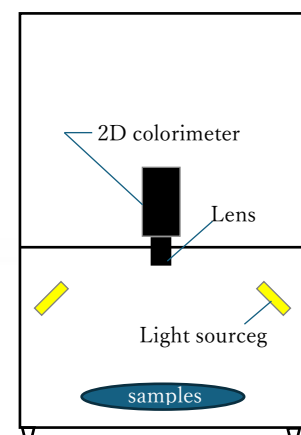
2-2. Measurement Environment

Item	Details
Enclosure	PPLB-400
2D colorimeter	High-resolution type
Lens	Focal length: 8 mm
Software	RCView
Lighting	oblique illumination (D65)

2-3. System configuration



Benchtop 2D colorimeter
PPLB-440



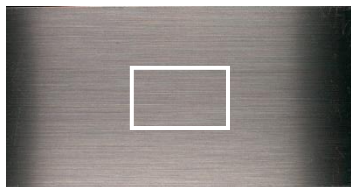
2-4. Measurement (analysis) method

(1) Pre-validation

Verify the measurement accuracy for this sample by repeated repositioning measurements.

Target: PRD-01 (top surface)

Measurement location: within the white frame in the figure below



Number of measurements: 6

Other: alignment was adjusted visually on the monitor using the overlay function of the measurement software.

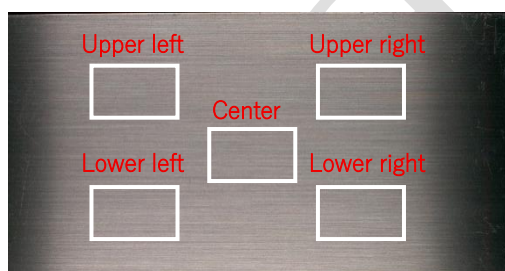
The measurement points were selected to avoid dents/scratches/foreign matter/unevenness and to be as similar in surface geometry as possible.

(2) Measurement

Targets: all samples

Sample	Measurement points
PRD-01	Center, upper left, upper right, lower left, lower right (5 points total)
PRD-02	Center, upper left, upper right, lower left, lower right (5 points total)
PRD-03	Center, upper left, upper right, lower left, lower right (5 points total)
PRD-04	Center, upper left, upper right, lower left, lower right (5 points total)
PRD-05	Center, upper left, upper right, lower left, lower right (5 points total)
PRD-06	Center, upper left, upper right, lower left, lower right (5 points total)

Measurement location: within the white frame in the figure below



Number of measurements: 1 per sample type

(3) Analysis

A. Comparison of visual evaluation and $L^*a^*b^*$ values

Compare the Δ Lab values at the other four points (relative to the center measurement) with the visual evaluation provided by your company.

B. Correlation between visual evaluation and ΔE

Evaluate the correlation between the color difference ΔE at the other four points (relative to the center measurement) and the visual evaluation provided by your company.

3. Results

(1) Pre-validation

	Color	Measurement Location	Measurement Count	L	a	b	ΔE	ΔL	Δa	Δb
1	BR	Top Surface	1	39.622	26.938	18.492	0.000	0.000	0.000	0.000
2			2	39.479	27.126	18.623	0.156	-0.143	0.188	0.130
3			3	39.544	27.094	18.642	0.113	-0.078	0.156	0.149
4			4	39.565	26.966	18.572	0.067	-0.056	0.028	0.079
5			5	39.542	27.086	18.574	0.099	-0.079	0.148	0.082
6			6	39.438	27.109	18.640	0.186	-0.184	0.171	0.148
Average				39.532	27.053	18.591	0.104	-0.090	0.115	0.098
Std Dev				0.059	0.073	0.052	-	-	-	-

(2) Measurement

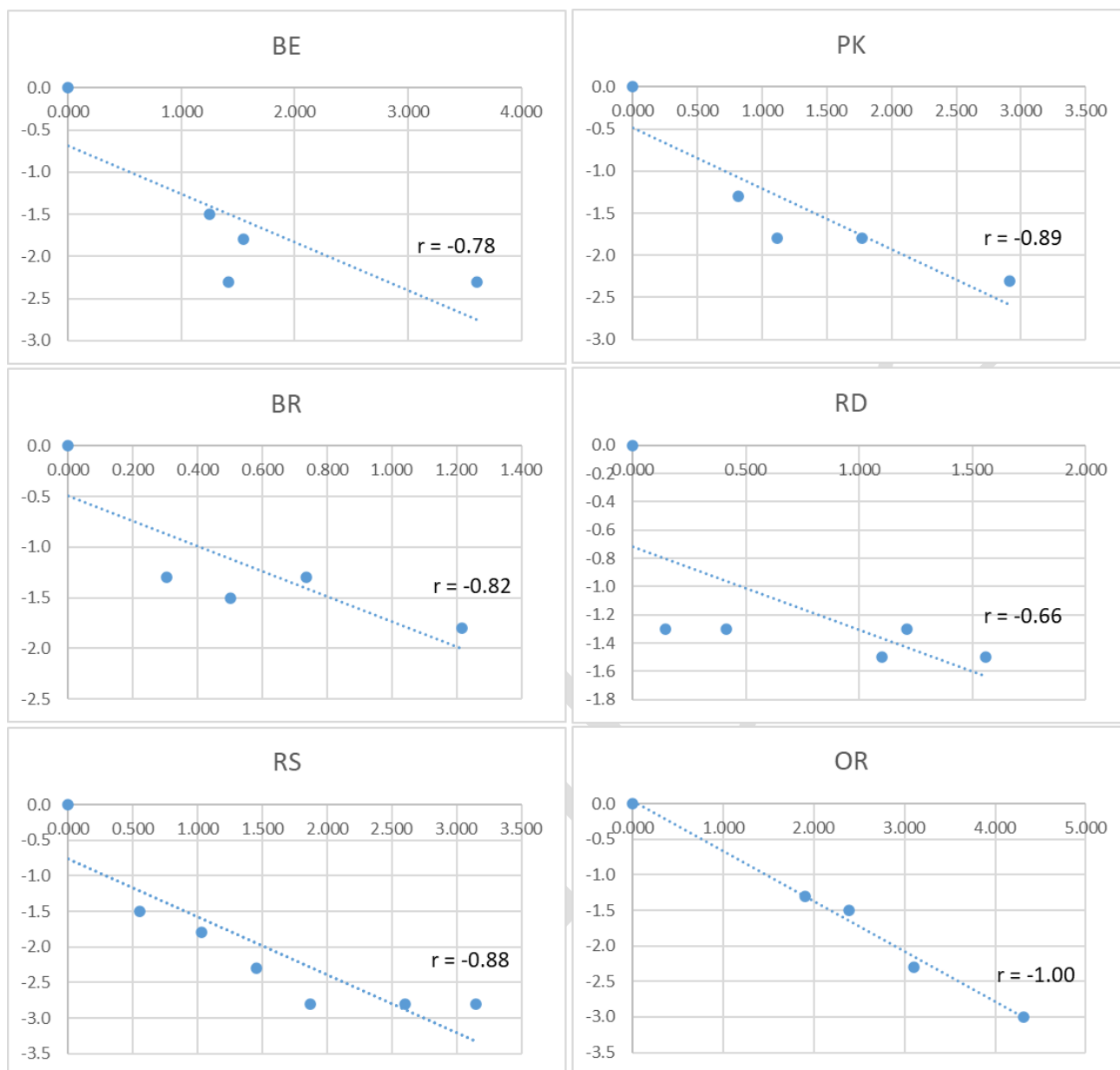
		L*	a*	b*	ΔE	ΔL	Δa	Δb	xy3D [%]	Lab(H) [%]	Lab(M) [%]	Lab(L) [%]	Texture [%]
PRD-01	Center	50.253	21.453	15.415	0	0	0	0	100	100	100	100	100
	Upper Left	50.151	21.929	17.909	1.543	-0.002	0.476	2.494	61	44	48	52	85
	Lower Left	49.950	21.354	17.436	1.411	-0.303	-0.098	2.021	69	53	57	60	90
	Upper Right	49.114	22.394	15.729	1.246	-1.139	0.941	0.313	86	55	61	84	92
	Lower Right	46.845	23.648	17.037	3.606	-3.408	2.196	1.622	56	1	2	5	90
PRD-02	Center	38.585	28.278	19.429	0	0	0	0	100	100	100	100	100
	Upper Left	39.324	28.484	20.070	0.735	0.739	0.206	0.641	86	59	81	85	86
	Lower Left	39.797	27.889	20.183	1.215	1.213	-0.38	0.754	85	38	64	65	85
	Upper Right	38.462	27.913	18.906	0.305	-0.122	-0.365	-0.523	85	84	85	88	85
	Lower Right	38.071	28.002	18.991	0.502	-0.514	-0.276	-0.438	87	72	70	91	87
PRD-03	Center	53.433	59.085	37.475	0	0	0	0	100	100	100	100	100
	Upper Left	51.744	60.975	40.045	1.905	-1.689	1.91	2.57	49	13	19	22	89
	Lower Left	51.180	61.024	39.919	2.389	-2.253	1.959	2.444	46	4	5	7	92
	Upper Right	49.750	58.484	32.533	4.314	-3.683	-0.581	-4.942	58	1	1	1	86
	Lower Right	50.382	60.768	37.096	3.105	-3.052	1.703	-0.379	65	2	1	1	89
PRD-04	Center	52.140	53.734	13.291	0	0	0	0	100	100	100	100	100
	Upper Left	53.088	52.239	13.857	1.116	0.948	-1.485	0.567	84	63	70	72	84
	Lower Left	52.826	52.180	13.144	0.816	0.685	-1.544	-0.147	84	72	76	78	89
	Upper Right	51.896	49.338	10.402	1.774	-0.245	-4.386	-2.887	51	28	30	37	89
	Lower Right	49.559	49.818	11.372	2.91	-2.582	-3.907	-1.919	73	6	13	28	89
PRD-05	Center	37.613	49.230	27.181	0	0	0	0	100	100	100	100	100
	Upper Left	38.000	49.997	27.601	0.412	0.387	0.766	0.42	92	78	79	92	100
	Lower Left	37.457	49.282	27.080	0.146	-0.156	0.032	-0.101	93	92	94	98	93
	Upper Right	36.419	45.751	25.056	1.559	-1.194	-3.479	-2.125	74	33	42	50	90
	Lower Right	36.445	47.083	26.010	1.212	-1.168	-2.148	-1.171	87	39	58	66	91
PRD-06	Center	34.876	29.044	4.848	0	0	0	0	100	100	100	100	100
	Upper Left	34.025	28.309	6.662	1.453	-0.851	-0.735	1.814	74	41	48	68	88
	Upper Right	34.548	28.697	6.326	1.029	-0.329	-0.347	1.478	78	65	67	75	89
	Lower Left	34.830	28.469	5.540	0.551	-0.046	-0.575	0.692	88	83	86	86	88
	Lower Right	33.371	24.795	2.783	2.601	-1.505	-4.249	-2.065	65	28	31	51	90

(3) Analysis

A. Comparison of visual evaluation and L*a*b* values



B. Correlation between visual evaluation and ΔE



4. Summary

A. Comparison of visual evaluation and $L^*a^*b^*$ values

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B. Correlation between visual evaluation and ΔE

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