



Textile Engineering Solutions

Professional Color Analysis Solutions

Color Analysis Report

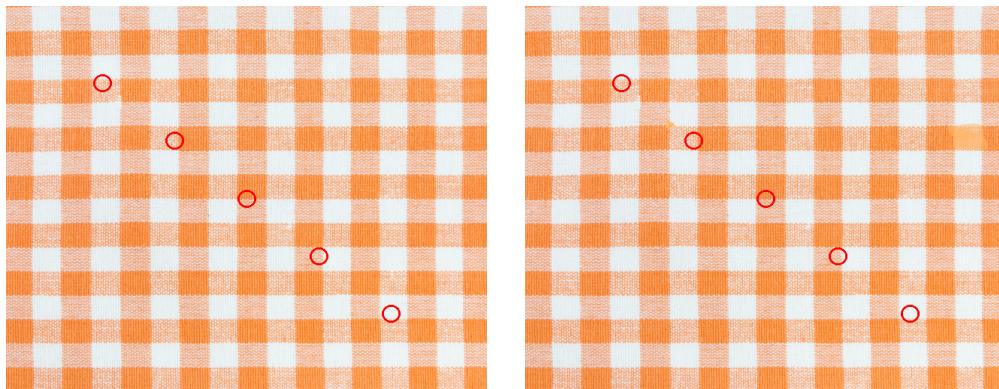
Report Metadata	
Report Date	November 28, 2025 at 03:43 PM
Operator	Operator
Analysis ID	SPEC_20251128_154318
Software Version	1.1.0

■ EXECUTIVE SUMMARY: ACCEPT

Metric	Score	Status
Color Score	98.1/100	PASS
Pattern Score (SSIM)	99.8/100	PASS
Pattern Repetition	85.3%	PASS
ΔE2000 (Mean)	0.05	PASS
Overall Score	99.0/100	ACCEPT

Color Unit

Input Images



Filenames	
Reference	aslia.png
Sample	al3bi.png
Regional Analysis	
Mode	5-point grid within central area
Circle radius (px)	12
Centers (x,y)	(128,107), (224,187), (320,268), (416,348), (512,428)

Color Measurements

5-point regional analysis with Reference vs Sample comparison

RGB Color Values

Region	Position	Ref R	Test R	Ref G	Test G	Ref B	Test B
1	(128, 107)	248	248	192	192	149	149
2	(224, 187)	242	242	194	194	172	172
3	(320, 268)	225	225	121	121	51	51
4	(416, 348)	242	242	220	220	206	206
5	(512, 428)	239	239	245	245	245	245

LAB* Color Space Values

Region	Ref L*	Test L*	Ref a*	Test a*	Ref b*	Test b*
1	81.75	81.75	14.61	14.61	29.39	29.39
2	82.08	82.08	14.02	14.02	17.57	17.57
3	61.59	61.59	35.48	35.48	54.11	54.11
4	89.17	89.17	5.32	5.32	9.62	9.62
5	96.10	96.10	-1.98	-1.98	-0.69	-0.69

XYZ Tristimulus Values

Region	Ref X	Ref Y	Ref Z	Test X	Test Y	Test Z
1	62.99	59.83	36.66	62.99	59.83	36.66
2	63.36	60.44	47.35	63.36	60.44	47.35
3	38.49	29.93	6.88	38.49	29.93	6.88
4	73.35	74.52	68.90	73.35	74.52	68.90
5	84.73	90.25	99.32	84.73	90.25	99.32

CMYK Color Values

Region	Ref C%	Ref M%	Ref Y%	Ref K%	Test C%	Test M%	Test Y%	Test K%
1	0.0	22.6	39.9	2.7	0.0	22.6	39.9	2.7
2	0.0	19.8	28.9	5.1	0.0	19.8	28.9	5.1
3	0.0	46.2	77.3	11.8	0.0	46.2	77.3	11.8
4	0.0	9.1	14.9	5.1	0.0	9.1	14.9	5.1
5	2.4	0.0	0.0	3.9	2.4	0.0	0.0	3.9

Color Difference Metrics

Region	ΔE76	ΔE94	ΔE2000	Status
1	0.00	0.00	0.00	PASS
2	0.00	0.00	0.00	PASS
3	0.00	0.00	0.00	PASS
4	0.00	0.00	0.00	PASS
5	0.00	0.00	0.00	PASS

ΔE Summary Statistics

Metric	Mean	Std Dev	Min	Max	Overall Status
ΔE76	0.09	1.56	0.00	57.73	
ΔE94	0.06	1.17	0.00	53.59	
ΔE2000	0.05	0.81	0.00	28.93	PASS

Interpretation: Not perceptible

Statistical Analysis (RGB)

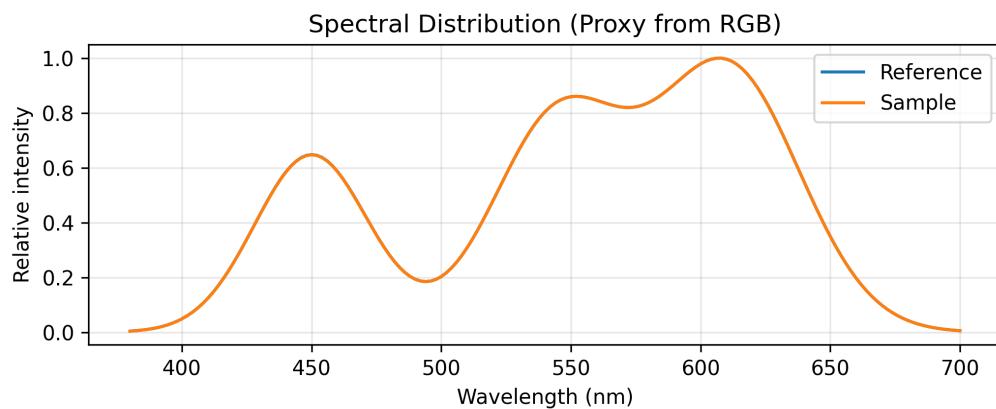
Channel	Mean Diff	Std Dev	Max Diff	Min Diff	RMSE
R	-0.03	0.56	0.00	-28.00	0.56
G	0.03	1.35	60.00	-52.00	1.35
B	0.18	3.55	142.00	-43.00	3.56

Color Quality Indices

Index	Value	Status	Interpretation
Metamerism Index	0.01	PASS	Color consistency across D65/TL84/A illuminants
Uniformity Index	84.4/100	CONDITIONAL	Spatial consistency of color across the sample

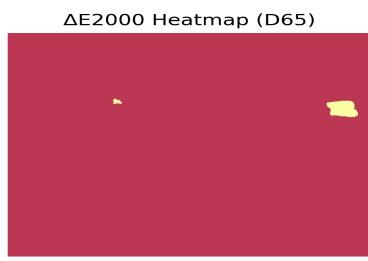
Spectral Analysis (Proxy)

The chart approximates spectral behavior from RGB averages to aid visual comparison.



Visual Difference Analysis

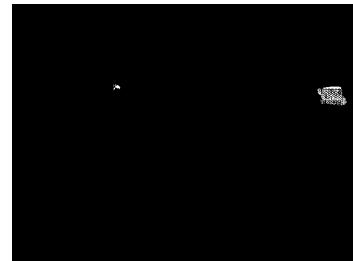
ΔE2000 Heatmap (D65)



Absolute Difference (gray)



Defect Mask (Otsu)

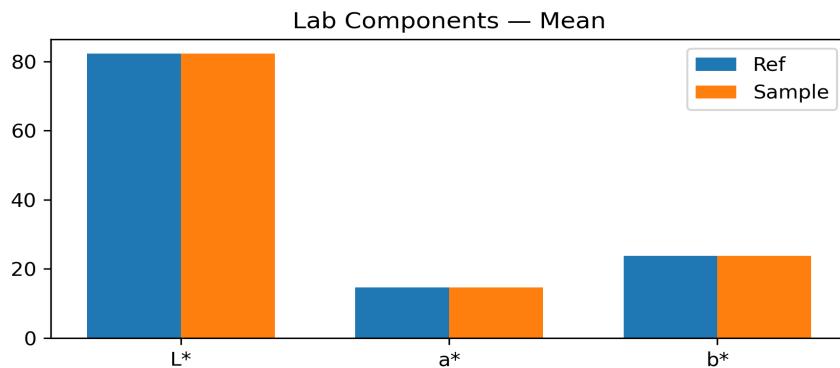
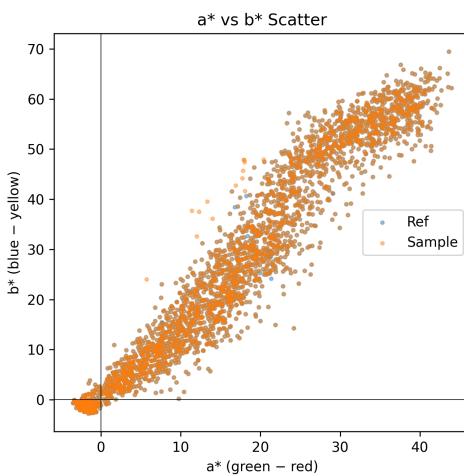


Detailed Lab* Color Space Analysis

Component	Reference	Sample	Difference	Interpretation
L* (Lightness)	82.32	82.31	-0.01	No significant change
a* (Green-Red)	14.59	14.60	0.01	No significant shift
b* (Blue-Yellow)	23.74	23.82	0.08	No significant shift

Lab* Visualizations

a*-b* chromaticity plot and L*a*b* component comparison.



Quality Assessment (Lab* thresholds)

Parameter	Threshold	Actual	Status
ΔL^*	≤ 1.0	0.01	PASS
Δa^*	≤ 1.0	0.01	PASS
Δb^*	≤ 1.0	0.08	PASS
Overall Magnitude	≤ 2.0	0.08	PASS

Recommendations (Based on Lab*)

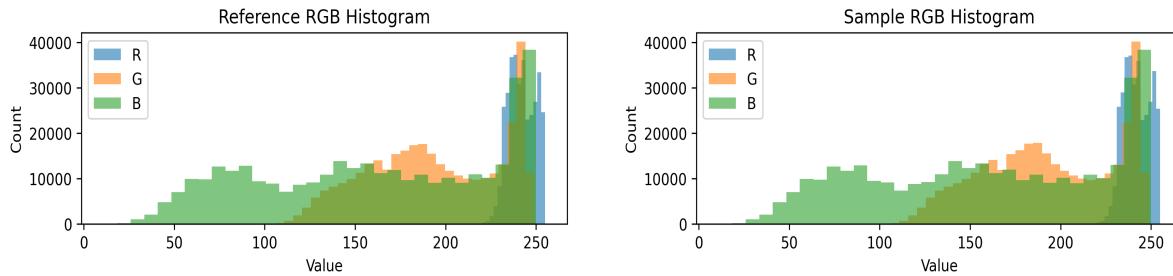
Parameter	Action
Status	Within tight tolerances. Maintain current parameters and monitor periodically.

Pattern Unit

Pattern Metrics

Metric	Value	Status
SSIM	99.8%	PASS
Symmetry	22.1%	
Repeat (px)	H:0 V:22	
Edge Definition	27.1/100	
Defect Density (rel.)	24.7	

Histograms (RGB)

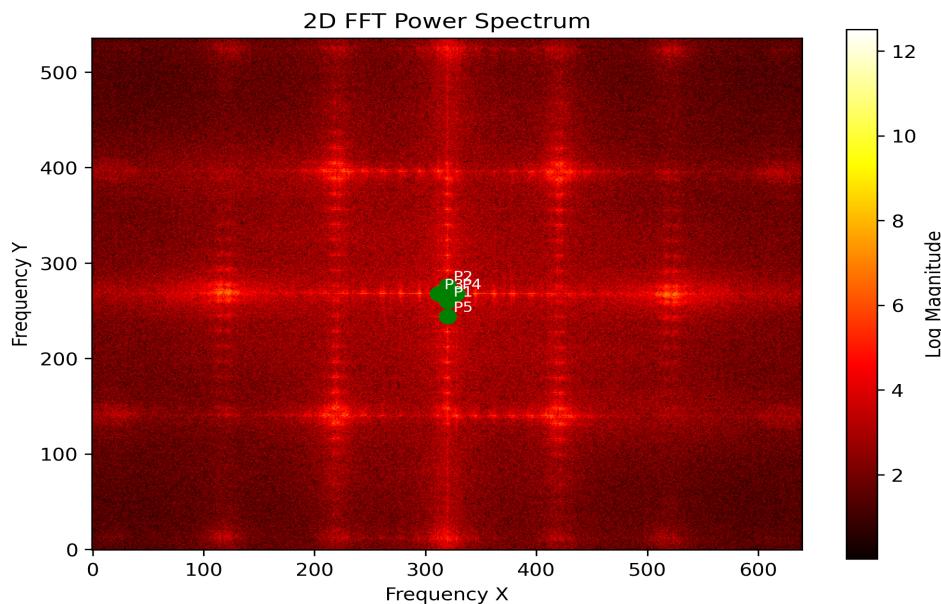


Interpretation: RGB histograms show the distribution of color values across the image. Similar histogram shapes between Reference and Sample indicate consistent color reproduction. Shifts in peak positions suggest color bias; narrower distributions indicate more uniform color.

Advanced Texture Analysis

Fourier Domain Analysis

2D Fast Fourier Transform reveals periodic structures and directional patterns in the fabric.



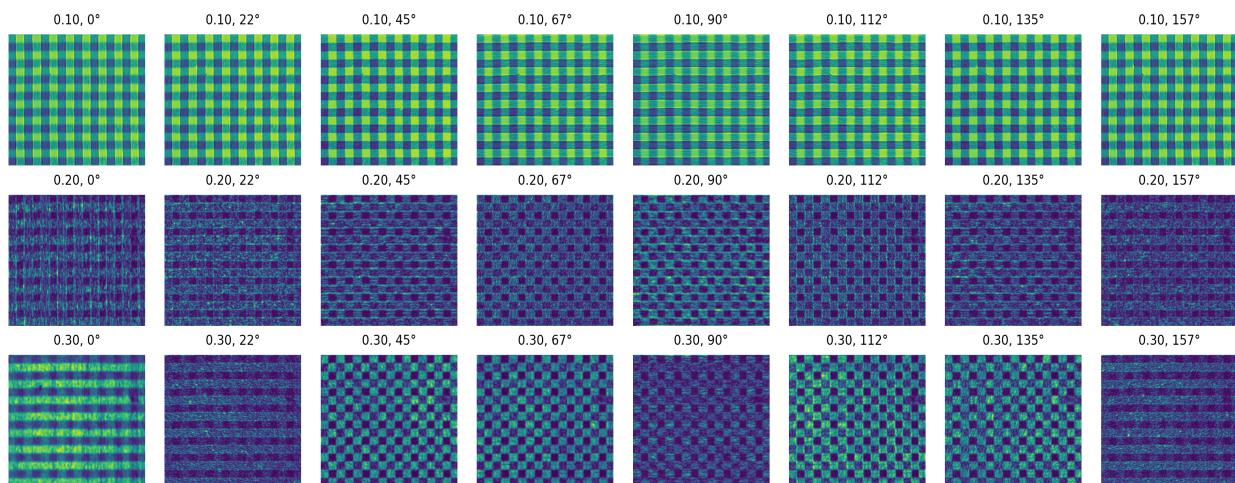
Peak	Radius	Angle (°)	Magnitude
P1	8.00	-90.00	16023.37
P2	8.00	90.00	16023.37
P3	8.00	180.00	13253.67
P4	8.00	0.00	13253.67
P5	24.00	-90.00	5096.53

Metric	Reference	Sample
Fundamental Period (px)	67.00	67.00
Dominant Orientation (°)	-90.00	-90.00
Anisotropy Ratio	2.50	2.50

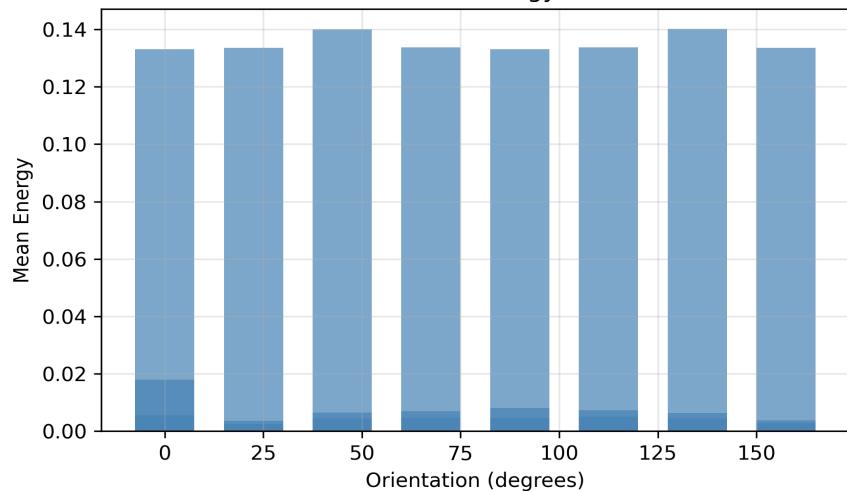
Gabor Filter Bank Analysis

Multi-scale and multi-orientation responses capture texture at different frequencies and angles.

Gabor Filter Bank Responses



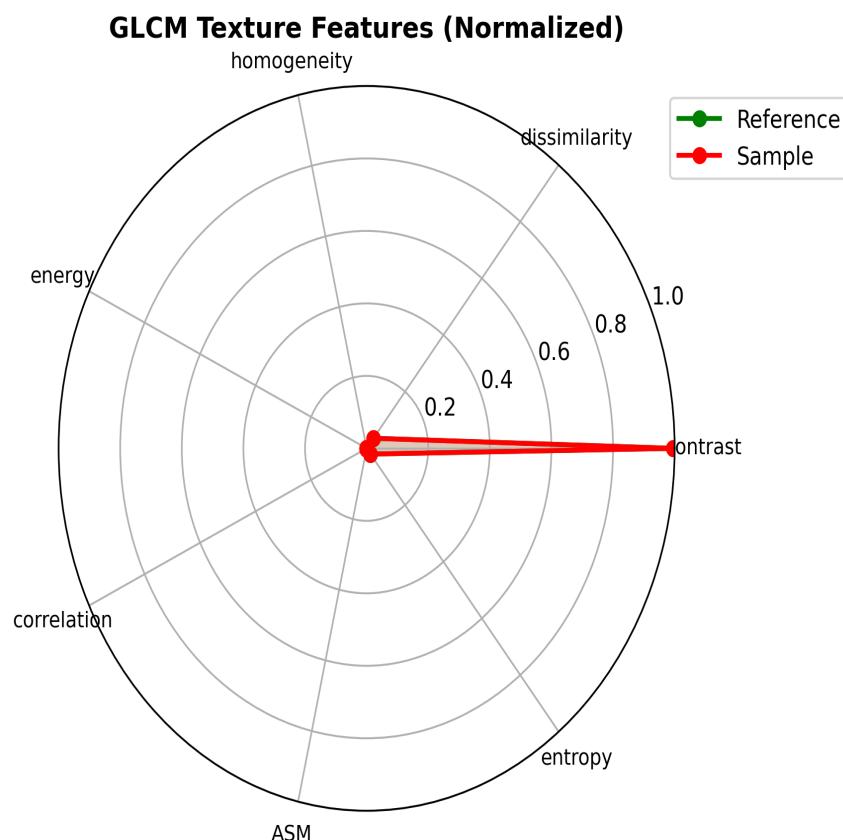
Gabor Orientation Energy Distribution



Metric	Reference	Sample	Δ
Dominant Orientation (°)	135.00	135.00	0.00
Coherency	2.86	2.86	0.00

GLCM Texture Features

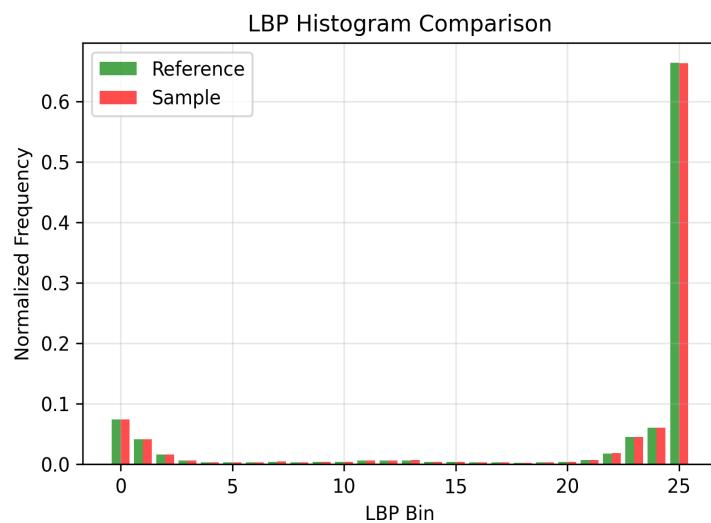
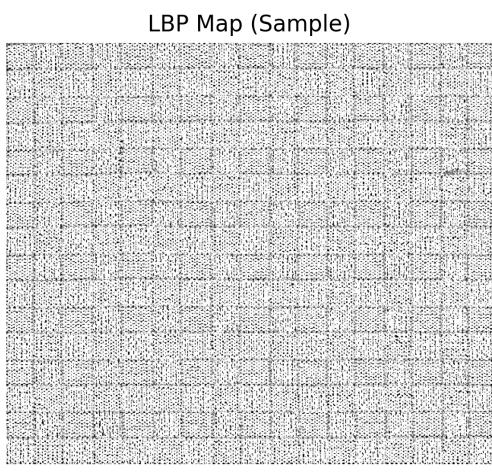
Gray Level Co-occurrence Matrix (GLCM) quantifies spatial relationships in texture.



Feature	Reference	Sample	Δ	z-score	Interp.
Contrast	431.14	429.16	1.98	-0.04	Similar
Dissimilarity	15.38	15.33	0.05	-0.01	Similar
Homogeneity	0.10	0.10	0.00	0.00	Similar
Energy	0.02	0.02	0.00	-0.00	Similar
Correlation	0.75	0.75	0.00	0.01	Similar
Asm	0.02	0.02	0.00	-0.00	Similar
Entropy	8.67	8.66	0.00	-0.00	Similar

Local Binary Patterns (LBP)

LBP captures local texture by encoding pixel neighborhoods into binary patterns.

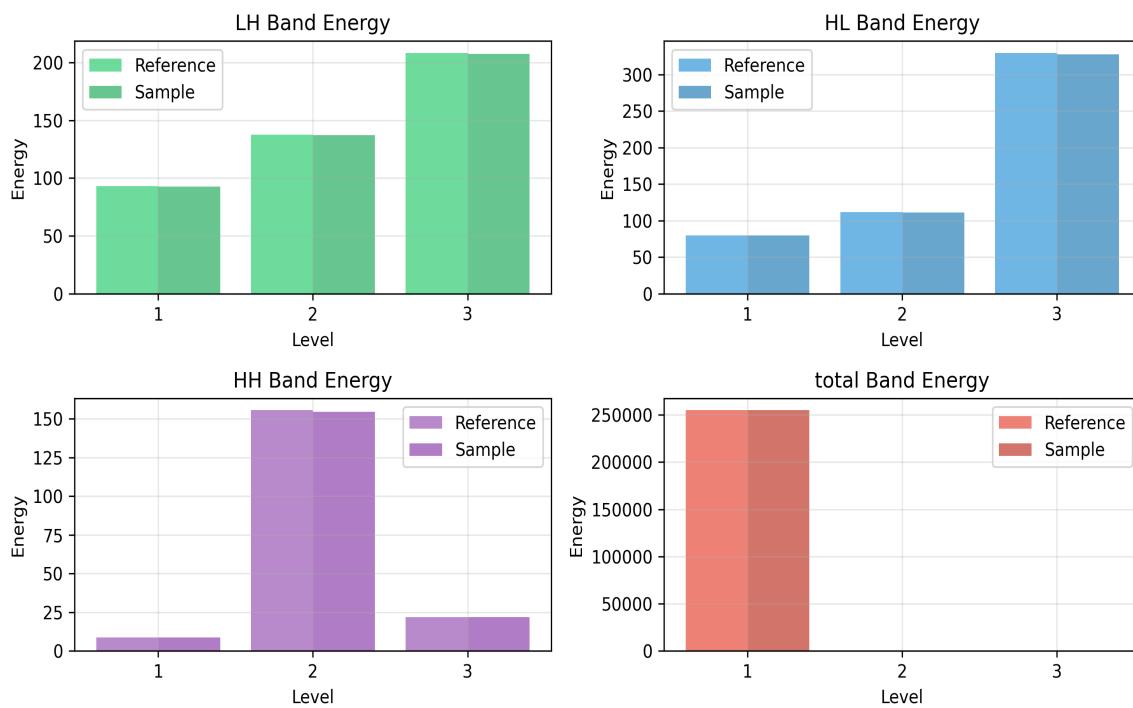


Metric	Value	Interpretation
χ^2 Distance	0.00	Lower is more similar
Bhattacharyya Distance	0.00	Lower is more similar

Wavelet Decomposition

Multiresolution analysis using db4 wavelet at 3 levels.

Wavelet Decomposition Energy

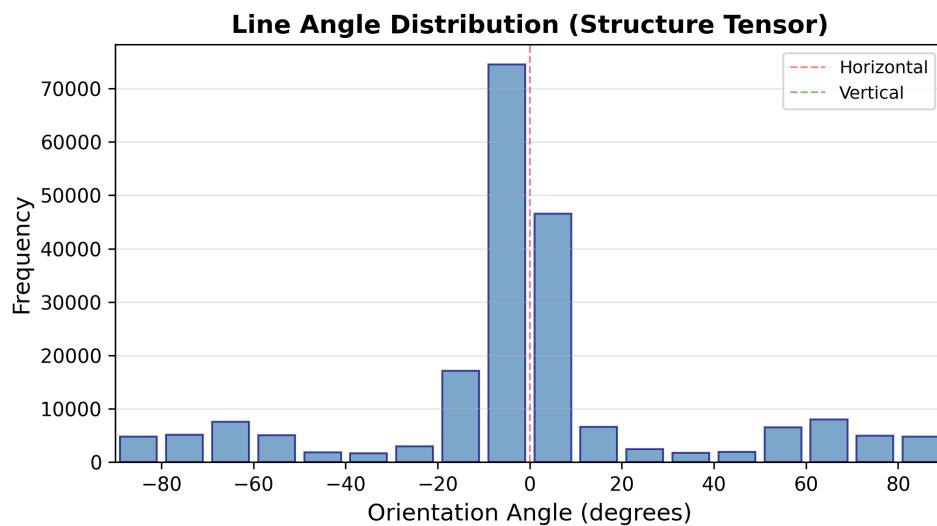


Level	Band	Ref Energy	Sample Energy	Ratio
1	LH	9.3e+01	9.3e+01	1.00
1	HL	8.0e+01	7.9e+01	0.99
1	HH	8.7e+00	8.8e+00	1.01
2	LH	1.4e+02	1.4e+02	1.00
2	HL	1.1e+02	1.1e+02	1.00
2	HH	1.6e+02	1.5e+02	0.99
3	LH	2.1e+02	2.1e+02	1.00
3	HL	3.3e+02	3.3e+02	1.00
3	HH	2.2e+01	2.2e+01	1.00

Structure Tensor Analysis

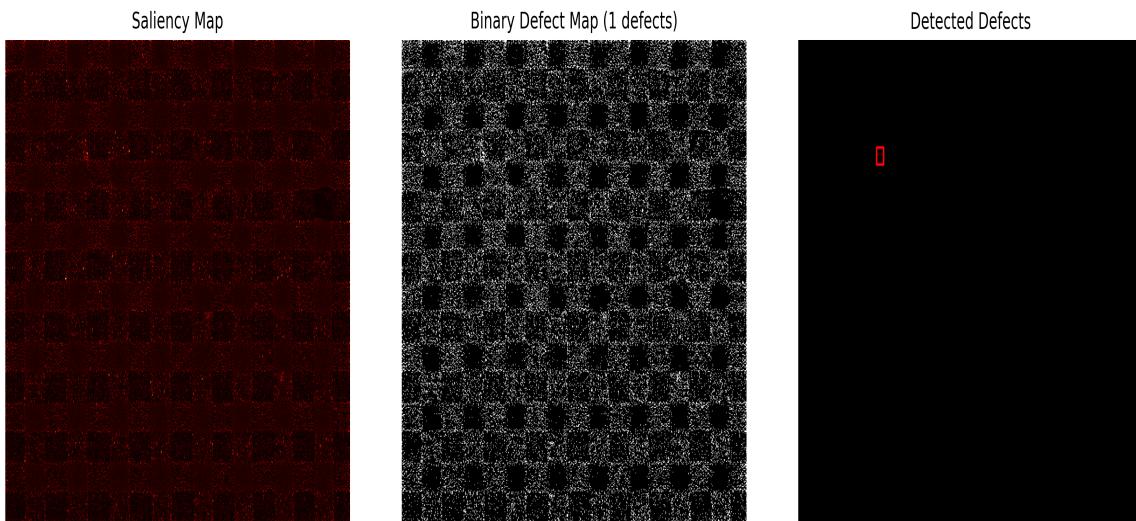
Metric	Reference	Sample
Mean Coherency	0.40	0.40
HOG Edge Density	0.15	0.15

Line Angle Distribution



Defect Detection & Saliency Map

Spectral residual saliency combined with morphological operations identifies potential defects.



ID	Type	Area (px ²)	Bounding Box (x0,y0,x1,y1)
1	Anomaly	75.0	(145,119,158,138)

Total defects detected: 1

Pattern Repetition Unit

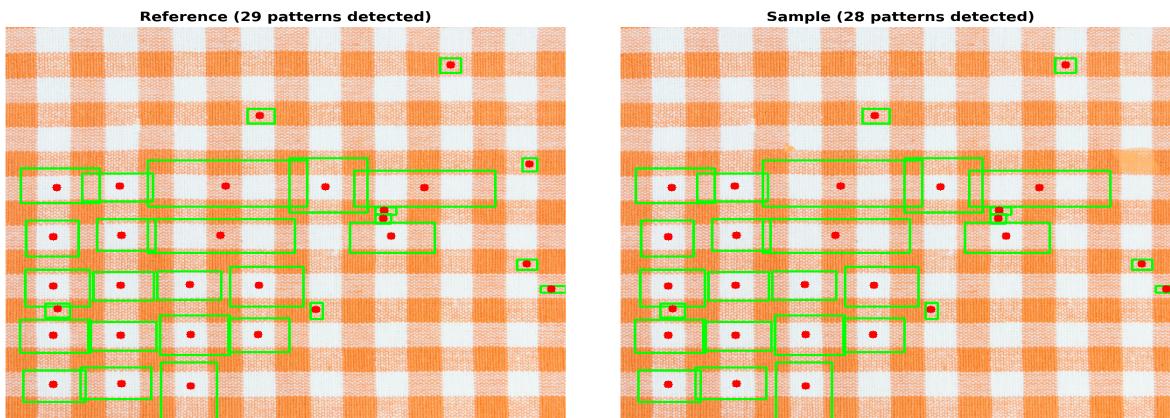
Analysis of pattern count, distribution, and integrity.

Pattern Detection Summary

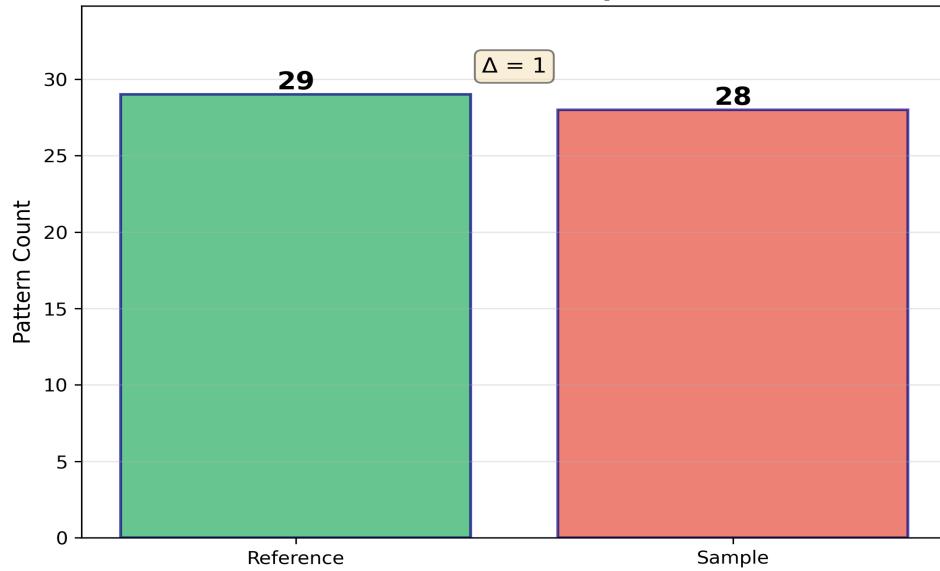
Metric	Reference	Sample	Δ	Status
Total Pattern Count	29	28	+1	PASS
Mean Pattern Area (px ²)	1417.38	1462.96	45.58	
Pattern Size CV%	72.47	69.46	-3.0%	
Spacing Uniformity (%)	0.00	0.00	0.00	FAIL
Pattern Integrity (%)	100.0	85.28	-14.72	

Pattern Count Analysis

Detected patterns in reference and sample images using connected components analysis.



Pattern Count Comparison



Blob Detection Results

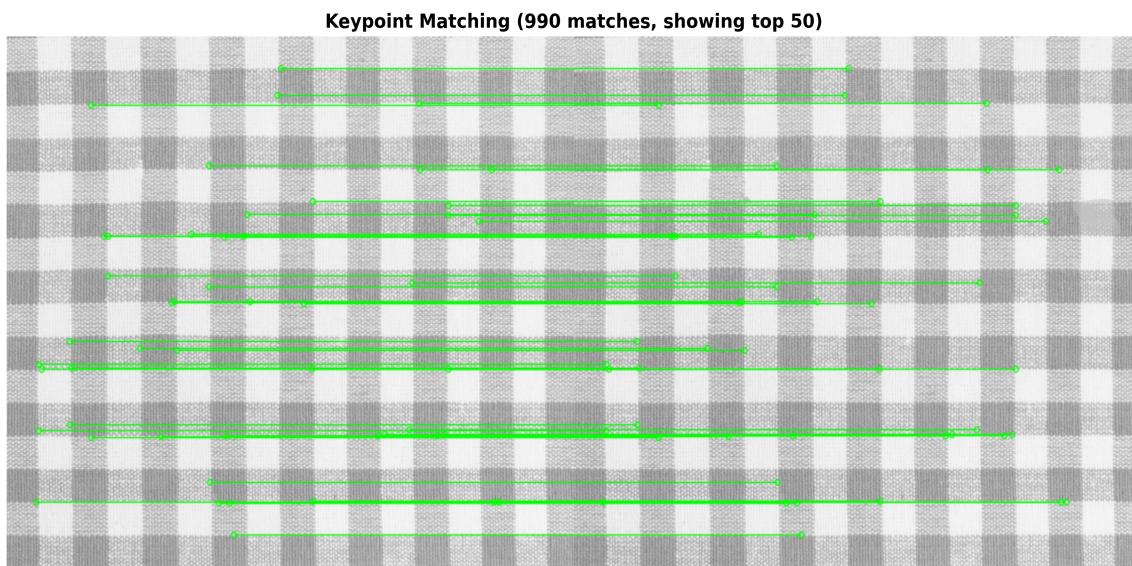
SimpleBlobDetector analysis with circularity and convexity filtering.

Metric	Reference	Sample
Blob Count	0	0

Keypoint Matching Analysis

Feature-based matching using ORB detector.

Metric	Value
Detector Type	ORB
Keypoints (Reference)	1000
Keypoints (Sample)	1000
Good Matches	990
Match Ratio	99.00%
Matching Score	99.00%
Inliers (RANSAC)	989

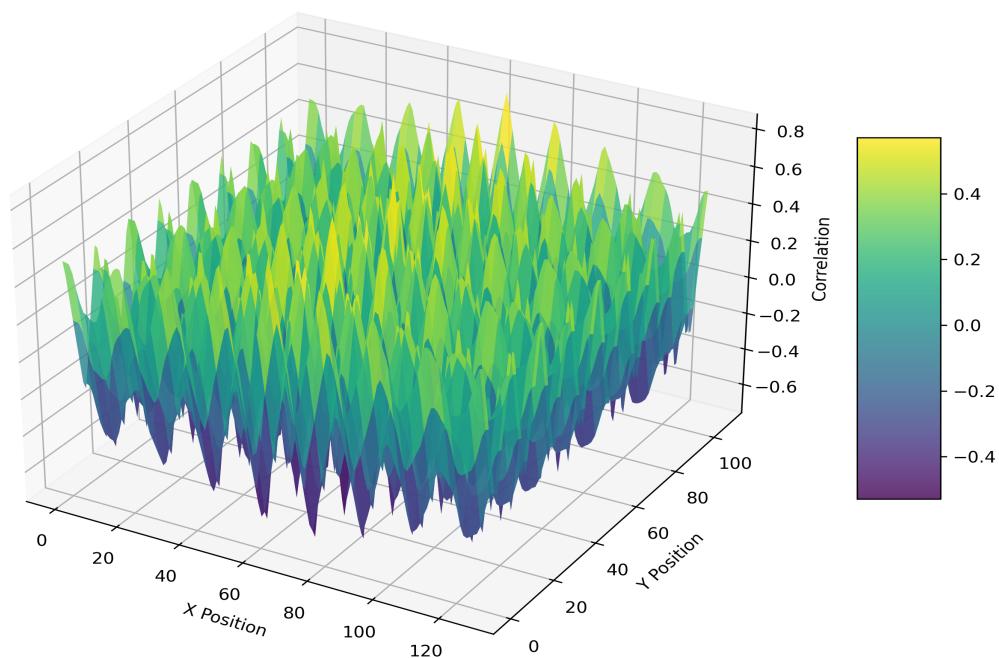


Auto-correlation Analysis

2D auto-correlation reveals pattern periodicity and regularity.

Metric	Reference	Sample
Periodicity Score	60.75	60.90
Pattern Spacing (px)	335.88	335.88
Regularity Score	84.41	84.41
Detected Peaks	10	10

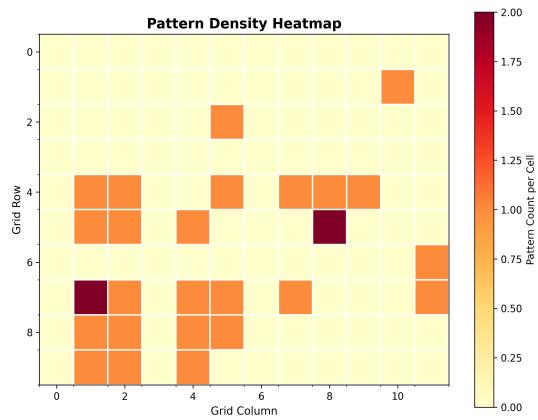
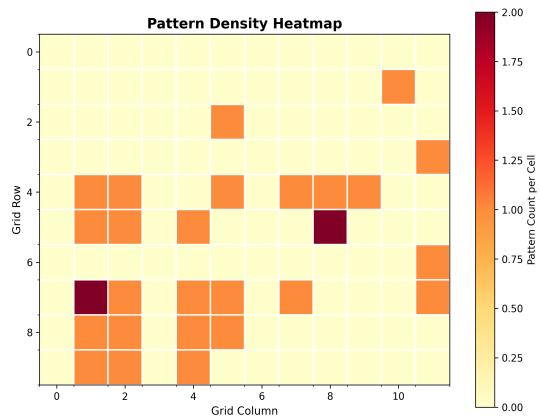
Auto-correlation Surface (Pattern Periodicity)



Spatial Distribution Analysis

Grid-based pattern density analysis (cell size: 50px).

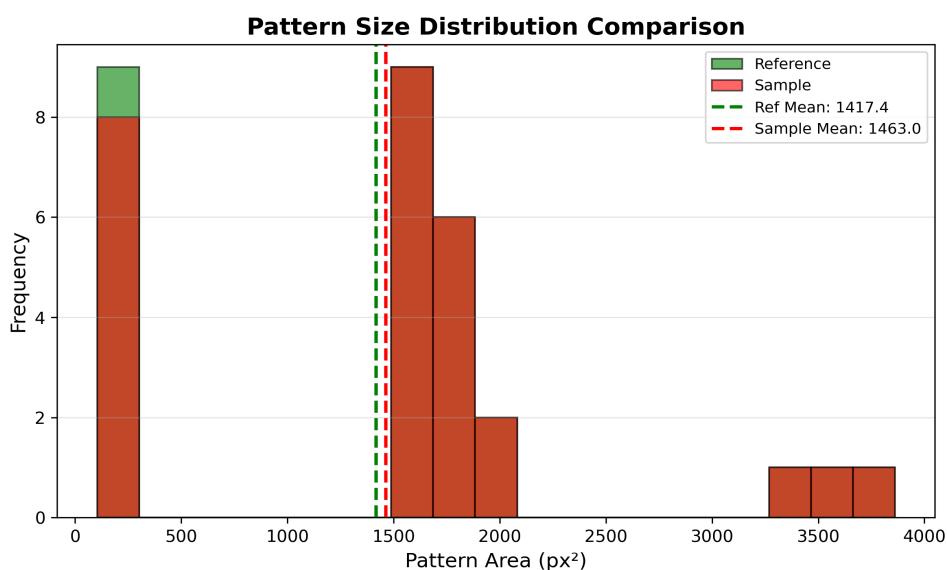
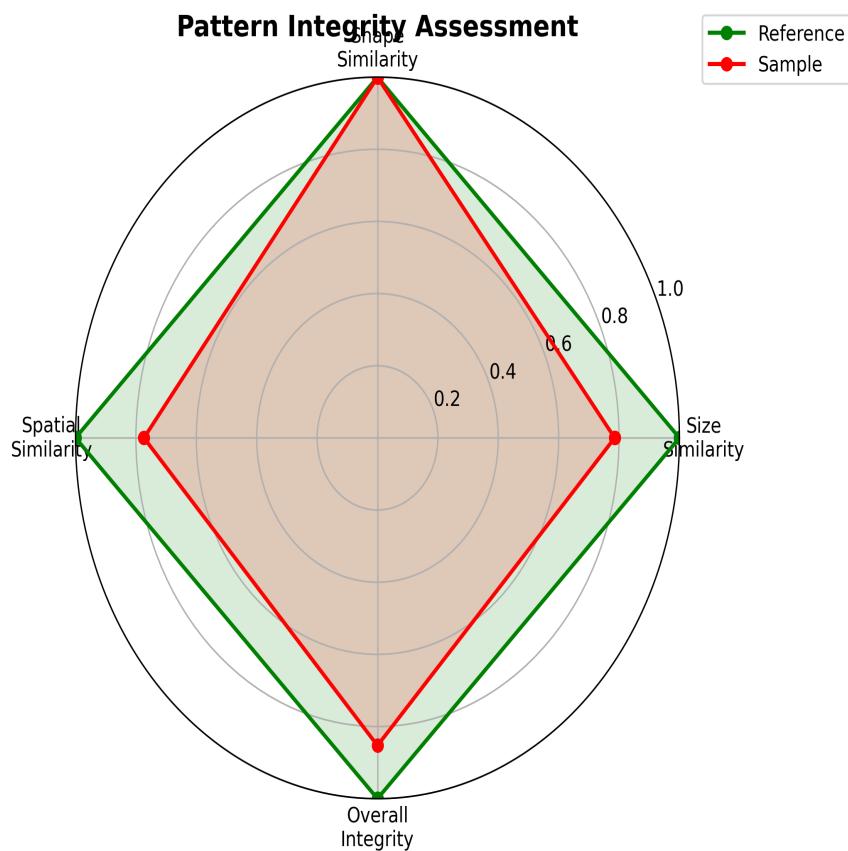
Metric	Reference	Sample
Grid Size	10 × 12	10 × 12
Mean Density	0.24	0.23
Density Std Dev	0.47	0.46
Density CV%	192.58	197.43
Uniformity Score	0.00	0.00



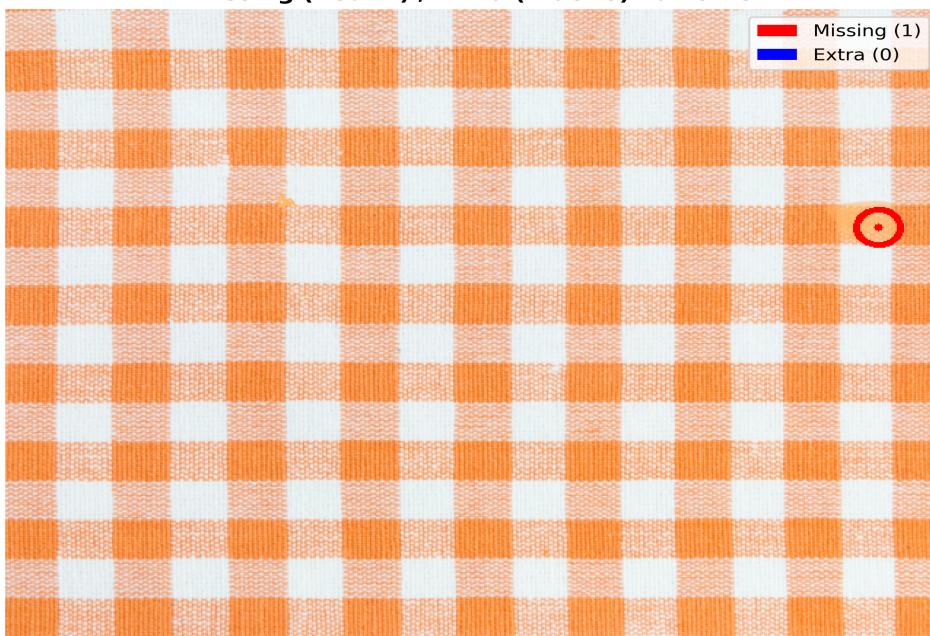
Pattern Integrity Assessment

Multi-dimensional comparison of pattern properties.

Metric	Score (%)	Status
Size Similarity	78.56	CONDITIONAL
Shape Similarity	99.95	PASS
Spatial Similarity	77.34	CONDITIONAL
Overall Integrity	85.28	PASS



Missing/Extra Patterns Catalog

Missing (Red: 1) / Extra (Blue: 0) Patterns

Missing Patterns (1)

ID	Location (x, y)	Expected Size (px ²)	Severity
1	(598, 186)	~141	Medium

No extra patterns detected.

Pattern Repetition Recommendations

Parameter	Action
Poor Spatial Uniformity	Check fabric tension and printing alignment

Spectrophotometer Simulation

Instrument Configuration

Parameter	Value
Observer Angle	2°
Geometry Mode	d/8 SCI
Illuminant (Primary)	D65
UV Control	UV control not available for RGB images

Color Difference Methods

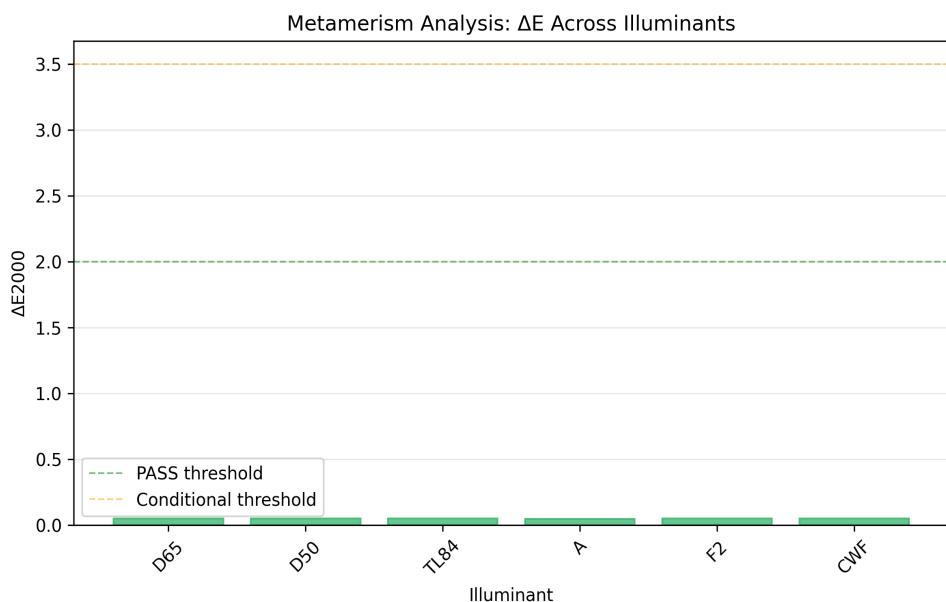
Method	Mean ΔE	Status
ΔE76 (CIE 1976)	0.09	PASS
ΔE94 (CIE 1994)	0.06	PASS
ΔE2000 (CIEDE2000)	0.05	PASS
ΔE CMC (2:1)	0.08	PASS

Whiteness & Yellowness Indices

Index	Reference	Sample	Threshold	Status
CIE Whiteness (ISO 11475)	-14.75	-15.16	≥ 40.0	FAIL
CIE Tint	-32.33	-32.40	—	—
Yellowness Index (ASTM E313)	42.64	42.79	≤ 10.0	FAIL

Metamerism Analysis

Color difference under various illuminants to assess metamerism.



Illuminant	ΔE_{2000}	Status
D65	0.05	PASS
D50	0.05	PASS
TL84	0.05	PASS
A	0.05	PASS
F2	0.05	PASS
CWF	0.05	PASS

Worst-case metamerism: D65 ($\Delta E = 0.05$)

Calibration & Limitations

Parameter	Status / Note
White Tile Calibration	Simulated (not available for RGB images)
UV Control	UV control not available for RGB images
Data Source	RGB → XYZ conversion

Conclusion & Decision

Recommendation: ACCEPT

- Sample matches reference within acceptable tolerances.
- Maintain parameters and regular monitoring.