

The Use of Tonal Histograms for the Study of Stamp Shades

by

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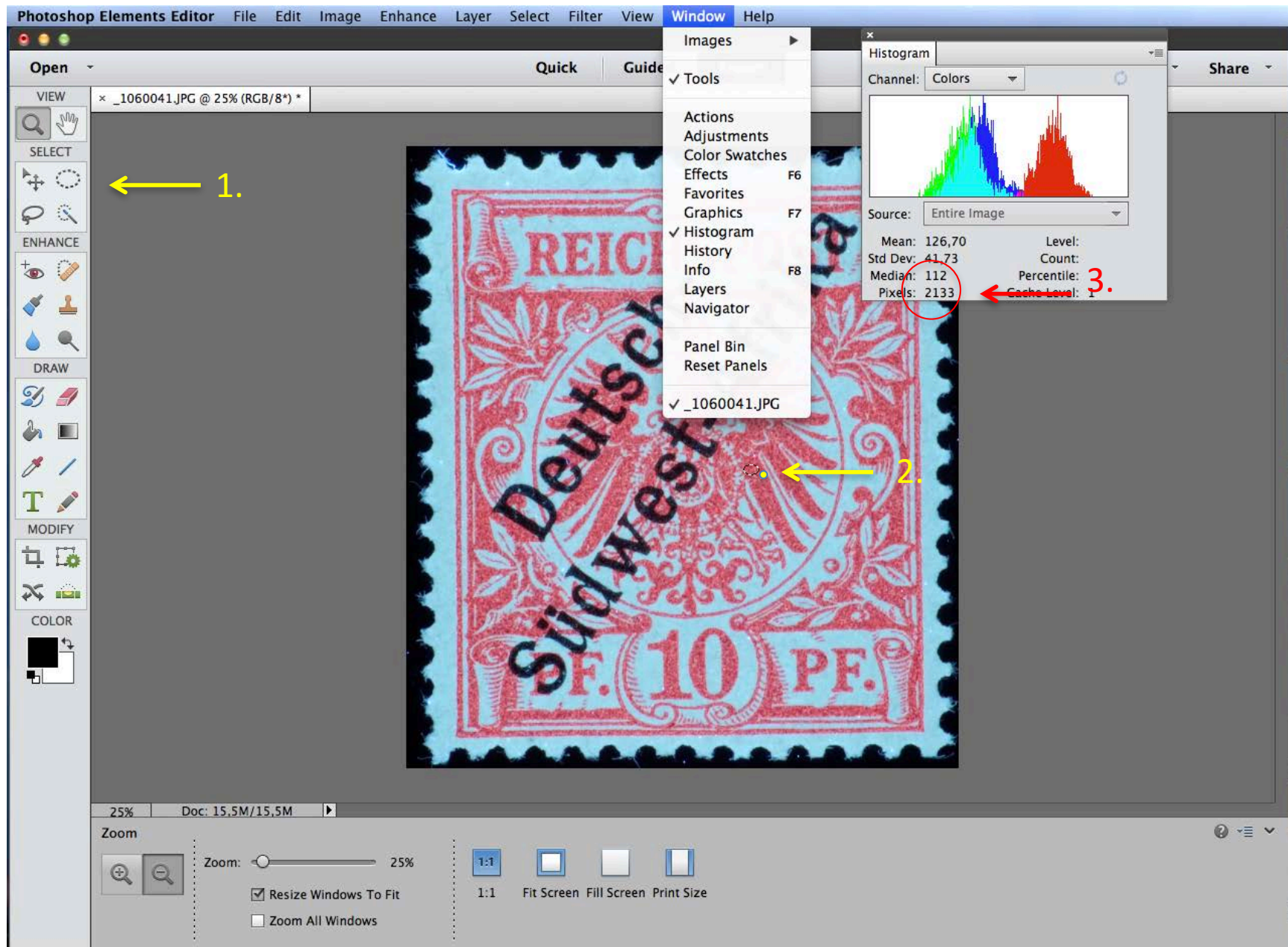
1. The purpose of this work was to determine the value of tonal histograms in identifying stamp shades of an issue whose catalog listings comprise more than two varieties.
2. The 10 Pfennig value of the 1889 “crown and eagle” issue from the German Empire was chosen for this investigation. This is a classical red stamp under VIS light with some 11 different shades in UV described in the Michel® Germany Specialized catalog.
3. Because of the large number of possible shades, this study concentrated on the red-type shades designated as types “d”, red (shades) in UV, “da”, dark red in UV, and “db”, pale vermilion in UV.
4. Some of these stamps sent for use in four German colonies, including the Marianas, Carolines, New Guinea and German Southwest Africa, are listed as having only one or two of these d-type shades, so presumably could serve as models for that shade—offering some advantage to the choice of this shade type for this investigation.
5. The three different shades could be distinguished by three different patterns of tonal histograms along the X-axis. The stamps examined from the Marianas, Carolines, and New Guinea islands exhibited tonal histograms in keeping with their expectations from the Michel® catalog descriptions, whereas those from South West Africa did not. The three patterns can be seen at the single pixel level and characterized numerically with data collected at this level.
6. Three stamps encountered in this study showed the presence of two of these shades that could be affirmed using tonal histograms, indicating there were some common elements of the dyes and pigments used in their production.
7. From these investigations, it is reasonable to expect that tonal histograms can provide an objective tool for distinguishing different, but closely related shades of stamps.

“All the fifty years of conscious brooding have brought me no closer to answer the question, "What are light quanta?" Of course today every rascal thinks he knows the answer, but he is deluding himself.”--Albert Einstein

“Absolute color identification, in terms of CIE color specification terminology, *is not really essential to the philatelist* who is attempting to correlate the color of a stamp *he* possesses with a catalog description.”--R. H. White, Color in Philately
(italics mine)



Camera and attachments for making UV photographs.



A Photoshop Elements window for examining tonal histograms. 1. = circular selection tool. 2 = region of shade selected (small circle) for producing tonal histogram. 3 = number of pixels used for this tonal histogram shown in the “Colors” channel.

Mi. Nr.	Shade in VIS light	Shade in UV light
47a	rose-red (carmine-rose)	brilliant carmine (rose to red)
47aa	magenta (lilac-carmine)	dark carmine
47b	bright rose-red (brown-rose)	brown
47ba	bright rose-red	brownish-red
47c	medium (carmine) red (brownish red)	ochre
47ca	medium (carmine) red	dark yellow
47d	bright lilac-red (carmine, red)	red (shades)
47da	red-carmine	dark red
47db	lilac-red (blood red)	pale vermilion
47e	dark rose red (red) (brown-red)	bright ochre
47ea	dark rose red (red) (brown-red)	yellowish-orange

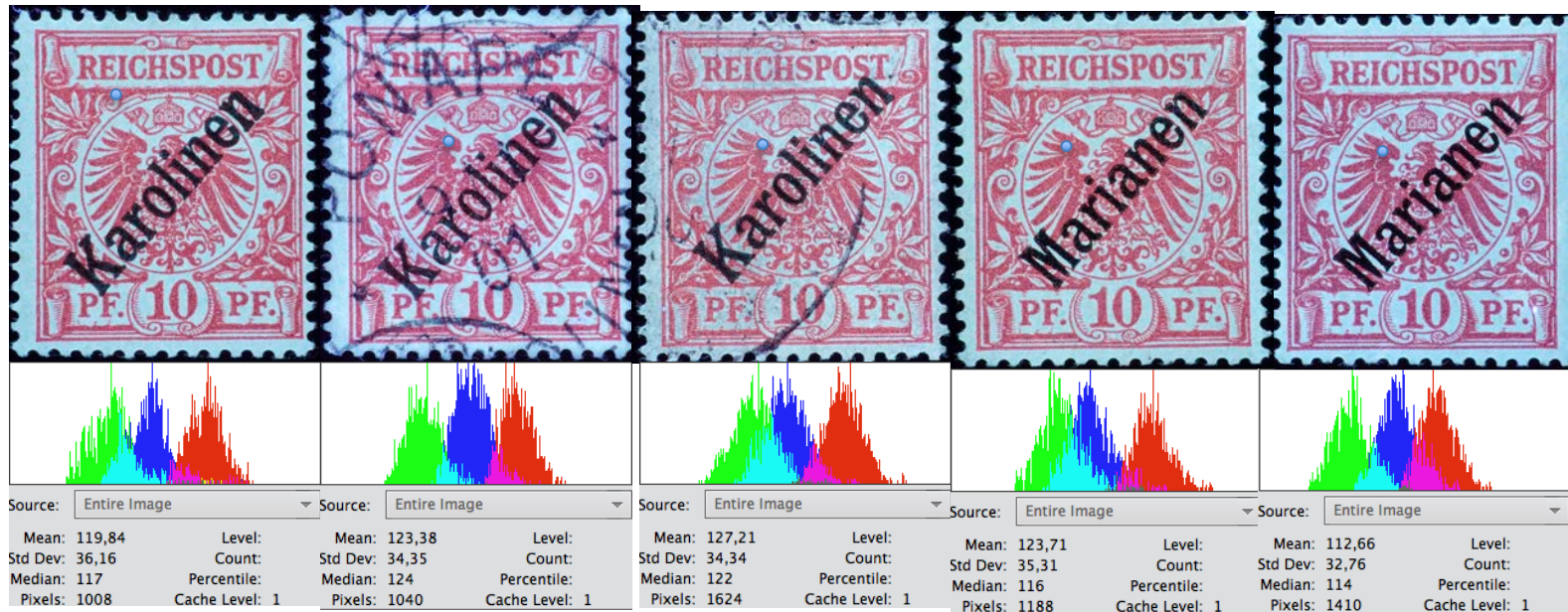
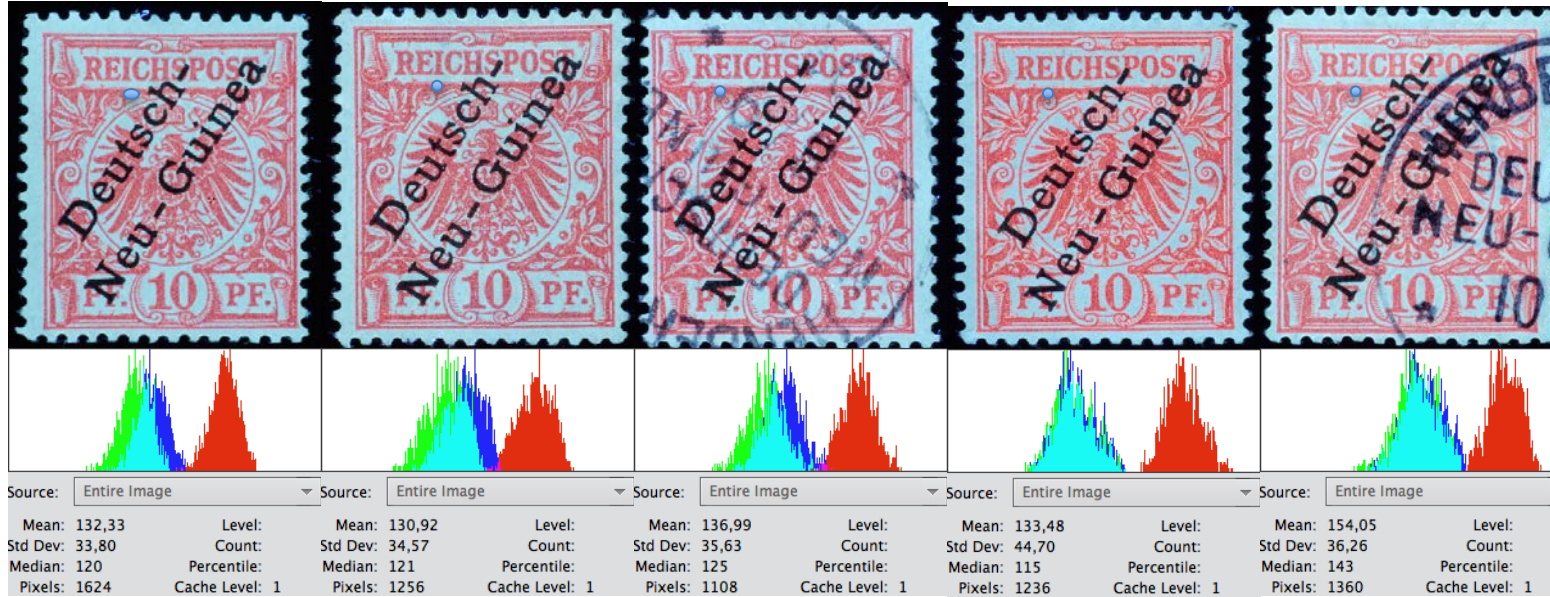
Shades of the 10 Pfennig “crown and eagle” issue of the German Empire 1889 listed in Michel® Germany Specialized catalog. Those in red were used for this investigation.

Colony	Overprint	10 Pfennig shade(s) in UV
German South West Africa (7)	Deutsch-Südwest-Afrika (three words)	red (shades) (d type)
Caroline Islands (3)	Karolinen (48° angle)	dark red (da type)
Marianas (2)	Marianen (48° angle)	dark red (da type)
German New Guinea (5)	Deutsch-Neu-Guinea	red (shades) (d type) pale vermilion (db type)

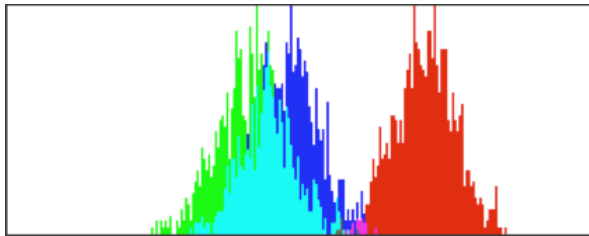
German Empire “crown and eagle” 10 Pfennig stamps overprinted for use in the colonies shown in the table and can be recognized by their overprints or are listed in Michel® as having only two possible shades.

German New Guinea red (shades) in UV

vs. pale vermilion

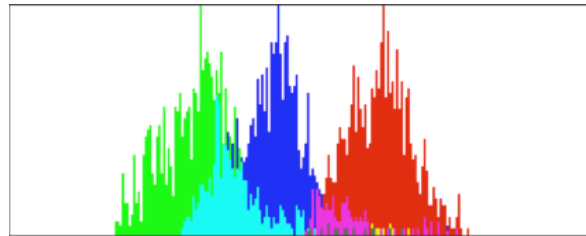


German Carolines and Marianas dark red in UV



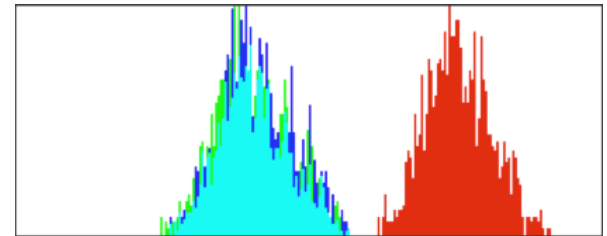
Red (shades) in UV: d

“GB split”



Dark red in UV: da

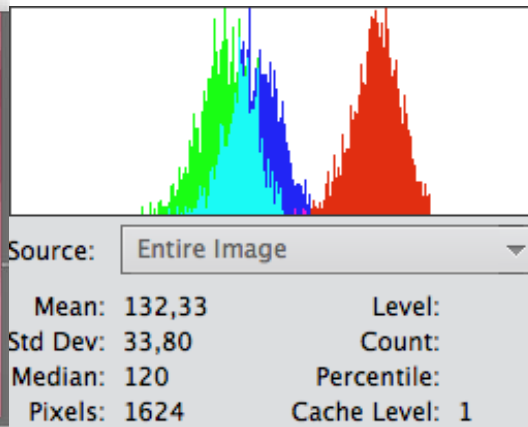
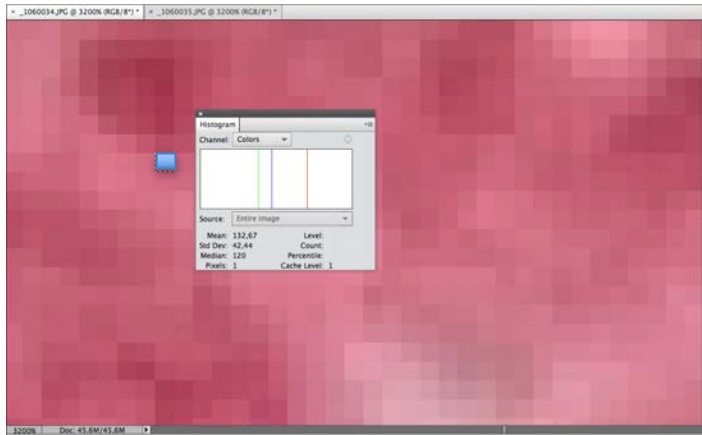
“Three sisters”



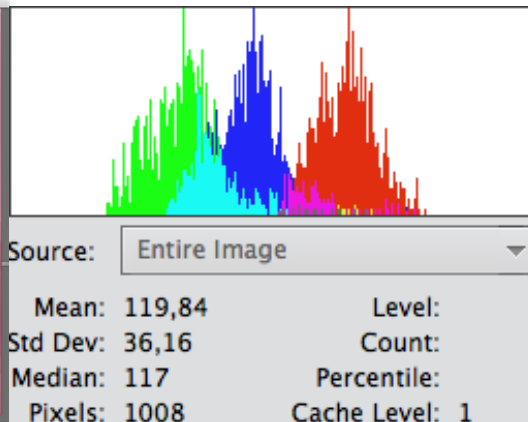
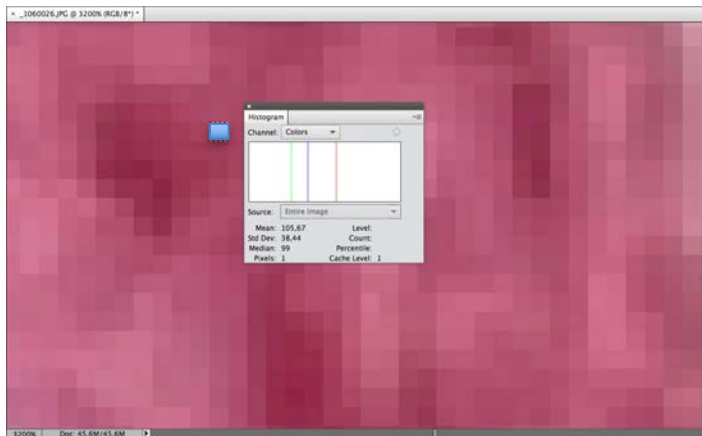
Pale vermillion UV: db

“Cyan mountain”

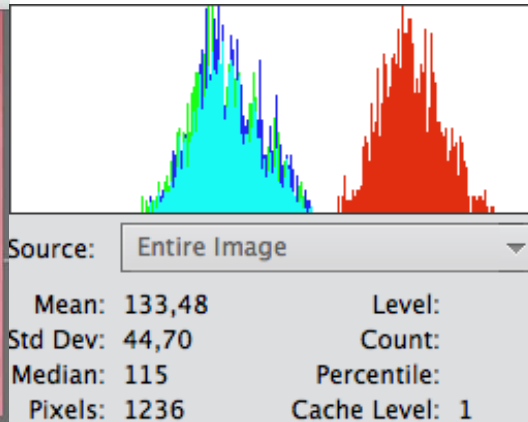
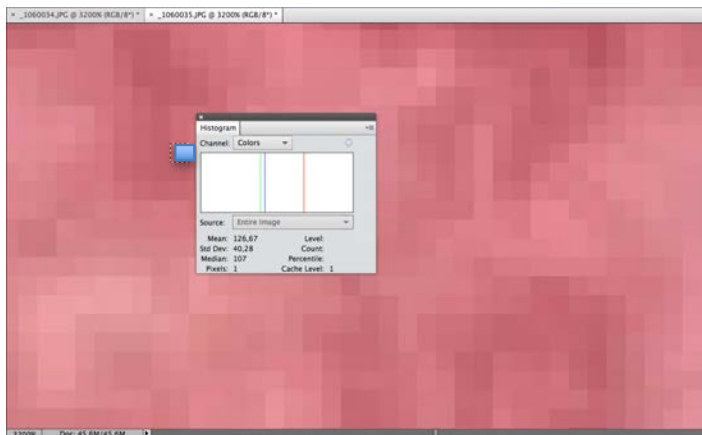
Tonal histograms for the d-type shades of the 10 Pfennig 1899 “crown and eagle” issue.



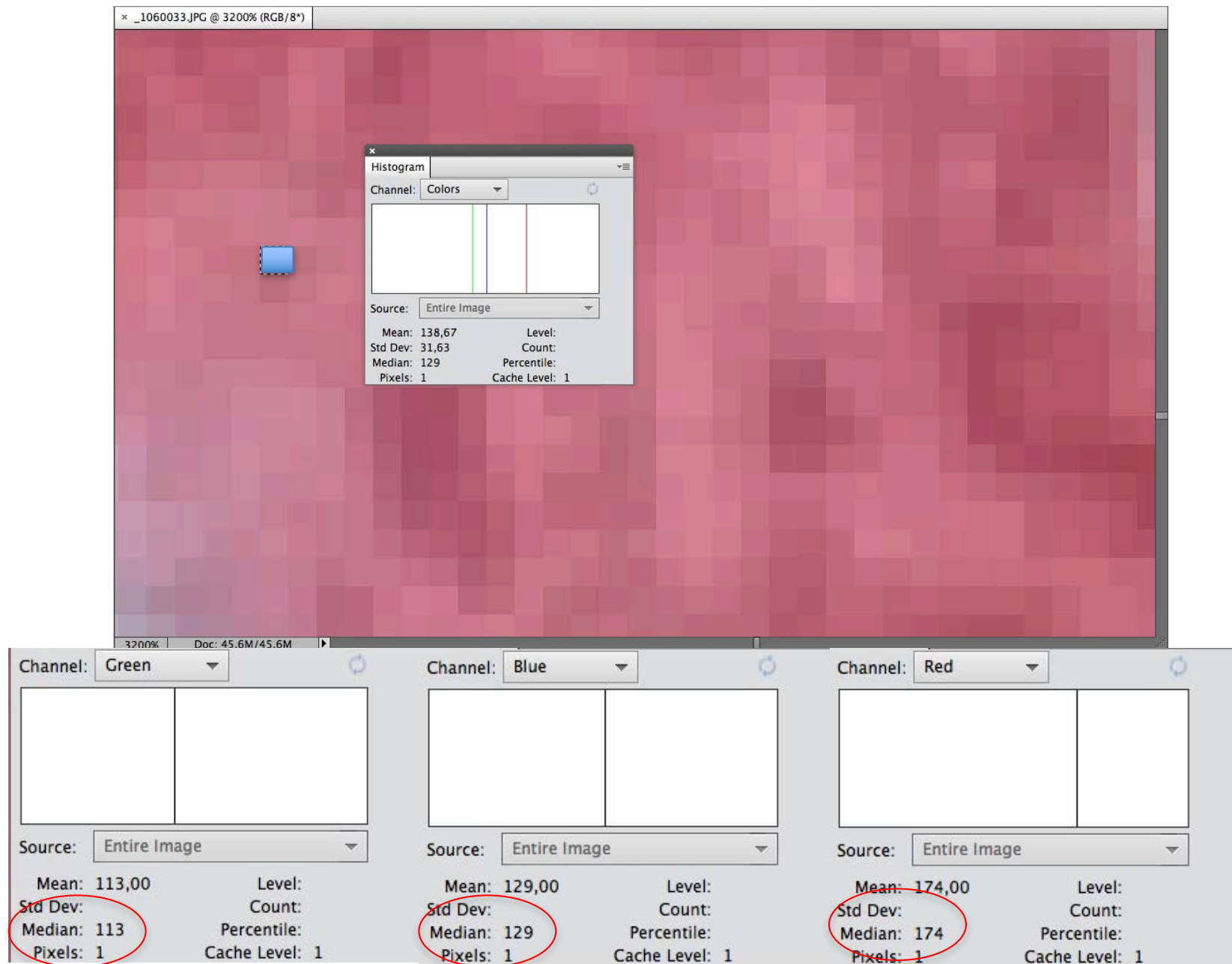
Red (shades) in UV- d shade



Dark red in UV- da shade



Pale vermilion in UV- db shade



Luminance values for each color channel from a single pixel—red (shades) in UV d-type shade.

Table1 Luminance values from the red (R), blue (B), and green (G) channels taken from individual pixels of the red (shades) in UV, d type, and sorted according to the red luminance in ascending order. The red-blue (R-B) distance is approximately twice that of the green-blue (B-G) distance, which is affirmed by the calculation of R-B/B-G. This results in the asymmetry of the three curves exhibited in the tonal histogram.

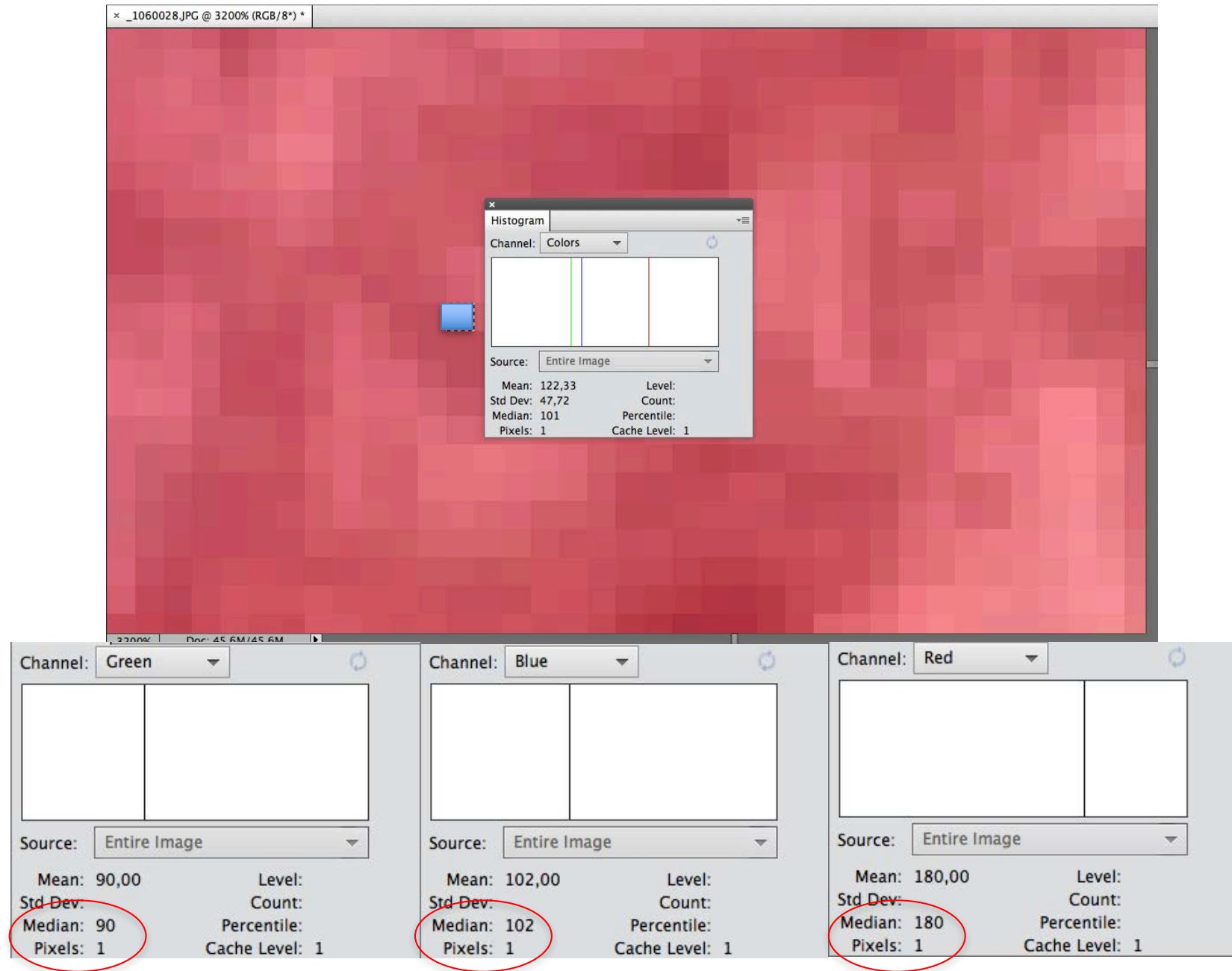
	R	B	G	R-B	B-G	R-B/B-G
	178	109	77	69	32	2,16
	178	110	77	68	33	2,06
	178	109	77	69	32	2,16
	182	110	77	72	33	2,18
	182	126	97	56	29	1,93
	183	107	71	76	36	2,11
	183	111	78	72	33	2,18
	184	108	72	76	36	2,11
	185	112	79	73	33	2,21
	185	112	79	73	33	2,21
	188	112	80	76	32	2,38
	188	113	81	75	32	2,34
	188	119	87	69	32	2,16
	189	115	77	74	38	1,95
	191	118	88	73	30	2,43
	192	140	107	52	33	1,58
	194	123	93	71	30	2,37
	194	121	91	73	30	2,43
	195	120	89	75	31	2,42
	195	120	88	75	32	2,34
	196	124	95	72	29	2,48
	196	124	94	72	30	2,4
	197	146	115	51	31	1,65
	203	134	105	69	29	2,38
	204	133	105	71	28	2,54
	211	141	112	70	29	2,41
	211	143	115	68	28	2,43
	213	147	116	66	31	2,13
	218	151	120	67	31	2,16
	220	150	120	70	30	2,33
AVG	193	124	92	70	32	2
StdDev	11,9	14,1	15,6	6,4	2,3	0,2



Luminance values for each color channel from a single pixel—dark red in UV da-type shade .

Luminance values from the red (R), blue (B), and green (G) channels taken from individual pixels of the dark red shade (da type) stamp and sorted according to the red luminance in ascending order. The red-blue (R-B) distance is approximately equal to that of the green-blue (B-G) distance, which is affirmed by the calculation of R-B/B-G. This results in the symmetry of the three curves exhibited in the tonal histogram for this shade variety .

	R	B	G	R-B	B-G	R-B/B-G
	126	89	50	37	39	0,95
	128	91	52	37	39	0,95
	130	94	54	36	40	0,9
	131	94	55	37	39	0,95
	131	95	55	36	40	0,9
	134	98	58	36	40	0,9
	135	111	65	24	46	0,52
	135	96	57	39	39	1
	136	96	57	40	39	1,03
	140	102	64	38	38	1
	141	94	58	47	36	1,31
	146	109	71	37	38	0,97
	149	101	65	48	36	1,33
	151	104	67	47	37	1,27
	152	114	74	38	40	0,95
	156	108	67	48	41	1,17
	156	110	73	46	37	1,24
	157	109	73	48	36	1,33
	158	111	74	47	37	1,27
	159	111	75	48	36	1,33
	161	113	77	48	36	1,33
	161	113	77	48	36	1,33
	162	114	78	48	36	1,33
	163	117	80	46	37	1,24
	164	121	84	43	37	1,16
	166	122	87	44	35	1,26
	166	142	93	24	49	0,49
	167	121	85	46	36	1,28
	170	146	98	24	48	0,5
	172	126	90	46	36	1,28
AVG	150,1	109,1	70,4	41	38,6	1,1
StdDev	14,4	13,8	13	7,4	3,5	0,3

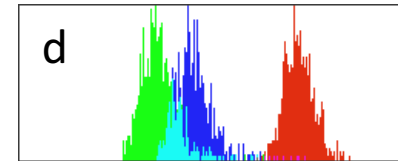


Luminance values for each color channel from a single pixel—pale vermilion in UV db-type shade.

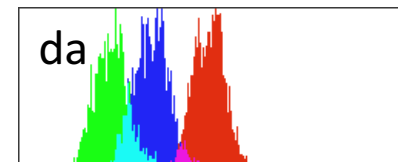
Luminance values from the red (R), blue (B), and green (G) channels taken from individual pixels of the pale vermilion shade, db type, and sorted according to the red luminance in ascending order. The red minus blue (R-B) and blue minus green (B-G) distances are fixed about a mean with little variation regardless of the large differences in luminance values. The very small B-G value with some variation is indicative of the large and varying overlap of these two curves in tonal histograms.

	R	B	G	R-B	B-G	R-B/B-G
	190	79	68	111	11	10,1
	191	81	68	110	13	8,5
	193	82	73	111	9	12,3
	194	83	72	111	11	10,1
	195	84	75	111	9	12,3
	197	86	75	111	11	10,1
	198	85	77	113	8	14,1
	199	88	81	111	7	15,9
	200	89	80	111	9	12,3
	202	91	82	111	9	12,3
	203	92	81	111	11	10,1
	205	94	83	111	11	10,1
	205	92	86	113	6	18,8
	206	96	83	110	13	8,5
	207	96	85	111	11	10,1
	208	98	85	110	13	8,5
	209	99	86	110	13	8,5
	209	96	88	113	8	14,1
	210	99	88	111	11	10,1
	212	101	90	111	11	10,1
	213	102	91	111	11	10,1
	213	102	91	111	11	10,1
	214	104	91	110	13	8,5
	215	104	93	111	11	10,1
	216	106	96	110	10	11,0
	218	108	93	110	15	7,3
	218	108	93	110	15	7,3
	219	108	97	111	11	10,1
	219	109	94	110	15	7,3
	223	112	101	111	11	10,1
AVG	206,7	95,8	84,9	110,9	10,9	10,6
StdDev	9,3	9,5	8,7	0,8	2,2	2,6

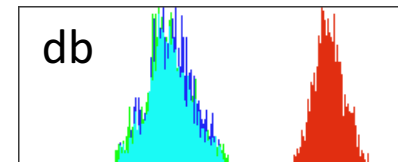
	<u>R</u>	<u>B</u>	<u>G</u>	<u>R-B</u>	<u>B-G</u>	<u>R-B/B-G</u>
AVG	193	124	92	70	32	2
STD	11,9	14,1	15,6	6,4	2,3	0,2



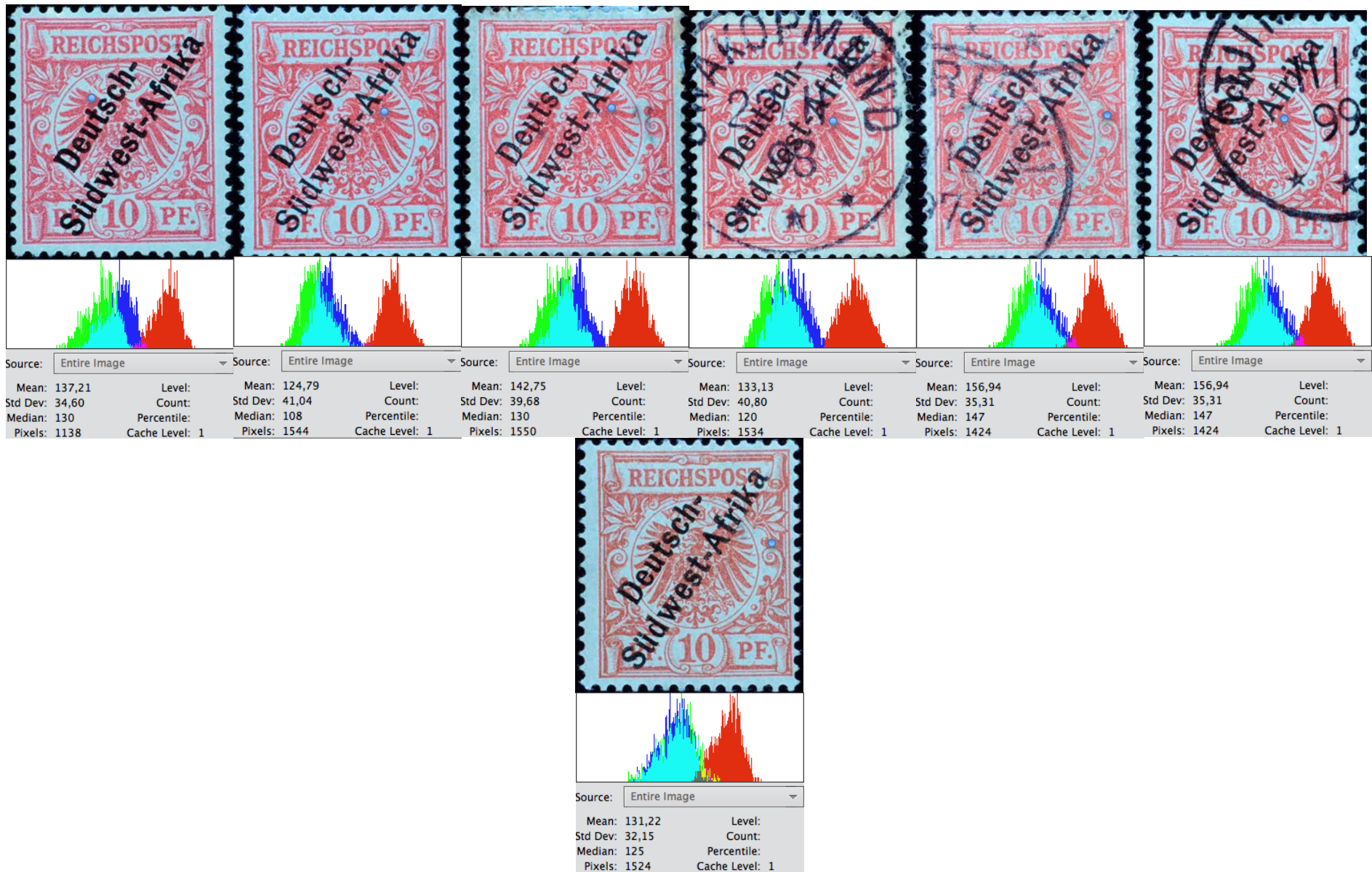
AVG	150,1	109,1	70,4	41	38,6	1,1
STD	14,4	13,8	13	7,4	3,5	0,3



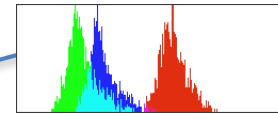
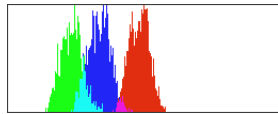
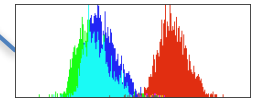
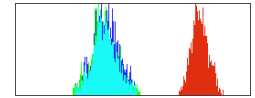
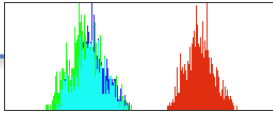
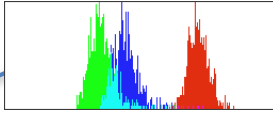
AVG	206,7	95,8	84,9	110,9	10,9	10,6
STD	9,3	9,5	8,7	0,8	2,2	2,6



Summary of results of per pixel luminances for the three d-type shades



German South West Africa items with the three word overprint apparently not limited to the red (shades) in UV



German colonies and offices 10 Pfennig “crown and eagle” stamps exhibiting two of the three d-type shades as verified by tonal histograms.