basICColor display 6 Pro

basICColor display 6 Pro – Additional Features

Option

The optional Pro Version offers a mixed bag of additional features over and above basICColor display 6. basICColor display 6 Pro has an unprecedented wealth of functions and features, no other monitor calibration/profiling/QC software offers.

Licensing

The Pro version is unlocked with a separate license key (.lic) which – as usual – can be generated on-line 24/7 with a TAN (TransActionNumber) provided by basICColor – Ingenieurbüro Dipl.-Ing. Karl Koch (sales@basiccolor.de). Licensing is described in the documents EN - basICColor Licensing.pdf and DE - basICColor Lizenzierung.pdf in English and German respectively.

The TAN can be used only once and will be „burnt" thereafter (Exception: multiple-license TANs).

The TAN comes in 2 „flavours":
– Upgrade: Holds the Pro feature only and can be licensed to a computer which has a seat of basICColor display 6 licensed already (Upgrade price € 190,-/USD 240.-)
– Full: Holds the key for basICColor display 6 Pro and can be licensed to a computer without a previous display 6 license (License Price € 256.-/USD 329.-)

The Pro functionalities are spread across different WORKFLOW components and can only be activated if basICColor display 6 Pro has been licensed.

Here a short overview of the modules and their position in the software.

| Function	Module	Selection
DICOM	Calibrate	Tonal Response
DICOM VM	Calibrate	Tonal Response
CIECAM	Calibrate	Tonal Response
Printer Profile	Emulate	Printer Profile RGB/CMYK
Uniformity	Validate	5x5, 5x3, 3x3
Sensors	Validate	Compare
Sensors	Validate	Create Correlation
Sensors	Validate	Measure External
White Point Edit	WORKFLOW	after Calibrate/Profile
Spectral measurement	Light	with spectrophotometer only
Spectral 2°/10°	Preferences…	Pro Features – Measurement
XYZ, xyY, uvY color models	Preferences…	Pro Features – Readouts

1. Uniformity

This allows to validate the uniformity of your monitor in different patterns
– Off: No uniformity check
– coarse: 3x3 patches for a quick overview
– wide: 5x3 patches for wide format monitors
– standard: 5x5 patches as defined in the ISO standard
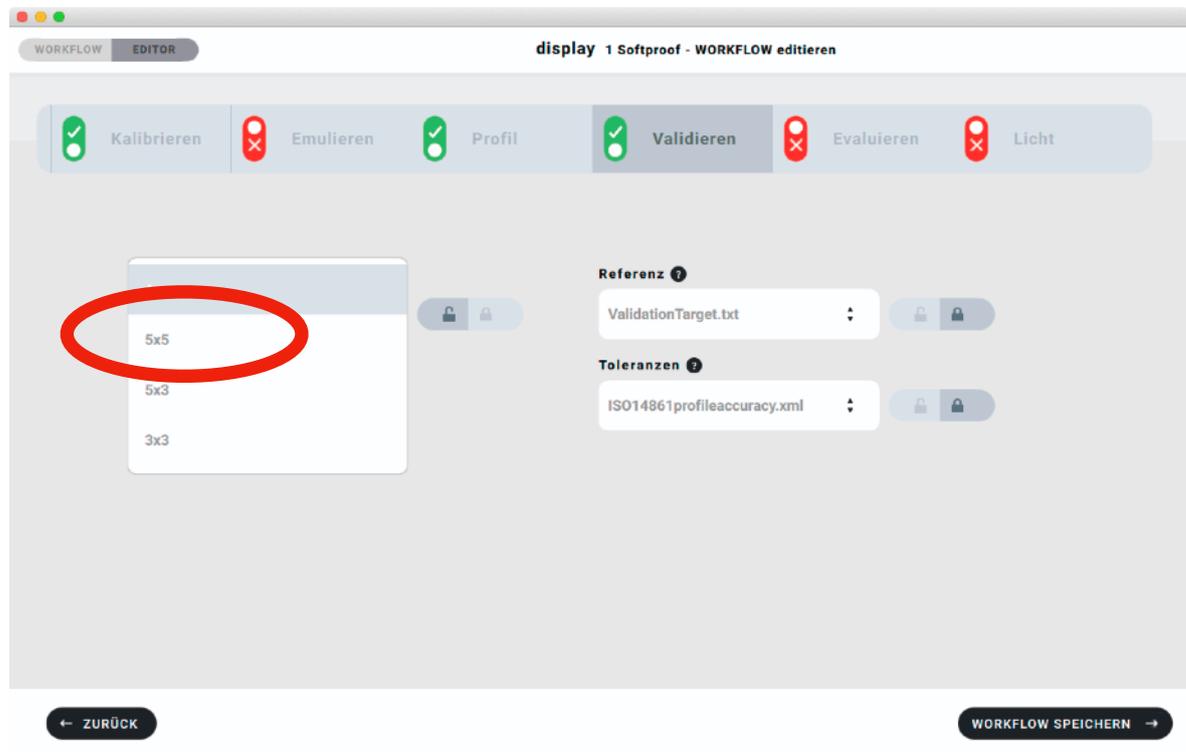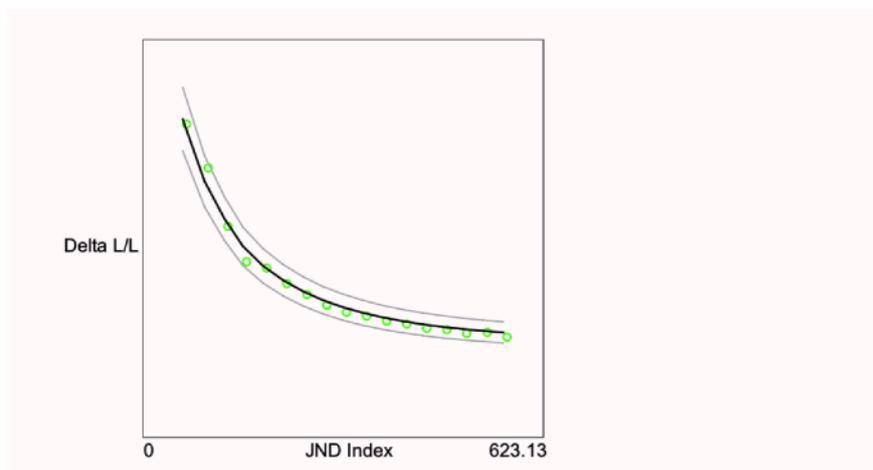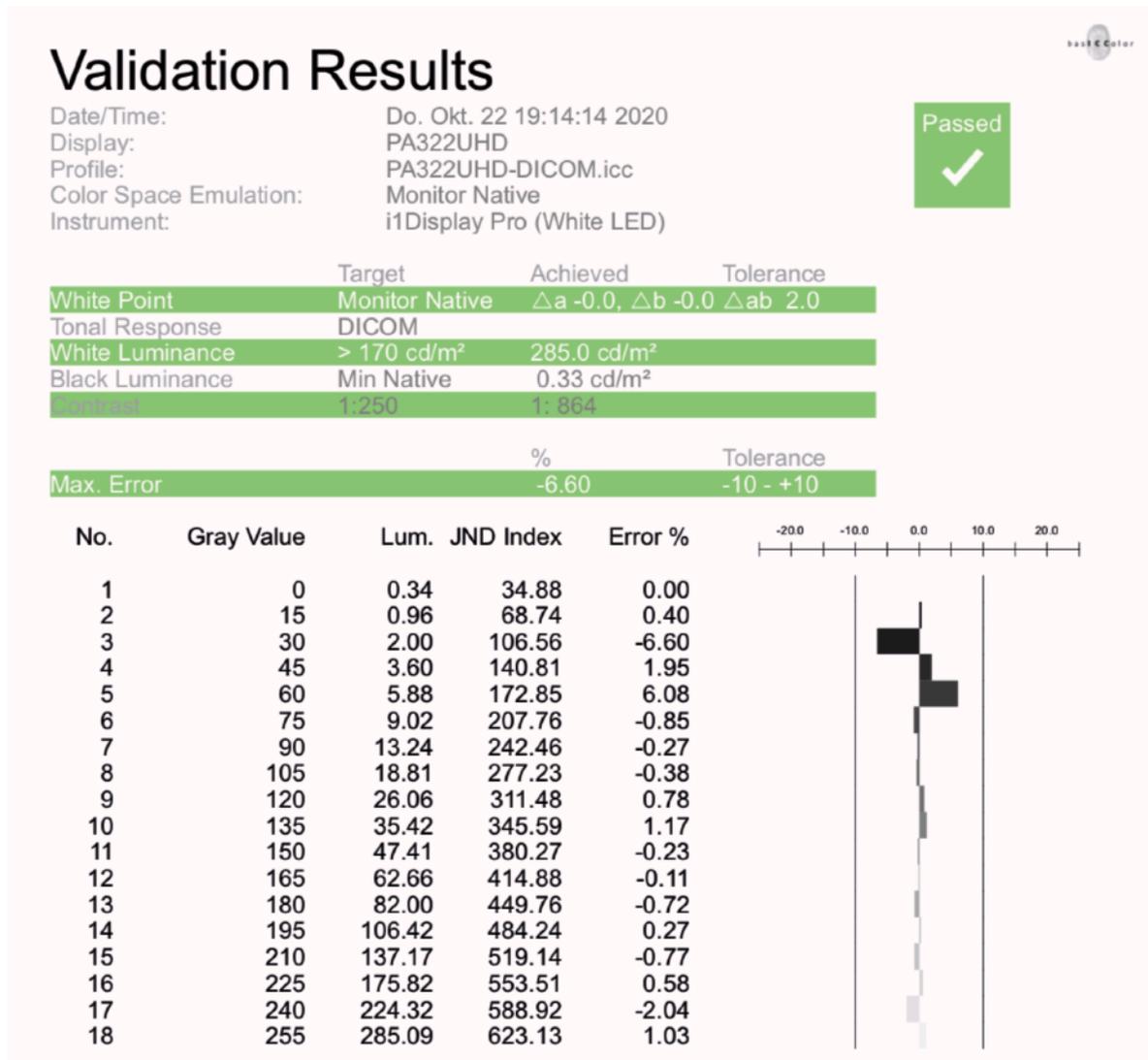

NOTE: If your **Tonal Response** curve in **Calibrate** is set to DICOM there is only a choice of switching Uniformity **On** or **Off**.
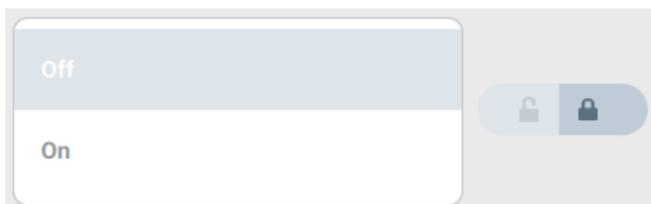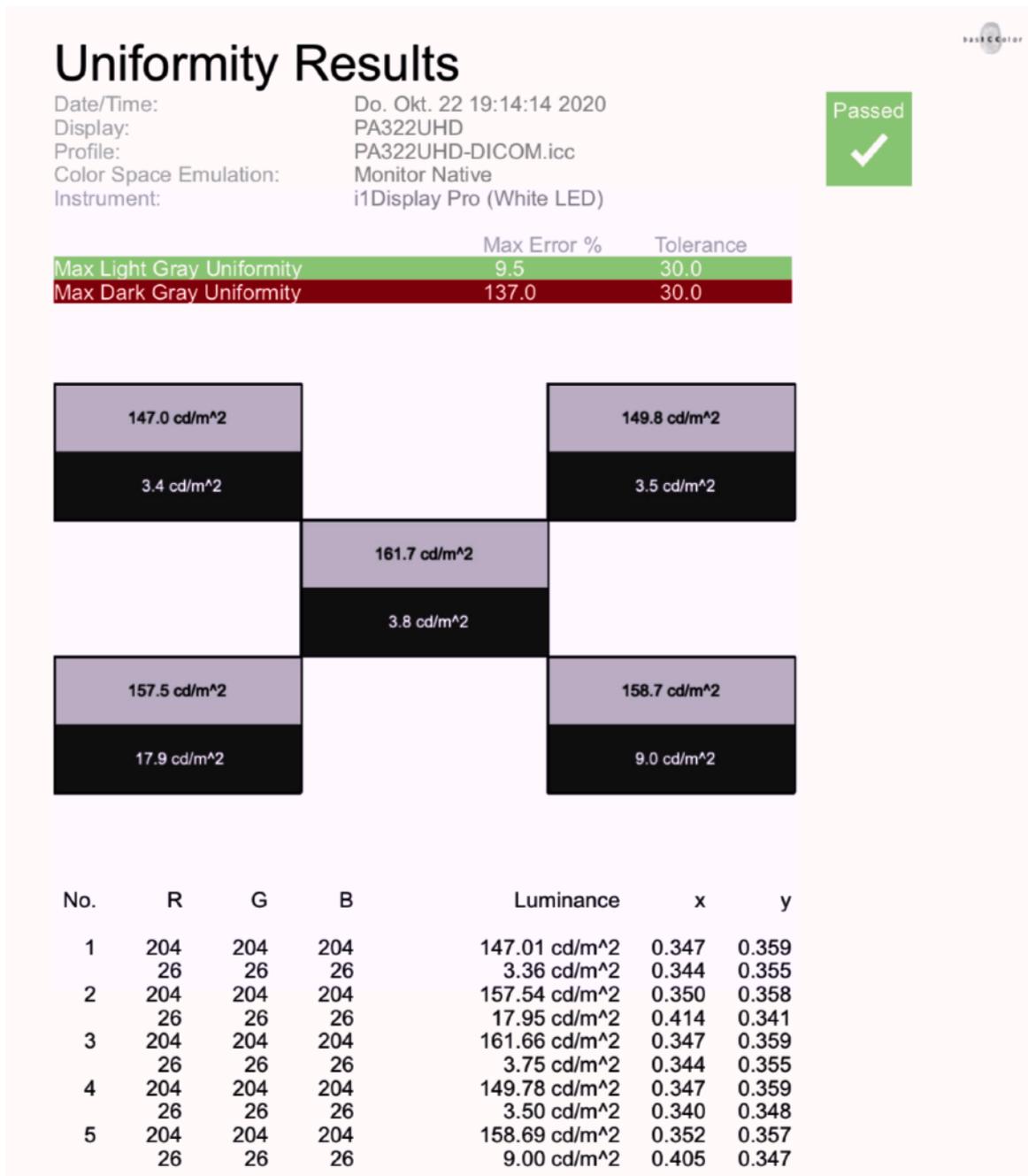

On will display a pattern of 5 patches, as defined in the DICOM standard

2. DICOM

For calibrating and Validating a monitor for medical diagnosisbasICColor display 6 Pro offers a separate WORKFLOW which sets the correct DICOM Tonal Response curve, checks for JND (Just Noticeable Difference) and the uniformity according to DICOM/ GSDF standards.

Validation Results

Date/Time:	Do. Okt. 22 19:14:14 2020			Passed ✓
Display:	PA322UHD			
Profile:	PA322UHD-DICOM.icc			
Color Space Emulation:	Monitor Native			
Instrument:	i1Display Pro (White LED)			

	Target	Achieved	Tolerance
White Point	Monitor Native	△a -0.0, △b -0.0	△ab 2.0
Tonal Response	DICOM		
White Luminance	> 170 cd/m²	285.0 cd/m²	
Black Luminance	Min Native	0.33 cd/m²	
Contrast	1:250	1: 864	

		%	Tolerance
Max. Error		-6.60	-10 - +10

No.	Gray Value	Lum.	JND Index	Error %
1	0	0.34	34.88	0.00
2	15	0.96	68.74	0.40
3	30	2.00	106.56	-6.60
4	45	3.60	140.81	1.95
5	60	5.88	172.85	6.08
6	75	9.02	207.76	-0.85
7	90	13.24	242.46	-0.27
8	105	18.81	277.23	-0.38
9	120	26.06	311.48	0.78
10	135	35.42	345.59	1.17
11	150	47.41	380.27	-0.23
12	165	62.66	414.88	-0.11
13	180	82.00	449.76	-0.72
14	195	106.42	484.24	0.27
15	210	137.17	519.14	-0.77
16	225	175.82	553.51	0.58
17	240	224.32	588.92	-2.04
18	255	285.09	623.13	1.03

The results of the uniformity check are displayed graphically and numetrically.

Uniformity Results

Date/Time:	Do. Okt. 22 19:14:14 2020	
Display:	PA322UHD	Passed ✓
Profile:	PA322UHD-DICOM.icc	
Color Space Emulation:	Monitor Native	
Instrument:	i1Display Pro (White LED)	

	Max Error %	Tolerance
Max Light Gray Uniformity	9.5	30.0
Max Dark Gray Uniformity	137.0	30.0

147.0 cd/m^2		149.8 cd/m^2
3.4 cd/m^2		3.5 cd/m^2
	161.7 cd/m^2	
	3.8 cd/m^2	
157.5 cd/m^2		158.7 cd/m^2
17.9 cd/m^2		9.0 cd/m^2

No.	R	G	B	Luminance	x	y
1	204	204	204	147.01 cd/m^2	0.347	0.359
	26	26	26	3.36 cd/m^2	0.344	0.355
2	204	204	204	157.54 cd/m^2	0.350	0.358
	26	26	26	17.95 cd/m^2	0.414	0.341
3	204	204	204	161.66 cd/m^2	0.347	0.359
	26	26	26	3.75 cd/m^2	0.344	0.355
4	204	204	204	149.78 cd/m^2	0.347	0.359
	26	26	26	3.50 cd/m^2	0.340	0.348
5	204	204	204	158.69 cd/m^2	0.352	0.357
	26	26	26	9.00 cd/m^2	0.405	0.347

3.   Emulate

With basICColor display 6 Pro you can emulate any printing color space – RGB and CMYK – for which you have an ICC profile on your system. The standard version basICColor display 6 allows for emulating monitor profiles and color space profiles (RGB) only.
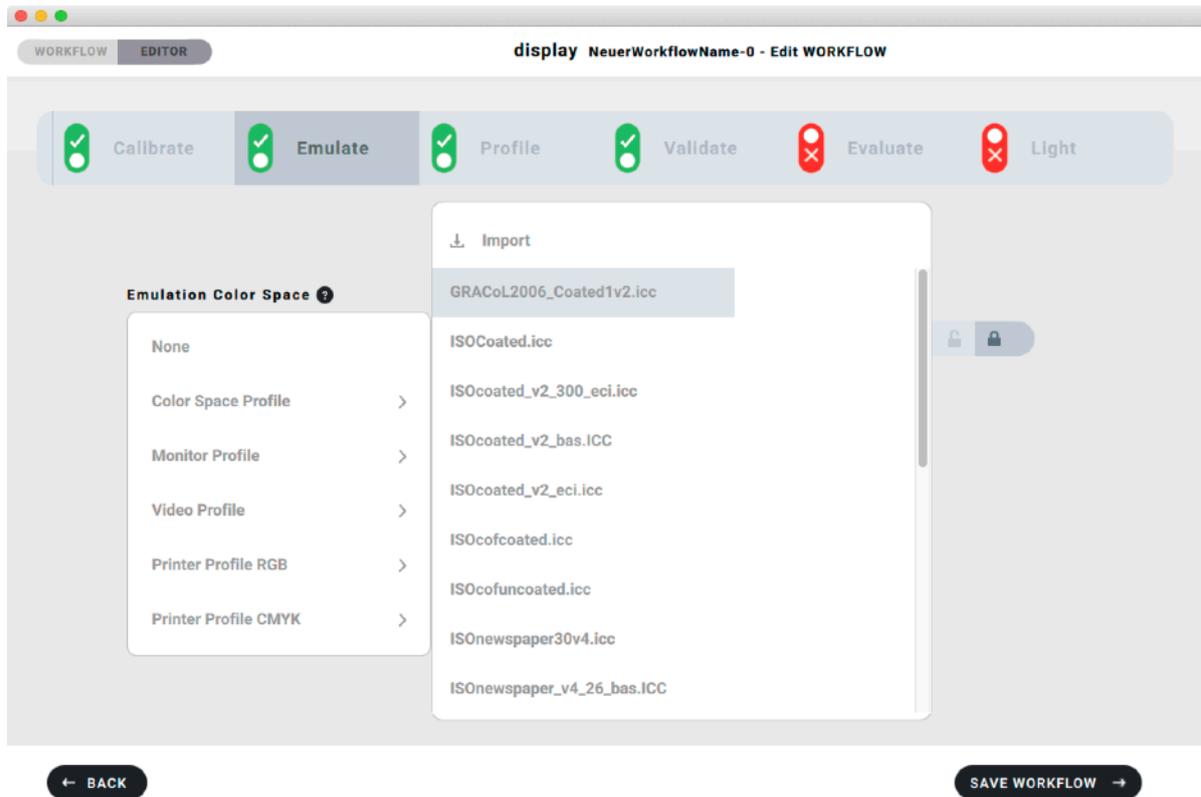

NOTE: Use this calibration method only If you want to view a softproof prediction without converting your data into the printing color space and without leaving your design software-

Wide Gamut Monitors which can be hardware-calibrated (e.g. NEC or EIZO) can emulate a smaller gamut by using a color matrix or 3D-LUT. This functionality can be used to restrict the gamut of the monitor to a printing space. and thus view RGB data as if they had been converted to CMYK.

basICColor display 6 Pro allows for any CMYK space to be emulated if you have an ICC profile for this color space. We install a basICColor Profiles folder within the operating system´s profile folder that offers the most common printing profiles like ISOcoated v2, PSOcoated, PSOuncoated, ISOnewspaper …. You can use any other profile that´s installed in your system.

If you use a WORKFLOW that Emulates another color space the calibration contains the selected color space and the entire monitor will show the reduced gamut and the resulting ICC profile will describe this state of the monitor.

Several graphics show the progress of the calibration with „Emulate" selected.
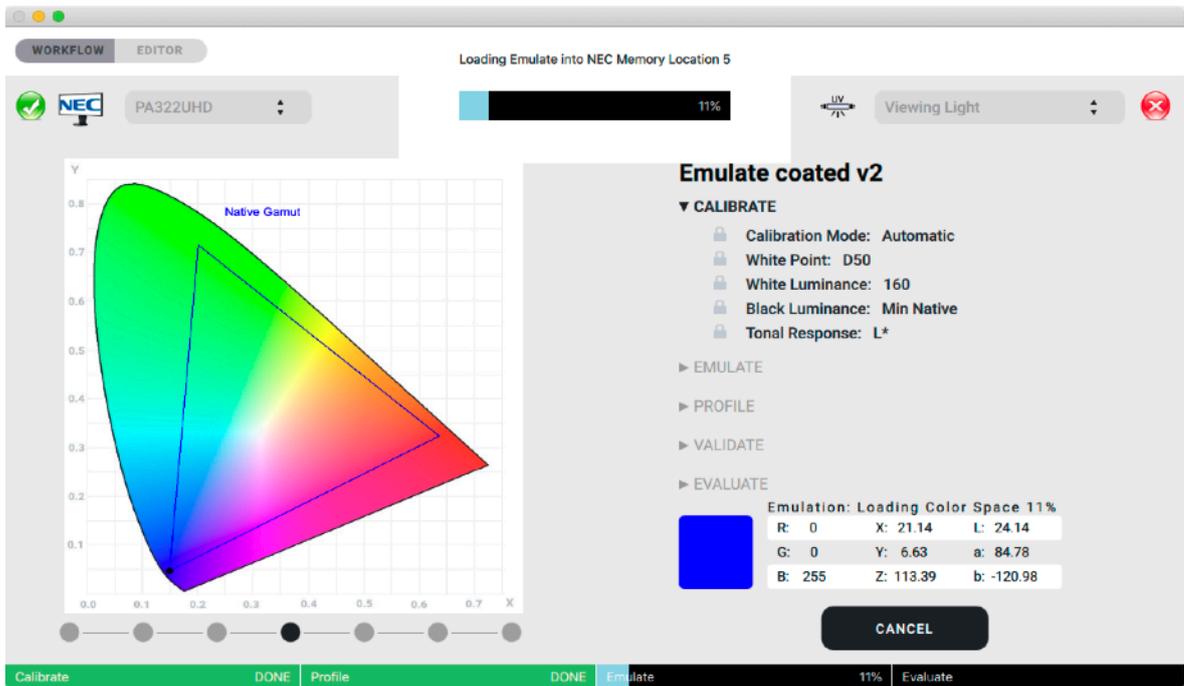
„Evaluate" will show the usability for the desired purpose.
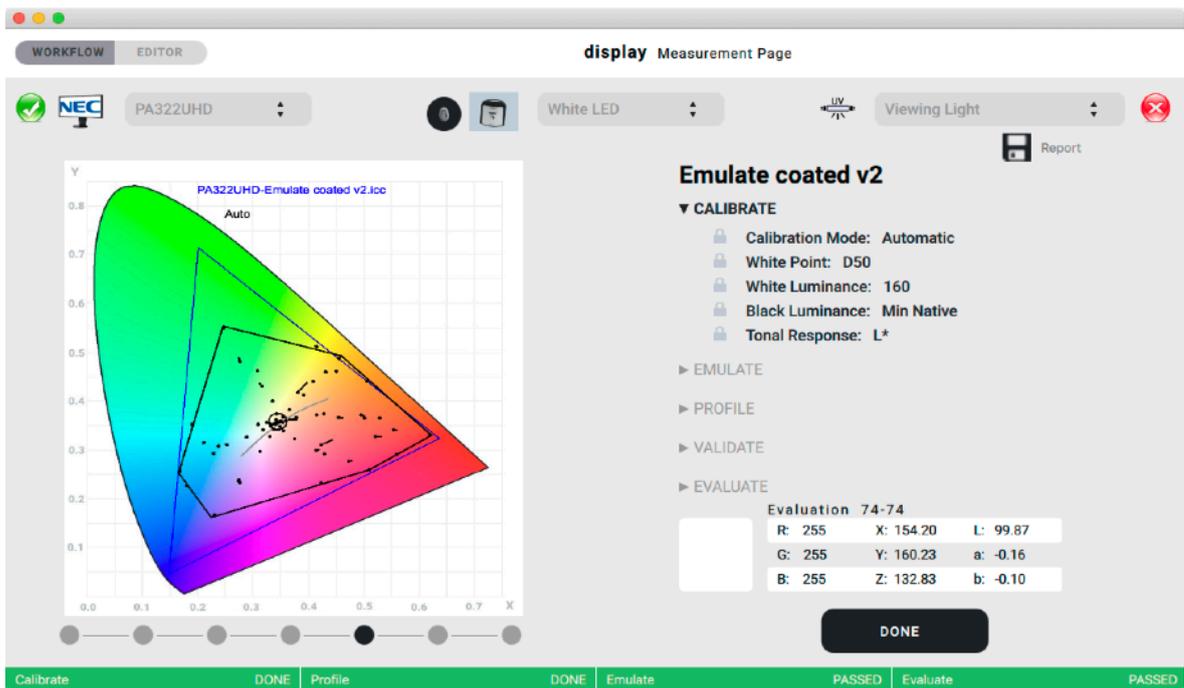
„Evaluate" is designed for this purpose only and should not be used with other WORKFLOWs, except you want to evaluate the general ability of a monitor to emulate a specific color space. In this case, leave the „Emulate" tab off and „Evaluate" if a specific gamut COULD be emulated.

Evaluation Results

Date/Time:	**Fr. Juni 4 15:23:40 2021**	
Display:	**PA322UHD**	
Profile:	**PA322UHD-Emulate coated v2.icc**	
Color Space Emulation:	**ISOcoated_v2_bas.ICC**	
Color Space Evaluation:	**Auto**	
Instrument:	**i1Display Pro (White LED)**	

Passed ✓

	△E00	Tolerance
Max.	2.18	10.00
Average	0.69	3.00
Max. Primaries	1.06	10.00

| No.	C	M	Y	K	Lref	Aref	Bref	L	A	B	△E
1	0	0	0	0	95.37	0.48	-1.53	95.37	0.48	-1.53	0.00
2	100	0	0	0	55.36	-36.53	-49.58	55.60	-37.32	-48.51	0.57
3	70	0	0	0	67.21	-24.26	-36.66	67.43	-24.56	-36.16	0.32
4	40	0	0	0	80.01	-12.12	-21.38	80.25	-12.08	-20.33	0.55
5	20	0	0	0	88.02	-5.32	-11.37	88.11	-5.13	-10.83	0.38
6	10	0	0	0	91.89	-2.47	-6.44	91.86	-2.45	-5.85	0.46
7	0	100	0	0	48.32	74.52	-2.60	48.64	74.38	-2.12	0.37
8	0	70	0	0	61.18	51.10	-6.29	61.79	50.14	-6.05	0.61
9	0	40	0	0	76.69	26.40	-6.46	77.00	25.50	-6.23	0.49
10	0	20	0	0	86.52	12.54	-4.75	86.71	12.10	-4.34	0.45
11	0	10	0	0	91.08	6.32	-3.37	91.14	5.95	-2.90	0.52
12	0	0	100	0	89.36	-4.54	93.49	89.48	-4.76	88.25	1.06
13	0	0	70	0	90.71	-4.23	63.07	90.83	-4.48	63.90	0.26
14	0	0	40	0	92.55	-3.01	31.81	92.53	-2.62	32.07	0.33
15	0	0	20	0	93.99	-1.15	13.81	93.95	-1.24	14.23	0.27
16	0	0	10	0	94.72	-0.45	5.82	94.64	-0.35	6.15	0.31
17	0	0	0	10	89.44	0.48	-1.38	89.59	0.24	-0.72	0.71
18	0	0	0	20	83.12	0.48	-1.22	83.45	0.05	-0.20	1.18
19	0	0	0	40	69.55	0.48	-0.87	69.94	0.46	-0.02	0.88
20	0	0	0	60	54.35	0.48	-0.49	54.71	-0.16	0.05	1.14
21	0	0	0	80	36.77	0.48	-0.04	37.18	-0.46	-0.44	1.50
22	0	0	0	100	16.49	0.48	0.47	17.30	0.23	0.14	0.73
23	0	100	0	100	10.64	14.74	1.80	11.74	14.44	-0.35	1.69
24	0	70	70	60	33.58	25.84	21.40	33.96	24.32	21.31	0.90
25	0	0	70	80	34.58	-2.80	22.81	35.08	-2.89	22.73	0.42
26	100	100	0	0	24.26	22.55	-45.60	25.03	22.42	-44.34	0.83
27	70	70	0	0	41.18	18.39	-36.16	41.54	17.81	-35.93	0.44
28	40	40	0	0	63.90	10.87	-23.39	64.30	10.51	-22.58	0.54
29	20	20	0	0	79.74	5.60	-13.21	79.93	6.11	-12.73	0.79
30	10	10	0	0	87.62	3.08	-7.62	87.78	3.02	-6.69	0.73
31	0	100	100	0	47.29	68.55	48.60	47.41	68.03	47.50	0.40
32	0	70	70	0	58.83	47.60	38.43	59.35	46.82	38.86	0.69
33	0	40	40	0	74.44	23.53	21.97	74.92	22.92	22.20	0.58

If your WORKFLOW contains „Emulate", the option „Validate" doesn´t make sense and should be deactivated.

4. Viewing Light Audit (ISO 3664-2009)

basICColor display 6 Pro allows you to check **Ambient Light** and **Viewing Light** using a spectrophotometer and will display the spectral curve.
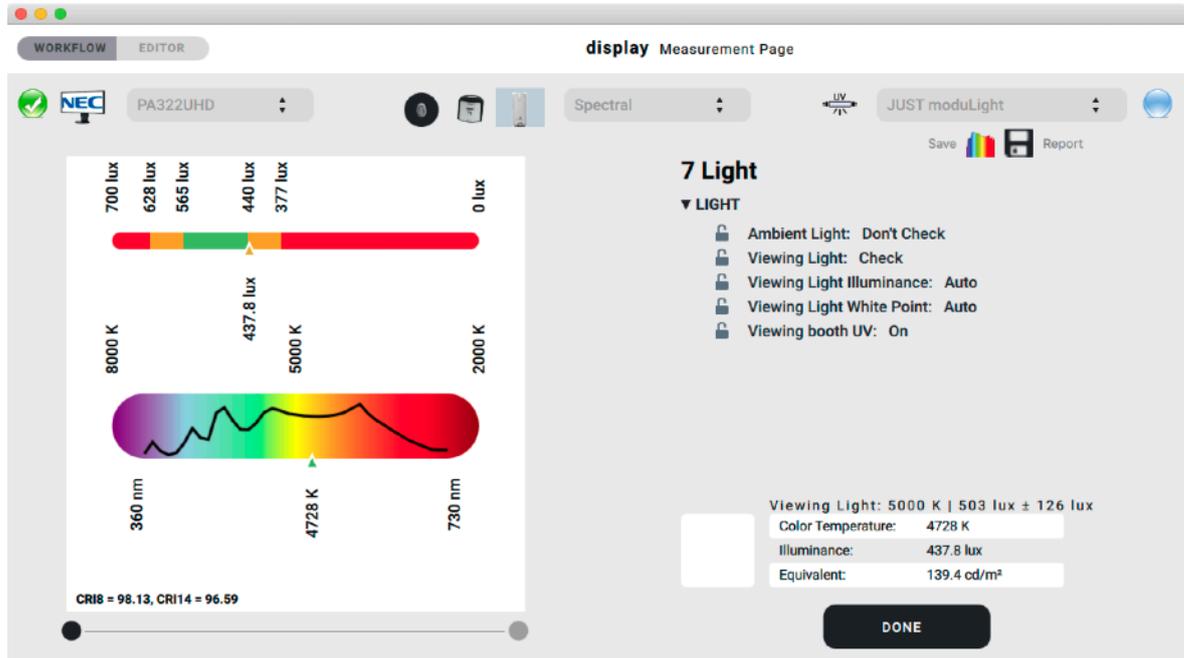
Spectral values can be saved in CGTS format by clicking the spectrum symbol. These can be used in basICColor input 6 Pro as an illuminant for camera profiling if you measure your capture illuminant.
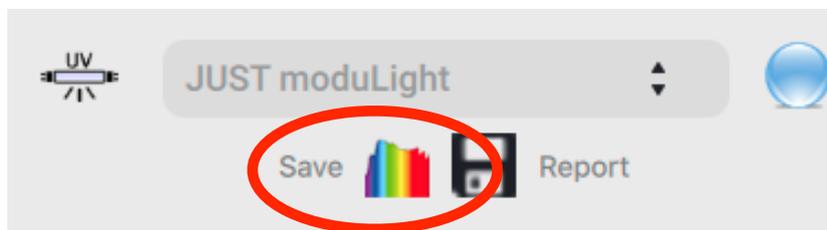
The Light measurement report additionally shows the color rendering index (CRI) as well as the general CRI as also the extended CRI. The general CRI takes 8 reference colors into account, the extended CRI checks a total of 14 colors. The CRI rates the measured light against D50 standard illuminant.

Viewing booth

	Target	Achieved	Required	
Color Temperature	5000 K	4728 K	+- 500 K	Passed
Illuminance	503 lux	438.0 lux	+- 126 lux	

ISO 3664:2009

		Achieved	Required
CRI (CIE 13.3)		98.1	> 90
Metamerism Index MIvis		0.77	< 1.0
Metamerism Index MIuv		0.01	< 1.5
Chromaticity Coordinates (x,y 10°)		0.0001	< 0.005
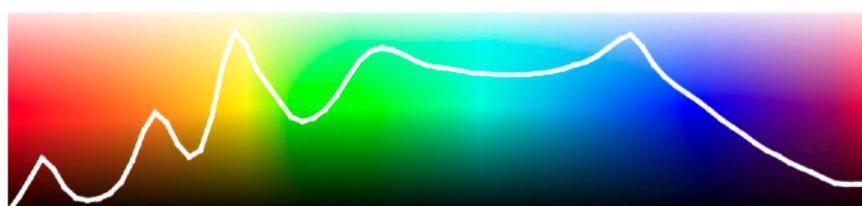
360 nm   730 nm

General CRI (Color Rendering Index)   **Ra (R1-R8)**   **98.1**
Extended CRI   Ra (R1-R14)   96.6

Color	Patch	Value
Light greyish red	R1	99.1
Dark greyish yellow	R2	98.0
Strong yellow green	R3	95.1
Moderate yellow green	R4	97.3
Light bluish green	R5	99.1
Light blue	R6	98.9
Light violet	R7	98.8
Light reddish purple	R8	98.9
Strong Red	R9	97.5
Strong Yellow	R10	95.4
Strong green	R11	93.7
Strong blue	R12	86.0
Light yellowish pink	R13	98.5
Moderate olive green	R14	95.9

Test against reference D55:
   meets chromaticity tolerance
   Metamerism index (vis): 0.46
   Metamerism index (uv): 0.49
   category: BB

Test against reference D65:
   outside chromaticity tolerance
   Metamerism index (vis): 1.16
   Metamerism index (uv): 1.47
   category: DD

Test against reference D75:
   outside chromaticity tolerance
   Metamerism index (vis): 1.68
   Metamerism index (uv): 2.31
   category: DE

5. White Point Edit

After having executed a WORKFLOW you end up in the 3D Comparison window. You can call the 3D Window later by clicking the „Active Workflow bubble"
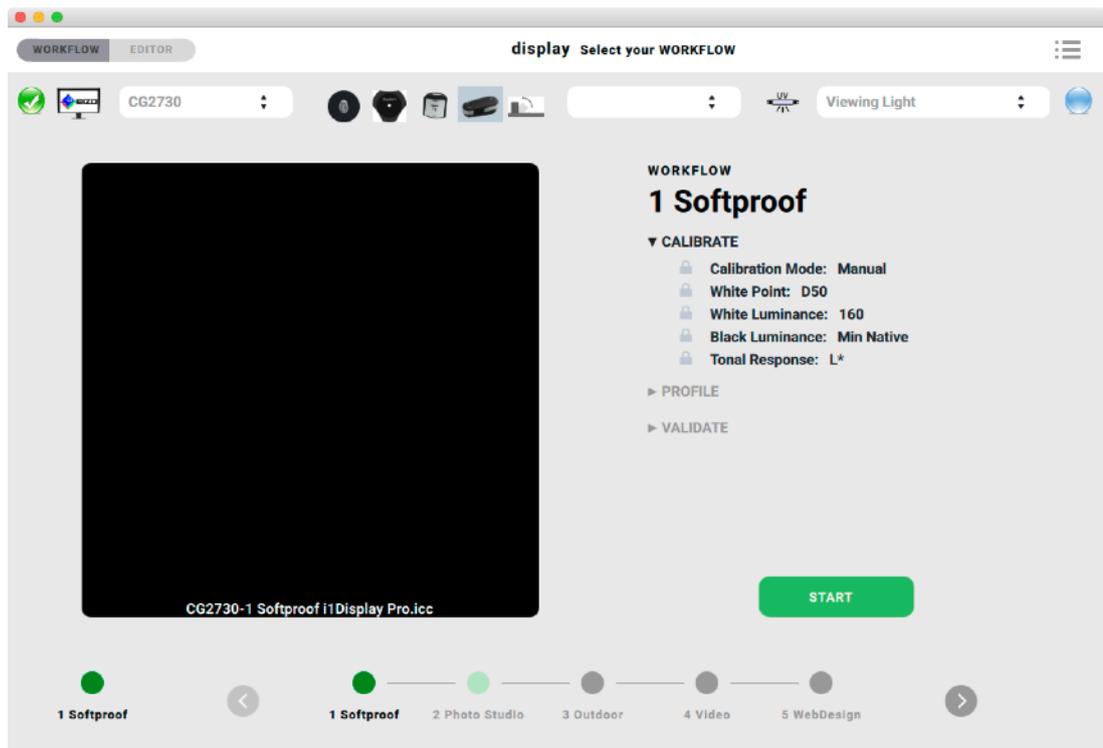
This will take you to the 3D View, the last window within the overview of all your WORKFLOW steps.
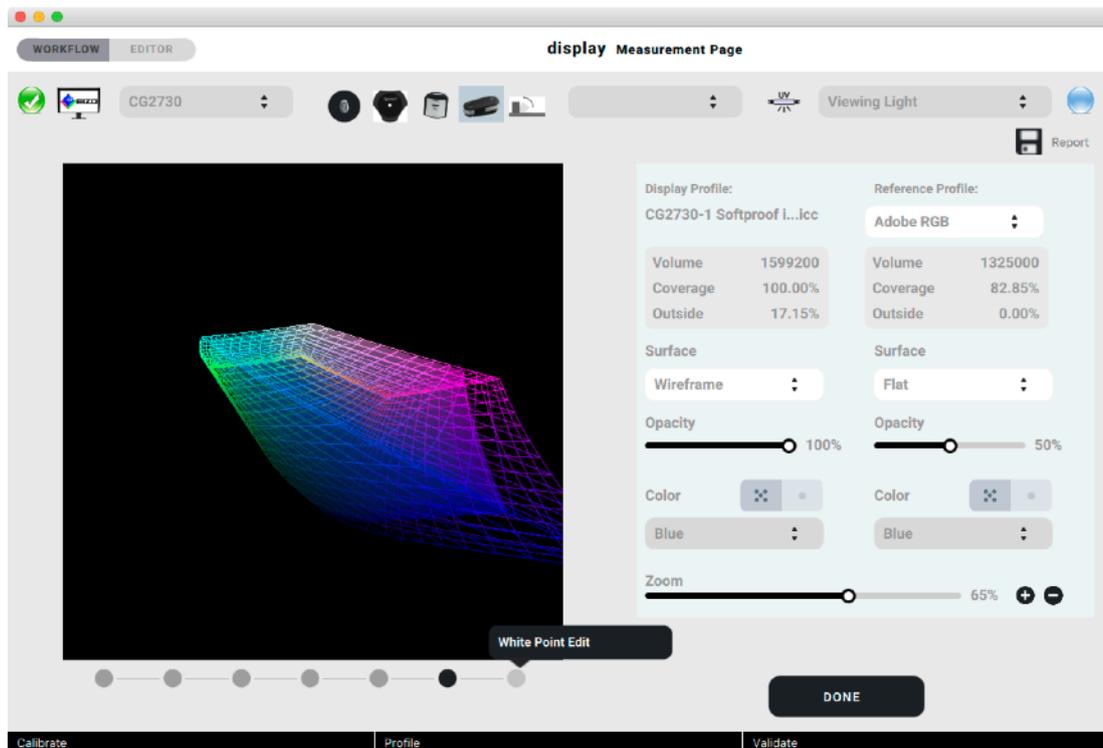
The Pro version has another bullet to the right of the 3D bullet, the White Point Edit. Clicking that will take you to this window:
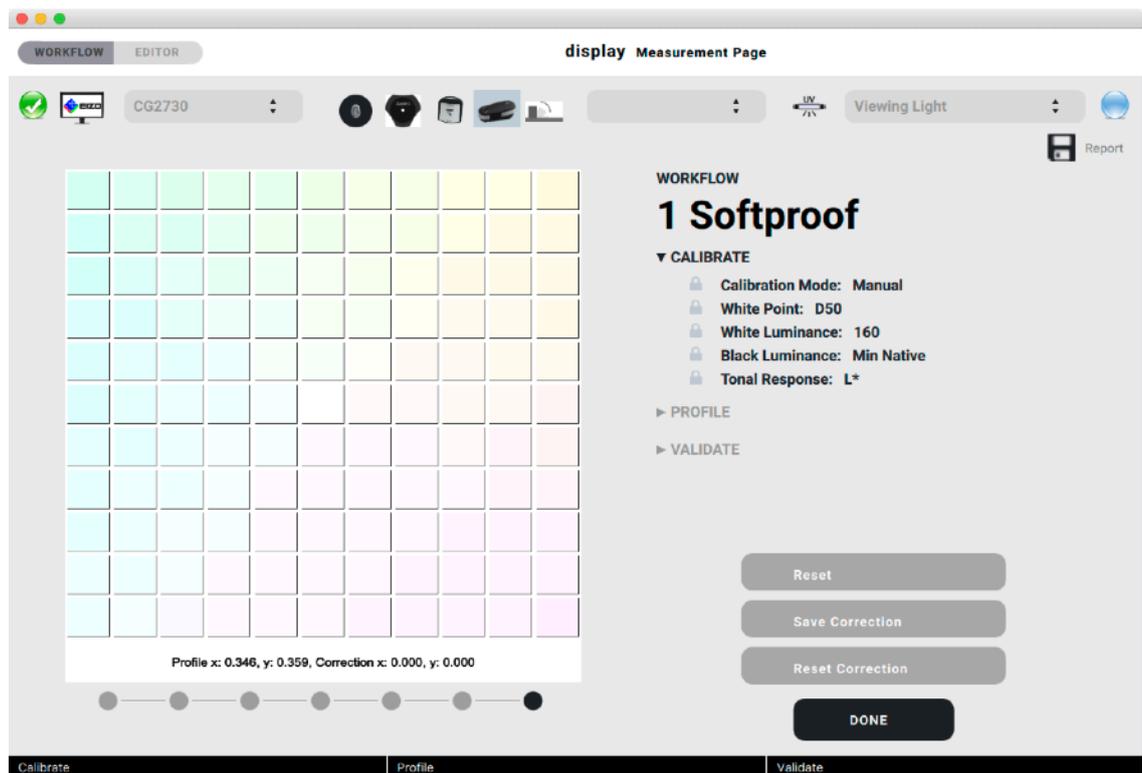

This is an xy view of the surrounding of the measured and calibrated white point. Each square represents a difference of 0.005 in x or y direction. The changes are additive, that means the center (white point) moves in the selected direction, the next click to the same square adds the respective interval.

This button will reset all corrections
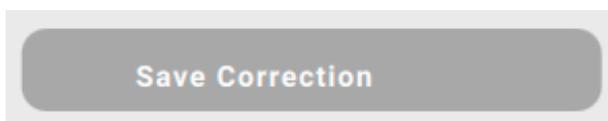
This button will save the correction to a monitor and instrument related preference.
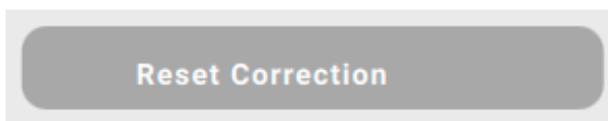
This button will remove the correction for the active instrument from the preferences.

When corrections are saved, they will be factored in with any new calibration/profiling executed on the related monitor with this instrument.

6. Sensor Correlate

basICColor display 6 Pro allows you to compare and/or correlate instruments.

This absolutely unique feature allows you to automatically create correction matrices for all your instruments, ideally based on measurements from a high-end spectro like the MYIRO-1.
Select the pre-defined WORKFLOW for Sensor Correlation. Connect as many instruments with your computer as you want to compare/correlate, then click:
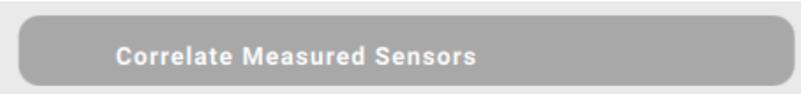

Make sure to select the reference instrument first before you click that button! Some instruments, e.g. i1 Pro and i1 Pro 2 use the same libraries and thus cannot be distinguished by our software. These need to be connected one after the other.

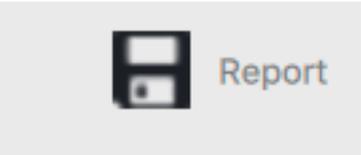Select or connect the next sensor and click this button again.

When done with all your instruments click

This will save the correction matrices monitor/instrument related so that they will be used with any consecutive measurement of this monitor with this instrument.

And don´t forget to save the Report.

BTW: A Report will be created automatically and the latest one can be found in the cache folder within the Reports folder. This one will be overwritten when you execute the same WORKFLOW again. So if you should have forgotten to save the Report after Compare or Correlate you can do so before you start over.

You will (most probably) be flabbergasted when you see the differences (BTW this is a very modest example). You can find much better correlations with higher end instruments.

You can find an extensive example of a 9-instrument-correlation on our Facebook page (accessible from our website).

Sensor Comparison and Correlation

Reference Instrument: i1Display Pro (S/N: I1-11.A-01.100848.02, White LED)

Instrument: Eizo Sensor (Eizo CG2730)

△Eoo Ø   Max.

2.12   3.41

| No.	L	a	b	x	y	Y	△E
1	100.00	0.00	0.00	0.347	0.361	175.41	
	96.31	1.39	-1.66	0.346	0.357	159.19	3.30
2	75.33	0.21	-0.11	0.347	0.361	85.62	
	72.45	1.39	-1.47	0.346	0.357	77.75	2.99
3	50.71	-0.02	0.22	0.347	0.362	33.36	
	48.32	1.19	-0.72	0.348	0.357	29.90	3.10
4	26.05	-0.06	-0.03	0.346	0.361	8.36	
	24.06	0.65	-0.29	0.348	0.358	7.23	1.81
5	1.18	0.29	-3.16	0.249	0.245	0.23	
	0.86	0.30	-2.65	0.241	0.232	0.17	0.49
6	98.14	-18.43	113.96	0.447	0.522	167.09	
	94.46	-17.03	114.86	0.450	0.523	151.47	2.28
7	63.27	119.02	-58.06	0.413	0.176	55.98	
	60.69	117.13	-58.17	0.411	0.172	50.68	2.24
8	59.90	102.87	92.53	0.681	0.312	49.13	
	57.41	100.62	98.99	0.687	0.313	44.46	3.41
9	49.44	-9.90	62.71	0.446	0.517	31.49	
	46.95	-8.57	64.51	0.453	0.519	28.04	2.66
10	29.73	67.51	-33.18	0.411	0.177	10.75	
	28.03	66.44	-33.14	0.410	0.173	9.59	1.33
11	27.62	58.26	42.04	0.672	0.311	9.32	
	25.95	57.00	42.75	0.681	0.312	8.30	1.45
12	87.64	-94.01	-18.59	0.184	0.390	125.08	
	84.39	-89.71	-20.07	0.184	0.384	113.68	2.46
13	85.56	-141.02	92.94	0.216	0.723	117.73	
	82.37	-136.73	90.99	0.217	0.725	106.98	2.19
14	43.75	-53.84	-10.65	0.185	0.390	23.97	
	41.49	-51.07	-11.28	0.185	0.385	21.35	2.30
15	42.48	-80.02	50.81	0.217	0.712	22.48	
	40.16	-77.29	50.29	0.218	0.718	19.90	2.17
16	23.42	91.97	-125.20	0.152	0.043	6.88	
	22.01	92.10	-123.97	0.151	0.041	6.17	1.08
17	7.64	49.97	-70.38	0.154	0.048	1.48	
	6.69	49.56	-69.09	0.153	0.046	1.30	0.70

Why is it important to repeat this process with each monitor you want to calibrate?

Colorimeters are prone to sensor metamerism (even spectros are to a certain extent), which in practical terms means, they would return different xyz or L*a*b* values from the exact same color on the same monitor. And different again on 2 different monitors. If you want to closely match your monitors with a colorimeter, selecting the custom corrections that come with the instrument may not be good enough.

7. Preferences

On a a Mac you find the Preferences under „basICColor display" in your menu bar, on a Windows PC you can find it under the „File" menu.
The Pro features in the lower part of the preferences pane.
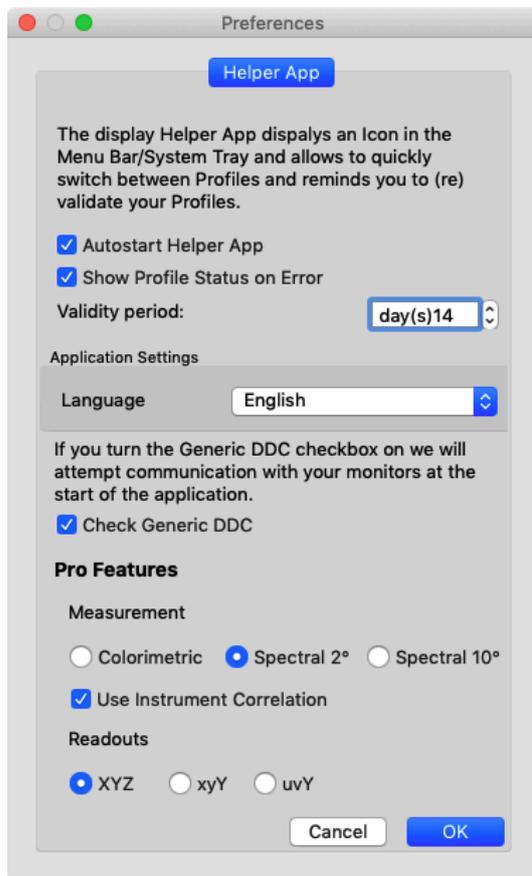
7.1 Measurement

If you use a spectro basICColor display 6 Pro will either use the colorimetric values read from the instrument or it will calculate colorimetriv values from the spectral data for either a 2° or 10° standard observer.

7.2 Use Instrument Correlation

If you have correlated instruments you can decide if you want to use the corretion matrices for a specific monitor. The corrections are stored in basICColor Jobs¬Jobs display 6¬Instruments, instrument and monitor-specific.

7.3 Readouts

You can display measurement values and color space graphics in different color models. default is XYC.