dt on macOS Profile Test

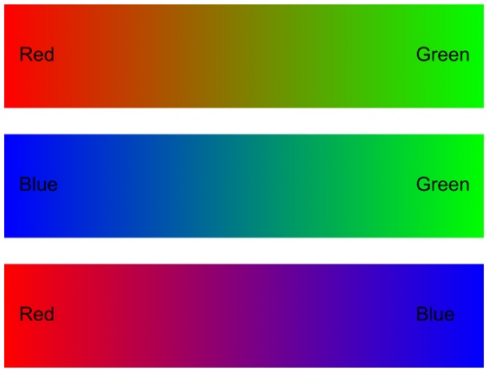
1/21/23

There are multiple forum threads between 2016 and 2022 discussing the color profile behavior of darktable-gtk-cairo on macOS, which is, to my understanding, different than Linux (Windows?) since display color management occurs at the operating system level rather than at the individual application level.

I have read though most of them but I'm not being familiar with macOS APIs, darktable, gtk-library, and cairo-library code yet, so I wanted to get preliminary idea of how the profiles behaved before looking at the code. One forum link provided a test ICC profile where the green and blue channels are swapped so it is easily observable if this profile is being use based on the large effect.

Test Image

I made a simple test image transitionRGB.tiff to help accentuate the primary channel colors swapped green and blue channels. It is a 16-bit TIFF in sRGB (sRGB IEC61966-2.1) I created using another application (AffinityPhoto2) with each primary transitioning into another as noted by text. It can be imported into darktable since it is a tiff file format.



Display

I used a MacBook with external LG display that covers most of Display-P3 space, although not important for this test.

Environment

I did the tests using darktable 4.2.0 and macOS 13.1/Ventura. No idea about other versions as I have only been using dt for a year and macOS a few more years.

Darktable installed profiles

The BGR-test in the table has B and G channels swapped, so R=R, G=B, B=G.
Downloaded from (https://github.com/haasn/cms/blob/master/bgr-test.icc).
Internal Description: Microsoft BGR Test Profile - for testing only - ICC profile is ordered RBG, embedded WCS profile will correctly render a BGR image.

~/.config/darktable/color/out/bgr-test.icc

macOS created and installed profiles

The **ProfiledLG** in the table was created for the LG display with an x-rite Color Munki and is a typical configuration, so R=R, G=G, B=B.
/Library/ColorSync/Profiles/Displays/LG UltraFine_17-11-2022.icc

Same as above for darktable just in a macOS profile folder.
~/Library/ColorSync/Profiles/bgr-test.icc

Tests

Each test image shows the macOS Preview app (generic image/doc viewer) on top with the transitionRGB.tiff loaded. Preview only uses the native macOS display ColorSync color management so shows only that contribution to the observed colors.

darktable display rendering passes through both the darktable display profile as shown in the expanded soft proof popup and then through the macOS display color management profile.

I used my iPhone photos to capture observed results and avoid any screen grab effects.

Here is a table of the tests and observed colors in each app, see display photos at bottom.

Test	macOS display Profile	observed macOS Preview colors	darktable display profile	observed darktable colors
1	ProfiledLG	correct RGB	*System display profile*	correct RGB
2	ProfiledLG	correct RGB	sRGB (web-safe)	correct RGB
3	ProfiledLG	correct RGB	BGR-test	B & G swapped
4	BGR-test	B & G swapped	sRGB (web-safe)	B & G swapped
5	BGR-test	B & G swapped	BGR-test	correct RGB (B & G swapped twice)

6	BGR-test	B & G swapped	*System display profile*	B & G swapped

Conclusions for Preview

Tests 1-6 the Preview app RGB colors were all as expected based on macOS installed profiles, Correct RGB for the ProfiledLG profile and B & G swapped for the BGR-test profile.

Conclusions for darktable

Tests 1 and 2 are a baseline test of “normal” color rendering. Both macOS Preview and darktable render RGB as expected. But see test 6 for issue.

Test 1 shows correct RGB as expected.

Test 2 shows correct RGB as expected.

Test 3 shows B & G swapped as expected, due darktable display profile.

Test 4 shows B & G swapped as expected, due macOS display profile.

Test 5 shows correct RGB as expected, due macOS + darktable display profile. So, two channel swaps cancel out as expected.

Test 6 shows B & G swapped incorrectly, due macOS display profile. If the darktable display profile programmatically copied the macOS display profile it should have looked like test 5.

Test 6 proved darktable does not programmatically inherit the native/macOS display profile when display profile = [System display profile]. If it did, the net results would be the same as Test 5, explicitly doing a double B & G swap resulting in B=b and G=G.

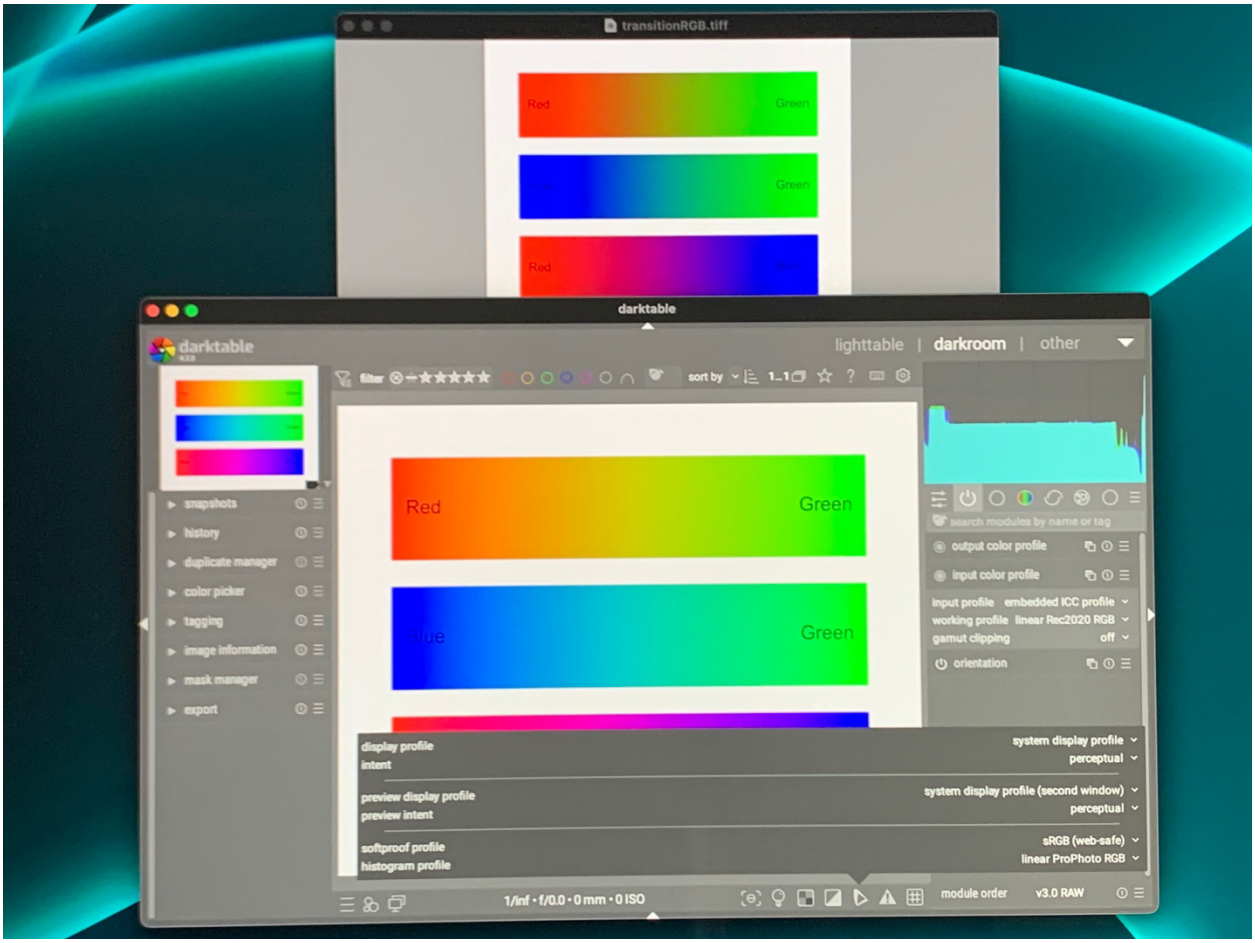
So, while display profile = [System display profile] might work correctly on other systems e.g. Linux, it does not appear to work as expected on macOS. (Windows?)

Open Questions

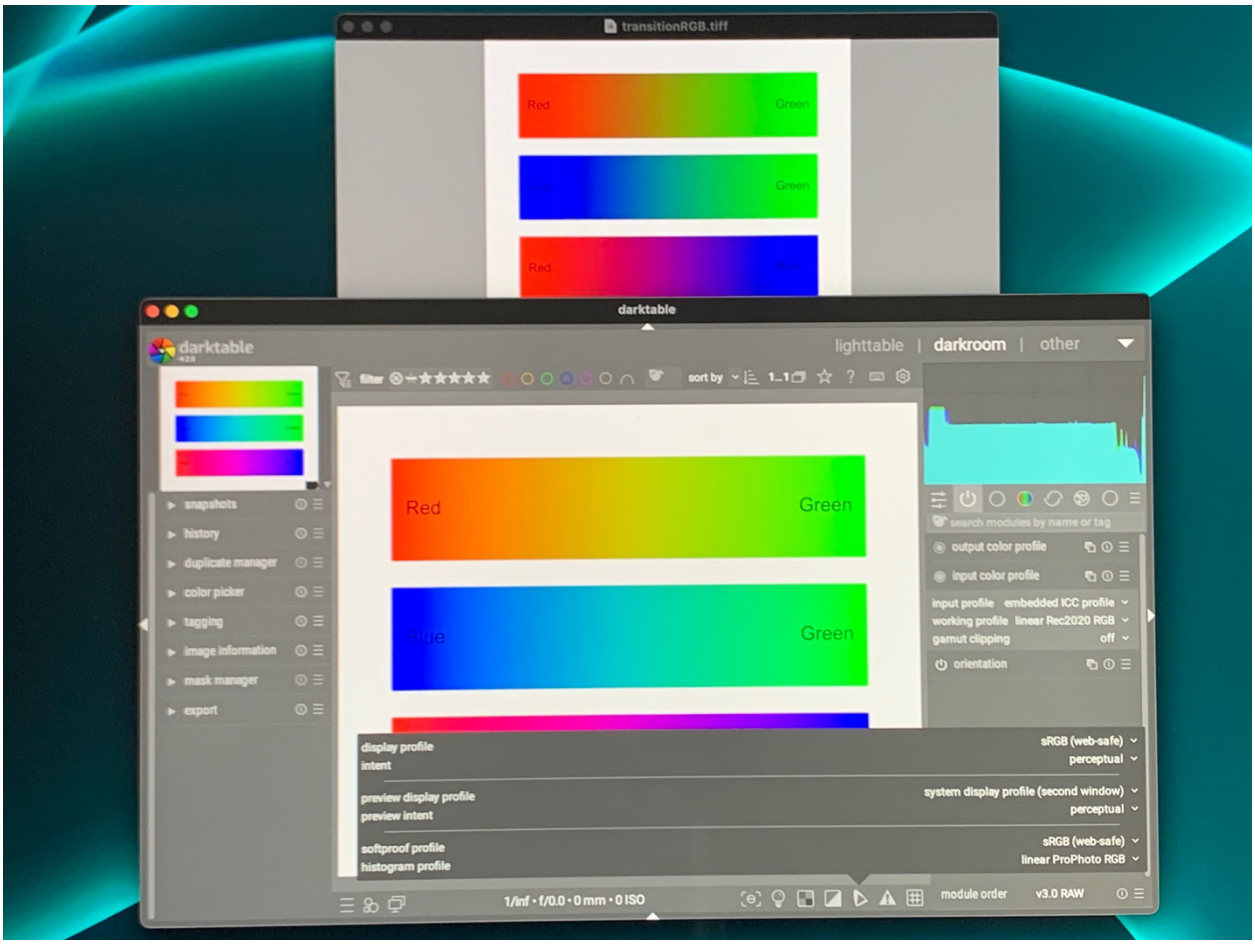
Based on forum threads there seems to be/have been some confusion/lack of clarity about how dt works with the OS level color corrected macOS, maybe some one understands it, but threads did not make it clear to me. Hoping this helps the non-coder macOS users.

Display Photos

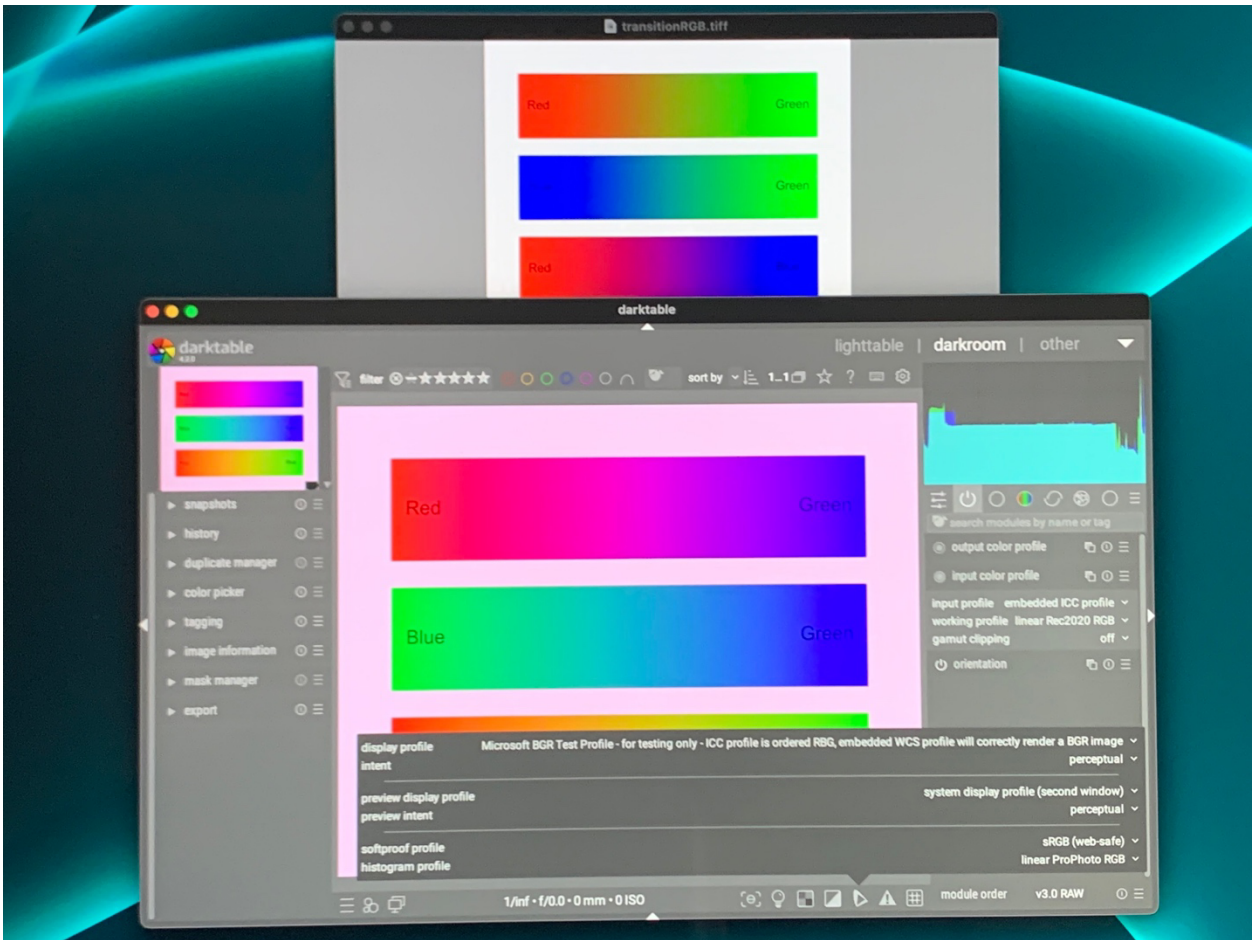
Test1


transitionRGB.tiff
Red
Green
Green
Red
darktable
lighttable | darkroom | other
filter
sort by
snapshots
history
duplicate manager
color picker
tagging
image information
mask manager
export
Red
Green
Green
search modules by name or tag
output color profile
input color profile
input profile embedded ICC profile
working profile linear Rec2020 RGB
gamut clipping off
orientation
display profile system display profile
intent perceptual
preview display profile system display profile (second window)
preview intent perceptual
softproof profile sRGB (web-safe)
histogram profile linear ProPhoto RGB
1/inf • f/0.0 • 0 mm • 0 ISO
module order
v3.0 RAW

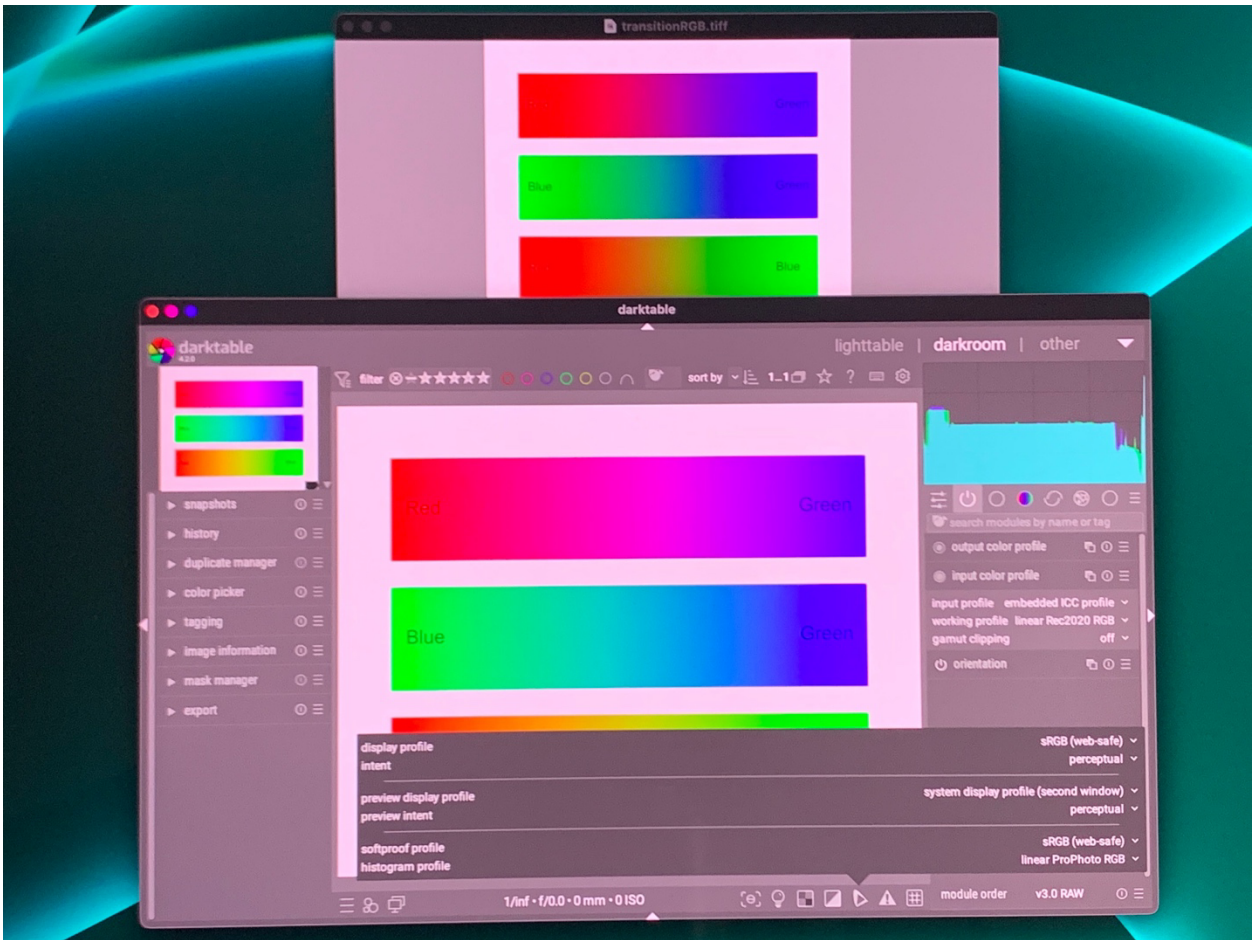
Test2


transitionRGB.tiff
Red
Green
Green
Red
darktable
darktable
lighttable | darkroom | other
filter
sort by
snapshots
history
duplicate manager
color picker
tagging
image information
mask manager
export
Red
Green
Blue
Green
search modules by name or tag
output color profile
input color profile
input profile embedded ICC profile
working profile linear Rec2020 RGB
gamut clipping off
orientation
display profile sRGB (web-safe)
intent perceptual
preview display profile system display profile (second window)
preview intent perceptual
softproof profile sRGB (web-safe)
histogram profile linear ProPhoto RGB
1/inf • f/0.0 • 0 mm • 0 ISO
module order
v3.0 RAW

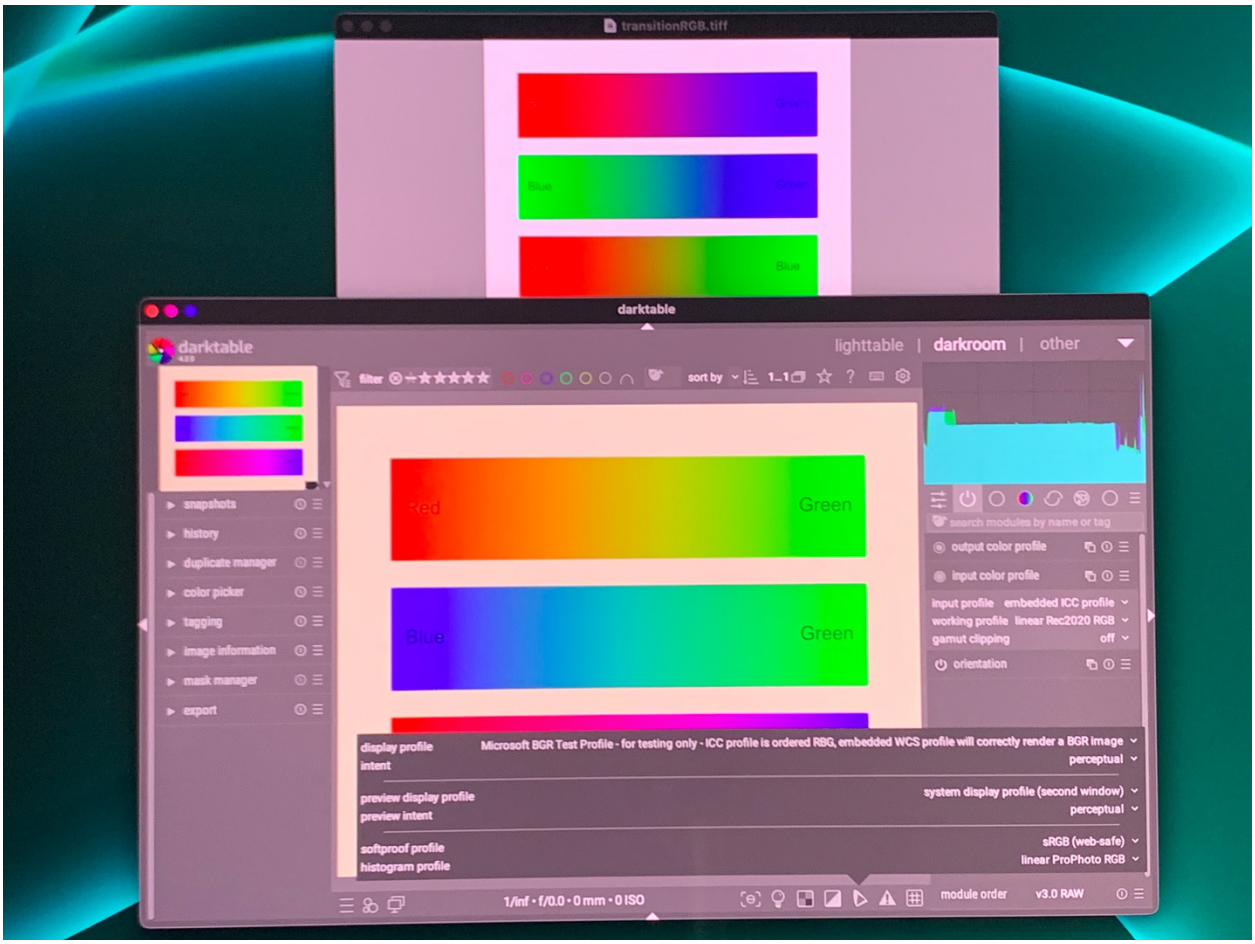
Test3


transitionRGB.tiff
Red
Green
Green
Red
darktable
darktable
lighttable | darkroom | other
filter
sort by
snapshots
history
duplicate manager
color picker
tagging
image information
mask manager
export
Red
Green
Blue
Green
output color profile
input color profile
input profile embedded ICC profile
working profile linear Rec2020 RGB
gamut clipping off
orientation
display profile Microsoft BGR Test Profile - for testing only - ICC profile is ordered RBG, embedded WCS profile will correctly render a BGR image
intent perceptual
preview display profile system display profile (second window)
preview intent perceptual
softproof profile sRGB (web-safe)
histogram profile linear ProPhoto RGB
1/inf • f/0.0 • 0 mm • 0 ISO
module order
v3.0 RAW

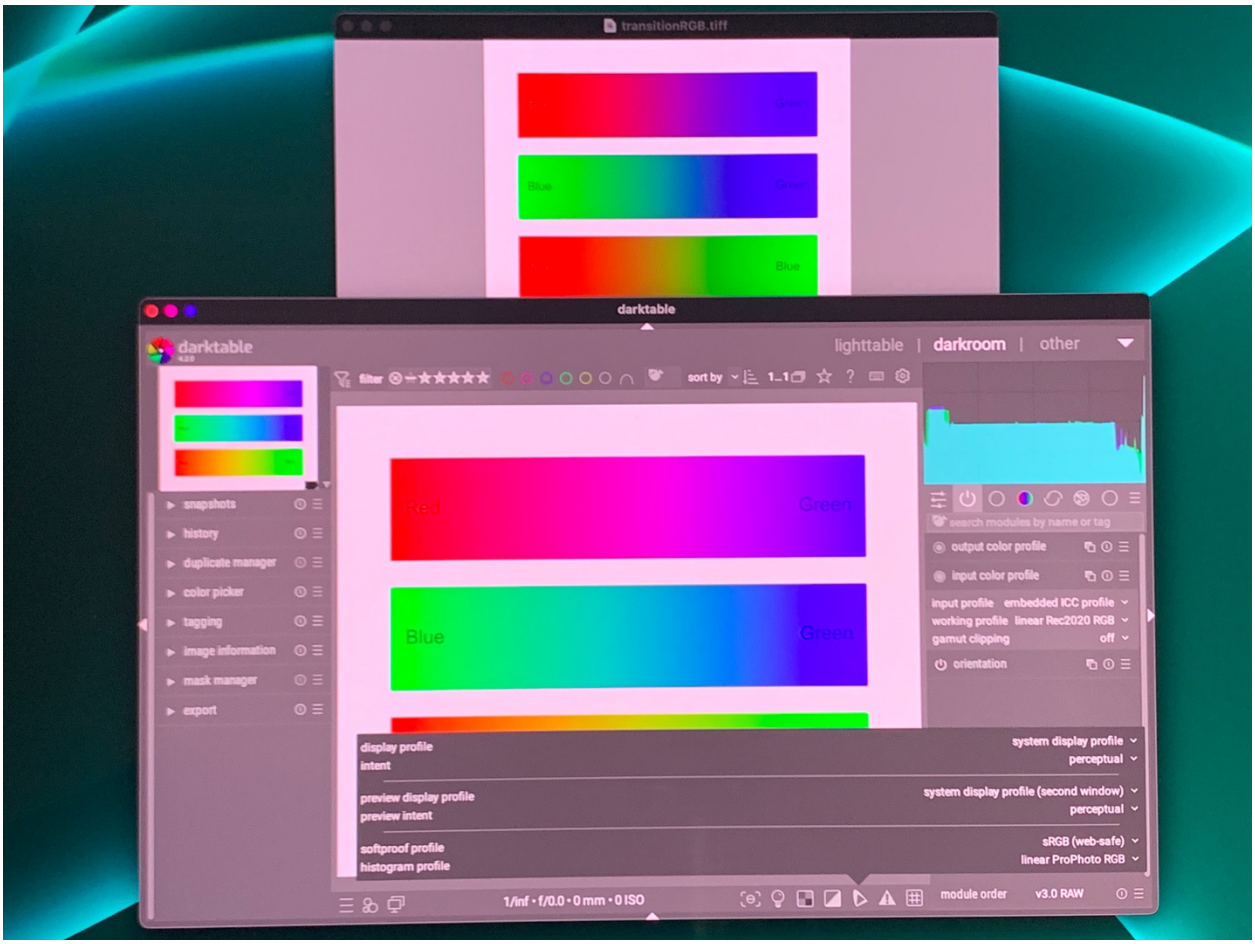
Test4


transitionRGB.tiff
darktable
lighttable | darkroom | other
snapshots
history
duplicate manager
color picker
tagging
image information
mask manager
export
Red
Green
Blue
Green
output color profile
input color profile
input profile embedded ICC profile
working profile linear Rec2020 RGB
gamut clipping off
orientation
display profile sRGB (web-safe)
intent perceptual
preview display profile system display profile (second window)
preview intent perceptual
softproof profile sRGB (web-safe)
histogram profile linear ProPhoto RGB
1/inf • f/0.0 • 0 mm • 0 ISO
module order
v3.0 RAW

Test5


transitionRGB.tiff
darktable
lighttable | darkroom | other
Red
Green
Blue
Green
snapshots
history
duplicate manager
color picker
tagging
image information
mask manager
export
output color profile
input color profile
input profile embedded ICC profile
working profile linear Rec2020 RGB
gamut clipping off
orientation
display profile Microsoft BGR Test Profile - for testing only - ICC profile is ordered RBG, embedded WCS profile will correctly render a BGR image
intent perceptual
preview display profile system display profile (second window)
preview intent perceptual
softproof profile sRGB (web-safe)
histogram profile linear ProPhoto RGB
1/inf • f/0.0 • 0 mm • 0 ISO
module order
v3.0 RAW

Test6


transitionRGB.tiff
darktable
lighttable | darkroom | other
snapshots
history
duplicate manager
color picker
tagging
image information
mask manager
export
Red
Green
Blue
Green
output color profile
input color profile
input profile embedded ICC profile
working profile linear Rec2020 RGB
gamut clipping off
orientation
display profile system display profile
intent perceptual
preview display profile system display profile (second window)
preview intent perceptual
softproof profile sRGB (web-safe)
histogram profile linear ProPhoto RGB
1/inf • f/0.0 • 0 mm • 0 ISO
module order v3.0 RAW

END