BAPCo MobileMark® 25 Brightness Profiler User Guide

Revision 1.1   Final release

Introduction

Starting with MobileMark 25, BAPCo introduced an innovative Brightness Profiler solution to aid users in meeting the screen brightness requirement. This program is unique and a first of its kind for laptop battery benchmarks. Details are provided in the following sections covering its features, the color science considered and program usage. Finally, an appendix section is available with guidelines to operation of various luminance meters.

Features

BAPCo Brightness Profiler program integrates a number of features, such as:

- Integration into MobileMark 25 benchmark testflow.
- Results are saved and presented in FDR report.
- Improve user interface with on-screen instructions.
- Built-in warm-up timer.
- Built-in 4x3 checkerboard test pattern.
- Build-in display brightness slider.
- Calculation of target display luminance based on Perceptual Contrast Length (PCL), providing a perception-based method to quantify display performance across different display technologies.

PCL - Color Science

As display technologies advances, a fair comparison of various display technologies has progressed beyond a simple comparison of peak luminance alone. What a typical person perceives on screen depends on brightness, which is related to the peak luminance, as well as the contrast with the black level. Thus, a true measurement of display quality must account for those additional attributes.

When brightness is computed for the white and black levels of the display, the separation between these levels yields a Perceptual Contrast Length (PCL) value, defined in SEMI D 75-0118[1]. Subsequently, PCL is based on CIECAM02[2], a well-known and proven model of the human vision system that tells us how much brightness a human perceived rather than only how much light a display can produce. Together, they provide a scalable method to objectively quantify the luminance and contrast across different display technologies.

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[1] Semiconductor Equipment and Materials Institute (SEMI). SEMI D75-0118. Test method for color reproduction and perceptual contrast of display. SEMI; 2018.
[2] Commission on Illumination (CIE) Technical Committee 8-01. CIE 159:2004. A color appearance model for color management systems: CIECAM02. CIE; 2004. Available from: www.cie.co.at

Usage

Follow the on-screen prompt at each major section of the Brightness Profiler program:

- Screen warm-up
- Panel dark luminance
- Panel target white luminance

The program is launched via the MobileMark25 Verification dialog (Figure 1) after starting the benchmark.

Figure 1 Launching Brightness Profiler

Screen Warm-up

This first section of the program shows a system up-time counter. Depending on the screen technology, the display needs to be power-on for certain time until the luminance is stabilized. This is especially true for CFL-backlight, but to a lesser extend for LCD- or LED-backlights. For OLED display, warm-up time are not required.

Panel Dark Luminance

In this section, the luminance of the black is recorded. Typically, this value is queried from the display, as specialized equipment and dark environment are required to measure at the lowest luminance level. This is especially the case for OLED displays, where typical equipment cannot reliable read deep black at 0.0005 cd/m^2. An alternative option is provided for advance users to manually measured, if required.

Panel Target White Luminance

In this last section (Figure 2), the targeted luminance is shown in the top portion of the screen. Position the probe at the target overlay position. Once the probe is in position, press 'F1 ' to toggle the overlay guides. Next, adjust the slider at the bottom until the screen has reach the targeted luminance. Click "Finish" when complete. If the screen cannot achieve the target luminance, it shall be noted as such during result submission.
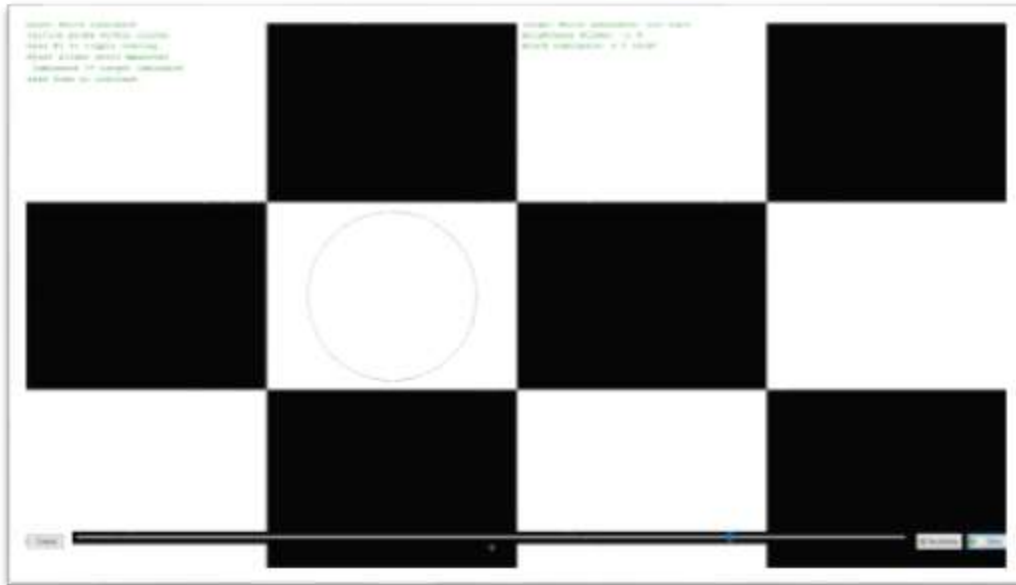

Figure 2 Target Luminance - Test Pattern

Appendix A – Equipment Procedure Guidelines

This section provides informative guidelines on using various luminance measurement equipment and their related software. Aside from the equipment listed here, other luminance meters and test equipment may be compatible. Note that BAPCo does not endorse a specific vendor solution. Please contact the respective equipment vendor for further questions and support.

X-Rite - i1Display Plus / i1Profiler

Luminance can be measured using X-Rite's i1Display Plus colorimeter along with the i1Profiler software using the following procedure:

1. Follow vendor instructions to install i1Profile and connect the i1Display Plus. Recommend using a separate PC other than the laptop being tested.
2. Start i1Profiler, select "Advanced", then "Display" → "Profiling" (Figure 3).
3. Under "Luminance", select "Measure" (Figure 4).
4. Select "paper in booth" (Figure 5)
5. Follow instruction from i1Profiler to adjust the cover for the probe, and position over the measurement target on the test laptop, remember to press 'F1' to remove the target overlay.
6. Click on the "Measure" button and record the measured luminance (Figure 6). Adjust the slider in the Brightness Profiler program until the luminance reach the target specified.
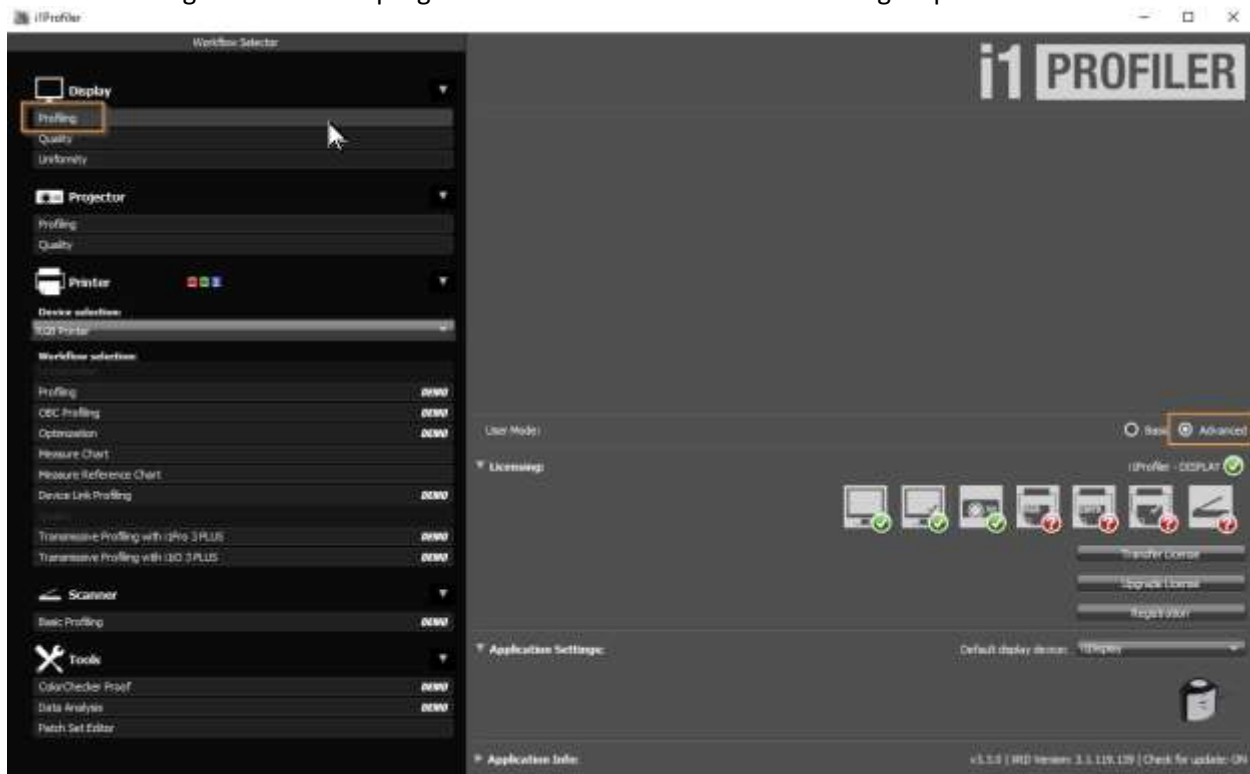

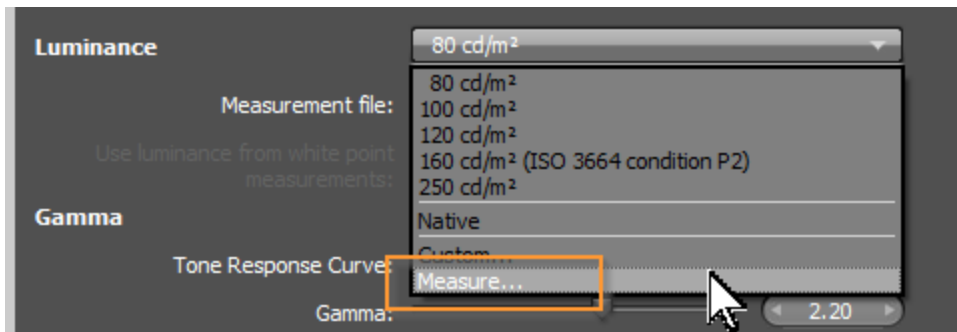*Figure 3* i1Profiler Advance Settings
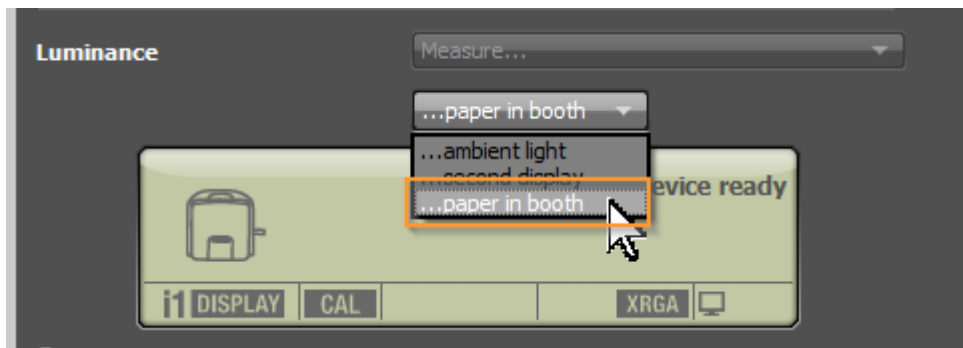
Figure 4 Luminance -> Measure
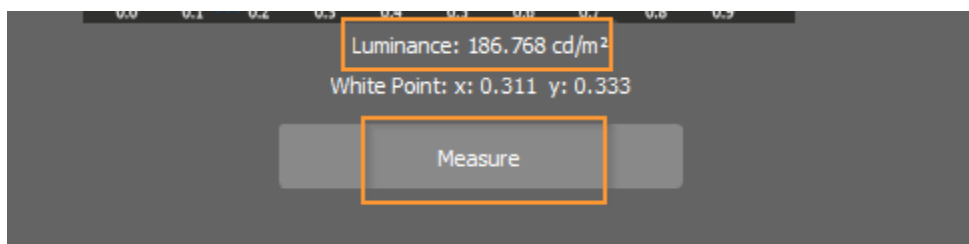

Figure 5 Select "paper in booth" option

Figure 6 Position probe and click Measure

Konica Minolta - CA-410 / CA-S40

Luminance can be measured using CA-410 color analyzer along with the CA-S40 software. Note that a variety of probes are available depending on the performance required.

1. Follow vendor instructions to install the software and connect the probe. Recommend using a separate PC other than the laptop being tested.
2. Start CA-S40, cover the lens of probe, select "Color" Tab, "LV, x, y" mode and click on "0-CAL" (Figure 7).
3. Remove the lens cover and position probe over the measurement target on the test laptop, remember to press 'F1' to remove the target overlay.
4. Click on the "Measure" button and record the measured luminance (Figure 8). Adjust the slider in the Brightness Profiler program until the luminance reach the target specified.
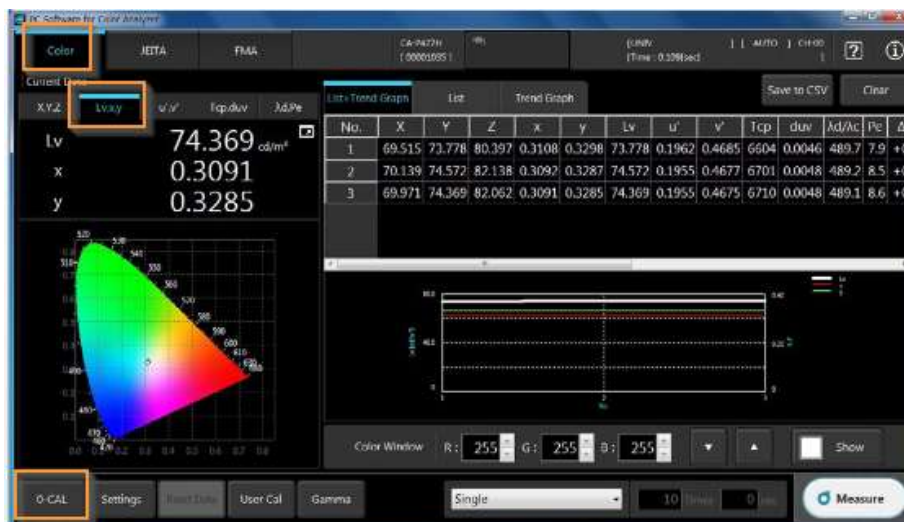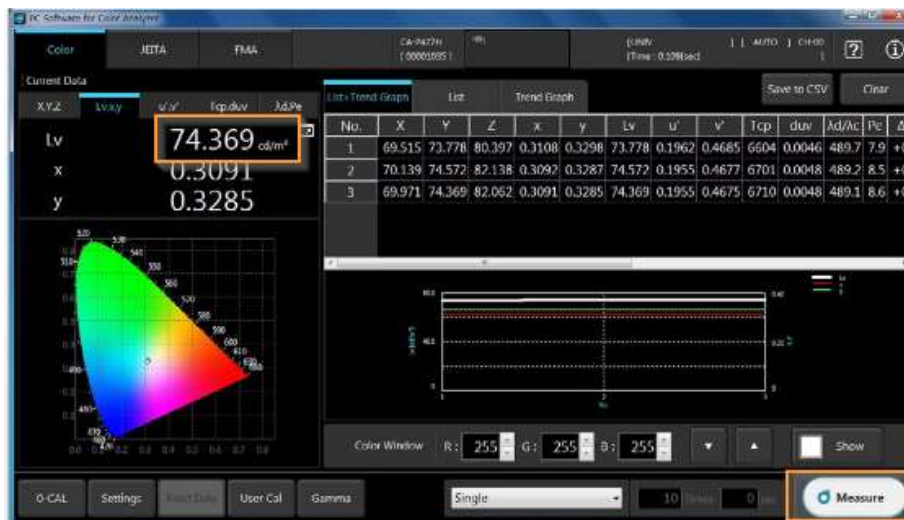

Figure 7 Zero-calibration

Figure 8 Measurement