Flicker is an artifact observed in digital imaging where a region of an imaged scene appears to rapidly fluctuate in brightness, even though the light source appears constant when viewed directly by a human observer.

In collaboration with IEEE/P2020 standardization committee, DXOMARK has developed a measurement setup, software, and metrics for evaluating the sensitivity of a camera to flicker.

The proposed DXOMARK measurement process and shooting procedure is fully automatic, thus saving time and ensuring repeatability.

Key features

- **Automated workflow for capturing and analyzing flicker for a wide range of frequencies, duty cycle and luminance in only one video.**
- **Automatic detection of chart and frequencies during video analysis**
- **Supports wide-angle cameras and highly distorted images**
- **Fully compliant with IEEE/P2020 standard for automotive camera image quality**
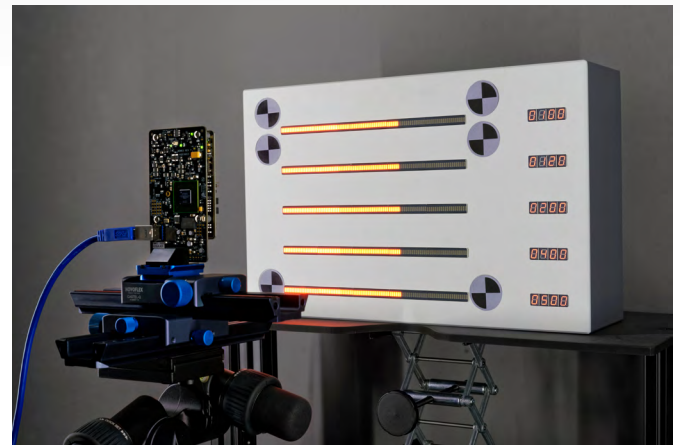
AUTOMOTIVE APPLICATION
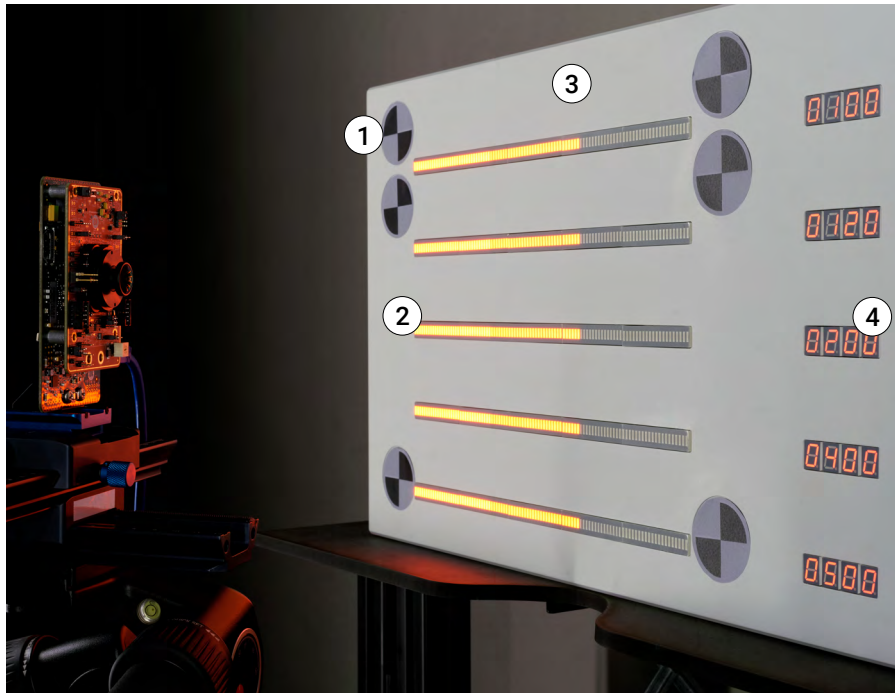

Measurement automation

Flicker mitigation evaluation requires testing many flicker scenarios (frequencies, duty cycles, and phases) under several different lighting conditions.

ANALYZER's flicker solution automates both capture and measurement.

- **Captures tests conducted under a large number of conditions in one video.**
- **Analyzes the entire video automatically in one click.**

With the rise of camera usage for ADAS and the increasing number of LED-based lights in the automotive industry, flicker mitigation is becoming crucial.
ANALYZER's flicker measurement setup can evaluate and quantify the effectiveness of flicker mitigation.

![ANALYZER by DXOMARK logo]

LED Universal Timer mkII in flicker mode

① Markers for automatic detection during processing, ② Adjustable flicker led illuminance from 350 to 7000cd/m², ③ Adjustable background luminance using Kinoflo Celeb250 lights, ④ Led flicker frequency from 50 to 2000 Hz, with adjustable duty cycle and phases from 0 to 100%
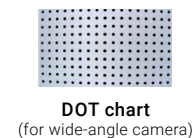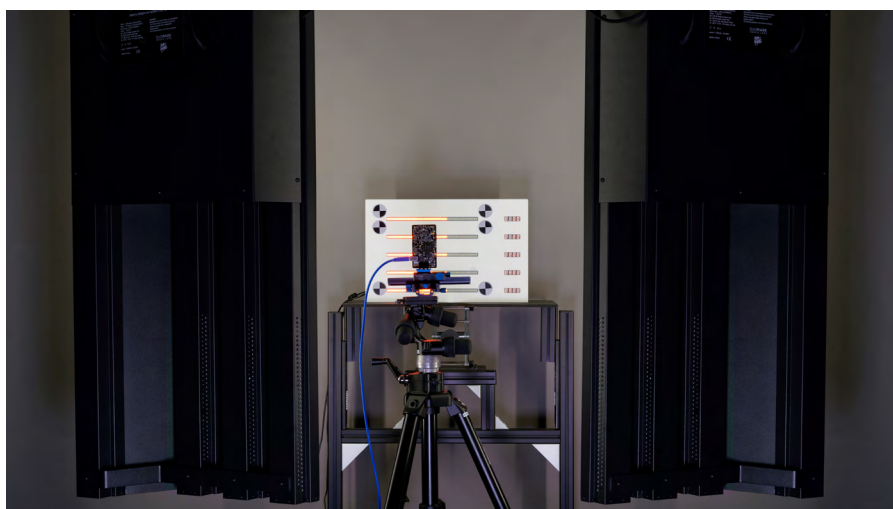
Required equipment

LED Universal Timer mkII

Recommended equipment

FRAMING & ACCESSOIRES

Gossen Luxmeter - Mavolux 5032B

Tripod

Lighting: 2 Kinoflo Celeb 250

White background

DOT chart
(for wide-angle camera)

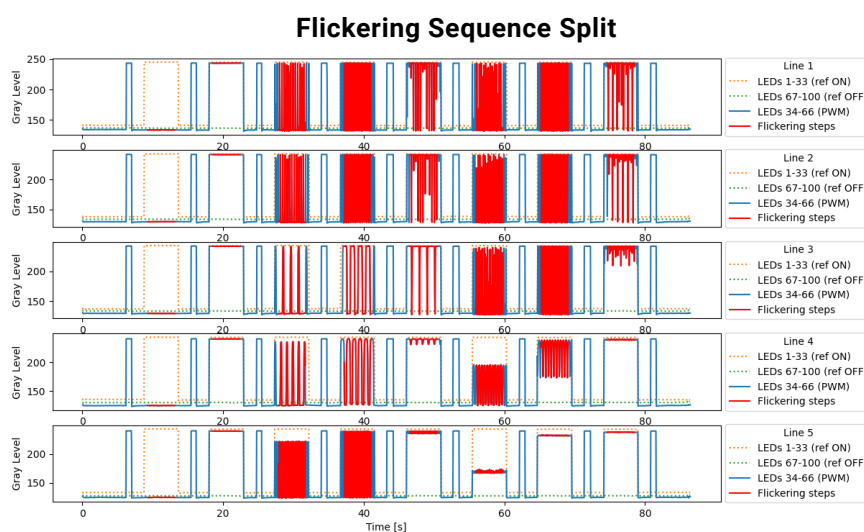## LED Flicker measurement setup

Both the LED Universal Timer mkII and lighting are controlled by the same software, letting you create multiple scenarios.

Timer control software
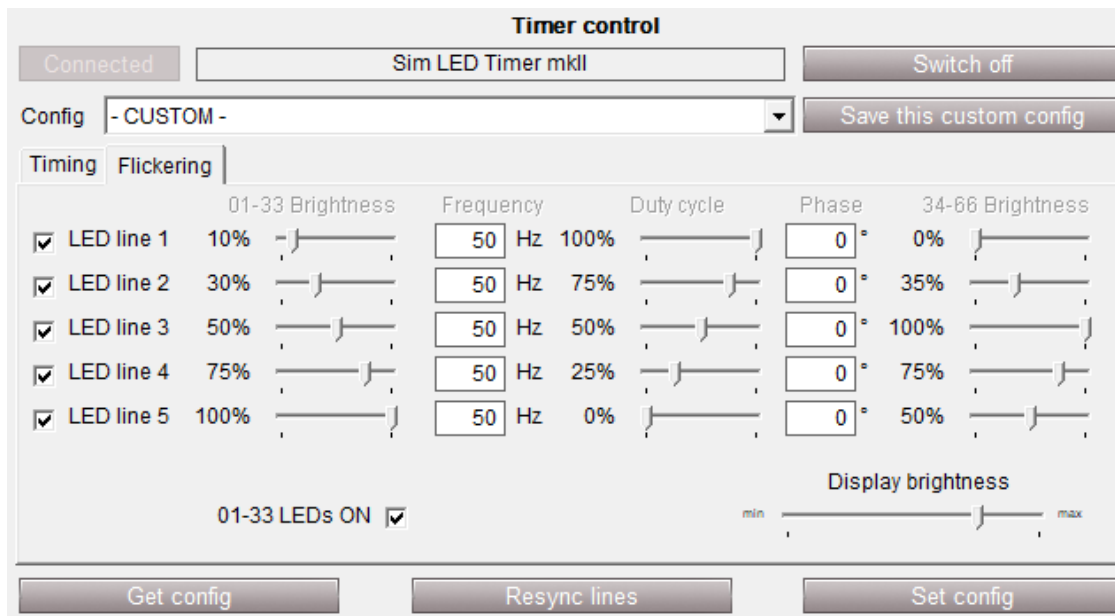
Timer control software, included in ANALYZER software suite, lets you easily set the LED **duty cycle**, **repetition rate** and **luminance**.
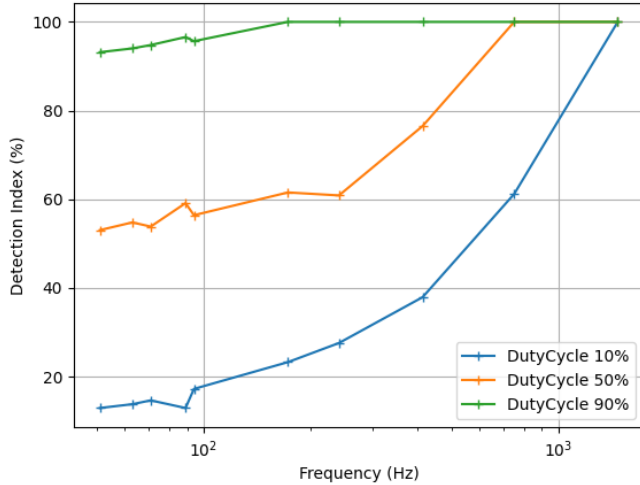
Python scripts

Flickering Sequence Split

With the Flicker evaluation module, DXOMARK provides a Python script template to let you easily program both your **flicker scenario sequences** and the **environmental lighting** conditions. An operator can launch as many scenarios as needed five by five in a row. The measurement software can automatically detect and discriminate between each scenario and provide the final metrics listed above.
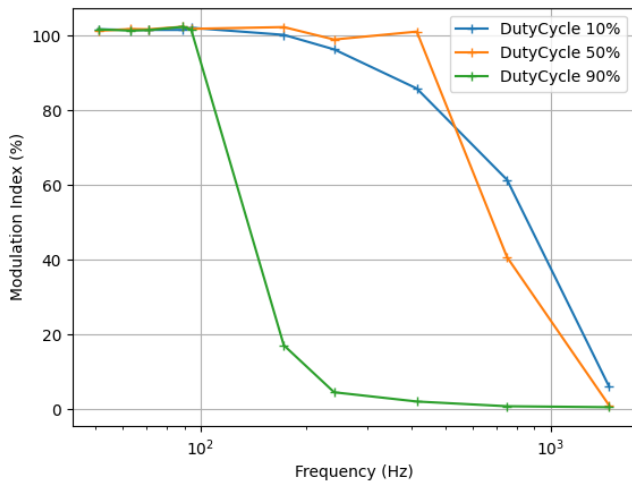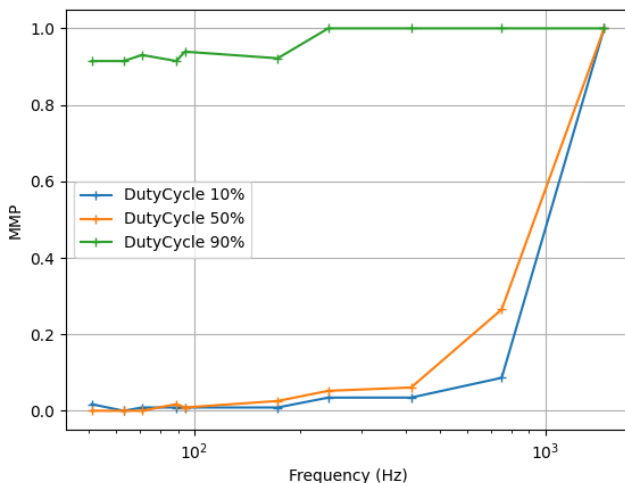
Detection Index

The Detection Index is the probability of detecting the object affected by the flicker. 0% means that the object will never be detected and is displayed as an off light. 50% means that the object can be seen half the time on, half the time off.

Modulation Index

The Modulation Index is an indicator of the amplitude of signal variation over time. 100% means that the object's intensity will change from fully off to fully on over time.

Mitigation Modulation Probability

The Mitigation Modulation Probability (MMP) is the probability that the signal is close to the expected value.

FLICKER MEASUREMENT ACCURACY

KPI	Precision, in % of KPI dynamic
Detection Index	0.5%
Modulation Index	10%
MMP	1%

Compatibility with wide-angle cameras and highly distorted images

ANALYZER's automatic flicker measurement is compatible with wide-angle cameras and can handle highly distorted images, ensuring good accuracy for any field of view up to 170°.

Specifications

CAMERA TESTING

Min resolution: VGA (noise / exposure / white balance) or 1 Mpix with distortion < 4% (texture)

Max resolution: up to 50Mpix

FOV: up to 160°, provided there is an area of at least 1 Mpix with distortion < 4% in the image

Focal length: down to 12 mm (in 35 mm format)

Spectral sensitivity: measurements have been designed for visible spectrum cameras

File formats:

Images: .jpeg, .bmp, .png, .tif, and many RAW formats (latest release notes provides a list of supported RAW formats)

Videos: Windows Media Foundation (WMF) and DirectShow are used to open video files. Available video formats depend on the operating system and the DirectShow codecs installed.

A list of available video codecs in WMF is available here.

PLATFORM REQUIREMENTS

PC-type computer with the following minimum configuration:

Intel Pentium IV ® processor or higher
Windows 10 operating system
2 GB of RAM or more
At least 30 GB of free disk space to operate the software
A video card with 3D driver, compatible with DirectX 9c
1024 x 768 or more
At least two USB port

It is possible to run Analyzer on a virtual computer, such as a Mac platform, for instance, or to control it remotely. Depending on the selected remote OS, Analyzer may not generate certain graphics.

LABORATORY REQUIREMENTS

Laboratory minimum size: 3 x 3m
Temperature: 23°C ± 2°C (ISO 554:1976)
Humidity: 50% ± 20% (ISO 554:1976)

REFERENCES

IEEE / P2020 home page:
https://standards.ieee.org/project/2020.html