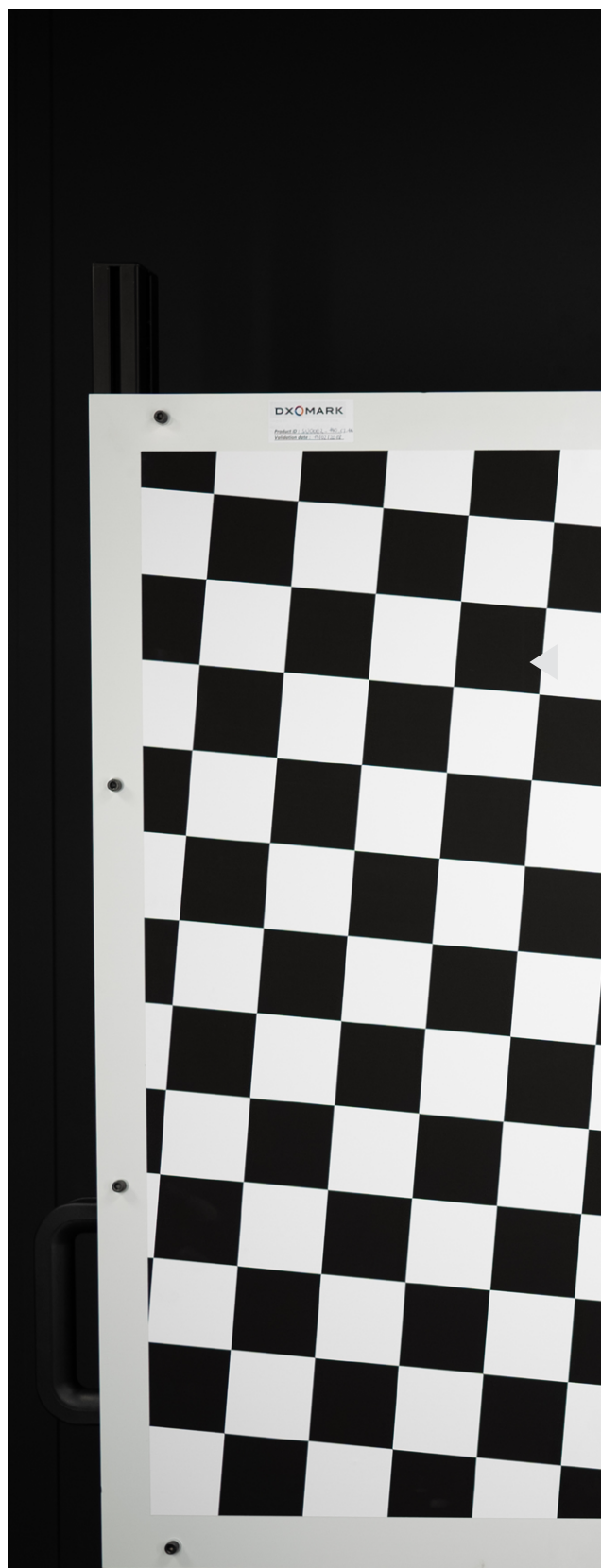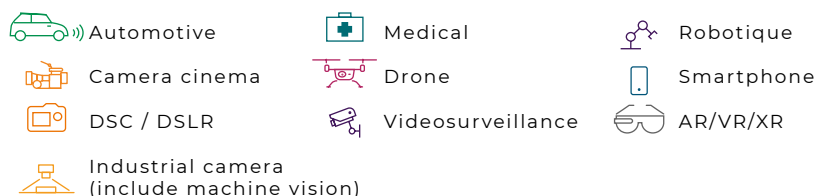# AN‖‖LYZER

Catalog 2024

by DX⦾MARK

1.Introduction

DXOMARK Analyzer is the most comprehensive and scientifically rigorous image quality benchmarking solution available on the market. Its extensive testing capabilities make it the most trusted choice for camera equipment manufacturers and industry experts. Thanks to our participation in international standard organizations and to our collaboration with renowned academic partners, in addition to our own user preference studies, DXOMARK is in a unique position to have deep insights into the impact of new imaging technologies on the user experience.

The DXOMARK Analyzer solution is constantly enriched with new measurement protocols. Our calibrated hardware ensures consistent and accurate results, and our software automates the testing process, minimizing user errors and ensuring repeatability. With DXOMARK Analyzer, you can challenge your device's capabilities through realistic use cases in a fast, precise, repeatable and fully automated fashion.

As the core of DXOMARK's consulting services, benchmarking, and web publications for the last fifteen years, DXOMARK Analyzer has been honed to work with huge volumes of tests and to exploit lab resources in the most efficient way to guarantee the highest possible throughput.

One of the unique strengths of the DXOMARK Analyzer solution is its versatility and its range of applications. From DSLRs to drones, from smartphones to automotive cameras, from medical equipment to surveillance systems, our experts and our customers have tested thousands of different imaging systems over the years using DXOMARK Analyzer's extensive array of measurement protocols.

By helping leading image processing actors to continuously challenge and optimize the quality of their products, DXOMARK Analyzer has been on the cutting edge of advancements in digital photography for the last two decades.
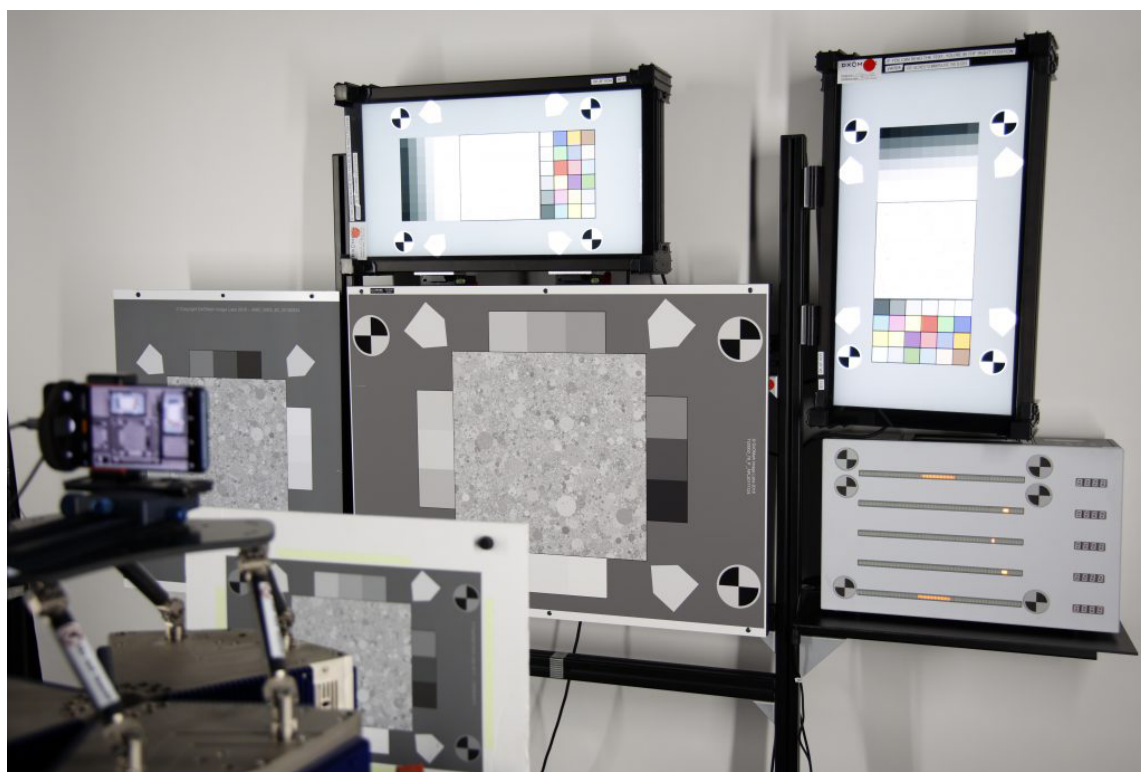
CONTENTS

🚗 Automotive   ➕ Medical   Robotique

Camera cinema   Drone   Smartphone

DSC / DSLR   Videosurveillance   AR/VR/XR

Industrial camera
(include machine vision)

2.Setups & solutions

2.1. HDR Autofocus motion & timing

Analyzer lets you characterize your camera's autofocus effectiveness with the greatest depth and precision. Using this setup, your device's autofocus capability can be challenged by HDR lighting, shaking, and background moving objects. This module includes such essential hardware as moving objects, dead leaves charts, and LED timer box, along with software for performing a suite of timing and autofocus performance tests for digital cameras. You can analyze autofocus performance (sharpness, speed, repeatability), electronic rolling shutter (ERS), exposure time, vertical blanking, frame rate, missing frames, and both positive and negative time lags such as shooting time lag and shutter release time lag. Further, you use can perform multiple measurements using the same

image or video, along with HDR measurements using the composite chart slide on light panels with a Kino Flo lighting system.
In addition, our software can compute objective metrics for motion blur evaluation using the background moving chart. All the laboratory instruments can be computer contolled to automate the following condition changes : lighting conditions, objects movement speed, HDR slides light levels, LedTimer configuration, etc.
You can perform all of these evaluations in various simulated conditions, such as handheld shooting, using our stabilization platforms.
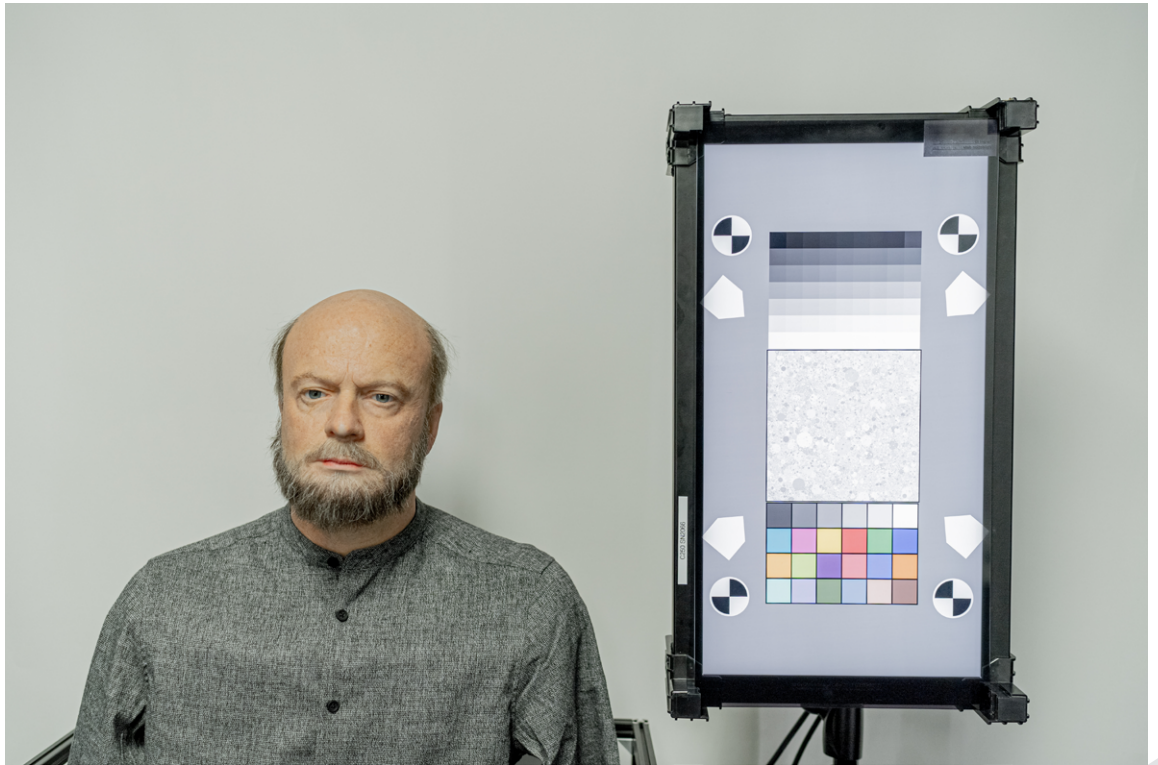
Key metrics:
· Autofocus speed
· Motion blur and equivalent exposure time
· Autofocus accuracy
· Autofocus repeatability
· Repeatability
· Visual noise
· Texture preservation
· Electronic rolling shutter characterization

· Frame rate
· Missing frames
· Vertical blanking
· Exposure time
· Shutter release
· Shooting time lags
· HDR Photo Exposure

2.2. HDR Portrait

The HDR Portrait setup simulates a real use case of a person close to a window, This setup provides repeatable and controlled conditions for testing portrait quality in HDR. It includes:

Materials:
· Realistic mannequin : REALMAN_001
· Composite chart : CT002
· Lighting system : Gemini 2x1
· Software comparison tool

Composite Chart for verification:
· Evaluates color reproduction and noise management
· Validates contrast and texture preservation against an objective reference
· Compares the final capture d'image with the smartphone screen preview

Accessories and lighting:
· Stabilization Platform H860
· Automated Moving Object
· Multispectral Lighting System
· Stabilization Platform H860 (HEXAPOD_H860)
· Automated Moving Object (AMO_004R)
· Multispectral Lighting System (MLS_001 & MLS_ SUNIR_001)
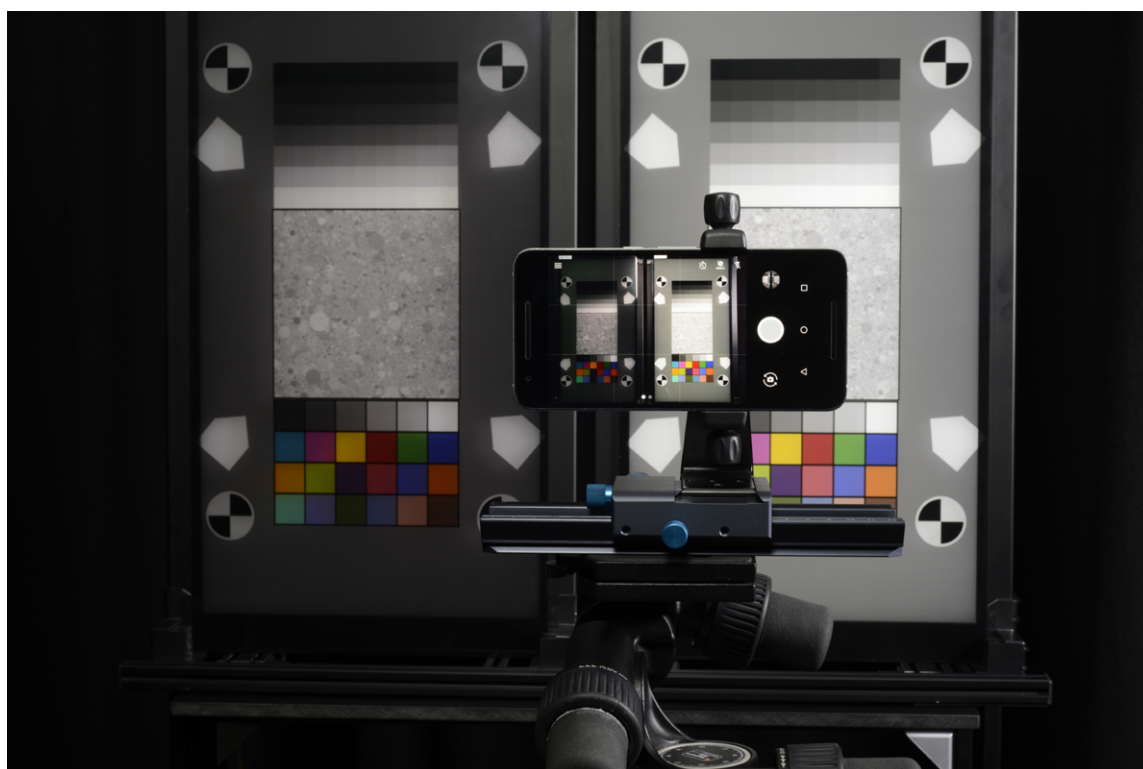
Key metrics:
· Entropy to evaluate the clipping in hight tones.
· Contrast preservation (Local Contrast Indicator)
· Exposure of the face
· AI-based facial detail preservation (beard and eyes)

2.3. HDR tone mapping

This setup is composed of two Litepanels Gemini 2x1 Soft with their Composite charts. The Composite chart contains three main patterns — grayscale, 24-color matrix, and dead leaves.

The setup lets you verify your camera's ability to consistently reproduce colors, manage noise, and preserve contrast and texture in comparison with an objective reference. Using recommended lighting, you can simulate a dynamic range of up to 15 EV in the test scene.

Key metrics:
· Tone mapping
· Dynamic and tonal range
· Signal-to-noise ratio
· Artifact analysis: texture loss, moiré, aliasing, color shift

Texture preservation:
· Texture MTF and acutance
· Edge MTF and acutance
· Visual noise at 50%
· Exposure (gray level at 18%)

Contrast preservation:
· Histogram
· Entropy for each channel
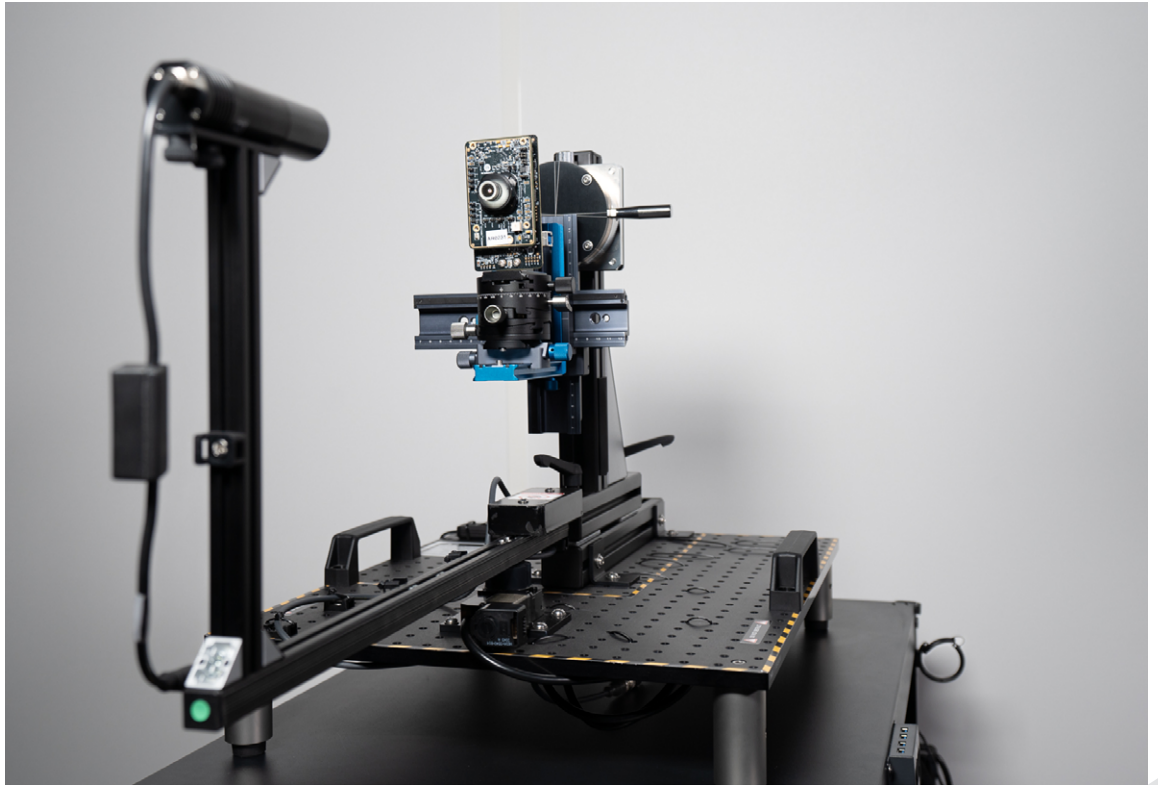
Color consistency:
· Color fidelity
· White balance
· Metrics: ΔL, Δa, Δb, Δab, ΔE, ΔC, ΔH

Equipment and lighting:
· Composite Chart CT002
· Lighting system: Gemini_2x1

2.4. MTF at infinity and flare evaluation Bench

The Flare Bench : is a measurement setup that can generate sun-like flare images in a lab setup. The compact, automated, and easy to move table-top setup incorporates a bright light source, close in apparent size and color temperature to the sun. Analyzer measures flare attenuation by processing RAW images taken by the device under test. With a motorized rotation capacity of the source from -130° to +130° and a manual rotation capacity of the camera from 0° to 360° on two axes, you can measure flare from all possible angles with a precision of up to 2 arcmin.

Collimated Flare Sources:
· Visible >10klux (Flare_Source_001)
· NIR 940 nm >40 W/m2 (Flare_IR94_001)
· NIR 850 nm >20 W/m2 (Flare_IR85_001)

Collimators:
· MTF collimator f50 mm (COL50_001)
· MTF collimator f100 mm (COL100_001)

The MTF collimator : a versatile piece of equipment, the MTF collimator is designed to be compatible with a wide range of cameras and lenses. Equipped with our collimator, the COMPASS bench can be used to measure MTF at infinity.

With a motorized rotation capacity of the source from -160° to +160° and a manual rotation capacity of the camera from 0° to 360° on two axes, this add-on allows you to perform measurements over the entire field of view, with a precision up to 2 arcmin.

2.5. Flickering mitigation & timing
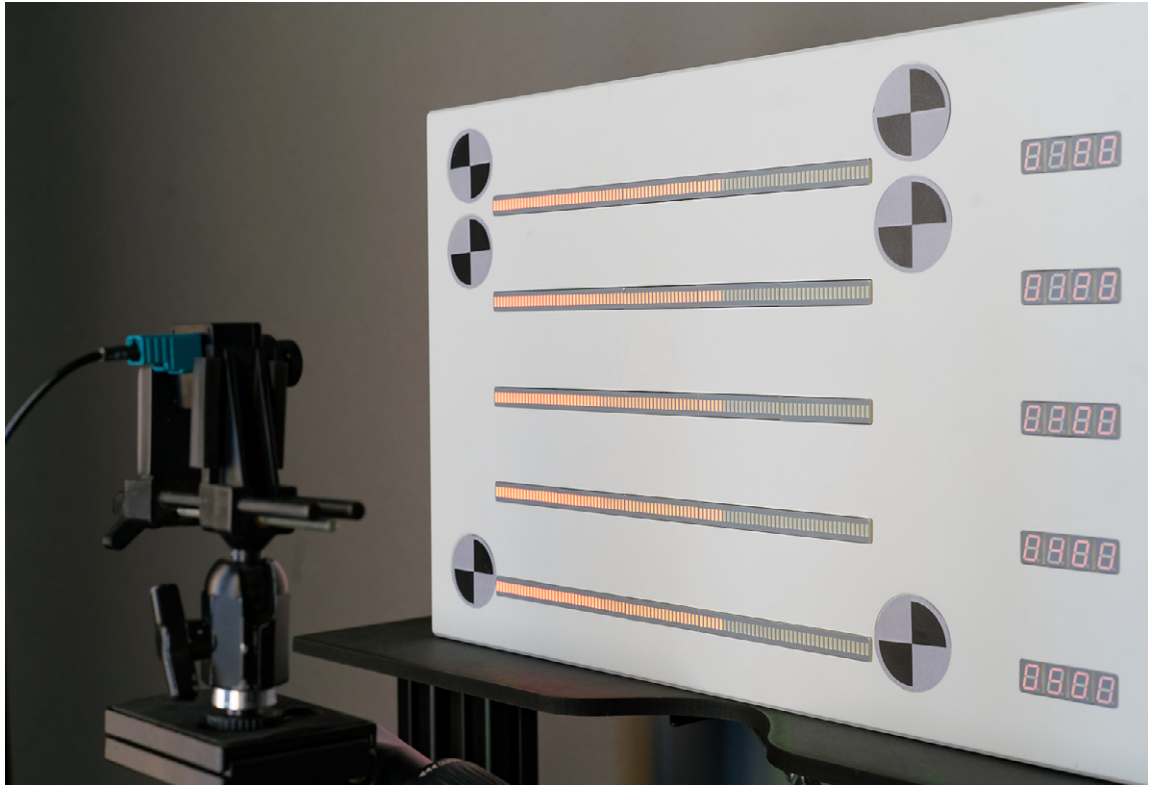
Handling flicker is a serious challenge that camera manufacturers face. This challenge is even more crucial for the automotive camera industry, where flickering can lead to severe consequences. The Analyzer Flicker module is a test setup ideal for performing flicker measurements based on upcoming IEEE / P2020 standards. The module contains the LED Universal Timer Mark II, which has software support and updated hardware for 5 rows of LED lights that can be programmed to perform 5 tests simultaneously, allowing for automation and improved efficiency. Tests measure camera sensitivity to LED flicker, which is essential to automotive cameras that need to accurately ascertain and compensate for flickering. The software suite provided with this setup offers a unique and proven efficient workflow for flickering evaluation. the software allows to test a high number of flickering conditions, including frequency, duty cycle, light intensity, and phase within a short amount of time.

Key metrics:
· Pulse Detection Index
· Pulse Contrast
· MMP (modulation mitigation probability)

Key features:
· Comprehensive and intuitive
· Standard: IEEE-P2020

Link to accessories and lighting:
· Multispectral Lighting System (MLS_001 & MLS_SUNIR_001)
· LED Universal Timer (LED_TIMER_FL01)

2.6. 170dB Dynamic range

The image sensor sector is booming, especially in new markets such as autonomous cars. Such applications require increased performance — for example, handling very high dynamic range. However, obtaining repeatable and rigorous measurements of these new capabilities is very complex.

We at DXOMARK follow these improvements by participating on scientific committees such as IEEE and ISO. In close collaboration with the industry and with the IEEE P2020 committee, we have developed a dynamic range measurement setup that can measure 150 dB or higher in one frame, thus meeting the requirement of the standard.

Our setup consists of 4 light panels whose intensity and spectrum can be controlled separately. High-quality test patterns complement the light panels and allow for high-precision measurements.

The brightest panel can reach 1.5 million cd/m², saturating all sensors currently on the market.

Key metrics:
· Observed & real relative luminance
· Contrast-to-noise ratio (CNR)
· Tonal contrast gain (TCG)
· Contrast dynamic range (CDR)

General specifications:
· Size: 1200 x 1200 x 800 mm
· Power supply: 100–240 V, 50–60Hz
· Total maximum power: 1800 W
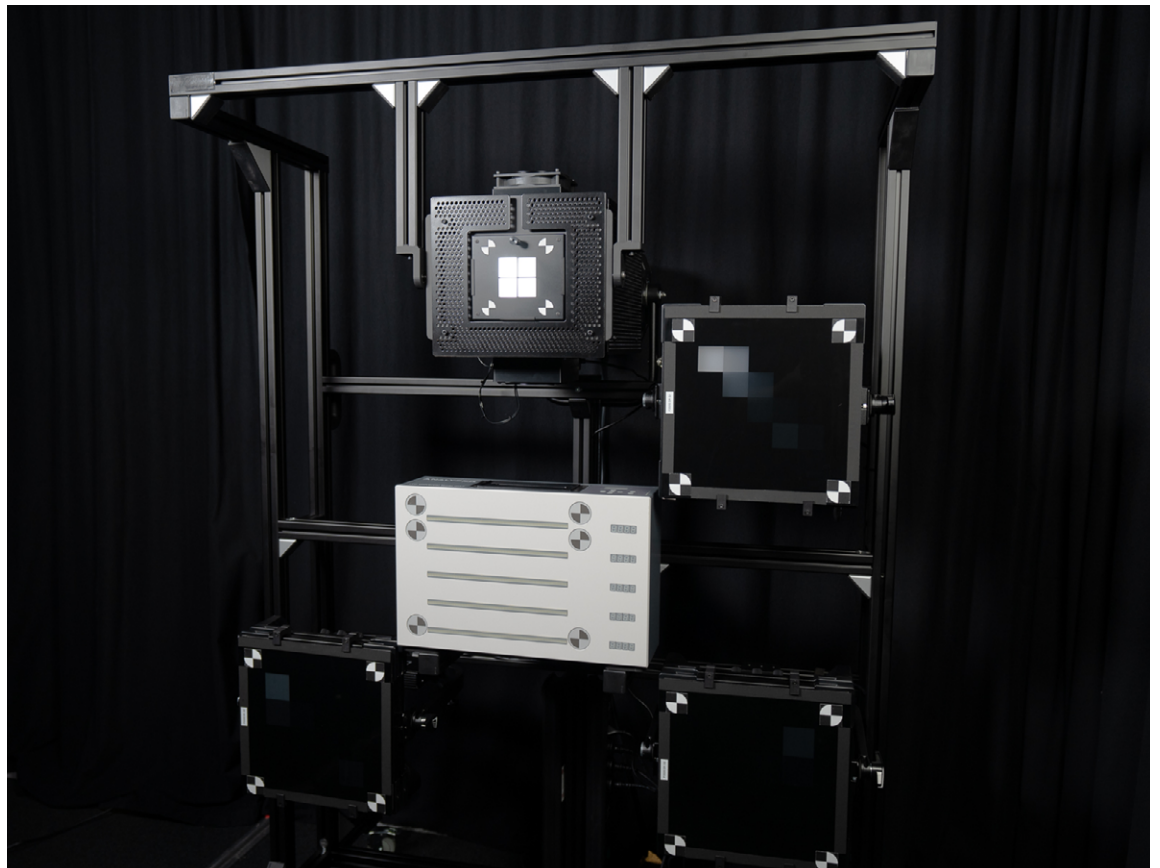
Technical specifications:
· 4 separated light panels
· Dynamic range: 0.002 to 1 500 000 cd/m2
· Max luminance: adjustable between 40 000 cd/m2 and 1 500 000 cd/m2
· CCT: 5600 K
· CRI>95

Key features:
· Up to 177 dB
· Flicker-free (DC-driven)
· Computer control (DMX or Arnet)
· Full automatic measurements
· Support for RAW images up to 32 bits/pixels

Reference: AHDR150_001

2.7. Camera hardware evaluation

Selecting the right components plays an important role in the ultimate performance of a camera module. DXOMARK RAW is a new standard for camera modules that can help component makers design better parts and can help phone and other imaging device manufacturers select better modules for their products. The test protocol is based on objective measurements of sensor, lens, and module sensitivity on RAW data. This new addition to the Analyzer testing suite contains a dedicated testing setup and RAW scripts that generate an overall score for module performance, as well as a detailed report containing test data for various attributes of image quality.

ISO standards ensure good communication between OEMs and suppliers. Until now, however, no report has gathered objective metrics and reflected the entire hardware performance with one single scalar metric. The new DXOMARK RAW standard allows a comprehensive comparison of camera modules, is based on hardware specifications (focal length of optics, sensor size, etc.) and on objective measurements (distortion, luminance, color shading, etc.).The better the imaging hardware, the better the final processed image and the less effort needed for ISP. Tradeoffs between IQ attributes define the limits of the ISP — for example, noise versus detail.

DXOMARK provides the lab tools, the software, and the protocol automation to allow you to automatically compute the DXOMARK RAW score and generate a full and comprehensive report. We can also provide a wide range of services such as benchmarks, full test reports, and training sessions. DXOMARK RAW provides a single-score system for camera hardware evaluation based on RAW images.

Key metrics:
· Color depth
· Dynamic range
· Low-light ISO
· Aperture
· SNR10
· Distortion
· Lateral chromatic aberration
· Vignetting
· Color lens shading
· Best sharpness
· Sharpness in the field
· Flare

2.8. Stereovision camera

Analyzer's Dual Camera & 3D module help you calibrate the intrinsic and extrinsic parameters for a variety of setups that use an array of imagers or a pair of cameras to provide a 3D view of the world or a depth map for advanced gesture-based user interfaces.
Our 3D Bench integrated solution includes essential hardware and software for analyzing stereoscopic devices and camera arrays. Thanks to the very accurate glass chart associated with a mechanical setup for controlling camera movement, you can perform all these measurements and achieve high-precision results with just two shots of the target, thus allowing you to calibrate the intrinsic and extrinsic parameters quickly and easily.

Key metrics:
· Camera pose
· Distortion curves
· Focal points & focal lengths

Link to accessories and lighting:
· Stabilization Platform H860 – 6-axis hexapod with controller (HEXAPOD_H860)
· Multispectral Lighting System (MLS_001 & MLS_SUNIR_001)

Measurement descriptions:
Intrinsic calibration
Intrinsic calibration measures the geometrical distortion of the lens, but it also delivers the accuracy of the distortion profile. Several distortion models can be computed:
· OpenCV 5 parameters
· Open CV 12 parameters
· Internal polynomial 14 degree XY
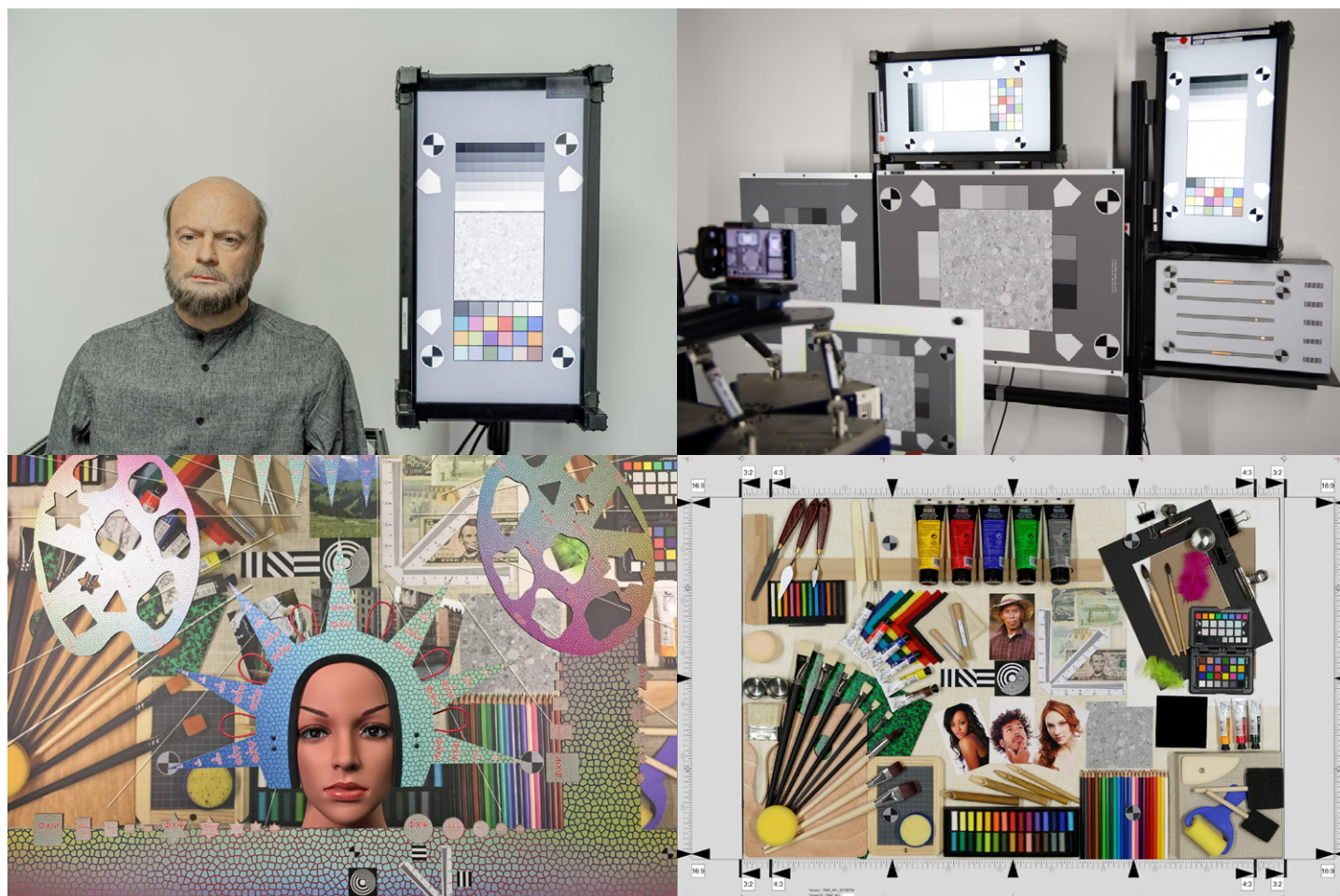**Extrinsic calibration**
The relative position and orientation of the two cameras are computed with very high accuracy using a minimal number of shoots. The result is a set of parameters compatible with the OpenCV stereovision model.

References:
· DU0002_120
· 3D_CAM_BENCH
· 3D_CAM_BENCH_ACC

2.9. DXOMARK camera V5 setups

Our Analyzer solution allows you to reproduce all our lab tests in your own laboratory. Further, we offer a unique solution of protocol automation that allows you to automatically reproduce the totality of the shots and obtain all the measurements as stipulated in our Camera v5 protocol. Our software suite automatically detects areas of interest on charts and setups, and then processes all objective and AI-based measurements. To optimize measurement repeatability, we calibrate and test each chart and every piece of equipment before shipping them from our facilities in Paris.
The necessary tools for perceptual analysis, such as our famous DXOMARK chart, are also available and we can provide training in perceptual evaluation to help you perform your own assessments. As for testing using natural scenes, we can help you create your own shooting plan accompanied by image quality metrics in line with our protocol.

Starter kit
- Analyze basic image quality attributes based on objective and perceptual measurements.

HDR Portrait
- Analyze portrait rendering performance in various HDR conditions.

HDR Autofocus, Motion & Timing
- Analyze combined autofocus, timing, HDR, and motion blur performance in a single setup.

Bokeh setup
- Analyze bokeh rendering in a repeatable and consistent way.

Reference: BOKEH_001

2.10. Bokeh setup

Evaluating the quality of a device's computational bokeh requires a lab setup that ensures accuracy and repeatability in your testing procedure. Our

Bokeh setup contains a movable foreground apparatus mounted on a rail that you can adjust according to a device's FOV. You can use this setup to perceptually assess background and foreground blur, sharpness, artifacts, and detail preservation.
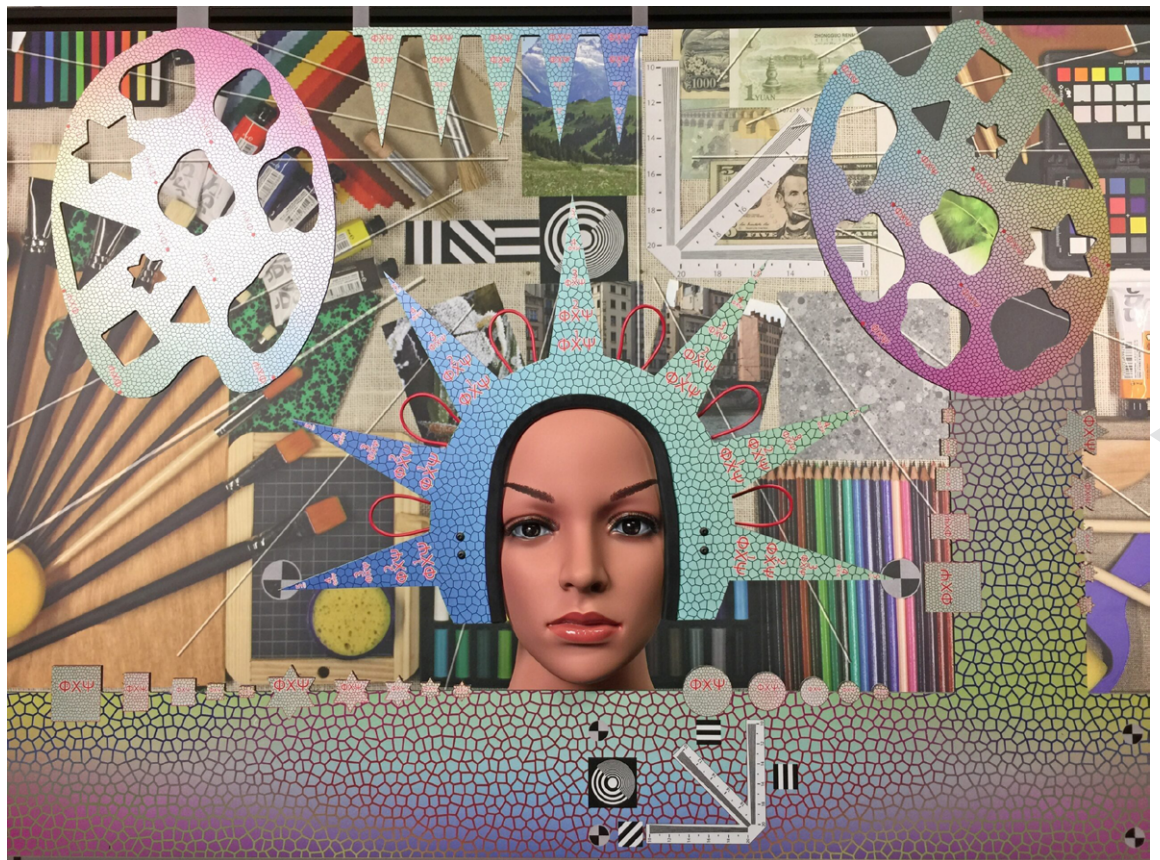
Elements:
· Background
· Head
· Easel
· Chart
· Lights

Dimensions:
· 2700 x 4000 mm
· 490 x 385 x 200 mm
· 1600 x 1050 x 520 mm
· 1050 x 630 mm
· 310 x 80 x 80 mm

Materials:
· Printed fabric, aluminum
· Dibond, plastic, rubber, aluminum
· Aluminum, laminated Resin impregnated
· Dibond
· Plastic case, 2 LED lights

3.Analysis software

tyMeasure_20210525_132354.mp4.azv - Ana ✕   2023 155445_VideoColorFidelityMeasure_20210525_132354.mp4.azv - Ana ✕

| s | Summary | Details per patch | Temporal tab |
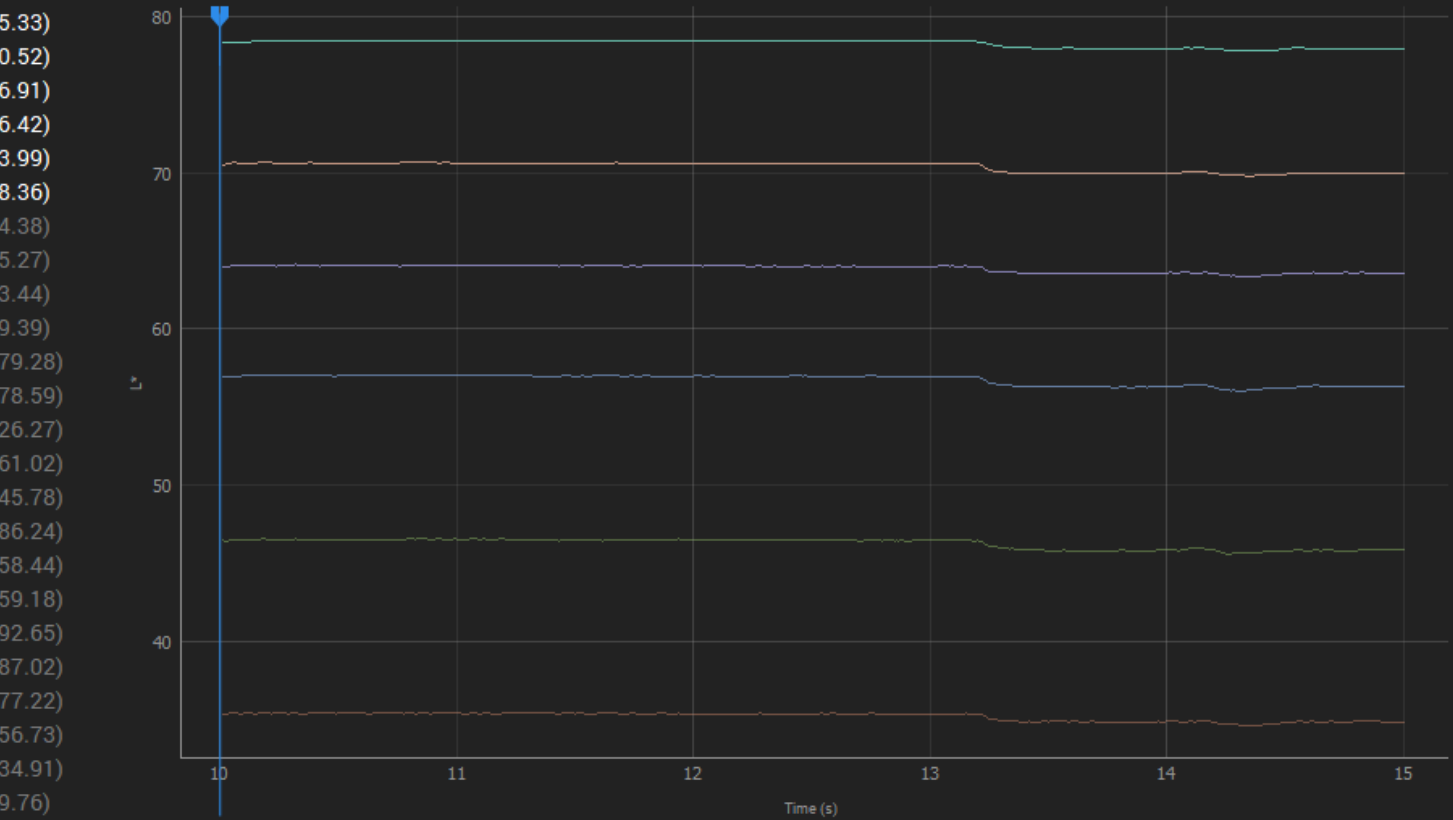
3.1. Analyzer software GUI
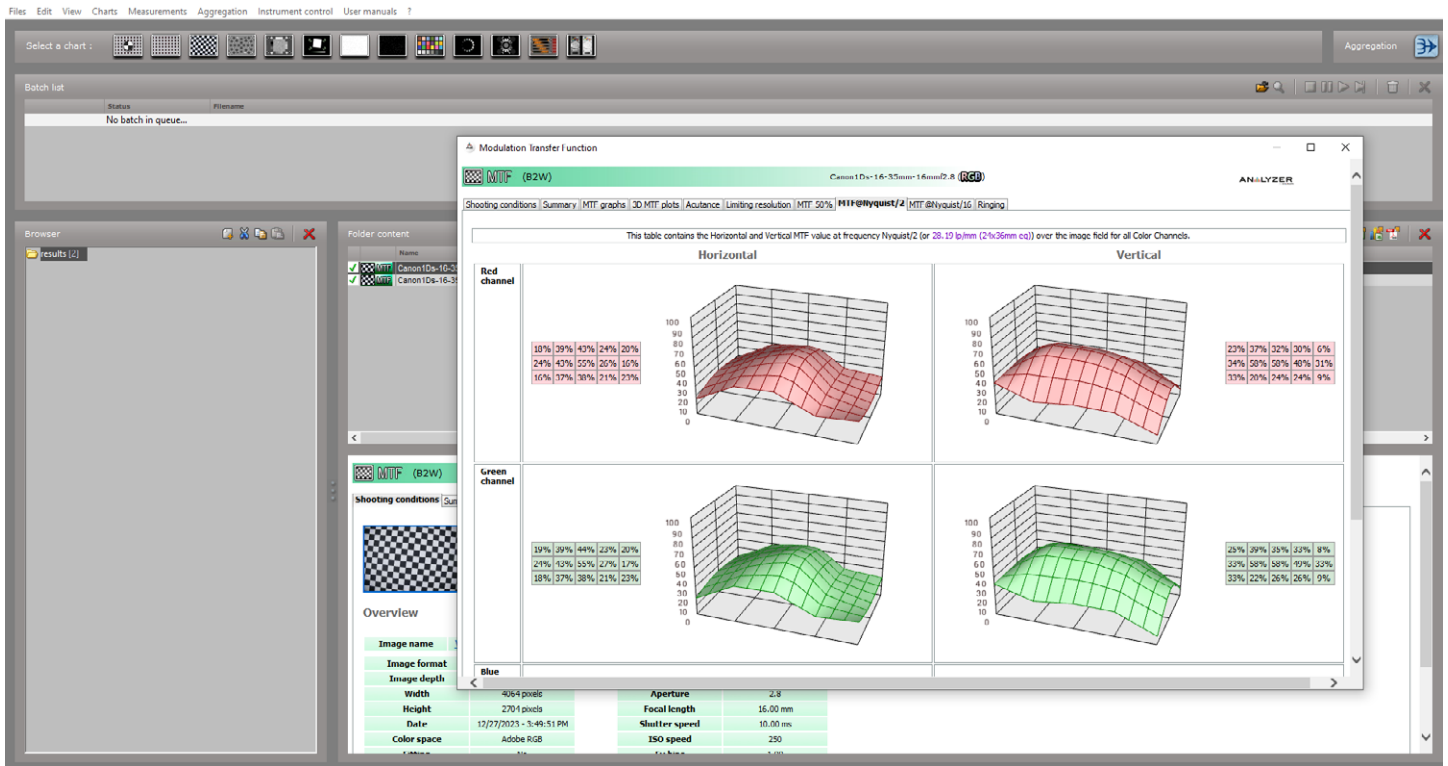
This software contains a comprehensive set of image quality measurement capabilities related to sensor, lens, and ISP evaluation. Metrics are compliant with most image quality standards; further, DXOMARK's proprietary metrics take you even further in your evaluations.

Key modules:
- Optics: Distortion, blur, vignetting, lateral chromatic aberration, color fringing, MTF, flare
- Photo: Texture, white balance, color fidelity, auto-exposure, noise
- HDR: Tone mapping, color consistency, noise consistency, texture consistency
- Autofocus: AF accuracy, AF shooting lag
- Stabilization: photo and video
- Timing: Exposure time, electronic rolling shutter, vertical blanking, frame rate
- Video: Texture, noise, timing

Key features:
- User friendly
- Measurement waiting list
- Automatic detection and cropping of interest area
- Easy export: (detailed or short) Excel, HTML, PDF
- Comprehensive and intuitive

## 3.2. Analyzer video software

If you want to dig even deeper, Analyzer offers AZ Video — software that is fully dedicated to video analysis. It features a video preview with dynamic visualization of measurements and DXOMARK temporal metrics. Adaptable for any kind of video camera, the software has a distortion compensation tool for ultra-wide-angle cameras. Still image metrics can be applied to video frames, but for comprehensive video quality evaluation, you must also consider the dynamic aspect of the image quality. Analyzer introduces a package

that provides you with the necessary equipment to simulate dynamic lighting changes such as a sudden lux level transition or a slow change in the color temperature.

AZ Video is a complete set of video measurements with easy visualization. After you easily compute video spatial and temporal metrics available in Analyzer, the measurements are displayed in a comprehensive and intuitive way and are synchronized with a preview of the video ROI. DXOMARK has optimized video algorithms to reduce the processing time — up to10 times faster using a regular laptop, and up to 40 times faster
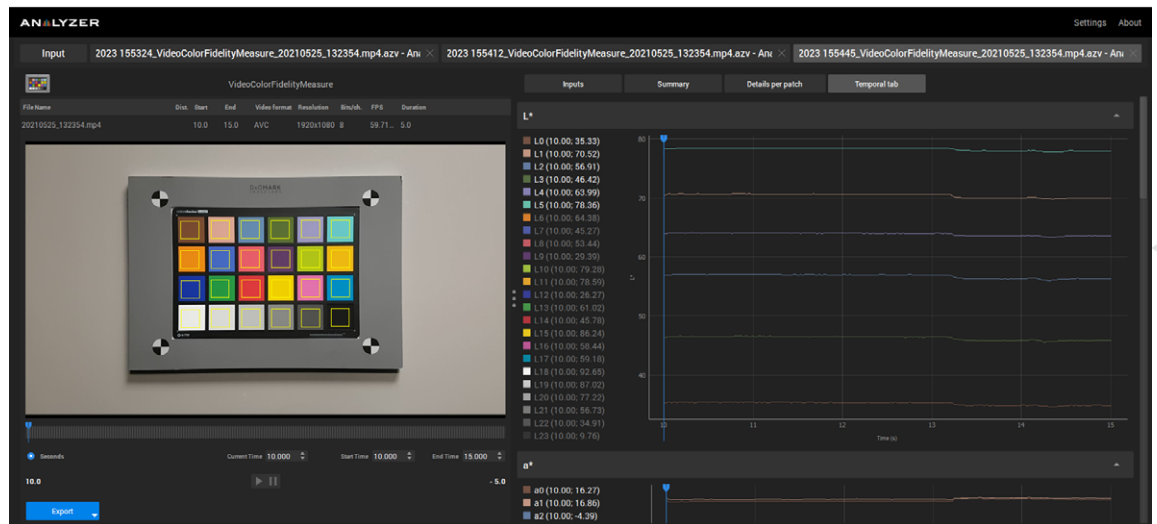
Key metrics:
· Auto-exposure convergence
· White balance stability
· Spatial and temporal visual noise
· Video texture
· Video timing
· Video flickering

Key Features:
· Video preview
· Easy setting of start and end processing time
· Intuitive and interactive display of measurement results
· Wide-angle and fisheye camera compatibility

Recommended accessories:
· Multispectral Lighting System (MLS_001 & MLS_SUNIR_001)
· Dynamic lighting system (DLS_001)
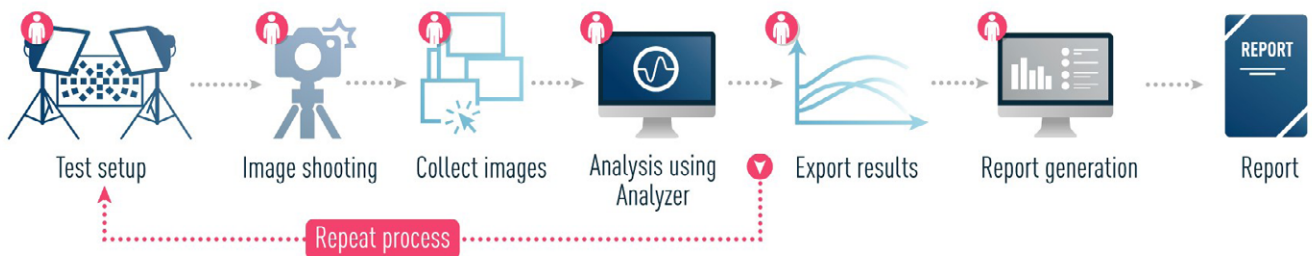
3.3. Protocol automation software

Camera manufacturers need to perform tests swiftly and efficiently. Camera testing is typically a complex process that requires lab operators to manually intervene and prepare the test setup each time they need to perform a new test. DXOMARK Protocol Automation provides testing scripts that you can use to automate the testing workflow from data acquisition to test result aggregation, including automated control of lighting and of different equipment such as the Hexapod Shaker, Timer, AMO, and Trigger. Protocol Automation also handles automatic data classification and transfer onto your master computer. You can improve efficiency by freeing up your lab operators' time, as they will need to intervene only at the beginning to prepare the tests.

Protocol Automation contains all the testing scripts that DXOMARK uses in its Smartphone Camera test protocols to take all measurements automatically. Using DXOMARK Protocol Automation, camera engineers can automatically replicate all of the protocols' still photo and video objective tests and measurements.

This software does not provide a full report, but returns test results in a json file. Because DXOMARK reports also gather perceptual tests and analyses, you can also reproduce them in your lab and testing environment, thanks to DXOMARK services.

Test setup → Image shooting → Collect images → Analysis using Analyzer → Export results → Report generation → Report

Repeat process

3.4. Python API: Work flow manager & automation

Two recurrent issues with image quality testing are the time it takes to test and the necessity of dealing with the limited flexibility of software and equipment. Most testing workflows require dedicated staff to manually intervene during most stages of testing, which is time-consuming. Moreover, doing so manually makes it very challenging to maintain the same level of consistency and precision.

Along with our services, Analyzer's Workflow Manager enables greater automation and customization to help you save precious time and resources every step of the way while maintaining high testing standards. Workflow Manager is Analyzer's Application Program Interface (API). It comes with a Python 3.10 x 64 library of all Analyzer measurements, along with full documentation and demo scripts.
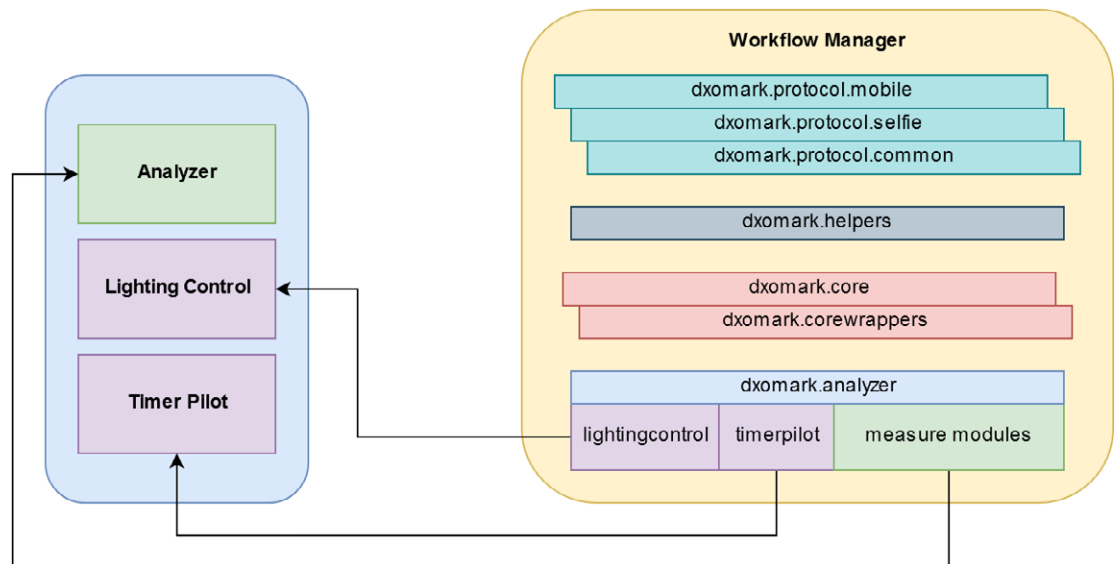
Key content:
· Python libraries for measurement and equipment control
· Online help and documentation
· Training and coaching
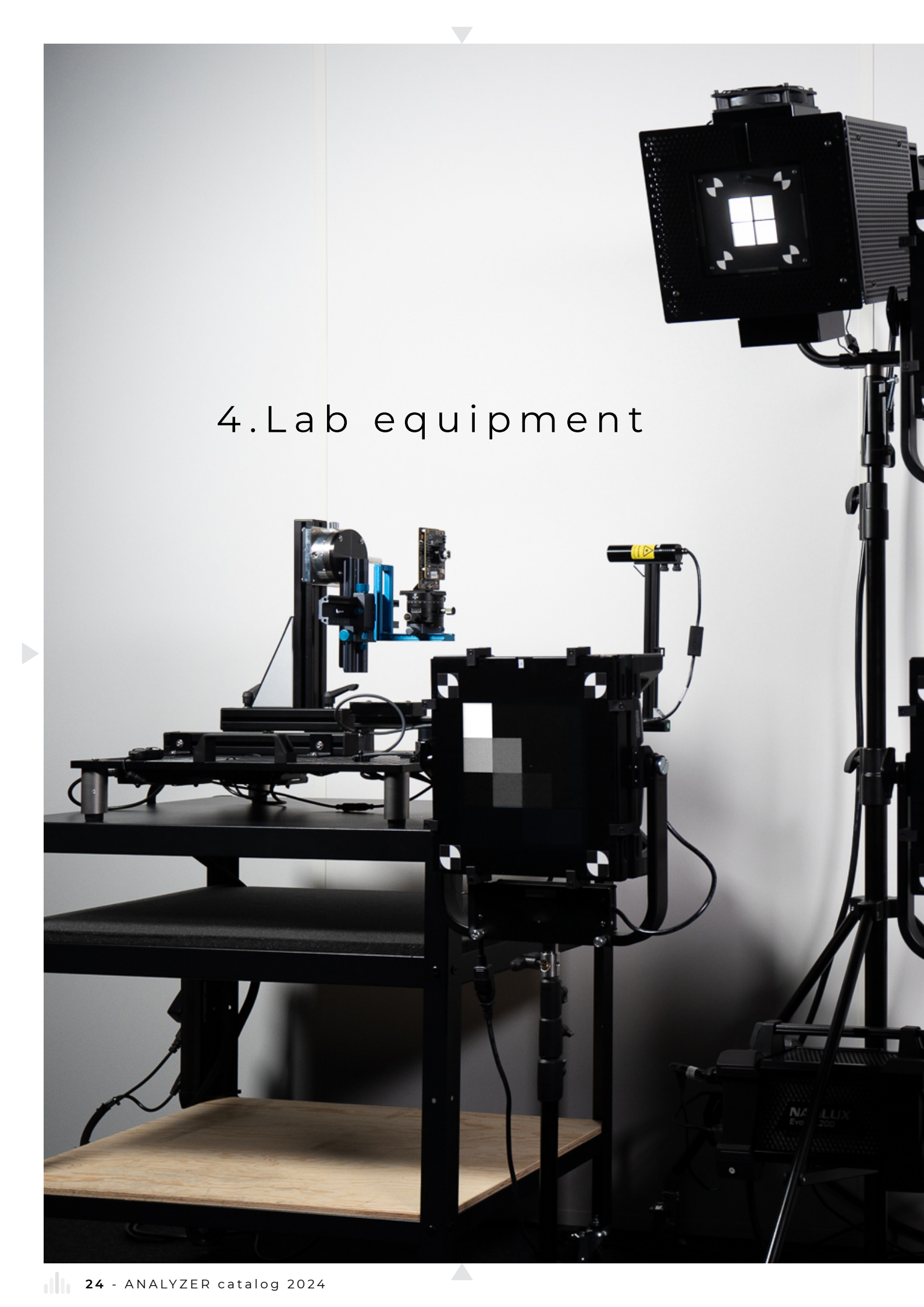
Additional equipment and software for fully-automated lab:
· Juke box for charts
· Positioning system for lighting
· Motorized rails for camera positioning
· Robotic arm
· Auto-alignment algorithm

Key features:
· Customize your workflow to fit your testing needs
· Reduce testing time to 1/30th of what it takes manually
· Automate testing protocols and liberate testing resources
· Create your own measurements
· Design your own automated lab
· Use Python environment to call measurements and analyze results
· Compatibility with Python 3.10

4.Lab equipment

4.1. Charts

DXOMARK Chart

Our iconic DXOMARK chart is handmade in our lab with more than 100 components, including real objects, miniature charts, and portraits that use a variety of colors, textures, and skin tones.

The chart also contains specially designed markers that let you use Analyzer software to autonomously obtain all available objective metrics, some of which are based on a neural network trained on the 20+ years of perceptual image quality evaluations in our DXOMARK database. All the elements are carefully selected to ensure the same results between two DXOMARK charts, and we assign each chart a unique identification number to facilitate high traceability.

Key metrics:
· Detail preservation
· Noise
· Resolution
· Exposure
· Perceptual analysis, including aliasing and moiré

Key features:
· Size: 1300 x 890 x 18 mm
· Material: PVC (polyvinyl chloride)

References: DMC_002, EASEL_S0002

HDR Noise Chart

This high-end, optically dense chart is made of black metallic plate and is designed to mitigate veiling glare and ghosting. It contains 28 neutral density patches and 5 polarizers for exposure adjustment, and has a dynamic of 120 dB.

This chart also contains specially designed markers that let you use Analyzer software to autonomously obtain all objective metrics. We test and calibrate every HDR Noise chart in our labs before shipping to ensure the same results between two charts, and assign each chart a unique identification number to facilitate high traceability.
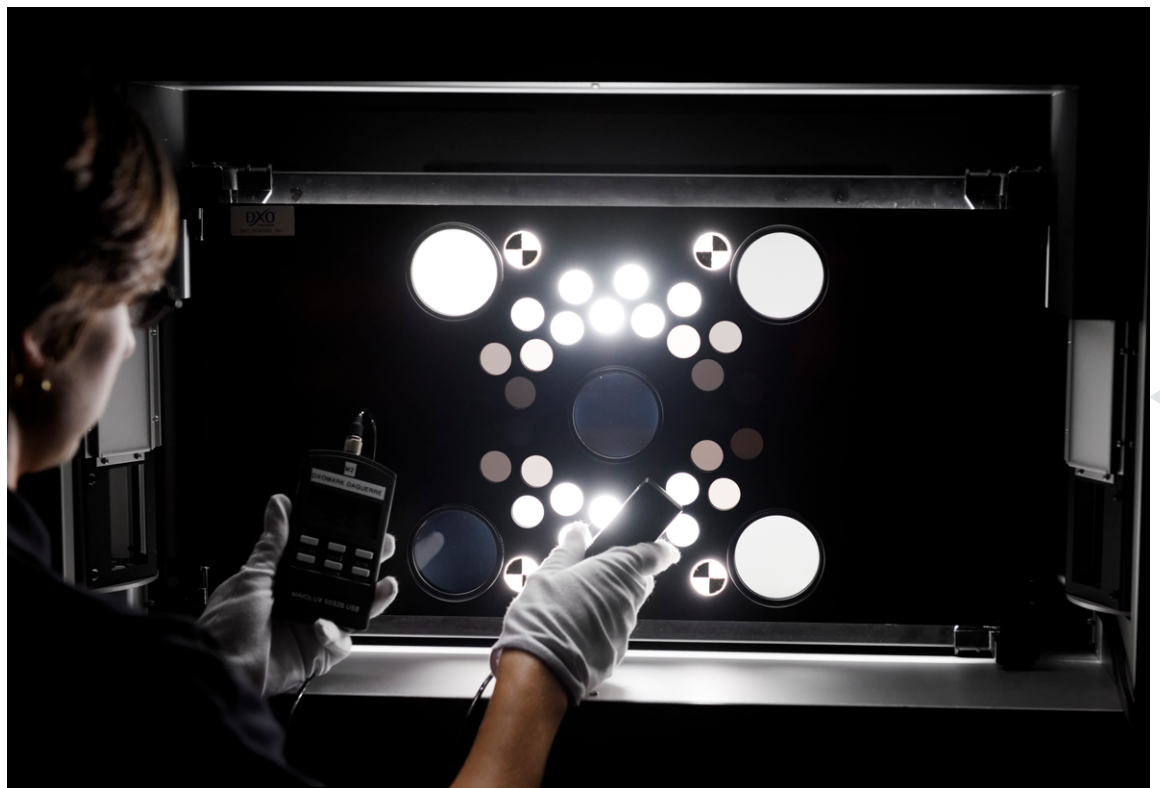
Key metrics:
· OECF (opto-electric conversion function)
· Dynamic and tonal range
· Tone curve
· Noise and SNR
· Noise grain size
· ISO speed rating
· Dark signal

Key features:
· Size: 315 x 315 x 23.5 mm
· Material: Aluminum
· Reference: HDR0002
· Standard: ISO 12232/15739/14524 & IEEE-P2020
· Light system: GEMINI_1x1

Reference: HDR0002

Dead Leaves Chart

This IEEE-CPIQ compliant chart lets you evaluate texture preservation and noise. It features the standard dead leaves pattern for assessing texture preservation as well as 12 grey patches for assessing visual noise to help you characterize a device's noise-vs-texture tradeoff.

Produced by a specialized precision printer, this chart with specific markers lets you use Analyzer software to autonomously obtain ROI placement and all objective metrics. We test and calibrate each Dead Leaves chart in our labs before shipping to ensure the same results between two charts, and assign each chart a unique identification number to facilitate high traceability.
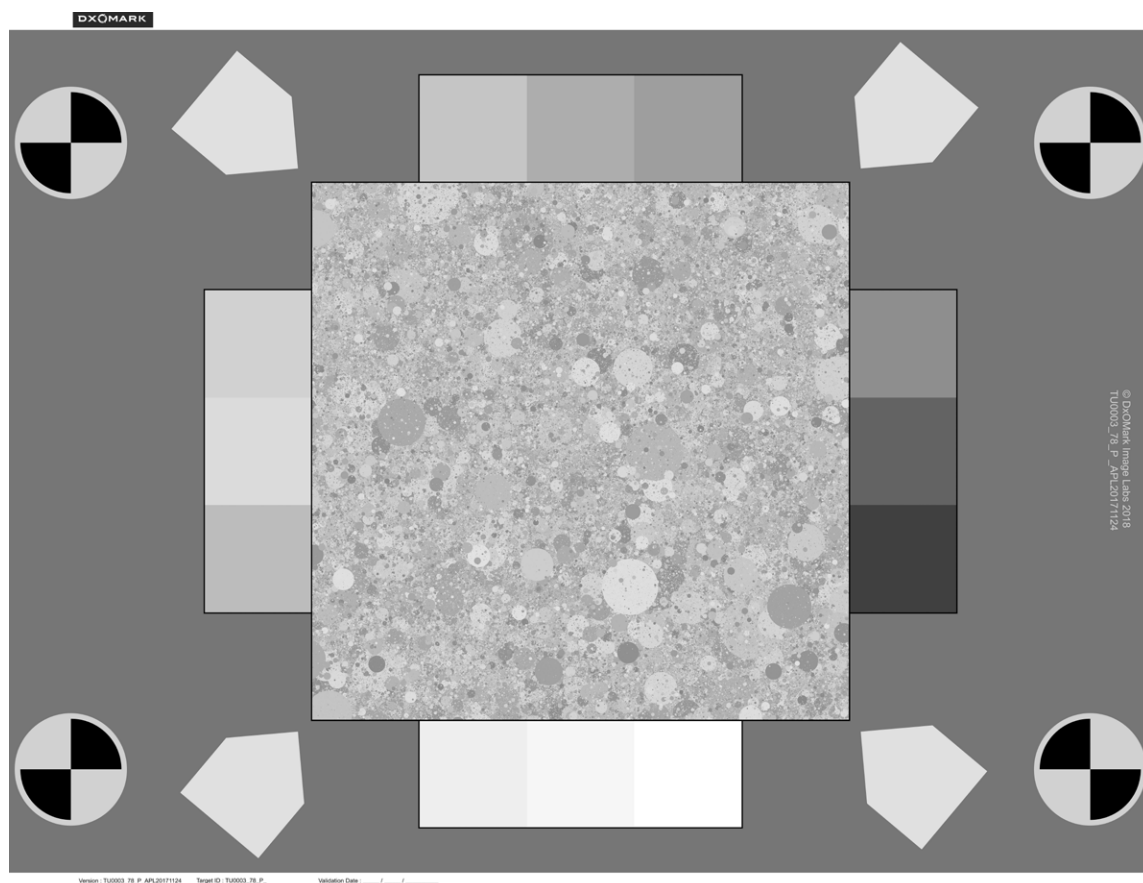
Key metrics:
- Photo and video texture preservation
- Texture and edge acutance
- Ringing
- Visual noise
- Photo and video stabilization

Key features:
- Size: 785 x 603 x 3 mm
- Material: White Dibond

References:
- TU0003_78_P   TF0003_78 (chart frame)
- EASEL_0003_MK2 (optional easel)

Standard: IEEE-CPIQ P1858 compliant

Color Checker

Whether it pertains to skin tones in video calls or scenery in landscape panning shots, color is an integral part of photo and video quality. You can use this chart to evaluate white balance amplitude and intensity as well as color rendering amplitude and intensity. These charts have a specific frame that contains markers so you can use Analyzer software to autonomously obtain ROI placement and all available objective metrics.
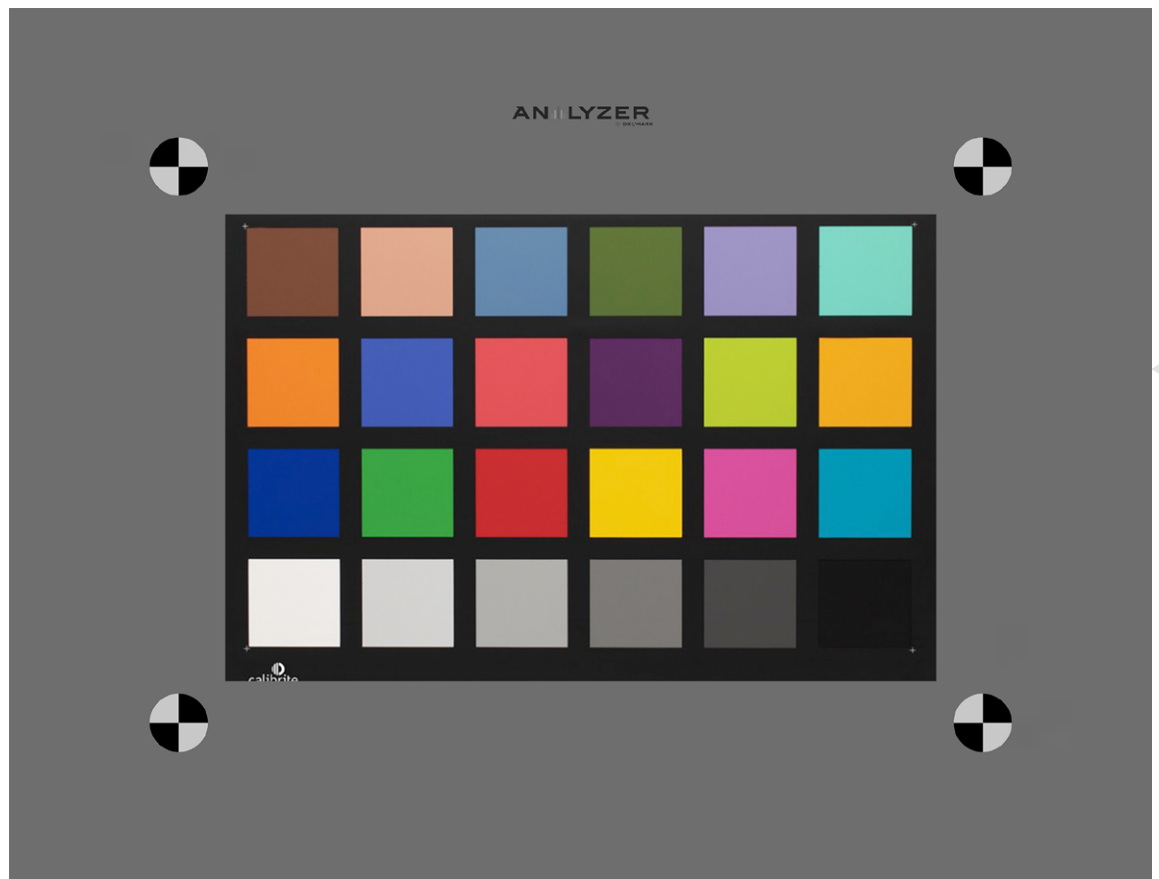
Material: PVC (polyvinyl chloride)

Key metrics:
· White balance
· Color fidelity
· Color rendering
· Color sensitivity (from RAW data)
· Exposure
· Noise
· Auto-exposure convergence
· ISO speed rating
· White balance stability

References:
· CC_XL_01 (785 x 603 x 7 mm)
· TF0003_78 (chart frame)

References:
· X-RITE_COLOR_CHART (215.9 x 279.4 mm)
· FRAME_CC002 (frame)
· TF0003_78 (chart frame)
· CCF0003_78P (mounting frame)

Realistic Mannequins

These hyper-realistic mannequins are designed to facilitate image quality evaluation, each having a specified spectral response for skin tone and all the details of a real human face. Due to the static nature of these mannequins (compared to a real person who moves), test scenes using these mannequins are absolutely identical, making resulting measurements repeatable and reliable. Further, using a mannequin can save precious testing time for a lab operator. We have three mannequins, each with a different skin tone, produced by a specialized French provider. We test and measure the spectral response of each realistic head in our labs before shipping to ensure the same quality, and assign each mannequin a unique identification number to facilitate high traceability.

Key metrics:
· Exposure
· Noise
· Face detail preservation
· Perceptual analysis

Key features:
· Material:
    · Polyurethane foam
    · Proprietary skin-like pigmentation
    · Silicon
    · Real hair
    · Glass eyes
· Add-on: Support trolley (SUPPORT_REALMAN) 895 x 445 x 1290mm
· Add-on: Motorized rotation system for realistic mannequins (ROT_REALMAN_001)

Eugene REALMAN_001, Size: 500 x 250 x 400 mm
Sienna REALMAN_002_1, Size: 400 x 250 x 360 mm
Diana REALMAN_003, Size: 450 x 300 x 470 mm

Background Mountain Bokeh Setup

⸤.⸥

To analyze the quality of bokeh blur, DXOMARK has developed a setup with two planes — one on the right and one on the bottom — which are almost parallel to the optical axis. We add to this setup a portrait subject (mannequin head) or a macro object (vase with plastic flowers) in the foreground. Both planes are covered with regular patterns and extend in front of the subject. At the far end, we have placed tiny LEDs to help you analyze the shape of the bokeh.

This setup allows you to evaluate the equivalent aperture of the bokeh and the smoothness of the blur gradient on the regular patterns on the bottom and along the line of black and white squares on the right plane. Having the same pattern at all distances in the setup can reveal even the smallest inconsistencies that would go unnoticed in many real-world scenes. The setup also makes it possible to analyze noise consistency by comparing the gray patches on the in-focus area and on the background. Any difference in grain will be the result of computerized bokeh processing.
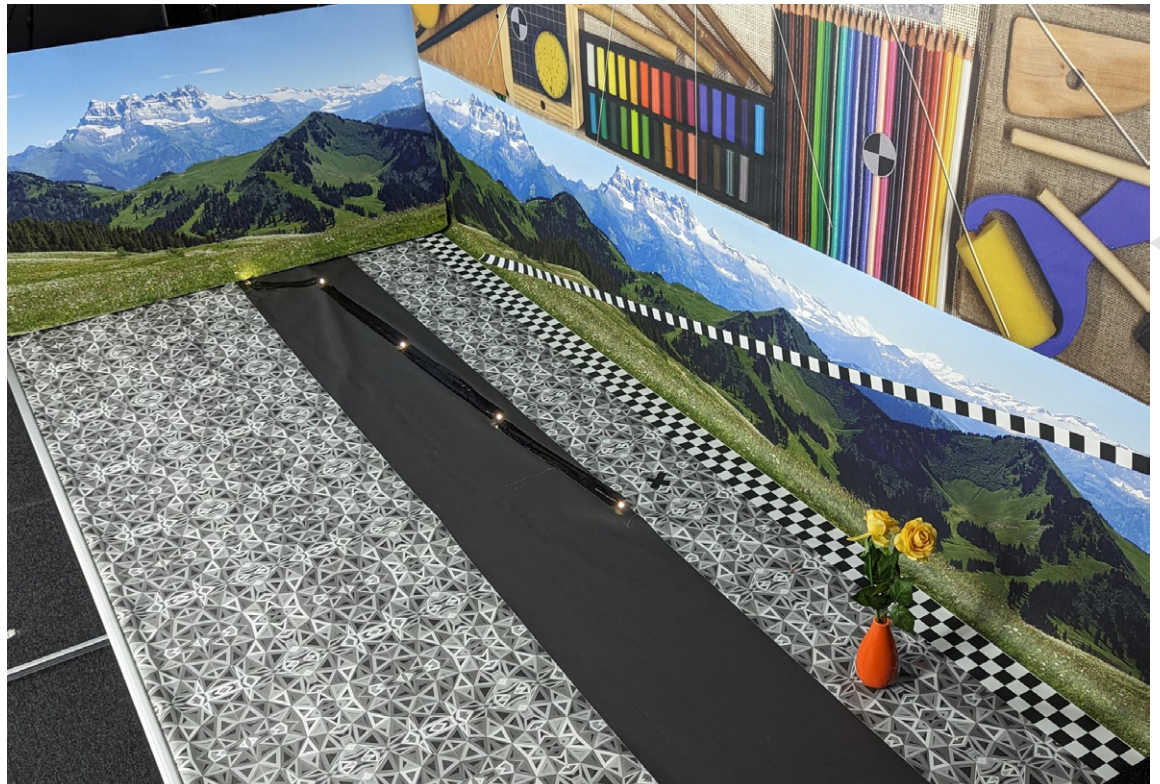
Key features:
· Reference: BOKEH_BGMT_001
· Perceptual analysis

Elements:
· Background
· Mountain side chart

Dimensions:
· 2700 x 4000 mm
· 1420 x 750 x 5 mm

Materials:
· Printed fabric, Aluminum
· Feather board
· LED lights, mannequin head, and vase with flowers not provided

Visual Noise Chart

This chart is composed of seven large gray patches designed specifically for measuring visual noise on video. These measurements complement those taken using the gray chart. You can also use this chart to evaluate various important video quality metrics related to temporal analysis, spatial analysis, and noise chromaticity.

Produced by a specialized provider, this chart with specific markers lets you use Analyzer software to autonomously obtain ROI placement and all objective metrics. We test and calibrate every Visual Noise chart in our labs before shipping to ensure the same results between two charts, and assign each chart a unique identification number to facilitate high traceability.
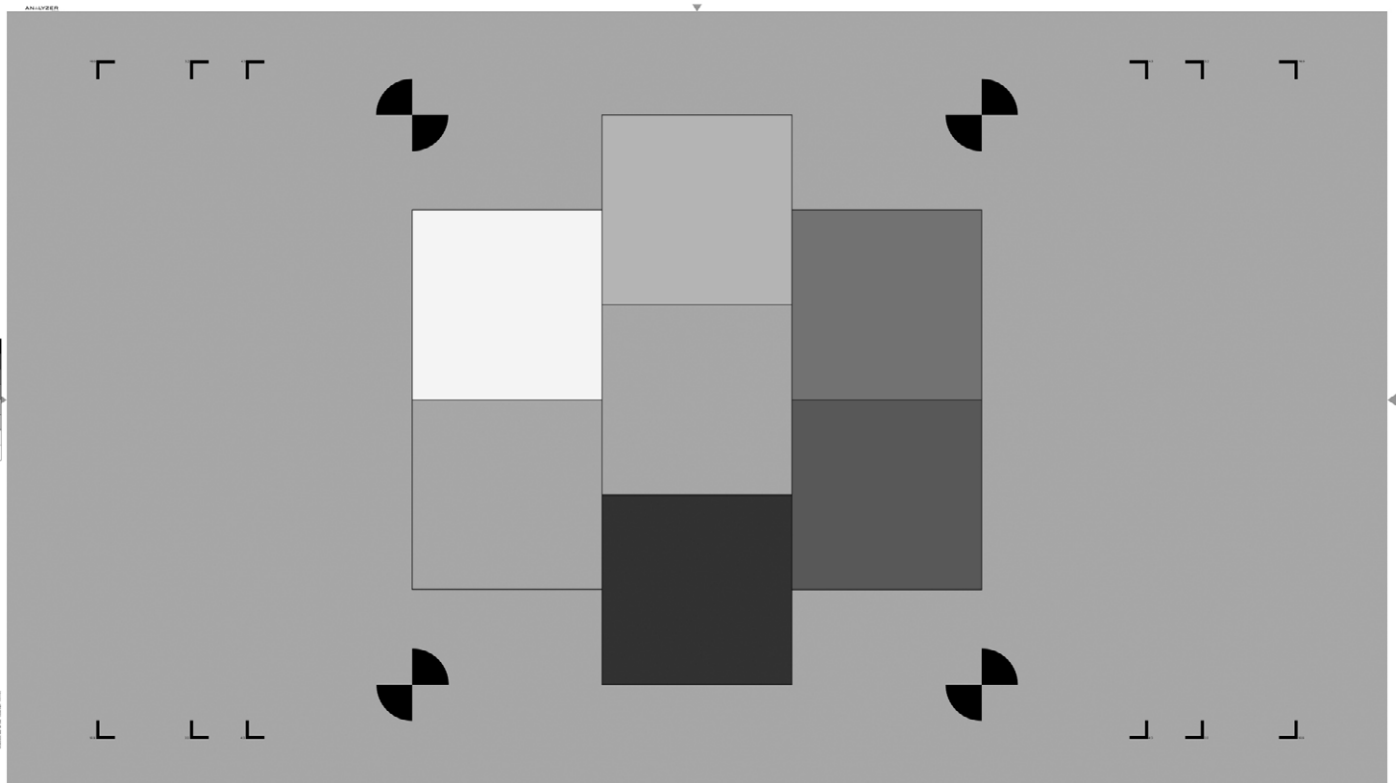
Key metrics:
· Video visual temporal noise
· Video visual spatial noise

VNU0001_200_P:
· Size: 2000 x 1350 x 3 mm
· Material: White Dibond
· Easel: EASEL_001nt

VNU0002_140_P:
· Size: 1400 x 970 x 3 mm
· Material: White Dibond
· Easel: EASEL_S0002

Dot Chart

The very flat surface of this glass-supported dot-pattern chart ensures precise optical measurements of shading, sharpness, lateral chromatic aberration, distortion, and focal length from one shot. It is available in various sizes and is compatible with most types of cameras.

Produced by a specialized provider, this chart with specific markers lets you use Analyzer software to autonomously obtain ROI placement and all objective metrics. We test and calibrate every Dot chart in our labs before shipping to ensure the same results between two charts, and assign each chart a unique identification number to facilitate high traceability.
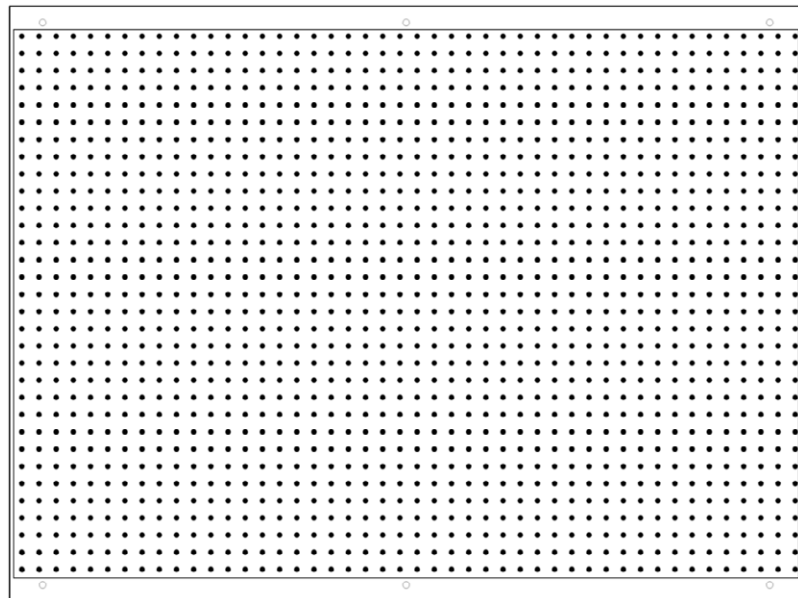
Key metrics:

High productivity, field-wide optical aberration measurements in one shot
· Luminance and color shading
· Sharpness
· Lateral chromatic aberration
· Distortion
· Focal length

Key features:
· Standards:
  · IEEE-CPIQ P1858 compliant
  · ISO 17850/17957/19084 compliant
· Glass or Honeycomb to ensure perfect flatness (recommended for 3D calibration)

DU0002_120:
· Size: 1200 x 900 x 10 mm
· Material: Safety glass
· Easel: EASEL_D0102

DU0001_200_V2:
· Size: 2010 x 1360 x 25 mm
· Material: Aluminum honeycomb
· Easel: EASEL_0001

DU0002_120_D:
· Size: 1200 x 890 x 3 mm
· Material: White Dibond
· Easel: EASEL_D0102

DU0003_60 & DF0003-60 (frame):
· Size: 600 x 470 x 6 mm
· Material: Safety glass
· Easel: EASEL_0003_MK2

MTF Chart

Available in various sizes, including those that support measuring fisheye lenses up to 190° FOV, and high-resolution cameras up to 50 MPix, this chart features a grid of slanted-edge patterns for measuring SFR maps across the field, astigmatism, longitudinal chromatic aberrations, and ringing —

all in one shot.

The MTF chart lets you use Analyzer software to autonomously obtain all objective metrics. We calibrate Analyzer software to remove the chart resolution from the SFR measurements, and we test every chart in our labs before shipping to ensure the same results between two charts. We also assign each chart a unique identification number to facilitate high traceability.
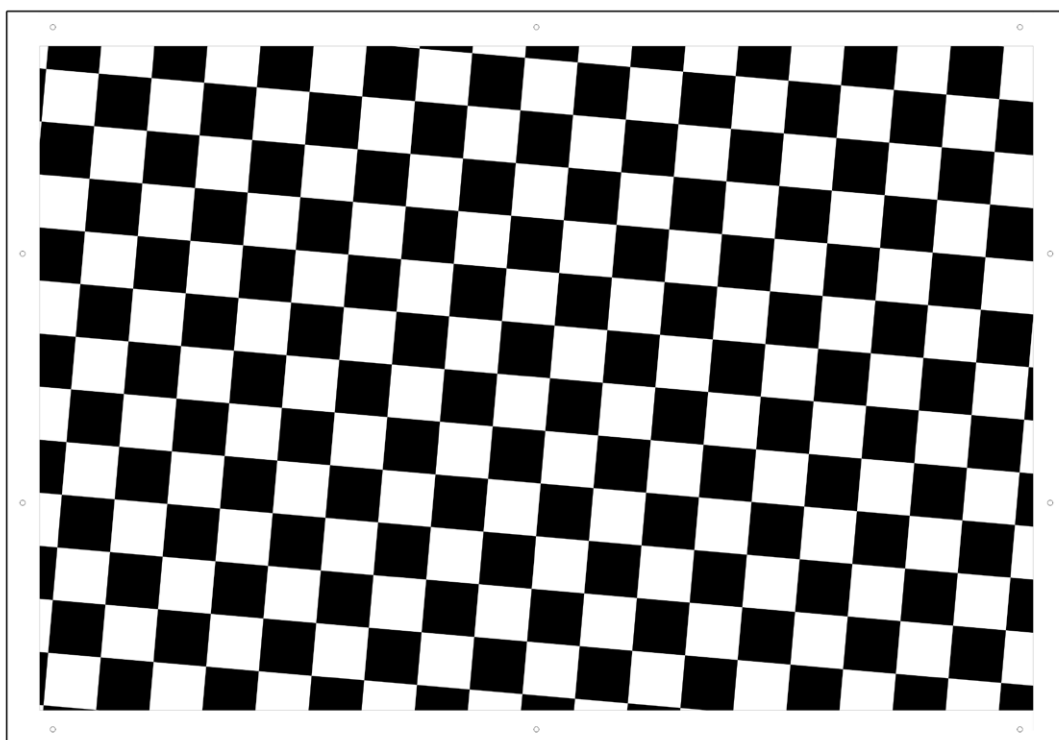
Key metrics:
· SFR
· Acutance
· Astigmatism
· Axial chromatic aberration
· Ringing artifacts

Key features:
· Material: matte paper glued on white Dibond
· Standard: ISO 12233 compliant

SU0001_200 & SF0001_200 (frame):
· Size: 2000 x 1350 x 3mm
· Square size: 120 x 120 mm
SU0002_140 & SF0002-140 (frame):
· Size: 1400 x 970 x 3 mm
· Square size: 70 x 70 mm
**SU0007_200 & SF0007_200 (frame):**
· Size: 2000 x 1350 x 3 mm

Radial MTF Compliant chart

This 140 cm SFR chart is designed to be compliant with the IEEE P1858 standard, also called CPIQ. You can use Analyzer software to autonomously obtain all objective metrics. We calibrate Analyzer software to remove the chart resolution from the MTF measurements, and we test every MTF Compliant chart in our labs before shipping to ensure the same results between two charts. We also assign each chart a unique identification number to facilitate high traceability.
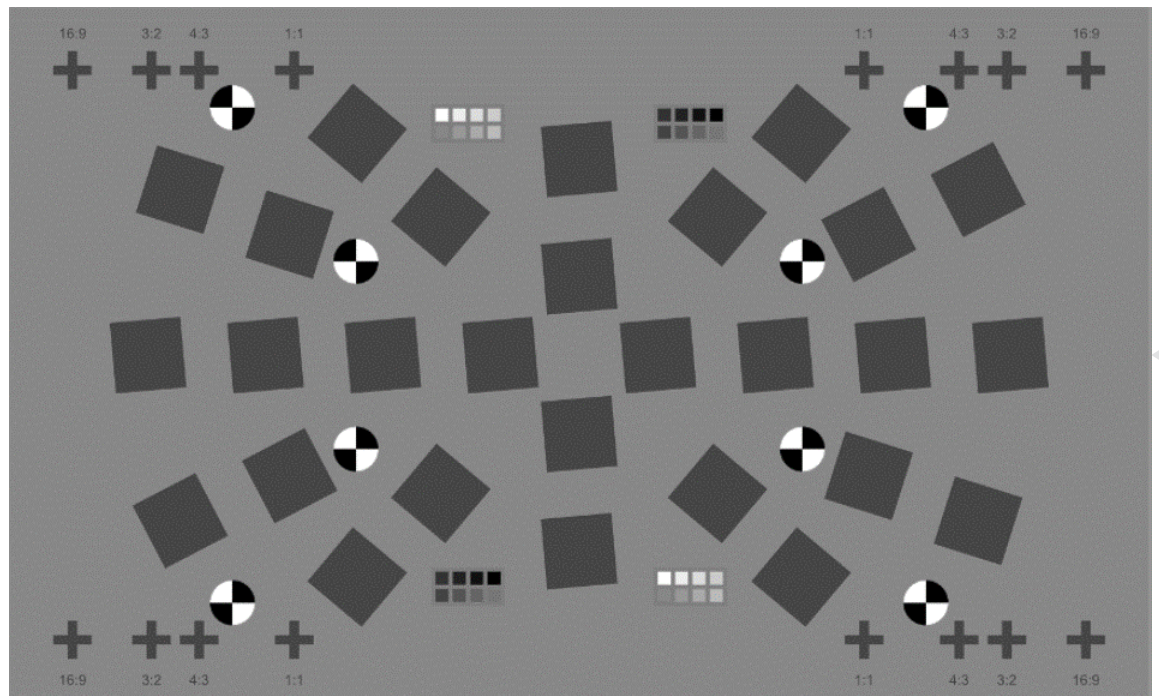
Key metrics:
· Sagittal and tangential SFR
· Acutance
· CPIQ subjective quality (JND)

Key features:
· Material: Matte paper glued on white Dibond
· Standard: IEEE P1858

SRU0002_140 & SF0002-140 (frame):
· Size: 1400 x 970 x 3 mm
· Pattern size: 1315 x 805 mm
· Square size: 80 x 80 mm

Composite Chart

The Composite chart contains three main patterns — grayscale, 24-color matrix, and dead leaves. The chart lets you verify your camera's ability to accurately reproduce colors, manage noise, and preserve contrast and texture in comparison with an objective reference. Using recommended lighting, you can simulate a dynamic range of up to 15 EV in the test scene.

Produced by a specialized provider, this chart with specific markers lets you use Analyzer software to autonomously obtain ROI placement and all objective metrics. We test and calibrate every Composite chart in our labs before shipping to ensure the same results between two charts, and assign each chart a unique identification number to facilitate high traceability.
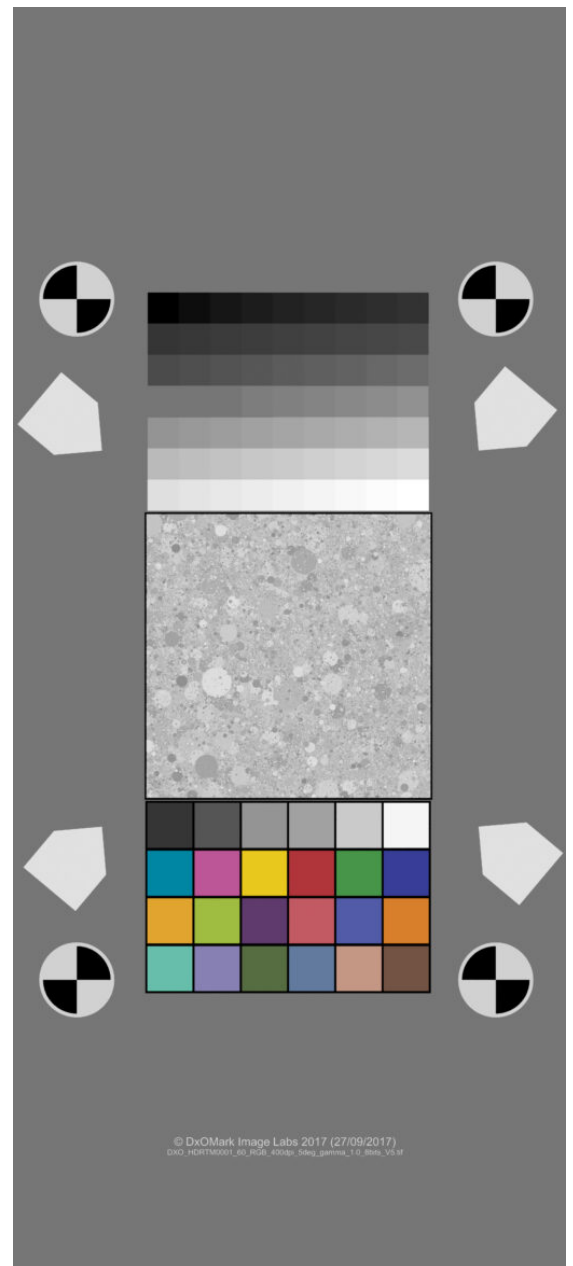
Key metrics:
· Temporal noise reduction (TNR)
· HDR tone mapping
· Dual-cam
· Large sensor
· Texture preservation
· Contrast preservation
· Color consistency

Key features:
· Size: 292 x 583 x 3 mm
· Material: Plexiglas
· References: CT002

Link to accessories:
· Lighting system: Gemini_2x1

Natural Scene Chart

Containing a detailed real-life scene for performing lab-based perceptual analyses under controllable HDR conditions, this chart facilitates evaluation of texture loss, moiré, aliasing, color shift, and sharpness. Using recommended lighting, you can simulate a dynamic range of up to 15 EV in the test scene.

This chart is produced by a specialized provider. We test and validate every Natural Scene chart in our labs before shipping to ensure the same results between two charts, and assign each chart a unique identification number to facilitate high traceability.

Key features:
· Size: 292 x 583 x 3 mm
· Material: Plexiglas
· Reference: NS002

Link to accessories:
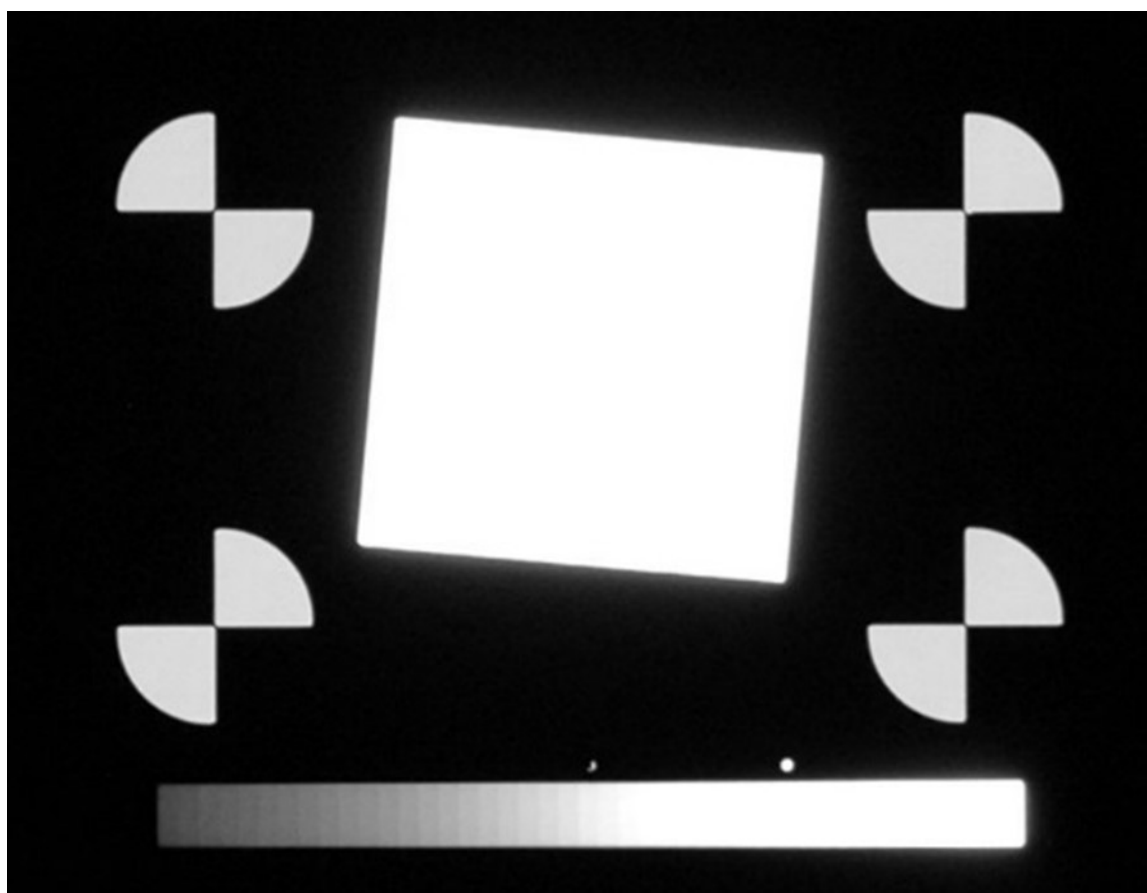· Lighting system: GEMINI_2x1

Color Fringing Chart

This transmissive chart consists of a square pattern positioned on a uniform light table. You can use this for measuring color inaccuracies caused by chromatic aberration — a flaw that is especially visible in highly saturated areas.

Produced by a specialized provider, this chart with specific markers lets you use Analyzer software to autonomously obtain ROI placement and color fringing metrics. We test and calibrate each Color Fringing chart in our labs before shipping to ensure the same results between two charts, and assign each chart a unique identification number to facilitate high traceability.

Key metrics:
· Color fringing

Link to accessories:
· CF0002_MASK (chart mask)
· Lighting system: GEMINI_2x1

Key features:
· Size: 320 x 290 x 5 mm
· Material: Aluminum
· References: CF0002_32

Grey Chart

This uniform grey-colored chart is designed for evaluating exposure, shading, defective photosites, flash, and video noise.

Consistency of video performance during recording is critical for producing quality results. Analyzer's Video & Stabilization module comprises an extensive set of tests to perform when recording a uniform background so as to help you characterize your camera's video stability. These tests include measuring variations in exposure and white balance, as well as color shifts, and temporal and spatial noise (including row and column noise). You can also use the Grey chart to evaluate other video metrics such as exposure stability and convergence.

Produced by a specialized provider, this chart lets you use Analyzer software to autonomously obtain all objective metrics. We test and calibrate each Grey chart in our labs before shipping to ensure the same results between two charts, and assign each chart a unique identification number to facilitate high traceability.

Key metrics:
· Luminance and color shading
· Noise
· Defective photo sites
· Flash

Link to accessories:
· Size: 1400 x 970 x 3 mm
· Material: White Dibond
· Reference: GU0002_140_P &   GU0003_60_P

Focus Range Chart

The Focus Range portrait chart helps you evaluate a device's ability to focus on faces at various distances by measuring edge acutance and MTF. Our measurement software calibrates the MTF measurement from the chart resolution.

Produced by a specialized provider, this chart with specific markers lets you use Analyzer software to autonomously obtain ROI placement and all objective metrics. We test and calibrate each Focus Range chart in our labs before shipping to ensure the same results between two charts, and assign each chart a unique identification number to facilitate high traceability.
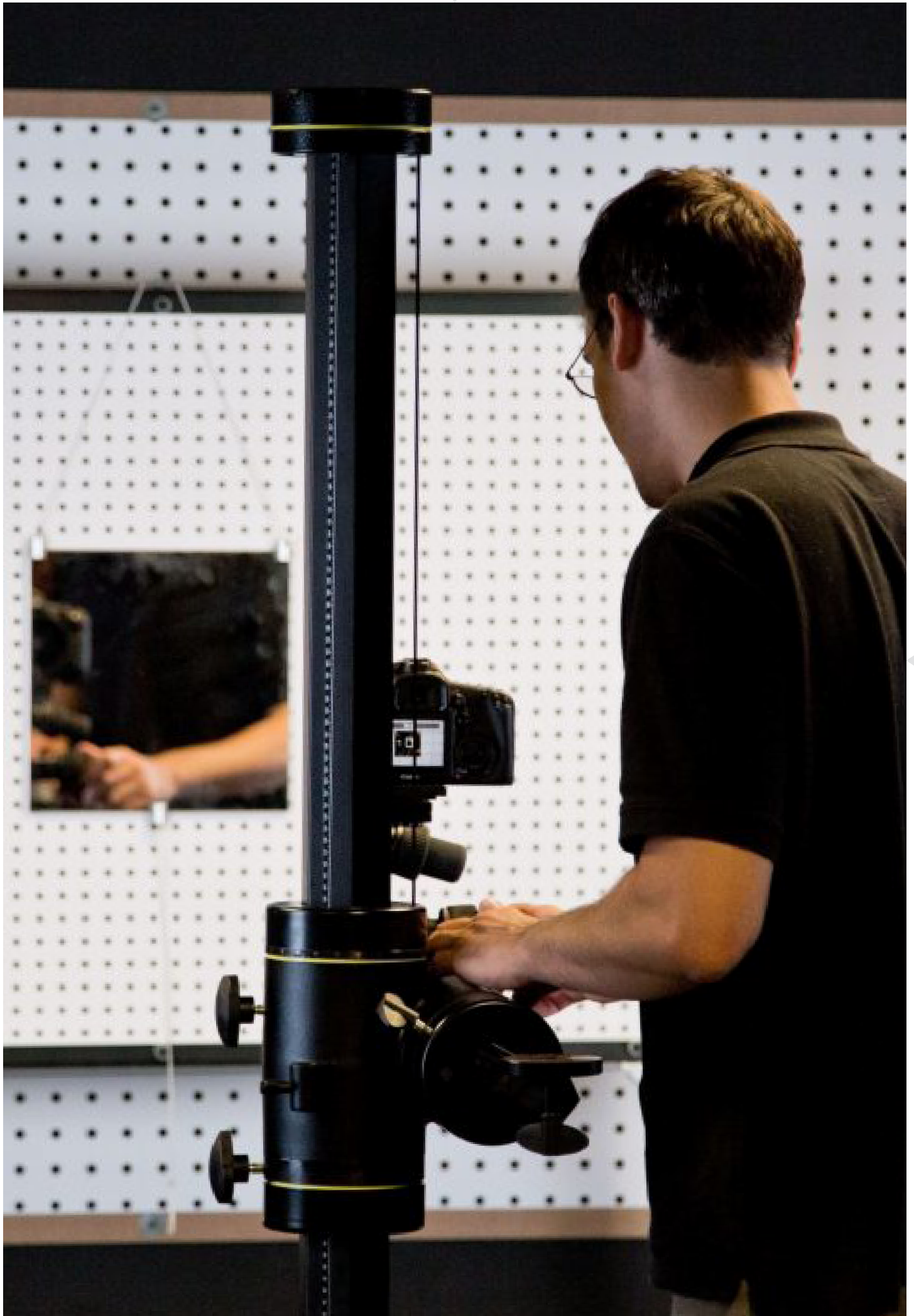

ROF001_30_APL20190412
S/N : ROF001_30_

Key metrics:
· Sharpness
· Focus

Key features:
· Size: 420 x 297 x 3 mm
· Material: White Dibond
· Reference: ROFF001_30

4.2. Lighting & Equipment

Multispectral Lighting Systems

Standard Multispectral Lighting System

The Multispectral Lighting System (MLS) is designed to illuminate test charts of up to a width of 2 meters with more than 90% uniformity for image analysis. This new lighting system uses 16 LED channels that can be fully controlled independently and can automatically fit a spectrum with a closed-loop (standard spectra are pre-calibrated). The LED channels are DC-driven, ensuring flicker-free light, although LED flicker can be activated. This lighting system can reach very low light (down to 0.1 lux with 10% precision). An illuminance feedback loop automatically stabilizes light levels, and the entire system is computer-controlled so that you can program your own lighting scenarios, including the color temperature. The software ensures perfect repeatability of your illumination conditions.

Sunlight-Near Infrared Multispectral Lighting System

This lighting system has the same characteristics as the standard MLS product, but comes with 4 additional LED channels in near-infrared (NIR) and one additional LED channel in visible light. This creates an unprecedented ability to mimic daylight by reaching light levels up to 50K lux with a spectrum that goes through the full range of visible light and NIR.

General specifications:
· Size: 785 x 203 x 1590 mm
· Material: Aluminum
· Weight: 45 kg

Technical specifications:
· From 0.1 to 50 000 lux
· Spectrum: 360–980 nm
· Flicker mode: 50–1000 Hz (50% duty cycle)
· Ethernet connection
· 100-240V 50-60Hz
· max consumption : 2500 W

Key features:
· Flicker-free (DC-driven)
· Light level closed loop
· Custom Spectrum (closed-loop)
· Computer control & API software
· Flicker mode (independent for each side)
· Short raise time (<30 ms)
· Daylight (0.1 to 50K lux), IR (700 to 980 nm)
· Reference: MLS_001 & MLS_SUNIR_001

Hexapod Stabilization Platforms

Camera motion and subject motion are two of the hardest aspects of video quality to measure in an accurate and repeatable way. Analyzer's Video and Stabilization module works seamlessly with our purpose-built hexapod shake table and control software to ensure that you're testing your device against different kinds of camera movement.

This high-precision shaking platform for image stabilization testing provides repeatable motions that simulate real-life movements.

Our two main models of stabilization platforms, called Hexapods, can help you simulate movement on your camera sensor or module.
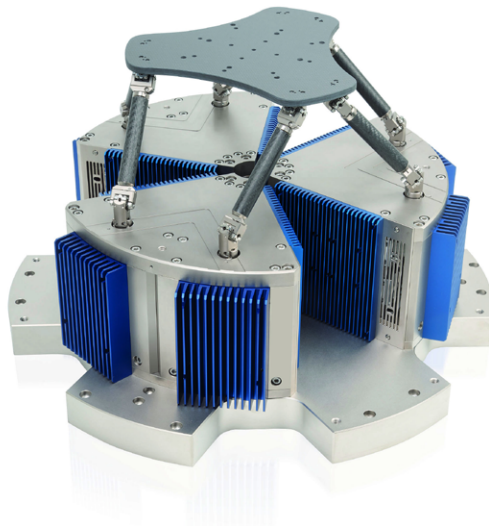
Key features:
· High velocity and dynamics
· Minimal moved mass and inertia
· Velocity up to 250 mm/s
· Precise path tracking
· Friction-free voice coil drive

References:
· HEXAPOD_H860 Voice coil drives up to 15°.Hz and 30 mm.Hz
· NEWPORT_STA_H860
· DEVICE_HOLDER_860
· HEXAPOD_H840 Brushless motors up to 5.1°.Hz and 23 mm.Hz
· NEWPORT_STA_H840
· DEVICE_HOLDER_840

Motorized Rotation System for Realistic Mannequins

A motorized platform designed to rotate realistic mannequins at controlled speeds and acceleration, simulating realistic head rotation.

Key features:
• Size: 520 x 140–376 x 68 mm
• Material: Aluminum
• Reference: ROT_REALMAN_001

Automated Moving Object – AMO

Autofocus testing requires defocusing multiple times during each photo session, which can be tedious and laborious. AMO's automated Defocusing Object makes taking measurements easy and rapid with PC-controlled synchronization of the AF setup and automated image capture using a touchscreen digital trigger. Using AMO, you can fully automate autofocus testing from image capture in various lighting conditions to highly repeatable and accurate output.

Two components:
· Moving Background: Continuously moving chart that simulates scene motion at adjustable speed.

· Defocusing Object (foreground): Self-moving chart for resetting cameras to their reference setting. It can move outside of the camera FOV in less than 100 ms.

Reference: AMO_004R

Background:
· Low position: 1364 mm
· High position: 1964 mm
· Max travel: 600 mm
· Max speed: 2 m/s
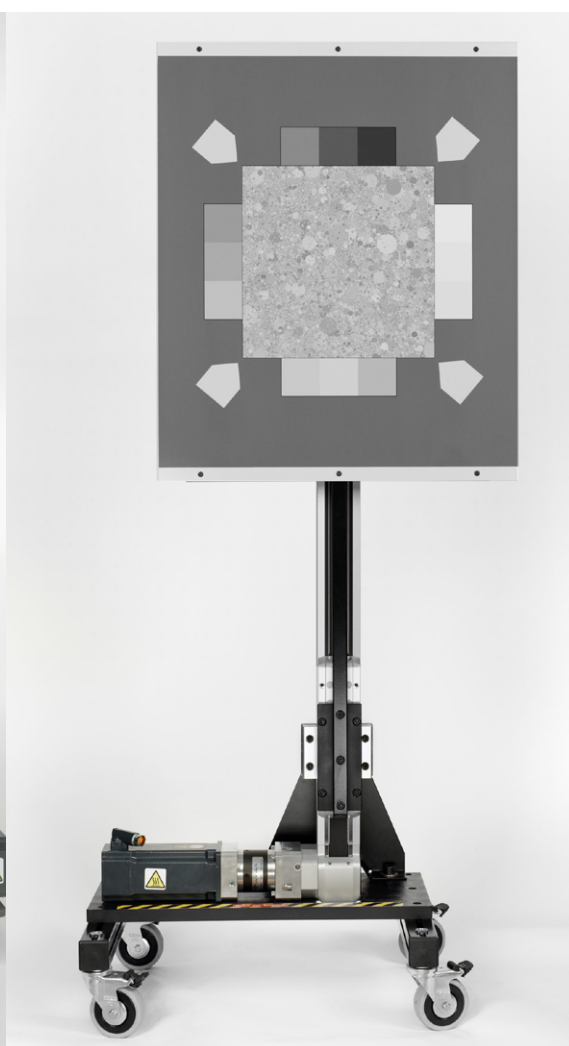
Foreground:
· Low position: 1025 mm
· High position: 1625 mm
· Max travel: 600 mm
· Max speed: 2 m/s

5.Services & support

Available for on-site training and setup, as well as for on-site and remote consulting, **DXOMARK** scientists and technicians have the knowledge and experience to help you optimize every phase of your product development.

Optimized development

It is important to select components and technologies that can meet end-product quality targets early in the development cycle. Thanks to our extensive database of quality performance data, we can help you select the hardware and software components that are appropriate for your product positioning. We can also support you during the software tuning phase, when your engineers need to adjust the hundreds of parameters of your digital signal processor to optimize your device's performance in all relevant use cases to ensure a good end-user experience.

Benchmarking

From defining initial product marketing requirements to developing and commercializing your product, it is essential for engineers and marketers to understand how new products compare against competing products in terms of user experience. Our in-depth quality database, which contains the test results of hundreds of consumer devices over more than 10 years, allows us to provide you with tailored benchmarking to let you accurately track how you are doing in the marketplace.

Database service

Our in-depth audio, battery, camera, and display quality performance databases for consumer electronics (smartphones, laptops, tablets, speakers, cameras, and lenses) are also available as web services for clients looking to continuously track the evolution of products and technologies.

Custom testing

We have many fully equipped testing labs and dedicated engineering teams for producing customized measurements of consumer and professional electronics. In addition to digital cameras, smartphones, laptops, and speakers, we have also performed measurements for drones, surveillance cameras, automotive sensors, and other products using camera, display, and/or audio components. We can provide such customized measurements for you, or we can rent one or more of our labs to you and provide training as necessary so that you can create and perform your own testing protocols.

6.Contacts

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