CUBERT HYPERSPECTRAL

The experts for real-time, light field spectral imaging
2024

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Meet the Hyperspectral Experts

Welcome to Cubert - the pioneers of hyperspectral video cameras for real-time solutions! Since our inception in 2012, we have been committed to exploring untapped markets and applications with our technology, and we're excited to take this journey with our customers.

At Cubert, we offer a wide range of cutting-edge solutions to meet your needs. Our off-the-shelf hyperspectral light field cameras are built to the highest standards, providing high-quality imaging that is unmatched in the industry. Cubert's own spectral imaging software is designed to provide you with the most accurate data possible, allowing you to make informed decisions quickly.

Covering main application fields including remote sensing from UAVs, quality control in areas such as food quality, and biomedical imaging ranging from skin to the eye, Cubert offers full flexibility with our Light Field HSI technology to meet your unique requirements. This makes it easy to build the camera that best fits your needs.

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At Cubert, we understand that every project is unique. That's why we offer product customization services to ensure that our solutions meet your exact specifications. Our team of experts is available to help you every step of the way, from product conception to final delivery.

Finally, our application and integration support services are designed to help you get the most out of your investment. Whether you need help integrating our solutions into your existing systems or need assistance with application development, our team is always available to help.

At Cubert, we're committed to delivering the highest quality solutions to our customers. Contact us today to learn more about how we can help you achieve your goals with our advanced hyperspectral video cameras and software solutions.

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What's new in 2024?

Camera Product Portfolio

The **ULTRIS 5** stands out as the most affordable and versatile entry-level choice, featuring a compact design and swift 75 Hz performance. The **ULTRIS X20** takes the lead as a premium scientific-grade camera, offering the highest spectral resolution and comprehensive coverage of the entire VNIR range. For remote sensing from UAVs, the **ULTRIS X20 Plus** introduces dual-sensor capabilities and pansharpening for advanced applications. The **ULTRIS XM** represents the next generation with USB3 connectivity and the highest native spatial resolution, while the **ULTRIS SWIR 1** pioneers SWIR imaging at an impressive 80 Hz, capturing the range from 980-1650 nm. Notably, the ULTRIS 5, XM, and SWIR 1 models allow lens changes through a C-Mount adapter, ensuring adaptability for various applications.

Accessory Packages

Lab Lite Package: Essential **starter kit** included in all packages. It contains the software, camera calibration, and basic accessories you need to get started.

Flight Lite Package: This package extends the Lab Lite with a **mini computer** and **GPS**, making it ideal for automated and semi-automated application fields, as well as UAVs.

Flight Pro Package: The ultimate UAV integration solution for capturing high-quality aerial imagery with ease. This package extends the Lab Lite with the **UXG Gimbal** designed for the **DJI M300/350 RTK**, including a mini computer and connected via **Skyport**.

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What's new in 2024?

Cubert CUVIS Software Suite

Outperforming the **previous CUVIS 2.9.1 Fuchsia** , meet our latest software version. **CUVIS 3.2.1 Ginger** introduces a revised Touch version as well as an extensive Software Development Kit (SDK) based on C, now available for both Windows and Linux.

In Ginger, the file format has undergone significant changes. The **new session files** (cu3s) now encompass all calibration files, including White and Dark, streamlining the service team's ability to respond promptly to customer requests. Notably, the **Cubert Touch GUI** has seen enhancements, introducing a **light mode** that greatly improves visibility and ease of operation in sunny and bright conditions. Additionally, the software is now **multilingual**, automatically adapting to the language settings of the Windows system. Feel free to reach out for a demonstration or training session to explore these updates further.

Software Development Kit (SDK)

This robust SDK enhances the flexibility of our imaging systems, allowing seamless integration into a wide range of applications. With wrappers for **Python**, **C++**, and **C#**, Ginger provides a comprehensive development environment, catering to diverse programming preferences. This expansion in SDK capabilities ensures optimal compatibility and ease of use for developers across different platforms and coding languages.

The **CUVIS SDK**, coupled with **CUVIS AI**, our innovative open-source platform for applying machine learning in hyperspectral imaging, is now conveniently accessible on GitHub. Visit **https://github.com/cubert-hyperspectral** to learn more.

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Technical Specifications Overview

	ULTRIS 5	ULTRIS X20	ULTRIS X20 Plus	ULTRIS XM	ULTRIS SWIR 1
	Affordable Versatility	**Premium Scientific Grade**	**Dual Sensor Remote Sensing**	**Next-Gen High Resolution**	**SWIR Snapshot Pioneer**
Technology	Light Field	Light Field	Light Field, Dual-Sensor	Light Field	Light Field
Readout	Global Shutter	Global Shutter	Global Shutter	Global Shutter	Global Shutter
Spatial Resolution	290 x 275 pixel	410 x 410 pixel	410 x 410 pixel, 1886 x 1886 pixel (Pan)	1000 x 1000 pixel	200 x 200 pixel
Wavelength Range	450 - 850 nm	350 - 1000 nm	350 - 1000 nm	400 - 900 nm / modular	980 - 1650 nm
Spectral Bands	51	164	164	51	38
Spectral Sampling	8 nm	4 nm	4 nm	10 nm	18 nm
FWHM	26 nm @ 532 nm	Constant 10 nm	Constant 10 nm	Constant 25 nm	70 nm @ 950 nm
Spectral Data Points	51 x 79 750 (4 M)	164 x 168 100 (24.5 M)	164 x 168 100 (24.5 M)	51 x 1 000 000 (51 M)	38 x 40 000 (1.5 M)
Bandpass Filter	LVF	Mosaic	Mosaic	Mosaic	LVF
Integration Time	0.1 – 1000 ms	0.1 – 1000 ms	0.1 – 1000 ms	0.1 – 1000 ms	0.1 – 1000 ms
Attachable Optics	C-Mount (for 2/3" sensors)	-	-	C-Mount (for 1" sensors)	C-Mount (for 2/3" sensors)
FOV (Field of View)	15° (standard) / lens-dependent	35°	35°	12° (standard) / lens-dependent	lens-dependent
Data Depth	12 bit	12 bit	12 bit	12 bit	12 bit
Max Frame Rate	15 Hz / 75 Hz (HFR)	8 Hz	3 Hz	10 Hz	80 Hz
Data Link	GigE / 10 GigE (HFR)	GigE	GigE	USB 3.0	USB 3.0
Sensor	Sony IMX264	CMOSIS CMV20000	CMOSIS CMV20000 / Sony IMX264	Sony IMX540	Sony IMX990
File size	< 8 MB	< 55 MB	< 55 MB / < 1.2 GB pansharpened	pending	3 MB
Weight	126 g	350 g	630 g	pending	140 g (w/o lens)
Dimensions	29 x 29 x 65 mm	60 x 60 x 57 mm	86 x 121 x 105 mm	40 x 40 x 40 mm	30 x 30 x 85 mm (w/o lens)
Variants	Relay Lens Adapter High Frame Rate (HFR) Industrial Housing (IP66)	Industrial Housing (IP66) Underwater Housing (IP68)	-	Relay Lens Adapter	Relay Lens Adapter

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Premium Scientific Grade

ULTRIS X20

Hyperspectral Powerhouse for Highest Standards

The ULTRIS X20 stands as a premium scientific-grade camera, distinguished by its exceptional spectral resolution and quality. Encompassing the entire VNIR range (**UV VIS NIR**), it delivers comprehensive spectral coverage essential for diverse applications. With a substantial resolution of 410x410 pixels, this camera excels in capturing detailed imagery, making it an ideal choice for applications demanding top-notch precision and scientific accuracy.

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Dual Sensor Remote Sensing

ULTRIS X20 Plus

Hyperspectral Camera for UAV Aerial Mapping

Designed specifically for remote sensing applications from UAVs, the Ultris X20 Plus presents a cutting-edge solution with dual-sensor capabilities. Integrating a second high-resolution panchromatic sensor, this camera elevates imaging capabilities, allowing for enhanced spatial resolution through **pansharpening** techniques. While its complexity may be notable, this camera effectively broadens the capabilities established by the X20, rendering it well-suited for advanced applications that demand sophisticated data analysis.

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Next-Gen High Resolution

ULTRIS XM

1 Megapixel & Flexible Filter Options for Hyperspectral Imaging

The **ULTRIS XM** represents the next generation in hyperspectral imaging, featuring USB3 connectivity for enhanced data transfer capabilities. Coming with the highest-ever native **spatial resolution of 1 Megapixel** among Cubert hyperspectral snapshot cameras. Operating as a classic VNIR camera, it covers the spectrum from 400 to 900 nm. Additionally, its adaptability Additionally, a **C-Mount adapter** provides users with flexibility in selecting lenses based on their specific needs, or even mounting the camera on other optical systems such as microscopes. Unique to the ULTRIS XM is the selection of fixed **filter configurations available** at the time of purchase, allowing a **custom 500 nm range** within the entire VNIR spectrum covering 385 to 1000 nm

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Affordable Versatility

ULTRIS 5

Compact & Swift: Advancing Hyperspectral Imaging

The **ULTRIS 5** emerges as the **most affordable** and versatile model, positioning itself as an ideal entry-level choice for a wide range of applications. Its **compact and user-friendly** design facilitates easy handling and operation, ensuring a seamless user experience. With swift performance featuring a rapid 75 Hz frame rate, this camera excels in efficient data acquisition, catering to dynamic scenarios. Notably, its adaptability is enhanced through support for lens changes using a **C-Mount adapter**, enabling flexibility across diverse applications.

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SWIR Snapshot Pioneer

ULTRIS SWIR 1

Hyperspectral Snapshot SWIR Camera at Video Rates

The **ULTRIS SWIR 1** stands as the pioneering hyperspectral snapshot SWIR camera, leveraging cutting-edge light field technology. Distinguished by its remarkable speed, boasting an **80 Hz** frame rate, it proves highly effective in capturing dynamic scenes with precision. Covering the SWIR range from **980 to 1650 nm**, this camera provides unique spectral insights essential for a myriad of applications. Notably adaptable, it allows for lens changes through a **C-Mount adapter**, further enhancing its versatility across a diverse range of applications..

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UXG Gimbal

ULTRIS gimbal for DJI M300/350 RTK

Our gimbal designed exclusively for the **DJI M300/350 RTK**. The UXG Gimbal integrates the **X20 Plus**, the major model for UAV acquisitions, onto the M300, making it the perfect choice for your next mission.

The gimbal connects seamlessly via the **DJI Skyport**, making it easy to set up and use. With a built-in Mini PC, you record image data and GPS data gathered from the M300, giving you valuable insights into your flight data.

The gimbal also comes with the **Cubert Touch** software accessible in the **DJI Controller**, allowing you to control the camera and adjust the settings with ease. And, with the camera triggered by the drone, you can be sure that you're capturing exactly what you need to make informed decisions.

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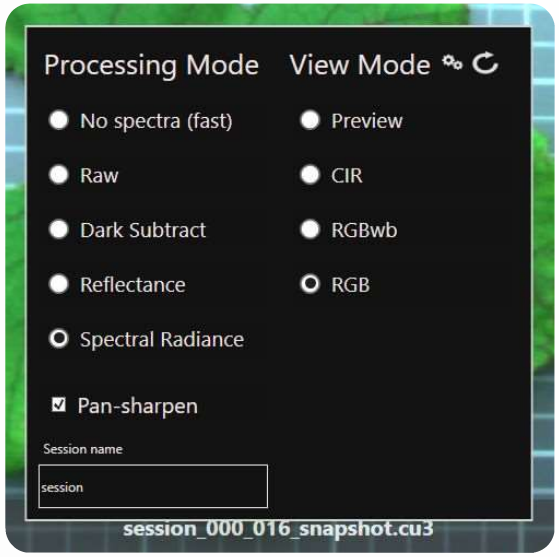
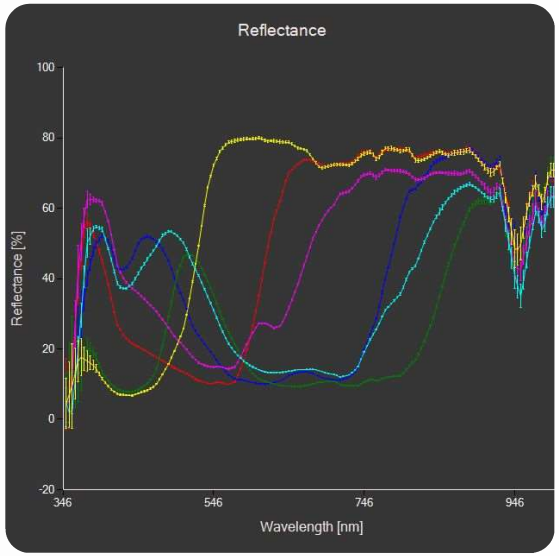
Radiometric Calibration

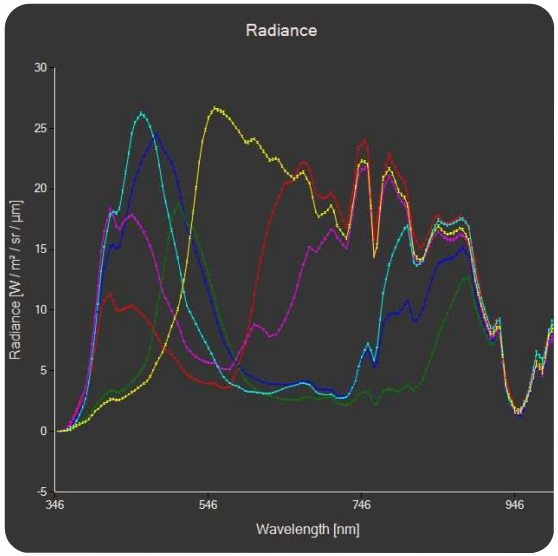
Over the past few years, we have made significant advancements to our basic software, which we are excited to share with our customers.

Thanks to our improved manufacturing capabilities, we are now able to perform radiometric calibration on all camera products. This means that all of our cameras, in addition to the well-known data formats of **Raw Data** and **Reflectance**, are now able to take **Radiance** data as well. This is crucial for any calibration process, whether it's in-field or in-lab, or for the precise characterization of light, just to name a few examples.

Reflectance, which is the dimensionless ratio of reflected to incident radiation, and radiance, which describes the energy flux leaving the surface and has a physical unit (W/m² sr nm), are both now supported.







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Cubert CUVIS HSI Software

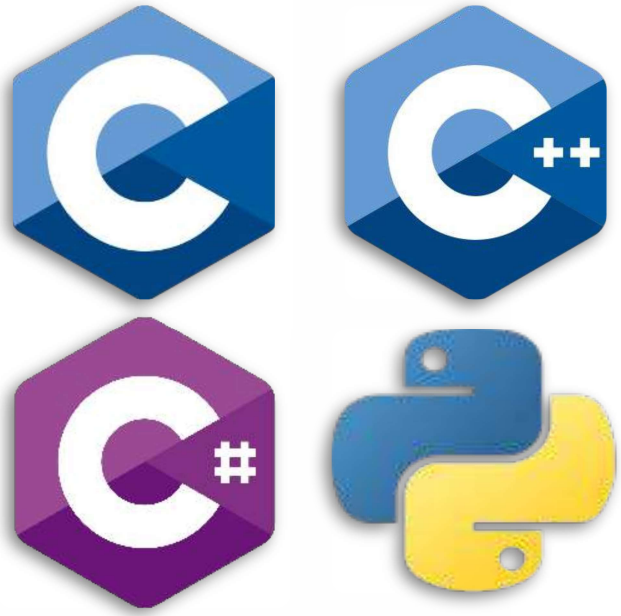
Our latest software suite, **Cubert CUVIS 3.2.1 Ginger**, still includes the GUI (Cubert **Touch**) and the backend (Cubert **Core**) for Windows-based systems, now equipped with more features, such as the much more sophisticated **export tool**.

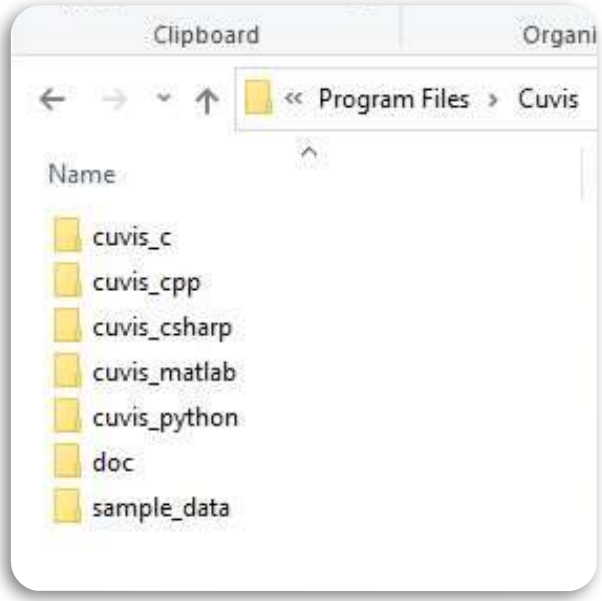
Introducing the powerful and versatile **CUVIS SDK** - the ultimate solution for developers looking to create advanced imaging applications!

Built on **C Code**, our SDK offers unparalleled flexibility and performance for your development needs. With additional wrappers for **C++, C#**, and **Python (3.9)**, you can choose the language that best suits your development workflow.

Our SDK is available for **Windows 10**, **11**, and **Ubuntu 20.04**, making it easy to integrate into your existing environment. Plus, with all the functionalities available in the GUI, you can create high-performance applications with ease.

With our **doxygen documentation**, you can get up and running quickly, while simple examples for all wrappers for measurement manipulation and capturing make it easy to get started. And to make things even easier, we've included sample data so you can dive right in and start exploring the full capabilities of the SDK.





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Comparison of new Key Software Features

Key Features	Cuvis 2.9 Fuchsia	Cuvis 3.2 Ginger
GUI		
❖ GUI Bright Mode for improved Outdoor Visibility	⊖	✓
❖ GUI Colorblind Mode	⊖	✓
❖ Gallery Mode	✓	✓
❖ Integration of the advanced Export Tool	⊖	✓
❖ General Warning for poor Data Quality	✓	✓
❖ Detailed Quality Warnings	⊖	✓
Backend		
❖ Reading of proprietary .cu3 files	✓	✓
❖ Recording of Multi-File Data Format (.cu3)	✓	⊖
❖ Recording of Session files (.cu3s) incl. Calibration Data	⊖	✓
❖ Improved Latency and Processing Speed	⊖	✓
❖ Hardware Binning (optional)	⊖	✓
❖ Extended Language Support (AR,DE,EL,EN,ES,FR,HE,NL,UK,ZH)	⊖	✓
❖ Ubuntu 20.04 Support	⊖	✓

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Comparison of new Key Software Features

Key Features	Cuvis 2.9 Fuchsia	Cuvis 3.2 Ginger
SDK		
❖ SOAP Client	✓	–
❖ SDK (C, C++, C#, Python, Matlab)	–	✓
❖ Access to Community Hub	–	✓
Supported Camera Models		
❖ Firefly 185	✓	–
❖ Firefly V185	✓	✓
❖ Firefly 285	✓	–
❖ Firefly 485	✓	–
❖ ULTRIS 5	✓	✓
❖ ULTRIS X20	✓	✓
❖ ULTRIS X20 Plus	✓	✓
❖ ULTRIS XM	–	✓
❖ ULTRIS SWIR 1	–	✓

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