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S1-EVK2b Multispectral Imager Evaluation Kit

Spectricity's evaluation kit allows users to test the full functionality of the S1 multispectral image sensor and start developing applications based on multispectral imaging.

Description

S1-EVK2b is a plug-and-play evaluation kit (EVK) for evaluation of the S1 multispectral image sensor with SVGA resolution (864 x 648 format) alongside a 5Mpix RGB image sensor. The S1 sensor provides 16 color channels covering both the visible and Near-IR spectrum (400-850nm) and is ideally suited for applications like Illuminant detection, Skin tone detection, Skin health, Cosmetics, Industrial inspection, Machine vision, Security, and many others. The S1 multispectral image sensor is based on pixelated spectral filters, integrated on-chip, and captures full spectral images per frame, no scanning is involved.

The S1 sensor is integrated in the S1-M camera module and includes fully calibrated optics alongside the RGB imager. The NVIDIA Jetson computer included with the EVK runs the multispectral and RGB processing pipelines and converts RAW images into distortion-corrected multi-channel images with equalized spectral responses across the field of view.

The camera allows for a direct connection to a PC. The EVK is accompanied with a simple software GUI and Python API supporting basic camera control and frame grabbing, displaying images, video streams and spectra, as well as basic functionality for RGB-spectral geometrical image alignment.

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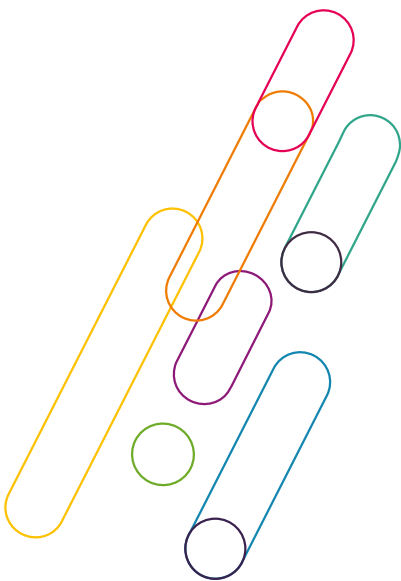
Box content

The EVK contains the following items:

- **Camera module**

- **NVIDIA Jetson Xavier module - connecting the camera to a PC**

- **12V power supply to power the Jetson module**

- **HDMI cable to connect camera module to Jetson**

- **USB-C cable to connect Jetson to laptop**

- **Mini tripod to fix camera module**

- **Macbeth chart for camera calibration check**

- **White reference chart**

The hardware

The S1-EVK2b dual camera unit consists of a **co-packaged S1-M spectral camera module and 5Mpix RGB image sensor**, both compactly integrated with fixed focus lenses. The dual camera unit is equipped with 1/4-20 UNC threads to enable tripod mounting.

RGB camera   S1-M

S1-EVK2b dual camera unit

An **NVIDIA Jetson computer** is included with the EVK to process the imaging pipelines and provide the interface with the PC of the user. The dual camera unit is connected to the Jetson platform through an HDMI cable. The interface between the user's computer and Jetson is provided by a separate USB-C cable.
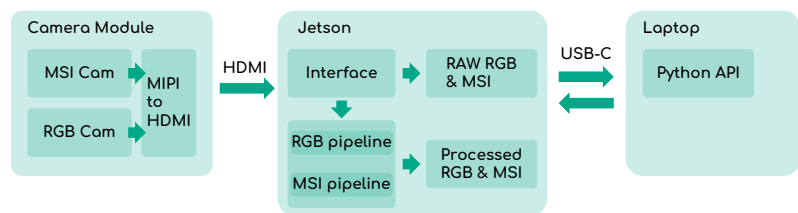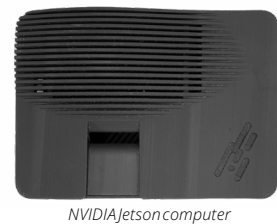
NVIDIA Jetson computer

Figure 1. Block diagram of the image processing architecture

Interface and image pipeline

The NVIDIA Jetson runs a multispectral as well as a RGB image processing pipeline. Both pipelines convert the RAW mosaiced image data of the respective cameras into distortion-corrected multi-channel images with equalized spectral responses across the field of view. In addition, we provide stereo alignment of both images for image fusion applications.

Python API and SDK
The user is given access to the camera through an intuitive Python API supporting basic camera settings (exposure time, frame rate) and processing pipeline configuration (pipelines on/off, viewpoint correction on/off), and frame grabbing in default and RAW mode. In addition, the Python API enables access to some camera calibration data after the processing pipeline (camera projection matrices, stereo alignment, spectral responses).
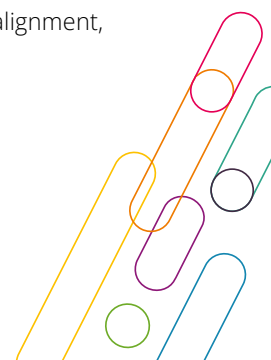
A Software Development Kit (SDK) using the API enables users with the freedom to develop their own algorithms tailored to their specific needs. The SDK also contains advanced features such as HDR capture and proof-of-concept applications such as automatic white balancing (AWB).

GUI software

The evaluation kit is also delivered with a Graphical User Interface (GUI), which provides a plug'n'play experience for quick exploration and collection of data. The GUI allows immediate viewing of S1 and RGB images side-by-side, review of the spectra, sensor control settings, data collection, and even training of simple detection algorithms on the fly. MacOS, Windows and Linux are supported.
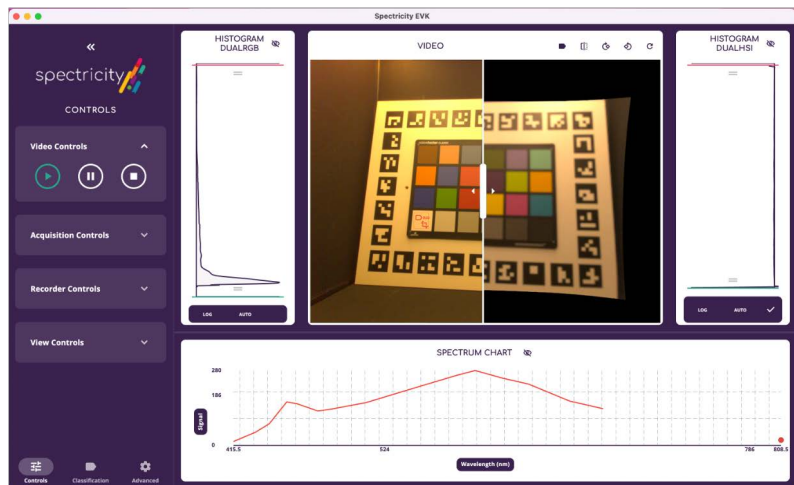

Figure 2. S1-EVK2b Graphical User Interface (GUI)

Optical specifications

	Multispectral Camera	RGB Camera
Spectral range	400 - 850 nm	400 - 680 nm
Number of spectral channels	15 visible + 1 IR	3
Spatial resolution	SVGA (864x648)	5Mpix (2624x1992)
Frame rate	14 fps (fixed)	14 fps (fixed)
FoV	77°	97°
F-number	2	2.2

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Mechanical Information

Dual camera unit dimensions (W x L x H)	40 x 52 x 23 mm
Dual camera unit weight	45g
Camera connection	HDMI
Jetson module dimensions (W x L x H)	125 x 93 x 41 mm
Jetson module weight	352g
Jetson module connection	USB-C (to computer) HDMI (to camera) 12V (to power supply)