



# Unispectral Multispectral Imaging Guidelines

## Document Details

Purpose	Instructions and guidelines for correct usage of Unispectral Camera
Scope	UNS Monarch - UNS53000 Multispectral Camera
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### 1). **Background**

This document purpose is to provide recommended guidelines and instructions for using our multispectral camera to produce a good quality multispectral images.

For basic instructions of using the Monarch camera app refer to:

[Monarch Application User Guide.pdf](#)

## 2). General guidelines

### Important note:

It is recommended to conduct the first user tests with the product in a controlled environment (as much as possible), though at the implementation phase it can be used at the standard user scenario.

- 2.1). **Environment** – the environment conditions should be controlled and steady (Humidity, temp etc.)
- 2.2). **Illumination** - try to keep a uniform illumination conditions. it is important for the image processing phase.
- 2.3). **Camera positioning**
  - 2.3.1). The Camera should be stabilized to reduce vibrations. (We recommend using a tripod).
  - 2.3.2). Pictures angle uniformity – for taking a series of images of the same object type, try to take all pictures from the same viewing angle.
- 2.4). **Object location** in FOV – make sure that the required object is located at the image center. where the camera multispectral measurement is most effective.



- 2.5). **Use Black diffusive background (if applicable)**

Example:



## 2.6. Spectralon

- 2.6.1). It is highly recommended to use a Spectralon (white balance material with equal reflectance properties across the NIR range (600-1000 nm))
- 2.6.2). It is important for standardizing the results at the data analysis phase – to overcome the challenge of changing light conditions.

$$\text{Ref}_{\text{target}} = \frac{(\text{DN}_{\text{Object}} - \text{DN}_{\text{dark}})}{(\text{DN}_{\text{panel}} - \text{DN}_{\text{dark}})} / \text{Ref}_{\text{panel}}$$

- 2.7). **Gain / exposure settings** – make sure to set the Gain and Exposure values correctly to prevent important image data lost. (More details below)

## 2.8. RGB image

- 2.8.1). In addition to the multispectral cube, it is recommended to take an additional RGB image.
- 2.8.2). Preferably from the same angle.
- 2.8.3). You can use a mobile phone or a simple PC web camera.

### 3). Indoor environment guidelines

- 3.1). Use a steady robust jig to stabilize the camera and keep a uniform distance.
- 3.2). Use NIR light source (Halogen lamp or similar).
- 3.3). Place the object on black background
- 3.4). Take a reference image of a Spectralon.
- 3.5). Indoor set-up example:



#### 4). Outdoor environment guidelines

- 4.1). Try to avoid shading and changing illumination as much as possible.
- 4.2). Stabilize the camera.
- 4.3). Exposure – outdoor conditions are very sensitive to over exposure, make sure to set the exposure correctly for all bands.
- 4.4). Take an image of a Spectralon (two options):
  - 4.4.1). At the same frame of the object image (as shown below)
  - 4.4.2). As a separate image every 10-15 min
- 4.5). Outdoor set-up example



## 5). Steps for capturing a spectral cube

- 5.1). Connect and turn on the camera.
- 5.2). Camera positioning
  - 5.2.1). Choose a clear and uniform view angle - try to take all images of the same object from the same angle.
  - 5.2.2). Distance: For best results place the object 50-90 cm in front of the camera.
  - 5.2.3). Object centering – make sure that the required object is located at the image center.
- 5.3). Stabilize the camera using a tripod (or similar).
  - 5.3.1). To reduce vibrations and improve the image quality.
- 5.4). Gain / exposure settings
  - 5.4.1). Gain
    - 5.4.1.1). The gain value should be 1 (unless there is not enough light source)
    - 5.4.1.2). Increasing the gain value may lower the image quality.
  - 5.4.2). Exposure
    - 5.4.2.1). Preview the image of each band and make sure none of the bands are saturated (over exposure)
    - 5.4.2.2). In case one the bands is saturated – reduce the exposure time by increasing the exposure parameter [ 1/X ].
    - 5.4.2.3). Keep reviewing all bands and change the exposure accordingly until none of the bands is saturated.

### Note:

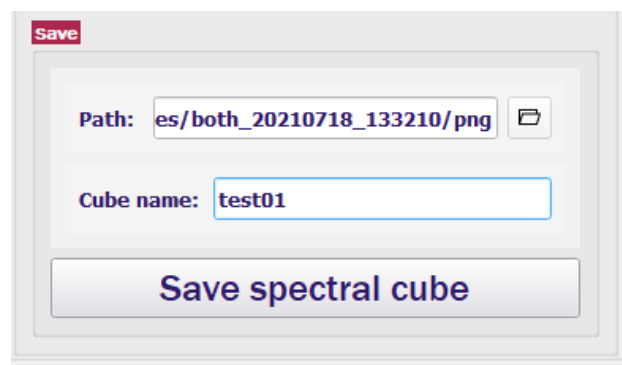
Refer to the [Image capturing samples](#) chapter below for examples.

- 5.5). Set the directory path for the saved images.
- 5.6). Set the cube name.

### Note:

A current timestamp will be added automatically to the file name.

- 5.7). Press **Save spectral cube** button.



The screenshot shows a software dialog box titled "Save". It contains two input fields: "Path:" with the value "es/both\_20210718\_133210/png" and a folder icon, and "Cube name:" with the value "test01". At the bottom of the dialog is a large button labeled "Save spectral cube".

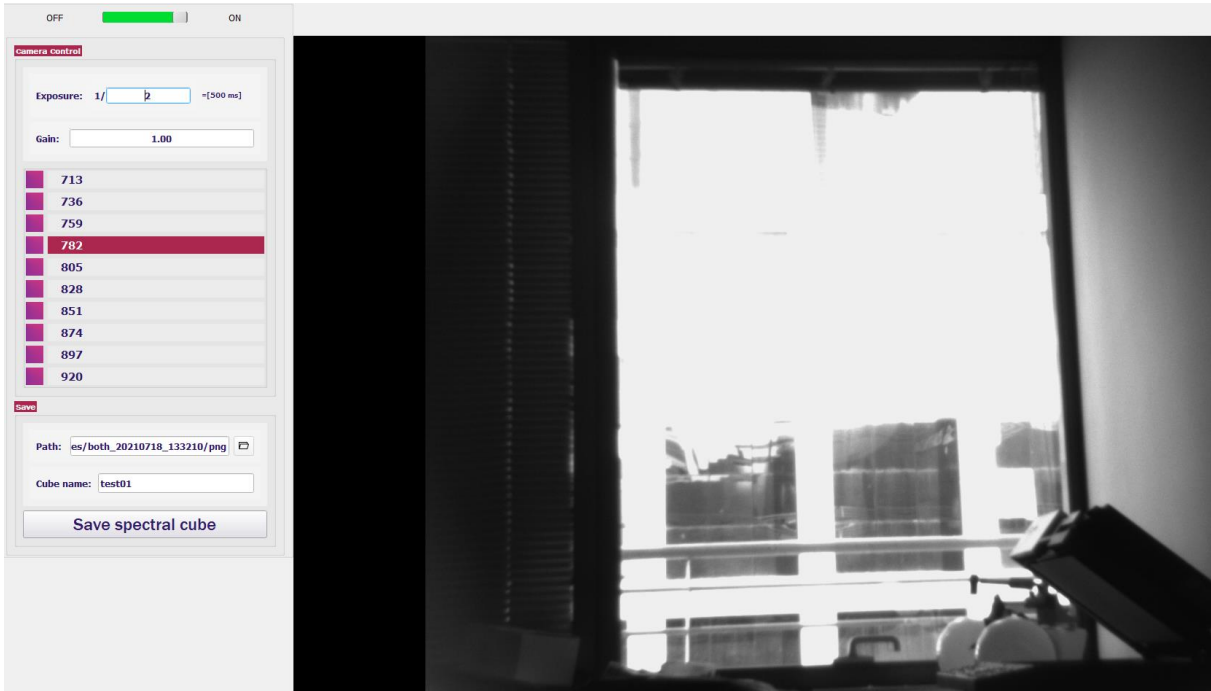
## 6). Image capturing samples

6.1). Exposure settings example

6.1.1). Example of a saturated image

6.1.1.1). Band = 782

6.1.1.2). Exposure = 1 / 2



6.1.2). Example of a valid image

6.1.2.1). Band = 782

6.1.2.2). Exposure = 1 / 20





6.2). Outdoor image capturing sample with Spectralon.

Valid exposure



Over exposure



6.3). Band's selection example.

Note:

Unless you know exactly which specific bands are needed for your project, it is highly recommended to capture and save all 10 bands.

All 10 bands will be saved

camera control

Exposure: 1/  =[500 ms]

Gain:

<input type="checkbox"/>	713
<input checked="" type="checkbox"/>	736
<input type="checkbox"/>	759
<input type="checkbox"/>	782
<input type="checkbox"/>	805
<input type="checkbox"/>	828
<input type="checkbox"/>	851
<input type="checkbox"/>	874
<input type="checkbox"/>	897
<input type="checkbox"/>	920

Save

Path:

Cube name:

Save spectral cube

Only 9 bands will be saved  
(Band 874 is excluded)

camera control

Exposure: 1/  =[500 ms]

Gain:

<input type="checkbox"/>	713
<input type="checkbox"/>	736
<input checked="" type="checkbox"/>	759
<input type="checkbox"/>	782
<input type="checkbox"/>	805
<input type="checkbox"/>	828
<input type="checkbox"/>	851
<input checked="" type="checkbox"/>	874
<input type="checkbox"/>	897
<input type="checkbox"/>	920

Save

Path:

Cube name:

Save spectral cube