HySpex models overview

All HySpex cameras (except ODIN) can be used for both ground based and airborne applications. The cameras can be delivered with a wide range of close-up lenses, making them very versatile and ideal for a wide range of applications requiring different spatial resolutions without compromising the optical performance of the system.

Main specifications

<table>
<thead>
<tr>
<th></th>
<th>VNIR-1024</th>
<th>VNIR-1600</th>
<th>VNIR-1800</th>
<th>SWIR-384</th>
<th>ODIN-1024</th>
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</thead>
<tbody>
<tr>
<td>Spectral sampling</td>
<td>400 – 1000 nm</td>
<td>400 – 1000 nm</td>
<td>400 – 1000 nm</td>
<td>930-2500 nm</td>
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<tr>
<td>Spatial pixels</td>
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<td>1600</td>
<td>1800</td>
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<td>1024</td>
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<td>3.26 nm</td>
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<td>17°</td>
<td>16°</td>
<td>15°</td>
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<tr>
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<td>12 bit</td>
<td>16 bit</td>
<td>16 bit</td>
<td>16 bit</td>
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<tr>
<td>Noise floor</td>
<td>11 e⁻²</td>
<td>40 e⁻²</td>
<td>2.4 e⁻²</td>
<td>150 e⁻²</td>
<td>2.4 e⁻²</td>
</tr>
<tr>
<td>Dynamic range</td>
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<td>1000</td>
<td>20000</td>
<td>7500</td>
<td>37000</td>
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<tr>
<td>Peak SNR</td>
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<td>&gt;200</td>
<td>&gt; 255</td>
<td>&gt; 1100</td>
<td>&gt;500</td>
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<td>180 fps</td>
<td>450 fps</td>
<td>180 fps</td>
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<td>6 W</td>
<td>30 W</td>
<td>30 W</td>
<td>60 W</td>
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<td>36 – 9.9 – 15 cm</td>
<td>39 – 9.9 – 15 cm</td>
<td>38 – 12 – 17.5 cm</td>
<td>113.4 – 42.3 – 72.6 cm</td>
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<td>4.6 kg</td>
<td>5.0 kg</td>
<td>5.7 kg</td>
<td>105 kg</td>
</tr>
</tbody>
</table>

(VNIR | SWIR)
HySpex VNIR-1800

The new HySpex VNIR-1800 hyperspectral camera from NEO, is developed for field, laboratory, airborne and industrial applications.

HySpex VNIR-1800 utilize a cutting edge actively cooled and stabilized scientific CMOS detector. This makes VNIR-1800 the ideal camera for high-end data acquisitions where high radiometric accuracy is required.

The dynamic range of 20 000 ensures outstanding SNR levels even in darker areas of an image of highly dynamic scenes. With a max frame rate of 180 fps, combined with aberration corrected optics and high optical throughput (f/2.5), HySpex VNIR-1800 offers a unique combination of data quality, high speed and sensitivity.

A wide range of close-up lenses allows the use of the camera at working distances ranging from a few cm with a spatial resolution of 24 µm, to infinity for e.g. airborne remote sensing.

Flight line with vegetation enhanced in red to the right.

Main specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral sampling</td>
<td>400 – 1000 nm</td>
</tr>
<tr>
<td>Spatial pixels</td>
<td>1800</td>
</tr>
<tr>
<td>Spectral channels</td>
<td>182</td>
</tr>
<tr>
<td>Spectral sampling</td>
<td>3.26 nm</td>
</tr>
<tr>
<td>FOV</td>
<td>17°</td>
</tr>
<tr>
<td>Pixel FOV across/along</td>
<td>0.16/0.32 mrad</td>
</tr>
<tr>
<td>Bit resolution</td>
<td>16 bit</td>
</tr>
<tr>
<td>Noise floor</td>
<td>2.4 e−</td>
</tr>
<tr>
<td>Dynamic range</td>
<td>20000</td>
</tr>
<tr>
<td>Peak SNR (at full resolution)</td>
<td>&gt; 255</td>
</tr>
<tr>
<td>Max speed</td>
<td>180 fps</td>
</tr>
<tr>
<td>Power consumption</td>
<td>30 W</td>
</tr>
<tr>
<td>Dimensions (l–w–h)</td>
<td>39 – 9.9 – 15 cm</td>
</tr>
<tr>
<td>Weight</td>
<td>5.0 kg</td>
</tr>
</tbody>
</table>
The new HySpex SWIR-384 hyperspectral camera from NEO, is developed for field, laboratory, airborne and industrial applications. The new state of the art MCT sensor with cooling down to 150K yields low background noise, high dynamic range and exceptional SNR levels.

With a max frame rate of 450 fps, combined with an aberration-corrected optical system with high optical throughput (f/2), the data quality, speed and sensitivity is truly state of the art.

A wide range of close-up lenses allows the use of the camera at working distances ranging from a few cm with a spatial resolution of 53 µm to infinity for e.g. airborne remote sensing.
HySpex ODIN-1024

HySpex ODIN-1024 is a next generation state-of-the-art airborne hyperspectral imager, covering the spectral range from 400 to 2500 nm.

Perfect co-registration between 1024 spatial pixels for VNIR and SWIR is achieved by employing a novel common fore-optics design.

In addition to the extreme resolution, the unique design provides high sensitivity and low noise, low spatial and spectral misregistration (smile and keystone).

In addition to its supreme data quality, HySpex ODIN-1024 includes real-time data processing functionalities such as real-time georeferencing of acquired images. It also features built-in on-board calibration system to monitor the stability of the instrument.

Main specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral sampling</td>
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<tr>
<td>Spatial pixels</td>
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<td>Spectral channels</td>
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<tr>
<td>Spectral sampling (VNIR</td>
<td>SWIR)</td>
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<tr>
<td>FOV</td>
<td>15°</td>
</tr>
<tr>
<td>Pixel FOV across/along</td>
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<tr>
<td>Bit resolution</td>
<td>16 bit</td>
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<tr>
<td>Noise floor (VNIR</td>
<td>SWIR)</td>
</tr>
<tr>
<td>Dynamic range (VNIR</td>
<td>SWIR)</td>
</tr>
<tr>
<td>Peak SNR (at full resolution)</td>
<td>&gt;500</td>
</tr>
<tr>
<td>Max speed</td>
<td>180 fps</td>
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</tr>
</tbody>
</table>

False color VNIR and SWIR representation of flight line acquired during ODIN test flight.
Airborne Applications

High resolution and high speed, combined with low weight and power consumption, make NEO's HySpex cameras very well suited for airborne data acquisition.

A typical airborne installation consists of the HySpex cameras coupled with an airborne data acquisition unit, a navigation system (IMU/GPS) and a mounting platform.

Both actively stabilized and passively damped mounting platforms can be supplied, as well as standard mounting plates with no damping.

IMU/GPS solutions from leading manufacturers can be supplied and integrated with the cameras. Alternatively, HySpex systems can be interfaced with the customer’s existing navigational hardware.

Laboratory Setup

For lab and field use, a scanning stage is needed to scan the cameras and build the hyperspectral data cube of the scene. A user friendly table-top lab setup with translation stage, VNIR-SWIR light sources and close-up lenses can also be supplied for scanning of samples of varying sizes.

The scanning speed is automatically controlled by the data acquisition unit, based on the selected lens option. The lab rack includes a camera adjustment platform, to facilitate camera focus adjustment when using different close-up lenses.

Field Setup

For field operations, NEO supplies a range of high precision rotation stages tailored to fit the number of cameras and the operational scheme. Long-life Li-ion battery powered solutions are available for increased portability.

For fast and precise scanning of larger areas, such as a mine face, outcrop or building, NEO can supply an automatic pan-tilt scanner. By inputting the number of degrees and scan lines to scan in both the horizontal and vertical direction, the stage will automatically scan the pre-programmed area, ensuring the desired overlap between scan lines.

To ensure stable and reliable acquisitions in challenging field conditions, a rugged, yet portable, tripod is supplied. NEO supplies a variety of tripods with pan/tilt-heands that will accommodate the payload of the cameras and rotation stage used.