

# nüvü cameras

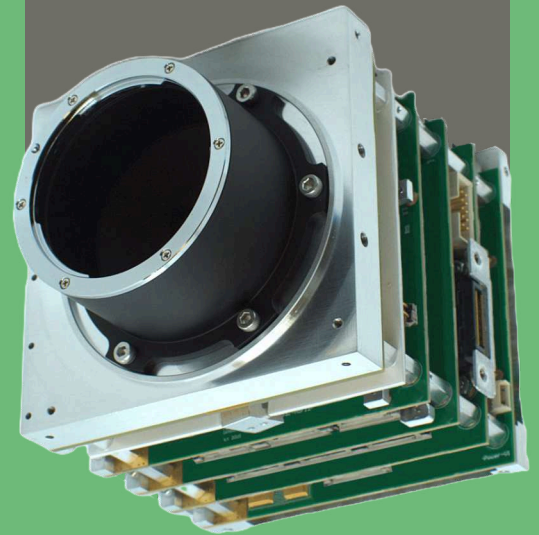
every photon counts

## nüSpace EMCCD BUILT FOR SPACE

BREAKING BARRIERS IN  
LOW LIGHT  
SPACE-BASED IMAGING

EXTREME SENSITIVITY FOR  
DEMANDING LOW LIGHT  
APPLICATIONS

CUSTOMIZABLE CAMERA  
PLATFORM FOR CUBESATS



## nüSpace EMCCD

SYSTEM PARAMETERS	Size (H W D) <sup>1</sup>	91.0 x 103.8 x 95.5 mm Tailored to fit in 1U
	Mass <sup>1</sup>	< 1.1 kg
	Power consumption <sup>2</sup>	< 15 W
	Power supply	18-28 V DC
	Thermal interface	Heat strap, contact us for more details
	Control & image interface	Camera Link
	Software interface	Software development kit (SDK) compatible with Linux & Windows
	Imaging features	Binning Multiple Region of Interest (ROI) Photon Counting More available on request
	Scanning modes	High Dynamic Range (HDR) mode Time Delay Integration (TDI) mode
	Metadata	Timestamping available
ENVIRONMENTAL CONDITIONS	Thermal Vacuum Cycling (TVAC)	-45°C to 70°C and <10 <sup>-4</sup> Torr NASA-STD-7000B
	Random vibration	6.8 g RMS, 1 min/axis, 20-2000 Hz NASA-STD-7001B
	Radiation tolerance	>25 kRad for >5 years in LEO Contact us for MEO, GEO or other
	Operating temperatures	-35 °C to 60 °C

### OUTSTANDING PERFORMANCES THANKS TO NÜVÜ'S PROPRIETARY TECHNOLOGIES

The nüSpace platform is a state-of-the-art imaging solution built to bring Nüvü's signature electronics to nanosatellites, with proven applicability to LEO, GEO and beyond.

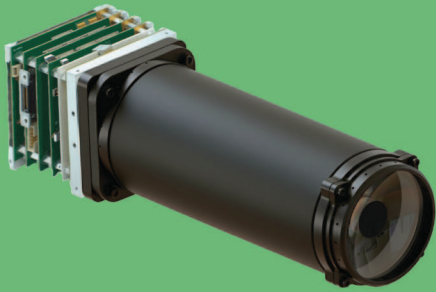
With unmatched imaging sensitivity and flexibility with customizable detectors, optics & interfaces, the nüSpace camera platform supports your novel space mission goals.

### Potential space applications :

- Nighttime & daytime Earth observation
- Space surveillance (SSA)
- Sensitive UV imaging
- Extrasolar planet imaging
- Adaptive optics
- High resolution spectroscopy

# nüSpace EMCCD

With EMCCD sensors, the nüSpace enables single photon level imaging in space, combined with innovative readout modes like our exclusive TDI and HDR modes.



Benefit from Nüvü's extensive expertise focused on sensor control electronics for sensitive imaging applications both space and ground-based.

The nüSpace is available with multiple EMCCD sensors, contact us for more specifications.

## nüSpace using Teledyne's CCD201-20 sensor

### OPTICAL CHARACTERISTICS

Operation frequencies <sup>3</sup>	10 MHz horizontal frequency 800 kHz vertical frequency
Imaging area	1024 x 1024 pixels 13 x 13 μm pixel area 13.3 x 13.3 mm effective area
Operating temperatures <sup>4</sup>	-135°C to 60°C
Frame rate	8.5 fps, faster with ROI
Readout noise <sup>5</sup>	<0.1 ē with EM gain
Linearity	>99%
Clock-induced charges <sup>5</sup>	0.0015 ē/pixel/frame
Dark current <sup>5</sup>	0.00007 ē/pixel/s @ -85°C
EM gain	1-5000
Spectral range	250 - 1100 nm
Data format	16 bits, FITS images available

### WITH OPTICS (CUSTOMIZABLE)

Swath @ 500 km	7.4 km
GSD @ 500 km	7.2 m
Focal length	900 mm
Aperture	80.5 mm

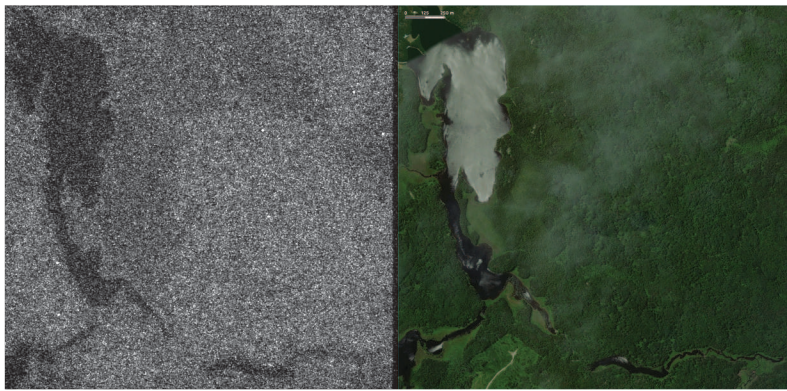


Figure 1  
Left: Nighttime nüSpace EMCCD ground image in starlight conditions taken with f/11 optics using 1 fps standard snapshot imaging with EM gain;  
Right: Comparative satellite daytime ground image.

### QUANTUM EFFICIENCY

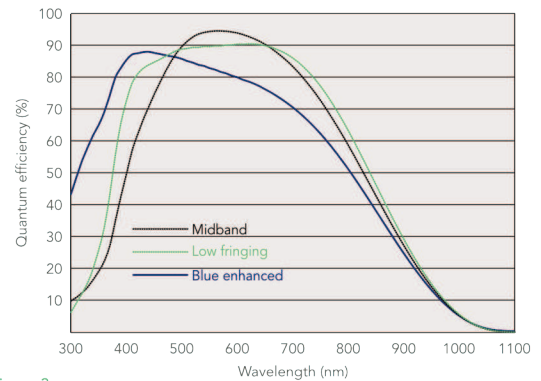


Figure 3  
Typical spectral response as a function of wavelength, as specified by Teledyne for the CCD201-20 sensor<sup>6</sup>

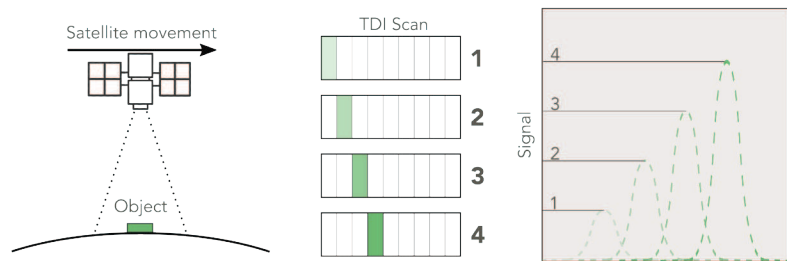
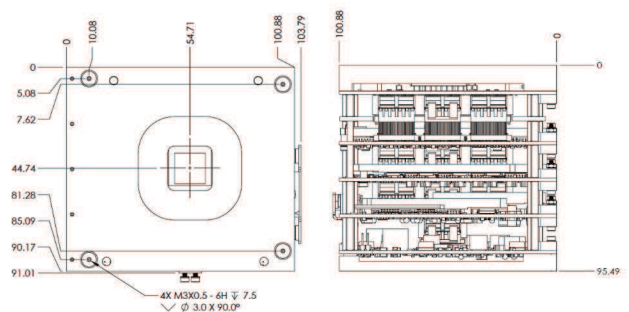


Figure 2  
TDI readout scheme. TDI allows the capture of low-light-level images at very high satellite speeds. This mode overcomes limitations in illumination by shifting the image across the sensor during integration to track a moving target, thus achieving longer exposures & higher signal without blurring.

### TECHNICAL DRAWINGS<sup>1</sup>



- 1 With standard front & back plates. Mechanical interface plates can be removed and/or modified.
- 2 Mean power. Measured at 1 FPS.
- 3 More clock speeds available upon request.
- 4 As per the EMCCD detector manufacturer's data sheet. Other configurations may exist.
- 5 Typical values measured at horizontal frequency 10 MHz, vertical frequency 800 kHz and EM Gain 1000. These numbers may vary depending on the individual EMCCD detector.
- 6 Nüvü gives only the specifications of the EMCCD detector's manufacturer for grade 1 sensors (e.g. Quantum efficiency, aesthetic specifications, blemishes).

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 CANADA



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 nüSpace Specification Sheet 3.1.5  
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