



Optical Astronomy & Adaptive Optics Applications

Raptor Photonics is a leader in **innovative**, **ultra-compact** and **price performance** camera solutions.



ASTRONOMY 2015

Overview

Raptor is a leading player in the design and development of cameras for optical astronomy and adaptive optics applications. With access to some of the most sensitive sensors in the world we have developed a range of standard “off the shelf” and custom designs offering different features and benefits in terms of resolution, speed, sensitivity, cooling, wavelength optimisation, exposure and triggering all packaged into our small and ruggedly designed cameras.

Products

Camera	Sensor Format	Wavelength (nm)	Peak QE	Resolution (Pixels)	Pixel Size (µm)	Frame Rate (Hz)	Read Noise (e-)	Dark Current (e/p/s)
Eagle	1 ½” CCD 39.1mm Diagonal	350-1100	95% @ 550nm	2048 x 2048	13.5x13.5	0.4	2.3	0.0001@ -100°C
Falcon	⅔” EMCCD	350-1100	65% @ 600nm	1004 x 1002	8x8	30	< 1	<1 @ -20°C
Kite	½” EMCCD	350-1100	52% @ 530nm	658 x 496	10x10	50	< 1	<1 @ -20°C
Osprey	1” sCMOS	350-1100	64% @ 600nm	2048 x 2048	5.5x5.5	37.5	< 9	<9 @ +15°C
Kingfisher	1” CCD	310-1100	77% @ 525nm	2758 x 2208	4.54x4.54	3	< 7	<0.08 @ +25°C
Ninox	⅔” Vis-SWIR	400-1700	85% @ 1.35µm	640 x 512	15x15	120	< 50	<1500 @ -20°C

Software

Raptor only make cameras, but we understand that we need to deliver solutions that integrate with relevant software for capture and analysis of images so we have developed solutions that work with the following software packages.

	Eagle V CCD	Falcon EMCCD	Kite EMCCD	Osprey sCMOS	Kingfisher CCD	Ninox InGaAs
EPIX XCAP / XCLIB	✓	✓	✓	✓	✓	✓
MicroManager	✓	✓	✓	✓	✓	✓
Genika Astro (Airlabs)		✓	✓		✓	✓
LabView	✓	✓	✓	✓	✓	✓
Redlogix / Astro-Control	✓	✓	✓		✓	✓

NINOX

Longer exposures in SWIR

- Cooled to -20°C
- High sensitivity imaging from 400nm to 1700nm

Applications: Planetary Transient Studies

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Introducing Scientific SWIR! The Ninox-640 is a cooled digital VIS-SWIR camera enabling high sensitivity imaging from $0.4\mu\text{m}$ to $1.7\mu\text{m}$. The $15\mu\text{m} \times 15\mu\text{m}$ pixel pitch enables highest resolution VIS-SWIR image and with less than 50 electrons readout noise the Ninox enables the highest VIS-SWIR detection limit. With TEC and liquid cooling to -20°C the Ninox reduces dark current to $\sim 1,500\text{e/p/s}$, allowing longer exposures.



Images of Orion Nebula

VIS



VIS SWIR



Courtesy of Alain Klotz

SWIR ONLY



Courtesy of Lyu Abe

EAGLE V

Long exposure and high resolution

- Deep Cooled CCD
- Low readout noise
- Large pixels
- Highest possible quantum efficiency

Applications: Deep Sky, Exoplanets

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The Eagle is one of the most sensitive CCD cameras in the world! Deep cooled to $\Delta 120^{\circ}\text{C}$ using PentaVac™ vacuum technology allows the camera to stare into space for longer, enabling hours of exposures without build-up of dark current. Using a CCD4240 sensor from e2v, the Eagle V offers outstanding resolution and sensitivity.



Image of Messier 42



Courtesy of Michel Boër and Alain Klotz

KITE

Speed and sensitivity

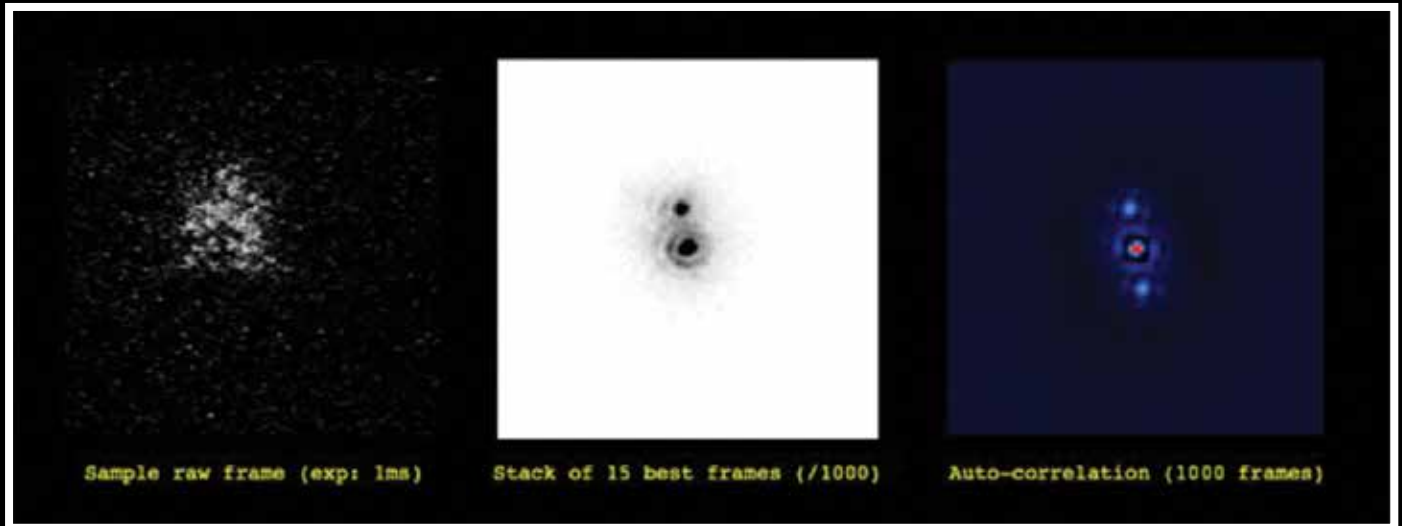
- Cooled EMCCD
- Up to 50fps full resolution

Applications: Double Stars, Adaptive Optics, Occultations

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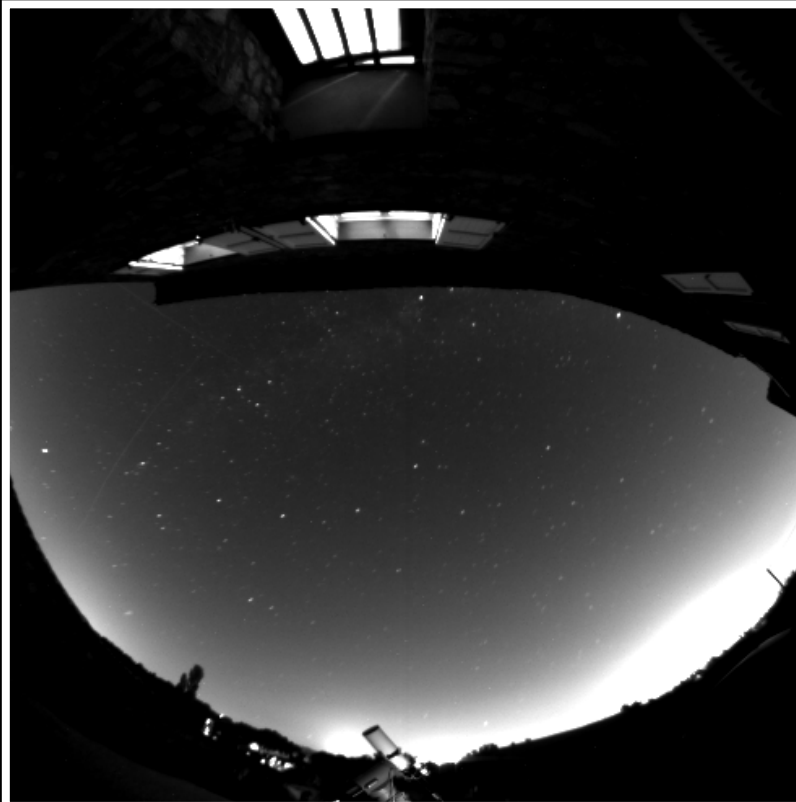


Washington Double Star Catalog



Courtesy of Jocelyn Sérot

Image of All Sky - Alcor System



Courtesy of Cyril Cavadore, Alcor System, Lyon, France

OSPREY

Resolution and speed

- 4.2MP sCMOS
- 37.5 Hz Full Frame

Applications:
Solar Eclipse, Lucky Imaging



HAWK

Speed and sensitivity

- EMCCD sensitivity
- Compact size and ruggedness

Applications:
All Sky Monitoring

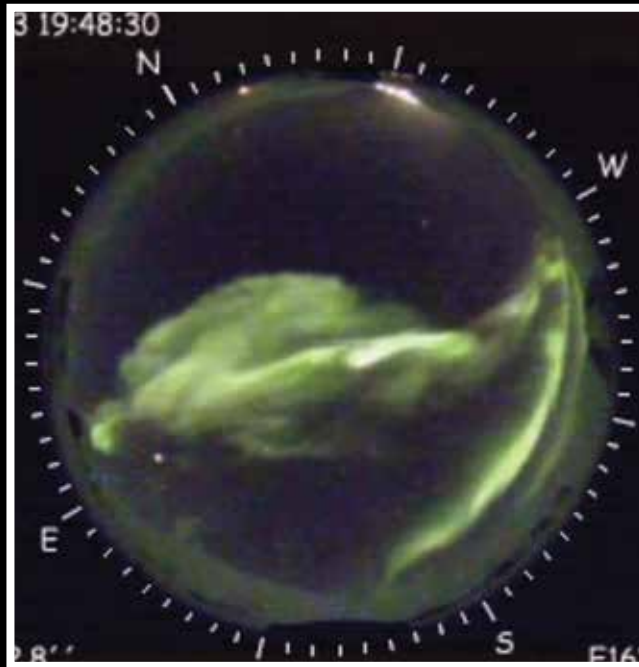


Image of solar eclipse November 3 2013 in Gabon



Courtesy of Philippe Lamy, Laboratoire d'Astrophysique

Image of Northern Lights monitoring



Courtesy of Dr. Fred Sigernes, Kjell Henriksen Observatory (KHO),
The University Centre in Svalbard

About Us / Capabilities

Raptor develop, manufacture and market a range of high quality **CCD**, **EMCCD**, **SWIR**, **CMOS** and **sCMOS** cameras targeting the global Scientific and Industrial Imaging markets, specifically for OEMs and instrumentation manufacturers.

Whatever your imaging requirements
Raptor offers the best combination of:

- Speed
- Resolution
- Size
- Ruggedness
- Sensitivity
- Range
- Cost
- Reliability

Total Solutions

And if you want a total "plug and play" solution, Raptor can provide everything you need, including the camera, lens, frame grabber, cables, leads, software, laptop / PC all packaged up in a sturdy Peli case for easy transport and shipping.



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