Boston Electronics

Lytid

Deep cooled scientific SWIR camera

SIRIS

InGaAs sensor

> FPA 640x512, 0.9- 1.7 µm

Ultra-low Read-Out Noise

> below 5e-

Vibration and Cryogenic-Free Cooler

> selectable T° down to 77 K

Ultra-high Dynamic Range

> in Lin/log mode : > 140 dB

High speed sensor

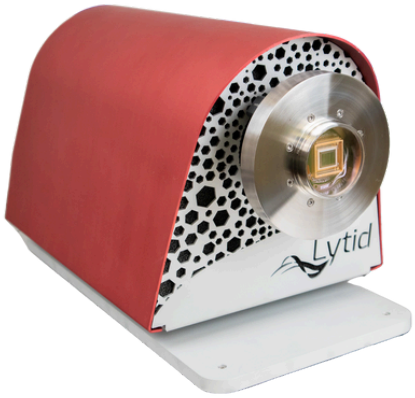
> up to 200 fps full frame

SIRIS

High-performance SWIR Camera

Short-wave **I**nfra**R**ed **I**maging **S**ystem

SIRIS is the most versatile and best performing scientific SWIR InGaAs camera on the market, combining ultra low noise, ultra large dynamic range and high speed. The camera is field proven on many observation missions at the T1M telescope of the Pic du Midi over the past couple of years. Only the most reliable components are integrated, like a vibration-less (below 1um) 200.000hrs MTBF Stirling cooler or a high-grade FPGA embedded platform for the most demanding applications you can imagine.

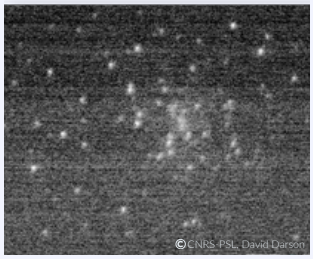


With SIRIS, SWIR photons have no where to hide from your eyes!

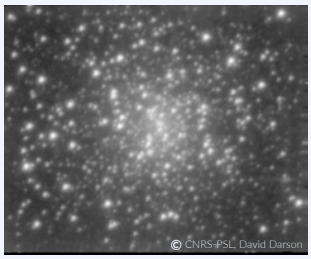
Noise reduction with Non Destructive Read Out

With SIRIS, the longer you expose, the lower the noise! Using Non Destructive Read Out (NDRO) you can read the accumulated charges during an exposure without destroying them, and therefore achieve efficient readout noise reduction. SIRIS's exclusive NRDO read-out noise reduction allows to drastically reduce the read-out noise to ***less than 5e-*** using intra-exposure frame averaging. This unique feature on the market combined with a deep-cooled sensor (77-150K) can let you acquire shot-noise limited images in ultra-low light applications.

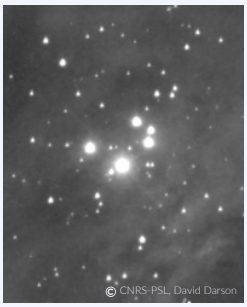
M15 : with **100 NDROs** during a 1s exposure (right). The measured noise is 14e-, resulting in a reduction of approximately ***6 times*** when compared with standard exposure (left). This is equivalent of **2 magnitude** detection gain between the two images.



STANDARD



NDRO



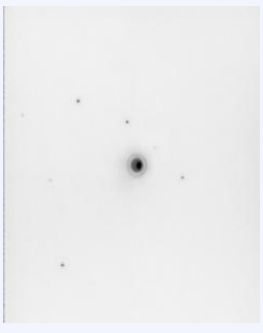
SIRIS

HUBBLE SPACE TELESCOPE
IN VISIBLE AND IR

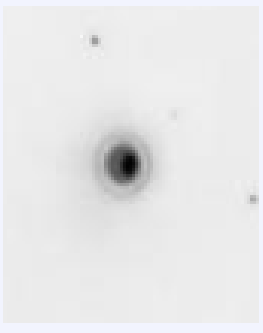
A close view of a filed in the very center of the **ORION NEBULAE** (with the trapeze). Stack of exposures of 2s from our SIRIS SWIR Camera (left) with NDRO noise reduction . On the right, the same field taken by the SWIR camera of the Hubble Space Telescope.

URANUS : Stack of 400ms subexposures with **NDRO** noise reduction. Satellites, pole clouds, and **rings** can be seen. Same image, inverted confirms rings observation.

ORIGINAL



INVERTED



Zoom on URANUS

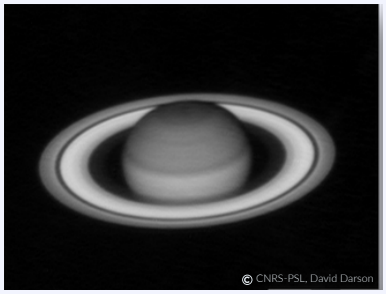
All pictures has been aquired with SIRIS on 1m Telescope at Pic du Midi

Lytid

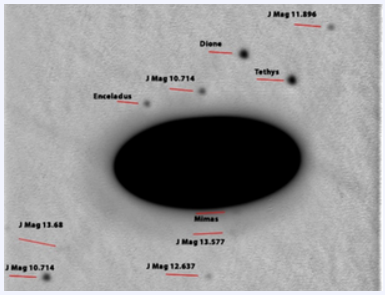
Dual read-out mode : -CTIA -Lin/log

SIRIS provides two read-out modes, full linear (CTIA) and linear/logarithmic for class-leading **>140dB** dynamic range. Three adjustable gain levels ensure flexibility to suit broad variety of illumination conditions. Long exposure time up to one hour is achievable, and selectable region-of-interest on the detector allows exceptional frame rate values from 200fps full frame up to more than 10k fps ROI.

SATURN in **Lin/log** : With just **one frame** of 4s exposure time, on the right the same image as the left one but with viewing levels streched and turn on negative to better see low signals objects.



ORIGINAL



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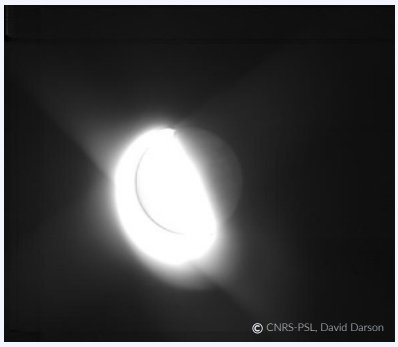


1175 nm

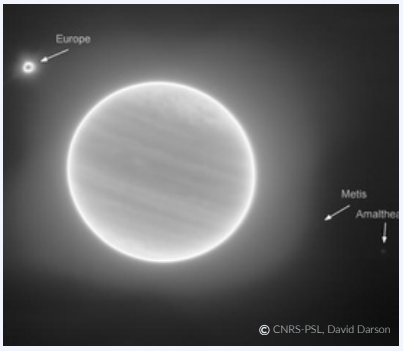
1275 nm

VENUS in **CTIA** : Dark side of Venus could be observed by SIRIS with stack of 200ms exposure time at wavelengths of **1175nm** (50nm FHWM) filter and **1275nm** (50nm FWHM) filter with **no NDRO**.

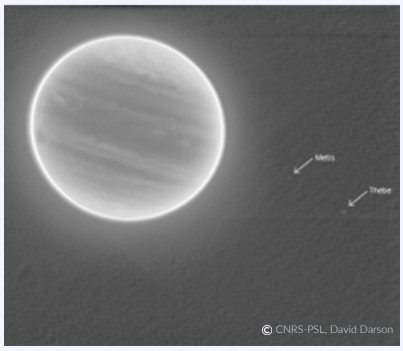
Highest dynamic range, lowest read noise ever achieved

Thanks to our new ultra-HDR (uHDR) method combine with the use of NDRO, the best ultra-high dynamics range images could be achieved. This is possible with the use of CTIA mode (ie full linear), on the same acquisition of very high signals and very low ones.

JUPITER with **METIS** and **AMALTHEA** or **THEBE** on the same raw images. The two images are from a stack of 32 1s sub-exposure with **NDRO** use for noise reduction combined with **uHDR**. The magnitude of Jupiter is **-2.7** and Metis is **17.5**. Magnitude difference of **20.3** on this image with only use of NDRO during 1s sub-exposure frame.



JUPITER, METIS, AMALTHEA



JUPITER, METIS, THEBE

All pictures has been aquired with SIRIS on 1m Telescope at Pic du Midi

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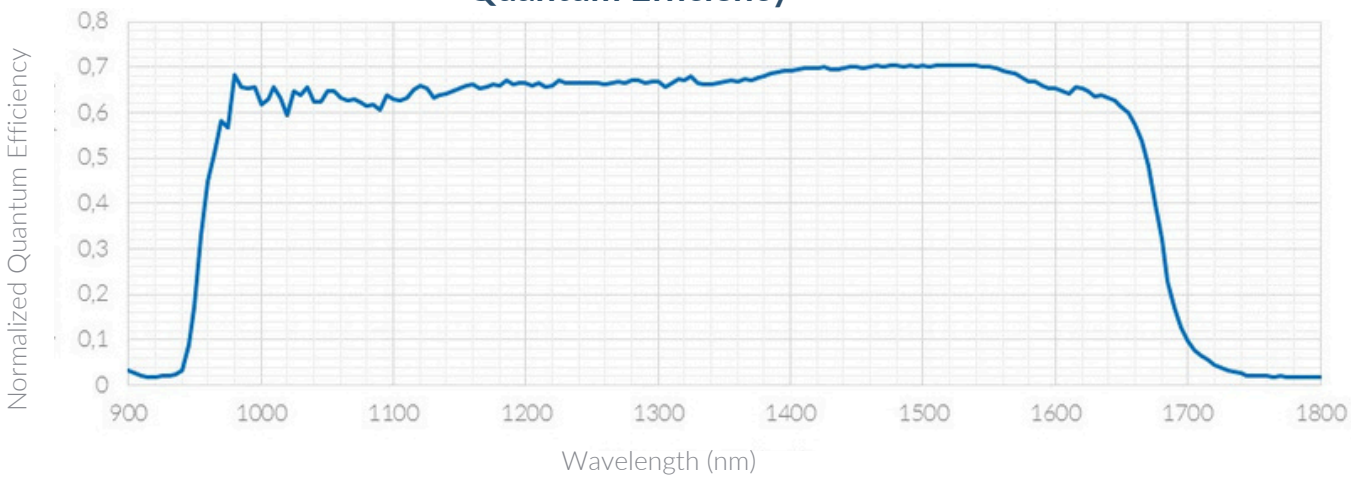
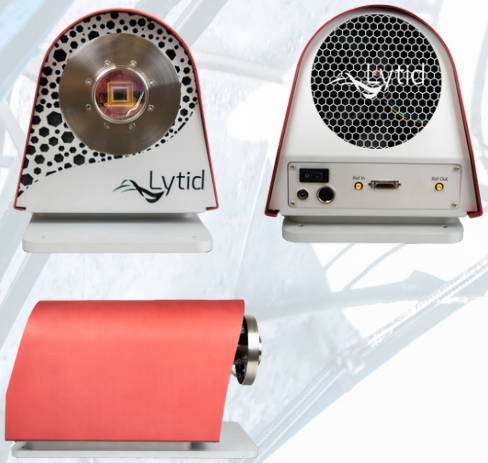
Quantum Efficiency





Specifications	SIRIS
Detector	
Type	InGaAs
Resolution	640 x 512
Spectral Response	0.9 – 1.7 µm
Pixel size	15 µm
Dual-mode sensor	CTIA-linear Lin/Log
Performance	
Dark signal	<10e-/s @ 150 K
Gain	3 pixel-gain levels
Read-out-modes	Standard & NDRO
Read-out-Noise	<50e- lin mode, high gain <5e- NDRO
Well depth	300ke-, lin mod, low gain
Dynamics	>140dB, lin/log
Digitization	16-bit
Shutter	Global & NDRO
Region-of-interest	ROI on detector, configurable
Frame-rate	200 fps full frame > 10 000 fps with ROI
Exposure-time	From 1 µs to 1h
Trigger	Trig. In and Out (to 10ns)
Communication	Camera link
Cooling	300 K–77 K, cryocooler
Dimensions	41 x 25 x 23 cm
Weight	~10 kg

Lytid SAS
10 rue A. Domon et L. Duquet
75013 Paris - FRANCE
sales@lytid.com
www.lytid.com

US & Canada:
Boston Electronics
www.boselec.com
thz@boselec.com
+1.617.566.3821

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