



Player One

Neptune 664C Camera Manual

V1.0

Dec, 2024

Table of Contents

Product Features	3
Technical parameters	4
Product Description	5
Super AR Plus window	5
STARVIS 2 Technology	6
Non-Amp-Glow	6
Features	7
Comparison of 3 generations	7
Cutting-edge Design	8
2nd Gen – Sensor Tilt Plate	8
256M DDR3 Cache	9
DPS technology	10
Passive Cooling System	11
Overvoltage and overcurrent protection mechanism	11
Data Port	11
Performance	12
Readout Noise	13
HCG Mode	13
QE Curve	13
Mechanical Drawing	14
Package List	15
Warranty & Shipping Policy	16

Product Features

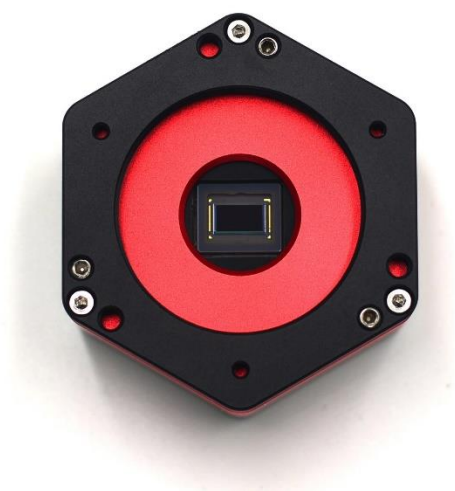


Technical parameters

Sensor	SONY IMX664 1/1.8" CMOS (color)
Diagonal	9mm
Total Pixels	4.2 Mega Pixels
Max Resolution	2704×1540
Pixel Size	2.9μm
Chip Size	7.8mm×4.5mm
Frame Rate	136FPS (10bit)
Bayer Matrix	RGGB
Shutter	Rolling shutter
Exposure Range	32μs-2000s
Readout Noise	6.1e~0.67e
QE Peak	≈91%
Full Well	38.5k e
ADC	12 bit
Data Port	USB3.0/USB2.0
Adapter	1.25" / M42X0.75
Back Focal Length	12.5mm
Protective Window	D21*1.1MM High Quality AR Plus (Anti Reflection) Multi-Layer Coating
Diameter	66mm
Weight	180g
Resolution and FPS	<p>Under USB3.0 mode</p> <p>Resolution 12bit ADC 10bit ADC</p> <p>2704×1540 93FPS 46.5FPS</p> <p>2560×1440 105FPS 52.5FPS</p> <p>1920×1080 187FPS 93FPS</p> <p>1280×720 275FPS 203FPS</p> <p>800×600 325FPS 240FPS</p> <p>640×480 398FPS 294FPS</p> <p>More resolution options could be setup in capture software!</p>

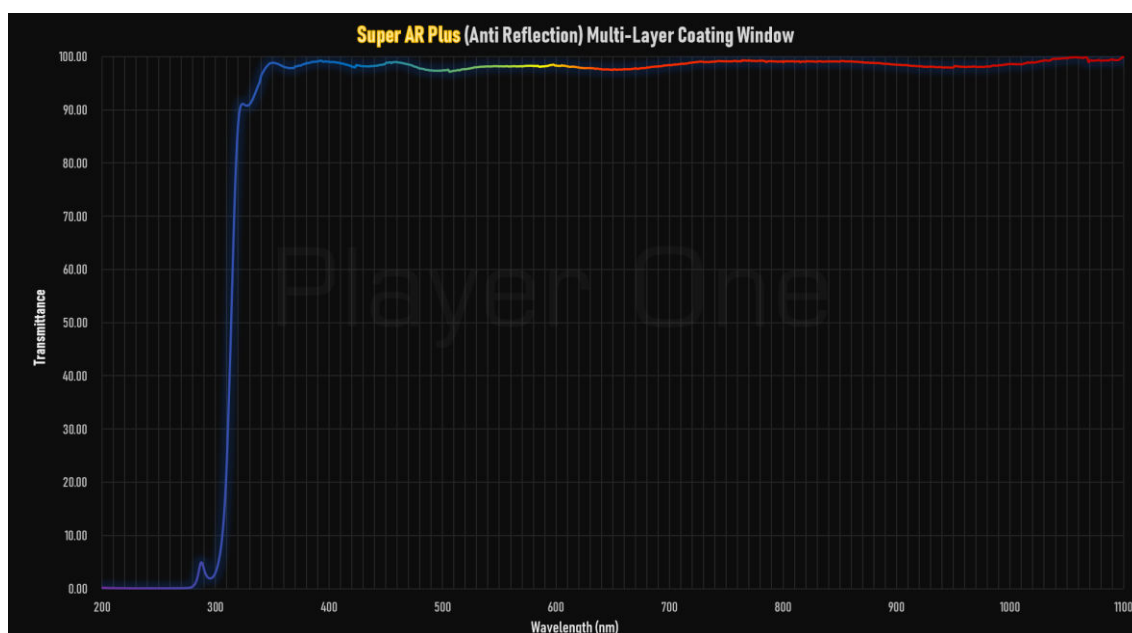
Product Description

NEPTUNE 664C opened NEPTUNE 3rd Gen gate, the newest planetary camera which developed by Player One Astronomy. A successor of Neptune-C II (IMX464) camera. **NEPTUNE 664C** camera adopts the Sony IMX664 **1/1.8" color** sensor. The **2.9um pixel size** accommodates a well depth of **38.5ke** with a total of **4.2MP** (the resolution is 2704*1540), and the diagonal is 6.46 mm.



Super AR Plus window

NEPTUNE 664C using this Super AR Plus window in front of it. This window glass can give super high transmittance from 310nm to 1100nm. This important improvement, make **NEPTUNE 664C** camera has much better performance in both Ultraviolet and NIR.



The naming of Player One Astronomy cameras is unique. For example, we name the planetary cameras after planets (They are Mercury, Venus, Mars, Jupiter, Saturn, Uranus, and Neptune, Earth is not included). The size of each planet to a certain extent represents the size of camera sensors. We will name Saturn with a 1-inch sensor camera, and for Mars, we will name it with a ½inch sensor camera. All names will be engraved on the housing of the cameras.

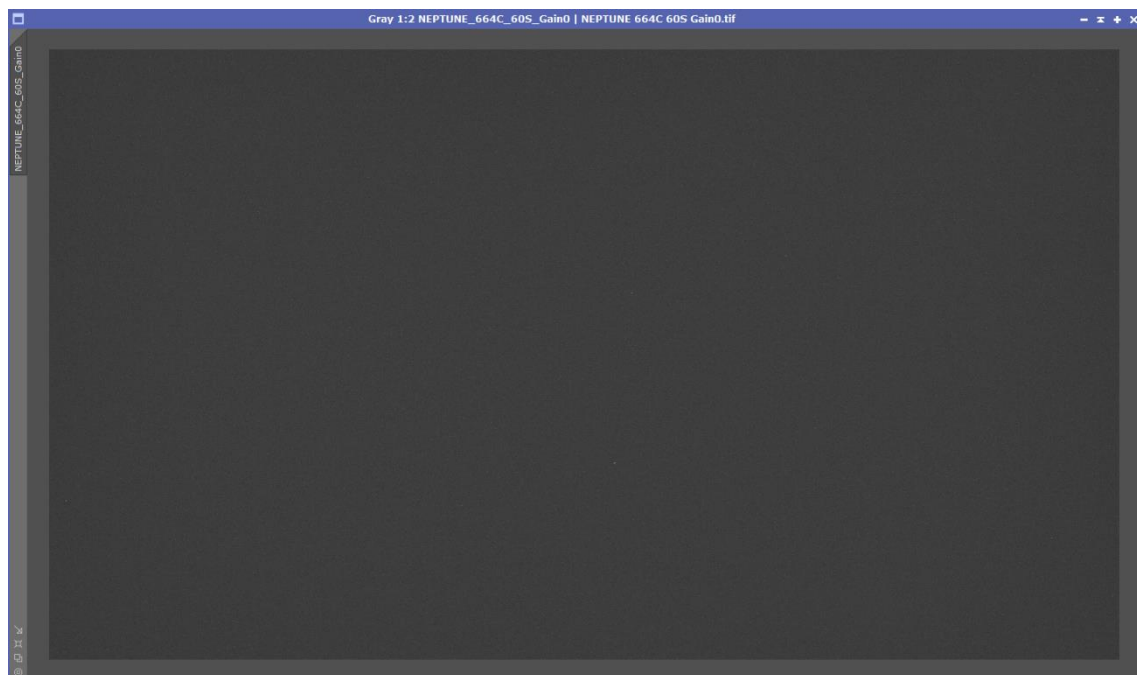
STARVIS 2 Technology

NEPTUNE 664C based on **Sony newest STARVIS 2 technology**, it is back-illuminated pixel technology used in CMOS image sensors.

Non-Amp-Glow

Biggest surprise of **NEPTUNE 664C** camera is, its dark frame is totally “dark”, whatever we strength the curve, there is no AMP glow at all!

60s dark frame of **NEPTUNE 664C** camera (resize to 50%):



Features

1/1.8"
4.2 Mega Pixels

2.9um
Pixel Size

12bit
ADC bit depth

93FPS
2704 × 1540

91%
CQE Peak

0.67e
Readout Noise

38.5Ke
Full Well

NEPTUNE 664C

3

Sony IMX664 Non-Amp-Glow Back-illuminated Color Sensor

Neptune Gen 3rd Series



Front 3P
Sensor Tilt Plate

256MB
DDR3 buffer

Super AR+
High transmittance from UV to NIR

DPS
Supported

Passive Cooling
ACS supported

USB3.0
USB Type-B port

12.5mm
Back Focal Length

Comparison of 3 generations

Player One add all our best technology into 3rd Gen **NEPTUNE 664C**. You will see the advantages, like Super AR plus window, Passive cooling system. Those features will make sure **NEPTUNE 664C** to be very competitive on the market!

	NEPTUNE-C	NEPTUNE-C II	NEPTUNE 664C
Sensor	IMX178	IMX464	IMX664
Amp-Glow	Exist	Exist	Don't Exist
NIR Enhanced	NO	YES	YES
Super AR+ window	NO	NO	YES
Passive Cooling	NO	NO	YES
Pixel Size	2.4um	2.9um	2.9um
FPS	60FPS	93FPS	93FPS
Full Well	15000e	12000e	38500e
Bit Depth	14bit	12bit	12bit
Read Noise	1.3e	0.7e	0.67e

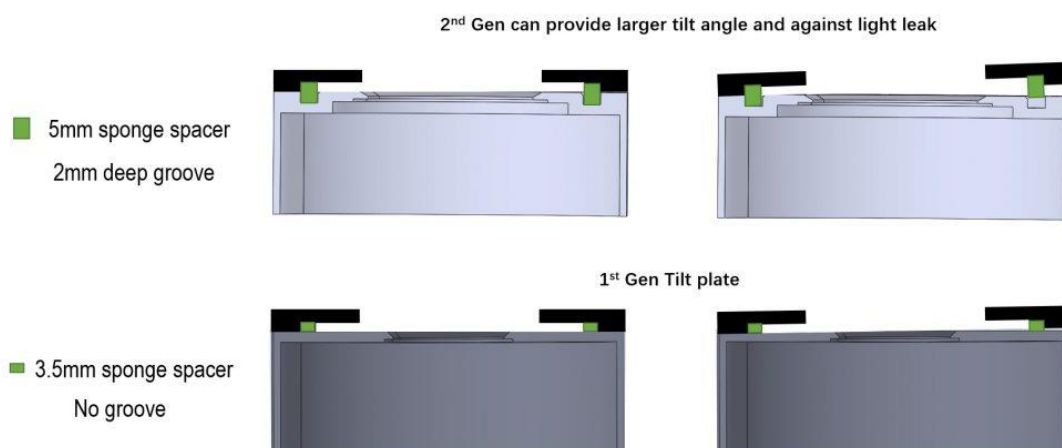
Cutting-edge Design

The planetary cameras developed by Player One Astronomy use a scientific and technological regular hexagon to construct the main body line, supplemented by round chamfers to achieve both rigidity and flexibility. The positive red, which is like a summer fire, is matched with the low-key and steady black, and the super-fine frosting process on the entire surface makes the camera look luxurious and cool, highlighting the style of high-end players, can't take my eyes off.

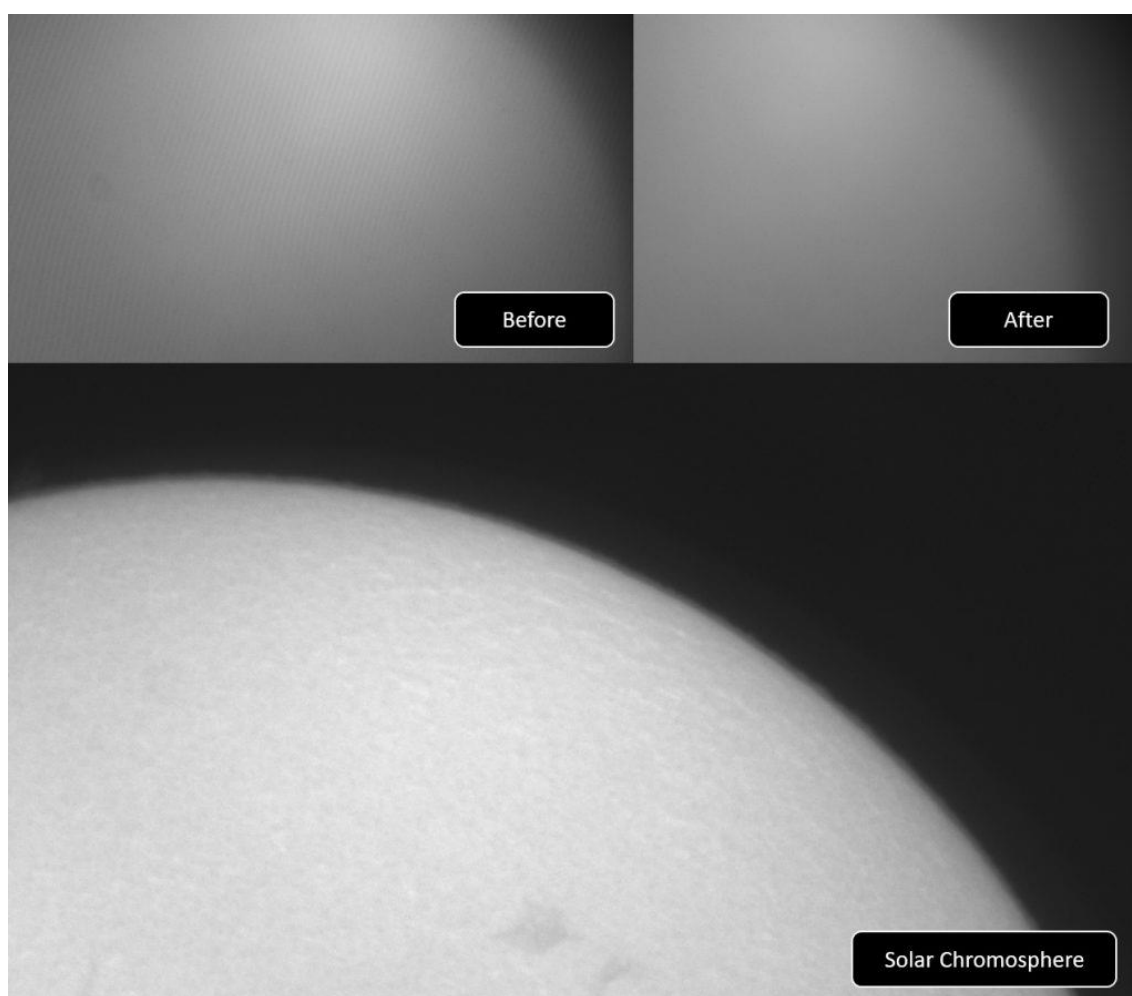


2nd Gen – Sensor Tilt Plate

The built-in high-density sponge shading pad can block the light from the side slits without any side leakage.

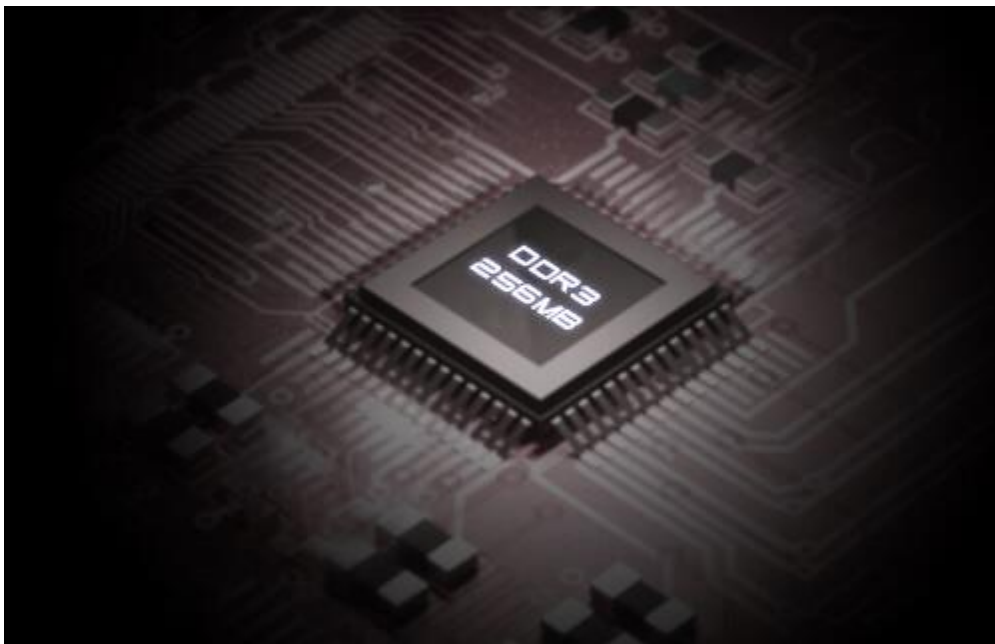


When taking solar photograph with prominence telescope, the Newton ring is annoying. Smoother solar image without Newton ring could be taken by adjusting the focal plate. Get a much smaller field curvature of the telescope.



256M DDR3 Cache

Player One Astronomy cameras are the first ones who adopt the DDR3 cache in all planetary cameras in the world! It helps stabilize and secure data transmission, effectively avoids frame dropping, and greatly reduces read noise.



With the DDR3 cache, the camera does not have high demands on computing needs any longer, it will still have excellent performance even if it is connected to a USB 2.0 port.

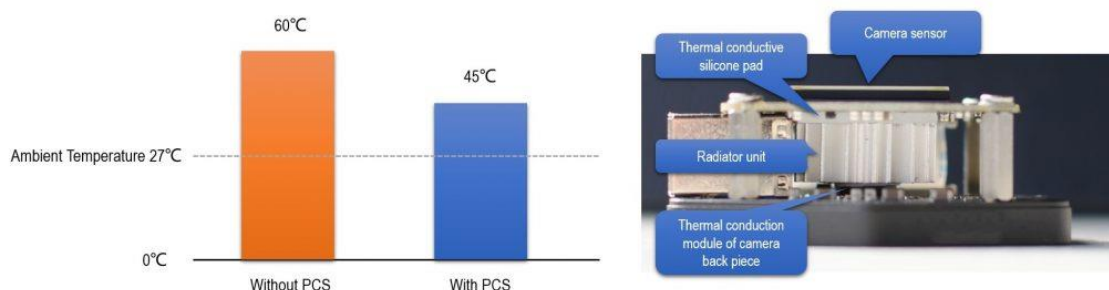
DPS technology

The planetary cameras from Player One Astronomy have **DPS (Dead Pixel Suppression)** technology. The DPS analyses many dark frames to find out those fixed abnormal pixel and record the map in camera memory. In imaging, each exposure frames, those position of dead pixels will be given a median value according to the active pixels around that abnormal pixel.



Passive Cooling System

Player One add a new feature called Passive Cooling System to conduct the heat from the sensor out.



Overvoltage and overcurrent protection mechanism

Player One cameras produced by the number one player ensure the safety of your camera and other equipment through overvoltage and overcurrent protection mechanisms.

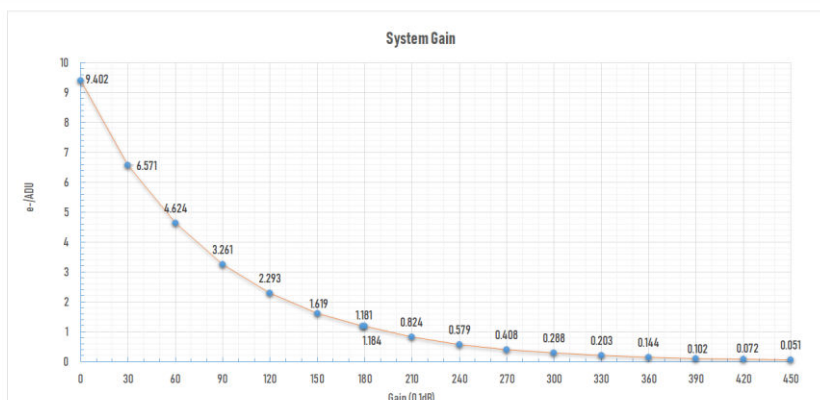
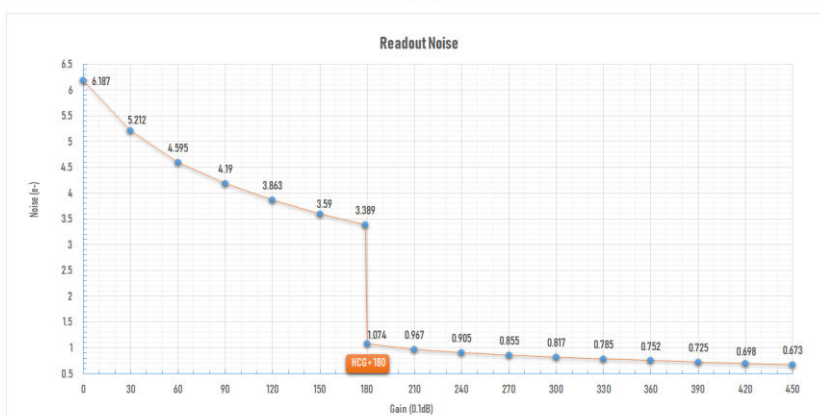
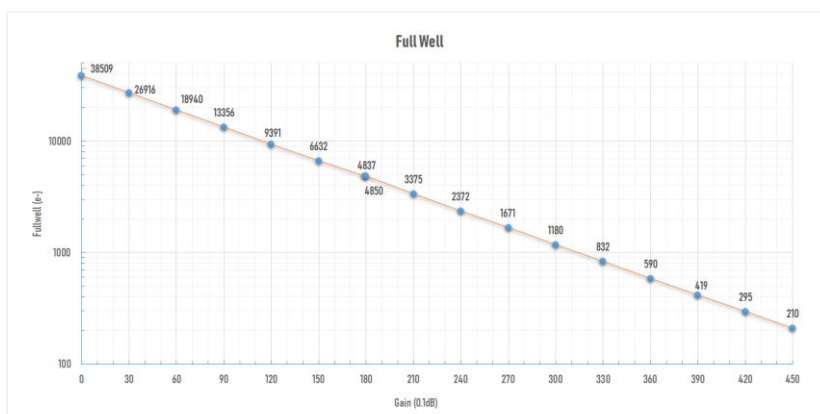
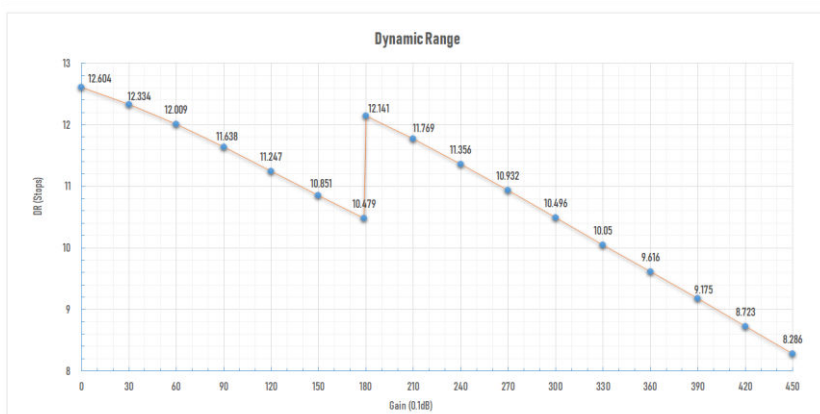
Data Port

When the camera is connected to the USB3.0 interface and a full-resolution preview is used, it can reach 93 FPS in RAW8 mode (10bit ADC), and the frame rate in RAW16 mode (12bit ADC) is 46.5 frames per second. When recording images, since the actual writing speed will be affected by the writing speed of the hard disk itself, when the hard disk writing speed is slow, the recording may not reach the theoretical speed. It is recommended that you use a high-quality solid-state drive to record data to give full play to the performance of the camera.



Use the ST4 guide cable to connect the camera and the AUTO GUIDE port of the equatorial mount to do the guiding.

Performance



Readout Noise

Regarding readout noise, we solemnly promise that all values are obtained from actual tests. And for users, you could use Sharpcap 4 for testing. SC4 has a function called **Sensor Analysis**, provide a very simple way to test readout noise.



We wrote a tutorial on our website:

<https://player-one-astronomy.com/service/manuals/>

After many rigorous readout noise tests, the camera can reach a low readout noise of 0.75e at a gain of 350 and around 0.67e at a gain of 450. If you are interested in readout noise testing, you may try it yourself, which is very simple.

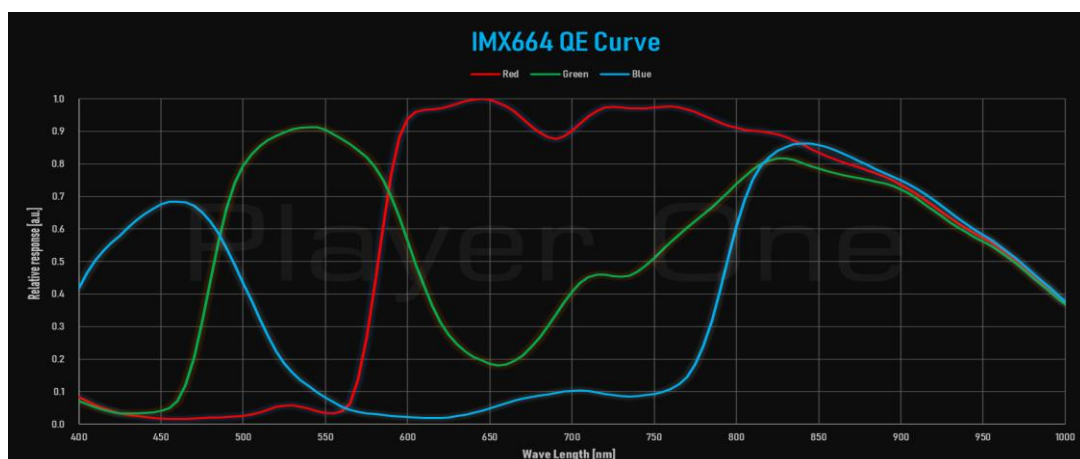
HCG Mode

NEPTUNE 664C camera has a unique HCG mode, which will automatically turn on when the camera gain setting is ≥ 180 . The HCG mode can greatly reduce the readout noise and retain the same high dynamic range as the low gain.

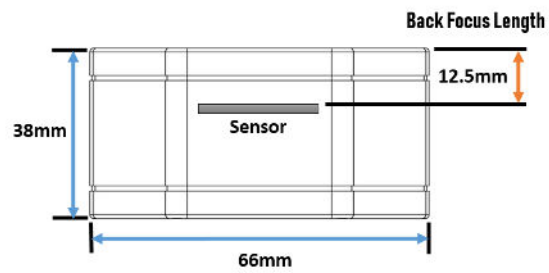
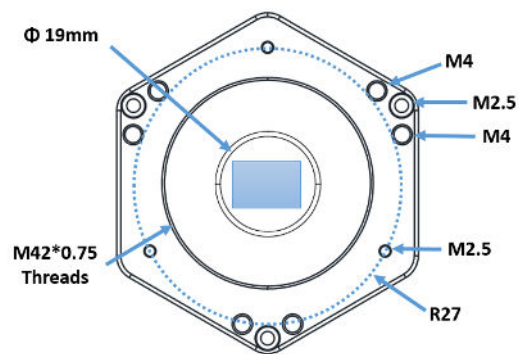
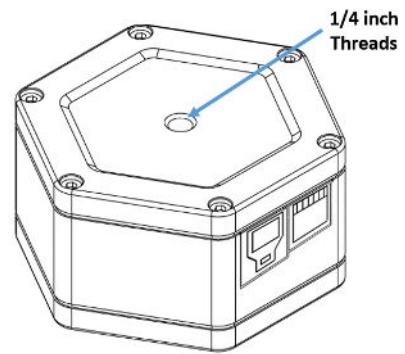
QE Curve

The QE curve of the **NEPTUNE 664C** camera tell us that this camera is NIR enhanced camera. working after Super AR Plus window, this camera will keep very high QE in infrared.

This is the relative QE curve which provided by Sony, the absolute QE peak about 91%.



Mechanical Drawing



Package List



Camera Package

<p>1</p> 	<p>2</p> 	<p>3</p> 
Camera and T-mount	USB3.0 Cable	ST4 Cable
<p>4</p> 	<p>5</p> 	<p>6</p> 
M2 Hexagonal wrench	1.25" Cover	Air Blower

Warranty & Shipping Policy

Payment method

We provide *PayPal* and *PayPal checkout* on our website.

Shipping and Delivery

Shipping Fee:

- Amount $\geq$ 299USD: free express shipping
- Amount $<$ 299USD: 29.9USD for express shipping

Shipping Services:

- We usually use DHL, UPS, FedEx, TNT for shipping.
- Make sure your email is correct, we maybe will contact with you through emails in case of emergency.

If customer wants to designate a shipping company or has special requirement, please send an email to support@player-one-astronomy.com and tell us your detailed requirement.

Shipping time:

- Usually 7-14 days.
- Tracking number will be updated in 3 days after paid.

For orders from areas where transportation is not easy, such as islands, town in mountainous regions, delivery time will be slightly longer.

Please send an email to support@player-one-astronomy.com immediately, if the following occurs:

- Shipping delayed or has some abnormal information.
- The packing is badly damaged on arrival, take pictures and do not sign.

Tax

- The price on our website without tax.
- Please note that buyers are liable to charge tax involved, such as Import tax, VAT, customs handling fee, etc.
- Those fees possibly will be collected at the time of delivery by courier.

For best experiences, we recommend customers to purchase our products form local dealers.

After-sales Service

Warranty Policy

2-year free warranty (time start from delivered) for Player One products. If the product has any issue, please send the image or video and description to support@player-one-astronomy.com for further check to confirm.

- Purchase from Player One official online store, we will provide warranty service directly.
- Purchase form dealer, we will provide warranty service through dealer.

Repair in warranty, customer only pay the shipping fee of shipping back the product to us or dealer, and no other extra fees.

Replacement Policy

You can request our Replacement Service:

- √ Within 30 calendar days of receiving the product if the product does not match the original description of the product in one or more significant respects.
- √ Within 30 calendar days of receiving the product if the product suffers performance failure.

Please contact our After-Sales team by email to support@player-one-astronomy.com within 30 calendar days of receiving the products. Player One shall be responsible for the two-way replacement freight for any products sent in for replacement due to performance faults.

Warranty and Replacement Policy Exceptions:

- × Warranty service time or replacement service time expired.
- × Legal proof-of-purchase, receipts, or invoices are not provided, or are reasonably believed to have been forged or tampered with.
- × A product sent to Player One for replacement does not include all original accessories, attachments and packaging, or contains items damaged by user error.
- × A product is found to have no defects after all appropriate tests are conducted by Player One.
- × Any fault or damage of the product is caused by unauthorized use or modification of the product, including exposure to moisture, entry of foreign bodies (water, oil, sand, etc.) or improper installation or operation.
- × Product labels or serial numbers show signs of tampering or alteration.
- × Damage is caused by uncontrollable external factors, including falling down, fires, floods, or lightning strikes, etc.
- × Proof of damage during transit issued by the carrier cannot be provided.
- × Other circumstances stated in this policy.

In those situations, repair the product might have extra cost, we will estimate cost and email customer to know the information before send product back.