

Saturn-M SQR Camera Manual

V1.0

Dec, 2024

Table of Contests

Product Features....3
Technical parameters....4
Product Description....5
STARVIS Technology....5
Format....5
Extend Full Well Capacity....6
High Frame rate....7
Dual Sampling Mode....7
Highlights....8
Non-Amp-Glow....9
Recommended accessories....10
Features....12
Cutting-edge Design....12
2nd Gen – Sensor Tilt Plate....13
Passive Cooling System....14
256M DDR3 Cache....14
DPS technology....14
Overvoltage and overcurrent protection mechanism....15
Data Port....15
Performance....16
Readout Noise....17
Absolute QE Curve....17
Mechanical Drawing....18
Package List....19
Warranty & Shipping Policy....20

Product Features

Saturn-M SQR and Saturn-C SQR is the most powerful planetary camera in our history! Based on IMX533 BSI sensor, high image quality, high resolution and square format, non-amp-glow feature, the camera will be great for lunar, solar mosaic and DSO lucky imaging.

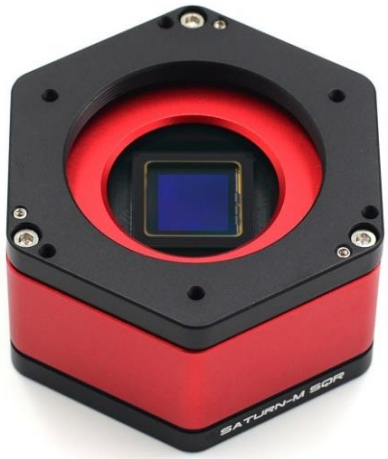


Technical parameters

Sensor	New SONY IMX533 1" CMOS (mono)
Diagonal	16mm
Total Pixels	9 Mega Pixels
Max Resolution	3008×3008
Pixel Size	3.76μm
Chip Size	11.31mm×11.31mm
Frame Rate	43FPS（10bit）
Shutter	Rolling shutter
Exposure Range	32μs-2000s
Readout Noise	4.46-1e
QE Peak	≈91%
Full Well	73k e
ADC	14 bit
Data Port	USB3.0/USB2.0
Adapter	1.25″ / M42X0.75
Back Focal Length	12.5mm
Protective Window	D32*2MM High Quality AR Plus (Anti Reflection) Multi-Layer Coating
Diameter	66mm
Weight	160g
Resolution and FPS	Under USB3.0 mode Resolution 10bit ADC 14bit ADC 3008×3008 43FPS 19.5FPS 2560×1440 95FPS 40FPS 1920×1080 125FPS 53FPS 1280×720 185FPS 79FPS 800×600 220FPS 93FPS 640×480 272FPS 115FPS More resolution options could be setup in capture software!

Product Description

Saturn-M SQR (IMX533) camera is developed by Player One Astronomy, SQR means its sensor is square. Saturn-M SQR camera, which adopts **Sony IMX533 1" square format** monochrome sensor. The **3.76um pixel size** accommodates a well depth of **73Ke** with a total of 9**MP** (the resolution is 3008*3008)**,** and the diagonal is **16mm**.

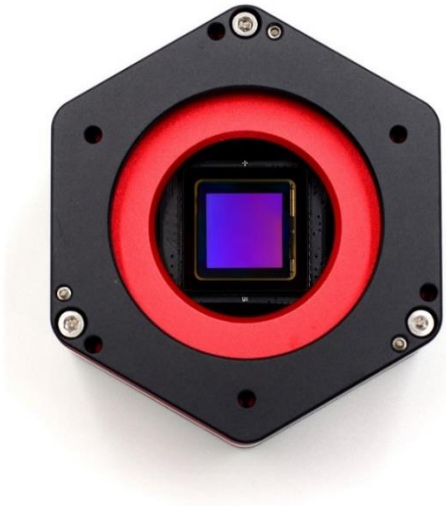


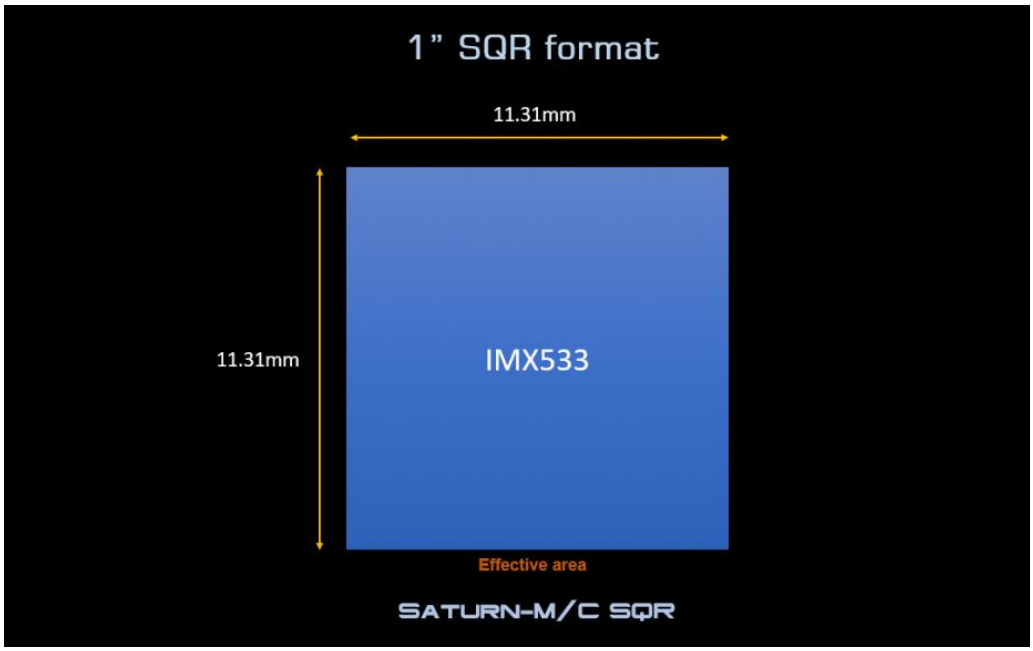
STARVIS Technology

Saturn-M SQR (IMX533) camera based on **Sony STARVIS technology**, it is back-illuminated pixel technology used in CMOS image sensors.

Format

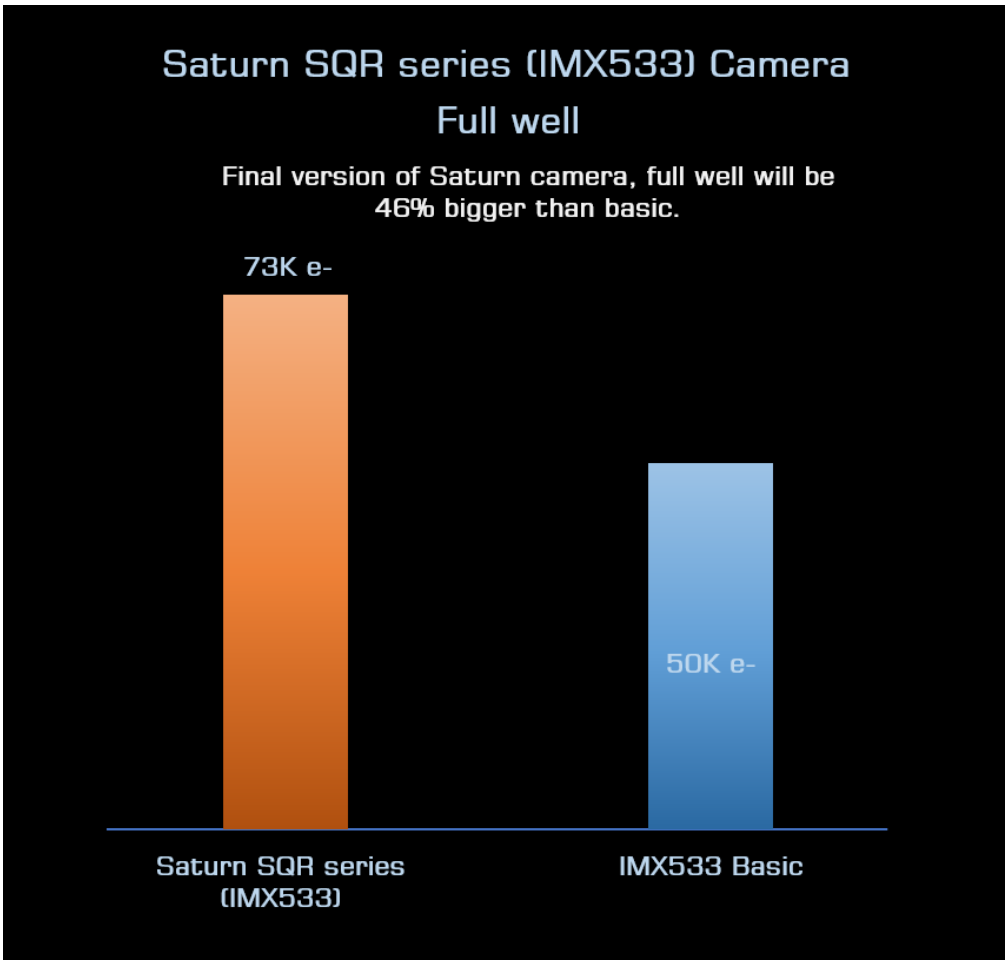
Saturn-M SQR camera has 1″format, this size is quite big for imaging.





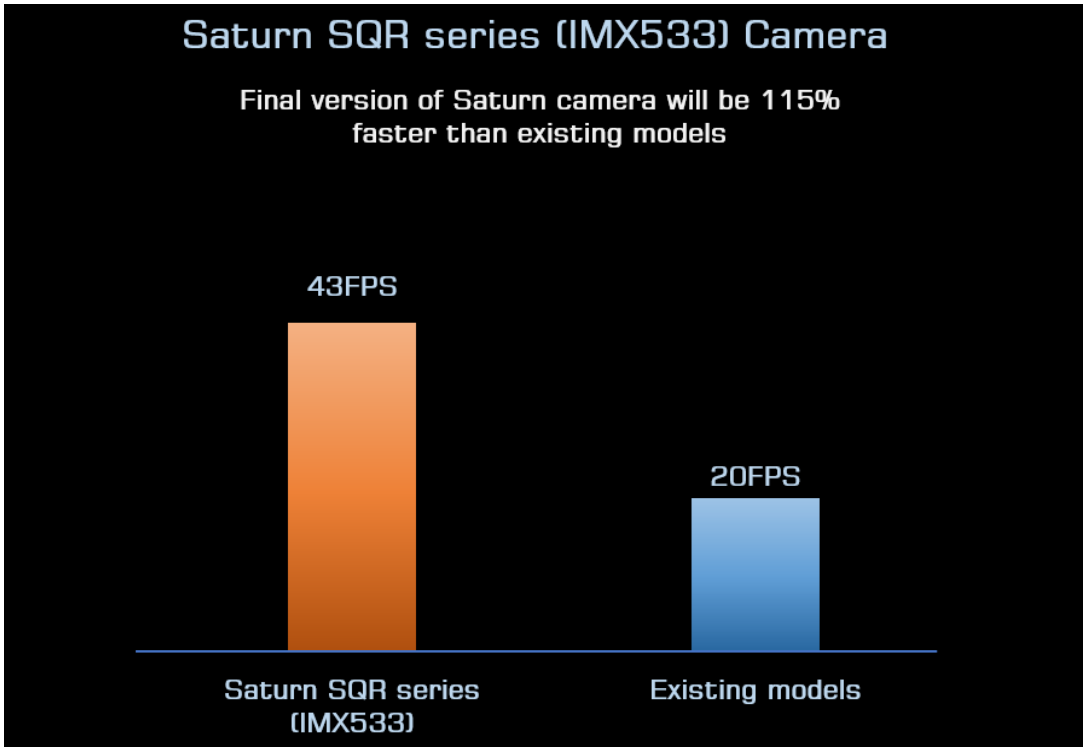
Extend Full Well Capacity

Based on our technology, we improved the full well of Saturn-M SQR camera to **73Ke**, it’s almost 1.5 times than IMX533 Basic (50ke).



High Frame rate

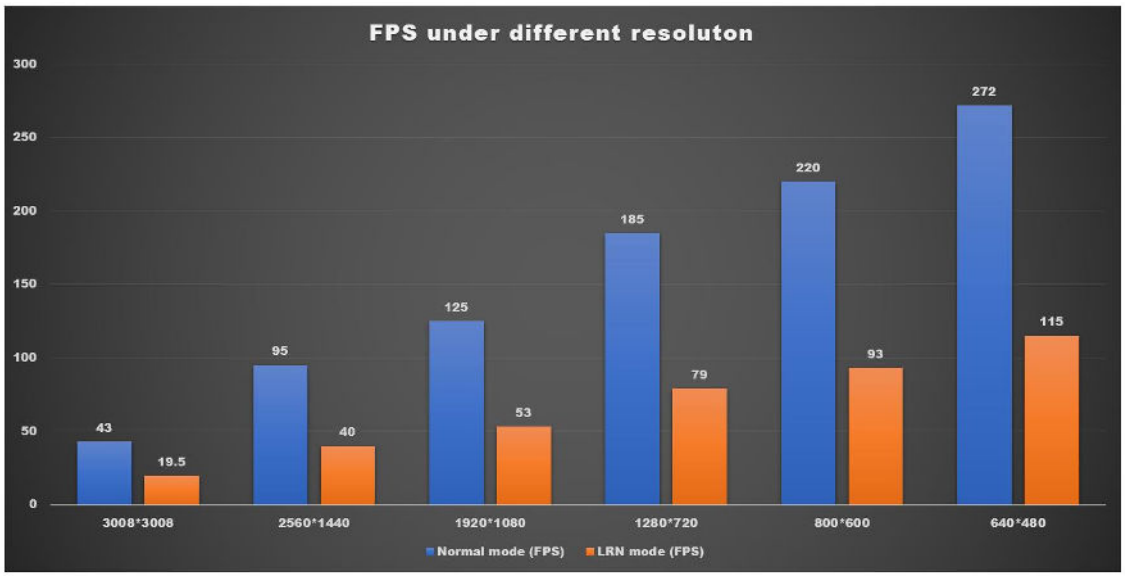
Based on our technology Saturn-M SQR camera can run 43FPS under RAW8 mode, that's much faster than existing models on market.



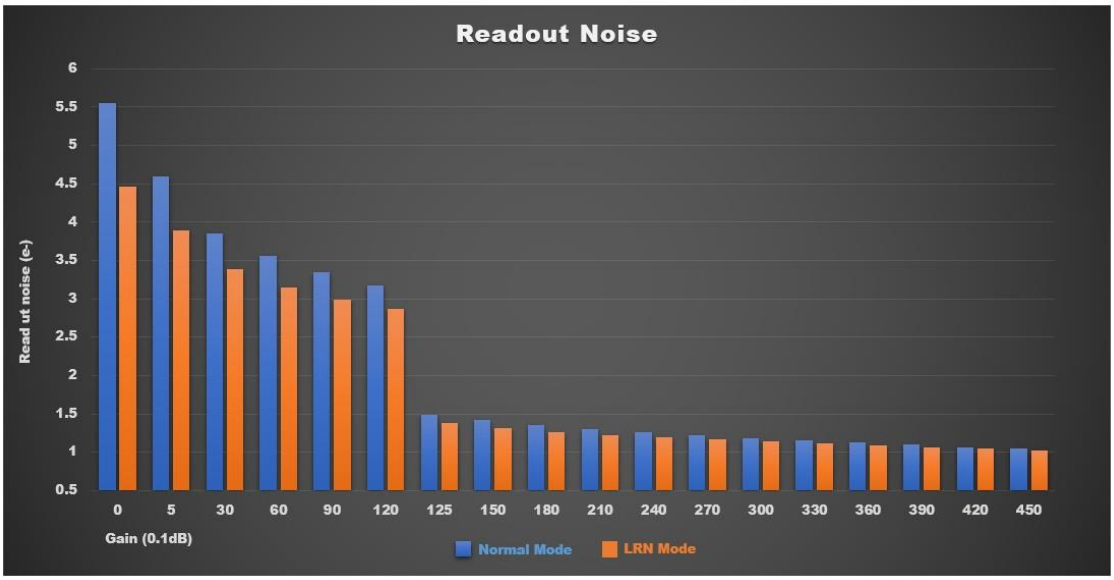
Dual Sampling Mode

Saturn SQR series has dual sampling mode. Normal mode and LRN mode, they have different advantages in imaging.

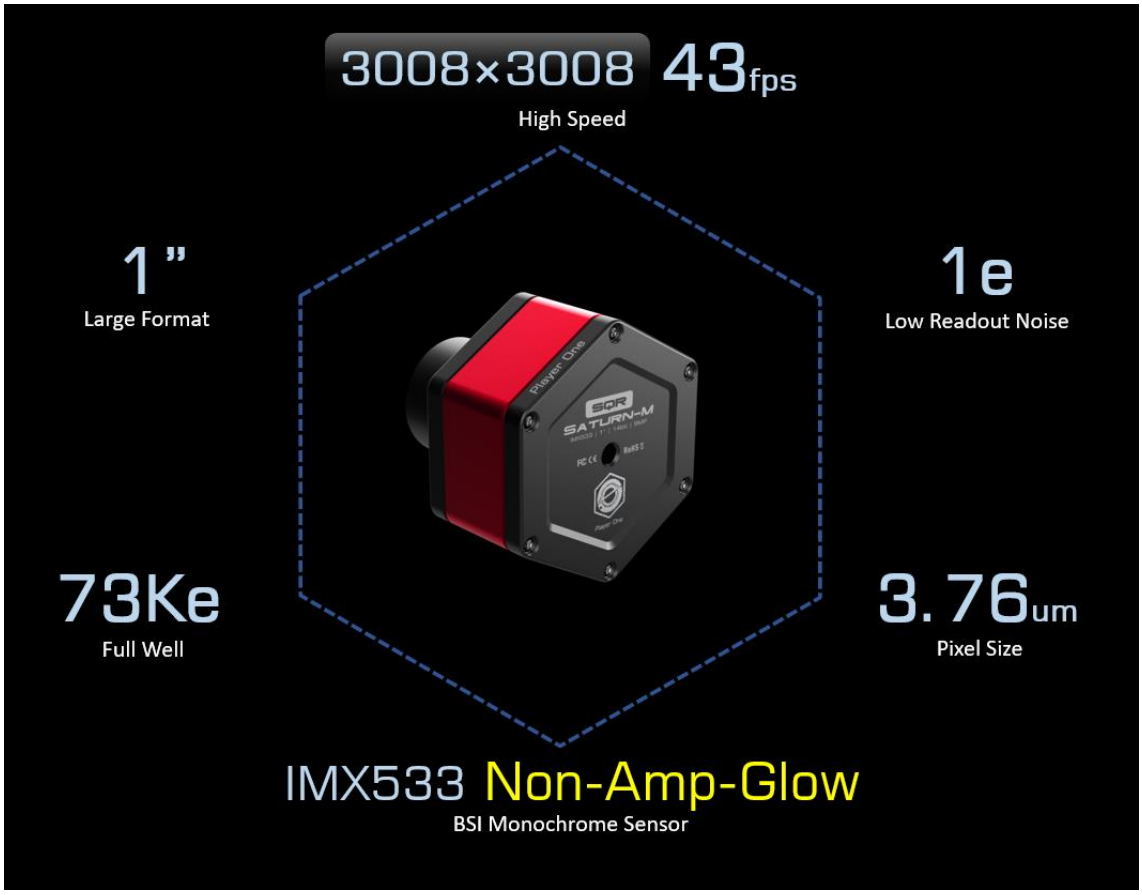
1. Normal mode has faster FPS, it is more suitable for planetary imaging.



2. LRN (low readout noise) **mode** has lower readout noise and higher dynamic range. it is more suitable for DSO lucky imaging.



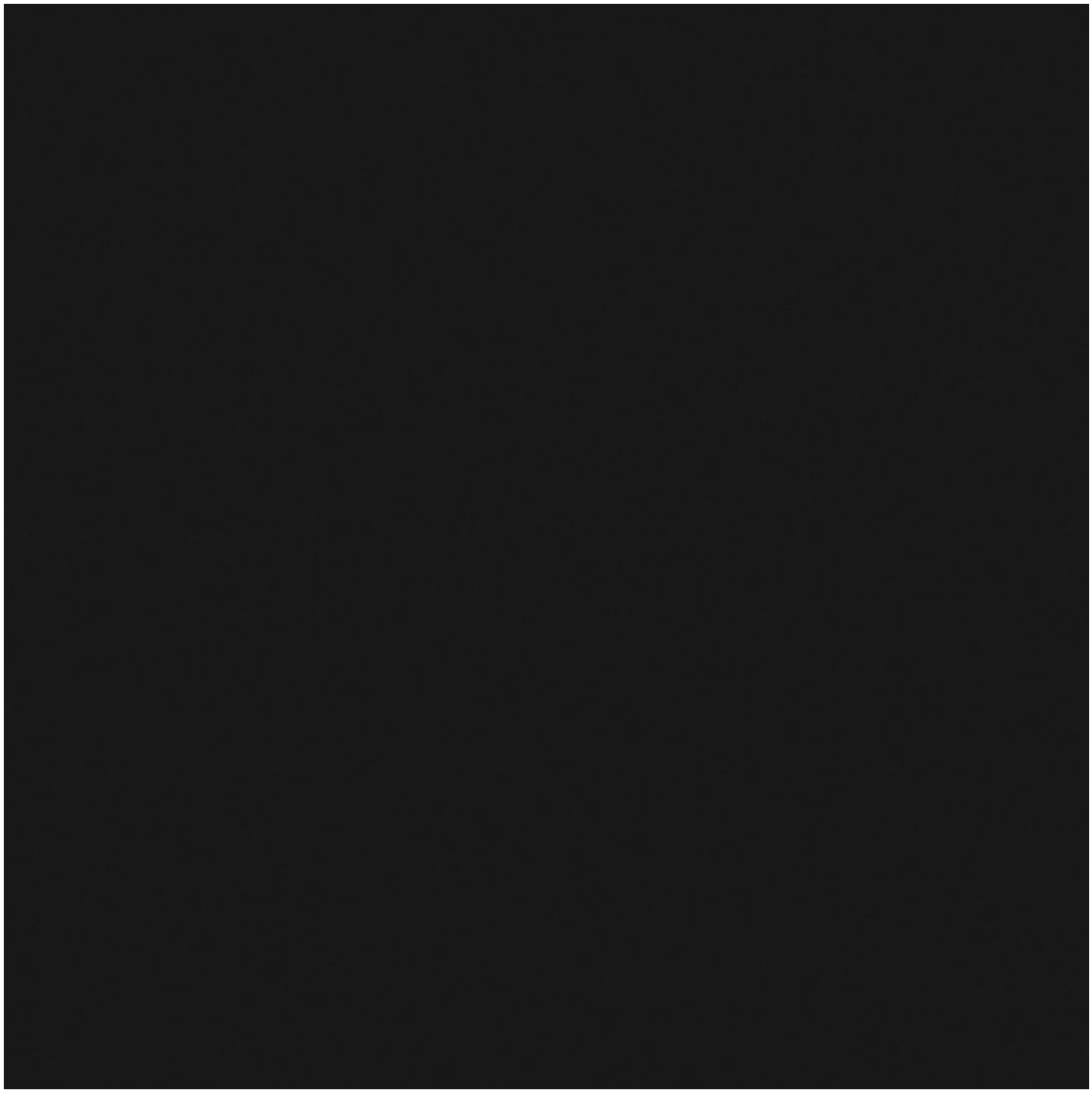
Highlights



Non-Amp-Glow

Dark frame of Saturn SQR (IMX533) camera is totally “dark”, that’s we called it “Non-Amp-Glow” camera!

300s dark frame of Saturn SQR camera (resize to 50%):



Non-Amp-Glow can give us very clean background, much easier to get high quality images.

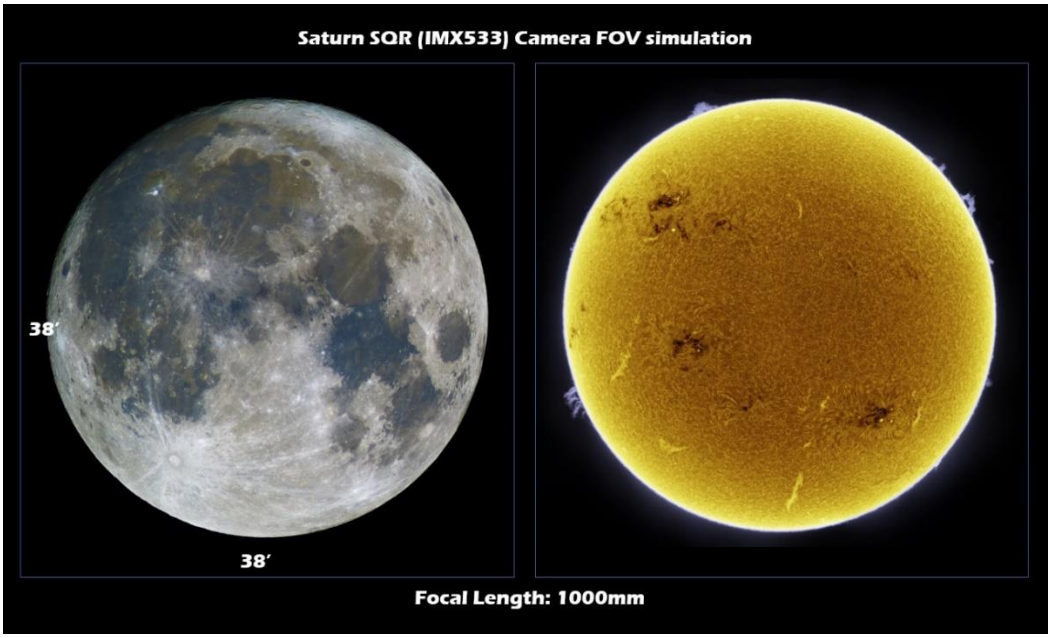
Recommended accessories

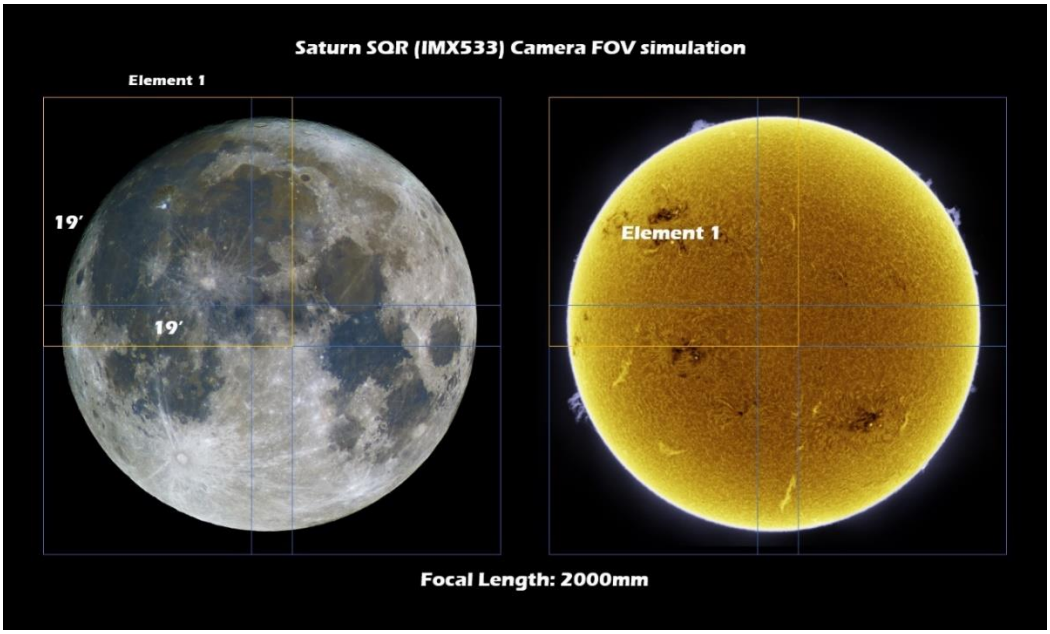
ACS (Active Cooling System) is an external air-cooled system, designed for solar and big format planetary cameras which already has PCS (Passive Cooling System).
ACS can provide much better temperature control. When camera has PCS + ACS, temperature is only 7℃ higher than ambient, camera body is a little warm but won't hot!

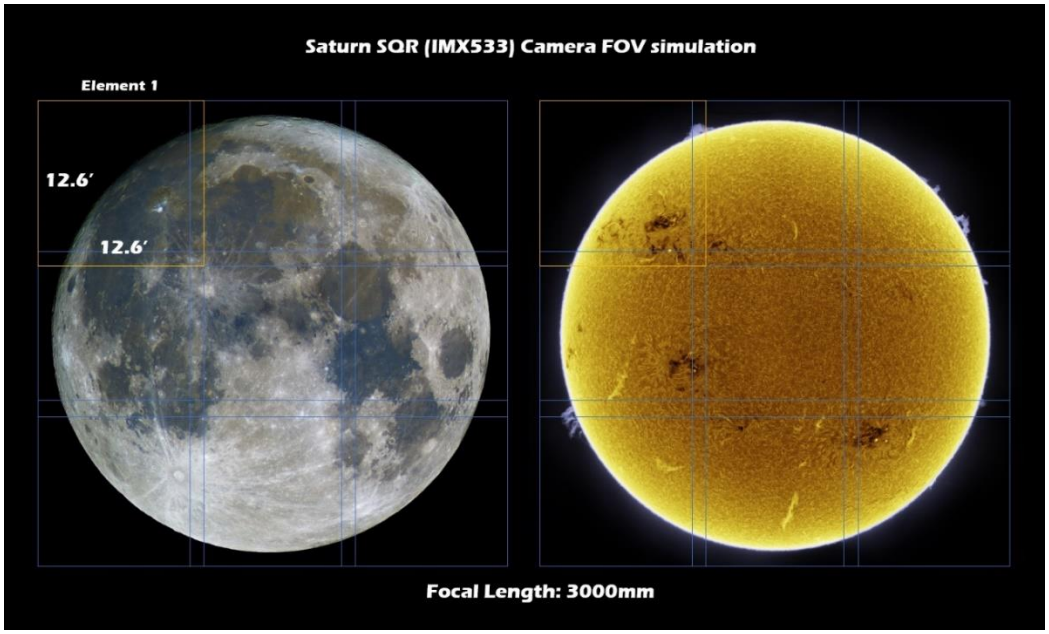
ACS is not only can be used in daylight for solar imaging, it also could be used in night for DSO lucky imaging.
https://player-one-astronomy.com/product/active-cooling-system-acs-for-uncooled-cameras/



Saturn SQR camera also very good for lunar and planetary imaging, its 1″ big format and 9MP total pixels, easier to capture full disk of the Moon and the Sun, or make mosaic more efficient.




Saturn SQR (IMX533) Camera FOV simulation
Element 1
19′
19′
Element 1
Focal Length: 2000mm


Saturn SQR (IMX533) Camera FOV simulation
Element 1
12.6′
12.6′
Focal Length: 3000mm

Features

The naming of Player One Astronomy cameras is unique. Planetary camera line, naming depend on the size of planets, Mars (1/3″), Neptune (1/2″), Uranus (1/1.2″), Saturn (1″), Jupiter (4/3″).



Drivers and software download:
http://player-one-astronomy.com/service/software/
Manuals download:
http://player-one-astronomy.com/service/manuals/

Cutting-edge Design

The planetary cameras developed by Player One Astronomy uses 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



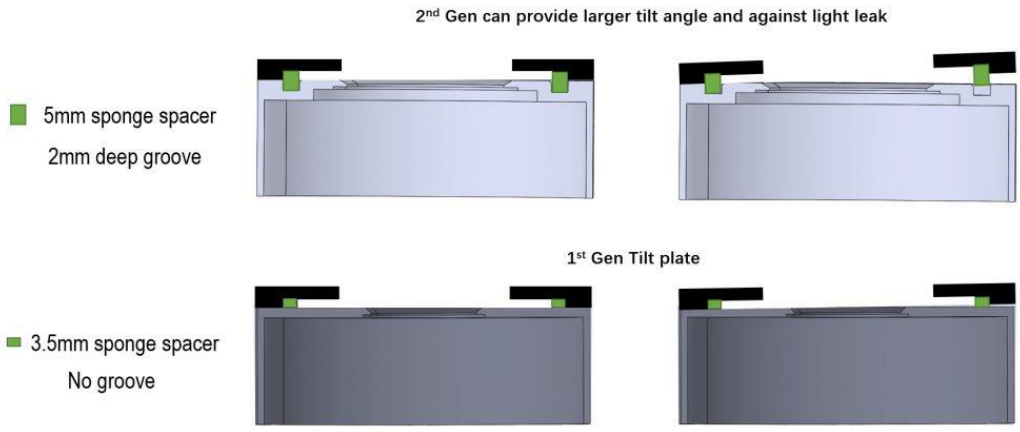


2nd Gen – Sensor Tilt Plate

When taking deepsky objects, using sensor tilt plate can get a much smaller field curvature of the telescope.

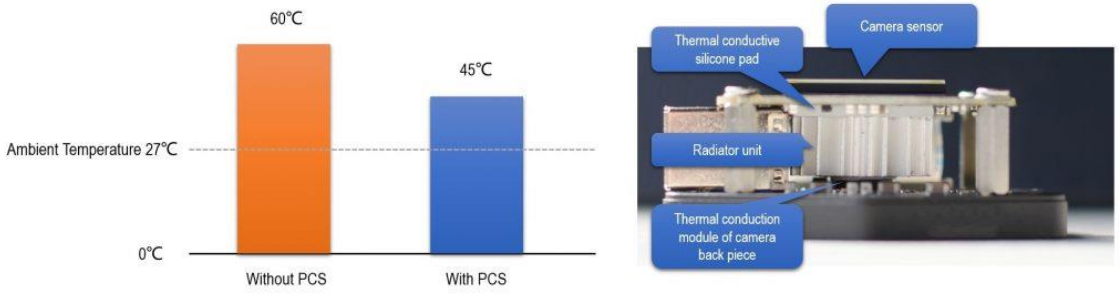


The built-in high-density sponge shading pad can block the light from the side slits without any side leakage.



Passive Cooling System

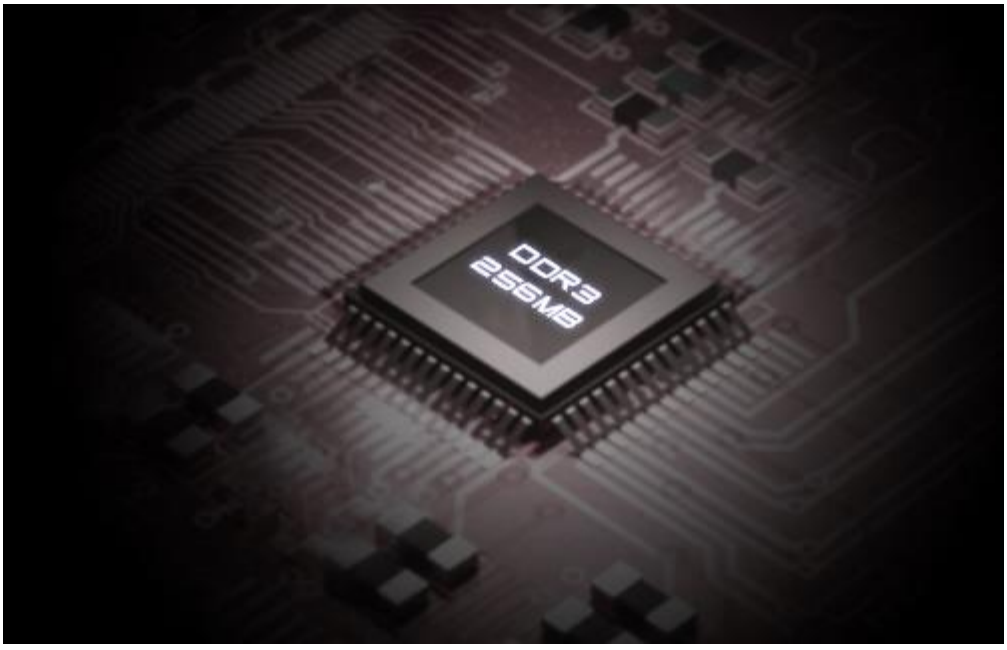
Player One add a new feature called Passive Cooling System to conduct the heat from the sensor out.



256M DDR3 Cache

Player One Astronomy cameras are the first one who adopts the DDR3 cache in all planetary cameras in the world! It helps stabilize and secure data transmission, it effectively avoids frame dropping and greatly reduces readout 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 is 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.



Overvoltage and overcurrent protection mechanism

Player One cameras produced by us ensures the safety of your camera and other equipment through overvoltage and overcurrent protection mechanisms.

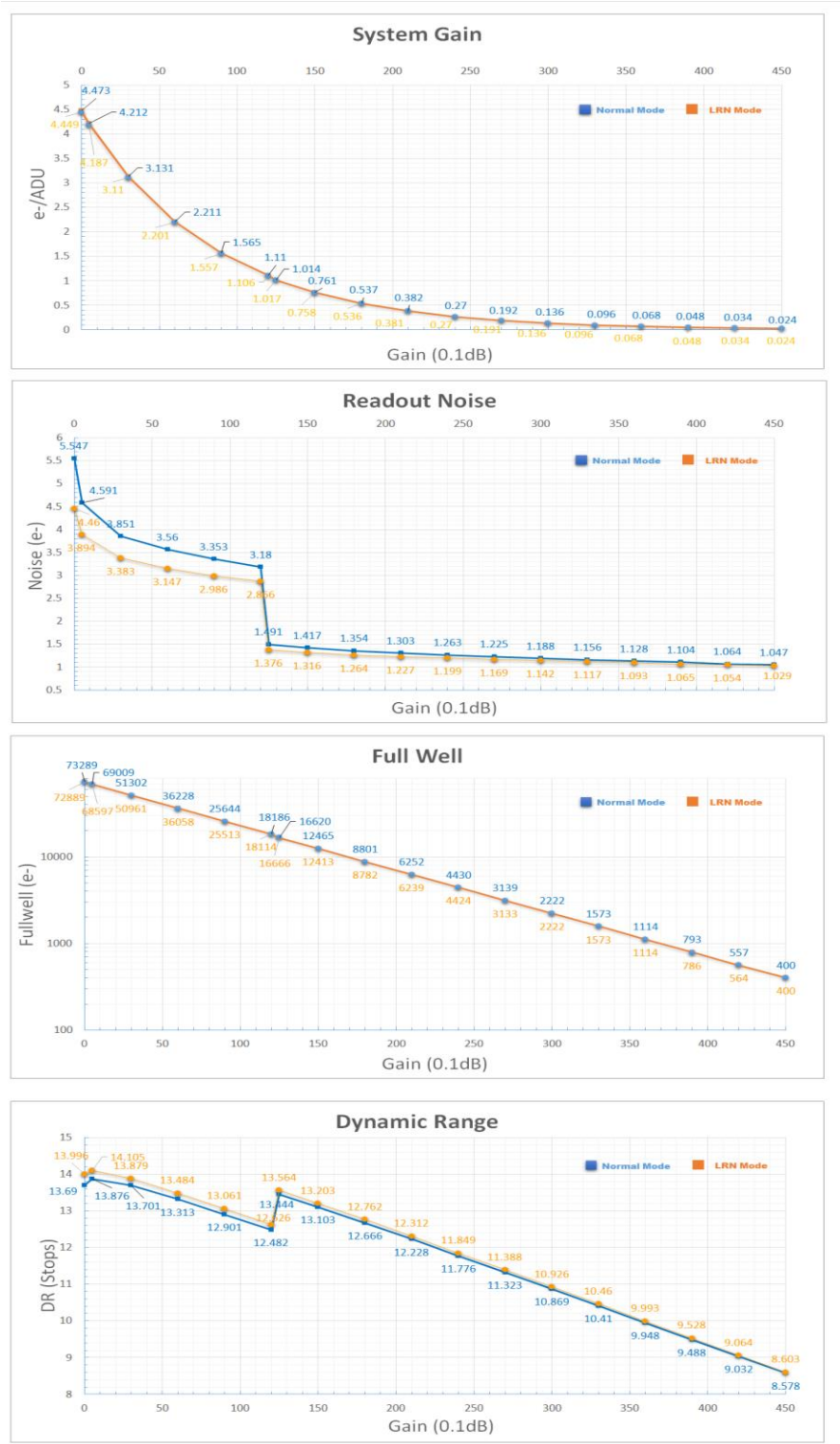
Data Port

When the camera is connected to the USB3.0 interface and full-resolution preview is used, it can reach 43 FPS in RAW8 mode (10bit ADC). 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 guiding.



Performance

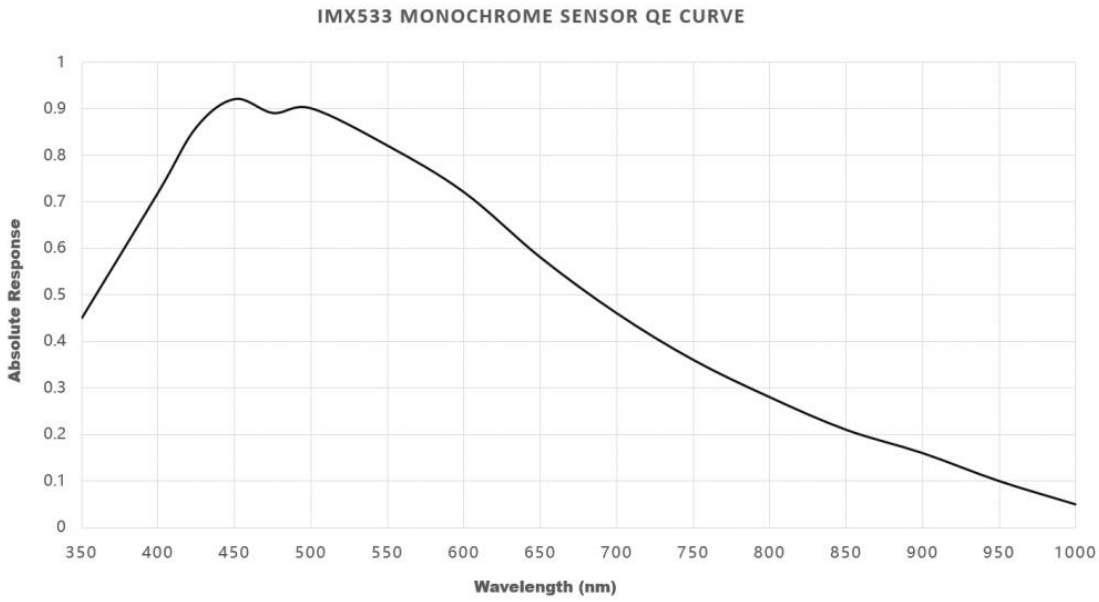
HCG open at gain=125. Saturn SQR series has dual sampling mode, Normal mode has faster fps, LRN (low readout noise) mode has lower readout noise and higher dynamic range.



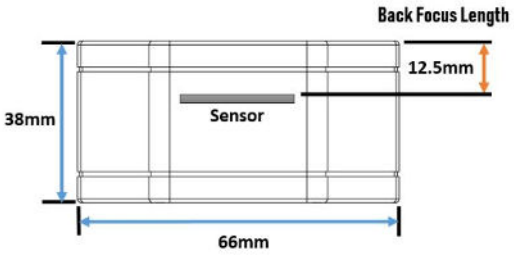
Readout Noise

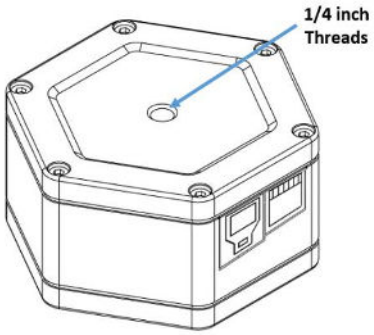
Regarding readout noise, we solemnly promise that all values are obtained from actual tests. And for users, you could use Sharpcap 4 for testing. SC4 has a function called **Sensor Analysis**, provide a very simple way to test readout noise.
We wrote a tutorial on our website:
https://player-one-astronomy.com/service/manuals/
If you are interested in readout noise testing, you may try it yourself, which is very simple.

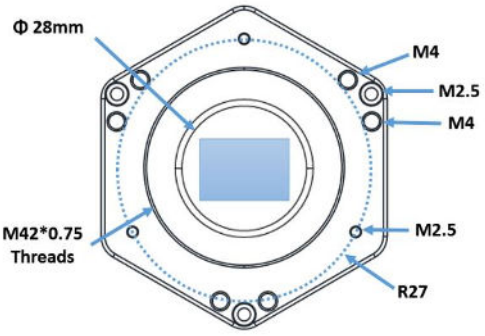
Absolute QE Curve



Mechanical Drawing







Package List



Warranty & Shipping Policy

Payment method

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

Shipping and Delivery

Shipping Fee:

- Amount >= 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.