



Player One

# Saturn-M SQR Camera Manual

V1.0

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## 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.



The advertisement features two Saturn Series cameras, the Saturn-M SQR and the Saturn-C SQR, positioned on a stylized Saturn planet. The Saturn-M SQR is on the left, labeled as 'Mono', and the Saturn-C SQR is on the right, labeled as 'Color'. Both cameras are black with red accents and feature the IMX533 sensor, USB 3.0, and 43FPS capabilities. The text 'SATURN SERIES' is prominently displayed at the top. Below the cameras, the text 'Introduce two new Non-Amp-Glow cameras' is followed by 'Saturn-M SQR & Saturn-C SQR Available NOW!' and the website 'player-one-astronomy.com'.

**SATURN SERIES**

**SATURN-M SQR**  
IMX533  
USB 3.0 43FPS  
Mono

**SATURN-C SQR**  
IMX533  
USB 3.0 43FPS  
Color

Introduce two new **Non-Amp-Glow** cameras  
**Saturn-M SQR & Saturn-C SQR Available NOW!**  
Want to know more, please visit: [player-one-astronomy.com](http://player-one-astronomy.com)

## Technical parameters

<b>Sensor</b>	New SONY IMX533 1" CMOS (mono)
<b>Diagonal</b>	16mm
<b>Total Pixels</b>	9 Mega Pixels
<b>Max Resolution</b>	3008x3008
<b>Pixel Size</b>	3.76μm
<b>Chip Size</b>	11.31mmx11.31mm
<b>Frame Rate</b>	43FPS (10bit)
<b>Shutter</b>	Rolling shutter
<b>Exposure Range</b>	32μs-2000s
<b>Readout Noise</b>	4.46-1e
<b>QE Peak</b>	≈91%
<b>Full Well</b>	73k e
<b>ADC</b>	14 bit
<b>Data Port</b>	USB3.0/USB2.0
<b>Adapter</b>	1.25" / M42X0.75
<b>Back Focal Length</b>	12.5mm
<b>Protective Window</b>	D32*2MM High Quality AR Plus (Anti Reflection) Multi-Layer Coating
<b>Diameter</b>	66mm
<b>Weight</b>	160g
<b>Resolution and FPS</b>	Under USB3.0 mode Resolution 10bit ADC 14bit ADC 3008x3008 43FPS 19.5FPS 2560x1440 95FPS 40FPS 1920x1080 125FPS 53FPS 1280x720 185FPS 79FPS 800x600 220FPS 93FPS 640x480 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 **9MP** (the resolution is 3008\*3008), and the diagonal is **16mm**.

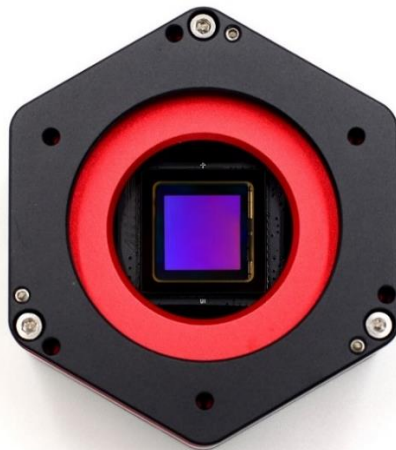


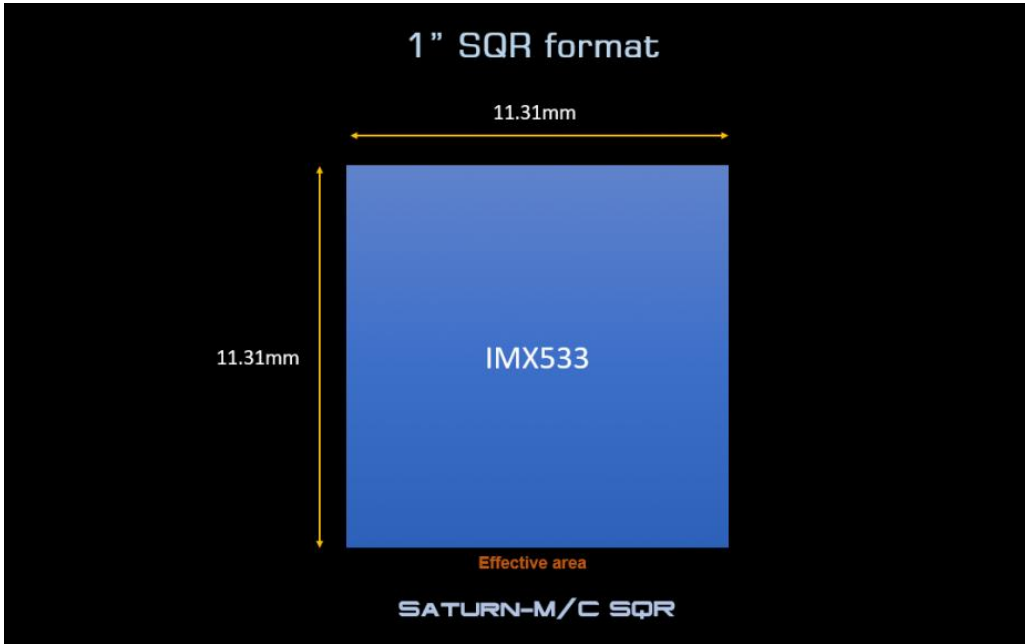
### STARVIS Technology

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

### Format

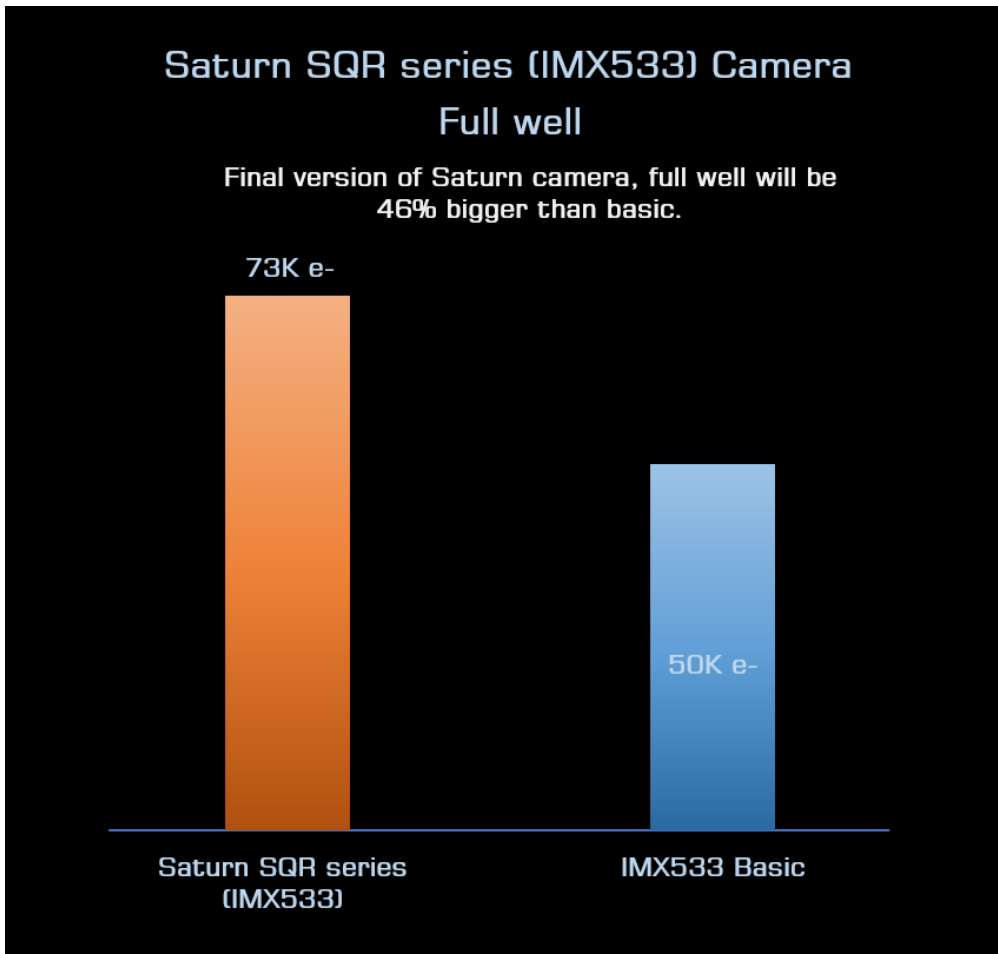
Saturn-M SQR camera has 1"format, this size is quite big for imaging.





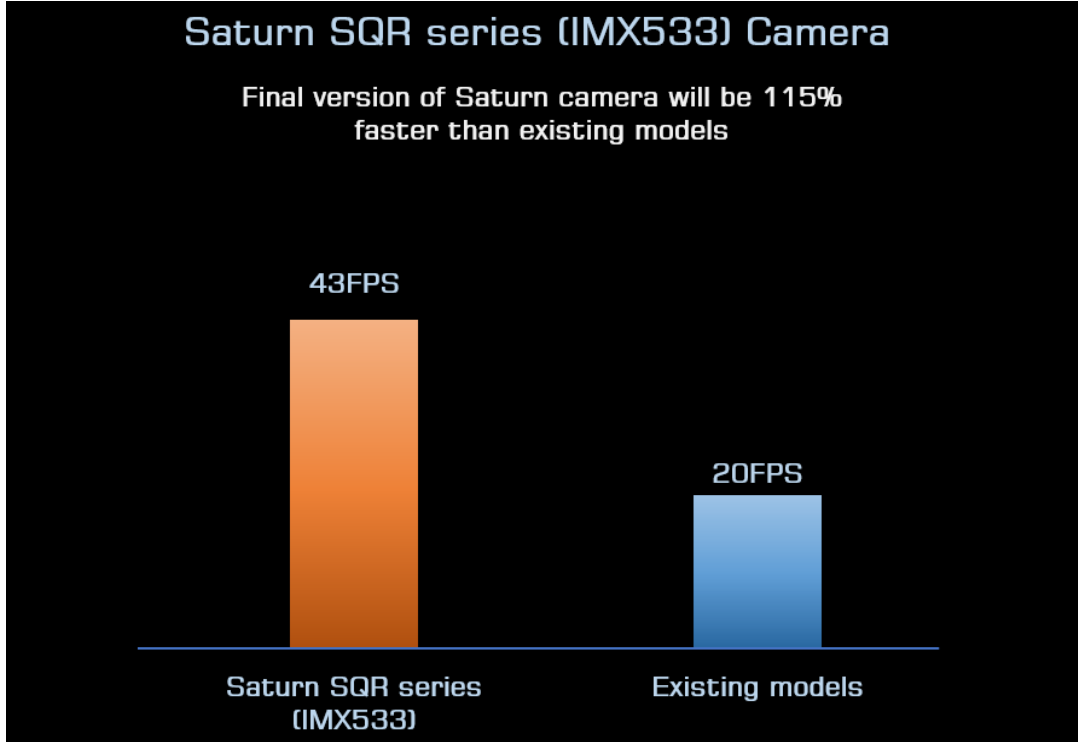
### Extend Full Well Capacity

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

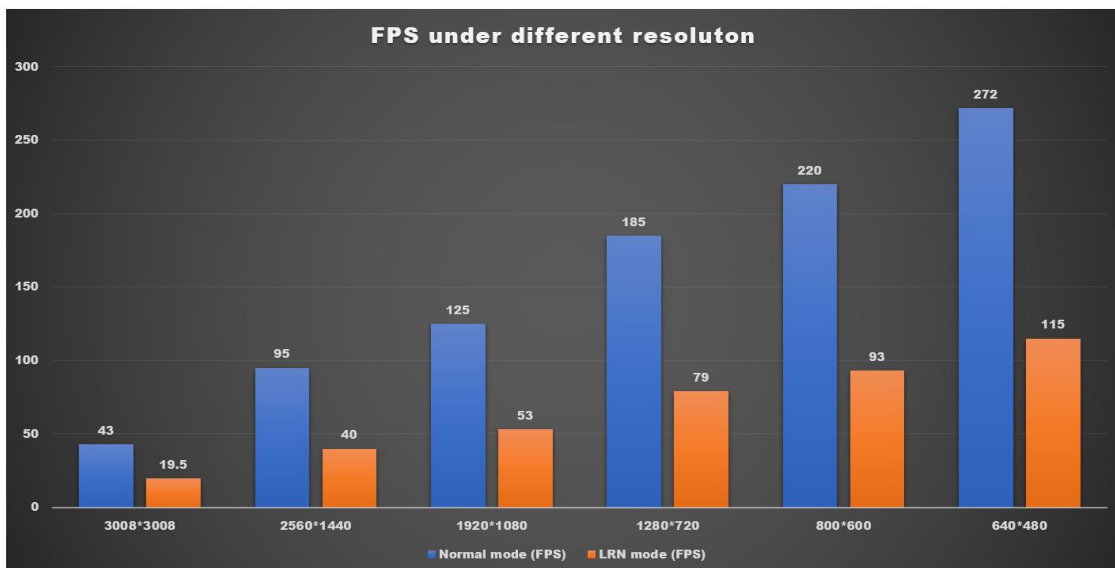
Based on our technology Saturn-M SQR camera can run 43FPS under RAW8 mode, that's much faster than existing models on market.



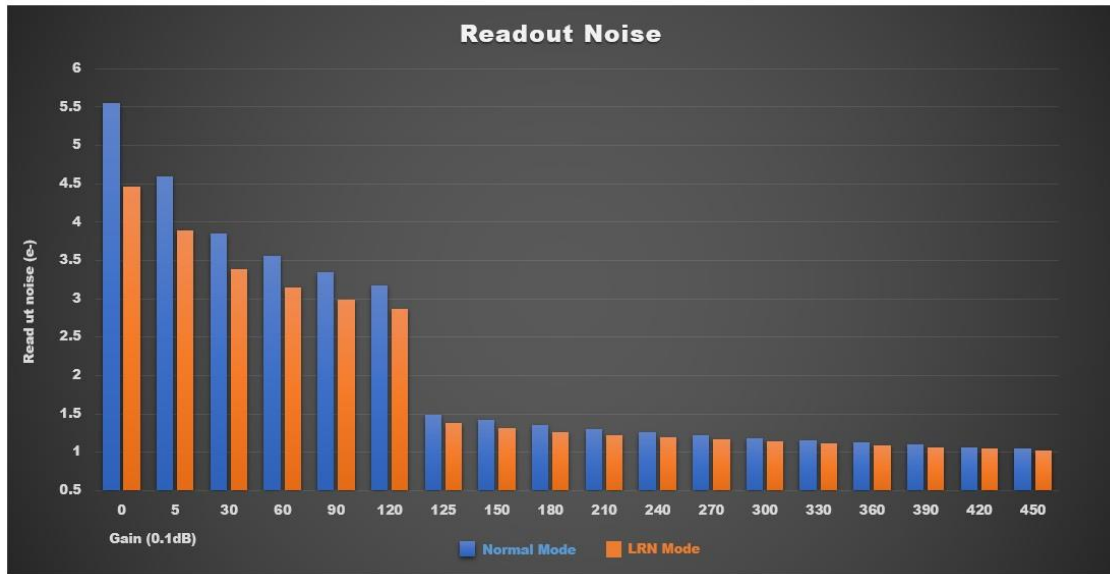
## Dual Sampling Mode

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

**3008x3008 43<sub>fps</sub>**  
High Speed

**1"**  
Large Format

**1e**  
Low Readout Noise



**73Ke**  
Full Well

**3.76<sub>um</sub>**  
Pixel Size

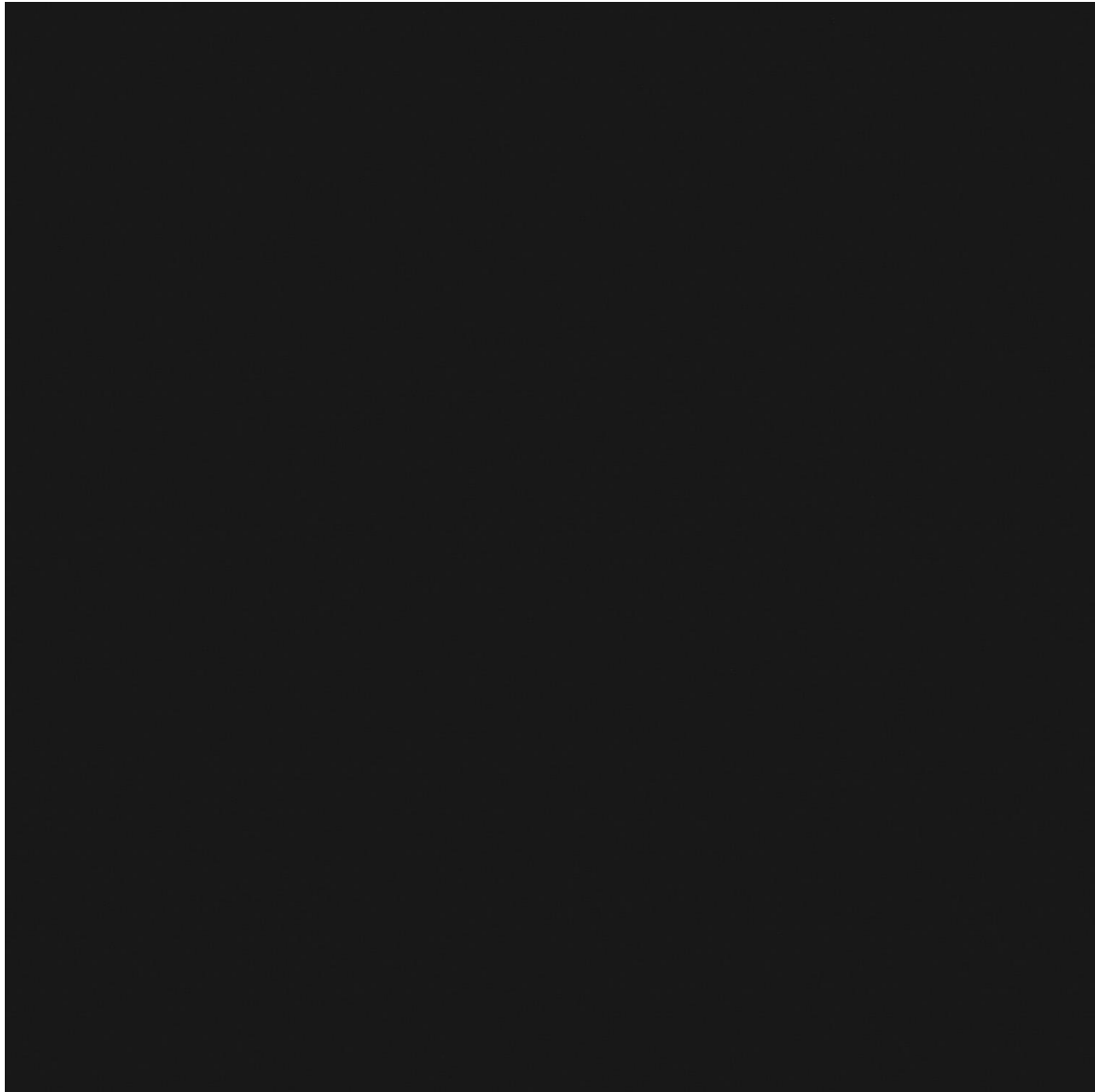
**IMX533 Non-Amp-Glow**  
BSI Monochrome Sensor



## 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

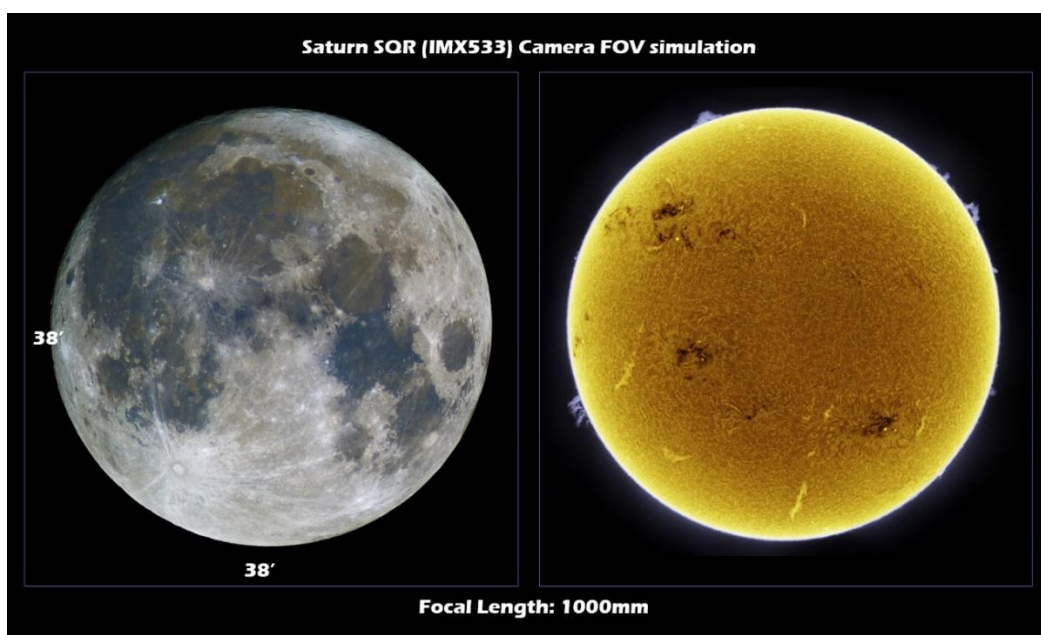
**ACS (Active Cooling System)** is an external air-cooled system, designed for solar and big format planetary cameras which already has PCS (Passive Cooling System). ACS can provide much better temperature control. When camera has PCS + ACS, temperature is only 7°C higher than ambient, camera body is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

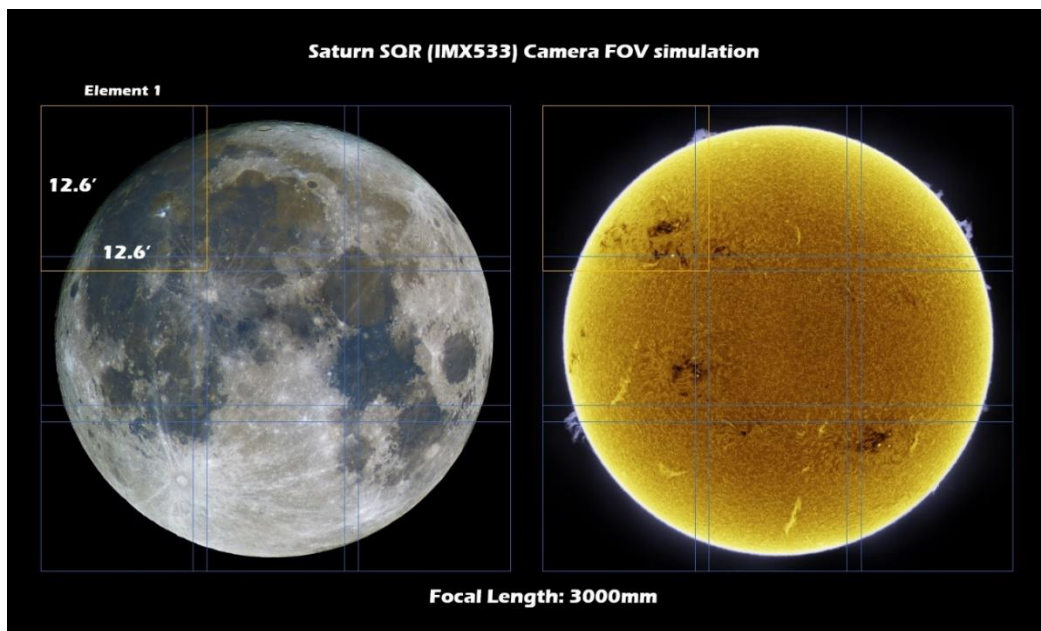
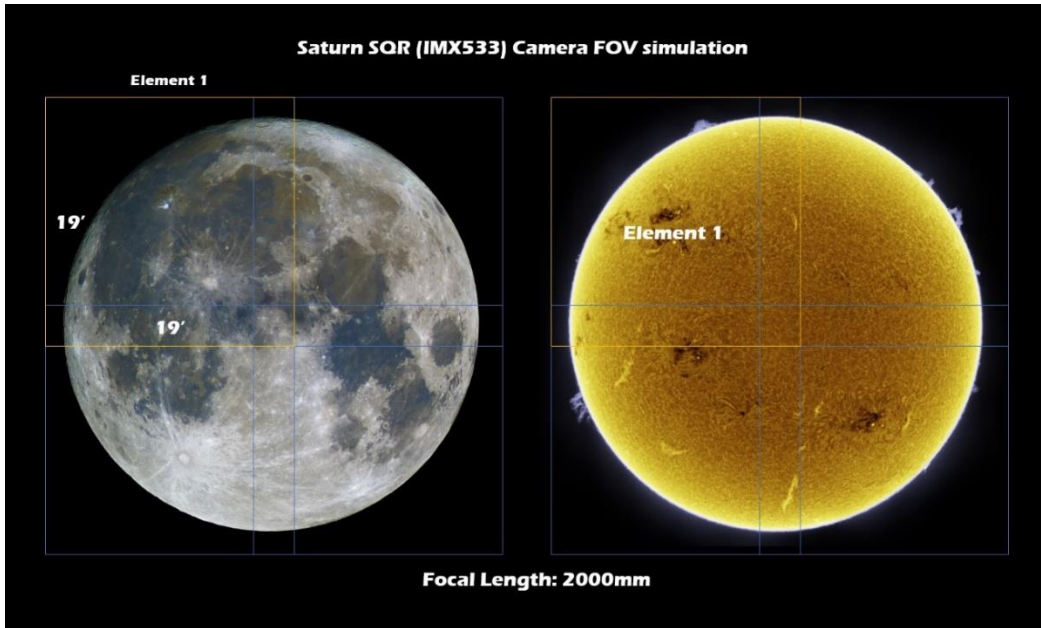
ACS is not only can be used in daylight for solar imaging, it also could be used in night for DSO lucky imaging.

<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.





## 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").



3008\*3008@43fps    2K@105fps    1080P@159fps

**Features:**

- ✓ High Sensitivity | Newest Sony IMX533 monochrome sensor.
- ✓ DDR Cache | DDR3 256MB.
- ✓ Passive Cooling System | Lower the sensor temperature.
- ✓ DPS Technology | Suppress dead pixels, improve image quality.
- ✓ Sensor Tilt Plate | Remove newton ring in solar imaging.
- ✓ USB3.0 | Up to 43FPS.
- ✓ ST4 Port | Easy for guiding.

**SATURN-M SQR**  
MONO CAMERA

Saturn-M SQR is best for Solar, Lunar imaging and DSO lucky imaging.

Drivers and software download:

<http://player-one-astronomy.com/service/software/>

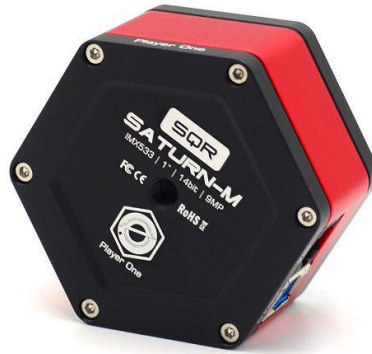
Manuals download:

<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





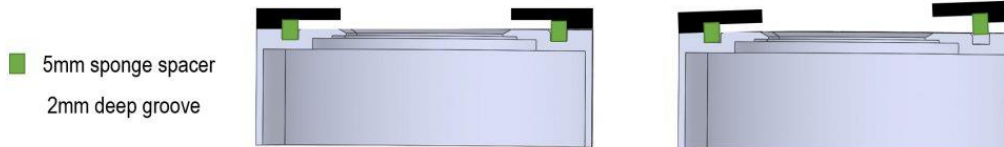
### 2nd Gen – Sensor Tilt Plate

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.

2<sup>nd</sup> Gen can provide larger tilt angle and against light leak

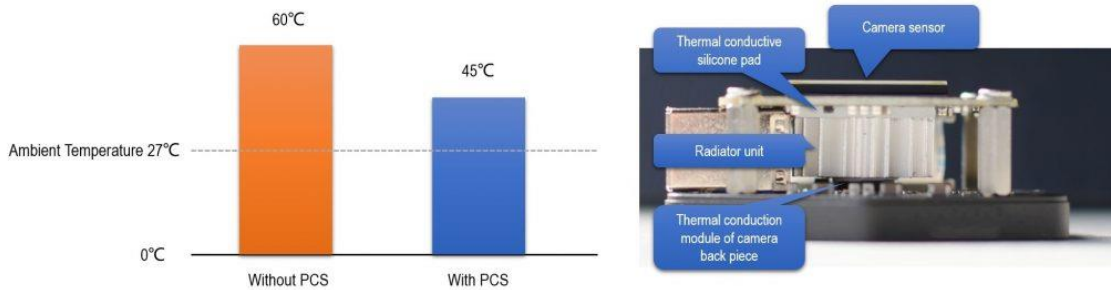


1<sup>st</sup> Gen Tilt plate



## Passive Cooling System

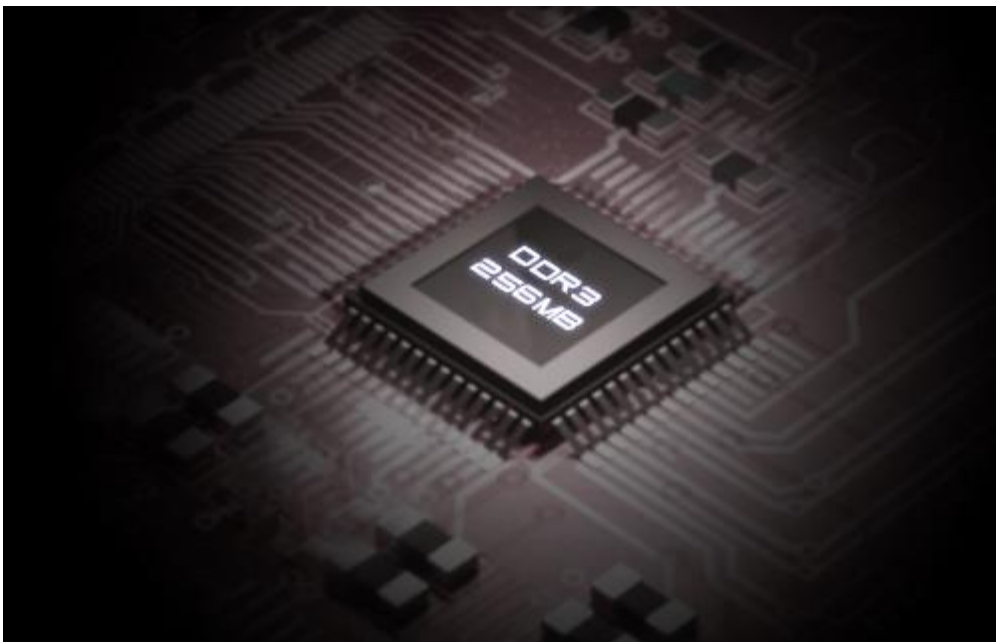
Player One add a new feature called Passive Cooling System to conduct the heat from the sensor out.



## 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.



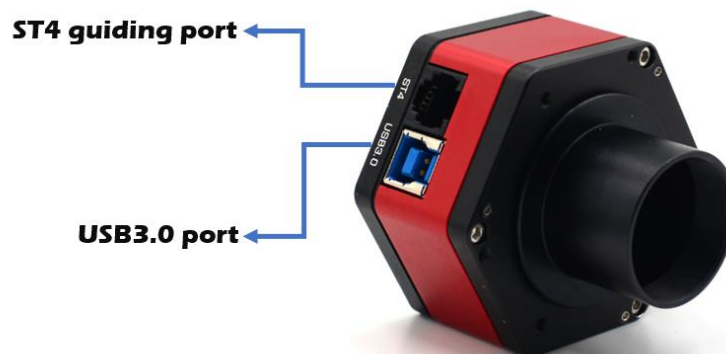
### Overvoltage and overcurrent protection mechanism

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

### Data Port

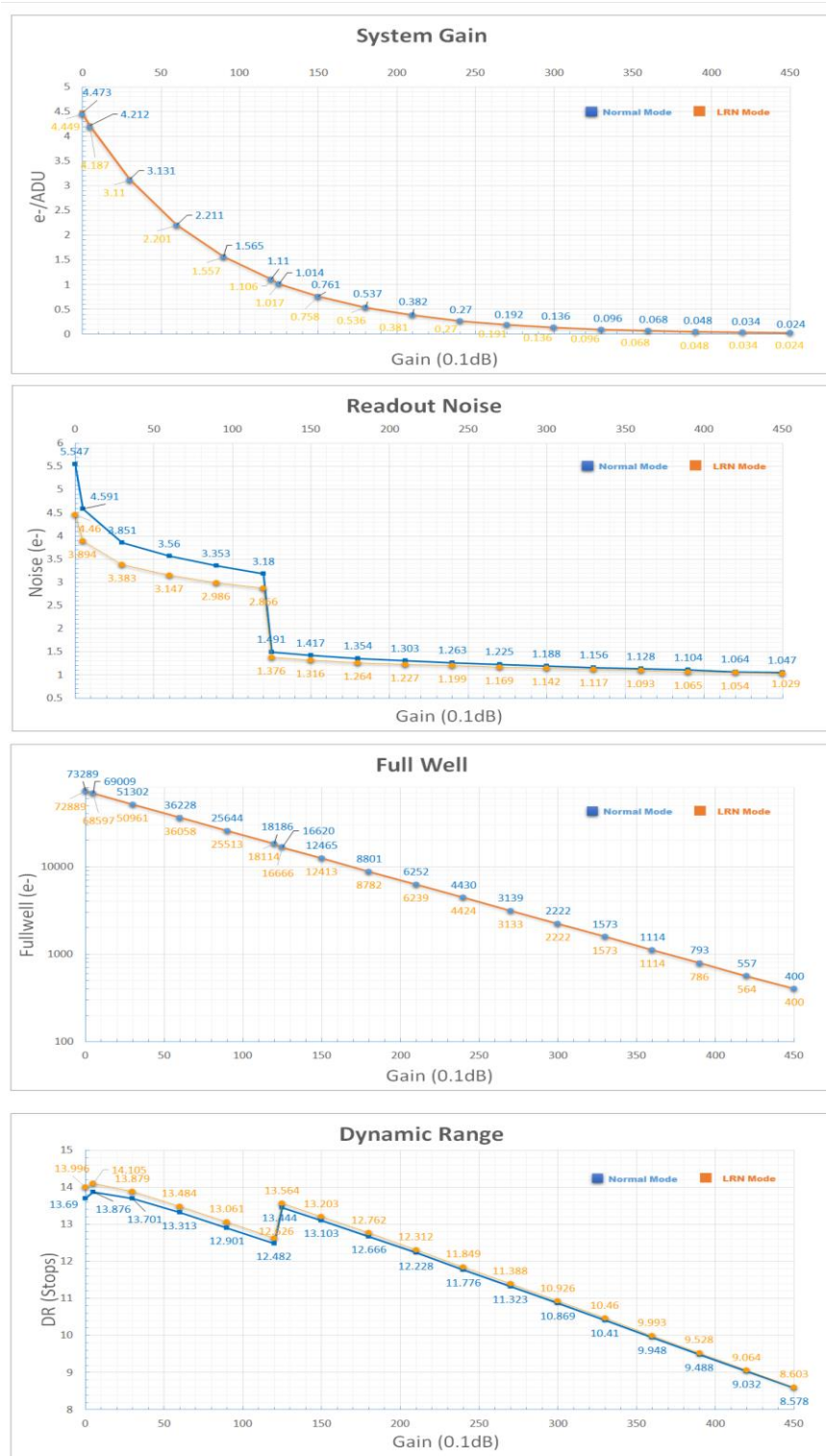
When the camera is connected to the USB3.0 interface and full-resolution preview is used, it can reach 43 FPS in RAW8 mode (10bit ADC). When recording images, since the actual writing speed will be affected by the writing speed of the hard disk itself, when the hard disk writing speed is slow, the recording 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

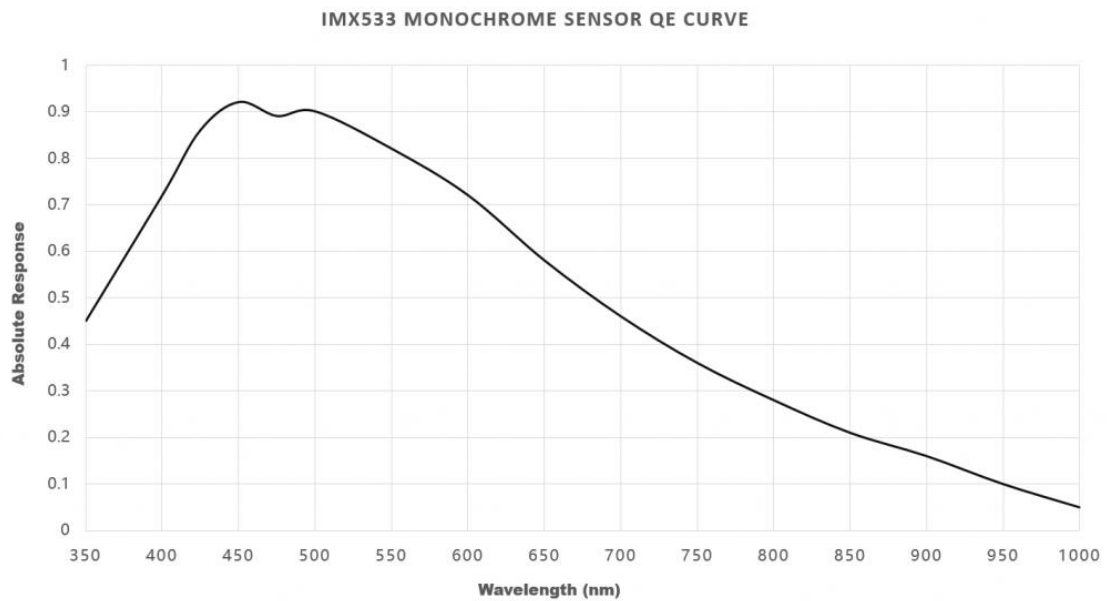
Regarding readout noise, we solemnly promise that all values are obtained from actual tests. And for users, you could use Sharpcap 4 for testing. SC4 has a function called **Sensor Analysis**, provide a very simple way to test readout noise.

We wrote a tutorial on our website:

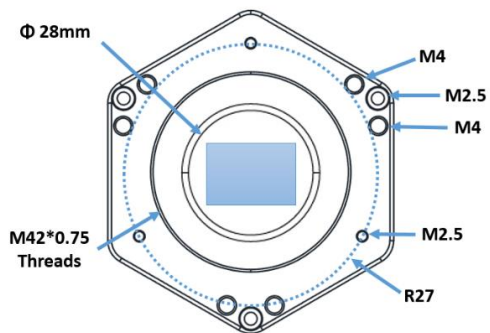
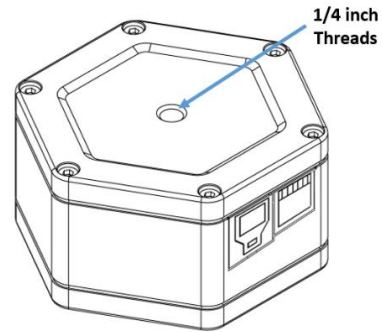
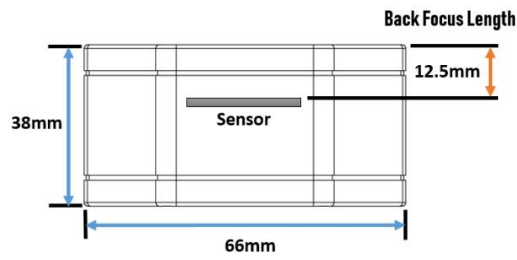
<https://player-one-astronomy.com/service/manuals/>

If you are interested in readout noise testing, you may try it yourself, which is very simple.

## Absolute QE Curve



## Mechanical Drawing



## Package List



# Camera Package

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

## 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](mailto: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](mailto: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](mailto: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.