SPECS

Model	QHY174M-GPS
CMOS sensor	IMX174
Pixel Size	5.86um*5.86um
Full Resolution	1920*1200
Effective Pixels	2mega pixels
Active Image Size	11.25*7.03mm
Full Well	>32ke-
output sample depth	8bit/12bit
Typical Size	1/1.2 inch
Interface	USB3
Mono version	QHY174M
Guide Port USB2 hub	6PIN Guide Port (early model only)
TEC	2-stage TEC with -40C below ambient with tempearture regular
Optic window heater	Yes
Telescope Interface	M42/0.75 thread
Silicon Gel Socket	Yes

Re: [Planoccult] New QHYCCD camera with GPS and timestamping inside

Sun Aug 21, 2016 10:52 am (PDT) . Posted by:

"Carlos Perell=c3=b3" rigilk44

Hi,

Some days ago, Hristo Pavlov answered in the Planoccult list:

I am doing beta testing of one of these cameras at the moment
but I need to write software to control it. I have completed
most of the work to control the camera but tests haven't been
completed yet.

I will post more information as soon as I have it - hopefully within next couple of weeks - once the Chariklo campaign in Australia finishes on 20 Aug. The more information should contain sensitivity comparison with other cameras (WAT-910 and Raptor) and hopefully test of the timing accuracy of the camera by Dave Gault and Tony Barry.

I will include full support of the camera in OccuRec, which will also include recording of the GPS tagged video in ADV file format. I will also later release an open source public ASCOM Video Driver for the camera.

So far I can tell you that the packaging is impressive for its price - a very nice case but I haven't had any sky time with the camera yet so I don't know more.

Cheers,
Hristo.

I will wait until Hristo complete its analysis.
Carlos.

On 25/11/2016 Hristo wrote in PLANOCCULT Vol 326, Issue 1

Hi Jean,

The first batch of the QHY174-GPS camera had a problem in 16-bit mode where the embedded timestamp wasn't transmitted at all. My understanding is that this problem has been fixed but you should check before buying that the camera that you are going to get is not going to have this issue.

I have a QHY174-GPS Cooled camera, which I obtained for testing and for writing software. I did a sensitivity comparison with WAT-910DB and with a Raptor Merlin ME247 emCCD using a star field. Here are the preliminary results:

I used a star field close to the south pole which stayed at an almost constant altitude during the time when I recorded videos with the 3 different cameras in different gain modes. I used in all cases a 1.28 sec exposure with a 35cm Meade LX-200 on a Moonless night from suburban Sydney (visual limiting magnitude in Zenith around 4 - 4.5).

The QHY174-GPS was running in a cooled mode and was cooling to temperature of -15 Deg C - the maximum it could achieve with the +22 deg outside air temperature. WAT-910BD videos were recorded with OccuRec using the AAV file format (one frame per integration period). The QHY174-GPS camera was run in 8-bit mode. The Raptor was also running in a cooled mode.

From the videos that I recorded, for this preliminary result, I measured the same 4 stars of various brightness. The stars were:

4U 067-000648, Mag 15.371
4U 067-000647, Mag 14.776
4U 067-000657, Mag 13.969
4U 067-000660, Mag 12.571

The magnitudes are the UCAC4 unfiltered magnitudes and all measured videos were unfiltered as well. I measured the light curves of those stars in 100 consecutive frames using Aperture Photometry with a 5 pixel aperture and using Average Background. I then measured the SNR of the four stars computed as SNR = MEDIAN / STDEV, where MEDIAN and STDEV calculations were done in Excel. Here are the results for the 3 cameras per star. I only give the highest SNR with the corresponding Gain for each camera that has achieved the highest SNR for that star:

Star Mag 15.371:

WAT-910BD, 35dB Gain, SNR = 6.32
QHY174-GPS, 80% Gain, SNR = 5.35
Raptor ME247, 45% Gain, SNR = 4.41

Star Mag 14.776

WAT-910BD, 30dB Gain, SNR = 13.08
QHY174-GPS, 60% Gain, SNR = 10.72
Raptor ME247, 45% Gain, SNR = 8.99

Star Mag 13.969

WAT-910BD, 30dB Gain, SNR = 20.20
QHY174-GPS, 60% Gain, SNR = 16.39
Raptor ME247, 45% Gain, SNR = 15.43

Star Mag 12.571

QHY174-GPS, 60% Gain, SNR = 39.67
Raptor ME247, 45% Gain, SNR = 37.71
WAT-910BD, 30dB Gain, SNR = 21.80 (smaller value possibly due to corrected non-linear response of the chip at bright levels)

The videos were only recorded in 3 different gain modes. For QHY174-GPS they were 60%, 80% and 90%. For WAT-910BD they were 30dB, 35dB and 40dB. For Raptor ME247 they were 45%, 52% and 56%.

I intend to do a full write up of this comparison with a lot more detail and using a lot more stars in the comparison. This write up will also contain comparison between WAT910BD and Raptor ME247 with a Sloan r' filter. I will see if I can get this submitted to the Journal for Occultation Astronomy but will need some time to complete it.

So talking about the QHY174-GPS camera:

The advantage of the camera is the embedded GPS timestamps, that you won't need a separate timing equipment and also the wider range of exposures it supports. To my knowledge however the accuracy of the GPS timestamps haven't been independently verified just yet. I am still working on the software to make it possible to test the camera properly as the control of the timestamp works in what I would call "a non-standard way" and the software control of the camera will need to make sure that it uses the timestamping to the highest possible accuracy. As I am not satisfied that I have done this yet I haven't asked Dave Gault or Tony Barry to test the timestamping accuracy of the camera with their SEXTA devices. Additionally the issues I had with the timestamps in 16-bit mode have delayed my progress significantly. I am still to patch manually the firmware of my camera before I can test the timestamps in 16-bit mode. The manufacturer of the camera is providing help with the firmware update but things are moving quite slow. Please note that I didn't pay for the camera but got it from QHY to test it and to write software so paid customers may receive a lot faster support.

On the other hand the WAT-190BD/HX appears to be a more sensitive camera where you can go deeper and get a better SNR. The QHY174-GPS is getting close and I haven't tested it in 16-bit mode yet but I think that for observing fainter stars WAT-910 remains the more capable camera.

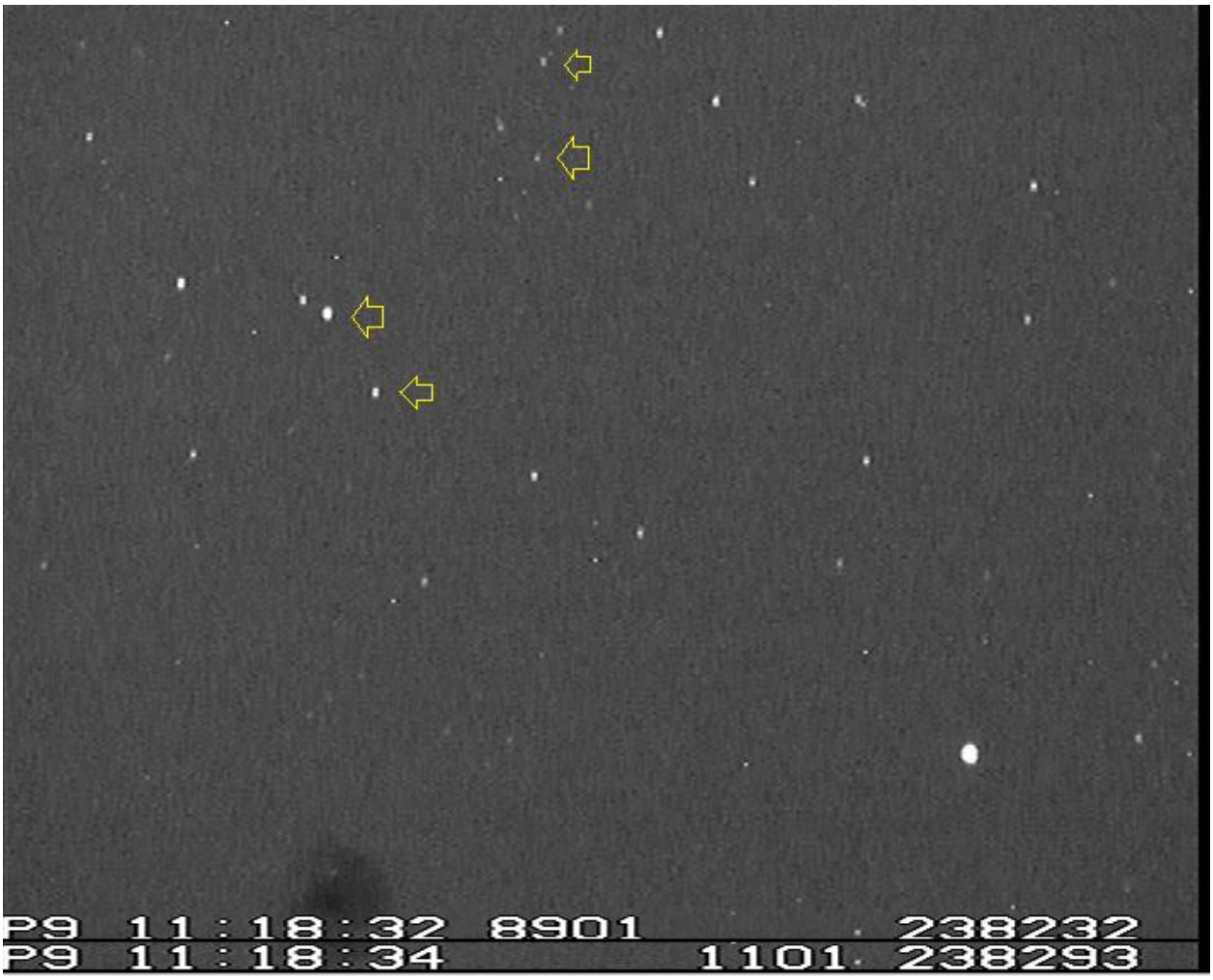
I know that this information is incomplete but as I got asked from a number of places how is my testing going so I thought I will piggyback on your email and provide some information. I hope that this information will be useful to you and everyone else interested in the camera. If anyone wants more details, including my test videos, please drop me a private email and I'll see what I can do.

In regards to the full report (which will show a more detailed comparison between the cameras) I am not committing to any timelines but hopefully it will be take less than a couple of months to complete it and submit it for publication.

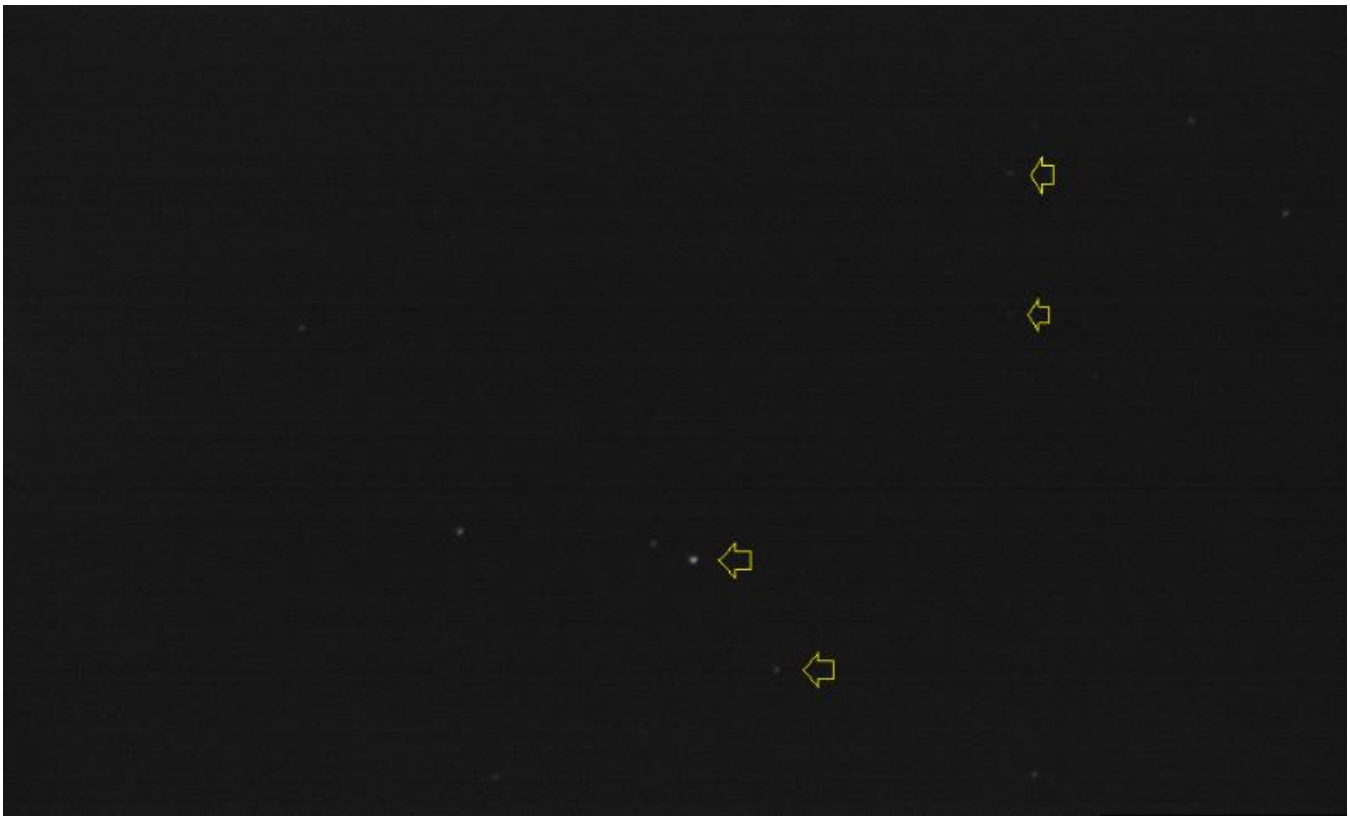
Cheers,
Hristo.

P.S. And as a picture is worth a 1000 words here are screenshots from the fields with the measured stars marked with an arrow,

from the QHY147-GPS (at 80% gain):



and the WAT-910BD (at 35dB Gain)



61870**Re: [IOTAoccultations] Re: News article on MU69 expedition**

Expand Messages

- **Roger Venable**

May 26

We'll be using the QHY174-GPS. I'm not sure of what integration has been decided upon, but tests have imaged the target star (mag 15.5) quite well at 1/4 and 1/2 second using 16-inch reflectors at prime focus. One convenience of the camera is that it stamps a GPS time onto each frame without using a time inserter -- the GPS is integral with the camera. This camera has the potential to solve IOTA's problem of needing an all-digital occultation system! I understand that the quantum efficiency of the camera is about 78% and the read noise is low. A further advantage of the camera is the large size of the CMOS chip. The current price of the camera is somewhat more than that of the Watec 910HX but less than $1000.00. Think Christmas present or something. <g>

I have been able to image the target with integration of 1/4 second with a Watec 910HX, using a 14-inch SCT at f/2.0, with S/N of 3.7, from my home, where conditions were less favorable than those expected at the South America and South Africa observing sites. I think the 16-inch scopes that the expedition will be using will provide a S/N somewhat better than that.

-- Roger

61880**Re: emCCDs**

Expand Messages

- **driftscanner**

May 27

I understand Bruce Holenstein has such a camera but since the observers on the MU69 expedition have chosen a QHY174-GPS that's probably the best option for occultations at a reasonable price. It's larger-than-video field of view is especially suitable for identifying star fields through larger telescopes and enabling a reasonable interval for drift-through observations. The same camera with the thermoelectric cooler option could be used for long-exposure drift scans and deep sky imaging if calibration images are applied. I'll probably buy one and resurrect my 20" f/2.7 asteroid-hunting reflector after its tarnished silvered mirror is aluminized. If I build a mobile fold-up alt-alt mount, that would be a powerful combination for observing faint distant occultations that are otherwise out of my league.

John

61869**Re: News article on MU69 expedition**

Expand Messages

- **driftscanner**

May 26

They'll need to use half-second exposures on the most sensitive cameras available for the 15th-magnitude occultation on June 3. The camera options I'm aware of are QHY174-GPS, Watec 910HX, Malincam Recon 428/828 and emCCDs. I guess the professionals already have a few back-illuminated CCD cameras they used on previous Pluto-related occultations.

John

61937**(537) Pauly occultation comparison**

Expand Messages

- **iotadunham**

Jun 12 8:34 PM

Last night, Steve Conard, Joan, and I recorded a 3.6-sec. occultation of a 12.1-mag. star in Capricornus by (537) Pauly from Steve's driveway in Gamber, Maryland. We recorded the occultation with two telescopes, side-by-side, Steve's 9-inch SCT using a Watec 910 camera and IOTA-VTI for timing, recording video with the IOTA video capture program at 30 frames/second, and with the "MU69" system, our 16-in. Skywatcher Dobsonian and Steve's QHY 174 GPS camera, using SharpCap to record 15 time-stamped fits images per second. Steve had to leave later in the morning on a business trip, so it may be a few days before a proper comparison of the timings with the two systems can be made. The observed duration was about half the predicted central duration, consistent with the location's distance of 24 km north of center (the limits were predicted to be 33 km from center), but the occultation occurred about 15 seconds early. Joan and I also ran two remote stations with 10-in. suitcase telescopes, one beside the Astronomical Society of Greenbelt's observatory (trees blocked the view of the event from our home) that was 17 km south of center, and the other only 3 km south of center at a fast-food parking lot near the Applied Physics Laboratory in Laurel. The latter had a good dark view, but sometime while we were away (don't know yet if it was before or after the 3:19am occultation), a water truck came through spraying water irregularly around the parking lot, maybe to keep down dust and water nearby vegetation during our current dry heat wave. One water spurt hit the telescope (now drying out in our family room) but although the towel covering the IOTA-VTI and recording equipment was somewhat wet, that equipment was dry and worked fine for a VTI position recording that Joan made when we returned to the site after the occultation. This evening, if the sky remains clear enough, we'll try to record the occultation of a 15.9-mag. star in Libra by the Plutino object (469506) 2003 FF128 with the 16-in. from Gamber. David