QHYCCD

QHY174GPS Design

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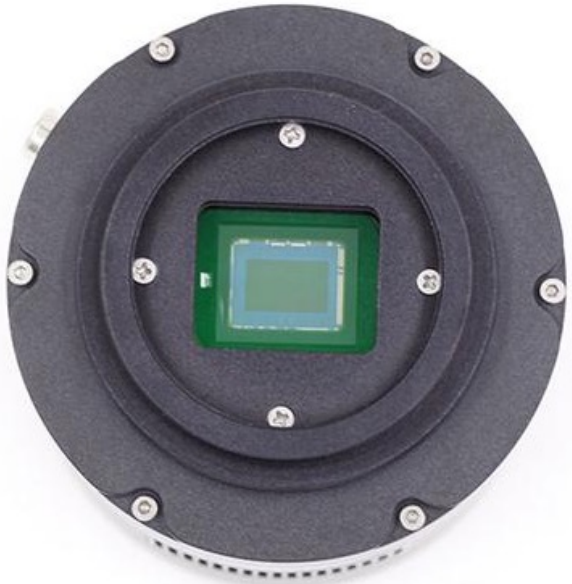
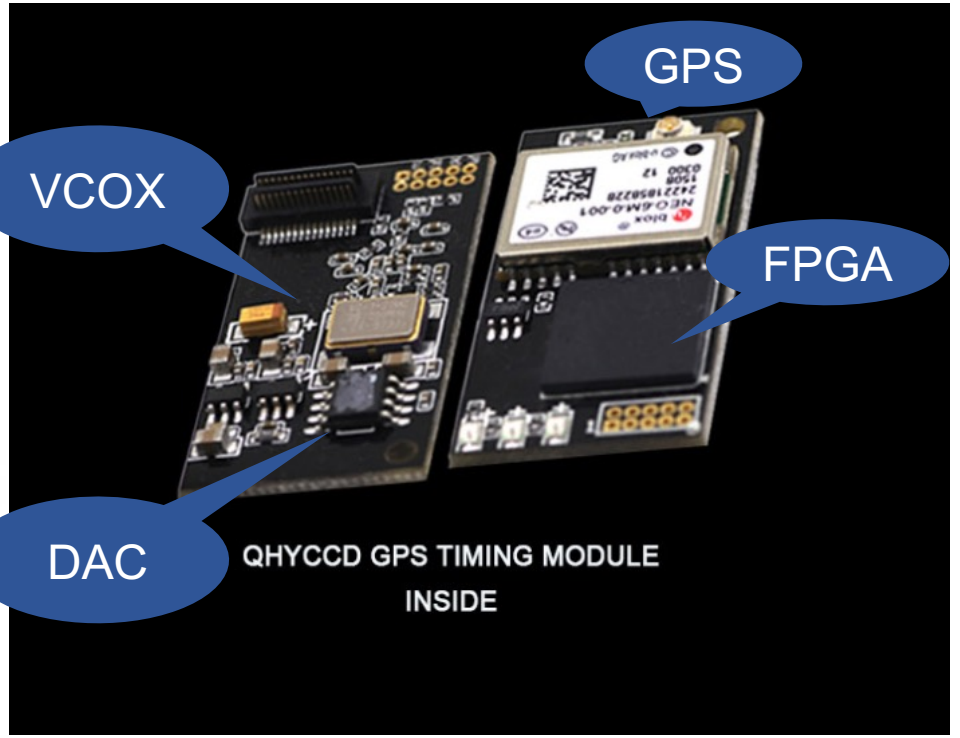
QHY174GPS





1.GPS Module Inside in the Camera
Design Target : Accurate 1 us Resolution 0.1us

2. Sony Global Shutter CMOS
1920*1200 UP TO 138FPS , 78% QE
2e to 5e readout noise 12/8bit output

Major Component	Feature
GPS module	Standard
FPGA	6000 gates, fully programmable
VCOX	10MHz Voltage Controlled Cystal
DAC	Digital to Analog Convetor for VCOX frequency control

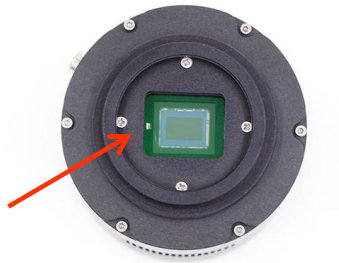
LED Calibration Method

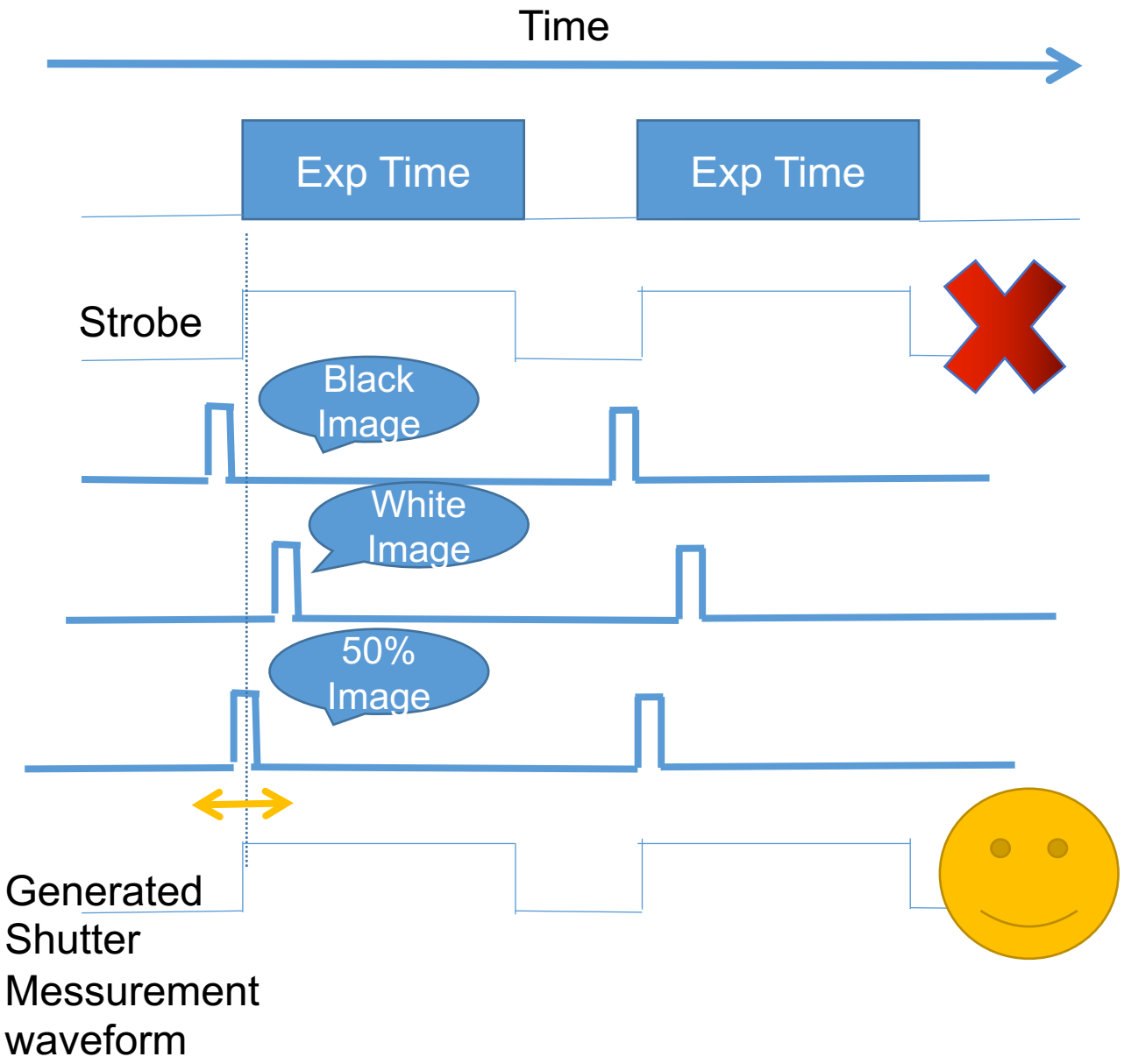
① Build in LED on front of sensor

Strobe Signal is not so precise . QHYCCD has a build-in LED emitter to flash a short pulse .By adjusting postion of this pulse we can find the begin and end of the exposure edges.

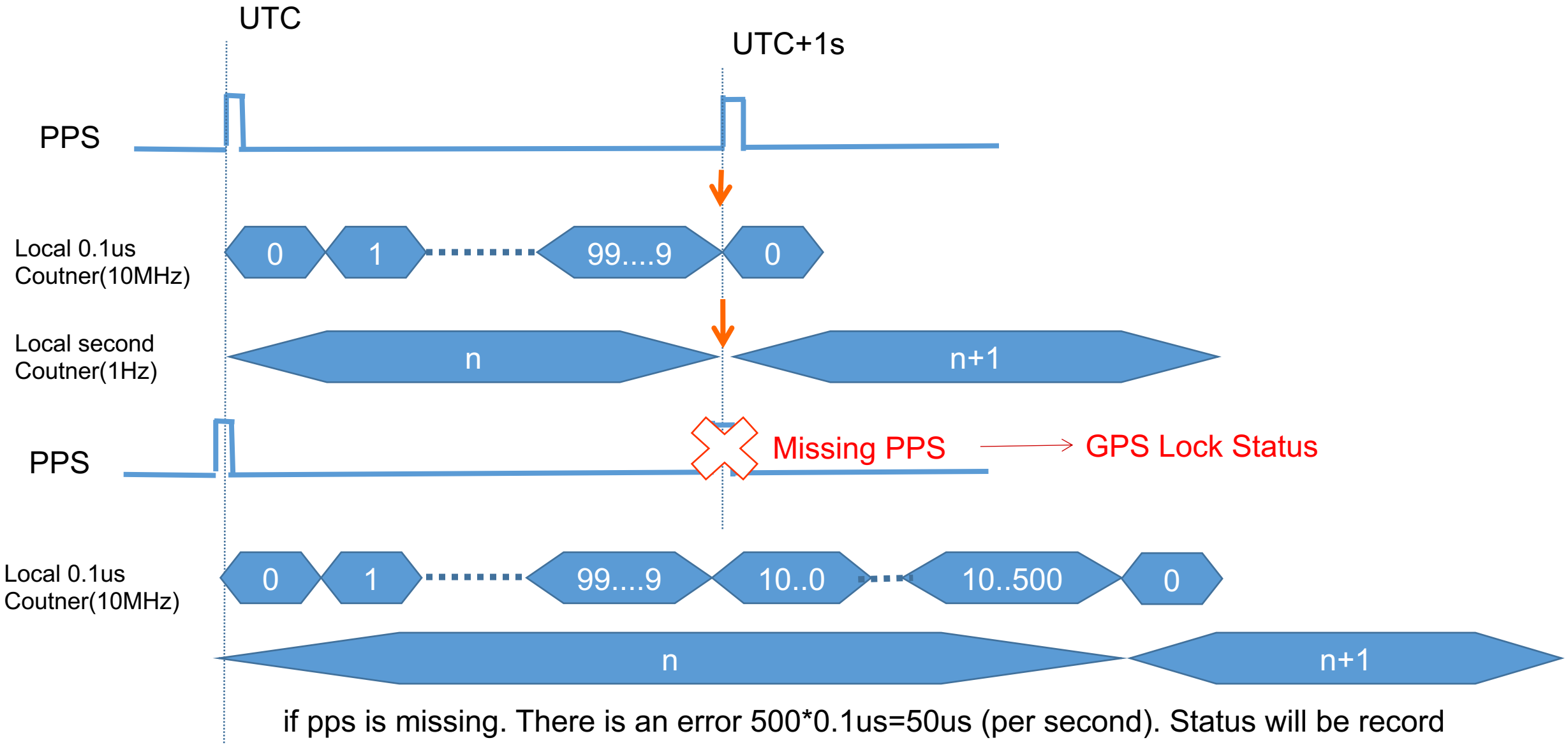
② Need to be Calibrated before using

This needs to be calibrated only once for each different exposure time. Data can be stored in software (dependent on software) and can be reused in future.



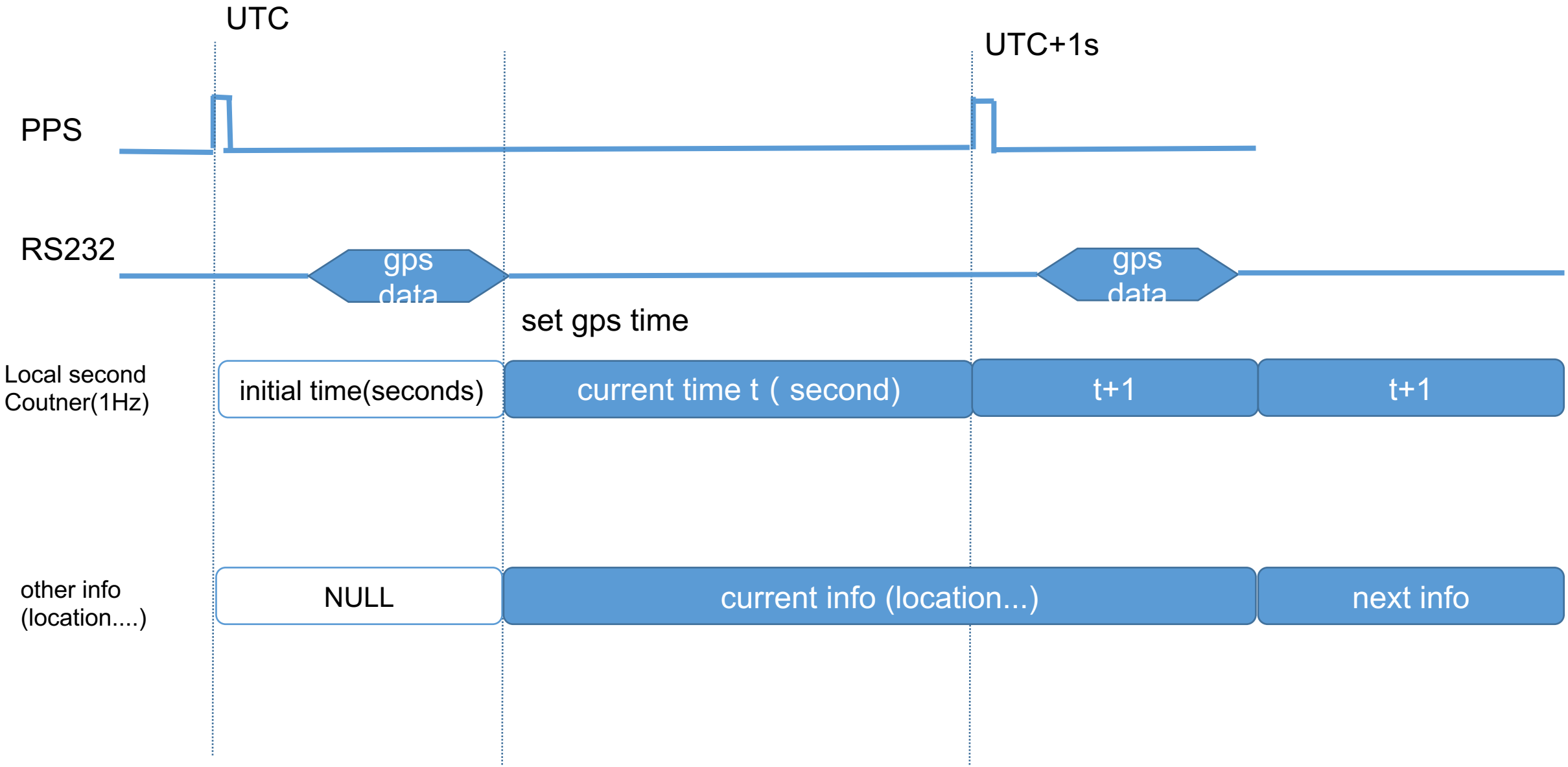


PPS Synchronized Timer / Missing Handle



if pps is missing. There is an error 500*0.1us=50us (per second). Status will be record

GPS year/month...../sec/positions initial timing



Hardware TimeStamp in image head pixels

0 Sequence Number MSB
1 Sequence Number
2 Sequence Number
3 Sequence Number LSB

4 temporary Sequence Number (Normally no use)

5 Image Width MSB
6 Image Width LSB

7 Image Height MSB
8 Image Height LSB

Latitude is the current latitude report by GPS.
9 latitude MSB
10 latitude
11 latitude
12 latitude LSB

Longitude is the current longitude report by GPS.
13 longitude MSB
14 longitude
15 longitude
16 longitude LSB

17 Start_Flag (GPS STATUS)

Shutter start time (JS)
18 Start Second MSB
19 Start Second
20 Start Second
21 Start Second LSB

22 Start micro second MSB
23 Start micro second
24 Start micro second LSB

25 End flag (GPS STATUS)

Shutter end time (JS)
26 End Second MSB
27 End Second
28 End Second
29 End Second LSB

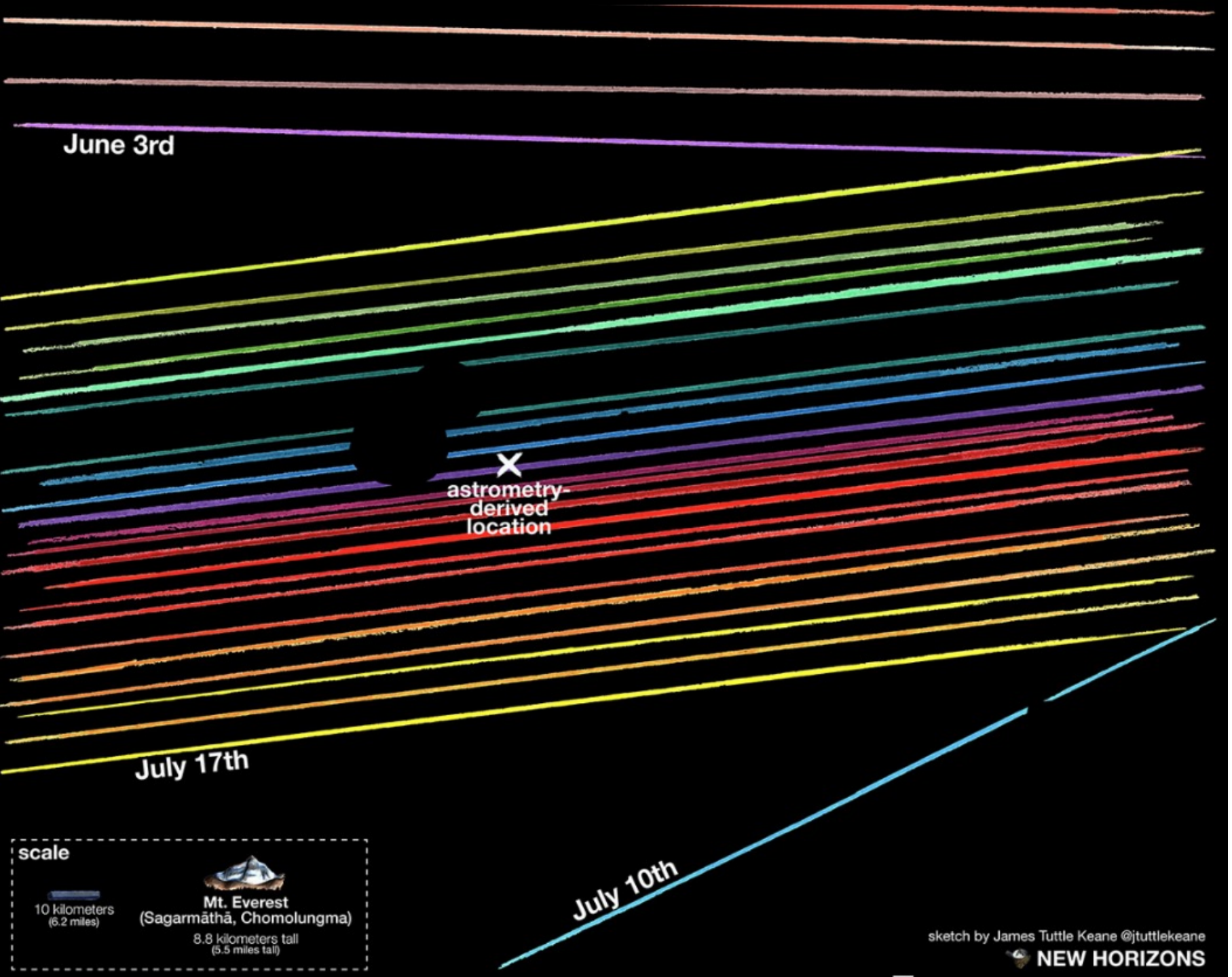
30 End micro second MSB
31 End micro second
32 End micro second LSB

33 now flag: this can be used for the GPS statu indicator bit[7..4] is the

The now time is the time that of the vertical sync of the CMOS sensor. It does not the precision time of shutter open or close
34 now second MSB
35 now second
36 now second
37 now second LSB

38 now micro second MSB
39 now micro second
40 now micro second LSB

The counter value of two PPS. it should be about 10,000,000. But since the temperature of the crystal. It is not exactly the 10,000,000. You can adjust the VCXO to let it close to it. And when the PPS signal lost, it will become 10,000,500. When exceed this value, FPGA will generate a second to instead of the GPS PPS signal to avoid the second counter lost one second.
41 count of PPS MSB
42 count of PPS
43 count of PPS LSB



A successful Project using QHY174GPS

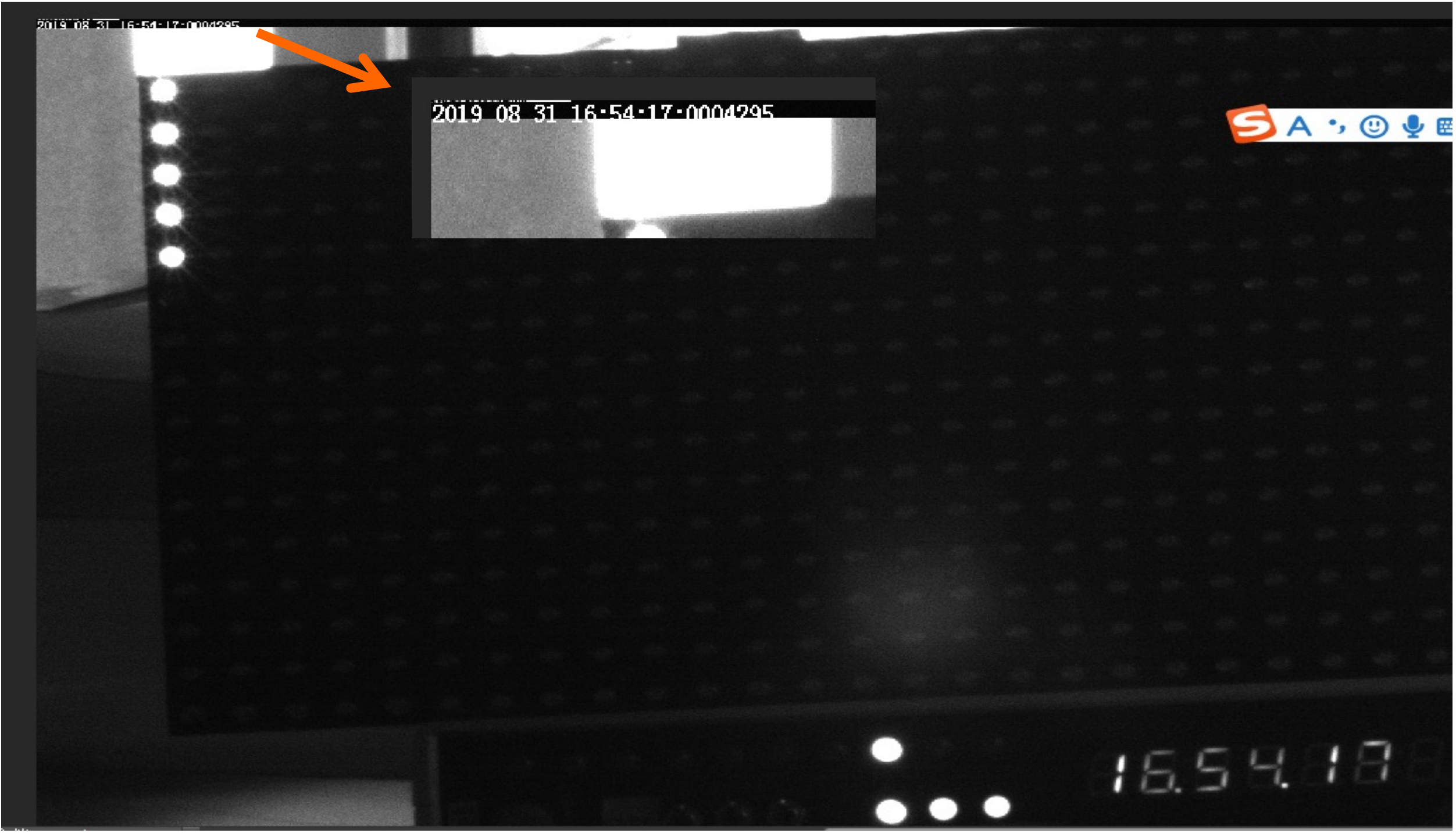
MU69 Occulation Observing by NASA New Horizons Team

2017.7.17 in Agentina

Using more than 20 QHY174GPS,400mm Dob.

Five Signals has been Recorded


2019 08 31 17:05:52:0178414
2019 08 31 17:05:52:0178414
17.05.52


2019 08 31 16:54:17:0004295
16.54.18

Future Development / Products

Standalone GPS BOX with the support for the most QHYCCD CMOS cameras.
Support GPS signal or GPS/BD dual mode signal.

Most QHY CMOS Camera is FPGA based . Can be re-programed to support GPS sync and hardware time stamp on image

We can add the support based on user's requirements. Currently we have QHY163 added. The QHY4040,2020,6060, 411, 461, 600 etc. are under development plan.

The major challenge is that the most CMOS cameras have rolling shutters. For rolling shutter cmos each row does not begin/ends its exposure at the same time. Image based re-calculation is required. Data processing is more complex.

The QHY174GPS using global shutter IMX174 cmos sensor. QHYCCD is developing more global shutter based cmos camera, like IMX342(APS-C), IMX432(1.1inch), Gense0806(APS-C) etc.

Other low cost global sensor is under considering for low cost solution.