

## Astrophotography with Pentax k-m

*Short version in English*

*by Tihomir Yosifov*



Pentax k-m и with Samyang F 500mm; 1:6.3

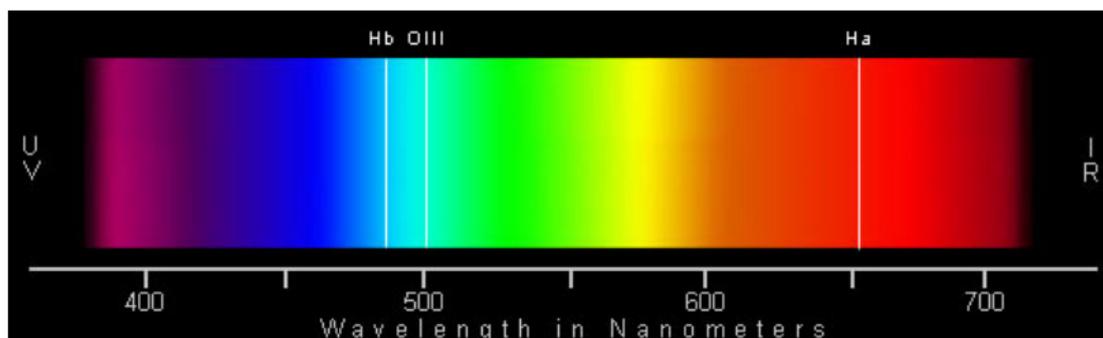
Pentax k-m is a nice entry level camera and as most of the other cameras in its range, this one is designed for daytime, general photography. It is one of the last DSLR with a CCD sensor. The current trend among is to move to CMOS architecture as it has the advantage of lower power consumption and higher read out speed – needed for the new HD video feature. The CCD has slight higher quantum efficiency but suffers of a design disadvantage in regards to long exposures - amplifier glow.



Dark frame, ISO 1600, t +20 Deg, exposure 5 min.

It could be corrected with a dark frame subtraction but the signal in the affected area is lost.

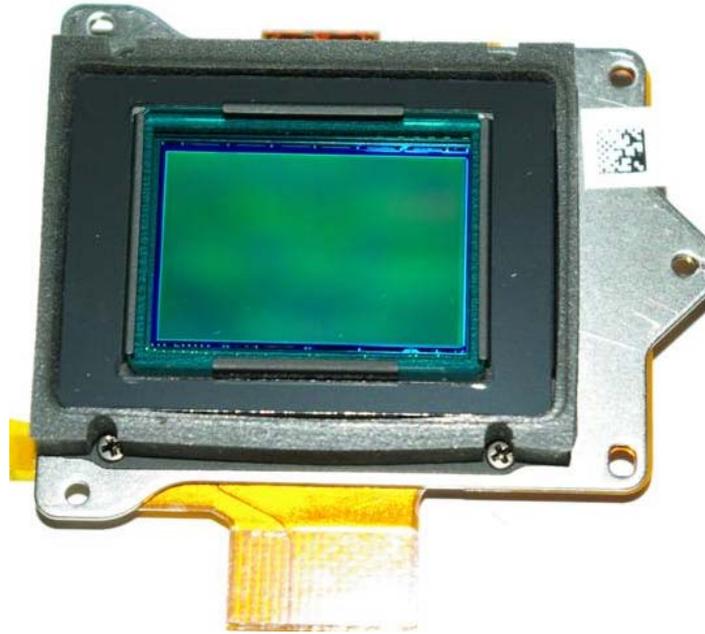
All the DSLR cameras have IR cut filter mounted in front of the CCD chip. It cuts most of the hydrogen-alpha emission at 656nm and the entire IR spectrum. Hydrogen-alpha is the most common wavelength emitted by the hydrogen in the nebulas and this reduces the sensitivity of the camera against such objects.



The visible portion of the electromagnetic spectrum ranges from approximately 400 nm to 700 nm.

[http://www.astropix.com/HTML/I\\_ASTROP/DSLRL\\_HA.HTM](http://www.astropix.com/HTML/I_ASTROP/DSLRL_HA.HTM)

My camera has been successfully modified by removing that filter to extend the available wavelength for astrophotography. The firmware was calibrated so there is no need of substitute filter to be placed. The autofocus and metering are working correctly and a manual lens could focus to infinity. When using the R72 IR pass only filter, the autofocus is well but the metering is incorrect so manual shooting is needed. Also the shake reduction is working well after the modification.



<http://2k8.ch/xdeltax-alt/tutirmodding/>

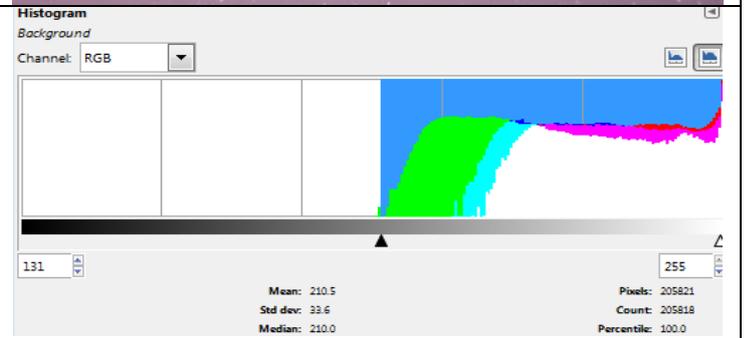
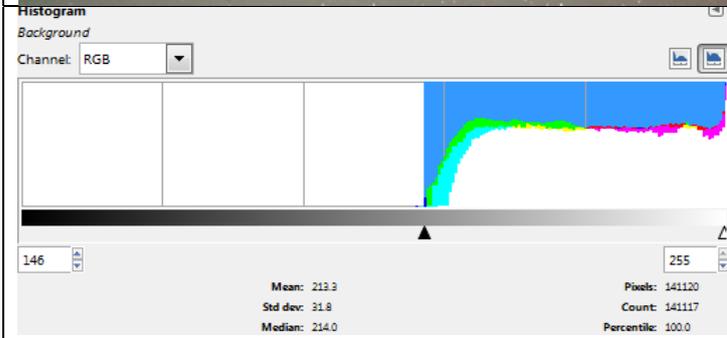
The build in filter has a green to blue color and that is why after the modification, the camera should be used with manually calibrated white balance. I have an external IR-cut filter (B + W 486 IR UV cut) that can be placed in front of the objective in order to be able to take good photos outdoor.



Pentax k-m, crop, 1/160, ISO 100, 1:5.6; B + W 486 IR UV cut filter, manual white valance



Pentax k-m, crop, 1/60, ISO 100, 1:8; no IR – cut филтър, auto white balance



M42, Pentax k-m (before modification), F 200mm, 1:3.8, ISO 1600, 5 min exposure, auto white balance, unprocessed frame

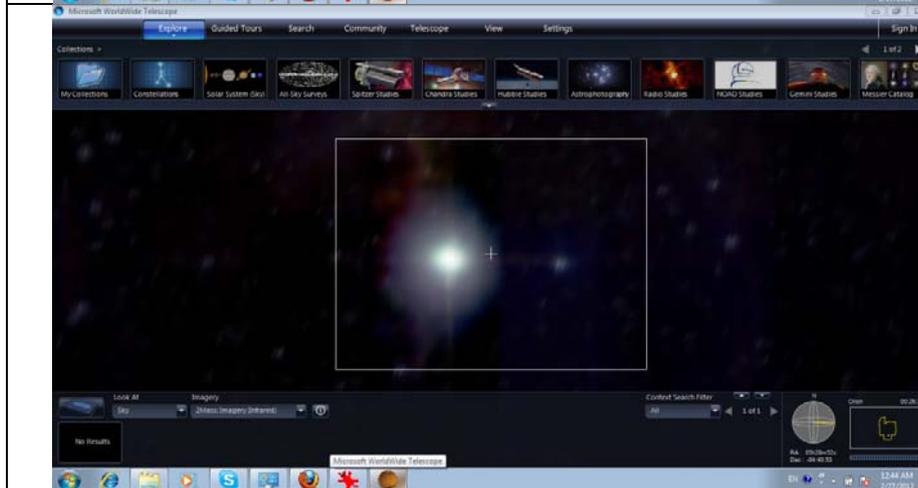
M42; Pentax k-m, no IR - cut filter; F 200mm, 1:3.8, ISO 1600, 2 min exposure, auto white balance, unprocessed frame

Comparing the histogram of the center of the Orion nebula, we can conclude that for this specific object the exposure has been shortened by factor of 2.5x. I noticed as well two spots at the photo, taken after the modification. They seem to be infrared sources. They are well visible even at 30 sec exposure. I have researched on them with World Wide Telescope. The upper spot is S Orionis - HIP25669 (HD294176 SIMBAD). A double system with a red giant, 588ly away.

<http://www.eso.org/public/news/eso0725/>



WWT: (Digitized sky survey - color).



WWT: (2Mas imagery - infrared).



WWT: (Hipparcos Catalog)

This image of the area around the Lagoon nebula illustrates how an objective of 6 lens could not focus IR and visible light at the same focal plate. This is causing a glow around the stars and it is typical for multi lens systems. Therefore refractors are not suitable for wide spectrum photography.



The region of M8 from the National Observatory - Rozhen, Bulgaria, Pentax k-m (modded), Synagor MC Auto, F 200mm, 1:3.8, ISO 800, 2 min, manual white balance calibrated at daylight, curves processing with Photoshop



2m RC telescope of NAO Rozhen. Pentax k-m (modded), R72 IR pass only filter, 1/1000s, Pentax DAL F18mm, 1:8, ISO 200, WB: auto, focus: auto



Lagoon nebula M8, RGB + IR. Stack 14 x 45s ISO 1600, Pentax k-m, Samyang F 500, 1:6.3, a bit noisy at  $\sim +25$  Deg. Curves processed with Photoshop



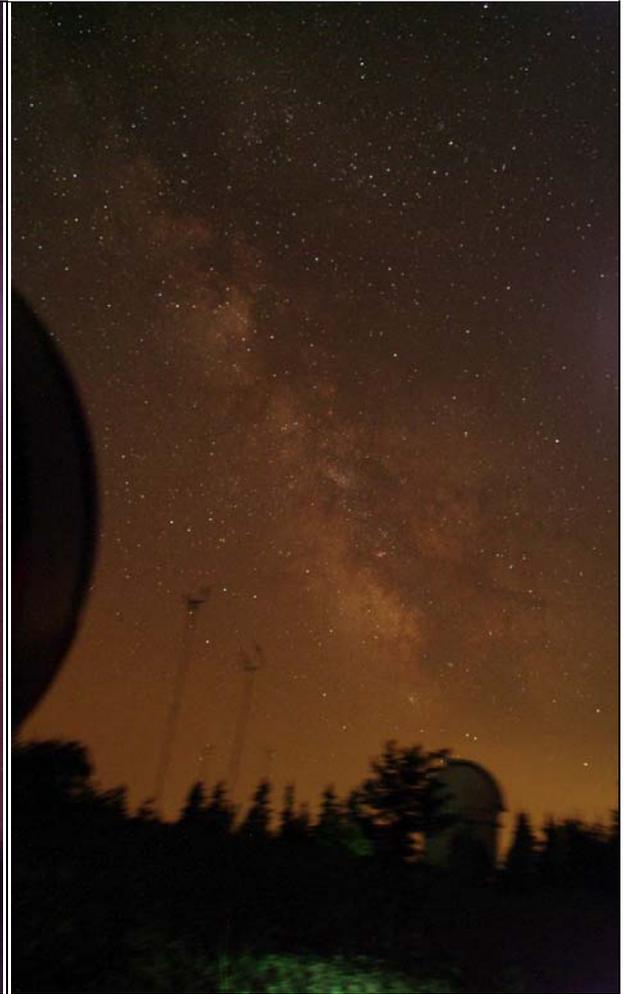
The region of South America nebula. Pentax k-m (modded), 300s, Pentax DAL F55mm, 1:5.6, ISO 800, no dark subtraction.  
Curves processed with GIMP



Milky Way over the 2m RC telescope of National Observatory - Rozhen, Bulgaria. Unprocessed frame, JPEG, Pentax k-m (modded). Pentax k-m, DAL 18mm, 1:5,6, 200 s, ISO 800. No filter



Milky Way over the 2m RC telescope of National Observatory - Rozhen, Bulgaria. Unprocessed frame, JPEG, Pentax k-m (modded). Pentax k-m, DAL 18mm, 1:5,6, 200 s, ISO 800. Hoya R72 Infrared pass only



Milky Way over the 2m RC telescope of National Observatory - Rozhen, Bulgaria. Unprocessed frame, JPEG, Pentax k-m (modded). Pentax k-m, DAL 18mm, 1:5,6, 200 s, ISO 800. B+W 486 Digital UV/IR Blocking, visible light only

There are some differences in the fine details. The IR image gives best contrast as it filters most of the light pollution in the sky. The combined image with no filter is the brightest one.