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Ricoh Imaging Americas Corporation

WHITE PAPER



NEW STANDARD OF PERFORMANCE SERIES

#1-The Anti-Aliasing Filter Simulater Technology Explained

K-3

December 2013

INTRODUCTION

The Pentax K-3 is the premier DSLR in Ricoh Imaging's robust and full-featured APSC digital SLR lineup. While it boasts some very impressive features such as a 24 megapixel APS-C CMOS sensor, incredibly fast 8.3 frames per second maximum frame rate, a 27 point Auto Focusing system, an advanced 86,000 pixel metering sensor, outstanding HD video performance and a complete wireless solution with the dedicated Pentax Flu SD Card, it is also the world's first camera to offer the user the possibility of turning on or off the Anti-Aliasing filter effect. This is accomplished by using Pentax's new AA Filter Simulator Technology.

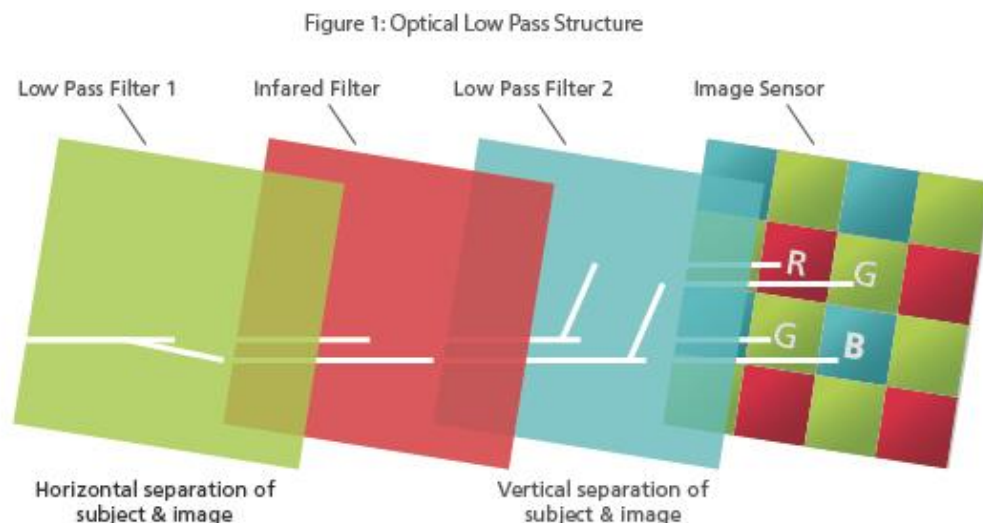
The objective of this White Paper is to explain Pentax's AA Filter Simulator Technology.

MOIRE

Moiré is the resulting pattern created by the interaction of fine pattern in the subject with the pattern in the image sensor, and is manifested in the form of odd stripes or color in the image. Subjects that typically yield moiré patterns are fine woven textile patterns, hair, or repetitive patterns in architecture.

THE OPTICAL LOW PASS FILTER

The conventional method to reduce moiré is to introduce an Optical Low Pass filter stack in front of the Image Sensor as shown in Figure 1 below. Each of these Low Pass Filter elements is a birefringent^[1] material that splits the ray of light into two. The effect of the stack below on the single ray of light shown is to split it into four; the first filter element splitting the incident ray horizontally and the second element splitting each of the two incident rays vertically. The visible result of this when applied to all the light incident on the sensor is a slight blurring of the image that removes the high spatial frequency components and thus reduces if not entirely prevents the occurrence of moiré.

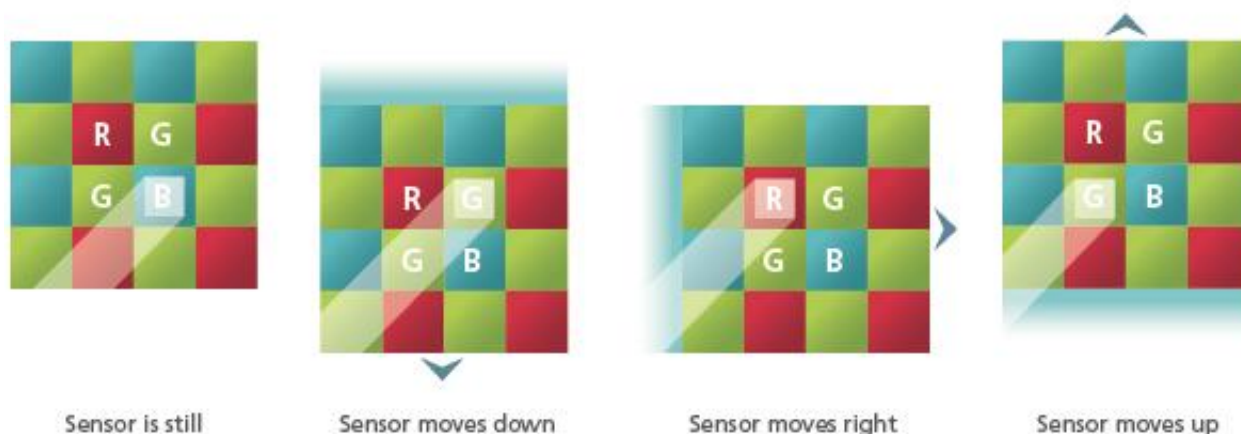


[1]-Optical property of a material having a refractive index that depends on the polarization and propagation direction of incident light

PENTAX'S ANTI-ALIASING FILTER SIMULATOR

The Pentax's Anti-Aliasing Filter Simulator recreates the same effect as the conventional Optical Low Pass filter. Through Pentax's Shake Reduction (SR) mechanism, it is possible to apply microscopic vibrations to the sensor during exposure, and effectively have the same effect as splitting a beam of light, as described below in Fig. 2.

Figure 2: Detailing the movements of the sensor to simulate the AA filter



The Anti-Aliasing Filter simulator in the K-3 offers the choice of three settings to obtain the desired effect: "TYPE 1" to attain the optimum balance between image resolution and moiré; "TYPE 2" to prioritize moiré compensation; and "OFF" to prioritize image resolution. You can now switch the AA filter effect on and off depending on your subject. For example, if you are shooting fashion, architecture or other type of subjects that involve tight repeating patterns, it would be necessary to turn the simulator to Type 1 or Type 2. Conversely, if you are shooting landscape or portraits, you can capture optimum resolution by switching the AA Filter Simulator OFF.

The Pentax Anti-Aliasing Filter Simulator is most effective at shutter speeds of 1/1000 or slower.

PENTAX'S ANTI-ALIASING FILTER SIMULATOR IN ACTION

Two real world test cases - each shot under the three available options – have been detailed below (Figure 3 and Figure 4). One can clearly notice the presence of moiré pattern but greater sharpness in image when the AA filter is off, reduced moiré pattern and slightly reduced image sharpness in Type 1, and the least moiré pattern occurrence and image sharpness in Type 2.

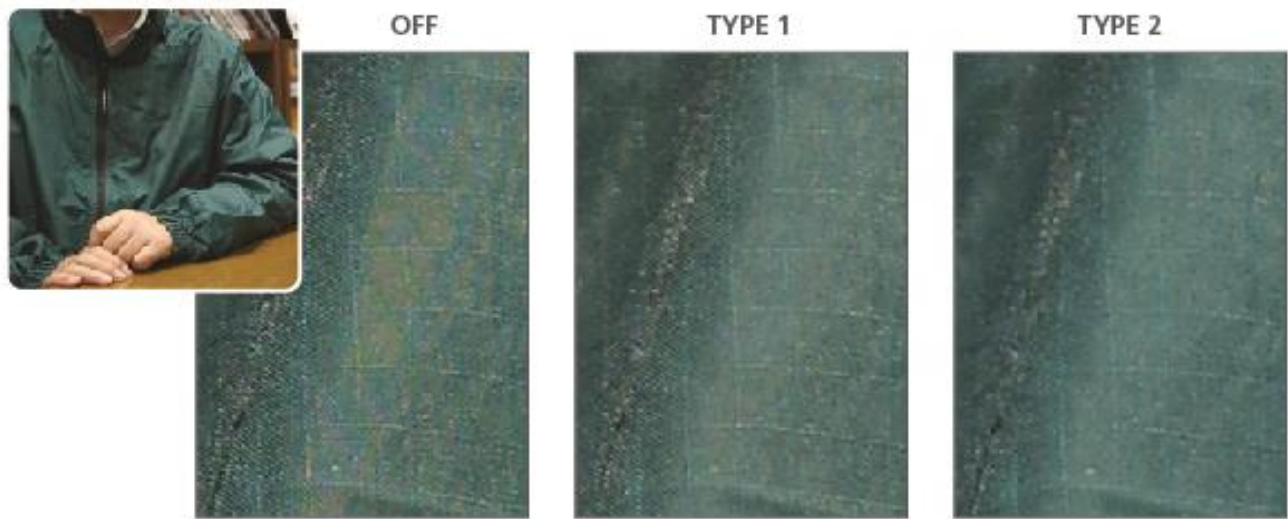


Figure 3: Example of AA Filter Simulator in Action



Figure 4: Example of AA Filter Simulator in Action

SUMMARY

Thanks to this innovative feature, the K-3 offers the benefits of two completely different cameras — the high-resolution images assured by an AA-filter-free model, and minimized false color and moiré assured by an AA-filter-equipped one.

About Ricoh Imaging Americas Corporation

Ricoh Imaging Americas Corporation is a subsidiary of Ricoh Company Ltd., a global technology company specializing in office imaging equipment, production print solutions, document management systems and IT services. Headquartered in Tokyo, Ricoh Group operates in about 200 countries and regions.

The company now known as Ricoh Imaging Americas Corporation was originally founded in 1919, under the name Asahi Optical Joint Stock Co. and launched its first SLR camera in the 1950s under the PENTAX name. Today, Ricoh Imaging Americas Corporation continues to produce the heritage-rich, award-winning line of PENTAX DSLR cameras, lenses and sport optics equipment as well as Ricoh's offering of stylish and compact digital cameras, known for their wide-ranging, rich set of features.

About the Author

Krishnan Sangameswaran is the Product Marketing Manager at Ricoh Imaging Americas Corporation.