www.baader-planetarium.de

NOTES about the stacked 1¼" K-Line Filter

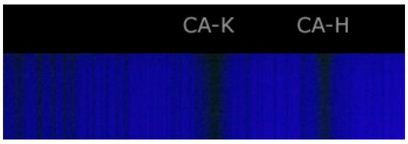
Important Safety Note: The Baader K-Line filter must be used only with an additional OD-reduction filter, e.g. AstroSolar® Photo Film w. Optical Density 3.8 (included). It is designed exclusively for photographic use with CCD-cameras or video modules (like monochrome Celestron Skyris cameras). It is not intended for visual observation[1].

In 1814, Joseph v. Fraunhofer observed the spectral lines of the sun for the first time and assigned a nomenclature to the most striking lines, beginning in the red part of the spectrum and ending in the violet part. Some of his designations are still in use today.

The stacked Baader K-Line Filter shows the Sun in the two Fraunhofer-lines:

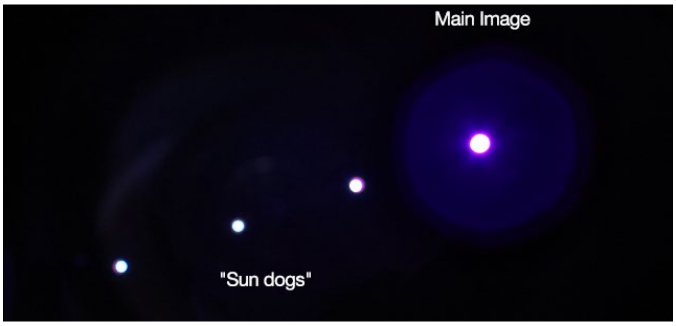
CA-K: 393.37 nm (3933.7 Å)

CA-H: 396.85 nm (3968,5 Å)



This distinctive part of the spectrum is also called CA-II. The K-line is very broad and can be split – with special, very expensive filters – into the components K1, K2 and K3. The Baader K-Line-filter has a half band width (HBW) of 8nm (80 Å). The human eye is almost blind at these UV-wavelengths, and at the same time UV-radiation below 390nm can cause severe damage to the eye. This is why the Baader K-Line filter is NOT approved for visual observation[1].

The small spectral width of the filter of only 8nm delivers much higher contrast than what would be predicted because two such filters are combined (stacked) in one filter cell. They are mounted slightly tilted towards each other inside of their common housing. This avoids reflections between the two filters. In this way, reflections and scattered light will not impair the contrast of the image. See the following image for comparison::



If you were to take a – very short – glance at the sun through the K-Line-filter in combination with Astro Solar Photo Film, you would see some asymmetrical, very dim "sun dogs" far away from the center of the image. They are caused by the tilt of the filters. With parallel filters, these reflections would all overlap and destroy the image quality. But since all reflections are directed to the side, you can image the centered UV-Sun through your telescope.

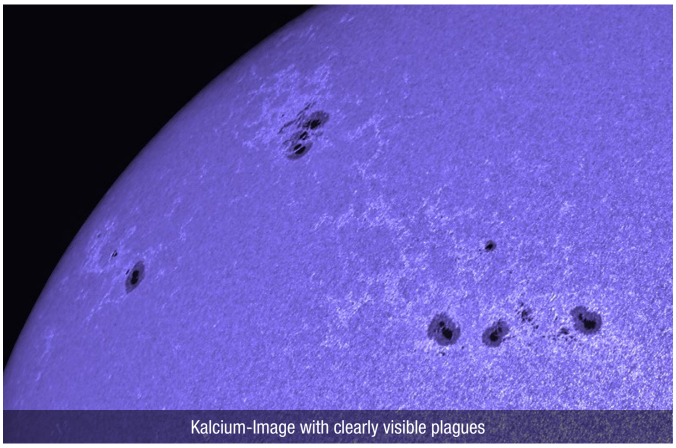
These reflections are not an indicator of problems with the filter – instead they are the reason why the Baader K-line filter works as well as it does - at a stunningly low price!

Please remember: Never look into the sun with the K-Line filter without an additional OD-reduction filter!

This warning is valid for observation with a telescope as well as for the naked eye. The sensory cells in our eye are almost blind for the UV-part of the spectrum. If you hold this filter in front of your eyes in bright daylight, you'll see nothing of the landscape at all. If you hold it against the sun, you will see it – and it will not at all feel gleaming bright. But exactly here lies the danger: although you don't perceive it, there is a lot of harmful UV radiation entering your eye.

UV-intensity must be very high for us to see anything in UV at all. It is mindboggling negligence to bring such a high energy density (that is: it is the almost full intensity of sunlight at around 390nm) directly into anyones eyes. We really can't understand why telescopes with CaK-filters were ever offered for visual observations – and sometimes are still being offered!

Calcium-K-light (at around 390 nm) is emitted from a layer of the sun which is about 500 km above the photosphere (which is called white light = continuum at about 550 nm). Basically, you look into the boundary layer between upper photosphere and lower chromosphere, while H-alpha-light at 656.28nm is emitted within the upper chromosphere, which marks the boundary layer between the chromosphere and the inner corona of the Sun.



Kalcium-Image with clearly visible plagues

The solar disk appears blue in CaK-light, exhibiting a network of structures in the chromosphere which appears much brighter.

These bright "plages" are usually associated with faculae and sunspots in the photosphere - and these plagues can be seen all over the sun.

This network in the chromosphere consists of cells of supergranulation which measure roughly 30,000km in diameter. There are very strong magnetic fields at their edges. The network appears much more prominent and richer in contrast in CaK-light than in white-light.

Sunspot group on the edge of the sun, taken with Baader K-Line Filter

As you are imaging the boundary region to the chromosphere (H-alpha light), you may sometimes even capture a picture of so called Ellerman bombs – these are micro-flares close to sun spots. CaK-images are usually taken in monochrome (black & white) and are color coded later during image processing.

You can find an animation on our website which shows the difference between white-light (continuum, 550nm) and Calzcium-K (395nm). There are also illustrations and explanations regarding Ellerman bombs and Supergranulation:: www.astrosolar.com/animation-cak-cont

AstroSolar Photo Film OD 3.8 has been delivered since mid-2015 with the warning sticker shown on the right. Please attach it to your filter-cell to avoid accidents

[1] **Please do not use this product if you don't feel well-informed about the risks and hazards involved in improper handling.**

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