Schneider Platinum IRND Filters

By Alfonso Parra AEC



In this article we are going to study in depth the Scheneider's Neutros infrared cut filters, which were launched to the market under the name of Platinum. These filters are designed to limit the pass of infrared around the visible spectrum range (near-infrared and far-red), so they keep better both color reproduction and blacks more neutral as well as the resolution of the camera-lens set. Due to the fact that filters are not dichroic they do not cause neither color deviation when we go away from the optical axis nor reflected light nor vignetting on the image periphery.

We have checked filters with four different cameras: ALEXA and RedOneMX which use CMOS, F35 which uses CCD and finally a low range camera as Canon XF305 which uses three 1/3" CMOS sensors, although we are not going to show images from the last one because the IR effect is not significant.

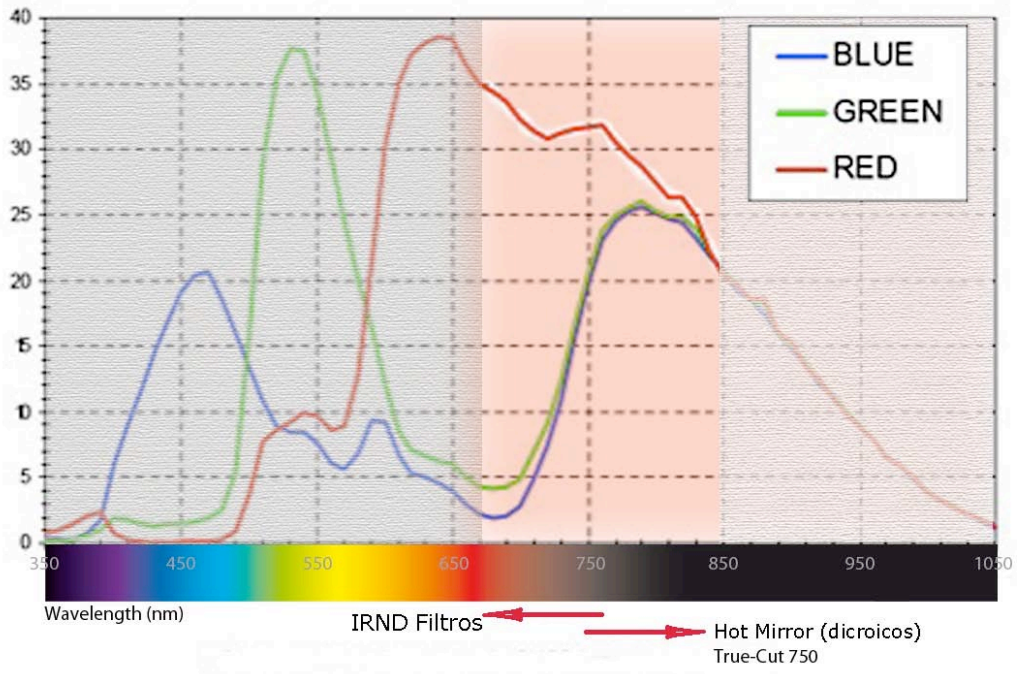
Throughout the article we are going to focus above all on the effect of the filters with the ALEXA camera because it shows a more visible correction.

However, before beginning with our tests, let us do a short review about what the infrared light is and what it means.

Infrared effect (IR)

Visible spectrum, that is, wavelengths that we can see, are between 380nm and 680nm. Wavelengths bellow 380nm are known as ultraviolet light, and above 680nm are called infrared light. Digital sensors, especially CMOSs, have not only sensitivity to visible light but also, and above all, to red and infrared wavelengths; therefore we have to filter these wavelengths to avoid contamination of the visible light from infrared. Each one of the manufacturers provides an IR filter together with the sensor, however not all of them follow the same criterion: not all the filters prevent the way for the same wavelengths. Therefore we have to add an additional correction filter if we do not want to obtain blacks and shadows with typical features of red/magenta. In addition, if we do not control IR, they cause lower resolution of the image and color desaturation. Next, on graph we can see how the spectral generic response of a CMOS sensor is through a Bayer pattern. Graph is not related to any specific camera, I use it merely as a reference to show better where IR comes from.

Altogether, we can see how red have the highest response, for example, high above the blue one. Red slope after maximum point does not drop as dramatically as green does; but it keeps a high value up to reach 850nm. In this section, red and infrared responses are much higher than the blue and green ones, above all between 650nm and 800nm.



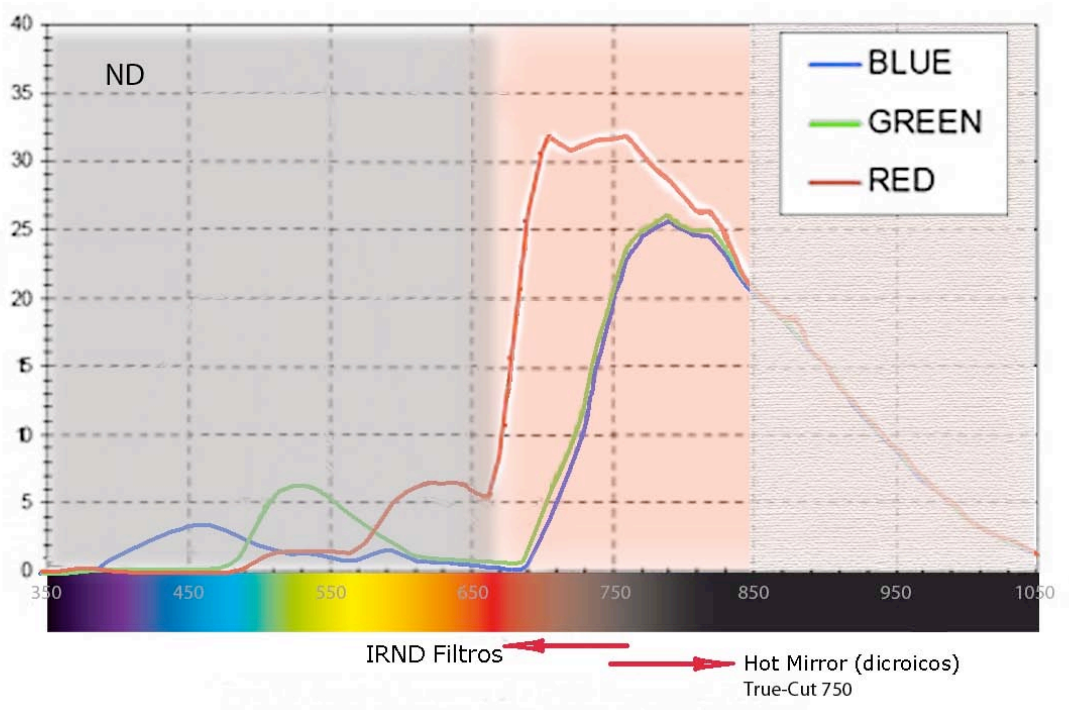
This range of red and infrared causes the red/magenta contamination. Both infrared (from 750nm) and red wavelengths near to the visible spectrum (around 680nm) affect digital cameras, and every manufacturer adjusts the built-in IR filter with the sensor in different ways.

The effect of sensor sensitivity to red and infrared is more visible when we use filters of neutral density (ND) at camera in order to control the exposure: the denser the filter is, the more visible is the IR effect.

Next, on graph we can see how by using a neutral of high density, for example an ND1.5, decreases spectral values of red, green and blue; however neither red wavelengths near to the visible spectrum nor infrared do not decrease, but both of them keep the same value. Because of their responses are larger than those provided by visible wavelengths, it is clear where the contamination, of which we have already spoken about above, is coming from.

There are digital cameras that need an IR correction of the wavelengths near visible spectrum limits, such as ALEXA or F35, whereas others need to prevent from infrared (from 750nm), such as RedOneMX.

Therefore, every camera needs a different filter: the one suitable for a camera may be useless for other one, in addition we have to take into account that camera response to IR is not uniform. It depends on both external circumstances and surfaces which reflect infrared.





ALEXA and RedOneMX are ready to test

As we have already said, every manufacturer uses a different IR filter which usually is built-in to the sensor. For example, both ALEXA and F35 have a built-in IR which cuts from 700nm, thus filters as Hot Mirror or True-Cut have hardly any effect. However, the RedOne's MX sensor needs an external filter which cuts infrared from 750nm. All of these special features of the cameras lead to show different kinds of image contamination caused by infrared.

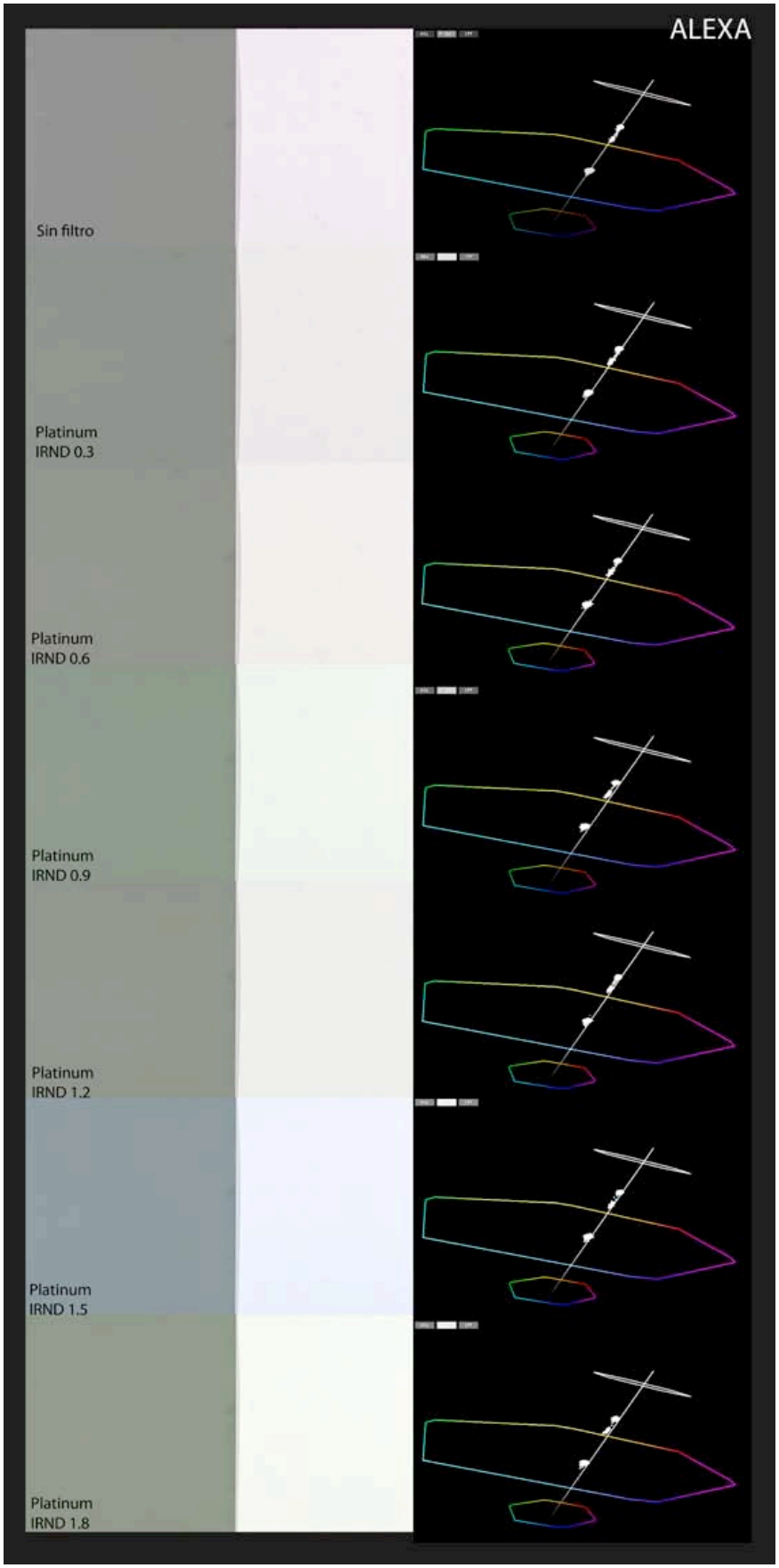
Next, let us compare the three cameras. We have used tungsten lighting which is very rich in red and infrared. We have filtered and compensated the exposure from an ND 03 to an ND 1.8. Image contains a black coat which reflects a lot infrared as well as our Chroma du Monde chart.

From an ND 0.9, with ALEXA, coat turns red, whereas with RedOneMX turns cyan/purplish and with F35 turns dark brown. Among the three cameras, F35 shows the smallest deviation, whereas ALEXA and RedOneMX are totally different. So, the question is; are Platinum filters useful to improve deviations for these three cameras? We aim to answer the question with the test.





First, we have learnt about filter consistency regarding color response, in other words, how neutral they are. We know already that is quite difficult to make filters totally neutral, even more difficult trying to keep the same response among different densities. Next, we show an 18% gray chart as well as a normalized white. We have photographed with every filter at the ARRI ALEXA camera. We have also used the same test with the other cameras and we have obtained similar results.



For a more precise observation we have firstly photographed gray and white without exposure correction at camera; and then we have changed it in order to keep the same percentage % of gray for each neutral-density. On the right side of the chart I show the Y Cb Cr space of color. Gray and white arrange in a straight line with luminance axis when they are right. Deviation caused by using filters lead to move away slightly gray and white values from the mentioned axis.

We have seen the following results:

IRND3 is slightly toned toward green/yellow.

IRND6 is slightly toned toward yellow.

IRND9 is clearly toned toward green/yellow.

IRND1.2 is very slightly toned toward green/yellow.

IRND1.5 is toned toward cyan/blue. It is totally obvious.

IRND1.8 is turned toward green yellow.

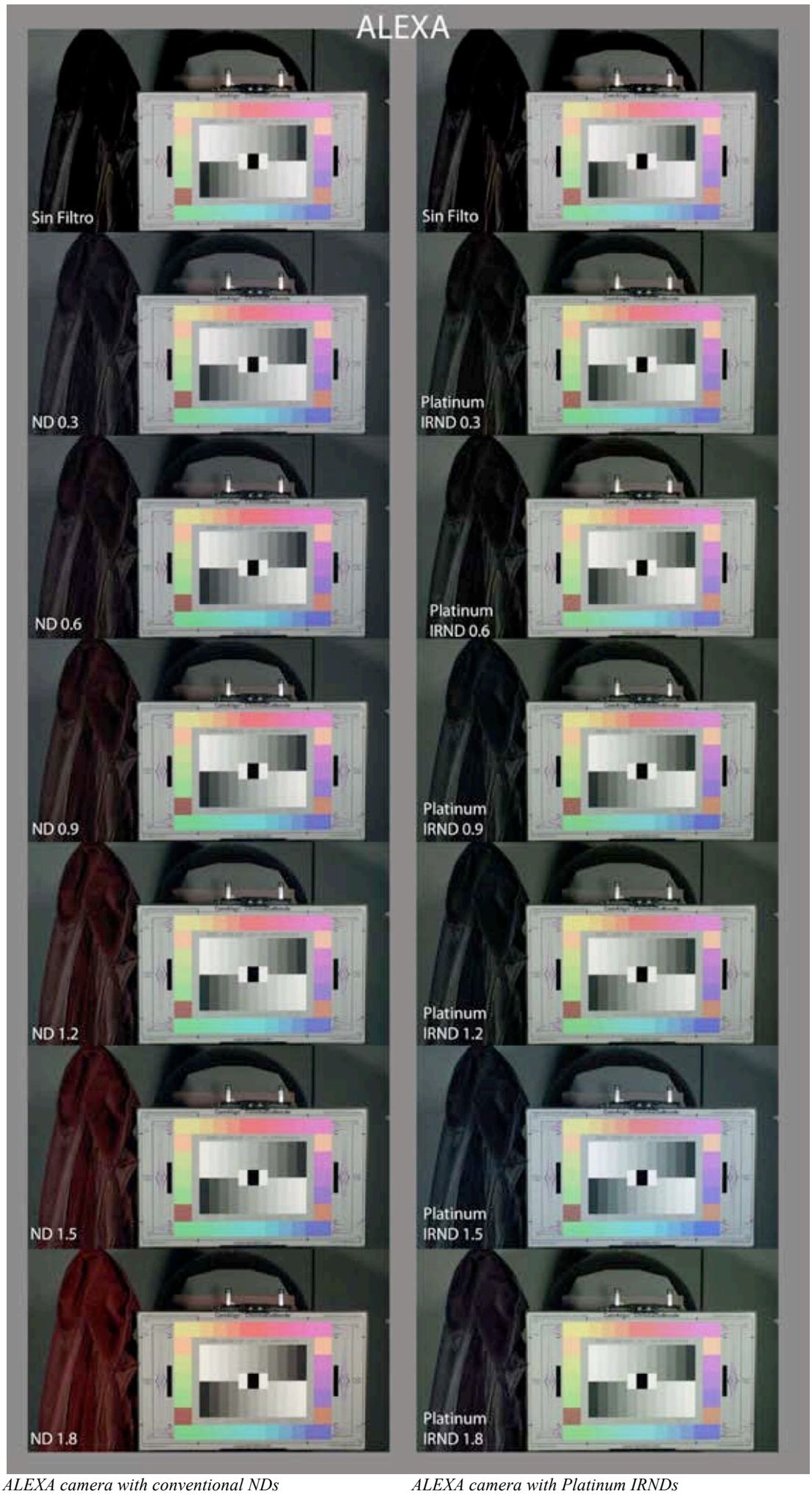
As we had expected, these filters with IR correction show a green/yellow-like color which has to be corrected either at postproduction or at the own camera if it is possible. IRND1.5 shows the largest anomaly because it is clearly toned toward cyan/blue.IRND0.9 and IRND1.8 are also toned largely toward green.

Since we know these deviations we will be able to make the needed adjustment, not only at camera or postproduction but also, for example, at making-up, since these filters, as we are going to see bellow, affect the skin tones.

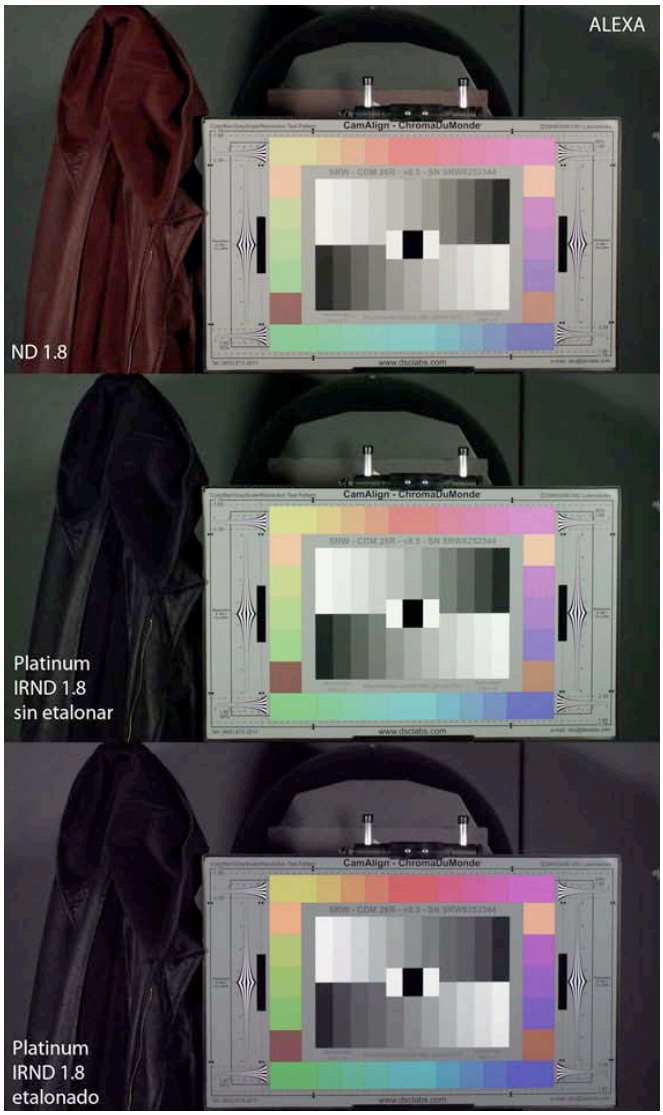
On the next image we show the effect of Platinum filters on the black coat as well as our DSCLAB chart. We can see how red-like color of the fabric really disappears and as a consequence blacks become blacker, although with a general green-like tone all over the image. This tone is very easy to correct at grading, much easier than trying to prevent the IR effect over the image.



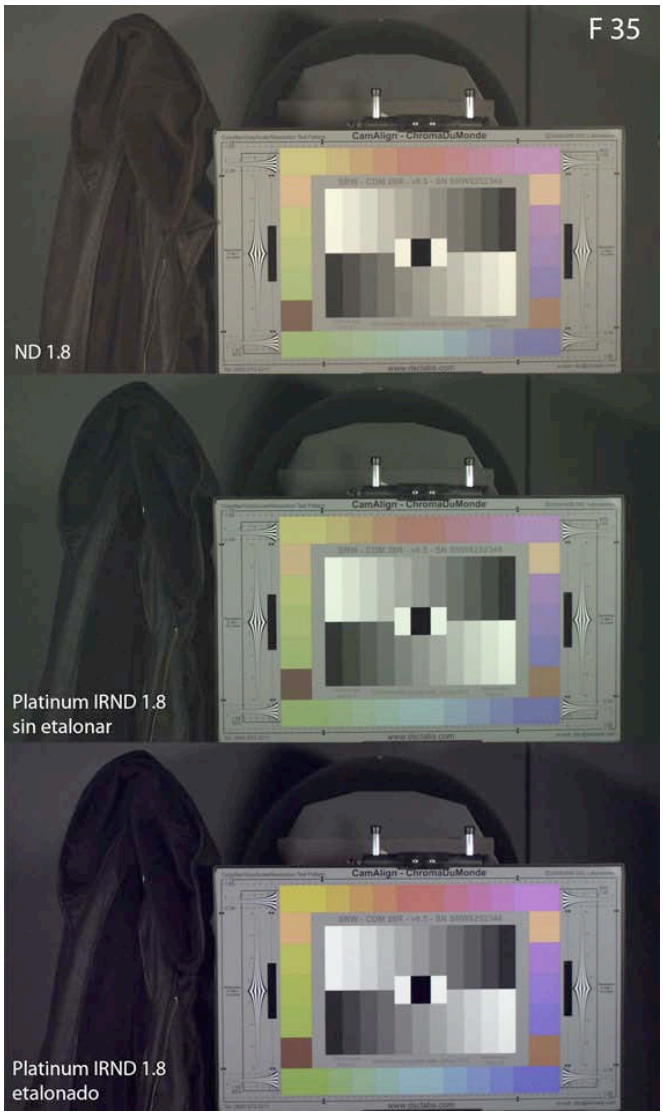
Shooting in outdoor location



ALEXA camera with conventional NDs *ALEXA camera with Platinum IRNDs*



ALEXA camera. 3300ºK .Whithout grading and graded



F35 camera. 3300ºK Whithout grading and graded

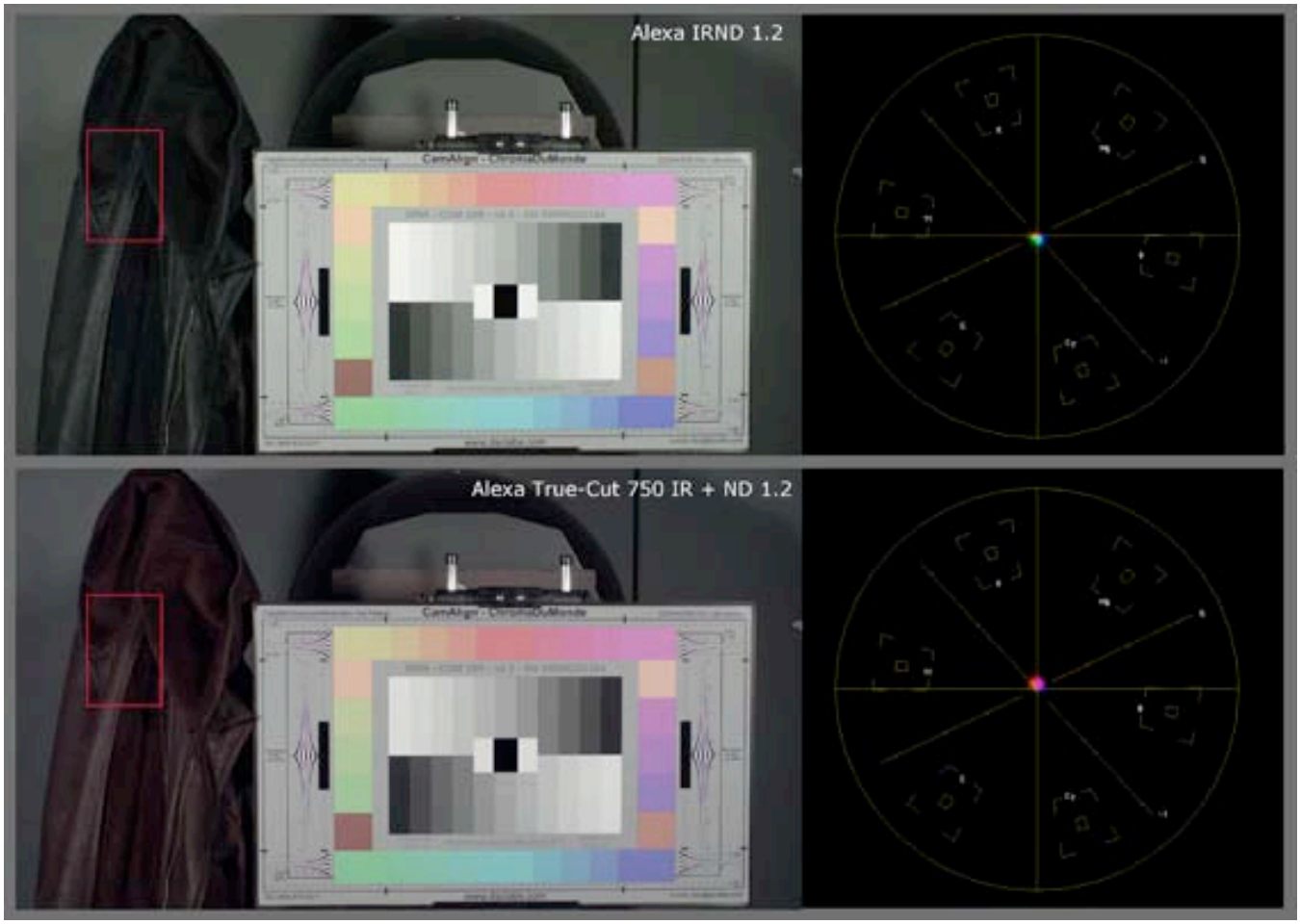


ALEXA camera. 3300º. Enlarged part. Left: conventional ND 1.8 filter. Middle: Platinum IRND 1.8, without grading. Right: with Platinum IRND 1.8, graded to keep neutral middle gray of the chart



F35 camera. 3300º. Enlarged part. Left: conventional ND 1.8 filter. Middle: Platinum IRND 1.8, without grading. Right: with Platinum IRND 1.8, graded to keep neutral middle gray of the chart

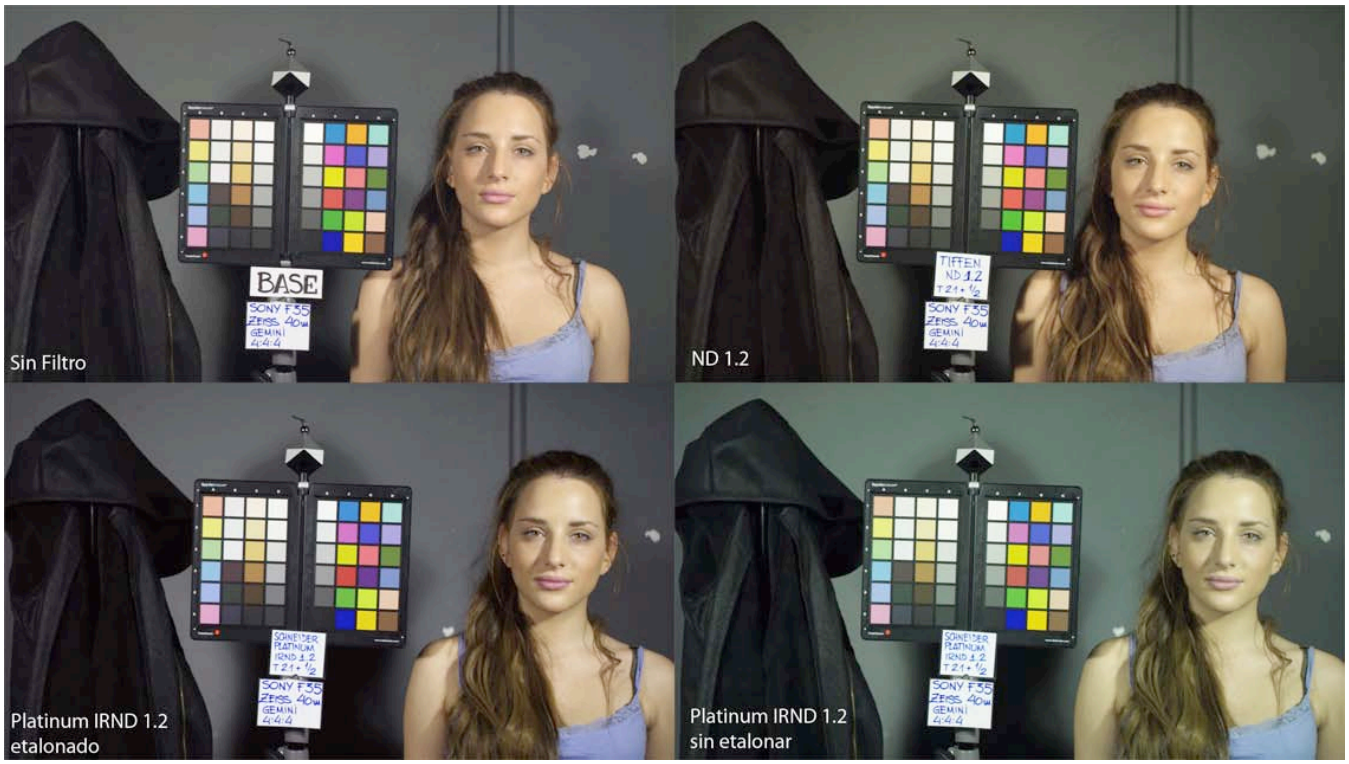
Next, we show how IRND filter corrects IR contamination from the nearest wavelengths to the visible spectrum limit; nevertheless does not happen the same if we add a True-Cut 750 to the neutral density filter. For example, True-Cut does not correct IR effect at cameras as ALEXA or F35, however it does at RedOneMX as we are going to see bellow.



ALEXA camera Zeiss 50mm. T 6.8. 3300ºK. ISO 800. Top: with an IRND 1.2. Bottom: an ND 1.2 plus True-Cut 750 IR

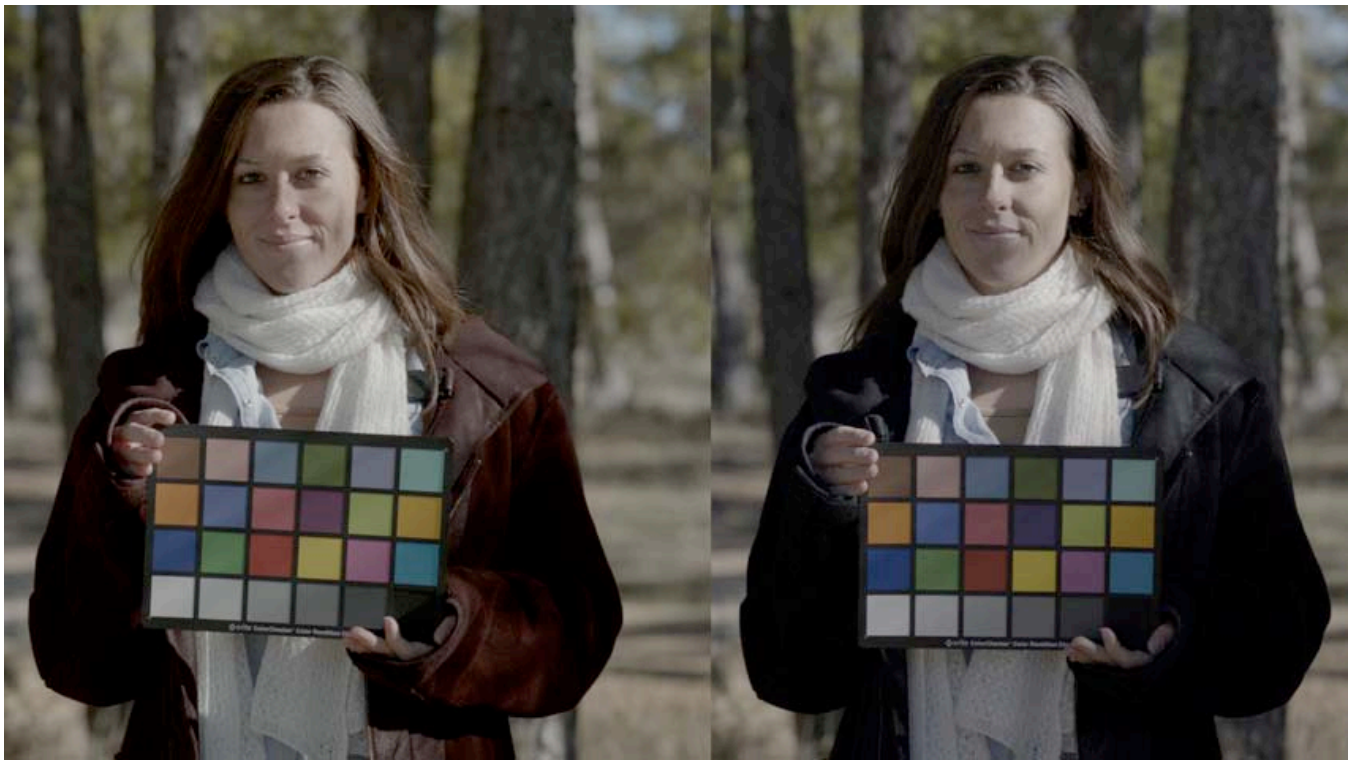
On the next group of four images we show our first model with the color chart and the *hell's coat*. Top right, we have not used any filter. Top left, we have used a conventional ND filter. We can see how the black coat is contaminated from the IR effect and as a consequence it turns brown. Bottom right, we have used the IRND filter, image is without grading. Bottom left, with IRND filter and graded; we can see on the last image how black is really black, although the model's skin tone shows a bit more yellow-like, toward green and less red-like.

Something similar happens with the ALEXA camera.



Sony F35 camera shooting with Gemini 4:4:4 at dpx. 40mm 3200ºK. From left to the right, up and down, Without filter, with ND 1.2, Platinum IRND 1.2 graded and Platinum IRND 1.2 without grading.

Let us see next frames of our second model. It was shot with ALEXA in Cuenca's Ciudad Encantada (Spain).



ALEXA camera. Leica Summilux-C 100mm T 6.3. ND 1.8

ALEXA camera. Leica Summilux-C100mm T 6.3.Platinum IRND 1.8.

On the left image, without IR correction, we can see how the model's coat and hair turn red-like. On the right, with the Platinum filter, black tone and all of the shadows are corrected in general. Now, her hair is less mahogany and her skin tone is also colder.

On the general view of these frames we can see how green colors have gained a more natural and intense tone with the Platinum filter than without it. We have also checked with resolution charts that filters do not cause lost of sharpness or contrast.

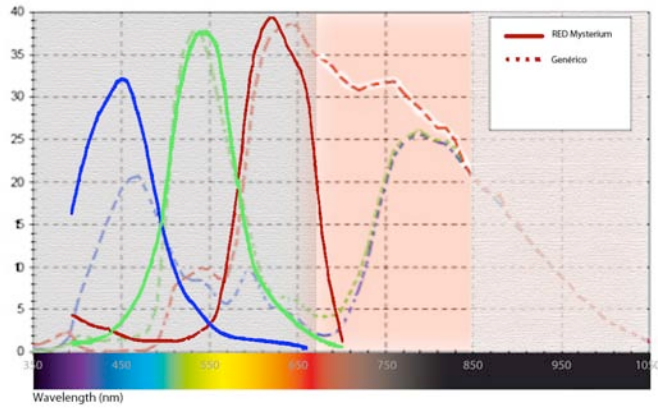


ALEXA camera, Leica Summilux-C 35mm T 5.6. ND 1.8



ALEXA camera, Leica Summilux-C 35mm T 5.6. Platinum IRND 1.8

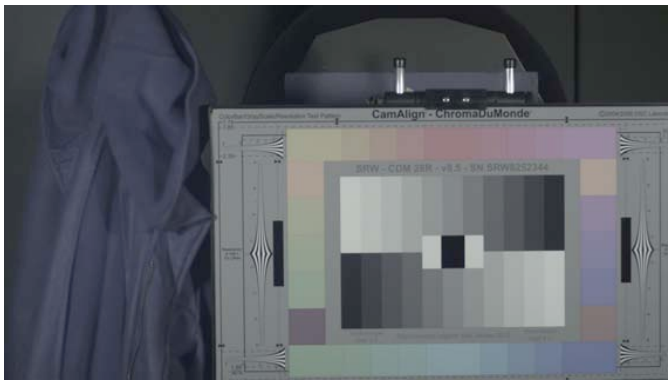
We have not still pointed out corrections provided by these filters at a camera like RedOneMX, and we have not done that because they are simply not significant.



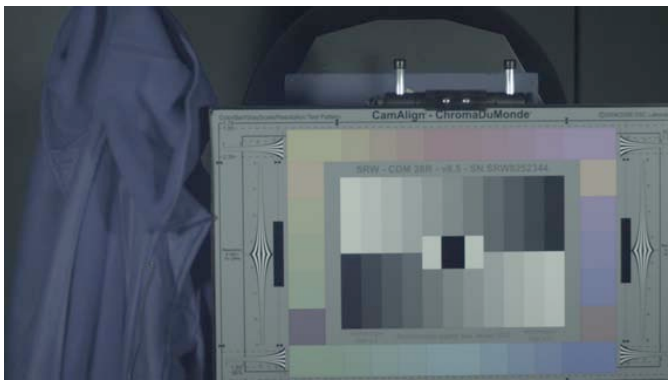
In order to understand better why the RED cameras do not need correction, when we are on the visible limit of red and on the nearest IR to this limit, we have superimposed curves of spectral response of the Mysterium sensor (published by RED at the time) to our "generic" CMOS sensor. We can see that in addition to a significant increasing of the spectral response of the blue, the red curve, just after reaching its maximum point, decreases dramatically until minimum values on the limit of the red spectrum and the nearest IR, whereas through the generic one, there is a high response at these wavelengths.

The red drop at these wavelengths would show why it is not needed to be corrected, as opposed to other cameras like ALEXA or F35. Michael Bravin, in one of Art Adams articles about IR, answers the question of why these other cameras do not make correction: *"Flesh tone. Realistic and pleasing flesh tones require some far red in order to look natural."* (Art Adams July 2010). We do not have information about the RED's spectral response beyond visible limit, although we suppose that it should be high, above 750nm, where filters as True-Cut of Hot Mirror are effective.

To verify it, let us see next two images. On the left, it has a conventional ND 1.8 filter, on the right, a Platinum IRND 1.8. There is practically no difference, in other words, Platinum filter does not correct infrared contamination with tungsten light on RedoneMX.

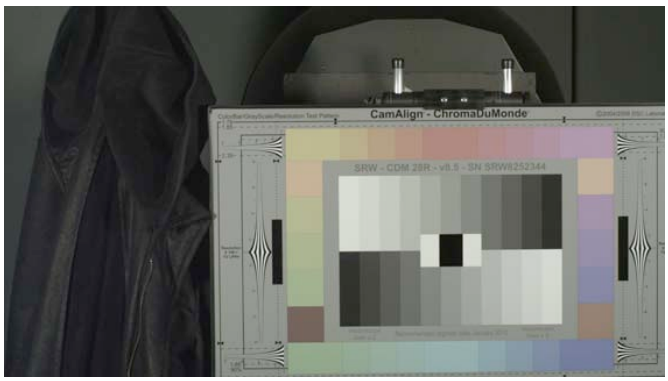


RedOneMX. T 2.8 ND 1.8 filter

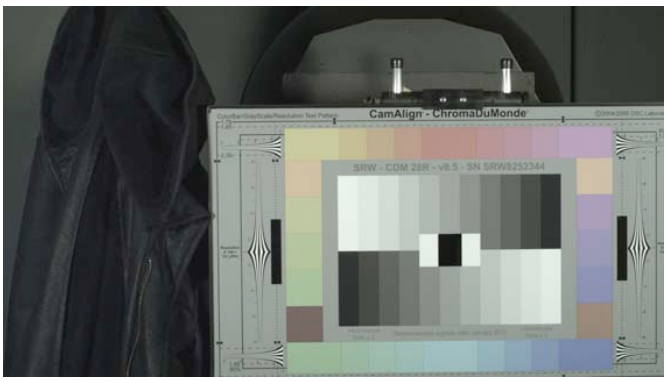


RedOneMX. T 2.8 with Platinum IRND 1.8 filter

Next, now the two images has been corrected with a Schneider and Tiffen filters which remove contamination



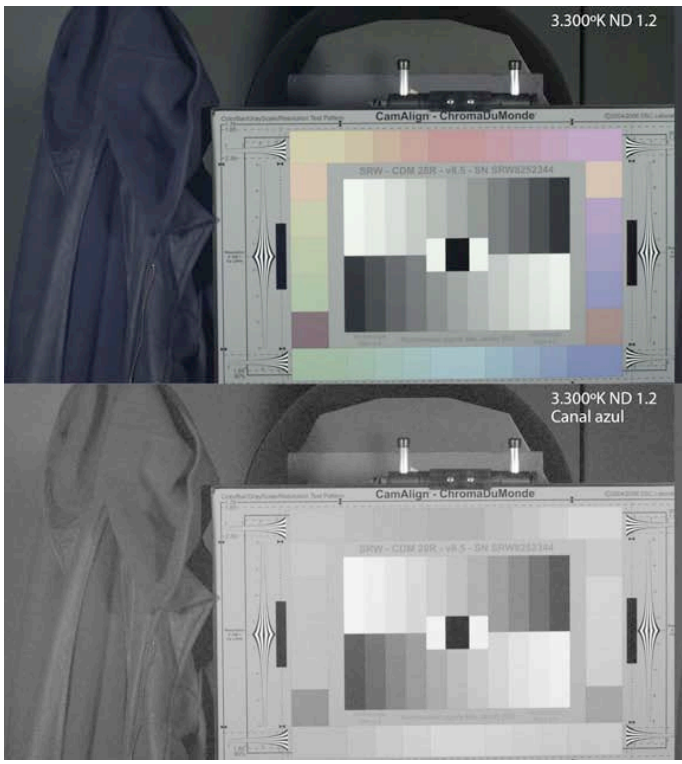
Corrected with Tru-Cut 750 filter



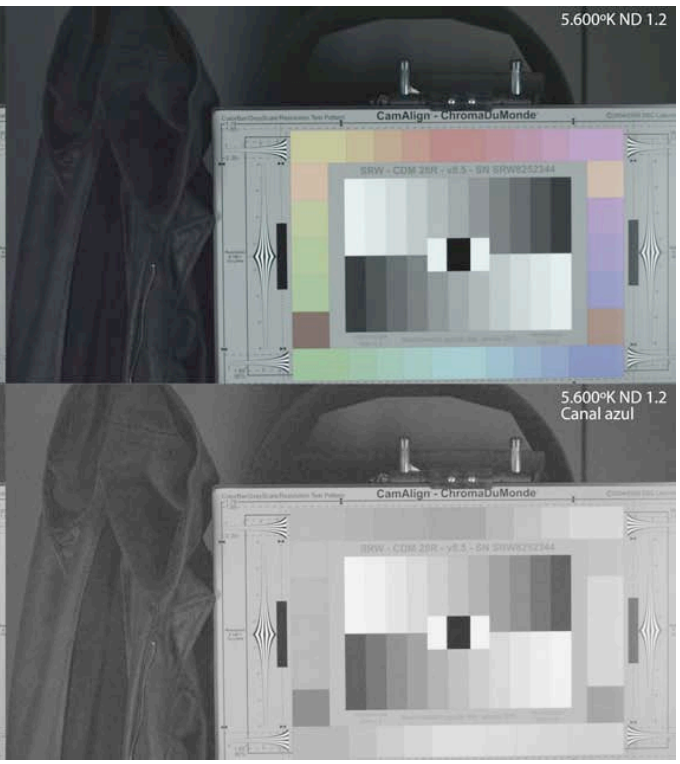
Corrected with Hot Mirror filter

Due to the spectral response of the sensor with the RedOneMX, contamination from IR is not the same with tungsten and daylight. At 5600ºK light we cannot see the bluish color, whereas we can see it with tungsten. In addition, if we pay attention to the blue channel, we can see how part of the texture of the lining of the coat is lost, whereas it displays better with cold light.

However in outdoor locations with high NDs, we can see the red-like color which is typical of infrared.



RedOneMX ND1.2 with tungsten light. 3300ºK. Bellow: blue channel



RedOneMX ND 1.2 with day light 5600ºK. Bellow: blue channel

Next, we show three images at day light. We have compared how two IR correction filters work with the top image which doesn't have that.

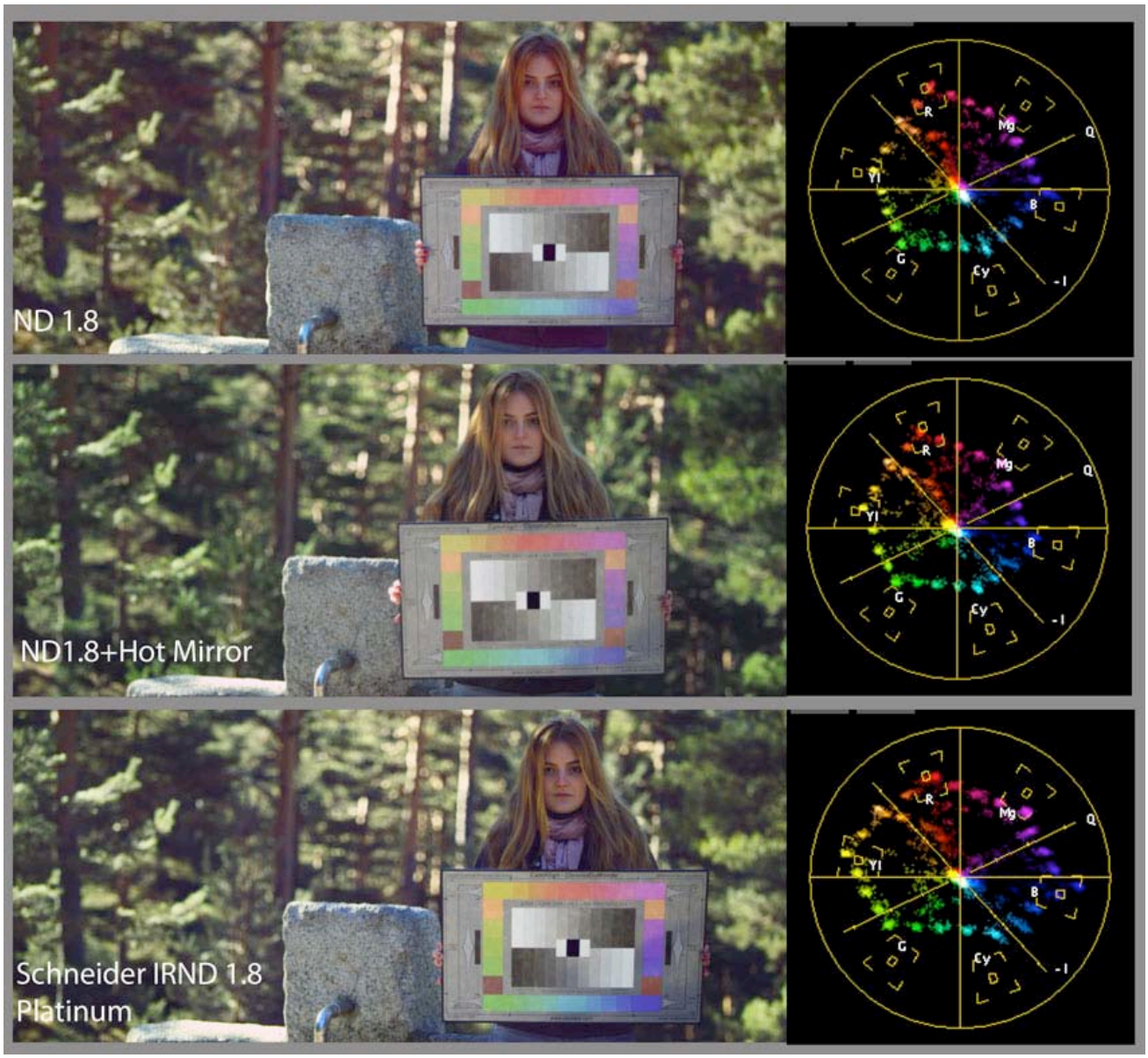
Images are graded to the chart, middle gray keeps at 45%, white at 80% and black in the center (black-hole) at 0%.

On the top image, with the neutral value of density ND 1.8, the IR effect is clearly shown: shadow has a red-like tone which increases on the tree barks that are in shadow, looses color saturation in greens and it changes to yellow/red. Our third model's skin tone and blonde hair show red-like color.

On the next image in the center, correction made by Tiffen Hot Mirror is showed. Correction is excellent; it removes totally the predominant red and gives a nicer tone to our model's skin, as well as to her blonde hair. Greens are cleaner and in general the image feeling is more natural.

As we have already been talking about in this article, infrared correction to RedOneMX is not on red limits of the visible spectrum but on infrared far from this limit, that is, from 700-750nm. Therefore, as we can check on the last image, correction of Platinum filters is not so effective. In this case, as we can see on vectorscopio, red/magenta contamination is still showing in shadows, even though we have this skin tone and blonde hair are a bit better than with just ND, it does not become to make as good correction as Hot Mirror or True-Cut 750 do.

In addition, if we see the chart colors, we can see how green tones change into more yellow-like, whereas blues are cyaner. We can say that the horseshoe-shape created by the color samples of the chart "stretches" on the yellow-blue axis.



RedOne camera 4.5K Leica Summilux-C 40mm T 1.4 25fps 180º.MTD ISO 800. 5600ºK

CONCLUSIONS

We believe that Platinum filters are especially adapted to those cameras which show more sensitivity from infrared which are nearer to the limit of the visible spectrum, that is, roughly 680nm, as makes the F35, but above all, the ALEXA. In such cases filters have been especially effective. However, with cameras as the RedOneMX which has to remove infrared from larger wavelengths, 750nm, Platinum filters do not show effective; moreover do not correct enough contamination.

Because of particular features of digital sensors regarding IR, it is not advisable to use ND filters without any correction, above all with the present cameras which are highly sensible. And neutral filters of high sensitivity are needed. It is enough to consider the example of the image of our second model in Cuenca's Ciudad Encantada (Spain): to ISO 800 value we had to filter it with an ND 1.8 to obtain a 6.3 T.

Therefore, it seems essential to plan with this kind of filters, looking for the most suitable filter to the camera with which we will shoot.

CREDITS:

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Dit: Carlos Rho

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Essentials:

Art Adams' analysis, http://provideocoalition.com/

Tiffen's documents, http://www.tiffen.com/tiffen_product_literature.html

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