Test of the Canon XF305 camera

by Alfonso Parra AEC



As usual, we are going to evaluate image quality provided by the Canon XF305 camera. Quality has to be considered from both objective and subjective views: objective from observation of the different charts and technical evaluations; subjective, according our estimation of the whole image. We have used the ESSER, ISO12332, Macbeth or Spyderchekr charts, and we have analyzed them through the Imatest or ImageJ programs. For lighting adjustment and evaluation of recorded images we have used a HD monitor, a waveform monitor/vectorscope, the Seconic L-558/Cine light meter and Minolta´s Color meter IIIF, all of them suitably calibrated.

We have handled the different camera parameters, at both the resolution and gamma curves and color matrix, in order to choose those ones that showed the best quality. Test is not intended to describe all the performances of the camera regarding its abilities. Test could be considered as a way of general approach to the camera behavior. It can be the starting point in realizing those tests that each one thinks necessary for one's own production.

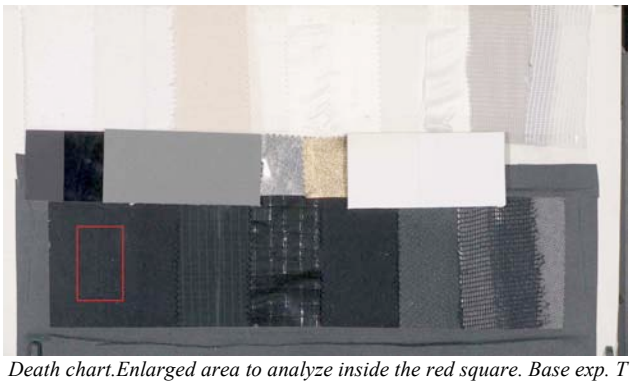
The camera records in MPEG-2 MXF on CF cards up to 50 Mbps, with 4:2:2 sampling. So, we were able to import native images, in addition we will be able to work with Color and Iridas on set.

Article images are from the original frames, but turned into CMYK space. They should be used merely as a comparative reference.

NOMINAL/EFFECTIVE EVALUATION OF EXPOSURE INDEX (IE)

In order to evaluate the nominal index of exposure which is calculated over the base saturation, we have begun to use the formula proposed by Kodak (App note MTD/PS-0234).

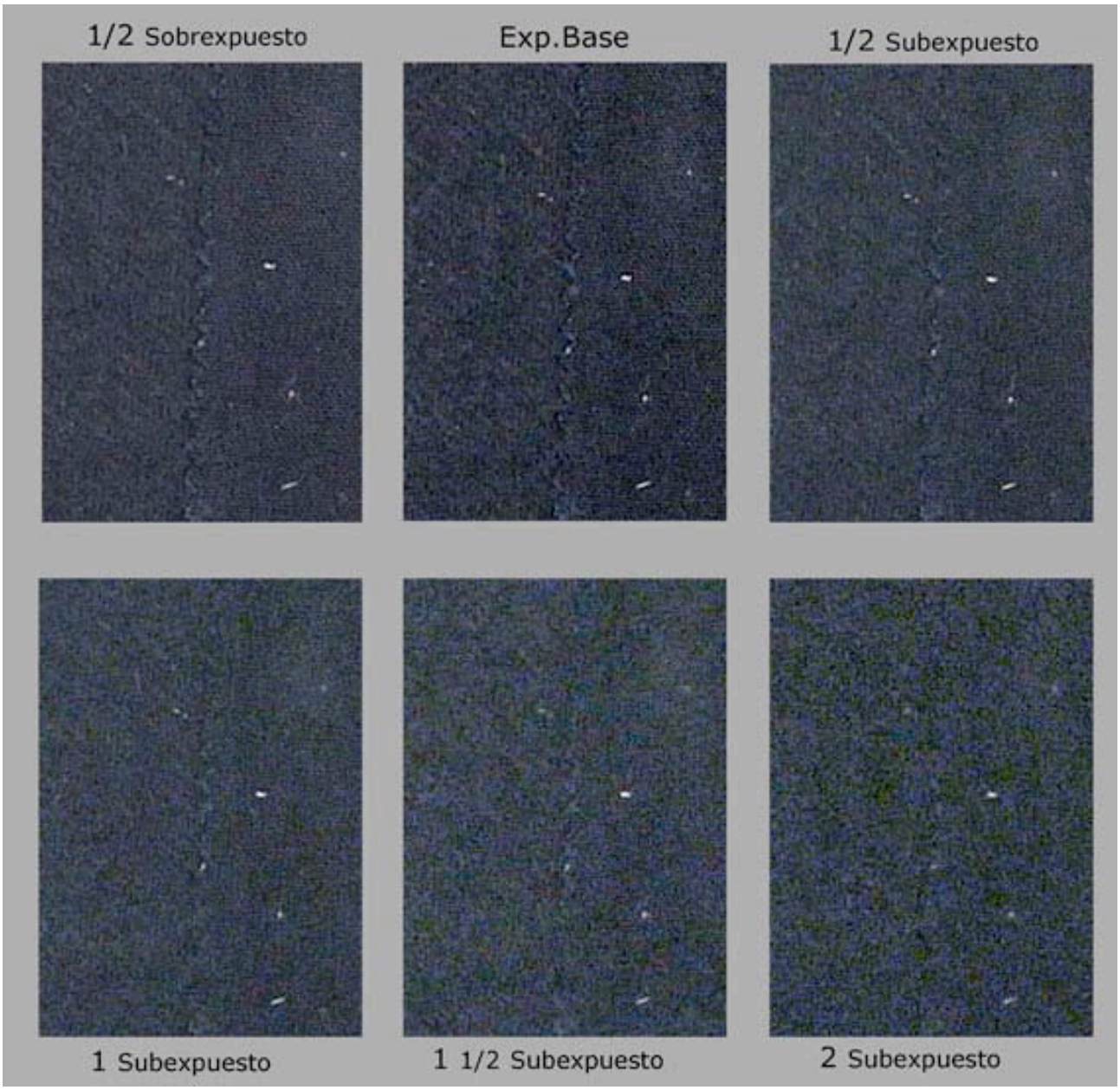
$$ISO = \frac{15.4 \cdot f\#^2}{L \cdot t}$$



Death chart.Enlarged area to analyze inside the red square. Base exp. T 5.6, 1/50 sec. 0db. Normal 3 gamma. Sharpness 0. Noise Reduction off

Number 15.4 is a constant. It depends on the lens transmittance or the vignetting factor, among other considerations. f value is the squared diaphragm; *L* value is the reflection light from 18% gray chart in cd/m^2, and *t* value is exposure time in seconds.

Formula gives us around ISO 125. We have contrasted this value with the result provided by the CIPADC-X004-2004 (http://www.cipa.jp/english/both): of them are alike. Even though sensitivity values are suggested for the digital sensors for fixed images, we also believe these are acceptable for the video cameras, if we use the gamma 2.2 and the YCbCr (sRGB) space of color. We do not have to be surprised by such low sensitivity of the camera: it uses 1/3" sensors with an approximate pixel size of 2.5 microns. Such small pixels entail less sensitivity, noise increase, and as a result, the dynamic range decrease. Now, taking the nominal sensitivity, in other words, effective sensitivity as starting point, we are going to study our Death Chart, above all at shadow; we are going to see noise, detail and fabrics texture.



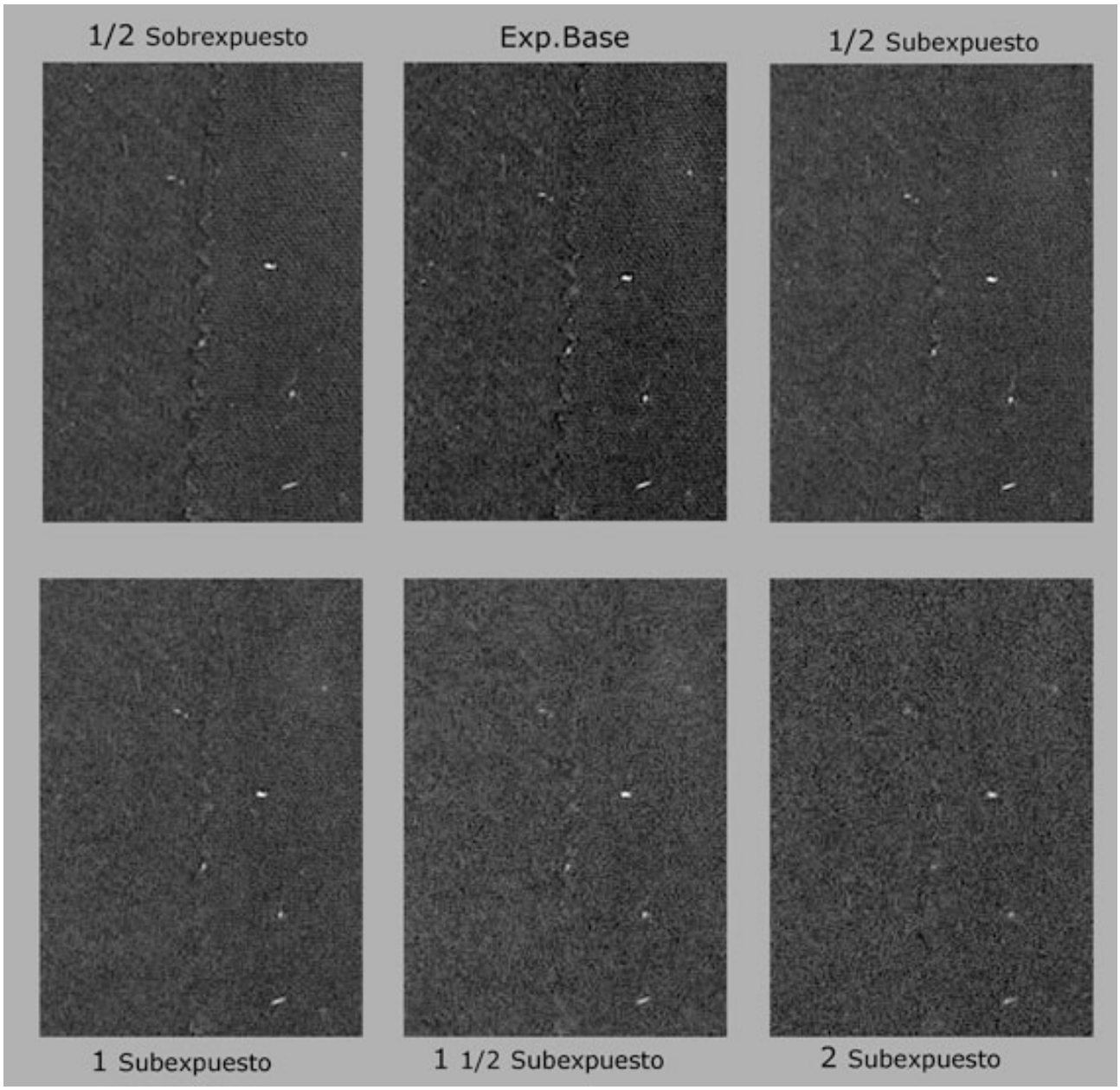
Overexposed ½ - Base exp – Underexposed ½ - Overexposed 1 – Overexposed 1 ½ - Underexposed 2



Test room in INFOTV

With our Base Exposure we see the fabrics texture, but also a bit of noise. This is already clearly visible at underexposure 1 stop (as if we considered ISO 250 value); there is a clear lost of detail and texture. With underexposure ½ stop we can still see fabrics texture and noise, although it is higher than noise regarding Base Exposure; in my opinion, it is still bearable. We have also seen on the images at +½ overexposure, that noise decreases at shadow, and detail and texture increase. Therefore we can say that the effective sensitivity of the camera is around ISO 200.

As other occasion, I point out again that the noise evaluation holds subjective elements within certain limits, therefore; each one has to verify its acceptable noise level regarding the shooting requirements; the size of the final image shouldn't be forgotten either: it is not the same whether the image will be seen in theatre or on TV. On the same way we should bear in mind the distance from which our images will be seen.



Green Channel. Overexposed ½ - Base exp – Underexposed ½ - Overexposed 1 – Overexposed 1 ½ - Underexposed 2

On the previous image we show just the green channel (the channel that holds the greatest information). We can see with more precision how the detail gets lost regarding different exposures.

Next, frame of the "*Wake";* we can verify what we observe on the Death Chart. The middle gray is underexposed around 3 stops. The camera shows an acceptable representation until reaching this limit; however image shows significant noise, in spite of having applied the automatic option of noise reduction system.

The image areas that are more underexposed than middle grey: on the right side of the wall in the background, we can see clear loss of quality as a consequence of the high level of noise, although also due to insufficient quantification; it brings clearly some kind of posterization.

We show the three channels in the next image. We can see the consequences of the 4:2:2 sampling, at both resolution and noise.



"Wake" F 58.2 mm T 1.8 1/50sec. 25p. 3300ºK, 0 db. Cine1 gamma curve. NR auto.



Above, we show the blue channel. We can see high level of noise, in addition loss of resolution as a result of noise reduction system application.

Conclusions:

-Nominal IE is around ISO 125.

-Effective IE is in between ISO 160 and 200.

My choice is to use ISO 160 as IW due to the high level noise, above all in the blue channel. This choice is good for lighting, with both tungsten and day light. I have also chosen this value for any gamma curves that camera provides.

It could be considered increasing slightly the gain without reaching 6stops, and applying the noise reduction system to increase the effective ISO; nevertheless, we believe these actions are not able to go beyond ISO 250, if we take in account the sharpness factor that we are going to study in the following section.

RESOLUTION/SHARPNESS

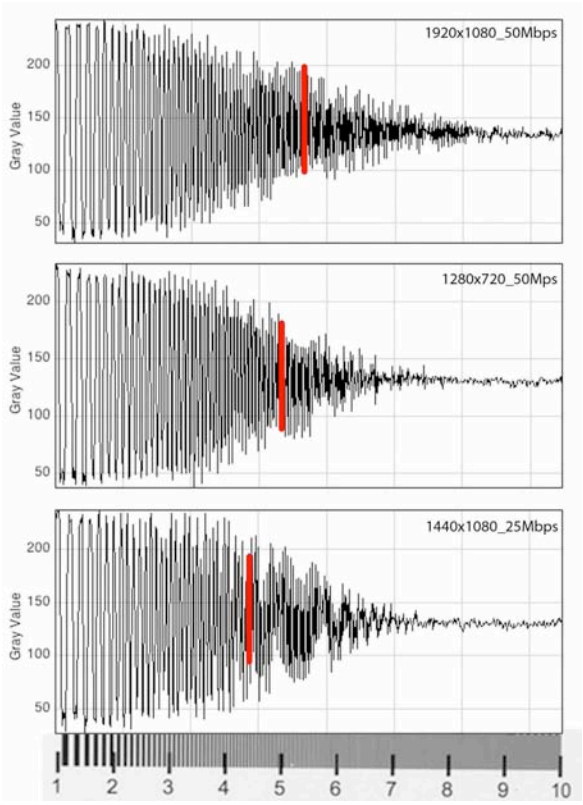
As we have pointed out other times, I would like to stress again that the resolution evaluation comes from the resolution charts through MTF curves. Result is expressed in en Lw/ph, Lp/ph or another usual unit. Frame size and transference rate do not settle anything about resolution, about the ability of camera to capture detail and texture, about its "sharpness". The same way, the shape of a car doesn't say anything about its engine power. The camera provides different sizes of image recording with different transference rates: 1920x1080 and 1280x720 at 50Mbps, or 35Mbps and 1440x1080 at 25 Mbps; with 4:2:2 at 50Mbps and 4:2:0 at 35Mps y 25Mbp color sampling. All of the formats can use the speed of 25p.

We have used the analysis of the resolution ISO12332 chart through the Imatest program to get the MTF curve. Just as we expected, 1929x1080 at 50Mbps value provides the best resolution, as we can check in the comparative graph about the three resolutions.

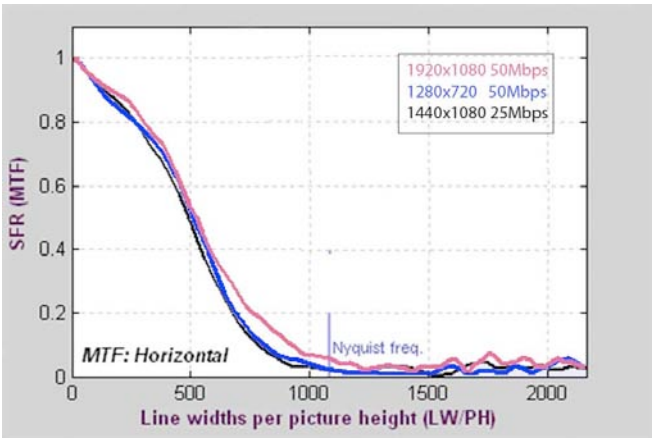
Next; we show horizontal resolution results for the three image sizes. I we record at 35Mbs speed, differences regarding resolution are small; however, we can see a bit more compression and worse color response.

Results with different formats are:

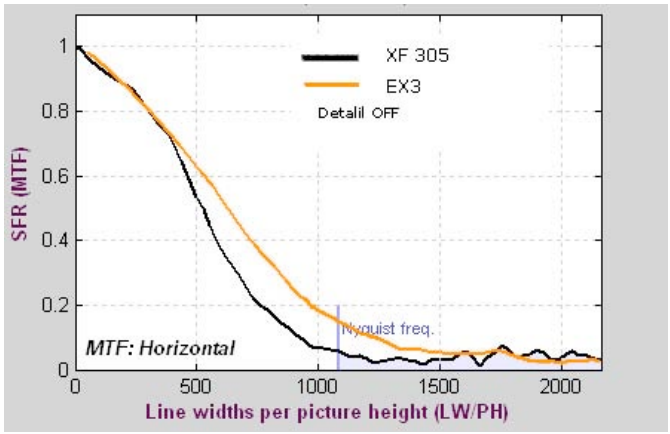
1920x1080_50Mbps	MTF 50%	520.5 Lw/ph
1280x720 _50Mbps	MTF 50%	508.0 Lw/ph
1440x1080_25Mbps	MTF 50%	499.1 Lw/ph



Profile of the resolution in three different formats. Red line shows the MTF value at 50%.



The three different formats of MTF curves comparatively



MTF curves of the XF305 and the Sony EX3 comparatively

Just as a reference; in order to settle much better the camera resolution; we show the comparative graph of the MTF curves from the Canon camera and the Sony EX3. Both cameras release a 1920x1080 image. The EX3 shows at 50% up to 100 Lw/ph more on the MTF curve in the center of the image; which allows representing a bit better textures.

We are going to use the "resolution" 1920x1080 with 50 Mbps for the rest of the tests. We have evaluated the resolution not only in the center of the image but also in the sides. It should be pointed out that we have got excellent results with a small difference of 3%. This result is undoubtedly owned to the high quality of the lens: zoom 18x, F=4.1-73.8mm, f 1.6-2.8, and the smallest sensor size.

Observing the MTF curve as well as the profile from ImageJ, we can conclude that the 1920x1080 format shows sharpest details at higher frequencies, from 700Lw/ph the same way it functions at lower frequencies. Although the 1280x720m format gives a good result at middle frequencies (where the textures are represented), it will be usually less sharp than the 1920x1080 one.

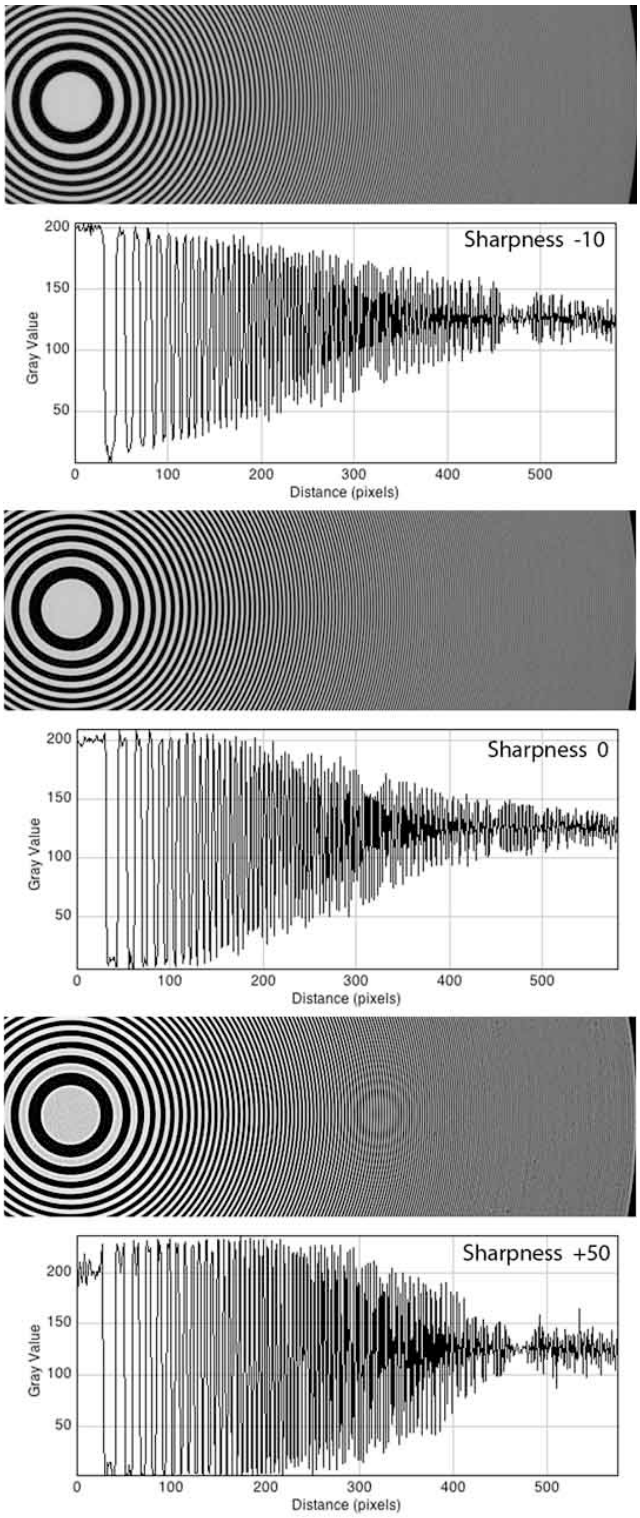


Prêt-à-porter chart

Exactly, to see the texture we have used the Prêt-à-porter (PaP) chart designed by Parra&Lucchino for Cameraman. We have compared the resulting image with other cameras in order to see much better the texture value, although we have not tried in any way to compare cameras that are in so different market segments.



We take the REDOne camera with its original setting as a reference. The REDOne shows all of the texture of the thread, above all the top right fabric, as well as a greater sharpness in the flowers of the patterned fabric. With the REDOne resolution diminished, image shows also a bit more sharpness than the XF305; at the same time this latter one is very above of the Panasonic. Therefore, the XF305 resolves well the middle frequencies and textures; in general, it provides a good feeling of sharpness up to 700Lw/Ph.



When we have applied the standard detail correction provided by the program, we have also seen that the MTF value increases through the Imatest analysis. Therefore; we are able to improve sharpness using the detail circuit included in the camera menu. Both the *Sharpeness* menu and the noise reduction system are very effective, moreover they are very extensive regarding the offering of correction possibilities. If we use the extreme values of the detail circuits (*Sharpeness*) we can see much stressed clipping on the contrast limits; resulting in a very artificial, electronic image.

The *Sharpeness* menu allows a primary adjustment of sharpness level what we apply to the image, then we can adjust the frequency of the horizontal sharpness, and lastly, with *Coring*, we can minimize the detail application effects on the noise. Coring is able to apply the correction based on lighting. We can adjust relation between vertical and horizontal details as well. Detail can also be adjusted for higher frequency areas; we can adjust level of detail on several areas of the gamma curve with *Knee aperture* and *Level depend*. As we can notice in this short description, menu is really extensive, quite amazing for a camera of middle segment like this. From the Alan Robert's test realized for the BBC, we have checked different changes of sharpness in order to search the most natural image as possible, so we have lowered the *Level* to -4, and increased of the horizontal frequency to +8. We have adjusted the value of higher frequencies around +10.

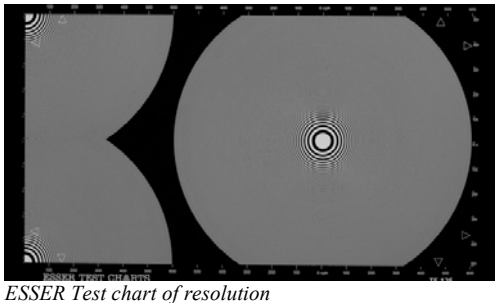
Coring level has usually been left at 0, with the exception of frames with candles where we have used the value 10. When we have worked with the gamma curve *Cine1*, we have not changed any other parameters which already were specified.

On the left image, we show the resolution change applying different quantities of sharpness. On profiles, we can see how contrast is larger with higher levels (lines are wider) than with negative values.

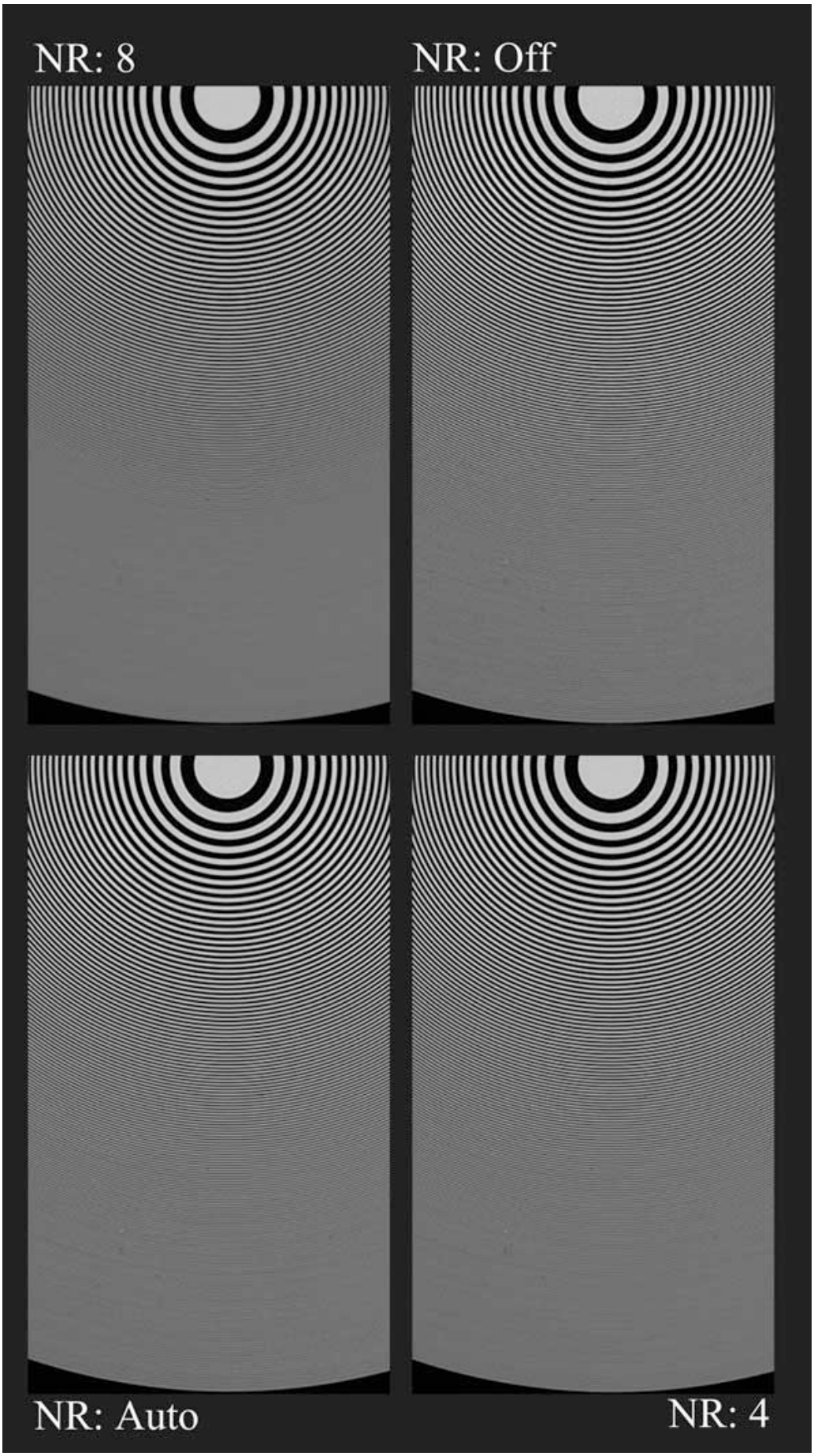
One of the facts intimately related with the resolution is the noise. As we will see later, it affects also the dynamic range.

The camera shows clearly noisy, even with levels of light more than acceptable. In order to control to a certain extent the noise, the camera offers a noise reduction circuit that can be switched on/off. Menu options go from an automatic value through manual operation; camera decides the application of the noise reduction with the first option, with the latter one we decide among different levels: from 1 to 8.

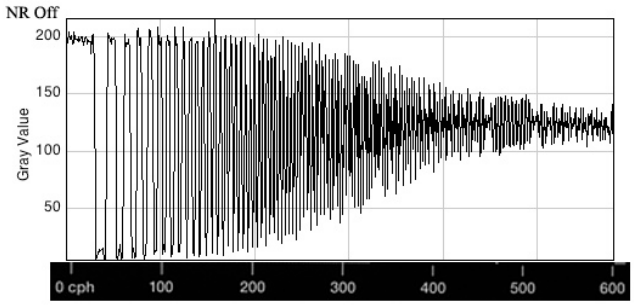
Like all of the noise reduction systems; this takes out of focus the noise: it contributes to its lower visibility, however, also to a loss of detail. On the next image, we show a part of the ESSER chart with these values. We can check how using 8 value means loss of resolution in all the frequencies.



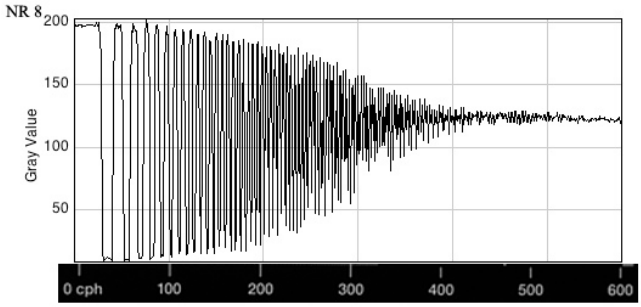
ESSER Test chart of resolution



In order to see more clearly, let us see the profile with NR off and with the largest value, 8.

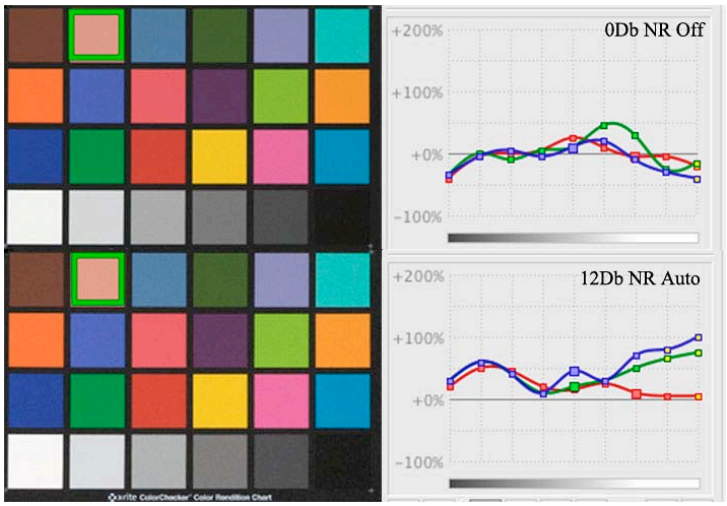


Profile of the resolution chart, NR off

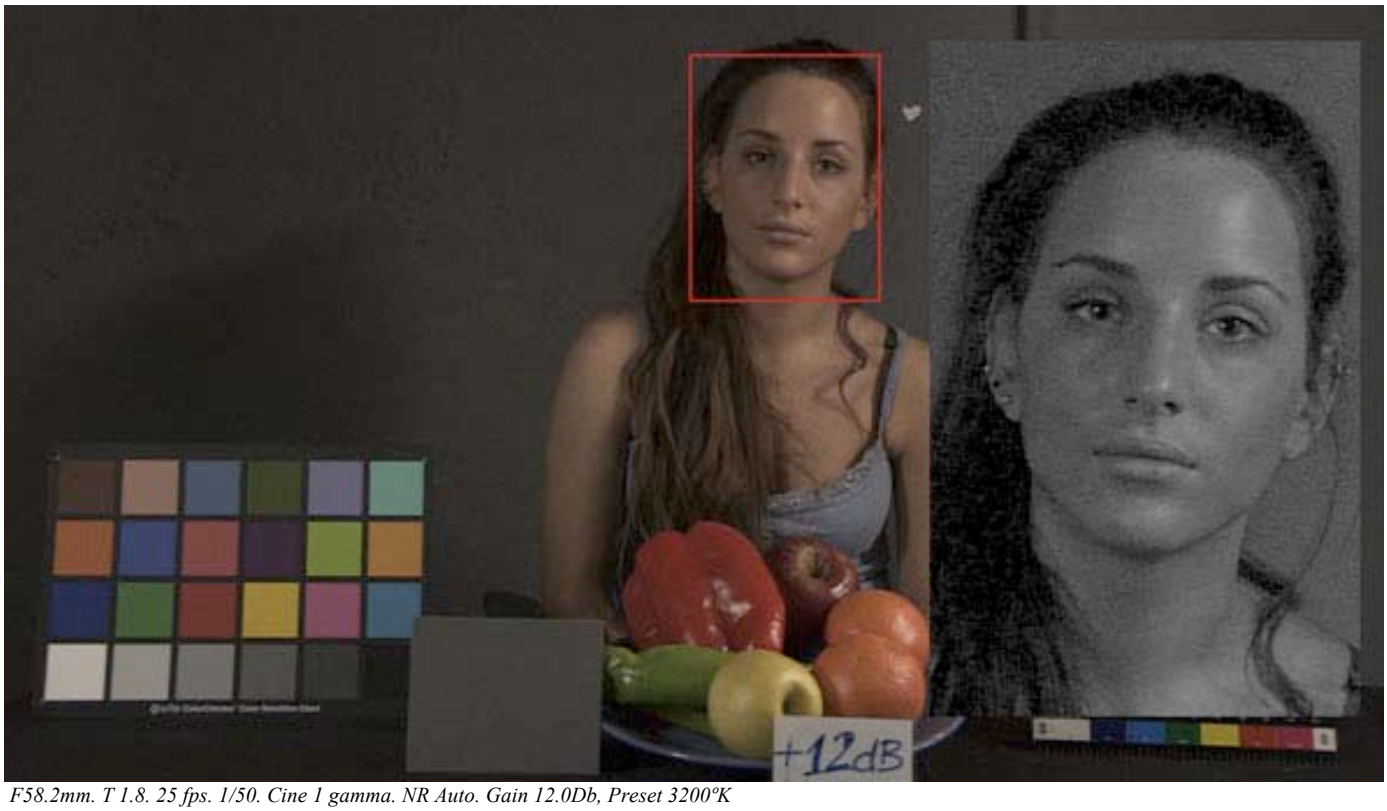


Profile of the resolution chart, NR 8

There are other factors involved in the noise visibility, among them, using the Db.



On the left image, we show the noise analysis on the sample (2) which represents the Caucasian skin tone made with the Neat Image plugin. We can see how the noise remains stable enough around 0% at 0 Db, with increasing at middle high lights of the green channel. Nevertheless, using +12Db value with the NR circuit on, the noise increases considerably, above all at the blue and green channels: it reaches almost 100% at high lights and around 50% at shadow



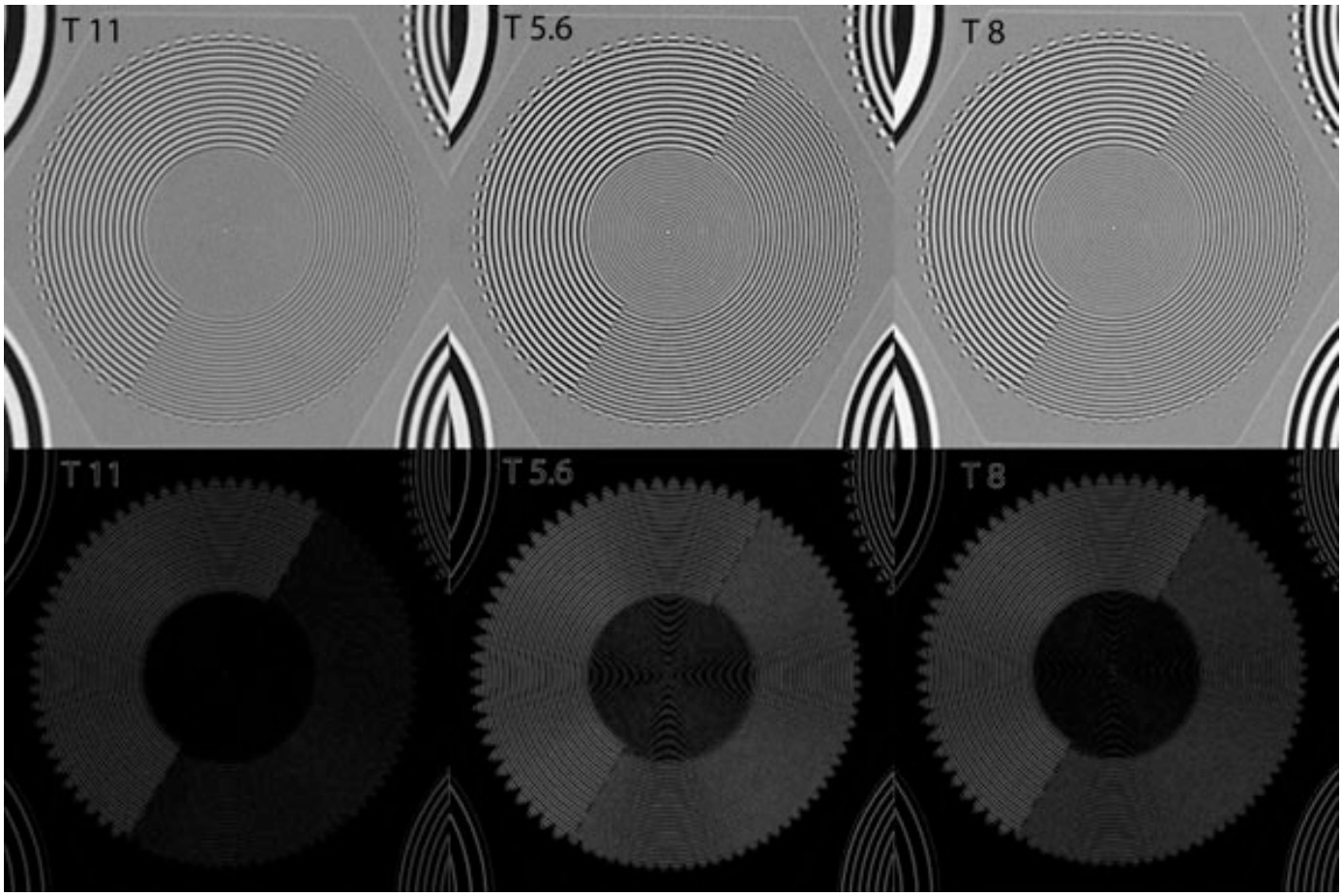
F58.2mm. T 1.8. 25 fps. 1/50. Cine 1 gamma. NR Auto. Gain 12.0Db, Preset 3200ºK

On previous image, we can see the level of noise with 120Db on the whole image; on the enlarged part Ana's face at the blue channel.

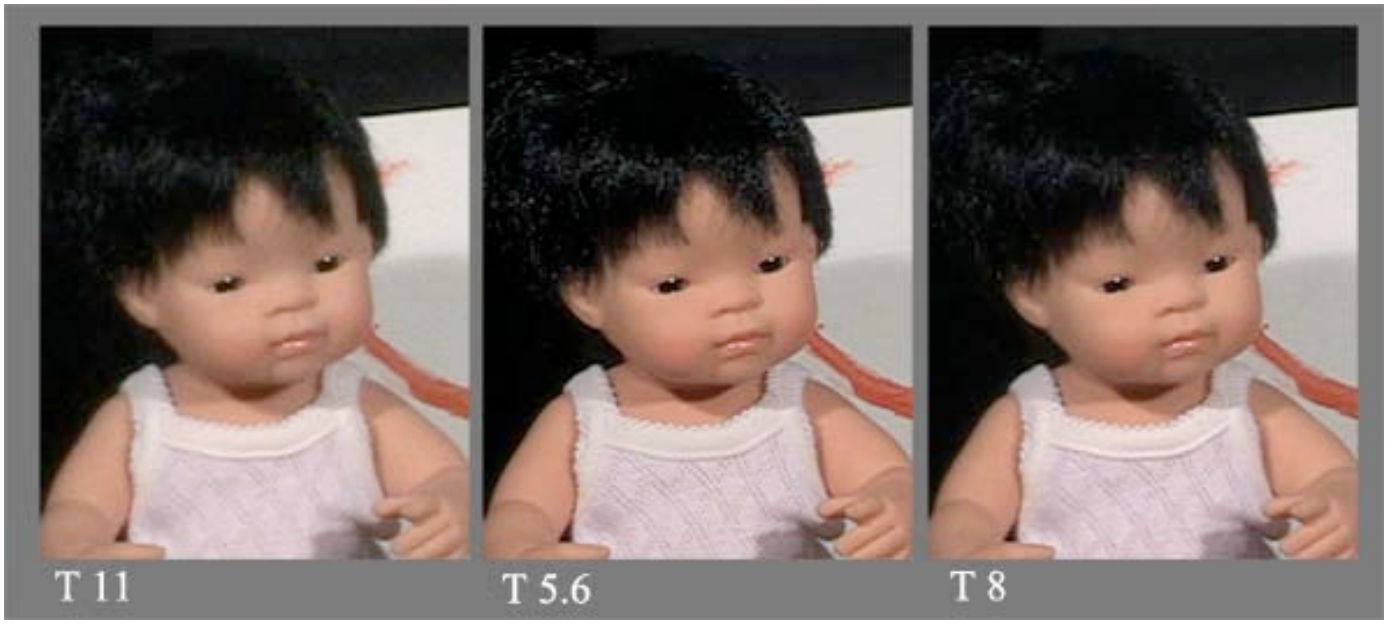
It should be pointed out that the camera has apart from the noise reduction system another system of noise control: it can be decreased selectively, in other words, we can apply the reduction filter just on certain parts of the image, these parts can depend on tone, saturation or particular areas.

The Db adjustment can be reached accurately; values can be increased up to 0.5Db. We can use also negative values (-3; -6Db) to minimize the noise, although the RD has to be changed.

Lastly, we have to speak about the diffraction effect; as we already know, it is a physical effect that has its influence on the resolution. Loss of resolution increases as we close the diaphragm.



On previous image, we can see the central part of the Putora chart. We can see the resolution of the central circle, as well as the concentric ones with a 5.6 diaphragm. Sharpness of the inside circle has disappeared and also has decreased on the rest of concentric ones with T8. All of the frequencies have lost too much sharpness with T11. Below, we have applied the edge detector to the central part of the Putora chart in order to see much better detail losses. The fewer contrast there is among lines, the more uniform appear frequencies on the edge detector. Due to the small size of the sensors (1/3”), and as a consequence the size of the pixels too (near to 2.5 microns), the diffraction effect is very significant, and T stops values are practically useless from 6.8.



On the image our Lù nà (璐娜) doll. We can see the general loss of detail, above all on the hair and the t-shirt.

Next, we show an outdoor frame. We can see the camera resolution: it is quite a good feeling of sharpness under suitable conditions of lighting and correct exposure. So much so that BBC includes this camera among other ones in broadcasting.



Madrid Mountain Range (Spain). F29.3mm. T 4.4. 25 fps. 1/50. ND 1/16. Cine 1 gamma. NR Auto. Sharpen level -3(menu changes showed told before). Preset Daylight

Conclusions:

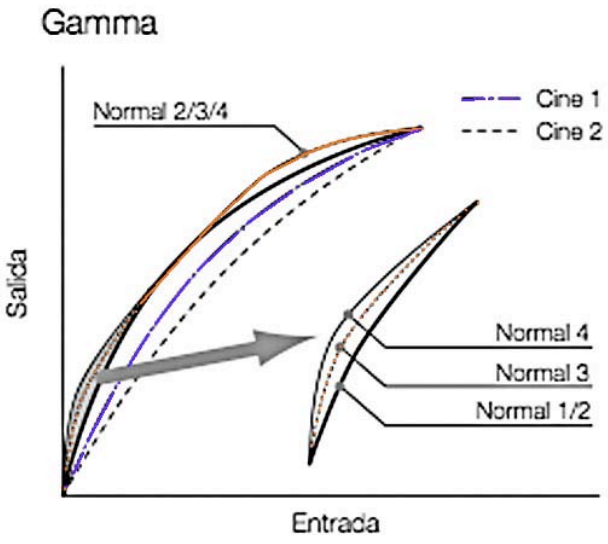
The camera shows a good resolution among its segment; it provides enough sharpness and an acceptable detail at high frequencies. However, it shows certain deficiency on textures.

Feeling of image sharpness, as well as its "natural" appearance improves considerably with a suitable combination of the values of the detail menu and the noise reduction system. If we do not use these menus we have checked that image appears more electronic, more "garish", with a touch of artificial look.

It should be pointed out that the diffraction effect appears with T upper 6.8; therefore in order to keep the diaphragm value within optimal values, we have to use neutral filters, suitable lighting, shutter changes, etc.

**In addition to the influence of the diffraction effect, we have to take also in account the noise reduction automatic circuit influence that we have used on the three exposures*

El Rango dinámico. Curvas de Gamma



The camera provides the following gamma curves:

Normal 1 : NHK 4.0

Normal 2: ITU 709, with a bit more contrast at high light

Normal 3: ITU 709 standard

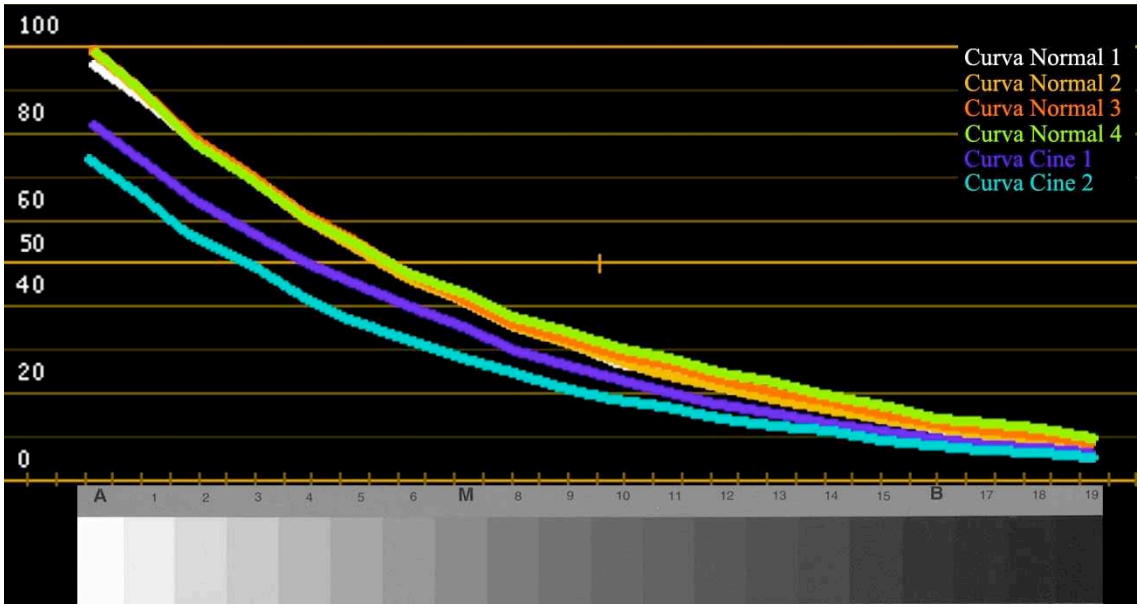
Normal 4: BBC 0.4

Cine 1: gamma with pseudoLog structure for video output.

Cine 2: gamma designed to transfer image on analogical film.

Changes of the *Normal* gamma curves are concentrated above all at the middle tones and shadow. The 1st and 2nd curves are practically alike, although the 2nd one shows a bit more contrast at high lights; white is a bit brighter. The 3rd curve is slightly brighter than the 1st and 2nd ones at shadow; it is also softer, and it shows a bit more detail in these areas. The 4th curve is still brighter than the 3rd one at shadow. Practically, all of

the *Normal* curves keep the middle gray value very similar, they are practically the same at high lights. Just only, let us point out that the 1st curve is slightly less contrasted at high lights, as we have already specified.



Graph of the Kodak gray scale through the different gamma curves

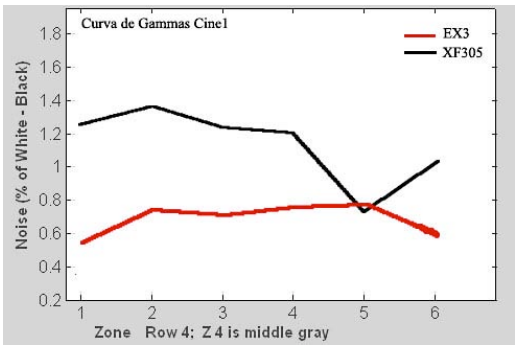
Nevertheless, the *Cine* curves are different. They show much less contrast than the *Normal*. They capture more detail at high lights: although contrast of both kinds of curves is alike, differences appear at shadow. The *Cine 2* curve shows less contrast than the *Cine 1* at shadow. The *Cine 1* places the middle gray around 35% and the *Cine 2* around 28%. In other words, if we use the same T value, image through the 2nd curve is darker than the 1st one

Regarding the noise through the different gamma curves, we can see that it is very similar; all of the curves show more or less the same level of noise. On next table, we show the values form the analysis of the gray samples of the Macbeth chart through the Imatest program. Values do not change considerably.

Just as a reference, on the following graph we compare the noise of the *Cine 1* curve, to both our camera and the Sony EX3; as we already know, the last one uses lager sensors, ½"

.

Gamma curve	Average noise of Y at middle gray (122) (% normalized value from white to black at 8 bits)
Normal 1	1.11
Normal 2	1.17
Normal 3	1.31
Normal 4	1.17
Cine 1	1.28
Cine 2	1.15

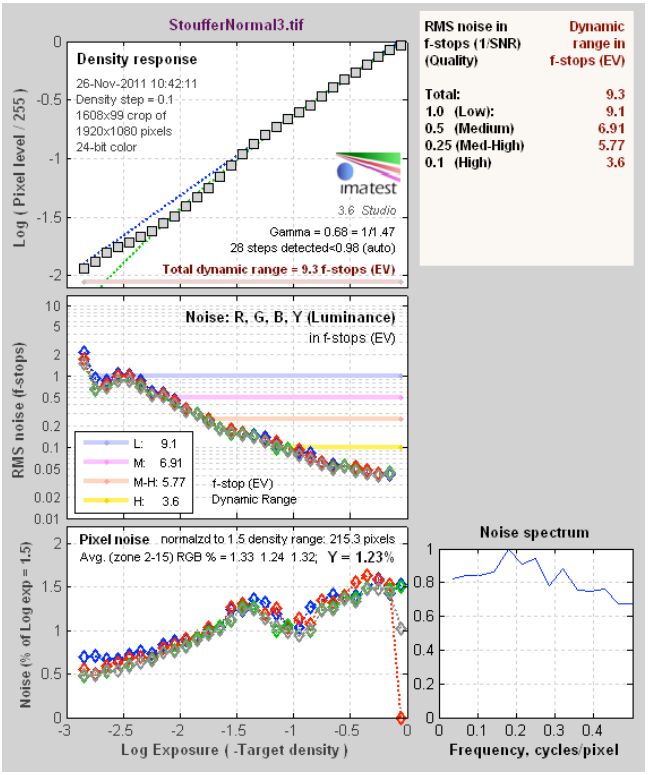


The XF305 with noise reduction system off

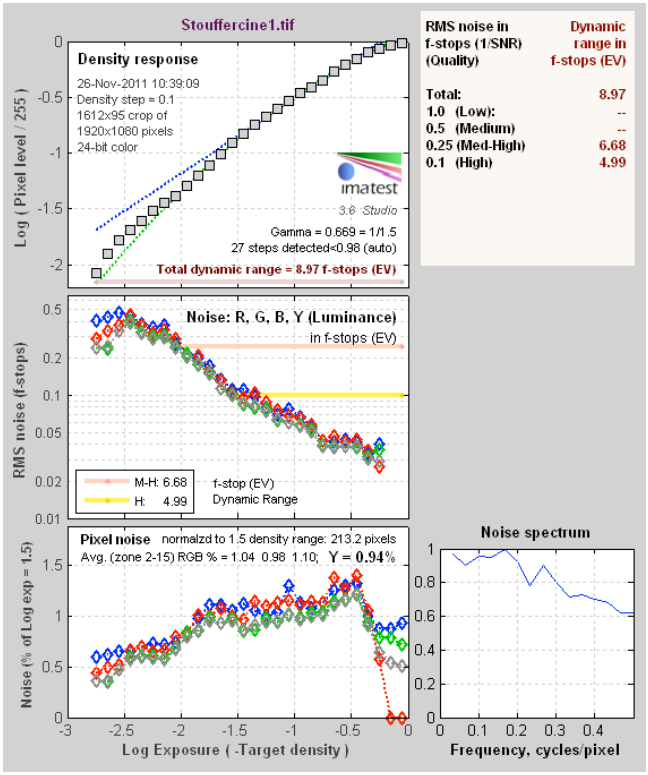
Stouffer strip:



The total range (captured) is 9.3 stops with the *Normal 3* curve, but there is an extremely high level of noise, (Y=23%). As a result, we have to consider to evaluate RD (effective) a Med-High value (0.25 f stops) as 5.77 stops. If we compare with the *Cine 1* curve; we can see that the total amount of RD value is lower, however Med-high values is 6.68, and it shows less noise (Y=0.94%). Therefore, *Cine 1* curve shows around one more RD stop.

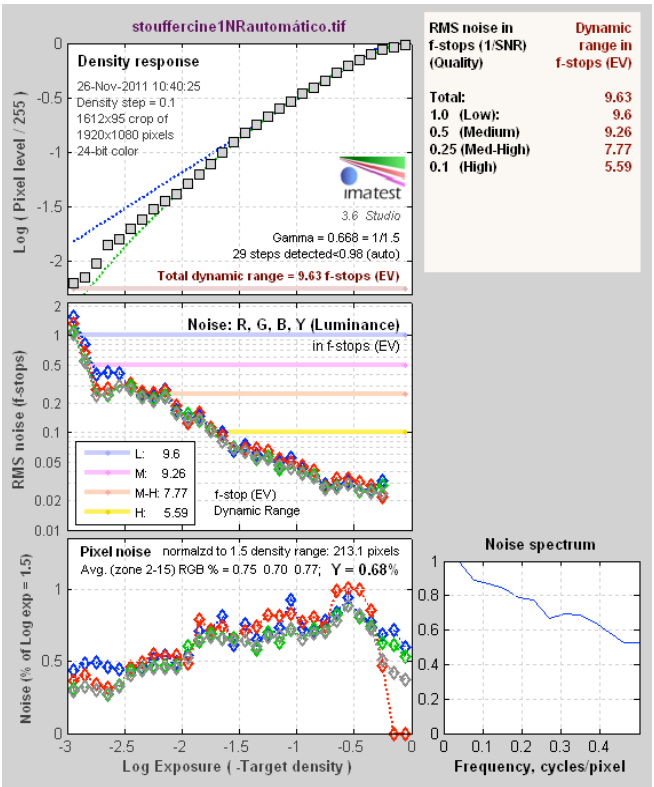


Normal 3 gamma

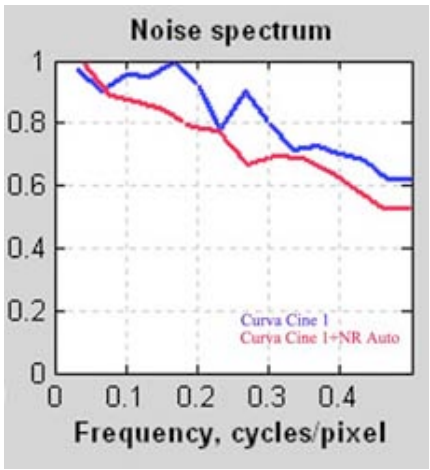


Cine 1 gamma

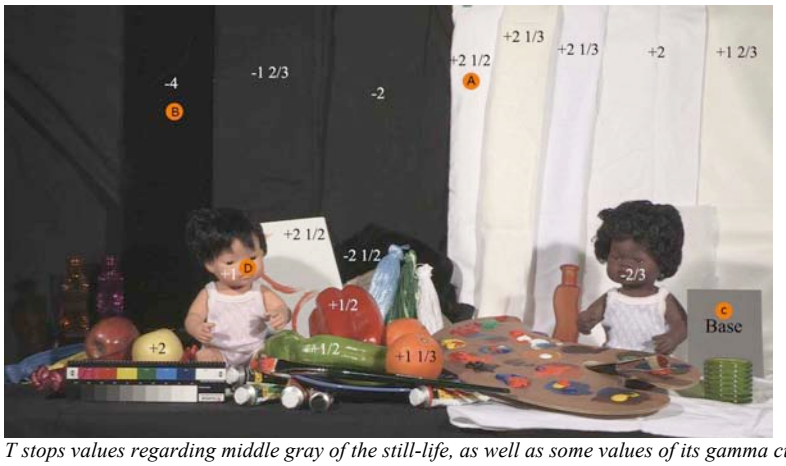
However, since the noise is high owing to the using of CMOS with just 1/3 inch, Canon provides in the camera menu a very precise and efficient noise reduction circuit. If we apply the circuit in automatic mode, and we analyze the Stouffer strip with *Cine 1* gamma, then we can see that RD increases up to 9.63, and the Med-High value is 7.77 stops, i.e., 2 more stops than *Normal 3* curve provides, and a bit more than 1 regarding *Cine 1* without applying the automatic circuit. Noise is 0.68% at Y.

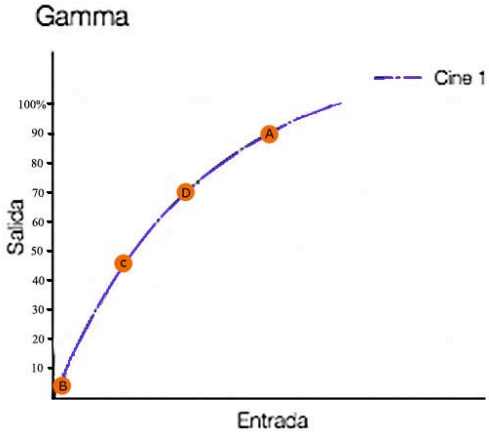


This increase of dynamic range due to the noise reduction involves a pay toll: decreasing the resolution, practically in all of the frequencies. We can check on the noise spectrum graph; we compare *Cine 1* gamma without noise reduction system and with it in automatic mode.

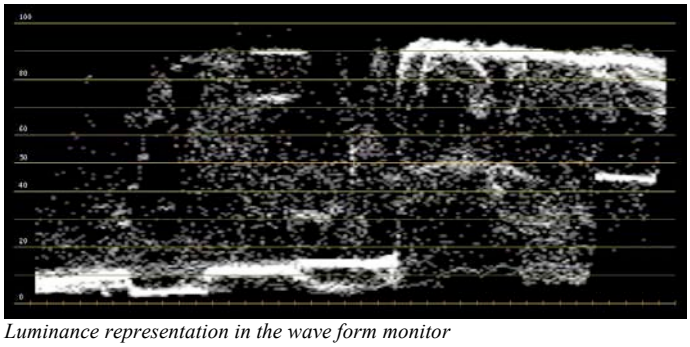


Therefore, with all of the information we can consider the *Cine 1* curve as the curve which offers more effective dynamic range, i.e., around 7 stops from a captured range of 9 stops. As usual, we are going to see how this initial approach is realized in our still-life; we are going to observe both resolution and texture, as well as color through different exposures.





T stops values regarding middle gray of the still-life, as well as some values of its gamma curve.



Luminance representation in the wave form monitor



The assistant camera David Panizo prepares the still-life



Reference frame at base exposure. F 55.7mm. T 5.6. 25 fps. 1/50. Cine 1 gamma. NR Auto Preset Tungsteno



At one light (overexposures shots) *Grading each exposure (overexposures shots)*



At one light (underexposures shots) *Grading each exposure (underexposures shots)*

At one light

With base exposure, we can distinguish all the textures at both high lights and shadow without problems. At shadow, we can see certain texture in the darkest velvet which is **at** -4. With -1, there is certain texture in black, although we see very high noise. Despite of loss of texture and increasing of noise, with larger underexposures the camera still distinguishes lighting changes up to -7 stops.

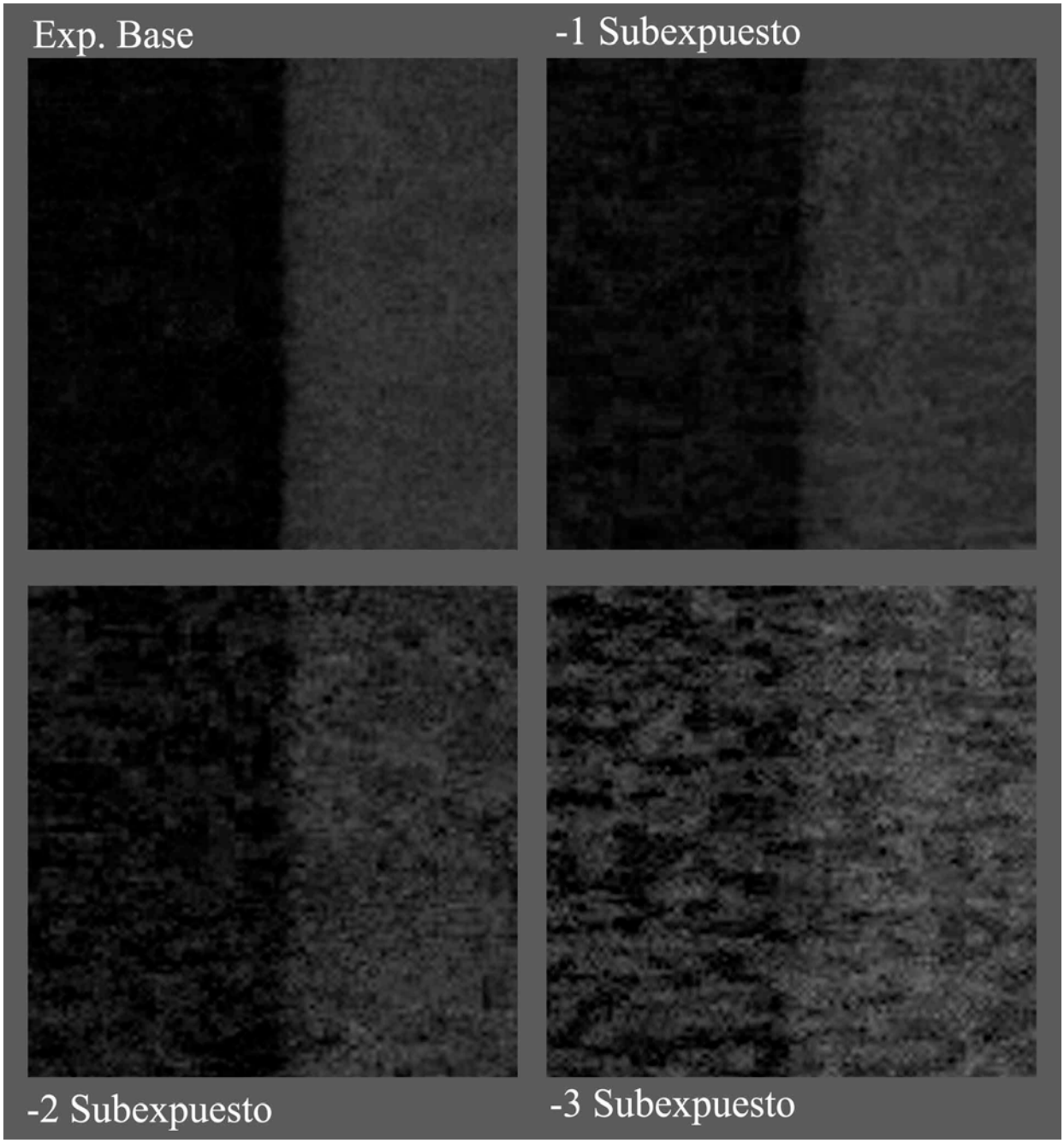
At high lights, fabrics keep their textures with +1/2 overexposure, in other words, the brightest one which is 2 ½ with the base exposure, now is +3. However, with +1 overexposure the brightest white is clipped. From here up, with larger overexposures, textures and details disappear. Therefore, we can say that our effective RD is around 8 stops, 3 above, and around 5 below.

Grading each exposure

Nevertheless, we can delimit still much better these values watching the grading multi exposure strip.

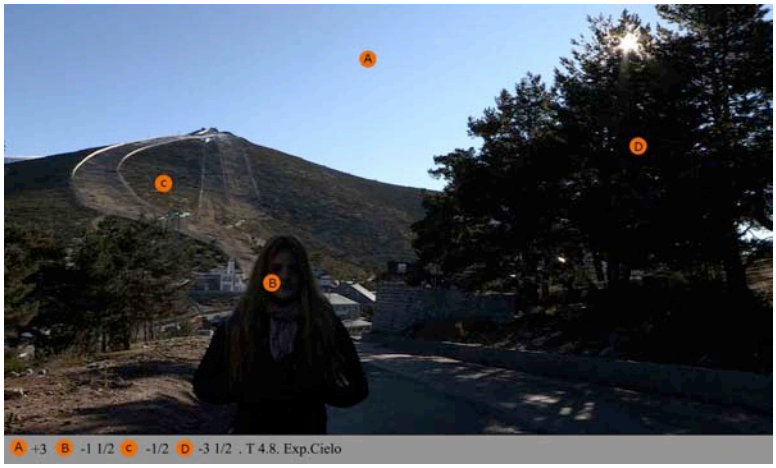
We can recover all of the texture of white with +1/2 without problems. However, it is not true with +1 overexposure; although white is not yet clipped it is on its limit, in addition it has lost the texture. Therefore, we can conclude that latitude above is around 3 1/3 in order to keep the texture.

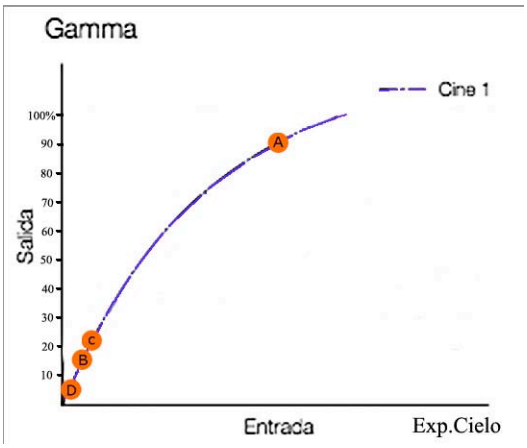
At underexposures, we can see clearly noise with -1; noise clouds the texture, but we can still notice the black velvet. With larger underexposures, noise is excessive, consequently the dynamic range below is limited up to 4 or 4 ½; it depends on our preference about how many degree of noise we accept.



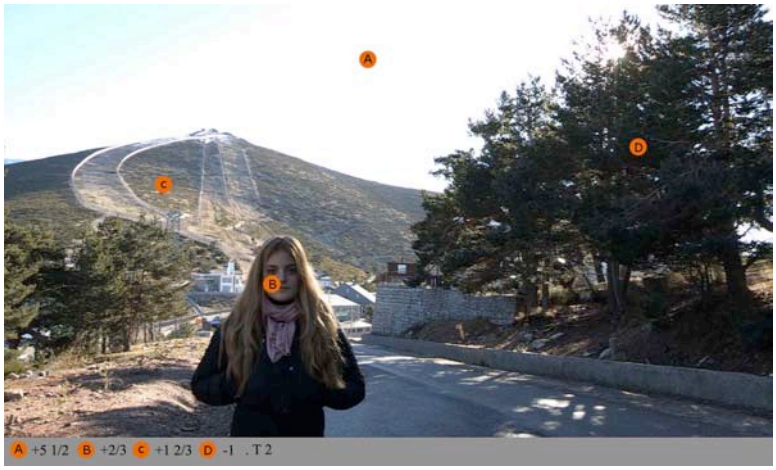
Cutting of darkest velvet together with the black fabric in the still-life. 800% enlarged. Blue channel

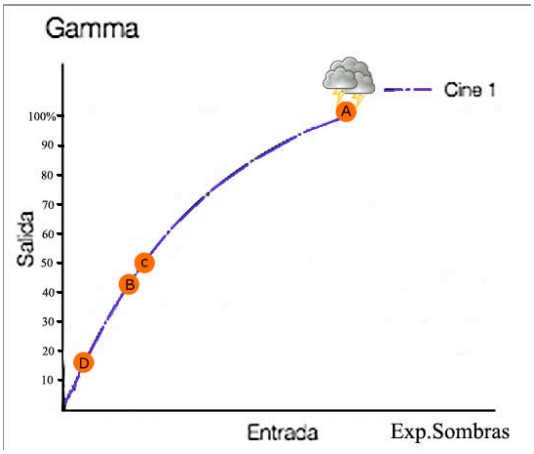
Now, some frames in outdoor location will help us to confirm the camera DR.





Madrid Mountain Range (Spain).F 30.6mm. T 4.8. 25 fps. 1/50. ND 1/16. Cine 1 gamma. NR Auto





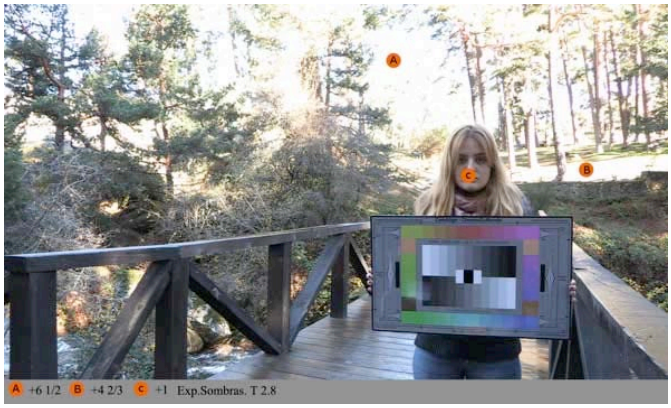
Madrid Mountain Range (Spain).F 30.6mm. T 2. 25 fps. 1/50. ND 1/16. Cine 1 gamma. NR Auto

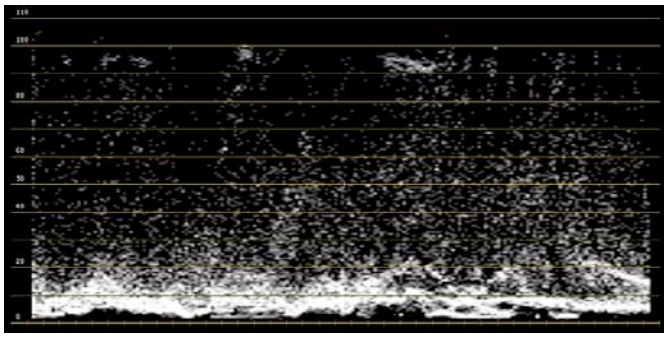
We see really how the sky exposure keeps at 3 stops above my diagram value, however the darkest area of the trees keeps at -3 1/2; here, we can still see detail and texture. Our model's face is a bit more than 1 ½ stop below. It is not a lot underexposure, but skin tone is excessively gray-like. We will see in more detail under the color analysis.

Skin tone keeps well at shadow exposure; however sky rises quickly above 5 stops, and as we already checked the camera is not able to solve. Mountain area (C) is perfectly reproduced with all of its texture and detail.

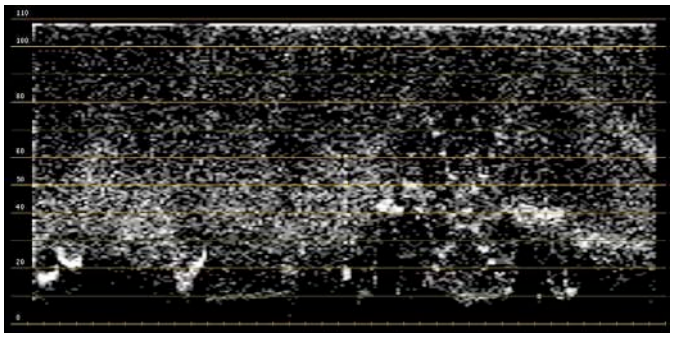
Finally, with one more example we will try to average the exposure in order to get the best detail as possible.



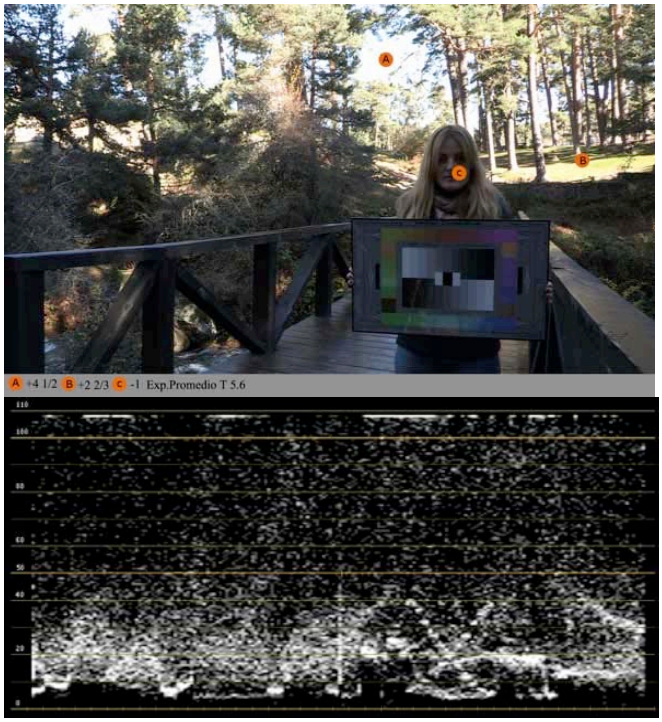




WFM high lights



WFM shadow



WFM Averaged exposure

Images are from Boca del Asno in Madrid Mountain Range (Spain). We can see clearly the limit of the camera abilities. At shadow exposure, the sky and the illuminated field (A, B) keep totally clipped because they are more than 4 stops above. We already know that our latitude above is around 3 1/3 at the most if we want to guarantee not only white without clipping but also white showing certain texture. On the other hand, at high lights exposure, sky is nearly 3 stops, so it keeps all of its color; field keeps also all of its color, it is just 1 stop. However, our model's face is more than -3 stops, it keeps totally dark. With no more options as illuminating the face or using filters to high lights, we have to average the exposure, clipping as less as possible high lights, and trying to get as much as possible detail on the model.

The average value places skin tone at -1, illuminated field (B) keeps all of its detail because it is nearly +3 stops, however sky is irremediably clipped in spite of keeping certain tone.

Conclusion:

Captured RD of the camera is around 9 stops with of *Cine 1* gamma curve; *effective* is a bit more than 7, in other words, this is what we can use because they show enough detail with an acceptable noise. These 7 stops are divided up around 3 above and 4 below the average. These values are achieved regarding the noise reduction application (auto mode) and an ISO 160 value.

The value from the analysis of the Stouffer strip through Imatest after shooting is Med-High; i.e., around 7.77 stops.

Range is smaller nearly 2 stops with the *Normal* gamma curves; however we can use the Knee circuit with these curves, as well as the gamma circuits in order to change slightly the range.

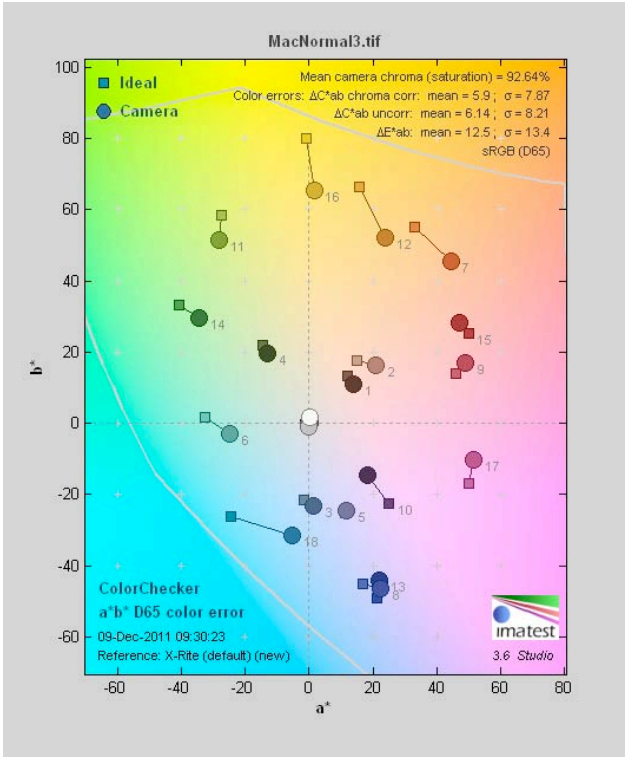
Color

The camera provides several choices among different color matrixes, and then they can be changed regarding saturation and tone. It works accurately over the vectors. The camera allows also choosing particular color tones within an image area, and then it can change them, adjusting phase, chroma and lighting.

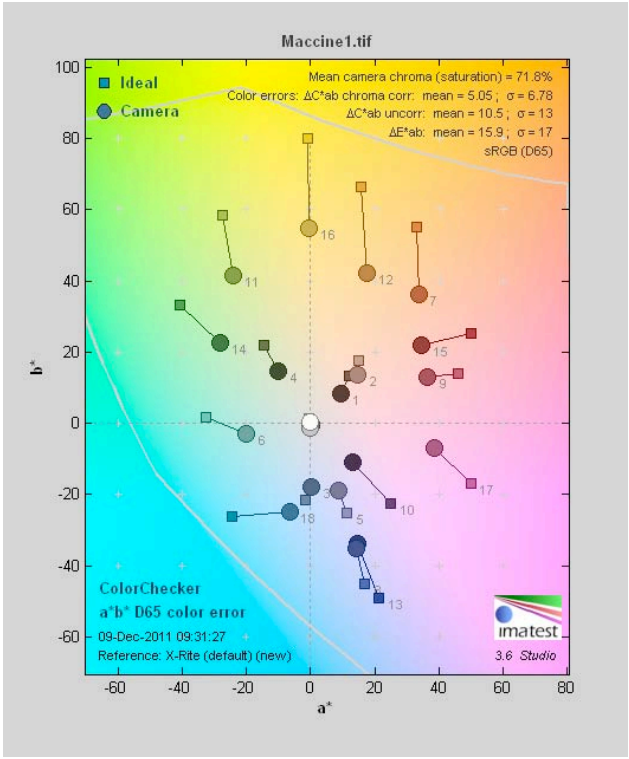
Color matrixes match the gammas, so, there are four *Normal* and two *Cine*. We have analyzed the Macbeth chart photographed with all of matrixes through Imatest. However, here, we show just the *Normal 3* and *Cine 1*. Differences among *Normal* matrixes are really irrelevant.



X-rite chart. Numbering of the samples: from top to bottom, from left to right.



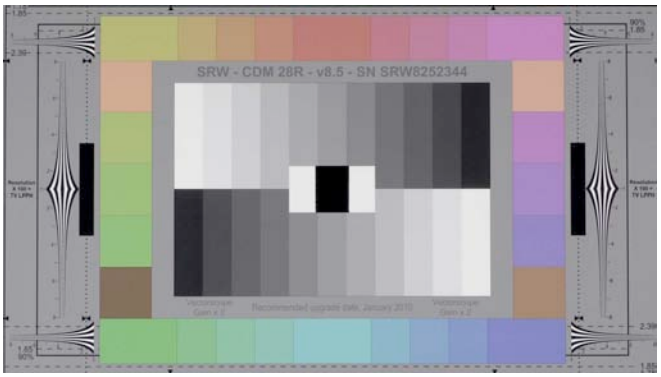
Normal 3 gamma curve

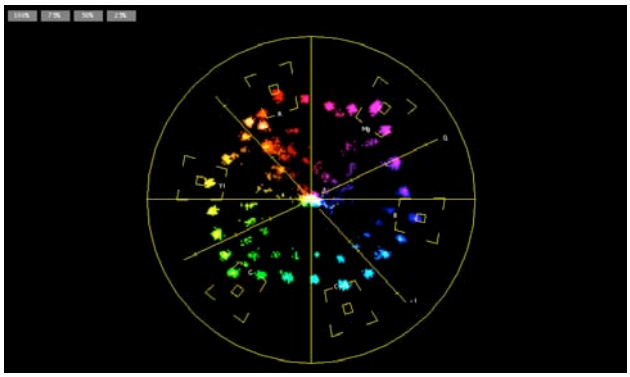


Cine 1 gamma curve

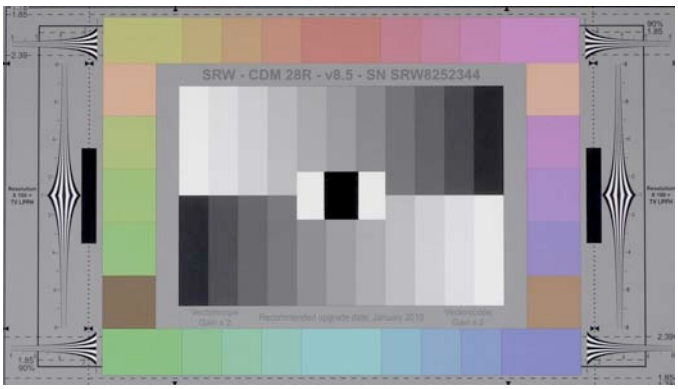
Sigma value (RMS) is a magnitude that evaluates color deviations photographed by the camera regarding the standard reference values. After the saturation correction, sigma value is 7.87 with *Normal*, and 6.78 with *Cine 1*. We can consider color reproduction as normal with these values.

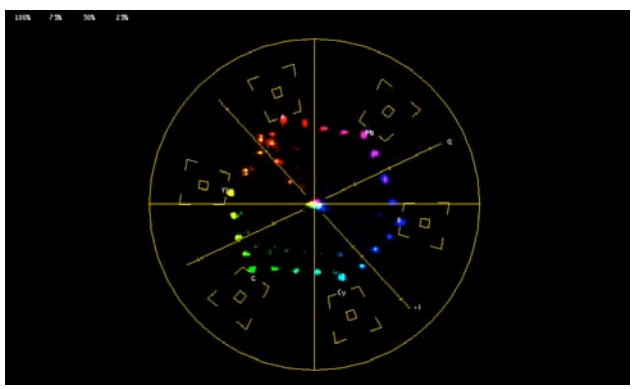
Differences between *Normal 3* and *Cine 1* are not significant regarding tone. With lower tone saturation, *Cine 1* changes red tones, they become a bit warmer (towards yellow), and some magenta tones turn colder. Green tones are alike between both matrixes.





On the previous image, we show the DSCLabs ChromaDuMonde chart shot with *Normal 3*, on the right, its representation on vectorscopio. We can see that all colors are toned according to standard; however, green is a bit more yellow-like. Below, we show the same chart with *Cine 1*. We can see clearly on vectorscopio how decreases color saturation and how color tones are quite similar to the *Normal 3* ones, just with slight differences we have spoken about in Macbeth chart.





Observing the charts and skin tones (next image); we have decided to introduce some changes using the color menu at R-G (-10) and B-G (-11).

With B-G we can operate on yellow/green. We have changed slightly green and yellow; the first one is less yellow, and the second one is a bit greener (towards cyan).

With R-G we can operate on red/magenta. We have changed slightly red, it is "colder" and less "orange-like". Despite of skin tones being right, they look a little artificial, above all if we are working at low range, with not so high underexposures.

We have photographed the model with a reference chart to analyze skin tones. We have graded to adjust gray in order to keep it neutral.



F 119.8mm. T 5.2. 25 fps. 1/50. Cine 1 gamma. Cine 1 matrix without correction. NR Auto.Exp at neutral gray

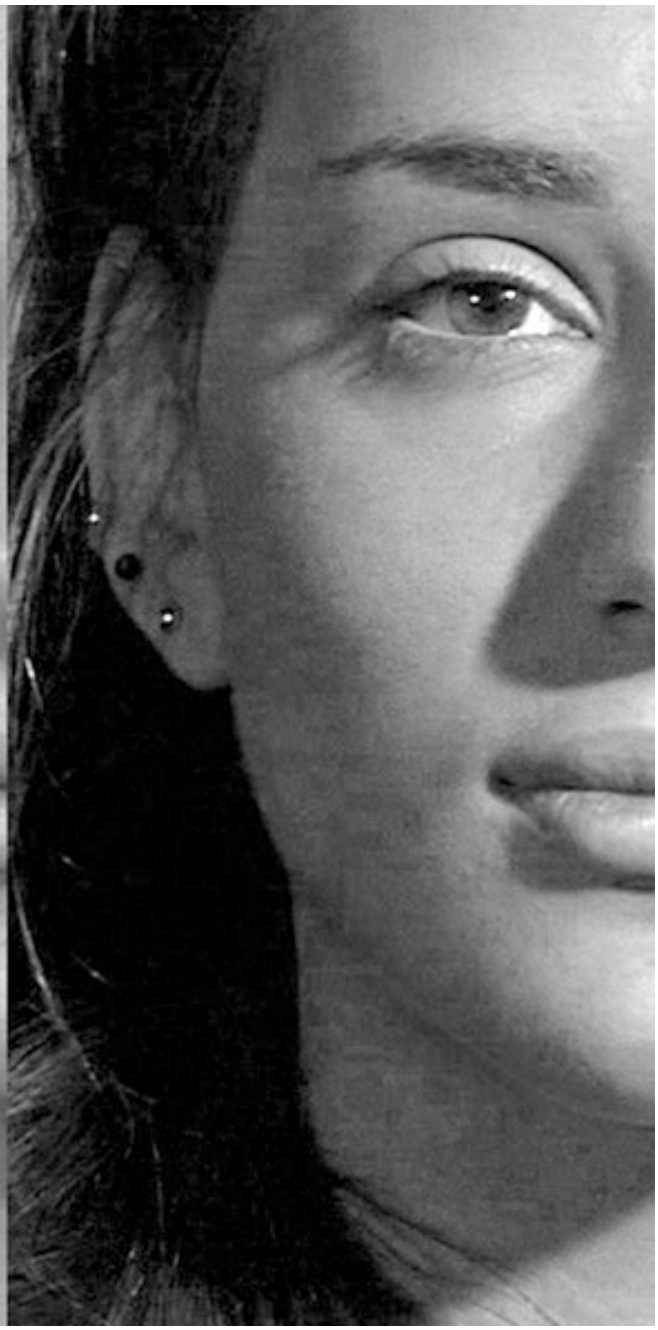


Ana's face with different contrast relations

Though skin tone is fine, we can see that it is a bit saturated and "quite red". Matrix correction, as we have pointed out, improves this aspect. If we change contrast relation, we can see that from 8:1 (3 stops of difference) skin tone at shadow is gray-like, and it shows already compression artifacts and inadequate quantification; above all at blue channel, as it was expected.



Blue channel 2:1

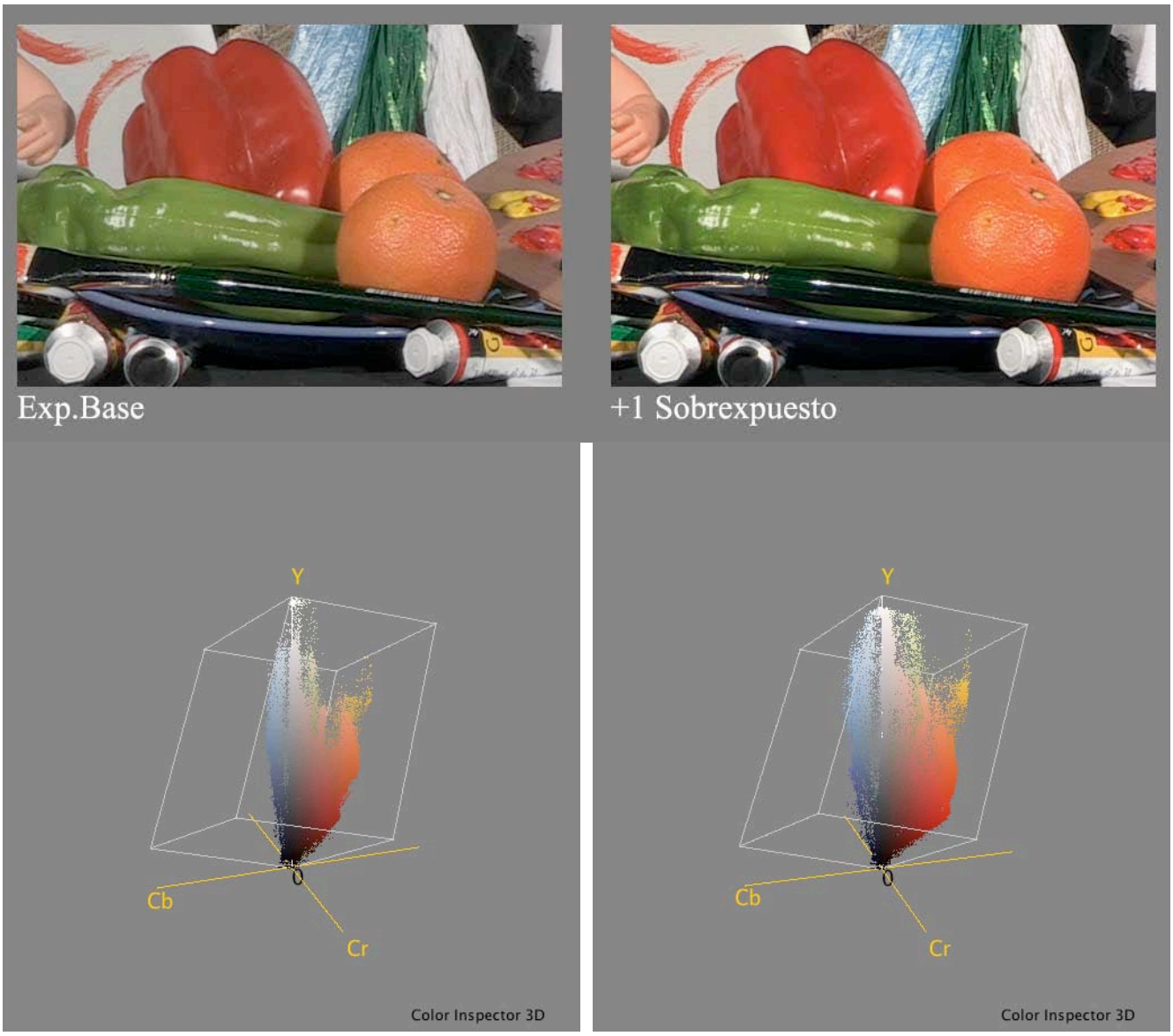


Blue channel 8:1

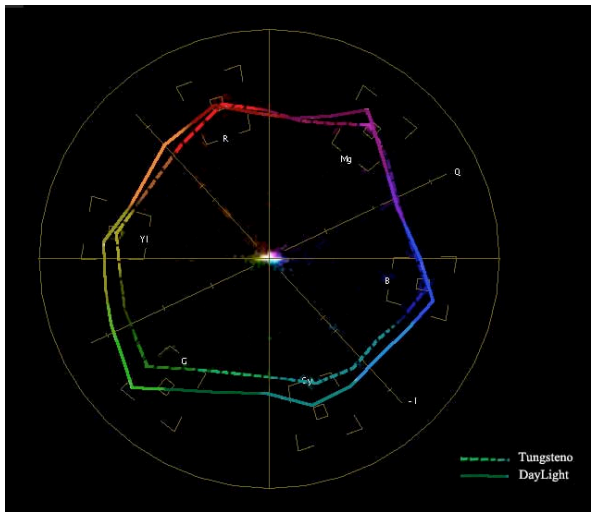
Loss of skin tone under certain degree of underexposure can be clearly seen in the candles frame, as well as in the outdoor location frame we shot in Navacerrada (Spain). In the last one, at high lights exposure, model's face is underexposed nearly 2 stops. In addition of the noise, all of the effects already seen appear when we try to recover the face.

We have seen in the still-life that tones keep reasonably uniform at different exposures; however saturation rises quickly at underexposures; color is completely garish. Owing to overexposure, skin tones are slightly overexposed, and they show an artificial aspect; however, if they are correctly exposed they doo not show so much deviation, in other words, if they are around 1 point above middle gray (around 60% or 65% on the wave form monitor).





We have checked also the difference of the preset of color temperature: we have lighted the DSCLabs chart at 3200ºK and 5600ºK with suitable correction on lighting devices, we have checked also that middle gray was exposed correctly, as well as its tone was neutral. With daylight preset, in general, image shows slightly toned towards green/cyan, because tones show a bit more saturation. If we use accurately the Matrix menu, we can adjust color temperature without problems.



On the right image, we can see in comparison the “color wheel” from tungsten and day light.

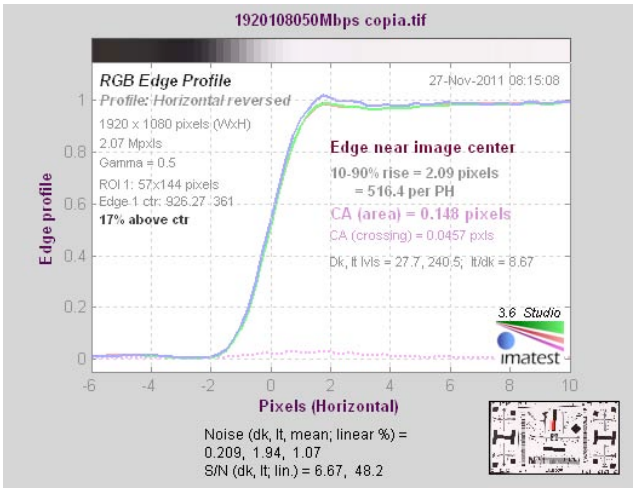
Regarding the neutral filters of the camera, they change hardly color tones; differences are really irrelevant, although it should be pointed out that green/cyan tones are a bit less warm than those with filter application off, in other words, green tones are cyaner. However, I insist, there is no need for any correction on images far from the world of charts.

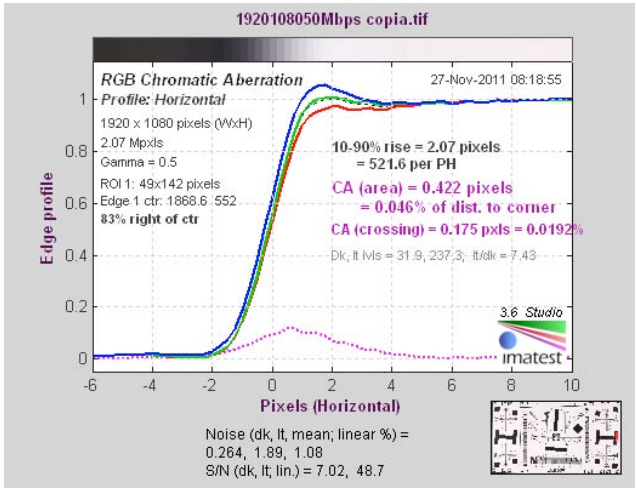
Conclusion:

We can consider color reproduction of our camera as normal, within the camera segment that it belongs to. It has the typical restriction from the 8 bits and compression system. Under a suitable adjust, skin tones are acceptable at normal exposure, however, they are not so good at underexposures; they are excessively gray-like, in addition they loss texture.

OTHER CONSIDERATIONS

Regarding aberrations, it should be emphasized that there is hardly any chromatic aberration, undoubtedly owing to the exceptional quality of the lens. Next, we show the Imatest analysis as a reference.





We can see this minimal aberration in our *Via Stellae* chart. We show one of the punch-holes enlarged. We can see the small green/magenta deviation.



About the rest, we have not seen other kind of aberration, as spherical, astigmatism, etc. Regarding lens, the only thing we do not like is the endless ring of diaphragm: we have to look for diaphragm values on the LCD screen of the camera.

We have not seen special artifact either; just those are related to the 8 bits format and a high degree of compression. Codec used by Canon is strongly efficient, so that, it allows, as example, we were able to shoot Navacerrada's sky without banding. Finally, we should comment on the effect produced by the shutter (Rolling shutter): vertical looks as diagonals in fast panoramic, in addition if we change quickly the movement direction, then we can see the typical "gelatin" effect.



Rolling shutter effect in a quickly panoramic over the pine wood, changing direction.

We have not seen IR effect on images, even if we have used the densest Neutro filter provided by the camera.

Regarding camera handling, we believe that it is very easy to operate in all of the aspects. It is a camera easy to use, light and quite versatile; however, regarding other endangered professional views, we cannot make shoulder camera recording (although we can make it on hand), if we do not use some kind of ad hoc device.

FINAL CONCLUSIONS

The XF305 belongs to the low segment of professional cameras where professional and consumerism fields contaminate each other; and where a lot of time this border is dissolved. As a DoP, I like to know these fields that are on the peak owing to the crisis (not only economic but also ethic and professional).

It should be stressed that Canon has made an excellent work in this camera, using sensors of just 1/3". It can be put in comparison in a lot of senses with the quality provided by other cameras like the EX3 which uses sensors of larger size.

In short:

We like

-Enough image resolution
-Price-quality ratio
-Excellent quality of optics
-High control of the image through different menus which are very precise and efficient
-Incorporation of wave form monitor and vectorscopio which can be seen on the camera screen
-Simple and easy to use workflow
-Lack of significant optical aberrations, especially chromatic (that causes me strong allergies owing to some reason)
-An efficient codec to compress at 8 bits which does not show generally any ghosting, blurring, banding, etc.

We do not like so much

-Lack of texture and color depth (typical in cameras with such features). Above all in skin tones at certain degree of underexposure
-Low sensitivity
-High level of noise at middle tones and shadow
-The *Cine* curves are not as efficient as we expected to recover detail at high lights
-High diffraction effect
-Rolling-shutter effect

Credits:

Cinematographer: Alfonso Parra AEC
Dirección de Fotografía: Alfonso Parra AEC
First Assistants: David Panizo and Saúl Oliveira
Ayudantes de cámara: David Panizo y Saúl Oliveira
Dit: Carlos Rho

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