

Notes on Sony F35 camera

by Alfonso Parra AEC

During the last February we tested the digital Sony camera F-35. The tests were done in HD video 1920x1080, 24fps, 172,8 shutter angle, framed in 1:1.85 and using the S-Log gamma curve with Extended Dynamic Range and S-Gamut Color Space, recorded in a SRW-1 docked to the camera in HDCAM SR format in RGB 4:4:4 SQ mode at 10 bits. We used Zeiss Ultraprime lenses. For the adjusting of the light and evaluation of the recorded images we used a CinetalCinemage Monitor 4:4:4 waveform/vectorscope incorporated. We also used a Sekonic L-558/Cine and the Minolta color meter IIF, all of them suitably calibrated. We captured frames in Tiff format with the Cinetal monitor and in DPX format with the SRW-1 which incorporates this new feature.

For Color Correction and analysis of the frames we used Photoshop CS3 and Iridas Speed Grade On-set software's, as well as Imatest and ImageJ. We shot models and reference charts, over and underexposing them, and scenes in different locations in Madrid and El Escorial (Spain).

As we did with F23, our target was to get a wide vision of the performance of the camera, from the DoP point of view, taking into account both objective elements like the resolution, latitude and color analysis from the Imatest software and also subjective elements like noise valuation, texture and general appearance of the images. In many cases the results are compared with those obtained with F23, avoiding long explanations we developed there, in these cases we give references to that article. For all this, these tests must be considered as a specific application of those done with F23 and can be used as a starting point for the necessary adjustments of your project.

The images presented here come from the original frames though converted to CMYK color space, for what they must be taken as a mere reference.



Cinematographer Alfonso Parra AEC and Yaiza Gonzalez, camera assistant.

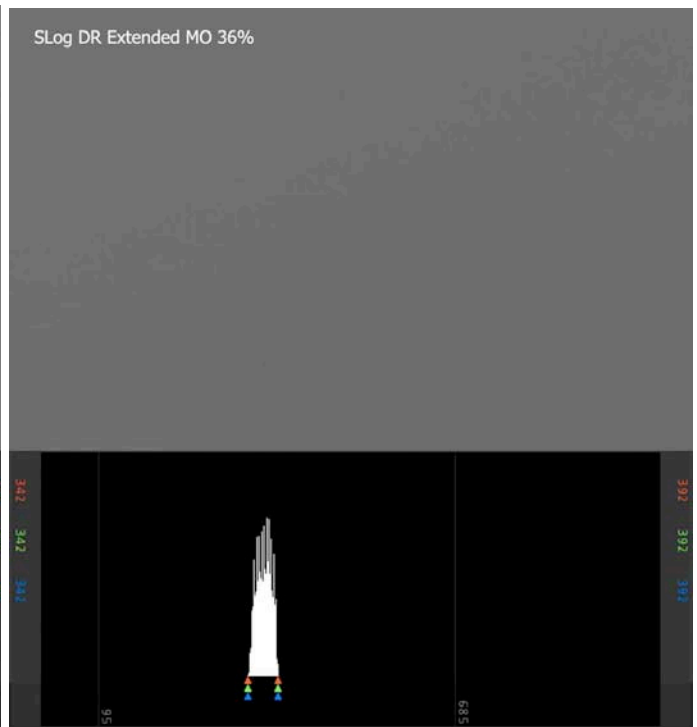
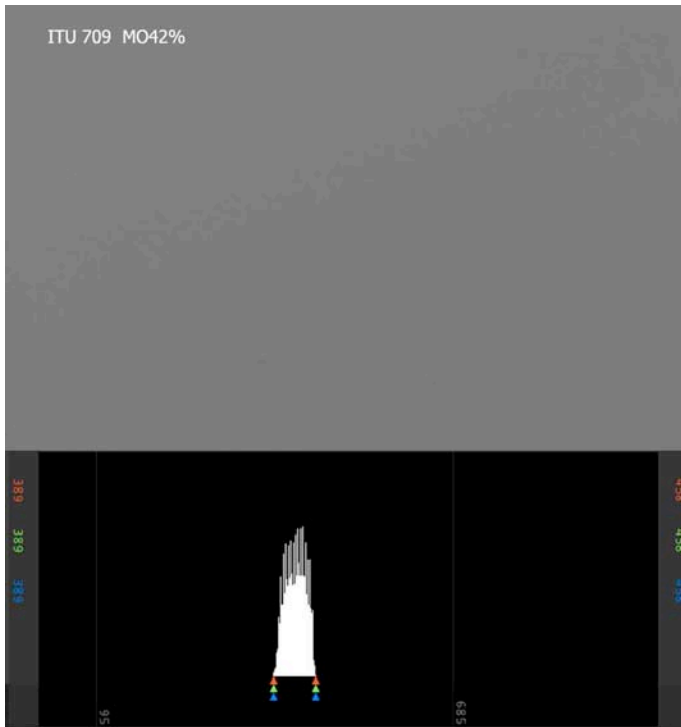
SENSITIVITY (Exposure index).(IE)



Alfonso Parra checking camera settings at room test in INFOTV

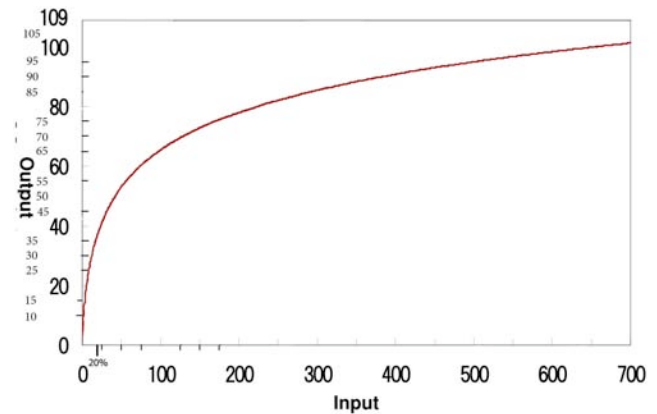
As we always do, we evaluated the exposure index with 18% grey chart properly lit and our light meters properly calibrated. We paid special attention to the S-Log gamma curve which provides the widest dynamic range, capturing a high level of detail both in highlights and shadows. Also this time, we tested the sensitivity without gamma correction, this means in linear mode, and applying the formula provided by Kodak for the calculation of the minimum ISO value with the measure of the base saturation point (ISO standard 12232:1998).

By evaluating both results we have an idea of how to use the EI.



S-Log curve. As we can see, an input value of 20% gives an output signal between 35 and 40%, very similar to the recommended 36% for Panavision PanaLog curve. In these 18% grey images and histograms we compare Itu and S-Log curves.

In the Assistant Panel Display of the F35, in the Gain and White Balance menu page, we see information provided by the camera about the sensitivity and dynamic range. The exposure index in parentheses is defined by the value of a photographed 18% grey representing the 20% of the input signal value. It must be said that the output signal value will depend on the applied gamma curve, so we can also consider the exposure index taking into account this output value for that 20% input. For different curves and configurations we'll have variations in the exposure index as we show in the next table.



Curva Gamma	Rango dinámico	Db	Valor señal de entrada (%)	Valor MO (%)	Valor promedio píxel 10 bits (Ref.LAD 445)	Índice de Exposición (ASA)	Referencia T Stop
S-LOG	Normal	0	20	42	437	250	8
ITU 709	Normal	0	20	42	435	400	8 2/3
S-Log	Normal	0	20	36	380	320	8 1/2
S-Log	Extended	0	20	36	360	400-500	11
Lineal Gamma OFF	-----	0	20	36	350	200 (160)	5.61/2

If we take the Digital LAD value as reference we note that the S-Log gives an EI of 250 Asa for a 42% value in the waveform monitor. For the same value, the Itu curve shows an EI of 400 Asa. Nevertheless, if we consider that the S-Log is quite close to the PanaLog, and these curves are designed to work with the Cineon Standards, then the value for the 18% grey should sit in the recommended 36%; with this value, and considering a value of 96 as black, the S-Log gives 320 Asa in Normal Dynamic Range and between 400 and 500 Asa in Extend Dynamic Range.

The Camera also shows information about the dynamic range in % and T stop values taking the 18% grey as the base exposure. The relationship is shown in this table:

The dynamic range and the exposure index are affected, among other factors, by the use of the gain and the Dynamic Range adjustment (D-Range). The information provided by the camera in the Assistant Panel match what we saw in our light meters, so for the rest of the tests with the S-Log curve we adjusted them to 400 Asa (DR Extend) or 320 Asa (DR Normal). The sensitivity of the camera is basically similar to F23, although the F35 looks slightly faster, around 1/3 stop.

For a detailed work it'll be necessary to evaluate each curve for adjusting our light meters, because the camera has not only the S-Log curve, but 4 HyperGammas, 6

DB DR Normal	ASA	T STOPS
+12 db	1350 ASA	5 E
+ 9 db	950 ASA	5 E
+ 6 db	670 ASA	5 E
0 db	340 ASA	4.9 E
- 3 db	240 ASA	4.3 E
-6 db	170 ASA	3.9 E

CURVA	D-RANGE	DB	ASA	
GAMMA S-LOG	NORMAL	0	340	4.9 Stops over18%
GAMMA S-LOG	EXTEND	0	450	5.3 Stops over 18%

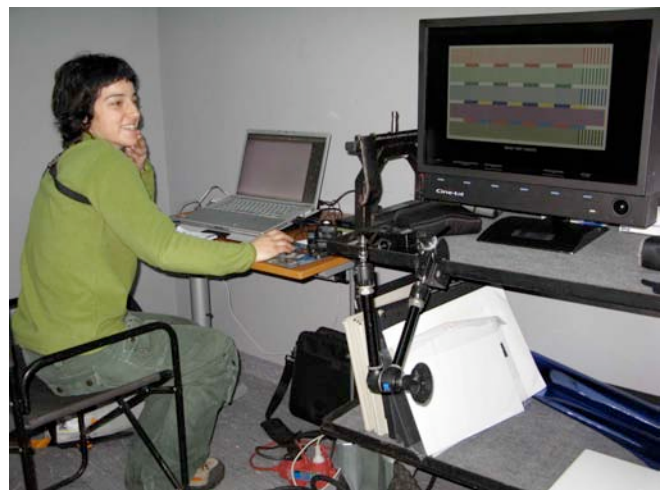
Standard curves, and the possibility to load up curves created with the CVPFileEditor. Light Illusion offers 20 different gamma curves for the F23 and F35 that will be studied in future articles. With all these curves we can have a precise control of our image in any situation.

Following some film tradition, I make a distinction between nominal sensitivity and effective sensitivity. The first one refers to the values obtained by the Standards established by different organizations and indicated above by the Iso value and also using the camera as a light meter evaluating the 18% grey with Gamma Off (in linear mode). The second one, the effective sensitivity, is the one obtained when evaluating the 18% and different images taking into account the noise, the applied gamma curve and the contrast in the low light areas. Facing the lighting process I always use the effective sensitivity, which normally is higher than the nominal one.

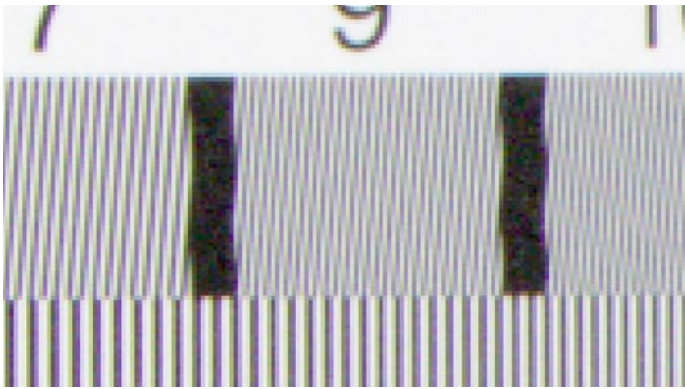
Resolution / Sharpness

As we said many times before, the final image resolution depends on the resolution of every element involved in the capture of the image. This time we evaluated the resolution with an ISO 12233 chart and the Imatest analysis software. We also had a look at some frames shot on location, all this with different camera settings applied. Shooting with another kind of lenses, for example, will modify these results, but we believe the results here give a clear idea about what the camera can do.

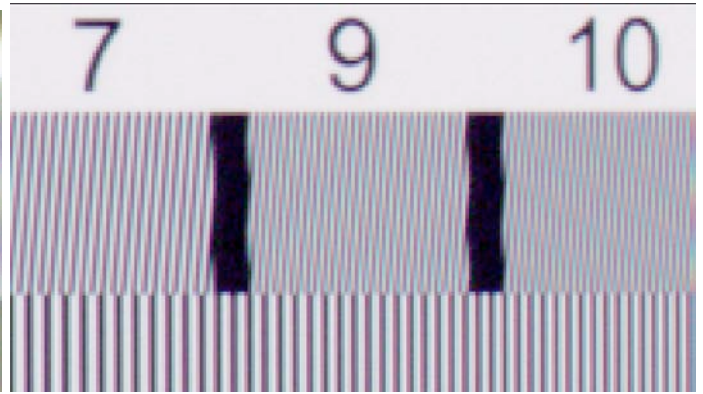
The camera resolution is similar to what we got with F23 but we saw that the imperfections in the high frequency areas look different as we can see in the following images.



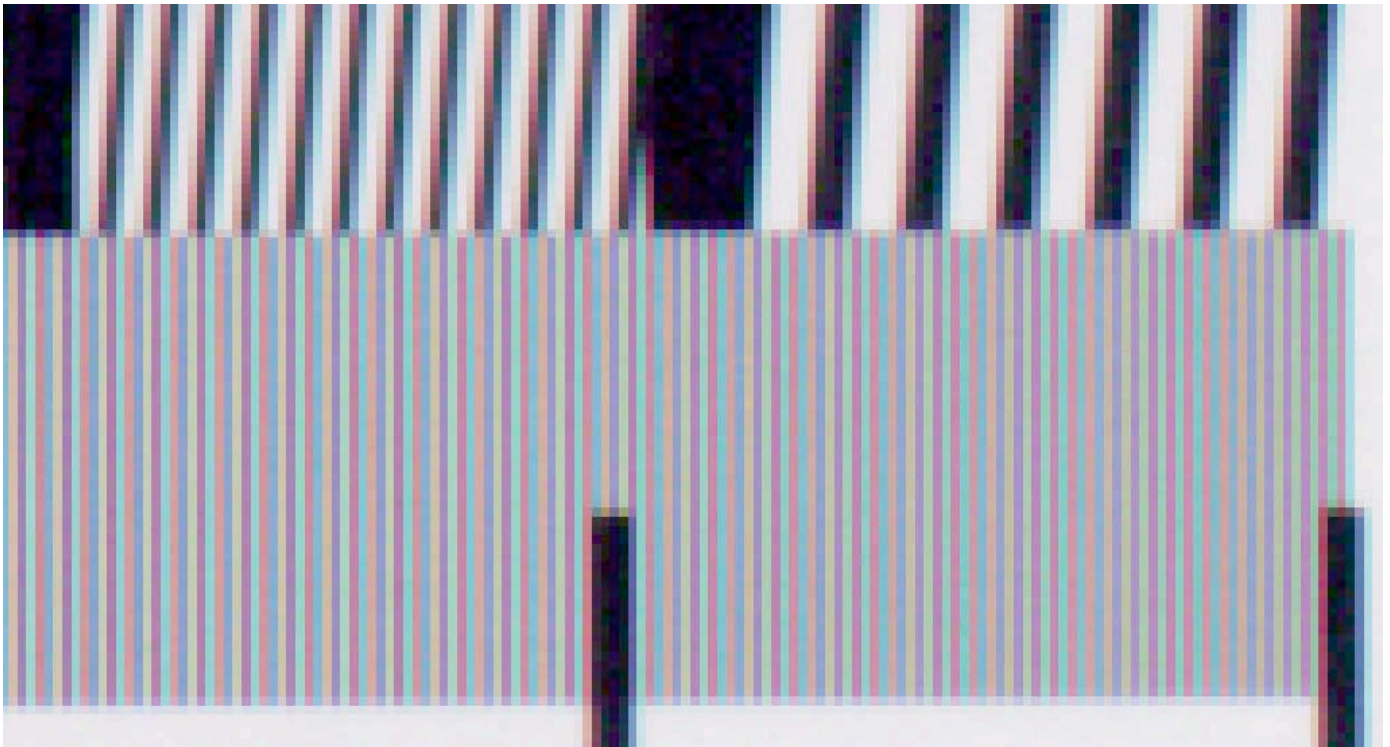
Yaiza, camera assistant, during a resolution test



Magnified chart with F23



Magnified chart with F35

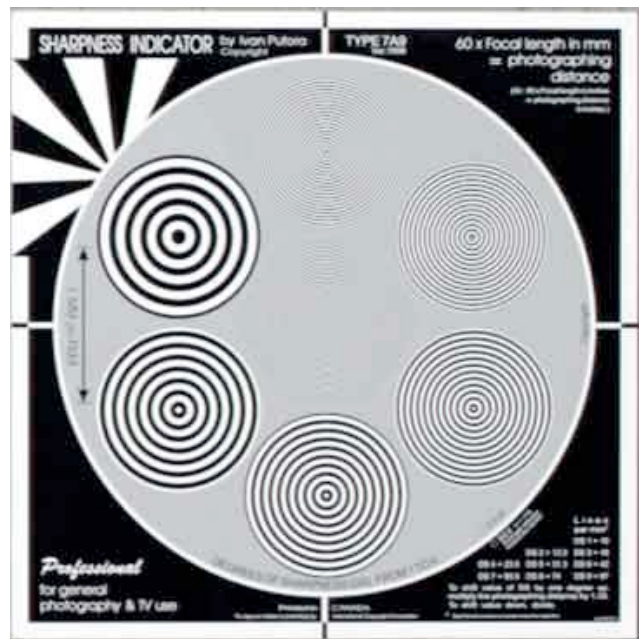


Magnified a 650% to the 900Lph and 1000Lph patterns

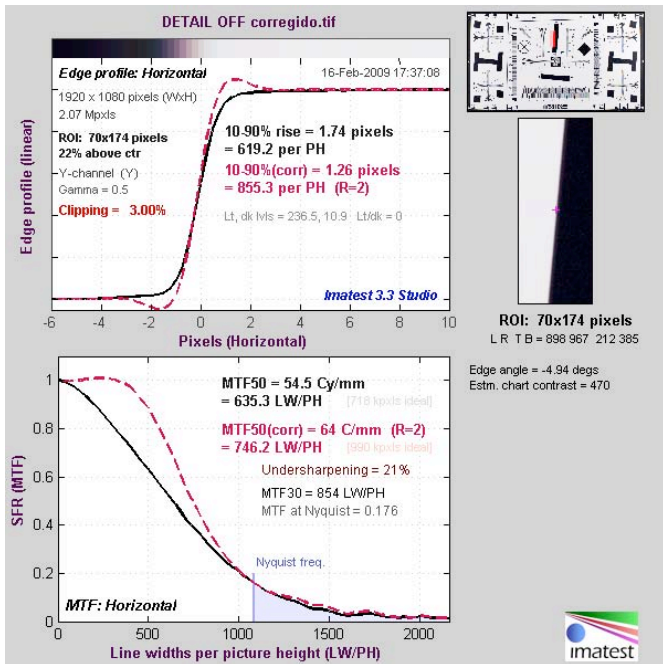
The F23 produces an interference color pattern less noticeable than the one the F35 produces. Our impression is that the F23 has the advantage of using a separate sensor for each color, and this gives a better color separation. On the contrary, the F35 uses one single chip with RGB columns on it so it doesn't "see" these frequencies in the same way. We also see the Magenta-Cyan deviation typical in the chromatic aberrations.

The general impression is that the F23 is sharper separating the color in the high frequency areas.

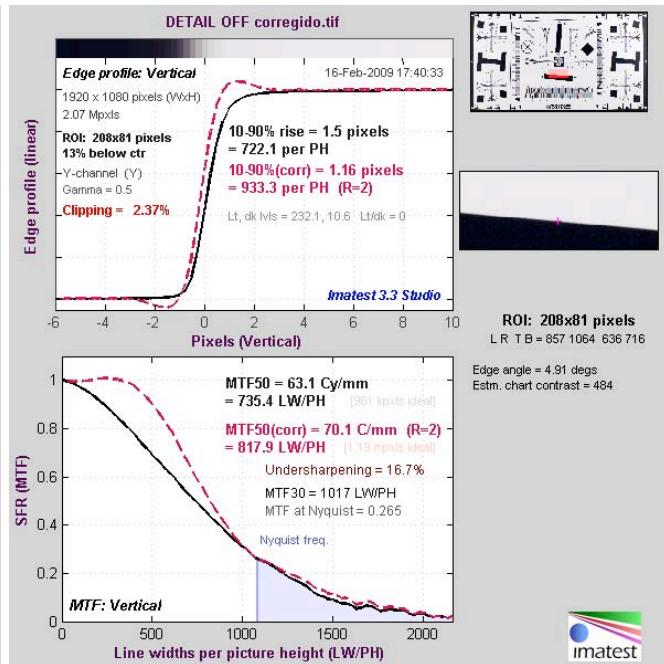
In the Putora chart we can clearly see up to 42L/mm (6) and some interference effects in 55,5L/mm (7). Comparing it to the Putora chart recorded with F23 and a Digiprime 20mm Lens (equivalent to the 50mm Ultraprime in the F35) we see the F23 shows more resolution as long as we clearly see till pattern number 7. Let's see what Imatest says about this.



Putora test chart. F 50mm T4 S-log. Drange Normal



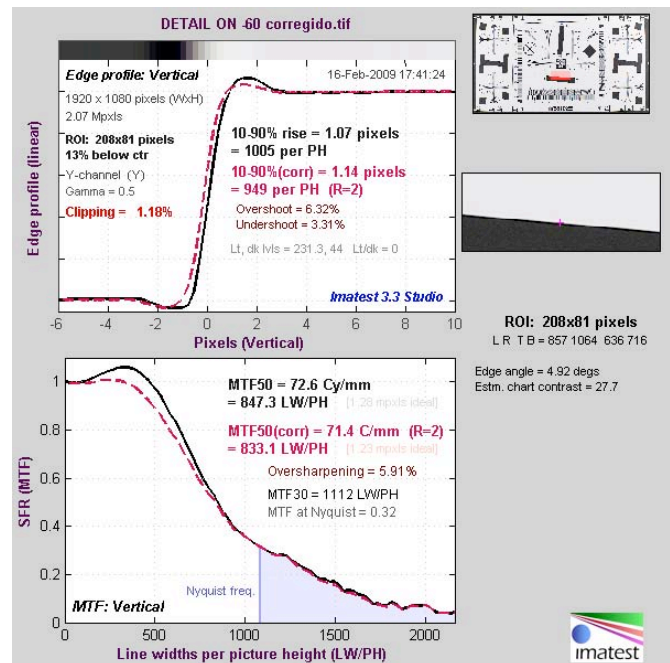
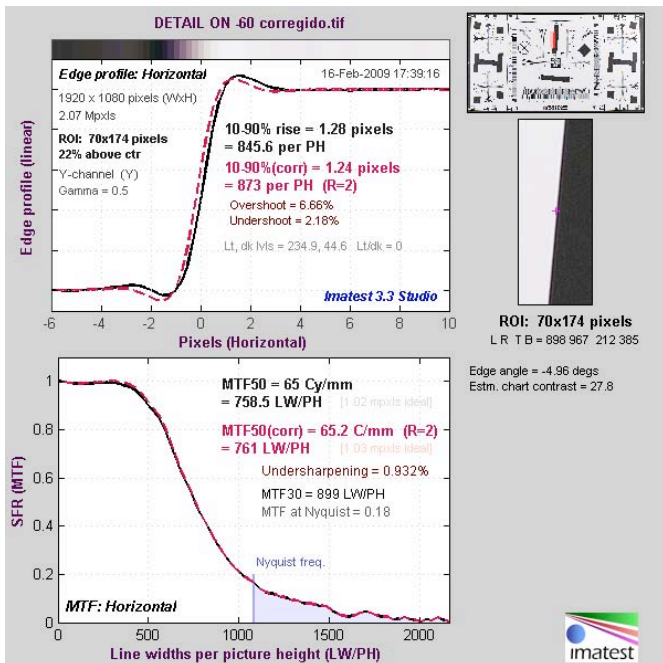
Horizontal resolution with Detail OFF



Vertical resolution Detail OFF

The horizontal resolution (MTF) is 635,3LW/PH and with the standard Sharpen correction applied it sits in 746,2LW/PH. In the graphic on the right, the vertical resolution sits in 735,4 LW/PH; 817,9 with the correction applied. This resolution is, for example, far below what we got with the Red One camera in 4K, although is quite similar when the Red material is exported to 2K as we saw in that test.

To increase the sharpness we can use the Detail correction which we manipulated between -60 and -99. Raising detail up to -60 the image gets sharper without imperfections in the edges and without the electronic feeling so typical with these kinds of adjustments. The variation in the resolution values with Imatest using Detail -60 is as follows:



In the horizontal, comparing the MTF (50%) curve with the one obtained with Detail OFF we see that we get a sharpness similar to the standard the software applies, with an excellent sharpness till 500 Lw/pH and reaching the 800Lw/ph. We also see the range 10-90% rise is 1.28 pixels with Detail -60 versus 1.74 pixels with Detail OFF (the smaller the number of pixels, the better the resolution). For better understanding of this representation visit www.imatest.com.

In these two images the effect of the Detail can be seen, especially in the edges between the forest and the vegetation.



S-Log curve. DR Extend. Preset 5600°K. Ultraprime 24mm.T6.8. Filters: Polarizer, ND1.2. Detail OFF. Graded frame

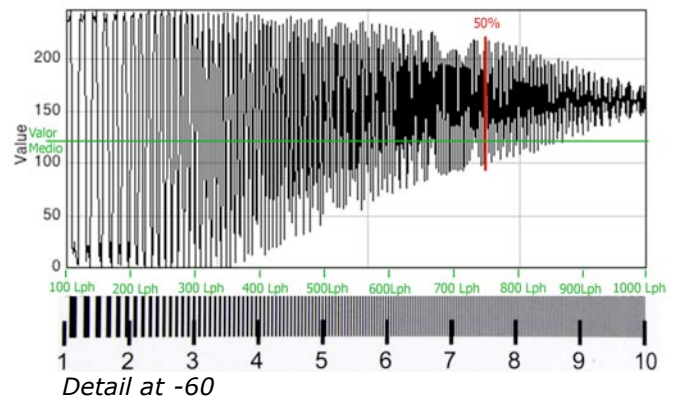
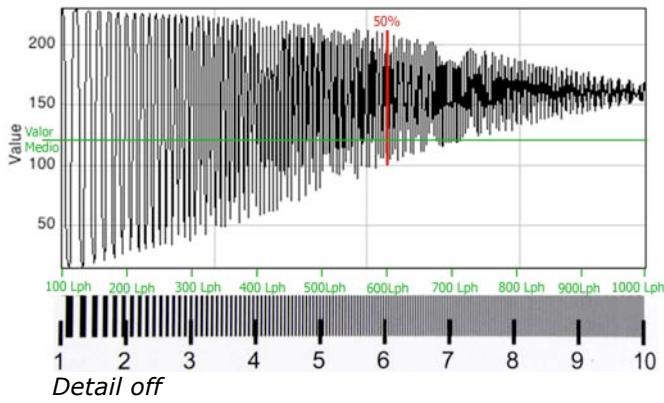


S-Log curve. DR Extend. Preset 5600°K. Ultraprime 24mm.T6.8. Filters: Polarizer, ND1.2. Detail -60. Graded frame

Let's see this difference in the resolution profiles obtained with ImageJ software with the same ISO chart.



Latitude test with a still live set up



Added to the resolution difference we observed that in both cases there is a sharpness loss (less contrast between the white and black lines) because of different factors like lens flares, the sensor itself, etc...)

To finish, we show the resolution in this forest shot.



S-Log curve. DR Extend. Preset 5600°K. Ultraprime 24mm.T9.6. Filters: Polarizer, ND1.2. Detail OFF

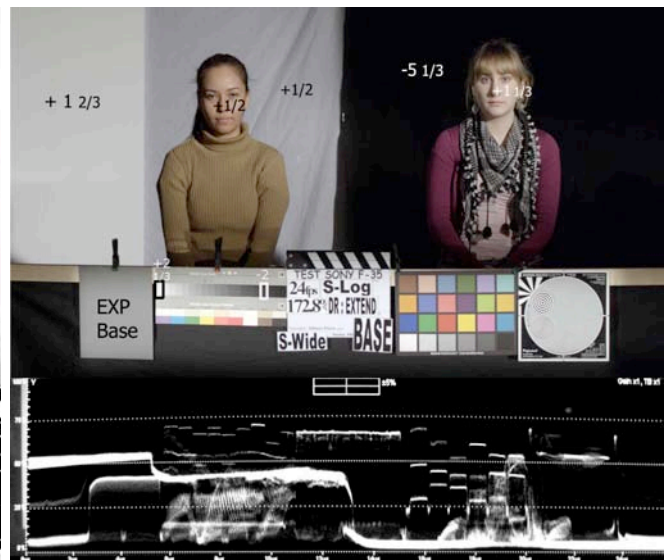
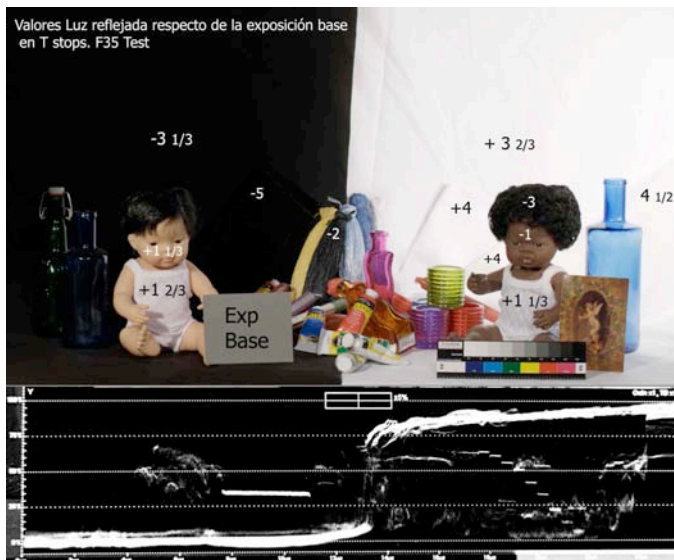
Conclusions:

In the way we set up the camera and with the lenses we used the resolution sits around 700Lw/Ph or between 42 and 55,5 L/mm. All this is slightly below what we got with F23. The results confirm the F23 is slightly sharper and the color interference artifacts are less noticeable than with F35. In the other hand, the resolution is equal in the three RGB channels. Anyway, as we said before, this resolution is more than enough for the cinematographic projection in commercial theaters.

Latitude / Dynamic Range (DR)

As we did with F23, to evaluate the latitude (dynamic range) of the camera we used the Imatest analysis software and also recorded models with charts and a still live set under and overexposing in 1 stop steps. We corrected this exposures one light grading and also adjusting each exposure. We used the S-Log gamma curve with Dynamic Range Extended for a middle grey 18% value of 36% in the waveform that, as we said before, corresponds to 400Asa sensitivity. On location outdoors we used the same gamma curve and sensitivity, with camera Preset 5600°K and adjusting the exposure using neutral density filters.

Evaluating exposure on the models and still live shots



S-Log Curve. DR extended F: Ultraprime 50mm T 8

S-Log Curve DR extended F: Ultraprime 40mm

T stops values for reflecting light with 18% grey as the base exposure

First thing we see in the still live set is that, with the values above, all the image detail is inside the range of the camera. This way, the white foam on the right at $+4 \frac{1}{2}$ retains all the texture and can be clearly distinguished from the background white fabric that is slightly below $+4$. In the low light areas we see the texture on the black velvet (at -5 from the 18% grey) and can be distinguished from the background black fabric.

Let's see the exposures:

Still Live. Highlights

Overexposing 1 stop, the white foam is then at $5 \frac{1}{2}$ over the 18% grey and can be distinguished from the background fabric but it lost the texture. The rest of the fabrics also retain detail.

Overexposing 2 stops the foam disappears as well as the detail on the white background fabric that is now at $+5 \frac{2}{3}$. The white fabric in the center, at $+6$, is also out.

Overexposing 4 stops, the white doll's t-shirt is at $+5 \frac{2}{3}$ and it lost detail.

The color balance is uniform without significant deviations.

Still Live. Shadows

The texture on the black velvet disappears at -3 (that's at 8 stops below).

Underexposing 2 stops we still have texture on the velvet although with a noticeable noise level.

In the graded frames we still distinguished the velvet (at -9) from the black fabric (at $-7 \frac{1}{3}$). This means the camera can see detail $\#$ at -9 stops but, as the one light graded frames indicate, the limit is at -7 , and considering a certain noise level we can work with -6 stops.

Underexposing 5 stops, the face of the black doll (at -6) retains detail.

With heavy underexposures we see some cyan/green deviation.

So, in the still live set we can establish a dynamic range between 11 and 12 stops. With Normal Dynamic Range setting we can say between 10 and 11 stops. If we observe the low light areas noise level and the highlight detail we can conclude the camera can effectively release 10 stops. This makes sense with the fact that the camera A/D conversion is 14bits, with an S/N of 54dB and a 10bits output. So, depending on the camera setting we'll have 5 stops over and 5 stops under, or 4 over and 6 under.

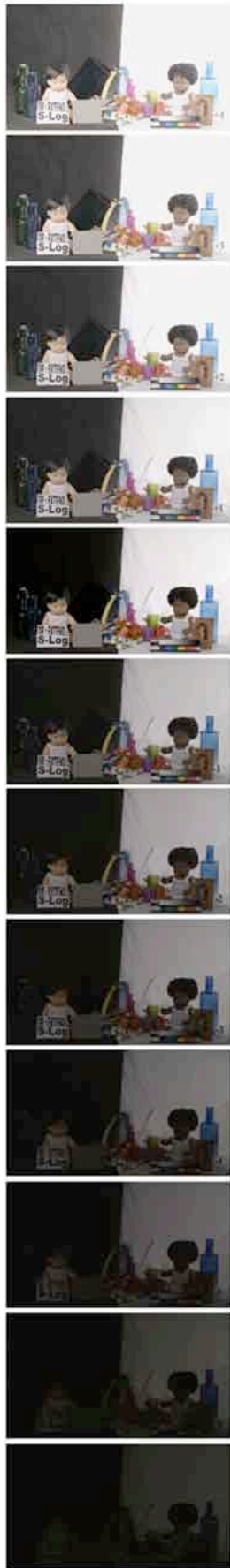
Nevertheless, this is the "mathematical" value (of course real), but our perception of shadows and highlights on a screen is a bit different, and it is there where we perceive detail up to 7 stops under and 5 over. To follow some tradition we could say the nominal dynamic range is around 10 stops (slightly below according to the noise consideration of Imatest as we'll see later), 11 useable but with some detail feeling till 13 stops.

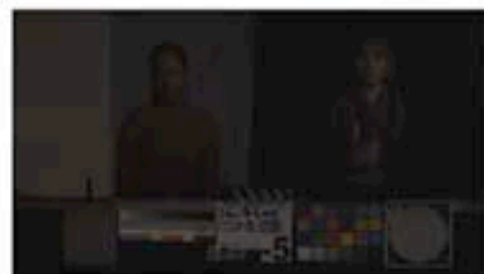
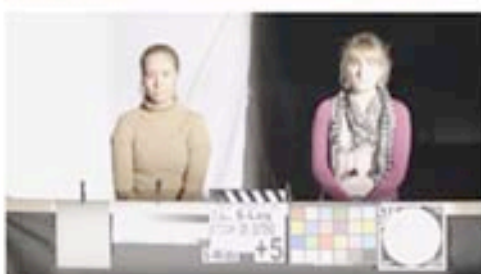
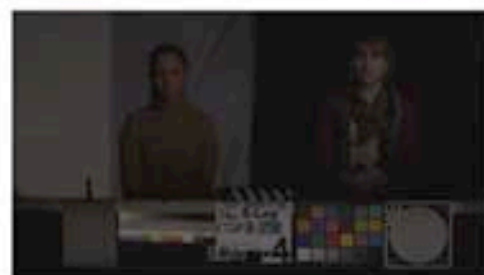
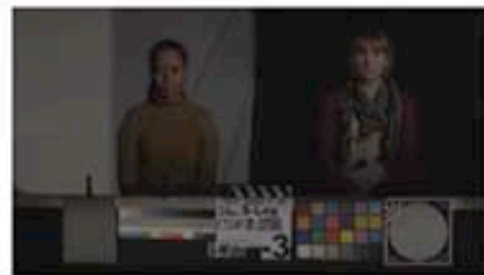
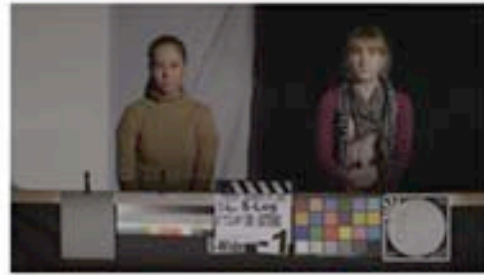
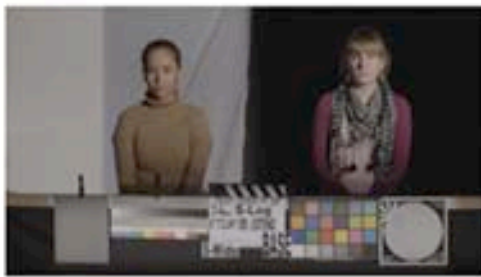
Let's now have a look at the exposures with the models and no longer with plastic dolls (cute, but insufficient).

Originales de cámara

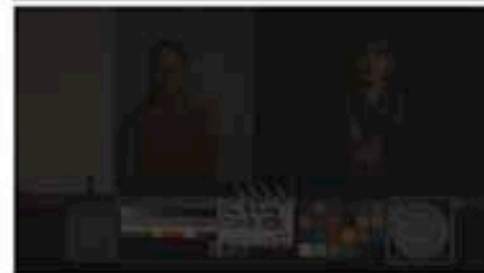
Etalonado a una luz

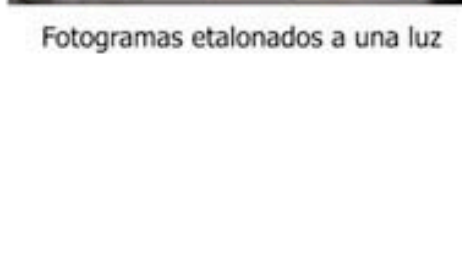
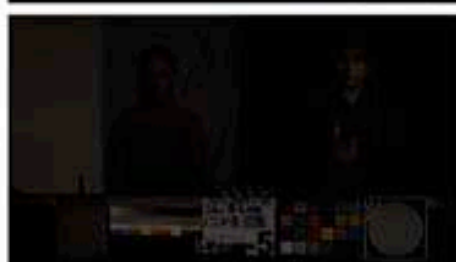
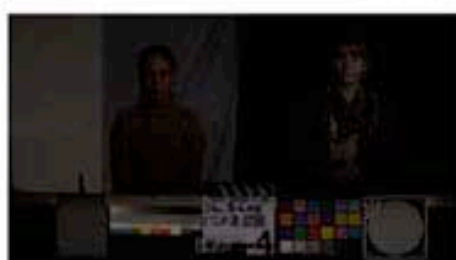
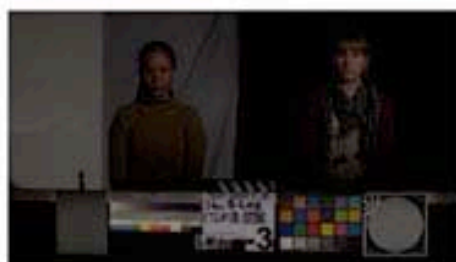
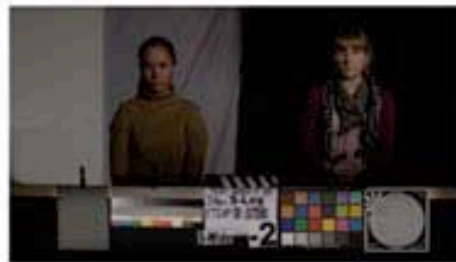
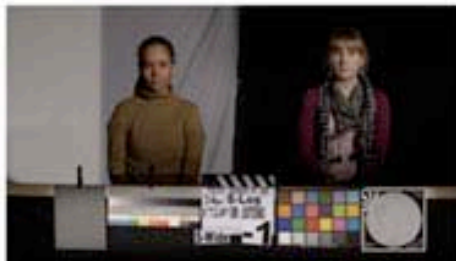
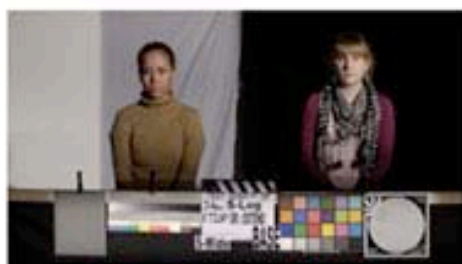
Etalonada cada exposición





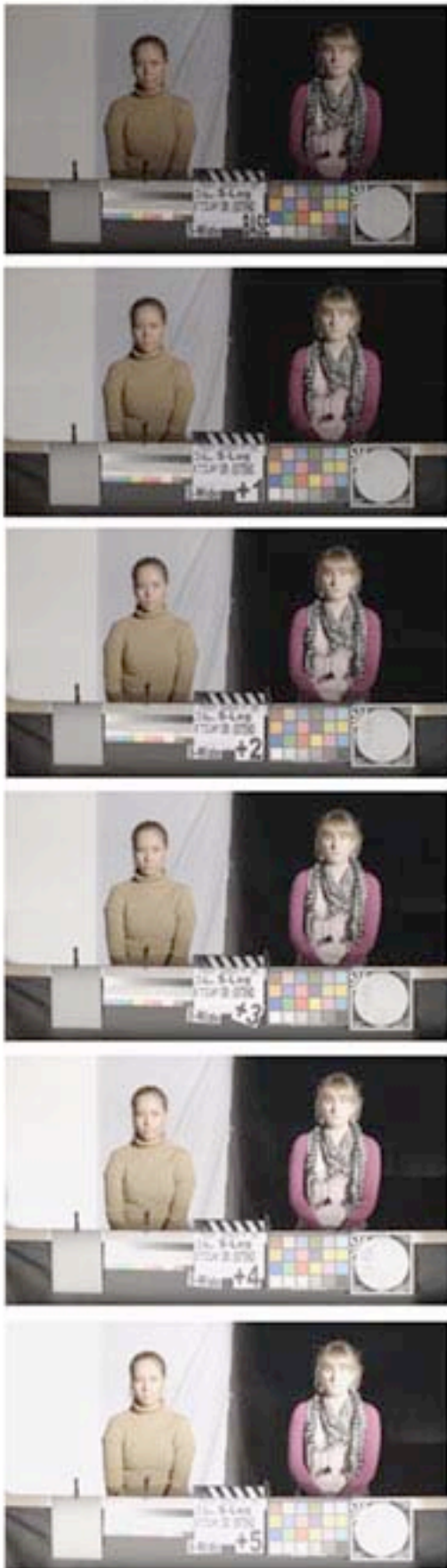
Fotogramas originales de cámara
Sobrexpuestos y Subexpuestos en
pasos de 1 T Stop.
Nota: El último fotograma subexpuesto
esta a $-6 \frac{1}{2}$



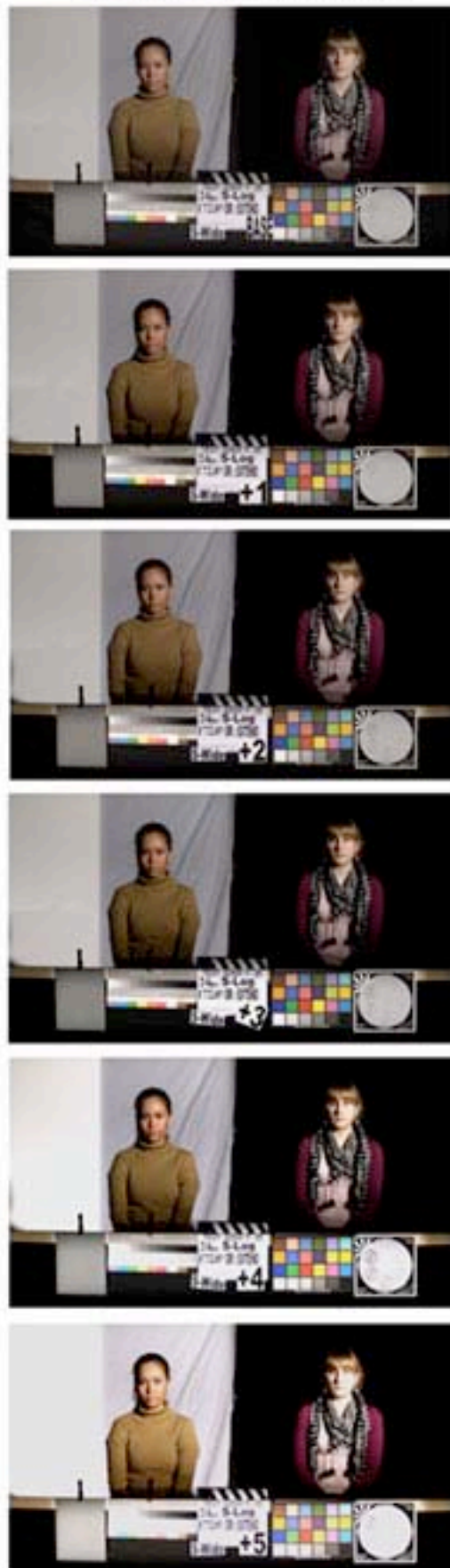


Fotogramas etalonados a una luz

Fotogramas originales



Etalonada cada exposición



Overexposure frames

Fotogramas originales



Etalonada cada exposición



Underexposure frames

In the **one light graded** frames we see we can underexpose the image -5 stops and still distinguish the 18% grey and the faces, although we lost detail in the black background fabric (now at -10 stops).

In highlights, overexposing 2 stops we lost detail in the face of Irati (now at +3 1/3). We understand we have a wide range to adjust the exposure, between 2 stops over and 3 stops under.

In the corrected frames we see that with +3 stops we can recover all the detail in the faces and the white panel. This means Irati's face is at +4 1/3 and the white panel at +4 2/3, almost +5 and still with texture.

Overexposing 4 stops, the white panel lost texture and the white model's face (now at +5 1/3) start losing detail, although doing a mask we can recover some skin tone and texture. The dark skin model, Lis, retains the skin texture being at +4 1/2. In the Kodak chart the last 3 white steps disappeared.

Overexposing 5 stops, Irati's skin (now at +6 1/3) can't be recovered and Lis' shows some clipping in the bright areas. The texture in the brighter areas is all gone.

The test with the models confirms what we saw with the Still Live set: we can establish a limit in 5 stops over with the S-Log gamma curve and Extend Dynamic Range setting and 4 1/2 with Normal Dynamic Range setting. In the Low light areas we can work between 6 and 7 stops under.

Conclusion: What are the limits I must adjust in my spot meter for shooting Outdoors? Around 11 stops, 5 over and 6,5 under the 18% grey. This means between 1/2 and 1 stop more in highlights and the same in shadows compared to F23. However, I always considered this values as the limits, but for real shooting I prefer to keep my whites around 4 1/2 over and the detail in shadows between 5 and 6 stops under. As we'll see these values are similar to what we get with Imatest in the "Medium" evaluation of the Stouffer transmission step wedge. It must be said that the values here are similar to what Sony indicates in the camera manual and in the dynamic range information in the Gain menu screen of the Assistant Panel.



Test session at Cherokee set



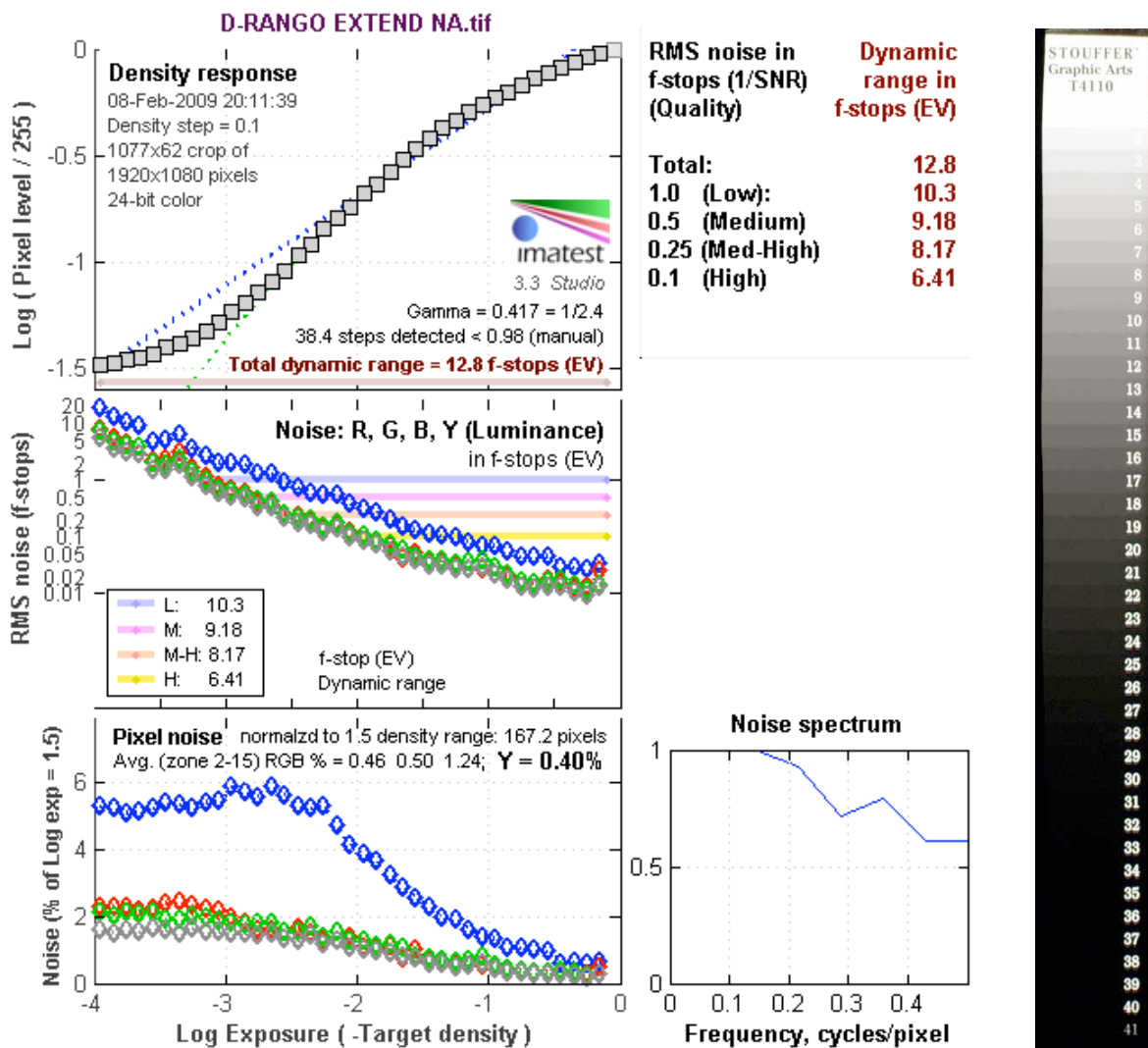
Here we show Irati's face with histograms. Overexposing 3 stops we still have all the detail, being the face at 4 1/3 over. Overexposing 4 stops we have some clipping in the Red channel, been the skin at 5 1/3 over the 18% grey. This confirms the use of 4 1/2 effective stops over, with some margin till 5.

In the Imatest analysis the results show that evaluating the dynamic range in relation to the noise, measured in F stops, for a 0.5 stops value the dynamic range sits in 9, 18 stops, close to our results with the exposures shown above. This is around 4 1/2 over and 5 under.

Accepting a higher level of noise we can reach a value of 10.3 stops although the camera can see density changes in the Stouffer wedge till 12.8 stops. So, in the Low Value we are working with 10 stops.

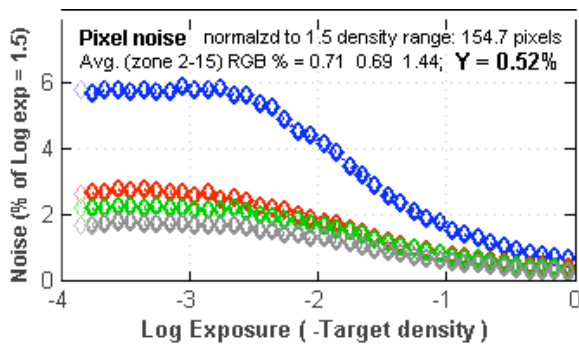
I must say that I believe the Imatest analysis shows some orientative information about the camera but this is not enough. It is necessary to evaluate the over and underexposures with models and objects in order to have a deeper knowledge of what the camera can see. For example, I remember that while with F35 the MID and LOW value is very close to the results with the models and objects, with the Red One the HIGH and MEDIUM-HIGH value was closer.

About the noise, the level in the low light areas is acceptable till 6 stops; this means for example that underexposing 2 stops the black fabric in the background (now at -7 1/3) shows a substantial level of noise. In the One Light Graded frames we see the noise is acceptable till -3 stops, but let's see the noise in detail.

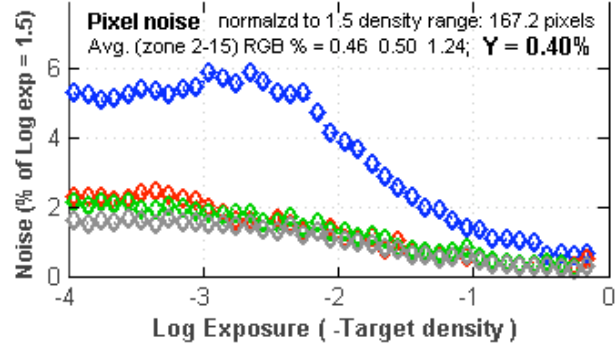


The Noise

The two lower graphics above this text show the noise in RGB and Y channels. As we can see, the noise in the blue channel is higher than in the Red and Green channels (this two are quite similar). In the middle we see a graphic that shows the Dynamic Range in relation to the noise (in F-stops), an average DR of 9.18 stops (M) shows a maximum noise of 0.5 stops against the value of DR 6.41 stops with 0.1 f-stops of noise in the High DR (H). From the graphic below we conclude that the noise in the blue channel increases with underexposure so that at -2 (log exposure) around 3.5 stops under the middle grey the noise value in the Red and Green channels is around 1.25% against the 1.8% of the F23 and the Blue channel is 3.2 times noisier than the other two channels (for a log exposure of -2 the Red and Green are 1.25% of the log of exposure standard at 1,5 against 4% of the blue channel). This relationship between the Red and Green Channels with the Blue one is similar to that on F23 although there is a decrease of noise in the Red and Green channels that makes the F35 images less noisy in general in the underexposure areas giving a cleaner image than F23.



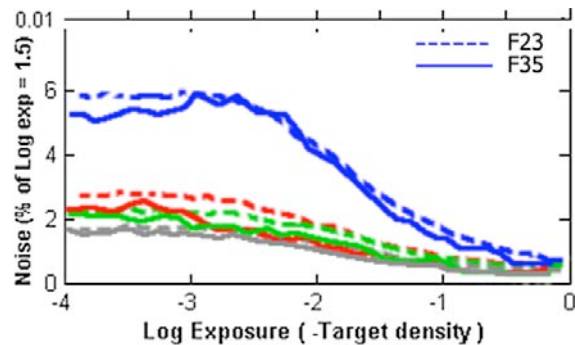
F23 pixel noise



F35 Pixel noise

We see here that the average values of RGBY are lower with the F35.

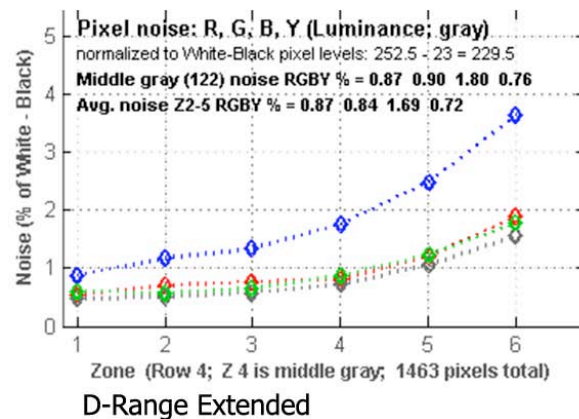
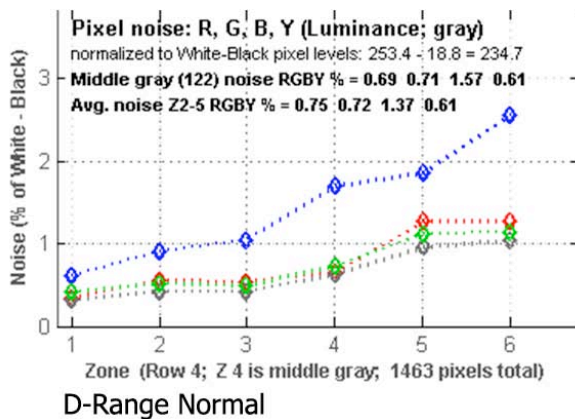
In the graphic on the right the discontinuous lines represents the RGB noise of F23 and the continuous line the noise of F35. There is a decrease in the noise of the three channels, especially in the Red and Green ones. The decrease in the noise can be noticed especially from 2 stops of underexposure. As with F23, the noise in the Blue channel increases with underexposure and stays stable from -8 or -9 stops.



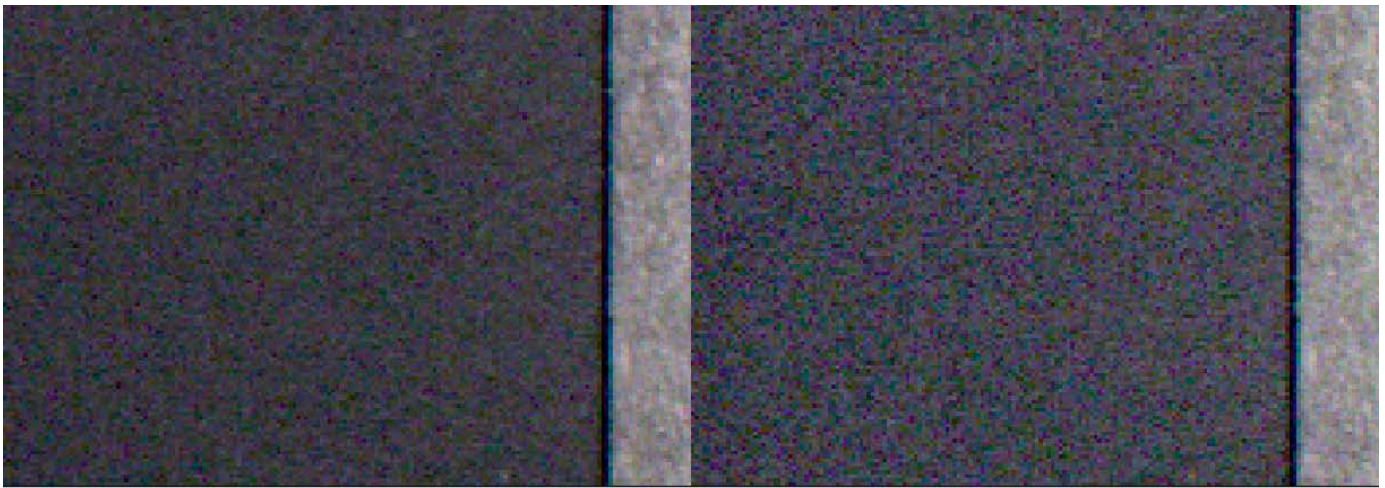
If we take the second Imatest graphic we see we can work with enough quality, considering the noise, with 10 stops. According to what we saw in the

latitude test it would be 5 over and 5 under the middle grey. But we saw that in the low light areas the noise level can be acceptable (taking into account some subjective perspective) till 7 stops under. The camera can see detail till -9 but with a high noise level. Different things affect the noise level, we'll consider two of them here.

As with F23, the use of the Extended Dynamic Range increases the noise level around 2dB. In the two Imatest graphics we can see the difference of noise between DR Normal and Extend evaluating it with the Macbeth color chart and in % of the difference value between black and white.



As we see, the average noise level in Y is 0.61 with DR Normal and 0.72 with DR Extend. In both cases the noise of the blue channel in the middle grey (patch number 4) is higher than 1% (1.57 in Normal and 1.69% in Extend). The noise difference is clear in the darker blacks. In the middle grey (4) the difference is not very noticeable.

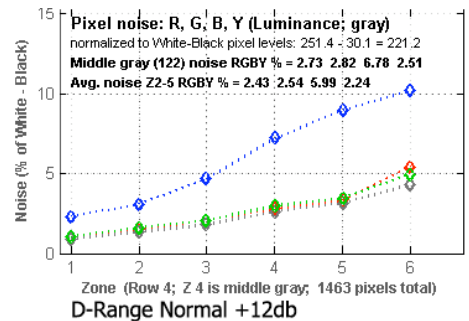
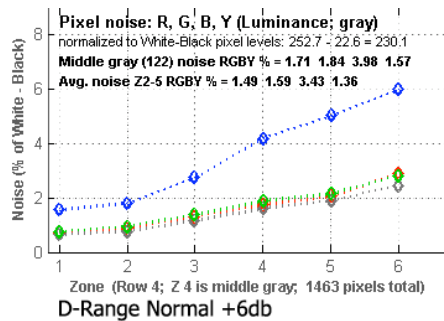
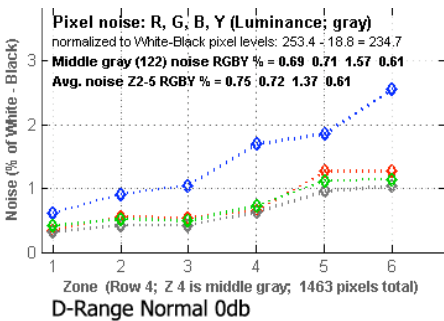


DR Normal (parche 6 de la carta ampliado 500%)

DR extended (parche 6 de la carta ampliado 500%)

For this increment in the noise level we get around 1/2 stop more of latitude.

The other thing affecting the noise level is the Gain. As we know, 6dB means 1 stop. Let's see the graphics for +6 and +12.

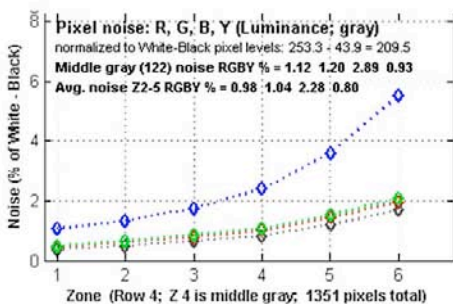


The average value of Y for 0dB with DR Normal is 0.61 against 1.36 for +6dB and 2.24 for +12dB. The value for the blue channel in Patch number 4 (middle grey) is 1.57 for 0dB, 3.98 for +6dB and 6.78 for +12dB.

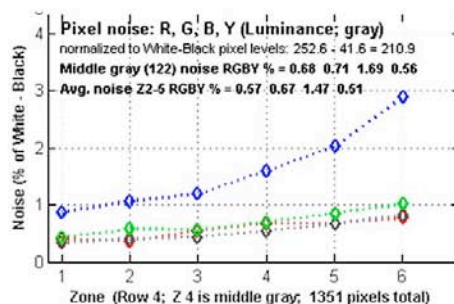
In general, values over 1% can be considered as noisy and it can be seen in the dark and middle areas. But, taking into account that there is a subjective element in the noise evaluation it is advisable that everyone set the camera according to what he/she considers acceptable and necessary for the project.

Noise Suppression Setting

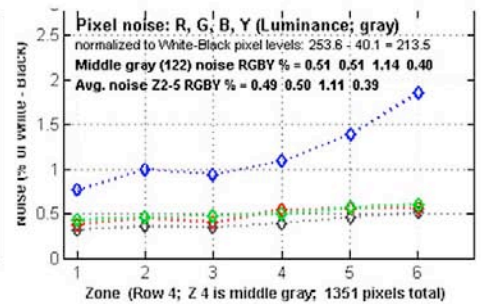
F35 has a menu setting called Noise Suppression. This menu page is useful for reducing the noise in 4 levels: 30%, 60%, 90% y MAX 100%. The effect is quite surprising; it actually decrease the perception of the noise in the image decreasing the sharpness but without decreasing resolution. We recorded the ISO resolution chart with the 4 levels and analyzing it with Imatest we saw no resolution lost. Let's see the difference in the graphics of Imatest with the Macbeth chart and with S-Log curve and DR Extend.



Reducción de ruido OFF

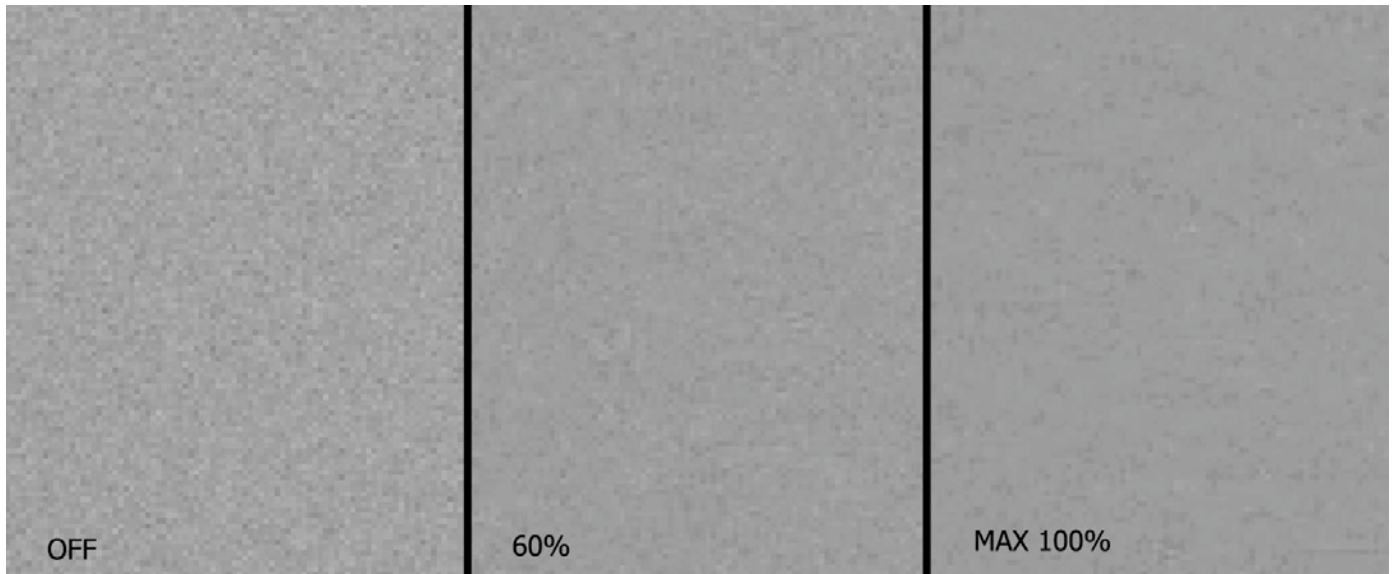


Reducción de ruido al 60%



Reducción de ruido al 100%

As we can see, the Noise Suppression is very effective. In the middle gray (Patch 4) the blue channel with Noise Suppression OFF shows a value of 2.89% while with Noise Suppression ON at 60% it is 1,69 and with 100% is 1,14; the average for Y sits in 0.80, 0.51 and 0.39 respectively.

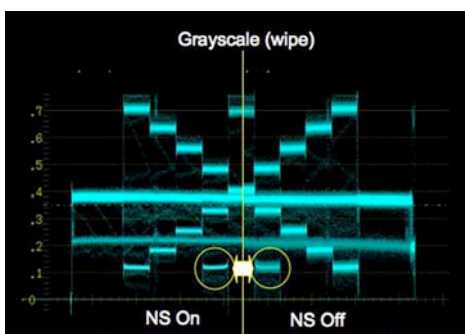
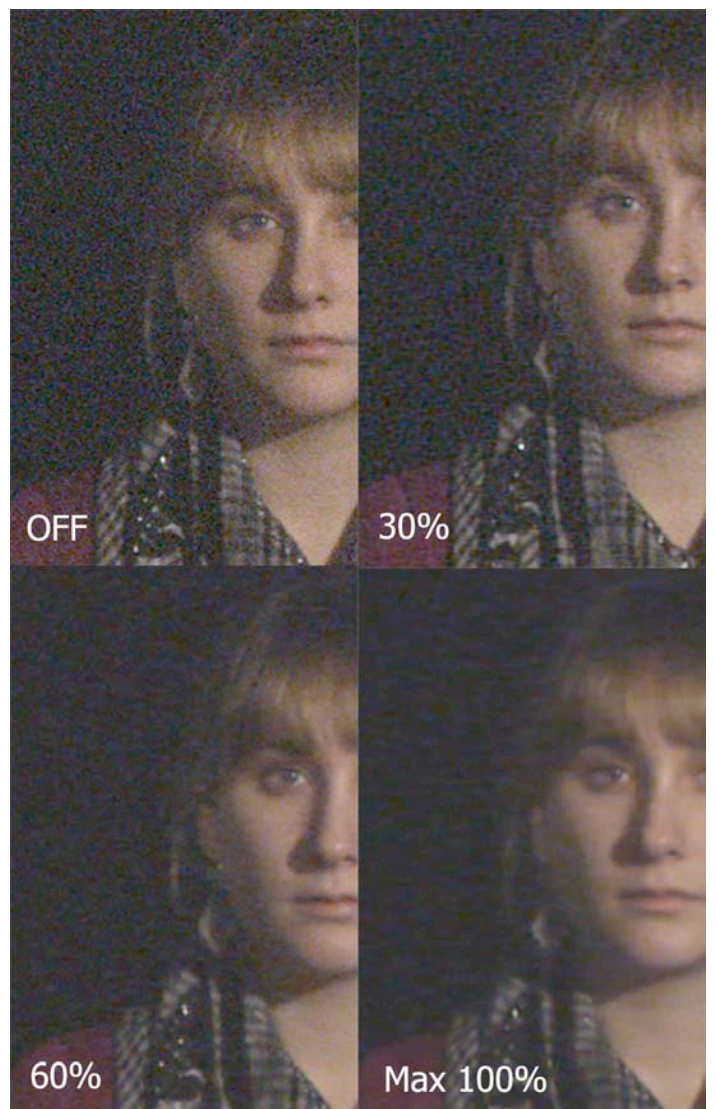


This is Patch number 4 (middle grey) of the Macbeth chart magnified 200% with different levels of Noise Suppression. I modified the contrast so we can better see the difference

In order to see the effect of this circuit we have used 4 stop underexposed frame with the Irati's face magnified.

In Irati's face against a black background we can see the effect of the Noise Suppression set up. Result looks as if a defocus effect were applied to the noise with some sharpness lost that stays hidden. I liked the effect, if it is moderate, as long as it gives the image some softness and a clean look that adds some kind of texture. It looks to me that both the Max and the 90% are excessive, but the 60% value is very useful combined with a -70 Detail Level.

The effect is a good tool not only to reduce the noise but also to give some texture to the image that is quite interesting. We tested the effect with images of the models with candles and the results, as we show below, are very satisfactory. With a correct exposure the effect of sharpness lost is decreased so with the models and candles the face of the girls looks better with that "soft" effect created by the setting.



Slog. DR Extend. UltraPrime 40mm T 13.6. Underexposure 4 stops and graded. Magnified 200.



Original camera frame. S-Log curve. DR Extend. Preset 3200K. Ultraprime 50mm. T2. Noise Suppression OFF



Original camera frame. S-Log curve. DR Extend. Preset 3200K. Ultraprime 50mm. T2. Noise Suppression 100%

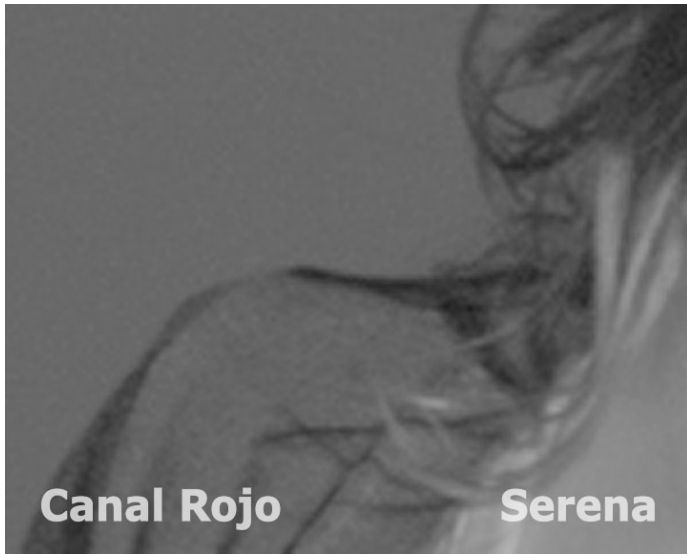


The image below shows a noise decrease and a softer texture in the skin. Both images are ungraded.

The noise reduction with 100% raises the S/N ratio 8dB, the normal ratio of the camera is at 54dB and becomes 62dB.

Shooting on location in Madrid

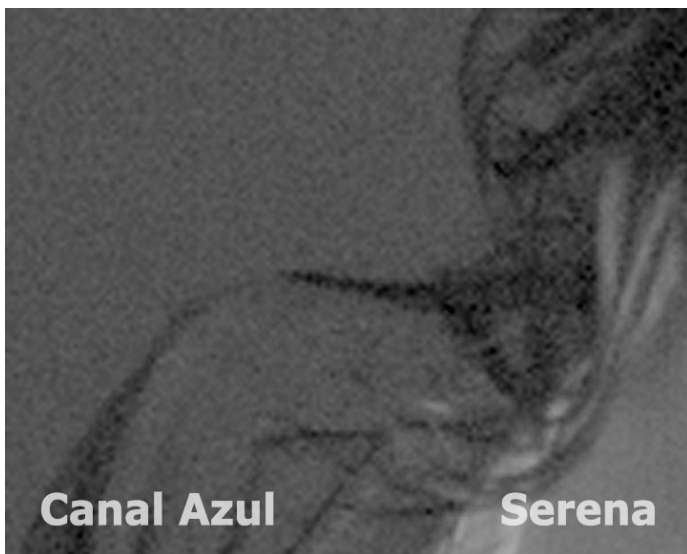
To finish, we show here 3 images of the 3 RGB channels with a green screen background where we can see the good rendition of the camera in the transitions generating an aleatory noise pattern. This allows for a good color separation. The images have Noise Suppression OFF, S-Log curve and DR Extend.



F35 Red channel 10 bits 4:4:4 SQ



F35 Green channel 10 bits 4:4:4 SQ



F35 Blue channel 10 bits 4:4:4 SQ

To finish the Dynamic Range part let's see now some images recorded on location.



In this image we show the values for reflective light (RL) and incident light (IL) in T stops.

Exposure for the shadows

Original



Graded



S-Log curve. DR Extend. Preset 5600K. Ultraprime 32mm.T3.4 Filters: Polarizer+ND 1.2

Exposing for the shadows gives us a sky without detail as long as it is 5 1/2 stops over the middle grey and some parts of Lis' yellow sweater. This confirms that with this curve we have 5 stops over.

Exposing for the highlights

Original



Graded



S-Log curve. DR Extend. Preset 5600K. Ultraprime 32mm.T16 Filters: Polarizer+ND 1.2

Exposing for the highlights we keep the detail of the exterior in the sun areas and we have detail in the faces, Irati's face is 4 1/2 under and Lis' is 5 under. When we try to raise the shadows in the grading process we see a high noise level.

Average exposure

Original



Graded



S-Log curve. DR Extend. Preset 5600K. Ultraprime 32mm.T5.6 Filters: Polarizer+ND 1.

The average exposure allows us to keep all values in the correct place, the sky is at +3 with all the detail, the yellow sweater keeps detail and also the shadows, both in the faces and Lis' hair.

Let's see another image where the texture of the snow is kept perfectly.



A +3 1/2 **B** +1 **C** +1/2



Curve Slog RD extended Preset 5.600°K F40mm
T 6.8 Filter: Pola+ND1.2. Graded



Curve Slog RD extended Preset 5.600°K F40mm
T 10 Filter: Pola+ND1.2. Graded

In the frames we show 2 exposures, one for the snow (on the right) and one for the shadows. In both images the result is excellent, keeping detail and texture both in the snow and Lis' hair as well as in the darker parts of the clothes.

Let's see another example:

Camera original

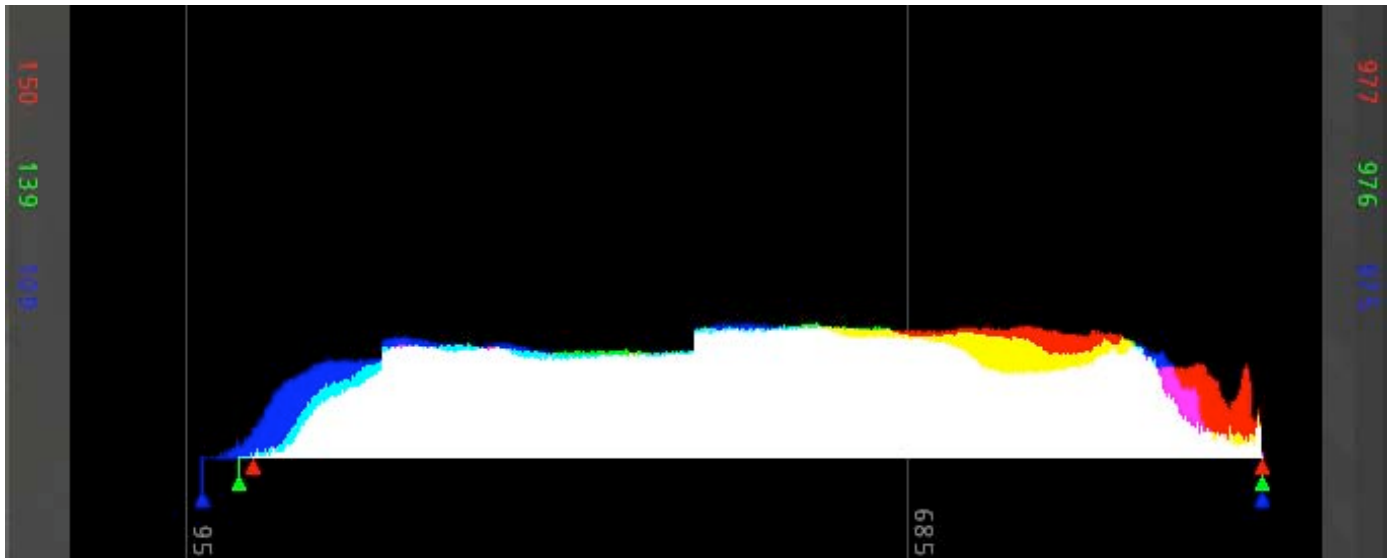


Graded



*Curve Slog RD Extend Preset 5.600°K F32mm T:2 Filters:: Pola+ND1.2.
Incident Light values (IL). Sun: T8. Shadow in the pass between the rocks: T1.7. A 4 1/2 stops difference.*

In this image we exposed to see the biggest amount of detail in the shadows between the rocks, overexposing more than 4 stops the models area. Grading the frames we could recover all the detail in the image with great amount of shades in the low light areas, keeping the texture in the stone and without problems in the skin tones that were more than 5 stops over. Anyway there must be said that this is the limit the camera allows as we can see in the histogram. If we had any element over 5 stops, it would be clipped, for example, if we had a bride with a white dress crossing the frame to take some photos. In the original histogram we see that all the range is included.



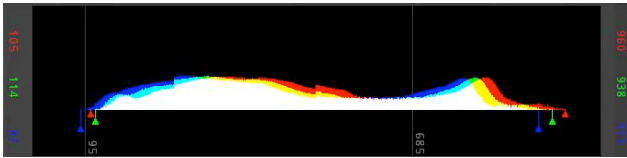
And another example:

Camera original



Graded





Reflective light t stop values
 Stone ground in sun: T13
 Stone ground in shadow: T: 4.5
 Lis` s face: T3.2
 Irati` sface: T 5.6

Curve Slog RD extended Preset 5.600°K F32mm T:4.8 Filters:: Pola+ND1.2. Original camera histogram.

In this image we also keep all the detail in the stone and the texture both in the highlights (3 1/2 stops over) and in the shadows.

To finish let`s see this beautiful landscape in Madrid:



Original camera frame. Slog curve RD extended Preset 5.600°K F40mm T 10 Filters:: Pola+ND1.2

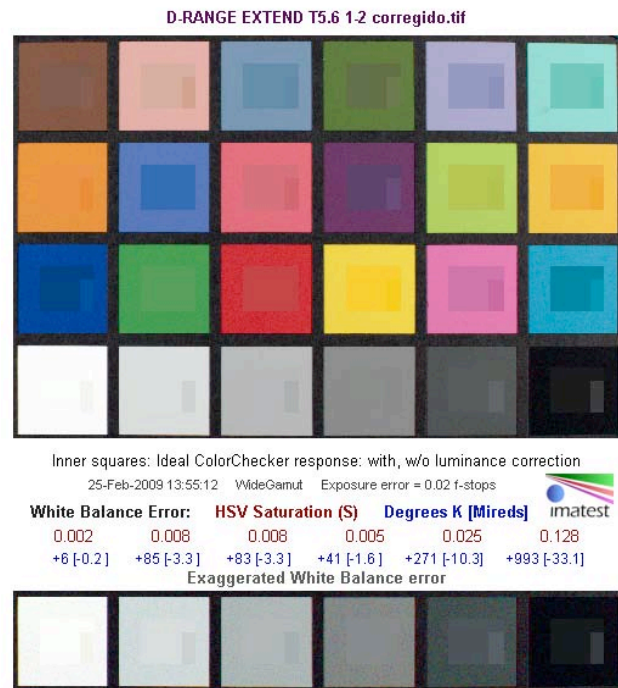
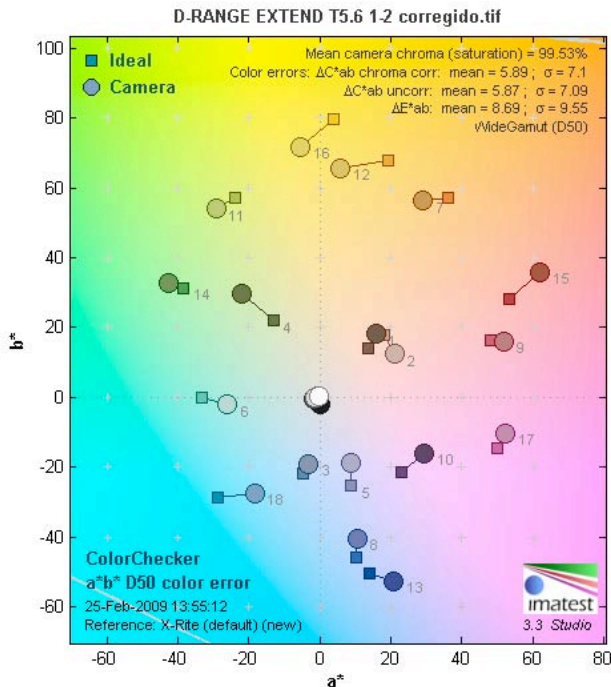


Frame graded with Iridas.Slog curve RD extended Preset 5.600°K F40mm T 10 Filters: Pola+ND1.2.

In conclusion: it looks like we have a limit of 5 stops over although I prefer to use 4 1/2, this is 1 stop more than F23; under the middle grey we keep detail till 7 stops, although considering the noise we can get 5 or 6. Actually, as we said, the dynamic range stays in 10 stops although the camera shows detail till 1/2 stop more over and till 1 stop more in the shadows (7 stops). Anyway the distribution of the information the S-Log curve gives exceeds what we can expect from any HD camera. The performance in the highlights and shadows is amazing.

The color

For the evaluation of the color we used both models and a Macbeth color chart recorded with S-Log gamma curve, Extend Dynamic Range and S-Gamut color space because, as we saw with F-23, this is the space that represents more colors and shades. As we expected, in the F35 this color space makes an excellent work representing very natural colors. We already explained the characteristics of this space so we won't repeat it here. We corrected the levels in the Macbeth chart to obtain correct values in the grey scale.

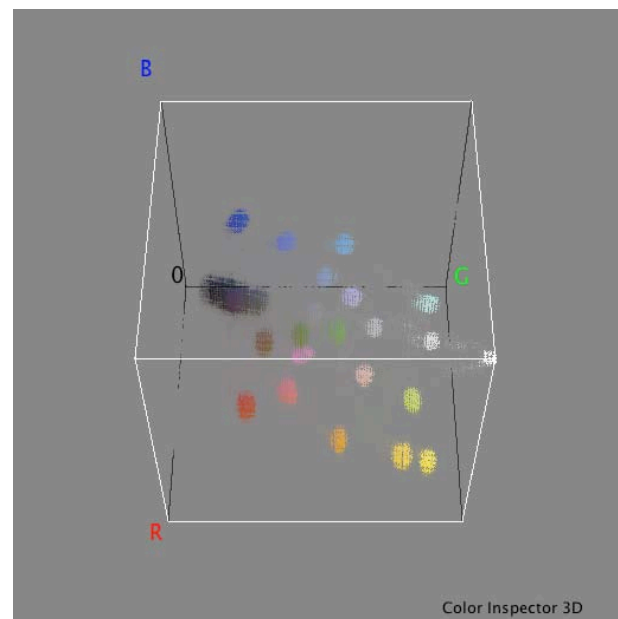


In the analysis with Imatest we see the Sigma (RMS) value (that evaluates the drift of the colors recorded by the camera from the ideal values) is 7.1, this is below what we got with F23 that was 9.34; with an average drift, correcting the saturation, of 5.89, against the 7.53 of the F23 camera.

This reproduction of the color is considered excellent and in the graphic on the right we can see the recorded values are close to the ideal ones. Nevertheless we can see some drifts that we also compared with the shots of the models; for example, pattern number 15 shows a higher saturation and in general the orange and yellow shades show a slightly drift towards red and a higher saturation. Irati's coat in the mountains, once color corrected, was a little bit saturated so we cut down the red -10, enough to eliminate a too aggressive color.

The greens and blues are very natural as well as the magentas. The drifts towards magenta that we saw on F23 are much reduced here. The patterns of the skin tones on the chart are very close to what the camera sees. Nevertheless, we recommend you to have a look at the F23 test where we explained in detail the meaning of the Imatest analysis.

It must be said that the camera hasn't got filter wheels, neither neutral density filters nor color correction filters, so we have to use the typical glass filters in front of the lens. The color rendition of the camera is so good that it can see color drifts in neutral density filters.



Distribution of the colors on the Macbeth chart recorded in the RGB space.

The camera has the possibility to save color corrections for the different neutral density filters used on set. For detailed information about how to work with these memories see:

http://provideocoalition.com/index.php/aadams/story/the_sony_f35_and_nd_filters/

Another thing to consider is the IR pollution in the image when we use neutral filters of high density. Art Adams shows in http://provideocoalition.com/index.php/aadams/story/f35_ir_filter_shoot_out/ some valuable examples of the effect of infrared frequencies in the F35 sensor.



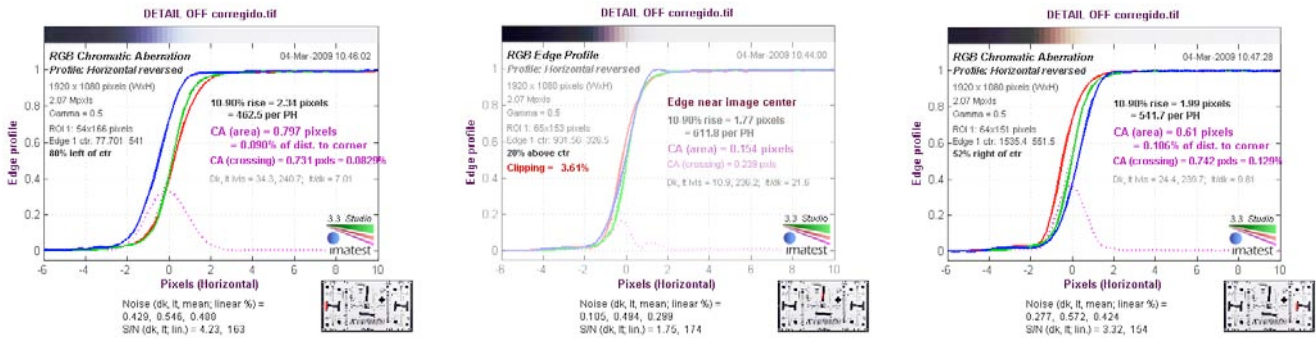
Curve Slog DR extend Preset 3200°K F 50mm T 9.6. Graded



Curve Slog DR extend Preset 5600°K F 85mm T 6.8 Filters: Pola+ND 0.6. Graded

In the two frames above we can see a very natural skin tone both under tungsten and daylight conditions. If we observe the skin tone compared to the Macbeth chart we see that the faces maintain a good color rendition in the shadows and middle areas. We also have to say that chromatic aberrations are minimized here in relation to what we saw with F23 camera. These are the results

measuring the aberration in the center and sides of the image with an Ultraprime 50mm lens and a T stop 5.6.



Right side

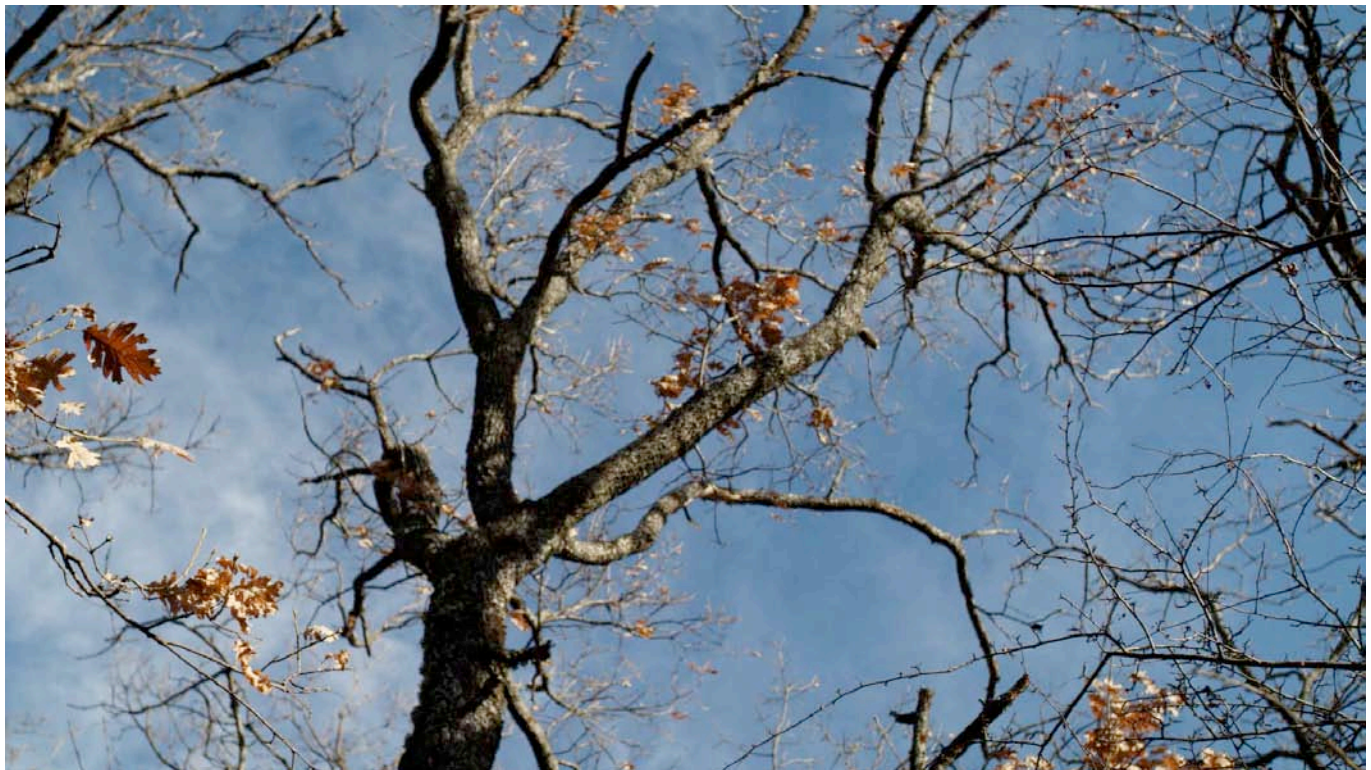
Image center

Left side

As we know chromatic aberrations are most noticeable on the image sides as we can see in the graphics. Imatest evaluates aberrations in different ways, we are going to look at the value of the CA (area) (magenta color) that represents the area in % showed by the discontinuous magenta curve and is presented by the range between the minimum and maximum pixel (10-90% rise) in relation to the distance from the center of the image.

In the right side this value is 0.106% and in the left side is 0.090%. In the image center we consider that there are no chromatic aberrations. These values according to Imatest evaluation are considered low-moderate and are far below what we saw with F23 camera, both with Angenieux HD Optimo and the Zeiss DigiPrime lenses. Is this due to the absence of prism in the Optical Head Block of the F35? We think so, but anyway the results are much better with the F35. As usual, it must be said that aberrations change depending on the lenses used, so it is recommended that you test your lenses for a proper evaluation.

Let's see this shot, a typical frame to see chromatic aberrations and we'll observe that they are hardly noticeable in the limits between the branches and the sky.



Curve Slog DR extend Preset 5.600°K. F32mm T6.8 Filters Pola+ND 1.2 Detail Off



Magnified 500% where we can see a slight chromatic aberration



Regarding the blue/green screen work, they are easily selected; the camera shows a low noise level in the blacks and enough resolution for a good cut. The 10 bits depth as well as the 4:4:4 sampling is enough to obtain a good color separation. Taking into account the good noise behavior and the lack of "artifacts" as we saw, the separation of the green/blue screen is easier than with Hdcam or even Red One material.

Conclusions

As a DoP I really appreciate the effort the manufacturers make to create better cameras that satisfy our needs on set. Regarding F35 we must highlight the high sensitivity (set in an effective value of 400Asa) that allows me to shot in low light conditions, something I really like. Also considering the good response in the shadows I can use a value of 800 Asa with no problems, this means underexpose 1 stop and then recover practically all the detail in postproduction without a substantial increase in the noise. We have to add the excellent color rendition, that through the S-Gamut color space, gives me the possibility to work with much depth and detail. No need to say that the performance in the highlights is extremely good with a distribution that allows us to capture 5 stops, preserving texture above 4 stops.

Sony reduced the noise considerably compared to F23. We also have a new setting that suppress the noise and creates some texture in the low light areas that I really liked. The use of a single sensor and a PL mount opens the possibility to work with the wider range of lenses used for 35mm film cameras. This also allows us to use narrower depth of fields, something I actually never considered decisive in benefit or against a camera.

As with F23 and other cameras like Genesis or Viper, the most valuable thing for me is the texture of the camera, something like a "film" feeling; the resolution, the grain, the color, the dynamic range

conform a smooth image, with no noticeable video clipping and with a random discrete grain and white areas that disappear gradually till the limit.

The skin tones lack of that excessive sharpness so typical with other cameras and especially in high contrast situations, considering that the camera can see ratios of 800:1 and 1000:1. The work with the camera is simple and has no mystery, allowing us to use all the typical Sony menus if we want to. The aspect, size and weight are similar to a 35mm film camera so it can be used in all the typical situations: steady cam, travellings, crane, etc... except handheld camera work, for which I consider it is too heavy and not so ergonomic. Without any doubt, the worse part is the viewfinder, Sony has forgotten that the camera operator and sometimes the DoP look through the camera to evaluate the frame, the focus and some other things. It looks like they relegate the viewfinder in favor of the monitors that, far from the set, are used to evaluate the image, not only by the director and the DoP, but also by everyone around.

On the other side, the camera satisfy all the expectations of robustness for the film style sets, with good performance in all kind of conditions like humidity, dust, cold and so on. It is clear anyway that as usual we need good assistants that take good care of the equipment and understand the needs of the camera, as the power requirements and the need of good and reliable batteries.

So, ultimately, I liked the camera so much and the level of quality of the HD digital images reaches now unsuspected limits.

Thanks to: as usual to my inestimable assistants Saul Oliveira and Yaiza González. And of course to Fernando Muro for his support as well as Julio Paniagua and Manuel López.



Han colaborado igualmente



serena



www.alfonsoparra.com

www.imatest.com

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<http://providecoalition.com>