Photographic evaluation of ARRI's ALEXA camera

by Alfonso Parra AEC

Alfonso Parra AEC shoots "Concert for two violins"

I am asking myself why ARRI´s new camera is called so. Alexa is a short form of Alexandra, feminine of Alexander. Alexander comes from the Greek name Alexandros, it can be split in *alexo*, that means "to defend", and *aner*, that means "man". Because Alexa has the same origin, Alexa means "people's defender". Alexander's name has been used several times in History, but the name reached the height of significance when the legendary King of Macedonia used it: Alexander III, Alexander the Great. Does ALEXA transform the digital image closer to the analogical sensitivity, i.e., more human, keeping off men from reductionist ideas of digital technologies? Does ALEXA try to conquer, as Alexander did, the international market with a tempting image? In the following long investigation we try to show the characteristics of the new and astonishing ARRI's digital camera, and if it is possible to answer the two previous questions.

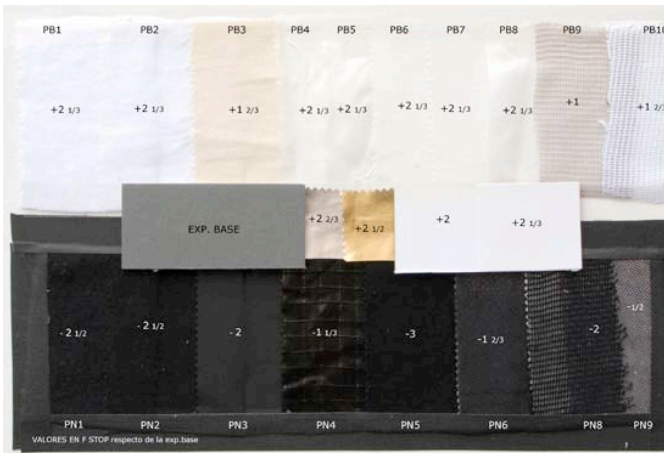
We have used the camera with the firmware 2.1. when shooting. Although the firmware 3 will be able to install when this test were published (this new version incorporates very important new releases like the Wide space color). We are not able to evaluate cameras with the very last improvements; they are released continuously all of time. We have used UltraPrimes lenses; we recorded on SxS charts at Prores 4444, 1920x1080 fps and 180º shutter angle as usual. We have worked with the LogC curve because it gives more information for subsequent grading. For lighting adjustment and evaluation of recorded images, we have used Cinetal monitor at room test, SekonicL-558/Cine light meter and Minolta Color meter IIIF, all of them suitably calibrated. In addition, we have used beside HD monitor an Astro WfM/vectorscopio. We have done viewing, correction and evaluation of images in TELSON postproduction room; we have worked with Nucoda Digital FilmMaster. We used HD format for all of processing.

Our target was to get a wide vision of the behavior of the camera from the DoP point of view, taking into account both objective elements like resolution, latitude and color analysis from the Imatest software and, also subjective elements like noise evaluation, texture and general appearance of the images. This time we could shot "Concert for two violins" short film, directed by Elbia Álvarez and produced by Jazz Films: a "Midnight *winter* dream" fable about how music fills mistrust and splits among Man.

These tests are a general approximation to the behavior of the camera and they can be used as a starting point for the necessary adjustments of your project.

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

Nominal EI. Image evaluation at Linear mode



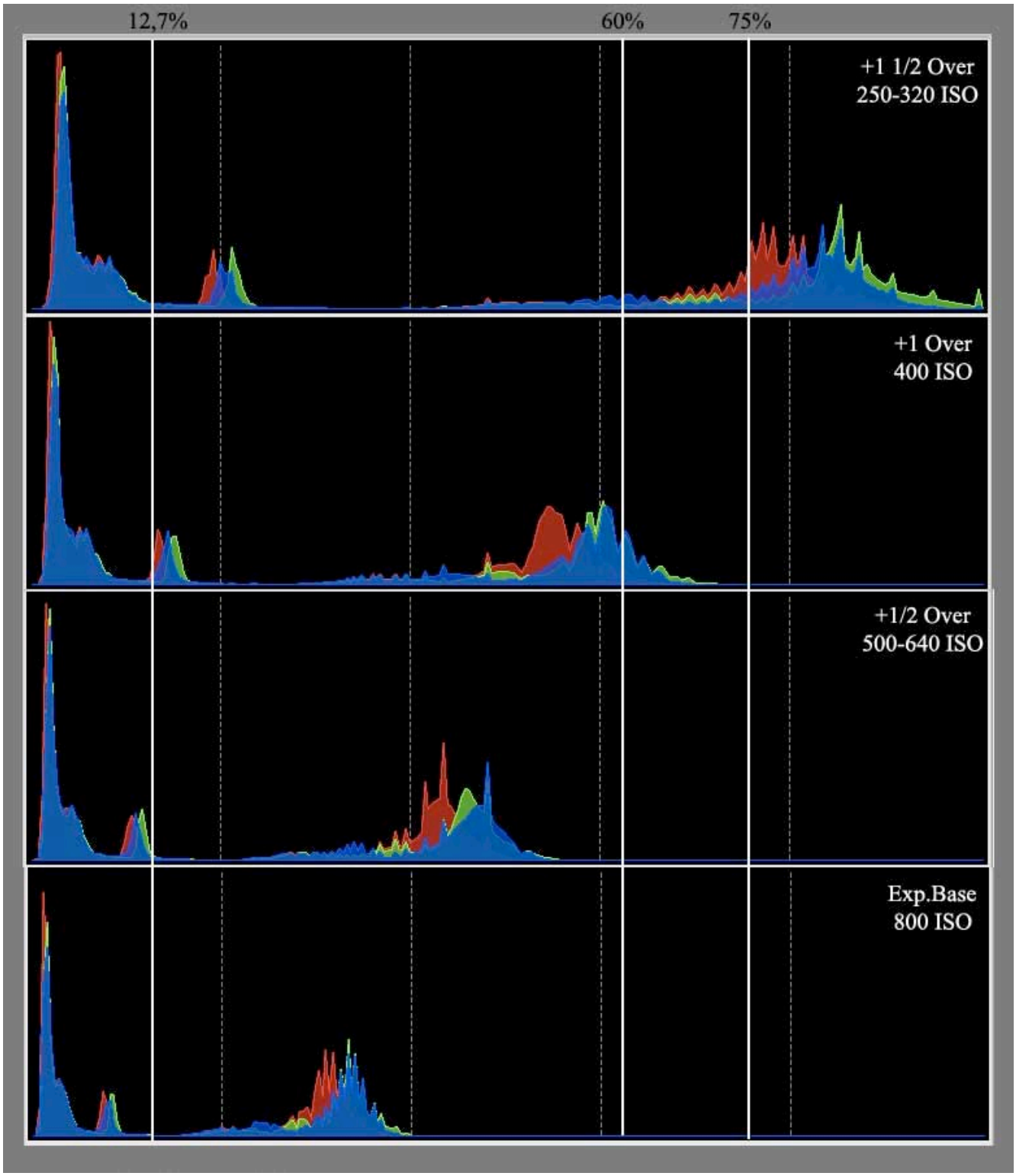
Death Chart. Luminance values at T stops regarding 18% middle gray

For evaluation purposes, we see our "Death Chart" image at linear mode because we have changed the Logarithmic image through a LUT. We are going to refer to determined values by ISO 12232:1998 standard. If the linear mode is assumed, this standard establishes that a white reflectation of 100% represents a 70% of captured image saturation, and that a 18% gray generates a 12.7% saturation value in camera output. Values above 70% are reserved to specular reflections.

We have considered 60% white value at histograms because white chart does not reflect 100% but nearly 90% of incident light.

Let us begin observing the histogram at linear mode from our indicated base exposure (EI800). The 18% gray value gives an 8% output value, and averaged white is nearly 35%. These data show us

we underexposure the image as we can see in the histograms. If we change exposure through half stop steps, we see in the histogram, that closer values to the standard ones appear at +1 exposure, then gray is slightly above at 12,7 and white nearly 60%.

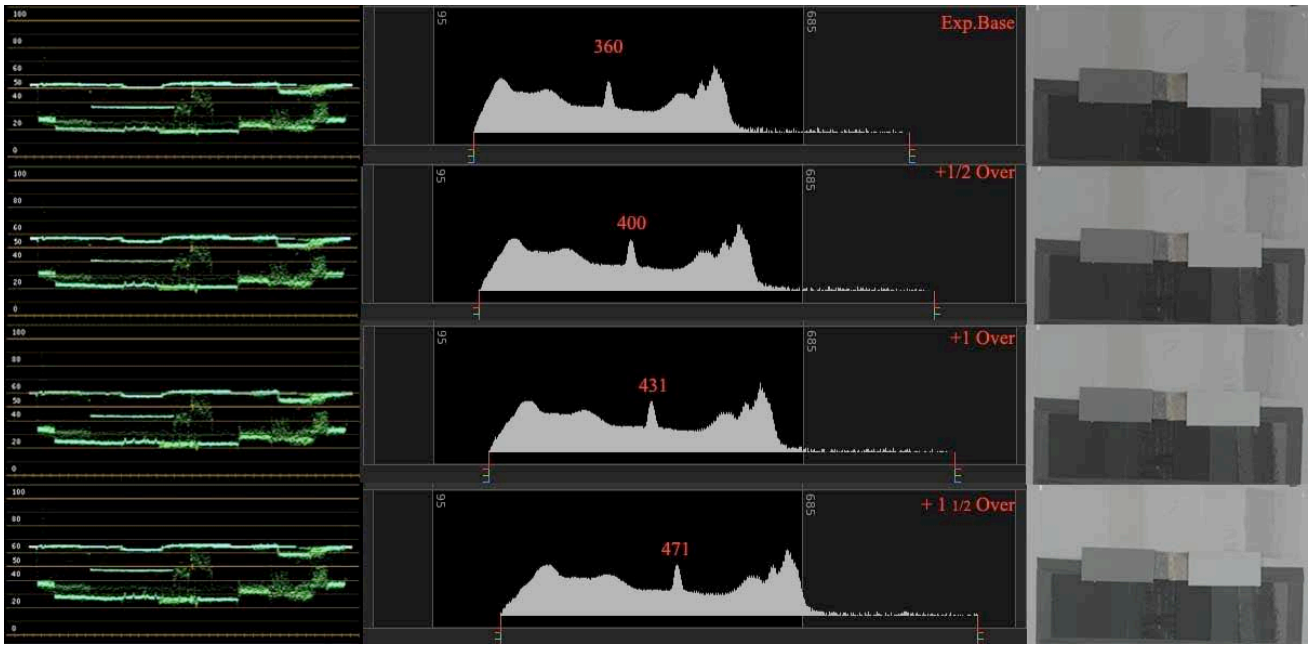


Histograms of the chart at linear mode. We have photographed chart with a 85mm lens. T 5.6. LogC800 curve. EI ISO800. 3200ºK. 25fps. Obt 180º

Linear Mode LUT applied to LogC	Histogram Value (%) Gray Ref. 18% ISO12232:2006 (12.7%)	Average pixel value 10 bits (Gray Ref.18% 130)	Exposure Index (ISO)	T Stop Reference
LogC BASE	8	82	800	5.6
LOGC +1/2 Over	11	114	500-640	4.7
LOGC +1 Over	14	145	400	4
LOGC +1 1/2 Over	19	196	250-320	3.3

Let us compare these results with the other ones from our Death Chart images evaluation (our reference is the LAD digital value). With +1 exposure (EI ISO 400), LogC curve in the waveform monitor shows that middle gray is nearly 42%, and pixel value is 431, close to the LAD one.

If we consider to things: first, LogC curve is similar to PanLog and Slog ones; second, all of them are adjusted to work under the Cineon standard, then, 18% gray is nearly 36% value, although ARRI recommends 39% value with 400 pixel value.



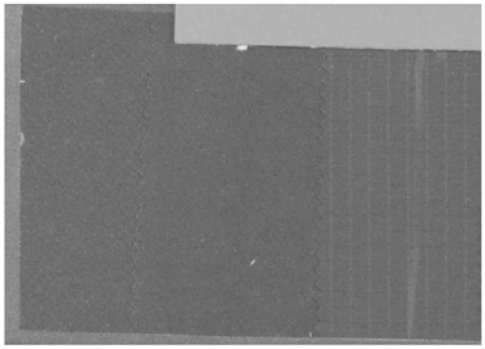
Representation of DeathChart values in waveform monitor and histogram.

Gamma Curve	WfM value (%)	Average pixel value 10 bits (LAD Ref.445)	Exposure Index (ISO)	T Stop Reference
LogC BASE	38	360	800	5.6
LOGC +1/2 Over	40	400	500-640	4.7
LOGC +1 Over	43	431	400	4
LOGC +1 1/2 Over	47	471	250-320	3.3

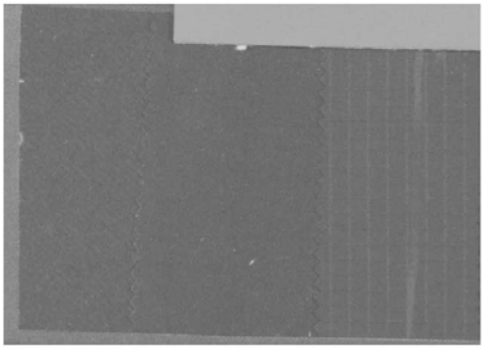
We can say generally that *nominal EI* is between ISO 400 and ISO 500, from both image at linear mode evaluation and values related to Kodak digital LAD. This value is similar to the theoretical one from ITU 709 curve.

Effective exposure index.

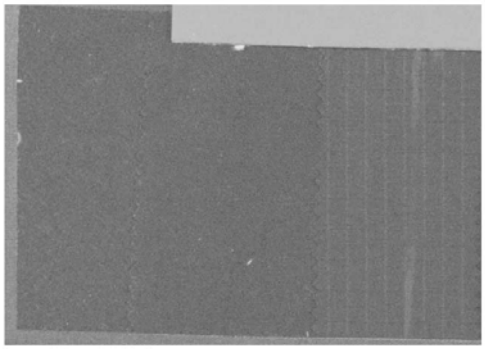
We obtain effective EI through evaluation of noise, textures and detail, above all at shadows. We have focused our attention in a chart part related to PN1, 2, 3 blacks. This part is at blue channel (we already know that blue channel is always noisier than other ones). Altogether, ISO 800 base exposure gives an acceptable image with a bit of tolerable noise. Nevertheless, blacks texture results much better with at least ½ stop overexposure, and definitely wonderful with 1 point of overexposure, i.e., as we use ISO 400 or ISO 500 instead of ISO 800. As we will see below, it does not mean that we have to change ISO in the camera, but we have to overexposure LogC800 between 1 and ½ stops. Thus, we can guarantee very good textures at blacks. Does it affect highlights? Yes, obviously, but ALEXA behavior at highlights is so outstanding that we can generally overexposure without losing detail or texture at highlights.



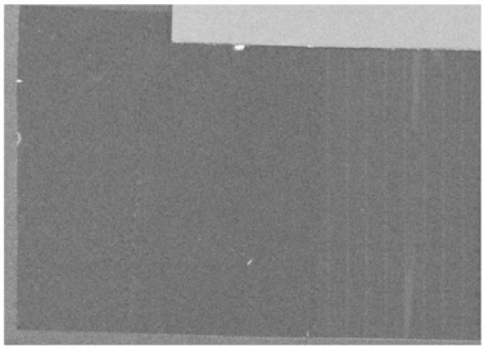
Exp+1 T4



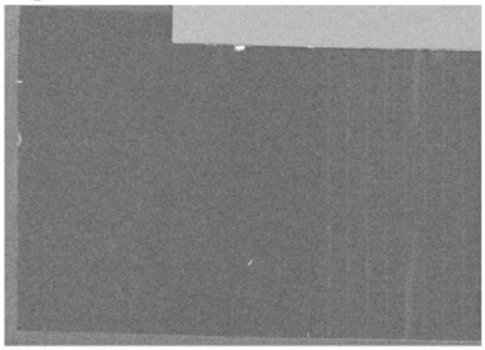
Exp+1/2 T3.4



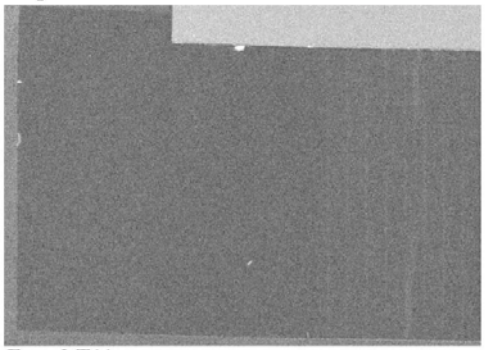
Exp.Base T 5.6



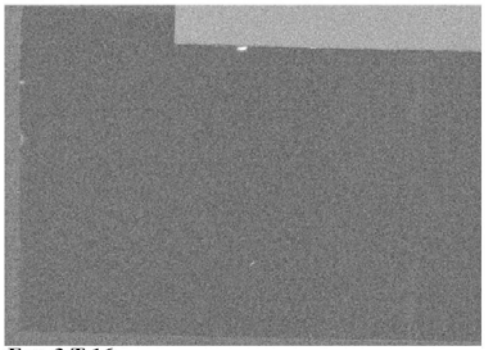
Exp-1 T8



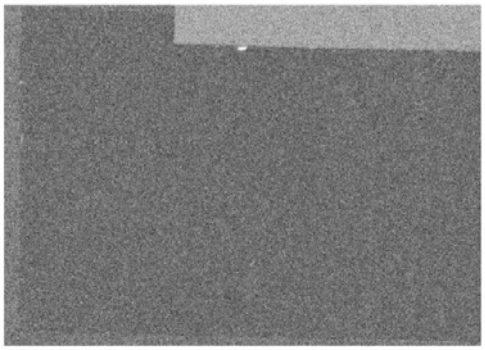
Exp -1 1/2 T 9.6



Exp -2 T11



Exp-3 T 16

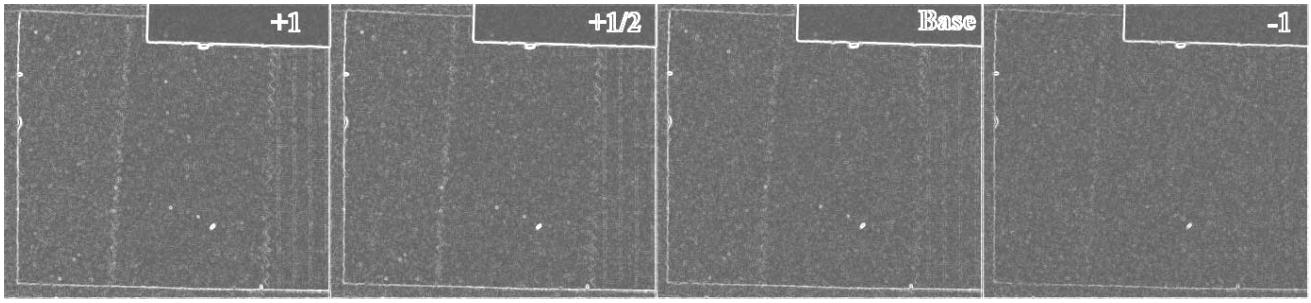


Exp-4 T 22

We distinguish black background fabrics and their textures at base exposure; however, the weft loses some sharpness in PN1 regarding +1 overexposure (we can see perfectly the weft at +1 overexposure).

We can see also background fabrics at -1 value, but there is already some noise level. If we consider ISO 400 as nominal value, then, we underexposure our gray 2 stops. Detail and texture are lost at -2. Let us pay attention what it means: blacks between 4 and 5 stops below base exposure show noise and detail loss. Below, we are going to check it with models and several tests in outdoor locations.

Conducting test on outdoor locations with very cold weather.



This image, as the previous one, is related to blue channel. We have applied over it an edge detector. As an example, let us take how the two background fabrics edges are progressively losing; we can perfectly see them at +1, edges are slightly lost at base exposure, although it is still enough.

As we checked until now, we can specify a "floating" EI between ISO 400 and ISO 1000, but we have to accept some noise level and texture loss in the deepest blacks. We have chosen for an effective EI of ISO 500. I put this effective EI into my light meters for pre lightings. Nevertheless, I do not put ISO 500 in the camera, but I keep using 800 value. As we know, we can use different ISO values in digital cameras, although it does not mean that cameras change their sensitivity, but they apply more or less gain to sensor of signals. Thus, cameras show more or less image detail, and, of course, the related noise. It should be pointed out that different ISO values affect the dynamic range distribution of the scene as we are going to see below. Therefore, it is important to decide firstly, an useful effective EI for choosing our lighting tools; secondly, how many detail/noise we are going to allow in our image.

Our impression is that nominal sensitivity of the camera is nearly ISO 400. Since the sensor behavior is very good regarding noise, we can underexposure our middle gray until one more stop (ISO 800). As a result of this, we do not risk too much detail at blacks, as we can see in the still life image and in the outdoor location. Candles light the still life and outdoor location were shot in Segovia (Spain) by night.

Original. Focal 50 mm. T 2. LogC800 curve. EI ISO800. 3200ºK

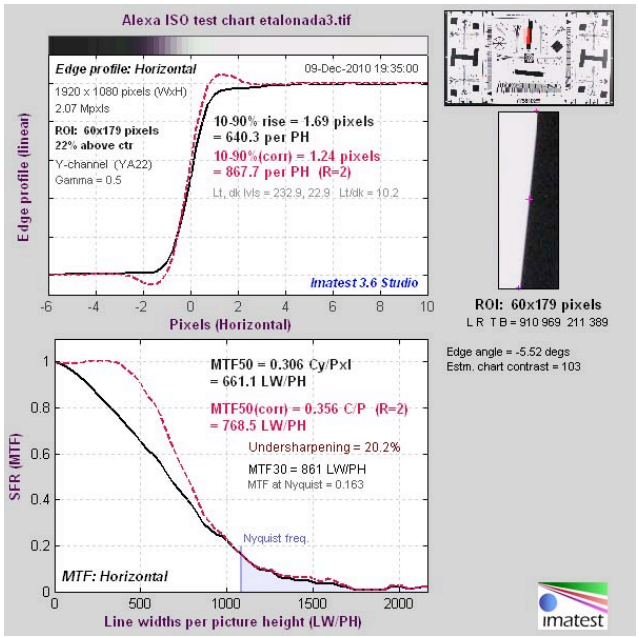
Graded

Original. Focal 40 mm. T 2.8. LogC800 curve. EI ISO800. 3200ºK

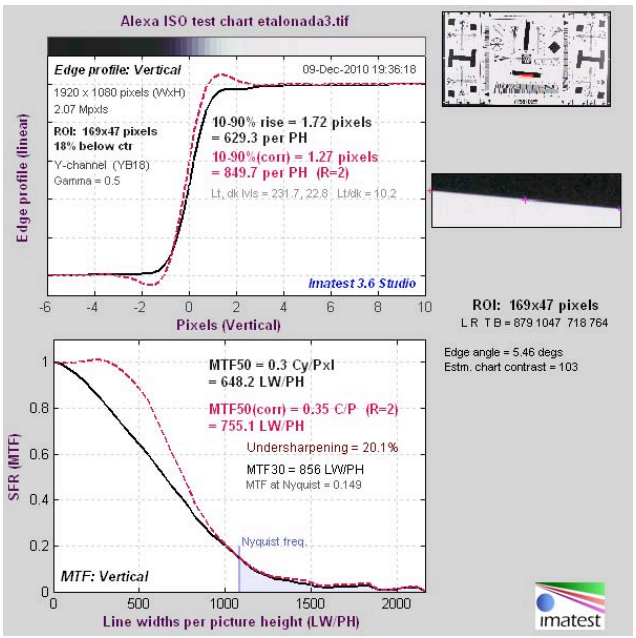
Graded

Resolution

We have made resolution tests with our ISO 12233 chart. We have evaluated results with Imatest program; moreover, we have made a visual inspection on screening during postproduction. Resolution (in Lw/ph) gives a normal value that is between HD 1920x1080 standards, i.e., nearly 661.1 Lw/ph (MTF 50%) at horizontal resolution in the center of the image and with proper lenses. Vertical resolution has similar value.



Horizontal resolution

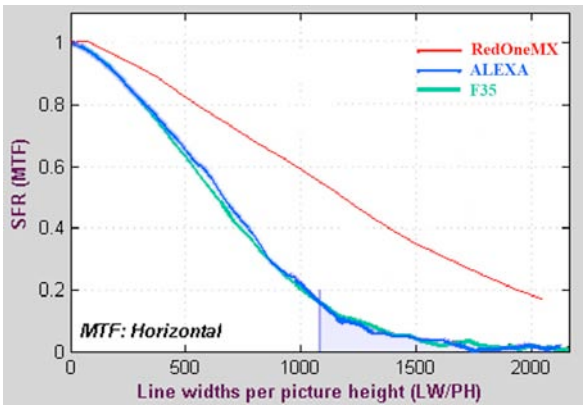


Vertical resolution

We have obtained these values from the chart without using any kind of filter. If we apply a "Sharpen" correction standard (dotted red line), then, value is nearly 770 Lw/ph.

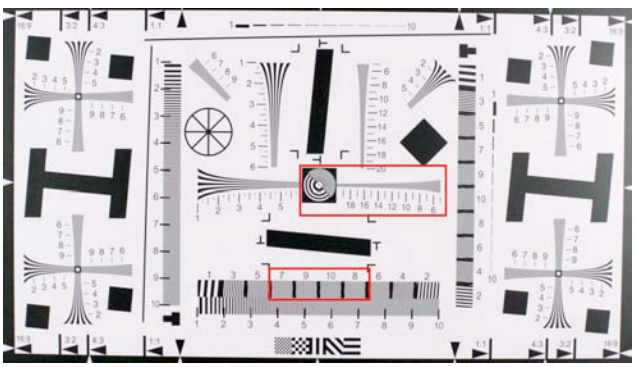
If we consider a 30% MTF value, then, horizontal resolution remains in 861 Lw/ph. As we could check on screening, this resolution is enough to show detail and texture; however, sharpness is far from the results that we obtained during the REDoneMX tests.

Let us see the comparative graph about the three MTF curves regarding cameras F35 of Sony, ALEXA and REDoneMX. This comparison is relative: we used Ultra primes lenses with ALEXA and F35, whereas, we used Master primes ones with REDoneMX. Anyway, we can appreciate that both ALEXA and F35 show a similar MTF curve, whereas, REDoneMX has a curve, which leaves a greater area below. It means not only that its resolution power is greater, but also it represents much better textures.



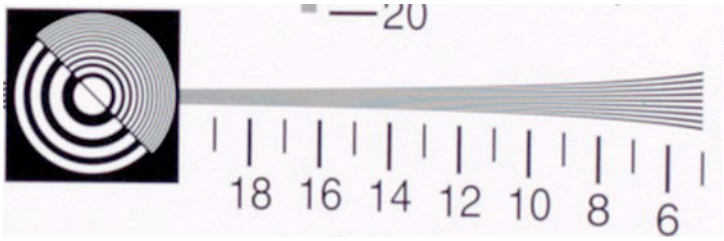
MTF curves in comparison

If we compare images from ALEXA with other ones, it is clear, firstly, REDoneMX images are sharper; secondly, Sony and ARRI images are amazingly similar.

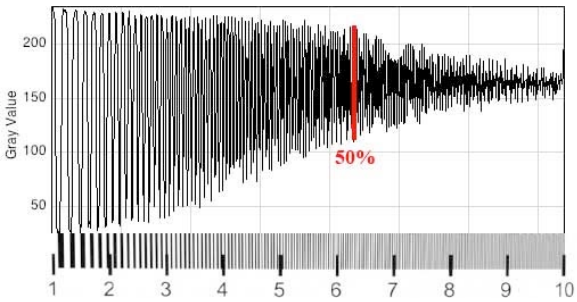


In other words, horizontal resolution is slightly more than 1.3K, at chosen format, with lenses we have used and in the center of the image. Although the change of parameters lead to some variations, this test is still useful to check the camera resolution ability, both for TV projects and cinematographic ones.

If we carefully focus on our chart, we see how the color Moiré appears at high frequencies. We have already seen this effect with the F35 camera, to a lesser extent with the REDoneMX one: regardless the chromatic aberrations.



500% enlargement of part of ISO chart. We can see Moiré of color effect and loss of contrast from 800Lph. We can see interference effect in the circle.

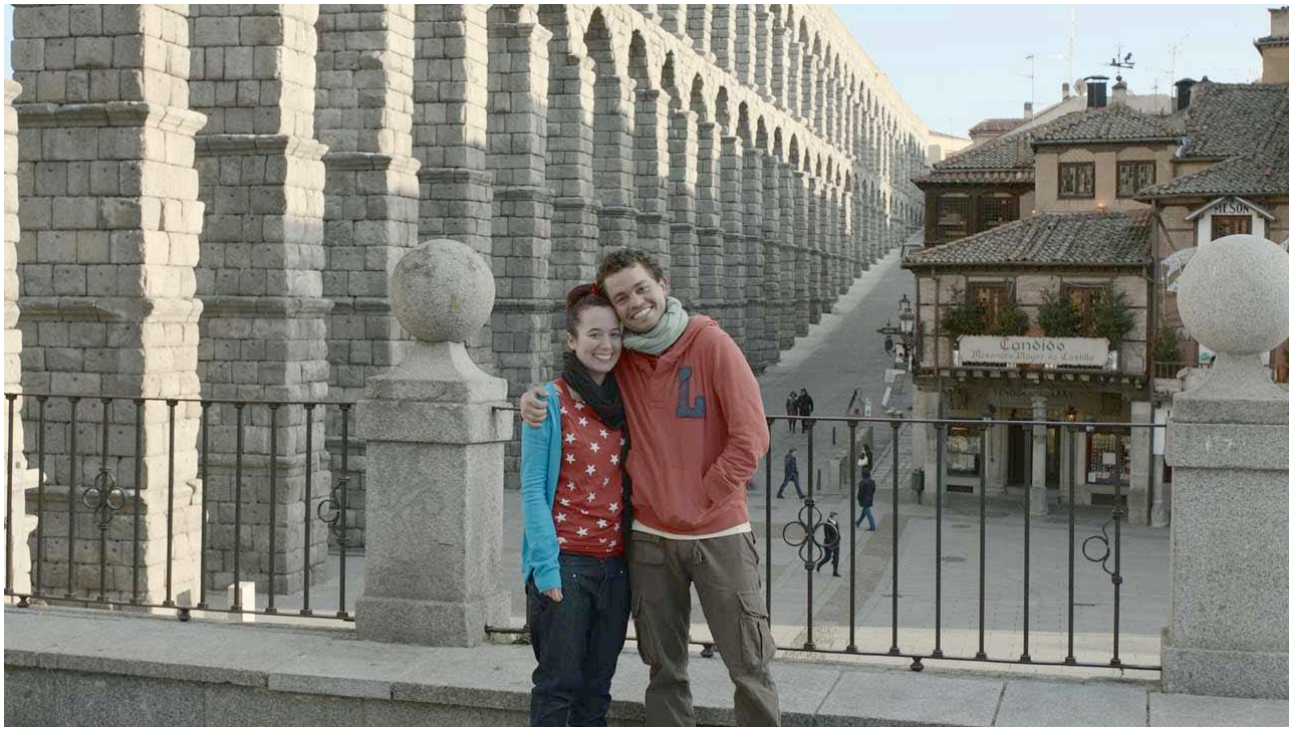


Seeing resolution by other ways. Profile of frequency lines of ISO chart through ImageJ

Let us leave aside charts world and let us focus on theses frames. As we check in post-screening room. Sharpness and detail were enough to have a feeling of a good image.

Focal 24 mm. T 8. LogC800 curve. 5600ºK . Filter ND 0.9. Graded with a slight application of detail (Sharpen)

La Pedriza (Spain) frame, a Natural Park where polite rangers usually visit us. We can see how camera solves very well both foliage and deep stones background. In spite of using a slight "Sharpen" to improve sharpness sensation; image is "natural", without electronic appearance. We checked this fact with the F35 camera when we used a detail of -60. Since ALEXA has not menus for this kind of modifications, we have to make detail improvements at postproduction. Anyway, applied detail is nearly 5%.

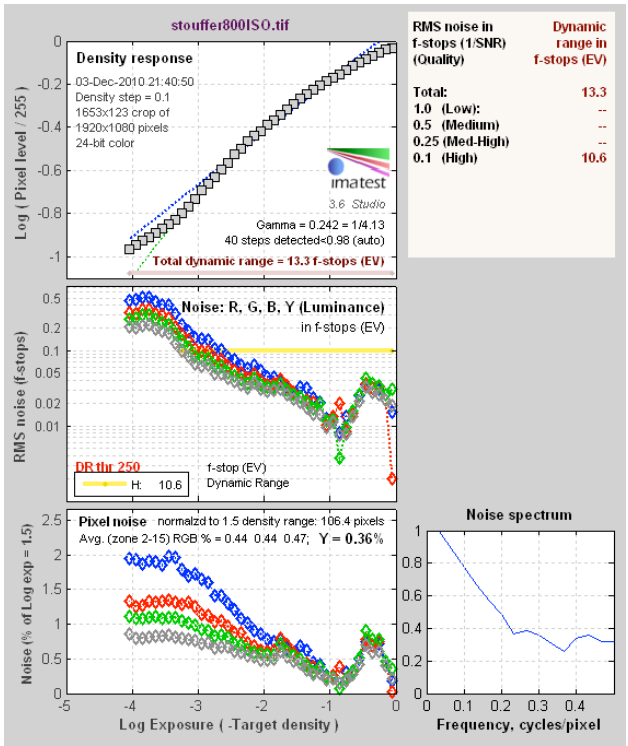


Focal 32 mm. T 6.8. LogC800 curve. 5600ºK . Filter ND 0.9. Graded with a slight application of detail (Sharpen).

We selected this image to check textures, because stones surface are very difficult to imitate. ALEXA shows a very natural texture in both parts: directly lit by the sun and in the shadow. Moreover, it contributes to the skin tones of lovers. We do not have seen the Moiré effect, neither in vanishing points of the aqueduct, nor on the roofs. In spite of compression, we do not have seen "artifacts" either caused by compression.

Dynamic range evaluation

As we have checked on other occasions, we have conducted a test DR in different ways. We were trying to find a reference value when we expose with the camera. First, we have evaluated Stouffer strip with Imatest program.



Evaluation shows that camera is able to see all of exposure strip with a very low level of noise (Y 0,36). It is opposed to 0,40 of the F35 camera, i.e., captured DR by ALEXA is at least 13.5 stops. RMS (High) quality indicator of 10.6 stops allows foreseeing that recoverable DR will be at least 11 stops. This great dynamic range is not only the most astonishing, but, as we have checked, it is always the same one, whichever ISO value we use.

Let us consider, for example, RMS total is the same with ISO 200 and ISO 800, Med-High is 12.2 stops. We have photographed the strip with the rest of ISO values, and we have similar results, even with ISO 1600.

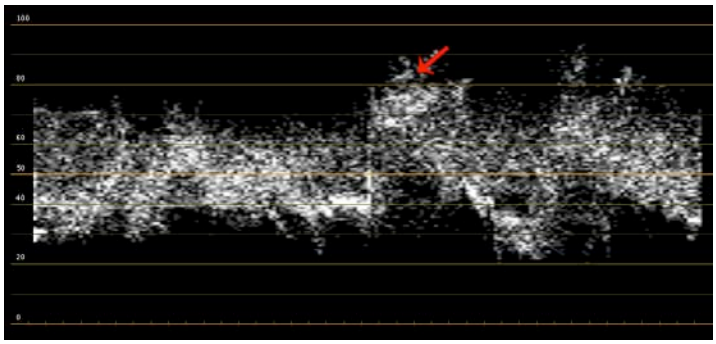
Therefore, how do different ISO values affect DR? Ability to show detail at high lights and shadows change regarding middle gray value. ARRI points out that ISO 800 is the value where number of stops above middle gray is equal to the number of stops below.

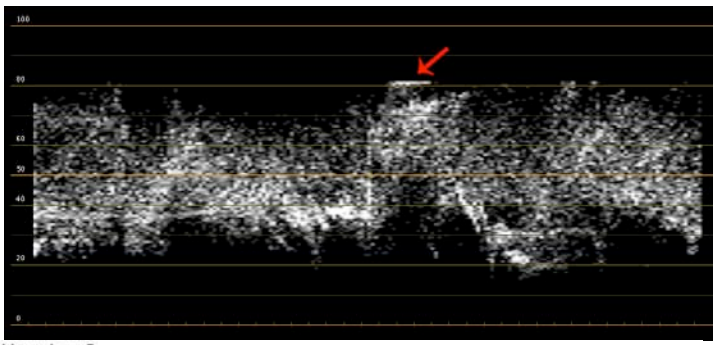
ARRI gives the following information:

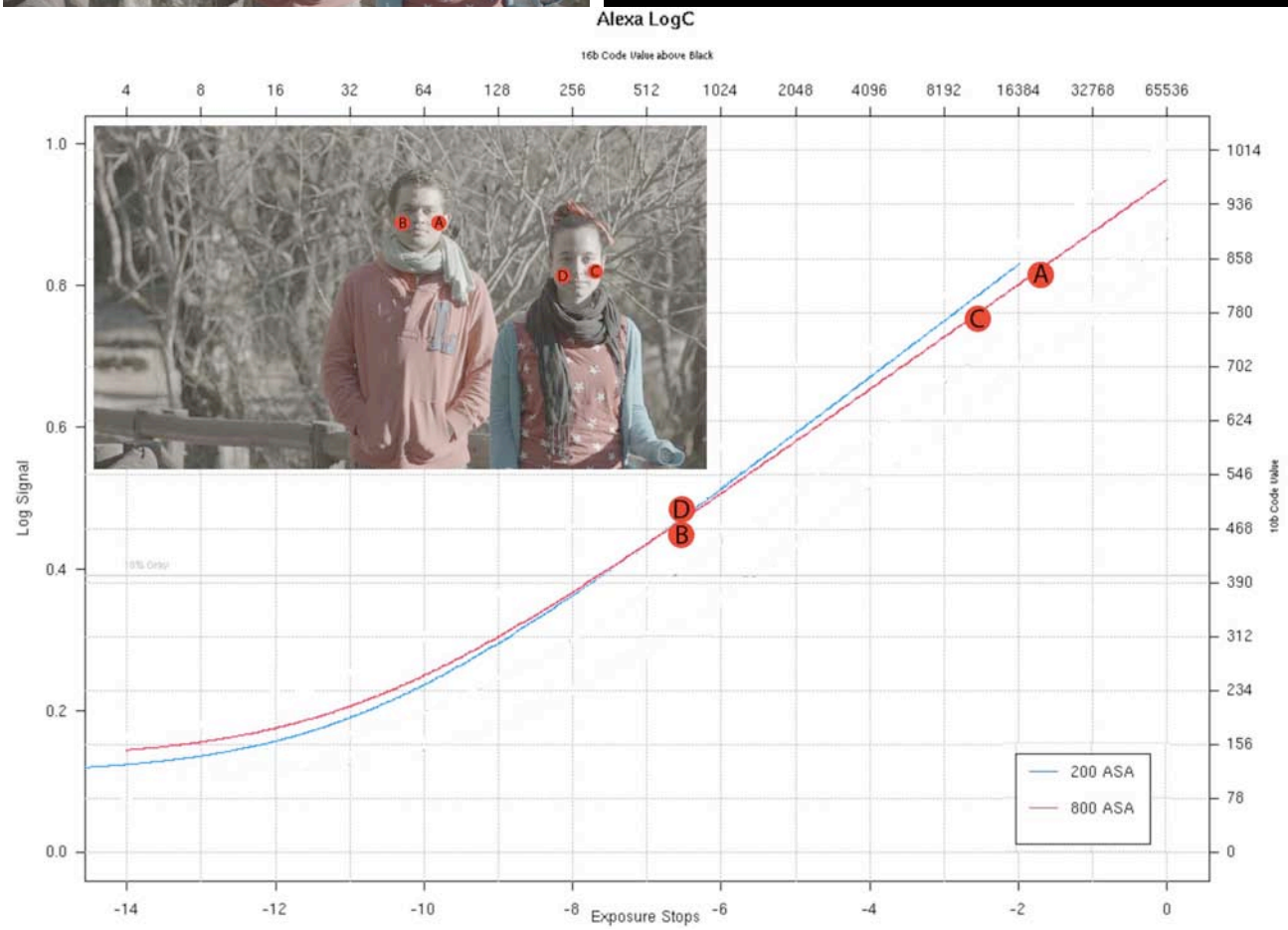
$EI160^{+5}_{-9}$ $EI200^{+5.3}_{-8.7}$ $EI400^{+6.3}_{-7.7}$ $EI800^{+7}_{-7}$ $EI1600^{+8.4}_{-5.6}$

We believe that specified DR is the captured one. As we did on other occasions, we have conducted our test to know recoverable DR and visible one.

We have checked the effect of different ISO values over camera dynamic range. We have photographed our models on the bridge over the river Manzanares (Spain). First image: we have used ISO 800, we have exposed to get a 39% middle gray at shadow. Second image: ISO 160, 39% middle gray at shadow.



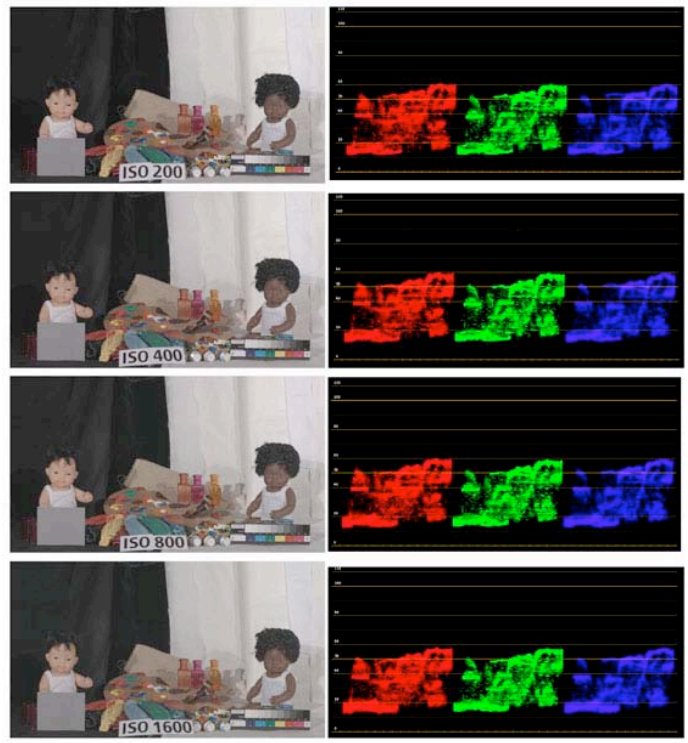




Second image limit whites values to 80%. Thus, Hector's face is clipped (it is lit by the sun); occurs the same with Mari Cruz's forehead. Nevertheless, ISO 800 does not clip any white of the image. The results match the observations from the LogC curve evaluation with the different ISOs provided by ARRI:

- DR (or latitude in analogical terms) is the same with all of ISO values. We have been able to check it during Stouffer strips evaluation.
- The different ISO values distribute DR in different ways high lights and shadows regarding middle gray. The lowest ISO values clip high light rather than the highest ISO ones. Vice versa, the lowest ISO values show more "density" values at shadows.
- The lowest ISO values give a more contrasted image than the highest ones, because curves show different gamma values.
- The lowest ISO values show a lower noise level.
- In spite of the lower ISO values show more "density" values at shadows, these are darker and more contrasted than the higher ISO ones show.

Below image: we have shut the still life with different ISO values. We can appreciate that the lowest ISO gives a more contrasted image than the highest one. We can also appreciate that both show less noise in Wfm. Since luminance values are within visible camera range (whichever ISO is used), we can choose any of them to work. If we want to have stronger blacks with less noise, then we have to choose the lower ones. If we want to have a softer image that shows more details at blacks, then we have to choose the higher ones.

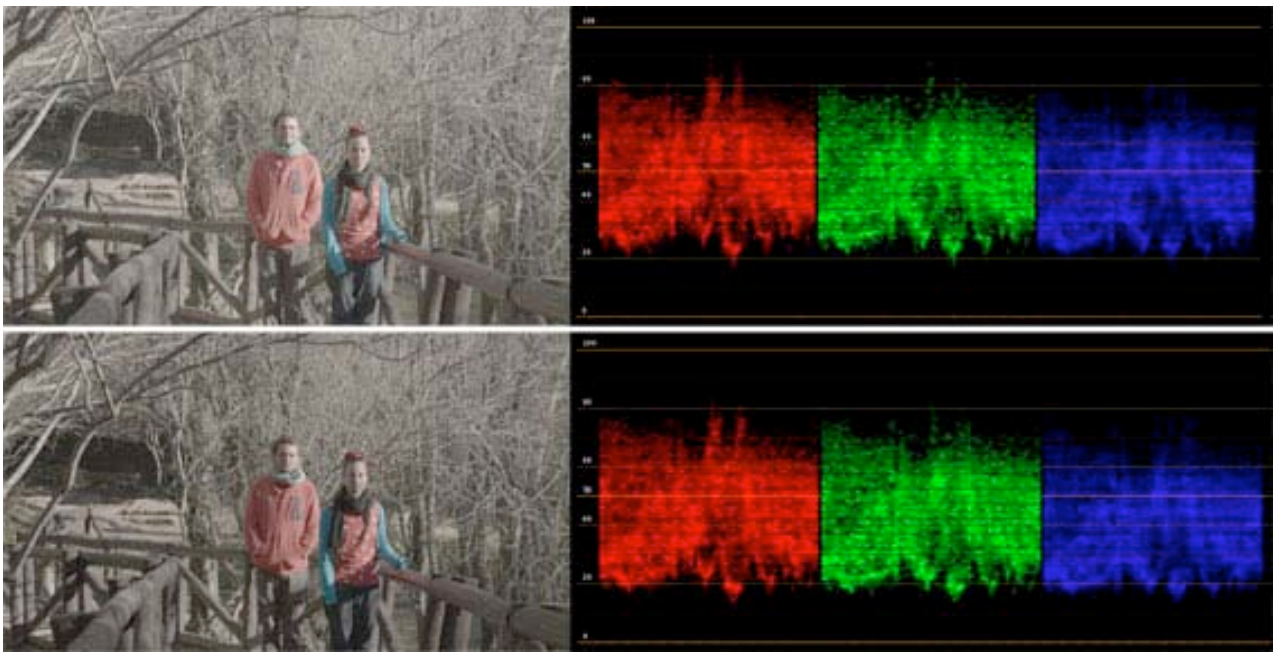


Still life shot with different ISO values and LogC curve.

Therefore, ISO value election will depend on:
- Dynamic range of the scene.
- Lighting conditions of each production.
- Noise levels are taken into account, e.g., visual special effects, above all at chromes.
- What style we are looking for the image: contrast, detail, sharpness, color, etc.

B/W image: we show the blue channel of the different ISOs. We also show processed image through an edge detector; thus, we can see better the noise. We can perfectly see the difference in black background fabrics: ISO 1600 value is noisier, ISO 200 is cleaner. It should not be a surprise, if it was not because noise is very low when appears, as has been said above when we were talking about sensitivity.

Next image: we used two different ISO values; exposures are suitable for them. We can confirm difference of contrast and noise. We can appreciate that their exposures are right in WfM.



Top image. 40mm lens. T 5.6. LogC800. 5600ºK. 25fps. Obt 180º. ND 0.6 filter
Below top image. 40mm lens. T 4. LogC200. 5600ºK. 25fps. Obt 180º. ND 0.6 filter

Below frames: we can see how an averaged exposure allows reaching details at both high lights and shadows (average exposure contributes to shadows and avoid clipping at high lights). Mari Cruz's face is +5 stops above T, the darker area around base of trees is -2.

24mm lens. T 6.3. LogC800. 5600ºK. 25fps. Obt 180º. ND 0.9 filter. Original of Camera.

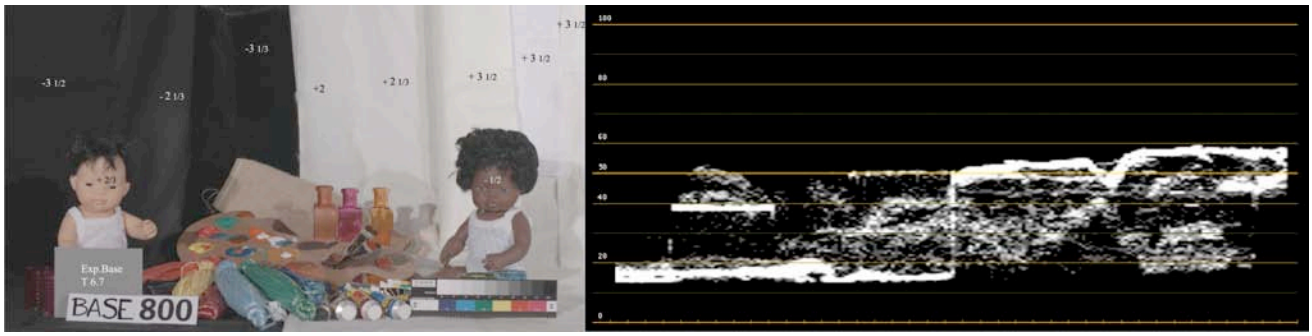
Graded

Recovering high lights.

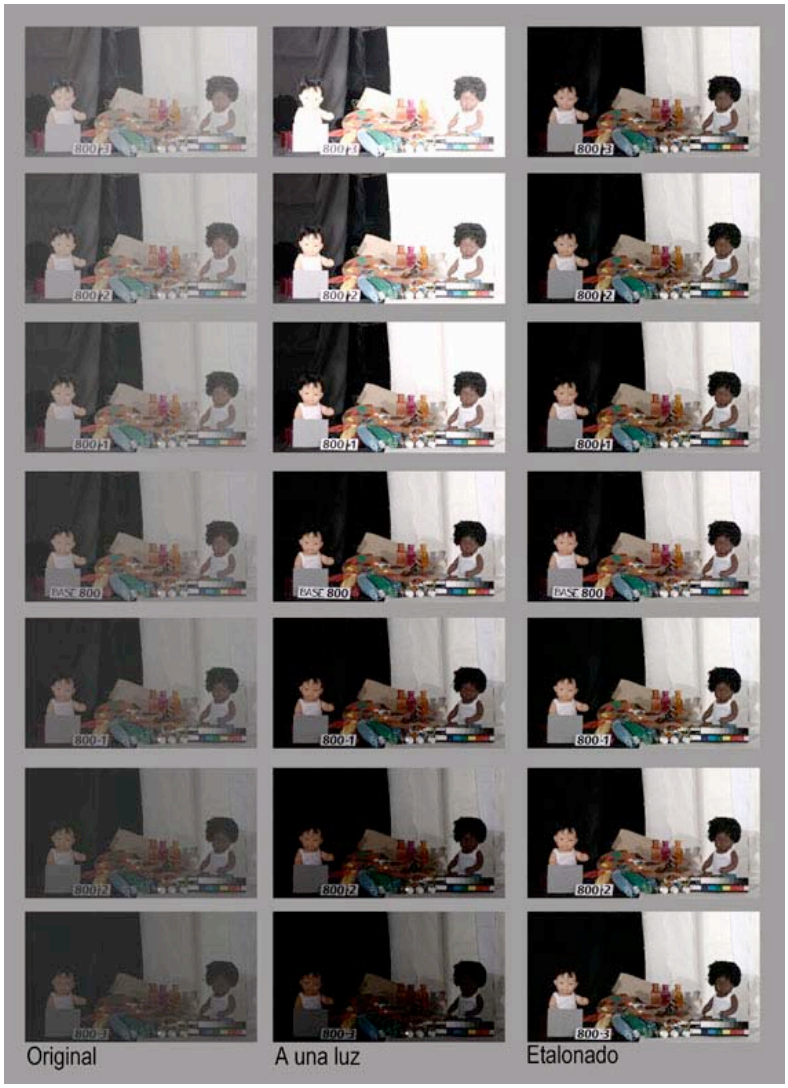
Recovering shadows

We have checked how details are at high lights during grading. We have seen there is no clipping on trees barks (the closest tree is +4); shadows have detail with very low noise level. There is no clipping on water brightness either. In general terms, it gives a natural sensation.

Below, let us evaluate the multi exposures of still life.



50mm lens. T 5.6. LogC800. 5000ºK. 25fps. Obt 180º. T stops values from reflected light regarding Base Exp.



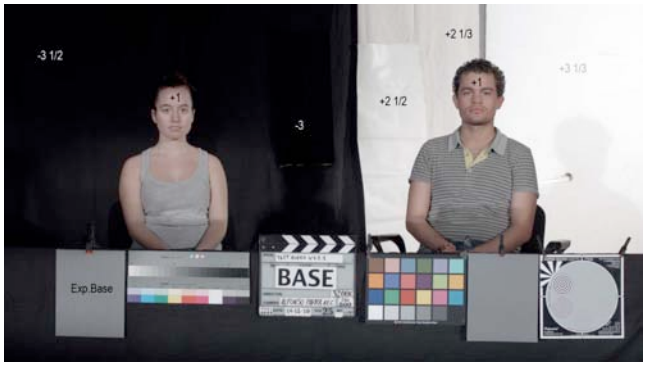
At one light graded exposures; with base exposure whites are nearly clipping limit, although white background fabrics still show part of their textures. With +1 all of the white values are clipping, they are losing details. We can say that quantity of *observable* detail is 3 stops above middle gray, this quantity depends on displays ability.
With -1 we can see difference among black background fabrics. They are between -3 1/3 stops and 4 ½.; we can still see velvet texture.

With -2 we cannot already see texture of black background fabrics, although we can distinguish them. We estimate visible detail at nearly 4 1/3 stops below middle gray.
Therefore, we can place the observable DR a bit more than 7 stops.

It should be pointed out the color consistency and no significant deviations of it, at both high lights and shadows. In spite of compression, we have not seen "artifacts" either: banding, blurring, posterization, etc.

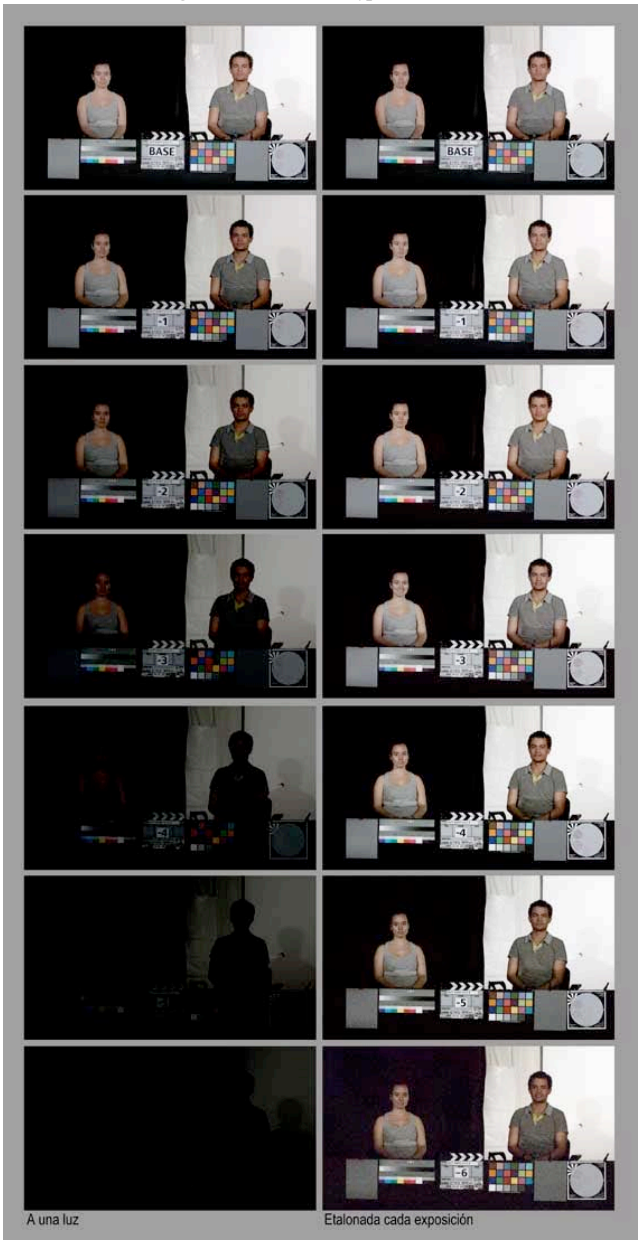
At graded exposures. With +3 white background fabrics keep their texture without clipping. They are 6 ½ above.
With -3 black texture is completely lost; fabrics are -6 ½. Even, it disappears at 5 1/3, in addition, noise is very high.
With -2 we can appreciate some noise, although we accept it. Black background fabrics have lost the texture. We can only appreciate it slightly when fabrics are -2 1/3 at Base exposure (it is now -4 1/3).
With -1 we can see black texture, but there is some noise.
Colors keep a good tone, at both underexposures and overexposures. As was to be expected, we can only see saturation decrease at extreme underexposure and saturation increase at corrected overexposure.
As a conclusion, we can think that effective *extracted* DR is -4 at blacks and 7 at whites; the total is a bit more than 11 stops.
We have refined theses data with models on the stage.

T stops values from reflected light regarding Base Exp.
Overexposures
40mm lens. T1.1. LogC800. 3200ºK. 25fps. Obt 180º.



T stops values from reflected light regarding Base Exp.
Underexposures
40mm lens. T2.8. LogC800. 3200ºK. 25fps. Obt 180º

Overexposures



Underexposures

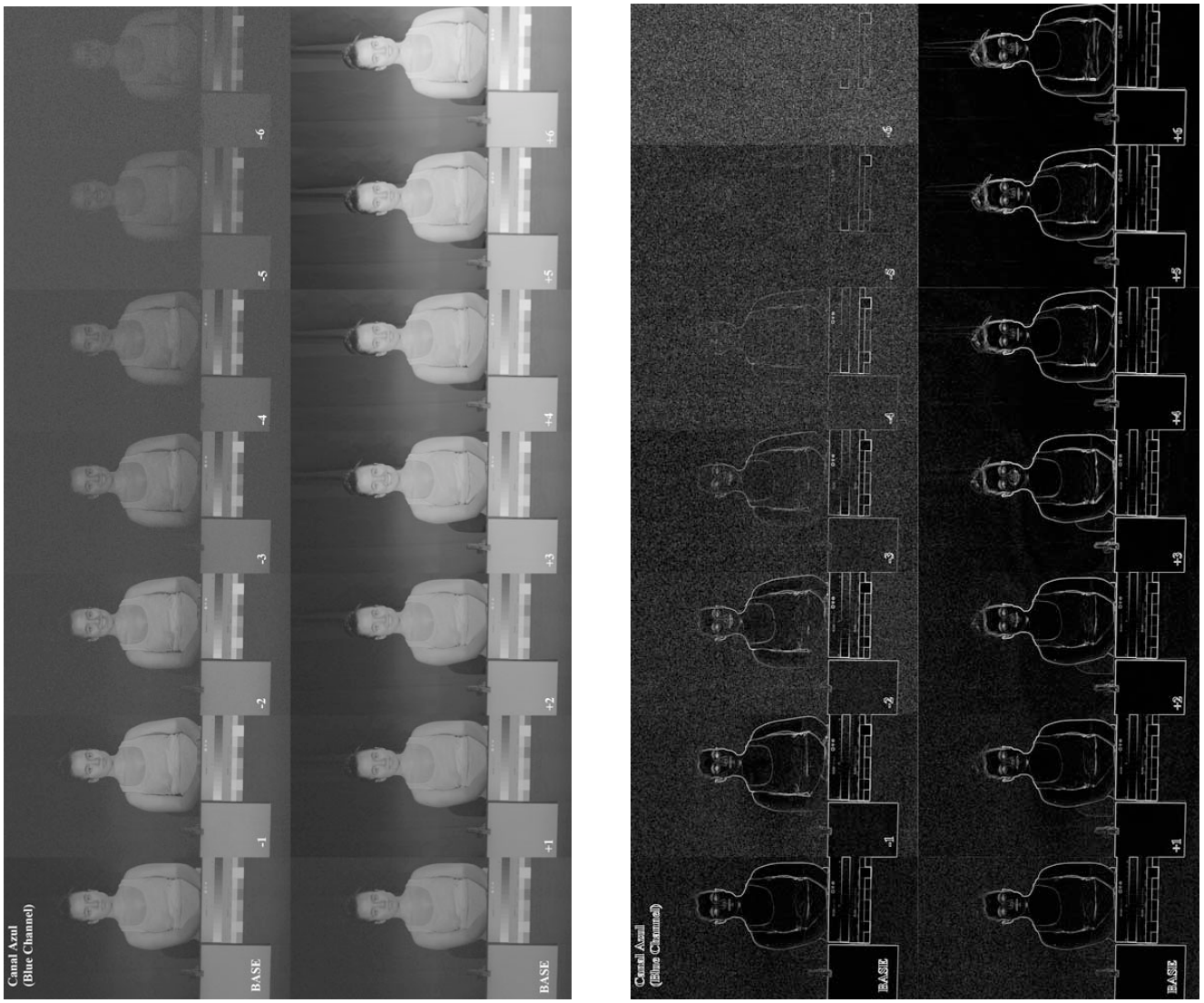
At base exposure, all of the values are within range; we can perfectly see textures of both blacks and whites. At one light, strip shows results, just like still life.
In grading strip of *overexposures*, we see that the polystyrene texture keeps until +4, i.e., it is +7. White already was clipped at +5.

Until +4, we can still recover all of image detail, we can keep a good balanced color at every exposures. It should be pointed out that at higher overexposures, skin tones are slightly reddish when we are grading to middle gray.

At underexposures, with -1, we can recover blacks texture with no significance noise. On the right of the black background fabrics are -4 ½.

With -2, black background fabrics loose detail and we can see noise. At this underexposure fabrics are -5 ½, thus, if we want to have detail we must be around 4 ½.

With -3, image noise is already significant. Black background fabrics texture and detail have disappeared.

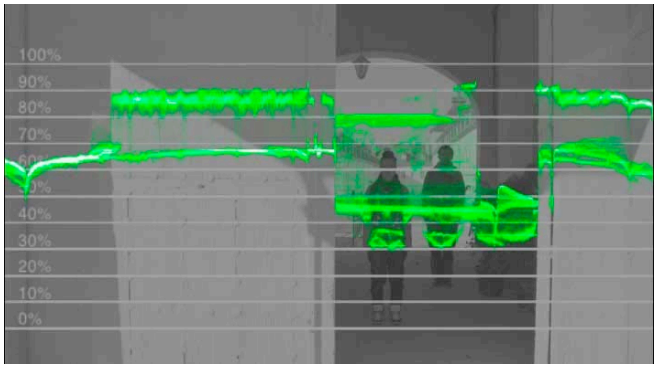


Blue channel of both overexposures and underexposures. Same image through the edge detector for seeing better the noise

We have extraordinary information from the test conducted on stage, from both at "day" lighting and tungsten one. This fact supports us to face up outdoor locations. Below, we are going to show through examples, how camera behaves with natural light. As we did earlier, we have not used any kind of support light.

Conducting test in Roman Aqueduct*, Segovia (Spain)*

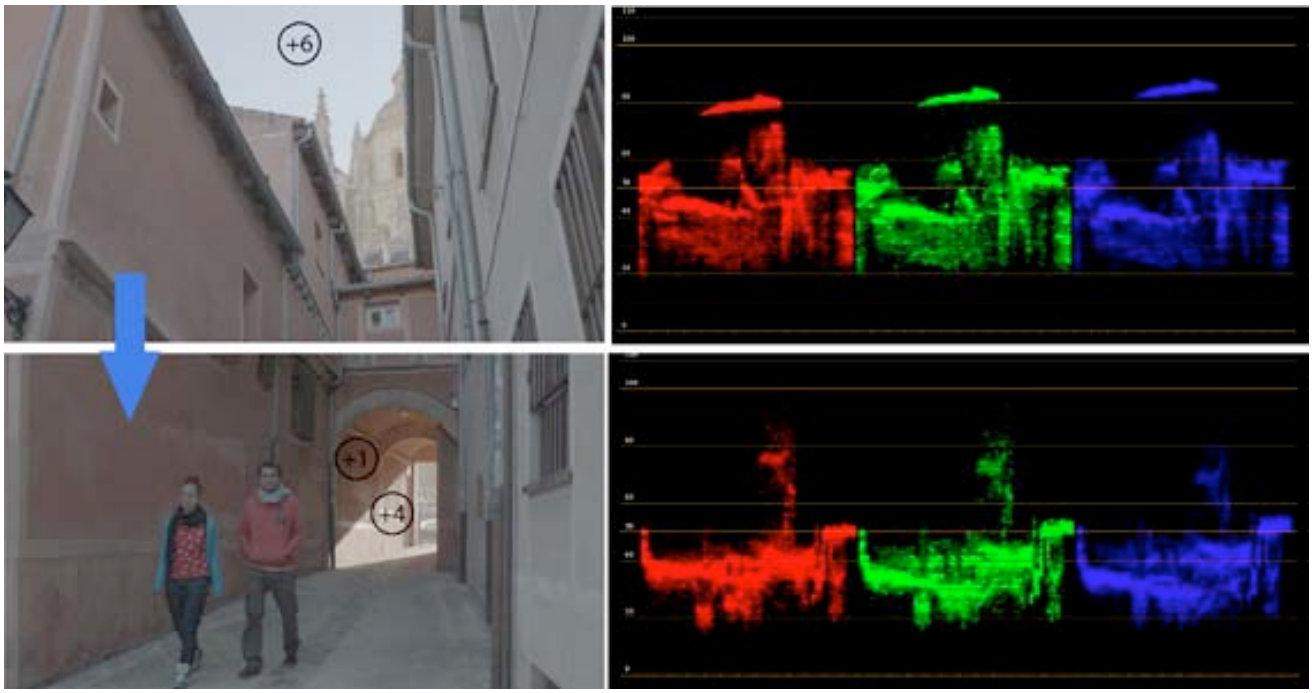
24mm lens. T 5. LogC800. 5600ºK. 25fps. Obt 180º. ND 0.9 filter



Original frame from camera and its representation through WfM. Exposure was made at shadows, whites are near of clipping limit.

Graded frame.

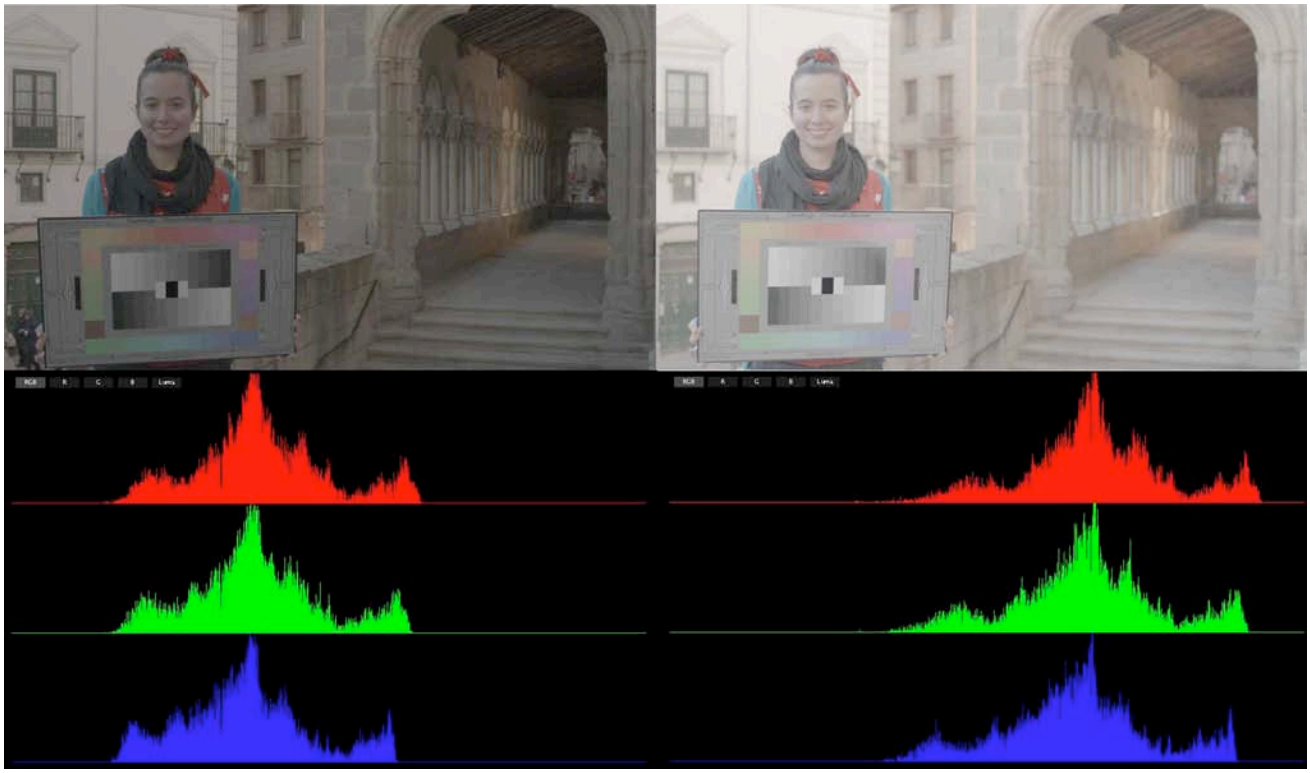
There is not much to say when we see this image. Camera is able to show a great quantity of detail at shadows, without clipping (contrast relation is around 64:1). There is no significant noise at shadows!
Let us see some more examples in the same way:



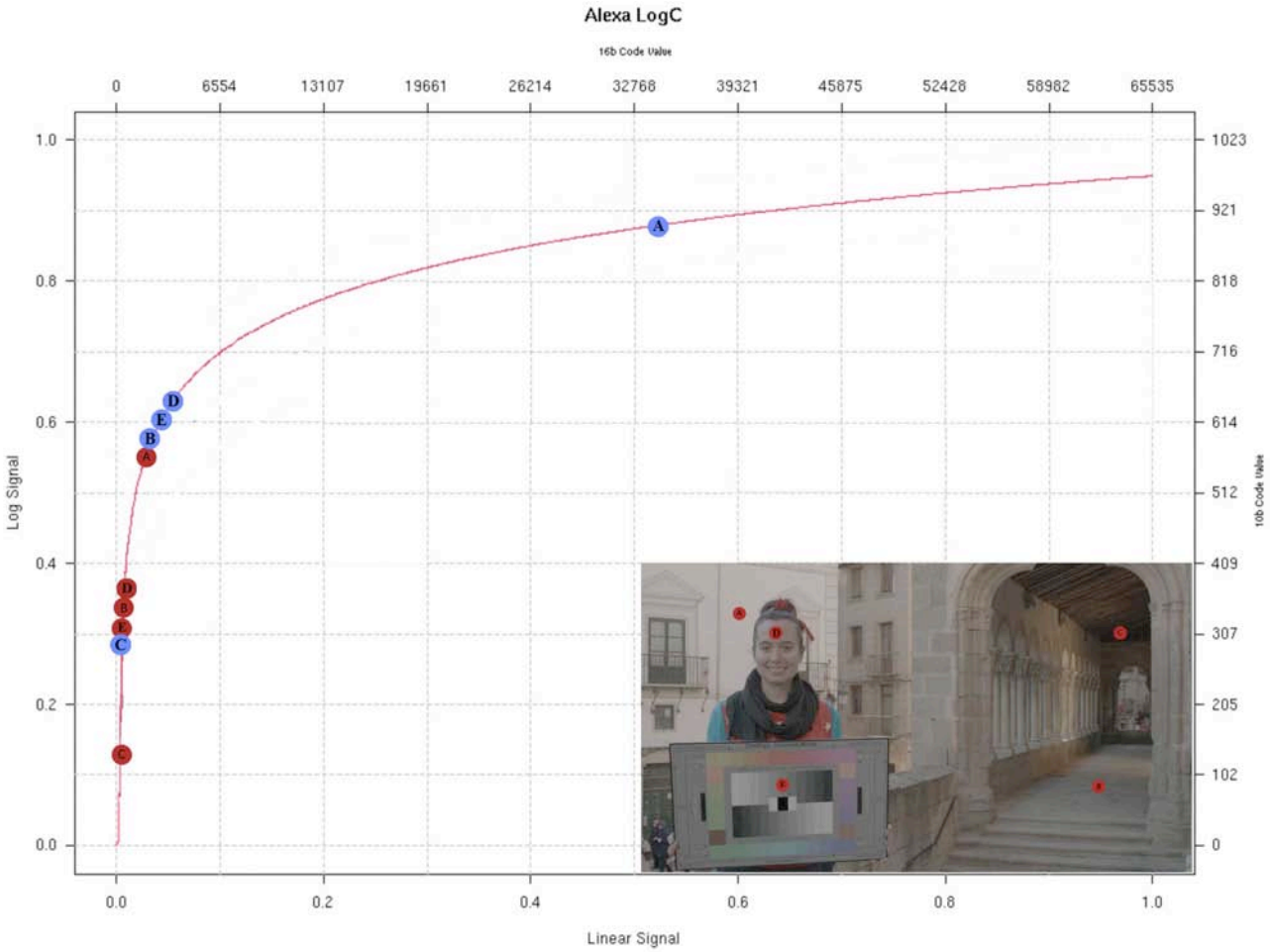
Vertical panoramic view from top to bottom. Original frames from camera and their representations in the waveform monitor.
32mm lens. T 4.8. LogC800. 5600ºK. 25fps. Obt 180º. ND 0.9 filter. Averaged exposure.

Horizontal panoramic view from right to left. Original frames from camera.
32mm lens. T 8. LogC800. 5600ºK. 25fps. Obt 180º. ND 0.9 filter. Averaged exposure.

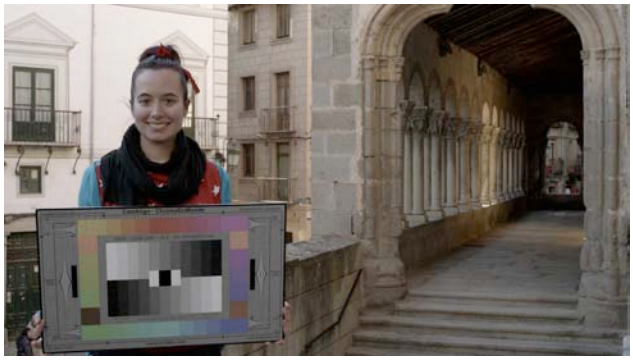
Frame of San Martin church, Segovia (Spain). We can see the exceptional response of ALEXA regarding DR. We can see until 4 stops without loss of information at high lights, we gain detail at shadows, and the noise level is even more lowered.



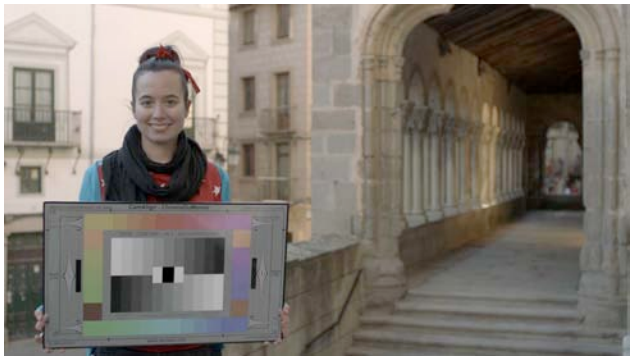
Left image. 32mm lens. T 11. LogC800. 5600ºK. 25fps. Obt 180º. ND 0.3filter
Right image. 32mm lens. T 2.8. LogC800. 5600ºK. 25fps. Obt 180º. ND 0.3filter



Bit values on LogC curve. Red values regarding gray middle value at 39% in Wfm. Blue values regarding overexposed image at 4 stops.



Graded frame from gray exp shadow at 39%.



Graded overexposure until 4 stops

The two images do not show differences regarding DR when they are graded. Nevertheless, since we use so different diaphragms that field depth, contrast and sharpness change.

Considering what we have seen about camera behavior, in general, I decided to use LogC800 curve at work, I overexpose image at least 1 stop. I adjust light meters with 500 EI to pre lighting; finally, I adjust exposure in Wfm. Below frames: inside of the sentry box in "Concert for two violins" short film, and the "Christmas" in Plaza Mayor of Segovia (Spain).

Original. 40mm lens. T 8. LogC800. 3200ºK. 25fps. Obt 180º. IE 500 ISO.

Graded frame.

Original. 32mm lens. T 2.8. LogC800. 3200ºK. 25fps. Obt 180º. EI ISO 500

Graded frame

All things considered, we can conclude:

-Captured DR by sensor is nearly 14 stops.

-Recoverable DR is between 11 stops and 12 stops. If we are conservative regarding detail and texture, we are 11 at shadows. If we tolerate a certain noise and loss of sharpness, we are a bit more than 12.

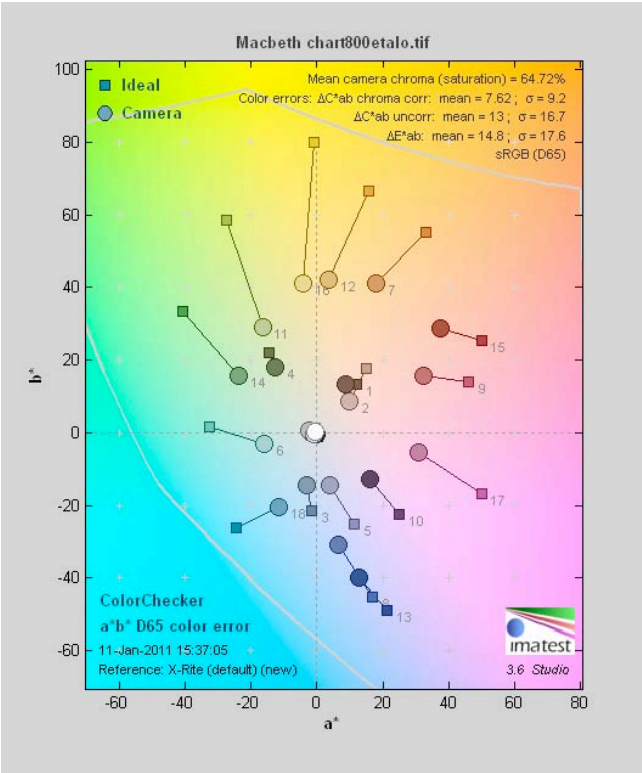
DR distribution depends on ISO applied to LogC curve (taking into account middle gray). We have used LogC800, because of this; we have settled it at 7 above gray and 4 ½ below it.

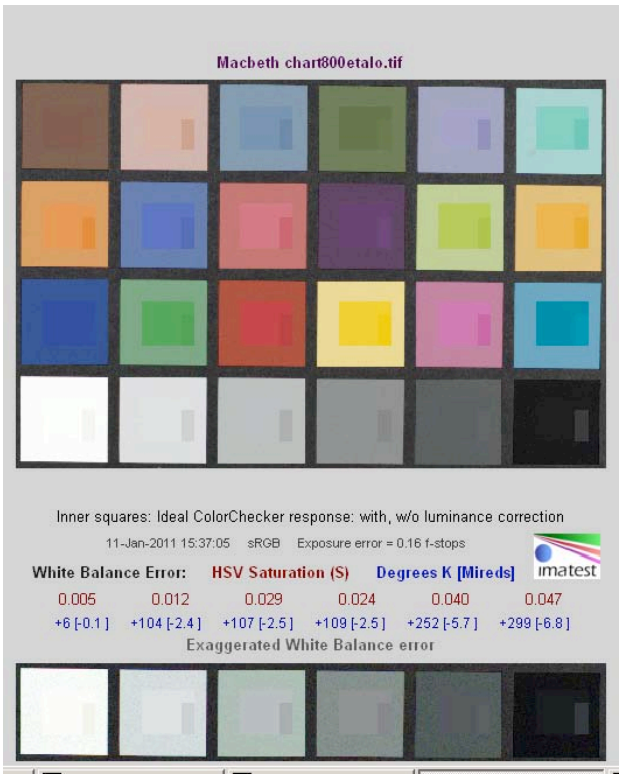
-Visual range is nearly 7 (it depends on different viewing systems).

Therefore, we can say that ALEXA is the camera with the greatest DR, within camera that we have tested. It breaks one of the last barriers (if not the last one) about the old fight against the analogical system: the latitude of negative. We think that it is exceptional that a digital camera reaches such dynamic range in such short period of time. Its development has taken less years than development of the analogical systems; as a result, we should not be surprised if we found real wonders in the future, as RED announce of the HDR process.

Color

For color evaluation purposes, we have used models, a Macbeth chart recorded with LogC curve (color temperature was adjusted at 3200ºK), and a ChromaDuMonde chart. We have adjusted white, black and middle gray values in the Macbeth chart, for placing in their HD standard references (18% gray at 45% in WfM). We have corrected a slight deviation of middle gray without touching whites or blacks. We have considered that small deviation of ºK and the tone are acceptable, above all if we realize that so many parameters are involved: lighting devices, gelatins of correction, lenses, measurement devices, etc.





Sigma (RMS) gives photographed color deviations with the camera regarding "ideal" at its space of color (in this case, sRGB/Rec709). After we have corrected saturation, sigma value is 9,2, with no correction is 16,7. 9,2 value shows that color reproduction is good.
Imatest graph shows a strong saturation decrease, above all in yellow/green, except for: skin tones, patch 4 (foliage green) and patch 3 (blue sky). All of the colors generally are correctly toned without any excessive deviation.

Top on the right image (it deserves to examine this picture), the biggest squares show the color as photographed, and they are related with circles on the left graph. The smallest squares (they are in the center of the biggest ones) are ideal values of chart color corrected by luminance of the photographed. Finally, small rectangles are ideal values of color without luminance correction.

We can see how skin tones are related to standard, e.g., violet tone (patch 5) and blue (patch 13). Green (patch 14) is well toned, but it is slightly cyan. Magenta is a bit more "pink-like" and orange is a bit more yellow. Sigma value is 9,6 with corrected saturation, whereas is 10 with no correction. As we can see, values are similar to previous ones from graph of the original image, i.e., there is no saturation increase. Red saturation increase causes differences between the corrected and the not corrected one. As we should check at grading images in postproduction, they had to be saturated slightly.

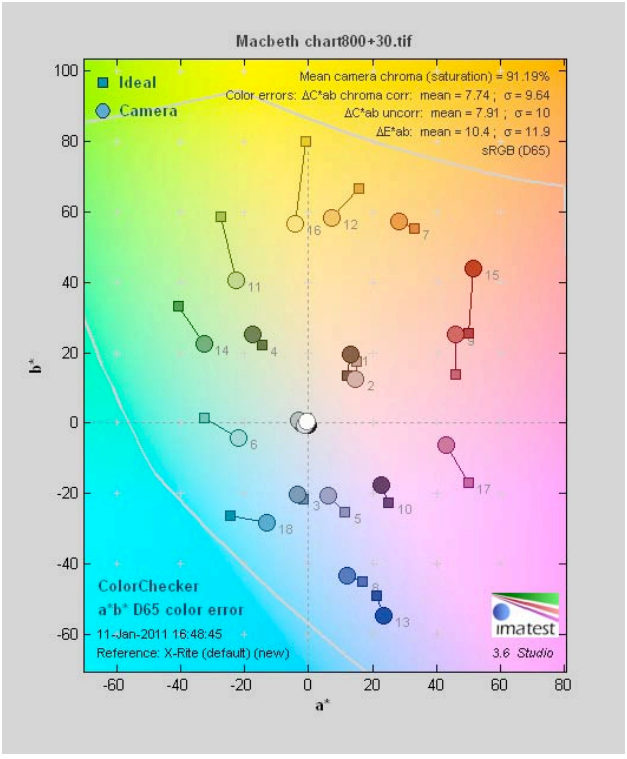
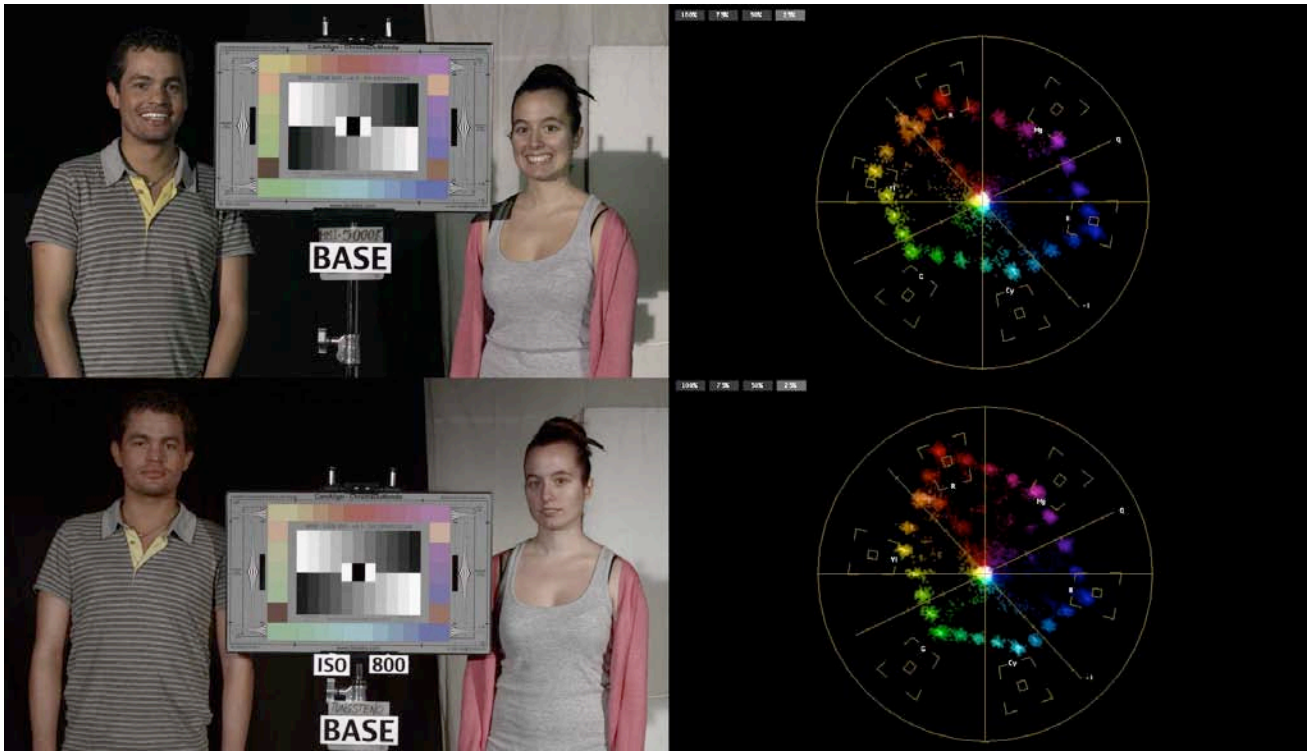
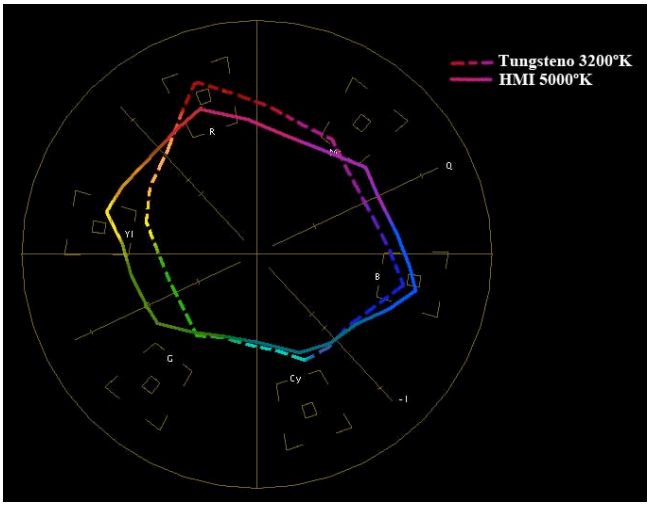


Chart values with saturated originals

We can compare Macbeth chart with REC709 accurate values of ChromaDuMonde chart.



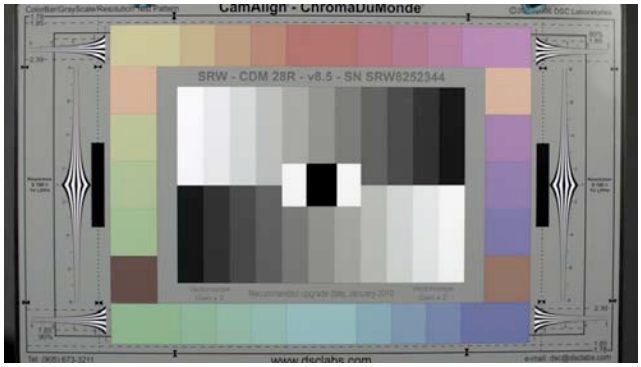
Previous image: light base is at 5000ºK; below image: 3200ºK. Both images are graded for reaching a neutral middle gray. As can be appreciated through tungsten and Macbeth, we can see more saturation in red and less in yellow. Color distribution at 5000ºK is more balanced, it presents slight deviation towards magenta at whites and towards cyan at shadows. These deviations are not significant at normal exposure, however they increase at extreme overexposures and underexposures (more than +3, less than -3). We have also seen these deviations in the still life (it was lit with HMI at 5000ºK). We have chosen this "day" color temperature because blue and red channels amplifications are similar.



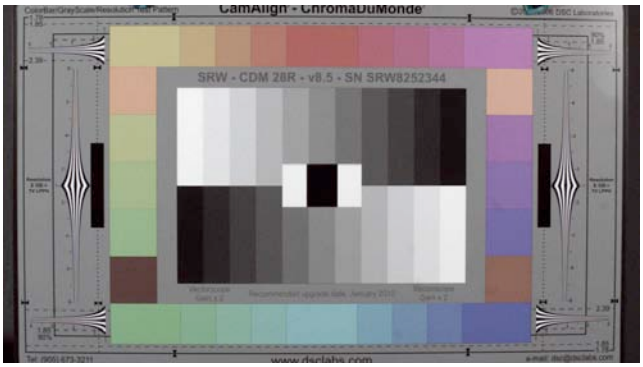
Distribution of ChromaDuMonde chart color in comparison with tungsten and HMI.

With tungsten lighting, white are well tuned towards green/cyan, and shadows towards magenta, both at extreme overexposures and underexposures. These deviation are not significant, they can be fixed at grading. With neutral middle gray chart, skin tones are slightly toned towards yellow at day light (HMI), and red at tungsten. We can check in images from the vectorscope.

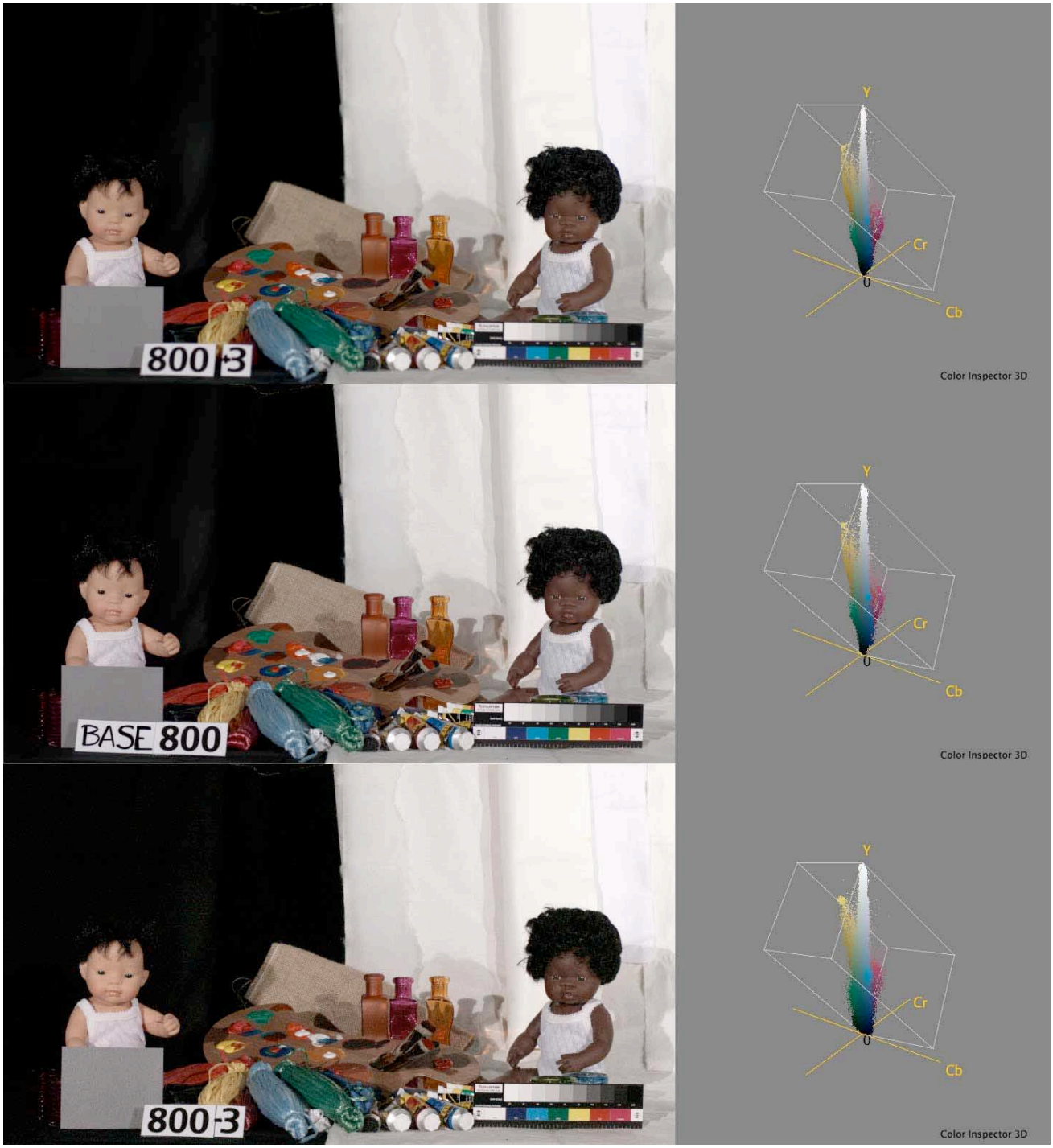
Color tones keep well, at both overexposures and underexposures. Image shows generally a great consistence and cohesion.



ChromaDuMonde chart at overexposure 4stops, graded. (50mm lens. T 2. LogC800. 3200ºK)

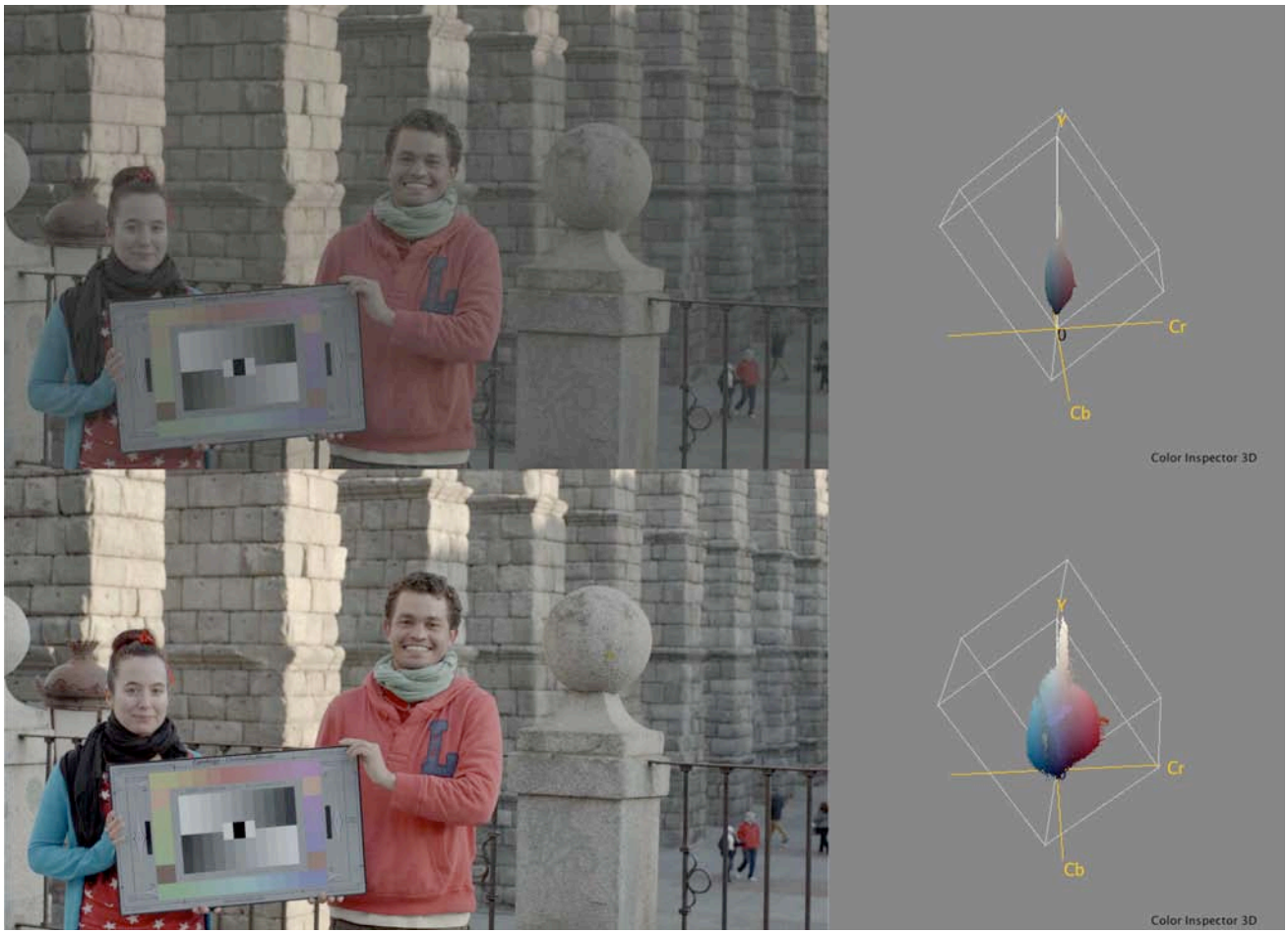


ChromaDuMonde chart at underexposure -3stops, graded



Top image: we show graded frames of still life at both overexposure and underexposure of 3 stops, and its YcbCr representation. After we have saturated underexposure and we have slightly decreased saturation of overexposure, differences of color tones are hardly seen.

Below, a “natural” image with no correction and another one graded. We have adjusted blacks, whites and middle tones at grading; after we have saturate slightly.



50mm lens. T 6.8. LogC800. 5600ºK. 25fps. Obt 180º. Middle gray at shadow 39%

We have checked at grading that skin tones are truly pleasant, very natural, without "plastic" or "electronic" sensations, on both outdoor locations and stage. Even, face appearance is excellent in "Concert for two violins" short film, even though light is very colored.

We have not seen color differences either when we have worked with different ISO in camera.


50mm lens. T 2.8. LogC800. EI500. 3200ºK. 25fps. Obt 180º.


32mm lens. T 2.4. LogC800. EI500. 3200ºK. 25fps. Obt 180º

It should be pointed out that camera needs certain IR correction, when we use neutrals of high density, from 0.9. Thus, we avoid red/magenta tones at shadows, above all in some kind of black fabrics. IR filter is the same that we have used with F35. It corrects visible red extreme, since camera has its own absorption filter of infrared. IR filters are not dichroic, they should not be confused with HOTMIRROR or similar ones. We trust that we will be able to write a specific article in short time, about this topic with the new firmware 3.

Conclusions:

We do not know if ALEXA, to honor its name, is going conquer the civilized world of the cinematographic photography, but it has enough chances. ALEXA is within the high sensitivity cameras, its nominal ISO is 400, and its effective "floating" EI is between ISO 500 and ISO 1000, thus, we can work whatever situation, whichever level of light. In spite of its resolution is the normal one within top range of HD cameras, it keeps good sharpness with enough texture and resolution power for using wherever we want; TV, cine, Internet, etc. Nevertheless, the very surprising is its dynamic range, above all its response at high lights; its DR is around 14

stops, thus, we can get an extracted DR between 11 stops and 12 stops. DR distribution depends on applied ISO to LogC curve, e.g., with LogC800, until 7 stops above middle gray, and around 4 ½ below. If we take into account previous facts, the low noise level, the very natural and consistent process of color (particularly on skin tones) altogether; we can state that ARRI is in the vanguard of digital technology market, regarding capture of images. Moreover, it is a "friendly" camera, easy to manage, with simple menus, with very low noise level, that does not heat up, and as it was to be expected, with the same strength that ARRI analogical cameras always had.

With this ARRI step forward, I think that to choose between several cameras from top range of digital ones will become a matter of taste: differences between them begin to be small. Equally, what occurs with the very best lenses; we choose between them, not because of technological considerations, but personal sensations. The truth of matter is that ALEXA has come in the social imaginary of DoP, making a grand entrance.

*images from "Concert for two violins" short film by courtesy of Jazzfilms and Elbia Álvarez
*gamma curve graphs that we have used as base of our evaluations by courtesy of ARRI

Credits:

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Second Assistant: Albatros Flández.
Colorist: Gabriel de la Merced.

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