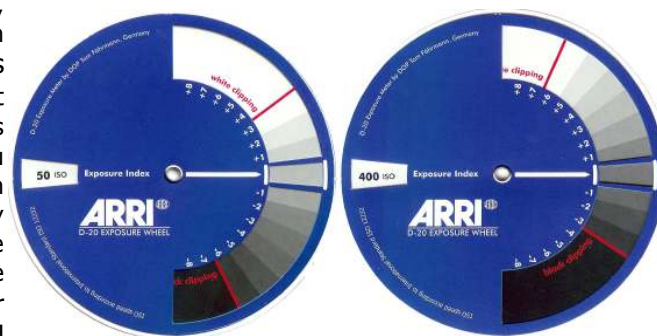


We have shot during two days with the digital camera ARRI D20 in the last month of June in Zaragoza and inside of Congress TEA 2006. Test of the camera have done in video mode HD 1920x1080, 24fps, Mechanical shutter of 172'8°, 1:1.85 and with gamma curve ITU R BT.709 EI320 and at times curve Log C and Filmstream, recording in a Sony HDCAM SR 4:4:4 SQ in RGB and 10 linear bits. We could not try the camera in their cinema mode where camera generates "RAW" data with all of the information that the sensor can offer, these data are recorded on disk array and after they "are developed" in postproduction for working with them. Images have been worked in Fotofilm/Deluxe(Madrid) and Image Film (Barcelona) capturing these from a Sony SRW 5500 in RGB, dual link exit 4:4:4 with a DVS Clipster, entrance format RGB, dual link 4:4:4. The video images are turned into real time to data, format DPX 10 bits. Data have been transferred to Lustre's local storage where the correction of colour was accomplished, being necessary the creation of two projects, linear one and logarithmic other, depending of the image. We filmed with Arrilaser, using an internal conversion of linear 10 bits to 10 logarithmic for the linear images. We filmed the logarithmic images without applying any conversion. Unlike a normal HD, "sharpness" correction has not been applicable, right now than, apparently, additional saturation is not necessary either. We filmed on Kodak 5242 and the positive was Kodak Vision and Premier. Nevertheless we made a little test too filming with Arrilaser in 16bits and a 20% plus of chroma.

Test has been based on overexposure and underexposure images with models and referential charts as well as at different natural locations of Zaragoza.

Sensibility:

In an attempt of joining the concepts of analogical systems that we are accustomed, with the digital context, Arri D 20 use curves of gamma that are characterize with different sensibility ISO 50, 100, 200, 320. However this relation is difficult to establish so CMOS sensors doesn't work like an emulsion. Arri proposes different sensibilities when, as it's demonstrate with wheel of exposition, you are overexpose or underexpose the referential grey with the peculiar characteristic that according to the sensibility used, the distribution of the latitude respect of middle grey varied, in that way with 400 Asa we have three stops (shadow) below the middle grey and six stops over (high lights) and with 50 Asa there are 6 stops under and three stops over.



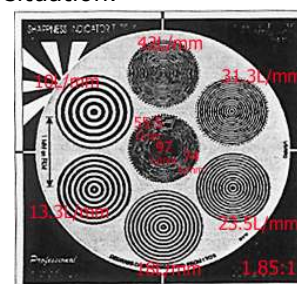
We see the curious paradox that using the most sensitive exposition it is had minus detail in the shadows, when normally, in analogical, we use the emulsions of high sensibility to be able to see more in the shadows with not much light. We have to say that sensors do not behave in the same way in different conditions of light, either with different temperatures of colour or with the quantity of light that you use.

With the linear curve that we have used the value of the middle gray 18 % places itself between 25 and 30 % of value in the monitor of waves, different so that we used in video HD normally where the value we placed it between the 40 and the 50 %. This value of 25 or 30 % evidenced their correct correlation with the value of 320 ASA as we could have seen in the set's images but not that way in another one situations like the picture of the girls with candles where there isn't too much light and the sensibility of the camera seems to be less that 320 ASA. Also sensibility change with the logarithmic curves where this gets closer at the value of 160ASA.

Therefore the indications of the light meter are relatively reliable and in reality the adjustment of the exposition we have to make it with the monitor waves especially in situations of low light or surroundings with temperature of colour far from the standard 3200 or 5600K for example very warm 2500 or very cold 10000K and, of course different kinds curves of gamma. The sensibility that the camera picks up the light is different in these cases and we have to do test in order to determine the real ASA in each situation.

Definition/ Resolution

The sensor CMOS of the size of the Super 35mm has a resolution of 3018 x 2200 (Active sensor pixels. 2880 x 1620 in video mode). This sensor has been designed to give 1920 horizontal pixels exit for which needs a sensor with more pixels than the indicated. We have to say than with BAYER pattern, resolution is not equal in RGB, as ARRI describe in some of the technical papers of his Web. The resolution of red and blue would find between one value of 2880x2160 and 1440x1080.



We have worked at video mode going out to RGB 1920 x 1080. We have to say that the resolution has been one of the characteristics what we have liked it too much of the camera. We could have considered it like "very good" according to the reading of the Putora chart where it can be gotten to see patch nº 5

corresponding to 31,3 line for mm.. We have to indicate nevertheless that the resolution depends on several factors in addition to the sensor, like the lens used in camera, the processes of quantification, the curve it of applied gamma, the compression, the resolution of the recorder, the emulsion and definitively even the own lens of projection. We included some images where the detail at the greenbelts can be observed in addition to the chart of resolution as well as at the landscape.



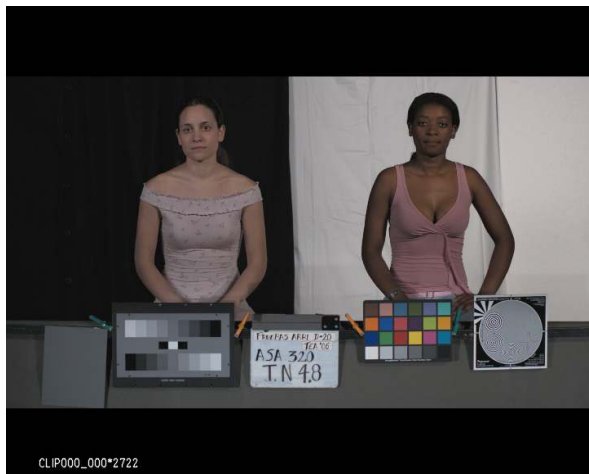
We could appreciate the good resolution of the camera in the Galachos's landscape. So much in the green backgrounds as in the first terms the detail and clarity are further than enough for a projection in big screen.

Latitude/ Noise/ Color.

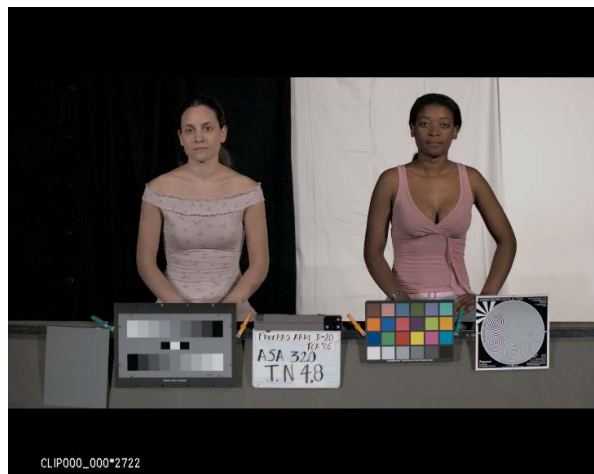
Valores	Luz reflejada Stops	Monitor de ondas (%)
Estico blanco	+3	80%
Tela Blanca	+2 1/3	70%
Cara blanca	+ 1	40-45%
Gris 18% (REF)	N	25-30%
Cara oscura	N	30%
Tela negra	- 3	0- 5%

Modo Video HD 4:4:4 24Psf
 Salida: RGB NORM RANGE
 GRABADOR: SRW-1 HDcamSR SQ 4:4:4 10Bits
 Obturación: 172.8º
 Curva Gamma ITU-R. BT.709 EI 320
 Blanco: Preset 3200K

We presented in this image The values of reflected light As well as his correspondents in the monitor of waves. You can see as the value of The middle grey 18% is in the 30 %. We have over and underexposure this image in increments of one point of stop.

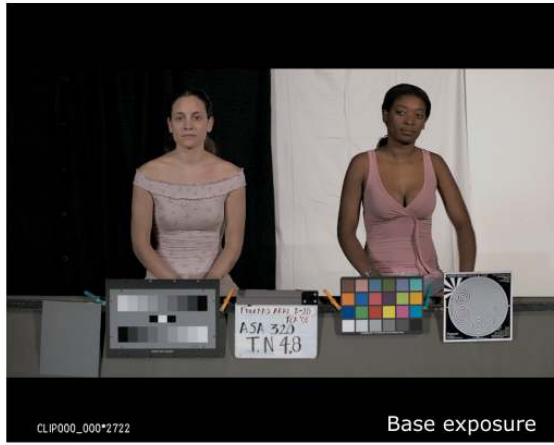


Original frame from camera



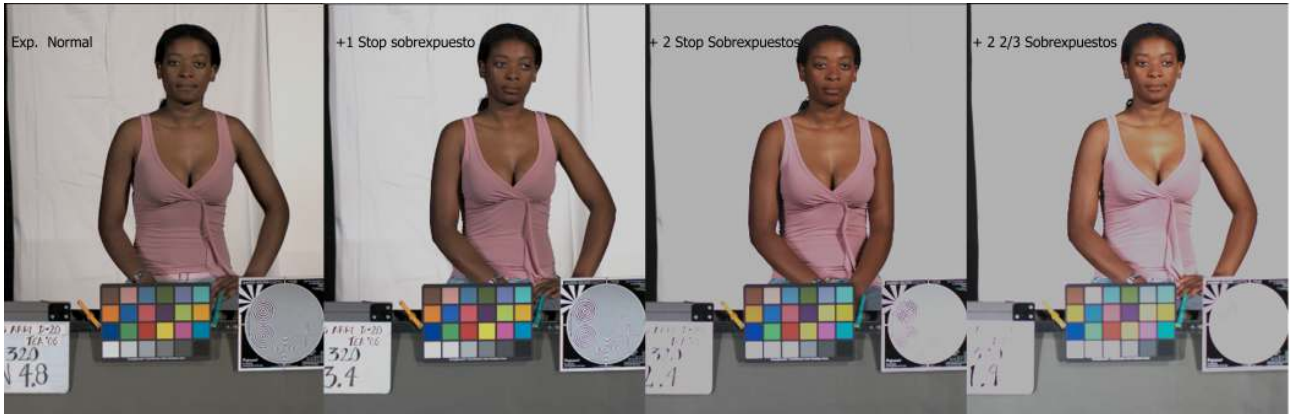
Grading frame with Lustré

The dynamic range that the sensor can manage is around 1000:1 (some 10 stop) even though in the mode that we have used the camera, the latitude of exposition finds itself between six to eight stop, although as we indicated previously with a different distribution of the scale of greys according to the curve of elected sensibility. As one can observe in the proofs with two points of overexposure, you right now lose the detail in the white skin, taking place the typical cut of whites that leaves the zone without any information. Also the details in the white cloth like in the white reflector have disappeared, this mean that with the curve 320 almost have 2 1/2 points of latitude over the middle grey.





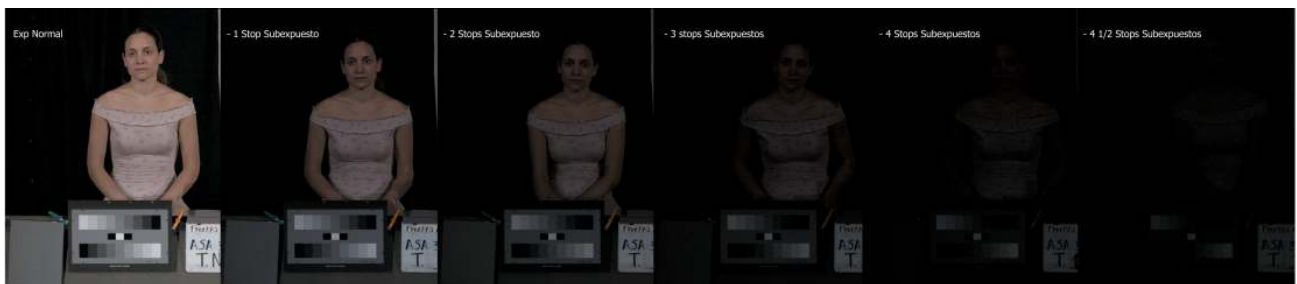
Effects of the overexposure and underexposure in the tones of white skin (detail)



Effects of the overexposure and underexposure in the dark-skin tones (detail)



We can observe how the white clipping make impossible to recover any detail in high lights with almost 2 and a half stop of overexposure when however with three stops the photographic image has still a good detail in high lights although some face's zones right now are slightly overexposure.



One can observe in the white girl as, with the underexposure, shadows show unnatural and lightly metallic grey tone, as with a few colour information.

You can look right now with one point of underexposure so much in the face with like in the arms the little unnatural grey of the skin. As from two points of underexposure shadows and blacks prove to be too artificial and quite flat. Equally there is a high noise level.

The black cloth's texture disappears barely with one point of underexposure and the hair for example of the white girl gets mislaid with the black bottom.



To three stop under the normal exposition we observe a certain amount of detail in the black girl's skin, underneath three stops sign the detail of the skin dies out. Nevertheless we still observe some detail of colour in the Macbeth colour chart with over four stops. In any event even though the tone of colour of the shadows keeps well balanced the noise is right now considerable with two stop signs under and clearly excessive beyond three.

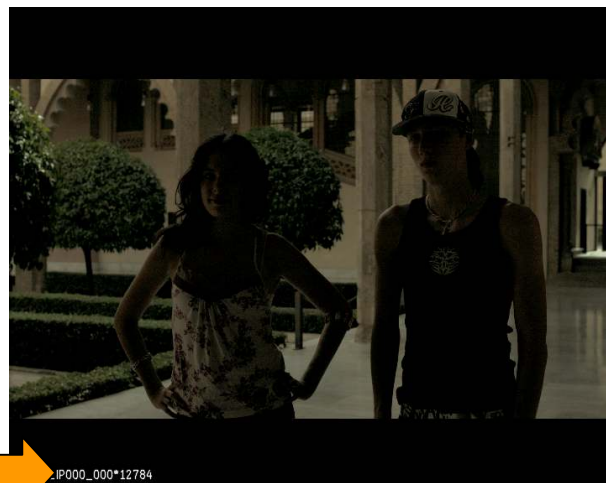
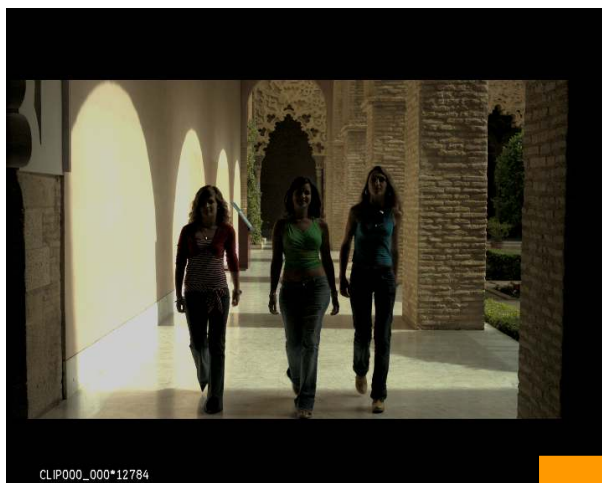
In your linear form and with the used curve, the camera drives around seven stop sign of effective form and using logarithmic curves we can go up to eight. This latitude is the same that can drive a camera conventional of HD hired conveniently like for example the right now historic F900.

We can say like conclusion than in mode video the latitude of the camera is comparable to another one HD existent on the market. Depending on the curve, between six to eight stop. An elevated noise level in the shades, and a hard with clipping in highlights.

High lights

You can observe in the following images as a consequence of the previously explained, lacking detail so much in high lights like in shadows if you expose for the first. We see lacking detail in the sunlit wall as well as the ground. If we recovered detail for the high lights we checked the high noise level of the shades and your lack of information giving a grey black, enough flat.

As from true level high lights detail is suppressed giving the characteristic flat whites without information of the video.



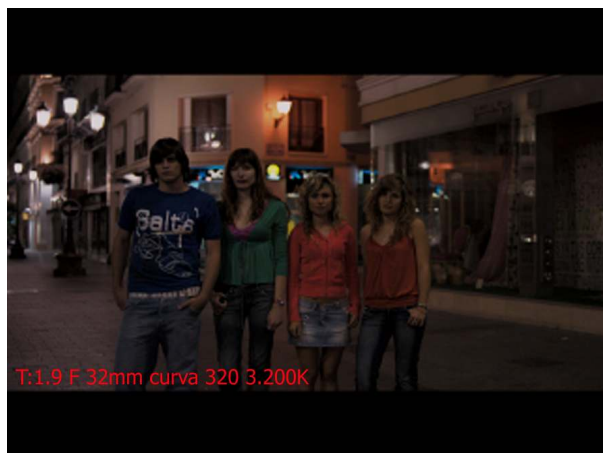
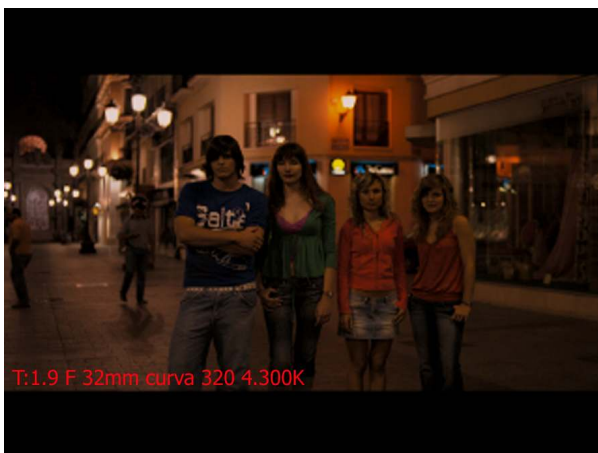


Without any illumination on the models we can appreciate that there is not detail in the arch of the background being $4 \frac{1}{2}$ stops over exposure T stop. We see in second image as detail in the arch now has recovered being $3 \frac{1}{2}$ over exposure T stop and girls are illuminated in order that there not be too much underexposed. Nevertheless the clipping of whites is still observed in some zones of the arch. We can say for it than with the camera that way configured we can have some three stops over the half exposition.

Shadows

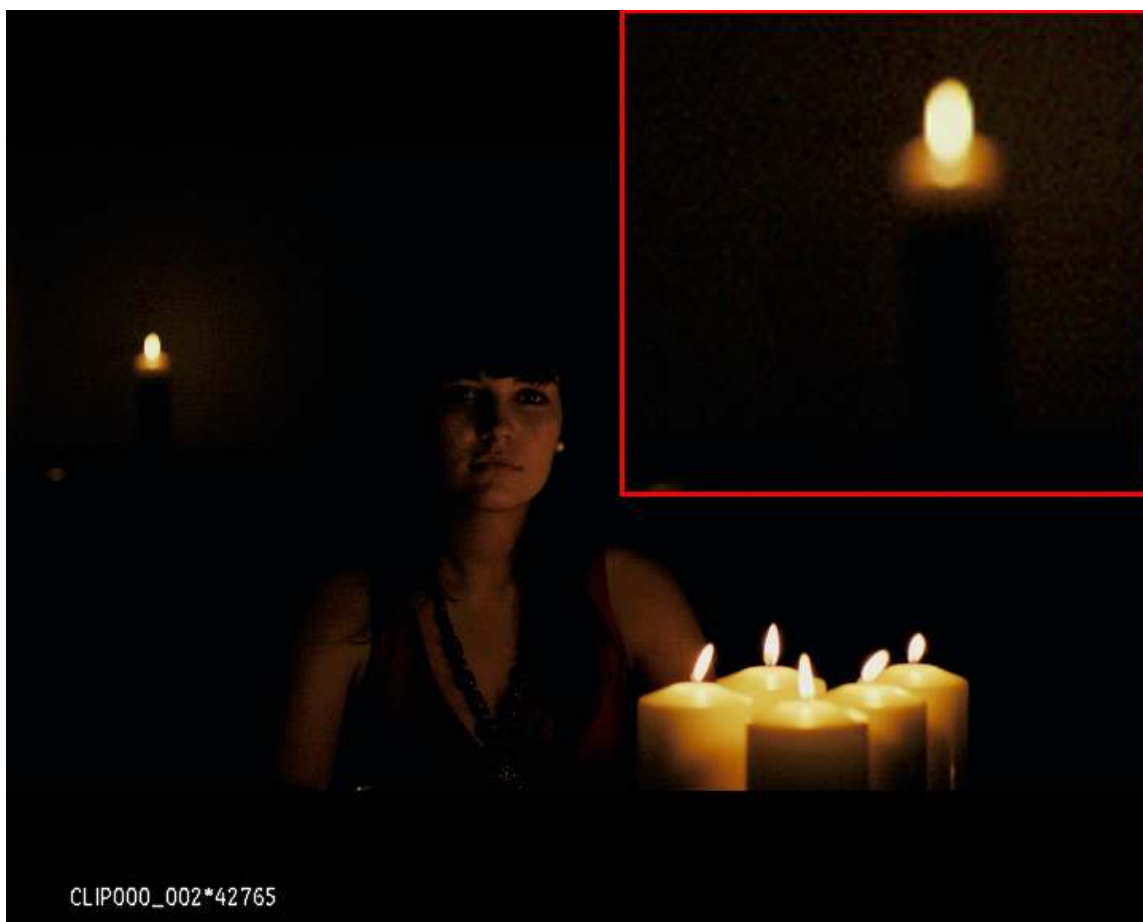


On shadows we have to indicate their greyish aspect, unnaturally, like without enough information and with noise. This noise takes place so much when we used linear curves like logarithmic. At night frames we observe this effect on the blacks that are flat. Nevertheless the camera control different light sources with different temperatures of colour very well, look at yourself in the image the mixture of lamps of Mercury with the lamps of sodium.



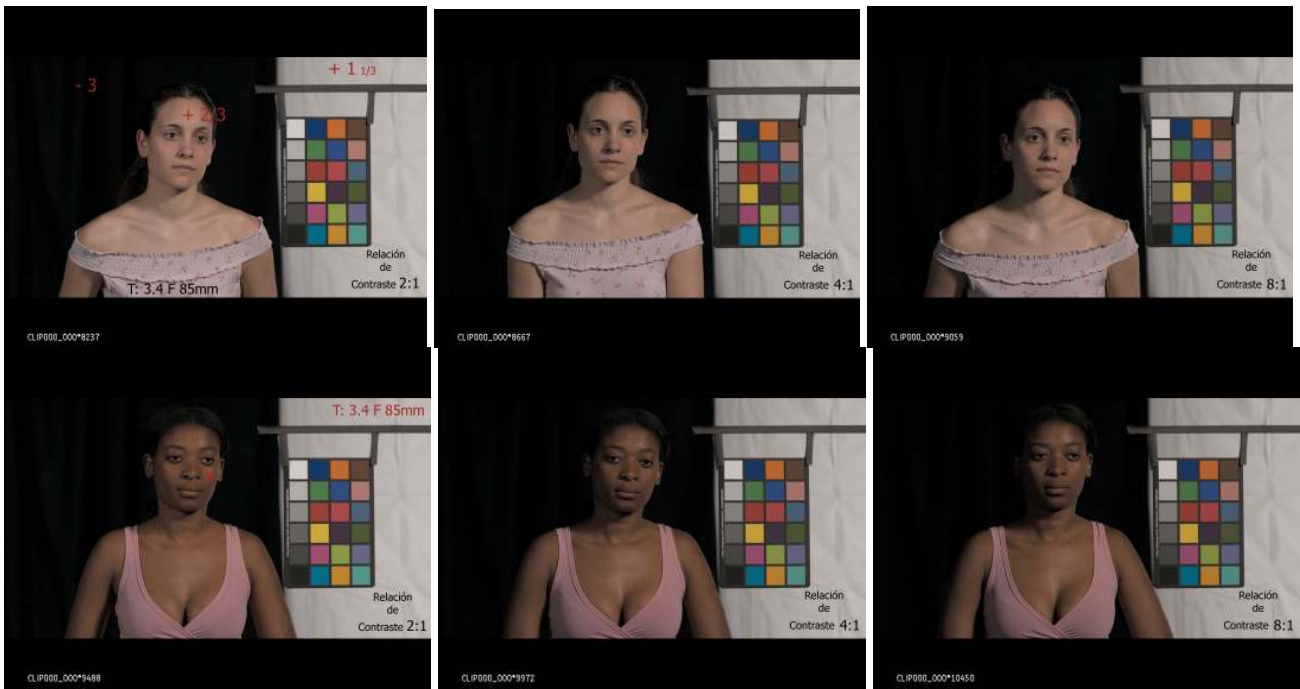


We could check the different sensibility shown by the camera in respect of 320 Asa's nominal value in this image. Equally you showed a high level of noise and in general some blacks tonelessly and greyed.

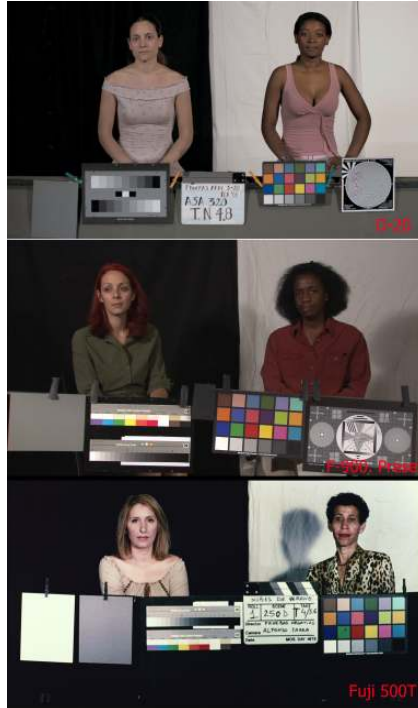
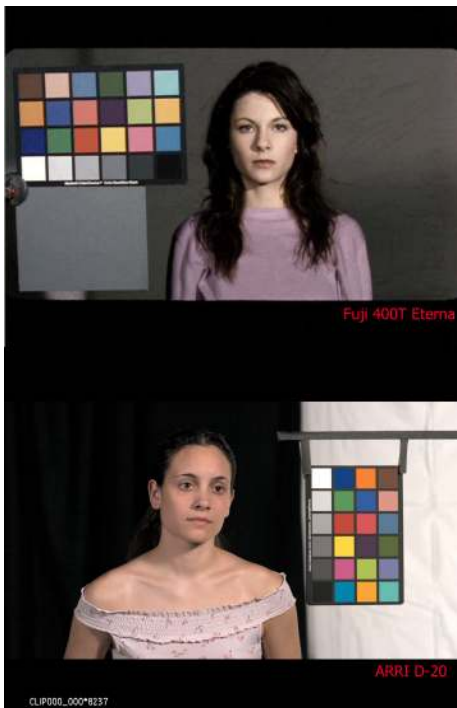


The tones of skin

You see the depth of colour incremented without a doubt when the camera works on 12 bits, although the recording is at 10 and with 4:4:4. The quality in the colour is that shows more comparing with others cameras HD generalized in the market like Sony or Panasonic. Sony, Hdcam records 8 bits and 3:1:1 in the meantime than the second best does it also to 8 bits and 4: 2: 2. Colours seem more natural with the Arri D20 and with more tones. This includes more soft tones of skin and like less "digital look" when they are exposed correctly, that is within the range that the camera can reproduce. In reality that exposition is critical because changing course lightly (over or underexposure) generates an image with grey shadows and burn white turning the hue skin something artificial, like conventional video images.



Colours in general are less saturated than the F 900 but more than the emulsion of 35mm that clearly you maintain, to be a space of different colour, different intonations of colour. The impression is the D 20 what one refers in to colour finds at an intermediate zone between the digital video with compression and the photographic emulsion.



The answer of colour of the camera as compared with Fuji's emulsion and the F900 can be observed in these freeze-frames. We can see like the hues of colour from D20 are more saturated than the ones belonging to the emulsion although less than the ones belonging to the F900. The D20 gives a tone of more natural skin and close to the 35mm avoiding those poor and copper-colored (minus colour information) tones of conventional HD.



Original frame from camera



Grading frame

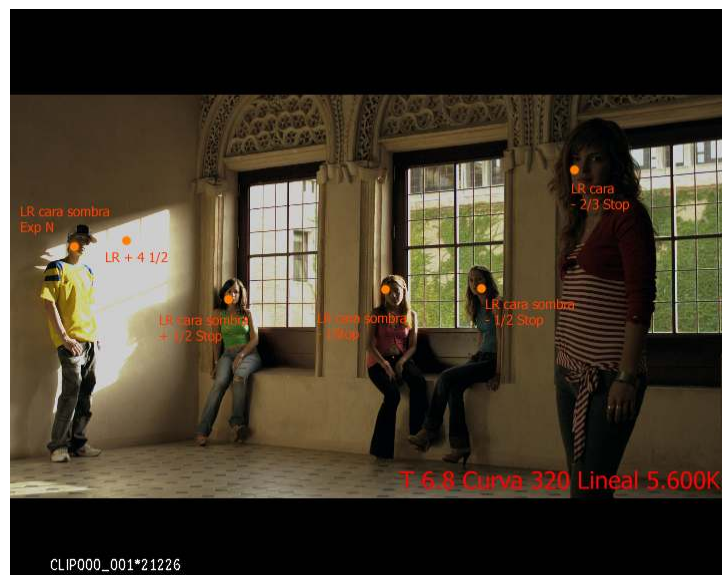
We can check the tone of skin here without and with light of filling at a natural location.



Colour in an exterior without elevated contrast.

Linear curves and log curves.

We can observe like the curve LOG C gather of more soft form the values of the high lights with over detail in front of the linear. Between C and Filmstream observes a difference in the shadows himself. Log C is lightly further soft than Film stream that has the something blacks more dark and whites a little bit more luminous. The sensation is with Log curves the distribution of the information into the curve of gamma is better than lineal curves.



Values of light in the frame for the linear and Log curves



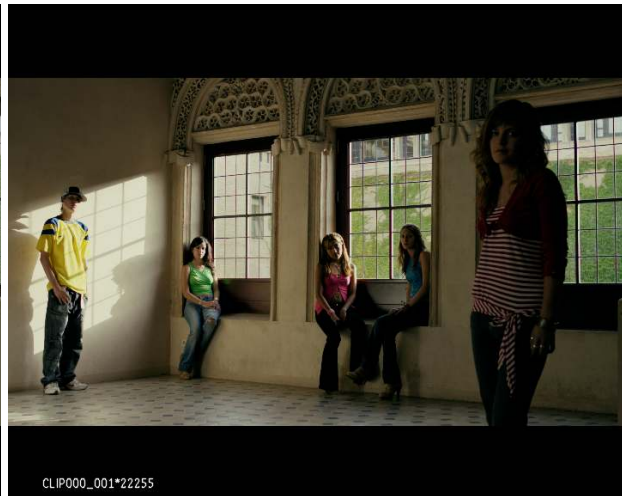
Original Frame from Camera with Lineal curve



Grading Frame.



Original Frame with LOG C



Grading Frame with Log C



Original Frame with FilmStream



Grading Frame with FilmStream curve



Depth of field

When the camera count on a sensor of the size of the S35mm, this uses the lenses of 35mm and therefore the depth of field in the images is very seemed to the one which we are accustomed in analogical, even though the loss of the focus is slightly minus soft and somewhat a little bit more "flat".



T:2 F 50mm curva 320 S.35mm. Filmm: Pola + ND6 + ND8



Conclusions:



An excellent resolution.

Natural colours and with more tones with correct exposure.

Tones of skin softer.

Depth of field like the 35mm

Optic viewfinder that you allow to see outside Of the picture.

Simple handling of the camera with All the elements of ARRI in the 35mm.



- Scarce latitude of exposition, especially in the high lights.

- A loss of detail in high lights very hard and unnaturally burn colour.

- Grey and flat shadows, with lack of information in underexposures.

- The exposition criticizes.

- Elevated noise level in the image (Specially on shadows)

- Variation of the distribution of the latitude depend on the adopted sensibility.

