Noise study on the Sony ILME-FX3 camera

By Alfonso Parra AEC, ADFC

On the occasion of the filming of the documentary *If I Tell You the Truth, I'm Lying (Colombian Cinematic Heterodoxies)*—a chronicle documenting recent discoveries about three 20th-century Colombian filmmakers—we conducted an in-depth study of the noise performance of the Sony FX3 camera. This model is widely used in both professional and independent audiovisual productions, and its prevalence stands as evidence of its technical excellence.

Adriana Bernal ADFC and Alfonso Parra AEC, ADFC, responsible for the direction and cinematography of the documentary If I Tell You the Truth, I´m Lying (Colombian Cinematic Heterodoxies) by the Fendetestas collective.

Our analysis, conducted from the perspective of the director of photography, delves into the nature of digital noise to understand how it works and to optimize its use in different visual narratives. This approach will allow us to strategically adapt the camera's performance to the creative demands of the documentary and to future projects.

The quality of digital cinematic images is closely related to noise, as it affects dynamic range, resolution, texture, and color, among other factors. In addition, it can be a relevant element in the aesthetic creation of images, contributing to the generation of atmospheres and spaces unique to the audiovisual work.

For these reasons, it is essential to have a clear understanding of how the FX3 camera handles noise: what it looks like, how much it generates, and how it changes when different camera parameters are adjusted.

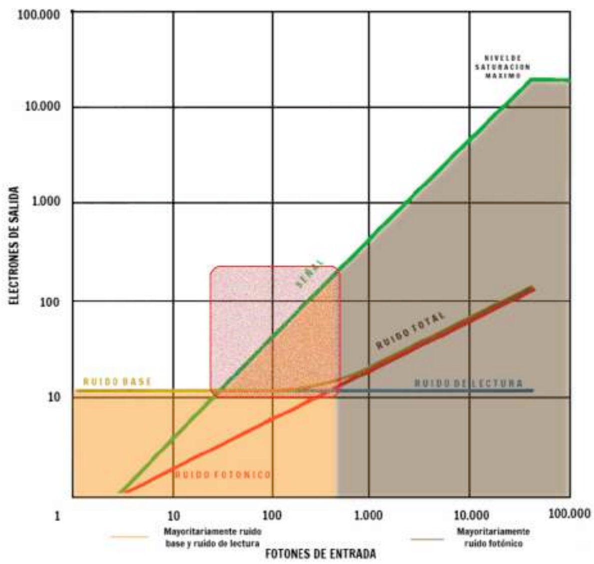


Figure 1. Version of the graph from 123 of digital imaging. https://123di.com/

Noise comes from different sources, the most relevant being photon noise and readout noise (*Figure* 1). However, other types—such as thermal noise (produced by the heating of the camera) or noise generated during quantization processes—also have an influence. Digital noise is inherent to the image creation system, and although manufacturers reduce its impact year after year, it is always present. This is particularly true in the case of photon noise, which is inherent to light itself and to the way it reaches the sensor.

To examine noise, we employed numerical comparisons supported by corresponding graphs, offering a clear visualization of its behavior. Our aim is to present this information in a precise and accessible manner, without replacing the individual testing that cinematographers may wish to conduct for their specific projects.

As in previous analyses, we began our study by evaluating the camera's base noise (dark noise), which is generated when no light reaches the sensor. To measure it, we recorded with the lens cap on and the camera completely wrapped in black cloth. We had previously configured the technical parameters: Full Frame resolution of 3840 × 2160 at 23.98 fps, with a shutter speed of 1/48, and either Cine EI mode or Flexible mode activated. The recording format was XAVC S-I 4:2:2 10-bit. The material was processed in DaVinci Resolve 20, applying the 709 LUT in ACES space.

Within this CINE mode, there are three operating variants: the first is Cine EI, followed by Cine EI Fast, and finally Flexible ISO. Both Cine EI and Cine EI Fast record exclusively at base EI values of 800 and 12800, and it is essential to understand that in both cases, the image is always recorded at the selected base EI value. Although the Fast mode allows you to adjust the EI value during recording, this modification only affects the on-screen LUT display and does not alter the recorded material.

In contrast, the Flexible ISO option actively applies the user-selected ISO value, with a range from ISO 160 to ISO 409600.

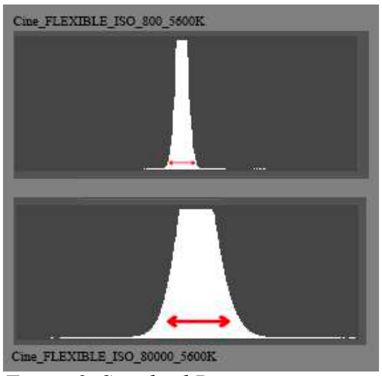


Figure 2. Standard Deviation

When processed in DaVinci Resolve Studio 20, the resulting images were, as expected, completely dark. To reveal the underlying noise, we uniformly increased exposure and contrast across all clips. It is important to emphasize that these adjustments are purely illustrative: the noise shown does not appear in this way in the original footage but is intentionally exposed through this adjustment process.

To establish a reference for base noise, we measured the standard deviation of pixel brightness in each frame (*Figure 2*). This metric reflects the amplitude of variations in light intensity, and—due to the random nature of pixel fluctuations at different EI values—the histogram forms a bell-shaped curve whose base widens as sensitivity increases. These are relative values, useful for comparing noise behavior across EI settings. We conducted tests at two color temperatures (5600 K and 3200 K), using both base EI values (800 and 12800) as well as Flexible ISO settings.

<u>Analysis of dark noise in CINE EI mode</u> at base EI 800, and 12800 at 5600K in RGBY

EI values 5600K	R	G	B	Y
800	1,95	1,15	1,37	1,08
12800	1,7	1,2	1,31	1,16

Table 1

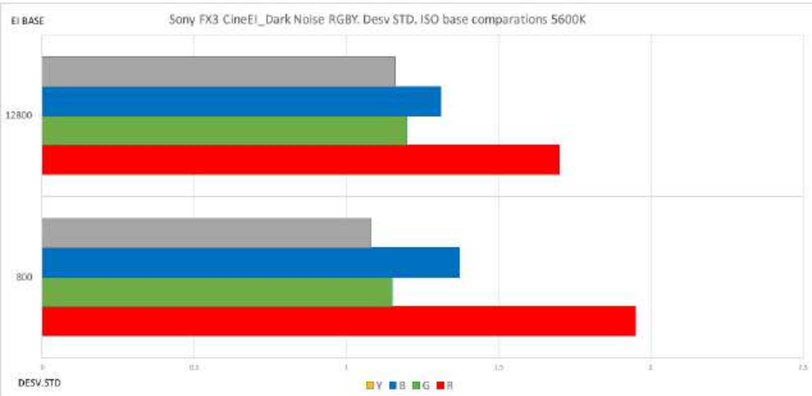


Figure 3

Table 1 and *Figure 3* present the standard deviation for both EI values. Noise levels show only slight variations between EI 800 and EI 12800, both in individual color channels and in luminance (**Y**). In **Y** (gray bar), EI 800 measures 1.08, while EI 12800 reaches 1.16—just 7.14% noisier.

The red channel (red bar) shows the largest variation, influenced by the 5600 K white balance, which boosts that channel; here, EI 12800 is 13.6% less noisy than EI 800. In the green channel, EI 800 is 4.2% less noisy, and in blue, EI 12800 has 4.4% less noise. Averaging all channels, the difference is only 2.9%, meaning that while noise changes are visually perceptible, they are negligible in practical terms.

Let's look at 3200K

EI values 3200K	R	G	B	Y
800	1,35	1,1	2,17	1,02
12800	1,3	1,15	1,73	1,11

Table 2

In **Y** (gray bar), EI 800 shows a deviation 8.4 % lower than EI 12800. At 3200K, the red channel now registers less deviation than the blue channel, reversing the pattern observed at 5600K, because the blue channel undergoes greater amplification at this color temperature. In the red channel, the values are similar, with EI 12800 being 3.7 % less noisy than EI 800. In the green channel, EI 800 records 4.4 % less noise than EI 12800, while in the blue channel the difference is more pronounced: EI 12800 is 22.5 % less noisy than EI 800. On average, the overall difference between the two base values is 6.5 % (*Table 2* and *Figure 4*).

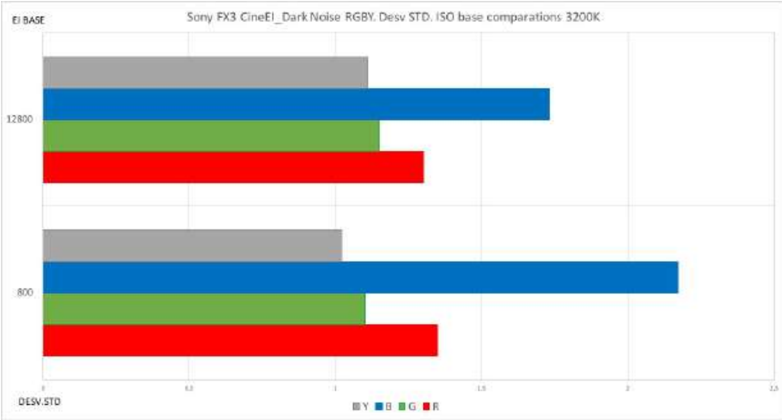


Figure 4

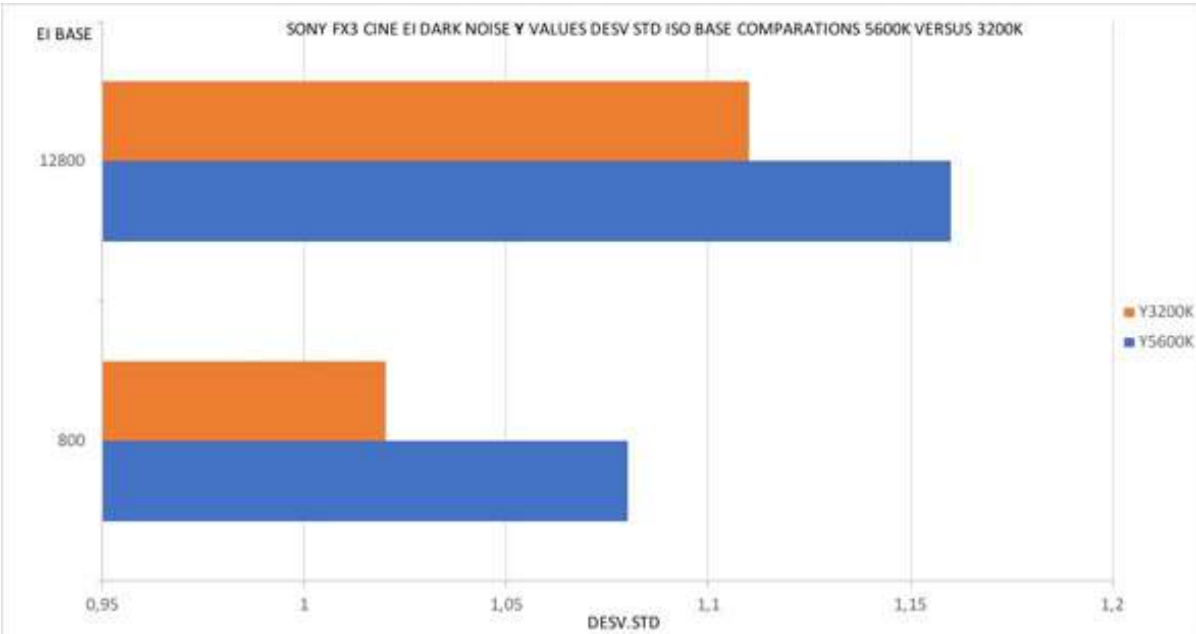


*Figure 5. **Y** deviation of the base EI at 5600K versus 3200K.*

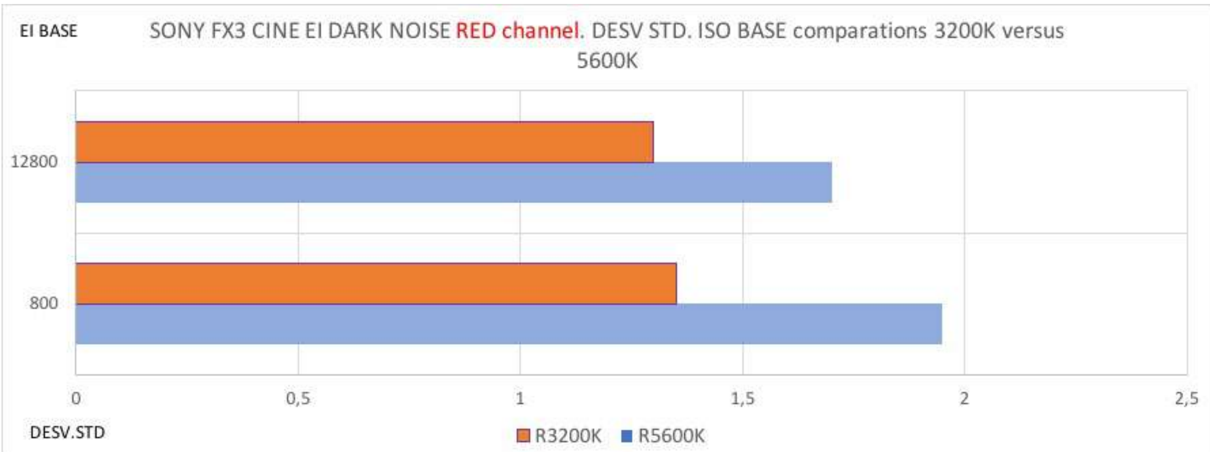


Figure 6. Deviation in R of the base EI at 5600K versus 3200K

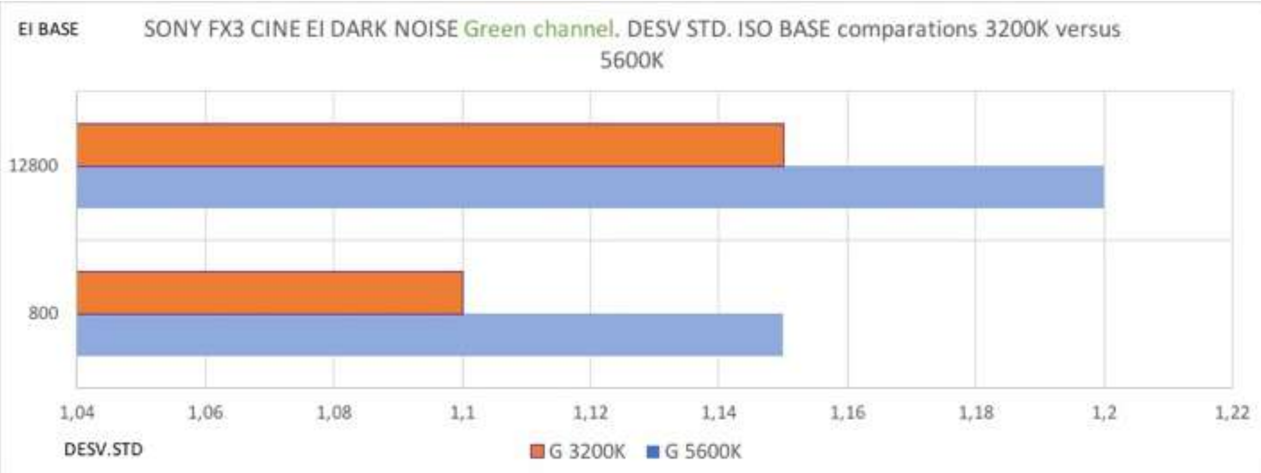


Figure 7. Deviation in G of the base EI at 5600K versus 3200K

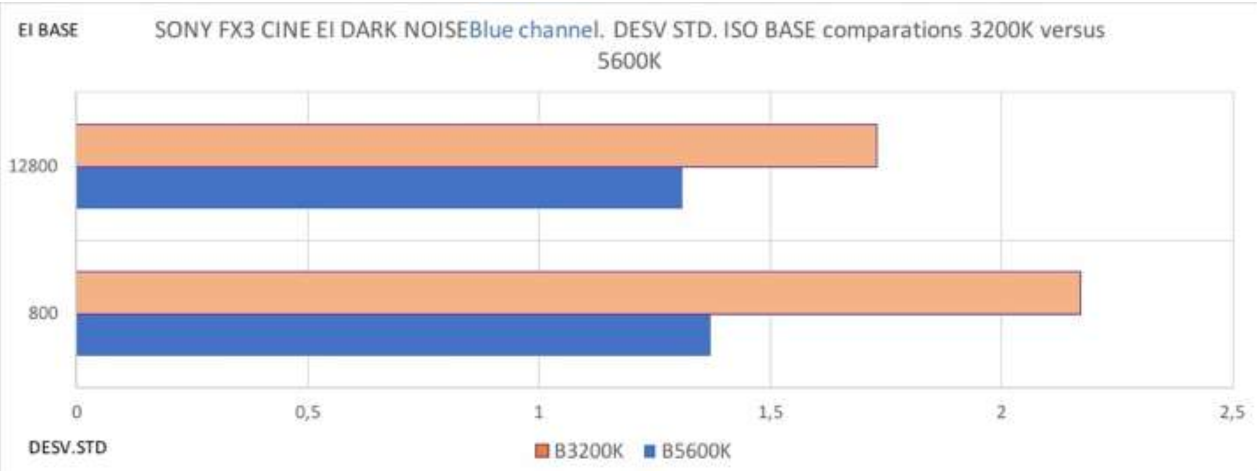


Figure 8. Deviation in B of the base EI at 5600K versus 3200K

Alfonso Parra AEC, ADFC, during the filming of the documentary. Image from the making of

In conclusion, at 3200K there is a moderate increase in base noise, primarily due to the contribution of the blue channel. As the data show, raising the EI value from 800 to 12800 does not result in a uniform increase in noise across all channels.

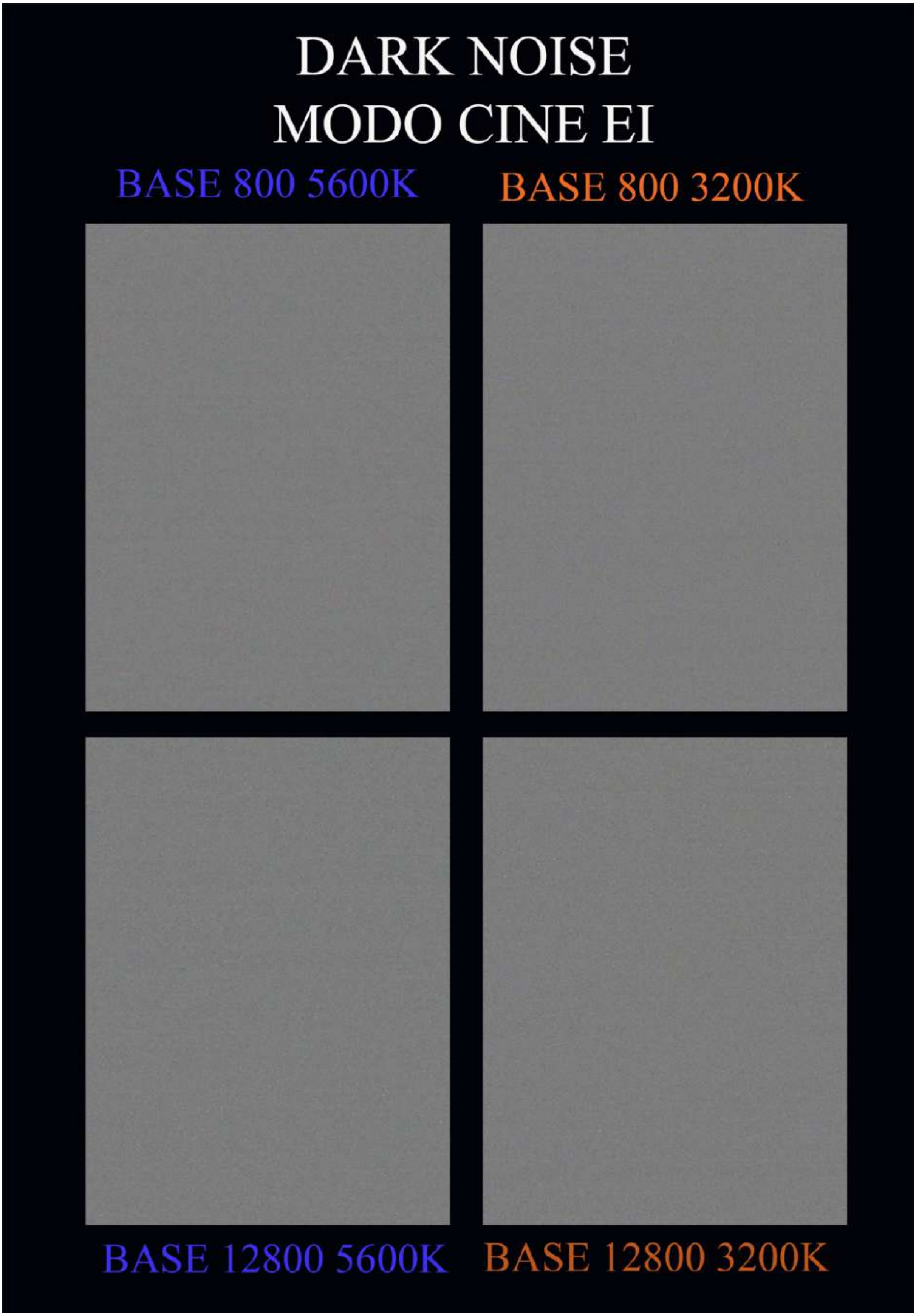


Figure 9

As shown in *Figure 9*, comparing the two base EI values (800 and 12800) at both 5600K and 3200K reveals minimal visual differences in noise, confirming our earlier observations. To detect more subtle variations, we analyzed the red and blue channels separately (*Figure 10*) using a specific visualization process: increasing contrast and enlarging the image until the differences between the two sensitivity levels became apparent.

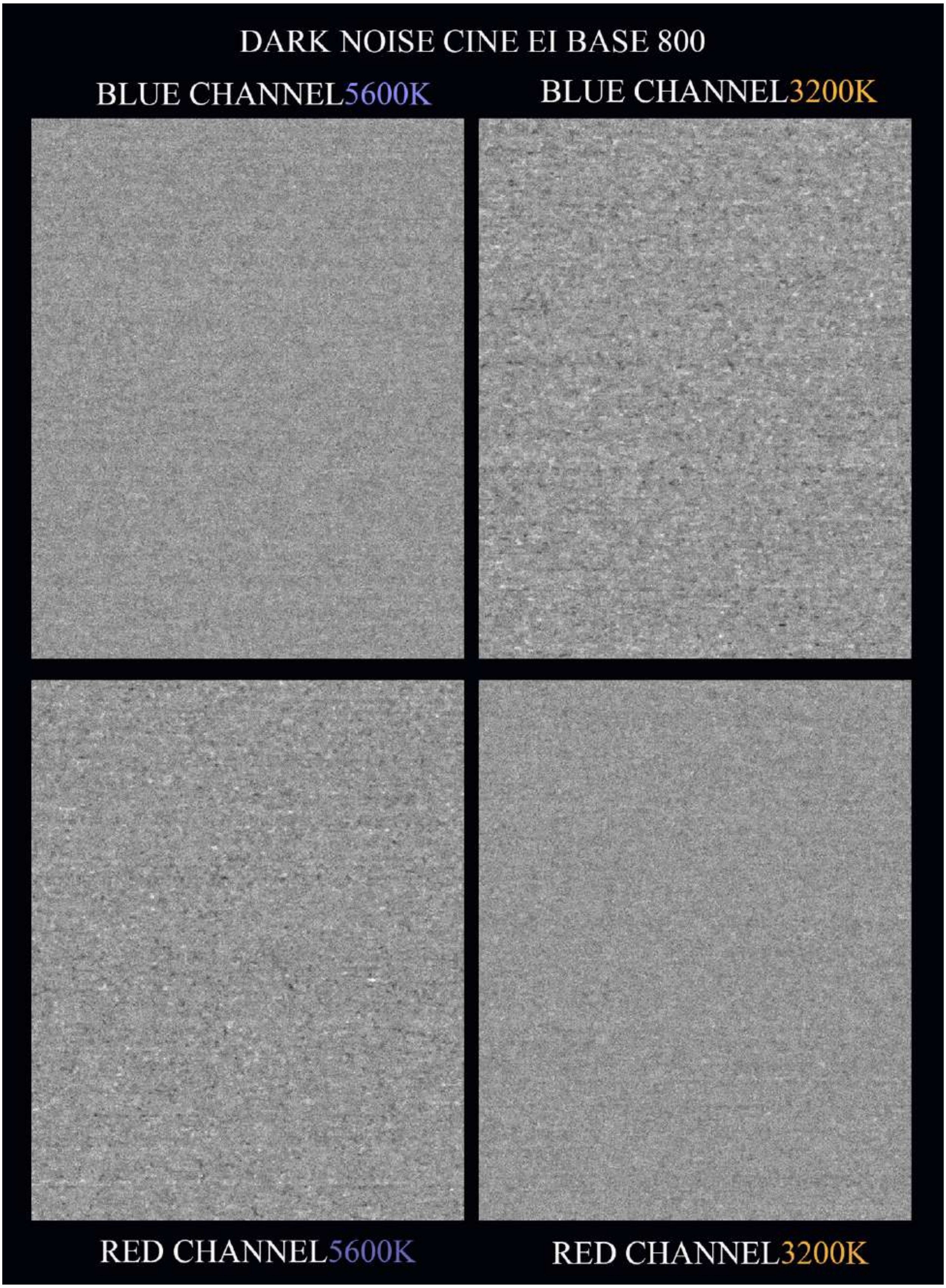


Figure 10

Indeed, the blue channel exhibits greater noise at 3200K than at 5600K, while the red channel shows the opposite pattern, with higher noise at 5600 K than at 3200K, as illustrated in the graphs above. This behavior remains consistent at an EI value of 12800 (*Figure 11*), although the effect is less pronounced than at EI 800.

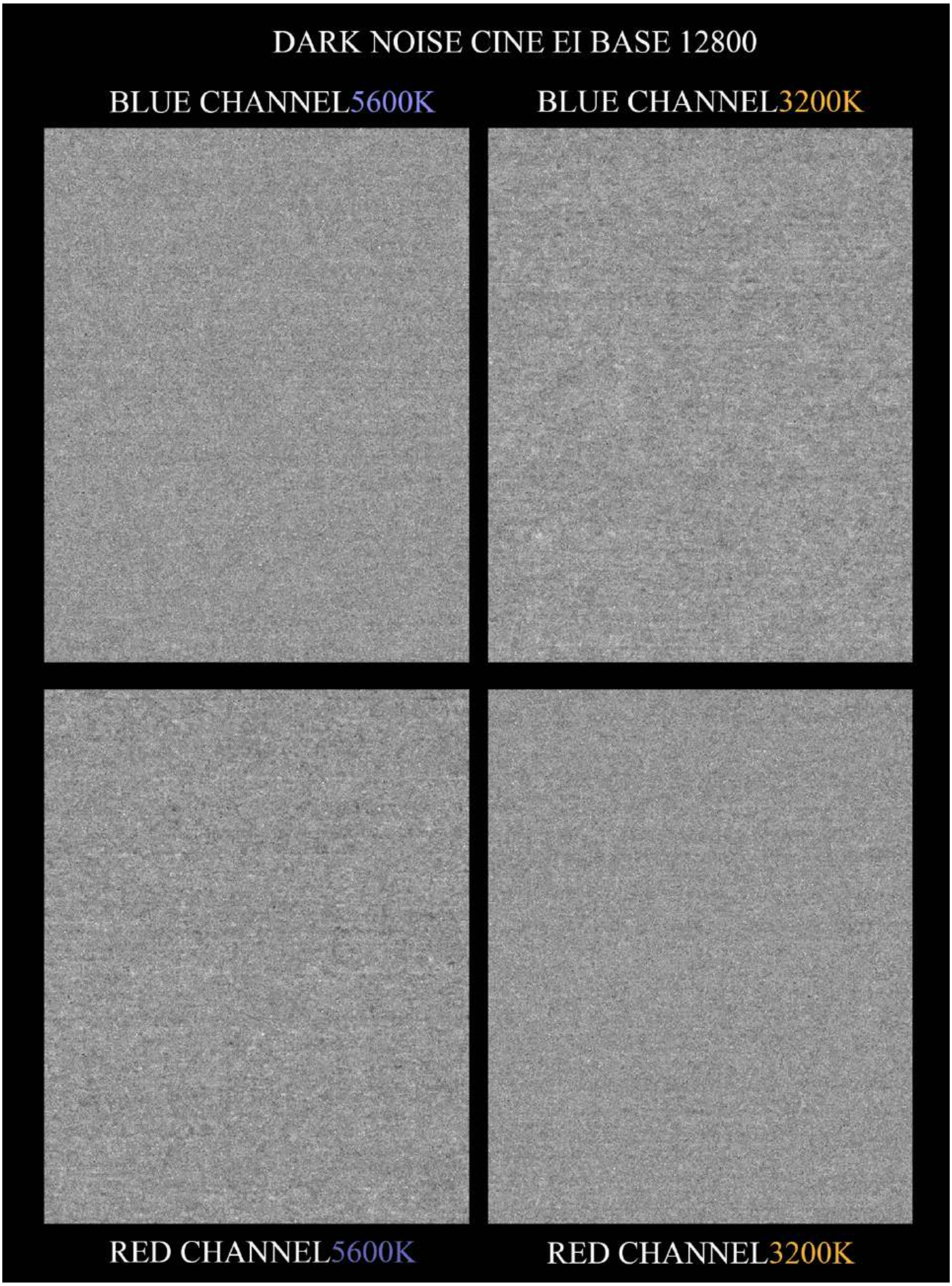


Figure 11

After a thorough analysis of the base noise, it is clear that increasing the base EI value in the Sony FX3 (from 800 to 12800) does not produce a uniform rise in noise across all channels, but instead generates differential variations primarily linked to the selected color temperature. At 3200K, the blue channel shows a markedly higher noise level (up to +22.5%), whereas at 5600K, it is the red channel that records the highest levels (+13.6%), revealing an inverse relationship between the two channels depending on white balance.

Despite these channel-specific disparities, the overall noise difference between the two EI values remains visually imperceptible under normal viewing conditions, with average variations ranging from 2.9% to 6.5%. These discrepancies become apparent only after applying targeted amplification and contrast adjustments, yet their pattern remains consistent for both EI values, as illustrated in *Figures 8 to 10.*

The determining factor in noise distribution is, therefore, the color temperature, which alters the relative amplification of each RGB channel and, in turn, redefines its contribution to total noise. Consequently, for optimal noise management, controlling white balance—especially in scenes dominated by critical channels such as blue or red—is more important than the choice of base EI value.

Photonic noise—an intrinsic property of light—remains an unavoidable factor. To quantify its impact, we evaluated a Macbeth ColorChecker chart using the Imatest software, measuring the signal-to-noise ratio (SNR) according to the formula:

$$SNR_{BW} = 20\ log_{10}\ (\frac{S_{White} - S_{BLACK}}{N_{MID}})$$

(For detailed information, see: Imatest documentation).

<u>SNR (signal-to-noise ratio) analysis in CINE EI mode,</u> with its two base EIs and two color temperatures.

SNR DB EI BASE 800	R	G	B	Y
5600K	45	48,6	47,3	49,4
3200K	45,5	48	46,1	49,1

Table 3

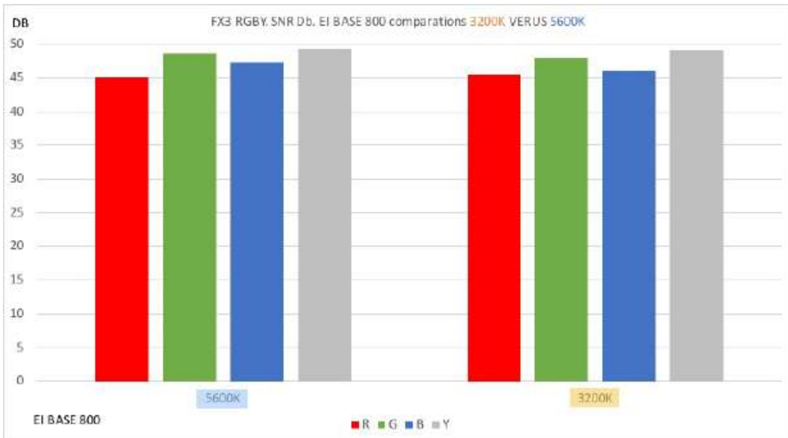


Figure 12

Table 3 and *Figure 12* show that at EI 800, the signal-to-noise ratio in both the RGB and Y channels remains remarkably consistent across the two evaluated color temperatures, with only minimal variations directly attributable to this parameter. In luminance (**Y**), SNR is 0.6 % higher at 5600K compared to 3200K, whereas the red channel exhibits the opposite trend, favoring 3200K by 1.1 %. The green channel records a modest 1.2 % increase at 5600K, and the blue channel shows the largest deviation—a 2.5% advantage also at 5600K. While subtle, these oscillations confirm that color temperature plays a measurable role in the channel-by-channel SNR response, even when the EI value remains fixed. Overall, the mean difference between the two color temperatures is just 0.69%, a value of negligible practical impact.

Adriana Bernal ADFC on the set of the documentary. Atanasio Bernal's farm.

SNR EI BASE 12800	R	G	B	Y
5600K	38,8	39,3	39,1	39,5
3200K	36,2	37,5	37,2	37,7

Table 4

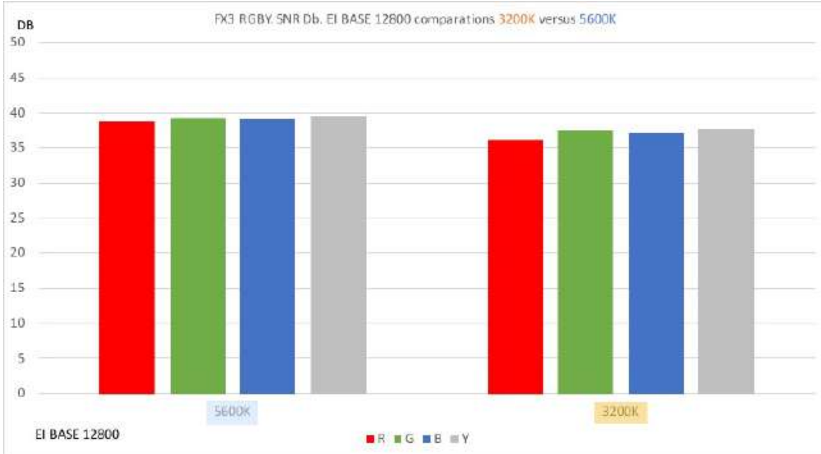


Figure 13

At the base EI of 12800, the differences between color temperatures become markedly more pronounced than at EI 800. As seen in *Table 4* and *Figure 13*, the **Y** channel delivers a 4.6 % higher SNR at 5600K, a tendency amplified in the red channel, which shows a 6.9% improvement at this same temperature. The green channel follows with a 4.6% advantage, and the blue channel records a 4.9% gain—both again in favor of 5600K. The overall average difference rises to 5.29 %, underscoring that at high sensitivity, the performance gap between the two color temperatures is substantially greater than that observed at EI 800. In contrast to the low-EI results—where SNR values were nearly equivalent—the higher EI setting consistently favors 5600K across all channels. The individual channel trends are further illustrated in *Figures 14 to 17*.

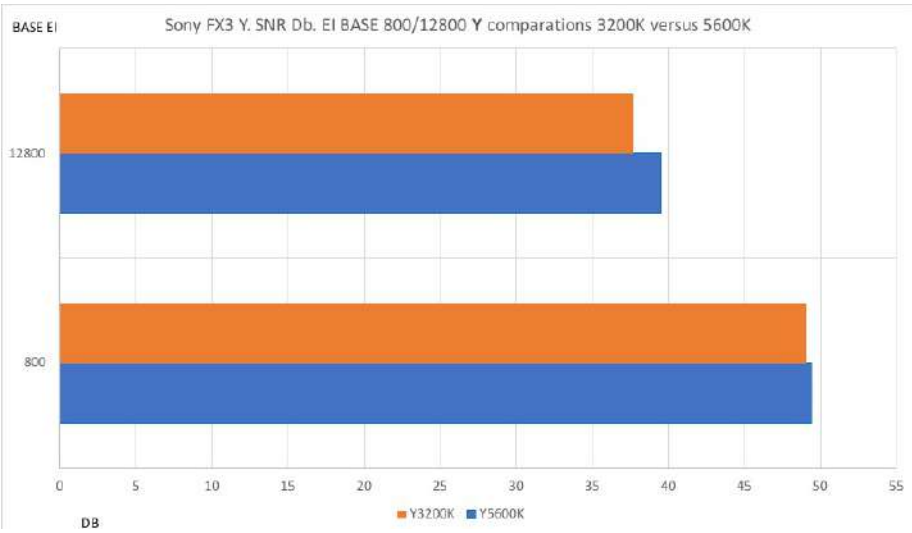


Figure 14. SNR deviation in Y of the base EI at 5600K versus 3200K.

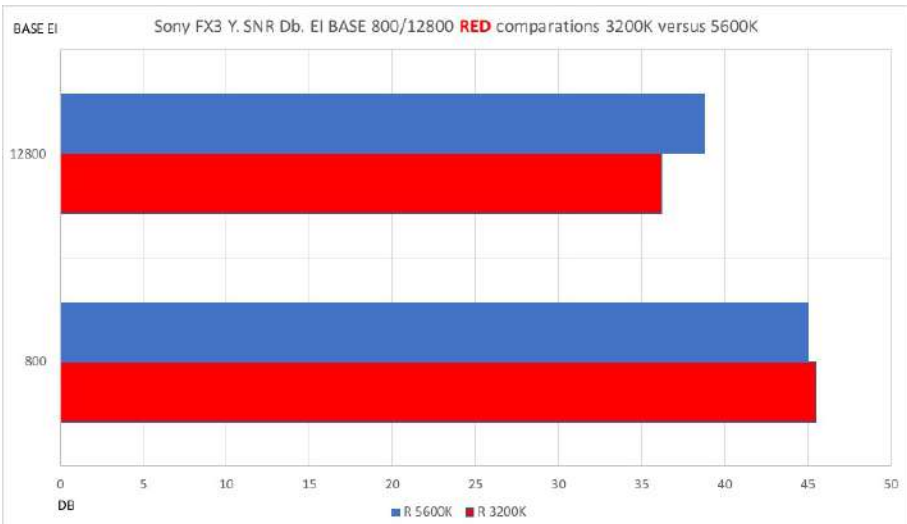


Figure 15. SNR deviation in R of the base EI at 5600K versus 3200K

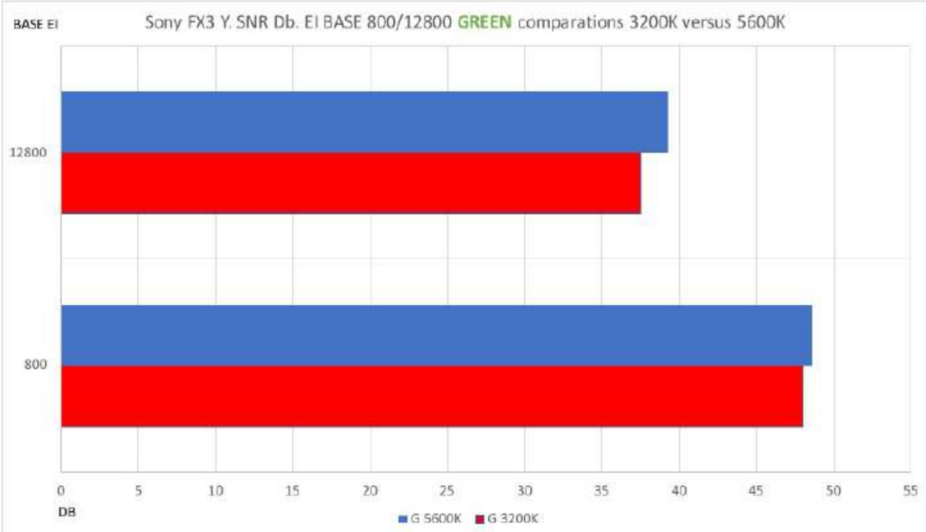


Figure 16. SNR deviation in G of the base EI at 5600K versus 3200K

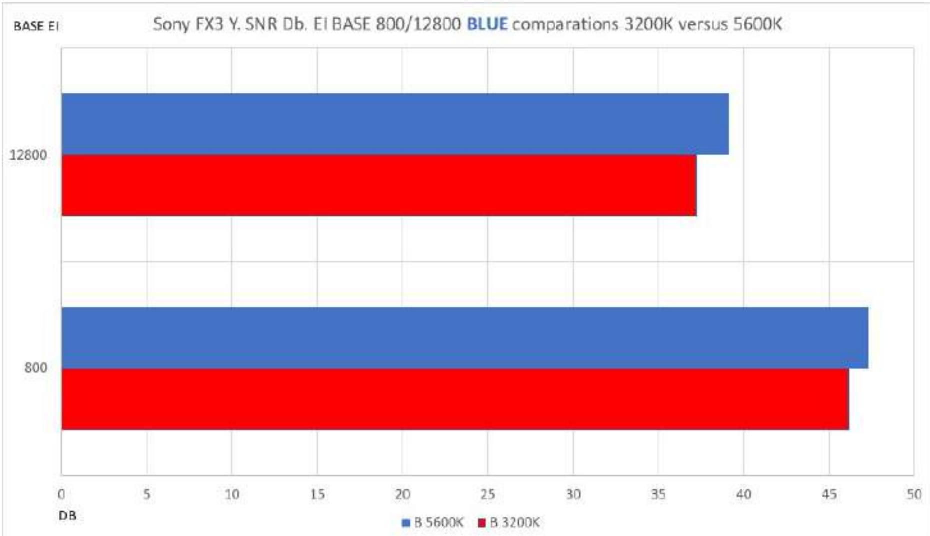


Figure 17. SNR deviation in B of the base EI at 5600K versus 3200K

Figures 18 and *19* present a cropped section of sample 22 (medium gray) from the Macbeth chart, subjected to significant enlargement and contrast adjustments to visually emphasize noise behavior under the tested conditions. These modifications are purely illustrative, intended to highlight two phenomena: (1) chroma noise variations linked to color temperature, and (2) tonal shifts associated with the chosen base EI.

At 560 K with EI 800, cold chroma noise—dominated by violet, blue, and magenta tones—prevails, whereas at EI 12800, green components become more pronounced. At 3200K with EI 800, the noise acquires a warmer profile (magenta/yellow with some green), a pattern that reverses at EI 12800, where green once again dominates the chromatic signature. This interplay between color temperature and sensitivity not only alters the magnitude of the noise, as seen in the SNR measurements, but also redefines its visual fingerprint.


Alfonso Parra AEC, ADFC, during filming at Atanasio Bernal's farm. Image from the making of.

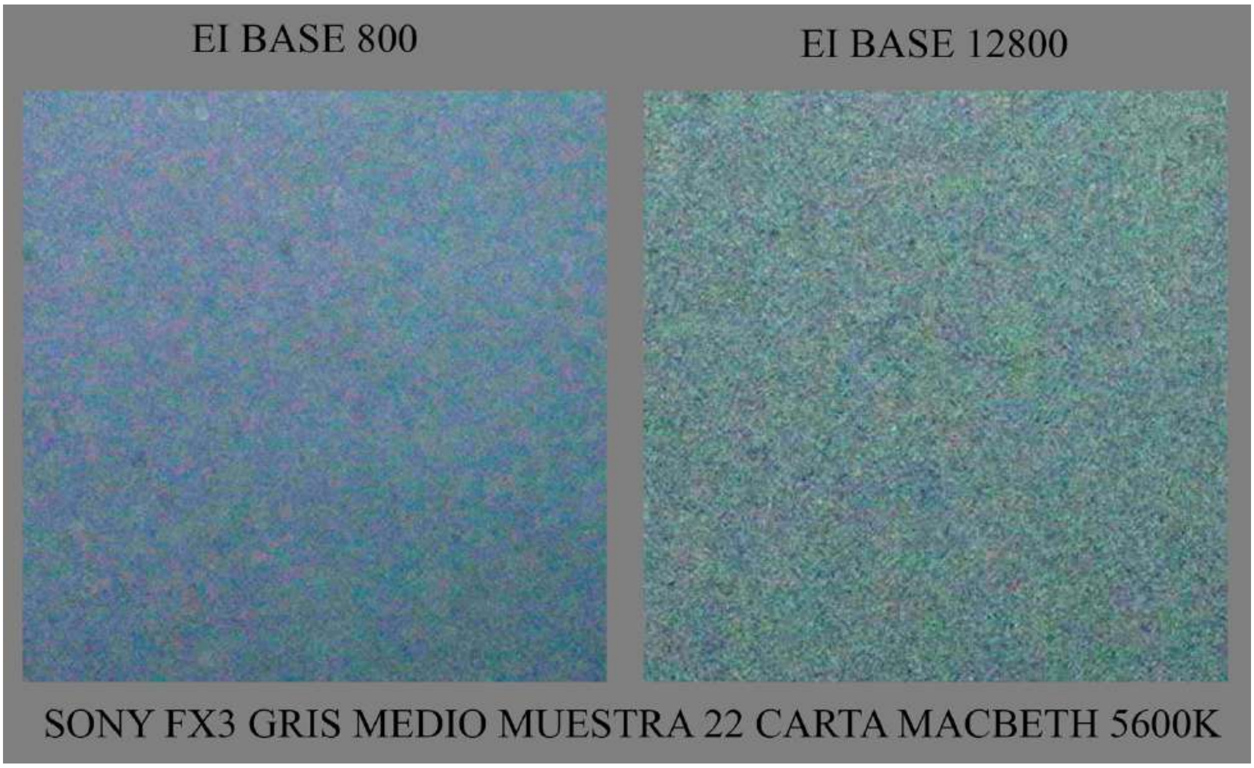


Figure 18

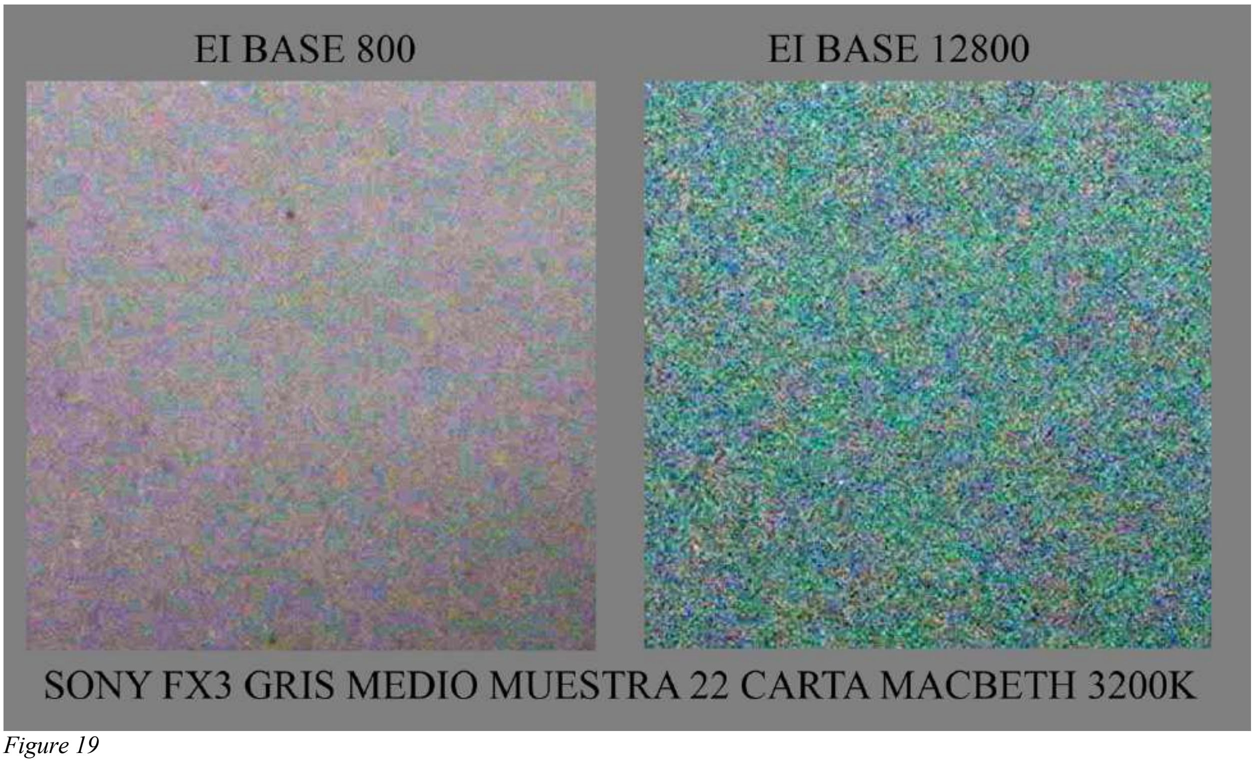


Figure 19

After an exhaustive analysis of the SNR data in CINE EI mode, it is clear that color temperature exerts a far greater influence on the signal-to-noise ratio (SNR) in the Sony FX3 than the variation between base EI values. At low sensitivity (base EI 800), differences between 3200K and 5600K are minimal, with 5600K showing a slight advantage in luminance, green, and blue channels (up to +2.5%), while 3200K offers only a marginal benefit in the red channel (+1.1%). This balance shifts dramatically at high sensitivity: at EI 12800, 5600K outperforms across all channels—gaining 4.6% in luminance, 6.9% in red, 4.6% in green, and 4.9% in blue—bringing the overall average difference to 5.29%. This confirms that the higher base EI value significantly amplifies the performance gap between color temperatures. The blue channel is the most volatile, showing large fluctuations depending on color temperature, while the red channel behaves as an inverse counterpoint.

This interplay between channels and color temperature explains why 5600K excels in high-sensitivity conditions, despite its specific disadvantage in the red channel at EI 800. Achieving an optimal SNR therefore requires adjusting both color temperature and EI in relation to the scene's dominant tonalities. Base EI alone cannot control noise effectively without considering white balance and the spectral characteristics of the lighting. These results challenge the common belief that increasing EI inevitably degrades image quality; instead, they show that, when the interaction of parameters is understood, noise can be deliberately shaped and managed.

Let us now turn to our model, *Sónya*, lit solely by candlelight, where warm wavelengths (1800–2000K) dominate over cooler tones (*Figures 20–22*).

Figure 20 FX3. CINE EI Mode Base 800 Slog3-Sg3cine. 3200k

FX3. CINE EI Mode Base 800. ACES 709. 3200k

Figure 21. FX3. CINE EI Mode Base 12.800 Slog3-SG3cine. 3200k

FX3. CINE EI Mode 12.800. ACES 709. 3200k

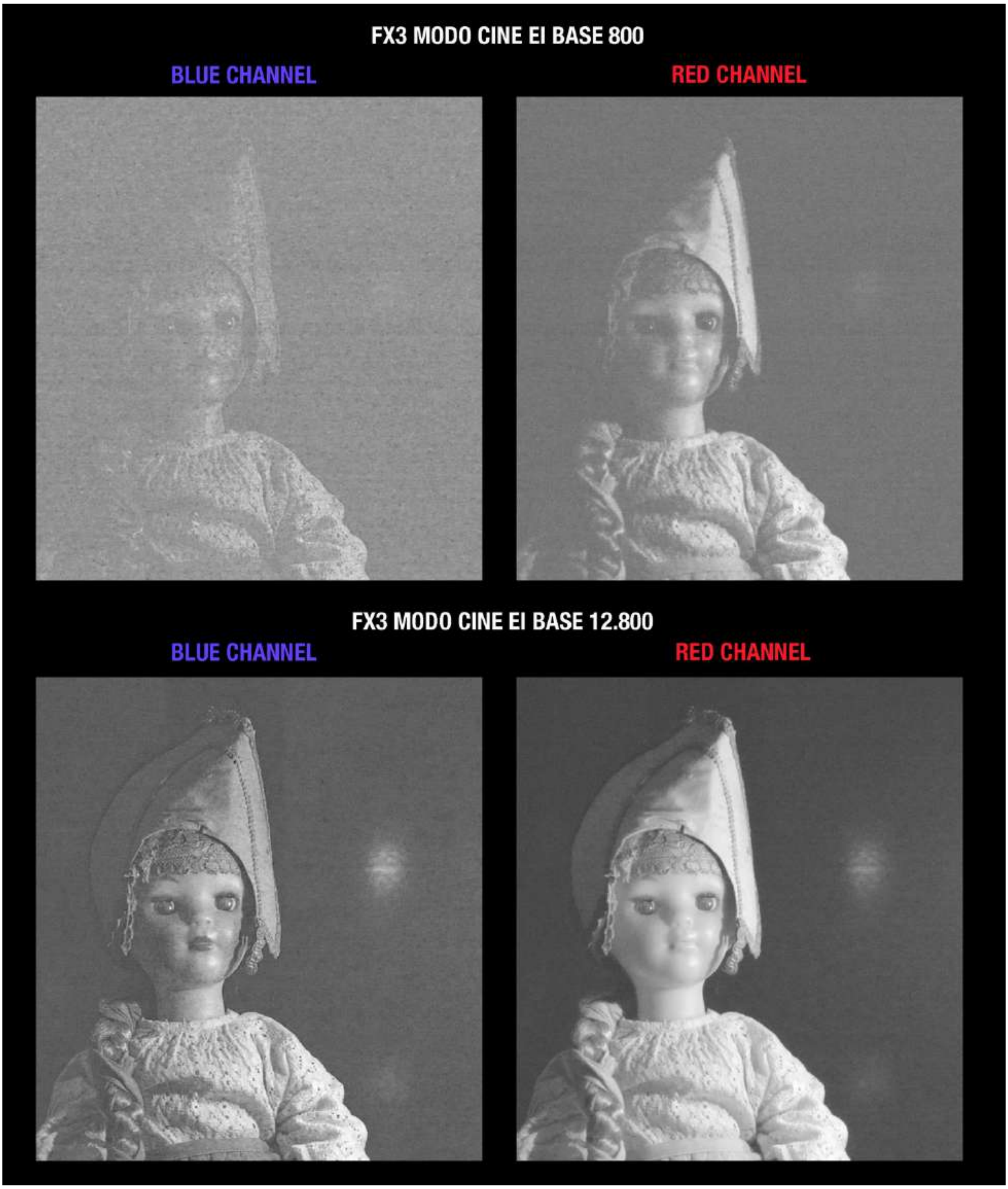


Figure 22. Blue and red channel at two EI Base in CINE EI mode. We have increased the brightness of the channels to better illustrate the differences between them.

At EI 800 in the red channel, the image appears dark, with limited shadow detail and a high noise level. The red channel is underexposed because the camera's sensitivity at this gain is insufficient to efficiently capture the warm tones emitted by the candles. At EI 12800, however, the improvement is substantial: the image is brighter, Sónya's features are better modeled, and noise is significantly reduced. This behavior confirms the advantage of Dual ISO, as the red channel operates far more efficiently at EI 12800 in warm-light environments.

In the blue channel at EI 800, noise is prominent and detail is low, as the signal is very weak due to the absence of "cool" light in the scene. At EI 12800, clarity improves slightly, but the channel still exhibits a considerable amount of noise. Even with the gain increase, the lack of blue spectral information limits performance. At EI 12800, the SNR in the red channel exceeds that of the blue channel by several dB, resulting in less visible noise. Additionally, at this same gain level, the dynamic range (DR) improves, preserving detail in both shadows and highlights—an essential factor in low-light shooting.

Analysis of dark noise in Flexible mode.

In this mode, the camera lets you set ISO values directly, without relying on a base EI. The images are therefore captured at the selected ISO. However, as we will see later, this choice influences not only image noise but also the distribution of dynamic range. We begin by examining dark noise at different ISO settings.

Let's take a look at the different ISO values at 5600K.

EI values 5600K	Red	Green	Blue	Y
160	0,6	0,35	0,43	0,33
200	0,69	0,41	0,51	0,39
250	0,83	0,49	0,63	0,47
320	0,95	0,59	0,72	0,57
400	1,16	0,7	0,87	0,68
500	1,43	0,86	1,04	0,82
640	1,72	1,05	1,25	0,98
800	1,95	1,16	1,38	1,08
1000	2,3	1,31	1,54	1,23
1250	2,89	1,58	1,8	1,52
1600	3,16	1,71	1,92	1,64
2000	3,96	1,93	2,23	1,95
2500	4,17	2,12	2,4	2,09
3200	5,19	2,49	2,8	2,49
4000	6,17	2,8	3,14	2,96
5000	7,48	3,3	3,66	3,61
6400	8,5	3,92	4,29	4,29
8000	9,41	4,33	4,69	4,8
10000	10,46	4,97	5,49	5,5

Table 5

EI values 5600K	Red	Green	Blue	Y
12800	1,72	1,22	1,31	1,18
16000	2,06	1,35	1,47	1,31
20000	2,74	1,65	1,86	1,58
25600	3,09	1,92	2,12	1,85
32000	3,67	2,33	2,53	2,24
40000	4,41	2,68	2,94	2,64
51200	5,31	3,22	3,43	3,2
64000	6,16	3,71	3,96	3,72
80000	7,39	4,41	4,71	4,45
102400	9,14	5,23	5,59	5,37
128000	9,45	6,04	6,44	6
160000	10,94	7,24	7,74	7,12
204800	12,85	8,56	9,15	8,33
256000	14,56	9,85	10,55	9,63
320000	17,07	11,29	12,29	11,1
409600	19,32	12,98	13,83	12,5

Table 6

Tables 5 and 6 present the standard deviation (noise) values in the RGBY channels at 5600K, while *Figure 23* shows these same results as a function of the EI values, plotted on a logarithmic scale along the horizontal axis, with the vertical axis remaining linear.The red channel displays the highest deviation—that is, the highest noise level—among all channels. An interesting observation emerges: the deviation drops sharply when moving from ISO 10000 to ISO 12800. For example, in the **Y** channel, noise decreases from 5.5 to 1.18—a drastic reduction, meaning ISO 10000 is 129% noisier than ISO 12800 despite being a nominally lower sensitivity setting.

The documentary clapperboard

This pattern repeats across all channels: the red channel exhibits 143% more noise at ISO 10000 than at 12800; green shows 121% more; and blue, 122.9% more. This counterintuitive result—where a higher ISO yields significantly less noise—demonstrates the effect of the Sony FX3's Dual ISO system. When operating at its second native base EI of 12800, the camera resets and optimizes the base noise floor relative to its first native base EI of 800.

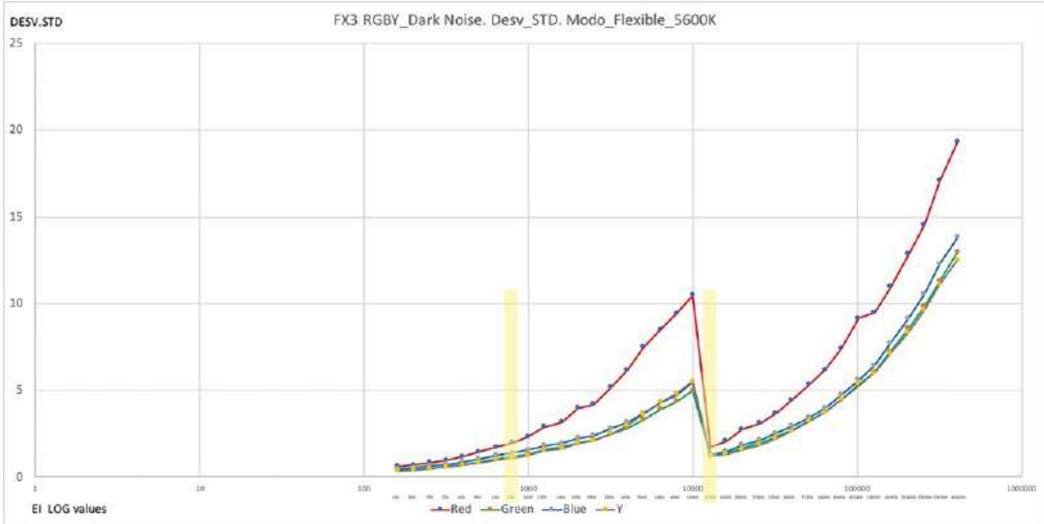


Figure 23 Noise (standard deviation) in RGBY at 5600K versus EI. Logarithmic scale (EI) on the horizontal axis and linear scale on the vertical axis.

In this regard, the base noise at ISO 12800 is only slightly higher than that at ISO 800, while the base noise at ISO 10000 is comparable to that produced at ISO 102400.

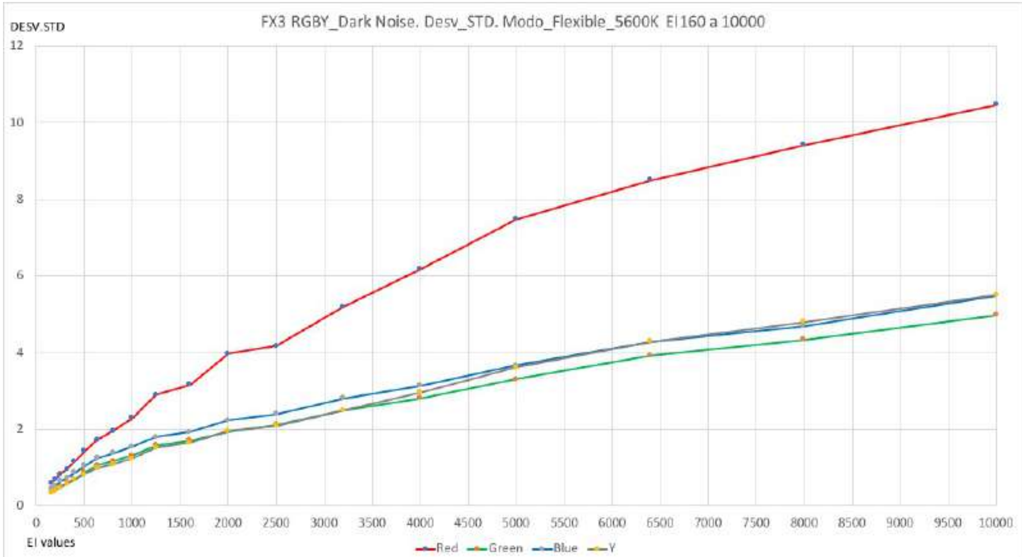


Figure 24 From ISO 160 to 10000. Linear EI and Std Dev values

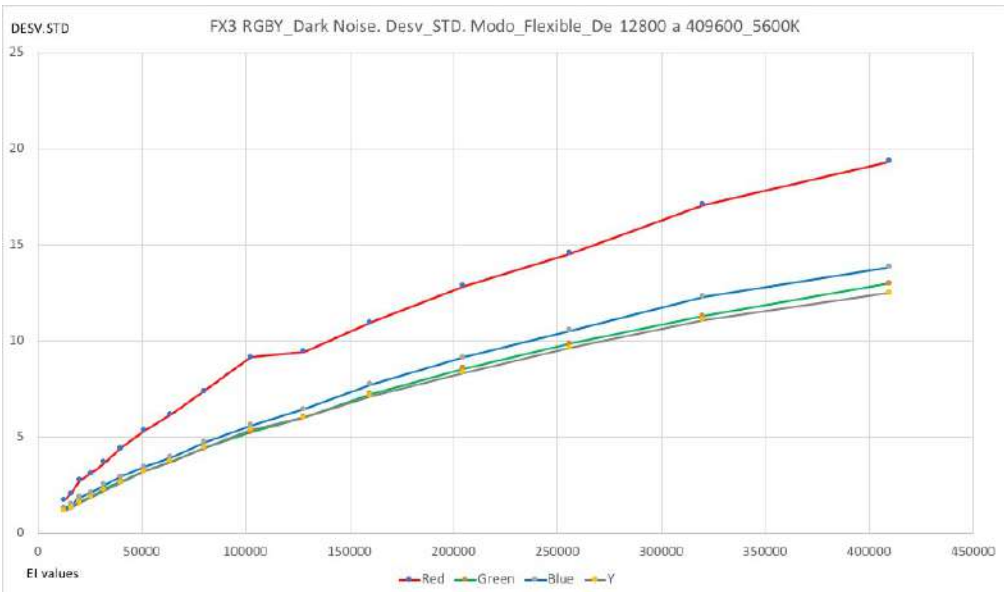


Figure 25. From ISO 12800 to 409600. Linear EI and Std Dev values

Figures 24 and 25 show the same values as in *Figure 23*, but with EI represented on a linear scale instead of a logarithmic one. This perspective confirms that the progression of base noise increase follows similar patterns when comparing ISO 160 and ISO 12800 as starting points. However, a key difference in slope emerges: from ISO 160 to ISO 10000, the increase in noise is relatively moderate, whereas on the ISO 12800 scale (*Figure 25*), the rise becomes markedly steeper beyond ISO 102400—especially in the green, blue, and Y channels.

This differential behavior illustrates how the Sony FX3's native dual-gain architecture operates in two distinct modes: the first circuit (ISO 160–10000) keeps noise growth contained, while the second circuit (ISO 12800–409600) exhibits a sharper increase in noise as sensitivity rises, particularly at the upper end of the range where base noise becomes more pronounced.

Now, we turn to the base noise at a color temperature of 3200K.

EI values 3200K	Red	Green	Blue	Y
160	0,41	0,3	0,66	0,29
200	0,48	0,38	0,75	0,35
250	0,6	0,47	0,92	0,45
320	0,68	0,57	1,07	0,55
400	0,83	0,67	1,28	0,65
500	1,02	0,82	1,57	0,78
640	1,23	1,01	1,96	0,95
800	1,37	1,1	2,18	1,03
1000	1,54	1,25	2,48	1,16
1250	1,84	1,48	3,07	1,39
1600	1,96	1,59	3,06	1,47
2000	2,33	1,75	3,49	1,63
2500	2,47	1,94	3,75	1,79
3200	2,99	2,24	4,29	2,07
4000	3,29	2,44	4,52	2,3
5000	3,9	2,77	5,08	2,69
6400	4,45	3,2	5,78	3,17
8000	5,07	3,67	6,53	3,73
10000	5,45	4,23	6,8	4,21

Table 7

EI values 3200K	Red	Green	Blue	Y
12800	1,32	1,16	1,74	1,12
16000	1,48	1,29	2,07	1,23
20000	1,89	1,56	2,8	1,47
25600	2,13	1,8	3,11	1,71
32000	2,56	2,18	3,67	2,05
40000	2,96	2,5	4,24	2,37
51200	3,43	2,98	4,87	2,83
64000	4,06	3,45	5,73	3,32
80000	4,83	4,07	6,69	3,93
102400	5,75	4,8	8	4,67
128000	6,47	5,64	9,05	5,44
160000	7,78	6,79	10,71	6,54
204800	9,45	8,08	13,18	7,84
256000	10,5	9,24	14,45	8,92
320000	11,92	10,54	16,42	10,1
409600	13,74	12,12	18,98	11,52

Table 8

At this specific color temperature, *Tables 7* and *8* show that the blue channel consistently exhibits the highest standard deviation. At the same time, a previously observed phenomenon reappears: base noise undergoes a sharp reduction when moving from ISO 10000 to ISO 12800—a behavior whose intensity varies by channel. In luminance (**Y**), for example, the deviation drops from 4.21 to just 1.12.

Figure 26 (with EI values plotted on a logarithmic scale along the horizontal axis and a linear scale on the vertical axis) not only corroborates the magnitude of this discontinuity, but also evidences the efficiency of the Sony FX3's second native gain circuit, which is activated at ISO 12800. At this point, the camera achieves a substantial optimization of base noise compared to lower values that operate outside its optimal base range.

The agreement between the numerical data and its graphical representation highlights a key operational principle: to minimize base noise—whether at 3200K or 5600K—Flexible ISO at 12800 is consistently preferable to ISO 10000. In this configuration, base noise is reduced by 114% to 122% across all channels, with a particularly strong benefit in the blue and red channels, where the dual-native ISO architecture delivers its maximum gain efficiency. Moreover, values up to ISO 80000 remain preferable to ISO 10000, as base noise stays lower throughout this range.

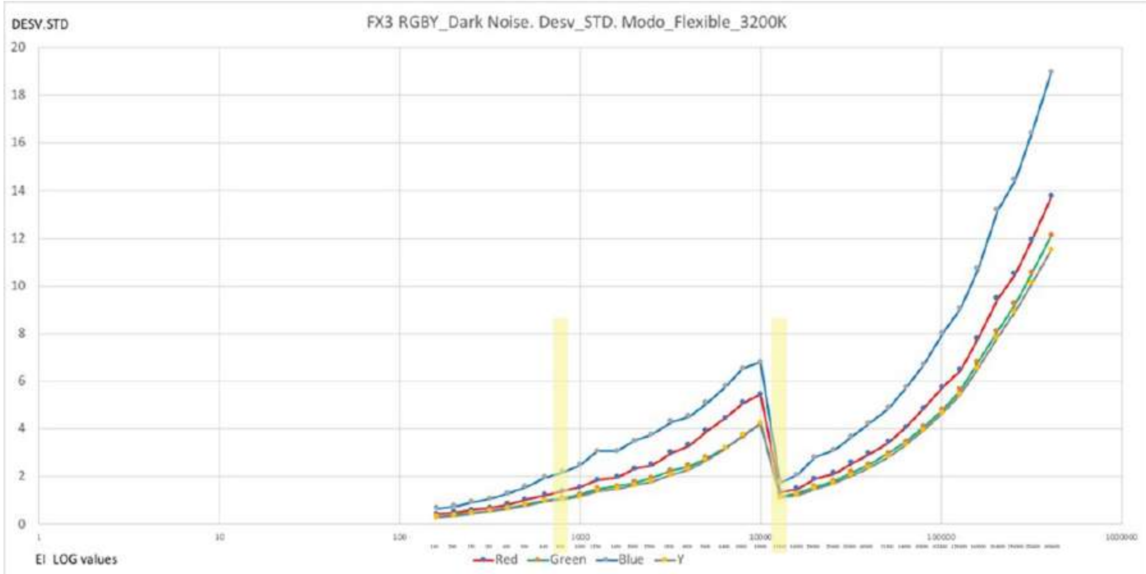


Figure 26. Noise (standard deviation) in RGBY at 5600K versus EI. Logarithmic scale (EI) on the horizontal axis and linear scale on the vertical axis.

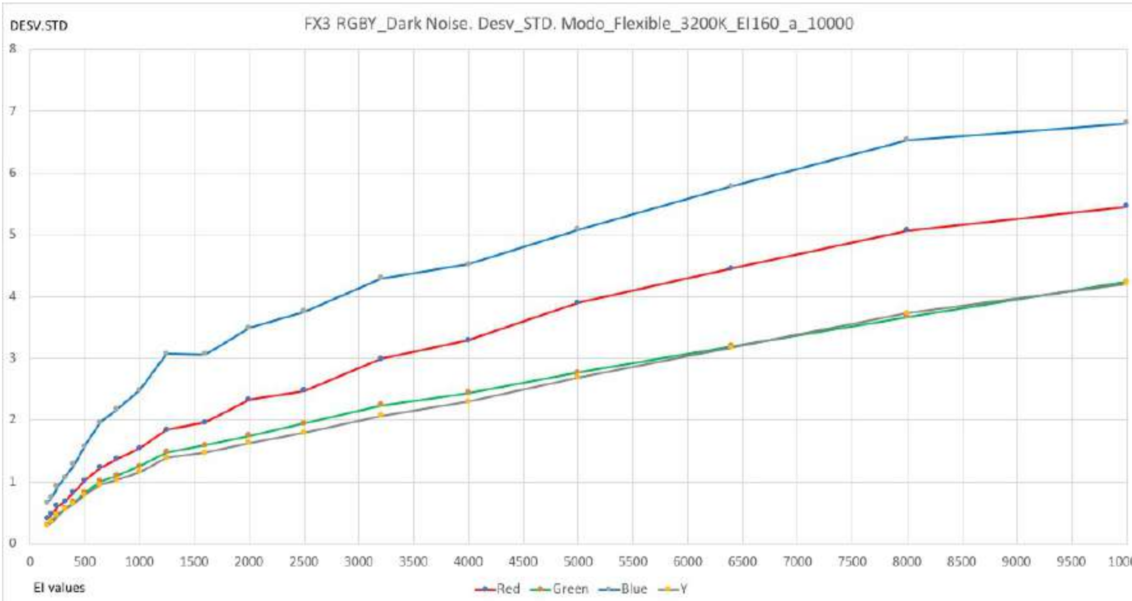


Figure 27. From ISO 160 to 10000. Linear EI and Std Dev values

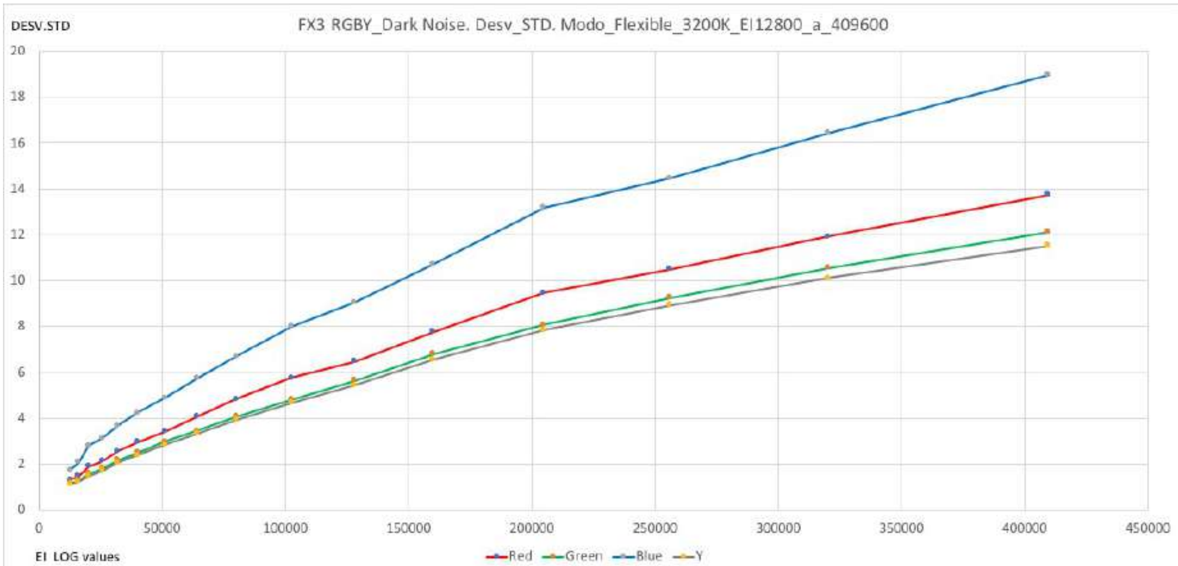


Figure 28. From ISO 12800 to 409600. Linear EI and Std Dev values

Figures 27 and 28 present the same noise data as *Figure 26*, but with both axes plotted on a linear scale instead of logarithmic EI values, allowing key patterns to be confirmed: the blue channel shows a significantly greater increase in noise (with a steeper curve slope) between ISO 320 and 4000 than in the same range starting from ISO 12800, evidencing a stronger variation at mid sensitivities. This behavior is also observed in the red channel, although with less intensity. The green channel and luminance (**Y**), in turn, maintain similar slopes up to ISO 3200, but beyond this point the slope increases relative to the curves originating from ISO 12800.

This divergence underscores two operational principles. First, medium ISO ranges (400–6400) produce more pronounced noise progression, particularly in the blue and red channels. Second, shifting directly to ISO 12800 not only delivers the previously demonstrated sharp reduction in base noise, but also yields a more moderate noise progression across higher ISO settings—the gentler slope reflecting the efficiency of the FX3's second native gain circuit (Dual ISO).

A direct comparison of the red and blue channels between the two color temperatures is presented below.

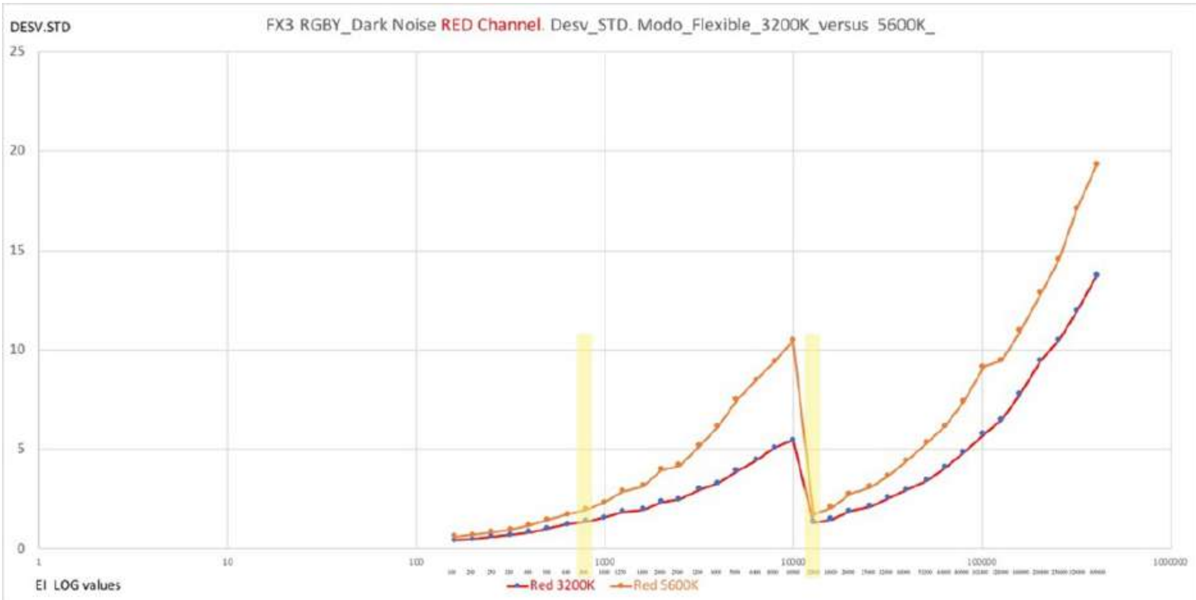


Figure 29. Comparison in the red channel (R) of the different ISO values at the two color temperatures, 5600K and 3200K. Logarithmic scale (EI) on the horizontal axis and linear scale on the vertical axis.

Figure 29 presents the noise behavior of the camera's red channel under two color temperature settings—3200K and 5600K—in flexible mode, with ISO values represented logarithmically on the horizontal axis and the vertical axis indicating the standard deviation of noise (Std Dev), a direct measure of noise magnitude.

Behind the scenes of the documentary If I Tell You the Truth, I'm Lying (Colombian Cinematic Heterodoxies).

The data confirm the expected trend: in both cases, noise levels increase with ISO sensitivity. However, a clear divergence emerges between the two white balance settings. Across almost the entire sensitivity range, the 5600K curve (orange) lies above the 3200K curve (blue), with the difference becoming especially pronounced from ISO 2000 onwards. This indicates that, under daylight conditions (5600K), the red channel is more affected by noise growth.

From a practical standpoint, this behavior is relevant: the lower noise level of the red channel at 3200K can help preserve the richness of warm tones, particularly in tungsten-controlled environments. Conversely, at 5600K—typical daylight—the red channel requires greater digital amplification to match the other channels, which explains its relatively higher noise level.

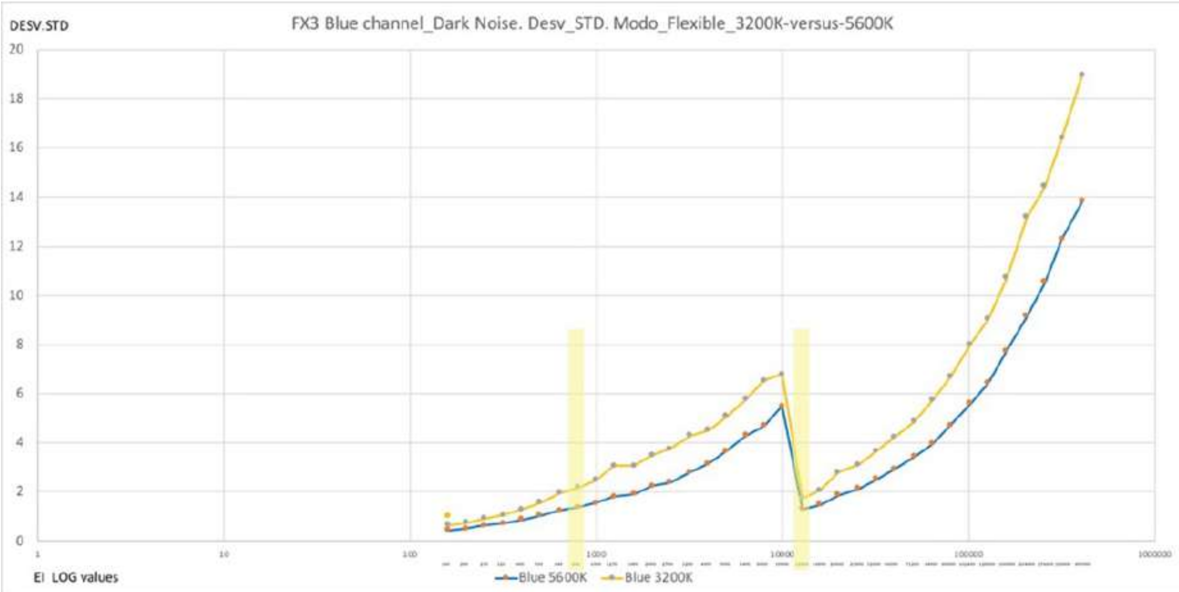


Figure 30. Comparison in the Blue channel (B) of the different ISO values at the two color temperatures, 5600K and 3200K. Logarithmic scale (EI) on the horizontal axis and linear scale on the vertical axis.

Figure 30 provides a comparative view of the base noise behavior in the blue channel of the Sony FX3 when working with two different color temperatures: 3200K and 5600K. As in the previous graph for the red channel, the horizontal axis represents sensitivity values (ISO) on a logarithmic scale, while the vertical axis shows the linear standard deviation of noise (Std Dev), that is, the amount of fluctuations or base noise present in the blue channel.

As expected, noise levels rise progressively with increasing ISO, consistent with the general behavior of digital sensors. However, the blue channel displays a pattern opposite to that observed in the red channel.The yellow curve, corresponding to 3200K, consistently registers higher base noise than the blue curve for 5600K across the entire sensitivity range, with the gap widening at higher ISO values.

From a technical perspective, this is logical: under warm lighting such as 3200K, the blue channel receives less native light energy and therefore requires greater digital gain to balance with the other channels. This extra amplification inherently increases the channel's base noise.

Setup for filming the tests of the unexposed film stock found in the old house of Atanasio Bernal (1915–1997).
Image from the documentary shot with the FX3.

As in the previous graph, a clear discontinuity appears around ISO 12800, where both curves drop sharply before rising again. This point corresponds to a change in the camera's base ISO, a characteristic feature of sensors with dual native ISO architecture, such as the FX3. This transition reflects a shift in the sensor's internal processing, which directly influences the amount of perceived noise.

Notably, the blue channel exhibits the opposite trend to the red channel: while 3200K produced lower noise in the red channel, 5600K proves more favorable for minimizing noise in the blue channel.

In summary, comparing the red and blue channels of the Sony FX3—both evaluated under dark noise conditions in flexible mode at two different color temperatures (3200K and 5600K)—reveals significant differences, highlighting the sensor's uneven color sensitivity to varying light spectra.

The red channel performs better under warm light (3200K), showing lower noise across most of the ISO range because tungsten lighting contains more red energy, requiring less channel gain. By contrast, at 5600K (daylight) the red channel needs greater compensation, which increases noise—especially at medium and higher ISOs.

The blue channel behaves oppositely: it is cleaner at 5600K, where the light supplies more blue energy and less digital gain is required; at 3200K the blue content is lower, so digital amplification increases its noise.

Both channels display a pronounced discontinuity around ISO 12800, corresponding to the sensor's dual-native ISO transition. This shift alters internal processing and affects perceived noise in both channels, though not identically in magnitude.

Alfonso Parra AEC, ADFC during the shooting of the feature-length documentary with the Sony FX3 camera.

Overall, these results underscore that color temperature differentially impacts each RGB channel according to the light's spectral distribution and the sensor architecture; therefore, effective noise management requires coordinating white balance with ISO selection rather than relying on base EI alone.

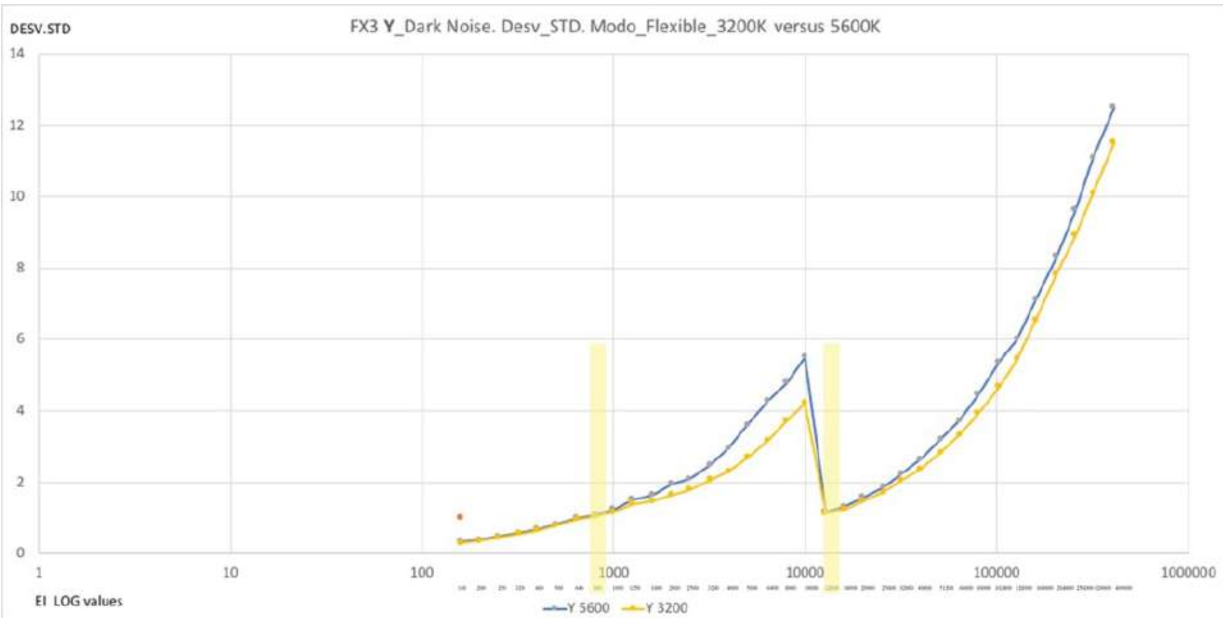


Figure 31. Comparison in Y of the different ISO values at the two color temperatures, 5600K and 3200K. Logarithmic scale (EI) on the horizontal axis and linear scale on the vertical axis.

Figure 31 analyzes the behavior of noise in luminance (**Y**), which represents a weighted sum of the three color channels and defines the image's perceived brightness. This component is critical because the human visual system is more sensitive to luminance variations than to chrominance, and the most visually distracting noise typically manifests here.

The curves for 3200K (yellow) and 5600K (blue) reveal a consistent trend: as ISO increases, the standard deviation of base noise rises steadily, except for a marked drop near ISO 12800—corresponding to the camera's native ISO—previously observed in the red and blue channels.

Unlike these chromatic channels, luminance shows more subtle differences between the two color temperatures. Up to around ISO 2500, the 3200K and 5600K curves are virtually identical. Beyond this point, noise at 5600K begins to exceed that at 3200K, and the gap widens progressively with ISO. In this range, luminance at 5600 K displays higher standard deviation, implying a stronger perception of grain or fluctuation.

This behavior is consistent with the patterns observed in the individual channels. Since **Y** is a weighted combination of the three RGB channels—with greater emphasis on green, but also contributions from red and blue—it is expected that the cumulative differences in the red channel (noisier at 5600K) and the blue channel (noisier at 3200K) would average out in the Y channel. The result is a slight overall increase in noise under daylight conditions (5600K).

Figure 32 further illustrates this by showing the dark noise patterns at 5600K for each ISO setting. These samples—cropped images captured in total darkness following the initial methodology—enable the evaluation of the noise's density, distribution, and chromatic characteristics. It is important to note that extreme exposure and contrast adjustments were applied for visualization purposes; the images are intended for illustrative reference only.

Dark noise remains almost imperceptible up to ISO 400, with faint chromatic fluctuations appearing from ISO 500 onward, still yielding an acceptably clean image. At ISO 800–1000, noise texture becomes visible and chromatic noise emerges, though still within tolerable limits. At mid-range ISO values, pronounced RGB noise in reddish and magenta tones appears, consistent with the increased red-channel activity observed earlier. At ISO 3200–4000, noise becomes denser and more randomly distributed, with a multicolored character in which red predominates.

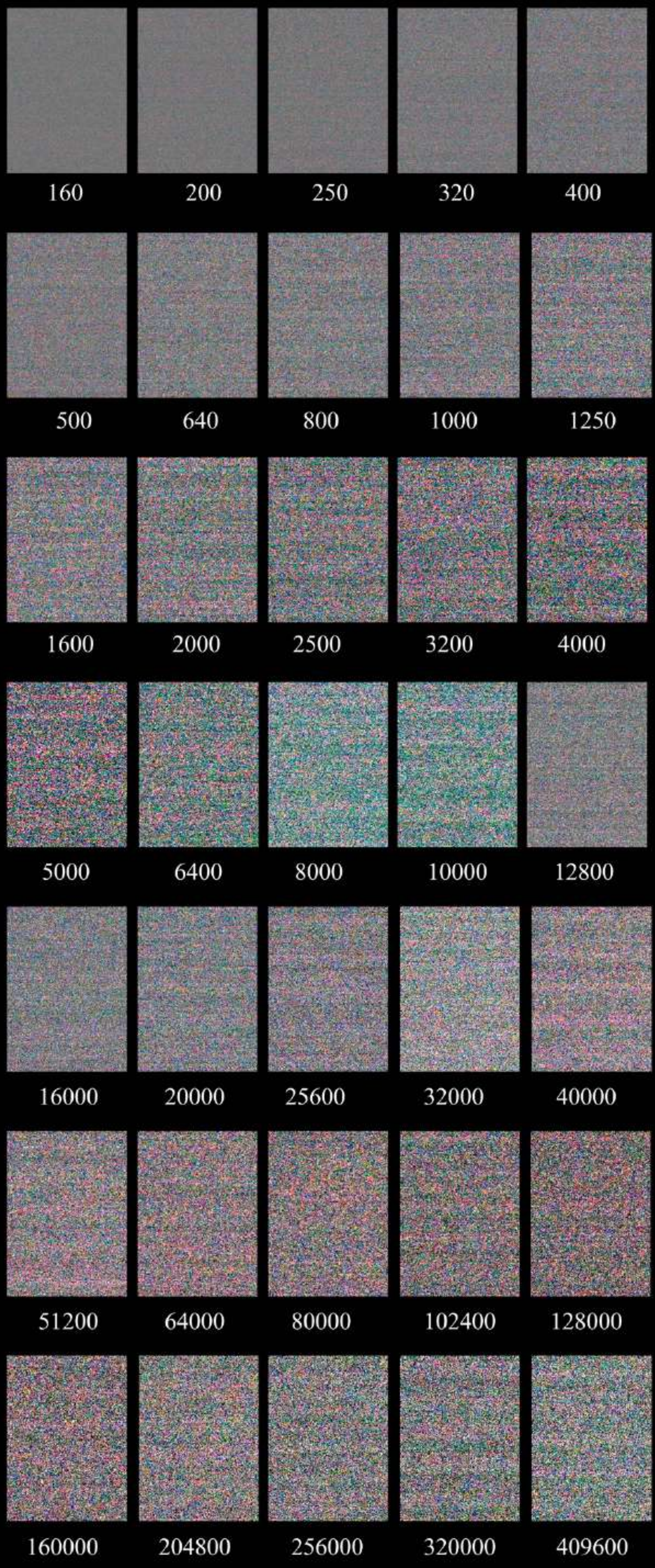
Adriana Bernal ADFC, testing the unexposed emulsion found and manufactured by Atanasio Bernal. Image from the documentary filmed with the FX3.

From ISO 6400 onwards, the increase in the standard deviation slope of the Y channel confirms the loss of tonal uniformity. At high ISO settings (8000–12800), blacks take on a "dirty" appearance, mainly due to the contribution of the red channel—a phenomenon consistent with the previous standard deviation graphs. Very high values (16000–128000) intensify aggressive patterns of saturated noise, with a predominance of magentas and greens due to interchannel imbalance, where even the relative stability of blue fails to compensate for the light degradation. Extreme ISOs (160000–409600) generate visual chaos: they compromise the perception of black, obliterate details in shadows, and add chromatic artifacts with linear patterns.

Figure 33 shows the visual behavior of noise in complete darkness (dark noise) at a color temperature of 3200K. In the ISO 160–640 range, noise is minimally perceptible and slightly more contained than at 5600K. Between 800 and 1250, progressive chromatic grain emerges without abrupt transitions, remaining manageable with a slight advantage over 5600K. Medium-high sensitivities (ISO 1600–6400) develop visible color patterns, while at ISO 8000–12800, noise becomes clearly intrusive. It should be noted that both temperatures share a pattern change when crossing from ISO 10000 to 12800. At extreme values, violet tones replace the dominant reds at 5600K, reflecting the different relative amplification of the red and blue channels depending on the color temperature.

Part of the Fendetestas collective during the tests of Atanasio Bernal's unexposed film stock.

CINE EI MODO FLEXIBLE
DARK NOISE
5600K



CINE EI MODO FLEXIBLE
DARK NOISE
3200K

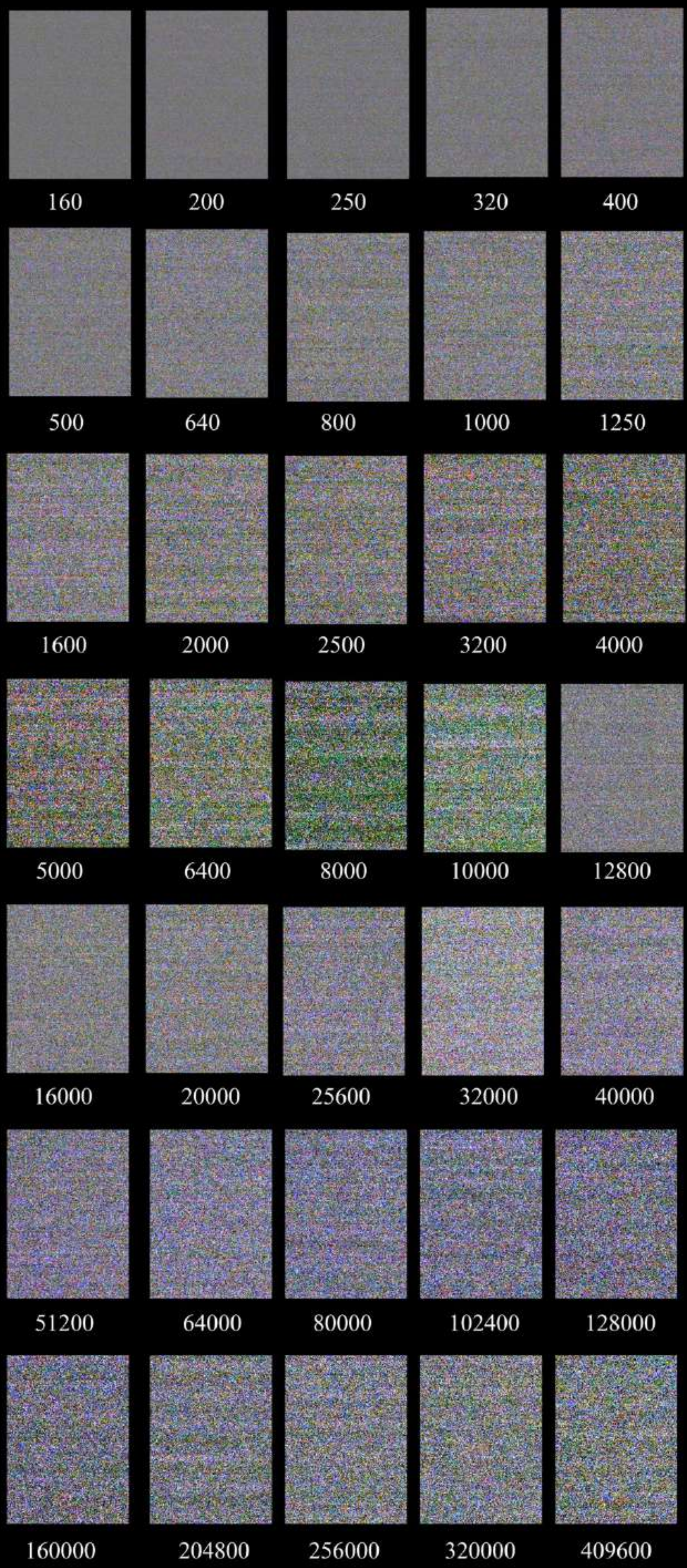


Figure 33

Remember that all this analysis in Flexible mode corresponds to the base noise, and that we will make the final evaluation below, considering the signal-to-noise ratio as we did in Cinema EI mode.

SNR (signal-to-noise ratio) analysis in FLEXIBLE CINEMA mode

All noise, including background noise, is added to the SNR ratio. Once again, we use the Macbeth chart and the Imatest program to analyze it.
Let's start by reading the chart at 5600K and the different ISO values.

EI values 5600K	R	G	B	Y
200	49,3	50,7	50,5	51,1
400	45,8	49,4	49,1	50,3
800	44,2	47,6	46,8	48,4
1600	42,7	46,1	45,3	47
3200	40,8	44,4	43,6	45,1
6400	38,7	40,09	41,1	41,1
12800	37,9	38,8	38,7	38,9
25600	34,2	36,3	36,6	36,6
51200	31,1	33,4	33,5	33,7
102400	28,5	30,9	30,09	31,1
204800	28,5	30	30,2	30,2
409600	26	26,6	26,7	26,7

Table 9

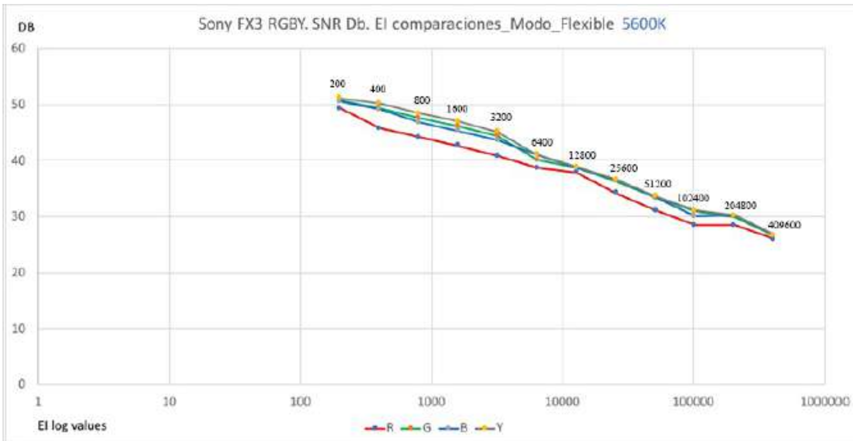


Figure 34

Figure 34 and *Table 9* document the signal-to-noise ratio (SNR in dB) for the R, G, B, and **Y** channels in Flexible EI Cinema mode at 5600K, revealing that both luminance (**Y**)—a weighted average of RGB—and the green channel (G) consistently maintain the best SNR due to the Bayer pattern sensor design, which favors green photodiodes. In contrast, the red channel (R) consistently records the lowest SNR values across the entire ISO range, while blue (B) follows a similar pattern to the general trend with minimal deviations.

When comparing ISO 800 and 12800, the differences are significant: the blue channel shows an 18.9% better SNR at ISO 800, red 15.3%, green 20.3%, and luminance achieves a 21.7% advantage at the lower value. This progression confirms the constant degradation of SNR as sensitivity increases, although with particularly steep, non-linear drops between 6400–12800 and 102400–204800—intervals where noise most severely impacts image quality. It should be noted that the red channel exhibits more drastic variations at high ISO, while luminance shows greater stability with smooth transitions. These findings are summarized in Table 10, which establishes the dB thresholds associated with optimal quality—that is, where noise is not visible, does not erode details in shadows, does not reduce the dynamic range, and does not distort color fidelity.

ISO range 5600K	Observations
100-3200	≥ 40Db Excellent quality
6.400-12800	[35, 40] Db Very good quality
25.600-51200	[30, 35] Db Quality still acceptable with some noticeable noise
102.400-409600	≤ 30 DB very noticeable noise

Table 10

Let's take a look at the performance at 3200K.

EI values 3200K	R	G	B	Y
200	51,4	51,1	47,6	51,8
400	49	50,2	47,8	51
800	46,2	48,4	46,3	49,2
1600	44,8	47,4	44,8	48,3
3200	42,3	44,8	42,1	45,4
6400	41,2	42,8	41,6	43,1
12800	38,5	39,6	39	39,8
25600	35,5	36,8	35,7	37,2
51200	33,7	34,8	34,1	35,1
102400	31,1	31,6	31	31,7
204800	28,9	29	28,7	29,1
409600	25,3	25,6	25,5	25,7

Table 11

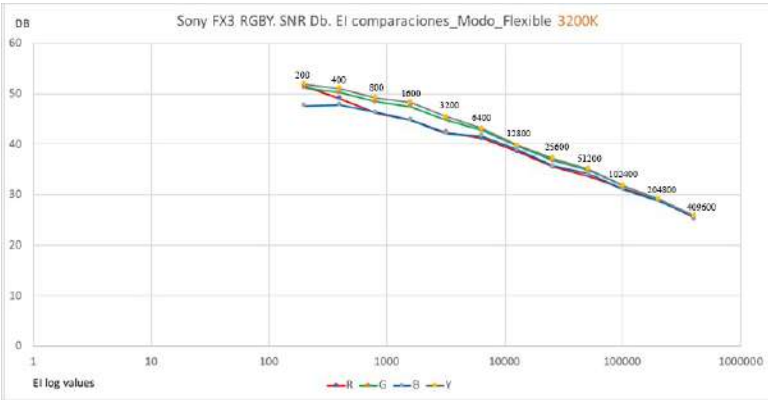


Figure 35

Table 11 and *Figure 35* show the behavior of the RGBY channels at 3200K. In this profile, the blue (B) and red (R) channels have very similar SNR values starting at ISO 800, both being lower than green (G) and luminance (**Y**). Their curves maintain variations of less than 0.2 dB between different ISO values, indicating excellent color balance in warm light conditions. When directly comparing the ISO 800 and ISO 12800 values at 3200K, there is a consistent advantage of the lower ISO in all image channels: luminance (**Y**) shows a 21% improvement in signal-to-noise ratio, the red channel (R) 18%, green (G) 20%, and blue (B) 17%.

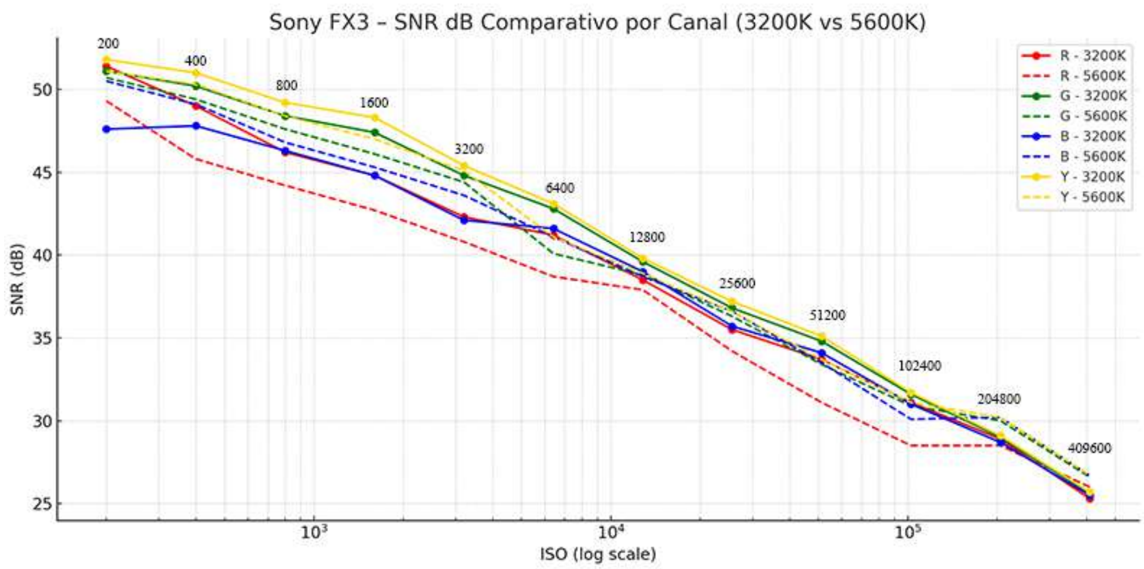


Figure36

Figure 36 shows the differences in the RGBY channels for both color temperatures, while *Figure 37* and *Table 12* present a quantitative analysis of the SNR curves (in dB) for the red (R), green (G), blue (B) channels, and luminance (**Y**) as a function of the EI values. To evaluate the overall performance, we calculated the area under the SNR curve for each channel using the formula: Area = ∑ SNR(EI) * ΔISO.

Channel	Area under the curve 3200K	Area under the curve 5600K	Absolute difference	Difference %
RED (R)	12,164,120	11,823,630	+340,490	+2.88%
Green (G)	12,344,810	12,459,722	–114,912	–0.92%
Blue (B)	12,170,960	12,448,492	–277,532	–2.23%
Luma (Y)	12,403,960	12,542,680	–138,720	–1.11%

Table12

This method quantifies the cumulative signal-to-noise ratio performance across the entire sensitivity range.

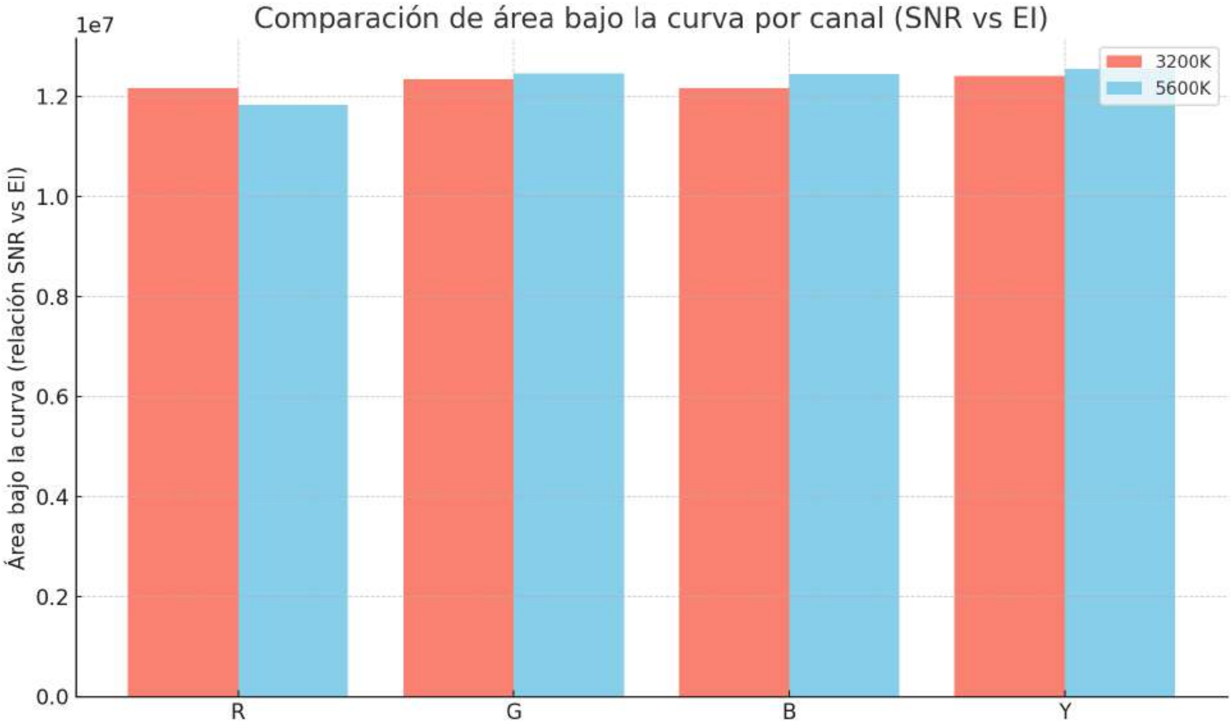


Figure 37. Comparison of the area under the curve by channel (SNR vs EI)

The green channel (G) and luminance (**Y**) maintain the best overall SNR, while the red channel (R) is the only one that shows a significant improvement at 3200K, with an average signal-to-noise ratio that is 2.88% higher. This behavior is due to the spectral response of the sensor to warm light sources. The green (G), blue (B), and luminance (**Y**) channels show better SNR at 5600K, with blue standing out with the largest percentage difference (-2.23% compared to 3200K).

Although these variations are not drastic, they show how color temperature affects capture efficiency per channel and impacts SNR. These differences are more clearly seen in *Figures 38 and 39*, which show independent comparisons for the red and blue channels.

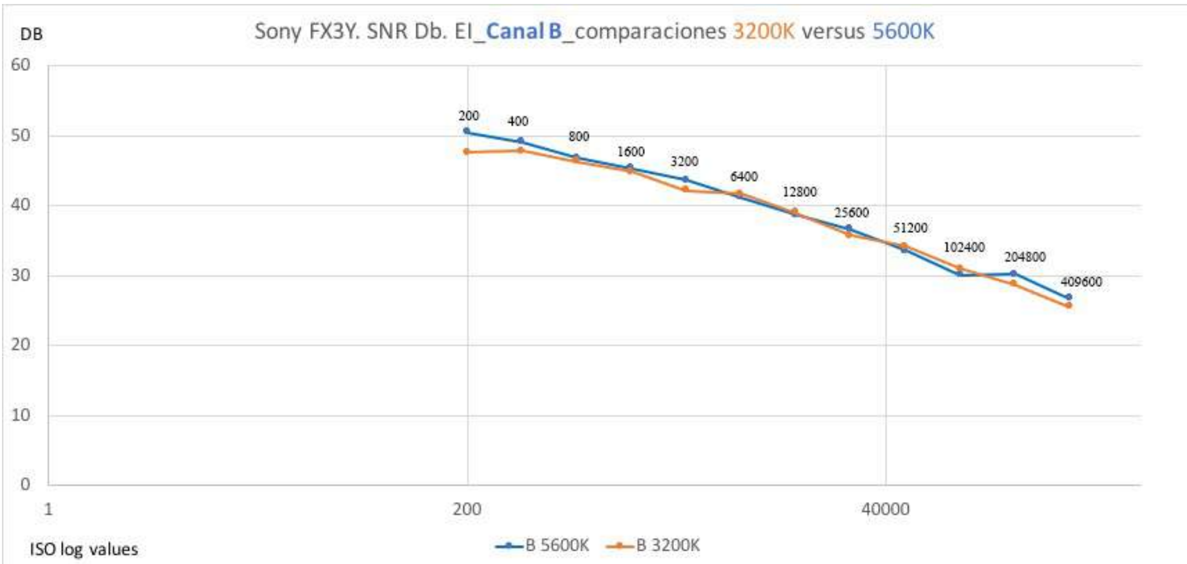


Figure 38. SNR comparison of ISO values at two color temperatures in the blue channel.

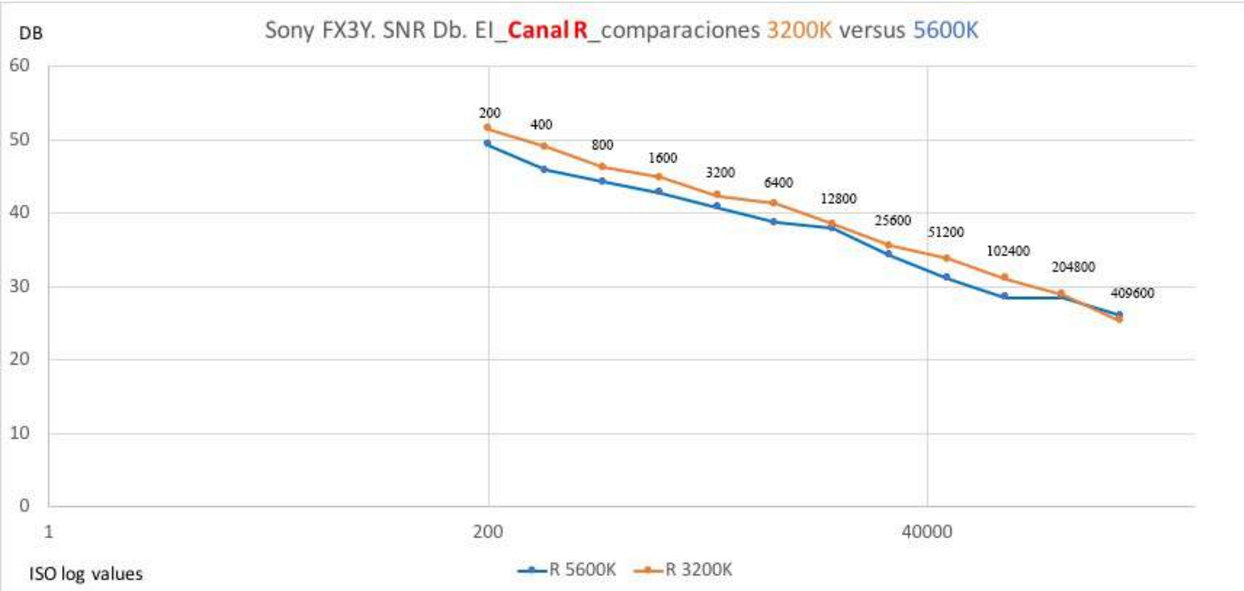


Figure 39. SNR comparison of ISO values at two color temperatures in the Red channel.

In summary, both color profiles show that SNR values are higher at low ISO settings (200–800), indicating cleaner images. As ISO increases, SNR decreases progressively across all channels, with a sharp drop until approximately ISO 12800, after which the curves stabilize with minor differences between channels.

The red channel shows a consistently higher SNR at 3200K, a consistency that reflects its greater spectral presence in warm light. The area under the curve confirms the advantage of this profile at low-to-medium ISO settings. In the green channel, the SNR is slightly higher at 5600K—especially between ISO 800 and 12800—and is the highest in absolute terms due to its weight in the Bayer pattern. The blue channel performs better at 5600K, with a notable difference between ISO 400 and 6400, and equalizing with red from ISO 800 onwards.

Luminance (Y) offers the best overall performance: high and stable SNR at all ISOs, with a slight advantage at 5600K, which consolidates it as a solid option in neutral or daylight conditions. For practical purposes, the camera demonstrates equivalent performance at both color temperatures, with acceptable noise handling between ISO 160 and 51200.

You didn't need so much luggage for this trip!


Adriana Bernal ADFC, during the filming of the documentary If I tell you the truth, I'm lying (Colombian cinematic heterodoxies) by the Fendetestas collective.

Let's return to Sónya and her gaze in the candlelight (*Figures 40 to 42*). At low values (EI 200 to 800), the logarithmic image is severely underexposed, dominated by deep blacks where details are barely visible, while in the ACES 709 conversion, the highlights of the flames achieve visibility at the cost of completely losing the subject's face and body in irretrievable shadows. As we move up to EI 1600–3200, the logarithmic curve begins to reveal facial and clothing textures; although the ACES 709 version improves tonal separation, noise persists noticeably in backgrounds, reflecting a still limited SNR that only makes it feasible to prioritize highlights at the expense of detail in shadows. EI 6400 marks a turning point: the logarithmic balance makes the subject fully recognizable, and in ACES 709, effective contrast is achieved with differentiated shadows and highlights, despite residual noise in dark areas. This value represents an acceptable compromise between noise control and information retention.

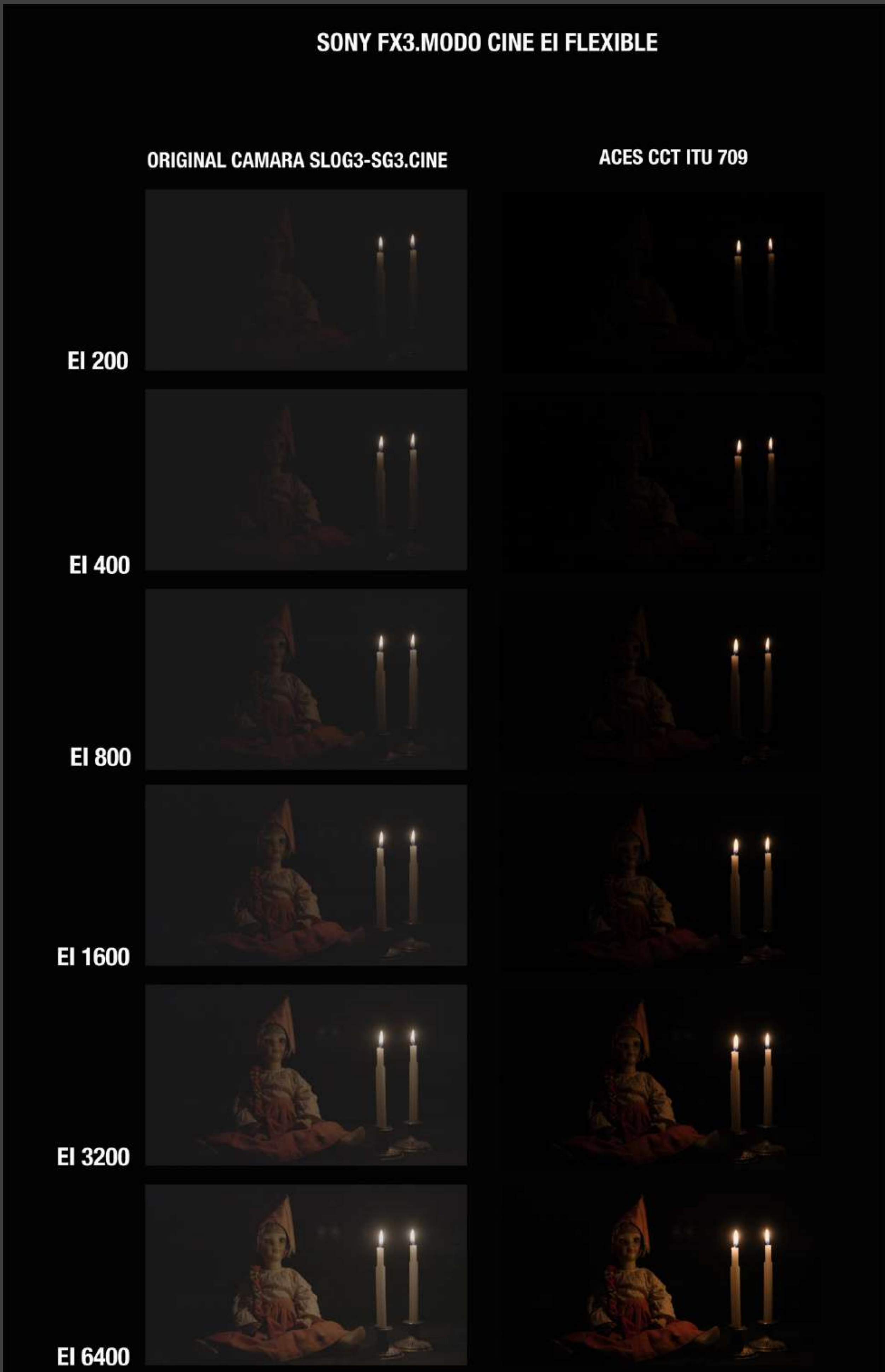


Figure 40. Comparison of flexible Cine EI mode flexible at different ISO values

Figure 41. Comparison of flexible mode Cine EI at different ISO values

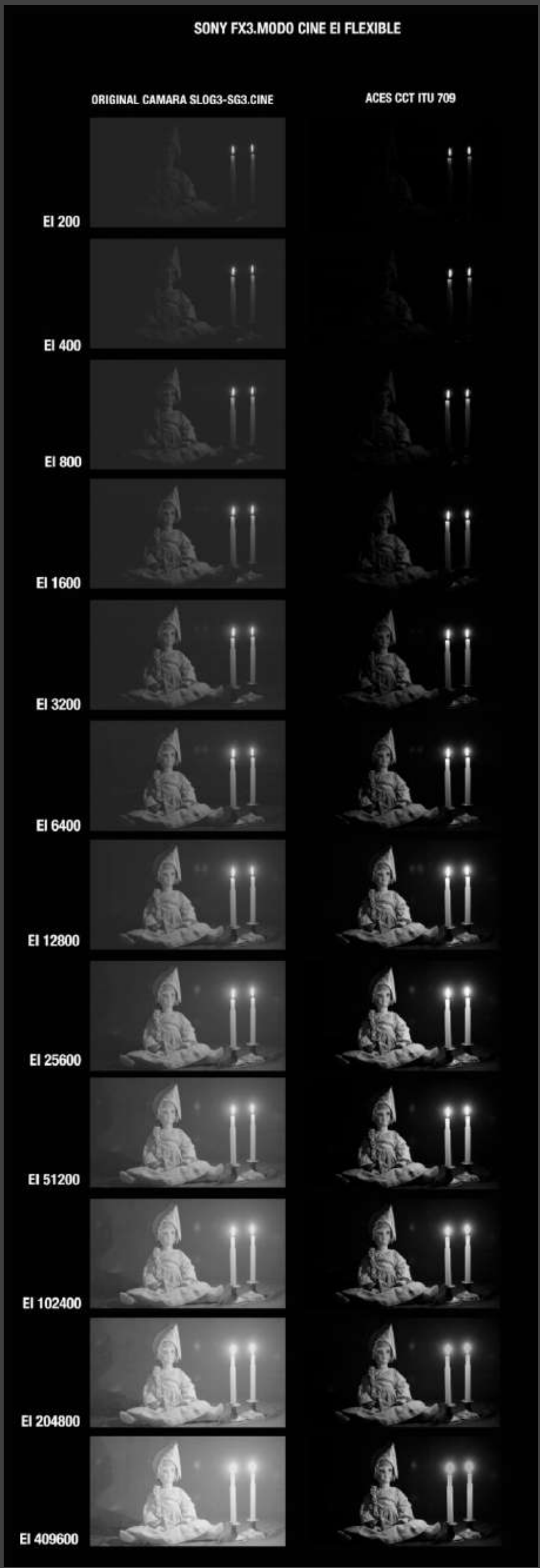
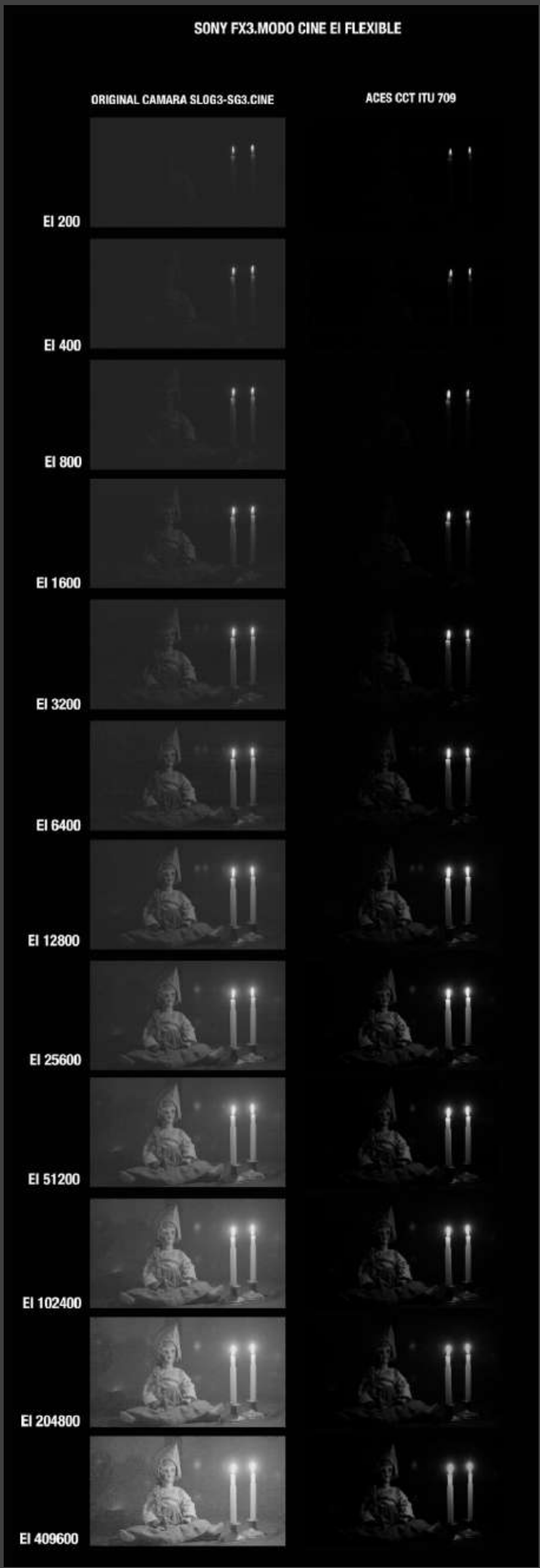


Figure 42. Red Channel



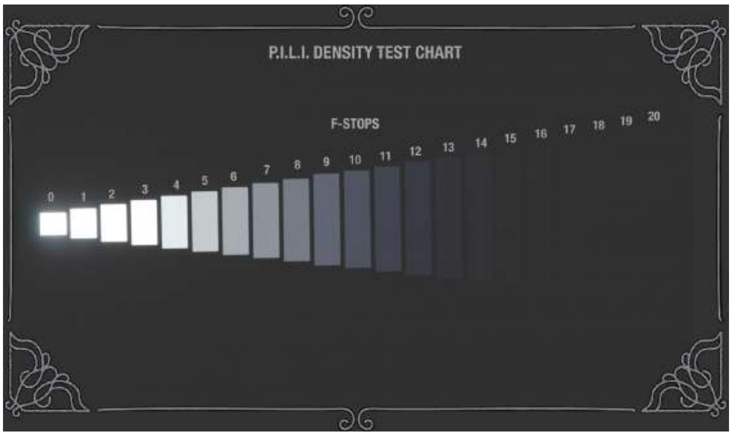
Blue Channel

True optimization occurs at EI 12800 (high ISO base), where logarithmic exposure achieves cleanliness, tonal range, and optimal dynamic range, translating in ACES 709 to balanced colors with barely perceptible noise, confirming this EI as ideal for scenes with critical lighting, such as candles.

Beyond that, EI 25600–102400 introduces excessive exposure in logarithmic with increasing chromatic noise, and although ACES 709 simulates correct brightness, the degradation of SNR is evident, relegating its use to extreme situations that require aggressive post-production. Finally, EI 204800–409600 shows overexposed and washed-out logarithmic images, burning details in highlights, while ACES 709 exhibits unmanageable noise and loss of information, practically invalidating these extreme values except for narrative textures chosen by the cinematographer.

Dynamic Range (DR) Analysis in CINE El mode.

Next, we analyze how noise affects dynamic range, considering that its distribution changes depending on the selected ISO value and the noise observed. For this study, we photographed the P.I.L.I. test chart (Precision Imaging & Lighting Institute) of 21 density steps (inspired by the renowned DSCLab Xyla test chart) and processed the data with Imatest. From the metrics generated by the software, we specifically used the medium noise value because it corresponds to real working conditions based on our experience.



These are the results for the base EI values (800 and 12800) in CINE EI mode (*Figures 43 and 44*).

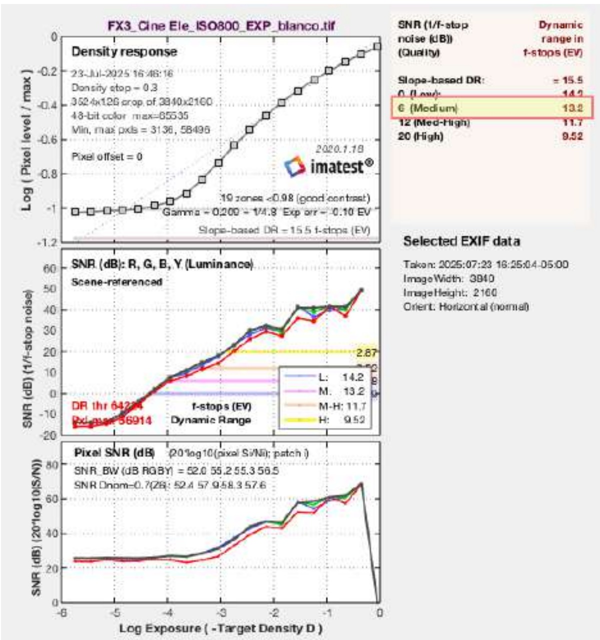


Figure 43. Cine EI base 800

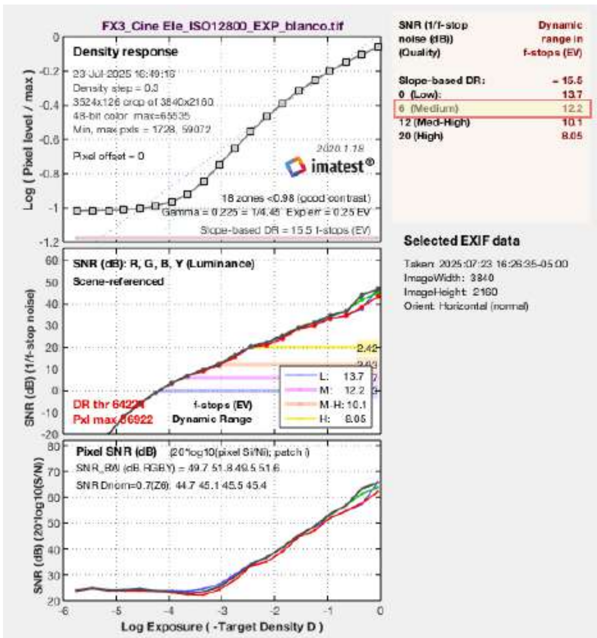


Figure 44. Cine EI Base 12800

At EI 800, the dynamic range is 13.2 stops considering the noise level, while at EI 12800, the dynamic range—considering the same noise value—is 12.2. This difference of 1 stop contrasts with the total dynamic range without considering noise, which remains identical in both cases: 15.5 stops.

The waveform monitor (WFM) display corroborates this data: although practically the same steps can be distinguished in both EI settings, it can be seen that at EI 12800, the levels below mid-gray are wider, indicating an increase in noise in the shadows. This is why Imatest reduces the dynamic range of EI 12800 compared to EI 800. Figure 45 shows the 3D images at both EI values of the P.I.L.I. chart.

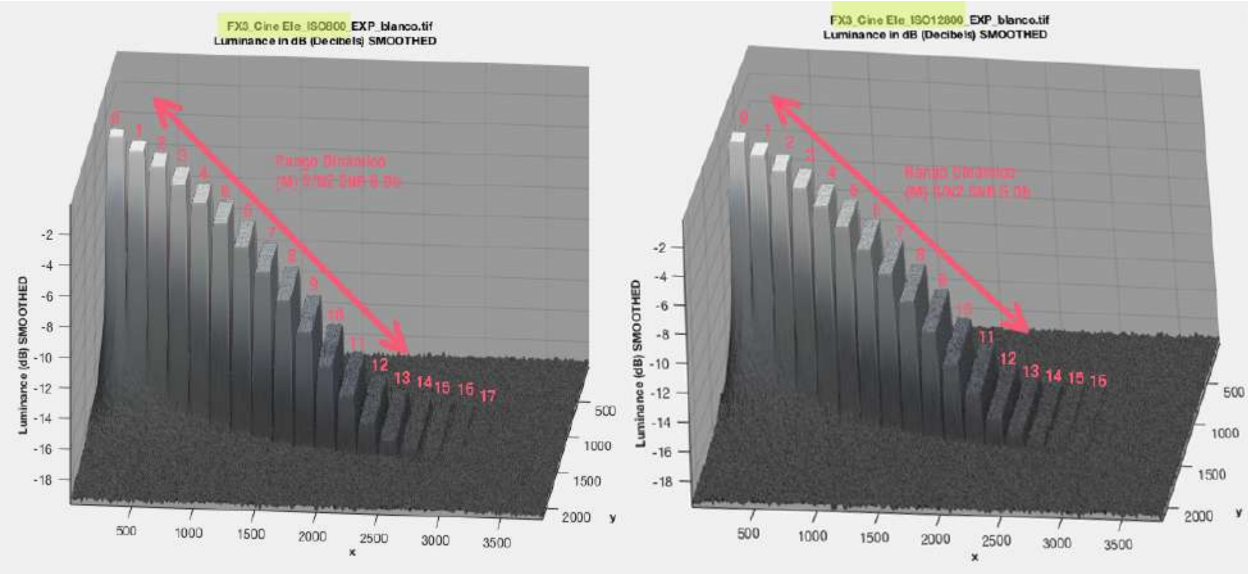


Figure 45

<u>Dynamic Range (DR) Analysis in CINE Mode The FLEXIBLE.</u>

In Flexible mode, we evaluated different ISO values, shown in *Table 13* and *Figure 46*, using the RD medium value calculated by Imatest as a reference.

EI values 5600K	Dynamic Range f-stops (medium)
200	13,1
400	13,3
800	13,2
1600	12,3
3200	11,5
6400	10,5
12800	12,6
25600	11,4
51200	10,5
102400	9,56
204800	8,66
409600	7,4

Table 13

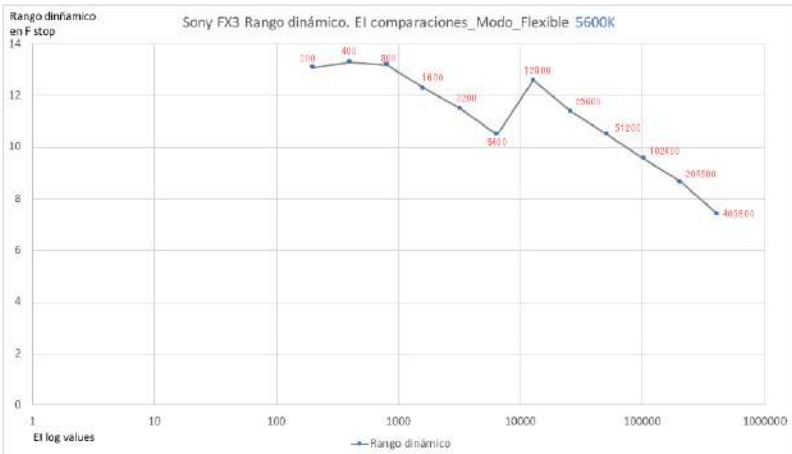


Figure 46

Between ISO 200 and 800, the camera achieves its maximum performance: from 13.1 to 13.3 stops. This slight variation indicates an excellent tonal range and low noise level, although, as shown in *Figure 47*, the distribution of this range varies, losing detail in the highlights from EI 800 downward. From ISO 800 at high values, the dynamic range in highlights remains at 6 stops, with the overall decrease attributable to noise in the shadows. From ISO 1600 onward, there is a gradual decline: 12.3 stops at 1600, 11.5 at 3200, and 10.5 at 6400, confirming that increased sensitivity leads to a significant loss of range. This reduction is due to increased electronic noise, which particularly affects shadow areas and compromises the ability to distinguish subtle nuances of luminance.

However, the familiar behavior at ISO 12800 is observed, where the dynamic range recovers significantly to 12.6 stops. This phenomenon demonstrates the use of native dual gain (dual ISO) in the FX3 sensor: above this value, the system electronically adjusts the signal conversion to minimize noise and maximize the use of the dynamic range, even in low light.

However, this improvement does not persist at higher values. From ISO 25600 onward, the deterioration becomes more pronounced: 11.4 stops at 25600, 10.5 at 51200, 9.56 at 102400, and down to 7.4 stops at 409600. This performance at extreme ISO values reveals a substantial loss of quality, and its use is recommended only when sensitivity takes precedence over visual fidelity—such as in emergency shots, nighttime documentaries, or recording unrepeatable events—or when noise is used creatively to generate meaningful textures.

RD test with the P.I.L.I. test chart at EFD Studios Colombia.

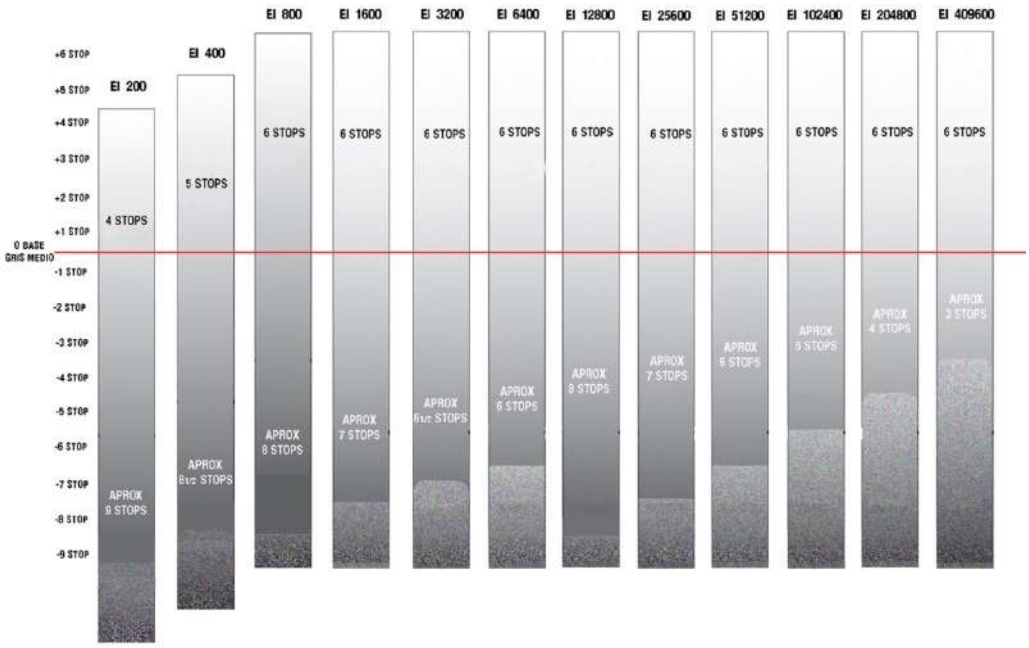


Figure 47. Dynamic range layout in Flexible EI Cinema mode, analyzed from the P.I.L.I. chart in WFM.

If we go back to *Figure 47*, we can see that with ISO 200 and 400, we have fewer stops of detail in the highlights.

In *Figure 48*, we compare the waveform monitor of the three ISO values.

Figure 48. Comparison of three ISO values

Similarly, in Figure 49, we also compare two different ISO values in the WFM, now upward (higher sensitivity values) to verify that the stops above mid-gray are indeed maintained.

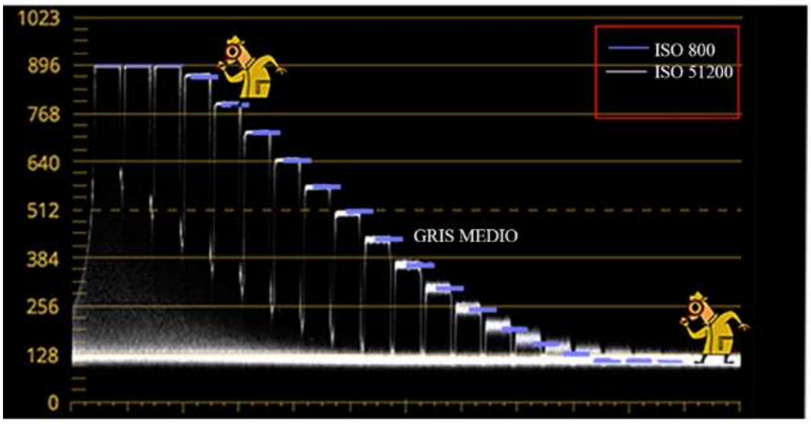


Figure 49. Comparison of ISO values.

What we do notice, as indicated above, is the increase in noise in the shadows (the width of the steps is greater at 51200 than at 800, which appear more like a thinner line). In *Figure 50*, we can see the 3D representation generated by Imatest for ISO 800 and 5200.

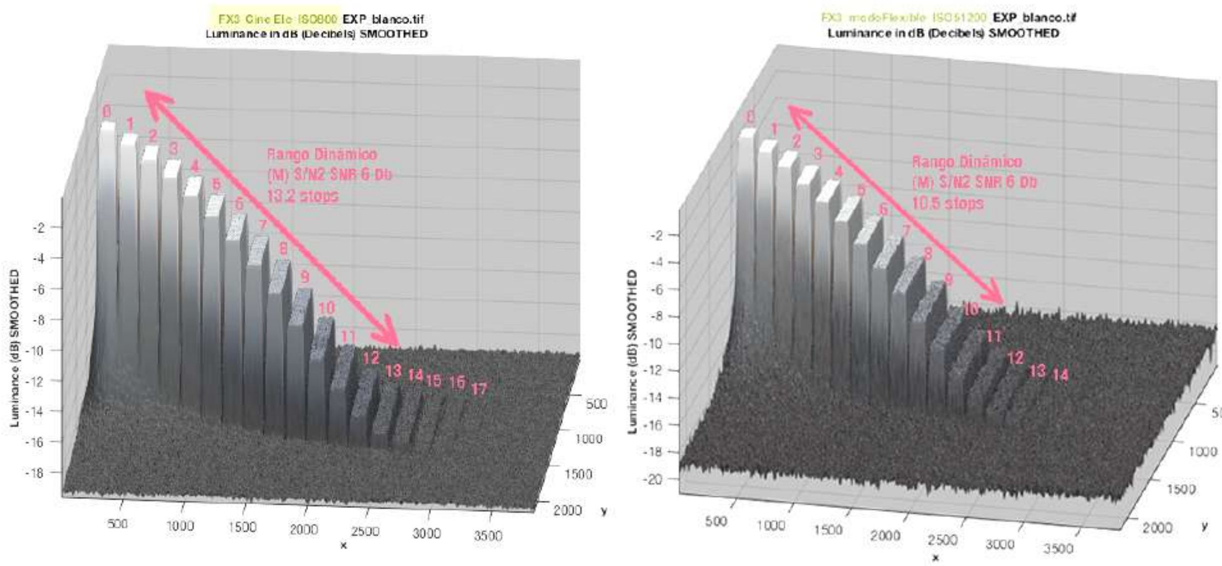


Figure 50. DR comparison at ISO 800 and 51200

Noise directly impacts the dynamic range, where we observe that although the behavior at ISO 51200 is remarkably good—reaching an effective dynamic range of 10.5 stops—the shadows present greater noise compared to ISO 800, where these areas appear cleaner, even when working with identical exposure values below middle gray.

The luminance curve reveals substantial differences between both sensitivity values: while at ISO 51200 there is an abrupt drop in detail in the shadows, at ISO 800 this transition occurs in a more gradual and controlled manner, allowing the useful information to extend to approximately 6 stops below middle gray compared to the 4 practical stops achieved at ISO 51200, where—although it is possible to distinguish some additional tones—the noise significantly limits the real usefulness of these extreme values.

This comparison clearly demonstrates the inverse relationship between ISO sensitivity and image quality in shadow areas, where noise acts as a limiting factor to the overall dynamic performance of the sensor.

I want to point out here the paradox that arises between the signal-to-noise ratio (SNR) and dynamic range (DR) when comparing ISO 6400 and ISO 12800 in Flexible Cine EI mode at 5600K. The data shows that the SNR, for example, in luminance (**Y**), decreases from 41.1 dB at ISO 6400 to 38.9 dB at ISO 12800, which represents a reduction of 5.3%. When ISO 12,800 is selected, the camera switches to operating in the sensor's high-gain mode —it is not simply a matter of digital amplification on the same ISO value scale— but rather the use of a higher analog conversion gain mode, which provides several observable advantages in both technical testing and workflow. First, it reduces read noise in the shadows compared to the previous native ISO reading, dropping from 1.133 e⁻ to 0.901 e⁻ (1), which represents a ≈20.5% reduction. Second, it expands low-light capture capability, adding approximately 2.1 usable stops in areas close to black.
In fact, the DCG (Dual Conversion Gain) shift occurs around ISO 1600, where read noise falls from ~4–5 e⁻ to ~1 e⁻, according to [PhotonsToPhotos] tests of the A7S III, which shares the same sensor as the FX3. Even though they are not the same camera, these results can be extrapolated.

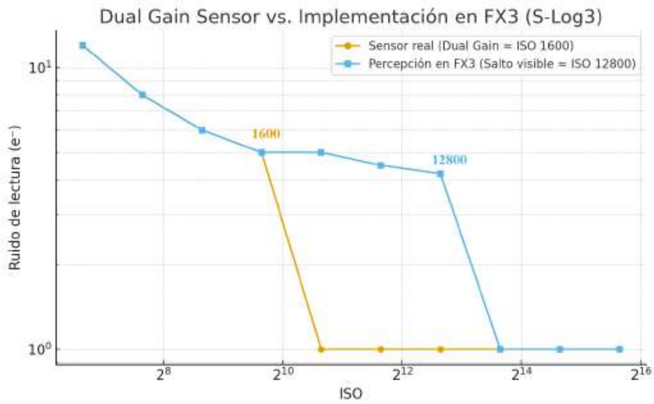


Figure 51

The FX3 shifts this actual hardware change to higher sensitivity values (≈ ISO 12,800) in order to maintain consistency in log curve linearity and in perceived dynamic range. Consequently, it can be said that the sensor retains its native dual-gain architecture around ISO 1600, but that, for the user, the noticeable noise-reduction jump manifests in practice at ISO 12,800.
In other words, the camera's base EI values effectively remap those ISO values in relation to the log curve, in order to preserve consistency in exposure and dynamic range.
Let's now look at a frame from a sequence shot from the documentary *"If I Tell You the Truth, I Lie to You" (Colombian Cinematic Heterodoxies)*. From her understanding of how noise works, Adriana Bernal chose to use it as a texture in this dramatized scene that takes place in a basement where much of the material of one of the most heterodox filmmakers, Cipriano Andrade (1920–2001), was found. Here, Adriana tells us, *"I wanted the dramatic reconstruction of the discovery to have that improvised, urgent tone, more typical of documentary, that would reveal the noise, almost like the handling of a handheld camera."*

Figure 52. Scene reconstructing the discovery of Cipriano Andrade's documents and memoirs. Sony FX3. CINEMA MODE EI Base 12800 Slog3-Sgamut3.Cinema. XAVCS-I 4:2:2 10 Bits. Underexposed 2 stops.

Point A is 4.5 stops below mid-gray, approximately 15% on the waveform monitor. That is, it is very close to the deep shadow range, although it still retains detail. When we raise it in post-production, we get the grain Adriana is talking about.

Point B has a very similar value to Point A, although with a slightly cooler tone.

Point C, the brightest in the sample, is 1 stop below the mid-gray reference for this curve (41% on the WFM).

Point D is the darkest, located just over 7 stops below mid-gray. Although it is quite noisy, detail can still be seen.

Point E is approximately 4 stops below (*Figure 52*)

Figure 53 shows the values indicated on the plane on the 3D graph of the P.I.L.I. chart. The graph on the left represents a normal exposure, aimed at obtaining a clean, noise-free image, while the one on the right shows the corresponding values when the plane has been underexposed by two stops. Raising these levels during the colorization process generates the type of noise Adriana Bernal refers to.

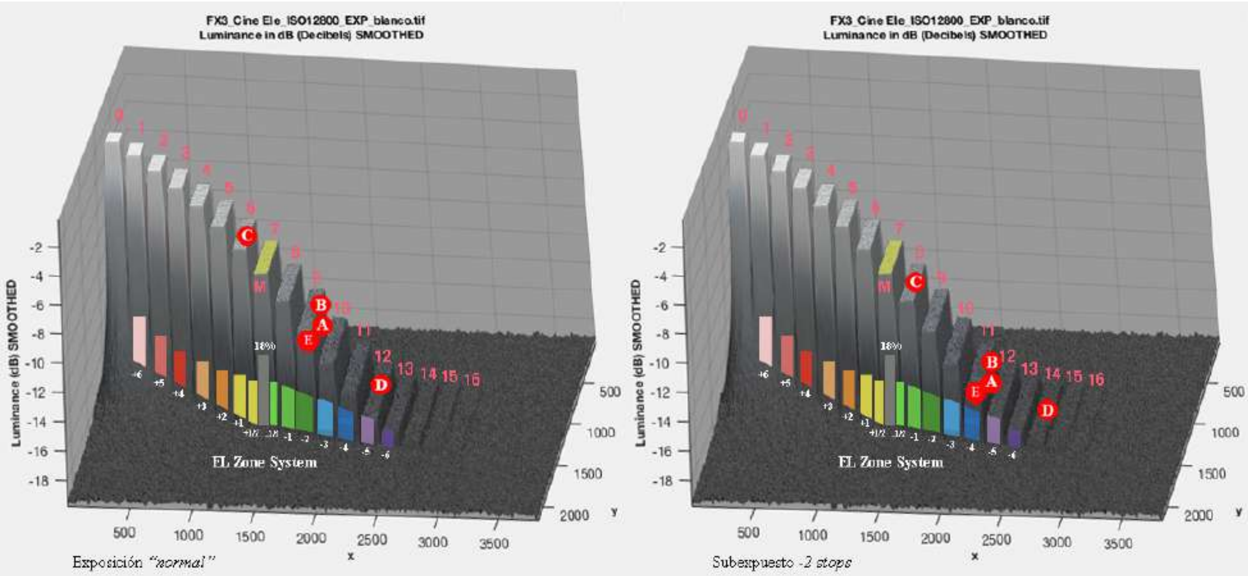


Figure 53. On the left the normal exposure, on the right the underexposed of 2 stops

With normal exposure, the effective dynamic range extends up to 12 stops, maintaining a good signal-to-noise ratio (SNR). Noise present in samples between 12 and 16 stops does not noticeably affect the final image, resulting in a clean image with precise color control and good detail.

However, by underexposing by two stops, the values labeled A, B, D, and E drop below the -12 dB threshold, causing a significant increase in noise when raised in post-production. Furthermore, the effective dynamic range is reduced by at least two stops. The result is a visually rougher image, with a texture reminiscent of Super 16mm emulsions (soft, random, organic grain).

It is important to note that the noise generated by this technique is distinguished by its more organic and structured character, very different from that produced by using extremely high ISO values or that artificially introduced during color correction. In this case, by underexposing and subsequently boosting the signal, the noise is distributed more evenly and smoothly, generating a visual texture closer to photochemical grain, especially when working with logarithmic profiles like S-Log3 and a properly controlled signal.

Below are the corrected frames for 709 in the three RGB channels (*figures 54 to 57*)

Figure 54. Scene reconstructing the discovery of Cipriano Andrade's documents and memoirs. Sony FX3. CINEMA MODE EI Base 12800 Slog3-Sgamut3.Cinema. XAVCS-I 4:2:2 10 Bits. Underexposed by 2 stops, corrected to 709 in ACES space with Davinci Resolve Studio 20.

Figure 55. Red Channel (R) of the image already corrected for 709

Figure 56. Green Channel (G) of the image already corrected for 709

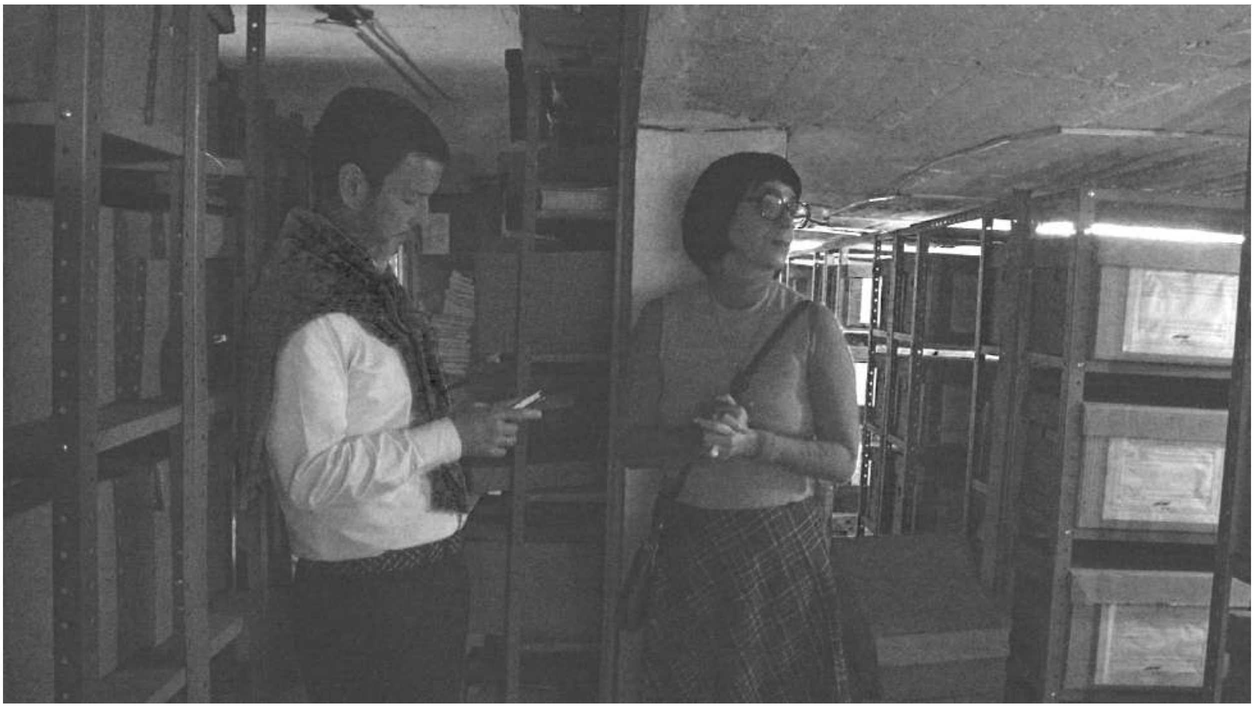


Figure 57. Blue channel (B) of the image already corrected for 709

The differential behavior of the RGB channels under two-step underexposure constitutes a deliberate technical-aesthetic resource aimed at constructing an image with a documentary appearance. In the color grading process, this chromatic imbalance is enhanced to generate a visual texture laden with meaning. The blue channel, affected by coarser noise and a washed-out texture, recalls the aesthetics of a deteriorated film archive, evoking a sense of immediacy and fragility. The red channel, meanwhile, introduces graininess and interference in the shadows that directly recall observational cinema of the 1970s, where organic and unpredictable elements were part of the expressive device. In contrast, the green channel, less affected by underexposure, preserves the legibility of the scene, allowing perceptual chaos to not compromise narrative clarity.

Adriana Bernal turns these technical peculiarities of the Sony FX3 into expressive tools. By shooting at EI 12800 with deliberate underexposure, she exploits the uneven response of the channels, accentuating the visual deterioration in blue and red to produce an unbalanced, almost improvised visual texture that reproduces the aesthetic of unplanned capture. The preservation of critical information in the green channel allows the main subject to remain recognizable, while the background dissolves into noise, thus drawing attention to the essential elements of the shot. As the director of photography herself states: *"The visual result of this scene is not an accident but a conscious emulation of certain traits of the heterodox Latin American documentary using the noise characteristic of the digital camera. The noise, in some way, emulates the graininess of 16mm or even S8mm copies, as in "La hora de los hornos" (The Hour of the Ovens) (2) or in many of the documentaries of the seventies and eighties. And this combination of clean highlights with chaotic shadows recalls a certain urgent, improvisational aesthetic that we wanted for this recreated scene."* In this sense, the intentional use of noise transcends technical knowledge and becomes a narrative strategy that reinforces both the emotional tension and the documentary character of the image.

(1) *The notations* 1.133 e^- to 0.901 e^- and ~4–5 e^- to ~1 e^-, *refer to read noise values measured in* ***electrons (e^-)***, *the fundamental unit for quantifying sensor performance* **e^- = (ADU / Gain)**
ADU*:* Analog-to-digital units (RAW values).
Gain*: Sensor conversion factor (e^-/ADU).*
(2) *1968 Argentine film directed by Pino Solanas and Octavio Getino*

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