

WHITE PAPER
CINEMATOGRAPHY TECHNICAL STUDY
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The Character of Shadow

**An Analysis of Noise and Dynamic Range in the Sony BURANO's Dual Base
EI System**

Instrumental Evaluation and Perceptual Analysis
S-Log3 / S-Gamut3.Cine
X-OCN LT

WHITE PAPER
EL CARÁCTER DE LA SOMBRA

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1. Introduction and Methodology

Measuring Darkness to Understand It

Over the past few months, Adriana Bernal and I have developed two projects of very different nature: a comedy series for Disney produced by Caracol Televisión, and the film *Indeleble*, produced by Sagitario Films, in which Adriana pushed the camera into extreme situations under very low-light conditions. Although these works differ significantly in their narrative and aesthetic approaches, in both cases we carried out a detailed study of the camera's behavior in relation to noise.

This analysis was carried out from the perspective of the cinematographer. A thorough understanding of the camera's performance and its processing tools makes it possible to adapt its response to the specific narrative needs of each project.

Resolution conditions varied between the two projects. In the case of the series, it was shot in 6K 16:9, graded in 4K, and delivered as a final HD master (1920×1080). This detail is not incidental: as will be discussed later, rescaling processes have a direct impact on the statistical behavior of noise and on the effective signal-to-noise ratio.

The film, for its part, was also shot in 6K 16:9, framed for a final 2.35:1 aspect ratio. In both cases, the X-OCN LT codec was used as the recording format.

All material—both production footage and test images—was analyzed in DaVinci Resolve Studio and evaluated using measurement tools such as Imatest and ImageJ, allowing perceptual observation and quantitative verification to be combined within a single workflow.

In-camera, we worked in Cine EI mode, using the S-Log3 logarithmic curve and its two base sensitivity values: EI 800 and EI 3200. Although the ISO value can be adjusted in the menu, in this mode those settings do not alter the EI of the recorded signal. The camera always records at one of the two selected base values, maintaining a constant gain structure associated with each base.

Changes in ISO function solely as a reference for monitoring and exposure, rather than as an actual modification of gain at capture. In other words, they affect how the image is viewed on screen and how exposure decisions are made, but not the true sensitivity at which the signal is recorded. The selected value is stored in the metadata and informs the subsequent grading process.



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This distinction is fundamental, as the interface may suggest that the camera is recording at different ISO values when in fact it remains anchored to the selected base. Only when using standard gamma curves (STD) or HDR are true ISO changes applied, modifying the recording gain.

The color space used during capture was S-Gamut3.Cine, with final grading delivered in Rec.709 for the series and in DCI-P3 for the film.

As in previous studies, we relied on numerical measurements supported by graphical representations to analyze noise behavior. The first step was to evaluate the camera's base noise, or Dark Noise.

This noise corresponds to the residual signal generated in the complete absence of incident light, consisting primarily of read noise and internal electronic components. To measure it, we captured images without a lens, with the mount covered and the camera body fully enclosed using a black cloth, ensuring that no photons reached the sensor. The resulting images appear, at first glance, completely black. To make the underlying noise structure visible, we uniformly increased exposure and adjusted contrast across all clips using the same parameters. It is important to emphasize that these adjustments serve a purely analytical purpose: the noise is not perceived in this way in the original footage, but is made visible through this deliberate amplification process.

To establish a comparative reference for base noise, we measured the standard deviation of luminance values in each frame (*Figure 2*), as this parameter quantifies the amplitude of statistical variation in the signal in the absence of light.

Given the random nature of pixel-to-pixel brightness fluctuations, the distribution of values follows an approximately Gaussian shape; as the EI value increases, the spread of this distribution



Adriana Bernal during the shooting of Indeleble, alongside director Jairo Estrada.

also increases, widening the base of the histogram. The standard deviation directly reflects this expansion. The values presented should be interpreted as comparative metrics that allow the quantification of noise differences between the different EI bases and the analysis of their behavior as the sensor's gain structure varies. In this section, we analyze Dark Noise in relation to the Noise Suppression function built into the camera's menu. This control is more complex than its name might suggest: rather than a simple "noise reduction" tool, it operates as a selective digital process acting on both luminance and chrominance components, likely at a stage following debayering. Its activation has direct implications for image texture, perceived sharpness, and grading flexibility.

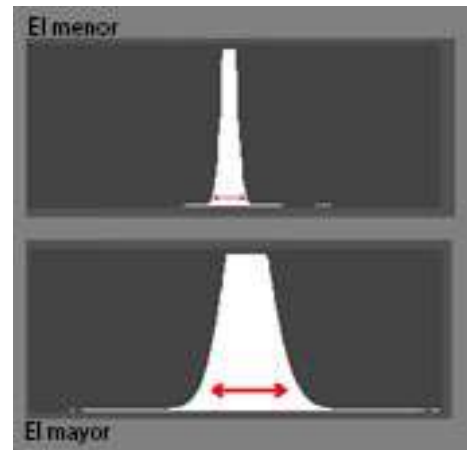


Figure 2. Standard Deviation

Sony designed this parameter to modulate the trade-off between maximum preservation of microdetail and texture—particularly relevant in skin tones and fine-grained surfaces—and the cleaning of the noise floor in deep shadows, with a corresponding impact on usable dynamic range. Later, based on our measurements, we will analyze the specific effects of the three available levels: LOW, MED, and HIGH.

2. Dark Noise

The System’s Murmur in the Absence of Light

Dark Noise Analysis in Cine EI Mode, EI 800 at 5600K: Evaluation Across RGBY Channels and the Effect of Noise Suppression

EI values 5600K	R	G	B	Y
EI BASE 800-NS OFF	15,94	6,64	17,92	7,11
E IBASE 800-NS LOW	13,16	5,54	14,8	5,96
EI BASE 800-NS MEDIUM	11,67	5,07	13,11	5,39
EI BASE 800-NS HIGH	10,19	4,38	11,36	4,69

Table 1. Standard Deviation

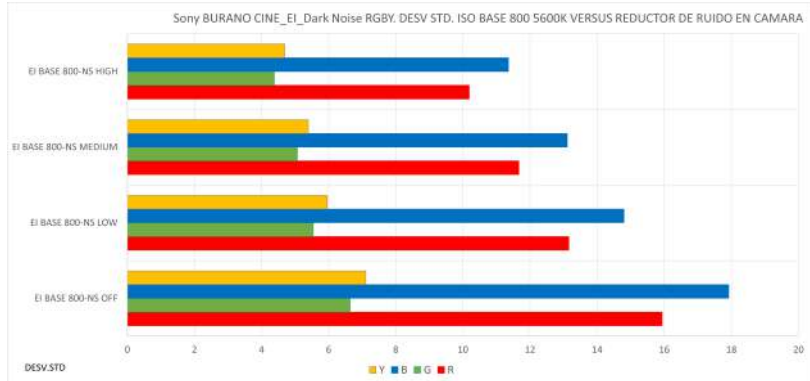


Figure 1. Standard Deviation

Figure 1 and Table 1 clearly show that the blue channel exhibits the highest baseline noise level, which is consistent with its lower quantum efficiency and, consequently, its lower signal-to-noise ratio compared to the other channels. The effect of Noise Suppression is particularly pronounced in this component: the reduction reaches 36.61% from OFF to HIGH, indicating a significant intervention on chromatic information.

In the red channel, the reduction reaches 36.07%, maintaining a similarly consistent and nearly linear behavior across the different intensity levels. The green channel—which starts from a lower baseline, as expected due to the double sampling of the Bayer pattern—shows a 34.04% reduction in HIGH mode.

The Y signal, corresponding to luma (a weighted average of RGB), is reduced by 34.05%, confirming that the algorithm does not act exclusively on chrominance, but also on luminance.

The close proximity of the percentages across channels indicates a balanced attenuation of noise, with no evident imbalance between chromatic and luminance information.

Channel 5600K EI 800	State	Reduction (%)	SNR Improvement Factor	Improvement (stops)
R	OFF	0	1	0
R	LOW	17,4	1,21	0,27
R	MED	26,8	1,37	0,45
R	HIGH	36,1	1,56	0,64
G	OFF	0	1	0
G	LOW	16,6	1,2	0,26
G	MED	23,6	1,31	0,39
G	HIGH	34	1,52	0,6

B	OFF	0	1	0
B	LOW	17,4	1,21	0,28
B	MED	26,8	1,37	0,45
B	HIGH	36,6	1,58	0,66
Y	OFF	0	1	0
Y	LOW	16,2	1,19	0,25
Y	MED	24,2	1,32	0,4
Y	HIGH	34,1	1,52	0,6

Table 2

Table 2 presents the percentage reduction of noise, the SNR improvement factor, and its equivalent in stops. The average shift is +0.27 stops in LOW, +0.42 in MED, and +0.63 in HIGH. In practical terms, these values describe the lowering of the noise floor in shadows when Noise Suppression is active.

Although these figures may initially appear promising, their implications should be carefully qualified. A strong intervention is not perceptually neutral: aggressive noise reduction can compromise microtexture in low-light areas and may lead to excessive smoothing or the introduction of unwanted artifacts.

We repeated the analysis at 3200K to verify the consistency of this behavior.

Dark Noise Analysis in Cine EI Mode, EI 800 at 3200K: Evaluation Across RGBY Channels and the Effect of Noise Suppression

EI values 3200K	R	G	B	Y
EI BASE 800-NS OFF	10,92	6,4	26,32	7,09
EI BASE 800-NS LOW	8,98	5,39	22,17	5,97
EI BASE 800-NS MEDIUM	8,04	4,9	19,86	5,41
EI BASE 800-NS HIGH	7	4,25	17,58	4,74

Table 3. Standard Deviation

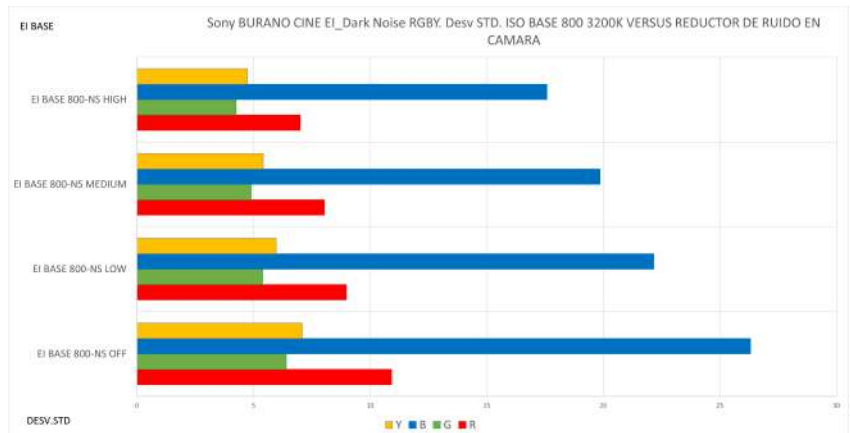


Figure 2. Standard Deviation

At this temperature (Table 3 and Figure 2), the blue channel again exhibits the highest absolute noise level, decreasing from 26.32 in OFF to 17.58 in HIGH. The higher noise in this channel reflects a structural characteristic of the system—related to its lower quantum efficiency and lower baseline SNR—rather than an effect derived from white balance.

The remaining channels maintain a progression consistent with what was observed at 5600K. The percentage reduction from OFF to HIGH once again falls within the 33% to 37% range, with

minimal differences between channels. The intervention of Noise Suppression remains stable and balanced, regardless of color temperature.

Channel 3200K EI 800	State	Reduction (%)	SNR Improvement Factor	Improvement (stops)
R	OFF (Baseline)	0	1	0
R	LOW	17,8	1,22	0,28
R	MED	26,4	1,36	0,44
R	HIGH	35,9	1,56	0,64
G	OFF (Baseline)	0	1	0
G	LOW	15,8	1,19	0,25
G	MED	23,4	1,31	0,38
G	HIGH	33,6	1,51	0,59
B	OFF (Baseline)	0	1	0
B	LOW	15,8	1,19	0,25
B	MED	24,6	1,33	0,41
B	HIGH	33,2	1,5	0,59
Y	OFF (Baseline)	0	1	0
Y	LOW	15,8	1,19	0,25
Y	MED	23,7	1,31	0,39
Y	HIGH	33,2	1,5	0,59

Table 4

Table 4 once again presents the percentage noise reduction, the signal-to-noise ratio (SNR) improvement factor, and its equivalent in stops.

Figure 3 shows that the behavior of Noise Suppression at EI 800 is remarkably consistent at both 5600K and 3200K. The differences between these two color temperatures are minimal and do not alter the structure of the reduction pattern.

At 5600K, the HIGH mode achieves reductions of 36.61% in blue, 36.07% in red, 34.04% in green, and 34.05% in Y. At 3200K, the values remain within a very similar range: 35.90% in red, 33.60% in green, 33.20% in blue, and 33.20% in Y. The maximum difference between temperatures barely exceeds three percentage points, confirming that the algorithm is not conditioned by white balance.

In LOW mode, the reduction is around 16–18%, with nearly identical values at both temperatures. In MED, the range increases to approximately 24–27%, maintaining a homogeneous distribution across channels. The progression from LOW to MED to HIGH is essentially linear and proportional.

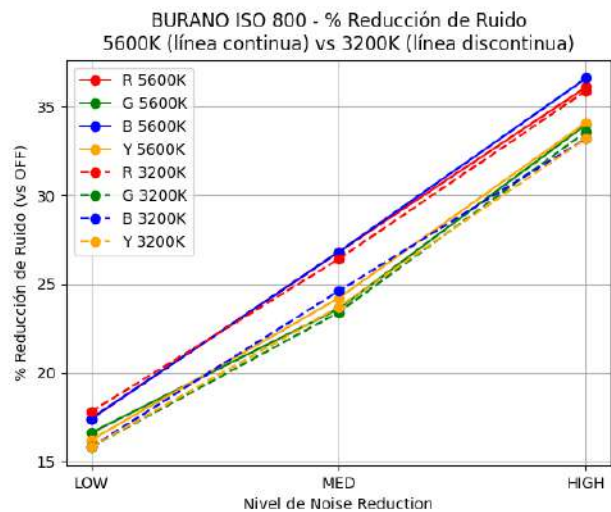


Figure 3

Although the blue channel shows a slight numerical advantage at 5600K, the magnitude of the difference is not sufficient to conclude that there is any specific prioritization of chrominance. The Y channel decreases in a comparable proportion to the chromatic channels, indicating that the intervention affects both luminance and chrominance.

What is truly relevant is not the minor variation between channels, but the structural consistency of the system: the reduction remains stable between 5600K and 3200K, proportional across RGB and Y, and mathematically consistent in its progression. There are no indications of selective processing dependent on color temperature.

From a technical standpoint, the algorithm behaves as a statistically balanced and chromatically neutral system, whose internal logic remains stable regardless of white balance.

The following graphs (*Figures 4 and 5*) illustrate the differences in stops between both color temperatures, as previously indicated in *Tables 2 and 4*. They represent the shift in base noise as a function of the applied Noise Suppression level.

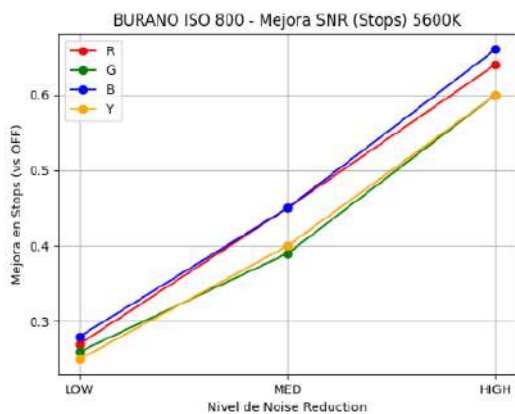


Figure 4

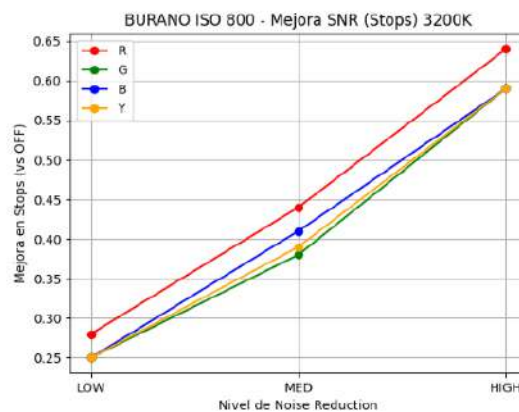


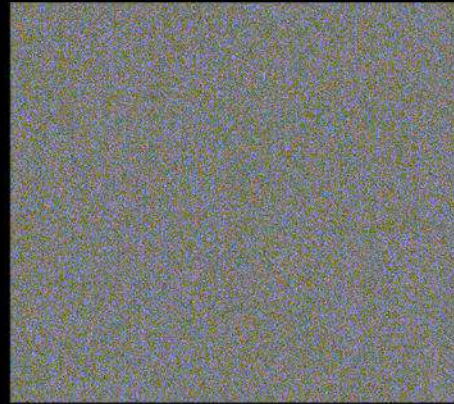
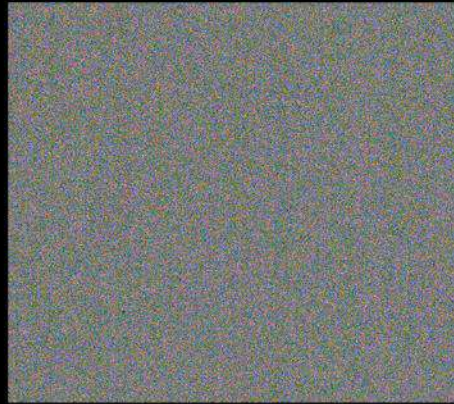
Figure 5

A subtle nuance emerges when comparing the red and blue channels. At 5600K, both curves almost coincide. At 3200K, the red channel appears slightly above the blue in terms of shift in stops. This is not the result of selective prioritization by the algorithm, but rather the mathematical consequence of applying a proportional reduction to different initial values: the blue channel starts from a higher noise level and, therefore, its conversion to a logarithmic scale results in a slightly lower value.

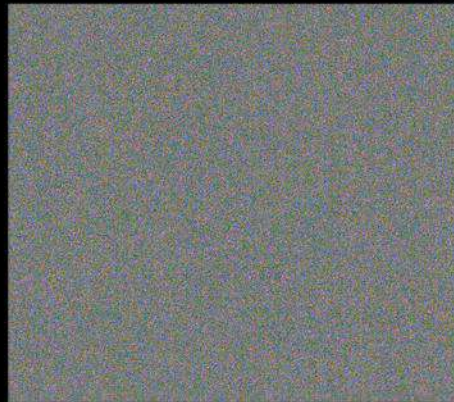
Figures 6 and 7 reinforce this interpretation. Visually, the base noise at 3200K is higher than at 5600K in OFF mode, confirming the difference in initial variance. However, the progression from LOW to MED to HIGH progressively reduces the amplitude of the pattern in both cases without altering its spatial structure or introducing differential artifacts. The graphs describe the quantitative behavior; the images confirm that the reduction acts on statistical amplitude rather than on the chromatic architecture of the noise. Both readings—numerical and visual—converge on the same conclusion: Noise Suppression maintains a consistent behavior independent of white balance.

Burano EI base 800 5600K. Dark noise

Burano EI base 800 3200K. Dark noise



NS OFF



NS LOW



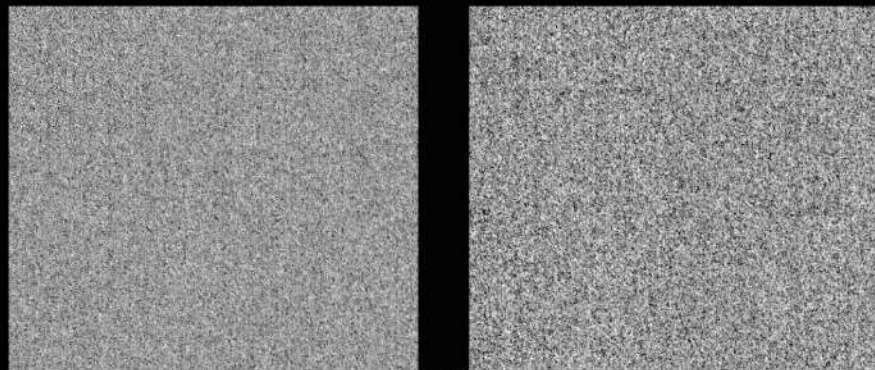
NS MED



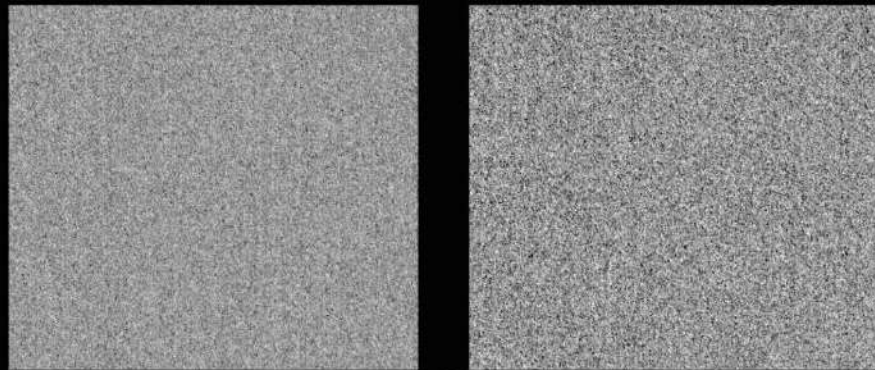
NS HIGH

Figure.6

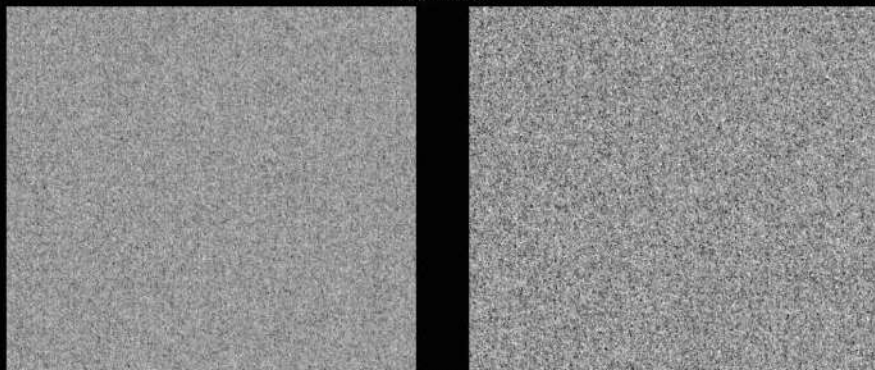
Canal azul (blue channel)
Burano EI base 800 5600K. Dark noise Burano EI base 800 3200K. Dark noise



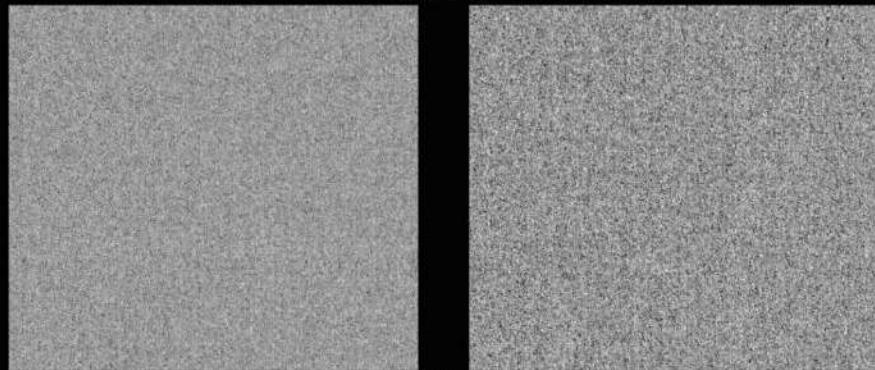
NS OFF



NS LOW



NS MED



NS HIGH

Figure 7

Dark Noise Analysis in Cine EI Mode at Base EI 3200 (5600K): RGBY Evaluation Versus In-Camera Noise Suppression

At this point, we switch the camera's base EI (dual ISO), where readout and analog amplification—prior to the A/D conversion stage—operate under a different regime. We now examine the resulting changes.

EI base 3200 5600K	R	G	B	Y
EI BASE 3200-NS OFF	14,87	6,19	16,46	6,65
EI BASE 3200-NS LOW	11,62	4,81	12,91	5,22
EI BASE 3200-NS MEDIUM	9,82	3,95	10,9	4,42
EI BASE 3200-NS HIGH	8,08	3,4	8,84	3,74

Table 5. Standard Deviation

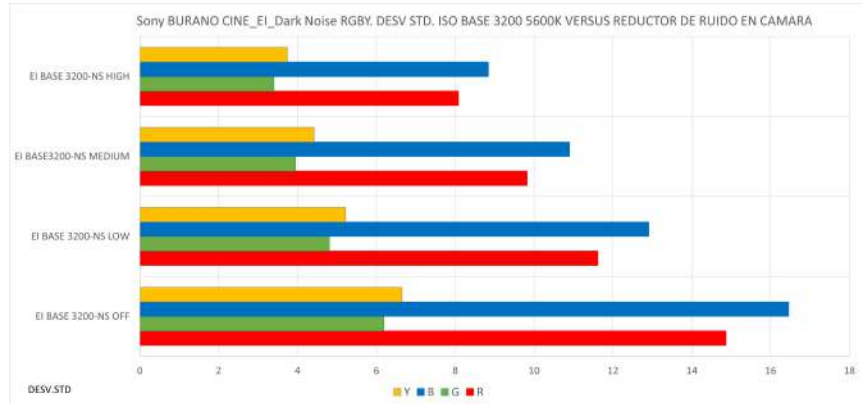


Figure 8 Standard Deviation

According to the data obtained (Table 5 and Figure 8), the average RGBY noise reduction is 21.81% in LOW, 34.36% in MED, and 45.20% in HIGH. This last value is higher than in EI 800, indicating that the noise reduction is more aggressive in this mode, achieving a proportionally greater reduction in noise.

Channel 5600K EI 3200	State	Reduction (%)	SNR Improvement Factor	Improvement (stops)
R	OFF (Baseline)	0	1	0
R	LOW	21,86	1,28	0,356
R	MED	33,96	1,514	0,599
R	HIGH	45,66	1,84	0,88
G	OFF (Baseline)	0	1	0
G	LOW	22,29	1,287	0,364
G	MED	36,19	1,567	0,648
G	HIGH	45,07	1,821	0,864
B	OFF (Baseline)	0	1	0
B	LOW	21,57	1,275	0,35
B	MED	33,78	1,51	0,595
B	HIGH	46,29	1,862	0,897
Y	OFF (Baseline)	0	1	0
Y	LOW	21,5	1,274	0,349
Y	MED	33,53	1,505	0,589
Y	HIGH	43,76	1,778	0,83

Table 6. Channel Relationships (%), SNR Values, and Stops.

A direct comparison can be made with base EI 800 at the same color temperature, where we observe that the reduction is significantly greater at EI 3200, likely as a result of the higher baseline noise level at this EI.

Direct Comparison – Average Percentage Reduction (RGBY)			
Estado NS	EI 800 5600K	EI 3200 5600K	Difference (%)
LOW	16,90%	21,81%	+4,91 pts
MED	25,37%	34,36%	+8,99 pts
HIGH	35,19%	45,20%	+10,01 pts

Table 7

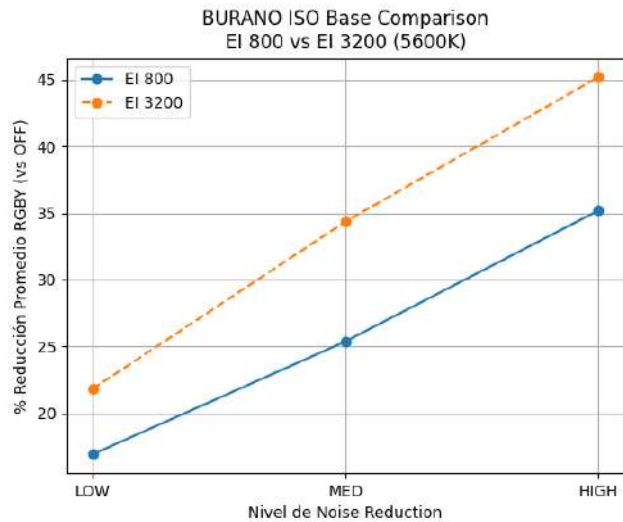


Figure 9

What can be observed in the measurements (Table 7 and Figure 9), first of all, is that simply changing the base does not produce a significant improvement in absolute dark noise. If we compare EI 800 OFF with EI 3200 OFF in luminance (Y channel), the standard deviation decreases from 7.11 to 6.65, which corresponds to only about 0.10 stops of difference. In other words, the gain structure associated with the second base, by itself, does not substantially reduce the noise floor. The initial structural improvement is essentially negligible.

However, when we analyze the behavior of the noise reduction, the situation changes clearly. In EI 800, the average RGBY reduction is 16.9% in LOW, 25.37% in MED, and 35.19% in HIGH. This represents a progressive and relatively restrained intervention: even in HIGH, the system removes approximately one third of the noise, corresponding to roughly 0.6 stops of real improvement in shadows (Fig. 10).

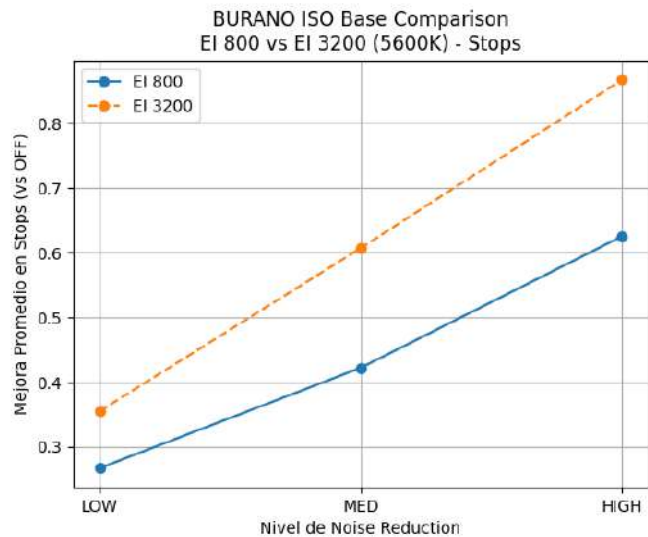


Figure 10

In EI 3200, by contrast, the slope becomes clearly steeper. LOW reaches an average reduction of 21.81%, MED rises to 34.36%, and HIGH reaches 45.20%. This represents increases of nearly 5 percentage points in LOW, close to 9 in MED, and around 10 in HIGH compared to EI 800. The difference is not marginal, but structural.

In terms of stops, the HIGH mode in EI 3200 approaches 0.9 stops of improvement—nearly a full stop.

What is significant is that this effectiveness does not derive solely from the change of base, but from the intensity with which the algorithm operates in the second base. This shift cannot be attributed only to the gain structure; it is the combined result of operating at the higher base and applying a more aggressive internal noise reduction. The second base does not radically transform dark noise when the noise reduction is disabled. What truly changes is the extent of internal processing. In EI 800, the HIGH mode can be understood as a refinement of the shadow floor. In EI 3200, that same mode becomes a much more decisive tool for noise cleaning.

In cinematographic terms, this means that the benefit of the higher base is neither purely “organic” nor exclusively attributable to the capture architecture. It is strongly conditioned by subsequent digital processing. The second base does not only change the gain structure at capture; it also modifies the intensity with which the camera processes the signal. And this difference, although quantifiable in mathematical terms, manifests primarily as a change in the character of shadow texture.

It is also important to emphasize that the fact that EI 3200 in OFF mode shows only a minimal improvement in absolute dark noise compared to EI 800 OFF does not mean that the second base lacks relevance. Rather, it indicates that the benefit of the higher base does not necessarily manifest in noise measured in the absence of signal, but in the signal-to-noise ratio when meaningful information is present in the scene.

Dark noise represents a limiting condition—complete absence of light—where what is primarily measured is read noise and internal electronic behavior. In real shooting conditions, what matters is not only the absolute black floor, but how the sensor responds to weak signals in shadow regions. In this context, the second base can optimize analog amplification to better preserve the signal-to-noise ratio prior to digital processing, even if pure base noise does not change dramatically. Another relevant aspect is the steeper progression of Noise Suppression in EI 3200. Not only does the maximum reduction increase, but the separation between LOW, MED, and HIGH also becomes more pronounced. This suggests that the algorithm is calibrated differently in the second base, possibly because the structure and spectral behavior of the noise change slightly as the analog amplification regime is modified. It is not simply “more of the same,” but rather a contextual adjustment of the system.

From a critical perspective, this raises an important question for the study: does the perceived benefit in EI 3200 stem primarily from the dual ISO architecture, or from the more intensive internal processing? The base noise data suggests that processing plays a significant role in the final improvement of the usable shadow floor.

Finally, there is an aesthetic nuance that should not be overlooked. If EI 3200 in HIGH mode shifts the lower limit by nearly a full stop, it is reasonable to expect that the microtexture of deep shadows may be more affected than in EI 800. This is not necessarily a drawback, but it does imply that enabling HIGH in the higher base has a greater visual impact than in the lower base.

In summary, at this stage of the analysis we are no longer simply measuring noise reduction; we are beginning to define the true character of the camera in its second base. And that difference is not only technical, but also expressive.

Dark Noise Analysis in Cine EI Mode at Base EI 3200 (3200K): RGBY Evaluation Versus In-Camera Noise Suppression

EI base 3200 3200K	R	G	B	Y
EI BASE 3200-NS OFF	10,24	5,99	24,39	10,24
EI BASE 3200-NS LOW	8,06	4,74	19,21	5,29
EI BASE 3200-NS MEDIUM	6,78	3,89	16,25	4,42
EI BASE 3200-NS HIGH	5,75	3,3	13,44	3,78

Table 8 Standard Deviation

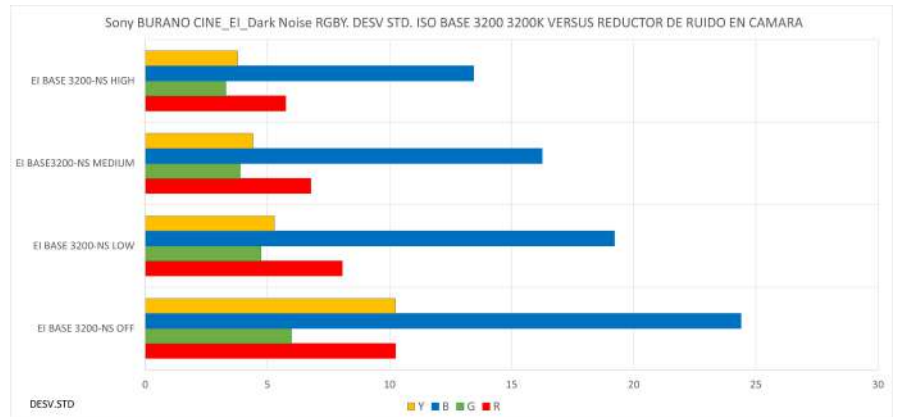


Figure 11 Standard Deviation

When analyzing dark noise at EI 3200 with the color temperature set to 3200K, the results largely confirm the trend observed at 5600K, though with a particularly interesting nuance in the luminance channel (*Table 8* and *Figure 11*).

Across the RGB channels, the percentage reduction relative to OFF remains almost identical to that observed at EI 3200–5600K (*Fig. 12*). In LOW, the reduction is around 21%; in MED it rises to approximately 34%; and in HIGH it reaches values close to 45%. The progression remains clear, proportional, and consistent across channels. This indicates that the reduction algorithm preserves its structural intensity regardless of color temperature, at least in terms of the chromatic components.

The stability observed across the RGB channels reinforces a conclusion already suggested earlier: the system does not appear to be conditioned by white balance in terms of percentage application. The second base retains its strong intervention profile—around 0.85 stops of real improvement in HIGH—both in daylight and at 3200K. From a technical standpoint, this suggests that the noise reduction operates on the statistical variance of the noise at a stage following white balance adjustment, maintaining a consistent internal logic.

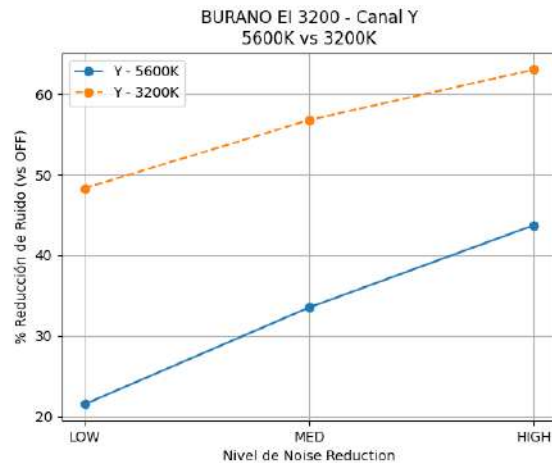


Figure 12

However, the Y channel shows a significant difference (*Fig. 13*). At 3200K, the reduction in luminance exceeds 60% in HIGH mode—a value clearly higher than that observed in RGB and no longer proportional to the behavior seen at 5600K. These observations suggest that, under 3200K, luminance responds differently—likely due to the gain redistribution associated with white balance,

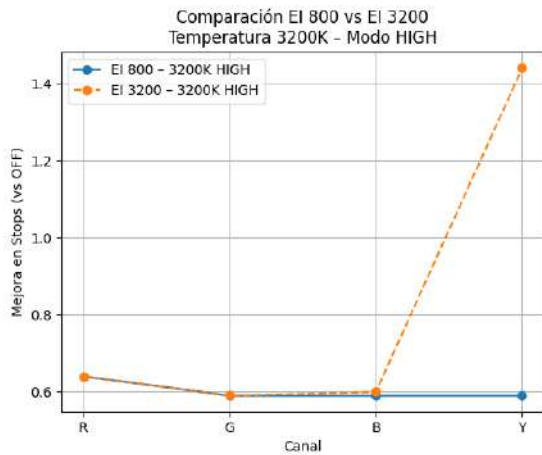


Figure 13

more stable, but the operational margin does not expand to the same extent.

This finding introduces an important nuance. While chromatic noise reduction remains consistent across color temperatures, luminance receives more intensive processing at 3200K (Fig. 13). In practice, this can result in perceptually cleaner shadows under 3200K when noise reduction is applied at higher levels, though it may also lead to some loss of microcontrast in deeper regions.

Taken together, the data confirms that at EI 3200 the system operates more aggressively than at EI 800. This increased intensity remains consistent across chromatic channels regardless of color temperature, but is not entirely uniform in luminance. The second base not only amplifies the overall intervention of the noise reduction, but also introduces nuances in how noise reduction is distributed between luma and chrominance depending on the spectral context of the scene.

Channel	State	Reduction (%)	SNR Improvement Factor	Improvement (stops)
R	OFF (Baseline)	0	1	0
R	LOW	21,29	1,27	0,345
R	MED	33,79	1,51	0,595
R	HIGH	43,85	1,781	0,833
G	OFF (Baseline)	0	1	0
G	LOW	20,87	1,264	0,338
G	MED	35,06	1,54	0,623
G	HIGH	44,91	1,815	0,86
B	OFF (Baseline)	0	1	0
B	LOW	21,24	1,27	0,344
B	MED	33,37	1,501	0,586
B	HIGH	44,9	1,815	0,86
Y	OFF (Baseline)	0	1	0
Y	LOW	48,34	1,936	0,953
Y	MED	56,84	2,317	1,212
Y	HIGH	63,09	2,709	1,438

Table 9

or to the interaction between the algorithm and the statistical structure of the signal at this color temperature.

It is important to clarify that this improvement, measured in dark noise—that is, in the absence of signal—does not translate linearly into an equivalent increase in usable dynamic range. Although the black floor is cleaned more effectively from a statistical standpoint, when meaningful signal is present the actual improvement in SNR is closer to one stop. In other words, absolute black becomes

Table 9 summarizes the relationship between noise reduction levels in terms of SNR, shift in stops, and percentage reduction, supported visually by Figures 14 and 15. The first key aspect is the stability of the chromatic channels: in red, green, and blue, the percentage reduction in HIGH mode remains nearly constant between 5600K and 3200K, with only minimal variations in both SNR and equivalent shift in stops. Although the blue channel exhibits higher baseline noise at 3200K, the progression from LOW to MED to HIGH maintains a proportionality equivalent to that observed at 5600K. The algorithm therefore operates uniformly on chromatic variance, regardless of white balance.

The situation changes in the luminance component (Y). At 5600K, the reduction in HIGH is around 44%, whereas at 3200K it exceeds 63%, corresponding to a shift of approximately 1.4 stops compared to about 0.8 stops in daylight. This difference indicates a stronger processing of noise in the luminance channel under 3200K.

This behavior is not simply an arithmetic consequence of the reduction applied to RGB, but rather a result of the gain redistribution associated with white balance at 3200K. This redistribution alters the statistical structure of the signal, allowing for more effective noise reduction in luma without disrupting chromatic proportionality.

From a perceptual standpoint, this translates into a greater sense of cleanliness in deep shadows when working at EI 3200 under 3200K with higher levels of noise reduction. The system's actual dynamic range is not altered; rather, it is the intensity of the processing applied to luminance that changes.

What both the data and visual assessment show is that the chromatic treatment of noise remains stable across color temperatures, while luminance varies significantly. Since the perception of cleanliness depends primarily on luma, white balance indirectly influences the final character of noise reduction at EI 3200.

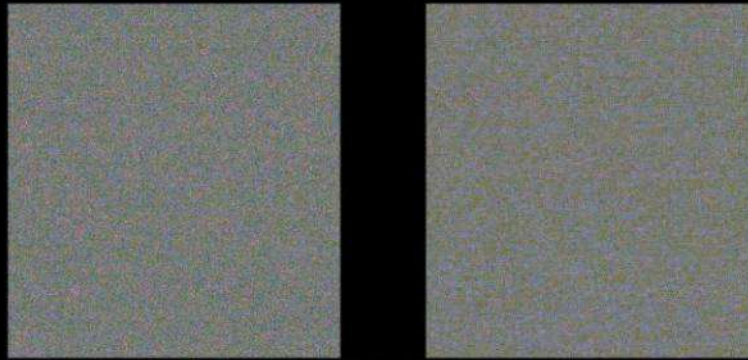


Alfonso Parra on set, preparing a scene for the comedy Pedro el escamoso 3

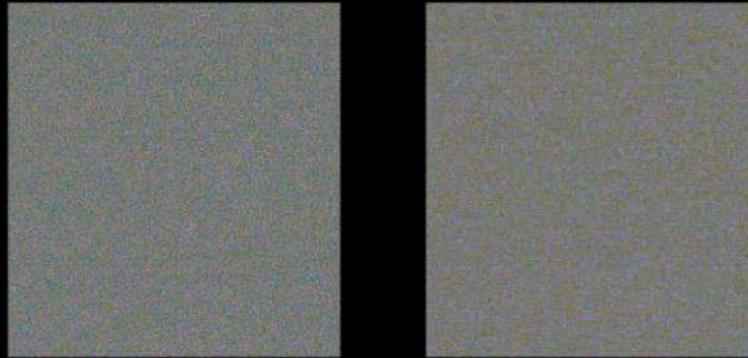
Ruido base
Dark noise

Burano EI base 3200 5600K

Burano EI base 3200 3200K



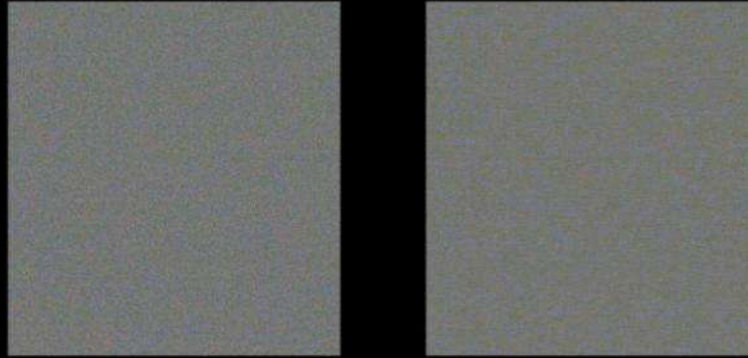
NS OFF



NS LOW



NS MED



NS HIGH

Figure 14

Ruido base canal azul (blue channel)
Dark noise

Burano EI base 3200 5600K

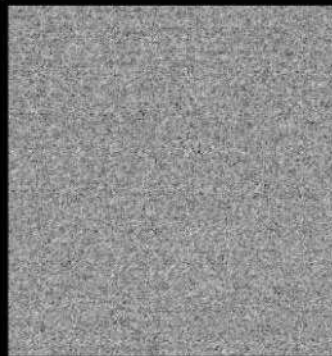
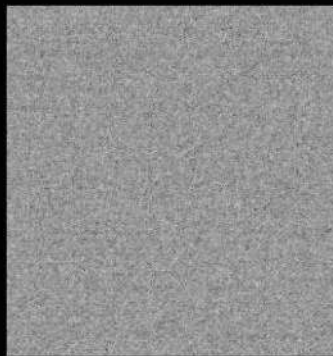
Burano EI base 3200 3200K



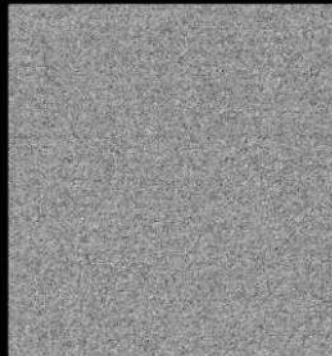
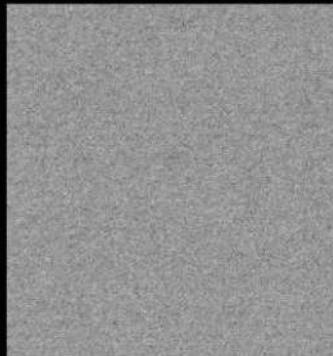
NS OFF



NS LOW



NS MED



NS HIGH

Figure 15

Direct Comparison – Average Percentage Reduction (RGBY)			
Estado NS	EI 800 3200K	EI 3200 3200K	Difference (%)
LOW	16,30%	27,94%	+11,64 pts
MED	24,53%	39,77%	+15,24 pts
HIGH	33,98%	49,19%	+15,21 pts

Table 10

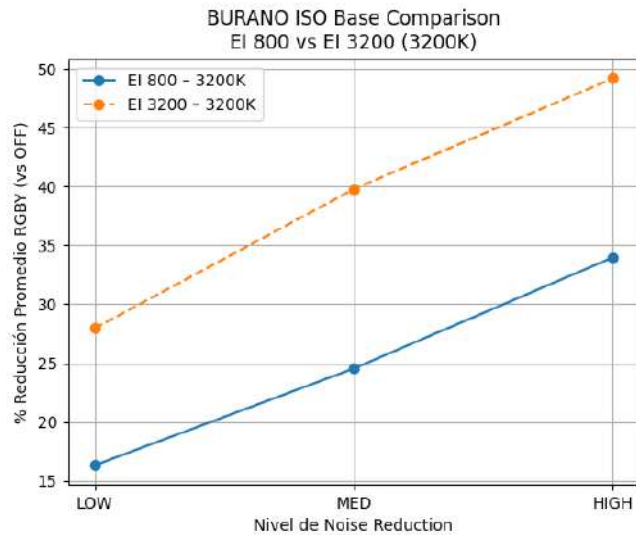


Figure 16

When comparing the average **RGBY** reduction between EI 800 and EI 3200 at 3200K (Figure 16 and Table 10), the difference between bases becomes even more pronounced than at 5600K. In LOW mode, EI 800 shows an average reduction of approximately 16.30%, while EI 3200 reaches 27.94%. This gap of more than eleven percentage points already indicates that the second base not only increases the effectiveness of noise reduction, but does so from the lowest level of Noise Suppression.

In MED mode, the separation widens further. EI 800 achieves an average reduction of 24.53%, whereas EI 3200 reaches 39.77%, representing a difference of over fifteen percentage points. This is not a marginal variation nor something attributable to rounding: the system is operating on a clearly different scale of intervention in the second base EI under 3200K conditions.

In HIGH mode, the trend is reinforced. EI 800 stands at 33.98%, while EI 3200 reaches 49.19%, maintaining a gap of close to fifteen percentage points. Thus, at 3200K, the second base EI not only retains its more interventionist character compared to EI 800, but also significantly amplifies the quantitative difference in noise reduction intensity between the two bases. The percentage gap in HIGH mode is greater than at 5600K, indicating that under 3200K conditions the difference between gain regimes takes on a more structurally pronounced role.

What is most relevant is that this widening does not stem from a uniform intensification across the chromatic channels—which remain relatively stable—but from the differential behavior of luminance. The increase in **Y** at EI 3200 raises the overall average, making the separation between EI 800 and EI 3200 more pronounced at 3200K than at 5600K.

From an interpretive standpoint, this suggests that at a color temperature of 3200K, the second base EI not only intensifies internal processing, but does so with a more pronounced perceptual impact on the overall cleanliness of the image. The difference between bases is no longer merely quantitative; it becomes a matter of character: at EI 3200–3200K, the noise reduction operates with a level of strength that noticeably alters the shadow floor compared to EI 800.

In summary, while the second base already exhibited a stronger intervention at 5600K, this difference becomes amplified at 3200K. The combination of a higher EI base and 3200K does not

alter the system’s chromatic logic, but it does intensify its overall effect by introducing a more pronounced reduction in luminance, making the gap between EI 800 and EI 3200 structurally greater in this context.

When placing the graphs comparing EI 800 and EI 3200 (*Figures 17 and 18*) across different color temperatures side by side, a clear pattern emerges that allows us to bring this analysis to a close.

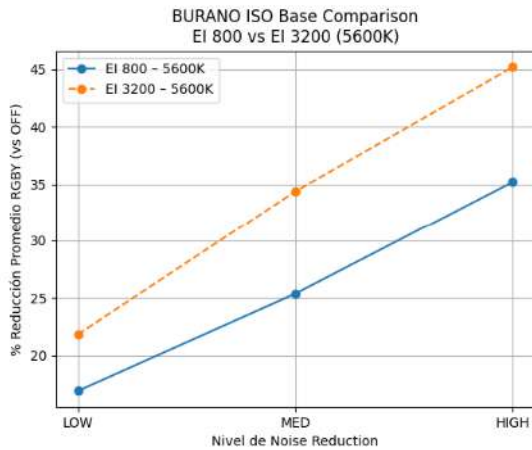


Figure 17

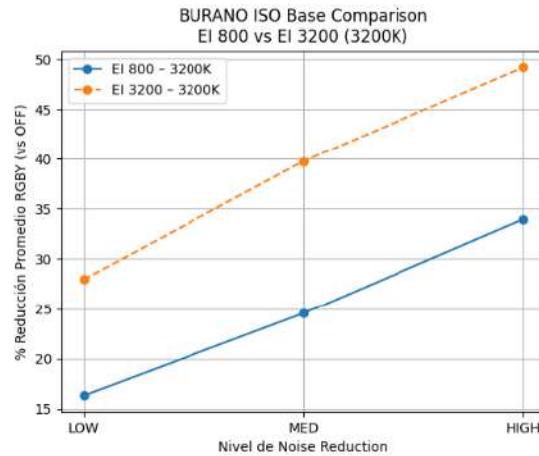


Figure 18

At 5600K, the difference between bases is consistent but moderate: in HIGH, EI 800 reaches an average RGBY reduction of 35.19%, while EI 3200 reaches 45.20%—a gap of roughly 10 percentage points. The slope for EI 3200 is steeper, but both curves maintain a largely parallel progression. The second base EI intensifies the intervention of noise reduction, but does so in a structurally uniform way.

At 3200K, by contrast, the separation between the curves increases significantly. In HIGH, EI 800 stands at 33.98%, while EI 3200 rises to 49.19%, representing a difference of more than fifteen percentage points. The slope of EI 3200 is not only steeper than that of EI 800, but the gap between the two bases is also larger than what is observed at 5600K. In other words, under 3200K lighting, the second base not only operates with greater intensity, but also clearly amplifies the structural difference between gain regimes.

If we compare both color temperatures, two key conclusions emerge. *First, the chromatic behavior of the system remains stable between 5600K and 3200K. The main differences do not originate in the RGB channels, which maintain a consistent logic across both temperatures. Second, the widening of the gap between EI 800 and EI 3200 at 3200K is strongly driven by luminance. Under 3200K conditions, the Y channel shows a disproportionately greater reduction in the second base, raising the overall average and accentuating the separation between the curves.*

Taken together, the analysis shows that:

- The second base, EI 3200, consistently increases noise reduction compared to EI 800.
- At 5600K, this increase is clear but controlled.
- At 3200K, the increase becomes more pronounced and carries a stronger perceptual impact.
- The difference between bases is more pronounced under 3200K than at 5600K (daylight).

From a cinematographic perspective, this means that the “character” of EI 3200 is more dependent on the spectral context of the scene than that of EI 800. In daylight (5600K), the second base provides a noticeable yet controlled improvement. At 3200K, that same base produces a more pronounced cleaning of the shadow floor—particularly in luminance—which can more noticeably affect the final texture of the image.

In summary, we are not only observing a difference between EI bases; we are seeing how that difference is modulated by color temperature. The second base is not simply more sensitive—it is more active in how the signal is processed, and even more so when the spectral balance of the scene shifts toward 3200K.

Practical Implications for Cinematography

Beyond the quantitative analysis, a key conclusion emerges: the choice between EI 800 and EI 3200 is not simply a matter of nominal sensitivity, but a decision about the character of the shadows and the degree of internal processing applied through noise reduction.

Changing the base alone does not significantly reduce dark noise when noise reduction is disabled. The improvement in the absence of signal is limited, indicating that the second base does not inherently reduce noise without digital intervention. The effective shift of the shadow floor appears when internal processing comes into play, particularly in HIGH mode.

At EI 800, noise reduction behaves as a progressive refinement. In HIGH, the improvement is around 0.6 stops in practical terms. The intervention is perceptible but controlled: the system reduces roughly one third of the variance without significantly altering the tonal structure. From a practical standpoint, this makes it a suitable base when the goal is to preserve microcontrast and a certain degree of organic texture in deep shadows, especially in controlled environments.

At EI 3200, the intervention is more assertive. In HIGH mode, the improvement approaches one stop and may exceed it in luminance under 3200K conditions. The system does not merely refine the shadow floor—it shifts it more decisively, increasing stability in deeper regions and slightly extending the usable margin under underexposure. This gain, however, comes with a stronger digital intervention, which may result in subtle smoothing of microstructure in low-light areas and, in some cases, the appearance of artifacts, as will be discussed later.

The difference becomes more pronounced when comparing daylight and 3200K. Across the chromatic channels, behavior remains consistent between 5600K and 3200K. In luminance, however, reduction becomes significantly more aggressive in the second base under 3200K. This implies that, in warmer scenes, shadows may appear cleaner when working at EI 3200 with noise reduction enabled—not due to an intrinsic improvement in the capture system, but to the increased effectiveness of processing in the luminance domain.

From an aesthetic standpoint, the implications are clear. In daylight, the difference between EI 800 and EI 3200 is noticeable but balanced. At 3200K, the gap widens in luminance, which can translate into more controlled shadows, albeit with a slightly more processed texture.

From an operational standpoint, the choice can be framed as follows:

- EI 800 when prioritizing texture, natural grain, and a more restrained level of processing.
- EI 3200 when greater stability in deep shadows or an extended operational margin is required under challenging conditions.
- EI 3200 + HIGH under 3200K when the priority is to maximize cleanliness at the lower end, accepting a stronger intervention in luminance.

Ultimately, the second base is not simply more sensitive: it introduces a greater capacity to shape the shadows, and that intervention is not distributed uniformly between chrominance and luminance. The choice of EI—especially at 3200K—is therefore not only technical, but a decision about the density, stability, and degree of processing in the shadows of the image.

3. SNR Evaluation

When the Signal Begins to Dominate the Noise

This base noise analysis is necessarily complemented by a more practical metric for real-world work: SNR, that is, the signal-to-noise ratio of the image. To evaluate SNR, we used a Macbeth chart analyzed with Imatest, calculating the signal-to-noise ratio according to the following formula:

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

(For further details <https://www.imatest.com/support/docs/23-1/colorcheck/>)



SNR Analysis in Cine EI Mode (Base EI 800) at 5600K and 3200K

EI 800 values 5600k	R	G	B	Y
EI BASE 800-NS OFF	44	45,9	43	47,1
EI BASE 800-NS LOW	44,7	47,6	43,6	47,8
EI BASE 800-NS MEDIUM	46,1	48,9	45	49,1
EI BASE 800-NS HIGH	47,3	50,1	46,2	50,4

Table 11. SNR Values in dB

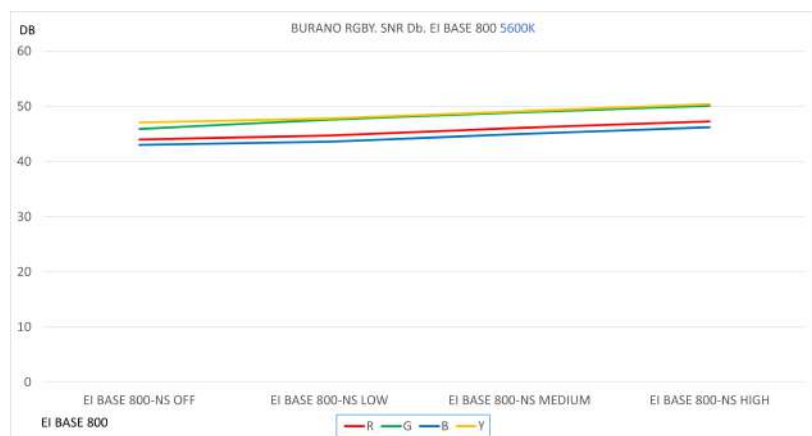


Figure 19. SNR Values in dB

EI 800 values 3200K	R	G	B	Y
EI BASE 800-NS OFF	44,2	46,5	40,1	46,6
EI BASE 800-NS LOW	45,3	47,6	41,1	47,7
EI BASE 800-NS MEDIUM	46,3	48,6	42,1	48,8
EI BASE 800-NS HIGH	47,4	49,5	43	49,6

Table 12. SNR Values in dB



Figure 20. SNR Values in dB

When examining the two SNR measurements at EI 800—both at 5600K and 3200K (*Tables 11 and 12; Figures 19 and 20*)—the behavior of Noise Suppression in the lower base is confirmed to be stable, coherent, and technically consistent.

Reference Values
≥ 40dB High Quality.
[35, 40] dB Very Good Quality
[30, 35] dB Still acceptable quality, with some visible noise
≤ 30 dB Highly visible noise

At 5600K, the transition from OFF to HIGH produces an improvement of between 3 and 4 dB, equivalent to approximately 0.6 stops of real increase in signal-to-noise ratio. At 3200K, the improvement is around 3 dB, or roughly 0.5 stops. The difference between temperatures is small and does not alter the overall behavior of the system: noise reduction operates with comparable intensity under both spectral conditions.

This result confirms that the reduction observed in the dark noise analysis is not merely a perceptual effect. The statistical improvement measured in black translates into a real increase in SNR when the signal is evaluated using the Macbeth chart. At EI 800, the system therefore reduces noise variance without significantly affecting the useful signal amplitude.

Furthermore, even under 3200K—where the blue channel starts from a lower SNR due to the greater amplification required by white balance—the improvement in dB remains proportional across channels. This indicates that the algorithm operates globally on the noise structure, without applying selective processing to any specific chromatic component.

Taken together, the data show that at EI 800, Noise Suppression shifts the lower limit by approximately half a stop in practical terms, with a controlled and consistent intervention across color temperatures. It does not substantially alter the structure of the signal, but rather functions as a technical refinement that increases the statistical stability of the noise while preserving the overall character of the image.

SNR Analysis in Cine EI Mode (Base EI 3200) at 5600K and 3200K

EI 3200 values 5600k	R	G	B	Y
EI BASE 3200-NS OFF	36	39,4	35,3	39,5
EI BASE 3200-NS LOW	38,3	41,5	37,3	41,7
EI BASE 3200-NS MID	40,1	43,5	39,1	43,7
EI BASE 3200-NS HIGH	42,1	45,4	41	45,7

Table 13. SNR Values in dB

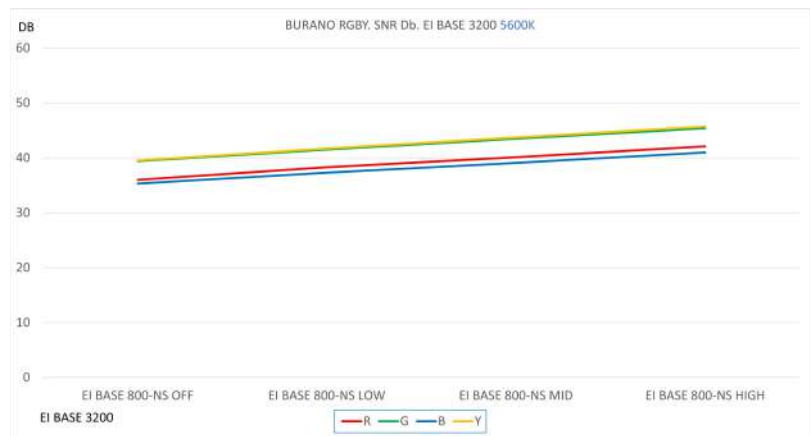


Figure 21. SNR Values in dB

EI 3200 values 3200k	R	G	B	Y
EI BASE 3200-NS OFF	36,3	38,6	32,4	38,6
EI BASE 3200-NS LOW	38,5	40,8	34,4	40,9
EI BASE 3200-NS MID	40,5	42,9	36,1	43
EI BASE 3200-NS HIGH	42,5	44,9	37,8	45

Table 14. SNR Values in dB



Figure 22. SNR Values in dB

The SNR analysis at EI 3200 (Tables 13 and 14; Figures 21 and 22) provides one of the most significant conclusions of the study. Unlike EI 800, where Noise Suppression operates as a moderate adjustment, in the second base EI the magnitude of the intervention is substantially greater.

At 5600K, the transition from OFF to HIGH produces an increase of approximately 6 dB in signal-to-noise ratio, equivalent to about one real stop (≈ 1.03 stops). At 3200K, the improvement is around 1.06 stops. From an operational standpoint, the difference between temperatures is minimal, confirming that in the second base the system's real effectiveness remains stable with respect to white balance.

This result is particularly relevant because, in the dark noise analysis, luminance under 3200K showed a significantly greater percentage reduction. However, when SNR is measured on a meaningful signal—using the Macbeth chart and considering the effective amplitude between white and black—this apparent advantage does not translate into an additional increase in usable dynamic range. The percentage gain observed in the Y channel under 3200K primarily reflects the initial variance and does not imply a further shift in the operational threshold in SNR terms.

Another key finding is that, at EI 3200, Noise Suppression improves the signal-to-noise ratio by roughly twice as much as observed at EI 800. While in the lower base the real gain is around half a stop, in the second base it approaches a full stop. This difference is not trivial: it indicates that at EI 3200, processing plays a decisive role in defining the usable lower limit.

It is also important to emphasize that EI 3200 starts from a lower absolute SNR in OFF mode compared to EI 800. Without active noise reduction, the second base exhibits a lower signal-to-noise ratio. It is the intervention of Noise Suppression that largely compensates for this initial condition. In this sense, the second base is not inherently cleaner; its performance depends more heavily on internal processing.

The technical conclusion is clear: at EI 3200, Noise Suppression not only reduces variance in the absence of signal, but also increases the signal-to-noise ratio in practical imaging by approximately one real stop, consistently across color temperatures. There is no additional advantage under 3200K in terms of effective SNR; the difference observed in dark noise between 5600K and 3200K does not translate into a further operational gain.

From both a technical and cinematographic perspective, this reframes how the second EI base should be understood. Its benefit does not lie solely in a higher gain regime, but in the combination of that regime with more intensive digital processing. EI 3200 does not provide more signal on its own; it provides a greater capacity for noise cleaning when suppression is active. This difference—quantifiable as roughly an additional half stop compared to EI 800—is what defines the true operational character of the second base.

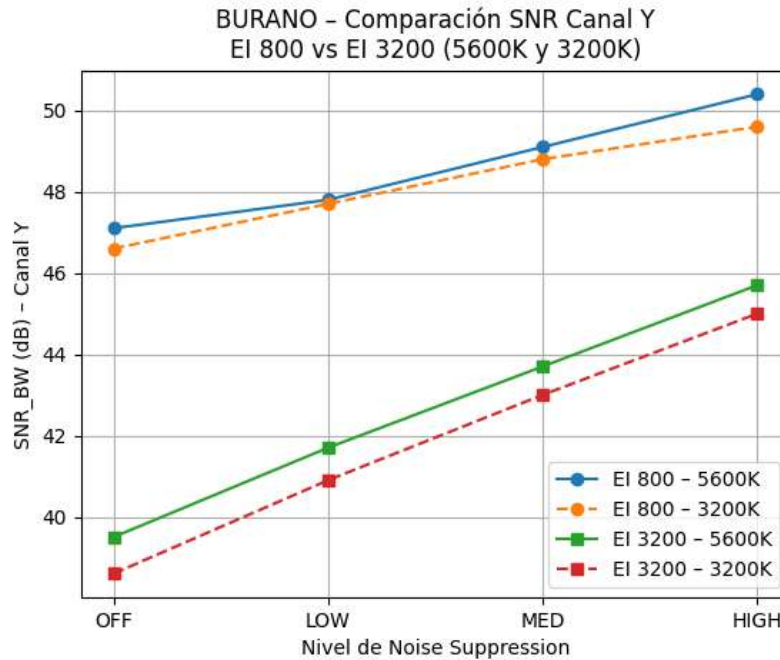


Figure 23

Figure 23 compares SNR values in the Y channel, clearly illustrating the relationship between bases and color temperatures in terms of effective luminance.

First, the vertical separation between EI 800 and EI 3200 in OFF mode is clear and consistent. EI 800 starts from a significantly higher SNR—around 47 dB—while EI 3200 is approximately at 39 dB. This initial difference confirms that, without noise reduction, the second base exhibits a lower signal-to-noise ratio in luminance (the weighted average of RGB).

As the level of Noise Suppression increases, both bases improve progressively, but with different slopes. In EI 800, the curve rises in a moderate and nearly linear fashion, reaching roughly half a stop of additional improvement in HIGH mode. The gain is consistent, but limited in magnitude. In EI 3200, the slope is clearly steeper. The curve rises more aggressively and significantly reduces the gap relative to EI 800. Although it does not fully close it, the initial separation narrows noticeably. This visual representation confirms what has already been quantified: in the second base, Noise Suppression delivers roughly twice the real SNR improvement compared to EI 800.

Another relevant aspect is that the curves corresponding to 5600K and 3200K within each base remain nearly parallel. The differences between temperatures are minimal when SNR is measured on a meaningful signal. This reinforces an important conclusion: color temperature does not substantially affect the system's real efficiency in terms of effective signal-to-noise ratio, even if the percentage analysis of dark noise might suggest otherwise.

The graph thus encapsulates a central idea: EI 3200 does not start from a higher signal-to-noise ratio; it starts from a lower one. It is the activation of Noise Suppression that significantly compensates for this initial condition, providing approximately one additional real stop compared to about half a stop at EI 800.

From an operational standpoint, this indicates that the second base relies more heavily on internal processing to stabilize its lower limit in the shadows. Its final behavior is strongly conditioned by digital intervention when enabled, as reflected in the steeper slope of its improvement curve.

The next step in the analysis is to observe these processes in real footage of a model, starting from EI 800. To make the noise structure more clearly visible, a controlled underexposure of four stops was applied, followed by compensation in color grading to match the gray level to that of a correct exposure. This procedure is not intended to replicate a typical shooting scenario, but rather to serve as an analytical tool that amplifies the system's behavior under critical SNR conditions. By reducing the signal at capture and raising it later in postproduction, the relative proportion of noise increases, allowing for a more precise evaluation of its texture, distribution, and response to Noise Suppression.

What the images confirm is that, at EI 800 (*Figure 24*), noise reduction operates as a refinement rather than a reconfiguration of the noise. The grain structure remains perceptible, chromatic noise does not dominate, and no structural artifacts appear. This behavior aligns with the SNR measurements: the improvement is real, but remains on the order of about half a stop.

Even at 3200K—where the blue channel starts from a lower SNR due to the amplification associated with white balance—the noise does not take on an excessively chromatic character. The grain maintains a balanced distribution, and no imbalance is observed between luminance and chrominance.

In practical terms, Noise Suppression at EI 800 reduces variance without altering the microstructure or the chromatic balance of the residual noise. The shadows retain texture and character: the statistical improvement is perceived as greater stability, not as homogenization. The system attenuates the amplitude of the grain while preserving its identity.



*Burano. EI 800.5600K Slog3-SGamut3.cine. Base exposure
Middle Gray 41%*

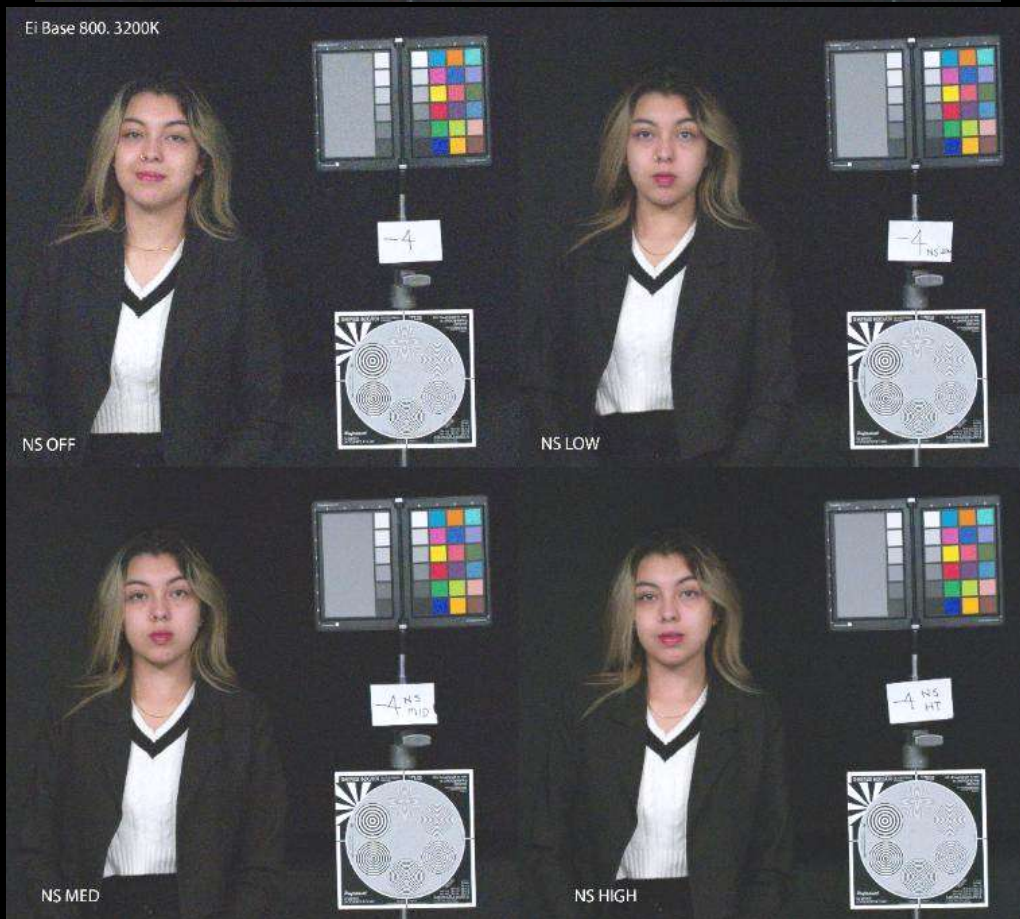
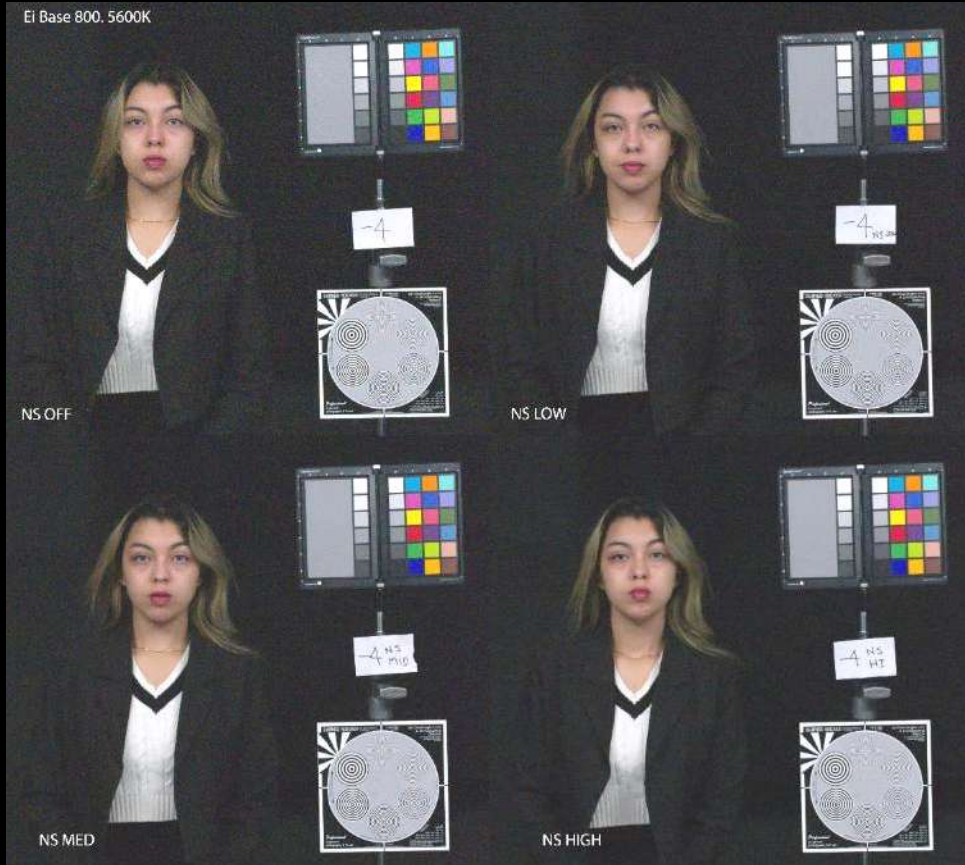


Figure 24. S-Log3 / S-Gamut3.Cine, graded in DaVinci Resolve with underexposure corrected and converted to Rec.709



Figure 25. S-Log3 / S-Gamut3.Cine, graded in DaVinci Resolve, with -4 stops of underexposure corrected and converted to Rec.709

Figure 25 compares Noise Suppression in OFF and LOW at EI 800 and 3200K, allowing the numerical data to be translated into a concrete visual reading. According to the SNR measurements, the transition from OFF to LOW represents an increase of approximately 1.1 dB in luminance, equivalent to about 0.18 real stops. This is therefore a technically measurable improvement, but of limited magnitude.

The image confirms this behavior. In OFF mode, grain is visible in the dark background and in the shadow areas of the face, with a perceptible granular texture and some chromatic variability. In LOW, the fine noise becomes slightly more compact and more evenly distributed. Variability in the shadows is reduced, but the overall structure of the image remains intact. There is no noticeable loss of microdetail in the skin, nor any evident smoothing effect. Likewise, the Putora resolution chart shows no degradation in sharpness associated with the change in mode.

The consistency between measurement and perception is significant. An increase of 0.18 stops cannot produce a substantial transformation of the image—and indeed it does not. LOW does not meaningfully shift the lower SNR limit or alter the overall structure of the signal; it simply reduces the amplitude of the most visible noise fluctuations.

From a practical standpoint, this behavior aligns with a Log-based workflow intended for later grading, or with situations where preserving the original texture without introducing perceptible digital intervention is desired. Microcontrast in skin is maintained, shadows retain their natural density, and the image shows no signs of aggressive processing.

In summary, the visual comparison validates the quantitative analysis: at EI 800 and 3200K, LOW mode provides a real but subtle technical improvement. It does not redefine the signal; it stabilizes it slightly. It is a fine adjustment, not an aggressive noise-cleaning mechanism.



Figure 26. *S-Log3 / S-Gamut3.Cine*, graded in *DaVinci Resolve*, with *-4 stops of underexposure corrected and converted to Rec. 709*

As a synthesis, *Figure 26* focuses the analysis on skin tone and dermal detail at EI 800 and 3200K. In OFF mode, skin texture is fully visible, and fine grain can be perceived across the surface and in shadow areas. The dermal structure—pores and subtle tonal transitions—remains intact, although the micro-variation of the noise introduces a slight instability in tonal perception.

In LOW mode, consistent with the approximately 0.18-stop increase measured in SNR, the change is subtle. Fine noise becomes slightly more compact and chromatic variation decreases, but dermal texture and microcontrast remain essentially unchanged. The skin appears somewhat more uniform, without noticeable loss of detail or evident smoothing.

With NS MID, a more visible intervention begins to emerge. The skin becomes more homogeneous, and fine noise is reduced more effectively. However, microcontrast starts to decrease slightly: pores and more delicate transitions lose some definition, although still within a natural range.

In NS HIGH, the cleaning is evident. Grain is clearly reduced, and the skin surface becomes more uniform. In exchange, microdetail is slightly compressed, and tonal transitions lose some of their fine relief. The intervention is not extreme, but it is perceptible compared to OFF. This is consistent with the roughly half-stop improvement observed at EI 800: the refinement is real, but it does not substantially alter the structure of the image.

In *Figure 27*, we now examine the second base, EI 3200, at a color temperature of 3200K. With NS OFF, the skin texture is clearly affected by noise amplification. The grain is coarser and more visible than at EI 800, consistent with the lower baseline SNR measured in this second base without active reduction. The skin surface retains its microdetail, but tonal rendering is disrupted by the random fluctuations of noise. Shadows in the cheeks and facial contours show a noticeable noise shimmer that affects the perceived cleanliness of the image.

With NS LOW, the change relative to OFF is now more noticeable than at EI 800. The skin begins to clean up in a clearly perceptible way: fine grain becomes more compact, and the texture appears more uniform. Even so, microdetail remains recognizable and tonal relief is preserved. There is no artificial homogenization yet, but there is a stronger sense of uniformity across the skin surface. At EI 3200, even LOW already operates more effectively than in the lower base.

In NS MID, the intervention becomes clearly visible. The skin appears more uniform, and fine noise is reduced more significantly. However, microcontrast begins to decrease slightly. Tonal transitions become smoother, and fine relief loses some depth. It does not become “plastic,” but the signal already shows clear signs of processing. This progression is consistent with the significant SNR increase observed in the data.

With NS HIGH, the cleaning is unmistakable. The skin takes on a much more uniform appearance, and grain is significantly reduced. In return, dermal texture loses some of its fine definition. Microdetail is compressed, and the surface becomes smoother. The effect is not extreme, but it is clearly perceptible compared to OFF. This is where the additional stop of SNR we measured becomes visually evident: the improvement is real, but it comes with a more pronounced intervention on the tonal structure.



Figure 27. S-Log3 / S-Gamut3.Cine, graded in DaVinci Resolve, with -4 stops of underexposure corrected and converted to Rec.709

Unlike EI 800—where the progression is gradual and restrained—at EI 3200 the transition between levels is clearly more pronounced. The second base starts with more visible noise, but Noise Suppression compensates with greater intensity. In LOW, a perceptible stabilization is already evident; MID introduces a clear homogenization; and HIGH significantly reduces noise variability, at the cost of some loss in microcontrast. Most importantly, the visual improvement aligns with the SNR data: in HIGH mode, the gain is approximately one real stop. This is not a subjective effect or a purely perceptual impression, but a statistically measurable improvement in

signal-to-noise ratio. However, this gain comes with a more visible intervention on skin texture and fine tonal structure.

Finally, let us examine the comparison between the two base EI values with noise reduction disabled (*Figure 28*).



Figure 28. S-Log3 / S-Gamut3.Cine, graded in DaVinci Resolve, with -4 stops of underexposure corrected and converted to Rec.709

The direct comparison between EI 800 and EI 3200 in Noise Suppression OFF mode is particularly revealing, as it removes any influence of internal processing and allows the native behavior of each EI base to be observed under the same extreme condition of underexposure followed by recovery in postproduction.

Visually, the difference is clear. At EI 3200, grain appears more pronounced, with greater dispersion in both luminance and chrominance, especially in the shadow areas of the face. The skin shows more evident variability, and noise directly competes with tonal rendering. At EI 800, although grain is also visible due to the four-stop lift, the texture appears more stable and less intrusive. Microdetail in the skin—pores and fine transitions in the cheeks and contours—remains more legible.

These observations are fully consistent with the SNR data obtained earlier. In OFF mode, EI 800 shows approximately 46–47 dB in luminance, while EI 3200 sits around 38–39 dB. This difference of nearly 8 dB corresponds to slightly more than one real stop in signal-to-noise ratio. The image confirms this gap: the second base EI starts from a lower SNR when processing is disabled.

Another relevant aspect is tonal stability. At EI 800, facial shadows exhibit greater structural coherence, whereas at EI 3200, the amplification associated with the higher gain regime increases noise variability and reduces both chromatic and luminance stability. This is not an effect of noise reduction—since it is inactive here—but a direct consequence of a lower signal-to-noise ratio at capture.

This comparison is fundamental because it clearly separates native electronic behavior from the effects of internal processing. Without digital intervention, the noise floor is less stable.

Ultimately, the image clearly visualizes what the quantitative analysis had already indicated: EI 800 offers a higher native SNR and a more stable texture under critical conditions. EI 3200, by contrast, relies more heavily on the noise reduction system to compensate for its initial disadvantage. We also want to highlight an effect observed in *Figure 29* when using the HIGH setting of Noise Suppression: the appearance of a trailing artifact or “ghosting” in fast movements. The frame in which the model moves her hand reveals a behavior that does not appear in static shots and is key to understanding the true cost of the HIGH mode.

In this configuration, the Noise Suppression system does not appear to rely solely on spatial intraframe filtering, but most likely incorporates a temporal reduction component based on the analysis of multiple consecutive frames. The principle is well known: noise varies randomly from frame to frame, while the structural signal tends to remain temporally coherent. By integrating temporal information, the algorithm can effectively increase the signal-to-noise ratio.

However, this mechanism performs best in static regions and presents limitations with fast-moving elements. When the hand moves quickly, it no longer behaves as a temporally coherent signal and instead introduces significant discontinuities between frames. Under these conditions, the system may interpret part of that variation as noise or inconsistent information and, in attempting to stabilize it, produces visible artifacts: slightly softened edges, localized loss of definition, and a partially averaged appearance in the moving region.

This phenomenon aligns closely with the SNR data obtained in the EI 3200 section. HIGH mode provides approximately one additional real stop of improvement in signal-to-noise ratio compared to OFF—a significant gain. However, this improvement is achieved through more intensive

processing which, in the presence of fast motion, can compromise the temporal coherence of fine detail.

From a cinematographic perspective, the implication is clear. In static scenes or those with gentle movement, HIGH can deliver very effective cleaning in deep shadows, reinforcing image stability. By contrast, in sequences with rapid gestures or dynamic foreground elements, the increase in SNR may be accompanied by perceptible temporal artifacts. The gain in statistical stability is therefore balanced by a potential loss of natural motion rendering.

This frame demonstrates that the SNR improvement measured in the lab translates directly into real imagery, but also that this gain involves a trade-off under certain dynamic conditions. HIGH mode does not simply reduce noise variance; it alters the temporal response of the system, introducing an additional dimension to consider when deciding whether to use it.



Figure 29. S-Log3 / S-Gamut3.Cine, converted to Rec.709. EI 3200, NS HIGH. Shutter 1/48 sec (180°), 23.97 fps

Summary and Practical Guidelines for Using In-Camera Noise Reduction

At the LOW setting, the system's intervention is subtle and restrained. The camera applies a light filtering process, likely combining temporal and spatial components at higher frequencies, without significantly altering the overall structure of the signal. The fine noise pattern remains largely intact; only the most evident irregularities are attenuated, such as residual fixed-pattern noise in darker regions.

The visual result preserves the original texture of the digital grain, maintaining a clean and natural appearance very close to the character of the recorded signal. There is no aggressive smoothing or noticeable loss of microdetail, allowing perceived sharpness and textural richness to be retained in complex surfaces such as skin, fabrics, or finely detailed backgrounds.

From a practical standpoint, this setting is particularly well suited for Log workflows intended for full grading in postproduction. It is also a coherent choice in low-light situations where preserving the natural character of the noise without introducing obvious digital intervention is

desired. Aesthetically, LOW delivers an organic image with minimal loss of sharpness and a balanced compromise between cleanliness and texture.

At the MED setting, the system’s intervention becomes more apparent. The camera increases smoothing, particularly in the luminance component, and to a lesser extent in chrominance. The effect is clearly visible in shadows and midtones, where noise is significantly reduced and the image takes on a more uniform appearance.

This additional cleaning introduces a subtle shift in texture. The image becomes more polished, but may also acquire a slightly “plastic” quality if the signal is pushed in grading. At EI 800, the impact remains relatively moderate; however, at EI 3200 the reduction becomes more noticeable, and digital processing plays a greater role in shaping the shadow floor.

From a practical standpoint, MED can be suitable for documentary shooting or interviews where skin tones are relatively uniform and a clean image is desired without the need for extensive postproduction. It also fits well within fast-paced workflows where no additional noise reduction is expected during color grading.

However, in large-format projection or HDR environments, a slight softening of microdetail in fine textures may become noticeable, particularly in delicate details. It is also advisable to avoid this setting if further temporal reduction or denoising is planned in tools such as DaVinci Resolve, as the cumulative effect of multiple processes may compromise microdetail and accentuate an artificial smoothing.

At the HIGH setting, the system’s intervention becomes clearly structural and moves beyond simple refinement. All indications suggest that the camera applies a more intensive temporal filtering—likely based on multiple frames—with particular emphasis on luminance. The result is a very noticeable reduction in visible noise, approaching one real stop of improvement in SNR—and potentially slightly more in luminance under certain conditions—although the perceived cleanliness on a monitor may appear even greater.

This gain, however, is not neutral. The image begins to lose microcontrast, and fine texture becomes perceptibly smoother. In profiles such as S-Log3, when shadows are lifted in postproduction, skin and uniform surfaces may take on a slightly waxy appearance, indicating a stronger level of intervention in the signal. The image becomes more stable and cleaner, but also less organic.

In practice, this setting can be useful in extremely low-light environments where the priority is to obtain a controlled signal, even at the expense of fine detail. It can also serve as a preventive measure when working with more compressed codecs, where noise may exacerbate compression artifacts.

However, its use is best reserved for edge cases. HIGH mode reduces flexibility in color grading and may affect perceived sharpness, particularly in delicate textures. In HDR mastering or large-format exhibition—where microdetail and tonal depth are critical—this level of suppression may prove overly intrusive.



Is Mr. Parra reflecting on the Burano’s noise characteristics on set?

4. Dynamic Range and Noise Analysis

The Threshold Between Noise and Texture

Dynamic Range (DR) Analysis in Relation to Noise in Cine EI Mode

For the analysis of dynamic range in relation to noise, we used the 21-step P.I.L.I. (*Precision Imaging & Lighting Institute*) chart—based on the Xyla chart from DSC Labs—and processed the data using Imatest.

These are the results for the base EI values (800 and 3200) in Cine EI mode with noise reduction disabled (*Figures 30 and 31*).

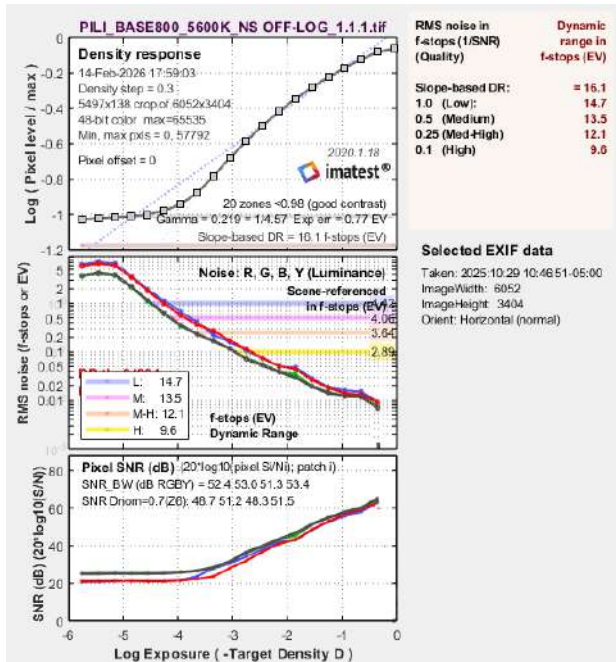
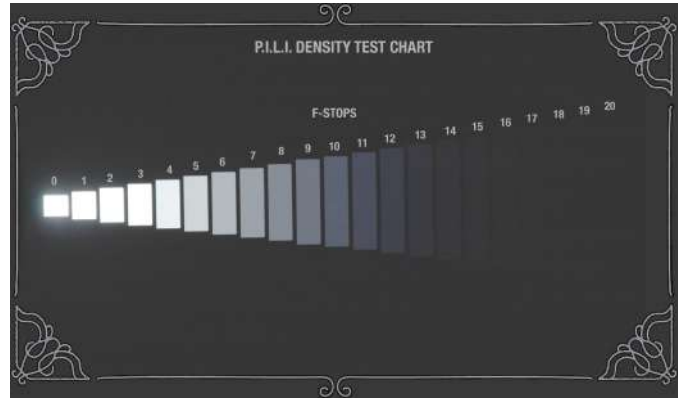


Figure 30. Base EI 800 5600K

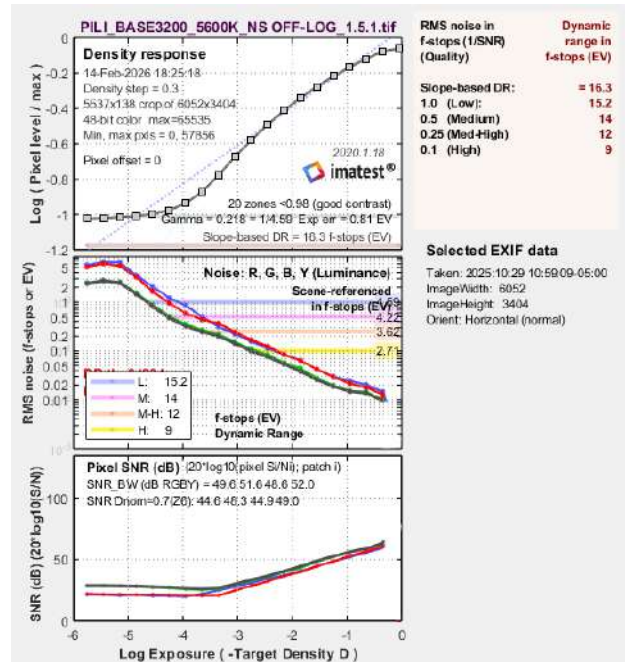


Figure 3.1 Base EI 3200 5600K

Measurements at 5600K allow for an analysis of dynamic range behavior in both bases when evaluated against different signal-to-noise ratio (SNR) thresholds. The graph plots dynamic range in EV against SNR levels of 1, 2, 4, and 10.

In nominal terms (slope-based DR), both bases show virtually identical values: 16.1 EV at EI 800 and 16.3 EV at EI 3200. This difference is operationally negligible and confirms that the gain regime does not alter the maximum encoded range of the system.

Differences begin to emerge when examining the SNR thresholds.

At the lower thresholds (SNR = 1 and SNR = 2), EI 3200 shows approximately half a stop more than EI 800. At SNR = 1, it reaches 15.2 EV compared to 14.7 EV; at SNR = 2, 14.0 EV versus

13.5 EV. This indicates that, under the most permissive criterion—where the signal is barely distinguishable from noise—the second base maintains detectability slightly deeper into the shadows.

However, when a more stringent criterion is applied, this advantage diminishes. At SNR = 4, both bases are nearly identical (12.1 EV vs. 12.0 EV). And at SNR = 10—representing a region of high cleanliness and tonal precision—EI 800 outperforms EI 3200 (9.6 EV vs. 9.0 EV).

The comparative curve (*Figure 32*) clearly illustrates this behavior: the line corresponding to EI 3200 lies above that of EI 800 at lower thresholds, converges at the intermediate threshold, and falls below it at the most demanding level. This is not a uniform improvement in dynamic range, but rather a redistribution of performance depending on the applied noise cleanliness criterion.

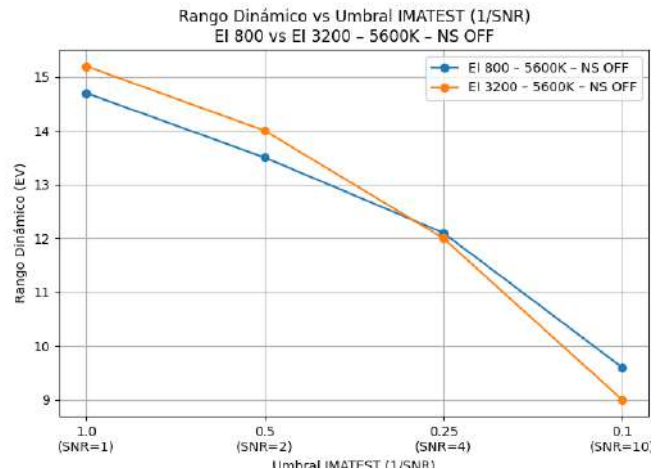


Figure 32

These results are consistent with what was observed in the previous dark noise and SNR analyses. Although EI 3200

exhibited a slightly higher absolute noise floor, its behavior under very low signal conditions shows marginally extended detectability. This explains why the SNR = 2 threshold shifts slightly deeper into the shadows at EI 3200, even though the absolute black level is noisier.

As a result, the second EI base does not extend the clean dynamic range nor alter the upper limit of the signal in S-Log3, but rather subtly reshapes the transition zone between deep shadow and distinguishable signal. The difference does not lie in the maximum attainable depth or in the purity of black, but in the point at which the signal begins to rise above the minimum threshold of detectability.

From a practical standpoint, EI 3200 introduces a modest additional margin in low-light regions, specifically within the transition zone between usable signal and noise dominance, and conditioned by the chosen SNR criterion. This is not a global expansion of dynamic range, but a modulation of the behavior of the lower limit.

We now examine in greater detail the effect of Noise Suppression on dynamic range based on measurements obtained with the P.I.L.I. chart, starting with EI 800 at 5600K (*Table 15*).

EI 800 values 5600k	SLOPE BASED DR	1.0 LOW	0.5 (MEDIUM)	0.25 (Med-HIGH)	0.1 (HIGH)
EI BASE 800-NS OFF	16,1	14,7	13,5	12,1	9,6
EI BASE 800-NS LOW	16,1	15,1	14	12,6	9,92
EI BASE 800-NS MEDIUM	16,1	15,2	14,1	13	10,1
EI BASE 800-NS HIGH	15,9	15,4	14,5	13,3	10,6

Table 15

When analyzing the Imatest data at EI 800 and 5600K, the first point to note is that enabling Noise Suppression does not significantly modify the nominal dynamic range in S-Log3. The slope-based DR value remains essentially constant: 16.1 EV in OFF, LOW, and MEDIUM, and 15.9 EV in HIGH. This stability confirms that internal processing does not alter the upper limit of the encoded signal or expand the maximum available brightness range.

The difference emerges when dynamic range is evaluated not as a single figure, but in relation to the different signal-to-noise ratio thresholds defined by Imatest (1/SNR). It is in this perspective that the true effect of the system becomes evident.

Using the OFF state as a reference, LOW mode introduces a moderate but consistent improvement. The shift in the threshold crossing point is approximately between 0.3 and 0.5 EV, depending on the SNR criterion considered. The intervention is gentle and relatively uniform: it does not alter the overall signal profile, but slightly shifts the lower limit within the shadow region. In MEDIUM, the intervention becomes more concentrated in the mid-range. The increase at the more permissive thresholds remains around half a stop, but at SNR = 4—a reasonable criterion for cinematographic use—the improvement reaches approximately 0.9 EV. This indicates that the system does not simply attenuate noise in the deepest blacks, but operates more effectively in the range where the signal begins to develop usable tonal consistency.



Preparing the P.I.L.L.I. test chart shoot

At SNR = 4—a reasonable criterion for cinematographic use—the improvement reaches approximately 0.9 EV. This indicates that the system does not simply attenuate noise in the deepest blacks, but operates more effectively in the range where the signal begins to develop usable tonal consistency.

HIGH mode introduces a more decisive level of intervention. The shift reaches approximately one real stop across several thresholds and rises to around 1.2 EV at SNR = 4. This is particularly significant: the greatest benefit does not occur at the most permissive criterion (SNR = 1), nor solely at the most demanding (SNR = 10), but in the intermediate range where the signal begins to exhibit texture and volume—to acquire “body.”

Figure 33, which plots the shift relative to OFF, clearly illustrates this behavior: the curve corresponding to HIGH shows its steepest slope precisely in the region where the transition between deep shadow and usable signal becomes critical.

This pattern confirms that Noise Suppression does not expand the physical dynamic range of the signal encoded in S-Log3, nor does it alter the saturation margin in the highlights. What it does is digitally shift the lower signal-to-noise threshold. It does not change the system’s upper limit; it redefines the point at which the signal becomes operationally usable.

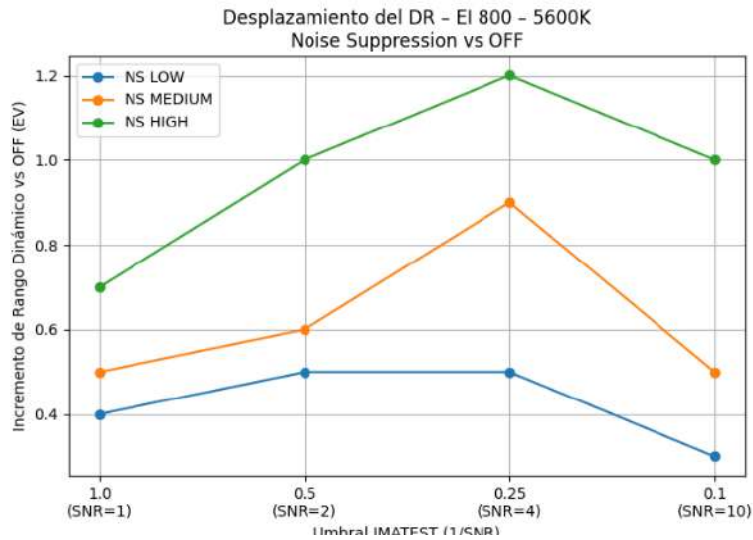


Figure 33

In practical terms, this means that at EI 800, HIGH mode can provide approximately one additional real stop of usable dynamic range, concentrated in the region where the signal begins to acquire tonal and structural consistency. This is not a physical expansion of dynamic range, but an optimization of the lower usability threshold.

The sensor does not capture more information in absolute terms; what changes is the internal criterion at which the signal is considered sufficiently clean to be part of the operational range.

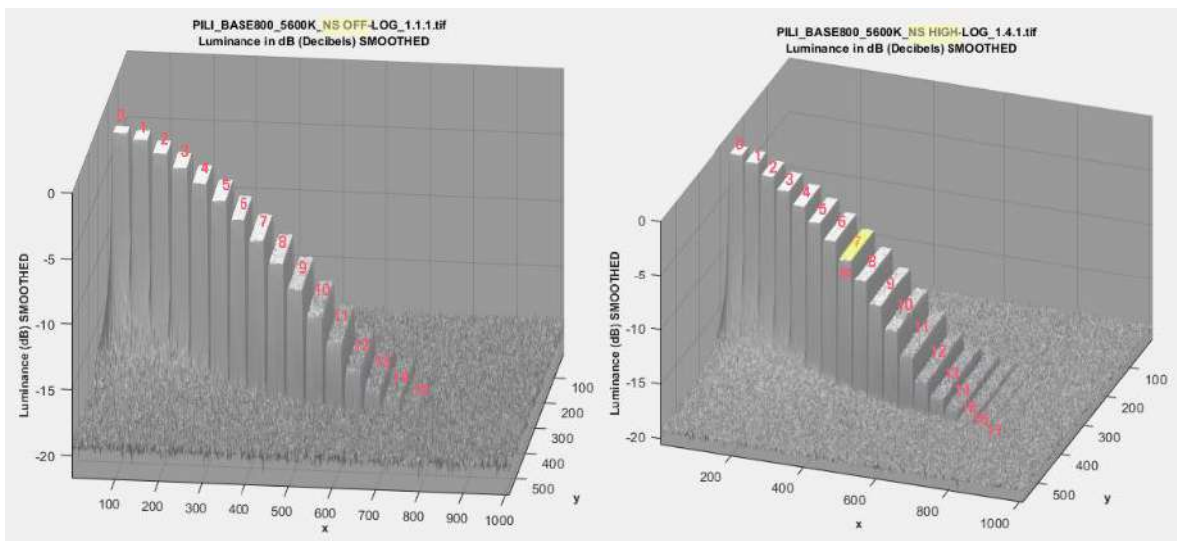


Figure 34 EI 800 5600K NS OFF

EI 800 5600K NS HIGH

The three-dimensional comparison at EI 800 (Figure 34) shows that NS HIGH does not modify the upper limit of the signal nor alter the tonal structure in the mid and highlight regions. Its effect is concentrated at the lower end, where digital integration reduces noise variance and shifts the detectability threshold downward. The lowest steps gain greater volumetric separation from the base plane, resulting in an increase in operationally usable dynamic range, without any change to the maximum physical range.

The intervention remains progressive and controlled, consistent with what was observed in the SNR measurements.

This nuance is essential. Dynamic range does not depend solely on the physical capabilities of the sensor, but also on the internal criterion used to define the lower usability threshold. At EI 800, Noise Suppression operates as a selective shift of that threshold, with greater impact in the range where the signal begins to separate from the noise and acquire cinematic consistency.

Let us now examine the values at EI 3200 and 5600K.

EI 3200 values 5600k	SLOPE BASED				
	DR	1.0 LOW	0.5 (medium)	0.25 (Med-HIGH)	0.1 (HIGH)
EI BASE 800-NS OFF	16,3	15,2	14	12	9
EI BASE 800-NS LOW	16,3	15,7	14,5	13,1	9,54
EI BASE 800-NS MEDIUM	16,3	16	14,8	13,3	9,73
EI BASE 800-NS HIGH	16,3	16,3	15,2	13,8	10,3

Table 31

When analyzing the behavior of Noise Suppression in the second base (EI 3200) at 5600K (Table 31), the first relevant finding is that the nominal dynamic range remains constant. The slope-based DR value stays at 16.3 EV regardless of the level of suppression applied. This confirms that the upper limit of the signal within the capture and encoding system is not altered.

The difference emerges when dynamic range is examined in relation to the 1/SNR thresholds defined by Imatest (*Figure 35*).

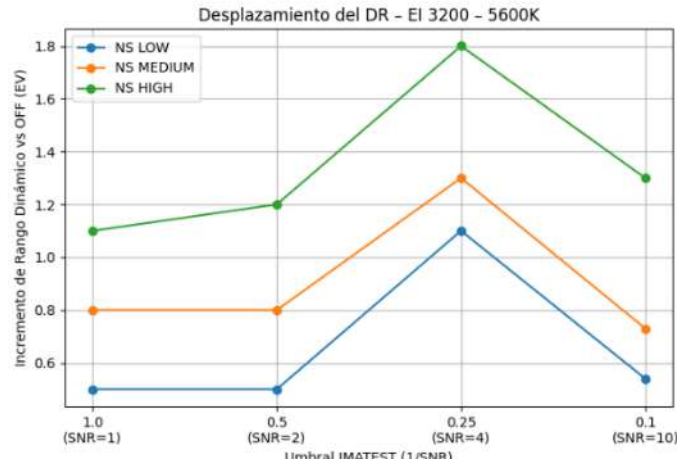


Figure 35

In LOW mode, the shift relative to OFF is already noticeable. The improvement is around half a stop at the SNR = 1 and SNR = 2 thresholds, but reaches approximately +1.1 EV at SNR = 4. This indicates that even at the most moderate level, the system operates with particular effectiveness in the mid-range where the signal begins to become operationally usable.

In MEDIUM, the action on noise becomes more pronounced. The shift is around +0.8 EV at SNR = 1 and SNR = 2, and reaches approximately +1.3 EV at SNR = 4. The transition zone between deep shadow and usable signal is clearly displaced. This is not simply a reduction of base noise, but a modification of the threshold at which the signal meets the quality criterion defined by SNR.

It is worth noting that the shifts at SNR = 1 and SNR = 2 are virtually identical. This is because both thresholds lie in the region closest to the noise floor, where the slope of the curve is shallow and the algorithm’s intervention acts in an approximately proportional manner. In this range, small statistical variations translate into very similar EV increases, which explains the apparent overlap observed in the graph.

In HIGH mode, the effect becomes structural. The increase reaches approximately +1.1 EV at SNR = 1, +1.2 EV at SNR = 2, and approaches +1.8 EV at SNR = 4. Even at the most demanding threshold (SNR = 10), the shift is on the order of +1.3 EV. Once again, the greatest benefit is concentrated around SNR = 4—that is, in the cinematographically operative range.

Compared to EI 800, the magnitude of the shift at EI 3200 is significantly greater. While in the first base HIGH mode provided roughly one stop of improvement in the operational range, in the second it approaches two stops. This indicates that processing operates with greater intensity when the system is in the higher gain regime.

In structural terms, the second base does not expand the total encoded range, but more decisively shifts the lower threshold defined by the signal-to-noise ratio. It is the interaction between the gain regime and internal processing that produces this effect.

The three-dimensional representation (*Figure 36*) helps visualize this reconfiguration: although the upper limit remains stable, the deepest steps gain greater separation from the noise floor when HIGH mode is active. The physical range of the system is not expanded, but the point at which the signal becomes operationally usable is more strongly redefined.

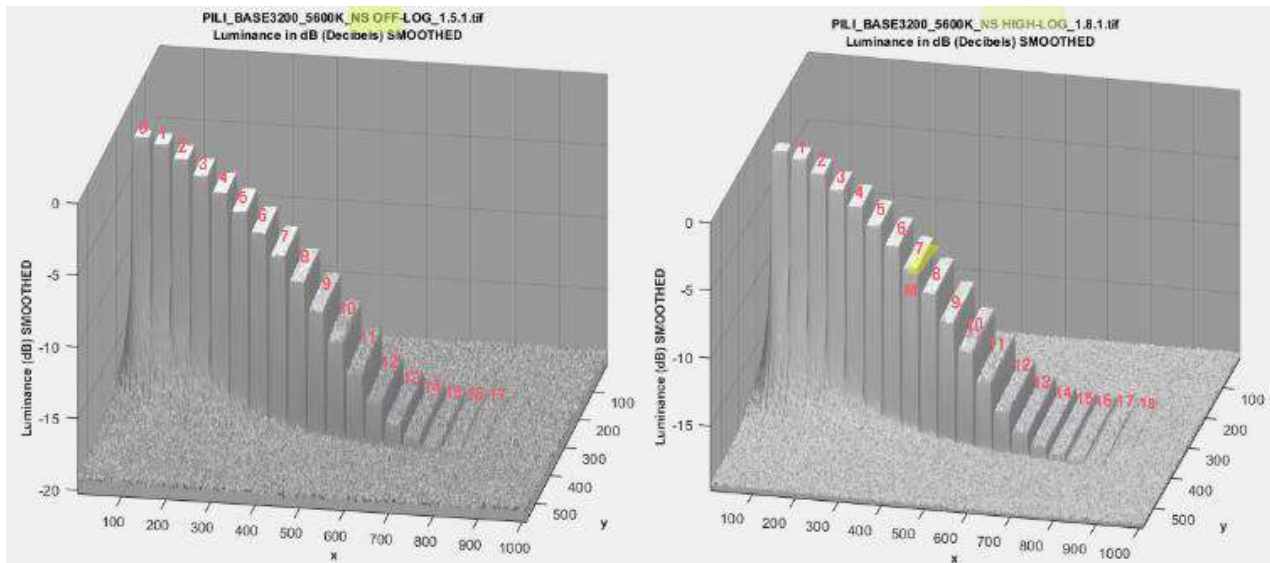


Figure 36 NS OFF

NS HIGH

We illustrate this point from a different perspective.

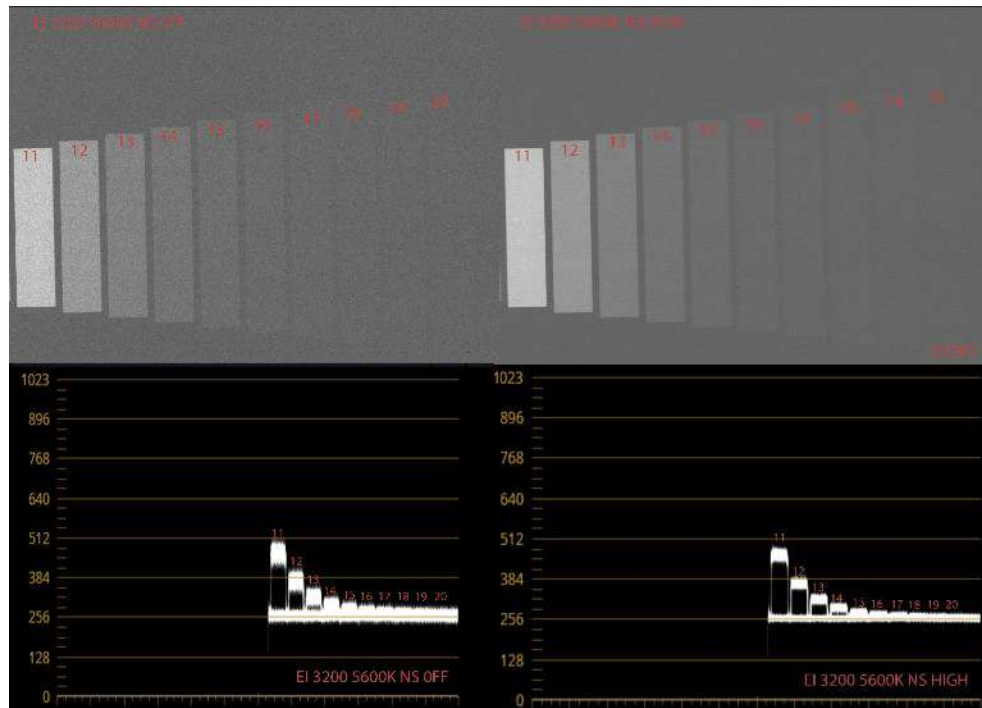


Figure 37

NS OFF

NS HIGH

In the P.I.L.I. chart crop, the deepest steps—particularly from 15 to 20—show, in NS OFF, a surface characterized by constant micro-variation of noise. The texture exhibits a fine noise shimmer, and the background retains a perceptible level of noise activity that makes it difficult to distinguish between very low levels.

In HIGH mode, the difference does not lie in the appearance of new information or in a significant shift of the mean values. The steps retain their relative position within the range. What changes is the stability of the surface: micro-variation is reduced, dark areas become more uniform, and the transition toward the noise floor becomes more contained. The separation between the deepest steps is perceived more clearly.

The waveform monitor confirms this visual reading (*Fig. 37*). In NS OFF, each step appears as a band with noticeable thickness. This vertical thickness represents the statistical dispersion of luminance values: the signal fluctuates around its mean with significant amplitude. In HIGH, the bands become visibly narrower. The average level remains largely unchanged, but the distribution becomes more compact. The noise floor no longer appears as a broad band, but is concentrated into a more defined line.

This narrowing reflects an effective reduction in variance. The physical range of the system is not expanded, nor is the upper limit modified; what decreases is the fluctuation around each level. In the deepest steps—where the distance between levels is comparable to the thickness of the noise—this compaction becomes decisive: as dispersion is reduced, the effective separation between levels becomes perceptible again.

The improvement measured in terms of SNR finds its visible counterpart here. HIGH mode does not add dynamic range, but stabilizes the lower limit by concentrating the signal within a narrower interval. The shadow does not shift—it becomes more stable. It is this reduction in

dispersion, rather than any structural modification of the system, that explains the operational difference observed in the second base.

Figure 38 presents a direct comparison of absolute dynamic range (in EV) for both EI bases across the four Noise Suppression levels (OFF, LOW, MEDIUM, and HIGH), plotted against the Imatest thresholds (1/SNR). Solid lines correspond to EI 800 and dashed lines to EI 3200, allowing a clear visualization of how the operationally usable dynamic range varies depending on the base and the level of suppression applied.

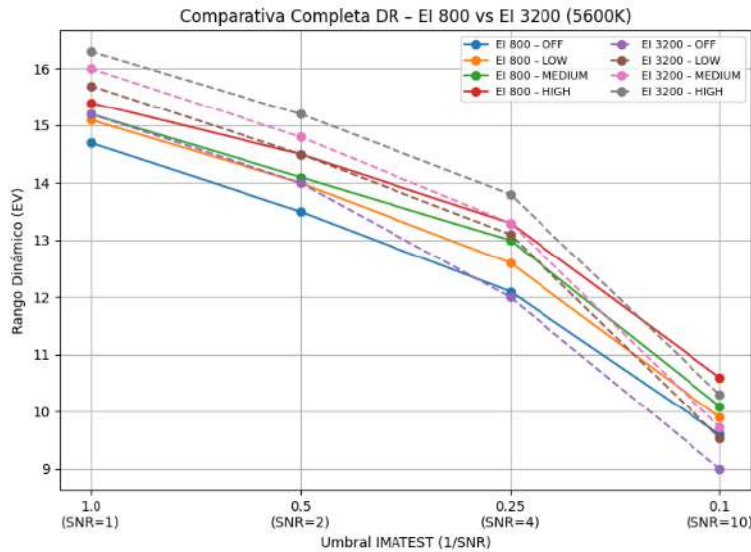


Figure 38

With Noise Suppression disabled, the differences between the two bases are moderate and depend on the threshold considered. EI 3200 shows a slight advantage under the more permissive criteria (SNR = 1 and 2), is nearly identical at SNR = 4, and falls below EI 800 at the most stringent threshold (SNR = 10). This confirms that the second base does not expand clean dynamic range, but rather modifies behavior in the transition zone toward the noise-dominated lower limit.

Once Noise Suppression is enabled, the divergence becomes more evident.

At EI 800, the progression from OFF → LOW → MEDIUM → HIGH shifts the lower threshold in a gradual and controlled manner. HIGH mode provides approximately one stop of improvement in the operational range (SNR ≈ 4), with smaller gains at the other thresholds.

At EI 3200, by contrast, the slope is steeper. A significant increase is already apparent from LOW around SNR = 4, and in HIGH mode the shift at this same threshold approaches two stops relative to OFF. The greater vertical separation between the dashed curves (EI 3200) and the solid ones (EI 800) reflects a stronger processing intervention in the second base.

The graph reveals a key point: the largest shift does not occur at the most permissive threshold, but around SNR = 4. In other words, the system does not primarily act on statistical black, but on the range where the signal begins to acquire usable tonal consistency.

The upper limit remains constant across all curves. No level of intervention alters the system's maximum headroom; all variation is confined to the shift of the lower threshold.

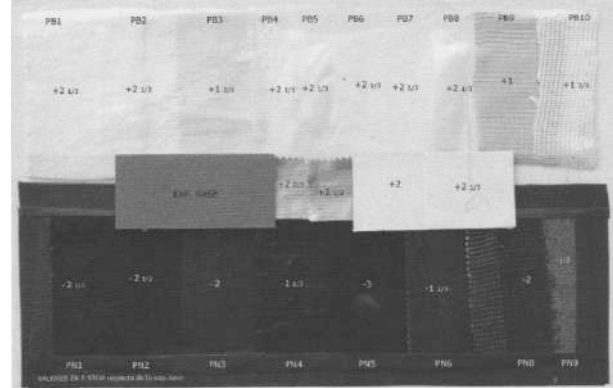
In structural terms, EI 3200 not only involves a different gain regime, but also a greater degree of processing when noise suppression is active. At EI 800, noise reduction functions as a progressive refinement of the shadow floor. At EI 3200, it becomes a more decisive tool for reconfiguring the usable dynamic range.

From a shooting standpoint, the choice between EI 800 and EI 3200 is not merely a matter of sensitivity, but of shadow character. *The first base maintains a more restrained and organic behavior. The second—especially with noise suppression enabled—offers greater stability in low-light regions, at the cost of more pronounced digital intervention. The difference is not only quantitative; it is, above all, a variation in the character of darkness.*

5. Texture Analysis Using the CDM Chart

The Limit of Texture in the Shadows

Dynamic range and signal-to-noise ratio measurements describe, in quantitative terms, the behavior of the capture and processing system within the workflow employed. However, it is through direct observation of texture that these values acquire true operational meaning. For this purpose, we used the *Cloth Density Matrix* (CDM) chart from ChromaVis Labs, analyzing black fabric samples at different levels of underexposure in order to determine the point at which the image ceases to convey volume and texture, and noise begins to dominate the useful signal.



CDM test chart showing the reflectance values of each sample

The black fabric samples underexposed between -3 and -5 stops (*Figure 39*) make it possible to visualize how far detail in deep shadows retains structural stability—understood as the ability to describe weave and volume—and from which point it transitions into mere tonal suggestion. The image has been converted to black and white to isolate the luminance component and facilitate the reading of low-amplitude variations.

At -3 stops, the fabric structure is clearly identifiable. Regions around $-5\frac{1}{2}$ to -6 EV maintain sufficient tonal separation to distinguish the weave. Noise is present, but does not interfere decisively. Texture retains volume and material presence. This range corresponds to what the SNR curves indicated as the operationally usable zone.

At -4 stops, the transition becomes more critical. Areas around $-6\frac{1}{2}$ EV still contain information, but around -7 EV the texture begins to disappear. Tonal separation remains, although it requires greater attention to perceive. The fabric is still recognizable, but with less clarity. Noise begins to compete with the fine microstructure of the samples. We are at a threshold: the signal is detectable, but its definition diminishes.

At -5 stops, the character changes clearly. Around $-7\frac{1}{2}$ EV the texture barely holds, and toward -8 EV the structure is practically lost. The pattern loses definition, and tonal separation no longer describes volume with clarity. The signal does not disappear, but it loses material consistency.

This observation confirms what the measurements anticipated: the system can maintain detectable signal below -5 EV, but detectability is not equivalent to structural stability. *The truly robust range in terms of texture lies approximately between -4 and -5 EV. Beyond that limit, although the signal persists, tonal continuity weakens, and the shadow gradually ceases to describe volume in detail, becoming more atmospheric in nature.*

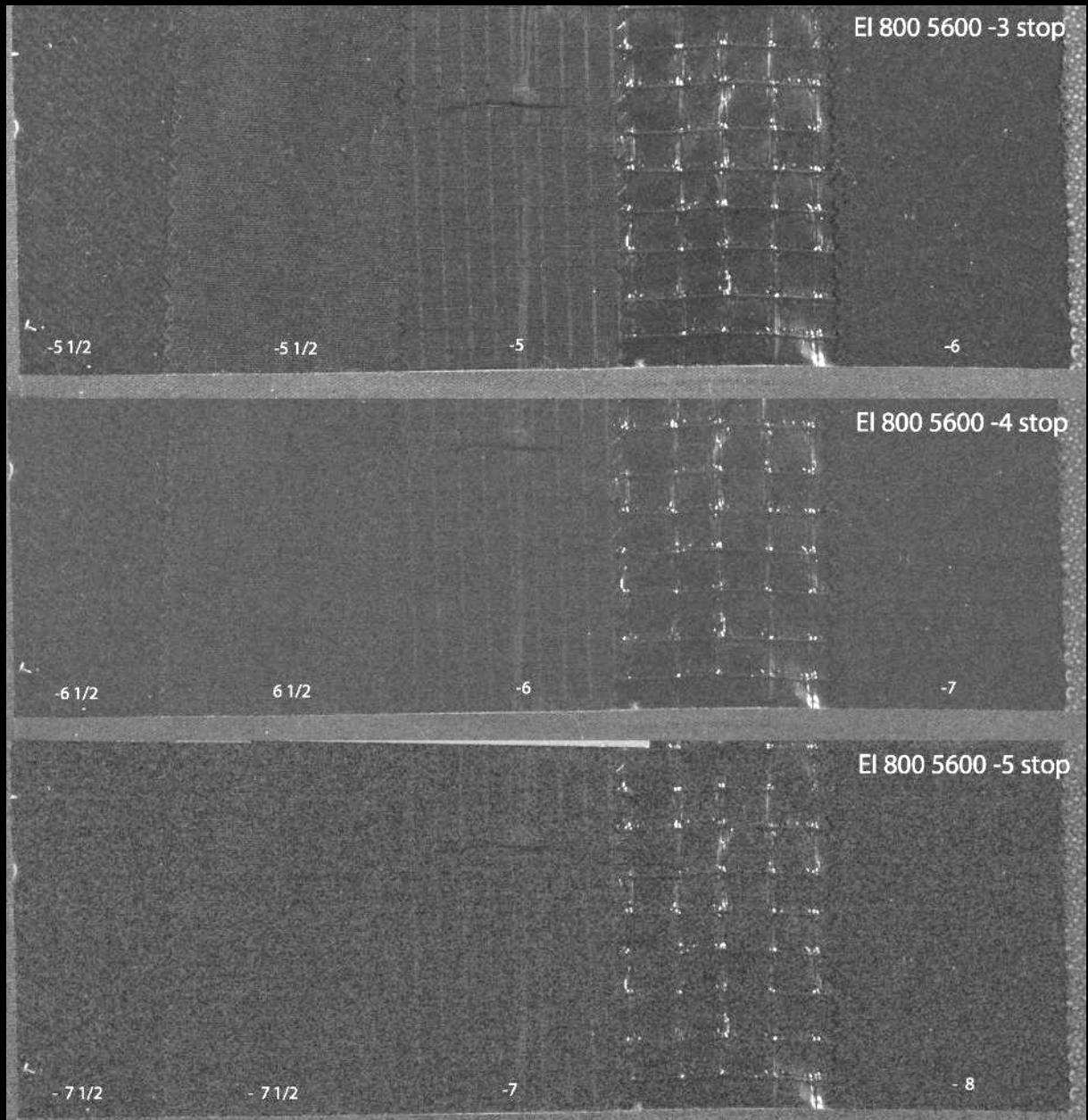


Figure 39

From a cinematographic perspective, this difference is decisive. At -3 stops, black fabrics retain volume and texture down to values close to $-5\frac{1}{2}$ EV below middle gray. At -4 stops, the image takes on a more atmospheric quality; from approximately -6 EV onward, its descriptive character progressively gives way to a sensation closer to pure darkness. At -5 stops of underexposure; the shadow becomes a more abstract space where noise and signal share prominence.

These samples allow the measured dynamic range to be translated into effective perception. It is not enough to know how many stops exist below middle gray; what matters is how far texture maintains structural coherence. At EI 800 and 5600K, the safe zone for detail extends to approximately -5 stops of underexposure. Beyond that point, texture loses consistency and ceases to be descriptive, becoming primarily an expressive element.

This is the true operational limit of shadows in this base.

We now examine the behavior of the EI 3200 base at 5600K under the same protocol (Figure 40).

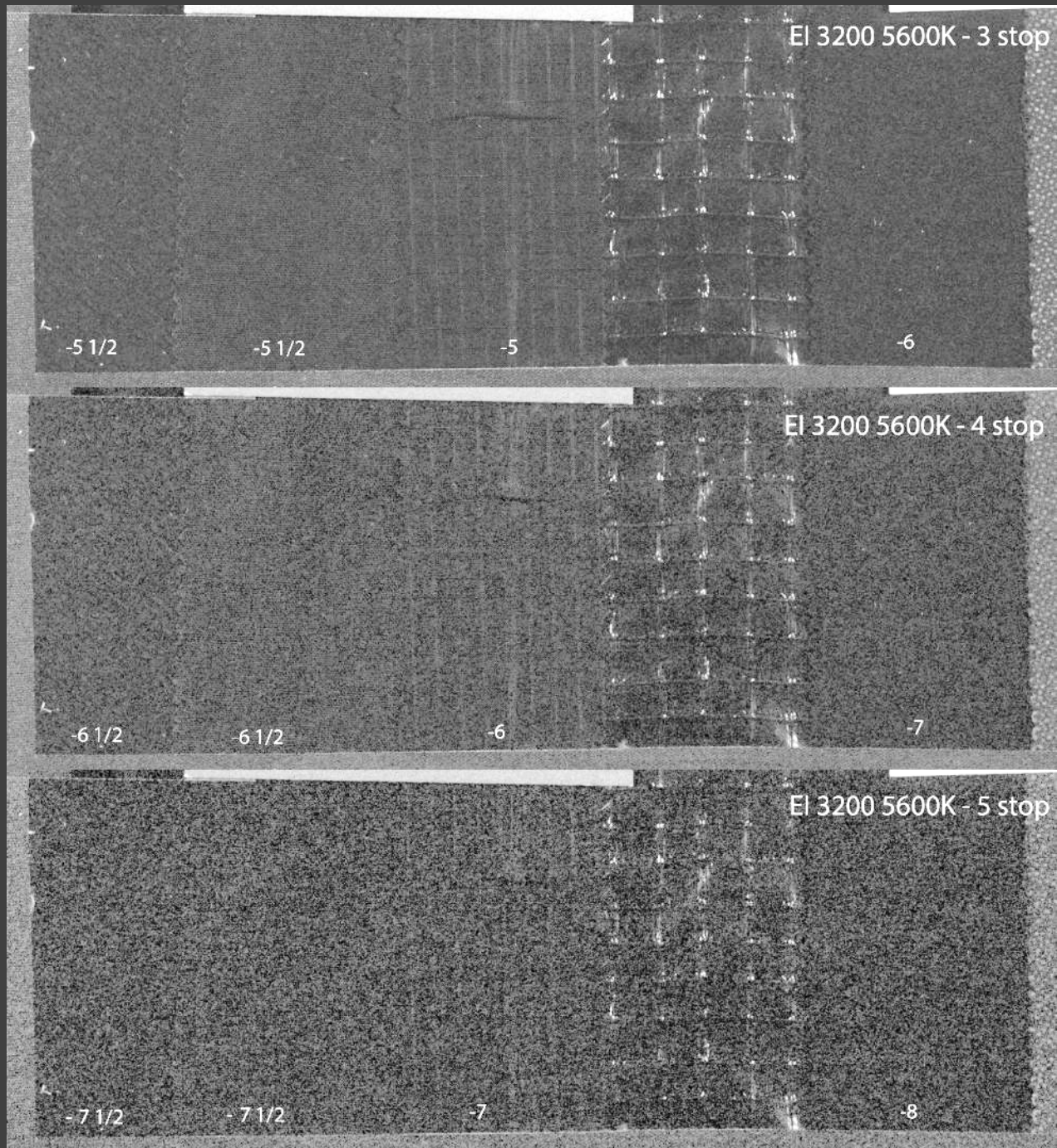


Figure 40

Repeating the test at EI 3200 under the same conditions—underexposures of -3 , -4 , and -5 stops on the black fabric samples—allows for a direct comparison with EI 800, isolating the intrinsic behavior of the second base with Noise Suppression disabled.

At -3 stops, the fabric structure remains clearly recognizable. Areas around $-5\frac{1}{2}$ to -6 EV retain tonal separation and volume, although fine noise is slightly more present than at EI 800. The shadow preserves detail, but the grain is more visible and less contained.

At -4 stops, the divergence becomes more pronounced. Areas around $-6\frac{1}{2}$ EV still contain information, but around -7 EV the texture weakens earlier than in the first base. The signal persists, but with less solidity, and noise begins to compete more directly with the microstructure.

At -5 stops, the degradation is evident. Regions around $-7\frac{1}{2}$ EV barely retain texture, and by -8 EV the structure is nearly lost. Noise becomes more prominent, and tonal separation loses clarity. The signal does not disappear, but it loses its ability to describe texture with consistency.

The comparison is clear: while at EI 800 texture maintains coherence up to approximately -4 EV and the degradation toward -5 EV is gradual, at EI 3200 instability appears earlier when digital processing is not applied. The second base is not inherently cleaner; without active suppression it offers greater sensitivity, but also a stronger presence of noise in deep shadows.

From an operational standpoint, this means that at EI 3200 (NS OFF), the truly stable texture range lies closer to -4 EV than to -5 EV. Beyond that threshold, texture begins to degrade earlier than at EI 800.

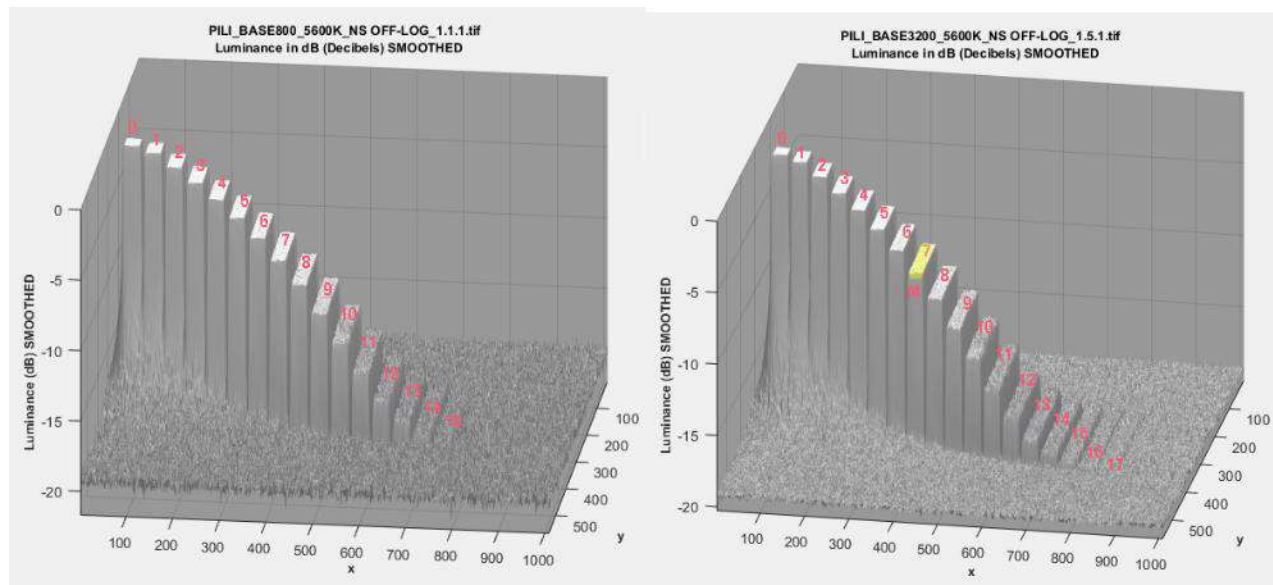


Figure 41

EI 800 NS OFF

EI 3200 NS OFF

We can now establish a methodological cross-reference between quantified dynamic range and operational texture. The three-dimensional reading of the P.I.L.I. chart (*Figure 41*) shows that at EI 3200, with Noise Suppression disabled, approximately one and a half additional steps appear before the signal merges with the noise floor. Taking the clipping point as (0) reference, the second base slightly extends the measured dynamic range under permissive criteria: the distance between the upper limit defined by the S-Log3 curve and the statistical detection threshold increases by a little more than one step.

However, this extension lies in a region where noise is more active than at EI 800. The last visible step shows reduced volumetric separation and lower tonal stability. The signal remains detectable,

but it occupies a range where the image structure begins to break down. The quantified range increases, but it does so in a region where tonal continuity starts to fade.

When this reading is compared with the CDM chart—referenced to middle gray and real reflectance values—the nuance becomes clear. In terms of actual texture, the second base does not extend the consistency of deep shadows when processing is disabled. The loss of texture appears slightly earlier than at EI 800, even though the step chart may register an additional level under certain SNR thresholds.

This allows us to distinguish between two levels of analysis:

- **Structural dynamic range**, defined by the statistical detection threshold from the clipping point.
- **Operational (or textural) dynamic range**, defined by perceptual stability and tonal continuity in deep shadows.

The second base may slightly extend the former without necessarily improving the latter.

There is no contradiction between these two measurements. The step chart informs detectability; the CDM reveals how far that signal retains descriptive capacity. The additional step at EI 3200 confirms a quantitative extension of the structural range, but this extension lies within a region of lower visual stability.

In practical terms, the second base does not “see more” in a fully perceptual sense; it simply keeps the signal distinguishable for one additional step before the signal-to-noise ratio falls below the operational threshold. The character of the shadow continues to be defined in the region immediately above that limit.

With this cross-reference, the analysis is complete: the total dynamic range measured within the capture and encoding system remains essentially constant. What varies is the position of the lower limit at which the signal is considered usable. That boundary is not an absolute value, but a matter of tonal stability and operational criteria.

Aesthetic Implications of Shadow Behavior Base EI, Noise Suppression, and Tonal Character

Beyond numerical values and EV shifts, the analysis of dynamic range in relation to Noise Suppression reveals a deeper aspect: the character of shadows varies depending on the selected base and the degree of digital intervention applied.

Highlight headroom remains stable across all tested scenarios. The upper limit of the signal is not altered. The transformation occurs exclusively at the lower threshold, in the region where the signal begins to separate from the noise. And it is precisely in this range that much of the image’s aesthetic is defined.

Texture tests under subexposure confirm this: it is not enough to know how many EV exist below middle gray; what matters is how far the structure retains material quality rather than collapsing into mere tonal variation. Differences between bases and suppression levels do not affect absolute black, but the stability of the region immediately preceding it.

When the intervention is mild—as in EI 800 with LOW or MEDIUM—the shadow preserves its microstructure. Fine noise remains visible, not as a defect but as texture. Transitions between penumbra and black retain subtle tonal modulations that sustain a sense of depth. This is not a loss

of sharpness in optical terms, but a reduction in microcontrast: small tonal variations that support volume and the perception of three-dimensionality.

When the intervention intensifies—especially at EI 3200 with HIGH—the change becomes clearly perceptible. The shadow becomes more stable before reaching full black: fine noise is attenuated more rapidly, and the transition toward black appears more uniform. The depth of black itself is not extended; rather, the region leading up to it is more tightly controlled. The more pronounced shift around $\text{SNR} \approx 4$ confirms that the system's effectiveness is concentrated in the operational range of the signal, not at the extreme dark end.

This nuance is decisive. The noise reduction does not alter absolute black; it redefines the intermediate region where the signal ceases to be perceived as noise and begins to read as volume and detail. By reducing micro-variations, skin may lose some of its fine texture, and backgrounds may take on a more compact appearance. Tonal relief is preserved, but with a smoother texture and reduced fine contrast.

The difference between EI 800 and EI 3200 becomes truly perceptible when processing is active. With Noise Suppression disabled, both bases retain a similar character, although the second exhibits greater noise activity in deep shadows. With noise reduction enabled, EI 3200 amplifies the degree of digital intervention. At EI 800, processing functions as a progressive refinement; at EI 3200, it can become a more pronounced reconfiguration of the operationally usable dynamic range.

This is not a matter of better or worse, but of aesthetic intent. *EI 800 tends toward a more organic shadow, with perceptible micro-variation. EI 3200 with active suppression tends toward a more stabilized and controlled shadow, offering greater robustness under low-signal conditions.*

In HDR environments or large-format projection, these differences may become more evident: strong reduction can introduce a degree of homogenization in dark areas or a slight perceptual compression in fine textures. In traditional SDR, the effect may simply be perceived as effective noise cleaning.

Ultimately, the choice of EI base and Noise Suppression level is not merely technical; it is a decision about the character of darkness. It does not alter the system's total measured dynamic range, but it redefines the point at which the signal can still sustain form and texture. And it is precisely within this range that much of the cinematic atmosphere is shaped.

6. Frame-by-Frame Evaluation

Where Measurement Becomes Visual Expression

The following frames demonstrate how these measured shifts translate into real images.



From the film *Indeleble*. Sony BURANO at EI 3200, NS LOW. S-Log3 / S-Gamut3. Cine with a 709 LUT. 6K, 16:9. Cinematography by Adriana Bernal, ADFC

The image in this scene is built upon a structure of penumbras: large dark masses shape the frame, and the figure emerges laterally from a barely suggested background. There are no clipped blacks, but rather a controlled, progressive compression toward the lower limit.

The Y values of the original frame are shown below on the S-Log3 curve to reconstruct the actual signal distribution during shooting (*Figure 42*).



Figure 42, Original S-Log3 frame with signal values plotted on the curve.

The scene is positioned within a range extending from approximately 0 EV down to -6 EV relative to middle gray. The illuminated skin sits around middle gray, while most of the relevant information is concentrated between -2 and -4 EV—above the threshold at which the signal maintains a sufficient signal-to-noise ratio (SNR \approx 4) to convey volume and tonal continuity.

Below this level—around -5 EV (SNR \approx 2)—the signal enters a region where visual structure begins to degrade and noise starts to dominate perception.

The scene does not use dynamic range uniformly, but rather organizes information around this threshold: placing the subject within the range where the signal retains volume, while allowing the background to fall deliberately into regions where the signal approaches degradation.

The shadow maintains solidity at low levels without breaking into chromatic noise or losing tonal continuity. The transition toward black is uniform; the penumbra shows no noise-induced fluctuations or fragmentation. The image does not capture more information, but preserves coherence in the levels preceding its degradation.

On the face, the microstructure remains contained yet present. The relief of the cheek and the bridge of the nose retains volume in the darkness; the shadow side does not become “plastic,” although it also does not exhibit the more open micro-variation typical of a lower base with minimal noise reduction. The black jacket maintains enough tonal separation to avoid becoming a uniform mass, and the background preserves shape without resolving fine texture. Depth is built through a smooth gradation of shadows.

This behavior confirms what was anticipated in the technical analysis: at EI 3200, character does not stem from greater physical capture capability, but from how the gain regime and processing redefine the lower limit. The improvement is not in absolute black, but in the region immediately preceding it, where the signal still retains volume and tonal separation before degrading.

From an aesthetic perspective, the difference is clear. This is not a “vibrant” darkness driven by noise activity, but a more homogeneous and contained shadow. In a scene of tension—an extended weapon, a firm gesture—that tonal stability reinforces the dramatic intent: form remains solid and legible.

The frame thus confirms visually what the measurements suggested. EI 3200 does not increase the amount of captured information; it shifts the point at which that information loses volume and texture and begins to merge with noise. And it is within this margin—narrow but decisive—that the visual character of the sequence is shaped.



From the TV series Pedro el escamoso 3. Sony Burano at EI3200 NS LOW Slog3-Sgamut3-cine with a 709 Lut. 6k, 16:9 Cinematography by Alfonso Parra AEC.

When observing this second frame, the system's behavior takes on a different nuance from the previous case. The scene is not constructed in an extreme low-key, but in a warm mid-low key organized around a practical source: the table lamp. The light does not dramatize the space; it structures it.

The illuminated side of the face sits approximately between -0.5 and -1 EV relative to middle gray, while the shadow side falls to around -2.5 or -3 EV. The background gradually descends between -3.5 and -5 EV, with some areas approaching values close to -6 EV without collapsing abruptly. This distribution confirms that the image operates within a comfortable working range, where the signal retains consistency before approaching the lower limit. The EV values are relative estimates based on the Rec.709-transformed image and are used here as an interpretive tool, not as a direct measurement of the original S-Log3 encoding.

Unlike the previous frame—where the shadow appeared more compact and stabilized—here the penumbra retains a slight tonal micro-variation. Noise Suppression at the LOW setting does not restructure the noise floor; it refines it. Fine noise does not invade the form, but neither does it disappear to the point of turning the shadow into a uniform mass. The transition toward black preserves gradation, and that gradation sustains the atmosphere.

In the skin, fine relief remains intact. The shadow side of the cheek and the neck preserve microcontrast; there is no sign of artificial smoothing or excessive uniformity. The texture remains legible, without aggressive chromatic activity. This represents a moderate stabilization of noise, consistent with what the measurements indicated for EI 3200 at low suppression levels: a slight shift of the lower threshold without structural reconfiguration.

The background, in turn, does not present itself as a visual block. It does not alter the system's total measured range, but it redefines the point at which the signal can still reveal form and texture.

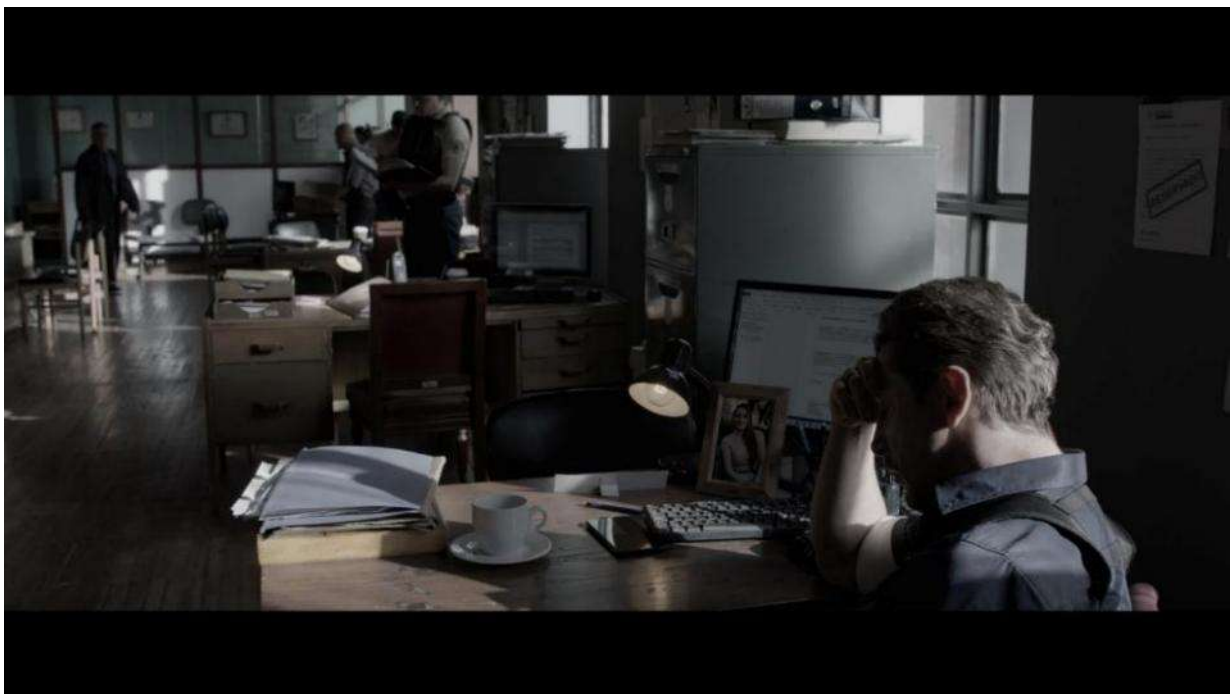
There is a gentle tonal separation between planes and architectural elements. This slight activity in the penumbra adds naturalness and a sense of real space. Darkness does not impose itself; it supports.

From an aesthetic perspective, the difference is clear. If in the previous case the shadow reinforced dramatic tension through stability and restraint, here the penumbra sustains intimacy and everyday realism. The goal is not a tense darkness, but a habitable one. EI 3200 does not function as a tool for dramatization, but as a technical support that enables low-light work without sacrificing texture or naturalness.

This frame confirms that the final character does not depend solely on the gain regime, but on the level of processing applied. At EI 3200 with moderate suppression, the shadow does not become rigid or uniform: it retains enough tonal variation to preserve texture and depth. The signal is not expanded; it is stabilized at the necessary threshold. And it is within this balance that the visual tone of the sequence is constructed.



Adriana Bernal, cinematographer (ADFC), preparing a scene for "Indeleble"



From the film Indeleble. Sony BURANO at EI 3200, NS LOW. S-Log3 / S-Gamut3.Cine with 709 LUT. 6K, 16:9. Cinematography by Adriana Bernal, ADFC

This frame introduces a different situation from the previously analyzed scenes. Here, darkness does not function as an enveloping atmosphere, but as an element of spatial organization. The lateral light entering through the window segments the space into diagonal bands of contrast and clearly establishes the hierarchy between illuminated zones and shadow areas.

The illuminated side of the main character's face sits approximately around -0.5 EV relative to middle gray. The shadow side falls to values close to -2 or -2.5 EV. The lit surface of the desk

hovers around -1 EV, while the background and floor, in areas farther from the window, gradually fall between -4 and -5 EV, with some points approaching -6 EV without abrupt clipping. These values are again relative estimates based on the Rec.709-transformed image and are used as a tonal reading tool; they do not correspond to a direct measurement of the original S-Log3 signal.

What is significant is not so much the total amplitude as its distribution. The image operates predominantly within a mid-to-low range without pushing the system's lower limit. Areas that fall toward -5 EV retain tonal separation and structural coherence. There is no visible chromatic noise shimmer or breakdown in the transition toward black. The shadows preserve enough information to describe walls, furniture, and floor without collapsing into an undifferentiated mass.

From the standpoint of EI 3200 behavior, this shot is illustrative precisely because it does not operate at the critical threshold. Unlike scenes in which penumbra forms the dramatic core and requires the system to perform near the SNR limit, here the signal remains in a comfortable region. Texture does not appear compressed or subject to heavy noise reduction. Darkness is not atmospheric density; it is spatial order.

In aesthetic terms, the shadow does not dramatize; it structures. It defines hierarchies, separates planes, and guides the viewer's eye without pushing the signal toward its lower limit. The tonal stability within the -3 to -5 EV range reinforces a key point raised throughout the study: the system's behavior is not only revealed at the shadow limit, but also when one deliberately operates at a certain distance from it.

This frame reminds us that dynamic range is not merely an available amplitude, but a conscious management of that amplitude. Here, the image does not exploit the extreme; it works within a safe margin. And that choice produces a darkness that is firm and structured, more closely tied to spatial order than to atmospheric tension.



From the TV series Pedro el escamoso 3. Sony Burano at EI3200 NS LOW Slog3-Sgamut3-cine with a 709 Lut. 6k, 16:9 Cinematography by Alfonso Parra AEC.

This frame, from a comedy context, presents a substantially different use of dynamic range compared to the previous scenes. Here, darkness does not organize the space through tension or act as a dramatic boundary. Instead, it functions as an enveloping atmosphere—a warm support for an intimate conversation.

The distribution is gradual and continuous. There are no abrupt transitions toward the lower limit, nor areas that push the system into the critical region identified in the study. The range between -4 and -5 EV—which in more extreme contexts can become a fragile zone where SNR conditions structural stability—remains here as a stable background. The signal retains sufficient tonal separation to preserve the texture of the leather and the depth of the space without taking on an opaque density.

From the standpoint of EI 3200 behavior, this shot illustrates a deliberately restrained use of dynamic range. It does not aim to exploit the last usable margin in the shadows or to aggressively redefine the lower threshold. The image remains within a comfortable operating range, where the signal-to-noise ratio does not perceptibly condition the reading of volume and texture.

In aesthetic terms, the shadow does not dramatize; it supports. The transition between light and penumbra is smooth, and darkness functions as tonal continuity rather than as a compact mass. The character is not one of tension or high-contrast structuring, but of emotional stability. Texture remains, but it does not vibrate with noise; contrast is present, but not dominant.

This frame confirms that dynamic range is not defined solely by how much the system can capture at its extremes, but by how that range is used. In this comedic context, EI 3200 is not employed to sustain a critical boundary between signal and noise, but to ensure continuity, softness, and tonal cohesion. Here, darkness is not a limit—it is atmosphere.

When observing the four frames together—two from *Indeleble* and two from the comedy *Pedro el escamoso 3*—what emerges is not a difference in the system's technical capability, but a difference in how dynamic range and exposure are managed.

In the two *Indeleble* shots, the lighting tends toward directionality and contrast. In the gun shot, the shadow becomes a dramatic territory: several areas approach the critical lower range, forcing EI 3200 to render volume and texture where the signal begins to weaken. The darkness is dense and intentional; the system operates close to its operational limit. In the police station shot with lateral light, although the tension is lower, the contrast architecture organizes the space into bands of light and shadow. Here, the EI is not at the edge of the shadow floor, but it still contributes to a more pronounced volumetric construction, where shadow structures the narrative.

In *Pedro el escamoso 3*, by contrast, the lighting follows a different logic. In both frames, the lighting design is enveloping and warm, with smooth transitions and a more even distribution across the range. Areas that fall toward -4 or -5 EV do not aim to dramatize or push the lower limit; they function as tonal continuity. EI 3200 is not used to operate in deep penumbra, but to ensure stability and cohesion within an intimate atmosphere. Shadow is not a boundary—it is accompaniment.

The comparison reveals something essential: EI does not impose a character on its own. Under contrast-driven lighting, it can become a tool to sustain form at the threshold of the shadow floor. Under balanced, enveloping lighting, it acts as a margin of stability, maintaining tonal coherence without the need for aggressive intervention.

In *Indeleble*, darkness is tension and limit. In *Pedro el escamoso 3*, darkness is continuity and a lived-in space. In both cases, the system is the same. What changes is the relationship between exposure and lighting intent. And it is within that relationship—more than in the selected sensitivity value—where the true character of the image is defined.



Alfonso Parra, AEC cinematographer, setting up a shot

Ultimately, what these four frames reveal is not a difference in technical capability, but a difference in choice. The same system, the same EI, can sustain a tense shadow at the edge of the limit or a soft, enveloping penumbra that simply supports the scene. It can operate near the threshold where the signal begins to become fragile, or remain within a zone of stability where darkness is comfortable.

As a cinematographer, the question is no longer just how much dynamic range I have, but how I choose to use it. If I want shadow to function as dramatic territory, the lighting will push the signal toward that boundary where every stop matters. If I seek continuity and emotional proximity, I will manage the range so that darkness does not compete with texture, but supports it without drawing attention to itself.

EI does not determine the image; lighting intent gives it meaning. Technique provides the margin. Exposure determines how far to take it. And it is in that decision—more than in the chosen sensitivity value—where the true character of the scene is ultimately shaped.

7. Noise Reduction via Rescaling

Resolution as a Statistical Tool for Noise Reduction in Shadows.



Figure 43

but exclusively within the domain of the final image. The starting point is the 6K image recorded by the camera after all internal processing, and from that same frame, the 4K and HD versions are generated through controlled downscaling in post-production. In this way, the comparison is made between equivalent representations of the same image, varying only in spatial resolution.

This distinction is crucial for the interpretation of the results. The aim is not to establish an equivalence between sensor behavior and final image behavior, but rather to evaluate how the spatial integration associated with downscaling affects noise performance under real production conditions. In this context, the analysis evaluates the effective SNR improvement introduced by downscaling in the final image, rather than its equivalence to the ideal model of independent sample integration (i.e., pixels with uncorrelated noise).

This framework allowed us to pose a specific technical question: to what extent does downscaling practically realize the statistical SNR improvement predicted by theory?

From a mathematical standpoint (Figure 44), reducing resolution implies spatial integration. If noise were completely random and independent at the pixel level—ideal white noise—then integrating N samples would reduce variance proportionally to \sqrt{N} . In terms of signal-to-noise ratio:

$$SNR_{nuevo} = SNR_{original} \times \sqrt{N}$$

when expressed in stops:

$$\Delta stops = \frac{1}{2} \log_2(N)$$

In the Disney comedy *Pedro El Escamoso 3*, we explored an additional approach to influence noise behavior. In this case, we shot in 6K 16:9 (6052×3404), performed grading in 4K (3840×2160), and delivered final masters in HD (1920×1080) (Figure 43).

It is important to clarify the methodological framework in which this analysis is situated. The comparisons are not established between sensor-level data and processed image values,

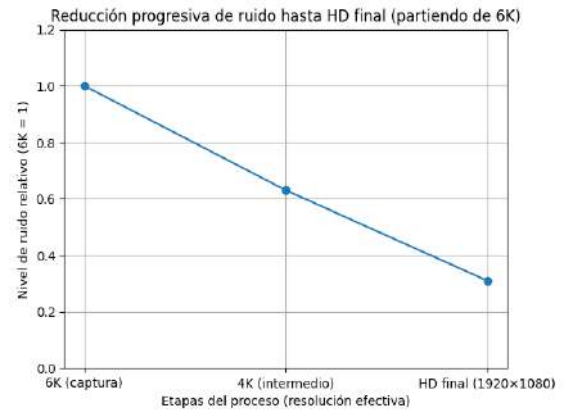


Figure 44

Under this ideal model, a reduction from 6K to 4K would imply approximately a +0.65 stop improvement in SNR (*Figure 45*), while a reduction from 6K to HD would yield around +1.66 stops. These figures represent a theoretical upper limit, valid only when noise is statistically independent and exhibits no spatial correlation.

To understand why the improvement observed through downscaling does not reach this theoretical limit, it is necessary to consider the nature of the noise itself.

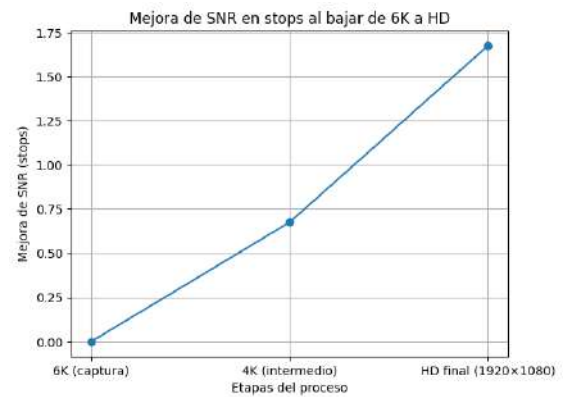


Figure 45

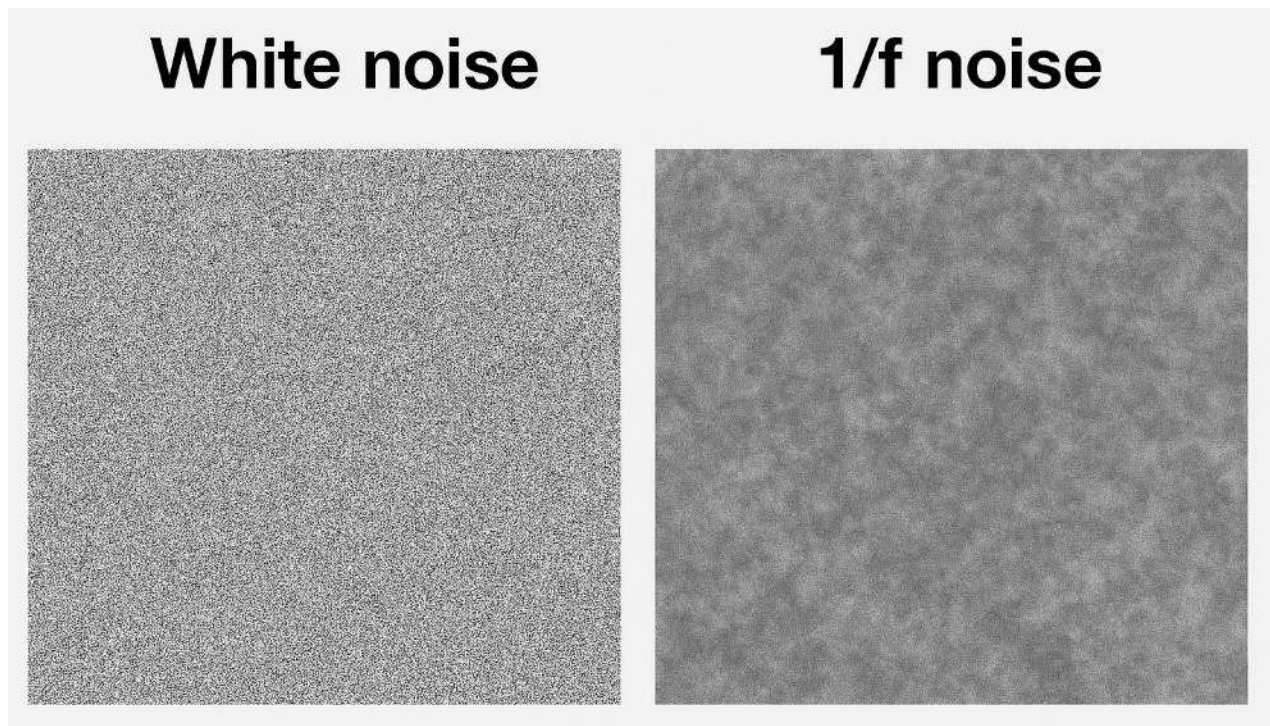


Figure 46

Figure 46 shows two distinct behaviors. On the left, white noise: a completely random, fine pattern with no continuity or perceptible structure. Each point fluctuates independently, like a microscopic rainfall of isolated brightness variations. In this ideal scenario, spatial integration operates at maximum efficiency: by averaging pixels, variations cancel out and the noise texture quickly diminishes.

So-called $1/f$ ($P(f) \propto \frac{1}{f}$) takes its name from the fact that its energy is not uniformly distributed across all frequency scales, but instead decreases as frequency increases. In less mathematical terms: larger-scale variations carry more energy than fine, fully random fluctuations. While white noise distributes its intensity evenly across all levels of detail, $1/f$ noise has a stronger presence at broader spatial scales.

In visual terms, this means we are not dealing with a simple “rain” of independent pixels, but with a texture that exhibits continuity. Small clusters, gentle undulations, and regions where variation is grouped begin to appear. The noise is no longer purely granular; it acquires a low-frequency structure.

This nuance is crucial for understanding the real behavior of the image. When noise is completely independent, spatial integration—as in downscaling—reduces its presence very effectively. But when part of that energy is organized at larger scales, averaging does not fully eliminate the variations. The improvement still exists, but it no longer follows the ideal model: the structure of the noise limits the effectiveness of rescaling.

It is important to emphasize that this mechanism does not expand the physical dynamic range of the capture system nor alter highlight headroom. The upper limit remains unchanged. What shifts is the practical threshold at which the signal maintains a sufficient signal-to-noise ratio to be considered operational. In an analysis where the structural texture limit has been placed around -4 to -5 EV, an improvement of more than one stop in SNR would be, in theoretical terms, significant. This observation becomes particularly relevant when connected to what was observed at EI 3200. At native resolution, the second base with Noise Suppression disabled exhibited a more active noise floor in deep underexposure. However, if that capture is delivered at a lower output resolution, part of that activity is statistically integrated. The result can be a more stable shadow without the need for aggressive digital suppression.

Rescaling does not modify the tonal response of the system nor eliminate the structural differences between EI 800 and EI 3200. It also does not replace the function of Noise Suppression. What it does is increase the signal-to-noise ratio through statistical averaging, reducing the visibility of random noise fluctuations and stabilizing the perception of shadows without necessarily relying on strong digital noise reduction.

Shooting at higher resolution not only provides flexibility for reframing or stabilization; it effectively turns resolution into a statistical margin. Each increase in resolution that is subsequently integrated through downscaling implies, under the ideal model, an improvement in signal-to-noise ratio. And each SNR improvement can translate into a shift of the lower threshold at which the signal becomes usable.

Figure 47 expresses this improvement in more intuitive terms: equivalent ISO in relation to perceived noise. Starting from a 6K capture at ISO 800, downscaling to 4K would imply an approximate $+0.7$ stop gain in SNR, corresponding—in noise terms—to working at around ISO 500. Further reduction to HD could approach a $+1.6$ stop improvement, placing the equivalent behavior near ISO 260.

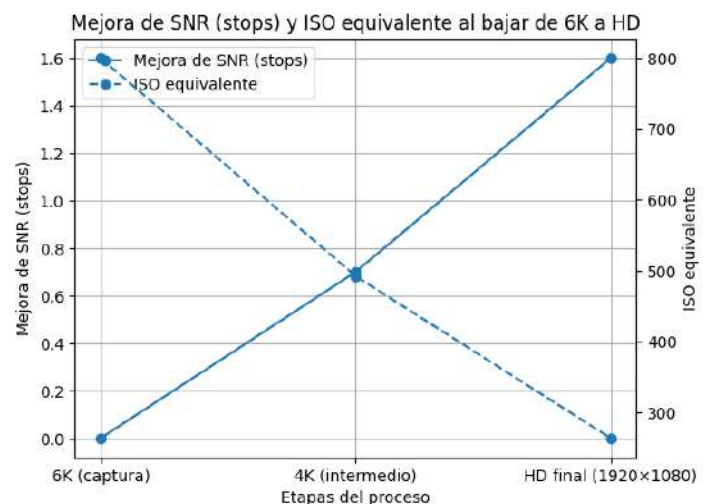


Figure 47

In strictly statistical terms, what decreases is the noise variance as a result of spatial integration of samples. The coherent signal is preserved, while random fluctuations tend to cancel each other out. This equivalence is illuminating because it turns resolution into a concrete operational margin: it is not only a matter of sharpness, but of stability in the shadows.

Shooting in 6K and finishing in HD can, under conditions close to the ideal model, approximate working at a lower sensitivity from the standpoint of visible noise. The physical dynamic range of the system is not expanded, nor is the upper limit altered, but the practical threshold at which the signal maintains sufficient tonal consistency in deep shadows is shifted. In this sense, downscaling acts as a form of passive statistical cleaning: it does not selectively intervene in texture, but reduces random variability through spatial averaging.

To evaluate how this theoretical model translates into real-world shooting conditions, we carried out an empirical validation.

First, the standard deviation (STD) was measured on patch 23 (deep gray no. 5 on the grayscale) of the Macbeth chart, using the images shown in Figure 46. The results are presented in *Table 32*.

EI 800 values Std.Desv. 5600K	R	G	B	Y
6K (6052x3404)	16,37	7,78	14,14	6,92
4KUHD (3840x2160)	16,35	7,69	14,11	6,84
HD (1920x1080)	16,33	7,66	14,04	6,82

Table 32

Figure 48, which represents the standard deviation in luminance (Y), allows for a comparison between the theoretical model and the behavior observed in real signal. A progressive decrease in variability is evident when moving from 6K to 4K and subsequently to HD. However, the slope is moderate and clearly lower than that predicted by the ideal model based on independent noise.

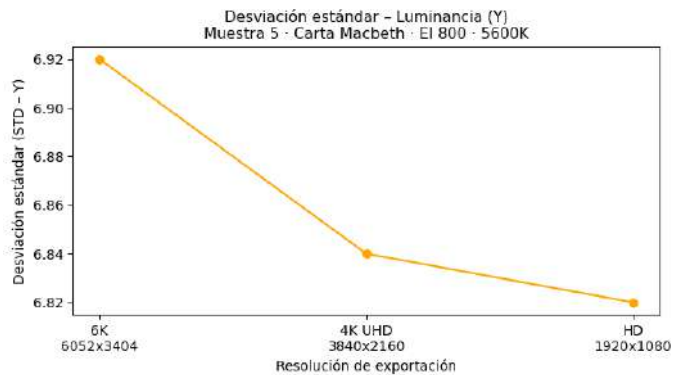


Figure 48

The images used for the analysis (Figure 49) were taken from the original footage opened in DaVinci Resolve, with no noise reduction, sharpening, or additional processing applied. The same frame was exported as an uncompressed TIFF in three resolutions—native 6K, 4K, and Full HD—using the Mitchell algorithm and ensuring a single spatial interpolation, while keeping color space and gamma curve constant.

To make the phenomenon more evident, the measurement was performed on a capture underexposed by four stops relative to middle gray and subsequently compensated in grading, placing the signal in a low-SNR regime.

Visually, a slight reduction in pixel-to-pixel variability can be observed in the lower-resolution versions, with no appreciable structural changes. The differences between 6K, 4K, and HD are small and clearly fall below the theoretical prediction, indicating that the spatial correlation present in the signal limits the effectiveness of statistical averaging.

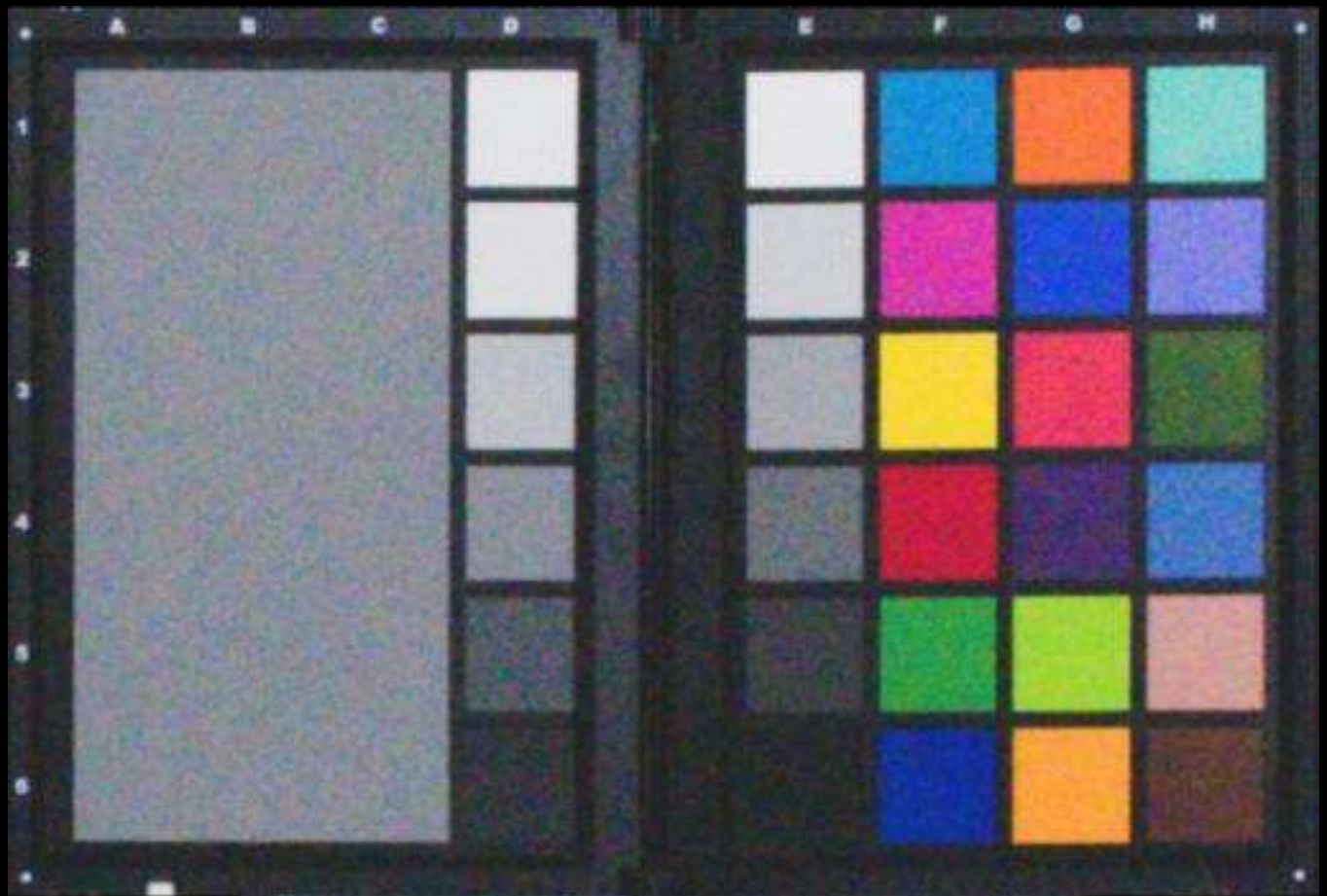
This result is consistent with the real nature of the signal. Following Bayer demosaicing, color processing, and internal image processing, the noise no longer behaves as ideal white noise. Part of its component exhibits spatial correlation and residual structure, which reduces the efficiency of statistical averaging.

It is also important to distinguish between objective variance reduction and perceptual noise reduction. Perception depends on the angular size of the pixel and viewing distance: when detail falls below the resolution threshold of the visual system, variations tend to be perceptually integrated. In this comparison, the material was evaluated at 100% scale to isolate the actual statistical improvement from this perceptual effect.

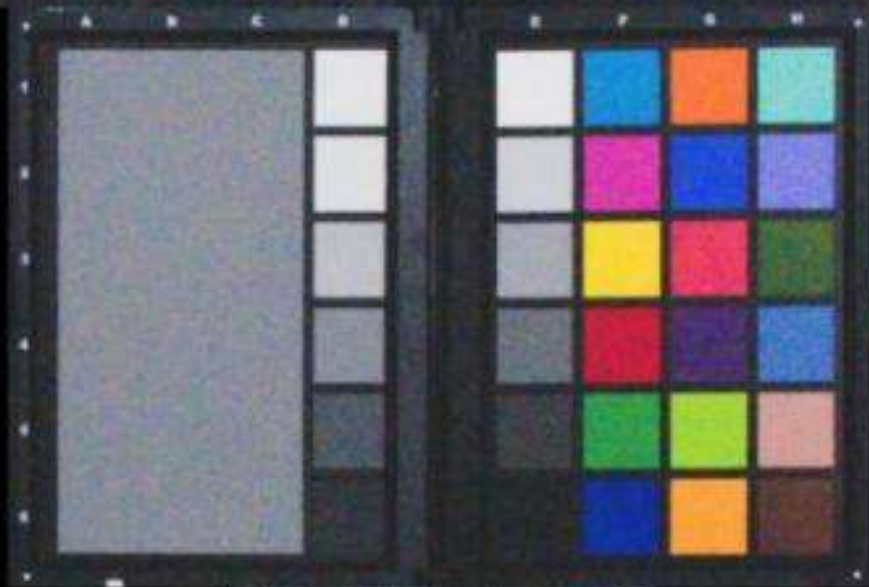
The conclusion is twofold. On the one hand, downscaling introduces a measurable improvement in the statistical stability of the signal. On the other, in real camera footage this improvement typically falls below the theoretical maximum, due to the structure and correlation of the noise present.

Downscaling does not fundamentally redefine the behavior of the shadow floor nor replace noise control at capture, but it does provide an additional margin—limited but real—in the signal-to-noise ratio.

Rather than invalidating the model, this observation contextualizes it: resolution can become a statistical margin, although that margin is conditioned by the actual nature of the noise in the signal. Theory defines the potential; practice determines its extent.



6k



4K UHD

FULL HD



Figure 49

8. Final Conclusions

The Character of Darkness

After measuring, comparing, underexposing, and reconstructing the signal across different scenarios, what remains is not a definitive figure or an isolated value, but a more precise understanding of how darkness behaves.

The analysis has not revealed a “better” or “worse” system, nor an intrinsically superior base. It has shown something more interesting: that the character of shadow is the result of a process. It depends on the chosen gain regime, the level of processing accepted, the final resolution, and the way the signal will ultimately be presented.

On set, that decision is not framed in terms of SNR or EV, but as a simpler question: do I want a shadow that breathes, or one that is more compact with less tonal variation? Do I prefer the vibration of grain, or a more homogeneous and controlled texture?

EI 800 tends toward a darkness with greater micro-variation and perceptible texture. EI 3200—especially with active noise reduction or within a downscaling workflow—leads toward a more uniform and contained shadow.

From a practical standpoint, this distinction translates into concrete guidelines. When the priority is to preserve texture and micro-variation in deep shadows, EI 800 with moderate levels of suppression generally offers a more organic and predictable behavior. If the goal is to stabilize the lower limit under low-signal conditions, EI 3200 can provide a greater operational margin, especially when processing is active. In workflows involving downscaling, part of the fine noise will be statistically integrated, which may allow for a less aggressive approach during capture. And in scenes with fast movement, the HIGH mode should be evaluated carefully, as the improvement in SNR may come at the cost of temporal naturalness.

These are not universal rules, but interpretive tools. The final choice always depends on the desired visual character and the exhibition context.

Both EI bases are valid possibilities within the Burano system. The difference lies not in their validity, but in the visual intention we pursue. They are distinct responses to the same boundary: the point at which the signal ceases to be perceived as noise and begins to reveal form, volume, and texture.

Dynamic range is not only a measurable span between black and white. It is also the way that span is organized—how penumbra transitions and how the image chooses to remain legible before dissolving. It is within that transition that atmosphere is constructed.

Ultimately, dynamic range is not just luminous amplitude. It is the space where we decide how much mystery we allow into the image.

And that decision is technical, deeply photographic, and inherently artistic.

Frames from Indeleble courtesy of Sagitario Films.

Frames from Pedro el escamoso 3 courtesy of Caracol TV and Disney.

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Contributors

