PRACTICAL GUIDE

Sensors and Megapixels

Which cameras read the full sensor and which crop or skip lines in each mode



by Luis Taveras · Colorist

More megapixels isn't better video

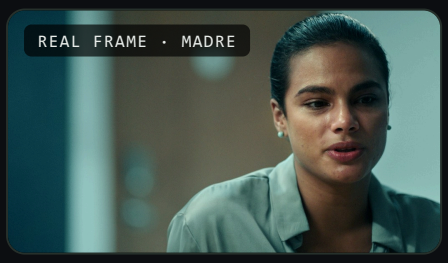
A stills camera can have 40 megapixels, while an ARRI ALEXA 35, which costs far more, has a 4608 × 3164 photosite sensor: about 14.6 megapixels. A sensor is made of millions of photosites that collect light. If you put fewer megapixels on the same sensor size, with the same technology, each photosite is larger, receives more light and holds more information before clipping: less noise and more dynamic range.



Illustration.

CAMERA	SENSOR	MEGAPIXELS	PHOTOSITE SIZE
ARRI ALEXA 35	Super 35 · 27.99 × 19.22 mm	≈ 14.6 (4608×3164)	≈ 6.1 µm
Sony FX3 / a7S III	Full frame · 35.6 × 23.8 mm	12.1 (stills) · 10.3 (video, FX3)	≈ 8.4 µm*
40 MP stills camera	Full frame	40	≈ 4.6 µm*
Sony VENICE 2 / BURANO	Full frame · 8.6K	≈ 49.8 (8640×5760)	≈ 4.2 µm*

* Approximate, computed by dividing the sensor width by the horizontal pixel count. The VENICE 2 and BURANO have many megapixels, but they read the whole sensor and deliver oversampled 4K: that's why they don't share the stills cameras' problem.



Clean skin: the sensor got plenty of light.



Smooth gradients without noise.



Fine textures in wardrobe and background.

Frames from *Madre* and *La Fábrica de Bodas*, color graded by Luis Taveras. *Sintel* (2010) and *Tears of Steel* (2012) © Blender Foundation · durian.blender.org · mango.blender.org · CC BY 3.0 license.

The four ways to read a sensor

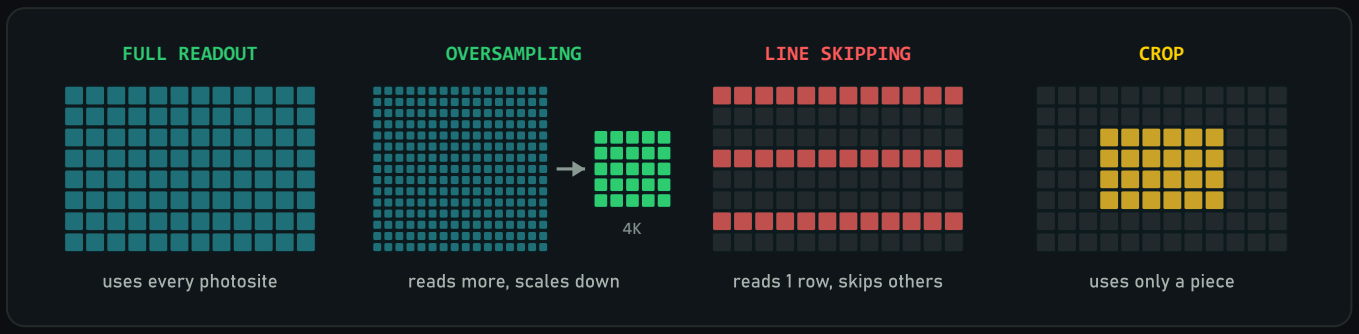
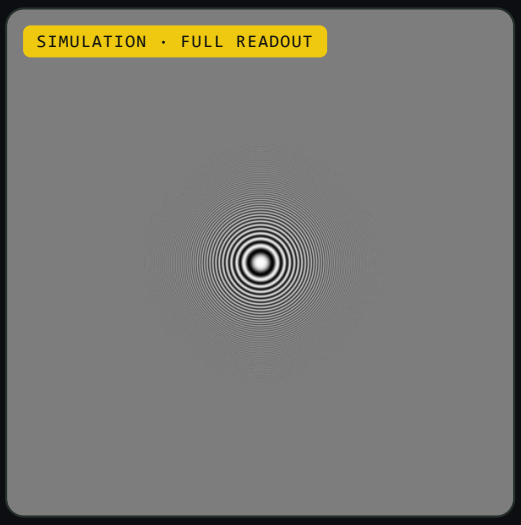
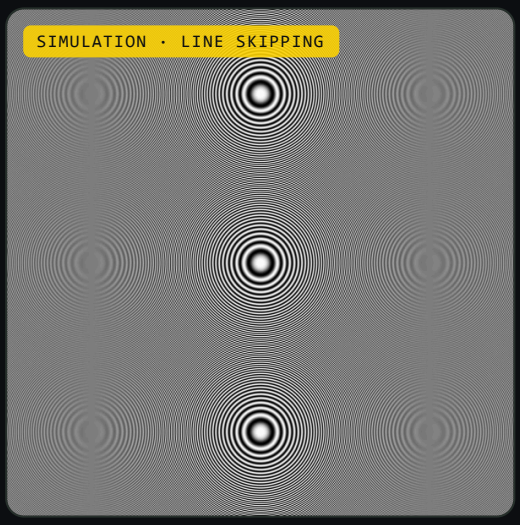


Illustration.

- **Full readout:** the camera uses every photosite. Ideal when the sensor already matches the final image size, like the FX3 in 4K.
- **Oversampling:** reads the full sensor, e.g. at 6K or 8K, and scales it down to 4K. Noise averages out and the image gets sharper and cleaner.
- **Line skipping:** the camera can't process that many pixels, so it reads one row, skips others and builds the image from what's left. Moiré and jagged edges appear.
- **Crop:** uses only part of the sensor. It changes the lens's field of view and, using less area, raises noise and lowers dynamic range.



Test pattern read in full: fine rings soften, no false patterns.



The same pattern reading one row in three: rings that don't exist appear (moiré).

Computer-generated test pattern (zone plate) for the simulation.

Camera by camera, mode by mode

None of this is printed big on the box. What matters is how the camera reads the sensor in the exact mode you'll shoot.

CAMERA	MODE	HOW IT READS THE SENSOR
ARRI ALEXA 35	4.6K 3:2 Open Gate	Full: 4608 × 3164
Sony VENICE 2 (8K)	8.6K 3:2	Full: 8640 × 5760; the 4K deliverable is oversampled
Sony FX3 / a7S III	4K up to 60p	Full readout without pixel binning
Sony FX3 / a7S III	4K 120p	No binning, with a ≈ 1.1x crop (per reviews)
Sony a7S III	Full HD 240p	Softer and with aliasing in independent tests
Sony FX30	4K up to 60p	Oversampled from 6K
Sony FX30	4K 120p	≈ 1.6x crop (Sony: 1.62x) without oversampling
Sony a7 III	4K 24p	Oversampled from 6K, full width
Sony a7 III	4K 30p	1.2x crop (about 5K scaled to 4K)
Sony a7 IV	4K 30p	Oversampled from 7K, full frame
Sony a7 IV	4K 60p	1.5x Super 35 crop (from 4.6K)
Canon 5D Mark II	Full HD	Skips lines (technical analyses: reads about one row in three)

Green: full read or oversampled. Yellow: crops. Red: skips lines or loses quality. Modes change with firmware: always confirm in your camera's manual.

The camera that started the revolution

The Canon 5D Mark II (2008) made filmmaking with stills cameras possible. But to record video it skipped sensor rows, which is why so many videos from that era show moiré on clothes, buildings and water.

Frames from *Madre* and *La Fábrica de Bodas*, color graded by Luis Taveras.

What the colorist receives

When a shot is recorded with a sensor crop, a smaller area is used and scaled up to 4K. Noise grows with it. If the same scene has oversampled shots and cropped shots, the colorist has to match two different textures.



Full sensor scaled to 4K: noise averages out.



Only part of the sensor enlarged: more noise, less detail and a different framing.

- **Moiré can't be fixed well in the grade.** It can be disguised by softening or desaturating that area, but with a loss.
- **A crop changes the lens:** a 35 mm behaves like a longer lens, and the shot doesn't cut the same with the rest.
- **More shadow noise** forces more noise reduction, and that eats skin texture.
- **Slow motion is usually the weakest mode.** If you'll use it, test it before the shoot with real wardrobe and backgrounds.

No colorist can bring back what was never recorded

Color can clean, match and enhance. But information the sensor didn't read doesn't exist in the file.

Frames from *Madre* and *La Fábrica de Bodas*, color graded by Luis Taveras. Simulations are computed on frames from *Madre* and *La Fábrica de Bodas* (graded by Luis Taveras) to explain the effect; they are not tests of any specific camera.

Before choosing a camera: quick checklist

1. **Ask how it reads the sensor** in the exact mode you'll use: resolution, frame rate and format.
2. **Look for "full readout" or "oversampling"** in the specs; be wary of "crop", "line skipping" or "binning".
3. **Shoot the whole scene in the same mode** whenever you can: the same texture on every shot.
4. **Test slow motion** with striped clothes, buildings and water before the shoot.
5. **Tell the colorist** which shots were recorded with a crop or in slow motion.

The key question

Before looking at megapixels, ask: **how does this camera read the sensor at the resolution and frame rate I'm going to use?** That answer says more about the final image than any number on the box.

For the colorist, texture rules

A clean, detailed shot can be taken to any look. A shot with moiré or crop noise limits what can be done with it.







Frames from *Madre* and *La Fábrica de Bodas*, color graded by Luis Taveras.

ABOUT THE AUTHOR



Luis Taveras

COLORIST

Luis Taveras is a colorist, member of the Colorist Society International, with five feature films and more than 500 music videos. His credits include *Madre: a dos centímetros de ti*, winner of five awards at the 2025 New York Dominican Film Festival, and *La Fábrica de Bodas*, which premiered at the United Palace in New York. For him, color is the last place where a film can still change its emotion, and the skin always has to feel true.

5	500+	10
feature films	music videos	years in the craft

What I do

- Color grading for film
- Music videos
- Commercials and brands
- Cinema mastering and delivery (DCP)

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Planning your next shoot?

I'd love to collaborate with you on the color of your next project. Write to me and watch my demo reel.

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