

SONY
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F65

F65. True 4K and beyond.

DPs gave Sony a wish list. Higher resolution than any previous digital motion picture camera.¹ Even greater exposure latitude, dynamic range and wider color gamut than Sony's previous best. Plus file-based SR Codec recording for fast, efficient episodic TV production workflow. Plus 16-bit linear RAW to support the most demanding feature films. On the Sony F65 digital motion picture camera, it's all true. And it's only the beginning. (Expected availability January 2012.)

CAMERA

1. As of August 2011.

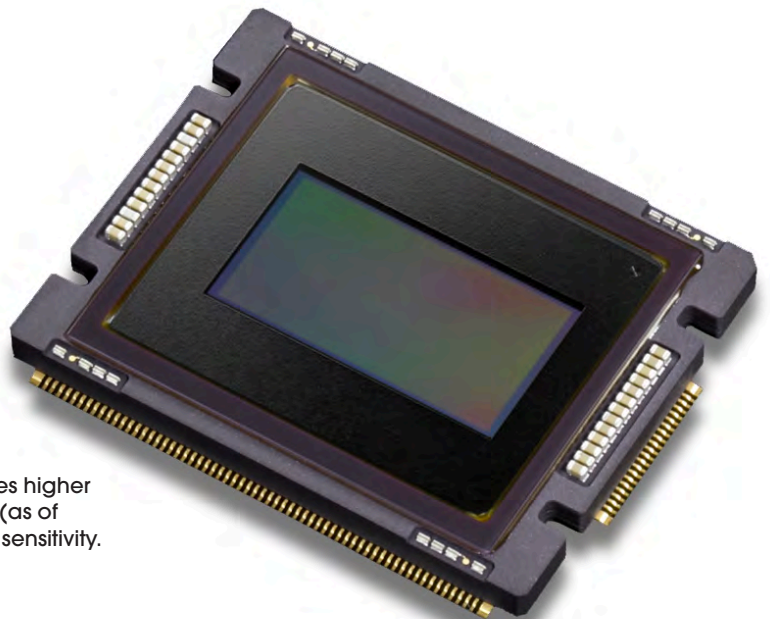
4K is just the beginning

The F65 exceeds the resolution of any previous digital motion picture camera (as of August 2011), the result of a remarkable Sony Super 35 image sensor. Sony has been developing semiconductor image sensors since 1973 and manufacturing commercial quantities since 1985. Through all the decades, our design goal has always been to match the photographic quality of 35mm film. But now we're setting our sights even higher: to surpass the limits of human vision. The F65 image sensor is the first of this new breed.



The sheer resolution of the F65 gratifies the eye in this still from "The Arrival," directed and shot by Curtis Clark, ASC. (JPEG from an actual F65 frame.)

In its ability to resolve detail, to handle lighting extremes, to see into the darkness and still come up with a clear image, the F65 is blowing away veteran cinematographers and colorists. The Sony F65 is a stand-out in every one of these areas largely because the sensor incorporates technology that cannot be found anywhere else.



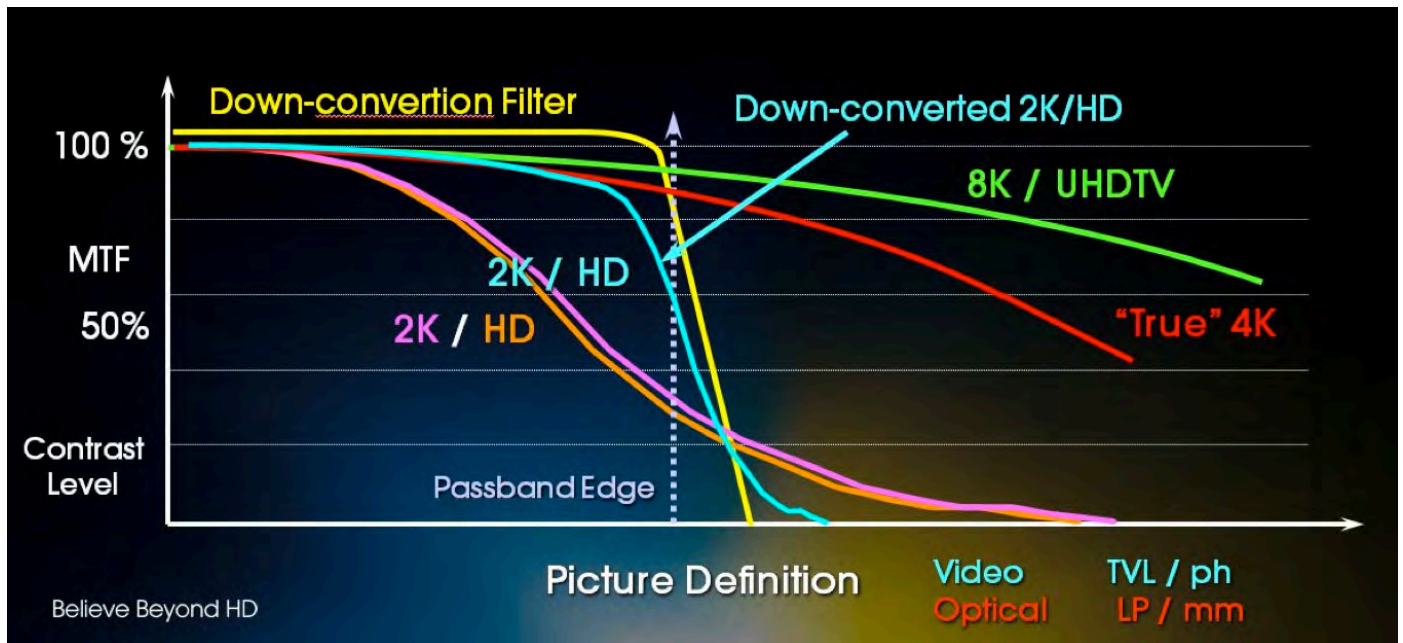
The F65 employs a unique Sony CMOS sensor which achieves higher resolution than any previous digital motion picture camera (as of August 2011) while delivering superb exposure latitude and sensitivity.

A study in superlatives, the F65 image sensor boasts the most photosites of any digital motion picture camera (20 million) and is the world's first to offer a dedicated green photosite for every pixel in the 4K output image. The F65 can provide exquisite images of supersampling 1080p high definition, perfect for the time-is-money pressures of episodic television. The F65 can also output 16-bit linear RAW, which preserves all the information obtained from every photosite on the image sensor—up to 8K of resolution. This gives you phenomenal ability to demosaic, adjust grayscale, color correct, composite and even re-frame the image in post. The advantage here is ability to derive 4K, 2K, HD from 16-bit linear RAW.

Exquisite supersampling HD and 2K

Even if your postproduction workflow and deliverable are currently high definition or 2K, the 20 million photosites of the F65 deliver a powerful imaging advantage. The difference is “supersampling.” All cameras deliver high contrast on large image areas. But as the detail gets finer and finer, contrast suffers. We can draw up a chart of this loss with the vertical axis representing contrast from 0% to 100% and the horizontal axis representing picture definition, which can be measured either as line pairs per millimeter (LP/mm) in the optical domain or TV lines per Picture Height (TVL/ph) in video terms.

Conventional HD cameras start at near 100% contrast and begin to drop off as the picture details get progressively finer. Thanks to the new image sensor, the F65 contrast remains strong, even in fine details. So the picture is dramatically sharper.

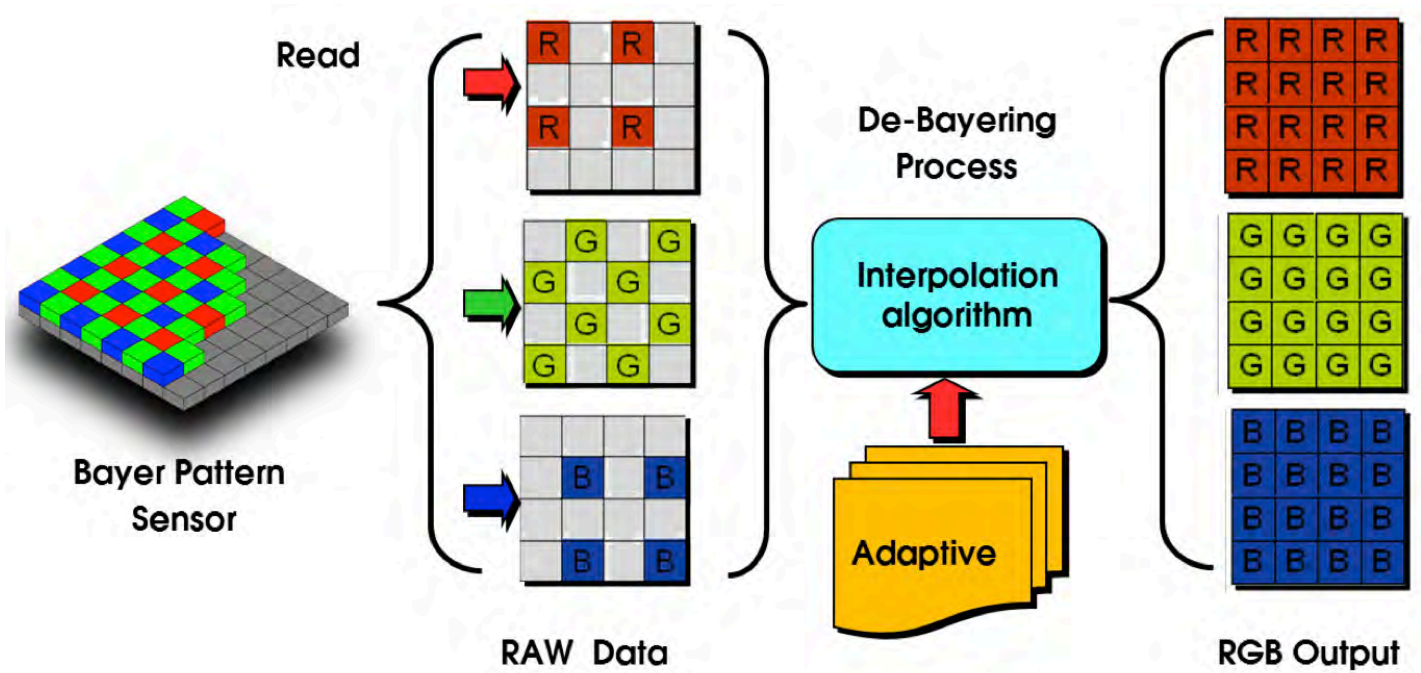


Conventional HD cameras (orange curve) incur a noticeable loss of contrast as picture detail approaches the resolution limit. As applied in the F65, supersampling and electronic downconverting deliver far higher contrast at high frequencies, for a noticeably sharper picture.

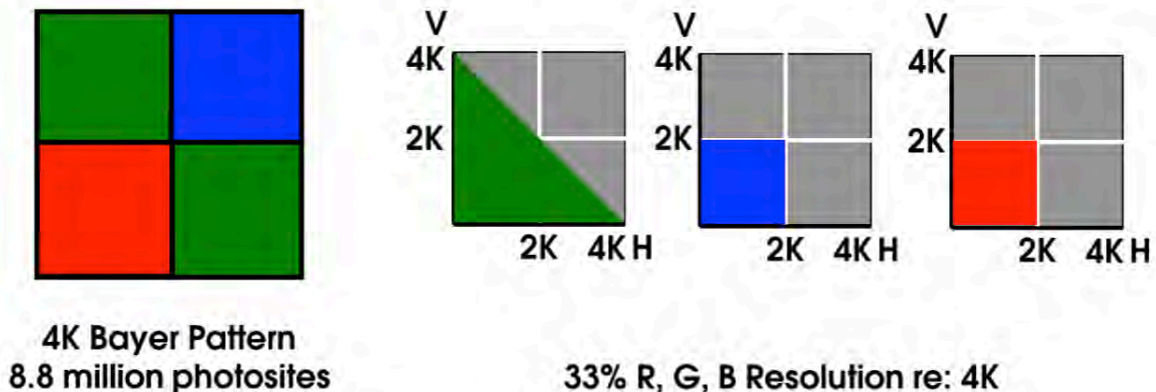
20 million photosites versus "4K"

Some camera manufacturers measure their sensor resolution on the basis of "K," a unit that equates to 1024 horizontal photosites. So a 4K sensor might have 4096 photosites on every row. Unfortunately, the actual resolution is less because these sensors use Bayer color filter arrays. This design leverages two facts. First, the human eye is more sensitive to black & white (luminance) detail than to color detail. Second, the largest component of luminance is Green. In the Bayer array, 50% of the photosites detect Green light only, 25% detect Blue only and the remaining 25% detect Red only.

The 4K Bayer array runs into challenges when you try to construct a 'true' 4K RGB output image from the compromised RGB Bayer components. This requires a de-Bayering process, an exercise in guesswork that must estimate two out of three color values for each pixel. For example, on a Red photosite, the de-Bayering algorithm must guess at Green and Blue values. However sophisticated the de-Bayering algorithms may be, they still cannot fully recreate image information that was never captured to begin with. For this reason, the final resolution falls, to various degrees, short of true 4K.

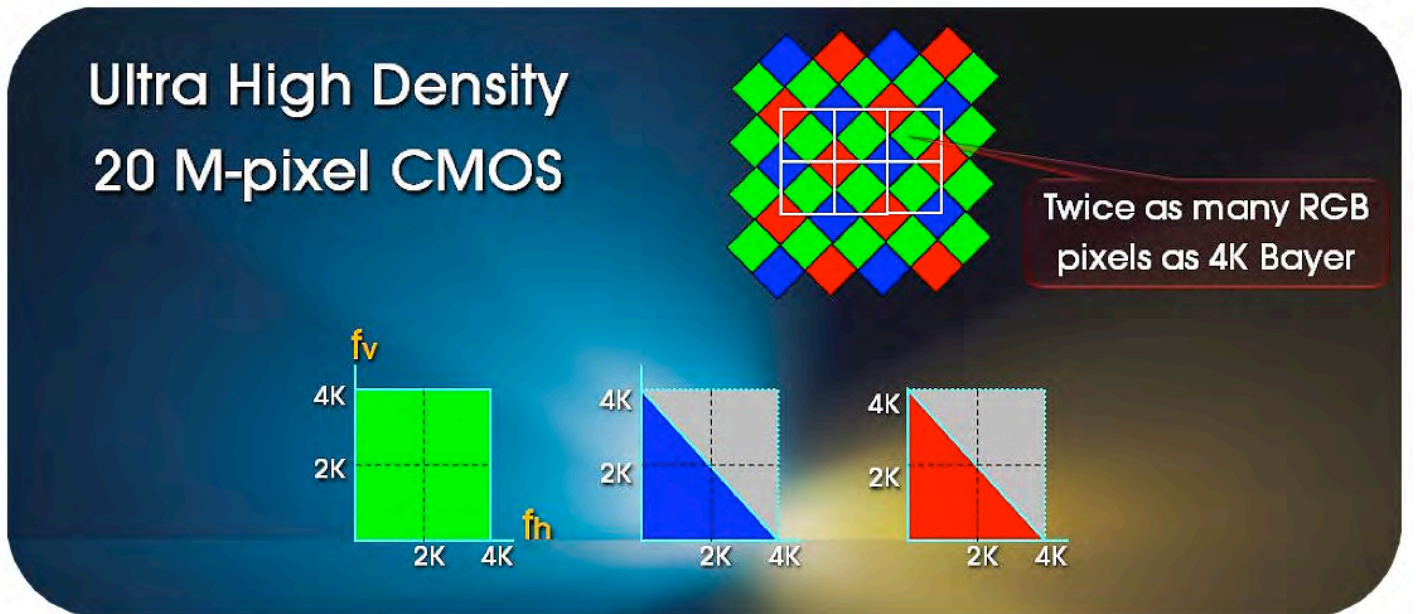


The de-Bayering process is an attempt to guess at data that was never present to begin with. The result is something less than the full resolution promised by the simple count of image sensor photosites.

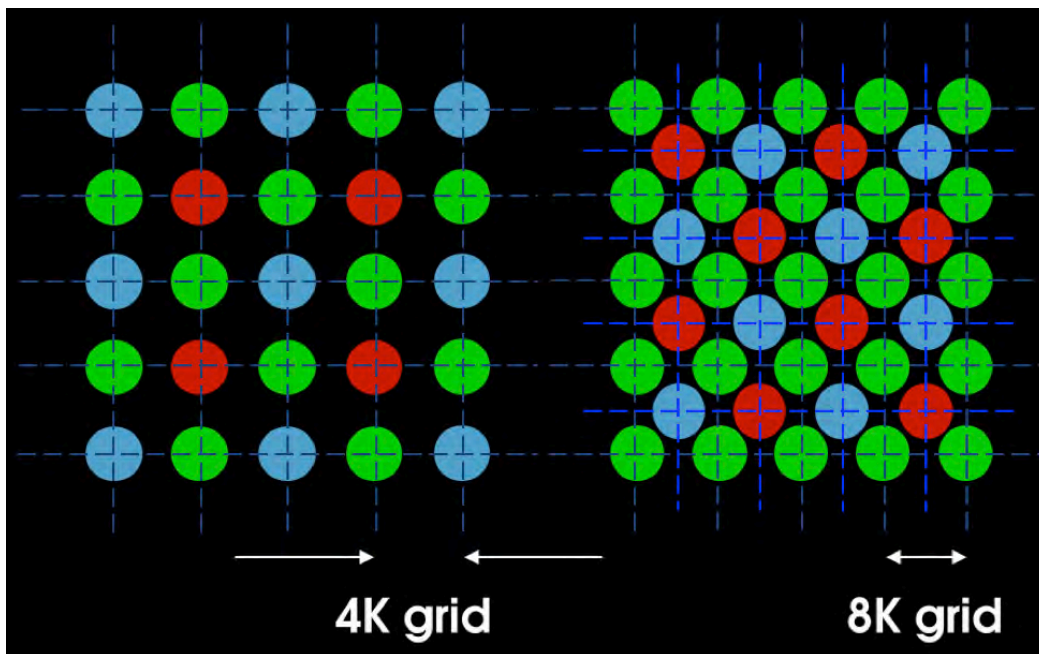


A typical 4K Bayer sensor with 4096 x 2160 photosites falls short of true 4K resolution.

As a leader in image sensor technology, Sony was able to develop an original image sensor of substantially higher pixel density. Compared to the 8.8 million photosites of the typical 4K sensor, the F65 sensor has 20 million photosites. Where the 4K sensor has half as many green photosites as there are 4K output pixels, the F65 sensor has a one-to-one ratio: one green photosite for each pixel of the 4K output image. This new “Zig-Zag” sampling structure results in best-in-class image sharpness, including full 4K resolution on the all-important Green channel. In this way, when an F65 RAW image is demosaicked to 4K, there’s absolutely no guesswork required in the Green channel, and twice as much precision for the Blue and Red.



Sony’s F65 is the first digital cinema camera to deliver true 4K, with full horizontal, vertical and even diagonal resolution on the Green channel, plus full V and H resolution on the Blue and Red channels.



Compared to a conventional 4K sensor, Sony’s F65 has an 8K grid with twice the number of photosites. It’s a much finer sampling grid.

Choice of picture composition

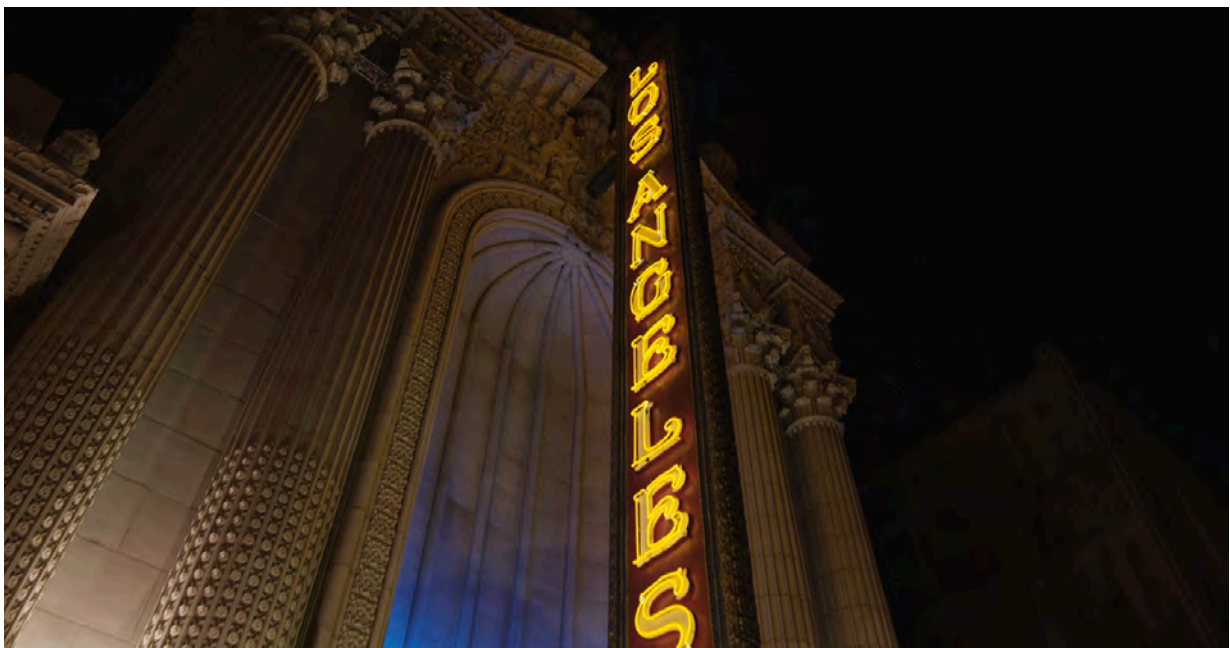
The F65 adheres to the 1.9:1 aspect ratio of the DCI projection standard (4096 x 2160 or 2048 x 1080). This canvas enables a choice of picture composition as needed: 1.85:1, 1.78:1, 1.66:1, 1.33:1, 2.35 spherical, 1.3x anamorphic, or 2x anamorphic cropped.

Exposure latitude and sensitivity

Conventionally, increased resolution comes at the sacrifice of other photographic qualities. But the F65 is no conventional camera. It takes advantage of Sony's expertise in creating ever smaller photosites with ever higher performance in sensitivity and signal-to-noise ratio. Thanks to Sony CMOS advances, the F65 empowers the cinematographer with prodigious exposure latitude, high sensitivity and extremely low noise.



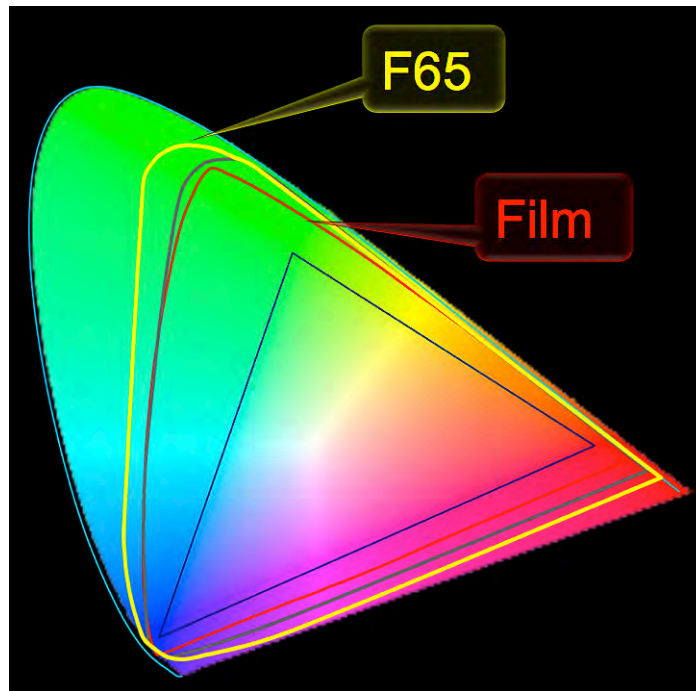
The F65 holds detail in the sunlit exterior, as well as the interior blacks in this still from "The Arrival," directed and shot by Curtis Clark, ASC. (JPEG from an actual F65 frame.)



In another still from "The Arrival," even dimly lit details are exceptionally clean. (JPEG from an actual F65 frame.)

Extended color gamut

In kindergarten, you probably wanted the biggest box of crayons. In digital cinematography, you definitely want it. Many HD cameras are limited to the Rec.709 color space. While this produces broadcast-legal color for television productions, it still falls short of motion picture film. The Sony F65 transcends this limitation. The camera features a new Color Filter Array on the sensor, along with a 3D lookup table (LUT) and proprietary color management systems. In this way, the F65 can shoot in either Rec.709 or F65 Gamut, which actually exceeds the SMPTE specification for color negative film in every direction.



Here's the bigger box of crayons you always wanted. The range of available colors in Sony's F65 Gamut is larger than that of the SMPTE specification for color negative film.

Up to 120 frames per second

To support slow motion and fast motion, the F65 provides over- and undercranking at frame rates of 1 to 60 frames per second (4Kx2K resolution), and up to 120 frames per second (4Kx1K resolution). In both modes, you get high-speed shots without "windowing," crop factor or change of effective focal length.

Rotary shutter option

Typical CMOS sensor cameras are prone to “rolling” shutter defects, where the exposure timing of each row of pixels is slightly offset from the next. Row after row, these differences can trigger geometric distortion in moving objects or camera movements, particularly visible in the horizontal movement of objects with strong vertical lines. Rolling shutter artifacts are especially troublesome in 3D mirror rigs, where one camera is upside down. The artifacts in the left camera don’t match those in the right, causing unwanted disparities. Rolling shutter also incurs “flash banding” where a strobe light illuminates only a horizontal band across the frame. As with other Sony cameras, the F65 uses an advanced CMOS design to reduce rolling shutter artifacts to a bare minimum.



The curved housing accommodates Sony’s optional Rotary Shutter.

But for productions that demand complete geometric accuracy, the F65 can go further still. The Rotary Shutter option eliminates rolling shutter artifacts. The Rotary Shutter takes the form of rotating blades and supports variable shutter angles (shutter speeds). With the Rotary Shutter option, the geometric integrity of on-screen objects is preserved. And flash banding is not an issue.

SRMASTER™ recording

While others design cameras, Sony designs comprehensive production systems that anticipate your needs from the set to postproduction, delivery and archiving. That's why the F65 camera is designed to work with the docking SR-R4 SRMASTER field recorder, which captures your work to solid-state SRMemory cards. Here is file-based recording of phenomenal versatility, capacity and image quality. Best of all, the SR-R4 is just one part of a comprehensive, next-generation production system that includes field recorders, studio decks, a transfer station as well as the SRMemory cards.

The SRMASTER system represents a significant in advance in two distinct production styles: episodic TV and cinema.

For episodic television: SR Codec

The tyranny of the weekly schedule imposes unique production requirements on episodic television. Under this time-is-money pressure, the SRMASTER system thrives thanks to Sony's SR Codec.

- Well-established postproduction system that's already a fixture in high-end facilities all over the world via the HDCAM SR™ tape format
- Virtually lossless and visually lossless recording at 440 and 880 Mbps plus space-saving 220 Mbps SR Lite
- Choice of 4:2:2 YCbCr or 4:4:4 RGB recording
- Superb grayscale rendition with 10-bit and 12-bit recording
- Faster than real-time file transfers
- File playback on a laptop PC
- Broad file compatibility with popular editing and color correction systems
- Compatible with HDCAM SR tape for archiving and program exchange

For cinema: 16-bit linear RAW recording

For music videos, commercials and feature film production, the SRMASTER system delivers stunning image quality and flexibility of 16-bit linear RAW recording.

- Preserves the full quality of the original captured image, including the full resolution of 20 million photosites
- Flexible demosaicking "develops" the latent RAW image into RGB output files
- Your choice of resolution: gloriously supersampled HD, supersampled 2K, true 4K or even 8K
- Maximum image quality for vigorous color correction and grayscale enhancement
- Incredible resolution for compositing at the very highest quality
- Overhead resolution for punching in and motion stabilization in post
- Flexibility to extract 4K, 2K, and HD quadrants from the full-resolution image

What they're saying about the F65

"The F65 is the first camera I've seen that elevates the platform to achieve something that might not only be comparable to 35mm film in all of its spectacular glory and 4K scan resolution, but also might even exceed it."

—Curtis Clark, ASC

[Look behind the scenes](#) at the making of Curtis Clark's short film, "The Arrival."



Winner: TV Technology Mario Award 2011

Sony unveiled the F65 at NAB 2011, where it was recognized as a technical breakthrough with a [Mario Award](#) from TV Technology's legendary Masked Engineer.

Sony's Kazuo Endo and Peter Crithary pose with TV Technology's "Mario" Award.



Winner: Cine Gear Expo 2011: Best Camera Technology

At the 2011 Cine Gear Expo, the show's panel of expert judges recognized the Sony F65 with the award for [Best Camera Technology](#).

Preview of the F65 in Jon Fauer's Film and Digital Times

Read Jon's [exclusive coverage](#) of his trip to Sony's Atsugi Tech Center (camera engineering) and Kumamoto Tech Center (image sensor production).