The Path to 3D4Kp48

The Next Step for Cinema

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The Society of Motion Picture and Television Engineers (SMPTE) has published spatial resolution and temporal resolution standards for 2D and 3D digital cinema presentations. These standards, embodied in the SMPTE Digital Cinema Package (DCP), establish the technical standards for 2D productions and presentations with spatial resolutions (pixel counts) of either 2K or 4K and temporal resolutions (frame rates) of either 24 or 48 *unique* frames per second[1]. In addition SMPTE has established standards for 3D productions with a spatial resolution of 2K and a temporal resolution of 24 fps. Significantly, the SMPTE-DCP falls short of establishing a standard for 3D presentations with a spatial resolution of 4K and a temporal resolution of 48 fps. Presumably the engineers on the SMPTE 21DC Technical Committee believed that the data transport storage demands of a 3D4Kp48 presentation would--at least for the immediate future--render that format functionally impractical.

It is true that daunting data transport and storage demands are involved in the step-up to 3D4Kp48. On the reasonable assumption that the data load of a video signal is proportional to the product of the spatial and temporal resolutions of the signal, a 3D4Kp48 presentation would consume *four times* the data load of a 3D2Kp24 presentation, or *sixteen times* the data load of a 2D2Kp24 presentation. And that translates into a need for transport systems that can carry four times the data load required for a 3D2Kp24 presentation; for storage systems that can store four times the volume of data; for producers who are prepared to accept VFX render times that are four times as long as those involved in a 3D2Kp24 production; and for studios who are ready to accept production budgets that may be 20% higher than those for a comparable 3D2Kp24 production.

Based on today's digital projection technology, a 3D4Kp48 presentation--in order to achieve an acceptable level of luminance--would need to employ two projectors. The brightest 4K projector that is currently available outputs 22K lumens, a level that is less than half the output by a typical 35 mm projector and less than 5% of the 600K lumens delivered to the screen by a 15 perf/70 mm IMAX projector. Efforts have been underway for years to improve the brightness of digital projectors, but the assumption on the street is that the DLP and SXRD technologies in current use have little more headroom to exploit, and new projection technologies—like the laser-based grating light valve technology under development at Sony—may be required in order to help the movie industry advance to its next major level.

Because of the costs involved in doubling the number of projectors while doubling the demands of data load and storage, It seems likely that, in the short run at least, the 3D4Kp48 format will be best suited to "event" or "tentpole" productions. That is, the kind of pictures that currently, by virtue of their 3D format, earn a premium of around 20% relative to comparable 2D releases.

But if 3D2Kp24 is now earning a premium of 20%, why expend that much-needed revenue bump by producing a film in 3D4Kp48?

In pondering that question it may be useful to remind ourselves that there has been no armistice declared in the format wars. TV screens continue to grow in size, contrast, and brightness; high-resolution Internet streaming is becoming commonplace; and, together, television, videogames, and the net continue to steal audience share from the cinema market, even as--by virtue of rising ticket prices--the film industry posts modest boxoffice gains. In view of these trends, no one in Hollywood should imagine for a moment that this is a time to coast, assured by the illusion that the cinema standards of the future have been set.

Instead, the time has come to start drawing up plans for the kind of cinema that *cannot* be easily replicated at home. And that means the presentation of giant-screen 3D productions with at least four times the luminance levels, spatial resolutions of at least 4K, and temporal resolutions of at least 48

fps—the kind of productions designed to play in venues with floor-to-ceiling screens, steeply-ramped stadium seating, and an average distance from the viewer to the screen of no more than two picture-heights. To win an audience for such films and to offset their added cost, a clever branding strategy will undoubtedly be required. But all that is needed is a catchy name. "Super 4K?" "Super 4-48?" Or, unless IMAX threatens to sue, maybe "4MAX?"

On giant 3D screens such as these, spatial artifacts like image noise and temporal artifacts like motion flicker—the kind of minor annoyances that we have grudgingly accepted on smaller screens--become a major annoyance to the audience. On screens such as these, all the old artifacts from the "flicks" are not merely at the periphery of your perception; they are in your face.

What we need now is for a bold producer to take the first step—to roll the dice on a longform picture that originates in 3D4Kp48 and is displayed in that format--the kind of production that can serve as a proof-of-concept for a new generation of truly compelling cinema experiences.

Comments and critiques are invited, and may be directed to barryclark@telenova.us

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[1]By unique frames I mean non-duplicated frames. Current cinema projectors, in order to diminish motion judder, double or triple flash each individual frame. But, for most viewers, a projector that displays images at 48 unique frames per second should all but eliminate motion judder.