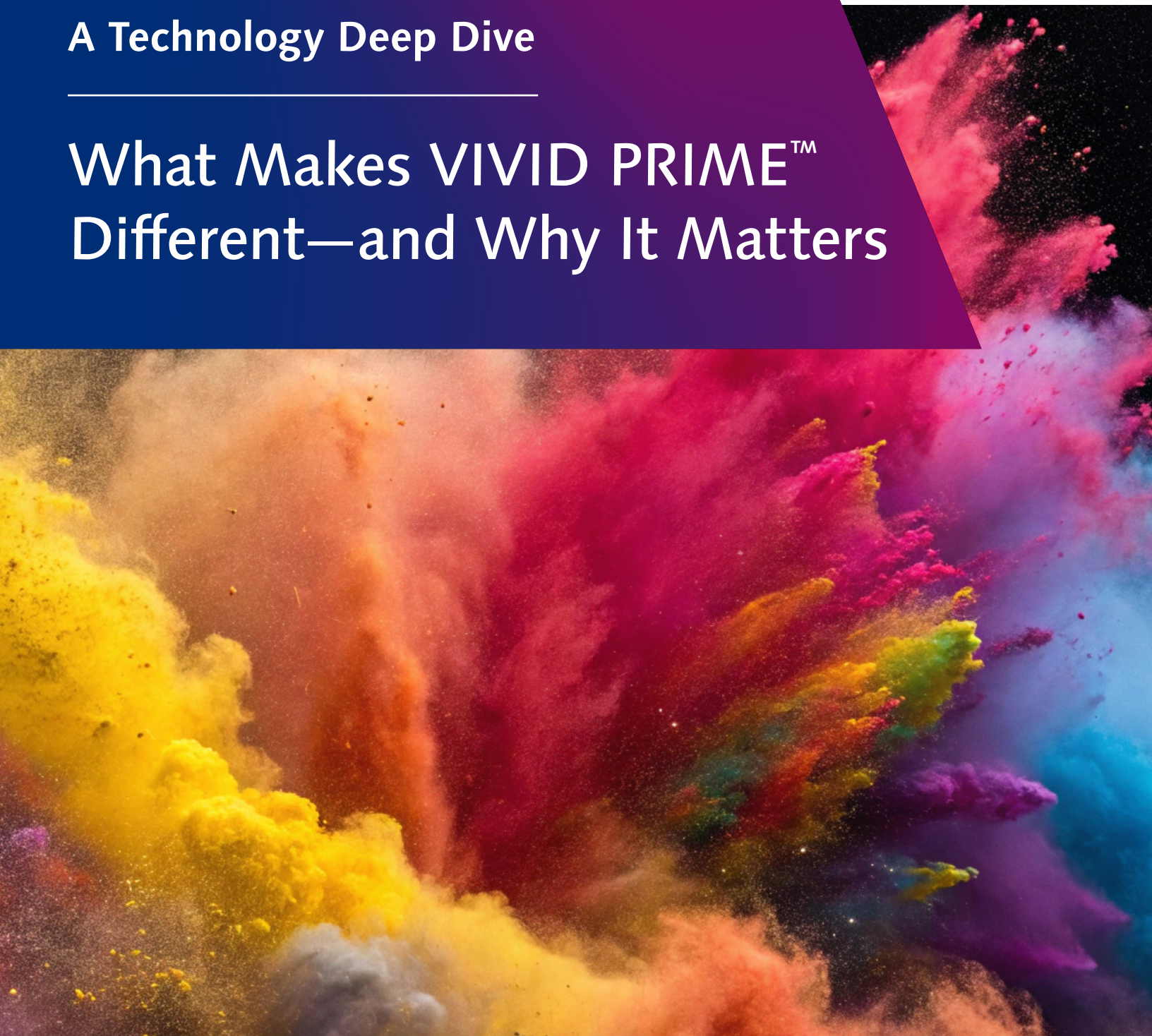


A Technology Deep Dive

What Makes VIVID PRIME™ Different—and Why It Matters



What Makes VIVID PRIME™ Different From Pure RGB Laser Projection?

Some say pure RGB laser projectors represent the current state of the art in color gamut—capable of reaching the wide Rec.2020 color space. So why isn't pure RGB laser the end of the story?

The answer lies in trade-offs that can emerge specifically from what makes pure RGB laser so good at color.

The history of projection technology is, in many ways, a history of trade-offs. Want more brightness? Accept a larger, heavier body size. Want more color reproduction? Sacrifice cost. Want a compact footprint? Compromise on color and image quality. For decades, manufacturers have optimized individual components in isolation—and hit the same walls.

VIVID PRIME™ was our breakthrough answer.

Rather than treating light source, drive circuitry, and image processing as separate engineering problems, VIVID PRIME™ integrates all three into a unified system—the optical design, the light source architecture, and DMD drive circuitry, each engineered to work in concert. The result is a projection technology that resolves long-standing conflicts between image quality parameters—not by cleverly managing trade-offs, but by engineering around them entirely.

VIVID PRIME™ is not just our answer to overcoming 1-Chip DLP™ limitations like restricted color space and the rainbow effect—it also addresses the significant challenges that pure RGB introduces: camera color shift, speckle noise, and the inherent tension between wide color gamut and fine gradation reproduction—freeing creators and installers from the trade-offs they've long had to accept.



The Rainbow Effect: What It Is, Why It Happens, and How VIVID PRIME™ Addresses It

If you've spent time watching a 1-Chip DLP™ projector, you may have encountered the rainbow effect—brief flashes of spectral color at the edges of bright objects, most visible when the eye scans across a high-contrast scene like white subtitles against a black background.

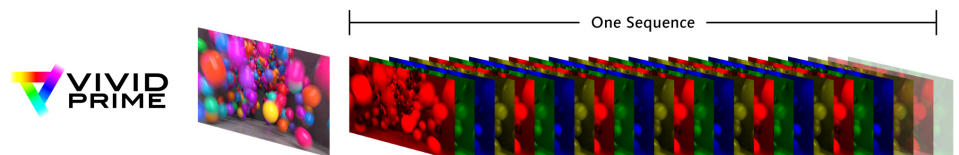
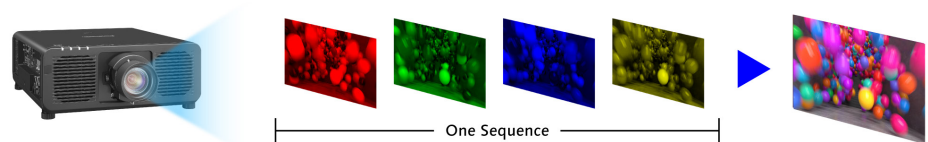


It happens because a single DMD chip can only display one color at a time. Each frame is divided into a rapid sequence of subframes—distinct red, green, and blue images that the human visual system blends into a color picture through persistence of vision. Under normal viewing conditions, this works well. The problem arises when the eye moves across the screen, capturing single-color subframes rather than perceiving them blended.

Why It's Harder to Solve Than It Looks

The intuitive fix is to increase subframes per second—shorter color segments mean less separation during any given eye movement. But simply driving the light source faster tends to introduce gradation loss and dither noise patterns that create a different kind of artifact. Solving the rainbow effect without introducing these secondary problems requires precise coordination between the light source and the DMD sequencing.

VIVID PRIME™'s newly developed light source architecture delivers color switching speeds more than five times faster than conventional systems, dramatically increasing the subframe rate. But the key to doing so without degradation is the collaborative DMD sequencing with Texas Instruments (TI): a proprietary architecture that maintains full gradation fidelity and suppresses artifacts even at these elevated speeds. Neither the advanced light source architecture alone nor the advanced subframe sequence alone would be sufficient. It's the combination that makes the difference.



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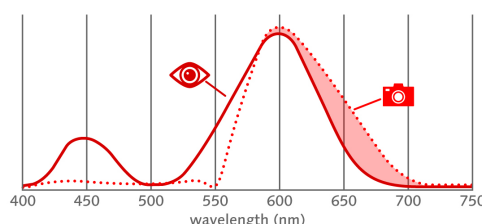
Beyond Rainbow Effect Reduction: The Full Advantage Stack

Eliminating the rainbow effect is the most immediately perceptible improvement for viewers—but it's far from the only benefit VIVID PRIME™ delivers. The same system architecture that solves the rainbow effect also addresses a set of technical challenges that have long constrained what projection—even pure RGB—can deliver in demanding environments.

Advantage 01 — Reducing Color Shift

Pure RGB laser systems use a longer-wavelength red laser to achieve Rec.2020 primaries—and camera sensors happen to be especially sensitive at that wavelength. The result: cameras over-detect the red component, and footage of pure RGB laser projection looks redder on-screen than it does to the human eye in the room.

Differences in red spectral sensitivity

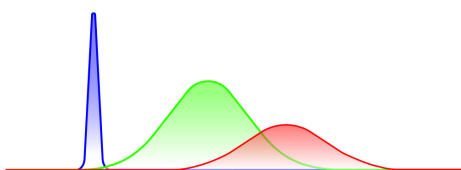


This isn't a projection error—it's a fundamental mismatch between laser spectral output and camera sensor response curves.

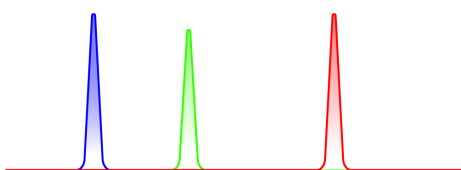
VIVID PRIME™ addresses this by combining RGB lasers with a phosphor wheel. The phosphor wheel broadens the wavelength distribution of the light reaching the screen, narrowing the gap between what the human eye perceives and what a camera sensor captures. Critically—and this is where Panasonic's accumulated optical design expertise becomes a differentiator—introducing a phosphor wheel typically forces a compromise in color gamut. VIVID PRIME™ maintains wide color gamut while using the phosphor wheel, a balance that requires precise optical system engineering and decades of multi-platform development experience across lamp, LED, laser, and phosphor light sources. The phosphor wheel doesn't dilute the image—in VIVID PRIME™, it expands what's possible.

Spectrum differences

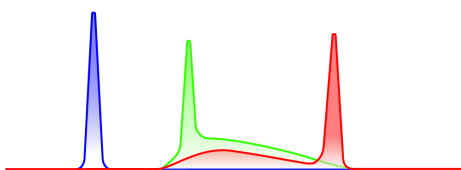
Blue LD + Phosphor



Pure RGB LD



RGB LD + Phosphor (VIVID PRIME™)



The phosphor wheel doesn't dilute the image—in VIVID PRIME™, it expands what's possible.

This balance is achieved through expertise accumulated across multiple light source types and projection methods—1-Chip DLP™, 3-Chip DLP™, and LCD—enabling compact coexistence of RGB lasers and a phosphor wheel within the same system. VIVID PRIME™ can suppress color shift while maintaining a wide color gamut because the optical system was designed, from the start, to do both.

VIVID PRIME™'s newly developed system delivers color switching speeds more than five times faster than conventional systems. Combined with controlled current modulation that suppresses overshoot, this makes it possible to optimize color gamut and brightness for each image mode—and to effectively leverage the broad light output of the phosphor wheel precisely when it's needed.

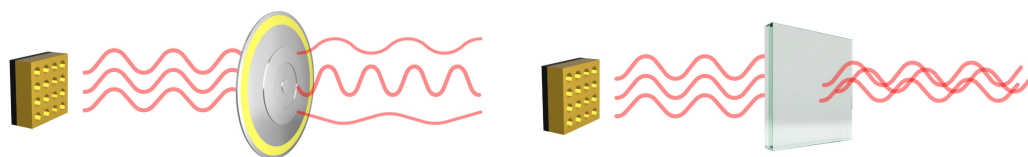
Advantage 02 — Reducing Speckle Noise

Laser diodes emit highly coherent light—and coherence interacts with screen surface micro-textures to create the shimmering "speckle" noise visible in pure RGB laser projection. VIVID PRIME™ reduces coherence through two complementary approaches: phosphor-diffuse light mixed with the laser output, and a vibrating diffuser plate that continuously varies the speckle pattern over time. The result is perceptually smooth projection without the characteristic laser glitter.

While phosphor wheels and diffuser plates are general technologies, their placement, count, and control conditions must be precisely optimized—otherwise the trade-offs lead to larger body size and reduced brightness. VIVID PRIME™ achieves speckle noise reduction while maintaining brightness and compact size through a newly shaped optical lens and a new optical system architecture built around a vibrating diffuser plate.

Phosphor wheel and Diffuse plates function

Image for illustrative purposes only.



Advantage 03 — Achieving Both: Wide Color Gamut and Fine Gradation

Wide color gamut and smooth gradation are fundamentally in tension in pure RGB laser systems. When the light source primaries are set for Rec.2020, displaying Rec.709 content uses only a subset of the available signal range—reducing effective gradation steps and making tonal discontinuities more likely. VIVID PRIME™'s phosphor-hybrid light source system reconstructs Rec.709 primaries through an analog approach, preserving fine gradation in each mode rather than forcing a compromise.

Achieving this requires careful examination of how to construct the primary colors for each color gamut—a technically demanding process. The optical system that blends phosphor wheel and RGB laser light plays a critical role in defining these primaries. From that baseline, gradation is further improved through an optimal sequence constructed by combining the laser drive engine—a proprietary engine that operates within a shorter timeframe than the DMD drive cycle—paired with a dedicated DMD sequence developed in collaboration with TI.

What connects all of these advantages is that they are not independent features bolted onto a base product. They emerge from the same integrated system design. The phosphor wheel that broadens wavelength distribution also reduces speckle. The light source architecture that reduces rainbow effect also enables the mode-switching that preserves gradation. The DMD sequence developed with TI that suppresses rainbow effect also supports finer gradation. Each element of VIVID PRIME™ earns its place in the system multiple times over.

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Where VIVID PRIME™ Shines: Applications Built for This Technology

VIVID PRIME™'s combination of capabilities makes it particularly well-suited to applications where multiple image quality demands converge — settings where no single compromise is acceptable, and where the audience or operators are likely to notice.



Museums and Cultural Institutions

Exhibition environments increasingly rely on projection for both interpretive display and artistic installation. Accurate, stable color reproduction — including camera-accurate output for documentation — and artifact-free imagery at extended viewing distances make VIVID PRIME™ well-suited to gallery and museum deployments where quality expectations are high and content changes frequently.



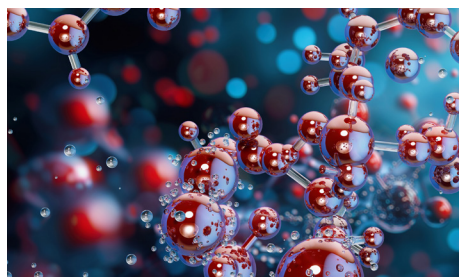
Themed Entertainment and Immersive Environments

Projection mapping and immersive experience design place extraordinary demands on image quality: long operating hours, complex multi-projector blending, and audiences scrutinizing imagery at close range. Strong screen uniformity and consistent color performance across modes all become critical. VIVID PRIME™'s compact form factor — a byproduct of its efficient optical system design — also simplifies integration into constrained installation environments.



Corporate and Large-venue Presentation

In environments where a single projector must handle everything from photographic brand imagery to text-heavy presentations to video — often with mixed ambient lighting — VIVID PRIME™'s image mode flexibility becomes a practical operational advantage. Different color gamut modes can be optimized for each content type without the gradation trade-offs that pure RGB laser systems encounter when switching between wide-gamut and standard content.



Simulation and Visualization

Training simulators, scientific visualization, and data-driven display environments require both wide color coverage and fine detail resolution — applications where speckle noise and color inaccuracy translate directly into operational problems. VIVID PRIME™'s speckle suppression and gradation fidelity directly address these needs.

By integrating optical system design, light source architecture, and DMD sequencing into a unified architecture—and by drawing on decades of cross-platform development experience—Panasonic has built a technology that doesn't ask users to choose between the image qualities they need.

VIVID PRIME™ is best understood not as a product feature but as an engineering philosophy: the belief that the most persistent image quality problems in projection cannot be solved by optimizing components in isolation. By integrating optical system design, light source architecture, and DMD sequencing into a unified architecture—and by drawing on decades of cross-platform development experience—Panasonic has built a technology that doesn't ask users to choose between the image qualities they need.

For integrators and end users evaluating projection technology for demanding applications, that represents something genuinely new.

Introducing: PT-HTQ20

The PT-HTQ20 is the first projector to bring VIVID PRIME™ technology to market. A 1-Chip DLP™ RGB laser projector delivering 20,000 lumens and 4K resolution, it is designed for the demanding installation environments where VIVID PRIME™'s advantages matter most—themed entertainment, live production, simulation, and large-venue presentation. Compatibility with Panasonic's 3-Chip DLP™ lens lineup, a built-in 12G-SDI terminal, and a dust-resistant filterless optical engine round out a platform built for long-term reliability in mission-critical deployments.

