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HDR On-Set Monitoring

This guide is designed to help productions effectively manage HDR workflows on set with GEM's platform. While we recommend leveraging HDR monitoring early in production to ensure accurate image evaluation, GEM does not mandate HDR monitoring on-set for all projects.

GEM is available to support productions navigating their unique HDR workflow challenges. Production teams are encouraged to consult with GEM's specialized support contacts to tailor solutions that fit their needs.

Selecting the Right Monitor

Panel Technologies & Backlighting
Traditional LCD monitors face challenges achieving the deep blacks and broad viewing angles that high-quality HDR requires. Local dimming can enhance LCD dynamic range but low-cost implementations may suffer from issues like "blooming" or "halo" effects around bright objects.

Global dimming LCDs, which adjust the entire backlight uniformly, are unreliable for static image monitoring commonly needed on set.

Dual-layer LCDs separate luminance and color modulation to provide more stable images, but these monitors are generally heavy, costly, and not typical for on-set use.

OLED displays, where each pixel emits its own light, offer true blacks and wide viewing angles, making them ideal for on-set HDR monitoring but typically at a higher price point.

Emerging technologies such as Quantum-Dot OLED (QD-OLED) and RGB OLED further improve on traditional OLED with wider color gamuts, higher peak luminance, and greater efficiency.

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Note: Beware of "Bright SDR" (BSDR) displays marketed as HDR-capable but lacking true HDR dynamic range, which are unsuitable for precise on-set HDR monitoring.

Viewing Environment Considerations

The optimal display choice depends on the production environment:

- LCDs often deliver higher peak brightness, beneficial in bright or outdoor settings.
- OLED and advanced OLED variants excel in controlled darker environments where superior black levels and color accuracy enhance detail visibility at different viewing angles.

Viewing Angle
Critical for on-set situations where multiple viewers may observe monitors from different positions. Monitor type, screen reflectivity, environment lighting, and physical placement all influence uniformity of luminance and color. Ideally, colors should appear consistent regardless of horizontal or vertical viewing angles.

Size, Weight, and Ergonomics
Consider physical monitor characteristics such as dimensions, weight, durability, and acoustics. New panel technologies like QD-OLED are enabling lighter, durable HDR monitors optimized for the rigors of on-set use.

Power and Noise
HDR monitors can consume considerable power and sometimes require fans, which may introduce noise that interferes with production sound recording.

Operational Requirements
Review manufacturer recommendations for operating temperature and set-up considerations, including robust mounting solutions to support heavy monitors.

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Display Performance Characteristics

Peak Brightness
For color grading reference, Dolby Vision recommends a minimum of 1000 nits peak luminance. On-set monitors should ideally approach this level, but more critical is their ability to sustain high brightness while maintaining deep blacks, accurately revealing highlight and shadow details in real time.

Contrast Ratio
Though contrast ratios (peak brightness to black level) are commonly marketed with inflated terms such as "infinite contrast," hands-on calibration and viewing tests remain the best method to evaluate true performance.

Color Gamut
Most HDR displays support wide gamuts like P3-D65 or BT.2020, offering a "color volume" that covers significantly more vibrant colors and luminance than traditional SDR Rec.709 monitors.

Color Management Strategies

Maintaining consistent color management across SDR and HDR signal paths is crucial. Using a unified color management framework (such as ACES) for both SDR and HDR outputs ensures consistent comparison and avoids misinterpretation due to differing color pipelines.

Signal Distribution & On-Set Equipment

Camera Output Standards:

- Color space: Log format is recommended.
- Bit depth: Minimum 10-bit.
- Color subsampling: 4:4:4 or 4:2:2 minimum.
- Resolution: 4K ideal; 1080p HD acceptable for monitoring.

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Signal Distribution:

- Use signal splitters like 3G-HD-VDA for cabled distribution to multiple monitors.
- Routers and switchers rated for the signal format (3G-SDI, 12G-SDI, HDMI) enable flexible monitor monitoring choices.
- Wireless HDR transmission requires systems capable of at least 10-bit 4:2:2 color space.

Lighting and Scopes:

- Implement light meters mindful that HDR lighting roll-offs differ from SDR, requiring adjustments in exposure ratios during production.
- Scopes must support HDR EOTFs (such as PQ/ST.2084) and operators need training to interpret HDR signals correctly.

Live Grading & LUTs

Real-time control of HDR images on set benefits greatly from live grading software supporting high-precision 3D LUTs (at least 33x33x33) and color management frameworks like ACES.

Alternatives include in-camera LUT outputs or monitors with built-in LUT support for direct HDR display processing.