# DELL - VESA HDR Applications

High Dynamic Range (HDR) technology provides superb contrast with brighter hues, darker shades and greater color depth resulting in vibrant, lifelike images that pop on screen.

The increased range of luminance and color enable displays to better represent what the eye sees in the real world.

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SDE LCD Engineering
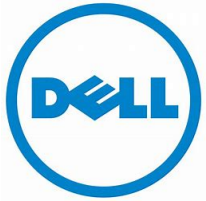
- Dell EMC, a global company, develops, sells and supports computers, and related products and services.

- Founded in 1984, Dell has more than 96,000 employees and a annual revenue of over 52 billion dollars.

- Dell supports multiple product lines covering commercial, consumer, gaming and education.

At Dell, meeting customers' needs with industry-leading innovation underpins the solutions we design.

It is this commitment to delivering best-in-class technology for our customers that has led to Dell earning a place as the **No. 1 displays brand in the world for four consecutive years**.

As a VESA member, Dell participated in defining the new HDR standards for PC use in partnership with other association members.

A **Dell initiative** launched the new VESA industry standard for narrow border display 13", 14", 15" and 17"

VESA impact on DELL products

- Dell relies on many VESA standards for multi vendor compatibility and continuity of supply.

- New VESA standards help push display and sub components vendors to higher levels of performance and production.

  - DP and eDP standards

  - New Narrow Border

  - Display HDR

  - Display ID 2.0

HDR - Review of Standards

The TV industry uses a variety of HDR standards, the primary ones being HDR10 and Dolby Vision.

The display market has many types of HDR ranging from tone mapping to Dolby Vision (the top tier). HDR Microsoft 10 Streaming – HDR content for viewing on a standard display.

The HDR standard, for PC monitors and displays, was released by VESA in three tiers varying in luminance and color.

DisplayHDR-400   contrast ratio   1000:1

DisplayHDR-600   contrast ratio   6000:1

DisplayHDR-1000   contrast ratio   20000:1

VESA High-performance Monitor and Display Compliance Test Specification

HDR Challenges for the Laptop Market Ecosystem

The HDR laptop market offers many unique challenges, especially when combined with narrow border displays and long battery life.

- Luminance - Peak White screen Brightness, lower Black points

- Color - 10 bit processing

- Mechanical - fit

- Power / Thermal

Luminance, White and Black

The VESA HDR luminance requirement creates challenges for narrow border battery powered devices.

- The **minimum** white luminance is taken from the front of the display in its final configuration. The loss of luminance due to touch or cover lens solutions must be compensated for in the base panel to meet always meet the minimum.

- HDR400 is the simplest tier with ***single edge lighting and <u>global dimming</u>***.

- HDR600 and HDR1000 require ***<u>local dimming</u>*** to achieve the low blacks. Two main types; segmented (1D,1.5D) and direct backlighting (2D)

Color Depth and Gamut

HDR-400

10 bit image processing
95% BT709

HDR-600

10 bit image processing
99% BT709 and > 90% DCI-P3

HDR-1000

10 bit image processing
99% BT709 and > 90% DCI-P3

Transition 6 bit panels

Mechanical, Narrow Border

There are four new VESA Narrow Border Display Module Standards. The border reduction was limited to facilitate cost effectively replace of the standard border panels.

The panel top and sides are reduced by ~ 2mm and the panel (X) is reduced by 5mm to 9mm.

VESA Narrow Bezel Display Module Standard								
Display Size	Panel Type	Module X	Module Y	Module thickness / with PCB	Border Left & Right	Border Top	Border Bottom	Module Y with flex or PCB
13.3	Bent	299.46	176.59	2.4/5.1	2.85	2.85	8.50	1.6
13.3	Flat	299.46	176.59	2.4/3.2	2.85	2.85	8.50	10.4
14.0	Bent	315.85	186.09	2.85/5.25	3.25	3.25	8.85	1.6
14.0	Flat	315.85	186.09	2.85/3.2	3.25	3.25	8.85	11.5
15.6	Bent	350.7	205.68	3.0/5.4	3.25	3.25	8.85	1.6
15.6	Flat	350.7	205.68	3.0/3.2	3.25	3.25	8.85	11.5
17.3	Bent	394.93	229.34	3.7/6.1	6.50	5.50	9.00	1.6
17.3	Flat	394.93	229.34	3.7/3.7	6.50	5.50	9.00	13.5

The HDR panel Ecosystem

The HDR Decoding Algorithm is the key driver of the panel design.
- The HDR decoding is generally done in the GPU or the Tcon.
- A system alignment is required between GPU, Tcon, backlight and backlight controller.

Display ID 2.0 is planned to provide the luminance data
(current EDID Base block does not provide panel luminance data)

Expectations

- HDR content will continue to increase in quality and availability
- Brighter is better. Blacker is better
- Backlights are improving with local dimming performance

For Laptops

HDR400 solutions will increase as solutions standardize
In the next year more narrow border HDR600 solution will be available

For AIO

HDR600 and HDR1000 solution are in the works

Thank You