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BRING LIGHT TO LIFE

LASER PHOSPHOR DISPLAY (LPD)

Introduction to LPD Technology and its Advantages in Large Format Displays

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AGENDA

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- Introducing Prysm & LPD: Basic LPD Architecture
- Key Features with few detailed examples
- Green Manufacturing
- LPD Application and Video

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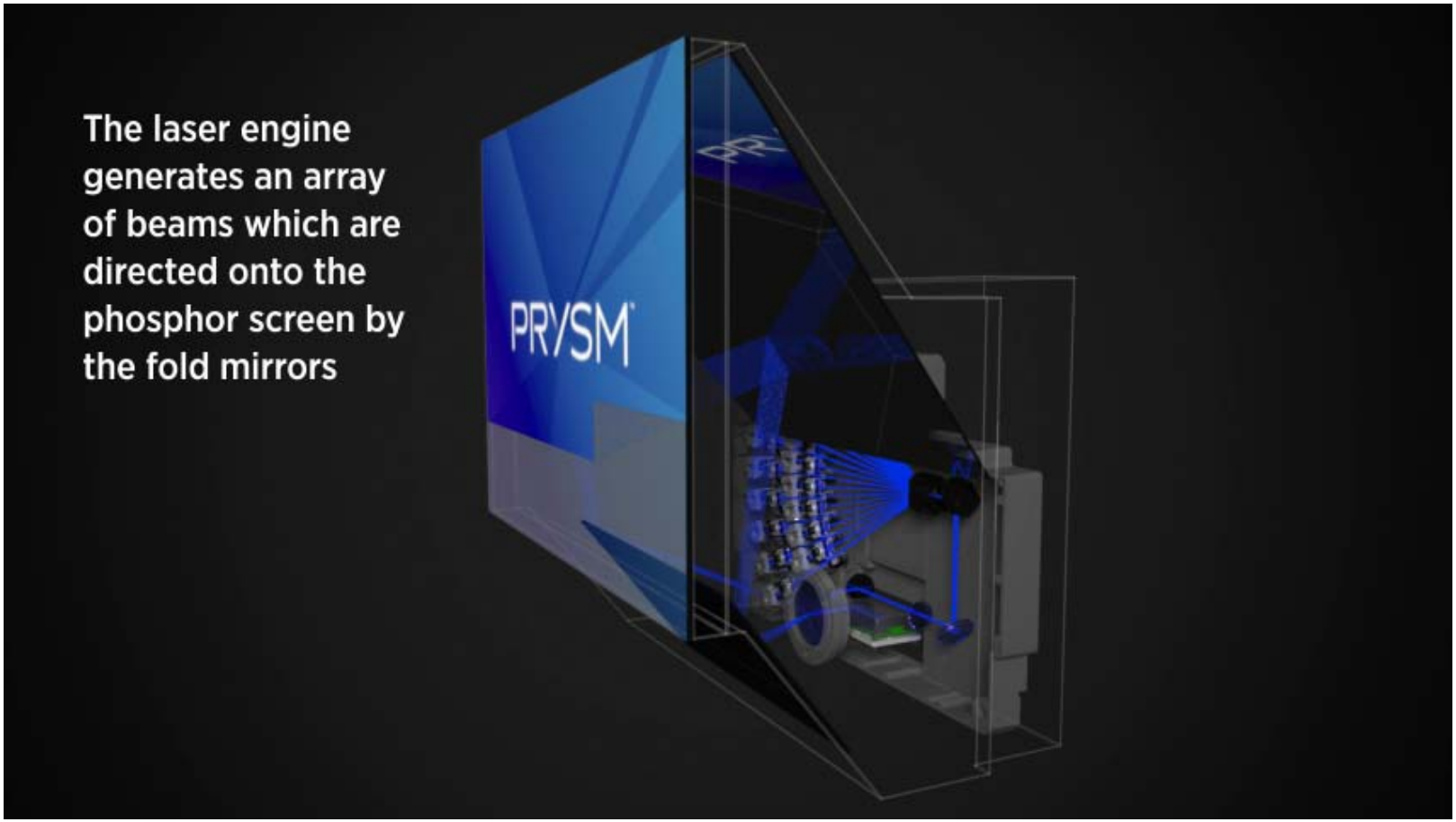
About	Founded in 2005: Prysm Inc. is a privately held global manufacturer of large-format Laser Phosphor Display (LPD) systems • Headquarters: San Jose CA • Engineering offices: San Jose; Boston; Bangalore • Manufacturing: USA Japan & China
Product & Technology	**LPD – Laser Phosphor Display** A breakthrough phosphor screen technology powered by a laser engine, Prysm has introduced the most ecovative and high performance electronic display technology
Unique & Innovative	Exclusive and full ownership of this technology

LPD ARCHITECTURE

- Raster scanning laser light excitation on a phosphor screen



OVERVIEW OF LASER PHOSPHOR DISPLAY (LPD)

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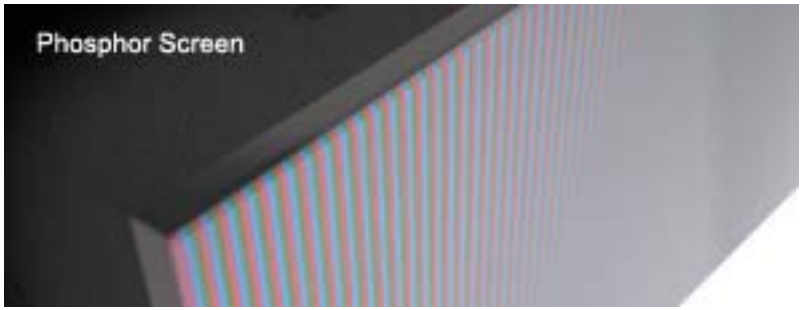
- LPD uses solid state lasers to excite phosphors that generate high-resolution images

Laser Diode (LD)

- As lasers scan the surface, phosphors emit in the red, green & blue colors with very rapid response
- Lasers modulate by turning on & off for each pixel to create an image
- LPD is a surface emissive display with very fast response time; which translates into no motion blur with 180 degree viewing angles, incredible contrast and longer life than any conventional display



LPD ARCHITECTURE

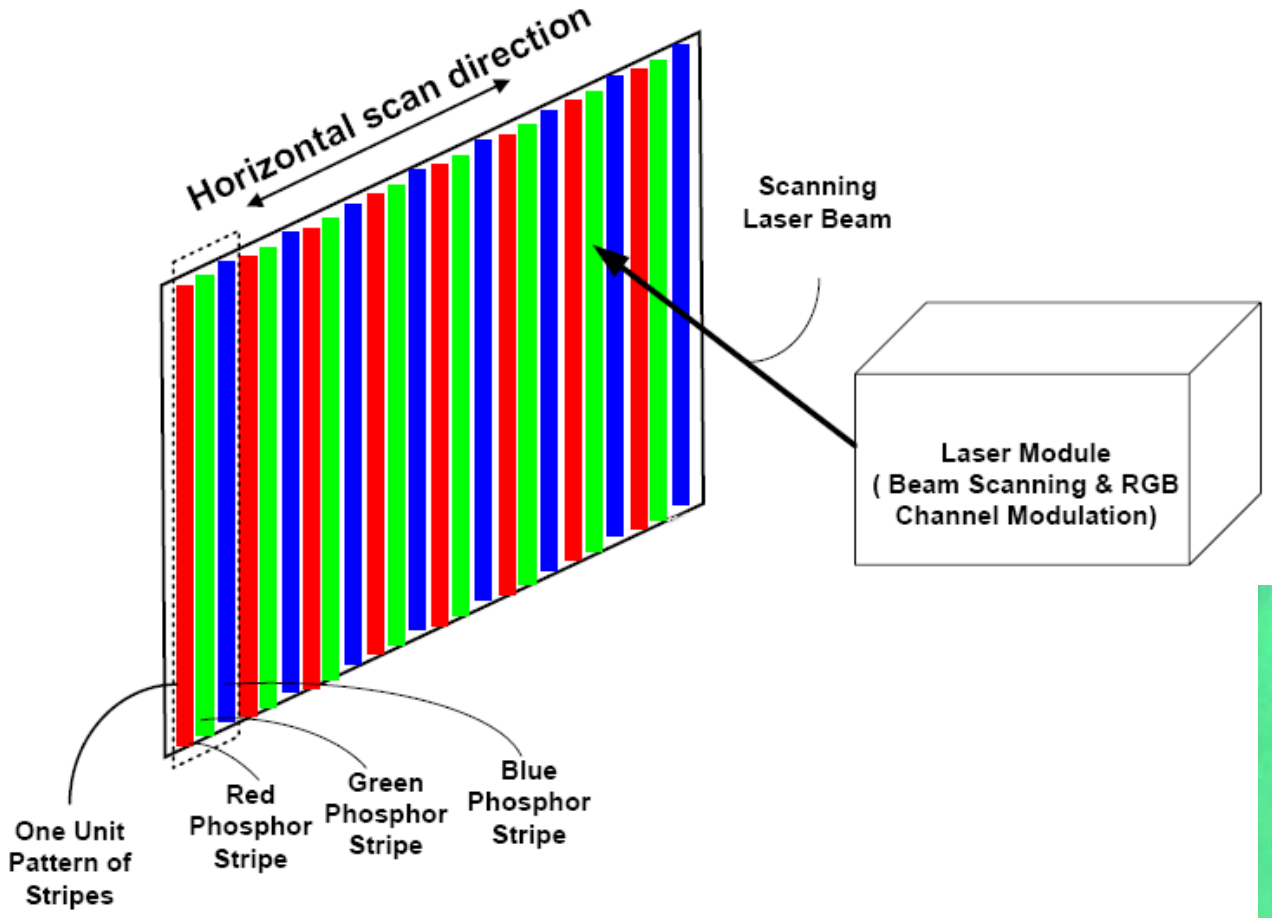
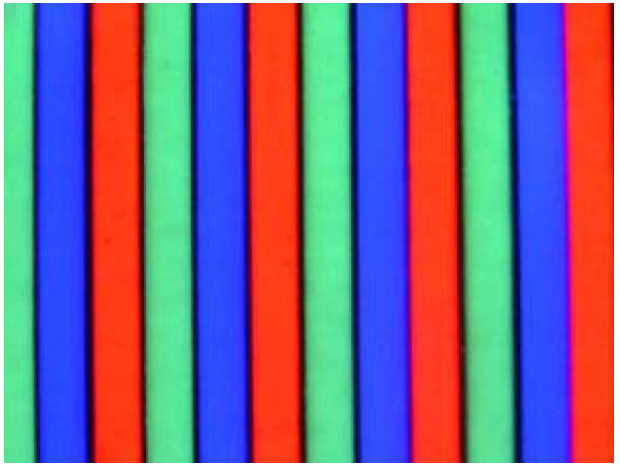


Photo of Panelsegment



KEY FEATURES

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- Today's display market is fragmented by use:
  - Commercial (high brightness but low resolution, large)
  - Consumer (high resolution but low brightness, small)
- LPD is scalable in such it can offer high resolution AND high brightness in different sizes from 25" to 100s" in an Ecovative* way

- * Ecovative: means GREEN throughout the life cycle, from manufacturing to use to recyling
- More Key Functional Features Next…

SELECT FEATURES TO DISCUSS TODAY

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- KEY FEATURES
  - Low Power Consumption
  - Wide Viewing Angle
  - Long Lasting
  - Visually Seamless Tiles
  - Fast Pixel Response / No Motion Blur

KEY FEATURE: LOW POWER CONSUMPTION

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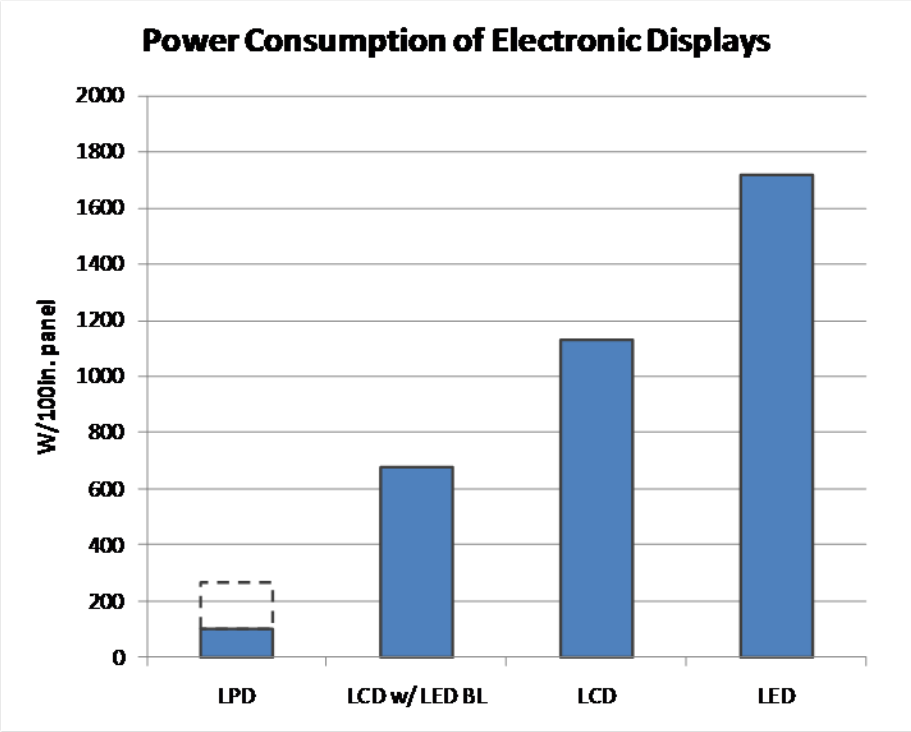
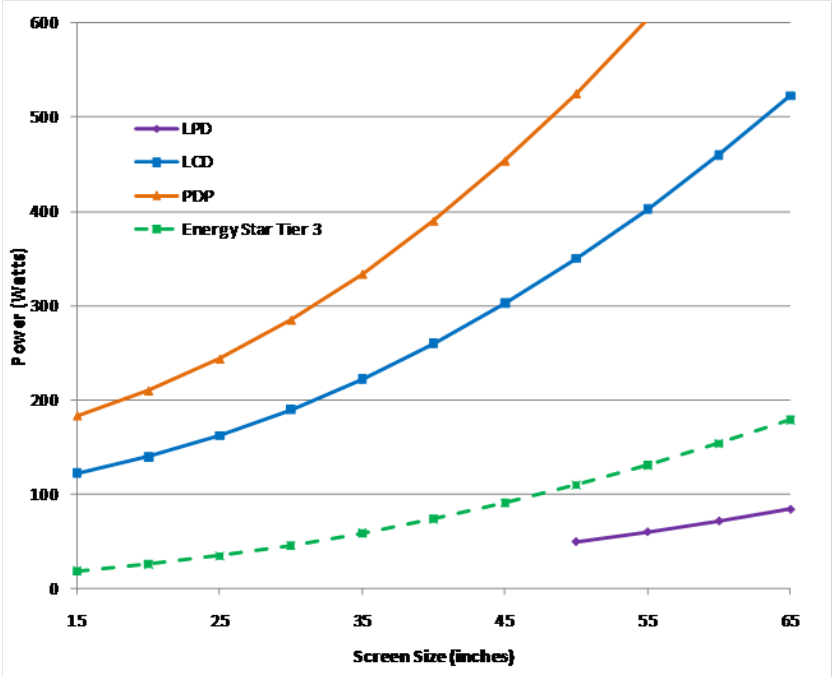
- The power consumption of a display is determined by the illumination source throughput and utilization:
- Source Throughput:
  - In LPD, most of the excitation laser light, around 80%, makes it to each sub-pixel at a point in time.
  - The conversion efficiency of each subpixel from excitation light into color R, G or B light approaches 30%.
  - The aggregate throughput of LPD “excitation light to viewer light” is > 20%. This makes it highly efficient when compared to other technologies such as LCD or RPTV.
- Source Utilization:
  - Given that the source is modulated for video content, the average level of the source is only a fraction of the maximum power level.
  - Example: for incoming video with 35% APL and gamma 2.2, the source light level is only 10% on average.
  - This makes the display extremely efficient

LPD POWER CONSUMPTION 75% LOWER THAN OTHER DISPLAYS EXCEEDING HIGHEST ENERGY STAR RATING



- - - - Indicates demonstrated LPD power consumption 2010



LOW POWER CONSUMPTION LEADS TO LOWER COST OF OWNERSHIP

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Electrical Operating Costs Display Comparison

	LPD	LED LCD	LCD Tile	LED	RP	LED RP or Front Projection
Total Power Consumption (kW)	2.5	5.4	9.0	11.1	13.2	17.3
Total Energy Cost ($/life)	$ 12,292	$ 26,747	$ 44,579	$ 54,543	$ 65,131	$ 85,224
Additional Cost vs. LPD	-	+$14455	+$32286	+$42251	+$52839	+$72931
Greenhouse Gas Produced (tons/life)	88	191	318	389	465	608
% Saved with LPD	-	54%	72%	77%	81%	86%

Notes:

- For 20 sq. m display operating 18hrs/day for 5 years
- $0.15 per kWh
- Does not include consumables, maintenance or floor space
- See dynamic web TCO calculator at prysm.com

KEY FEATURE: WIDE VIEWING ANGLE

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- LPD is an emissive display like CRT
- When excited, the RGB phosphors emit light uniformly in all angles
- Phosphor emission and the fact that it is located in a layer closest to the viewer provides for a wide viewing angle.
- In addition to brightness uniformity vs. angular field of view, another important attributes for wide angular viewing are the black and color shifts of the display:
  - In LPD the laser is OFF during black video, which means true black is rendered. This allows the contrast ratio to be constant vs. field of view.
  - In LCD, contrast and color change vs. field of view have been noted in the literature and measured on certain off the shelf TVs.

LPD MAINTAINS WIDE VIEWING ANGLE IMAGE QUALITY

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	Axial View	60 deg. horizontal	45 deg. vertical
LPD			
LCD TV (w/ LED Backlight)			

LPD MAINTAINS IMAGE QUALITY OVER WIDE VIEWING ANGLE
HORIZONTAL ANGLE

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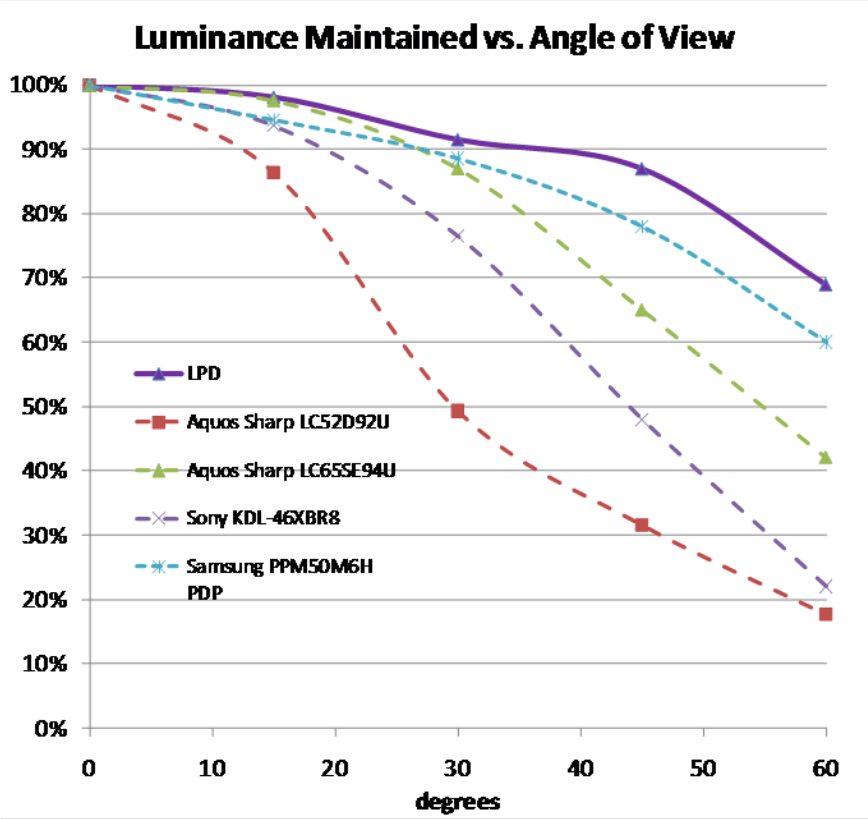

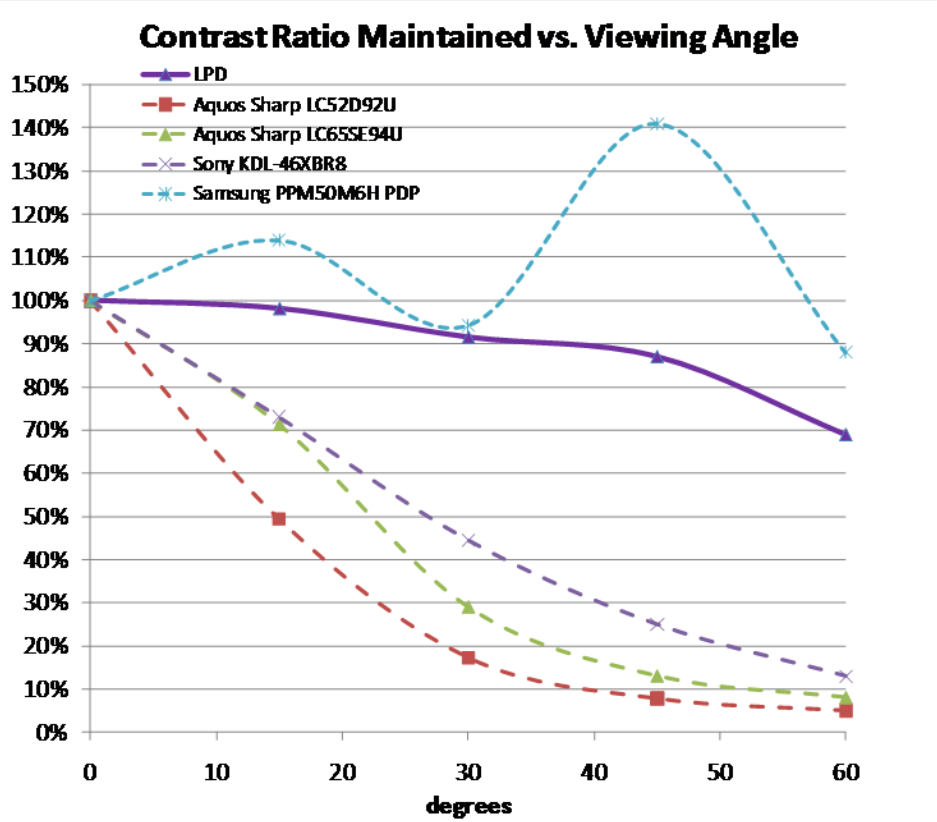

LPD MAINTAINS IMAGE QUALITY OVER WIDE VIEWING ANGLE
VERTICAL ANGLE

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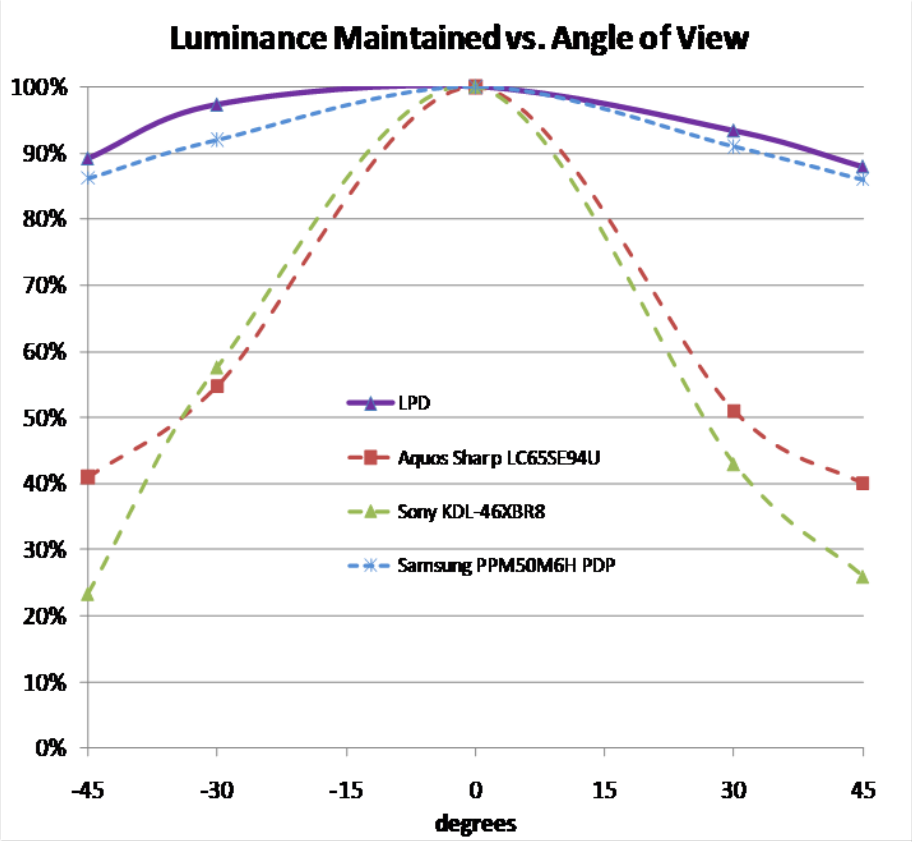

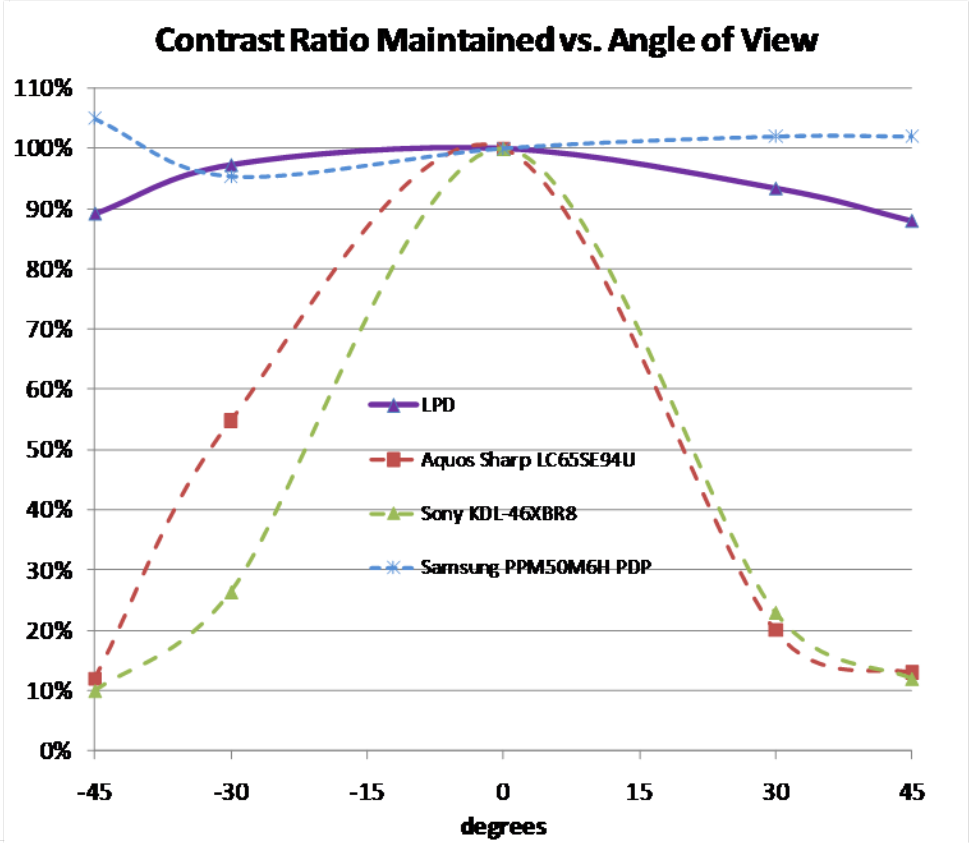

KEY FEATURE: LONG LASTING

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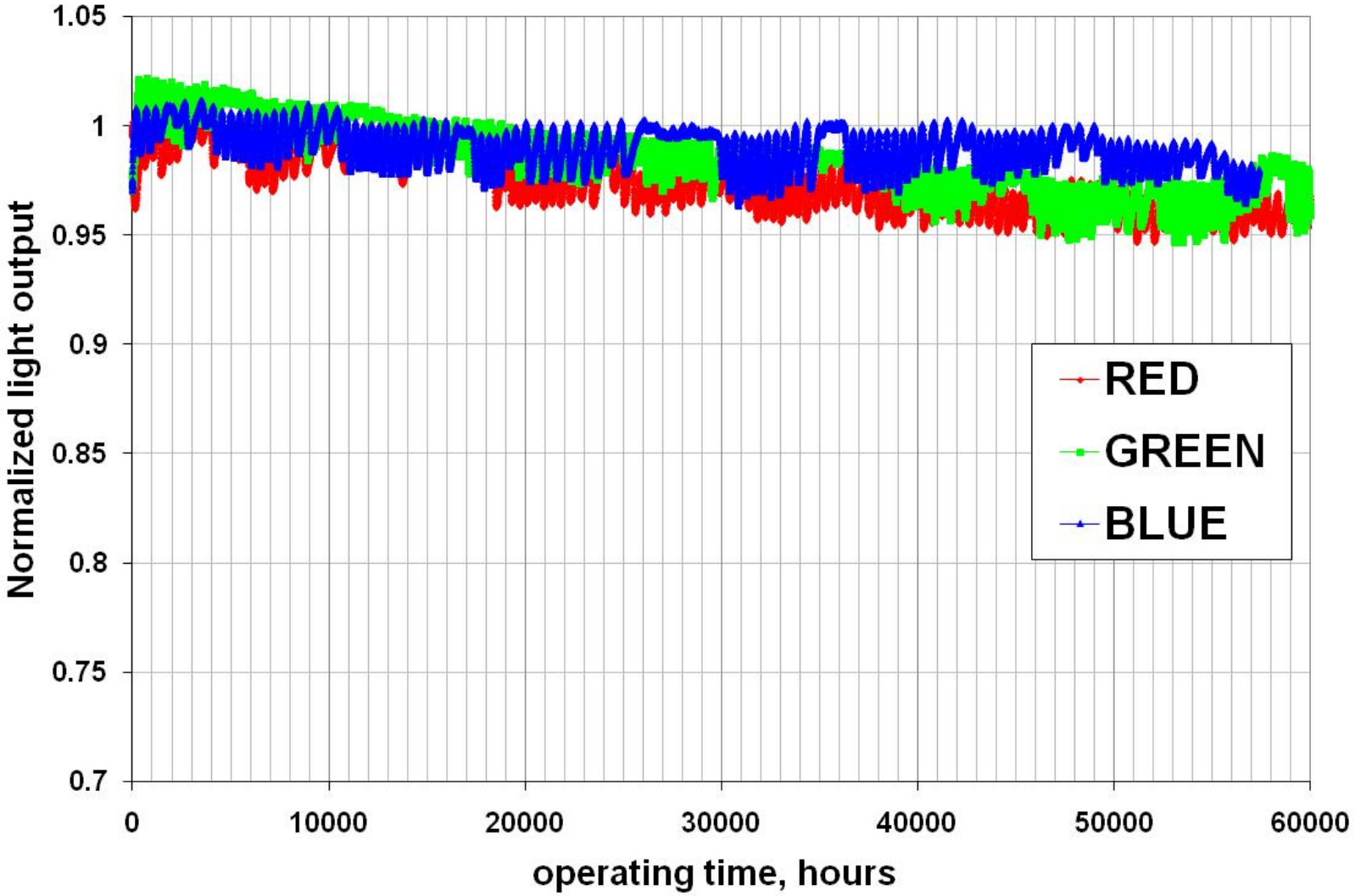
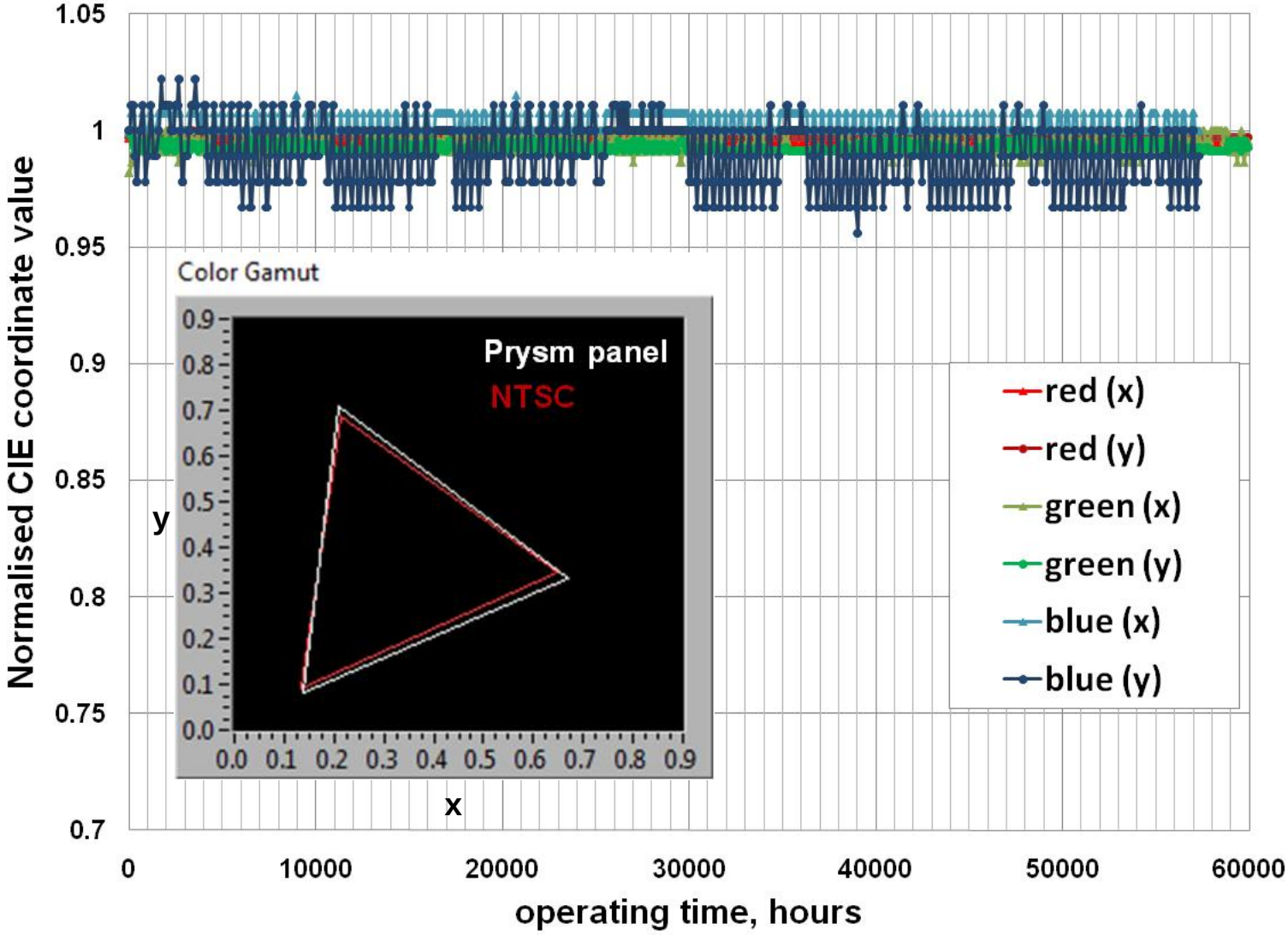
- LPD is a long lasting display with no panel burn-in / decay over many years
  - Excitation energy and the phosphor environment is “friendly” in comparison to other displays such as PDP or CRT
    - LPD 2.7 eV low energy no heat (source decoupled from phosphor) and no vacuum required
    - PDP 3.4-6.2eV high energy with heat (source close to phosphor) with VUV and vacuum/humidity degradation over time
    - CRT 25-30Kev catho-luminescence (heat) and vacuum required
  - Because of raster scanning, the amount of “exposure” is very short per sub-pixel

ACCELERATED PANEL TESTING: BRIGHTNESS



ACCELERATED PANEL TESTING: COLOR



KEY FEATURE: Visually Seamless Tiles

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LPD has “nearly” no seam from edge of sub-pixel to edge of panel

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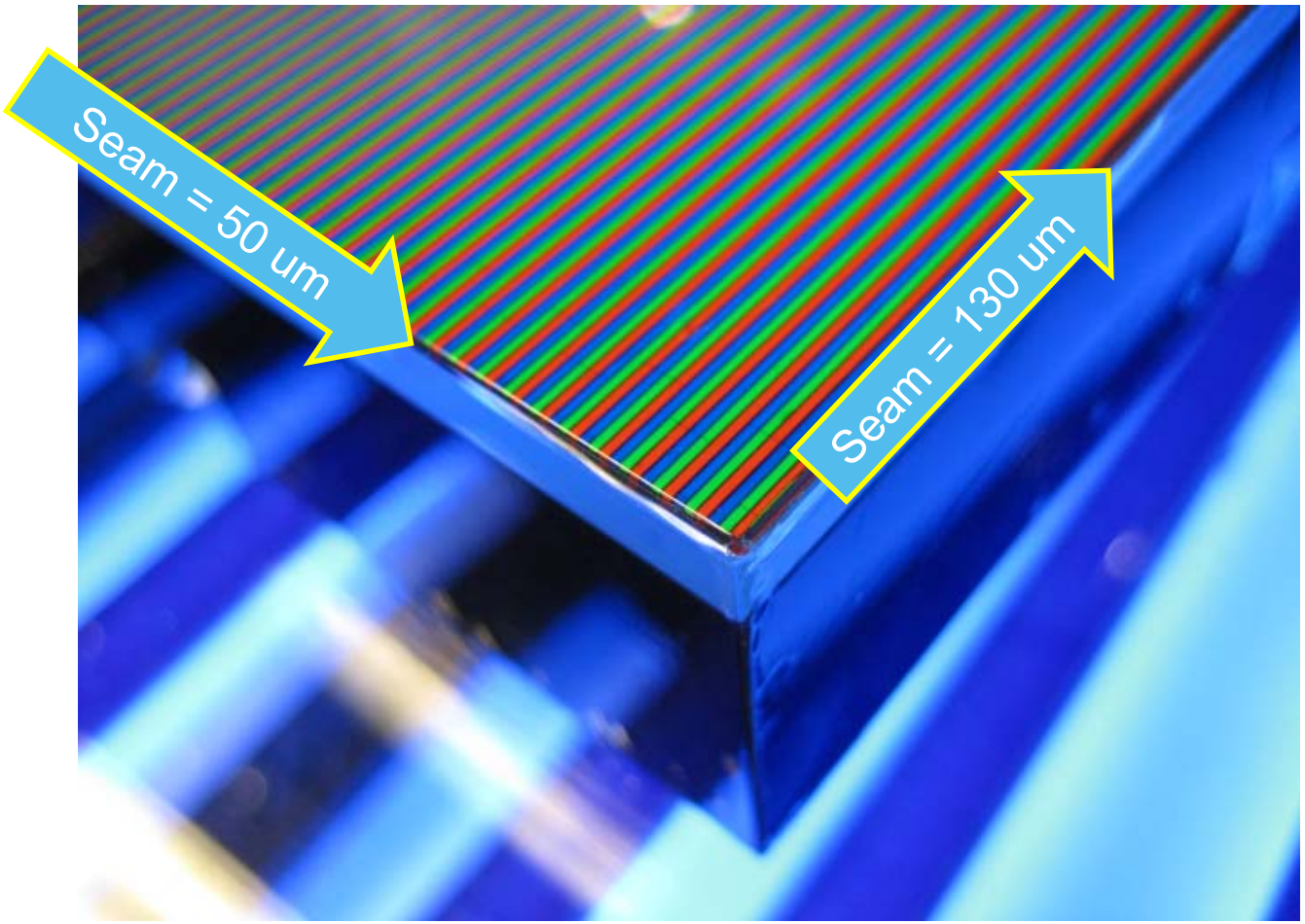

ADDITIONAL EDGE BOOST REDUCES SEAM VISIBILITY IN LPD TILE PRODUCTS

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WITHOUT edge boost

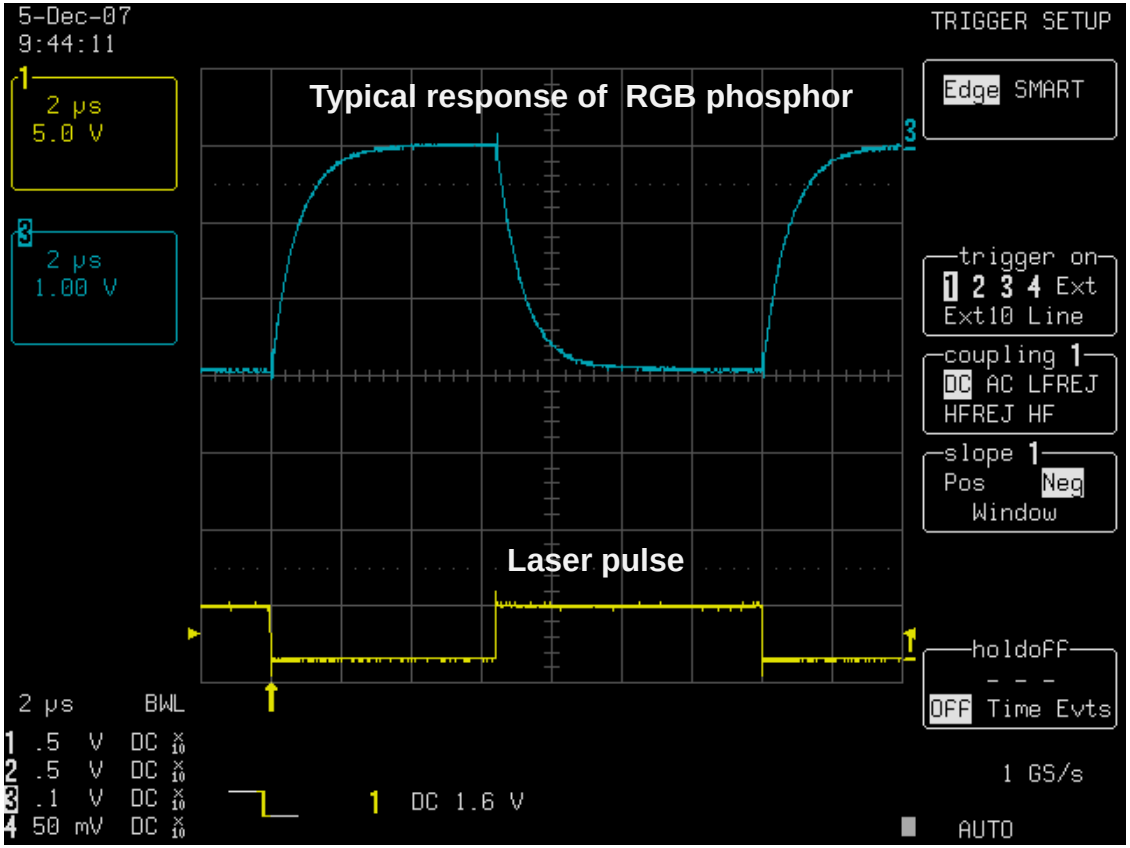
WITH edge boost

- Taken from 3 m distance
- Boost factor is 1.2x average

KEY FEATURE: Fast Pixel Response / No Motion Blur

- LPD uses raster scanning to render an image
- This means that there is a blanking or “black field” between successive video fields
- This attribute is perfect for applications such as 3D or multiview as there is 100% no cross talk between video fields
- Also, the phosphor response time is < 2-3 usec, allowing for very high refresh rate between video fields–(currently set to 240 Hz or 4 msec per field)

FAST PIXEL RESPONSE TIME ELIMINATES MOTION BLUR ARTIFACTS AND IMPROVES 3D PERFORMANCE



The values of rise/decay times of all Prysm RGB phosphors are within 2-3 us.

FAST PIXEL RESPONSE TIME ELIMINATES MOTION BLUR ARTIFACTS AND IMPROVES 3D PERFORMANCE

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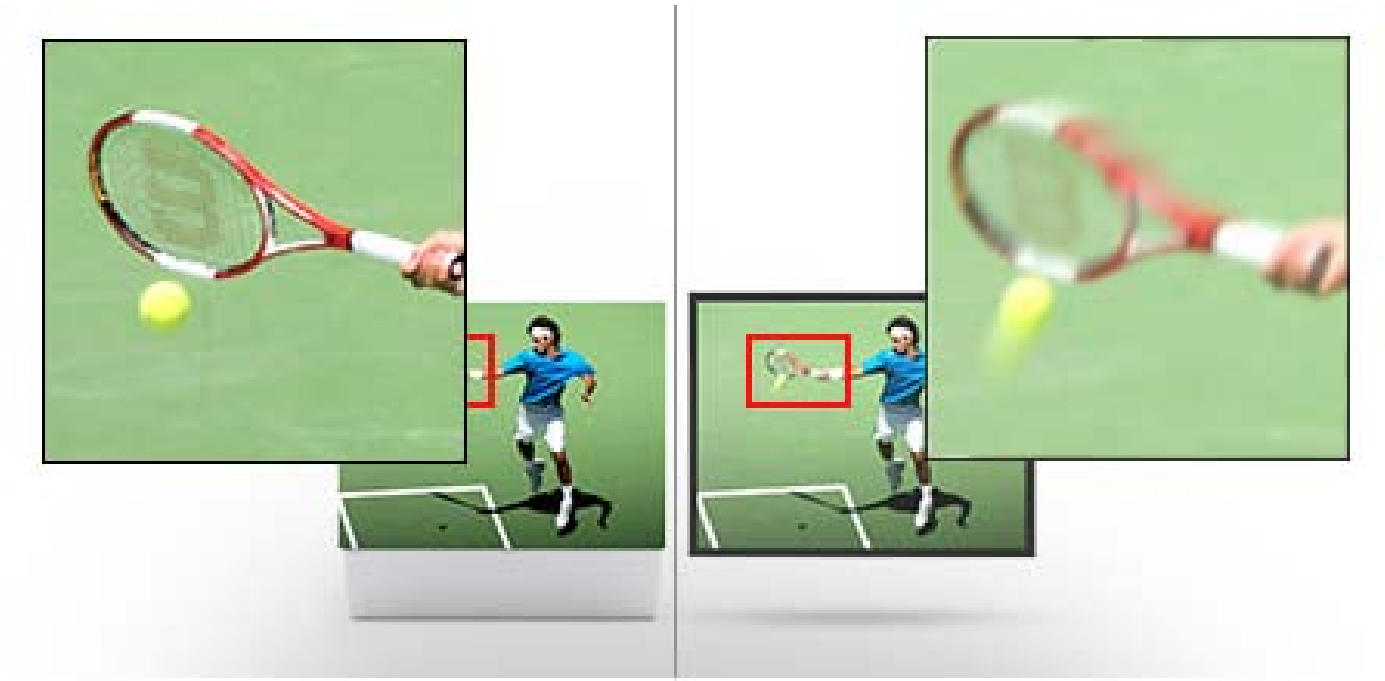
Millisecond frame response with microsecond phosphor response

No Motion Blur

Motion blur



LPD

LCD/Plasma

LPD GREEN MANUFACTURING

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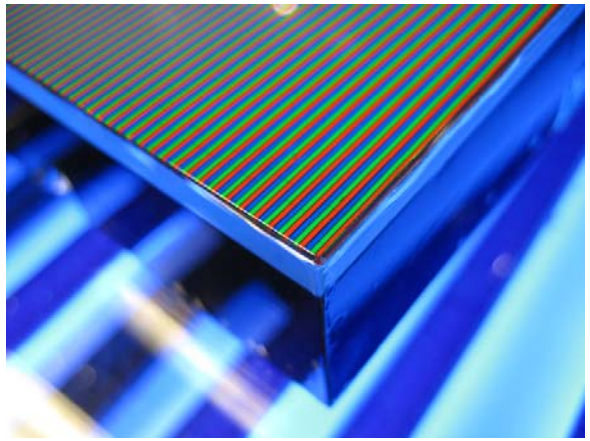
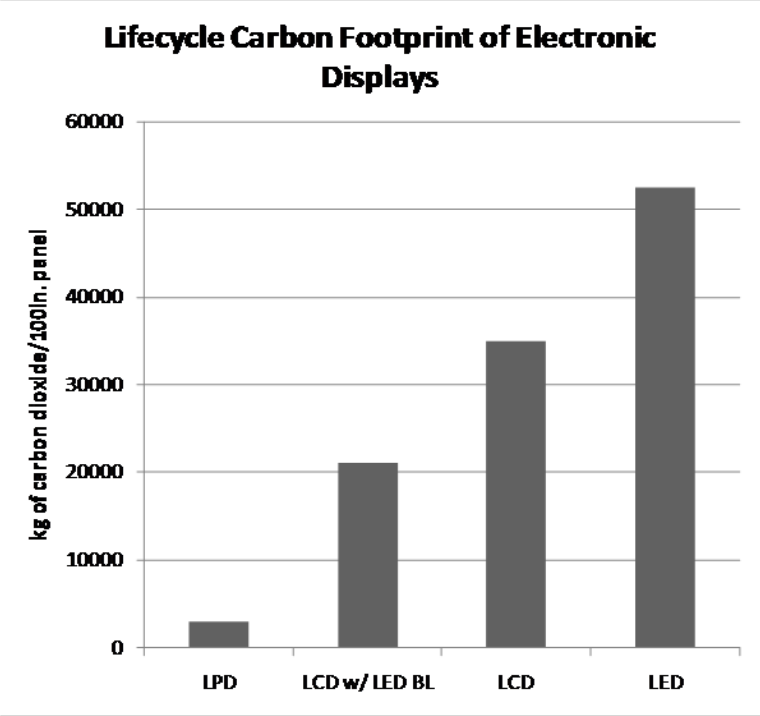
- 1000 times less emissions than conventional flat panel fabrication
  - Almost no production of waste water or greenhouse gas
  - LPD is assembled from components not a wafer or glass fab process
  - Low energy production
- No toxic materials used
  - RoHS compliant
  - Support LEED green building designs
- Recyclable parts & materials



LPD LIFECYCLE CARBON FOOTPRINT 90% LOWER THAN OTHER DISPLAYS



LPD eliminates requirement for large, energy intensive fabrication plants like the example shown here.

*Source: Sharp LCD

LPD OFFERS A BREAKTHROUGH FOR PUBLIC DISPLAYS

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THANK YOU

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