

**TVlogic**

- TVLogic Introduction
- CRT vs LCD
- The use of ND filters
- Automatic Alignment
- LED backlights, myth or reality?
- All LCD panels are created equal, right?
- Q & A

- TVLogic is a Korean based manufacturer of High-End broadcast and post-production display solutions.
  - TVLogic focuses solely on research, development, and manufacturing; they do not sell directly to end-users.
  
- Distribution in the Americas is handled by two companies:
  - West Coast USA Distributor: Preco
  - Rest of North, Central, & South American distribution: Desmet & Associates
  - Desmet & Associates works with local resellers in every territory to ensure that customers get timely and attentive responses to their needs
  - Authorized NY area reseller is Vidkey

LCD displays do face some challenges in professional applications, but successfully overcome many problems encountered with CRT displays

Challenge	CRT	LCD
Corner Focus	<b>Never perfect</b>	<b>Excellent</b>
Geometry and linearity (multi-format)	<b>Never better than 0.5%</b>	<b>0% error</b>
Resolution	<b>Not capable of full native resolution</b>	<b>Full native resolution from 23" size on</b>
Convergence Errors	<b>0.3 – 0.5 mm in the corners</b>	<b>0 error</b>
White Uniformity	<b>Influenced by warping of shadow mask at high light output</b>	<b>Very good at full power</b>
Light Output (HD)	<b>Too Low (can't get to 35 fL on HR CRTs)</b>	<b>Typically Too High w/o ND Filter</b>
Banding	<b>Analog device, no issues</b>	<b>8 bit panels, 10 bit dithering</b>
Black Levels	<b>Perfect black</b>	<b>Often Too Bright w/o ND Filter</b>
Life Expectancy	<b>Low at high light output</b>	<b>60,000 hrs+ (half life)</b>
Power Consumption	<b>Power hungry</b>	<b>Typically half of CRT</b>
Environmental Issues	<b>High lead levels and X-rays</b>	<b>OK</b>
Native Resolution	<b>SD Oriented</b>	<b>HD oriented</b>

# Why are CRTs no longer available?



- ❑ “It’s the glass, dummy!”
- ❑ Commercial and broadcast CRTs shared the same glass.
- ❑ Same glass could be equipped with different phosphors, guns and shadow masks
- ❑ Hence, low quantity production was possible albeit expensive
- ❑ Unfortunately LCD panels are a different story, and there is a worldwide shortage of panels (the factories are humming 24/7)



- ❑ There are no dedicated “Broadcast” or “Post” LCD panels
- ❑ Our industry needs to use what’s available from these markets
  - ❑ Consumer TV
  - ❑ Graphics
  - ❑ Signage
- ❑ As these applications are so different from a “Broadcast” application the LCD monitor manufacturer needs to find ways around the specs of these panels
- ❑ Brightness, black level and color temperature are issues that need to be addressed
- ❑ Almost all panels are manufactured in Asia, with different viewing preferences



- LCD panels are typically capable of brightness levels 3 to 5 times higher than (HR) CRTs (350 to 700 nit is normal)
- Far East TV is viewed at 9300 K (so is most graphics and signage)
- With 800 to 1200 contrast ratios blacks are difficult to bring under 0.5 fL



- ❑ High brightness is a major issue
- ❑ We have tried adjustable backlights as a solution (and still use them for different purposes)
- ❑ Fluorescent lights don't like to be dimmed: white uniformity suffers enormously when adjustable backlight drivers are used.
- ❑ We have found the best practice to be operating at full power and install a ND contrast enhancing filter.
- ❑ In addition to bringing the high lights down from over 100 fL to the 26-35 fL range there is an added bonus
- ❑ The blacks are really blacker!!

## No Glass / Matte Finish Panel

100 fL

White

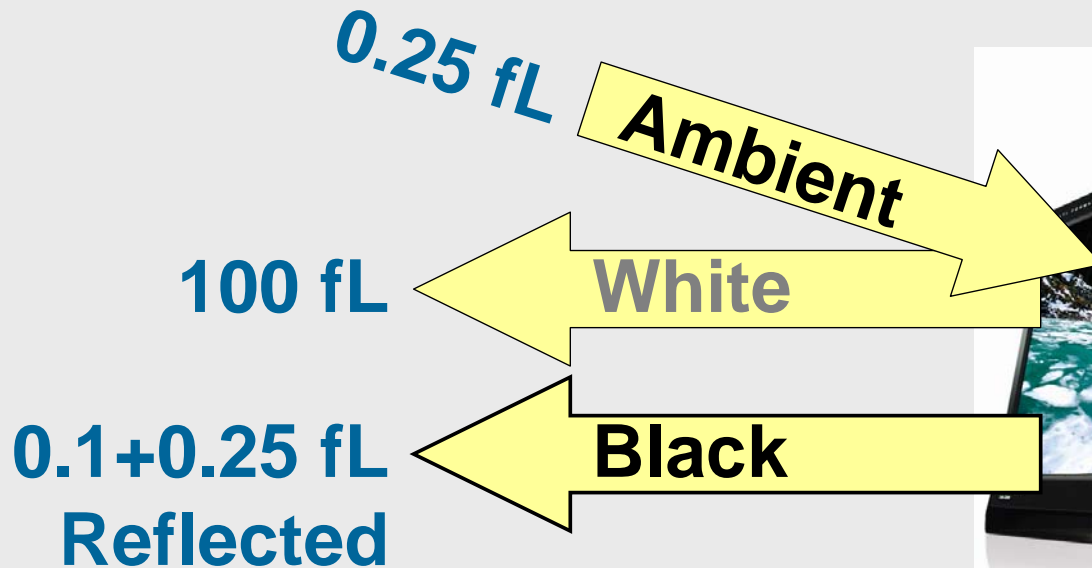
0.1 fL

Black



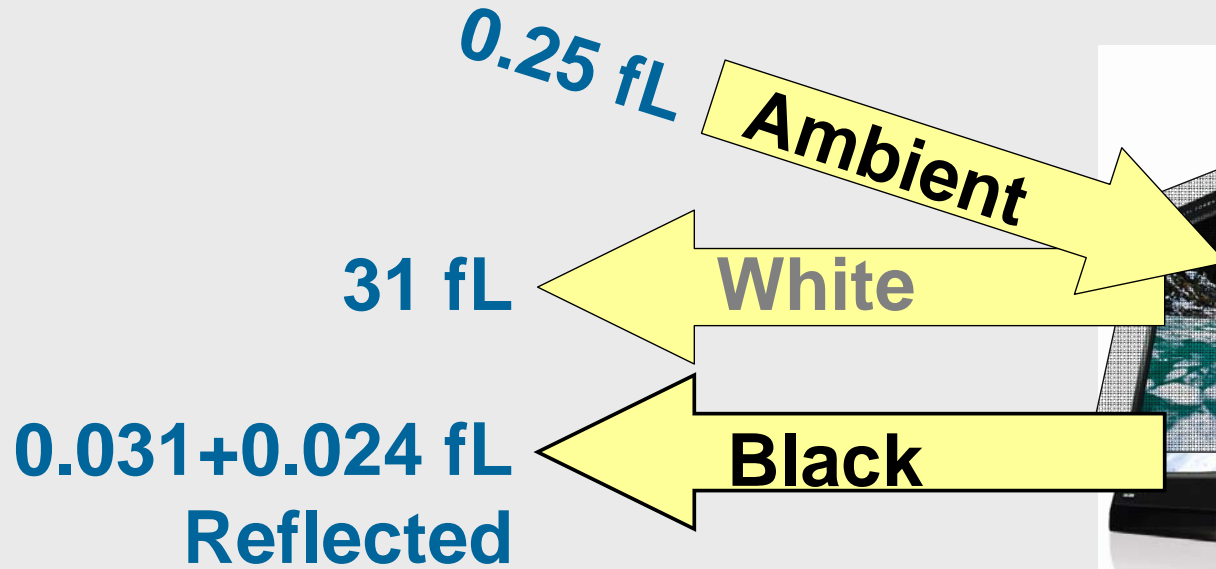
Theoretical Contrast Ratio is 1000:1

## Ambient Light Factor Reduces Contrast



**Actual Contrast Ratio is 285:1**

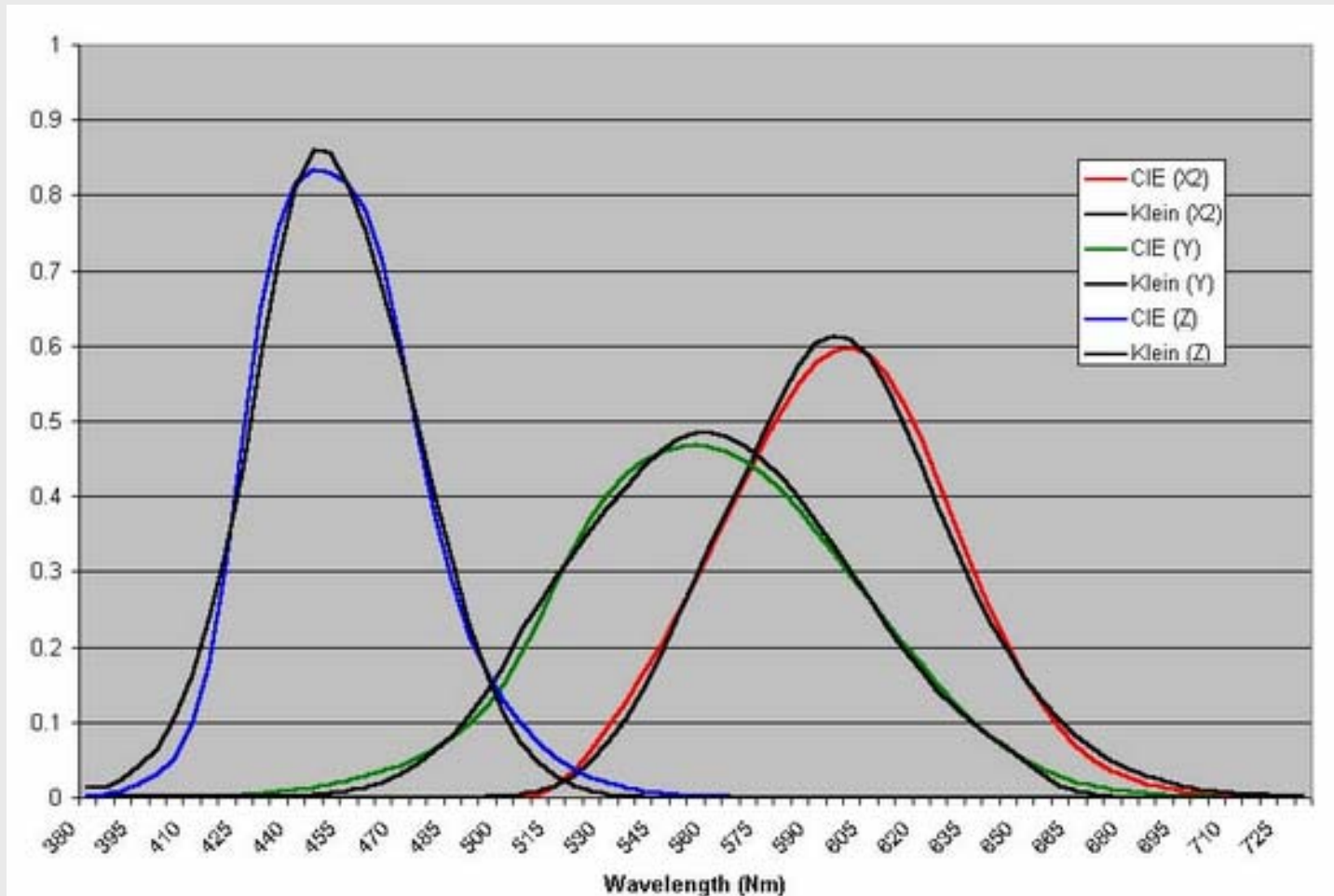
## Neutral Density Glass Filter Improves Contrast



Actual Contrast Ratio is 550:1 with a 31% transmission factor ND Filter.



- What can be used as measurement probe?
  - Photospectroradiometer – very precise but slow and expensive
  - Tri-stimulus colorimeters – but they need a measurement head that is calibrated for LCD panels
  - CRT measurement probes cannot be used for LCD panels
  - In case of LED backlight panels new probes need to be designed (except for the Photospectroradiometer that can be used on any kind of light).

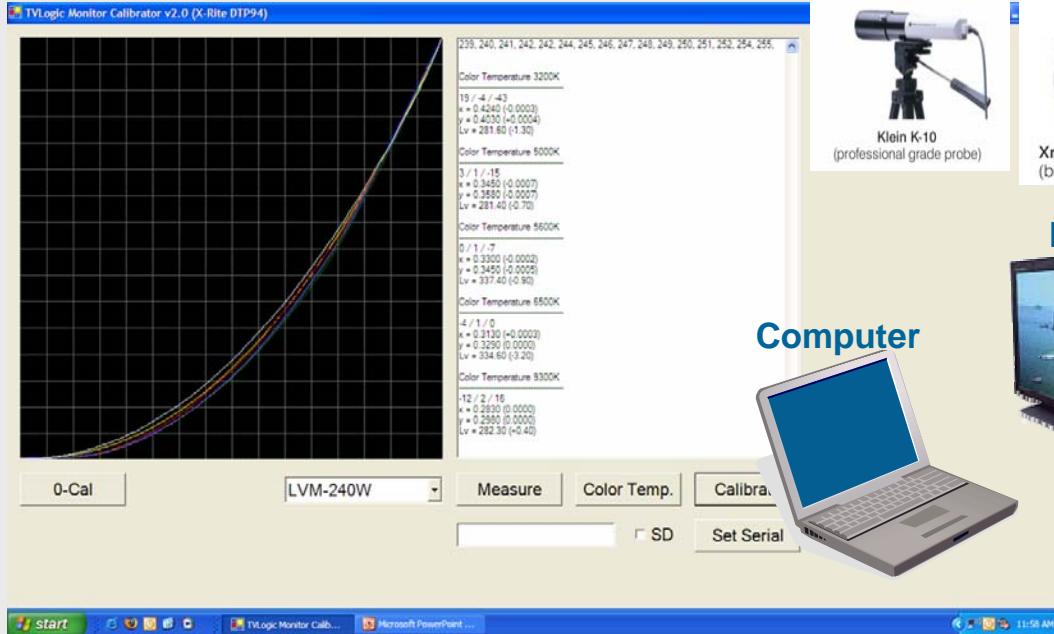




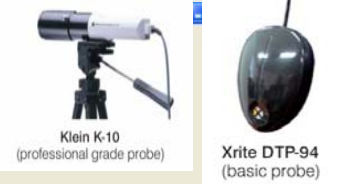
- ❑ All LCD panels are different and have no natural fixed gamma like CRTs
- ❑ The panel needs to step through all 256 levels of for Red, Green and Blue
- ❑ Each step needs to be measured to build an internal LUT
- ❑ After the measurement the correct gamma needs to be calculated
- ❑ Only then can the RGB gains of the LCD panel be manipulated to align the different color temperatures (including 3200, 6500 and 9300)

## TVLogic's Color Calibration System is a four part system

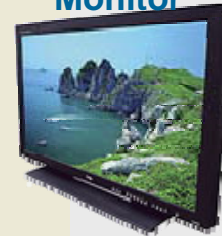
Software Interface



Probe



Monitor

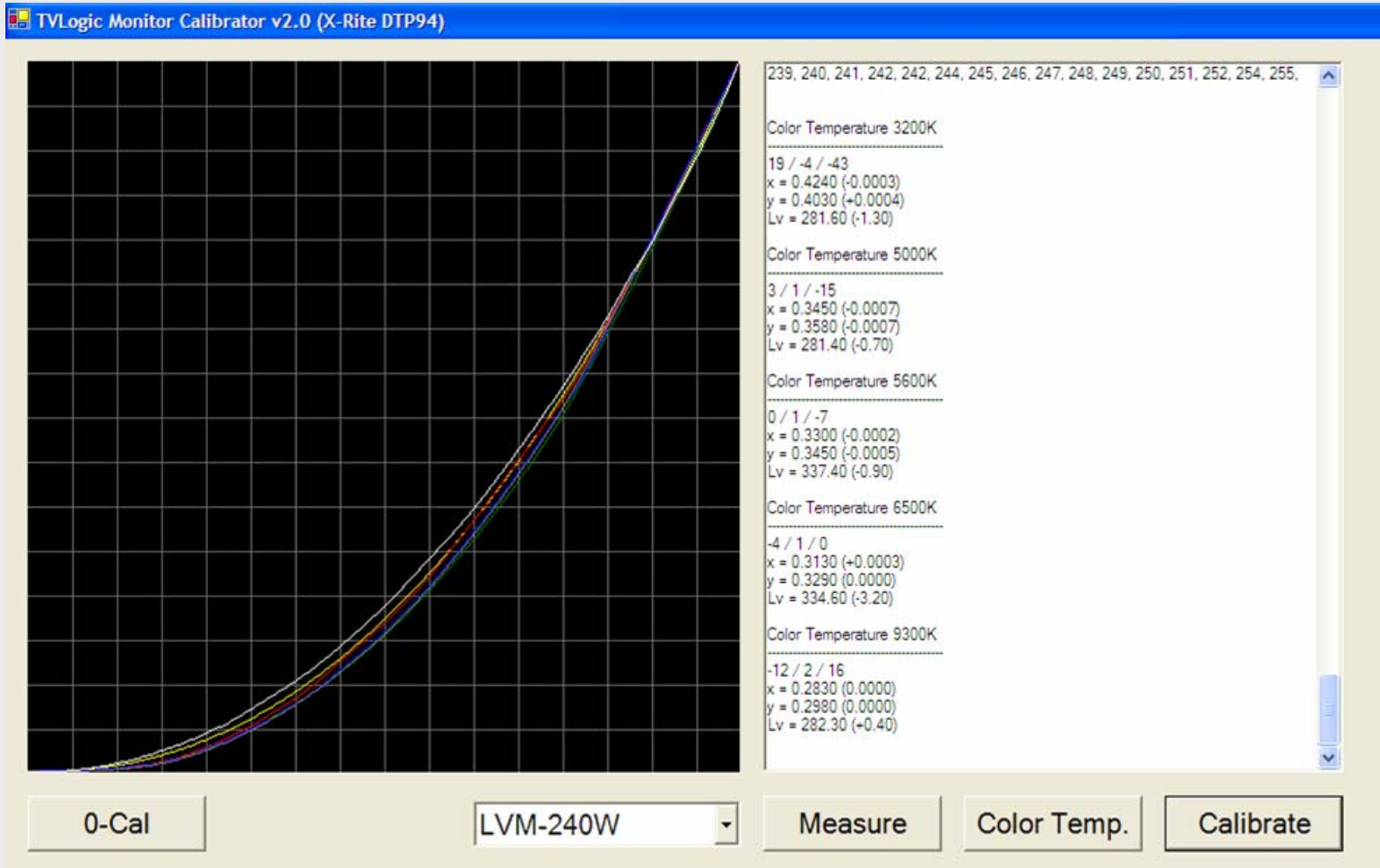


Computer



The TVLogic color calibration system provides a unique way to match TVLogic LCD displays with an automated calibration utility.

# Color alignment on LCD panels





- ❑ Two types of LED backlight solutions
- ❑ A matrix of a 1,000 + white LEDs
- ❑ Achieves high contrast ratios by modulating the backlight with the Y info
- ❑ As the resolution of the LED matrix is much lower than the LCD panel the contrast enhancement does not work on details (only large surfaces)
- ❑ Very hard to find matching LEDs that will age uniformly
- ❑ Color gamut from white LEDs is much smaller than Red, Green and Blue (in fact it is very similar to the color gamut of CCFLs)



- ❑ Two rows of high powered Red, Green and Blue LEDs
- ❑ Color balancing can be performed on the backlight instead of the LCD panel
- ❑ Very pure monochromatic light
- ❑ Resulting in a very large color gamut
- ❑ By nature these LEDs are very unstable, but the panel has an internal thermal and optical feedback system that guarantees the stability
- ❑ First consumer application shown at CES on a 70" display
- ❑ Panels will become available around NAB 2007 time
- ❑ Will be very expensive at first
- ❑ TVLogic's prototype is here on display

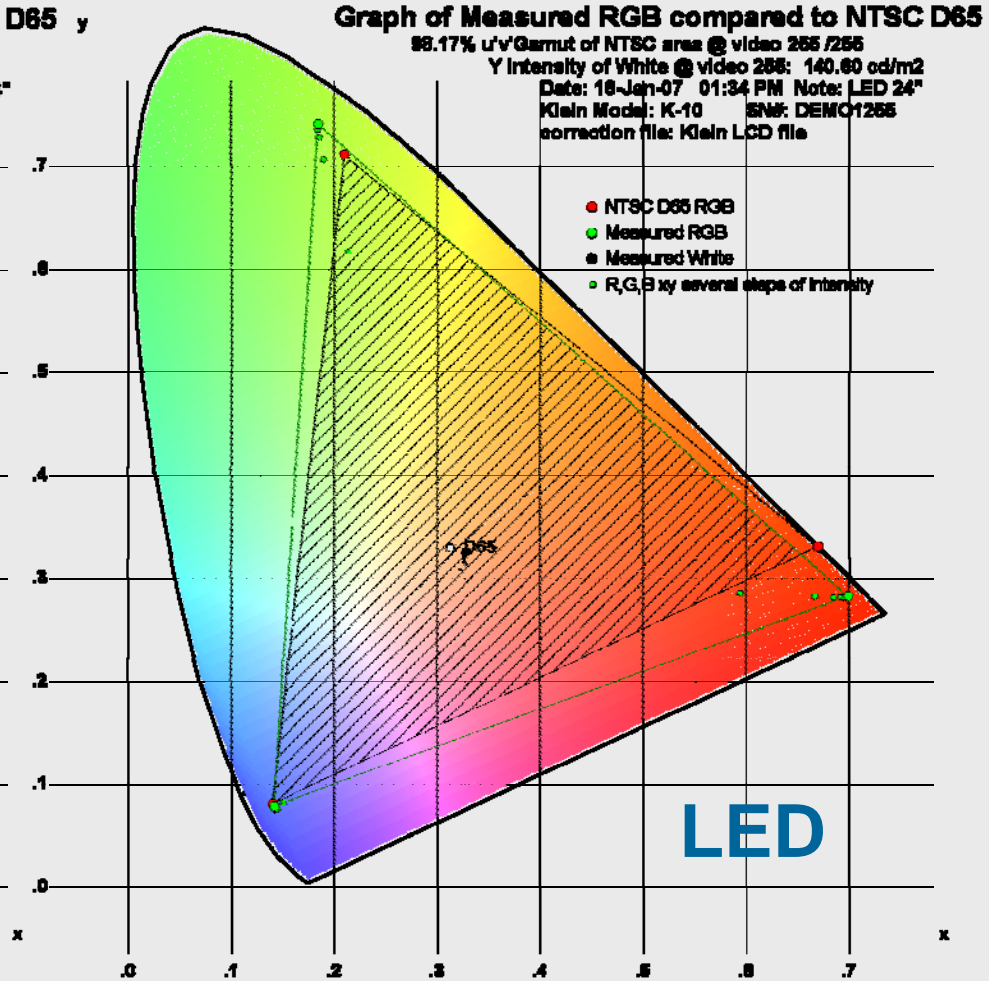
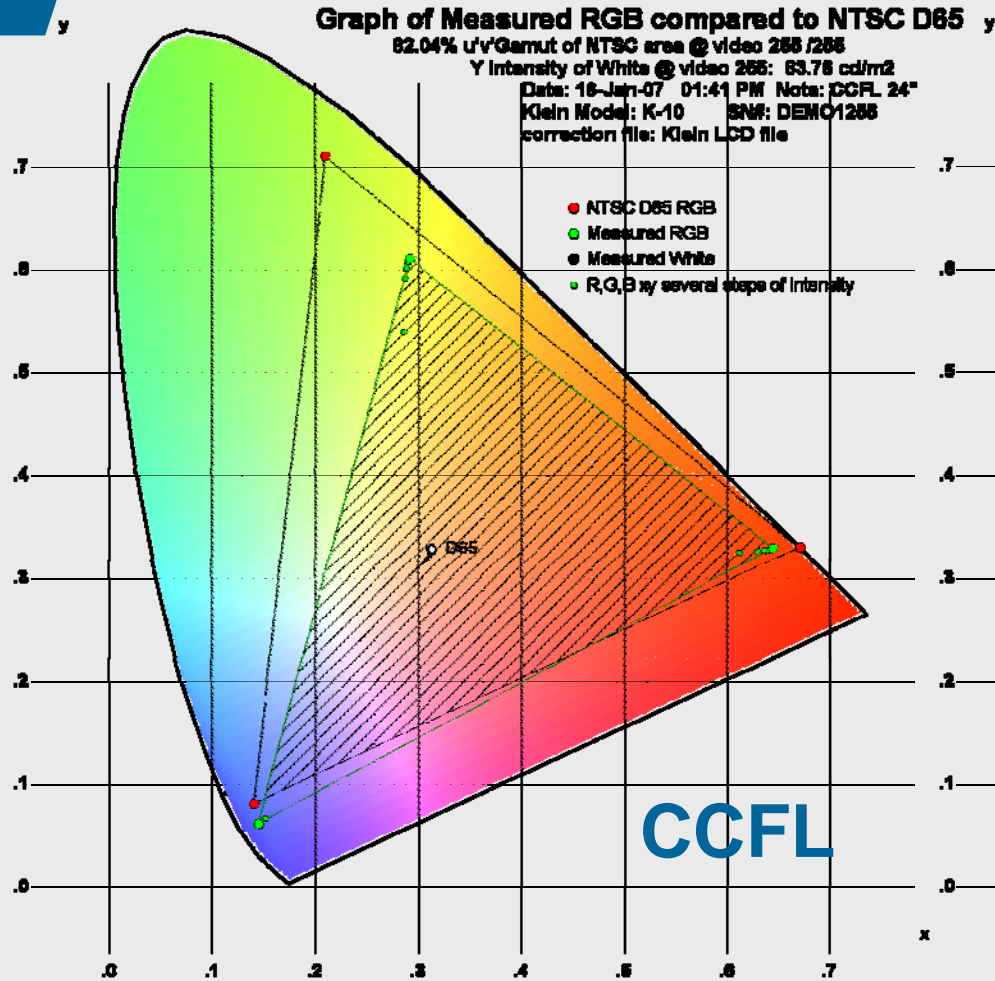
- LED backlight equipped LCD panel
  - Uses a row of high powered red, green, and blue LEDs as light source instead of CCFL



- ❑ Uses a folded light guide
- ❑ Mixes the three colors
- ❑ Produces a uniform backlight



# LED vs CCFL Backlight Gamut



Thank you