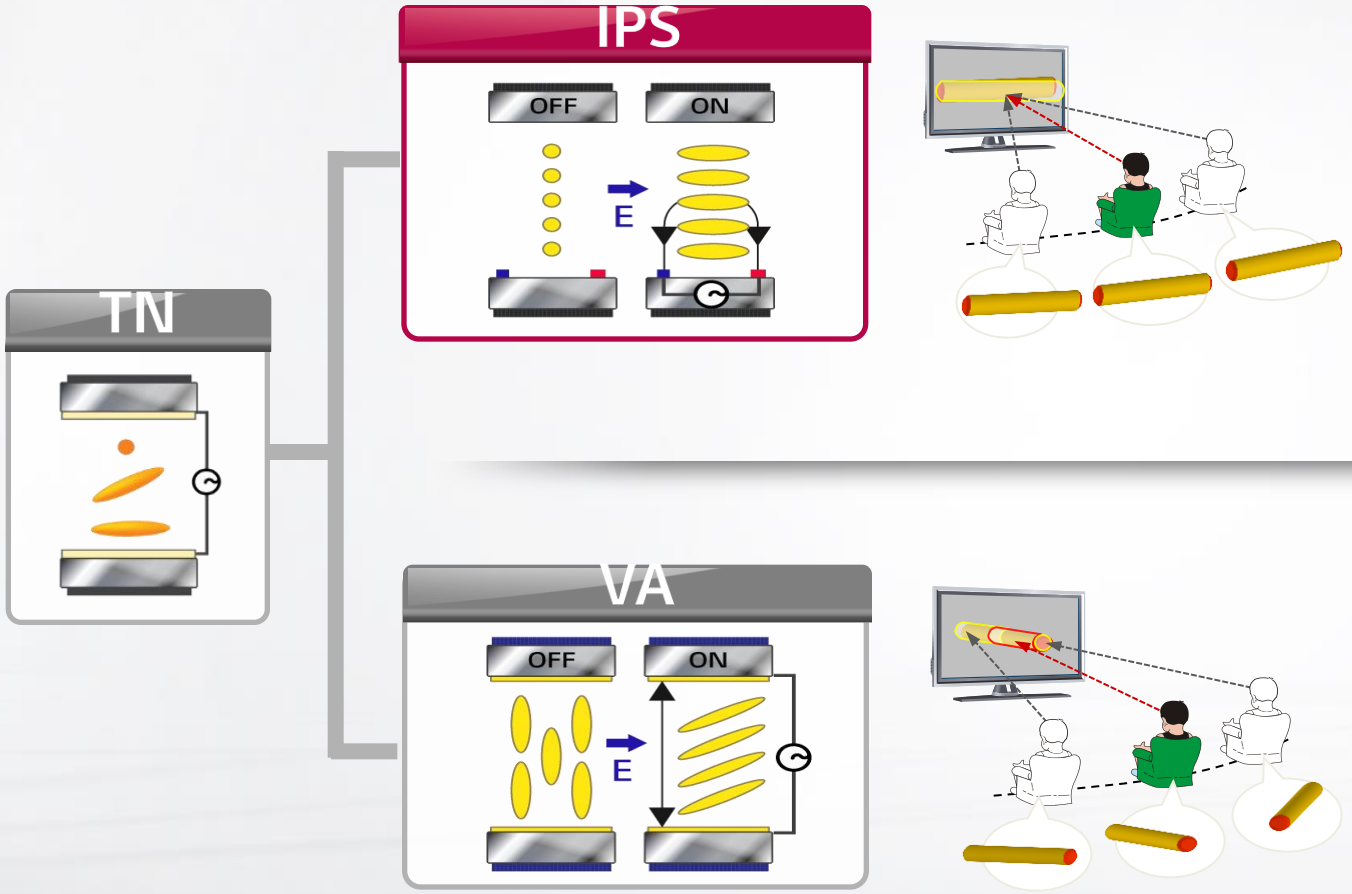
Why IPS
Commercial Display

LG Display

Contents

1. PANEL TECHNOLOGY

Display technology is defined by Liquid Crystal alignment and IPS is completely different from conventional.



✓ Horizontal alignment

✓ **Completely different from TN matrix**

✓ Vertical alignment,

✓ **Modified to solve the main limitations of the TN matrix.**

LCD : A flat panel that uses the light modulating properties of liquid crystals
IPS : In-plane switching
VA : Vertical Alignment

1. PANEL TECHNOLOGY

1) Wide Viewing Angle

IPS

“ WIDE VIEWING ANGLE ”

No Color Wash from any angle !

- When △u’v’=0.02 or above, color shift is noticeable with human eyes.
- *IPS has viewing angle 120˚ or above while VA has only 100˚*

Comparison in Color Coordinates (viewing angle 60˚)

VA

IPS

(Dimension : △u’v’)

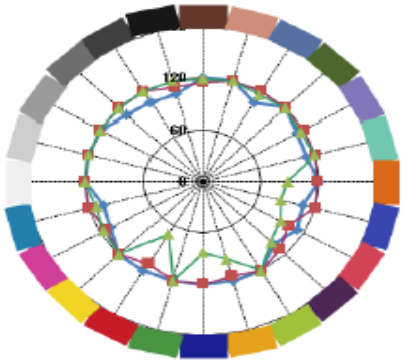
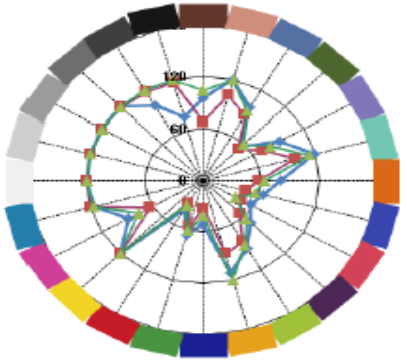
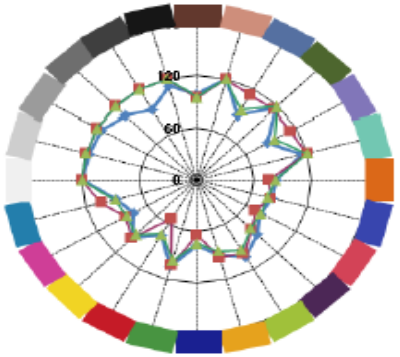
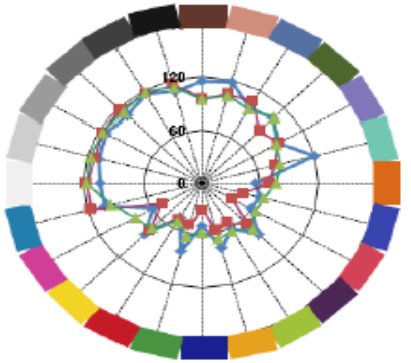
	Red	Green	Blue
VA	0.108	0.029	0.122
✓ IPS	0.011	0.004	0.004

LG Display

1. PANEL TECHNOLOGY

IPS

Color Shift

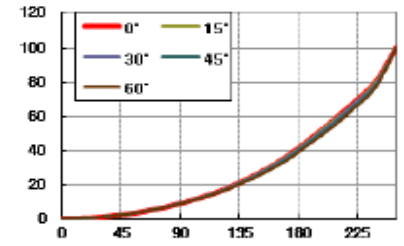
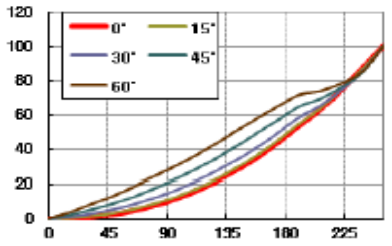
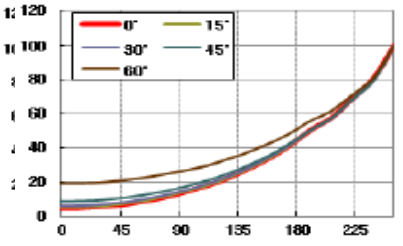
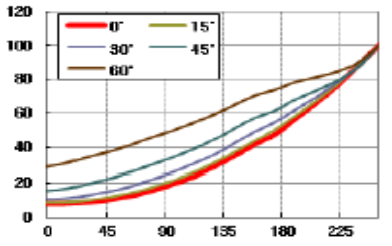
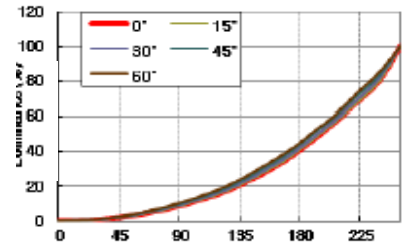
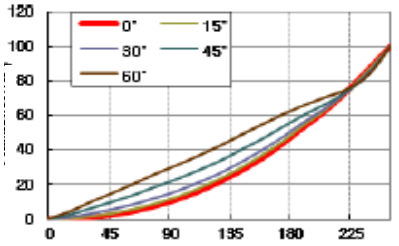
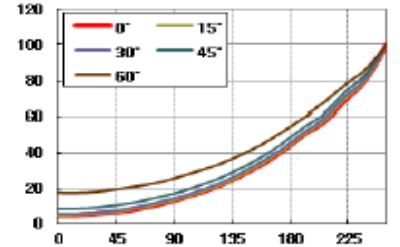
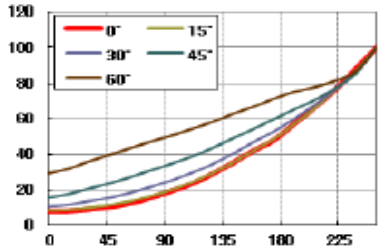
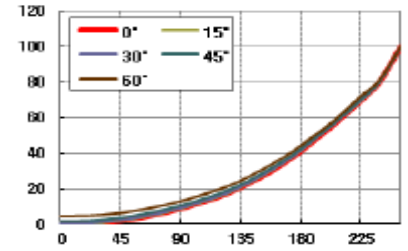
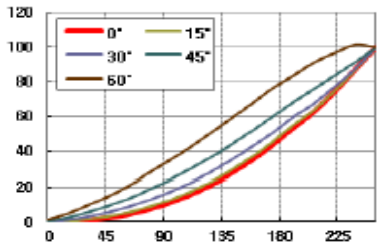
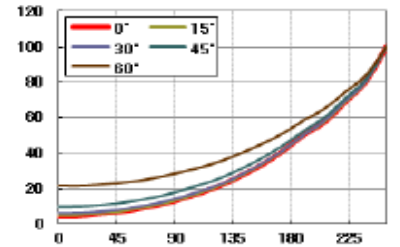
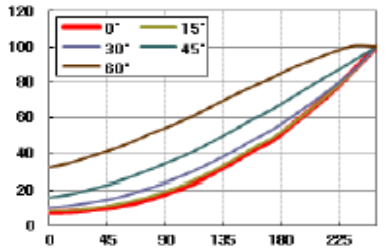
Lux	LGD (IPS)	Viewing Angle	Direction	Viewing Angle	Competitors (VA)
0 lx		114°	Horizontal	91°	
		117°	Vertical	83°	
		109°	Diagonal	90°	
3,000 lx		97°	Horizontal	88°	
		100°	Vertical	81°	
		99°	Diagonal	87°	

1. PANEL TECHNOLOGY

1) Wide Viewing Angle

IPS

Gamma Shift

Direction	0 lx		3,000 lx	
	LGD	Competitors	LGD	Competitors
Horizontal				
Vertical				
Diagonal				

LG Display

Certification on Wide Viewing Angle

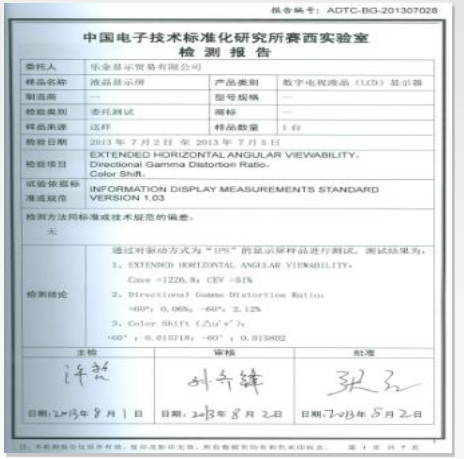
IPS

84” UHD received a certificate from intertek

LG Display 84” UHD IPS Panel showed better performance
than 85” UHD VA Panel in terms of color shift, the viewability and the directional Gamma Distortion Ratio

84” UHD received Test Report from CIEA

IPS Panel had better viewability compared to VA Panel.



Item	VA	IPS
Color Shift	0.0298	0.0170
Viewability	23.6%	40.9%
Gamma Distortion	41.9%	2.5%

Test result

Item	VA	IPS
Color Shift	0.031	0.016
Viewability	32%	51%
Gamma Distortion	47.28%	2.21%

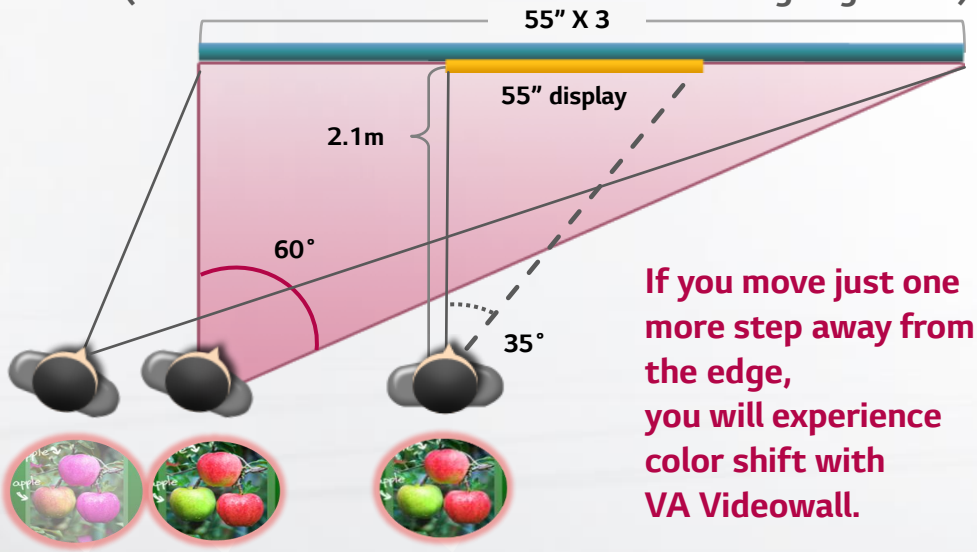
LG Display

Videowall

Importance of Viewing Angle in Video Wall

Video Wall consists of multiple displays tiled together. Video Wall has larger screen sizes and more influenced by viewing angle.

(Color wash is detected in VA with viewing angle 60˚)



If you move just one more step away from the edge, you will experience color shift with VA Videowall.

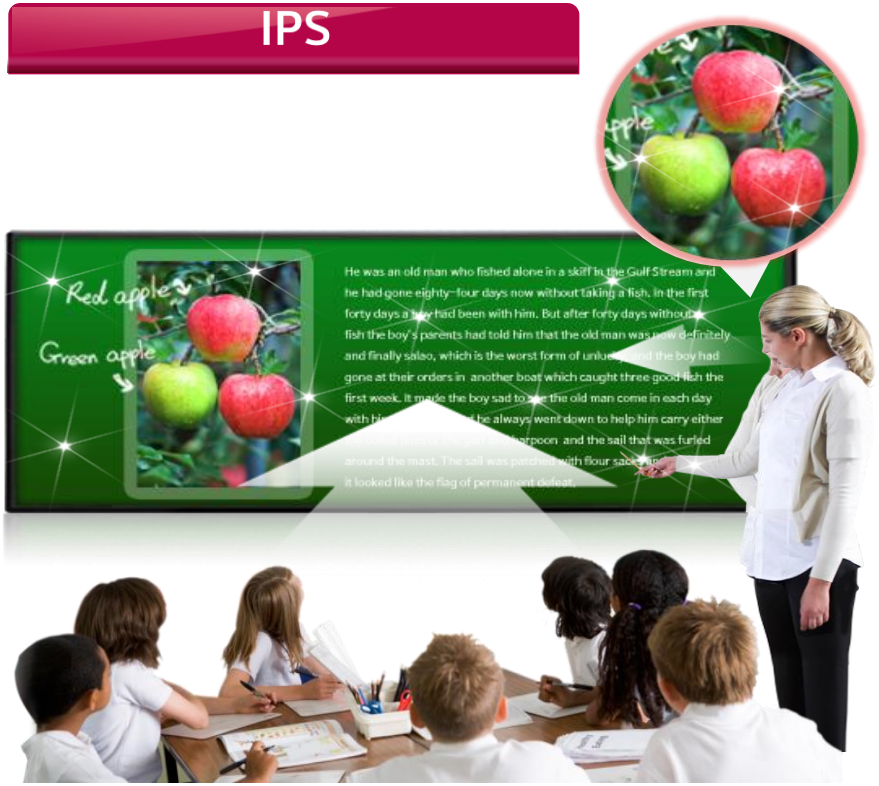
Viewing Distance* (D) = height x 3 = 2.1m

Interactive White Board

When Teachers or presenters explain, they stand very closely at the corner to the panel.

Competitors

IPS

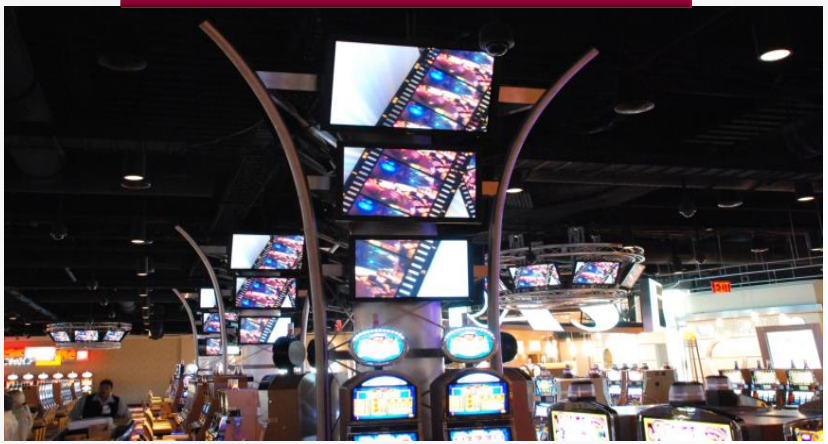


1. PANEL TECHNOLOGY

1) Wide Viewing Angle

IPS

Casino



Face Up Touch Display

Menu board

LG Display

1. PANEL TECHNOLOGY

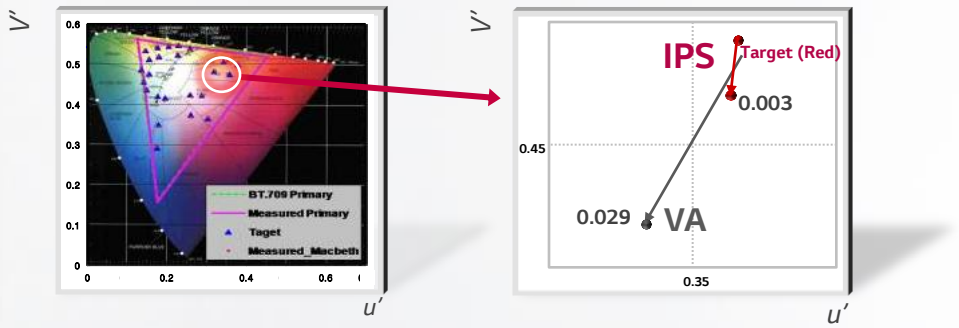
2) Color Accuracy

IPS

"COLOR ACCURACY"

Because IPS projects the color close to real objects, it is widely used in broadcasting, medical and professional designing.

(Testing with Mcbeth24color chart , IPS shows the accurate color between input and output color signal)



	Broadcasting MNT	VA	IPS
Red	0.0017	0.0290	0.0030
Green	0.0023	0.0203	0.0029
Blue	0.0037	0.0217	0.0054
Average	0.0029	0.0102	0.0025

"It's got a **gorgeous IPS display**"

"**Super high quality display** using IPS technology"

"IPS provides much more **accurate color**"

- Steve Jobs quote

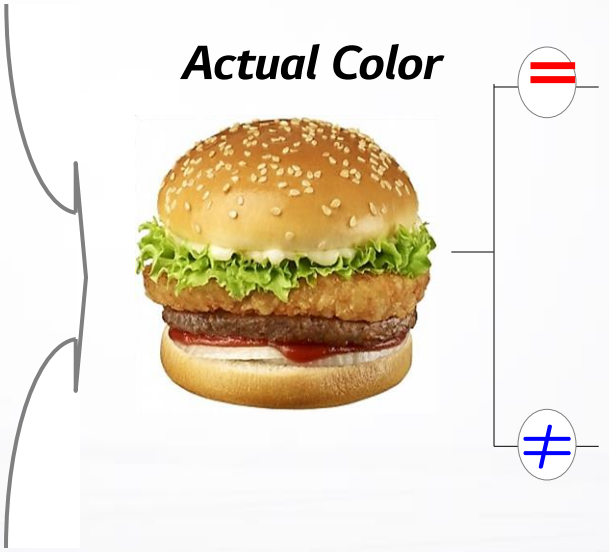
LG Display

1. PANEL TECHNOLOGY

2) Color Accuracy

IPS

- For IPS, Actual color and the color on the screen are the same.



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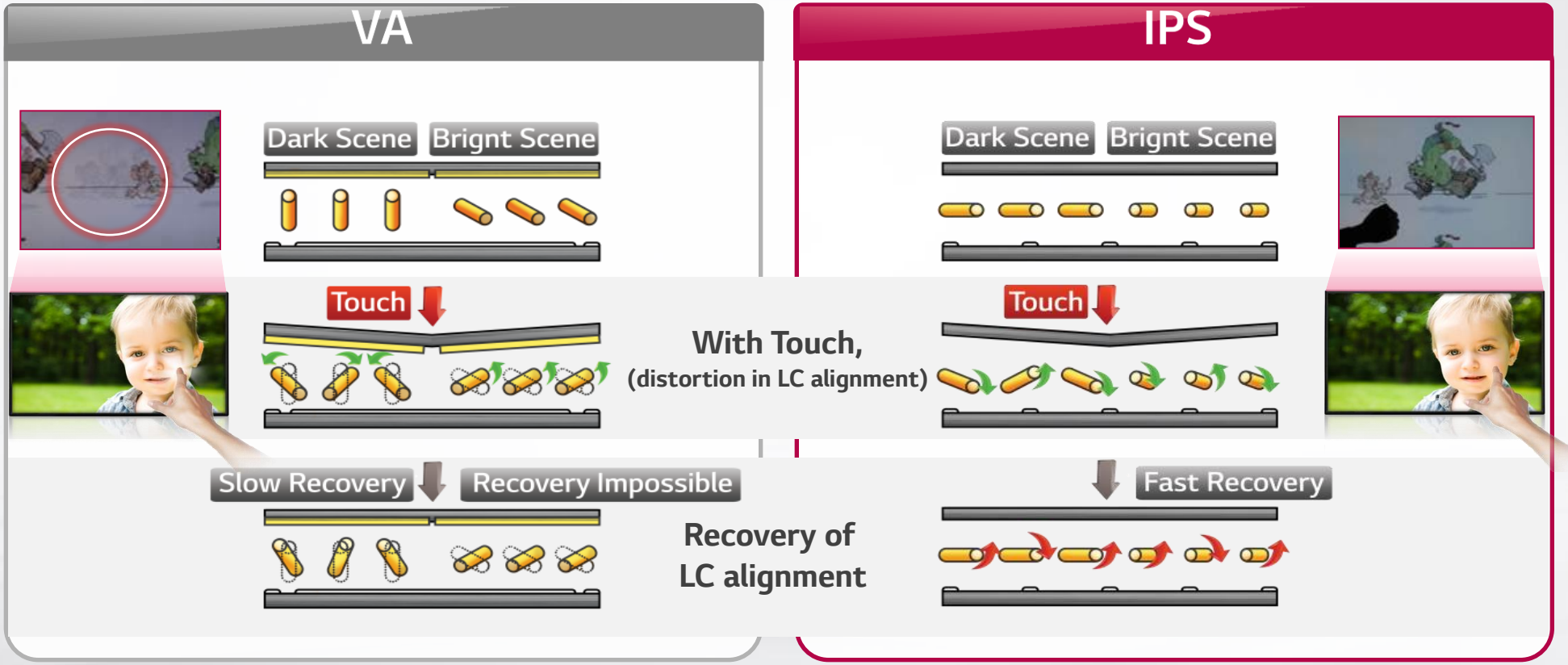
" STABLE PANEL "

IPS has a fast Liquid Crystal recovery property. Therefore, no flash occurs when touching the screen.
However, VA panels have a slower Liquid Crystal recovery property which causes flash upon touch of screen.



IPS vs. VA

IPS

How to Distinguish between IPS and VA??

Well, IT'S VERY SIMPLE!!

"Just Knock" and YOU WILL SEE.

VA

IPS

LG

2. Why IPS COMMERCIAL DISPLAY

vs. TV IPS

- Commercial display **needs exclusive developments due to various usage conditions**

TV		COMMERCIAL
300~450 nit	Luminance	300~2,500 nit↑
8~10 Hr/ a day	Operating hour	16~24 Hr/ a day
Moving Picture	Main Contents	Static Image
Landscape	Mode	Portrait & Landscape
12 ~ 24M	Warranty	24 ~ 36M

Exclusive developments for Commercial display

- Liquid Crystal
- Mechanism

Design

- Optics Design
- Circuit Design

LG Display

2. Why IPS COMMERCIAL DISPLAY 1) Yogore Free

IPS

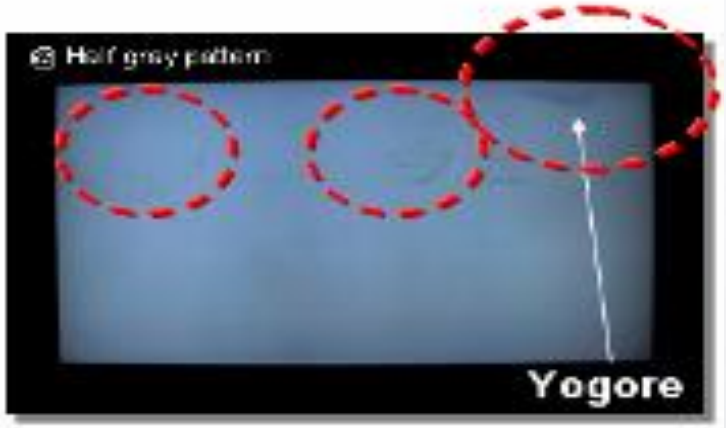
Yogore defects , When a static picture is displayed for a long time, the Yogore Defect may happen. The exclusive liquid crystal applied to all LGD's CD panels improves the defect.

Yogore Free

LGD's Commercial Panel
-18hr/7days usage

Operating a static image For long periods

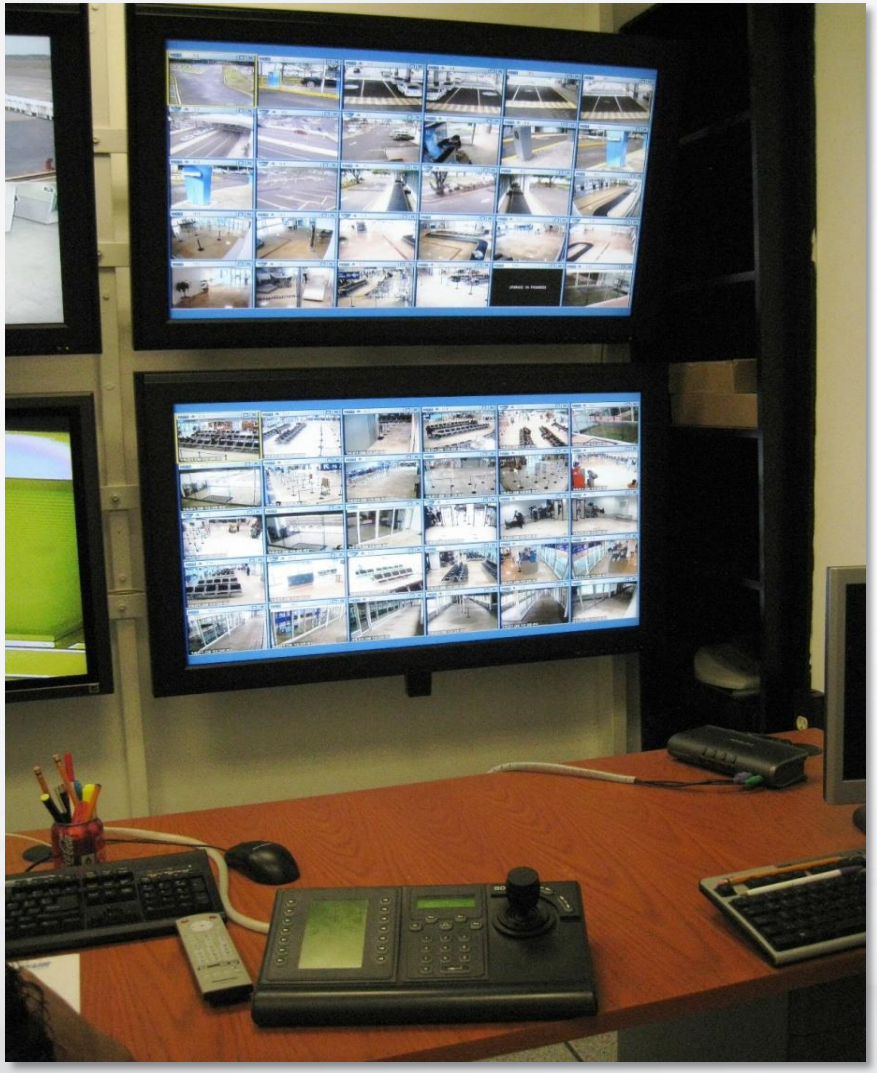
TV Panels
-8hr/7days usage



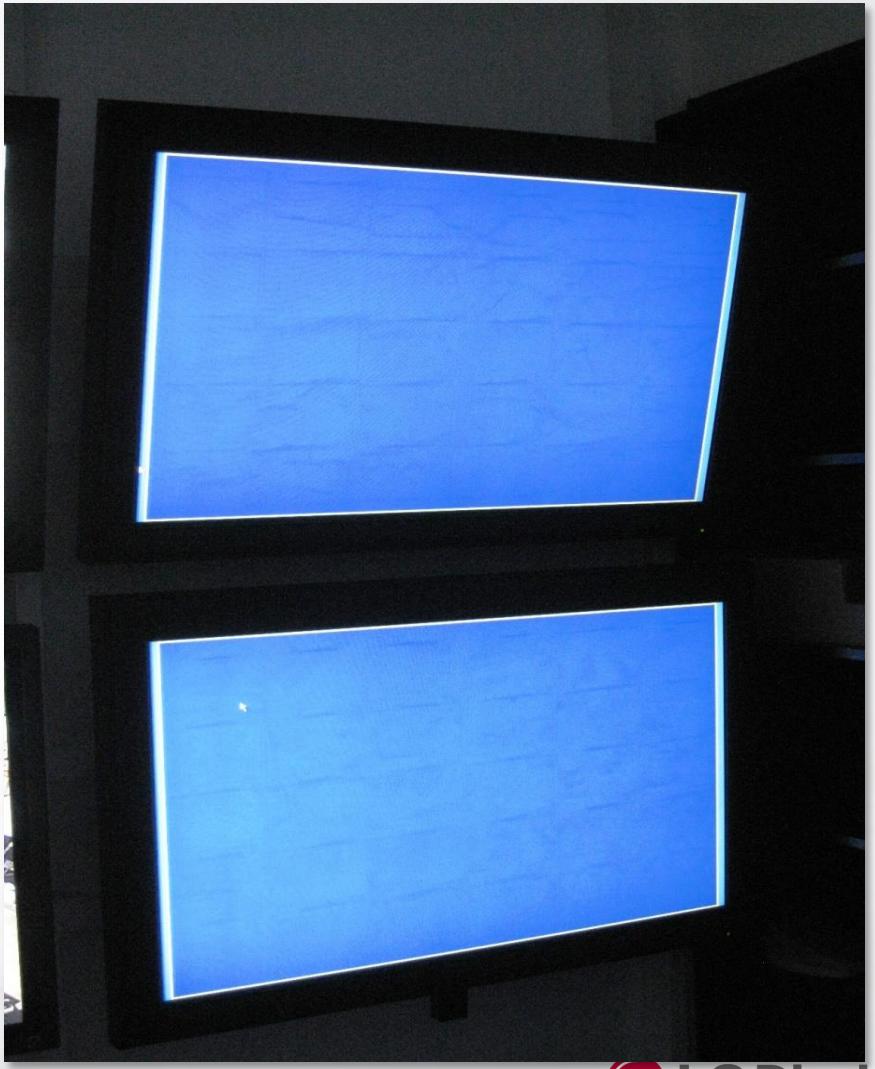
** Yogore Mura: Permanent image sticking including indeterminate stain*

LG Display

Control Room MNT (Signal On)



Control Room MNT (Signal-Off)



2. Why IPS COMMERCIAL DISPLAY

2) Blackening Free

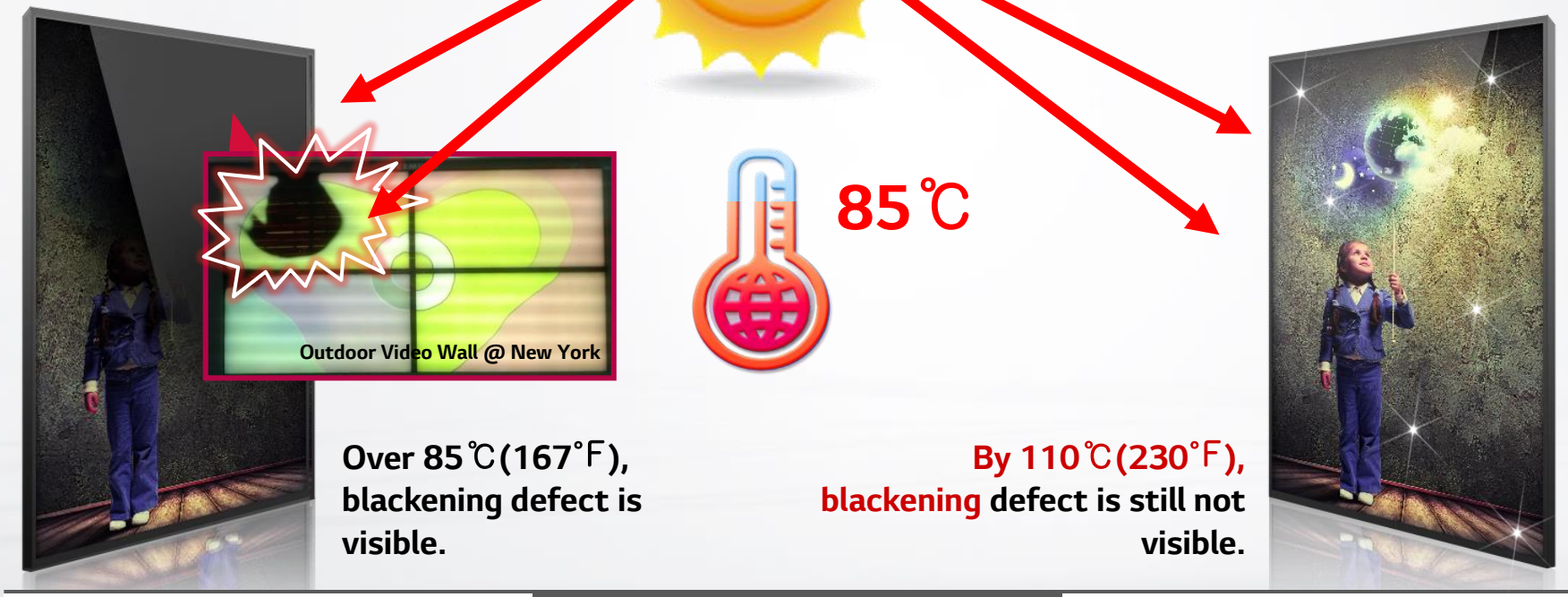
IPS

Blackening defects , causes when liquid crystal loses its own characteristics over the critical point of temperature. LGD **improves** it by increasing the critical point up to 110 degree.

Blackening Free

VA

LGD



Over 85℃(167˚F), blackening defect is visible.

By 110℃(230˚F), blackening defect is still not visible.

85℃	Tni Temperature	110℃

LG Display

Blackening Field Issue

Direct Sunlight

Blackening

Recovering
If there is no direct sunlight

* Outside Temp : -1℃
* Inside Temp : 20℃

Outdoor Video Wall @ New York in Winter

2. Why IPS COMMERCIAL DISPLAY 3) Portrait Mode

- LGD improves gravity defect by optimizing volume of liquid crystal and increasing cohesive power.

Gravity Defect Free

LGD's Commercial Panels

Liquid crystal does not flow down.

Flow-downed liquid crystal makes a picture yellowish.

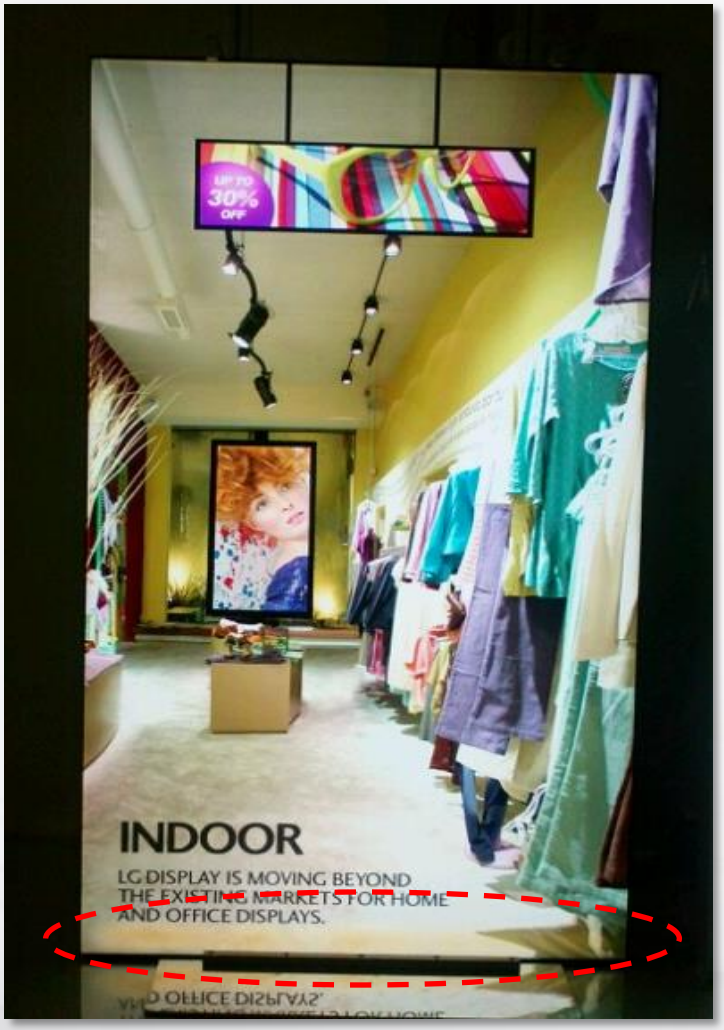
Conventional TV Panels

Force of gravity

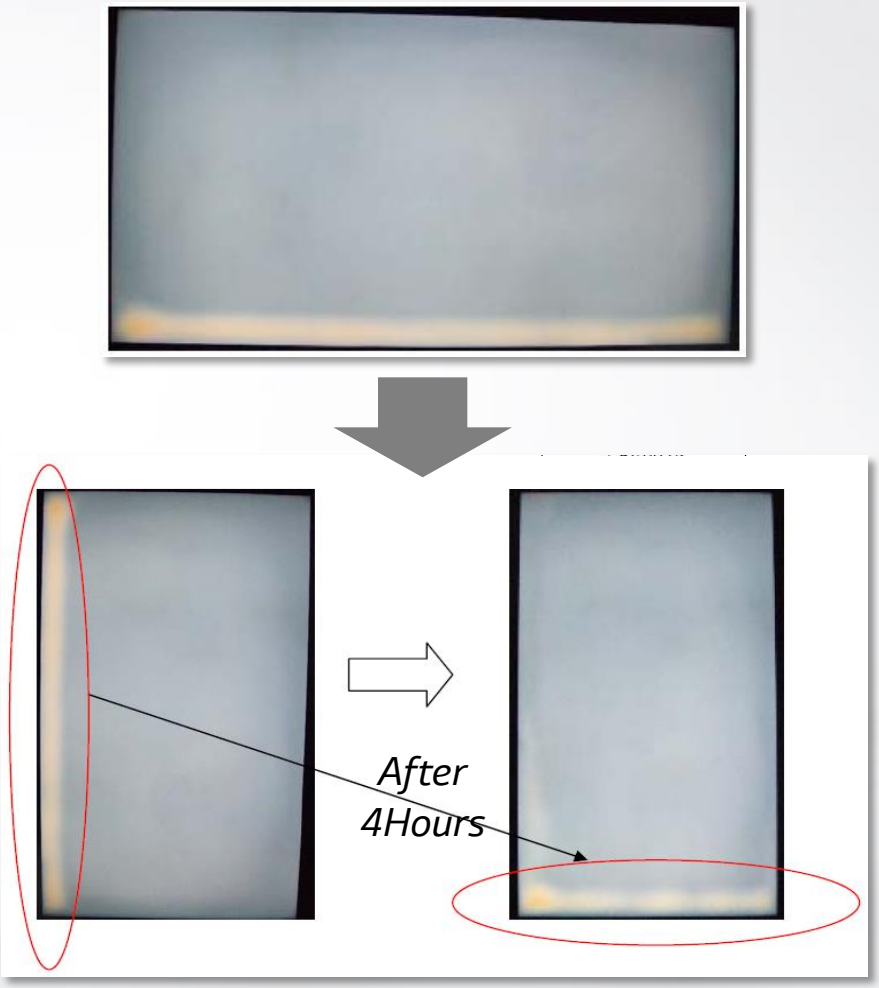
Gravity defect

LG Display

In Portrait Mode



In Landscape Mode



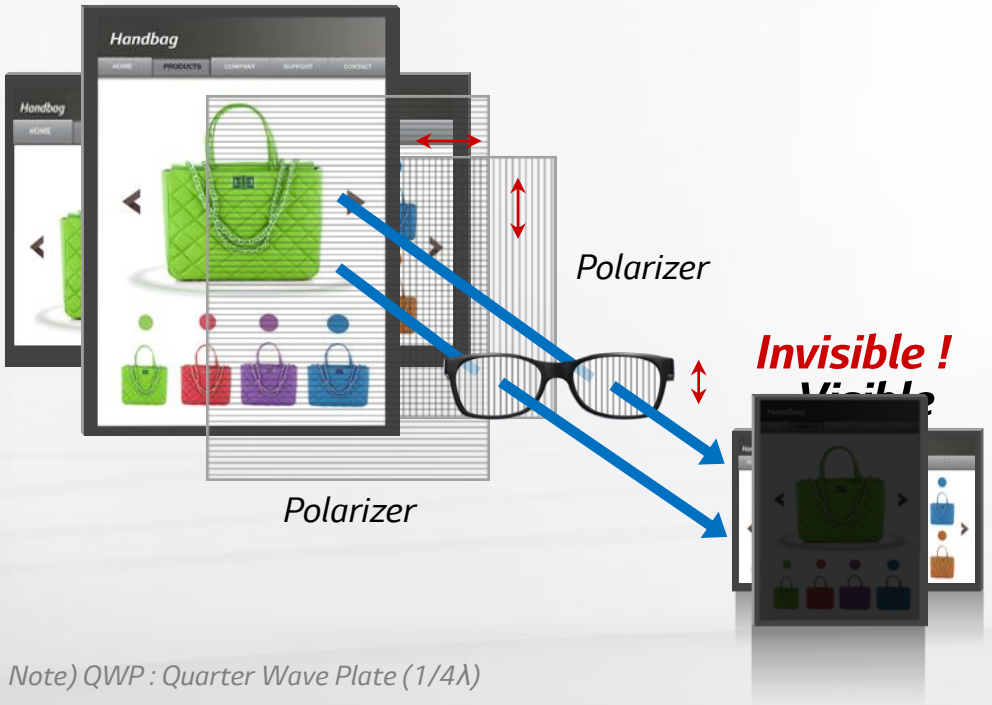
2. Why IPS COMMERCIAL DISPLAY

A) QWP Technology

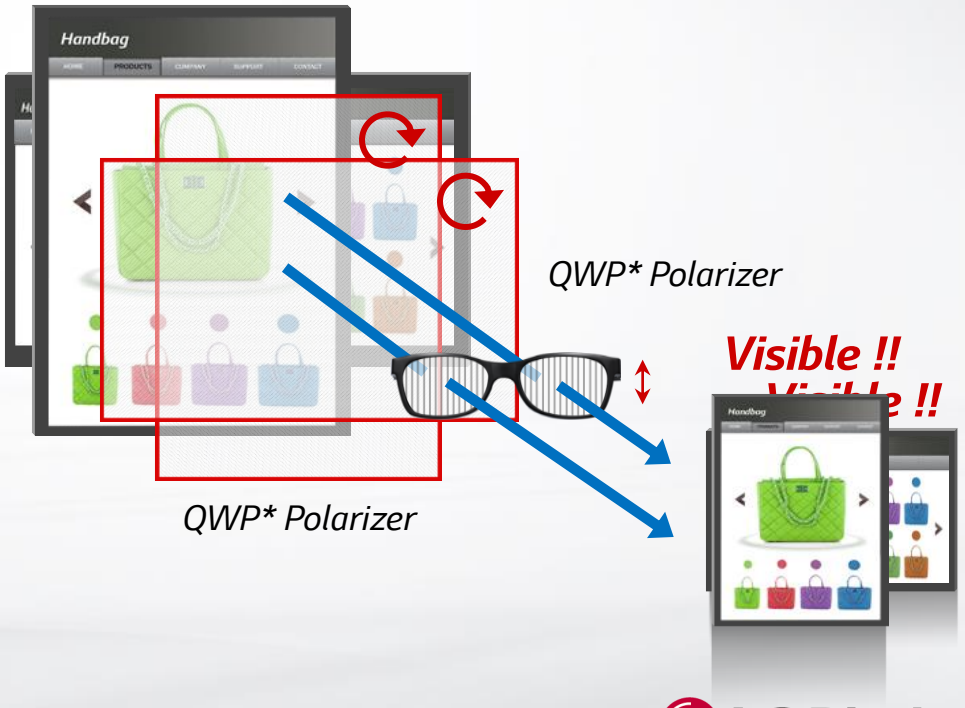
- ***With QWP application, Display is still visible even with wearing polarized sunglasses.***
  (Over 50% of drivers put on sunglasses and about 10% among them uses polarized sunglasses in US)

QWP Polarizer

Conventional TV Panel



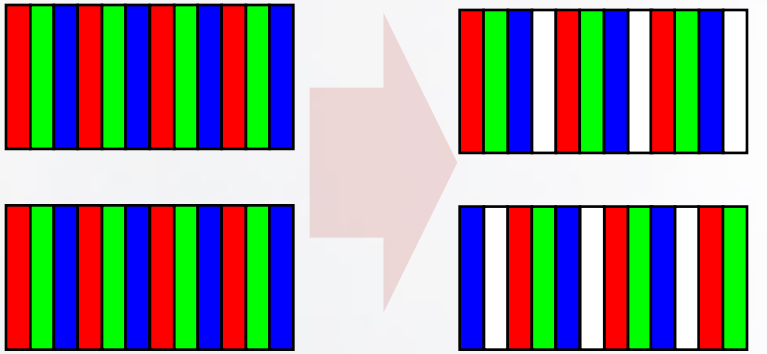
LG's Commercial Display



Note) QWP : Quarter Wave Plate (1/4λ)

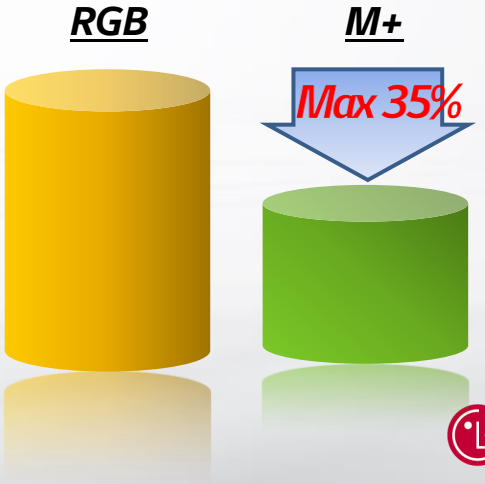
New Technology

M+ Structure



High Brightness

Power Consumption



- Save Energy
- Save Environment

Take away

1. **IPS is the only Technology for Commercial Display**

   - *Wide Viewing Angle*
   - *Color Accuracy*
   - *Stable Panel (Touch)*

2. **Commercial use of a display must use the Commercial Dedicated Display with Different Liquid Cristal / Mechanical Design etc. Use of Consumer TV may cause critical Quality Issue. .**

   - *Yogore / Image sticking / Blackening*
   - *Portrait Mode*
   - *QWP Technology*


THANK YOU