Physical versus Virtual Resolution: The Impact of VPW™ RGBW Display Technology on Mobile Applications

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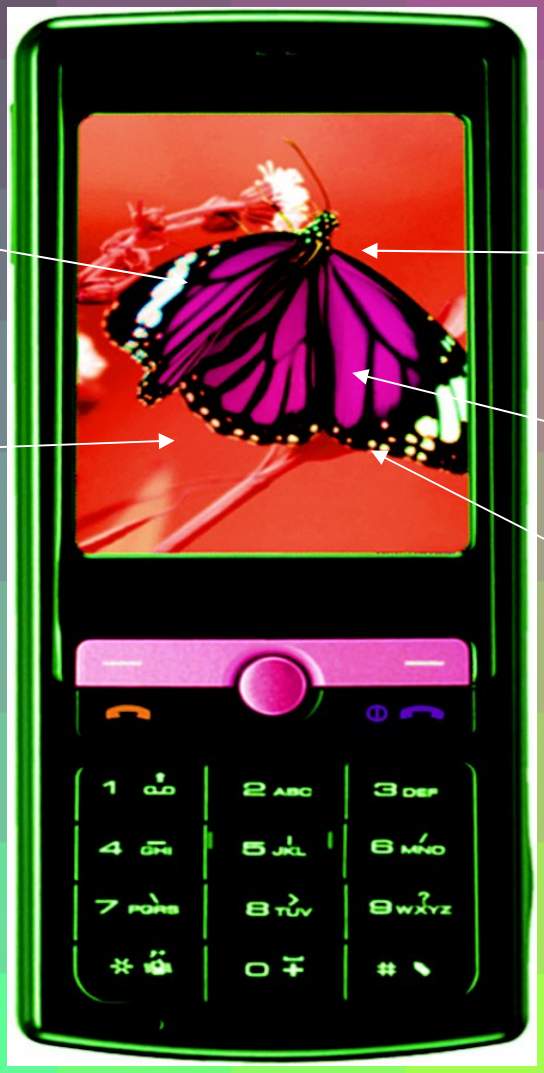
Contents

- Dilemma of mobile HD entertainment
- Visual Perception White (VPW™)
- Physical versus Virtual resolution
- Conclusions

Consumer's Expectation



More battery time

More resolution

More contrast

More brightness

More color

Always More !

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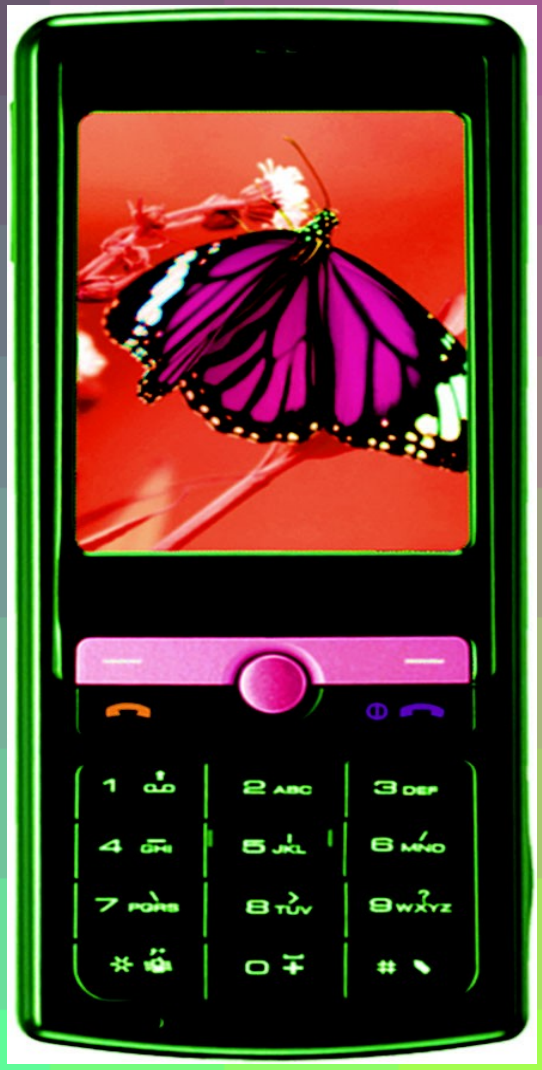
Consumer's Expectation



Price

$$$$

$$$

$$

$

Always Less !

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Consumer's Expectation

We Want VPW Display Now !

Always Now !

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Technical Difficulties

- Mass production difficulty for display with Full HD resolution of 1920x1080 and <10”
- Very high power consumption
- Short battery time
- Heat dissipation problem
- High production cost

Structure of TFT LCD

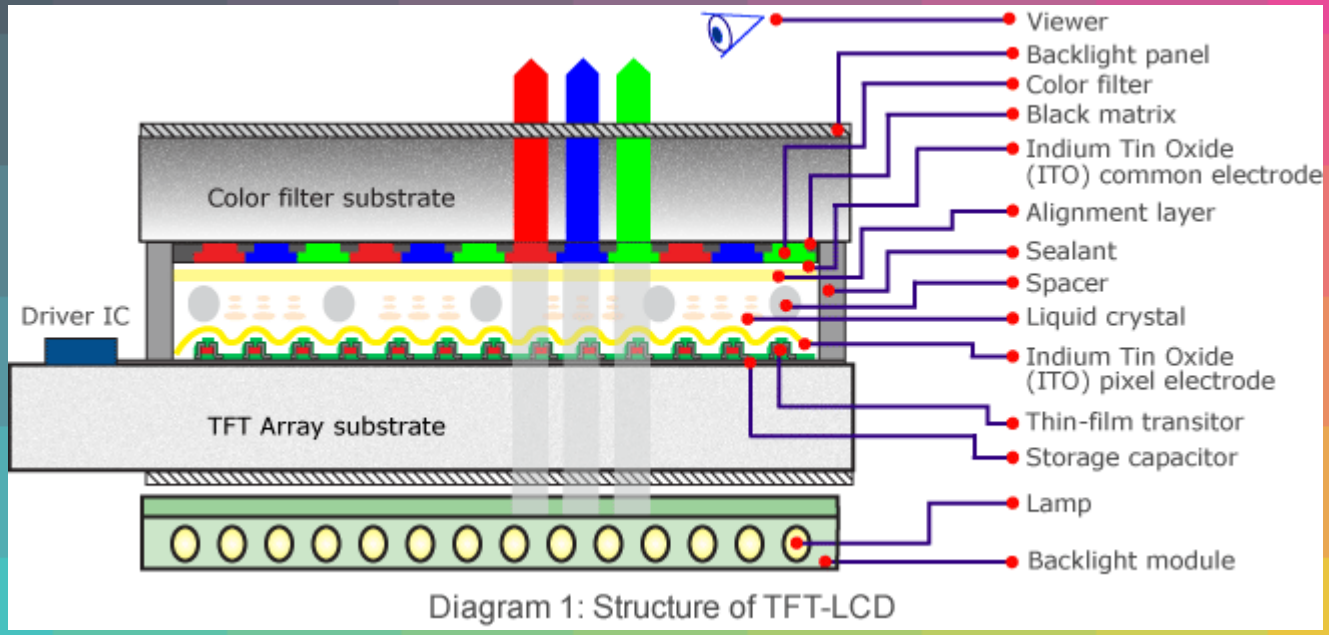


Diagram 1: Structure of TFT-LCD

Source: AUO

Liquid Crystal Mechanism

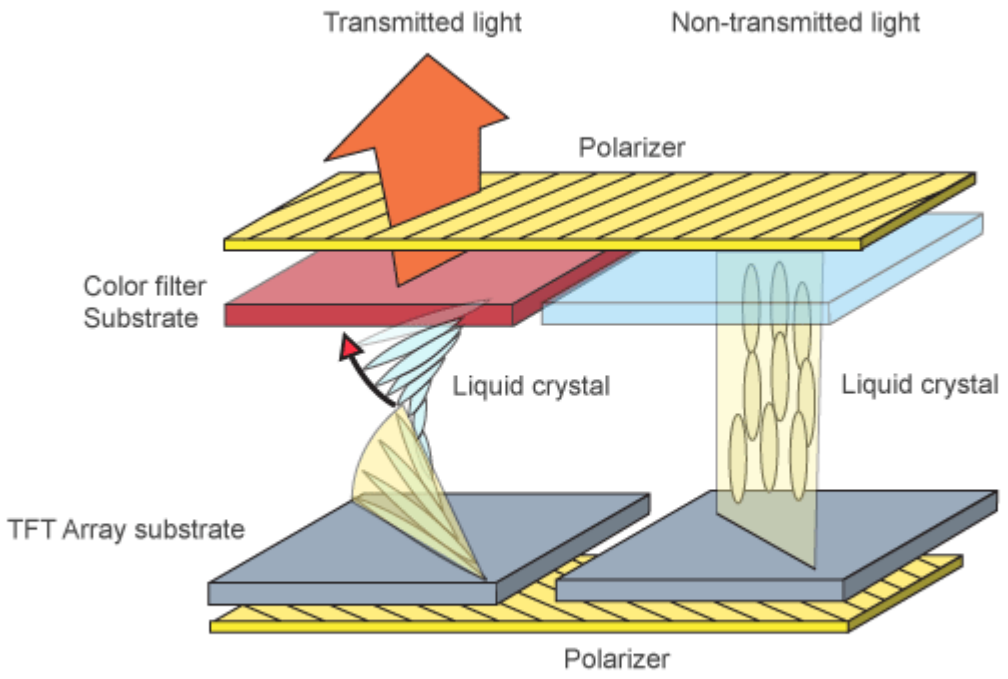
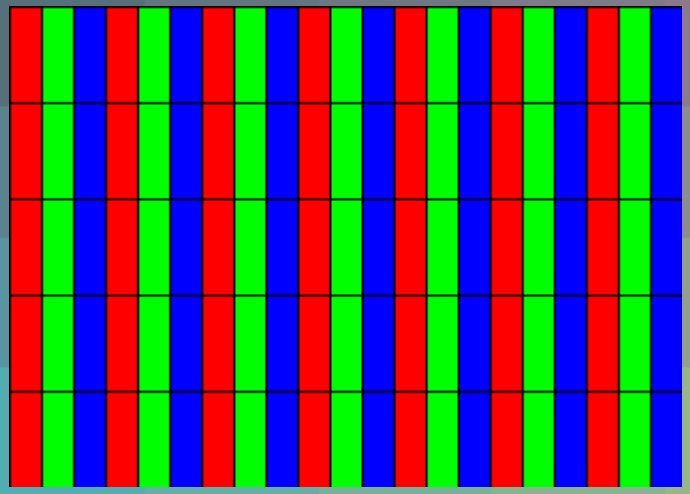


Diagram 2: The Fundamental Photonics of Liquid Crystal (Twisted Nematics)

Source: AUO

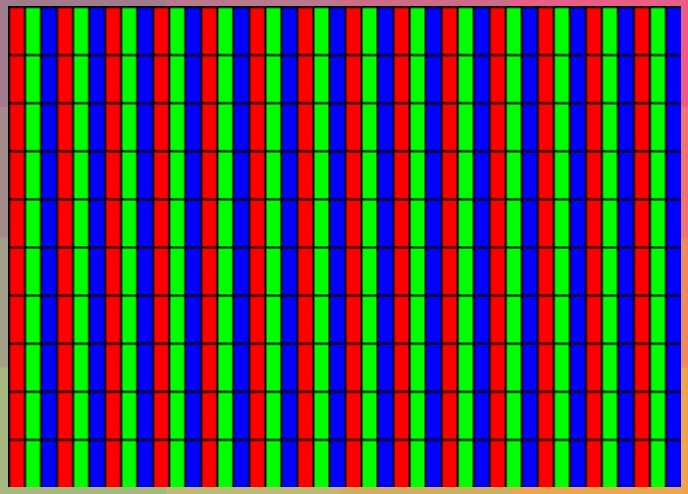
Pixel Density

X. RGB. Y



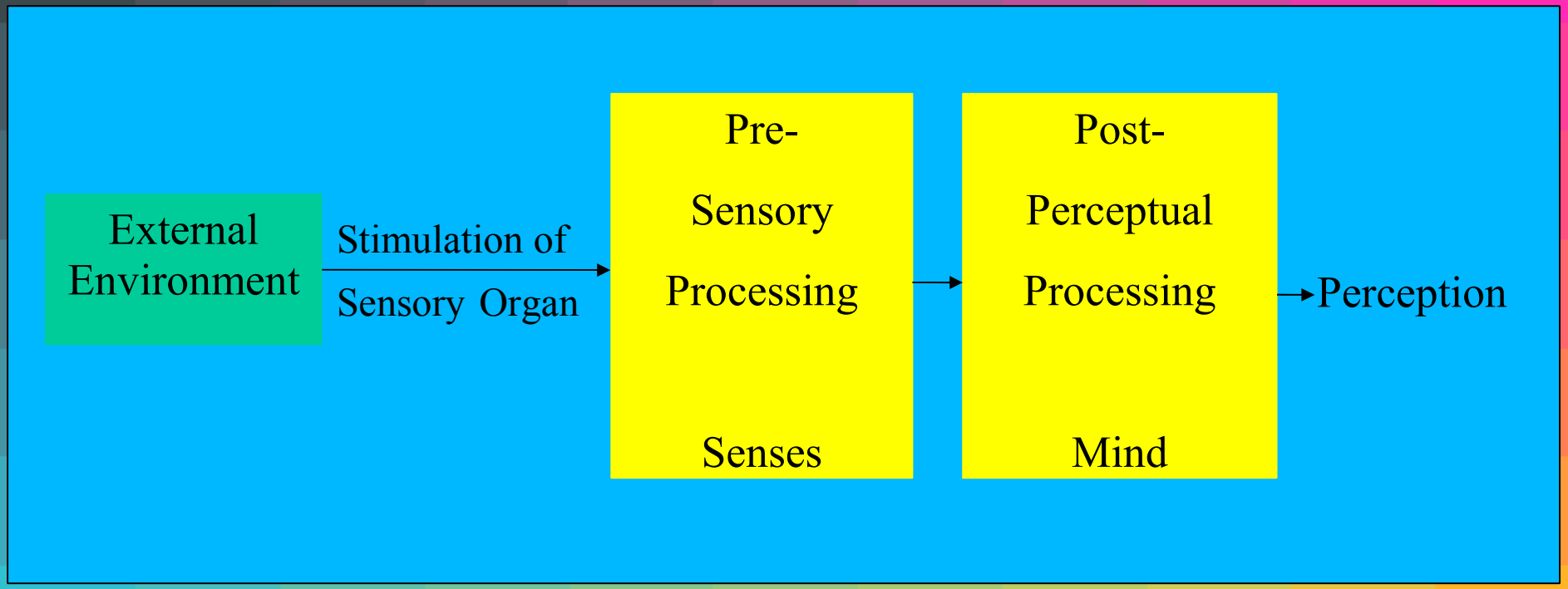
1x

2X. RGB. 2Y



4x

Procedure of Human Perception

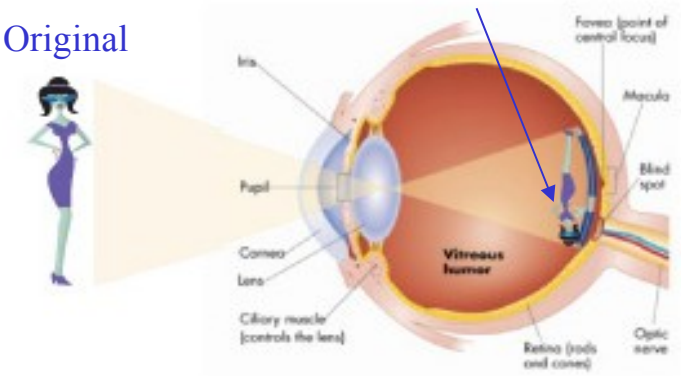


From Sensation to Perception

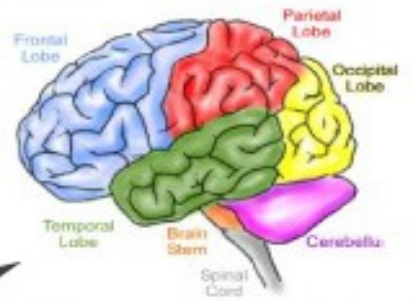
Upright
perceived Picture

Upside down Picture
on retina

Original

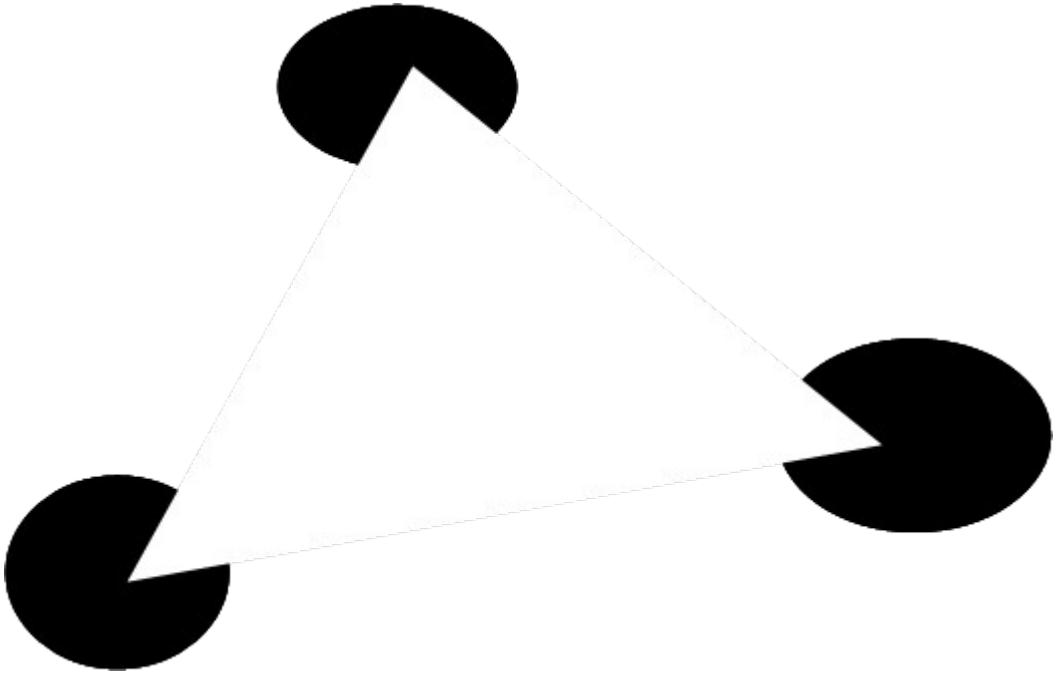


Sensation



Perception

Visual Perception: Seeing vs Perceiving



Source: Zaltman, 2003, p.68

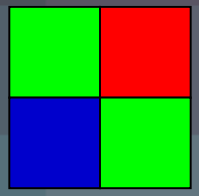
Visual Perception is reconstructive and creative !

Prof. J. Dowling, Harvard University

VPW™ Sub-pixel rendering principle

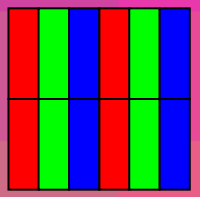
The dual of mosaicing

Image Sensor



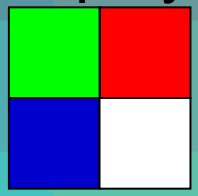
Bayer Pattern

De-mosaicing



RGB signal

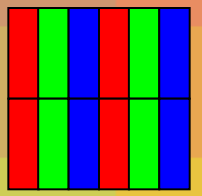
Display



VPW™ RGBW

Sub-pixel rendering

“Mosaicing”



RGB signal

Note: sub-pixel rendering common used today in rendering fonts.
MS ClearType™ is a sub-pixel rendered font in Windows today.

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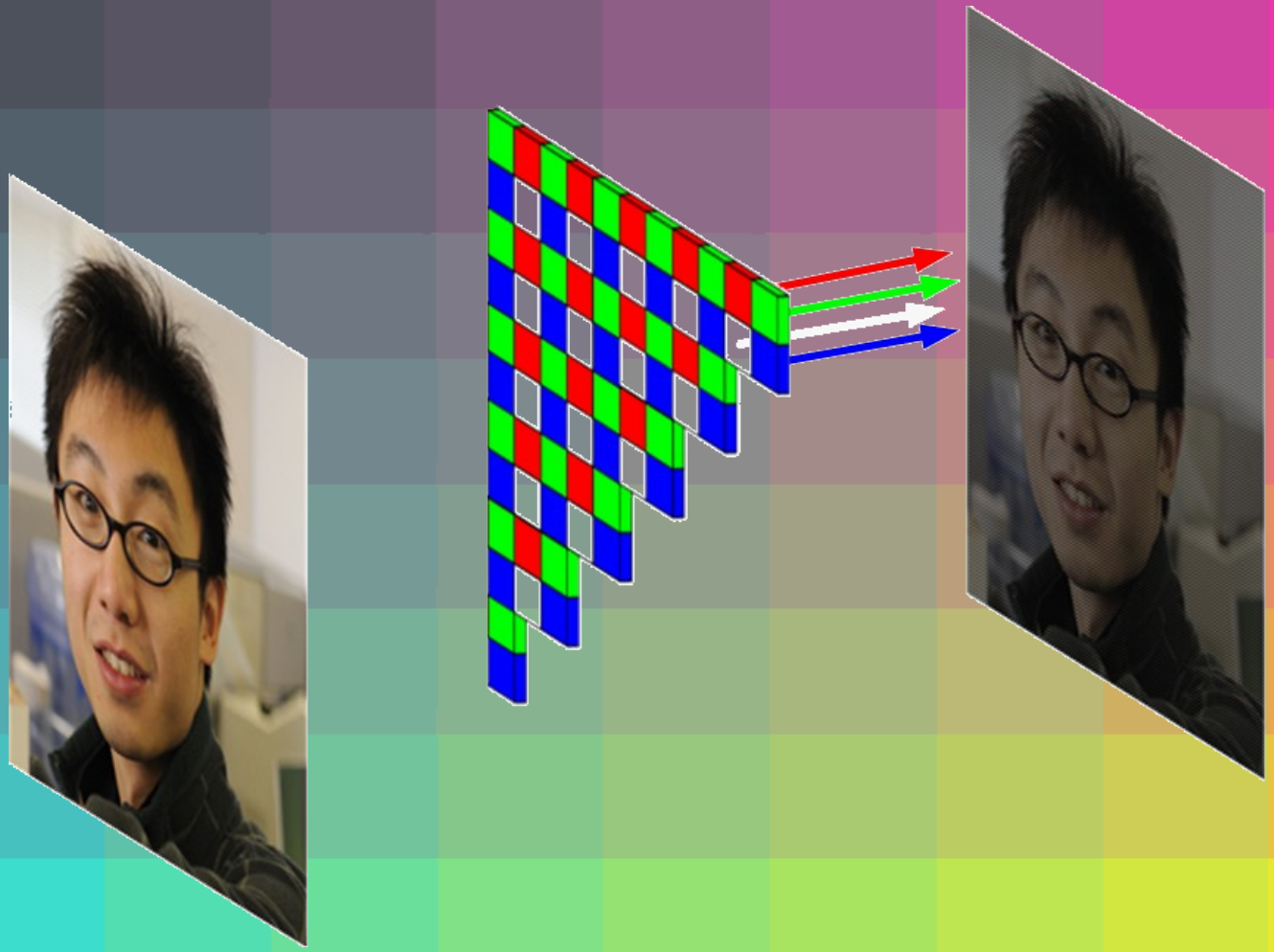
VPW™ Color Filter



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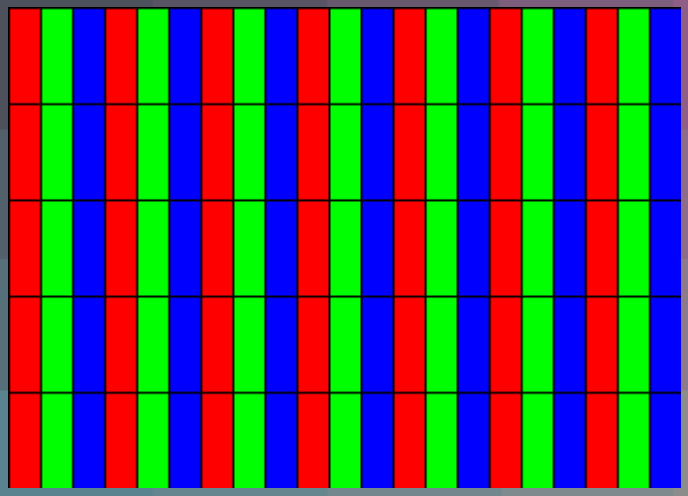
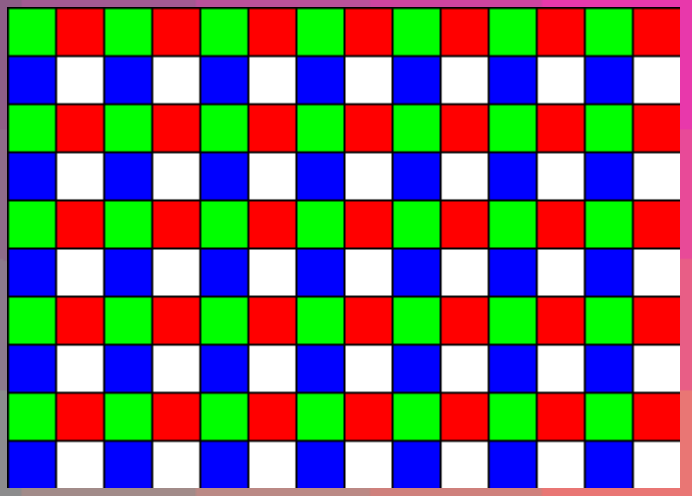
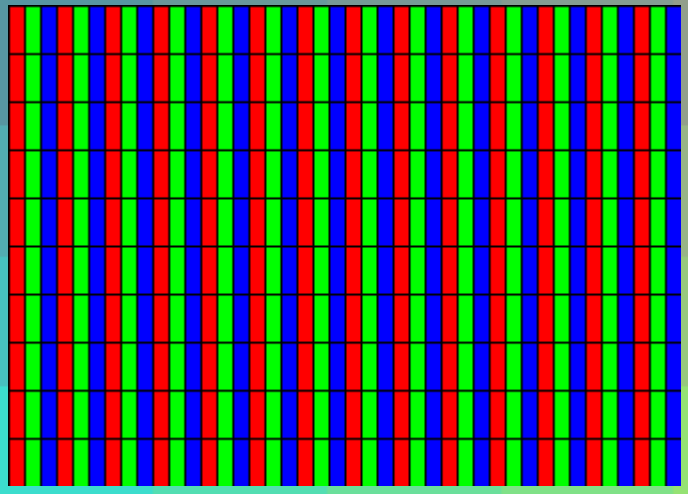
From Physical to Physical Resolution

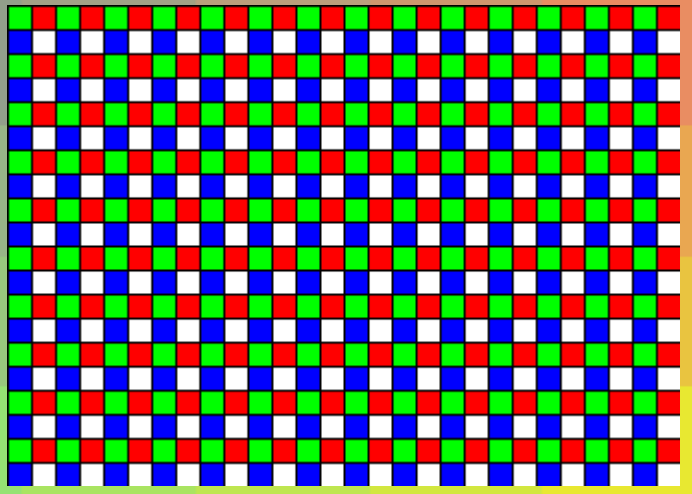
X. RGB. Y



X. RGBW. Y



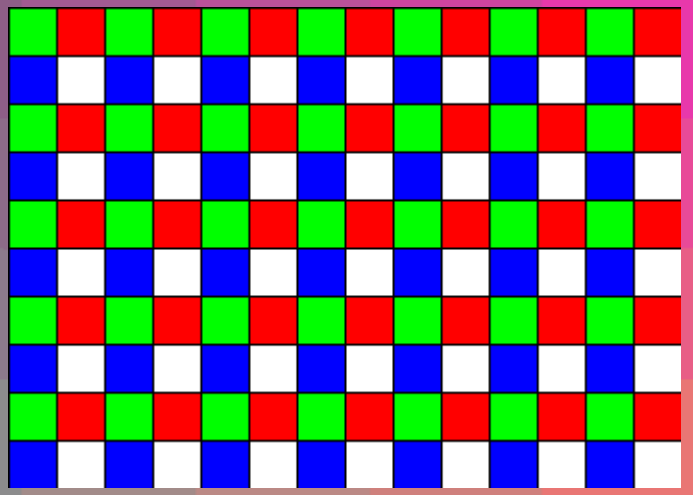




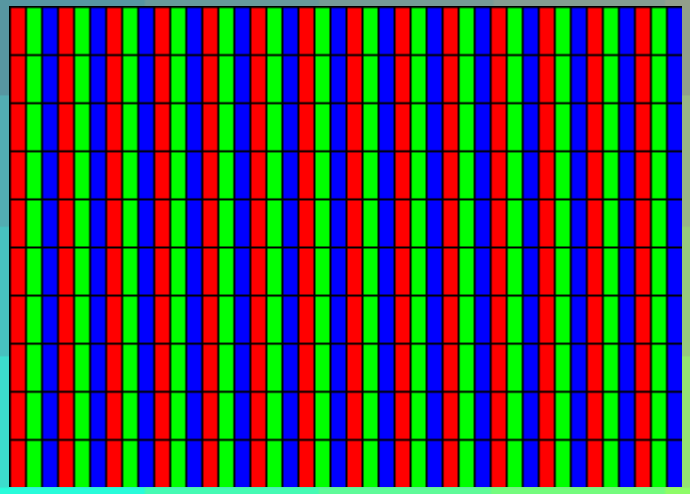
2X. RGB. 2Y

2X. RGBW. 2Y

From Physical to Virtual Resolution



2X. RGB. 2Y

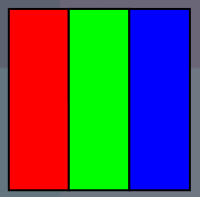


Physical X. RGBW. Y
Virtual 2X. VPW. 2Y

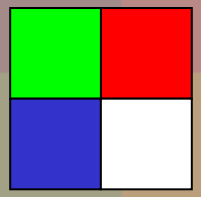
RGBW=Physical Pixel=4
VPW= Virtual Pixel = 1

VPW™ Duo Resolution Full HD Display

RGB signal
960xRGBx540

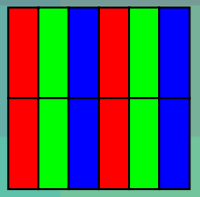


Physical mode (S)



VPW™ HD Display
960xRGBWx540(S)
1920xVPWx1080(E)

RGB signal
1920xRGBx1080



Virtual mode (E)

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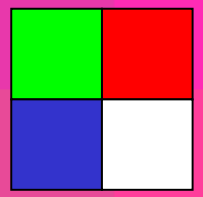
Transition from idea to product

- Basic idea of “less can be more” was formed by VP Dynamics in the 90s in Germany
- Human oriented technologies (MP3 & VPW)
- Visual Perception™ Technology / Visual Perception White (VPW™) by VP Dynamics
- Exploiting consumer’s visual perception capability in the mind
- First patent application in Germany in 1997
- Applied R&D in Hong Kong since 2004

RGB vs VPW™

Tradition

Innovation



RGB	VPW™
single resolution	duo resolution
Physical: 960xRGBx540(qHD)	960xRGBWx540(qHD)
Virtual : not applicable	1920xVPWx1080(FHD)
high power	lower power
low contrast	higher contrast
Mobile FHD not possible	Mobile FHD possible

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RGB vs VPW™

RGB VPW™ 4x

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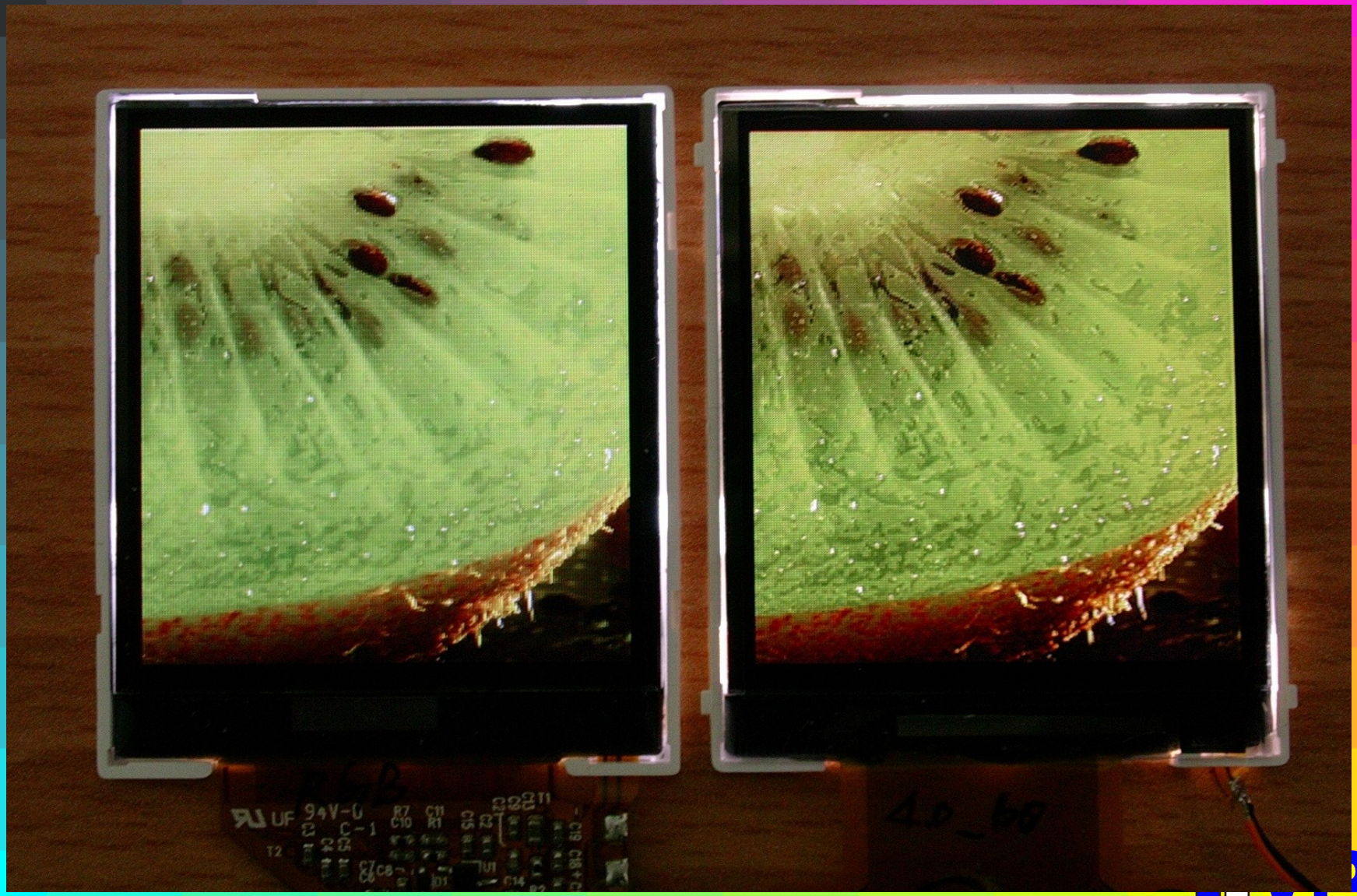
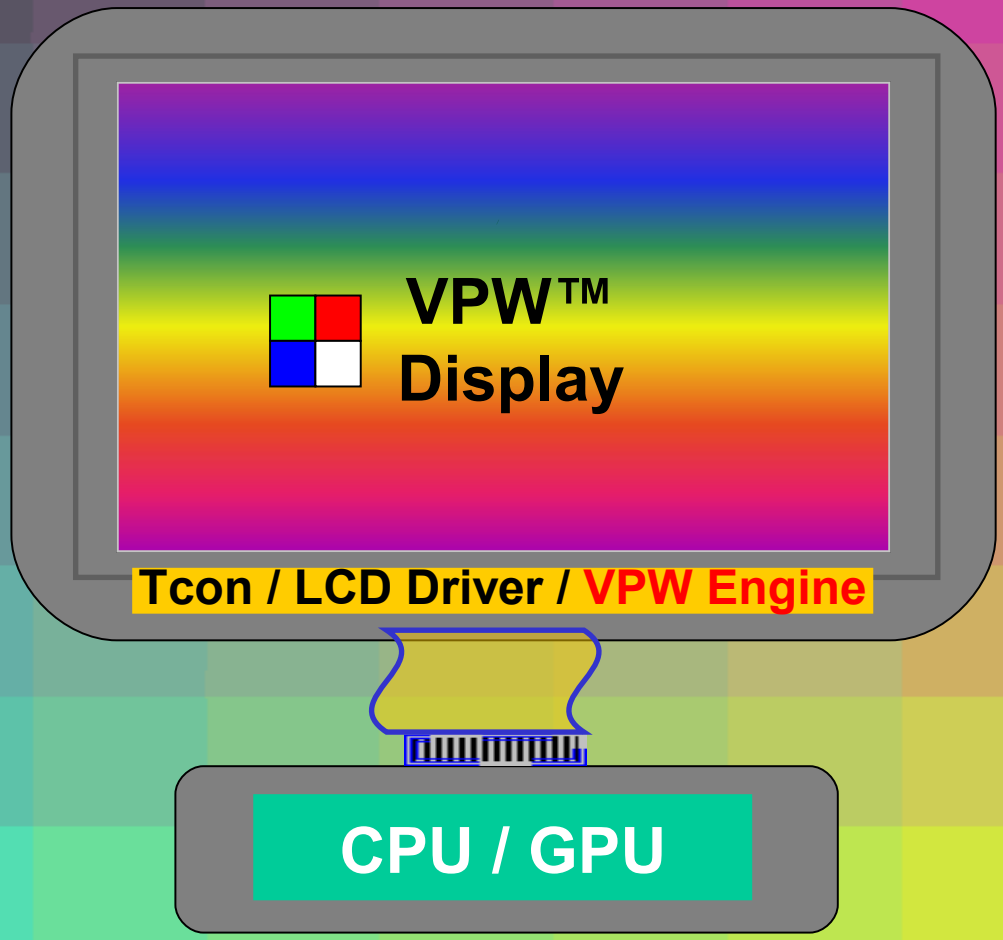
Image Quality – RGB vs. VPW™

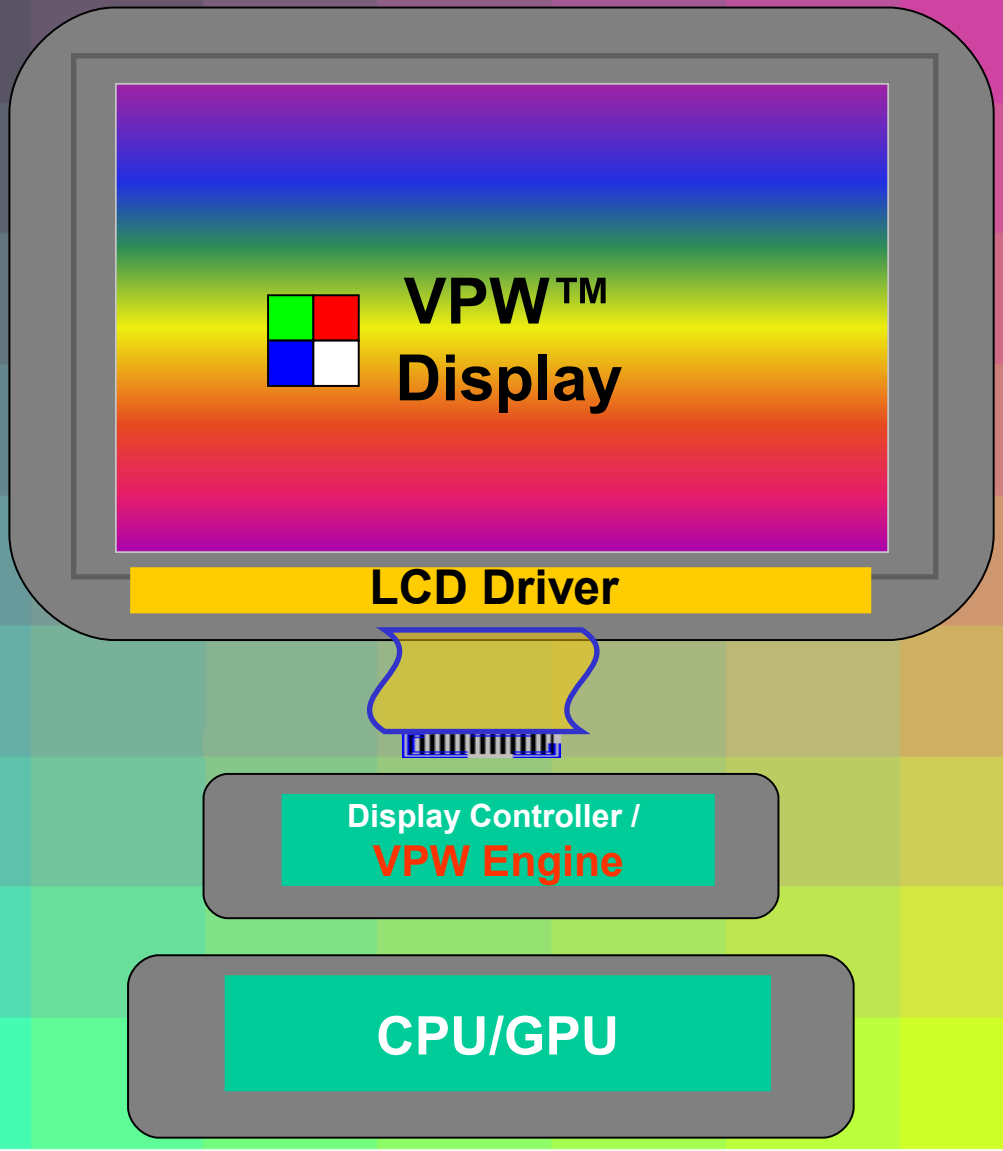
Image Quality – RGB vs. VPW™



VPW engine embedded in driver IC



VPW engine embedded in display controller



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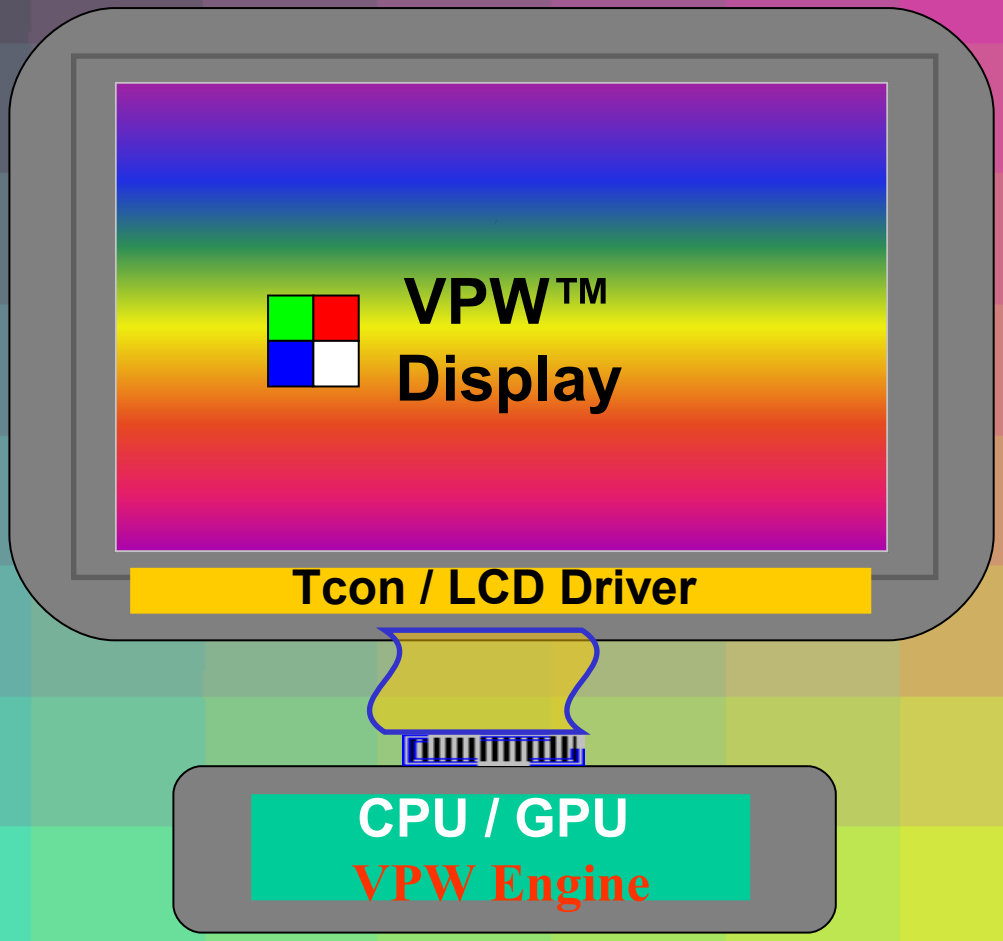
VPW engine embedded in CPU/GPU



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VPW™ value creation

- Excellent display performance and ultra low power with RGBW & DBLC (Dynamic Backlight Control)
- Full HD display (1920x1080) of less than 10”
- Dual resolution mode for system power saving
- Selectable modes for different applications
- Low 100ppi acceptable for Notebook and Netbook
- Support MS True Type™ and Clear Type™ fonts
- Smaller IC dye size with fully tested VPW™ core
- Optimized cost/performance factor
- Enhancing user visual experiences

VP™
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Conclusions

VPW™ Technology competitive advantages :

- Product Differentiation and Innovation
- Full HD mobile display with unmatched visual performance
- Ultra low power => **Ultra Green !**

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Thank You

Please enjoy VPW™ Demo

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