LCoS Micro-Display Panel solution for AR/VR/XR, Projector/Holo/HUD, WSS/Lidar, Metaverse Platform Builder

Cell Cubes Co., Ltd.
Nov 2021

Cell Cubes key value and expertise

Semiconductor Chip Design Expertise

- SoC (system on chip) Design with AP core: 30 + designs
- Analog / Mixed signal design experience: Over 30 Device
- Display Device Design: LCD, LCOS, OLED: over 20+ designs
- Display/DVR system building: over 10 products

Chip design own IP

- Library IP: System Architecture/Hard Macro/Circuit IP: 7 library set
- Memory Macro/ Analog IP: over 100 IPs

World top design IP for LCOS chip

- World highest resolution LCOS IP: 4Kx4K /8Kx4K
- World smallest Pixel IP: 3.6um/3.2um
- World Fast system architecture for frame rate: 180Hzx3
- World best color depth supporting: 12bit x 3 = 36bit contents supporting

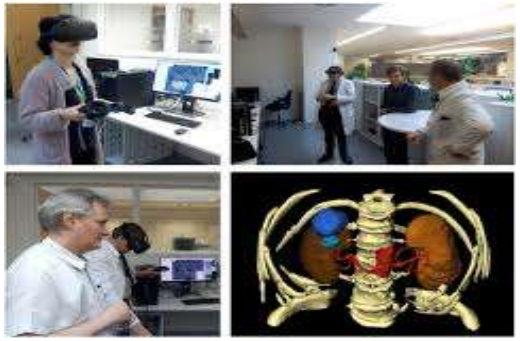
Secured Foundry Partner

- Long term foundry partner: over 18 years binding partnership with IP supporting
- Build own process technology on LCOS product

General LCoS Application I (AR/VR/MR/XR)

Game, Military, 4D Design, Education, Medical, Surgical

Practice, Simulator, Robot, Maintenance, etc.



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LCoS Application II (Projector/Holo/UST)

Pico Projector

UST

Holography

OTT Set/

Portable TV
+
AI Speaker

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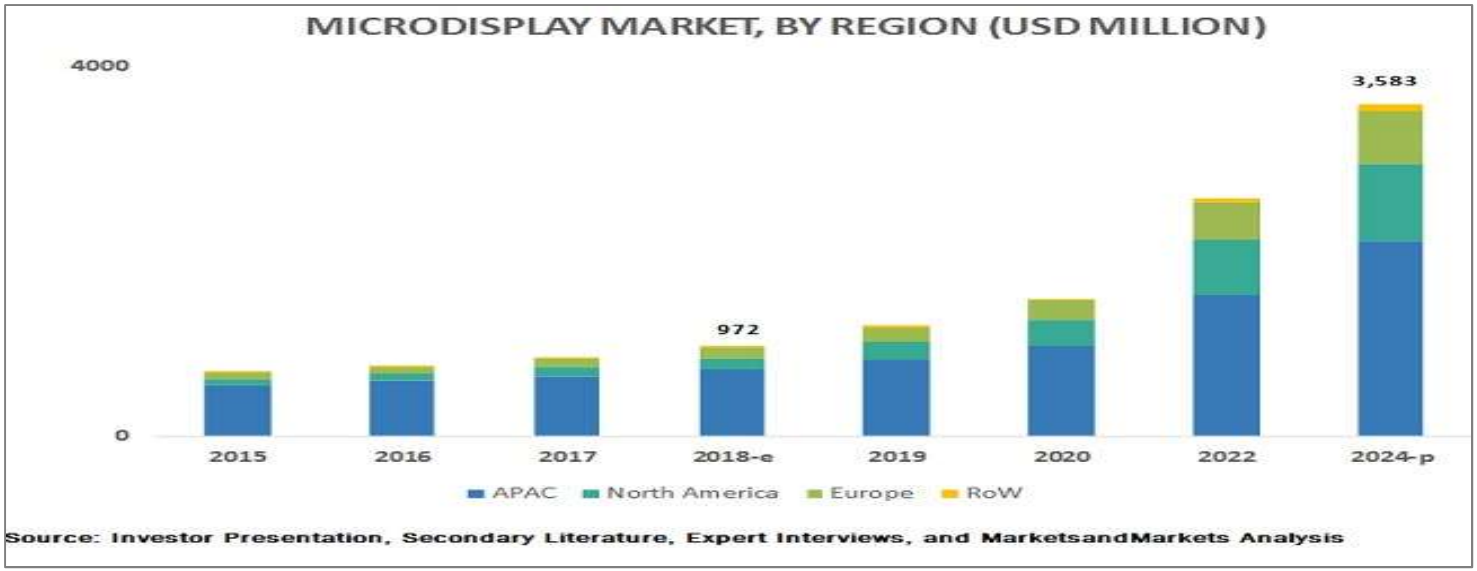
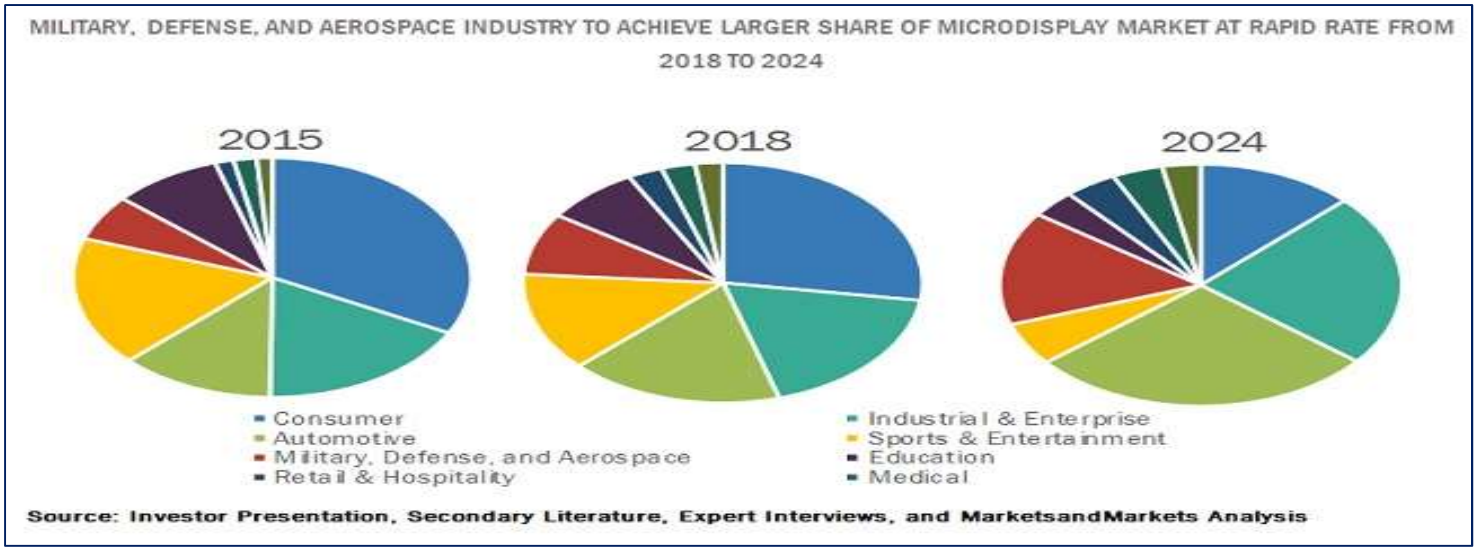
Micro-display Market Forecast in Display Sector





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LCOS vs OLED vs DLP Comparison

Feature	LCOS	OLED	DLP
See-Thru	Yes	Partially Yes	Partially Yes
Pixel Form	Single Pixel with 3 light	3 pixels for one color feature	DMD(Digital micro mirror) base, weak for wearable
Brightness control	Very easy with LED/Laser	**Limited with pixel size**	Good for projector
Higher Resolution Panel Making	**Easy with smaller pixel**	Hard from Limited pixel size	Hard from mirror pixel size
Power Consumption	moderate	small	**high**
Life Time	**Long**	**Short**	Short
Freedom for color composition	**Easy**	Hard over limited material	Hard over switching speed
Cost	**Low**	**high**	**High for high resolution**
Mass Production yield control	moderate	**Very hard**	Hard from MEMS yield
Flexibility	bad	good	bad
Color Performance	Good	Good	Moderate

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Embedded LCOS Applications

Micro-cameras and Simulator (4K UHD)

Digital Cinema

Simulation

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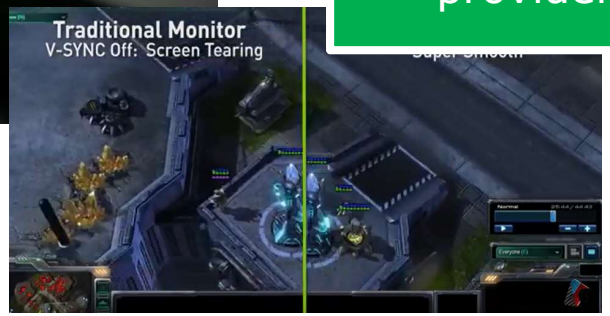
Metaverse/XR Console Engine

X-reality
Game service

Qualcomm
snapdragon

NVIDIA

X-reality
Solution
provider



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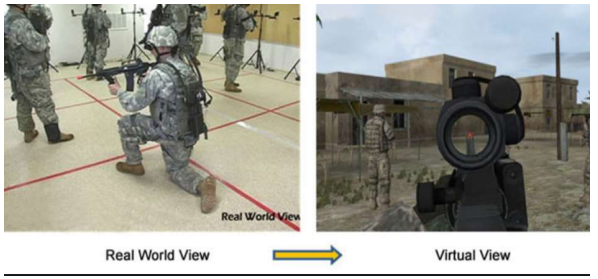
Cell Cubes LCOS target application area

HMD (Head Mounted Display) Application

- Movie, 3D Game (Replacement of monitor)
- Virtual reality simulation
- Augment Reality Display
- Personal monitor in plane and train
- Medical Image viewer
- Industry monitor
- Personal duplicate viewer over mobile

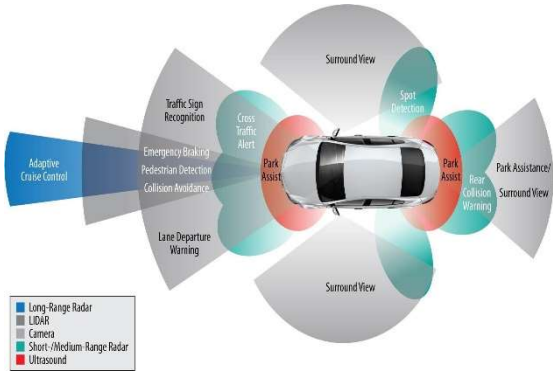


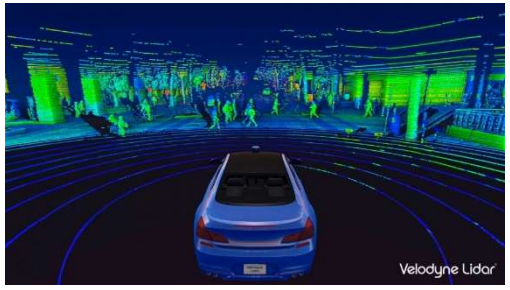
Media Display

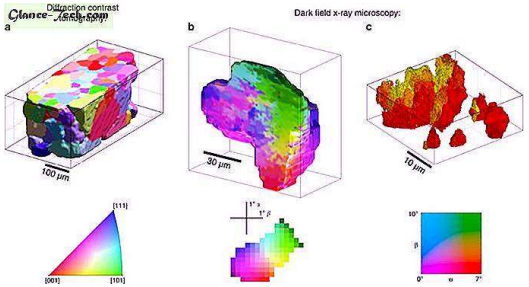
- Projector(Portable Pico/Office)
- Movie Theatre Projector (4K/8K)
- Automotive (HUD) media display
- Public Signage

New LCoS application for Lidar/Telecom/Medical

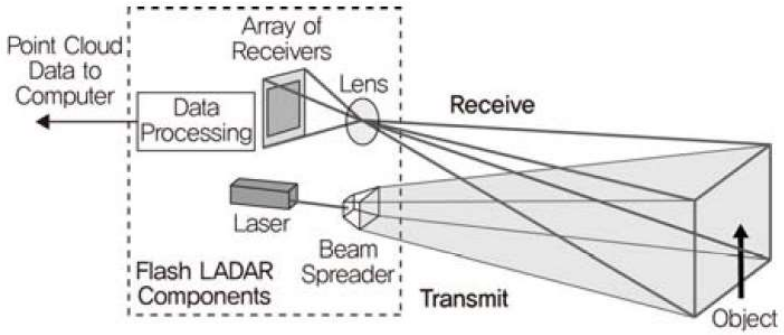
1. Autonomous Vehicle
2. Drone/Ship/Airplane
   - Media co-processor (edge-computing) for sensing: with 3D camera/voice/motion/9-Axis/GPS/360 viewer
3. Telecommunication for 6G/Satellite/Drone Telecom
   - WSS for RoadM Module
   - Optic communication engine with laser module
4. Medical/Military/Smart Factory/Robot







Lidar sensing and Mobility adapting



	RADAR	CAMERA	ULTRASONIC	LIDAR
Range of Detection	Short*/Med/Long	Short	Short	Short/Medium
Detection Accuracy	High	Medium	High	High
Detection Resolution	Medium	High	Medium	High
Speed Measurements	Good	No	No	No
Robustness vs. Enviromental Conditions (temperature, dust, etc.)	Good	Poor	Medium	Medium
Dark/Light Independent	Good	Poor	Good	Good
Size	Small*	Small to Med	Small	Large
Cost	Low*	Low/Medium	Low	High

New Architecture ??

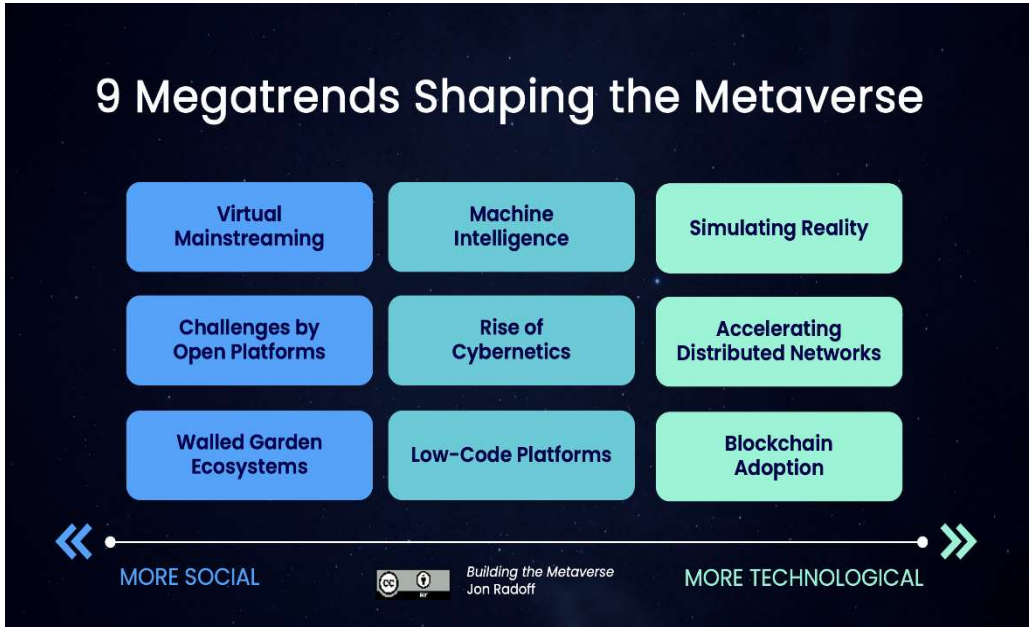
with Cellcubes LCoS

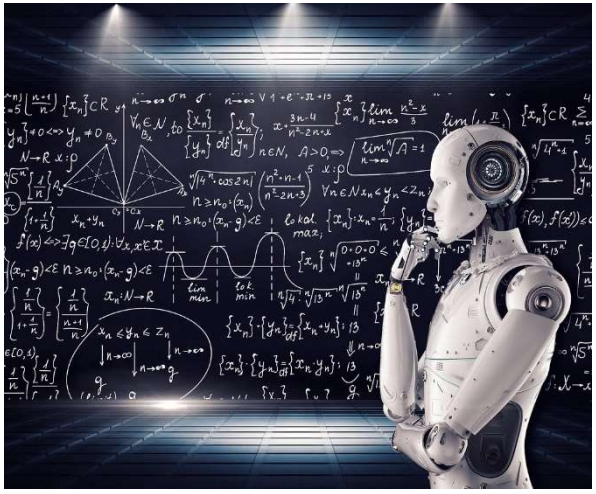
for combined Radar/Lidar solution

MetaVerse Platform evolve

AI-ed Humanoid ??

Roblox blow

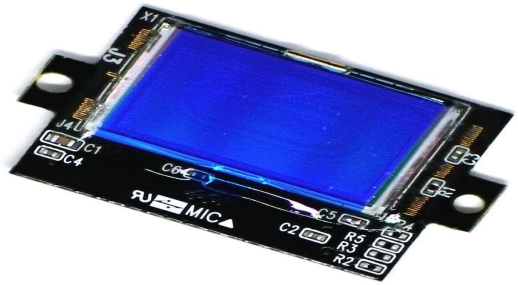




Cell Cubes LCoS Panel 1080P/4Kx2K

1080P

- 1984 x 1144 pixel array
- 120 Frame Per Second
- 12bit Color Depth supporting
- 90.04% Aperture Ratio
- AR/VR/MR/Projector/HUD/ Holography Application



4Kx2K

- 3860 x 2180 pixel array
- 120 Frame Per Second
- 12bit Color Depth supporting
- 90.04% Aperture Ratio
- AR/VR/MR/Projector/HUD/ Holography Application

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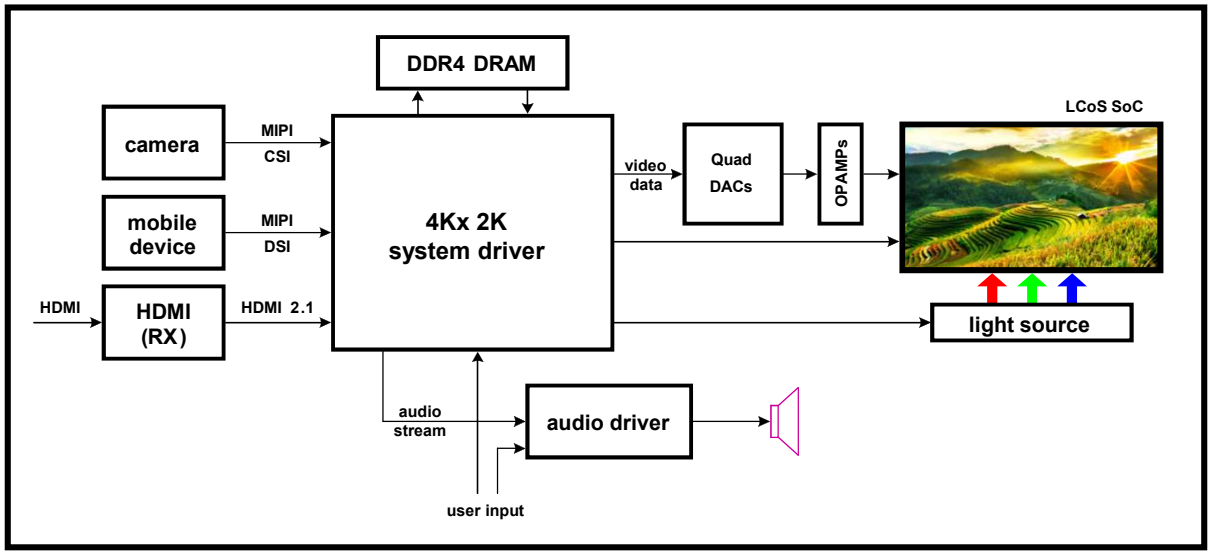
HMD Headset System Features (example)

Input Sensing Features: object detection/recognition:

- Kinetic-Finger sensing: over 4 tips in same time
- Gyro sensing: 9 Axis (9 DOF), support 360 viewing
- 3D camera for pattern sensing, image capturing
- Voice Recognition
- GPS: positioning



Connecting:

- Media Connecting through: 60GHz WiGig, IEEE802.11ay
- Mirroring: WiFi, 5G
- Through Cable: HDMI2.0/2.1 DP1.4/2.0

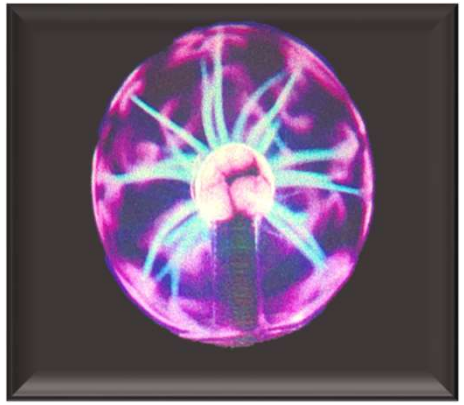
Cell Cubes LCOS Panel Device

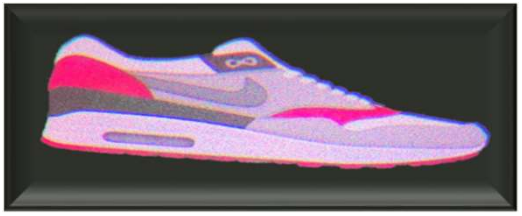
(March 2021)

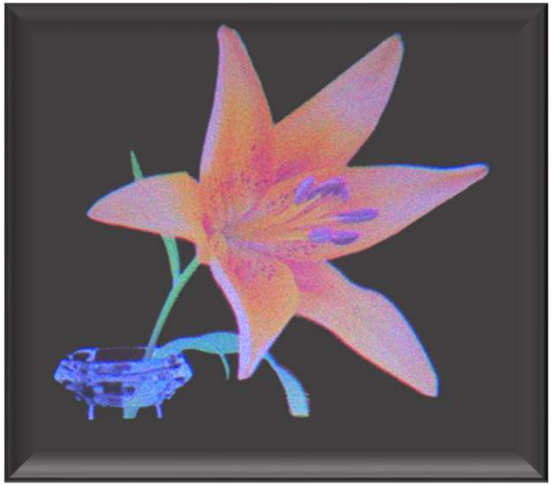
Device	Frame Rate	Imager size	Status	
1080P	120 fps	0.39”	Built	Mass
800P	60 fps	0.27”	Built	Mass
2160T(4K)**	120 fps	0.62”	Built	Mass
2160P(4K)*	120 fps	0.78”	Built	Mass
S1080P	120 fps	0.31”	Develop	design
L1080P	120 fps	0.55”	Built	Mass
4K x 4K *** (LCOS16M)	120 fps	0.81”	Develop	DB
4320P (8K)	60/120 fps	1.25”	Develop	design
1080P	120 fps	0.37”	Develop	DB

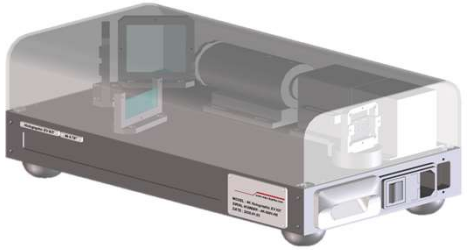
*: world first real 4Kx2K panel
**: world smallest 4K panel with smallest pixel (3.6um)
***: will be highest resolution micro-display in 2021

Hologram Platform with 4Kx2K CGH

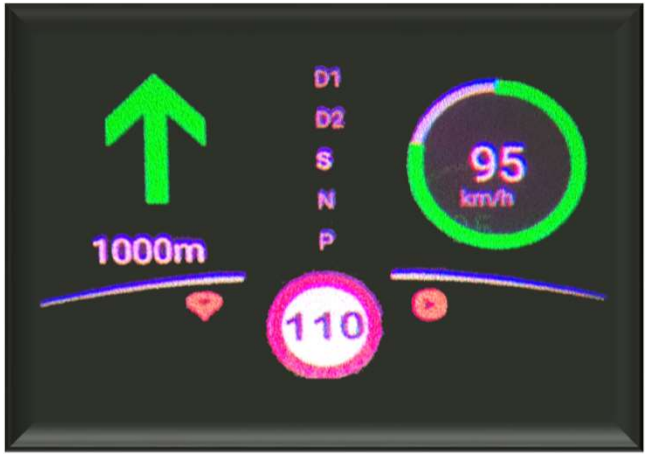








Hologram Engine



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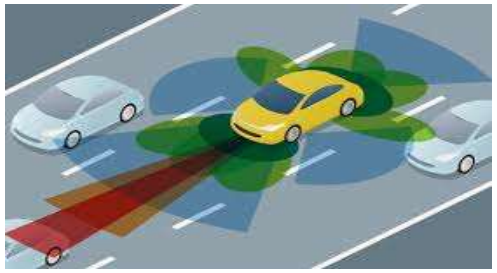
Collaborating Area with ADAS Application



1. As a Solution provider/Component supplying
   - Develop LiDAR solution and Module build
   - Need OEM partner to tier 1 vendor (Automotive/Mobility)
   - Component supply to Module maker

2. Customizing IC component for special customers
   - Media co-processor (edge-processor) for ADAS sensing
   - Light Telecom solution for 6G/Satellite/Drone Telecom
   - Optic communication engine with laser module

Possible Co-Developing Product Area

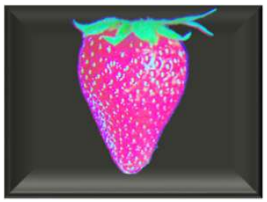







1. Set solution build for AR/VR/XR/Projector/Hologram/HUD:
    - Micro Display LCOS panel with optic engine: 8K-4K/10K-10K
    - Display Driver SoC : 120fs/Special DP-HDMI cable
    - Display-Media Connection Co-processor IC build: custom AOC / Wi-Gig
2. Contents Maker / Service Carrier
    - Dedicated contents with 120fps/12bit Color Depth
    - Service bundle with OEM Product
3. Key Component Supplier for 6G/Satellite/Drone Telecom
    - WSS with system SoC for RoadM Module
    - Optic communication engine with laser module

Thank you



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