



SUNNY OPTICAL TECHNOLOGY (GROUP) COMPANY LIMITED

舜宇光學科技（集團）有限公司

(Incorporated in the Cayman Islands with limited liability)

(Stock Code: 2382.HK)

Corporate Presentation

Investor Day

June 2022

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Agenda

1

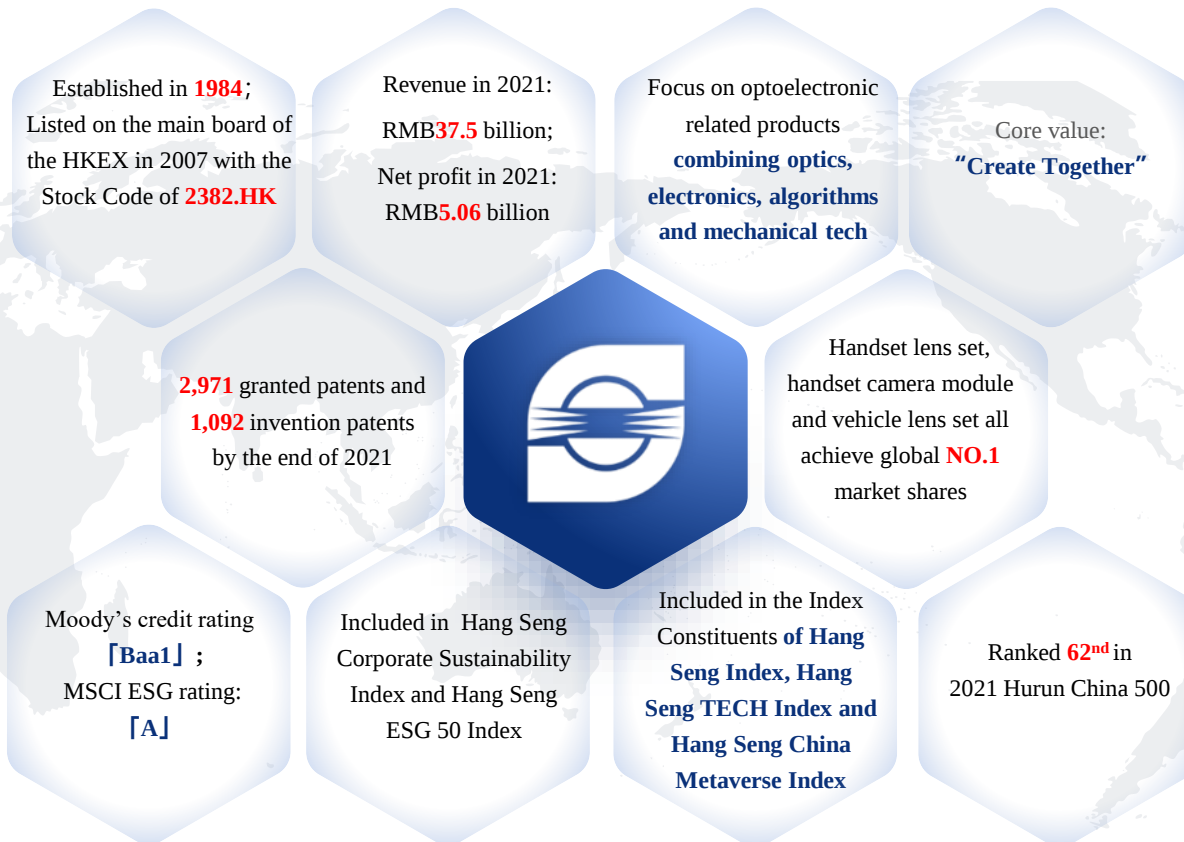
Company Overview

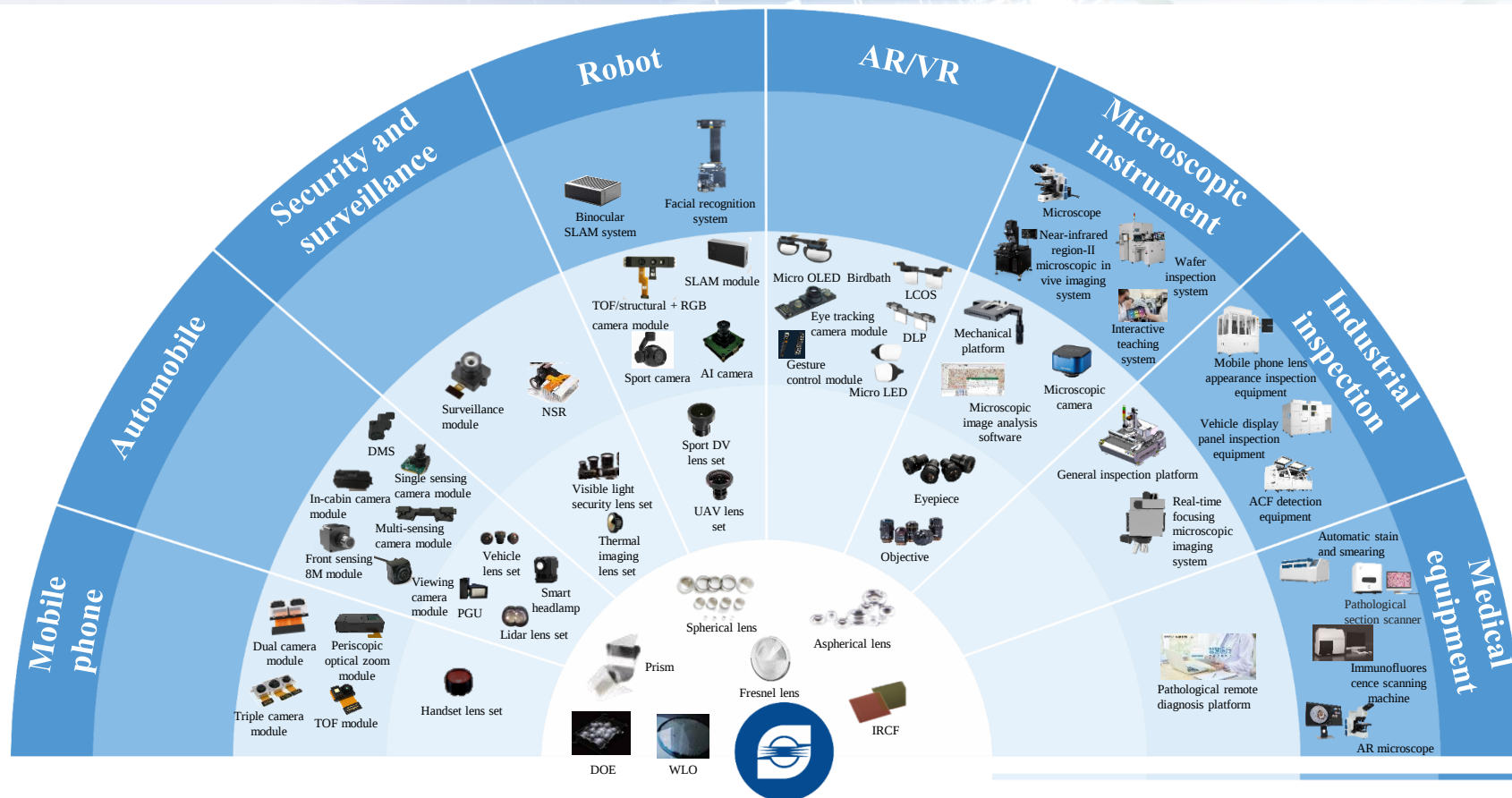
2

Market Trends & Opportunities

Company Overview

The background of the slide is a light blue gradient. On the right side, there is a large, complex graphic consisting of concentric circles and radial lines, resembling a technical drawing or a stylized eye. A bright white light source is at the center of these circles, creating a lens flare effect. The overall aesthetic is clean and professional, with a focus on optics and technology.





R&D Centers and Production Bases



Production Base



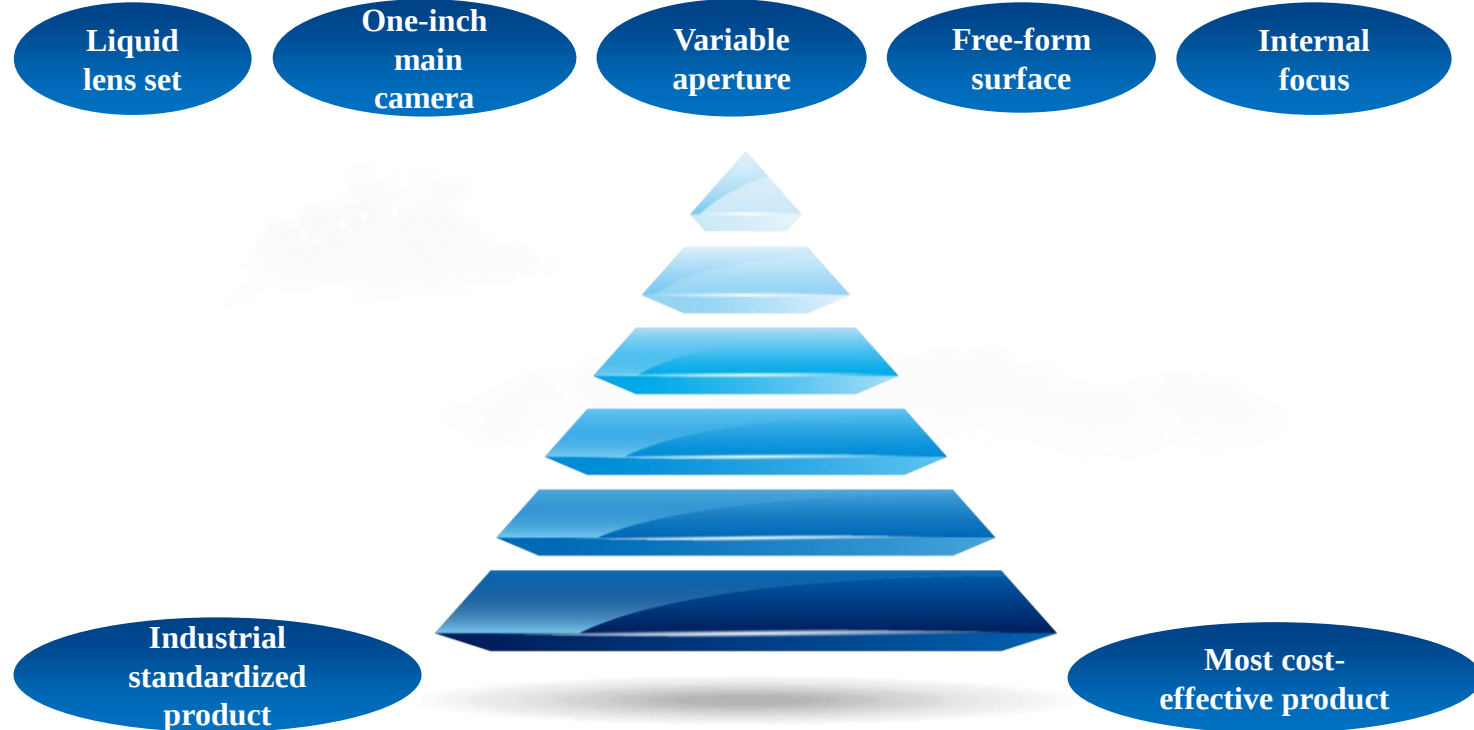
R&D Center





坚定不移实施名配角战略 共同创造 打造驰誉全球的光电

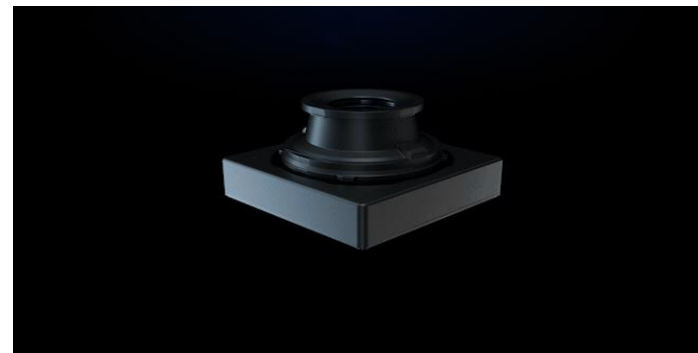
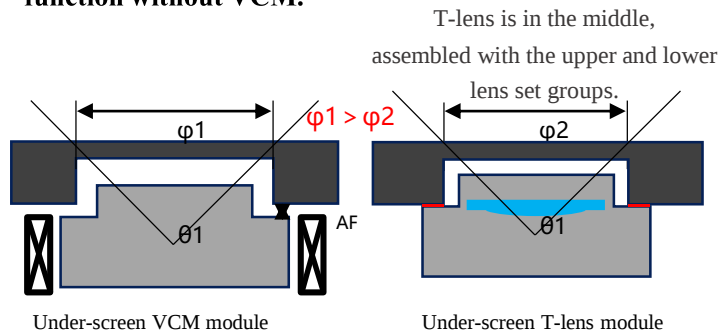
Market Trends & Opportunities



- ◆ Sunny Optical's comprehensive product layout is capable of developing the most difficult and cost-effective products in the industry for customers.

T-lens to achieve AF function

In our existing small head design solution, adding T-lens between the upper and lower groups can realize the front AF function without VCM.



T-lens application highlights

- Extremely fast focusing
- Small size modules
- Panoramic deep shooting

Advantages



no gravity



no magnetic
interference



low power
consumption



clear panorama



fast focus

Disadvantages



high cost

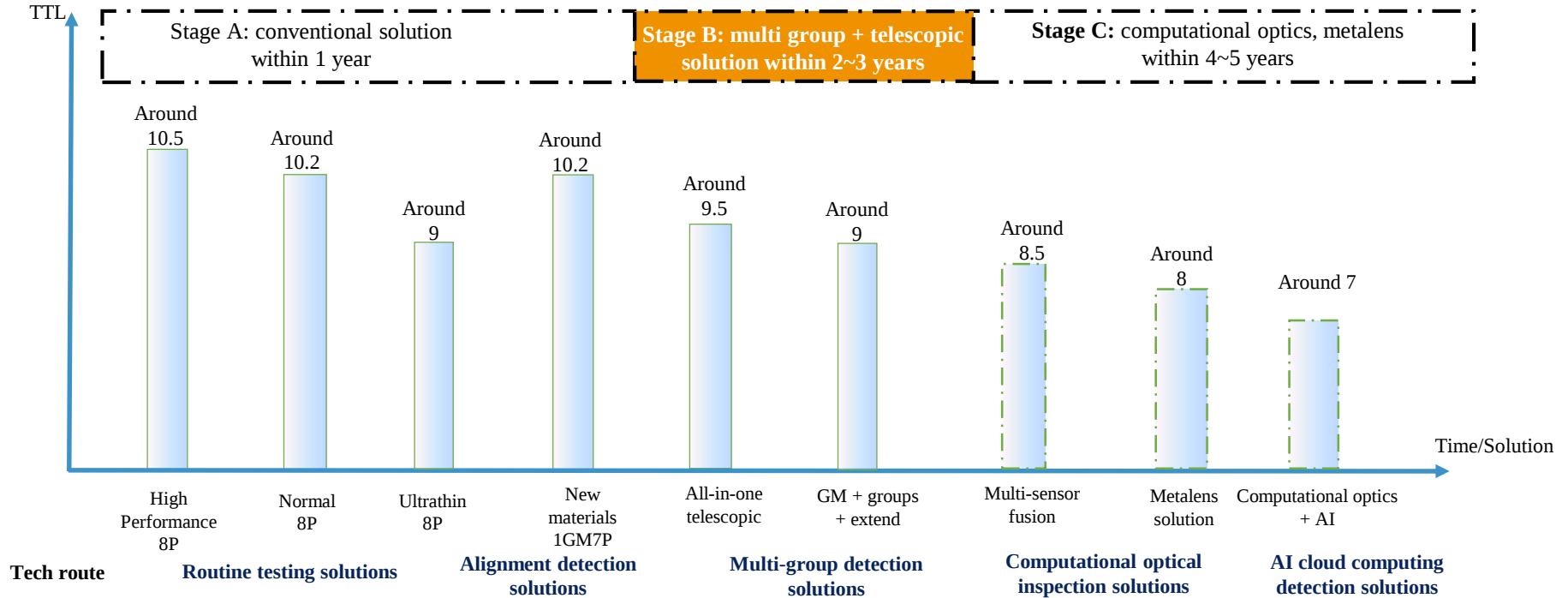


height
increase

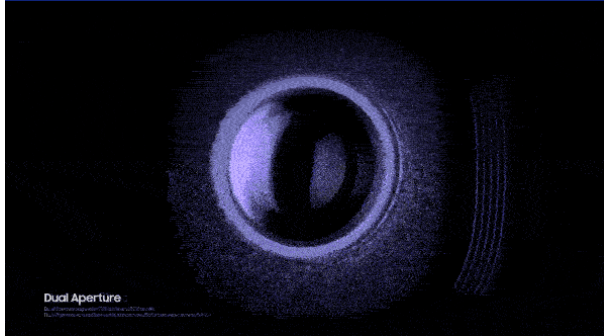


high
reflectivity

Stage A: reduce TTL by using conventional multi-P and sacrificing performance; **Stage B:** introduce new materials such as GM to balance performance to reduce TTL ; **Stage C :** combine the industrial chain and AI computing to balance performance to reduce TTL



Mass production models



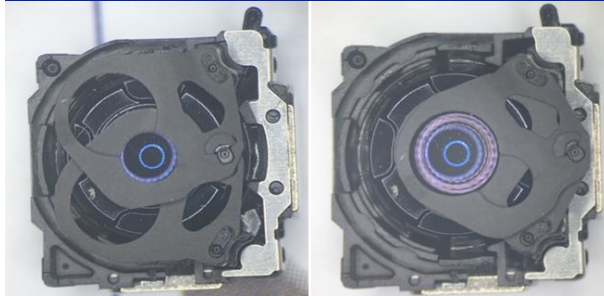
Location shooting



F1.5

F2.4

Variable aperture structure



【Principle】 : Electromagnetically driven mechanical shading plate is used to realize the amount change of light entering the lens set, so that the aperture can be selected between $f/1.5$ and $f/2.4$.

【Advantages】 :

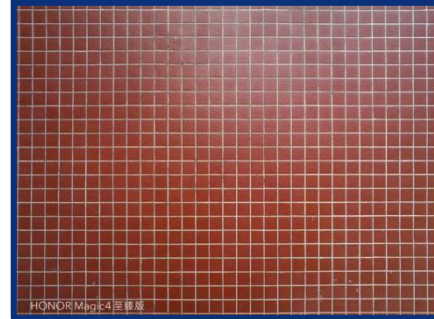
1. Low light: Large aperture increases the amount of light entering.
2. High light: Small aperture avoids over-exposure and gets more details.
3. The combination of software and hardware reduces the image quality loss caused by algorithm optimization.

Conclusion : Achieve shooting in more complex lighting environment and narrow the gap between mobile phones and professional cameras, so as to provide users with a better shooting experience.

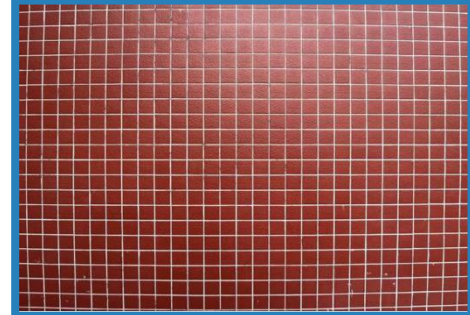
Freeform super wide-angle lens set – location shooting



Freeform Wide-angle Distortion



Normal Wide-angle Distortion



Highlights: The application of free-form surfaces can basically eliminate the distortion caused by ultra wide-angle shooting.

Outer focus



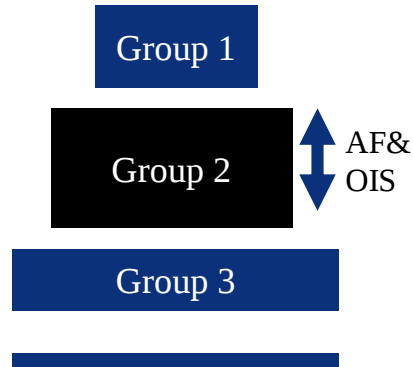
Internal focus



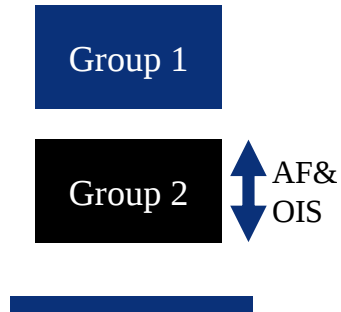
Advantages of internal focus :

- ❑ Distance of the internal focus is significantly shortened, and the focus is faster;
- ❑ (Tele lens) can focus on a closer object, and the magnification can be larger; and
- ❑ The lens can be driven by more driving methods.

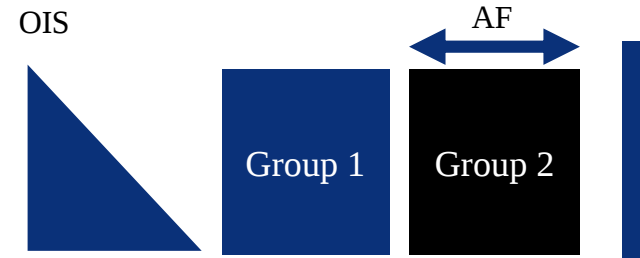
➤ Front or main camera



➤ Upright telephoto



➤ Periscope telephoto



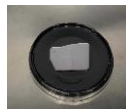
Fresnel
optical elements



Aspherical
optical elements



AR optical
waveguide



◆ Rich experience in the design and production of VR large lens optical elements, covering the current mainstream VR near-eye display solutions such as aspheric and fresnel. In terms of AR optical waveguide applications, we provide customers with a complete set of services including product design, plate making, mass production and testing.

Gesture recognition
lens set

- Monocular RGB/ Multi-ocular
- Global shutter
- Wide-angle HV FOV
- Infrared visible confocal



Eye tracking lens set

- Customized IR lens set
- Ultra small size, short TTL

Perspective lens set

- High pixel, high resolution
- Wide angle, low distortion

Scene
positioning lens set

- Fisheye wide-angle solution
- G+P (GM+P)
- Improve positioning accuracy at high temperature

◆ Actively cooperates with customers to develop customized interactive lens set solutions, which can enhance the interaction accuracy of VR products with excellent optical effects.

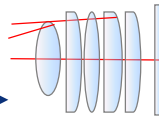


Flying glasses



2E elements

High image quality
small distortion



5E elements

HD main camera



1/2"

More main camera
specifications



Large image size
Large field of view

Obstacle avoidance
system



Binocular solution

Reduce module
weight to enhance
endurance ability



Fisheye lens set

- ◆ Provides multi-lens components, large image size, and large field of view lens set solutions based on excellent optical design in the field of UAV platform.



Visual system



Wide angle
single/binocular

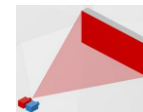
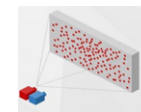
Increased FOV



Fisheye single/binocular

SLAM system

3D modeling



Main camera
system

Security
integration



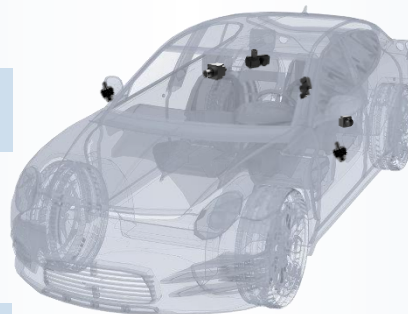
- ◆ Has developed single/binocular fisheye lens sets, SLAM lens sets in the field of smart sweepers, and provides comprehensive optical lens set system for future home security integration.

Sensing Camera module

Resolution	1M	1.7M	2M	3M	5M	8M
Single	√	√	√			√
Dual	√		√		√	√
Surround Sensing			√	√	√	√

Sensing + Viewing Camera module

Resolution	2M	3M
E-Mirror	√	√
CMS	√	√



Viewing Camera module

Resolution	1M	2M	3M	others
Surround View	√	√	√	
Rear View	√	√	√	
Carlog				√

In-Cabin Camera module

Resolution	VGA	1M	2M	5M
DMS		√	√	
OMS			√	√
TOF	√			

- ◆ Different product designs are planned and implemented based on different scenarios, and four product lines are laid out to provide all visual solutions required by automobiles, so as to provide high-value and highly reliable products and services to Tier1 and automobile enterprises.

Global Partners and Clients of Vehicle Camera Modules



- ◆ We closely cooperate with world-renowned platforms, algorithm and solution partners in terms of ecological cooperation; Our camera modules passed the qualifications of mainstream platforms. Meanwhile, we cooperate with algorithm and solution partners to develop high-value solutions.

- ◆ Our customers are from Europe, America, Japan and South Korea, as well as traditional auto companies and new EVs in China. Based on our own high-value products, we serve globally well-known Tier1 and auto companies. In 2021, there were more than 10 designated and mass production projects of 8M sensing modules and we were the first one to start mass production in the world.

Thanks!





Key Words and Countermeasures of 2022 Overall Smartphone Market

- Affected by global pandemic, overseas regional wars, global inflation and weak consumption, the 2022 overall smartphone demand has declined significantly. The Company expected that 2022 global smartphone shipment will decline by **7.9%** to **1.22 billion** compared to 2021, **10.9% decrease** compared to the original forecast at the beginning of 2022.
- 2022 China smartphone shipment will decline by **16.9%** to **260 million** compared to 2021, **17.1% decrease** compared to the original forecast at the beginning of 2022.
- Affected by Russia-Ukraine War, 2022 Europe smartphone shipment will decline by **15%** to **170 million** compared to 2021, **19% decrease** compared to the original forecast at the beginning of 2022.
- In other areas including North America and South America, India and Indonesia, Asia Pacific, Africa etc., the smartphone shipment will decline by **2.6%** to **790 million** compared to 2021, **6.6% decrease** compared to the original forecast at the beginning of 2022.
- **Foldable Smartphone** becomes a market trend with intensive release, along with ultra thin cameras; high-end smartphones focus more on **the experience of great image performance**.
- The weak demand, intensive market competition and other factors result in **higher cost pressure**. The configuration and specs of phone cameras appear to be degraded; and **average number of cameras per phone continues to decline**.



Key Words and Countermeasures of 2022 Overall Smartphone Market

Target: Continue to Improve Profitability

- Give full play to technology advantages & product innovation; increase domestic customer stickiness; enhance business development of overseas customers
- Enhance the R&D & MP capabilities of core actuator components (including OIS); enable the integrated design of Lens, Actuator and Module; strengthen the capability of systematic integration of camera module products
- Give full play to the advantages of scale, and continuously improve the cost competitiveness of products
- Further enhance the global supply capability by large-scale operation of international benchmark factories in Vietnam and India
- Continue to promote the construction of factory digitalization and intelligentization
- Develop and expand product lines in XR and AIoT areas by leveraging technology advantages, speed up the strategic planning and development in new business



Upgrade Trend of Next Generation Products

1 Inch Sensor



1/2" Sensoer 1" Sensor

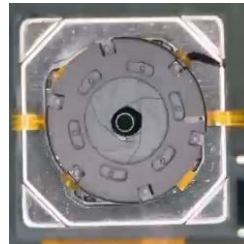
Chip performance improves with higher signal-to-noise ratio and dynamic range. Product upgrades towards APS-C and full frames.

Hybrid OIS



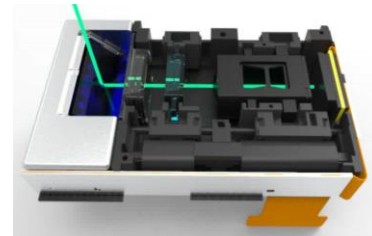
Lens & Sensor Hybrid OIS can provide better stabilization effects (and larger angle) to fulfill the needs of sports imaging, video etc.

Variable Aperture



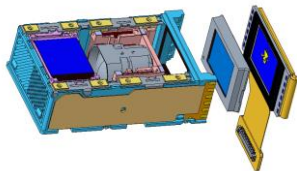
Extremely large aperture captures more lights. Variable aperture can cover multiple photography scenarios to achieve great image performance.

Cont. Zoom



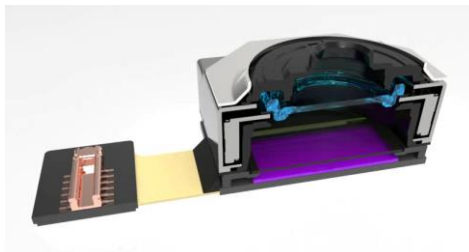
Optical zoom evolves towards continuous zoom; large image size started to be applied; smartphone camera replaces digital camera.

Large Image Size for Portrait



Portrait photography pursues more & more extreme image performance; large image size product with optimized zoom could further improve portrait photography experience.

Lens Element Focus



Renovation from "Lens focus" to "Lens Element focus" to improve the focus accuracy, and significantly optimize the optical performance in different shooting distance.

Ultra-Thin

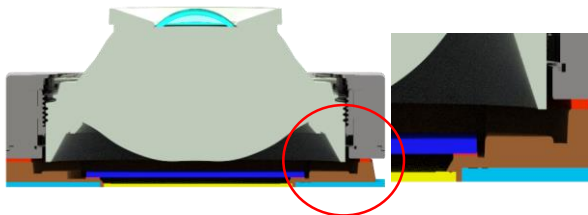


Ultra-thin product will better fit the extreme size requirement for foldable phones while keeping good image performance.



Core Platform Technologies

Molding Packaging



Advantage:

1. Module **height reduction > 0.37mm**
2. Especially for sensor format > 1/1.3", molding enables module height reduction, thus benefit smartphone thickness reduction
3. Better heat dissipation, **3°C cooler** than COB

Sunny Capability

1. Pioneered the mass production of highly reliable modules in industry;
2. Pioneered the development & mass production of the thinnest CMOS packaging solution.

High-precision Optical Assembly



Advantage:

Multiple optics alignment at sub-micron level with contemporary adjustment of the key optical performance indicators including Peak, Tilt, FC etc.; breakthrough in the optical system's assembly tolerance, and enable the MP of complex optical systems of camera module

Sunny Capability:

1. **MP of Lens-element focus, G+P hybrid lens etc.**
2. **MP of 1/1.12" and other extremely large image size;**
3. **MP of FNo1.4 and other larger aperture;**
4. **MP of high X zoom periscope camera, with multi-lens and multi-group optics high-precision assembly capability.**

High-precision Actuating



Advantage:

Integrated design of Actuator-Lens-Module to enable smaller size, better performance, fewer components, competitive cost etc., boosting the continuous innovation of module design & manufacturing.

Sunny Capability:

1. **Integrated design capability** of optical, mechanical, electric systems;
2. Over 250 patents; successfully developed **OIS** actuator with **independent IP**;
3. Highly integrated and full-automated **assembly line** for **MP**.

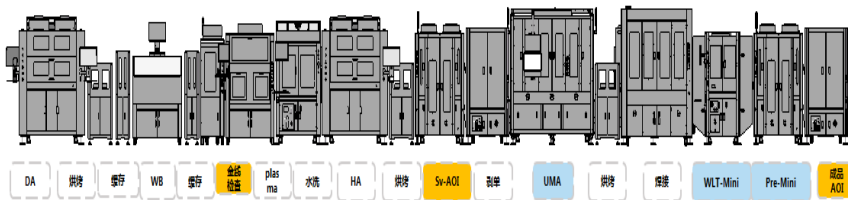


Process Capability

CAT Line (Close Loop Assembly & Testing Line)

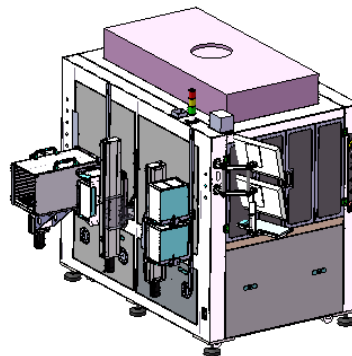
- ① 1st industry initiative of **fully integrated module assembly & testing line**; enable COB-AA-Testing fully connected production, Lead time reduction > 50%, UPPH improvement > 30%
- ② **Self-developed intelligent close-loop software system**, enabling self-feedback & correction production, with yield improvement by 0.8%
- ③ Widely applied in **mass production**: over 10 lines

Carrier transfer



SV-AOI (Automated Optical Inspection)

- ① Fully automatic loading & unloading to reach **full appearance inspection** of modules
- ② Self-developed visual inspection algorithms, leading inspection capabilities in the industry
- ③ **Widely applied in mass production**, coverage rate $\geq 90\%$ in process inspection





Process Capability

UMA

(Ultra Multi Assembly)

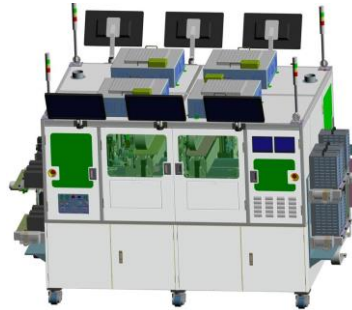
- ① 1st industry initiative of UMA packaging technology with **both optical & mechanical assembly capabilities** which takes lead in industry
- ② UPH > 1400, efficiency improve 200%
- ③ **Widely used in mass production**



OLW-mini

(Online Welding)

- ① **Online automatic welding device, higher process integration (N→1)**
- ② Self-developed visual inspection algorithm, leading inspection capabilities in the industry
- ③ Widely used in mass production



OIS-Mini

- ① OIS module, **1-stop correction and testing solution**, enabling the correction and testing integration of multi-direction/function/testing item
- ② UPH > 600, **efficiency improve > 300%**
- ③ **Widely used in mass production**



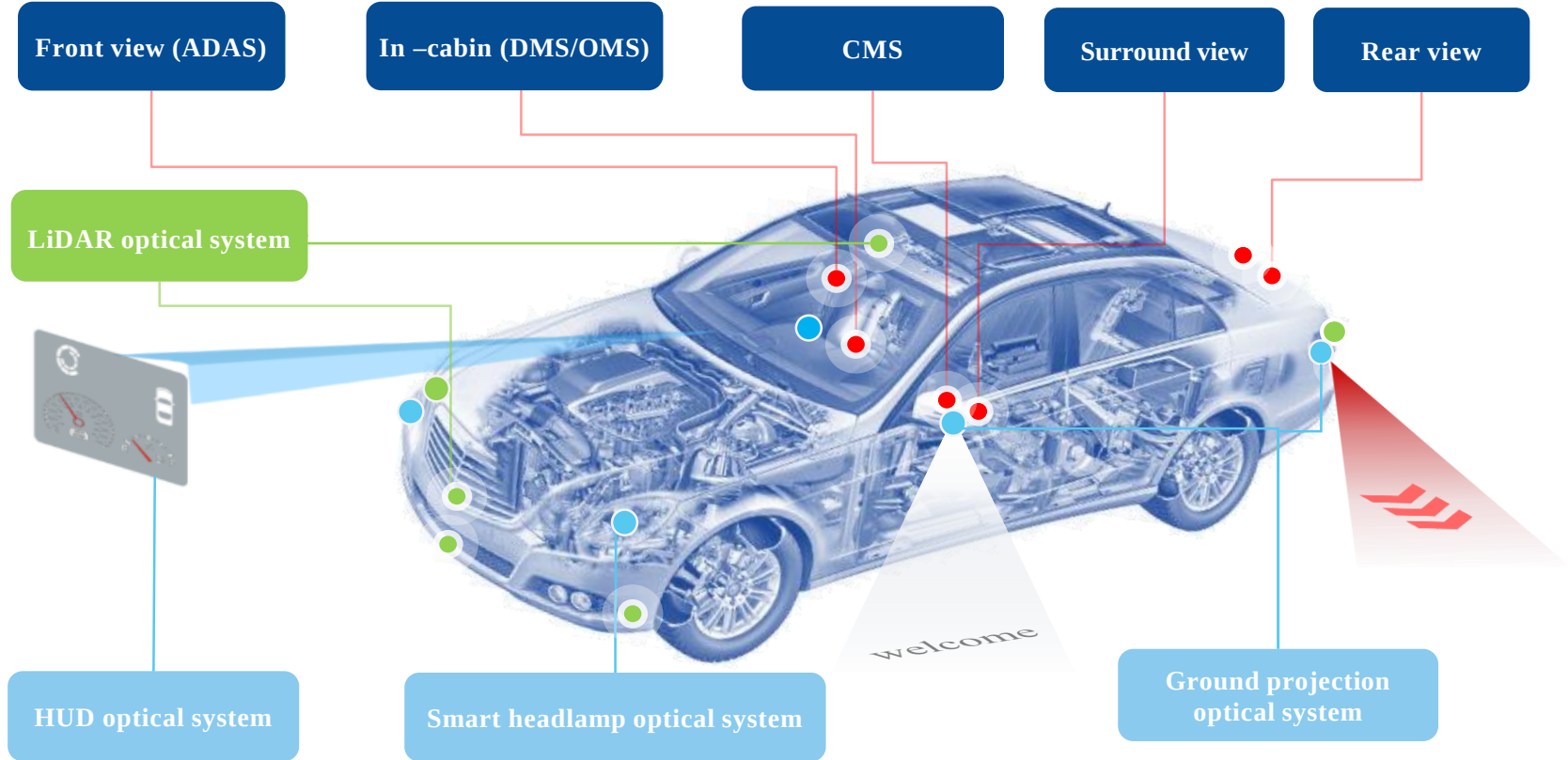
Thanks

www.sunnyoptical.com



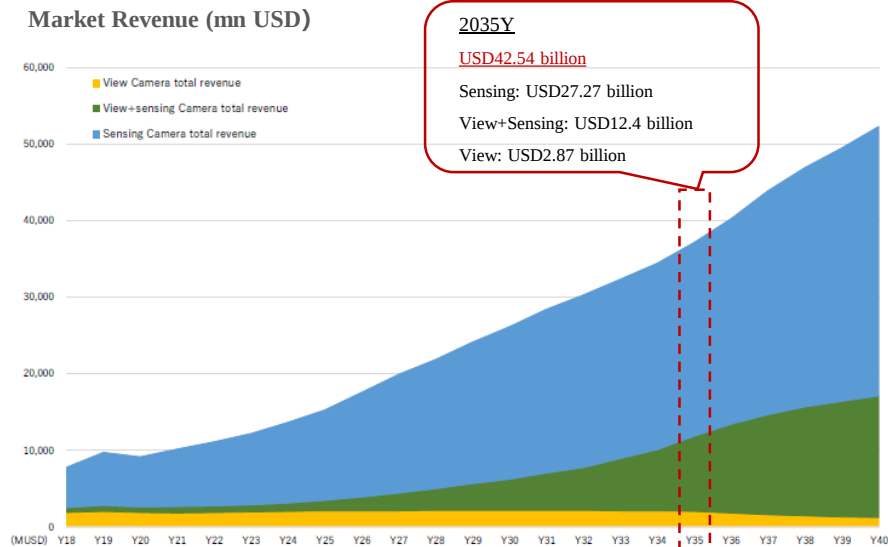
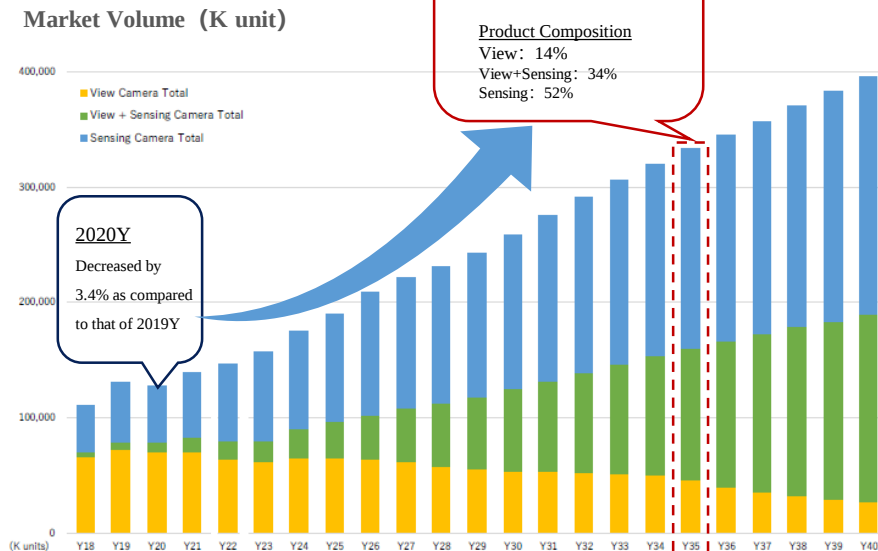


Rapid Progress of Autonomous Driving & Huge Potential in Optical Applications





1. Attractive Opportunity in Global Automotive Camera Market



(Source: 2022Y TSR Automotive Camera Report)

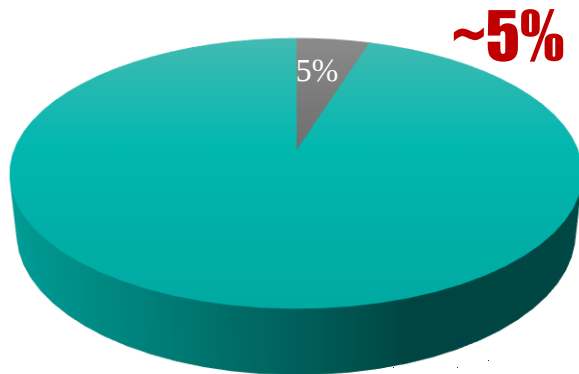
- In the automobile market, the global new vehicle sales in 2021Y only increased by approximately 4.0% as compared to that of 2020Y, and the global automotive camera market increased by 10.2% as compared to that of 2020Y. The shortage of chips in the supply chain became the major factor to restrict the recovery of the global automobile market. However, the rapid rise of new energy vehicles and the continuous iteration of autonomous driving technologies further boosted the development of ADAS and autonomous driving systems and the higher requirements on the number and specification of cameras on single vehicle. Sunny is actively responding to the market changes and continues to seize the opportunities in high-profile products. Sunny's growth is expected to far exceed the market's average growth rate and will maintain No.1 in the vehicle lens sets field and rise further.
- In the next 15 years and more, the automotive camera market will sustain the growth and the sensing camera market will become a main driving force in automotive camera. Sunny will continue to make efforts in sensing camera products and will increase the market share continuously in the future.



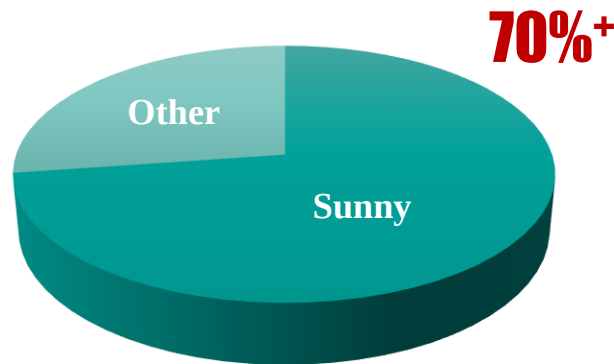
1. Cooperating with New EVs & Maintaining a Leading Market Share

- Sunny supports world-renowned new EVs, including but not limited to new energy vehicle OEM, internet giants, technology companies, travel service providers, etc. and supplies popular new energy vehicle brands.
- Sunny is cooperating actively with major new EVs and has been the No.1 in terms of the vehicle lens sets shipment among the Chinese new EVs with a market share of over 70% in 2021Y.

2021Y Vehicle Lens Sets Shipment from Global Major New EVs



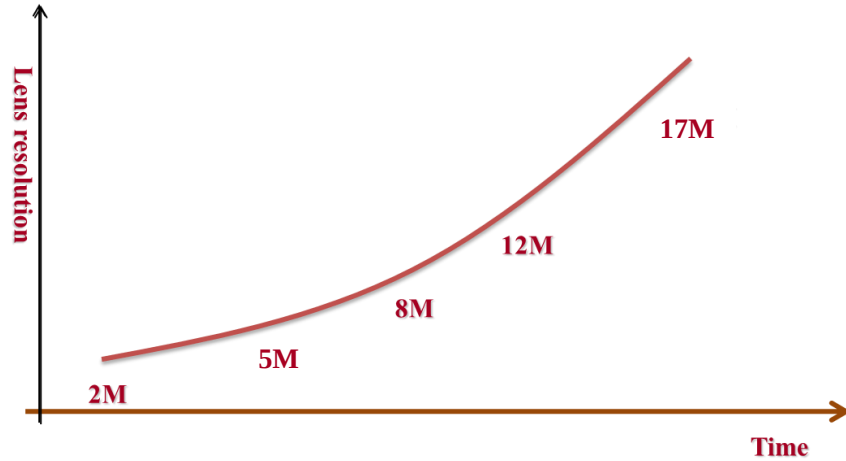
2021Y Sunny's Vehicle Lens Sets Shipment in Major Chinese New EVs





1. Continuous Micro-innovations & Technology Accumulation

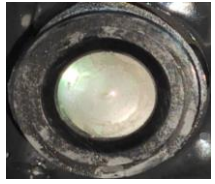
1. The **resolution** of the vehicle lens sets will be getting higher, in order to view cleaner and further.
2. The requirements for **active anti-environmental interference** is higher.



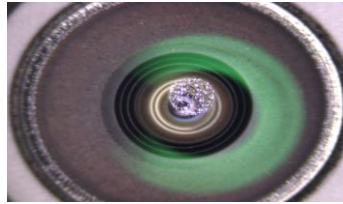
Foul environment



Rainy days



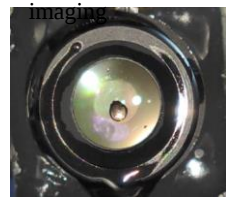
Ensure clear imaging



Fog
(Water mist)



Frost



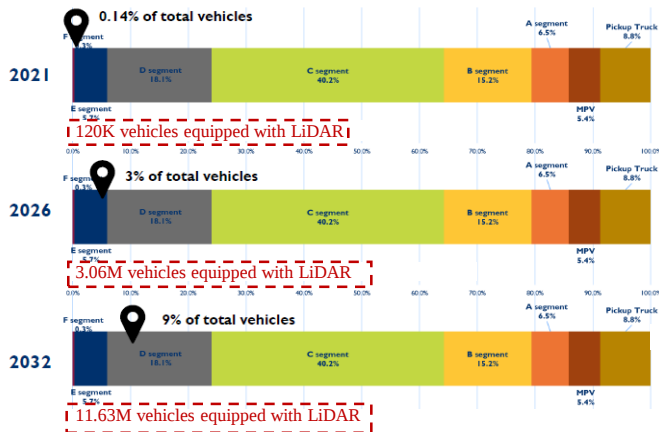
Water droplets

- Vehicles will identify and judge by itself with the development of autonomous driving technology in the future. Automotive cameras need to capture more dynamic images and details accurately and require stronger anti-interference ability of automotive lens, such as how to clearly see the roads and pedestrians by cameras in the rainy or the foul environment conditions.
- Sunny will consider various problems such as abrasion-resistant, self-cleaning and waterproof from the application point of view.
Sunny successfully **developed the hydrophilic coating** to solve the problem of small water droplets on the lens surface. Meanwhile, Sunny **initiated ADAS vehicle lens sets with the automatic defrosting and demisting functions to guarantee the high imaging quality** and has obtained level 3 to level 4 autonomous driving platform-based projects from various automobile manufacturers.



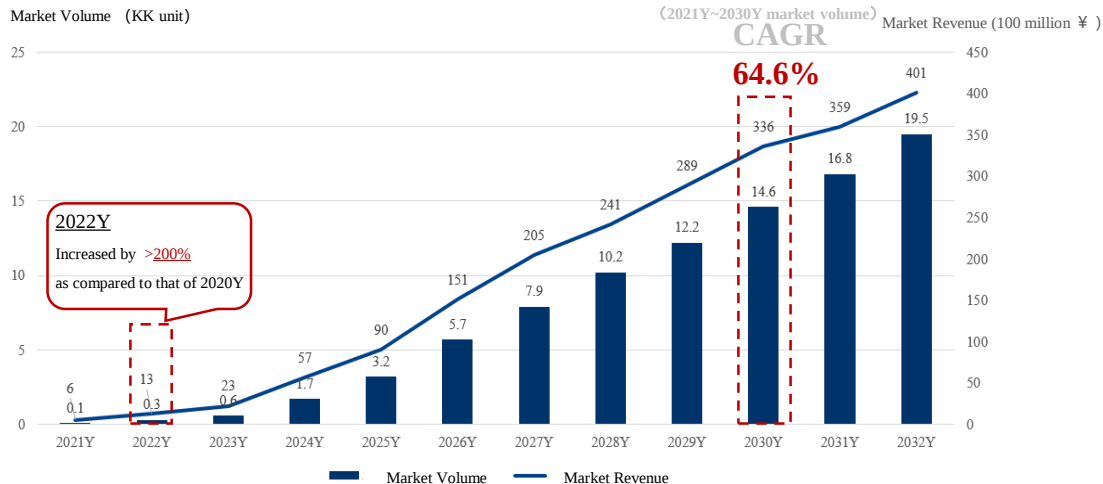
2. Attractive Opportunity in Global Automotive LiDAR Market

LiDAR adoption prediction (%)



(Source: 2021Y Yole LiDAR Report)

Global Automotive LiDAR Market Forecast



- Driven by traditional carmakers and new EVs in China, the market volume of LiDAR is expected to increase from 2021Y and LiDAR is gradually becoming the standard configuration of EVs. Numerous vehicle models equipped with LiDAR will be available in 2022Y and LiDAR mass production will enter into a intensive period during 2022Y-2025Y. After 2024Y, the vehicle models with LiDAR will penetrate from high-end segment to mid- to low-end segment. In the next 10 years, LiDAR market will have a broad growth prospects.
- Sunny supports **more than 20** global leading LiDAR players and tier-1 customers and has obtained over 20 designated cooperative projects, **more than 10 of which will commence mass production in 2022Y~2023Y**. Among 35 models with LiDAR currently released in the market, Sunny has **provided product solutions for 21 models**. The Company will improve the market penetration rate in the field of LiDAR in the future.



2. Defining Strategic Positioning & Continuing to Empower LiDAR Customers

- Focusing on module business and providing module design & processing on optoelectronic products or OEM service;
- Supporting China's first LiDAR mass-production project, Sunny first LiDAR module has commenced mass production and supplied to the most popular new energy vehicle brand.

Module design & processing



Transmitting Module



Receiving Module



Transceiver Module

OEM

Mechanical LiDAR



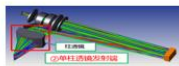
3D Flash LiDAR



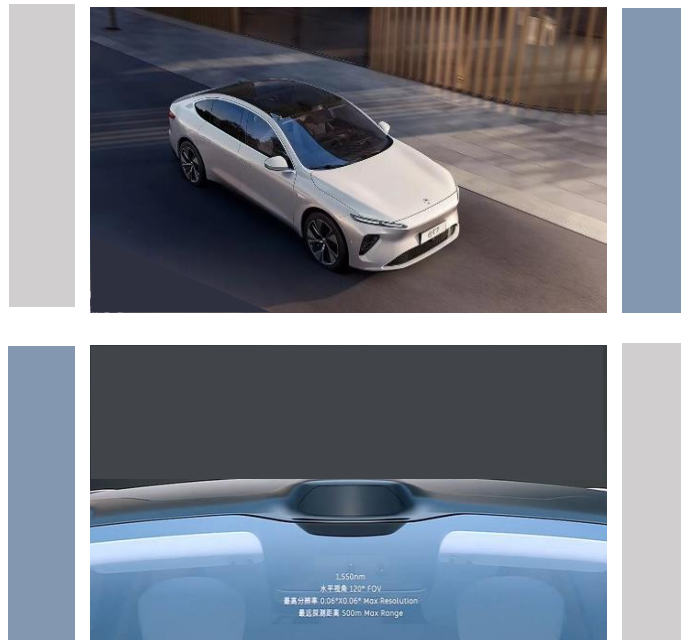
Polygon Scanning LiDAR



MEMS/Galvo LiDAR



Providing OEM service for different types of LiDAR

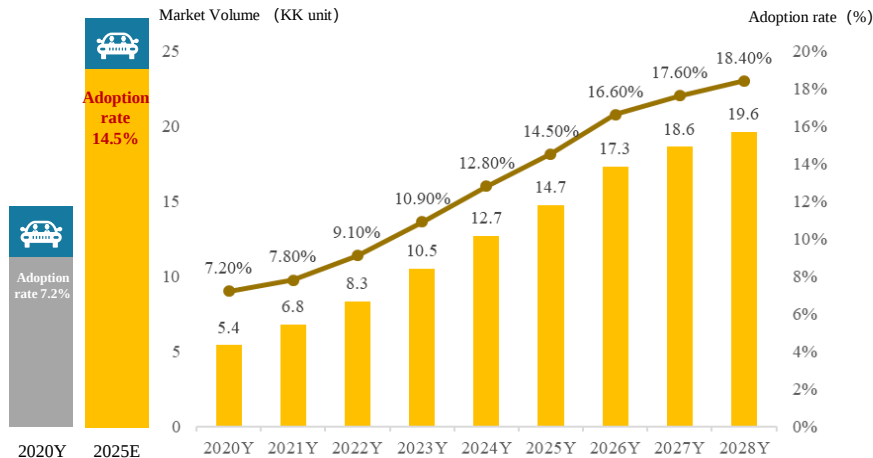


(Photo source: official channel)



3. Attractive Opportunity in Global Automotive HUD Market

HUD Market Forecast



(Source: 2021Y IHS HUD Report)

AR HUD Market Forecast



- HUD market volume and adoption rate will grow continuously during the period of 2022Y-2028Y. This growth is driven by the improvement of HUD technology and the continued expansion of HUD installations by automakers. AR HUD commenced mass production and entered into commercial phase in 2021Y. The global market volume of AR HUD is expected to exceed 1KK units and the market penetration rate will continue to rise in the future.
- Sunny continues to speed up the R&D and market promotion of new HUD products. Sunny has various solutions for HUD core optical engines and has obtained orders from a number of global leading customers.



3. Speeding Up AR HUD Product Diversification & Maximizing Customer Satisfaction

- Providing different PGU solutions for AR-HUD & W-HUD based on customer needs to maximize customers' satisfaction.
- Sunny has obtained multiple HUD projects and supplied new energy vehicle brands and traditional OEM models.

PGU for AR-HUD



DLP PGU
(3030)



DLP PGU
(3030 dual-screen)

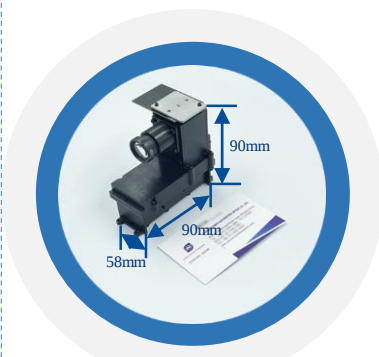


DLP PGU
(5530)

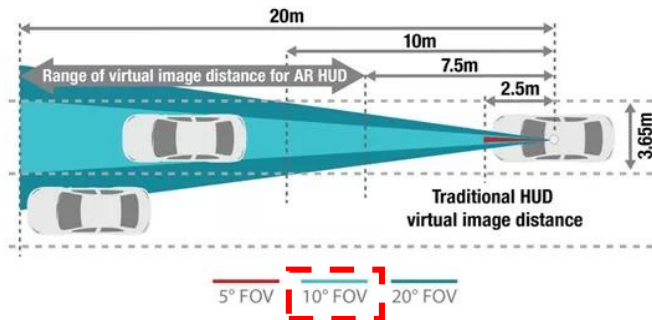


MEMS PGU (LBS)

PGU for W-HUD

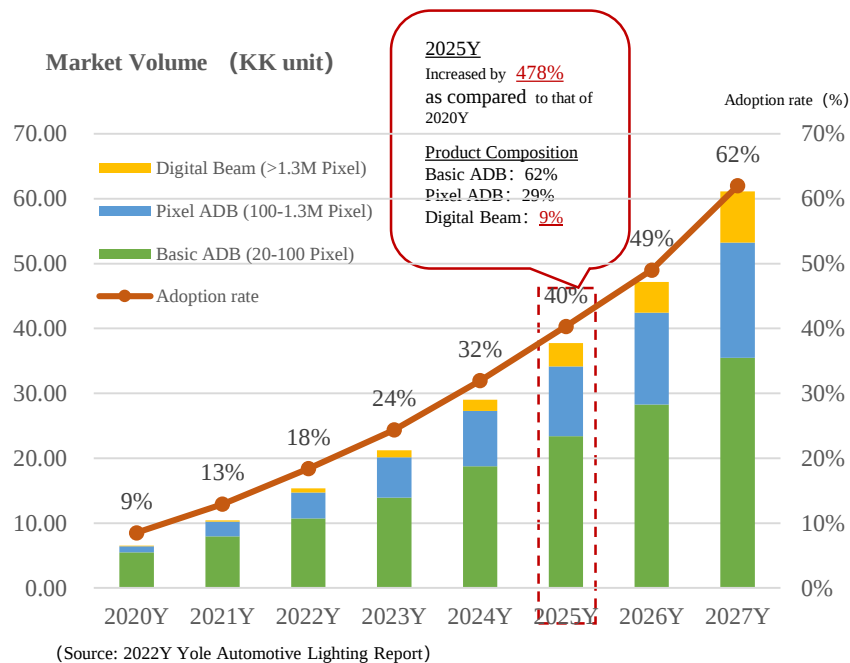


DLP PGU (3020)

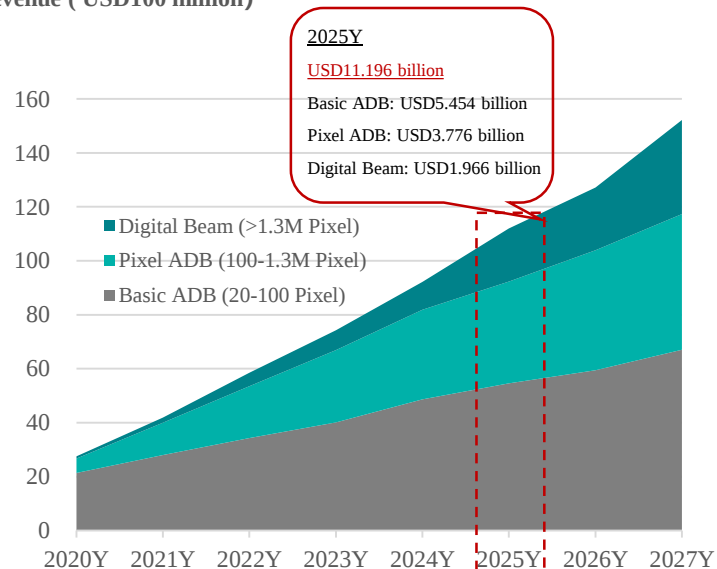




4. Attractive Opportunity in Global Automotive Smart Headlamp Market



Market Revenue (USD100 million)



- Headlamp will gradually develop from traditional lighting to imaging optics which develops towards high resolution and carries more imaging contents with the development of intelligent driving.

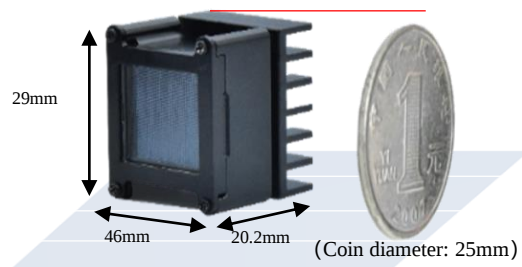
The market demand for smart headlamp is expected to constantly increase in the future and the market volume of high-resolution headlamp is expected to exceed 8KK units in 2027Y.

- Sunny supports global leading automotive lighting enterprises and various smart headlamp products have commenced mass production and supplied to high-end models of well-known brands. Sunny will further improve the market penetration rate.



4. Mastering Advanced Smart Headlamp Technology

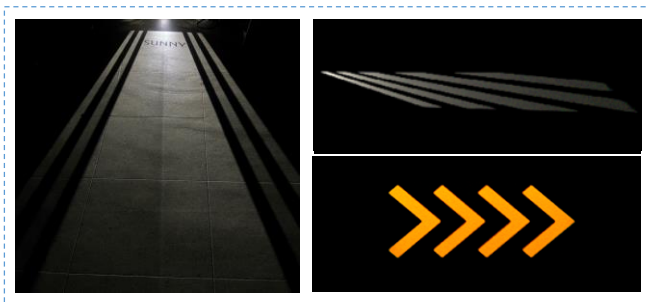
- By expanding the product line of ground projection lamp and successfully developing the industry's first array projection lamp product, Sunny has seized the market opportunity and obtained substantial business opportunities from many tier-1 customers;
- Sunny has obtained designated projects of high resolution smart headlamp (mega pixel), which will commence its mass production by the end of 2022Y and will supply to the high-end model of a well-known brand.



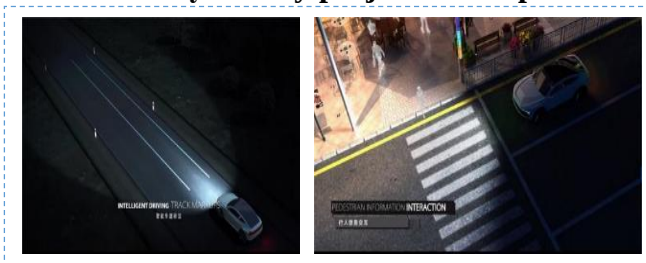
Sunny's array projection lamp



Sunny's core lens sets for various mega pixel projecting modules



The pictures above show the effects of Sunny's array projection lamp

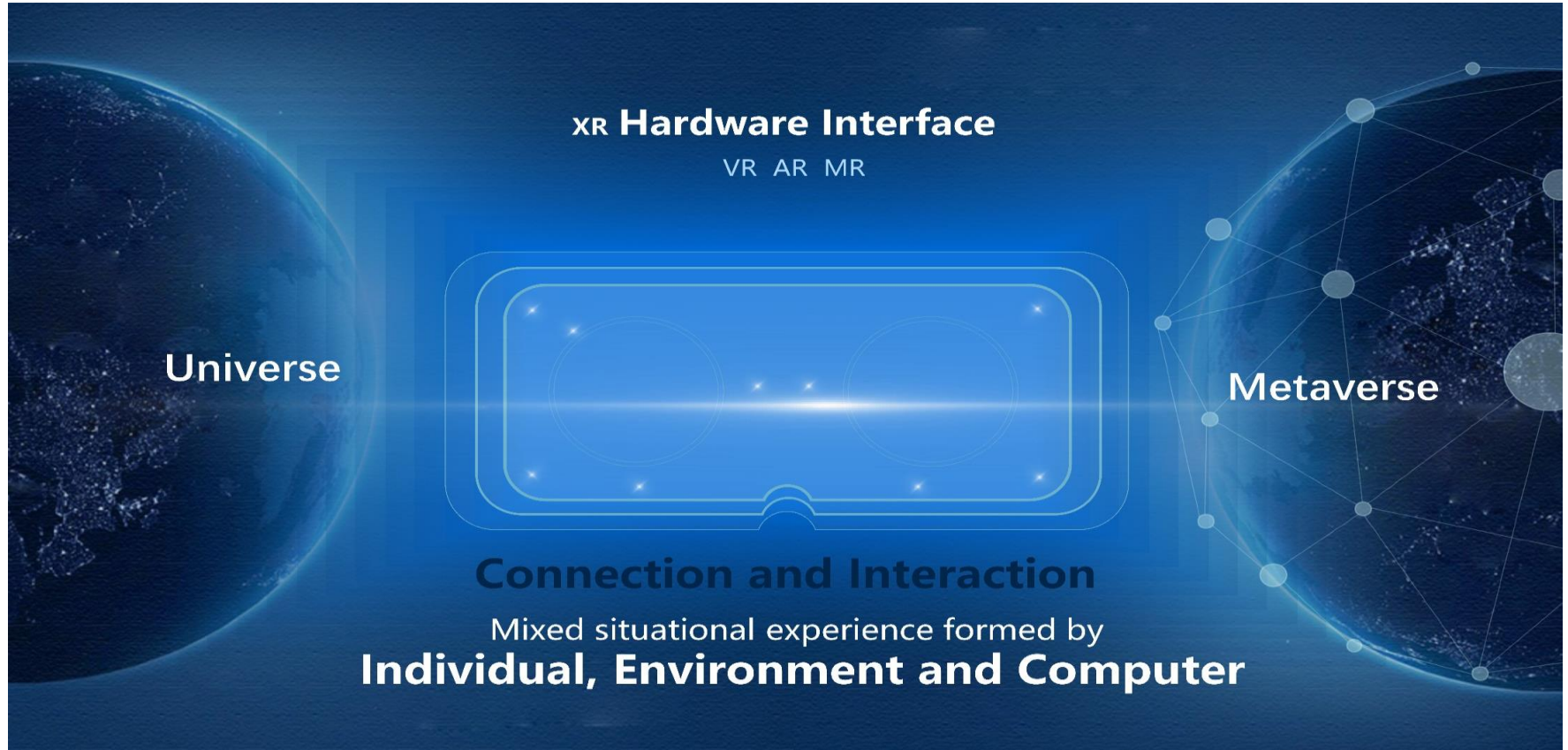


The pictures above show the effects of smart headlight (core parts from Sunny)

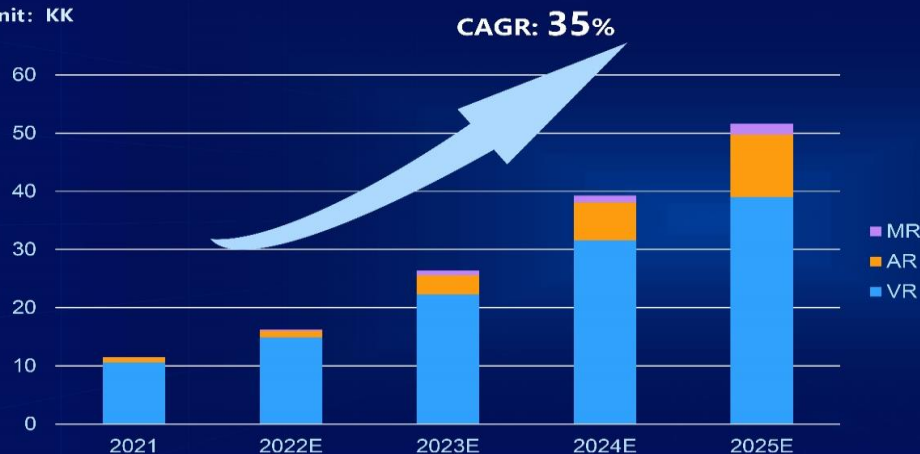
Thanks

www.sunnyoptical.com





Unit: KK



Growth rate of VR terminal

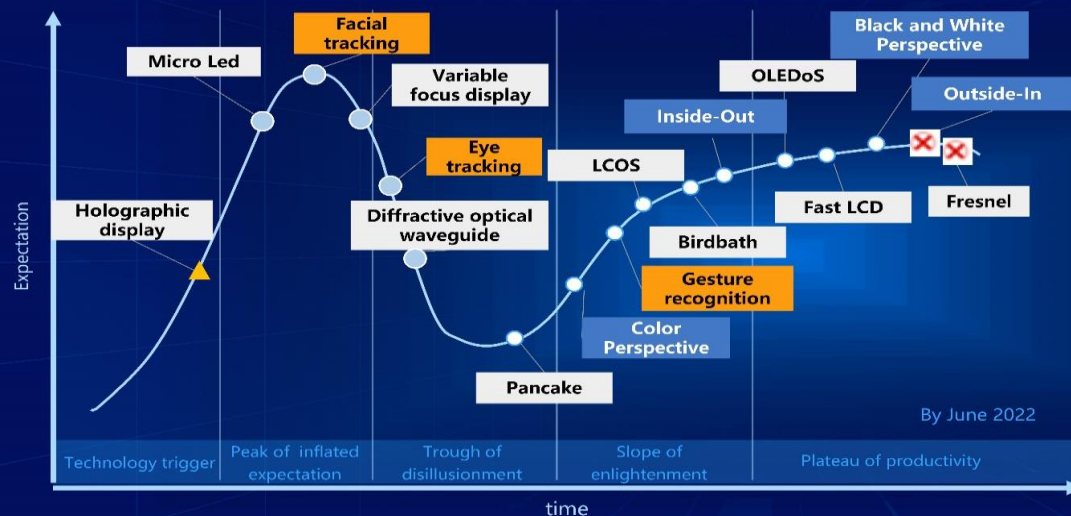
30%

Growth rate of AR terminal

60%

2025
The XR terminal shipment

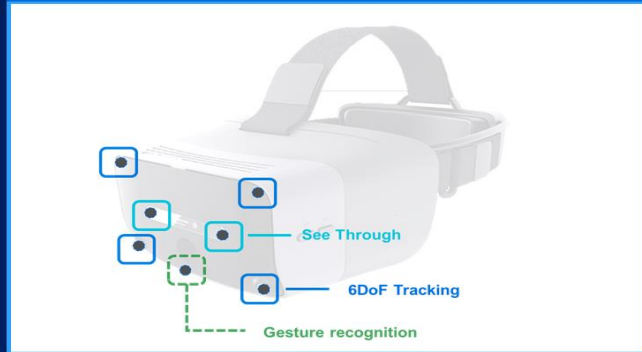
**Exceeds 50 million
Units**



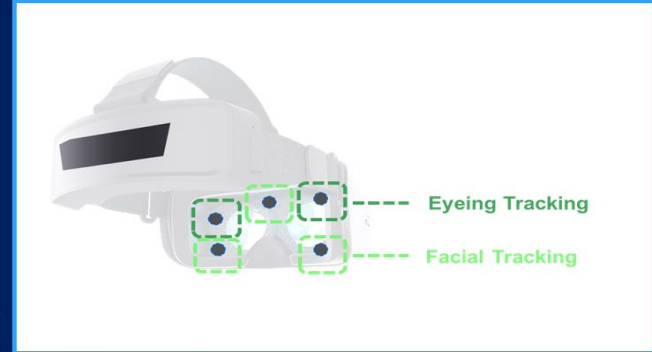
Maturation time: ● <2 years ● 2~5 years ● 5~10 years ▲ >10 years ✕ Obsolete before plateau



Perception



Interaction



Location & Tracking

3 DoF



Camera: 0

Outside-in



Camera ≥ 2

Inside-out



Camera ≥ 4

Mixed-out



Camera ≥ 10

More cameras support millimeter level precise positioning and stable tracking

See Through

Black and White



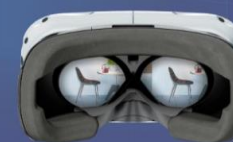
Multiplexed 6 DoF camera

Color



Camera: 1

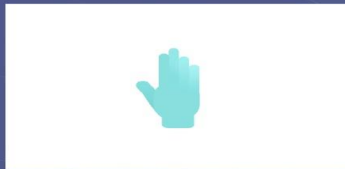
Human eye simulation



Camera: 2

Simulating the human eye's perception and accessing the outside world to enhance the safety level and the sustainability of the experience

Gesture Interaction



2D gesture recognition

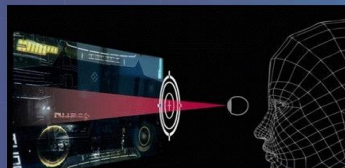


3D gesture recognition

Camera ≥ 1

Cameras (2D to 3D) provide image information to meet the user's strong interaction needs

Eye Tracking



User interface interaction



Fixation rendering

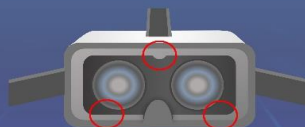
Camera ≥ 2

Eye tracking cameras (miniaturization) located on both sides of the user's left and right eyes

Facial Tracking



External



Built-in

Camera ≥ 3

Facial tracking cameras (from external to built-in) capture micro-expressions and synchronize the avatar

XR Camera
Shipment
High Speed
Growth

Unit: KK



3D Vision

*Multi-sensor
fusion*

*Exceeds
350KK units*

Sunny OIT—Robotic Vision Platform



SMART
HOME



SMART
INDUSTRY



SMART
BUSINESS



Thanks

www.sunnyoptical.com

