Imaging & Sensing Solutions Segment

Senior Executive Vice President
Sony Group Corporation

Representative Director, President and CEO,
Sony Semiconductor Solutions Corporation

Terushi Shimizu
I&SS Segment   FY21 Review

FY21 Sales : 1,076.4 billion yen
OI : 155.6 billion yen

Decentralization / expansion of customer base for mobile image sensors, recovery of volume share

Expansion of models for sensing applications
(SPAD ToF Depth Sensor, Event-based Vision Sensor (EVS), UV Image Sensor, Large-sized GS* Image Sensor etc.)

Launch of Edge AI Sensing Platform Service “AITRIOS™”

Operation start of Nagasaki Technology Center’s Fab5

Equity investment in Japan Advanced Semiconductor Manufacturing (JASM)

*GS : Global shutter
Despite the increase in multi-cameras being mature, sensor size is getting larger and continues to drive market growth.

Mobile Imaging
The market keeps the same level.

Sensing
Mobile:
Full-scale market expansion will take a few years due to a lack of applications.

Automotive:
ADAS*1 which requires installation of many cameras is expected to expand.
Market for AD*2 will take time to increase.

Industrial Applications:
The market is growing due to continued labor savings and automation needs.

Security:
The high value-added market is expanding due to growing demand for multi pixels and combination with AI.

*1 ADAS : Advanced Driving Assistance System
*2 AD : Autonomous Driving
Continued Growth in Mobile Imaging

Image sensor market outlook by smartphone price range (revenue)

Sensor size trend in the image sensor market (only for high-end model)

※ Source: Sony. Calculated using the average chip size of FY19 is 100%.
Smartphone Camera Market Trends and Our Strategies

**High-end model**

Pursue a high-performance camera system by developing technology that realizes a new imaging experience

Develop high value-added image sensor which contributes to high image quality and multi-functionality of cameras

**Mid-range model**

Pursue a balance of adopting small pixels and camera performance

Differentiate with enhancement of small pixel development and performance improvement through new signal processing / algorithm

*1 AP : Application Processor
*2 ISP : Image Signal Processor

FY19→30 (chip size)

Large pixel / Large-sized Image Sensor

Original AP*1 (Original ISP)

Original ISP*2

General-Purpose AP*1

FY19→30 (Pixel size : μm)

Small & Multi-Pixel Image Sensor

0.8 0.7 0.6X 0.5X 0.4X 0.35

1 type

1/1.3 type

1/1.5 type

1 type

or
2-Layer Transistor Pixel technology
Direction of Mobile Imaging Technological Evolution

**CY24**
- Still images are expected to exceed ILC *1 image quality by mobile camera’s large pixel + High Qs*2 technology + AI processing (still image)

**CY25**
- Evolution of High-speed readout
  - Support 8K video
  - Multi-frame processing (High SN ratio*3, Video HDR)
- Evolution of Edge AI
  - Realize AI processing for video
  - Realize low latency processing

**CY2030**
- Multi-camera evolution
  - Wide: Larger diameter
  - UW: High speed (Support video)
  - Tele: Multi pixels (Higher magnification)
  - ToF: Auto focus/Blur
- Sensor optimization for multi-camera
- Super HDR (Multi-frame x AI)
- Zoom (Folded optics x AI)
- High image quality video (Multi-frame x AI)
- 8K format (High-speed readout)
- Lighting
- Background blur

**Link with distance information**
- Apply to Focus and Production

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*1 ILC: Interchangeable lens camera
*2 Qs: Quantum saturation
*3 SN Ratio: Signal-to-noise ratio
Sensing Society
Sales Trend of Automotive Image Sensors

In FY25, do business with*1 75% of the top 20 global OEMs*2

*1 OEMs with transaction record and those who are expected to conduct any transaction by FY25.

*2 Based on CY21 results. Source: Sony

Sony Group Corporation
Automotive Camera Market Trends and Our Strategies

**Application**

- **Front**
  - HDR+LFM*1
  - High resolution
  - Cyber security etc.

- **Surround**
  - High sensitivity
  - High aspect ratio
  - Fusion of sensing and viewing etc.

- **Rear**
  - Low price
  - iSoC*2 etc.

- **Service car**
  - Higher resolution
  - Synchronization with LiDAR *3
  - Cyber security etc.

**Number of installed cameras**

- Front: 6-8 in total
- Rear: 16-20

**Customer request**

- Focus as a technology driver and aim to apply to other applications
- Approach to OEMs & platformers
- Deploy technologies from front sensing
- Aim for early business negotiation acquisition and monetization due to short development cycle
- Upfront investment for market rise in future

**Our Strategies**

- HDR+LFM*1
- High resolution
- Cyber security etc.

*1 LFM: LED flicker mitigation
*2 iSoC: Image sensor with ISP
*3 LiDAR: Light Detection And Ranging
Differentiated Technology in Front/Surround Sensing ~Sensor Fusion~

Technical overview

Achieve highly accurate object recognition with original early fusion technology

Front sensing FY25

Utilize not only for vehicle recognition in adverse environments but also for recognition of people and vehicles at night

Surround sensing (parking assistance) ~FY25

Apply to parking assistance functions that require highly accurate distance measurement
Industrial Applications

- **Luggage sorting at logistics bases**
- **Visual inspection**
- **Polarization**
- **ToF**
- **Spatial monitoring**
- **Production line monitoring**
- **Inspection of display**
- **Predictive maintenance of equipment**
- **Recycled material sorting**

- **New!!**
- **RGB (GS\(^2\))**
- **Large size (GS\(^2\))**
- **New!!**
- **New!!**
- **New!!**
- **EVS\(^3\)**
- **New!!**
- **SWIR\(^4\)**
- **UV**

*1 RS : Rolling Shutter
*2 GS : Global Shutter
*3 EVS : Event-based Vision Sensor
*4 SWIR : Short Wavelength Infra-Red*
### Solution Business Initiatives

- **2019/5**
  - Strategic partnership

- **2020/5**
  - Start collaboration to create smart camera solutions utilizing IMX500 and Microsoft Azure AI
  - Launch world’s first intelligent vision sensor “IMX500” with AI processing functionality

- **2021/6**
  - Start smart city trial project in Rome city

- **2021/8**
  - Support Nomad Go’s smart building solution

- **2021/10**
  - Launch Edge AI Platform Service “AITRIOS™”

- **~2021/12**
  - Establish joint innovation labs in US, Japan, China and Germany
AI開発環境
クラウドサービス
マーケットプレイス

Camera Manufacturer / Module Integrator
Application Developer

AI Developer
System Integrator

Camera development environment
Application development environment
AI development environment

Cloud Service
Marketplace
New Opportunities in the VR / AR Market

Head-Mounted Display

Virtual Display

OLED Microdisplay

Hand Tracking

ToF Image Sensor
VCSEL/VCSEL on Silicon

Mixed Reality (MR)

Image Sensor (RGB)

Iris Recognition

Image Sensor (SWIR)
VCSEL/VCSEL on Silicon

Gaze Detection

Image sensor (SWIR)
Event-based Vision Sensor

SLAM*1

Human/Space recognition

Image Sensor (B/W)
ToF Image Sensor
VCSEL/VCSEL on Silicon

AR Glass

Superimposition on Real Space

OLED Microdisplay
Micro LED

Red: Display device
Blue: Sensor
Green: Laser

Mixed Reality (MR)

Iris Recognition

ToF Image Sensor
VCSEL/VCSEL on Silicon

Iris Recognition

Image Sensor (SWIR)
VCSEL/VCSEL on Silicon

I&SS Segment

*1 Simultaneous Localization And Mapping
*2 Deep Neural Network
Image Sensor’s Capital Expenditure Investment Plan for 3 years

<table>
<thead>
<tr>
<th>FY</th>
<th>Actual (US GAAP)</th>
<th>Forecast (US GAAP)</th>
<th>Forecast (IFRS)</th>
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<td>21-23</td>
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Expanding area is expected to start operation in July 2022.
Equity investment in JASM

Secure a stable supply of logic semiconductors

Enhance technical collaboration with TSMC

Contribute to the enhancement of the supply chain in Japan
Management indicator

<table>
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<tr>
<th>FY19 Actual</th>
<th>FY20 Actual</th>
<th>FY21 Actual</th>
<th>FY22 Forecast</th>
<th>FY25 Target</th>
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<td>Sony</td>
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Image sensor revenue share

- FY19: 53%*
- FY20: 48%*
- FY21: 43%*
- FY22: 49%
- FY25: 60%

*Source: Sony. Excluding the sales of fingerprint sensor. Updated the share of 49% (FY20 ACT) announced at IR Day 2021 held on May 28, 2021.

ROIC

- FY19: 26% (US GAAP)
- FY20: 13% (US GAAP)
- FY21: 12% (IFRS)
- FY22: 12% (IFRS)
- FY25: 20%-25% (IFRS)

For the detail of ROIC calculation, please refer to "Supplemental Information for the Consolidated Financial Results for the Fourth Quarter Ended March 31, 2022" on page 8. ROIC is not a measure in accordance with US GAAP and IFRS. However, Sony believes that this disclosure may be useful information to investors.
I&SS’s Environment Responsibility

Target year to achieve carbon neutrality: 2050 → 2040

Target year to achieve 100% renewable energy: 2040 → 2030
“Fascinate with the wonders of the world.”

**Sense**
Word that suggests human ability to become aware of or develop a feeling something, their sensibilities, and image sensors

**Wonder**
Word that suggests corporate culture that Sony has been cherishing, curiosity which is the starting point of R&D, and recalls discoveries full of amazement and moves people’s souls
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