Annual Technical Report 2020

FY2020 OITDA

Optoelectronics Industry and Technology Development Association

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Message from OITDA

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It is my pleasure to issue Annual Technical Report 2020 that outlines the result of our surveys and R&D activities in FY2020.

In FY2020, the global economy was greatly affected by the COVID-19 pandemic. Although OITDA marked the 40th anniversary of its foundation on July 25, 2020, it decided to postpone a commemorative ceremony planned to be held in the winter to celebrate the anniversary, taking into consideration of these circumstances.

You can find the details of our activities in this report. So, I would like to point out noteworthy events in FY2020. First, we set up the sub-committee under the Technology Strategy Formulation Committee and developed the Smart Factory Photonics Roadmap in light of the post-COVID-19 pandemic era.

With regard to standardization, we actively carried out international standardization activities at IEC, ISO, IEEE, and other forums, primarily for the standardization of optical interconnects and switches within data centers, in-vehicle high-speed optical networks, and archival optical discs through the governmental projects.

OITDA has been continuing to promote the formulation of a R&D strategy and commercialization strategy regarding the optoelectronics technologies. At the same time, OITDA has engaged in the priority issues such as survey on the optoelectronics technologies and industry, and promotion of technology development and standardization.

In order to support the growth of the optoelectronics industry and technologies, OITDA will strengthen and enhance our activities in accordance with needs, under the guidance of the Ministry of Economy, Trade and Industry and other governmental organizations and with the understanding and cooperation of our supporting members and many other people from the business world and the academic community who are our important partners.

We wish you safe from COVID-19 and look forward to your continued guidance, support, and cooperation to our activities.

Optoelectronics Industry Trends

1. Introduction

OITDA has conducted "Survey of Trends of the Optoelectronics Industry" annually since its foundation in 1980. The accumulated survey data of more than 40 years are highly regarded as the basic source for properly recognizing the trend of optoelectronics industry.

This year, we have set seven research subcommittee under the "Optoelectronic Industry Trends Investigation Committee" and have conducted survey for getting the statistical data from FY 2019 to FY 2021, including the shipment value and domestic production value of entire optoelectronic industry.

2. Total Shipments and Domestic Production for the Optoelectronics Industry

2.1 Survey Method

1) We have sent the questionnaire for actual results for FY 2019, estimated values for FY 2020, and qualitative projec-tions for FY 2021 concerning total shipments and domestic production to the Japanese companies which produce optoe-lectronics-related products (optoelectronics equipment/systems, optical components).
2) In addition to the questionnaire survey, we also referred to the data of the Japan Photovoltaic Energy Association (JPEA), Japan Lighting Manufacturers Association (JLMA), Japan Electronics and Information Technology Industries Association (JEITA), Camera & Imaging Products Association (CIPA), and Fuji Chimera Research Institute, Inc. re-garding the photovoltaic energy field, solid-state lighting field, display field, and I/O field.

In the survey in FY2019, we changed the unit used to show the total shipments and domestic production in the sum-mary sheet, from million yen to 100 million yen.

For the survey, we classified the optoelectronics industry, together with relevant optical equipment/systems and com-ponents, into the seven fields shown below.

1. Optical Communication:	Optical transmission equipment/systems, optical fiber fusion splicer, light emitting devices, photo detectors, optical passive components, optical fiber, optical connectors, etc.
2. Optical Storage:	Optical disc equipment (read-only, recordable), optical disc media, laser diodes, etc.
3. Input/Output (I/O):	Optical printers, multifunction printers, digital cameras, digital video cameras, camera mobile phones, image sensors, surveillance cameras, and car-mounted cameras
4. Display and Solid-state Lighting:	Flat panel display devices and equipment, projectors, solid-state lighting devices and equipment, LED (for lighting and displays), etc.
5. Photovoltaic Energy:	Photovoltaic power generation systems, photovoltaic cells and modules
6. Laser/Optical Processing:	Laser/optical processing equipment, lamp/LD lithography, additive manufacturing (3D printers), laser oscillators
7. Sensing and Measuring:	Optical measuring instruments, optical sensing equipment
8. Others:	Hybrid optical devices, etc.

2.2 Overview of Survey Results of Total Shipments

Table 1 shows the results of FY 2019 (actual), FY 2020 (estimate) and FY 2021 (projections) for total shipments.

● FY 2019 (actual): 12,763 billion yen, growth rate: −4.1%

In FY2019, total shipments (actual) for the optoelectronics industry amounted to 12,763 billion yen (growth rate: −4.1%). This breaks down as: 8,730 billion yen for optoelectronics equipment/systems (growth rate: −6.0%; component ratio: 68.4%) and 4,033 billion yen for optical components (growth rate: 0.3%; component ratio: 31.6%)

The shipments by field were:

506 billion yen for the optical communication field (growth rate: 3.9%; component ratio: 4.0%),
643 billion yen for the optical storage field (growth rate: −12.5%; component ratio: 5.0%),
3,329 billion yen for the I/O field (growth rate: −1.3%; component ratio: 26.1%),
5,032 billion yen for the display and solid-state lighting field (growth rate: −5.2%; component ratio: 39.4%),
2,204 billion yen for the photovoltaic energy field (growth rate: −3.3%; component ratio: 17.3%),
682 billion yen for the laser/optical processing field (growth rate: −10.6%; component ratio: 5.3%),
and 269 billion yen for the sensing and measuring field (growth rate: 5.7%; component ratio: 2.1%).

● FY 2020 (estimate): 11,740 billion yen, growth rate: −8.0%

Total shipments for the optoelectronics industry in FY2020 are estimated to be 11,740 billion yen (growth rate: −8.0%). This breaks down as: 8,070 billion yen for optoelectronics equipment/systems (growth rate: −7.6%; component ratio: 68.7%) and 3,670 billion yen for optical components (growth rate: −9.0%; component ratio: 31.1%).

The shipments by field are estimated to be

547 billion yen for the optical communication field (growth rate: 8.1%; component ratio: 4.7%),
538 billion yen for the optical storage field (growth rate: −16.3%; component ratio: 4.6%),
2,908 billion yen for the I/O field (growth rate: −12.6%; component ratio: 24.8%),
4,539 billion yen for the display and solid-state lighting field (growth rate: −9.8%; component ratio: 38.6%),
2,226 billion yen for the photovoltaic energy field (growth rate: 1.0%; component ratio: 19.0%),
622 billion yen for the laser/optical processing field (growth rate: −8.9%; component ratio: 5.3%),
and 263 billion yen for the sensing and measuring field (growth rate: −2.2%; component ratio: 2.2%).

● FY 2021 (projections): flat

Total shipments are projected to be flat for the optoelectronics industry overall in FY2021. Total shipments for optoelectronics equipment/systems and optical components are projected to increase slightly.

By field, the I/O field, the photovoltaic energy field, and the laser/optical processing field will increase slightly; the optical communication field, the optical storage field, the display and solid-state lighting field, and the sensing and measuring field will remain steady.

2.3 Overview of Survey Results of Domestic Production

Table 2 shows the results of FY 2019 (actual), FY 2020 (estimate) and FY 2021 (projections) for Domestic Production.

● FY 2019(actual): 6,237 billion yen, growth rate: −7.5%

In FY2019, the domestic production of the optoelectronics industry (actual) was 6,237 billion yen (growth rate: −7.5%). This breaks down as 3,837 billion yen for optoelectronics equipment/systems (growth rate: −6.5%; component ratio: 61.5%) and 2,400 billion yen for optical components (growth rate: −9.1%; component ratio: 38.5%).

The domestic production by field was:

380 billion yen for the optical communication field (growth rate: −2.4%; component ratio: 6.1%),
73 billion yen for the optical storage field (growth rate: −19.1%; component ratio: 1.2%),
974 billion yen for the I/O field (growth rate: 1.8%; component ratio:

15.6%), 2,250 billion yen for the display and solid-state lighting field (growth rate: −12.4%; component ratio: 36.0%),
1,618 billion yen for the photovoltaic energy field (growth rate: −7.7%; component ratio: 26.0%),
656 billion yen for the laser/optical processing field (growth rate: −6.7%; component ratio: 10.5%),
and 210 billion yen for the sensing and measuring field (growth rate: 3.8%; component ratio: 3.4%).

● FY 2020 (estimate): 5,792 billion yen, growth rate: −7.1%

The domestic production of the optoelectronics industry in FY2020 is estimated to be 5,792 billion yen (growth rate: −7.1%). This breaks down as 3,632 billion yen for optoelectronics equipment/systems (growth rate: −5.3%; component ratio: 62.7%) and 2,160 billion yen for optical components (growth rate: −10.0%; component ratio: 37.3%).

The domestic production by field was:
411 billion yen for the optical communication field (growth rate: 8.3%; component ratio: 7.1%),
41 billion yen for the optical storage field (growth rate: −43.4%; component ratio: 0.7%),
850 billion yen for the I/O field (growth rate: −12.8%; component ratio: 14.7%),
1,973 billion yen for the display and solid-state lighting field (growth rate: −12.3%; component ratio: 34.0%),
1,632 billion yen for the photovoltaic energy field (growth rate: 0.9%; component ratio: 28.2%),
600 billion yen for the laser/optical processing field (growth rate: −8.5%; component ratio: 10.4%),
and 208 billion yen for the sensing and measuring field (growth rate: −0.7%; component ratio: 3.6%).

● FY 2021 (projections): Slight increase

The domestic production of the optoelectronics industry in FY2021 is projected to increase slightly. Optoelectronics equipment/systems will increase slightly and optical components will be flat.

By field, the optical communication field, the photovoltaic energy field, and the laser/optical processing field will increase slightly, and the optical storage field, the I/O field, the display and solid-state lighting field, and the sensing and measuring field will remain steady.

2.4 Trend in Optoelectronics Industry

Fig.1 and Fig.2 show changes in the total shipment value of the optoelectronics industry and trends in each field, respectively. Fig.3 and Fig.4 show changes in the domestic production value of the optoelectronics industry and changes by field, respectively. Fig.1 and Fig.3 show nominal GDP and electronic industry production in order to compare changes in the scale of the optoelectronics industry with those of the Japanese economy and other industries.

The optoelectronics industry in Japan had continued to grow for a long period over 20 years since FY1980 although it suffered a temporary decline due to the bursting of the information technology bubble; however, the industry turned into a negative growth due to the influence of global financial crisis in 2008, and it further faced a tough situation due to the influence of the Great East Japan Earthquake in 2011. Thereafter, the industry turned into a positive growth thanks to rapid growth of the photovoltaic energy industry, but it again reversed to a significant downward trend after peaking in FY2014; the industry as a whole declined for two consecutive years during FY2015 and FY2016. In FY2016, both the total shipments and domestic production decreased by at least 10% since a decline in the display and I/O fields was significant. In FY2017, growth in the industry almost leveled off, and it was expected that the decline would come to an end; however, it declined slightly in FY2018 due to the influence of trade frictions between the U.S. and China and other circumstances. According to the survey result of this fiscal year, the downward trend continued in FY2019, and the extent of decrease will be higher in FY2020 due to the impact of the COVID-19 pandemic. In FY2021, while the industry will be heading for a recovery, the total shipments are projected to level off, and the domestic production is projected to increase slightly.

Below is a summary of the survey and analysis results in FY2020.

● FY2019 (actual)

In the optical communications field, the total shipment increased slightly since optical transmission equipment and systems as a whole performed well due to an increase in domestic capital investments for 5G systems; components such as optical connectors decreased slightly due to higher dependency on overseas production. In the sensing and measuring field, both the total shipments and domestic production increased slightly since optical measuring instruments and wafer inspection devices stayed firm. In the I/O field, both the total shipments and domestic production were almost flat since a decrease in smartphones and digital cameras was compensated by an increase in image sensors and car-mounted cameras. In the display and solid-state lighting field, price declines for 4K and large-screen TVs were accelerated despite an increase in demand, and the growth of LED lighting fixtures was decelerated due to widespread use. Thus, the total shipments decreased slightly and domestic production decreased. In the laser/optical processing field, although fiber lasers and excimer lasers increased, lamp/LD exposure machines significantly decreased owing to the deceleration of capital investments mainly for flat panel displays. Consequently, both of the total shipments and domestic production decreased slightly. In the optical storage field, both the total shipments and domestic production decreased since demand decline continued due to the progress of Internet distribution. In the photovoltaic energy field, both the total shipments and domestic production decreased slightly due to price declines despite an increase in applications.

In the optoelectronics industry as a whole, the total shipments were 12,763 billion (growth rate: −4.1%) and the domestic production was 6,237 billion yen (−7.5%), resulting in a decrease.

● FY 2020 (estimate)

In the optical communications field, both the total shipments and domestic production are estimated to increase slightly since optical transmission components for trunk/metro lines will increase due to domestic capital investments for 5G systems, and components such as light-emitting devices and optical fibers will stay firm. In the photovoltaic energy field, growth of both the total shipments and domestic production will turn slightly positive thanks to the efforts for promoting the introduction of various types of renewable energy. In the optical storage field, both the total shipments and domestic production are estimated to decrease since demand decline will continue. In the I/O field, both the total shipments and domestic production are estimated to decrease since optical printers and multifunction printers, and imaging equipment as a whole will decrease due to the influence of the spread of COVID-19 and image sensors will also turn to a decrease due to the influence of trade frictions between the U.S. and China. In the display and solid-state lighting field, price declines will be accelerated despite an increase in high-value-added TVs due to an increase in demand for goods and services to be consumed by people to enjoy staying home, and LED lighting fixtures will decrease following FY2019. Thus, the total shipments are estimated to decrease slightly, and domestic production is expected to decrease. In the laser/optical processing field, the total shipments and domestic production will show a negative growth for two consecutive years since fiber lasers, which have been performed well, will decrease due to the influence of capital investment cuts against the backdrop of the global spread of COVID-19, and excimer lasers will also decrease in reaction to a significant increase in FY2019. In the sensing and measuring field, both the total shipments and domestic

Table 1　Shipment of Optoelectronics Industry (Summary)

Product Items	FY 2018 Shipment Actual (in 100 million yen)		Growth Rate(%)	FY 2019 Shipment Actual (in 100 million yen)		Growth Rate(%)	FY 2020 Shipment Estimate (in 100 million yen)		Growth Rate(%)	FY 2021 Shipment Prediction
Optical Communications Field	4,871		▲ 3.3	5,059		**3.9**	5,468		**8.1**	flat
Optical Transmission Equipment	1,362		0.7	1,552		**14**	1,851		**19.3**	flat
Truck Line and Metro Line		649	19.7		728	**12.2**		989	**35.9**	slight decrease
Subscriber Line		378	▲ 9.4		425	**12.4**		422	▲ 0.7	slight increase
Router and Switch		261	▲ 19.9		241	▲ 7.7		221	▲ 8.3	slight increase
Optical Fiber Amplifier		74	10.4		158	**113.5**		219	**38.6**	flat
Optical Transmission Components	3,298		▲ 5.0	3,323		**0.8**	3,433		**3.3**	flat
Optical Transmission Link		553	▲ 31.4		381	▲ 31.1		347	▲ 8.9	flat
Light Emitting Device		543	▲ 1.3		670	**23.4**		781	**16.6**	slight increase
Photo Detectors		179	5.9		158	▲ 11.7		156	▲ 1.3	flat
Optical Passive Component		236	▲ 2.9		227	▲ 3.8		242	**6.6**	flat
Optical Circuit Component		280	▲ 5.7		289	**3.2**		270	▲ 6.6	flat
Optical Fiber		1,080	10.1		1,097	**1.6**		1,122	**2.3**	flat
Optical Connector		272	1.1		321	**18**		335	**4.4**	flat
Others (Semiconductor Amplifying Device, etc.)		155	▲ 0.6		180	**16.1**		180	**0**	flat
Optical Fiber Fusion Splicer	211		▲ 1.4	184		▲ 12.8	184		**0**	flat
Optical Storage Field	7,349		▲ 6.5	6,428		▲ 12.5	5,380		▲ 16.3	flat
Optical Disk	7,248		▲ 6.2	6,345		▲ 12.5	5,320		▲ 16.2	flat
Equipment		6,889	▲ 6.0		6,042	▲ 12.3		5,033	▲ 16.7	flat
Read-only (CD, DVD, BD)		4,689	▲ 5.9		3,805	▲ 18.9		2,925	▲ 23.1	flat
Recordable		2,200	▲ 6.2		2,237	**1.7**		2,108	▲ 5.8	slight decrease
Media		359	▲ 10.3		303	▲ 15.6		287	▲ 5.3	slight decrease
Laser Diode		101	▲ 23.5		83	▲ 17.8		60	▲ 27.7	flat
Input/Output Field	33,733		▲ 8.1	33,289		▲ 1.3	29,080		▲ 12.6	slight increase
Optical I/O Equipment	25,096		▲ 12.7	22,517		▲ 10.3	19,733		▲ 12.4	flat
Optical Printer・Multifunction Printer		7,164	▲ 1.0		6,924	▲ 3.4		6,348	▲ 8.3	slight increase
Imaging equipment		9,859	▲ 10.3		8,604	▲ 12.7		6,996	▲ 18.7	decrease
Digital Camera, Digital Video Camera		8,211	▲ 13.0		6,721	▲ 18.1		5,333	▲ 20.7	decrease
Security camera, Car-mounted camera *		1,648	6.2		1,883	**14.3**		1,663	▲ 11.7	slight increase
Camera Mobile Phone		7,443	▲ 23.2		6,258	▲ 15.9		5,512	▲ 11.9	flat
Others (Barcode Reader, Image Scanner, etc.)		630	▲ 23.5		731	**16**		877	**20**	flat
Image Sensor	8,637		8.4	10,772		**24.7**	9,347		▲ 13.2	slight increase
Display and Solid-state Lighting Field	53,079		▲ 5.1	50,324		▲ 5.2	45,393		▲ 9.8	flat
Display Equipment	26,166		▲ 2.4	25,746		▲ 1.6	23,848		▲ 7.4	flat
Flat Panel Display		23,594	▲ 1.4		22,900	▲ 2.9		21,698	▲ 5.2	flat
Projector		2,392	▲ 12.7		2,650	**10.8**		1,970	▲ 25.7	flat
Large-scale LED Display		180	29.5		196	**8.9**		180	▲ 8.2	flat
Display Device	16,320		▲ 12.7	14,290		▲ 12.4	12,460		▲ 12.8	flat
Solid-state Lighting	6,940		0	6,843		▲ 1.4	6,129		▲ 10.4	slight increase
LED Device		6,422	2.2		6,406	▲ 0.2		5,749	▲ 10.3	slight increase
LED Lamp		518	▲ 20.4		437	▲ 15.6		380	▲ 13.0	slight decrease
LED	3,653		4.1		3,445	▲ 5.7		2,956	▲ 14.2	slight increase
Photovoltaic Energy Field	22,783		▲ 2.4	22,035		▲ 3.3	22,259		**1**	slight increase
Photovoltaic Power System		16,374	▲ 1.4		15,211	▲ 7.1		15,423	**1.4**	slight increase
Photovoltaic Cell/Module		6,409	▲ 4.9		6,824	**6.5**		6,836	**0.2**	slight increase
Laser/Optical Processing Field	7,629		4.5	6,823		▲ 10.6	6,217		▲ 8.9	slight increase
Laser and Optical Processing Equipment	6,925		5		6,215	▲ 10.3		5,588	▲ 10.1	slight increase
CO_2 Laser		466	▲ 14.2		300	▲ 35.6		339	**13**	flat
Solid State Laser		479	8.9		461	▲ 3.8		398	▲ 13.7	increase
Fiber Laser		734	16.3		892	**21.5**		782	▲ 12.3	slight increase
Semiconductor Laser Direct Processing Equipment		39	11.4		31	▲ 20.5		40	**29**	flat
Excimer Laser		1,507	7.1		2,010	**33.4**		1,429	▲ 28.9	slight increase
Lamp/LD Exposure Machine		3,672	4.7		2,499	▲ 31.9		2,581	**3.3**	flat
Additive Manufacturing (3D Printer)		28	▲ 9.7		22	▲ 21.4		19	▲ 13.6	flat
Oscillator	704		▲ 0.1		608	▲ 13.6		629	**3.5**	slight increase
Optical Sensing and Measurement Field	2,540		8.3	2,686		**5.7**	2,628		▲ 2.2	flat
Optical Measuring Instrument		119	▲ 3.3		139	**16.8**		143	**2.9**	flat
Optical Sensing Equipment		2,421	9		2,547	**5.2**		2,485	▲ 2.4	flat
Others Field		1,096	▲ 0.6	981		▲ 10.5	977		▲ 0.4	flat

ProductItems	FY2018ShipmentActual (in100millionyen)		GrowthRate(%)	FY2019ShipmentActual (in100millionyen)		GrowthRate(%)	FY2020ShipmentEstimate (in100millionyen)		GrowthRate(%)	FY 2021 Shipment Prediction
SubTotalforOptoelectronicsEquipment	92,862		▲ 4.6	87,299		▲ 6.0	80,704		▲ 7.6	flat
SubTotalforOptoelectronicsComponents	40,218		▲ 5.0	40,326		**0.3**	36,698		▲ 9.0	slight increase
TotalforOptoelectronicsProducts	133,080		▲ 4.7	127,625		▲ 4.1	117,402		▲ 8.0	flat

Table 2 Domestic Production of Optoelectronics Industry (Summary)

Product Items	FY 2018 Shipment Actual (in 100 million yen)		Growth Rate(%)	FY 2019 Shipment Actual (in 100 million yen)		Growth Rate(%)	FY 2020 Shipment Estimate (in 100 million yen)		Growth Rate(%)	FY 2021 Shipment Prediction
Optical Communications Field	3,892		▲ 3.5	3,800		▲ 2.4	4,114		**8.3**	slight increase
Optical Transmission Equipment	1,181		▲ 4.8	1,383		**17.1**	1,693		**22.4**	flat
Truck Line and Metro Line		628	17.2		708	**12.7**		973	**37.4**	slight decrease
Subscriber Line		368	▲ 20.2		419	**13.9**		418	▲ 0.2	slight increase
Router and Switch		125	▲ 34.6		121	▲ 3.2		117	▲ 3.3	slight increase
Optical Fiber Amplifier		60	13.2		135	**125.0**		185	**37.0**	flat
Optical Transmission Components	2,508		▲ 2.7	2,244		▲ 10.5	2,246		**0.1**	slight increase
Optical Transmission Link		307	▲ 19.8		100	▲ 67.4		86	▲ 14.0	slight increase
Light Emitting Device		277	▲ 13.2		327	**18.1**		361	**10.4**	slight increase
Photo Detectors		77	▲ 34.2		58	▲ 24.7		59	**1.7**	flat
Optical Passive Component		217	▲ 4.8		203	▲ 6.5		212	**4.4**	slight increase
Optical Circuit Component		227	▲ 4.6		247	**8.8**		217	▲ 12.1	slight increase
Optical Fiber		1,008	8.7		937	▲ 7.0		957	**2.1**	slight increase
Optical Connector		250	11.6		211	▲ 15.6		191	▲ 9.5	slight increase
Others (Semiconductor Amplifying Device, etc.)		145	2.1		161	**11.0**		163	**1.2**	flat
Optical Fiber Fusion Splicer	203		▲ 5.1	173		▲ 14.8	175		**1.2**	flat
Optical Storage Field	904		▲ 31.6	731		▲ 19.1	414		▲ 43.4	flat
Optical Disk	877		▲ 31.6	706		▲ 19.5	392		▲ 44.5	flat
Laser Diode	27		▲ 30.8	25		▲ 7.4	22		▲ 12.0	flat
Input/Output Field	9,573		▲ 13.1	9,741		**1.8**	8,498		▲ 12.8	flat
Optical I/O Equipment	4,613		▲ 6.4	4,440		▲ 3.8	3,917		▲ 11.8	flat
Optical Printer・Multifunction Printer		607	3.8		779	**28.3**		633	▲ 18.7	slight increase
Imaging equipment		2,608	30.2		2,304	▲ 11.7		1,893	▲ 17.8	decrease
Digital Camera, Digital Video Camera		2,279	▲ 13.0		1,869	▲ 18.0		1,530	▲ 18.1	decrease
Security camera, Car-mounted camera *		329	4.1		435	**32.2**		363	▲ 16.6	slight increase
Camera Mobile Phone		1,151	▲ 1.4		1,076	▲ 6.5		1,051	▲ 2.3	slight decrease
Others (Barcode Reader, Image Scanner, etc.)		247	1.2		281	**13.8**		340	**21.0**	slight increase
Image Sensor	4,960		▲ 18.4	5,301		**6.9**	4,581		▲ 13.6	flat
Display and Solid-state Lighting Field	25,692		▲ 8.9	22,497		▲ 12.4	19,732		▲ 12.3	flat
Display Equipment	4,906		▲ 2.3	4,017		▲ 18.1	3,301		▲ 17.8	slight increase
Flat Panel Display		4,534	▲ 2.7		3,661	▲ 19.3		2,951	▲ 19.4	slight increase
Projector		192	▲ 13.5		160	▲ 16.7		170	**6.3**	flat
Large-scale LED Display		180	29.5		196	**8.9**		180	▲ 8.2	flat
Display Device	13,877		▲ 16.2	11,819		▲ 14.8	10,508		▲ 11.1	flat
Solid-state Lighting	4,777		4.1	4,611		▲ 3.5	4,131		▲ 10.4	slight increase
LED Device		4,674	4.6		4,526	▲ 3.2		4,062	▲ 10.3	slight increase
LED Lamp		103	▲ 13.4		85	▲ 17.5		69	▲ 18.8	slight decrease
LED	2,132		4.0		2,050	▲ 3.8		1,792	▲ 12.6	slight increase
Photovoltaic Energy Field	17,535		▲ 3.8	16,184		▲ 7.7	16,324		**0.9**	slight increase
Photovoltaic Power System		16,104	0.2		14,973	▲ 7.0		15,237	**1.8**	slight increase
Photovoltaic Cell/Module		1,431	▲ 33.5		1,211	▲ 15.4		1,087	▲ 10.2	slight increase
Laser/Optical Processing Field	7,031		▲ 1.6	6,558		▲ 6.7	6,002		▲ 8.5	slight increase
Laser and Optical Processing Equipment	6,346		▲ 1.6	5,970		▲ 5.9		5,391	▲ 9.7	slight increase
CO_2 Laser		436	▲ 17.1		280	▲ 35.8		323	**15.4**	flat
Solid State Laser		422	9.3		393	▲ 6.9		345	▲ 12.2	increase
Fiber Laser		622	11.7		736	**18.3**		658	▲ 10.6	slight increase
Semiconductor Laser Direct Processing Equipment		36	5.9		30	▲ 16.7		36	**20.0**	flat
Excimer Laser		1,507	7.1		2,010	**33.4**		1,429	▲ 28.9	slight increase
Lamp/LD Exposure Machine		3,295	▲ 6.0		2,499	▲ 24.2		2,581	**3.3**	flat
Additive Manufacturing (3D Printer)		28	▲ 9.7		22	▲ 21.4		19	▲ 13.6	flat
Oscillator	685		▲ 1.7		588	▲ 14.2		611	**3.9**	slight increase
Optical Sensing and Measurement Field	2,021		10.3	2,098		**3.8**	2,084		▲ 0.7	flat
Optical Measuring Instrument		109	0.0		123	**12.8**		131	**6.5**	flat
Optical Sensing Equipment		1,912	3.3		1,975	**3.3**		1,953	▲ 1.1	flat
Others Field		773	▲ 0.8		757	▲ 2.1		755	▲ 0.3	flat

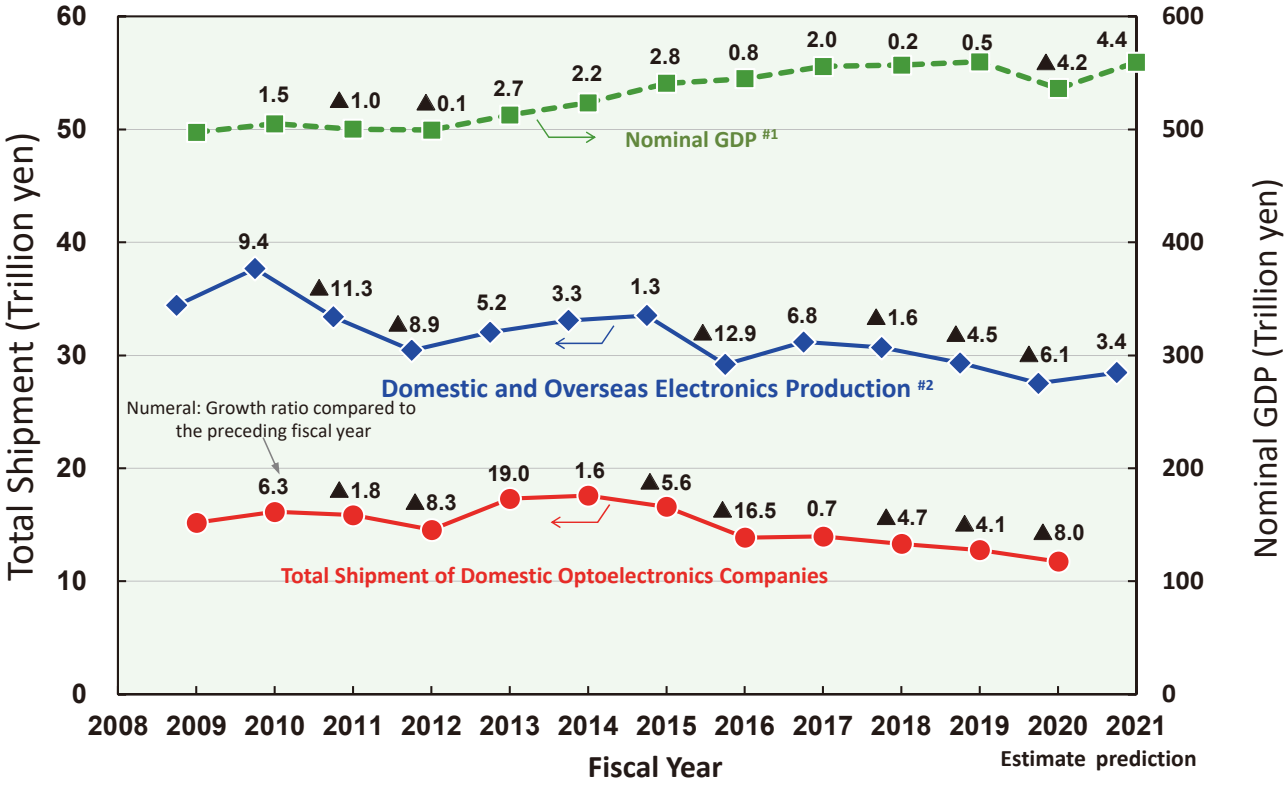
Product Items	FY 2018 Shipment Actual (in 100 million yen)		Growth Rate(%)	FY 2019 Shipment Actual (in 100 million yen)		Growth Rate(%)	FY 2020 Shipment Estimate (in 100 million yen)		Growth Rate(%)	FY 2021 Shipment Prediction
Sub Total for Optoelectronics Equipment	41,028		▲ 1.4	38,371		▲ 6.5	36,321		▲ 5.3	slight increase
Sub Total for Optoelectronics Components	26,393		▲ 14.7	23,995		▲ 9.1	21,602		▲ 10.0	flat
Total for Optoelectronics Products	67,421		▲ 7.1	62,366		▲ 7.5	57,923		▲ 7.1	slight increase

production are estimated to decrease slightly due to the influence of capital investment cuts although optical communication devices/components will stay firm.

In the optoelectronics industry as a whole, the total shipments (11,740 billion yen; growth rate: −8.0%) and domestic production (5,792 billion yen; growth rate: −7.1%) are expected to decrease slightly following the previous fiscal year.

● FY 2021 (projections)

In the optical communications field, the total shipments are projected to remain flat, and the domestic production is projected to increase slightly since domestic capital investments for 5G systems will continue. In the optoelectronics industry as a whole, both the total shipments and domestic production are projected to increase slightly since continuing demand increase is expected. In the laser/optical processing field, both the total shipments and domestic production are projected to increase slightly because recovery in automobile-related capital investments is expected. In the I/O field, the total shipments are projected to increase slightly, and the domestic production is projected to remain flat since car-mounted cameras and image sensors will recover. In the display and solid-state lighting fields and the sensing and measuring field, both the total shipments and domestic production are projected to remain flat because favorable factors are insufficient. In the optical storage field, both the total shipments and domestic production are projected to remain flat because the downward trend will be eased due to an increase in products such as 4K BDs. In the optoelectronics industry as a whole, the total shipments are projected to be flat, and the domestic production is projected to increase slightly with the moderate economic recovery as a backdrop although the harsh situation has continued for the last few years.



#1 Cabinet Office: National Accounts for 2019/Fiscal 2021 Economic Outlook (Jan. 18, 2021 [Cabinet Decision])
#2 JEITA: Production Forecasts for the Global Electronics and Information Technology Industries, Dec., 2020

Fig.1 Total Optoelectronics Shipment, Nominal GDP, and Domestic & Overseas Electronics Production

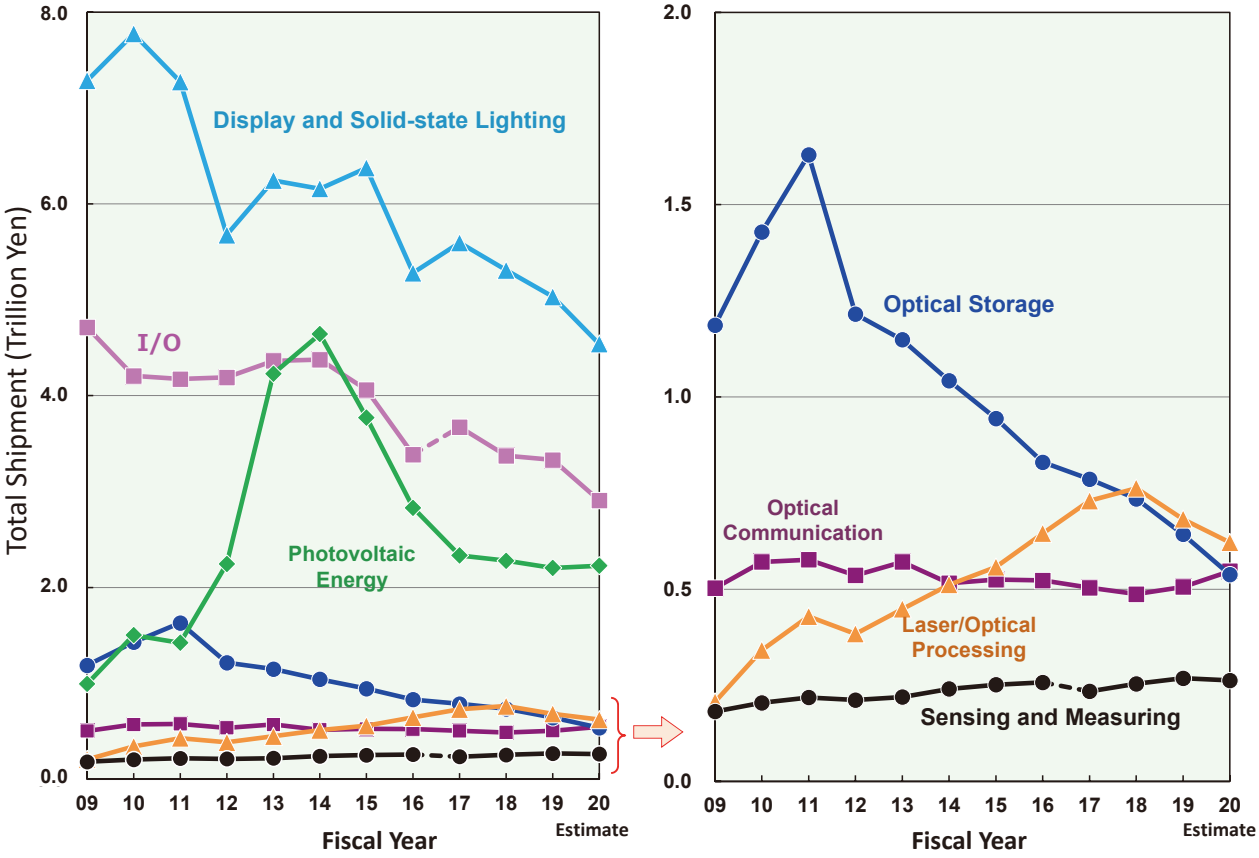
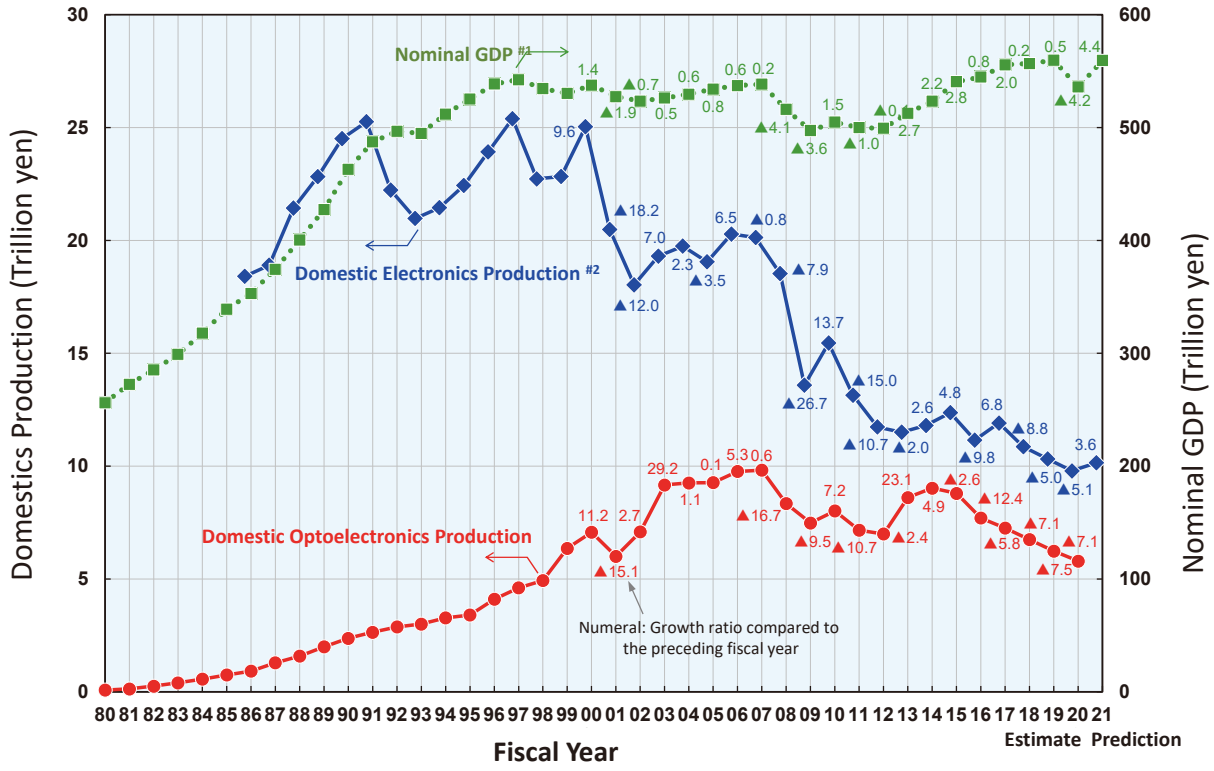


Fig.2 Shipment by Product Field

[Note] The data between FY2016 and FY2017 in the sensing and measuring field and the I/O field are shown by the dotted lines because surveillance cameras and car-mounted cameras have been moved from the sensing and measuring field to the I/O field.



#1 Cabinet Office: National Accounts for 2019/Fiscal 2021 Economic Outlook (Jan. 18, 2021 [Cabinet Decision])
#2 JEITA: Production Forecasts for the Global Electronics and Information Technology Industries, Dec., 2020

Fig.3 Domestic Optoelectronics Production, Nominal GDP, and Domestic Electronics Production

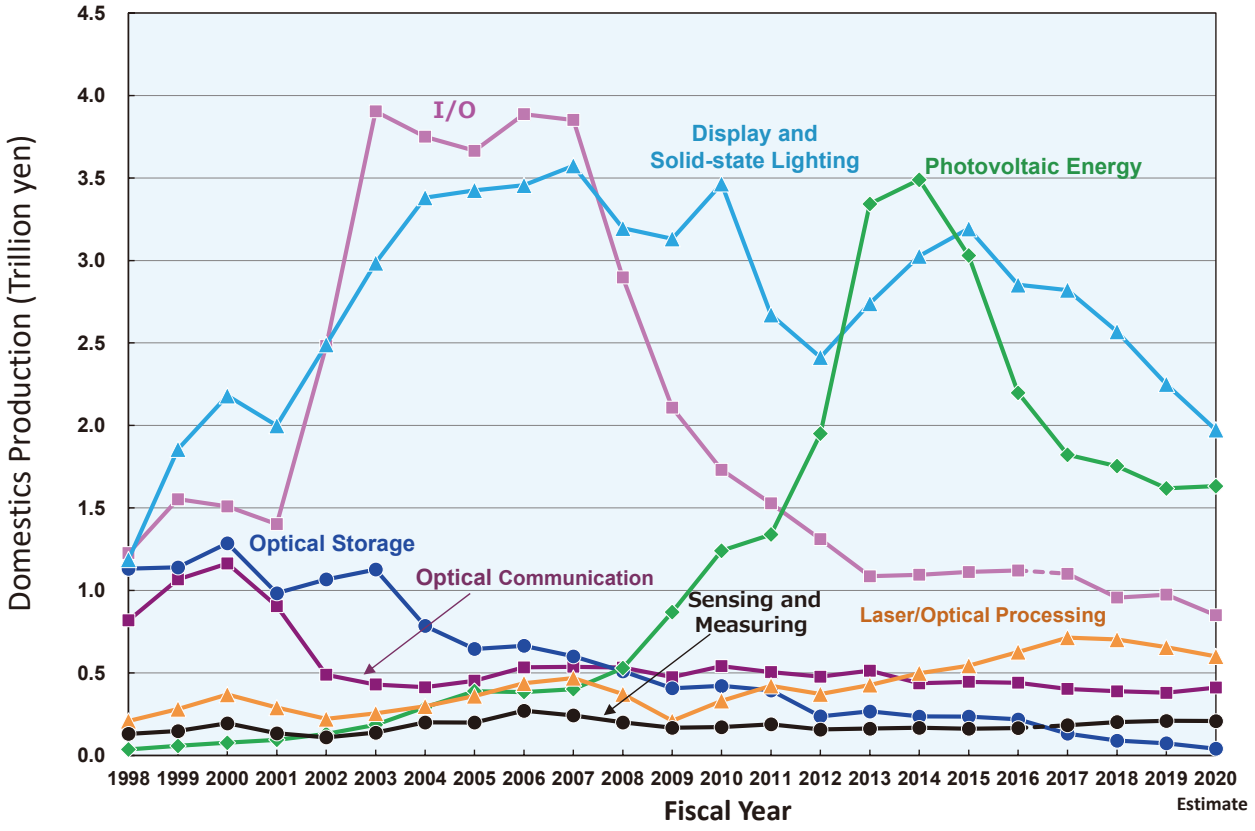


Fig.4 Domestic Optoelectronics Production by Product Field

[Note] The data between FY2016 and FY2017 in the sensing and measuring field and the I/O field are shown by the dotted lines because surveillance cameras and car-mounted cameras have been moved from the sensing and measuring field to the I/O field.

Technological Strategy Development

1. Introduction

OITDA has been developing Optical Technology Roadmap since 1996 with the aim of identifying the future growth of the optoelectronics industry and directing the research and development of optical technologies.

In FY2020, with the focus on "smartened manufacturing," we have developed the roadmap under the theme of "Smart Factory Photonics" to lead to productivity improvements and cost reduction.

2. Optical technology roadmap

The roadmap assumes that the future Japanese society will be forced to cope with reduction in labor population and aging and address higher geopolitical risks, and will face a significant change in working pattern accelerated due to the impact of the COVID-19 pandemic. Based on the assumed vision of the society, we extracted technological needs, investigated and studied required technologies, and organized the optical element technologies in the two areas including (1) labor-saving and automation and (2) remote operation and human-machine interface (HMI), as a direction that smart factories from 2035 onward should pursue. The roadmap also incorporates the viewpoints of SDGs as it is important to respond to environmental issues.

2.1 Labor-saving and automation area

The primary needs assumed in the labor-saving and automation area include new manufacturing technologies for small-lot production of a wide variety of products; advanced automation technologies and visualization and failure detection technologies at a level equivalent to the one that can be achieved by skilled human workers for processes difficult to be automated and automation of maintenance; automated transfer systems in and outside factories, transfer or spacial measurement/monitoring technologies with drones, aiming for integrated management including multiple bases and transportation; and safety technologies that eliminate constraints on the cooperative work between humans and machines and the need for isolation. To respond to the needs, six element technologies are described here. Although artificial intelligence (AI) is not exactly classified into optical technologies, it is covered herein because AI is a fundamental technology that supports the entire measuring field.

(1) Edge computing cameras

Edge computing cameras are required for in-process implementation inspections and appearance inspections of completed products, recognition of the surrounding environment by an automatic guides vehicle (AGV) or a drone, and video content analysis (VCA) systems used as surveillance cameras in factories. With the pixel size of 20 M pixels and the frame rate of 500 fps, the autonomous control and processing technology linked to the simultaneous localization and mapping (SLAM)/high-definition locator (HDL) processing is also required.

(2) Stereo cameras

Spacial and time resolutions of stereo cameras improve in line with reduction in cell pitch of image pickup elements and advancement of the hardware for distance calculation. It is considered that enabling a stereo camera capable of total pixel measurements in the order of milliseconds in the next 15 years is no longer a dream.

(3) Time of Flight (ToF) cameras

In factories, automated transportation robots equipped with ToF sensors have already been used to detect nonconforming products primarily in the inspections to check for flaws/scratches and shapes. It is expected that commercialization of a low-cost ToF camera capable of detecting even humans with a measurement range from 1 to 300 m will enable cooperative work between humans and robots, for example, a robot handles heavy parts and a human operator fixes the parts with an electrical screwdriver or a robot automatically stops its motion when a person comes near the robot for maintenance.

(4) High-speed cameras

It is assumed that high-speed cameras will be used to analyze the data obtained from the images taken and feed the results back to the actuator in a short time for robot vision or detection of anomalies. For this application, the streaming method enabling quick feedback is suitable. We expect that streaming cameras will achieve the performance of 15 GP/s (1 million pixels, 15000 fps) by 2030 and 25 GP/s (1 million pixels, 25000 fps) by 2035, and those with the performance of 40 GP/s (1 million pixels, 40000 fps) will appear in or after 2036.

(5) Optical processing using AI

Laser processing expected to be used for a wider range of purposes in the future include laser removal, laser bonding, and laser modification. Laser beams are suitable for micro-machining and high-precision processing because they are highly directional and can be sharply focused. Laser beams can be used to process a wide variety of materials such as a metal, glass, ceramic, wood, plastic, leather, and rubber and fuse different materials at the same time; therefore, they can be used to bond different materials. Laser processing combined with an AI technique to monitor the progress of processing and machine learning for fine control will enable processing of materials that could never been processed or processing with a high precision or at a high speed never before possible.

(6) Application of spectroscopic imaging to recycling

Recycling wastes is an effective means to make the transition to a carbon-neutral society with consideration given to the promotion of SDGs such as carbon-dioxide emissions in transportation of raw materials and electricity production. We expect that, from 2036 onward, a novel system will be made possible so that plastic materials such as boards and packages, which have never been rendered reusable with conventional technologies, can be crushed and chipped and the chips can be identified and sorted through spectroscopic imaging using infrared beams.

2.2 Remote operation and HMI area

Primary needs in the remote operation and HMI area include monitoring, giving guidance, and performing operations from remote locations through the senses of sight, force, and touch as if the person is on site; responding to risks of major accidents due to operational errors by operators; and further monitoring operators to increase efficiency by supporting their operations. To respond to the needs, four element technologies are described here.

(1) Remote monitoring

Remote monitoring is an essential function in a so-called "dark factory" that is almost fully automated. The use and evolution of remote monitoring are expected even in the quality inspection called sensory testing using five human senses. Technology elements required for automation and remote operation of the sensory visual inspection include the advancement of image processing algorithms, improved resolutions of cameras and displays (spatiotemporal resolution, quantization resolution), and faster image transmission (uncompressed transmission of a 48-bit full color image with 100 M pixels at 60 fps in the 300 Gbps order). In addition to these, the analysis and dynamic control of the physical behaviors of lighting, that is, the actions of (controlled) light on the test object are also included in the important technology elements.

(2) Eye tracking

An eye tracking device measures a test subject's eye movements and displays his/her gazes on the view or display image as points of gazes. Wearable and non-wearable eye tracking devices are available. Non-wearable eye tracking devices are capable of showing the same image to each test subject, which makes it easy to integrate results, for example, enabling points of gazes of each test subject to be displayed

superimposed. We expect the appearance of a device that achieves the frame rate of 200 fps and the delayed time of 10 ms and is calibration-free by 2030. This is enabled by the combination of an edge AI with a current image pickup device. We forecast that replacement of the image pickup device with the vision chip enables a device that achieves the frame rate of 1000 fps and the delayed time of 2 ms and is calibration-free by 2035. We consider that these achievements of higher performance will satisfy the needs for remote operation in the future.

(3) Head-mounted display (HMD)

A head-mounted display receives attention as a human-machine interface to enable remote operation of robots and on-site monitoring as well as to give assistance and guidance to operators.

For a shielded HMD, light weight, excellent fit, and high resolution are desired. An HMD weighing not more than 40 g with a resolution of 8 K (7680 × 4302 pixels) and a wide viewing angle of 180 degrees seems to be required. There is a possibility that an evolution of the meta-lens technology will enable the appearance of an ultra-small light-weight shielded HMD to achieve lens functions with fine structural patterns.

An optical see-through HMD is an image display device that enhances visual information by superimposing an image over the real-world view through the glasses. In addition to the standard performance required for a shielded HMD, excellent visibility to show clear images without interfering with the actual view is also desired; therefore, a high transmission of at least 98% is required.

The frame rates required to prevent visually induced motion sickness and experience an HMD pleasantly seem to be 90 fps to 120 fps. To express smooth motions with an HMD, the development of HMDs is likely to be proceeded with, aiming at 240 fps or a higher frame rate in the future.

(4) Glasses-free 3D display

Unlike an HMD or 3D glass method, a glasses-free 3D display can display 3D images without using any special gear. To perform remote management or operations smoothly, the person who performs remote management or operations must understand the on-site circumstances accurately as if he/she is there. To this end, although it is important to introduce a 3D display that can express the depth of an image at the end that remote management/operation is performed, operations may be performed intensively for a prolonged time, and therefore a non-wearable glasses-free 3D display is strongly desired. The specifications required for such glasses-free 3D display are a horizontal viewing angle of at least 100 degrees and a resolution of at least 600 ppd for 3D images, assuming that a high-precision eye tracking system is used in combination with the display. Achieving these specifications makes it possible to provide highly realistic 3D images. It is recommended to adopt a dome shape that covers the vertical field of view and to set each of the horizontal and vertical viewing angles to 180 degrees to further increase the realistic sensation. To enable pleasant remote operation for a prolonged time, a dome-shaped glasses-free 3D display that can solve issues such as visual fatigue caused by vergence-accommodation mismatch and provide 3D images allowing the person who performs remote operation to feel as if he/she is on site is suitable. To put glasses-free 3D displays to actual use, however, a breakthrough to conventional technologies is expected.

3. Summary

Through the development of this roadmap, we have figured out the following two points regarding issues and suggestions for the issues.

(1)The optimum division of work between humans and machines should be pursued.

This roadmap considers it important to differentiate between the areas suitable for automation with machines and the areas suitable for human work and combine them in an appropriate manner. Considering that the labor population will decrease in the future, it is critical to allow machines to support human work and enable manufacturing centered on people who are able to work regardless of their physical abilities.

(2)An optical information system that integrates an optical device with information processing is important, and efforts should be focused on this field.

In the automation and labor-saving area and the remote operation and HMI area, the optical sensing and processing technologies and the human optical sensing and display technologies will be important, respectively. In most cases, these devices alone do not serve a sufficient function, but they function properly only when they are combined with an appropriate information processing (AI) or communication infrastructure. Japan has basically been excelling in the optical device field; we consider that focus should also be put on the systematization that integrates optical devices with information processing.

Standardization

1. Introduction

Standardization has been one of OITDA's major activities since its establishment and has been promoted broadly across the optoelectronics industry. OITDA's standardization efforts are mainly focused on the optical communication, but they also include several optical applications and lasers. Besides, working for domestic standardization (JIS), OITDA is also working on international standardization such as IEC and ISO through field-specific sub-committees in order to respond to rapid changes of industrial structure and technologies. Outlined below are the standardization activities that have been carried out by the standardization committees.

2. Fiber Optics Standardization Committee

The Fiber Optics Standardization Committee plays a vital role in planning and promoting standardization by coordinating the integrity and overall direction of the other committee's activities.

Partly because remote work was strongly recommended as a deterrent measure against the spread of COVID-19 starting from the beginning of 2020, demand and expectations for the IT-related communication infrastructure have been increasing, and the cloud technologies and home information appliances have been developing. Following these trends, the wide range of applications of fiber optics-related technologies are becoming broader.

3. Optical Fiber Standardization Committee

This committee proceeds with review of the JIS to ensure harmonization with various testing methods and product standards in the IEC and ITU-T. And this committee also conducts survey and research activities to respond to new technologies so that it can precisely recognize the domestic and international circumstances and deliberate or revise a draft of JIS in a timely manner.

4. Fiber Optic Interconnecting Device Standardization Committee

It is anticipated that communication networks such as backbone networks, metro networks, and access networks to data center networks will dramatically grow in capacity and scale. For fiber optic interconnecting device, which interconnects the optical fiber cords/cables in the infrastructure equipment in the networks, different types of interconnecting device are supplied by different manufacturers. Therefore, it is required to ensure product compatibility. This committee has been promoting harmonization between the JIS and the corresponding international standards such as IEC standards in accordance with the WTO agreement on Technical Barriers to Trade (TBT Agreement).

5. Optical Passive Components Standardization Committee

This committee prepares drafts of new JIS, revises of existing JIS as well as deliberates on the common rules and testing/measuring methods by conducting the surveys on the trend of international standardization.

6. Optical Active Device Standardization Committee

This committee develops and improves JIS based on the rule of adopting a harmonized standard system of IEC.

In the formulation of standards related to optical active devices by IEC, a draft standard for the devices such as small optical transceivers for 40 Gb/s optical transmission, surface emitting lasers, semiconductor optical amplifiers, tunable laser modules, and packages for optical integrated circuits have been currently proposed and deliberated, with a view to the development of new optical transmission systems such as WDM-PON, digital coherent transmission, and high-speed LAN. In addition to the standardization of individual optical active device, discussions on the standardization of such devices as integrated functional devices have been developing, including package and performance standards for mobile fronthaul analog optical transceivers and photonic integrated circuits (PIC). This committee has been proceeding with activities while collecting information on these trends.

7. Optical Amplifier and Dynamic Module Standardization Committee

In response to the IEC's decision to integrate TC 86/SC 86C/WG 35 with WG 5, Optical Amplifier Standardization Committee and Dynamic Module Committee under Fiber Optics Standardization Committee were integrated and Optical Amplifier and Dynamic Module Standardization Committee has been established. The main activities of the committee are (1) preparing a draft JIS in corresponding to the IEC standards and the circumstance in Japan and (2) grasping the trends in international standardization and making proposals as appropriate via the domestic committee.

8. Optical Subsystem Standardization Committee

IEC/TC 86/SC 86C/WG 1 addresses the standardization for the physical layers of optical communication systems and subsystems and proceeds with the establishment of design guidelines and the standardization of testing methods for optical systems (general systems, digital systems, optical cable equipment, and optical links). This committee has been supporting the standardization activities of SC 86C/WG 1 and proceeded with the development of JIS based on the IEC standards according to the needs in Japan. This committee also aids the survey on new technologies and the preparation of proposal documents to promote the technologies, in which Japan is ahead of other countries, to IEC.

9. Optical Measuring Instrument Standardization Committee

This committee examines revisions of JIS for testing methods for measuring optical attenuators, light reflection attenuation measuring instruments, calibration methods for optical power meters, and light sources for optical fibers.

10. TC 76/Laser Safety Standardization Committee

This committee have functions as a domestic deliberation committee for IEC/TC 76, the international electrotechnical committee for standardization regarding optical radiation safety and laser equipment, as well as a draft creation committee that develops relevant JIS. In this fiscal year, this committee participated in the deliberations for standardization of the following:

1 Safety requirements for products intentionally exposing face or eyes to laser radiation
2 Moving Platform Laser Products
3 Measurements for classification of laser products
4 Particular requirements for the basic safety and essential performance of non-laser light source equipment intended for therapeutic, diagnostic, monitoring, and cosmetic/aesthetic use
5 Guidelines for the safe use of laser beams on humans
6 Safety of free space optical communication systems used for transmission of information
7 Safety of optical fiber communication systems (OFCSs)
8 Guidance for laser display and shows
9 Safety of laser products—A user's guide
10 Photobiological Safety of Lamps and Lamp Systems—Part 4: Measuring Methods
11 Photobiological Safety of Ultraviolet Lamp Products
12 Laser processing machines—Part 2: Safety requirements for hand-held laser processing devices
13 Eye and face protection—Protection against laser radiation—Part 1:

Requirements and test methods

11.ISO/TC 172/SC 9 Standardization Committee

This committee conducts various activities such as collecting domestic opinions and reviewing draft international standards proposed by ISO/TC 172/SC 9.

In FY2020, the committee reviewed the following draft standards.

1 Lasers and laser-related equipment—Test methods for laser beam parameters—Polarization
2 Test methods for laser beam widths, divergence angles, and beam propagation ratios
3 Test methods for laser-induced damage threshold
4 Test method for angle-resolved scattering
5 Optics and Photonics—Effective numerical aperture of laser lenses—Definition and verification procedure
6 Laser and laser-related equipment
7 Test method for total scattering by optical components
8 Cavity ring-down method for high-reflectance and high-transmittance measurements
9 Test method for total scattering by optical components
10 Integrated optics—Vocabulary
11 Integrated optics—Interfaces

12.Optical Disc Standardization Committee

This committee specializes in the standardization of optical disc-related technologies. Its main tasks are to prepare drafts of domestic standards and to survey and research the trends in the related technologies.

13.International Standardization Committee on System Integrity of In-vehicle Ethernet

While in-vehicle communication is expected to increase drastically due to the development of the advanced driving support systems and autonomous driving, the in-vehicle Ethernet standards, which strengthen the real-time performance and fail-safe function, require in-vehicle communication systems to ensure high reliability as a communication backbone and sensor network that connect between base units for self-driving vehicles. Regarding EMC characteristics, a reliable in-vehicle communication system can be achieved by combining a communication board having excellent EMC characteristics with an optical harness that neither generates electromagnetic noise nor has EMC vulnerability. In FY2020, the 4th term project (three years) was launched to proceed with (1) development of the evaluation method for in-vehicle communication systems to ensure the system integrity and (2) preparation for establishment of testing/certification organization and (3) development of IEC, ISO, and IEEE standards.

14.International Standardization Committee on Quality Evaluation Method for Optical Discs for Long-term Data Storage and Method of Operating Systems for Long-term Storage

In the optical disc field, JIS have been developed concerning the reliability of digital data including a Life-estimation standard and data-migration standard for optical discs, as well as physical and logical standards for each product such as CDs and DVDs. Therefore, wide range of markets have been cultivated. With rapid increase of the information in recent years, optical discs are expected to promote the creation of an archive market, serving as a strategic storage medium for digital data.

This committee develops gradings for media products, based on the physical and Life-estimation standards which had been developed already for each product (DVD-R, BD-R, etc.) and using the initial performance of optical discs themselves as an indicator. And this committee also develops evaluation criteria for an optical disc archive system, including the compatibility with drives, to assure recording quality of digital data and works on the development of JIS based on the gradings and evaluation criteria.

Educational and Public Relations Activities

1. FY 2020 Symposium on the Optoelectronics Industry and Technology

The FY 2020 Symposium on the Optoelectronics Industry and Technology was held at the Tokyo Big Sight on Wednesday, December 9, 2020, with support from the Ministry of Economy, Trade and Industry. Under the theme of “New normal era and photonics”, six important lectures were given as shown in Table 4. with around 140 participants.

2. interOpto

interOpto 2021, an international exhibition of cutting-edge optoelectronics technology, was held at Tokyo Big Sight for three days from December 9th to December 11st, 2020, with support and cooperation from the Ministry of Economy, Trade and Industry and many other organizations.

This time, due to the spread of COVID-19 infection and the accompanying postponement of the Tokyo Olympics, the holding time was moved from January to December and the scale of the real exhibition was reduced. The event was held as a hybrid exhibition of real and online. The exhibition hall was held while taking all possible measures against corona infectious diseases, such as limiting the number of visitors by a complete pre-registration system, thorough temperature measurement and disinfection at the entrance of the venue, and mandatory wearing of masks.

Similar to the previous exhibition, the simultaneous exhibitions include 11 exhibitions such as "LED JAPAN", "Imaging Japan", "MEMS Sensing & Network System Exhibition", and "nano tech", an international exhibition of nanotechnology. It was held at the exhibition. The scale of the real exhibition was 45 booths of 41 companies by interOpto alone, and 86 booths of 73 companies by total of 4 exhibitions related to light and micromachine. The total number of registered visitors for the three-day period was 10,615, including nano tech, which allowed mutual admission, and a total of 15 exhibitions, and 22,704 including online participation.

Table 4　FY 2020 Symposium on the Optoelectronics Industry and Technology

10:00 ～ 10:05	Opening Remarks	Mr. Yasuhisa Odani President / Vice Chairman, OITDA
10:05 ～ 10:15	Guest Greeting	Mr. Kazumi Nishikawa Director, IT Industry Division, Commerce and Information Policy Bureau, METI
10:15 ～ 11:15	Large-scale optical quantum computing with quantum teleportation	Dr. Akira　Furusawa Professor　Department of Applied Physics, School of Engineering, The University of Tokyo
11:15 ～ 12:00	New trends in photonics network technology	Dr. Takeshi　Hoshida Future Network Division Fujitsu Limited
13:00 ～ 13:45	Safety and efficacy of inactivate of Bacteria and Corona Viruses by using Care 222(222nmUV-C) which is safe for human	Mr. Tatsushi Igarashi Executive Technical Advisor, Care 222nm Project, Business Management Head Quarters, Ushio Inc.
13:45 ～ 14:30	The World After Coronavirus 7 Emerging Megatrends	Mr. Masahiro Kato Editor-in-Chief, Nikkei xTECH (Advanced Technology, Information Technology) Nikkei Business Publications, Inc.
14:45 ～ 15:30	Optoelectronics Industry Trends ～ History of 40 Years ～	Dr. Naoto Kobayashi Professor Emeritus WASEDA university
15:30 ～ 16:15	Optoelectronics Technology Trends and Prospects	Dr. Yoshiaki Nakano Professor Department of Electrical and Electronic Engineering The University of Tokyo
16:20 ～ 17:00	The Award Ceremony of 36th Kenjiro Sakurai Memorial Prize	

A “Notable Optoelectronics Technology and Special Exhibit Zone” was set up in the Exhibition Hall. In this zone, recommended by the working groups of OITDA’s Optoelectronics Technology Trend Committee exhibited their technologies and products. A Notable Optoelectronics Technology Seminar was also held at the seminar site in the Exhibition Hall.

At the OITDA booth, we conducted public relations activities such as introducing activities and providing the latest information, such as exhibiting panels, especially for research on the optical industry and technology, such as displaying research reports and distributing Annual Technical Report for free.

3. 36h Kenjiro Sakurai Memorial Prize

The Kenjiro Sakurai Memorial Prize, was established in 1985 and celebrates the great achievements of the late Kenjiro Sakurai, who promoted the development of the optoelectronics industry and served as a board member of OTDA.

It’ll be awarded to individuals and groups who have made pioneering contributions to the optoelectronics industry and technological development.

By 2020, 68projects (171 people) have been awarded.

In 2020, two projects were awarded.

One prize was awarded to Dr.Tsutomu Miyasaka.

Dr. Tsutomu Miyasaka at Toin University of Yokohama has developed Hybrid Organic-Inorganic Perovskite Solar Cell ahead of the rest of the world. Perovskite materials are relatively simple to make. And those have the potential for low cost and mass production. Improvement of material stability and development of lead-free material systems are also making wide progress. In the future, Perovskite materials is expected to develop as one of the solar cell materials that will build a sustainable society.

The other prize was awarded to Dr.Tadashi Oshima, Mr. Hazime Kato of Toyota Central R&D Labs, and Mr. Natsuki Sugiyama, Mr. Hironori Aoyama of Toyota Motor Corporation.

Dr. Tadashi Oshima and his team at Toyota Central R&D Labs. realized the production of metal additive manufacturing valve seats for automobile engines by using semiconductor laser processing. This significantly improved wear resistance, heat resistance, intake and exhaust port shape freedom. It is extremely significant that the photo-forming method, which is a powerful means of 3D processing, is operating at the heart of the core industry, and it is an excellent achievement that greatly contributes to the development of the optical industry in Japan.

Awardees of the 36th Kenjiro Sakurai Memorial Prize
Back row, from left: Mr. Hazime Kato, Mr. Natsuki Sugiyama, Mr. Hironori Aoyama
Front row, from left: Dr. Tadashi Oshima, Dr. Tsutomu Miyasaka

The award ceremony was held on December 9th, 2020 following the FY 2020 Symposium on the Optoelectronics Industry and Technology.

At the ceremony, Dr.Yasuhiko Arakawa (The University of Tokyo), who is the chairperson of the Kenjiro Sakurai Memorial Prize Committee, reported on the selection process and results. This was followed by the presentation of certificates, medals, and extra prizes to the awardees.

Supporting Members

(As of March 31, 2021)

[Chemistry]

Fujifilm Corporation

Mitsubishi Chemical Holdings Corporation

Nissan Chemical Corporation

Shin-Etsu Chemical Co., Ltd.

Sumitomo Bakelite Co., Ltd.

Yamamoto Kogaku Co., Ltd.

[Glass & Ceramics]

AGC Inc.

Corning International K.K.

Nippon Sheet Glass Co., Ltd.

Sumitomo Osaka Cement Co., Ltd.

Toyo Seikan Group Holdings, Ltd.

[Electric Wire & Cable]

Fujikura Ltd.

Fujikura Dia Cable Ltd.

Furukawa Electric Co., Ltd.

Sumitomo Electric Industries, Ltd.

SWCC Showa Holdings Co., Ltd.

[Electronics & Electronic Appliances]

Anritsu Corporation

Asahi Kasei Microdevices Corporation

Fujitsu Limited

Hamamatsu Photonics K.K.

Hitachi, Ltd.

Honda Tsushin Kogyo Co.,Ltd.

Huawei Technologies Japan K.K.

Hakusan, Inc.

Japan Aviation Electronics Industry, Ltd.

Kyocera Corporation

Lumentum Japan, Inc.

Mitsubishi Electric Corporation

NEC Corporation

NTT Electronics Corporation

Oki Electric Industry Co., Ltd.

Panasonic Corporation

Pioneer Corporation

Santec Corporation

Sanwa Denki Kogyo Co., Ltd.

Seiko Epson Corporation

Seiwa Electric Mfg. Co., Ltd.

Sharp Corporation

Sony Corporation

Taiyo Yuden Co., Ltd.

Toshiba Corporation

Ushio Inc.

Yokogawa Electric Corporation

[Precision Instrument]

Konica Minolta, Inc.

Nikon Corporation

Olympus Corporation

Ricoh Company, Ltd.

Seikoh Giken Co., Ltd.

Sigma Koki Co., Ltd.

Suruga Seiki Co., Ltd.

Topcon Corporation

[Commercial & Advertisement]

JTB Communication Design, Inc.

Marubun Corporation

The Optronics Co., Ltd.

[Electric Power]

Central Research Institute of Electric Power Industry

[Other Manufacturing]

Adamant Namiki Precision Jewel Co., Ltd.

Dai Nippon Printing Co., Ltd.

Optoquest Co., Ltd.

[Others]

Granopt Ltd.

Institute for Laser Technology

Japan Optomechatronics Association

KDDI Research, Inc.

Nippon Telegraph and Telephone Corporation

NTT Advanced Technology Corporation

Photonics Electronics Technology Research Association (PETRA)

TOYOTA Central Research and Development Labs., Inc.

UL Japan, Inc.

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