

Future Creation Vision with Utilization of Photonics and Electronics Technologies



PHOTON VISION

Promotion Council of Future Creation Vision with Utilization of Photonics and
Electronics Technologies

Member Organizations of Promotion Council
of Future Creation Vision with Utilization of Photonics and Electronics Technologies

Industry Support Organizations and Commerce and Industry Organizations

Hamamatsu Chamber of Commerce and Industry
Iwata Chamber of Commerce and Industry
Fukuroi Chamber of Commerce and Industry
Kakegawa Chamber of Commerce and Industry
Shizuoka Prefectural Federation of Chambers of Commerce and Industry
Shizuoka Prefectural Federation of Small Business Associations West Office
JETRO Hamamatsu
Hamamatsu Agency for Innovation

Universities

National University Corporation Shizuoka University
National University Corporation Hamamatsu University School of Medicine
Public University Corporation Shizuoka University of Art and Culture
Educational Corporation Shizuoka Institute of Science and Technology
Educational Corporation The Graduate School for the Creation of New Photonics Industries

Financial Institutions

Shizuoka Bank
Hamamatsu Iwata Shinkin Bank
Shimada Kakegawa Shinkin Bank
Enshu Shinkin Bank

Administrative Bodies

Shizuoka Prefecture
Hamamatsu City
Iwata City
Kakegawa City
Fukuroi City
Kosai City
Omaezaki City
Kikugawa City
Mori Town

Member Organizations of Promotion Council of Future Creation Vision with Utilization of Photonics and Electronics Technologies

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Aiming to form a cluster - Photonics and electronics technologies have an infinite potential –

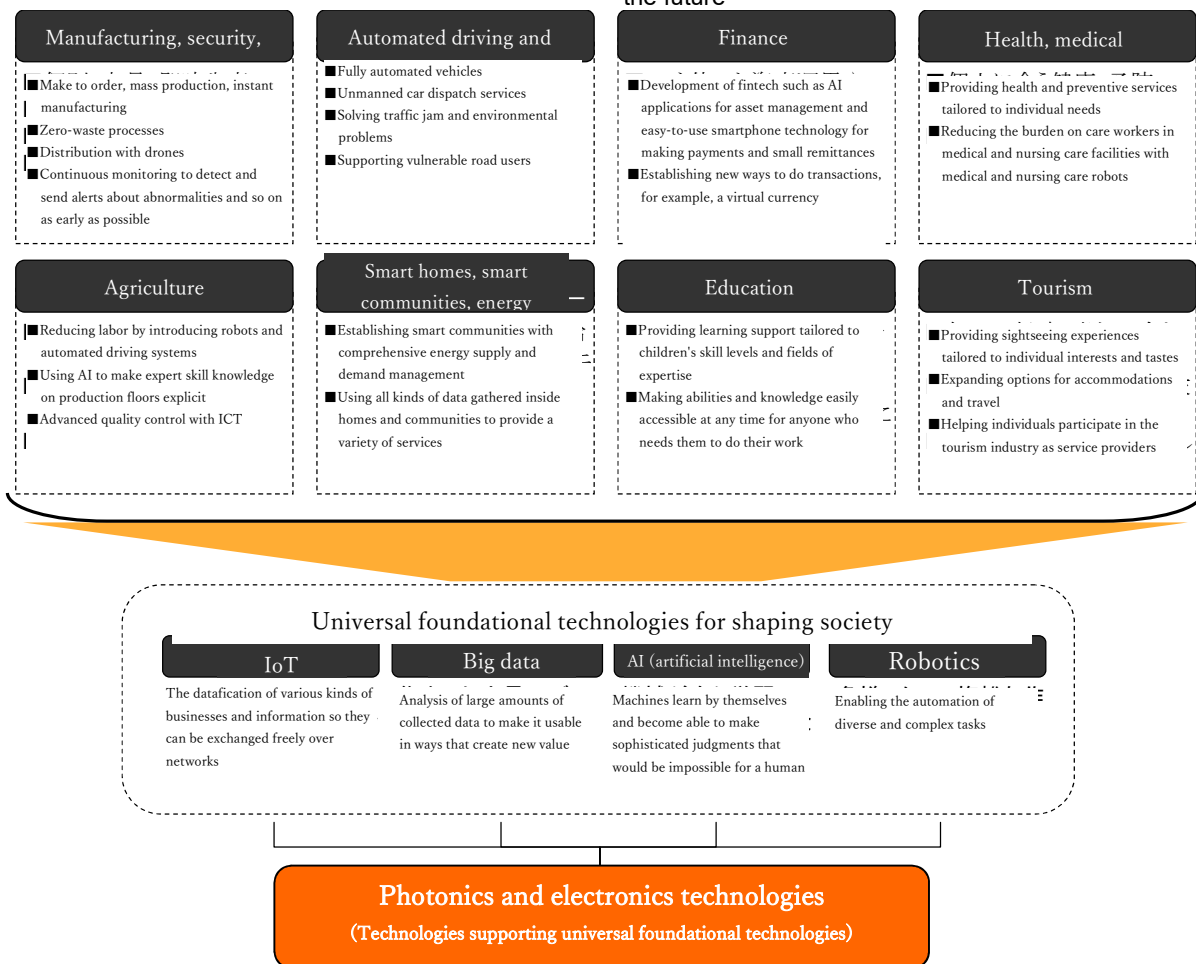
Chapter 1 Expectation for Photonics and Electronics Technologies (Current Situation and Challenges)

1 Infinite Possibilities of Photonics and Electronics Technologies

(1) The future that photonics and electronics technologies bring

- What role will photonics and electronics technologies play in the society of the future?
- The Fourth Industrial Revolution is set to revolutionize manufacturing. Technologies such as the Internet of things (IoT), big data, AI (artificial intelligence), and robotics will shape the foundations of the society of the future.
- Photonics and electronics technologies are one of the Key Enabling Technologies* that will allow those foundational technologies to reach their full potential. Photonics and electronic technologies will shape new industries and transform society and the way we live, for example by enabling automated driving, smart homes, and surgical robots.
- The development of photonics and electronics technologies opens the door to the future of our society, our industry, and our daily lives.

Fig. 1: Photonics and electronics technologies are crucial fundamental technologies that support the society of the future



(Created by our office by referring to the Interim Report of the Industrial Structure Council of METI "New Industrial Structure Vision" and the concept of KETs (see below))

*The "Key Enabling Technologies" are six technologies that the European Union believes are important for supporting economic growth and employment. They are also called KETs.

(1) micro and nanoelectronics (2) nanotechnology (3) industrial biotechnology (4) advanced materials (5) photonics (6) advanced manufacturing technologies (See: <http://ec.europa.eu/>)

(2) Photonics and electronics technologies transform manufacturing

- Photonics and electronics technologies have transformed the way this region carries out manufacturing, one of its core strengths.
- Automatic selection, failure analysis, and microanalysis with sensors and light sources have helped save labor and reduce manufacturing costs of businesses.
- Alternative implementation methods that make use of photonics and electronics technologies are also increasingly proving useful on manufacturing floors where skills and knowledge are passed on from worker to worker.
- The development of lasers and related technologies also helps solve problems and increase the advancement of work on manufacturing floors by enabling workers to do instantaneous fine processing and non-contact processing.
- As the Internet of things develops further, it will become integrated with more and more objects, meaning that possible applications for light sensing and communication technology on manufacturing floors will only increase. Photonics and electronics technologies provide solutions for productivity improvement not just to manufacturing, but also to myriad other fields from logistics to retail, design, services, and so on.



Architecture x Photonics and Electronics Technologies

Since the illumination uses daylight, a top light system with a function to send a light control signal to the high ceiling LED lighting equipment based on data of external illuminometers was produced experimentally. Since a specific lighting method is required to secure the feeling of brightness, commercialization of a top light with illumination integrated will be the goal in the future.



▲ Top light system



Agriculture x Photonics and Electronics Technologies

A prototype of an irrigation control manual for stress cultivation using a “wilt detection soft sensor” was developed. This sensor forecasts the wilt status with high accuracy from environment information and plant images obtained from various sensors, and cameras set in farm fields by using AI. In the future, research and development will be conducted to see whether the differences of the medium amount and variety and the differences of the season and region can be accepted, and service deployment will be discussed.

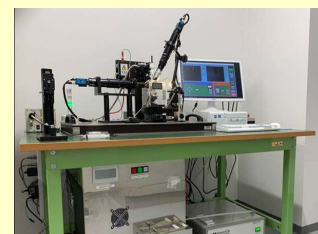


▲ Tomato watering control system



Medical Care x Photonics and Electronics Technologies

A prototype that can drop and measure a very small amount of droplets more accurately was developed by adding a temperature and humidity control device to Droplet Spotter for Patterning using an electrostatic-force (ODS-P Series). In the future, the company to which support is requested will improve the deliverable, temperature and humidity control chamber for the exiting electrostatic dispensing patterning equipment and will commercialize it as an option of the equipment.



▲ Microdroplet spotter for patterning using an electrostatic-force

2 Global Bases of Photonics and Electronics Technologies and Western Shizuoka Prefecture

(1) Global bases

Europe and the U.S. are the bases where the research and development and industrial application of the photonics and electronics technologies are the most flourishing in the world.

1) Across Europe

- The integrated project “ACTPHAST” (abbreviation of **A**ccess **C**enter for **P**hotonics **I**nnovation **S**olutions And **T**echnology Support) in the European Union Seventh Framework Program for Research and Technological Development (FP7) is in progress across Europe (project period: 2013 - 2017).
- More than 200 specialists from 23 organizations in Europe that lead photonics research work together with the Brussels Photonics Team (B-PHOT) in Vrije Universiteit Brussel in the center to support short-term innovation projects of small and medium-sized companies.



▲ 23 organizations linked by ACTPHAST
(Source: <http://www.actphast.eu/>)

2) Germany

- In Germany, optics is one of the key industries. It is a cross-industry technology used for lighting technology, communication technology, display, measurement technology, medical care, and biotechnology. There are clusters in different regions in Germany with optical technology in the center, for example, OptoNet in Jena where Carl Zeiss and others are located and OptecBB in Berlin where Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute, HHI, etc. exist.
- These clusters with the optical industry in the center have established cooperative relationships beyond the regional boundaries and founded a cooperative association OptecNet Deutschland e.V. to work on research and development, application, education, and public relations.

Fig. 2: Eight clusters composing OptecNet



(Source : <http://optecnet.de/>)

3) U.S.

- In 2012, industry, academia, and government cooperated and established a photonics initiative (National Photonics Initiative) (Office: Stanford University).
- To make the U.S. more powerful, photonics is positioned as a critical technology of five major areas (Energy & Environment, Information Technology & Communications, Advanced Manufacturing, Biomedicine, Defense & National Security).
- In 2015, AIM Photonics (American Institute for Manufacturing Integrated Photonics) was started at the initiative of the Research Foundation for the State University of New York.
- This research institute is an industry-academia-government collaboration consortium that consists of 124 organizations including companies, non-profit organizations, and universities, for which 110 million dollars are provided by the Department of Defense and more than 500 million dollars by agencies other than the federal government.

Major universities: Massachusetts Institute of Technology, Stanford University, Columbia University, etc.

Major companies: Intel, Hewlett-Packard, etc.

(2) Situation of industries related to photonics and electronics technologies in Japan and approaches in different regions

- According to “Survey Results of Total Shipments and Domestic Production of the Optical Industry in 2015” published by the Optoelectronics Industry and Technology Development Association in March 2016, the domestic production of the optical industry in Japan has been fluctuating between 5 trillion to 10 trillion yen since 2010. It was about 8 trillion yen in 2015.
- In addition to the Hamamatsu/Higashi-Mikawa area, Saitama Prefecture, Itabashi Ward in Tokyo, and Minoh City in Osaka are major areas in Japan that work on industrial development utilizing photonics and electronics technologies.

Fig. 3: Major areas that work on industrial development utilizing photonics and electronics technologies

Tochigi Prefecture (Tochigi Optical Industry Development Council)

The **“Tochigi Optical Industry Development Council”** was established in June 2009 by manufacturers of optomechanical apparatuses and lenses and semiconductor lithography equipment that represent Japan, universities, industry support organizations. It implements various support projects such as human resource development and securement support projects, research and development support projects, etc.

Saitama Prefecture (Vision for Saitama OPTVILLAGE)

In order to form a regional industry brand of **“Saitama strong in opto-electronics”**, the prefecture works on collaboration with early stage and large companies, collaboration with application areas such as information communication and semiconductors, research of the latest technology trends, and discovery of seeds.

Itabashi Ward, Tokyo

One of the themes for new industry development is “light and color.” Itabashi Ward participates in various specialized exhibitions for companies related to optics and holds technology research and development network events to promote industry-academia collaboration and collaboration between companies.

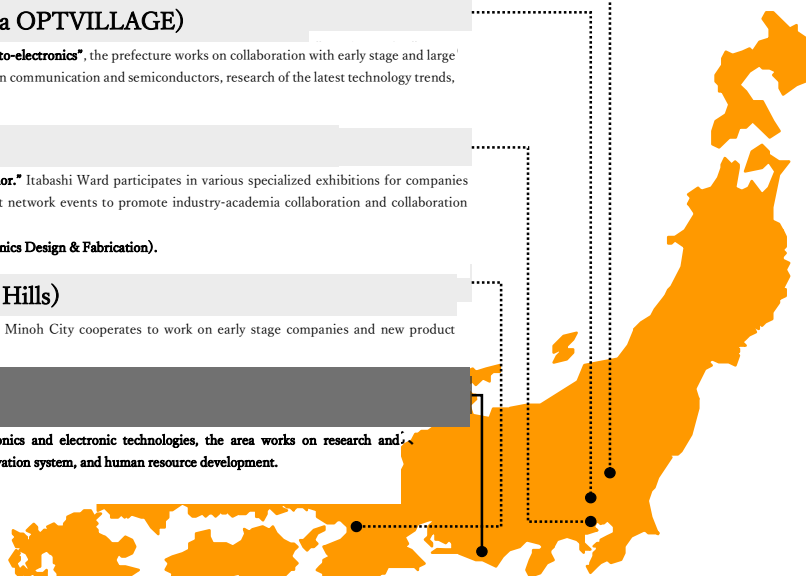
The ward bid for ODF (International Conference on Optics-photonics Design & Fabrication).

Minoh City, Osaka (Minoh Photonics Hills)

With **Osaka University Photonics Center Building** in the center, Minoh City cooperates to work on early stage companies and new product development.

Hamamatsu/Higashi-Mikawa area

In order to create new industries based on cutting-edge photonics and electronic technologies, the area works on research and development, sharing of research instruments, building of an innovation system, and human resource development.

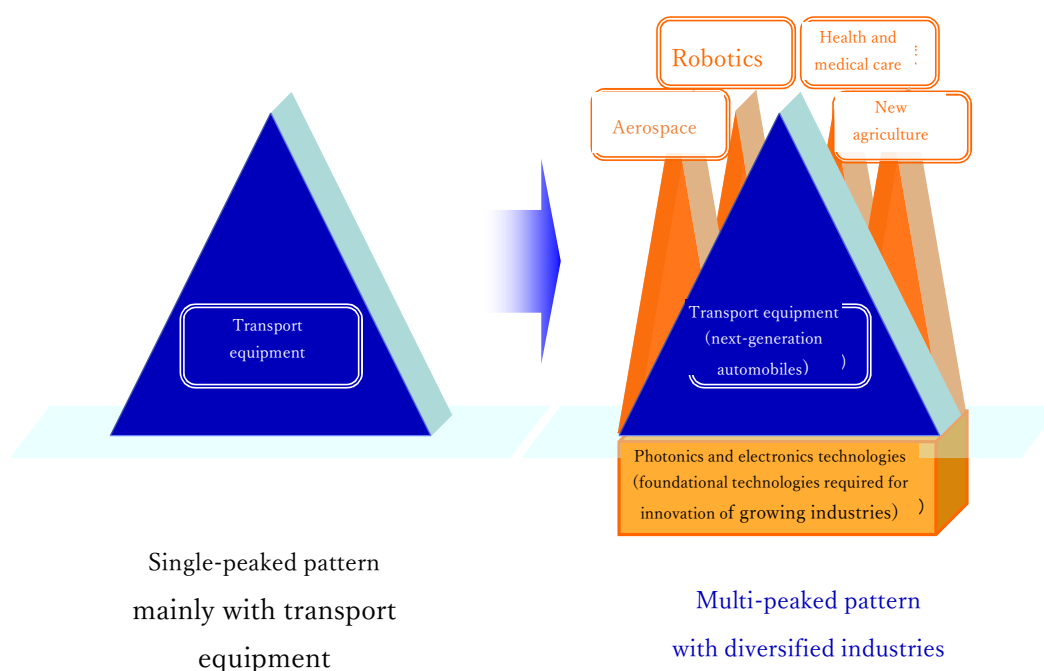


(3) Situation of industries related to photonics and electronics technologies in western Shizuoka Prefecture

1) Expectation for photonics and electronics technologies in western Shizuoka Prefecture

- It is expected that innovation will occur in the transport equipment industry that leads western Shizuoka Prefecture because of the transition to next-generation automobiles such as electric vehicles and breakthroughs in automated driving technology.
- Especially, the competitive environment of next-generation automobiles is diversified as many parts including engines will no longer be required and electronics manufacturers enter the automobile industry one after another because of the transition to electric vehicles.
- Therefore, new industrial development is required for western Shizuoka Prefecture in addition to transport equipment including next-generation automobiles.
- Aerospace, robots, health and medical care, and new agriculture are areas for which growth in the future is continuously expected. They have a potential to be new basic industries in which the manufacturing strength of western Shizuoka Prefecture can be exerted.
- Since the photonics and electronics technologies are fundamental technologies required for innovation of these growing industries, it is essential for western Shizuoka Prefecture to develop and agglomerate industries related to the photonics and electronics technologies.

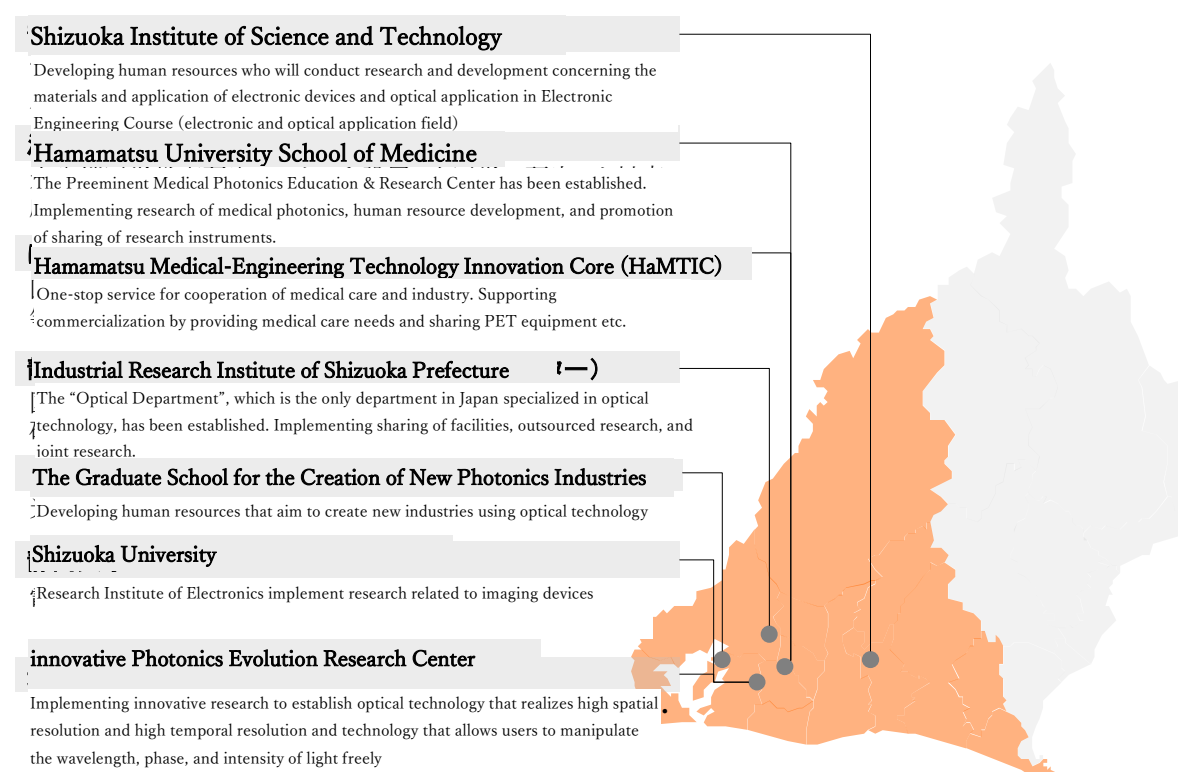
Fig. 4: From single-peaked pattern to multi-peaked pattern



2) Agglomeration state of academic research institutes related to photonics and electronics technologies

- The industries related to the photonics and electronics technologies in western Shizuoka Prefecture are agglomerated with the Hamamatsu area in the center as they are largely descended from Dr. Kenjiro Takayanagi who projected a character “ \angle ” on a television in Shizuoka University for the first time in the world.
 - The Hamamatsu area has many companies including global companies with advanced photonics and electronics technologies that supported winning of the Nobel Prize and early stage companies originated from universities with the photonics and electronics technologies as their theme. It is an area where research and development of light sources and sensors and manufacturing of various measuring equipment and image sensors are actively carried out.
- Not only companies but also academic research institutes such as universities that conduct research related to the photonics and electronics technologies are agglomerated geographically and work together, which is also a unique characteristic of the area.
- With of the adoption by JST (Japan Science and Technology Agency) subsidy in 2009, equipment related to imaging such as PET/CT equipment was introduced in the Hamamatsu University School of Medicine and equipment related to laser processing, etc. in the Hamamatsu Technical Support Center, Industrial Research Institute of Shizuoka Prefecture respectively, and operation of the “Hamamatsu Medical-Engineering Technology Innovation Core (HaMTIC)” that creates regional innovation with fusion of manufacturing technologies and medical care/medical science was started. This hub is intended to enhance the function as a one-stop service for cooperation of medical care and industry with adoption of the “Regional Science and Technology Demonstration Base Establishment Project” of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in 2016.
- On June 11, 2013, four organizations, Shizuoka University, Hamamatsu University School of Medicine, The Graduate School for the Creation of New Photonics Industries, and Hamamatsu Photonics K.K. announced “Photonics Declaration 2013 in Hamamatsu” to make Hamamatsu a preeminent photonics city.
- In 2015, the building of the innovative Photonics Evolution Research Center was completed in the Hamamatsu Campus of Shizuoka University, and innovative research and development are conducted by researchers and early stage companies.

Fig. 5: Agglomeration state of research institutes such as universities



3) Creation of results with regional revitalization project

• With regard to the regional approaches conducted until now, industry, academia, government, and finance have worked together with the Hamamatsu area in the center and conducted research and development and industrial development utilizing national projects to create results since adoption of “Collaboration of Regional Entities for the Advancement of Technological Excellence” in 2000, followed by adoption of the “Knowledge Cluster Initiative” in 2002 and the “Regional Innovation Strategy Support Program” in 2012.

Fig. 6: History of major national projects and research results

2000	<p>Collaboration of Regional Entities for the Advancement of Technological Excellence (JST) Period: 2000 - 2005</p> <p>Theme: Ultra-high-density photon industrial base technology development</p>		
2002	<p>Knowledge Cluster Initiative (MEXT) Period: 2002 - 2006</p> <p>Theme: Research and development of ultra- visual imaging technology to support next-generation industries and medical care (Vision for Hamamatsu Optronics Cluster)</p>	<p><Research outline></p> <ul style="list-style-type: none"> • Function integrated imaging device (1) • Medical imaging system development • X-ray/ γ-ray solid imaging device development 	 (1) Wide dynamic range camera
2007	<p>Regional Innovation Strategy Support Program (global type) (Previous Knowledge Cluster Initiative Second Stage) (MEXT) Period: 2007 - 2011</p> <p>Theme: Building of a secure, safe, comfortable and sustainable innovation society with advancement of optronic technology (Vision for Hamamatsu Optronics Cluster)</p>	<p><Research outline></p> <ul style="list-style-type: none"> • Development of high-performance/high-function imaging devices and intelligent information processing (2) • Building an environment to support human activities • Ultra-high accuracy manufacturing support and observation system development 	 ((2) Ultra-high sensitivity non-cooling CMOS image sensor
2009	<p>Regional Industry-Academia-Government Collaborative Research Base Development Project (JST) Period: 2009 -</p> <p>Theme: Creation of regional innovation with fusion of manufacturing technologies and medical care/medical science (Base name: Hamamatsu Medical-Engineering Technology Innovation Core [HaMTIC])</p>	<p><<Example of result>></p>  Navigation system for endoscopic surgery Approval no. 22400BZX00072000	 Digital larynx strobe Approval no. 225AFBZX00027000 号
2012	<p>Regional Innovation Strategy Support Program (MEXT) Period: 2012 - 2016</p> <p>Theme: Life photonics innovation with fusion of cutting-edge photonics and electronics technologies and manufacturing foundational technologies</p>	<p><Research outline></p> <ul style="list-style-type: none"> • Realization of hardware and software for continuous terahertz light sources and application • Identification of molecular structure of protein and organic molecules with terahertz waves spectrum measurement • Realization of application of photonics and electromagnetic waves technology to medical care and drug development 	<p><Example of result></p>  Two-dimensional colorimeter
2013	<p>Project to Develop Bases for International Scientific Innovation Using Regional Resources Based on Industry-Academia Cooperation (MEXT) Period: 2013 -</p> <p>Theme: Realization of a society where light is manipulated freely beyond time and space</p>	<p><Research outline></p> <ul style="list-style-type: none"> • Realization of a paradigm shift of the industrial and medical care fields with wavefront control light sources • Innovation of infrared spectroscopic measurement technology and clarification of intermolecular interaction • Practical application of innovative time-space image construction technology • Innovation of optical time-space remote control technology • Practical application of an early diagnosis system of disease • Construction of gene optical control tools • Research of innovation of the commercialization promotion system 	
2015	<p>Completion of the building of innovative Photonics Evolution Research Center</p>		
2016	<p>Regional Innovation Ecosystem Building Program (MEXT) Period: 2016 - 2020</p> <p>Theme: New technology of medical photonics created by preeminent photonics city Hamamatsu</p>	<p>Regional Science and Technology Demonstration Base Development Project (MEXT) Period: 2016 -</p> <p>Theme: Development of practical application of new technology of medical photonics created by Hamamatsu (Enhancement of the function of Hamamatsu Medical-Engineering Technology Innovation Core [HaMTIC])</p>	

3 Advantages and Challenge of Western Shizuoka Prefecture from the Viewpoint of Photonics and Electronics Technologies

(Advantages)

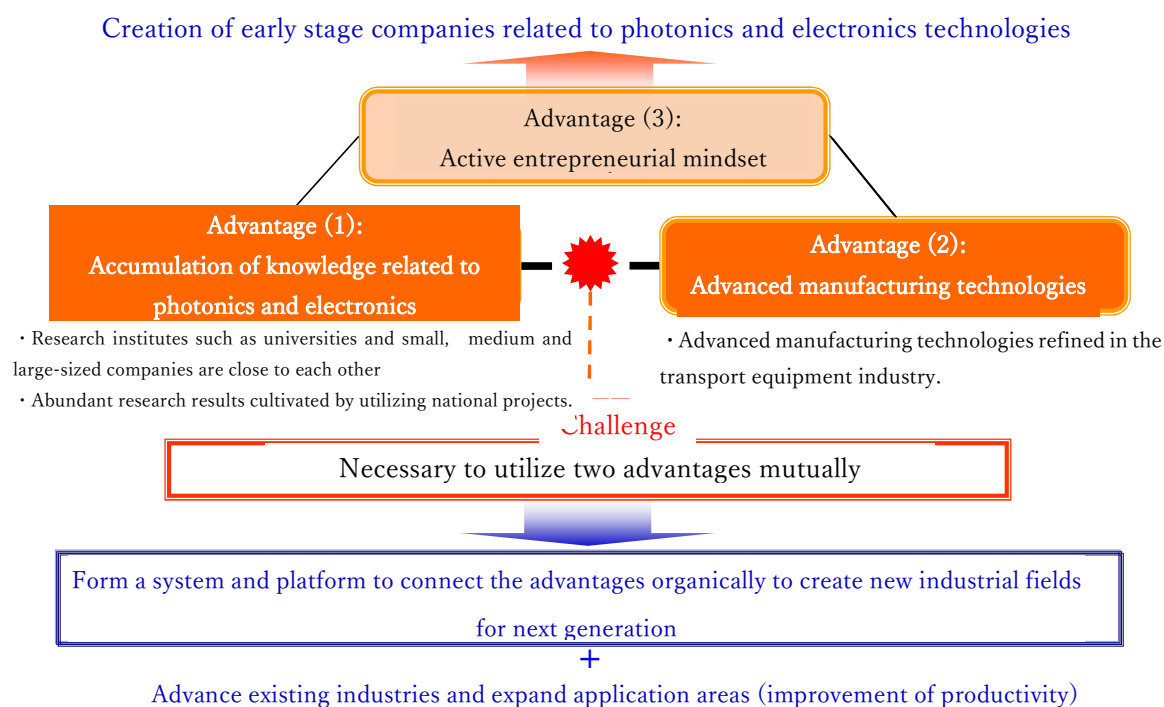
Advantages of western Shizuoka Prefecture concerning the photonics and electronics technologies are summarized into the following three.

- (1) The region has an “accumulation of knowledge” related to photonics and electronics technologies. Research institutes such as universities and small, medium and large-sized companies are agglomerated, and many research results are accumulated through utilization of national projects.
- (2) The region has world-leading “advanced manufacturing technologies” refined in the transport equipment industry.
- (3) The region features an “active entrepreneurial mindset” with many companies established with the photonics and electronics technologies as a theme, such as early stage companies originated from universities.

(Challenge)

- To improve regional industries to a more advanced level, it is necessary to mutually utilize each of (1) “accumulation of knowledge related to the photonics and electronics technologies” and (2) “advanced manufacturing technologies” among the advantages above. It can be said that the challenge of western Shizuoka Prefecture is to form a system and platform to combine these advantages organically and create new industry fields for the next generation.

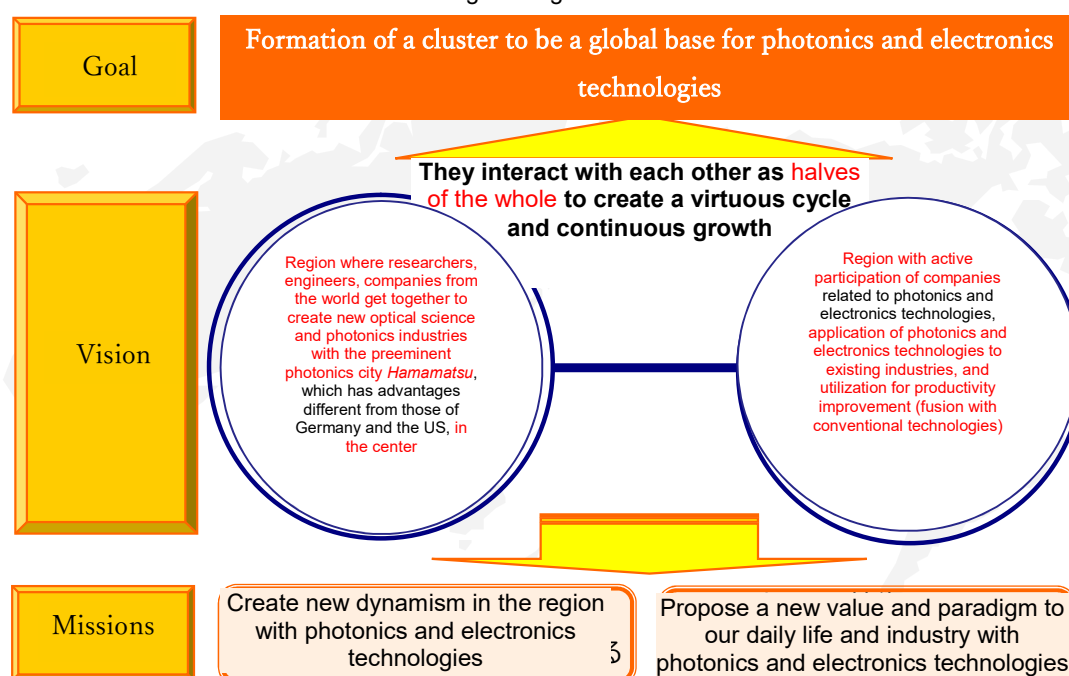
Fig.7: Necessary to combine two advantages organically



1 Regional Vision

- We will take actions for growth with the regional revitalization goal “formation of a cluster to be a global base for photonics and electronics technologies” by utilizing the future potential of the photonics and electronics technologies and advantages of western Shizuoka Prefecture.
- Based on the “Photonics Declaration 2013 in Hamamatsu”, we will develop this region into an area where new optical science and photonics industries are created with the “Preeminent Photonics City *Hamamatsu*” in the center (Half 1).
- We will create a dynamic region with fusion and development of photonics and electronics technologies and conventional technologies (Half 2).
- We will create a sustainably growing region with these as two halves of the whole that interact with each other to produce a virtuous cycle.

Fig. 8: Regional vision and missions



2 Approaches

- We will promote projects with the approaches of “open innovation” and “market in (market oriented).”

Business development with open innovation

Business will be promoted with cooperation of various parties concerned such as companies, universities and research institutes, local governments, and citizens with 26 organizations of industry, academia, government, and finance with western Shizuoka Prefecture in the center.

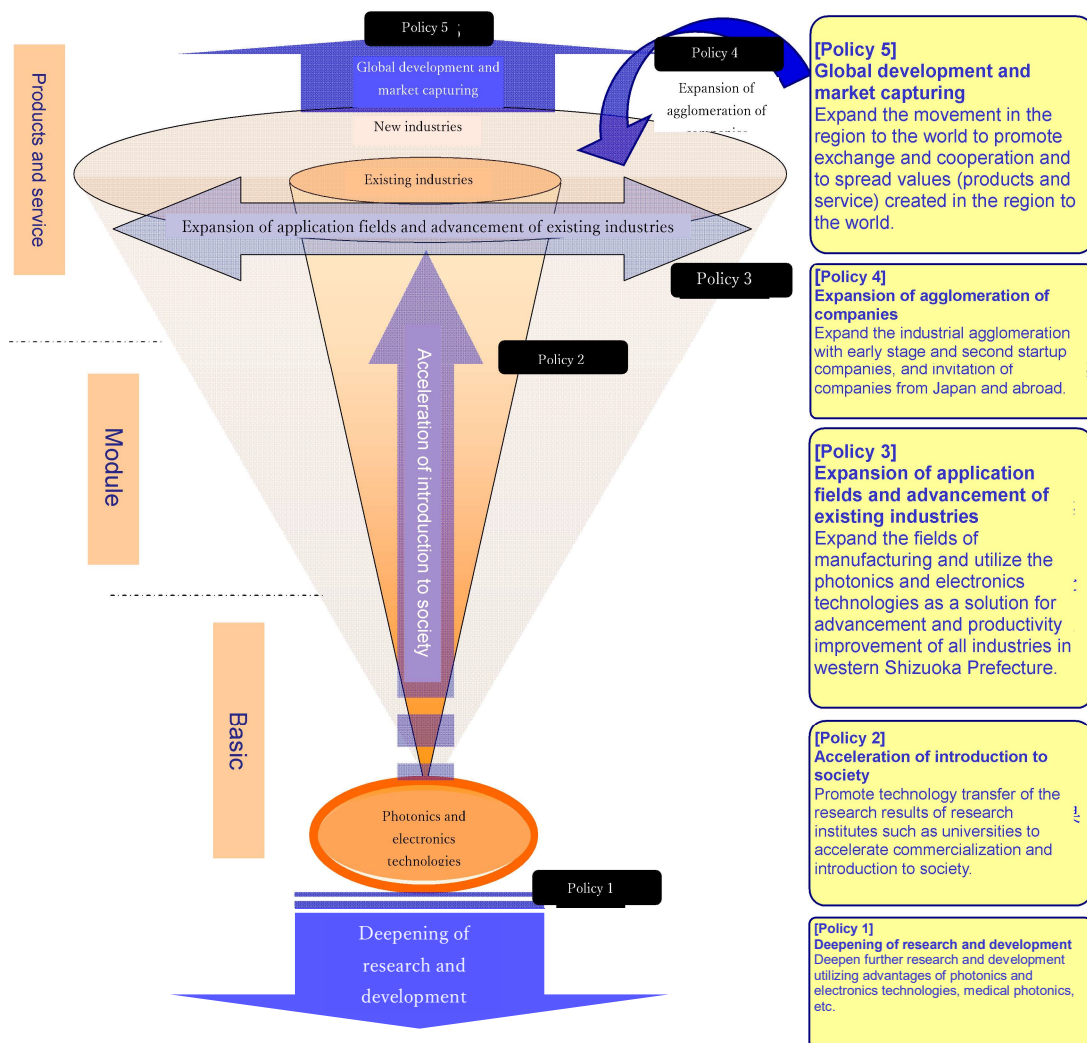
Promotion of commercialization with idea of market in

Business will be promoted with the idea of market in from research and development to productization and commercialization, human resource development, and utilization of photonics and electronics technologies (improvement of productivity).

3 Basic Policies of Implementation of Measures

- Unlike the pyramid structure of the transport equipment industry, the industries related to photonics and electronics technologies have a fan-shaped (inverted triangle) industrial structure.
- The photonics and electronics technologies, which are the fundamental and elemental technologies, are the “base” of the fan. There are modules in the middle toward the top of the fan, and the top part has various industrial fields such as the electronic equipment, transport equipment, medical care, agriculture, and service industries that provide final consumables.
- We focus on this industrial structure and establish five basic policies to further spread the fan and create dynamism of the industries related to photonics and electronics technologies.

Fig. 9: Five basic policies to create dynamism of industries related to photonics and electronics technologies



(Prepared by the office by referring to the website “Commercialization Process” of innovative Photonics Evolution Research Center)

4 Implementation of Measures

To achieve this goal, we specify and deploy the following six items as priority measures based on the five basic policies above to have organizations cooperate and work together to proactively participate and take actions.

– Priority Measure 1 – Construction and operation of platform

[Current situation and approaches]

- Hamamatsu Agency for Innovation Strategic Innovation Division, which is the overall coordination organization of “Hamamatsu/Higashi-Mikawa Life Photonics Innovation” utilizing the “Regional Innovation Strategy Support Program”, was established for a limited period of five years. (Scheduled abolition date was March 2017)
- The coordination functions established based on the business purposes of sectors such as universities and industry support organizations that flexibly work together.

[Vision for expansion and enhancement]

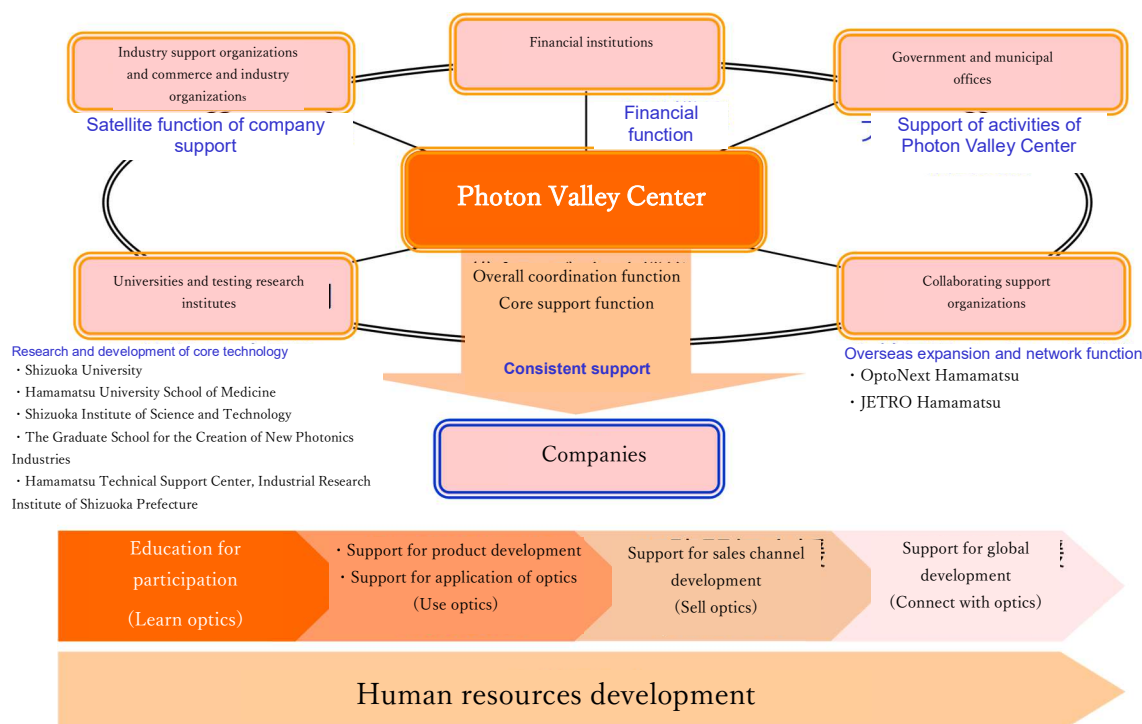
(Constructing a platform)

- The Photon Valley Center was established as a core support organization to enhance the cooperation with the industry-academia collaboration promotion organizations of universities and to promote networking of the group of companies to build a system (platform) to consistently support from the entrance to the exit.
- The approaches of overseas clusters will be researched, and a framework for new company support utilizing photonics and electronics applied technologies will be built with cooperation with universities, etc.

(Operating the platform)

- The Photon Valley Center will build a network of participating companies and will cooperate with coordinators of each sector to operate the platform.

Fig. 10: Operation image of platform



* OptoNext Hamamatsu : The name of the organization that builds a network of industry, academia, government, and finance with photonics and electronics technologies as a theme. Its office is in The Graduate School for the Creation of New Photonics Industries. It aims to share technology information and success cases of regional companies and to build cooperative relationships with global clusters of industries related to photonics and electronics technologies such as OptoNet in Jena, Germany and OptecBB in Berlin.

– Priority Measure 2 – Establishment and operation of human resources development system suitable for global base

[Current situation and approaches]

- Implementation of Hamamatsu Top Gun Project that cultivates future scientific human resources
- “Course of development of core human resources for manufacturing with lasers” held by The Graduate School for the Creation of New Photonics Industries
- Higher education and adult education in universities and graduate school

[Vision for expansion and enhancement]

(Preparing systematic curricula suitable for a global base)

- Consideration of curricula attractive for students, engineers, and researchers in Japan and abroad
- Consideration of diversified curricula according to growth, such as secondary and higher education and adult education
- Consideration of opportunities to learn a wide range of knowledge and technology (industry design, marketing, management, etc.) not limited to direct knowledge and technologies of the photonics and electronics technologies
- Enhancement of development of human resources aiming at early stage and second startup companies

(Activating human resource exchange between universities)

- Consideration of provision of opportunities for students to mutually attend classes between universities in Japan and abroad and introduction of credit transfer

(Activating human resource exchange between research institutes such as universities and companies)

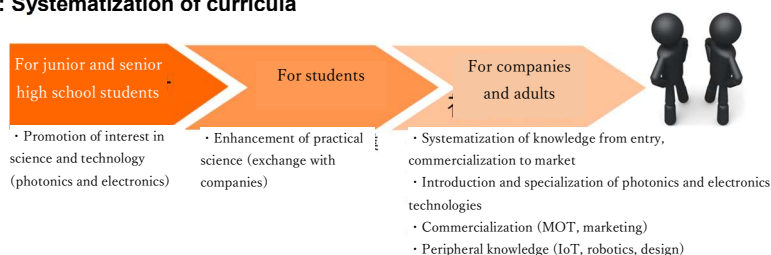
- Consideration of a system for companies to accept students and a system for universities to accept industrial human resources, including the view point of securement and prevention of loss of human resources, with reference to cases in Europe and the US

(Making the most of resources in Japan and abroad)

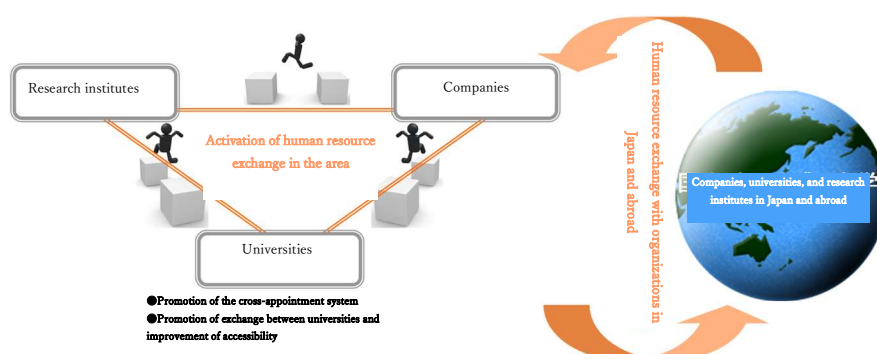
- Transfer of human networks, knowledge, and technology with utilization of retirees of companies
- Provision of human resources development opportunities by each sector (seminars by financial institutions, etc.)
- Utilization of resources of overseas cooperating organizations and dispatch of information from Japan

Fig. 11: Systematization of curricula and human resources development system (image)

Systematization 1: Systematization of curricula



Systematization 2: Systematization of human resources development system



– Priority Measure 3 – Promotion of business matching of companies

[Current situation and approaches]

- A joint unit with universities and companies promotes commercialization by utilizing the “Regional Innovation Strategy Support Program.”
- Shizuoka Technology Transfer Organization L.L.C. promotes circulation of patents of universities in the prefecture (technology seeds presentation, etc.)
- Industry-academia collaboration promotion organizations of universities promote matching of the research seeds in universities and companies.
- Hamamatsu Next-Generation Optical and Health and Medical Care Industries Creation Hub supports manufacturing companies and so forth to enter the health and medical care industries.

[Vision for expansion and enhancement]

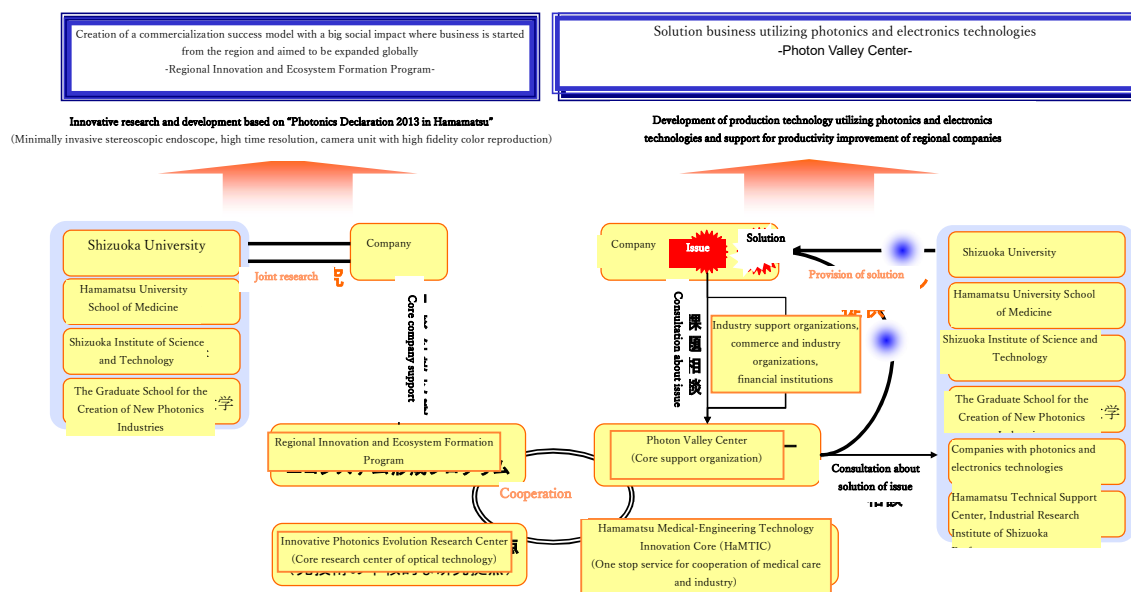
(Promoting matching and solution business)

- The Photon Valley Center will cooperate with each organization to make companies and operators in the region aware that many issues can be solved by utilizing photonics and electronics technologies and will promote matching and solution businesses that lead to advancement and productivity improvement of the industries.
 - Promotion of application to existing industries such as transport equipment industry, health and medical care industries, agriculture and forestry, and service industry.
 - Promotion of matching of issues and needs of companies with technology seeds of universities with help of the consulting service provided in the Photon Valley Center and financial institutions and commerce and industry organizations.

(Promoting technology transfer of research results and innovative research and development)

- The Photon Valley Center will cooperate with each organization to promote technology transfer of research results that have been obtained by utilizing national projects until now.
- Innovative research and development in the medical photonics field will be promoted with matching of seeds of universities and technologies of regional companies by utilizing “Regional Innovation and Ecosystem Formation Program.”

Fig.12 Innovative research and development, and development of production technology and support for productivity improvement of regional Companies



– Priority Measure 4 – Startup and preparation of locational conditions

[Current situation and approaches]

- Creation, cultivation and support of early stage companies by universities
- Startup and second startup support by the prefecture (management innovation plan support, commercialization aid, and others)
- Lending of startup funds by the prefecture, financial institutions
- Invitation of companies by the prefecture, cities and towns (invitation, preparation of an industrial park, etc.)
- Startup support by Hamamatsu Entrepreneur Café
- Promotion of creation of new businesses by Hi-cube (Hamamatsu new business creation type business facility)

[Vision for expansion and enhancement]

(Enhancing support measures for early stage and second startup companies)

- The Photon Valley Center will cooperate with each organization to enhance support measures for early stage and second startup companies (e.g., enhancement of the consultation system, support for acquisition of startup funds, support for acquisition of research and development funds, and support for sales channel development)
- Financial institutions will provide financing and solutions according to the needs and challenges of their client companies.
- The Photon Valley Center will cooperate with each organization to actively provide company information to venture capitalists in Japan and abroad.
- Diversification of startup funds such as utilization of crowd funding will be promoted.

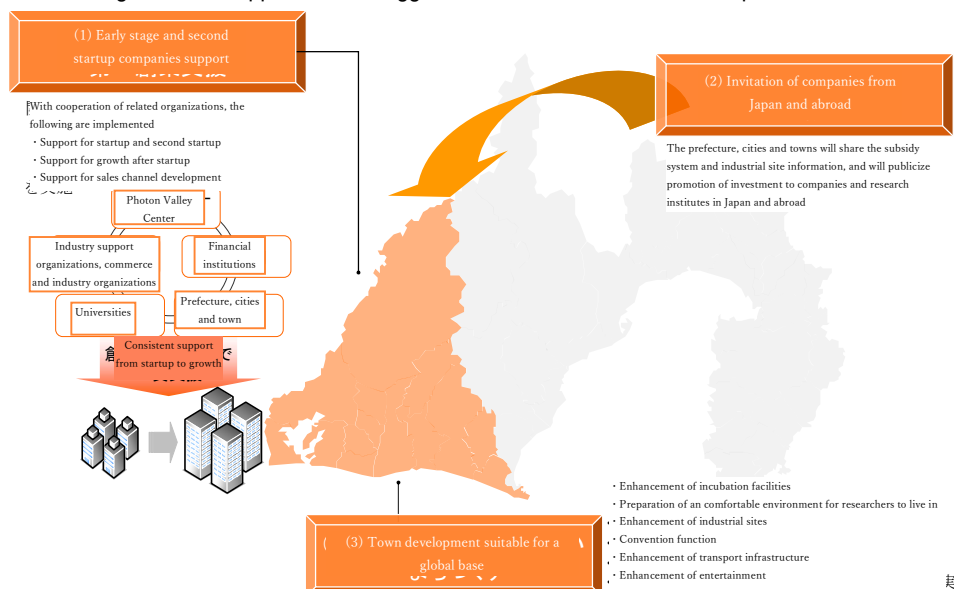
(Promoting invitation of companies aggressively)

- Cooperation among the prefecture, cities and towns (information sharing/joint PR activities etc.) will be enhanced to aggressively promote activities to invite companies related to the photonics and electronics technologies (light source manufacturers, optical system manufacturers, optical users, and others) from Japan and abroad.

(Promoting “town development” suitable for a global base)

- “Town development” will be promoted with the prefecture, cities and towns in the center to attract companies and researchers.

Fig. 13: Three approaches for agglomeration of industries related to photonics and electronics technologies



– Priority Measure 5 – Implementation of innovative research and development

[Current situation and approaches]

- Academic research institutes such as the Innovative Photonics Evolution Research Center, Hamamatsu University School of Medicine Preeminent Medical Photonics Education & Research Center, Hamamatsu Next-Generation Optical and Health and Medical Care Industries Creation Hub, and Hamamatsu Technical Support Center, Industrial Research Institute of Shizuoka Prefecture promote research and development.

[Vision for expansion and enhancement]

(Promoting research and development based on a long-term perspective)

- Research and development will be accelerated by mutual exchange of researchers and invitation of researchers from Japan and abroad based on the “Photonics Declaration 2013 in Hamamatsu” with the Hamamatsu area in the center.
- Regional advantages such as medical photonics and next-generation automobiles will be utilized, and research and development themes based on a long-term perspective will be promoted.
- Research and development of laser nuclear fusion that will be a source of a future paradigm shift will be promoted, and themes that will be the cores of the next basic research and applied research will be explored.
- Innovative research and development in the medical photonics field with matching of the seeds of universities and technologies of regional companies will be promoted by utilizing the “Regional Innovation and Ecosystem Formation Program.”
- National competitive funds will be continuously acquired to accelerate the movement toward the exit (commercialization).

Fig. 14: Issue for each phase of research



– Priority Measure 6 – Promotion of international exchange and support for sales channel development

[Current situation and approaches]

- Exchange between the Hamamatsu area and Thüringen, Germany
- Participation in a photonics exhibition event such as “Micro Photonics” held in Berlin, Germany
- Four organizations, Shizuoka University, Hamamatsu University School of Medicine, The Graduate School for the Creation of New Photonics Industries, and Hamamatsu Photonics K.K. have announced “Photonics Declaration 2013 in Hamamatsu” to make Hamamatsu a preeminent photonics city and declared that they would promote exchange of researchers and improve the centripetal force.

[Vision for expansion and enhancement]

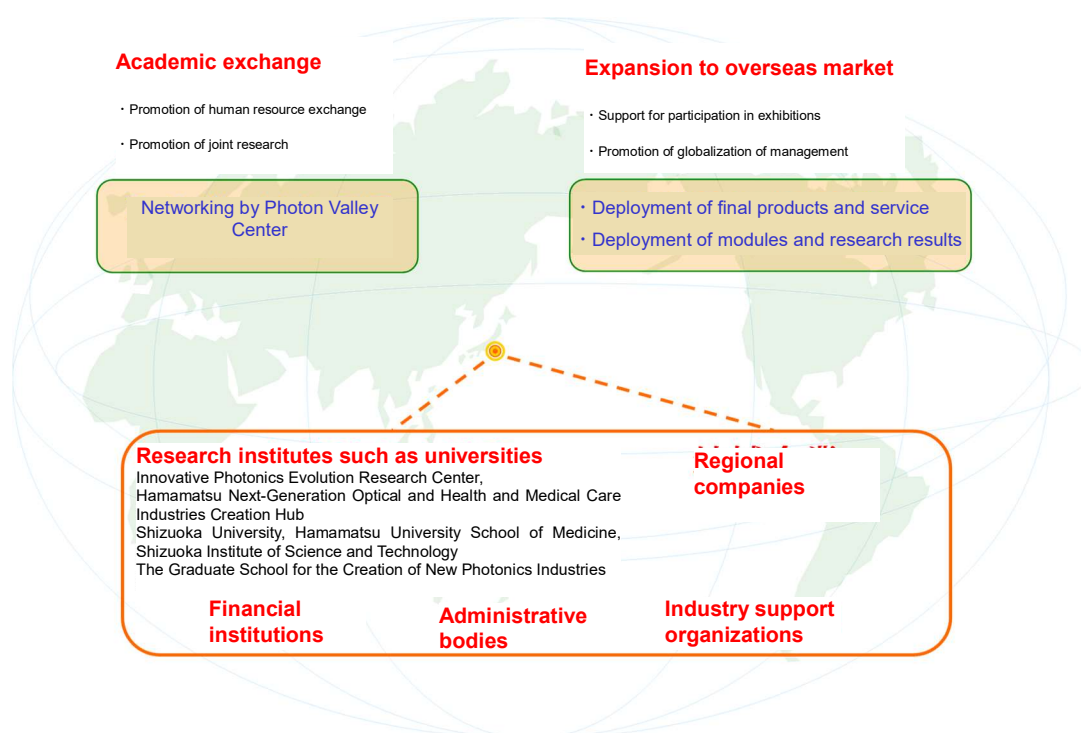
(Preparing an environment for international academic exchange)

- The Photon Valley Center will cooperate with each university and testing and research institute to build a network with overseas research institutes such as universities and their researchers.
- An environment to accept students and researchers from abroad will be prepared.
- International academic conferences and seminars will be held continuously.

(Enhancing support for expansion to overseas markets)

- The Photon Valley Center will cooperate with each organization such as JETRO to enhance support for overseas expansion of business (support for sales channel development, etc.)
- Students, technical intern trainees, and researchers from abroad will be accepted positively, and the relationships with global companies will be enhanced to promote globalization of management of regional companies.

Fig.15: Two types of overseas expansion



Chapter 3 System Establishment for Vision Promotion

To promote our vision steadily, we will establish the Photon Valley Center as a core support organization and build a cooperative system of industry, academia, government, and finance with voluntary participation and cooperation of sectors.

In addition, we will establish the Regional Vision Promotion Council (tentative name) to manage the progress of the vision.

1 Establishment of Photon Valley Center

- The Photon Valley Center will be established as a core support organization to hand down the research and development of photonics and electronics technologies conducted until now to the future and proceed with industrial agglomeration and industrial development strategically based on this vision.
- The Photon Valley Center will be established as an internal organization of the Hamamatsu Agency for Innovation that has a network built with previous development of industries related to photonics and electronics industries and grasps the research results that have been continuously handed down from the Knowledge Cluster Initiative.

(Outline of the Photon Valley Center)

Item	Contents
Organization Name	Photon Valley Center
Organizational Form	Internal organization of (Public Interest Incorporated Foundation) Hamamatsu Agency for Innovation
Address	National University Corporation Shizuoka University Hamamatsu Campus
Major Role	<ul style="list-style-type: none">• Operation of a platform• Management of the vision, comprehensive adjustment of each sector, etc.

2 Establishment of Regional Vision Promotion Council (Tentative Name) and Roles of Those Involved

- The Regional Vision Promotion Council (tentative name) that basically consists of the organizations of the Planning Meeting of Regional Vision with Utilization of Photonics and Electronics Technologies will be established to share information about the progress of the vision and activity status of each sector and discuss new measures required for realization of the vision on a regular basis.
- The roles of relevant organizations expected to realize the vision are as shown in the following table.

Table: Roles expected for realization of vision

Category	Organization name	Expected major role
University	Shizuoka University	<ul style="list-style-type: none"> Continuous research and development of imaging devices Creation of early stage companies originated from universities
	Hamamatsu University School of Medicine	<ul style="list-style-type: none"> Research of application of photonics and imaging technologies to medical care Support for development of medical equipment with provision of medical needs
	Shizuoka University of Art and Culture	<ul style="list-style-type: none"> Support for system development for socialization of design Support for branding strategies of companies and products, design marketing, and sales promotion
	The Graduate School for the Creation of New Photonics Industries (OptoNext Hamamatsu)	<ul style="list-style-type: none"> Cultivation of an entrepreneurial mindset Support for new business development of regional companies Building of a global network
	Shizuoka Institute of Science and Technology	<ul style="list-style-type: none"> Support for advancement of manufacturing technologies Human resource development for growing industrial fields such as robots and aerospace
	(Common)	<ul style="list-style-type: none"> Promotion of sharing of research instruments Implementation of active joint research with regional companies Promotion of acceptance of students from abroad and human resource exchange
(Research Institute)	innovative Photonics Evolution Research Center	<ul style="list-style-type: none"> Research and development with future-oriented backcast Aiming to be a hub where optical researchers in the world get together
	Hamamatsu Medical-Engineering Technology Innovation Core (HaMTIC)	<ul style="list-style-type: none"> Support for development of medical instruments by provision of medical needs Sharing of PET equipment, etc., provision of rental laboratories
	Hamamatsu Technical Support Center, Industrial Research Institute of Shizuoka Prefecture	<ul style="list-style-type: none"> Research of laser processing technology and technology transfer Acceptance of technical consultation from companies Technical support to companies
Industry	Chambers of Commerce and Industry (Hamamatsu, Iwata, Fukuroi, Kakegawa), Commerce and Industry Association	<ul style="list-style-type: none"> Hosting of workshops Startup consultation, extraction of issues by management instructor
	Federation of Small Business Associations	<ul style="list-style-type: none"> Hosting of seminars, workshops, and meetings Support for efforts (research and development, sales channel development) for growing fields by cooperative organizations (groups, associations) Support for establishment of a joint order receipt system of organizations related to medical care, nursing, and social welfare
	JETRO Hamamatsu	<ul style="list-style-type: none"> Support for overseas expansion of small and medium-sized companies Provision of the latest overseas business information
	Regional companies	<ul style="list-style-type: none"> Development of advanced parts and members related to

		<p>photonics and electronics technologies</p> <ul style="list-style-type: none"> • Development of inspection equipment utilizing photonics and electronics technologies • Introduction and utilization of products related to photonics and electronics technologies
	Hamamatsu Agency for Innovation	<ul style="list-style-type: none"> • Operation of the platform • Promotion of utilization of photonics and electronics technologies by companies • Promotion of participation in growing industrial fields
F inancial Institution	Shizuoka Bank, Shinkin Bank (Hamamatsu Iwata, Shimada Kakegawa, Enshu)	<ul style="list-style-type: none"> • Hosting of awareness-raising seminars for utilization of photonics and electronics technologies • Funding for early stage company development • Support for overseas expansion of companies utilizing overseas branches
G overnment Office	Shizuoka Prefecture, Hamamatsu City, Iwata City, Kakegawa City, Fukuroi City, Kosai City, Omaezaki City, Kikugawa City, Mori Town	<ul style="list-style-type: none"> • Human support and financial assistance of the platform • Enhancement of the research and development subsidy program • Support for sales channel development • Enhancement of the subsidy program, etc. for invitation of companies • Awareness rising of spreading of photonics and electronics technologies to companies

Aiming to form a cluster - Photonics and electronics technologies have an infinite potential -

“The 21st century is the age of light”

In December 2013, the UN General Assembly declared 2015 as the “International Year of Light and Light-based Technologies” to spread its importance to the general society, stating that Light-based technologies should be recognized to be important for future development of the global society regardless of the various regional development stages, and application of light-based technologies is the core of any scientific technology as well as art and culture, including medical care, energy, information, communication, primary industry, astronomy, architecture, etc.

Expectations for photonics and electronics technologies in the society are increasing. Western Shizuoka Prefecture has a foundation that allows it to meet those expectations and is required to achieve its social mission.

2026, ten years after the establishment of the planning meeting of this vision, is the 100th year since Dr. Kenjiro Takayanagi, who was from this region and is called the father of television, projected the character “ \angle ” on a television for the first time. We must continuously hand down his spirit and technology that will not fade after the period of 100 years.

Making this region “a cluster to be a global base for photonics and electronics technologies” means that many people in universities, companies, industry support organizations, financial institutions, and government should be players in an orchestra to complete one tune that has photonics and electronics technologies as a theme.

This vision is its compass and roadmap.

Light has infinite potential. And this region has a foundation to challenge the infinite potential. The organizations of industry, academia, government, and finance that established this vision will obtain a great driving force toward realization of the vision by cooperating, taking initiative and acting, and stimulating mutually.

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