

*We build  
the fast and safe  
hyper-connected world  
linked by light*



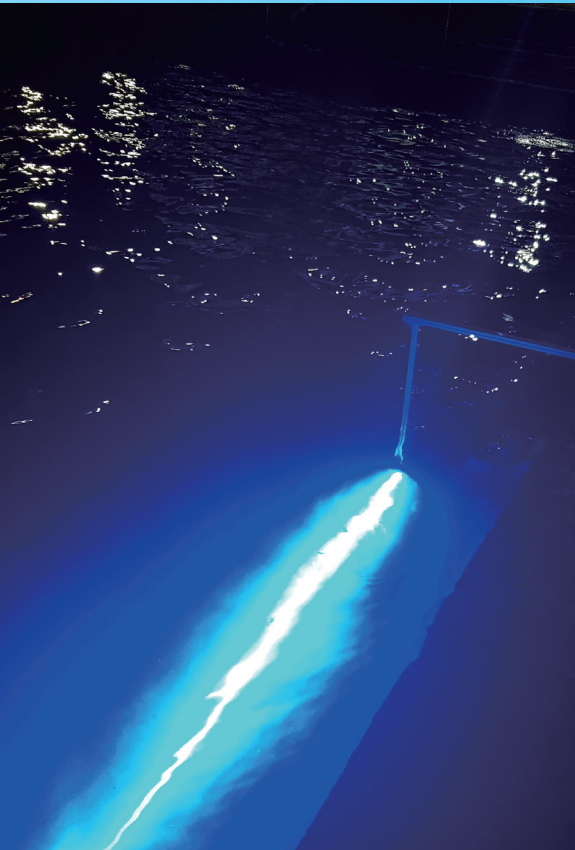
**BORSYS**  
— Blue Ocean Robotic System —



# About Us & History



The fast and safe wireless communication solutions in extreme environments



We, **BORSys (Blue Ocean Robotic System)**, are venture company that develops and supplies cutting-edge marine unmanned systems. Our competitive edges include technology for manufacture of remotely operated vehicles (ROVs), which perform duties on behalf of people in extreme underwater environments, as well as wireless optical communication technology that acquires real-time underwater information.

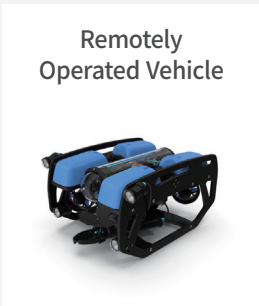
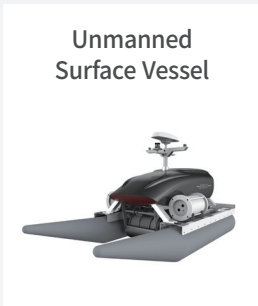
Nowadays, the unmanned systems are spreading in our daily lives. That means more frequency band is necessary for facilitating communication between unmanned systems and existing systems. In this case, the deficiency of frequency resource can be occurred.

And also, communication unavailability can be problem in underwater or in enclosed areas. So, wireless optical communication can be new solution, as it enables low latency, low power consumption, and smallization.

BORSys is taking the lead in creating a hyper-connected world where every location that needs communication, ranging from deep sea to outer space, will be connected through our light.

## MARINE-SPECIALIZED ELECTRONIC EQUIPMENT

### Marine inspection drones



### Underwater Optical Comm. Modem and Applied Products



2017

2018

2019

2020

2021-2022

2023

2024

**11**  
Established BORSys Corp.

**12**  
Acquired 2 patents and 1 non-exclusive license  
- Multi-functional underwater LED lamps, multi-DOF unmanned underwater operational robots, and etc.

**02**  
Approved as a corporate research institute

**04**  
Launching BOLcom (Underwater Optical Comm. Modem), delivered to KOMERI  
\* 1st Sales Performance

**09**  
Relocated in INNOPOLIS Busan and certified plant registration

**04**  
Approved as a venture company

**11**  
Applied for U.S. patent  
- OPTICAL COMMUNICATION SYSTEM AND METHOD CAPABLE OF MONITORING UNDERWATER INFORMATION IN REAL TIME

**12**  
Launching MIND (Marine INSpection Drone)  
  
Won the Marine Venture Business Award from KMOU Marine Venture Development Center

**03**  
Acquired 2 patents  
- Optical communication system and method capable of real-time monitoring of underwater information  
- Device to extend communication range between underwater optical communication devices

**04**  
Launching BOL-TWIN (Aquarium drone)

**09**  
Won the Minister of Oceans and Fisheries Award at Fourth Industrial Revolution Power Korea

**07**  
Selected as a partnership company by KITECH

**04**  
Received order from JEONJIN ENTECH Co., Ltd. for DP control system for LNG bunkering vessels

**05**  
Certified as a leading tech startup by Busan Metropolitan City

**12**  
Launching BOLcom-DV (Optical communication for divers)

**05**  
Won the prize at the HD Hyundai Heavy Industries Safe Open Market Contest, CCEI Ulsan (Unmanned optical comm. system for enclosed areas of vessels)

**11**  
Launching BOLcom-VLC (Wireless optical comm. for 1Gbps mid-range transmission of imaging signals)

**01**  
Participated in the High-tech Business Exhibition, National Science Museum



# Business Areas & Products

## 01 Wireless Underwater Optical Communication

### Wireless Optical Communication Modem : BOLcom (Blue Ocean Light Communicator)

BOLcom, a wireless optical communication modem, is designed to transmit large amounts of data wirelessly by expressing light on and off as the digital signal of 0 and 1 in the condition of underwater, in midair, and in space.

In water, a wireless optical communication modem can transmit high-capacity data, such as video data, in real time at the speed of over 10,000 times faster than a sound communication system (~Mbps). In particular, its ability to transmit data in a desired direction alone makes it suitable for defense applications requiring covertness. Other benefits include low latency, low power consumption, and smallization.

The development of wireless optical communication technology is accelerating for the depletion of radio wave (RF) frequency resources on land and high-speed communication in space. From optical communication among low orbit satellites to quantum communication, the application scope of optical communication is gradually expanding.

### Underwater docking and data transmission

Optical communication can be used in lamps and relative position sensors to guide underwater robots to a docking station, and also in collecting data after docking.

### Optical communication for divers

Wireless optical communication can be applied to diver-vessel and diver-diver communication to enable real-time transmission of underwater video and bio-signals.

### Water-air direct communication

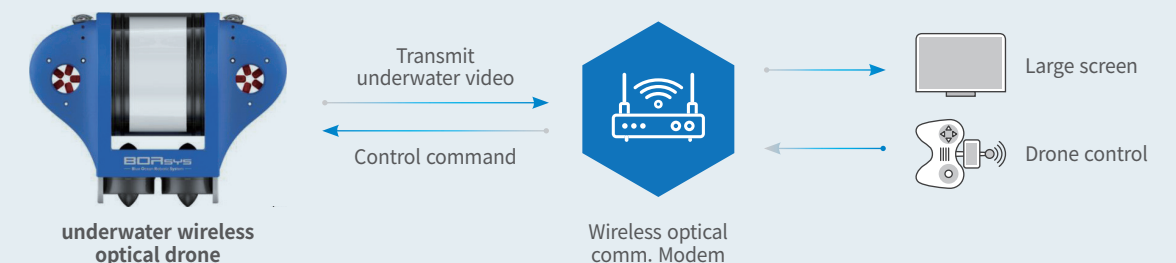
By the property of light to pass through both water and air, it enables direct communication between underwater and airborne platforms, as well as instant data collection at low cost.

### Communication in RF dead zones

Optical communication using different frequencies can replace RF communication in zones with severe interference and noise. It is highly resistant to radio jamming and available for covert communication.

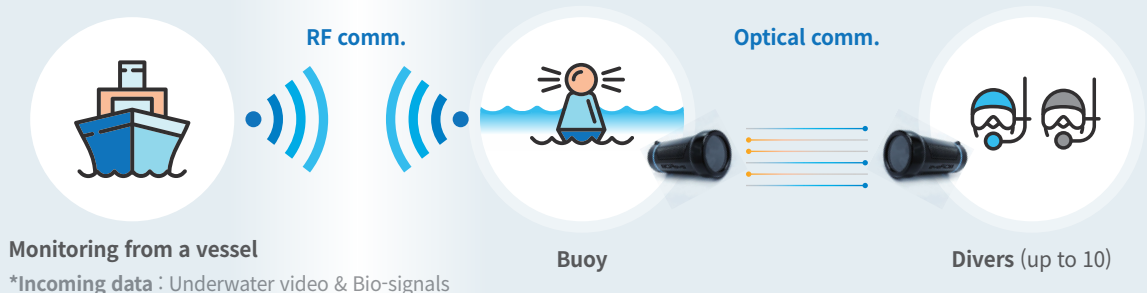
## Related Products

### Underwater wireless optical drone for aquarium management (BOL-TWIN)



BOL-TWIN provides a realistic experience to aquarium visitors. When they command control to BOL-TWIN, it transmits the underwater video in real-time to visitors using wireless optical communication.

### Diver-vessel optical communication modem (BOLcom-DV)



Wireless optical communication enables interactive communication between multiple divers (up to 10) and the optical communication beacon on a buoy. It also enables transmission of bio-signals from divers and transmission of work commands from a vessel.

### Submarine data storage and data collection platform (BOLcom-SUB)



A platform designed to collect and store underwater video or sensor data on a regular basis for a certain period of time. Data can be collected separately using an unmanned vessel, not collecting the platform itself.



# Business Areas & Products

## 02 Marine Robotic Platform

### Marine Inspection Drone (MIND)

Marine Inspection Drone is designed in the form of connecting an unmanned surface vehicle (USV) and a remotely operated vehicle (ROV) through the tether cable of a winch system to enable a land operator to monitor marine structures (underwater facilities, underwater bridges, submarine cabling, vessel bottoms, etc.) and underwater environment information (underwater video, submarine topography, water temperature, tidal current, etc.) in real time.

USV will move to the coordinate point by Ground Control System (GCS), and it launches ROV down to the desired depth using a winch system of USV.

The GPS equipped in the USV and the USBL in the ROV enable precise positioning and depth control, and various purpose-built sensors mounted on the ROV (side scan sonar, imaging sonar, single beam echosounder, multi beam echosounder, CTD, ADCP, sub bottom profiler, 3D LiDAR, etc.) make the MIND available for a wide range of marine inspection tasks.

### Components of the Product



#### Hull specs

**Size** L 3.25 m x W 1.5 m x H 1.8 m  
**Weight** 250kg (Including winch and ROV)  
**Payload** 100 kg (additional sensors mountable)  
**Hull material** PVC, air injected (shock absorption)

#### 1 Winch system

- Max. 150m tether cable
- ROV launch and recovery
- Communication and power supply

#### 2 Underwater relative positioning

A system for relative positioning of surface vessels and ROVs (USBL)

#### 3 Remotely Operated Vehicle

- Torpedo or hovering type, Commercial ROV mountable
- Posture and depth control
- Control of relative positioning with surface vessels

#### 4 Inspection equipment

Side-scan SONAR / Multi-beam SONAR / Optical camera CTD, SBP, gripper, etc.

#### 5 Electric thrusters

- For head control (1 hp x 1)
- For stern thrust (5 hp x 2)
- Max speed 5kts

#### 6 Battery

- Based on 8 hours of continuous operation  
24Vdc 160Ah | 48Vdc 80Ah
- Additional battery mountable

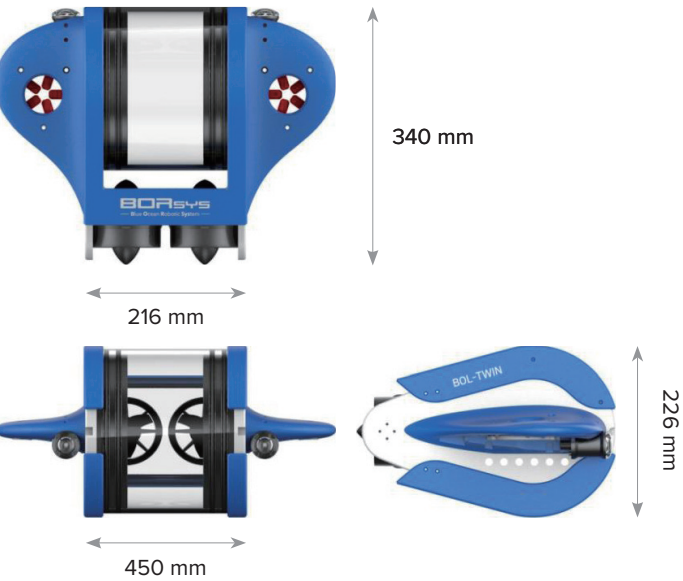
#### 7 GPS and navigation system

- Absolute position and posture measurement
- Thruster control
- Dynamic positioning, Way-point tracking

#### 8 Ground Control System

- Max. 10km wireless communication (100 Mbps)
- Windows PC installed
- C#-based GUI program
- AC 220 power supply

Classification	Specifications	
Main hull	Size	340 mm (L) x 216 mm (W) x 226 mm (H)
	Weight	8 gf (In Air)
	Depth of water	Up to 50 m (or 100 m depending on the option)
	Material	AL, HDPE (High Density Polyethylene)
Camera	Pixel	1080P or above (w/o zoom in/out)
	Angle	Horizontal: 80°, Vertical: 180° (+/- 90° camera tilt)
Lighting	Brightness	LED 3000 LUMENS
Thruster	Thrust	Torque: 5 kgf, 4 kgf or above Up/Down, Left/Right, Turning, Forward/Backward
	Speed	Forward 2 kts (or 3 kts depending on the option)
Sensor	Measurement	Roll / Pitch / Yaw / Azimuth
	Pressure	0 – 30 BAR
	Temperature	-20 - 80°C
Battery	Lithium-ion	



### Aquarium Drone (BOL-TWIN)

BOL-TWIN can monitor the activity or health of underwater creatures in large aquariums or personal fish tanks. It allows users to have underwater experiences using a display panel or VR goggles as if they are under water.

With BOL-TWIN, you can monitor aquarium fish systematically and in real time, present various attractions to visitors through display screens, and solve challenges related to the management of expensive underwater creatures (such as fish avoiding divers, diseases and labor cost).

By using this product, you can contribute to the aquarium industry, and also be applied to fish farms, marine structures, and marine environment research.



# Business Areas & Products

## 03 Marine Inspection

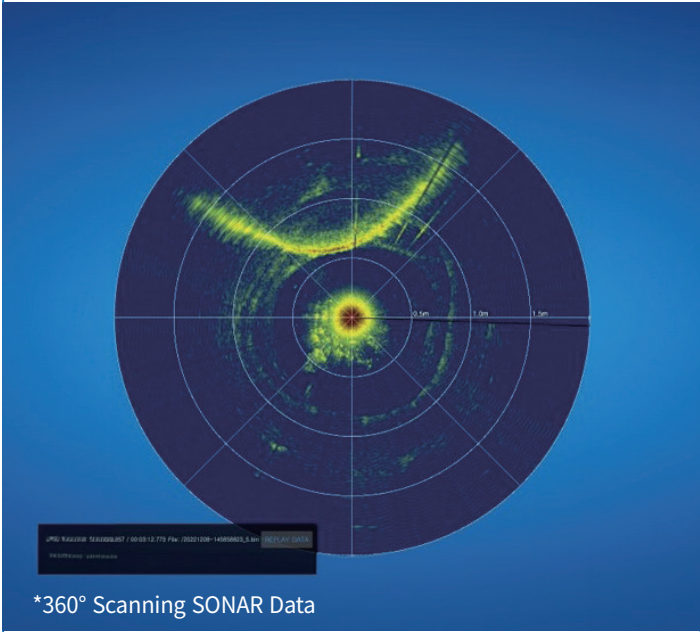
### Inspection of Marine Structures and Vessel Bottoms

The MIND (Marine INSpection Drone) can be used to conduct marine inspection, especially for the surface and underwater structures and the bottom of a vessel.

As increasing the number of marine structures, such as bridges, due to industries growth and cities expansion, the demands of maintaining them is also increasing. Nevertheless, the number of agencies and companies which can do such jobs is far from enough, while the extreme shortage of divers is making it urgent to find their alternatives. Replacing the existing way that is highly dependent on manpower, the MIND can monitor underwater environments in real time, significantly reducing the risk of casualties.

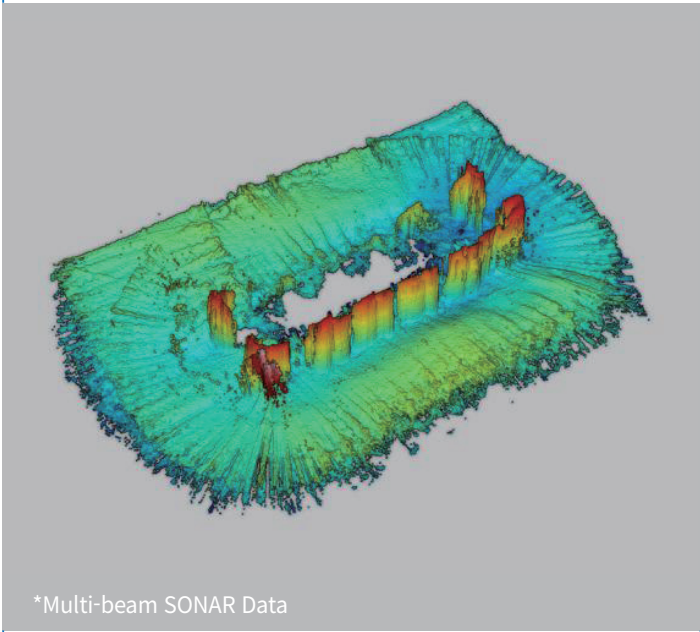
We will continue to study safer and more diverse ways to use them while showing another possibility for overcoming the physical limitations of marine surveys.

#### 360° Scanning SONAR



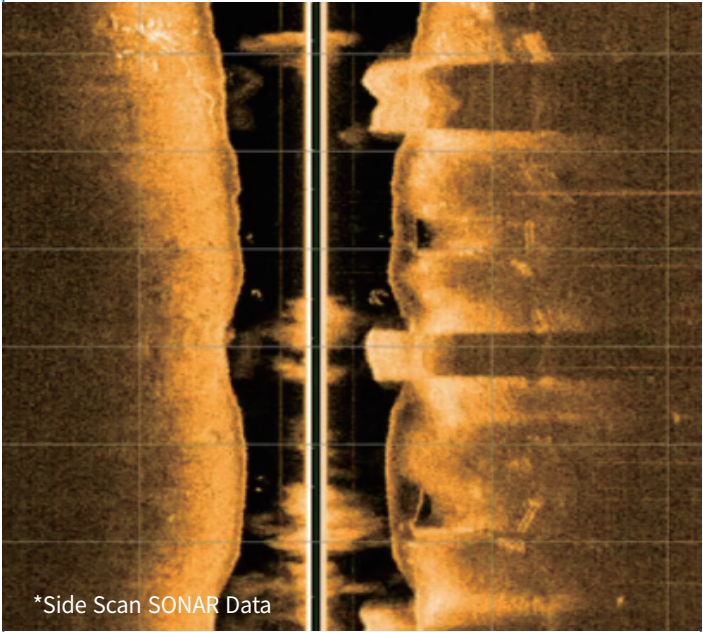
Able to navigate and measure distances in low visibility conditions, it can be used for underwater inspection, obstacle detection, and autonomous driving systems.

#### Measuring submarine topography using multi-beam SONAR



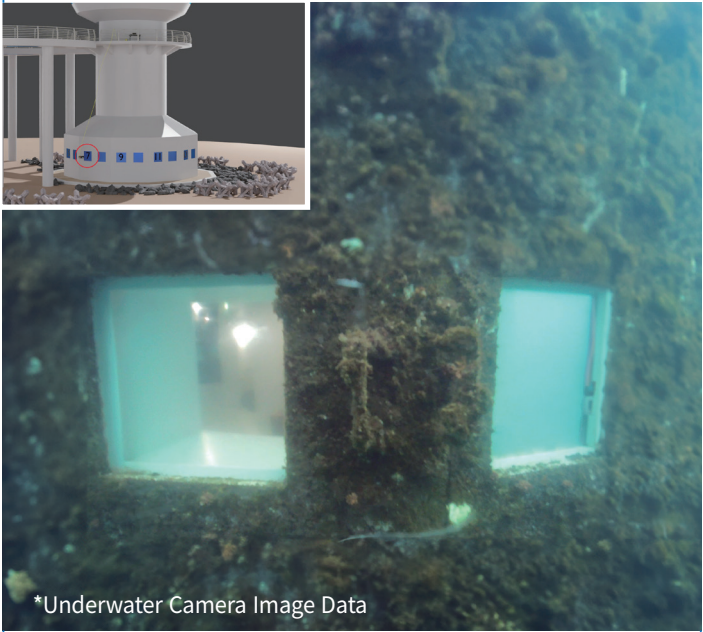
Multi-beam SONAR is used to implement 3D imaging of submarine topographies and structures for shape analysis.

#### Side Scan SONAR



This sonic wave system is used to explore a wide area of seabed efficiently, making use of inspection of the seabed and underwater structures.

#### Underwater ecosystem inspection using ROVs



A camera on a ROV captures images in real time to check the surface of structures and underwater ecosystems.

### Inspection Solution using unmanned system and wireless communication

The conventional research methods have relied on manpower, but they are increasingly unmanned due to extreme environments that are difficult for manpower to access and the risk of human accidents.

Instead of human resources, we can use MIND or underwater exploration drones to investigate the seabed topography and the marine environment. Surveys using various sensors can provide information can share reliable results.

Also, quantitative data can be collected and structural safety management can be effectively performed by building a database. In the future, a more systematic marine survey system can be established by expanding the establishment of an integrated management system using big data.

By utilizing the underwater and aerial transmission characteristics of light, wireless optical communication technology can be used to secure more three-dimensional three-dimensional inspection data in conjunction with land flight drones as well as underwater.





# Patents & Certifications



- 01 Multi-functional underwater LED lamp

02 Underwater LED lamp

03 Optical comm. system for real-time underwater monitoring

04 A device to extend the range of underwater optical communication

05 U.S. patent – Optical comm. system for real-time underwater monitoring

06 Underwater robot based on multi-DOF unmanned surface robot
- 07 Visible light comm. lantern for SCUBA divers

08 Differential mode underwater optical comm. method and system

09 Automated aiming method and apparatus for underwater optical communication

10 Design registration for underwater drone

11 Underwater drone supporting wireless remote control and image transmission (patent application)

12 U.S. patent - Automated aiming method and apparatus for underwater optical communication

# Awards



- 01 Award certificate from the Minister of Oceans and Fisheries (For contributions to the development of ICT convergence technology)

02 Award certificate from the Head of the Marine Venture Development Center, KMOU (Marine Venture Business Award)

03 Award certificate from the Head of the Creative Economy Innovation Center Busan (Outstanding Startup Business Award)

04 Award certificate from the Head of the R.O.K Naval Force Analysis, Power Analysis Test & Evaluation Group (Outstanding Paper for academic conference)

05 Plaque of Certification from the Head of the Creative Economy Innovation Center Ulsan (Outstanding Business Certification)

# Track Record

	Public Sector	Private Sector
2023	<div><div>12 National Ocean Science Museum</div><div>Conducted inspection of underwater structures of Underwater Observatory using ROVs</div><div>11 KAIST</div><div>Developed a wireless optical comm. modem for the underwater docking system of AUVs</div><div>06 Korea Maritime &amp; Ocean University</div><div>R&amp;D of simultaneous multiple access technology for underwater wireless optical comm.</div><div>01 Ministry of science and ICT</div><div>LARS (launch &amp; recovery system), an original technology development project for unmanned vehicles, and R&amp;D of optical comm. systems</div></div>	<div><div>11 Jeonjin Entech</div><div>Developed a DP system for LNG bunkering vessels</div><div>11 Samsung Electronics</div><div>Developed a wireless optical comm. solution for 1Gbps mid-range transmission of imaging signals</div><div>10 CiLab</div><div>Developed a marine positioning system for ROVs</div><div>09 PICO</div><div>Developed a DP (Dynamic Position) system for unmanned vessels</div><div>06 AXIOM</div><div>Developed an underwater platform for wireless optical comm. and unmanned surface vessels for collecting data</div><div>06 Samsung Electronics</div><div>Delivered a short-range wireless visible-light comm. module</div></div>
2022	<div><div>12 Ministry of Oceans and Fisheries</div><div>Developed underwater optical comm. system of smart devices for coast guard rescuers</div><div>12 Busan Techno Park</div><div>Conducted inspection of marine structures using marine inspection drones</div><div>11 ROK Navy Headquarters</div><div>Conducted research on the military application and effects of underwater optical comm.</div><div>01 KAIST</div><div>Designed and built wireless comm. and power circuit systems</div></div>	<div><div>12 Samsung Electronics</div><div>Developed a solution for short-range transmission of imaging signals</div><div>08 AXIOM</div><div>Developed optical comm. system for underwater monitoring</div></div>
2021	<div><div>12 ROK Naval Academy</div><div>Introduced a system to evaluate operators of underwater unmanned systems</div><div>11 Masan Robot Land</div><div>Delivered and exhibited remotely operated vehicles (ROV)</div><div>07 KAIST</div><div>Delivered unmanned optical comm. and power circuit system</div></div>	<div><div>10 RivenSEA</div><div>Developed LPG detection system</div></div>
2020	<div><div>07 KIOST</div><div>Delivered underwater optical comm. modem</div></div>	<div><div>09 LIG Nex1</div><div>Delivered 3-channel wireless optical comm. board</div></div>
2019	<div><div>04 KIOST</div><div>Developed GUI program for monitoring round steel pipe verticality</div></div>	<div><div>12 Hanwha Systems</div><div>Conducted test on optical guidance system</div></div>
2018	<div><div>04 KOMERI</div><div>Delivered underwater optical comm. modem</div></div>	<div><div>11 PICO</div><div>Delivered underwater optical comm. modem</div></div>





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