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**□** ARM **X** ENG **□** PAP **□** Input

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Agenda item 9

Technical Domain / Task Number TD#1

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Development of Small LED Beacon Applying Multi-Light Distribution to Enhance the Recognition of Light

Aids to Navigation(AtoN) are critically important for ships to navigate with safe. Thus, various physical ways are applied to enhance the recognition including visible aides, acoustic aids and etc. To provide the visible navigation information to ships, a variety of LED beacons are utilized as the AtoN because the LED light source consumes the reduced electrical power.

Navigating light buoy transfer the light signal which is generated from small LED Beacon on top of the navigating light buoy. Since the navigating light buoy are rolled by waves, the narrow light signal from small LED beacon could be lost from the point of view of navigator in ship when the ship is close to navigating light buoy resulting in the crash between the ship and buoy on occasion. The objective of this study is to develop multi-light distribution LED　lighting lantern to enhance the recognition of characterization of light. By means of multi-light distribution, it is expect to prevent marine accident and to secure ocean safety by minimizing the occurrence of dark region to navigator.

Table 1 System Specification of Small LED Beacon applying Multi-Light Distribution to Enhance the Recognition of Light

|  |  |  |  |
| --- | --- | --- | --- |
| Light Distribution | | Luminous intensity | Power[W] |
| Vertical | Horizontal |
| ± 5 ° | 360 ° | 1144 cd | 30W |
| ± 20 ° | 360 ° | 908 cd |
| ± 40 ° | 360 ° | 178 cd |

Daekee marine corporation and Korea Photonics Technology Institute (KOPTI) developed small LED beacon with multi-light distribution as shown in Fig. 1. We applied flickering LED modules with fourteen lighting sides which applying three optical lenses of ±5°/ ±20°/ ±40° (FWHM) on each side to realize multi-light distribution including the flashing control system. Three types of lens were verified by means of optical simulation software using LightTools. Highly efficient light-weight heatsink was applied to guarantee the performance of LED packages.

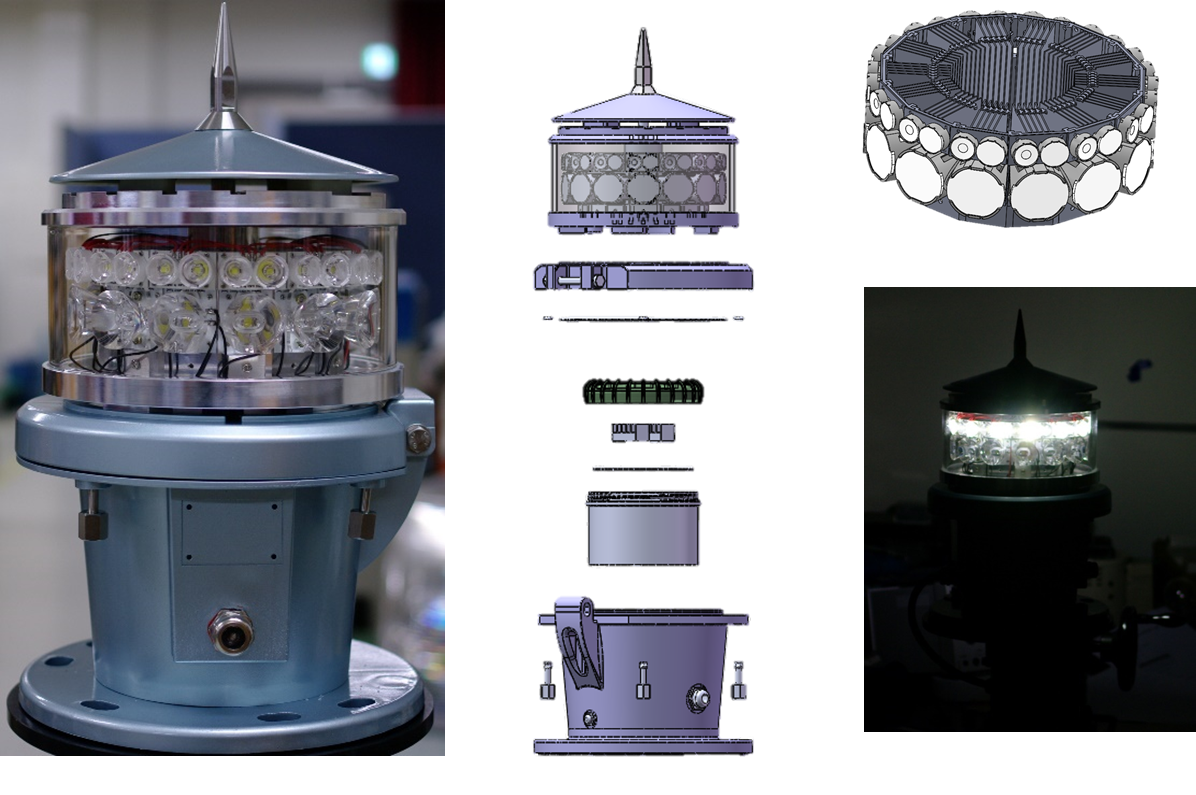


Fig.1 Prototype of Small LED beacon with multi-light distribution

Fig. 2 shows the simulation result of multi-light distribution by applying the combination of various optical lenses. The light distribution of Small LED beacon for navigating light buoy are designed conventionally less than ±5° (FWHM) to maximize the luminous intensity considering the beam distance. By applying the three optical lenses, the maximum luminous intensity required more than 720 cd for beam distance of 8 NM could be satisfied. Furthermore, the dark region in case of narrow lens only, ranging from ±20° to ±40°, could be eliminated with assistance of middle and wide lenses.

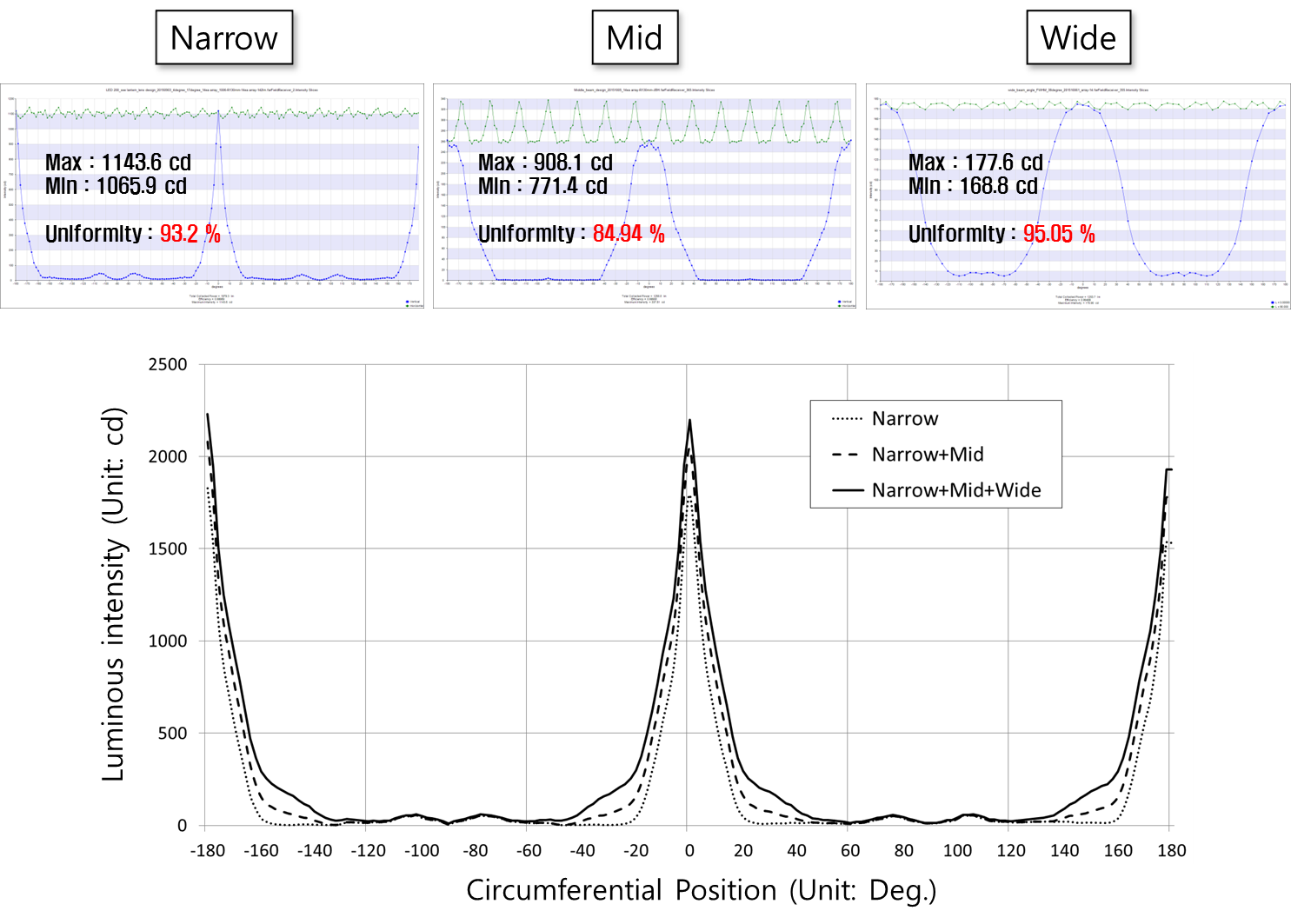


Fig.2 Comparison of multi-light distribution depending on the combination of various lenses

**Future Tasks**

We will validate the advantages of multi-light distribution of LED small beacon in field.

**Acknowledgement**

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