# Demonstration of Optical Wireless Power Transmission to Moving Object Using Infrared LED Marker in Dark Environment

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## Introduction

Optical Wireless Power Transmission (OWPT) is one of the Wireless Power Transmission (WPT) methods which can be used to transmit high power density to long distance by using laser. One of the applications of OWPT is power transmission to moving objects from far away [1]. This application brings several challenges which are needed to be solved. Two of the challenges are about how to direct the laser beam to the target and about how to recognize the target.

In ref.[2], we have demonstrated OWPT to moving object by using Galvano mirror to direct the laser beam and color filter method which is one of the computer vision method to recognize the target. This method has been proven to be reliable for OWPT to moving objects, although, not applicable for dark condition because the object recognition is very sensitive with environment condition. In this research, we improve the object recognition method by using infrared LED to increase the reliability of object recognition in dark condition.

## **Object Recognition Method**

The target which is small toy car is equipped with 850 nm LED and small battery as the power source of the LED. The modified toy car and recognition by the bandpass filter equipped camera can be seen from Fig. 1. Visible light is cut by the filter hence only the LED light will be detected by the camera. In this case, the object detection will not be affected by environmental condition.

The beam steering system to moving object is shown in Fig. 2. We use CMOS camera which is equipped with bandpass filter lens which allows 830 - 870 nm light to pass and Galvano-mirror to steer the beam. In this case, we can successfully demonstrate power transmission to mini car at dark environment.



Fig. 1. Detected Object by Camera (a). Without Filter and (b). With Filter



Fig. 2. Object Recognition and Beam Steering System

### Summary

We have demonstrated Optical Wireless Power Transmission (OWPT) to moving object with infrared LED marker which can be used in dark environment. We attached 850 nm LED as the infrared marker on the target. For the object recognition, we use camera with bandpass filter which allows 830 - 870 nm light to pass. In this case, we can cut all the visible light spectrum and the recognition of the target will not be sensitive to any environmental conditions.

#### References

- Putra et al., *IEEE Photon. Technol. Lett.*, Vol. 31(2), pp. 157-160, 2019.
- 2) H. Adinanta et al., *信学技報*, vol. 118 (62), LQE2018-12, pp. 9-12, 2018.