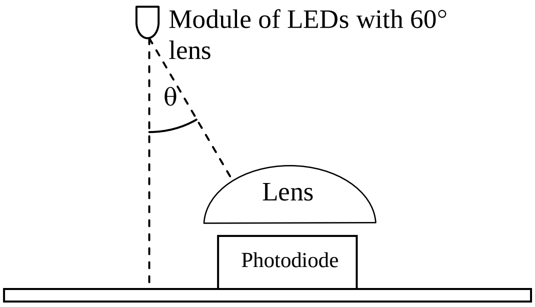

Fig. 6. Diagram of light measurement by photodiode at θ°.

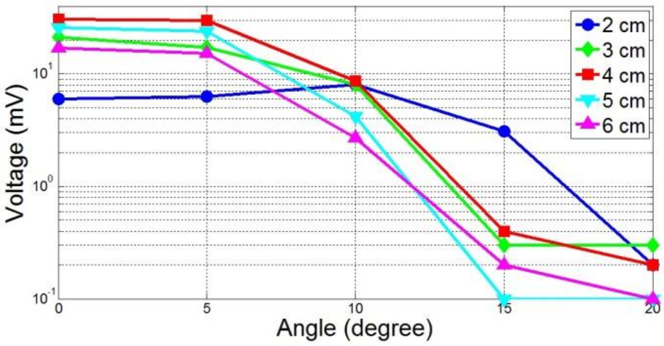

Fig. 7. An average signal intensity in term of the voltages across a resistor versus an angle of the LED and the PD in case of a convex lens.

Fig. 7 shows how an average signal intensity in term of the voltages across a resistor varies according to an angle of the LED and the PD in case of a convex lens for focusing the beam.

Likewise, the voltages across the resistor were altered comparing to the angle of the LED and the PD in case of a hemisphere lens as illustrated in Fig. 8.

Fig. 7 and 8 show the voltage measurement between 0 and 20 degree. From the result we should use hemisphere lens because it has uniform illumination better than convex lens at wide angle and hemisphere lens smaller than convex lens, making it suitable for practical use. The distance between lens and PD is 2.5 cm in order to make a wide-angle detection leading to the large coverage area.

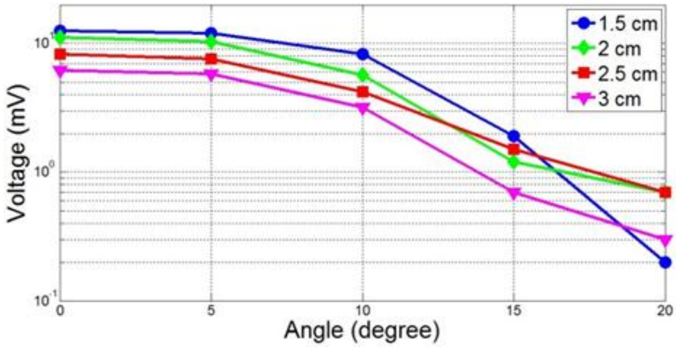

Fig. 8. An average signal intensity in term of the voltages across a resistor versus an angle of the LED and the PD in case of hemisphere lens.

IV. Conclusions

Overall, this paper presents the study of illumination coverage design for our VLC setup in indoor environment. Considered as a special case, our work focuses on low cost design which is different from the other existing configurations. The light distribution with 60 degrees lens is the most suitable for indoor illumination, but to ensure the uniform distribution more distribution and tilting of LEDs are recommended. Furthermore, at the receiver the hemispherical lens are suggested to employ in the system with the best allowable gap of 1.5 cm from the PD.

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