

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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Author: Mr. Yang Liu

Beijing Institute of Aerospace Systems Engineering, China Aerospace Science and Technology Corporation
(CASC), China, yangliu_npu@163.com

Mr. Hongping XU

Beijing Institute of Aerospace Systems Engineering, China Aerospace Science and Technology Corporation
(CASC), China, 2531543629@qq.com

Mr. Hang YI

Beijing Institute of Aerospace Systems Engineering, China Aerospace Science and Technology Corporation
(CASC), China, luwei.spacecraft@gmail.com

Mrs. Xige ZHANG

Beijing Institute of Aerospace Systems Engineering, China Aerospace Science and Technology Corporation
(CASC), China, ctr_1991@126.com

Mr. Xiaotao YAN

Beijing institute of Astronautical Systems Engineering, Beijing, China, luwei.spacecraft@gmail.com

Dr. Qingping Shi

Beijing Institute of Aerospace Systems Engineering, China, qingpingshi@163.com

Dr. Weiqiang Xia

Beijing Institute of Aerospace Systems Engineering, China, xiaweiqiang@126.com

Mr. Muye Chen

Beijing institute of Astronautical Systems Engineering, Beijing, China, chen.muye@qq.com

CABLELESS COMMUNICATION INNER THE SPACE LAUNCH VEHICLE BASED ON THE LED
VISIBLE LIGHT COMMUNICATION TECHNOLOGY**Abstract**

The weight loss of spacecraft plays a great role in deep space exploration and reducing the cost of space launch vehicle. Communication system, as the neural network of spacecraft, is responsible for transmitting information between systems. However, many disadvantages tag along, such as complex wiring, expensive cable, the limitation of the communication rate, too heavy and large occupied space. And other problems, such as large probability of breakage, inflexible, and electromagnetic interference existed when we use the optical fiber or radio frequency communication.

In this paper, the overall structure of the LED Visible Light Communication (VLC) system is proposed for the space launch vehicle applications for the first time, which is a on-vehicle communication system that fully explores the advantages of LED VLC system including, high speed, low cost, power efficient, small size, electromagnetic interference free, and secure data communication besides green lightening. According to the actual environment of the spacecraft cabin, the optimization algorithm of the spatial distribution for LED light source is designed based on the illumination. Based on the analysis of the characteristics of duplex communication link, we design the duplex communication system of on-spacecraft using the VLC technology. In order to solve the problem of severe multi-path effect in the narrow space of the spacecraft, the modified OFDM modulation technique is used to suppress.

On the basis of elaborating the principle, difficulty, realization method and key technology of the on-vehicle VLC system, the duplex high-speed communication experimental system between the Fault

Detection system and Control system of the Launch Vehicle is designed for experiments. The Fault Detection system is responsible for spacecraft safety monitoring and rapid response, the state parameters of Control system are transmitted to the Fault Detection system reliably through VLC system. the error rate, communication rate, and reliability of the system are also tested to evaluate the performance. Without reducing the quality of normal communication, the larger space, more payload, and more valuable space exploration applications can be obtained by using and improving the LED-based VLC technology.