Standard of Japan Electronics and Information Technology Industries Association

Visible Light Beacon System

This standard stipulates communication method of single directional visible light beacon system based upon the communication method created by the Visible Light Communication Standardization Project Group in Technical Standardization Committee on AV & IT Systems of Japan Electronics and Information Technology Industries Association.

Visible light beacon system is a system for providing various applications such as identification of matters, providing positional information, and establishment of various guiding systems by radiation transmission of simple information or ID information unique to the visible light source from visible light sources ubiquitously surrounding us. This standard aims at establishment of a unified standard concerning lower communication layer common to these applications to utilize it commonly, and do not deal with upper communication layer which depends upon individual applications.

This standard prescribes the single directional communication system with visible light as the medium (hereinafter referred to as visible light beacon system). It especially prescribes the standard concerning IF-a (interface point a) part in the visible light beacon system in Fig. 1.
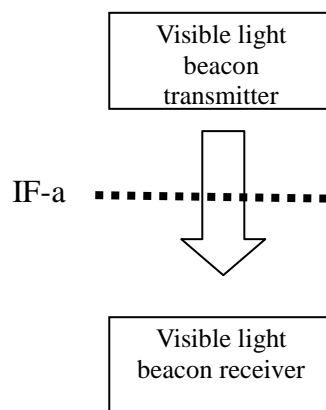

Fig. 1 Visible light beacon system

The visible light beacon transmitter can transmit ID. The ID code system used is selectable, and various services, for example, equipment identification, position information and data transmission function can be provided. For equipment identification, the visible light beacon transmitter transmits ID of target equipment (Serial number, etc., can be included.). The receiver identifies equipment by ID resolution and can obtain information concerning the equipment. The information includes maker name, product name, specification sheet and

manual of the equipment, information of consumables, use history, etc. For positional information, the visible light beacon transmitter transmits coded geographical information of the place where the instrument is installed (positional information ID). The receiver can obtain its positional information by ID resolution. Detection of peripheral services based on the present position, transmission position report function at the time of emergency report and so forth can be realized in buildings or underground malls where use of GPS is difficult. Further, the function can be used as the means for a robot to detect its position. For data transmission function, the frame structure of visible light beacon can have one or both of ID and DATA in the information part (Payload). The visible light beacon transmitter can utilize the DATA region to transmit optional data stream. For example, it can transmit texts which is the common data form, if the receiver responses, data or commands for specific procedure or application.

Carrier frequency of this system shall be visible light of peak wave length of 380~780 nm. Visible light is intensity modulated by 4PPM (Pulse Position Modulation) signals, of which information data rate is 4.8 kb/s.

Frame structure is shown in Fig. 2. The frame consists of start part (SOF), Payload, and end part (EOF). Further, SOF is divided into preamble (PRE) and Frame-type (F-TYPE), and information part consists of ID and/or DATA part. The EOF is cyclic redundancy check (CRC-16).

SOF (Start of Frame)		Payload	EOF (End of Frame)
PRE (6-bit)	F-TYPE (8-bit)	ID / DATA (128-bit)	CRC-16 (16-bit)

Fig. 2 Frame structure

The PRE is encoded 4PPM signals, which does not occur by normal 4PPM encode of data, is set as the frame start position. In the F-TYPE, the codes indicating kinds of payload are represented by 8 bits in order to enable use of IDs and codes of different plural systems and transmission of data. The Payload consists of 128 bits ID and/or data. CRC field length shall be 16 bits. Reception side judges whether frame data were correctly received. Since visible light beacon system is single directional communication incapable of re-transmission request, received data are discarded if error was detected. Calculation results of CRC are stored in CRC field. Calculation ranges of CRC are F-TYPE and Payload.