

Design of Regular Communication Area for Infrared Electronic-Toll-Collection Systems

Authors : Wern-Yarng Shieh, Chao Qian, Bingnan Pei

Abstract : A design of communication area for infrared electronic-toll-collection systems to provide an extended communication interval in the vehicle traveling direction and regular boundary between contiguous traffic lanes is proposed. By utilizing two typical low-cost commercial infrared LEDs with different half-intensity angles $\Phi_{1/2} = 22^\circ$ and 10° , the radiation pattern of the emitter is designed to properly adjust the spatial distribution of the signal power. The aforementioned purpose can be achieved with an LED array in a three-piece structure with appropriate mounting angles. With this emitter, the influence of the mounting parameters, including the mounting height and mounting angles of the on-board unit and road-side unit, on the system performance in terms of the received signal strength and communication area are investigated. The results reveal that, for our emitter proposed in this paper, the ideal "long-and-narrow" characteristic of the communication area is very little affected by these mounting parameters. An optimum mounting configuration is also suggested.

Keywords : dedicated short-range communication (DSRC), electronic toll collection (ETC), infrared communication, intelligent transportation system (ITS), multilane free flow

Conference Title : ICMWC 2014 : International Conference on Mobile and Wireless Communications

Conference Location : Prague, Czechia

Conference Dates : July 10-11, 2014