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Optical Wireless Communications Omnidirectional Receivers for Vehicular Communications

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Abstract

Wide aperture omnidirectional free-space optical (FSO) receivers using wavelength shifting (WLS) fibers that enable the use of small active area high-speed photodetectors in optical wireless communications, are presented. In particular, the influence of WLS fiber decay time in the bit rate is evaluated when receiving intensity modulated light generated with commercial off-the-shelf light-emitting diodes. The option of increasing the photon collecting area of a 7mm^2 active area avalanche photodiode using WLS fiber, gave a 300% improvement in the bit rate, when compared with the option of using a bare 31mm^2 active area avalanche photodiode. It was also experimentally verified, that a WLS spiral receiver mounted over a reflective base gave more gain than simulated Lambert's cosine law, proving that reflective optics can be used to increase the WLS-FSO receiver aperture.

Keywords: OWC; VLC; FSO; WLS; V2V; V2I

1. Introduction

The tetherless teleoperation of vehicles [1] using high-definition video, dense LIDAR data [2] and haptic virtual telepresence needs the existence of a broad-

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