Promising laser devices for optical communication, reliability, high-speeds and stability

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Abstract:

At the present time, optical communications (OC) either free space or fibers, are using laser beams as a carrier for transmission signals through communication channels. This field of study has become substantially interesting in research paper topics in the last few years. Therefore, investigation of OC based on laser beams gives attention greater than ever before in the research field.

Free space optical communication (FSO) is concerned with data transmission through the atmosphere from one point to another using visible or invisible light to get a network connection.

Optical sources or laser sources are utilized in such communication systems, it's the key components to enable high-speed data transmission, reliability and stability of the OC system. Laser sources offer advantages in bandwidth and speed for FSO applications over the traditional systems of communications. Lately, the laser beam increases the wireless capacity of 5G services and beyond for future applications.

Recently, underwater OC based on laser devices have also given wide interest in applications. Normally, FSO communication uses the wavelength range from short to long wavelength, which is from 700 nm to 1600 nm, because the wave optical energy which travels through the atmosphere has comparable properties at the visible and near-IR wavelength. However, shorter and longer wavelengths of laser beams are also being considered for specific applications. The wavelengths between 780-850 nm are the most popular and widely used due to readily available and inexpensive components, which has an attenuation of less than 0.2 dB/km.

The semiconductor laser diode applications employ high pump sources, like edge emitting lasers (EELs), which are the dominant and traditional source. However, EELs are too costly, requiring optical fiber coupling, which results in additional power loss. Therefore, attention has focused on vertical cavity surface emitting lasers (VCSELs) devices with potentially low manufacturing cost for various applications including OC systems. VCSEL is a semiconductor laser, which has a resonant cavity that is vertically formed on the surfaces of the epitaxial layers. VCSELs gained a reputation as a superior technology for applications such as Gigabit Ethernet and intra-systems, FSO communications, optical fiber communications and optical recording.

Furthermore, VCSEL with external optical feedback has become a hot security topic due to its encryption capabilities and is extremely popular in wide applications in modern communication. These brief words give a highlight to the topic and contribute to developing knowledge in a field of study.

Biography:

Salam Nazhan currently works at Diyala University as an Assistant Professor in the Department of Communication, college of engineering. He received the BS and MS degrees in physics, and electronics physics from Al Mustansiriya University, Baghdad, Iraq, in 1998 and 2005 respectively, and the PhD degree in optoelectronics from Northumbria University, Newcastle, United Kingdom in 2016. Prior to attending the Optical Communications Research Group at Northumbria University, he worked as a researcher with the optoelectronics group at Bangor University, Wales, UK, for around one year from 2011 to 2012. His research focuses on the characterization of lasers for free space optical communications, particularly, vertical-cavity surface emitting lasers (VCSELs) devices. He published many research papers in the top journals in the field and several conference papers. He also presented his research at a number of international conferences and events around the world.