

ULTRA-LOW LOSS HOLLOW-CORE WAVEGUIDES

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ABSTRACT

The ability to generate long optical delays with low intrinsic loss is useful for a wide range of applications including optical signal processors, RF filtering, optical buffers, and optical sensing. Optical fibers have been used for these applications with advantages such as ultra-low loss, dispersion and nonlinearity and an exceedingly large bandwidth. However, they are bulky, heavy, and lack of manufacturing scalability.

Lithographically defined, chip-scale waveguides have been reported in SiO₂/Si and III-V material systems. They are desirable because they are compact, light-weight, and can be integrated with other optoelectronic devices. The lowest reported loss achieved to-date in chip-based waveguides is on the order of 1 dB/m, three to four orders of magnitude higher than that of optical fibers. This loss is unacceptably high for most applications requiring 0.01 dB/m. The fundamental reasons for the high losses are direct band-edge absorption, free carrier absorption, and absorption due to interaction with optical phonons. In addition, these devices are expected to have high nonlinearity and dispersion.

To address these limitations, Researchers at UC Berkeley have invented a novel ultra-low loss hollow-core waveguide structure. The new structure provides unprecedented mirror reflectivity and fabrication tolerance. The design can achieve exceedingly low propagation loss that cannot be achieved by conventional waveguide concepts. In addition, the researchers show a potential 2D design with loss estimated to be less than 0.01 dB/m.

APPLICATIONS

On-chip optical communication, Compact optical delay line, Advanced optical filters, True-time delay for phased array antennas, Data packet traffic engineering Interferometric sensors.

ADVANTAGES

Ultra-low loss, Low propagation loss, High fabrication tolerance

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,442,374	05/14/2013	2009-057

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OTHER INFORMATION

KEYWORDS

communications, networking, optical

CATEGORIZED AS

- » **Communications**
- » Networking
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