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UNDERWATER: ONE WAY TO BOAST THE BREAKTHROUGH

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Abstract

Underwater communication is sure met with certain obstacles, a quick rundown of a big hindrance that is Ocean floor mapping, Noise interference during communication and inefficiency of acoustic waves that result into huge time intervals between communications. Unravel methods to improve and the results of new improvisation techniques and conclude a meaningful solution to it. Over the years, evident modifications used in underwater communication and boasting the breakthrough of these technologies.

Keywords:- *Doppler effect, SONAR, electromagnetic waves, Column samplers, Wireless transmission and acoustic systems.*

Introduction

Difficulties in underwater communication include the delay of acoustic waves which results into late transmission and leads into missing important information from the sender. There has a been a recent advancement in optical wireless communication including the requirements for the transmission speed and distance of UWC (Underwater wireless communication) technology. Method to improve and implicate a noiseless communication.

Theory

Underwater acoustic communication has proven to be much of a practical approach comparatively, it can transmit data up to a long distance through waves in water. UAC suffers from a relatively low data rate on the order of kbps due to the low system bandwidth of about kHz, and the low bandwidth is limited to the low carrier frequency (10 Hz–1 MHz). The UAC propagation speed of acoustic wave is five orders of magnitude lower than radio which leads to a delay of 0.67s per kilometer. Also considering the fact it is uneconomical. As the light propagation in the underwater environment is complex, underwater transmission channels are extremely challenging. Light propagating in the aquatic medium suffers from attenuation due to the severe absorption and scattering effects. The emerging technology has made astonishing advancements.

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Experiment

Light Source[a]	Modulation Scheme[b]	Channel Length	Data Rate	Reference
450 nm LED	16-QAM-OFDM	2 m	161.3 Mbps	[7]
470 nm LED	DPIM	9 m	0.6 Mbps	[5]
405 nm LD	OFDM	4.8 m	1.45 Gbps	[8]
445 nm LD	OAM-OOK	2.96 m	3 Gbps	[9]
450 nm LD	16-QAM-OFDM	5.4 m	4.8 Gbps	[10]
450 nm LD	16-QAM-OFDM	6.6 m	3.2 Gbps	[11]
520 nm LD	NRZ-OOK	7 m	2.3 Gbps	[12]
532 nm LD	NRZ-OOK	2 m	1 Gbps	[13]
660 nm LD	128-QAM-OFDM	6 m	1.324 Gbps	[14]
Red LD	OOK	30 cm	20 Mbps	[15]
450 nm LD	NRZ-OOK	12 m	2.0 Gbps	This work
450 nm LD	NRZ-OOK	20 m	1.5 Gbps	This work

[a]Light sources: LD stands for laser diode; LED stands for light-emitting diode.
[b]Modulation techniques: NRZ stands for non-return-to-zero; OOK stands for on-off-keying; DPIM stands for discrete pulse interval modulation; QAM stands for quadrature amplitude modulation; OFDM stands for orthogonal frequency-division multiplexing; OAM stands for orbital angular momentum multiplexing.

In order to improve the performance of UWOC, apart from optimizing the design of transmitting and receiving devices, the spectrally efficient modulation techniques have also attracted great interests and attention in academic and industrial communities.

1.) Using a Vector hydrophone (which receives acoustic waves)
2.) Using sound barrier (suppressing of local emission interference)
3.) Stainless steel cabin (equipped with battery, signal processing board, power amplifier, etc.
4.) Sound barrier (suppressing of local emission interference transceiver) [transmitting and receiving]

Result

Advancement in sensing technology can save major time loss into communicating. Acoustic signals are mechanically-actuated signal, the dynamic nature of the underwater medium disrupts the signal quality. The existing bio inspired system around us in ocean is a rich depository for ideas to man made issues. Intricate and precise measurements for instance ocean floor mapping, smooth transmission of signals for underwater communication that includes being updated with emerging technologies and having a wide variety of options during disaster management which hinders the communication.

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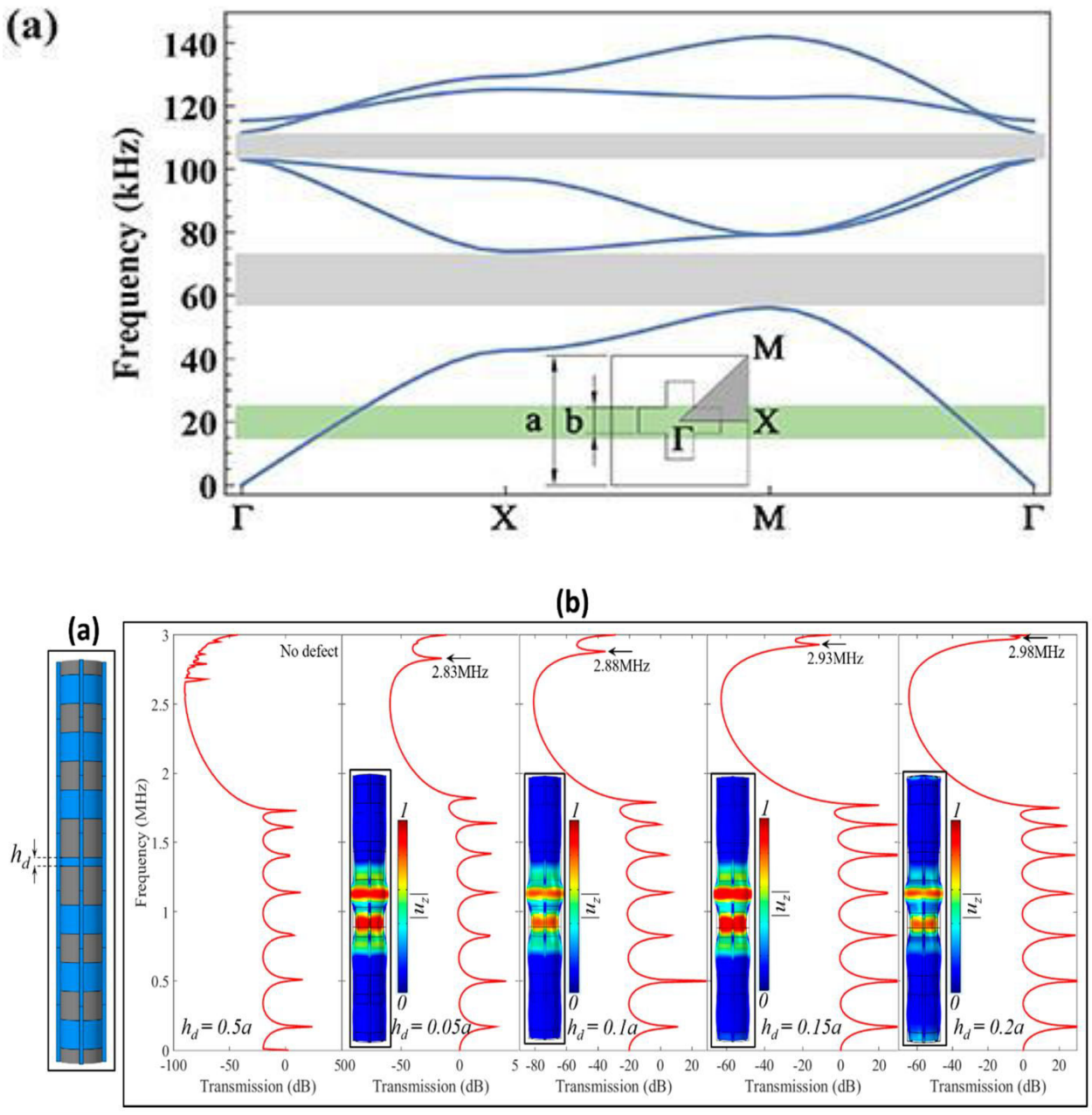
Interpretation



The above diagrams explain how acoustic waves behave depending on different frequencies.

Discussion

UWOC technology has developed rapidly and achieved many notable results in recent years. Achieving a reliable long-distance and high-speed data transmission is one of the challenges for the UWOC system. The short communication distance is a major obstacle to limit UWOC development, which originates from serious absorption and scattering of the optical waves.

Conclusion

The recent progress in terms of the key technologies including system transmitters and receivers, modulation formats and underwater channels is evolving along with time. Emphasis is placed on the techniques to achieve high-speed, long-distance and practical UWOC systems.

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