INTRODUCTION

In recent years, underwater communication has become an active research area as there is still a big gap between the development of technology and its usage. As communication has become faster and cheaper, sea exploration, ocean mapping and research data collection are also getting easier due to this advancement [1-4].

Communication is the most important process in underwater technology. The process enables the data transfer between two endpoints. However, the wireless connection is preferred over the wired connection especially when it comes to deal with the depth that wired connection is not practical or impossible.

SOURCES OF PROBLEMS

As for terrestrial application, the underwater wireless communication is not a straight forward process. When considering the underwater wireless communication, the radio wave will be affected by many factors. As a result, the research is a complex task due to dynamic nature of water. Interferences are mainly caused by three major factors:

1. Characteristics of signal carrier
   In underwater world, there are 3 types of carrier wave that are most commonly used in wireless communication [1-4].

   i. Electromagnetic wave
   Using electromagnetic wave, the communication can be established at higher frequency and bandwidth. The limitation is due to large size of antenna needed, hence affects the design complexity and cost.

   ii. Optical wave
   Optical wave also offers high data rate transmission. Nevertheless, the signal is rapidly absorbed in water and suffers from scattering effect [1-4]. This will affect the data transmission accuracy.

   iii. Acoustic wave
   Acoustic is the most preferred signal used as carrier by many application, owing to its low absorption characteristic for sound wave. The low absorption characteristic enables the carrier to travel at longer range as less absorption faced by the carrier.
2 Environment/Propagation Medium
Unlike the communication in terrestrial application, for underwater wave propagation, the challenges are quite different. Scattering, reflection, refraction, and also absorption of the medium are factors that need to be taken into account. The medium of propagation, whether it is water or other aquatic media, can have a significant effect on the communication performance. The characteristics of the medium, such as turbidity, temperature, and salinity, can affect the propagation of the acoustic waves, leading to signal degradation.

3 Instrumentation System Devices.
In ensuring the effective underwater communication, the communication system design plays a vital role. Factors such as the power requirements, bandwidth, and receiver sensitivity need to be carefully considered. The design of the devices must be suitable for the medium and the application. For instance, the use of high-performance communication modems can offer many advantages compared to the conventional approach.

RECENT PROGRESS: INSTRUMENTATION ASPECTS
Although the complete system for underwater communication has been around throughout various applications, nevertheless, the modem has always changed rapidly. Researchers are competing in developing a better system with better performance. One example is an effort carried out by a group of researchers from Micro and Nanotechnology lab, University of Illinois. They have designed a new modem that is capable of operating in a variety of environments.

In instrumentation system point of view, power consumption becomes one of the main concerns when developing communication systems. The relationship between several important parameters such as attenuation, distance, frequencies and transmission loss must be understood to minimize the power consumption.

MEMS APPROACH
In today’s world, many electronic devices are designed to be small. In most cases, small devices offer several advantages such as power consumption, portability, production and cost. MEMS (Micro Electro Mechanical Systems) have been extensively used in this field for its ability to miniaturize the devices. However, the realisation of MEMS in underwater communication especially in sensor design could be a worth effort.

Reduction in size has offered a lot of advantages in terms of its power consumption, portability, production and cost. MEMS based sensor is also thought be worthwhile if it can also be implemented for communication purposes, especially for underwater.
REFERENCES


