

## **Techniques used in Underwater Acoustic Communications**

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Research in Underwater Communications is tremendously growing now-a-days. Because of changes in undersea environment and multipath fading, it has become a challenging task for the researchers and scientists to communicate underwater. Various applications of underwater communications include Oceanography, Marine archaeology, and offshore oil exploration, Rescue missions, under water sports, Military and Navigation purposes. The four major means of communication through underwater are using (i) Acoustic waves (ii) EM waves (iii) Optical signals (iv) Optical fibre cables. EM waves work in power limited region and they get attenuated rapidly in water. Optical signals are limited to short distances (less than 100m) and rapidly absorbed in water, though they can carry more information. So we are left with Acoustic signals that can travel to longer distances. Underwater Acoustic Communications (UWAC) pose new challenges to wireless communications research due to the harsh underwater environments and due to limited bandwidth, extended multipath, rapid time variation and severe fading. OFDM is a multi-carrier modulation technique that has received considerable attention for UWA communications. It handles delay spread introduced in UWAC techniques. The three main factors that characterize the UWAC propagation are attenuation which increases with signal frequency, low speed of sound and time varying multipath propagation. The noise which affects the underwater channel is the ambient noise or the background noise. The waves caused by the sea surface, interior turbulence, fluctuations in the speed of the sound etc., contribute for random signal variations. To overcome the effect of multipath fading, diversity technique is used in UWAC. Spatial diversity along with Maximal Ratio Combining (MRC) is found to be a better approach to improve the error performance. On application of Forward Error Correction (FEC), especially the block codes such as hamming and LDPC codes, the BER values are decreased which provides quality signal by reducing the numbers of errors in UWAC.