EE455 - Mobile Communication

Homework 2-BER Performance for OFDM in frequency selective channels

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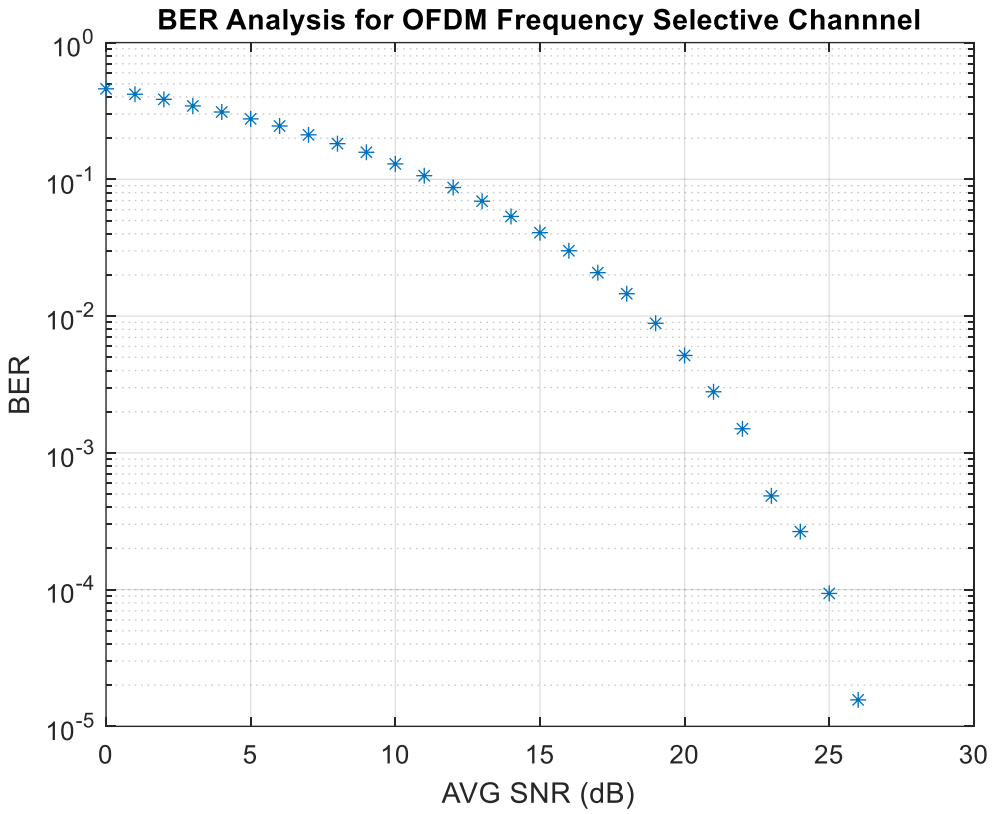

In that figure, bit error rate analysis of the OFDM (Orthogonal Frequency-Division Multiplexing) for Frequency Selective Channel can be seen. According to the figure, it can be said that the BER of the Frequency Selective Channel decreases when average SNR incrases. On the other hand, the reduction rate of BER increases as the SNR increases.

First, the input data stream is created randomly and modulated with QPSK. The symbol stream is then processed through a serial-to-parallel converter, which produces a set of 64 parallel QPSK symbols as the output. As a result, the discrete frequency components of the OFDM modulator output are the 64 symbols output from the serial to parallel converter. The frequency components are translated into time samples by performing an inverse DFT on these 64 symbols, which is quickly accomplished using the IFFT technique. As a result, that sequence is observed:

$$x[n] = \frac{1}{\sqrt{N}} \sum_{i=0}^{N-1} X(i) e^{j2\pi ni/N}, where\ 0 \leq n \leq N-1.$$

The generated time samples are organized by the parallel-to-serial converter and transmitted through a D/A converter to produce the baseband OFDM signal, which is appended with cyclic prefix. The received signal is the result of the broadcast signal being filtered by the channel impulse response and distorted by additive noise (AWGN). The high-frequency components are removed by downconverting the signal to baseband and filtering it. The A/D converter samples the resulting signal to obtain,

$$y[n] = x[n] * h[n] + v[n]$$

where h[n] is the channel's discrete-time equivalent lowpass impulse response.

The first 16 samples are eliminated from the y[n] prefix. These time samples are translated from serial to parallel and run through an FFT. The original data is recovered by converting the FFT output to serial and then passing it via a QPSK demodulator. Then, error is analysis is plotted by comparing the output bits with the information signal.

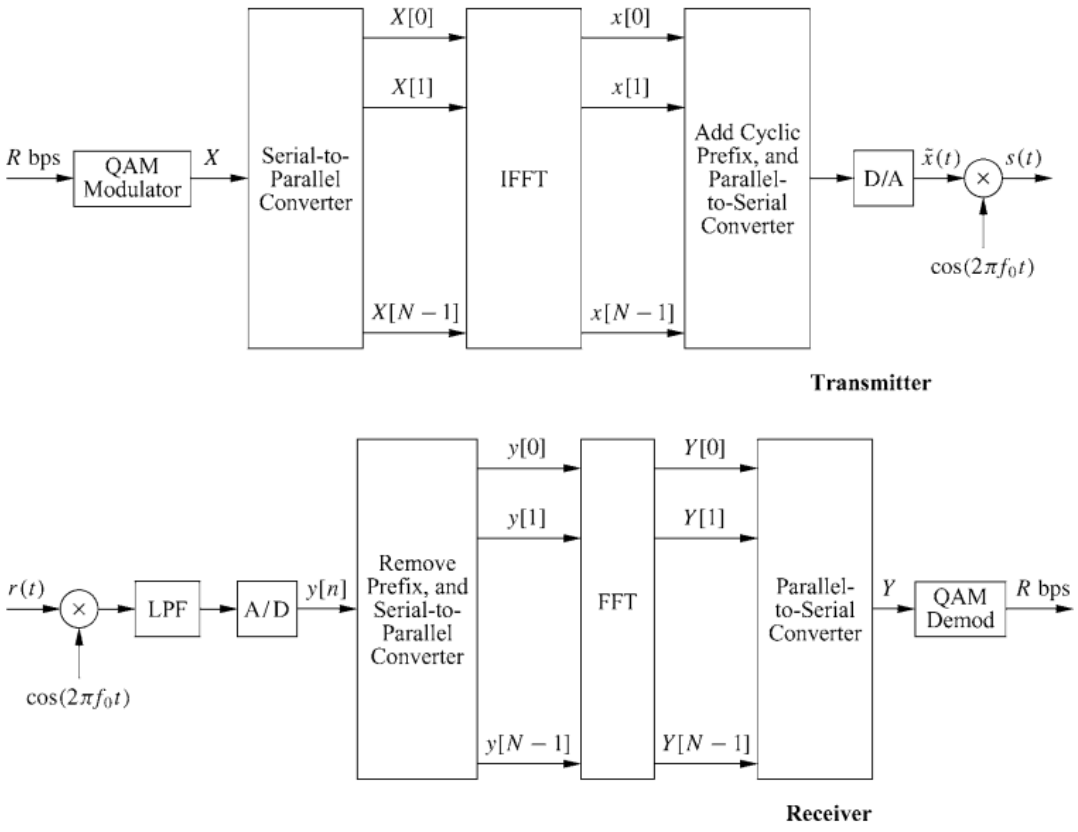

Figure 1:OFDM with IFFT/FFT implementation.[1]

References

[1] Goldsmith, A. (n.d.). *Wireless communication*. Cambridge Univ Press.