# REAL TIME HIGH FREQUENCY ANALYSIS SYSTEM

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# ABSTRACT

The HF with 3 to 30 MHz spectrum is utilized for long distance communications by the military, amateur radio, shipping and diplomatic services. Communications is no longer limited to voice and telegraphy, but now include applications such as email, text messaging, image, and telemetry. This project looks into the design and development of A Real Time High Frequency Analysis System provides a program to analyze High Frequency (HF) signal. This thesis presents work carried out in developing a user friendly system to observe and analyze HF signal with MATLAB environment. The system consist two main parts; Offline HF analysis and real time (online) HF analysis. In offline mode, user can analyzes the signal by using HF signal in '*.wav' file form. While in online mode, the system requires HF receiver (YAESU VR 5000) to be connected to personal computer and online signal will be observed, recorded and analyzed. This analysis system only capable to read the HF signal data in '*.wav' file (audio file format), in order to access the HF data to be load into the system. Sampling frequency that is used is 8000Hz and the channel bandwidth is 3 kHz. This corresponds to the typical voice bandwidth used in HF communication systems. This system provides a FIR filter to filter the signal in order to observe a smooth result. This system also can determine the modulation type, the frequency contains and the bit rate of the signal by using the periodogram and spectrogram techniques.

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# CHAPTER 1

# INTRODUCTION

## 1.1 High Frequency (HF) Communication

The existence of essential electrons in ionosphere makes long distance communication possible. Some of ionosphere layers act like mirror where the signal in the ionosphere experience maximum refraction, that they are bent back toward the earth's surface. This characteristic makes skywave propagation using high frequency (HF) available while for short distance transmissions, groundwave propagation will be used [1],[2]. Transmission using HF spectrum (3-30MHz) is required to get a system that available to operate over a broad range of adverse channel. Due to ionosphere variability, these problems makes HF left behind compared to satellite and fiber optic communication network. However, HF spectrum is still widely used for tactical and strategic military purpose. Besides that, HF communication system requires minimum infrastructure at low cost. HF free to use because the ionosphere is not own by anyone and equipment required is with minimal infrastructure. Therefore, the cost to setup a HF communication system is much cheaper as compared to other means of communication such as satellite [3].

The purpose of this project is to develop HF analysis system by highlight the significant of HF in communication system. The application of HF are only available as part of military communication equipment and is too costly for commercial user. Thus, there is a need for the development of a HF Transmission System for commercial use.