

Developments of Real Time and Low Cost VHF/UHF Data Acquisition System

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ABSTRACT

Very High Frequency (VHF)/Ultra High Frequency (UHF) plays a significant and vital role in our daily communications life. Thus, making it crucial to develop a data acquisition system to assist and facilitate further research and studies on VHF/UHF such as in amplitudes variations due to propagations characteristics, spectrum management and radio frequency information gathering in military/intelligence applications. Currently, available data acquisition systems (such as Spectrum Analyzer) are very expensive, complex (non-user friendly), rigid and limited capabilities due to its hardware restrictions/limitations. Consequently, a real-time and low-cost data acquisition system was developed by using microcomputer (Raspberry Pi 3b) and Software Defined Radio (RTL-SDR). The system successfully acquired and collected relevant data (e.g. frequency amplitudes) that would be resourceful for further analysis and studies of the VHF/UHF signals.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Radio Frequency plays a significant and vital role in our daily communications life. From voice to data, Very High Frequency (VHF) from 30-300MHz and Ultra High Frequency (UHF) from 300-3000MHz utilizations and applications throughout day-to-day activities has driven us to further studies the VHF and UHF characteristics.

1.1.1 Radio Frequency Propagations

Signals propagations explain the way radio frequency propagates from an antenna of a transmitter to the other end of receiving antenna. The propagation is affected by various ways depends on the medium and propagation methods used.

Signals that travel along or close to the Earth's surface on their path between transmitting and receiving antenna are called Ground Wave. Due to the Earth poor electrical conductor characteristics, the ground wave strength diminishes rapidly with distance. The attenuation of the surface wave signals also increases rapidly as the frequency is increased. Its frequency ranges from VLF (3-30 kHz), LF (30-300 kHz) to MF (300-3000 kHz). Applications range from Navigations, Space Weather research and long-range communications.

Travelling signals that reflected back by the ionospheric layers are called sky wave. HF (3-30MHz) operated by Sky Wave and is highly affected by the ionospheric refractions. Amateurs and military are still using it for long-range communications.