

Reliable Data Communication Over HF Link Using System On Chip Technology

Somkheart Kraisin
Defence Technology Institute
Nonthaburi , Thailand
somkheart.k@dti.or.th

Wichai Pawgasame
Defence Technology Institute
Nonthaburi ,Thailand
wichai.p@dti.or.th

Abstract—HF communication is one of the important aspects in military radio communication, even though it has been seen as a difficult and tedious task because of instability of ionosphere layer. To make HF communication becomes easier, many digital techniques have been introduced. It is also desirable to have all these techniques implemented in a single radio. This can be achieved through software defined radio (SDR) concept. Thus, a HF radio becomes more like a computer whose radio functions can be implemented through software. This paper presents some of the modern digital techniques and software defined radio architecture for HF communication aspect using System-on-Chip and FPGA technologies.

I. INTRODUCTION

Our world has changed from the Industrial Age to the Information Age due to the renovation in the information technology and communications. Military concept has been affected as well. The developments in information technology and communications drive the battlefield into the new era of an Information Warfare, or Network-Centric Warfare by connecting different units and forces into the network and information system. The main components for the stability of the system are the Centric Warfare and the well-design infrastructure on the various support systems, including secured, flexible, compatible, and cost-effective communication and telecommunication equipment. Radio Centric Network integrates information from various networks, including radar, satellite, airborne and PC data; with the HF, VHF and UHF radio systems. This allows combination between control center and tactical units on the same network for the effective operations. Software defined radio (SDR) concept, especially for high frequency (HF) ManPack or small-size radio for mobile use, is one of the main technology applicable to this innovation. SDR consists of a general hardware platform and upgradable software that allow implementation of different frequencies, desired bandwidth, functions, and output power level. SDR also has the flexibility to allow new software installation without changing or replacing new hardware modules. This paper focuses on some of modern HF technologies and the exclusive design of the software defined HF radio.

II. BACKGROUND

A. HF Chanel

The High Frequency (HF) band is between 1.6 - 30 MHz. It is the main frequency band for maritime, military and aeronautical systems and global communication. In this

band, radio waves can propagate in two paths; the ground wave propagation path and the sky wave propagation path. There are three types of ground waves, including direct wave, ground reflected wave and surface wave. The ground waves are used to communicate within near distance due to the high rate of distortion. It is often used for communication between ships and stations on the coast since surface waves can propagate over a sea surface with less attenuation. Therefore, the communication can be produced in longer distance. On the other hand, the sky wave can propagate to a remote station at longer distance by use of reflected in The High Frequency (HF) band is between 1.6 - 30 MHz. It is the main frequency band for maritime, military and aeronautical systems and global communication. In this band, radio waves can propagate in two paths; the ground wave propagation path and the sky wave propagation path. There are three types of ground waves, including direct wave, ground reflected wave and surface wave. The ground waves are used to communicate within near distance due to the high rate of distortion. It is often used for communication between ships and stations on the coast since surface waves can propagate over a sea surface with less attenuation. Therefore, the communication can be produced in longer distance. On the other hand, the sky wave can propagate to a remote station at longer distance by use of reflected

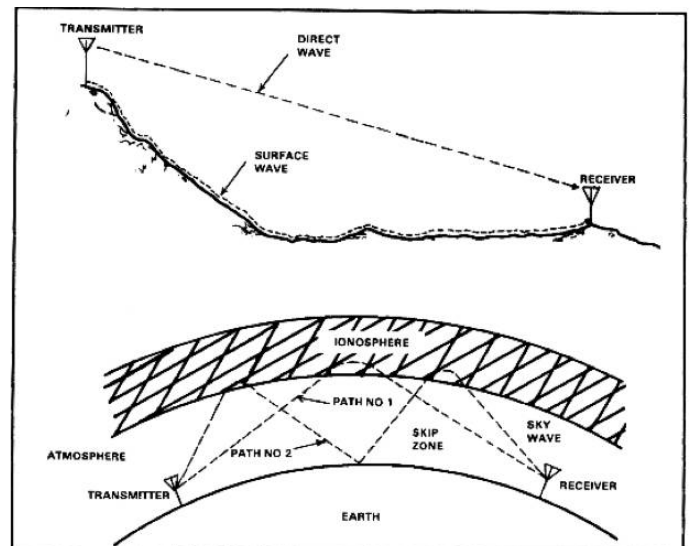


Fig. 1. Ground Waves and Sky Waves Propagation from [1]