Chapter 1
Introduction

Since recent decades, multimedia has been pervasive in our daily-life through the conveyance of telecommunication. No matter wired or wireless communication, the demand for high data rate and high-quality is rapidly growing. Conventional TDM and FDM communication systems can not meet the demand of the high-rate requirements. In order to alleviate the problem, the most promising solution seems to be the technique of Orthogonal Frequency Division Multiplexing (OFDM) [1] which can achieve good transmission efficiency and provide high data capacity.

Attractive features of OFDM include its multi-carrier architecture, where the carriers are orthogonal and can be combined by using fast Fourier transform techniques. This yields efficient implementation and spectrum utilization. High data rates are achieved by using a large number of carriers. OFDM has been widely used in wireless transmission standards, such as wireless MAN (Metropolitan Area Network)

IEEE 802.16a [2], [3], [4], European Digital Audio Broadcasting (DAB) [5], [6] and Digital Video Broadcasting Terrestrial (DVB-T) [7], [8]. Those systems can support point to multi-point transmission with high data rate. However, in those systems, both carrier synchronization and symbol timing synchronization are difficult receiver design problems. For this reason, we propose the synchronization schemes that jointly complete frame, carrier frequency, and symbol synchronization for Eureka 147 DAB, DVB-T, and IEEE 802.16a DL systems.

This thesis is organized as follows. In chapter 2, we explain the OFDM concept and discuss the effects of synchronization error. As our designs consider the Eureka 147 DAB, DVB-T, and IEEE 802.16a standards, chapter 3 introduces baseband concept of these three standards. The proposed synchronization structures are described in chapter 4. The synchronization structures are simulated by the Matlab program and the results are shown in chapter 5. Finally, a brief conclusion and ideas on the future works will be presented in chapter 6.