Chapter 6
Conclusion and Future Work

In this thesis, we have designed the synchronization schemes that jointly achieve symbol, carrier, and frame synchronization for Eureka 147 DAB, DVB-T, and IEEE 802.16a receivers and analyzed the performances under the AWGN and multipath fading channels. We apply the maximum likelihood criterion to the estimations of symbol timing and fractional frequency offset for all these systems. For Eureka DAB 147, the frame synchronization is done by exploiting two sliding windows to calculate the windowed symbol energy for the detection of null symbol. The integral frequency offset can be estimated after FFT by a differential matched filter using PRS. For DVB-T, the integral frequency synchronization is done by exploiting the continual pilots of two symbols in the frequency domain. Frame detection is done by matching the 1~16 bits of TPS. For IEEE 802.16a DL, fixed-location pilots are used to estimate integral frequency and frame start. After simulations, those synchronization schemes

work well in AWGN and multipath channels. From these simulations, we find that the length of guard interval duration and multipath delay are the deciding parameters for an OFDM system to operate successfully in a multipath channel. With a long multipath delay spread, the conventional method failed, because it only considers the correlation part. On the other hand, the simplified ML estimation has better ability to detect symbol timing. We find that the conventional matched filter is not suited for IFO estimation due to its poor phase effect. We adopt the method of differential matched filtering against channel distortion and symbol timing shift. From these simulations, it can be observed that the differential matched filtering is more robust against AWGN and multipath channels.

Up to now, the simulations of our thesis are done by using floating-point operations. The future work is to conduct fixed-point simulations so that we can honestly reflect practical software and hardware realization and/or implementation designs.