ABSTRACT

This thesis proposes a simple algorithm to detect multiple waveforms of telecommunication generation technologies that minimize power consumption of Mobile cognitive radio base station (MCRBS) due to limited source of power in the disaster area. MCRBS is an alternative to soon recover cellular networks after the main base station (BTS) are damaged by disaster causing power outage. MCRBS has two modes of (i) *Normal mode*, with regular seperated frequency, and (ii) *Ad–hoc mode* with a single frequency network. MCRBS in *Ad–hoc mode* requires capability of detecting multiple waveforms of telecommunication generation technologies of the second (2G), third (3G), forth (4G), and fifth (5G) to recover the networks.

The Normal mode assumes that disaster area is small such that each generation can work properly based on their allocated frequency, while the *Ad–hoc mode* assumes that disaster area is large, such that frequency of 5G may need to be shifted to lower frequency to serve victim users located far away from the MCRBS. This thesis aims to provide header detection capability for both two modes using combination of cross-correlation and capture effect technique for better accuracy. Four different header sequences are following the standard of all telecommunication generation technologies. To complete the analysis, this thesis also evaluates header detection both in synchronous and unsynchronous transmission, in terms of mean square error (MSE) under additive white Gaussian noise (AWGN) and frequency–flat Rayleigh fading channels.

This thesis found that MSE below 10^{-3} at average SNR more than 0 dB is achievable for: (a) header detection for single user of 2G, 3G, 4G, and 5G header sequences, and (b) header detection for multi generation on synchronous transmission and unsynchronous transmission. These results confirm that MCRBS with Ad-hoc mode is possible in detecting multiple waveforms using low frequency covering long range to provide connections for more victims located far away from the MCRBS. These results are expected to provide contributions to the development of wireless technologies for disaster and recovery networks in Indonesia.

Keywords: Header Detection, Header, Wireless, Telecommunication Generation Technologies, Disaster Recovery Networks.