



Department of Electrical Engineering

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SWITCH DIVERSITY SYSTEM IN MOBILE RADIO

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This thesis embodies the results of supervised project work which made up All of the work for the degree.

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CONTENTS

	<u>page</u>
Acknowledgements	(i)
Contents	(ii)
Summary	(iv)
List of Symbols	(v)
I. Introduction	1
II. Mobile Radio Diversity	4
II.1 Mobile Radio Reception	4
II.2 Diversity Concepts in Mobile Radio	15
III. Space-Diversity Systems in Mobile Radio	19
III.1 Diversity Techniques	21
III.2 Pre- and Post-Detection Combining	28
III.3 Discussions	29
IV. Switch Diversity Frequency-Shift-Keying (FSK) System in Mobile Radio	30
IV.1 Introduction	30
IV.2 Theoretical Studies of Switch Diversity	34
IV.3 Error Rates of a Non-Coherent FSK Receiver Using Switch Diversity	40
IV.4 Some Practical Aspects of Switch Diversity	49

V.	Experimental Switch Diversity FSK Receiver	51
	V.1 Implementation of the Receiver	51
	V.2 Experimental Results	56
VI.	Conclusion	63
	References	65
	Appendix A	A.1
	Appendix B	B.1
	Appendix C	C.1

SUMMARY

In the past few years, various techniques of space diversity have been studied to provide an increase in quality of communication in Mobile Radio. When the noise inputs on the diversity branches are highly correlated, switch diversity systems offer an attractive, economical alternative to the well-known diversity techniques, which are selection, maximal-ratio, and equal-gain combining. A data communication system, using Frequency-Shift-Keying (FSK) and switch diversity, is investigated, when the transmission is subject to Rayleigh fading as encountered in Mobile Radio.

Mobile Radio propagation and principles of diversity reception and techniques are first reviewed, and then switch diversity is studied. Error rates are calculated for a receiver using switch diversity and non-coherent FSK demodulator. An experimental receiver was constructed in the laboratory. The experimental results, obtained by using two simulated independently Rayleigh fading signals, agree reasonably well with the theoretical predictions. They show a power saving of about 7 db at reasonable error rates (from 10^{-3} to 10^{-4}).

STATEMENT OF ORIGINALITY.

This thesis contains no material which has been accepted for the award to me of any degree or diploma in any University and, to the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the text of the thesis.

List of Symbols

r, r_1, r_2	received signal envelopes
R	switch-diversity resultant signal envelope
b_o	signal power, $2b_o = \langle r^2 \rangle$
f_c	carrier frequency in Hz
v	speed of vehicle in m/sec
λ	wavelength in m, $\lambda = \frac{c}{f_c}$
c	speed of light in m/sec
f_m	maximum Doppler shift, $f_m = \frac{v}{\lambda}$
γ	local (averaged over one RF cycle) mean carrier-to-noise power ratio CNR
γ_o	mean CNR over fading, $\gamma_o = \langle \gamma \rangle$
T	switching threshold
p	probability of a successful switching
q	probability of an unsuccessful switching
τ_p	average duration when the signal envelope is above T
τ_q	average duration of a fade below T