

Thesis Title

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
JAHANGIRNAGAR UNIVERSITY

DECEMBER 2015

Abstract

Write your abstract here.....

Declaration

The research work entitled “**THESIS TITLE**” has been carried out in the Department of Computer Science and Engineering, Jahangirnagar University is original and conforms the regulations of this University.

I understand the University’s policy on plagiarism and declare that no part of this thesis has been copied from other sources or been previously submitted elsewhere for the award of any degree or diploma.

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Acknowledgement

Write your acknowledgement here.....

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LIST OF SYMBOLS

<i>Symbol</i>	<i>Description</i>
\mathbf{H}	Random MIMO Channel Matrix
$E\{\cdot\}$	Expectation
$(\cdot)^+$	Hermitian Transposition
$E[\text{trace}(\mathbf{H}^+\mathbf{H})]$	Expectation of the trace of complex channel matrix $(\mathbf{H}^+\mathbf{H})$
$E[\text{trace}\{(\mathbf{H}^+\mathbf{H})^2\}]$	Expectation of the trace of complex channel matrix $(\mathbf{H}^+\mathbf{H})^2$
$E[x^k]$	k^{th} Moment of the MIMO Channel
$\frac{E_b}{N_0 \text{ min}}$	Minimum Normalized Transmit Energy per Information Bit
$\frac{E_b}{N_0}$	Normalized Transmit Energy per Information Bit
S_0	Wideband Slope
R_c	Code Rate in bits/s/Hz
$C\left(\frac{E_b}{N_0}\right)$	Shannon's capacity function with respect to E_b/N_0
μ	Mean of Gaussian random variable
σ	Standard deviation
λ	Scale Parameter
m	Shape Parameter
$\Gamma(x)$	Gamma function
γ_{av}	Ratio of shape and spread parameter
k	Constant

LIST OF ALGORITHMS

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Chapter 1

Introduction

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1.1 Testing

1.1.1 Testing

Each figure must be referred in literature like ‘fig. 1.1.’. All figures and graph must be in gray scale except some special cases.

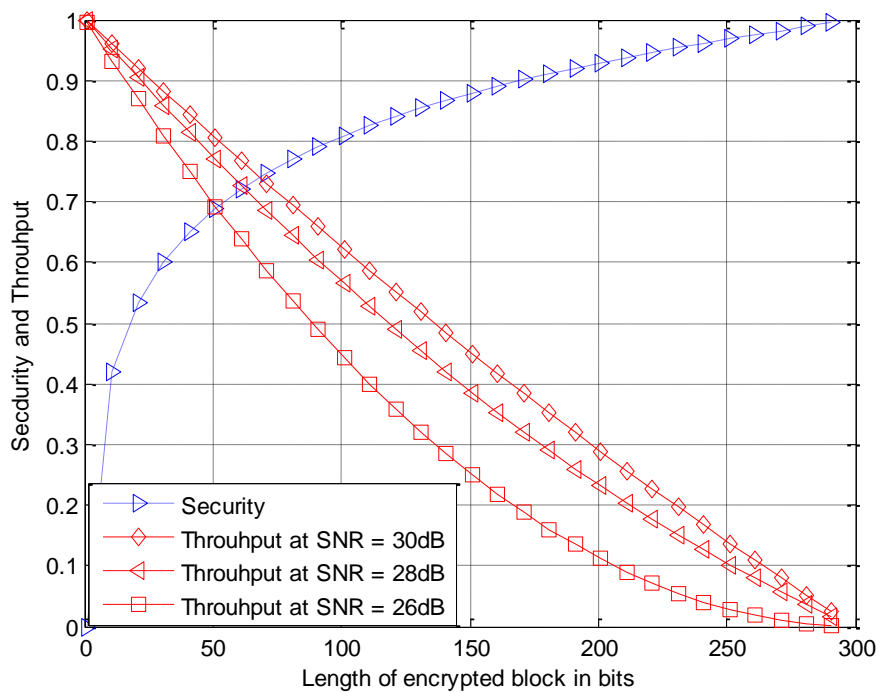


Fig. 1.1 Performance of wireless channel under awgn environment taking service time as a parameter

The figure must be numbered like above with title. The figure should be referred in literature like, ‘the profile of throughput and security level is shown in fig.1.1’. All figures and graph must be in gray scale except some special cases.

TABLE 1.1
UNITS FOR MAGNETIC PROPERTIES

SYMBOL	QUANTITY	CONVERSION FROM GAUSSIAN AND CGS EMU TO SI ^A
Φ	magnetic flux	1 Mx $\rightarrow 10^{-8}$ Wb = 10^{-8} V·s
B	magnetic flux density, magnetic induction	1 G $\rightarrow 10^{-4}$ T = 10^{-4} Wb/m ²
H	magnetic field strength	1 Oe $\rightarrow 10^3/(4\pi)$ A/m
μ_r	relative permeability	$\mu \rightarrow \mu_r$
w, W	energy density	1 erg/cm ³ $\rightarrow 10^{-1}$ J/m ³
N, D	demagnetizing factor	1 $\rightarrow 1/(4\pi)$

Table must have both number and title and must be mentioned in literature. All tables, graphs and figures must be centered.

The following Equations:

$$\int_0^{r_2} F(r, \varphi) dr d\varphi = [\sigma r_2 / (2\mu_0)] \quad (1.1)$$

All mathematical variables must be in italic, vectors and matrix in bold phase in the literature. Equations must be left aligned but their numbers must touch the right end of the lines. All characters in literature must be in Times New Romans 12 points font and subscripts/superscripts in 10 pints font.

Chapter 2

Literature Review

Write review here [1]. Write review here.

2.1 Testing

2.1.1 Testing

References

- [1] W. K. Chen. *Linear Networks and Systems*. Belmont, CA: Wadsworth, 1993, pp. 123-35.
- [2] J. E. Bourne. "Synthetic structure of industrial plastics," in *Plastics*, 2nd ed., vol. 3. J.Peters, Ed. New York: McGraw-Hill, 1964, pp.15-67.
- [3] G. Pevere. "Infrared Nation." *The International Journal of Infrared Design*, vol. 33, pp. 56 - 99, Jan. 1979.
- [4] D. B. Payne and H. G. Gunhold. "Digital sundials and broadband technology," in *Proc. IOOC-ECOC*, 1986, pp. 557-998.
- [5] B. Brandli and M. Dick. "Engineering names and concepts," presented at the 2nd Int.Conf. Engineering Education, Frankfurt, Germany, 1999.
- [6] M. Duncan. "Engineering Concepts on Ice. Available online: www.iceengg.edu/staff.html, Accessed on Oct. 25, 2000.
- [7] S. Mack. "Desperate Optimism." M.A. thesis, University of Calgary, Canada, 2000.