

* If an applicant does not submit the required documents, he/she will be disqualified from the evaluation process as 'incomplete documents'.

(Application for 2024 Fall Graduate Admission)

☐ scholarship Scholarship(Government or UNIST) () Other Scholarship(Company, Institute, Yourself, etc.) ()

☐ Intended Degree Master () Master-Doctor () Doctor ()

☐ Application Unit (Major)

☐ Applicant Name ☐ Nationality

☐ Date of Birth (yy/mm/dd) ☐ ID Number

☐ Address ☐ Military

☐ Phone number ☐ Cell phone

☐ Fax Number ☐ E-Mail☐ College / University Attended

☐ Undergraduate

☐ Graduate☐ English Proficiency English Test Scores

TOEFL(PBT,CBT,iBT) IELTS

TOEIC (Test Date 2024/01/31) TEPS

G-TELP(Level 2) TOEIC S/W

G-TELP(Level 3) OPIC

Exemption ()

I agree to provide my personal information and academic information (UNIST & Dormitory) ☒ Agree ☐ Not Agree

I Apply for entrance to this graduate school with some documents

Signature _____ Date 2024/03/18 (yy/mm/dd)



- * Submit the printed(downloaded) documents(PDF files) along with other scanned documents(Transcripts, Diploma(certificate of degree), English Proficiency Test Score, Additional documents and so on) as a single PDF file.
- * Please scan clearly and neatly for better identification during evaluation.
(Only PDF file with a size of 32MB or less can be uploaded on the application website)

Check List of Documents ()

Please submit the documents in the following order.

()

No.	List of Documents ()	Attachment	
		Yes	No
1	Application form: Print out after completing online application (:)		
2	Check list of documents(Form 1): Print out after completing online application (:) (1)		
3	Transcripts of Bachelor's degree (()) *		
4	Transcripts of Master's degree ()		
5	Diploma (certificate) of Bachelor's degree () * 가 , 가 * If submission is not possible, please submit 'certificate of expected graduation' or 'certificate of enrollment'.		
6	Diploma (certificate) of Master's degree () * 가 , 가 * If submission is not possible, please submit 'certificate of expected graduation' or 'certificate of enrollment'.		
7	Study Plan and Personal Statement(Form 2): Print out after completing online application (:) (2)		
8	English Test Report (:) * 가 가		
9	Letter of Disclosure Agreement(Form 3): Print out after completing online application (:) (3)		
10	Recommendation Letter from Others(Company, Institute, etc.) (Form 4) () (4, *) * () () * () * Only for student funded by Others(Company, Institute, etc.) * No need to submit for those who pay for education expenses(tuition) by yourself		
11	Certificate of Employment (()) * * 가 * ICT , * Only for student funded by Others(Company, Institute, etc.) * Submit only those who can issue a certificate * Applicants for the ICT Convergence 'are required to submit an employment certificate, which is not optional but mandatory		
12	Additional documents ()		

* Most foreign applicants apply for 'Scholarship(Government or UNIST)', and documents for items 10 and 11 are not submitted by foreigners.

* If you are working at a Korean company(institute) and plan to complete a graduate school program with support from that company(institute), submit documents for items 10 and 11.

- * Submit transcripts with a GPA that can be verified at the time of application submission.
- * Submit the certificate with english notarization or Apostille(Consular confirmation).



Government College University Faisalabad, Pakistan

TRANSCRIPT

BSc Electrical Engineering in Telecommunication Session 2009- 2013

Name: [REDACTED]

Reg. No: 2009-GCUF-2084-522

Father Name: [REDACTED]

Roll No: 1823

Course Code	Title of The Course	Credit Hours	Total Marks	Obtained Marks	%Age Obtained	Letter Grade	G.P.	Remarks
1st Semester								
CS-111	COMPUTER FUNDAMENTALS	3(2-1)	60.00	34.75	58	C	6.00	
EE-101	CIRCUIT ANALYSIS	4(3-1)	80.00	62.00	78	B+	13.2	
EE-112	WORKSHOP PRACTICE	2(2-0)	40.00	23.50	59	C	4.00	
GS-105	APPLIED CALCULUS	3(3-0)	60.00	42.00	70	B	9.00	
HS-106	ISLAMIC STUDIES	2(2-0)	40.00	29.00	73	B	6.00	
HS-104	COMMUNICATION SKILLS	3(3-0)	60.00	46.00	77	B+	9.90	
Semester Total:		17	340.00	237.25	68.89		48.10 GPA ->	2.83

2nd Semester								
EE-121	COMPUTER AIDED DRAWING	1(0-1)	20.00	10.00	50	C-	1.70	
EE-125	MECHANICS OF MATERIALS	3(3-0)	60.00	37.00	62	C+	6.90	
EE-126	BASIC ELECTRONICS	4(3-1)	80.00	43.00	54	C-	6.80	
HUM-127	PAKISTAN STUDIES	2(2-0)	40.00	32.50	81	A	7.40	
MTH-123	LINEAR ALGEBRA	3(3-0)	60.00	39.00	65	B-	8.10	
MGE-124	ENGINEERING MANAGEMENT	3(3-0)	60.00	47.00	78	B+	9.90	
PHY-122	APPLIED PHYSICS	4(3-1)	80.00	60.00	75	B+	13.2	
Semester Total:		20	400.00	268.50	66.43		54.00 GPA ->	2.70

3rd Semester								
CSE-234	OBJECT ORIENTED PROGRAMMING	4(3-1)	80.00	44.00	55	C	8.00	
EE-236	ANALOG ELECTRONICS	4(3-1)	80.00	45.90	57	C	8.00	
EE-233	ELECTRICAL MACHINES	4(3-1)	80.00	54.00	68	B-	10.8	
MTH-235	DIFFERENTIAL EQUATIONS	3(3-0)	60.00	31.00	52	C-	5.10	
MTH-231	NUMERICAL ANALYSIS	3(3-0)	60.00	45.50	76	B+	9.90	
HUM-232	ENGINEERING ETHICS	3(3-0)	60.00	44.50	74	B	9.00	
Semester Total:		21	420.00	264.90	63.59		50.80 GPA ->	2.42

4th Semester								
EE-242	DIGITAL LOGIC & DESIGN	4(3-1)	80.00	47.00	59	C	8.00	
EE-243	NETWORK ANALYSIS	4(3-1)	80.00	48.65	61	C+	9.20	
EE-244	SIGNAL & SYSTEM	3(3-0)	60.00	45.00	75	B+	9.90	
MTH-245	COMPLEX VARIABLE & TRANSFORMS	3(3-0)	60.00	32.00	53	C-	5.10	
MGE-241	ENGINEERING ECONOMICS	3(3-0)	60.00	41.00	68	B-	8.10	
Semester Total:		17	340.00	213.65	63.24		40.30 GPA ->	2.37

5th Semester								
EE-351	ELECTROMAGNETIC FIELD THEORY	3(3-0)	60.00	39.00	65	B-	8.10	
EE-352	DIGITAL ELECTRONICS	4(3-1)	80.00	54.50	68	B-	10.8	
EE-354	COMMUNICATION SYSTEM	4(3-1)	80.00	57.50	72	B	12.0	
EE-355	COMPUTER COMMUNICATION & NETWORK	4(3-1)	80.00	54.50	68	B-	10.8	
MTH-353	PROBABILITY & STATISTIC FOR ENGINEERS	3(3+0)	60.00	37.00	62	C+	6.90	
Semester Total:		18	360.00	242.50	66.96		48.60 GPA ->	2.70

6th Semester								
EE-361	DIGITAL COMMUNICATION	4(3-1)	80.00	46.00	58	C	8.00	
EE-362	LINEAR CONTROL SYSTEMS	4(3-1)	80.00	51.00	64	C+	9.20	

Prepared By: [Signature]

(Errors and omissions excepted)

Checked By: [Signature]



Government College University Faisalabad, Pakistan

TRANSCRIPT

BSc Electrical Engineering in Telecommunication Session 2009- 2013

Name:

Reg. No: 2009-GCUF-2084-522

Father Name:

Roll No: 1823

EE-365.	MICROPROCESSOR BASES SYSTEMS	4(3-1)	80.00	49.00	61	C+	9.20	
EE-363.	POWER ELETRONICS	4(3-1)	80.00	57.00	71	B	12.0	
EE-364.	DIGITAL SIGNAL PROCESSING	4(3-1)	80.00	50.00	63	C+	9.20	Repeated
Semester Total:		20	400.00	253.00	63.25		47.60 GPA ->	2.38

7th Semester

EE-471.	INTRODUCTION TO POWER-ENGINEERING	3(3-0)	60.00	35.50	59	C	6.00	
EE-474.	WIRELESS AND MOBILE COMMUNICATION	3(3-0)	60.00	31.15	52	C-	5.10	
EE-472.	ANTENA AND WAVE PROPAGATION THEORY	4(3-1)	80.00	57.00	71	B	12.0	
Semester Total:		10	200.00	123.65	60.78		23.10 GPA ->	2.31

8th Semester

EE-473	TRANSMISSION AND SWITCHING	4(3-1)	80.00	41.00	51	C-	6.80	
EE-475	ELECTRICAL ENGINEERING PROJ.	6(0-6)	120.00	102.00	85	A	22.2	
EE-483	SATELLITE COMMUNICATION	4(3-1)	80.00	45.00	56	C	8.00	
EE-482	RF AND MICROWAVE ENGINEERING	4(3-1)	80.00	52.00	65	B-	10.8	
EE481	OPTICAL FIBER COMMUNICATION	4(3-1)	80.00	50.00	63	C+	9.20	
Semester Total:		22	440.00	290.00	64.00		57.00 GPA ->	2.59
Grand Total:			145.00	2900.00	1,893.45	65.29	369.50	

Cumulative Grade Point(CGPA) required 2.00, Earned-> 2.55

(Errors and Omissions excepted)

Certified that the candidate has successfully completed his/her degree requirements.

This transcript is valid when signed by the Additional Controller of Examinations along with official seal.

Prepared By:

Checked By:

Dy. Controller:

Result Declaration Date:

Date Of Issue:

Serial No.:

Additional Controller of Examinations,
G C University, Faisalabad



**NATIONAL
UNIVERSITY**
of Computer & Emerging Sciences
www.nu.edu.pk

Student Name: _____

Date of Birth: _____

UF

Univ. Reg. No: 14L-5114

Roll No: 14L-5114

Degree: MS(EE)

Fall 2014

Code	Course Title	Crd	Pnt	Grd	Rmk
EE506	Advanced Digital Signal Processing	3	2.67	B-	
EE545	Advanced Probability Theory	3		W	
SS310	Research Methodology	1	3.00	B	
Credits Attempted: 4			GPA: 2.75		
Credits Earned: 4			CGPA: 2.75		

Spring 2015

Code	Course Title	Crd	Pnt	Grd	Rmk
EE516	Power Electronics & Applications	3	3.00	B	
EE524	Speech Processing	3		W	
EE528	Linear Systems	3	2.67	B-	
Credits Attempted: 10			GPA: 2.84		
Credits Earned: 10			CGPA: 2.80		

Fall 2015

Code	Course Title	Crd	Pnt	Grd	Rmk
EE523	Analog and Discrete Electronics	3	3.33	B+	
EE545	Advanced Probability Theory	3	3.67	A-	
Credits Attempted: 16			GPA: 3.50		
Credits Earned: 16			CGPA: 3.06		

Spring 2016

Code	Course Title	Crd	Pnt	Grd	Rmk
EE509	Signal Detection & Estimation	3	3.67	A-	
EE521	Optical Communications	3	3.67	A-	
EE591	MS Thesis - I	3	4.00	A	
Credits Attempted: 25			GPA: 3.78		
Credits Earned: 25			CGPA: 3.32		

Fall 2016

Code	Course Title	Crd	Pnt	Grd	Rmk
EE504	Advanced Wireless Communications	3	3.67	A-	
EE502	MS Thesis - II	3	4.00	A	
Credits Attempted: 31			GPA: 3.84		
Credits Earned: 31			CGPA: 3.42		

CGPA Required: 2.50	Credits Required: 31	Credits Transferred: 0
CGPA Earned: 3.42		Credits Earned: 31
	Degree Status: Completed	Credits Completed: 31

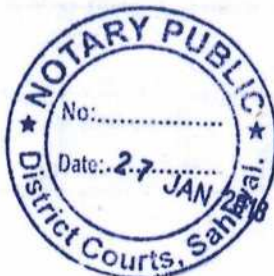
August 14, 2017

NATIONAL UNIVERSITY
of Computer & Emerging Sciences
Islamabad

Wali
Controller Examinations

ATTESTED

TO BE THE TRUE COPY



FARZANA LATIF CH.
Advocate High Court
Notary Public Chamber # 86-A
District Courts, Sahiwal.

- * If you cannot submit a graduation certificate(degree certificate) because you are currently enrolled, please submit a certificate of expected graduation or a certificate of enrollment.
- * Submit the certificate with english notarization or Apostille(Consular confirmation).

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Government College University

Faisalabad, Pakistan



On the recommendations of the Faculty,
by virtue of the authority vested in it,
the University confers upon

[Redacted Name]

the degree of

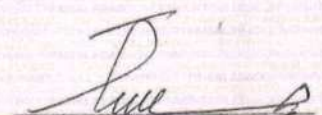
BSc


Electrical Engineering in Telecommunication
Session 2009-2013

with all the rights, honours and privileges pertaining thereof,

He/She Obtained Cummulative Grade Point Average of 2.55 / 4.00




Controller of Examinations


Vice Chancellor


Chancellor

Serial # **033179**

Date **November 08, 2013**

Reg. #
2009-GCUF-2084-522

* If you cannot submit a graduation certificate(degree certificate) because you are currently enrolled, please submit a certificate of expected graduation or a certificate of enrollment.

* Submit the certificate with english notarization or Apostille(Consular confirmation).

National University
of Computer & Emerging Sciences



This is to certify that

has been admitted to the degree of

Master of Science (Electrical Engineering)

With all the honours, privileges, and responsibilities pertaining thereto.

Awarded in the city of Islamabad on the Thirteenth day of June in the year 2017.

Amir Muhammad

Rector



Nasim Sajjad

Chancellor

14L-5114

17-1387

* 'Study Plan and Personal Statement' must be written in English within the specified number of characters(bytes). If you write more than that, the excess characters will be automatically deleted.

* The 'Study Plan and Personal Statement' can only be filled out, printed, and submitted on the online admissions application website(Uway). And applicants are prohibited from filling out and submitting any non-designated forms.

* In addition to text, pictures or tables cannot be entered on the form.

Study Plan and Personal Statement
(연구계획서 및 자기소개서)

1. Name (성명) _____, 2. Application number (수험번호) _____

3. Scholarship (장학 구분)
☐ Scholarship(Government or UNIST) ☒ Other Scholarship(Company, Institute, Yourself, etc.)

4. Degree Proposed (지원 학위) ☒ Master ☐ Combined Master-Doctor ☐ Doctor

5. Application Unit (Major) (지원 모집단위) Artificial Intelligence (기재 사항: _____)

6. Colleges/Universities Attended (학력 사항)

구분	University (대학명)	Major (전공)	Dates Attended (입학일)	GPA/Scale (평점/만점)
Bachelor (학사)				
Master (석사)				
Doctor (박사)				

7. Research Achievements (연구실적)

No.	Author (저자)	Title (제목)	Journal (출판)	Date Issued (발행일)
1				
2				
3				

8. Preferred study field in detail (관심연구 분야 - 영문으로 줄 바꿈, 띄어쓰기 포함 500자 이내 작성)

9. Study Plan (학업계획서 - 영문으로 줄 바꿈, 띄어쓰기 포함 3,000자 이내 작성)

10. Personal Statement (자기소개서 - 영문으로 줄 바꿈, 띄어쓰기 포함 3,000자 이내 작성)

* When applying for admission, you should(must) submit the designated official 'Proficiency English Test Score'.

* If you are a native speaker of English, or if you have completed 100% of your degree course in English(submission of proof(english certificate) is required), you can be exempted from submitting an English score.

IELTS™

Test Report Form

ACADEMIC

NOTE Admission to undergraduate and post graduate courses should be based on the ACADEMIC Reading and Writing Modules. GENERAL TRAINING Reading and Writing Modules are not designed to test the full range of language skills required for academic purposes. It is recommended that the candidate's language ability as indicated in this Test Report Form be re-assessed after two years from the date of the test.

Centre Number

PK011

Date

12/AUG/2021

Candidate Number

005697

Candidate Details

Family Name

First Name

Candidate ID



Date of Birth

Sex (M/F)

M

Scheme Code

Private Candidate

Country or Region of Origin

Country of Nationality

First Language

Test Results

Listening

6.5

Reading

6.0

Writing

6.0

Speaking

7.0

Overall Band Score

6.5

CEFR Level

B2

Administrator Comments

Centre stamp

British Council
Lahore PK011

www.britishcouncil.org.pk

Validation stamp



Administrator's Signature

[Signature]

Date

24/08/2021

Test Report Form Number

21PK005697TANMD11A



Cambridge Assessment English

* As an example of a certificate that the degree course was taught in English, in order to be exempted from submitting an official English score, the following 'English Certificate' must be officially issued and submitted by the school.



Central Queensland
UNIVERSITY

17 MARCH 2008

Student Reference No:

[Redacted]
Unit 8/16-17 Alexandra Pde
Rockdale
NSW 2216 Australia

(SAMPLE)

To Whom It May Concern - Notification of Completion

This letter is to advise that on March 07, 2008, [Redacted] [Redacted], born the [Redacted] completed the requirements for the award of Master of Accounting [Redacted] from Central Queensland University with an award conferral date of [Redacted]

The Master of Accounting is a Postgraduate award studied over 2 Years (104 weeks) of full time study.

[Redacted] was enrolled as a full-time International Full Fee paying student at the Sydney campus of Central Queensland University. All courses studied under this program were conducted in English.

[Redacted] commenced study in the Master of Accounting program on [Redacted]

Yours sincerely

Manager
Student Administration

The University endeavours to ensure that all information regarding students is accurate and up to date. However it is important for individuals to check to ensure the accuracy and to contact the University regarding any discrepancies.

- * In the 'Letter of Disclosure Agreement', please describe the degrees you have earned prior to the degree you wish to apply for.
- * For Master's degree and Combined Master & Doctoral degree applicants, please provide information on your undergraduate(bachelor's) degree.
- * For Doctoral degree applicants, please provide information on your master's degree.

Letter of Disclosure Agreement
(학력조회 동의서)

To whom it may concern (학력조회 담당자 귀하)

This letter is to confirm that I attended _____

I have applied to UNIST, Republic of Korea, for the 2024 academic year and have agreed to allow UNIST to officially request my academic records from previously attended schools. In this regard, I would like to request your full assistance when UNIST contacts you regarding verification of enrollment and transcripts.

(본인은 2024학년도 울산과학기술원 대학원 입학에 지원하였으며, 울산과학기술원에서 공식적으로 요청하는 학력조회에 협조를 요청합니다.)

School Name (출신학교 이름)	
Student Name (지원자 성명)	
Major (전공)	
Date of Birth (생년월일)	
Date of Admission (입학일)	
Date of Graduation (졸업일)	

Date (날짜): 2024. 03. 18

Name (이름):

(Signature)

* Additional documents ' is to selectively submit documents that are judged to prove your excellence in research or learning , such as Thesis data , Research reports , Awards (Prizes) , Recommendation letters, and Patents, as additional documents.

Department of
Electrical Engineering



**NATIONAL
UNIVERSITY**
of Computer & Emerging Sciences

Reference Letter for

Dear Sir/ Madam,


I am writing to recommend Farrukh for admission in your esteemed institution. I have known Farrukh for 3 years, and I have taught him the subjects of "Advance Wireless Communication" and "Optical Communications". I was also the committee member for his research thesis.

It should go without saying that he is a remarkable talent, he would be a good catch for any department and I urge you to consider his candidacy seriously.

Farrukh has always taken his role seriously and is passionate about his results. Beyond his passion on driving performance, Farrukh is a good researcher and fights hard for his beliefs. He's at his best in a group environment and is consciously proactive at getting full involvement of all other team members to derive the best results possible.

I have the deepest personal and professional respect for Farrukh and sincerely believe he will bring his unique energy, optimism, passion, and tireless creativity to institution. He has my highest endorsement. If you have any questions about this recommendation or my endorsement of Farrukh please contact me at 0300-9177000.

Sincerely,



Professor
Name



Reference Letter for Mr. Farrukh

Dear Sir/ Madam,

It gives me immense pleasure in recommending Mr. Farrukh for the PhD program at your venerated institution. I have known him for three years when he first enrolled in master's program at "National University of Computer and Emerging Sciences". In 2014, I taught him the course of "Advanced Digital Signal Processing". He has shown the motivation, intelligence, preserving nature and analytical aptitude for graduate study.

Farrukh's attendance and his presence of mind has been a key part of his study program. Moreover, he has contributed effectively while working as a part of the team. As a team worker, he balanced competing needs with humor and professionalism.

In my view, Farrukh stands among with my best students. I am sure, he will make an outstanding performance at her PhD studies. I strongly recommend him for admission to a PhD program at your esteemed university. I also strongly recommend him for a position as research assistant. If you would like further information about Farrukh's recommendation, I may be contacted at amjad.hussain@nu.edu.pk.

Sincerely,

Amjad Hussain 2017

Dr. Amjad Hussain

Professor and Head

Department of Electrical Engineering

National University of Computer & Emerging Sciences

Research Proposal or Study Plan

I had completed my post graduate studies in Electrical Engineering specialized in Telecommunications from "National University of Computer and Emerging Sciences", Pakistan in June 2017. I attained a "Cumulative Grade Point Average (CGPA)" of 3.42 out of 4. During my post graduate studies, I was actively involved in numerous curricular and extra-curricular activities. In fact, I was academically efficient and esteemed in the top 10 out of 80 students in my post graduate class. If observed by the perplexing efforts, I remained very proficient and I had passed all entrance tests organized by the academic institutions of my education with high acquisition and secured overall 3rd place during my graduate studies. Since the beginning of my undergraduate studies, Information and Telecommunication has been a subject that fascinated me with its power of applications. The subjects that I have studied include "modern information theory, multimedia analysis and retrieval, broadband multimedia information processing and transmission, optical wireless communication, transmission and switching, digital signal processing, advance probability theory, analog and digital communication, signal estimation and detection, C++ and object oriented programming".

Moreover, I performed my post graduate dissertation on "Fading due to scintillation and pointing error on an optical wireless multiple input multiple output (MIMO) channel". Although Optical wireless communication (OWC) has attractive advantages over radio frequency (RF) communication, but the main drawback of OWC is the loss of optical energy due to gas molecule, vapor, pollutants, dust, fog and other particles present in the atmosphere which create irradiance fluctuation in the received signal[1][2][3][4]. Therefore, OWC communication is severely impacted by scintillation due to atmospheric turbulence and pointing errors due to misalignment[5]. Scintillation and pointing error cause fading effects in OWC. These fading effects can be reduced by using multiple input multiple output optical wireless channel[6][7][8]. In order to mitigate the effects of scintillation and pointing error, I am looking forward to derive the closed form expressions for the probability of outage and bit error rate (BER) of a 2×1 optical wireless MIMO channel. The closed form results for the probability of outage of an OW MIMO channel has never been derived by using the joint distribution of scintillation and pointing error. Therefore, In my Doctoral research, I shall apply an analytical technique to model an optical wireless MIMO channel both in terms of probability of outage and BER. Probability of outage is the probability of output signal to noise ratio (SNR) falls below a certain threshold level. It occurs when instantaneous error probability exceeds a specified value[10]. While bit error rate is the ratio of the number of error bits divided by total number of transmit bits. BER has no specific units and it is often expressed as a percentage. The proposed MIMO system is shown in the diagram below.

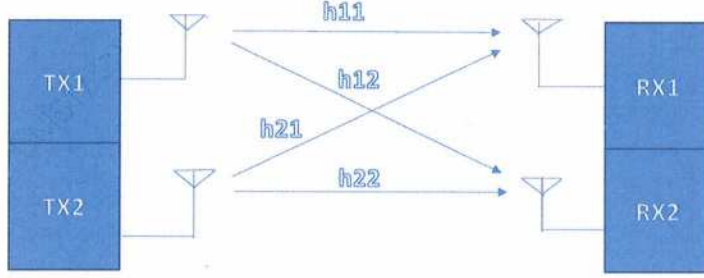


Figure 1: Proposed Optical Wireless MIMO channel

Where TX1, TX2 are the transmitted signals. While, h_{11} , h_{12} , h_{21} , h_{22} are the corresponding channel gains and RX1, RX2 are the received signals.

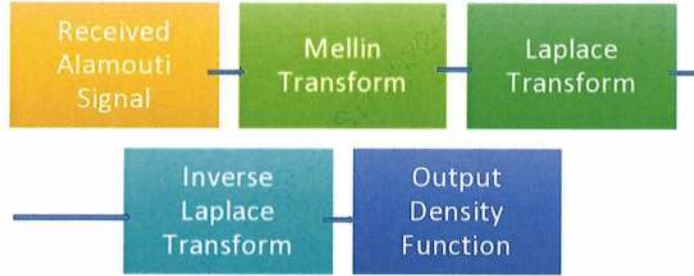


Figure 2: Proposed scheme to model MIMO channel

The received modified Alamouti signal in terms of on-off keying (OOK) Modulation schemes is given by [10][11],

$$\tilde{y} = (h_{11}^2 + h_{12}^2)x + \tilde{N} \quad (1)$$

Where h_{11}^2 and h_{12}^2 are the channel responses of a 2×1 MIMO FSO channel. x represents the transmitted signal and \tilde{N} is the additive white Gaussian Noise (AWGN). h_{11} has the density function $f(h_{11})$. But the received signal contained the square of h_{11} and h_{12} . Therefore, Mellin transform is applied to find $f(h_{11})^2$ and $f(h_{12})^2$. Where $f(h_{11}^2 + h_{12}^2) \sim g(X)$. The Laplace transform for the received density function is computed.

$$\mathcal{L}[f(h_{11}^2 + h_{12}^2)] = \mathcal{L}f(h_{11}^2)\mathcal{L}f(h_{12}^2) = \mathcal{L}[g(X)] \quad (2)$$

Then the inverse Laplace transform of $g(X)$ is applied to compute the cumulative density function (CDF) for the probability of outage $F(X \leq X_{TH})$. Where X_{TH} is the normalized Threshold (Ptn) in decibels (dB).

$$F(X \leq X_{TH}) = \mathcal{L}^{-1}\left[\frac{1}{s}\mathcal{L}[g(X)]\right] \quad (3)$$

The joint Probability density function (Pdf) of scintillation and pointing error is given by [9],

$$f_X(x) = \frac{\alpha_i^2 \beta_i^2 \xi_i^2}{\Gamma(\alpha_i)\Gamma(\beta_i)} G_{1,3}^{3,0} \left(\xi_i^2 - 1 \mid \alpha_i \beta_i \sqrt{x} \right) \quad (4)$$

Where $G_{p,q}^{m,n}(\cdot)$ is the Meijer-G function. α represents large scale turbulent cells and β denotes small scale turbulent cells. While, $\Gamma(\cdot)$ is a gamma function and ξ is a pointing error parameter. During my Doctoral studies, I am interested to apply the proposed scheme on joint density function $f_X(x)$ to compute the Cumulative distribution function (CDF) for the probability of outage of a free space optical wireless MIMO channel.

I shall compute the probability of outage of a MIMO optical wireless channel both by using MuPad and Monte Carlo simulations and by setting different values of large scale turbulent cells α , small scale turbulent cells β and pointing error parameter ξ .

Furthermore, I am also quite enthusiastic to determine closed form expressions for Ergodic capacity of a proposed MIMO channel and to apply Machine learning algorithms like (Linear Regression and Decision Trees) in the domain of free space optical wireless communication (OWC)[12]. There are numerous implementation issues in the OWC systems, such as signal dependent properties of OWC channels from non-trivial challenges both in modulation and demodulation of optical signals. However, such issues can be best resolved by using deep learning algorithms. Furthermore, a very little research has been done to model OWC systems by using machine learning techniques. Therefore, I am deeply interested in using Machine Learning techniques in the domain of optical wireless communication[13][14].

Finally, I am looking forward to apply for the scholarship program in Communication and Media Engineering from Ulsan national institute of science and technology of in Korea and it is evident from my research work and current job position that I have a vast knowledge about the practical applications of Electrical Engineering. This caught my attention towards a "Ulsan national institute of science and technology Scholarship" and created a thirst of knowledge in me to study my chosen program in South Korea. It is my ultimate desire to work in an international field related to Electrical Engineering. Therefore, I shall prefer to gain more deeper practical knowledge in managing most innovative projects. I hope to be able to take part in maximizing the research of my country in the

field of Telecommunication Engineering. Moreover, I shall perform my services as Assistant Professor after coming back to my homeland. I have a strong belief that this Scholarship Program will provide me a great chance to get in touch with modern Telecommunication systems which will allow me to globalize the industry at my homeland.

Last but not the least I am completely committed to continue my research from the well renowned universities in South Korea. Therefore, it is my very humble request to take my application into consideration and grant me a suitable scholarship position under "Ulsan national institute of science and technology scholarship program".

With Warm Regards,
Muhammad Farukh Tanveer

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