

# SABA SHAFaq

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## WORK EXPERIENCE

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<b>INTERNATIONAL ISLAMIC UNIVERSITY, ISLAMABAD, PAKISTAN</b> ASSISTANT PROFESSOR	<b>2015-TO DATE</b>
<b>INTERNATIONAL ISLAMIC UNIVERSITY, ISLAMABAD, PAKISTAN</b> ASSISTANT PROFESSOR (VISITING FACULTY)	<b>2013 – 2015</b>
<b>QUAID-E-AZAM UNIVERSITY, ISLAMABAD</b> ASSISTANT PROFESSOR(IPFP)	<b>2011 – 2012</b>
<b>SIEGEN UNIVERSITY, SIEGEN, GERMANY</b> TEACHING ASSISTANT	<b>2008 – 2010</b>
<b>GC UNIVERSITY, LAHORE</b> LECTURER PHYSICS	<b>2004 – 2007</b>
<b>NATIONAL ENGINEERING AND SCIENCE COMMISSION</b> ASSISTANT MANAGER – PHYSICS	<b>2001 – 2003</b>

## EDUCATION

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<b>SIEGEN UNIVERSITY, SIEGEN, GERMANY</b> <b>Ph. D. (Physics)</b> Supervisor: Professor Dr. Thomas Mannel Thesis: Flavor Physics & Right-Handed Models	<b>2007 – 2010</b>
<b>QUAID-E-AZAM UNIVERSITY, ISLAMABAD</b> Master of Philosophy of Sciences ( <b>M.Phil.</b> ) Supervisor: Dr. Fayyaz Uddin Thesis Topic: Extension of Standard Model & Flavor Changing Processes	<b>2000 – 2002</b>
<b>QUAID-E-AZAM UNIVERSITY, ISLAMABAD</b> Master of Sciences ( <b>M.Sc.</b> ) As regular student with Physics (1 <sup>st</sup> Division)	<b>1997 – 2000</b>
<b>PUNJAB UNIVERSITY, LAHORE</b> Bachelor of Sciences ( <b>B.Sc.</b> ) As regular student with Maths A&B/Physics (Roll of Honor)	<b>1995 – 1997</b>

FEDERAL BOARD OF INTERMEDIATE SECONDARY EDUCATION ISLAMABAD  
Higher Secondary/Intermediate Examinations (F.Sc.)  
As regular student with Pre-Engineering Majors (1<sup>st</sup> Division)

1993 – 1995

FEDERAL BOARD OF INTERMEDIATE SECONDARY EDUCATION ISLAMABAD  
Secondary School Examinations (**Matriculation Examination**)  
As regular student with Science Majors (1<sup>st</sup> Division)

1991 – 1993

## RESEARCH FIELDS

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- i. Interested in the study of B-decays within and beyond Standard Model. Specialized in field of effective theories (limiting cases of full QCD theory) specially heavy quark effective theory and the soft collinear effective theory, helps to study the behavior of some interaction towards the end of phase space. Calculating symmetry breaking corrections to relevant form factors to get a better insight and improved results for decay cross sections.
- ii. Study of left right symmetric models, Extension of gauge sector of Standard Model to explain the mass hierarchy among three quark families in collaboration with research group working in University of Siegen, Germany under the supervision of Prof. Dr. Thomas Mannel. Such models are important for the study of phenomenology of elementary particles especially giving some insight to the neutrino masses.
- iii. Recently study of B-decays using the techniques beyond Standard Model by taking into account new physics parameters is under consideration. The main focus is on the Branching Ratios, Angular Observables, CP Asymmetries and Lepton Polarization especially by taking into account Model Independent scenario as well as in Leptoquark and  $Z'$  models. This Phenomenology of B-mesons decay is being studied in collaboration with the high energy research groups working in Quaid-e-Azam University and National Center of Physics Islamabad.

## PUBLICATIONS

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- i. Saba Shafaq, Ishtiaq Ahmad, M. Jamil Aslam, M Junaid **Model independent analysis of  $B \rightarrow K_2 \mu^+ \mu^-$  decay**. Journal of High Energy Physics(JHEP), Volume 2012, Number 2(2012), 45.(Uploaded at ORIC web site IIU and duly vetted and approved)
- ii. Saba Shafaq, Mariam Saleh Khan. **Left right models with additional family symmetry**. Physics Essays (PE) Publication Volume 2017, Number 2(2017), 30.
- iii. Aqsa Nasrullah, M. Jamil Aslam, Saba Shafaq, **Analysis of angular observables of  $\Lambda_b \rightarrow \Lambda(\rightarrow p\pi)\mu^+\mu^-$  decay in Standard and  $Z'$  models**. Progress of Theoretical and Experimental Physics (PTEP) 04, (2018), 043B08. (Uploaded at ORIC web site IIU and duly vetted and approved)
- iv. Saba Shafaq, Ishtiaq Ahmad, M. Jamil Aslam. **Symmetry-breaking corrections to the form factors for Heavy-to-Heavy B-meson at large recoil energy**. International

Journal of Modern Physics A (IJMPA) Vol 34, No. 08 (2019) 1950046. (Uploaded at ORIC web site IIU and duly vetted and approved)

- v. M. Arsalan, Saba Shafaq, M. Jamil Aslam, Ishtiaq Ahmed. **Vertex renormalization and hard scattering symmetry-breaking corrections to B to axial vector meson form factors at large recoil.** Physical Review D (PRD) Phys. Rev. D 100 (2019) No.5, 056013 (Uploaded at ORIC web site IIU and duly vetted and approved)
- vi. S. Gurmani, N. Ahmad, T. Hussain, S. Shafaq, T. Iqbal, J. Tacza. **Comparative analysis of local and global atmospheric electric field at northern Pakistan.** Journal of Atmospheric and Solar-Terrestrial Physics 206 105326 2020 (Uploaded at ORIC web site IIU and duly vetted and approved)
- vii. Saba Shafaq, M. Arslan, M. Jamil Aslam, Ishtiaq Ahmed. **Radiative B to axial-vector meson decays at NLO in Soft-Collinear effective theory** Journal of Physics G (J. Phys. G): Nucl. Part. Phys. **48** (2021) 045005 (Uploaded at ORIC web site IIU)
- viii. Saba Shafaq, I. Ahmad, R. Bano, N. Javaid, A. Nasrullah, T. Barakat. **Analysis of different asymmetries in  $B \rightarrow K^* l^+ l^-$  in 2D and 1D scenarios.** Physica Scripta 96 (2021), 085301 (Uploaded at ORIC web site IIU)
- ix. Aqsa Nasrullah, Ishtiaq Ahmed, M. Jamil Aslam, Saba Shafaq, Z. Asghar. **Probing New Physics effects in  $\Lambda_b \rightarrow \Lambda l^+ l^-$  decay via model independent approach.** Physica Scripta, Phys. Scr. 96 (2021) (Uploaded at ORIC web site IIU)
- x. Saba Shafaq, Arslan Sikander, M. Jamil Aslam, **Symmetry breaking radiative corrections to B to tensor meson form factors at large recoil** Journal of Physics G, Nuclear and Particle Physics, *J.Phys.G* 49 (2022) 10, 105002(Uploaded at ORIC web site IIU)
- xi. Alamgir Khan, Saba Shafaq, Taimoor Khurshid, Yasir ali, Zain ul Abidin, **Study of  $K^*(892)^0$  and  $\phi(1020)$  meson production in  $p-p$ ,  $p-Pb$  and  $Pb-Pb$  collisions at LHC Energies** The European Physical Journal of Plus, Eur. Phys. J. Plus (2023) 138:248(Uploaded at ORIC web site IIU)
- xii. Muhammad Arslan, Tahira Yasmeen, Saba Shafaq, Ishtiaq Ahmed, **Analysis of  $b \rightarrow cl\nu$  anomalies using weak effective Hamiltonian and complex couplings and their impact on various physical observables** Chinese Physics C, (2024) Vol. 48, No. 8(Uploaded at ORIC web site IIU)
- xiii. Tahira Yasmeen, Muhammad Ishtiaq, Saba Shafaq, Muhammad Arslan and Muhammad Jamil Aslam, **Probing New Physics in Light of Recent Developments in  $b \rightarrow c l \nu$  Transitions** Progress of Theoretical and Experimental Physics, ISSN,0033-068X (print) 134-4081(web) (2024) (Uploaded at ORIC web site IIU)
- xiv. Ijaz Ahmad, Saba Shafaq, Muhammad Jamil, **Probing Heavy Charged Higgs Boson Using Multivariate Technique at Gamma-Gamma Collider** Chinese Physics C, ISSN 1674-113, Vol. 49, No. 4 (2025) IF= 3.6

## TEACHING EXPERIENCE:

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Possess vast experience in teaching not only the core Physics courses but also the specialized courses require to help research at MS and PhD levels. During the tenure 2004-2007 in Govt. College University Lahore have been teaching Classical and Statistical Mechanics to M.Sc. students along with supervising undergrad student in their lab work.

During stay in Germany, have been taking problem classes of the international Master students for courses of both Statistical and Advanced Quantum Mechanics which helped to get valuable experience of teaching with world renowned professors.

After returning home engaged in teaching for almost two years in Quaid-e-Azam University, Islamabad. The courses taught at QAU were Nuclear Physics, Particle Physics and Mathematical Methods of Physics to MS students. Co- supervised three MS students at QAU in completing their research work, writing thesis and conducting their final viva exam held in Department of Physics.

Associated with International Islamic University since February 2013 as visiting faculty and taught courses of Statistical Mechanics, Special Theory of Relativity and Classical Mechanics and Quantum Mechanics. Joined the same institute as their TTS Faculty member in November 2015 and is teaching Core Physics Courses like Quantum Mechanics, Mathematical Methods for Physicists, Particle Physics and specialized courses like Quantum Field Theory etc. Along with these teaching assignments extensively involved in research project with undergraduate and graduate level. Also got the opportunity to teach courses of Finite Temperature and Density Field Theory at High Energy and Application of Symmetry Groups in Physics to Ph.D students.

Before these teaching jobs, had a unique experience of running a lab in National Engineering and Scientific Commission, Islamabad (NESCOM) for almost three years involving high tech instruments.

## MS STUDENTS SUPERVISED

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- i. Ms. Saba Ayub  
Thesis Title: **Factorization Scheme in Radiative Decays of B Meson into Leptons.**
- ii. Ms. Tayyaba Sahar  
Thesis Title: **Study of Leptonic Sector of LR Models with Additional Family Symmetry**
- iii. Ms. Maria Altaf  
Thesis Title: **Analysis of Left Right Symmetric Model with Additional Family Symmetry.**
- iv. Ms. Madiha Liaquat  
Thesis Title: **SCET Analysis of  $B \rightarrow D l \bar{\nu}$  decay**
- v. Ms. Rawish Bano  
Thesis Title: **Study of the Standard Model and Majorana Neutrino Contribution to  $B^+ \rightarrow K^{(*)\pm} \mu^+ \mu^\mp$**
- vi. Ms. Madiha Fareed

- Thesis Title: **Study of B-meson decay in G (221) model and vector leptoquark model.**
- vii. Ms. Nida Javed  
Thesis Title: **Analysis of Semi-leptonic B decay using Leptoquark Models.**
- viii. Mr. Rehmat-Ullah  
Thesis Title: **Higgs Decay Analysis in Two Higgs Doublet Model Along with Generator Level Study.**
- ix. Mr. Sajjad Ali  
Thesis Title: **Theoretical and Generator Level Analysis of  $H \rightarrow ZZ \rightarrow 2\ell^+ + 2\ell^-$  Decay at 13TeV.**
- x. Ms. Kubra Sattar  
Thesis Title: **Study of the Cut Optimization of tWZ using 2017 CMS Data.**
- xi. Ms. Saba Younus  
Thesis Title: **Symmetry-Breaking Corrections to Heavy-to-Light B Meson Form Factors at Large Recoil**
- xii. Ms. Saba Asghar  
Thesis Title: **Calculations of  $R_D$  and  $R_{D^*}$  within and Beyond Standard Model.**
- xiii. Ms. Sehrish Zubair  
Thesis Title: **Electromagnetic Correction to The Rare B-meson Decay  $B^0 \rightarrow l^+ l^-$**
- xiv. Ms Shaffaq Arshad  
Thesis Title: **Mass spectrum of multiquark states with charm components.**
- xv. Ms. Kanwal Shaheen  
Thesis Title: **Angular Analysis of  $\Lambda_b \rightarrow \Lambda^* l^+ l^-$  Decay**
- xvi. Ms. Iqra Haider  
Thesis Title: **Study of HVV (Z, W,  $\gamma$ ) Couplings within and Beyond Standard Model**
- xvii. Ms. Naila  
Thesis Title: **Angular Analysis of Baryonic  $\Lambda_b \rightarrow \Lambda c l \nu$  Decay**
- xviii. Ms. Isma Nadeem  
Thesis Title: **Model Independent Study of  $B \rightarrow K_1 l^+ l^-$  with polarized and unpolarized  $K_1$**
- xix. Ms. Salma Jabeen  
Thesis Title: **Reducing Tensor Integrals using Passarino Veltman Functions.**
- xx. Ms. Ureeda Saloomi  
Thesis Title: **Investigating CP even Observables in  $b \rightarrow c$  Transitions.**
- xxi. Ms. Maryam Bibi  
Thesis Title: **Study of  $B \rightarrow D(D^*)$  Anomalies using Asymmetrical Observables**

## **PHD STUDENTS UNDERSUPERVISION**

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- i. Ms. Tahira Yasmeen  
Thesis Title: **Statistical Analysis to Search New Physics (NP) in Rare B-Decays**

- ii. Ms. Saba Ayub  
Thesis Title: **Calculation of Form Factors and Observables using HQET Factorization Approach**
- iii. Ms. Madiha Fareed  
Thesis Title: **Study of New Physics contributions to  $b \rightarrow sl^+l^-$  Transitions**

## REFERENCES

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**Prof. Dr. Thomas Mannel**

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Email: mannel.physik.uni-siegen.de

Department of Theoretical Physics, Siegen University, Germany.

**Prof. Dr. Hans D. Dahmen**

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**Prof. Dr. Fayyaz Uddin**

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