

Meysam Ghanbari

Satellite and Optical Communications PhD

OISL | FSO | Receiver Design | FPGA

Doha, Qatar

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Technical Profile

PhD researcher and engineer focused on satellite and optical communications, including inter-satellite optical links (OISL), free-space optical (FSO) systems, optical receiver and TIA design, and pointing, acquisition, and tracking (PAT). Develops end-to-end analytical and Monte Carlo models for link budgets, receiver noise, beam propagation, alignment, BER/SER, and outage. Experience also includes FPGA development, MATLAB/Python/C, physics-based digital twins, and Siemens industrial automation. Published in IEEE OJ-COMS, JSAC, TCOM, TVT, ICC, and WCNC.

Technical Expertise

Satellite and optical links OISL, FSO, HAPS/UAV links, non-terrestrial networks, quantum optical links, optical link budgets, Gaussian-beam propagation

Receiver and photonics Optical receiver architecture, photodetector/TIA interface, gain-bandwidth-noise tradeoffs, receiver sensitivity, detector capacitance, ADC interfacing

PAT and control Pointing error and jitter, acquisition and alignment, fine tracking, angle-of-arrival estimation, tracking-control modeling

FPGA and digital systems FPGA development, digital logic, communication-system implementation, signal processing

Modeling and software Analytical and closed-form modeling, Monte Carlo simulation, optimization, physics-based digital twins, MATLAB, Python, C

Circuits and automation PSpice, Proteus, Siemens PLC, SCL, STEP 7, WinCC, Siemens Twin Builder

Selected Space and Optical Engineering Projects

- **Integrated optical receiver for OISL:** Developed a receiver architecture that combines communication detection and fine tracking; analyzed detector geometry, received-power distribution, and alignment sensitivity for inter-satellite FSO links. Submitted to IEEE VTC 2027-Spring.
- **All-optical multi-hop inter-satellite relaying:** Derived closed-form performance models and designed regenerative M-PAM relay operation for multi-hop OISL; evaluated performance through numerical and Monte Carlo simulation. Submitted to IEEE Transactions on Communications.
- **Power-neutral information and energy transfer:** Developed an analytical inter-satellite FSO framework using Stokes-orthogonal signaling to coordinate information reception and optical energy transfer under power constraints. Submitted to IEEE ICC 2027.
- **Inter-HAPS multi-branch optical reception:** Designed a progressively attenuated multi-branch receiver strategy and analytical performance model for inter-HAPS optical links. Submitted to IEEE VTC 2027-Spring.

Research and Engineering Experience

PhD Researcher - Satellite, Optical and Wireless Communications

2025-Present

Hamad Bin Khalifa University (HBKU) | Doha, Qatar

- Design analytical and simulation models for inter-satellite, HAPS/UAV, optical wireless, quantum, and non-terrestrial communication systems.
- Derive closed-form link and receiver models, then validate them with MATLAB/Python numerical and Monte Carlo simulations under pointing, turbulence, noise, relay, and power constraints.
- Translate receiver and link concepts into publishable engineering studies and collaborate with international research teams across optical, satellite, and wireless communications.

Part-Time Industrial Automation and Digital Twin Engineer

2023-2025

- Programmed Siemens PLC control logic in SCL for oil and gas automation projects using STEP 7 and WinCC.
- Contributed to industrial digital-twin and control-system models in Siemens Twin Builder and prepared implementation documentation.

Education

PhD in Electrical Engineering / Communications

2025-Present

Hamad Bin Khalifa University | Doha, Qatar | Supervisor: Prof. Khalid A. Qaraqe

Research: satellite communications, inter-satellite optical links, non-terrestrial networks, and quantum communications

MSc in Telecommunications Systems

2020-2023

Shahid Beheshti University | Tehran, Iran | GPA: 3.77/4.00 | Thesis grade: A+

Thesis: Channel modeling and transmitter-parameter optimization for free-space optical communications

BSc in Electrical Engineering

2015-2019

Shahid Chamran University of Ahvaz | Ahvaz, Iran | GPA: 3.50/4.00 | Thesis grade: A+

Journal Publications

- **M. Ghanbari**, M. T. Dabiri, M. Hasna, and K. A. Qaraqe, "All-Optical Multi-Hop Inter-Satellite Relaying for M-PAM Systems: Closed-Form Performance Analysis and Regenerative Design," *submitted to IEEE Transactions on Communications*
- **M. Ghanbari** et al., "When Future Communications Shift Toward Narrow Beams: A Forward-Looking Survey on Pointing Errors and Alignment Limits," *IEEE Open Journal of the Communications Society*, vol. 7, pp. 4959-5006, 2026 [DOI](#)
- M. T. Dabiri, **M. Ghanbari**, M. Hasna, R. Ammuri, S. Al-Kuwari, and K. A. Qaraqe, "Toward City-Scale Quantum Timing: Wireless Synchronization via Quantum Hubs," *IEEE Journal on Selected Areas in Communications*, vol. 44, pp. 5388-5403, 2026 [DOI](#)
- M. T. Dabiri, **M. Ghanbari**, R. Ammuri, M. Hasna, and K. A. Qaraqe, "Real-Time Joint Tracking and Polarization Alignment for Satellite Quantum Key Distribution Using an Artificial-Angle Auxiliary System," *IEEE Transactions on Communications*, vol. 74, pp. 11062-11075, 2026 [DOI](#)
- M. Erdem, M. T. Dabiri, **M. Ghanbari**, M. O. Hasna, and K. Qaraqe, "Terahertz Coverage Analysis with Fixed-Wing UAVs: Analytical Framework and Closed-Form Outage Modeling," *IEEE Transactions on Vehicular Technology*, 2026 [DOI](#)
- **M. Ghanbari**, M. Atace, and S. M. S. Sadough, "Outage Probability Minimization by Optimal Beamwidth Selection for UAV-to-HAP FSO Links Under Pointing Inaccuracies," *Optik*, article 171953, 2024 [DOI](#)

Conference Publications

- **M. Ghanbari**, M. T. Dabiri, A. Alomainy, Q. H. Abbasi, M. O. Hasna, and K. A. Qaraqe, "Integrated Optical Receiver for Communication and Fine Tracking in Inter-Satellite Links," *submitted to IEEE VTC 2027-Spring*
- **M. Ghanbari**, B. Beidas, W. O. Popoola, M. O. Hasna, K. A. Qaraqe, and M. Elamassie, "Progressively Attenuated Multi-Branch Reception for Inter-HAPS Optical Links," *submitted to IEEE VTC 2027-Spring*
- **M. Ghanbari**, M. O. Hasna, and K. A. Qaraqe, "Power-Neutral Joint Information and Energy Transfer over Inter-Satellite FSO Links via Stokes-Orthogonal Signaling," *submitted to IEEE ICC 2027*
- **M. Ghanbari**, M. T. Dabiri, R. Ammuri, M. Hasna, and K. A. Qaraqe, "AI-Assisted Next-Gen Outdoor Optical Networks: Camera Sensing for Monitoring and User Localization," *IEEE ICC, Glasgow, United Kingdom, 2026*, pp. 1-6 [DOI](#)
- M. T. Dabiri, **M. Ghanbari**, R. Ammuri, M. Hasna, and K. A. Qaraqe, "Hierarchical Deep Learning for Joint Turbulence and PE Estimation in Multi-Aperture FSO Systems," *IEEE WCNC, Kuala Lumpur, Malaysia, 2026*, pp. 1-6 [DOI](#)
- **M. Ghanbari**, M. T. Dabiri, M. Hasna, T. Alam, and K. A. Qaraqe, "Deep Learning Surrogate for Fast CIR Prediction in Reactive Molecular Diffusion-Advection Channels," *accepted at IEEE ICMLCN, 2026*
- M. T. Dabiri, **M. Ghanbari**, R. Ammuri, S. Al-Kuwari, M. Hasna, and K. A. Qaraqe, "CV Quantum Communications with Angular Rejection Filtering: Modeling and Security Analysis," *IEEE ICUFN, Milan, Italy, 2026*, pp. 593-598 [DOI](#)
- G. H. Al-Maadeed, N. Abunada, R. Ammuri, M. T. Dabiri, **M. Ghanbari**, and K. Qaraqe, "Optical IRS Assisted Relay Architecture for Enhancing LOS Quantum Key Distribution Links," *IEEE ICETES, Amman, Jordan, 2026*, pp. 477-483 [DOI](#)

- **M. Ghanbari**, M. S. Jahed, and S. M. S. Sadough, "On the Interaction Between Meteorological Conditions and Performance Optimization in MISO Free-Space Optical Communication," *IEEE ICEE, Tehran, Iran, 2023*, pp. 479-483 [DOI](#)
- M. S. Jahed, **M. Ghanbari**, and S. M. S. Sadough, "Bit Error Rate Analysis for a Mixed Underwater OWC-FSO Relaying System in the Presence of Pointing Error," *IEEE ICEE, Tehran, Iran, 2023*, pp. 512-516 [DOI](#)
- **M. Ghanbari**, M. Atace, and S. M. S. Sadough, "Outage Performance Analysis for UAV-Based Mixed Underwater-FSO Communication Under Pointing Errors," *IEEE WASOWC, Tabriz, Iran, 2022*, pp. 1-5 [DOI](#)

Additional Experience and Distinctions

Teaching Wireless Communications Instructor, Texas A&M University at Qatar (2025); Teaching Assistant, Stochastic Processes and Telecommunications Circuits Laboratory, Shahid Beheshti University (2021-2023)

Systems and workflow analysis Technical Business Analyst / Workflow Modeling Specialist in FinTech (2020-2023)

Academic distinctions Top 1% among approximately 300,000 candidates in the Iranian national BSc entrance exam; rank 37 among approximately 4,000 MSc candidates; top-three MSc graduate at Shahid Beheshti University