Daniele Dequal

Gender: Male **Date of birth:** 25/02/1983 **Nationality:** Italian

PROFESSIONAL SUMMARY

Short resume

Experimental physicist with 10 years of experience in designing, developing, testing and operating terminals for satellite quantum communication. Leads experimental activities for optical and quantum communication at the Matera Laser Ranging Observatory (MLRO) optical ground station in collaboration with both academic and industrial partners. Contributes as project scientist to national programs dedicated to the development of a quantum transmitter payload, the upgrade of the existent MLRO station and proof of principle experiments for quantum physics investigation over space scale. Responsible of the assembly, integration and test for the new optical ground station for satellite laser ranging (SLR) in Matera. Advisor of the Italian delegation at the Joint Board on Communication Satellite Programmes at ESA (ESA-JCB) for all matters concerning optical and quantum communications.

WORK EXPERIENCE

[2020 – Current]

Researcher

Italian Space Agency, Telecommunication and Navigation Unit

City: Matera

Country: Italy

- Responsible of the realization, verification and operation of an optical ground station based on the Matera Observatory for the LaserCube mission, in collaboration with StellarProject spin-off
- Project scientist of the program for MLRO upgrade. This activity includes the support of the industrial team in identifying technological solutions for the optical upgrade and in the monitoring of the implementation and test process and compliance with requirements.
- Within the project QUANCOM, funded with 10 M€ global budget, responsible of the work package dedicated to the free-space quantum communication. Managing a team composed of SME and academic institutions.
- Responsible of the technical specification for the calls for tender of a “New Satellite Laser Ranging station” and “Space Debris Laser Ranging station”
- Project scientist of the national program “I-QKD” for the realization of an IOD mission for satellite QKD
- Payload expert for a Concurrent Engineering Facility study dedicated to assess the feasibility and requirements of a mission dedicated to QKD form LEO
- Advisor of the Italian delegation at ESA-JCB

[2017 – 2020]

Researcher

Italian Space Agency, Scientific Research Unit

City: Matera

Country: Italy

- Responsible for the development, integration, test and operation with the Micius satellite of a BB84 Quantum Key Distribution receiver in the near infrared for the Matera Observatory ground station in collaboration with academic partner
- Responsible for the development of a high rate Satellite Laser Ranging demonstrator, including HW and SW design and development, data analysis and result publication
- Directing operational activity for the first demonstration of Space Debris Laser Ranging from Matera Observatory

- Project scientist of the national program “QSec-Ground Space” for the realization of an intermodal QKD connection between free-space and optical fibers.
- Main software developer for satellite QKD simulator, organizing an international team of 3 active SW developers
- Supervising and mentoring academic teams during research and development activity at the Matera observatory

[2013 – 2016]

Post-Doctoral Researcher

Padova University, Information Engineering Department

City: Padua

Country: Italy

- Responsible of the control and data acquisition subsystem of satellite quantum communication experiments at Matera Observatory
- Responsible for the software development and data analysis of satellite quantum communication experiments at Matera Observatory
- Collaborated in the design, implementation and test of the optical section of quantum transmitter and receiver
- Collaborated to data taking campaign, problem resolution, results interpretation and publications

EDUCATION AND TRAINING

[2010 – 2012]

PhD in Physics

Padova University, Physics Department

- Contribution in the development, test and integration of 650 FPGA-based trigger boards in the ICARUS T-600 neutrino detector
- Development of a multilevel trigger system for ICARUS T-600
- Analysis of the trigger efficiency in the 2010-2012 data taking campaign

[2007 – 2009]

Master’s degree in physics cum laude

Padova University, Physics Department

[2003 – 2007]

Bachelor’s degree in physics

Padova University, Physics Department

COMPETENCES

Technical and behavioural skills

Planning, implementing and monitoring validation and test strategies

Technical supervision of operational and research teams

Quantum terminal design, development and verification, both for ground and space segment

Deep knowledge of quantum information and communication principles and applications

Optical ground station operations

Programming and data analysis

Public speaking and reports and proposals writing

Problem solving

Critical thinking

Adaptation to changing circumstances

Strategic thinking and planning

Prioritizing tasks

Networking

Open communication

PUBLICATIONS

Research output summary

Reference: ORCID ID: 0000-0002-2206-5038

Published documents: 38

Citations: 1080

h-index: 19

Presentation to conferences/workshop/seminars: 35+

Selection of 5 most significant publications:

- G. Vallone et al., "Experimental satellite quantum communication", Phys. Rev. Lett. 115, 040502 (2015), selected as viewpoint in Physics and as highlight of the year 2015 by the American Physical Society
- D. Dequal et al., "Experimental single-photon exchange along a space link of 7000 km", Phys. Rev. A 93, 010301 (2016), rapid communication
- F. Vedovato et al., "Extending Wheeler's delayed-choice experiment to space", Sci. Adv. 3, e1701180 (2017)
- D. Dequal et al., "100 kHz satellite laser ranging demonstration at Matera Laser Ranging Observatory", J. Geod. 95, 26 (2021)
- D. Dequal et al., "Feasibility of satellite-to-ground continuous-variable quantum key distribution", npj Quant. Inf. 7, 3 (2021)

NETWORKS AND MEMBERSHIPS

Active and past membership

2021-today Member of the International Network in Space Quantum Technologies (EPSRC)

2020-today Member of the Space Debris Study Group of International Laser Ranging Service

2017-2020 Member of "Quantum Technology in Space" European COST Action

2015-2018 Member of "Nanoscale Quantum Optics" European COST Action

2009-2012 Member of ICARUS collaboration

2009-2012 Associate to the National Institute of Nuclear Physics (INFN)

COMMISSIONS OF TRUST

Commissions of trust

Italian Advisor at the ESA Joint Board on Telecommunication Satellite Programmes (JCB)

Italian Delegate at the JCB - ScyLight Advisory Committee -SCOTT

Guest Editor for the Special issue "Satellite Quantum Communications", Sensors (MDPI)

PhD thesis evaluator for Dr. Andrea Stanco, Mujtaba Zahidi, Andrea Vettor

LANGUAGE SKILLS

Mother tongue(s): Italian

Other language(s):

English

LISTENING C1 **READING** C1 **WRITING** C1

SPOKEN PRODUCTION C1 **SPOKEN INTERACTION** C1

French

LISTENING A2 **READING** A2 **WRITING** A1

SPOKEN PRODUCTION A1 **SPOKEN INTERACTION** A1

DIGITAL SKILLS

Programming in Matlab | Programming in Labview (including Real Time and FPGA module) | Programming in VHDL | COMET-IME (Basic user) | Zeemax optic studio (Basic knowledge)