Dr D M S Sultan, Ph.D., SMIEEE

High-Speed PCB/FPCB & Signal Integrity | Detector Instrumentation | Radiation-Hard Silicon Sensors | Sensor Systems R&D

Oxford, UK | +44 7949 098639 | d.m.s.sultan@gmail.com | LinkedIn | ResearchGate | Oxford profile

PROFESSIONAL PROFILE

Researcher and instrumentation engineer with a Ph.D. in micro-technology and strong cross-over expertise in GHz-class PCB/FPCB development, signal-integrity verification, detector readout, silicon sensor R&D and automated laboratory test systems. Career history spans the University of Oxford, INFN/TIFPA, University of Trento, University of Geneva, CERN/ATLAS, Chalmers, Huawei and academic teaching roles. Current work focuses on PSI Mu3e detector-ladder electronics, high-speed data-link hardware and practical electrical qualification of HVCMOS-based detector systems.

Target roles: Signal Integrity Engineer | High-Speed Hardware / PCB Engineer | Detector / Instrumentation Engineer | Sensor Systems R&D Engineer | Electronics R&D Engineer

SELECTED VALUE & IMPACT

- Developed GHz/high-speed compliant PCB and FPCB hardware for Mu3e HVCMOS detector ladders, contributing to stable 2 Gbps class data-link transmission from monolithic detector chips.
- Recognized with a 2025 Award of Excellence/appreciation for contributions to Mu3e high-frequency PCB design, GHz transmission and system integration.
- Built and qualified experimental infrastructure for ATLAS ITk 3D Si sensor quality control, including cold-test, X-ray burn-in, cooling, motion-control and HV-distribution systems.
- Designed and characterized small-pitch, thin 3D silicon sensors for HL-LHC upgrades using TCAD-guided layouts, L-Edit mask work, wafer/device tests and irradiation campaigns.
- Integrated detector readout and test platforms including Peary-Caribou, USBPix3, ALIBAVA/TCT benches, automated instrumentation and MATLAB-based data analysis workflows.

CORE TECHNICAL EXPERTISE

High-speed hardware	High-speed PCB/FPCB design, controlled interconnects, detector ladder electronics, GHz data-link hardware, manufacturing-aware layout reviews.
Signal integrity	VNA/S-parameter measurement, post-layout SI verification, de-embedding workflows, link troubleshooting, practical GHz measurement interpretation.
Detector instrumentation	HVCMOS detectors, 3D Si sensors, ATLAS ITk QC, Mu3e detector ladders, irradiation systems, cold tests, X-ray burn-in systems.
Laboratory automation	MATLAB numerical modeling, data analysis, acquisition workflows, Arduino-based control, motion stages, HV distribution and test-bench integration.
Microfabrication/devices	TCAD-informed device design, L-Edit layout, clean-room processing exposure, photolithography, wet/dry etching, SEM and optical microscopy.
Tools and platforms	Altium, Cadence/Allegro, HyperLynx, MATLAB, Cascade Microtech 300x, XRAD iR160, FTIR, Peary-Caribou, USBPix3, ALIBAVA, top-TCT.

PROFESSIONAL EXPERIENCE - FULL CHRONOLOGY

Oct 2023 - Present — **Research Fellow** | University of Oxford, OPMD / Department of Particle Physics, *Oxford, UK*

- Contribute to the PSI Mu3e experiment within the Oxford Physics Microstructure Detector laboratory, supporting Layer 3 and Layer 4 HVCMOS-based detector-ladder development.
- Develop high-speed PCB and FPCB hardware for detector readout and system integration, with emphasis on stable GHz-class transmission, controlled interconnects and manufacturability.
- Electrically qualify built detector ladders and verify signal integrity using measurement-led workflows, including VNA/S-parameter checks and link-level troubleshooting.
- Support quality-control activities for CERN ATLAS HL-LHC detector modules commissioned at the Oxford Physics Microstructure Detector laboratory.
- Participate in undergraduate electronics teaching and provide practical guidance in electronics, detector testing and laboratory workflows.

Nov 2021 - Sep 2023 — **Research Fellow** | National Institute of Nuclear Physics (INFN), TIFPA, *Trento, Italy*

- Coordinated and developed experimental setups for quality control of FBK 3D silicon bare sensors for the ATLAS ITk inner layer at the HL-LHC.
- Built and integrated test infrastructure for ATLAS-ITk ring-triplet activities, including cold tests, X-ray burn-in tests, an Amptek Mini-X2-based cabinet and associated system benches.
- Prepared cooling infrastructure, X-ray-gun temperature-control hardware, an X-ray 3D moving-stage concept and an Arduino-based interactive 1-to-24 channel HV splitter.
- Supported a Ph.D. candidate and contributed to academic activities within the University of Trento Department of Industrial Engineering.

Jul 2021 - Nov 2021 — **Collaborator** | Department of Industrial Engineering, University of Trento, *Trento, Italy*

- Developed experimental test setups for ATLAS ITk 3D sensor modules as part of HL-LHC upgrade activities.
- Set up a top-TCT workbench to study space-resolved functional properties of 3D Si sensors, including charge collection, timing response, and avalanche-multiplication behavior.

Jul 2017 - Jun 2021 — **Post-Doctoral Research Fellow** | University of Geneva| *Geneva, Switzerland*

- Contributed to R&D on radiation-hard High Voltage CMOS monolithic pixel detectors for HL-LHC tracking applications, including prototypes produced in AMS 180 nm and TSI CMOS technologies.
- Worked on detector readout development, Peary-Caribou integration, associated PCB/interface design, and coordination of irradiation campaigns with the University of Geneva team.
- Participated in SiGe-based BiCMOS sensor development for Thin-TOF PET, targeting ultrafast timing for 511 keV photons and small-animal imaging applications.
- Guided undergraduate students, supported regular research activities, and contributed to teaching.

Dec 2016 — **Visiting Researcher** | Albert Ludwig University of Freiburg| *Freiburg, Germany*

- Participated in experimental investigations of thin 3D Si sensors for HL-LHC, including source measurements using the ALIBAVA readout system.

Jan 2016 - Jun 2016 — **ATLAS Author Qualification Candidate** | CERN *Geneva, Switzerland*

- Investigated the low-voltage leakage rise of the FE-I4 readout module after accumulated LHC operational dose and contributed guidance for ATLAS pixel operation beyond the 2016 winter run.
- Built and qualified custom cooling-system laboratory infrastructure for X-ray irradiation and used MATLAB-based numerical modeling to estimate dose absorption in silicon.
- Qualified the USBPix3 readout module for the FE-I4 front-end and developed data-acquisition / analysis workflows for low-voltage experiments.
- Supported installation, commissioning and integration of the XRAD iR160 irradiation chamber, then developed related acquisition systems and experimental setup.

Feb 2014 - Jun 2017 — **Ph.D. Candidate** | University of Trento *Trento, Italy*

- Developed small-pitch, thin, radiation-hard 3D silicon sensors for CERN HL-LHC pixel-detector upgrades, focusing on 50 x 50 um and 25 x 100 um pixel geometries and approximately 100 um active thickness.
- Performed systematic electrical and functional characterization of FBK double-sided 3D sensor technologies from wafer to diced-device stages, before and after irradiation.
- Designed single-sided small-pitch 3D Si sensor layouts informed by TCAD expectations and characterization results; contributed to qualification of an optimized 6-inch FBK production approach.
- Created optimized L-Edit layouts submitted in 2017 for thin 3D Si sensor fabrication.

Nov 2013 - Jan 2014 — **Assistant Professor |** American International University-Bangladesh (AIUB) *Dhaka, Bangladesh*

Study leave: Feb 2014 - Jan 2017.

- Served on the Faculty of Engineering Thesis Committee and acted as a signatory member for quality and transparency in undergraduate thesis work.
- Supervised thesis work in communication engineering, device physics and photonics; delivered coursework in electronics and communication engineering.
- Supported inter-industry and academic knowledge transfer and participated in departmental development activities.

Sep 2012 - Oct 2013 — **Lecturer, Dept. of EEE**| American International University-Bangladesh (AIUB) *Dhaka, Bangladesh*

- Delivered undergraduate coursework and helped bridge research activity between industry and academia within the Faculty of Engineering.
- Contributed to interdepartmental development activities.

Sep 2011 - Mar 2012 — **IT Consultant** | Maersk Oil and Gas A/S *Copenhagen, Denmark*

- Supported and maintained SAP Enterprise Resource Planning systems and contributed to intra-networking support and upgrades.

Mar 2010 - Mar 2011 — **Research Student, Photonics Laboratory, MC2** | Chalmers University of Technology *Gothenburg, Sweden*

- Continued M.Sc. research on optical characterization of GaN/AlN-based quantum-well heterostructures using FTIR spectroscopy, including absorption, transmission and emission measurements.
- Designed optical benches with lenses, filters and sample holders to obtain intersubband absorption under transverse-magnetic-polarized light.
- Prepared samples using cleaning, grinding and dicing workflows in the MC2 Nanofabrication Clean Room and performed post-processing investigation using SEM and high-end microscopy.
- Participated in clean-room laser-device processing, including MBE, chemical treatment, photolithography, plasma dry etching and e-beam lithography.

Feb 2007 - Aug 2007 — **Assistant Product Engineer** | Huawei Technologies, *Dhaka, Bangladesh*

- Worked as a solution architect for next-generation fixed-network systems, including SoftX3000, MRS6100, UMG9000, UA5000, DSLAM and related telecommunications platforms.
- Supported installation and commissioning activities, client support, interdisciplinary solution-architect training and bidding activities.

Oct 2006 - Jan 2007 — **PBX Administrator** | eXtend Broadband Ltd., *Kyrenia, North Cyprus*

- Developed an Asterisk-based PBX exchange and trained employees to support and maintain the platform.

Mar 2006 - Mar 2007 — **Lecturer, Dept. of CSE** | University of Development Alternative, *Dhaka, Bangladesh*

- Taught courses in computer networks, microprocessors, UNIX programming, data and telecommunications, peripheral interfacing and VLSI.
- Served as a commission member supporting reorganization and development of undergraduate exercise laboratories.

EDUCATION

Ph.D. in Materials, Mechatronics and System Engineering | University of Trento, Italy | Feb 2014 - Jun 2017
Dissertation: Development of Small-Pitch, Thin 3D Sensors for Pixel Detector Upgrades at HL-LHC. Doctor Europaeus distinction.

M.Sc. in Communication Engineering | Chalmers University of Technology, Sweden | Sep 2007 - Mar 2010
Electrical Engineering specialization in photonics/device research.

B.Sc. in Computer Engineering | American International University-Bangladesh | May 2002 - Dec 2005
Major: Data Communication.

SELECTED PUBLICATIONS & RESEARCH PORTFOLIO

- Quality Control (QC) of FBK Preproduction 3D Si Sensors for ATLAS HL-LHC Upgrades; D M S Sultan et al.; arXiv:2209.12991.
- Electrical characterization of 180 nm ATLASPix2 HV-CMOS monolithic prototypes for the High-Luminosity LHC; D M S Sultan et al.; arXiv:1910.11750.
- Electrical characterization of AMS aH18 HV-CMOS after neutron and proton irradiation; D M S Sultan et al.; arXiv:1902.05914.
- Additional publications and citations are available through ResearchGate / public research profiles.

AWARDS, RECOGNITION & MEMBERSHIPS

- Award of Excellence/appreciation, 2025, for outstanding contribution to Mu3e high-speed PCB designs, GHz transmission and system integration.
- Contributor within an ATLAS Collaboration body recognized as a 2025 Breakthrough Prize in Fundamental Physics laureate collaboration.
- Ph.D. thesis recognized among the best contributions by the Emilio Gatti and Franco Manfredi Award, IEEE Nuclear and Plasma Sciences Society, Italian Chapter.
- Doctor Europaeus distinction awarded with Ph.D. title.
- Adlerbertska Hospitiefonden scholarship, Chalmers / University of Gothenburg; full academic scholarship for B.Sc. studies.
- Senior Member, IEEE; Member, International Association of Engineers; Global Member, Internet Society; Member, ISOC Bangladesh, Dhaka Chapter.