

Ecole Polytechnique Fédérale de Lausanne (EPFL)

Quantum Architecture Group (Project coordinator)

The Quantum Architecture Group (AQUA) at the EPFL's School of Computer & Communication Sciences, has as its research mission the modelling and development of systems based on quantum devices. It pursues two main research directions around the central theme of CMOS quantum architectures. The first relates to the modelling and design of low power, high performance 2D/3D imagers and detectors based on SPADs and other quantum devices. The second focuses on analysis algorithms and automation methodologies for the design of these imagers and of embedded computational/arithmetic units associated with them.

EPFL has extensive experience in the design of fast imagers [C-10]. Over the last four years it has focused its research on single photon detectors [C-1,C-3,C-4,C-5]. The first fully integrated CMOS SPAD pixel was designed at its premises [C-7]. EPFL has conceived and fabricated the world's largest array of SPAD pixels designed in CMOS technology.

The AQUA Group is headed by Edoardo Charbon, SNSF (Swiss National Research Fund) Professor, who built since 2002 a group of five graduate students and several undergraduates. Before joining the EPFL, Prof. Charbon has been the Chief Architect at Canesta, Inc., where he directed 10 engineers studying, designing, and implementing 2.5D and 3D imaging systems. His areas of expertise include I) 2D/3D Optical Imager Design, II) Numerical substrate/temperature analysis and circuit simulation, and III) Ultra low-noise IC design for instrumentation and sensor applications. Prof. Charbon has served as Guest Editor for selected issues in the IEEE J. Solid-St. Circ. as well as for the IEEE Trans. Comp. Aided Design, as Reviewer for several high-impact journals and international conferences (CICC, DAQ, etc.). He also was Conference Session Chair for the 1999-2005 CICC. He has co-authored two books, 7 patents on sensors and other devices, and over 65 scientific and technical papers. Prof. Charbon has been very active in promoting SPADs at major international conferences and at over 60 invited talks in universities and companies worldwide.