

Europass Curriculum Vitae



**Personal information** 

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Nationality	Italian
Date of birth	1/8/1955
Work experience	
2024-present 2021-2023 2020-2021 2014- 2020 2007-2021 2002-2007 1998-2001 1985-1986 1983 1982-1998 1979-1982	Research Director Emeritus associated at IMM-CNR Senior Associate at IMM Rome Unit Head of the Institute for Microelectronics and Microsystems (IMM) – Rome UNIT Director of IMM-CNR Research Director at IMM-CNR Research Director at IFN-CNR Senior Scientist at IFN-CNR Visiting Scientist (16 months) at Hirst Research Centre - GEC (London), Prof. C. Hilsum and Prof. P. Migliorato; Visiting scientist (3 months) at the Tokyo Institute of Technology, Prof. M. Matsumura. Researcher at the Institute for Photonics and Nanotechnologies (IFN) –CNR Post-Doc at the Physics Dept. of Rome University "La Sapienza", prof. A. Frova and Prof. F. Evangelisti

## **Education and training**

1979 Laurea degree (summa cum laude), University of Rome "La Sapienza". Thesis on numerical modelling of solar cells characteristics (Prof. F. Bassani).

Title of qualification awarded Mother tongue(s) Doctor in Physics Italian

Other language(s) Self-assessment

European level (\*) English

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(\*) <u>Common European Framework of Reference for Languages</u>

His research activity was focused, since the early '80s, on thin film transistor (TFT) technologies, aetting expertise on both amorphous silicon TFTs (visiting scientist in 1983 at the Prof. M. Matsumura lab. Tokyo Institute of Technology) and polycrystalline silicon TFTs (visiting scientist in 1985-86 at the Chief Scientist Unit. Prof. C. Hilsum. GEC Hirst Research Center. London). His main scientific contribution has been on the device physics of amorphous and polycrystalline silicon TFTs. In particular, he gave relevant contributions in the understanding of electrical instabilities, short channel effects and sensor applications of amorphous silicon TFTs while in the case of polysilicon TFTs he investigated a variety of electrical phenomena, including evaluation of the density of states by field effect analysis, high electric field induced effects, such as hot-carrier effects and kink effect, noise performance, short channel effects and off-current, combining experimental characterizations with numerical simulations. His group set up a fabrication facility where devices for large area electronics applications could be fabricated and in the early '90s he introduced, for the first time in Italy, the use of excimer laser annealing for low-temperature polysilicon TFT fabrication. His activity in large area electronic has been internationally recognized, as demonstrated by the long record of industrial research contracts with the main European companies involved in the field (GEC-MARCONI, THALES, PHILIPS and ST-Microelectronics) and the involvement in some of the main European projects in the field (ECAM III, FlexiDis, COSMIC). He then focused on flexible electronics, developing with his group new TFT technologies within the European project FlexiDis (coordinated by Philips) and the Italian Ministry of Research funded public-private lab Plast\_IC (coordinated by ST-Microelectronics). One of the main results has been the development of a polysilicon TFT technology on polyimide and the fabrication of flexible circuits, based on such technology, such as a touchkeypad, flexible chemical sensors and pressure sensors for robotic applications. The technology developed by his group was adopted by Samsung and today flexible displays, based on polysilicon TFTs on polyimide active matrix, are present in commercial products (Galaxy Z Fold5 or Galaxy Z Flip5). Still in the field of flexible electronics applications, his group developed organic TFTs based on solution process and printing techniques and analysed, combining numerical simulations and experimental data, some OTFT electrical characteristics, with special attention to contact effects and electrical stability (European project COSMIC, coordinated by Fraunhofer). His group has also developed a compact model for OTFTs, used to design circuits and currently adopted to design complex circuits in industrial environment (Flexterra). He is one of the main international expert on thin film transistor, as demonstrated by the large number (37) of invited talks delivered at International Conferences, the large number of papers written, including the "thin film transistor" voice in the Encyclopedia of Electrical and Electronics Engineering (John Webster Editor, Wiley 1999), and the many projects managed on the subject.

The large experience gained in excimer laser annealing processes for low temperature polysilicon TFTs allowed to apply in the early 2000' this technique to ultra-shallow junction formation in Si for 'power electronics (European project FLASH). The project demonstrated the integration of the process at industrial level leading to the successful fabrication in ST-Microelectronics of power MOS with superior performance (2007). The results of this activity have been recently highlighted in the book chapter "Historical evolution of pulsed laser annealing for semiconductor processing", G Fortunato, L Mariucci, A Pecora, V Privitera, F Simon, in "Laser Annealing Processes in Semiconductor Technology", F. Cristiano and A. La Magna Editors, 2021.

He has also been involved in the development of low-temperature deposition of Si nanowires (NW) for sensors applications, showing also the possibility to fabricate flexible electrochemical biosensors based on Si-NW. On this subject, he has been co-PI of the project ASTROMAT, funded by AFOSR, demonstrating the successful growth of astrocytes on a forest of randomly-oriented Si-NW and recording signals from undifferentiated cells. His group has also exploited the vast expertise in the flexible electronics to develop ultra-flexible microelectrode arrays for brain signal recording and stimulation. An ultra-flexible microelectrodes array integrated with a compact system, able to record in vivo and in vitro brain signals and electrically stimulate in closed loop, was demonstrated within the European project CORTICONIC, a tool which substantially improved electrophysiology instrumentation. More recently, he was involved in the device physics of transistors based on wide bandgap semiconductors, including the analysis of interface states in SiC MOSFETs and the self-heating in GaN HEMTs.

He published more than 260 papers on JCR journals (h-index 41 http://scholar.google.it/citations?user=8dWdm8QAAAAJ) and 7 chapters on books, has given 37 invited talks at International Conferences, holds 11 patents (see attached list) and is co-author of more than 190 contributions to Proceedings of International Conferences. He has been included in the " World's Top 2% Scientists List", published by the Stanford University ("Updated science-wide author databases of standardized indicators". citation https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/6), in the 2020 edition (at the 135007 https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/2/files/9cb11466-b3a6-4f20position. 92e6-02f5d9b81d1d) as well as in the successive editions, including the last edition 2023 (at the 152344 position. https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/6/files/d2537947-3d38-42e5-9c34-15c3dfe04f59).

Page 2/4 - Curriculum vitae of Guglielmo Fortunato For more information on Europass go to http://europass.cedefop.europa.eu © European Union, 2004-2010 24082010 Main Responsibilities

Since 1987 he has been leader of the "Amorphous silicon devices" at IFN-CNR and in 2004 he became Head of the "Devices for large area electronics" Group.

He has been scientific responsible of several National (10) and European (7) projects and also of industrial research contracts including ST-Microelectronics, Philips, THALES and Leonardo.

He has been Member of the Scientific Councils of IFN-CNR and IMM-CNR, Member of the Board of Delegates of the European MRS, Member of Society for Information Display and of the Electrochemical Society, Member of the CNR Committee for International Collaborations and Agreements.

After moving in 2007 from IFN-CNR to IMM-CNR, he was appointed Head of the IMM-CNR Rome Unit in June 2014 and in Aug. 2014 he became acting Director of IMM-CNR. He was Director of IMM-CNR, one of the largest CNR Institute with Headquarters in Catania and Units in Agrate, Bologna, Rome, Naples (this Unit left IMM in 2020), Lecce and Catania, from July 2015 to June 2019 and then acting Director till June 2020. From July 2020 till his retirement (June 2021) he was Head of IMM-CNR Rome Unit. As Director of IMM-CNR, he promoted the re-organization of the scientific activities, which included three application areas and three technological areas, the homogenization of the internal administration (manuals were produced for the different procedures) and the realization of a completely new website, which not only presents the main features of IMM to external visitors but also allows the exchange of information and news among the IMM researchers. He fostered integration of research activities among the different IMM Units, supporting projects and meetings with Industrial partners and international public Institutions and involving diverse expertise available at IMM Units. In this respect, he strengthened Industrial collaborations with ST-Microelectronics (two IMM Units had already labs embedded in ST sites of Catania and Agrate), Enel Green Power (a new IMM lab was established within EGP site in Passo Martino and later also in the 3Sun Factory) and promoted publicprivate initiatives with Leonardo, LFoundry and Micron. He also encouraged collaborations with Universities, considering always the role of IMM-CNR as a bridge between Academic Institutions and Industries. Several relevant Infrastructural initiatives involving IMM also started during his mandate: at regional level (Bevond Nano funded by Regione Sicilia and NanoMicroFab funded by Regione Lazio). National level (It-Fab) and European level (Europanolab and Esteem). In particular, he has been Scientific Responsible and Director (from July 2018 to Sept. 2022) of the NanoMicroFab Infrastructure, a facility allowing to support companies operating in the field of micro-nanoelectronics by providing services in the following application areas: GaN based electronics; Flexible and printed electronics; Sensors, microsystems and IoT. The NanoMicroFab facility is distributed between the CNR Research Area of Tor Vergata and the Univ. of Rome Tor Vergata and allowed to rationalize the CNR clean room facilities (nearly 600 m<sup>2</sup>) in Rome. In Sept. 2022 the facility was completed and in Nov. 2022 approved by the Regine Lazio. Two major service contracts from Leonardo and the participation to the European project Agami\_Eurigami, funded by EDF, are already active on the GaN technoloav.

From Apr. 2015 to Dec. 2022 he has been the Italian Representative to the International Union of Pure and Applied Physics (IUPAP). During his mandate he managed to increase the number of Italian members of IUPAP Commissions from 9 to 14 and has been Chair and co-organizer of the Workshop on "Physics for Sustainable Development", held in Rome on 19 September 2022 as a satellite event of the Centennial Celebrations of IUPAP and also linked to the IYBSSD. The Workshop, which had considerable success, was organized as guest event of the NanoInnovation 2022 Conference. From 2016 to Sept. 2023 he has been President of the Nanotechnology Panel of CNR for the evaluation of project proposals within the "Bando MiSE", funded by the Ministry of the Economic Development.

He was part-time professor of Semiconductor Device Physics at the Roma III University between 2001 and 2006 and tutor of more than 30 Ph.D. and master students.

Organisational and Editorial activities **He has been co-Organizer of 8 International Workshops** ("Thin Film Transistors for Flat Panel Displays", within the 26th European Solid State Device Conference ESSDERC'96, (8-11 Sept.1996, Bologna, Italy); "Thin Film Materials for Large Area Electronics" E-MRS Spring Meeting, Strasbourg 30 May- 2 June 2000; "Thin Film Materials for Large Area Electronics", within the E-MRS Spring Meeting, Strasbourg 18-21 June 2002; SID-Mid Europe Chapter Spring Meeting on "Polysilicon technology and applications for AM-LCDs and AM-OLEDs", Rome, 21-22 March, 2002; Si-Workshop, Genova 11-13 Februaryof micro and nano engineering

2004; "Non-conventional thermal processes for advanced CMOS", Roma 21 January 2005; E-MRS Spring Meeting 2006, "Thin Film Materials for Large Area Electronics", Nice 29-May 2-June 2006; 2008 Co-organizer of the E-MRS Spring Meeting 2008, Workshop on Thin Film Materials for Large Area Electronics, Strasbourg, 26-30 May 2008;

**Chairman or co-Chairman of 6 International Conferences** (Third International Thin Film Transistor Conference, Rome, 25-26 January 2007; 4th International Thin Film Transistor Conference, Seoul, 24-25 January 2008; Workshop "Active Matrix Devices", 8th International Meeting on Information Displays, Seoul, 13-17 October 2008; Workshop "Active Matrix Devices", 9th International Meeting on Information Displays, Seoul, 12-16 October 2009; 29th International Display Research Conference, Eurodisplay 2009, Roma, 14-17 Sett. 2009; International Conference on Organic Electronics (ICOE) 2011, 22-24 June, Roma, 2011).

**Editor of the following special issues:** Proceedings of Symposium "Thin Film Materials for Large Area Electronics", EMRS 2000 Spring Meeting, Symposia Proceedings Volume 103, published as vol. 383 of Thin Solid Films; Proceedings of Symposium "Thin Film Materials for Large Area Electronics", EMRS 2002 Spring Meeting, Symposia Proceedings Volume 134, published as vol. 427 of Thin Solid Films.Solid State Electronics, vol. 52, Issue 3, March 2008, Papers selected from the 3rd International Thin Film Transistor Conference. He is currently Associate Editor of the Journal of Information Display and Area Editor of Micro and Nano Engineering (Elsevier).

**He acts as reviewer for many International Journals** (Applied Physics Letters, J. Applied Physics, IEEE Transaction on Electron Devices, IEEE Electron Device Letters, Electronics Letters, Thin Solid Films, Solid State Electronics, J. Electrochemical Society).