PROGRAM

WORKSHOP ON MEMRISTORS

SECOND EDITION

Barcelona, 30th of June and 1st of July 2025.

Residència d'Investigadors (CSIC)

Chairs:

Mireia Bargalló (IMB-CNM, CSIC)

Juan B. Roldán (UGR)

Scientific Committee:

Antonio Rubio (UPC)

Rosana Rodríguez (UAB)

Enrique Miranda (UAB)

Jordi Suñé (UAB)

Francesca Campabadal (IMB-CNM, CSIC)

Helena Castán (UVA)

Salvador Dueñas (UVA)

Rodrigo Picos (UIB)

Francisco Jiménez (UGR)

Marisa López (UPM)

Luis Camuñas (IMSE-CNM, CSIC)

Miguel Muñoz (ICMM, CSIC)

Blas Garrido (UB)

Anna Palau (ICMAB, CSIC)

Juan Bisquert (ITQ-UPV-CSIC)

Rosa Rodríguez (UPC)

Antonio Calomarde (UPC)

Albert Cirera (UB)

Carol de Benito (UIB)

Xabier Iturbe (Ikerlan)

Motivation and workshop summary

Memristors are nowadays considered key elements in many different areas of electronics such as information storage, neural networks, in-memory computing, cryptography, etc. Since the proposal of the first practical implementation of a memristor by HP in 2008, the interest in the theoretical foundations and uses of these devices has been growing relentlessly and many research groups worldwide devote important efforts to the fabrication, modeling, simulation, circuit design, and development of system applications. However, despite the outstanding advances in the field, there is still room to improve and deepen our understanding about memristors.

In this workshop, we aim to gather national and international groups working on memristors in any of their facets. We will discuss and exchange information about suitable materials, fabrication processes, modeling approaches, simulation tools both in the framework of isolated devices as well as of advanced circuits and systems.

This second edition of the Workshop on Memristors will be held in Barcelona.

Topics of interest to Workshop on Memristors 2025 include, but are not limited to:

-Materials for memristors. Fabrications processes

-Memristor device modeling and simulation

-Memristor electrical characterization

-Conventional circuits using memristors. CMOS integration.

-Memristor applications in Neuromorphic and Bioinspired Computing (Neural Networks, Emerging Computing Paradigms, Architectures for Hardware Accelerators, Bioinspired Circuits)

-Memristor applications in Data Sensing, Signal Processing, Cryptography

-Memristor applications in Photonics, Spintronics, Quantum Computing

-Random networks of memristors. Reservoir computing

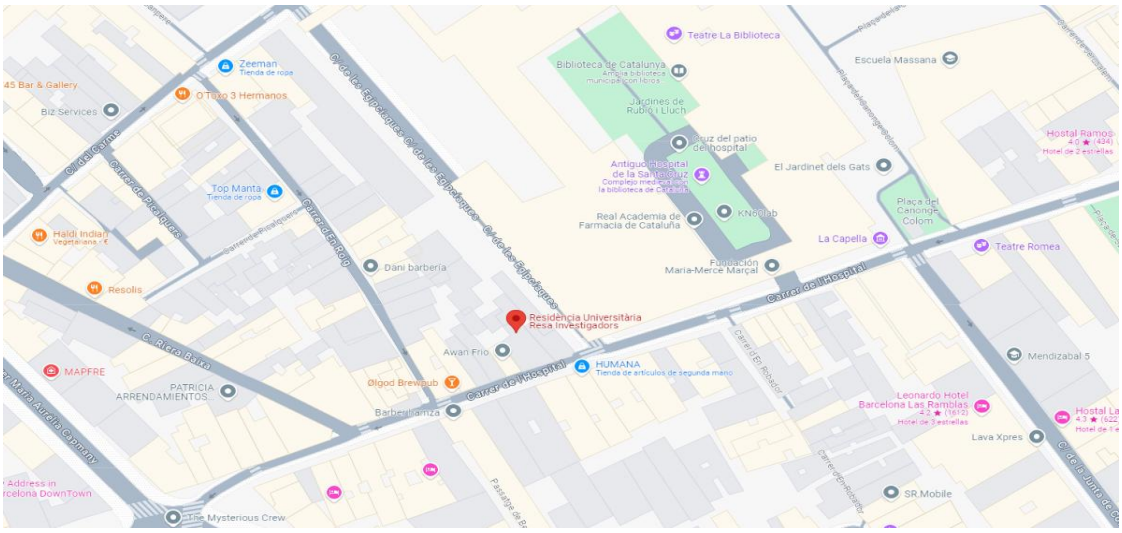
-Novel and unexplored effects, energy consumption, power dissipation

-Reliability of memristive devices and circuits

More information in:
https://ugr.es/~jroldan/workshop_on_memristors_2/index.htm

Location

The conference will be held at the "Residència d'Investigadors" (Carrer de l'Hospital, 64, Barcelona).



See it in maps: https://maps.app.goo.gl/pD5JSk4gaJDthVaQ9

30th of June 2025

8:30-8:50 - Welcome to Attendees

8:50-9:00 – Workshop Presentation

9:00-10:00 – Keynote Presentation

Chair: Juan B. Roldán (UGR)

Mario Lanza (National University of Singapore)

"Advanced neuromorphic computing with single-transistor-based electronic neurons and synapses"

10:00-11:30 - Modeling and Simulation

Chair: Salvador Dueñas (UVa)

-Application of a memristors stochastic model for synapses and neurons
J. Suñé (UAB), E. Miranda (UAB)

-On the compact modelling of TiN/Ti/HfO_2/W memristors at different time scales
F. Jiménez-Molinos (UGR), G. Vinuesa (UVA), H. García (UVA), H. Castán (UVA), S. Dueñas (UVA), M.B. González (IMB-CSIC), F. Campabadal (IMB-CSIC), J.B. Roldán (UGR)

-S-Type Memristor Oscillators
R. Fenollosa (ITQ-UPV-CSIC), J. Bisquert (ITQ-UPV-CSIC)

-In depth study of the parameters influencing the dynamics of resistive switching in HfO_2-based memristors
S. Dueñas (UVA), G. Vinuesa (UVA), H. García (UVA), T. Del Val (UVA), K. Kalam, M. B. González (IMB-CSIC), F. Campabadal (IMB-CSIC), H. Castán (UVA)

11:30-12:00 - Coffee Break

12:00 – 13:30 - Materials and Fabrication Processes

Chair: Anna Palau (ICMAB)

-Memristive nanogaps with biophoton-like properties for advanced nanophotonic applications
M. Ćwierzona (LICB-UdB), D. Singh (LICB-UdB), K. Malchow (LICB-UdB), S. Hamdad (LICB-UdB), A. Bouhelier (LICB-UdB)

-Environmental impacts of memristors production
L. Serrano-Luján (URJC), N. Benito (URJC), J. C. Pérez Martínez (URJC), Á. Lao-Zea (CIEMAT), A. Urbina (UN), J. B. Roldán (UGR)

-Unraveling the resistive switching mechanism of YBCO/LSMO heterostructures through space charge limited currents
T. Günkel (ICMAB), E. Miranda (UAB), N. Mestres (ICMAB), A. Palau (ICMAB), J.Suñe (UAB)

-Understanding Charge Injection-Induced Electroluminescence in Memristive Artificial Neurons
D. Singh (LICB-UdB), M. Cwierzona (LICB-UdB), K. Malchow (LICB-UdB), A.Bouhelier (LICB-UdB)

13:30 – 15: 30 - Lunch at La Poma Restaurant

(La Rambla, 117, https://restaurantelapoma.com/)

15:30 – 16:30 – Sponsors Session

Chair: Mireia Bargallò (CNM-CSIC)

-Accelerate the development of next generation non-volatile memory
*Benoit Mongellaz (*Keysight technologies)

-Datatec

-Web of Talents: recruit excellent students and postdocs easily and fast
Mario Lanza (Web of Talents)

16:30 – 17:00 – Technical Program Committee Meeting

16:30 – 18:00 - Poster Session, Sponsor Demonstrations, and Coffee Break

-Effect of thickness on the resistive switching characteristics of Pt/Ag/HfO_2/W MIM Stacks
T. Del Val (UVA), K. Kalam (UT), G. Vinuesa (UVA), H. García (UVA), M. B. González (IMB-CSIC), F. Campabadal (IMB-CSIC), H. Castán (UVA), S. Dueñas (UVA)

-Role of the buffer layer in the performance of halide perovskite memristors
J. C. Pérez-Martínez (URJC), D. Martín-Martín (URJC), B. Arredondo (URJC), B. Romero (URJC)

-Study of the resistive switching properties of silicon nitride with embedded silicon nanocrystals
A. Vázquez (NIAOE), M. Moreno (NIAOE), A. Morales Sánchez (NIAOE)

-High-linearity tuning and evaluation method based on program levels characteristics of analog memristor
Z. Diao (UO), R. Yamamoto (UO), Z. Meng (UO), T. Tohei (UO), A. Sakai (UO)

-Fully inkjet-printed memristors based on cross-linked poly(4-vinylphenol) insulating layer
L. Navarro (IMB-CSIC), C. Ferreyra (IMB-CSIC), S. Pérez (IMB-CSIC), E. Ramon (IMB-CSIC), F. Campabadal (IMB-CSIC), M.B. González (IMB-CSIC), C. Martínez-Domingo (IMB-CSIC)

-Resistive switching behavior, variability, and stability in Ti/HfO_2 and Ti/HfO_2/Al_2O_3-Based memristors
Z. Su (IMB-CSIC), C. Ferreyra (IMB-CSIC), E. Ramon (IMB-CSIC), F. Campabadal (IMB-CSIC), M.B. González (IMB-CSIC)

-Memcapacitor emulator using commercial memristors
F. J. Romero (UGR), C. Guijosa (UGR), D.P. Morales (UGR), N. Rodriguez (UGR), J.B. Roldán (UGR)

-Enhancing memristor-based neural network accuracy using a variability reduction technique
A. Cantudo *(UGR)*, M.A. Villena *(UGR)*, F. Jiménez-Molinos *(UGR)*, J.B. Roldan *(UGR)*

-Scalability and ON/OFF ratio performance of HfO_2-based Resistive Random Access Memories
S. Guitarra (IMNE)

-Effect of the layers thickness on the stability of TiN/Ti/HfO_2/W Memristors
M.A. Villena (UGR), A. Cantudo (UGR), F. Jiménez-Molinos (UGR), M.B. González (IMB-CSIC), F. Campabadal (IMB-CSIC), J.B. Roldán (UGR)

-Stanford model parameter fitting of experimental I-V curves using a genetic algorithm
D. Maldonado (URJC), A. Cantudo *(UGR)*, M.A. Villena *(UGR)*, *M.B. González (IMB-CSIC), F. Campabadal (IMB-CSIC),* F. Jiménez-Molinos *(UGR)*, J.B. Roldan *(UGR)*

-The commutative problem in vector matrix multiplications based on memristive crossbar architectures
M. V. Rebollo (UPM), A. Herranz (UPM), M. López-Vallejo (UPM)

-Optimizing HfO_2 memristors with an Al_2O_3 barrier: toward reliable non-volatile memory
M. Shooshtari (IMSE-CSIC), F. Campabadal (IMB-CSIC), B. Linares-Barranco (IMSE-CSIC)

-A RRAM based on a kinetic Monte Carlo description of filamentary switching in TiN/Ti/Al_2O_3/W memristors
A. López (UGR), M.A. Villena (UGR), A. Cantudo (UGR), F. Jiménez-Molinos (UGR), M.B. González (IMB-CSIC), F. Campabadal (IMB-CSIC), J.B. Roldan (UGR)

19:30 – Social Event and Gala Dinner at Fàbrica Moritz
(Rda. de Sant Antoni, 41, https://fabricamoritzbarcelona.com/)

1st of July 2025

9:00-9:40 – Keynote Presentation

Chair: Mireia Bargallò (CNM-CSIC)

Xabier Iturbe (Ikerlan)

From devices to deployment: advancing neuromorphic sensing and computing in Spain

9:40 – 11:10 - Neuromorphic Computing

Chair: Juan B. Roldán (UGR)

-Test infrastructure for multi-core memristor-CMOS neuromorphic chip
I. Díez-de-los-Ríos *(IMSE-CSIC)*, L. Camuñas-Mesa *(IMSE-CSIC)*, T. Serrano-Gotarredona *(IMSE-CSIC)*, B. Linares-Barranco *(IMSE-CSIC)*

-Study of new interaction mechanisms at the level of neural bundle Clusters
D. Llobet (UPC), A. Calomarde (UPC), I. K. Chatzipaschalis (UPC), A. Rubio (UPC)

-Memristor-based digital twin of mycelium for unconventional computing
I. K. Chatzipaschalis (UPC)*, I. Tompris (UT), G. Kleitsiotis (UT), T. P. Chatzinikolaou (UT), I.-A. Fyrigos (UT), A. Calomarde* (UPC)*, G. Ch. Sirakoulis (UT), A. Rubio* (UPC)

-Theoretical insights into the noise and variability effect of memristive synapses in cellular nonlinear networks
V. Ntinas (TUD), D. Prousalis (TUD), C. Theodorou (UG), I. Messaris (TUD), A.S. Demirkol (TUD), A. Ascoli (PdT), R. Tetzlaff (TUD)

11:10 - 11:40 - Coffee Break

11:40 – 13:10 – Memristive Devices

Chair: Jordi Suñè (UAB)

-Current driven exploration of h-BN based inkjet-printed ReRAM: new opportunities for endurance, computation in memory and security applications
P. A. Vila (UB), F. Palacio-Bonet (UB), G. Vescio (UPC), S. Hernández (UB), B. Garrido (UB), A. Cirera (UB)

-The role of the Ti/HfO_2 thickness ratio in the resistive switching characteristics: experimental and simulation study
M. Saludes-Tapia (IMB-CSIC), F. Campabadal (IMB-CSIC), E. Miranda (IMB-CSIC), M. B. González (IMB-CSIC)

-Stochastic resonance in RRAM devices subjected to dynamic input voltages
F. Salvador, R. Rodríguez (UAB), E. Miranda (UAB), A. Rubio (UPC), A. Crespo-yepes (UAB), J. Martín-Martínez (UAB), M. Nafria (UAB)

-Comprehensive Analysis of Complementary Resistive Switching in Ti/HfO_2-Based Memristive Systems
C. Ferreyra (IMB-CSIC), F. Campabadal (IMB-CSIC), M. B. González (IMB-CSIC)

13:10 – 13:20 – Announcement of PhD Student Awards

13:20 – 15: 20 - Lunch at La Poma Restaurant
(La Rambla, 117, https://restaurantelapoma.com/)