

# 7<sup>th</sup> imec-Stanford International Workshop on Resistive Switching Memories

September 7-8, 2017, imec Leuven

## Workshop Program

### DAY I: September 7<sup>th</sup>, 2017

8:15 – 8:45 Registration

8:45-9:00 Welcome – Bogdan Govoreanu / Philip Wong (imec/Stanford Univ.)

Session 1: Fundamentals   Chair: Regina Dittmann, FZ Juelich			
9:00-9:30	M. Skowronski <sup>1</sup> , Y. Ma <sup>1</sup> , A. Herzing <sup>2</sup> , D. Li <sup>1</sup> , and J. A. Bain <sup>1</sup>	<sup>1</sup> CMU <sup>2</sup> NIST	Formation of the Non-Volatile Filament in TaOx Resistive Switching Devices: A TEM Study
9:30-10:00	Chris Regan	UCLA	Imaging current pathways in selector and metal oxide RRAM devices
10:00-10:30	Sergiu Clima	imec	A first-principles study on possible OTS mechanisms in GeSe

10:30 – 11:00 – Coffee break

Session 2: Selectors   Chair: Bogdan Govoreanu, imec			
11:00-11:30	Carsten Funck	RWTH Aachen	Mechanism of threshold switching in NbOx
11:30-12:00	Z. Jiang, S. Qin, H. Li, S. Simon Wong, H.-S. P. Wong	Stanford University	Selector requirements for 3D vertical RRAM
12:00-12:30	Hongxin Yang	Avalanche Technology	Volatile Switch Selector development for 3D RRAM and STT-MRAM

12:30 – 13:30 Lunch break (sandwiches)

Session 3: RRAM-1   Chair: Yang-Yin Chen, Western Digital			
13:30-14:00	Susanne Hoffman-Eifert	FZ Juelich	Stable counter-8 wise and 8 wise switching in OxRAM cells containing TiO2 layer
14:00-14:30	Attilio Belmonte	imec	Stack engineering of WOx - based CBRAM: identifying material properties for improving reliability
14:30-15:00	Hangbing Lv, Ming Liu	Institute of Microelectronics, CAS	3D RRAM for Storage Class Memory Application

15:00 – 15:30 – Coffee break

Session 4: RRAM-2   Chair: Franz Kreupl, Technical Univ. Munich			
15:30-16:00	Philippe Boivin	ST Microelectronics	Embedded Memory requirements for IoT
16:00-16:30	Kazuyuki Kouno	Panasonic	ReRAM device and circuit design for memory and future beyond-memory applications
16:30-17:00	Eric Lee	Macronix	Recent WOx ReRAM Results, Applications, and Outlook

17:00 – 18:00 – Posters Session

19:30 – 22:30 – Dinner at the Faculty Club

## DAY 2: September 8<sup>th</sup>, 2017

Session 5: Applications: Neuromorphic Computing   Chair: Geoffrey Burr, IBM			
9:00-9:30	Daniele Ielmini	Politecnico di Milano	Neuromorphic hardware for pattern learning with memristive synapses
9:30-10:00	Praveen Raghavan	imec	OxRAM as an neuromorphic element: what are the possibilities?
10:00-10:30	Shimeng Yu	Arizona State University	System-level Benchmark of Resistive Synaptic Device Characteristics for Neuro-inspired Computing

10:30 – 11:00 – Coffee break

Session 6: PCM-I   Chair: Daniele Ielmini, Politecnico di Milano			
11:00-11:30	Matthias Wuttig	RWTH Aachen University	Chalcogenide materials exploration for PCM and OTS applications
11:30-12:00	S. Fong, C. Neumann	Stanford University	Thermal confinement of PCM using dielectric multilayer stacks

12:00-13:30 – Lunch (cold buffet)

Session 7: PCM – 2   Chair: Philip Wong, Stanford University			
13:30-14:00	Enrico Varesi	Micron	Highlights and challenges of chalcogenide superlattice PCM
14:00-14:30	Keh-Chung Wang	Macronix	Recent Progress and Prospect of PCMs

14:30 – 15:00 – Coffee break

Session 8: Exploratory – Memory & Beyond   Chair: Dirk Wouters, RWTH Aachen University			
15:00-15:30	Mario Lanza	Soochow University	Status and prospects of 2D materials based memristors
15:30-16:00	Joshua J. Yang	Univ. Mass. Amherst	Challenges and possible solutions for RRAM-based computing
16:00-16:30	Laurent Cario	Nantes University	Mott insulator for implementing single component LIF artificial neuron

16:40 – 17:50 – Panel discussion

Topic: **Is PCM the next RRAM?**

Moderator: Philip Wong (Stanford University)

Panelists:

Philippe Boivin (ST Microelectronics), Geoffrey Burr (IBM), Daniele Ielmini (Politecnico di Milano), Kazunari Ishimaru (Toshiba), Takumi Mikawa (Panasonic), Keh-Chung Wang (Macronix)

17:50 – 18:00 Workshop Closure