

LabOSat as a versatile payload for small satellites: first 100 days in LEO orbit

Gabriel A. Sanca, M. Barella, F. Gómez Marlasca, G. Rodriguez, D. Martelliti, L. Patrone, P. Levy and F. Golmar
ECyT-UNSAM, CMNB-INTI, CAC-CNEA, CONICET

1st IAA Latin American Symposium on Small Satellites, 7th-10th March 2017, Buenos Aires

UNSAM – Campus Miguelete



Who we are?



INTI

Instituto
Nacional
de Tecnología
Industrial



UNIVERSIDAD
NACIONAL DE
SAN MARTÍN




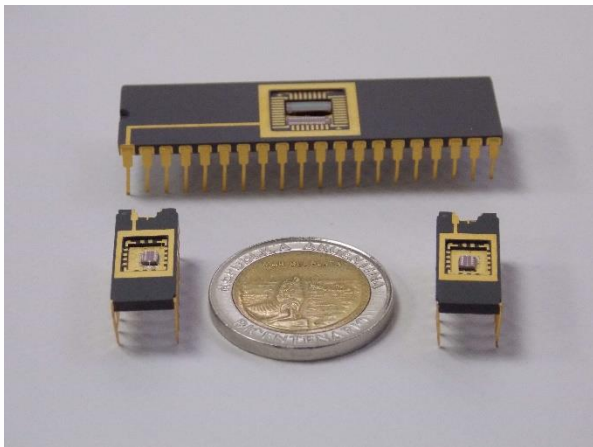
Comisión Nacional
de Energía Atómica

CONICET

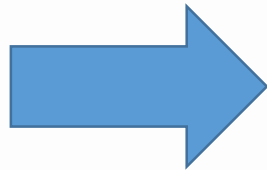


Background: MeMOSat-01

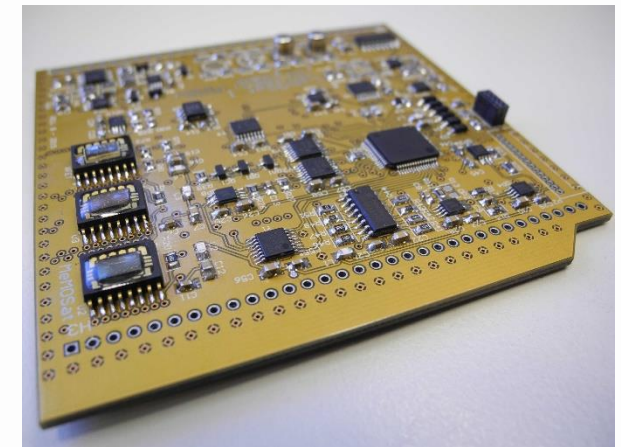
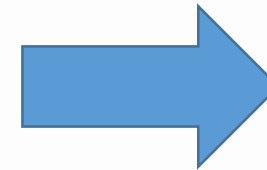
- CubeSat like platform
- Designed to test ReRAM devices
- Since June 2014, operating inside BugSat-01 



MeMO



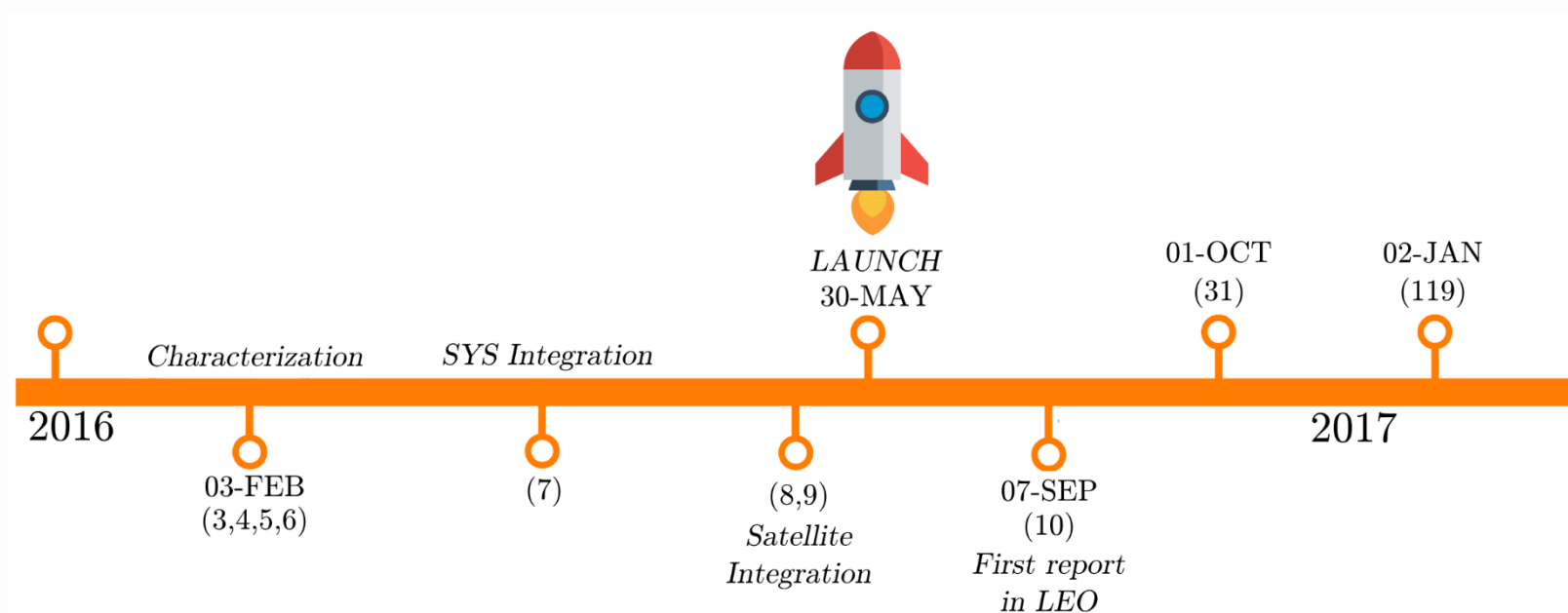
MeMOSat



LabOSat

Introduction to LabOSat

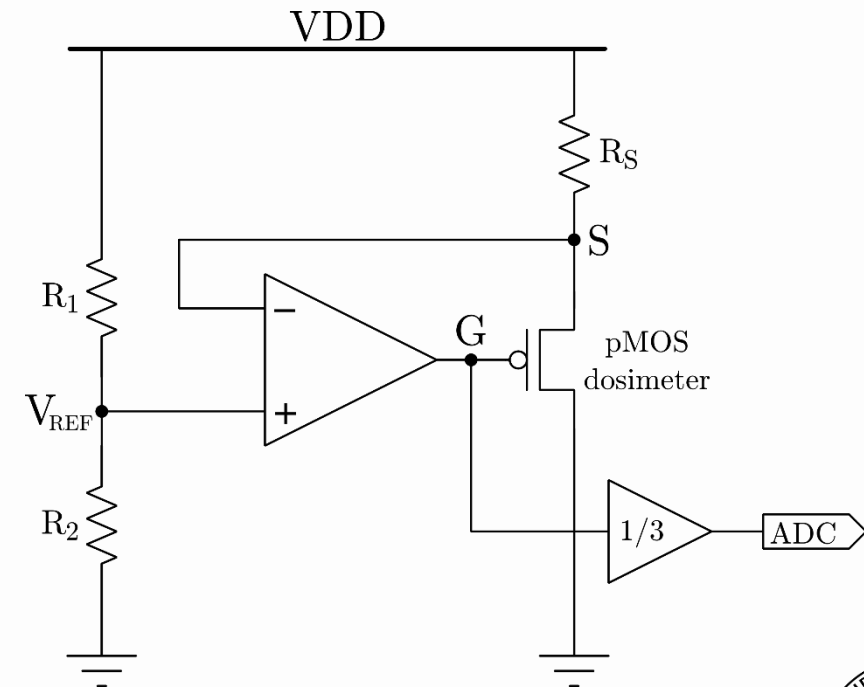
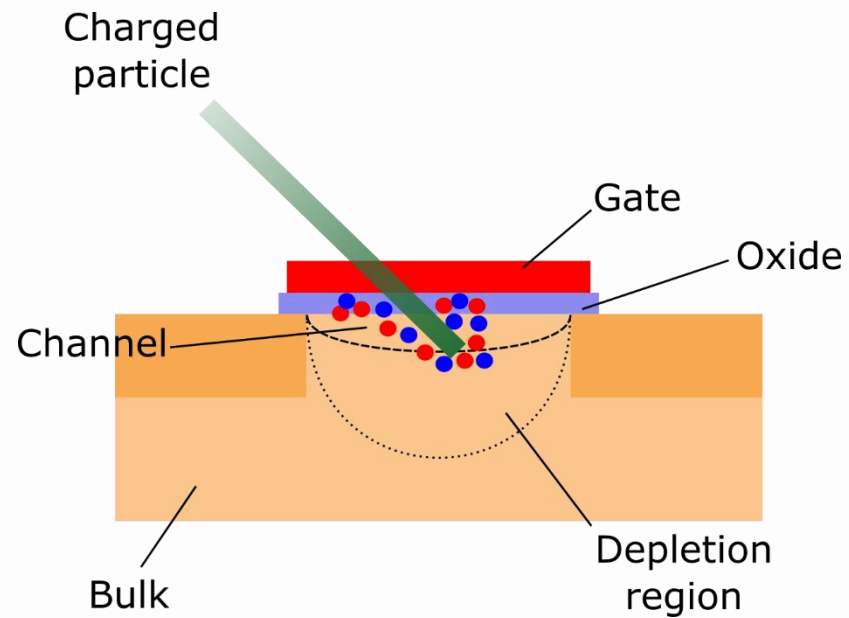
- LabOSat: instrumentation payload in LEO
- Ñusat missions, 



Platform description

- Hardware
 - Tested parts
 - Inherit and improved topologies from MeMOSat-01
- Firmware
 - Three main tasks:
 - Communicate with satellite main computer
 - Control the experiments
 - Process data acquired during the experiments
 - Standard test routine (all on board experiments)

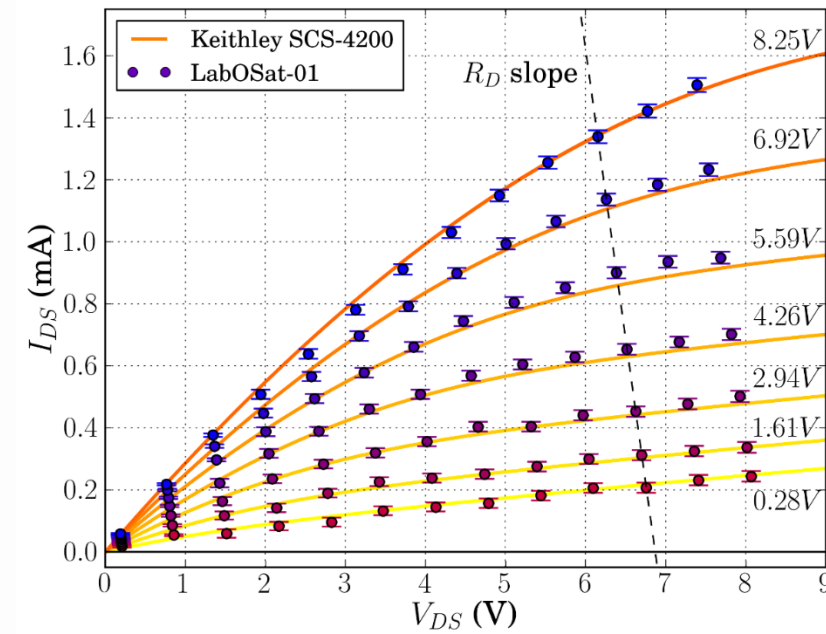
Dosimetry



We use same topology as in MeMOSat
IAA-LA-06-05 Wednesday 17.40

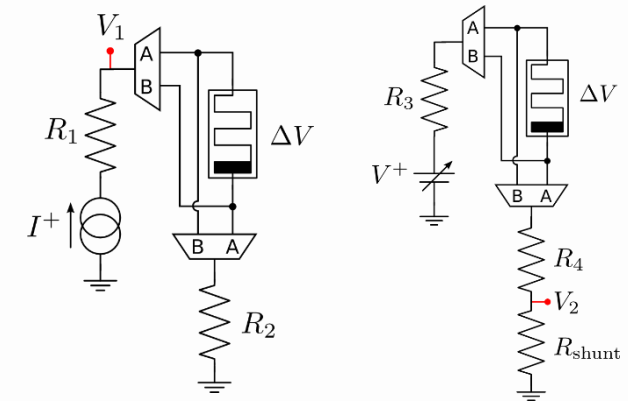
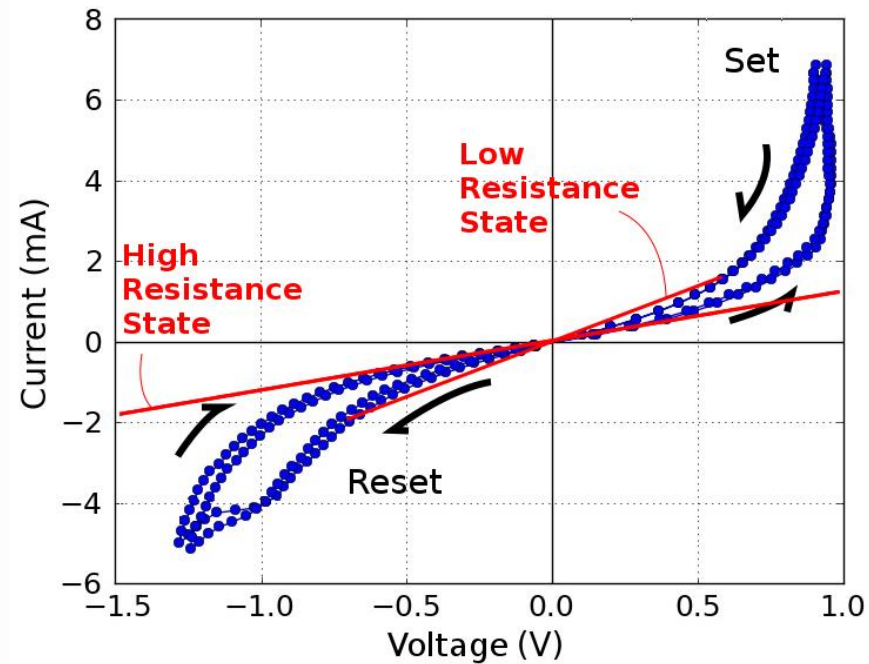
Devices Under Test (DUTs)

- xFET subsystem
 - TFT devices
 - 3-terminal
 - I-V curves



Devices Under Test (DUTs)

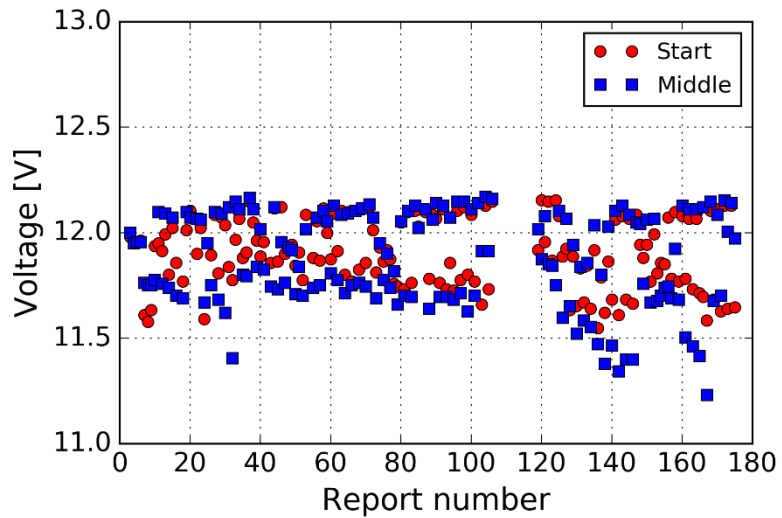
- MeMO subsystem
 - ReRAM devices
 - SMUs
 - 2-terminal
 - I-V curves
 - Endurance tests



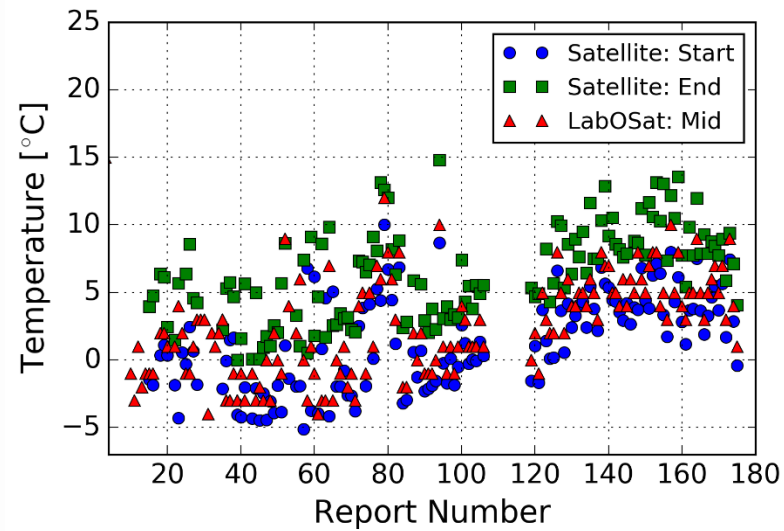
Results

Operating conditions

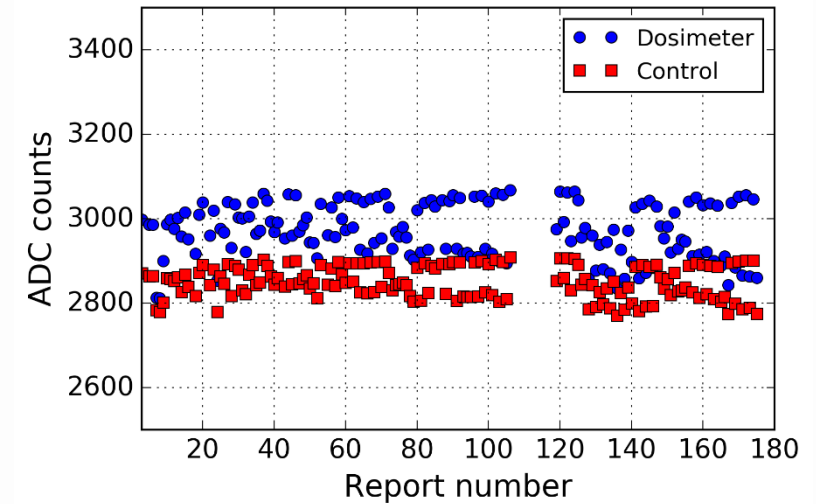
Power Supply



Temperature

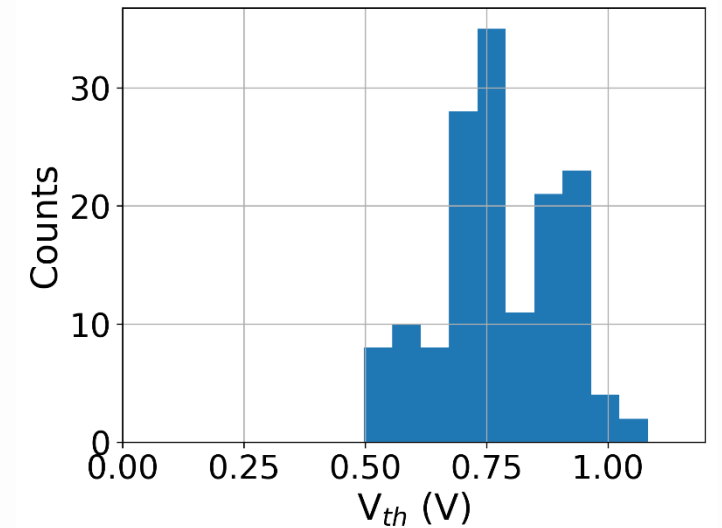
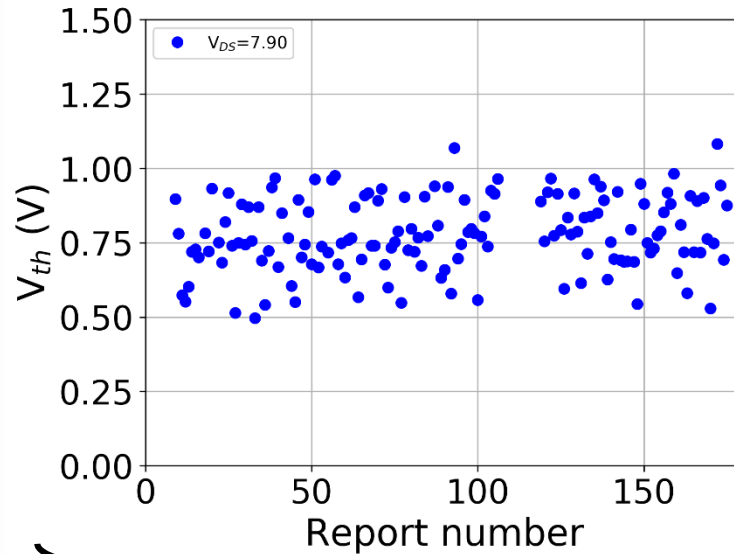
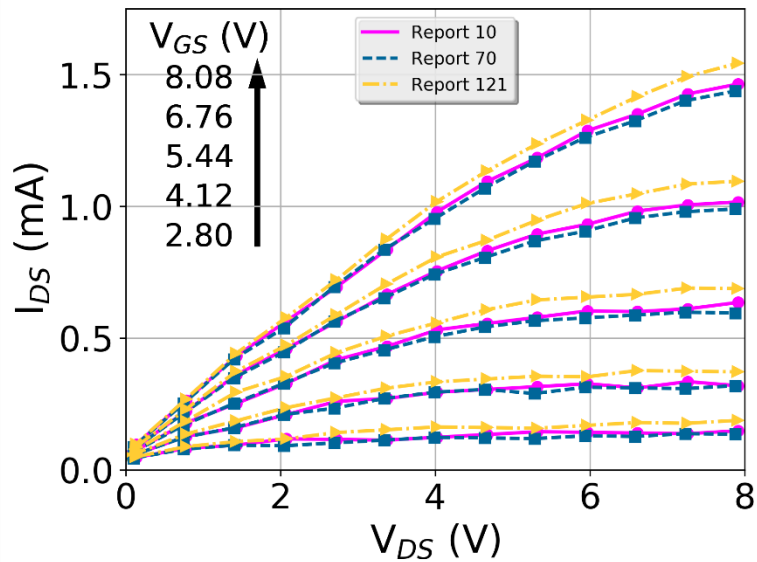


Dosimetry



DUTs experiments

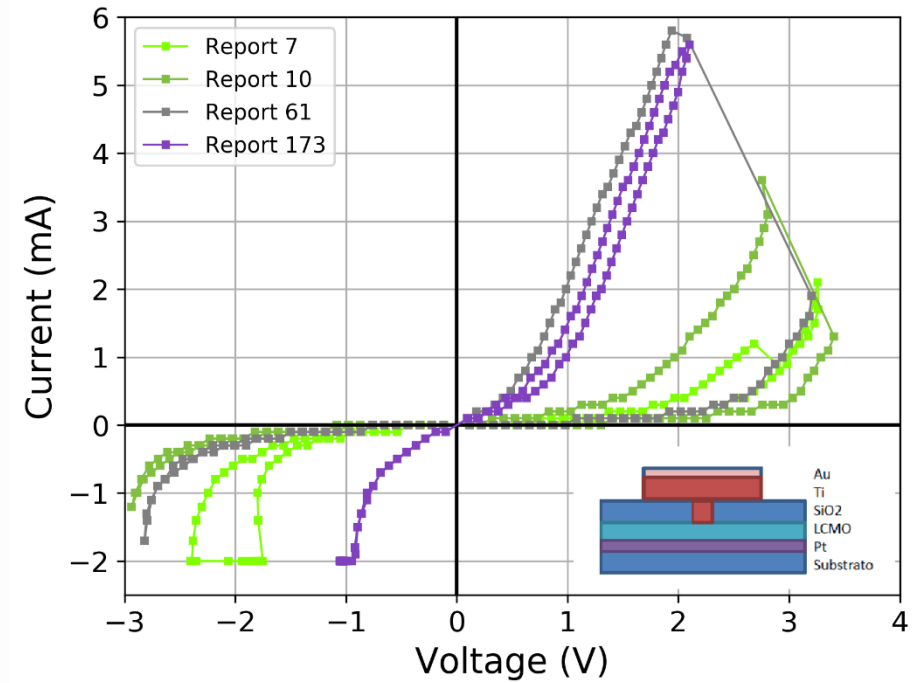
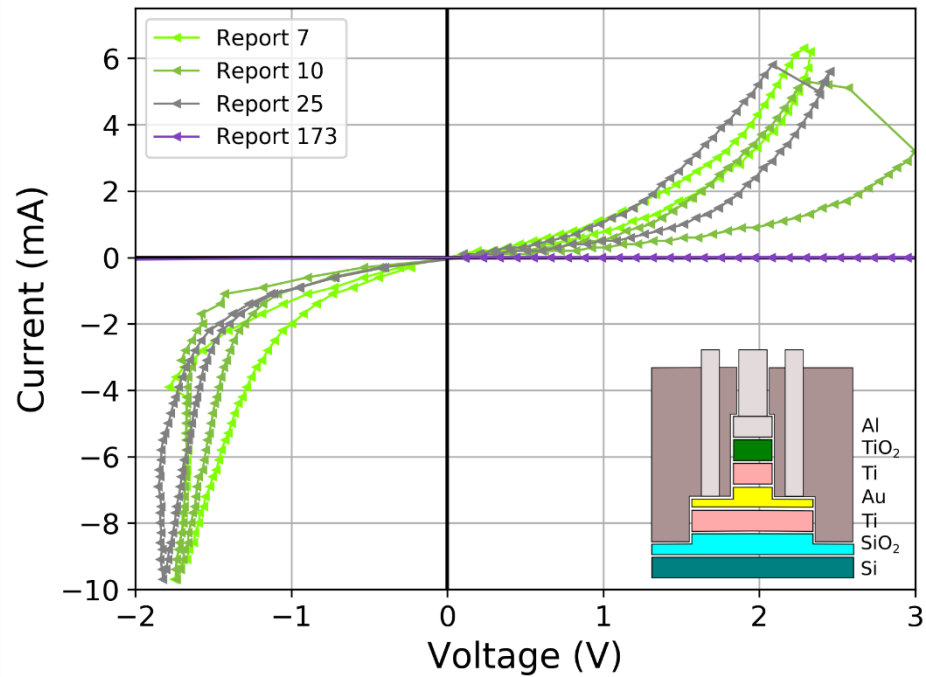
TFT devices



From ID vs VGS curve

DUTs experiments

ReRAM devices



Closing remarks

- LabOSat is **working in LEO for more than 160 days**. Regarding performance, all subsystems are working as expected.
- On Earth calibration, supply voltage and temperature measurements in orbit allow us to carry out **corrections to improve accuracy** in DUTs experiments.
- TID measurements are still inconclusive, but are consistent with the expected results, signaling very low radiation levels.
- TFT devices continue to operate correctly. No changes in threshold voltage were observed. This analysis is still unfinished although the low level of absorbed dose.
- ReRAM devices still exhibit hysteresis. Variations of I-V curves are due to low endurance instead of absorbed dose.

Conclusions

- LabOSat on board on Ñusat by Satellogic is a **versatile platform capable of measuring both custom and commercial devices** for validation at LEO.
- LabOSat is envisaged as an **efficient and reliable platform** for performing a variety of experiments at LEO!

Contact
gsanca@unsam.edu.ar

labosat.unsam.edu.ar