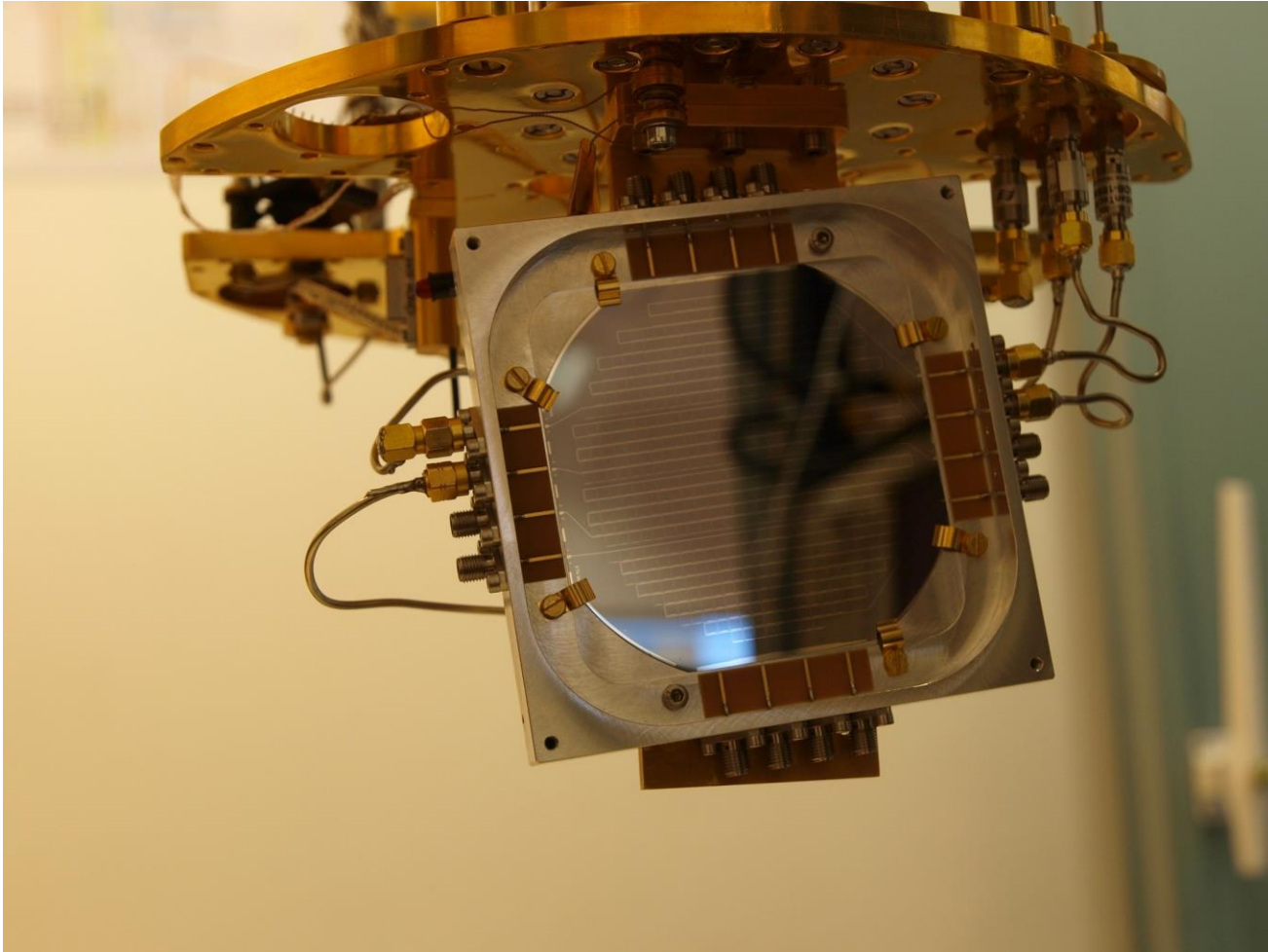

Grupo de Tecnologías Superconductoras Centro de Astrobiología (CSIC – INTA)



Presented by **Marina Calero de Ory**
on behalf of **Alicia Gómez**

mcalero@cab.inta-csic.es

*Agencia Espacial Española: Jornada
conjunta ciencia-industria espacial*

Universidad de Alcalá

5 - Febrero - 2025

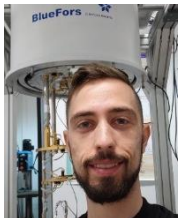


Who are we?

The most important thing: We are a team



Marina Calero de Ory



David Rodriguez



Maria Teresa Magaz



Victor Rollano



Alejandro Pascual



Daniel Granados



Francisco Najarro



Jesús Martin-Pintado



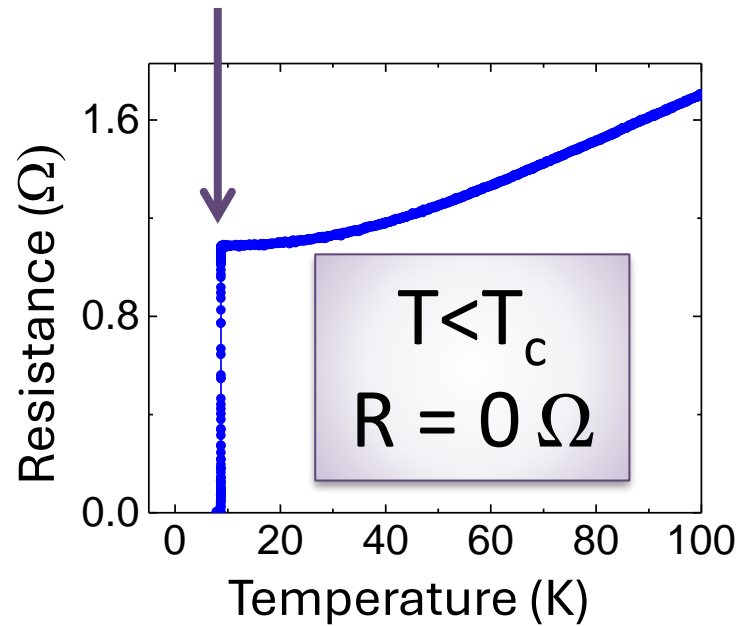
Alicia Gómez



What are we doing?

Superconducting Circuits

SUPERCONDUCTING STATE

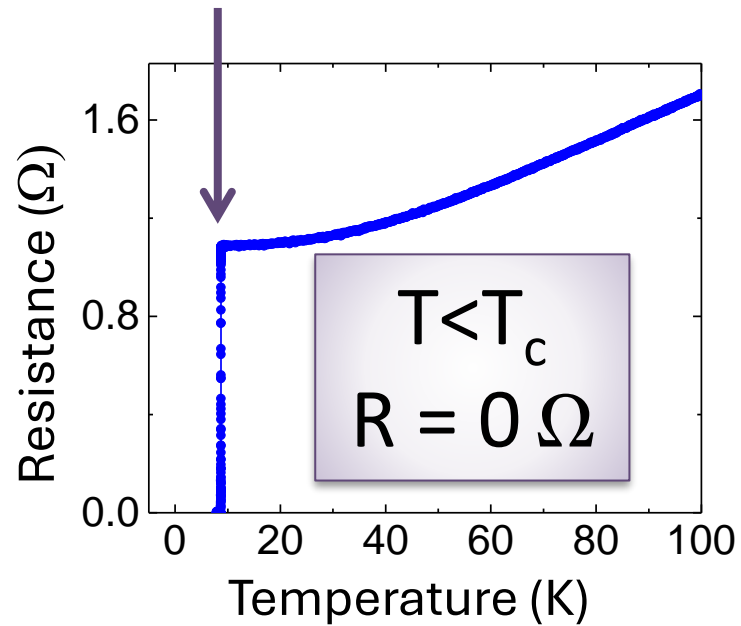


- ✓ Conduct electric energy without losses
- ✓ Low intrinsic noise

What are we doing?

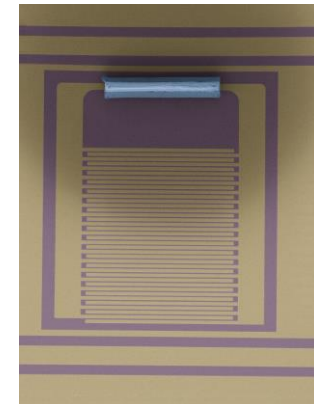
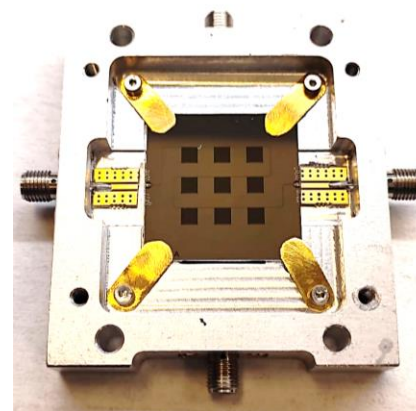
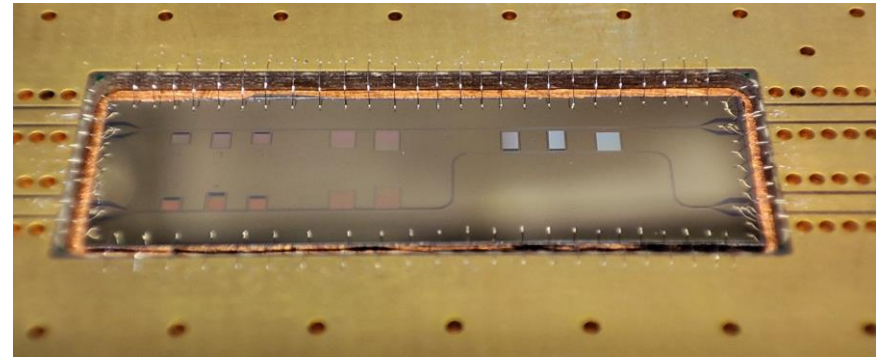
Superconducting Circuits

SUPERCONDUCTING STATE



- ✓ Conduct electric energy without losses
- ✓ Low intrinsic noise

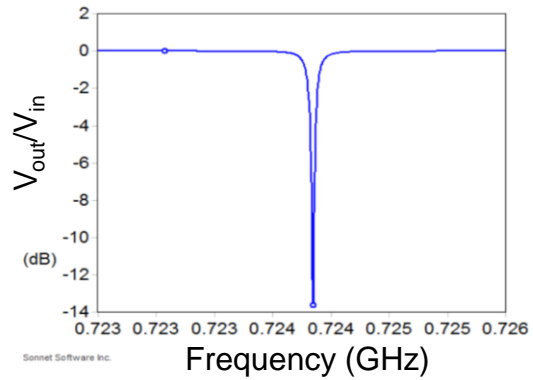
Applications in
Space instrumentation and
Quantum Technologies



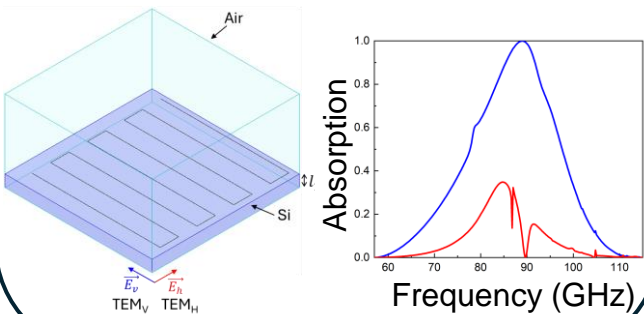
What do we use?

Millimeter-Wave Engineering

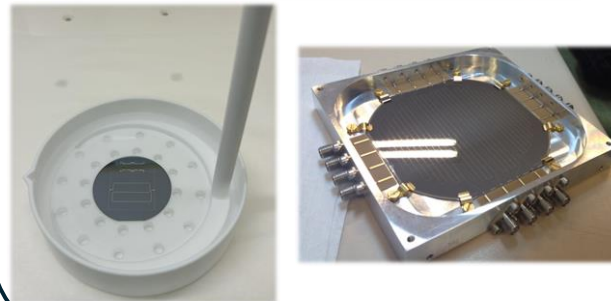
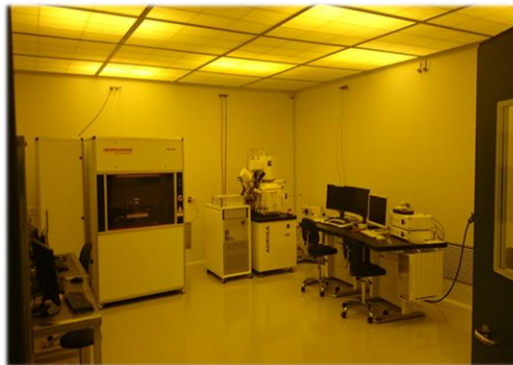
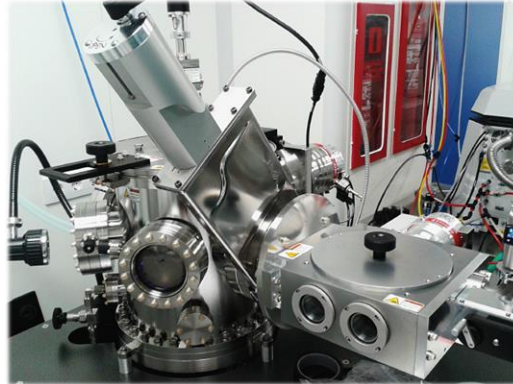
- *Low Frequency Design*
Sonnet Software



- *mm-wave Design*
CST /HFSS Softwares

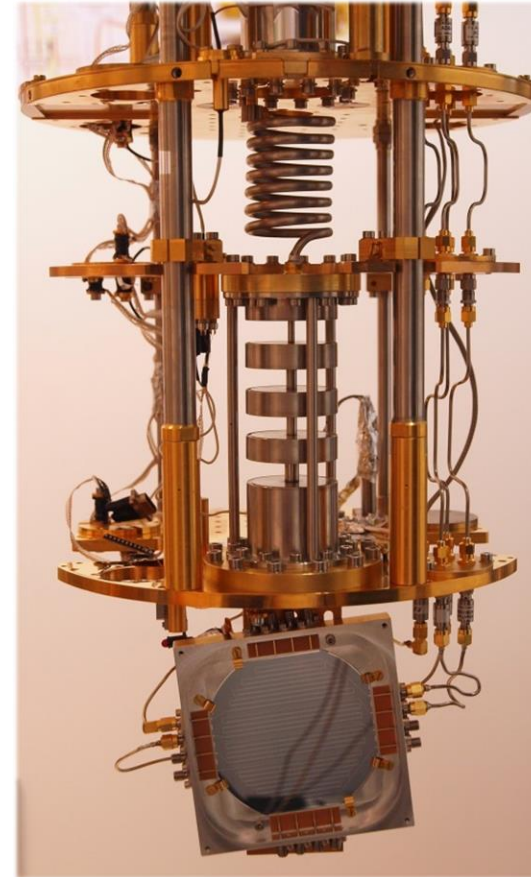


Clean Room Nanofabrication



Cryogenics

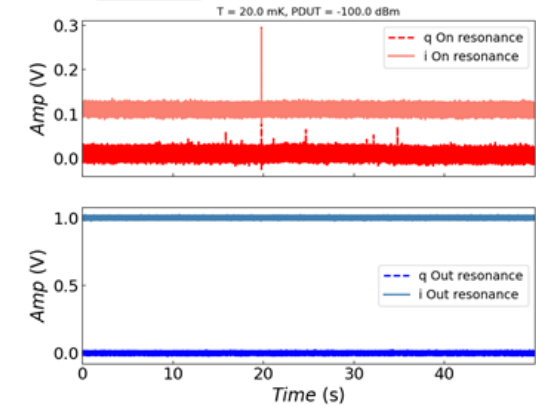
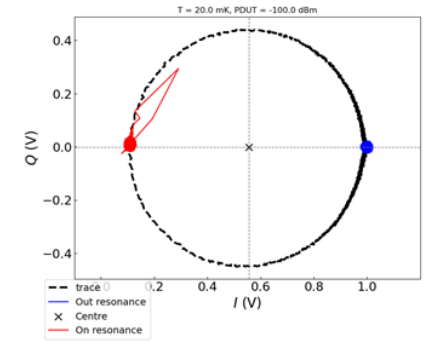
He³/He⁴ Dilution Refrigerator



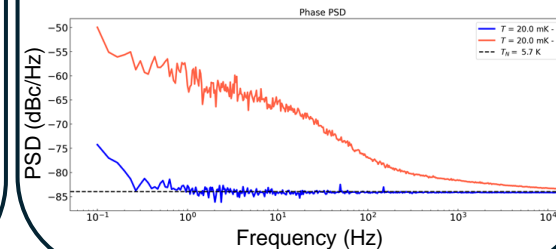
Mixing Chamber Plate $T = 12$ mK

Data Analysis

- *IQ traces in time*

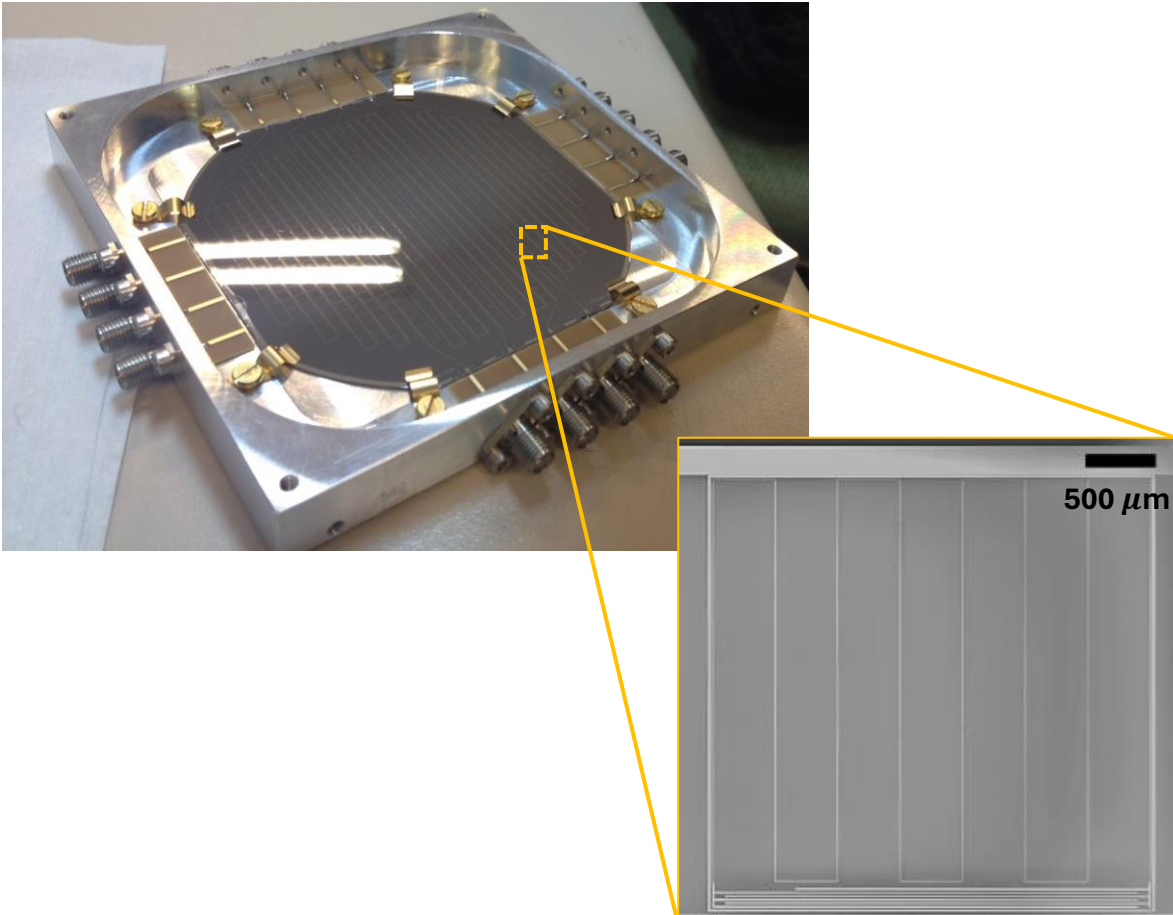


- *FFT \rightarrow PSD*



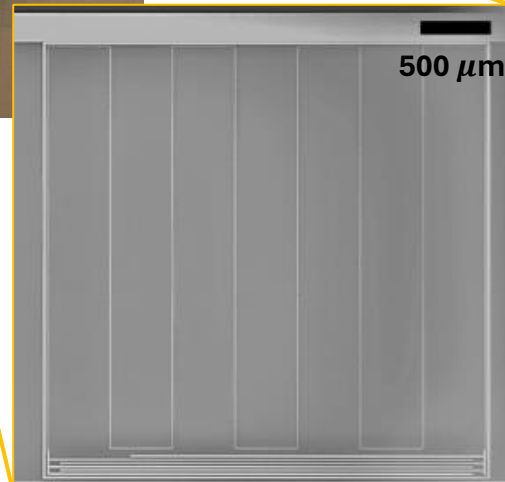
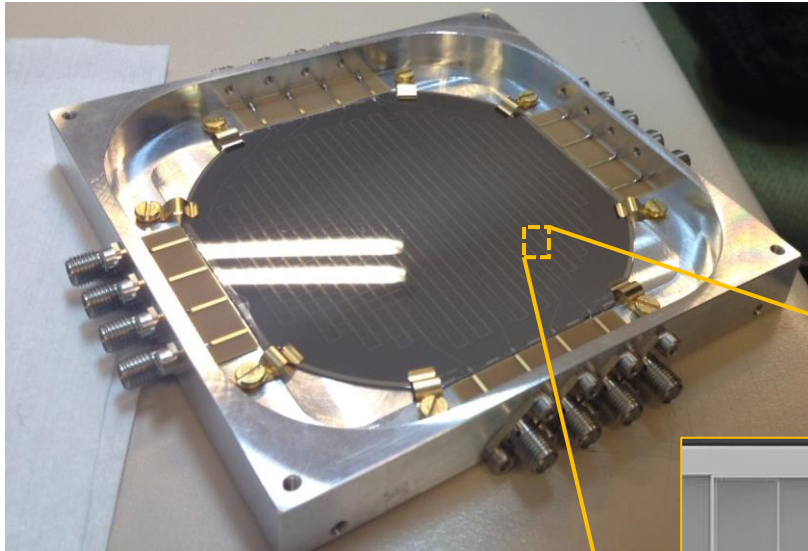
Kinetic Inductance Detectors (KIDs)

Large format
polarimetric cameras

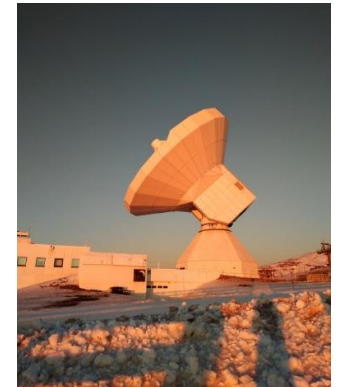
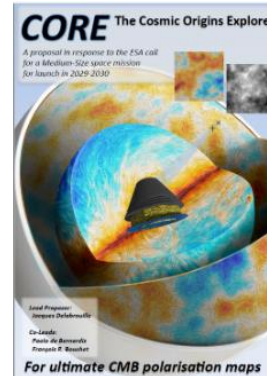


Kinetic Inductance Detectors (KIDs)

Large format
polarimetric cameras



Astrophysical instrumentation



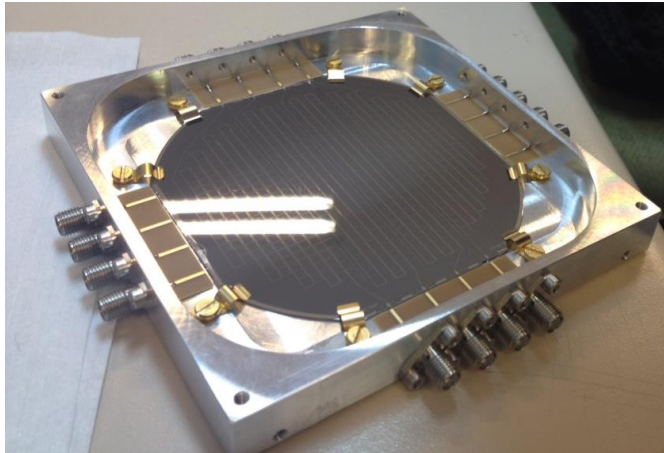
Dark Matter experiments: axions detection



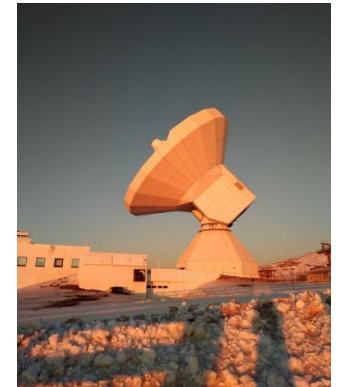
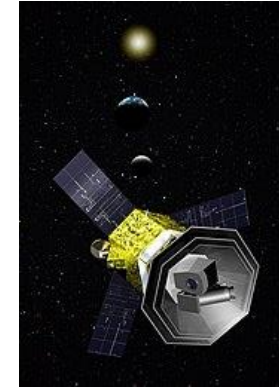
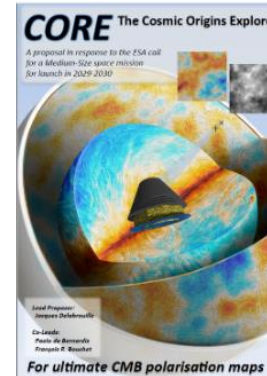
CADEX
Collaboration

Kinetic Inductance Detectors (KIDs)

Large format
polarimetric cameras



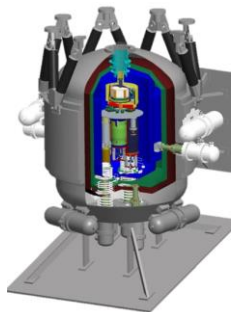
Astrophysical instrumentation



Dark Matter experiments: axions detection

Peripheral technologies

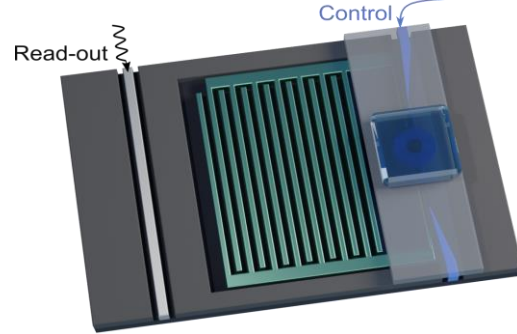
- Cryogenic systems:
 - Athena (ESA)
 - MOSAIC (ESO)
- FPGA Multitone read-out system



CADEX
Collaboration

Superconducting circuits for quantum processors

Molecular spin quantum processor unit



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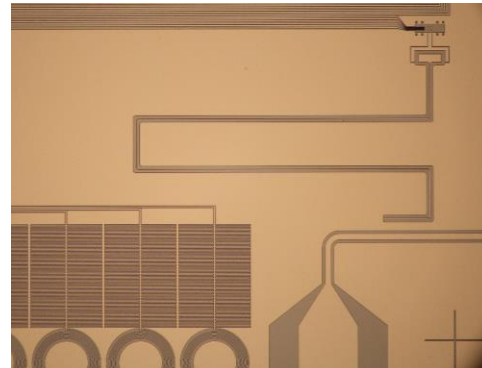
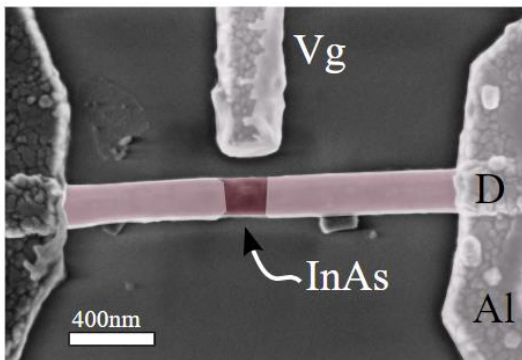
Fernando Luis

V. Rollano et al.
arXiv:2203.00965 (2022)

Coupling to semiconducting nanowires: Gatemon Qubits

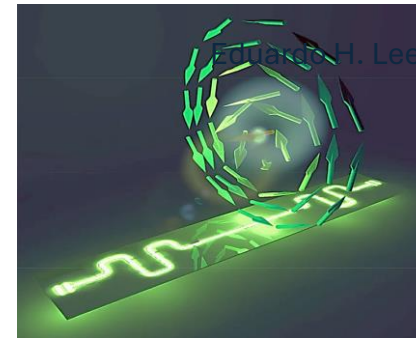
E. H. Lee

UAM
Universidad Autónoma
de Madrid



E. Prada, Nat. Rev. Phys. (2020)

Magnonic quantum systems: Magnetic vortices and FeB nanorods



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Y MATERIALES DE ARAGÓN

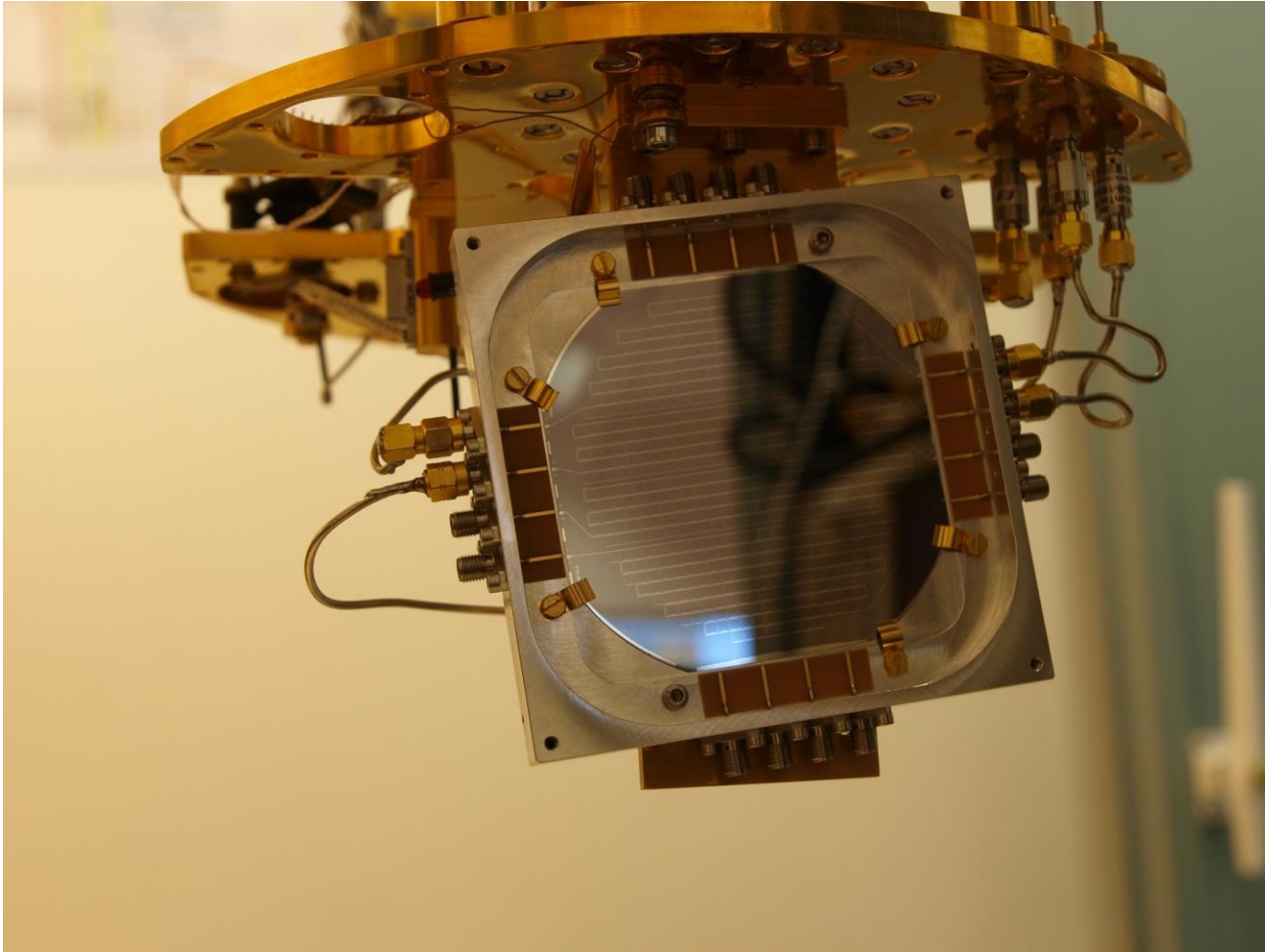
Pepa Martínez-Pérez

icmm

Jesús M^a González

M.J. Martínez-Pérez, ACS Photonics (2019)

Grupo de Tecnologías Superconductoras Centro de Astrobiología (CSIC – INTA)



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Looking for new synergies

***Thank you for your
attention!***

