Quantum Sensors for Science Exploration

25-26 May 2023

European Space Agency, ESTEC, Noordwijk, the Netherlands

Room: Newton 2

Programme

Thursday 25 May 2023

8:30-9:30 Door opens, badge collection at the security gate, gathering, coffee, populate the poster boards

Introduction and setting the scene part 1

Chair: Olivier Witasse

9:30-9:40	Welcome, introduction, logistics, goals of the workshop
	Olivier Witasse, Olivier Carraz, Lisa Wörner, Aaron Strangfeld
9:40-10:00	The ESA science programme / solar system exploration
	Luigi Colangeli, ESA
10:00-10:30	Open questions in planetary sciences
	Olivier Mousis, Université Aix-Marseille
10:30-11:00	Open questions in heliophysics
	Laura Hayes, ESA

11:00-11:30	Coffee break, posters display
Setting the scene part 2	
Chair: Lisa Wörner	
11:30-11:50	ESA's Quantum Technology Cross Cutting Initiative *Eric Wille, ESA*
11:50-12:10	From Earth to the Solar System: The Potential of Quantum Sensing for ESA's Observations *Aaron Strangfeld, ESA*
12:10-12:40	Quantum Sensors in Space for Gravity Field Observation *Federica Migliaccio, Politecnico di Milano*
12:40-13:00	Sensitive magnetometry using nitrogen-vacancy center ensembles in diamond towards space application *Takuya Kitamura, Universität Ulm*
13:00-14:30	Lunch break, posters display
Magnetic fields	
Chair: Matt Taylor	
14:30-14:45	Space weather monitoring using quantum magnetometers *Mark Bason, STFC – RAL Space*
14:45-15:00	The Scalar Magnetometer on board the JUICE Mission and its Potential as a Vector Magnetometer *Christoph Amtmann, Graz University of Technology*
15:00-15:15	OSCAR-QUBE: Diamond Quantum Sensors from Lab to LEO *Jaroslav Hruby, Hasselt University*
15:15-15:30	Quantum Sensing Tesbeds in the Netherlands *Clara Osorio Tamayo, TNO Delft*
15:30-16:00	Coffee break, posters display

Towards Quantum Instrument Space Qualification

Chair: Luigi Cacciapuoti

16:00-16:15 Hybrid inertial sensing through correlation of atom interferometers with opto-mechanical resonators

Dennis Schlippert, Leibniz Universität Hannover

16:15-16:30 Qualifying Photonic Components for Space

Sarah Wittig, ESA

16:30-16:45 An all-optical high flux BEC source, utilizing time-averaged potentials and tunable interactions

Alexander Herbst, Leibniz University Hannover

16:45-17:15 Discussion (all)

17:30-19:00 Welcome drink (Wintergarden)

Friday 26 May 2023

8:30-9:00 Gathering, populate the poster boards

9h00-11h00 Poster session

1. Quantum Technologies in Space: Present and future Application Scenarios, *Dennis Knoop*
2. SQUID: A Simulator for Atom Interferometry Satellite Missions, *Gina Kleinsteinberg*
3. Progress towards development of a trapped strontium ion space optical clock, *Alessio Spampinato*
4. Micro-fabricated components for laser cooling platforms, *James McGilligan*
5. NEW PARAMETRIC TECHNOLOGIES FOR FUTURE SPACEBORNE DIAL, *Myriam Raybaut*
6. Quantum Sensing for Positioning, Navigation and Timing: A Defence Perspective, *Reinier Tan*
7. Atom Interferometry and Squeezing for Fundamental Physics (AION), *Elizabeth Pasatembou*
8. Bose-Einstein Condensation in a Compact Vacuum Chamber for an Earth Gravity Gradiometer, *Anna Marchant*
9. Optical Vector Magnetometer Based on the Hanle Effect, *Sunny Laddha*
10. A fibered-laser system for on-satellite absolute acceleration measurements based on cold atoms, *Aurelien Eloy*
11. Individual cold atoms as single-photon detectors, *Laura Zarraoa*
12. The Design of the BECCAL Laser System for Cold Atom Experiments Onboard the ISS, *Hamish Beck*
13. Towards a quantum hybrid inertial sensor for space applications, *David Latorre Bastidas*
14. Quantum Computing Primer for Space, *Jose Pizarro*
15. The Cat and the Qubit: Exploring Quantum Conundra through Quantum Computing, *Bjorn Grieger*
16. The importance of a strong ecosystem, *Johannes Verst*
17. Cold Atom Interferometers for Gravity Field Recovery of Mars, *Andrea Iannone*
18. BECCAL – The Bose-Einstein Condensate and Cold Atom Laboratory, *Christian Deppner*
19. Measurement techniques on the JUICE mission, *Olivier Witasse*
20. ESA planetary missions posters, *ESA project scientists*

Geodesy

Chair: Olivier Carraz

11:00-11:15 Mars science gravity field case

Bart Root, Delft University of Technology

11:15-11:30 CARIOQA-PMP: Towards climate studies using quantum technologies

Thomas Lévèque, CNES

11:30-11:45 Cold Atom Interferometry for Enhancing the Radio Science Gravity Experiment: A Phobos Case Study

Michael Plumaris, Rome University

11:45-12:00	Control enhanced quantum sensing for geodesy
	Russel Anderson, Q-CTRL Pty. Ltd., Sydney, NSW Australia
12h00-12:15	Coffee break, poster display

Quantum sensors for science exploration

Chair: Aaron Strangfeld

12:15-12:30	A compact cold-atom double-resonance clock
	Paul Griffin, University of Strathclyde
12:30-12:45	Towards quantum metrology with cold Rydberg atoms
	Sylvain Schwartz, ONERA, Université Paris-Saclay
12:45-13:00	Margins
13:00-14:00	Lunch break

14:00-15:30: Panel discussion, wrap up, next steps, white paper, recommendations, take-away messages, adjourn