Mar 13 – 14, 2023 > CERN

Terrestrial Very-Long-Baseline Atom Interferometry

WORKSHOP

The event will take stock of the developing international landscape of large-scale Atom Interferometer prototypes and discuss their synergies and complementarity. Such devices will be able to detect ultralight dark matter and gravitational waves in the mid-frequency band, complementing the capabilities of optical interferometers on Earth and the future LISA space mission, and offering unique sensitivity to ultralight bosonic dark matter.

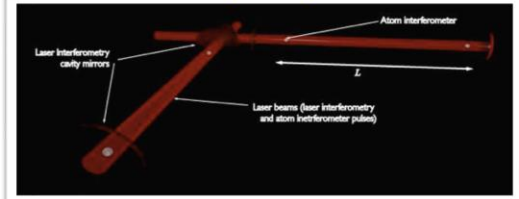
Organisers:

International Organisation Committee
Kai Bongs, University of Birmingham, UK
Philippe Bouyer, CNRS, Institut d'Optique, France
Oliver Buchmueller, Imperial College London, UK
Benjamin Canuel, CNRS, Institut d'Optique, France
Marilù Chiofalo, University of Pisa and INFN Pisa, Italy
John Ellis, King's College London, UK
Naceur Gaaloul, Leibniz Universität Hannover, Germany
Jason Hogan, Stanford University, US
Timothy Kovachy, Northwestern University
Ernst Rasel, Leibniz Universität Hannover, Germany
Guglielmo Tino, Università di Firenze and LENS, Italy
Wolf von Klitzing, IESL-FORTH, Greece
Mingsheng Zhan, Wuhan Institute of Physics and Mathematics, China

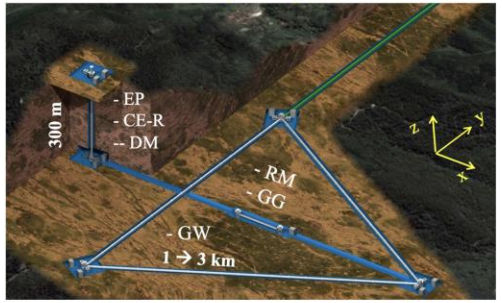
Local Organisation Committee
Gianluigi Arduini, CERN, Geneva, Switzerland
Sergio Calatroni, CERN, Geneva, Switzerland
Albert De Roeck, CERN, Geneva, Switzerland, and University of Antwerp, Belgium
Michael Doser, CERN, Geneva, Switzerland
Elina Fuchs, CERN, Geneva, Switzerland

Information
https://indico.cern.ch/event/1208783/

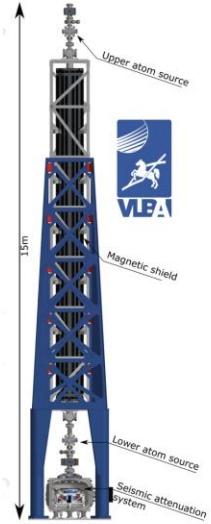
MIGA: Terrestrial detector using atom interferometer at O(100m)
(France)

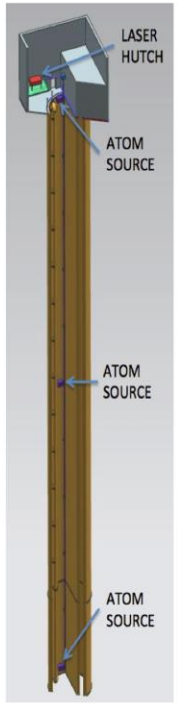


ZIGA: Terrestrial detector for large scale atomic interferometers, gyros and clocks at O(100m)
(China)

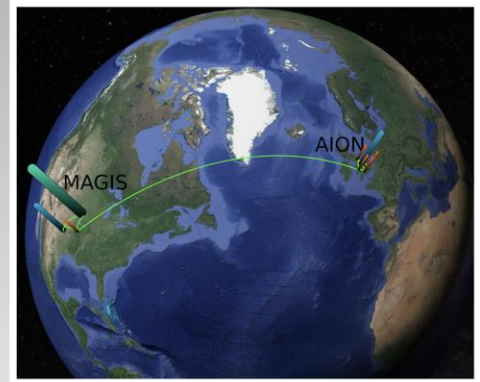


VLBAI: Terrestrial tower using atom interferometer O(10m)
(Germany)





AION: Terrestrial shaft detector using atom interferometer at 10m – O(100m) planned
(UK)



MAGIS: Terrestrial shaft detector using atom interferometer at O(100m)
(US)

Planned network operation

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Kai Bongs, University of Birmingham, UK
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John Ellis, King's College London, UK
Naceur Gaaloul, Leibniz Universität Hannover, Germany
Jason Hogan, Stanford University, US
Timothy Kovachy, Northwestern University
Ernst Rasel, Leibniz Universität Hannover, Germany
Guglielmo Tino, Università di Firenze and LENS, Italy
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Albert De Roeck, CERN, Geneva, Switzerland, and University of Antwerp, Belgium
Michael Doser, CERN, Geneva, Switzerland
Elina Fuchs, CERN, Geneva, Switzerland

Physics Beyond Colliders

AIP Publishing

QUANTUM TECHNOLOGY INITIATIVE

Workshop Picture

Towards a Workshop Summary & Roadmap

We will follow the same documentation strategy as for the Cold Atoms in Space Community workshop:

a) Write-up of each session led by session conveners** & speakers:

b) Establish a Roadmap Draft for discussion

We plan to publish the Summary & Roadmap in the special AQS journal issue, with the session conveners and organisers as core editors.

All workshop participants are invited to contribute and sign the document.

We will set-up an Overleaf skeleton of the document and kick-off writing with dedicated organisers & session conveners meeting in the near future.

** *"The conveners' charges include choosing a set of contributors who present a diverse set of perspectives on the topic, collecting write-ups from them subsequently and integrating them into a combined document that serves as an input into the formulation of the road-map."*

Alonso et al. *EPJ Quantum Technology* (2022) 9:30
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Cold atoms in space: community workshop summary and proposed road-map

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Springer

VLBAI Workshop at CERN: Introduction

AION

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Special AQS issue

- In addition to publishing the Workshop Summary & Roadmap, we encourage every speaker and poster presenter to consider writing up their contribution as a concise standalone contribution to the special volume.
- There is even the option for participants to propose a special contribution to the volume which was not covered at the workshop but aligns with the workshop theme.

Therefore, we foresee:

1. Contributions from Workshop Speakers
2. Contributions from Poster Presenters
3. Contributions from Workshop Participants

➢ **John and Oliver will be in touch with speakers and poster presenters, and participants can contact us if you are interested to submit a contribution.**

A few thoughts for RoadMap and Next Steps

- Based on this workshop and our common desire to push the landscape of (very) large-scale atom interferometry to the next level (100m prototypes to km-scale detectors), we could form an INTERNATIONAL Proto-Collaboration** (TVLBAI or similar) to promote this effort.
- We can use the workshop summary & roadmap as part of our Expression of Interest (EoI).
- The Proto-Collaboration would enable us to approach official institutions like CERN, STFC Boulby Lab, national and international funding agencies to further explore options on a more official level.

** Proto-Collaboration is a first informal stage towards a more official collaboration

Thank You!

A big thank you to the CERN team, especially Patricia, Sergio, Gianluigi, Elina …

… and session conveners, speakers, poster presenters and participants!