

Workshop on Atomic Experiments for Dark Matter and Gravity Exploration

Report of Contributions

Contribution ID: 1

Type: **not specified**

Welcome and Introduction

Monday 22 July 2019 11:00 (15 minutes)

Contribution ID: 2

Type: **not specified**

The ZAIGA Experiment

Monday 22 July 2019 11:15 (30 minutes)

The Zhaoshan long-baseline Atom Interferometer Gravitation Antenna (ZAIGA) is an underground laser-linked interferometer facility under construction near Wuhan, China. It has an equilateral triangle configuration with two 1-km-apart atom interferometers in each arm, a 300-meter vertical tunnel equipped with an atom fountain and atomic clocks, and 1-km-arm-length optical clocks linked by locked lasers. It is designed for experimental research on gravitation and related problems including gravitational wave detection and high-precision tests of the equivalence principle. <https://arxiv.org/pdf/1903.09288.pdf>

Presenter: ZHAN, Mingsheng (Wuhan Institute of Physics and Mathematics)

Session Classification: Towards Space: Review of Terrestrial Projects

Contribution ID: 3

Type: **not specified**

The MIGA Experiment:

Monday 22 July 2019 11:50 (30 minutes)

The Matter-wave laser Interferometric Gravitation Antenna (MIGA) Experiment aims at demonstrating precision measurements of gravity with cold atom sensors in a large-scale instrument and at studying associated applications in geosciences and fundamental physics. In particular, it will assess future potential applications of atom interferometry to gravitational wave detection in the mid-frequency band between 0.1 and 10 Hz, intermediate between LISA and LIGO/Virgo/KAGRA/INDIGO/ET. <http://miga-project.org/>.

Presenter: SABULSKY, Dylan O (Institut d'Optique d'Aquitaine)

Session Classification: Towards Space: Review of Terrestrial Projects

Contribution ID: 4

Type: **not specified**

The MAGIA-Advanced Experiment

Monday 22 July 2019 13:30 (30 minutes)

The MAGIA-Advanced Experiment is a project funded by the Italian Ministry for Research and Istituto Nazionale Fisica Nucleare for a large scale atom interferometer based on ultracold Rb and Sr atoms. In additions to lab R&D activity, the team is investigating the possibility of a 100-300 m atom interferometer to be installed in a vertical shaft on Sardinia island. Main goals are GW observation and search for DM.

Presenter: TINO, Guglielmo Maria (INFN - National Institute for Nuclear Physics)

Session Classification: Towards Space: Review of Terrestrial Projects

Contribution ID: 5

Type: **not specified**

The MAGIS Project

Monday 22 July 2019 14:05 (30 minutes)

The Matter-wave Atomic Gradiometer Interferometric Sensor (MAGIS) project in the US plans a series of interferometers using cold atoms with progressively increasing baselines of 10m, 100m, and 1km. The first step is funded and under construction at Stanford, the second step is being prepared at Fermilab, and the third step is planned for the Sanford Underground Research Facility. <https://arxiv.org/pdf/1812.00482.pdf>

Presenter: COLEMAN, Jonathon (Physics Dept, University of Liverpool)

Session Classification: Towards Space: Review of Terrestrial Projects

Contribution ID: 6

Type: **not specified**

The AION Project

Monday 22 July 2019 14:40 (30 minutes)

The UK Atom Interferometry Observatory and Network (AION) project in the UK proposes a series of atom interferometers with baselines of 10m, 100m, and 1km, similar to MAGIS. The first stage would be located in Oxford, with sites for the subsequent steps awaiting study. <http://www.hep.ph.ic.ac.uk/AION-Project/>

Presenter: BUCHMULLER, Oliver (Imperial College (GB))

Session Classification: Towards Space: Review of Terrestrial Projects

Contribution ID: 7

Type: **not specified**

The ELGAR Project

Monday 22 July 2019 15:45 (30 minutes)

ELGAR is a European initiative to build a terrestrial infrastructure for cold atoms for gravitational wave detection with potential applications also for dark matter. Configurations similar to MAGIS/AION are included in the proposal, and a White Paper about this infrastructure is being prepared [https://indico.obspm.fr/event/58/contributions/214/attachments/88/98/Slides-bouyer2018_06_21_MIGA_GDR.pdf]

Presenter: SABULSKY, Dylan O (Institut d'Optique d'Aquitaine)

Session Classification: Towards Space: Review of Terrestrial Projects

Contribution ID: 8

Type: **not specified**

Discussion and Preparation for Day 2

Monday 22 July 2019 16:55 (30 minutes)

Session Classification: Towards Space: Review of Terrestrial Projects

Contribution ID: 9

Type: **not specified**

The BECCAL Project

Tuesday 23 July 2019 10:20 (30 minutes)

The Bose-Einstein Condensate and Cold Atom Laboratory (BECCAL) is a bilateral project of NASA and DLR for a multi-purpose facility on the international space station, based in the heritage of drop tower (QUANTUS) and sounding rocket experiments (MAIUS). It will enable a variety of experiments in atom optics and atom interferometry to cover a broad spectrum ranging from fundamental physics to studies for applications in earth observation. It is intended as a pathfinder for future space missions:

Presenter: SCHUBERT, Christian (Leibniz Universität Hannover)

Session Classification: Towards the White Paper: Other Relevant Space Missions

Contribution ID: **10**

Type: **not specified**

The STE-QUEST Mission

Tuesday 23 July 2019 10:55 (30 minutes)

Presenter: HEES, Aurelien (SYRTE - Paris Observatory)

Session Classification: Towards the White Paper: Other Relevant Space Missions

Contribution ID: 11

Type: **not specified**

The SAGE Mission

Monday 22 July 2019 16:20 (30 minutes)

The Space Atomic Gravity Explorer (SAGE) mission was proposed to the European Space Agency in 2016 in response to a Call for “New Ideas” (<https://www.cosmos.esa.int/web/new-scientific-ideas>). It has the scientific objective to investigate Gravitational Waves, Dark Matter, and other fundamental aspects of gravity as well as the connection between gravitational physics and quantum physics combining quantum sensing and quantum communication based on recent impressive advances in quantum technologies for atom interferometers, optical clocks, microwave and optical links.

Presenter: TINO, Guglielmo Maria (INFN - National Institute for Nuclear Physics)

Session Classification: Towards Space: Review of Terrestrial Projects

Contribution ID: 12

Type: **not specified**

Space Optical Clock mission

Tuesday 23 July 2019 09:45 (30 minutes)

Presenter: SCHILLER, Stephan (Heinrich-Heine-Universität Düsseldorf)

Session Classification: Towards the White Paper: Other Relevant Space Missions

Contribution ID: 13

Type: **not specified**

Introduction to AEDGE White Paper Physics Case

Tuesday 23 July 2019 11:30 (15 minutes)

Presenter: BUCHMULLER, Oliver (Imperial College (GB))

Session Classification: White Paper: The Physics Case of AEDGE

Contribution ID: 14

Type: **not specified**

AEDGE: Gravitational Waves

Tuesday 23 July 2019 11:50 (20 minutes)

Presenter: LEWICKI, Marek (Kings College London)

Session Classification: White Paper: The Physics Case of AEDGE

Contribution ID: 15

Type: **not specified**

AEDGE: Dark Matter

Tuesday 23 July 2019 12:15 (20 minutes)

Presenter: MCCABE, Christopher (King's College London)

Session Classification: White Paper: The Physics Case of AEDGE

Contribution ID: 16

Type: **not specified**

Co-signing community letter to ESA's Director of Science, Guenther Hasinger

Monday 22 July 2019 19:00 (1 hour)

List of people co-signing the community letter to ESA's Director of Science, Guenther Hasinger:
Status 22/07/2021