JGW-G2112904 KAGRA Telecon (Online) May 12, 2021

### Short Introduction to 学術変革 ダークマター (Transformative Research Area "Dark Matter")

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### **Ultralight Dark Matter**

- Ultralight DM (<~1 eV) behaves as classical wave fields  $f=242~{\rm Hz}\left(\frac{m_{\rm DM}}{10^{-12}~{\rm eV}}\right)$
- Laser interferometers are sensitive to tiny length changes from such oscillations



# **Our Strategy**

 Use both table-top optical cavities and large-scale laser interferometric gravitational wave detectors



# Our Team



### PI: Yuta Michimura (道村唯太, UTokyo) Experiment Yuka Oshima Hiroki Fujimoto Koji Nagano



#### **%Non-LVK member**

Co-I: Tomohiro Fujita (藤田智弘, ICRR) Theory & Data analysis Ippei Obata Hiromasa Nakatsuka Soichiro Morisaki Jun'ya Kume Atsushi Nishizawa



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### MAX-PLANCK-GESELLSCHAFT

### ... and more to come!







Co-I: Matteo Leonardi (マテオ・レオナルディ, NAOJ) Optical characterization



ICRR Institute for Cosmic Ray Research University of Tokyo

Co-I: Shinji Miyoki (三代木伸二, ICRR) KAGRA

## The Budget

- 1.49億円 (~1.37M USD) in total
   from November 2020 to March 2025
- Roughly half is planned be used for KAGRA
  - Already spent some to buy optics etc. for KAGRA
  - Improving the sensitivity to GW will improve the sensitivity to DM
- 1 Project Researcher will join us from July 2021
   Will work on birefringence studies and other interferometer simulations for KAGRA
- By the way, we are also looking for another Project Researcher working on the data analysis

### Past Presentations/Publications

- On axion search by Koji Nagano at F2F April 2019 (Poster Award)
- On DM searches by Tomohiro Fujita and Yuta Michimura at KIW7 Dec 2020
- Y. Michimura+, Phys. Rev. D 102, 102001 (2020)
   Submitted through CPC
- S. Morisaki+. <u>Phys. Rev. D 103, L051702 (2021)</u>
  Presented at LVK Dark Matter call on Oct. 28, 2020

## **Expected LVK Publications**

- Gauge boson dark matter search using O3GK KAGRA data
  - On-going
  - New approach to use MICH/PRCL data (Unique to KAGRA since we use sapphire)
- Axion dark matter search using O4 KAGRA data
  - Using polarization optics
- Updated gauge boson dark matter search using O4 KAGRA data
  - Hopefully do better than LIGO DARM
- Also, some short author papers discussing the data analysis pipelines and experimental proposals