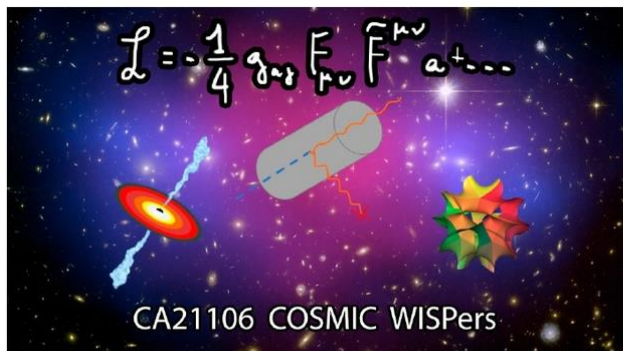
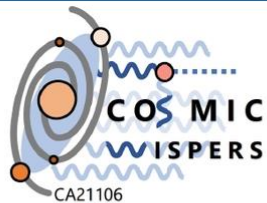




Funded by the European Union

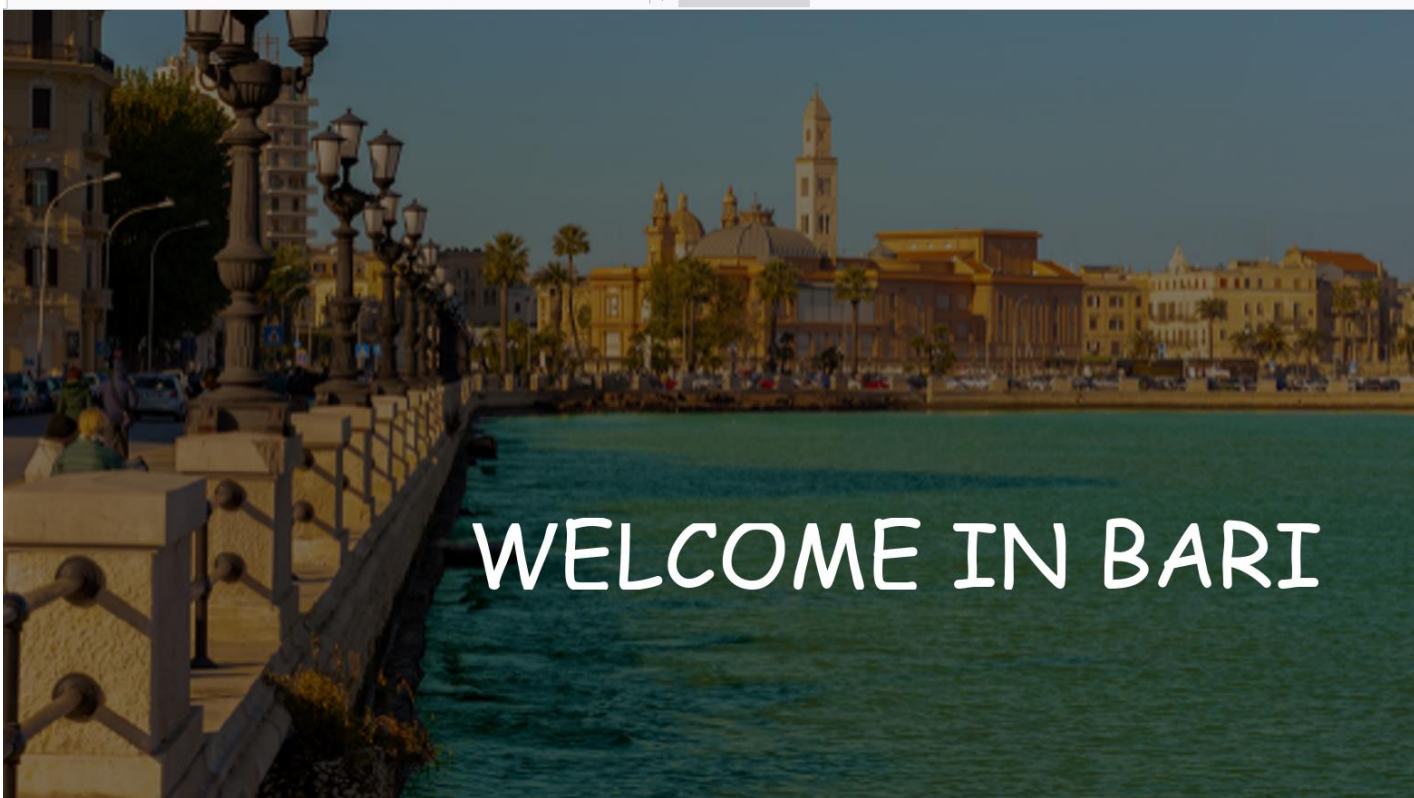


CA21106 COSMIC WISPERs

## 1st General Meeting of COST Action COSMIC WISPERs (CA21106)

5-8 Sept 2023  
Centro Polifunzionale Studenti (ex Palazzo delle Poste e Telegrafi), Bari (Italy).  
Europe/Rome timezone

Enter your search term



## COST ACTION "COSMIC WISPERs" (CA21106)



Funded by the European Union

1<sup>st</sup> GENERAL MEETING  
Bari (IT) 5-8 Septemb

1<sup>st</sup> TRAINING SCHOOL  
Lecce (IT) 11-14 September 2023



[https://agenda.infn.it/e/CA21106\\_General\\_Meeting](https://agenda.infn.it/e/CA21106_General_Meeting)  
Contact person: Prof. Alessandro MIRIZZI  
(alessandro.mirizzi@ba.infn.it)



[https://agenda.infn.it/e/CA21106\\_Training\\_School](https://agenda.infn.it/e/CA21106_Training_School)  
Contact person: Prof. Daniele MONTANINO  
(daniele.montanino@le.infn.it)



### International Organizing Committee

Ilaria BRIVIO (Bologna Univ. & INFN, Italy),  
Francesca CALORE (LaPT, CNRS, France),  
Andrea CAPUTO (CERN, Switzerland),  
Pierluca CARENZA (Stockholm Univ., Sweden),  
Maria BENITO CASTAÑO (Tartu Observatory, Estonia),  
Serkant CETIN (Istinye Univ., Turkey),  
Michele CICOLI (Bologna Univ. & INFN, Italy),  
Loredana GASTALDO (Heidelberg Univ., Germany),  
Claudio GATTI (LNF INFN, Italy),  
Marin KARUZA (Rijeka Univ., Croatia),  
Venelin KOZHUHAROV (Sofia Univ., Bulgaria),  
Iuliu-Calin LAZAROIU (Horia Hulubei, Romania),  
Olga MENA (IFIC, Spain),  
Alessandro MIRIZZI (Bari Univ. & INFN, Italy),  
Daniele MONTANINO (Lecce Univ. & INFN, Italy),  
Nicholas RODD (CERN, Switzerland),  
Javier REDONDO (Zaragoza Univ., Spain),  
Oscar STRANIERO (INAF, Italy),  
Edoardo VITAGLIANO (the Hebrew Univ. of Jerusalem, Israel)

### Topics

Axions and other very weakly interacting slim particles (WISPs):  
> Theory  
> Cosmology  
> Astrophysics  
> Experiments



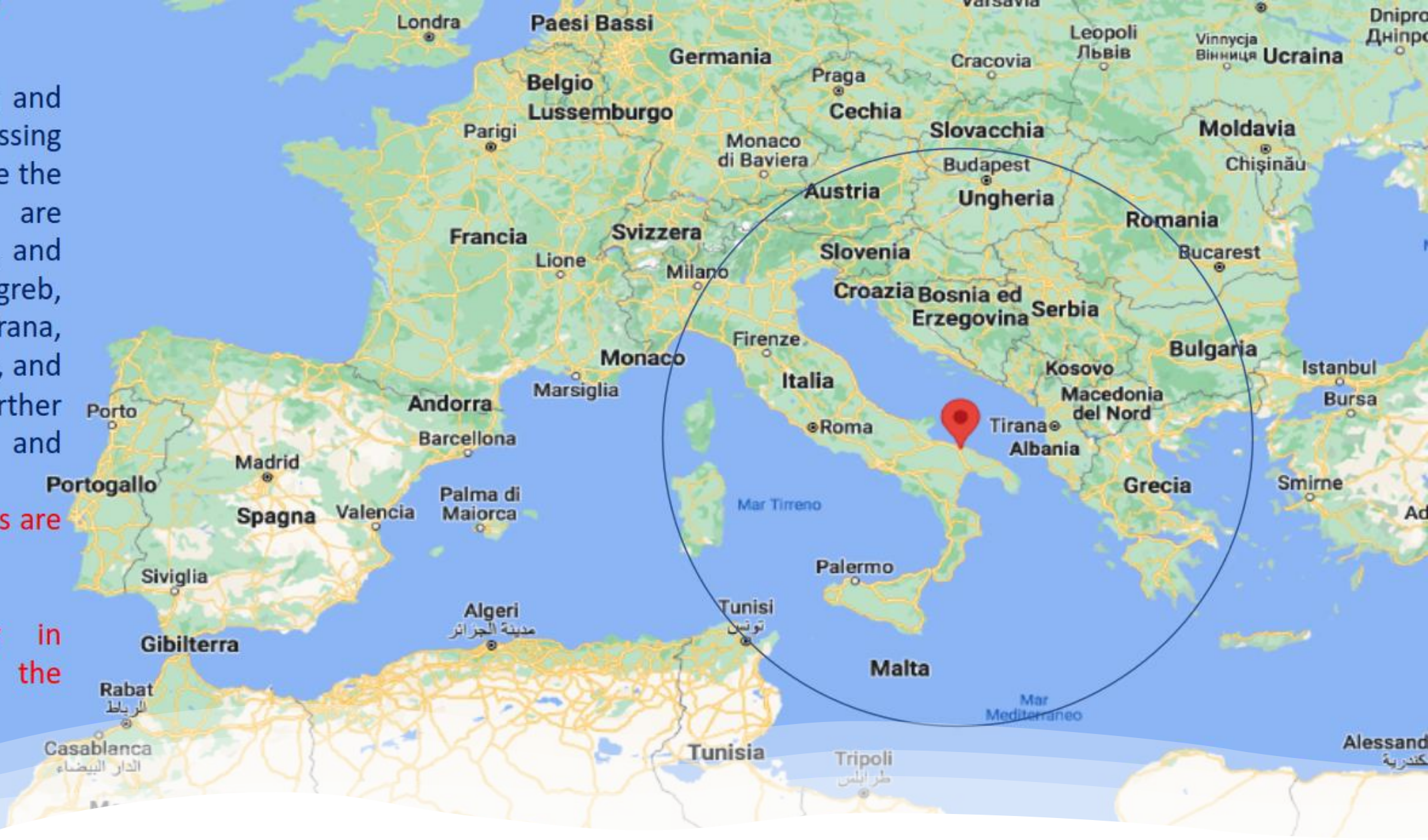
CA21106 COSMIC WISPERs

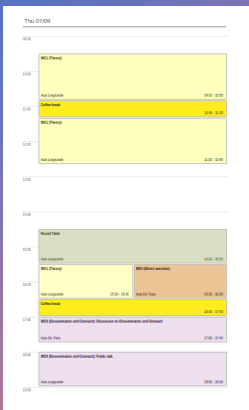
## Location for our COST Action

If we focus on Bari and draw a circle passing through Milan, inside the circle there are Budapest and Sofia, and then Belgrade, Zagreb, Sarajevo, Tirana, Thessaloniki, Athens, and Tunis. Just a little further there are Tripoli and Istanbul.

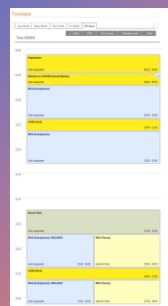
Most of ITC countries are in the circle.

We are together in Europe and the Mediterranean.

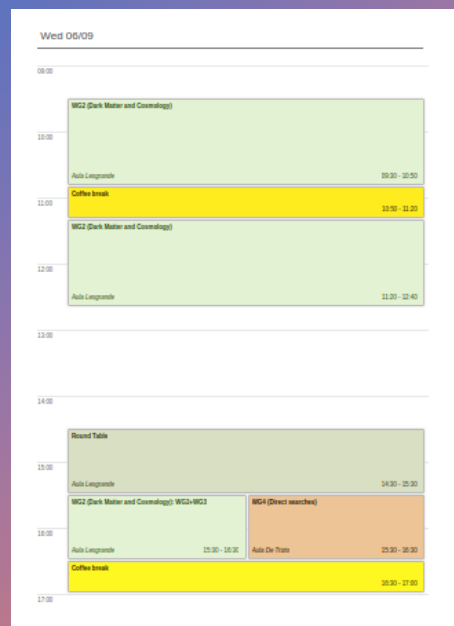




+



- Four intense days
- Parallel sessions
- <https://agenda.infn.it/event/34125/>



- 
- 105 registered participants - from Indico
  - 65 contributions



# WG1

## Axions and Festina Lente

Gerben Venken  
COSMIC WISPer 1st general meeting  
05/09/2023

[Montero, Van Riet, GV '19], [Montero, Vafa, Van Riet, GV '21], [Guidetti, Righi, GV, Westphal '22]

## Prospects to scrutinise or smash SM\*A\*S\*H

Andreas Ringwald  
1st General Meeting of COST Action COSMIC WISPERS  
Bari, Italy  
Sep 5-8, 2023

HELMHOLTZ RESEARCH FOR  
GRAND CHALLENGES

CLUSTER OF EXCELLENCE  
QUANTUM UNIVERSE



Uncovering the axion  
and BSM CP violation  
with electric dipole moments

Kiwoon Choi

COSMIC WISPer, Bari

KC, Im, Jodkowski, arXiv: 2308.01090



## Swampland conjectures/bounds

Festina Lente is a swampland bound

Swampland bounds: constraints on low-energy EFT by demanding couple consistently to quantum gravity

### Standard Model\*Axion\*Seesaw\*Higgs-Portal Inflation

Minimal model of particle physics and cosmology [Ballesteros, Redondo, AR, Tamarit, arXiv:1608.05414; 1610.01639]

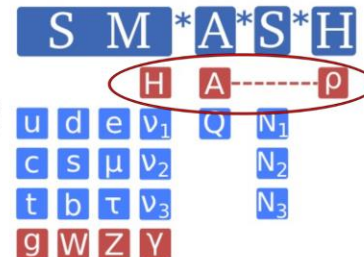
SM\*A\*S\*H extends the SM by

- 3 right-handed SM singlet neutrinos  $N_i$
- a SM singlet complex scalar field  $\sigma$
- a vector-like quark  $Q$

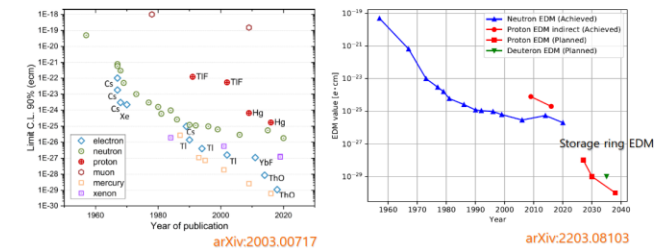
all charged under a new global  $U(1)_{PQ}$  symmetry, that is spontaneously broken by  $\text{vev } \langle |\sigma| \rangle = v_\sigma / \sqrt{2} \sim 10^{11} \text{ GeV}$

It solves six puzzles in particle physics and cosmology in one smash:

1. Strong CP problem (Peccei Quinn (PQ) mechanism)
2. Dark matter (Axion)
3. Neutrino masses and mixing (Type I seesaw mech.)
4. Baryon asymmetry (Thermal leptogenesis)
5. Inflation (Higgs-portal inflation)
6. Vacuum stability



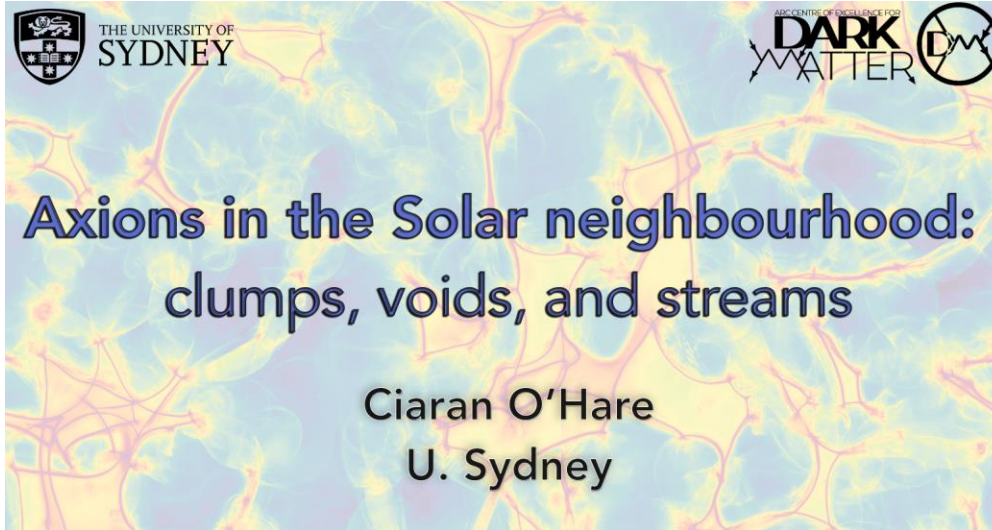
EDMs have a bright prospect for significant experimental progress.



$$\begin{aligned} d_n &< 1.8 \times 10^{-26} \text{ e cm} \\ d_e &< 4.1 \times 10^{-30} \text{ e cm} \\ d_{Hg} &< 7.4 \times 10^{-30} \text{ e cm} \end{aligned}$$

Abel et al '20  
Roussy et al '22  
Graner et al '16

# WG2

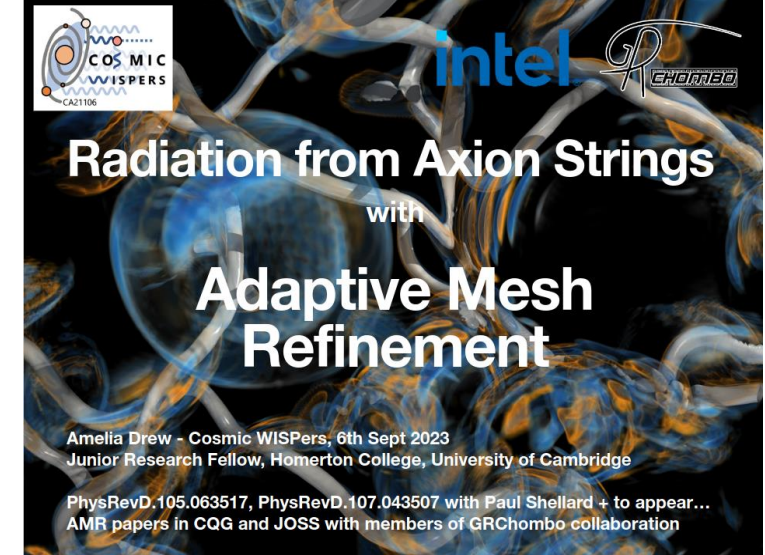


THE UNIVERSITY OF SYDNEY

DARK MATTER

## Axions in the Solar neighbourhood: clumps, voids, and streams

Ciaran O'Hare  
U. Sydney



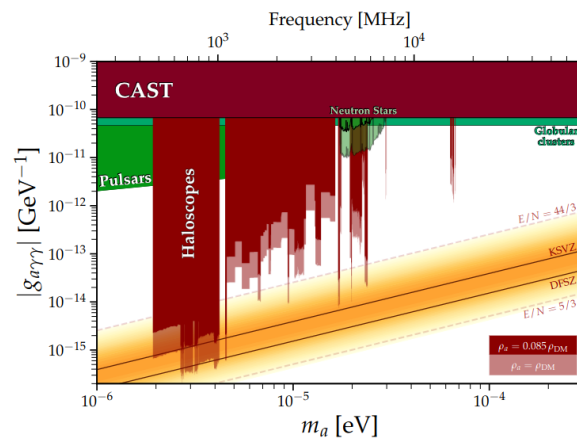
intel

## Radiation from Axion Strings with Adaptive Mesh Refinement

Amelia Drew - Cosmic WISPers, 6th Sept 2023  
Junior Research Fellow, Homerton College, University of Cambridge

PhysRevD.105.063517, PhysRevD.107.043507 with Paul Shellard + to appear...  
AMR papers in CQG and JOSS with members of GRChombo collaboration

## Implications for haloscopes



Eggemeier, CAJO+ [2212.00560]

Typical density in the minivoids is  
~0.085 of the mean density of  
dark matter

→ the miniclusters are no longer  
growing at the final redshift of the  
simulation, therefore this places a  
**lower bound** on the density of  
axions

→ Not a nice conclusion, but it  
could have been much worse!

## To Do:

- What does this modelling mean for post-inflationary axion mass/spectrum prediction? WG3?
- Can we incorporate this into current axion constraints?
- Is it helpful to link this to existing string network models eg. velocity one-scale model (VOS)?
- How does this link to string 'scaling'?
- How does this link to cosmic string constraints?
- Many more questions to discuss with COST WGs!



## Unveiling dark fifth forces with Large Scale Structures

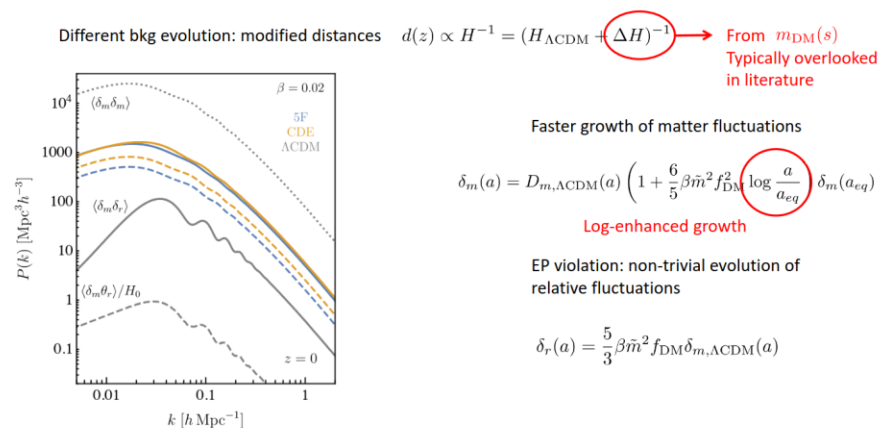
Salvatore Bottaro

In collaboration with: E. Castorina, M. Costa, D. Redigolo, E. Salvioni



COSMIC WISPerS - September 5, 2023

### Fifth forces in the Dark Sector



## Stellar Probes of Feebly Interacting Particles, Circa 2023

1st General Meeting of COST Action COSMIC WISPerS (CA21106),  
Bari, Italy  
September 5, 2023

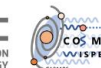
Edoardo Vitagliano

edoardo.vitagliano@mail.huji.ac.il

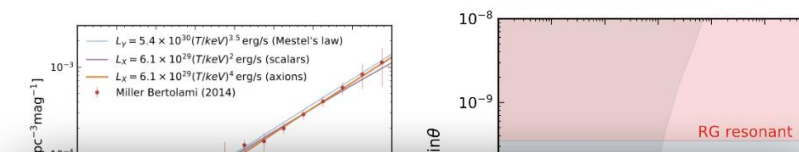
Hebrew University of Jerusalem



האוניברסיטה העברית בירושלים  
THE HEBREW UNIVERSITY OF JERUSALEM



### Energy loss bounds from white dwarfs



#### Take home lesson

- Identify system appropriate for the particle model you are interested in
- Compute the FIP emission
- Identify the **observable**

Fresh new bounds on scalar emission from WDs (dominant constraints in the eV-keV range)

Be careful with larger masses (Dolan et al. 2306.13335)



# WG4

## Observation of anomalies supporting the existence of the new particle X17

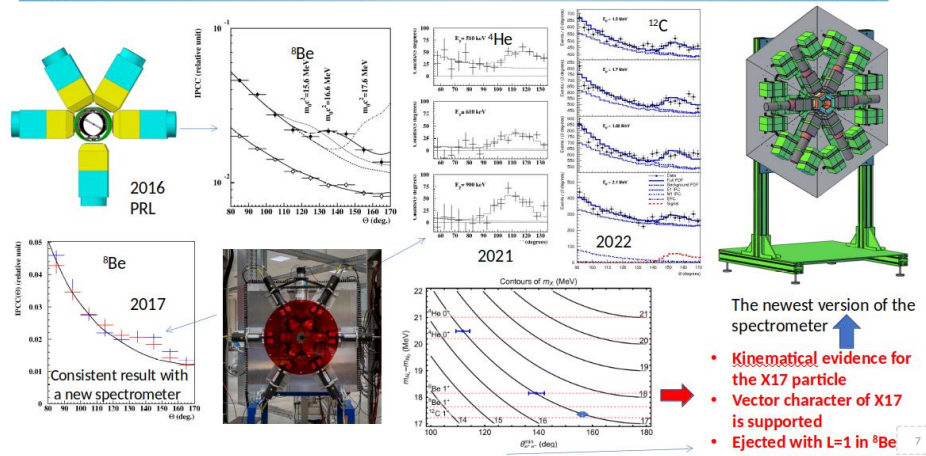


1st General Meeting

Attila J. Krasznahorkay  
Institute for Nuclear Research (ATOMKI)  
Debrecen  
Hungary



## Previous experimental results



## Searching for new light particles with PADME (and fixed target experiments)

Venelin Kozhuharov for the PADME collaboration  
Faculty of Physics, Sofia University and Laboratori Nazionali di Frascati, INFN

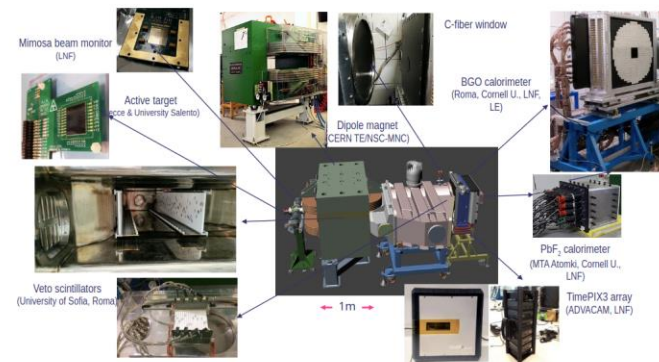
1st General Meeting of COST Action COSMIC WISPERs (CA21106)  
5 – 8 September 2023  
Centro Polifunzionale Studenti, Bari (Italy).



CA21106 COSMIC WISPERs

## PADME

Positron Annihilation into Dark Matter Experiment





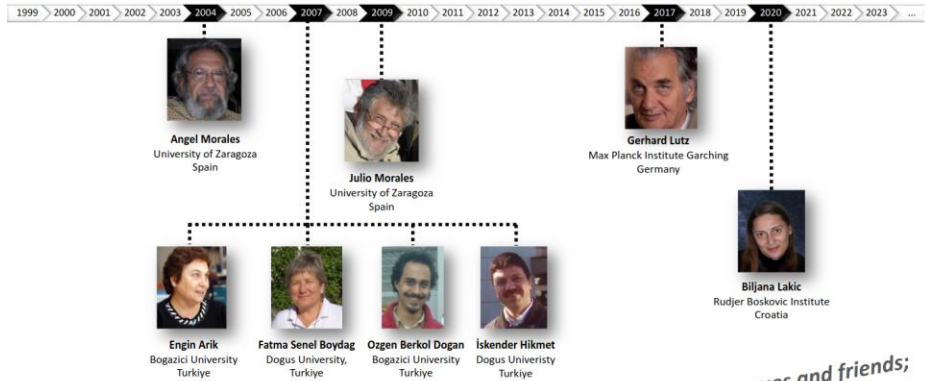
## CAST and more than CAST; *A Dark Sector Probe for 20+ Years*

Serkant Ali Çetin

On behalf of the CAST Collaboration



1st General Meeting of COST Action COSMIC WISPERs (CA21106)  
5-8 Sep 2023 / Bari, ITALY



*In loving memory of our dear colleagues and friends;  
CASTers who passed away during the lifetime of CAST...*

## VMB@CERN 2023

ŠTĚPÁN KUNC

ON BEHALF OF VMB@CERN COLLABORATION

1ST GENERAL MEETING OF COST ACTION COSMIC WISPERs (CA21106)

## VMB@CERN collaboration

Collaboration to measure Vacuum Magnetic Birefringence  
Started in 2019

PVLAS + Q&A + OSQAR-VMB + LIGO group (Cardiff)

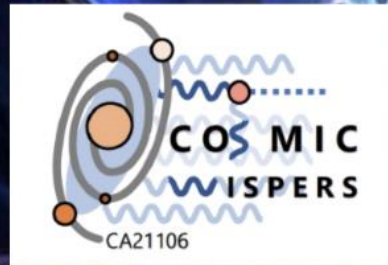
## VMB@CERN

about 15 members from 10  
Institutes from Czech Republic, France, Italy, Poland, Republic of China and Wales

WG5

# Alla scoperta dell'universo invisibile: materia oscura, onde gravitazionali e buchi neri

**Andrea Caputo (CERN)**  
**Bari 07/09/2023**



# BARI, Sep. 2023

- St. Nicholas



- Streets of Bari



- Bari visit dinner (panzerotti, pizza, bear, sgaliozzi, beer)
- Social dinner (focaccia barese, spaghetti all'assassina, riso patate e cozze and much much more)



IMG\_8212.jpg

Grazie Alessandro and LOC!

IMG\_8210.jpg