

# CNRS Helmholtz Dark Matter Lab (DMLab)



Thomas Schoerner (DESY) and Dirk Zerwas (DMLab)

DMLab Steering Committee Meeting

October 16, 2024



# Steering Committee Meeting 16/10/2024

## Steering Committee

### Original French Members:

- Reynald Pain/Berrie Giebels
- Patrice Verdier (chair)
- Vincent Poireau
- Laurent Vacavant

### Original German Members:

- DESY: Joachim Mnich
- GSI: Yvonne Leifels
- KIT: Johannes Bluemer
- External: Hans Stroeher (chair)

**Last Steering Committee Meeting: 13/07/2022**

## Article 4 – Committees

### (1) Steering Committee

The Steering Committee is the principal decision-making body of the Laboratory and takes the most important decisions. It especially decides on strategic issues regarding Laboratory's Programme.

The Steering Committee is composed of 8 (eight) members listed in Annex 2 or their representatives, with entitlement to vote:

- Four (4) representatives **appointed by CNRS - IN2P3**,
- Four (4) representatives appointed by the Helmholtz Centers.

The Director and the Deputy Director assist the Steering Committee in an advisory capacity.

### French Members:

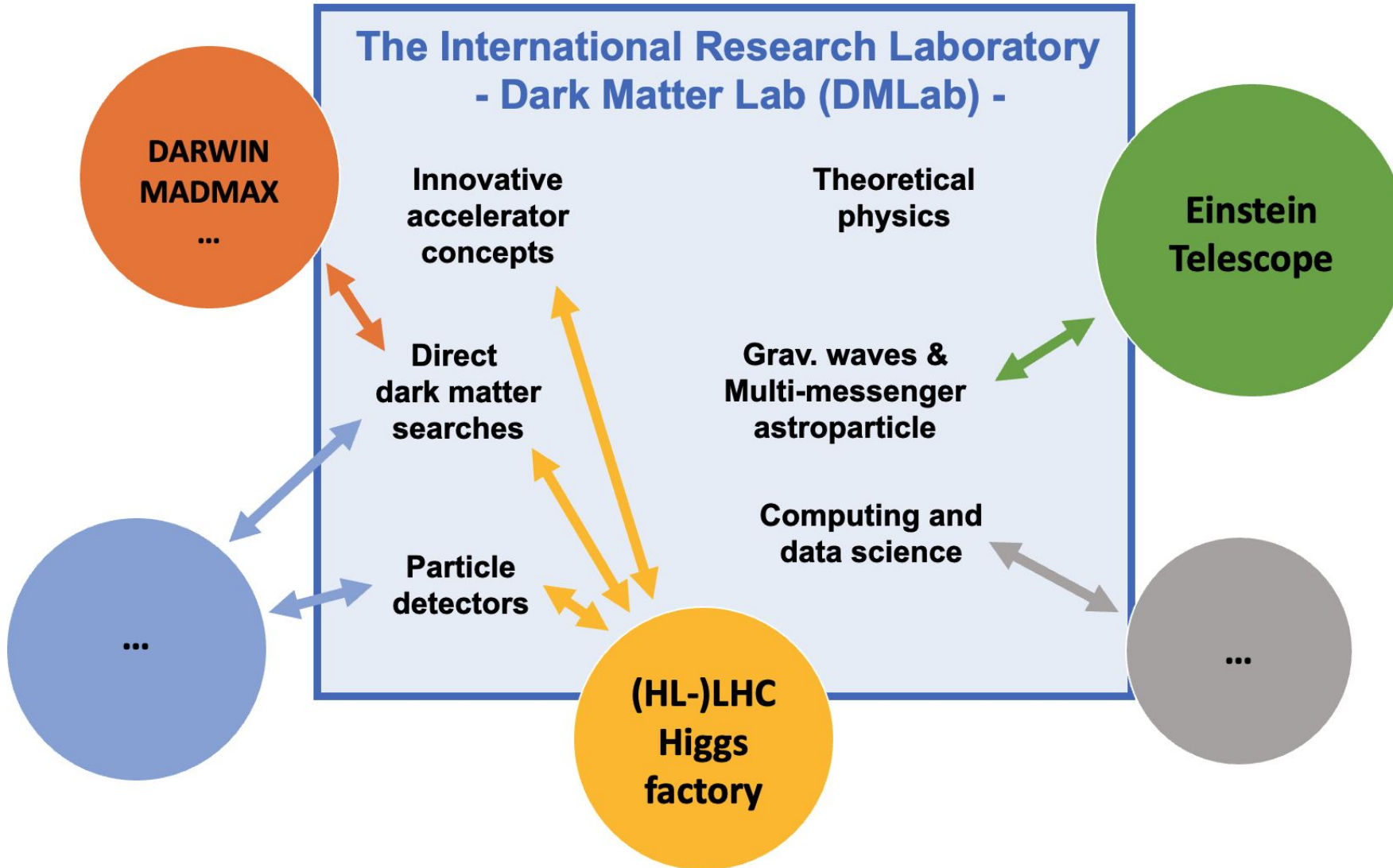
- Christelle Roy
- Patrice Verdier (chair)
- Vincent Poireau
- Laurent Vacavant

### German Members:

- DESY: Beate Heinemann (and Ties Behnke)
- GSI: Yvonne Leifels
- KIT: Marc Weber (represented by Klaus Eitel)
- External: Klaus Desch

# Scientific Topics of DMLab

Organized around the central theme of dark matter



## IRL goal:

- develop new ideas
- across topic boundaries
- glued by dark matter

## Charge to the lab:

1. **Personnel at DESY, KIT and GSI**
  - a. F: affectation
  - b. D: sabbatical
2. **Working visits** (typically 1-2 weeks) to DESY, KIT, GSI
3. **Workshops** broad and narrow
4. **Funding** acquisition
5. **Develop** French-German collaboration

# Steering Committee 16/10/2024

## Formal History

### Getting to DMLab:

- 2019: Discussions Helmholtz “Matter and Universe” and IN2P3 (Johannes Bluemer and Reynald Pain)
- 2019: Paris: Identification of interest centers and projects (KIT, GSI, DESY,(FZJ))
- 2020-2021: White paper of projects (Thomas and Dirk)
- Helmholtz (VP) decision: signature by centers involved (KIT, GSI, DESY), FZJ-institute moved to GSI

### Learning Legal English:

- “CNRS/DESY/GSI/KIT sign on behalf of DMLab”
- French counsel interpretation:”DMLab is not a legal entity”
- German counsel interpretation:”if CNRS/DESY/GSI/KIT signs on behalf of DMLab, DMLab becomes de facto a legal entity (Oberfinanzdirektion)”

### DMLab

- created formally on Jan 1, 2023 (dictionary need: French/German lab/institute, IN2P3(institut)/faculty or department) between **CNRS and DESY, GSI, KIT**
- MoU last signature May 17, 2023
- French budget managed by CNRS-Delegation Paris-Normandie (DR16) Lawrence Saint-Eloy and Stephanie Lumbu
- long term visitor: Dirk@DESY since dec 2023
- order of 30 short term to visits to DESY, KIT and GSI: mainly PhD, PostDoc and young researchers

# DMLab: Web existence

## Infrastructure

- Mailing lists established
  - Open: [dmlab-general@desy.de](mailto:dmlab-general@desy.de) (all interested people)
- Web page:
  - <http://dmlab.in2p3.fr>
- Laboratoire in IN2P3 indico:
  - <https://indico.in2p3.fr/category/915/>



# Steering Committee 16/10/2024

## Projects

### Projects status:

- reconfiguration in detectors
- new initiatives under discussion

### Workshops/Annual Meetings:

- Dec 12-13, 2022 @DESY
- Nov 16-17, 2023 @KIT
- Oct 17-18, 2024 @LPNHE

adiabatic advancement of the calendar

<b>Direct Searches</b>	Darwin	Julien Masbou (Subatech)	Klaus Eitel (KIT)
	MadMax	Fabrice Hubaut (CPPM)	Axel Lindner (DESY)
<b>GW and MM Astroparticles</b>			
<b>Accelerators</b>	Laser-plasma acceleration of Electrons	Nicolas Delerue (IJCLab)	Matthias Fuchs (KIT)
	Laser-plasma acceleration of Hadrons	Medhi Tarisien (LP2i)	Vincent Bagnoud (GSI)
<b>Computing and ML</b>	Precision and Machine Learning	David Rousseau (IJCLab)	Margarete Mühlleitner (KIT)
	High Precision for Dark Matter	Fawzi Boudjema (LAPTH)	Peter Marquard (DESY)
<b>Particle Detectors</b>	Tracking Detectors	Marc Winter (IJCLab)	Ingrid-Maria Gregor (DESY)
	CBM-MVD	Auguste Besson (IPHC)	Michael Deveaux (GSI)
	Calorimeters	Roman Poeschl (IJCLab)	Katja Krueger (DESY)
	Germanium Detectors	Gilbert Duchene (IPHC)	Juergen Gerl (GSI)
<b>Theory</b>	Dark Matter, Gravity, Cosmology	Adam Falkowski (IJCLab)	Geraldine Servant (DESY)
	Dark Photons	Juergen Brunner (CPPM)	Peter Marquard (DESY)
	DM Gravity Cosmology	Daniele Steer (APC)	Thomas Konstandin (DESY)
	Probing Strongly Interacting BSM	Giacomo Cacciapaglia (IP2I)	Christophe Grojean (DESY)
	Strangeness in Nuclear Matter	Joerg Aichelin (Subatech)	Elena Bratkovskaya (GSI)
	FIPs	Luc Darme (IP2I)	Felix Kahlhöfer (KIT)

# Steering Committee 16/10/2024

## Outreach

### Embassy attaché visit:

- Attaché pour la Science et la Technologie (Hugo Zusslin + Orane Belguerras), Jihane Maalmi and Dominique Breton (IJCLab)
- live visits:
  - Beate Heinemann
  - AHCAL (Katja Krueger)
  - Testbeam (Marcel Stanitzki)
  - Flash (Matthew Wing)
  - Electronics lab (ZE)
  - (Madmax)
- the French flag was raised :)
- new attachée (Julie Le Gall): visit envisaged for 2025

### 2023 Sciences et Avenir:

- Coralie Lemke
- Visits and discussions:
  - Madmax
  - AHCAL (Katja Krueger)
  - Testbeam (Marcel Stanitzki)
  - Darwin (Julien Masbou and Klaus Eitel)
  - Pheno of Dark Matter (Marco Cirelli)
- online article (paywall)



# Steering Committee 16/10/2024

## Additional Funding/PhD/Internships

### **2024 Procope24+: successful (and that's the short story)**

- DAAD: 6K
- French Embassy in Berlin: 4K

### **2024 MITI PhD Thesis:**

- Plasma:
  - IJCLab “with” KIT

### **2024 Internship**

- DESY (Axion group)
- 3rd year Ecole Polytechnique

### **2022 MITI PhD Thesis:**

- Madmax:
  - CPPM “with” DESY



# Steering Committee 16/10/2024

## Additional Funding: ANR-DFG

### 2024 ANR-DFG: HALOX (Direct Searches):

- ANR:
  - 300K
  - 1 PostDoc
  - CPPM
- Germany:
  - 475K
  - 2 PhD
  - UHH and DESY

### 2023 ANR-DFG: CALO5D (detector development):

- ANR:
  - 500K
  - 2PostDocs, 1PhD
  - IJCLab and LLR
- Germany:
  - 500K
  - 2 positions, upgraded to PostDoc by own funds
  - DESY, KIT, University of Mainz

# Publications

## Cumulative

### Publications:

- Focus topics for the ECFA study on Higgs / Top / EW factories, e-Print: [2308.00515](#) [hep-ex]
- Technical Design Report for the LUXE Experiment, e-Print: [2308.00515](#) [hep-ex], ***Eur.Phys.J.ST (2024)***
- SuSpect3: A C++ code for the supersymmetric and Higgs particle spectrum of the MSSM, e-Print: [2211.16956](#) [hep-ph], ***Comput.Phys.Commun. 291 (2023) 108805***
- The Higgs boson mass as fundamental parameter of the minimal supersymmetric standard model, e-Print: [2202.06919](#) [hep-ph], ***Eur.Phys.J.C 82 (2022) 7, 657***

### Acknowledgements:

- Adrian William Romero Jorge, Elena Bratkovskaya, Laura Sagunski [Search for dark photons in heavy-ion collisions](#) arXiv:2409.20141

# Conclusions

Year 2

## Realizations by the lab:

1. **Personnel at DESY, KIT and GSI**
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2. **Working visits to DESY, KIT and GSI**
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### 2020:

- The particle physics community must further strengthen the unique ecosystem of research centres in Europe. In particular, **cooperative programmes between CERN and these research centres** should be expanded and sustained with adequate resources in order to address the objectives set out in the Strategy update.
- A diverse programme that is complementary to the energy frontier is an essential part of the European particle physics Strategy. Experiments in such diverse areas [as **dark matter**....

### 2025:

- It should also indicate priorities for areas of exploration that are **complementary to colliders**, for other experiments to be considered at CERN and at other laboratories in Europe,

### Dark Matter:

- Next generation experiments beyond capabilities of a single lab
- Common interests in software, magnets, RF, detectors could be fostered/coordinated
- Facilities:
  - Beam facilities (CERN-Ship, DESY-LUXE(-NPOD), ELSA-Lohengrin,...)
  - Magnets (CERN, DESY,....)
  - Underground facilities: LSM (Tesseract), Gran Sasso (Xenon and Darwin/XLZD)

### Idea:

- propose a “Dark Matter Network” going beyond “information desk”
- some positive feedback from HEPHY Vienna, U Bonn, and informal discussions at DESY