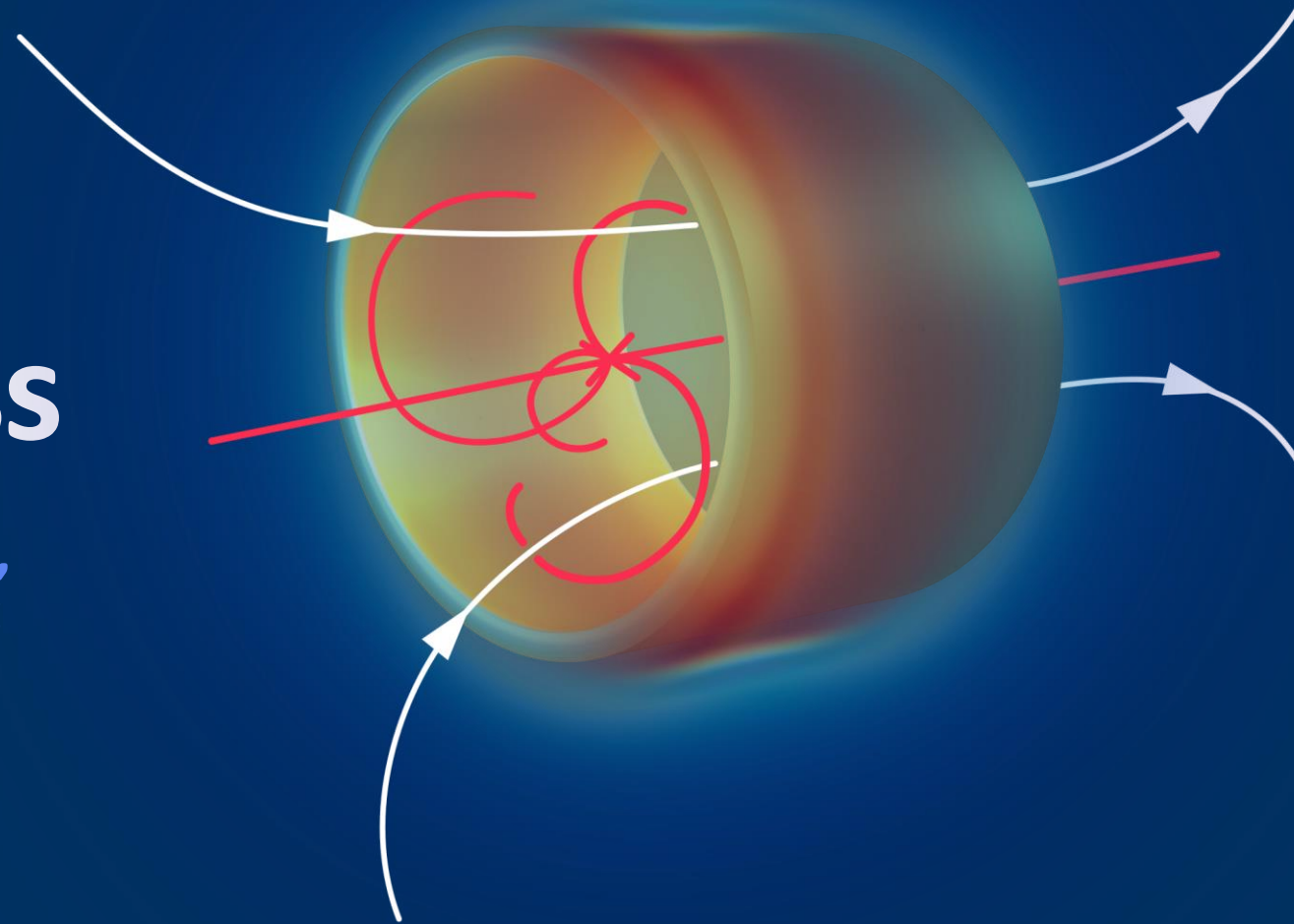


# Opening Address

Matthias Mentink and Toru Ogitsu,  
Superconducting Detector Magnet  
Workshop

12/9/22



# Introduction

- The Superconducting Detector Magnet Workshop is organized by CERN and KEK, and is hosted at CERN in hybrid format
- For the purpose of:
  - Addressing the issue of commercial availability of aluminum-stabilized conductor technology for future superconducting detector magnets
  - Informing the community of on-going and future projects
  - To exchange ideas, concepts, best practices, and to advance superconducting detector magnet technology
  - Fostering collaboration
- With 88 participants (55 on-site and 33 online) from 36 institutes and companies
- **Welcome!**



# Aluminum-stabilized conductor technology & possible alternatives

The aluminum-stabilized Nb-Ti/Cu conductor is the traditional workhorse that is used in nearly all superconducting detector magnets

For a given amount of mass, aluminum-based superconducting conductors give strong performance needed for superconducting detector magnets:

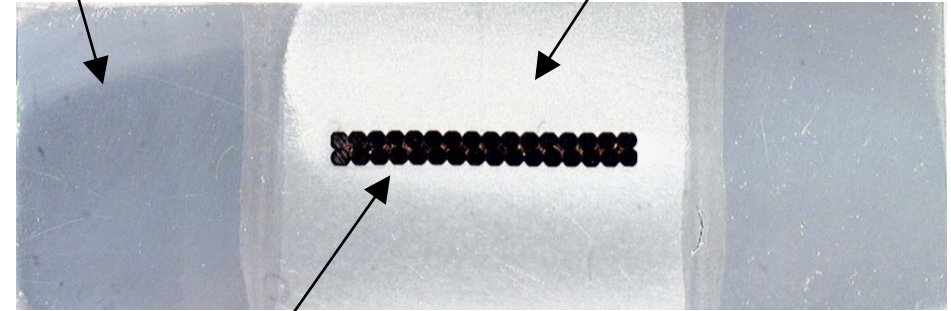
- Significant heat capacity for a given amount of weight
- Excellent electrical and thermal conductivity at 4 K (pure or nickel-doped aluminum)
- Very good mechanical properties (nickel-doped aluminum or aluminum-alloy)
- Affordable, in combination with superconducting Nb-Ti/Cu Rutherford cables

→ However, in recent years, commercial availability has been an issue

Can we obtain it? Do viable alternatives exist?

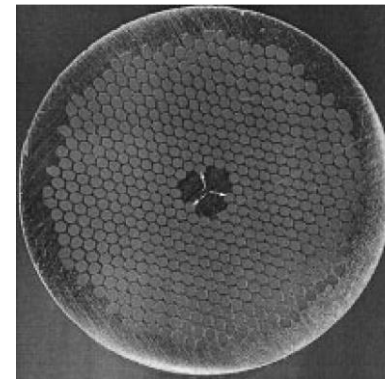
Aluminum-alloy for mechanical reinforcement

Pure aluminum for excellent electrical and thermal properties



Nb-Ti/Cu Rutherford cable

Courtesy: The CMS collaboration



Cross-section of a Nb-Ti/Cu strand used in the CMS conductor (Blau et al, "The CMS conductor", IEEE Trans 2002)

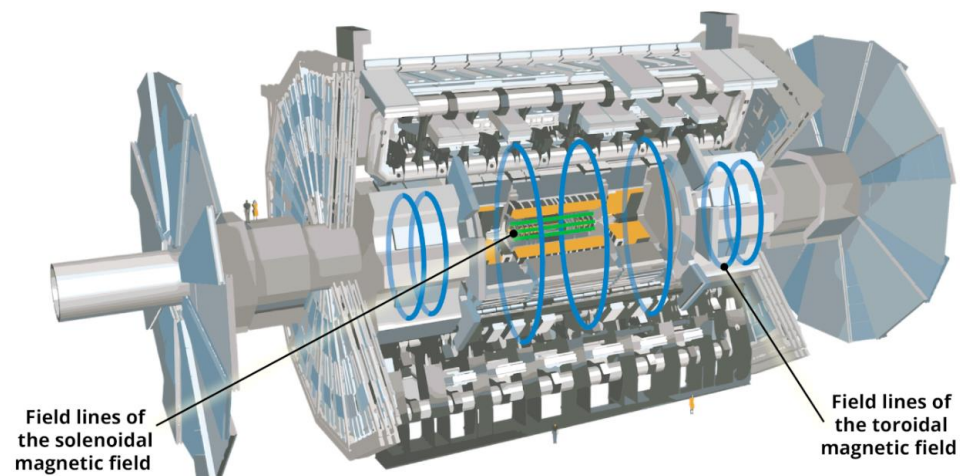
# Historical experiences of the ATLAS and CMS magnet projects

## Very large superconducting detector magnet projects!

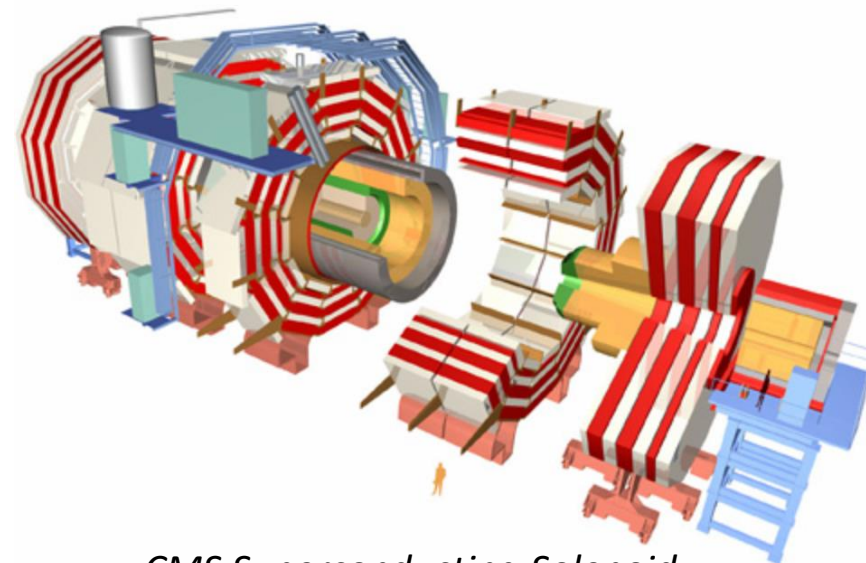
- Time-scale for engineering design and validation effort, the construction, and the commissioning: More than 15 years each
- Production of components (conductor, coils, support structure, etc) in industry, and subsequent assembly at CERN
- Designed, constructed, commissioned, and maintained with strong support from multiple institutes:
  - ATLAS: CEA-Irfu, KEK, INFN-LASA, RAL, NIKHEF, JINR-Dubna, IHEP-Protvino, ITAM Novosibirsk, CERN
  - CMS: CEA-Irfu, ETH Zurich, INFN Genoa, University of Wisconsin, Fermilab, ITEP Moscow, CERN

## Important lessons:

- For large superconducting detector magnets a long-term strategy is needed
- **The historical importance of collaboration is evident**



*ATLAS Superconducting magnets*



*CMS Superconducting Solenoid*

# Acknowledgements

Welcome address: Joachim Mnich, Director of Research and Computing (CERN)

Program committee: Benoit Cure (CERN), Lionel Quettier (CEA), Renuka Rajput-Ghoshal (JLab/BNL), Vadim Kashikhin (Fermilab), Ken-ichi Sasaki (KEK), Yasuhiro Makida (KEK), and **Akira Yamamoto** (Chair, KEK)

Local organizing committee: Nikkie Deelen (CERN) and Connie Potter (CERN)

The speakers, the participants of the preparation meetings, and the participants of the workshop

**Thank you very much for all your efforts and let us have a productive workshop!**