



HELMHOLTZ ZENTRUM
DRESDEN ROSSENDORF

CELLEAR Community Meeting 2022
November 28 – 30

Closing Remarks

Konrad Schmidt



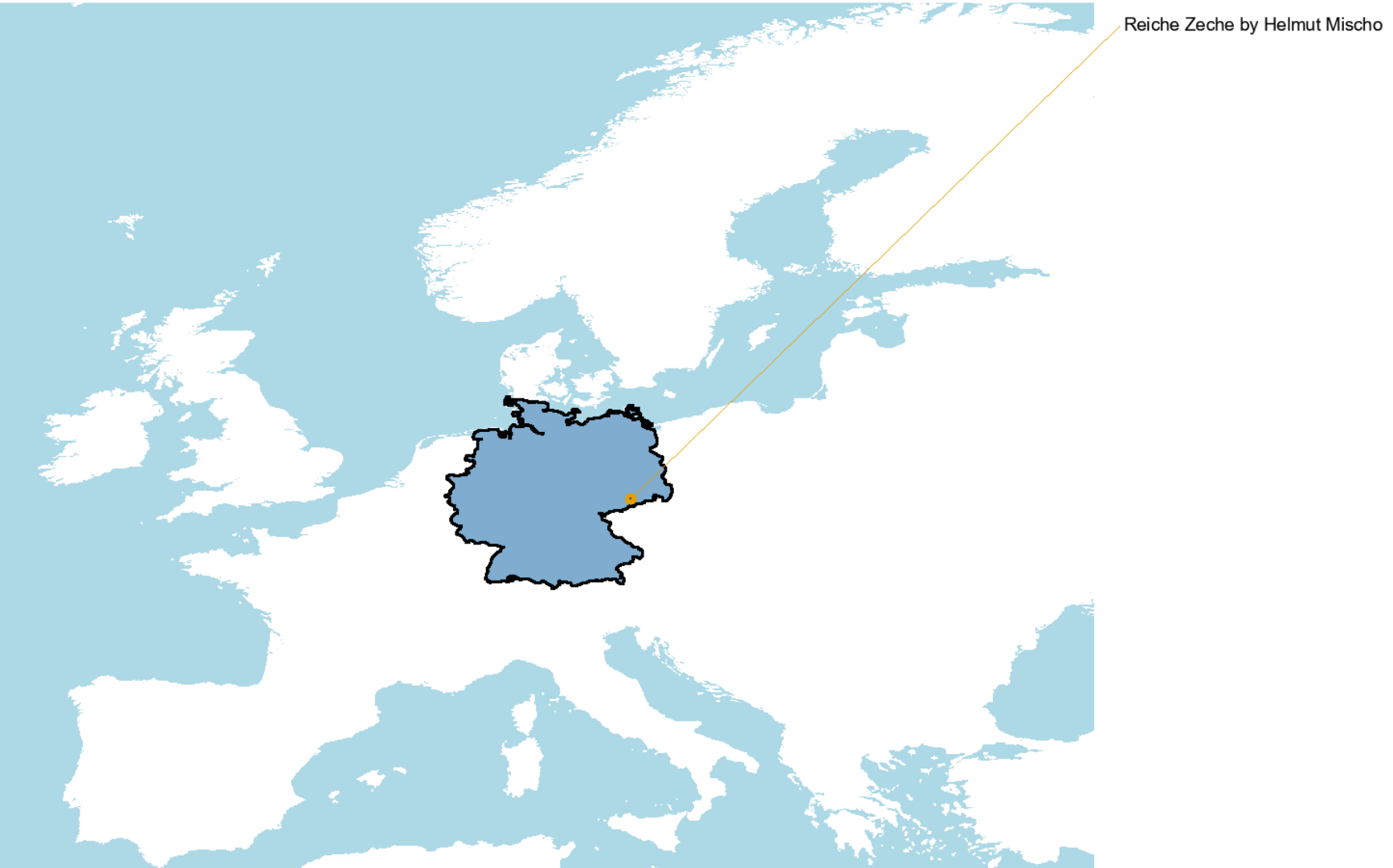
Institute of Radiation Physics · Division of Nuclear Physics · konrad.schmidt@hzdr.de · www.hzdr.de



CELLAR Community Meeting 2022 – a trip through Europe



CELLAR Community Meeting 2022 – a trip through Europe



CELLAR Community Meeting 2022 – a trip through Europe

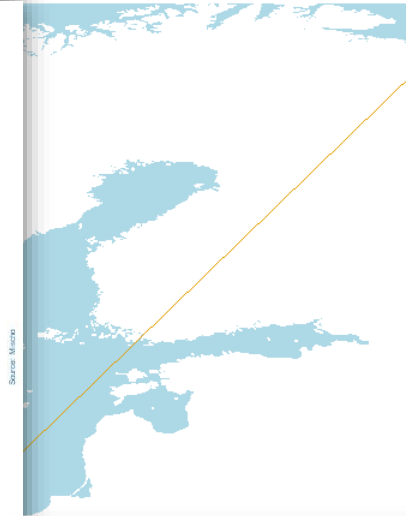


Example Forschungs- und Lehrbergwerk Reiche Zeche



Univ.-Prof. Dr.-Ing. Helmut Mischo, Pr. Eng.
Professur für Rohstoffabbau und Spezialverfahren unter Tage
Wissenschaftlicher Direktor des Forschungs- und Lehrbergwerkes

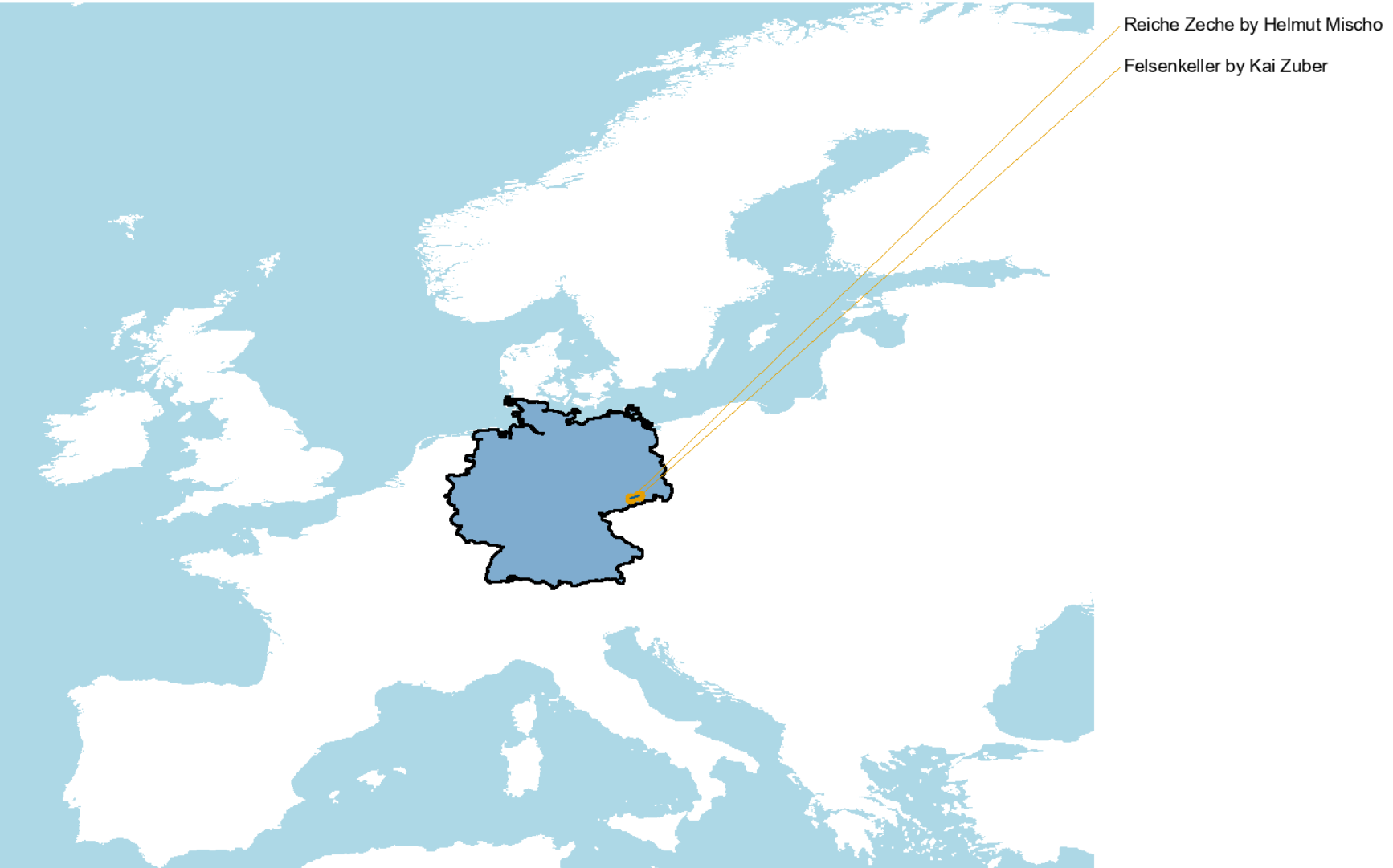
TU Bergakademie Freiberg
Fuchsmühlenweg 9
09599 Freiberg



Reiche Zeche by Helmut Mischo



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Summary

- Neutrino-less double beta decay is a very hot topic in science
- There is no super-isotope, so different groups focus on this topic
- The observation would prove that lepton number would be violated by 2 units and thus Physics beyond the Standard Model of Particle Physics

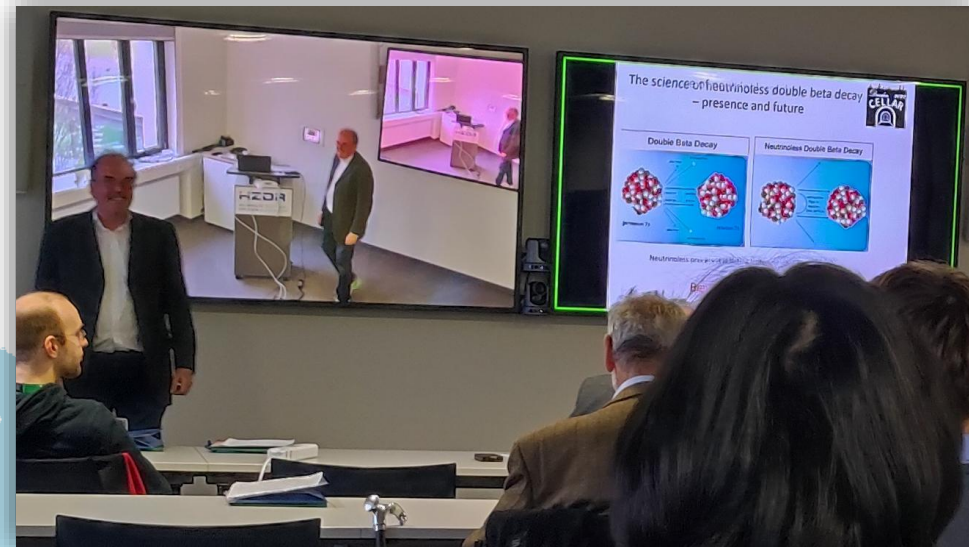


Kai Zuber, Cellar Meeting 28.11.2022

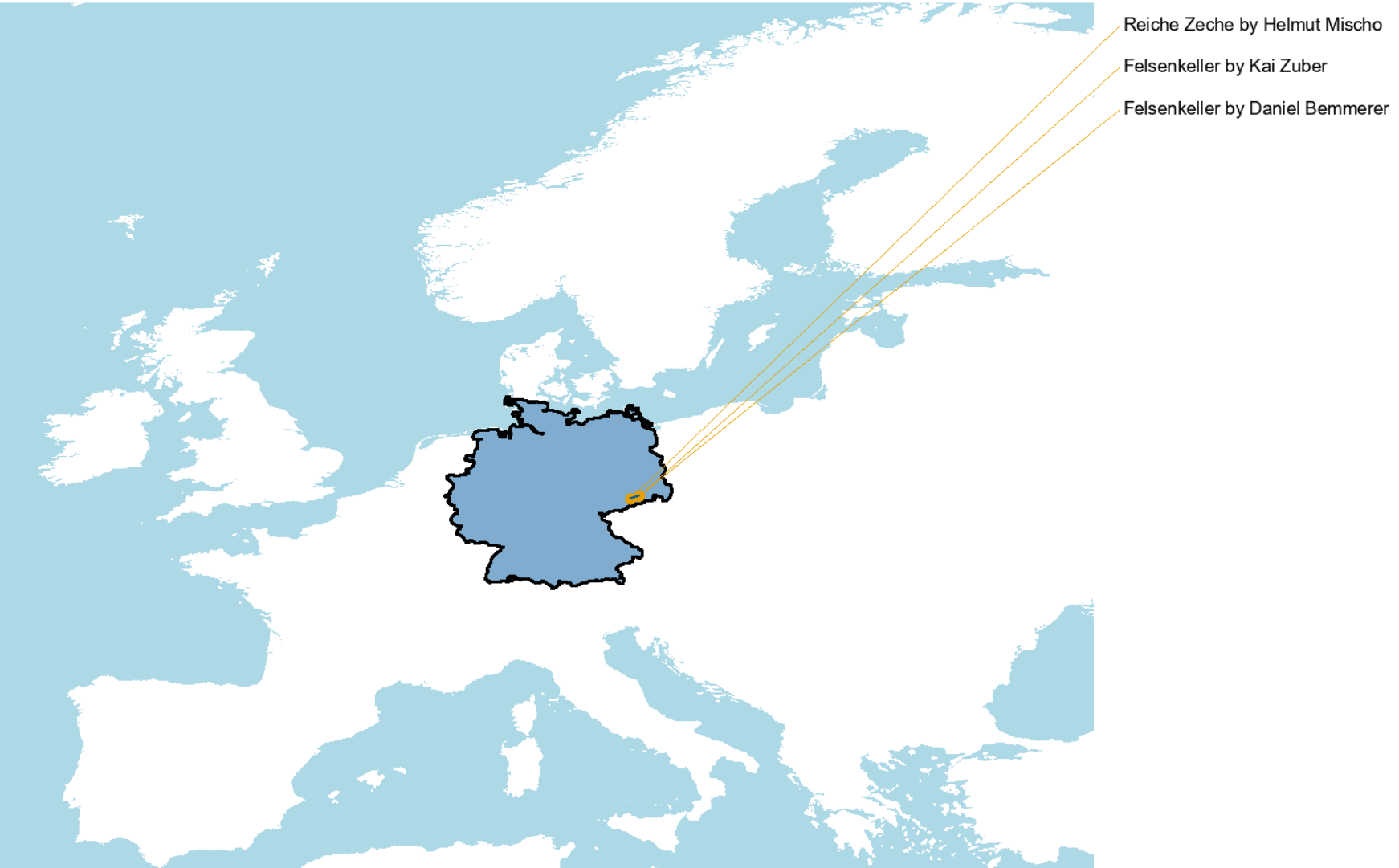


Reiche Zeche by Helmut Mischo

Felsenkeller by Kai Zuber

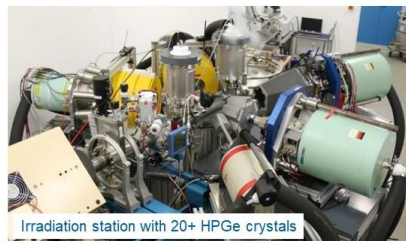


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Felsenkeller 5 MV underground ion accelerator

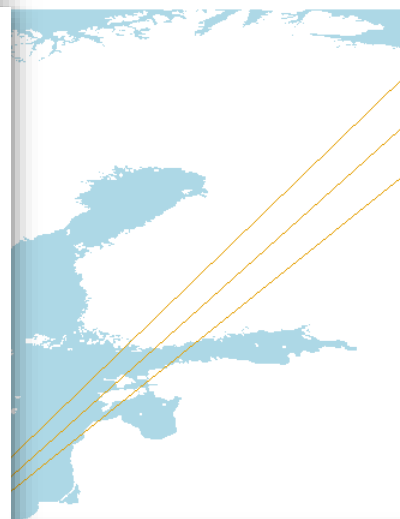


5 MV accelerator (0.4-3.8 MV), two alternative ion sources

- Internal RF ion source: 30 μA ^1H , ^4He
- SNICS sputter ion source: 30 μA ^{12}C
- 24 hour operation permitted even without operator
- Personnel is allowed at target while beam is on
- Control and counting rooms at surface
- EU-supported transnational access available



26.11.2022 Daniel Bemmerer Nuclear astrophysics in an underground lab

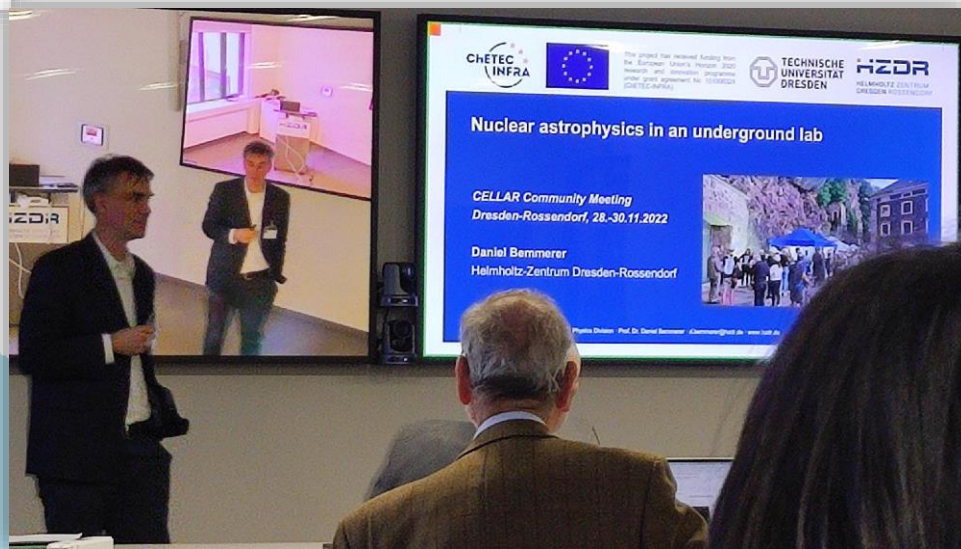


Reiche Zeche by Helmut Mischo

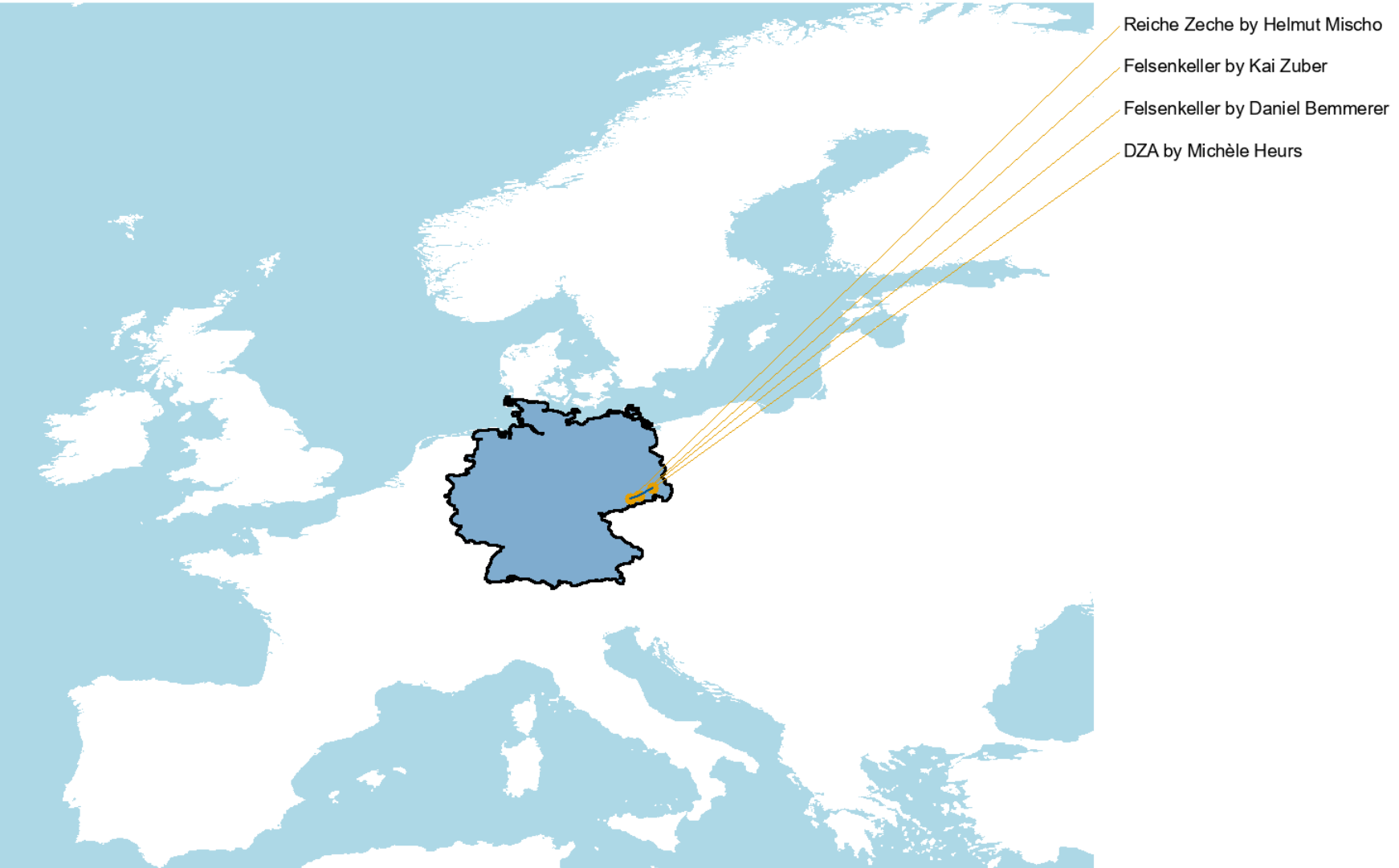
Felsenkeller by Kai Zuber

Felsenkeller by Daniel Bemmerer

21



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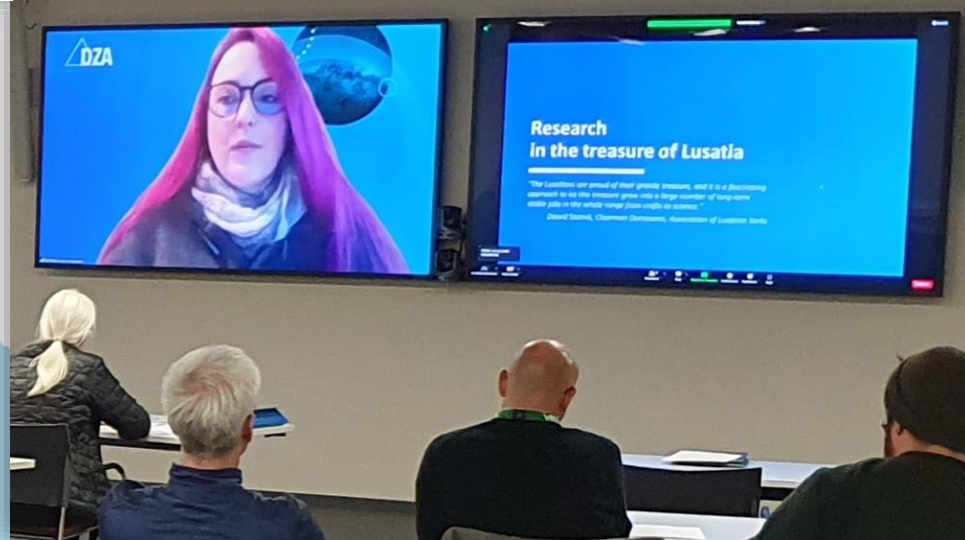
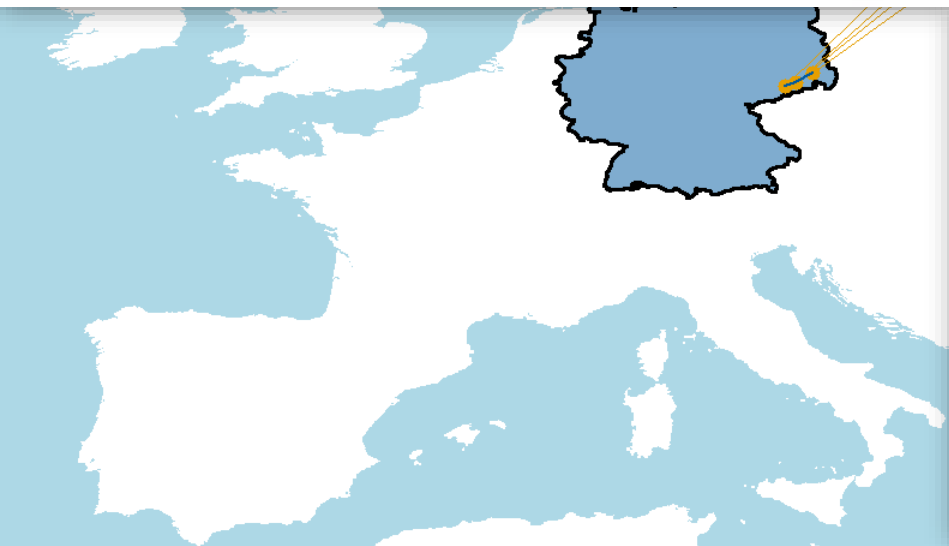
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Das Low-Seismic-Lab

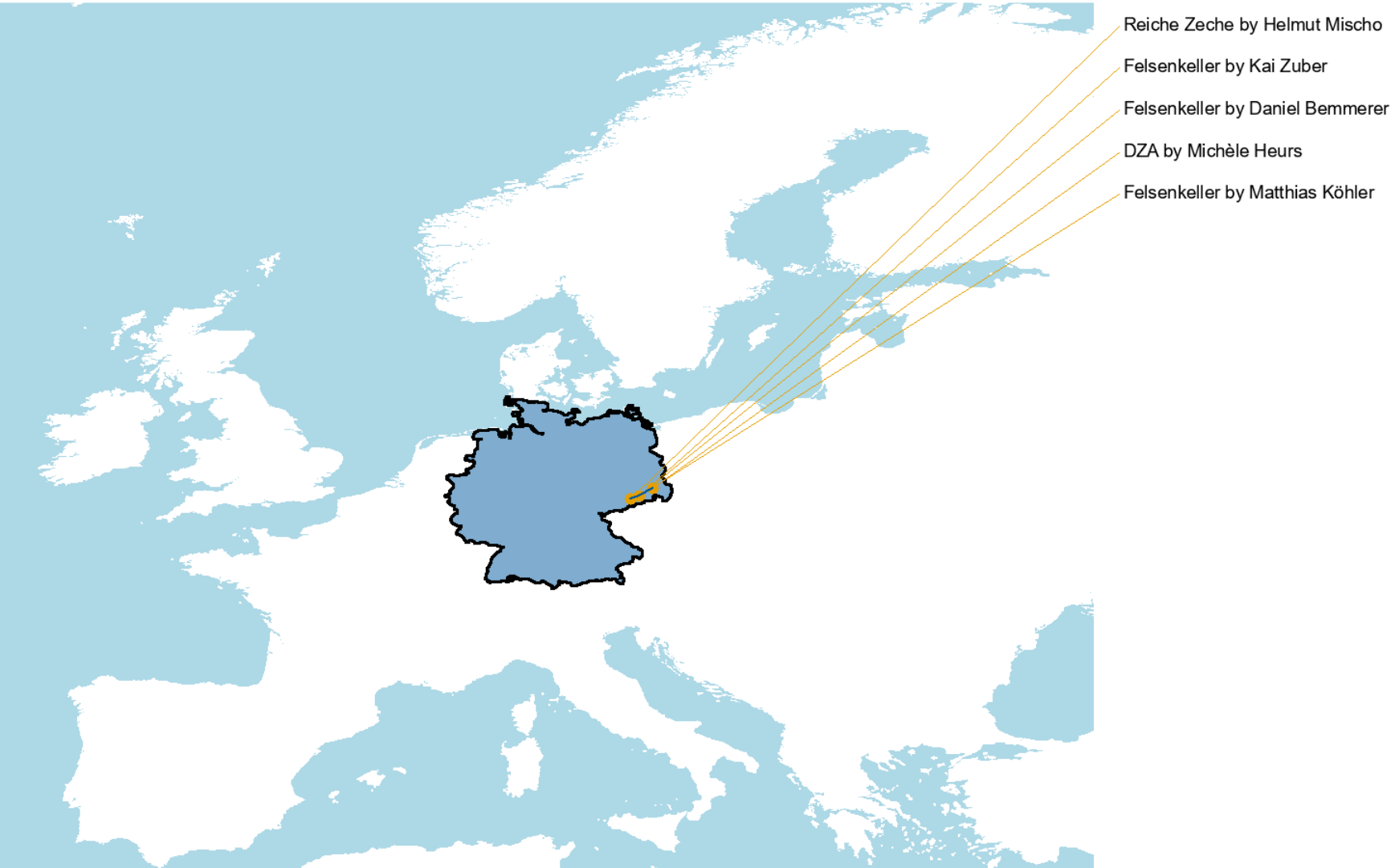
- Technology development for gravitational wave astronomy
- Adaptive seismic noise reduction
- Sub-nanometer microscopy and photolithography
- Astrophysics with accelerators



Reiche Zeche by Helmut Mischo
Felsenkeller by Kai Zuber
Felsenkeller by Daniel Bemmerer
DZA by Michèle Heurs



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UNDERGROUND LABORATORY Felsenkeller
1982 – 2022

40TH ANNIVERSARY



VKTA

40 years underground laboratory Felsenkeller

22.11.2022

Reiche Zeche by Helmut Mischo

Felsenkeller by Kai Zuber

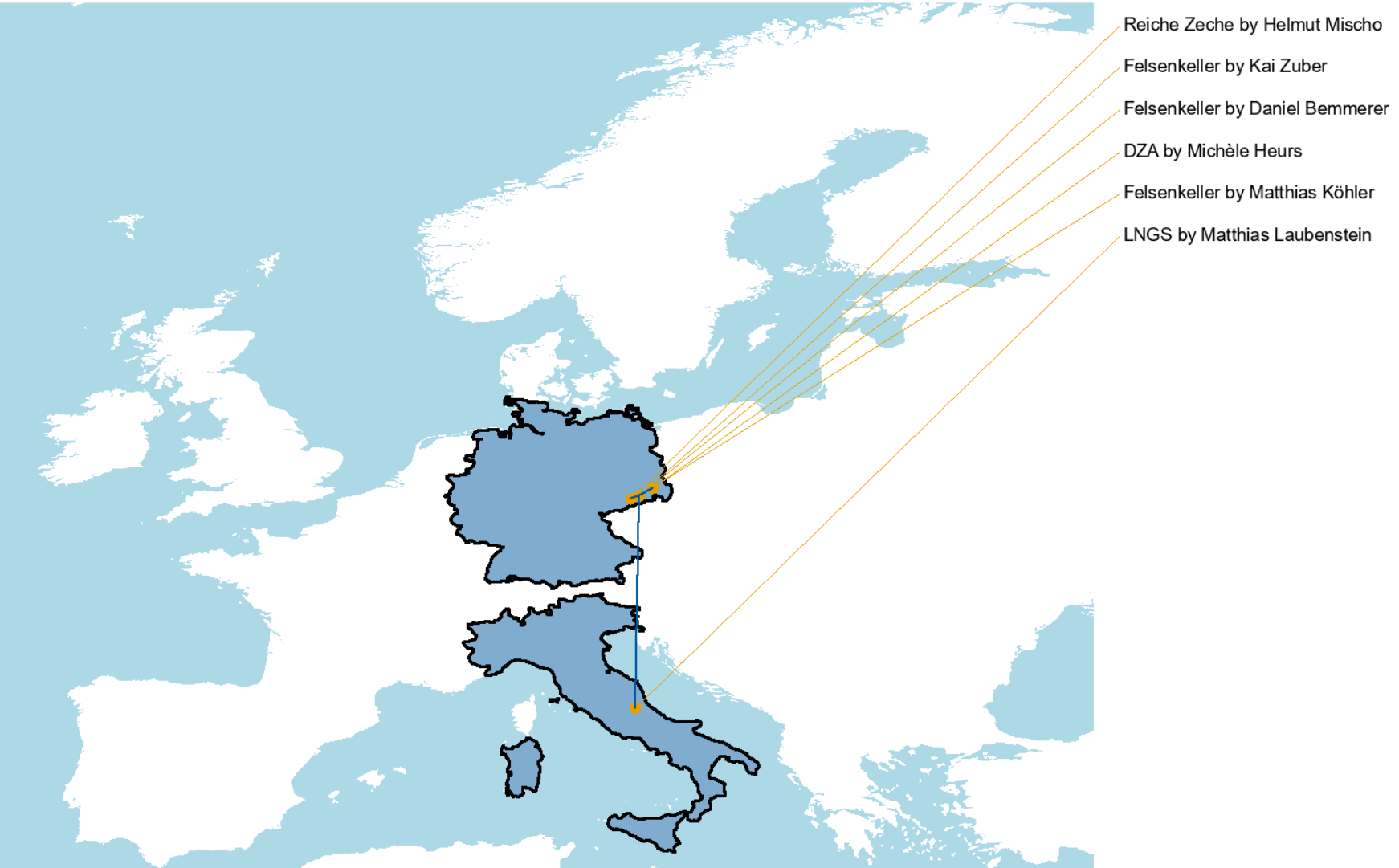
Felsenkeller by Daniel Bemmerer

DZA by Michèle Heurs

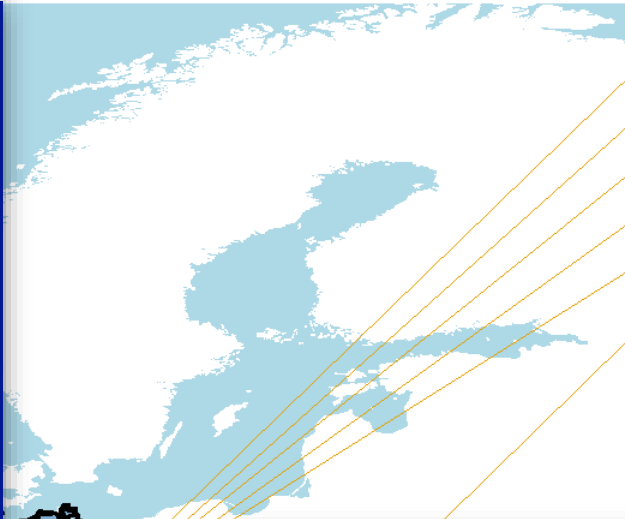
Felsenkeller by Matthias Köhler



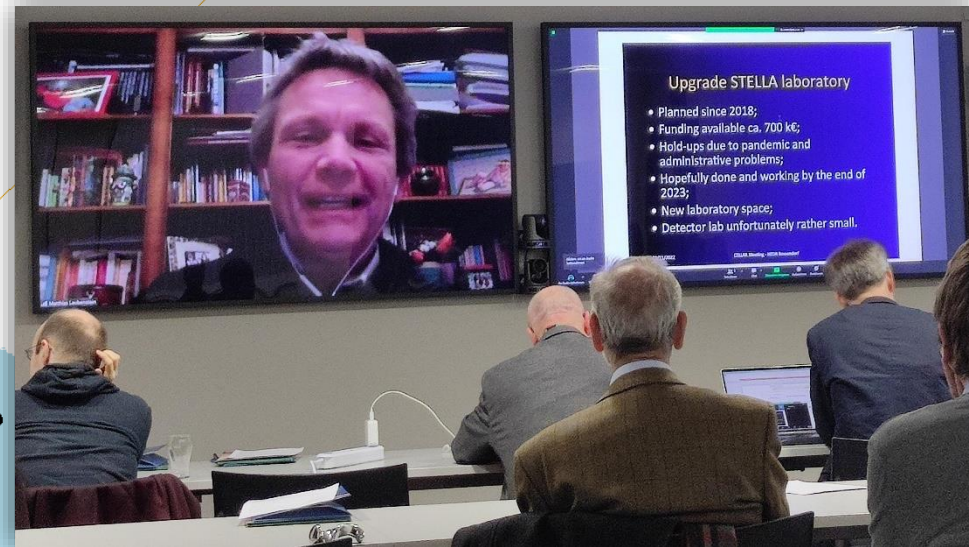
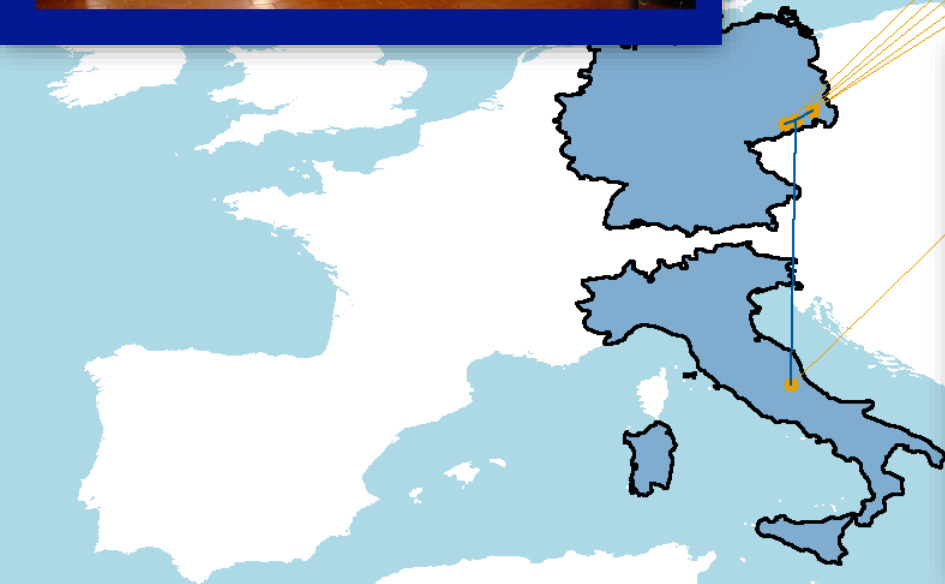
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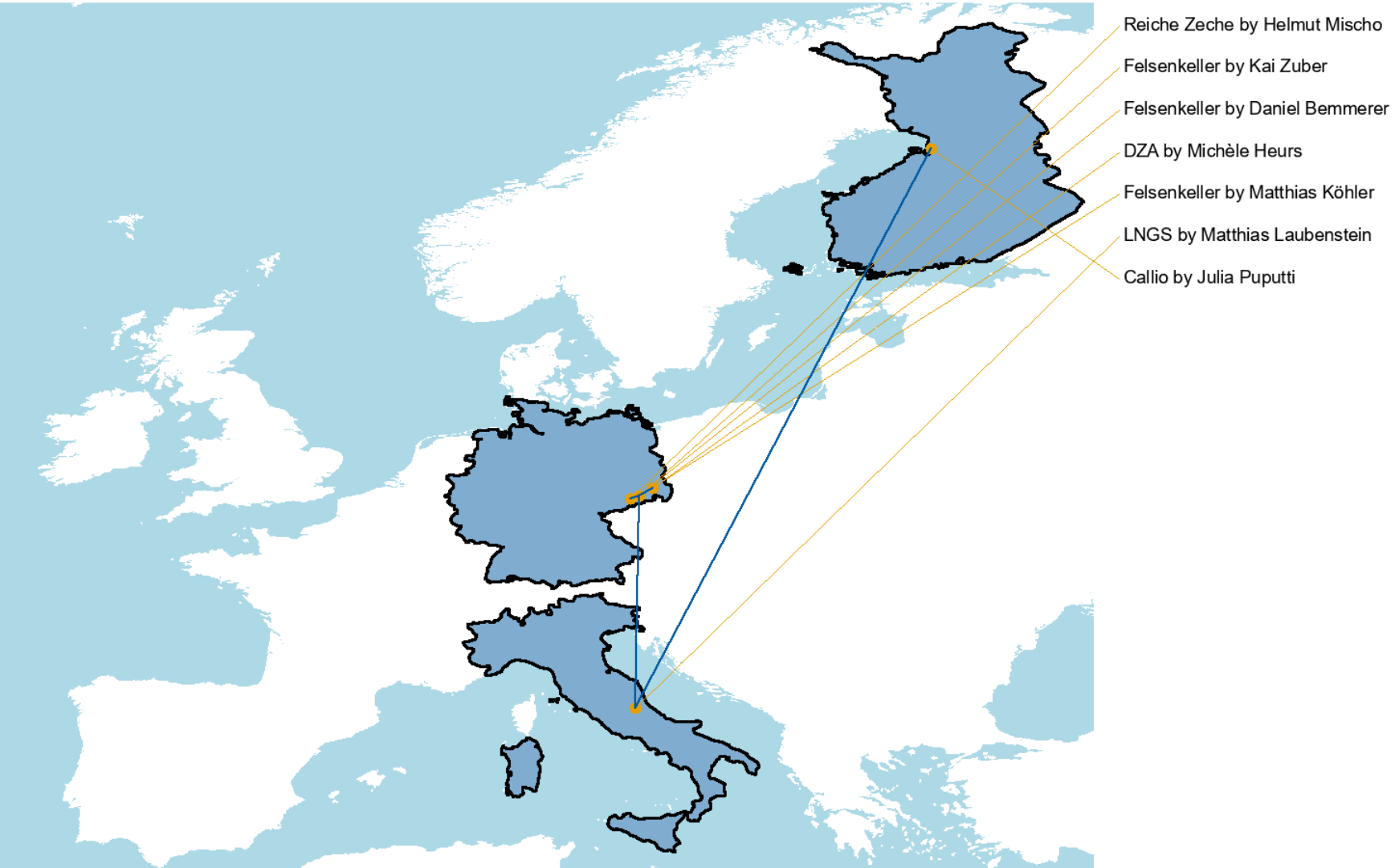
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- Reiche Zeche by Helmut Mischo
- Felsenkeller by Kai Zuber
- Felsenkeller by Daniel Bemmerer
- DZA by Michèle Heurs
- Felsenkeller by Matthias Köhler
- LNGS by Matthias Laubenstein



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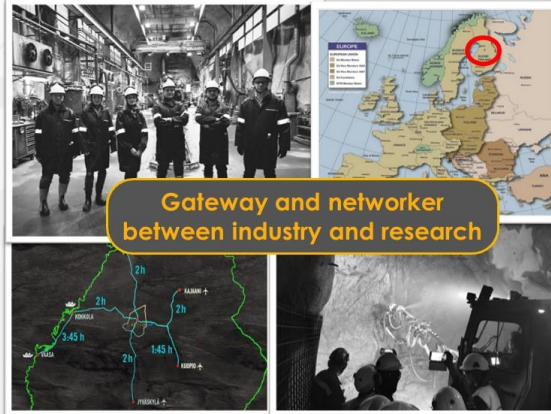
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CALLIO LAB at the Pyhäsalmi Mine, in Pyhäjärvi Finland

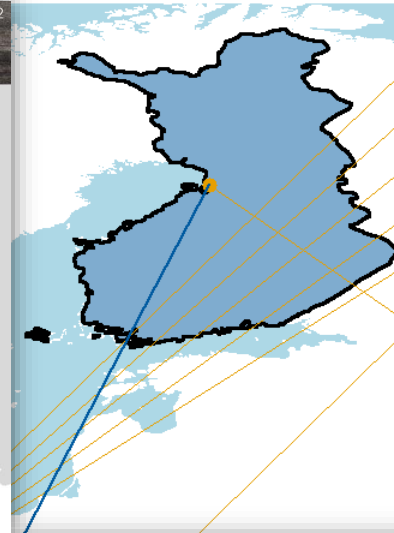
- LOCATED AT THE 1.4 KM DEEP PYHÄSALMI MINE, IN PYHÄJÄRVI, FINLAND (~4000 M.W.E.)
- UNDERGROUND MINING 1962-2022
- POST-MINING ACTIVITIES COORDINATED BY THE PYHÄJÄRVI TOWN OWNED **CALLIO PYHÄJÄRVI**
- SCIENTIFIC ACTIVITIES ARE COORDINATED THROUGH CALLIO LAB

Owner of site: Pyhäsalmi Mine
Reuse coordinator: Callio Pyhäjärvi
Scientific coordination: Callio Lab

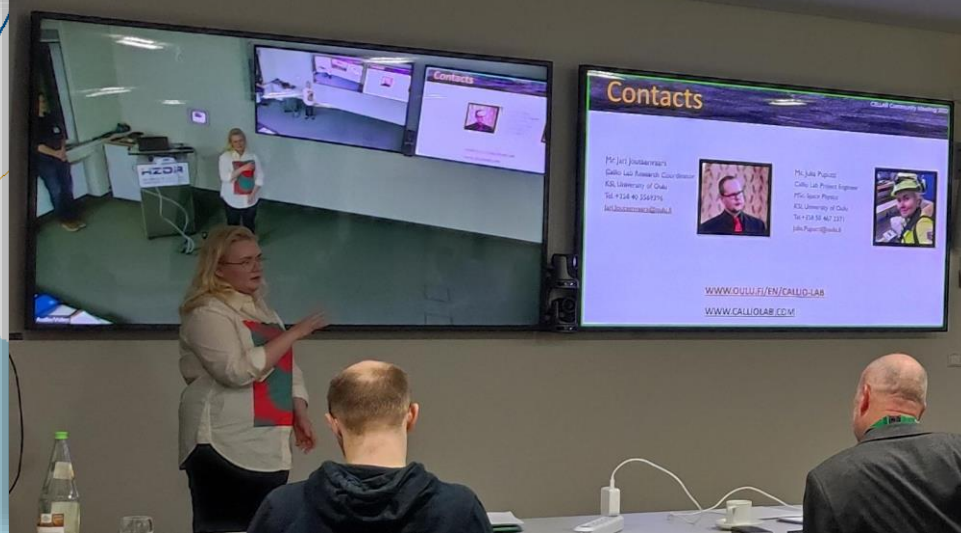
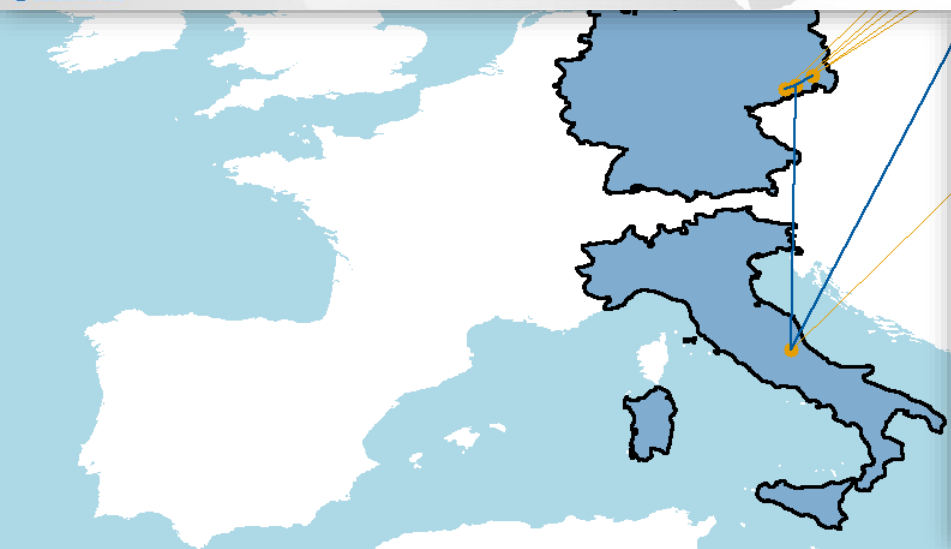
UNIVERSITY OF OULU



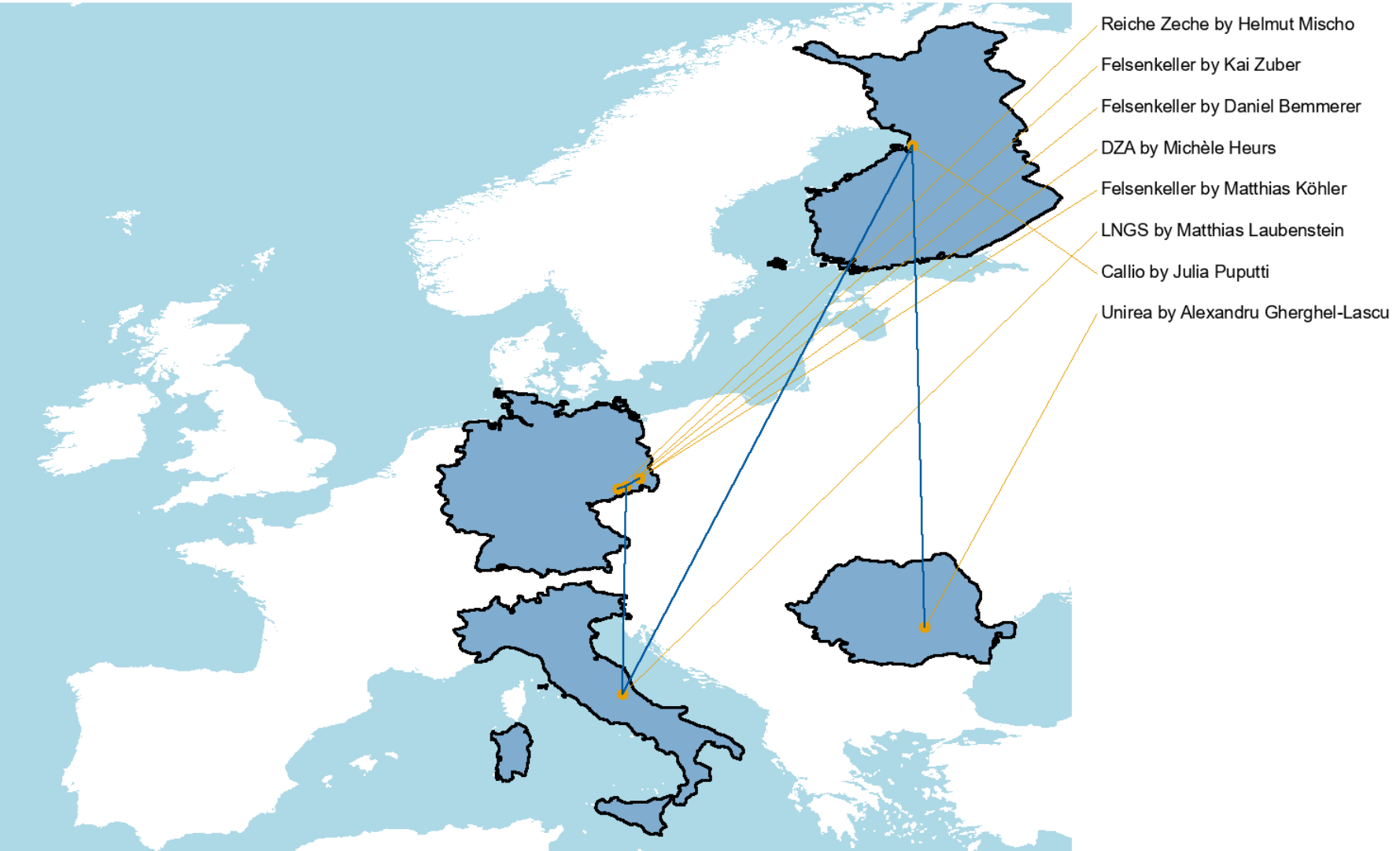
Gateway and networker
between industry and research



Reiche Zeche by Helmut Mischo
Felsenkeller by Kai Zuber
Felsenkeller by Daniel Bemmerer
DZA by Michèle Heurs
Felsenkeller by Matthias Köhler
LNGS by Matthias Laubenstein
Callio by Julia Puputti



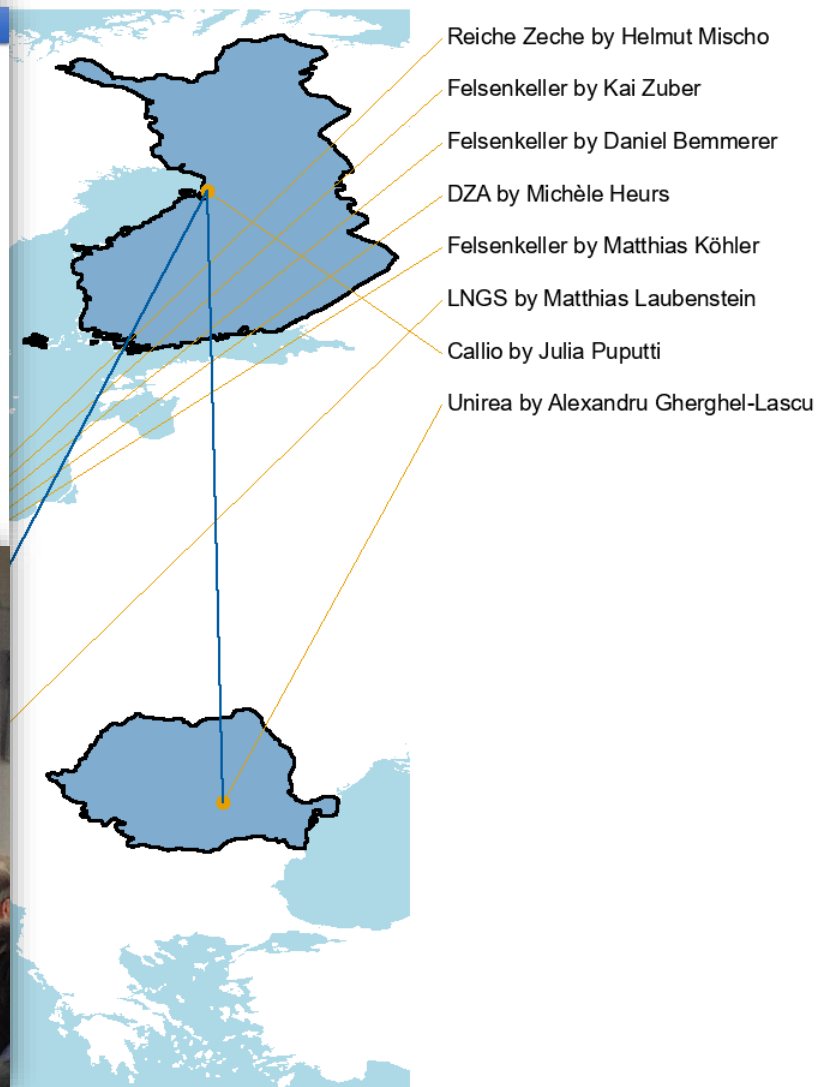
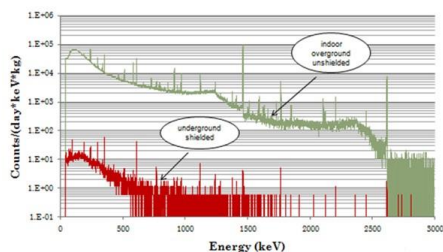
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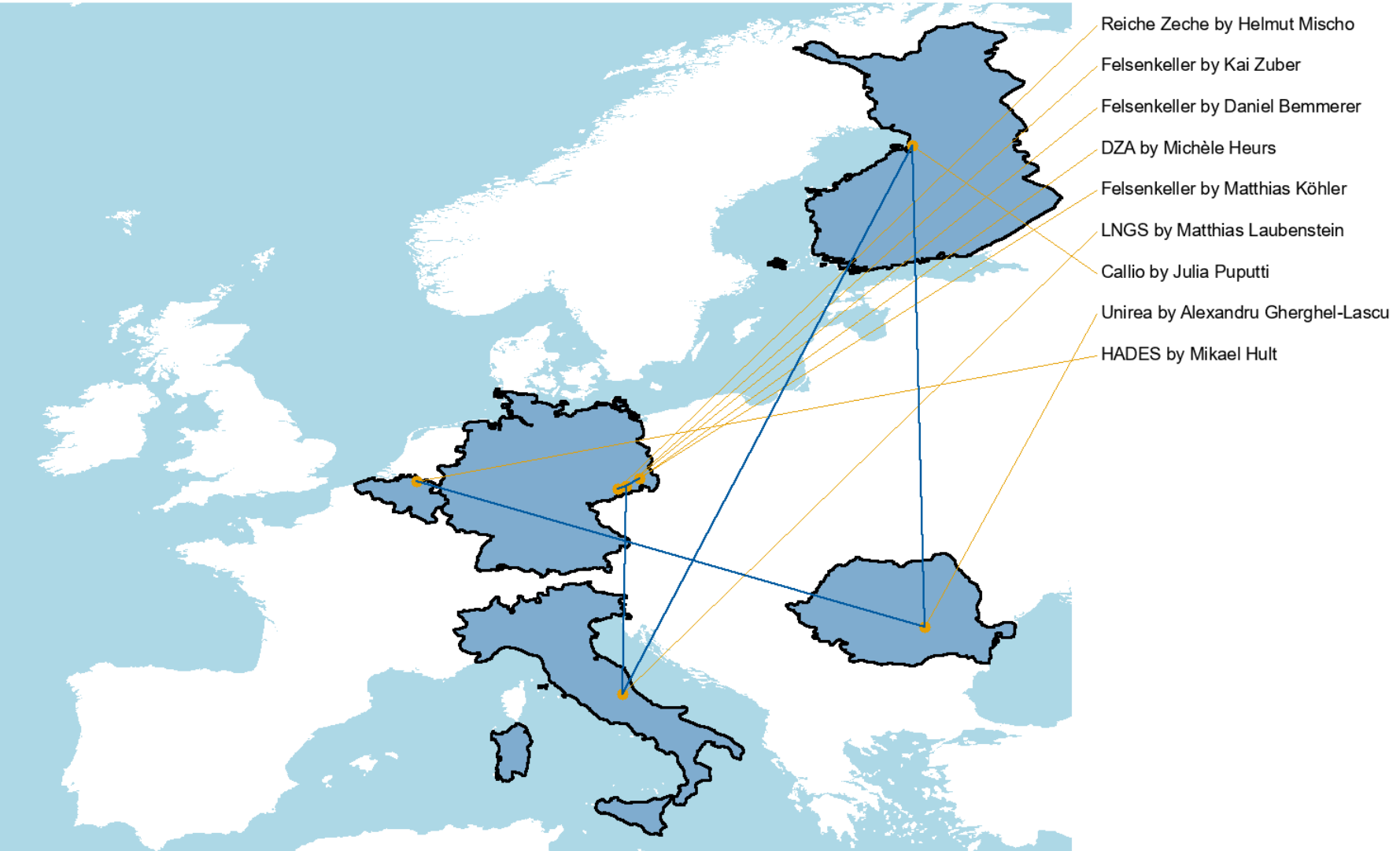
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Low background Gamma spectrometry

CANBERRA GeHP rel. ef. 136%



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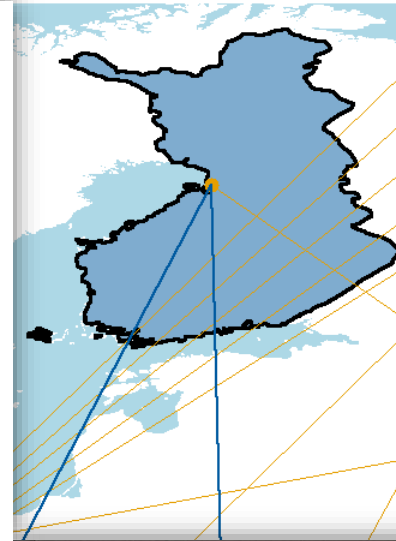
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HADES

- 8 ultra low-background HPGe-detector systems
 - SAGE-well detectors, BEGe, REGe, XtRa
- 2 systems for scanning deadlayers (via LEGEND)
- 2 Systems for detector testing (via LEGEND)
- Storage of materials (including a “normal” freezer)
- ISO/IEC 17025

• [Science in the deep underground. Short version^o – YouTube](#)

European Commission



Reiche Zeche by Helmut Mischo

Felsenkeller by Kai Zuber

Felsenkeller by Daniel Bemmerer

DZA by Michèle Heurs

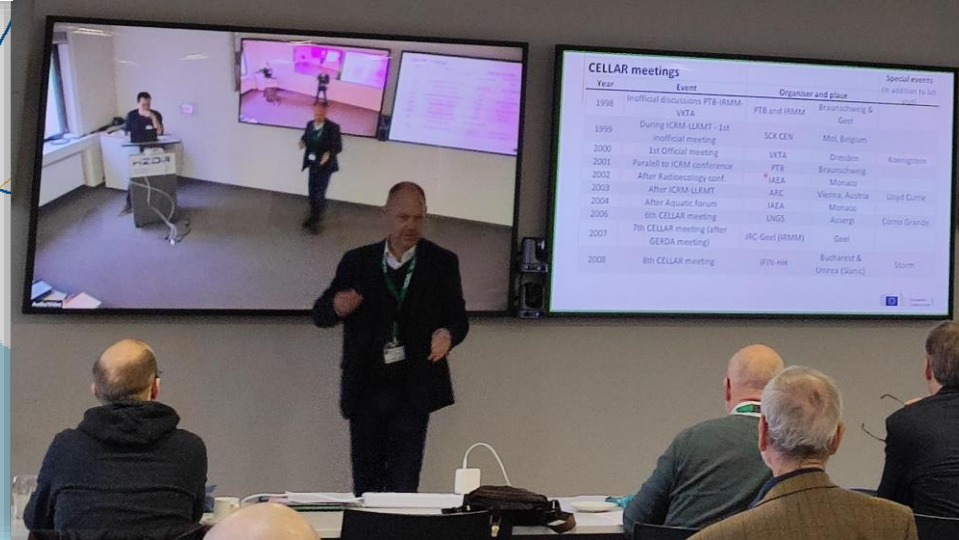
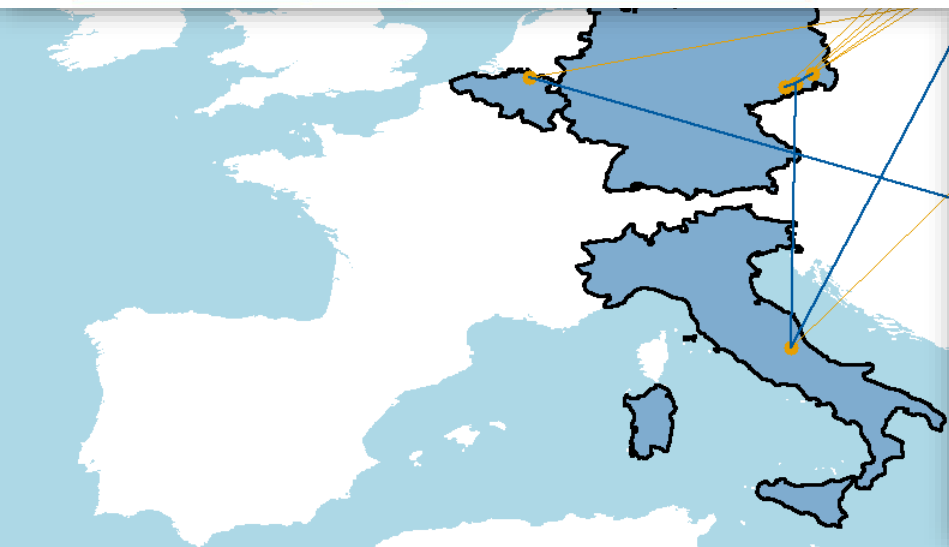
Felsenkeller by Matthias Köhler

LNGS by Matthias Laubenstein

Callio by Julia Puputti

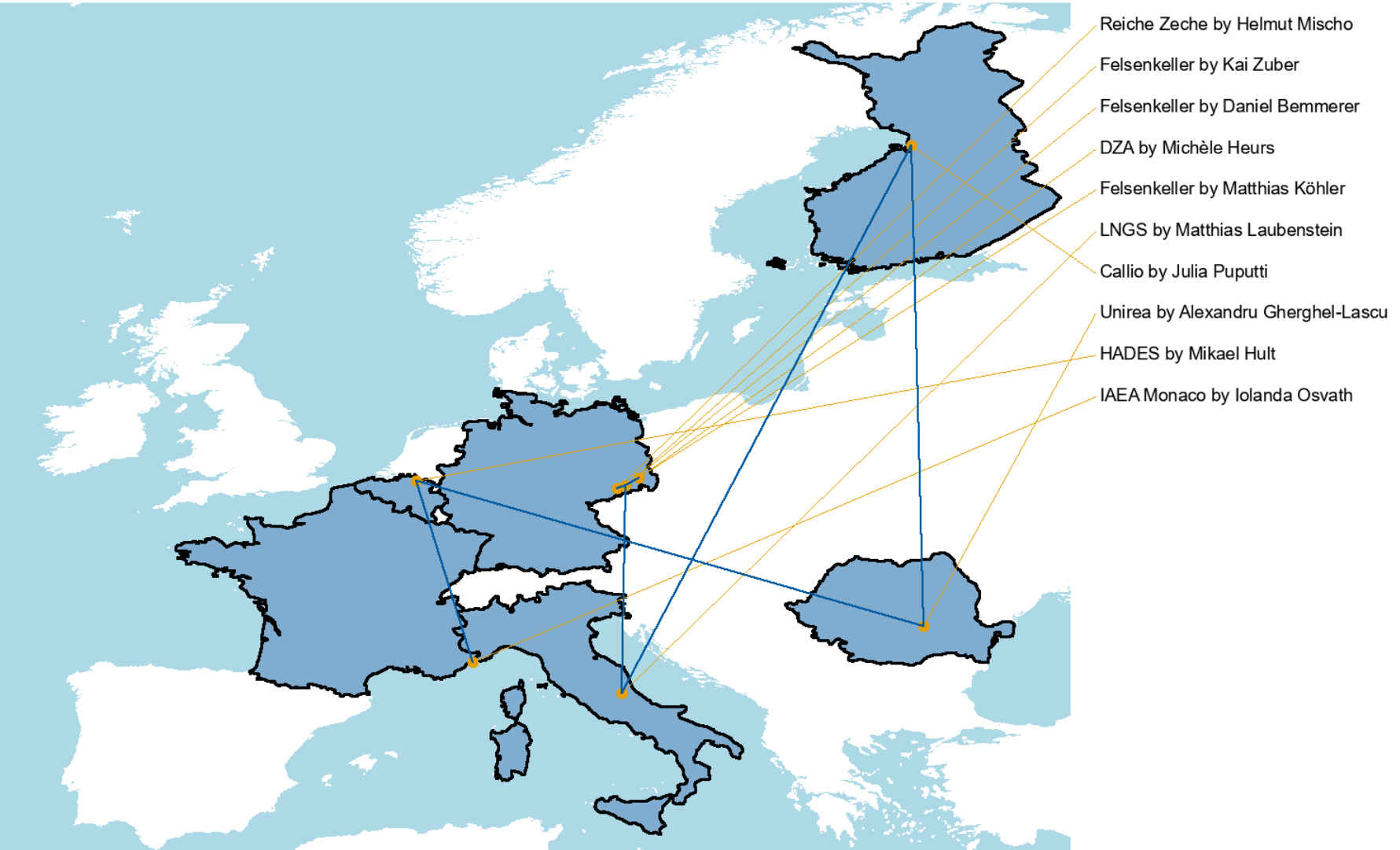
Unirea by Alexandru Gherghel-Lascu

HADES by Mikael Hult



Year	Event	Organiser and place	Special events (in addition to the main event)
1998	Informal discussions PTB (BRM) - VKTA	PTB and BRM	Braunschweig & Göttingen
1999	During ICM-LUMAT - 1st informal meeting	SOX CEN	Mel, Belgium
2000	1st Official meeting	VKTA	Dresden
2001	Parallel to ICM conference	PTB	Braunschweig
2002	After Radiology conf	IAEA	Moscow
2003	After ICM LUMAT	AKC	Vienna, Austria
2004	After Aquatic forum	IAEA	Moscow
2006	6th CELLAR meeting	LNGS	Acropolis
2007	7th CELLAR meeting (after GEMMA meeting)	IRC-Gem (BRM)	Gem
2008	8th CELLAR meeting	IFN-KH	Bucharest & Unirea (Romania)

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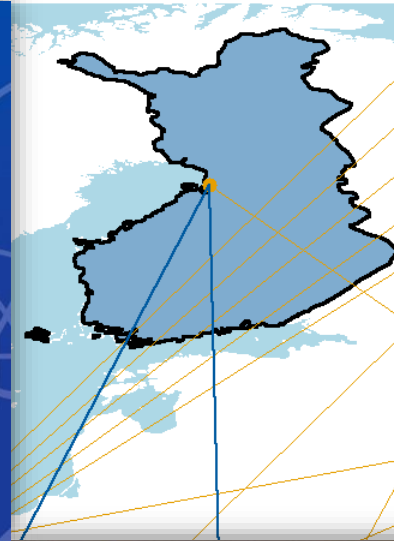
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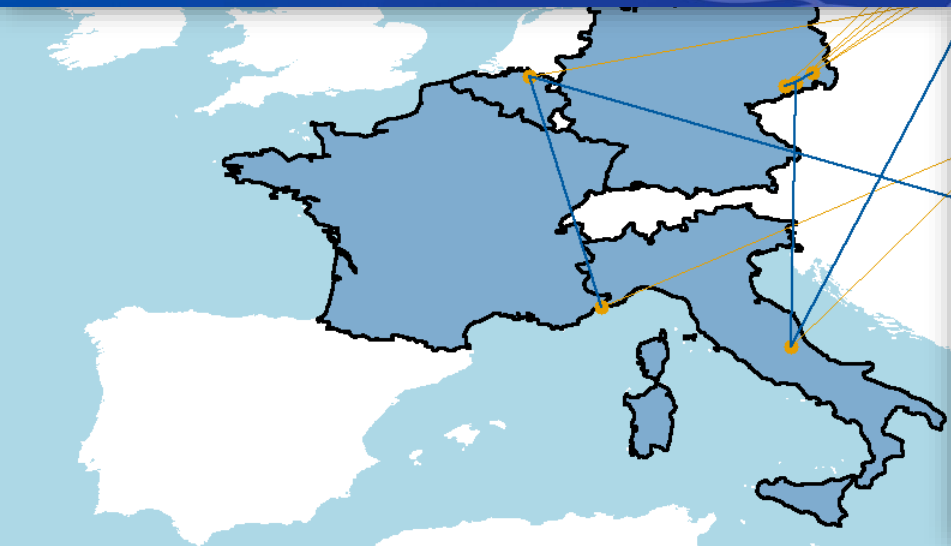
IAEA's underground laboratory in Monaco: upgrades and projects

Iolanda Osvath
IAEA Marine Environment Laboratories, Monaco

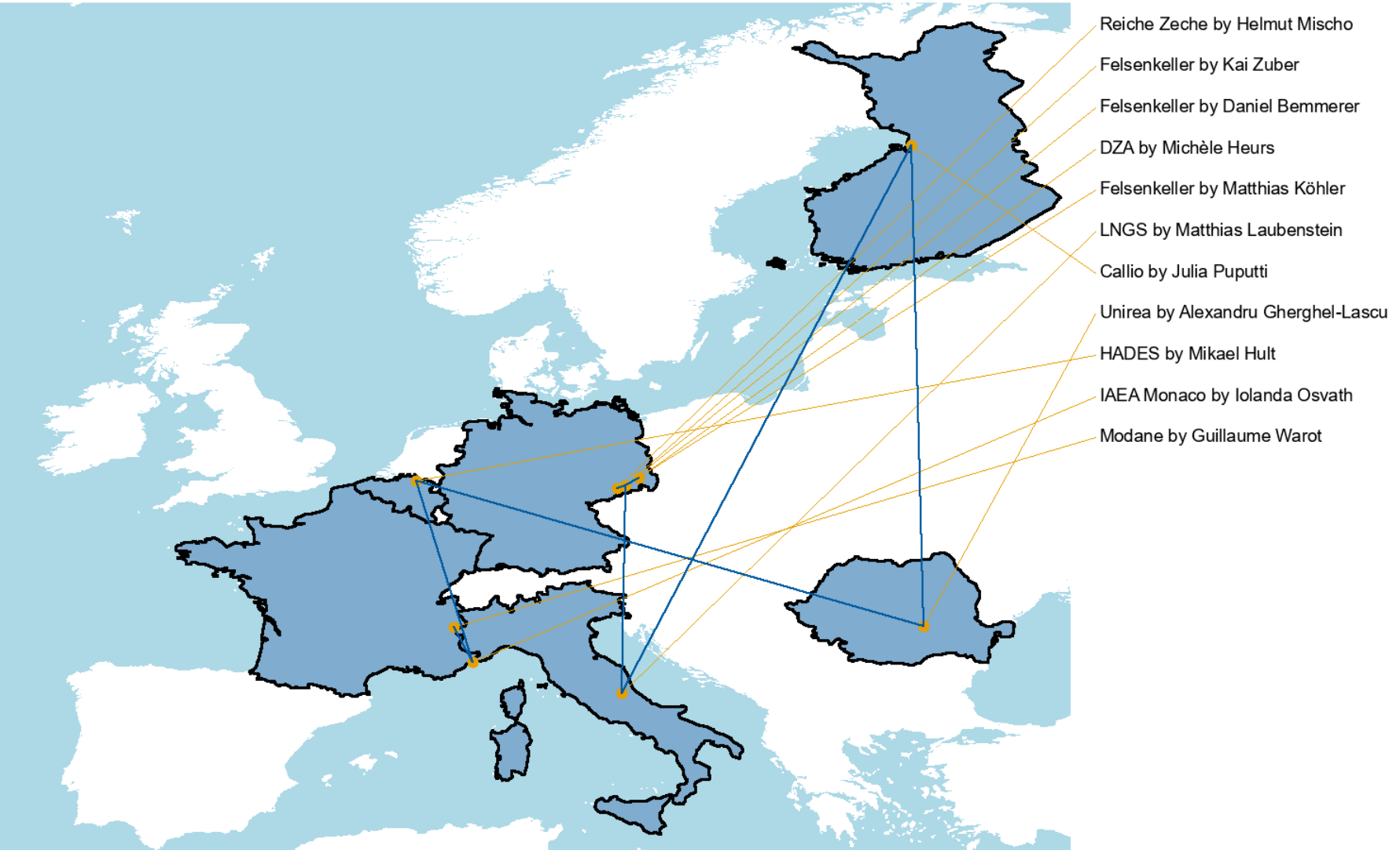
CELLAR Community Meeting, Dresden, 28-30.11.2022



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Unirea by Alexandru Gherghel-Lascu
HADES by Mikael Hult
IAEA Monaco by Iolanda Osvath



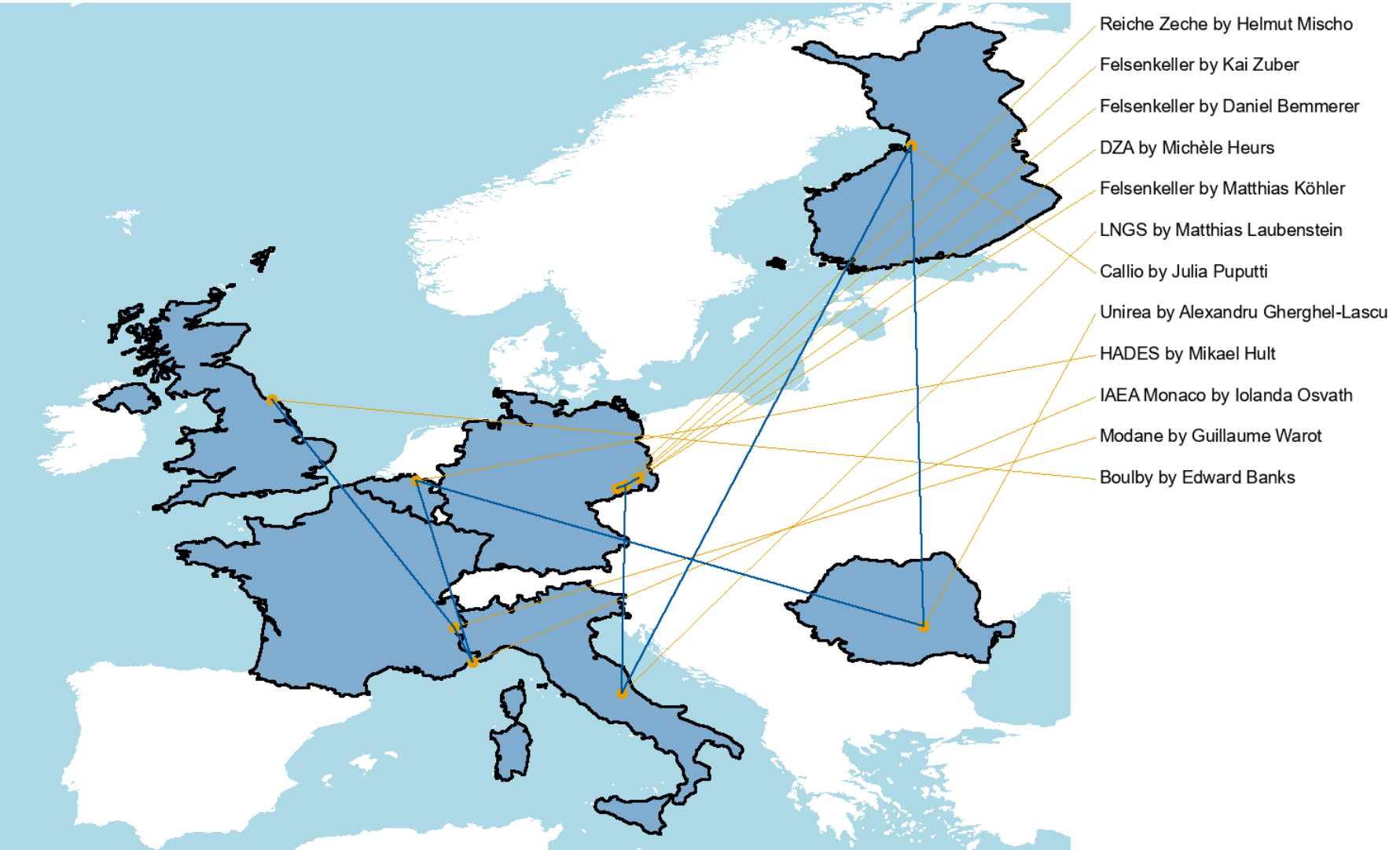
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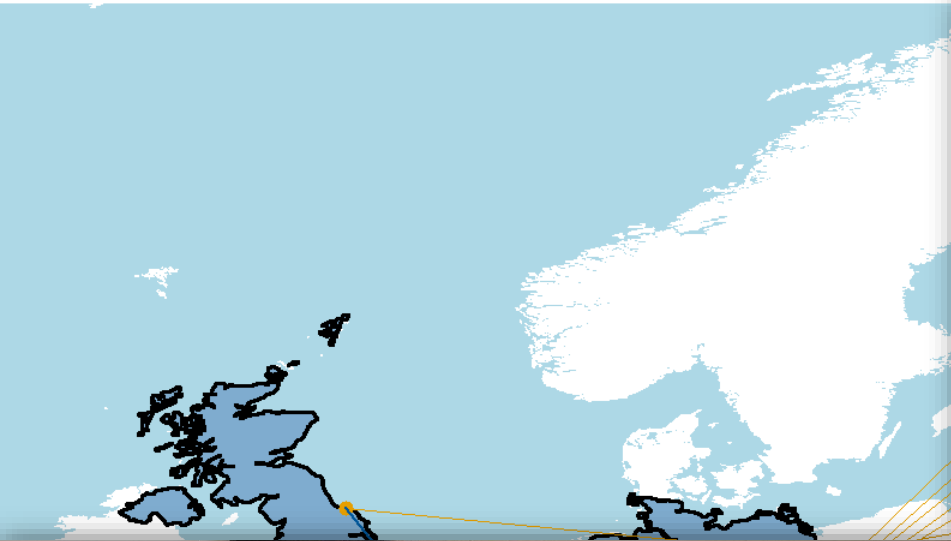
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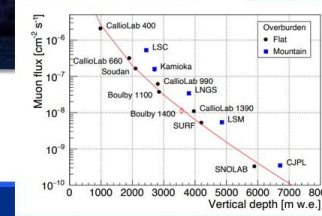
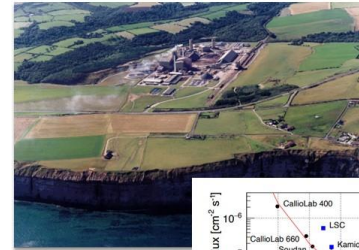
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Boulby Underground Laboratory

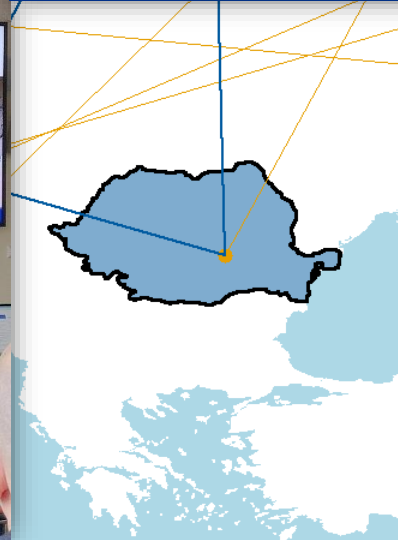


- The UK's deep underground science facility at 1.1km
- One of six STFC sites
- Low natural radon levels (3 Bq/m³)
- Diverse science programme
- Science and industry partnership

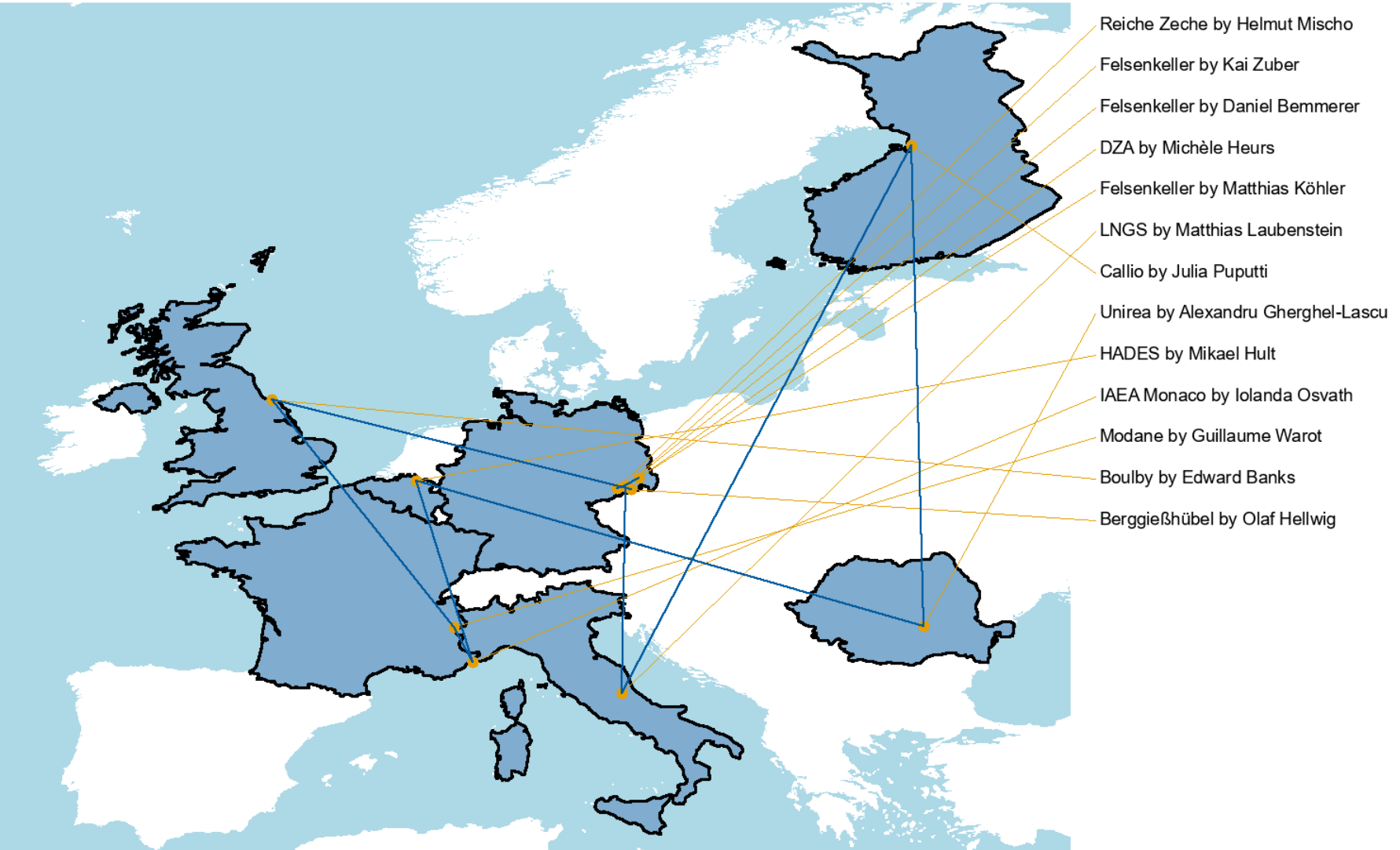


Modane by Guillaume Warot

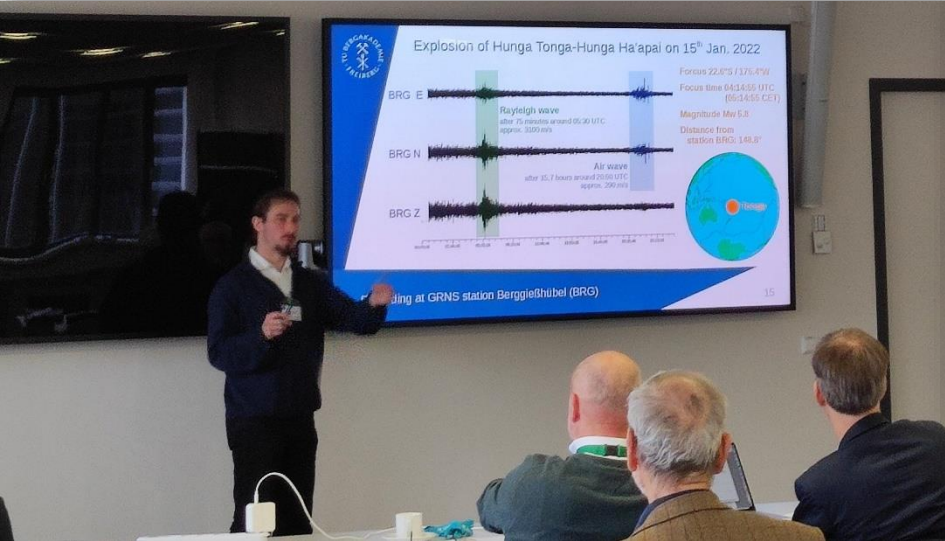
Boulby by Edward Banks



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Seismological observatory and underground lab

Former exploration tunnel from iron ore mining (today main access)

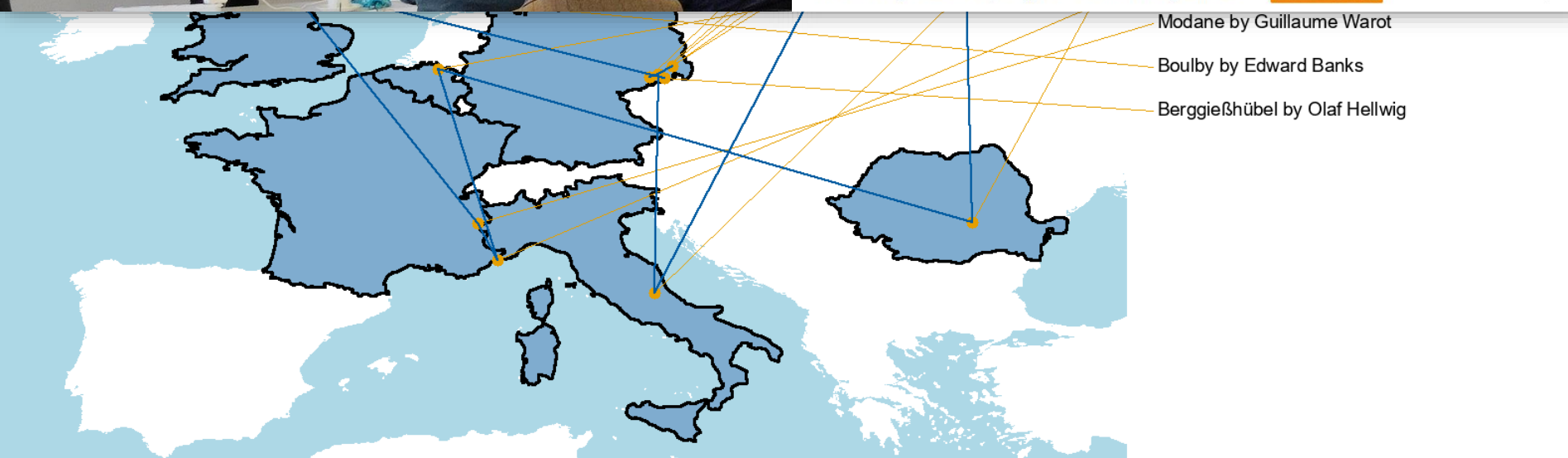
Measurement chambers 36 m below the surface

- Excellent coupling of the instruments to the crystalline basement

The seismological observatory Berggießhübel and its underground lab

Station building

4



Innovation Session

Latest development of the specialty ultra-low background detector manufacturing

Pascal Quirin

Building 114, Room 201/202, HZDR

11:10 - 11:30

Developments in low level radiation detector technology

Paul Schotanus

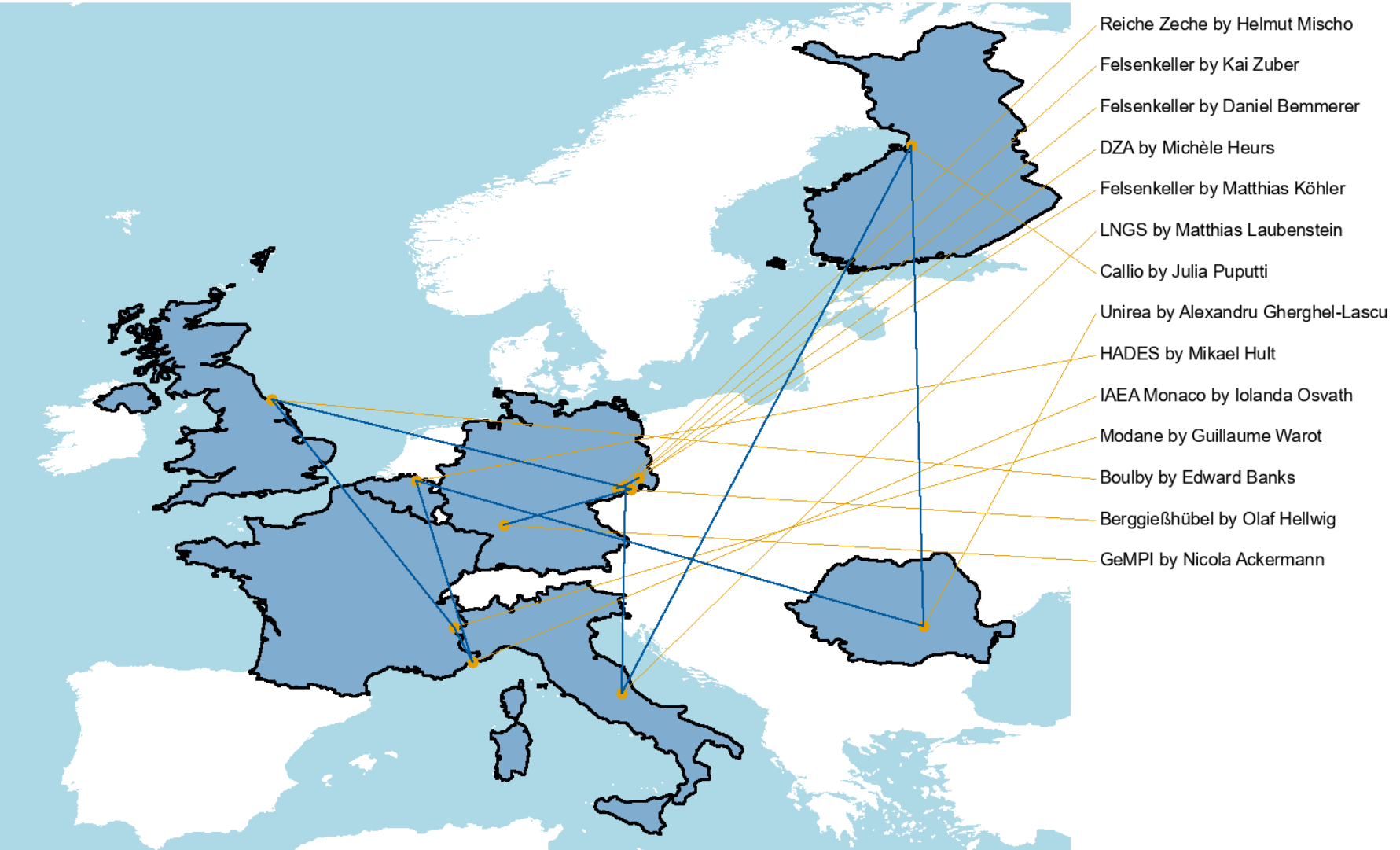
Building 114, Room 201/202, HZDR

11:30 - 11:50

Presentation of SHR - an universal High Precision High Voltage Laboratory Source and Measure Unit by iseg, manufact...

Tobias Pöthig

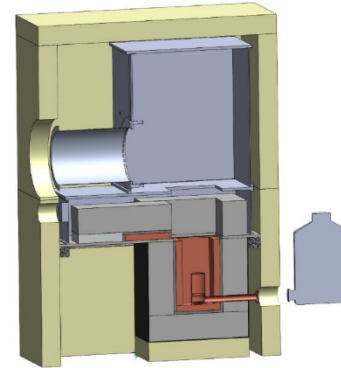
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Results: Suggested shield design with 2 cm of very pure lead as inner layer

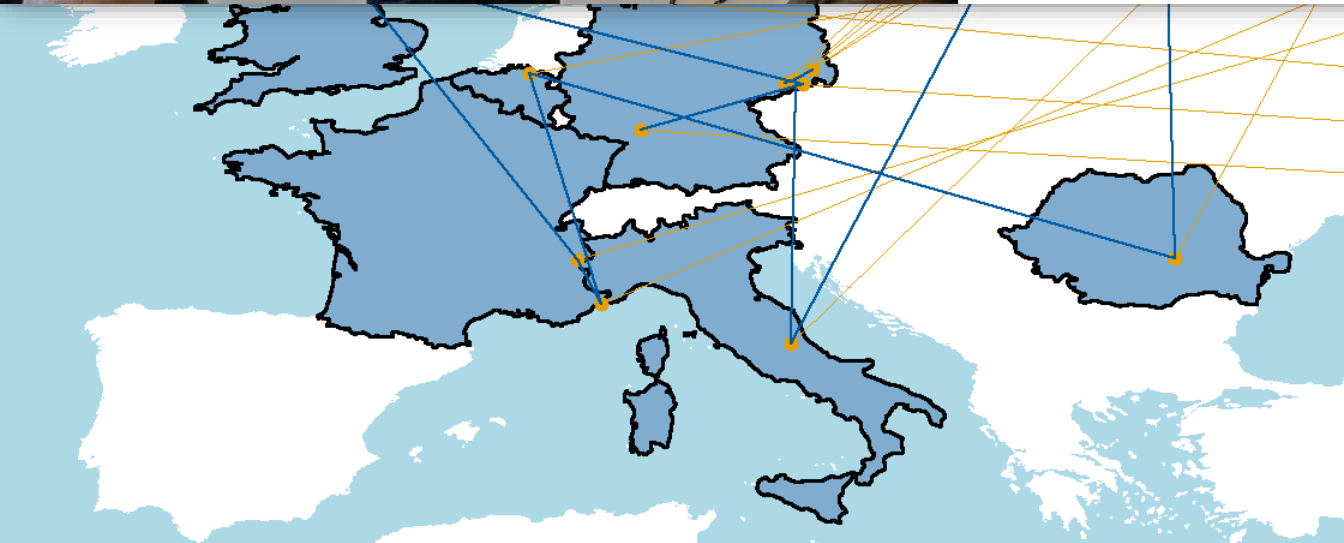


- Results suggest for future GeMPI detectors:
2 cm layer of very pure Pb as inner shield:
Assuming 0.5 Bq/kg Pb210 in new inner layer and 10 Bq/kg in outer layer
→ Reduction of Pb210 contribution to (3.12 ± 0.59) cts/d/kg in the interval [40, 2700] keV

30.11.22

Nicola Ackermann (MPIK) - CELLAR community meeting 2022

12



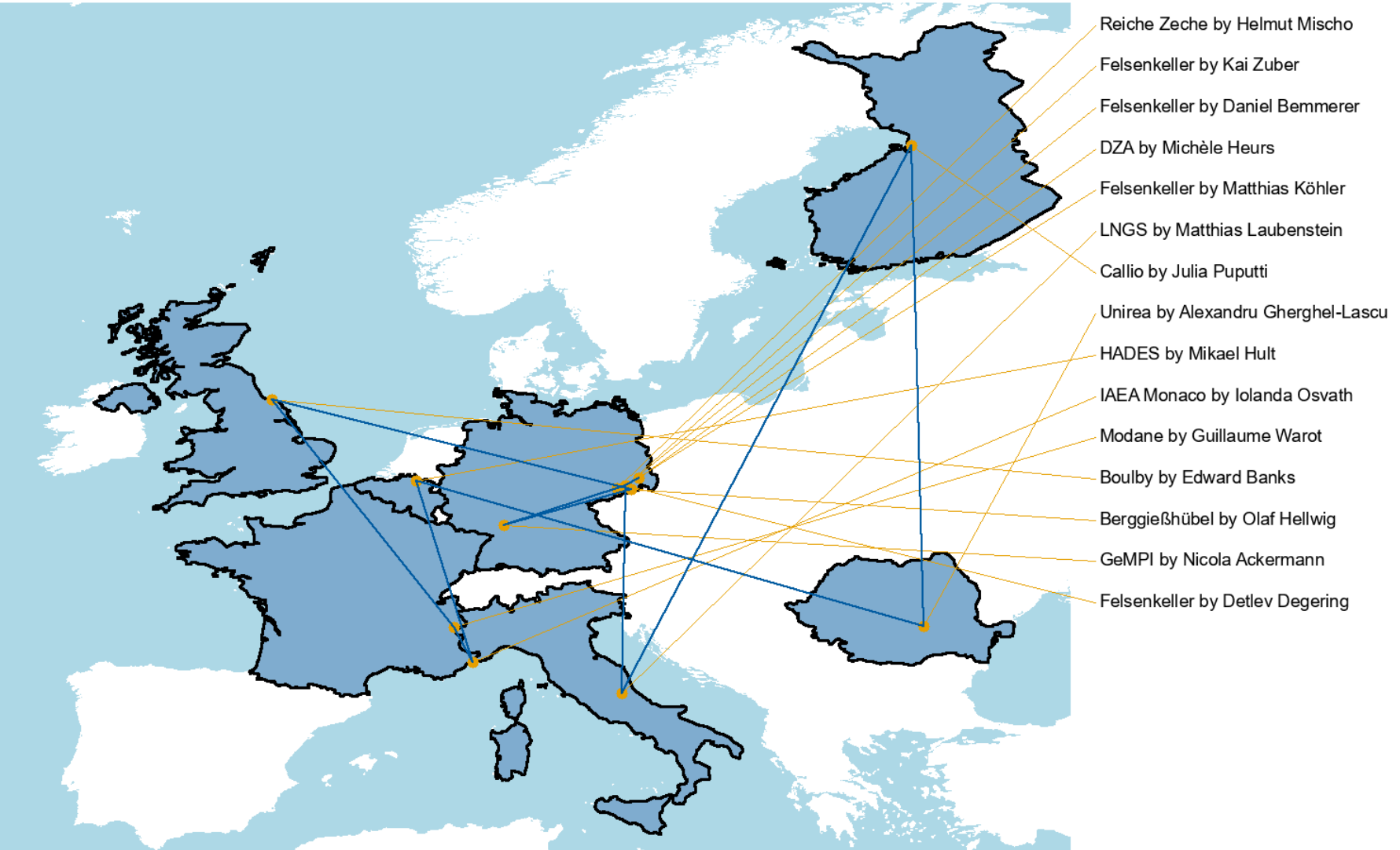
Modane by Guillaume Warot

Boulby by Edward Banks

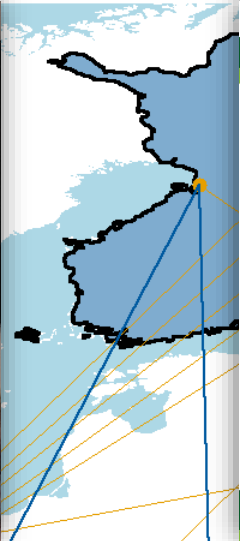
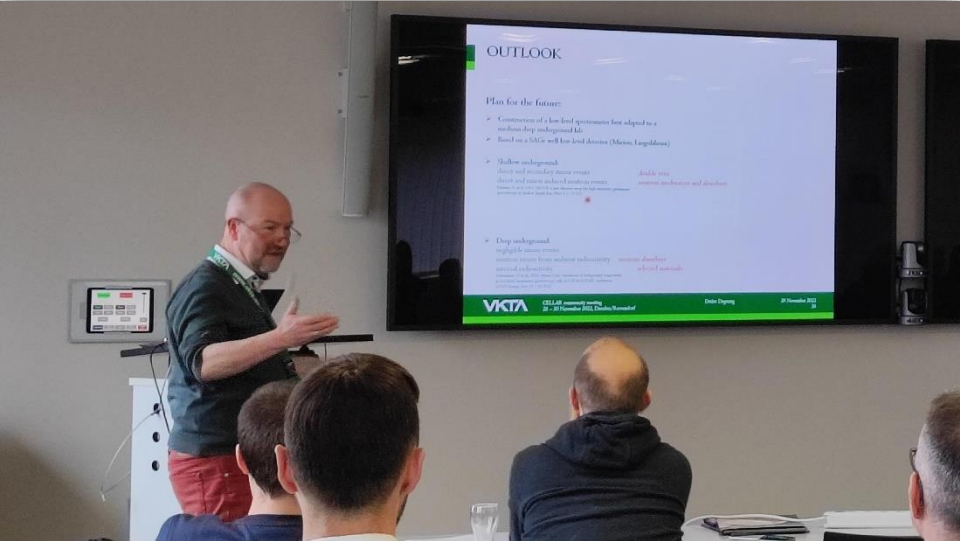
Berggießhübel by Olaf Hellwig

GeMPI by Nicola Ackermann

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INTRODUCTION

Location, Characterisation, Methods, Equipment

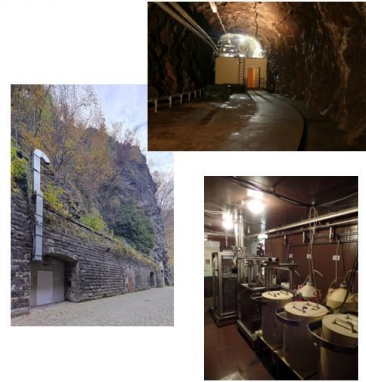
Location:

- Cellars of a former brewery used for storage of ice
- laboratory founded in 1982 (NAA)
- ≈ 140 m w.e. overburden (≈ 45 m of rock)
- Monzonite (low quartz content):

^{238}U	100 ... 230 Bq/kg
^{232}Th	100 ... 210 Bq/kg
^{40}K	400 ... 1300 Bq/kg
- Tunnel:

^{222}Rn	130 ... 500 Bq/m ³ (↑ since 2018)
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- Measuring chambers:

MK1:	old steel + serpentinite (1.3 Bq/kg ^{238}U , 0.3 Bq/kg ^{232}Th , 6 Bq/kg ^{40}K)
MK2:	28 cm steel + 5 cm old steel + 3 cm "boliden" lead



VKTA

CELLAR community meeting
28 – 30 November 2022, Dresden/Rossendorf

Detlev Degering

29 November 2022
4

Modane by Guillaume Warot

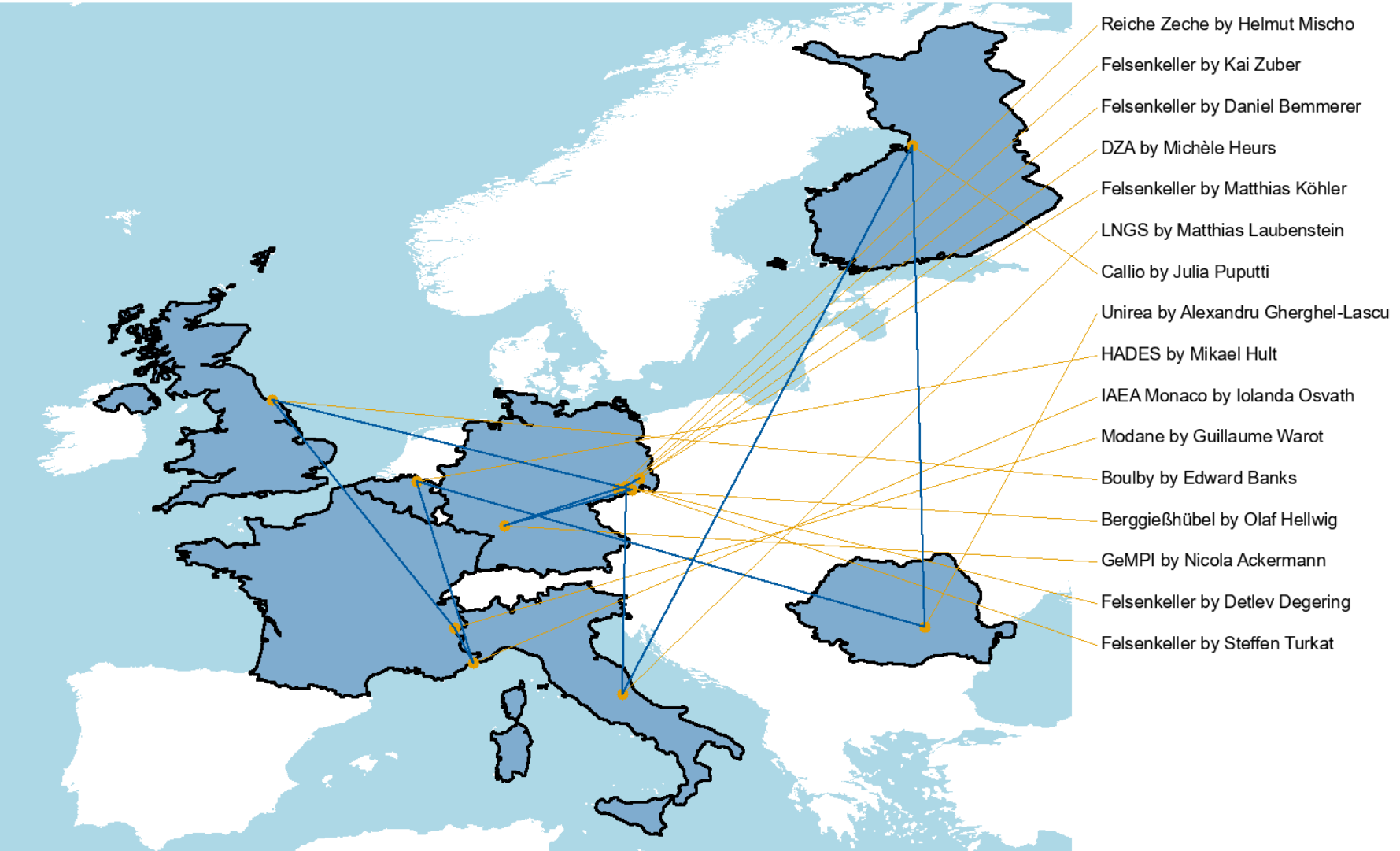
Boulby by Edward Banks

Berggießhübel by Olaf Hellwig

GeMPI by Nicola Ackermann

Felsenkeller by Detlev Degering

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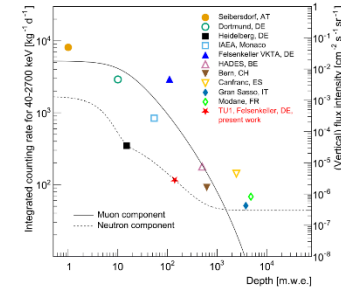
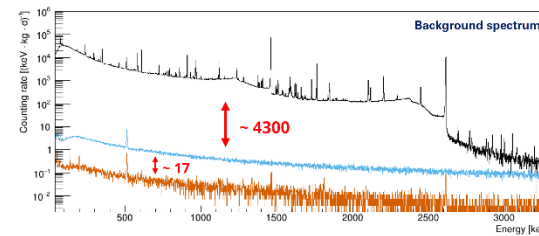
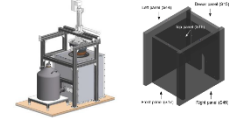
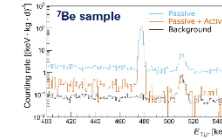
Applying the active veto on TU1

Integrated counting rate [40keV;2700keV]

- Passive: $R = 1982(3) \text{ kg}^{-1} \text{ d}^{-1}$
- Passive & active: $R = 116(1) \text{ kg}^{-1} \text{ d}^{-1}$

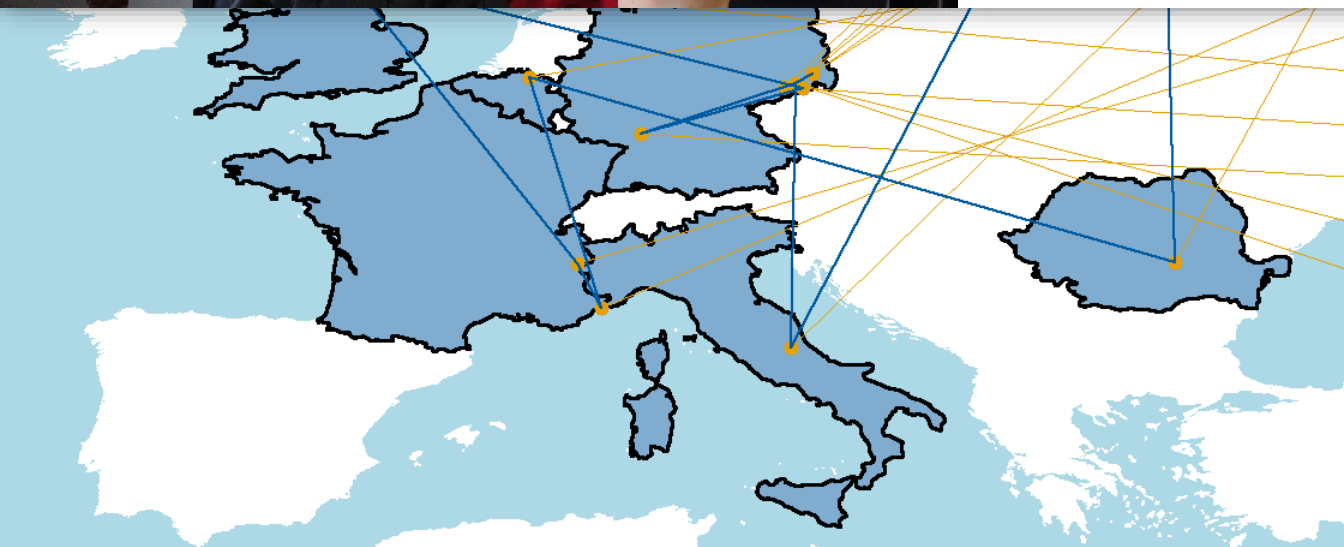
Veto efficiency of the active veto

- Efficiency: 99.52(19) %



A new ultra low-level HPGe activity counting setup in the Felsenkeller shallow-underground laboratory
(11) All community meeting Dresden – 29.11.2022
Steffen Turkat

Slide 8/11



Modane by Guillaume Warot

Boulby by Edward Banks

Berggießhübel by Olaf Hellwig

GeMPI by Nicola Ackermann

Felsenkeller by Detlev Degering

Felsenkeller by Steffen Turkat

Poster Session and Innovation Exhibition

**POSTER: Low
background X-ray
setup**

*Christoph
Seibt*

POSTER: Pulse ...

Yingjie ...

Building 114, upp...

14:00 - 15:00

POSTER: Invest...

Marie ...

Building 114, upp...

14:00 - 15:00

**POSTER:
Felsenkeller
Neutron
Background**

*Thomas
Hensel*

**POSTER: C0BRA:
Low background
measurements
with CdZnTe
detectors**

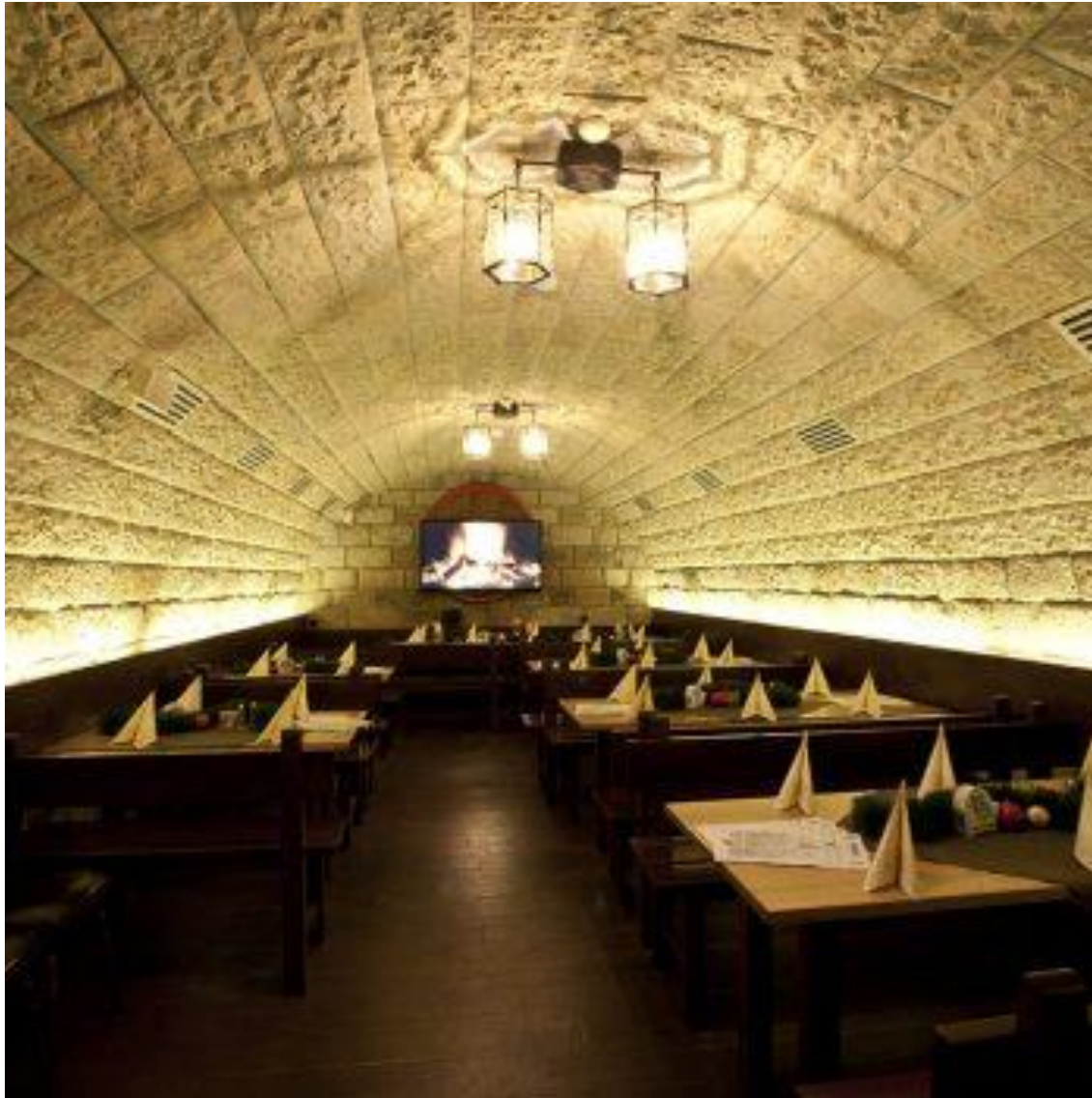
*Juliane
Volkmer*

**Innovation
session: Coffee
exhibition**

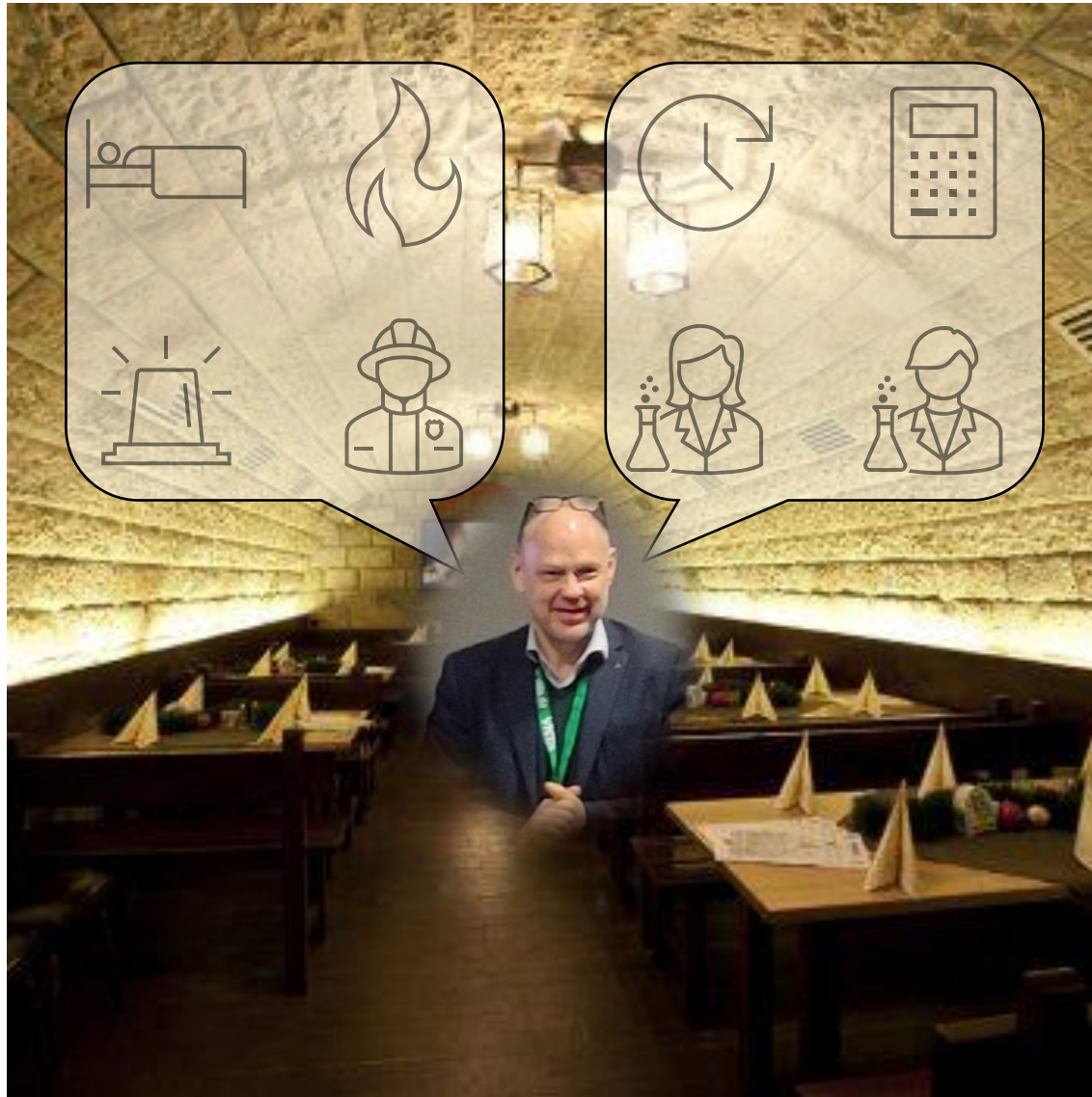
*Building 114,
Room 203, HZDR*

14:00 - 15:00

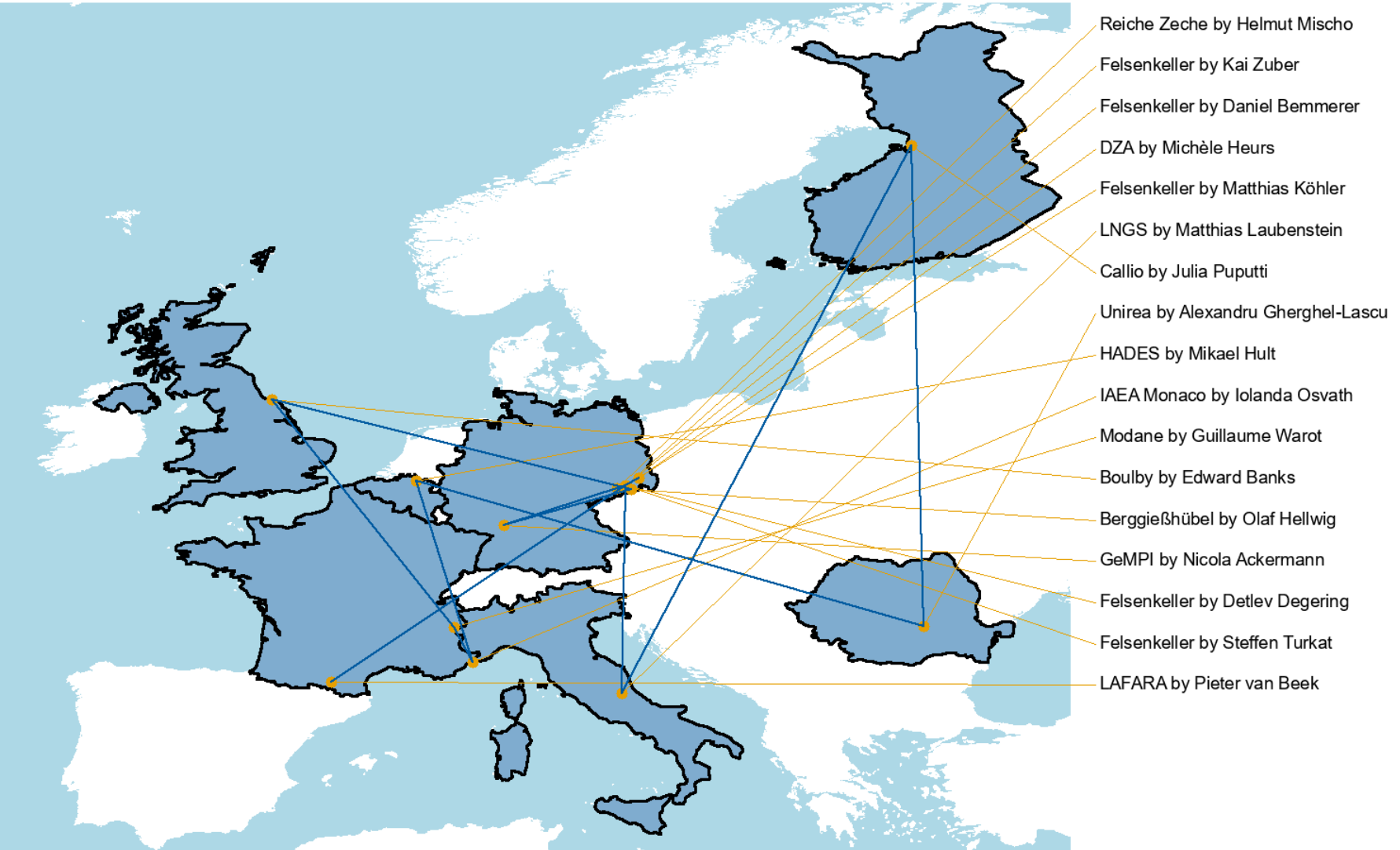
Conference Dinner



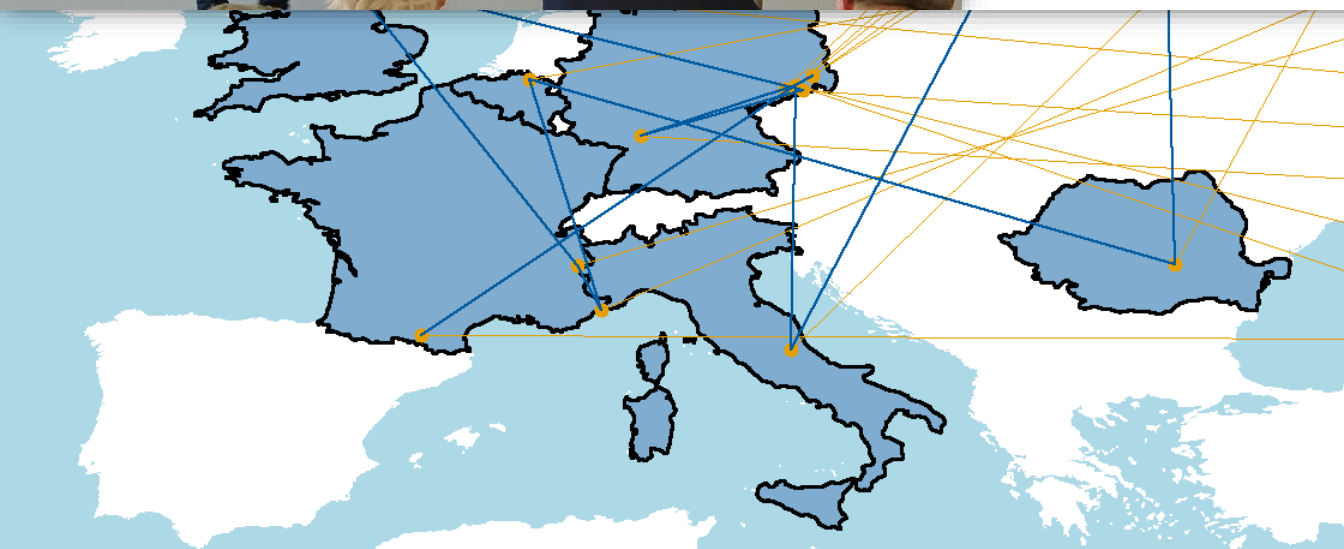
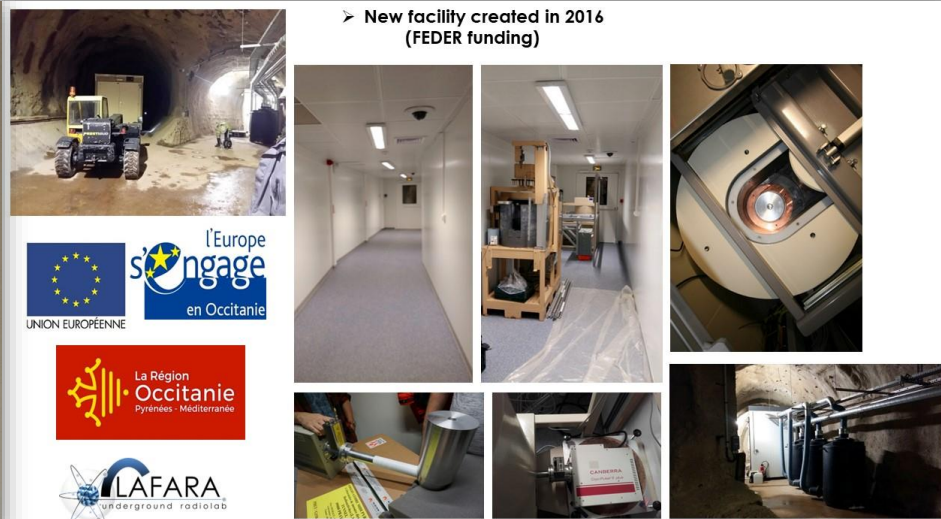
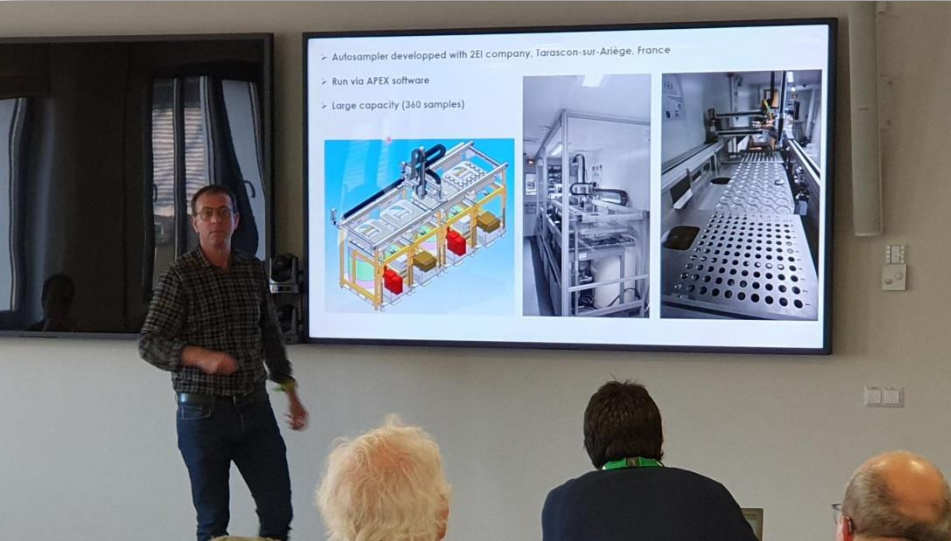
Dinner Talk



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Modane by Guillaume Warot

Boulby by Edward Banks

Berggießhübel by Olaf Hellwig

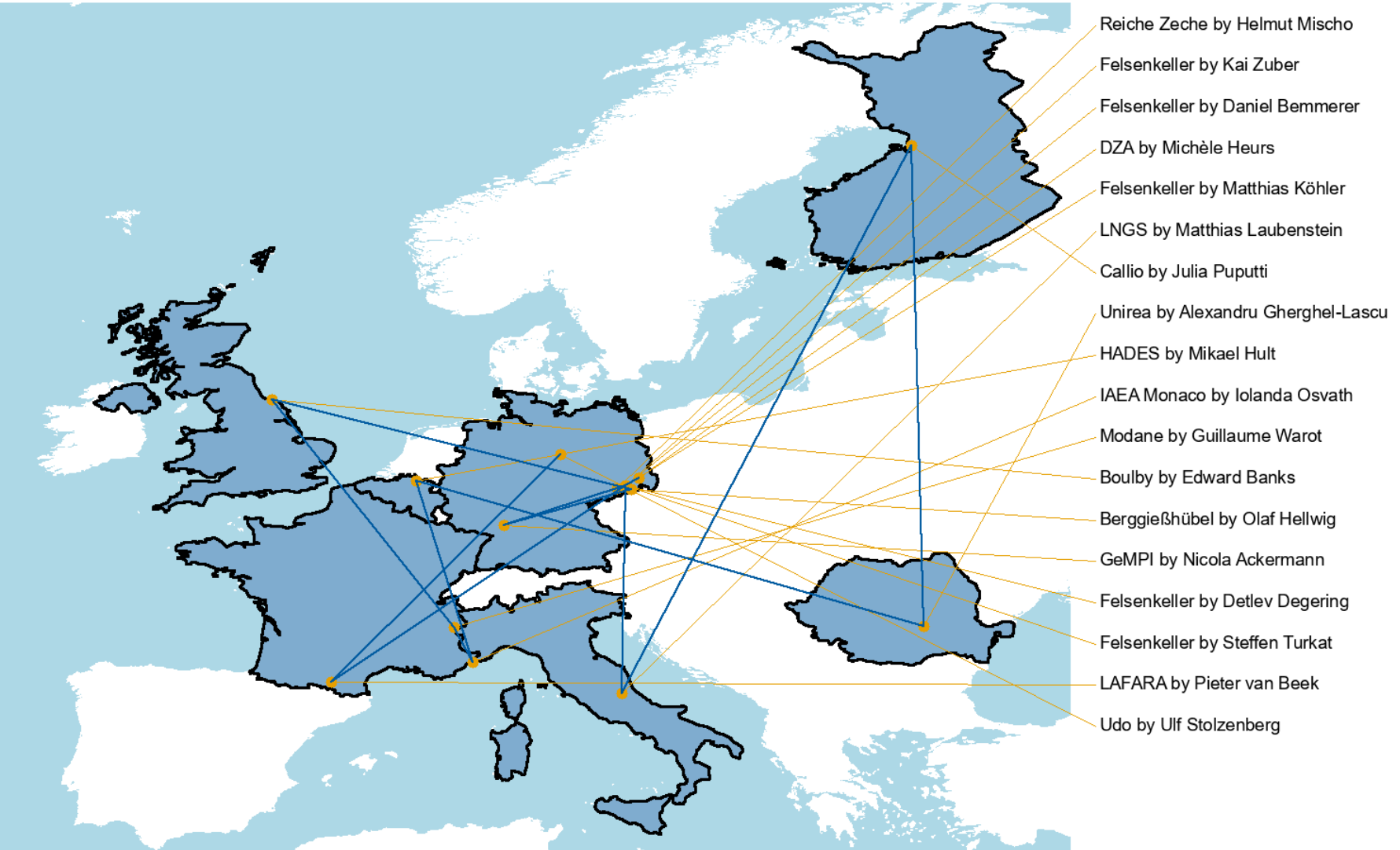
GeMPI by Nicola Ackermann

Felsenkeller by Detlev Degering

Felsenkeller by Steffen Turkat

LAFARA by Pieter van Beek

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PTB The PTB Underground laboratory for DOsimetry (UDO II)



The PTB Underground laboratory for DOsimetry and spectrometry (UDO II) at the Braunschweig-Lüneburg rock salt mine.

UDO II is located at a depth of **430 m below the ground** and serves as a **reference facility** for calibrations at **ultralow dose rates**.

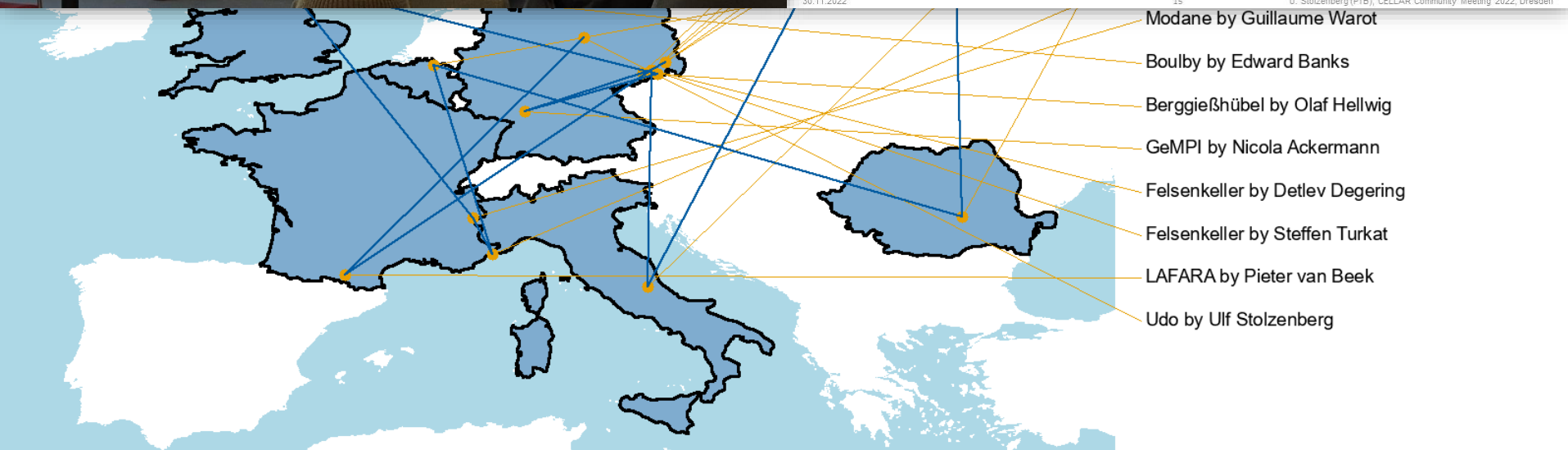
The secondary cosmic radiation intensity (exclusively, **muon intensity**) is **reduced by about 4 orders of magnitude** compared to ground level

Determine $\dot{M}_0$ and q_{TR} via Ra-226

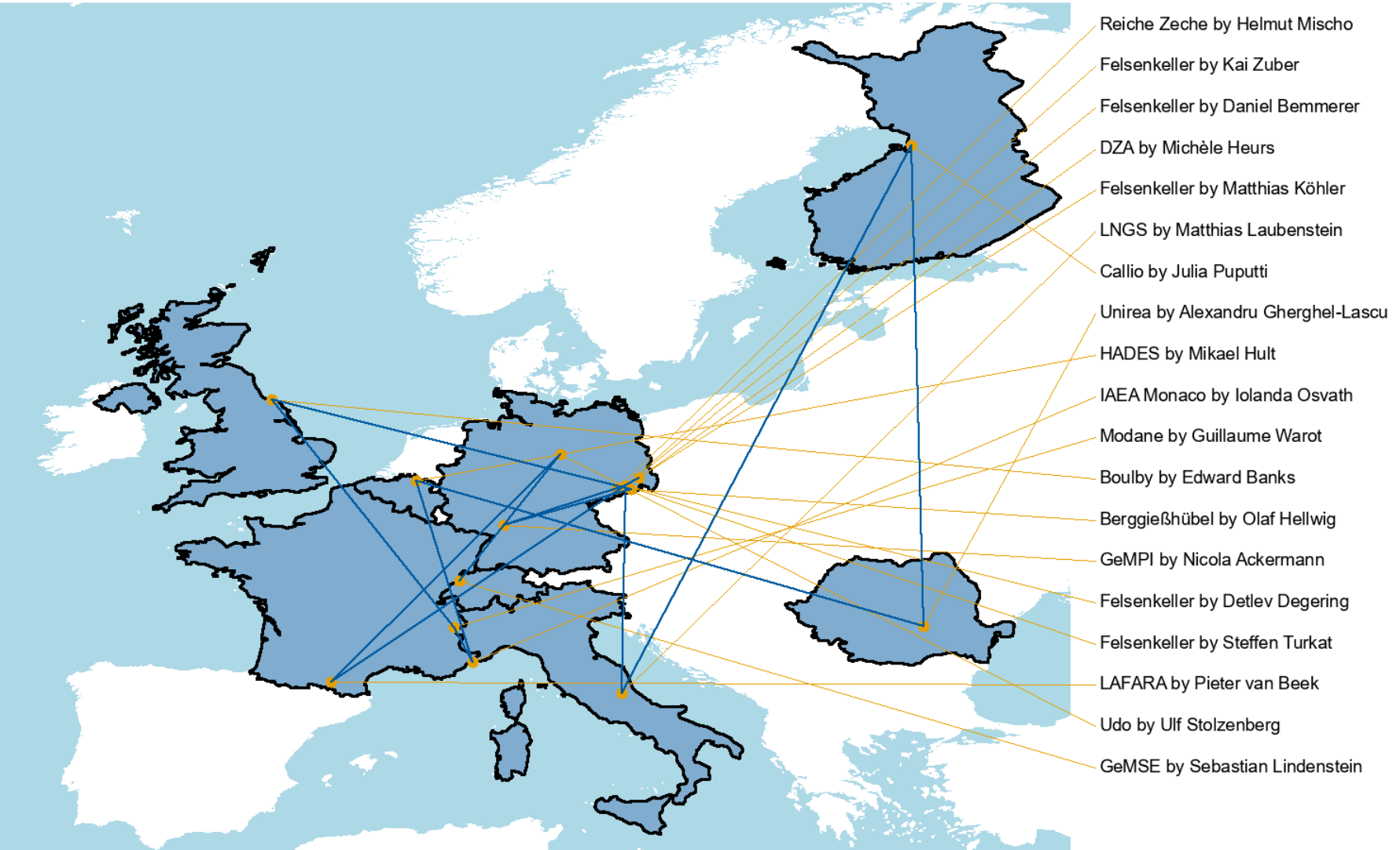
Background dose rate (1.5 ± 0.2) nSv/h

A. Röttger and P. Kessler, Journal of Environmental Radioactivity **205** (2019) 48–54.

H. Dombrowski and S. Neumaier, Radiation Protection Dosimetry **140**, 223 (2010).



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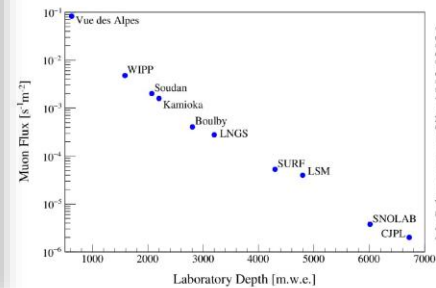
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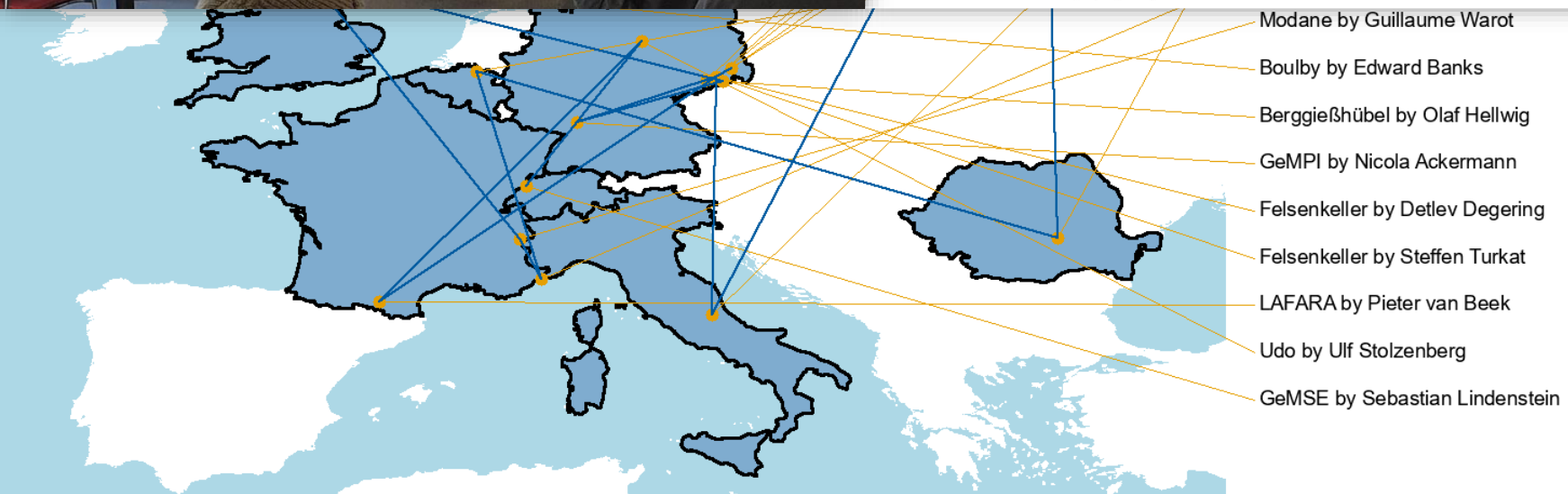
GeMSE: Location

Vue-des-Alpes Underground Laboratory
(near Neuchâtel, Switzerland)

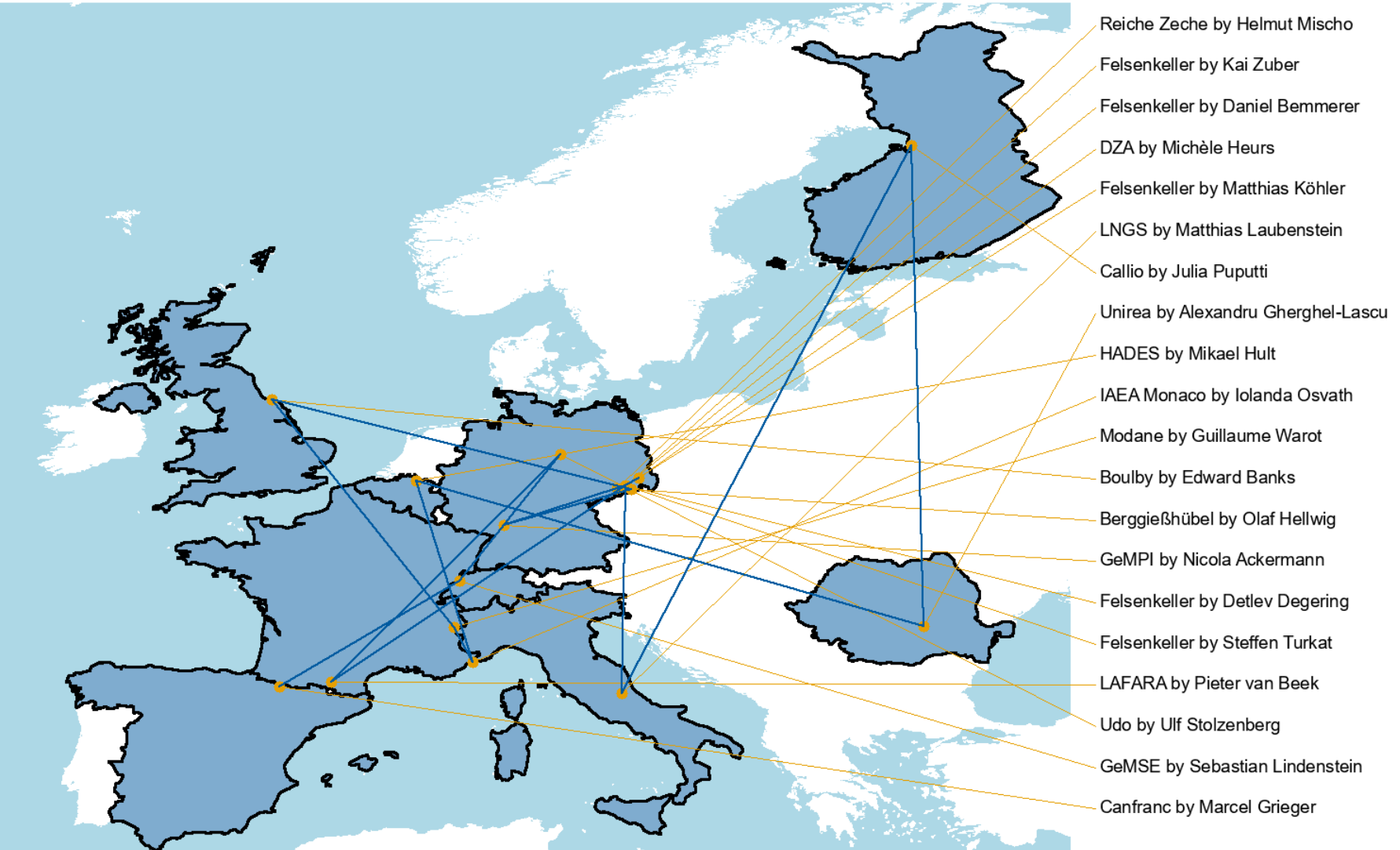
- 230 m rock overburden (620 m.w.e)
→ 2000x reduction of cosmic muons



- Car tunnel provides easy access
- One-hour drive from Bern, 2h from Freiburg



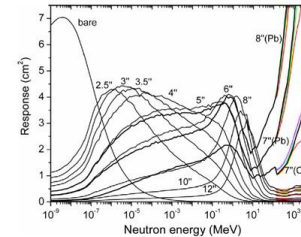
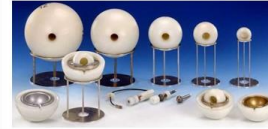
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Detection by moderation – Bonner Sphere Approach

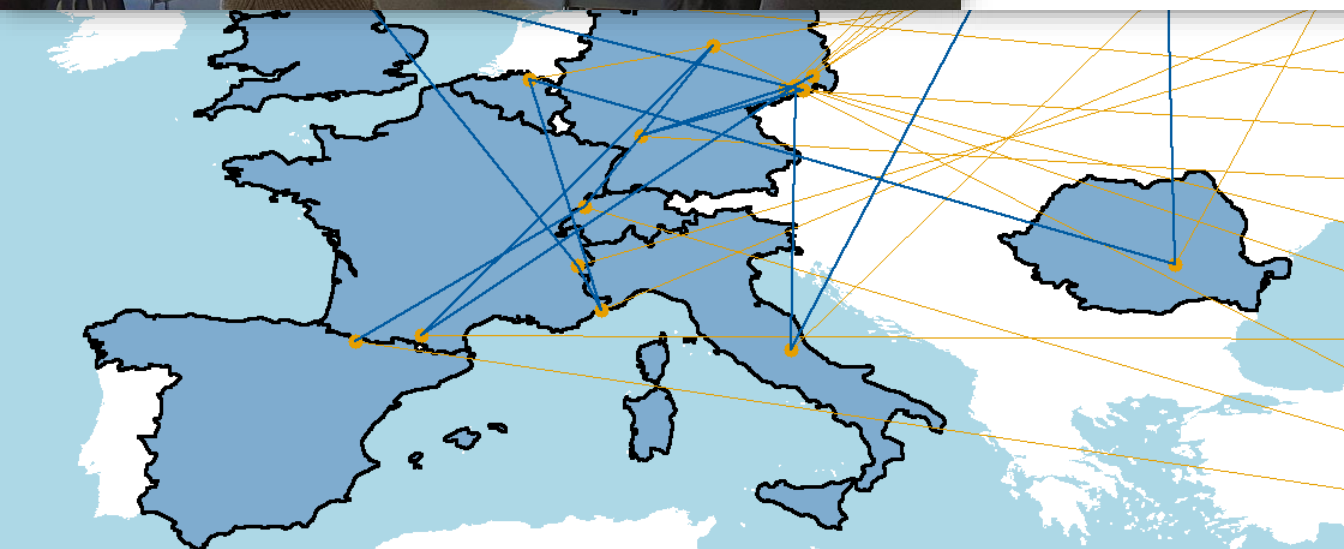


Also see poster by Thomas Hensel: „Ambient Neutron Background in the Felsenkeller Underground Laboratory“

6 30.11.2022 Neutron Flux Studies at the Canfranc Underground Laboratory



DRESDEN concept HZDR



Modane by Guillaume Warot

Boulby by Edward Banks

Berggießhübel by Olaf Hellwig

GeMPI by Nicola Ackermann

Felsenkeller by Detlev Degering

Felsenkeller by Steffen Turkat

LAFARA by Pieter van Beek

Udo by Ulf Stolzenberg

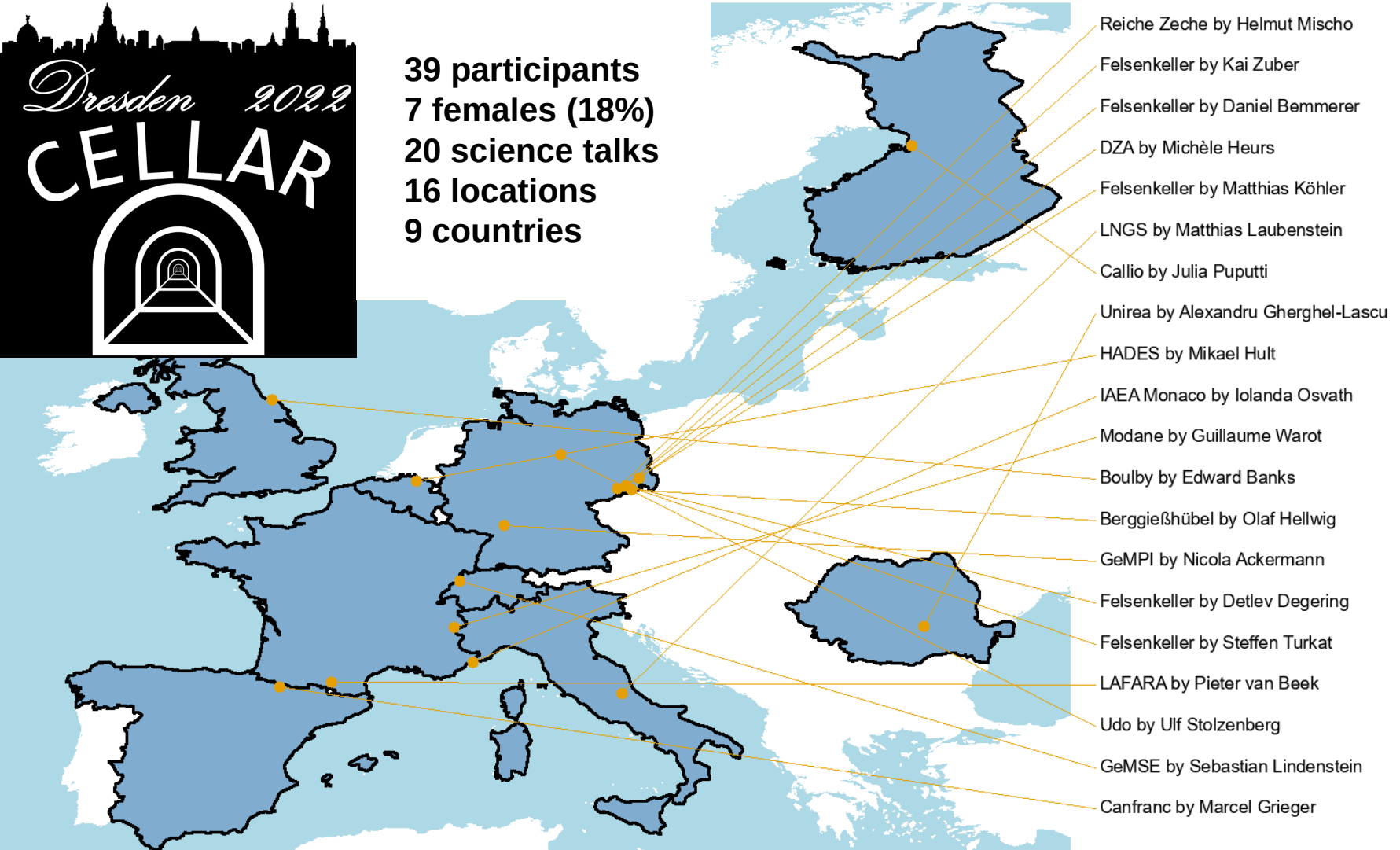
GeMSE by Sebastian Lindenstein

Canfranc by Marcel Grieger

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39 participants
7 females (18%)
20 science talks
16 locations
9 countries



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Konrad Schmidt · Closing Remarks · November 30, 2021 · Cellar Community Meeting 2022
Institute of Radiation Physics · Division of Nuclear Physics · konrad.schmidt@hzdr.de · www.hzdr.de

