WG5 Siting Update
XZLD Collaboration Meeting
30 June 2025

Candidate Sites

Facilities and locations being considered; laboratory representatives also indicated

Location		Depth		Muon flux	
Kamioka (JP)	/Lab-C	1,000 m	2,700 m w.e.	128 /m^2/d	Y. Itow
LNGS (IT)	/Hall C	1,400 m	3,800 m w.e.	29.7 /m^2/d	M. Selvi
Boulby (UK)	/New	1,300 m	3,330 m w.e.	14.6 /m^2/d	H. Araujo
SURF (USA)	/New	1,490 m	4,300 m w.e.	4.6 /m^2/d	D. Akerib (D. Taylor)
SNOLAB (CA)	/Cube Hall	2,070 m	5,890 m w.e.	<0.3 /m^2/d	H. Lippincott

Candidate Sites

Facilities and locations being considered; laboratory representatives also indicated

Horizontal access

Location		Depth		Muon flux	
Kamioka (JP)	/Lab-C	1,000 m	2,700 m w.e.	128 /m^2/d	Y. Itow
LNGS (IT)	/Hall C	1,400 m	3,800 m w.e.	29.7 /m^2/d	M. Selvi
Boulby (UK)	/New	1,300 m	3,330 m w.e.	14.6 /m^2/d	H. Araujo
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SNOLAB (CA)	/Cube Hall	2,070 m	5,890 m w.e.	<0.3 /m^2/d	H. Lippincott

Vertical access (with shaft)

Candidate Sites

Facilities and locations being considered; laboratory representatives also indicated

Existing facilities

Location		Depth		Muon flux	
Kamioka (JP)	/Lab-C	1,000 m	2,700 m w.e.	128 /m^2/d	Y. Itow
LNGS (IT)	/Hall C	1,400 m	3,800 m w.e.	29.7 /m^2/d	M. Selvi
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New excavation needed

WG5 Updates

- In Spring, Hugh Lippincott replaced Henrique Araujo as co-chair with Marco Selvi
  - Henrique now leading XLZD@Boulby pre-Construction project
- Preliminary Shortlisting Report released last April: link
  - In 2024, three sites were shortlisted: Boulby, LNGS, SURF
  - See matrix on next slide
- With recent nEXO news, SNOLAB has re-engaged more directly
  - Hugh has been on SNOLAB Experimental Advisory Committee for last three years, serving as new point of contact
  - WG5 after discussion with Exec agreed to add SNOLAB to the shortlist
    - See XLZD@SNOLAB talk in next session

Siting Report

INTERIM REPORT

XLZD-TN-2024-XXX

SHORTLISTING OF UNDERGROUND LABORATORIES TO HOST A NEXT-GENERATION LIQUID XENON OBSERVATORY FOR RARE EVENT SEARCHES

For the XLZD Consortium:

D.S. Akerib[†1], H.M. Araújo[†*2], A.-P. Colijn[3], J. Cuenca[4], P. Decowski[3], P. Di Gangi[5], Y. Itow[†6], V.A. Kudryavtsev[7], A. Lindote[8], M. Schumann[9], A. Schwenck[10], M. Selvi[†*5], T.J. Sumner[2], D. Taylor[11], K. Valerius[10], B. von Krosigk[†10], and R. Wang[12]

[1] *SLAC National Accelerator Laboratory,* [2] *Imperial College London,* [3] *Nikhef & the University of Amsterdam* [4] *University of Zurich,* [5] *University of Bologna & INFN-Bologna,* [6] *Nagoya University,* [7] *University of Sheffield,* [8] *LIP-Coimbra & University of Coimbra,* [9] *University of Freiburg,* [10] *Sanford Underground Research Facility,* [11] *Karlsruhe Institute of Technology,* [12] *University of Alabama*

[†] *Underground laboratory liaison roles*
[*] *Lead contacts: h.araujo@imperial.ac.uk; selvi@bo.infn.it*

Contents

Siting Matrix (2024)

Requirement categories

SCI-BG: backgrounds
thanks to Vitaly, Alex, Pietro, Ryan, Jose

INS-UG: instrument sizing
thanks to Tim and A-P

FAC-UG: underground facilities
thanks to Tim and A-P

FAC-SF: surface facilities
thanks to Tim and A-P

Table 8: Compliance matrix for the candidate sites against the requirements.

Requirement ID	Note	Boulby	Kamioka	LNGS	SNOLAB	SURF
SR-XLZD-SCI-BG-0010	Muon (DM)		128 m^2/d			
SR-XLZD-SCI-BG-0020	Muons ($0\nu\beta\beta$)		128 m^2/d			
SR-XLZD-INS-UG-0010	Space 1	Planned 2030	350 m^2	Minor mods	280 m^2	Planned 2030
SR-XLZD-INS-UG-0020	Space 2	Planned 2030	Hall-D?	With mods	208 m^2	Planned 2030
SR-XLZD-INS-UG-0025	Space 3 (OD)	Planned 2030				Planned 2030
SR-XLZD-INS-UG-0027	LS					Planned 2030
SR-XLZD-INS-UG-0030	Tank	Planned 2030	10 m (D & H)			Planned 2030
SR-XLZD-INS-UG-0035	Crane(19.5)	Planned 2030			~18.5 m	Planned 2030
SR-XLZD-INS-UG-0037	Crane(15)	Planned 2030	Replace 2.6 t			Planned 2030
SR-XLZD-FAC-UG-0010	Radioassay					
SR-XLZD-FAC-UG-0020	LN2 supply	1,500 L/day		TBC	300 L/day	Power/vent
SR-XLZD-FAC-UG-0030	Ventilation	Planned 2028				Planned 2030
SR-XLZD-FAC-UG-0040	Radon	Planned 2028	TBC	Exists, TBD	TBC	Planned 2030
SR-XLZD-FAC-UG-0050	Comms					Planned 2030
SR-XLZD-FAC-UG-0060	Power	Planned 2030	With mods			Planned 2030
SR-XLZD-FAC-UG-0070	Workshop	Planned 2030	Small one	TBC		Planned 2030
SR-XLZD-FAC-UG-0080	Messroom	Planned 2030				Planned 2030
SR-XLZD-FAC-UG-0090	Goods-in	Planned 2030	30 m^2			Planned 2030
SR-XLZD-FAC-UG-0100	Storeroom	Planned 2030	With mods	Minor mods		Planned 2030
SR-XLZD-FAC-UG-0105	Max size	4.0 m D × 0.75 m H	4.0 m D × 2.6 m H	4.0 m D × 5.0 m H	TBC	3.9 m D × 1.5 m H
SR-XLZD-FAC-UG-0110	Manufacture	Planned 2028	N/A	N/A	TBC	Planned 2030
SR-XLZD-FAC-UG-0120	Cleaning	Planned 2028	N/A	N/A	TBC	Planned 2030
SR-XLZD-FAC-UG-0130	Assembly	Planned 2028	N/A	N/A	TBC	Planned 2030
SR-XLZD-FAC-SF-0010	Surface	Planned 2028				Planned 2030

- the site meets the requirement;
- the site does not comply presently but has plans to do so, or does not strictly comply but is close;
- the site cannot comply, and there are no plans to do so.

Siting Matrix (2024)

- Several requirements laid down in siting report
  - Might be useful for WBS exercises
- To be updated with new SNOLAB information (turning most of the red SNOLAB boxes green or orange)
- Will continue to update this as we go forward

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SR-XLZD-FAC-UG-0130	Assembly	Planned 2028	N/A	N/A	TBC	Planned 2030
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the site meets the requirement;
the site does not comply presently but has plans to do so, or does not strictly comply but is close;
the site cannot comply, and there are no plans to do so.

WG5 Next Steps

- Many technical details on the instrument have still to be defined. Need to spell out those aspects to fully proceed with siting evaluation, e.g.:
  - LN2 needs
  - Recovery vessels
  - Reduced radon
- This will interface with the WBS exercise, to spell out the specific of each site
- On the political side (Exec level), we are basically in “stand-by” mode: waiting to see if and how the UK option will proceed.
- It is also clear that before any realistic approval to be hosted in any of the Lab we need to have some funding approval.
- Need to keep good communicating with the sites and funding agencies to understand needs
  - E.g. expressions of interest, preliminary commitments to secure funding

Siting WG next steps

- What else needs to be finalized for this document?
  - Requirements
    - Atmospherics are different from place to place. Need to formally include that in teh report - Oxford group doing this (Giles Barr) - Dan T might know about it
    - Difference in radiogenics in different labs - shielding outside the water tank. Factor 2 meant to cover some of this
      - XnT 100 kg outside/LZ has XX - need a proper MC of activation (not done in the 0vBB paper)
      - 20 cm of borated plastic
    - Other…
- Still need to spell out the technical details of some key subsystems (e.g. Xe recovery, Cryogenics, …) before a realistic interaction with the various sites can fruitfully happen
- What are sites actually doing at the moment to think about how you would build XLZD at that site?