Future Projects Workshop 2021

Report of Contributions

https://indico.cern.ch/e/987061

Contribution ID: **1** Type: **not specified**

SuperCDMS SNOLAB Near-Term and Long-Term Plans

Monday, 10 May 2021 12:00 (20 minutes)

SuperCDMS SNOLAB will search for dark matter using phonon- and ionization-mediated sub-Kelvin detectors in a new low-background, cryogenic facility under construction in the SNOLAB Ladder Lab. The experiment will have sensitivity to the mass range 0.5-5 GeV using nuclear recoils and to MeV masses using electron recoils. We anticipate science data-taking will begin in 2023 with two science runs during a 4-year operations phase 2023-2027, the details of which we will outline. We are already anticipating evolution of the detector payload after 2027. A long-term planning effort is working to define development scenarios that would enable multiple future dark matter searches in the SuperCDMS SNOLAB facility. One possible scenario would yield new mass reach below 0.5 GeV using nuclear recoils via a new detector payload soon after 2027. This scenario would involve installation of gram-scale detectors with eV-scale thresholds in the current facility with no significant infrastructure changes. We will also comment on potential post-2029 scenarios for the facility. We will discuss how this program will make use of CUTE as a testbed for technology to be deployed in SuperCDMS SNOLAB.

Presenter: GOLWALA, Sunil

Session Classification: Dark Matter Searches

Contribution ID: **2** Type: **not specified**

DARWIN - A Low-Background, Low-Threshold Astroparticle Physics Observatory

Monday, 10 May 2021 13:30 (20 minutes)

I will present the science case and the status of DARWIN, a liquid xenon time projection chamber (TPC) with a target mass of ˜40 t. It will be sensitive to WIMP dark matter interactions down to the neutrino floor, the double beta decay of Xe-136, will allow for a precision measurement of low energy solar neutrinos, and will be sensitive to many other rare processes as well

Presenter: Prof. SCHUMANN, Marc (Albert Ludwigs Universitaet Freiburg (DE))

Session Classification: Dark Matter Searches

Contribution ID: **3** Type: **not specified**

Development of the ARGO dark matter experiment

Monday, 10 May 2021 12:40 (20 minutes)

It has long been known that most of the matter in our Universe is dark. The direct detection of dark matter particle interactions is one of the most important topics in particle physics - a positive measurement would provide unambiguous evidence of the particle nature of dark matter in the Universe. In this talk we will present an overview of the phased approach to dark matter searches by the Global Argon Dark Matter Collaboration, including DEAP-3600, Darkside-20k, and an ultimate detector that will employ a 300-tonne sensitive target of liquid argon with sensitivity to the neutrino floor, ARGO. The status of R&D activities in Canada towards ARGO will be presented.

Presenter: BOULAY, Mark (Carleton University)

Session Classification: Dark Matter Searches

Contribution ID: **4** Type: **not specified**

Freon-filled bubble chambers to the neutrino floor

Monday, 10 May 2021 12:20 (20 minutes)

Freon filled bubble chambers have several characteristics that strongly complement other dark matter search techniques. Starting operation in 2023, PICO-500 will be the focus of PICO scientific efforts through this decade. Larger detectors require a candidate material to replace the synthetic silica as the inner vessel container. Several candidate materials are under investigation, and PICO-500 can be a testbed for these materials later in the decade. By the end of the decade, a vetted design for a 50-ton detector sensitive to the neutrino floor would require a site at either SNOLAB or a similarly deep underground facility.
The technical requirements and scientific case for a 50-ton freon bubble chamber will be presented in relation to other developments in bubble chamber and dark matter detector technologies.

Presenter: ROBINSON, Alan (Université de Montréal)

Session Classification: Dark Matter Searches

Contribution ID: **5** Type: **not specified**

Oscura

Monday, 10 May 2021 15:00 (20 minutes)

The proposed Oscura project plans to deploy a skipper-CCD detector with 10 kg of active mass to search for low mass dark matter at SNOLAB. This projects brings together the teams working in previous CCD and skipper-CCD experiments (DAMIC,SENSEI, DAMIC-M) and is currently in its R&D stage. I will discuss the scientific reach of this project, and its status and plans.

Presenter: ESTRADA, juan (fermilab)

Session Classification: Dark Matter Searches

Contribution ID: **6** Type: **not specified**

Scintillating Bubble Chamber

Monday, 10 May 2021 13:50 (20 minutes)

Increased attention to low mass dark matter has necessitated the need for detectors with lowered energy thresholds. The Scintillating Bubble Chamber, to be installed at SNOLAB in 2022, builds on the world-leading work of the PICO collaboration, replacing the fluorine-based target with a noble liquid. The associated reduction in gamma sensitivity allows a much lower threshold to be set. Plans for the SNOLAB chamber will be discussed, as well as the possibility of scaling up the detector, all in relation to developments in other bubble chambers and dark matter detector technologies.

Presenter: CLARK, Ken (Queen's University)

Session Classification: Dark Matter Searches

Contribution ID: **7** Type: **not specified**

The DarkSide-LowMass search for dark matter below 10 GeV/c^2

Monday, 10 May 2021 14:10 (20 minutes)

DarkSide-LowMass is a tonne-scale liquid argon time projection chamber (LAr TPC) being planned by the Global Argon Dark Matter Collaboration (GADMC) to search for dark matter candidates with masses below 10 GeV/c^2 by optimizing the TPC for an electron-counting analysis and using underground argon that has been further depleted in argon-39. The DarkSide-50 detector has previously set leading limits for dark matter candidates in this mass range, demonstrating the significant potential of this technology, due to chemical and kinematic properties of LAr. DarkSide-LowMass aims to build upon the lessons learned with DarkSide-50 to search for low-mass dark matter candidates down to the solar neutrino floor. This region is well-motivated by a growing body of theories, and the search in this region complements GADMC's efforts to reach the atmospheric neutrino floor for higher mass dark matter with the Argo experiment, being planned for SNOLAB, and they will benefit significantly from infrastructure developed by DEAP-3600 and by GADMC in preparation for the DarkSide-20k and Argo projects. DarkSide-LowMass is currently in the planning stages, with simulation and R&D activities underway to optimize the detector design, minimize backgrounds, and further reduce the energy threshold.

Presenter: WESTERDALE, Shawn (Carleton University)

Session Classification: Dark Matter Searches

Contribution ID: **8** Type: **not specified**

Status and Future of NEWS-G

Monday, 10 May 2021 15:20 (20 minutes)

The NEWS-G collaboration searches for low mass dark matter particles with spherical proportional counters (SPCs) filled with light atomic mass gases. The current phase of the experiment, a 140-cm diameter SPC, is set to start searching for dark matter as soon as spring or summer 2021. The collaboration is planning to replace the commercial copper SPC with a fully electroformed SPC to be fabricated at SNOLAB at the ECUME facility. The collaboration is also interested in the possibility of constructing the next generation NEWS-G experiment, a 5-meter diameter electroformed SPC: DarkSphere.

Presenter: GIROUX, Guillaume (Queen's University)

Session Classification: Dark Matter Searches

Contribution ID: **9** Type: **not specified**

The SPICE and HeRALD experiments for Sub-GeV dark matter direct detection

Monday, 10 May 2021 15:40 (20 minutes)

The TESSERACT project is currently in a planning phase, funded under the DOE Dark Matter New Initiatives program, and aims to produce fully defined experiments (dubbed HeRALD and SPICE) that will explore DM mass parameter space down to 10 MeV, with upgrade paths to sub-MeV. It will be sensitive to both nuclear recoil DM
(NRDM) and electron recoil (ERDM). An initial period of targeted R&D is needed to make technical choices
and retire technical risks, leading to a well-defined set of design parameters with baseline values. Multiple target materials will be used, sharing identical readout. In addition to maximizing sensitivity
to a variety of DM interactions, this provides an independent handle on instrumental backgrounds. The
HeRALD experiment will use superfluid helium as a target material. Helium, with its light mass, has good
NRDM sensitivity, but minimal sensitivity to low-mass dark photons. The SPICE experiment will use polar
crystals, which will ultimately have the best sensitivity to dark photon mediated DM, but require lower
energy thresholds than LHe for the same NRDM reach. Scintillating crystals such as GaAs have sensitivity
to ERDM with kinetic energy greater than the electronic bandgap of the material.

Presenter: MCKINSEY, Daniel

Session Classification: Dark Matter Searches

Contribution ID: **10** Type: **not specified**

Welcome

Monday, 10 May 2021 11:00 (10 minutes)

Presenter: SMITH, Nigel (SNOLab)

Session Classification: Introduction and Overview

Contribution ID: **11** Type: **not specified**

SNOLAB Introduction

Monday, 10 May 2021 11:10 (25 minutes)

Presenter: HALL, Jeter (SNOLAB)

Session Classification: Introduction and Overview

Contribution ID: **12** Type: **not specified**

Superconducting quantum bits at underground facilities

Tuesday, 11 May 2021 11:00 (20 minutes)

Superconducting circuits are emerging among the leading technologies to develop quantum processors. There are increasing evidences that a low-radioactivity environment could largely benefit next-generation quantum bits both in terms of coherence time and quantum error correction protocols. In this talk I will review the status and perspectives of the studies relating radioactivity to quantum bits.

Presenter: CARDANI, Laura (INFN - National Institute for Nuclear Physics)

Session Classification: Converging Scientific Programs

Contribution ID: **13** Type: **not specified**

Researching the Effects of the Absence and Presence of Ionizing Radiation (REPAIR)

Tuesday, 11 May 2021 11:20 (20 minutes)

Researching the Effects of the Absence and Presence of Ionizing Radiation (REPAIR) is a deep-underground radiobiology experiment investigating the effects of Natural Background Radiation (NBR) on biological systems. Utilizing a specialized experimental incubator that was designed and engineered to shield NBR below levels found at the surface, REPAIR is using several biological model systems to explore this novel field of radiobiological research. Past and current model systems that REPAIR utilizes include lake whitefish embryonic development, the CGL1 human hybrid cell culture system, the nematode worm C. elegans as well as S. cerevisiae yeast. Each of these model systems offers unique advantages at the molecular level in studying the effects sub-NBR. Utilizing novel infrastructure and the extremely unique research environment within SNOLAB, REPAIR aims to understand the role that this naturally occurring ionizing radiation plays in life at the surface of the planet.

Presenter: PIRKKANEN, Jake (Laurentian University)

Session Classification: Converging Scientific Programs

Contribution ID: **14** Type: **not specified**

SNO+ and the Future of Tellurium Loading

Tuesday, 11 May 2021 13:00 (20 minutes)

The origin of neutrino mass is one of the central puzzles in particle physics today. It is intimately connected to the question of whether neutrinos can act as their own antiparticle, with fundamental implications for both particle physics and cosmology. The only known experimental approach that can be practically used to address this question is the search for neutrinoless double beta decay, but a meaningful test may require instruments that are several orders of magnitude more sensitive than any current devices. This poses significant practical challenges, with the next generation of germanium and xenon instruments already pushing the boundaries of affordability. In contrast, SNO+ has pioneered a significantly more affordable approach that promises high sensitivity and can continue to be extended beyond that of the currently planned next generation of instruments. This talk will discuss the potential for SNO+ beyond the initial Phase I tellurium loading, both in terms of a straightforward increase of tellurium levels to dramatically increase sensitivity (Phase II) and as a stepping stone to what may be the only practical approach able to achieve sensitivity in the region of the normal neutrino mass ordering with a future project.

Presenter: BILLER, Steven Douglas (University of Oxford (GB))

Session Classification: Neutrino Searches

Contribution ID: **15** Type: **not specified**

Searching for Majorana neutrinos with nEXO

Tuesday, 11 May 2021 13:20 (20 minutes)

Despite tremendous progress in understanding the fundamental properties of neutrinos over the past decades, several key questions remain unanswered. In particular, we do not yet know if neutrinos are Majorana particles, i.e., are neutrinos and antineutrinos identical? The most sensitive experimental probe of the Majorana nature of the neutrino is to search for the lepton-number violating neutrinoless double-beta decay (0νββ). A positive observation of this decay mode would confirm that neutrinos are Majorona particles and demonstrate physics that is not explained by the Standard Model. Several collaborations worldwide are searching for 0νββ in different isotopes with various detector technologies, yet, an observation is still outstanding. Sensitivity limits on the half-life of this decay are on the order of 10ˆ25 to 10ˆ26 years.
In order to increase the sensitivity to 0νββ decays the nEXO collaboration is developing a time-projection chamber with 5 tonnes of liquid xenon, enriched in the isotope Xe-136. Events inside the detector create ionization charges and scintillation light that are being recorded by a segmented anode and a photon sensor array, respectively. This simultaneous measurement allows a full reconstruction of an event's location, multiplicity, and energy. The anticipated energy resolution is 1% at the Q-value. The nEXO detector is being designed to improve the current 0νββ decay half-life measurement by almost two orders of magnitude, and it is anticipated to be located at the CryoPit at SNOLAB.

Presenter: BRUNNER, Thomas (McGill University)

Session Classification: Neutrino Searches

Contribution ID: **16** Type: **not specified**

LEGEND

Tuesday, 11 May 2021 13:40 (20 minutes)

The LEGEND Collaboration pursues an experimental program to discover the neutrinoless double-beta decay of Ge-76, using an array of high-purity Ge detectors operated in a bath of liquid argon. The program follows a staged approach starting with a 200-kg mass experiment currently under preparation at the Gran Sasso Laboratory in Italy. LEGEND-200 will begin operations in 2021, reaching in five years the sensitivity to probe double-beta decay half-life values up to 1e27 years. The second stage will be a 1000-kg experiment with a discovery power beyond 1e28 years. LEGEND-1000 will not only be able to test the full parameter space assuming the inverted neutrino mass ordering, but it will also have a high discovery potential assuming normal ordering and other new-physics scenarios. The design of LEGEND-1000 builds on the successful technology pioneered by the GERDA and MAJORANA DEMONSTRATOR Collaborations, and further refined for LEGEND-200. The conceptual design of LEGEND-1000 is under preparation assuming several possible host laboratories, including SNOLAB.

Presenter: AGOSTINI, Matteo (University College London)

Session Classification: Neutrino Searches

Contribution ID: **17** Type: **not specified**

Status of the NEXT experiment

Tuesday, 11 May 2021 14:30 (20 minutes)

The NEXT project will be presented, describing the excellent performance of the current NEXT-White apparatus (5 kg of enriched xenon), and the status of NEXT-100 detector (100 kg of enriched xenon), currently under construction. Plans for the ton-scale phase will also be discussed. Currently two options are being studied by the collaboration. NEXT-HD would be a detector with a mass in the range of 1 ton, which would build incrementally over NEXT-100 capabilities, and can explore comfortably lifetimes of 10ˆ27 years. An upgraded detectors with barium tagging and several tons of mass could be the next stage, able to reach a sensitivity beyond 10ˆ28 year. Intense R&D is under way aimed to produce a demonstrator of a barium-tagging capable detector within about 5 years.

Presenter: GOMEZ CADENAS, Juan Jose (Donostia International Physics Center (DIPC) (ES))

Session Classification: Neutrino Searches

Contribution ID: **18** Type: **not specified**

THEIA: A hybrid optical detector for neutrino physics and astrophysics

Tuesday, 11 May 2021 14:50 (20 minutes)

Traditional optical neutrino detectors have fallen into two general categories: Cherenkov detectors that utilize the prompt, directional light from superluminal charged particles, and scintillator detectors that use the isotropic light from excitation of aromatic molecules via ionization. Both types have advantages and disadvantages as regards to tracking, energy resolution, and particle identification. The development of very fast photosensors, chromatic filters, and water-based liquid scintillator has led to the possibility of making large hybrid detectors where both Cherenkov and scintillation light are detected separately. This talk explores the scientific potential of THEIA, a hybrid detector being developed by an international consortium to investigate current questions in neutrino physics, astrophysics, and nucleon decay. Versions of the THEIA concept have been proposed both for the DUNE long-baseline experiment at SURF and as a stand-alone detector for deep underground facilities.

Presenter: SVOBODA, Robert Charles (University of California Davis (US))

Session Classification: Neutrino Searches

Contribution ID: **19** Type: **not specified**

NuDOT: A Prototype Directional Liquid Scintillator

Tuesday, 11 May 2021 15:10 (20 minutes)

NuDOT is a ton-scale prototype of a directional liquid scintillator. The direction of particles is reconstructed using a combination of fast photodetector timing, long wavelength sensitivity and novel liquid scintillators. The detector has been constructed and will be commissioned this summer. We have currently planned a 3-5 yr surface run for demonstrating the technique on this scale and the testing of several technologies to increase the sensitivity of the detector. We will present the current program and several options for underground running that may complement a future liquid scintillator program at SNOLAB.

Presenter: Y GRUSZKO, Julieta

Session Classification: Neutrino Searches

Contribution ID: **20** Type: **not specified**

FLAME - the future of exploring underground biology using the fly model

Tuesday, 11 May 2021 11:40 (20 minutes)

Working deep underground is a physiological challenge. Anecdotally, we know that working deep underground is physically and mentally demanding adding a challenge beyond what we experience on the surface. As mines, and laboratories go deeper, these challenges will become more pronounced. What if we could reduce this stress? As a first step in this process, we have quantified the effect of working deep underground using the fruit fly model system and SNOLAB. We demonstrate that the effects of working underground are wide reaching leading to broad changes in gene expression and metabolism. These effects are also sensitive to genetic background and sex; different individuals can expect to respond to the underground environment differently. Future research will quantify changes in behaviour, activity, and sleep patterns. Further, research will explore whether simple changes in diet or activity can reduce the negative effects of working deep underground.

Presenter: MERRITT, Thomas (LU)

Session Classification: Converging Scientific Programs

Contribution ID: **21** Type: **not specified**

CUTE - a low-background cryogenic facility for kg-scale experiment

Wednesday, 12 May 2021 11:00 (20 minutes)

The Cryogenic Underground TEst facility (CUTE) –developed as a test facility for devices that require low temperatures (~10 mK) and low backgrounds –is operational at SNOLAB since 2019. Particular care was also taken in providing a low-noise and low-vibration environment for the experimental setup. This presentation discusses the features and performance of the facility, the current operation for testing SuperCDMS detectors and the plans for a first dark matter search with these detectors, as well as possible future uses for the testing of other cryogenic devices (e.g. particle detectors or Q-bits) or small scale rare event searches.

Presenter: RAU, Wolfgang

Session Classification: SNOLAB Future Capabilities

Contribution ID: **22** Type: **not specified**

Xe-Still Status and Goals

Wednesday, 12 May 2021 11:20 (20 minutes)

The possible need of nearly 50 tonnes of 136Xe to search for neutrinoless double beta decay motivates an investigation of economical ways to enrich the xenon. The technique currently available at a limited number of manufacturers is centrifuge separation. Distillation is a potential alternative that relies on the isotopic variation of vapour pressures. Our group has provided the first credible measurement of these parameters for xenon using a 1.8 m tall still, and is finishing installation of an eightfold scaled-up version of the same still in the Cryopit at SNOLAB. This project is called Xe-Still and in this talk we will discuss its current status and near term goals.

Presenter: LICCIARDI, Caio (Laurentian University)

Session Classification: SNOLAB Future Capabilities

Contribution ID: **23** Type: **not specified**

The Material Screening and Assay Program at SNOLAB

Wednesday, 12 May 2021 11:40 (20 minutes)

Astroparticle physics experiments searching for rare events, such as neutrinoless double beta decay and dark matter particle interactions, have to be shielded from background radiation and have to exhibit a radioactive background as low as reasonably achievable. The material selection for the next generation of low-background experiments is becoming crucial to inform the final design of the shielding scheme and to estimate the ultimate background rate in the energy region of interest of the experiments.
The SNOLAB material screening and assay program allows the direct measurement of the experimental background sources. In this talk I will review the low background measurement capabilities at SNOLAB and will discuss plans and options to expand the facility to allow for the increased sensitivity required by the next generation of experiments.

Presenter: SCORZA, Silvia (SNOLAB)

Session Classification: SNOLAB Future Capabilities

Contribution ID: **24** Type: **not specified**

The New Copper Age of Particle and Astrophysics

Wednesday, 12 May 2021 12:35 (20 minutes)

As the inexorable march of particle and astrophysics continues, the requirements for purity of metals for use in every conceivable aspect of these experiments grows. Returning to one of the very first metals utilized in large scale by humans, we are embarking upon a New Copper Age in particle and astrophysics, requiring previously near inconceivable levels of elemental purity and perfection of size, shape, porosity, and surface chemistry, of copper for use in detector systems, shielding, and various other aspects of the work done at SNOLAB. Already home to the upcoming Ecumé project, producing a 1.4 m diameter copper sphere of the utmost purity, SNOLAB is continuing to expand our capabilities in this field with the goal of developing ever more refined methods, skills, and capabilities required to create copper with sub part per quadrillion in Uranium and Thorium. Of equivalent importance is the ability to produce copper parts of arbitrary shape and size, as well as to provide the most complete characterization of the surface, bulk, and elemental properties. These exciting new developments find themselves at a unique intersection between many subdisciplines of chemistry, physics, and metrology, making it a truly interdisciplinary affair.
We invite any and all interested in the applications of copper in particle and astrophysics to attend for a short introduction to SNOLAB's chemical personnel, electroforming, purification, and production methods as well as a discussion of our current goals and projects in copper electroforming at SNOLAB.

Presenter: HALL, Shaun (SNOLAB)

Session Classification: SNOLAB Future Capabilities

Contribution ID: **27** Type: **not specified**

The Cosmic Ray Live Project @SNOLAB

Tuesday, 11 May 2021 12:00 (20 minutes)

The Cosmic Ray Live project aims at building three muon detectors at SNOLAB. The detectors can measure muons in real time and show their trajectories. They would add significant data to the existing array and promote the international relationships that make science possible. One of SNOLAB's missions is to inspire the next generation of innovators through strong educational outreach. This project aims to develop a tangible way for students and visitors to the Science North Museum to understand cosmic rays and why SNOLAB is located 2km underground. Our international partner at Laboratori Nazionali del Gran Sasso (LNGS) has perfected the build requirements and the accompanying smartphone app, which makes this science accessible to everyone in Canada. I will review them along with the current status of the project.

Presenter: SCORZA, Silvia (SNOLAB)

Session Classification: Converging Scientific Programs

Contribution ID: **28** Type: **not specified**

Radon Counting Facility

Wednesday, 12 May 2021 12:55 (15 minutes)

Backgrounds from radon decay products are problematic for current and future low energy neutrino and rare-event searches. At SNOLAB we have various instruments in order to monitor radon in the air and in ultra pure water and to constrain radon emanating from detector components. We also have brand new data acquisition system used for radon counting. My talk will focus on these topics and will give hint to possible future activities.

Presenter: FATEMI, Nasim

Session Classification: SNOLAB Future Capabilities

Contribution ID: **29** Type: **not specified**

High Purity Liquid Nitrogen Plant U/G at SNOLAB

Wednesday, 12 May 2021 13:10 (15 minutes)

Multiple projects as SNOLAB use liquid nitrogen to cool and operate their experiments on a day-to-day basis. High purity Nitrogen is also used for cover gas, purification processes, and operating high purity equipment. Currently, up to 3,000 L per week of Liquid Nitrogen is shipped underground at SNOLAB and consumed.

This project will generate high purity liquid nitrogen (99.999%) underground in the clean lab space. The plant is sized to meet all the labs current and near-term liquid nitrogen requirements. It will serve as a model for future experiments requiring an independent liquid nitrogen system.

A small-scale plant is planned to be operational summer 2021 with the main plant operational by end of year.

Presenter: BACK, Steven (SNOLAB)

Session Classification: SNOLAB Future Capabilities

Contribution ID: **30** Type: **not specified**

Summary

Session Classification: SNOLAB Strategic Plan

Contribution ID: **31** Type: **not specified**

Scientific Support Services

Wednesday, 12 May 2021 12:30 (5 minutes)

Scientific Support Services play an integral role in the science at SNOLAB providing quality data, expertise and support to experiments, internal projects, and operations. Capabilities include low background counting, analytical and radio assay techniques, radon emanation studies and chemical purification processes.
I will be presenting a general overview of our scientific capabilities, facilities, and the services we have to offer, as well as how to submit a request.

Presenter: ANSELMO, Lina (SNOLAB)

Session Classification: SNOLAB Future Capabilities

Contribution ID: **32** Type: **not specified**

SNOLAB Strategic Plan development 2023-2029

Wednesday, 12 May 2021 15:40 (30 minutes)

Presenters: FLYNN, Blaire (SNOLAB); BANKS, Daniel

Session Classification: SNOLAB Strategic Plan

Contribution ID: **33** Type: **not specified**

Introduction

Wednesday, 12 May 2021 15:30 (10 minutes)

Session Classification: SNOLAB Strategic Plan

Contribution ID: **34** Type: **not specified**

Discussion

Wednesday, 12 May 2021 16:10 (20 minutes)

Session Classification: SNOLAB Strategic Plan