



PRINCETON UNIVERSITY

Research Lab Operations Plan during COVID-19

This template is for use by PIs and facility directors who oversee on-campus research laboratories. Faculty should complete this for their own labs. Facility directors should answer this on behalf of their operations (e.g., NMR facility, clean room).

Principal Investigator or Facility Director

Prof. William C. Jones	
Laboratory or Facility Name	Jones Group - Observational Cosmology
Academic Unit/Facility	Last Revised Date
Physics	7/1/2020

Department Chair/Institute Director Approval		[DATE]
Dean for Research Approval		[DATE]

PURPOSE

Jones Group, Observational Cosmology
Research Lab Operations Plan (COVID-19)
Last revised 6/18/2020

This Research Lab Operations Plan will document how each lab will perform research operations during the COVID-19 pandemic. Operation levels, from fully operational to completely shut down, will be laid out in detail to enable transitions between levels as needed. Some of this information was requested in the Research Essential Operations Plan in March. PIs may wish to use that document as an important source in filling out this template.

Given the uncertain course of the COVID-19 pandemic, PIs must plan in ways that minimize the impact of disruption to their research activity overall. PIs must consider scenarios such as what happens if a lab member tests positive or lab members are asked to quarantine for two weeks. These possibilities require careful planning and readiness to shift from one level of research operations to another. It is possible for different laboratories to be at different levels at any given time depending on lab-specific conditions. These same issues apply to core facilities and research services upon which a laboratory depends.

Princeton researchers consistently report that communications from their PI have more influence on their plans and actions than communications from anyone else in authority. Please recognize the impact you have on how your research team operates throughout the COVID pandemic.

If you have lab space in multiple departments, you must share this completed plan with each of the relevant chairs or directors. A copy of the version approved by the department chair or institute director must be uploaded in SHIELD, the research health and safety management system (<https://princeton.bioraft.com/>), for review and final approval by the Office of the Dean for Research. The plan below should be shared with members of the laboratory.

A. Leadership Succession

List people who can make operational decisions, in order of succession, if the head of the lab/unit is unable to do so:

	Name	Title	Phone Number	Alt Phone Number
Principal Investigator/Facility Director	William Jones	Assoc. Prof.	x4413	(m) 609.495.5773
Successor 1	Dr. Steven Benton	Researcher	x2313	sbenton@princeton.edu
Successor 2	Dr. Aurelien Fraisse	Lecturer/ Researcher	x6347	afraisse@princeton.edu

B. Emergency Communication Systems

To communicate rapidly with your group in an emergency, and to stay in touch during an extended disruption, we encourage all research groups to prepare and maintain contact information in paper and electronic formats, including alternative email and phone numbers.

X Yes, contact information for my lab is up-to-date and available in paper and electronically.

Document the communication methods that the group will use to communicate with members during an extended disruption. Potential communications tools include phone, email/listserv, text message, social media, group messaging platforms, etc.

Our group communications happen over several redundant platforms. The primary one is a dedicated messaging platform (open source rocketchat), where we coordinate daily lab operations. Group members have access via mobile, laptop and desktop. This is coupled with an online logbook, used to document these lab operations. Both of these are fully archived and backed up. We maintain separate channels on the platform to differentiate between critical and non-critical functions. The chat is tied to alert systems on the cell phone app that all members use. Furthermore, we use a group-wide email list to announce urgent and/or persistent messages. Finally, we maintain a listing of our cell phone numbers in case these methods do not result in a sufficiently timely response. These systems, modulo the cell network, are those that we use during Antarctic deployments, are backed by UPS systems, and are robust to all but extended (> 3 hour) power outages or building-wide network outages.

Describe who is designated to communicate with group members regarding lab operations. Designate those responsible for updating contact information and establish a specific schedule for updating.

Daily operations are discussed each morning. The organization chart is rather flat – all members are capable and encouraged to communicate over these platforms. The PI is directly in contact each morning, including a check to ensure that team members who need to physically access the lab properly report via the current PU Symptom Tracker. William Jones is responsible for ensuring clear lines of communication.

C. Research Lab Operations Level Descriptions

The four levels listed below describe the range of research operations that may be implemented during the COVID-19 pandemic, either in large scale across the University or individually in laboratories as needed. For research operations at levels 2, 3, and 4, including experiments or critical maintenance and monitoring, the plan must be reviewed

and accepted by the academic chair or director and receive final approval by the Office of the Dean for Research.

Level 1 - Normal Operations

At this level of research, labs conduct research activities within the following parameters, without the need for written plans and approval.

- Normal research operations.
- All personnel adhere to hygiene, health and safety protocols as prescribed by Environmental Health and Safety (EHS).
- Undergraduates allowed in laboratories.

Level 2 - Phased Resumption

- Department chairs or institute directors, working closely with academic managers and, where applicable, building managers (e.g., Engineering Quadrangle) must submit a Research Infrastructure Plan for resumption of research activities. This plan must include identification of critical dependencies (e.g., utilities, loading docks, procurement), a plan for re-opening core facilities, a plan for enforcing social distancing and best practices for cleaning common areas, PPE use, and circulation patterns in common areas. Research Infrastructure Plans must be approved by the Office of the Dean for Research.
- PIs must submit Research Lab Operations Plans (this completed template) detailing how labs will comply with EHS-prescribed campus metrics, enact social distancing, and enforce hygiene practices (e.g., PPE, cleaning). The plan must be reviewed by the department chair or institute director and approved by the Office of the Dean for Research.
- Experimental work resumes within the parameters reviewed and approved by the department chair or institute director and the Office of the Dean for Research.
- Research that requires core facilities or services commences after consultation with the facility director (e.g., LAR for animal research, clean room).
- All personnel must adhere to hygiene, health and safety protocols, including protective equipment, established by EHS to ensure safety.
- Undergraduate students are not allowed in laboratories until further notification by the University.
- All research buildings are set to card access “weekend” schedule.
- Remote work is required for non-laboratory activities.

Level 3 - Essential Operations

- PIs must submit Research Lab Operations Plans (this completed template) detailing shut-down procedures or requesting maintenance or essential research activities. Plans must be reviewed by the department chair or institute director and approved by the Office of the Dean for Research.

- Essential and COVID-19-related research must be approved by the Office of the Dean for Research.
- Maintenance of key resources—animals, cell lines, liquid N₂, sensitive equipment, etc.—must be approved by the Office of the Dean for Research.
- In labs approved for critical maintenance, essential research, or COVID-19 work, one to three lab members (including the PI) must be identified in the plan and approved for building access. Any additional personnel, such as lab member(s) needed during hazardous operations, or persons with critical maintenance expertise, require approval by the Office of the Dean for Research.
- Approved research work commences only with acknowledgment from relevant departments and institutes confirming that required services and facilities are in operation or can be brought online.
- All personnel must adhere to hygiene, health and safety protocols as prescribed by EHS.
- Undergraduate students are not allowed in the lab.
- All research buildings are set to card access “weekend” schedule.
- Remote work is required for non-laboratory activities.

Level 4 - Operations Suspended

- Research Lab Operations Plans (this completed template), including critical monitoring and maintenance, are reviewed and approved by the Office of the Dean for Research.
- All experiments are stopped, except for COVID-19 research specifically approved by the Office of the Dean for Research.
- Key resource maintenance is allowed only for irreplaceable animals (e.g., transgenic mice, zebrafish, *Drosophila*), cell lines that cannot be cryopreserved, and equipment that cannot be shutdown. Activities must be approved by the Office of the Dean for Research.
- Vertebrate animal management is allowed only by Laboratory Animal Resources (LAR), with access to animal facilities by research personnel as required and with the express approval of LAR.
- At most, one person per lab is allowed on campus at any given time for critical maintenance functions only and these functions must not include activities that fall under “hazardous operations.”
- All personnel must adhere to hygiene, health and safety protocols as prescribed by EHS.
- Undergraduate students are not allowed in the lab.
- Only designated critical staff are granted building access.
- Remote work is required for all activities not specifically listed above.

D. Research Lab Operations Plans

Key Transition Activities for All Levels

Briefly describe the key activities necessary for an orderly transition between levels of research, whether resuming research or scaling it down. Consider what needs to be accomplished in sequence and by whom. Please review these checklists for laboratory [ramp-down](#) or [ramp-up](#), which spell out a variety of important activities to conduct during transitions.

The Emergency Communication Protocols outlined in part B) are in effect at all times while the cryostat is cold, regardless of the Operational Level. Furthermore, shifts are staffed to monitor the housekeeping information at all times.

Transition to level 2 – phased resumption of research

Transition to L2 from L1: PI will establish shift schedule that allow personnel density that is consistent with EHS guidance both in the highbay, lab and office areas. Non-critical projects, identified as those not on the critical path for deployments scheduled within the following 12 months, will be ramped down if necessary to meet the density requirements. PI will implement rigid cryogenic maintenance schedule that reduces necessary personnel to less than three (but not less than two) individuals present at a time. Cryogenic test schedules will be adjusted to conform to this schedule, allowing temporal separation of cryogenic maintenance and testing/integration activities. Where possible, undergraduates will be shifted to remote projects.

Transition to L2 from L3: PI will assess what laboratory projects can be re-initiated based on the occupational considerations above. For our group, this means resumption of work on the Spider gondola as well as the SuperBIT optical telescope assembly in the highbay and in Jadwin 245. The Spider deployment was canceled in May, due to the cancellation of all NSF support for NASA's Antarctic operations. Since that time, the ramp-down described below was put into effect, and remains in effect. A resumption of activity will adhere to the same operational requirements outlined in the Continuity of Operations Plan (COOP) described at the end of this section.

Transition to level 3 – essential operations

Transition to L3 from L2: Non-critical projects, identified as those not on the critical path for deployments scheduled within the following 6 months, will be ramped down. These cryogenic systems will be warmed as quickly as possible, all testing immediately curtailed. Vacuum systems will then be safed and brought to ambient pressure. gas purges stopped and supply cylinders secured, and associated pumps and equipment will be safely shut down. Mechanical assemblies will be locked and secured in a safe mode. The PI will submit a continuation plan for projects on a critical deployment path on a case by case basis. Projects not granted a waiver will be safed as above. Physical access and activities will strictly limited as described in the Research Continuity of Operations Plan (COOP) described at the end of this section.

The lab activities in our group are centered around the preparation of two stratospheric balloon payloads, Spider and SuperBIT. The former is a millimeter wavelength polarimeter designed to characterize the polarization of the Cosmic Microwave Background Radiation. The latter is a diffraction limited near-UV to near-IR wide-field imaging telescope, designed to measure the weak- and strong-lensing of galaxy clusters to probe the properties of dark matter, and relate early- and late-time cosmological observables.

Spider is a cryogenic payload, which uses a bath of liquid helium to cool the telescopes and filters to 2K, and a suite of closed cycle ^3He coolers to cool the focal plane instrumentation to 0.3 K.

Both payloads are designed to operate autonomously at altitudes above 38km , and include all the pointing control, post-flight attitude determination, power, data storage and communications in addition to the science instruments. The students are responsible for all aspects of the design, implementation and integration of these systems. Once assembled, each system must go through a period of pre-launch calibration and test. The assembly, cryogenic operation and testing of these systems requires occasional close proximity work involving two-to-four persons, depending on the operation. All cryogenic operations require the presence of at least two people, for reasons of physical safety.

When operations require closer proximity than 2 meters, the PI will consult with EHS regarding the duration of the operation to establish the appropriate mitigation measures and PPE.

Transition to level 4 – suspension of operations

All on-campus activities are to be ramped down. The cryogenic systems will be warmed as quickly as possible, all testing immediately curtailed. Vacuum systems will then be safed and brought to ambient pressure. gas purges stopped and supply cylinders secured, and associated pumps and equipment will be safely shut down. Mechanical assemblies will be locked and secured in a safe mode.

Continuation of Operations Plan:

During level 2, or under a special exemption under level 3, our group will implement the following protocols: First, personnel are only allowed in the lab for operations that cannot be done remotely. For Spider's cryogenic operations, safety considerations require that at least two individuals be present. Each day, all individuals scheduled to be on campus within seven days time are required to report via the PU Symptom Tracker. For those scheduled to be on campus, they will continue daily Symptom Tracker reports, and follow the EHS requirements reported through that system. Personnel are required to wear masks when not in their personal stations, and to wear latex/nitrile gloves while in the lab or using common

computers or equipment. All personnel will maintain 2m separation whenever possible. When necessary to conduct operations closer than this for any extended period of time, the PI will consult with EHS to determine proper precautions, including face shields to be worn unless doing so poses an elevated physical risk.

Level 2 - Phased Resumption

In this section, detail how the lab will enact strict social distancing requirements and comply with EHS-prescribed density and hygiene metrics and practices. All work that can be done remotely must continue to be done remotely. When devising the plans, consider the laboratory space as well as spaces that researchers use between experimental procedures (e.g., cold room, dark room, prep room, grad office space, break rooms). Because laboratories differ with regard to the types of experiments, equipment and staff, laboratories will need to develop plans customized to their particular situations. Describe the plan in sufficient detail for the academic chair or director to conduct a meaningful evaluation of your proposal.

Review the EHS [Guidelines for Safe Research during COVID-19 Pandemic](#) in developing your plans.

Occupancy Plans: Describe how staffing and scheduling will be organized to meet the occupancy metrics. A variety of models can be considered, such as daily shifts, rotations of days on and off, or cohorts. List the parameters for the number of people in the lab or in particular rooms at any one time. If a staffing rotation is necessary, describe the nature of the rotation and how the schedule will be maintained for all lab members.

Over the weekend of March 14-15, we implemented the following protocols: First, personnel are only allowed in the lab for operations that cannot be done remotely. For Spider's cryogenic operations, safety considerations require that at least two individuals be present. Each day, all individuals scheduled to be in Jadwin are required to register via the PU Symptom Tracker. Personnel shall wear latex/nitrile gloves while in the lab, using common computers or equipment, or handling shared tools or facilities. Whenever possible in the lab, they will maintain a minimum 2m separation. During mechanical or cryogenic operations that require multiple personnel (cryogen fills, mechanical assemblies, etc), all PPE will be worn and the duration of the procedures will be strictly limited to the minimum required to reduce potential exposure. In these circumstances, operational teams will be established to minimize any potential cross contamination, in coordination with EHS.

The group will operate in shifts, to ensure that the EHS occupational density guidelines are met in the existing laboratories and work areas. The nature and staffing of these shifts will necessarily be dynamic to adapt to the current phase of payload readiness. The conduct of undergraduate senior thesis research will comply with all protocols described in this document and any additional guidance from EHS.

Space Utilization: Describe how the facilities and work spaces will be managed to support physical distancing. What work areas will be designated for use or restricted (tape on floor, bench, or chair). Describe any adaptations (e.g., plexiglass barrier) that must be in place prior to working in a space.

Lab in Jadwin 245: A maximum of three people will be allowed in the 245 lab at a time, and within must conform to the distancing rules described above.

Highbay: As a shared space, the number of group personnel will depend upon the activities of the other groups and Physics personnel. We will coordinate these efforts with the department manager and EHS to ensure that the distancing requirements above are met.

Grad student office: Access restricted to those scheduled to be on campus, to limit the density. Occupancy of the shared graduate student space will be limited to ensure that the 2m distancing requirement is met. Whenever possible, work breaks/meal will be taken outside.

Sanitizing Plan: Building services will sanitize common areas within buildings, but researchers will be responsible for sanitizing lab space and research equipment. Describe the specific laboratory items that will require regular sanitizing, along with the appropriate sanitizing agents, frequency, and responsible individuals.

Doors will be left open while spaces are occupied. Handles will be sanitized at the beginning and ending of each shift with isopropanol, or the reagents suggested by EHS. Use of terminals other than personal computers will be restricted to designated individuals. This includes the ground-station and housekeeping computers in the highbay and the design and storage systems in 245. Steven Benton will be responsible for establishing the designated individual in each shift. Between shifts, mice and keyboards will be cleaned with isopro, or the reagent suggested by EHS. Nitrile gloves will be washed with soap per EHS hand-washing guidelines before and after handling shared hardware.

Special Considerations: List any activity that requires special attention or a unique management plan with regard to implementing the EHS-prescribed campus hygiene and safety practices (e.g., new procedure training, two-person operations). List each activity with the plan for adequate safety and hygiene. Consultation with EHS is available for developing individual plans. Request a consultation by emailing ehs@princeton.edu or through the [Princeton Service Portal](#).

Multi-person operations include cryogenic fills and operations, mechanical assembly/dis-assembly of the payload. Personnel are trained in the use of PPE including masks and face shields. This is already common practice for cryogenic operations.

Level 3 - Essential Operations

During the research ramp-down in March, 2020, PIs submitted plans for this level of operations. Please provide the information again here, including any relevant revisions or modifications you would have made based on the experience of the last several weeks.

In the event of a building or University closure, the goal is to reduce the load of activity and people on campus to allow all resources to be focused on critical functions. During such a time, no routine activities should proceed.

If your lab needed to shut down for a certain period of time, could you close your lab and walk away fully or are there critical activities that would need to be maintained on a regular schedule (daily, weekly, etc.)?

Check all that apply.	Selection
<input type="checkbox"/>	I will close my lab and walk away for the duration of the closure. (Leave the rest of this section blank and continue to Level 4.)
<input type="checkbox"/>	I must conduct critical maintenance and monitoring of equipment or organisms that would otherwise be irreversibly lost.
X	I have essential experiments that could not otherwise be replaced or repeated, even at great inconvenience, or COVID-19 research that must continue.

NOTE: my response to the above depends upon the duration and timing of the transition to L3, relative to deployment deadlines. The next of these is in November 2020., for SuperBIT's deployment to New Zealand I assume below that we are well within six months of that deployment. Unlike Spider, SuperBIT does not employ a complex, liquid-cryogen based cooling system. It is relatively easy to shut down (transition to L4), taking hours not days to safe it.

For those components that could not be suspended without unreasonable loss of data, organisms, reagents or finances, we ask that you describe a plan to maintain them using the minimum possible number of personnel, and the shortest amount of time on campus. Include activities/equipment that would be unsafe, irreversibly damaged, or detrimentally impacted if left unmonitored.

List a small number of lab group members (one to three persons, including the PI) who would need to have access to the building to continue to provide all essential operations listed in the tables below. *The list should not exceed 3 people total, including the PI.*

*For safety reasons, cryogenic operations require continuous monitoring. We therefore describe operations with two shifts. The shifts will be timed to ensure there is no temporal overlap. I list below the six personnel that would staff the two shifts, as indicated after the name. **No more than three people would be present at any time. No undergraduate students will be permitted in Jadwin under Level 3 operations, per EHS guidance.***

Research Personnel	PUID# <i>9-digit number</i>	Position/Status <i>Faculty, research staff, postdoc, graduate student</i>
1. William Jones (1)	[PUID]	PI
2. Steve Benton (2)	[PUID]	Researcher
3. Corwin Shiu (1) 4. Joseph van der List (2) 5. Vy Thuy Luu (1) 6. Suren Gourapura (2)	[PUID]	Graduate students

Critical maintenance and monitoring	Responsible Person <i>Indicate who from the</i>	Location <i>List building</i>	Frequency and Time Period
--	---	---	----------------------------------

List each activity.	<i>list above is responsible for each function.</i>	<i>and room numbers to which each person needs access.</i>	<i>List frequency, time of day, and duration.</i>
Optical alignment of the SuperBIT Optical Telescope Assembly (OTA)	William Jones	Jadwin highbay	As needed prior to shipment
Spider cryogenic operations, shift 2	Steven Benton	Jadwin highbay	
Spider cryogenic operations, shift 1	William Jones	Jadwin highbay	

Essential Experiments, COVID-19 research	Responsible Person	Location	Frequency and Time Period
Provide description and justification of essential research or COVID-19 research. <i>Use appendix space for longer descriptions or justification.</i>	<i>Indicate who from the list above is responsible for each function.</i>	<i>List building and room numbers to which each person needs access.</i>	<i>List frequency, time of day, and duration.</i>
[DESCRIPTION OF ESSENTIAL FUNCTION]	[RESPONSIBLE PERSON]	[LOCATION]	[FREQUENCY AND TIME]

Level 4 - Operations Suspended

In the event of a catastrophic impact from COVID-19, it could be necessary to suspend activity in order to manage an outbreak. During such a time, no routine activities would proceed. A few key differences make level 4 different from level 3: equipment is shut down rather than idled; cell lines are cryopreserved rather than maintained; and only irreplaceable organisms (e.g., transgenic mice, zebrafish, Drosophila) are maintained.

Vertebrate animal management will be handled only by LAR. Only designated critical staff will be granted access to buildings to manage irreplaceable resources or COVID-19 research.

Critical maintenance and monitoring	Responsible Person	Location	Frequency and Time Period
List each activity, with brief justification as to why it requires maintenance or monitoring at Level 4.	<i>Indicate who from the list above in Level 3 is responsible for each function.</i>	<i>List building and room numbers to which each person needs access.</i>	<i>List frequency, time of day, and duration.</i>
None	[RESPONSIBLE PERSON]	[LOCATION]	[FREQUENCY AND TIME]

COVID-19 Research	Responsible Person	Location	Frequency and Time Period
Provide description and justification of COVID-19 research. <i>Use appendix for longer descriptions or justification.</i>	<i>Indicate who from the list above is responsible for each function.</i>	<i>List building and room numbers to which each person needs access.</i>	<i>List frequency, time of day, and duration.</i>
[DESCRIPTION OF ESSENTIAL FUNCTION]	[RESPONSIBLE PERSON]	[LOCATION]	[FREQUENCY AND TIME]

E. Core Facilities and Support Services

List research support facilities or services within your department/institute, another department/institute, or provided centrally, upon which your lab depends during level 2, 3 or 4 research operations. Recognize that each core facility or research service faces the possibility of curtailing or suspending services temporarily due to COVID-19, even if activity proceeds in other parts of the department or campus. The purpose of preparing this list is to facilitate consultations with the core facilities or service providers about their operational status during different levels of research. Do not list the services upon which all University labs rely, such as the Energy Plant, OIT (for internet, e-mail and central servers), or Procurement.

Research core facility or support service:	Research levels in which service or facility would be needed	Department/institute in which facility or service is managed
Highbay crane operations	2,3	Physics
Liquid Helium Plant	2,3	Physics
Liquid Nitrogen/Gas cylinder supply	2,3	Physics
Loading Dock	2,3	Physics
Stock room	2,3	Physics

--	--	--

Appendix: