

Future missions to the Moon, Mars, and beyond will require the appropriate characterization and mitigation of the many of the health risks associated with cosmic radiation exposure. An ongoing partnership between the National Aeronautics and Space Agency (NASA) and the Office of Science for the U.S. Department of Energy (DOE) has established the NASA Space Radiation Laboratory (NSRL) at the DOE Brookhaven National Laboratory (BNL) to create a space radiation ground-analog. NSRL provides the capability to use simulated space radiation with high energy ion beams for assessment of biological outcomes relevant space radiation risks as well as electronics testing for avionics safety.

Current NSRL irradiation capabilities include a variety of exposure variables available for experimental needs:

- Up to approximately 10 Gy/min dose-rates with a 20 × 20 cm² beam area.
- Down to several hundred particles within a 60 × 60 cm² beam area.
- Dose fractionation across multiple days is also possible.
- For most radiobiology experiments the exposure structure, referred to as “spills”, has a 4 second repetition time where ions are extracted uniformly during a 0.3-0.4 second spill, followed by a ~3.6 second recovery time when the beam is off.
- Both single or mixed-beam field irradiations are possible including a full 33-beam GCRSim and 6-beam SimGCRSim.

Biological experiment capabilities: Two labs for Cell/tissue culture procedures can be conducted in two lab spaces with a separate lab available for sample processing that contains two chemical fume hoods. Sixteen fully equipped cell culture laboratories are available in the NSRL’s Long Term Support area in the Medical Building. The current vivarium configuration can support approximately 8,000 rodents/year for animal-based experiments. The NSRL area animal husbandry system includes five caging racks with 48 spaces in each coupled to a ventilation/filtration system in largest room, and two smaller rooms with conventional caging systems.

Schedule: The NSRL is nominally open for experiment scheduling during three runs per year; Spring (March – May), Summer (May - June), and Fall (Sept – Nov). NASA funding is not required for biological and electronic testing experiments at the NSRL.