

Hardware Development for the Radio Neutrino Observatory in Greenland (RNO-G)

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The Radio Neutrino Observatory in Greenland (RNO-G) is an in-ice Askaryan radio detection array near to NSF Summit Station. RNO-G is currently under construction, with the first stations being deployed to Greenland in Summer 2021. By the end of 2023, RNO-G will be the world's largest in-ice radio detector and, after a five year science run, will have a world-leading sensitive to the diffuse astrophysics neutrino flux at energies above 10 PeV. RNO-G will be composed of 35 autonomous stations in a 5x6 km grid. Each station is composed of the following:

- Data acquisition system (DAQ) inside of an environmental enclosure, composed of:
 - In-house developed, 24 channel digitizer board
 - 4-channel, low threshold trigger board with FPGA-based phased array trigger
 - Controller board powered by a commercial single board computer
 - Low-noise amplifiers for receiver of surface antennas and RF-over-fiber receivers for deep antennas
 - GPS receiver for timing and position calibration
 - Calibration pulser source with transmitter to 'helper strings'
- Deep science antennas deployed 100 m down into the ice in 11.2" diameter boreholes. The equipment down each borehole, called 'strings', are:
 - 1x 'power string' with four vertically polarized antennas for phased array triggering
 - 2x 'helper strings' for azimuth reconstruction of events and calibration
- Surface science antennas used for surface air shower tagging, noise rejection and improved reconstruction of deep-triggered events
- Power system of solar panels, a battery bank and the future possible addition of a wind turbine
- Wireless communication via an LTE and LoRAWAN network

The RNO-G experiment development and deployment is ongoing, with most systems coming online for the first time during the ICRC 2021 conference. We have developed hardware for a detector composed of modular, autonomous stations, including wireless communication, solar power system, low-threshold triggering and borehole-deployed antennas. With the hardware so far developed and deployed, RNO-G is well on its way to accomplishing its science goals.