

NERT Temperature-Gain Calibration

Abstract

The gain of the North-Georgia Radio Telescope (NERT) receiver is sensitive to changes in the receiver temperature (T_R). To improve the accuracy and repeatability of the measured radio flux (output voltage of the square-law detector), a temperature-gain calibration must be determined and applied to the raw output voltage. To determine the calibration, NERT is pointed to the North Celestial Pole which for our non-tracking system allows the system to point in the same celestial position continuously and provides a source of constant radio flux. A calibrated noise source (CNS) is also used for a stronger constant flux. During a transit observation of a program object such as the Sun, the receiver temperature and the raw output voltage are recorded as a function of time. The temperature scan and the temperature-gain calibration are used to create a gain-corrected output voltage normalized to a $T_R = 20^\circ \text{C}$ and a gain of 10 dB. This allows the system to measure the same value of the output voltage for a given observed flux despite the temperature of the receiver, ensuring accurate and repeatable measurements.