

Reducing the Unwanted Effects of Stray Radiation from Radio Telescope Observations

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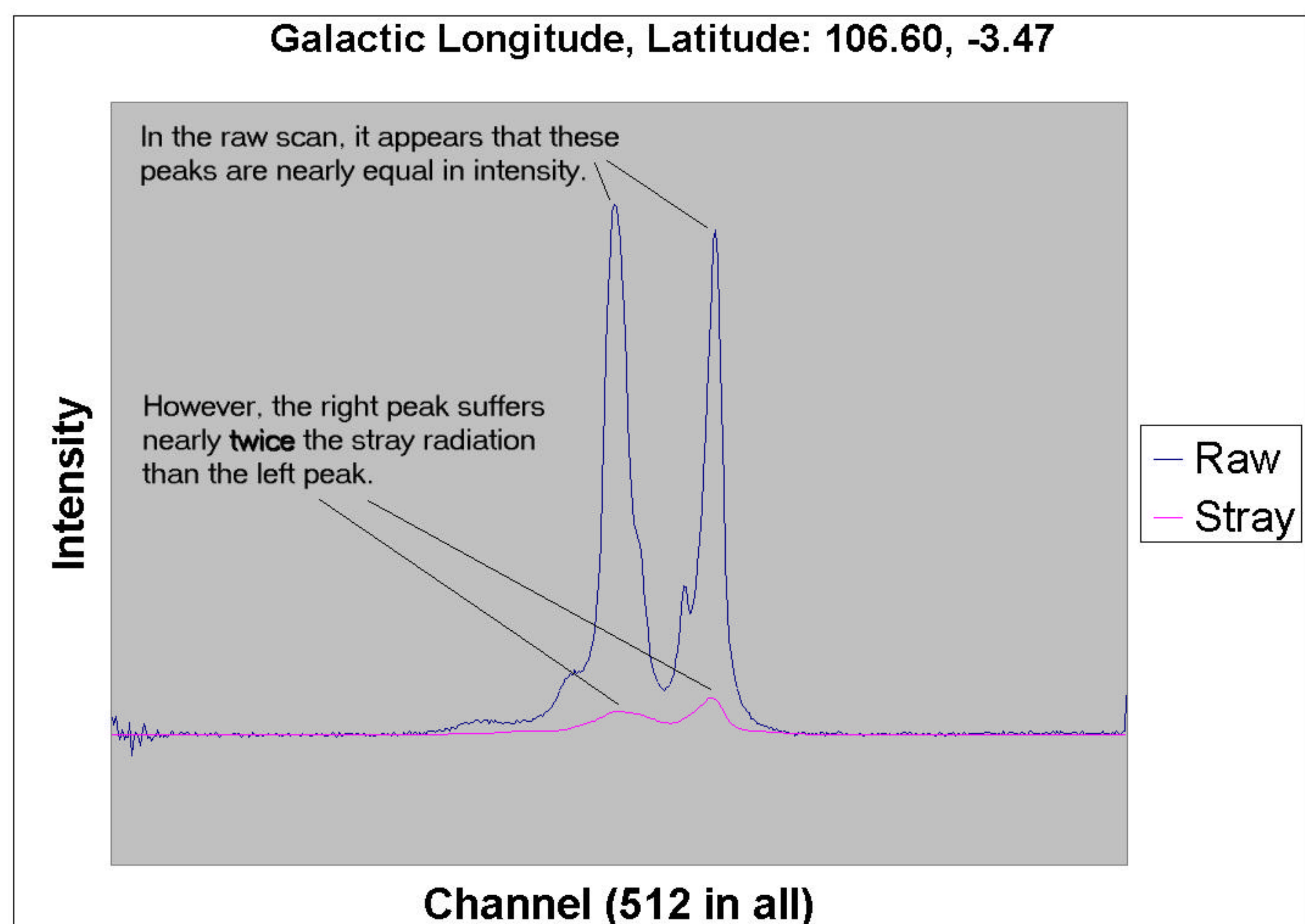
Abstract

Some fraction of the signal detected by a radio telescope typically consists of unwanted signals from directions off the main line of sight. This so-called stray radiation is undesirable, as it limits the dynamic range of observations and in some cases dominates the total signal received. Stray radiation in data from a given telescope can be estimated, and possibly removed, if the response of that telescope can be determined in all directions on the sky. Considerations such as the size and shape of the feed support legs, the receiver housing, the dish shape and defects, and even the surrounding terrain determine the response pattern. Given the all-sky response of a telescope, and maps of the radio emission from the sky at the frequency of interest, the cross-correlation of the two functions gives an estimate of the stray component in the data.

The goal of this project is two-fold: First, we wish to develop software that uses the already-determined response attributes of the NRAO 140-foot telescope at Green Bank and removes stray radiation from observations made by that telescope. Second, we wish to determine the response attributes of the new 100-meter diameter Green Bank Telescope (GBT) so that the same software can be used to estimate stray radiation in GBT observations as well.

This research experience will also be brought into the classroom through a specially designed computer science course. A typical CS course usually focuses on smaller and more academic problems for the purpose of teaching specific concepts. This special course will go beyond that, since it will present students with the challenge of designing, implementing, and maintaining a large real-world software project.

Accounting for Stray Radiation can better establish relative magnitudes of peaks in a scan.



Accounting for Stray Radiation can both validate and invalidate peaks in a scan.

