

TIME: Probing the Epoch of Reionization and Star Formation with LIM

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Abstract

TIME is a mm-wavelength spectrometer that aims to study the epoch of reionization through its star formation by measuring spatial fluctuations in [CII] line intensity.

The objective of this project was to develop a data analysis pipeline for this instrument.

Introduction

Line intensity mapping (LIM) is a method to measure the integrated emission lines from all frequencies within a spatial region. This allows us to include signals from galaxies too faint to detect with standard galaxy redshift surveys.

TIME's spectral range of 185-323 GHz corresponds to [CII]'s $157.7\mu\text{m}$ fine structure line redshifted from a z of 5-9, overlapping with the epoch of reionization.

Data obtained from TIME's 2019 engineering run and simulated data generated by Dongwoo Chung were used for the data analysis in this project.

Data Analysis

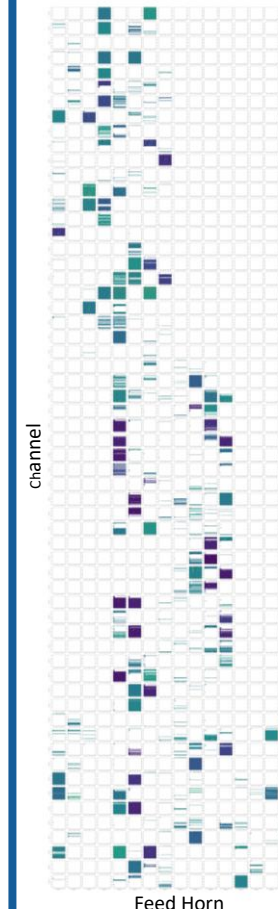
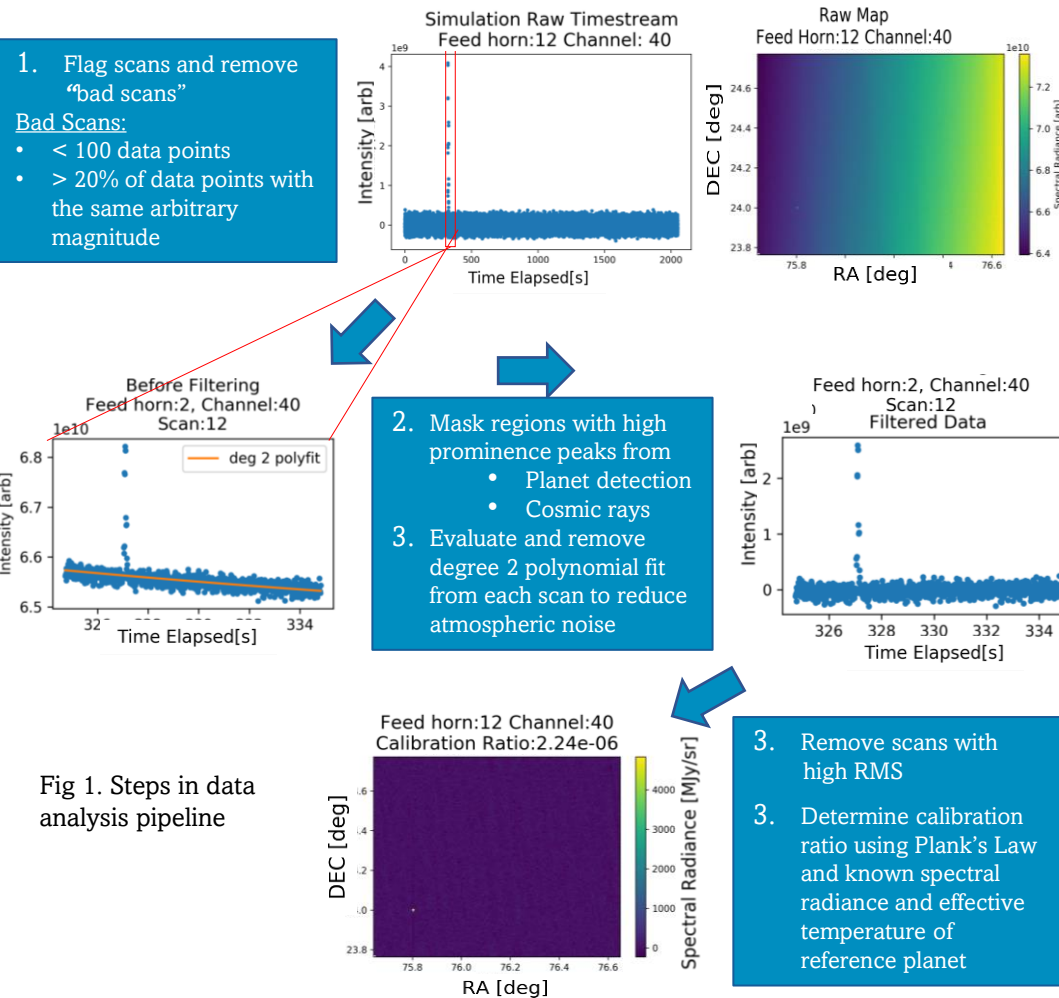
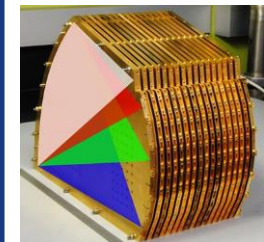


Fig 2. All maps from 2019 engineering run

Instrument



(Top)
Grating spectrometer. There are 16 feed horns spanning spatially, and 60 spectral channels.



(Bottom)
The instrument at Kitt Peak National Observatory for an engineering run in 2019.

(Abigail Crites, Isaac Trumper, Dan Marrone, Nick Emerson)

Next Steps

TIME's next deployment is scheduled for November 2021. With instrument updates we expect to obtain data with improved optics, lower read-out noise and reduced noise from reflection.