

1. Introduction

- (a) 21-cm Basics
- (b) History of the Intergalactic Medium
 - i. Cosmic Microwave Background and the Epoch of Recombination
 - ii. Dark Ages
 - iii. Cosmic Dawn
 - iv. Epoch of Reionization
 - v. Galaxy Evolution (is there a formal name?)
- (c) Intensity Mapping
- (d) Other Possible Topics
 - i. Dark Energy
 - ii. BAO

2. SCI-HI Experiment

- (a) Overview
- (b) System Design
 - i. Antenna
 - A. Design Considerations
 - B. Simulation
 - C. Scale Model Testing
 - D. Antenna Pattern and Impedence
 - E. Construction
 - F. Portability and Travel
 - ii. Electronics
 - A. Calibration Switch
 - B. Amplifiers
 - C. Impedence and Efficiency
 - D. Filters and Attenuation
 - iii. Data Processing (aka Computer)
 - A. ADC (sampling, integration, etc)
 - B. Power (AC vs DC, Consumption and Heating)
 - C. Noise Generation
 - D. Faraday Cage
- (c) Deployment and Site Testing

- i. Overview
 - ii. Preliminary Site Testing
 - A. Pittsburgh
 - B. Zona del Silencio
 - C. Algonquin
 - D. Green Bank, West Virginia
 - iii. Isla Guadalupe
 - A. Site evaluation (aka summit vs fishing village)
 - B. Logistical Challenges
 - C. Weather Impacts (both to experiment and to expeditions)
 - D. Measurements
 - iv. Future Sites
 - A. Isla Socorro
 - B. Isla Clarion
 - C. South Africa (Marion and Gough Islands)
- (d) Data Analysis
 - i. Integration and Sampling
 - ii. Calibration Data
 - iii. Efficiency Data (VNA measurements)
 - iv. RFI
 - A. Ionospheric effects
 - B. FM band
 - C. AM band
 - D. Time variability
 - E. Local RFI (aka village generator, spark plugs for trucks, etc.)
 - v. Calibration Factor (K)
 - A. Johnson Noise Calibration
 - B. Milky Way Galaxy (GSM) Modelling
 - C. Daily Variance
 - D. GSM vs Δ GSM
 - vi. Polynomial Fitting and Subtraction
 - vii. Signal Removal Check (simulation)
- (e) Results
 - i. Day-to-Day differences
 - ii. Noise Contributions

3. GBT-IM Experiment

- (a) Overview
- (b) Observing
 - i. Scan Strategy
 - ii. Field Coverage
 - iii. Data volume
- (c) Calibration
 - i. Stokes Parameters
 - ii. Absolute Flux Calibration
 - iii. Full Mueller Calibration
 - iv. Significant Mueller Parameters
 - v. Time Variability
- (d) Results (discuss current paper results and impacts of larger dataset).