SALSA is an ICT based educational tool for Astrophysics students to study structure and dynamics of Milky Way Galaxy

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Overview

Introduction

ICT based astronomy and astrophysics tools have been developed for decades for undergraduate level use including radio telescopes controllable over the Internet at minimal cost. These radio telescopes can effectively be used to study galactic structure and dynamics. This paper presents an observation to study galaxy dynamics and map its spiral structure which was carried out between galactic coordinate longitudes 6° to 225° and latitudes 0° to 35° with two low cost 2.3 meters Haystack model type radio frequency receiving systems called SALSA radio telescopes at Onsala Space Observatory in Sweden which is maintained by Chalmers University of Technology.

SALSA Telescope

Basic Details of SALSA

SALSA is a part of the European Hands-On Universe project(EU-HOU) [1] designed to bring interactive lessons of astronomy to the classroom [2]. There are two SALSA telescopes with the same specification see Table 1 [3].

Anyone can control these telescopes using Internet browser by log in `https://vale.oso.chalmers.se/salsa/` for free at any time.

Basic Diagram of a SALSA Small Radio Telescope

Figure: Block Diagram of Haystack Small Radio Telescope [4]

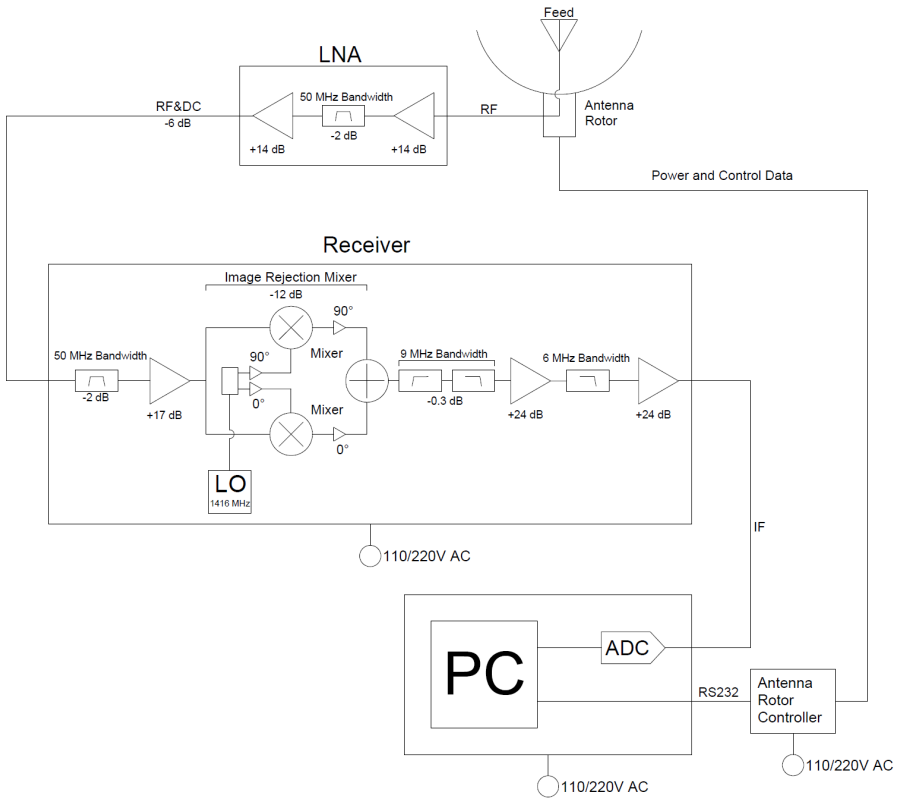

Table: Specification of SALSA

Parameter	**Value**
Diameter	2.3 m
Focal length	0.9 m (f/0.37)
Angular resolution	7 degree at 1420 MHz
Frequency range	1420 ± 20 MHz
Frequency resolution	9.375 kHz (2.4 MHz over 256 frequency channel
Noise diode temperature	$\approx$ 100K
System temperature	$\approx$ 500K
Aperture efficiency	$\approx$ 50%
Mount	two-axis azimuth/elevation
Pointing accuracy	$\approx$ 0.2 degree
Travel limits	0-90° vertically, 0-360° horizontally

Components of SALSA

- A 2.3 meter satellite dish on a fully steerable, motorized azimuth-elevation mount
- A rotor controller to run the motors which steer the telescope
- A feed composed of a helical antenna backed by a cavity
- A super-heterodyne receiver providing 10 MHz bandwidth centered on the 1420.4 MHz (21-cm) hydrogen line
- A low-noise amplifier
- A/D conversion on a dedicated PCI card
- Software on a desktop computer to receive and process data from the telescope and control it

HI Surveys

1. In 1933, Karl Guthe Jansky detected first extraterrestrial radio frequency [5]
2. In 1945 then Van de Hulst predicted 21 cm wavelength emission [6]
3. Detected HI line by Muller and Oort in the same year [7]
4. A preliminary survey was made by Christiansen and Hindman [8] in Australia
5. In Netherlands, Muller and Westerhout [9]
6. All-sky mapping in HI line based on EBHIS and GASS [10]

Within these periods angular resolution has been developed from 30° to 30 -μas [11, 12].

Paragraphs of Text

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Bullet Points

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- Aliquam blandit faucibus nisi, sit amet dapibus enim tempus eu
- Nulla commodo, erat quis gravida posuere, elit lacus lobortis est, quis porttitor odio mauris at libero
- Nam cursus est eget velit posuere pellentesque
- Vestibulum faucibus velit a augue condimentum quis convallis nulla gravida

Blocks of Highlighted Text

Block 1

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Block 2

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Block 3

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Table

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table: Table caption

Theorem

Theorem (Mass–energy equivalence)

$E = mc^2$

Verbatim

Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

Figure

Uncomment the code on this slide to include your own image from the same directory as the template .TeX file.

Citation

An example of the `\cite` command to cite within the presentation:

This statement requires citation [Smith, 2012].

References


John Smith (2012)
Title of the publication
Journal Name 12(3), 45 – 678.


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