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Industrial Visit to "Gauribidanaur Radio Observatory" Organized by Astronomy Club, MVJCE.

Industrial Visit to Gauribidanaur Radio Observatory

Astronomy Club and the Department of Aeronautical Engineering, MVJCE, organized an Industrial Visit to Gauribidanaur Radio Observatory, from 11.00 a.m. to 2.00 p.m. on 03.04.2019.

Participants

47 participants from various department participated in this industrial visit. Mr. Antony Samuel Prabu G (AP, AE, and Astronomy Club Faculty Coordinator) organized the event, along with the Student Coordinator Mr.Shashi R Mistry (1MJ17AE054).

About the Event

Gauribidanaur Heliograph:

A radio heliograph to obtain two dimensional images of the solar corona simultaneously, at different frequencies in the range 40 - 150 MHz, has been functional here since 1997. The basic receiving element used is a log-periodic dipole (LPD), and the array consists of 384 of them, configured as 64 groups. The dipoles are arranged in a 'T' configuration similar to the GEETEE. The present spatial and temporal resolution of the GRAPH is ~3 arc min (@ 150 MHz) and ~256 msec, respectively. The array is in regular operation, and the observing period is ~9 am - 5 pm (03:30 - 11:30 UT), every day.

Lecture on Radio Observatory

Professor Ramesh, Indian Institute of Astrophysics, explained about radio frequency interference. In Gauribidanaur, 35 to 500 megahertz frequency has been calculated. There is a radio telescope of 12m dish antenna. And it is used to read the radio signals with the help of sensors.

Based on the theoretical formulations for the response of a correlation interferometer to polarized radiation, an east-west one-dimensional array of 40 log periodic dipoles has been set up, to probe the coronal magnetic field in the height range ~0.2 - 0.8 Rs, above the solar surface. The dipoles are arranged as 3 groups, oriented at 0° and 90°, with respect to the terrestrial north. This helps in

capturing the polarization state of the incident radiation, with good accuracy. The idea is to get information on the coronal magnetic field through observations of circularly polarized radio emission from the discrete sources in the corona. The spectral dependence of the observed emission in the above height range is derived through simultaneous multi-frequency observations.

The Radio Interferometry Polari meter

The next session was on the Radio Interferometry Polari meter. The Resource Person explained about the burning sun. Electromagnetic spectrum can detect the radiations from outer atmosphere to inner atmosphere. The core of the sun has more electron density. Volume density decreases at the outside of the core. Outermost of the sun is Photosphere Corona, it is very small, and it cannot be seen due to the radiation.

Characterization

By using the on-board satellite and earth ground station radio telescopes, accurate radiations which have emerged from the universe can be got. Piezoelectric material is used as a transducer. The basic receiving system consists of a pair of dipole antennas tuned to receive radio frequency (RF) signal at ~191 MHz The RF signal incident on each antenna is amplified independently in a broad band amplifier, and then transmitted to the receiver room via coaxial cables. In the receiver room, the signal from each antenna is first passed through a band pass filter having centre frequency ~191.4 MHz and half-power bandwidth ~6 MHz, to minimize the contribution from interfering signals at other frequencies. The filtered signal is then mixed with a local oscillator (LO) signal at 180.7 MHz to down convert the RF signal to an intermediate frequency (IF) signal at 10.7 MHz The output of the mixer is amplified and passed through a band pass filter with centre frequency ~10.7 MHz and half-power bandwidth ~1 MHz.

Ground Control Centre

Radio waves travel at the speed of light. While capturing the radio waves with the help of Polari meter, all the signals are collected, and given to the ground control station with the help of the co-axial cable. The signals are stepped-up with the help of an amplifier, and then converted from analogue to digital format with the help of computer and software. Low noise amplifier is used in this process.

Industrial visit to Gauribidanaur Radio observatory from the Astronomy club members of MVJ college of Engineering on 03.04.19.

Industrial visit to Gauribidanaur Radio Interferometry Polarimeter from the Astronomy club members of MVJ college of engineering on 03.04.19

Industrial Visit to Gauribidanaur observatory Radio control station from the Astronomy Club members of MVJ college of engineering on 03.04.19.

Industrail Visit to Gauribidanaur Radio Observatory Radio Control station from the Astronomy Club members of MVJ college of engineering on 03.04.19

Outcome of the Event:

This Industrial Visit helped the students to understand the different types of Radio Telescopes and the difference between Radio heliographs, Low-frequency Solar Spectrograph, Radio Interferometry Polari meter, Brazilian Decimetre Array. Students can also apply for internship in Gauribidanaur Radio Observatory, which will lead them to innovative ideas to make new observations in the universe.