XAVIER INSTITUTE OF ENGINEERING

A SISTER INSTITUTION OF ST. XAVIER'S COLLEGE

# INDUSTRIAL VISIT TO SATELLITE EARTH STATION, YEUR, THANE

DATE: 02/03/2019

**Event Coordinator(s)**

**1. Prof. Shailaja Udtewar**

**Student Coordinator(s)**

**1. Tailor Rajnish**

**Time & Place:**

**10:00 a.m. to 2.30 p.m**

**BSNL Satellite Earth Station, Yeur, Thane**

**Department:**

**Electronics and Telecommunication**

**No of participant:**

**1 Faculty**

**25 Students**

**OBJECTIVE:**

To amalgamate theoretical knowledge with the practical one, knowledge through books alone is not sufficient. Thus, the Department of Electronics and Telecommunication, Xavier Institute of Engineering strive to acquaint its students with the latest technology and developments in the world.

An Industrial Visit to a Satellite Earth Station at Yeur, Thane was planned for Final year EXTC students to make them aware of the various tasks and activities or work carried out in the Earth Station. Every engineering student has a right to fair knowledge in this fast-growing technology, since, Satellite Communication is a fast growing field, having advanced uninterrupted features and on huge demand in the global market.

**SCOPE:**

As students of the final year Electronics and Telecommunication have Satellite Communication and Networks as one of their subjects, so the visit to Satellite Earth Station, Yeur, Thane would definitely help them to provide a practical scenario of Satellite Communication and Networks and the Earth Station.

**RESOURCE PERSONS:**

1. Ms. Revathi B., Divisional Engineer (Satellite Mtce)
2. Mr. Vinod Bansal, Junior Telecom Officer
3. Mr. Dharmendra Kumar, Junior Telecom Officer

A group of 25 students gathered around 10.30 a.m. at the BSNL Earth station. The day started off with a prayer and welcome speech by Ms. Revathi B. who also spoke about the inescapable role of satellites in today's world. Then students were then divided into 2 groups and each group underwent vigorous training.

In the first session, students were explained about the basic transmission and reception blocks of the C-Band INSAT 3C satellite system by Mr. Dharmendra Kumar. The students were shown a number of equipment that was handling satellite live traffic. Students were also able to visually observe the spectrum of C-Band (IDR), Ku- Band and Ka-Band HUB the precautions and measures that are taken while handling such equipment.

In the second session, VSAT architecture and networking by VSAT for data communication was demonstrated to the students by Mr. Vinod Bansal. Very Small Aperture Terminal (VSAT) refers to an earth station linked to the satellite using RF link and usually will have different diameter antennas. VSATs provide an important communication link to set up a satellite-based communication network. VSATs can be used for voice, data, or video transmission and reception.

Corporations and Organizations that require financial and other information to be exchanged between their various locations use Artificial Satellites (about 3000) to facilitate the transfer of data through the use of Very-Small-Aperture-Terminal (VSAT) networks.

VSAT comprises of two modules viz. an outdoor unit and an indoor unit. The outdoor unit mainly houses Antenna, feed horn, RF Transceiver, LNA, Power Amplifier. The antenna size is typically 1.8 or 2.4 meter in diameter, although smaller antennas are also in use. The indoor unit functions as MUX-DEMUX, modem, and interfaces with the end user equipment like PCs, LANs, Telephones or an EPABX.

The VSAT's (Very Small Aperture Terminal) communicates to the HUB through AM1 satellite. A HUB is located at Bangalore and VSAT's are located all over the country. All the VSAT's are connected in a star topology but communicates through the HUB at Bangalore. The Instructor at BSNL also explained the students about how frequencies of K, Ku and C band were used at the center to provide data communication using VSAT to every house. VSAT 's were used because it could make communication possible even in places where conventional media like copper cable, optical fiber, radio & microwave would not be possible.

In the third session, students were taken outside the earth station but within the premises where various satellite C-Band, Ku-Band and Ku-Band antennas were located.

Mr. Dharmendra guided the students to each of these antennas and explained, in brief, their work and function. He described the significance of their position and orientation and also showed how we can move Antennas vertically and horizontally with the help of Azimuth and Elevation Angle. The students were also shown the generator systems responsible for keeping satellite system running without any hindrance.

At the end, Mr. Dharmendra gave a very good example of handling interferences and what's gonna happen if there is interference in the received signal. He explained about the immediate antenna setup that needs to be done during any natural calamities so as to provide basic communication and also about the antenna that is required when any VIP person comes to visit earth station to provide his safety.

At the end of each session the respective co-ordinators handled the doubts and queries of the students. Students have learned following technical points –

**SATELLITE EARTH STATION EQUIPMENT**

- C- Band INSAT 3C:currently in use to connect Port Blair to Yeur, Kolkata and Delhi
- Link Capacity is 34Mbps
- Intermediate Frequency used is 70 $\pm$ 18 MHz i.e. 52 to 88 MHz
- Receiver Range is 3.7 to 4.2 GHz. Radar cutoff filter at receiver attenuates frequencies up to 3.6GHz with 50dB attenuation
- Trans. rejection filter prevents mixing of transmitted and received data.
- Beacon signal is measured to determine quality of signal
- Network Operation Control Central (NOCC), Sikandrabad, controls all operations
- Antenna used has diameter 11m (remote antenna has 3m diameter, primary antenna has 7.5m diameter)
- LNA used is $45^{o}$ K ( remote uses $90^{o}$ K LNA, Primary uses $120^{o}$ K LNA)
- Antenna Control unit for tracking satellite movements, it performs a check every 30 minutes
- Antenna Movements are of two types : Azimuth and Elevation
- Beacon Tracking Receiver (BTR) works at 4187.5 MHz and its spectrum is observed using spectrum analyzer
- Bit Error Rate (BER) limit is $10^{-6}$ (anything more, say $10^{-5}$, is not acceptable)
- Traffic diversion through other antenna, if something wrong happens to present antenna to maintain the communication

**INSAT SERIES**

- 500 MHz Bandwidth with 24 C Band Transponders, 6 S Band Transponders, 2 Extended C Band Transponders
- Each transponder has a bandwidth of 40 MHz of which 4 MHz is used as Guard bands and the rest 36MHz is utilized for traffic
- Out of the 24 C Band Transponders, 1-12 are horizontally polarized (used for uplink) and 13-24 are vertically polarized (used for downlink)

**ANTENNA CONTROL UNIT (ACU)**

- Modem uses 1+1 configuration

**STUDENT FEEDBACK**

Students have observed and studied how Earth station signals are transmitted to and fro from the Earth station. Earth station was monitored continuously, i.e., various parameters such as Azimuth and Elevation angles of the antenna were continuously adjusted to keep the orientation properly with respect to the satellite. Apart from learning about Satellite Communication the students also had fun while learning and was overall a great day.

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**PHOTOS:**


भारत संचार निगम लिमिटेड
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