# DESIGN AND CONSTRUCTION OF SATELLITE COMMUNICATIONS DEMONSTRATOR

*Design Project*

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May 2010

# DESIGN AND CONSTRUCTION OF SATELLITE COMMUNICATIONS DEMONSTRATOR

Undergraduate Design Project
Submitted to the Faculty of
Cavite State University
Indang, Cavite

In partial fulfillment
of the requirements for the degree of
Bachelor of Science in Electronics and Communications Engineering



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**ALVIN U. SUMADSAD**

May 2010

# ABSTRACT

**ENCABO, ROSE ANN C. and SUMADSAD, ALVIN U. Design and Construction of Satellite Communications Demonstrator.** Undergraduate Design Project. Bachelor of Science in Electronics and Communications Engineering. Cavite State University, Indang, Cavite. May 2010. Adviser: Engr. Michael T. Costa

The Design and Construction of Satellite Communications Demonstrator was conducted at Cavite State University Main Campus, Indang, Cavite from October 2009 to February 2010. The main objective of the project was to design and construct a Satellite Communications Demonstrator. Specifically, it aimed to demonstrate the concept of satellite communications system by providing three separate stations. It aimed to illustrate the principle and function of satellite by using a light as a medium. Moreover, it aimed to demonstrate the process of satellite communications and its function of being a repeater.

The designed Satellite Communications Demonstrator has three different stations: the originating ground station (transmitter), the satellite station, and the destination ground station (receiver). The transmitter has an input channel for an audio inputs and the receiver has an available channel for speaker outputs. The circuitry of the device was designed with built-in potentiometer to adjust the sensitivity of each station.

The design project was setup and evaluated at the Department of Computer and Electronics Engineering Laboratory Room of College of Engineering and Information Technology. During the evaluation, the adviser and the technical critic examined the device. The device was setup with MP3 player and a 4Ω 3W speaker. To evaluate

whether the input signal (audio/sound) coming from the originating ground station will reach the destination ground station through the satellite station. Oscilloscope was used to observe the output waveform of the audio/sound.

The device was also evaluated using the function generator as an input and the output was observed using the oscilloscope. The test tone frequency of 1kHz with an amplitude or voltage of 1V was used to test the capabilities of the device. The distances between the stations were varied to further evaluate the efficiency, reliability and accuracy of the device. Channel one of the oscilloscope was connected to the output of the receiver in satellite station and channel two was connected to the output of the receiver station. Input and output waveforms were observed and analyzed to see the behavior of the device. Input and output voltages were also measured to be able to compute the attenuation on each given distance.

Results of the waveforms and computed values of attenuation proved that the device is working in accordance to what is expected. As the distance or length goes higher the attenuation and losses also goes higher.

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**Encabo, Rose Ann C.**
**Sumadsad, Alvin U.**

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[1/]An undergraduate design project submitted to the faculty of Department of Computer and Electronics Engineering, College of Engineering and Information Technology, Cavite State University, Indang, Cavite in partial fulfillment of the requirements for graduation with the degree of Bachelor of Science in Electronics and Communications Engineering with Contribution No. BSECE–2009–10–003. Prepared under the supervision of Engr. Michael T. Costa.

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## INTRODUCTION

Satellite is an object which has been placed into orbit by human endeavor. Such objects are sometimes called artificial satellites to distinguish them from natural satellites such as the Moon. Satellites are used for a large number of purposes. Common types include military (spy) and civilian Earth observation satellites, communication satellites, navigation satellites, weather satellites, and research satellites. Space stations and human spacecraft in orbit are also satellites. Satellite orbits vary greatly, depending on the purpose of the satellite, and are classified in a number of ways.

Satellite is one of the most helpful tools in communications. Satellite communications provide a microwave radio relay technology complementary to that of submarine communication cables. They are also used for mobile applications such as communications to ships, vehicles, planes and hand-held terminals, and for TV and radio