

5.5 Direct Broadcast Satellites (DBS/DTH)

Introduction

Satellites provide broadcast transmissions in the fullest sense of the word, since antenna footprints can be made to cover large areas of the earth. The idea of using satellites to provide direct transmissions into the home has been around for many years, and the services provided are known generally as direct broadcast satellite (DBS) services. Broadcast services include audio, television, and Internet services.

A type of satellite service that allows direct transmission of signals from the satellites present in the geostationary orbit to the personal dish antennas present in homes audiences is known as Direct Broadcast Satellite. It is abbreviated as DBS.

More simply, DBS is regarded as a technique of transmitting messages or signals directly to the general public (existing as an individual or a community) using artificial satellites orbiting the earth. The frequency band in which the DBS operates change according to the region in which the operation is taking place.

DBS

Direct Broadcast Television is nothing but digital TV. The use of satellites for the purpose of providing services directly to homes using satellites has evolved several years ago, more specifically, DBS-TV was introduced in the year 1986. The various broadcasting services offered by the DBS are audio, video and internet services.

The frequency band of operation for the direct broadcast television service changes according to the region of operation. Generally, Ku-band (14/12 GHz) is specified for DBS services as it is less prone to problems such as interference. The reason is

that at such high-frequency bands the chances of congestion are quite low, along with that, ku-band is not utilized in terrestrial microwave communication. When the frequency is high then the receiving antenna required will also be of small length and due to smaller antenna size higher value of EIRP is obtained from the satellite. This resultantly reduces the overall cost of the equipment.

For DBS, it is said that the satellites used for providing the service offers broadcast transmission in a way that the antenna footprints are made wide so that it can cover a sufficiently large region. Thus, the satellite in motion in space when receives a signal from one earth station then that respective signal can be received by various home TV dish antennas that are present within the footprint region. Thus, DBS allows direct reception of signal that is coming from the satellite.

It is to be noted here that at the receiving end, it can be a single user that is willing to receive or it can be a group of users among which the received signal is distributed.

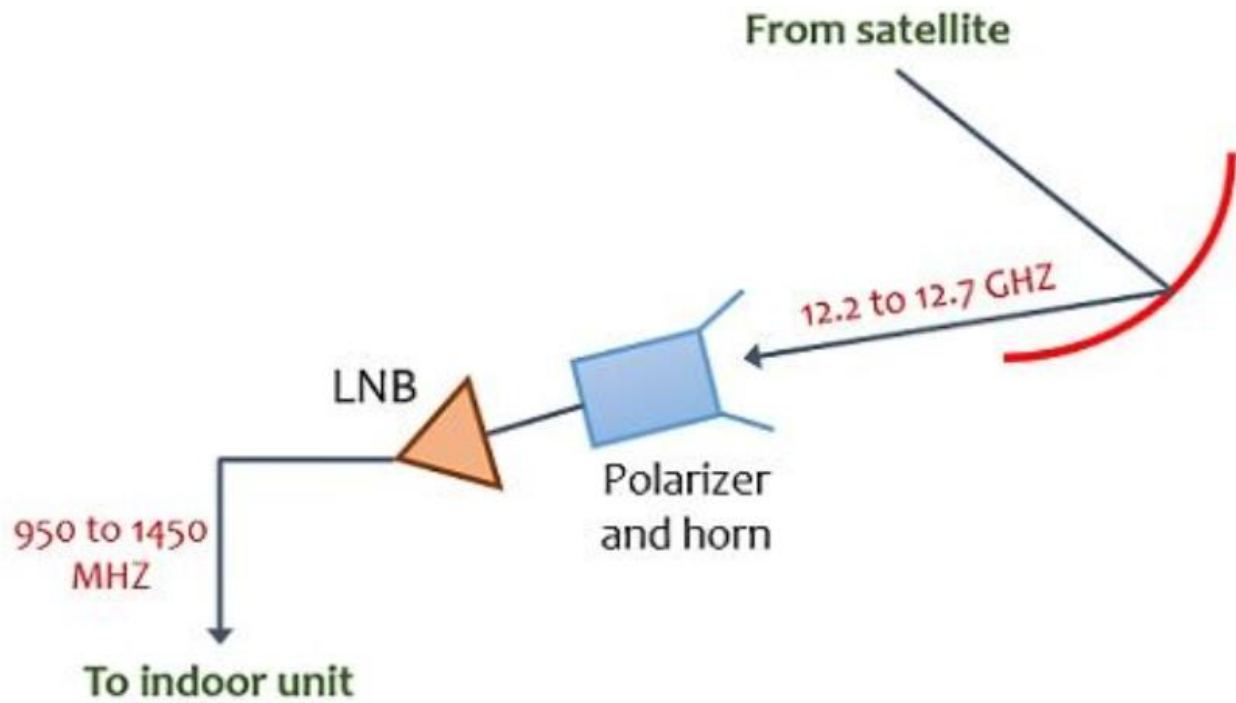
DBS is known to be an active field of satellite development and can help in providing innovations in other fields as well such as HDTV.

DBS – Home Receiver

The home receiver system of a Direct Broadcast System mainly has 2 units namely, an outdoor unit and an indoor unit. Let us first see:

The Outdoor Unit

The figure below represents the schematic of the Outdoor Unit for the DBS Home Receiver:



Schematic of Outdoor Unit

Block diagram of outdoor unit of DBS

It is clearly shown in the above figure that the dish antenna at the receiver first receives the downlink signal from the satellite which is in the range from 12.2 GHz to 12.7 GHz. The received signal is then focussed towards the receive horn. The receive horn directs the signal towards the polarizer that helps to pass the left-hand circular or right-hand circular polarized signals by performing adequate switching.

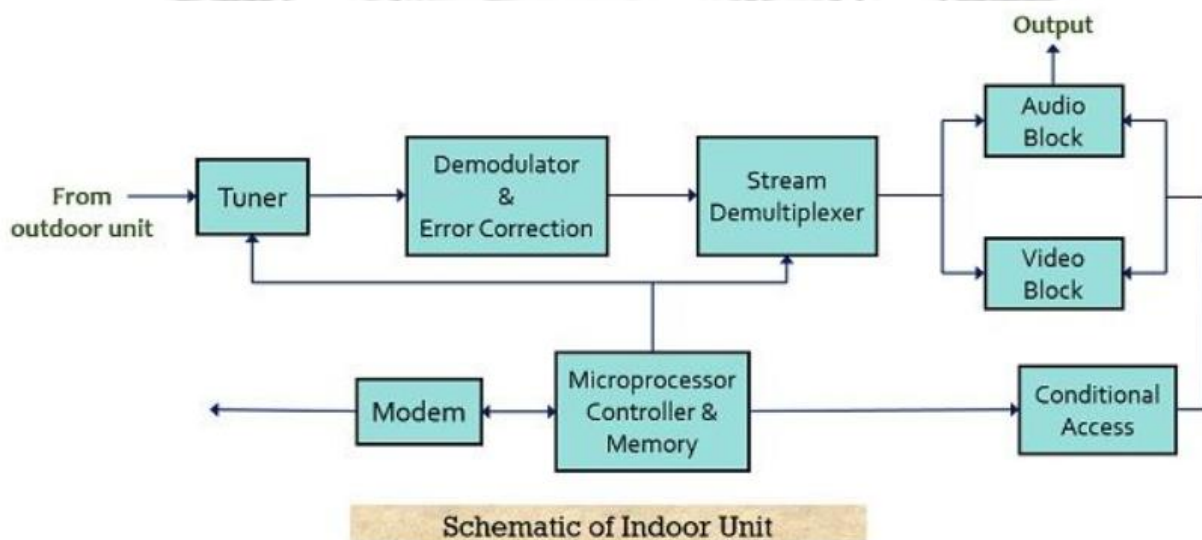
There is a low noise block that contains a combination of a Low Noise Amplifier (LNA) and a downconverter. The LNA is the unit that is responsible for the amplification of low strength signals. These are the signals that are hardly recognized by the antenna and necessary amplification must be performed without the addition of noise. Now, the downconverter comes into action and down-conversion of the signal in the range from 12.2 to 12.7 GHz is performed which is

converted into the range 950 to 1450 MHz. The reason for this down conversion is that for the transmission of a signal from the connecting cable to the indoor unit, these down-converted frequencies are suited properly.

It is to be noted here that in order to gather most of the signal the arrangement of the receiving antenna must be such that it should exhibit an obstruction-free view from the satellite cluster in space. And as there is a cluster of satellites thus, the beamwidth of the antenna should be sufficiently wide so that it can receive from all the satellites present in the cluster.

The Indoor Unit

The figure below shows the block diagram representation of the indoor unit:



Block diagram of indoor unit of DBS

The tuner is the foremost block of the indoor unit which is used for selecting the transponder. As we know that the down-converted frequency is in the range from 950 to 1450 MHz but the guard band of 24 MHz is maintained by the transponder

in the selected bandwidth. Thus, out of the 32 transponders, any of them must be received by the indoor unit.

It is to be noted here that for a single polarization only a signal from 16 transponders must be available. The modulation of the carrier at the centre frequency performed here is QPSK. Further, demodulation of the quadrature phase-shift keying modulated signal is performed and it is converted into the equivalent bitstream. Once this is done then an error correction scheme is implemented to eliminate the errors from the received sequence.

Here demultiplexing of the received sequence is performed where individual programs get separated and then get separated in the buffer memories so that further processing may take place. At this stage, further processing may correspond to the conditional accessibility, usage history view, modem connection, etc.

Applications of DBS

The approach of transmitting the signals directly from the satellite to the home receivers helps in providing broadcast services of audio and video along with other interactive data services. A properly installed DBS system helps in providing information when any rapid disaster (such as forest fire) occurs in any remote area. DBS also finds applications in fields where on-demand information is required such as weather forecasting. One of the basic applications includes providing distance learning programs.

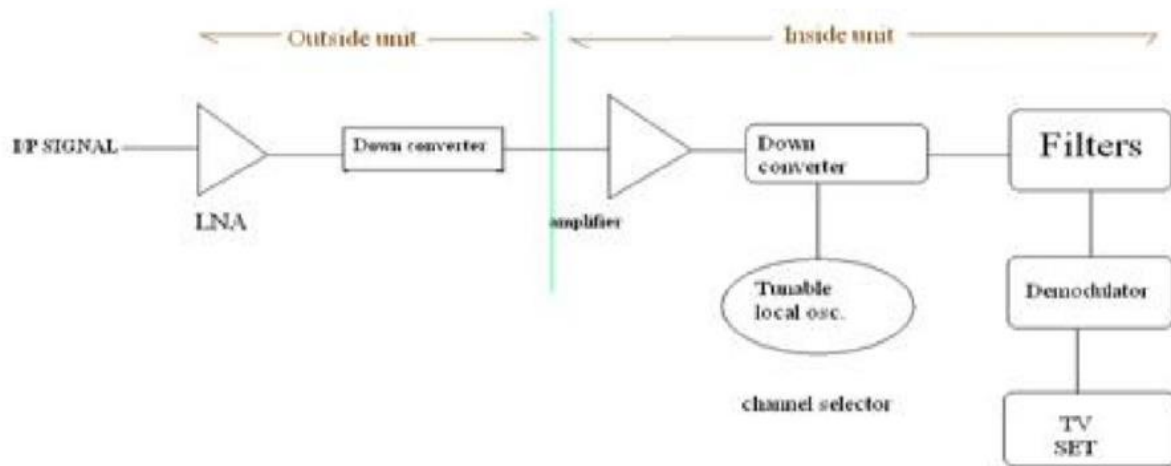
Direct to home Broadcast (DTH):

DTH stands for Direct-To-Home television. DTH is defined as the reception of satellite programmes with a personal dish in an individual home.

- DTH Broadcasting to home TV receivers take place in the ku band(12 GHz). This service is known as Direct To Home service.
- DTH services were first proposed in India in 1996. Finally in 2000, DTH was allowed.
- The new policy requires all operators to set up earth stations in India within 12 months of getting a license. DTH licenses in India will cost \$2.14 million and will be valid for 10 years.
- Working principal of DTH is the satellite communication. Broadcaster modulates the received signal and transmit it to the satellite in KU Band and from satellite one can receive signal by dish and set top box.

DTH Block Diagram:

- A DTH network consists of a broadcasting centre, satellites, encoders, multiplexers, modulators and DTH receivers
- The encoder converts the audio, video and data signals into the digital format and the multiplexer mixes these signals.
- It is used to provide the DTH service in high populated area A Multi Switch is basically a box that contains signal splitters and A/B switches.
- The outputs of group of DTH LNBS are connected to the A and B inputs of the Multi Switch.



Block Diagram of DTH Service

Advantages of DTH:

- DTH also offers digital quality signals which do not degrade the picture or sound quality.
- It also offers interactive channels and program guides with customers having the choice to block out programming which they consider undesirable.
- One of the great advantages of the cable industry has been the ability to provide local channels, but this handicap has been overcome by many DTH providers using other local channels or local feeds.
- The other advantage of DTH is the availability of satellite broadcast in rural and semi urban areas where cable is difficult to install.

What is the difference between DTH and DBS?

Direct to home technology is the satellite television broadcasting process which is actually intended for home reception. This technology is originally referred to direct broadcast satellite (DBS) technology.

