Chapter : CABLE TV

CONSTRUCTIONAL DETAILS, WORKING AND RADIATION PATTERN OF DISH ANTENNA

[Q] DRAW TYPICAL CABLE TV NETWORK PLAN AND STATE THE FUNCTION OF DIFFERENT TYPES OF AMPLIFIERS USED IN CABLE TV SYSTEM

Trunk amplifier:
Trunk amplifiers with equalizers are used at regular intervals in the trunk system to overcome the losses in the cable, which increases towards the high end of the spectrum. These trunk line repeaters providing a gain of about 20 dB, compensate the corresponding loss of a cable run of about 600m, depending on the type of cable used and maintain the signal level 1 to 3 mV.
Bridging amplifier:
Bridging amplifier is used for feeding a branch lines from the main trunk, distributing the signal to subscriber drops. A bridge amplifier, sometimes used with trunk amplifier, providing a gain of about 20 to 40 dB, to feed the signals to the subscriber cables through directional couplers and signal splitters which provide isolation from reflections or interferences coming from subscriber set.

Line amplifier:
Line amplifiers are inserted in the branch line to make for the cable losses that connects the distribution system. Typical gain is 20 to 40 dB

[Q] DRAW THE NEAT SKETCH OF DISH ANTENNA AND LIST ANY FOUR SPECIFICATIONS OF DISH ANTENNA.

1; Size-8 feet.
2. Gain-36 dB.
3. Band-C-(3.7 to 4.2 GHz downlink frequency).
4. Look angle-360 degree rotation in azimuth.18to90 degree rotation in elevation.
6. Focal length—90cm.
7. Elevation angle range=17 to 90 limit
8. Azimuth angle = 0 to 360 degree
9. Aperture efficiency = 75%

LIST SPECIFICATION OF DISH ANTENNA USED IN CABLE TV.

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[Q] WHY DISH ANTENNA IS PARABOLIC IN SHAPE AND MESHY SURFACE?

☐ While installing the dish antenna look angles are taken into consideration.
☐ Once look angel adjusted installation should not be disturbed
☐ Due to atmospheric changes like rain, wind there is a possibility of change in look angle of dish. Due to meshy structure, rain and wind will go through holes by keeping fix position of dish antenna.
☐ The parabola is a plane curve defined as the locus of point which moves so that its distance from another point (called the focus) plus its distance from a straight line (directrix) is constant. These geometric properties yield an excellent microwave or light reflector
WORKING PRINCIPLE OF FOLLOWING COMPONENTS LNBC, MULTIPLEXER, ATTENUATORS CONNECTORS (TWO WAYS AND THREE WAYS), AMPLIFIER AND CABLE.

DRAW AND DESCRIBE THE BLOCK DIAGRAM OF LNBC. LIST IT“S ANY TWO APPLICATIONS

Dish antenna and feed horn: A feed horn is actually a flared open waveguide section which is mounted at focal point and its function is to receive signals reflected towards it by the delivers these to the close by located unit called as Low Noise Block Convertor (LNBC).

- **Low Noise Amplifier (LNA):** The CVS collected by the feed horn is fed to LNA which is specially designed to provide enough gain which maintains maximum possible S/N ratio.
- **Mixer (down convertors):** Mixer translates the incoming microwave signals to a lower frequency range of 950-1450MHz. This is achieved by mixing local oscillator frequency of 5150 MHz at mixer and selecting only the difference from output.
- **Band pass filter:** A BPF at the output mixer separates the wanted IF signals from the other signals.
**Multistage IF amplifier:** It amplifies the down converted signals and then sent through high grade coaxial cable to the CATV.

**Applications of LNBC :-**
1. It is the device on the front of a satellite dish that receives the very low level microwave signal from the satellite, amplifies it, changes the signals to a lower frequency band and sends them down the cable to the indoor receiver.
2. This down conversion allows the signal to be carried to the indoor satellite TV receiver using relatively cheap coaxial cable; if the signal remained at its original microwave frequency it would require an expensive and impractical waveguide line

**[Q] DESCRIBE THE NEED OF MULTIPLEXER AND ATTENUATOR IN CABLE TV.**

Need of multiplexer:
- In cable distribution center many channel signals are separated, modulated and frequency is allotted to each channel.
- Now to distribute this channel to users many channel signal must put into one single cable. So multiplexer gives one output from many signal.

Need of attenuator:
- To equalize the signal
- To mix the signal at different proportion
- Reduces distance by specific value which is express in dB
• MATV,

DRAW THE BLOCK DIAGRAM OF MATV & EXPLAIN FUNCTION OF EACH BLOCKS

DRAW THE LAYOUT DIAGRAM FOR DISTRIBUTION OF CABLE CONNECTION FOR MATV AND DESCRIBE IT.

Master antenna TV was the four runner of the present day cable TV system. It started to provide TV telecast signal to the areas which fell in the shadow of a hillock or some high land features. To get the clear reception the antenna should be installed on the hill top, which is named as master antenna or community antenna. Block diagram of a typical MATV system is shown in fig

One or more antennas are located on roof top. The numbers are depending on telecast and their direction.
Each antenna is located in such direction that all stations are received simultaneously.

MATV system are designed to have 75Ω impedance so that matching between co-axial line and component is achieved.

Antenna outputs are fed into 4 way hybrid. Hybrid is signal combining linear mixer which provides impedance matching to avoid, standing Waves standing waves results in ghost.

The output from hybrid is fed to distribution amplifier by preamplifier. Function of these amplifier is fed to raise signal to level sufficient to prevent losses of distribution system.

The output from distribution amplifier is fed to splitters through co-axial line. splitter: it is also known as directional couplers which split the signal to feed the main branch lines. Co-axial distribution lines carry TV signals from the output of splitters to point of delivery called subcarrier tap-off.

Tap-off are either transformer coupled or capacitive coupled. They provide isolation between receivers thus prevent mutual interference. There are TV receivers which receives the signal from branch line.

Terminating Resistor: Each branch line terminates in a resistor of 75Ω to prevent formation of standing waves on the co-axial cable.

WHAT IS THE NEED OF TERMINATING RESISTANCE IN MATV?
- Max power is transfer if load impedance is equal to source impedance
- If load impedance is not equal to source impedance standing wave pattern is generated.
- As terminating resistance in MATV is 75ohm, if source impedance is equal to terminating impedance, non of the signals are reflected
- But if terminating impedance is not equal source impedance signal are reflected back forming a “GHOST IMAGE” in the TV screen.
- The viewer will view a shadow image the picture in his screen.
STATE THE NEED OF Multiplexer AND Attenuator IN Cable TV.

Need of Multiplexe:
- In cable distribution center many channel signals are separated, modulated and frequency is allotted to each channel.
- Now to distribute this channel to users many channel signal must put into one single cable. So multiplexer gives one output from many signal.

Need of Attenuator:
- To equalize the signal
- To mix the signal at different proportion
- Reduces distance by specific value which is express in dB
CATV

DRAW AND EXPLAIN BLOCK DIAGRAM OF CATV SYSTEM.

CATV (Cable TV). CATV is nothing but the home-to-home Cable TV delivery using traditional coaxial cable connection to each of the residential premises to distribute TV from a central point or head end. CATV services are more or less irrelevant for large Hospitality properties, since majority of their clients may not require local channels.

The traditional CATV system consists of a shared coaxial cable network that transmits analog television signals to downstream subscribers. It is estimated that over 100 million homes are reachable by CATV cable, of which approximately 75 million of those homes are CATV subscribers.

The cable network mimics the over-the-air radio frequency broadcast signals that you would receive via a TV antennae, but they are carried on cable. Television signals are transmitted in 6-MHz channels.
CATV is a shared cable system that uses a tree-and-branch topology in which multiple households within a neighborhood share the same cable. The topology of the CATV system is pictured in Figure 1.

Since the CATV network was primarily designed for downstream transmission of television signals, most of the existing network is being refitted to support two-way data transmissions. For example, amplifiers are used at various points along the cable to boost signals, but these amplifiers only work in one direction. Upgrading those components, along with many other components has been a big and expensive task. A temporary solution to provide two-way communications is the dual-path approach, in which subscribers transmit data upstream via a separate telephone connection. This scheme is being phased out as full two-way systems are put into place.
CCTV.

DRAW AND EXPLAIN BLOCK DIAGRAM OF CCTV SYSTEM.

Closed Circuit Television (CCTV):
- Closed Circuit Television (CCTV) are used for industrial applications, security and surveillance, education and training, public information displays and many others. In some of the above mentioned applications CCTV are characterized by less complex circuitry and low cost where professional grade broadcast standards are not required.

- In CCTV the pick up camera tubes generally used are vidicon for industrial and medical X-ray applications, plumbicon is used for high light applications, multidiode silicon vidicon and charge coupled device camera are used for security and surveillance.

- Solid state circuitry is used in the camera unit and the display units. Considerable simplification is possible due to random interlace system and less simple type signal waveform called as ‘industrial sync’.

- In case of closed circuit television the composite video signals are not modulated. They are directly fed to the video receivers. CCTV does not follow the television broadcast standards. The block diagrams for direct camera link and wireless link are as shown in figure.

WHAT IS CCTV? STATE ITS USE. COMPARE CCTV WITH MATV (ANY FOUR POINTS).

CCTV stands for Closed Circuit Television.
CCTVs are used for industrial applications, security and surveillance, education and training, public information displays and many others.

<table>
<thead>
<tr>
<th>Sr No</th>
<th>CCTV</th>
<th>MATV</th>
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<tbody>
<tr>
<td>1</td>
<td>CCTV stands for Closed Circuit Television</td>
<td>MATV stands for Master Antenna Television</td>
</tr>
<tr>
<td>2</td>
<td>CCTVs are used for industrial applications, security and surveillance, education and training, public information displays and many others</td>
<td>MATVs is used to provide RF signals from antennas to every television receiver in buildings, schools etc.</td>
</tr>
<tr>
<td>3</td>
<td>In this CVS are directly fed to the receivers.</td>
<td>In this splitter or directional coupler is used to direct the signal to the receivers.</td>
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<tr>
<td>4</td>
<td>Simple circuitry.</td>
<td>Complex circuitry.</td>
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- INTERPRET THE ARCHITECTURE OF CABLE TV NETWORK.
BLOCK DIAGRAM OF DB METER WITH WORKING PRINCIPLE.

DRAW THE BLOCK DIAGRAM OF DB METER AND EXPLAIN ITS OPERATION.

Principle:
The logarithmic term is applied to an electronic voltmeter when the current or voltage produced in the indicating instrument by an applied voltage is proportional to the logarithm of applied voltage.

- Such a characteristics leads to a linear decibel scale for the indicating instruments and finds many applications in electronics.
- The reading on the meter scale is calibrated in decibels and hence the instrument is called a dB voltmeter or simply dB meter.

BLOCK DIAGRAM:

Working:
- The RF signal to be measured is connected to the input of high impedance input circuit through a RF connector, whose input impedance is 75 Ω.
- The range selector switch selects the band and range of its frequencies to be tuned.
- The logarithmic amplifier is connected to the differential amplified whose signal output Deflects the dB scale in the dB meter. To obtain logarithmic characteristics, the meter use a diode in feedback loop of an op-amp.

dB is the unit for losses and gains. Note that you can express the amplifier gain and attenuation in regular decibels because these values are voltages ratios without any reference.

Cable signal voltages are always measured across the same 75 Ω impedance voltage levels are expressed in decibels. The reference used for CATV is 1 mV across 75 Ω. With this reference, the units are indicated as ‘dBmV’. This reference is an arbitrary value but 1 mV happens to be just about the minimum signal voltage measured across 75 Ω that a receiver needs for a noise free picture.
DIRECT TO HOME SYSTEM (DTH) INTRODUCTION AND BLOCK DIAGRAM

[Q] DRAW THE BLOCK DIAGRAM OF DTH & EXPLAIN ITS OPERATION

Direct-to-Home (DTH) satellite television is becoming a buzzword in the satellite broadcast industry due to the fact that DTH offers immense opportunities to both broadcasters and viewers.

With rapid development of digital technology, DTH broadcast operators worldwide have been able to introduce a large number of new interactive applications in the television market besides a large number of entertainment programmes over a single delivery platform. In addition, since digital technology permits a highly efficient exploitation of the frequency spectrum. The number of TV channels that can be broadcast using digital technology is significantly higher than with analog technology.

DTH service is the one in which a large number of channels are digitally compressed, encrypted and beamed from very high power satellites. The programs can be directly received at homes.

This mode of reception facilitates the use of small receiving dish antennas of 45 to 60 cm diameter installed at convenient location in individual buildings without needing elaborate foundation or space etc.

Also, DTH transmission eliminates local cable operator completely since an individual user is directly connected to the service providers. DTH is contrast to cable TV lends itself to easy monitoring and control.

All the encoded transmission signals are digital, thus providing higher resolution picture quality and better audio than traditional analog signals. A DTH network consists of broadcasting center satellites, encoders, multiplexers, modulators and DTH receivers.
A DTH service provider has to lease Ku-band transponders from satellite. The encoder converts the audio, video and data signals into the digital format and the multiplexers mixes these signals. At the user end, there will be a small dish antenna and set top box to decode and view numerous channels.

On the user’s end, receiving dishes can be as small as 45 cm in diameter. DTH is an encrypted transmission that travels to the consumer at his end through the small dish antenna.

A set top box, unlike the regular cable connection, decodes the encrypted transmission.
Direct to home technology refers to the satellite television broadcasting process which is actually intended for home reception. This technology is originally referred to as direct broadcast satellite (DBS) technology.

The technology was developed for competing with the local cable TV distribution services by providing higher quality satellite signals with more number of channels.

In short, DTH refers to the reception of satellite signals on a TV with a personal dish in an individual home. The satellites that are used for this purpose is geostationary satellites. The satellites compress the signals digitally, encrypt them and then are beamed from high powered geostationary satellites. They are received by dishes that are given to the DTH consumers by DTH providers.

Figure: Block diagram of DTH system
• Though DBS and DTH present the same services to the consumers, there are some differences in the technical specifications.

• While DBS is used for transmitting signals from satellites at a particular frequency band [the band differs in each country], DTH is used for transmitting signals over a wide range of frequencies [normal frequencies including the KU and KA band].

**Outdoor unit:**
• It consists of a receiving antenna, low noise amplifier & converter the receiving antenna is parabolic reflector with a horn as the active element. The horn can be directly in front of reflector, or it may use an offset feed as shown in fig. The reflector diameter may be 0.6m for 11GHz & still smaller for K & Ka bands.
• The low noise block consists of a low noise wide band amplifier followed by a convertor. The output of convertor consists of a signal of UHF frequency ranging from 950-1450MHz.
• The advantage of using UHF frequency is that a low cost coaxial cable can be used as feeder from the outdoor unit to the indoor unit.
• LNB cannot be kept indoor because long cable between horn & the first amplifier will cause substantial degradation of the overall noise figure of the set.
Satellite TV works by broadcasting video and audio signals from geostationary satellites to satellite dishes on the Earth’s surface. These geostationary satellites orbit the earth in a region of space known as the Clarke Belt, which is approximately 22,300 miles above the equator.

Each of these satellites carries a number of transponders. These transponders each carry a signal back to the Earth.

These signals are typically on C Band, Ku Band, or Ka Band. The band of a signal describes, in broad terms, the frequency of the signal.

After travelling over twenty thousand miles, these signals are received by a satellite dish. This dish can be as small as 18” across, or it can be 9’ or larger across. The purpose of the dish is to act as a collector and a reflector. The dish collects the signal and reflects it towards the feedhorn.
The feedhorn receives the reflected signal and sends it to the LNB.

The LNB amplifies the signal and converts it to a frequency more suitable for transmission over a cable. In satellite terminology, that cable is known as the IFL.

The LNB transmits the signal over the IFL to the satellite receiver. The satellite receiver then sends the signal to your television set.

Digital Satellite TV

Most satellite TV is now encoded digitally. This enables satellite broadcasters to offer more television channels using the same amount of satellite bandwidth.

Satellite TV is available in both standard resolution and in the new ATSC High Definition (HDTV) format. The digital data is usually compressed with MPEG-2 or a variation thereof. MPEG-4 is beginning to replace MPEG-2 in some satellite networks.

Satellite TV Options

Dozens of vendors operate satellite television networks across the globe. Your options for satellite TV will differ depending upon what country you live in. In addition, some spot beam services only serve specific large cities. In the United States, the largest satellite TV vendors are Dish Network and DirecTV. Both DirecTV and Dish Network offer programming on the Ku and Ka bands. In addition, National Programming Service and Superstar offer programming on C Band. Some free-to-air satellite TV channels are even available at no cost if you have a Free-to-Air receiver.