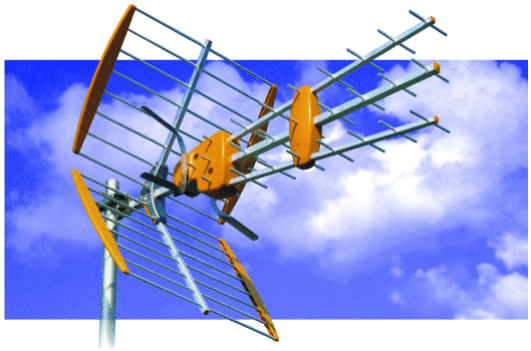
TELEVES AERIALS AND THE DTT (Digital Terrestrial Television)

PRESENTATION OF THE DAT45 ANTENNA AND ITS MRD DEVICE

1. Topics

1. UHF antenna minimum gain.
2. Front-to-Back antenna ratio.
3. Antenna Directivity.
4. Other factors

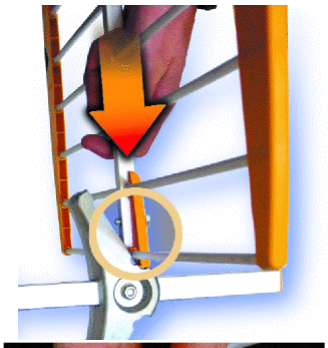


An UHF broadband antenna is the future since it will not have to be changed when the TV digital generation arrive.

2. Introduction

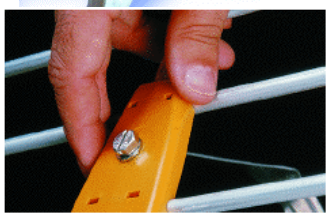
Gain, Directivity and Front-to-Back ratio F/B (difference between the antenna gain in the direction of maximum gain and the gain in the opposite direction) are very strongly linked concepts and their values are directly related.

In other words, more gain implies greater directivity and greater F/B ratio and vicebersa. Normally, antenna catalogues give both Gain and F/B parameters (they give the F/B ratio as an indicator of its directivity).



3. Gain

The recommendation of the 1997 Chester act fixes minimum levels of electric field in BIV and BV obtained by an antenna gain of 12 to 14 dBi respectively.



4. Directivity

A F/B ratio that could be considered good would be a level greater than 25 dB. This value will guarantee a good directivity.

5. dBd versus dBi

To measure the gain of an antenna you always do it with regards to a pattern antenna. Normally, pattern antennas are ideally omnidirectional (antennas that radiate the same energy in all directions).

But, what does it mean that a particular antenna features 25 dB gain for a given direction in the space?: simply that this antenna gains 25 dB more than the pattern antenna in the same direction.

The pattern antenna can be either an “isotropic” antenna or a “dipole”. Thus, the measured gain is given either in dBi (dB with respect to an isotropic antenna) or in dBd (dB with respect to the dipole).

Conversion from one unit to the other is very simple:

- if units are in dBd, just add 2.15 to obtain units in dBi:

N (dBi) = N+2.15 (dBd); *12 dBi = 14.15 dBd*

- subtract 2.15 to do the opposite conversion (dBd to dBi):

  N (dBd) = N - 2.15 (dBi); *14 dBd = 11,85 dBi*

There is no specific reason to choose one or the other measurement. .

6. Expected rejection by using a broadband antenna or a grouped one

A broadband antenna does not select channels in frequency like a grouped one.
A grouped antenna, if it has a good design, will reject the channels that do not belong to that group which in a way can be very handy if those channels come from another TV relay station and belong to another group.

In any case we are talking of very little rejections between channels, especially in frequencies that are very close.

7. Benefits between using a grouped filter or a grouped antenna.

First of all, a grouped filter always has greater rejections to the channels that are out of the group than a grouped antenna, even if the antenna has a very complex design.

Typically, in a filter you can obtain rejections greater than 20-dB to frequencies out of the group (more than 20MHz away) which is impossible to obtain with an antenna.

8. Ground noise and its influence

The exact definition of ground noise is:

"Microwave signals generated by heat of the ground (physically) and captured by an antenna"

This type of noise is only important in satellite reception, since the level of reception is very low.

In terrestrial TV, this noise is not important and generally is not taken into account.

The type of noise that is important in terrestrial TV is the "impulsive noise".
Impulsive noise does not last long. It is characterized by a fast rise time and it can appear in both in UHF and VHF bands.
Man's industrial activity pollutes the RF spectrum with these sort of signals.
The polluting agents are the power lines, car ignitions or home appliances.
COFDM digital receivers can be affected and work incorrectly if the impulsive noise is considerable: the image freezes for a moment or disappears entirely.
To solve this problem, a higher input signal level is necessary in the digital receiver.

9. Noise Sources

- **The antenna itself**
  Obviously, it is the most important device through where the impulsive noise can ingress into a TV distribution network.

  Regarding the noise entering in the same direction that the TV signal, there is very little left we can do. But, in most of the cases, this is not the way the noise comes through.

The impulsive noise comes from the surroundings of the antenna, from the street, and that is the reason to have both high gain and great directivity antennas to avoid this sort of noise, especially in environments where there is a high noise level, like urban areas.

- **Impedance adapter**
  An antenna adapter (balun) within a non shielded junction box, gets high amount of noise.
  It will be able to capture noise from different directions even though the antenna presents great rejection due to its directivity. This consideration is relevant when the noise source is next to the antenna.

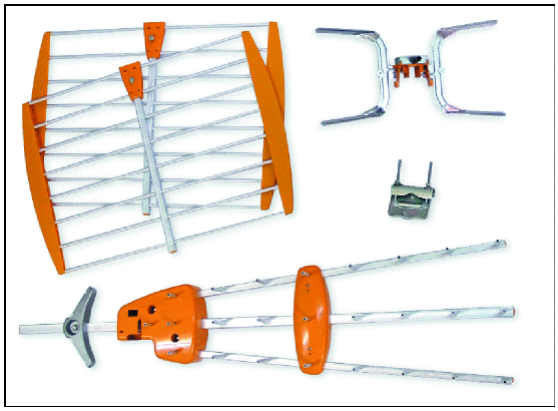
- **Cables**
  These elements become very important if they are not shielded.
  Nevertheless, in most of the cases, connectors and their installation are the elements through the noise comes in due to mismatching factors.

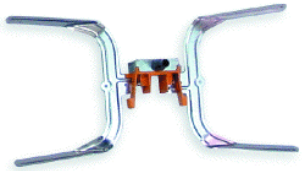
- **Mixers**
  They must be shielded. Otherwise they can capture high level of impulsive noise that could interfere the reception of TV digital signals.

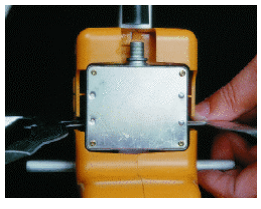
  To solve all these problems it is paramount:

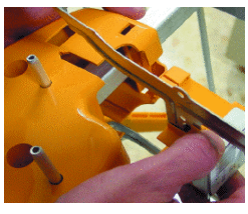
  a) Make a little amplification in the antenna junction box to increase the signal level before getting any noise.
  b) Use antennas with a shielded junction box, so the adapter will never capture impulsive noise.
  c) Make use of F connectors which will give the best shielding.
  d) Never use poor shielded cables. Otherwise all the efforts above mentioned will be cancelled.

The best example is our new **DAT45** antenna working in conjunction with its MRD (Marging Rise Device).
The DAT45 antenna and the MRD work together to achieve the best reception for digital terrestrial TV signals.
An antenna with a high level of directivity like the DAT45, adequately orientated, will not receive impulsive noise from the street.
On the other hand, the MRD avoids the amplification of the noise that would enter via the cable if it were situated on the mast.









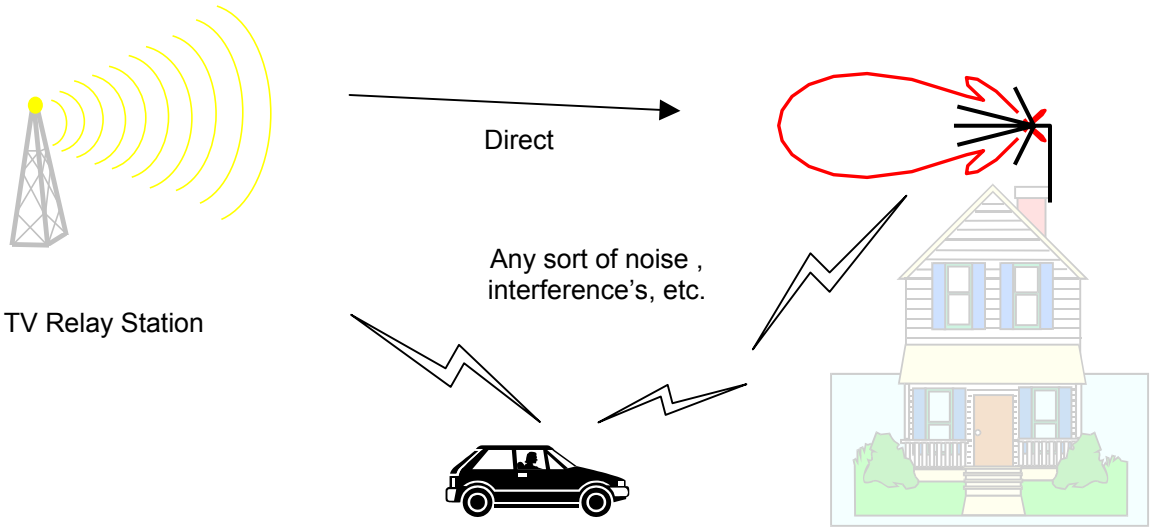
Its diecast junction box and F connector avoid the ingress of noise.

The MRD 12-dB gain makes the signal levels higher without making the analogue channels cause the saturation of the digital receivers.

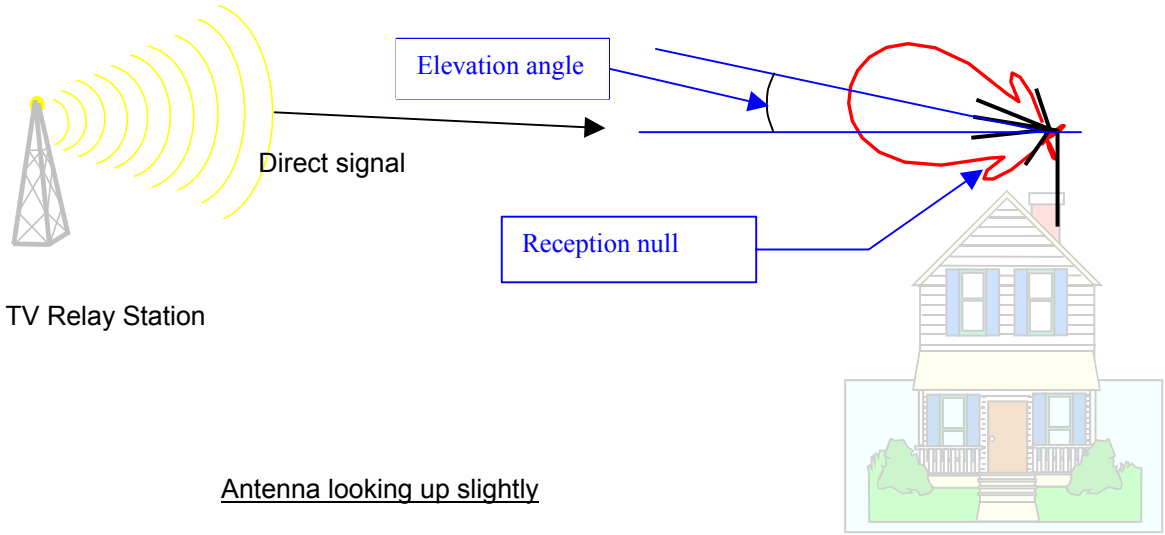
- ***Other considerations***

Usually an antenna is installed facing a little up to minimize interference's of any sort (radio-electric noise, bouncing signals, etc.) that could come from the ground and surroundings of the antenna.
As we point it up and up we loss gain but we gain rejection against these interference's since we make to coincide a null on the radiation diagram with the direction where the interference comes from (see figures).

The exact angle comes from the installation activity and can only be determined on site (not always is necessary to point it up).
Never point the antenna to the ground because besides loosing signal and get away from the TV relay station direction, we will likely capture more interference's.



Usual way to mount one antenna (looking to the TV emitter)



Antenna looking up slightly