

Ofcom fact sheet on coverage No. 1

How are the terrestrial TV coverage predictions worked out?

Summary

- 1.1 To assist the process of planning for switchover, computer modelling is used to predict digital terrestrial television (DTT) signal levels in the UK. The models are used to assess whether a specific location will be reliably covered by digital terrestrial television signals at switchover. Their accuracy will depend on many factors such as the distance from a transmitter, location of hills and valleys, trees and buildings close by and even the weather. However it is important to be aware that this is just a model and cannot capture all local aspects that may impact on reception. This means that it is possible that some people will receive digital signals when the model (expressed via the postcode checker) says they won't and vice versa.

Introduction

- 1.2 Terrestrial (that is land based) television services are transmitted using radio waves from a UK wide network of television transmitters. These are usually located on hills or on tall masts to maximise their coverage. 1,154 transmitter sites were used prior to the start of digital switchover to provide near universal coverage of the analogue terrestrial television services of the BBC, ITV and Channel 4/S4C in the UK. The Freeview digital terrestrial television (DTT) services were originally broadcast from 80 of these transmitters. The radio waves used to carry analogue and digital TV signals are very similar.
- 1.3 This fact sheet explains how the coverage of these transmissions is worked out and how this will be affected by digital switchover.

What factors can affect coverage?

- 1.4 The distance over which a terrestrial television service can be received by viewers depends fundamentally on the power used and the height of the transmitting and receiving antennas. However, this distance can be limited by geographical obstacles such as hills or valleys, or because the radio waves are reduced in strength by passing through or around obstructions, such as buildings and trees. In the UK interference from both domestic and international transmitters is often a factor in limiting coverage too. Interference happens when signals from distant transmitters use the same frequencies. Due to using the same frequencies they can interfere with each other and this limits the maximum range at which the signals can be successfully received.

- 1.5 This coverage distance for terrestrial television transmitters can range from over 50 km for the large, high power main stations such as those serving London (Crystal Palace transmitter) or Birmingham (Sutton Coldfield transmitter) down to a few hundred metres for small low power relay stations which are typically used to fill gaps in the coverage of the main transmitter coverage areas. These gaps can be caused by obstructions or because the reception of radio waves in a particular location is adversely affected by interference from distant transmitters.
- 1.6 The level of interference from distant transmitters can vary with weather conditions. This can give rise to situations where the quality and extent of a transmitter's coverage can vary throughout the year. While digital signals are somewhat more robust than analogue, the coverage of both analogue and digital television services are similarly affected by interference, weather and physical obstructions.

Domestic reception issues

- 1.7 The television signal is typically received at a viewer's home via a roof-top aerial, and passed as an electrical signal from the aerial via a down lead to the TV set. In order to correctly receive the television signal it is important that the aerial has sufficient signal strength from the television transmitter and that the levels of interference from any other transmitters operating on the same frequency are below a critical level.
- 1.8 The receiving aerial (and down lead which connects the aerial to the television) needs to be in good condition. The aerial should also be of the appropriate frequency group for the transmitter being used.
- 1.9 Ofcom's guidance is that householders should always use an external roof mounted aerial of the correct group and orientation. Further advice can be sought from an experienced aerial installer who is a member of a trade body such as the Confederation of Aerial Industries (CAI), or who is validated by the registered digital installer scheme. Further information on registered digital installers may be found on this website: www.rdi-lb.tv.

Coverage prediction models

- 1.10 In order to enable Ofcom and the broadcast planners to design the terrestrial television transmitter network it was necessary to build computer models that can predict the coverage of the transmitter network. These models include the details of the location, frequency and power of every transmitter in the UK and the majority of high power transmitters used across Europe. These models can also be used to predict TV reception at different locations in the UK, and results from these models are used for DTT post-code and address point predictions made by organisations such as Digital UK.
- 1.11 The computer model (known as the UK Planning Model - UKPM) used in the UK has been developed jointly by planners from the BBC, Ofcom, Arqiva and National Grid Wireless. (Arqiva and National Grid Wireless own and manage the network of 1,154 terrestrial television transmitters). This work has taken place within the Joint Planning Project (JPP). The JPP is responsible for the planning of the DTT transmission network for digital switchover.
- 1.12 The UKPM divides the UK up into a grid of 100 metre squares. It then calculates the predicted signal strength from the transmitter serving each of these squares.

The model takes into account whether large geographical features such as hills and valleys are between that square and the transmitter. It also takes into account whether a square is in a built up or rural area to simulate the effect of adjacent buildings and trees which may affect reception.

- 1.13 The UKPM also takes into account interference from distant transmitters. In general the model will ensure that a frequency used at one site is not used at another site unless it is sufficiently far enough away not to cause excessive interference to the intended service.
- 1.14 However, in some atmospheric conditions interfering signals can travel significantly greater distances than normal. The UKPM calculates the likelihood of this happening for every transmitter that could be the cause of interference and ensures that the service in each square is protected for at least 95% of the time for analogue services and 99% of the time for DTT services.
- 1.15 Therefore a 100m square is considered to be covered for digital reception if any such interference is predicted not to cause the loss of reception for more than 1% of the time (which is equivalent to anything up to total of 3.7 days per year). This interference could occur in one or two long periods or could be spread across a number of instances (5 to 10) throughout the year. The equivalent figure for analogue coverage is 5% of the time which equates to a total of 18.3 days per year.
- 1.16 Because the model calculates predicted reception only for part of each 100 metre square, a safety factor is used to give added assurance that other locations within the square will be covered. For digital, a safety factor of two times the signal strength is used. This safety factor means that for a square to be considered only just covered the predicted coverage will extend to 70% of locations within the square. For the majority of squares the percentage figure for locations would be much higher.
- 1.17 The equivalent figure for analogue coverage is 50% of locations. This figure is less stringent than the 70% figure for digital because a slightly degraded analogue TV picture may still be watchable, while a degraded digital picture is likely to be unusable.

Coverage prediction model accuracy

- 1.18 Whilst the computer model is very sophisticated and takes into account a large number of factors it remains a computer prediction of the real world. As such there are occasions where the predictions may not be accurate for every household.
- 1.19 For instance a consumer might check his address on the Digital UK post-code checker and find that it is predicted that his address is not covered for DTT services. This could be because the house is in a square where interference is predicted for 2% of the time rather than the 1% threshold, but on trying a receiver he may find that it works correctly for most of the time. Whilst this may be acceptable for the viewer, the level of service he is receiving is below that which is normally considered acceptable and the advice given would normally be that he considers an alternative platform such as digital satellite or cable if available.
- 1.20 As noted above a home is considered covered if there is predicted to be enough signal strength for a standard aerial to pick up at a standard height of 10 metres above ground level. A householder may have installed a higher gain aerial on a tall

mast and achieve good reception even if this is not predicted. Equally a house may be predicted to be covered but it may only be practical for the householder to mount an aerial at lower height, and so good reception may not be achievable in practice.

- 1.21 The model also can not take into account local factors which may affect reception by a particular house or group of houses within a square. So for instance if a house is next to a large building or tree which already obstructs the analogue television signal, the post-code checker may show a home to be covered for DTT when in practical terms it is not covered. Other factors which could cause this effect include the house being located in a slight dip in the land, proximity to localised interference, or that the house is exposed by a particular route to interference which is screened from other nearby houses.
- 1.22 The coverage predictions are very accurate for most households, because the signal levels for most of the country are sufficiently high that small variations or errors in the modelling are insignificant. For the small percentage of households where predicted signal levels are closer to the minimum, these small variations in the model take on greater significance. In a small number of practical tests for homes in marginal coverage areas it was found that the modelling accurately predicted coverage for approximately 7 out of 10 households in these marginal coverage areas.

Advice to viewers

- 1.23 The predictions given by the post-code checker available on the Digital UK web site and telephone help line give excellent indication of the likelihood of coverage of digital terrestrial TV signals at the address point or post-code entered before, during and after switchover. The predictions should be treated as a guide only and not as an absolute assurance of the availability or otherwise of digital TV signals. The transmitter plans both in neighbouring countries and the UK are still under development, so address point predictions may change as the plans develop. In general the UK plans will be fixed and reflected in the address point checker six to nine months in advance of switchover for the region concerned. The quality of pre-switchover analogue reception is in most cases a good indicator of whether an address will be covered for digital terrestrial TV after switchover, and taken together with a positive post-code checker result, is likely to be an excellent indication in most cases of whether DTT reception is likely to be possible.

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