

**A report on the Digital Terrestrial Television Trial**

**Ireland**

**August 2006 – August 2008**

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# 1. Executive Summary

A trial of Digital Terrestrial Television (DTT) took place in Counties Dublin and Louth between August 2006 and August 2008.

DTT is the digital equivalent of the analogue terrestrial broadcasting service currently used to provide over the air coverage of RTÉ, TV3 and TG4 throughout the country. DTT is intended to replace the analogue network in the long term.

The trial provided the opportunity to increase public awareness and stakeholder interest in the development of national DTT services ahead of legislation to provide for DTT in Ireland.

The trial comprised two main aspects – a friendly user trial and a public and technical trial.

The friendly user trial operated from August 2006 to March 2007 and was used to prepare for the public trial. Public reaction to DTT was gauged by a trial involving 500 public participants managed by Amarach Research. This trial ran from March 2007 to August 2008 and Amarach Research conducted quarterly surveys with participants. The majority of the trial participants enjoyed the DTT service. Moving forward, trial participants cited the importance of having a high quality, reliable, easy to use service with content from both the Irish and UK public service TV stations, as a minimum requirement. Additional content and services were perceived as being necessary to attract participants to a commercial DTT service.

Technical tests were conducted by key stakeholders involved in the DTT trial. A stakeholder group was formed to ensure that all interested parties obtained the maximum benefit from the trial, both in terms of learning about and testing new technologies and services and to ensure that the trial operated successfully from the perspective of the participants/users.

Stakeholder participants included BT, RTÉnl, content providers – RTÉ, TG4, TV3, Channel 6, Eircom, The Houses of the Oireachtas, Setanta, UPC/Chellomedia, Sky, Today FM, Communicorp, Digital Audio Productions, Capital Radio Productions Limited, Dublin Rock Radio Ltd. and other interested parties, CEDA the BCI and

ComReg. The National Disability Association (NDA) and the National Council for the Blind of Ireland (NCBI) also participated.

The technical trials provided an opportunity to test a number of different technologies and services – MPEG 2, MPEG 4, HDTV, audio-description, a digital (AERTEL) teletext service. The trial also provided for the development of a minimum receiver specification for the Irish market. In addition, the trial also provided information on user reactions to DTT and expectations of the service which will be useful in developing DTT services in the future.

One of the key decisions from the trial was a decision to use MPEG 4 as the compression technology for future national and commercial Irish DTT services. MPEG 4 is the technology of choice in most countries which started to develop DTT Services from 2006. It offers advantages over MPEG 2 – in particular, it can offer more content and high definition services.

The trial also provided valuable insights for those intending to provide DTT services throughout Ireland in the future. Some of these insights are highlighted below:

1. Viewers would prefer to have access to a service which, at minimum, provides access to both the Irish and the main four UK TV channels.
2. Viewers will consider the DTT service as a single entity, from end to end. Any issues with any aspect of this service – reception difficulties, receiver quality, network issues, EPG issues, content delivery or customer service problems will impact equally on viewer confidence in the service.
3. It is important that viewers find the service easy and instinctive to use.
4. As services are upgraded, there may be a need to upgrade the software on the receivers. An over the air download facility, permitting software upgrades to be delivered over the network, is essential.
5. The availability of a wide range of receivers is essential– from the cheap and accessible to more sophisticated digital TV's and video recorders.
6. Ireland is a small market so it is essential that the Irish receiver specification is not unique to Ireland.

7. A basic specification for DTT receivers was developed as part of the DTT trial. This sets a minimum specification for DTT receivers in Ireland. It is advisable that this specification be finalised as quickly as possible to accommodate the ready availability of receiver equipment for the Irish market in time for launch of DTT services.
8. There should be a facility to test and approve DTT receivers for the Irish market.
9. DTT receivers intended for the Irish market should be clearly marked.
10. Although in many cases an indoor aerial will be sufficient for DTT reception, an outdoor aerial may also be required. Broadcasters and equipment suppliers should provide advice on the correct aerials to buy and on how to set up these aerials to ensure the best local reception of the DTT service.
11. The retail industry has an important role to play in ensuring that consumers are given accurate information about DTT receivers and their suitability for the Irish DTT services.

## 2. Background

The development of Digital Terrestrial Television (DTT) or Digital Aerial Television (DATV) in Ireland is a necessary step to ensuring the continued success of the Irish broadcasting industry.

Europe and the rest of the world are going through a broadcasting technological revolution. The old analogue TV technology is inefficient and is being replaced by digitalisation. Digital technology is more efficient than analogue technology and as well as offering benefits to broadcasting services - excellent picture quality, more services, more content and more functionality – it frees up spectrum for use by other communications services. This revolution started in the 1990's as commercial digital broadcast technologies began to emerge. However, initial consumer take-up was slow and many of the original DTT networks failed. Since 2005, DTT take-up throughout Europe has increased and most European countries plan to cease analogue services by 2012.

Ireland's first attempt to introduce DTT was made in 2001 with the development of the Broadcasting Act, 2001. The 2001 Act provided for a single commercial operator to operate a national DTT network. However, this model failed to interest the market, possibly because its introduction coincided with a downturn in technology stock values and investments.

By 2006 there was still no interest in DTT under the model proposed in the 2001 Act but national and international pressure for DTT was mounting, in particular:

1. The fundamental policy requirement for a digitised universal free to air TV platform, regulated in Ireland, remained pre eminent – a requirement unmet by other platforms.
2. The cost of maintaining the ageing RTENL analogue network is increasing;
3. The broadcasting industry worldwide has largely ceased the production of TV analogue equipment;
4. The EU and the commercial communications sector, in particular the mobile industry, has highlighted the economic importance and advantages of making TV broadcasting spectrum available for other services, once analogue switch off occurs;
5. The European Commission has established a deadline of 2012 for switching off the analogue networks throughout Europe.

6. An international broadcasting planning Agreement, Geneva-06, was established and Ireland is a signatory to this Agreement. It provides for a new broadcasting plan for digital television throughout Europe, the Middle East and Africa. This agreement sets a deadline of 2015, beyond which analogue TV services will no longer be protected.

In 2005, the Department of Communications, Energy and Natural Resources, decided on a two pronged approach to DTT development.

1. To develop new legislation to provide for DTT in Ireland;
2. To operate a trial of DTT.

In March 2007, the Broadcasting (Amendment) Act was enacted. This legislation provides for RTÉ to develop public service multiplex(es) to ensure the continued provision of free to air broadcasting services in the digital era. It also requires the Broadcasting Commission of Ireland (BCI) to seek commercial DTT operators.

Further information on the current status of broadcasting in Ireland and on digital television is available at Annex 1 and Annex 2.

The Department has also launched a website – [www.digitaltelevision.ie](http://www.digitaltelevision.ie) which provides information on the DTT trial as well as general information on digital television and information on the development of digital television in Ireland.

### 3. The DTT Trial

In August 2006, The Department of Communications, Marine and Natural Resources commenced a trial of Digital Terrestrial Television. The purpose of the trial was to bring momentum to the transition to digital terrestrial broadcasting and to test and trial various aspects of the service. In doing so, the trial sought to identify issues associated with a national rollout and to provide information, which will help find solutions to these issues. This trial concluded in August 2008.

The trial operated from two broadcast transmission sites – Three Rock Mountain, Co. Dublin and Clermont Carn, Co. Louth. The multiplex centre, located in Citywest, Dublin operated four multiplexes, one offering the Irish national TV and radio stations, two offering content from commercial stakeholders and the fourth offering a trial of high definition (HDTV) services and a new channel “Oireachtas TV”.

The trial was operated in two main phases - a Friendly User Trial followed by a Public and technical Trial. During the friendly user trial the trial network was tested and issues resolved prior to the launch of the public trial. The public and technical trial provided an opportunity for public participants and key stakeholders to use DTT and also provided an opportunity to test different technologies and services.

Amarach Research managed the interaction with public participants and 500 families from Counties Dublin and Louth were chosen to participate in the public trial.

Stakeholder interest in the trial was excellent with participation from the main players in the Irish broadcasting market including, RTÉ, TG4, TV3, Channel 6, Eircom, Setanta Sports, UPC/Chellomedia, Sky, Communicorp, Digital Audio Productions, Today FM, 98FM, FM104, Phantom 105.2, Capital Radio Productions Limited, and other interested parties, BT, The Houses of the Oireachtas, CEDA the BCI and ComReg. The National Disability Association (NDA) and the National council for the Blind of Ireland (NCBI) also participated.

A stakeholder group, comprising stakeholder participants in the trial and other interested parties, was developed and this group helped to ensure that the trial operated successfully and that stakeholders gained maximum advantage from the trial.

Stakeholders were provided an opportunity to:

- test the technical aspects of DTT and of operating a DTT network;

- Trial different compression technologies – MPEG 2, MPEG 4;
- Test HD services;
- Develop a specification for DTT receivers for the Irish market;
- Develop, test and trial a range of services and content over DTT including;
  - 18 TV channels and 16 radio channels
  - a digital teletext service;
  - accessibility services;
  - an Oireachtas TV channel.

### **3.1. Friendly User Trial**

The friendly user trial commenced in August 2006 with about 50 trial participants – mainly from the Department and from other organisations involved in the trial. During this phase, only one multiplex was used, broadcasting the four national TV and six national radio channels. This phase ended in March 2007.

During this phase:

1. Additional content was sourced for the public trial;
2. A range of receivers was tested with a view to identifying suitable receiver equipment for the public trial;
3. A range of DTT technologies were tested and network upgrades made, as required; (MPEG 2, MPEG 4, different modulation techniques, management processes etc).
4. The public trial was established;

#### **3.1.1. Additional Content for the Trial**

During the friendly user trial, expressions of interest were sought from those interested in providing content for the DTT public trial. The aim of seeking additional content for the trial was both to show public participants how much more versatile DTT is

compared to analogue and as a means of getting those interested in providing future DTT services involved in the process.

Each content provider signed a contract with the Department of Communications, Energy and Natural Resources for the provision of content to the multiplex centre. The content providers were also offered a place on the pilot stakeholder group.

Content for the public trial was provided by RTÉ, TG4, TV3, Channel 6 Broadcasting Ltd, Chellomedia Services Limited, Communicorp Group Limited, Eircom, The Houses of the Oireachtas, Sky Broadcasting Ltd, Setanta Sports Channel Ireland Ltd, Today FM, Capital Radio Productions Ltd, Dublin Rock Radio Ltd. and Digital Audio Productions.

### **3.1.2. Identifying a suitable set top box for the public trial**

The friendly trial used an MPEG 2 set top box sourced from the UK market and initially it was planned to use a number of UK receivers, with different functionalities, for the public trial. However, it was found that many of the UK set top boxes either did not work at all on the Irish DTT network or only partially worked. Testing of these boxes was conducted by the UK Digital Television Group (DTG)<sup>1</sup> on our behalf. They found a number of issues associated with the use of UK boxes in Ireland:

- Many of the UK boxes tested were designed to operate only in the UK and to receive only UK originated services.
- Other boxes gave preference to UK originated services and placed all other services in a different numbering range – So for example RTÉ 1 would appear as channel 801 instead of channel 1.

A summary of these findings is available at **Appendix 1**. Further information is contained in the report on Set Top Boxes in the context of the DTT Trial in Ireland, which can be found at [www.digitaltelevision.ie](http://www.digitaltelevision.ie)

The issue of finding appropriate set top boxes for the trial was further complicated by the requirement for encryption. Encryption was needed to protect broadcasting rights associated with the use of commercial content on the DTT trial. None of the UK boxes catered for encryption services apart from the “Top up TV” boxes which use a proprietary encryption system.

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<sup>1</sup> The DTG is a UK organisation set up to develop specifications for DTT receiver equipment and to test receivers on the Market.

In addition, the MPEG 4 standard had been developed and the newer European DTT markets were adopting this standard. It was considered important that MPEG 4 be tested as part of the Irish DTT trial.

In order to fully test the potential for DTT services in the Irish market a set top box was sought which was capable of:

1. decoding MPEG 2 standard definition services;
2. decoding MPEG 4 standard definition and high definition services;
3. offering encryption services.

A specification was developed and circulated to manufacturers. A prototype box, developed and manufactured by Humax for the BBC HD trial in the UK was chosen for the trial. The box is an MPEG2/MPEG 4 box capable of providing both standard and high definition services and contains a CAM slot for encryption services. Several software changes had to be made to this box before it was suitable for use on the Irish DTT network.

### **3.1.3. Testing and developing the network**

Network testing and development was conducted by BT, NEC and RTÉnl. BT was responsible for the multiplex network whilst NEC was responsible for building the transmission network. In addition, BT operated a 24 hour monitoring facility for the multiplex network whilst RTÉnl monitored and maintained the transmission network. Throughout both the friendly and public trial, BT enhanced their monitoring process by, interalia, developing a dedicated software based diagnostic tool for reporting on network performance, by providing 24/7 monitoring facilities, and by establishing a dedicated DTT customer service team.

There were a number of network upgrades both during and after the friendly user trial to include:

#### **Radio feeds**

The initial DTT multiplex network provided for terrestrial radio feeds on one multiplex only. A further 2 multiplexes were set up to accept satellite feeds only. As a result of the huge level of interest amongst the Irish radio industry, the network was upgraded to accept additional terrestrial radio feeds.

#### **MPEG 4**

The initial network used the MPEG 2 compression system and had to be upgraded to provide for testing of MPEG 4 services.

In addition, the trial set top box needed to be upgraded to decode standard definition MPEG 4 signals. Upgrading of the set top box had to be done manually as the box was not equipped to accept software downloads over the network.

Two MPEG 4 standard definition channels and an MPEG 4 high definition service were tested during the trial.

### **Conditional Access**

In order to protect broadcast content rights of some of the content providers on the DTT trial, an encryption service comprising a Conax CAM based system, was added.

### **Multiplex 4**

Shortly after the public trial began it was decided to add a fourth multiplex to test HD services. A fourth transmitter and multiplex service was added to the network. This multiplex provided space for 2 TV channels – a standard definition MPEG 4 channel and a high definition MPEG 4 channel.

#### **3.1.4. Establishing the Public Trial**

Amarach Research was commissioned to establish and manage the public trial. The establishment of the trial involved:

- A qualitative baseline survey;
- identifying 500 public participants, 250 from each of the areas covered by the trial,
- placing the receiver equipment in the homes and
- conducting an initial establishment survey with each of the trial participants.

### **3.2. Public Trial**

The public trial commenced in March 2007. This phase involved 1000 participants including the 500 public participants, participants from the Department and from other organisations involved in the trial and specialist participants with a specific interest in testing new technologies.

Each participant was provided with a set top box. Initially, three multiplexes offering standard definition TV and radio channels were available. Additional content was added as the trial progressed. To protect broadcast rights holders the TV content on the second and third multiplex was encrypted. The fourth multiplex which offered High Definition (HD) services and a new channel – Oireachtas TV – was added later.

The public participants were chosen by Amarach Research on behalf of DCENR. Amarach Research actively engaged with the participants throughout the trial period and conducted quarterly surveys to highlight participants' reactions to DTT.

All industry stakeholders involved in the trial were invited to join the Pilot Stakeholder Group (PSG). The PSG included members from the DCENR, BT, RTÉnl, RTÉ, TG4, TV3, Channel 6, Eircom, Sky, UPC/Chellomedia, Communicorp, Digital Audio Productions, Today FM, CEDA the BCI and ComReg.

The main aims of this group were to oversee the smooth operation of the trial, to use the trial to test new technologies and to gain experience and expertise in relation to DTT which might be used in the development of national DTT services.

In order to progress these aims, a number of working groups were developed -

1. Operational review working group: This group was established to help ensure the smooth running of the DTT trial – from a technology and quality perspective.
2. High Definition (HD) Working Group: This group was established to study and test HDTV over the DTT network.
3. Accessibility Working Group: This group was established to test accessibility services over the DTT network.
4. Interactive Services Working Group: this group was established to test digital teletext services.
5. DTT Receiver Specification Working Group: this group was established to develop a specification for DTT receivers for the Irish market.

### 3.2.1. Operational Issues

The aim of the operational review group was to help ensure the smooth running of the DTT trial – from a technology and quality perspective. In particular, this group identified issues affecting the quality of the trial network and sought to resolve those issues.

Some of the issues dealt with by this group included lipsynch issues, receiver issues, the availability of programme schedules on all TV channels and PCR Jitter.

Lipsynch occurs when there is a timing difference between the on screen dialogue and the audio. Problems with lipsynch were investigated by the group and were concluded to be associated with the set top box rather than the transmission or multiplexing parts of the network.

There were several other issues with the prototype set top box:

1. Although the box was MPEG 4 enabled – it only worked to receive MPEG 4 HD services. Humax provided software to upgrade the box to accept MPEG 4 standard definition content and also to reduce lipsynch issues.
2. As the STB was a prototype, it was not set up to receive over the air downloads so the software upgrades had to be performed manually. Amarach Research upgraded each of the 500 boxes being used by public participants.
3. Testing of the STB close to the border with Northern Ireland revealed difficulties with cross border reception of DTT services. Moving forward, the issue of set top box behaviour close to the border will need to be further studied. DTT operators are advised to work with the DTG in the UK with a view to resolving this issue.

The capability to provide programme schedule information is an important differentiator between DTT and analogue television. Through the operational review group, a common mechanism for providing scheduling information was agreed and implemented.

The “PCR Jitter” issue was more difficult to resolve. This was an intermittent problem which caused the transmitted signal to go slightly out of specification, on occasions. Numerous tests were conducted to ascertain the route of the problem. It is likely that this problem was caused by a faulty component or loose connection. The situation eventually corrected itself after some routine maintenance of the transmitter network was conducted.

### **3.2.2. Testing of High Definition (HD) Services**

The HD Working Group was responsible for the operation and management of the High Definition (HD) service tests. The aim of the group was to test the technical viability and implications of delivering HD signals over the DTT platform.

A trial of HD services was launched by Minister Eamonn Ryan with a live viewing of the GAA Leinster football final from Croke Park on 15<sup>th</sup> July 2007. Since 17<sup>th</sup> July, a loop of HD content provided by the three terrestrial broadcasters, RTÉ, TV3 and TG4 was broadcast. A range of content was chosen to test the system and demonstrate the improvement in picture quality. For this phase, only trial participants with an existing High Definition TV (HDTV) could see the full benefits of the service.

### **3.2.3. Accessibility Trial**

The Accessibility Working Group was chaired by RTÉ and comprised members from RTÉ, TG4, TV3, DCENR, NCBI and the NDA. This group studied the potential for testing new services which will facilitate enjoyment of TV by those with sensory disabilities. In particular, a trial of audio-description services was organised.

DTT offers the potential for broadcasters to broadcast additional services to help those with accessibility issues. Audio description is a service which uses an audio voiceover to provide additional descriptive information about the scene during silences in a programmes dialogue. Audio description can be used to provide people who are sight impaired with a better understanding and appreciation of TV programmes. As part of the trial, the Irish terrestrial broadcasters (RTÉ, TG4 and TV3) tested audio description in order to see how the technology worked and a user trial was organised.

The audio description services trial was managed by the National Council for the Blind of Ireland (NCBI). Six participants were recruited. The objective of the trial was to ascertain if the audio description was of sufficient audio quality for people with a sight impairment to gain the benefits of the service. The results of the trial showed that the audio quality was excellent, the descriptions were clear and the volume was about right.

Audio-description is not a standard feature on set top boxes so a special set top box was required for this trial. This set top box is no longer being manufactured.

In the UK, the National Council for the Blind has been working to develop set top boxes for the UK market.

### **3.2.4. Information Services Trial**

DTT will require a new digital teletext service to be developed as a replacement for the existing AERTEL service. RTÉ developed a new digital teletext service for the trial and Amarach Research distributed set top boxes, capable of receiving this service to 50 of the public trial participants. Amarach followed up with telephone surveys.

The following were the findings:

- There was high usage of the Aertel digitext services on the interactive trial, however the test service was very slow to load and this was a cause of frustration amongst users.
- News, TV listings and Sport were the most frequently used features on the service.
- Users rated the service highly particularly in relation to the overall look of the service. The load time of the service was the lowest rated aspect and is an area that will need improvement before a public launch.
- The EPG service was rated highly.
- There was higher incidence of using the standard EPG button than using the green button which provided additional services and games. Users preferred the simplicity of using the more intuitive approach to accessing the service.

### **3.2.5. DTT Receiver Specification**

The DTT Receiver Specification Working Group was set up to develop a specification detailing the minimum technical requirements for receivers intended for the Irish market. This group included members from the DCENR, BSkyB, CEDA, TG4, UPC Ireland, BT Ireland, BCI, RTÉ, RTÉNL and ComReg. The specification produced by the group is available at **Appendix 2** and from [www.digitaltelevision.ie](http://www.digitaltelevision.ie)

### **3.2.6 The Oireachtas Channel**

In May 2008, a test Oireachtas Channel was introduced to the DTT trial. This channel was an MPEG 4 standard definition channel. The Channel was developed and managed by the Houses of the Oireachtas who are studying the feasibility of introducing an Oireachtas Channel on the DTT platform, in the future.

### **3.2.7 Market Research**

Amárach Research, a market research company, developed and managed the user panel and conducted face to face surveys with the 500 trial participants on a quarterly basis to highlight participants' reactions to the DTT service. Participants were asked questions about the quality of the service, ease of use, functionality and content. The results of these surveys are available at [www.digitaltelevision.ie](http://www.digitaltelevision.ie). A summary of the research is at **Appendix 3**.

The survey provided useful information on the perception of DTT amongst the participants and on the type of service they would like to see in the future.

### **3.2.8 Summary**

By the end of the trial, there were 18 television channels and 16 radio channels (See **Appendix 4**) with content from various content providers.

The reaction of the 500 people who participated in the public trial was very favourable with over 75% of the 500 public participants retaining interest throughout the trial. In particular, public participants liked the ease of use, the functionality, the quality and the range of channels. Most participants, however, would have preferred the trial to offer the mainstream UK channels as well.

The trial has also generated awareness and discussion among broadcasters, TV distribution companies, telecommunications companies and other interested parties regarding a move towards a full national rollout of DTT. The trial provided the opportunity for these stakeholders to test a variety of services and DTT technologies and this information will be useful to DTT service providers moving forward. A large number of the DTT stakeholders also participated in the BCI application process for commercial DTT providers.

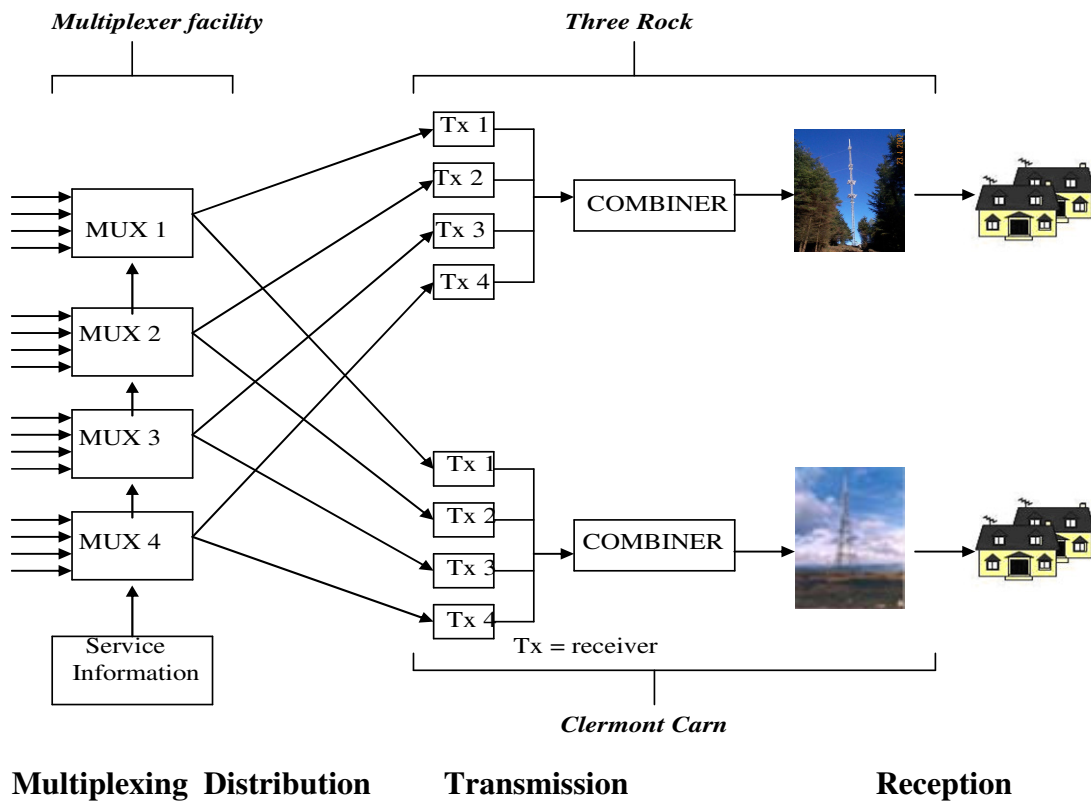
## 4. The Trial Network

The trial network comprised of two elements – the multiplex network and the transmission network. The multiplex network was built and managed by BT whilst NEC was responsible for building the transmission system. Mason Analysys was responsible for overseeing the project and for ensuring that the complete network was built to specification and in time to meet the August 2006 deadline for trial start up. In addition, RTÉNL was contracted to provide the transmission sites, assist in the transmission network build and to maintain the equipment on site during the trial period. A UK based technical consultant advised on the design and commissioning of the multiplexing network.

At the outset, detailed project plans, were agreed by the relevant parties. Regular meetings were held to ensure that build was on target and to identify any potential issues that may have caused delays. All parties worked in good faith to meet the tight build schedule which followed a five month period from signing the contract to final network delivery.

The initial network build – comprising the first three multiplexes was completed and operational in time for trial start up on 11<sup>th</sup> August, 2006. A fourth multiplex – to test HD services – was completed by March 2007.

The main components of the DTT Pilot Network are highlighted in the diagram below and described in the following paragraphs.



**Fig 1**

**Fig 1:** shows the main components of the DTT Pilot Network.

### **4.1. Multiplexing**

BT Ireland provided the multiplex and encryption services. Multiplexing is the key new activity that makes DTT different from analogue transmission. Multiplexing comprises a multiplex head-end (like an IT centre) which for the DTT trial was located in Citywest. The head-end collects the TV, radio and data services taking part in the trial and encodes and converts these services to a digital format. The services are also combined or multiplexed together before being transported to the Transmitter site. A single multiplex will have space for between 4 and 10 standard TV channels, depending on the compression and encoding system used (MPEG 2 or MPEG 4, 16QAM or 64 QAM). The head-end is also used to process the service information and subtitling.

There were 4 multiplexes used on the DTT trial. MUX 1 carried the national Irish TV and radio stations, MUX 2 and MUX 3 carried stations supplied by commercial broadcasters and MUX 4 carried the trial HD test channel and the Oireachtas channel.

One of the channels on MUX 3 and all of MUX 4 used MPEG 4 encoding. The rest of the network used MPEG 2 encoded services. An encryption service - a CAM based solution from Conax - was used on multiplexes 2 and 3.

## **4.2. Distribution**

Distribution involves the provision of the broadcasting streams from the broadcaster to the multiplex head-end and the provision of the multiplexed signal to the transmission sites. For the DTT trial, TV and radio content was provided by both national and commercial broadcasters. Their content was delivered to the multiplex (mux) centre by fibre, over satellite or, for some of the radio and HDTV content, was fed directly from play out servers housed at the mux centre. Once the content was multiplexed, it was transmitted over fibre and radio links to the broadcasting stations at 3 Rock near Dundrum in Co Dublin and Clermont Carn near Dundalk in Co Louth.

## **4.3. Transmission and Reception**

The broadcast transmitters operated under a trial licence from ComReg, the telecommunications regulator. They were supplied and installed by NEC and maintained by RTÉnl. These high power transmitters were used to broadcast the signals over a wide area. For the DTT trial the transmitters provided coverage of County Dublin and North Leinster.

Content on the trial was received by the DTT trial participants using a standard indoor UHF aerial in most cases and a set top box (STB) specifically designed for the DTT trial. The STB processed/decoded the received signal so that it could be displayed on an ordinary analogue TV. In areas where the DTT signal was low, a high power indoor aerial or an outdoor aerial pointed towards the transmitter was needed.

## **4.4. The DTT Trial Receivers**

A Humax “Fox 2T” MPEG 2 set top box was used for the friendly user trial. The main set top box used for the public trial was a prototype developed by Humax initially for

the BBC High Definition trial in the UK. This box was specially modified to work on the Irish DTT trial network. The box was extremely versatile, in terms of the services it offered and at the time the trial was launched was one of very few boxes in the world capable of providing these facilities. This box is specified to decode both MPEG 2 and MPEG 4 (video data compression software) signals, is capable of receiving and decoding High Definition signals and has a conditional access slot which can be used with a variety of encryption methods.

A second box was used to test accessibility services. This box was manufactured by Netgem for the UK market. At the time the trial started, this was the only box on the market which could be used to receive audio description services. This box has subsequently been discontinued.

Towards the end of the trial a third box was used to test and trial the new digital teletext services developed by RTÉ. This box was manufactured by Zinwell for the New Zealand market. This STB contains the MHEG 5 middleware which RTÉ required to operate their test digital teletext service.

## **5. Recommendations**

The DTT trial has provided an opportunity to see first hand, some of the issues associated with the rollout of a DTT network and to learn from this experience. As a result of the trial the following recommendations, which may be of use to DTT service providers, have been developed:

### **1. Reliability and ease of use**

TV viewers are more interested in the service rather than the technologies used to deliver the service. In this regard it is essential that the service offered is reliable and easy to use. Any issues with any aspect of this service – reception difficulties, network availability, receiver quality, network breakdown, issues with the EPG, content delivery issues or customer service problems will impact equally on consumer confidence in the service.

### **2. Over the air Downloads**

Receiver equipment is likely to require software upgrades from time to time. This need may arise as the DTT network functionality changes or to ensure that the equipment works as expected with the DTT multiplex network. For this reason:

1. The multiplex network must be capable of delivering any software upgrades, over the air.
2. There should be a facility and test suite in place to test the affect of any over the air software downloads on the set top boxes and other receiver equipment. This testing will need to be conducted in advance of implementing the download.
3. Over the air downloads should not rely on the receiver being permanently left on. There should be a facility which prompts the user to download the new software.

### **3. Content and Services**

DTT can provide more to viewers in terms of additional high quality content, electronic programme guides, HDTV, accessibility services, a simple user interface and excellent

quality reception. In relation to content, trial participants have indicated an expectation that the Irish and main UK channels will be provided on the service as a minimum. A range of other content – general interest channels, news channels, sports and children's channels are also expected to be available over a DTT network.

#### **4. Receiver specifications**

A basic specification for DTT receivers was developed as part of the DTT trial. This sets a minimum specification for DTT receivers in Ireland. A final specification and an accreditation process needs to be agreed between DTT service providers as a matter of priority to ensure the ready availability of a wide range of affordable receiver equipment (from basic set top boxes to iDTV's) for the Irish market in time for launch of DTT services.

In this regard, the behaviour of DTT receivers in border areas needs to be examined closely. DTT service providers are advised to work closely with the DTG in the UK to find a resolution to any issues that may arise.

## 6. Conclusion

The DTT trial succeeded in its main aims i.e. to enhance user and key stakeholder interest in DTT. Additionally, the trial provided an opportunity to identify issues associated with the development of a national DTT network and to test new technologies and services. As a result of the trial and with the co-operation of all key stakeholders a decision was taken to launch national DTT services using the latest compression standard – MPEG 4. This standard means that extra content and services as well as HDTV services can be provided over an Irish DTT network in the future.

Shortly before the trial ended RTÉ was issued with a licence to provide national DTT services offering content from the existing free to air national TV channels and some new Irish content. In addition, a commercial company – Boxer – is finalising a contract with the BCI to provide commercial DTT services. DTT services are expected to launch in Ireland in autumn 2009 and the analogue services are expected to switch off in 2012.

## 7. Acknowledgements

The Department of Communications, Energy and Natural Resources would like to thank all those who participated in the development and success of the DTT trial.

Special thanks to:

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## Annex 1 - Television Broadcasting in Ireland

The television industry in Ireland comprises of 3 main sectors – broadcasters, channel content providers and the multichannel television delivery or re-broadcasting sector.

There are three terrestrial TV broadcasters operating in Ireland. Two of these, RTÉ and TG4, are public sector broadcasters and there is one commercial broadcaster - TV3. These Broadcasters use radio frequencies to broadcast their content from the transmission network which is made up of mountain top transmitters and other transmitters throughout the country. There are 13 main transmitters and about 150 smaller transmitters used to provide coverage of these TV channels throughout Ireland. RTÉ networks limited (RTÉNL), a subsidiary of RTÉ, owns operates and controls the analogue transmission network.

The content from RTÉ, TV3 and TG4 is received by viewers through a rooftop or set top aerial. The TV network and service uses an analogue technology.

The broadcasting sector is regulated by primary legislation. RTÉ, TV3 and TG4 are all available free to air throughout Ireland. RTÉ is funded by the television licence scheme and through revenue gained from advertising. TG4 is funded by the Government and also through advertising revenue and TV3 is funded commercially.

Irish commercial TV service providers offer access to multichannel television over cable, MMDS, IPTV, deflector or satellite networks, on a subscription basis. Cable, MMDS, IPTV and deflector systems operate on a local or regional basis within Ireland and operate by collecting a variety of foreign and Irish television channels at a collection point or “headend” and re-broadcasting or retransmitting these over their networks. The satellite systems provide services over much wider areas – generally to a number of different countries - and operate by collecting content at a satellite orbiting in space, this content is then broadcast and received by viewers through a satellite dish and set top box.

Cable/MMDS and UHF deflector operators have networks in Ireland and are regulated under Irish law by the Commission for Communications Regulation (ComReg). Existing satellite operators do not have networks in Ireland and have sought not to be regulated under Irish law.

Information from the Central Statistics Office indicates that there are approximately 1.46 million TV households in Ireland.

The current market breakdown of TV distribution in Ireland was summarised in the most recent ComReg Quarterly Report (ComReg 08/43). This indicated that approximately 25% of TV licence households rely on analogue free to air (FTA) TV. The remaining subscribe to Analogue cable (17%), Digital Cable (15%), MMDS (6%) and Satellite (38%). In addition, many households across Ireland use analogue FTA TV on at least one TV set in the household. A small number of Irish viewers may also use IPTV services.

## **Annex 2 - Digital Television**

TV is presently undergoing a transition from analogue broadcasting to digital broadcasting. This is probably the biggest change in TV since the transition from black and white television to colour. Modern computers are digital devices which process information in the form of data elements and digital broadcasting is essentially the broadcasting of TV or radio programme content as a stream of data. The ability to transmit TV content in the form of data instead of pictures and sound means that more information can be transmitted over a digital network than an analogue network. As a result a digital broadcasting network can be used to provide more versatile services such as more TV channels, radio channels, digital quality pictures and sound, high definition pictures, enhanced teletext, electronic programme guides and even interactive services.

Digital television is commonly available in Ireland over commercial re-broadcasting services - cable, MMDS or satellite and over 50% of TV households already subscribe to digital television. Other technologies such as Internet Protocol Television (IPTV) are also starting to emerge.

A new digital television platform –Digital Terrestrial Television (DTT) – will be made available in Ireland on a phased basis starting in autumn 2009. This platform will provide for the continued availability of free to air public service broadcasting in Ireland. RTÉ will provide a Digital Terrestrial Television multiplex with capacity to replace the existing analogue terrestrial services currently provided by RTÉ, TV3 and TG4 and also some new Irish channels. In addition, there will be a commercial DTT service provider, Boxer DTT Limited, under contract from the Broadcasting Commission of Ireland (BCI).

### **How is digital Television Received?**

Digital television operates by first of all converting the pictures, sound, text and other information making up the TV content into digital data elements. This data is then compressed / squeezed for broadcasting to TV viewers. TV signals are broadcast over the air or via a cable connection to the viewer's premises. At the viewer's premises, the broadcast data is received via an aerial, satellite dish or cable and is decoded – by a digital decoder. The digital decoder converts the data into pictures, sound, text and other

information which can be broadcast over the TV.

In its simplest form a decoder can take the form of a set top box which is connected to the TV. Subscribers to Cable, MMDS or Satellite will be familiar with these devices. Some receivers also function as a digital video recorder. In developed Digital Terrestrial Television markets the receiver may be an internal device in the TV (iDTV) although, as with cable and satellite, set top boxes are generally used.

Pay TV operators generally encrypt their content and in these cases a receiver device with decryption capability is required.

### **Providing for a National DTT Service**

In April 2007, legislation to provide for the development of public Digital Terrestrial Television (DTT) services in Ireland was enacted under The Broadcasting (Amendment) Act, 2007. Under this legislation RTÉ, the Broadcasting Commission of Ireland (BCI) and the Commission for Communications Regulation (ComReg) are responsible for the development of DTT in Ireland. RTÉ is required to replace their obsolete analogue terrestrial network with a new DTT platform with the same coverage as the current analogue network and which can accommodate the RTÉ channels, TG4, TV3 and some new Irish channels. The BCI is responsible for ensuring that Ireland gains maximum benefit from DTT, by offering commercial DTT contracts to interested parties. ComReg is responsible for frequency planning for DTT and for issuing frequency licences to both RTÉ and the BCI.

RTÉ's DTT platform will provide near universal coverage of free-to-air digital television services throughout the country. The existence of such a network will be important in ensuring the continued availability of quality Irish programming.

In making the transition from analogue to Digital, Ireland will be able to provide capacity for additional TV channels as well as data and interactive services. DTT can provide more services than analogue terrestrial TV (8-10 times more TV channels) and can also provide advanced broadcasting services such as electronic programme guides, interactive services, digital teletext and High Definition TV. In addition, digital terrestrial broadcasting uses less spectrum or radio frequencies than analogue broadcasting so a move from analogue to digital TV frees up radio spectrum for other uses.

Information on the RTÉ DTT rollout is available from RTÉ whilst information on the BCI commercial services contract award process is available from the BCI. Further information on digital television and digital terrestrial television is available on the website <http://www.digitaltelevision.ie>

**Note:** Digital Terrestrial Television is not yet available in Ireland. In advance of this, it is not advisable to purchase digital receivers intended for use in the UK or other countries as these are not accredited to work on an Irish DTT network.

## **Digital Switchover in Ireland**

Digital Terrestrial Television will replace analogue terrestrial television in the long term. However during the transition phase, the free to air analogue terrestrial TV transmissions will be broadcast along with the digital terrestrial services. The transition period will allow time for the broadcasters to build and develop their DTT networks completely and will also allow time for TV viewers to update their receiving equipment before the analogue network is switched off.

Section 11 of the Broadcasting (Amendment) Act 2007 deals with analogue switch off and provides for a digital switchover date or dates to be announced by the Minister in due course.

In order to progress the change from analogue to digital TV, the European Commission has designated 2012 as the deadline for analogue switchover throughout Europe. Ireland has indicated that this date will be met. Switch off of analogue terrestrial TV has already taken place in Luxemburg, the Netherlands, Finland and Sweden and in several areas in Germany. Of the 27 European countries 25 have indicated analogue switch off by 2012.

More widely, at the Regional Radiocommunication Conference (RRC-06) held in Geneva in 2006, participating countries across Europe, Africa and the Middle East (including Ireland) agreed that after 2015, analogue terrestrial TV frequencies would no longer be protected from interference from other services. In effect this means that in many countries throughout the world, analogue TV will no longer be available after 2015.

The United Kingdom has planned a regional approach to analogue switch-off which started in October 2007 and ends in 2012. More information on these plans can be found at [www.digitaltelevision.gov.uk](http://www.digitaltelevision.gov.uk). The closure of the analogue broadcasts in the UK will impact on viewers in Ireland who currently receive their UK TV channels through overspill. In particular, the UK analogue transmitters are planned to be turned off in Wales in 2009 and this will impact viewers in the South East of Ireland. Northern Ireland is due to be switched off in 2012 and this will impact on viewers close to the border with Northern Ireland.

The exact analogue switch off date for Ireland will be determined by the Minister in line with Section 11 of the Broadcasting (Amendment) Act 2007. Whilst an exact date is not possible at this stage, the Department expects that the BCI and RTÉ processes will ensure that the European Commission 2012 deadline is met.

# Appendix 1: Summary of Digital Television Group Set

## Top Box Tests for the Irish DTT Trial

### Background

At the commencement of the Irish DTT trial, it was decided to test the suitability of basic MPEG 2 U.K. STBs for the Irish trial DTT network. These tests were conducted by the DTG in the UK.

As a result of these tests it became evident that many STBs did not perform as expected.

- Many of these failed automatically because the U.K. DTT system is based on 2000 (2K) carriers whereas, the model chosen for Ireland is based on an 8000 (8K) carrier system.
- The displayed on-screen time, date and/or channel number were incorrect in some cases.
- Some STBs expect to see the country\_availability\_descriptor as GBR and will not decode anything if this is not present

STB manufacturers apply the D-Book specification to STBs destined for the U.K. market. This does not adhere rigorously to the ETSI specification but was adopted at the start-up of U.K. DTT to ease the problems of starting a digital service.

### Tests performed

DTG Testing Ltd have a 'receiver zoo' which is used for testing conformity with the D-Book and this consists of 77 STBs and related equipment. A CDR copy of the Irish Transport Stream was recorded, firstly with GBR as the country\_availability\_descriptor and then with IRL as the Country\_availability\_descriptor and tested against this 'zoo' for correct decoding. This test was specifically to isolate the U.K. STBs pre-programmed to expect GBR only.

### Minimum Performance

For each stream, each receiver was rescanned and the following tests were performed:

- Check the receiver stores the expected TV and Radio services
- Check the Logical Channel Numbers (LCN) are correct.
- Check that the TV services are received correctly.
- Check that the Radio services are received correctly.

- Check that the subtitles are displayed correctly.
- Check EPG data is present and appears correct.
- Check time is displayed correctly.

For receivers storing the services on LCN numbers other than expected, an “OK” (but not “PASS”) result was recorded. Other problems were regarded as a failure. An ‘OK’ result is deemed unsatisfactory for STBs operating close to Northern Ireland where channel numbering confusion can arise.

A PASS was awarded only to STBs which performed *all* the tests correctly.

## Results

The following set top boxes and personal video recorders were found to operate satisfactorily using the Irish DTT trial transport stream with MPEG 2 compression. All other boxes tested did not. Generally, iDTVs have not been tested. Some of the operational boxes are no longer being manufactured.

Operating Boxes/PVRs

Receiver	Model
Sagem	ITD60
Sony	VTX-D800U
Nokia	121T
Ferguson	TUTV
Nokia	Mediamaster 221T
Philips	DTR100
Humax	F2FOX1
Sony	KD32DX51U
NetGem	I-Player
AstraTec	TOPD2

## **Appendix 2**

# **MINIMUM RECEIVER REQUIREMENTS FOR DTT IN IRELAND**

**V1.0**

**6 FEBRUARY 2008**

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## **APPENDICES**

### **APPENDIX A TERMS AND DEFINITIONS**

### **APPENDIX B REFERENCES**

### **APPENDIX C OTHER OPTIONAL FEATURES**

# 1 Introduction

This document has been developed by the DTT Specification Working Group. It sets out the minimum requirements, recommended features and optional features for a Digital Terrestrial Television receiver in Ireland.

For a Digital Terrestrial Television Receiver (“the Receiver”) to be deemed compliant with this document, it must satisfy all the requirements where the word “shall” is used (Sections 2 & 3). All other features (Section 4 & Appendix C) are recommended and/or optional. The Other Optional Features contained in Appendix C should conform to the provisions of the relevant ETSI standard or associated guideline should receiver manufacturers choose to implement them.

The numbers in square brackets refer to the standards listed in Appendix B. Where references are given and unless otherwise indicated, the latest version of each standard applies.

## 2 General Requirements

- 2.1 The Receiver shall receive and output all Irish free-to-air video and audio channels (“the Channels”) broadcast on the DTT Service<sup>2</sup>. This shall include the capability to:
- Receive and output SD and HD Channels
  - Receive and output DVB subtitles (when broadcast) if required by the viewer
  - Receive and output 16x9 and 4x3 video correctly formatted for the connected display device
- 2.2 On installation, the Receiver shall receive and output all Channels available at the installed location.
- 2.3 The Receiver shall provide the user with a means of selecting a primary network (e.g. country selection). The Receiver shall allocate Service Numbers directly corresponding to the LCN of Channels from the designated primary network. The Receiver shall make Channels received from the non-primary network available to the user through assignment of alternative unassigned Service Numbers.
- 2.4 The Channels being broadcast will change over time. To ensure that the viewer is always able to access all the Channels being broadcast, it is recommended that the Receiver automatically detect and reflect to the viewer any such changes.
- 2.5 All Channels shall be transmitted with an associated Logical Channel Number (LCN). LCNs shall be useable directly as Service Numbers on the Receiver. The Receiver shall assign a Service Number to all Channels received based on the LCN allocated to that Channel.
- 2.6 If duplicate Channels are received from different transmitters on the same network (i.e. same LCN and same network\_id), the Receiver shall allocate a Service Number directly corresponding to the LCN of the Channel with the highest received signal quality.
- 2.7 The Receiver shall provide a complete list of Channels and an EPG containing event information for all DTT services.

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<sup>2</sup> Note that the Irish DTT service has an original\_network\_id of 0x2174. Services shall use a network\_id in the range 0x3201-0x3300 [9].

### 3 Basic Requirements

All Receivers shall satisfy all of the requirements contained in Section 3 except where the requirement applies only to a set-top box. Requirements which have a related recommended feature in section 4 are indicated and hyperlinked with an asterix (\*).

#### **3.1 Tuner & Demodulator**

Input Connector	IEC 169-2[2], Female
Input signal level	-10 to -70 dBm
Frequency Range	470-862 MHz
Demodulation	16 QAM and 64 QAM in accordance with EN 300 744[1].
Carrier Mode	8k
FEC Mode Rate	1/2, 2/3, 3/4, 5/6, 7/8
Guard Interval	1/4, 1/8, 1/16, 1/32
The Receiver shall be able to scan the entire frequency range indicated above, and use the information from the PSI/SI tables to automatically display all available Channels to the viewer.	

#### **3.2 RF Modulator (Set-top box only)**

Loop through/modulator output (set-top box only)	IEC 169-2[2], Male
RF channel	User adjustable to any UHF channel between 21 and 69. Modulator to be preset on UHF channel 69.
Channel bandwidth	8 MHz
Colour system	PAL I

#### **3.3 MPEG-2 Decoder (Standard Definition)**

Transport Stream	ISO/IEC 13818-1[3]
Video Profile / Level	ISO/IEC 13818-2[4]: Main Profile @ Main level
Video Resolution	Standard Definition: 720x576
Audio Decoding	ISO/IEC 13818-3[5] (MPEG-1 Layer 2)
Audio Mode	Mono Stereo

### **3.4 MPEG-4 Decoder (Standard Definition)**

Transport Stream	ISO/IEC 13818-1[3]
Video Profile / Level	ISO/IEC 14496-10[6]: Main Profile @ L3.0
Video Resolution	Standard Definition: 720x576
Audio Decoding	ISO/IEC 14496-3[7] (HE-AACv1)
Audio Decoding (Sound Broadcasting Services)	ISO/IEC 13818-3[5] (MPEG-1 Layer 2)
Audio Mode	Mono Stereo

### **MPEG-4 Decoder (High Definition)**

Transport Stream	ISO/IEC 13818-1[3]
Video Profile / Level	ISO/IEC 14496-10[6]: High Profile @ L4.0
Video Resolution	High Definition (HD): <ul style="list-style-type: none"><li>• 1920x1080 (1080i)</li><li>• 1440x1080</li><li>• 1280x720 (720p)</li></ul> Set-top boxes shall be capable of downscaling HD Services for output via SCART.
Audio Decoding	ISO/IEC 14496-3[7] (HE-AACv1)
Audio Decoding (Sound Broadcasting Services)	ISO/IEC 13818-3[5] (MPEG-1 Layer 2)
Audio Mode	Mono Stereo

### **3.5 Video, Audio & Data Connectors for Set-top Boxes\***

Video connectors	<ul style="list-style-type: none"><li>• Primary output: 21-pin Euro SCART with both Composite and RGB for output to display.</li><li>• Secondary output: 21-pin Euro SCART with Composite and optionally RGB or S-Video.</li><li>• RCA/CINCH composite output</li></ul> SCART inputs and outputs should be fully wired for pass-through. Pin 8 should facilitate programme recording. <ul style="list-style-type: none"><li>• HDMI for output to display</li></ul>
------------------	--

Audio connectors	Two RCA/CINCH audio outputs (Left and Right)
Software upgrade	The Receiver shall support local software upgrades via a suitable connector.

### **3.6 Aspect Ratio Switching**

The Receiver shall offer the user the following display options:

- 16:9
- 4:3

To allow 16:9 content to be viewed on a 4:3 display, the Receiver shall offer the user two modes:

- Centre cut-out mode
- Letterbox mode

The Receiver shall support 14:9 and 16:9 letterbox modes

The Receiver shall support both SCART Pin8 and Line 23 signalling. Line 23 signalling shall be derived from the received MPEG header and reinserted by the Receiver. Where both are present, Line 23 signalling shall take priority.

Detailed information on the recommended receiver response to aspect ratio switching can be found in “*Recommended Receiver Reaction to Aspect Ratio Switching in Digital Video Broadcasting*” [8].

### **3.7 Logical Channel Numbers**

The Receiver shall allocate Service Numbers based on Logical Channel Numbers.

### **3.8 Electronic Programme Guide\***

Based on the ETSI EN 300 468[10] standard relating to DVB Service Information (SI) and MPEG Programme Specific Information (PSI), the Receiver shall provide an Electronic Programme Guide (EPG) using data provided in the Event Information Table (EIT). The EPG shall present the programme title, start time, duration, a description and parental rating for the currently running programme and future programmes over the following seven days. The EPG shall present programme or event information for all Channels on all available multiplexes.

### **3.9 Subtitles**

The Receiver shall receive and output DVB subtitles compliant with EN 300 743[11] (where broadcast) if required by the viewer.

### **3.10 Software Upgrade**

DVB-SSU	Receivers shall accept software upgrades in accordance with TS 102 006[12]
---------	--

### **3.11 Language Support\***

The Receiver shall support both English and Irish (Gaeilge) languages.

Electronic Programme Guide (EPG)	Data contained within the EPG shall be displayed in the language in which it is broadcast.
Data Broadcast Services	Data Broadcast Services shall support English and Irish

### **3.12 Power**

Input Voltage	AC 200 to 250V, 50 Hz
Plug	The plug shall be appropriately fused and meet BS1363[13] or IS401[14] for UK/Republic of Ireland (3-pin plug)

The Receiver shall have energy consumption characteristics for normal operation and in standby that are in line with good industry practise.

The EU has produced the Code of Conduct [15] recommendation to which manufacturers are encouraged to sign up and conform.

### **3.13 Additional Items**

Set-top boxes shall be supplied with the following items:

Remote Control meeting the requirements set out below.

Suitable batteries

1 x Fully-wired 21-pin Euro SCART lead

1 x Mains lead, with integrated correctly fused, 3-pin plug

Clear and easy to understand user instruction booklet including a quick setup/installation guide

### **3.14 Remote Control**

The following keys shall be included on the remote:

On/Standby	To toggle between active and standby mode
Numbers 0-9	For numeric entry
Up, Down Left, Right	Navigation keys
OK/Enter/Select	Confirmation of a screen choice or action
Back/Return	Move back one step in an EPG, interactive application or other user action
Info/i	Display a now/next banner or the current program event information
Text	Launch an interactive application
Guide/List	Display program event information for all services
Red, Green, Yellow, Blue	Launch interactive services or other functions
Program Up/Program Down	Change channel
The following keys are recommended:	
Alpha entry	“abc” “def” “ghi” “jkl” “mno” “pqrs” “tuv” “wxyz” Alpha entry should follow the format used by mobile telephones (ETSI standard ETS 300 640)
TV	Return directly to sound and vision from any user service currently selected
Sound Mute	Mute the audio input
Menu	Access the receiver set-up screens
Subtitles	Toggles visibility of Subtitles

## 4 Recommended Features

The features in Section 4 are recommended for enhanced receivers. Features are listed in order of priority.

### **4.1 Middleware**

Support for Data Broadcast Services is a highly recommended feature of the Receiver. If the Receiver supports middleware, the ability to receive and output Data Broadcast Services presented in accordance with the "MHEG-5 UK Profile, version 1.06[17]" is a minimum requirement.

### **4.2 Conditional Access**

In anticipation of a consensus approach by the multiplex contractors to a common conditional access (CA) system, if a set-top box is marketed as being capable of receiving encrypted signals, it should comply with the most recent common interface (CI) standard from the DVB or use an embedded CA solution.

The Universal Service Directive [16] requires that digital television sets with screen sizes greater than 30cm be fitted with at least one "open interface socket".

### **4.3 Closed Signing and Audio Description**

Receivers that are capable of presenting closed signing should provide at least the minimum user controls. Design of controls should take into account that many users of closed signing are hearing impaired.

Receivers that are capable of presenting audio description should provide at least the minimum user controls. Design of controls should take into account that many users of audio description are visually impaired.

### **4.4 Language Support**

Setup Menu	It is recommended that the set-up menu be available in both English and Irish according to the user's preference
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Main Menu	It is recommended that the main menu be available in both English and Irish according to the user's preference
-----------	--

#### **4.5 *Electronic Programme Guide***

It is recommended that Receiver be capable of outputting an alternative EPG if transmitted as a Data Broadcast Service application.

## **Appendix A**

### **Terms and Definitions**

**Receiver**

A device used for the reception of DVB-T signals.

**Channel**

A free-to-air video and/or audio channel broadcast on the DTT platform, which has a unique Logical Channel Number associated with it.

**Service Number**

A number assigned by a Receiver to a particular Channel based on that Channel's LCN.

**Duplicate Channels**

Channels that have the same LCN and the same original\_network\_id.

**Set-top Box (STB)**

A stand-alone receiver used to enable a television to display a DVB-T service.

**Logical Channel Number**

A Logical Channel Number is a pre-assigned default channel number.

**Data Broadcast Services**

Data services which are intended for free-to-air reception e.g. information pages, enhanced broadcasts and interactive services.

## **Appendix B**

### **References**

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2. IEC 60169-2, "Radio-frequency connectors. Part 2: Coaxial unmatched connector"
3. ISO/IEC 13818-1, "Information Technology - Generic Coding of Moving Pictures and Associated Audio; Part 1: Systems"
4. ISO/IEC 13818-2, "Information Technology - Generic Coding of Moving Pictures and Associated Audio; Part 2: Video"
5. ISO/IEC 13818-3, "Information Technology - Generic Coding of Moving Pictures and Associated Audio; Part 3: Audio"
6. ISO/IEC 14496-10, "Information technology - Coding of audio-visual objects - Part 10: Advanced Video Coding"
7. ISO/IEC 14496-3, "Information technology - Coding of audio-visual objects - Part 3: Audio"
8. *"Recommended Receiver Reaction to Aspect Ratio Switching in Digital Video Broadcasting"*, <http://www.dtg.org.uk/publications/books.html>
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11. ETSI EN 300 743, "Digital Video Broadcasting (DVB); Subtitling systems"
12. ETSI TS 102 006, "Digital Video Broadcasting (DVB); Specification for System Software Update in DVB Systems"
13. BS 1363-1, "13 A plugs, socket-outlets and adaptors. Specification for rewirable and non-rewirable 13 A fused plugs"
14. IS 401, "Safety requirements for rewirable and non-rewirable 13 A fused plugs for normal and rough use having insulating sleeves on live and neutral pins"
15. European Commission Directorate-General Joint Research Centre, Institute for Environment and Sustainability Renewable Energies Unit, "Code of Conduct on Energy Efficiency of Digital TV Service Systems", Version 4

16. “Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive)”
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**Appendix C**  
**Other Optional Features**

## C1 Introduction

This Appendix contains features which are not minimum requirements for the Receiver but are intended as a guide should manufacturers wish to implement them.

### Multichannel Audio

Where Dolby Digital Enhanced AC3 is implemented, it is recommended that receivers be capable of providing a 2 channel stereo down-mix of AC3 encoded content for output via analogue SCART and/or RCA/CINCH connectors.

### S/PDIF

Where the S/PDIF digital audio output is implemented, it is recommended that an optical connection be provided.

### Broadband

Where a broadband connection is implemented, it is recommended that an RJ-45 ethernet connector compatible with a home broadband router be used.

### USB

Where a USB connection is implemented, it is recommended that a USB 2.0 Type A receptacle be used.

## Appendix 3 – Amarach Report



**Summary Report**  
**Digital Terrestrial User**  
**Trial**

September 2008

**Prepared for:**

**By:**

**DCENR**

**Amárach Research**

**TD**

**S7-939**

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## **1. Executive Summary**

Digital Terrestrial Television (DTT) is a more advanced method of broadcasting television signals than the traditional analogue method. It allows improved picture and sound quality; enhanced services and the ability to transmit more channels in a smaller bandwidth. In a communication published in May 2005, the EU strongly advocated that by 2012 all analogue terrestrial TV transmitters in Europe should be switched off in order to free up radio frequencies for other uses. Many EU states have started introducing DTT and Ireland expects to meet this 2012 deadline.

The Department of Communications, Energy and Natural Resources (DCENR) managed a non-commercial trial of DTT in Ireland; Amárach Research was commissioned to manage the research element of the public user trial from March 2007 to August 2008.

Amárach Research recruited 500 panellists in counties Louth and Dublin. Quarterly surveys were conducted with the panellists in their own homes over the 18 month period.

The results revealed that there was very high satisfaction with the quality of picture; sound; navigation and overall usability. The majority of respondents also indicated they would recommend the service to a friend.

This report outlines the background of DTT; the approach taken to test the concept of DTT in Ireland and the results of the public user trial.

## **2. Introduction & Project Context**

### **2.1 Digital Terrestrial Television (DTT).**

Digital Terrestrial Television (DTT) is a system for broadcasting and receiving pictures and sound using digital signals. DTT is received through a set-top box, or integrated receiving device, that decodes the signal received by a standard aerial. DTT does not require a satellite dish or cable connection. This method of broadcasting is an upgrade from the traditional over the air analogue service that has been used in Ireland for over forty years providing free to air access to RTÉ, TV3 and TG4. DTT is considered to have several advantages over analogue television. DTT is more efficient than analogue and can offer many more services including an increased number of TV channels; radio stations; programme guide information; and enhanced Teletext services. Other advantages include more reliable picture and sound, increased viewer choice and better quality of service.

### **2.2 DTT in Europe.**

Recognising the diversity of the European television market, the EU has called on its Member States to manage the process of digital switchover. In a communication published by the European Commission on 24 May 2005 (ref SEC(2005)661), the EC strongly advocated that by 2012 all analogue terrestrial TV transmitters in Europe should be switched off in order to free up radio frequencies for other uses. Ireland expects to meet this deadline.

Switch off of analogue terrestrial TV has already taken place in Luxemburg, Sweden, Finland and the Netherlands and in several areas in Germany. Of the 27 European countries 25 have indicated analogue switch off by 2012. In Poland a switch-off date of 2015 is proposed.

In April 2007, legislation to provide for the development of public DTT services in Ireland was enacted under The [Broadcasting \(Amendment\) Act, 2007](#). Under this legislation RTE, the Broadcasting Commission of Ireland

(BCI) and the Commission for Communications Regulation (ComReg) are responsible for the development of DTT in Ireland.

### **2.3 The DTT Trial in Ireland.**

The Department of Communications, Energy and Natural Resources (DCENR) managed a non-commercial trial of DTT in Ireland from August 2006 to August 2008. During this time broadcasts were transmitted from the Three Rock site in Dublin and the Clermont Cairn site in County Louth.

The trial provided the opportunity for technical testing of services on both existing and new broadcast channels while allowing for viewers to experience the new service at user level.

BT Communications (Ireland) provided a multiplexing and distribution service to the DTT Trial. Multiplexing enables compression of television signals resulting in higher quality reception and more efficient use of broadcast spectrum. NEC (UK) Limited supplied and installed the transmission and combining systems required for the DTT Pilot. RTÉ Transmission Network Limited, which maintains Ireland's TV broadcasting network, assisted the Minister and his Department in the development and operation of the trial.

Amárach Research was commissioned by the Department of Communications, Energy and Natural Resources to manage the research element of the public user trial with a panel of 500 homes. DCENR distributed an additional 500 set-top boxes to stakeholders and other relevant bodies. This report provides a summary of the research methodologies used and details of the findings for the public user trial.

The DCENR Trial ended on 31<sup>st</sup> July 2008. On that date the range of channels received by trial participants through the DTT set-top box ceased to be available. Updates on DTT are available from [www.digitaltelevision.ie](http://www.digitaltelevision.ie).

Panellists were provided with a free set-top box which connected to their television. The following television channels and radio stations were available on the trial:

**TELEVISION**

RTE1  
RTE2  
TV3  
TG4  
Channel 6  
cBBC – test  
cBeebies - test  
BBC3 – test  
BBC4 – test  
BBC News24 – test  
Sky News  
Sky Sports 1  
Extreme Sports  
UKTV History  
Setanta Golf  
Setanta Ireland  
Oireachtas TV  
\*HD Ireland

**RADIO**

Radio 1  
RTE 2fm  
RTE Lyric fm  
RTE Raidio Na Gaeltachta  
Today FM  
RTE Radio 1 Extra  
Newstalk 106 - 108  
Dublin's 98FM  
East Coast FM  
Spin 1038  
DAP All 80s  
DAP Mocha  
RTE Choice  
RTE 2XM  
Phantom FM  
FM104

### 3. Objectives and Remit of the Investigation

The objectives of the public user trial by Amárach Research comprised two components:

#### **Establishment and Maintenance of User Panel, including:**

- The selection of potential demographic and geographic areas from which participants were recruited.
- Recruitment of 500 trial households which comprised a balanced test panel.
- Conducting initial face to face interviews with participant households to include the distribution of set-top boxes and accompanying information to participants.
- Providing information to the panellists throughout the course of the trial.
- Upgrading software where required.

#### **The collection and analysis of data on user experience of the DTT services including:**

- Conducting quarterly surveys to:
  - Monitor trial usage behaviour.
  - Assess the impact of DTT on users.
  - Gauge the panellists' reactions to the trial.
- Final / exit interviews with participants at the end of the trial.
- Evaluation and presentation of results to the DTT pilot stakeholder group on an ongoing basis.

## 4. Research Approach

A two phased approach was used to meet the objectives of the research.

### 4.1 Phase 1 – Qualitative Research

At the outset, a qualitative research programme was undertaken to explore the fundamental understanding and resonance of the various issues, attitudes, behaviours and perceptions of and towards television among the study's target audiences. More specifically the qualitative research explored:

- The world of television and entertainment today
- Perceived changes and innovation in the past ten years.
- The perceived future of television.
- Favourite channels and television programming.
- Reaction to the concept of digital television.
- Ideal television package.
- Reaction to DTT trial package and DTT trial box.

Focus groups were used to gather information and encourage a creative brainstorming environment. This maximized exploration of current behaviours, services used and preferred, along with any issues surrounding the introduction of a concept such as DTT.

Eight pre-task focus groups were conducted with users of analogue and digital; cable and digital satellite services. A pre-task diary exercise was conducted by participants of the focus group in which participants recorded their television viewing habits in the week prior to the focus group.

This exploration set a benchmark understanding of the issues as they existed for the target audiences. The findings of the research were then used to inform and gauge further research stages.

## **4.2 PHASE 2 – QUANTITATIVE RESEARCH**

### ***4.2.1 Sample Design***

In designing the panel for the pilot programme, non-interlocking quota sampling was used to provide the most efficient and cost-effective method of ensuring that a fully representative sample of adults were interviewed on this project. The reliability of the quota sampling method is consistently and convincingly demonstrated by the fact that virtually all published public opinion research in Ireland is based upon quota-controlled sample selection. Quotas were set based on Central Statistics Office data for age; gender; social class; marital status and incidence of children in the home.

In overall terms, product trials commonly experience members of the panel dropping out. This can be for a number of reasons – being unable to contact the respondent due to moving house or being unavailable at the time of interview; panellist electing to leave the trial; or if a product ceases working. In a trial that is reliant upon technology the drop-out rate may often be higher again. A sample size of 500 was established to allow for a statistically robust base and to allow for drop-out from the trial. The margin of error on a sample size of 500 is +/- 4.5%. Allowing for a drop-out of 20% the margin of error on the remaining sample size of 400 is +/- 5%.

### ***4.2.2 Sampling Point Selection***

Amárach Research selected two locations that met the following requirements:

- To be within the coverage area of the DTT Trial.
- To have sufficient scale to enable the population to support 250 triallists within the coverage area of each of the two transmitters at Clermont Cairn in Louth and at Three Rock in Dublin.
- To have a sufficient range of demographic profile that allows for a representative sweep of the population to be included.
- To be accessible for the trial team.
- To include a mix of locations and housing types.

The DTT trial was transmitted from Clermont Cairn in Louth and Three Rock in Dublin. Dundalk and environs were selected as the trial location in Louth. With a population in 2002 of 46,500 (CSO 2006 Data), and a socio demographic profile that is inclusive of all different social groupings, it was of sufficient scale and range to support the pilot activity. The town hinterland and population profile also includes traditional urban, suburban and rural components.

In Dublin the area's of Tallaght / Templeogue / Rathfarnham were selected - covering the local electoral districts of Tallaght Central; Tallaght South and Terenure/Rathfarnham. Tallaght and its environs have a population of 72,800 (Source SDCC Development Plan 2004). The electoral district of Terenure Rathfarnham covers Rathfarnham Knocklyon, Templeogue (but not Terenure). It is the second largest local electoral district in the Country with over 50,000 voters. This area was selected because of its scale and ability to support a trial, its social profile, including the fact that much of Terenure-Rathfarnham was built in the 1950s and 1960s and has an older demographic profile. The area also includes consumers with a range of reception types.

#### ***4.2.3 Trial Equipment***

Prior to the trial launch in 2007, DCENR conducted a search for suitable set-top boxes for use in the Irish DTT Trial. A report is available on [www.digitaltelevision.ie](http://www.digitaltelevision.ie). This report specifies that advanced set-top boxes were not readily available in the UK or Europe and would not be available before the trial launch in March 2007. An interim solution was required.

Therefore DCENR approached Humax – who had produced a prototype high Definition DTT set-top box for the HD trial in the UK. This box is specified to work with both MPEG 2 and MPEG 4 compression methods, is capable of receiving and decoding HD signals and has a conditional access slot which can be used with a variety of encryption methods. Within a very tight timeframe, Humax worked with the Department to adapt this box for the Irish DTT network in time for rollout in March 2007.

It should be noted that the DTT Trial box was very much a prototype rather than an off the shelf set-top box. The box has no associated middleware so testing of interactive services was not possible at this stage of the trial.

A further issue that arose during the testing of the boxes by DCENR related to over the air downloads. At this stage of their development set-top boxes often need to have software upgraded on an ongoing basis. During Wave Two of the trial, interviewers manually upgraded the software on each trial box in trial households using a software application on a portable laptop. Irish broadcasters and multiplex licensees will need to ensure in the future that they have systems in place to deliver these downloads without the requirement of manual intervention.

Trial equipment was distributed to the trial participants at Wave 1 of the research. This equipment consisted of:

- The Humax set-top box.
- A card for decoding the encrypted channels.
- An indoor aerial. All 500 participants were given a standard UHF indoor aerial that plugged into the set-top box. In some cases participants reported that signal strength was poor. In these cases the issued aerial was replaced with a higher strength mains powered aerial.

Participants were asked to use the trial on their main television if they received analogue reception; or on a spare television set.

## 5. Questionnaire Design

Once the panellists were recruited, the core research component of the trial commenced. This consisted of quantitative surveys.

Surveys were conducted face-to-face in the respondents own homes on a quarterly basis by Amárach Research's experienced interviewers. A number of core questions were tracked in waves 2, 3 and 4 –

- Overall satisfaction with trial.
- Rationale for satisfaction/ dissatisfaction.
- Quality of picture and sound.
- Reliability and ease of use.
- Navigation ratings.
- Usage of trial functions.
- Radio listenership and ratings.

**In addition to these tracked questions each of the four waves of the research had a different focus:**

### 5.1 Wave 1 - Panel Establishment and existing TV usage and attitudes survey- February 2007

The first wave of the quantitative research involved establishing the panel based on the quotas outlined in Section 4.2.1. At this wave data was collected in relation to:

- Demographics of panel.
- The number of television sets in the home.
- The mode of television reception in the home (satellite; cable or analogue.)
- The usage of television sets in the home.
- Channel viewing repertoire.

## **5.2 Wave 2 - Novelty Phase – August 2007**

This second wave of the quantitative research was the first stage of evaluating the DTT trial. The box had been in the home for approximately two months and the purpose of this wave was to gauge initial reaction to the trial and to measure satisfaction with ease of set up and use. During this wave of research a manual software upgrade was performed by interviewers using a portable laptop. Data was collected in relation to:

- The type of television set the trial was being used on.
- Ease of installing DTT Trial box.
- Desire for any extra functions.
- Trial channel viewing repertoire.
- Programming preferences.
- Frequency of channel viewing.
- Trials ability to meet expectations.

## **5.3 Wave 3 – Established User Phase – November 2007**

At this stage of the research the DTT trial had been in the home for 6 months. This wave concentrated on ongoing reaction to the DTT services with extra questions on identifying any issues

- Any issues encountered
- Types of issues encountered

## **5.4 Wave 4 - Final Phase – April 2008**

The final phase of the research was conducted in April 2008. The primary purpose of this phase of the research was to gauge overall reaction to the trial and to identify positive and negative issues for the concept of DTT going forward. Therefore in addition to the tracking questions, data was collected in relation to:

- Incidence of recommending to a friend.
- Rationale for recommendation/ non-recommendation to a friend.
- Any issues experienced.

- Satisfaction with trial package content.
- Desired television package content.

## **6. Research Findings - Pre-trial Qualitative Research**

A qualitative approach was used to explore the fundamental understanding and resonance of the various issues, attitudes, behaviours and perceptions of and towards television among the study's target audiences. This exploration set a benchmark understanding of the issues as they exist for the viewing audience. The findings of the research were then used to inform and gauge further research stages.

### **6.1 The world of television and entertainment today**

Television viewing is prolific across all ages and genders with programme and channel selection varying by gender and age. Where possible, households with children try to encourage family viewing. It is important to remember that many have multiple television sets around the house and as a result monitoring of children's viewing is not always an easy task. Television viewing is typically of a solus nature and is viewed as a form of relaxation and enjoyment.

In urban areas there are more options in terms of service provision between analogue, cable and satellite. The decision between service providers in Tallaght/Templeogue/Rathfarnham is based on individual requirements (e.g. desire for Sports channels) and pricing. In parts of Dundalk however where reception quality of analogue services can be poor, satellite provides the main alternative. As a result, choice is more limited here than in other areas.

- *Television viewing is a key component of many households and reception formats and quality differ between Dundalk and Dublin.*

## 6.2 Perceived changes and innovation in the past ten years.

The availability of more television channels was considered to be a key change in television viewing in the past ten years. This is largely associated with the developments in cable and satellite television. While these were available before, it is perceived that it is only in the past five to ten years that these methods of reception have become accessible, both physically and financially, to most Irish households.

The introduction of interactive television is viewed as an innovation in television viewing but was not widely used at the time the qualitative research was conducted (2007). Interactive television is largely associated with UK channels and is perceived as something that is unavailable to Irish viewers with many being aware of the “Red-button” option on channels – this is viewed as an attractive addition to television viewing. There is increasing awareness and advertising of interactive services such as recording programmes and auto-recording entire series on the hard drive – these services are largely associated with subscription satellite providers.

Television sets themselves are viewed as having experienced significant changes in recent years, most specifically with the introduction of plasma screen sets. Televisions have now become almost a display item in the home, taking pride of place over the fireplace rather than hidden in a corner or within a TV cabinet. Those who purchase these sets are viewed as most likely to seek television packages offering HD quality and a range of channels including movie channels.

- *Innovation in television viewing has boomed in recent years with the introduction of new technology and increased viewing options.*

### **6.3 Favourite channels and television programming and the ideal television package.**

A range of channels are desired, however those with satellite indicate selection of key channels as favourites with the majority of channels being excluded from their consideration. The Irish channels RTÉ1, RTÉ2, and TV3 are viewed strongly and are a key component of television viewing. The UK channels BBC1, BBC2, UTV and Channel 4 are also considered to be crucial to the success of a TV Package due to their current presence in the majority of Irish homes. Additional desired channels include: a children's channel, The Discovery Channel, a news channel, a sports channel, a movie channel and an entertainment channel such as E4 or Living TV.

- *Television viewers desire a wide range of channels – despite indicating that not all channels are viewed even when they are available. Offering choice to suit different members of the family is crucial.*

### **6.4 The perceived future of television.**

With such a high level of innovation in recent years it is perceived that innovation will level off in coming years, with the majority of new developments stemming from recent ones. Examples of anticipated changes include:

- Increased interactive services.
- Wider usage and availability of HD programming.
- Integration of the PC; games and recording devices into the one set.
- Increased pay-per view content, reduced free to air programming.
- Additional expectations are the availability of the internet on the television set and the use of the television as the control centre for all the homes services such as central heating; lighting and security.

## **6.5 Reaction to the concept of digital television.**

In early 2007, at the time of the qualitative research programme, there was limited awareness of the concept of Digital Television in Ireland. Digital Television was largely associated with the UK and the Freeview service available there. This is largely due to many of the UK channels viewed in Ireland featuring ads for Freeview enabled television sets.

The concept overall was considered to be appealing as a replacement for analogue and was especially well received in Dundalk where options of service providers are more limited and analogue is not of a high reception standard. The concept of higher quality picture and sound; increased number of channels and the potential for interactive services was viewed as attractive – particularly due to the fact that these could all be received through a standard indoor aerial, with no cable or satellite dish requirements. The ability to move the set-top box between rooms and not be limited to a central aerial point was attractive. The potential ability to take the set-top box to a holiday home was also considered to be an attractive concept.

- *Associations between the UK Freeview service and Digital Television were made. However awareness and understanding of DTT in Ireland was limited. Ease of use and fitting compared to cable and satellite installation was considered to be a benefit of DTT.*

## **6.6 Reaction to DTT trial package and DTT trial box.**

Reactions to the prototype set-top box were mixed due to the size and overall aesthetics of the box. However the box was considered to be comparable to a VCR or a satellite receiver and as such the primary concern was with its ability to work rather than the actual appearance of the box itself.

There was some disbelief amongst the groups that a simple internal aerial had the ability to provide signal for the 18 channels at the high level of quality viewed. The quality was viewed as being a significant improvement for

Dundalk residents over their current analogue signal; Dublin residents felt it was comparable to their current reception quality.

The proposed channels were considered to offer a good range for all the family however there was concern that the key UK channels (BBC1, BBC2, Channel 4 and UTV) would not be available as part of the trial.

➤ *Reaction to the trial package, box and concept was positive overall.*

## **7. Research Findings - Quantitative Research**

This section provides a summary of the findings of the Digital Terrestrial Television user trial. Individual reports are available on [www.digitaltelevision.ie](http://www.digitaltelevision.ie). Please note that the base size varied throughout the four waves of the trial due to being unable to contact panellists and panellist drop-out. The base size was 500 in Wave 1, 500 in Wave 2, 452 in Wave 3 and 407 in Wave 4. The results below detail the responses from all active panellists on the trial.

### **7.1 WAVE 1-PANEL ESTABLISHMENT & EXISTING TV USAGE AND ATTITUDES.**

#### ***7.1.1 Demographics of panel.***

At the panel establishment stage quotas were set to ensure a balanced sample based on age, gender, social class and reception format. Quotas allowed for marginally more women than men based on the member of the household responsible for grocery shopping and household decisions. Additional quotas were set to ensure a balanced representation between single occupied households; co-habiting households; and households with children. The average household size in the trial was 3.2 people.

➤ *The panel provided a good representation of the Irish public.*

### **7.1.2 *Number of television sets in the home.***

There was an average of 2.6 television sets per household on the panel. This was slightly higher in Dublin (2.8) than in Dundalk (2.4). Households with children aged over 13 were most likely to have 3-4 television sets in their home – illustrating the solus nature of television viewing in Ireland. The living room is the primary location for the main television set in the home. Of the 83% of households that had more than one television set in their home the most common location for this second set was an adults bedroom (67%) followed by another living room such as a playroom (35%) and the kitchen (29%). One in five respondents indicates there is a television in their child's bedroom.

- *The majority of panellists had at least two television sets in their home indicating that households have different viewing needs.*

### **7.1.3 *The usage of television in the home.***

The television is primarily used as a normal TV set in the home (95%). In a small number of cases it is used for games consoles (8%) – this is especially true for those with younger children (17%).

- *The television is used primarily for television viewing in all households.*

### **7.1.4 *The mode of television reception in the home.***

The majority of panellists had Cable reception (40%), the incidence of cable television was especially prolific in the Dublin area surveyed (78%). A third of respondents had analogue reception via either a roof top aerial or set-top aerial. One in four had a satellite dish.

- *The trial represented cable; satellite and analogue viewers.*

### **7.1.5 Channel viewing repertoire.**

Due to the different methods of television reception between panellists the number of channels received varied between participants. Over a third (35%) received less than 10 channels, just over a quarter (28%) received between 10 and 20 channels. One in seven (14%) received between 21 and 120 channels and just under one in five (17%) received over 120 channels. RTÉ1, RTÉ2, and TV3 are the three most viewed channels with at least 91% of panellists indicating they watched these channels prior to the trial. BBC1, UTV, TG4, BBC2 and Channel 4 also rank highly with between 83% and 89% indicating they watch these channels.

- *Despite the wide range of channels received the majority of panellists view the basic Irish channels in addition to the basic UK channels most often.*

## **7.2 TRACKED QUESTIONS – WAVES 2, 3 & 4.**

### **7.2.1 Overall satisfaction with trial.**

Satisfaction with the trial was consistently high across the three waves of research with the vast majority of active panellists indicating they were satisfied with the trial (Wave 2 - 85%; Wave 3 - 85%; Wave 4 - 84%). Between 4% and 8% indicated that they were neither satisfied nor dissatisfied with the trial resulting in approximately just one in ten indicating they were dissatisfied with the trial. (Wave 2 - 10%; Wave 3 - 11%; Wave 4 - 8%).

- *Satisfaction was consistently high throughout the research.*

### **7.2.2 Rationale for satisfaction/ dissatisfaction.**

Of the 84% of panellists that were satisfied with the trial, the larger range of TV channels and the picture quality were the main reasons for satisfaction. Less than one in ten were dissatisfied throughout the trial – the primary reason for dissatisfaction was the desire for more channels. Issues surrounding reliability of the set-top box also lead to dissatisfaction.

- *The primary reasons for satisfaction included the good range of TV channels and the picture quality.*

### **7.2.3 Ratings of quality of picture and quality of sound.**

The picture and sound quality were the two highest rated attributes across the three waves of research with approximately nine in ten panellists rating these attributes as “Good”, “Very Good” or “Extremely Good”.

- *Picture and sound quality were highly rated on the DTT trial.*

### **7.2.4 Navigation ratings**

Navigation ratings were rated highly across the three waves of research with over nine in ten rating the remote control as good, very good or extremely good and switching of channels as good, very good or extremely good.

- *The remote control was considered user friendly.*

### **7.2.5 Reliability and ease of use.**

The DTT trial receiver was considered to be easy to use amongst nine in ten panellists. The rating of ease of use was consistent throughout the trial. Problems with ease of use related to those who experienced reliability problems in which re-booting of the set-top box was necessary. Despite receiving marginally lower ratings than quality of picture, sound, navigation and ease of use – reliability was rated highly during the trial with four-fifths of panellists rating it as good, very good or extremely good.

- *The trial receiver was considered user friendly.*

### **7.2.5 Usage of trial functions.**

Three in five panellists used the menu function on the trial; two in five panellists used the programme information function; a third of panellists used the Now & Next feature; one in five used favourites and one in ten tried the parental lock. Those who did use the functions rated them highly in Wave 2. Those who were overall satisfied with the trial were most likely to use these functions.

- *The menu function was the most utilised function on the trial. Those who used the functions available rated them highly.*

### **7.2.6 Trial channel viewing repertoire.**

The trial panellists each watched an average of twelve out of the eighteen channels therefore a wide range of channels were viewed. The most popular channels were the Irish terrestrial channels and sports channels. Others included general entertainment and children's channels.

- *A wide range of channels were viewed across the course of the trial.*

### **7.2.7 Radio listenership and ratings.**

The radio was not widely used on the trial service with just over one in four panellists indicating that they listened to the radio as part of the trial. Those who used the DTT trial receiver in a bedroom or kitchen were more likely to have listened to radio than those who used the trial receiver in the living room. The rating for radio was the highest rated element of the trial with almost ten out of ten panellists who listened to radio rating it as good, very good or extremely good across all ratings.

- *The radio feature of the trial was not widely used, especially in a living room setting; however those who used this feature rated it extremely highly.*

## **7.3 WAVE 2 – NOVELTY PHASE**

This second wave of the quantitative research was the first stage of evaluating the DTT trial. In addition to the tracked questions this wave captured the following information:

### **7.3.1 Ease of installing DTT trial**

In the majority of cases the interviewers installed the set-top boxes in the panellists' homes. Panellists were asked to rate how easy they considered the installation process to be – over four in five described this as “Very easy” (55%), or “Easy” (29%). Less than one in ten considered it to be “Not easy” (5%) or “Not at all easy” (3%).

- *Four in five panellists considered the installation process to be easy or very easy.*

### **7.3.2 *The television set on which the trial is being viewed.***

Two in three panellists were viewing the trial on their main television set. In terms of location the majority used the trial in their living room (57%), followed by an adult's bedroom (18%), the kitchen (10%), another sitting room (9%) and then a child's bedroom (4%). Half of respondents indicated they were viewing the trial on a "standard television set"; the trial was also viewed on portable televisions (15%), widescreen televisions (13%), plasma screen televisions (8%) and LCD Televisions (7%).

- *Two thirds of the panel used the trial in a common room in their home (57% in living room, 9% in another sitting room)*

### **7.3.3 *Trial's ability to meet expectations.***

Over two in three panellists expected to receive more channels on the trial, two in three panellists also expected improved picture quality. One in three panellists expected improved sound quality. One in four expected the trial to be easy to use and a further one in four expected the trial to be reliable. Over two in three (69%) felt that the trial was actually better than they had expected, almost one in five (17%) felt that it was the same as what they had expected and a little over one in ten (13%) felt that the trial was worse than was expected.

- *Two thirds of the panel felt that the trial surpassed their expectations.*

### **7.3.4 *Desire for any extra functions or services on DTT.***

Almost half of respondents either did not desire any extra services or could not think of any additional services they would like to see on DTT. Half of respondents expressed a desire for Teletext, one in ten indicated they would like to see interactive services and a further one in ten indicated they would like DTT to have HD capabilities.

- *Half of panellists did not express a desire for additional services on DTT. Of those who expressed a desire for additional features Teletext was the most desired function.*

## **7.4 WAVE 3 – ESTABLISHED USER PHASE**

The tracking questions were all covered in this wave in addition to a number of questions to help identify any issues experienced by the participants on the trial.

### ***7.4.1 User issues experienced on the DTT trial***

Just over two in five panellists reported issues with the set top box. These were generally fixed by prompting or restarting the box.

- *Just over two-fifths of panellists reported issues with the DTT prototype box that was used in the trial.*

## **7.5 WAVE 4 - FINAL PHASE**

The final phase of the research was conducted in April 2008. The primary purpose of this phase of the research was to gauge overall reaction to the trial and to identify positive and negative issues for the concept of DTT going forward. Therefore in addition to the tracking questions, data was collected in relation to:

### ***7.5.1 Suggested improvements going forward***

More than half the panel (57%) indicate that they would make improvements to the DTT service going forward. The majority of these would like to see additional channels, in particular the main UK channels.

- *Desired improvements going forward are reasonable and actionable in nature with a requirement for more channels.*

### ***7.5.2 Rating of trial package content.***

The trial package as it stood with eighteen television channels and sixteen radio stations was rated highly at the final stage of the trial with nine out of ten panellists rating the package as “Good” (13%), “Very Good” (45%) or “Extremely Good” (33%).

- *Despite the strong desire for additional channels nine out of ten panellists*

*considered the current range of channels to be good.*

### **7.5.3 *Desired television package content.***

When asked what channel types would comprise their ideal television package nine out of ten panellists expressed a desire for the basic Irish channels and the basic UK channels (Channel 4, UTV, BBC1, and BBC2). There was also a strong desire for Sports Channels (60%); Factual Channels (57%); Movie Channels (53%) and News Channels (51%).

- *A wide range of channels are expected to comprise the ideal television package – however it is the basic Irish and UK channels that are most desired.*

### **7.5.4 *Payment expectations***

When asked what they would expect to have to pay for their ideal package nine out of ten panellists expected to get the Irish channels free of charge; nine out of ten also expected to get the basic UK channels free of charge. There was also high expectation of the free provision of News channels (73%). Panellists largely expect to have to pay for Movie Channels, Sports Channels and Music Channels. A once off payment option is the preferable method of paying for such services.

- *Panellists expect to receive the basic Irish and UK channels free of charge but are open to the idea of paying for more niche channels such as movie, music and sports channels.*

### **7.5.5 *Incidence of recommending to a friend.***

Four in five respondents indicate that they would recommend trial service to a friend. The main reasons for recommending include satisfaction with picture quality and overall range of channels. It is also considered to be useful on a spare television set. Of the one in five who would not recommend the service the primary reasons for not doing so are inadequate range of channels and the issues experienced with the set top box.

- *Four out of five panellists on the trial would recommend the service to a friend. The remaining one in five panellists were concerned about the inadequate range of channels provided on the trial and the issues with the*

*prototype set top box.*

## **8. Insights & Implications**

- There have been many technological advances in the world of television in recent years – both in terms of advances in services offered and television sets themselves. Both the concept of DTT and the trial of DTT itself were very well received. This was evidenced by high satisfaction scores for all aspects of DTT performance including quality and ease of use and by the vast majority of participants indicating they would recommend the service to a friend. Reception improvement and additional content were crucial to this satisfaction – particularly in homes currently relying on an analogue terrestrial service.

*IMPLICATION: Participants are open to the concept of an improved TV service and are comfortable with the evolution of technology. There was a high level of satisfaction and enjoyment of the trial DTT service.*

- Trial usage patterns varied amongst respondents; however differences were driven more by different tastes in content (e.g. preference for sports channels) than by technology. There was no real difference between age; gender or regional groupings in terms of finding it easy to use.

*IMPLICATION: The technology involved with using Digital Terrestrial Television was not a barrier to using the product. The primary differences between users related to personal preferences for different television channels and content.*

- Two in five participants experienced issues with the set top box.

*IMPLICATION: The role of the front end will be crucial to the success of the transition to DTT. Consumers are unlikely to distinguish between the broadcast methodology and the receiving methodology. Service providers will need to ensure that appropriate and easy to use receivers are available.*

- Radio was not extensively used in the trial – usage was influenced at least partly by the location of the set-top box. Those who did use it loved it.

*IMPLICATION: Radio will be a niche activity for DTT. However, it is a minority market that can be catered for.*

- Panellists indicated that they watched the majority of the eighteen channels on the trial and expressed a desire for more channels. With service providers offering a vast array of channels people expect an increasing number of channels to be made available to them. Although every channel may not be watched by any one person the viewing patterns vary amongst the household and people want to exercise the choice themselves.

*IMPLICATION: TV viewers have a preference for a wider range of channels. The provision of core Irish and UK channels is perceived as a basic requirement.*

## **9. Conclusion**

Overall, the Digital Terrestrial Television Public User trial was a success. All objectives of the research were met. DTT was well received by the panellists and going forward it is expected that DTT will be well received by the Irish public as a whole. The development of national DTT services is underway – RTE has initiated the development of a national network and a consortium comprising a Swedish company – Boxer, Communicorp and BT Ireland - has won a competition organised by the BCI, the Broadcasting Regulator, to offer commercial DTT services throughout Ireland. The detailed Quarterly Survey's conducted by Amárach are available on the following website <http://www.digitaltelevision.ie>. Further information on Digital Television and the DTT trial can also be found on this site.

## Appendix 4 – Content on the DTT Trial

The Channels made available on the Irish DTT trial are listed in the table below:

TELEVISION	RADIO
RTE1	Radio 1
RTE2	RTE 2fm
TV3	RTE Lyric fm
TG4	RTE Raidio Na Gaeltachta
Channel 6	Today FM
cBBC – test	RTE Radio 1 Extra
cBeebies - test	Newstalk 106 - 108
BBC3 – test	Dublin’s 98FM
BBC4 – test	East Coast FM
BBC News24 – test	Spin 1038
Sky News	DAP All 80s
Sky Sports 1	DAP Mocha
Extreme Sports	RTE Choice
UKTV History	RTE 2XM
Setanta Golf	Phantom FM
Setanta Ireland	FM104
Oireachtas TV	
HD Ireland	

## Appendix 5 – Glossary of Terms

**Analogue Broadcasting** - The traditional way of broadcasting television and radio. An analogue signal directly represents the pictures and sound. This is unlike digital broadcasting which operates by coding the pictures and sound into 'computerised' data.

**Analogue Terrestrial TV channels** - The analogue TV channels broadcast in Ireland and received via an aerial are RTÉ One, RTÉ Two, TV3, and TG4.

**Audio Description** - A spoken commentary on TV that describes what is happening on screen, particularly useful for visually impaired viewers. The commentary fits in between dialogue and describes action sequences, facial expressions, costume, scenery and so on.

**Broadcasting spectrum** – the range of radio frequencies that may be used for broadcasting. A single radio frequency (RF) channel takes up a certain amount of frequency space. In general only one signal transmitted on that RF channel can be received without interference at any one location. In analogue systems one programme service e.g. a single TV channel occupies one radio frequency channel. In digital systems a number of programme services will occupy a single radio frequency channel. Thus compared to the analogue systems of the past, digital systems can deliver the same services in less spectrum.

**Cable TV** – Broadcast signals are pulled off-air from terrestrial or satellite transmitters and distributed to receiving devices via co-axial or fibre cable. For digital cable, a decoder box is used to receive and decode any digital signals transmitted. Cable television was introduced in Ireland in the late sixties and is currently being upgraded to provide for digital transmissions.

**Conditional Access** – Conditional Access systems restrict television program access to certain groups of users either because of concerns for privacy or the desire to collect revenue for the service. Providing conditional access requires secure encryption of the program content, secure decryption in a set-top-box for each viewer, and an embedded serial number that is registered in a central conditional access system database.

**Decoder** - A device that turns digital signals back into analogue sound and picture signals. It may come in a set-top box, or be built into a TV set or PVR.

**Digital Switchover** - The process of switching from analogue to digital broadcasting. Most European countries plan to achieve digital switchover by 2012.

**Digital Terrestrial Television (DTT)** - Digital TV that is received via a standard aerial.

**Digital TV Group (DTG)** – Formed in the mid 90's, originally to facilitate the introduction of digital terrestrial TV in the UK, the group is the fulcrum of UK digital TV. The group is currently focused on digital switchover and the rich media services and products it will help enable. Emerging consumer devices and experiences include

high definition TV, mobile TV, video-on-demand, broadband TV and TV metadata (see below).

***DTT Receiver*** – this is the device that processes the incoming signal from the DTT transmitter and turns it into a format which can be displayed on the TV. It can take the form of a set top box or may be integrated into the TV itself.

The essential role of the DTT receiver is to receive, decode and decompress digital data to produce audio and video signals that can be displayed. It is a custom computer system whose processing power can vary considerably depending on the functionality and sophistication of the receiver.

All receivers use an Operating System to perform its basic functions. Some receivers offer a return path, via a telephone or broadband connection, to allow two-way communication or interaction. This generally requires a built in modem and is not a regular feature of most receivers currently on the market.

***DTV*** – The general term for digital television.

***DVB*** – A European consortium for the standardisation and deployment of digital television via terrestrial broadcast and satellite.

***Electronic Programme Guide (EPG)*** - software built into a set-top box that gives on-screen listings of what's on TV now and for a number of days or weeks ahead. You can use the EPG to go straight to a programme you want to watch or to select something to record.

***ETSI*** – The European Telecommunications Standards Institute (ETSI) is an independent, non-profit organisation, whose mission is to produce telecommunications standards for today and for the future.

***Free To Air (FTA)*** - A programme or service (provided by terrestrial transmitter) that you don't need to pay a subscription to receive.

***HD (High definition)*** - HD TV has up to four times as many pixels (dots on the screen) as standard-definition TV. The pixels make up the lines on a screen - standard screens have 625 lines, HD screens have 720 or 1080 lines. This gives a clearer, sharper picture with much more detail.

***Information services*** – The launch of DTT would allow the introduction of a digital version of teletext (Digitext). Digital teletext would offer the services provided by traditional teletext but with enhanced features such as faster page transitions, more aesthetically pleasing page layout, multiview capabilities and the possibility of regionally specific pages.

***Integrated Digital Television (iDTV)*** – A TV set with a built in receiver which carries out the functions of a set top box. Such a TV would not need a set top box to display unencrypted TV stations.

**Interactive services** – Digital TV will offer "red button features" where pressing a button on the remote control will activate enhanced features in the set top box providing additional information about programmes, alternative news stories or sports coverage along with the opportunity to join in quizzes or vote in polls.

**Metadata** – data about data. Metadata describes how and when and by whom a particular set of data was collected, and how the data is formatted. Metadata is essential for understanding information stored in data warehouses and has become increasingly important in XML-based Web applications.

**MHEG** – Multimedia and Hypermedia information coding Expert Group developed this ISO standard for multimedia scripting, display and user interaction. It is suggested as an alternative to HTML and Java for enhanced television.

**MHP** – Multimedia Home Platform (MHP) is a standard within the DVB for enhanced television. It defines a generic interface between interactive digital applications and the terminals on which those applications execute. It supports many kinds of applications including electronic program guides, information services, synchronous enhancements, e-commerce and secure transactions. It requires a Java run-time engine within the set-top-box, allowing complex applications to be developed.

**MPEG** – The Moving Picture Experts Group, a working group of ISO/IEC, has developed international standards for compressed digital video and audio. MPEG-1 provides resolution up to ¼ of standard definition video, at bit rates up to roughly 1.5 Mbits/second. MPEG-2 provides a family compression profiles and levels, including ones for High Definition Television. MPEG-4 provides an even higher range of resolution options, plus the ability to include image objects. MPEG-4 is likely to be the standard used for the transmission of High Definition (HD) content due to its enhanced compression ability and the large quantities of information contained in HD signals.

**Multichannel Multipoint Distribution Service (MMDS)** – MMDS is a telecommunications technology that offers an alternative method of cable television programming reception. Signals are in the form of high frequency radio waves that are broadcast over the air. MMDS is used in less populated areas where a special aerial receives the signal that would be distributed along a cable in more populated areas.

**Personal Video Recorder (PVR)** - Also known as a DVR (digital video recorder) or PDR (personal digital recorder). It records TV programmes digitally on to a hard disk (like saving information on a computer), instead of on video tape or DVD. It has an electronic programme guide built in, and allows you to pause and 'rewind' a programme while you are watching it.

**Receiver** - Equipment that receives signals from a transmitter and allows you to see and/or hear TV or radio broadcasts. TV sets (both analogue and digital), digital TV set-top boxes, and radio sets are all examples of receivers.

***Satellite*** - Satellite broadcasting services are received through geostationary satellites above the earth. The satellite receives signals transmitted from an uplink facility on the ground and broadcasts them so that they may be received by a dish antenna connected to a satellite receiver set top box. Satellite broadcasts have a wide coverage area and are subscription based.

***Set top box*** – An electronic device which can receive and decode digital TV signals so that they can be displayed on an analogue TV.

***Standard Definition (SD)*** – A level of screen resolution (number of pixels on the screen) that produces a picture quality comparable with good quality traditional analogue TV reception. Standard Definition screens have 625 lines on the screen.

***Terrestrial Television*** – Television broadcasts, over radio waves, which are transmitted from a transmitter located on the earth – generally on a mountain or hill site and intended for direct reception by the general public.