



**Commerical Requirement for
DVB-T2**

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Table of contents

1	Introduction	3
1.1	Market need for a second generation terrestrial DVB specification	3
1.2	Relationship to the current digital terrestrial DVB-T	3
1.3	Scope of the commercial requirements	4
1.4	Relationship to other standards bodies	4
2	Transmission and receiving conditions.....	4
3	Characteristics of the DVB-T2 specification	5
3.1	Frequency efficiency, frequency bands and channel bandwidths	5
3.2	Robustness.....	6
3.3	Reception-related issues	6
3.4	Network.....	7
4	Interoperability and consistency with the overall DVB architecture.....	8
4.1	Commonality with DVB satellite and cable, and other terrestrial broadcast services	8
4.2	Compatibility with DVB layers above the DVB-T2 physical layer	8
5	Backwards compatibility, implementation and co-existence strategies.....	9
6	Phases of market introduction	9

1 Introduction

1.1 Market need for a second generation terrestrial DVB specification

DVB-T has established itself as the leading specification for digital terrestrial TV broadcasting. Since DVB-T was initially specified, there have been substantial developments in both the modulation technology available and the economics of the transmission chain. There are new ways of modulating and error-protecting the broadcast stream, the commercial value of digital broadcast spectrum is on a rising trend and the cost and feasibility of including much more sophisticated technology at an acceptable cost in receivers has enabled a different balance to be struck between receiver complexity and bandwidth efficiency. We can also anticipate greater convergence between traditional broadcast services and telecommunications services, including mobile and broadband services. All these trends together with the increased capacity needs of High Definition TV (HDTV) give rise to the need to specify a second generation enhanced terrestrial DVB.

It is an open question whether the future TV applications require an ability to view the same signals on different devices with varying screen resolutions (e.g. mobile and fixed receivers), or the use of simultaneous distribution of the same service in different formats to suit each community of receivers and users. The enhanced DVB specification would therefore need to be capable of supporting both of these scenarios.

The switch off of analogue TV across the EU Broadcast Region will release the legacy analogue TV Spectrum for new applications and services.

This transition will create a window of opportunity for the introduction of new technologies and the short term requirement for a DVB-T2 Specification is to be ready for deployment on the new frequency allocations defined by the Geneva 2006 Agreement (GE06) post analogue TV switch off.

In addition to being ready in time for analogue TV switch off, a new DVB-T2 Specification must offer significant benefits in terms of payload capacity over the existing DVB-T Specification in order to be commercially viable.

1.2 Relationship to the current digital terrestrial DVB-T

A major contributing factor in the success of the current DVB-T System has been the ease by which a consumer can migrate from analogue reception. In the majority of cases a consumer can simply install a new DVB-T Receiver with no need to upgrade the domestic antenna or cabling.

It is critical for the sustained success of terrestrial DVB that DVB-T2 should offer a similar ease of migration from DVB-T and that DVB-T2 can be received by an existing DVB-T domestic antenna installation. The importance of such a **backwards compatibility** has been confirmed by the feedback gained by consulting the major European broadcasters.

A general policy of these requirements thus has been to call for a high level of compatibility with the existing DVB-T infrastructure including both transmission and domestic reception installations, to facilitate the migration from DVB-T.

Compatibility requirements may rule out the most significant performance improvements that could be gained by introducing **non-backwards compatible**, disruptive state-of-the-art, yet rapidly maturing technologies. It is planned that such technologies will be considered during future phases of DVB work.

1.3 Scope of the commercial requirements

The initial goal of the AMT initiative is to facilitate the successful launch of new terrestrial HDTV services on the digital terrestrial spectrum allotments made available in the Geneva 06 agreement after analogue switch-off.

However, as the DVB-T system is not limited to stationary reception but is deployed for portable and even mobile reception in some countries, a new DVB-T2 standard shall leave it also to broadcasters and network operators to decide to what extent the system is intended to be used for stationary, portable, and mobile reception conditions. The system design shall accommodate all variants.

This necessitates a significant overall performance improvement over the DVB-T system to meet the increased capacity demands. We may anticipate that there will be steady progress in refining source coding implementations based on MPEG-4 AVC, and that the state of the art for multiplexing may also gradually improve, but that no quantum leap in these technologies is anticipated in the near future.

These commercial requirements therefore concentrate on improvements to the **physical and transport layers of the system** with the objective that the DVB-T2 Specification shall provide a significant increase in payload capacity over the current DVB-T Specification.

The gravity of the numbered commercial requirements is indicated by using the wording “shall” for requirements that are considered as mandatory, “should” for those that are highly recommended, and “may” for desirable but less important characteristics.

1.4 Relationship to other standards bodies

Cooperation with other standards development organisations, such as 3GPP, may be particularly important at later stages of specifying any new mobile transmission standard. Wherever possible, DVB should look to adopt new terrestrial transmission solutions with high levels of commonality, in order to limit the extra cost, weight, power and complexity generated by the integration of a new technology in mobile phones.

2 Transmission and receiving conditions

It shall be possible to design a DVB-T2 network to support the following **three categories of receiving conditions**:

- **Fixed**, reception is typically through a rooftop antenna or another form of external antenna / MATV system with a reasonable gain in a suitably selected location, usually with some antenna gain and directionality. Typical reception of TV-services is on a mains powered TV set, though other types of services and/or display options exist;

- **Portable**, reception is typically through an embedded or indoor antenna by a device which can be a mains or battery powered receiver. A portable receiver is defined as a device which offers the broadcast service to the user in a static position, and the quality of the reception may vary when being moved.
- **Mobile**, reception is typically through an embedded antenna with a battery-powered device. A mobile receiver is a device which offers a broadcast service to the user on the move.

N°	Requirement
1	The DVB-T2 specification shall be designed for stationary reception. However, it shall be possible to design DVB-T2 networks for all three receiving conditions, fixed, portable and mobile.

3 Characteristics of the DVB-T2 specification

The DVB-T2 specification should take into account the future need for new DVB terrestrial specifications, such as mobile and non-backwards compatible, and should prepare for the highest possible degree of commonalities without sacrificing performance of the DVB-T2 specification.

3.1 Frequency efficiency, frequency bands and channel bandwidths

It is anticipated that future DVB-T2 broadcasts will have to co-exist with existing DVB-T broadcasts for a long period of time. The DVB-T and DVB-T2 systems shall be able to be operated simultaneously without mutual interference.

High spectrum efficiency together with reasonable network costs is of fundamental importance using DVB-T2, either alone or together with DVB-T.

In order to allow the new DVB-T2 standard to be used globally it is important to include a large flexibility with regard to frequency bands and channel bandwidths. Consideration may also be given to implementation of DVB-T2 specification using spectrum masks outside the scope of GE06, especially for applications outside of ITU-R Region 1.

N°	Requirement
2	Transmissions using the DVB-T2 specification shall meet the interference levels and spectrum mask requirements as defined by GE06 and not cause more interference than DVB-T would do.
3	The DVB-T2 specification should target the maximum increase in net payload capacity over DVB-T with similar or better robustness than DVB-T under similar conditions.

4	The DVB-T2 specification shall provide a minimum increase in net payload capacity of 30% greater than DVB-T for any given channel profile under similar conditions.
5	The characteristics of the DVB-T2 specification shall not impair the ability to perform, or efficiency of, statistical multiplexing of DTV Services.
6	The DVB-T2 specification should offer improved robustness against interference from other transmitters, compared to DVB-T, potentially improving frequency reuse.

3.2 Robustness

The system shall include a large degree of flexibility in terms of combinations of throughput and robustness, so that the operator can freely choose the desirable combination. In addition the system shall be designed in such a way that provides as large immunity as possible (subject to cost and other constraints) against impulsive noise interference, time variations of the wanted DVB-T2 signal, as well as unwanted interfering transmissions.

N°	Requirement
7	The DVB-T2 specification shall offer a choice of various robustness and protection levels to be applied equally on all data of a transport stream carried by a DVB-T2 signal in a particular channel.
8	The DVB-T2 specification should offer a choice of various robustness and protection levels for each service separately, within a transport stream carried by a DVB-T2 signal in a particular channel. When more than one transport stream is carried by a DVB-T2 signal in a particular channel the DVB-T2 specification should offer a choice of various robustness and protection levels for each transport stream separately.
9	The DVB-T2 specification shall provide a quality of service across the whole channel that approximates to no more than one corrupted event (to any audio, video or data services) per hour for HDTV and SDTV services.
10	Impulsive noise performance of DVB-T2 shall be no worse than the DVB-T performance and should be substantially improved from that of DVB-T.

3.3 Reception-related issues

This section indicates issues specific to receiver implementation that should be included in considerations for emission standards. It does not imply any specific implementation constraints on receivers.

DVB-T has been widely adopted and there is a very large and growing number of receiver IDTVs, set-top boxes, PC USB and PC-Card adapters and in-car entertainment TVs in the market. DVB-T broadcast services will continue into the foreseeable future. There must be no impediment to the operation of DVB-T and DVB-T2 services in close proximity, and it is anticipated that DVB-T2 receivers will include DVB-T functionality for compatibility with all services.

The DVB-T2 specification shall not prevent implementation of both DVB-T and DVB-T2 reception in a single tuner-demodulator.

It would be highly desirable if the DVB-T2 specification could enable receivers to perform channel scanning in a more efficient way than the current DVB-T receivers.

N°	Requirement
11	The DVB-T2 specification shall enable changes in modulation mode to be detected automatically within 0,5s. However, the receiver may not be capable of performing seamless changeover.
12	The DVB-T2 specification shall not introduce any more than 0,3s of additional delay in receiver channel changing and service selection times compared to DVB-T.

3.4 Network

It would be highly desirable for the DVB-T2 specification to enable use of existing broadcast transmitters, masts and sites and allow immediate reception with existing domestic antennas. The service should also be able to utilise other transmitter sites (e.g. mobile phone masts) to offer enhanced coverage and more robust mobile / portable coverage.

It is also very important that a DVB-T2 network is able to coexist, without significant mutual disturbances, with a dense network working in the same frequency band.

The DVB-T2 specification should be designed as far as possible to have characteristics which would allow synergies for the overall design of networks for fixed and mobile reception.

It would be highly desirable if the DVB-T2 system could be designed to allow lower cost transmitters than currently for DVB-T (for a given output power).

There are large differences in frequency planning conditions between different countries, differences in priorities between operators regarding capacity (number of channels and their quality) and coverage that DVB-T2 shall take into account.

N°	Requirement
13	The DVB-T2 specification shall be able to provide at least the minimum specified increase in payload capacity over DVB-T using existing transmitter sites and masts broadcasting to existing DVB-T domestic antenna and cable installations.
14	The DVB-T2 specification should be designed to allow lower cost transmitters (in terms of both capital and operational costs) than currently for DVB-T (for a given output power).
15	The DVB-T2 specification should enable larger scale SFNs than currently possible with DVB-T. The maximum distance between adjacent transmitters in the same SFN should be at least 30% larger than that offered by a comparable DVB-T 8k mode for the same level of self-interference.
16	The DVB-T2 specification should enable the development of cheap and regulation-compliant home gap fillers to ease indoor coverage, for fixed, portable and mobile services.

17	The DVB-T2 specification shall provide for local, regional and national coverage areas in an economical way (i.e. optimising infrastructure costs and spectrum usage including SFN and/or MFN techniques) whilst also meeting spectrum management conditions and constraints as defined within the relevant international treaties and other agreements.
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Consideration should be given in the design of the DVB-T2 modulation scheme to allow for cheap small transmitter cell implementation and permit regulation-compliant cheap (re-)transmitters, possibly on the same frequency, or retransmission from another network (e.g. satellite feed) to enable (cheap) 'dense' networks

It would also be helpful if the DVB-T2 system were to include some identification mechanism for transmitters, to ease field monitoring and network maintenance by identification of each transmitter's contribution within a SFN.

4 Interoperability and consistency with the overall DVB architecture

N°	Requirement
18	Any changes to the Service Information delivery caused by DVB-T2 specification shall be incorporated in the common DVB SI specifications.
19	The DVB-T2 specification shall support direct carriage of MPEG2 transport streams and shall be capable of carrying all DVB transports including MPEG2 and GSE.
20	The DVB-T2 specification shall support the carriage of multiple DVB transports simultaneously on a single channel.

4.1 Commonality with DVB satellite and cable, and other terrestrial broadcast services

It is vital that the DVB-T2 specification should be highly competitive in terms of its performance, flexibility and resilience when compared with other specifications available in the market. Provided that this vital requirement is not compromised, it would be desirable to offer commonality with other DVB emission formats that may be included in consumer devices alongside DVB-T2, since this could minimise development costs and for multi-emission-format receivers could reduce cost/complexity.

4.2 Compatibility with DVB layers above the DVB-T2 physical layer

Compatibility with higher level DVB protocols is required. This means that DVB transports such as e.g. MPEG-2 TS and Generic Stream Encapsulation must be supported. Since there is some interdependence between the various protocol layers the design of the physical layer may also affect the efficiency of higher layers. It must therefore be possible to achieve the required compatibility without compromising the efficiency of video coding, statistical multiplexing, used protocol schemes, zapping time or power consumption.

5 Backwards compatibility, implementation and co-existence strategies

N°	Requirement
21	The DVB-T2 specified signal shall be able to be received using existing DVB-T domestic antenna and cable installations.

6 Phases of market introduction

It is planned to start fixed / HD services using the DVB-T2 specification no later than the beginning of 2009.

The DVB Technical Module is requested to complete the DVB-T2 technical specification in a schedule that guarantees timely response to these market visions.