

## RECOMMENDATION ITU-R BT.1125

**BASIC OBJECTIVES FOR THE PLANNING AND IMPLEMENTATION OF DIGITAL  
TERRESTRIAL TELEVISION BROADCASTING SYSTEMS**

(Question ITU-R 121/11)

(1994)

The ITU Radiocommunication Assembly,

*considering*

- a) that a digital TV system may offer a number of advantages when compared with the existing PAL, SECAM and NTSC systems in terms of spectrum efficiency, picture quality and flexibility of operation;
- b) the rapid development of digital methods for the delivery of television and other image services to the home over terrestrial broadcast as well as over cable and satellite channels;
- c) that the need for a number of digital terrestrial television broadcasting (DTTB) service quality levels, ranging from HDTV to limited quality, has been identified;
- d) that flexible multi-programming and multiple sound and data services are feasible and desirable features of DTTB;
- e) that digital broadcasting technology may make it possible to improve reception on portable receivers, and that it may be desirable to identify the different reception assumptions, e.g. fixed, portable or mobile reception, and the use of omnidirectional or directional antennas;
- f) that with certain service planning philosophies it may be desirable to provide for “graceful degradation” at the edge of the service area in order to reduce the effect of local propagation variations;
- g) that the introduction of digital services may require the use of adjacent channels and related (taboo) channels in the current frequency plans;
- h) that digital services introduced into the current frequency plans must not cause significant disturbance to existing analogue services;
- j) that the use of single frequency networks\* may provide considerable improvement in spectrum utilization and in service reliability up to the edge of the service area;
- k) that the planning constraints, market implementation strategies and time-scales may be different from country to country;
- l) that consideration should be given to the following concepts: source coding based on common algorithms, hierarchical (scalable) coding, flexible dynamically-variable multiplex and header descriptors,

*noting*

that progress in the standardization of source coding and multiplexing under the auspices of ISO/IEC JTC MPEG has achieved great momentum, and that the MPEG standards offer the possibility of convergence between the satellite/cable and terrestrial broadcasting standards,

*recommends*

1. that the system standards adopted for DTTB should be able to support television services in a range of picture quality levels including, at the highest level, HDTV\*;
2. that where the practical implementation of the system cannot initially support the highest quality level, it should be structured so that compatible upgrades to achieve this level can be implemented at a later date;
3. that the system standard should basically support the transmission of a single quality level and, optionally, the transmission of a hierarchy of nested quality levels – i.e., scalability;

---

\* For an explanation of certain key concepts, see Annex 1.

4. that the system standard should provide for the option of multi-programming and a range of service options by reconfiguration\*;
5. that the system standard should optionally allow single-frequency network (SFN) operation. This should not preclude transmissions which do not allow SFN operation,

*further recommends*

1. that the system standards for DTTB, digital satellite and cable broadcasting should be harmonized.

## ANNEX 1

### Explanation of certain key concepts in the Recommendation

#### 1. The single-frequency network (SFN) concept

An SFN can be implemented by:

- on a local scale, by the implementation of coverage extenders and/or gap-fillers, for example being fed by a particular transmitter (either from the main transmitter or from a coverage extender or gap-filler). This first option may be termed a “local SFN”;
- on a larger scale, with medium-power transmitters, fed with the same programme in “regional” or “national” networks, in order to optimize terrestrial spectrum resources. This second option may be termed a “wide-area SFN”.

#### 2. Hierarchical multi-level and reconfigurable systems

##### 2.1 Introduction

The following outline is intended to illustrate the concepts of reconfigurability and hierarchical coding and modulation, where the term hierarchical refers to source coding which allows for nested quality levels.

The following quality level definitions are used here as a basis for comparison without prejudice for future definitions.

##### 2.2 Quality level definitions

HDTV quality, where the potential exists for the delivery of a picture which is subjectively identical with the interlaced HDTV studio standard. Quality shall remain consistent with this for a given proportion of television programme material (where this is a percentage in the high nineties, but is yet to be identified).

EDTV quality, where the potential exists for the delivery of a picture which is subjectively indistinguishable from the 4:2:2 level of Recommendation ITU-R BT.601. This quality shall be maintained for a given proportion of television programme material (where this is a percentage in the high nineties, but is yet to be identified).

SDTV quality, where the quality is approximately equivalent to that of current PAL or SECAM. This equivalent quality may be achieved from pictures sourced at the 4:2:2 level of Recommendation ITU-R BT.601 and subjected to processing as part of the bit rate compression. The result should be such that, when judged across a representative sample of programme material, subjective equivalence with PAL, NTSC and SECAM is achieved.

LDTV quality, where the quality is equivalent to that obtainable with the MPEG-1 system, which operates on a source resolution approximately 1/4 that of the 4:2:2 level of Recommendation ITU-R BT.601. This quality is considered by some to resemble that of VHS (albeit over a relatively small proportion of programme material).

---

\* For an explanation of certain key concepts, see Annex 1.

2.3 **Hierarchical systems and receiving situations**

The term “multi-layer” refers to reception of sub-sets of a data stream under various receiving conditions.

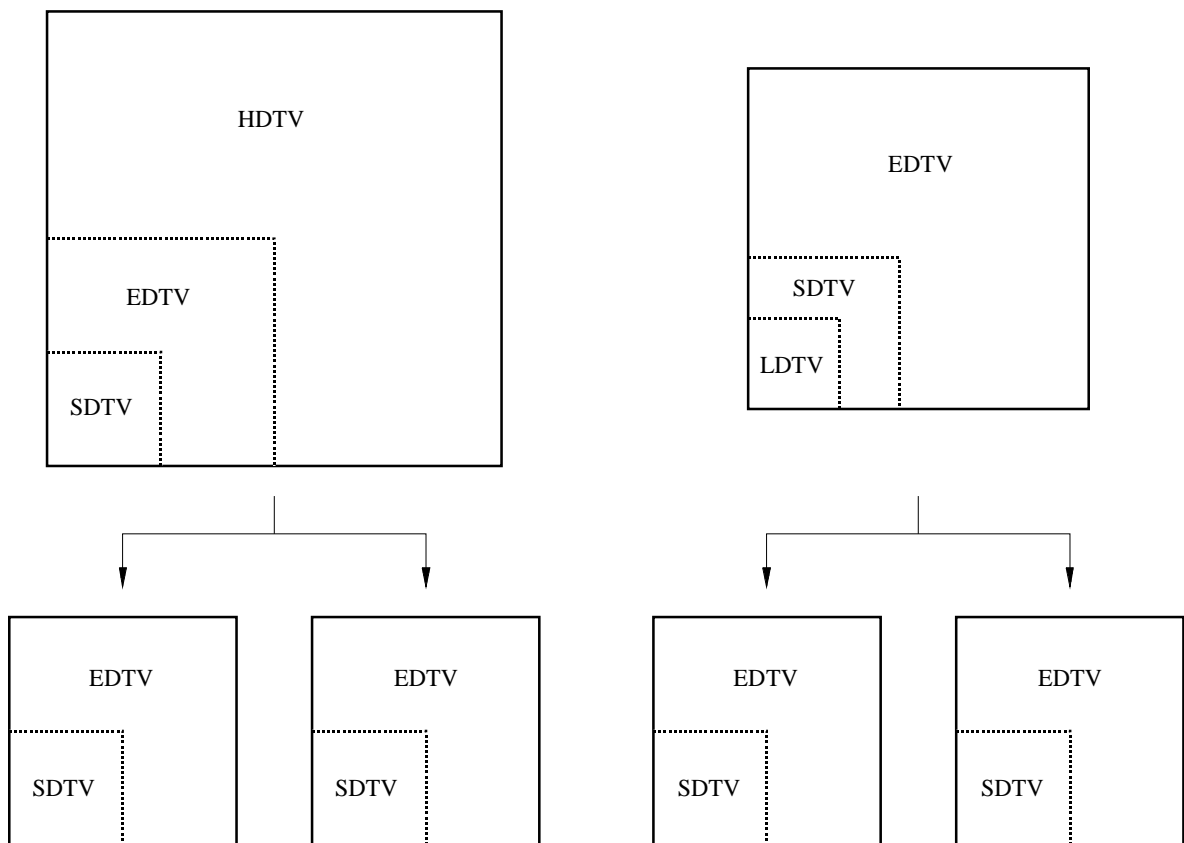
Three types of receiving conditions can be foreseen: reception using a fixed rooftop antenna, reception using a portable but non-moving receiver, and reception in a moving vehicle. Examples of hierarchical systems suitable in these conditions are:

- a three-level digital hierarchical terrestrial television system, allowing simultaneously, within one terrestrial channel, reception at HDTV quality via fixed roof-top antennas, reception at EDTV quality via fixed roof-top antennas and reception at SDTV quality via set-top (or built-in) antennas. In this last case, SDTV quality is designed for portable receivers;
- a two-level digital hierarchical system, allowing simultaneously reception at HDTV quality via fixed roof-top antennas and reception at SDTV quality via set-top (or built-in) antennas. In this last case, SDTV quality is designed for portable receivers.

2.4 **Reconfigurability**

A reconfigurable system allows alternative configurations to be carried in the same channel, at different times. For example, a channel carrying one HDTV signal could be reconfigured to carry two independent EDTV signals. This and various other examples of hierarchical and reconfigurable systems are illustrated in Fig. 1.

FIGURE 1  
Examples illustrating the concepts



*Example 1:* A hierarchical HDTV service reconfigured to provide two EDTV services with portable SDTV capability.

*Example 2:* A hierarchical EDTV service (with mobile LDTV) reconfigured to provide two EDTV services with portable SDTV capability.