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SERIES J: CABLE NETWORKS AND TRANSMISSION  
OF TELEVISION, SOUND PROGRAMME AND OTHER  
MULTIMEDIA SIGNALS

Transmission of 3-D TV services – Free viewpoint TV

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**Requirements for stereoscopic three  
dimensional television service over hybrid fibre  
and coaxial based networks**

Recommendation ITU-T J.900

ITU-T





## Recommendation ITU-T J.900

### Requirements for stereoscopic three dimensional television service over hybrid fibre and coaxial based networks

#### Summary

As digital broadcasting services have been rapidly deployed, many service operators are introducing more realistic broadcasting services such as three-dimensional television (3DTV). Recently, several research activities in Europe, Asia and North America for the 3DTV service have been completed. Moreover, some 3DTV service trials have been executed for various broadcasting media including terrestrial, cable and satellite TV. Recommendation ITU-T J.900 describes the services and system requirements for stereoscopic 3DTV service over hybrid fibre and coaxial (HFC) based networks. For providing cable 3DTV services, there are several technologies to be considered; 3D video format, video quality, service signalling, contents delivery, transmission efficiency and so on. Although a wide range of 3DTV technologies have been developed, 3D video services and content markets are still premature. Therefore, it is necessary to define the service and system requirements of 3DTV broadcasting for vitalization of 3D video services and related content markets.

#### History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T J.900	2014-10-29	9	<a href="http://handle.itu.int/11.1002/1000/11830-en">11.1002/1000/11830-en</a>

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

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In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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# Recommendation ITU-T J.900

## Requirements for stereoscopic three dimensional television service over hybrid fibre and coaxial based networks

### 1 Scope

This Recommendation defines service and system requirements for stereoscopic, three dimensional television (3DTV) transmission over HFC based network. The stereoscopic 3DTV is the service to provide realistic broadcasting services to cable service subscribers. The service requirements in this Recommendation include video quality, video fatigue, video signal expression, compatibility, 2D/3D switched service, conditional access and additional information. The system requirements in this Recommendation include video signal formats, multiplexing and service information.

### 2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T H.222.0] Recommendation ITU-T H.222.0 (2012) | ISO/IEC 13818-1:2013, *Information technology – Generic coding of moving pictures and associated audio information: Systems*.

[ITU-R BT.2021] Recommendation ITU-R BT.2021 (2012), *Subjective methods for the assessment of stereoscopic 3DTV systems*.

### 3 Definitions

#### 3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

**3.1.1 frame compatible** [b-ETSI TS 101 547-1]: Arrangement of the left and right images in a spatial multiplex which results in an image which can be treated like a normal HDTV image by the receiver demodulator and compression decoder.

**3.1.2 service compatible** [b-ETSI TS 101 547-1]: Arrangement of the left and right images such that an existing HDTV receiver is able to extract a 2D version of the video content from a stereoscopic 3DTV service.

**3.1.3 stereoscopic** [b-ETSI TS 101 547-1]: Three-dimensional picture that uses two single pictures, left and right, displayed on a single plane surface (the TV screen in the case of 3DTV).

#### 3.2 Terms defined in this Recommendation

None.

## 4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

2D	Two Dimension
3D	Three Dimension
3DTV	Three Dimensional Television
EPG	Electronic Programme Guide
ES	Elementary Stream
FC	Frame Compatible
HD	High Definition
HDTV	High Definition Television
HFC	Hybrid Fibre and Coaxial
MPEG-2	Motion Picture Experts Group version 2
PSI	Programme Specific Information
SC	Service Compatible
SI	Service Information
STB	Set-Top Box
TS	Transport Stream
VoD	Video-on-Demand

## 5 Conventions

In this Recommendation:

The keywords "**is required to**" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

The keywords "**is recommended**" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement need not be present to claim conformance.

The keywords "**is prohibited from**" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

The keywords "**can optionally**" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

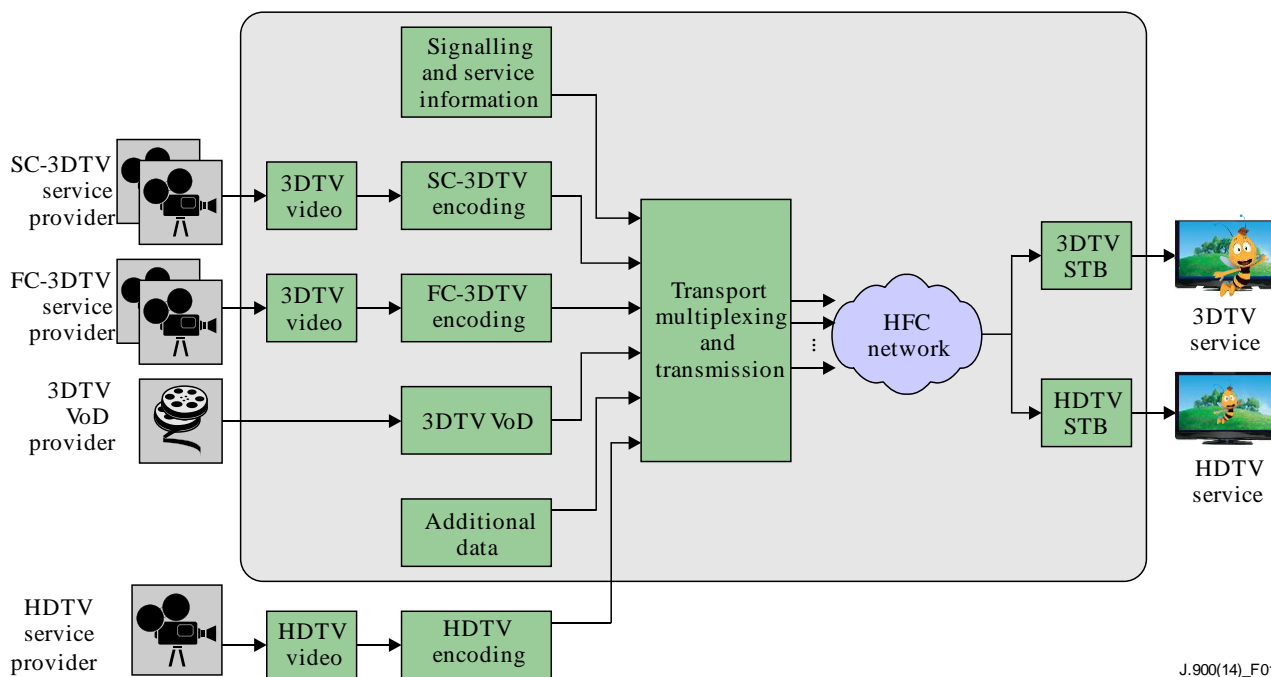
In the body of this Recommendation and its annexes, the words *shall*, *shall not*, *should* and *may* sometimes appear, in which case they are to be interpreted, respectively, as *is required to*, *is prohibited from*, *is recommended* and *can optionally*. The appearance of such phrases or keywords in an appendix or in material explicitly marked as *informative* are to be interpreted as having no normative intent.

## 6 Service and system overview

Stereoscopic 3DTV service over HFC-based network can be provided on digital cable 3D broadcasting system shown in Figure 1. Digital cable 3D broadcasting system can reuse the existing HDTV delivery infrastructure with some complications that need to be address around 3DTV service configuration. It provides real-time and non-real-time 3DTV services. It can provide frame



compatible stereoscopic 3DTV services and service compatible stereoscopic 3DTV services. It can also enable the mixed use of 2D/3D programmes time-wise.



**Figure 1 – Digital cable 3DTV broadcasting service and system**

3DTV stereoscopic services can be divided as shown below. The services are classified according to channel configuration, 2D compatibility and 3D programme configuration.

- 2DTV Compatible 3DTV Service: To provide 3DTV service that ensures compatibility with the legacy 2DTV service
- 2D/3DTV Simultaneous Service: To provide the legacy 2DTV service and 3DTV service in correspondence with 2DTV service.
- 3DTV Exclusive Service: To provide 3D service only without compatibility with the legacy 2DTV service

## 7 Service requirements

### 7.1 Video quality

The stereoscopic 3DTV service is required to provide the picture quality of at least the "4th scale level (Good)" according to subjective method for the assessment of picture quality of [ITU-R BT.2021].

The stereoscopic 3DTV service is required to provide the depth quality of at least the "4th scale level (Good)" according to subjective method for the assessment of depth quality of [ITU-R BT.2021].

### 7.2 Visual fatigue

The stereoscopic 3DTV service is required to provide the visual comfort of at least the "4th scale level (Comfortable)" according to subjective method for the assessment of visual comfort of [ITU-R BT.2021].

### 7.3 Video signal expression

The stereoscopic 3DTV service is required to include the video aspect ratio of 16:9.

The stereoscopic 3DTV service is required to include half HD resolution for left/right video respectively when a frame compatible 3DTV service is provided.

The stereoscopic 3DTV service is required to include HD resolution for left/right video respectively when a service compatible 3DTV service is provided.

#### **7.4 Compatibility with existing HDTV receivers**

The stereoscopic 3DTV service is recommended to provide backward compatibility with existing HDTV receivers so that the existing HDTV receivers can receive a 3DTV video programme and display it as a 2D video.

#### **7.5 2D/3D switched broadcasting service**

The stereoscopic 3DTV service is required to switch between 3DTV and 2DTV services in the same channel.

The stereoscopic 3DTV service is required to provide a method which can automatically distinguish and display either 2D or 3D broadcasting service in order to minimize viewers' inconvenience.

#### **7.6 Conditional access**

The stereoscopic 3DTV service is recommended to apply conditional access in order to provide a subscription-based 3D broadcasting service.

#### **7.7 Additional information service (subtitles, electronic programme guide, etc.)**

The stereoscopic 3DTV service is recommended to provide additional information services related to the 3DTV contents.

The stereoscopic 3DTV service is recommended to minimize viewers' visual fatigue when the additional information is displayed together with the 3DTV contents.

### **8 System requirements**

#### **8.1 Video signal format**

##### **8.1.1 Service compatible**

The stereoscopic 3DTV system is required to support service compatible formats that consist of left and right video signals each within a separate picture frame.

The stereoscopic 3DTV system is recommended to conform to the video signal format of Table 1 for each left and right video signal.

**Table 1 – Video signal format**

<b>Number of scanning lines</b>	<b>Number of pixels</b>	<b>Screen ratio</b>	<b>Sampling format</b>	<b>Screen playing ratio (Hz)</b>
1080	1920	16:9	4:2:0	59,94/60I, 59,94/60P, 50I, 50P, 29,97/30P, 25P, 23,98/24P
720	1280	16:9	4:2:0	59,94/60P, 50P, 29,97/30P, 25P, 23,98/24P

### **8.1.2 Frame compatible**

The stereoscopic 3DTV system is required to support frame compatible formats, such as side-by-side and top-and-bottom, which consist of left and right video signals within one picture frame.

The stereoscopic 3DTV system is recommended to satisfy a half number of scanning lines or pixels of the video signal format of Table 1 for each left and right video signal.

## **8.2 Multiplexing**

### **8.2.1 Basic unit of multiplexing**

The stereoscopic 3DTV system is required to use MPEG-2 TS packet as the basic unit for multiplexing 3D video, audio and data [ITU-T H.222.0].

### **8.2.2 Programme specific information**

The stereoscopic 3DTV system is required to provide programme specific information (PSI) signalling information in order to distinguish between 2D broadcasting service and 3D broadcasting service.

The stereoscopic 3DTV system is required to include PSI signalling information in order to distinguish between left and right video signals.

The stereoscopic 3DTV system is required to ensure that the added PSI signalling information for 3DTV service does not affect the operation of existing HDTV receiver.

## **8.3 Service information**

The stereoscopic 3DTV system is required to provide service information (SI) in order to distinguish between 2D broadcasting service and 3D broadcasting service.

The stereoscopic 3DTV system is required to provide guide information related to 3D broadcasting service.

The stereoscopic 3DTV system is required to provide channel information related to the transmission of 3D broadcasting service.

The stereoscopic 3DTV system is required to ensure that the added SI information for 3DTV service does not affect the operation of existing HDTV receiver.

## Bibliography

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