

Recommendation

ITU-T J.152 (07/2023)

SERIES J: Cable networks and transmission of television, sound programme and other multimedia signals

Digital television distribution through local subscriber networks

Requirements for cable television services to use IMT-2020 radio systems

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Recommendation ITU-T J.152

Requirements for cable television services to use IMT-2020 radio systems

Summary

Recommendation ITU-T J.152 specifies requirements for cable television (TV) systems that use an IMT-2020 radio system, also known as 5G, which is expected to replace the wiring inside apartment buildings in cities or to extend cable TV systems in rural areas. However, to use the available bandwidth, cable TV service signals have to meet certain requirements to be carried over IMT-2020.

History *

Edition	Recommendation	Approval	Study Group	Unique ID
1.0	ITU-T J.152	2023-07-14	9	11.1002/1000/15579

Keywords

5G, cable television network, cable television system, IMT-2020.

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Introduction

This Recommendation is a multi-part deliverable whose components are as follows.

Part 1: Requirements

Part 2: System architecture

This Recommendation is part 1 and covers requirements for cable television (TV) services to use the IMT-2020 radio system.

There have been issues in the environment surrounding cable TV in recent years. If an apartment complex is old, improvements in the viewing environment, such as making facilities and cables in the building more broadband capable, are necessary. In addition, community broadcasting facilities in suburbs require extensive equipment renewal due to aging and even more investment to extend them to remote areas is required.

To solve these issues, cable TV networks can provide services that communicate via both wireless and fixed line access. It is expected that the latest 5G will replace the wiring inside apartment buildings and enable extension of the cable TV system in or into remote areas. The same is also true for developing countries that are deploying cable TV infrastructure. However, 5G has limited available wireless bandwidth resources and there are certain requirements for using it as an alternative to cable TV.

This Recommendation specifies requirements for cable TV systems that use 5G.

Recommendation ITU-T J.152

Requirements for cable television services to use IMT-2020 radio systems

1 Scope

This Recommendation specifies requirements for cable television (TV) systems that use IMT-2020 radio systems, also known as 5G, as an alternative or extension of hybrid fibre-coaxial (HFC) or fibre to the home (FTTH).

Cable TV networks can provide services that use wireless communication as well as fixed-line communication. It is expected that the latest IMT-2020 will play this role such as replacement of the wiring inside the apartment building and extension of the cable TV system in or into remote areas. The same is also true for developing countries that are deploying cable TV infrastructure.

Cable TV systems use IMT-2020 with no change in specifications for fixed wireless access (FWA).

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.

- [3GPP TS 22.146] Technical Specification 3GPP TS 22.146 V17.0.0 (2022-03), *3rd Generation Partnership Project; Technical specification group services and system aspects; Multimedia broadcast/multicast service (MBMS); Stage 1.*
- [3GPP TS 22.246] Technical Specification 3GPP TS 22.246 V17.0.0 (2022-03), *3rd Generation Partnership Project; Technical specification group services and system aspects; Multimedia broadcast/multicast service (MBMS) user services; Stage 1.*

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

5G	fifth Generation
FTTH	Fibre To The Home
FWA	Fixed Wireless Access
HFC	Hybrid Fibre-Coaxial
IMT-2020	International Mobile Telecommunications 2020

IP	Internet Protocol
MBMS	Multimedia Broadcast and Multicast Service
MCS	Modulation and Coding Scheme
NG-RAN	Next Generation Radio Access Network
QAM	Quadrature Amplitude Modulation
RF	Radio Frequency
TV	Television
UE	User Equipment

5 Conventions

None.

6 Overview

6.1 Background

An IMT-2020 radio system, also known as 5G (fifth generation mobile communication system), is expected to be used in the cable TV system. A cable TV system uses 5G as FWA to solve recent issues in the environment surrounding cable TV. In the case of older apartment complexes, it is necessary to improve the viewing environment, such as making facilities and cables in the building more broadband capable. The repair cost is high. Instead of doing extensive construction throughout the apartment complex, each unit in the apartment complex can receive cable TV signals over 5G radio from the nearest 5G base station, as shown in Figure 1.

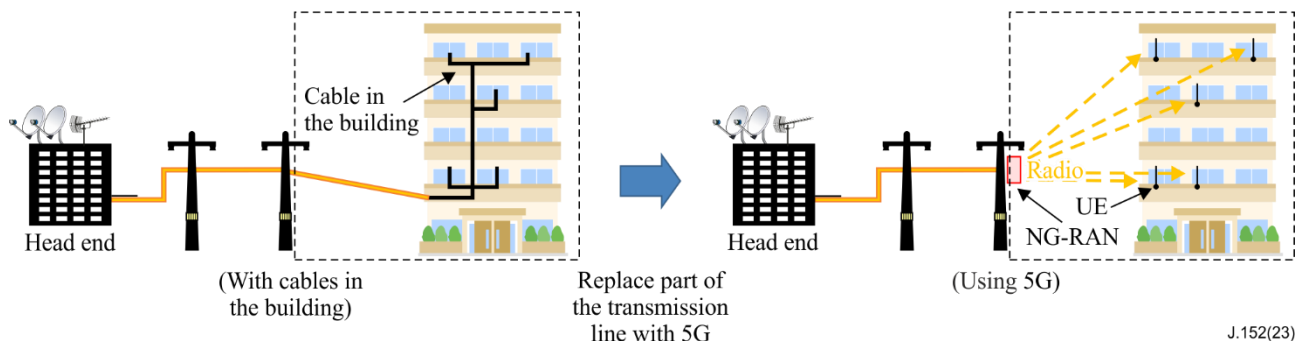


Figure 1 – Improvement of cable television viewing environment in apartment complex using 5G

In addition, the community broadcasting facilities in the suburbs require a large amount of equipment renewal costs due to aging and even more cost to extend them to remote areas. 5G, is expected to replace the wiring to extend cable TV systems in rural areas, as shown in Figure 2.

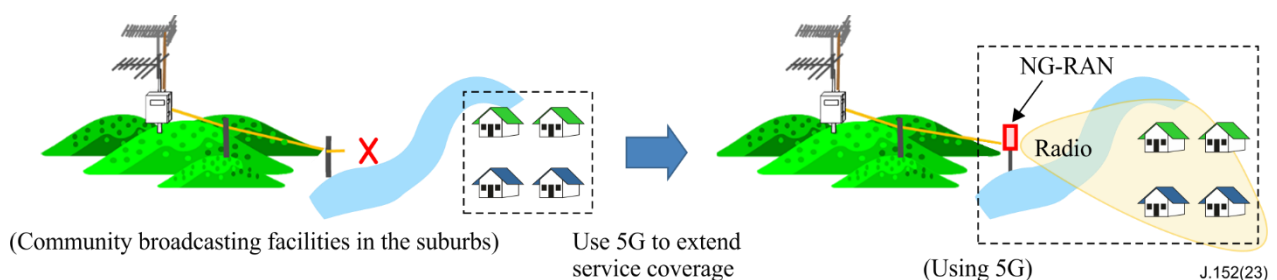


Figure 2 – Extension of the cable television service in or into remote areas using 5G

6.2 Cable television system with 5G

5G has been in service all over the world since 2019. In order to cope with the rapidly increasing communication traffic, 5G defines three requirements: enhanced mobile broadband, ultra-reliable and low latency communications and massive machine type communication. In addition, multimedia broadcast and multicast service (MBMS) for realizing multimedia broadcasting and broadcasting services on mobile phone networks has been standardized since the third and fourth generations, and in 5G, it is under consideration for multicast and broadcast services.

The MBMS specified in [3GPP TS 22.146] and [3GPP TS 22.246] provides the capability to transmit data from a single source entity to multiple endpoints for such broadcast or multicast services.

6.3 Considerations for cable television to use 5G radio

In order to use 5G as an alternative or extension of HFC or FTTH and provide services of the same quality as cable multi-channel video distribution services, the wireless bandwidth and wireless quality need to be carefully considered.

– Considerations for wireless bandwidth

Wireless bandwidth resources are limited compared to fixed communication. Efficient use of bandwidth must be fully considered for video distribution while maintaining the quality of cable TV services.

If the 5G radio signal is shared by cable TV services and other communication services, sufficient bandwidth resources for cable TV service signals should be secured.

– Considerations for wireless quality

The surrounding environment can affect the reception and transmission of 5G radio signals. Wireless quality changes due to obstacles and the effects of weather such as rain. If the radio quality and the reception level of the video signal deteriorate, packet loss can occur, which affects video quality.

7 Requirements

In order for cable TV services to use 5G radio system to realize Internet protocol (IP) broadcasting, the four issues in clauses 7.1 to 7.4 and requirements that are derived from the points to be considered are essential.

7.1 Efficiency

In wired IP broadcasting, all TV programmes are normally broadcast regardless of whether there are viewers. However, in IP broadcasting that uses 5G, the 5G radio band resources are limited, so if the wired method previously described is used, there is the problem of inefficient use of valuable radio bandwidth resources.

Requirement-Efficiency: The system is required to improve efficiency of radio bandwidth utilization in order to provide multi-channel broadcasting in a limited radio bandwidth.

7.2 Robustness

In wired IP broadcasting, the communication quality of the wired segment is relatively stable, so viewers can view TV programmes stably. The surrounding environment can affect the reception and transmission of 5G radio signals. Wireless quality changes due to obstacles and the effects of weather such as rain. If the radio quality and the reception level of the video signal deteriorate, packet loss can occur, which affects the video quality. If packet loss occurs in one-way communication such as broadcast, the packets are not resent, and it leads to degradation of video quality.

Requirement-Robustness: In IP broadcasting using 5G radio system, where it is difficult to use transmission with high power and large antennas for transmission and reception such as terrestrial broadcast system, the system is required to strengthen the error tolerance on the transmission path for one-way communication towards viewers. In particular, it must have high robustness against fluctuations in radio quality so as not to cause deterioration in video quality.

7.3 Reliability

In the 5G radio system, the modulation and coding scheme (MCS) changes in a fluctuating reception environment. When the MCS fluctuates, the video service must be maintained and continued while providing the best video quality that meets it. It is necessary to ensure the high video quality equivalent to 4K, which is the essential service of cable TV, as much as possible even in a wireless environment.

For example, if the MCS changes from 256 quadrature amplitude modulation (QAM) to 16 QAM due to a fluctuating reception environment, much more radio bandwidth is required to keep viewing 4K content and an interruption in viewing service can result due to lack of available bandwidth.

Requirement-Reliability: The system is required to ensure the maintenance of communication according to the fluctuating reception environment of the 5G radio system.

7.4 Latency

Since video distribution uses a 5G radio system and IP packets, there is the issue of minimizing latency compared to digital broadcasting using radio frequency (RF).

Requirement-Latency: The system is required to minimize the increase of latency, as low as digital broadcasting using RF.

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