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| **MINISTRY OF INFORMATION AND COMMUNICATIONS****\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**No. 14/2021/TT-BTTTT | **SOCIALIST REPUBLIC OF VIETNAM****Independence – Freedom – Happiness***Hanoi, October 29, 2021* |

**CIRCULAR**

**Promulgating “National Technical Regulation on Electromagnetic Compatibility (EMC) of Cable Network for Distribution of Television, Sound and Interactive Services”**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*Pursuant to the Law on Standards and Technical Regulations dated June 29, 2006;*

*Pursuant to the Law on Telecommunications dated November 23, 2009;*

*Pursuant to the Law on Radio Frequencies dated November 23, 2009;*

*Pursuant to Decree No. 127/2007/ND-CP dated August 1, 2007 of the Government detailing and guiding the implementation of a number of articles of the Law on Standards and Technical Regulations;*

*Pursuant to Decree No. 78/2018/ND-CP dated May 16, 2018 of the Government amending and supplementing a number of articles of the Decree No. 127/2007/ND-CP dated August 1, 2007 of the Government detailing the implementation of a number of articles of the Law on Standards and Technical Regulations;*

*Pursuant to Decree No. 17/2017/ND-CP dated February 17, 2017 of the Government defining the functions, tasks, powers and organizational structure of the Ministry of Information and Communications;*

*At the proposal of the Director General of the Department of Science and Technology,*

*The Minister of Information and Communications hereby promulgates the Circular promulgating the National Technical Regulation on Electromagnetic Compatibility (EMC) of Cable Network for Distribution of Television, Sound and Interactive Services.*

**Article 1.** This Circular is promulgated together with the National Technical Regulation on Electromagnetic Compatibility (EMC) of Cable Network for Distribution of Television, Sound and Interactive Services (QCVN 71: 2021/BTTTT).

**Article 2. Effect**

1. This Circular is effective from July 01, 2022.

2. The National Technical Regulation on Electromagnetic Compatibility (EMC) of Cable Network for Distribution of Television, Sound and Interactive Services (QCVN 71: 2021/BTTTT) .specified in Clause 3, Article 1 of Circular No. 16/2013/TT-BTTTT dated July 10, 2013 by the Minister of Information and Communications promulgating the National Technical Regulation on telecommunications expires from July 1, 2023.

**Article 3.** The Chief of Office, Director General of the Department of Science and Technology, Heads of agencies and units under the Ministry of Information and Communications, Directors of Departments of Information and Communications of provinces and centrally run cities and relevant organizations and individuals shall implement this Circular./.

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| ***Recipients:***- Prime Minister, Deputy Prime Ministers (for reporting);- Ministries, ministerial-level agencies, agencies under the Government;- People's Councils and People's Committees of provinces and centrally run cities;- Office of the Party Central Committee and Party Committees;- Office of the National Assembly;- Office of the President;- Supreme People's Court of Vietnam;- Supreme People's Procuracy of Vietnam;- Departments of Information and Communications of provinces and centrally run cities;- Department of Examination of Legal Documents (Ministry of Justice);- Official Gazette, Vietnam Government Portal;- Ministry of Information and Communications: Ministers and Deputy Ministers, agencies and units under the Ministry, the Ministry's portal;- Storage: Archives, Science and Technology (250). | **MINISTER**(Signed & sealed)**Nguyen Manh Hung** |

**SOCIALIST REPUBLIC OF VIETNAM**

**QCVN 71:2021/BTTTT**

**NATIONAL TECHNICAL REGULATION**

**ON ELECTROMAGNETIC COMPATIBILITY (EMC) OF CABLE NETWORK FOR DISTRIBUTION OF TELEVISION, SOUND AND INTERACTIVE SERVICES**

HA NOI – 2021

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**Foreword**

QCVN 71:2021/BTTTT replaces QCVN 71:2013/BTTTT.

QCVN 71:2021/BTTTT was compiled by the Authority of Radio Frequency Management, submitted to the Department of Science and Technology, reviewed by the Ministry of Science and Technology, and promulgated by the Ministry of Information and Communications together with Circular No. 2021/ TT-B TTTT dated 2021.

**NATIONAL TECHNICAL REGULATION**

**ON ELECTROMAGNETIC COMPATIBILITY (EMC) OF CABLE NETWORK FOR**

**DISTRIBUTION OF TELEVISION, SOUND AND INTERACTIVE SERVICES**

# 1. GENERAL PROVISIONS

## 1.1. Scope of regulation

This National Technical Regulation specifies requirements for electromagnetic interference radiation of cable networks used to transmit video, audio and interactive services in the band from 0.15 MHz to 3.5 GHz in Vietnam.

Cable networks starting from the headend to the system outlet (illustrated in Appendix D) must comply with this Regulation unless otherwise specified.

The application of this Regulation is to ensure that cable networks may operate simultaneously with radio services such as: safety, broadcasting, aeronautical mobile, aeronautical radio navigation and land mobile (including cellular networks) and other services specified in the National Radio Frequency Spectrum Plan without interference. The frequency range of some services is as shown in Annex c.

## 1.2. Subjects of application

This Technical Regulation applies to organizations and enterprises providing cable television services in the territory of Vietnam.

## 1.3. Normative references

IEC 60728-12:2017 Cable networks for television signals, sound signal and interactive services - Part 12: Electromagnetic compatibility of systems.

## 1.4. Interpretation of terms

**1.4.1. Electromagnetic radiation**

- Energy that comes from a source and travels through space.

- Energy travels through space in the form of electromagnetic waves.

NOTE By extension, the term "electromagnetic radiation" sometimes also includes the induction.

**1.4.2. Interactive services**

Services with two-way communication between the transceiver and the subscriber (e.g. internet service).

**1.4.3. Immunity to a disturbance**

Ability of an element, device or system to operate without degradation in the presence of electromagnetic disturbances (hereinafter referred to as immunity).

**1.4.4. Disturbance**

Any electromagnetic phenomenon that can degrade the operation of an element, device or system.

**1.4.5. Electromagnetic interference (EMI)**

Degradation of the performance of a device, transmission channel or system due to electromagnetic interference.

**1.4.6. Operating frequency range**

passband for the wanted signals for which the equipment has been designed

**1.4.7. Carrier-to-interference ratio**

The ratio between the carrier and the total noise power includes the disturbances internal to the system and interference from other systems.

**1.4.8. Headend**

Equipment that is connected between receiving antennas or other signal sources and the remainder of the cable network, to process the signals to be distributed

Note: The headend can comprise antenna amplifiers, frequency converters, combiners, separators and generators.

**1.4.9. System outlet**

Equipment for connecting the subscriber's cable to the cable network.

**1.4.10. Disturbance level**

Level of an electromagnetic disturbance at a given location, which results from all contributing interference sources

**1.4.11. Degradation of performance**

undesired departure in the operational performance of any device, equipment or system from its intended performance

NOTE: The term “deterioration” can be applied to temporary or permanent damage.

**1.4.12. Subscriber's feeder**

feeder connecting a subscriber's tap to a system outlet or, where the latter is not used, directly to the subscriber's equipment

NOTE: Subscriber cables may include filters and balun transformers.

**1.4.13. Receiver lead**

Lead that connects the system outlet to the subscriber's equipment.

**1.4.14. Digital, broadband signal**

In this Regulation, digital and broadband signals are digital television or internet signals.

**1.4.15. Narrowband signal**

The remaining radiation components such as analog television.

## 1.5 Abbreviated terms

AM Amplitude Modulation

BPF Band Pass Filter

CATV Community Antenna Television

DSC Distress, Safety and Calling

EMC Electromagnetic Compatibility

EMI Electromagnetic Interference

EPIRB Emergency Position Indicating Radio beacons

FM Frequency Modulation

HFC Hybrid fiber-coax network

ILS Instrument Landing System

ITU-R International Telecommunication

 Union - Radio communication

LNA Low Noise Amplifier

MATV Master Antenna Television Network

RF Radio Frequency

RMS Root Mean Square

SMATV Satellite Master Antenna Television Network

TV Television

VSB Vestigial Side Band

# 2. SPECIFICATIONS

## 2.1. Technical requirements

### 2.1.1. Digital, broadband signal radiation

The maximum allowable digital signal, broadband radiation limits specified in Table 1 apply to the measurement method in section 2.2 as follows:

**Table 1 - Digital, broadband signal radiation limits**

|  |  |  |
| --- | --- | --- |
| **Frequency band**MHz | **Limited radiated field strength @3m, measuring channel width 8 MHz**dB$μ$V/m | **Demodulation** **mode** |
| 30 to 950 | 37 | RMS |
| 950 to 2,500 | 43 | RMS |
| 2,500 to 3,500 | 45 | RMS |

### 2.1.2. Narrowband radiation

If the radiation from the cable network includes the narrowband radiation, the maximum allowable narrowband signal radiation is specified in Table 2, using the following method of measurement in section 2.2:

**Table 2 - Narrowband signal radiation limits**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency band**MHz | **Radiation field strength limit** **@3m**dB$μ$V/m | **Measurement bandwidth** | **Demodulation** **mode** |
| 30 to 950 | 27 | 100 kHz | RMS |
| 950 to 2,500 | 43 | 1 MHz | RMS |
| 2,500 to 3,500 | 45 | 1 MHz | RMS |

## 2.2. Measurement methods

These test methods describe the measurement procedure for checking the radiation come from the cable network.

The measurements include the essential measurement parameters and measurement conditions for the evaluation of electromagnetic incompatibility between the cable network and the radio communication network or other electrical and electronic equipment. During the test, the cable network shall operate under the normal operating conditions intended for the network.

### 2.2.1. General provisions

When testing cable network, terminals can be connected. Testing the cable network against relevant limits may require the terminals to be disconnected. When the limit is exceeded, individual parts of the network (e.g. terminals, outdoor satellite internet receiver, distribution installations...) can be next tested to determine which part of the network does not work within limits.

The test frequency must be selected to ensure not being affected by radio emissions with large intensity in the survey area such as digital television, mobile information ... to avoid abnormalities on measurement results.

The number of test frequency must be selected so that it can fully evaluate the radiation components on the entire actual frequency range of the cable network.

The number of measurement points in a geographical area of ​​the cable network should be selected so that it includes high-risk points (points with positive equipment of the cable network such as optical-electric converters, amplifiers ...etc.) to fully assess the possible cases of electromagnetic incompatibility of cable network.

The allowable maximum radiation level is specified in section 2.1.

### 2.2.2. Field strength measurement method



Measuring distance *d*

Cable network

Tripod mount

Measuring Point

Measuring antenna

Subscriber’s feeder

Meter

**Figure 1 - Illustrating field strength measurement diagram**

**2.2.2.1. Requirements for measuring equipment**

- To measure radiation from a cable network, the measurement system consists of a receiver with an antenna to measure the field strength;

- Use appropriate receiver which is calibrated capable of measuring channel power and appropriate demodulation modes;

- The antenna is calibrated (the antenna is identified parameters such as gain, antenna coefficient and impedance);

- The antenna cable has a defined loss/frequency;

- In case of necessity, calibrated low noise amplifier (LNA) and Band-pass filter (BPF) may be used which covers the frequency range as required;

- This regulation determines the radiation levels to the field strength at a distance of 3 m from the object of radiation. In special cases (the field cannot be measured at a standard distance of 3m) can be measured at another measurement distance as prescribed in Appendix A.

**2.2.2.2. Field strength measurement procedure**

It is required to ensure that the cable network is operating with a normal signal level.

The case can be determined that the radiation levels of the channels in the frequency band to be investigated are equivalent. The radiation of some channels can be measured in the survey band to evaluate representatives.

Set the meter to RMS detector mode, AVERAGE display mode; For the digital, broadband radiation sets the channel power measurement mode to calculate the total radiated power in 8 MHz. If the cable network includes digital, broadband signal with different channels of 8 MHz, measuring the radiated power in 8 MHz with the frequency of measurement is the central frequency of the survey channel and evaluation according to the limits in the table 1.

For narrowband signal radiation, set the resolution bandwidth (RBW) and evaluate to the limits given in the Table 2.

The measuring distance d is determined as follows: By the distance from the point to be investigated of the cable network to the reference point of the measuring antenna.

For a particular measuring point, the direction, height and polarization of the measuring antenna must be changed to obtain the maximum field strength value.

NOTE 1: The variation of antenna parameters, especially antenna height, depends on the frequency of measurement. When the size of the calibrated measuring antenna does not correspond to reality, it is useful to use a calibrated loop antenna.

If the meter provides the Result in the form of the meter input voltage level, the field strength level can be calculated converted using the formula

|  |  |
| --- | --- |
| *Edist = Ul + ac + ka* | (1) |

Where:

*Edist* is the field strength of the radiation, in dBμV/m;

*Ul* is the input voltage level of the measuring receiver dBμV (impedance 50Ω);

*ac* is the cable loss in dB;

*ka* is the antenna factor determined by the manufacturer's technical documentation, or antenna calibration process, in dB/m. For an antenna with an impedance of 50Ω, the antenna factor *ka* can be determined by the antenna gain by the formula:

*ka* = -29.77 - *g* + 20log(ƒ) (2)

Where:

*g* is the gain of the measuring antenna, in dBi;

*ƒ* is the measurement frequency, in MHz;

### 2.2.3. Subcarrier measurement method

The subcarrier measurement method is used when not directly measuring digital, broadband signal radiation (for example, when the field strength of radiation is smaller than the receiver sensitivity). This is due to a decrease in sensitivity at the input of the measuring receiver due to the reduction of the signal-to-noise ratio for the case of extending the bandwidth under measurement for the wideband signal.

**2.2.3.1. Radiation level and correction**

To assess the leakage radiation level of digital, broadband signal using the subcarrier method, an unmodulated sine wave carrier signal can be used interspersed between the broadband, digital signals. This subcarrier is set up so that the signal level measured with a measurement bandwidth of 200 Hz matches the measured value of the previously measured digital, broadband signal.

If necessary, the subcarrier can be cabled with a gain above the desired level of the broadband, digital signal. It is important to take into account the limitations of the system appropriately. The determination of the leakage field strength of digital, broadband signal is determined according to 2.2.3.2.

In all cases, the use of subcarriers will need to be coordinated with the network provider.

**2.2.3.2. Determination of radiation field strength**

Once the level of the subcarrier and the digital, broadband signal has been established in accordance with 2.2.3.1, the results of the subcarrier measurement at the relevant measuring points provide the dominant electric field strength directly or indirectly to voltage at the input of the measuring receiver.

If the subcarrier is fed into the cable network with a higher level than the desired broadband, digital signal, the value of the digital signal, the leaked broadband will be equal to the measured field strength value of the subcarrier minus difference between the subcarrier level and the abovementioned broadband, digital signal.

|  |  |
| --- | --- |
| *Eleak = Esub\_meas - ( Psub - Psigut)* | (3) |

Where:

*Eleak* isfield strength of the leakage signal to be measured (dBμV/m);

*Esub\_meas*  isleakage field strength of subcarrier (dBμV/m);

*Psub* issubcarrier power introduced into the cable network (dBm);

*Psigut* ispower of the broadband, digital signal to be measured (dBm).

# 3. MANAGEMENT

Electromagnetic interference radiations of cable networks transmitting video, audio and interactive services within the scope in section 1.1 must comply with the requirements specified in this Regulation.

# 4. RESPONSIBILITIES OF ORGANIZATIONS AND INDIVIDUALS

4.1. Cable television service providers shall ensure that the cable network that distributes television signals conforms to the Regulation during the design, installation, operation and maintenance process; and coordinate with related parties in the process of resolving interference from the cable network that affects the operation of other networks and services,

4.2. Cable television service providers shall ensure the immunity of their own cable networks (see Appendix B).

4.3. Cable television service providers shall state the conformity according to regulations and guidance of the Ministry of Information and Communications and be subject to regular and irregular inspections by State management agencies in accordance with the applicable regulations.

4.4. The Department of Telecommunications shall receive registrations for conformity statement, manage, guide and inspect the conformity statement. The order and procedures for conformity statement are prescribed in the Circular No. 28/2012/TT-BKHCN dated December 12, 2012 of the Minister of Science and Technology, providing for standard conformity, conformity statement and method of assessing conformity with standards and technical regulations.

# 5. ORGANIZATION OF IMPLEMENTATION

5.1. The Department of Telecommunications, the Department of Radio Frequency and Departments of Information and Communications are responsible for guiding and organizing the management of organizations and enterprises/ service providers to comply with this Regulation.

5.2. This Regulation is applied to replace the National Technical Regulation QCVN 71:2013/BTTTT "National technical regulation on electromagnetic compatibility (EMC) of cable network for distribution of television, sound and interactive services".

5.3. If the provisions of this Regulation are revised, supplemented or replaced, the new Regulation shall apply.

5.4. During the implementation of the Regulation, if any problems arise, organizations and individuals report in writing to the Ministry of Information and Communications (Department of Science and Technology) for guidance, resolution./.

# Appendix A(Normative) Measured at distances other than the 3 m standard distance

**A.1. Measuring at the distance of less than 3 m**

If measured at a distance of less than 3 m, the distance to the cable network is determined by the geometry of loop antenna.

If measuring at the 3 m standard distance cannot be achieved (for example in the confined space of an alley), a shorter distance measurement method may be used. However, the minimum measuring distance must be 1 m. In this case, the measuring result is calculated and adjusted according to the formula A-1.

 (A-1)

Where:

*Emeas* is the measuring result, in dBμV/m;

*Edist* is the adjusted measuring result, in dBμV/m,

*dmeas*is the measuring distance, in m;

*dstand*is the standard measuring distance (3 m).

**A.2. Measuring at the distance over 3 m**

If measuring at the 3 m standard distance cannot be achieved, a measurement at a distance above 3 m may be used. Two measuring points must be determined on an axis perpendicular to the direction of the cable network to be measured. The distance between the two measuring points should be as large as possible. The field strength is measured as described in 2.2.2. Measuring results must be in dBμV/m and shown as a logarithmic plot of the distance. The straight line connecting the measuring results represents the decrease in strength in the direction of measurement. If the field strength reduction may not be determined, additional measurements should be made. The standard field strength level shall be read from the graph by the connecting line.

# Appendix B (Informative) Noise Immunity of Cable Networks

**B.1. Technical requirements**

The immunity limit (Table B.1) defines the reference field strength level outside the cable network. For such value, a carrier-to-noise ratio as specified in Table B.2 (quality requirements) must be obtained for the wanted signal channel at any point of the cable network.

**Table B.1 - Maximum field strength**

|  |  |
| --- | --- |
| **Band (MHz)** | **Field strength (dBμV/m)** |
| 0.15 to 3,500 | 106 |
| 694 to 862 | 120a |
| a in the case of wanted signals using digital modulation. |

The quality requirements for cable networks correspond to AM-VSB-TV or QAM-DVB signals in the 30 MHz to 1 000 MHz bands and FM-TV signals in the 950 MHz to 3 500 MHz bands. When the cable network distributes other signals (such as digital modulated signals), the lower carrier-to-noise ratio of these signals allows, resulting in higher immunity of the cable network.

The measurement method is specified in B.2

**Table B.2 - Required Carrier-to-Noise Ratio**

|  |  |
| --- | --- |
| **Applicable band (MHz)** | **Carrier-to-noise ratio (dB)** |
| 30 to 1,000 | ≥ 57 (AM) |
| ≥ 35 (64/256 QAM) |
| 950 to 3,500 | ≥ 33 (FM) |
| ≥ 13 (QPSK) |

**B.2. Measurement methods**

In the case of interference, the carrier-to-noise ratio will be measured at the noisy outputs.

It is necessary to first measure the wanted signal in the disturbed channels at each output. Then the network cable will be disconnected from the transferring point or antenna of the system. Open ports need to be terminated with a 75 Ohm load. The signal level at each output is measured with a receiver in peak detection mode, taking into account the bandwidth of the wanted signal with ensuring that the meter has good impedance matching with the network and return loss can be taken into account.

The difference between the wanted signal level and the interference signal level is the carrier-to-noise ratio that shall be met as specified in Table B.2.

If the carrier-to-noise ratio is equal to or greater than the nominal value, the network meets the requirements. If the carrier-to-noise ratio is less than the required ratio, additional measurements should be made. All distributions installed outside of the output port system (receiver wiring, receiver and other subscriber settings will be disconnected from the network for testing. In most cases, the interference comes from these factors. It is necessary to re-measure the interference level. After the measurement, the normal operating condition of the network will be restored.

If these testing methods do not result in a better carrier-to-noise ratio, then interference signals are be considered as interference signals entering the cable network. In this case, the field strength of the signals outside the building side is measured at a point in the vicinity of the point where the interference is assumed.

The maximum field strength is determined by varying the antenna position. The field strength limits are as shown in Table B1, where the carrier-to-noise readings must meet in accordance with Table B.2

If the interference field strength is equal to or lower than these values, the network does not meet the requirements and the operator must take measures to improve the immunity of the network.

If the measured interference field strength exceeds these values, the requirements of the cable network do not correspond to the requirements of the other radio service (high power transmitter). The solution to this problem must be addressed by the management agency and radio operators.

# Appendix C (Informative) Radio frequency bands and services

|  |  |
| --- | --- |
| **Bands (MHz)** | **Protected radio systems** |
| 74.8 to 75.2 | Aeronautical radionavigation;ILS instrument landing system |
| 108 to 117,975 | Aircraft navigation radio |
| 121.450 to 121.550 | Emergency Position Indicating Radio Beacon (EPIRPs) |
| 156.525 | DSC Rescue |
| 156.7625 to 156.8375 | International Maritime Rescue |
| 328.6 to 335.4 | Air navigation radio |
| 406.0 to 406.1 | Emergency Position Indicating Radio Beacon EPIRP |
| 703 to 733 and 758 to 788 | Cellular communication |
| 824 to 835 | Cellular communication |
| 869 to 915 | Cellular communication |
| 925 to 960 | Cellular communication |
| 1710 to 1785 and 1805 to 1880 | Cellular communication |
| 1920 to 1970 and 2110 to 2170 | Cellular communication |
| 2300 to 2400 | Cellular communication |
| 2500 to 2690 | Cellular communication |

# Appendix D (Informative) HFC cable network diagram

Headend

Fiber node

Internet

Other satellites

 

Tap

Subscriber’s equipment

Coaxial Cable

Subscriber’s feeder

System outlet

Fiber cable

Amplifier

Amplifier

# References

[1] IEC 60728-12:2017 Edition 2.0 (06/2017) Cable networks for television signals, sound signals and interactive services - Part 12. Electromagnetic compatibility of systems;

[2] ITU-T K.106 (03/2015) Techniques to mitigate interference between radio devices and cable or equipment connected to wired broadband networks and cable television networks;

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[4] ICAO Doc 9718 AN/957 (2018) Handbook on Radio Frequency Spectrum Requirements for Civil Aviation - Volume I ICAO spectrum strategy, policy statements and related information;

[5] Title 47 Telecommunication (FCC Rules), Part 76: Multichannel Video and Cable Television Service.

[6] Recommendation ITU-R F.1336-5 (01/2019) Reference radiation patterns of omnidirectional, sectoral and other antennas for the fixed and mobile services for use in sharing studies in the frequency range from 400 MHz to about 70 GHz.

[7] QCVN 72:2013/BTTTT, National technical regulation on electromagnetic compatibility (EMC) of cable network for distribution of television, sound and interactive services.

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on the quality of signal of DVB-T2 Terrestrial Digital Television

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[9] Recommendation ITU-R BT 2033-1 (2015) Planning criteria including protection ratios, for second generation of digital terrestrial television broadcasting systems In the VHF/UHF bands.

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[11] Recommendation ITU-R BT.419-3 Directivity and polarization discrimination of antennas in the reception of television broadcasting

[12] ITU-R The Handbook on Spectrum Monitoring (2011).

[13] Decision No.71/2013/QD-TTg dated November 21, 2013 of the Prime Minister promulgating the National Radio Frequency Spectrum Planning.

[14] Decision No. 02/2017/QD-TTg dated January 17, 2017 of the Prime Minister amending and supplementing the National Radio Frequency Spectrum Planning issued together with the Decision No. 71/2013/QD-TTg dated November 21, 2013 of the Prime Minister.

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