# Technical Specifications for Narrowband Terminal Equipment of Mobile Broadband Business

**National Communications Commission (NCC)** 

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# Technical Specifications for Narrowband Terminal Equipment of Mobile Broadband Business

1. Legal source

The specifications are promulgated pursuant to Item 1, Article 42 of the Telecommunications Act.

2. Scope of application

The specifications have adopted the narrow-band terminal equipment type approval of LTE Machine Type Communications (LTE-M1) and Narrow-Band IoT (NB-IoT). According to its properties, equipment is categorized as either Frequency Division

Duplex (FDD) or Time Division Duplex (TDD).

- 2.1 The frequency bands that are applicable to LTE-M1 terminal equipment are as follows:
  - 2.1.1 Frequency Division Duplex (FDD):

700 MHz (uplink 703 MHz to 748 MHz; downlink 758 MHz to 803 MHz), 900 MHz (uplink 885 MHz to 915 MHz; downlink 930 MHz to 960 MHz), 1800 MHz (uplink 1710 MHz to 1785 MHz; downlink 1805 MHz to 1880 MHz), 2100 MHz (uplink1920 MHz to 1980 MHz; downlink 2110 MHz to 2170 MHz), 2500 MHz and 2600 MHz (uplink 2500 MHz to 2570 MHz; downlink 2620 MHz to 2690 MHz) frequency bands.

2.1.2 Time Division Duplex (TDD):

2500~MHz and 2600~MHz bands (2500 MHz-2570 MHz, 2570 MHz-2620 MHz and 2620 MHz-2690 MHz).

2.2 NB-IoT terminal equipment can only apply to Frequency Division Duplex (FDD) mode. The frequency bands that are applicable to NB-IoT terminal equipment are as follows:

700MHz (uplink 703 MHz to 748 MHz; downlink 758 MHz to 803 MHz),

900 MHz (uplink 885 MHz to 915 MHz; downlink 930 MHz to 960 MHz),

1800 MHz (uplink 1710 MHz to 1785 MHz; downlink 1805 MHz to 1880 MHz) and 2100 MHz(uplink1920 MHz to 1980 MHz; downlink 2110 MHz to 2170 MHz) frequency bands.

3. Technical standards

The specifications are stipulated in accordance with CNS14958-1, CNS14959, CNS13438, CNS14336-1, CNS 15598-1 and Technical Specifications for Mobile Broadband Business Terminal Equipment and other international technical specifications.

- 4. Definition of the terms
  - 4.1 Narrowband terminal equipment for mobile broadband business: Narrowband terminal equipment is divided into portable and mobile devices according to the distance to emission source; can be divided into LTE-M1 and NB-IoT terminal equipment according to the used frequency band.
  - 4.2 Portable terminal equipment: The emission source of the device is up to 20cm away from the human body in the normal operation mode.
  - 4.3 Mobile terminal equipment: The emission source of the device is more than 20cm away from the human body in the normal operation mode.
  - 4.4 LTE-M1 terminal equipment:

Refers to terminal equipment that receives network services through the mobile broadband network; the channel bandwidth shall be no more than 1.08 MHz (including).

- 4.5 NB-IoT terminal equipment: Refers to terminal equipment that receives network services through the mobile broadband network; the channel bandwidth shall be 180 kHz.
- 5. General testing items and eligibility criteria
  - 5.1 Tests of this section are applicable to LTE-M1 and NB-IoT terminal equipment.
  - 5.2 Frequency stability:
    - 5.2.1 Under normal supply voltage, the temperature shall vary between  $-20^{\circ}$ C and  $50^{\circ}$ C. At 10  $^{\circ}$ C as a unit, at different temperatures, results of the measurements shall be taken in increments of 0/2/5/10 minutes; the frequency should be maintained within 0.1PPM of the main wave frequency of the channel.
    - 5.2.2 The temperature at 20°C and the supply voltage within  $\pm 15\%$  of the rating voltage value; results of the measurements shall be taken in increments of 0/2/5/10 minutes; the frequency should be maintained within 0.1PPM of the main wave frequency of the channel. If the allowable value of the operating voltage cannot reach  $\pm$  15% of the rated voltage value, please take the self-declared voltage value of manufacturers.
  - 5.3 Specific Absorption Rate (SAR):
    - 5.3.1 This test is applicable to portable terminal equipment.
    - 5.3.2 SAR standard value:
      - 5.3.2.1 Shall comply with CNS14959. The partial exposure SAR limit for devices that get close to the head and trunk during usage is 2 W/kg; the

partial exposure SAR limit for devices that get close to the limb during usage is 4 W/kg.

- 5.3.2.2 CNS 14958-1 or IEC 62209-2 shall be adopted as the SAR measurement procedures.
- 5.4 Power density:
  - 5.4.1 This test is applicable to portable terminal equipment.
  - 5.4.2 The maximum value of power density:
    - 0.35mW/cm<sup>2</sup> for frequency 700MHz;
    - 0.45mW/cm<sup>2</sup> for frequency 900MHz;
    - 0.9mW/cm<sup>2</sup> for frequency 1800MHz;
    - 1.0 mW/cm<sup>2</sup> for frequency 2100MHz, 2500MHz and 2600MHz.

The measurement distance shall be 20 cm or less from the human body to the antenna declared by the device supplier.

5.5 The electromagnetic compatibility (EMC) test:

Shall comply with the standard specifications of CNS13438; devices to be tested shall be tested under the operating and idle modes (radiation disturbance) and the charging mode (conducted disturbance at the mains ports). Otherwise, tests shall not be conducted.

### 5.6 Electrical safety:

Shall comply with the standard regulations of CNS14336-1 or CNS15598-1.

- 5.7 IMEI number and unique guarantee:
  - 5.7.1 This test is applicable to devices that required SIM in the normal operation mode.
  - 5.7.2 The testing instrument reads and records IMEI. The applicant shall provide the unique guarantee of IMEI.
- 5.8 Terminal equipment featuring the charging function shall comply with charging and connection interface relevant provisions of Technical Specifications for Mobile Broadband Business Terminal Equipment.
- 5.9 Terminal equipment featuring the function of public warning and disaster prevention messages shall comply with Technical Specifications for Mobile Broadband Business Terminal Equipment relevant regulations.
- 6. Testing items and eligibility criteria for LTE-M1 terminal equipm
  - 6.1 Tests of this section are applicable to LTE-M1 terminal equipment.
  - 6.2 Power limits:
    - 6.2.1 Emission power limit:
      - 6.2.1.1 Effective radiated power (ERP)
        - 1 W for portable terminal equipment.

2 W for mobile terminal equipment.

- 6.2.1.2 Conducted output power limit:
  - Class 3: 23 dBm +2.7/-3.2 dB.
  - Class 5: 20 dBm +2.7/-3.2 dB.
- 6.2.2 Testing methods:
  - 6.2.2.1 When measuring the emission power, devices must be used with RMS (root mean square) equivalent voltage to measure any continuous transmission time. The measurement results shall be used to adjust the emission power based on the responding time, resolution bandwidth capability and sensitivity of the device.
  - 6.2.2.2 Testing shall be conducted on three channels: low, medium, and high. Tests shall be undertaken on the highest level of bandwidth on each channel and shall comply with the provisions of Table 1.
- 6.3 Spectrum emission mask:
  - 6.3.1 Limits of the spectrum emission mask: Shall comply with the spectrum emission mask values prescribed in Table 2.
  - 6.3.2 Testing methods:
    - 6.2.2.1 The spectrum emission mask limit values vary according to the bandwidth and f\_00B. The resolution bandwidth (RBW) during the measurement shall not be smaller than the set values prescribed in Table 2.
    - 6.3.2.2 Testing shall be conducted on three channels: low, medium, and high. Tests shall be undertaken on the lowest level of bandwidth, 5MHz, 10 MHz, and the highest level of bandwidth on each channel and shall comply with the provisions of Table 3.
- 6.4 Radiation emission limit outside the conduction band:
  - 6.4.1 Shall comply with specification values of the out-of-band radiation with the provisions of Table 4.
  - 6.4.2 Testing methods:
    - 6.4.2.1 Frequency range of the out-of-band radiation measurement does not include  $\Delta$  f\_00B stated in 6.3.1. During the measurement, the resolution bandwidth shall not smaller than the set value with the provisions of Table 4.
    - 6.4.2.2 Testing shall be conducted on three channels: low, medium, and high. Tests shall be undertaken on the lowest level of bandwidth on each channel and shall comply with the provisions of Table 5.
- 6.5 Adjacent channel leakage ratio (ACLR):

- 6.5.1 Shall comply with the ACLR specification values prescribed in Table 6.
- 6.5.2 Testing Methods:
  - 6.5.2.1 Measure the averaged power of the testing and adjacent channels to calculate the ACLR. During the measurement, the measurement bandwidth of the channels shall adhere to specification values of Table 6.
  - 6.5.2.2 Testing shall be conducted on three channels: low, medium, and high. Tests shall be undertaken on the lowest level of bandwidth, 5MHz, 10 MHz, and the highest level of bandwidth on each channel and shall comply with the provisions of Table 7.
- 6.6 Emission within non-resource blocks:
  - 6.6.1 Shall comply with specification values of non-resource blocks as prescribed in Table 8.
  - 6.6.2 Testing methods: Tests for the 5 MHz bandwidth shall be conducted according to Table 9.
- 7. Testing items and eligibility criteria for NB-IoT terminal equipment
  - 7.1 Tests of this section are applicable to NB-IoT terminal equipment.
  - 7.2 Power limits:
    - 7.2.1 Emission power limit:
      - 7.2.1.1 Effective radiated power (ERP)
        - 1 W for portable terminal equipment.
        - 2 W for mobile terminal equipment.
      - 7.2.1.2 Conducted output power limit:
        - Class 3: 23dBm +2.7/-2.7dB.
        - Class 5: 20 dBm +2.7/-2.7dB.
    - 7.2.2 Testing methods:
      - 7.2.2.1 When measuring the emission power, devices must be used with RMS (root mean square) equivalent voltage to measure any continuous transmission time. The measurement results shall be used to adjust the emission power based on the responding time, resolution bandwidth capability and sensitivity of the device.
      - 7.2.2.2 Tests shall be conducted according to Table 10.
  - 7.3 Spectrum emission mask:
    - 7.3.1 Limits of the spectrum emission mask: Shall comply with the spectrum emission mask values prescribed in Table 11.
    - 7.3.2 Testing methods:
      - 7.3.2.1 The spectrum emission mask limit values vary according to the

bandwidth and  $\Delta f_{00B}$ . The resolution bandwidth (RBW) during the measurement shall not be smaller than the set values prescribed in Table 11.

- 7.3.2.2 Tests shall be conducted according to Table 12.
- 7.4 Radiation emission limit outside the conduction band:
  - 7.4.1 Shall comply with specification values of the out-of-band radiation with the provisions of Table 13.
  - 7.4.2 Testing methods:
    - 7.4.2.1 Frequency range of the out-of-band radiation measurement does not include f\_00B at 1.7MHz. During the measurement, the resolution bandwidth shall not smaller than the set value prescribed in Table 13.
    - 7.4.2.2 Tests shall be conducted according to Table 14.
- 7.5 Adjacent channel leakage ratio (ACLR):
  - 7.5.1 Shall comply with the ACLR specification values prescribed in Table 15.
  - 7.5.2 Testing methods:
    - 7.5.2.1 Measure the averaged power of the testing and adjacent channels to calculate the ACLR. During the measurement, the measurement bandwidth of the channels shall adhere to specification values of Table 15.
    - 7.5.2.2 Tests shall be conducted according to Table 16.
- 7.6 Emission within non-resource blocks:
  - 7.6.1 Shall comply with specification values of non-resource blocks as prescribed in Table 17.
  - 7.6.2 Testing methods: Tests shall be conducted according to Table 18.
- 8. Test Requirement

Except as otherwise provided in these technical specifications, testing methods for examining emission power, out-of-band radiation emission and frequency stability shall all be processed based on the inspection requirements stated in Point 5 of the Low-power Radio-frequency Devices Technical Specifications (LPRFD Technical Requirements). The inspection procedures shall be processed in accordance of the Appendix 1 "Referential Procedures of Inspecting Transmitters" of the Low-power Radio-frequency Devices Technical Specifications.

- 9. Warning Labels
  - 9.1 Warning label of the electromagnetic wave
    - 9.1.1 Warning Content: "Please ensure to use the device properly in order to reduce the impact of electromagnetic waves"

- 9.1.2 Labeling: Position the label on the device properly and put labels on the package and instruction manual.
- 9.2 Warning label of the electromagnetic specific absorption rate (SAR)
  - 9.2.1 Tests of this paragraph are applicable to portable terminal equipment.
  - 9.2.2 Warning Content: "The standard value of SAR is \_\_\_\_W/kg; the measured value of tested product is \_\_\_\_W/kg".
  - 9.2.3 Labeling: Position the label on the device properly and put labels on the package and instruction manual.
- 10. The specifications shall become effective as of the date of promulgation.

	Downlink Configuration	Uplink Configuration			
Channel Bandwidth	Not applicable for the maximum emission power	Modulation	Resource Block Allocation		
			FDD and HD-FDD	TDD	
5MHz		QPSK	1	1	
5MHz		QPSK	(Class 5) 3	(Class 5) 3	
10MHz		QPSK	1	1	
10MHz		QPSK	(Class 3) 4 (Class 5) 5	(Class 3) 4 (Class 5) 5	
15MHz		QPSK	1	1	
15MHz		QPSK	6	6	
20MHz		QPSK	1	1	
20MHz		QPSK	6	6	

Note: The test method of the RB offset setting value and testing items adhere to 3GPP TS 36.521-1 technical standards.

Emission Limit (dBm)							
Channel Bandwidth Δf_OOB (MHz)	1.4MHz	3MHz	5MHz	10MHz	15MHz	20MHz	Measurement Bandwidth
±0 to 1	-8.5	-11.5	-13.5	-16.5	-18.5	-19.5	30kHz
±1 to 2.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	1MHz
$\pm 2.5$ to $2.8$	-23.5	-8.5	-8.5	-8.5	-8.5	-8.5	1MHz
±2.8 to 5		-8.5	-8.5	-8.5	-8.5	-8.5	1MHz
±5 to 6		-23.5	-11.5	-11.5	-11.5	-11.5	1MHz
±6 to 10			-23.5	-11.5	-11.5	-11.5	1MHz
±10 to 15				-23.5	-11.5	-11.5	1MHz
±15 to 20					-23.5	-11.5	1MHz
±20 to 25						-23.5	1MHz

Table 2. Set Value of Spectrum Emission Mask of LTE-M1 Terminal Equipment

Note:  $\Delta f_OOB$  refers to the frequency offset out-of-band ( $\Delta$  Frequency of Out-of-band emission)

# Technical Specifications of the Telecommunications Inspection Requirements

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	Configuration	Uplink Configuration				
Channel Bandwidth	N/A for SEM	Modulation	Modulation Resource Block Allocation			
	testing		FDD and HD-FDD	TDD	Narrowband Index (Note 1)	
		Low	and medium channels	S		
1.4MHz		QPSK	2	2	0	
1.4MHz		QPSK	5	5	0	
1.4MHz		QPSK	6	6	0	
1.4MHz		16QAM	2	2	0	
1.4MHz		16QAM	5	5	0	
3MHz		QPSK	2	2	0	
3MHz		QPSK	5	5	0	
3MHz		QPSK	6	6	0	
3MHz		16QAM	2	2	0	
3MHz		16QAM	5	5	0	
5MHz		QPSK	6	6	0	
5MHz (Note 3)		16QAM	1	1	0	
5MHz		16QAM	3	3	0	
5MHz		16QAM	5	5	0	
10MHz (Note 3)		<b>QPSK</b>	4	4	0	
10MHz		<b>Ö</b> PSK	6	6	0	
10MHz (Note 3)		160AM	3	3	0	
10MHz		160AM	5	5	0	
15MHz		OPSK	6	6	0	
15MHz		160AM	5	5	0	
	ł		High channel	L	L	
1.4MHz		QPSK	2	2	0	
1.4MHz		<b>Ö</b> PSK	5	5	0	
1.4MHz		<b>Ö</b> PSK	6	6	0	
1.4MHz		160AM	2	2	0	
1.4MHz		160AM	5	5	0	
3MHz		OPSK	2	2	1	
3MHz		<b>Ö</b> PSK	5	5	1	
3MHz		<b>O</b> PSK	6	6	1	
3MHz		160AM	2	2	1	
3MHz		160AM	5	5	1	
5MHz		QPSK	6	6	3	
5MHz (Note 3)		160AM	1	1	3	
5MHz		16ÕAM	3	3	3	
5MHz		160AM	5	5	3	
10MHz (Note 3)	1	QPSK	4	4	7	
10MHz	1	<b>Õ</b> PSK	6	6	7	
10MHz (Note 3)	1	16QAM	3	3	7	
10MHz	1	16ÒAM	5	5	7	
15MHz	1	OPSK	6	6	11	
15MHz	1	16QAM	5	5	11	

#### Table 3. Test Parameters for Channel Bandwidth of Spectrum Emission Mask for LTE-M1 Terminal Equipment

Note :

1. The definitino of "Narrowband Index" shall refer to 5.2.4 of 3GPP TS 36.211.

2. The testing method of the RB offset setting value and testing items adhere to 3GPP TS 36.521-1 technical standards. The RB offset value and testing methods for inspection items shall refer to technical specifications of 3GPP TS 36.521.

3.Only applicable to user equipment of Power Class 3.

Frequency Range	Maximum Level	Measurement Bandwidth
$9 \mathrm{kHz} \leq \mathrm{f} < 150 \mathrm{kHz}$	-36 dBm	1kHz
$150 \text{kHz} \le f < 30 \text{MHz}$	-36 dBm	10kHz
$30MHz \le f < 1GHz$	-36 dBm	100kHz
$1 GHz \leq f < 12.75 GHz$	-30 dBm	1MHz

Table 4. Out-of-band Radiation Value for LTE-M1 Terminal Equipment.

Table 5.Test Parameters for Channel Bandwidth of Out-of-band Radiation

	Downlink Configuration	Uplink Configuration				
Channel Bandwidth	Not applicable	Modulation	Modulation Resource Block Allocation			
	radiation tests		FDD and HD-FDD	TDD	Narrowband Index (Note)	
		Lov	w and medium channe	els		
1.4MHz		QPSK	1	1	0	
1.4MHz		QPSK	6	6	0	
3MHz		QPSK	1	1	0	
3MHz		QPSK	6	6	0	
5MHz		QPSK	1	1	0	
5MHz		QPSK	6	6	0	
High channel						
1.4MHz		QPSK	1	1	0	
1.4MHz		QPSK	6	6	0	
3MHz		QPSK	1	1	1	
3MHz		QPSK	6	6	1	
5MHz	]	QPSK	1	1	3	
5MHz		QPSK	6	6	3	

Note: The definitino of "Narrowband Index" shall refer to 5.2.4 of 3GPP TS 36.211.

## Table 6.ACLR specification values for LTE-M1 terminal equipment

E-UTRA							
		Channel Bandwidth					
	1.4MHz	3MHz	5MHz	10MHz	15MHz	20MHz	
E-UTRA ACLR1			29.2	2 dB			
UE channel	±1.4MHz	±3MHz	±5MHz	±10MHz	±15MHz	±20MHz	
E-UTRA Channel Measurement Bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz	
UTRA							
	Channel Bandwidth						
	1.4MHz	3MHz	5MHz	10MHz	15MHz	20MHz	
UTRA <sub>ACLR1</sub>			32.2	2 dB			
Adjacent Channel	$0.7+BW_{UTRA}/2$	$1.5+BW_{UTRA}/2$	$2.5+BW_{UTRA}/2$	$5+BW_{UTRA}/2$	$7.5+BW_{UTRA}/2$	$10+BW_{UTRA}/2$	
Offset (MHz)	-0.7-BW <sub>UTRA</sub> /2	-1.5-BW <sub>UTRA</sub> /2	-2.5-BW <sub>UTRA</sub> /2	-5-BW <sub>UTRA</sub> /2	-7.5-BW <sub>UTRA</sub> /2	-10-BW <sub>UTRA</sub> /2	
UTRA <sub>ACLR2</sub>	35.2 dB						
Adjacent Channel			2.5+3*BW <sub>UTRA</sub> /2	5+3*BW <sub>UTRA</sub> /2	7.5+3*BW <sub>UTRA</sub> /2	10+3*BW <sub>UTRA</sub> /2	
Offset (MHz)			-2.5-3*BW <sub>UTRA</sub> /2	-5-3*BW <sub>UTRA</sub> /2	-7.5-3*BW <sub>UTRA</sub> /2	-10-3*BW <sub>UTRA</sub> /2	
E-UTRA Channel Measurement Bandwidth	1.08MHz	2.7MHz	4.5MHz	9.0MHz	13.5MHz	18MHz	
UTRA 5MHz Channel Measurement Bandwidth (Note 1)	3.84 MHz						
UTRA 1.6MHz Channel Measurement Bandwidth (Note 1)	1.28 MHz						

Note:

1.Applicable to E-UTRA FDD co-existed with UTRA FDD in paired frequency spectrum.

2.Applicable to E-UTRA FDD co-existed with UTRA FDD in non-paired frequency spectrum.

3. The  $BW_{\rm UTRA}$  of UTRA FDD is 5 MHz; the  $BW_{\rm UTRA}$  of UTRA TDD is 1.6 MHz  $\circ$ 

		Downlink Configuration		Uplink Configuration		
Configuration ID	Channel Bandwidth	Not applicable to	Modulation	Resource Bl	ock Allocation	
		ACLR test.		FDD AND HD-FDD	Narrowband Index (Note 1)	
		Low and mediu	im channels			
1	1.4MHz		QPSK	2	0	
2	1.4MHz		QPSK	5	0	
3	1.4MHz		QPSK	6	0	
4	1.4MHz		16QAM	2	0	
5	1.4MHz		16QAM	5	0	
6	3MHz		QPSK	2	0	
7	3MHz		QPSK	5	0	
8	3MHz		QPSK	6	0	
9	3MHz		16QAM	2	0	
10	3MHz		16QAM	5	0	
11	5MHz		QPSK	6	0	
12 (Note 2)	5MHz		16QAM	1	0	
13	5MHz		16QAM	3	0	
14	5MHz		16QAM	5	0	
15 (Note 2)	10MHz		QPSK	4	0	
16	10MHz		QPSK	6	0	
17 (Note 2)	10MHz		16QAM	3	0	
18	10MHz		16QAM	5	0	
19	15MHz		QPSK	6	0	
20	15MHz		16QAM	5	0	
21	20MHz		16QAM	5	0	
		High cha	annel			
1	1.4MHz		QPSK	2	0	
2	1.4MHz		QPSK	5	0	
3	1.4MHz		QPSK	6	0	
4	1.4MHz		16QAM	2	0	
5	1.4MHz		16QAM	5	0	
6	3MHz		QPSK	2	1	
7	3MHz		QPSK	5	1	
8	3MHz		QPSK	6	1	
9	3MHz		16QAM	2	1	
10	3MHz		16QAM	5	1	
11	5MHz		QPSK	6	3	
12 (Note 2)	5MHz		16QAM	1	3	
13	5MHz		16QAM	3	3	
14	5MHz		16QAM	5	3	
15 (Note 2)	10MHz		QPSK	4	7	
16	10MHz		QPSK	6	7	
17 (Note 2)	10MHz		16QAM	3	7	
18	10MHz		16QAM	5	7	
19	15MHz		QPSK	6	11	
20	15MHz		16QAM	5	11	
21	20MHz		160AM	5	15	

### Table 7. Test Parameters for Channel Bandwidth of ACLR for LTE-M1 Terminal Equipment

Note:

1. The definitino of "Narrowband Index" shall refer to 5.2.4 of 3GPP TS 36.211.

2. Only applicable to user equipment of Power Class 3.

Parameter Descriptions	Unit		Applicable Frequency					
General	dB	max{-25-10 · 20 · log <sub>10</sub> EVM- -57dBm/180kHz-	$\begin{array}{c c} \max\{-25-10 \cdot \log_{10} (N_{RB}/L_{CRB}), \\ 0 \cdot \log_{10}EVM - 3 - 5 \cdot ( \Delta_{RB}  - 1) / L_{CRB}, +0.8 \\ 57dBm/180kHz - P_{RB}\} \end{array}$					
		-27.2	When the image frequency is the carrier center frequency, which is smaller than 1GHz, and the output power is more than 10dBm					
IQ Image dB	dB	-24.2	When the image frequency is the carrier center frequency, which is smaller than 1GHz, and the output power is less than 10dBm.	Image Frequency				
							-24.2	When the image frequency is the carrier center frequency, which is bigger than or equals to 1GHz.
		-27.2	Output power is >10dBm, and carrier center frequency <1GHz					
Carrier leakage	dBo	-24.2	Output power is $>10$ dBm, and carrier center frequency $\ge 1$ GHz	Comion froquer				
	ubc	-24.2	$0dBm \leq Output power \leq 10dBm$	Carrier frequency				
		-19.2	$-30$ dBm $\leq$ Output power $\leq$ OdBm	1				
		-9.2	-40dBm \le Output power < -30dBm					

#### Table 8. Radiation Set Value within Non-Allocated Resource Block of LTE-M1Terminal Equipment

Note:

1. The RB offset value and testing methods for inspection items shall refer to technical specifications of 3GPP TS 36.521-1.

2. The definition of parameters in Table 8 shall refer to Table 6.5.2.3EA.5-1 of 3GPP TS 36.521-1.

 Table 9. Test Parameters for Channel Bandwidth of radiation within the non-allocated resource block for

 LTE-M1 terminal equipment

	Downlink Configuration				Uplink Co	nfiguration		
	PUSCH							
Channel Bandwidth	Not applicable to radiation within the non-allocated resource block.			Modulation	Resource	ce Block A	llocation	
						FDD AND HD-FDD	TDD	Narrowband Index (Note)
5MHz					QPSK	1	1	0
				PUCCH	•			
Channel	Modulation	Resour	ce Block A	llocation	FDD : PUC	CCH format=	=Format 1a	L
Bandwidth					TDD: PU	CCH format	=Format 1a	/1b
		FDD	TDD	narrowband Index				
5MHz	QPSK	4@0	4@0	0				

Note: The definitino of "Narrowband Index" shall refer to 5.2.4 of 3GPP TS 36.211.

Configuration ID	Downlink Configuration	Uplink Configuration		
	Not applicable for maximum emission	Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)
1(Note 2)	power	BPSK	1@0	3.75
2 (Note 2)		BPSK	1@47	3.75
3 (Note 2)	]	QPSK	1@0	15
4 (Note 3)		QPSK	1@11	15
5(Note 1)		QPSK	3@3	15

Table 10. Test Paramete	rs for Channel Ban	dwidth of Emission	Power for NB-IoT
14010 101 1000 1 41411000			

Note:

1. Applicable to terminal equipment that supports multi-tone transmissions.

2. Only applicable to low channel.

3.Only applicable to high channel.

1		1 1
$\Delta f_{OOB}$ (kHz)	Spectrum Emission Limit (dBm)	Measurement Bandwidth
±0 to 100	$(27.5 + (F - 0) \times \frac{-3.5 - 27.5}{100 - 0})$	30 kHz
±100 to 150	$(-3.5 + (F - 100) \times \frac{-6.5 - (-3.5)}{150 - 100})$	30 kHz
±150 to 300	$(-6.5 + (F - 150) \times \frac{-27.5 - (-6.5)}{300 - 150})$	30 kHz
±300 to 500	$(-27.5 + (F - 300) \times \frac{-33.5 - (-27.5)}{500 - 300})$	30 kHz
±500 to 1700	-33.5	30 kHz

Table 11. Spectrum Emission Mask Value for NB-IoT Terminal Equipment.

Note:  $\Delta f_{OOB}$  is the off-set amount outside the emsision frequency band ( $\Delta$ Frequency of Out-of-band emission).

Configuration ID	Downlink Configuration	Uplink Configuration				
	Not applicable to spectrum emission	Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)		
1	mask.	QPSK	1@0	3.75		
2		QPSK	1@47	3.75		
3		QPSK	1@0	15		
4		QPSK	1@11	15		
5(Note)		QPSK	3@0	15		
6 (Note)		QPSK	3@3	15		
7 (Note)		QPSK	3@9	15		
8 (Note)		QPSK	6@0	15		
9 (Note)		QPSK	6@6	15		
10 (Note)		QPSK	12@0	15		

Table 12. Test Paramater for Bandwidth Fr	equency of Spectrum	Emission M	lask for NB-IoT	Terminal
	Equipment			

Note: the maximum power (MPR) of maximum emission power of terminal equipment shall refer to 6.2.3F.3 of 3GPP TS 36.521-1.

Table 13. Out-of-band Radiation Value for NB-IoT Terminal Equipment.

Frequency Range	Maximum Level	Measurement Bandwidth
$9 \text{kHz} \le \text{f} < 150 \text{kHz}$	-36 dBm	1kHz
$150 \text{kHz} \leq f < 30 \text{MHz}$	-36 dBm	10kHz
$30MHz \le f < 1GHz$	-36 dBm	100kHz
$1 GHz \leq f < 12.75 GHz$	-30 dBm	1MHz

Equipment.							
Configuration ID	Downlink Configuration	Uplink Configuration					
	Not applicable to out-of-band radiation	Modulation N <sub>tones</sub> Sub-carrier Spa (kHz)					
1	tests.	QPSK	1@0	3.75			
2		QPSK	1@47	3.75			
3		BPSK	1@0	15			
4		BPSK	1@11	15			
5(Note)		QPSK	12@0	15			

|--|

Note: Applicable to terminal equipment that supports multi-tone transmissions.

	GSM <sub>ACLR</sub>	UTRA <sub>ACLR</sub>
ACLR limit	19.2dB	36.2dB
Adjacent Channel Centre Frequency Offset from NB Channel Edge	±200kHz	±2.5MHz
Adjacent Channel Measurement Bandwidth	180kHz	3.84MHz
Measurement Filter	Rectangular Filter	Root-Raised Cosine Filter α=0.22
Channel Measurement Bandwidth	180kHz	180kHz
Channel Measurement Filter	Rectangular Filter	Rectangular Filter

Table 15. Test Parameters for Channel Bandwidth of ACLR for NB-IoT Terminal Equipment

Configuration ID	Downlink Configuration	Uplink Configuration				
	Not applicable to ACLR tests.	Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)		
1		QPSK	1@0	3.75		
2		QPSK	1@47	3.75		
3		QPSK	1@0	15		
4		QPSK	1@11	15		
5 (Note)		QPSK	3@0	15		
6 (Note)		QPSK	3@3	15		
7 (Note)		QPSK	3@9	15		
8 (Note)		QPSK	6@0	15		
9 (Note)		QPSK	6@6	15		
10 (Note)		QPSK	12@0	15		

Table	16.	Test Parameter	r for Channe	l Broadband	of ACLR f	for NB-IoT	Terminal	Equipment.
ruore	10.	rest i urumete		1 Dioudound	of field i		rennun	Equipment.

Note: Applicable to terminal equipment that supports multi-tone transmissions.

Parameter Descriptions	Unit		Applicable Frequency	
General	dB	max{-15-10 -18-5 · (   -57dBm/ (3.75	All non-allocated	
IQ Image	dB		Image Frequency	
	dBc	-24.2	0 dBm≦Output power f≦3.0GHz : 3.2dBm±3.2dB	
Carrier leakage		-19.2	-30 dBm≦Output power≦0 dBm f≦3.0GHz∶-26.8dBm±3.2dB	Carrier frequency
		-9.2	-40 dBm≦Output power≦-30 dBm f≦3.0GHz : -36.8dBm±3.2dB	

Table 17. Radiation Se	Value within	Non-Allocated	Resource Block	c of NB-IoT	Terminal Equipment
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Note:

1. The tone offset set value and testing methods of testing items shall refer to technical specifications of 3GPP TS 36.521-1.

2. The definition of parameters as described in Table 17 shall refer to Table 6.5.2.3F.5-1 of 3GPP TS 36.521-1.

# Technical Specifications of the Telecommunications **Inspection Requirements**

for NB-IoT Terminal Equipment						
Configuration ID	Downlink Configuration	Uplink Configuration				
	Not applicable to tests of radiations within	Modulation	$\mathbf{N}_{\mathrm{tones}}$	Sub-carrier Spacing (kHz)		
1	non-allocated	QPSK	1@0	3.75		
2	resource block.	QPSK	1@47	3.75		
3		QPSK	1@0	15		
4		QPSK	1@11	15		

Table 18. Test Parameter for Channel Broadband of Radiations within Non-allocated Resource Block