

Technical Specifications for Base Station Radio Frequency Equipment of Third Generation Mobile Telecommunication

National Communications Commission (NCC)

Technical Specifications for Base Station Radio Frequency Equipment of Third Generation Mobile Telecommunication

1. Legal source

The specifications are promulgated pursuant to Item 1, Article 50 of the Telecommunications Act.

2. Scope of application

This specifications apply to the type approval of the radio frequency equipment of base stations, femtocell access points and repeaters, which are WCDMA FDD stated in IMT-2000. The relevant frequency bands are as follows: Band 1 (1920 MHz~1980 MHz/2110 MHz~2170 MHz), Band 3 (1710 MHz~1785 MHz/1805 MHz~1880 MHz), Band 7 (2500 MHz~2570 MHz/2620 MHz~2690 MHz) and Band 8 (885 MHz~915 MHz/930 MHz~960 MHz).

3. Technical standards

The specifications are stipulated in accordance with CNS13438, CNS14336-1, CNS15598-1, 3GPP TS 25.104, TS 25.106, TS 25.141 and other international technical specifications.

4. General testing items and eligibility criteria

4.1 Channel spacing: 5 MHz.

4.2 Electromagnetic Compatibility (EMC): Shall comply with CNS13438.

4.3 Electrical safety: Shall comply with CNS13438 or CNS 15598-1.

5. Testing items and eligibility criteria for base station radio frequency equipment

5.1 Tests of this section are applicable to base station radio frequency equipment.

5.2 Occupied bandwidth: Shall be less than or equal to 5 MHz.

5.3 Maximum output power: In normal conditions, the maximum output power shall remain within +2dB and -2dB of the rated output power.

5.4 Frequency stability: Shall remain within ± 0.05 ppm of the main frequency.

5.5 Spectrum emission mask: Shall comply with the spectrum emission mask shown in figure 1 and the spectrum emission mask limit values prescribed in table 1.

5.6 Spurious emissions: Shall comply with the spurious emissions limit values prescribed in table 2.

5.7 Adjacent Channel Leakage power Ratio (ACLR): If the adjacent channel

offset is 5 MHz, the ACLR limit is 45 dB. If the adjacent channel offset is 10 MHz, the ACLR limit is 50 dB.

5.8 Transmit intermodulation:

5.8.1 The transmit intermodulation level shall not exceed the spurious emissions limit values prescribed in table2.

5.8.2 Testing methods: Inject modulated interference signal into the antenna connector at a power level of 30 dB lower than main signal. The interference frequency shall be offset $\pm 5\text{MHz}$, $\pm 10\text{MHz}$ and $\pm 15\text{MHz}$ from the main signal. The interference frequency that are outside of any downlink application band are excluded.

6. Testing items and eligibility criteria for femtocell access point radio frequency equipment

6.1 Tests of this section are applicable to femtocell access points radio frequency equipment.

6.2 Occupied bandwidth: Shall be less than or equal to 5 MHz.

6.3 Maximum output power: In normal conditions, the rated output power limit is 20 dBm, and the maximum output power shall remain within $+2.7\text{dB}$ and -2.7dB of the rated output power.

6.4 Frequency stability: Shall remain within ± 0.25 ppm of the main frequency.

6.5 Spectrum emission mask: Shall comply with the spectrum emission mask shown in figure 1, the spectrum emission mask limit values prescribed in table 1 and the extra spectrum emission mask limit values prescribed in table 3.

6.6 Spurious emissions: Shall comply with the spurious emissions limit values prescribed in table 2.

6.7 Adjacent Channel Leakage power Ratio (ACLR):

6.7.1 Adjacent channel leakage power shall comply with 6.7.2 or 6.7.3, whichever is the higher.

6.7.2 ACLR limit: If the adjacent channel offset is 5 MHz, the ACLR limit is 45 dB. If the adjacent channel offset is 10 MHz, the ACLR limit is 50 dB.

6.7.3 Adjacent channel leakage power limit: the RRC filtered mean power centred on an adjacent channel frequency shall be less than or equal to $-44.2\text{dBm}/3.84\text{MHz}$.

6.8 Transmit intermodulation:

6.8.1 The transmit intermodulation level shall not exceed the spurious emissions limit values prescribed in table2.

6.8.2 Testing methods: Inject modulated interference signal into the antenna connector at a power level of 30 dB lower than main signal. The interference frequency shall be offset $\pm 5\text{MHz}$, $\pm 10\text{MHz}$ and $\pm 15\text{MHz}$ from the main signal. The interference frequency that are outside of any downlink application band are excluded.

6.9 Output power for adjacent channel protection: According to the setting of table 4, shall comply with the limit values prescribed in table 5. The output power shall remain within $\pm 2.7\text{ dB}$ of the limit values in table 5.

7. Testing items and eligibility criteria for repeater radio frequency equipment

7.1 Tests of this section are applicable to repeater radio frequency equipment.

7.2 Maximum output power: In normal conditions, if the rated output power is more than or equal to 31dBm, the maximum output power shall remain within +2dB and -2dB of the rated output power. If the rated output power is less than 31dBm, the maximum output power shall remain within +3dB and -3dB of the rated output power.

7.3 Frequency stability: Shall remain within $\pm 0.01\text{ ppm}$ of the main frequency.

7.4 Spectrum emission mask: Shall comply with the spectrum emission mask shown in figure 1 and the spectrum emission mask limit values prescribed in table 1.

7.5 Spurious emissions: Shall comply with the spurious emissions limit values prescribed in table 6.

7.6 Input intermodulation: The input intermodulation limit values are prescribed in table 7, and the input intermodulation requirement for interfering signals in other systems are in table 8.

7.7 Out of band gain: Shall comply with limit values of out of band gain prescribed in table 9.

8. Test Requirement

Except as otherwise provided in these technical specifications, testing methods for testing items shall 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.

Table 1 : Limit Values of Spectrum Emission Mask

Maximum Output Power, P	Frequency offset of measurement filter-3dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Maximum level	Measurement bandwidth
$P \geq 43$ dBm	$2.5 \leq \Delta f < 2.7$ MHz	$2.515 \text{ MHz} \leq f_{\text{offset}} < 2.715 \text{ MHz}$	-14 dBm	30 kHz
	$2.7 \leq \Delta f < 3.5$ MHz	$2.715 \text{ MHz} \leq f_{\text{offset}} < 3.515 \text{ MHz}$	$-14-15 \cdot (f_{\text{offset}}-2.715)$ dBm	30 kHz
		$3.515 \text{ MHz} \leq f_{\text{offset}} < 4.0 \text{ MHz}$	-26 dBm	30 kHz
	$3.5 \leq \Delta f \leq \Delta f_{\text{max}}$ MHz	$4.0 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	-13 dBm	1 MHz
$39 \leq P < 43$ dBm	$2.5 \leq \Delta f < 2.7$ MHz	$2.515 \text{ MHz} \leq f_{\text{offset}} < 2.715 \text{ MHz}$	-14 dBm	30 kHz
	$2.7 \leq \Delta f < 3.5$ MHz	$2.715 \text{ MHz} \leq f_{\text{offset}} < 3.515 \text{ MHz}$	$-14-15 \cdot (f_{\text{offset}}-2.715)$ dBm	30 kHz
		$3.515 \text{ MHz} \leq f_{\text{offset}} < 4.0 \text{ MHz}$	-26 dBm	30 kHz
	$3.5 \leq \Delta f < 7.5$ MHz	$4.0 \text{ MHz} \leq f_{\text{offset}} < 8.0 \text{ MHz}$	-13 dBm	1 MHz
	$7.5 \leq \Delta f \leq \Delta f_{\text{max}}$ MHz	$8.0 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	$P - 56$ dBm	1 MHz
$31 \leq P < 39$ dBm	$2.5 \leq \Delta f < 2.7$ MHz	$2.515 \text{ MHz} \leq f_{\text{offset}} < 2.715 \text{ MHz}$	$P - 53$ dBm	30 kHz
	$2.7 \leq \Delta f < 3.5$ MHz	$2.715 \text{ MHz} \leq f_{\text{offset}} < 3.515 \text{ MHz}$	$P - 53-15 \cdot (f_{\text{offset}}-2.715)$ dBm	30 kHz
		$3.515 \text{ MHz} \leq f_{\text{offset}} < 4.0 \text{ MHz}$	$P - 65$ dBm	30 kHz
	$3.5 \leq \Delta f < 7.5$ MHz	$4.0 \text{ MHz} \leq f_{\text{offset}} < 8.0 \text{ MHz}$	$P - 52$ dBm	1 MHz
	$7.5 \leq \Delta f \leq \Delta f_{\text{max}}$ MHz	$8.0 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	$P - 56$ dBm	1 MHz
$P < 31$ dBm	$2.5 \leq \Delta f < 2.7$ MHz	$2.515 \text{ MHz} \leq f_{\text{offset}} < 2.715 \text{ MHz}$	-22 dBm	30 kHz
	$2.7 \leq \Delta f < 3.5$ MHz	$2.715 \text{ MHz} \leq f_{\text{offset}} < 3.515 \text{ MHz}$	$-22-15 \cdot (f_{\text{offset}}-2.715)$ dBm	30 kHz
		$3.515 \text{ MHz} \leq f_{\text{offset}} < 4.0 \text{ MHz}$	-34 dBm	30 kHz
	$3.5 \leq \Delta f < 7.5$ MHz	$4.0 \text{ MHz} \leq f_{\text{offset}} < 8.0 \text{ MHz}$	-21 dBm	1 MHz
	$7.5 \leq \Delta f \leq \Delta f_{\text{max}}$ MHz	$8.0 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	-25 dBm	1 MHz

Table 2 : Spurious Emissions Limit Values of Base station and Femtocell Access Point Radio
Frequency Equipment

Category		Band	Maximum level	Measurement bandwidth
Category A		9kHz – 150kHz	-13 dBm	1 kHz
		150kHz – 30MHz		10 kHz
		30MHz – 1GHz		100 kHz
		1GHz – 12.75 GHz		1 MHz
Category B	Band 1 Band 3 Band 7	9kHz ↔ 150kHz	-36 dBm	1 kHz
		150kHz ↔ 30MHz	-36 dBm	10 kHz
		30MHz ↔ 1GHz	-36 dBm	100 kHz
		1GHz ↔ $F_{\text{low}}-10\text{MHz}$	-30 dBm	1 MHz
		$F_{\text{low}}-10\text{MHz} \leftrightarrow F_{\text{high}}+10\text{MHz}$	-15 dBm	1 MHz
		$F_{\text{high}}+10\text{MHz} \leftrightarrow 12.75\text{GHz}$	-30 dBm	1 MHz
	Band 8	9kHz ↔ 150kHz	-36 dBm	1 kHz
		150kHz ↔ 30MHz	-36 dBm	10 kHz
		30MHz ↔ $F_{\text{low}}-10\text{MHz}$	-36 dBm	100 kHz
		$F_{\text{low}}-10\text{MHz} \leftrightarrow F_{\text{high}}+10\text{MHz}$	-16 dBm	100 kHz
		$F_{\text{high}}+10\text{MHz} \leftrightarrow 1\text{GHz}$	-36 dBm	100 kHz
		1GHz ↔ 12.75GHz	-30 dBm	1 MHz

Note: F_{low} is the lowest downlink frequency of the operating band ; F_{high} is the highest downlink frequency of operating band.

Table 3 : Extra Spurious Emissions Limit Values of Femtocell Access Point Radio Frequency Equipment

Maximum Output Power, P	Frequency offset of measurement filter-3dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Maximum level	Measurement bandwidth
$6 \leq P \leq 20$ dBm	$12.5 \leq \Delta f \leq \Delta f_{\text{max}}$ MHz	$13\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	$P - 56$ dBm	1 MHz
$P < 6$ dBm	$12.5 \leq \Delta f \leq \Delta f_{\text{max}}$ MHz	$13\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	-50 dBm	1 MHz

Table 4 : Test Parameters for Output Power for Adjacent Channel Protection of Femtocell Access Point Radio Frequency Equipment

Testing Environment	CPICH $\hat{E}_c$ (dBm)	Ioh (dBm)
1	-80	-50
2	-90	-60
3	-100	-70
4	-100	-50

Table 5 : Limit Values for Output Power for Adjacent Channel Protection of Femtocell Access Point Radio Frequency Equipment

Input Conditions	Output Power
$I_{oh} > \text{CPICH } \hat{E}_c + 43\text{dB}$ and $\text{CPICH } \hat{E}_c \geq -105\text{dBm}$	$\leq +10\text{dBm}$
$I_{oh} \leq \text{CPICH } \hat{E}_c + 43\text{dB}$ and $\text{CPICH } \hat{E}_c \geq -105\text{dBm}$	$\leq \max (8 \text{ dBm}, \min (20\text{dBm}, \text{CPICH } \hat{E}_c + 100\text{dB}))$

Note : CPICH $\hat{E}_c$: the code power of adjacent channel's common pilot channel

Ioh : received power density including the signal and interferences; however, the signal of the object to be measured is excluded

Table 6 : Spurious Emissions Limit Values of Repeater Radio Frequency Equipment

Category	Band	Maximum level	Measurement bandwidth
Category A	9kHz – 150kHz	-13 dBm	1 kHz
	150kHz – 30MHz		10 kHz
	30MHz – 1GHz		100 kHz
	1GHz – 12.75 GHz		1 MHz
Category B	9kHz – 150kHz	-36 dBm	1 kHz
	150kHz – 30MHz	-36 dBm	10 kHz
	30MHz – 1GHz	-36 dBm	100 kHz
	1GHz – 12.75 GHz	-30 dBm	1 MHz

Table 7 : Input Intermodulation Limit Values of Repeater Radio Frequency Equipment

f_offset	Interfering signal levels	Type of signals	Measurement bandwidth
3.5 MHz	-40 dBm	2 CW carriers	1 MHz

Note: f_offset is the distance between the centre frequency of first or last channel in the pass band and the interfering signals.

Table 8 : Input Intermodulation Requirement for Interfering Signals in Other Systems of Repeater Radio Frequency Equipment

Co-located other systems	Frequency of interfering signals	Interfering signal levels	Type of signals	Measurement bandwidth
GSM900	921 - 960 MHz	16 dBm	2 CW carriers	1 MHz
DCS1800	1805 - 1880 MHz	16 dBm	2 CW carriers	1 MHz
UTRA-FDD or E-UTRA FDD	2110 - 2170 MHz	16 dBm	2 CW carriers	1 MHz
UTRA-FDD or E-UTRA FDD	1805 - 1880 MHz	16 dBm	2 CW carriers	1 MHz
UTRA-FDD or E-UTRA FDD	2620 - 2690 MHz	16 dBm	2 CW carriers	1 MHz
UTRA-FDD or E-UTRA FDD	925 - 960 MHz	16 dBm	2 CW carriers	1 MHz
E-UTRA	758 - 803 MHz	16 dBm	2 CW carriers	1 MHz

Table 9 : Out of band gain limit values of Repeater Radio Frequency Equipment

f_offset	Out of band gain limit value
$2.7 \leq f_{\text{offset}} < 3.5 \text{ MHz}$	60 dB
$3.5 \leq f_{\text{offset}} < 7.5 \text{ MHz}$	45 dB
$7.5 \leq f_{\text{offset}} < 12.5 \text{ MHz}$	45 dB
$12.5 \text{ MHz} \leq f_{\text{offset}}$	35 dB

Note: f_offset is the distance between the centre frequency of first or last channel in the pass band and the interfering signals.

Figure 1 : Spectrum Emission Mask

