



RF TEST REPORT

Applicant Xiaomi Communications Co., Ltd.
FCC ID 2AFZZ-RMSDG1
Product Mobile Phone
Brand MI
Model MDG1
Report No. RXA1710-0339RF06R1
Issue Date November 29, 2017

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2017)/ FCC CFR 47 Part 22H (2017)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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Summary of measurement results

No.	Test Type	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Radiated Power	22.913(a)(2)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	22.917(a)	PASS
5	Peak-to-Average Power Ratio	22.913(d)	PASS
6	Frequency Stability	22.355	PASS
7	Spurious Emissions at Antenna Terminals	22.917(a)	PASS
8	Radiates Spurious Emission	22.917 (a)	PASS
Date of Testing: October 18, 2017~ November 1, 2017			
Note: PASS: The EUT complies with the essential requirements in the standard. FAIL: The EUT does not comply with the essential requirements in the standard.			



1. Test Laboratory

1.1. Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above. This report must not be used by the client to claim product certification, approval, or endorsement by any government agencies.

1.2. Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



1.3. Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
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2. General Description of Equipment under Test

Client Information

Applicant	Xiaomi Communications Co., Ltd.
Applicant address	The Rainbow City of China Resources,NO.68,Qinghe Middle Street,Haidian District,Beijing,China
Manufacturer	Xiaomi Communications Co., Ltd.
Manufacturer address	The Rainbow City of China Resources,NO.68,Qinghe Middle Street,Haidian District,Beijing,China

General Information

EUT Description			
Model	MDG1		
IMEI	SIM 1:865498030064281 SIM 2:865498030064828		
Hardware Version	P2		
Software Version	MIUI 9		
Power Supply	Battery/AC adapter		
Antenna Type	Internal Antenna		
Test Mode(s)	GSM 850: WCDMA Band V;LTE Band 5;		
Test Modulation	(GSM)GMSK,8PSK; (WCDMA)QPSK; (LTE)QPSK 16QAM;		
GPRS Multislot Class	33		
EGPRS Multislot Class	33		
HSDPA UE Category	24		
HSUPA UE Category	6		
DC-HSDPA UE Category	24		
LTE Category	4		
Maximum E.R.P.	GSM 850:	26.71dBm	
	WCDMA Band V:	17.27dm	
	LTE Band 5:	17.17dBm	
Rated Power Supply Voltage	3.85V		
Extreme Voltage	Minimum: 3.6V Maximum: 4.35V		
Extreme Temperature	Lowest: -10°C Highest: +55°C		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM850	824 ~ 849	869 ~ 894
	WCDMA Band V	824 ~ 849	869 ~ 894
	LTE Band 5	824 ~ 849	869 ~ 894
EUT Accessory			
Adapter-US	Manufacturer: Dongguan Aohai Power Technology Co., Ltd. Model: MDY-08-EZ		



Battery	Manufacturer: SCUD (Fujian) Electronics Co., LTD Model: BN35
USB Cable 1	Manufacturer: KeLi Model: KLC-2639, 82cm
USB Cable 2	Manufacturer: BROAD Model: 0US231XI0015, 82cm
Note: The information of the EUT is declared by the manufacturer.	



3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC CFR47 Part 2 (2017)

FCC CFR 47 Part 22H (2017)

ANSI/TIA-603-D (2010)

KDB 971168 D01 Power Meas License Digital Systems v02r02

4. Test Configuration

There is more than one SIM card slot, each one should be applied throughout the compliance test respectively, and however, only the worst case (SIM 1) will be recorded in this report.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, horizontal polarization) and the worst case was recorded.

All mode and data rates and positions were investigated. Subsequently, only the worst case emissions are reported.

The following testing in GSMWCDMA/LTE is set based on the maximum RF Output Power.

Test modes are chosen to be reported as the worst case configuration below:

	Test items	Modes/Modulation	
		GSM 850	WCDMA Band V
Conducted Test cases	RF power output	GSM GPRS EGPRS	RMC HSDPA/HSUPA DC-HSDPA
	Occupied Bandwidth	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Band Edge Compliance	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Peak-to-Average Power Ratio	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Frequency Stability	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Spurious Emissions at Antenna Terminals	GSM	RMC
Radiated Test cases	Effective Radiated Power	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Radiates Spurious Emission	GSM	RMC

Test modes are chosen as the worst case configuration below for LTE Band 5.

Test items	Bandwidth (MHz)				Modulation		RB			Test Channel		
	1.4	3	5	10	QPSK	16QAM	1	50%	100%	L	M	H
RF power output	O	O	O	O	O	O	O	O	O	O	O	O
Effective Isotropic Radiated power	O	O	O	O	O	O	-	-	O	O	O	O
Occupied Bandwidth	O	O	O	O	O	O	-	-	O	O	O	O
Band Edge Compliance	O	O	O	O	O	O	O	-	O	O	-	O
Peak-to-Average Power Ratio	O	O	O	O	O	O	-	-	O	O	O	O
Frequency Stability	O	O	O	O	O	O	-	-	O	-	O	-
Spurious Emissions at Antenna Terminals	O	O	O	O	O	-	O	-	-	O	O	O
Radiates Spurious Emission	O	O	O	O	O	-	O	-	-	O	O	O
Note	1. The mark "O" means that this configuration is chosen for testing. 2. The mark "-" means that this configuration is not testing.											

5. Test Case Results

5.1. RF Power Output

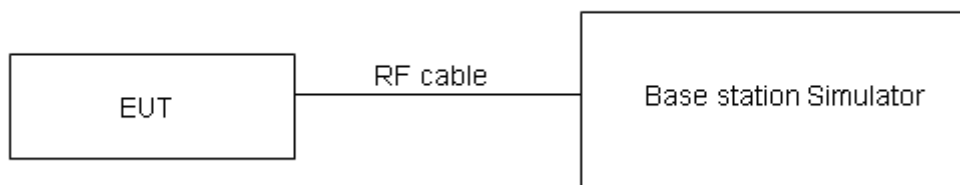
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.4$ dB.

Test Results

GSM 850		Conducted Power(dBm)		
		Channel 128	Channel 190	Channel 251
		824.2 (MHz)	836.6 (MHz)	848.8 (MHz)
GSM	Results	32.24	32.27	32.28
GPRS (GMSK)	1TXslot	32.20	32.27	32.26
	2TXslots	32.14	32.12	32.19
	3TXslots	30.11	30.19	30.15
	4TXslots	29.11	29.10	29.15
EGPRS (GMSK)	1TXslot	32.19	32.20	32.22
	2TXslots	32.12	32.10	32.13
	3TXslots	30.18	30.09	30.14
	4TXslots	29.11	29.00	29.02
EGPRS (8PSK)	1TXslot	25.91	25.87	25.92
	2TXslots	24.78	24.76	24.77
	3TXslots	22.94	22.96	22.95
	4TXslots	21.95	21.96	21.98

WCDMA Band V		Conducted Power(dBm)		
		Channel 4132	Channel 4183	Channel 4233
		826.4(MHz)	836.6(MHz)	846.6(MHz)
RMC	12.2k	22.93	23.00	23.01
HSDPA	Sub - Test 1	22.21	22.07	22.10
	Sub - Test 2	22.14	22.01	22.03
	Sub - Test 3	21.54	21.46	21.51
	Sub - Test 4	21.56	21.51	21.52
HSUPA	Sub - Test 1	21.97	22.08	22.10
	Sub - Test 2	21.59	21.62	21.66
	Sub - Test 3	21.98	22.03	22.21
	Sub - Test 4	22.08	21.97	22.03
	Sub - Test 5	22.01	22.07	22.14
DC-HSDPA	Sub - Test 1	22.13	22.00	21.96
	Sub - Test 2	22.05	21.93	21.88
	Sub - Test 3	21.44	21.37	21.35
	Sub - Test 4	21.39	21.28	21.21
HSPA+	16QAM	20.82	20.84	20.87



LTE Band 5				Conducted Power(dBm)		
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)		
				20407/824.7	20525/836.5	20643/848.3
1.4MHz	QPSK	1	0	23.02	23.10	23.00
		1	2	23.10	23.16	23.13
		1	5	22.96	23.11	22.93
		3	0	22.78	22.93	22.81
		3	2	22.79	22.92	22.82
		3	3	22.85	22.92	22.75
		6	0	21.96	21.95	21.93
	16QAM	1	0	21.89	21.90	21.76
		1	2	21.88	21.88	21.90
		1	5	21.74	21.71	21.67
		3	0	21.64	21.85	21.89
		3	2	21.62	21.98	21.84
		3	3	21.85	21.91	21.85
		6	0	20.99	20.88	20.91
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)		
				20415/825.5	20525/836.5	20635/847.5
3MHz	QPSK	1	0	23.03	23.13	23.02
		1	7	23.14	23.22	23.18
		1	14	22.98	23.15	22.96
		8	0	21.88	22.05	21.94
		8	4	21.92	22.03	21.93
		8	7	21.95	22.05	21.86
		15	0	22.05	22.00	21.98
	16QAM	1	0	21.91	21.91	21.78
		1	7	21.91	21.95	21.94
		1	14	21.76	21.75	21.69
		8	0	20.76	20.99	21.02
		8	4	20.72	21.10	20.95
		8	7	20.95	21.03	20.98
		15	0	21.03	20.93	20.93
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)		
				20425/826.5	20525/836.5	20625/846.5
5MHz	QPSK	1	0	23.02	23.09	23.00



		1	13	23.12	23.21	23.15	
		1	24	22.95	23.10	22.92	
		12	0	21.86	22.01	21.91	
		12	6	21.89	21.98	21.89	
		12	13	21.92	22.02	21.82	
		25	0	22.03	21.96	21.93	
	16QAM	1	0	21.86	21.89	21.76	
		1	13	21.89	21.92	21.92	
		1	24	21.73	21.71	21.66	
		12	0	20.73	20.97	20.99	
		12	6	20.69	21.05	20.91	
		12	13	20.93	20.99	20.95	
			25	0	21.00	20.88	20.89
	BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)		
20450/829					20525/836.5	20600/844	
10MHz	QPSK	1	0	22.99	23.05	22.97	
		1	25	23.11	23.17	23.13	
		1	49	22.93	23.09	22.89	
		25	0	21.83	21.96	21.87	
		25	13	21.87	21.94	21.86	
		25	25	21.89	21.97	21.78	
	16QAM	50	0	22.00	21.91	21.89	
		1	0	21.84	21.85	21.71	
		1	25	21.85	21.90	21.88	
		1	49	21.71	21.68	21.64	
		25	0	20.70	20.93	20.96	
		25	13	20.66	21.03	20.88	
		25	25	20.90	20.94	20.91	
			50	0	20.98	20.84	20.86

5.2. Effective Radiated Power

Ambient condition

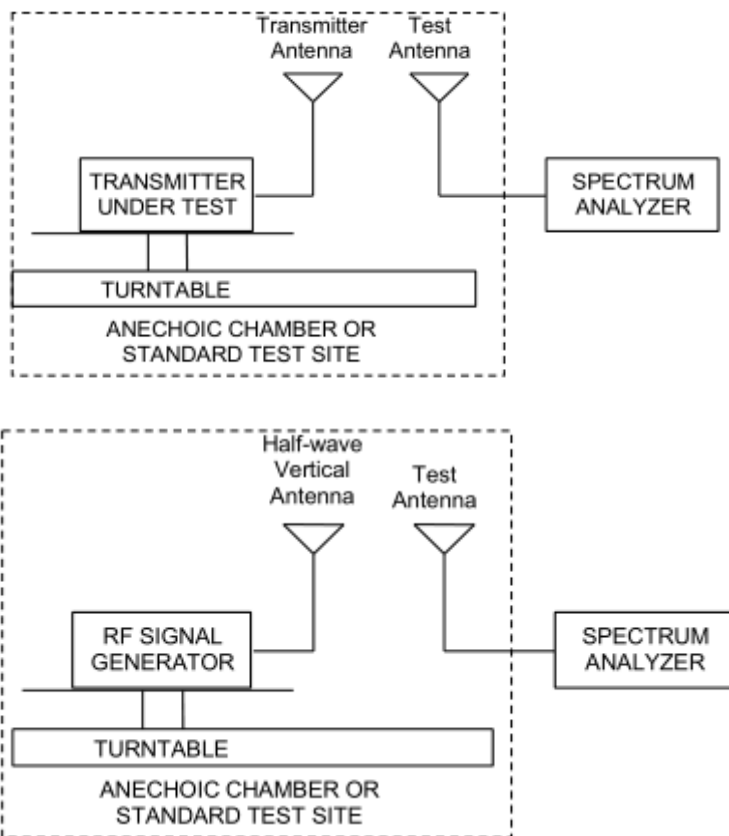
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI/TIA-603-D-2010.

- a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
- b) Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).
- c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.
- d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading. $LOSS = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$
- e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation: $ERP \text{ (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$
- f) The maximum ERP is the maximum value determined in the preceding step.
- g) When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g. transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:
 $ERP \text{ (dBm)} = \text{Output Power (dBm)} - \text{Losses (dB)} + \text{Antenna Gain (dBd)}$
where: dBd refers to gain relative to an ideal dipole.
 $EIRP \text{ (dBm)} = ERP \text{ (dBm)} + 2.15 \text{ (dB.)}$

Test setup



Limits

Rule Part 22.913(a) specifies that "Mobile/portable stations are limited to 7 watts ERP".

Limit	$\leq 7 \text{ W}$ (38.45 dBm)
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 1.19 \text{ dB}$

**Test Results:**

The measurement is performed for both of horizontal and vertical antenna Polarization, and only the data of worst mode is recorded in this report.

Mode	Channel	Frequency (MHz)	Polarization	Output Power (dBm)	Losses (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Conclusion
GSM 850	Low	824.2	Horizontal	-20.48	-45.53	1.06	26.11	38.45	Pass
	Mid	836.6	Horizontal	-20.32	-45.38	1.24	26.31	38.45	Pass
	High	848.8	Horizontal	-20.59	-45.37	1.38	26.16	38.45	Pass
GPRS 850	Low	824.2	Horizontal	-20.18	-45.53	1.06	26.41	38.45	Pass
	Mid	836.6	Horizontal	-19.92	-45.38	1.24	26.71	38.45	Pass
	High	848.8	Horizontal	-20.09	-45.37	1.38	26.66	38.45	Pass
EGPRS 850	Low	824.2	Horizontal	-23.26	-45.53	1.06	23.33	38.45	Pass
	Mid	836.6	Horizontal	-23.23	-45.38	1.24	23.39	38.45	Pass
	High	848.8	Horizontal	-23.95	-45.37	1.38	22.81	38.45	Pass
WCDMA Band V	Low	826.4	Horizontal	-29.54	-45.44	1.13	17.02	38.45	Pass
	Mid	836.6	Horizontal	-29.40	-45.38	1.24	17.22	38.45	Pass
	High	846.6	Horizontal	-29.46	-45.38	1.35	17.27	38.45	Pass



LTE Band 5									
bandwidth	Channel	Frequency (MHz)	Polarization	Output Power (dBm)	Losses (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Conclusion
1.4 MHz (QPSK)	Low	824.7	Horizontal	-32.56	-47.29	1.06	15.79	38.45	Pass
	Mid	836.5	Horizontal	-32.39	-47.15	1.24	16.00	38.45	Pass
	High	848.3	Horizontal	-32.93	-47.48	1.38	15.93	38.45	Pass
3 MHz (QPSK)	Low	825.5	Horizontal	-32.65	-47.26	1.06	15.67	38.45	Pass
	Mid	836.5	Horizontal	-32.57	-47.15	1.24	15.81	38.45	Pass
	High	847.5	Horizontal	-33.14	-47.44	1.38	15.68	38.45	Pass
5 MHz (QPSK)	Low	826.5	Horizontal	-34.70	-47.24	1.13	13.66	38.45	Pass
	Mid	836.5	Horizontal	-34.63	-47.15	1.24	13.76	38.45	Pass
	High	846.5	Horizontal	-35.06	-47.40	1.38	13.72	38.45	Pass
10 MHz (QPSK)	Low	829	Horizontal	-31.38	-47.19	1.13	16.94	38.45	Pass
	Mid	836.5	Horizontal	-31.47	-47.15	1.24	16.92	38.45	Pass
	High	844	Horizontal	-31.44	-47.29	1.33	17.17	38.45	Pass
1.4 MHz (16QAM)	Low	824.7	Horizontal	-32.85	-47.29	1.06	15.51	38.45	Pass
	Mid	836.5	Horizontal	-32.63	-47.15	1.24	15.76	38.45	Pass
	High	848.3	Horizontal	-33.26	-47.48	1.38	15.60	38.45	Pass
3 MHz (16QAM)	Low	825.5	Horizontal	-32.93	-47.26	1.06	15.40	38.45	Pass
	Mid	836.5	Horizontal	-32.89	-47.15	1.24	15.50	38.45	Pass
	High	847.5	Horizontal	-33.48	-47.44	1.38	15.35	38.45	Pass
5 MHz (16QAM)	Low	826.5	Horizontal	-35.02	-47.24	1.13	13.35	38.45	Pass
	Mid	836.5	Horizontal	-34.93	-47.15	1.24	13.46	38.45	Pass
	High	846.5	Horizontal	-35.38	-47.40	1.38	13.40	38.45	Pass
10 MHz (16QAM)	Low	829	Horizontal	-31.72	-47.19	1.13	16.60	38.45	Pass
	Mid	836.5	Horizontal	-31.84	-47.15	1.24	16.55	38.45	Pass
	High	844	Horizontal	-31.76	-47.29	1.33	16.85	38.45	Pass

5.3. Occupied Bandwidth

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.

RBW is set to 3kHz, VBW is set to 10kHz for GSM 850,

RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band V,

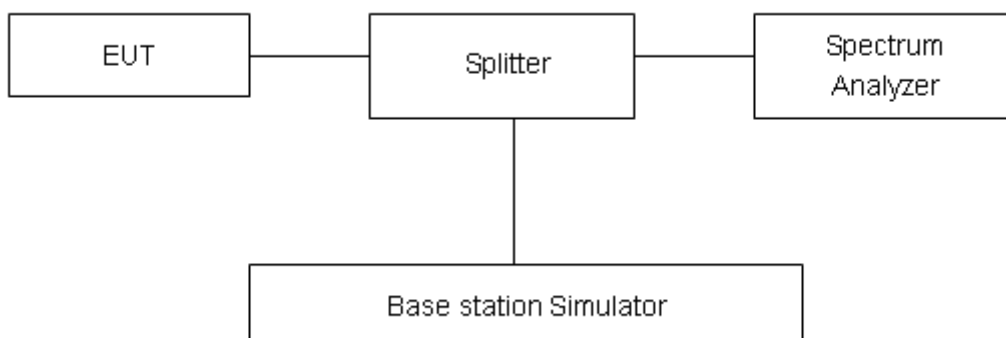
RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 5 (1.4MHz),

RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 5 (3MHz/5MHz),

RBW is set to 300 kHz, VBW is set to 1MHz for LTE Band 5 (10MHz).

99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 624\text{Hz}$.

Test Result

Mode	Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
GSM 850 (GSM)	128	824.2	0.24345	0.3111
	190	836.6	0.24394	0.3009
	251	848.8	0.24232	0.3116
GPRS 850 (GMSK)	128	824.2	0.24622	0.3163
	190	836.6	0.24706	0.3171
	251	848.8	0.24697	0.3176
EGPRS 850 (8-PSK)	128	824.2	0.24421	0.3115
	190	836.6	0.24309	0.3161
	251	848.8	0.24498	0.3124
WCDMA Band V (RMC)	4132	826.4	4.1129	4.672
	4183	836.6	4.1077	4.670
	4233	846.6	4.1288	4.693



LTE Band 5						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	20407	824.7	1.1012	1.253
			20525	836.5	1.1030	1.264
			20643	848.3	1.1024	1.260
		3	20415	825.5	2.7155	2.953
			20525	836.5	2.7149	2.954
			20635	847.5	2.7150	2.954
		5	20425	826.5	4.4726	4.809
			20525	836.5	4.4783	4.793
			20625	846.5	4.4781	4.814
		10	20450	829	9.0037	9.692
			20525	836.5	9.0174	9.703
			20600	844	8.9908	9.696
	16QAM	1.4	20407	824.7	1.1032	1.255
			20525	836.5	1.1016	1.252
			20643	848.3	1.1028	1.257
		3	20415	825.5	2.7158	2.955
			20525	836.5	2.7164	2.954
			20635	847.5	2.7191	2.962
		5	20425	826.5	4.4762	4.792
			20525	836.5	4.4792	4.779
			20625	846.5	4.4792	4.805
		10	20450	829	8.9957	8.699
			20525	836.5	9.0114	9.708
			20600	844	8.9875	9.687

