



RF TEST REPORT

Applicant Huawei Technologies Co., Ltd.
FCC ID QISE3619U-828
Product Huawei Locator
Model E3619U-828
Report No. R1812H0172-R3V1
Issue Date January 25, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2018)/ FCC CFR 47 Part 24E (2018)**. 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 Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Isotropic Radiated power	24.232(c)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	2.1051 /24.238(a)	PASS
5	Peak-to-Average Power Ratio	24.232/KDB 971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 24.235	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 / 24.238(a)	PASS
8	Radiates Spurious Emission	2.1053 / 24.238(a)	PASS
Date of Testing: January 8, 2019 ~ January 15, 2019			
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.

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.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City: Shanghai
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2. General Description of Equipment under Test

Client Information

Applicant	Huawei Technologies Co., Ltd.
Applicant address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.
Manufacturer	Huawei Technologies Co., Ltd.
Manufacturer address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.

General information

EUT Description			
Model	E3619U-828		
IMEI	/		
Hardware Version	IM1E3619UM VER.E		
Software Version	1.0.0.35(H126SP9C00)		
Power Supply	Battery		
Antenna Type	Internal Antenna		
Antenna Gain	GSM1900:-1.5dBi eMTC Band 2: -1.5dBi		
Test Mode(s)	GSM1900; eMTC Band 2;		
Test Modulation	(GSM)GMSK,8PSK; (eMTC)QPSK,16QAM		
GPRS Multislot Class	12		
EGPRS Multislot Class	12		
eMTC Category	M1		
Maximum E.I.R.P	GSM 1900:	31.12dBm	
	eMTC Band 2:	23.62dBm	
Rated Power Supply Voltage	3.82V		
Extreme Voltage	Minimum: 3.45V Maximum: 4.4V		
Extreme Temperature	Lowest: -15℃ Highest: +55℃		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM1900	1850 ~ 1910	1930 ~ 1990
	eMTC Band 2	1850 ~ 1910	1930 ~ 1990
EUT Accessory			
Battery 1	Manufacturer: Amperex Technology Limited Model: HB642735ECW		
Battery 2	Manufacturer: Tianjin Lishen Battery Joint-Stock Co., Ltd Model: HB642735ECW		
USB Cable 1	Manufacturer: HUIZHOU DEHONG TECHNOLOGY CO., LTD		



	17cm, shielded
USB Cable 2	Manufacturer: NINGBO BROAD TELECOMMUNICATION CO.,LTD 17cm, shielded
USB Cable 3	Manufacturer: Luxshare Precision Industry Co., Ltd. 17cm, shielded
EMI suppression Ferrite core	Manufacturer: Prosperity Electronic Co., Limited. Model: A2 RC 103B
Note: 1. The information of the EUT is declared by the manufacturer. 2. There is more than one USB cable, one Battery, each one should be applied throughout the compliance test respectively, and however, only the worst case (USB cable 1/ Battery 1) will be recorded in this report.	



3. Applied Standards

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

FCC CFR47 Part 2 (2018)

FCC CFR 47 Part 24E (2018)

ANSI C63.26 (2015)

KDB 971168 D01 Power Meas License Digital Systems v03r01

4. Test Configuration

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, vertical polarization) and the worst case was recorded.

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

The following testing in GSM/ eMTC 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 1900
RF power output	GPRS EGPRS
Effective Isotropic Radiated power	GPRS(1Tx slot) EGPRS(1Tx slot)
Occupied Bandwidth	GPRS(1Tx slot) EGPRS(1Tx slot)
Band Edge Compliance	GPRS(1Tx slot) EGPRS(1Tx slot)
Peak-to-Average Power Ratio	GPRS(1Tx slot) EGPRS(1Tx slot)
Frequency Stability	GPRS(1Tx slot) EGPRS(1Tx slot)
Spurious Emissions at Antenna Terminals	GPRS(1Tx slot)
Radiates Spurious Emission	GPRS(1Tx slot)

Test modes are chosen to be reported as the worst case configuration below for eMTC Band 2

Test items	Bandwidth (MHz)						Modulation		RB			Test Channel		
	1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF power output	O	O	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	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	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	O	O	O	O	O	O
Conducted Spurious Emissions	O	O	O	O	O	O	O	-	O	-	-	O	O	O
Radiates Spurious Emission	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

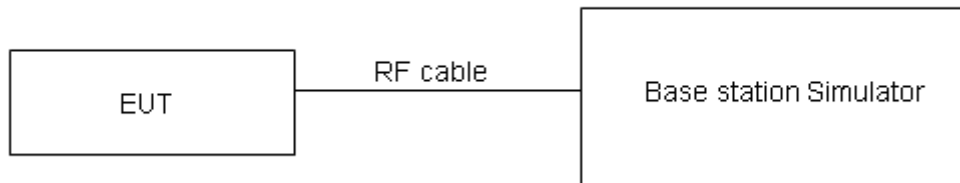
Ambient condition

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 1900		Conducted Power(dBm)		
		Channel 512	Channel 661	Channel 810
		1850.2(MHz)	1880(MHz)	1909.8(MHz)
GPRS/EGPRS (GMSK)	1TXslot	30.10	30.54	30.92
	2TXslots	27.90	27.87	27.97
	3TXslots	25.35	25.85	25.98
	4TXslots	23.27	23.76	23.70
EGPRS (8PSK)	1TXslot	25.89	26.35	26.75
	2TXslots	22.87	23.13	23.74
	3TXslots	20.72	20.91	21.34
	4TXslots	18.81	18.92	19.20

eMTC Band 2	Channel/ Frequency(MHz)	Index	RB# RBstart	Conducted Power (dBm)	
				QPSK	16QAM
1.4MHz	18607/1850.7	0	1#0	23.73	23.28
		0	6#0	21.95	21.92
	18900/1880	0	1#0	23.99	23.36
		0	6#0	22.20	22.21
	19193/1909.3	0	1#5	24.05	23.19
		0	6#0	22.28	22.67
3MHz	18615/1851.5	0	1#0	24.02	22.35
		0	6#0	21.88	22.09
	18900/1880	0	1#0	24.40	22.85
		0	6#0	22.30	22.81
	19185/1908.5	1	1#5	24.39	23.13
		1	6#0	22.41	22.98
5MHz	18625/1852.5	3	1#0	24.14	23.80
		0	6#0	23.00	22.25
	18900/1880	0	1#0	24.32	24.15
		0	6#0	23.23	22.48
	19175/1907.5	0	1#5	24.37	24.22
		3	6#0	23.36	22.44
10MHz	18650/1855	3	1#0	24.07	23.79
		0	4#0	24.34	23.42
	18900/1880	0	1#0	24.32	24.11
		0	4#0	24.42	23.74
	19150/1905	4	1#5	24.43	24.19
		7	4#2	24.36	23.45
15MHz	18675/1857.5	3	1#0	24.09	23.91



	18900/1880	0	6#0	23.99	24.30
		0	1#0	24.39	24.18
		0	6#0	24.37	24.34
	19125/1902.5	8	1#5	24.45	24.19
		11	6#0	24.33	24.43
20MHz	18700/1860	3	1#0	24.41	24.01
		0	6#0	24.13	24.36
	18900/1880	0	1#0	23.95	24.25
		0	6#0	24.44	24.18
	19100/1900	12	1#5	24.47	24.17
		15	6#0	24.30	24.43

5.2. Effective Isotropic Radiated Power

Ambient condition

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

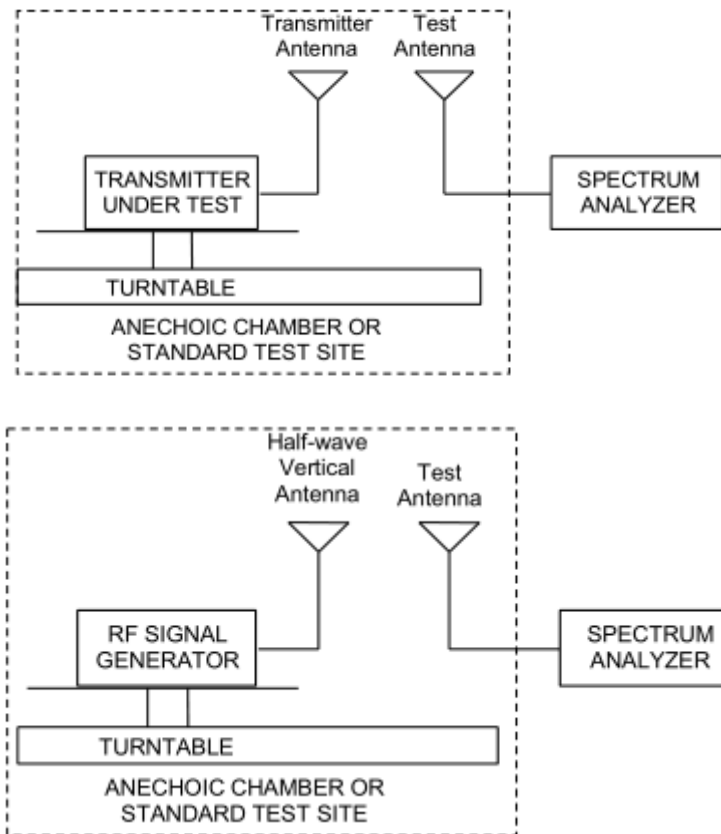
Methods of Measurement

The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI C63.26 (2015).

- 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.
- 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).
- 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.
- 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. $LOSS = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$
- Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation: $ERP \text{ (dBm)} = LVL \text{ (dBm)} + LOSS \text{ (dB)}$
- The maximum ERP is the maximum value determined in the preceding step.
- 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:
 $EIRP \text{ (dBm)} = \text{Output Power (dBm)} - \text{Losses (dB)} + \text{Antenna Gain (dBi)}$
where: dBd refers to gain relative to an ideal dipole.
 $EIRP \text{ (dBm)} = ERP \text{ (dBm)} + 2.15 \text{ (dB.)}$

The RB allocation refers to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 24.232(c) Mobile and portable stations are limited to 2 watts EIRP.

Rule Part 24.232(e) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Limit	$\leq 2 \text{ W}$ (33 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	EIRP (dBm)	Limit (dBm)	Conclusion
GPRS 1900	Low	1850.2	vertical	29.42	33	Pass
	Mid	1880	vertical	31.12	33	Pass
	High	1909.8	vertical	30.88	33	Pass
EGPRS 1900	Low	1850.2	vertical	26.49	33	Pass
	Mid	1880	vertical	28.02	33	Pass
	High	1909.8	vertical	27.71	33	Pass

eMTC Band 2							
Band width	Channel/ Frequency(MHz)	Polarization	RB	Index	EIRP (dBm)	Limit (dBm)	Conclusion
1.4 MHz (QPSK)	18607/1850.7	vertical	1#0	0	21.00	33	Pass
	18900/1880	vertical	1#2	0	23.07	33	Pass
	19193/1909.3	vertical	1#5	0	23.27	33	Pass
3 MHz (QPSK)	18615/1851.5	vertical	1#0	0	21.19	33	Pass
	18900/1880	vertical	1#5	0	22.84	33	Pass
	19185/1908.5	vertical	1#5	1	23.21	33	Pass
5 MHz (QPSK)	18625/1852.5	vertical	1#0	0	21.35	33	Pass
	18900/1880	vertical	1#5	1	22.76	33	Pass
	19175/1907.5	vertical	1#5	3	23.62	33	Pass
10 MHz (QPSK)	18650/1855	vertical	4#0	0	21.54	33	Pass
	18900/1880	vertical	4#2	3	22.71	33	Pass
	19150/1905	vertical	4#2	7	23.35	33	Pass
15 MHz (QPSK)	18675/1857.5	vertical	1#0	0	21.09	33	Pass
	18900/1880	vertical	1#5	5	22.76	33	Pass
	19125/1902.5	vertical	1#5	11	22.84	33	Pass
20 MHz (QPSK)	18700/1860	vertical	6#0	0	21.33	33	Pass
	18900/1880	vertical	6#0	7	22.13	33	Pass
	19100/1900	vertical	6#0	15	22.30	33	Pass
1.4 MHz (16QAM)	18607/1850.7	vertical	1#0	0	20.56	33	Pass
	18900/1880	vertical	1#2	0	22.64	33	Pass
	19193/1909.3	vertical	1#5	0	22.71	33	Pass
3 MHz (16QAM)	18615/1851.5	vertical	1#0	0	20.68	33	Pass
	18900/1880	vertical	1#5	0	22.29	33	Pass
	19185/1908.5	vertical	1#5	1	22.65	33	Pass
5 MHz	18625/1852.5	vertical	1#0	0	20.94	33	Pass



(16QAM)	18900/1880	vertical	1#5	1	22.19	33	Pass
	19175/1907.5	vertical	1#5	3	23.01	33	Pass
10 MHz (16QAM)	18650/1855	vertical	4#0	0	21.04	33	Pass
	18900/1880	vertical	4#2	3	22.29	33	Pass
	19150/1905	vertical	4#2	7	22.79	33	Pass
15 MHz (16QAM)	18675/1857.5	vertical	1#0	0	20.67	33	Pass
	18900/1880	vertical	1#5	5	22.36	33	Pass
	19125/1902.5	vertical	1#5	11	22.21	33	Pass
20 MHz (16QAM)	18700/1860	vertical	6#0	0	20.84	33	Pass
	18900/1880	vertical	6#0	7	21.99	33	Pass
	19100/1900	vertical	6#0	15	21.87	33	Pass

5.3.Occupied Bandwidth

Ambient condition

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

Method of Measurement

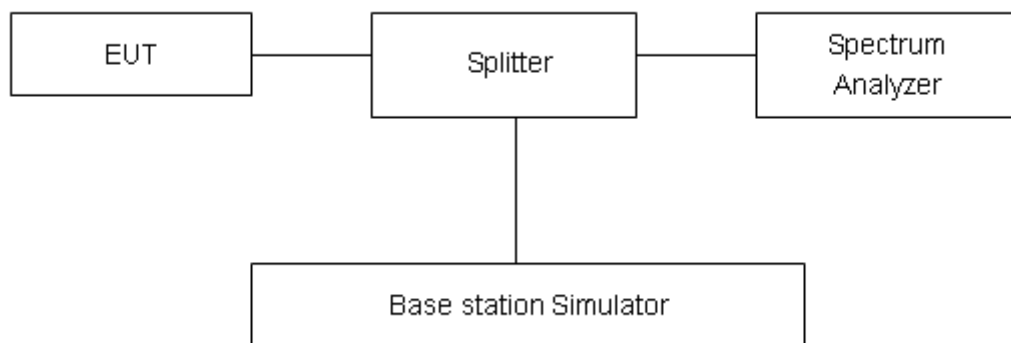
The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.

RBW is set to 3kHz, VBW is set to 10kHz for GSM 1900,

RBW is set to 51kHz, VBW is set to 160kHz for eMTC Band 2

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)
GPRS 1900 (GMSK)	512	1850.2	0.2457	0.3076
	661	1880.0	0.2457	0.3185
	810	1909.8	0.2449	0.3088
EGPRS 1900 (8-PSK)	512	1850.2	0.2443	0.3030
	661	1880.0	0.2472	0.3018
	810	1909.8	0.2429	0.3112

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	RB	Index	Bandwidth(MHz)	
						99% Power	-26dBc
eMTC Band 2	1.4MHz	QPSK	18900/1880	6#0	0	1.1097	1.332
		16QAM	18900/1880	6#0	0	0.9497	1.258
	3MHz	QPSK	18900/1880	6#0	0	1.1711	1.959
		16QAM	18900/1880	6#0	0	0.9850	1.352
	5MHz	QPSK	18900/1880	6#0	0	1.1863	2.091
		16QAM	18900/1880	6#0	0	1.0529	1.608
	10MHz	QPSK	18900/1880	6#0	0	1.1955	2.052
		16QAM	18900/1880	6#0	0	1.1038	1.875
	15MHz	QPSK	18900/1880	6#0	0	1.2337	2.041
		16QAM	18900/1880	6#0	0	1.1671	2.125
	20MHz	QPSK	18900/1880	6#0	0	1.2678	1.979
		16QAM	18900/1880	6#0	0	1.2377	2.112



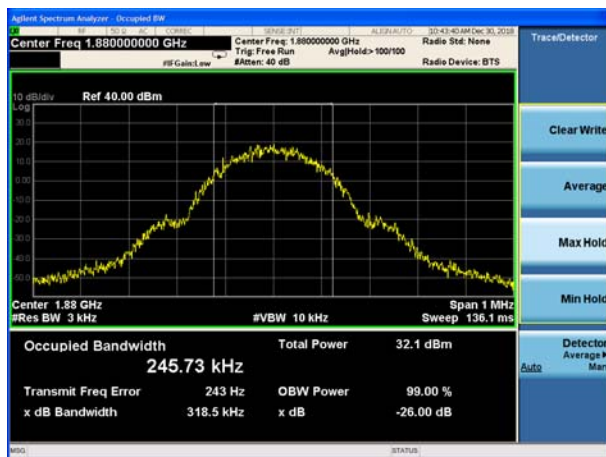
GSM1900 GPRS CH-Low



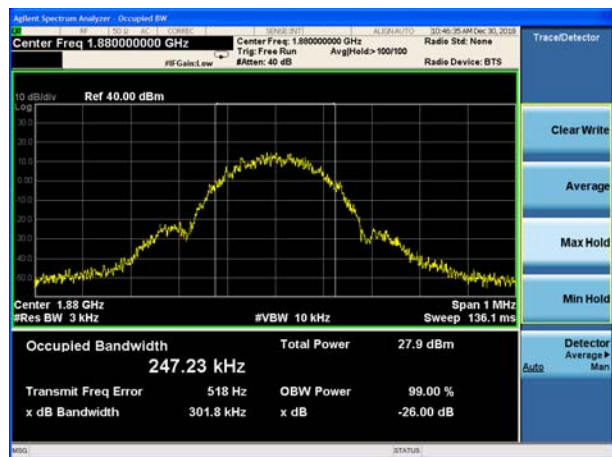
GSM1900 EGPRS CH-Low



GSM 1900 GPRS CH-Middle



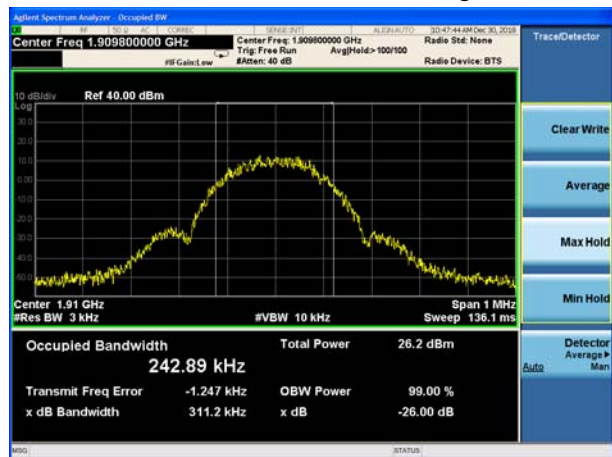
GSM 1900 EGPRS CH-Middle



GSM 1900 GPRS CH-High



GSM 1900 EGPRS CH-High



eMTC Band 2 1.4MHz QPSK CH-Middle



eMTC Band 2 3MHz QPSK CH-Middle



eMTC Band 2 5MHz QPSK CH-Middle



eMTC Band 2 10MHz QPSK CH-Middle



eMTC Band 2 15MHz QPSK CH-Middle



eMTC Band 2 20MHz QPSK CH-Middle





eMTC Band 2 1.4MHz 16QAM CH-Middle



eMTC Band 2 3MHz 16QAM CH-Middle



eMTC Band 2 5MHz 16QAM CH-Middle



eMTC Band 2 10MHz 16QAM CH-Middle



eMTC Band 2 15MHz 16QAM CH-Middle



eMTC Band 2 20MHz 16QAM CH-Middle



5.4. Band Edge Compliance

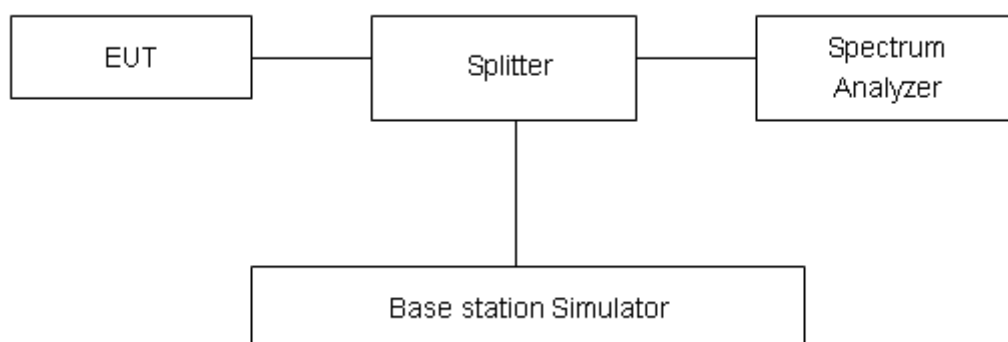
Ambient condition

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 band edge of the lowest and highest channels were measured. The Average detector is used and RBW is set to 3kHz, VBW is set to 10kHz for GSM 1900, RBW is set to 51kHz, VBW is set to 160kHz for eMTC Band 2. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee’s frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10} (P)$ dB.”

Limit	-13 dBm
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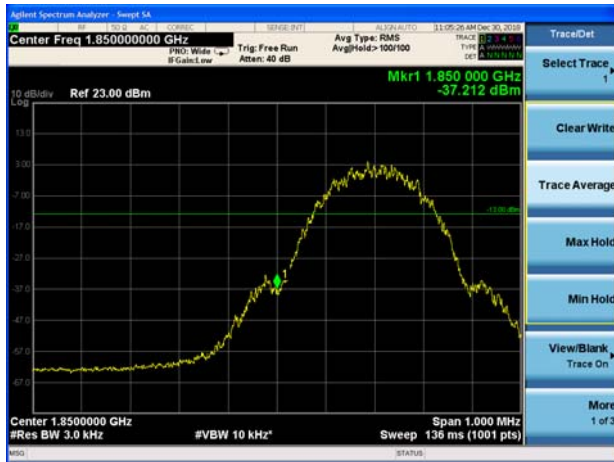
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U=0.684\text{dB}$.

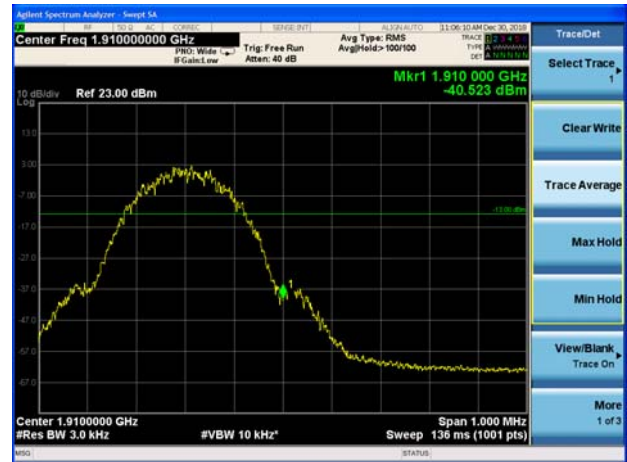


Test Result:

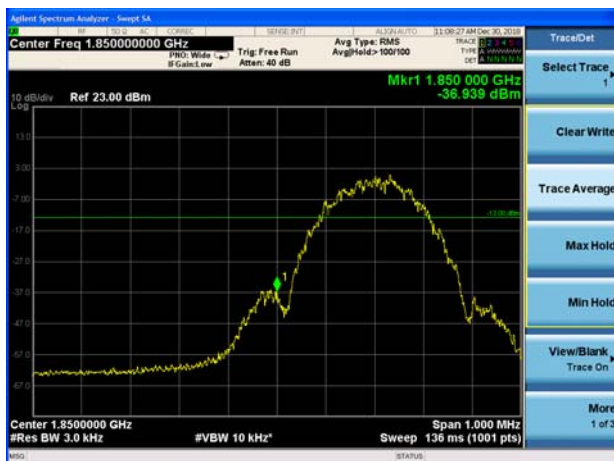
GSM1900 GPRS CH-Low



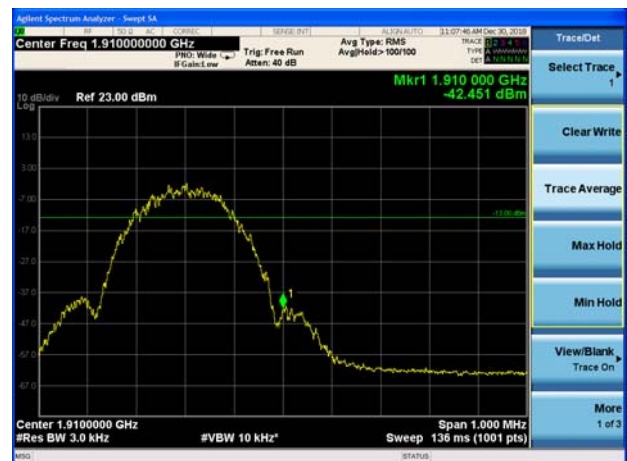
GSM 1900 GPRS CH-High



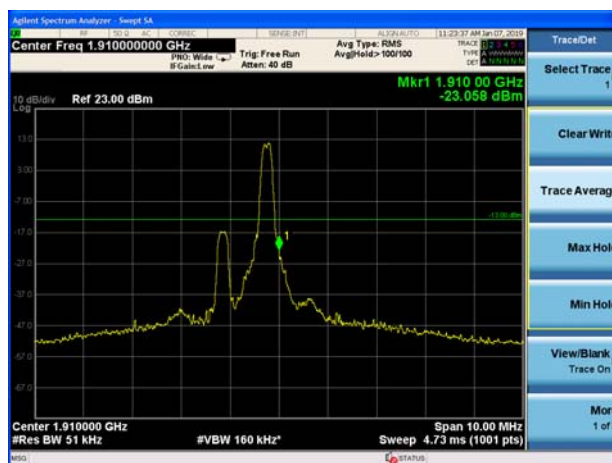
GSM1900 EGPRS CH-Low



GSM 1900 EGPRS CH-High



eMTC Band 2 1.4MHz QPSK 1RB CH-High



eMTC Band 2 1.4MHz QPSK 100%RB CH-High



eMTC Band 2 3MHz QPSK 1RB CH-High



eMTC Band 2 3MHz QPSK 100%RB CH-Low



eMTC Band 2 3MHz QPSK 100%RB CH-High



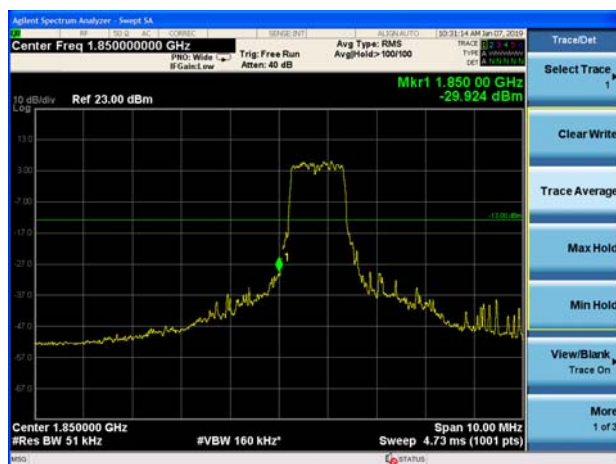
eMTC Band 2 5MHz QPSK 1RB CH-Low



eMTC Band 2 5MHz QPSK 1RB CH-High



eMTC Band 2 5MHz QPSK 100%RB CH-Low



eMTC Band 2 5MHz QPSK 100%RB CH-High



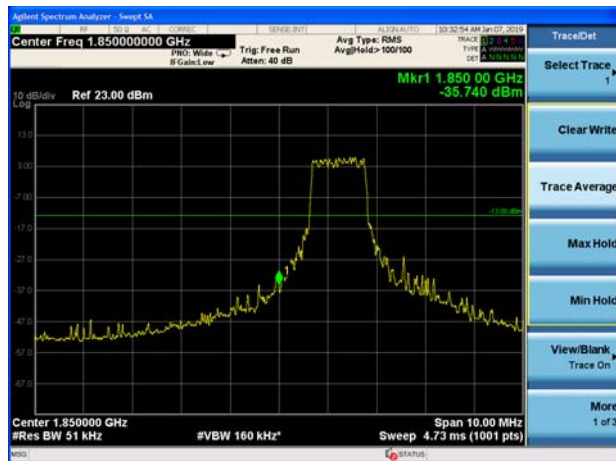
eMTC Band 2 10MHz QPSK 1RB CH-Low



eMTC Band 2 10MHz QPSK 1RB CH-High



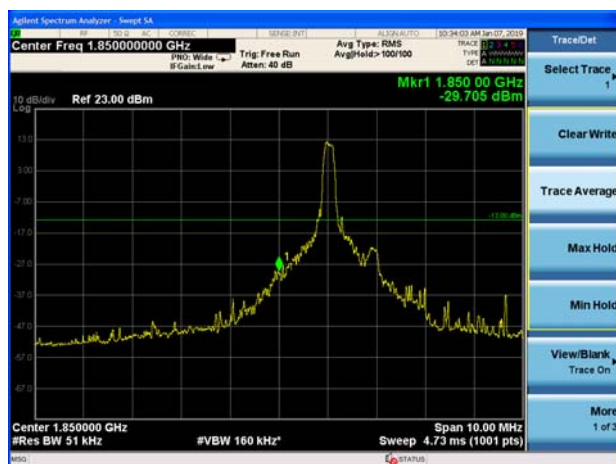
eMTC Band 2 10MHz QPSK 100%RB CH-Low



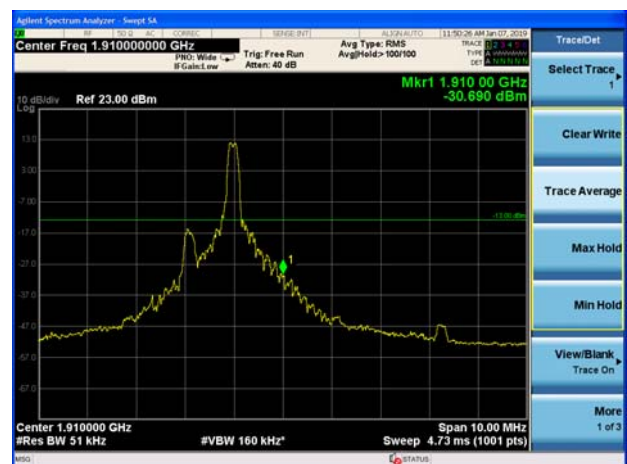
eMTC Band 2 10MHz QPSK 100%RB CH-High



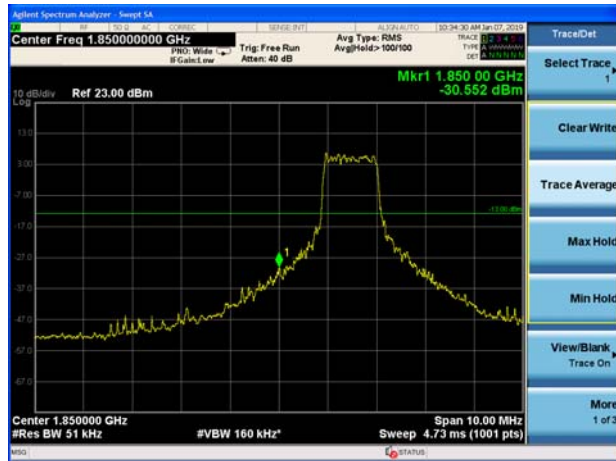
eMTC Band 2 15MHz QPSK 1RB CH-Low



eMTC Band 2 15MHz QPSK 1RB CH-High



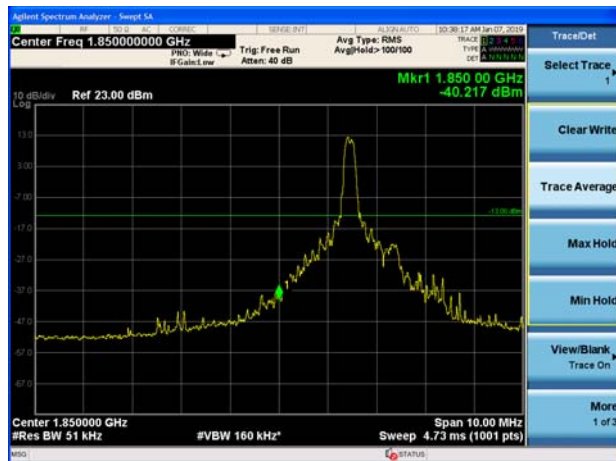
eMTC Band 2 15MHz QPSK 100%RB CH-Low



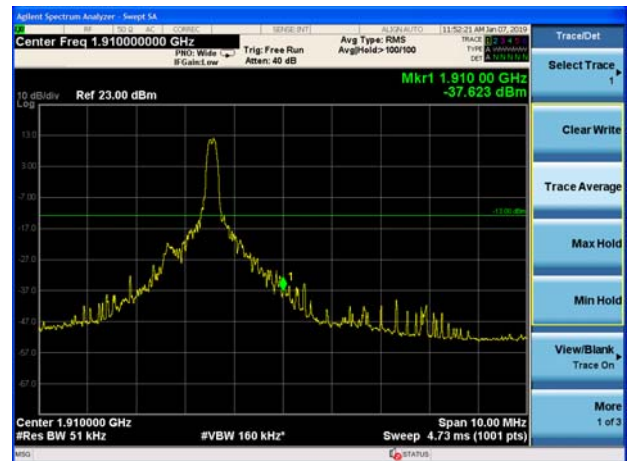
eMTC Band 2 15MHz QPSK 100%RB CH-High



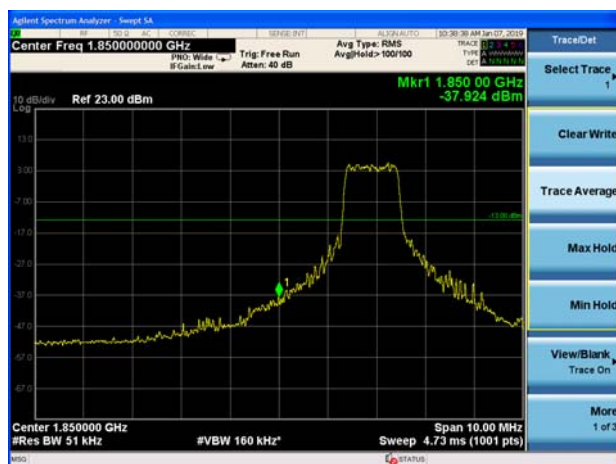
eMTC Band 2 20MHz QPSK 1RB CH-Low



eMTC Band 2 20MHz QPSK 1RB CH-High



eMTC Band 2 20MHz QPSK 100%RB CH-Low



eMTC Band 2 20MHz QPSK 100%RB CH-High



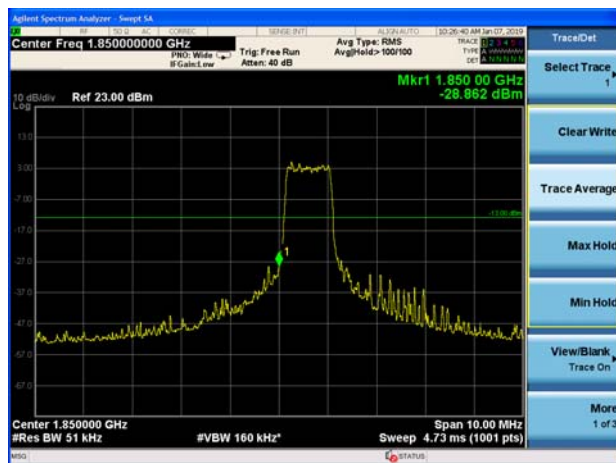
eMTC Band 2 1.4MHz 16QAM 1RB CH-Low



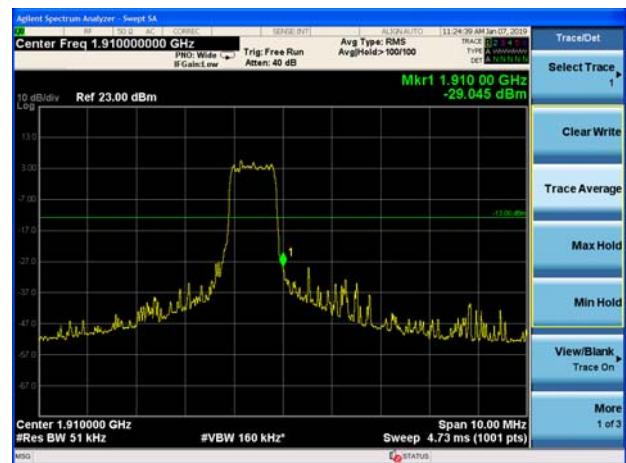
eMTC Band 2 1.4MHz 16QAM 1RB CH-High



eMTC Band 2 1.4MHz 16QAM 100%RB CH-Low



eMTC Band 2 1.4MHz 16QAM 100%RB CH-High



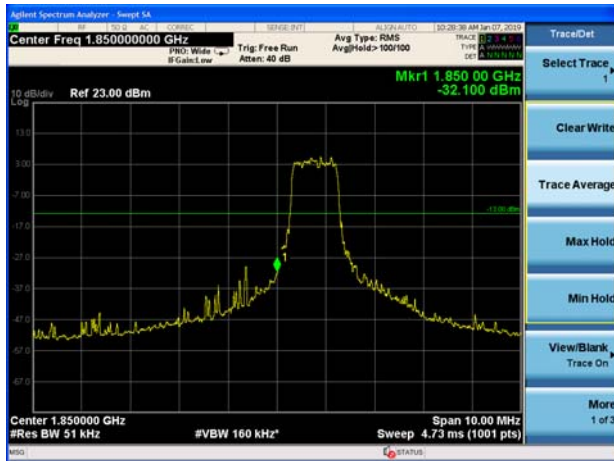
eMTC Band 2 3MHz 16QAM 1RB CH-Low



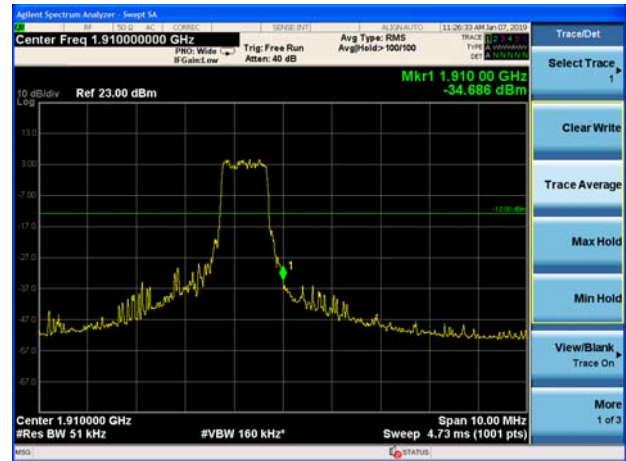
eMTC Band 2 3MHz 16QAM 1RB CH-High



eMTC Band 2 3MHz 16QAM 100%RB CH-Low



eMTC Band 2 3MHz 16QAM 100%RB CH-High



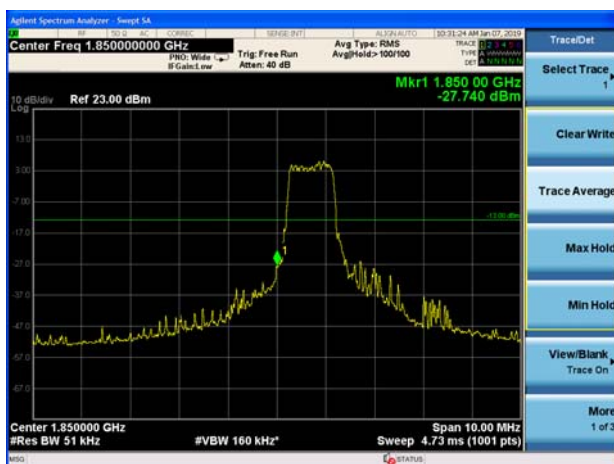
eMTC Band 2 5MHz 16QAM 1RB CH-Low



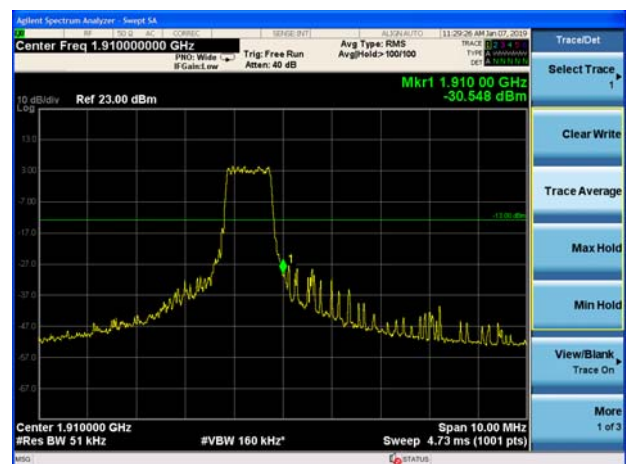
eMTC Band 2 5MHz 16QAM 1RB CH-High



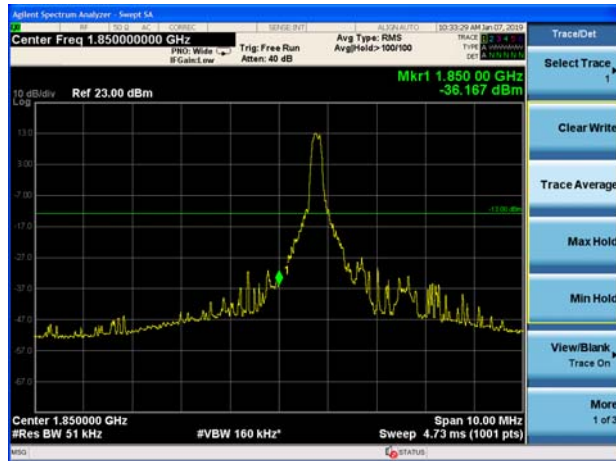
eMTC Band 2 5MHz 16QAM 100%RB CH-Low



eMTC Band 2 5MHz 16QAM 100%RB CH-High



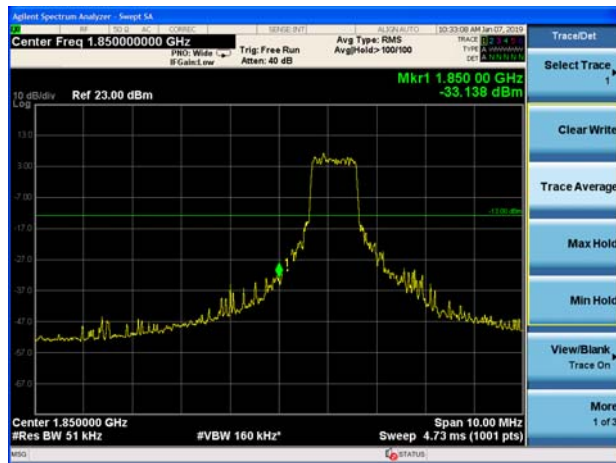
eMTC Band 2 10MHz 16QAM 1RB CH-Low



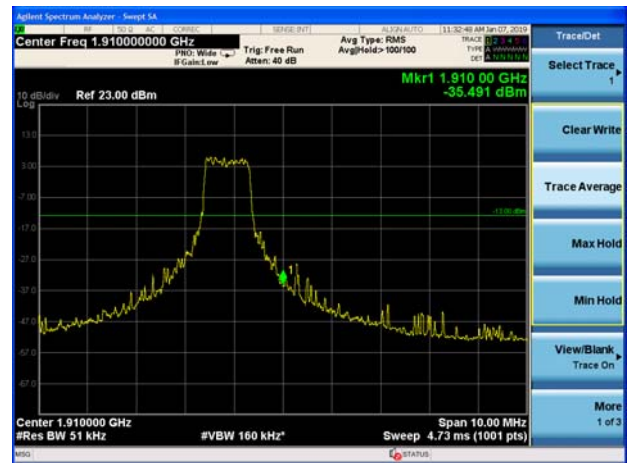
eMTC Band 2 10MHz 16QAM 1RB CH-High



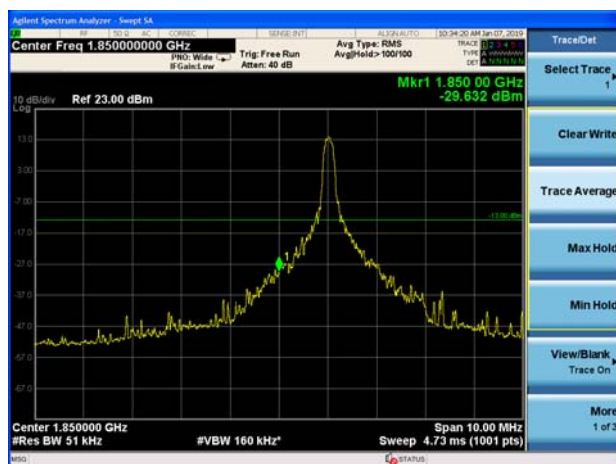
eMTC Band 2 10MHz 16QAM 100%RB CH-Low



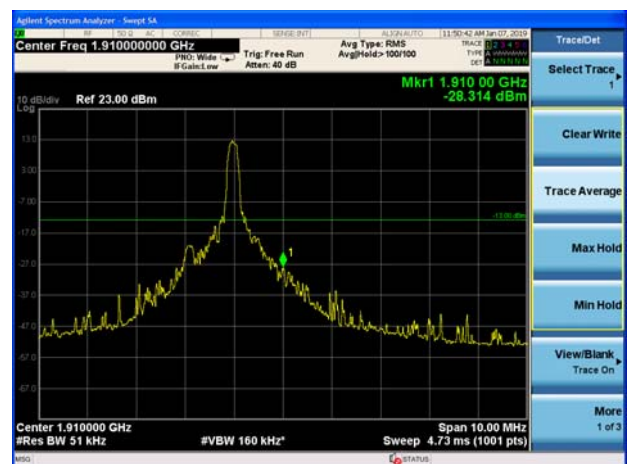
eMTC Band 2 10MHz 16QAM 100%RB CH-High



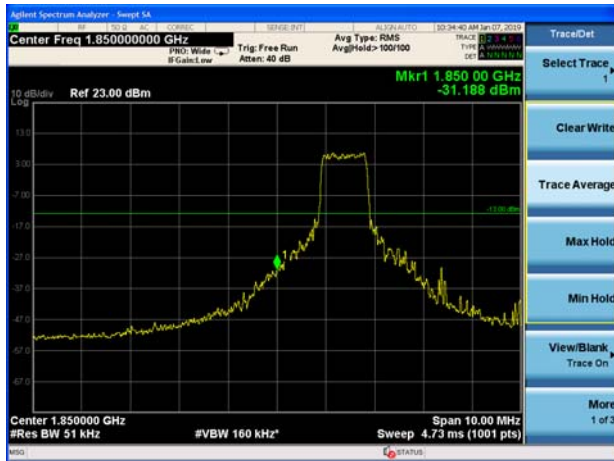
eMTC Band 2 15MHz 16QAM 1RB CH-Low



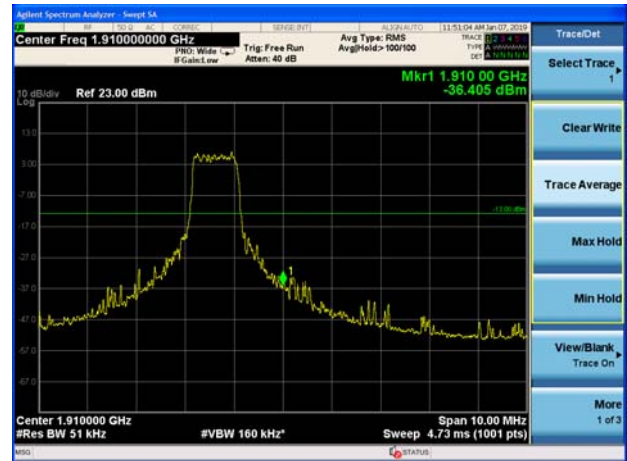
eMTC Band 2 15MHz 16QAM 1RB CH-High



eMTC Band 2 15MHz 16QAM 100%RB CH-Low



eMTC Band 2 15MHz 16QAM 100%RB CH-High



eMTC Band 2 20MHz 16QAM 1RB CH-Low



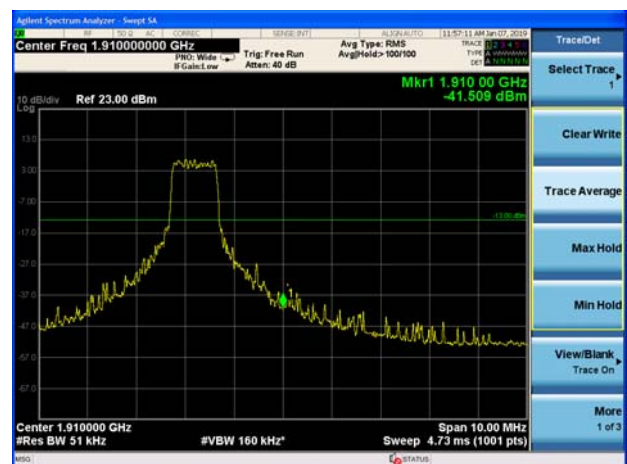
eMTC Band 2 20MHz 16QAM 1RB CH-High



eMTC Band 2 20MHz 16QAM 100%RB CH-Low



eMTC Band 2 20MHz 16QAM 100%RB CH-High



5.5. Peak-to-Average Power Ratio (PAPR)

Ambient condition

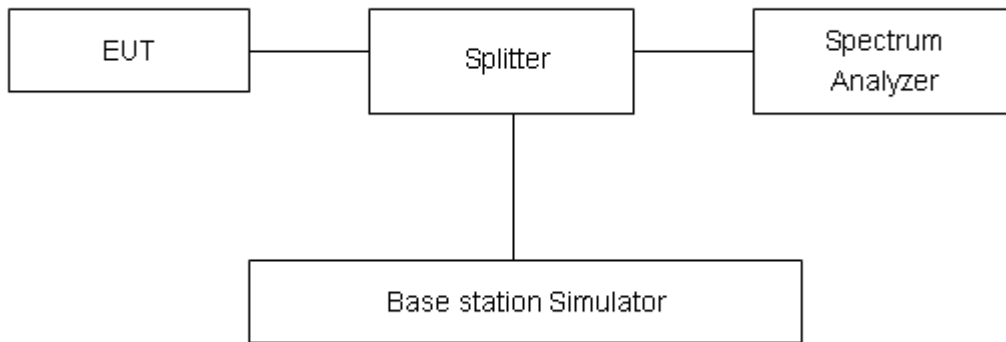
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Measure the total peak power and record as PPk. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$PAPR (dB) = PPk (dBm) - PAvg (dBm)$.

Test Setup



Limits

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB in 24.232(d).

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

Mode	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit(dB)	Conclusion
GPRS 1900 (GMSK)	512	1850.2	27.09	26.12	0.97	≤13	PASS
	661	1880	27.02	26.01	1.01	≤13	PASS
	810	1909.8	26.91	25.97	0.94	≤13	PASS
EGPRS 1900 (8-PSK)	512	1850.2	24.35	23.34	1.01	≤13	PASS
	661	1880	24.22	23.27	0.95	≤13	PASS
	810	1909.8	24.09	23.11	0.98	≤13	PASS

Mode	Bandwidth	Modulation	Channel/ Frequency (MHz)	Peak-to-Average Power Ratio (PAPR)			Limit (dB)	Conclusion
				Peak (dBm)	Avg (dBm)	PAPR (dB)		
eMTC Band 2	1.4MHz	QPSK	18900/1880	27.71	17.68	10.03	≤13	PASS
		16QAM	18900/1880	28.73	18.63	10.10	≤13	PASS
	3MHz	QPSK	18900/1880	27.69	17.87	9.82	≤13	PASS
		16QAM	18900/1880	28.78	18.58	10.20	≤13	PASS
	5MHz	QPSK	18900/1880	27.89	17.96	9.93	≤13	PASS
		16QAM	18900/1880	28.89	18.57	10.32	≤13	PASS
	10MHz	QPSK	18900/1880	27.62	17.57	10.05	≤13	PASS
		16QAM	18900/1880	28.77	18.97	9.80	≤13	PASS
	15MHz	QPSK	18900/1880	27.82	18.24	9.58	≤13	PASS
		16QAM	18900/1880	28.89	18.12	10.77	≤13	PASS
	20MHz	QPSK	18900/1880	27.73	16.75	10.98	≤13	PASS
		16QAM	18900/1880	28.89	18.30	10.59	≤13	PASS

5.6.Frequency Stability

Ambient condition

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

Method of Measurement

Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -30°C to +55°C in 10°C step size,

(1) With all power removed, the temperature was decreased to 0°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -30°C to +55°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

Frequency Stability (Voltage Variation)

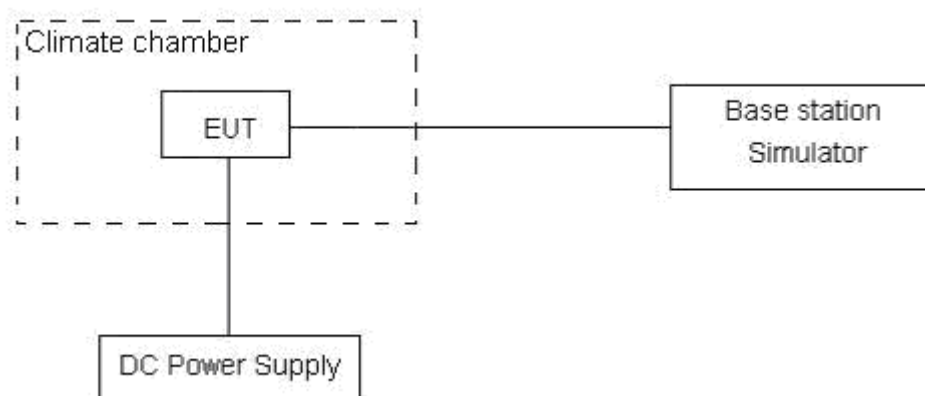
The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

This transceiver is specified to operate with an input voltage of between 3.45 V and 4.4 V, with a nominal voltage of 3.82V.

Test setup



Limits

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 3$, $U = 0.01\text{ppm}$.



Test Result

GPRS 1900					
Condition		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal (25°C)	Normal	1850.0604	1909.9436	24.83	0.01321
Extreme (55°C)		1850.0592	1909.9424	23.47	0.01248
Extreme (50°C)		1850.0591	1909.9423	20.16	0.01072
Extreme (40°C)		1850.0601	1909.9433	19.26	0.01024
Extreme (30°C)		1850.0592	1909.9424	20.33	0.01081
Extreme (20°C)		1850.0600	1909.9432	21.64	0.01151
Extreme (10C)		1850.0593	1909.9425	23.75	0.01263
Extreme (0°C)		1850.0599	1909.9431	17.94	0.00954
Extreme (-10°C)		1850.0594	1909.9426	19.62	0.01044
Extreme (-20°C)		1850.0598	1909.9430	21.85	0.01162
Extreme (-30°C)		1850.0595	1909.9427	18.31	0.00974
25°C	LV	1850.0596	1909.9428	19.58	0.01041
	HV	1850.0605	1909.9437	20.67	0.01099
EGPRS 1900					
Condition		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal (25°C)	Normal	1850.0652	1909.9298	22.31	0.01187
Extreme (55°C)		1850.0640	1909.9286	23.74	0.01263
Extreme (50°C)		1850.0639	1909.9285	24.49	0.01303
Extreme (40°C)		1850.0649	1909.9295	20.16	0.01072
Extreme (30°C)		1850.0640	1909.9286	19.35	0.01029
Extreme (20°C)		1850.0648	1909.9294	17.56	0.00934
Extreme (10C)		1850.0641	1909.9287	24.33	0.01294
Extreme (0°C)		1850.0647	1909.9293	21.90	0.01165
Extreme (-10°C)		1850.0642	1909.9288	20.43	0.01087
Extreme (-20°C)		1850.0646	1909.9292	19.48	0.01036
Extreme (-30°C)		1850.0643	1909.9289	23.21	0.01235
25°C	LV	1850.0644	1909.9290	18.97	0.01009
	HV	1850.0653	1909.9299	20.86	0.01110

eMTC Band 2						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	1.4MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	15.74	5.34	0.00837	0.00284	PASS
Extreme (55℃)		5.72	5.13	0.00304	0.00273	PASS
Extreme (50℃)		9.79	4.55	0.00521	0.00242	PASS
Extreme (40℃)		2.45	11.24	0.00130	0.00598	PASS
Extreme (30℃)		6.84	15.28	0.00364	0.00813	PASS
Extreme (20℃)		15.57	6.51	0.00828	0.00346	PASS
Extreme (10℃)		5.42	16.16	0.00288	0.00860	PASS
Extreme (0℃)		3.79	6.80	0.00202	0.00362	PASS
Extreme (-10℃)		4.02	10.91	0.00214	0.00580	PASS
Extreme (-20℃)		17.29	13.08	0.00920	0.00696	PASS
Extreme (-30℃)		13.00	7.68	0.00692	0.00408	PASS
25℃	LV	5.38	1.43	0.00286	0.00076	PASS
	HV	10.19	4.16	0.00542	0.00221	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	3MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	13.39	4.76	0.00712	0.00253	PASS
Extreme (55℃)		13.75	11.45	0.00731	0.00609	PASS
Extreme (50℃)		8.05	11.28	0.00428	0.00600	PASS
Extreme (40℃)		16.31	1.84	0.00868	0.00098	PASS
Extreme (30℃)		12.91	16.49	0.00687	0.00877	PASS
Extreme (20℃)		3.46	11.12	0.00184	0.00591	PASS
Extreme (10℃)		15.76	11.10	0.00838	0.00591	PASS
Extreme (0℃)		7.25	13.81	0.00386	0.00735	PASS
Extreme (-10℃)		16.29	1.55	0.00866	0.00083	PASS
Extreme (-20℃)		11.70	7.77	0.00623	0.00414	PASS
Extreme (-30℃)		5.46	17.94	0.00290	0.00954	PASS
25℃	LV	2.33	13.95	0.00124	0.00742	PASS
	HV	4.23	10.92	0.00225	0.00581	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	5MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	11.82	2.73	0.00628	0.00145	PASS



Extreme (55℃)		15.70	1.18	0.00835	0.00063	PASS
Extreme (50℃)		17.22	4.10	0.00916	0.00218	PASS
Extreme (40℃)		2.26	9.05	0.00120	0.00481	PASS
Extreme (30℃)		12.43	2.25	0.00661	0.00120	PASS
Extreme (20℃)		13.23	16.34	0.00704	0.00869	PASS
Extreme (10℃)		10.45	10.78	0.00556	0.00574	PASS
Extreme (0℃)		17.92	8.35	0.00953	0.00444	PASS
Extreme (-10℃)		14.13	13.23	0.00752	0.00704	PASS
Extreme (-20℃)		5.46	16.66	0.00290	0.00886	PASS
Extreme (-30℃)		11.95	11.40	0.00636	0.00606	PASS
25℃	LV	6.42	13.65	0.00341	0.00726	PASS
	HV	6.22	3.04	0.00331	0.00162	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	10MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	8.75	17.95	0.00465	0.00955	PASS
Extreme (55℃)		4.34	5.62	0.00231	0.00299	PASS
Extreme (50℃)		8.04	2.31	0.00428	0.00123	PASS
Extreme (40℃)		3.10	15.36	0.00165	0.00817	PASS
Extreme (30℃)		6.73	9.00	0.00358	0.00478	PASS
Extreme (20℃)		4.57	9.86	0.00243	0.00524	PASS
Extreme (10℃)		8.25	3.08	0.00439	0.00164	PASS
Extreme (0℃)		7.41	8.41	0.00394	0.00447	PASS
Extreme (-10℃)		17.11	12.05	0.00910	0.00641	PASS
Extreme (-20℃)		14.04	17.66	0.00747	0.00939	PASS
Extreme (-30℃)		14.57	9.29	0.00775	0.00494	PASS
25℃	LV	15.40	5.46	0.00819	0.00291	PASS
	HV	11.65	2.87	0.00620	0.00153	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	15MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	1.75	12.06	0.00093	0.00642	PASS
Extreme (55℃)		17.66	17.08	0.00939	0.00908	PASS
Extreme (50℃)		11.10	16.61	0.00590	0.00884	PASS
Extreme (40℃)		10.62	5.64	0.00565	0.00300	PASS
Extreme (30℃)		15.88	9.51	0.00845	0.00506	PASS
Extreme (20℃)		1.59	9.69	0.00084	0.00516	PASS
Extreme (10℃)		7.74	10.04	0.00412	0.00534	PASS
Extreme (0℃)		13.61	16.15	0.00724	0.00859	PASS
Extreme (-10℃)		3.91	17.81	0.00208	0.00947	PASS



Extreme (-20℃)		8.68	8.93	0.00461	0.00475	PASS
Extreme (-30℃)		5.16	3.38	0.00274	0.00180	PASS
25℃	LV	8.74	10.86	0.00465	0.00578	PASS
	HV	10.96	9.51	0.00583	0.00506	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	20MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	9.37	3.20	0.00498	0.00170	PASS
Extreme (55℃)		8.61	13.93	0.00458	0.00741	PASS
Extreme (50℃)		12.33	8.03	0.00656	0.00427	PASS
Extreme (40℃)		3.13	1.93	0.00167	0.00102	PASS
Extreme (30℃)		8.37	9.18	0.00445	0.00488	PASS
Extreme (20℃)		9.27	2.00	0.00493	0.00107	PASS
Extreme (10℃)		6.89	6.42	0.00366	0.00341	PASS
Extreme (0℃)		10.48	4.37	0.00558	0.00232	PASS
Extreme (-10℃)		10.64	6.04	0.00566	0.00322	PASS
Extreme (-20℃)		4.94	2.69	0.00263	0.00143	PASS
Extreme (-30℃)		16.61	1.98	0.00883	0.00105	PASS
25℃	LV	12.25	13.92	0.00652	0.00740	PASS
	HV	17.52	14.01	0.00932	0.00745	PASS

5.7. Spurious Emissions at Antenna Terminals

Ambient condition

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

Method of Measurement

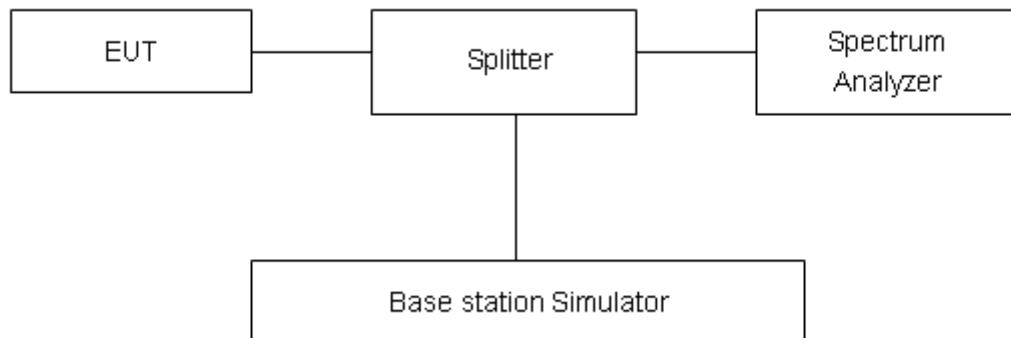
The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier. The peak detector is used.

RBW is set to 100kHz, VBW is set to 300kHz for 30MHz~1GHz

RBW is set to 1MHz, VBW is set to 3MHz for above 1GHz, Sweep is set to ATUO.

The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10} (P)$ dB.”

Limit	-13 dBm
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

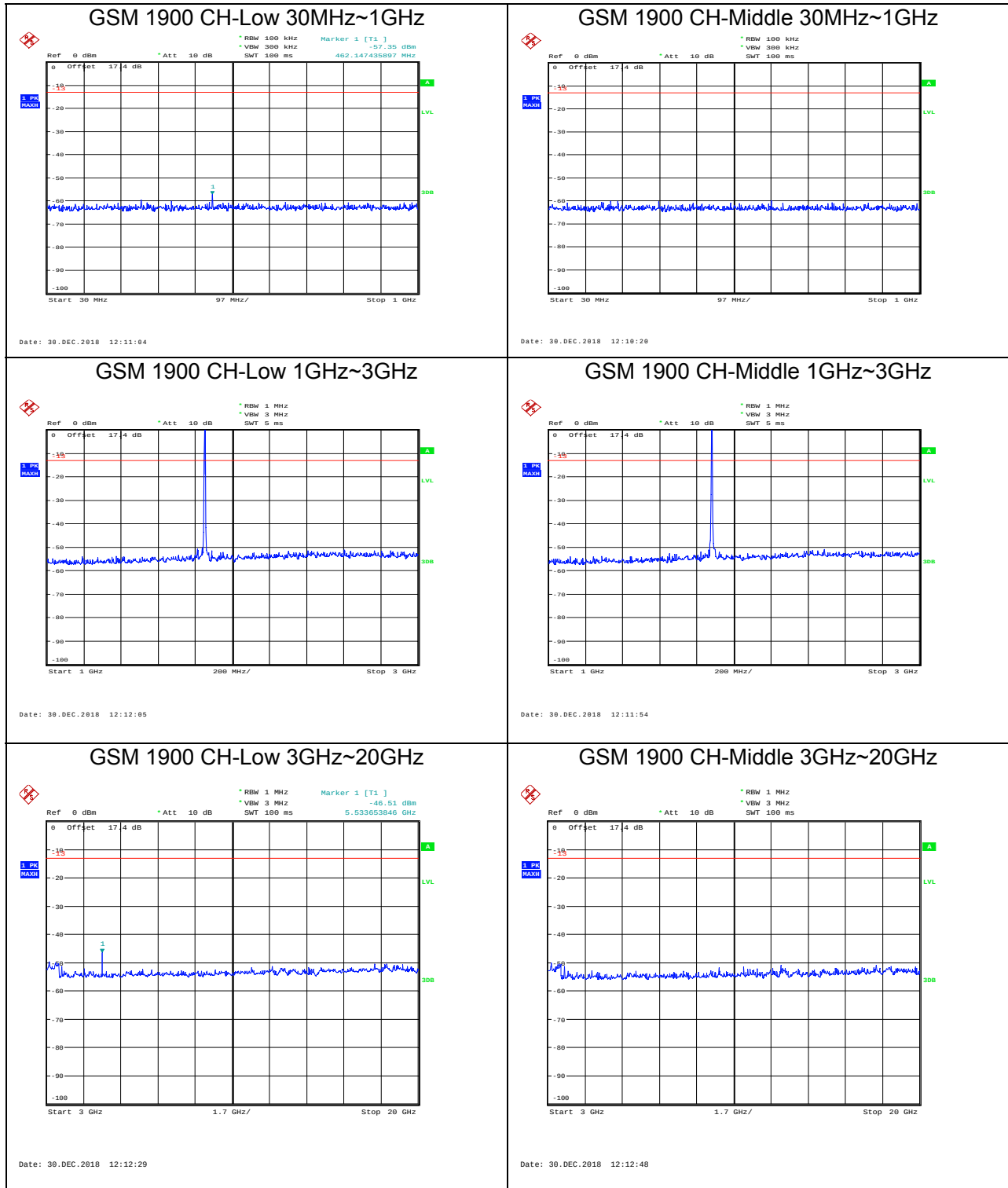
Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-20GHz	1.407 dB



Test Result

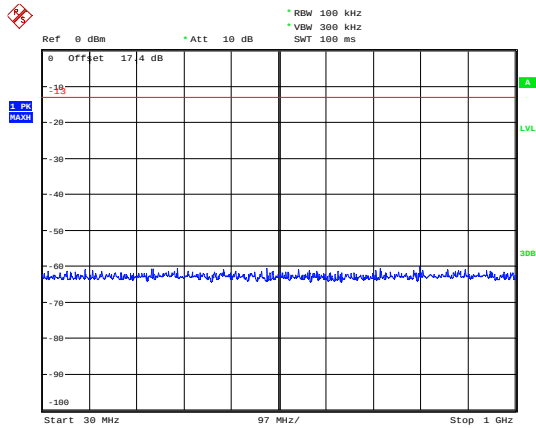
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

The signal beyond the limit is carrier.



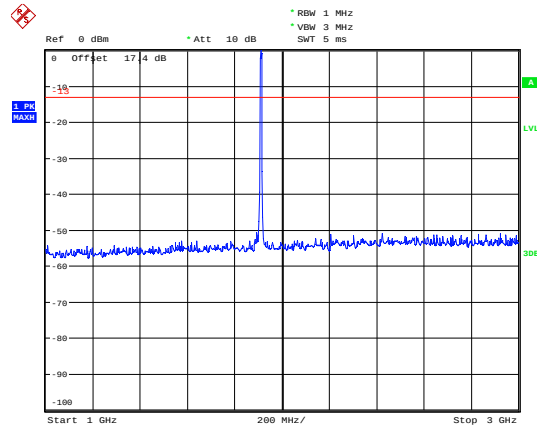


GSM 1900 CH-High 30MHz~1GHz



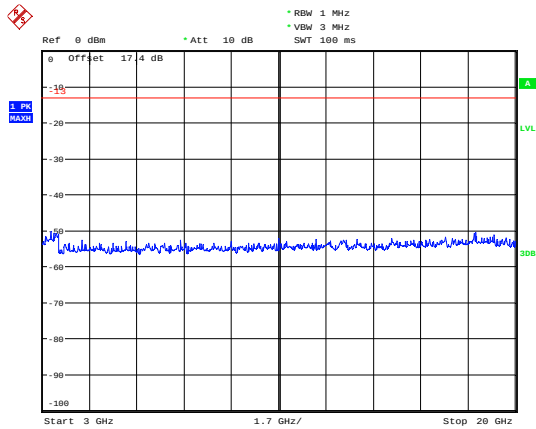
Date: 30.DEC.2018 12:11:18

GSM 1900 CH-High 1GHz~3GHz



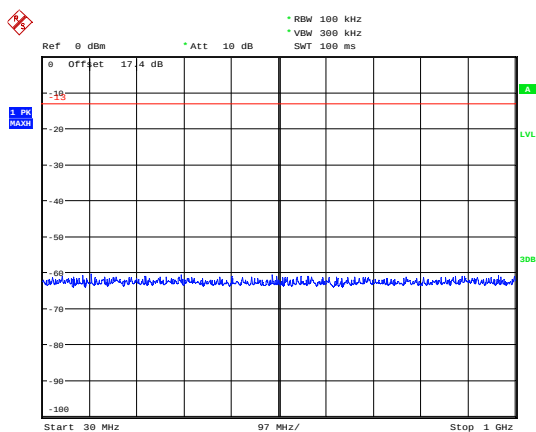
Date: 30.DEC.2018 12:11:41

GSM 1900 CH-High 3GHz~20GHz



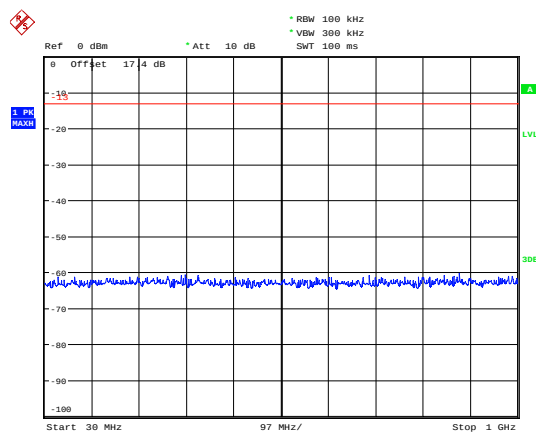
Date: 30.DEC.2018 12:12:57

eMTC Band 2 1.4MHz CH-Low 30MHz~1GHz



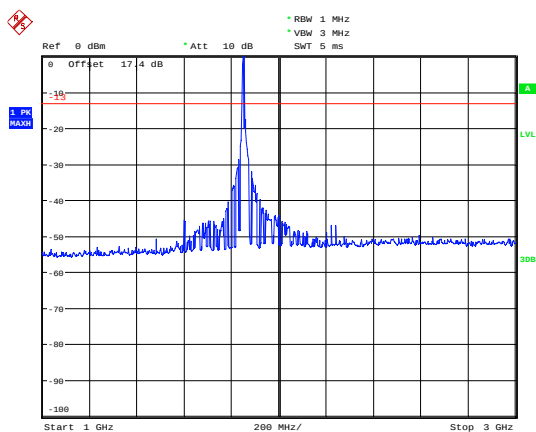
Date: 7.JAN.2019 17:43:35

eMTC Band 2 1.4MHz CH-Middle 30MHz~1GHz



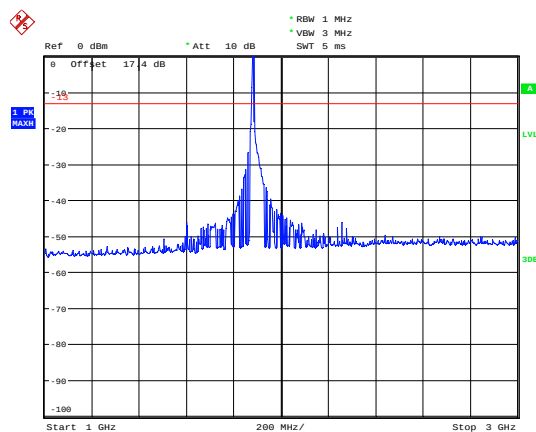
Date: 7.JAN.2019 17:54:26

eMTC Band 2 1.4MHz CH-Low 1GHz~3GHz



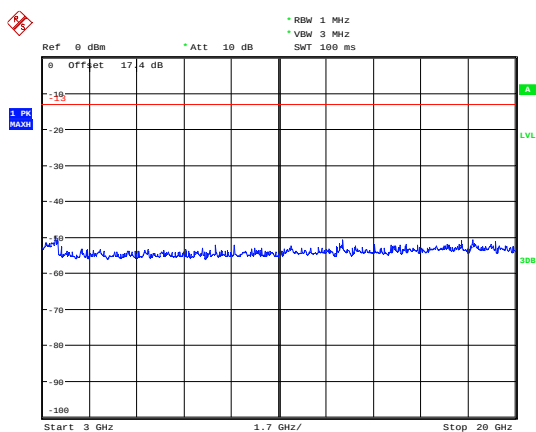
Date: 7.JAN.2019 17:46:48

eMTC Band 2 1.4MHz CH-Middle 1GHz~3GHz



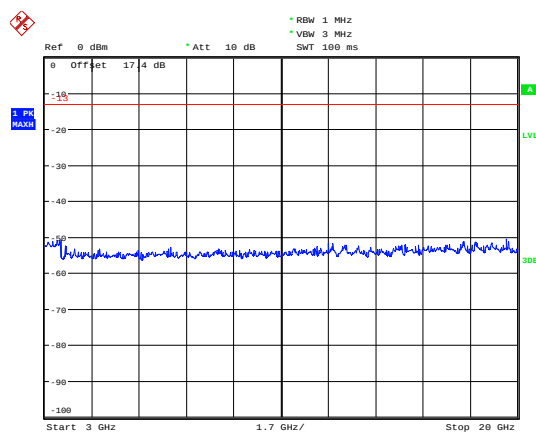
Date: 7.JAN.2019 17:54:09

eMTC Band 2 1.4MHz CH-Low 3GHz~20GHz



Date: 7.JAN.2019 17:47:00

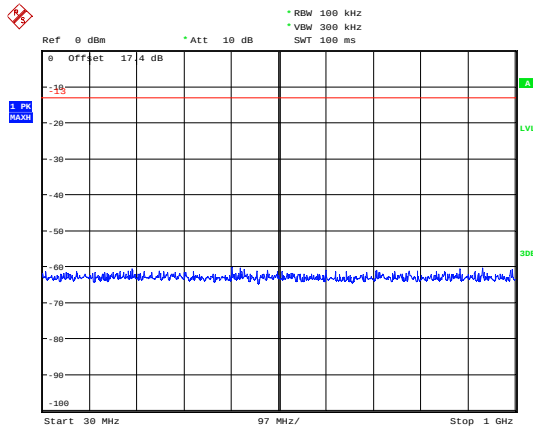
eMTC Band 2 1.4MHz CH-Middle 3GHz~20GHz



Date: 7.JAN.2019 17:53:05

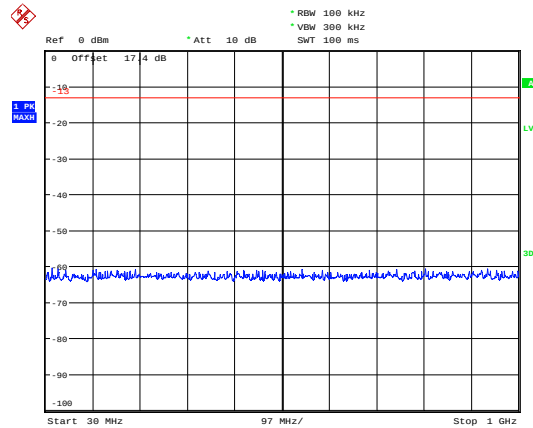


eMTC Band 2 1.4MHz CH-High 30MHz~1GHz



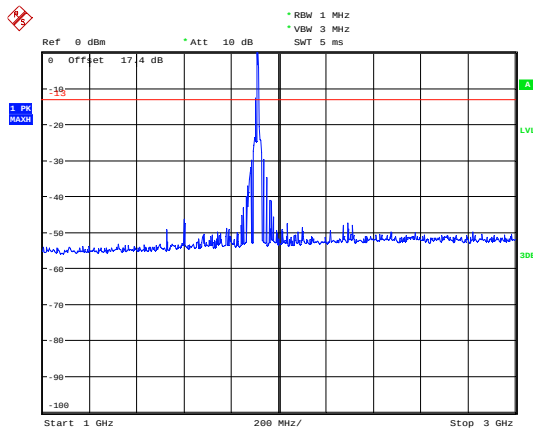
Date: 7.JAN.2019 17:59:19

eMTC Band 2 3MHz CH-Low 30MHz~1GHz



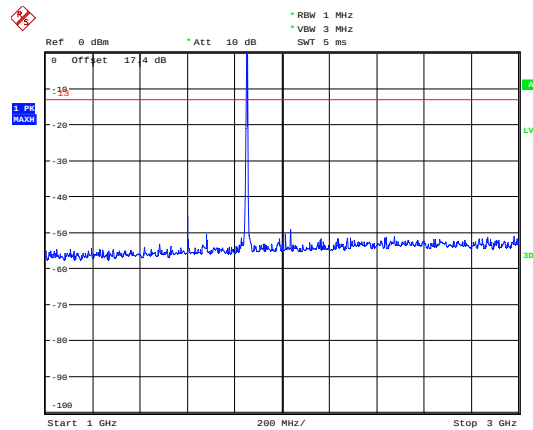
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eMTC Band 2 1.4MHz CH-High 1GHz~3GHz



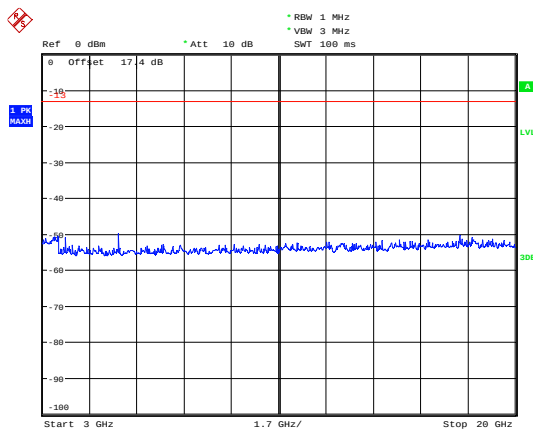
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eMTC Band 2 3MHz CH-Low 1GHz~3GHz



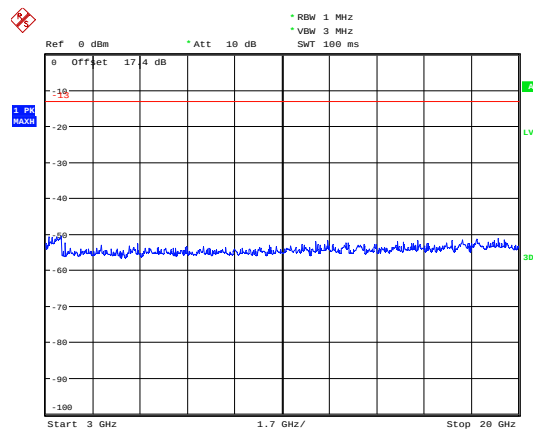
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eMTC Band 2 1.4MHz CH-High 3GHz~20GHz



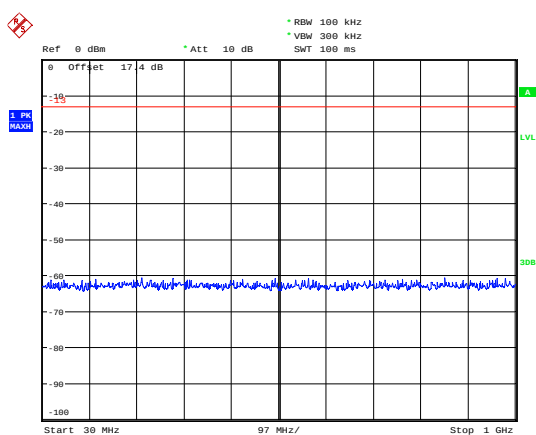
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eMTC Band 2 3MHz CH-Low 3GHz~20GHz



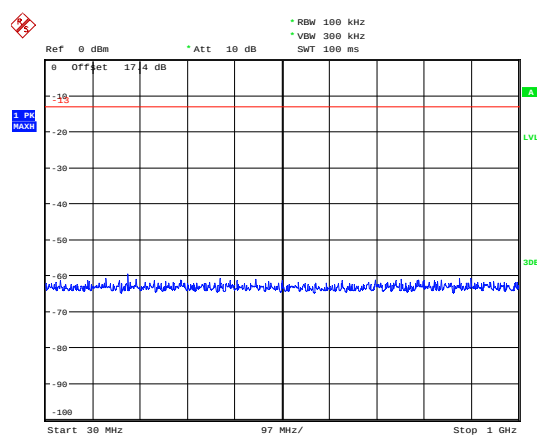
Date: 7.JAN.2019 19:33:06

eMTC Band 2 3MHz CH-Middle 30MHz~1GHz



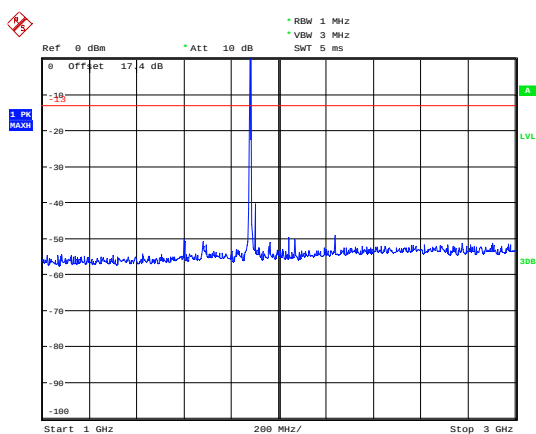
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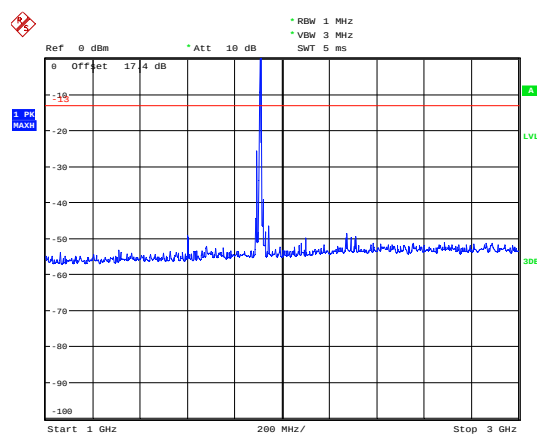
Date: 7.JAN.2019 19:56:13

eMTC Band 2 3MHz CH-Middle 1GHz~3GHz



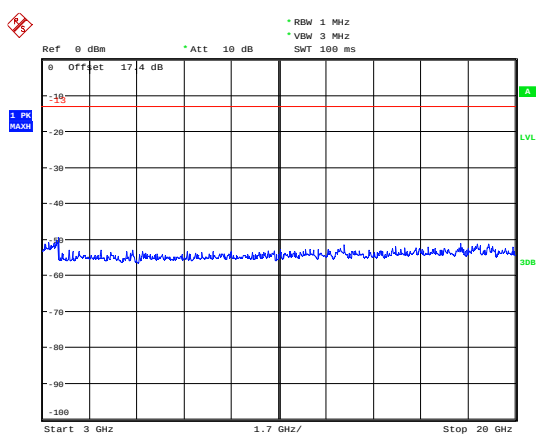
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eMTC Band 2 3MHz CH-High 1GHz~3GHz



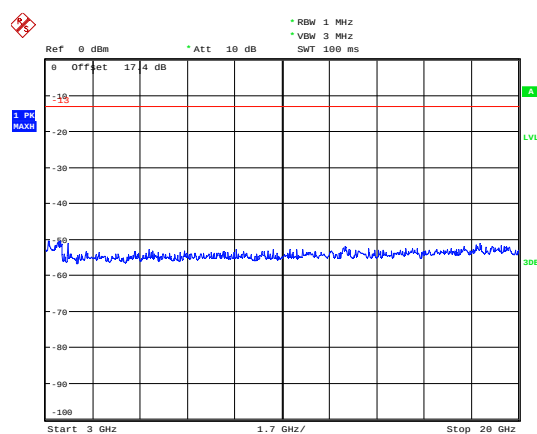
Date: 7.JAN.2019 19:56:33

eMTC Band 2 3MHz CH-Middle 3GHz~20GHz



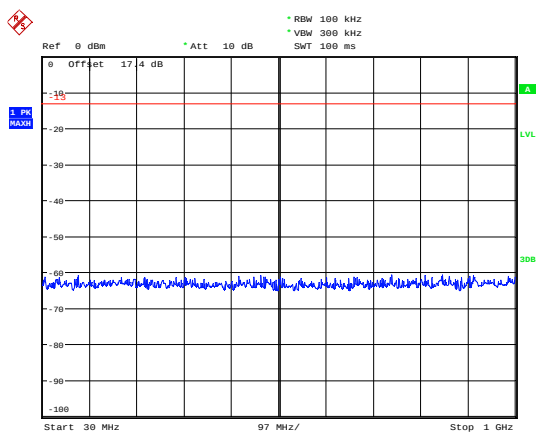
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eMTC Band 2 3MHz CH-High 3GHz~20GHz



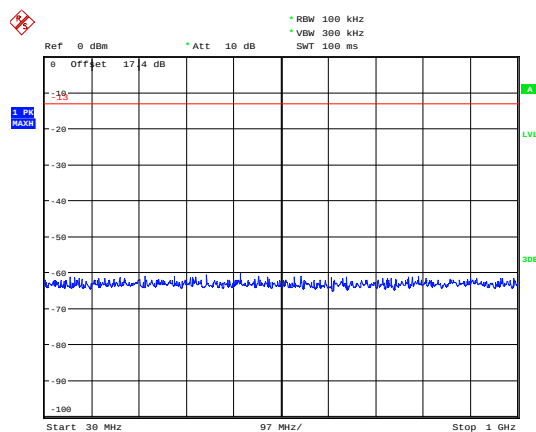
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eMTC Band 2 5MHz CH-Low 30MHz~1GHz



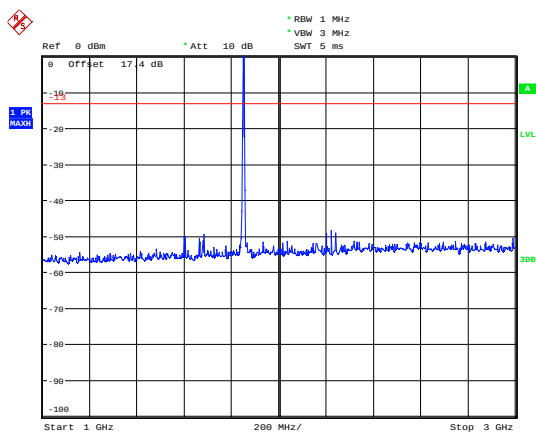
Date: 7.JAN.2019 19:58:33

eMTC Band 2 5MHz CH-Middle 30MHz~1GHz



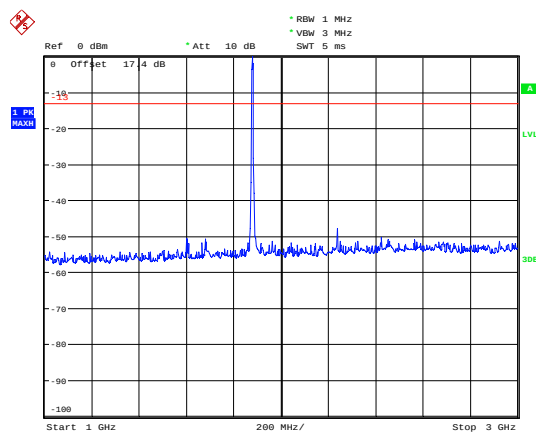
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eMTC Band 2 5MHz CH-Low 1GHz~3GHz



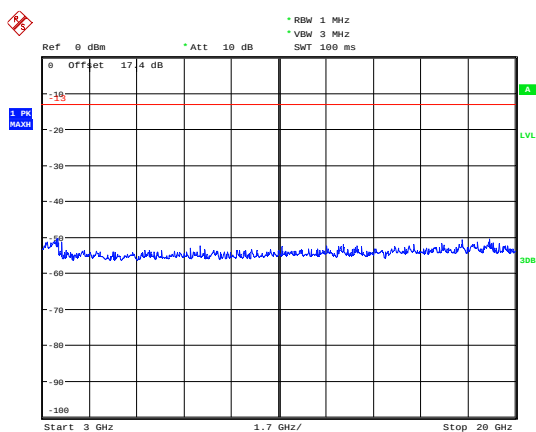
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eMTC Band 2 5MHz CH-Middle 1GHz~3GHz



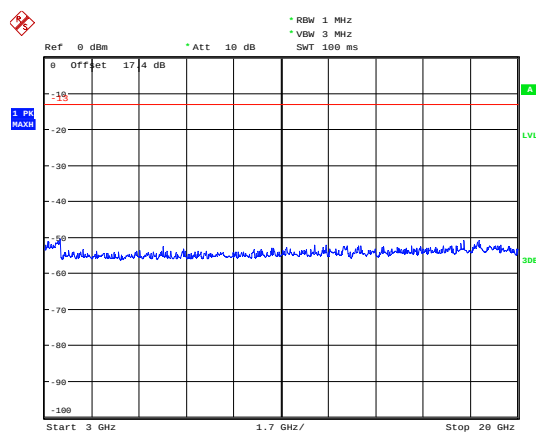
Date: 7.JAN.2019 19:59:24

eMTC Band 2 5MHz CH-Low 3GHz~20GHz



Date: 7.JAN.2019 19:57:54

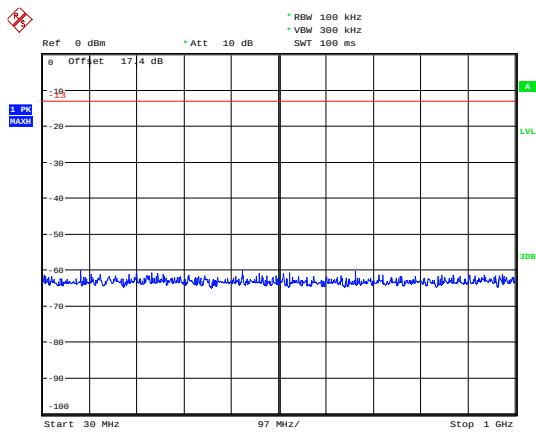
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Date: 7.JAN.2019 19:59:40

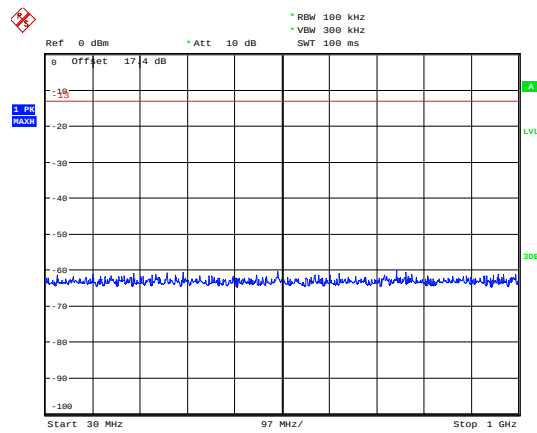


eMTC Band 2 5MHz CH-High 30MHz~1GHz



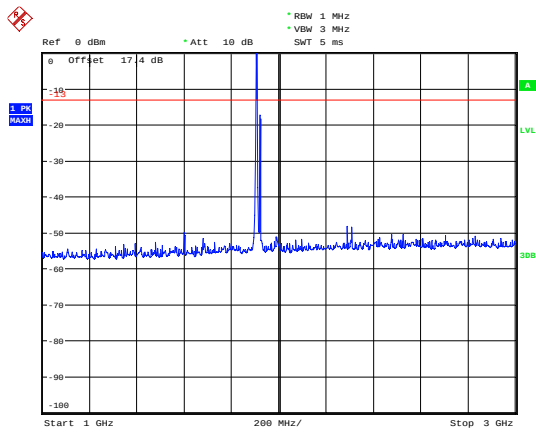
Date: 7.JAN.2019 20:00:58

eMTC Band 2 10MHz CH-Low 30MHz~1GHz



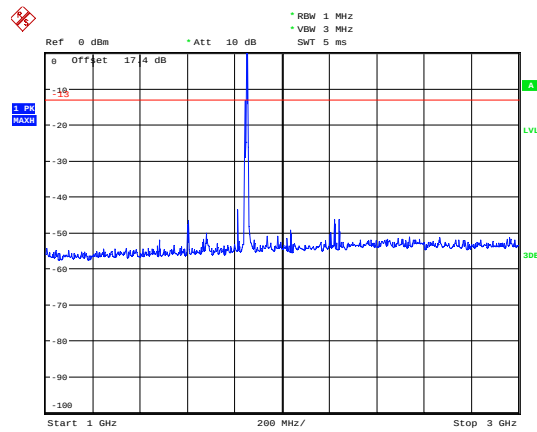
Date: 7.JAN.2019 20:44:49

eMTC Band 2 5MHz CH-High 1GHz~3GHz



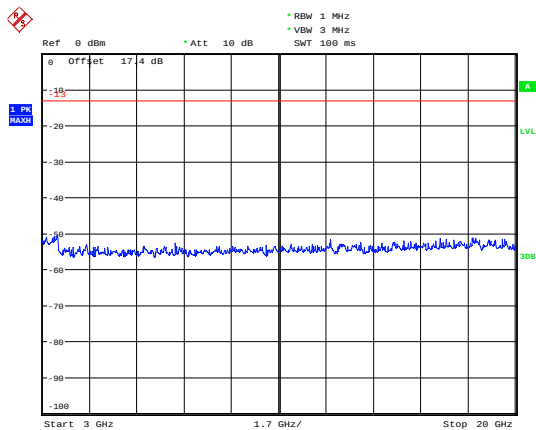
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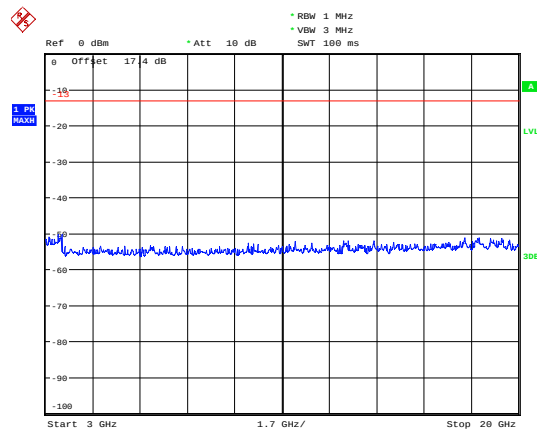
Date: 7.JAN.2019 20:45:09

eMTC Band 2 5MHz CH-High 3GHz~20GHz



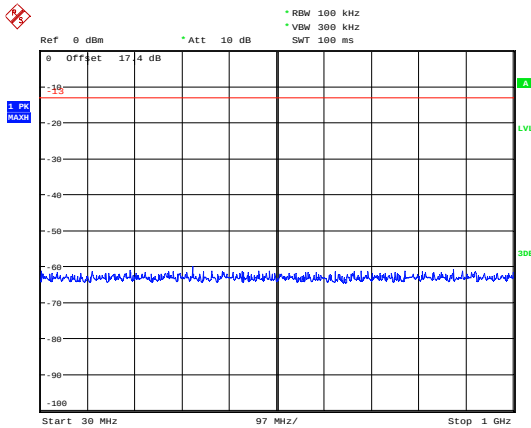
Date: 7.JAN.2019 20:00:29

eMTC Band 2 10MHz CH-Low 3GHz~20GHz



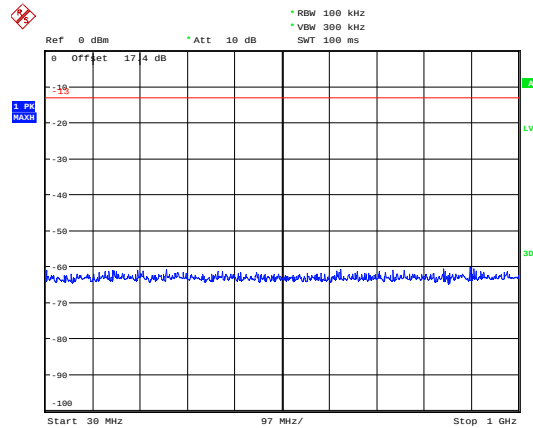
Date: 7.JAN.2019 20:45:32

eMTC Band 2 10MHz CH-Middle 30MHz~1GHz



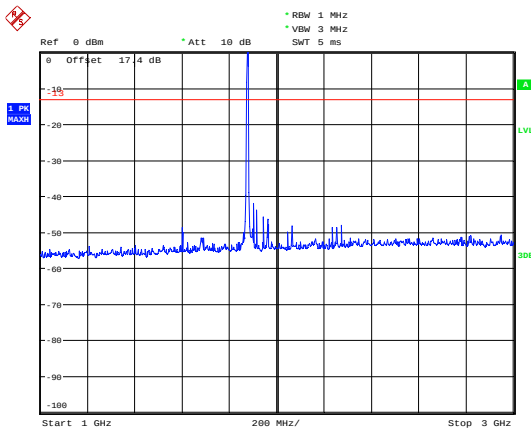
Date: 7.JAN.2019 21:30:56

eMTC Band 2 10MHz CH-High 30MHz~1GHz



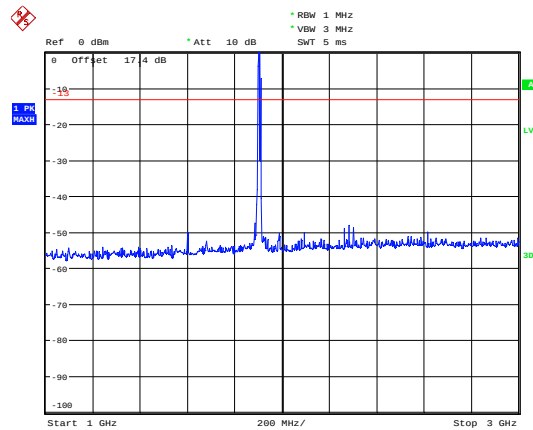
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eMTC Band 2 10MHz CH-Middle 1GHz~3GHz



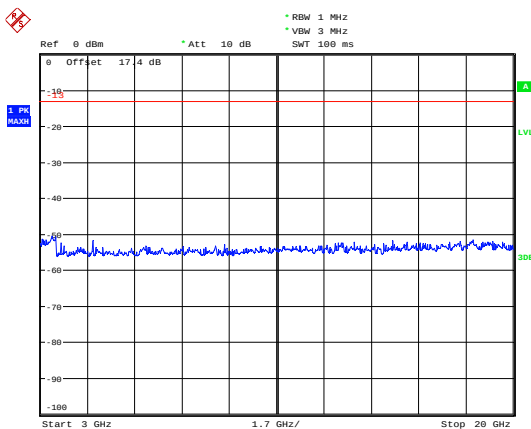
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eMTC Band 2 10MHz CH-High 1GHz~3GHz



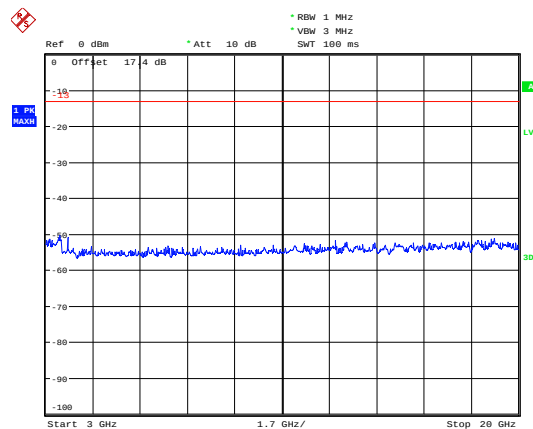
Date: 7.JAN.2019 21:32:31

eMTC Band 2 10MHz CH-Middle 3GHz~20GHz



Date: 7.JAN.2019 21:30:12

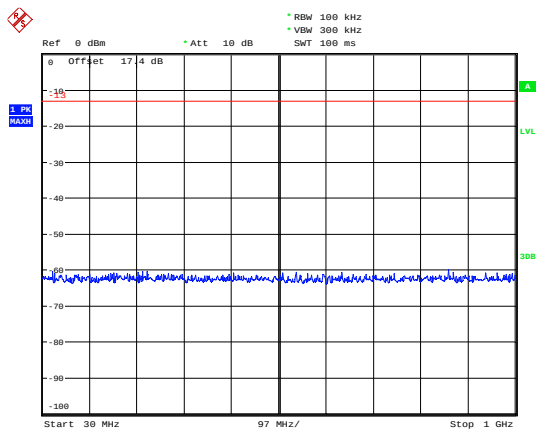
eMTC Band 2 10MHz CH-High 3GHz~20GHz



Date: 7.JAN.2019 21:32:51

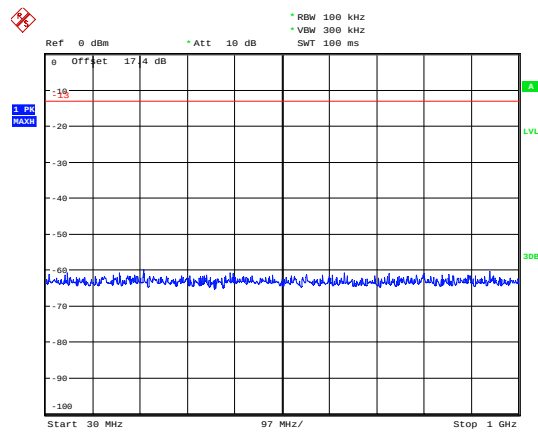


eMTC Band 2 15MHz CH-Low 30MHz~1GHz



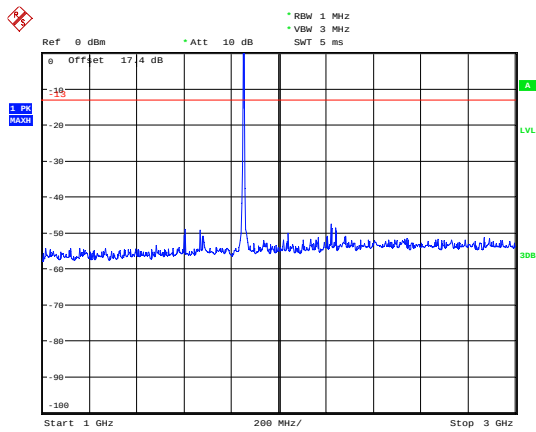
Date: 7.JAN.2019 21:37:05

eMTC Band 2 15MHz CH-Middle 30MHz~1GHz



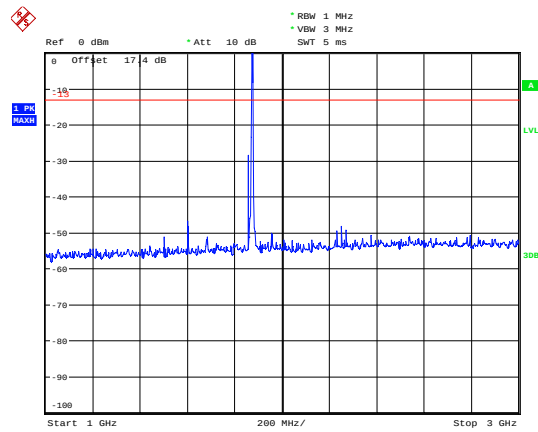
Date: 7.JAN.2019 21:44:03

eMTC Band 2 15MHz CH-Low 1GHz~3GHz



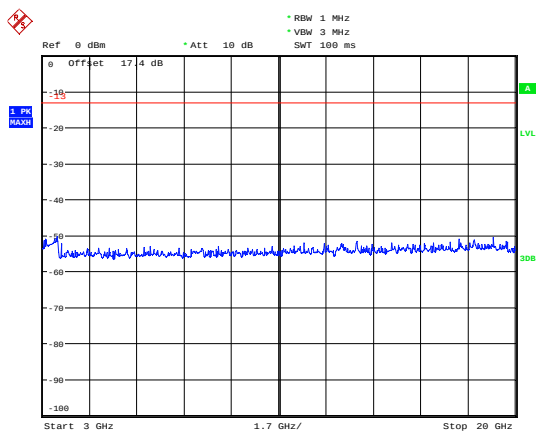
Date: 7.JAN.2019 21:35:52

eMTC Band 2 15MHz CH-Middle 1GHz~3GHz



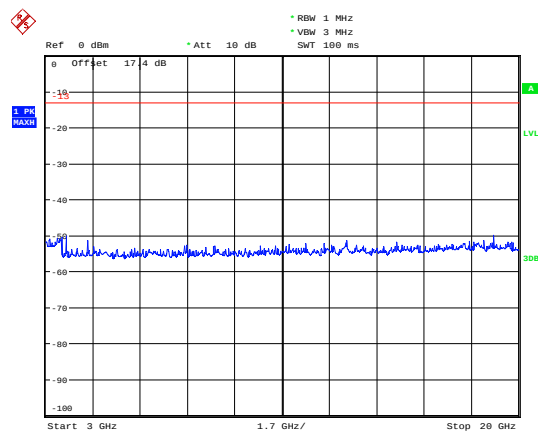
Date: 7.JAN.2019 21:44:23

eMTC Band 2 15MHz CH-Low 3GHz~20GHz



Date: 7.JAN.2019 21:35:32

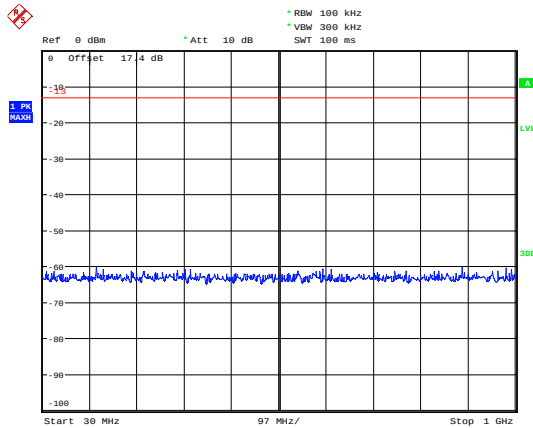
eMTC Band 2 15MHz CH-Middle 3GHz~20GHz



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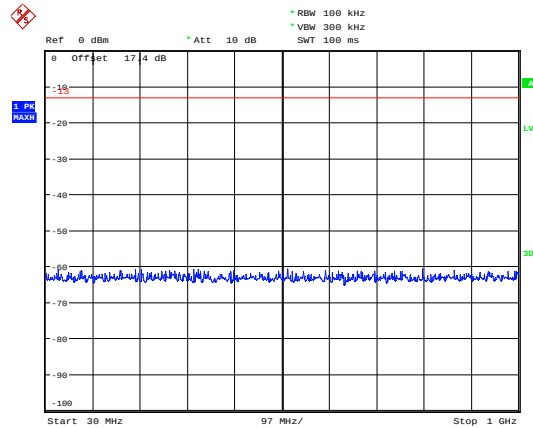


eMTC Band 2 15MHz CH-High 30MHz~1GHz



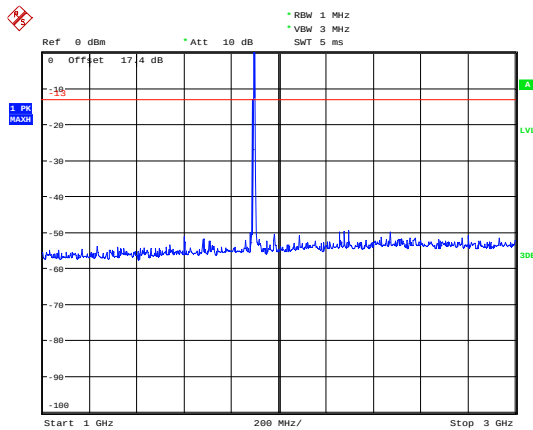
Date: 7.JAN.2019 21:56:01

eMTC Band 2 20MHz CH-Low 30MHz~1GHz



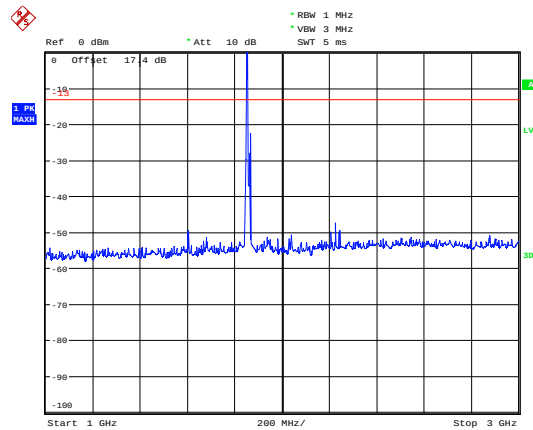
Date: 7.JAN.2019 21:56:59

eMTC Band 2 15MHz CH-High 1GHz~3GHz



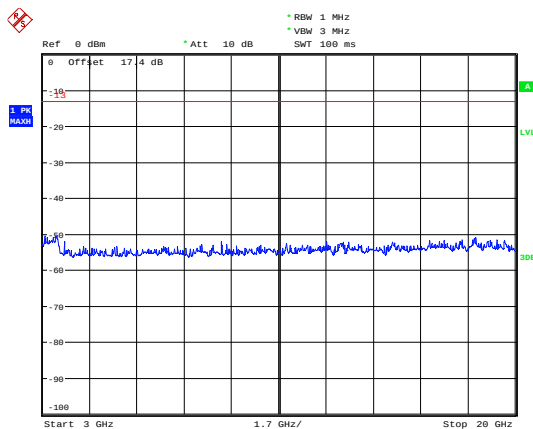
Date: 7.JAN.2019 21:55:33

eMTC Band 2 20MHz CH-Low 1GHz~3GHz



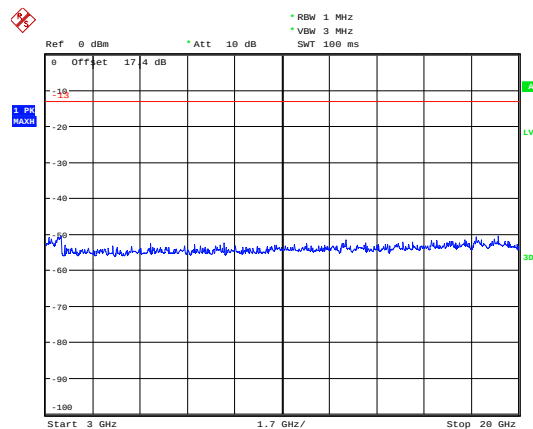
Date: 7.JAN.2019 21:57:14

eMTC Band 2 15MHz CH-High 3GHz~20GHz



Date: 7.JAN.2019 21:55:14

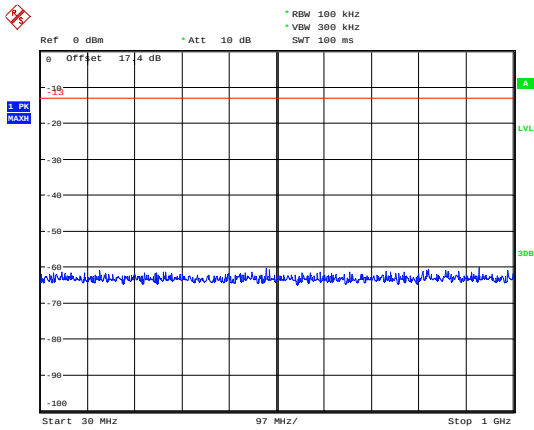
eMTC Band 2 20MHz CH-Low 3GHz~20GHz



Date: 7.JAN.2019 21:57:31

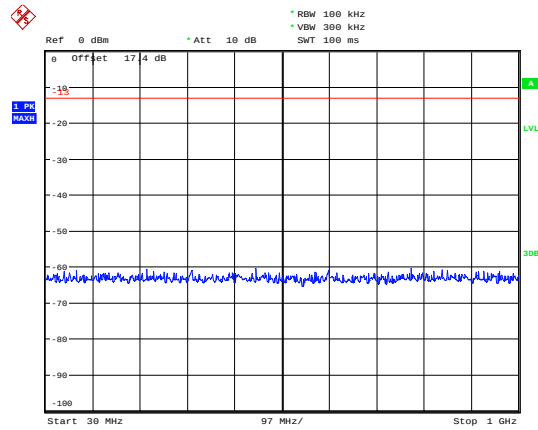


eMTC Band 2 20MHz CH-Middle 30MHz~1GHz



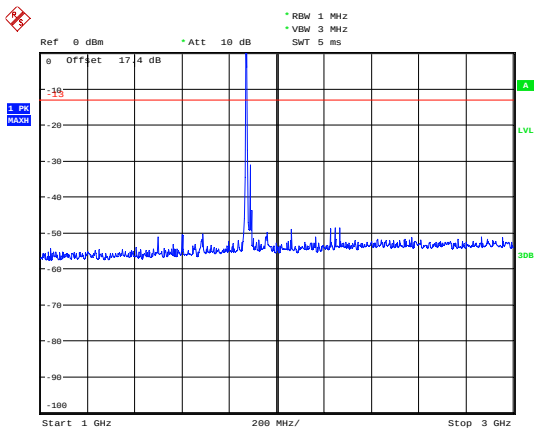
Date: 7.JAN.2019 21:58:53

eMTC Band 2 20MHz CH-High 30MHz~1GHz



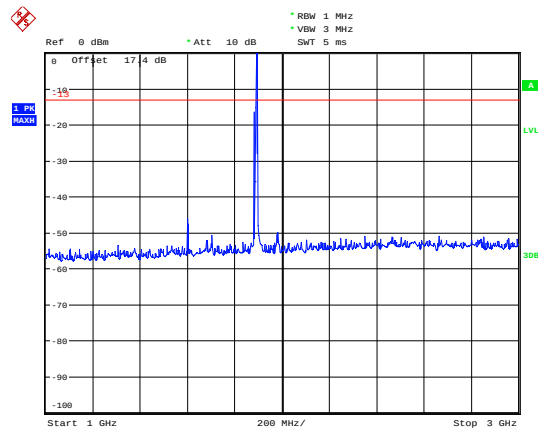
Date: 7.JAN.2019 21:59:45

eMTC Band 2 20MHz CH-Middle 1GHz~3GHz



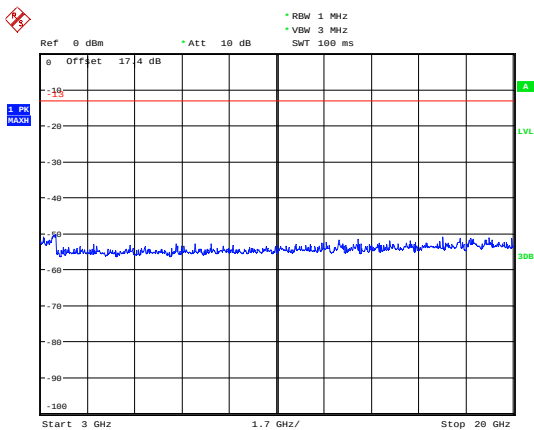
Date: 7.JAN.2019 21:58:38

eMTC Band 2 20MHz CH-High 1GHz~3GHz



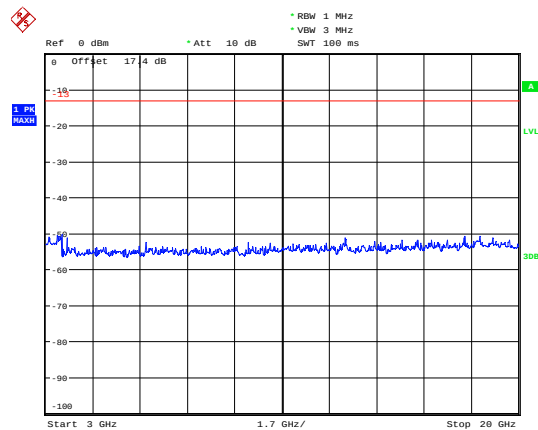
Date: 7.JAN.2019 22:00:05

eMTC Band 2 20MHz CH-Middle 3GHz~20GHz



Date: 7.JAN.2019 21:58:26

eMTC Band 2 20MHz CH-High 3GHz~20GHz



Date: 7.JAN.2019 22:00:18

5.8. Radiates Spurious Emission

Ambient condition

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

Method of Measurement

1. The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI C63.26 (2015).
2. Below 1GHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A loop antenna, A log-periodic antenna or horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=200Hz,VBW=600Hz for 9kHz150kHz , RBW=10kHz, VBW=30kHz 150kHz-30MHz , RBW=100kHz,VBW=300kHz for 30MHz to 1GHz and RBW=1MHz, VBW=3MHz for above 1GHz, And the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:

$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$
The measurement results are amend as described below:

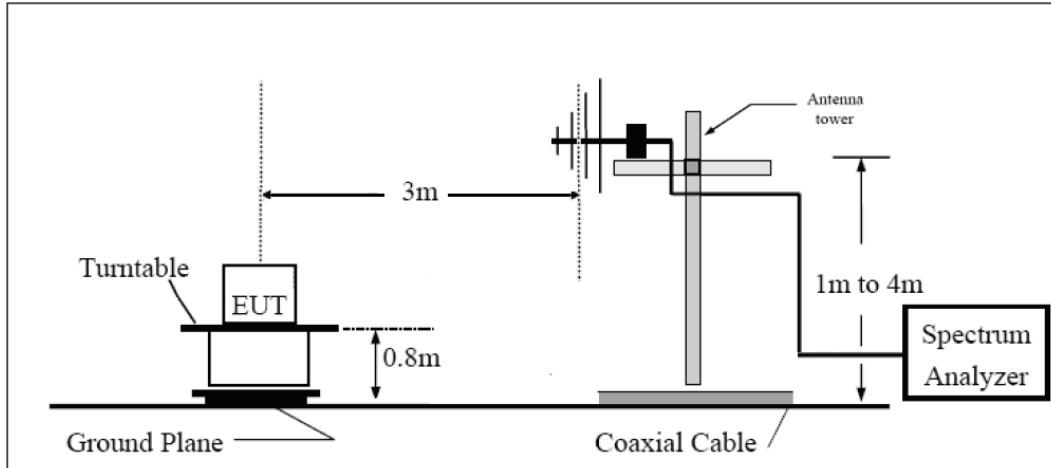
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi)

and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

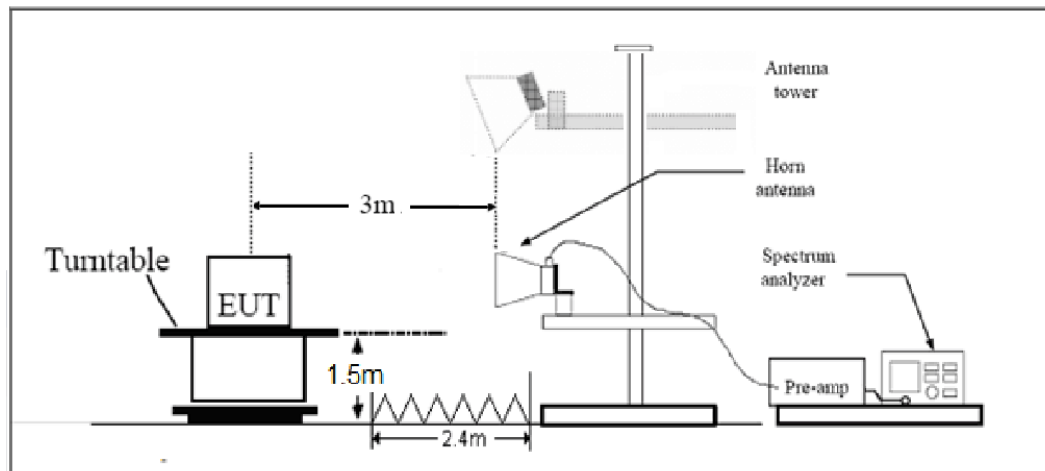
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

30MHz ~ 1GHz



Above 1GHz



Note: Area side: 2.4mX3.6m

Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10} (P)$ dB.”

Limit	-13 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 $k = 1.96$, $U = 3.55$ dB.

Test Result

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

GSM 1900 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3760.0	-55.03	5.10	11.05	Vertical	-49.08	-13.00	36.08	180
3	5640.0	-60.41	5.42	12.65	Vertical	-53.18	-13.00	40.18	135
4	7520.0	-55.03	6.70	13.85	Vertical	-47.88	-13.00	34.88	90
5	9400.0	-54.46	7.01	14.75	Vertical	-46.72	-13.00	33.72	315
6	11280.0	-52.17	7.48	15.95	Vertical	-43.70	-13.00	30.70	225
7	13160.0	-53.34	7.51	16.55	Vertical	-44.30	-13.00	31.30	90
8	15040.0	-52.14	8.24	15.35	Vertical	-45.03	-13.00	32.03	45
9	16920.0	-48.76	8.41	14.95	Vertical	-42.22	-13.00	29.22	0
10	18800.0	-61.90	8.54	15.45	Vertical	-54.99	-13.00	41.99	45

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Vertical position.

eMTC Band 2 1.4MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3759.0	-56.26	5.10	11.05	Vertical	-50.31	-13.00	37.31	135
3	5638.9	-60.31	5.42	12.65	Vertical	-53.08	-13.00	40.08	225
4	7520.0	-55.06	6.70	13.85	Vertical	-47.91	-13.00	34.91	90
5	9400.0	-55.16	7.01	14.75	Vertical	-47.42	-13.00	34.42	45
6	11280.0	-52.55	7.48	15.95	Vertical	-44.08	-13.00	31.08	0
7	13160.0	-51.04	7.51	16.55	Vertical	-42.00	-13.00	29.00	180
8	15040.0	-53.37	8.24	15.35	Vertical	-46.26	-13.00	33.26	225
9	16920.0	-49.71	8.41	14.95	Vertical	-43.17	-13.00	30.17	90
10	18800.0	-61.19	8.54	15.45	Vertical	-54.28	-13.00	41.28	90

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Vertical position.

eMTC Band 2 5MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3760.0	-56.65	5.10	11.05	Vertical	-50.70	-13.00	37.70	90
3	5640.0	-60.42	5.42	12.65	Vertical	-53.19	-13.00	40.19	270
4	7520.0	-55.42	6.70	13.85	Vertical	-48.27	-13.00	35.27	45
5	9400.0	-55.03	7.01	14.75	Vertical	-47.29	-13.00	34.29	315
6	11280.0	-53.02	7.48	15.95	Vertical	-44.55	-13.00	31.55	225
7	13160.0	-52.48	7.51	16.55	Vertical	-43.44	-13.00	30.44	90
8	15040.0	-49.12	8.24	15.35	Vertical	-42.01	-13.00	29.01	45
9	16920.0	-49.72	8.41	14.95	Vertical	-43.18	-13.00	30.18	0
10	18800.0	-61.07	8.54	15.45	Vertical	-54.16	-13.00	41.16	90

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Vertical position.

eMTC Band 2 20MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3760.0	-58.80	5.10	11.05	Vertical	-52.85	-13.00	39.85	225
3	5640.0	-60.07	5.42	12.65	Vertical	-52.84	-13.00	39.84	90
4	7520.0	-55.03	6.70	13.85	Vertical	-47.88	-13.00	34.88	135
5	9400.0	-55.37	7.01	14.75	Vertical	-47.63	-13.00	34.63	90
6	11280.0	-53.77	7.48	15.95	Vertical	-45.30	-13.00	32.30	225
7	13160.0	-52.74	7.51	16.55	Vertical	-43.70	-13.00	30.70	90
8	15040.0	-49.49	8.24	15.35	Vertical	-42.38	-13.00	29.38	135
9	16920.0	-50.02	8.41	14.95	Vertical	-43.48	-13.00	30.48	90
10	18800.0	-61.56	8.54	15.45	Vertical	-54.65	-13.00	41.65	90

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Vertical position.

6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMU200	118133	2018-05-13	2019-05-12
Base Station Simulator	R&S	CMW500	113824	2018-05-20	2019-05-19
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	/	/
Spectrum Analyzer	Key sight	N9010A	MY50210259	2018-05-20	2019-05-19
Universal Radio Communication Tester	Key sight	E5515C	MY48367192	2018-05-20	2019-05-19
Signal Analyzer	R&S	FSV30	100815	2018-12-16	2019-12-15
EMI Test Receiver	R&S	ESCI	100948	2018-05-20	2019-05-19
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-09-26	2019-09-25
Trilog Antenna	SCHWARZBECK	VUBL 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2020-06-19
Signal generator	R&S	SMB 100A	102594	2018-05-20	2019-05-19
Climatic Chamber	ESPEC	SU-242	93000506	2017-12-17	2020-12-16
Preamplifier	R&S	SCU18	102327	2018-05-20	2019-05-19
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2018-05-07	2019-05-06
RF Cable	Agilent	SMA 15cm	0001	/	/
Software	R&S	EMC32	9.26.0	/	/

*****END OF REPORT *****