

FCC PART 27
FCC PART 22H
MEASUREMENT AND TEST REPORT

For

Shanghai Huace Navigation Technology LTD.

Building C, 599 Gaojing Road, Qingpu District, Shanghai, China

FCC ID: SY4-B01008

Report Type: Original Report	Product Type: Data Collector
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Report Number: RKS170217001-00C	
Report Date: 2017-08-02	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Manufacturer	Shanghai Huace Navigation Technology LTD.
Tested Model	LT600
Series Model	LT600 WXYZ (WXYZ= 0-9, a-z)
Product Type	Data Collector
Dimension	235 mm(L)×138 mm(W)×30 mm(H)
Power Supply	DC 3.8V from rechargeable battery or DC 5.0V from adapter

Adapter Information:

Model: EA1012AVRU-050

INPUT: 100-240Vac, 50/60Hz, 1.0A

OUTPUT: 5V, 2.4A

Note: The difference between tested model and series model was explained in the declaration letter.

**All measurement and test data in this report was gathered from production sample serial number: 20170122001. (Assigned by BACL, Kunshan). The EUT was received on 2017-01-22.*

Objective

This type approval report is prepared on behalf of Shanghai Huace Navigation Technology LTD. in accordance with Part 2, Part 22-Subpart H and Part 27 of the Federal Communication Commission's rules.

The objective is to determine the compliance of EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability, and band edge.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS/DTS, Part 15B JBP submissions with FCC ID: SY4-B01008.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-Part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services

Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA-603-D-2010.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The test site A used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to TIA/EIA-603-D.

The final qualification test was performed with the EUT operating at normal mode.

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

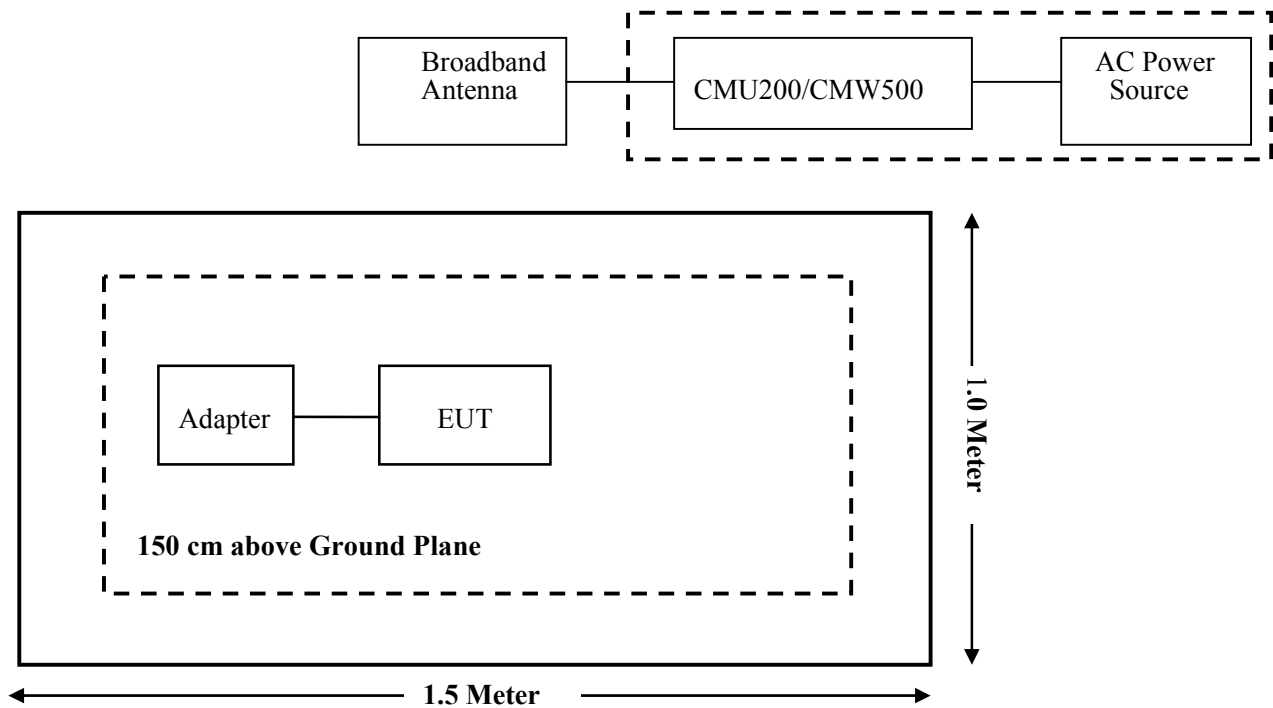
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

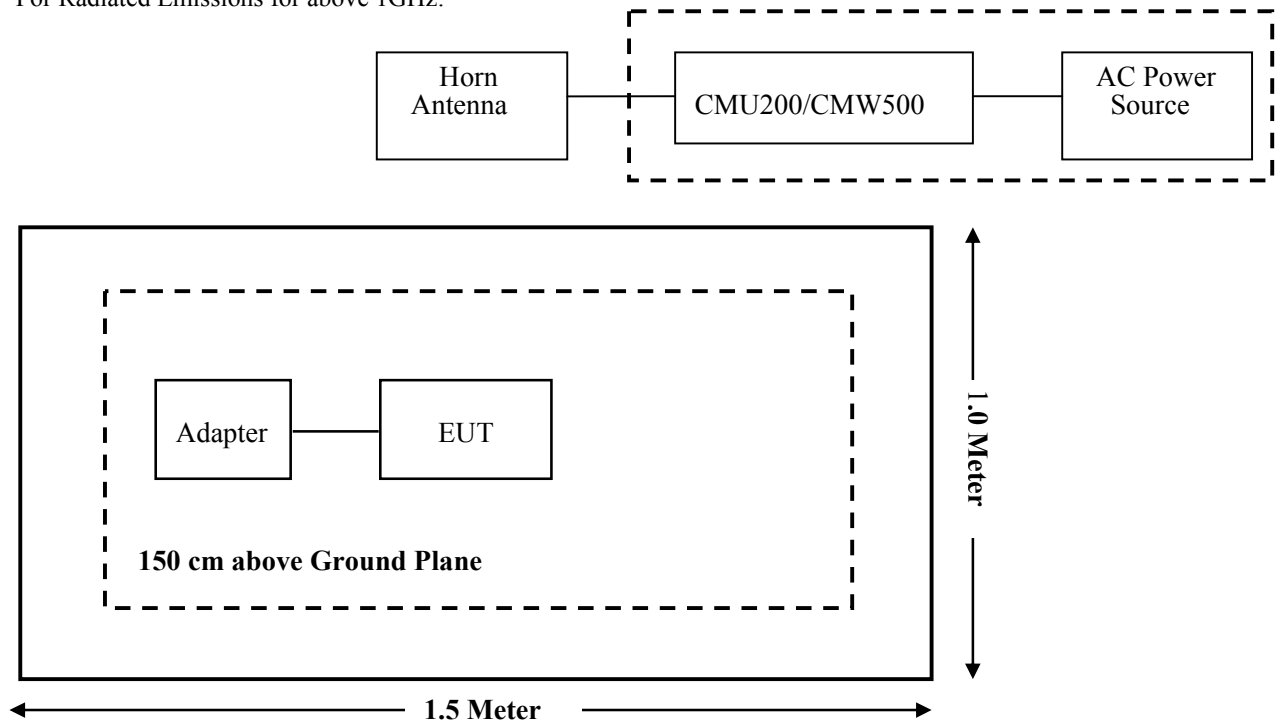
Cable Description	Shielding Type	Length (m)	From Port	To
USB Cable	Un-Shielding	0.8	EUT	Adapter

Block Diagram of Test Setup

For Radiated Emissions for below 1GHz:



For Radiated Emissions for above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307(b) & §2.1093	RF Exposure Information	Compliance*
§2.1046; § 22.913; (a) §27.50(h) (2)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; §27.53	Occupied Bandwidth	Compliance
§ 2.1051; § 22.917 (a); §27.53 (m)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917 (a); §27.53 (m)	Spurious Radiated Emissions	Compliance
§ 22.917 (a); §27.53 (m)	Band Edge	Compliance
§ 2.1055; § 22.355; §27.54;	Frequency stability	Compliance

Compliance*: Please refer to SAR report released by BACL, report number: RSH170303051-20B.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
HP	Signal Generator	8341B	DE23437	2016-08-29	2017-08-28
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-24
Sunol Sciences	Broadband Antenna	JB3	A040914-1	2016-01-09	2019-01-08
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
ETS-LINDGREN	Horn Antenna	3116	2516	2016-10-18	2019-10-17
Sonoma Instrunent	Amplifier	330	171377	2016-12-12	2017-12-11
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-12	2017-12-11
Heatsink Required	Amplifier	QLW-18405536-J0	15964001009	2016-12-12	2017-12-11
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
Haojintech	Coaxial Cable	Cable-1	001	2016-12-12	2017-12-11
Haojintech	Coaxial Cable	Cable-2	002	2016-12-12	2017-12-11
Haojintech	Coaxial Cable	Cable-3	003	2016-12-12	2017-12-11
MICRO-COAX	Coaxial Cable	Cable-4	004	2016-12-12	2017-12-11
MICRO-COAX	Coaxial Cable	Cable-5	005	2016-12-12	2017-12-11
MICRO-COAX	Coaxial Cable	Cable-7	007	2016-12-12	2017-12-11
RF Conducted Test					
Rohde & Schwarz	FSV40 Signal Analyzer	FSV40	101116	2016-07-04	2017-07-03
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2016-09-21	2017-09-20
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605	2016-11-25	2017-11-24
R&S	Wideband Radio Communication tester	CMW500	1201.002K50-146520-wh	2016-10-08	2017-10-07
BACL	Temperature & Humidity Chamber	BTH-150	30023	2016-10-10	2017-10-09
Huace	RF Cable	/	/	2017-02-14	2018-02-13

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1307, §2.1093.

Test Result

Compliance, please refer to the SAR report: RSH170303051-20B.

FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d) , Part 22H, Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

FCC §2.1046; § 22.913 (a) §27.50(h) (2) - RF OUTPUT POWER**Applicable Standards**

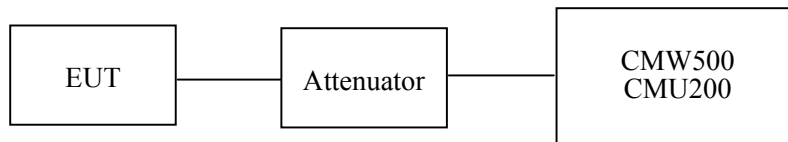
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to §27.50(h) (2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the CMW500/CMU200 through sufficient attenuation.

**Test Data****Environmental Conditions**

Temperature:	20~23 °C
Relative Humidity:	48~52 %
ATM Pressure:	100.5~101.0kPa

The testing was performed by Chris Wang on 2017-03-16 to 2017-03-20.

Conducted Power**Cellular Band (Part 22H)**

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	128	824.2	30.31	38.45
	190	836.6	30.29	38.45
	251	848.8	30.28	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.2	30.30	29.69	28.08	27.08	38.45
	190	836.6	30.29	29.62	27.96	26.87	38.45
	251	848.8	30.28	29.57	27.81	26.76	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	128	824.2	23.77	22.81	20.68	19.54	38.45
	190	836.6	23.67	22.67	20.58	19.42	38.45
	251	848.8	23.46	22.45	20.29	19.15	38.45

Peak-to-average ratio (PAR)**Cellular Band**

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	2.23	13
	Middle	2.31	13
	High	2.59	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	2.44	13
	Middle	2.41	13
	High	2.46	13

Radiated Power**GSM Mode:**

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dBd)			
Cellular Band (Part 22H), Middle Channel										
836.6	95.07	245	146	H	26.46	0.26	4.86	31.06	38.45	7.39
836.6	93.59	245	163	V	23.67	0.26	4.86	28.27	38.45	10.18

EDGE Mode:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dBd)			
Cellular Band (Part 22H), Middle Channel										
836.6	90.09	245	182	H	21.48	0.26	4.86	26.08	38.45	12.37
836.6	87.14	245	157	V	17.22	0.26	4.86	21.82	38.45	16.63

Note:

All above data were tested with no amplifier.

Absolute Level = Submitted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

LTE Band 7**Maximum Output Power**

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
5M	QPSK	RB Size=1, RB Offset=0	21.65	21.90	21.54	33.00
		RB Size=1, RB Offset=12	21.56	21.78	21.42	
		RB Size=1, RB Offset=24	21.74	22.02	21.63	
		RB Size=12, RB Offset=0	21.05	21.28	20.86	
		RB Size=12, RB Offset=6	20.96	21.24	20.80	
		RB Size=12, RB Offset=11	21.15	21.39	20.93	
		RB Size=25, RB Offset=0	20.77	21.17	20.71	
	16-QAM	RB Size=1, RB Offset=0	21.43	21.73	21.37	
		RB Size=1, RB Offset=12	21.36	21.67	21.33	
		RB Size=1, RB Offset=24	21.55	21.78	21.45	
		RB Size=12, RB Offset=0	21.03	21.19	20.72	
		RB Size=12, RB Offset=6	20.95	21.11	20.62	
		RB Size=12, RB Offset=11	21.13	21.23	20.81	
		RB Size=25, RB Offset=0	20.74	21.15	20.72	
10M	QPSK	RB Size=1, RB Offset=0	21.25	21.46	21.18	33.00
		RB Size=1, RB Offset=24	21.16	21.35	21.12	
		RB Size=1, RB Offset=49	21.29	21.57	21.22	
		RB Size=25, RB Offset=0	20.57	20.96	20.67	
		RB Size=25, RB Offset=12	20.45	20.85	20.57	
		RB Size=25, RB Offset=24	20.65	21.00	20.78	
		RB Size=50, RB Offset=0	20.67	20.96	20.63	
	16-QAM	RB Size=1, RB Offset=0	21.12	21.38	21.05	
		RB Size=1, RB Offset=24	21.03	21.31	20.94	
		RB Size=1, RB Offset=49	21.17	21.49	21.14	
		RB Size=25, RB Offset=0	20.73	21.03	20.79	
		RB Size=25, RB Offset=12	20.62	20.97	20.67	
		RB Size=25, RB Offset=24	20.82	21.09	20.83	
		RB Size=50, RB Offset=0	20.75	21.17	20.84	

Test Bandwidth	Test Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)	Limit (dBm)
15M	QPSK	RB Size=1, RB Offset=0	21.43	21.78	21.37	33.00
		RB Size=1, RB Offset=37	21.40	21.74	21.28	
		RB Size=1, RB Offset=74	21.54	21.91	21.48	
		RB Size=36, RB Offset=0	21.24	21.52	21.31	
		RB Size=36, RB Offset=18	21.12	21.40	21.26	
		RB Size=36, RB Offset=37	21.36	21.60	21.39	
		RB Size=75, RB Offset=0	21.54	21.88	21.64	
	16-QAM	RB Size=1, RB Offset=0	21.72	21.95	21.43	
		RB Size=1, RB Offset=37	21.65	21.84	21.39	
		RB Size=1, RB Offset=74	21.76	22.03	21.51	
		RB Size=36, RB Offset=0	21.27	21.64	21.34	
		RB Size=36, RB Offset=18	21.19	21.53	21.28	
		RB Size=36, RB Offset=37	21.34	21.72	21.40	
		RB Size=75, RB Offset=0	21.04	21.37	21.15	
20M	QPSK	RB Size=1, RB Offset=0	21.86	22.09	21.76	33.00
		RB Size=1, RB Offset=49	21.83	21.97	21.66	
		RB Size=1, RB Offset=99	21.99	22.17	21.83	
		RB Size=50, RB Offset=0	21.42	21.87	21.35	
		RB Size=50, RB Offset=24	21.35	21.74	21.31	
		RB Size=50, RB Offset=49	21.55	21.92	21.44	
		RB Size=100, RB Offset=0	21.24	21.54	21.36	
	16-QAM	RB Size=1, RB Offset=0	21.76	22.04	21.85	
		RB Size=1, RB Offset=49	21.73	22.00	21.77	
		RB Size=1, RB Offset=99	21.84	22.10	21.89	
		RB Size=50, RB Offset=0	21.42	21.64	21.32	
		RB Size=50, RB Offset=24	21.31	21.56	21.24	
		RB Size=50, RB Offset=49	21.49	21.75	21.39	
		RB Size=100, RB Offset=0	21.13	21.36	21.17	

Peak-to-average ratio (PAR)

Test Modulation		Test Bandwidth	Low Channel (dB)	Middle Channel (dB)	High Channel (dB)	Limit(dB)
QPSK	1 RB	20M	10.25	10.91	10.85	13.00
	100 RB		9.51	9.00	9.25	13.00
16-QAM	1 RB	20M	10.83	10.72	10.74	13.00
	100 RB		10.27	10.55	10.07	13.00

EIRP:**QPSK**

Frequency (MHz)	Receiver Reading (dBμV)	TurnTable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (cm)	Polar (H / V)	Submitted Level (dBm)	Cable loss (dB)	Antenna Gain(dB)		
Band 7 middle channel 5M									
2535.00	79.28	137	126	H	12.50	2.30	9.10	19.30	33
2535.00	84.50	314	172	V	16.80	2.30	9.10	23.60	33
Band 7 middle channel 10M									
2535.00	78.71	169	146	H	11.90	2.30	9.10	18.70	33
2535.00	84.17	2	193	V	16.50	2.30	9.10	23.30	33
Band 7 middle channel 15M									
2535.00	78.09	84	168	H	12.40	2.60	9.30	19.10	33
2535.00	84.06	308	123	V	16.10	2.60	9.30	22.80	33
Band 7 middle channel 20M									
2535.00	77.95	272	210	H	12.20	2.60	9.30	18.90	33
2535.00	84.32	228	201	V	16.40	2.60	9.30	23.10	33

16QAM

Frequency (MHz)	Receiver Reading (dBμV)	TurnTable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)
			Height (cm)	Polar (H / V)	Submitted Level (dBm)	Cable loss (dB)	Antenna Gain(dB)		
Band 7 middle channel 5M									
2535.00	79.12	251	136	H	13.40	2.60	9.30	20.10	33
2535.00	82.9	180	182	V	15.00	2.60	9.30	21.70	33
Band 7 middle channel 10M									
2535.00	76.25	238	192	H	10.50	2.60	9.30	17.20	33
2535.00	83.62	25	207	V	15.70	2.60	9.30	22.40	33
Band 7 middle channel 15M									
2535.00	76.75	39	246	H	9.50	2.60	9.30	17.70	33
2535.00	83.1	97	109	V	15.20	2.60	9.30	21.90	33
Band 7 middle channel 20M									
2535.00	78.14	344	182	H	12.40	2.60	9.30	19.10	33
2535.00	81.75	174	163	V	13.80	2.60	9.30	20.50	33

Note:

All above data were tested with no amplifier

Absolute Level = Submitted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

FCC §2.1049, §22.917, §22.905 & §27.53 - OCCUPIED BANDWIDTH

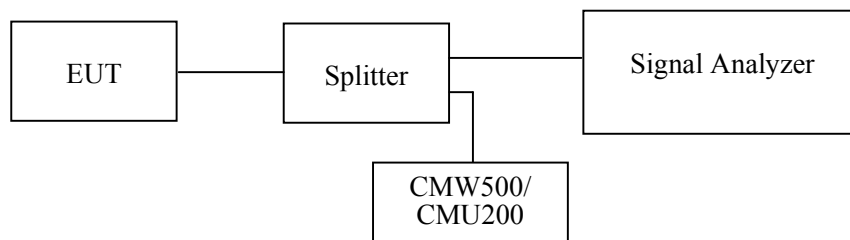
Applicable Standards

FCC 47 §2.1049, §22.917, §22.905 and §27.53.

Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 5 kHz (Cellular /PCS) & 100 kHz (WCDMA) and the 26 dB & 99% bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	20~23 °C
Relative Humidity:	48~52 %
ATM Pressure:	100.5~101.0kPa

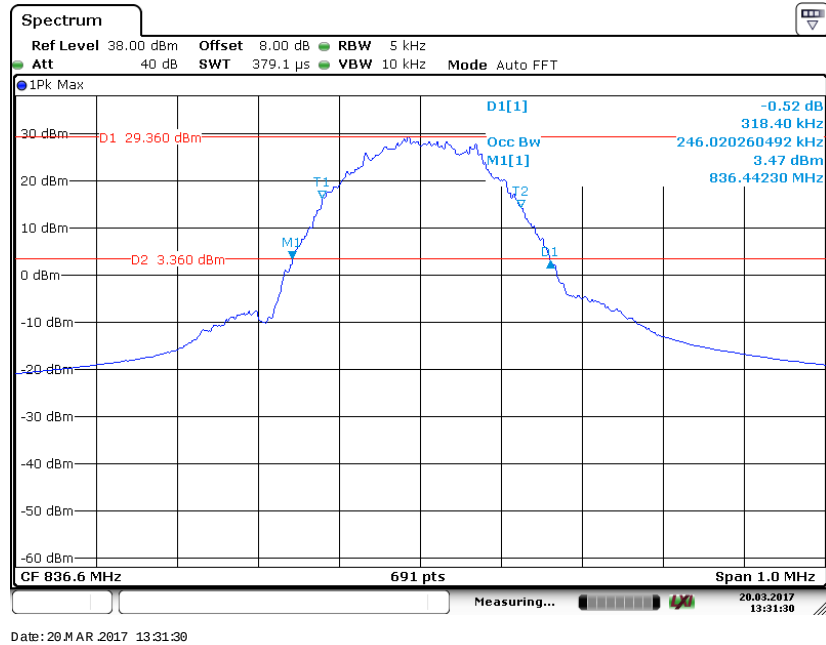
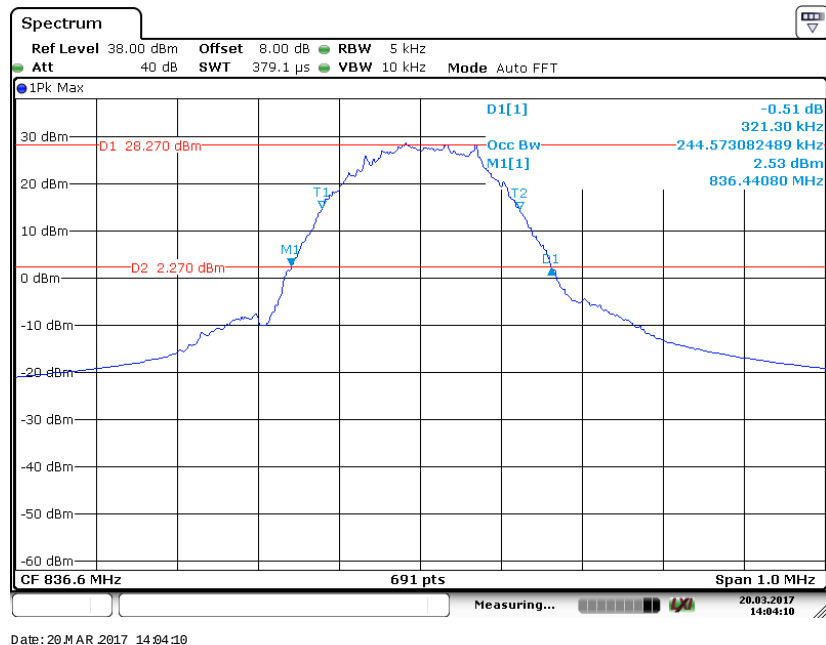
The testing was performed by Chris Wang on 2017-03-16 to 2017-03-20.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following tables and plots.

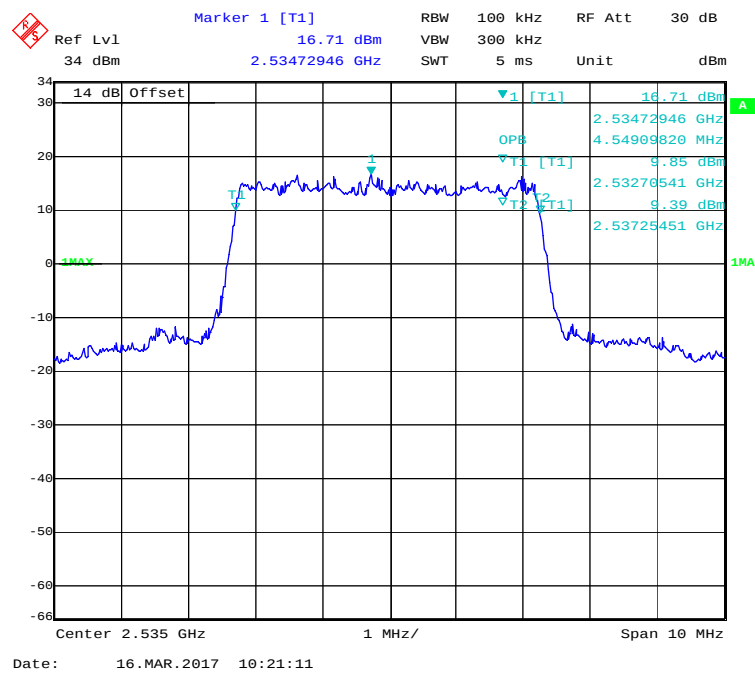
Cellular Band (Part 22H)

Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	836.6	246.02	318.40
EGPRS(8PSK)	836.6	244.57	321.30

Cellular Band (Part 22H)**99% Occupied & 26 dB Emissions Bandwidth for GSM (GMSK) Mode****99% Occupied & 26 dB Emissions Bandwidth for EGPRS(8PSK) Mode**

LTE Band 7:

Test Modulation	Test Bandwidth	Test Channel	99% Occupied Bandwidth	26 dB Bandwidth
			MHz	MHz
QPSK	5M	Middle	4.549	5.271
	10M		9.018	9.659
	15M		13.647	14.910
	20M		18.036	19.559
16-QAM	5M	Middle	4.549	5.070
	10M		8.978	9.820
	15M		13.587	14.970
	20M		18.036	19.639

QPSK (5.0 MHz) - 99% Occupied Middle channel

Marker 1 [T1]

Ref Lvl 34 dBm

16.30 dBm

RBW 100 kHz

RF Att 30 dB

34 dBm

2.53360721 GHz

SWT 5 ms

Unit dBm

14 dB Offset

▼1 [T1]

16.30 dBm

2.53360721 GHz

4.54909820 MHz

OPB

▼T1 [T1]

8.16 dBm

2.53270541 GHz

▼T1 [T1]

8.83 dBm

2.53725451 GHz

MAX

Center 2.535 GHz

1 MHz/

Span 10 MHz

Date: 16.MAR.2017 10:24:52

Ref Lvl 12.10 dBm
34 dBm 2.53269539 GHz

RBW 100 kHz
VBW 300 kHz
SWT 5 ms

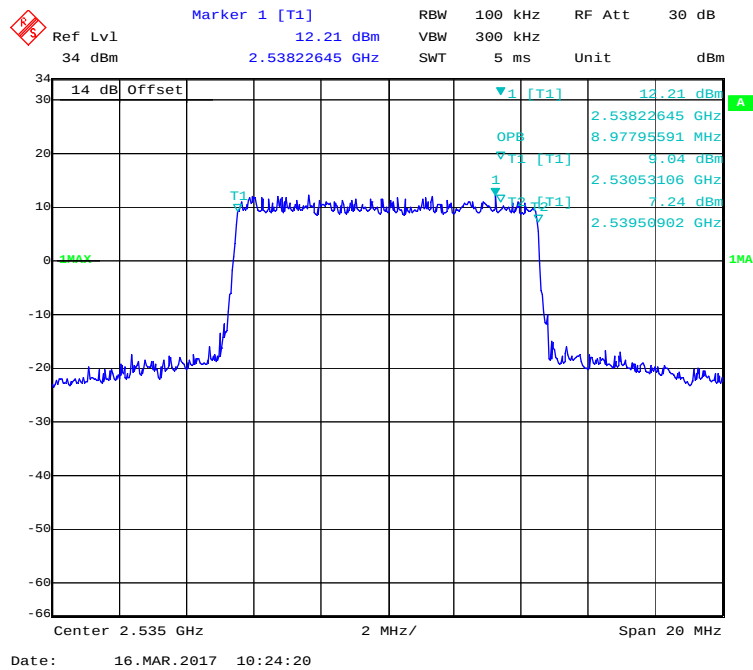
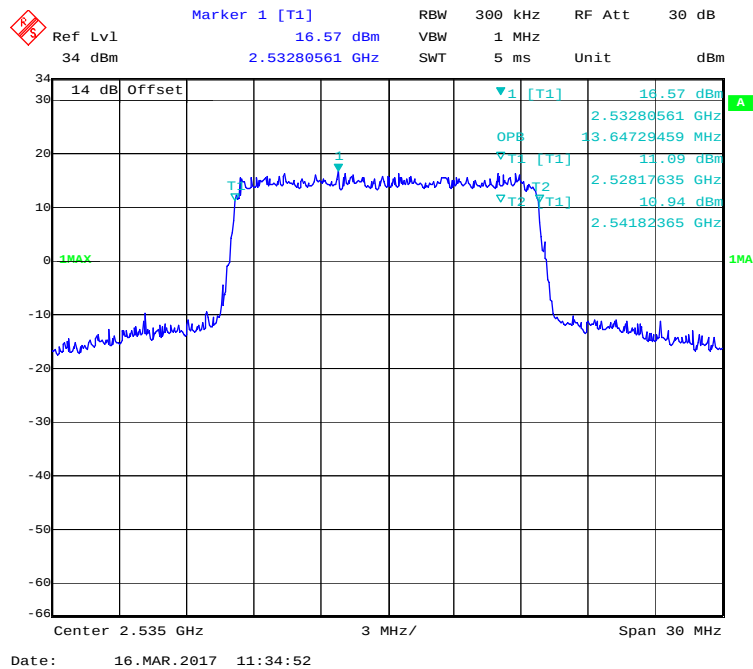
RF Att 30 dB
Unit dBm

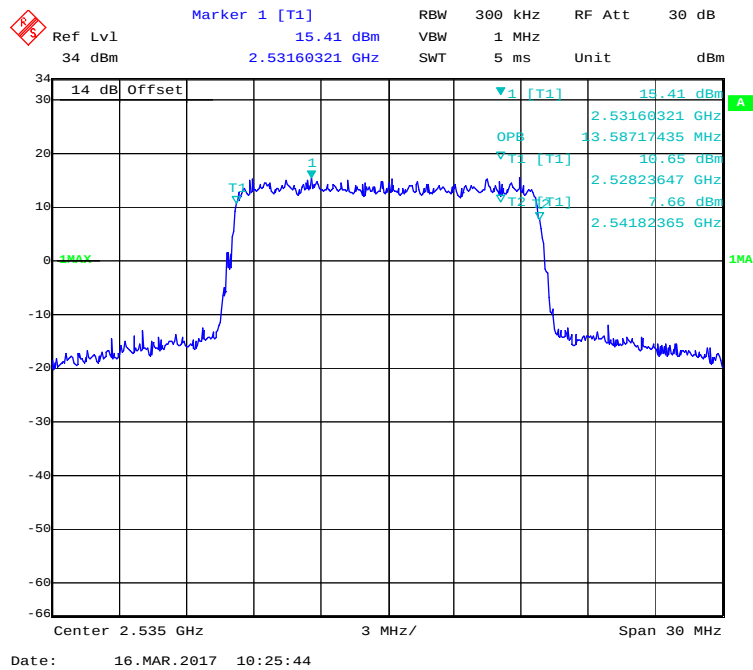
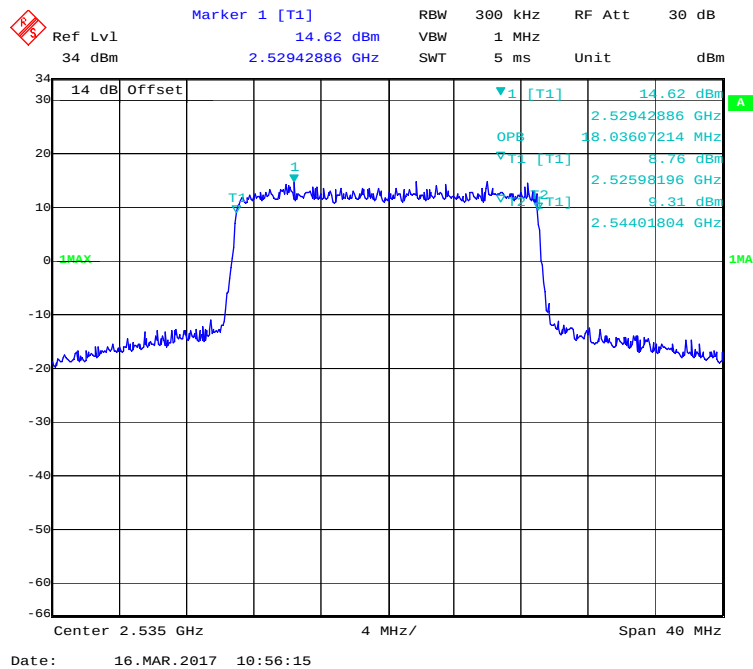
Marker 1 [T1]
▼1 [T1] 12.10 dBm
2.53269539 GHz
OPB 9.01803607 MHz
▼T1 [T1] 7.71 dBm
2.53049098 GHz
▼T2 [T1] 7.31 dBm
2.53950902 GHz

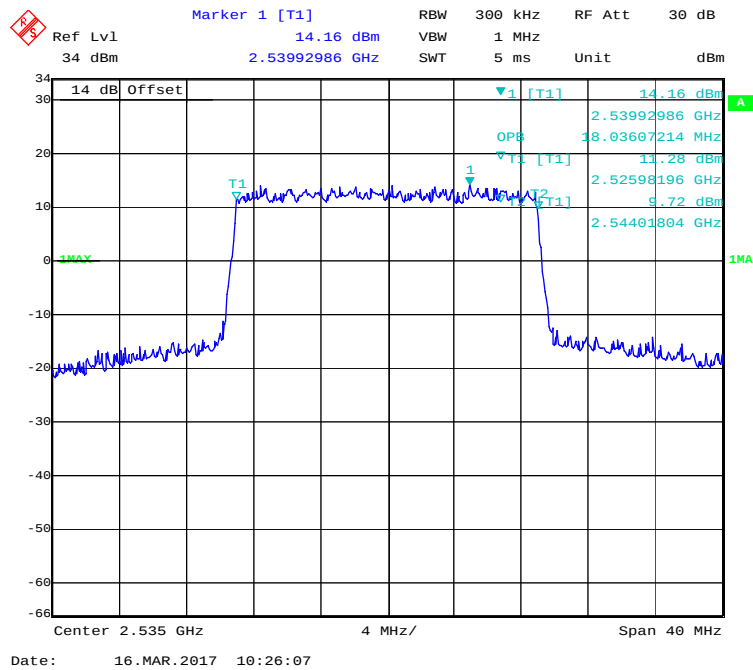
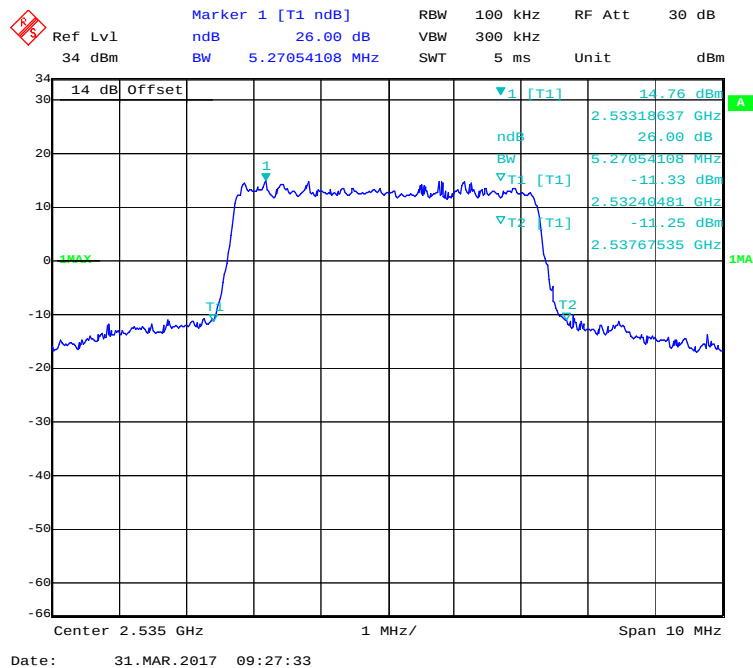
1MAX

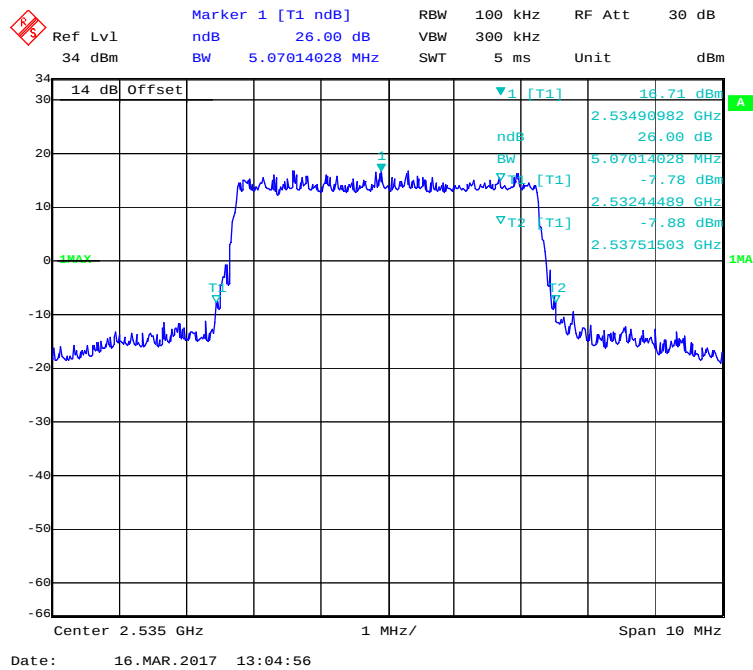
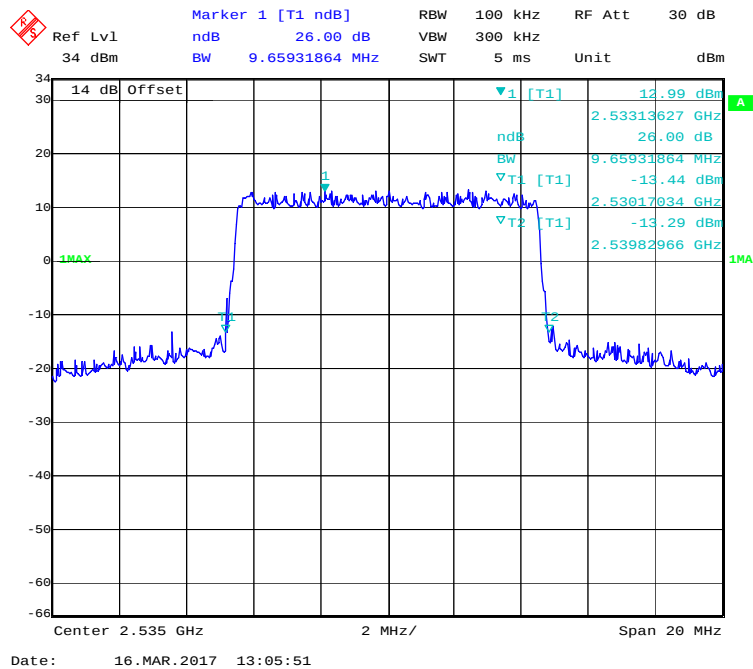
Center 2.535 GHz 2 MHz/ Span 20 MHz

Date: 16.MAR.2017 10:22:49

16-QAM (10.0MHz) - 99% Occupied Middle channel**QPSK (15.0 MHz) - 99% Occupied Middle channel**

16-QAM (15.0 MHz) - 99% Occupied Middle channel**QPSK (20.0 MHz) - 99% Occupied Middle channel**

16-QAM (20.0 MHz) - 99% Occupied Middle channel**QPSK (5.0 MHz) - 26 dB Bandwidth, Middle channel**

16-QAM (5.0 MHz) - 26 dB Bandwidth, Middle channel**QPSK (10.0 MHz) - 26 dB Bandwidth, Middle channel**

Ref Lvl 34 dBm
 Marker 1 [T1 ndB] ndB 26.00 dB
 BW 9.81963928 MHz
 RBW 100 kHz
 SWT 5 ms
 RF Att 30 dB
 Unit dBm

14 dB Offset
 12.90 dBm
 2.53261523 GHz
 26.00 dB
 9.81963928 MHz
 -13.51 dBm
 2.53013026 GHz
 -12.02 dBm
 2.53994990 GHz

Center 2.535 GHz
 2 MHz/
 Span 20 MHz

Date: 16.MAR.2017 13:05:17

Ref Lvl 34 dBm
 ndB 26.00 dB
 BW 14.90981964 MHz

RBW 300 kHz
 VBW 1 MHz
 SWT 5 ms

RF Att 30 dB
 Unit dBm

Marker 1 [T1 ndB]
 17.38 dBm
 2.53533066 GHz
 26.00 dB
 14.90981964 MHz
 -8.22 dBm
 2.52757515 GHz
 -8.77 dBm
 2.54248497 GHz

Center 2.535 GHz
 3 MHz/
 Span 30 MHz

Date: 16.MAR.2017 13:02:57

Ref Lvl 34 dBm
 ndB 26.00 dB
 BW 14.96993988 MHz
 RBW 300 kHz
 SWT 5 ms
 RF Att 30 dB
 Unit dBm

Marker 1 [T1 ndB]
 ndB 26.00 dB
 BW 14.96993988 MHz

▼1 [T1] 17.77 dBm
 ndB 26.00 dB
 BW 14.96993988 MHz
 [T1] -8.70 dBm
 ▼T2 [T1] -7.90 dBm
 2.54254509 GHz

Center 2.535 GHz
 3 MHz/
 Span 30 MHz

Date: 16.MAR.2017 13:04:26

Ref Lvl 34 dBm

Marker 1 [T1 ndB]

ndB 26.00 dB

BW 19.5591824 MHz

RBW 300 kHz

VBW 1 MHz

SWT 5 ms

RF Att 30 dB

Unit dBm

14 dB Offset

1MAX

T1

T2

1

2

▽1 [T1]

ndB

BW

▽T1 [T1]

▽T2 [T1]

15.56 dBm

2.53904810 GHz

26.00 dB

19.5591824 MHz

-16.30 dBm

2.52526052 GHz

-16.56 dBm

2.54481964 GHz

1MAX

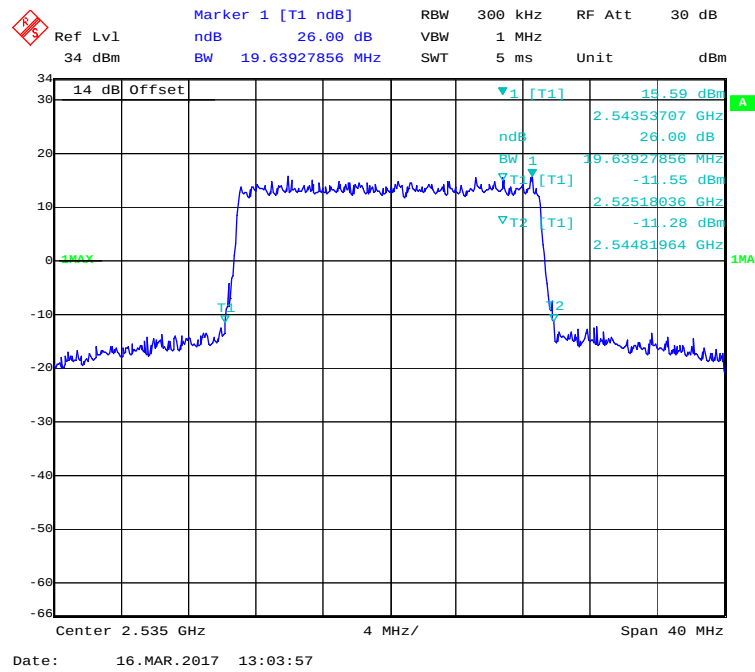
Center 2.535 GHz

4 MHz/

Span 40 MHz

Date: 16.MAR.2017 13:03:30

16-QAM (20.0 MHz) - 26 dB Bandwidth, Middle channel



FCC § 2.1051; § 22.917 (a);§27.53 (m) SPURIOUS EMISSIONS AT ANTENNA TERMINALS

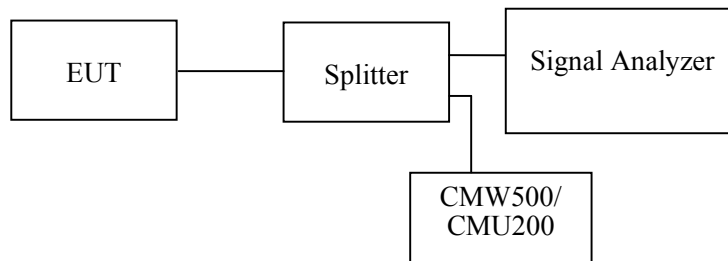
Applicable Standards

FCC §2.1051, §22.917(a) and §27.53(m).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Data

Environmental Conditions

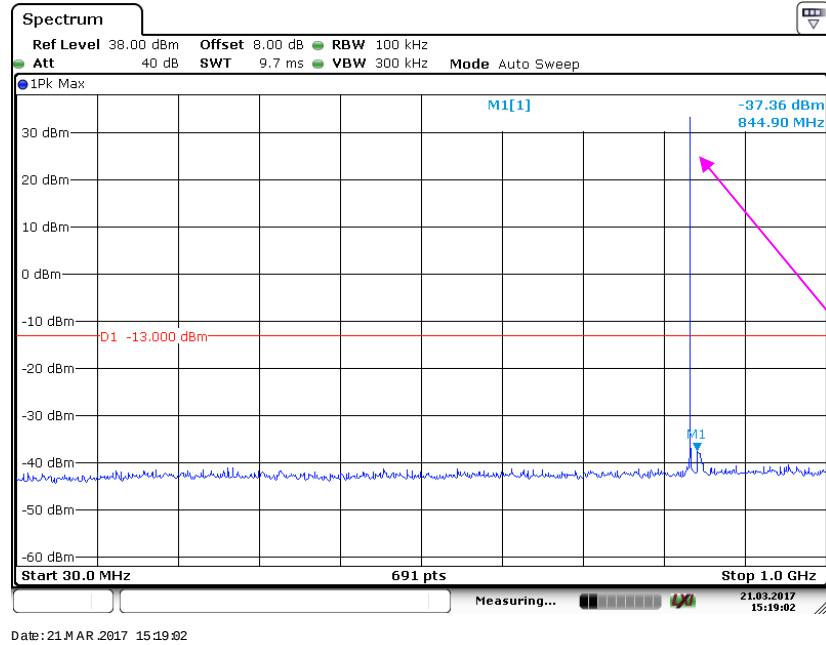
Temperature:	20~23 °C
Relative Humidity:	48~52 %
ATM Pressure:	100.5~101.0kPa

The testing was performed by Chris Wang on 2017-03-16 to 2017-03-21.

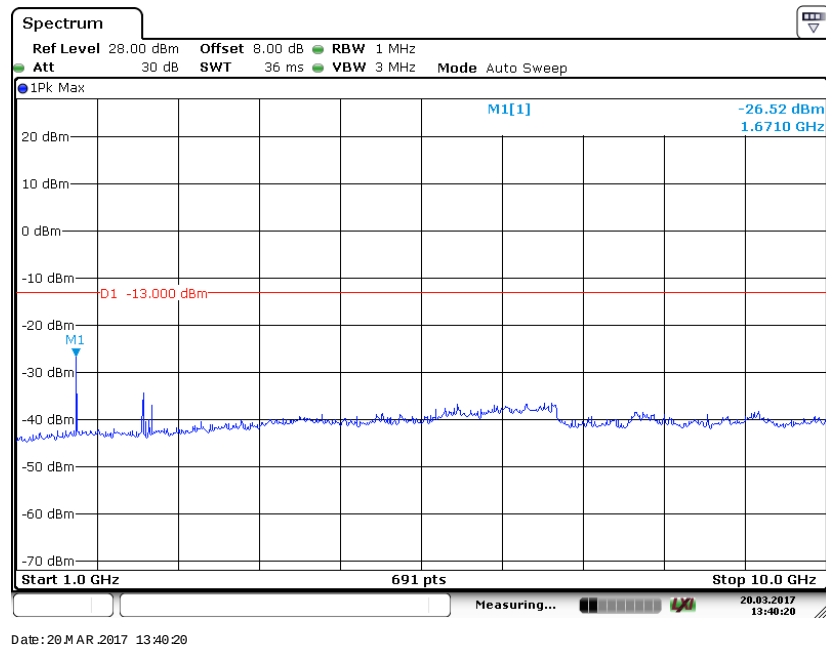
Please refer to the following plots.

Cellular Band (Part 22H)

30 MHz – 1 GHz (GSM Mode)

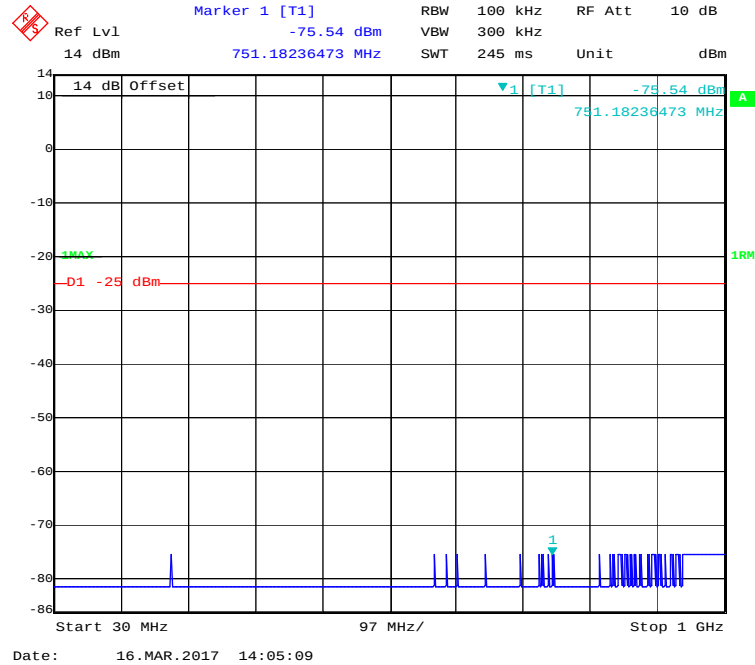


1 GHz – 10 GHz (GSM Mode)

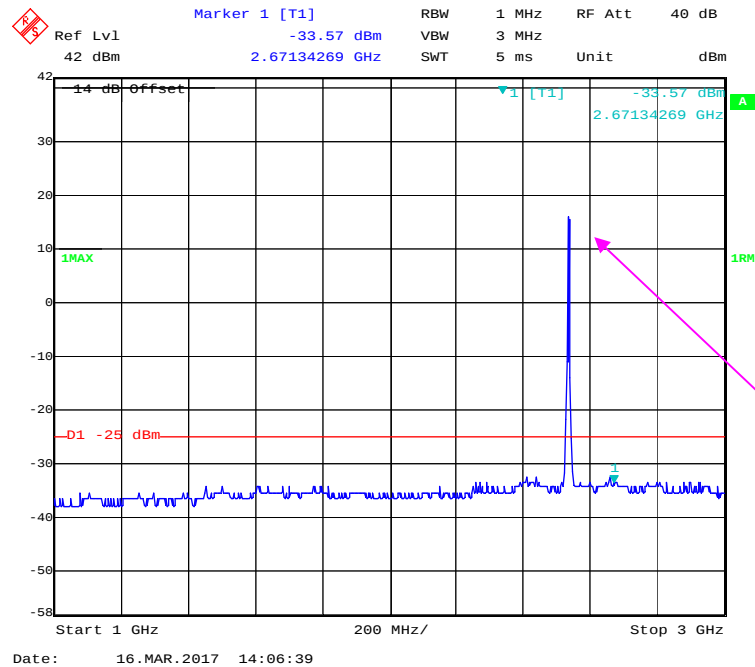


LTE Band 7(QPSK was the worst):

30 MHz - 1 GHz (5.0 MHz, Middle Channel)

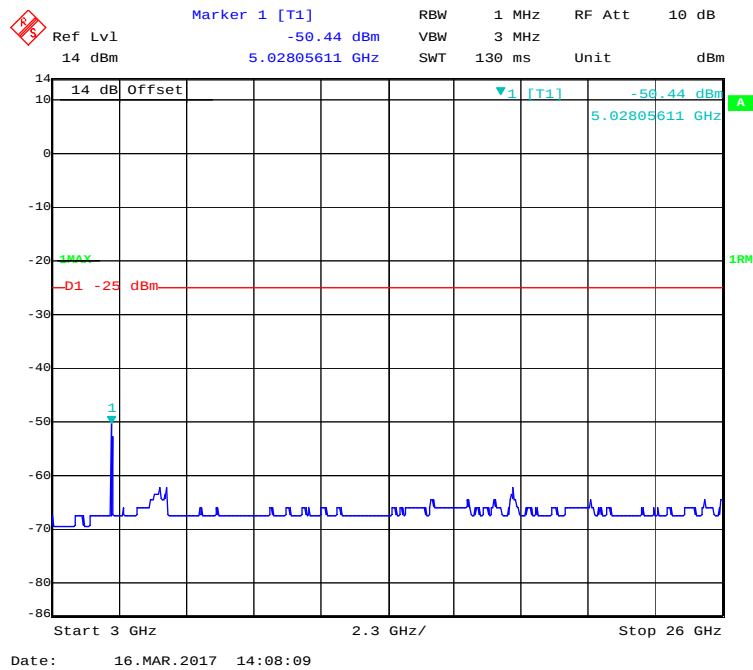


1 GHz – 3 GHz (5.0 MHz, Middle Channel)

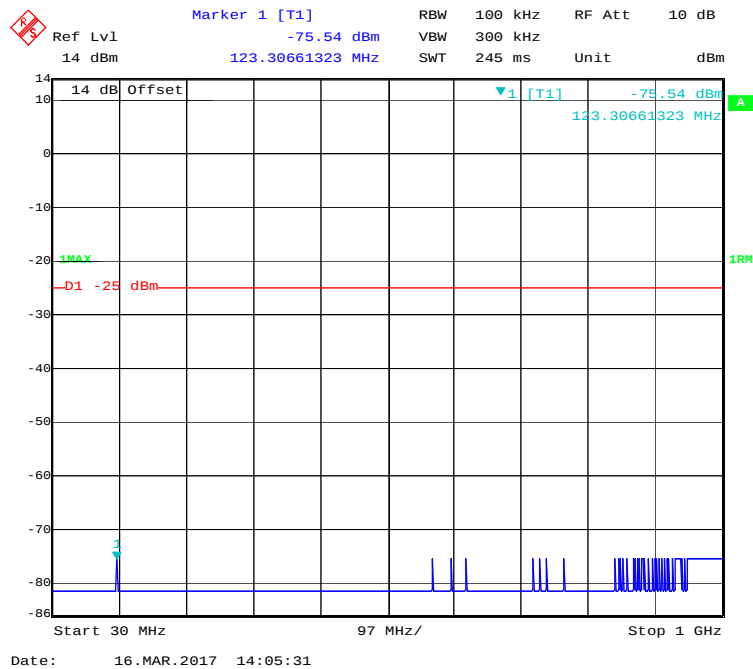


Fundamental test

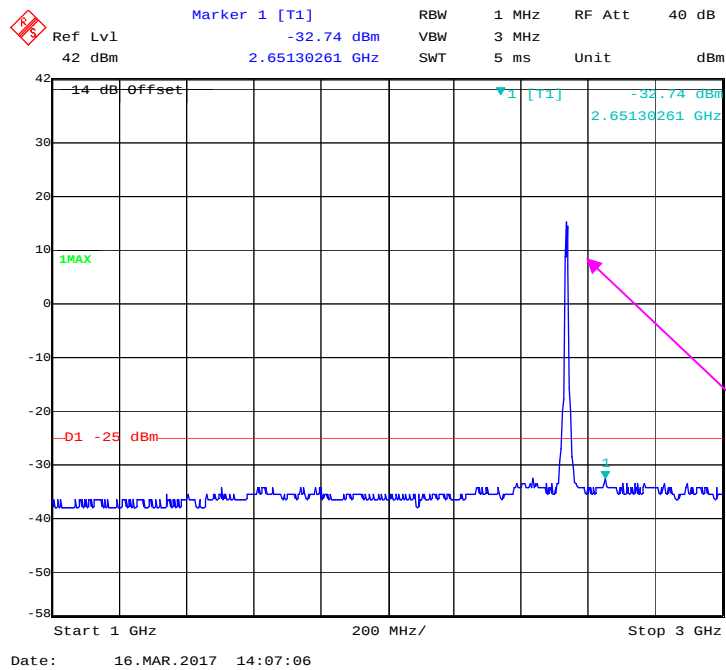
3 GHz - 26 GHz (5.0 MHz, Middle Channel)



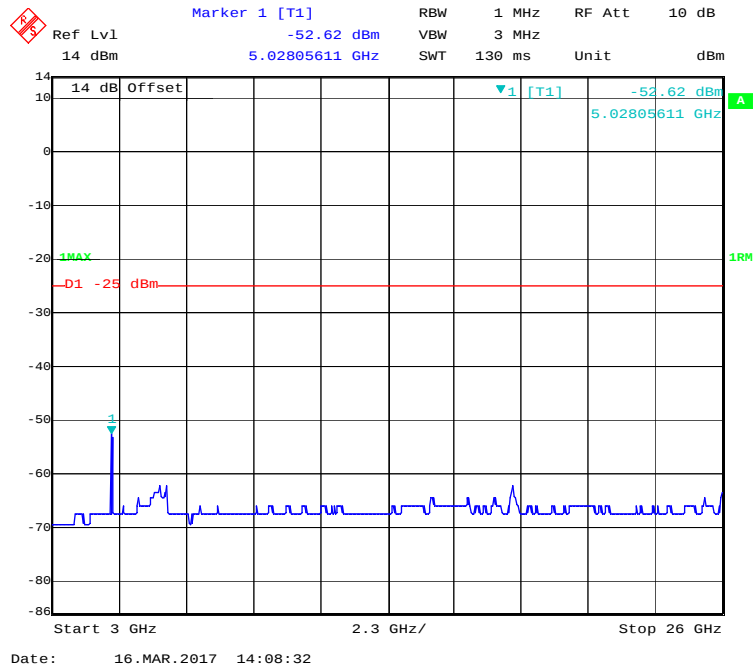
30 MHz – 1 GHz (10.0 MHz, Middle Channel)



1G Hz - 3 GHz (10.0 MHz, Middle Channel)



3 GHz – 26 GHz (10.0MHz, Middle Channel)



Marker 1 [T1]
 -75.54 dBm
 626.77354709 MHz

RBW 100 kHz RF Att 10 dB
 VBW 300 kHz
 SWT 245 ms Unit dBm

14 dB Offset
 14 dBm
 -25 dBm
 -14 dBm
 -75.54 dBm
 626.77354709 MHz

Start 30 MHz 97 MHz/ Stop 1 GHz

Date: 16.MAR.2017 14:05:47

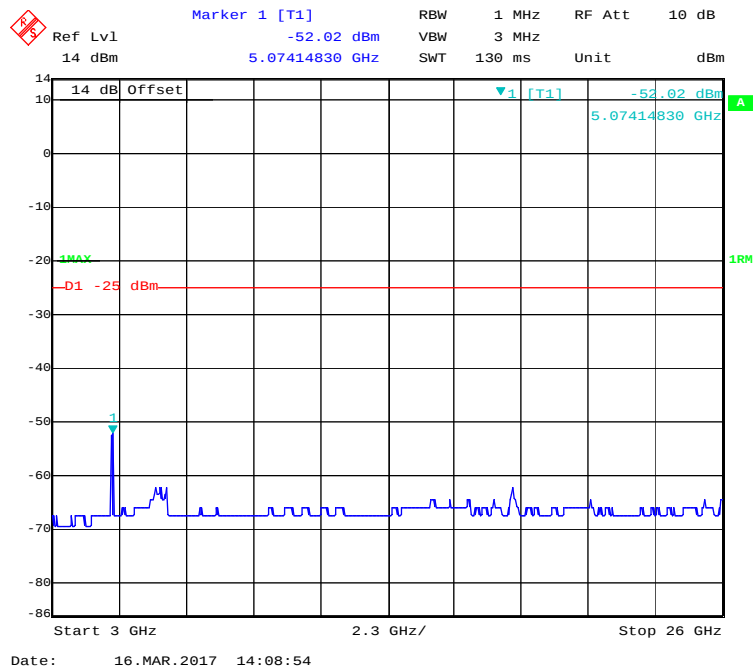
Marker 1 [T1]
 Ref Lvl -32.74 dBm
 42 dBm
 2.67134269 GHz
 RBW 1 MHz
 VBW 3 MHz
 SWT 5 ms
 RF Att Unit
 40 dBm
 dBm

14 dB Offset
 1MAX
 D1 -25 dBm
 Start 1 GHz
 200 MHz/
 Stop 3 GHz

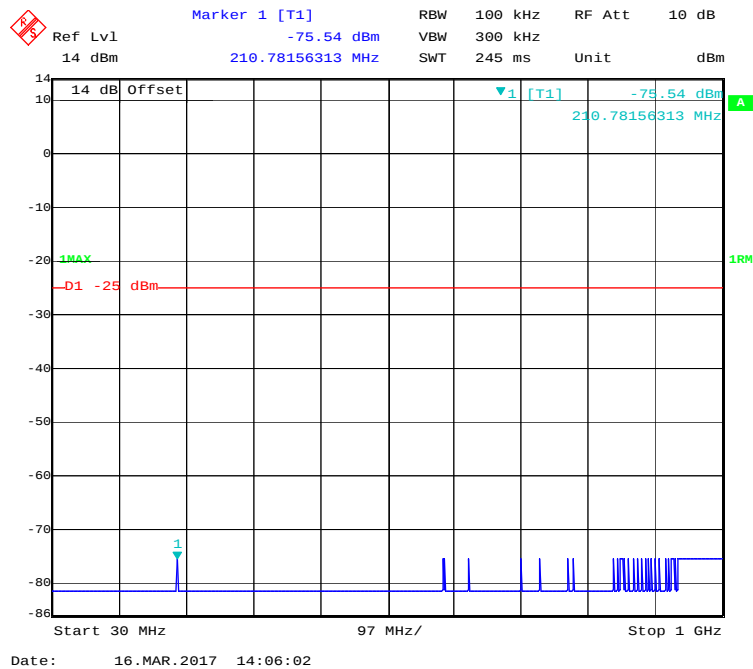
Date: 16.MAR.2017 14:07:27

Fundamental test

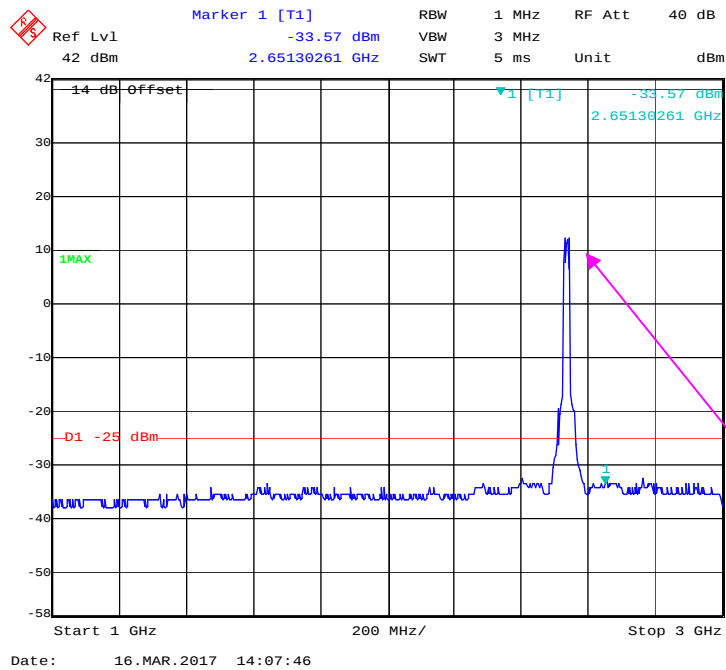
3 GHz - 26 GHz (15.0 MHz, Middle Channel)



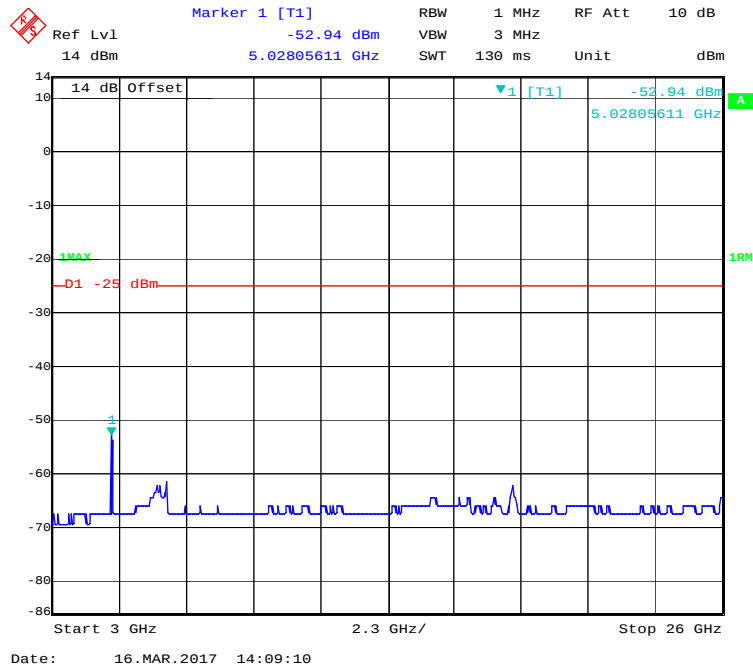
30 MHz – 1 GHz (20.0 MHz, Middle Channel)



1 MHz - 3 GHz (20.0 MHz, Middle Channel)



3 GHz – 26 GHz (20.0 MHz, Middle Channel)



FCC § 2.1053; § 22.917 (a); §27.53 (m) SPURIOUS RADIATED EMISSIONS**Applicable Standards**

FCC § 2.1053, §22.917(a) and § 27.53(m)

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TX pwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log₁₀ (power out in Watts)

Test Data**Environmental Conditions**

Temperature:	20~23 °C
Relative Humidity:	48~52 %
ATM Pressure:	100.5~101.0kPa

The testing was performed by Chris Wang on 2017-03-16 to 2017-03-20.

Test mode: Transmitting (Pre-scan with Low, Middle, High channel, and the worse case data as below)

30 MHz ~ 10 GHz:

Cellular Band (Part 22H)

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
GSM Mode, Middle channel										
225.03	34.18	112	241	H	-68.94	0.15	2.90	-66.19	-13	53.19
225.03	33.32	215	159	V	-74.10	0.15	2.90	-71.35	-13	58.35
1673.20	38.96	28	128	H	-71.20	0.39	8.48	-63.11	-13	50.11
1673.20	38.75	64	210	V	-73.34	0.39	8.48	-65.25	-13	52.25
2509.80	45.51	180	208	H	-65.40	0.49	10.09	-55.80	-13	42.80
2509.80	45.46	188	180	V	-66.16	0.49	10.09	-56.56	-13	43.56

Test mode: Transmitting in middle channel of QPSK mode of 20M bandwidth(worst case)

LTE Band 7:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
Middle channel 2535M										
175.35	37.52	303	139	H	-59.5	0.28	0	-59.78	-25	34.78
175.35	35.21	11	152	V	-61.8	0.28	0	-62.08	-25	37.08
5070.00	37.68	235	168	H	-44.4	1.60	11.20	-34.80	-25	9.80
5070.00	32.3	108	189	V	-49.4	1.60	11.20	-39.80	-25	14.80

Note:

Absolute Level = Submitted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

FCC § 22.917 (a); §27.53 (m) - BAND EDGES

Applicable Standards

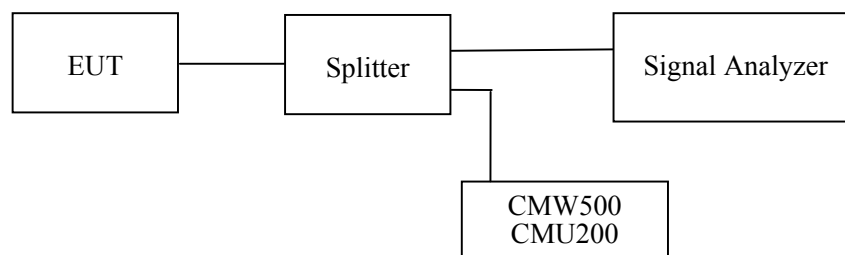
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

According to FCC §27.53 (m), for BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency



Test Data

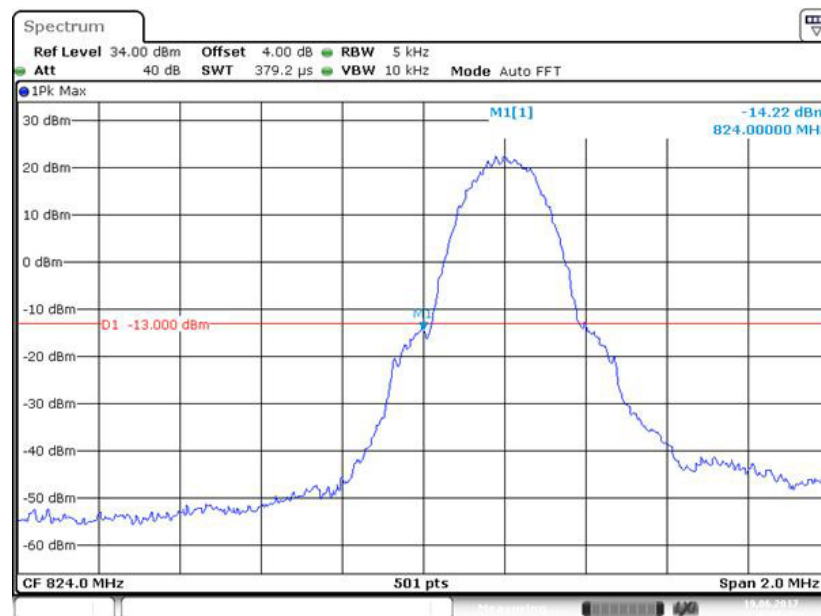
Environmental Conditions

Temperature:	20~23 °C
Relative Humidity:	48~52 %
ATM Pressure:	100.5~101.0kPa

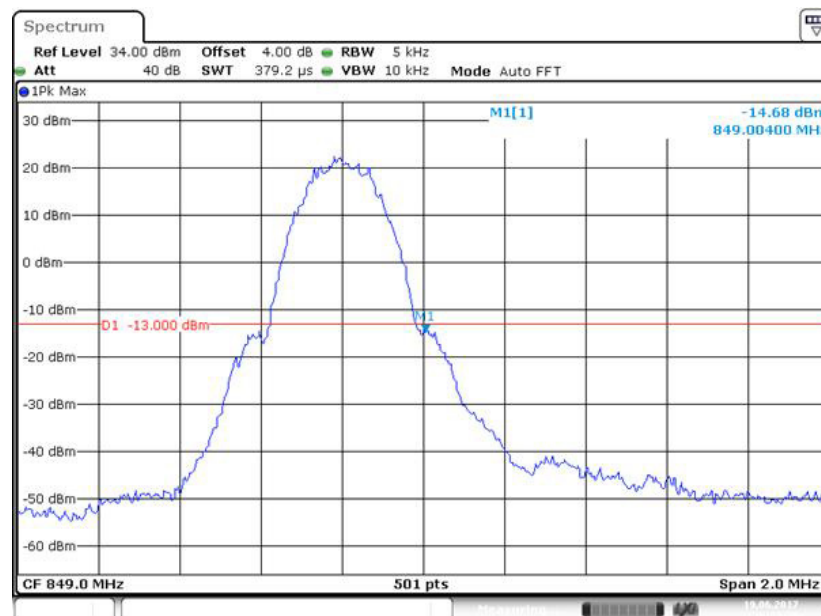
The testing was performed by Chris Wang on 2017-03-16 to 2017-03-20.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following plots.

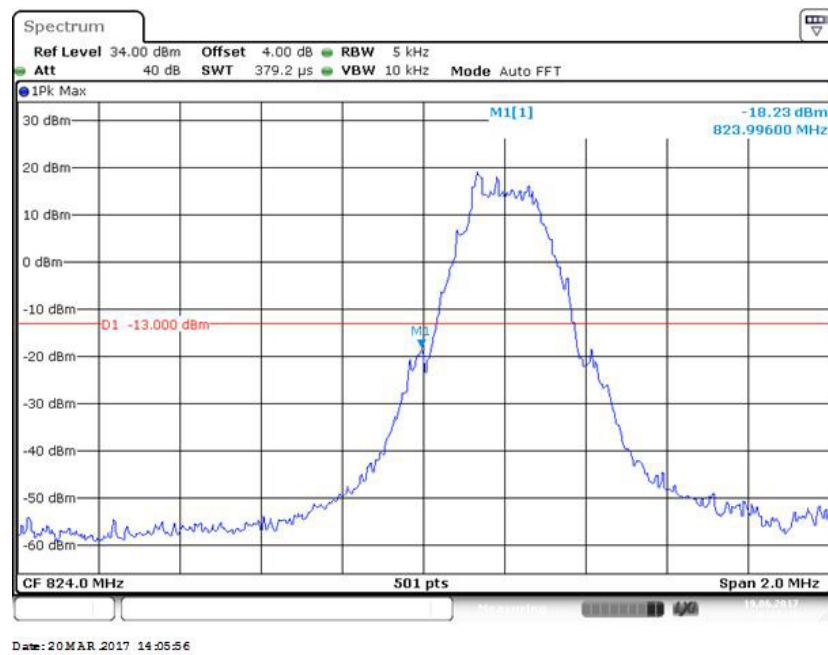
Cellular Band, Left Band Edge for GSM (GMSK) Mode

Date: 20 MAR 2017 14:05:22

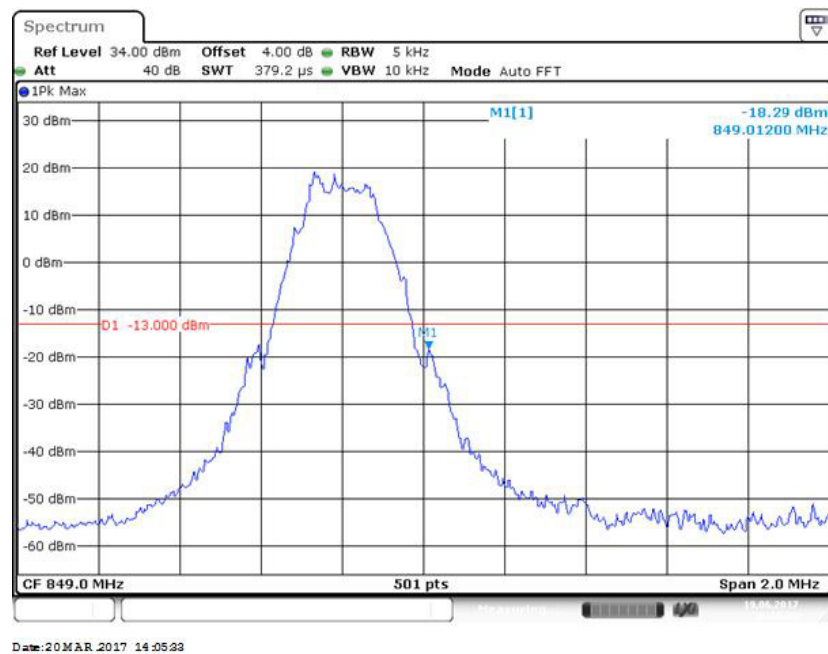
Cellular Band, Right Band Edge for GSM (GMSK) Mode

Date: 20 MAR 2017 14:05:28

Cellular Band, Left Band Edge for EGPRS Mode



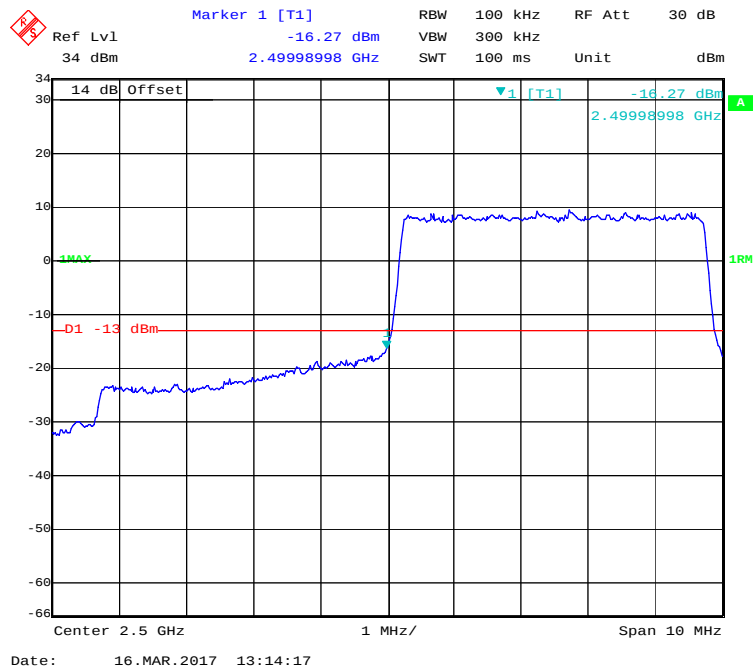
Cellular Band, Right Band Edge for EGPRS Mode



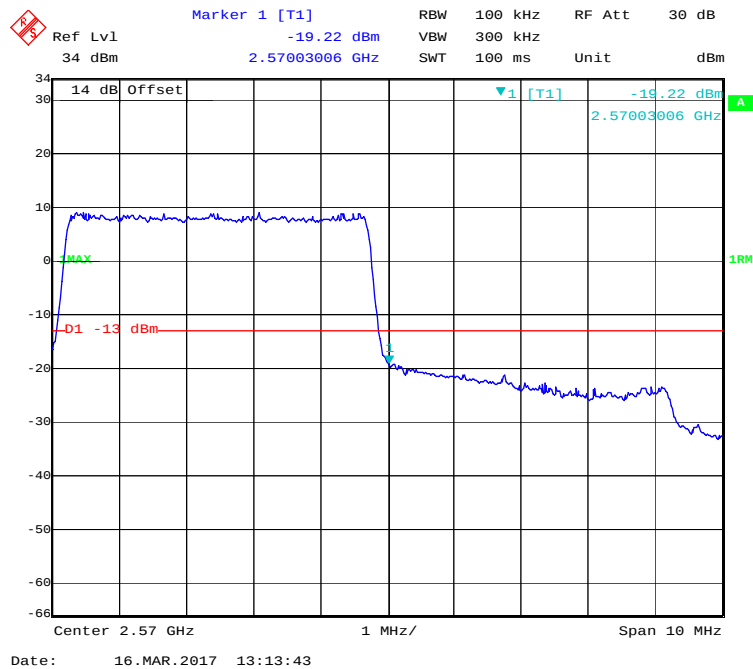
QPSK (5.0 MHz, FULL RB) - Left Band Edge



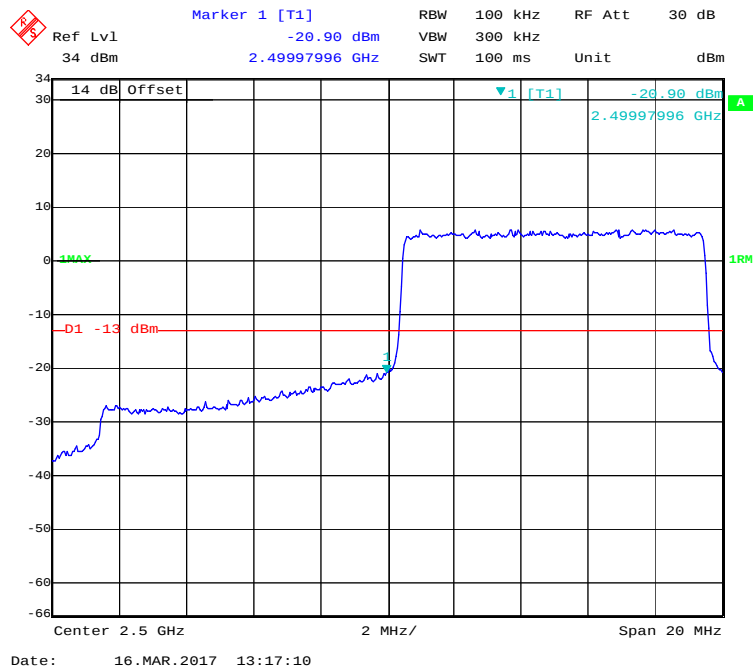
16-QAM (5.0 MHz, FULL RB) - Left Band Edge



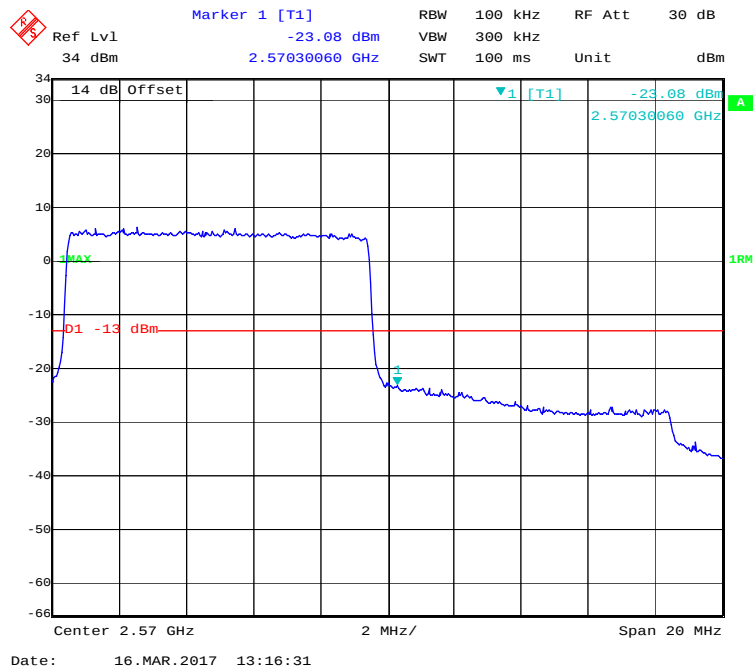
16-QAM (5.0 MHz, FULL RB) - Right Band Edge



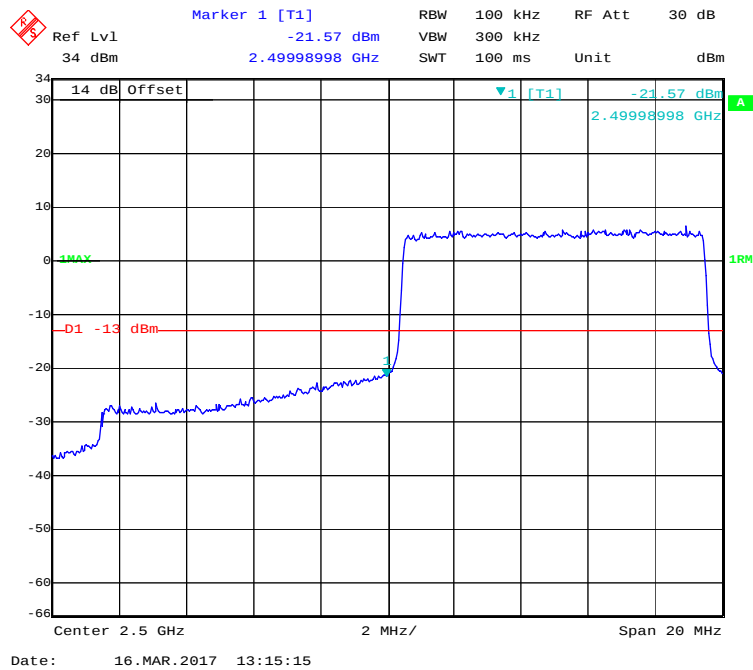
QPSK (10.0 MHz, FULL RB) - Left Band Edge



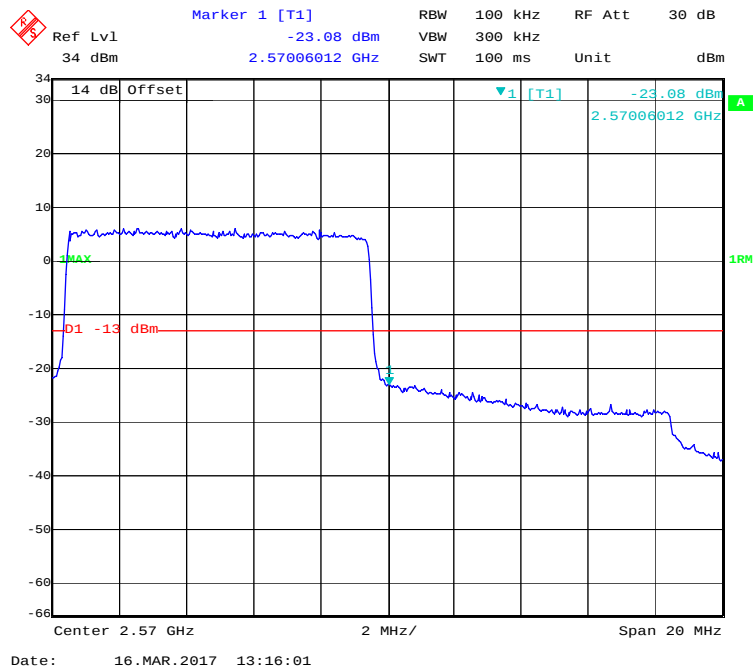
QPSK (10.0 MHz, FULL RB) - Right Band Edge



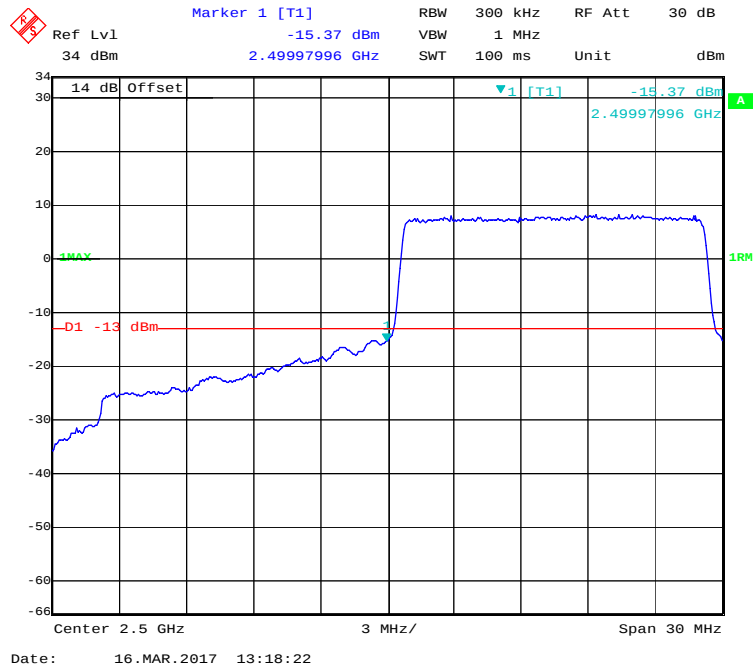
16-QAM (10.0 MHz, FULL RB) - Left Band Edge



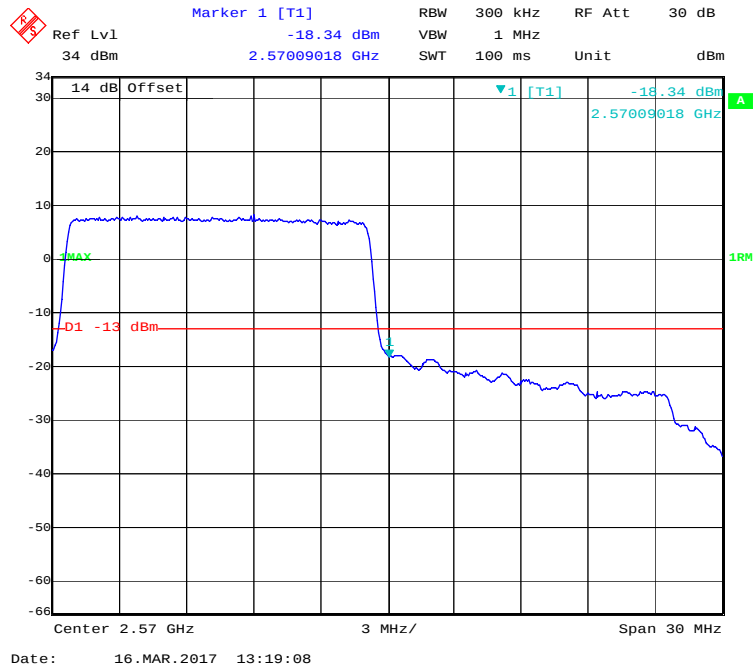
16-QAM (10.0 MHz, FULL RB) - Right Band Edge



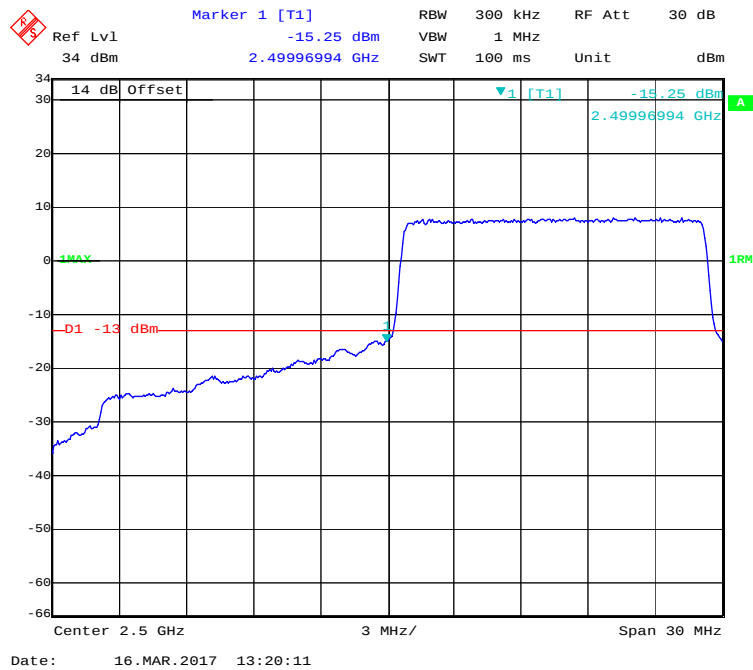
QPSK (15.0 MHz, FULL RB) - Left Band Edge



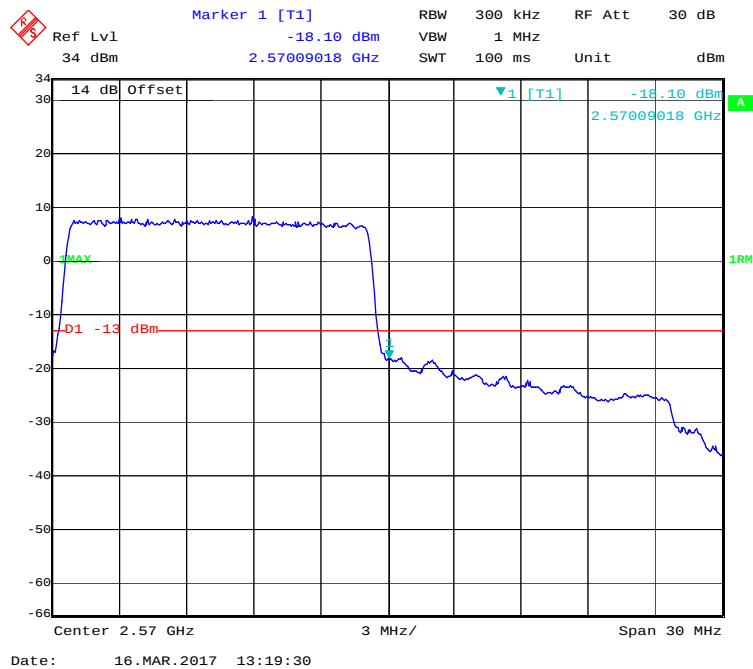
QPSK (15.0 MHz, FULL RB) - Right Band Edge



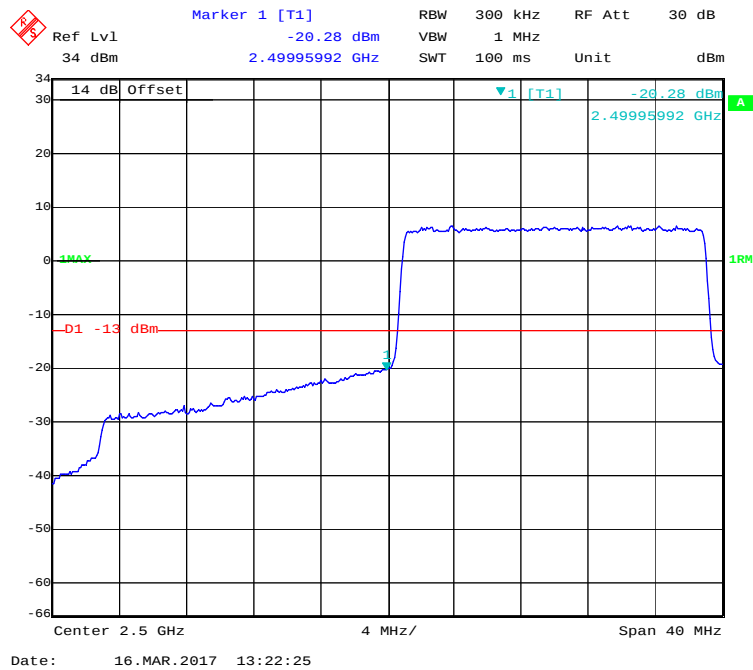
16-QAM (15.0 MHz, FULL RB) - Left Band Edge



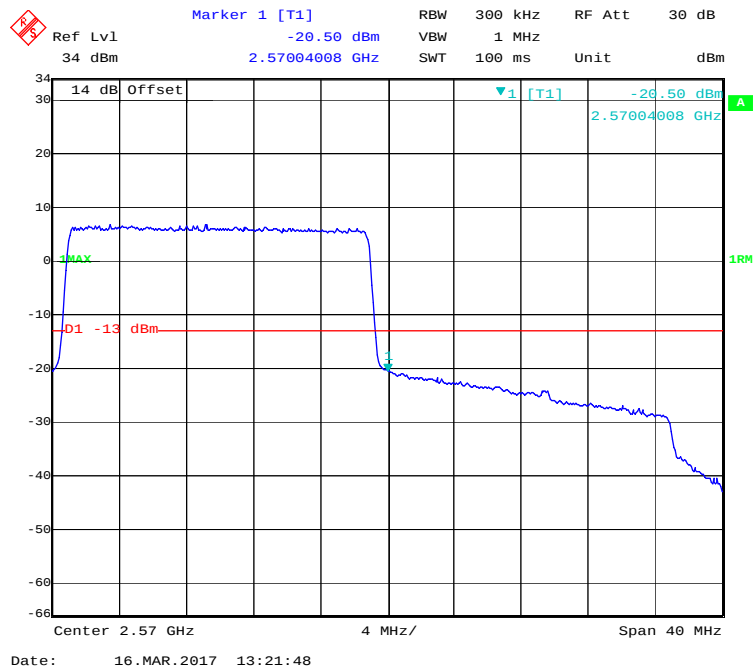
16-QAM (15.0 MHz, FULL RB) - Right Band Edge



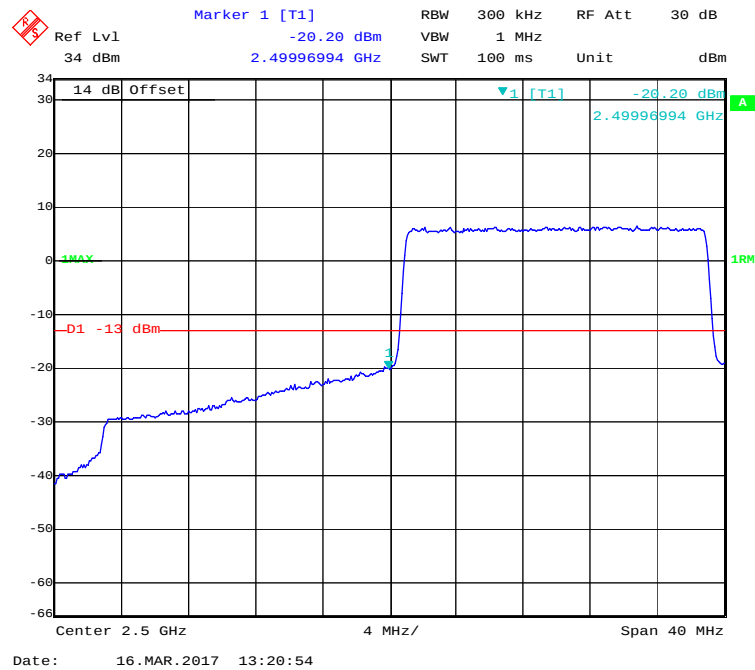
QPSK (20.0MHz, FULL RB) - Left Band Edge



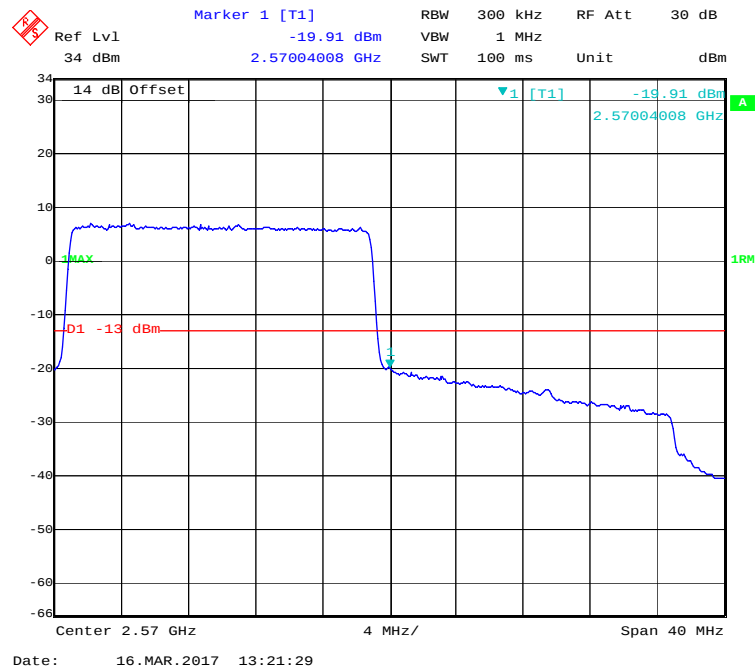
QPSK (20.0MHz, FULL RB) - Right Band Edge



16-QAM (20.0 MHz, FULL RB) - Left Band Edge



16-QAM (20.0 MHz, FULL RB) - Right Band Edge



FCC § 2.1055; § 22.355; §27.54; - FREQUENCY STABILITY**Applicable Standards**

FCC § 2.1055, §22.355 and §27.54.

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

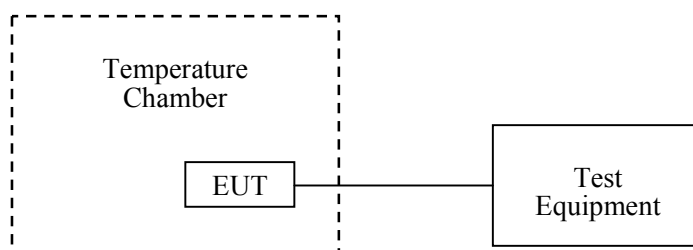
Frequency Range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



Test Data**Environmental Conditions**

Temperature:	20~23 °C
Relative Humidity:	48~52 %
ATM Pressure:	100.5~101.0kPa

The testing was performed by Chris Wang on 2017-03-16 to 2017-03-20.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following tables.

Cellular Band (Part 22H)**GSM Mode**

Middle Channel, $f_o = 836.6$ MHz				
Temperature (°C)	Power Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.8	11	0.01315	2.5
-20		14	0.01673	2.5
-10		14	0.01673	2.5
0		15	0.01793	2.5
10		15	0.01793	2.5
20		15	0.01793	2.5
30		14	0.01673	2.5
40		14	0.01673	2.5
50		14	0.01673	2.5
25	V min.= 3.6	15	0.01793	2.5
25	V max.= 4.2	14	0.01673	2.5

EDGE Mode

Middle Channel, $f_0 = 836.6$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.8	8	0.00956	2.5
-20		7	0.00837	2.5
-10		3	0.00359	2.5
0		5	0.00598	2.5
10		7	0.00837	2.5
20		8	0.00956	2.5
30		10	0.01195	2.5
40		10	0.01195	2.5
50		10	0.01195	2.5
25	V min.= 3.6	10	0.01195	2.5
25	V max.= 4.2	11	0.01315	2.5

Band 7:

10.0 MHz Middle Channel, $f_0 = 2535.0$ MHz (QPSK)				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	3.8	-60	-0.02367	pass
-20		-55	-0.02170	pass
-10		-55	-0.02170	pass
0		-35	-0.01381	pass
10		-35	-0.01381	pass
20		-29	-0.01144	pass
30		-35	-0.01381	pass
40		-40	-0.01578	pass
50		-45	-0.01775	pass
25	V min.= 3.6	-55	-0.02170	pass
25	V max.= 4.2	-68	-0.02682	pass

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