FCC PART 24E&PART 27

MEASUREMENT AND TEST REPORT

For

Iconnect

No.9, Aly. 58, Ln. 112, Ruiguang Rd., Neihu Dist.,Taipei City,Taiwan

FCC ID: 2AB8796

Report Type:	**Product Name:**
Original Report	4G LTE USB Dongle

Test Engineer:	*Tom Tang*
Report Number:	RDG170405005B
Report Date:	2017-05-05
Reviewed By:	Henry Ding EMC Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: 028-65523123, Fax: 028-65525125 www.baclcorp.com

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Iconnect*** 's product, model number: ***Onyx4G (FCC ID: 2AB8796)*** (the "EUT") in this report was a ***4G LTE USB Dongle***, which was measured approximately: 9.3cm (L) × 3.1 cm (W) × 0.7 cm (H), rated input voltage: DC5V from USB port.

Note: The series product,modelsOnyx4G-E,Onyx4GR,Onyx4GR-E,Onyx4GT,Onyx4GT-E,Onyx-4GRT, Onyx4GRT-E,Tube-U4G,Tube-U4GR,Tube-U4GT,Tube-U4GRT,N4G,N4GR,N4GT,N4GRT,CampPro-4G, CampPro-4GR,WISP-4G,WISP-4GR,Onyx5G,Onyx5GR,Tube-U5G,Tube-U5GR,N5G,N5GR,CampPro-5G,CampPro-5GR,WISP-5G,WISP-5GR and Onyx4G are electrically identical, we selected Onyx4G for testing, the differences between them were explained in the attached declaration letter.

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**All measurement and test data in this report was gathered from final production sample, serial number: 170405005 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-04-05, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of ***Iconnect*** in accordance with: Part 2-Subpart J, Part 24-Subpart E and part 27 of the Federal Communications Commission's rules.

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

Related Submittal(s)/Grant(s)

No Related Submittal.

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, Part 24 Subpart E and Part 27.

Applicable Standards: TIA/EIA 603-D-2010.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Chengdu).

Test Facility

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Test site at BACL 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 April 24, 2015. 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.: 560332. 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-2010.

The test items were performed with the EUT operating at testing mode.

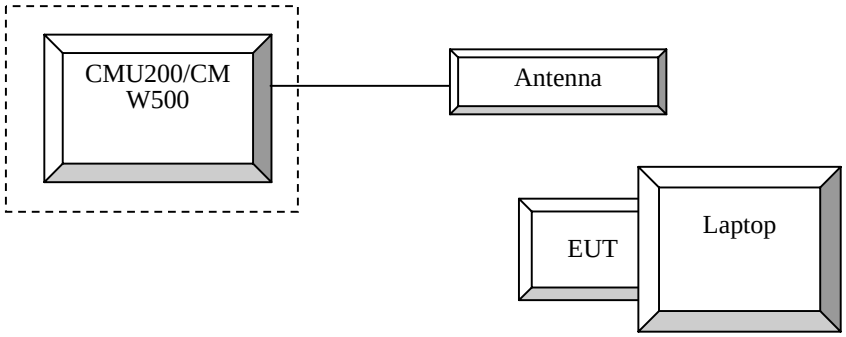
Equipment Modifications

No modification was made to the EUT.

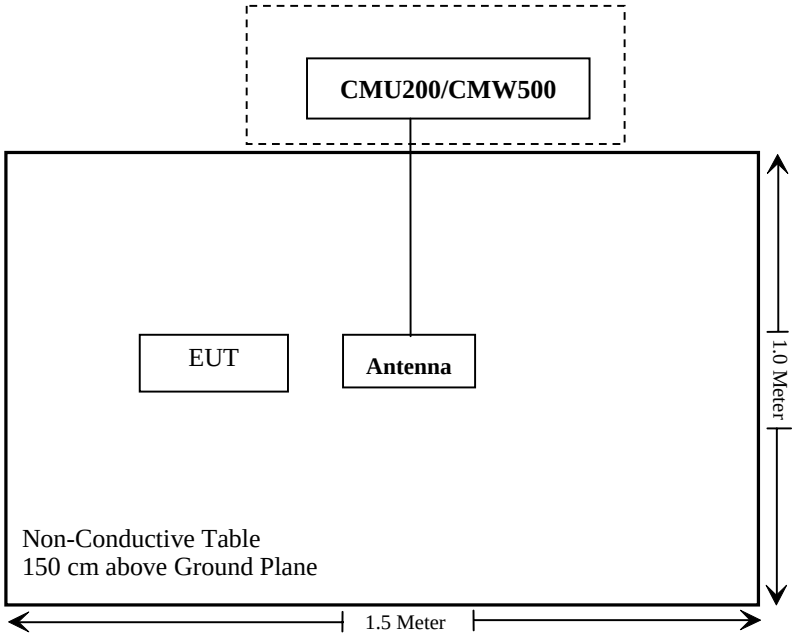
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1017
R&S	Universal Radio Communication Tester	CMU200	109 038
R&S	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310, §2.1093	RF Exposure	Compliance
§2.1046; § 24.232 (c); §27.50	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 24.238; §27.53	Occupied Bandwidth	Compliance
§ 2.1051, § 24.238 (a); §27.53	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053 § 24.238 (a); §27.53	Spurious Radiation Emissions	Compliance
§ 24.238 (a); §27.53	Out of band emission, Band Edge	Compliance
§ 2.1055 § 24.235; §27.54	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance

FCC §1.1310 & §2.1093- RF EXPOSURE

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliant, please refer to the SAR report: RDG170405005-20.

FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), 24E&Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

FCC § 2.1046,§ 24.232 (c) & § 27.50 - RF OUTPUT POWER

Applicable Standard

According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications..

According to FCC §2.1046 and §27.50 (d), (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

According to §24.232 (d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. 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.

Test Procedure

GSM/GPRS/EGPRS

Function: Menu select > GSM Mobile Station > GSM 850/1900
Press Connection control to choose the different menus
Press RESET > choose all the reset all settings
Connection Press Signal Off to turn off the signal and change settings
Network Support > GSM + GPRS or GSM + EGSM
Main Service > Packet Data
Service selection > Test Mode A – Auto Slot Config. off
MS Signal Press Slot Config Bottom on the right twice to select and change the number of time slots and power setting
> Slot configuration > Uplink/Gamma
> 33 dBm for GPRS 850
> 30 dBm for GPRS 1900
> 27 dBm for EGPRS 850
> 26 dBm for EGPRS 1900
BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel
Frequency Offset > + 0 Hz
Mode > BCCH and TCH
BCCH Level > -85 dBm (May need to adjust if link is not stable)
BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]

Channel Type > Off

P0 > 4 dB
Slot Config > Unchanged (if already set under MS signal)
TCH > choose desired test channel
Hopping > Off
Main Timeslot > 3
Network Coding Scheme > CS4 (GPRS) and MCS5 (EGPRS)

Bit Stream > 2E9-1 PSR Bit Stream
AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input
Connection Press Signal on to turn on the signal and change settings

LTE (FDD):

The following tests were conducted according to the test requirements in 3GPP TS36.101

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

Radiated method:

ANSI/TIA 603-D section 2.2.17

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A121808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
EMCO	Adjustable Dipole Antenna	3121C	9109-258	N/A	N/A
HP	Signal Generator	8648C	3623A04150	2016-05-23	2017-05-22
WILTRON	SWEPT FREQUENCY SYNTHESIZER	6737	213001	2016-05-23	2017-05-22
EMCT	Semi-Anechoic Chamber	966	966-1	2015-04-24	2018-04-23
Unknown	RF Cable (below 1GHz)	Unknown	NO.1	2016-11-10	2017-11-09
Unknown	RF Cable (below 1GHz)	Unknown	NO.4	2016-11-10	2017-11-09
Unknown	RF Cable (above 1GHz)	Unknown	NO.2	2016-11-10	2017-11-09
R&S	Universal Radio Communication Tester	CMU200	11-9435686-111	2016-07-28	2017-07-27
R&S	Wideband Radio Communication Tester	CMW500	106891	2016-11-23	2017-11-23

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	25.4 °C
Relative Humidity:	43%
ATM Pressure:	99.8kPa

The testing was performed by Tom Tang on 2017-05-04.

Conducted Power

PCS Band

Band	Channel No.	Peak Output Power (dBm)							
		GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot	EDGE 1 TX Slot	EDGE 2 TX Slot	EDGE 3 TX Slot	EDGE 4 TX Slot
PCS	512	31.63	27.29	25.93	24.12	25.79	23.65	21.62	19.62
	661	31.69	27.50	26.23	24.40	25.87	23.83	21.63	19.70
	810	31.99	28.58	27.14	24.78	25.98	24.07	21.68	19.89

LTE Band VII (PART 27)

Channel Bandwidth	Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
5 MHz	QPSK	1#0	22.19	22.23	20.73
		1#13	22.46	22.24	20.99
		1#24	22.37	21.99	21.12
		15#0	21.82	21.31	19.97
		15#11	21.78	21.32	20.12
		25#0	21.85	21.26	20.04
	16QAM	1#0	21.00	20.86	19.22
		1#13	21.45	20.82	19.45
		1#24	21.42	20.69	19.61
		25#0	21.03	20.69	19.37
10 MHz	QPSK	1#0	21.25	22.39	20.60
		1#24	21.93	22.30	20.78
		1#49	22.24	22.06	21.16
		25#0	21.14	21.12	19.56
		25#24	21.24	21.02	20.12
		50#0	21.35	21.19	19.97
	16QAM	1#0	20.95	21.61	20.17
		1#24	21.78	21.64	20.26
		1#49	21.34	21.34	20.58
		50#0	21.54	21.25	19.19

Channel Bandwidth	Modulation	Resource Block & RB offset	Low Channel (dBm)	Middle Channel (dBm)	High Channel (dBm)
15M	QPSK	1#0	22.06	22.31	20.90
		1#37	23.07	22.19	20.81
		1#74	23.00	21.62	21.49
		36#0	22.29	21.27	19.62
		36#35	21.87	21.14	20.21
		75#0	21.79	21.13	19.76
	16-QAM	1#0	21.52	21.54	20.09
		1#37	22.25	21.34	20.65
		1#74	22.54	20.72	20.65
		75#0	20.78	20.38	19.13
20M	QPSK	1#0	21.24	22.32	20.79
		1#49	22.79	22.73	21.68
		1#99	22.71	21.51	21.28
		50#0	22.33	21.40	19.64
		50#49	22.09	20.96	19.85
		100#0	19.60	21.17	19.60
	16-QAM	1#0	20.88	21.74	21.22
		1#49	21.60	21.48	20.84
		1#99	21.83	20.67	21.51
		100#0	20.88	20.29	18.87

PAR, Band VII

Test Modulation		Channel Bandwidth	Low Channel PAR (dB)	Middle Channel PAR (dB)	High Channel PAR (dB)	Limit (dB)
QPSK	1 RB	20M	4.76	4.96	5.60	13.00
	100 RB		6.36	6.16	6.32	13.00
16QAM	1 RB	20M	5.40	5.92	6.32	13.00
	100 RB		7.04	6.96	7.08	13.00

Note: peak-to-average ratio (PAR) <13 dB.

ERP & EIRP

Part 24E

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
PCS 1900_Middle Channel								
1880.000	H	91.23	18.6	11.7	2.7	27.6	33.0	5.4
1880.000	V	89.65	17.2	11.7	2.7	26.2	33.0	6.8
EDGE 1900_Middle Channel								
1880.000	H	89.63	17	11.7	2.7	26.0	33.0	7.0
1880.000	V	88.19	15.7	11.7	2.7	24.7	33.0	8.3

LTE Band VII

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK 5 MHz Middle Channel								
2535.000	H	87.93	15.3	13.1	3.1	25.3	33.00	7.7
2535.000	V	87.12	16	13.1	3.1	26.0	33.00	7.0
QPSK 10 MHz Middle Channel								
2535.000	H	88.31	15.7	13.1	3.1	25.7	33.00	7.3
2535.000	V	86.87	15.7	13.1	3.1	25.7	33.00	7.3
QPSK 15 MHz Middle Channel								
2535.000	H	87.69	15.1	13.1	3.1	25.1	33.00	7.9
2535.000	V	86.58	15.4	13.1	3.1	25.4	33.00	7.6
QPSK 20MHz Middle Channel								
2535.000	H	87.08	14.5	13.1	3.1	24.5	33.00	8.5
2535.000	V	87.63	16.5	13.1	3.1	26.5	33.00	6.5
16QAM 5 MHz Middle Channel								
2535.000	H	86.77	14.2	13.1	3.1	24.2	33.00	8.8
2535.000	V	86.74	15.6	13.1	3.1	25.6	33.00	7.4
16QAM 10 MHz Middle Channel								
2535.000	H	88.04	15.4	13.1	3.1	25.4	33.00	7.6
2535.000	V	87.16	16	13.1	3.1	26.0	33.00	7.0
16QAM 15 MHz Middle Channel								
2535.000	H	87.42	14.8	13.1	3.1	24.8	33.00	8.2
2535.000	V	86.75	15.6	13.1	3.1	25.6	33.00	7.4
16QAM 20 MHz Middle Channel								
2535.000	H	87.27	14.7	13.1	3.1	24.7	33.00	8.3
2535.000	V	87.91	16.8	13.1	3.1	26.8	33.00	6.2

FCC §2.1049, §24.238 & §27.53- OCCUPIED BANDWIDTH

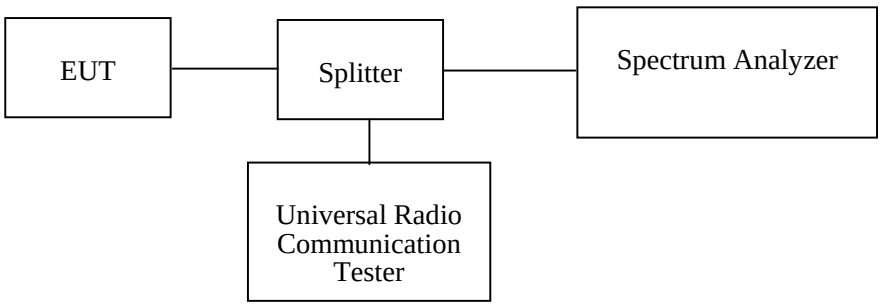
Applicable Standard

FCC §2.1049, §24.238 and §27.53.

Test Procedure

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

The 26 dB & 99% bandwidth was recorded.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	NO.3	Each Time	/
Unknown	Two-way Spliter	Unknown	OE0120121	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

Temperature:	22.1~22.8 °C
Relative Humidity:	39 %
ATM Pressure:	96.2~99.6kPa

The testing was performed by Tom Tang from 2017-04-19 to 2017-04-23.

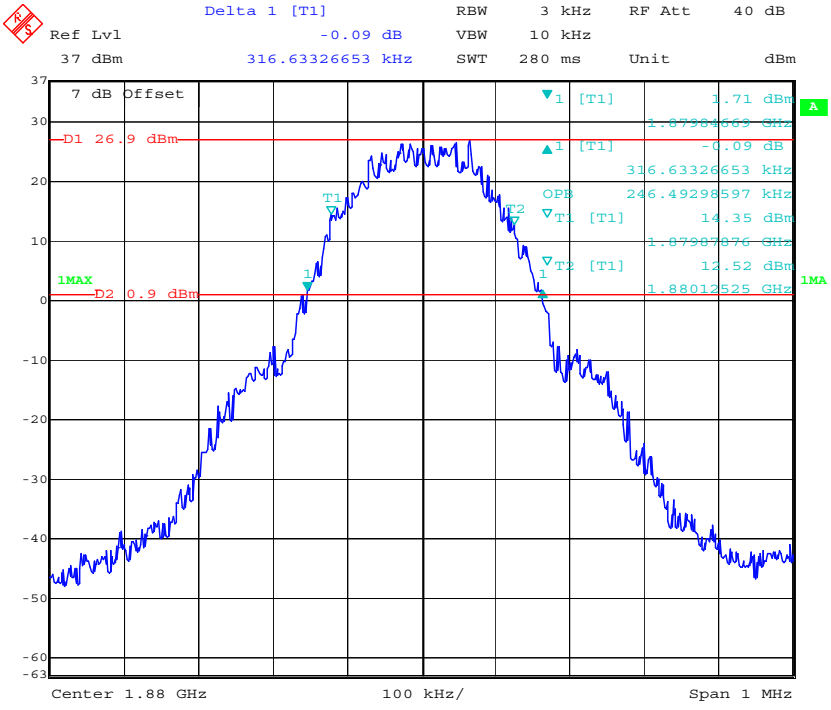
Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table and plots.

Band	Test Channel	Mode	99% Occupied Bandwidth (kHz)	26 dB Occupied Bandwidth (kHz)
PCS	M	GPRS	246.5	316.6
		EDGE	246.5	314.6

Band	Test Modulation	Test Bandwidth (MHz)	Test Channel	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
LTE Band VII	QPSK	5	M	4.520	5.120
		10		9.120	10.400
		15		13.560	15.220
		20		18.000	19.620
	16QAM	5	M	4.520	5.120
		10		9.120	10.360
		15		13.560	15.160
		20		18.000	19.680

GPRS 1900



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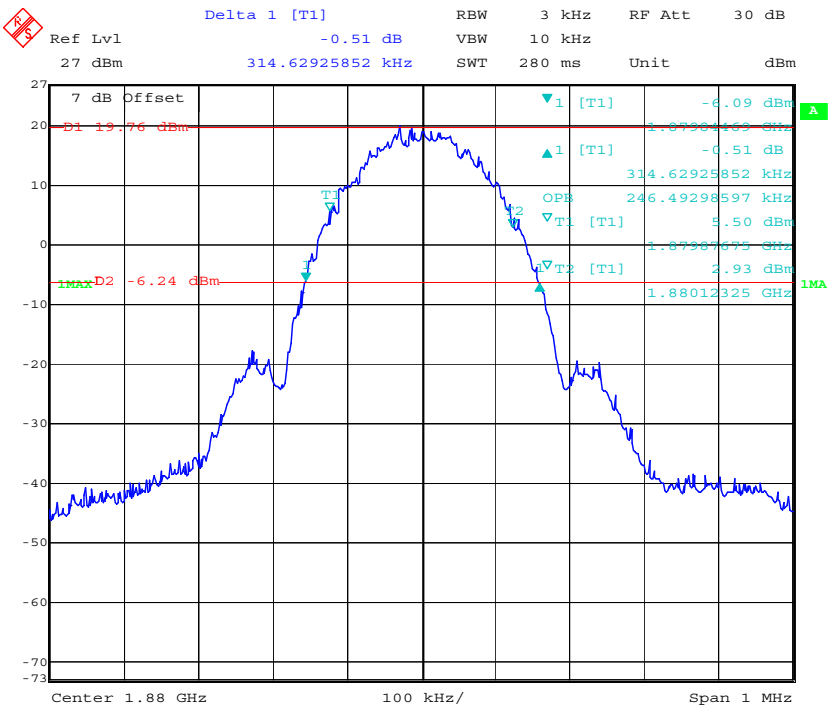
EDGE 1900



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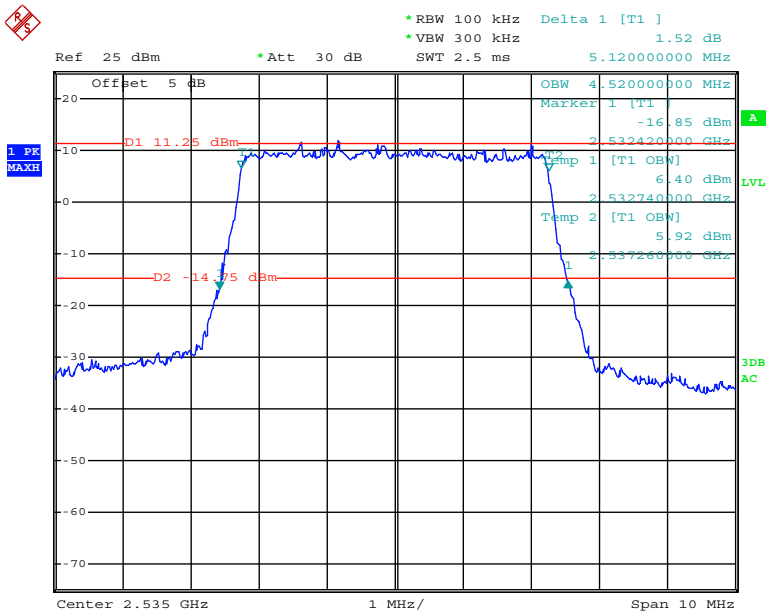
LTE Band VII

QPSK_5 MHz



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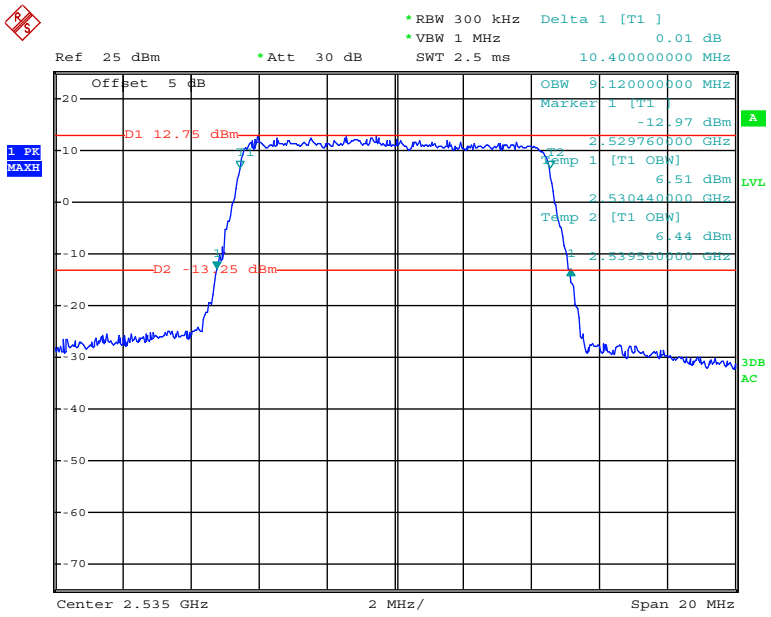
QPSK_10 MHz



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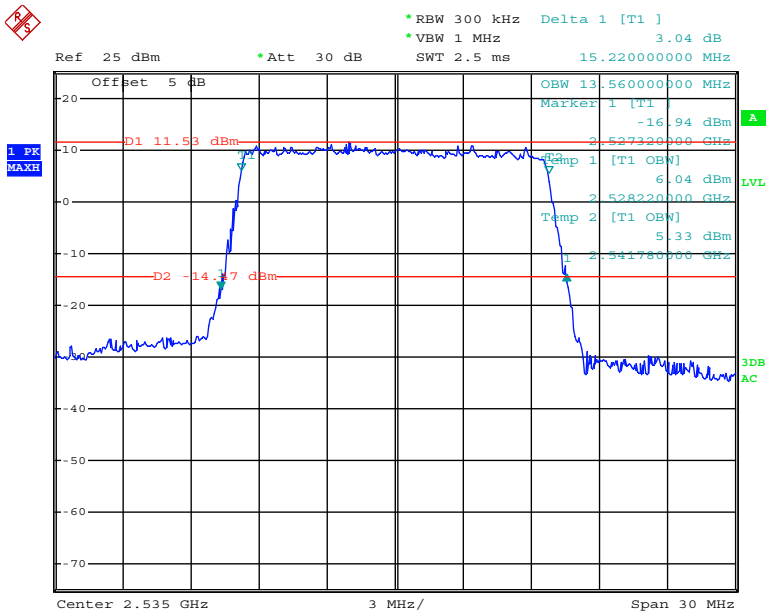
QPSK_15 MHz



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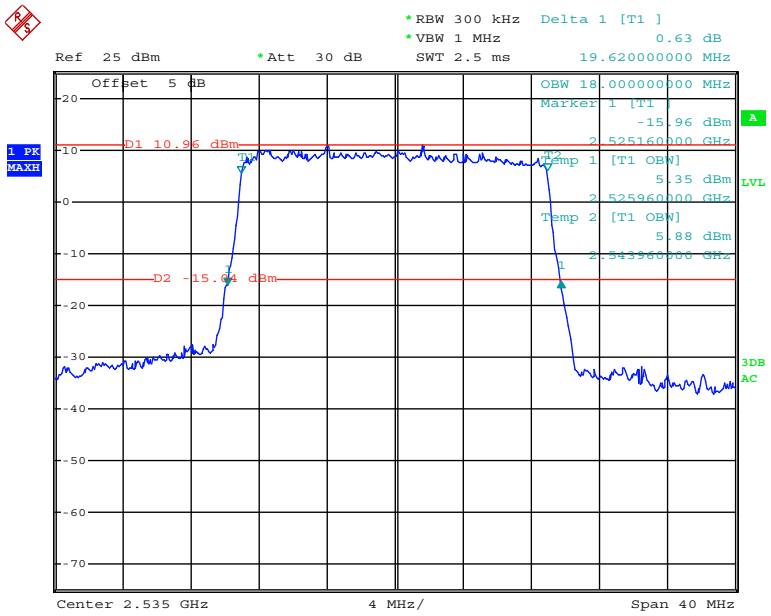
QPSK_20 MHz



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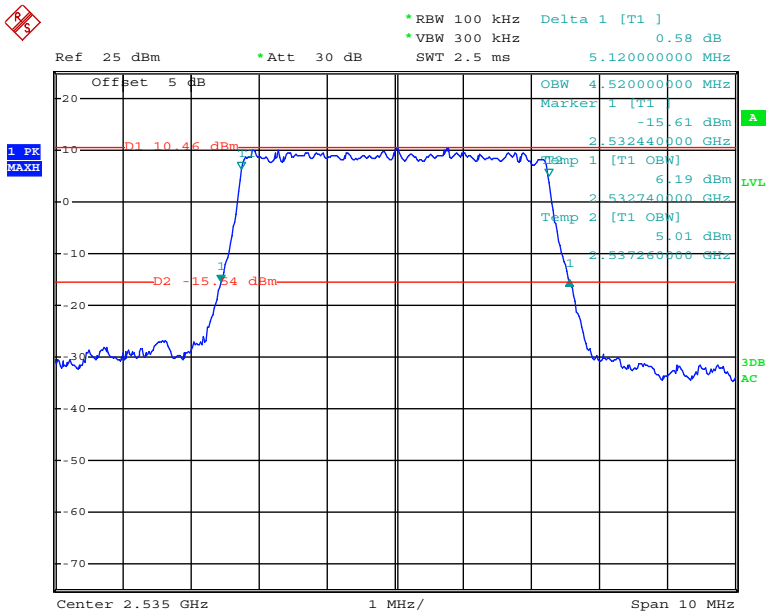
16QAM_5 MHz



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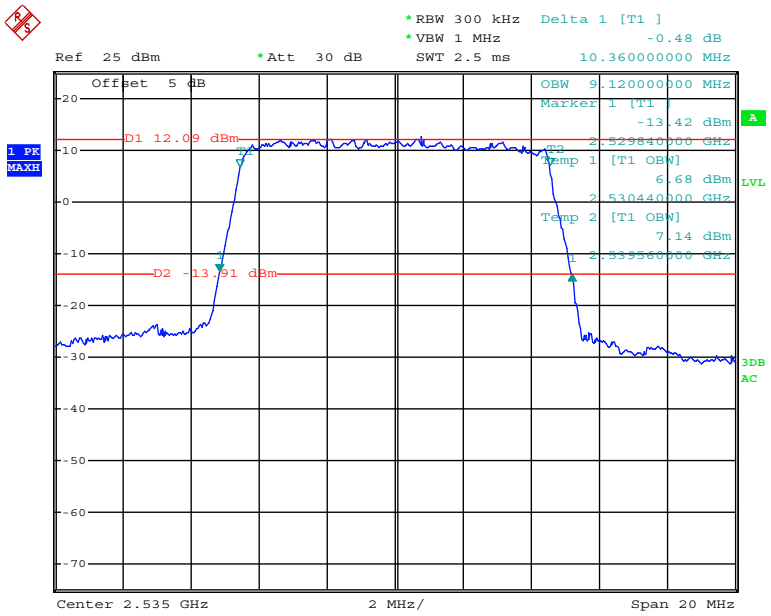
16QAM_10 MHz



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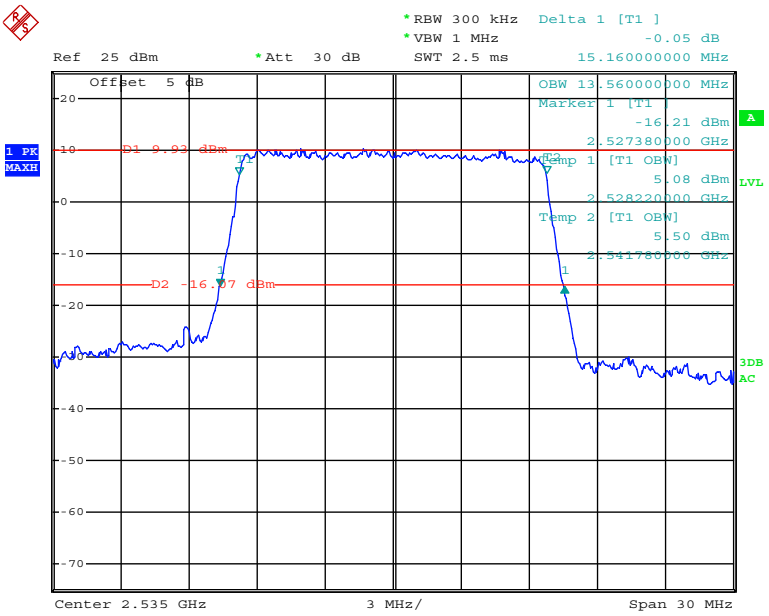
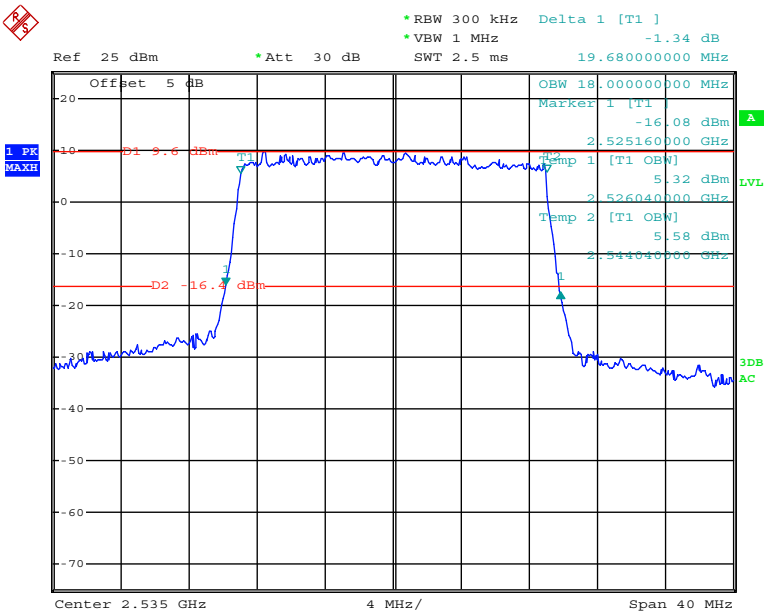
16QAM_15 MHz



Date: 19.APR.2017 10:34:01

16QAM_20 MHz



Date: 19.APR.2017 10:53:06

FCC §2.1051, §24.238(a) & §27.53- SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

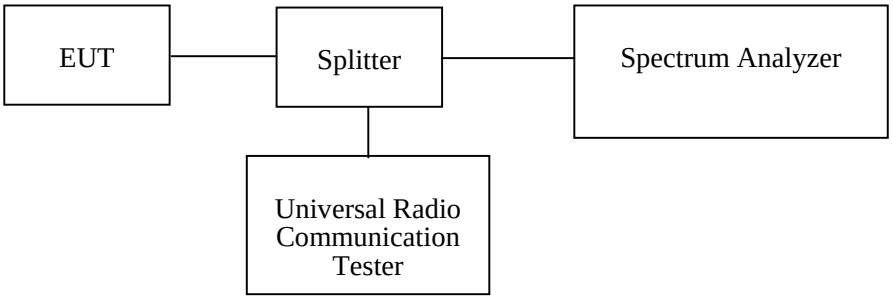
FCC §2.1051, §24.238(a) and §27.53.

According to §24.238(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 §27.53 (m), (4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Test Procedure

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



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	NO.3	Each Time	/
Unknown	Two-way Spliter	Unknown	OE0120121	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

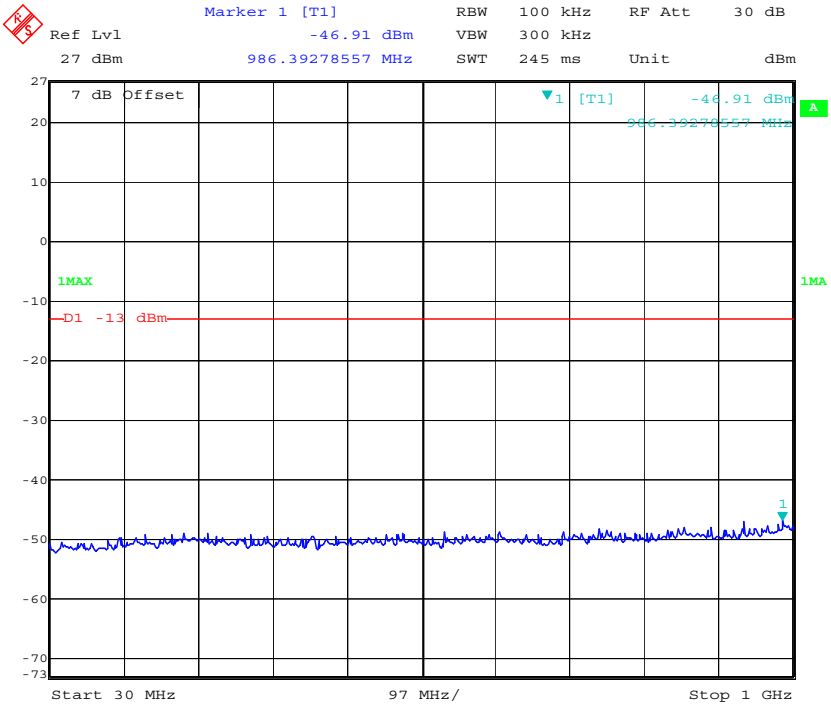
Environmental Conditions

Temperature:	22.1~22.8 °C
Relative Humidity:	39 %
ATM Pressure:	96.2~99.6kPa

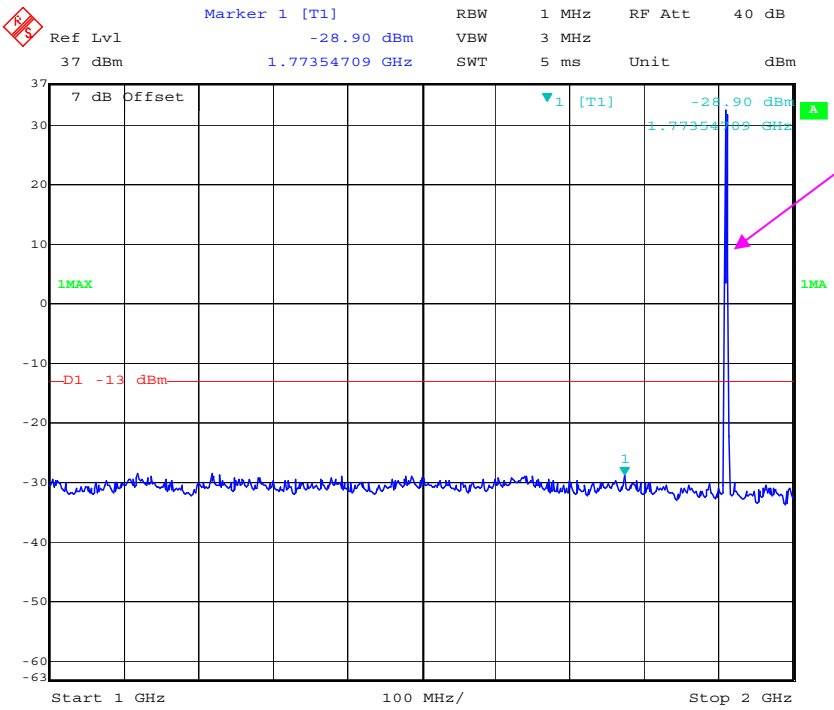
The testing was performed by Tom Tang from 2017-04-19 to 2017-04-23.

Please refer to the following plots.

GPRS1900_Middle Channel

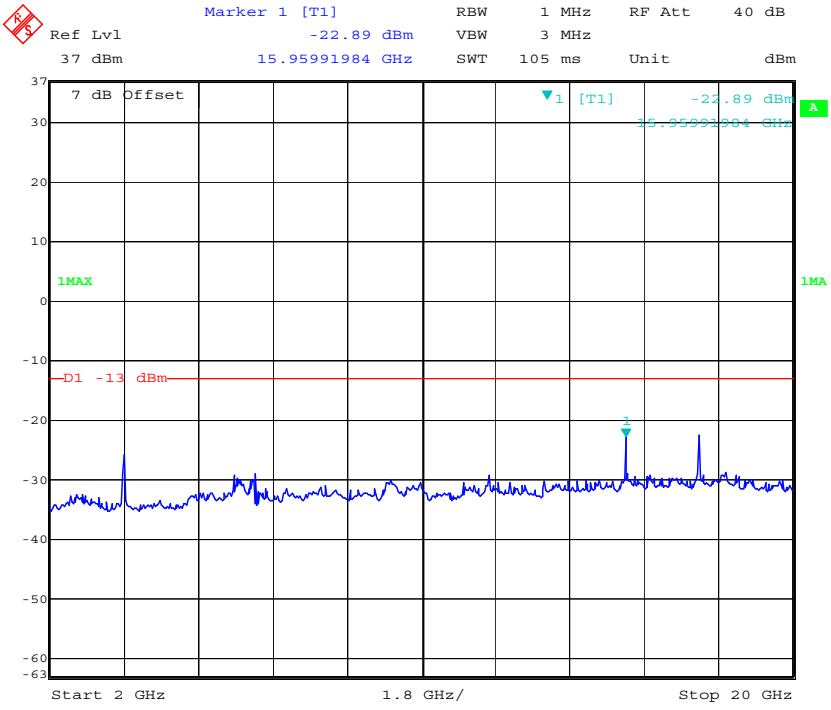


Date: 23.APR.2017 23:04:08

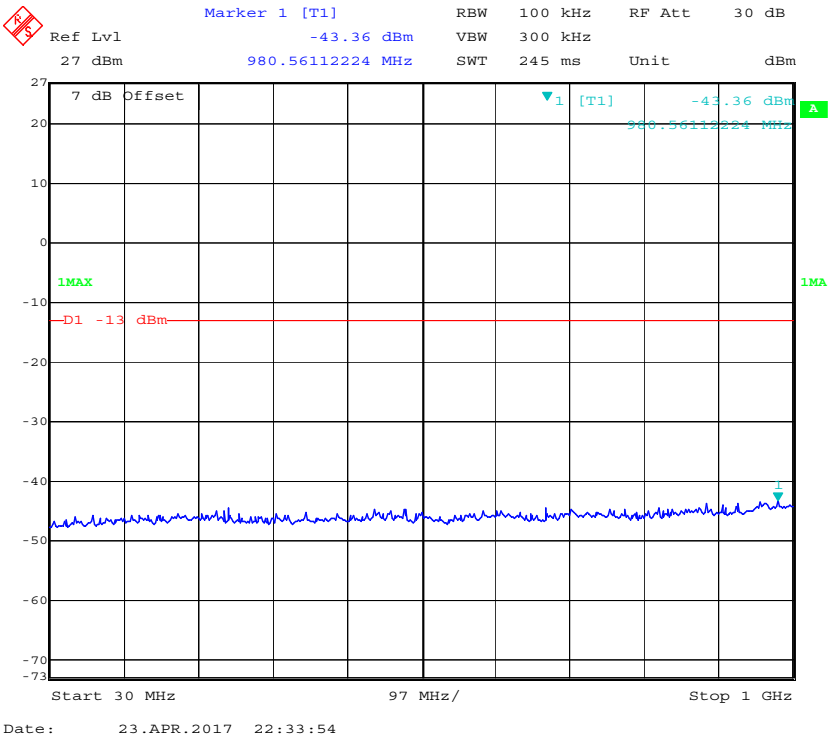


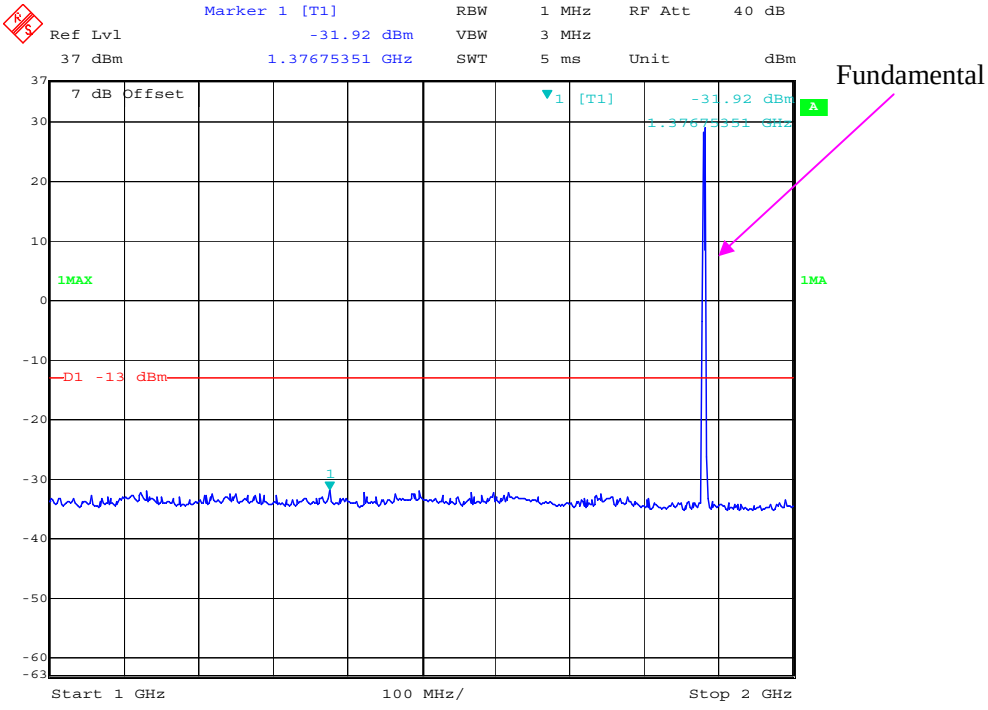
Fundamental

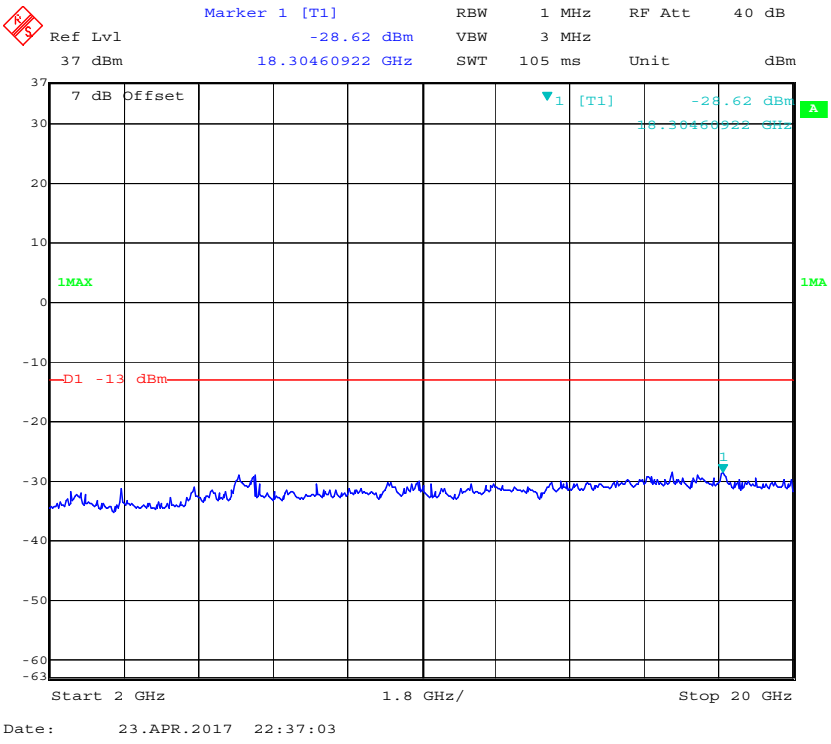
Date: 23.APR.2017 23:05:18



EDGE 1900_ Middle Channel

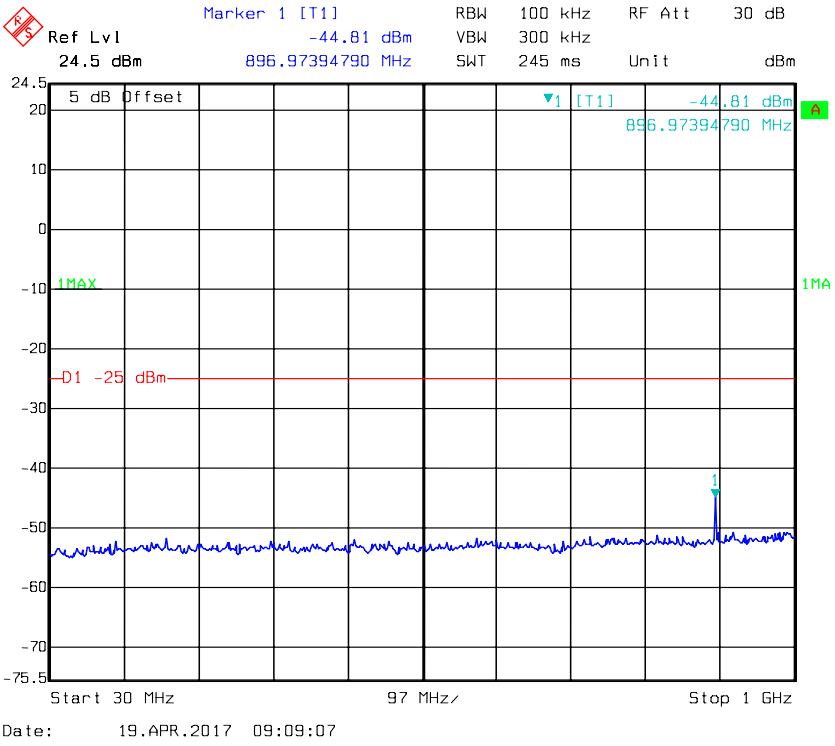


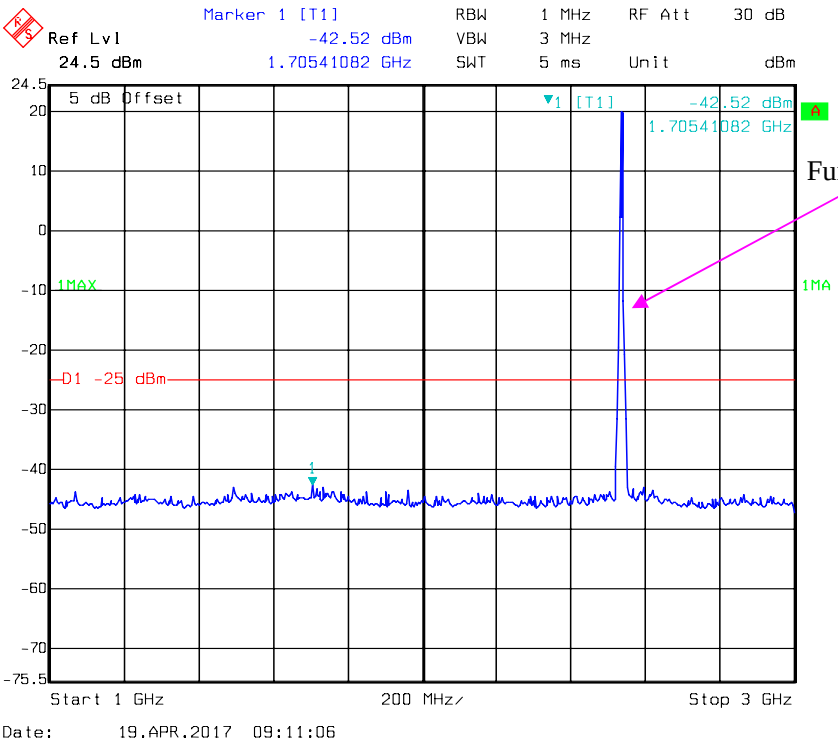

Marker 1 [T1]
RBW 1 MHz
RF Att 40 dB
Ref Lvl
-31.92 dBm
VBW 3 MHz
37 dBm
1.37675351 GHz
SWT 5 ms
Unit dBm
Fundamental
7 dB Offset
1 [T1]
-31.92 dBm
1.37675351 GHz
1MAX
1MA
D1 -13 dBm
Start 1 GHz
100 MHz/
Stop 2 GHz
Date: 23.APR.2017 22:36:09

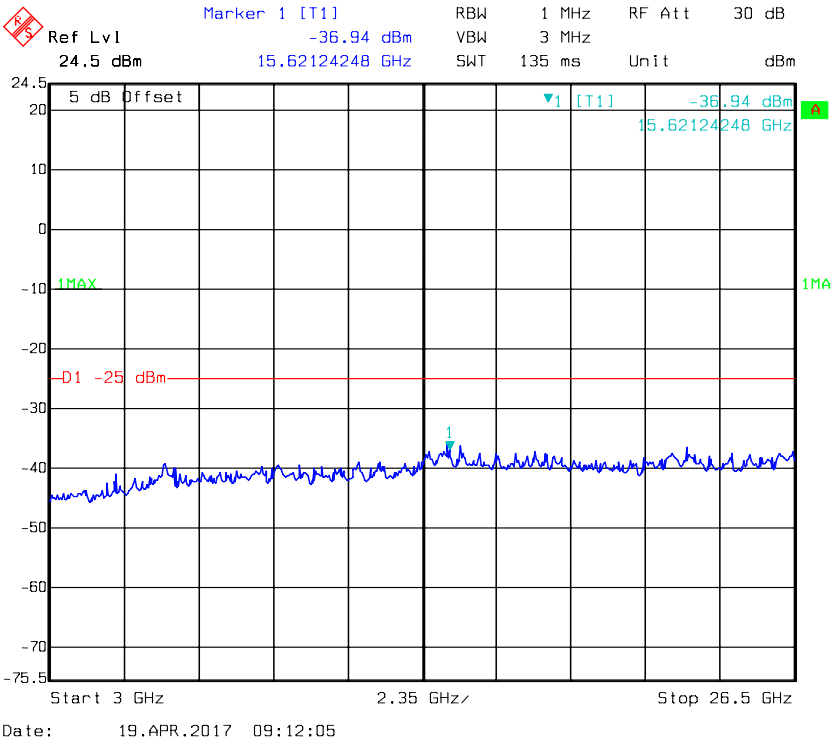

Marker 1 [T1]
RBW 1 MHz
RF Att 40 dB
Ref Lvl
-28.62 dBm
VBW 3 MHz
37 dBm
18.30460922 GHz
SWT 105 ms
Unit dBm
7 dB Offset
1 [T1]
-28.62 dBm
18.30460922 GHz
1MAX
1MA
D1 -13 dBm
Start 2 GHz
1.8 GHz/
Stop 20 GHz
Date: 23.APR.2017 22:37:03

LTE Band VII (Middle Channel)

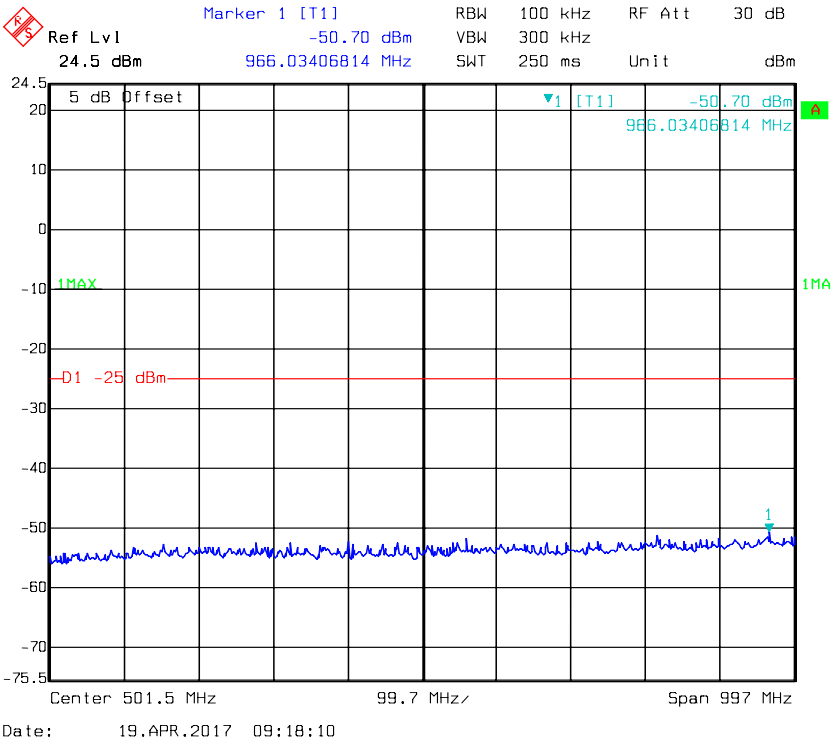
QPSK_5 MHz

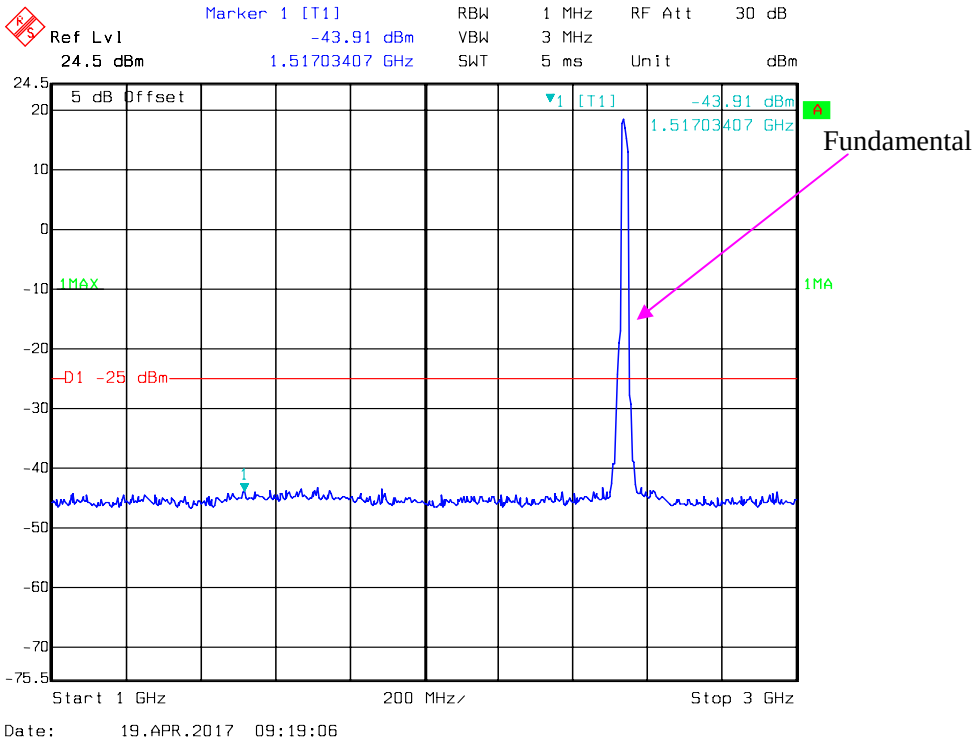


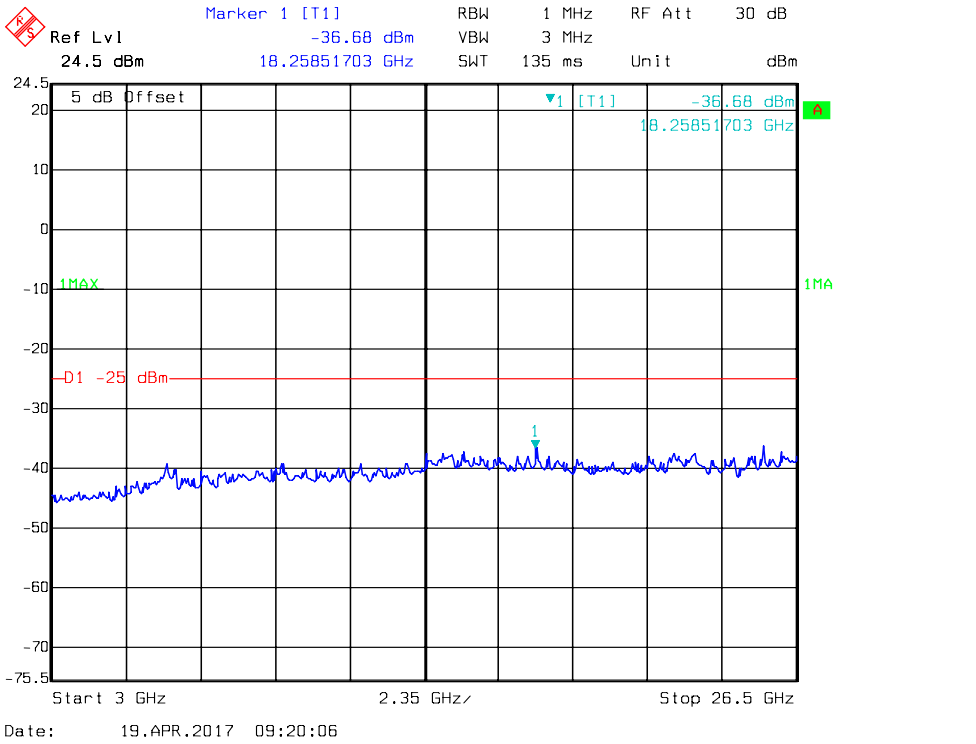



Marker 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
-36.94 dBm
VBW 3 MHz
24.5 dBm
15.62124248 GHz
SWT 135 ms
Unit dBm
5 dB Offset
[T1] -36.94 dBm
15.62124248 GHz
1MAX
1MA
D1 -25 dBm
Start 3 GHz
2.35 GHz/
Stop 26.5 GHz
Date: 19.APR.2017 09:12:05

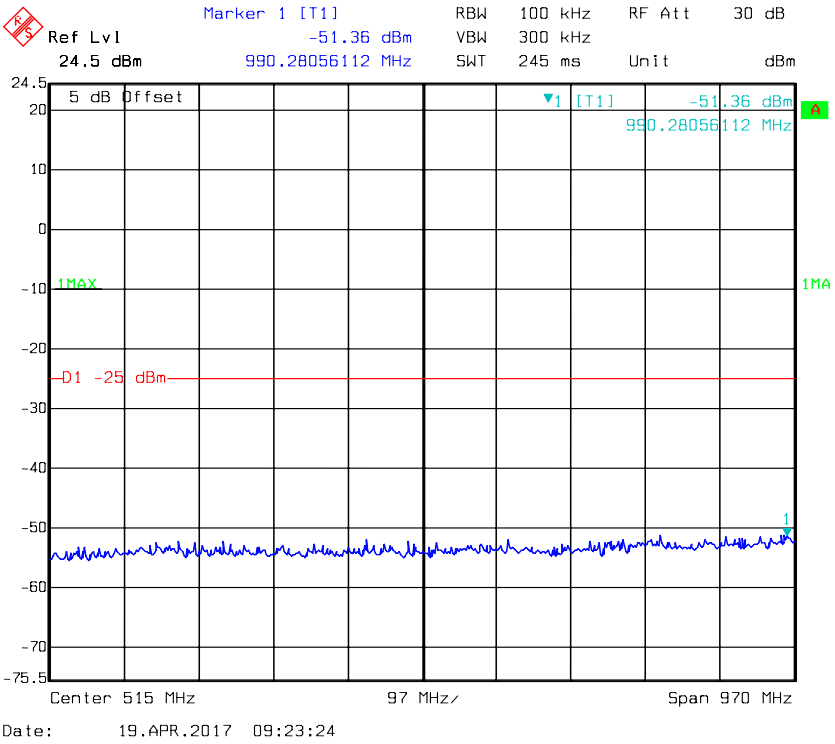
QPSK_10 MHz

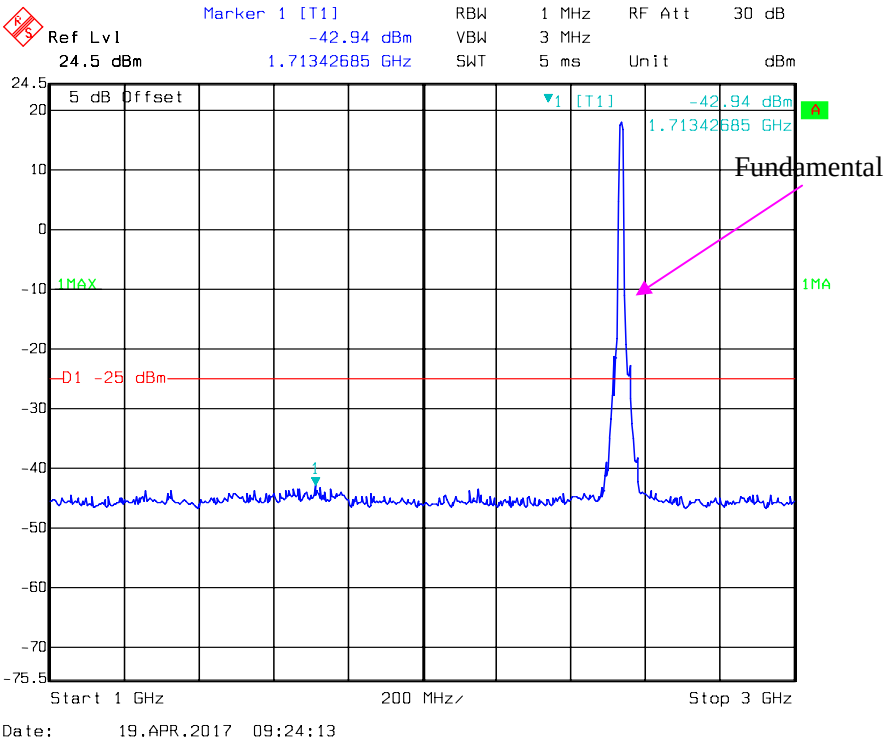

Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-50.70 dBm
VBW 300 kHz
24.5 dBm
966.03406814 MHz
SWT 250 ms
Unit dBm
5 dB Offset
[T1] -50.70 dBm
966.03406814 MHz
1MAX
1MA
D1 -25 dBm
Center 501.5 MHz
99.7 MHz/
Span 997 MHz
Date: 19.APR.2017 09:18:10

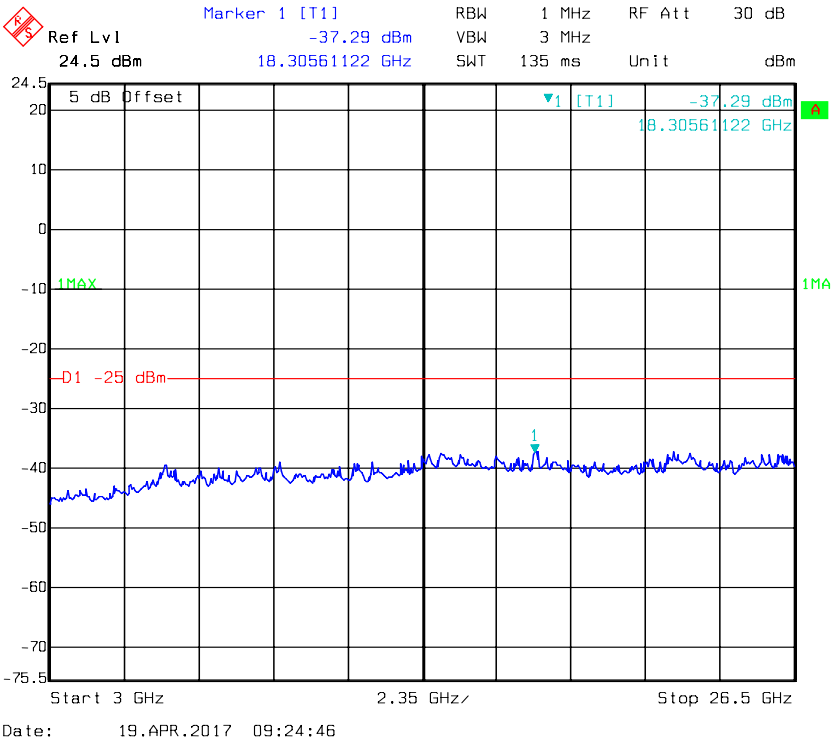

Marker 1 [T1]
Ref Lvl
24.5 dBm
-43.91 dBm
1.51703407 GHz
RBW 1 MHz
VBW 3 MHz
SWT 5 ms
RF Att 30 dB
Unit dBm
5 dB Offset
[T1] -43.91 dBm
1.51703407 GHz
Fundamental
1MAX
1MA
D1 -25 dBm
Start 1 GHz
200 MHz/
Stop 3 GHz
Date: 19.APR.2017 09:19:06


Marker 1 [T1]
Ref Lvl
24.5 dBm
-36.68 dBm
18.25851703 GHz
RBW 1 MHz
VBW 3 MHz
SWT 135 ms
RF Att 30 dB
Unit dBm
5 dB Offset
[T1] -36.68 dBm
18.25851703 GHz
1MAX
1MA
D1 -25 dBm
Start 3 GHz
2.35 GHz/
Stop 26.5 GHz
Date: 19.APR.2017 09:20:06

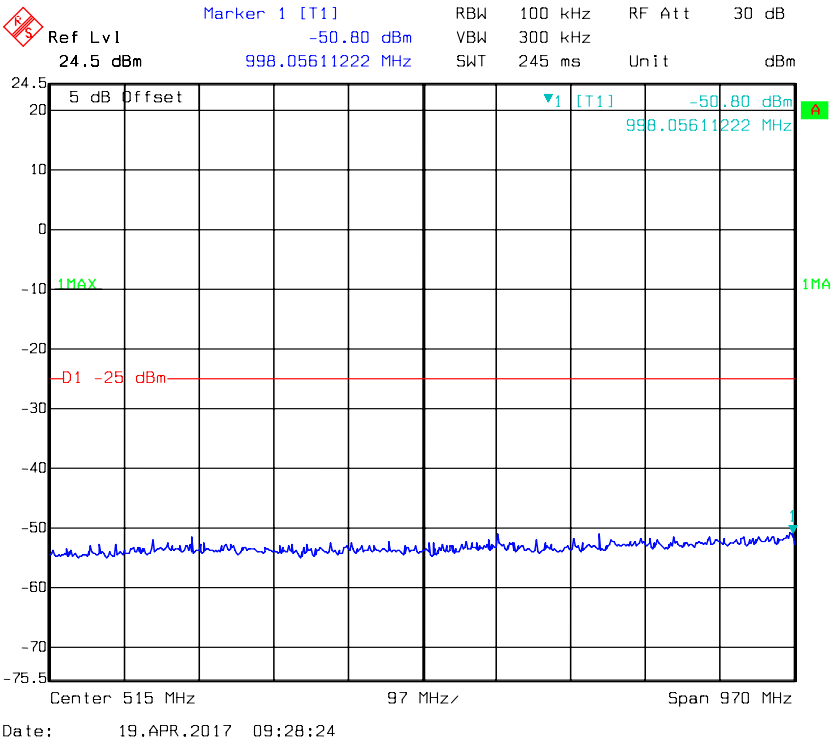
QPSK_15 MHz

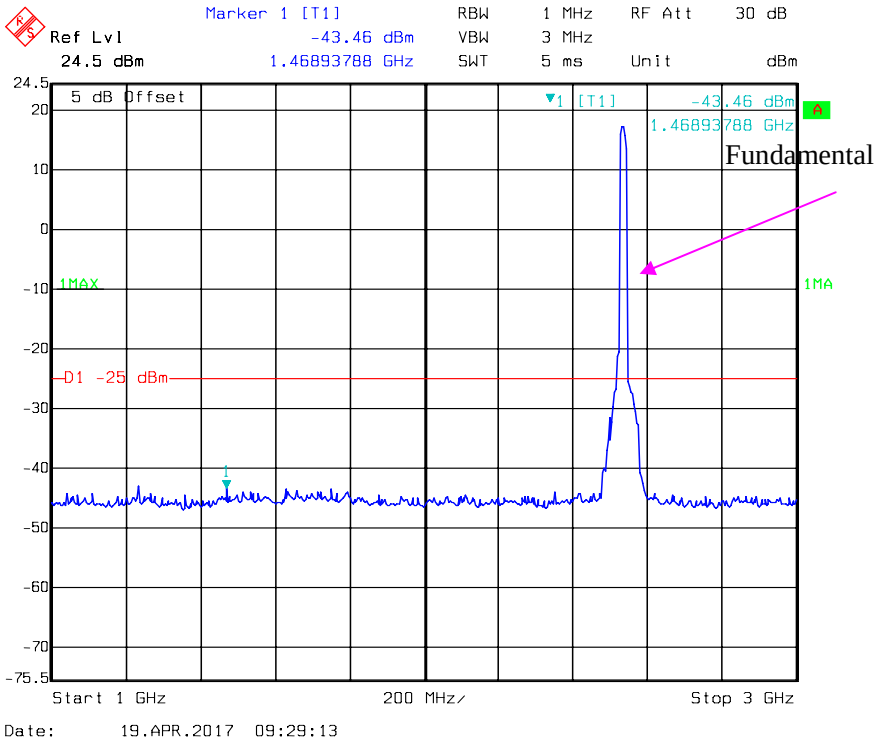

Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-51.36 dBm
VBW 300 kHz
24.5 dBm
990.28056112 MHz
SWT 245 ms
Unit dBm
5 dB Offset
[T1] -51.36 dBm
990.28056112 MHz
1MAX
1MA
D1 -25 dBm
Center 515 MHz
97 MHz/
Span 970 MHz
Date: 19.APR.2017 09:23:24

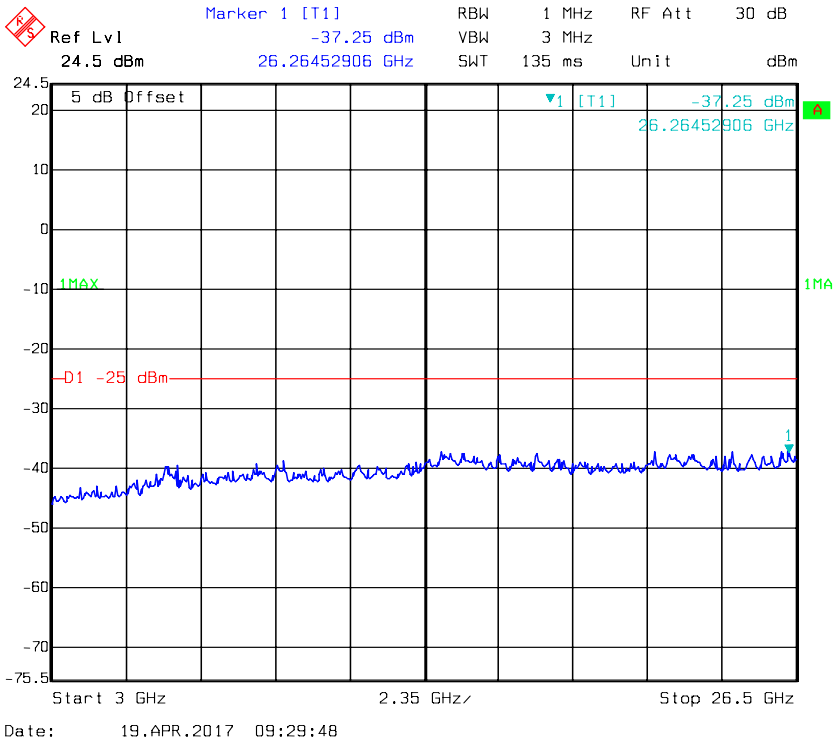

Marker 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
-42.94 dBm
VBW 3 MHz
24.5 dBm
1.71342685 GHz
SWT 5 ms
Unit dBm
5 dB Offset
[T1] -42.94 dBm
1.71342685 GHz
Fundamental
1MAX
1MA
D1 -25 dBm
Start 1 GHz
200 MHz/
Stop 3 GHz
Date: 19.APR.2017 09:24:13


Marker 1 [T1]
RBW 1 MHz
RF Att 30 dB
Ref Lvl
-37.29 dBm
VBW 3 MHz
24.5 dBm
18.30561122 GHz
SWT 135 ms
Unit dBm
5 dB Offset
[T1] -37.29 dBm
18.30561122 GHz
1MAX
1MA
D1 -25 dBm
Start 3 GHz
2.35 GHz/
Stop 26.5 GHz
Date: 19.APR.2017 09:24:46

QPSK_20 MHz


Marker 1 [T1]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
-50.80 dBm
VBW 300 kHz
24.5 dBm
998.05611222 MHz
SWT 245 ms
Unit dBm
5 dB Offset
[T1] -50.80 dBm
998.05611222 MHz
1MAX
1MA
D1 -25 dBm
Center 515 MHz
97 MHz/
Span 970 MHz
Date: 19.APR.2017 09:28:24


Marker 1 [T1]
Ref Lvl
24.5 dBm
-43.46 dBm
1.46893788 GHz
RBW 1 MHz
VBW 3 MHz
SWT 5 ms
RF Att 30 dB
Unit dBm
5 dB Offset
[T1] -43.46 dBm
1.46893788 GHz
Fundamental
1MAX
1MA
D1 -25 dBm
Start 1 GHz
200 MHz/
Stop 3 GHz
Date: 19.APR.2017 09:29:13


Marker 1 [T1]
Ref Lvl
24.5 dBm
-37.25 dBm
26.26452906 GHz
RBW 1 MHz
VBW 3 MHz
SWT 135 ms
RF Att 30 dB
Unit dBm
5 dB Offset
[T1] -37.25 dBm
26.26452906 GHz
1MAX
1MA
D1 -25 dBm
Start 3 GHz
2.35 GHz/
Stop 26.5 GHz
Date: 19.APR.2017 09:29:48

FCC §2.1053, §24.238 & §27.53- SPURIOUS RADIATED EMISSIONS

Applicable Standard

According to §24.238(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 §27.53 (m), (4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

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 (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A121808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
EMCO	Adjustable Dipole Antenna	3121C	9109-258	N/A	N/A
HP	Signal Generator	8648C	3623A04150	2016-05-23	2017-05-22
WILTRON	SWEPT FREQUENCY SYNTHESIZER	6737	213001	2016-05-23	2017-05-22
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-05-20	2017-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
EMCT	Semi-Anechoic Chamber	966	966-1	2015-04-24	2018-04-23
Unknown	RF Cable (below 1GHz)	Unknown	NO.1	2016-11-10	2017-11-09
Unknown	RF Cable (below 1GHz)	Unknown	NO.4	2016-11-10	2017-11-09
Unknown	RF Cable (above 1GHz)	Unknown	NO.2	2016-11-10	2017-11-09
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1315	2016-08-18	2017-08-18
Ducommun Technolagies	Horn Antenna	ARH-2823-02	1007726-01 1312	2016-08-18	2017-08-18

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	23.3 °C
Relative Humidity:	49 %
ATM Pressure:	98.2kPa

The testing was performed by Tom Tang on 2017-05-02.

EUT Operation Mode: Transmitting

PCS Band

30MHz-20GHz:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
GPRS1900, Frequency:1880.000 MHz								
3760.000	H	34.21	-61.7	13.8	3.8	-51.7	-13.0	38.7
3760.000	V	33.69	-60.9	13.8	3.8	-50.9	-13.0	37.9
381.000	H	42.64	-58.4	0.0	0.6	-59.0	-13.0	46.0
438.000	V	46.82	-56.3	0.0	0.6	-56.9	-13.0	43.9

LTE Band VII (30MHz-26GHz):

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
QPSK,Frequency:2535.00 MHz								
5070.000	H	37.14	-56.2	13.9	4.5	-46.8	-25.0	21.8
5070.000	V	39.63	-54.5	13.9	4.5	-45.1	-25.0	20.1
7605.000	H	36.58	-54.3	13.2	5.7	-46.8	-25.0	21.8
7605.000	V	35.52	-55.4	13.2	5.7	-47.9	-25.0	22.9
2655.000	H	54.37	-42.8	13.1	3.2	-32.9	-25.0	7.9
2655.000	V	51.96	-47.4	13.1	3.2	-37.5	-25.0	12.5
237.000	H	43.25	-61.3	0.0	0.5	-61.8	-25.0	36.8
542.000	V	47.24	-54.4	0.0	0.7	-55.1	-25.0	30.1

Note:
1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
2) Absolute Level = SG Level - Cable loss + Antenna Gain
3) Margin = Limit-Absolute Level

FCC §24.238(a) & §27.53- BAND EDGES

Applicable Standard

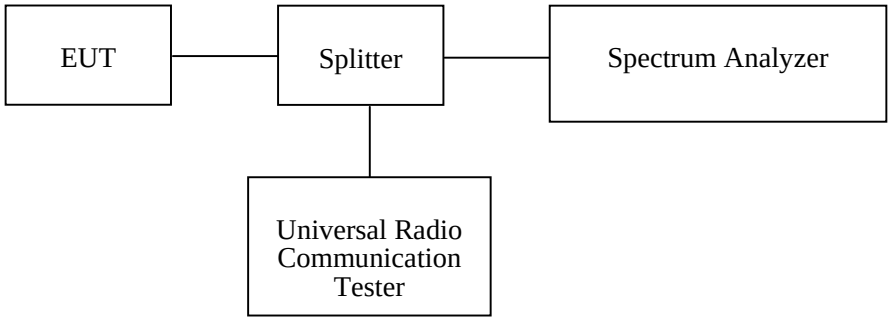
According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to §27.53 (m), (4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	NO.3	Each Time	/
Unknown	Two-way Spliter	Unknown	OE0120121	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

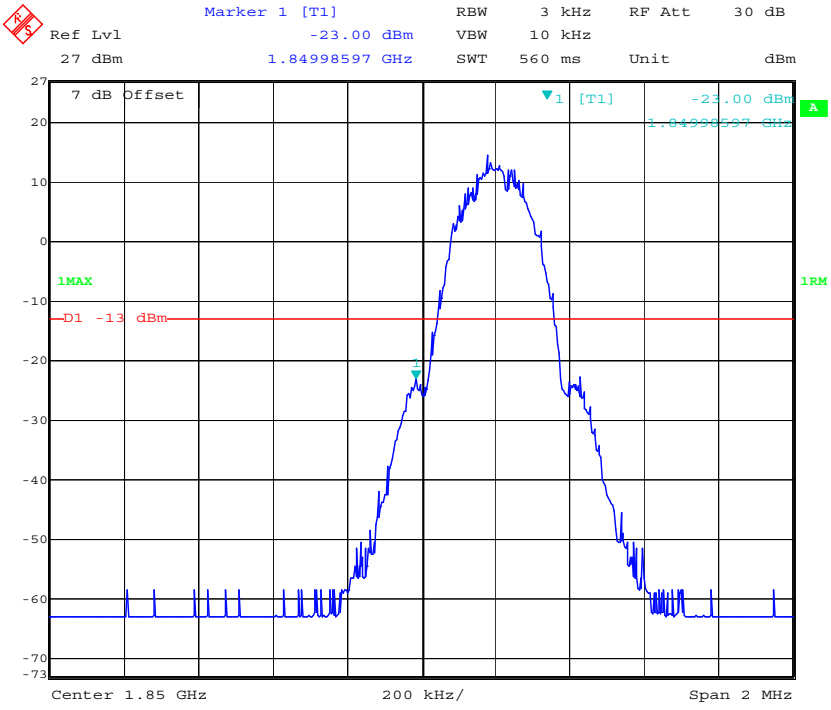
Temperature:	22.1~22.8 °C
Relative Humidity:	39 %
ATM Pressure:	96.2~99.6kPa

The testing was performed by Tom Tang from 2017-04-19 to 2017-04-23.

Test Mode: Transmitting

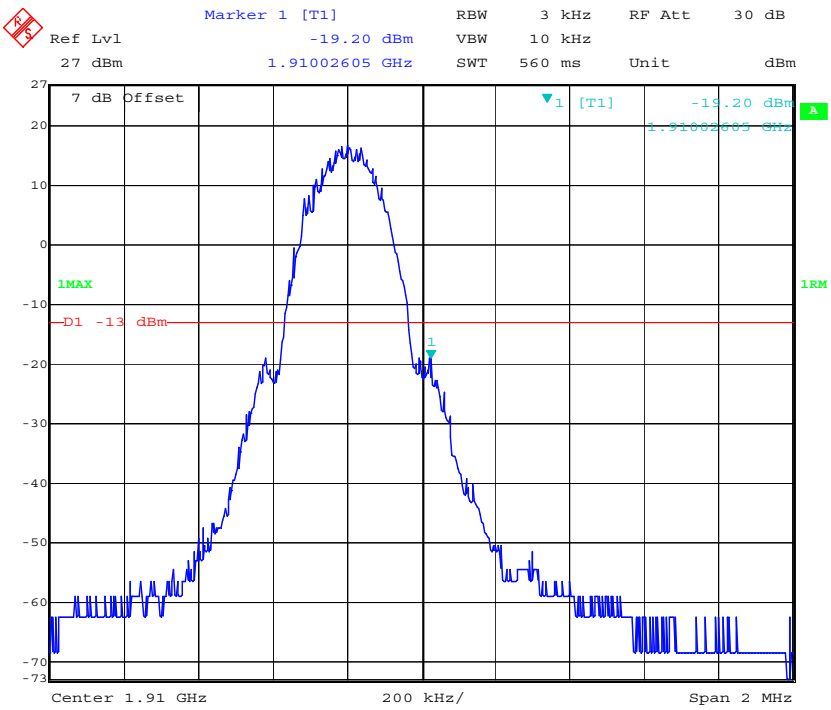
Test Result: Compliant. Please refer to the following plots.

GPRS 1900, Left Band Edge



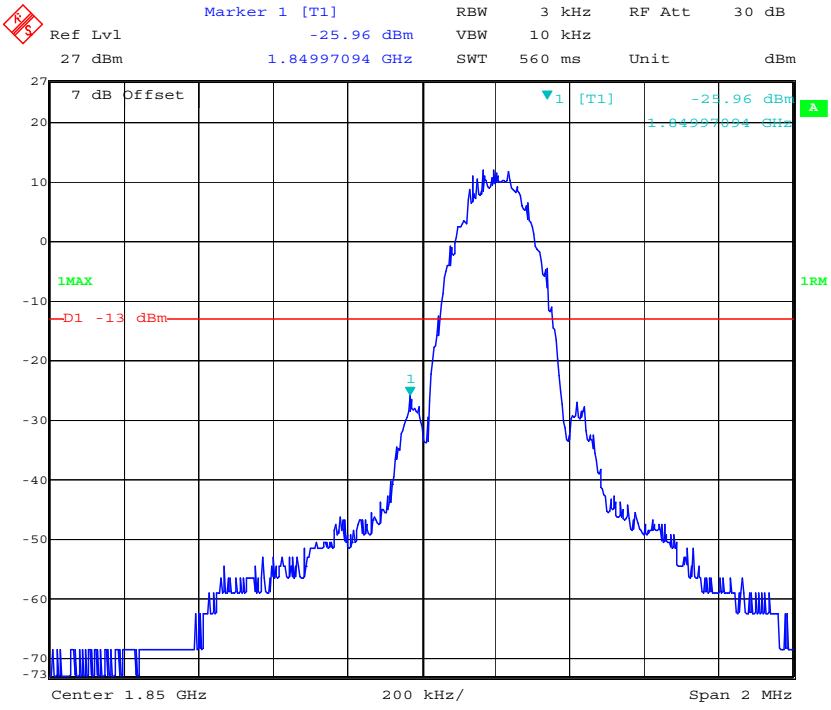
Date: 23.APR.2017 23:01:02

GPRS 1900, Right Band Edge



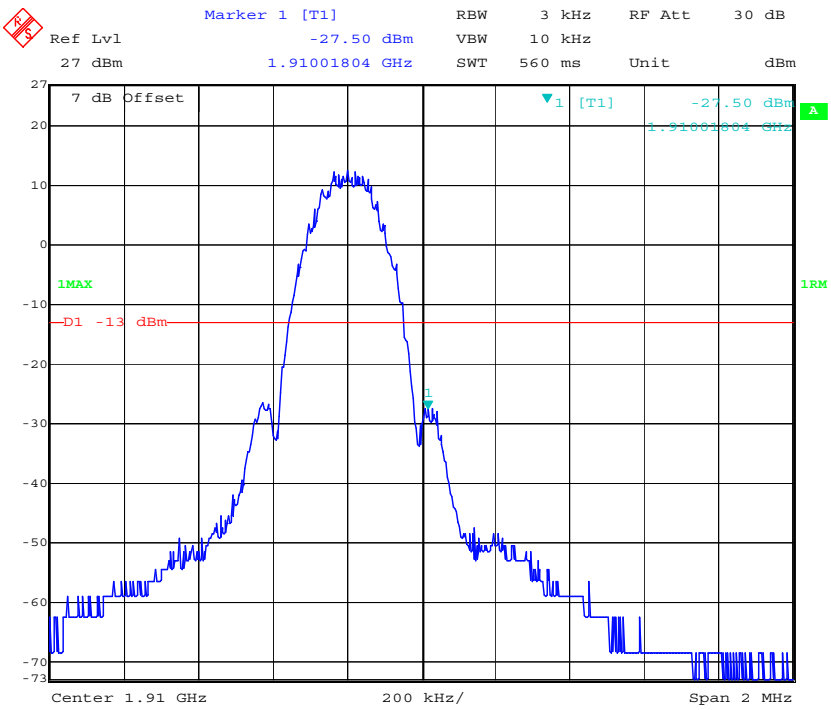
Date: 23.APR.2017 23:02:42

EDGE 1900, Left Band Edge



Date: 23.APR.2017 22:27:25

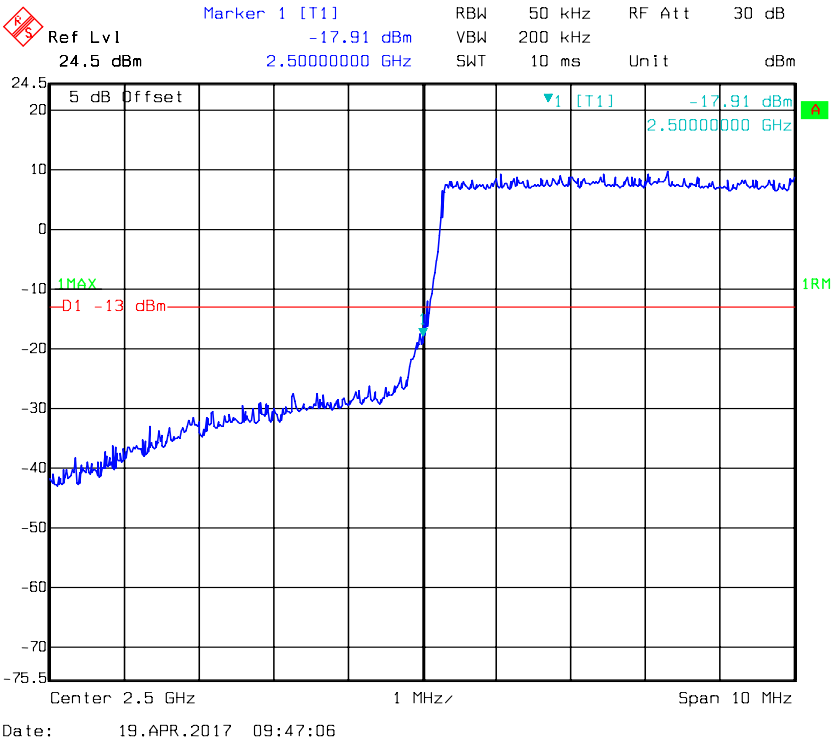
EDGE 1900, Right Band Edge



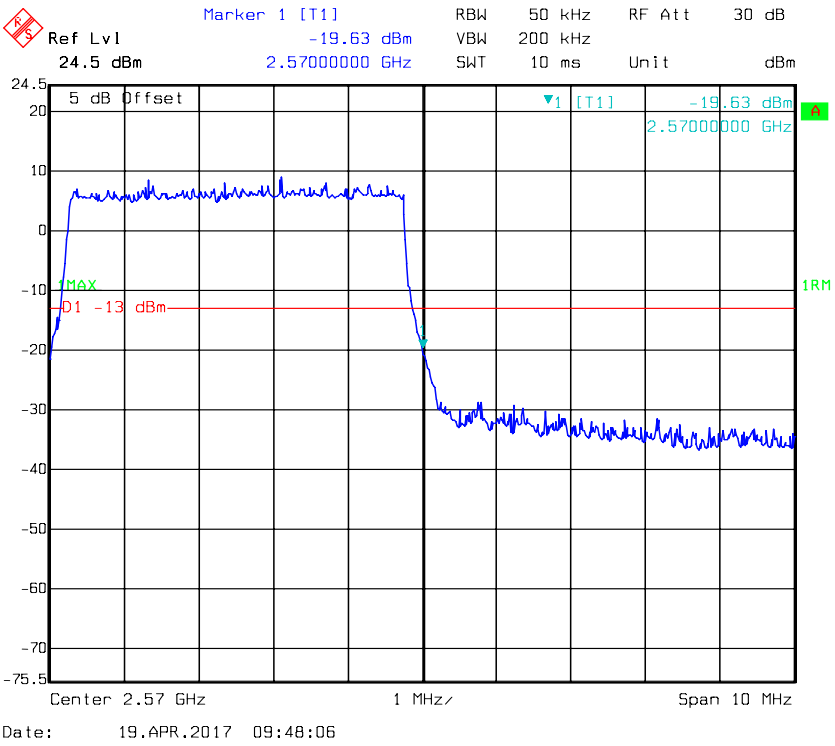
Date: 23.APR.2017 22:30:52

LTE Band VII

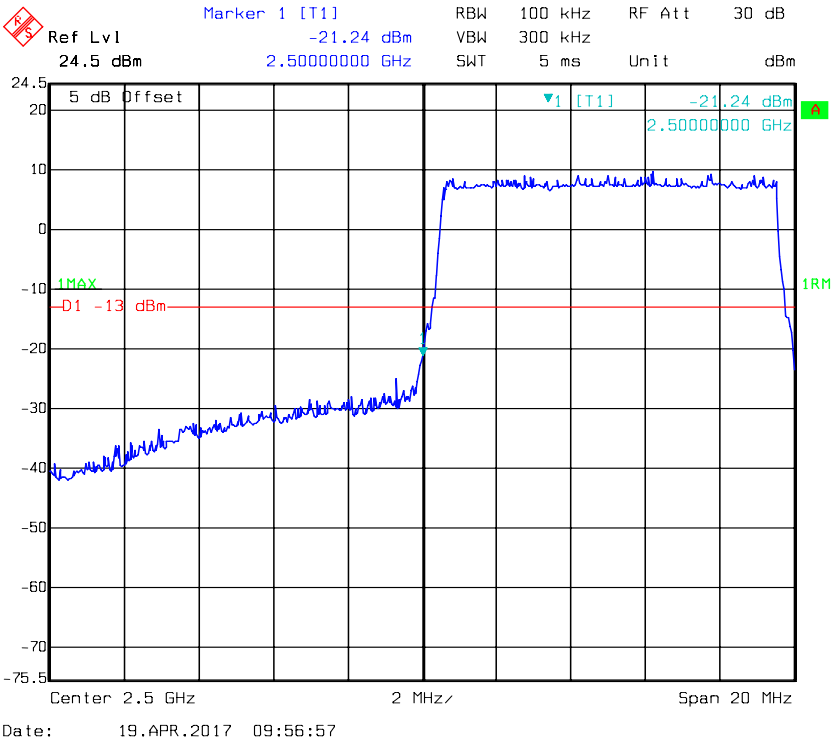
QPSK_5MHz_ 25 RB_ Left



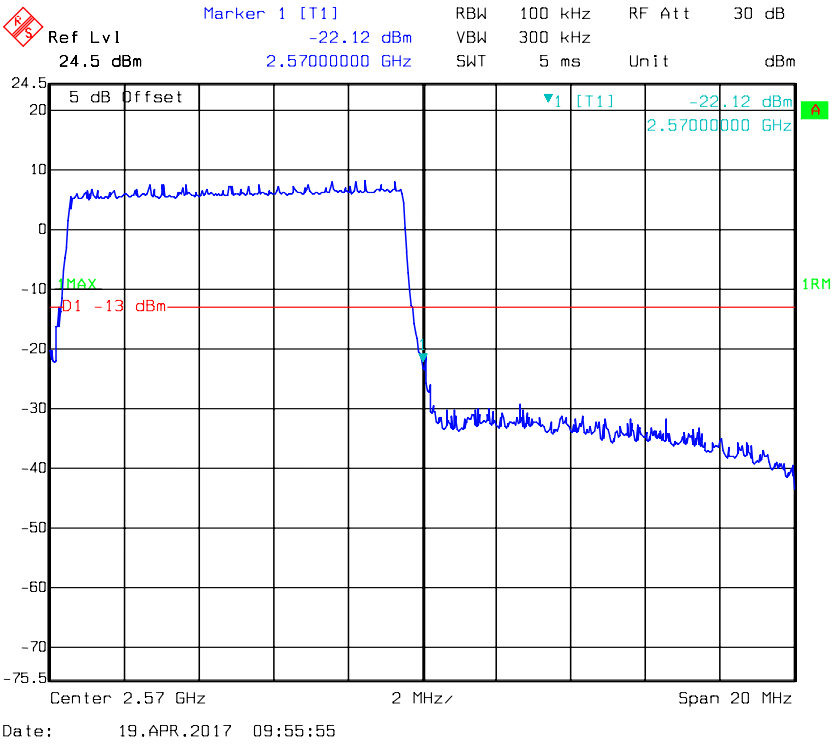
QPSK_5MHz_ 25 RB_ Right



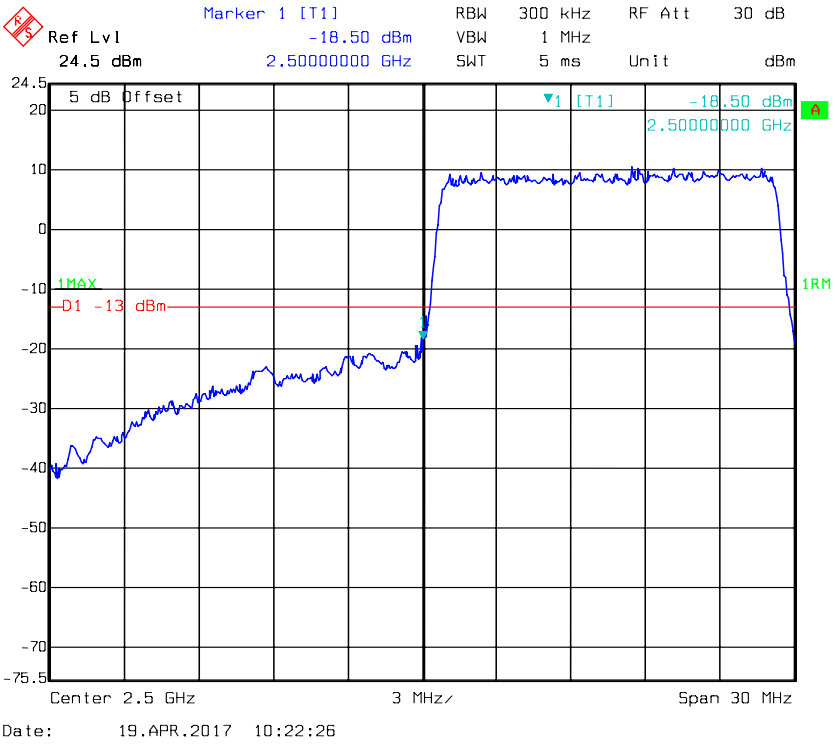
QPSK_10MHz_ 50 RB_ Left



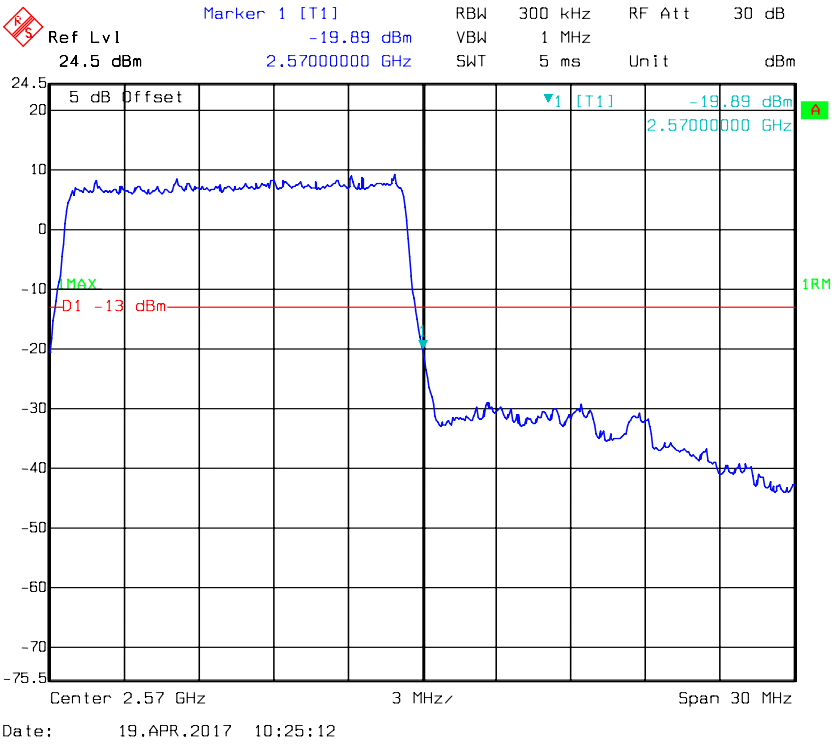
QPSK_10MHz_ 50 RB_ Right



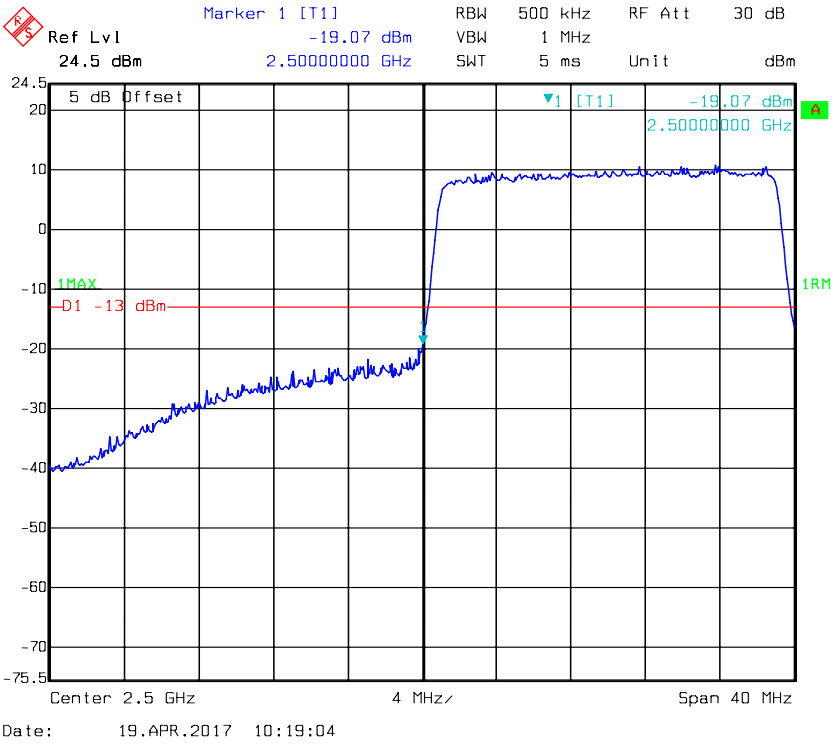
QPSK_15MHz_ 75 RB_ Left



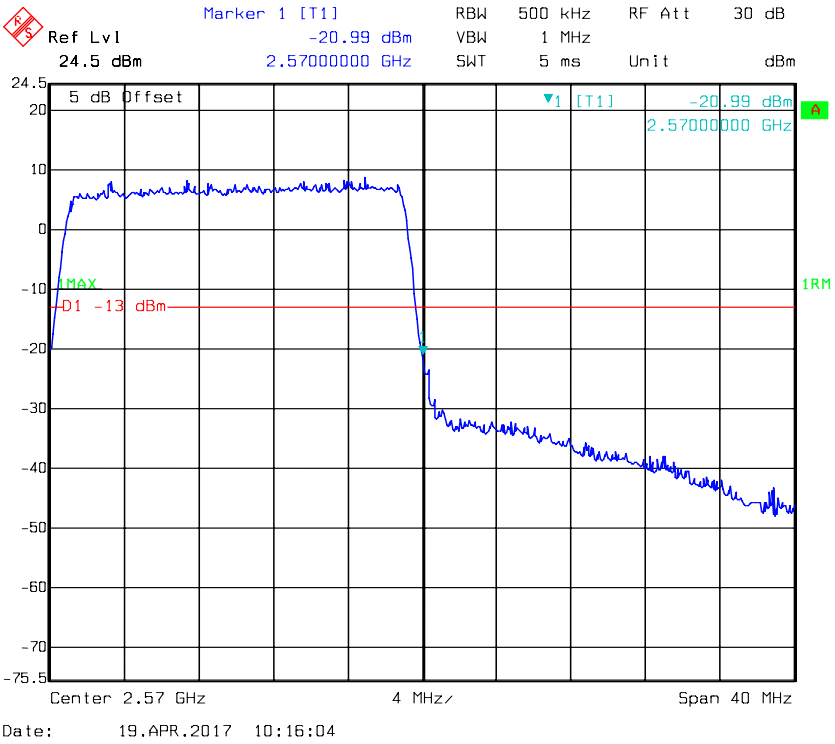
QPSK_15MHz_ 75 RB_ Right



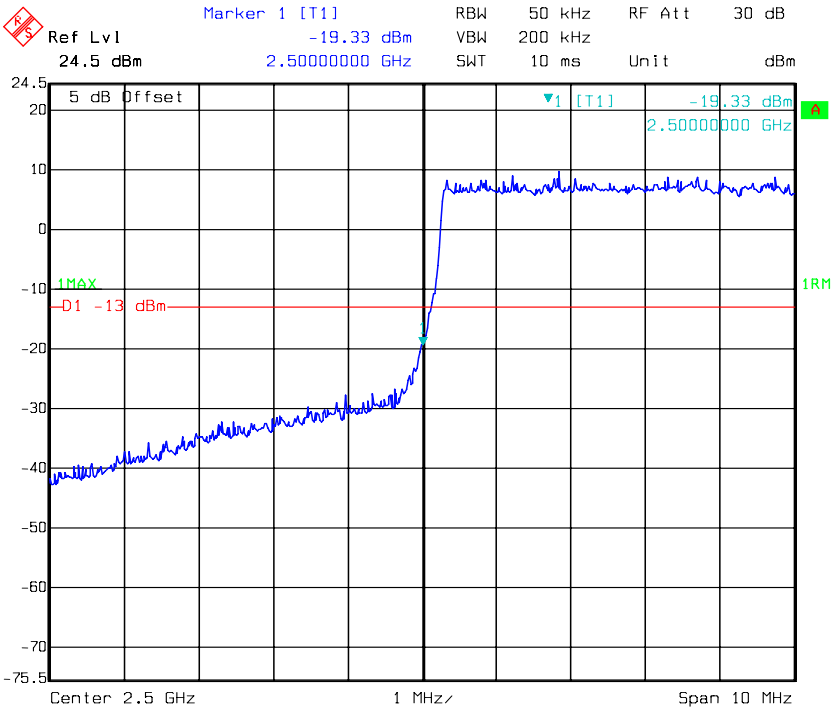
QPSK_20MHz_ FULL RB_ Left



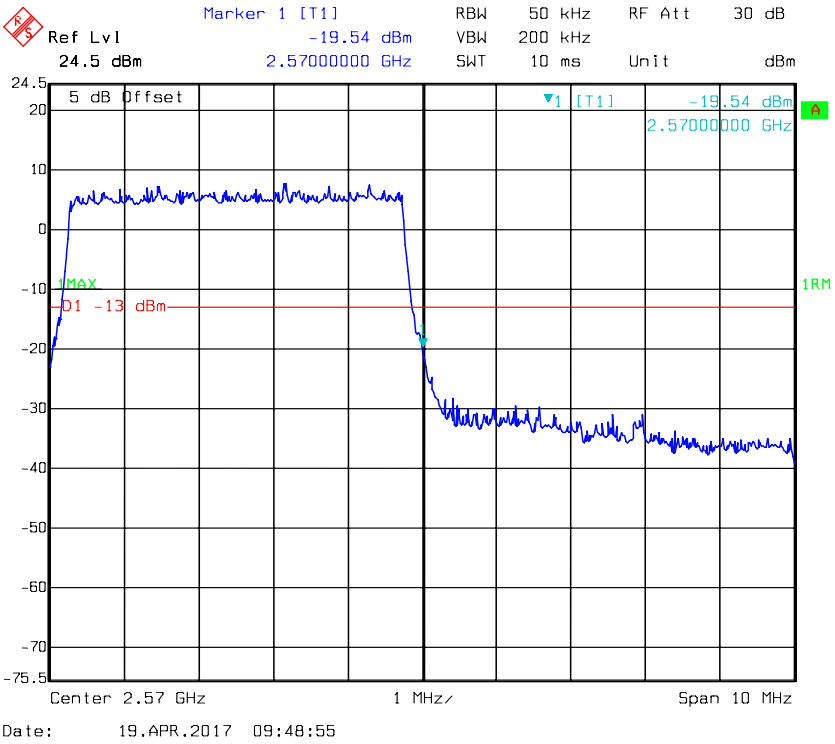
QPSK_20MHz_ FULL RB_ Right



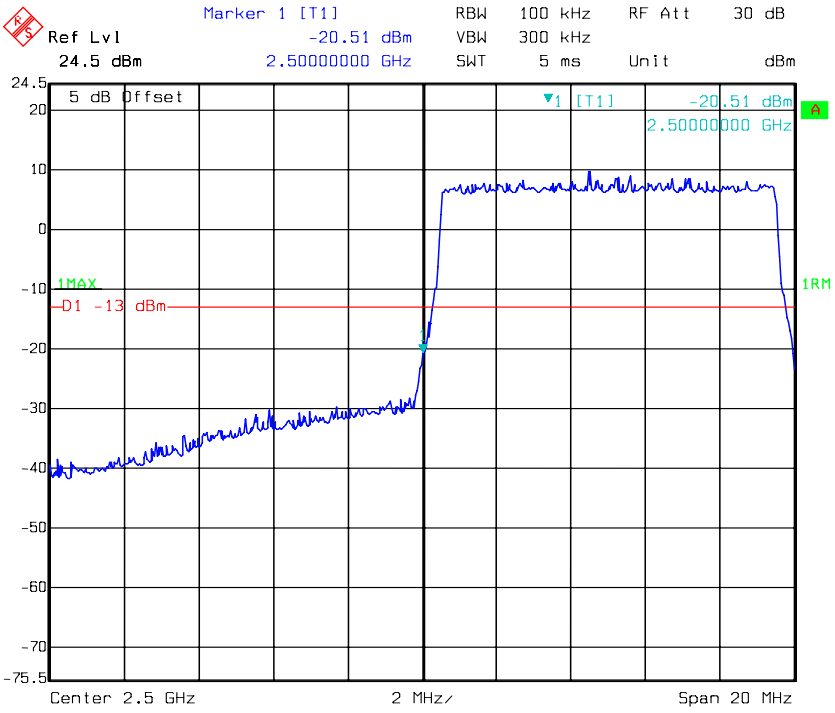
16QAM_5MHz_ 25 RB_ Left



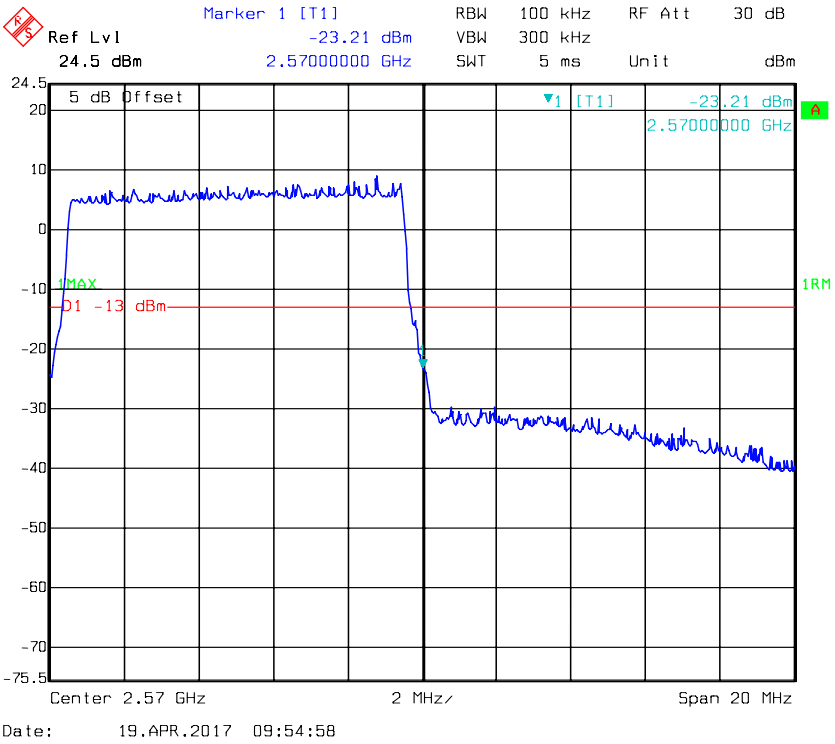
16QAM_5MHz_ 25 RB_ Right



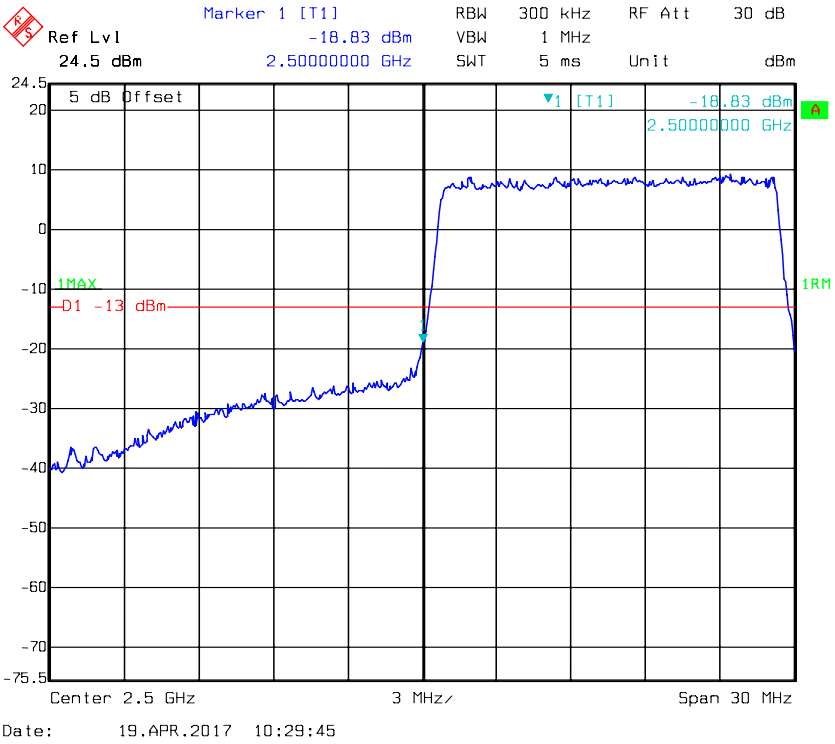
16QAM_10MHz_ 50 RB_ Left



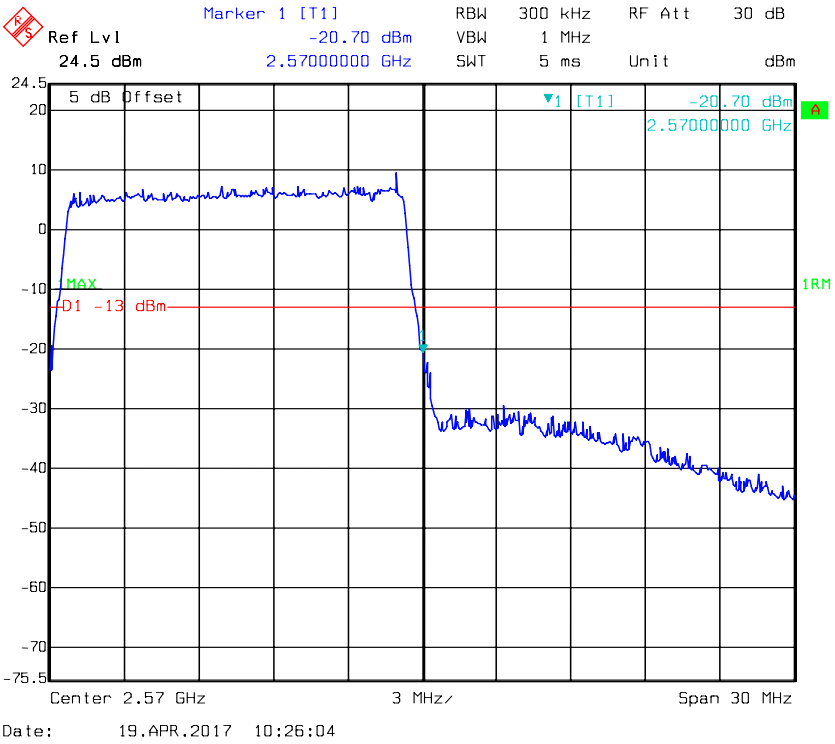
16QAM_10MHz_ 50 RB_ Right



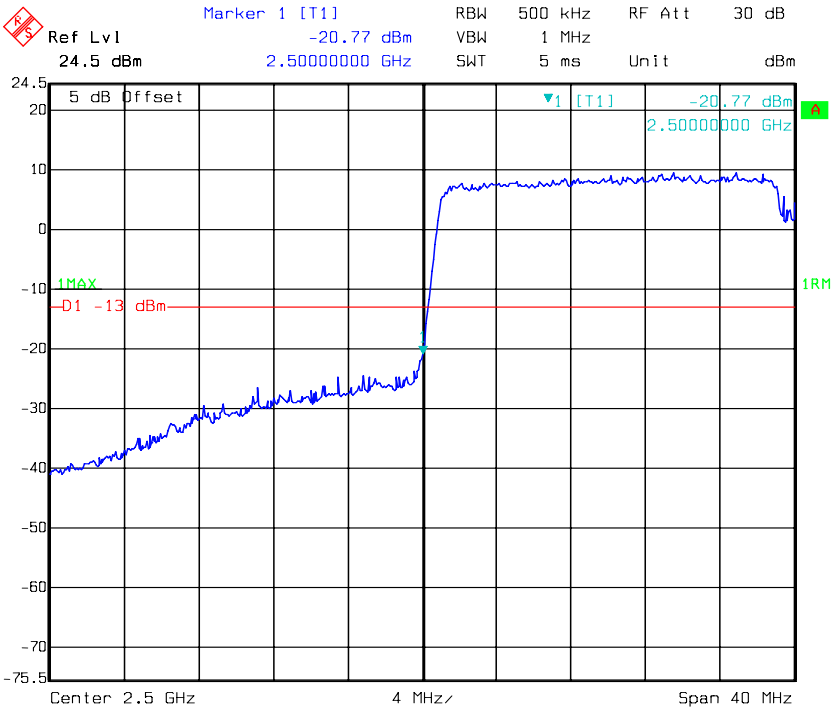
16QAM_15MHz_ 75 RB_ Left



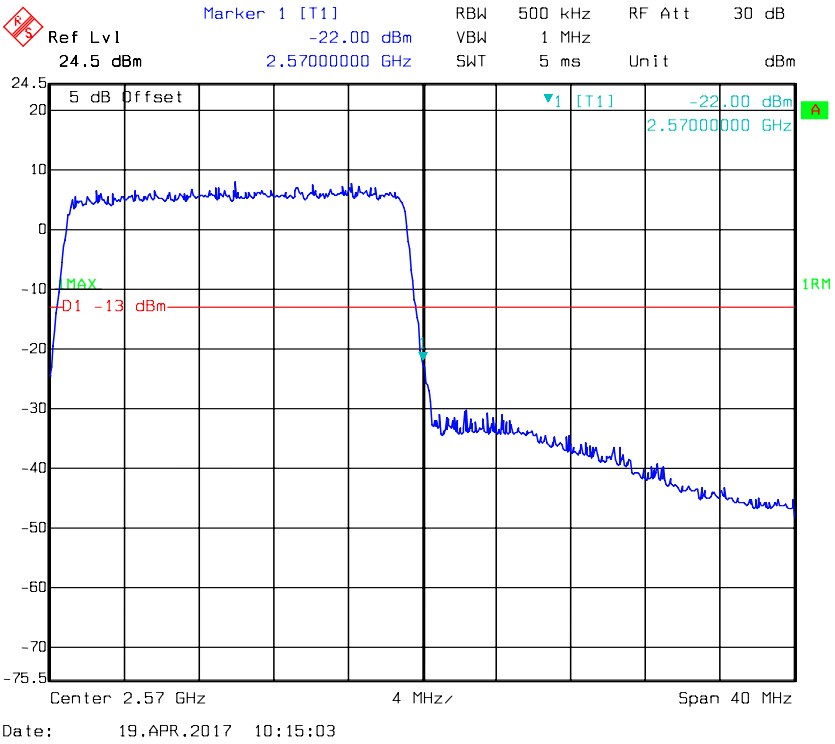
16QAM_15MHz_ 75 RB_ Right



16QAM_20MHz_ FULL RB_ Left



16QAM_20MHz_ FULL RB_ Right



FCC §2.1055, §24.235 & §27.54 - FREQUENCY STABILITY

Applicable Standard

FCC § 2.1055 (a), § 2.1055 (d), §24.235，§27.54

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

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

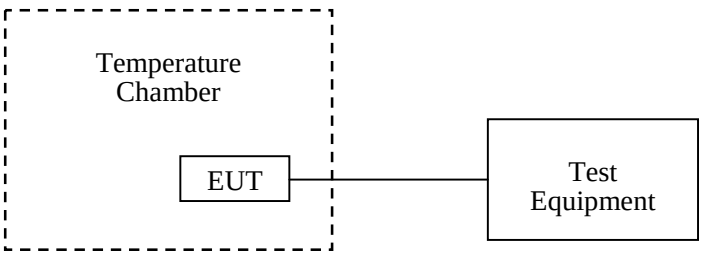
According to §27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set from 85% to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
BACL	High Temperature Test Chamber	BTH-150	30024	2016-12-02	2017-12-01
FLUKE	Multimeter	1587	27870099	2016-12-30	2017-12-29
R&S	Universal Radio Communication Tester	CMU200	11-9435686-111	2016-07-28	2017-07-27
R&S	Wideband Radio Communication Tester	CMW500	106891	2016-11-23	2017-11-23
Unknown	RF Cable	Unknown	NO.3	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

Environmental Conditions

Temperature:	22.1 ^{o}C
Relative Humidity:	39%
ATM Pressure:	96.7kPa

The testing was performed by Tom Tang on 2017-04-24.

PCS Band (Part 24E)

GMSK, Middle Channel, f_c = 1880.0 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{dc}	Hz	ppm	
-30	5.0	60	0.032	Pass
-20	5.0	69	0.037	Pass
-10	5.0	72	0.038	Pass
0	5.0	63	0.034	Pass
10	5.0	64	0.034	Pass
20	5.0	62	0.033	Pass
30	5.0	65	0.035	Pass
40	5.0	67	0.036	Pass
50	5.0	71	0.038	Pass

PCS Band (Part 24E)

EDGE, Middle Channel, f_c = 1880.0 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{dc}	Hz	ppm	
-30	5.0	29	0.015	Pass
-20	5.0	34	0.018	Pass
-10	5.0	33	0.018	Pass
0	5.0	38	0.020	Pass
10	5.0	31	0.016	Pass
20	5.0	34	0.018	Pass
30	5.0	32	0.017	Pass
40	5.0	38	0.020	Pass
50	5.0	35	0.019	Pass

LTE Band VII:

QPSK, Channel Bandwidth:10MHz Middle Channel, f_c = 2535 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{dc}	Hz	ppm	
-30	5.0	-2.34	-0.0009	Pass
-20	5.0	-1.87	-0.0007	Pass
-10	5.0	-2.45	-0.0010	Pass
0	5.0	-3.16	-0.0012	Pass
10	5.0	-1.95	-0.0008	Pass
20	5.0	-2.75	-0.0011	Pass
30	5.0	-2.67	-0.0011	Pass
40	5.0	-2.48	-0.0010	Pass
50	5.0	-1.94	-0.0008	Pass

16QAM, Channel Bandwidth:10MHz Middle Channel, f_c =2535 MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
℃	V_{dc}	Hz	ppm	
-30	5.0	-6.15	-0.0024	Pass
-20	5.0	-5.41	-0.0021	Pass
-10	5.0	-4.65	-0.0018	Pass
0	5.0	-5.27	-0.0021	Pass
10	5.0	-5.91	-0.0023	Pass
20	5.0	-5.11	-0.0020	Pass
30	5.0	-4.89	-0.0019	Pass
40	5.0	-5.37	-0.0021	Pass
50	5.0	-4.63	-0.0018	Pass

Note: The fundamental emissions stay within the authorized bands of operation based on the frequency deviation measured is small, the extreme voltage was declared by applicant.

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