FCC Part 22H, Part 24E

TEST REPORT

For

LugLoc INC.

550 NW 29th Street, Miami, Florida United States

FCC ID: 2AJ5H-GEGO

Report Type: Original Report	**Product Type:** Global Tracker Device

Report Producer: Himiko Chen

Report Number: RLK1801002-00C

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Reviewed By: Jerry Chang

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REVISION HISTORY

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
1.0	RLK1801002	RLK1801002-00C	2018.05.23	Original Report	Himiko

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	**LugLoc INC.** 550 NW 29th Street, Miami, Florida United States
Manufacturer	**Goldtek Technology CO., LTD.** 16F., No166, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.)
Brand(Trade) Name	GEGO
Product (Equipment)	Global Tracker Device
Model Name	GEGO V1
Series Model	GEGO V1W
Model Discrepancy	Refer below Model Difference Table
Frequency Range	GSM 850: 824 ~ 849 MHz PCS 1900: 1850 ~ 1910 MHz WCDMA Band V: 824 ~ 849 MHz WCDMA Band II: 1850 ~ 1910 MHz
Output Power	GSM 850: 31.13 dBm (1.2972 W) PCS 1900: 28.98 dBm (0.7907 W) WCDMA Band V: 22.59 dBm (0.1816 W) WCDMA Band II: 22.92 dBm (0.1959 W)
Received Date	Mar 01, 2018
Date of Test	Mar 02, 2018 ~ May 23, 2018
Related Submittal(s)/Grant(s)	FCC Part 15.247 DTS with FCC ID: 2AJ5H-GEGO

**All measurement and test data in this report was gathered from production sample serial number: 1801002 (Assigned by BACL, Taiwan).*

** Model Discrepancy:*

Model Difference Table		
Shell Color	GEGO V1	GEGO V1W
	Black	White

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☐ AC 120V/60Hz ☐ Adapter ☐ By Power Core
	☒ DC Type ☒ Battery 3.7V ☐ DC Power Supply ☒ External from USB Cable :5V ☐ External DC Adapter
	☐ Host System

1.3 Objective and Test Methodology

This report is prepared on behalf of *LugLoc INC.* in accordance with Part 2, Subpart J, Part 22H, Part 24E and C of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC Rules for Output Power, modulation characteristic, occupied bandwidth, spurious emission at antenna terminal, spurious radiated emission, frequency stability and band edge.

All tests measurements indicated in this report were performed in accordance with the Code of Federal Regulation Title 47 Part 2, Subpart J, Part 22H and Part 24E.

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

All radiation and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. (Taiwan)

1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power with Power Meter	± 0.55 dB
Occupied Channel Bandwidth	± 4.45 %
RF Conducted test with Spectrum	± 1.45 dB
Radiated Below 1G	± 5.83 dB
Radiated Above 1G-18G	± 5.35 dB
Radiated Above 18G-40G	± 4.49 dB

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

☒68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

2 System Test Configuration

2.1 Description of Test Configuration

The system was configured for testing in engineering mode which was selected by manufacturer. No modification was made to the EUT

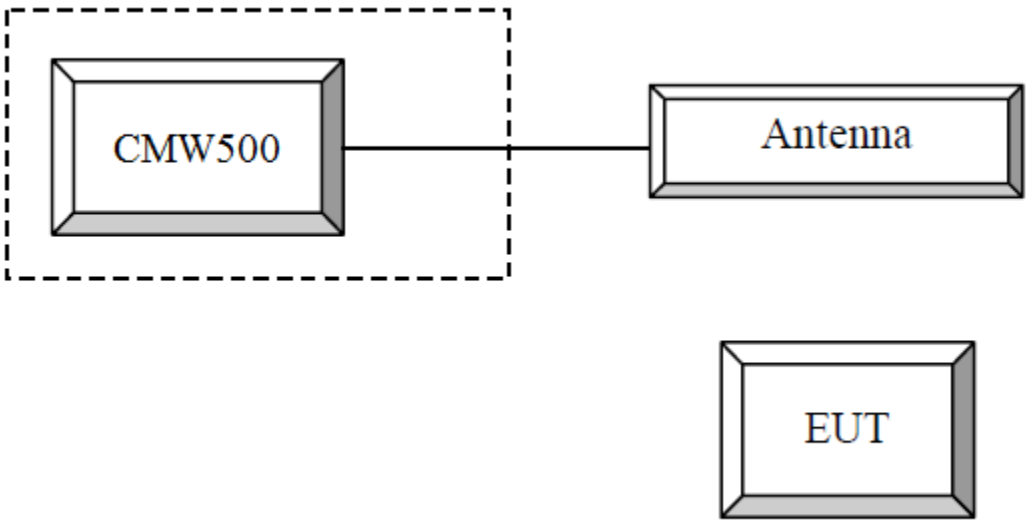
2.2 Support Equipment List and Details

Description	Manufacturer	Model	BSMI	FCC ID / DoC
Communication Tester	R&S	CMW 500	N/A	DoC

2.3 External Cable List and Details

Cable Description	Length (m)	From	To
N/A	**N/A**	**N/A**	**N/A**

2.4 Block Diagram of Test Setup



3 Summary of Test Results

FCC Rules	Description of Test	Result
§1.1310 ,§ 2.1091	Maximum Permissible Exposure (MPE)	Compliance
§ 2.1046; § 22.913(a); § 24.232 (c);	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Compliance
§ 2.1049, § 22.905 § 22.917, § 24.238	Occupied Bandwidth	Compliance
§ 2.1501 § 22.917 (a); § 24.238 (a)	Spurious Emission at Antenna Terminal	Compliance
§ 2.1503 § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a)	Out of band emission, Band Edge	Compliance
§ 2.1055, § 22.355; § 24.235	Frequency Stability of Temperature and Voltage	Compliance

4 FCC §1.1310, § 2.1091- Maximum Permissible Exposure (MPE)

4.1 Applicable Standard

According to subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);
For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

4.2 RF Exposure Evaluation Result

MPE evaluation:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
GSM 850	824-849	4.07	2.553	22.5	177.8	20	0.0903	0.55
PCS 1900	1850-1910	5.44	3.499	20	100.0	20	0.0696	1
WCDMA Band V	824-849	4.07	2.553	23	199.5	20	0.1013	0.55
WCDMA Band II	1850-1910	5.44	3.499	23	199.5	20	0.1389	1
BLE	2402-2480	0.5	1.122	-1	0.794	20	0.0002	1

*Due to GSM not have GPRS and EDGE, so only one Averaging Time and the power calculate as below
GSM 850: 31.5 – 9 = 22.5 (dBm) and PCS 1900 = 29 – 9 = 20 (dBm)

The BLE and WCDMA Band V can transmit simultaneously:

$=S_{BLE}/S_{limit\text{-}BLE} + S_{WCDMA\ BAND\ V}/S_{limit\text{-}WCDMA\ BAND\ V} = 0.0002/1 + 0.1013/0.55 = 0.1844 < 1.0$

Result: MPE evaluation meet 20 cm the requirement of standard.

5 FCC §15.203 – MODULATION CHARACTERISTIC

5.1 Applicable Standard

According to § 2.1047 (d), Part 22H and Part 22E,

There is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

6 FCC § 2.1046, § 22.913 (a) & § 24.232 (c) - RF OUTPUT POWER

6.1 Applicable Standard

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 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 §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.

6.2 Test Procedure

Radiated method: ANSI/TIA-603-D section 2.2.17

GSM:

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; 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 GSM 850 ; > 30 dBm for GSM 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 (GSM)

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

WCDMA-Release 99

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification. The EUT has a nominal maximum output power of 24dBm (+1.7/-3.7).

WCDMA General Settings	Loopback Mode	Test Mode
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc / βd	8/15

WCDMA HSDPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSDPA			
	Subset	1	2	3	4
WCDMA	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			
	βc/ βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR(dB)	0	0	0.5	0.5
HSDPA	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs=βhs/ βc	30/15			

WCDMA HSUPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSUPA				
	Subset	1	2	3	4	5
WCDMA	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSUPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/ βd	11/15	6/15	15/9	2/15	-
	βhs	22/15	12/15	30/15	4/15	5/15
	CM(dB)	1.0	3.0	2.0	3.0	1.0
	MPR(dB)	0	2	1	2	0
HSDPA	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback	4ms				
	CQI Repetition Factor	2				
	Ahs=βhs/ βc	30/15				
HSUPA	DE-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_FCls	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27	

6.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
966 Chamber					
Bilog Antenna with 6 dB Attenuator	Sunol & Mini-Circuits	JB6/UNAT-6+	A050115/15542_01	2017/12/20	2018/12/19
Bilog Antenna with 6 dB Attenuator	Sunol Sciences & EMEC	JB3 &EM-ATT18-6-NN	A061204 /ATT-09-003	2017/11/17	2018/11/16
Horn Antenna	EMCO	3115	2171	2017/07/17	2018/07/16
Horn Antenna	EMCO	3115	9311-4158	2018/04/20	2019/04/19
Horn Antenna	ETS-Lindgren	3116	62638	2017/09/13	2018/09/12
Sweep Signal Generator	Agilent	83650B	3420A00581	2017/06/29	2018/06/28
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2017/11/06	2018/11/05
Spectrum Analyzer	Rohde & Schwarz	FSEK30	825084/006	2017/12/15	2018/12/14
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2018/01/17	2019/01/16
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2018/03/05	2019/03/04
Microflex Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2017/10/31	2018/10/30
Mircoflex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2017/07/10	2018/07/09
Microflex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2017/11/10	2018/11/09
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Communication Tester	R&S	CMW500	149170	2017/05/13	2018/05/12
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2017/05/08	2018/05/07
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11
Communication Tester	R&S	CMW500	149170	2017/05/13	2018/05/12
Power Splitter	Mini Circuits	ZFRSC-183-S+	SF112701513	Each Time	/

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.*

6.4 Test Environmental Conditions

Temperature:	25.44°C
Relative Humidity:	52.1 %
ATM Pressure:	1011 hPa

The testing was performed by Ian Tu from 2018-03-01 to 2018-05-04.

6.5 Test Plots and Data

Conducted Output Power

1. GSM

Band (Test Mode)	CH		Frequency (MHz)	Ave. power (dBm)
GSM850	Lowest	128	824.2	**31.13**
	Middle	190	836.6	31.11
	Highest	251	848.8	31.09

Band (Test Mode)	CH		Frequency (MHz)	Ave. power (dBm)
PCS1900	Lowest	512	1850.2	**28.98**
	Middle	661	1880.0	28.91
	Highest	810	1909.8	28.85

2. WCDMA Band Ⅱ

Mode	3GPP Sub Test	Low Channel (Ave. Power)	Low Channel (PAR)	Middle Channel (Ave. Power)	Middle Channel (PAR)	High Channel (Ave. Power)	High Channel (PAR)
Rel 99	1	22.67	6.72	22.89	6.67	**22.92**	6.70
HSDPA	1	22.52	6.64	22.76	6.76	22.81	6.68
	2	22.43	6.67	22..63	6.66	22.74	6.72
	3	22.31	6.67	22.52	6.81	22.63	6.75
	4	22.29	6.64	22.39	6.72	22.51	6.64
HSUPA	1	22.51	6.64	22.65	6.68	22.74	6.68
	2	22.47	6.61	22.51	6.72	22.62	6.64
	3	22.35	6.72	22.41	6.61	22.50	6.67
	4	22.23	6.67	22.31	6.38	22.38	6.75
	5	22.02	6.75	22.13	6.46	22.21	6.70

3. WCDMA Band V

Mode	3GPP Sub Test	Low Channel (Ave. Power)	Low Channel (PAR)	Middle Channel (Ave. Power)	Middle Channel (PAR)	High Channel (Ave. Power)	High Channel (PAR)
Rel 99	1	**22.59**	6.65	22.47	6.75	22.38	6.64
HSDPA	1	22.52	6.78	22.25	6.72	22.34	6.64
	2	22.47	6.71	22.30	6.67	22.26	6.67
	3	22.39	6.72	22.25	6.64	22.18	6.76
	4	22.25	6.71	22.17	6.71	22.11	6.70
HSUPA	1	22.48	6.78	22.28	6.64	22.31	6.72
	2	22.36	6.75	22.19	6.67	22.25	6.78
	3	22.21	6.72	22.08	6.71	22.11	6.70
	4	21.93	6.67	21.76	6.61	21.82	6.64
	5	21.71	6.71	21.58	6.64	21.62	6.68

4. ERP and EIRP

Part 22H:

1) GSM 850 Middle CH

Frequency (MHz)	S.G. (dBm)	Cable loss(dB)	Ant.Gain (dBd/dBi)	Result (dBm)	Limit (dBm)	Margin (dB)	Polar (H/V)
836.6	26.78	4	6.77	29.55	38.45	-8.90	H
836.6	24.21	4	6.77	26.98	38.45	-11.47	V

2) WCDMA Band V Middle CH

Frequency (MHz)	S.G. (dBm)	Cable loss(dB)	Ant.Gain (dBd/dBi)	Result (dBm)	Limit (dBm)	Margin (dB)	Polar (H/V)
836.6	18.67	4	6.77	21.44	38.45	-17.01	H
836.6	16.68	4	6.77	19.45	38.45	-19.00	V

Part 24E:

1) PCS 1900 Middle CH

Frequency (MHz)	S.G. (dBm)	Cable loss(dB)	Ant.Gain (dBd/dBi)	Result (dBm)	Limit (dBm)	Margin (dB)	Polar (H/V)
1880	22.28	3.9	8.28	26.66	33.00	-6.34	H
1880	19.14	3.9	8.28	23.52	33.00	-9.48	V

2) WCDMA Band II Middle CH

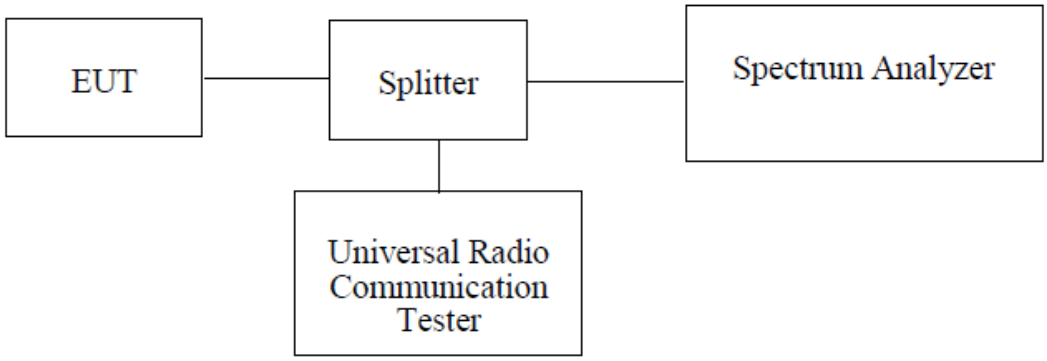
Frequency (MHz)	S.G. (dBm)	Cable loss(dB)	Ant.Gain (dBd/dBi)	Result (dBm)	Limit (dBm)	Margin (dB)	Polar (H/V)
1880	17.33	3.9	8.28	21.71	33.00	-11.29	H
1880	10.55	3.9	8.28	14.93	33.00	-18.07	V

7 FCC §2.1049, §22.917, §22.905 & §24.238 - OCCUPIED BANDWIDTH

7.1 Applicable Standard

FCC §2.1049, §22.917 and §22.905, §24.238.:

7.2 EUT Setup



7.3 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.

7.4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2018/05/04	2019/05/03
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11
Communication Tester	R&S	CMW500	149170	2018/05/11	2019/05/10
Power Splitter	Mini Circuits	ZFRSC-183-S+	SF112701513	Each Time	/

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.*

7.5 Test Environmental Conditions

Temperature:	25.5° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian from 2018-05-22 to 2018-05-23.

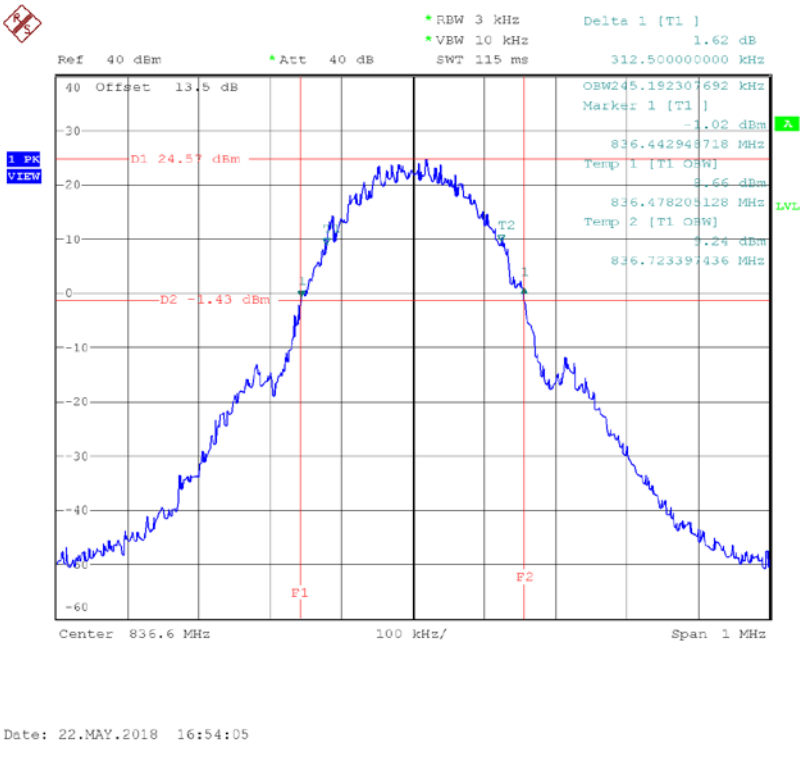
7.6 Test Results

Band	Channel	99 % OBW (MHz)	26 dB Bandwidth (MHz)
GSM 850	Middle	0.245	0.313
PSC 1900	Middle	0.244	0.319
Band II Rel 99 (WCDMA)	Middle	4.087	4.647
Band II HSDPA	Middle	4.087	4.696
Band II HSUPA	Middle	4.087	4.631
Band V Rel 99 (WCDMA)	Middle	4.087	4.647
Band V HSDPA	Middle	4.071	4.663
Band V HSUPA	Middle	4.071	4.615

Please refer to the following plots

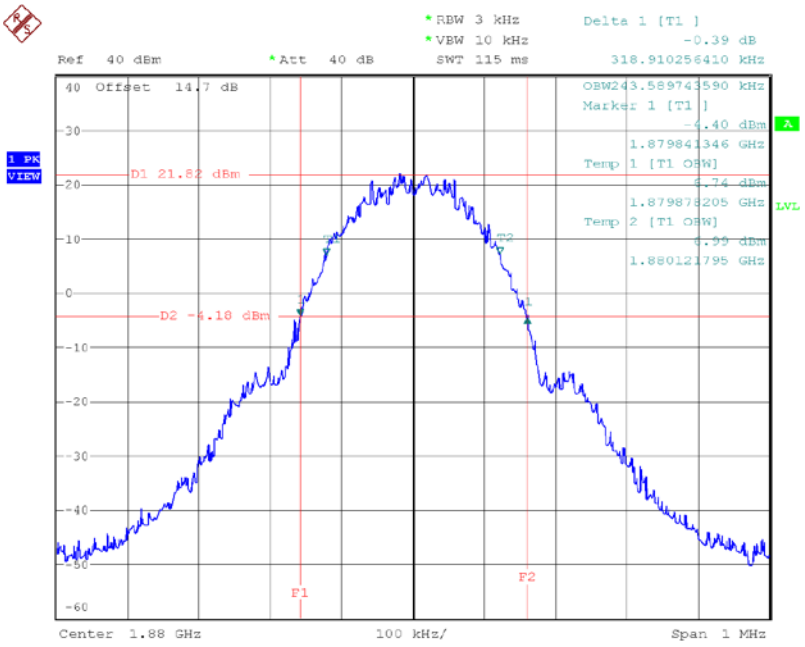
GSM 850:

Middle Channel



PCS 1900:

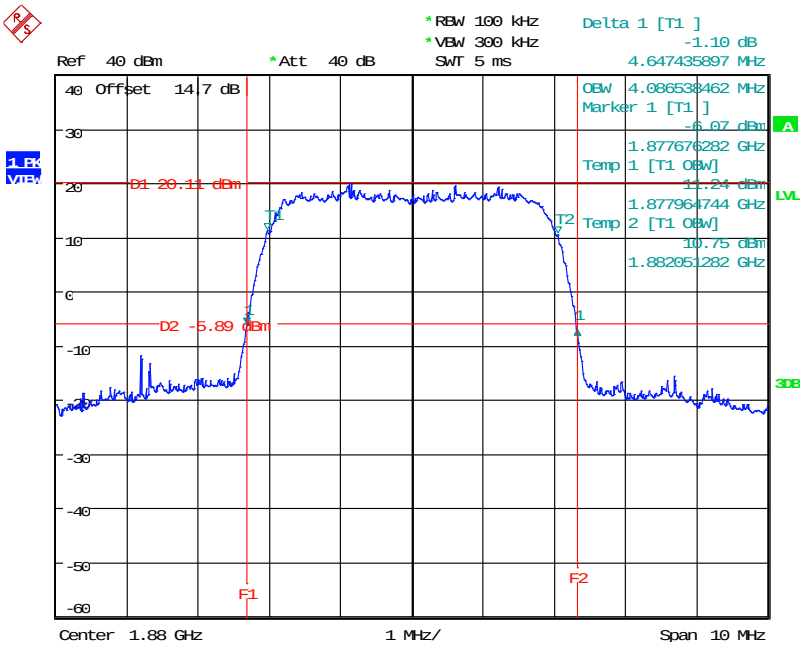
Middle Channel



Date: 22.MAY.2018 17:15:40

Rel 99 Band II:

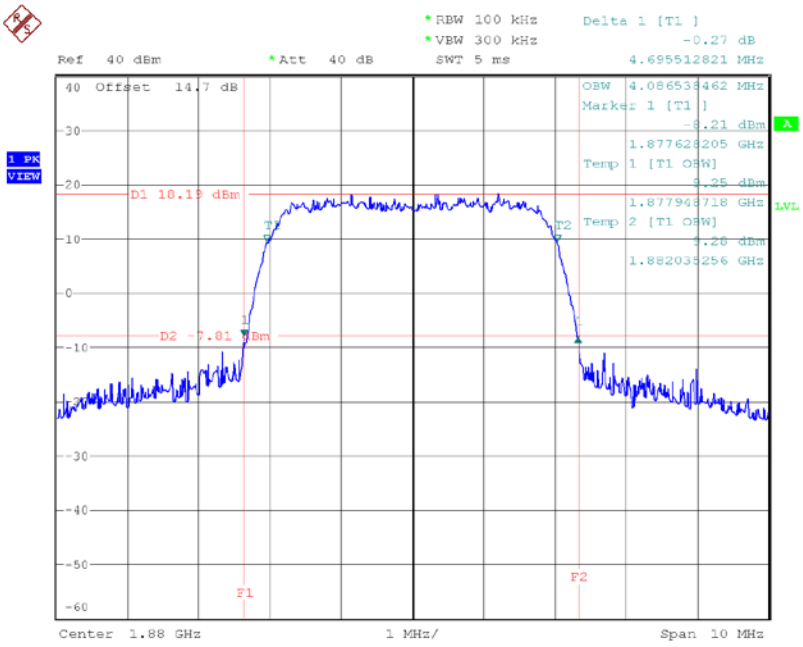
Middle Channel



Date: 21.MAY.2018 16:42:50

HSDPA Band II:

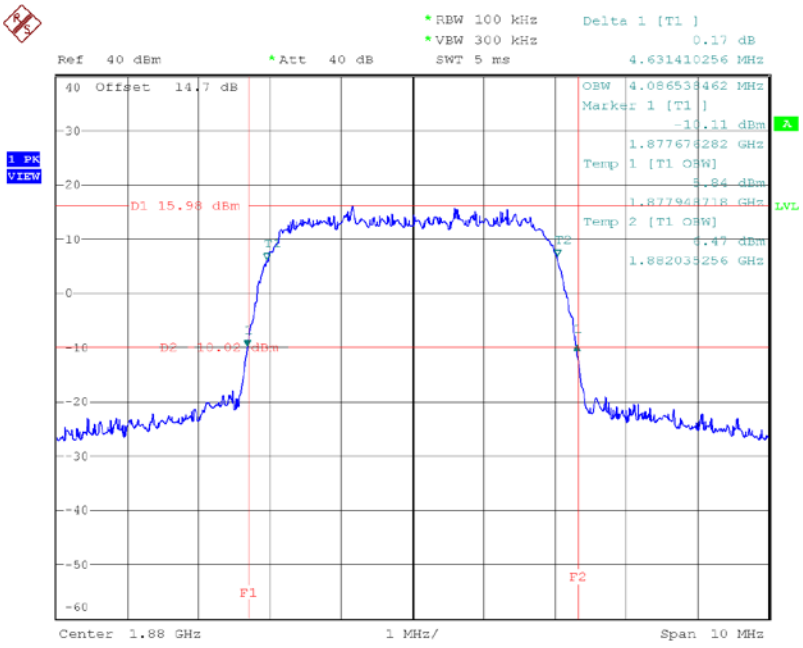
Middle Channel



Date: 23.MAY.2018 14:19:47

HSUPA Band II:

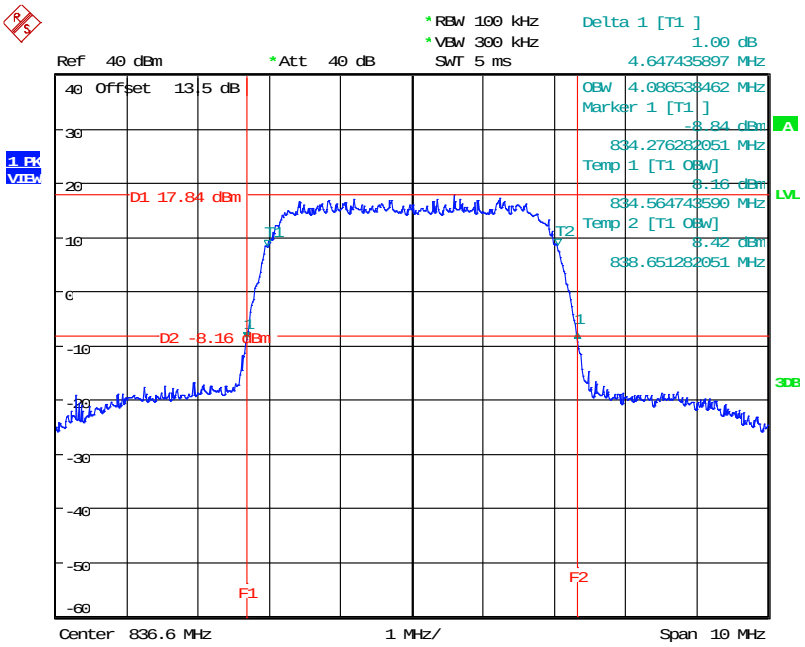
Middle Channel



Date: 23.MAY.2018 14:00:36

Rel 99 Band V:

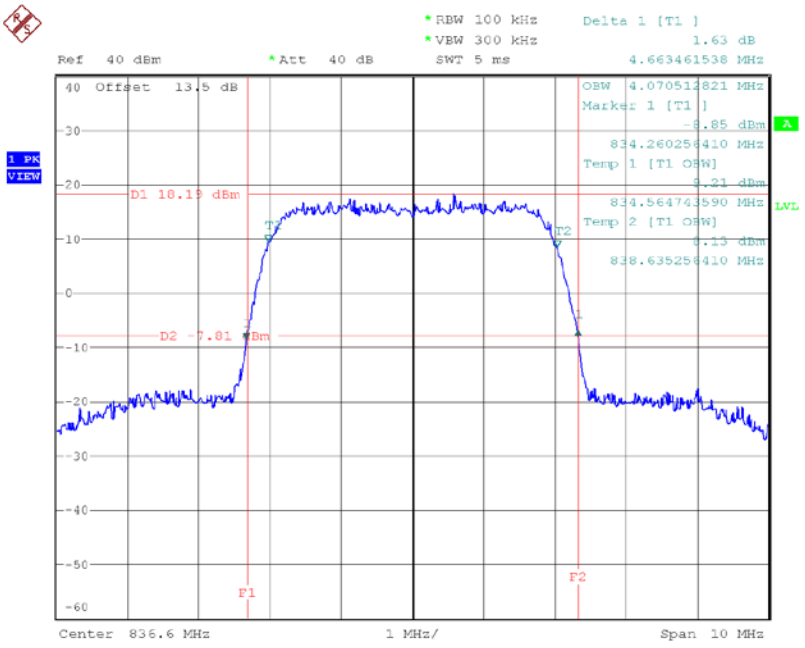
Middle Channel



Date: 21.MAY.2018 17:05:27

HSDPA Band V:

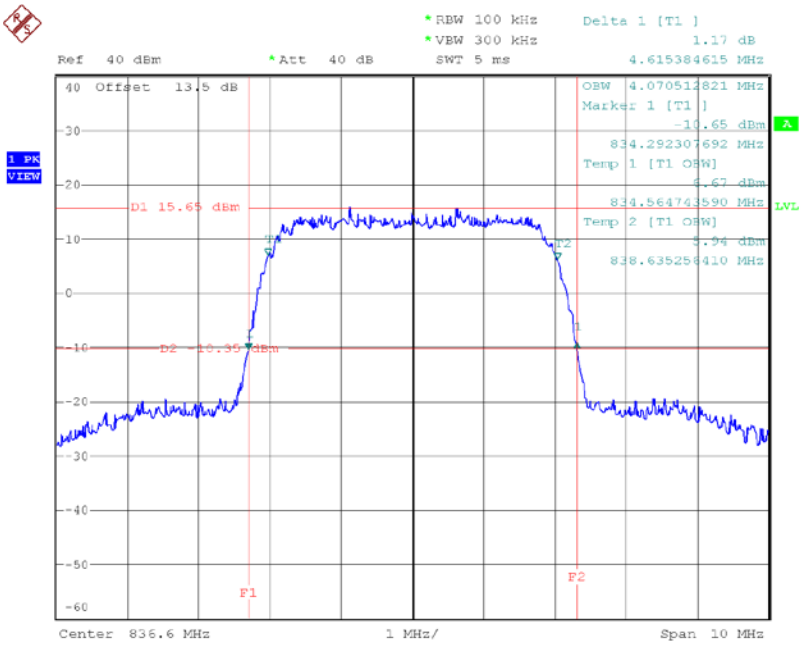
Middle Channel



Date: 23.MAY.2018 14:15:34

HSUPA Band V:

Middle Channel



Date: 23.MAY.2018 14:05:46

8 FCC §2.1051, §22.917(a) & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

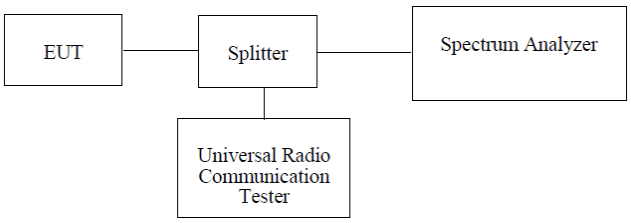
8.1 Applicable Standard

FCC §2.1051, §22.917(a) and §24.238(a).

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

8.2 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.



8.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2018/05/04	2019/05/03
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11
Communication Tester	R&S	CMW500	149170	2018/05/11	2019/05/10
Power Splitter	Mini Circuits	ZFRSC-183-S+	SF112701513	Each Time	/

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.*

8.4 Test Environmental Conditions

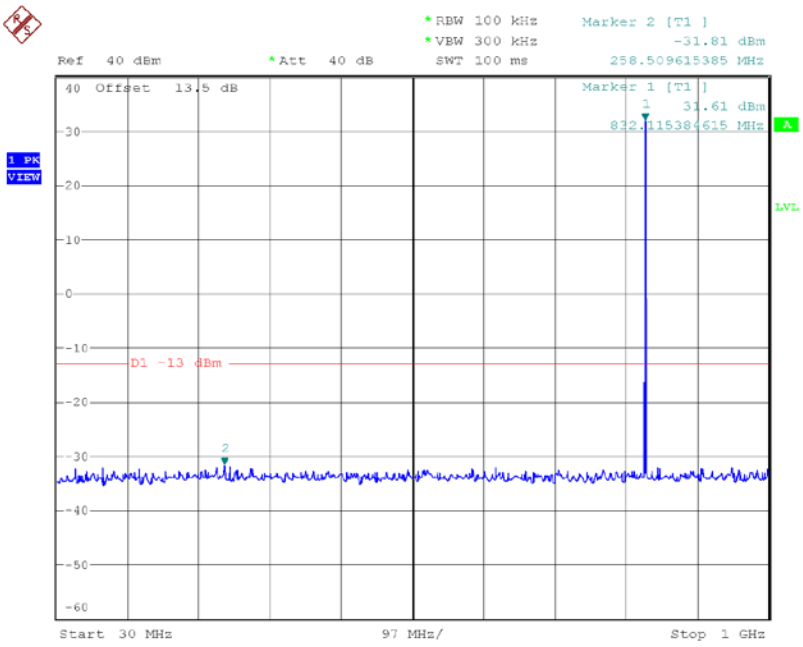
Temperature:	26° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian Tu from 2018-05-21 to 2018-05-22.

8.5 Test Results

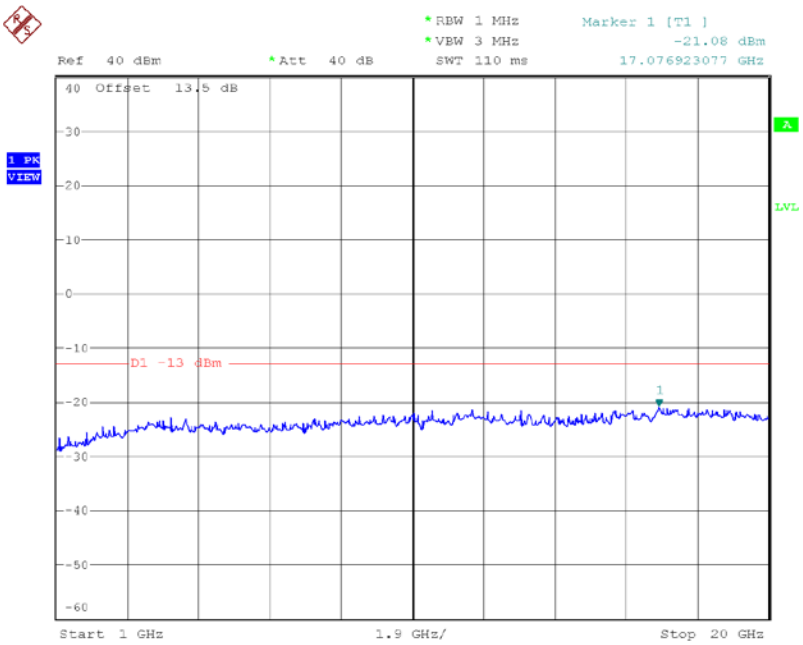
GSM 850:

Middle Channel (30MHz – 1GHz)



Date: 22.MAY.2018 16:59:29

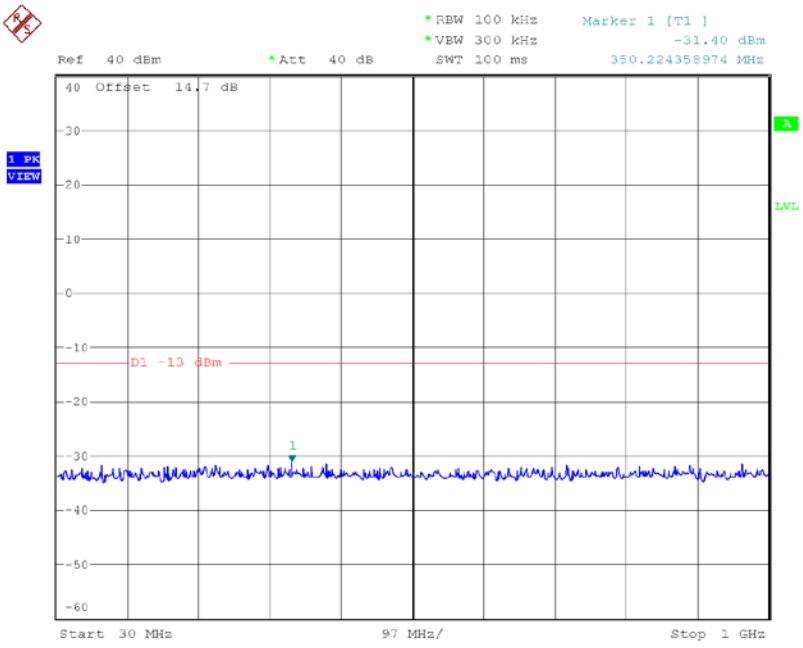
Middle Channel (1GHz – 20GHz)



Date: 22.MAY.2018 17:02:04

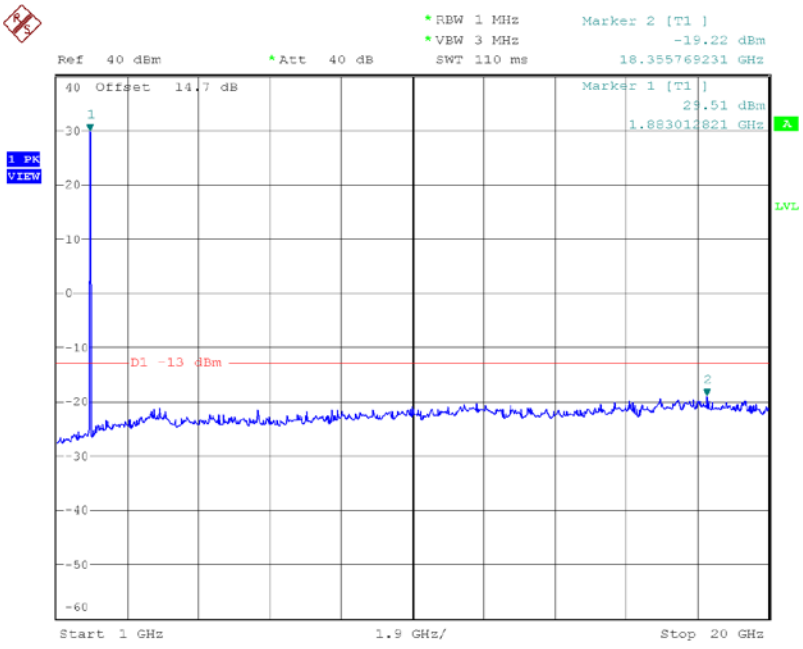
PCS 1900:

Middle Channel (30MHz – 1GHz)



Date: 22.MAY.2018 17:09:17

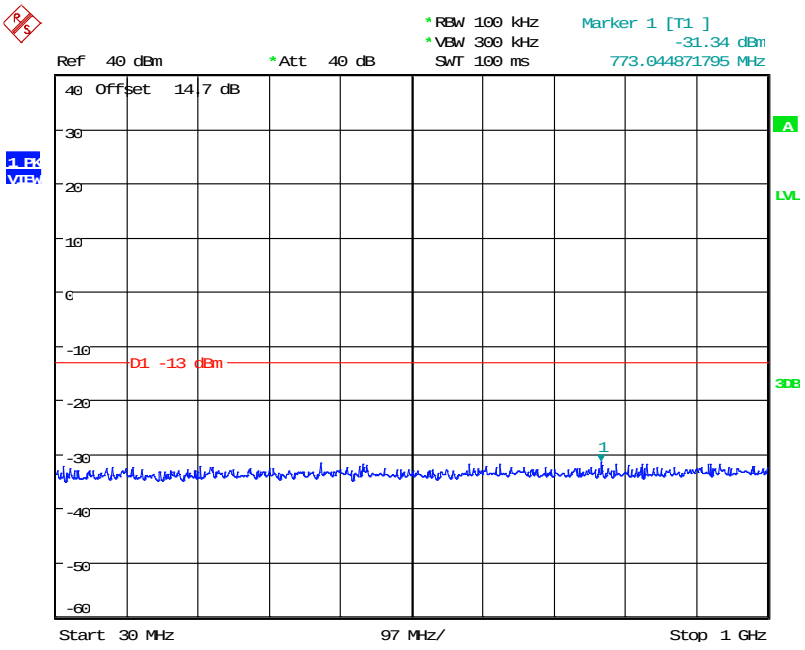
Middle Channel (1GHz – 20GHz)



Date: 22.MAY.2018 17:07:45

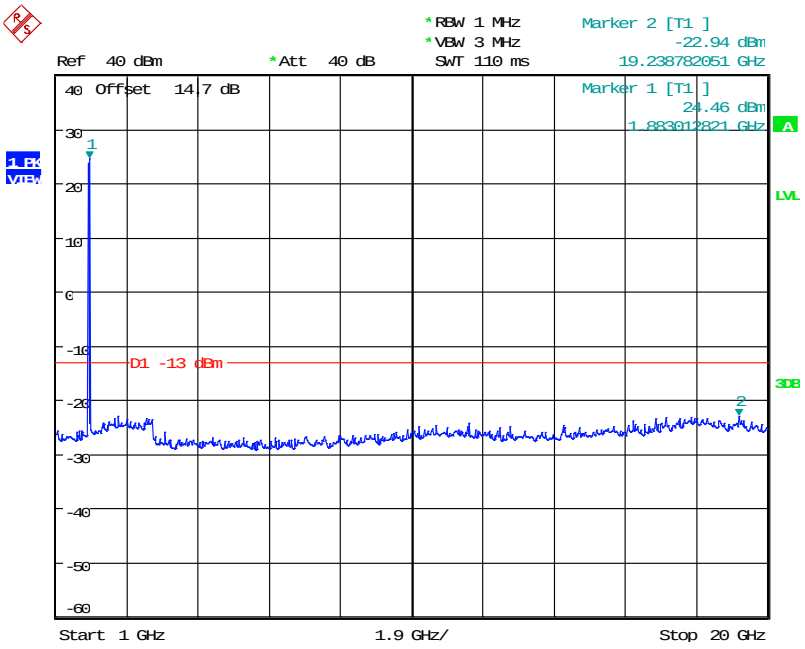
WCDMA Band II:

Middle Channel (30MHz-1GHz)



Date: 21.MAY.2018 16:52:53

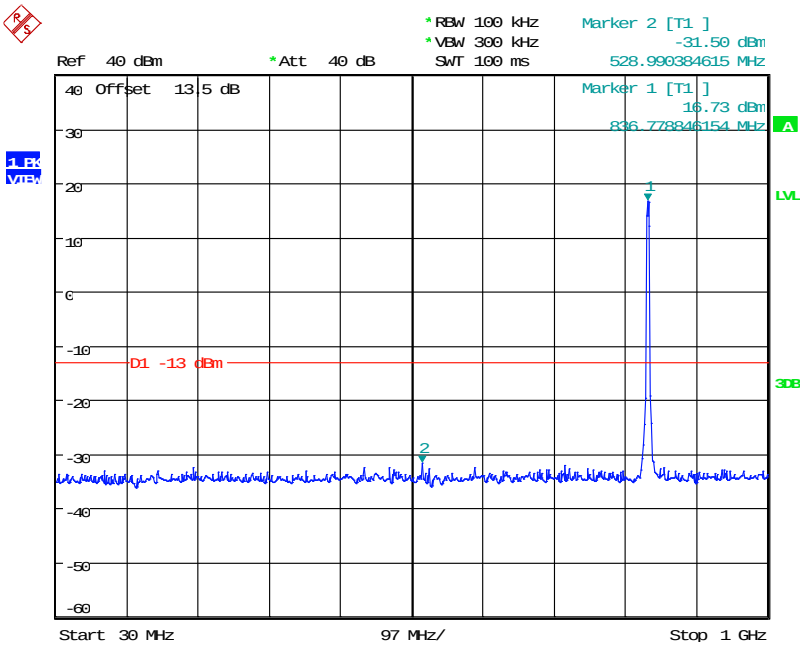
Middle Channel (1GHz-20GHz)



Date: 21.MAY.2018 16:50:07

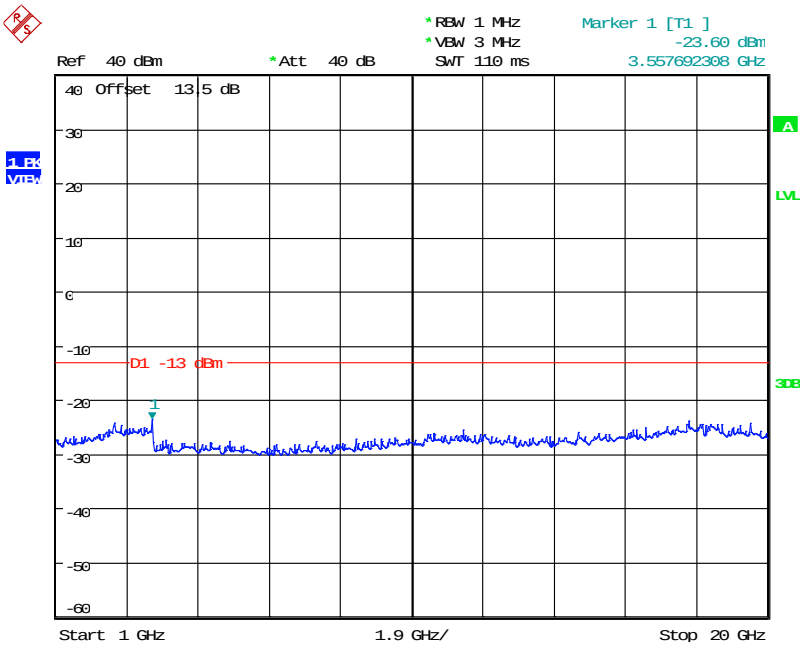
WCDMA Band V:

Middle Channel (30MHz-1GHz)



Date: 21.MAY.2018 16:57:06

Middle Channel (1GHz-20GHz)



Date: 21.MAY.2018 17:00:17

9 FCC §2.1053, §22.917 & §24.238 - SPURIOUS RADIATED EMISSIONS

9.1 Applicable Standard

FCC § 2.1053, §22.917 and § 24.238.

9.2 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 Log10 (power out in Watts)

9.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Bilog Antenna with 6 dB Attenuator	Sunol & Mini-Circuits	JB6/UNAT-6+	A050115/15542_01	2017/12/20	2018/12/19
Bilog Antenna with 6 dB Attenuator	Sunol Sciences & EMEC	JB3 &EM-ATT18-6-NN	A061204 /ATT-09-003	2017/11/17	2018/11/16
Horn Antenna	EMCO	3115	2171	2017/07/17	2018/07/16
Horn Antenna	EMCO	3115	9311-4158	2017/05/24	2018/05/23
Horn Antenna	ETS-Lindgren	3116	62638	2017/09/13	2018/09/12
Preamplifier	Sonoma	310N	130602	2017/07/03	2018/07/02
Preamplifier	EM Electronics Corp.	EM01G18G	060698	2017/12/14	2018/12/13
Microware Preamplifier	EM Electronics Corporatino	EM18G40G	060656	2018/01/15	2019/01/14
Sweep Signal Generator	Agilent	83650B	3420A00581	2017/06/29	2018/06/28
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2017/11/06	2018/11/05
Spectrum Analyzer	Rohde & Schwarz	FSEK30	825084/006	2017/12/15	2018/12/14
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2018/01/17	2019/01/16
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2018/03/05	2019/03/04
Microflex Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2017/10/31	2018/10/30
Mircoflex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2017/07/10	2018/07/09
Microflex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2017/11/10	2018/11/09
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Communication Tester	R&S	CMW500	149170	2017/05/13	2018/05/12

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another*

internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.

9.4 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian from 2018-03-01 to 2018-05-04

9.5 Test Results

Part 22H: 30MHz ~ 10GHz

1) GSM 850 Middle CH

Frequency (MHz)	S.G. (dBm)	Cable loss(dB)	Ant.Gain (dBd/dBi)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polar (H/V)
88.2000	-50.13	1.28	1.48	-49.93	-13.00	-36.93	peak	H
344.2800	-54.03	2.54	6.11	-50.46	-13.00	-37.46	peak	H
688.6300	-64.81	3.62	6.86	-61.57	-13.00	-48.57	peak	H
1749.000	-53.36	3.75	8.25	-48.86	-13.00	-35.86	peak	H
3114.000	-61.95	5.02	9.12	-57.85	-13.00	-44.85	peak	H
3891.000	-57.74	5.9	9.28	-54.36	-13.00	-41.36	peak	H
5032.000	-57.18	8.21	10.12	-55.27	-13.00	-42.27	peak	H
6054.000	-54.68	7.34	10.86	-51.16	-13.00	-38.16	peak	H
88.2000	-48.34	1.28	1.48	-48.14	-13.00	-35.14	peak	V
344.2800	-57.61	2.54	6.11	-54.04	-13.00	-41.04	peak	V
432.5500	-58.44	2.84	6.33	-54.95	-13.00	-41.95	peak	V
1749.000	-47.29	3.75	8.25	-42.79	-13.00	-29.79	peak	V
2659.000	-58.22	4.67	9.37	-53.52	-13.00	-40.52	peak	V
3800.000	-58.63	5.78	9.26	-55.15	-13.00	-42.15	peak	V
4185.000	-56.32	6.36	9.78	-52.90	-13.00	-39.90	peak	V
5879.000	-54.43	7.35	10.7	-51.08	-13.00	-38.08	peak	V

2) WCDMA Band V Middle CH

Frequency (MHz)	S.G. (dBm)	Cable loss(dB)	Ant.Gain (dBd/dBi)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polar (H/V)
256.0100	-62.86	2.17	6.06	-58.97	-13.00	-45.97	peak	H
315.1800	-65.82	2.43	5.96	-62.29	-13.00	-49.29	peak	H
392.7800	-68.27	2.71	6.28	-64.70	-13.00	-51.70	peak	H
2246.000	-64	4.29	8.89	-59.40	-13.00	-46.40	peak	H
3198.000	-58.6	5.1	9.14	-54.56	-13.00	-41.56	peak	H
4045.000	-57.32	6.12	9.42	-54.02	-13.00	-41.02	peak	H
5501.000	-55.53	7.41	10.4	-52.54	-13.00	-39.54	peak	H
6999.000	-53.49	7.87	10.8	-50.56	-13.00	-37.56	peak	H
44.5500	-48.26	0.93	-7.99	-57.18	-13.00	-44.18	peak	V
86.2600	-62.54	1.26	1.21	-62.59	-13.00	-49.59	peak	V
256.0100	-68.48	2.17	6.06	-64.59	-13.00	-51.59	peak	V
3198.000	-59.16	5.1	9.14	-55.12	-13.00	-42.12	peak	V
3996.000	-57.61	6.03	9.3	-54.34	-13.00	-41.34	peak	V
4990.000	-51.88	8.23	10.11	-50.00	-13.00	-37.00	peak	V
6432.000	-55.85	7.43	11.32	-51.96	-13.00	-38.96	peak	V
6971.000	-54.12	7.85	10.83	-51.14	-13.00	-38.14	peak	V

Part 24E: 30M ~ 20GHz

1) PCS 1900 Middle CH

Frequency (MHz)	S.G. (dBm)	Cable loss(dB)	Ant.Gain (dBd/dBi)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polar (H/V)
279.2900	-59.3	2.27	5.58	-55.99	-13.00	-42.99	peak	H
399.5700	-62.7	2.74	6.3	-59.14	-13.00	-46.14	peak	H
432.5500	-61.62	2.84	6.33	-58.13	-13.00	-45.13	peak	H
2400.000	-60.07	4.45	9.26	-55.26	-13.00	-42.26	peak	H
3758.000	-52.81	5.72	9.25	-49.28	-13.00	-36.28	peak	H
4234.000	-58.71	6.44	9.91	-55.24	-13.00	-42.24	peak	H
5704.000	-55.26	7.38	10.56	-52.08	-13.00	-39.08	peak	H
6824.000	-54.62	7.72	11.01	-51.33	-13.00	-38.33	peak	H
279.2900	-60.73	2.27	5.58	-57.42	-13.00	-44.42	peak	V
432.5500	-62.7	2.84	6.33	-59.21	-13.00	-46.21	peak	V
800.1800	-57.65	3.91	6.82	-54.74	-13.00	-41.74	peak	V
2127.000	-57.81	4.16	8.6	-53.37	-13.00	-40.37	peak	V
2491.000	-58.93	4.54	9.48	-53.99	-13.00	-40.99	peak	V
3758.000	-52.65	5.72	9.25	-49.12	-13.00	-36.12	peak	V
4976.000	-55.01	8.19	10.12	-53.08	-13.00	-40.08	peak	V
6187.000	-55.96	7.37	11.02	-52.31	-13.00	-39.31	peak	V

2) WCDMA Band II Middle CH

Frequency (MHz)	S.G. (dBm)	Cable loss(dB)	Ant.Gain (dBd/dBi)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark	Polar (H/V)
256.0100	-62.79	2.17	6.06	-58.90	-13.00	-45.90	peak	H
333.6100	-63.84	2.5	6.05	-60.29	-13.00	-47.29	peak	H
769.1400	-65.17	3.84	6.81	-62.20	-13.00	-49.20	peak	H
1959.000	-44.83	3.98	8.29	-40.52	-13.00	-27.52	peak	H
2484.000	-59.24	4.53	9.46	-54.31	-13.00	-41.31	peak	H
3765.000	-45.34	5.73	9.25	-41.82	-13.00	-28.82	peak	H
5627.000	-54.42	7.39	10.5	-51.31	-13.00	-38.31	peak	H
6992.000	-53.47	7.86	10.81	-50.52	-13.00	-37.52	peak	H
57.1600	-54.53	1.01	-2.37	-57.91	-13.00	-44.91	peak	V
86.2600	-59.87	1.26	1.21	-59.92	-13.00	-46.92	peak	V
519.8500	-68.6	3.13	6.46	-65.27	-13.00	-52.27	peak	V
1959.000	-52.65	3.98	8.29	-48.34	-13.00	-35.34	peak	V
2491.000	-58.03	4.54	9.48	-53.09	-13.00	-40.09	peak	V
3758.000	-54.61	5.72	9.25	-51.08	-13.00	-38.08	peak	V
4990.000	-52.74	8.23	10.11	-50.86	-13.00	-37.86	peak	V
6803.000	-54.32	7.7	11.04	-50.98	-13.00	-37.98	peak	V

10 FCC §22.917(a) & §24.238(a) - BAND EDGES

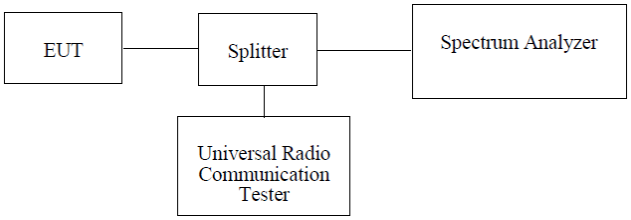
10.1 Applicable Standard

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 §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.

10.2 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.



10.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2017/05/08	2018/05/07
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2018/05/04	2019/05/03
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11
Communication Tester	R&S	CMW500	149170	2017/05/13	2018/05/12
Communication Tester	R&S	CMW500	149170	2018/05/11	2019/05/10
Power Splitter	Mini Circuits	ZFRSC-183-S+	SF112701513	Each Time	/

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.*

10.4 Test Environmental Conditions

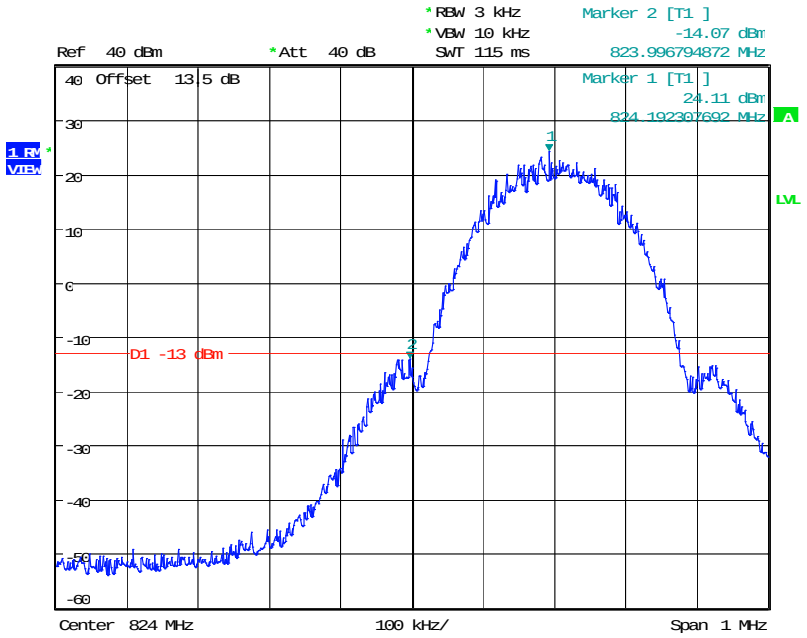
Temperature:	26° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian from 2018-03-19 to 2018-05-23

10.5 Test Results

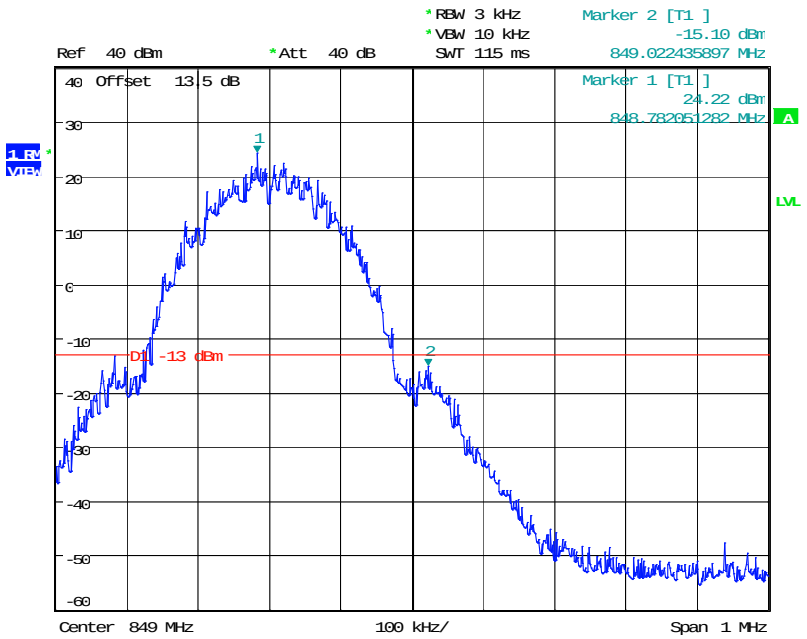
GSM 850:

Band Edge, Left Side



Date: 17.MAR.2018 01:33:15

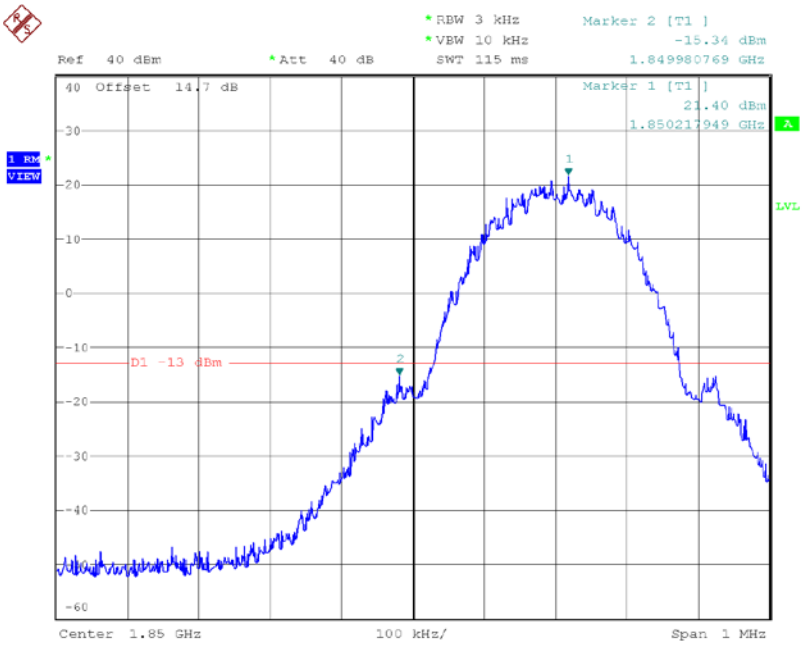
Band Edge, Right Side



Date: 17.MAR.2018 01:50:07

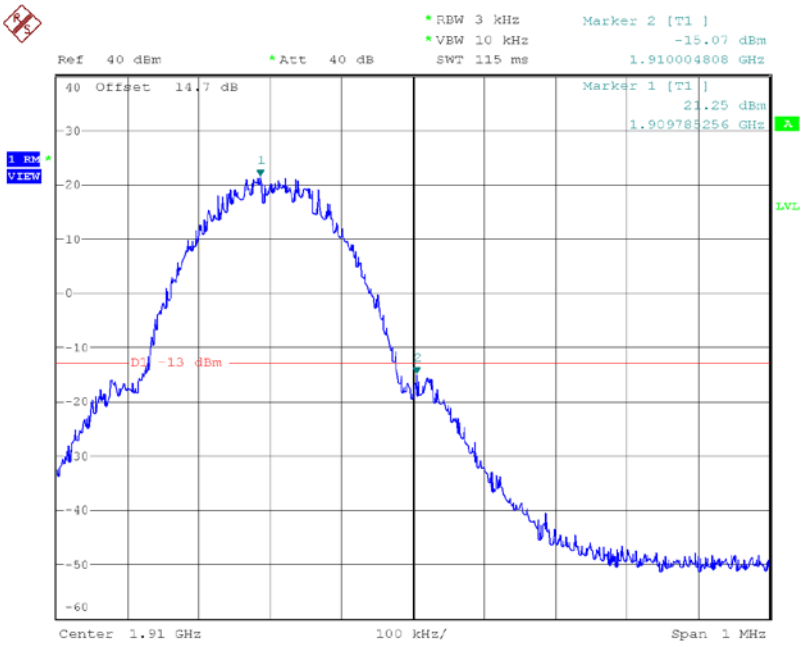
PCS 1900:

Band Edge, Left Side



Date: 22.MAY.2018 17:21:51

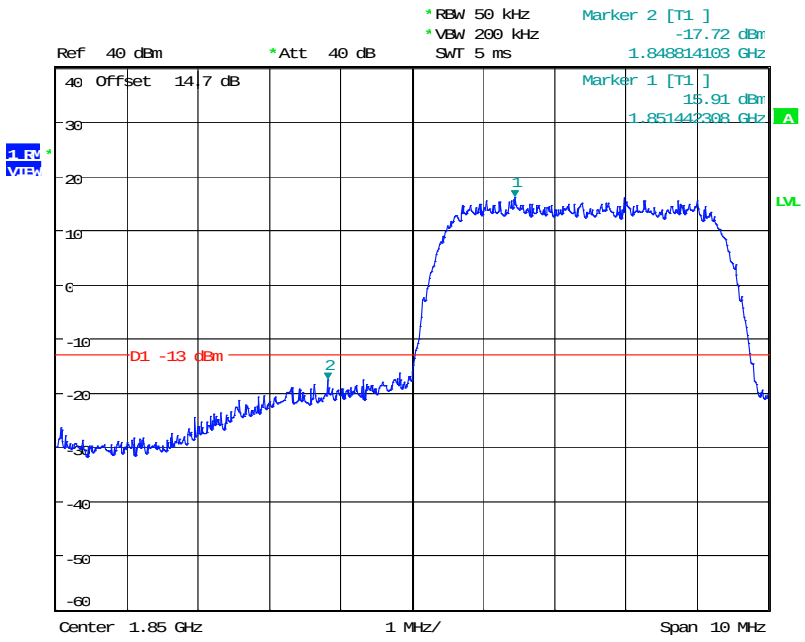
Band Edge, Right Side



Date: 22.MAY.2018 17:20:29

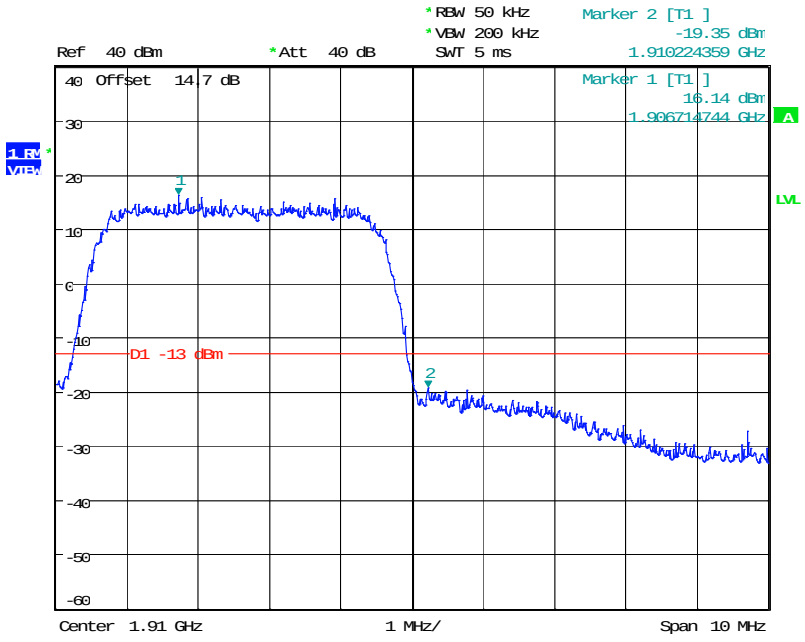
Rel 99 Band II:

Band Edge, Left Side



Date: 19.MAR.2018 23:39:19

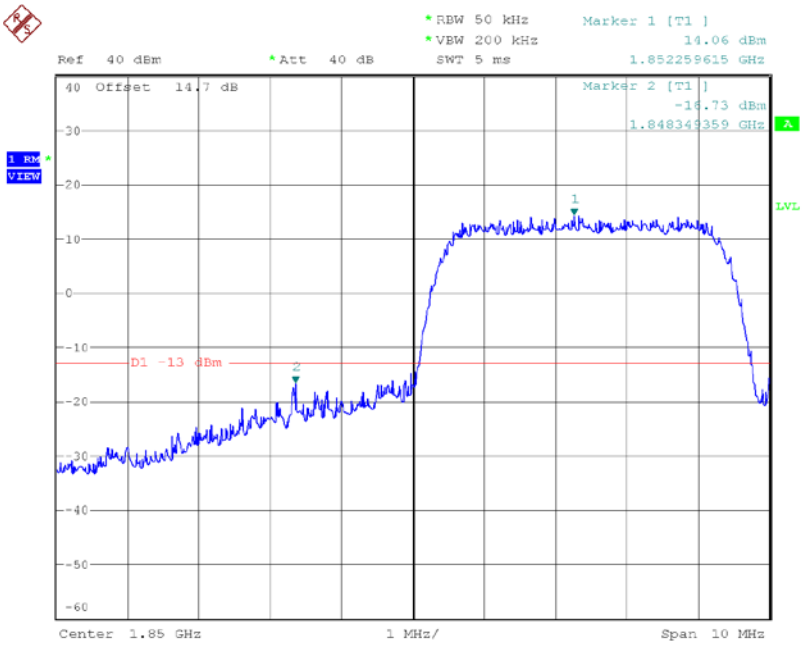
Band Edge, Right Side



Date: 19.MAR.2018 23:55:33

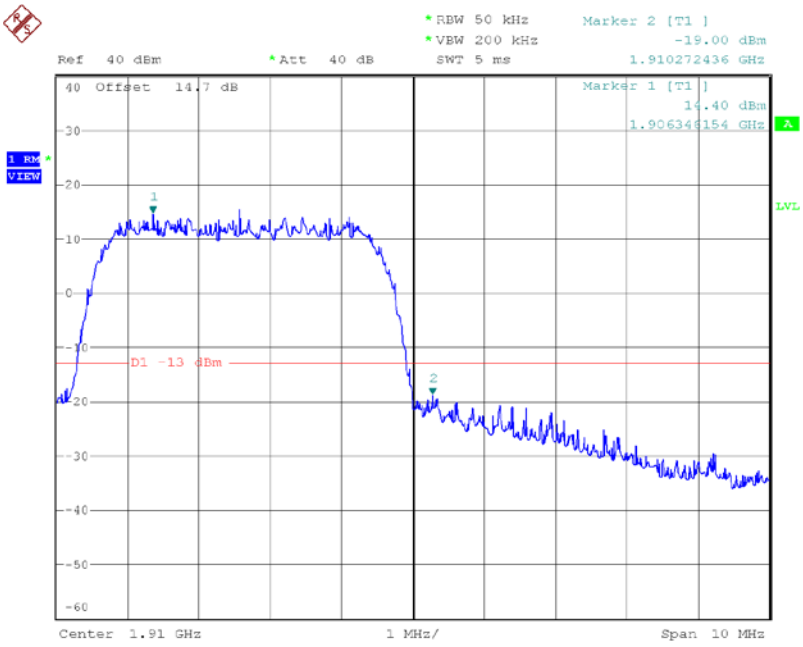
HSDPA Band II:

Band Edge, Left Side



Date: 22.MAY.2018 17:59:46

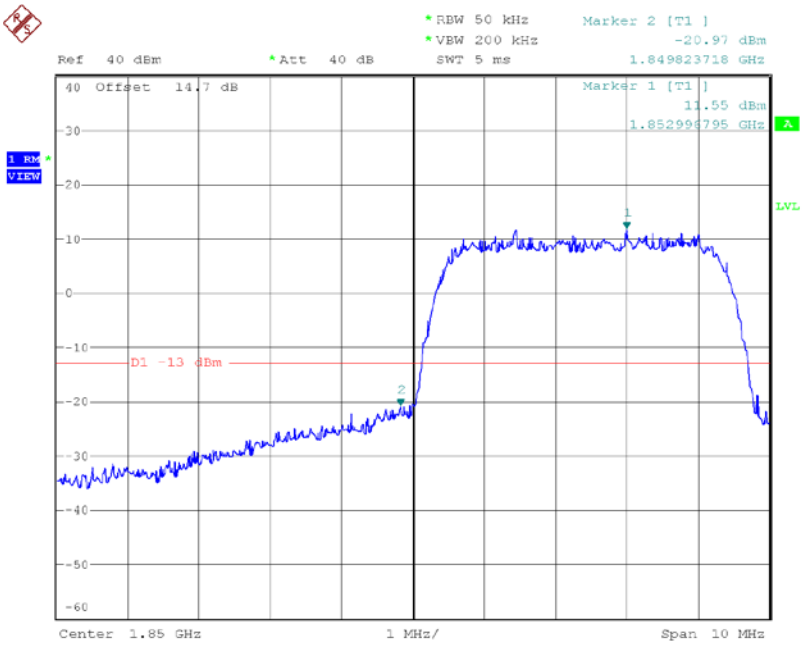
Band Edge, Right Side



Date: 22.MAY.2018 18:00:29

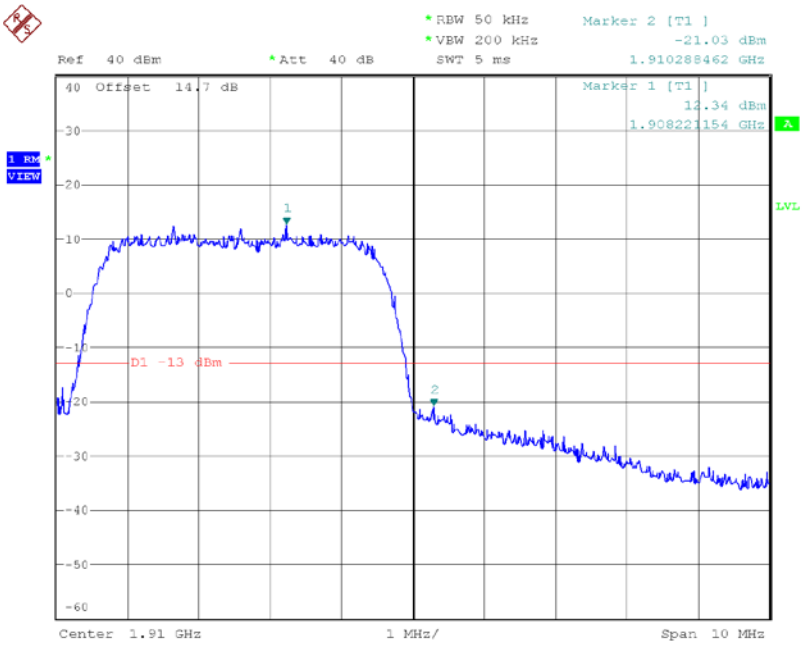
HSUPA Band II:

Band Edge, Left Side



Date: 23.MAY.2018 12:13:49

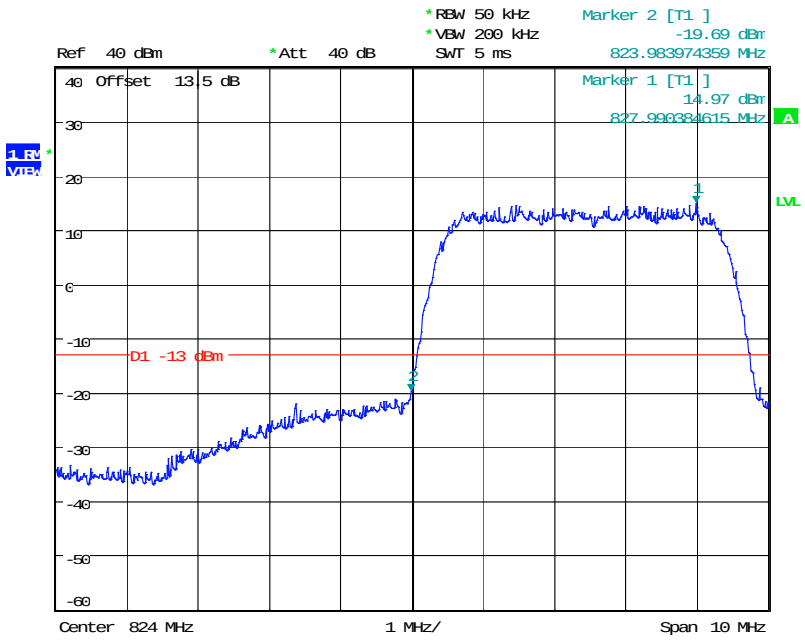
Band Edge, Right Side



Date: 23.MAY.2018 12:11:49

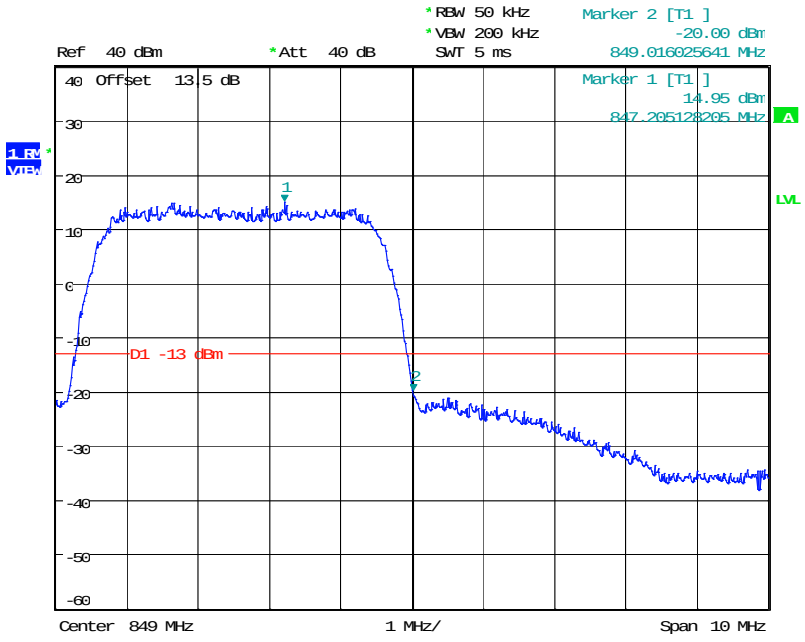
Rel 99 Band V:

Band Edge, Left Side



Date: 20.MAR.2018 03:25:03

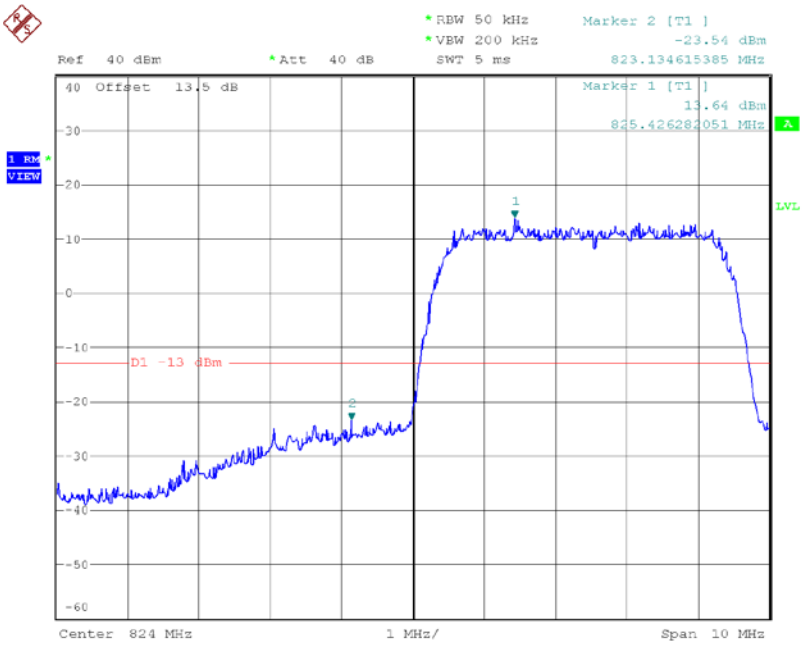
Band Edge, Right Side



Date: 20.MAR.2018 03:38:25

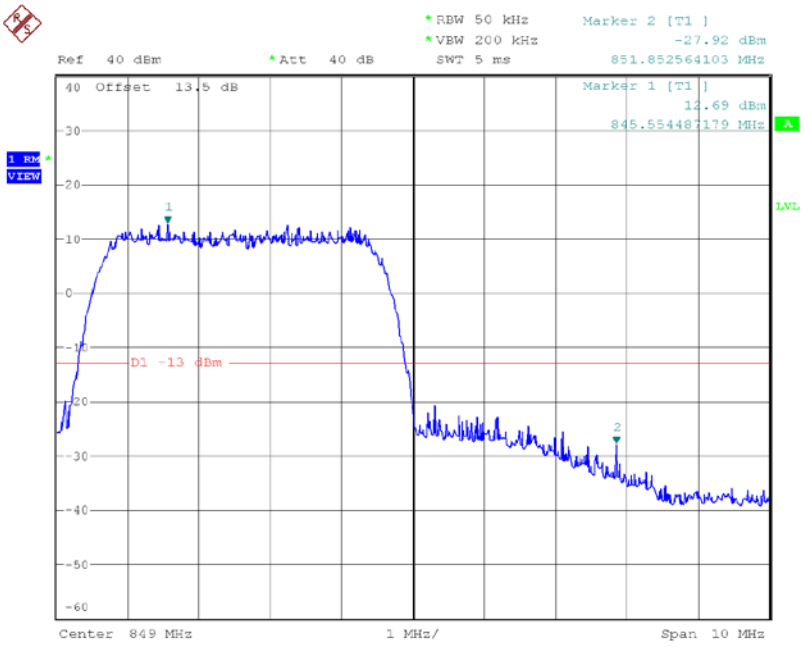
HSDPA Band V:

Band Edge, Left Side



Date: 22.MAY.2018 17:57:12

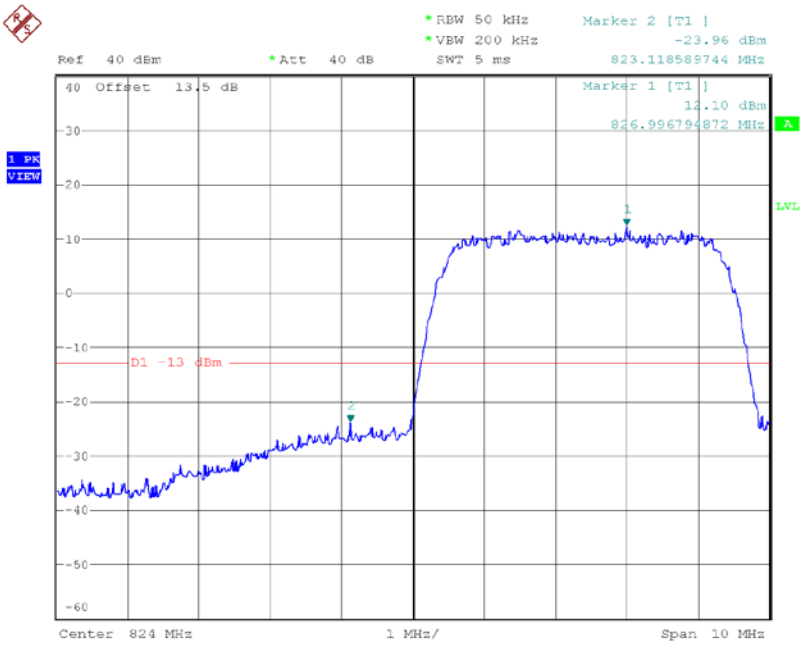
Band Edge, Right Side



Date: 22.MAY.2018 17:56:29

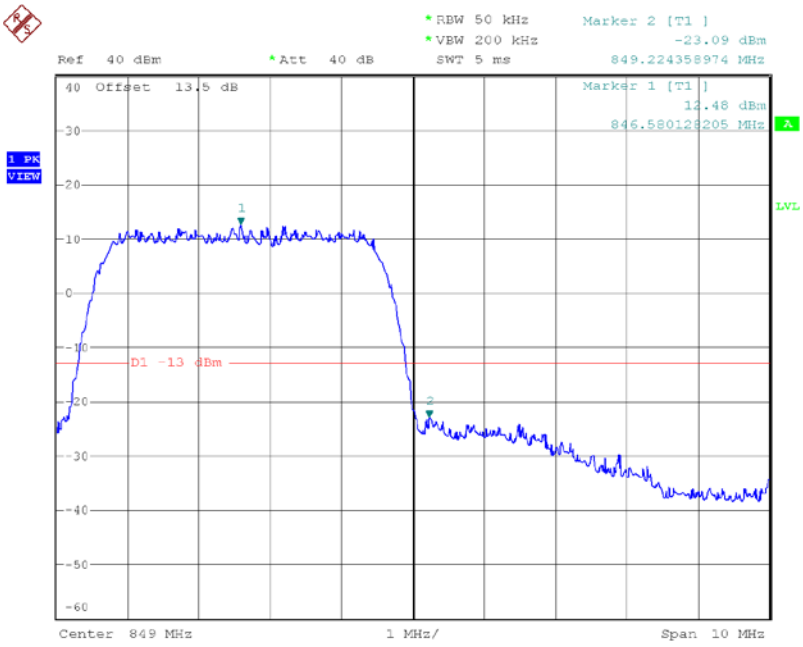
HSUPA Band V:

Band Edge, Left Side



Date: 23.MAY.2018 12:40:45

Band Edge, Right Side



Date: 23.MAY.2018 12:42:20

11 FCC §2.1055, §22.355 & §24.235 - FREQUENCY STABILITY

11.1 Applicable Standard

FCC § 2.1055 (a), § 2.1055 (d), §22.355, §24.235

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	20	50
50 to 450	5	5	50
450 to 512	2.5	5	5
821 to 896	1.5	2.5	2.5
928 to 929.	5	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10	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.

11.2 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.

11.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2017/05/08	2018/05/07
Temp & Humidity Chamber	BACL	BTH-150	30028	2017/12/18	2018/12/17
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11
Communication Tester	R&S	CMW500	149170	2017/05/13	2018/05/12
Regulated DC Power Supply	KIKUSUI	PMC35-2	MK002127	N.C.R	N.C.R
Multimeter	Fluke	114	28810152WS	2018/02/09	2019/02/08

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.*

11.4 Test Environmental Conditions

Temperature:	-30 ~ 50 ° C
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Ian from 2018-03-01 to 2018-04-16.

11.5 Test Results

GSM 850:

Reference Frequency: GSM Mid Channel 836.6 MHz				
Power Supply (Vdc)	**Environment Temperature (℃)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
3.7	50	-16	-0.0191	+/- 2.5
3.7	40	11	0.0131	+/- 2.5
3.7	30	20	0.0239	+/- 2.5
3.7	20	4	0.0048	+/- 2.5
3.7	10	19	0.0227	+/- 2.5
3.7	0	19	0.0227	+/- 2.5
3.7	-10	-25	-0.0299	+/- 2.5
3.7	-20	22	0.0263	+/- 2.5
3.7	-30	-16	-0.0191	+/- 2.5

Reference Frequency: GSM Mid Channel 836.6 MHz				
Power Supply (Vdc)	**Environment Temperature (℃)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
4.255	20	-14	-0.0167	+/- 2.5
3.145	20	-18	-0.0215	+/- 2.5

**Normal Voltage = 3.7Vdc, Voltage verify 85% to 115% of the nominal value => 3.145Vdc to 4.255Vdc.*

PCS 1900:

Reference Frequency: PCS Mid Channel 1880 MHz				
Power Supply (Vdc)	**Environment Temperature (℃)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
3.7	50	-1	-0.0012	PASS
3.7	40	2	0.0024	PASS
3.7	30	-4	-0.0048	PASS
3.7	20	8	0.0096	PASS
3.7	10	10	0.0120	PASS
3.7	0	-6	-0.0072	PASS
3.7	-10	24	0.0287	PASS
3.7	-20	0	0.0000	PASS
3.7	-30	-13	-0.0155	PASS

**Limit: PCS band have not limit.*

Reference Frequency: PCS Mid Channel 1880 MHz				
Power Supply (Vdc)	**Environment Temperature (℃)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
4.255	20	12	0.0143	PASS
3.145	20	-15	-0.0179	PASS

**Limit: PCS band have not limit.*
**Normal Voltage = 3.7Vdc, Voltage verify 85% to 115% of the nominal value => 3.145Vdc to 4.255Vdc.*

WCDMA Band II:

Reference Frequency: WCDMA Band II Mid Channel 1880 MHz				
Power Supply (Vdc)	**Environment Temperature (℃)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
3.7	50	-6.32	-0.0034	PASS
3.7	40	-12.46	-0.0066	PASS
3.7	30	-10.55	-0.0056	PASS
3.7	20	-13.34	-0.0071	PASS
3.7	10	-9.99	-0.0053	PASS
3.7	0	5.86	0.0031	PASS
3.7	-10	8.21	0.0044	PASS
3.7	-20	-4.79	-0.0025	PASS
3.7	-30	-18.12	-0.0096	PASS

**Limit: WCDMA band II have not limit.*

Reference Frequency: WCDMA Band II Mid Channel 1880 MHz				
Power Supply (Vdc)	**Environment Temperature (℃)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
4.255	20	-13.57	-0.0072	PASS
3.145	20	-13.76	-0.0073	PASS

**Limit: WCDMA band II have not limit.*
**Normal Voltage = 3.7Vdc, Voltage verify 85% to 115% of the nominal value => 3.145Vdc to 4.255Vdc.*

WCDMA Band V:

Reference Frequency: WCDMA Band V Mid Channel 836.6 MHz				
Power Supply (Vdc)	**Environment Temperature (℃)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
3.7	50	6.87	0.0082	+/- 2.5
3.7	40	-3.33	-0.0040	+/- 2.5
3.7	30	4.07	0.0049	+/- 2.5
3.7	20	8.52	0.0102	+/- 2.5
3.7	10	10.47	0.0125	+/- 2.5
3.7	0	-7.27	-0.0087	+/- 2.5
3.7	-10	-9.51	-0.0114	+/- 2.5
3.7	-20	-4.95	-0.0059	+/- 2.5
3.7	-30	-8.59	-0.0103	+/- 2.5

Reference Frequency: WCDMA Band V Mid Channel 836.6 MHz				
Power Supply (Vdc)	**Environment Temperature (℃)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
4.255	20	9.51	0.0114	2.5
3.145	20	7.67	0.0092	2.5

**Normal Voltage = 3.7Vdc, Voltage verify 85% to 115% of the nominal value => 3.145Vdc to 4.255Vdc.*

----- END OF REPORT -----