

FCC REPORT

(WCDMA)

Applicant: Neutron Holdings, Inc.

Address of Applicant: 85 2nd St, San Francisco, CA 94105 USA

Equipment Under Test (EUT)

Product Name: Central controller

Model No.: Lime-V3-US

Trade mark: Lime

FCC ID: 2APB2-LIME30US

Applicable standards: FCC CFR Title 47 Part 2
FCC CFR Title 47 Part 22 Subpart H
FCC CFR Title 47 Part 24 Subpart E
FCC CFR Title 47 Part 27 Subpart L

Date of sample receipt: 21 Feb., 2021

Date of Test: 22 Feb., to 30 Mar., 2021

Date of report issued: 31 Mar., 2021

Test Result: PASS*

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2. Version

Version No.	Date	Description
00	31 Mar., 2021	Original

Tested by:



Date:

31 Mar., 2021

Test Engineer

Reviewed by:



Date:

31 Mar., 2021

Project Engineer

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4. Test Summary

Test Item	Section in CFR 47	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1093	Pass (Please refer to SAR Report)
RF Output Power	Part 2.1046 Part 22.913 (a)(5) Part 24.232 (c) Part 27.50 (d)(4)	Pass
Peak-to-Average Power Ratio	Part 24.232 (d) Part 27.50(d)(5)	Pass
Modulation Characteristics	Part 2.1047	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917(b) Part 24.238(b) Part 27.53(h)	Pass
Out of band emission at antenna terminals	Part 2.1051 Part 22.917 (a) Part 24.238 (a) Part 27.53 (h)	Pass
Field strength of spurious radiation	Part 2.1053 Part 22.917 (a) Part 24.238 (a) Part 27.53 (h)	Pass
Frequency stability vs. temperature	Part 22.355 Part 24.235 Part 27.54 Part 2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	Part 22.355 Part 24.235 Part 27.54 Part 2.1055(d)(2)	Pass
Remark: 1. Pass: The EUT complies with the essential requirements in the standard. 2. The cable insertion loss used by "RF Output Power" and other conduction measurement items is 0.5dB(Fundamental Frequency below 1GHz)/1.0dB(Fundamental Frequency above 1GHz) (provided by the customer).		
Test Method:	ANSI/TIA-603-E-2016 ANSI C63.26-2015	

5. General Information

5.1 Client Information

Applicant:	Neutron Holdings, Inc.
Address:	85 2nd St, San Francisco, CA 94105 USA
Manufacturer/ Factory:	Quectel Wireless Solutions Co., Ltd.
Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

5.2 General Description of E.U.T.

Product Name:	Central controller		
Model No.:	Lime-V3-US		
Operation Frequency range:	WCDMA Band V: 826.4MHz-846.6MHz WCDMA Band II: 1852.4 MHz-1907.6 MHz WCDMA Band IV: 1712.4 MHz-1752.6 MHz		
Modulation type:	3G	☒ RMC(QPSK)	☒ HSUPA(QPSK) ☒ HSDPA(QPSK,16QAM)
Antenna type:	Internal Antenna		
Antenna gain:	WCDMA Band V: 3.82 dBi(declare by Applicant) WCDMA Band II: 1.72 dBi(declare by Applicant) WCDMA Band IV: 4.64 dBi(declare by Applicant)		
Power supply:	Rechargeable Li-ion Battery DC3.7V, 1250mAh		
External power supply :	DC 36V		
Test Sample Condition:	The test samples were provided in good working order with no visible defects.		

Operation Frequency List:

WCDMA Band V		WCDMA Band II	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
4132	826.40	9262	1852.40
4133	826.60	9263	1852.60
....			
4182	836.40	9399	1879.80
4183	836.60	9400	1880.00
4184	836.80	9401	1880.20
...	...	...	...
4232	846.40	9537	1907.40
4233	846.60	9538	1907.60
WCDMA Band IV			
Channel	Frequency (MHz)		
1312	1712.40		
1313	1712.60		
....			
1412	1732.40		
1413	1732.60		
1414	1732.80		
...	...		
1512	1752.40		
1513	1752.60		

Regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

WCDMA Band V			WCDMA Band II		
Channel		Frequency(MHz)	Channel		Frequency(MHz)
Lowest	4132	826.40	Lowest	9262	1852.40
Middle	4183	836.60	Middle	9400	1880.00
Highest	4233	846.60	Highest	9538	1907.60
WCDMA Band IV					
Channel		Frequency(MHz)			
Lowest	1312	1712.40			
Middle	1413	1732.60			
Highest	1513	1752.60			

5.3 Test environment and mode, and test samples plans

Operating Environment:	
Temperature:	Normal: 15°C ~ 35°C, Extreme: -30°C ~ +50°C
Humidity:	20 % ~ 75 % RH
Atmospheric Pressure:	1008 mbar
Voltage:	Nominal: 3.7Vdc, Extreme: Low 3.5 Vdc, High 4.20 Vdc
Test mode:	
RMC mode	Keep the EUT communication with simulated station in RMC mode
HSDPA	Keep the EUT communication with simulated station in HSDPA mode
HSUPA	Keep the EUT communication with simulated station in HSUPA mode
Remark: The EUT has been tested under continuous transmitting mode. Channel Low, Mid and High for each type band with rated data rate were chosen for full testing. The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for these modes. Just the worst case position (H mode) shown in report.	
Test Samples Plans:	
Samples Number	Used for Test Items
1#	Conducted measurements test method
2#	Radiated measurements test method
3#	EUT constructional details
Remark: JianYan Testing Group Shenzhen Co., Ltd. is only responsible for the test project data of the above samples, and will keep the above samples for a month.	

5.4 Description of Support Units

Test Equipment	Manufacturer	Model No.	Serial No.
Simulated Station	Anritsu	MT8820C	6201026545

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.16 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.20 dB (k=2)

5.6 Additions to, deviations, or exclusions from the method

No

5.7 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations: ● FCC - Designation No.: CN1211 JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551. ● ISED – CAB identifier.: CN0021 The 3m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1. ● A2LA - Registration No.: 4346.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf
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5.8 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.

Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.

Tel: +86-755-23118282, Fax: +86-755-23116366

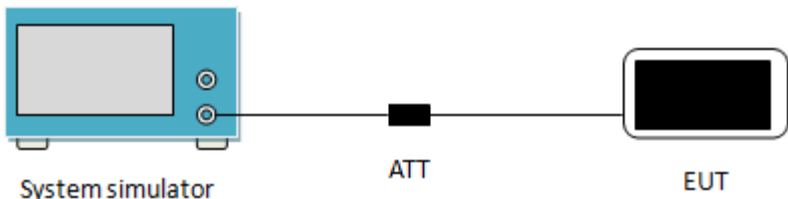
Email: info@ccis-cb.com, Website: <http://www.ccis-cb.com>

5.9 Test Instruments list

Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	ETS	9m*6m*6m	966	01-19-2021	01-18-2024
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
Biconical Antenna	SCHWARZBECK	VUBA9117	359	06-18-2020	06-17-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-18-2020	06-17-2021
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-18-2020	11-17-2021
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
Pre-amplifier	CD	PAP-1G18	11804	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-18-2020	11-17-2021
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
Spectrum Analyzer	Agilent	N9020A	MY50510123	11-18-2020	11-17-2021
Signal Generator	Rohde & Schwarz	SMX	835454/016	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
Signal Generator	R&S	SMR20	1008100050	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
RF Switch Unit	MWRFTTEST	MW200	N/A	N/A	N/A
Test Software	MWRFTTEST	MTS8200	Version: 2.0.0.0		
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
Cable	MICRO-COAX	MFR64639	K10742-5	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-03-2020	03-02-2021
				03-03-2021	03-02-2022
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	09-25-2020	09-24-2021
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	11-01-2020	10-31-2021
Simulated Station	Rohde & Schwarz	CMW500	140493	07-22-2020	07-21-2021

6. Test results

6.1 Conducted Output Power, ERP and EIRP

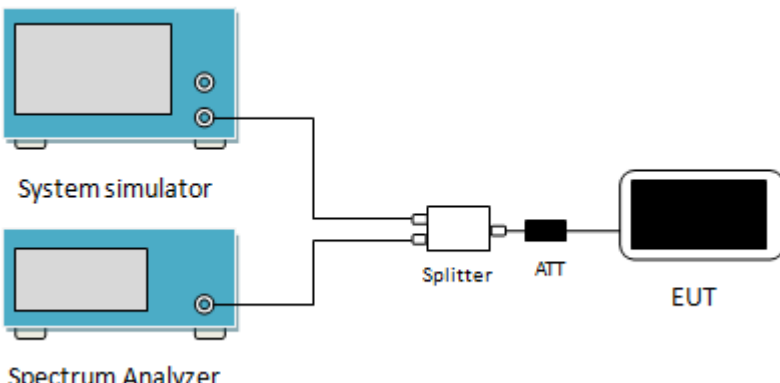
Test Requirement:	FCC part 22.913(a)(5), FCC part 24.232(c), FCC part 27.50(d)(4)
Limit:	WCDMA Band V: 7W, WCDMA Band II: 2W, WCDMA Band IV: 1W
Test setup:	 The diagram illustrates the test setup. On the left is a blue box labeled 'System simulator'. A line connects it to a black box labeled 'ATT' (attenuator). Another line connects the 'ATT' box to a black box labeled 'EUT' (Equipment Under Test).
Test Procedure:	The transmitter output was connected to a calibrated attenuator, the other end of which was connected to the simulated station. Transmitter output power was read off in dBm.
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data

EUT Mode		Burst Average power (dBm)		
		4132	4183	4233
		826.40 (MHz)	836.60 (MHz)	846.60 (MHz)
UMTS 850 HSDPA	Subtest 1	21.84	21.23	21.55
	Subtest 2	21.46	21.22	21.36
	Subtest 3	20.26	20.44	20.98
	Subtest 4	19.85	19.46	19.35
UMTS 850 HSUPA	Subtest 1	21.46	21.55	21.39
	Subtest 2	21.74	21.88	21.45
	Subtest 3	20.66	20.59	20.49
	Subtest 4	19.86	19.74	19.58
	Subtest 5	19.99	19.86	19.57
UMTS 850 RMC	12.2kbps	22.59	22.68	22.67
Antenna Gain (dBi)		1.72		
Max. ERP (dBm)		22.25		
ERP Limit (dBm)		38.45		
EUT Mode		Burst Average power (dBm)		
		9262	9400	9538
		1852.40 (MHz)	1880.00 (MHz)	1907.60 (MHz)
UMTS 1900 HSDPA	Subtest 1	21.56	21.66	21.48
	Subtest 2	21.17	21.06	21.23
	Subtest 3	20.26	20.44	20.39
	Subtest 4	19.89	19.74	19.55
UMTS 1900 HSUPA	Subtest 1	21.26	21.39	21.74
	Subtest 2	21.26	21.13	21.00
	Subtest 3	19.95	19.87	19.86
	Subtest 4	20.02	20.14	20.35
	Subtest 5	21.59	21.44	21.37
UMTS 1900 RMC	12.2kbps	22.26	22.34	22.19
Antenna Gain (dBi)		3.82		
Max. EIRP (dBm)		26.16		
EIRP Limit (dBm)		33.00		
Note: EIRP (dBm) = Burst Average power (dBm) + Antenna Gain (dBi).				
ERP (dBm) = EIRP (dBm) - 2.15 (dB).				

EUT Mode		Burst Average power (dBm)		
		1312	1412	1513
		1712.40 (MHz)	1732.40 (MHz)	1752.60 (MHz)
UMTS 1700 HSDPA	Subtest 1	21.16	21.59	21.44
	Subtest 2	21.10	20.98	21.03
	Subtest 3	19.95	19.46	19.37
	Subtest 4	20.98	20.37	20.56
UMTS 1700 HSUPA	Subtest 1	22.19	22.26	22.58
	Subtest 2	22.41	22.26	22.16
	Subtest 3	21.87	21.79	21.62
	Subtest 4	21.06	21.22	21.53
	Subtest 5	20.59	20.41	20.35
UMTS 1700 RMC	12.2kbps	22.23	22.36	22.19
Antenna Gain (dBi)		4.64		
Max. EIRP (dBm)		27.22		
EIRP Limit (dBm)		30.00		
Note: EIRP (dBm) = Burst Average power (dBm) + Antenna Gain (dBi).				

6.2 Peak-to-Average Power Ratio

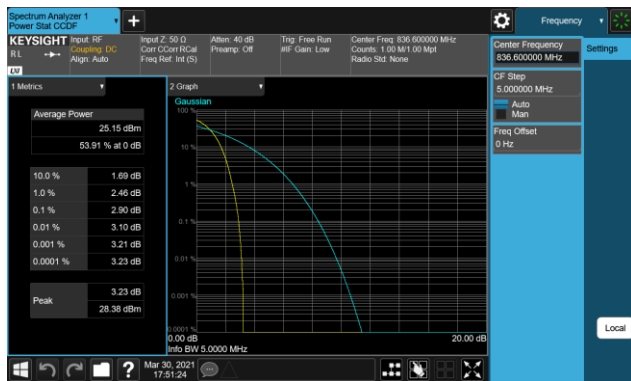
Test Requirement:	FCC part 24.232(d), FCC part 27.50(d)(5)
Limit:	The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.
Test setup:	 The diagram shows a test setup for measuring the Peak-to-Average Power Ratio (PAR). It includes a System simulator, a Spectrum Analyzer, a Splitter, an ATT (Attenuator), and the EUT (Equipment Under Test). The System simulator and Spectrum Analyzer are connected to the Splitter. The Splitter is connected to the ATT, which is then connected to the EUT.
Test Procedure:	1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 Set the CCDF option in spectrum analyzer, $RBW \geq OBW$, 3 Set the EUT working in highest power level, measured and recorded the 0.1% as PAPR level. 4 Repeat step 1~3 at other frequency and modulations.
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

Modulation	Test channel	PAPR
UMTS 850 RMC	4183	2.9
UMTS 1900 RMC	9400	2.99
UMTS1700 RMC	1413	3.03

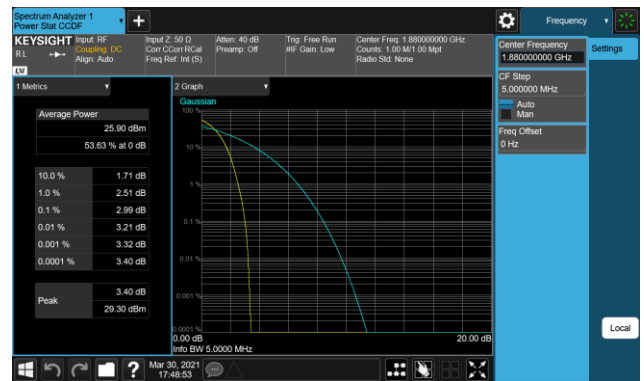
Test plots as below:

UMTS 850 RMC



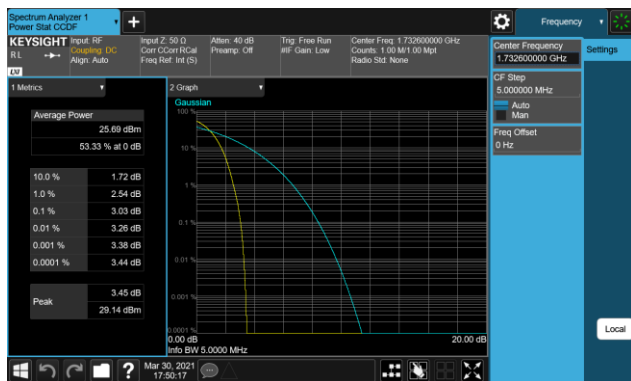
Middle channel

UMTS 1900 RMC



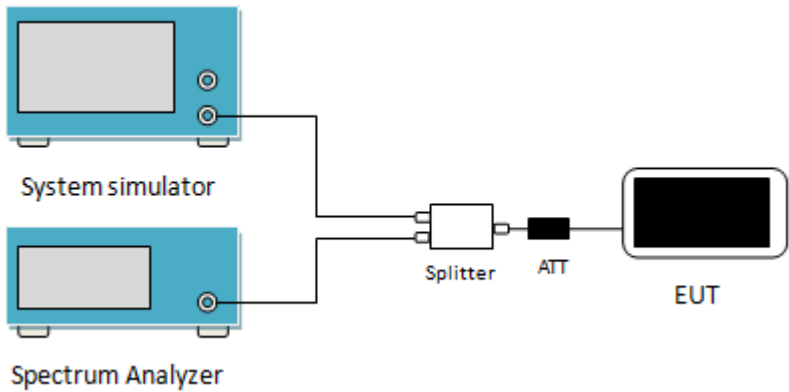
Middle channel

UMTS1700 RMC



Middle channel

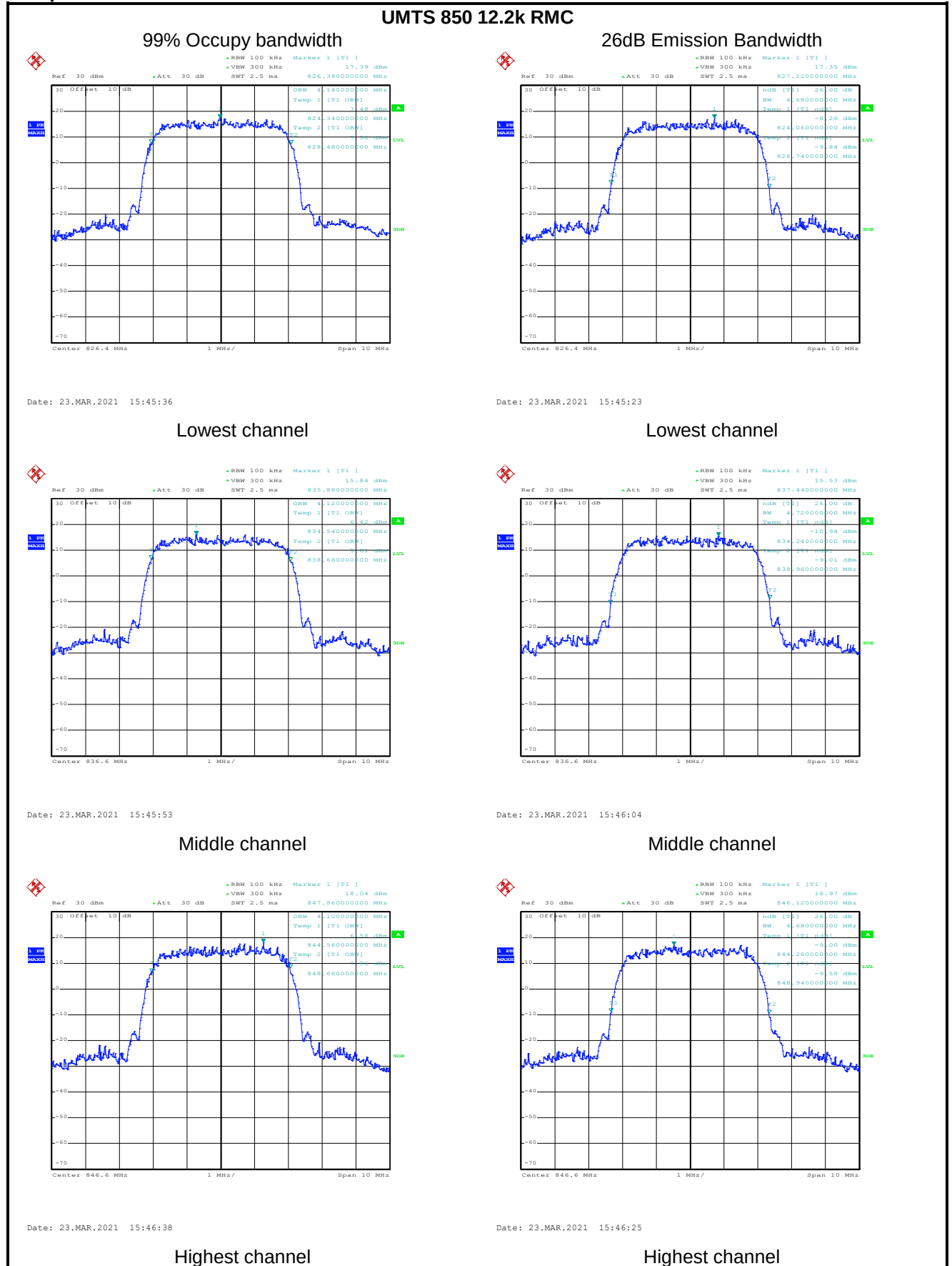
6.3 Occupy Bandwidth

Test Requirement:	FCC part 22.917(b), FCC part 24.238(b), FCC Part 27.53(h)
Test setup:	 The diagram illustrates the test setup. On the left, there are two blue rectangular units: the top one is labeled 'System simulator' and the bottom one is labeled 'Spectrum Analyzer'. Both have a single output port. These two ports are connected to a single input port of a white rectangular unit labeled 'Splitter'. The other output port of the 'Splitter' is connected to a black rectangular unit labeled 'ATT' (Attenuator). Finally, the output of the 'ATT' is connected to the input of a black rectangular unit labeled 'EUT' (Equipment Under Test).
Test Procedure:	1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer 2. RBW was set to about 1% of emission BW, VBW= 3 times RBW. 3. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

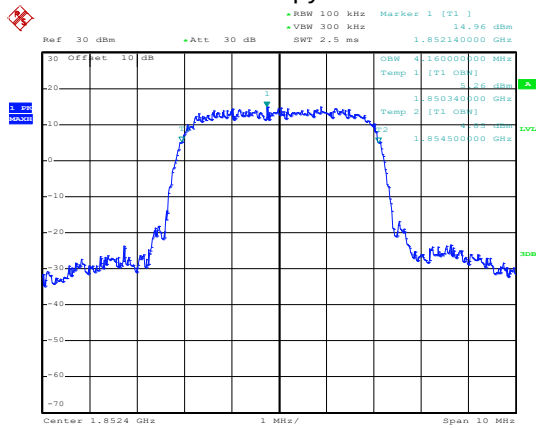
EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (kHz)	-26dB bandwidth (kHz)
UMTS 850 12.2k RMC	4132	826.4	4140	4680
	4183	836.6	4120	4720
	4233	846.6	4100	4680
UMTS 1900 12.2k RMC	9262	1852.4	4160	4680
	9400	1880.0	4140	4700
	9538	1907.6	4160	4700
UMTS 1700 12.2k RMC	1312	1712.40	4140	4760
	1413	1732.60	4180	4720
	1513	1752.60	4140	4740

Test plot as follows:



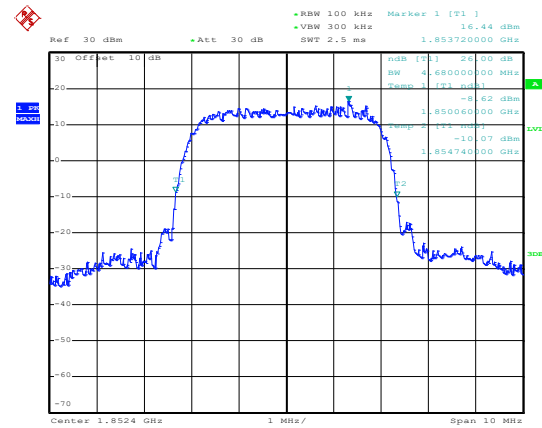
UMTS 1900 12.2k RMC

99% Occupancy bandwidth



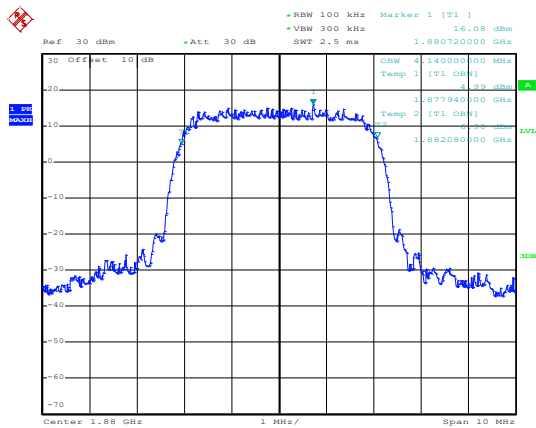
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26dB Emission Bandwidth



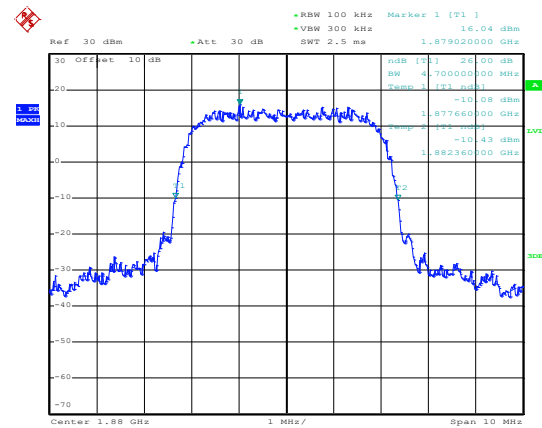
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Lowest channel



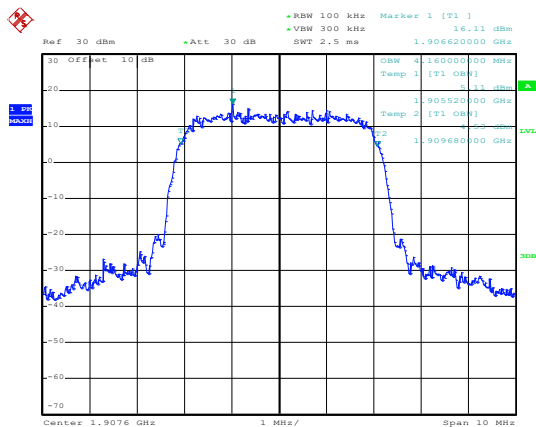
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Lowest channel



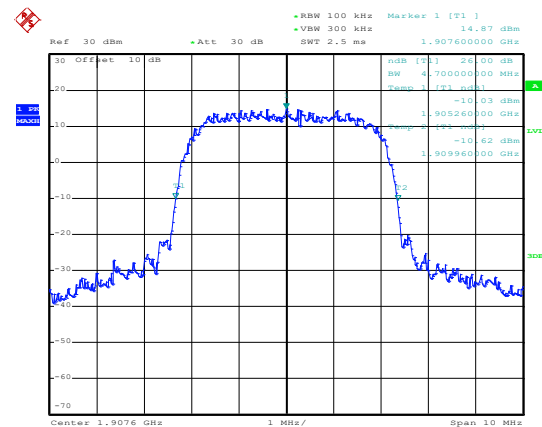
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Middle channel



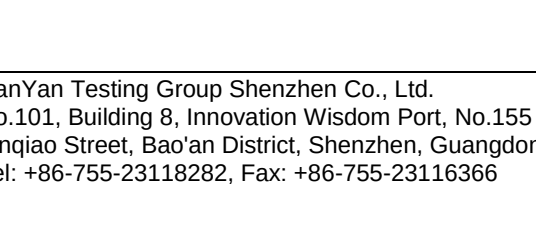
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Middle channel



Date: 23.MAR.2021 15:44:33

Highest channel

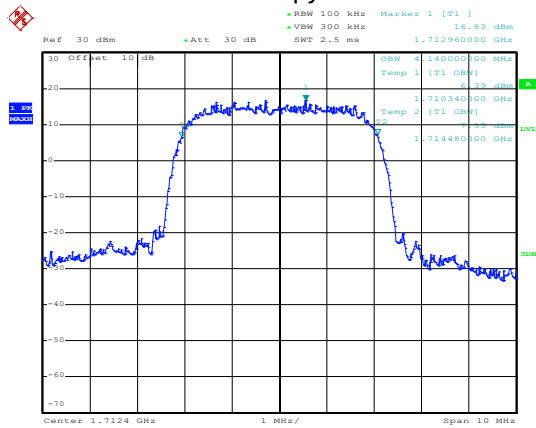


Highest channel



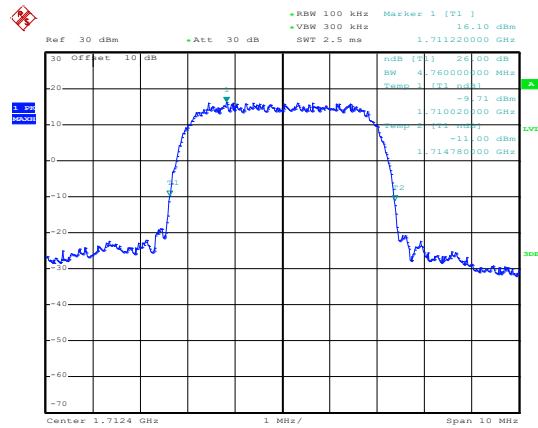
UMTS 1700 12.2k RMC

99% Occupancy bandwidth



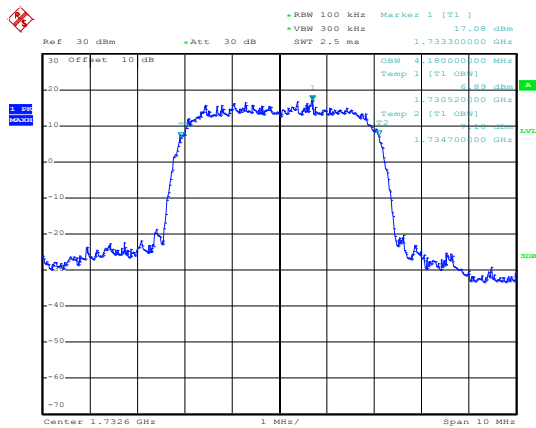
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26dB Emission Bandwidth



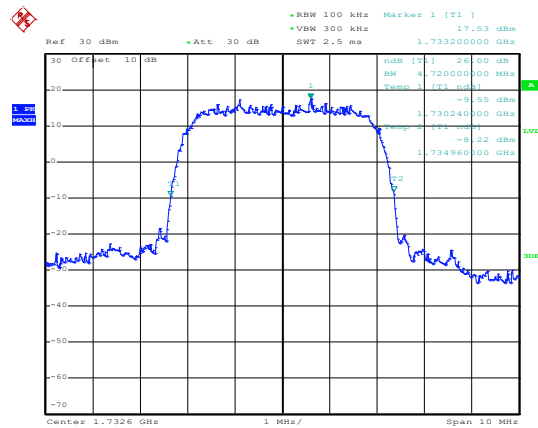
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Lowest channel



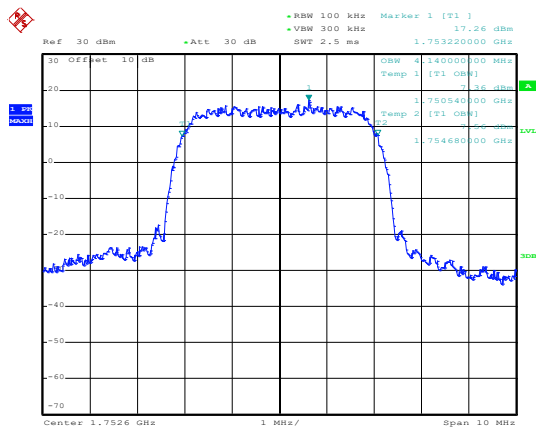
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Lowest channel



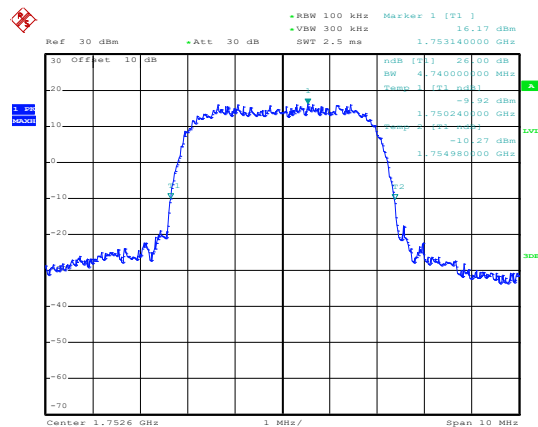
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Middle channel



Date: 23.MAR.2021 16:07:17

Middle channel



Date: 23.MAR.2021 16:07:10

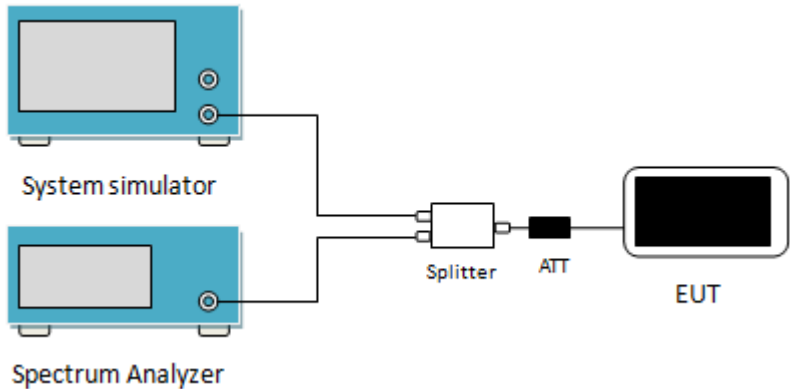
Highest channel

Highest channel

6.4 Modulation Characteristic

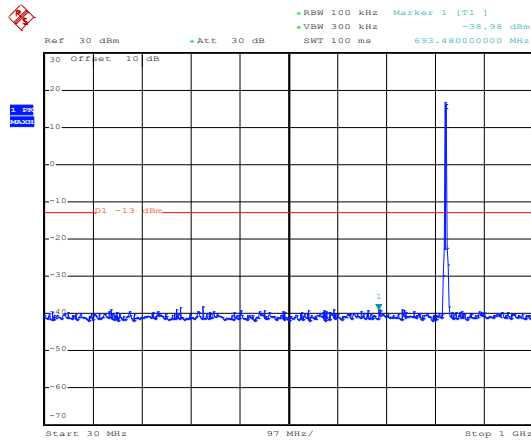
According to FCC § 2.1047(d), Part 22H & 24E & 27L there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

6.5 Out of band emission at antenna terminals

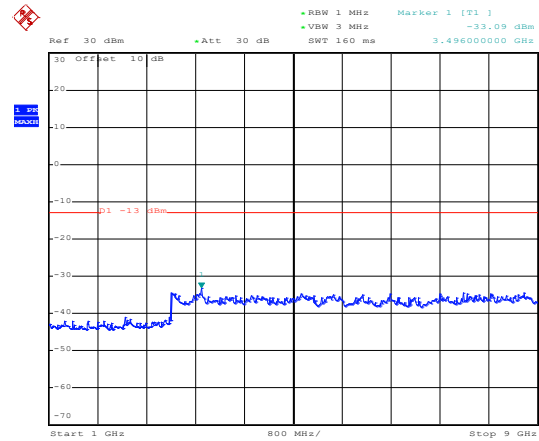
Test Requirement:	FCC part 22.917(a), FCC part 24.238(a), FCC Part 27.53 (h)
Limit:	-13dBm
Test setup:	 The diagram illustrates the test setup for out-of-band emission testing. A System simulator is connected to a Splitter. The other output of the Splitter is connected to an ATT (Attenuator), which is then connected to the EUT (Equipment Under Test). The Spectrum Analyzer is connected to the input of the Splitter.
Test Procedure:	1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 For the out of band: For GSM850&WCDMA850 set the RBW=100 kHz, VBW=300 kHz and for PCS1900 & WCDMA1900 set the RBW=1MHz, VBW=3MHz when below 1 GHz, RBW =1 MHz, VBW=3 MHz when above 1 GHz, Start=30MHz, Stop= 10th harmonic. 3 Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Test plots as follows (Spurious emission):

UMTS 850 12.2k RMC Lowest Channel

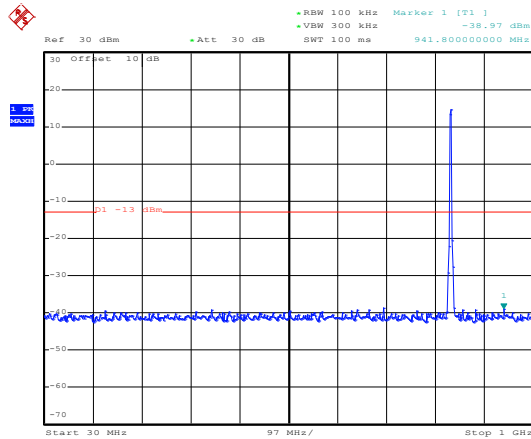


Date: 23.MAR.2021 16:03:25

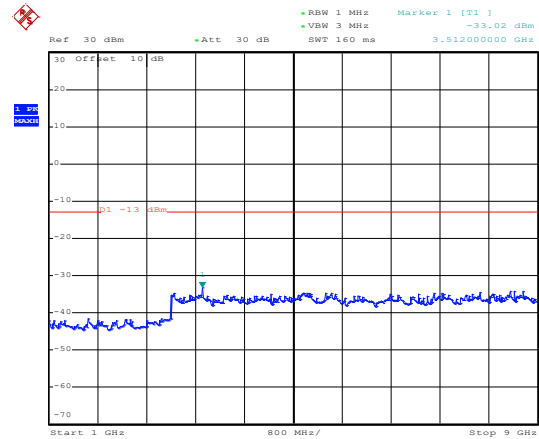


Date: 23.MAR.2021 15:58:49

Middle Channel

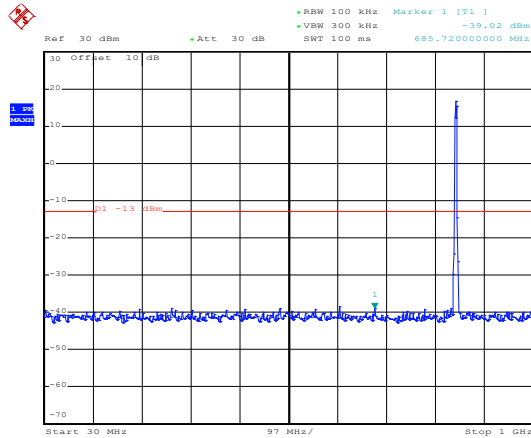


Date: 23.MAR.2021 16:03:53

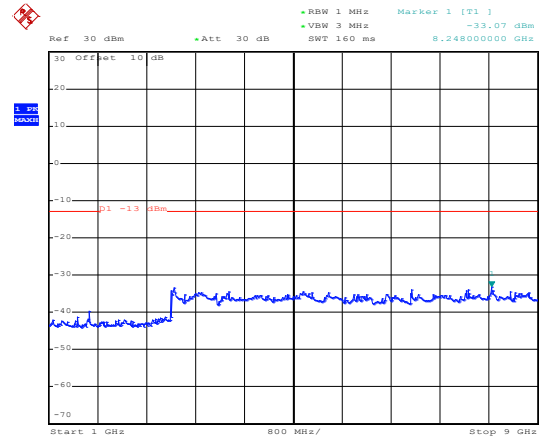


Date: 23.MAR.2021 15:59:03

Highest Channel

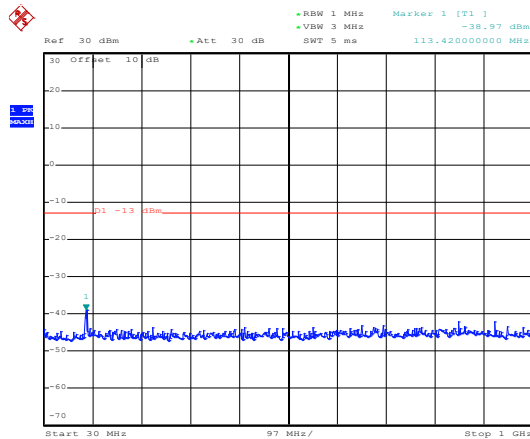


Date: 23.MAR.2021 16:04:20

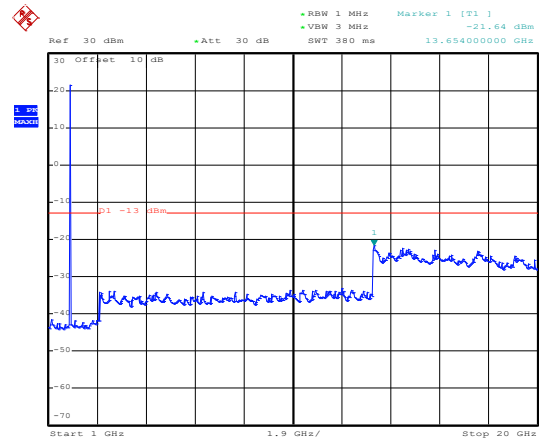


Date: 23.MAR.2021 15:59:21

UMTS 1900 12.2k RMC Lowest Channel

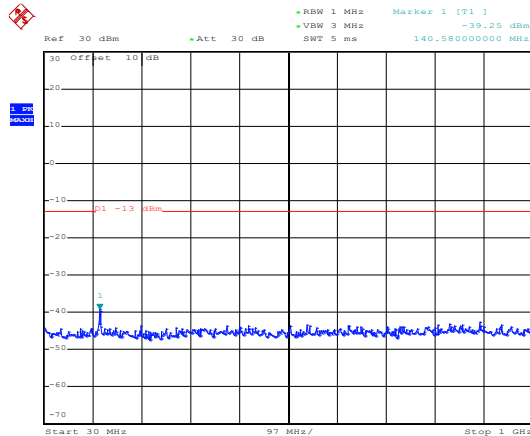


Date: 23.MAR.2021 16:01:36

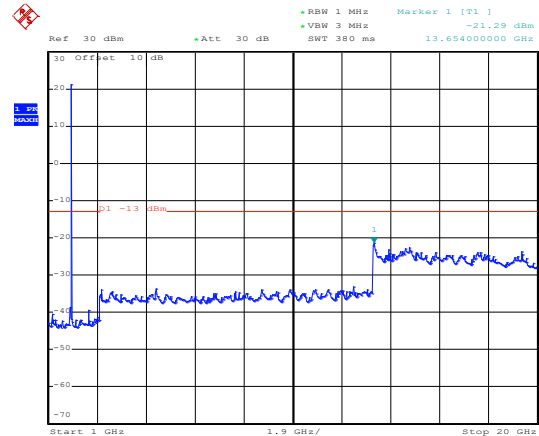


Date: 23.MAR.2021 15:51:02

Middle Channel

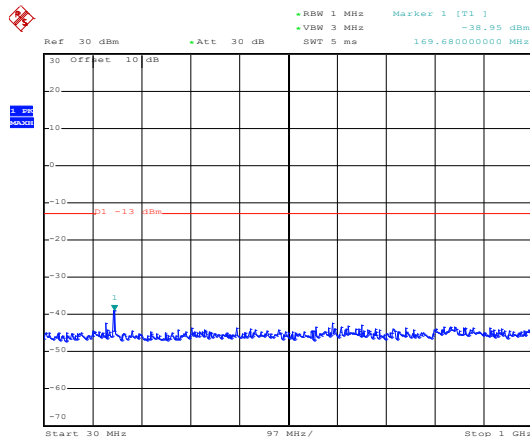


Date: 23.MAR.2021 16:01:51

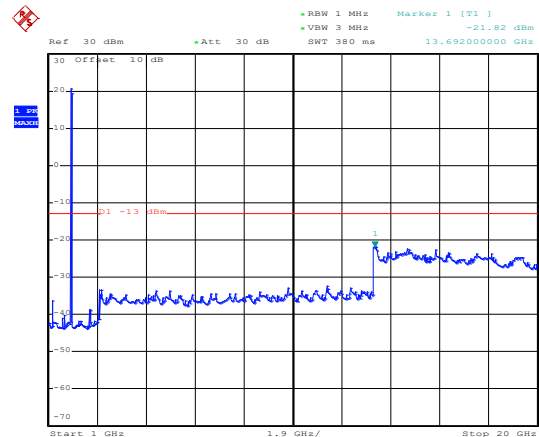


Date: 23.MAR.2021 15:57:58

Highest Channel

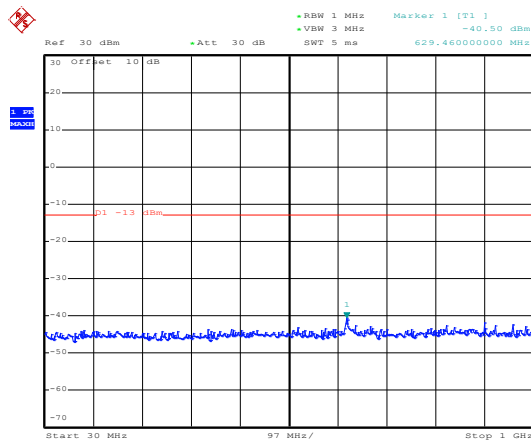


Date: 23.MAR.2021 16:02:07

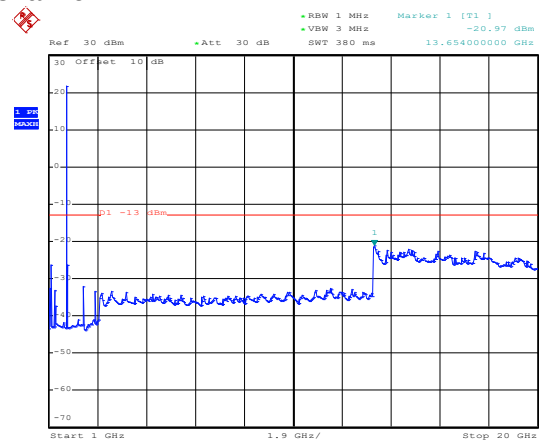


Date: 23.MAR.2021 15:50:41

UMTS 1700 12.2k RMC Lowest Channel

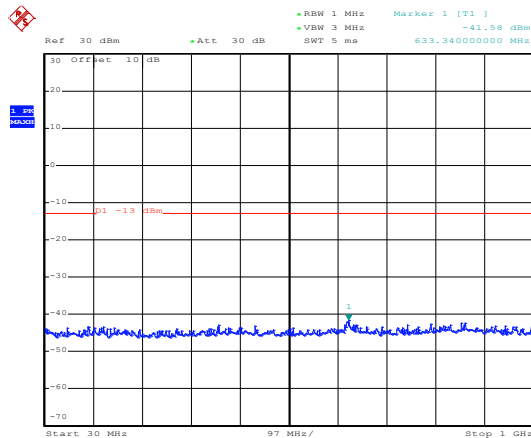


Date: 23.MAR.2021 16:00:59

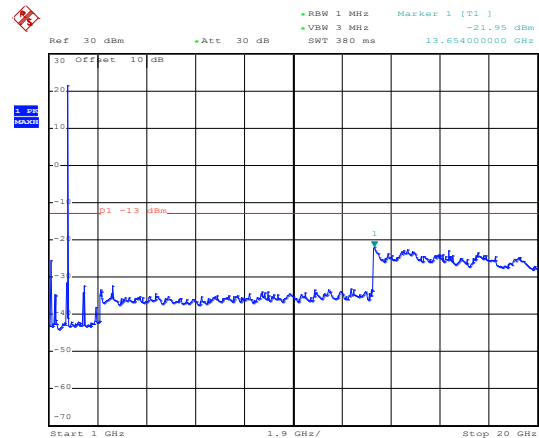


Date: 23.MAR.2021 15:59:55

Middle Channel

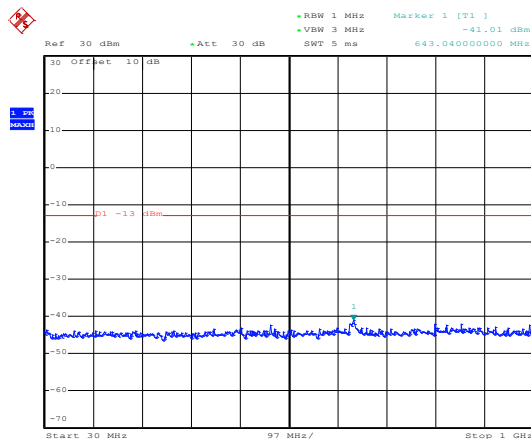


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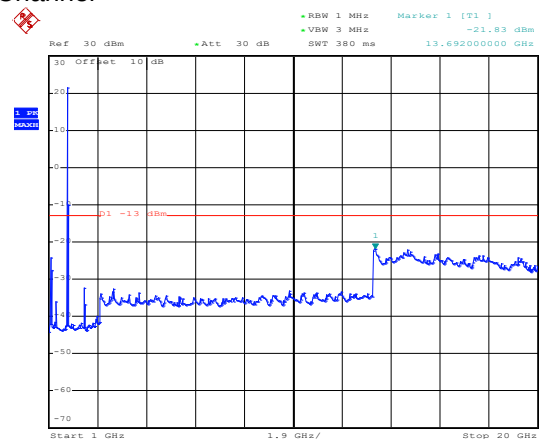


Date: 23.MAR.2021 16:00:11

Highest Channel



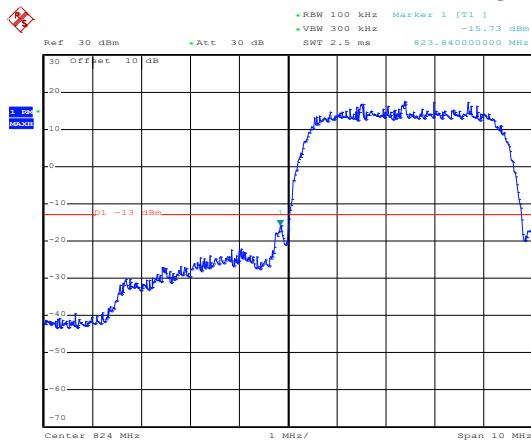
Date: 23.MAR.2021 16:00:47



Date: 23.MAR.2021 16:00:27

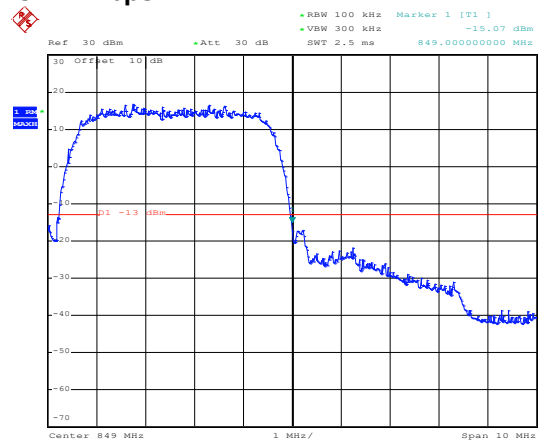
Band edge emission:

UMTS 850 RMC 12.2kbps



Date: 23.MAR.2021 15:48:15

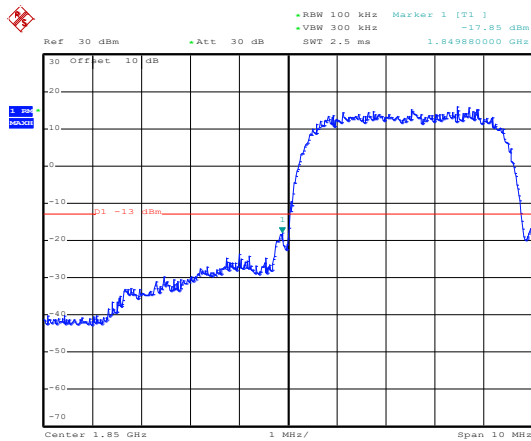
Lowest channel



Date: 23.MAR.2021 15:47:29

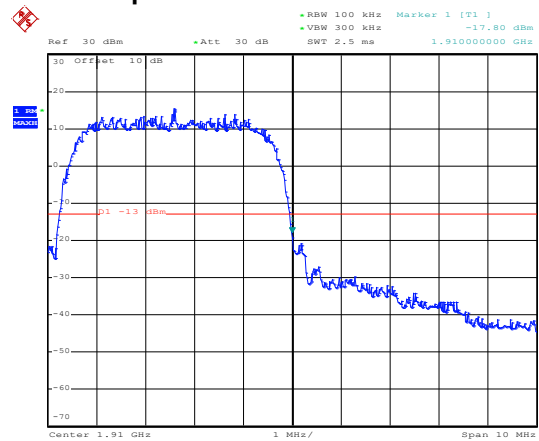
Highest channel

UMTS 1900 RMC 12.2kbps



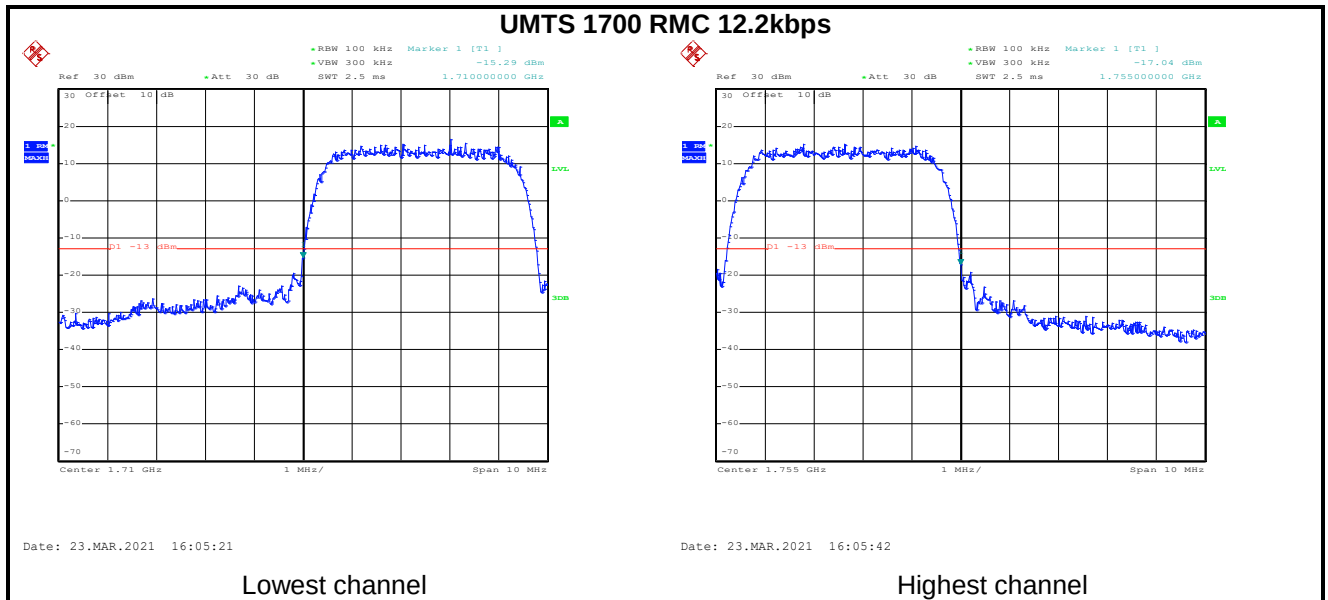
Date: 23.MAR.2021 15:49:31

Lowest channel

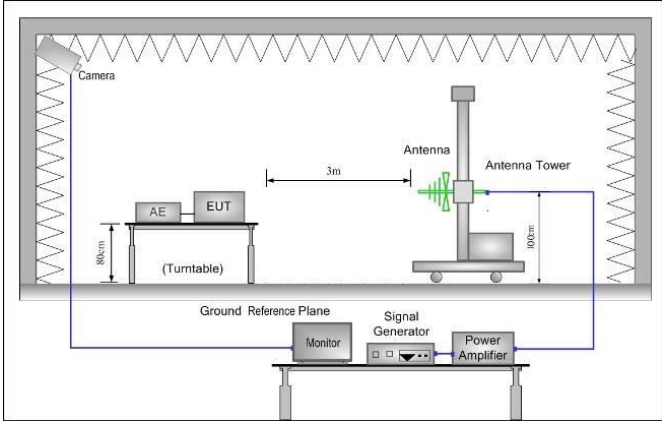
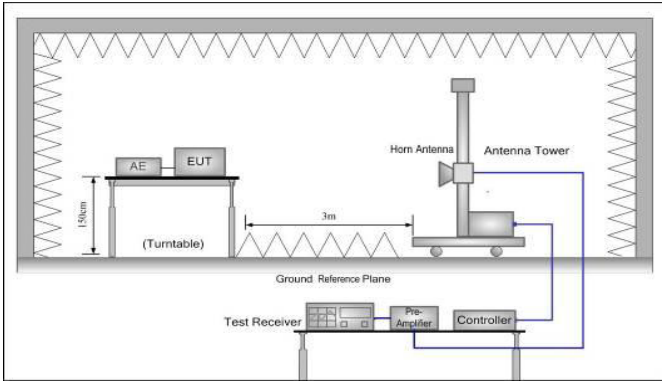


Date: 23.MAR.2021 15:48:46

Highest channel



6.6 Field strength of spurious radiation measurement

Test Requirement:	FCC part 22.917(a), FCC part 24.238(a), FCC part 27.53(h)
Limit:	-13dBm
Test setup:	Below 1GHz  Above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz)/1.5m(above 1GHz) above the ground at a 3 meter camber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer. 2. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations. 3. The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method. 4. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency. $ERP / EIRP = S.G. \text{ output (dBm) } + \text{Antenna Gain(dB/dBi) } - \text{Cable Loss (dB)}$
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details.
Test results:	Passed

Measurement Data (worst case):

WCDMA BAND V 12.2k RMC							
Lowest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
1652.80	-55.03	9.58	0.20	-45.65	-13.00	-32.65	Vertical
2479.20	-53.08	10.87	0.44	-42.65	-13.00	-29.65	Vertical
3305.60	-50.30	12.01	0.65	-38.94	-13.00	-25.94	Vertical
1652.80	-56.03	9.58	0.20	-46.65	-13.00	-33.65	Horizontal
2479.20	-55.57	10.87	0.44	-45.14	-13.00	-32.14	Horizontal
3305.60	-49.34	12.01	0.65	-37.98	-13.00	-24.98	Horizontal
Middle channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
1673.20	-55.60	9.66	0.21	-46.15	-13.00	-33.15	Vertical
2509.80	-55.67	10.91	0.46	-45.22	-13.00	-32.22	Vertical
3346.40	-48.12	12.09	0.66	-36.69	-13.00	-23.69	Vertical
1673.20	-57.30	9.66	0.21	-47.85	-13.00	-34.85	Horizontal
2509.80	-59.10	10.91	0.46	-48.65	-13.00	-35.65	Horizontal
3346.40	-48.62	12.09	0.66	-37.19	-13.00	-24.19	Horizontal
Highest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
1697.60	-57.15	9.74	0.24	-47.65	-13.00	-34.65	Vertical
2546.40	-57.88	12.09	0.50	-46.29	-13.00	-33.29	Vertical
3395.20	-48.20	12.19	0.68	-36.69	-13.00	-23.69	Vertical
1697.60	-55.15	9.74	0.24	-45.65	-13.00	-32.65	Horizontal
2546.40	-57.77	12.09	0.50	-46.18	-13.00	-33.18	Horizontal
3395.20	-49.40	12.19	0.68	-37.89	-13.00	-24.89	Horizontal
Remark:							
1. The emission levels of below 1 GHz are lower than the limit 20dB and not show in test report.							

WCDMA Band II 12.2k RMC							
Lowest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
3704.80	-59.54	12.65	0.76	-47.65	-13.00	-34.65	Vertical
5557.20	-54.95	12.77	1.14	-43.32	-13.00	-30.32	Vertical
7409.60	-49.80	11.45	1.63	-39.98	-13.00	-26.98	Vertical
3704.80	-59.74	12.65	0.76	-47.85	-13.00	-34.85	Horizontal
5557.20	-57.82	12.77	1.14	-46.19	-13.00	-33.19	Horizontal
7409.60	-46.40	11.45	1.63	-36.58	-13.00	-23.58	Horizontal
Middle channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
3760.00	-57.46	12.71	0.77	-45.52	-13.00	-32.52	Vertical
5640.00	-58.33	12.87	1.15	-46.61	-13.00	-33.61	Vertical
7520.00	-47.67	11.48	1.66	-37.85	-13.00	-24.85	Vertical
3760.00	-58.60	12.71	0.77	-46.66	-13.00	-33.66	Horizontal
5640.00	-59.57	12.87	1.15	-47.85	-13.00	-34.85	Horizontal
7520.00	-46.01	11.48	1.66	-36.19	-13.00	-23.19	Horizontal
Highest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
3815.20	-59.83	12.78	0.80	-47.85	-13.00	-34.85	Vertical
5722.80	-56.94	12.97	1.19	-45.16	-13.00	-32.16	Vertical
7630.40	-44.13	11.34	1.70	-34.49	-13.00	-21.49	Vertical
3815.20	-59.93	12.78	0.80	-47.95	-13.00	-34.95	Horizontal
5722.80	-58.40	12.97	1.19	-46.62	-13.00	-33.62	Horizontal
7630.40	-46.33	11.34	1.70	-36.69	-13.00	-23.69	Horizontal
Remark:							
1. The emission levels of below 1 GHz are lower than the limit 20dB and not show in test report.							

WCDMA Band IV 12.2k RMC							
Lowest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
3424.40	-60.80	12.25	0.44	-48.98	-13.00	-35.98	Vertical
5136.60	-61.99	12.92	0.71	-49.77	-13.00	-36.77	Vertical
6848.80	-47.97	11.41	0.90	-37.46	-13.00	-24.46	Vertical
3424.40	-57.34	12.25	0.44	-45.52	-13.00	-32.52	Horizontal
5136.60	-58.55	12.92	0.71	-46.33	-13.00	-33.33	Horizontal
6848.80	-47.71	11.41	0.90	-37.20	-13.00	-24.20	Horizontal
Middle channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
3464.80	-59.73	12.33	0.45	-47.85	-13.00	-34.85	Vertical
5197.20	-60.32	12.88	0.72	-48.16	-13.00	-35.16	Vertical
6929.60	-47.08	11.30	0.92	-36.69	-13.00	-23.69	Vertical
5197.20	-60.01	12.88	0.72	-47.85	-13.00	-34.85	Horizontal
6929.60	-58.90	11.30	0.92	-48.51	-13.00	-35.51	Horizontal
8662.00	-46.05	11.10	1.05	-35.99	-13.00	-22.99	Horizontal
Highest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
3505.20	-59.47	12.41	0.47	-47.52	-13.00	-34.52	Vertical
5257.80	-58.45	12.85	0.74	-46.33	-13.00	-33.33	Vertical
7010.40	-45.79	11.21	0.93	-35.51	-13.00	-22.51	Vertical
3505.20	-58.61	12.41	0.47	-46.66	-13.00	-33.66	Horizontal
5257.80	-59.97	12.85	0.74	-47.85	-13.00	-34.85	Horizontal
7010.40	-45.86	11.21	0.93	-35.58	-13.00	-22.58	Horizontal
Remark:							
2. The emission levels of below 1 GHz are lower than the limit 20dB and not show in test report.							

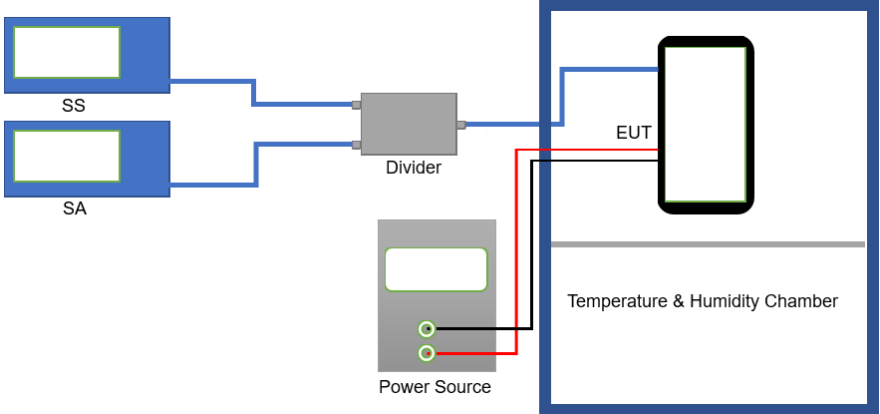
6.7 Frequency stability V.S. Temperature measurement

Test Requirement:	FCC Part 22.355, FCC Part 24.235, FCC Part 27.54 FCC Part 2.1055(a)(1)(b)
Limit:	±2.5 ppm WCDMA 850 Within authorized band WCDMA 1900 and WCDMA 1700
Test setup:	
Test procedure:	1. The equipment under test was connected to an external DC power supply and input rated voltage. 2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. 3. The EUT was placed inside the temperature chamber. 4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. 5. Turn EUT off and set the chamber temperature to –30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. 6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data (the worst channel):

Reference Frequency: WCDMA BAND V 12.2k RMC Middle channel=4183 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	178	0.212766	±2.5	Pass
	-20	168	0.200813		
	-10	146	0.174516		
	0	137	0.163758		
	10	130	0.155391		
	20	124	0.148219		
	30	116	0.138656		
	40	160	0.191250		
	50	153	0.182883		
Reference Frequency: WCDMA BAND II 12.2k RMC Middle channel=9400 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	177	0.094149	Within authorized band for WCDMA 1900	Pass
	-20	165	0.087766		
	-10	158	0.084043		
	0	145	0.077128		
	10	139	0.073936		
	20	124	0.065957		
	30	153	0.081383		
	40	113	0.060106		
	50	130	0.069149		
Reference Frequency: UMTS1700 12.2k RMC Middle channel=1413 channel=1732.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	175	0.101004	Within authorized band for WCDMA 1700	Pass
	-20	166	0.095810		
	-10	159	0.091770		
	0	145	0.083689		
	10	136	0.078495		
	20	127	0.073300		
	30	153	0.088307		
	40	119	0.068683		
	50	110	0.063488		
Note: Only the worst case shown in the report.					

6.8 Frequency stability V.S. Voltage measurement

Test Requirement:	FCC Part 22.355, FCC Part 24.235, FCC Part 27.54 FCC Part 2.1055(d)(2)
Limit:	± 2.5 ppm for WCDMA 850 Within authorized band for WCDMA 1900 and WCDMA 1700
Test setup:	
Test procedure:	1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage. 2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. 3. Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data (the worst channel):

Reference Frequency: UMTS 850 12.2k RMC Middle channel=4183 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.20	85	0.101602	±2.5	Pass
	3.70	78	0.093235		
	3.50	68	0.081281		
Reference Frequency: UMTS 1900 12.2k RMC Middle channel=9400 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.20	90	0.047872	Within authorized band for WCDMA 1900	Pass
	3.70	74	0.039362		
	3.50	80	0.042553		
Reference Frequency: UMTS1700 12.2k RMC Middle channel=1413 channel=1732.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.20	90	0.051945	Within authorized band for WCDMA 1700	Pass
	3.70	84	0.048482		
	3.50	57	0.032899		
Note: Only the worst case shown in the report.					