TEST REPORT

Reference No.	:	WTX21X08085117W-1
FCC ID	:	2AUY9-S2II
Applicant	:	A-ELEKTRONIK D.O.O.
Address	:	HINKA WUERTHA 12, 10000 ZAGREB, CROATIA
Product Name	:	SPRINTSHIELD
Test Model	:	S2II
Standards	:	FCC Part 22,FCC Part 24E, FCC Part 27
Date of Receipt sample	:	Aug. 18, 2021
Date of Test	:	Aug. 18, 2021 to Oct. 19, 2021
Date of Issue	:	Oct. 19, 2021
Test Result	:	**Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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Report version

Version No.	Date of issue	Description
Rev.00	Oct. 19, 2021	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: A-ELEKTRONIK D.O.O.
Address of applicant: HINKA WUERTHA 12, 10000 ZAGREB, CROATIA

Manufacturer: A-ELEKTRONIK D.O.O.
Address of manufacturer: HINKA WUERTHA 12, 10000 ZAGREB, CROATIA

General Description of EUT:	
Product Name:	SPRINTSHIELD
Trade Name:	SPRINTSHIELD
Model No.:	S2II
Adding Model(s):	/
Rated Voltage:	DC3.8V
Battery:	/
Adapter Model:	/
Software Version:	V05
Hardware Version:	DVT2
IMEI:	/
Device Category:	Portable Device
Note: The test data is gathered from a production sample provided by the manufacturer.	

Technical Characteristics of EUT: Main board	
4G	
Support Networks:	FDD-LTE
Support Band:	FDD-LTE Band 2, 4, 5, 7, 25, 66
Uplink Frequency:	FDD-LTE Band 2: Tx: 1850-1910MHz, FDD-LTE Band 4: Tx: 1710-1755MHz, FDD-LTE Band 5: Tx: 824-849MHz, FDD-LTE Band 7: Tx: 2500-2570MHz, FDD-LTE Band 25: Tx: 1850-1915MHz, FDD-LTE Band 66: Tx: 1710-1780MHz,
Downlink Frequency:	FDD-LTE Band 2: Rx: 1930-1990MHz, FDD-LTE Band 4: Rx: 2110-2155MHz, FDD-LTE Band 5: Rx: 869-894MHz, FDD-LTE Band 7: Rx: 2620-2690MHz, FDD-LTE Band 25: Rx: 1930-1995MHz, FDD-LTE Band 66: Rx: 2110-2200MHz,
RF Output Power:	FDD-LTE Band 2: 23.56dBm, FDD-LTE Band 4: 22.85dBm, FDD-LTE Band 5: 23.62dBm, FDD-LTE Band 7: 22.58dBm, FDD-LTE Band 25: 22.17dBm, FDD-LTE Band 66: 23.00dBm,
Type of Emission:	FDD-LTE Band 2: 17M9G7D, 17M9W7D FDD-LTE Band 4: 17M9G7D, 17M9W7D FDD-LTE Band 5: 8M98G7D, 8M97W7D FDD-LTE Band 7: 17M9G7D, 17M9W7D FDD-LTE Band 25:17M9G7D, 17M9W7D FDD-LTE Band 66: 17M9G7D, 17M9W7D
Type of Modulation:	QPSK, 16QAM
Antenna Type:	Integral Antenna
Antenna Gain:	FDD-LTE Band 2: 0.15dBi, FDD-LTE Band 4: -1.48dBi, FDD-LTE Band 5: -6.12dBi, FDD-LTE Band 7: 0.89dBi, FDD-LTE Band 25: 0.04dBi, FDD-LTE Band 66: -1.48dBi,

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 2: Frequency Alloca-Tions and Radio Treaty Mat-Ters; General Rules and Reg-Ulations.
FCC Rules Part 22: Private Land Mobile Radio Services.
FCC Rules Part 24: Public Mobile Services.
FCC Rules Part 27: Miscellaneous Wireless Communications Services.
TIA/EIA 603 E March 2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.
KDB 971168 D01 Power Meas License Digital Systems v03r01: Measurement Guidance for Certification of Licensed Digital Transmitters.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with TIA/EIA 603 E/ KDB 971168/ ANSI C63.26
The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Test Facility

Address of the test laboratory
Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.
Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990
Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintain ed in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A
The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	FDD-LTE Band 2	Low, Middle, High Channels
TM2	FDD-LTE Band 4	Low, Middle, High Channels
TM3	FDD-LTE Band 5	Low, Middle, High Channels
TM4	FDD-LTE Band 7	Low, Middle, High Channels
TM5	FDD-LTE Band 25	Low, Middle, High Channels
TM6	FDD-LTE Band 66	Low, Middle, High Channels

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	50~55 %.
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Frequency Stability	Conducted	2.3%
Transmitter Spurious Emissions	Conducted	±0.42dB
Transmitter Spurious Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
SEMT-1075	Communication Tester	Rohde & Schwarz	CMW500	148650	2021-03-27	2022-03-26
SEMT-1063	GSM Tester	Rohde & Schwarz	CMU200	114403	2021-03-27	2022-03-26
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2021-03-27	2022-03-26
SEMT-1079	Spectrum Analyzer	Agilent	N9020A	US47140102	2021-03-27	2022-03-26
SEMT-1080	Signal Generator	Agilent	83752A	3610A01453	2021-03-27	2022-03-26
SEMT-1081	Vector Signal Generator	Agilent	N5182A	MY47070202	2021-03-27	2022-03-26
SEMT-1028	Power Divider	Weinschel	1506A	PM204	2021-03-27	2022-03-26
SEMT-1082	Power Divider	RF-Lambda	RFLT4W5M18G	14110400027	2021-03-27	2022-03-26
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2021-03-27	2022-03-26
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2021-03-27	2022-03-26
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2021-04-12	2022-04-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2021-04-12	2022-04-11
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-19	2023-03-18
SEMT-1068	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-03-19	2023-03-18
SEMT-1042	Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2021-04-27	2023-04-26
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2021-04-27	2022-04-26
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2021-03-27	2022-03-26
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2021-03-27	2022-03-26
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2021-03-19	2023-03-18
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	/	/
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	/	/
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	/	/
SEMT-C004	Cable	Zheng DI	2M0RFC	/	/	/
SEMT-C005	Cable	Zheng DI	1M0RFC	/	/	/
SEMT-C006	Cable	Zheng DI	1M0RFC	/	/	/

Software List			
Description	**Manufacturer**	**Model**	**Version**
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
LTE Test System*	Tonscend	JS1120-1	V2.5

*Remark: indicates software version used in the compliance certification testing.

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§22.913(a), §24.232(c), §27.50(d)	RF Output Power	Compliant
§24.51, §27.50	Peak-to-average Ratio (PAR) of Transmitter	Compliant
§22.917(b), §24.238(b), §27.53	Emission Bandwidth	Compliant
§22.917(a), §24.238(a), §27.53(h)	Spurious Emissions at Antenna Terminal	Compliant
§22.917(a), §24.238(a), §27.53(h)	Spurious Radiation Emissions	Compliant
§2.917(a), §24.238(a), §27.53(h)	Out of Band Emissions	Compliant
§22.355, §24.235, §27.54	Frequency Stability	Compliant

3. RF Output Power

3.1 Standard Applicable

According to §22.913(a)(2), the ERP of mobile and portable stations transmitters and auxiliary test transmitters must not exceed 7 Watts.

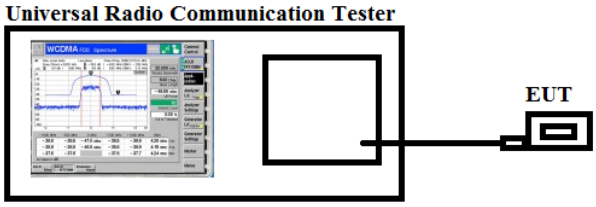
According to §24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to §27.50(d)(4), fixed, mobile, and portable (hand-held) stations operating in the 1710-1755MHz band and mobile and portable stations operating in the 1695-1710MHz and 1755-1780MHz bands are limited to 1 watt EIRP.

According to §27.50(c)(10), portable stations (hand-held devices) in the 698-746 MHz band are limited to 3 watts ERP.

3.2 Test Procedure

- Conducted output power test method:



- Radiated power test method:

1. The setup of EUT is according with per ANSI/TIA Standard 603E and ANSI C63.26 measurement procedure.
2. 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.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.

4. 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.

3.3 Summary of Test Results/Plots

Max. Radiated Power:

FDD-LTE Band 2

Channel Bandwidth: 1.4 MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	21.39	PASS
	MCH	21.24	PASS
	HCH	21.08	PASS
16QAM	LCH	21.36	PASS
	MCH	21.14	PASS
	HCH	21.58	PASS
Channel Bandwidth: 3 MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	21.06	PASS
	MCH	21.09	PASS
	HCH	21.13	PASS
16QAM	LCH	21.08	PASS
	MCH	20.98	PASS
	HCH	20.99	PASS
Channel Bandwidth: 5 MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.87	PASS
	MCH	20.92	PASS
	HCH	20.72	PASS
16QAM	LCH	20.86	PASS
	MCH	20.91	PASS
	HCH	20.82	PASS
Channel Bandwidth: 10 MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.64	PASS
	MCH	20.63	PASS
	HCH	20.57	PASS
16QAM	LCH	20.53	PASS
	MCH	20.57	PASS
	HCH	20.53	PASS

Channel Bandwidth: 15 MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.46	PASS
	MCH	20.49	PASS
	HCH	20.98	PASS
16QAM	LCH	20.75	PASS
	MCH	20.73	PASS
	HCH	20.82	PASS
Channel Bandwidth: 20 MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.69	PASS
	MCH	20.71	PASS
	HCH	20.83	PASS
16QAM	LCH	20.86	PASS
	MCH	20.69	PASS
	HCH	20.71	PASS

FDD-LTE Band 4

Channel Bandwidth: 1.4 MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	21.06	PASS
	MCH	21.02	PASS
	HCH	21.09	PASS
16QAM	LCH	21.16	PASS
	MCH	21.14	PASS
	HCH	21.13	PASS
Channel Bandwidth: 3 MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.96	PASS
	MCH	20.76	PASS
	HCH	20.75	PASS
16QAM	LCH	20.73	PASS
	MCH	20.74	PASS
	HCH	20.73	PASS

Channel Bandwidth: 5MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.69	PASS
	MCH	20.76	PASS
	HCH	20.78	PASS
16QAM	LCH	20.73	PASS
	MCH	20.72	PASS
	HCH	20.73	PASS
Channel Bandwidth: 10MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.36	PASS
	MCH	20.74	PASS
	HCH	20.46	PASS
16QAM	LCH	20.68	PASS
	MCH	20.73	PASS
	HCH	20.46	PASS
Channel Bandwidth: 15MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.97	PASS
	MCH	20.92	PASS
	HCH	20.84	PASS
16QAM	LCH	20.83	PASS
	MCH	20.76	PASS
	HCH	20.72	PASS
Channel Bandwidth: 20MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.68	PASS
	MCH	20.72	PASS
	HCH	20.65	PASS
16QAM	LCH	20.71	PASS
	MCH	20.64	PASS
	HCH	20.63	PASS

FDD-LTE Band 5

Channel Bandwidth: 1.4MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.46	PASS
	MCH	20.49	PASS
	HCH	20.59	PASS
16QAM	LCH	20.79	PASS
	MCH	20.67	PASS
	HCH	20.72	PASS
Channel Bandwidth: 3MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.87	PASS
	MCH	20.92	PASS
	HCH	20.96	PASS
16QAM	LCH	20.97	PASS
	MCH	20.93	PASS
	HCH	20.97	PASS
Channel Bandwidth: 5MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.46	PASS
	MCH	20.64	PASS
	HCH	20.47	PASS
16QAM	LCH	20.56	PASS
	MCH	20.47	PASS
	HCH	20.69	PASS
Channel Bandwidth: 10MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.59	PASS
	MCH	20.61	PASS
	HCH	20.68	PASS
16QAM	LCH	20.72	PASS
	MCH	20.72	PASS
	HCH	20.62	PASS

FDD-LTE Band 7

Channel Bandwidth: 5MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.74	PASS
	MCH	20.69	PASS
	HCH	20.52	PASS
16QAM	LCH	20.69	PASS
	MCH	20.74	PASS
	HCH	20.64	PASS
Channel Bandwidth: 10MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.73	PASS
	MCH	20.32	PASS
	HCH	20.79	PASS
16QAM	LCH	20.36	PASS
	MCH	20.47	PASS
	HCH	20.79	PASS
Channel Bandwidth: 15MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.98	PASS
	MCH	20.87	PASS
	HCH	20.83	PASS
16QAM	LCH	20.83	PASS
	MCH	20.84	PASS
	HCH	20.83	PASS
Channel Bandwidth: 20MHz			
Modulation	Channel	E.i.r.p [dBm]	Verdict
QPSK	LCH	20.72	PASS
	MCH	20.84	PASS
	HCH	20.76	PASS
16QAM	LCH	20.99	PASS
	MCH	20.89	PASS
	HCH	20.61	PASS

FDD-LTE Band 25

Channel Bandwidth: 1.4MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.96	PASS
	MCH	20.72	PASS
	HCH	20.36	PASS
16QAM	LCH	20.47	PASS
	MCH	20.72	PASS
	HCH	20.64	PASS
Channel Bandwidth: 3MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.27	PASS
	MCH	20.46	PASS
	HCH	20.13	PASS
16QAM	LCH	20.28	PASS
	MCH	20.46	PASS
	HCH	20.79	PASS
Channel Bandwidth: 5MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.36	PASS
	MCH	20.47	PASS
	HCH	20.59	PASS
16QAM	LCH	20.73	PASS
	MCH	20.31	PASS
	HCH	20.46	PASS
Channel Bandwidth: 10MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.98	PASS
	MCH	20.91	PASS
	HCH	20.87	PASS
16QAM	LCH	20.86	PASS
	MCH	20.83	PASS
	HCH	20.81	PASS
Channel Bandwidth: 15MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.64	PASS

	MCH	20.63	PASS
	HCH	20.61	PASS
16QAM	LCH	20.65	PASS
	MCH	20.63	PASS
	HCH	20.73	PASS
Channel Bandwidth: 20MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.69	PASS
	MCH	20.46	PASS
	HCH	20.39	PASS
16QAM	LCH	20.47	PASS
	MCH	20.69	PASS
	HCH	20.73	PASS

FDD-LTE Band 66

Channel Bandwidth: 1.4MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.39	PASS
	MCH	20.47	PASS
	HCH	20.49	PASS
16QAM	LCH	20.73	PASS
	MCH	19.99	PASS
	HCH	19.83	PASS
Channel Bandwidth: 3MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.13	PASS
	MCH	20.43	PASS
	HCH	20.25	PASS
16QAM	LCH	20.27	PASS
	MCH	20.13	PASS
	HCH	20.06	PASS
Channel Bandwidth: 5MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	19.97	PASS
	MCH	19.76	PASS
	HCH	19.35	PASS
16QAM	LCH	19.41	PASS
	MCH	19.87	PASS
	HCH	19.42	PASS
Channel Bandwidth: 10MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.36	PASS
	MCH	20.41	PASS
	HCH	20.98	PASS
16QAM	LCH	20.42	PASS
	MCH	20.36	PASS
	HCH	20.79	PASS
Channel Bandwidth:15MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	19.47	PASS

	MCH	19.02	PASS
	HCH	19.46	PASS
16QAM	LCH	19.32	PASS
	MCH	19.47	PASS
	HCH	19.68	PASS
Channel Bandwidth: 20MHz			
Modulation	Channel	E.r.p [dBm]	Verdict
QPSK	LCH	20.42	PASS
	MCH	20.32	PASS
	HCH	20.41	PASS
16QAM	LCH	20.49	PASS
	MCH	20.39	PASS
	HCH	20.79	PASS

Max. Conducted Output Power

Please refer to Appendix A: Average Power Output Data
Test result: Pass

4. Peak-to-average Ratio (PAR) of Transmitter

4.1 Standard Applicable

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 13dB.

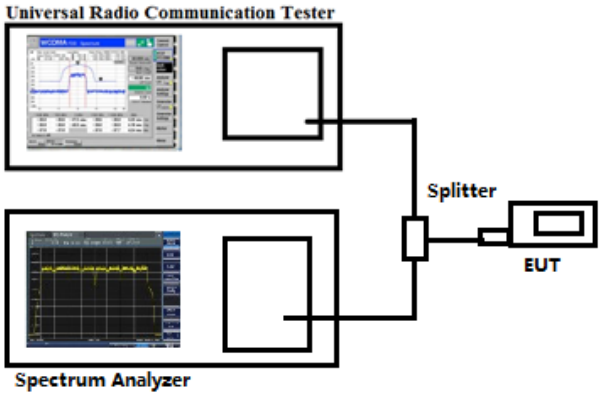
According to §27.50(B), the peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

4.2 Test Procedure

According with KDB 971168

1. The signal analyzer' s CCDF measurement profile is enabled.
2. Frequency = carrier center frequency.
3. Measurement BW > Emission bandwidth of signal.
4. The signal analyzer was set to collect one million samples to generate the CCDF curve.
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal " RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the " on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power.

Test Configuration for the emission bandwidth testing:



4.3 Summary of Test Results

Please refer to Appendix B: Peak-to-Average Ratio

Test result: Pass

5. Emission Bandwidth

5.1 Standard Applicable

According to §22.917(b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

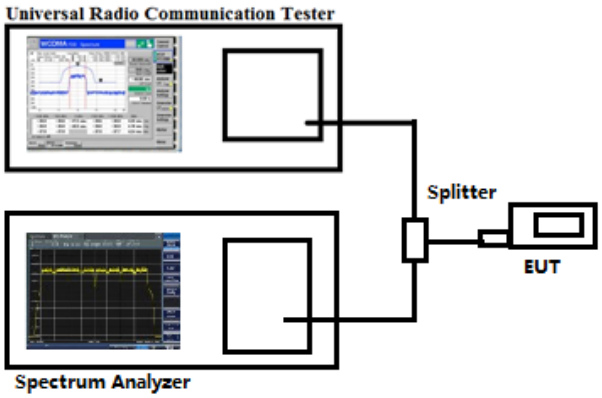
According to §24.238(b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

According to §27.53, the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

5.2 Test Procedure

According to §22.917(b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

Test Configuration for the emission bandwidth testing:



5.3 Summary of Test Results/Plots

Please refer to Appendix C: 26dB Bandwidth and Occupied Bandwidth

Test result: Pass

6. Out of Band Emissions at Antenna Terminal

6.1 Standard Applicable

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 emission 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(h), the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

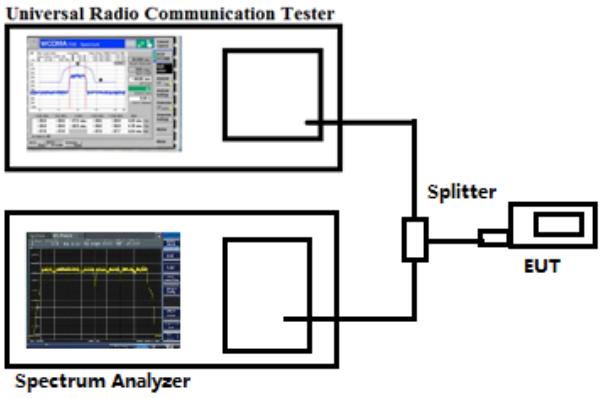
According to §27.53(g), for operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) 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 2490.5MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5MHz.

6.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 100kHz and 1MHz for the scan frequency from 30MHz to 1GHz and the scan frequency from 1GHz to up to 10th harmonic.

Test Configuration for the out of band emissions testing:



6.3 Summary of Test Results/Plots

Please refer to Appendix D & E: Band Edge & Conducted Spurious Emission

Test result: Pass

7. Spurious Radiated Emissions

7.1 Standard Applicable

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 emission 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(h), the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

According to §27.53(g) the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

7.2 Test Procedure

1. The setup of EUT is according with per ANSI/TIA-603-E and ANSI C63.4-2014 measurement procedure.
2. 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.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. 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 attenuation limit in dB =43+10 Log_{10} (power out in Watts)

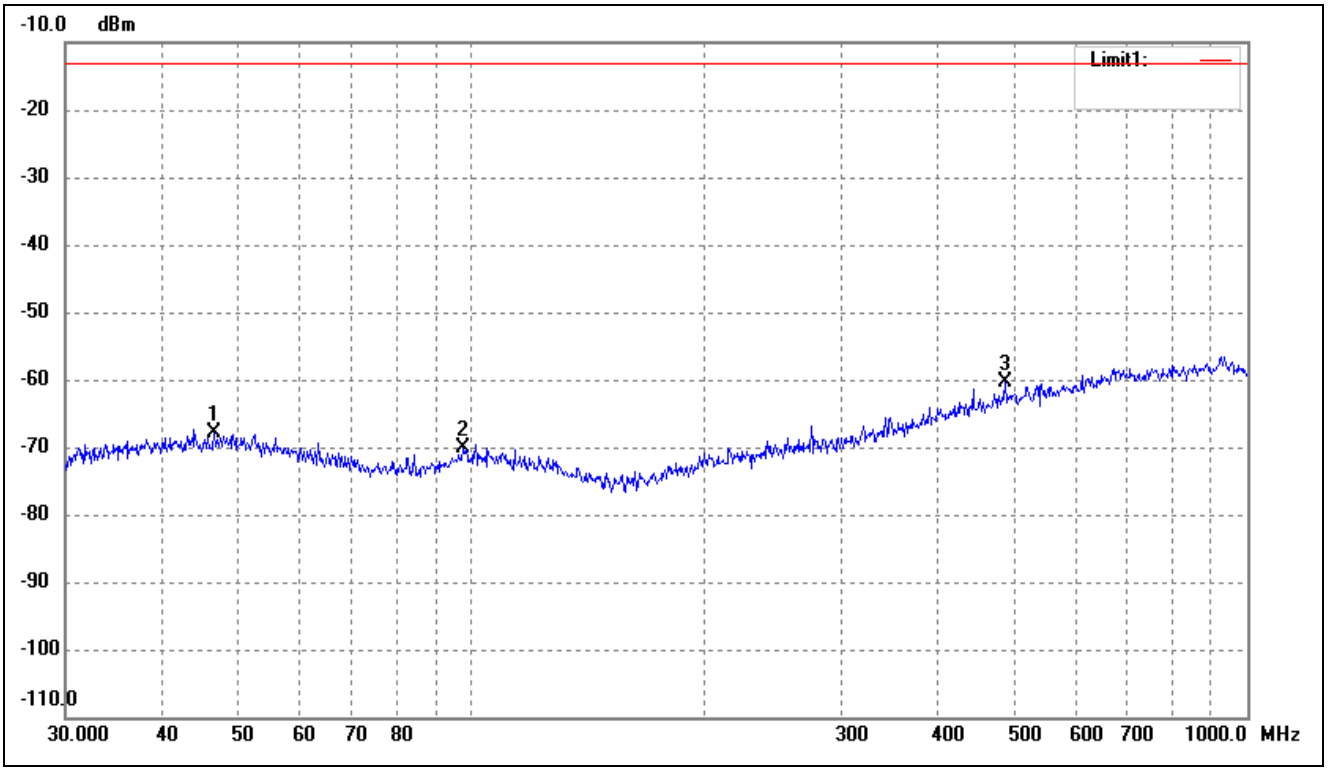
7.3 Summary of Test Results/Plots

Note: 1. this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

2. All test modes (different bandwidth and different modulation) are performed, but only the worst case is recorded in this report.

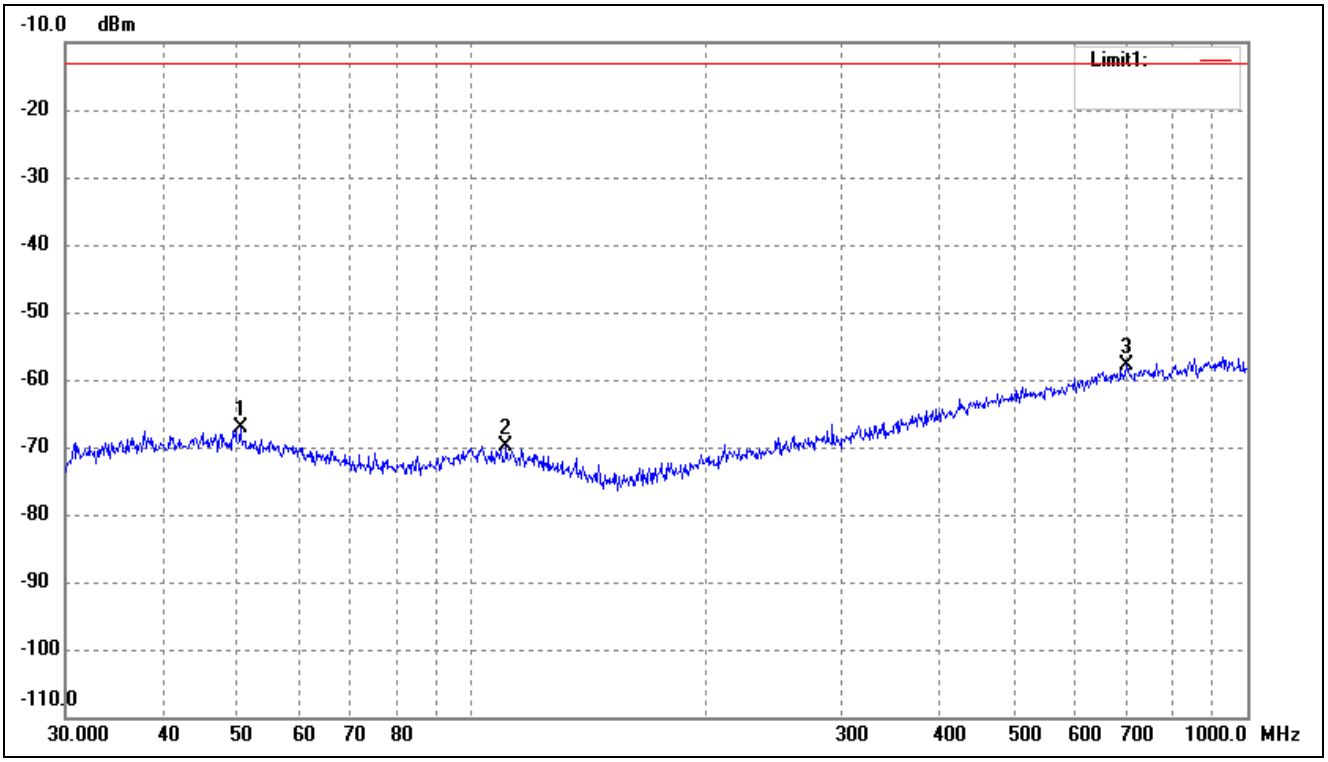
➢ Spurious Emissions Below 1GHz

Test Mode	FDD_LTE Band 2	Polarity:	Horizontal



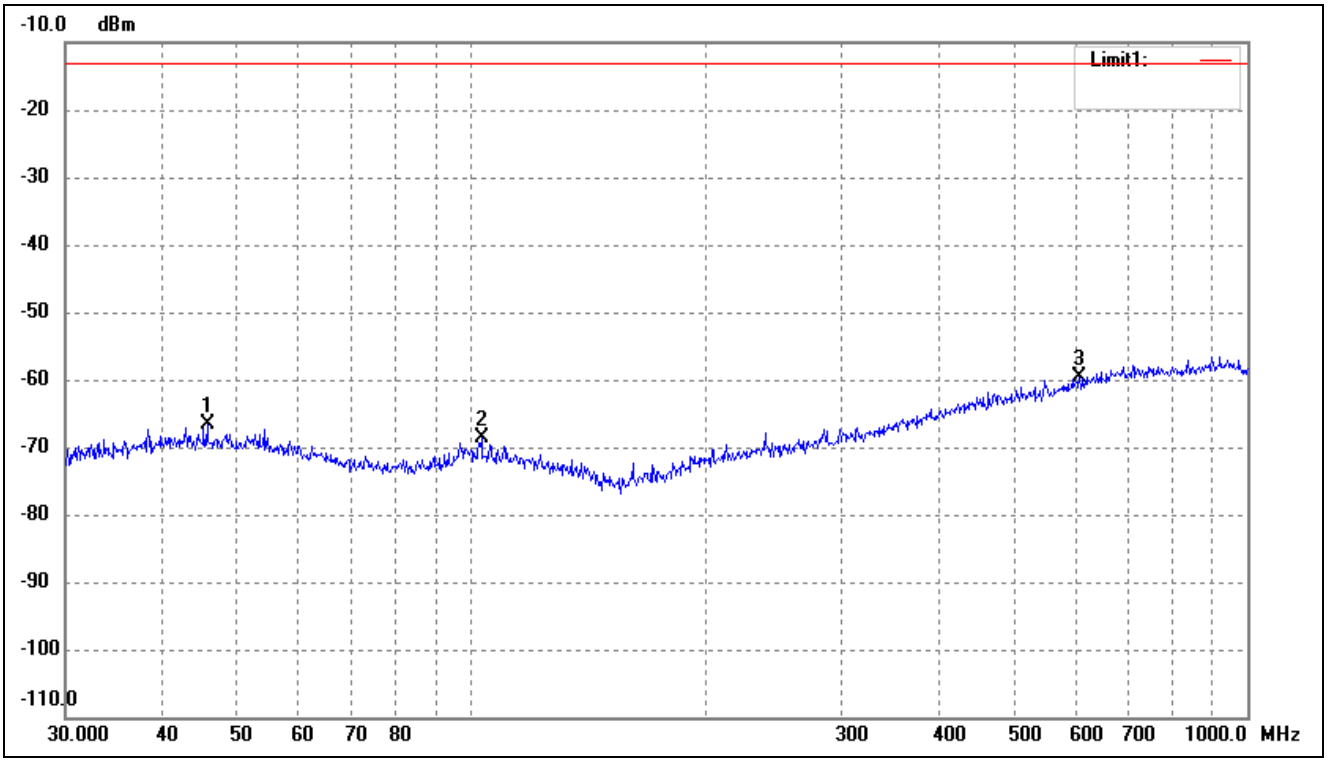
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	46.6664	-72.75	4.82	-67.93	-13.00	-54.93	ERP
2	97.7983	-72.67	2.67	-70.00	-13.00	-57.00	ERP
3	487.3151	-70.66	10.18	-60.48	-13.00	-47.48	ERP

Test Mode	FDD_LTE Band 2	Polarity:	Vertical



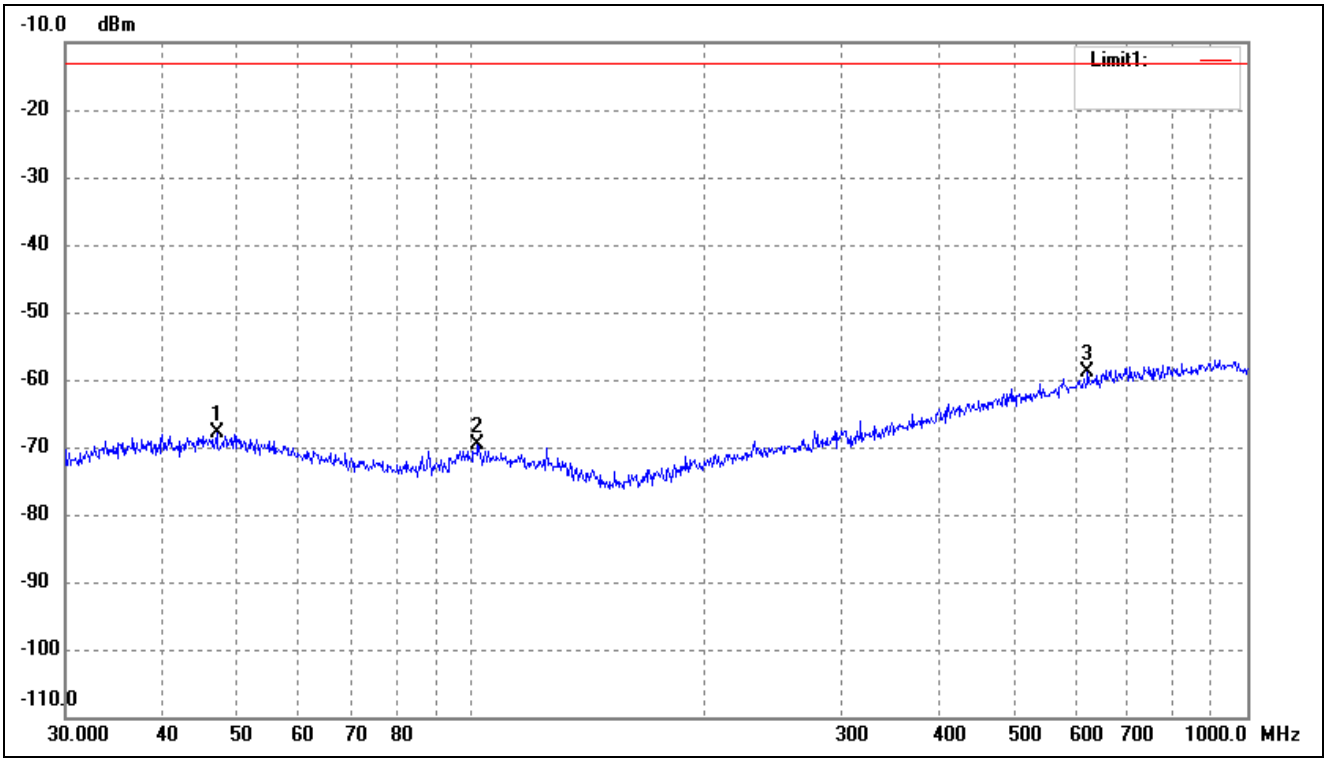
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	50.4089	-71.98	4.78	-67.20	-13.00	-54.20	ERP
2	110.9571	-72.68	2.86	-69.82	-13.00	-56.82	ERP
3	699.3046	-71.21	13.22	-57.99	-13.00	-44.99	ERP

Test Mode	FDD_LTE Band 4	Polarity:	Horizontal



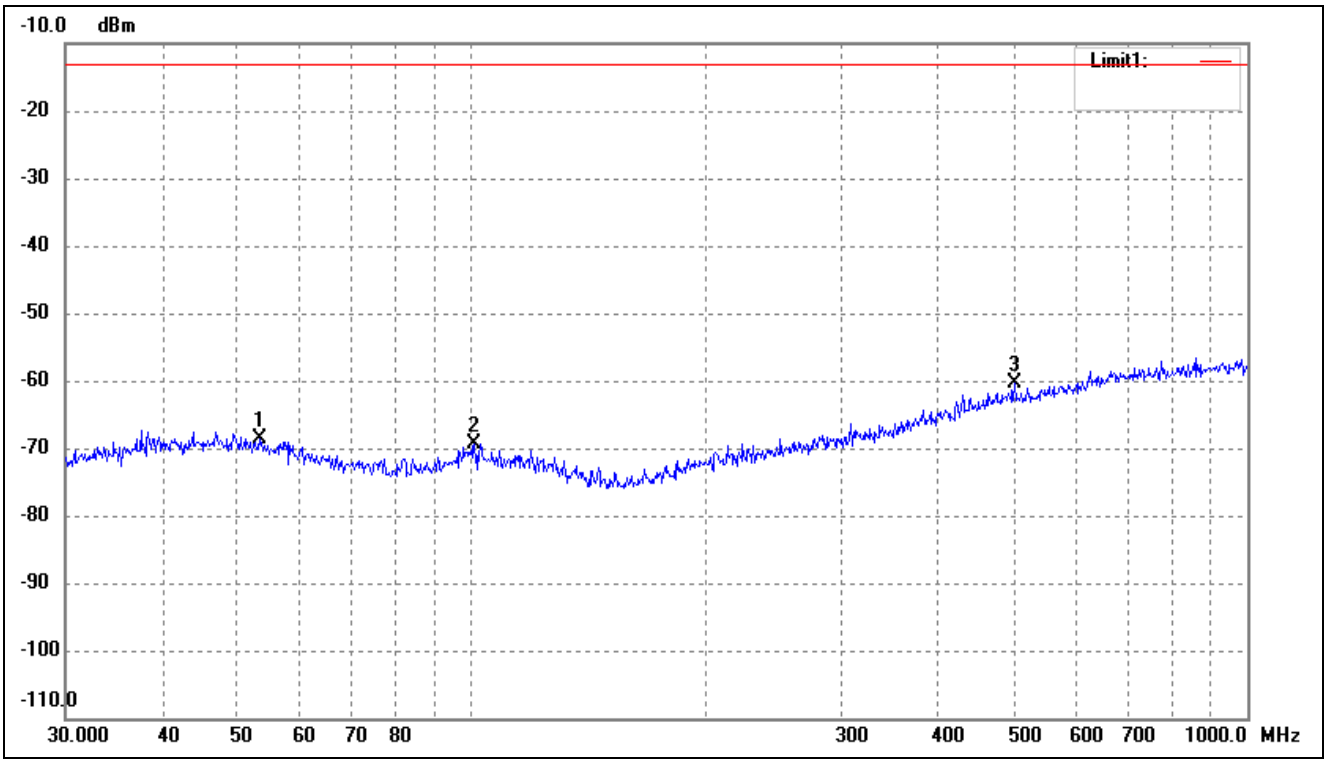
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	45.6948	-71.39	4.82	-66.57	-13.00	-53.57	ERP
2	103.0800	-71.72	3.03	-68.69	-13.00	-55.69	ERP
3	607.7867	-71.88	12.26	-59.62	-13.00	-46.62	ERP

Test Mode	FDD_LTE Band 4	Polarity:	Vertical



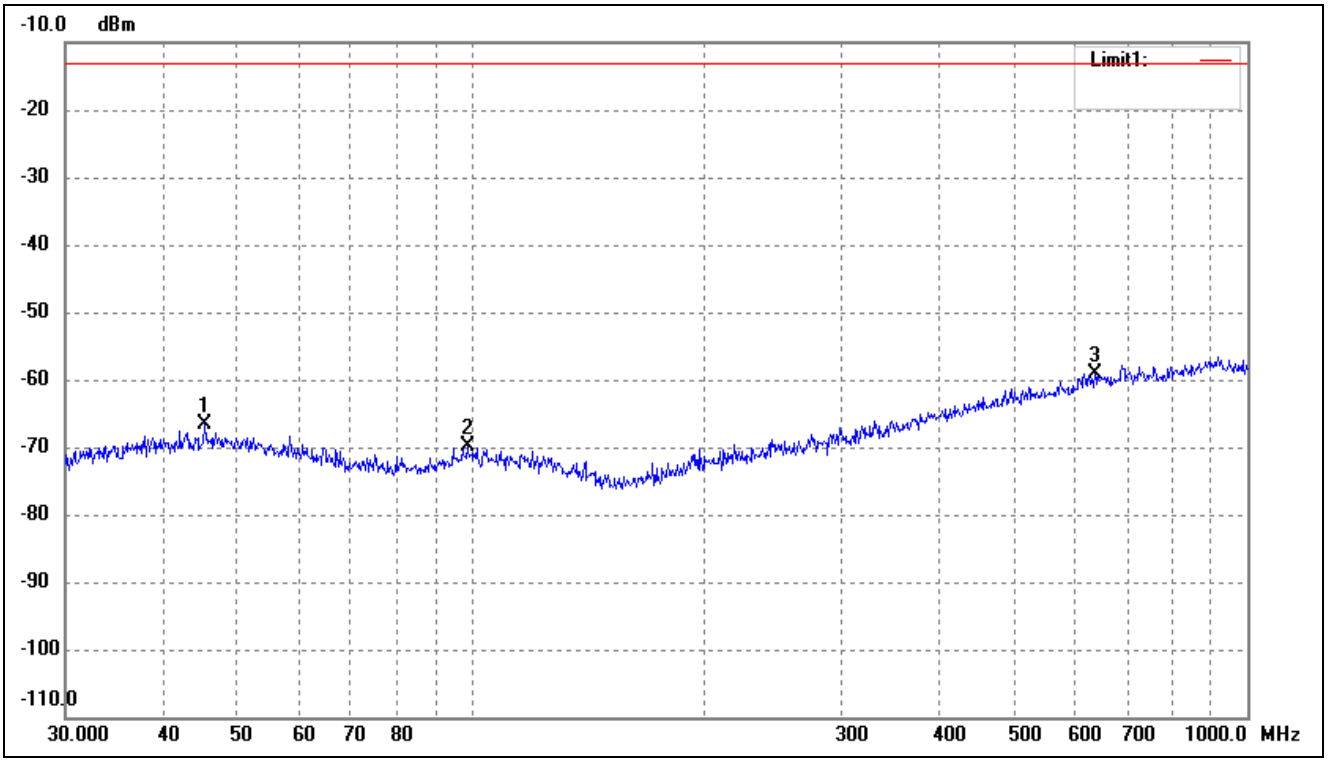
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	46.9948	-72.68	4.83	-67.85	-13.00	-54.85	ERP
2	102.0014	-72.64	3.04	-69.60	-13.00	-56.60	ERP
3	622.8900	-71.39	12.42	-58.97	-13.00	-45.97	ERP

Test Mode	FDD_LTE Band 5	Polarity:	Horizontal



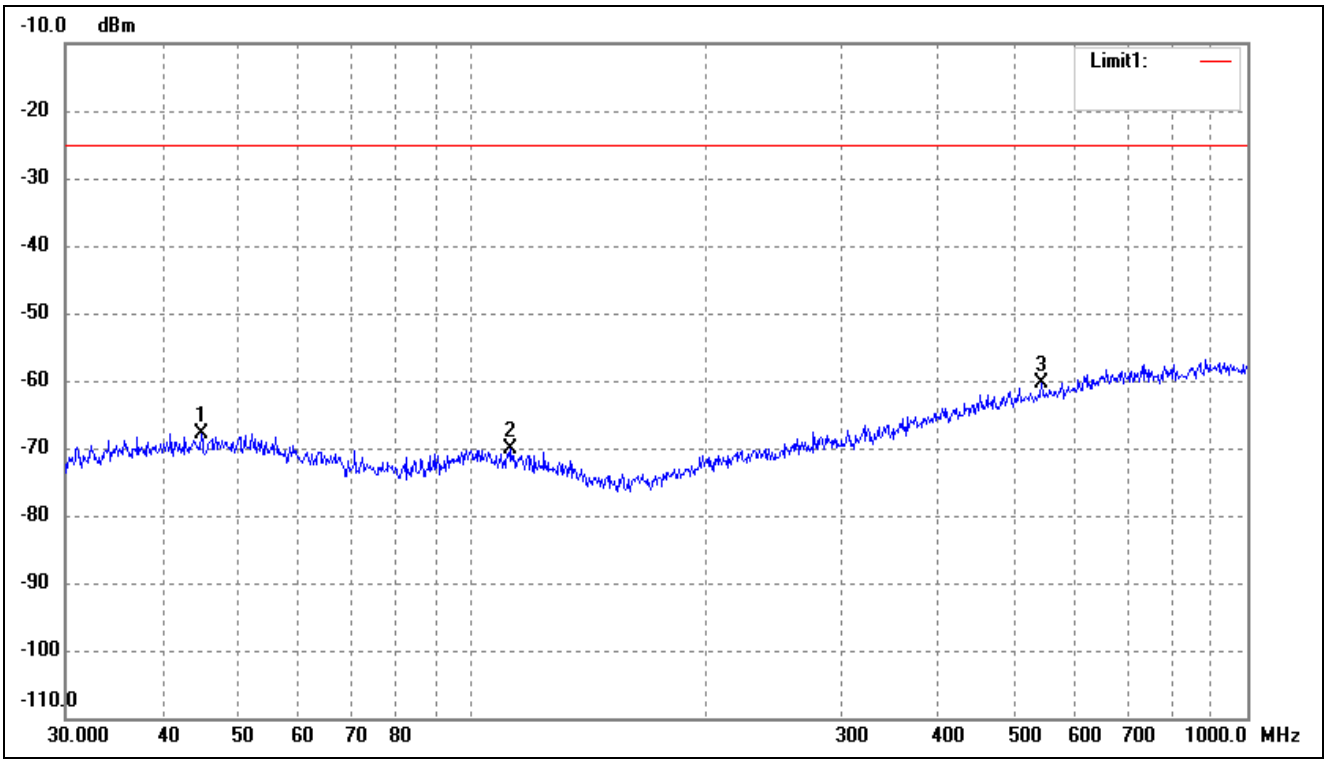
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	53.3179	-72.97	4.35	-68.62	-13.00	-55.62	ERP
2	100.9340	-72.51	3.06	-69.45	-13.00	-56.45	ERP
3	501.1790	-70.97	10.52	-60.45	-13.00	-47.45	ERP

Test Mode	FDD_LTE Band 5	Polarity:	Vertical



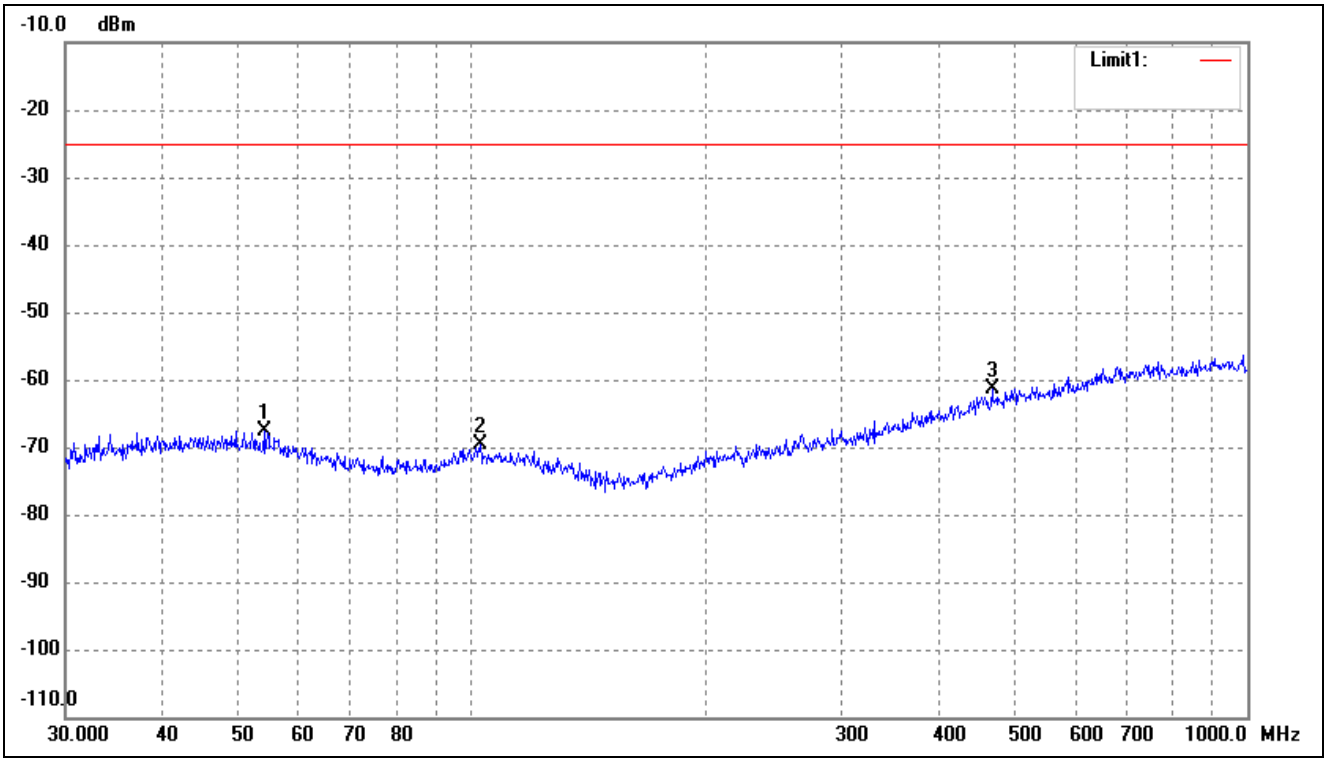
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	45.3755	-71.57	4.83	-66.74	-13.00	-53.74	ERP
2	98.8326	-72.84	2.86	-69.98	-13.00	-56.98	ERP
3	636.1340	-71.74	12.57	-59.17	-13.00	-46.17	ERP

Test Mode	FDD_LTE Band 7	Polarity:	Horizontal



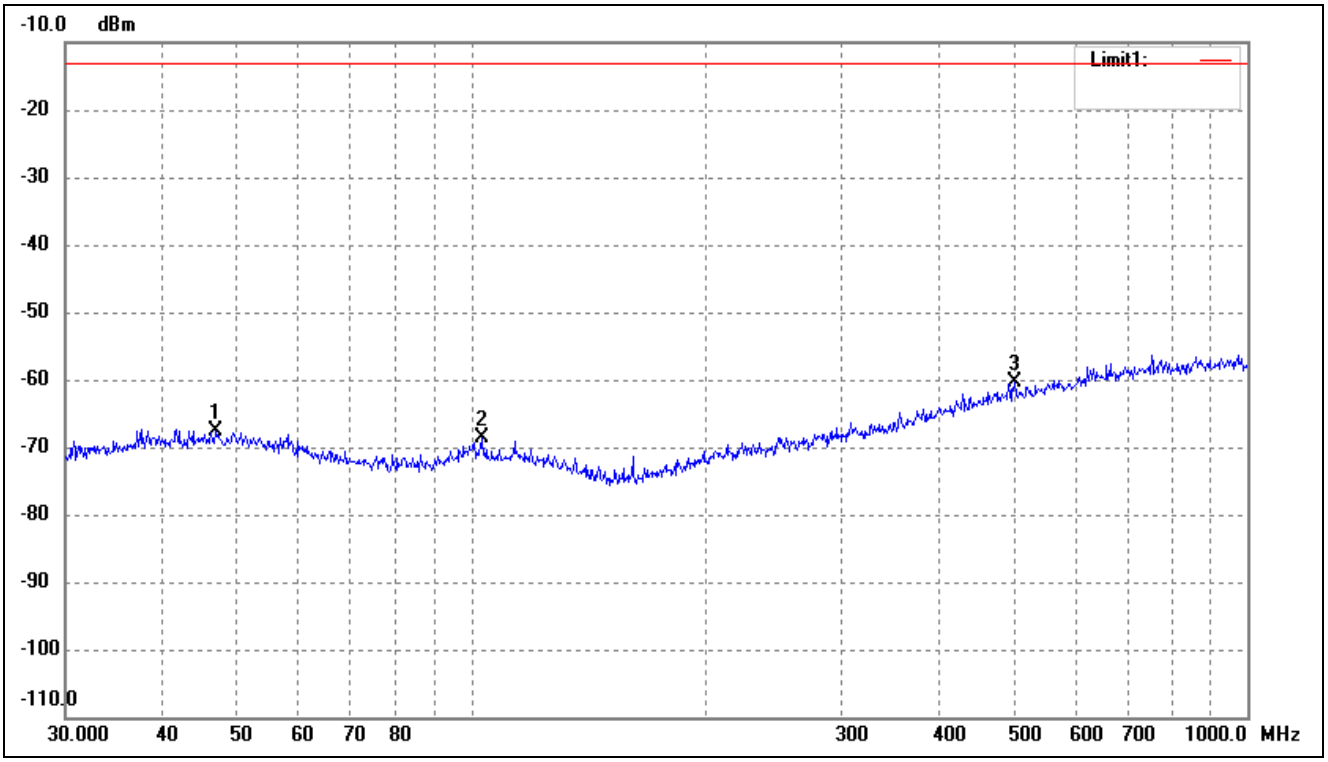
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	44.9006	-72.60	4.82	-67.78	-25.00	-42.78	ERP
2	112.5244	-72.89	2.75	-70.14	-25.00	-45.14	ERP
3	543.2742	-71.62	11.23	-60.39	-25.00	-35.39	ERP

Test Mode	FDD_LTE Band 7	Polarity:	Vertical



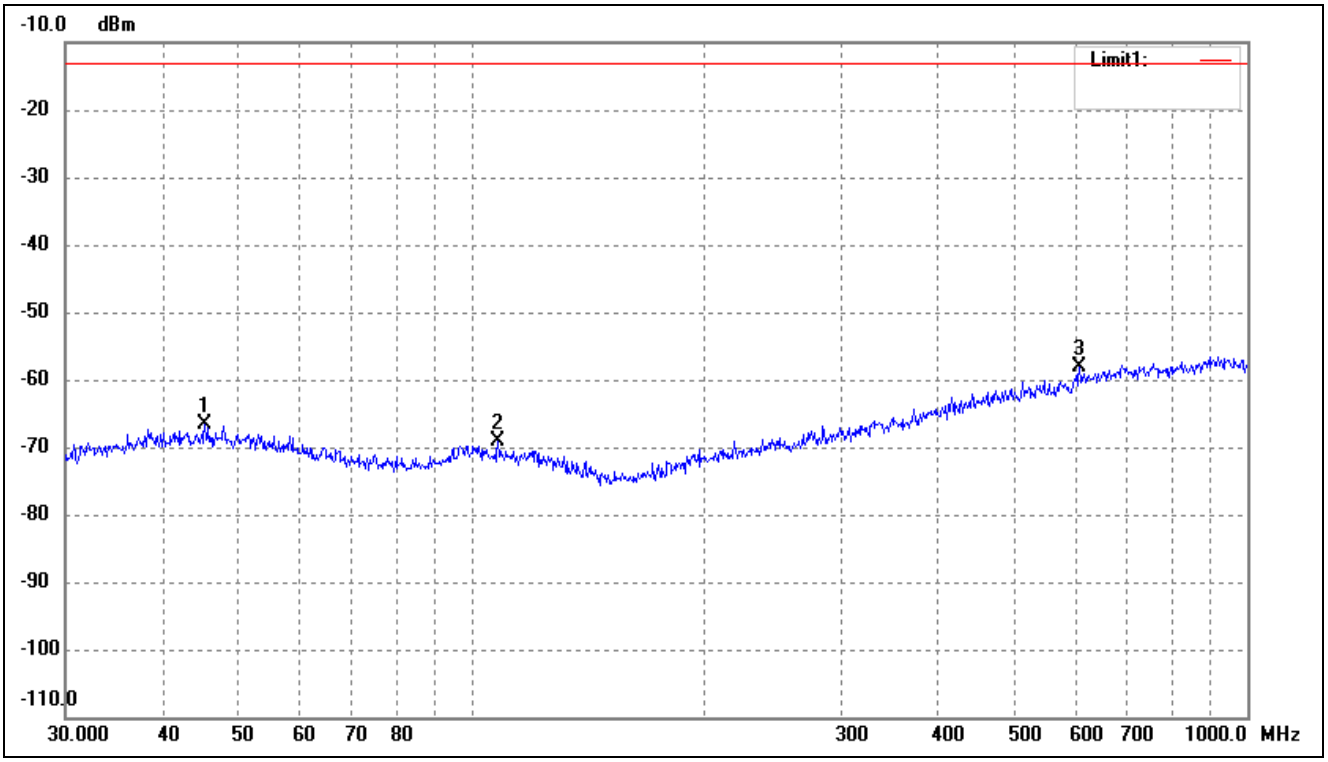
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	54.0711	-71.92	4.24	-67.68	-25.00	-42.68	ERP
2	102.7192	-72.73	3.03	-69.70	-25.00	-44.70	ERP
3	468.8762	-71.13	9.71	-61.42	-25.00	-36.42	ERP

Test Mode	FDD_LTE Band 25	Polarity:	Horizontal



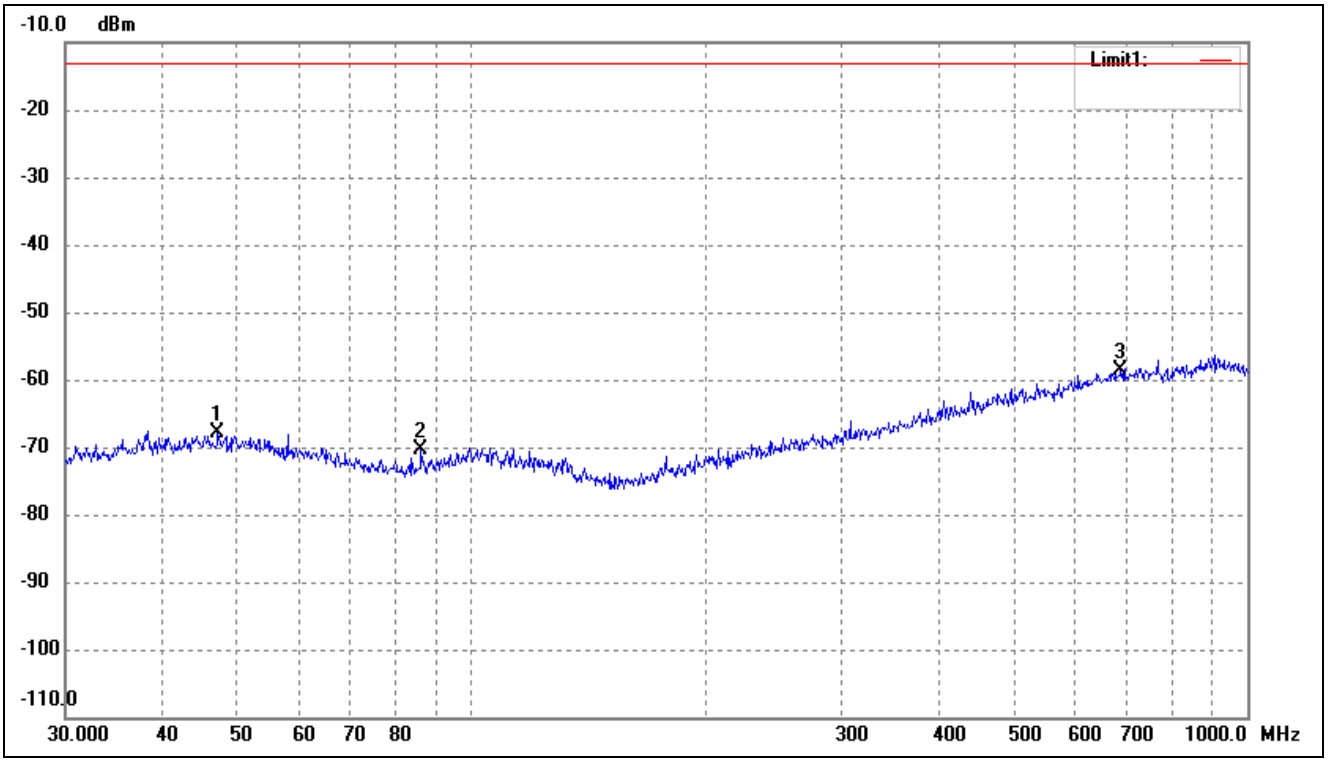
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	46.8303	-72.39	4.84	-67.55	-13.00	-54.55	ERP
2	103.4421	-71.63	3.02	-68.61	-13.00	-55.61	ERP
3	501.1790	-70.97	10.52	-60.45	-13.00	-47.45	ERP

Test Mode	FDD_LTE Band 25	Polarity:	Vertical



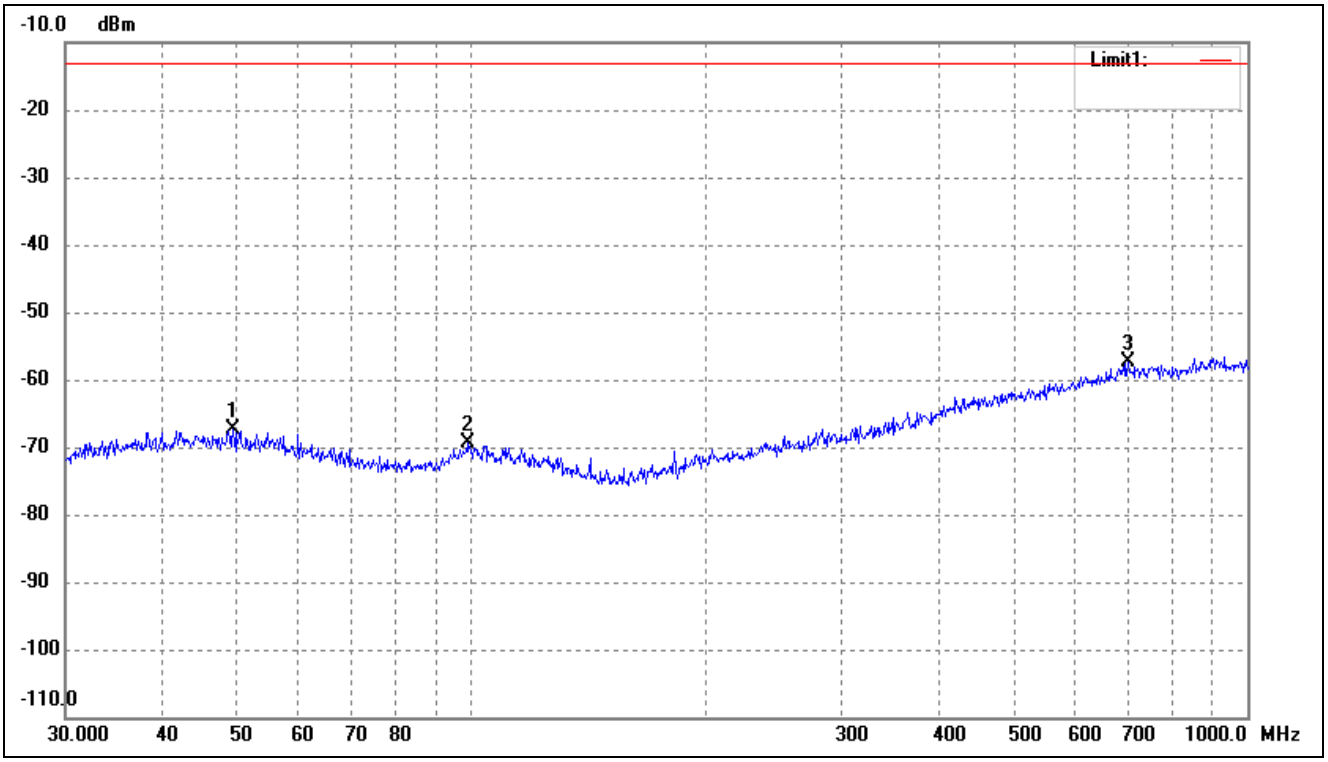
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	45.3755	-71.57	4.83	-66.74	-13.00	-53.74	ERP
2	108.2667	-72.07	2.95	-69.12	-13.00	-56.12	ERP
3	607.7867	-70.39	12.26	-58.13	-13.00	-45.13	ERP

Test Mode	FDD_LTE Band 66	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	47.1599	-72.71	4.83	-67.88	-13.00	-54.88	ERP
2	86.2001	-71.59	1.16	-70.43	-13.00	-57.43	ERP
3	687.1507	-71.69	13.10	-58.59	-13.00	-45.59	ERP

Test Mode	FDD_LTE Band 66	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	49.3594	-72.24	4.84	-67.40	-13.00	-54.40	ERP
2	98.8326	-72.31	2.86	-69.45	-13.00	-56.45	ERP
3	701.7610	-70.73	13.24	-57.49	-13.00	-44.49	ERP

Note: Margin= (Reading+ Correct)- Limit

- Spurious Emissions Above 1GHz

For FDD_LTE Band 2 Mode

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (1852.5MHz)						
3705.00	-36.41	10.54	-25.87	-13	-12.87	H
5557.50	-42.56	13.37	-29.19	-13	-16.19	H
3705.00	-37.53	10.54	-26.99	-13	-13.99	V
5557.50	-41.76	13.37	-28.39	-13	-15.39	V
Middle Channel (1880.0MHz)						
3760.00	-39.96	10.64	-29.32	-13	-16.32	H
5640.00	-43.45	13.54	-29.91	-13	-16.91	H
3760.00	-38.57	10.64	-27.93	-13	-14.93	V
5640.00	-43.85	13.54	-30.31	-13	-17.31	V
High Channel (1907.5MHz)						
3815.00	-39.48	10.74	-28.74	-13	-15.74	H
5722.50	-42.61	13.71	-28.90	-13	-15.90	H
3815.00	-37.43	10.74	-26.69	-13	-13.69	V
5722.50	-41.9	13.71	-28.19	-13	-15.19	V

For FDD_LTE Band 4 Mode

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (1712.5MHz)						
3425.00	-38.06	8.65	-29.41	-13	-16.41	H
5137.50	-40.04	12.03	-28.01	-13	-15.01	H
3425.00	-39.57	8.65	-30.92	-13	-17.92	V
5137.50	-40.8	12.03	-28.77	-13	-15.77	V
Middle Channel (1732.5MHz)						
3465.00	-37.28	8.91	-28.37	-13	-15.37	H
5197.50	-41.07	12.29	-28.78	-13	-15.78	H
3465.00	-36.47	8.91	-27.56	-13	-14.56	V
5197.50	-40.62	12.29	-28.33	-13	-15.33	V
High Channel (1752.5MHz)						
3505.00	-37.55	9.11	-28.44	-13	-15.44	H
5257.50	-43.28	12.56	-30.72	-13	-17.72	H
3505.00	-36.24	9.11	-27.13	-13	-14.13	V
5257.50	-40.85	12.56	-28.29	-13	-15.29	V

For FDD_LTE Band 5 Mode

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (824.7MHz)						
1649.40	-39.46	4.94	-34.52	-13	-21.52	H
2474.10	-43.41	8.46	-34.95	-13	-21.95	H
1649.40	-38.08	4.94	-33.14	-13	-20.14	V
2474.10	-43.92	8.46	-35.46	-13	-22.46	V
Middle Channel (836.5MHz)						
1673.00	-39.2	5.11	-34.09	-13	-21.09	H
2509.50	-42.33	8.54	-33.79	-13	-20.79	H
1673.00	-37.35	5.11	-32.24	-13	-19.24	V
2509.50	-44.94	8.54	-36.4	-13	-23.4	V
High Channel (848.3MHz)						
1696.60	-38.21	5.29	-32.92	-13	-19.92	H
2544.90	-44.93	8.59	-36.34	-13	-23.34	H
1696.60	-36.4	5.29	-31.11	-13	-18.11	V
2544.90	-41.34	8.59	-32.75	-13	-19.75	V

For FDD_LTE Band 7 Mode

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (2502.5MHz)						
5005.00	-42.92	11.66	-31.26	-25	-6.26	H
7507.50	-44.56	15.09	-29.47	-25	-4.47	H
5005.00	-43.44	11.66	-31.78	-25	-6.78	V
7507.50	-45.24	15.09	-30.15	-25	-5.15	V
Middle Channel (2535MHz)						
5070.00	-44.75	11.78	-32.97	-25	-7.97	H
7605.00	-43.56	15.21	-28.35	-25	-3.35	H
5070.00	-43.97	11.78	-32.19	-25	-7.19	V
7605.00	-44.89	15.21	-29.68	-25	-4.68	V
High Channel (2567.5MHz)						
5135.00	-44.75	11.89	-32.86	-25	-7.86	H
7702.50	-44.88	15.32	-29.56	-25	-4.56	H
5135.00	-43.47	11.89	-31.58	-25	-6.58	V
7702.50	-45.11	15.32	-29.79	-25	-4.79	V

For FDD_LTE Band 25 Mode

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (1850.7MHz)						
3701.40	-44.69	10.54	-34.15	-13	-21.15	H
5552.10	-43.99	13.37	-30.62	-13	-17.62	H
3701.40	-42.91	10.54	-32.37	-13	-19.37	V
5552.10	-45.57	13.37	-32.2	-13	-19.2	V
Middle Channel (1882.5MHz)						
3765.00	-43.07	10.64	-32.43	-13	-19.43	H
5647.50	-43.33	13.54	-29.79	-13	-16.79	H
3765.00	-41.25	10.64	-30.61	-13	-17.61	V
5647.50	-44.51	13.54	-30.97	-13	-17.97	V
High Channel (1914.3MHz)						
3828.60	-42.69	9.99	-32.7	-13	-19.70	H
5742.90	-43.20	13.51	-29.69	-13	-16.69	H
3828.60	-44.30	9.99	-34.31	-13	-21.31	V
5742.90	-44.91	13.51	-31.40	-13	-18.40	V

For FDD_LTE Band 66Mode

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (1710.7MHz)						
3420.77	-41.93	9.22	-32.71	-13	-19.71	H
5131.47	-43.59	11.35	-32.24	-13	-19.24	H
3420.77	-42.21	9.22	-32.99	-13	-19.99	V
5131.47	-45.76	11.35	-34.41	-13	-21.41	V
Middle Channel (1745MHz)						
3490.00	-41.27	9.53	-31.74	-13	-18.74	H
5235.00	-44.63	11.98	-32.65	-13	-19.65	H
3490.00	-43.69	9.53	-34.16	-13	-21.16	V
5235.00	-43.59	11.98	-31.61	-13	-18.61	V
High Channel (1779.3MHz)						
3558.60	-42.52	9.82	-32.7	-13	-19.7	H
5337.90	-44.23	12.35	-31.88	-13	-18.88	H
3558.60	-41.91	9.82	-32.09	-13	-19.09	V
5337.90	-43.77	12.35	-31.42	-13	-18.42	V

Note: Result=Reading+ Correct, Margin= Result- Limit

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

8. Frequency Stability

8.1 Standard Applicable

According to §22.355, §24.235, §27.54 the limit is 2.5ppm.

8.2 Test Procedure

According to §2.1055, the following test procedure was performed.
The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.
The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode.

8.3 Summary of Test Results/Plots

Note: 1.Normal Voltage NV=DC3.8V; Low Voltage LV=DC3.5V; High Voltage HV=DC4.35V

Please refer to Appendix F: Frequency Stability

Test result: Pass

APPENDIX PHOTOGRAPHS

Please refer to "ANNEX"

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