

# FCC Radio Test Report

## FCC ID: VSFMS3A

This report concerns: Original Grant

**Project No.** : 1907H013  
**Equipment** : Tablet  
**Brand Name** : Juniper Systems  
**Test Model** : MS3A  
**Series Model** : N/A  
**Applicant** : Juniper Systems  
**Address** : 1132 W 1700 N Logan, UT 84321 USA  
**Manufacturer** : Juniper Systems  
**Address** : 1132 W 1700 N Logan, UT 84321 USA  
**Date of Receipt** : Jul. 16, 2019  
**Date of Test** : Jul. 16, 2019 ~ Nov. 22, 2019  
**Issued Date** : Nov. 27, 2019  
**Report Version** : R00  
**Test Sample** : Engineering Sample No.: SH2019091645/SH2019091646/  
SH2019091641-5 /SH2019091641-6  
**Standard(s)** : FCC CFR47 Part 15C(2018)

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.



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Certificate # 5123.03

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## Declaration

**BTL** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

**BTL**'s reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

The report must not be used by the client to claim product certification, approval, or endorsement by NIST, A2LA, or any agency of the U.S. Government.

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**BTL**'s laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

**BTL** is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

## Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and is not use in determining the Pass/Fail results.

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**REPORT ISSUED HISTORY**

Report Version	Description	Issued Date
R00	Original Issue.	Nov. 27, 2019

## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

**Applied Standard(s): FCC Part15 (2018), Subpart C**

Standard(s) Section	Test Item	Judgment	Remark
15.207	Conducted Emissions	PASS	
15.225 (a) (b) (c) (d) and 15.209	Radiated Emissions	PASS	
15.225(e)	Frequency Stability	PASS	
-	20dB Occupied Bandwidth Measurement	PASS	

Note:

For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".

## 1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China  
BTL's Test Firm Registration Number for FCC: 476765  
BTL's Designation Number for FCC: CN1241

## 1.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty figures shall be calculated according the methods described in the ETSI TR 100 028 and shall correspond to an expansion factor (coverage factor)  $k=1.96$  or  $k=2$ (which provide confidence levels of respectively 90% and 95.45% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).  
Measurement Uncertainty for a Level of Confidence of 95 %,  $U=2\times U_{\text{C}}(y)$ .

The BTL measurement uncertainty as below table:

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U, (dB)
SH-C01	CISPR	150kHz ~30MHz	2.40

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U,(dB)
SH-CB01 (3m)	CISPR	9 kHz ~ 30MHz	2.46

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
SH-CB01	CISPR	30MHz ~ 200MHz	V	3.86
		30MHz ~ 200MHz	H	2.88
		200MHz ~ 1,000MHz	V	3.88
		200MHz ~ 1,000MHz	H	3.70

Test Site	Method	Measurement Frequency Range	U,(dB)
SH-CB01	CISPR	1GHz ~ 6GHz	4.40
		6GHz ~ 18GHz	4.86

Test Site	Method	Measurement Frequency Range	U,(dB)
SH-CB01	CISPR	18 ~ 26.5 GHz	3.64
		26.5 ~ 40 GHz	3.78

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	Tablet	
Brand Name	Juniper Systems	
Model Name	MS3A	
Series Model	N/A	
Model Difference(s)	N/A	
Product Description	Operation Frequency	13.56MHz
	Product Class	1
	Number of Channel	1
	Antenna Designation	Internal Antenna
Power Source	#1 DC voltage supplied from AC/DC adapter. Model: PSAA30R-120 #2 Supplied from Li-Ion battery pack.	
Power Rating	#1 I/P: 100~240V 0.8A 50~60Hz O/P: 12V --- 2.5A #2 7.2V, 6.0A, 43.2W	

Note:

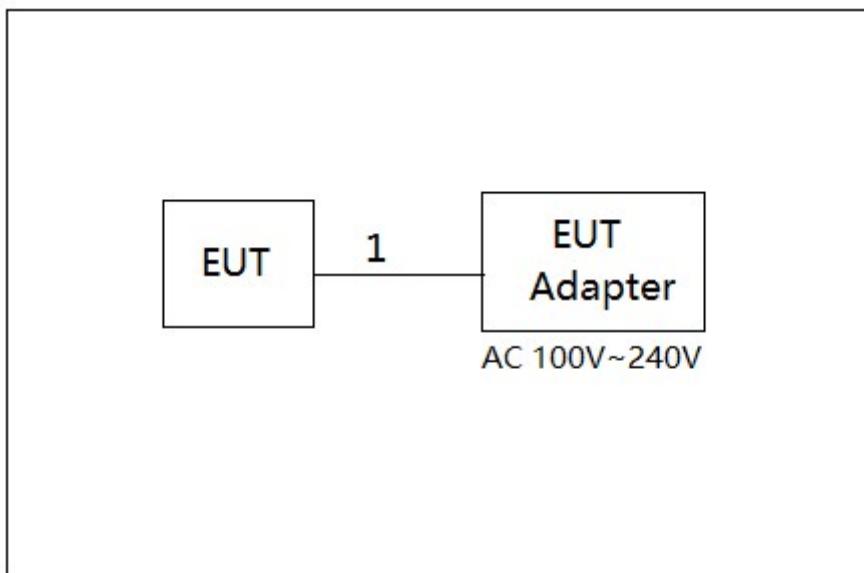
1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

## 2.2 DESCRIPTION OF TEST MODES AND ENVIRONMENT CONDITIONS

Test Items	Mode	Channel
Frequency Stability Tolerance	TX Mode	13.56MHz
Radiated Emissions	TX Mode	13.56MHz
Conducted Emissions	TX Mode	13.56MHz

Test Item	Temperature	Humidity	Test Voltage	Tested By
AC Power Line Conducted Emissions	22°C	53%	AC 120V	Forest Li
Radiated Emissions-30 MHz to 1GHz	20°C	42%	AC 120V	Forest Li
Radiated Emissions-Above 1000 MHz	22°C	55%	AC 120V	Forest Li
Frequency Stability Tolerance	25°C	48%	AC 120V	Forest Li

## 2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



## 2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
-	-	-	-	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	N/A	N/A	1.5m

### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 POWER LINE CONDUCTED EMISSION LIMITS (Frequency Range 150 kHz-30 MHz)

Frequency (MHz)	Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56*	56 to 46*
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

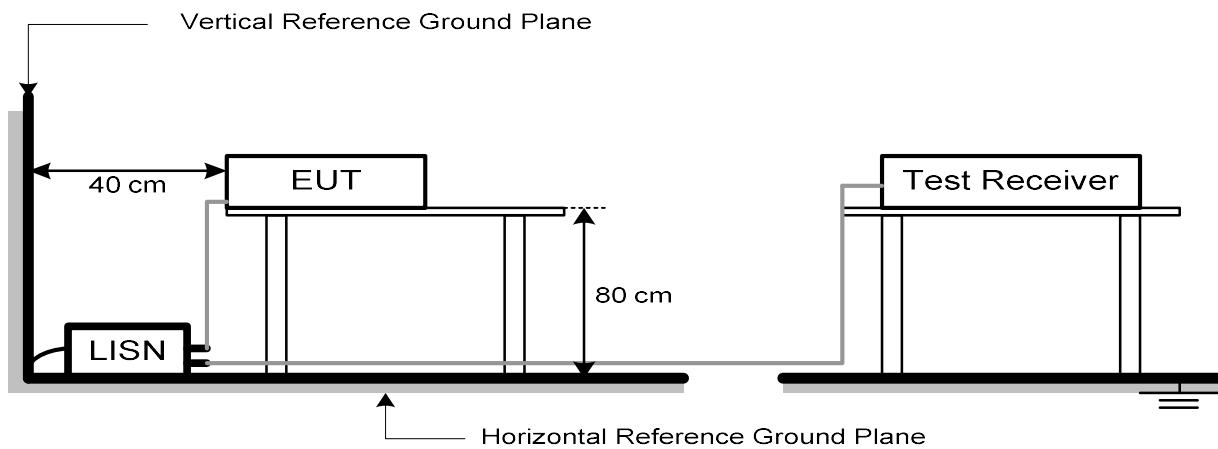
##### 3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item -EUT Test Photos.

##### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.4 TEST SETUP



### 3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

The EUT was programmed to be in continuously transmitting/TX mode.

### 3.1.6 TEST RESULTS

Please refer to the Appendix A.

### 3.2 RADIATED EMISSION MEASUREMENT

#### 3.2.1 RADIATED EMISSION LIMITS

Clause 15.225(a) the field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Clause 15.225(b) within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Clause 15.225(c) within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Clause 15.225(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

#### 3.2.2 TEST PROCEDURE

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

Below 1GHz (detector: Peak and Quasi-Peak)

RBW=100 kHz / VBW=300 kHz / Sweep=AUTO

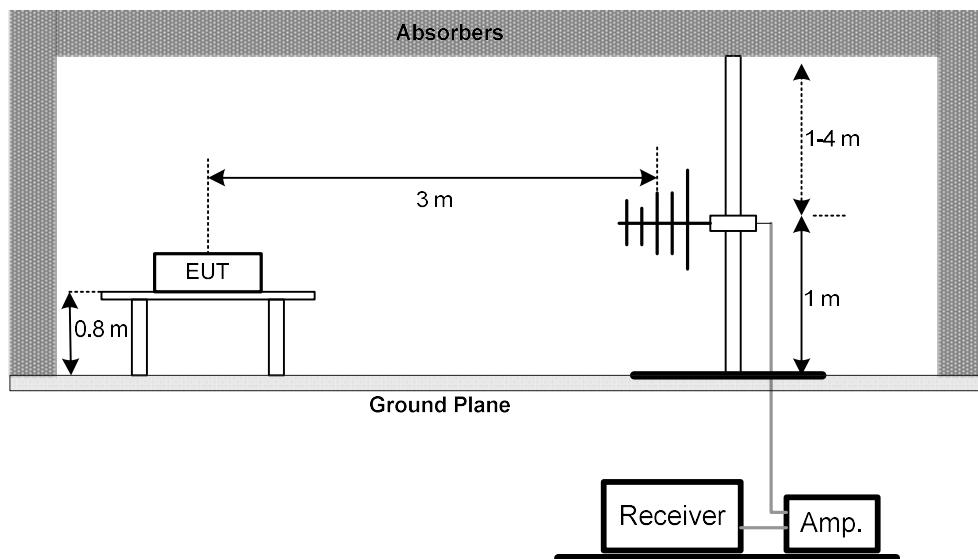
The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

#### 3.2.3 DEVIATION FROM TEST STANDARD

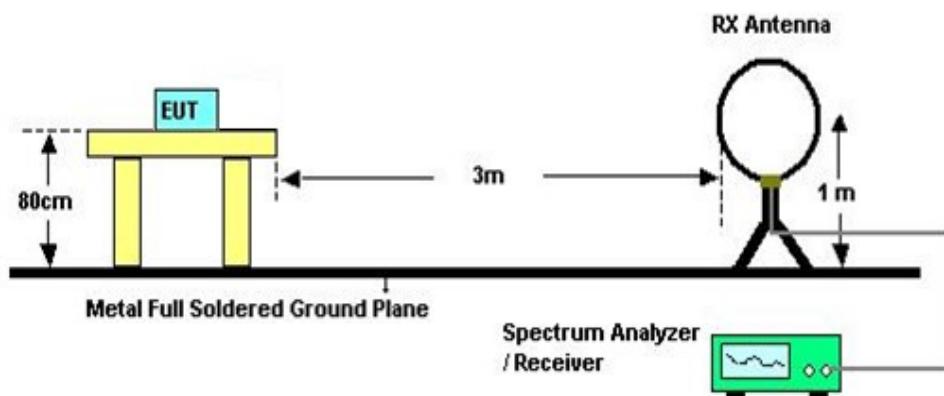
No deviation

### 3.2.4 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency 30 MHz-1000 MHz



(B) For Radiated Emissions 9 kHz-30 MHz



### 3.2.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

### 3.2.6 TEST RESULTS (9 kHz TO 30 MHz)

Please refer to the Appendix B

### 3.2.7 TEST RESULTS (30 MHz TO 1000 MHz)

Please refer to the Appendix C.

Remark:

- (1) No limit: This is fundamental signal, the judgment is not applicable.  
For fundamental signal judgment was referred to Peak output test.

## 4. FREQUENCY STABILITY

### 4.1 APPLIED PROCEDURES

FCC Part15 Subpart C				
Section	Test Item	Frequency Range (MHz)	Lmint (MHz)	Result
15.225(e)	Frequency Stability Tolerance	13.56MHz	±0.001MHz	PASS

#### 4.1.1 TEST PROCEDURE

##### 1. Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -20°C to +50°C in 10°C step size,  
(1) With all power removed, the temperature was decreased to 0°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a "call mode". These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.  
(3) Repeat the above measurements at 10°C increments from 0°C to +40°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

##### 2. Frequency Stability (Voltage Variation)

The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.  
(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

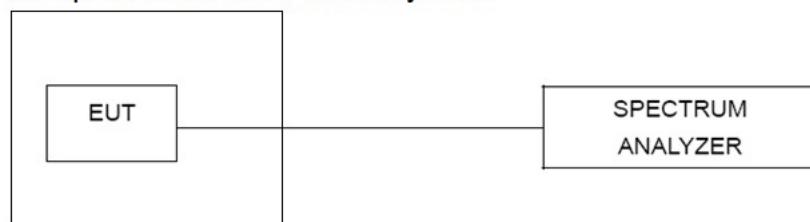
This transceiver is specified to operate with an input voltage of between 207 V AC and 253 V AC, with a nominal voltage of 230 V AC.

#### 4.1.2 DEVIATION FROM STANDARD

No deviation.

#### 4.1.3 TEST SETUP

Temperature And Humidity Box



#### 4.1.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 4.1.5 TEST RESULTS

Please refer to the Appendix D.

## 5. 20DB SPECTRUM BANDWIDTH MEASUREMENT

### 5.1 APPLIED PROCEDURES

The 20dB bandwidth shall be specified in operating frequency band.

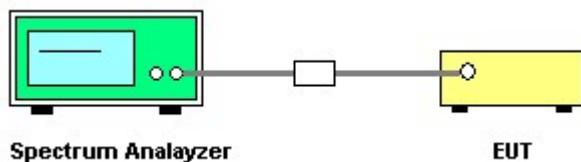
#### 5.1.1 TEST PROCEDURE

The bandwidth of the fundamental frequency was measured by spectrum analyzer. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

#### 5.1.2 DEVIATION FROM STANDARD

No deviation.

#### 5.1.3 TEST SETUP



#### 5.1.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 5.1.5 TEST RESULTS

Please refer to the Appendix E.

**6. MEASUREMENT INSTRUMENTS LIST**

Conducted Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Line Impedance Stabilisation Network	Schwarzbeck	NNLK 8121	8121-822	Mar. 29, 2020
2	TWO-LINE V-NETWORK	R&S	ENV216	101340	Sep. 01, 2020
3	Test Cable	emci	EMCRG400-BM-N M-10000	170628	Apr. 17, 2020
4	EMI Test Receiver	R&S	ESCI	100082	Mar. 29, 2020
5	50Ω Terminator	SHX	TF2-1G-A	17051602	Mar. 29, 2020
6	50Ω coaxial switch	Anritsu	MP59B	6201750902	Mar. 29, 2020
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission Measurement-9 kHz TO 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Loop Antenna	EMCI	EMCI LPA600	275	Mar. 29, 2020
2	EMI Test Receiver	R&S	ESCI	100082	Mar. 29, 2020
3	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

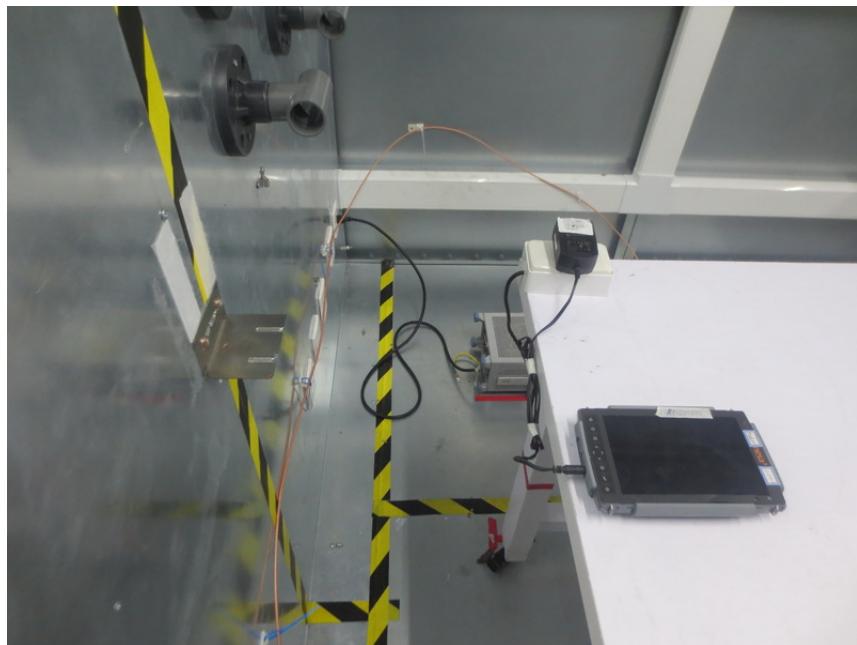
Radiated Emission Measurement-30 MHz TO 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	719	Mar. 29, 2020
2	Pre-Amplifier	emci	EMC9135	980400	Mar. 29, 2020
3	MXE EMI Receiver	Keysight	N9038A	MY57150106	Mar. 29, 2020
4	Test Cable	emci	EMC104-SM-SM-7 000	170330	Apr. 17, 2020
5	Test Cable	emci	EMC104-SM-SM-1 000	170331	Apr. 17, 2020
6	Test Cable	emci	EMC104-SM-NM-3 500	170621	Apr. 17, 2020
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

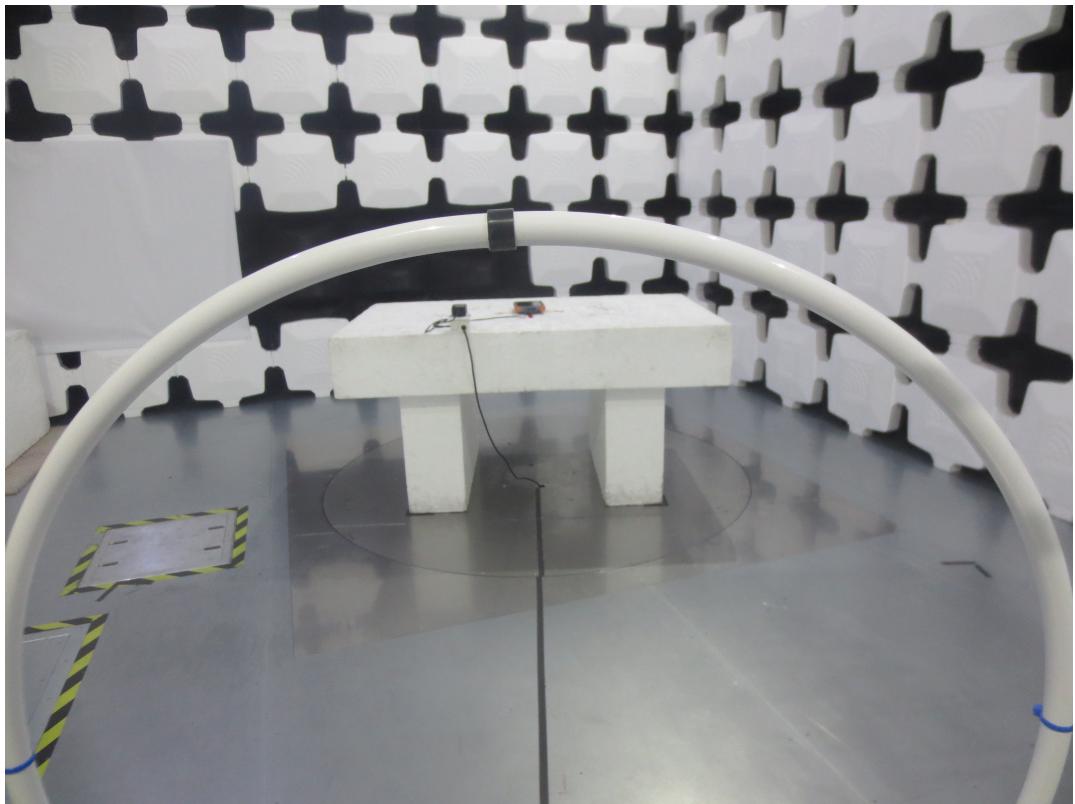
<b>Frequency Stability</b>					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100626	Mar. 29, 2020
2	Temperature And Humidity Box	Blue pand	BPHS-120B	170616454	Sep. 01, 2020

<b>Bandwidth Measurement</b>					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100626	Mar. 29, 2020

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

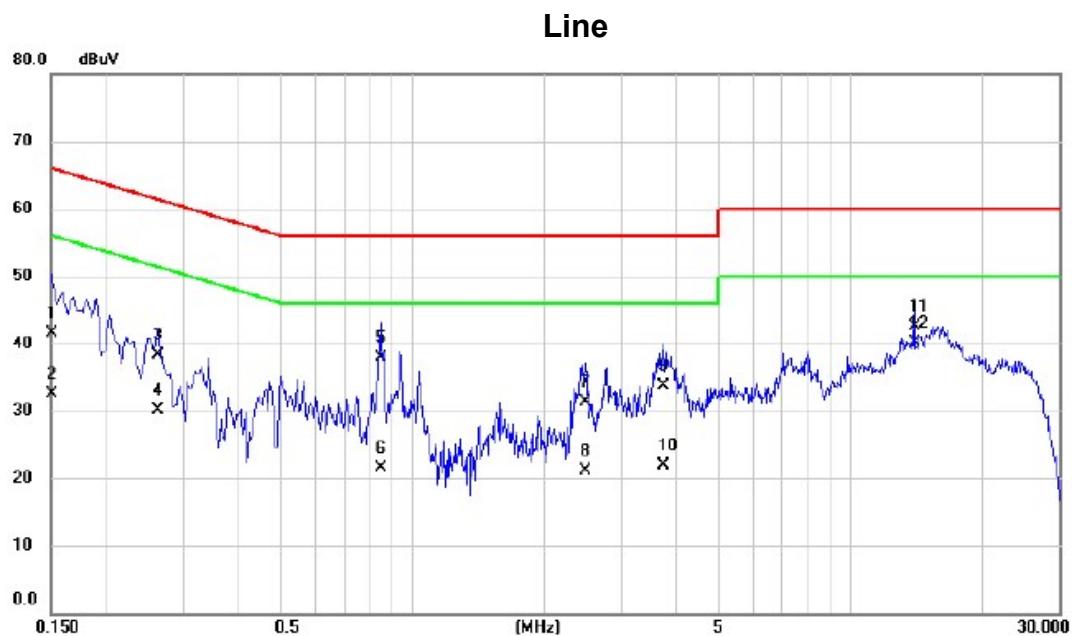
**7. EUT TEST PHOTO****Conducted Measurement Photos**

**Radiated Measurement Photos****9 kHz to 30 MHz**

**Radiated Measurement Photos****30 MHz to 1000 MHz**

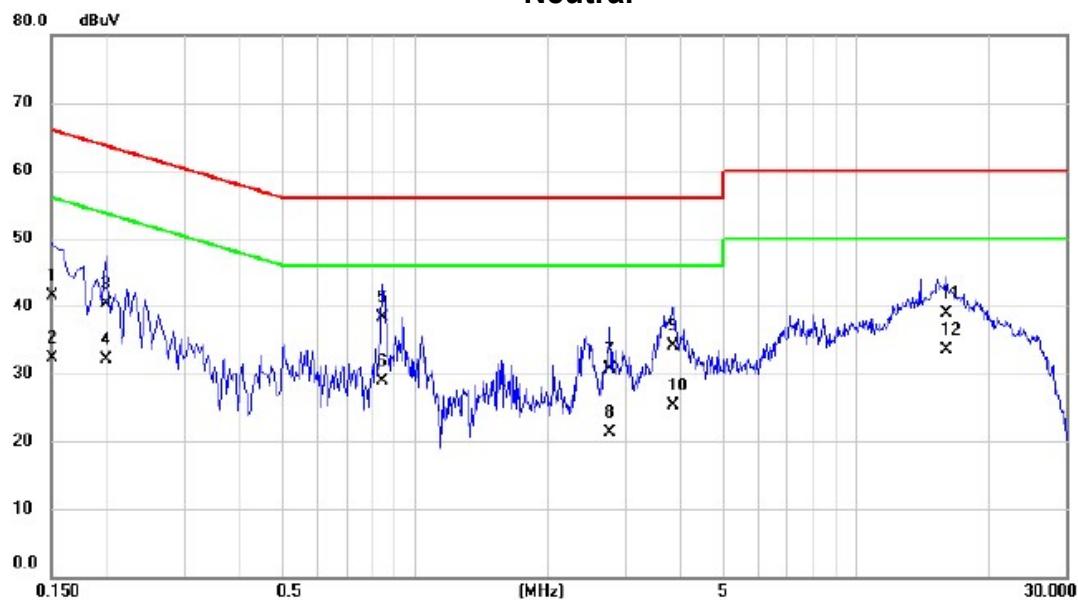
## APPENDIX A - CONDUCTED EMISSION

Test Mode: TX Mode



No.	Mk.	Freq. MHz	Reading Level	Correct Factor	Measure- ment	Limit	Margin	Detector	Comment
			dBuV	dB	dBuV	dB			
1		0.1500	31.80	9.76	41.56	66.00	-24.44	QP	
2		0.1500	22.70	9.76	32.46	56.00	-23.54	AVG	
3		0.2625	28.40	9.85	38.25	61.35	-23.10	QP	
4		0.2625	20.30	9.85	30.15	51.35	-21.20	AVG	
5		0.8475	28.00	9.82	37.82	56.00	-18.18	QP	
6		0.8475	11.70	9.82	21.52	46.00	-24.48	AVG	
7		2.4855	21.30	9.96	31.26	56.00	-24.74	QP	
8		2.4855	11.10	9.96	21.06	46.00	-24.94	AVG	
9		3.7500	23.70	10.03	33.73	56.00	-22.27	QP	
10		3.7500	11.90	10.03	21.93	46.00	-24.07	AVG	
11		14.0010	32.50	10.09	42.59	60.00	-17.41	QP	
12 *		14.0010	30.10	10.09	40.19	50.00	-9.81	AVG	

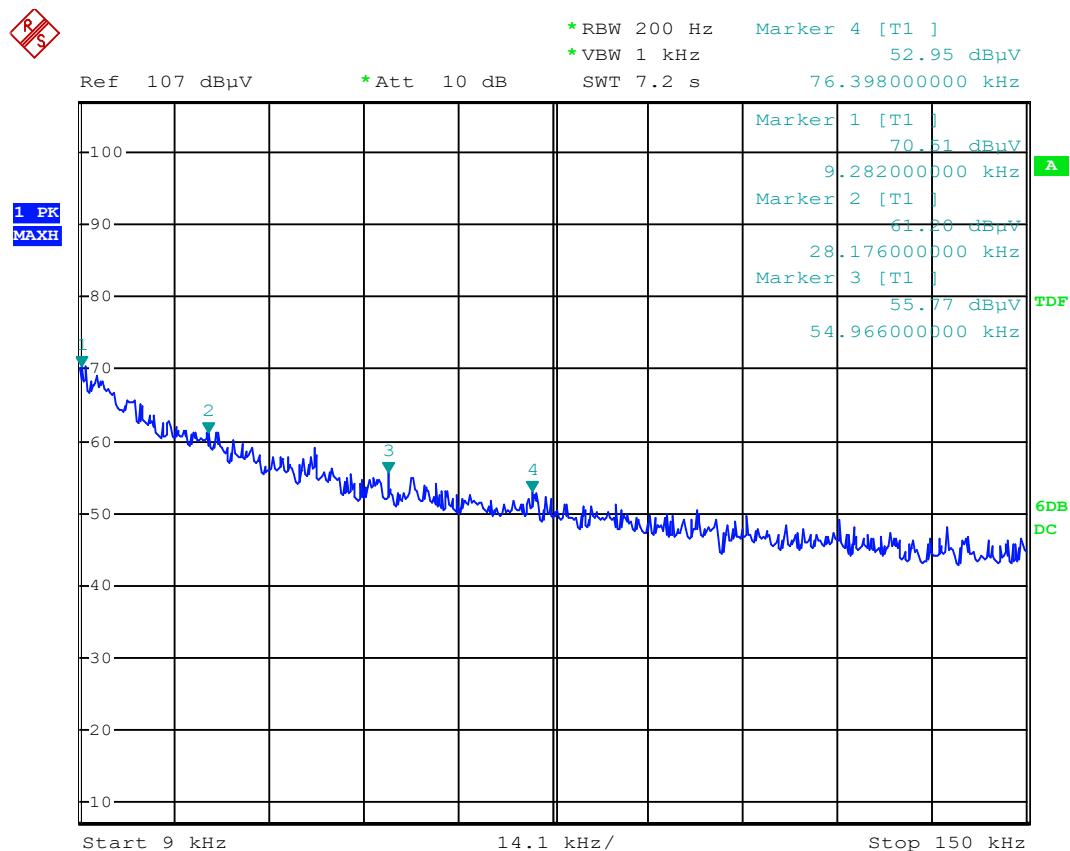
Test Mode: TX Mode

**Neutral**

No.	Mk.	Freq. MHz	Reading Level	Correct Factor	Measure- ment	Limit	Margin	Detector	Comment
			dBuV	dB	dBuV	dB			
1		0.1500	31.80	9.63	41.43	66.00	-24.57	QP	
2		0.1500	22.70	9.63	32.33	56.00	-23.67	AVG	
3		0.1995	30.70	9.66	40.36	63.63	-23.27	QP	
4		0.1995	22.50	9.66	32.16	53.63	-21.47	AVG	
5		0.8430	28.50	9.77	38.27	56.00	-17.73	QP	
6		0.8430	19.10	9.77	28.87	46.00	-17.13	AVG	
7		2.7690	20.70	10.01	30.71	56.00	-25.29	QP	
8		2.7690	11.30	10.01	21.31	46.00	-24.69	AVG	
9		3.8445	24.10	10.02	34.12	56.00	-21.88	QP	
10		3.8445	15.30	10.02	25.32	46.00	-20.68	AVG	
11		16.0800	28.80	10.11	38.91	60.00	-21.09	QP	
12 *		16.0800	23.30	10.11	33.41	50.00	-16.59	AVG	

**APPENDIX B - RADIATED EMISSION (9 KHZ TO 30 MHZ)**

Test Mode:	TX Mode
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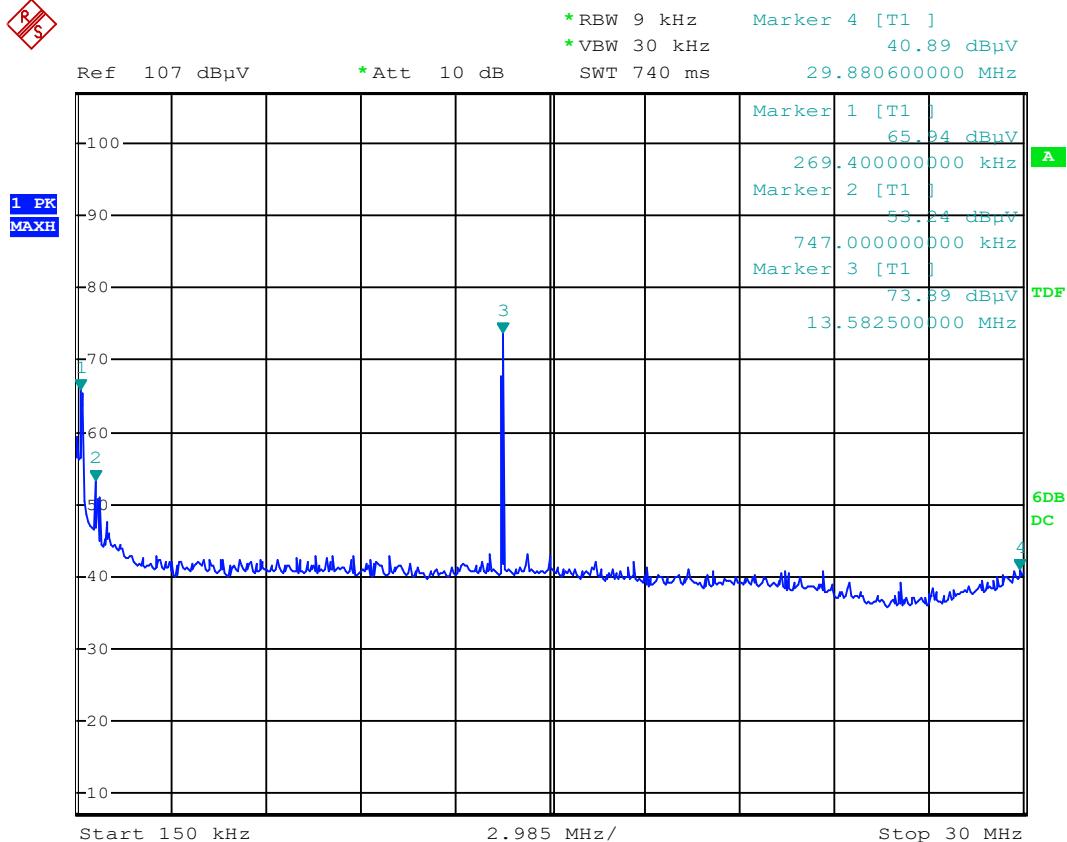


Date: 19.NOV.2019 22:31:22

Frequency (MHz)	Correct Amplitude (dB $\mu$ V/m)@3m	Detector PK/QP/AV	Limit (dB $\mu$ V/m)@3m	Margin(dB)
0.009	70.51	PK	128.52	58.01
0.028	61.20	PK	118.66	57.46
0.055	55.77	PK	112.80	57.03
0.076	52.95	PK	109.99	57.04

Test Mode:	TX Mode
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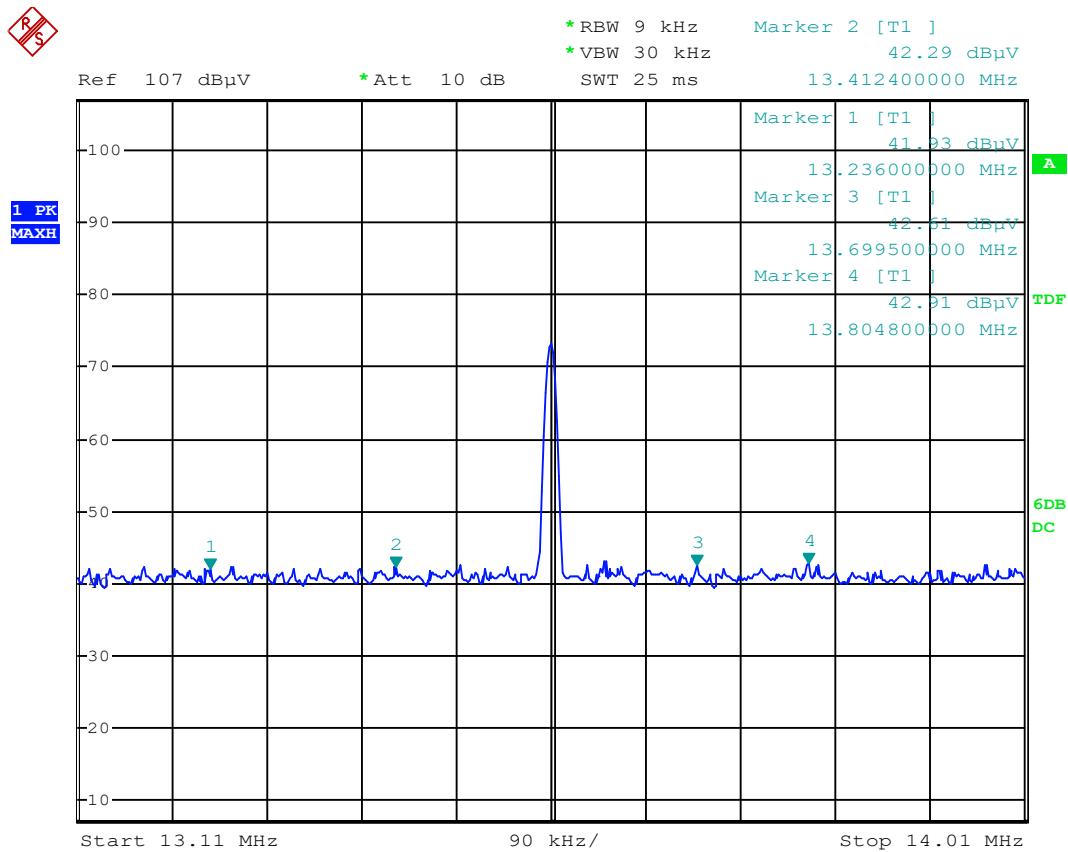
RS



Date: 19.NOV.2019 22:35:51

Frequency (MHz)	Correct Amplitude (dB $\mu$ V/m)@3m	Detector PK/QP/AV	Limit (dB $\mu$ V/m)@3m	Margin(dB)
0.27	65.94	PK	98.98	33.04
0.75	53.24	PK	70.10	16.86
13.56	73.89	PK	124.00	50.11
29.88	40.89	PK	69.54	28.65

Test Mode: TX Mode



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Frequency (MHz)	Correct Amplitude (dB $\mu$ V/m)@3m	Detector PK/QP/AV	Limit (dB $\mu$ V/m)@3m	Margin(dB)
13.24	41.93	PK	80.51	38.58
13.41	42.29	PK	90.47	48.18
13.70	42.61	PK	90.47	47.86
13.80	42.91	PK	80.51	37.60

**APPENDIX C - RADIATED EMISSION (30 MHZ TO 1000 MHZ)**

Test Mode: TX Mode

**Vertical**

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB	Margin Detector	Comment
1	*	39.7000	53.05	-16.23	36.82	40.00	-3.18	QP
2	!	59.5850	54.00	-17.56	36.44	40.00	-3.56	QP
3		88.2000	54.21	-20.44	33.77	43.50	-9.73	QP
4		283.6550	44.98	-15.00	29.98	46.00	-16.02	peak
5		605.6950	34.48	-8.64	25.84	46.00	-20.16	peak
6		941.3150	39.08	-5.19	33.89	46.00	-12.11	peak

Test Mode: TX Mode

**Horizontal**

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dB	Limit dBuV/m	Margin dBuV/m	Detector	Comment
1		85.7750	50.21	-20.39	29.82	40.00	-10.18	peak	
2		143.9750	49.95	-15.34	34.61	43.50	-8.89	peak	
3	*	283.6550	55.05	-15.00	40.05	46.00	-5.95	peak	
4		604.7250	34.09	-8.64	25.45	46.00	-20.55	peak	
5		893.3000	36.28	-5.49	30.79	46.00	-15.21	peak	
6		938.4050	37.53	-5.20	32.33	46.00	-13.67	peak	

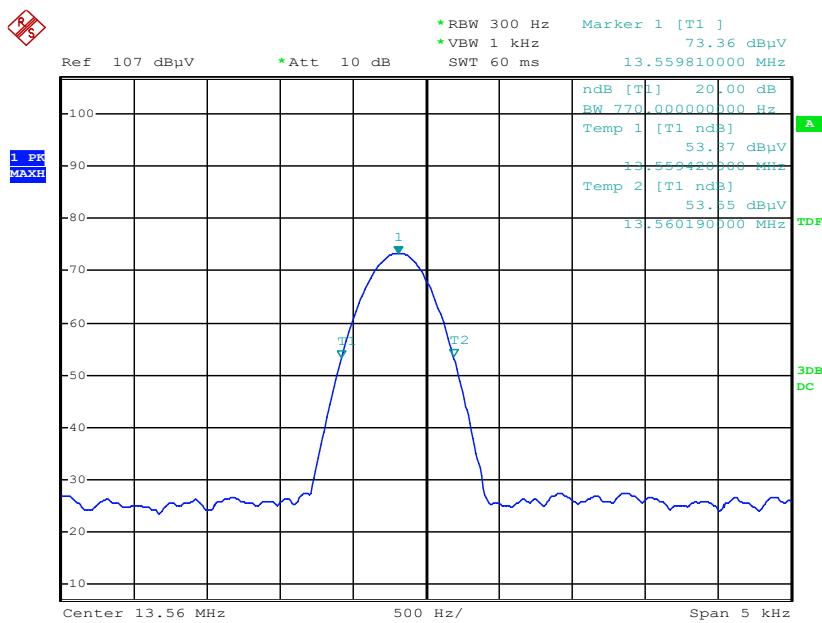
## **APPENDIX D - FREQUENCY STABILITY**

Power Supply(V <sub>DC</sub> )	Temperature (°C )	Measured Frequency (MHz)	Frequency Error(%)	Limit
7.2	-20	13.55959	-0.003	±0.01%
	-10	13.55981	-0.001	±0.01%
	0	13.55973	-0.002	±0.01%
	10	13.55978	-0.002	±0.01%
	30	13.55976	-0.002	±0.01%
	40	13.55959	-0.003	±0.01%
	50	13.55973	-0.002	±0.01%
6.12	20	13.55991	-0.001	±0.01%
8.28	20	13.55991	-0.001	±0.01%

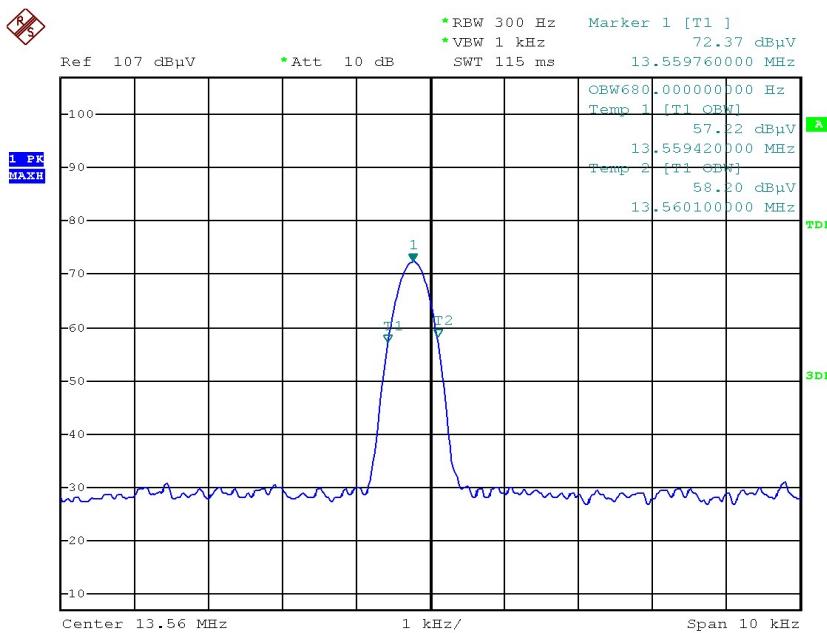
**APPENDIX E - 20DB SPECTRUM BANDWIDTH MEASUREMENT**

Test Mode: TX Mode

Frequency (MHz)	20 dB Bandwidth (KHz)	99% Occupied BW (KHz)	Test Result
13.56	0.77	0.68	Pass



Date: 19.NOV.2019 22:44:52



Date: 22.NOV.2019 08:53:17

**End of Test Report**