

**Shenzhen Global Test Service Co.,Ltd.**

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

FCC PART 90 TEST REPORT**FCC PART 90****Report Reference No. : GTS20181224005-1-20****FCC ID. : 2AU3C-B1**

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Date of issue : Nov.21,2019

Representative Laboratory Name.: Shenzhen Global Test Service Co.,Ltd.

Address : No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong,China

Applicant's name..... : RFinder.LLC

Address : 455 sunrise highway West Islip New York 11795 USA.

Test specificationStandard : **FCC Part 90**

TRF Originator..... : Shenzhen Global Test Service Co.,Ltd.

Master TRF : Dated 2014-12

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Test item description

Trade Mark : N/A

Manufacturer : Shenzhen Tinfull Technology Co.,Ltd.

Model/Type reference : B1

List Model : N/A

Modulation Type..... : FM for Analog Voice
FSK for Digital Voice

Operation Frequency : VHF:136MHz to 174 MHz;UHF:400MHz to 470MHz

Hardware Version : DT863-MB-V0.4

Software Version..... : N/A

Rating : DC 7.6V by Battery
Recharged by DC 8.7V/1.8A AdapterResult : **PASS**

TEST REPORT

Test Report No. : GTS20181224005-1-20	Nov.21,2019 Date of issue
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Equipment under Test : RFinder B1

Model /Type : B1

List Model : N/A

Applicant : **RFinder.LLC**

Address : 455 sunrise highway West Islip New York 11795 USA.

Manufacturer : **Shenzhen Tinfull Technology Co.,Ltd.**

Address : Floor 6&8, C1 Plant, changfang Industrial Park, julong mountain No.3
road, dagongyeyuan, longtian street, Pingshan District, Shenzhen,
China.

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 90](#): Private Land Mobile Radio Service.

[FCC Rules Part .2 Subpart J](#):EQUIPMENT AUTHORIZATION PROCEDURES.

[TIA 603-D: 2010](#):Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Oct. 28, 2019
Testing commenced on	:	Nov.01,2019
Testing concluded on	:	Nov.21,2019

2.2. Product Description

Product Name	RFinder B1
Trade Mark	N/A
Model/Type reference	B1
List Model	N/A
Model Declaration	N/A
Power supply:	DC 7.6V by Battery Recharged by DC 8.7V/1.8A Adapter
2G	
Support Band	GSM850/PCS1900/GPRS850/GPRS1900/EDGE850/EDGE1900
Release Version	R99
GPRS Class	Class 12
EGPRS Class	Class 12
GSM/EDGE/GPRS Power Class	GSM850:Power Class 4/ PCS1900:Power Class 1
GPRS/EDGE Multislot Class	GPRS/EDGE: Multi-slot Class 12
Type Of Modulation	GMSK for GSM/GPRS; GMSK/8PSK for EGPRS
Antenna Description	PIFA Antenna; -5.0dBi (max.) For GSM 850; -3.0dBi (max.) For DCS 1900;
3G	
UMTS Operation Frequency Band	UMTS FDD Band II/V
WCDMA Release Version	R6
HSDPA Release Version	Release 6
HSUPA Release Version	Release 6
Modulation Type	QPSK for UMTS
Antenna Description	PIFA Antenna; -3.0dBi (max.) For WCDMA Band II; -5.0dBi (max.) For WCDMA Band V
LTE	
LTE Operation Frequency Band	LTE Band 2, 4, 5, 7,12,17, 26, 38, 41
LTE Release Version	R9
Type Of Modulation	QPSK/16QAM
Antenna Description	PIFA Antenna; -3.0dBi (max.) For Band 2;-3.0dBi (max.) For Band 4;

	-5.0dBi (max.) For Band 5;-3.0dBi (max.) For Band 7; -5.0dBi (max.) For Band 12;-5.0dBi (max.) For Band 17; -3.0dBi (max.) For Band 26;-3.0dBi (max.) For Band 38 -3.0dBi (max.) For Band 41
Bluetooth	
Frequency Range	2402MHz ~ 2480MHz
Channel Number	79 channels for Bluetooth V4.0 (BDR/EDR) 40 channels for Bluetooth V4.0 (BT LE)
Channel Spacing	1MHz for Bluetooth V4.0 (BDR/EDR) 2MHz for Bluetooth V4.0 (BT LE)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8-DPSK for Bluetooth V4.0 (BDR/EDR) GFSK for Bluetooth V4.0 (BT LE)
Bluetooth Version	V4.0
Antenna Description	PIFA Antenna, -1.2dBi (Max.)
WIFI(2.4G Band)	
Frequency Range	2412MHz ~ 2462MHz
Channel Spacing	5MHz
Channel Number	11 Channel for 20MHz bandwidth(2412~2462MHz) 7 channels for 40MHz bandwidth(2422~2452MHz)
Modulation Type	802.11b: DSSS; 802.11g/n: OFDM
Antenna Description	PIFA Antenna, -1.2dBi (Max.)
WIFI(5.2G Band)	
Frequency Range	5180MHz ~ 5240MHz
Channel Number	4 channels for 20MHz bandwidth(5180-5240MHz) 2 channels for 40MHz bandwidth(5190~5230MHz)
Modulation Type	802.11a/n/ac: OFDM
Antenna Description	PIFA Antenna, -1.4dBi (Max.)
WIFI (5.8G Band)	
Frequency Range	5745MHz ~ 5825MHz
Channel Number	5 channels for 20MHz bandwidth(5745-5825MHz) 2 channels for 40MHz bandwidth(5755~5795MHz)
Modulation Type	802.11a/n/ac: OFDM
Antenna Description	PIFA Antenna, -1.4dBi (Max.)
PMR	
Frequency Range	VHF:136MHz to 174 MHz;UHF:400MHz to 470MHz
Channel Separation	Analog Voice 12.5KHz Digital Voice 12.5KHz
Modulation Type	FM for Analog Voice FSK for Digital Voice
Channel Bandwidth	12.5 KHz
Rate Power	4W/2W
Antenna Description	External Antenna, 1.8dBi (Max.)
RFID(13.56MHz)	
Frequency Range	13.56MHz
Channel Number	1
Modulation Type	ASK

Antenna Description	PIFA Antenna, -1.20dBi (Max.)
GPS Receiver	Support and only RX

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	☐ 230V / 50 Hz	☐ 120V / 60Hz
		☐ 12 V DC	☐ 24 V DC
		☒ Other (specified in blank below)	

DC 7.6V form battery

2.4. Short description of the Equipment under Test (EUT)

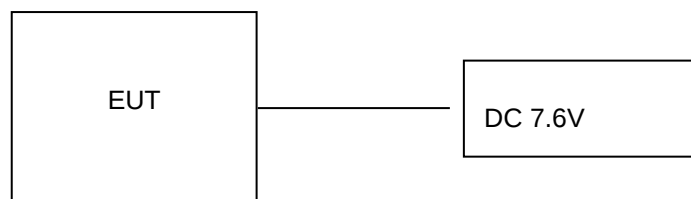
This is a RFinder B1

For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

Modulation Type	Channel Separation	Test Channel	Test Frequency (MHz)
			TX
Digital/FSK	12.5KHz	Ch1	136.0125
		Ch2	155.7525
		Ch3	173.9875
Digital/FSK	12.5KHz	Ch4	400.0125
		Ch5	453.2125
		Ch6	469.9875

2.6. Block Diagram of Test Setup



2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AU3C-B1** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8. Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
ShenZhen Tinfull Technology Co.,Ltd	Adapter	STK018-08718T	--	SDOC

2.9. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong, China, China.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS (No. CNAS L8169)

Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)

Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Summary of measurement results

FCC Rules	Description of Test	Results
§2.1093	RF Exposure	Compliance
§2.1046; §90.205	RF Output Power	Compliance
§2.1047; §90.207	Modulation Characteristic	Compliance
§2.1049; §90.210	Occupied Bandwidth & Emission Mask	Compliance
§2.1051; §90.210	Spurious Emission at Antenna Terminal	Compliance
§2.1053; §90.210	Spurious Radiated Emissions	Compliance
§2.1055; §90.213	Frequency Stability	Compliance
§90.214	Transient Frequency Behavior	Compliance

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Global Test Service Co.,Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

3.6. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2019/09/20	2020/09/19
LISN	R&S	ESH2-Z5	893606/008	2019/09/20	2020/09/19
EMI Test Receiver	R&S	ESPI3	101841-cd	2019/09/20	2020/09/19
EMI Test Receiver	R&S	ESCI7	101102	2019/09/20	2020/09/19
Spectrum Analyzer	Agilent	N9020A	MY48010425	2019/09/20	2020/09/19
Spectrum Analyzer	R&S	FSV40	100019	2019/09/20	2020/09/19
Vector Signal generator	Agilent	N5181A	MY49060502	2019/09/20	2020/09/19
Signal generator	Agilent	E4421B	3610AO1069	2019/09/20	2020/09/19
Climate Chamber	ESPEC	EL-10KA	A20120523	2019/09/20	2020/09/19
Controller	EM Electronics	Controller EM 1000	N/A	N/A	N/A
Horn Antenna	Schwarzbeck	BBHA 9120D	01622	2019/09/23	2020/09/22
Active Loop Antenna	Beijing Da Ze Technology Co.,Ltd.	ZN30900C	15006	2019/10/12	2020/10/11
Bilog Antenna	Schwarzbeck	VULB9163	000976	2019/05/26	2020/05/25
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2019/09/20	2020/09/19
Amplifier	Schwarzbeck	BBV 9743	#202	2019/09/20	2020/09/19
Amplifier	Schwarzbeck	BBV9179	9719-025	2019/09/20	2020/09/19
Amplifier	EMCI	EMC051845B	980355	2019/09/20	2020/09/19
Temperature/Humidity Meter	Gangxing	CTH-608	02	2019/09/20	2020/09/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	KL142031	2019/09/20	2020/09/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	KL142032	2019/09/20	2020/09/19
RF Cable(below 1GHz)	HUBER+SUHNER	RG214	RE01	2019/09/20	2020/09/19
RF Cable(above 1GHz)	HUBER+SUHNER	RG214	RE02	2019/09/20	2020/09/19
Data acquisition card	Agilent	U2531A	TW53323507	2019/09/20	2020/09/19
Power Sensor	Agilent	U2021XA	MY5365004	2019/09/20	2020/09/19
Test Control Unit	Tonscend	JS0806-1	178060067	2019/06/20	2020/06/19
Automated filter bank	Tonscend	JS0806-F	19F8060177	2019/06/20	2020/06/19
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2019/09/20	2020/09/19
EMI Test Software	Tonscend	JS1120-1	Ver 2.6.8.0518	/	/
EMI Test Software	Tonscend	JS1120-3	Ver 2.5.77.0418	/	/
EMI Test Software	Tonscend	JS32-CE	Ver 2.5	/	/
EMI Test Software	Tonscend	JS32-RE	Ver 2.5.1.8	/	/

Note: The Cal.Interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. FCC §2.1046 & §90.205 - RF OUTPUT POWER

Applicable Standard

FCC §2.1046 and §90.205

Test Procedure

Conducted RF Output Power:

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

Spectrum Analyzer Setting:

R B/W	Video B/W
100 kHz	300 kHz

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

Mode	Frequency Spacing (kHz)	Frequency (MHz)	Power level	Output (dBm)	Output Power(W)
Analog	12.5	136.0125	High	35.85	3.85
			Low	33.02	2.00
		155.7525	High	36.27	4.24
			Low	33.21	2.09
		173.9875	High	36.06	4.04
			Low	33.21	2.09
Digital		136.0125	High	35.98	3.96
			Low	33.20	2.09
		155.7525	High	36.14	4.11
			Low	33.23	2.10
		173.9875	High	36.12	4.09
			Low	33.15	2.07

Mode	Frequency Spacing (kHz)	Frequency (MHz)	Power level	Output (dBm)	Output Power(W)
Analog	12.5	400.0125	High	36.41	4.38
			Low	33.58	2.28
		453.2125	High	36.79	4.78
			Low	33.63	2.31
		469.9875	High	36.59	4.56
			Low	33.47	2.22
Digital		400.0125	High	36.72	4.70
			Low	33.53	2.25
		453.2125	High	36.74	4.72
			Low	33.39	2.18
		469.9875	High	36.58	4.55
			Low	33.27	2.12

Note: For Analog:

Rated high power is 4W, limit is 3.2-4.8W

Rated low power is 2W, limit is 1.6-2.4W

For Digital:

Rated high power is 4W, limit is 3.2-4.8W

Rated low power is 2W, limit is 1.6-2.4W

4.2. FCC §2.1047 & §90.207 - MODULATION CHARACTERISTIC

Applicable Standard

FCC§2.1047 and §90.207:

- (a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
- (b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

Test Procedure

Test Method: TIA/EIA-603-D

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

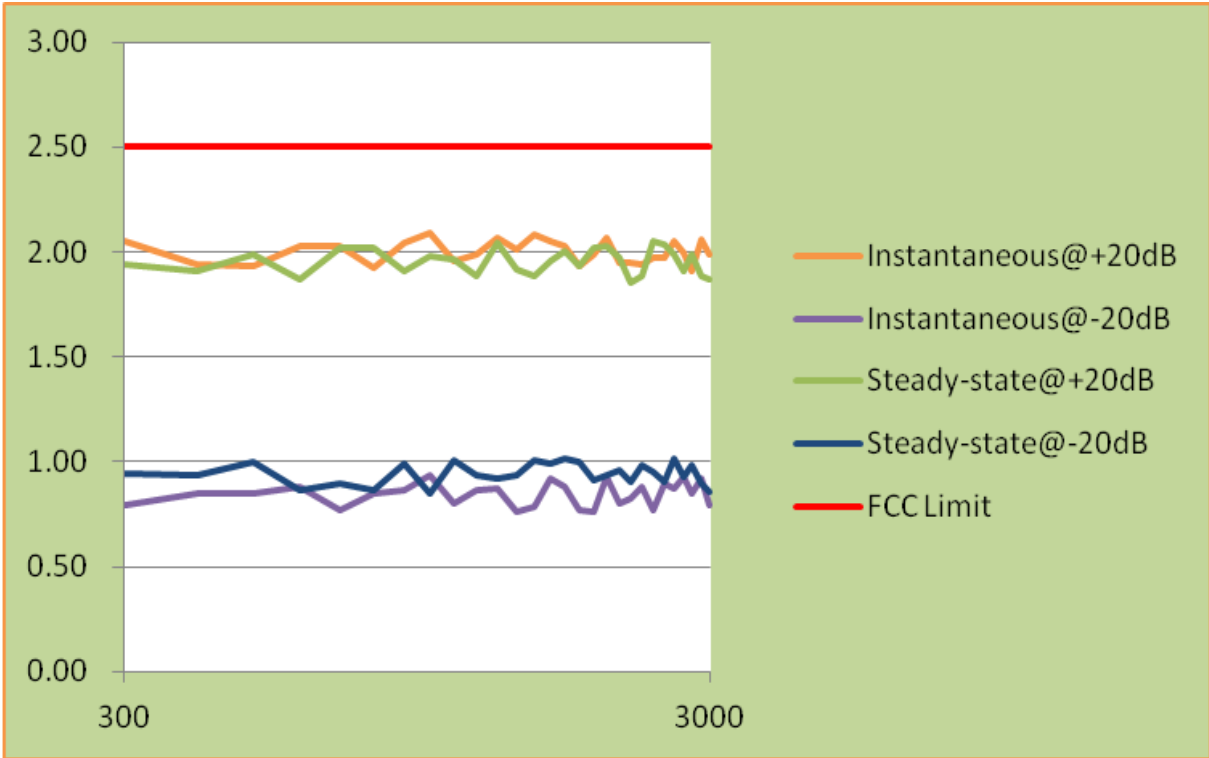
Please refer to the following tables and plots.

Analog Modulation:

MODULATION LIMITING

Carrier Frequency: 155.7525 MHz, Channel Separation=12.5 kHz

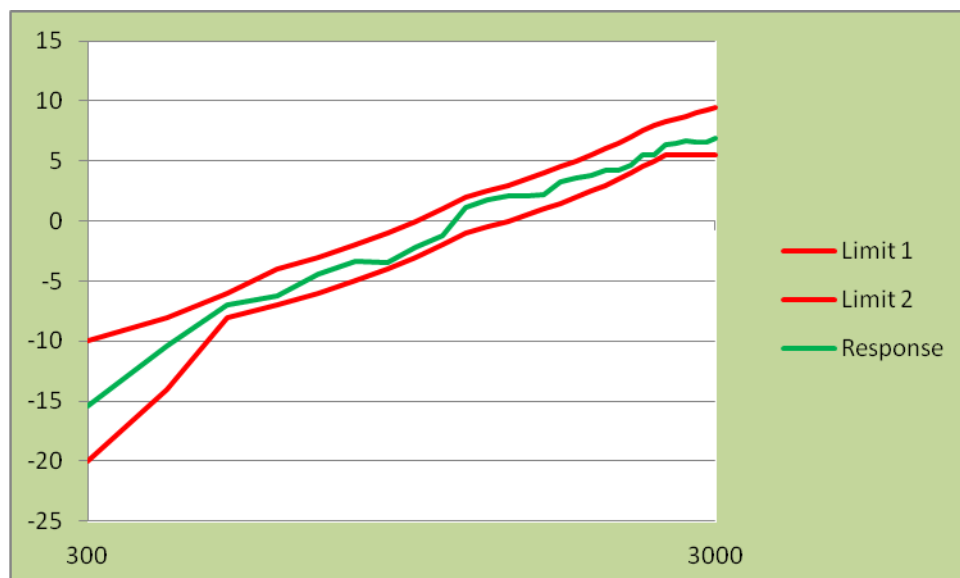
Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	2.05	0.80	1.94	0.94	2.50
400	1.94	0.85	1.91	0.93	2.50
500	1.93	0.85	1.99	1.00	2.50
600	2.03	0.88	1.87	0.87	2.50
700	2.03	0.77	2.02	0.90	2.50
800	1.92	0.85	2.02	0.86	2.50
900	2.04	0.87	1.91	0.99	2.50
1000	2.09	0.93	1.98	0.85	2.50
1200	1.95	0.80	1.96	1.01	2.50
1400	1.99	0.87	1.89	0.93	2.50
1600	2.07	0.88	2.04	0.92	2.50
1800	2.01	0.76	1.92	0.94	2.50
2000	2.08	0.78	1.89	1.00	2.50
2100	2.05	0.92	1.96	0.99	2.50
2200	2.03	0.88	2.00	1.01	2.50
2300	1.93	0.77	1.93	1.00	2.50
2400	1.99	0.76	2.02	0.91	2.50
2500	2.07	0.93	2.03	0.94	2.50
2600	1.95	0.80	1.97	0.96	2.50
2700	1.95	0.82	1.85	0.91	2.50
2800	1.94	0.88	1.89	0.99	2.50
2900	1.97	0.77	2.05	0.95	2.50
3000	1.97	0.90	2.03	0.91	2.50



Audio Frequency Response

Carrier Frequency: 155.7525 MHz, Channel Separation=12.5 kHz

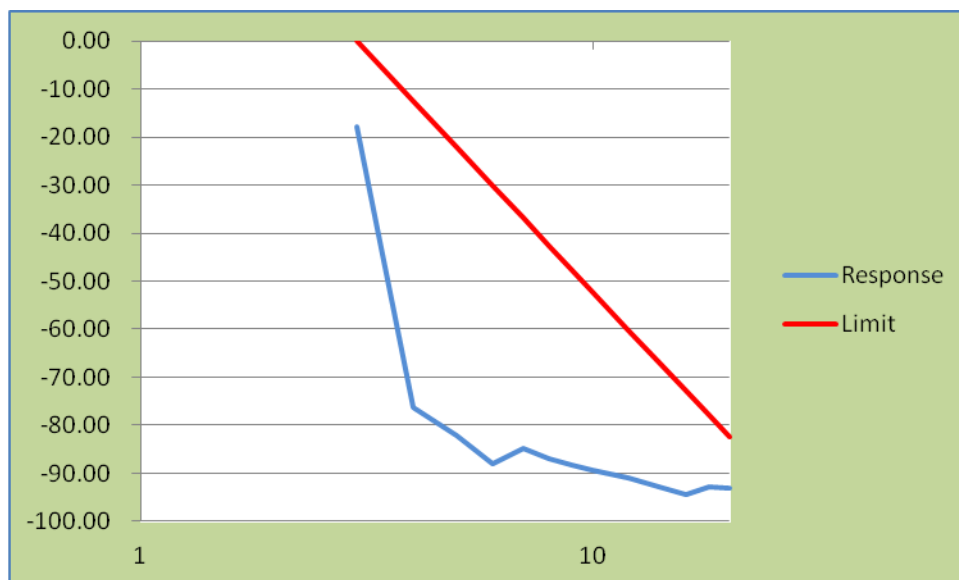
Audio Frequency (Hz)	Response Attenuation (dB)
300	-15.46
400	-10.44
500	-6.98
600	-6.26
700	-4.46
800	-3.37
900	-3.45
1000	-2.20
1100	-1.17
1200	1.13
1300	1.76
1400	2.05
1500	2.12
1600	2.25
1700	3.29
1800	3.61
1900	3.83
2000	4.22
2100	4.21
2200	4.68
2300	5.49
2400	5.56
2500	6.33
2600	6.50
2700	6.71
2800	6.53
2900	6.55
3000	6.87



Audio frequency lows pass filter response

Carrier Frequency: 155.7525 MHz, Channel Separation=12.5 kHz

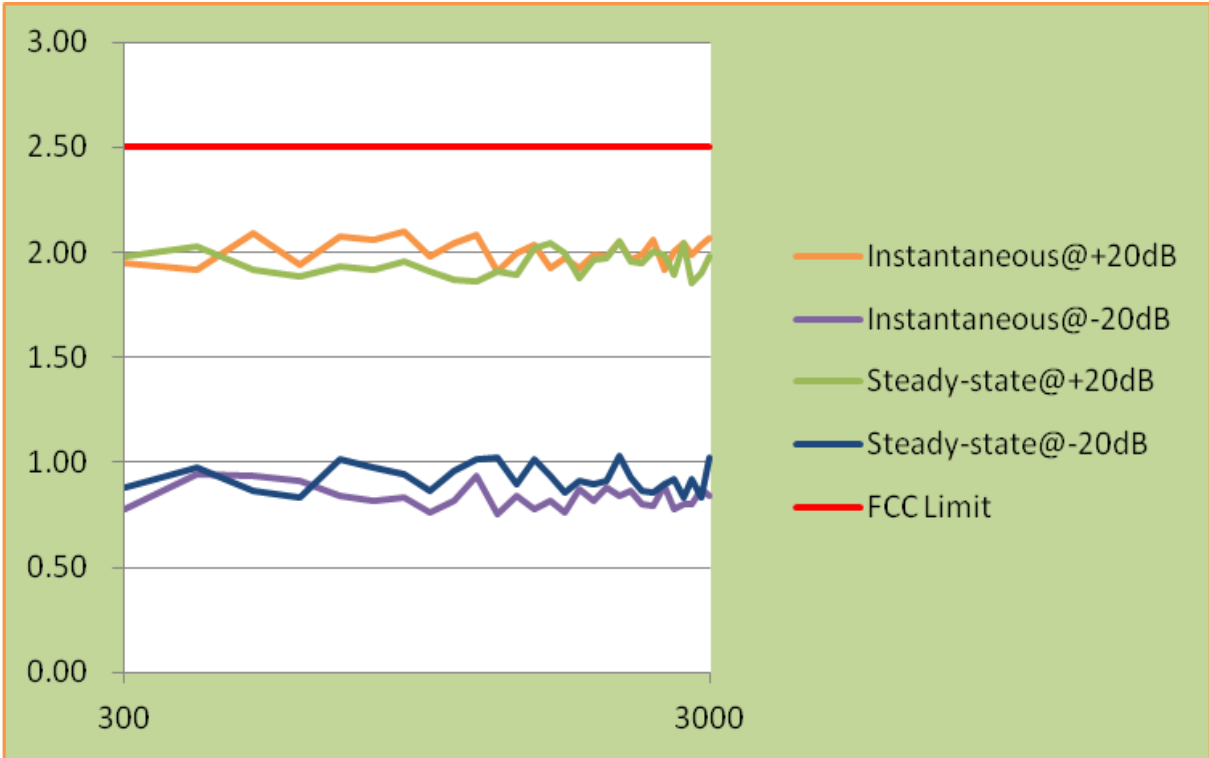
Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1.0	0.00	/
3.0	-17.81	0
4.0	-76.39	-12.5
5.0	-82.16	-22.2
6.0	-88.02	-30.1
7.0	-84.71	-36.8
8.0	-87.05	-42.6
9.0	-88.28	-47.7
10.0	-89.32	-52.3
12.0	-90.87	-60.2
14.0	-92.91	-66.9
16.0	-94.42	-72.7
18.0	-92.81	-77.8
20.0	-93.16	-82.5



MODULATION LIMITING

Carrier Frequency: 453.2125 MHz, Channel Separation=12.5 kHz

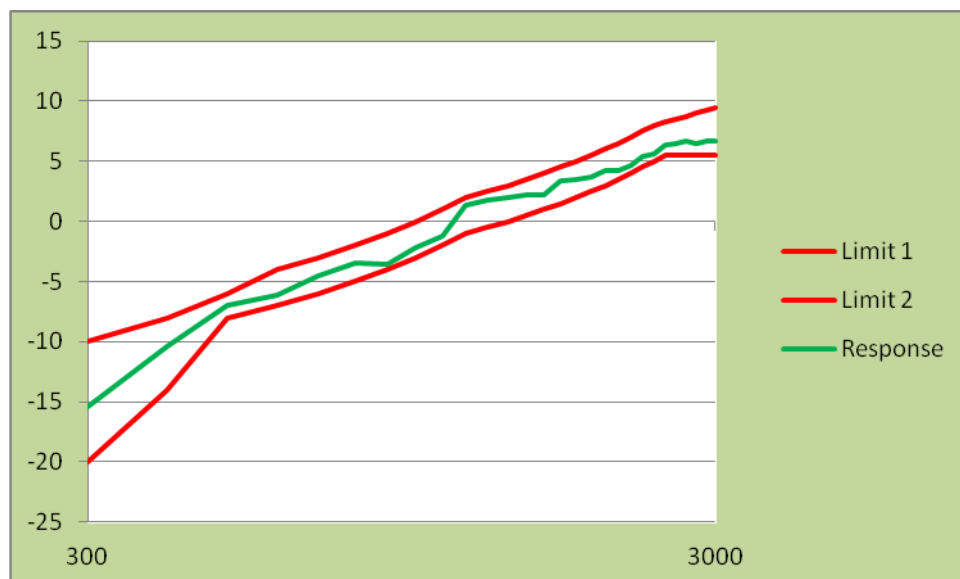
Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	1.95	0.78	1.98	0.88	2.50
400	1.92	0.94	2.03	0.98	2.50
500	2.09	0.93	1.92	0.86	2.50
600	1.94	0.91	1.89	0.84	2.50
700	2.08	0.84	1.93	1.02	2.50
800	2.06	0.82	1.92	0.97	2.50
900	2.10	0.84	1.96	0.95	2.50
1000	1.98	0.76	1.91	0.87	2.50
1200	2.04	0.82	1.87	0.96	2.50
1400	2.08	0.94	1.86	1.02	2.50
1600	1.91	0.75	1.91	1.02	2.50
1800	1.99	0.84	1.89	0.89	2.50
2000	2.03	0.78	2.02	1.01	2.50
2100	1.93	0.82	2.05	0.94	2.50
2200	1.97	0.76	2.00	0.86	2.50
2300	1.93	0.87	1.88	0.91	2.50
2400	1.99	0.81	1.96	0.89	2.50
2500	1.98	0.88	1.97	0.91	2.50
2600	2.05	0.84	2.05	1.03	2.50
2700	1.96	0.86	1.96	0.92	2.50
2800	1.99	0.81	1.95	0.87	2.50
2900	2.06	0.80	2.01	0.85	2.50
3000	1.92	0.89	1.99	0.90	2.50



Audio Frequency Response

Carrier Frequency: 453.2125 MHz, Channel Separation=12.5 kHz

Audio Frequency (Hz)	Response Attenuation (dB)
300	-15.37
400	-10.36
500	-6.94
600	-6.11
700	-4.49
800	-3.47
900	-3.56
1000	-2.16
1100	-1.16
1200	1.31
1300	1.80
1400	1.98
1500	2.16
1600	2.25
1700	3.35
1800	3.50
1900	3.71
2000	4.21
2100	4.25
2200	4.64
2300	5.39
2400	5.65
2500	6.33
2600	6.52
2700	6.64
2800	6.51
2900	6.65
3000	6.71



Audio frequency lows pass filter response

Carrier Frequency: 453.2125 MHz, Channel Separation=12.5 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1.0	0.00	/
3.0	-19.06	0.0
4.0	-76.32	-12.5
5.0	-79.79	-22.2
6.0	-85.23	-30.1
7.0	-83.26	-36.8
8.0	-85.19	-42.6
9.0	-90.65	-47.7
10.0	-88.50	-52.3
12.0	-88.57	-60.2
14.0	-91.49	-66.9
16.0	-91.84	-72.7
18.0	-93.27	-77.8
20.0	-90.20	-82.5



4.3. FCC §2.1049 & §90.210 – OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard

FCC §2.1049 and §90.210

Emission Mask D - 12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- 1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 , 0dB.
- 2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least $7.27 (f_d - 2.88 \text{ kHz})$ dB.
- 3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.

Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 100 Hz and the spectrum was recorded in the frequency band 50 kHz from the carrier frequency.

Test Data

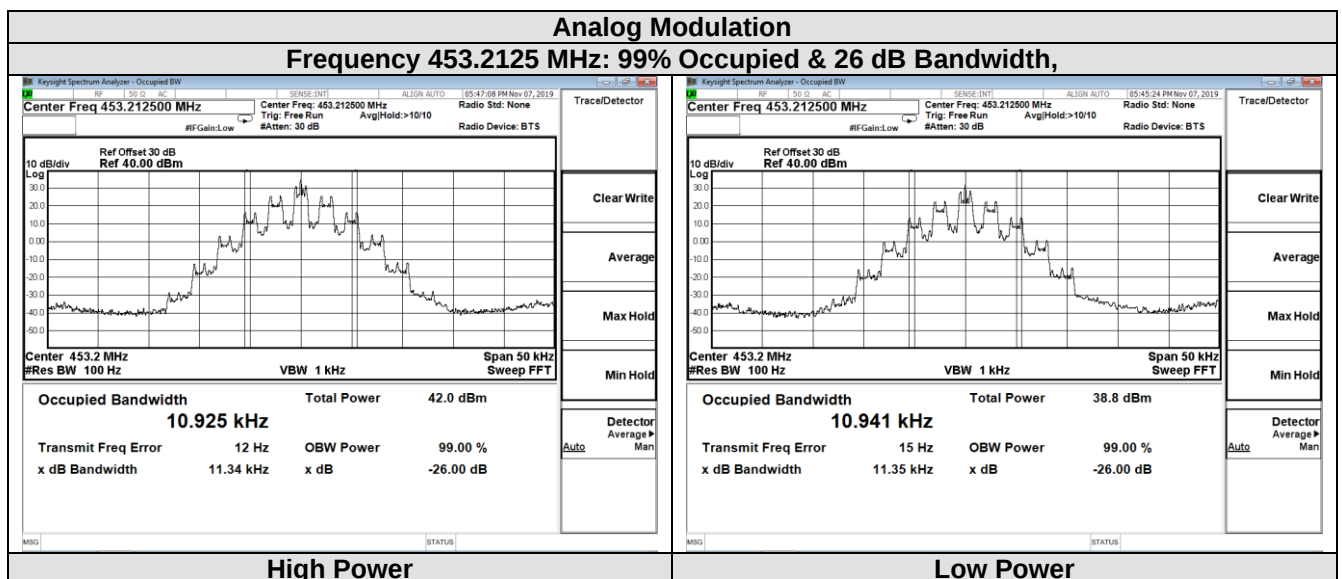
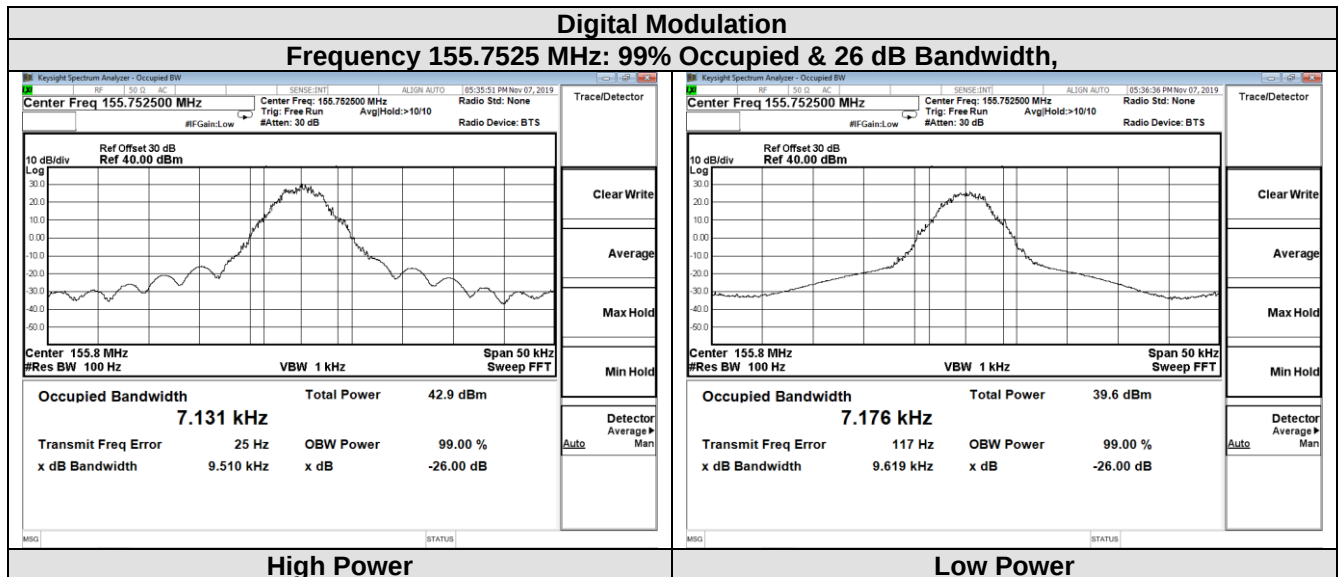
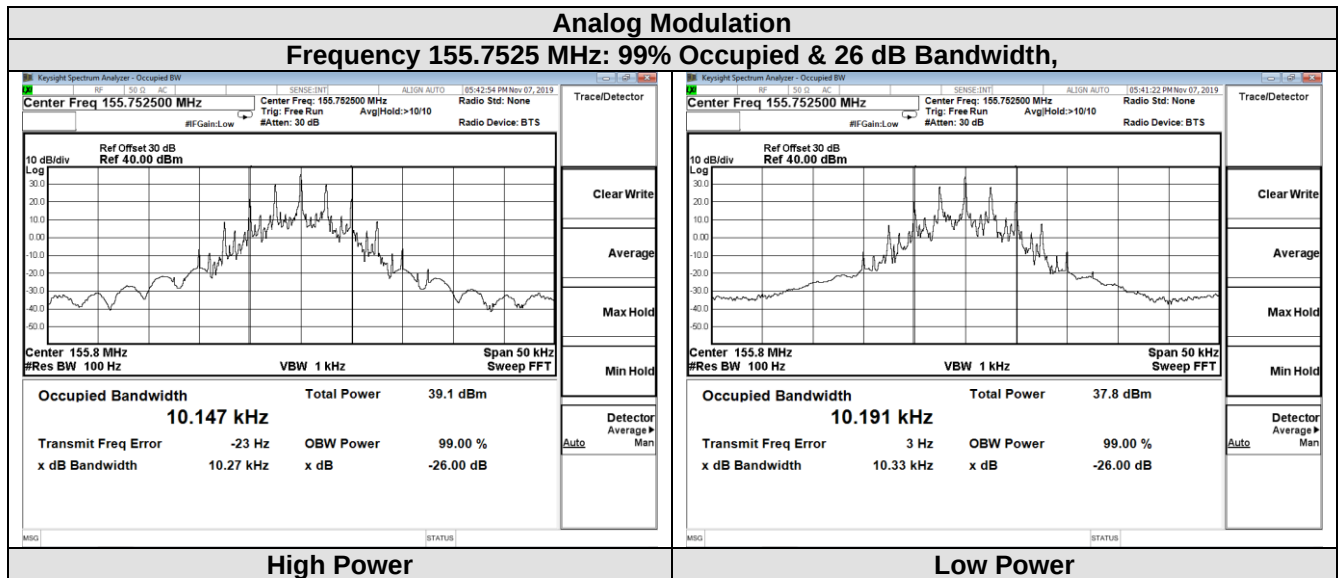
Environmental Conditions

Temperature:	24~27 °C
Relative Humidity:	50~57 %
ATM Pressure:	100.9~101.0 kPa

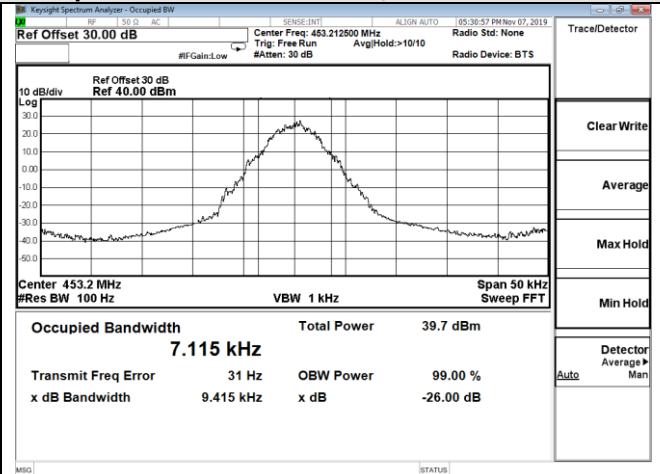
Test mode: transimitting

Modulation	Channel Separation (kHz)	Frequency (MHz)	Power Level	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)
Analog	12.5	155.7525	High	10.147	10.27
	12.5		Low	10.191	10.33
Digital	12.5	155.7525	High	7.131	9.510
	12.5		Low	7.176	9.619

Modulation	Channel Separation (kHz)	Frequency (MHz)	Power Level	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)
Analog	12.5	453.2125	High	10.925	11.34
	12.5		Low	10.941	11.35
Digital	12.5	453.2125	High	7.231	9.487
	12.5		Low	7.115	9.415

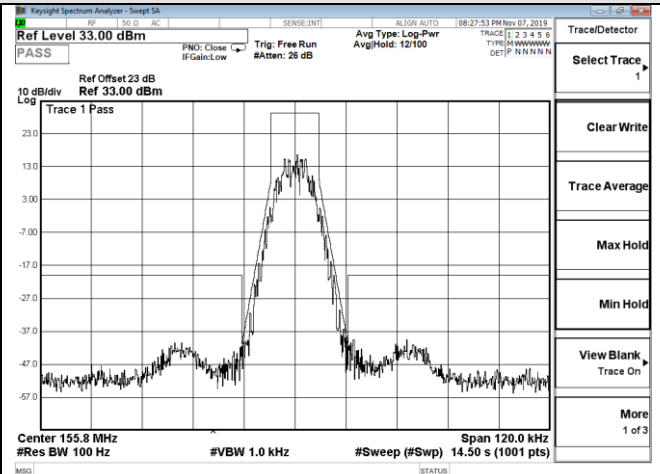


Frequency 453.2125 MHz: 99% Occupied & 26 dB Bandwidth,



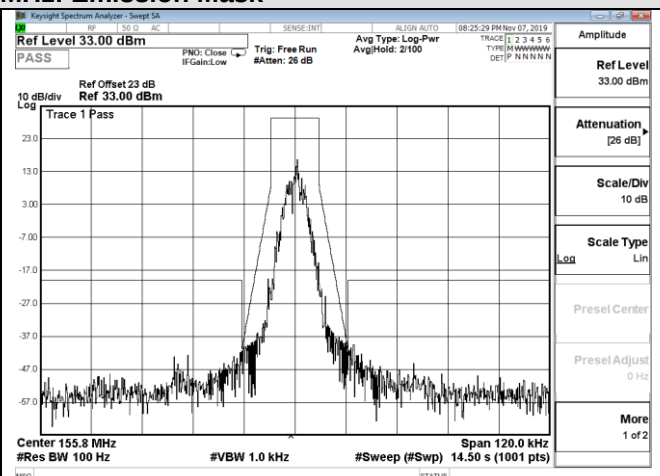
Low Power

Frequency 155.7525 MHz: Emission Mask

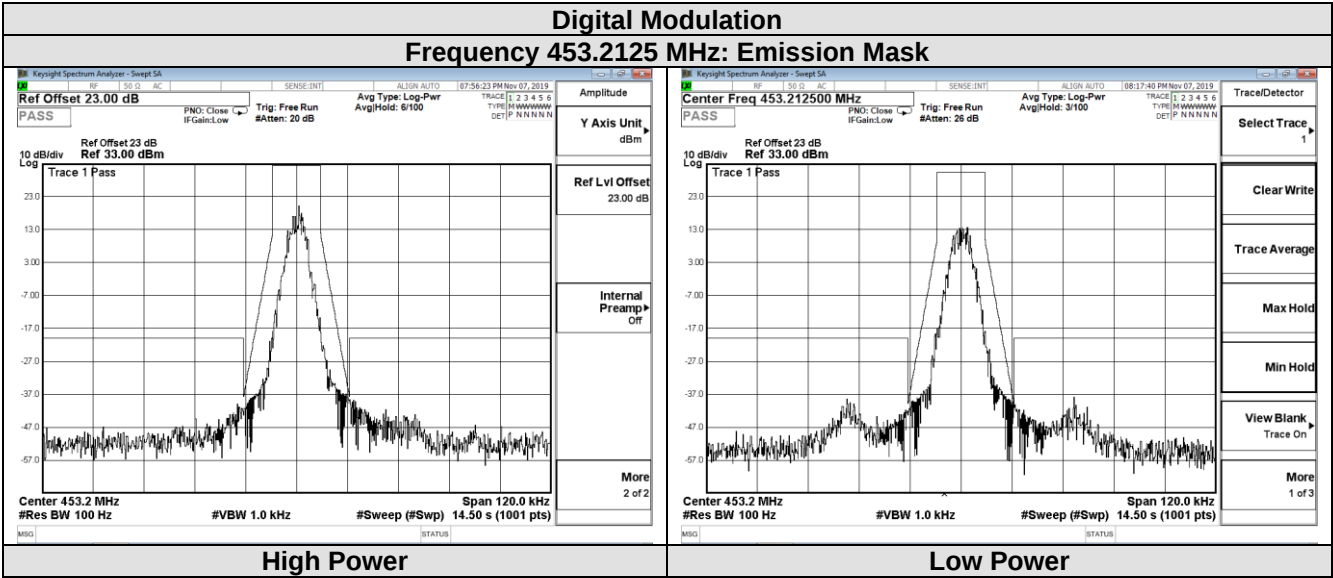
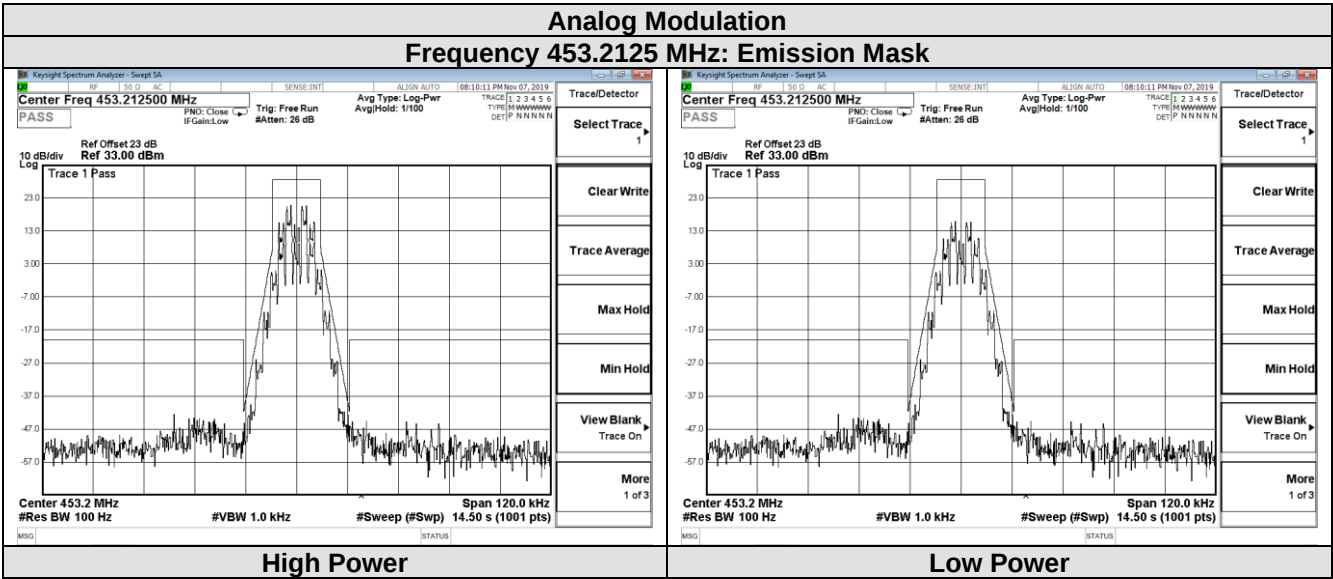


Low Power

Frequency 155.7525 MHz: Emission Mask



Low Power



4.4. FCC §2.1051 & §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- 1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 , 0 dB.
- 2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 ($f_d - 2.88$ kHz) dB.
- 3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.

Test Procedure

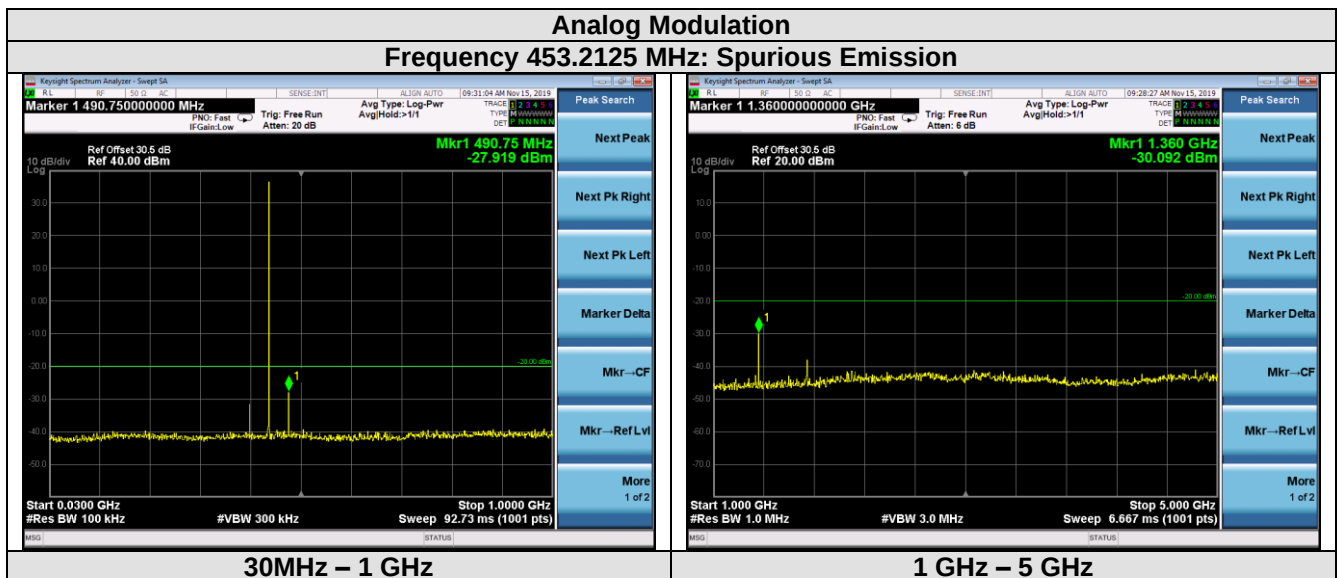
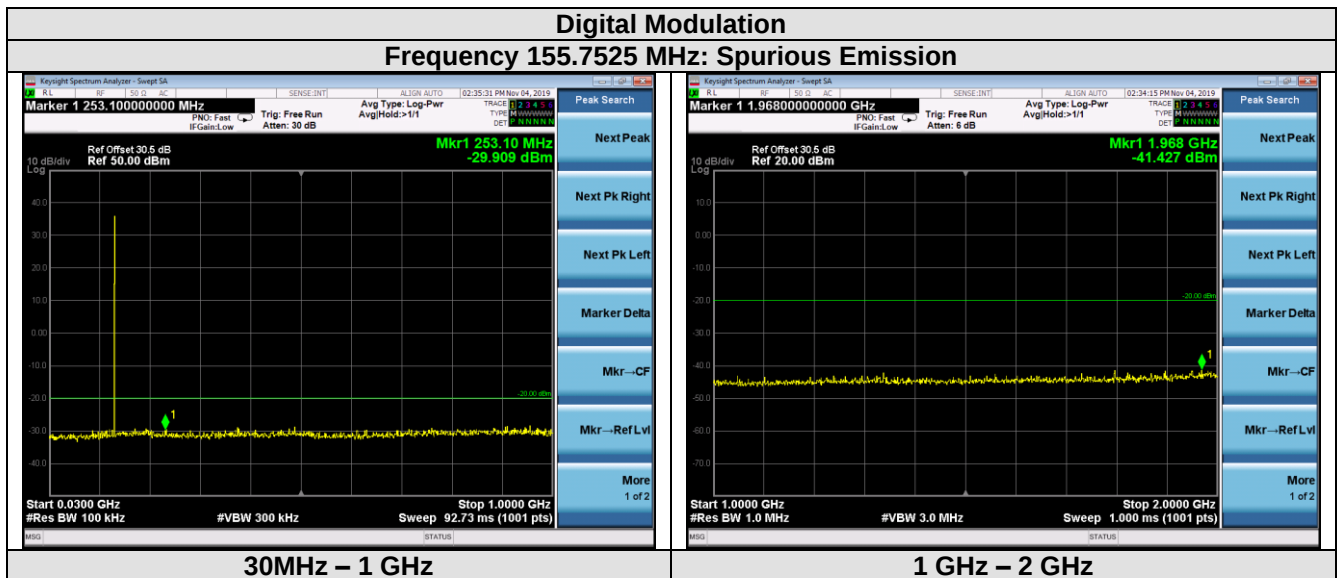
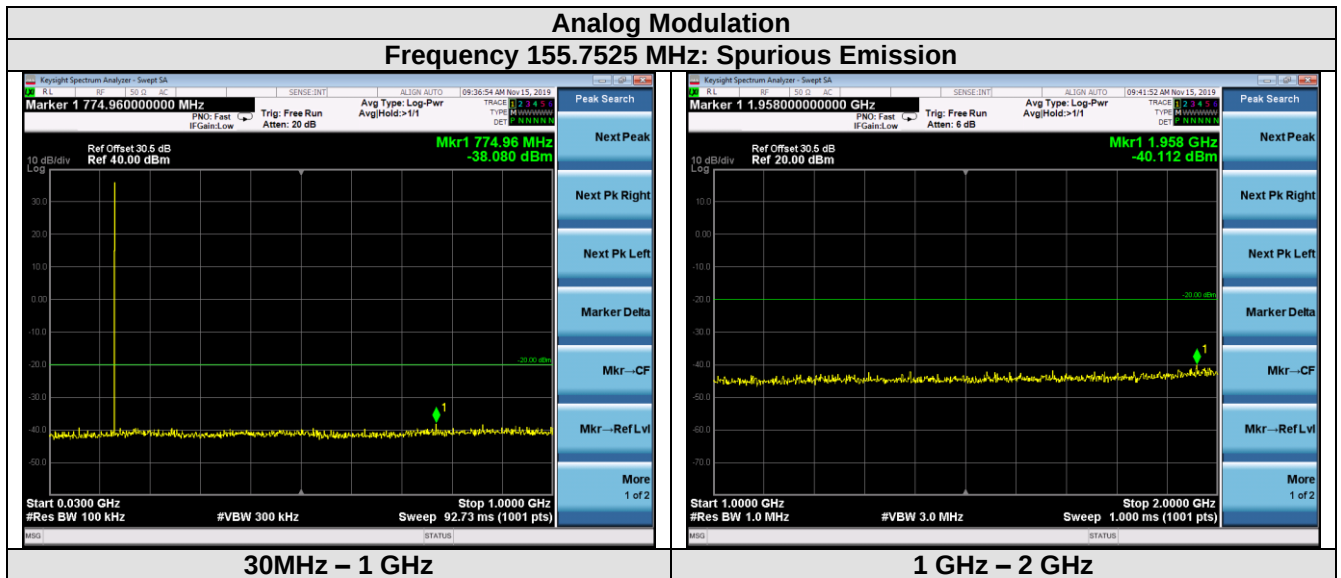
The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100kHz for below 1GHz, and 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

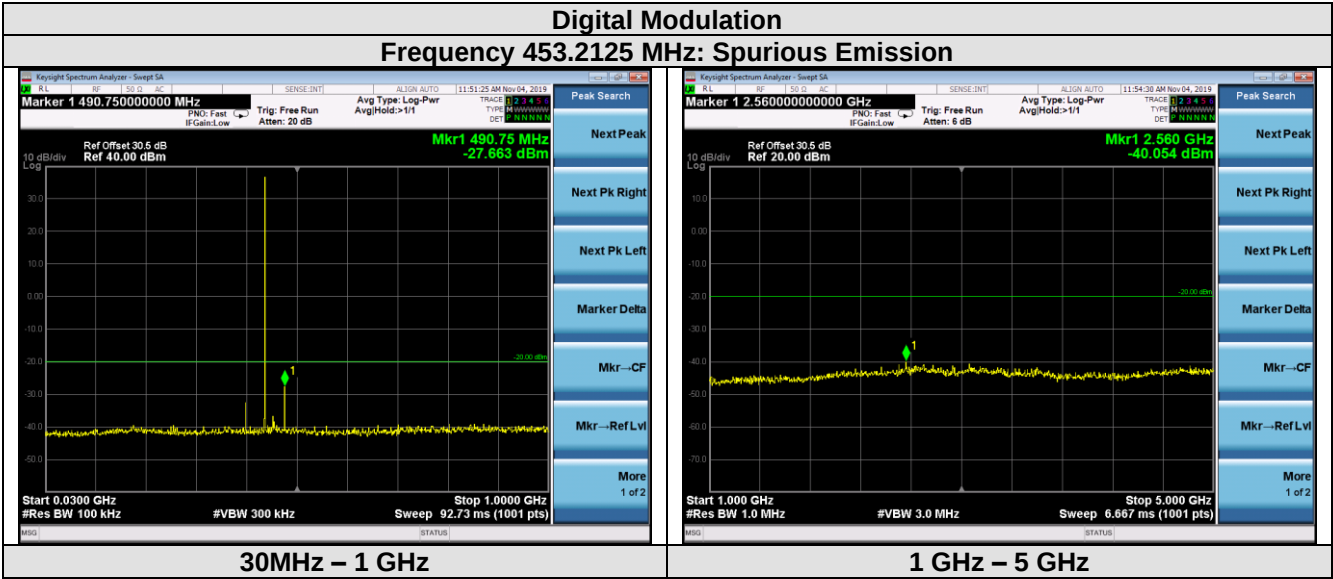
Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

Test Mode: Transmitting, worst case for High power level, please refer to the following plots.





4.5. FCC §2.1053 & §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053 and §90.210

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to teeth harmonic of the fundamental frequency was investigated. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001)-the absolute level
Spurious attenuation limit in dB = 50+10 Log10 (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

Test Mode: Transmitting, worst case for High power level.

30MHz - 5GHz:

Frequency	Meter Reading	Antenna Factor	Cable loss	Preamp factor	Emission Level	Limits	Margin	Detector Type	Comment
(MHz)	(dBμV)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
Analog Modulation 155.7525MHz-12.5 kHz									
311.508	-40.48	21.35	20.14	4.75	-34.52	-20	-14.52	Pk	Vertical
311.508	-41.60	21.35	20.14	4.75	-35.64	-20	-15.64	Pk	Horizontal
467.261	-42.98	23.58	21.67	5.56	-35.51	-20	-15.51	Pk	Vertical
467.261	-40.49	23.58	21.67	5.56	-33.02	-20	-13.02	Pk	Horizontal
Digital Modulation 155.7525MHz-12.5 kHz									
311.508	-40.54	21.35	20.14	4.75	-34.58	-20	-14.58	Pk	Vertical
311.508	-42.89	21.35	20.14	4.75	-36.93	-20	-16.93	Pk	Horizontal
467.261	-43.79	23.58	21.67	5.56	-36.32	-20	-16.32	Pk	Vertical
467.261	-39.85	23.58	21.67	5.56	-32.38	-20	-12.38	Pk	Horizontal

Frequency	Meter Reading	Antenna Factor	Cable loss	Preamp factor	Emission Level	Limits	Margin	Detector Type	Comment
(MHz)	(dBμV)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
Analog Modulation 453.2125MHz-12.5 kHz									
906.425	-41.06	25.14	22.29	6.17	-32.04	-20	-12.04	Pk	Vertical
906.425	-42.45	25.14	22.29	6.17	-33.43	-20	-13.43	Pk	Horizontal
1359.640	-42.27	27.83	23.75	6.58	-31.61	-20	-11.61	Pk	Vertical
1359.640	-40.68	27.83	23.75	6.58	-30.02	-20	-10.02	Pk	Horizontal
Digital Modulation 453.2125MHz-12.5 kHz									
906.425	-41.96	25.14	22.29	6.17	-32.94	-20	-12.94	Pk	Vertical
906.425	-43.03	25.14	22.29	6.17	-34.01	-20	-14.01	Pk	Horizontal
1359.640	-42.23	27.83	23.75	6.58	-31.57	-20	-11.57	Pk	Vertical
1359.640	-41.86	27.83	23.75	6.58	-31.20	-20	-11.20	Pk	Horizontal

Note:

1. mission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. The other emission levels were very low against the limit.

4.6. FCC §2.1055 & §90.213 - FREQUENCY STABILITY

Applicable Standard

FCC §2.1055 and §90.213

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external AC/DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The power cable and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

Test Mode: Transmitting, worst case for High power level.

For 12.5 kHz:

Analog Modulation, Reference Frequency: 155.7525 MHz, Limit: ± 2.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.6	155.752467	0.43
40	7.6	155.752482	0.53
30	7.6	155.752462	0.40
20	7.6	155.752441	0.26
10	7.6	155.752467	0.43
0	7.6	155.752485	0.55
-10	7.6	155.752449	0.31
-20	7.6	155.752452	0.33
-30	7.6	155.752467	0.43
Frequency Stability versus Input Voltage			
20	6.7	155.752432	0.21

Digital Modulation, Reference Frequency: 155.7525 MHz, Limit: ± 2.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.6	155.752481	0.52
40	7.6	155.752438	0.24
30	7.6	155.752467	0.43
20	7.6	155.752469	0.44
10	7.6	155.752453	0.34
0	7.6	155.752458	0.37
-10	7.6	155.752463	0.40
-20	7.6	155.752449	0.31
-30	7.6	155.752457	0.37
Frequency Stability versus Input Voltage			
20	6.6	155.752447	0.30

Analog Modulation, Reference Frequency: 453.2125 MHz, Limit: ± 2.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.6	453.212432	-0.15
40	7.6	453.212472	-0.06
30	7.6	453.212469	-0.07
20	7.6	453.212458	-0.09
10	7.6	453.212477	-0.05
0	7.6	453.212421	-0.17
-10	7.6	453.212465	-0.08
-20	7.6	453.212445	-0.12
-30	7.6	453.212472	-0.06
Frequency Stability versus Input Voltage			
20	6.7	453.212468	-0.07

Digital Modulation, Reference Frequency: 453.2125 MHz, Limit: ± 2.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	7.6	453.212425	-0.17
40	7.6	453.212462	-0.08
30	7.6	453.212453	-0.10
20	7.6	453.212455	-0.10
10	7.6	453.212469	-0.07
0	7.6	453.212458	-0.09
-10	7.6	453.212427	-0.16
-20	7.6	453.212469	-0.07
-30	7.6	453.212435	-0.14
Frequency Stability versus Input Voltage			
20	6.7	453.212472	-0.06

4.7. FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

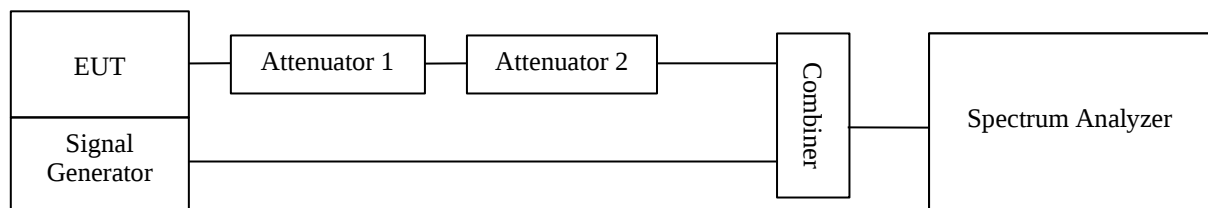
Applicable Standard

Regulations: FCC §90.214

Test method: ANSI/TIA-603-D

Test Procedure

- Connect the EUT and test equipment as shown on the following block diagram.
- Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
- Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ± 12.5 kHz deviation and set its output level to -100dBm.
- Turn on the transmitter.
- Supply sufficient attenuation via the RF attenuator to provide an input level to the Spectrum Analyzer that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the Spectrum Analyzer as P_0 .
- Turn off the transmitter.
- Adjust the RF level of the signal generator to provide RF power equal to P_0 . This signal generator RF level shall be maintained throughout the rest of the measurement.
- Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
- Adjust the vertical amplitude control of the spectrum analyzer to display the 1000 Hz at ± 4 divisions vertically centered on the display. Set trigger mode of the Spectrum Analyzer to "Video", and tune the "trigger level" on suitable level. Then set the "trigger offset" to -10ms for turn on and -15ms for turn off.
- Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be t_{on} . The trace should be maintained within the allowed divisions during the period t_1 and t_2 .
- Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period t_3 .



Test Data

Environmental Conditions

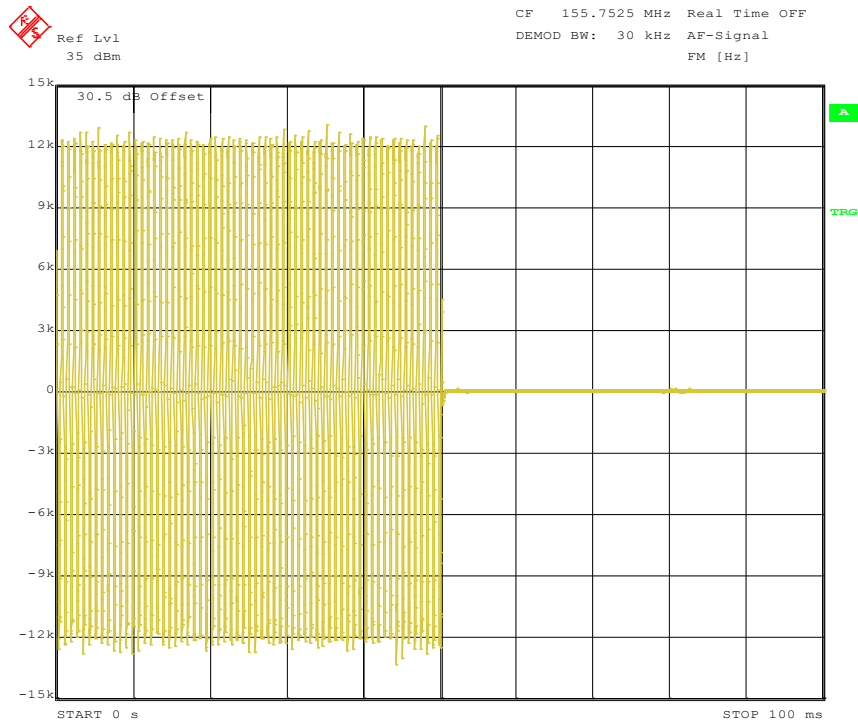
Temperature:	24 °C
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result
12.5	10 (t1)	<+/-12.5 kHz	Pass
	25(t2)	<+/-6.25 kHz	
	10 (t3)	<+/-12.5 kHz	

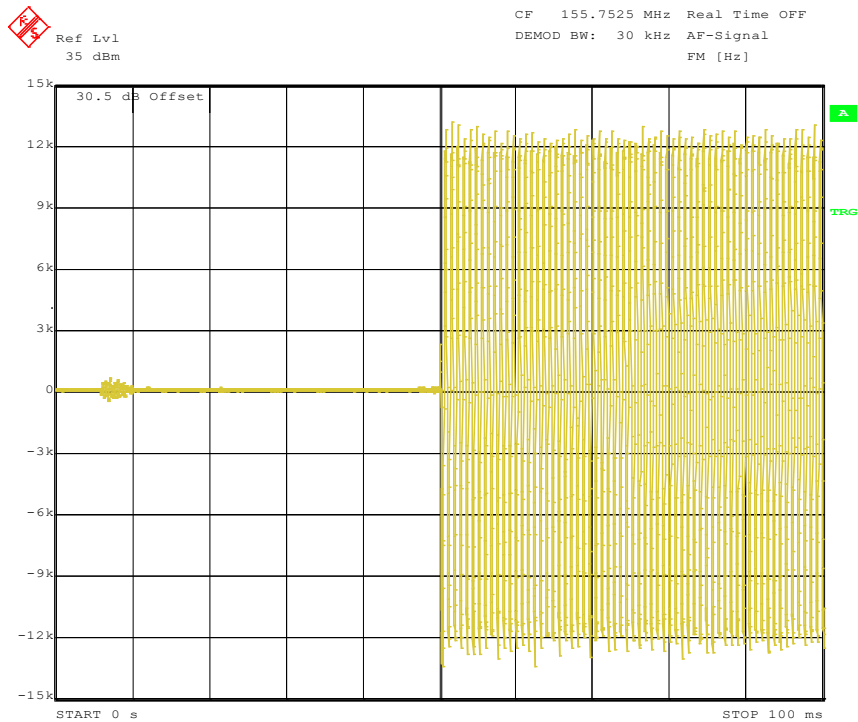
Please refer to the following plots.

Channel: 155.7525 MHz, 12.5 kHz

Turn on

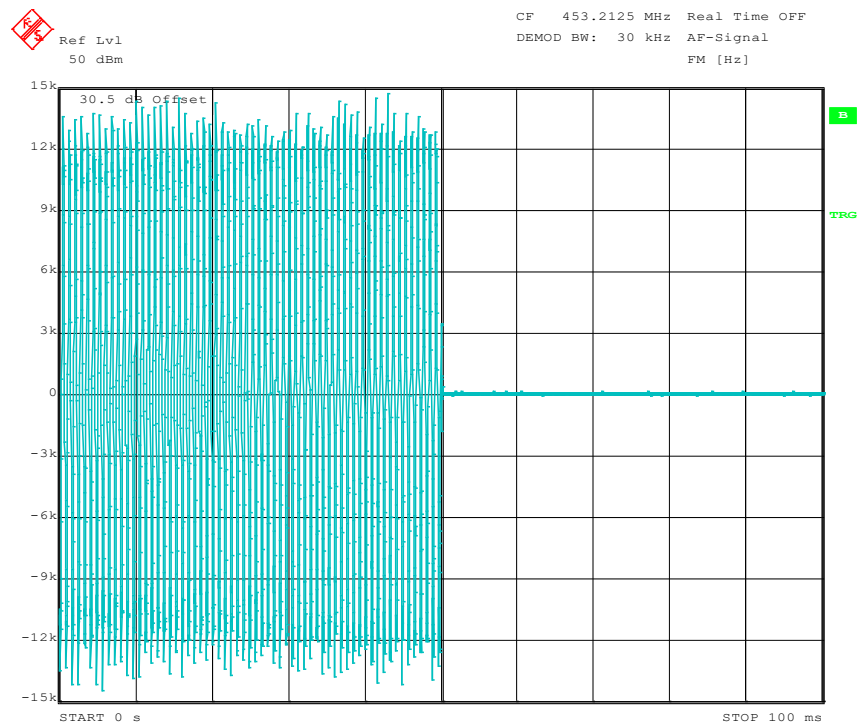


Turn off

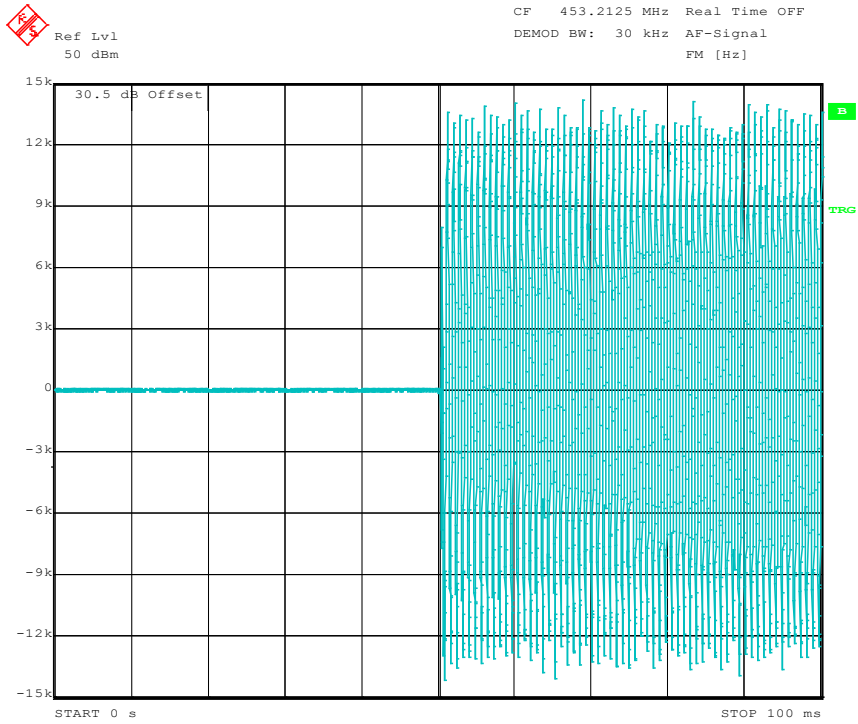


Channel: 453.2125 MHz, 12.5 kHz

Turn on



Turn off



5. Test Setup Photos of the EUT

Reference to the TEST SETUP PHOTOS

6. External and Internal Photos of the EUT

Reference to the EXTERNAL AND INTERNAL PHOTOS

.....End of Report.....