

Prüfbericht-Nr.: Test Report No.:	16082749 001	Auftrags-Nr.: Order No.:	174064455	Seite 1 von 33 Page 1 of 33
Kunden-Referenz-Nr.: Client Reference No.:	612849	Auftragsdatum: Order date.:	12 Apr 2017	
Auftraggeber: Client:	Sam Ash Music Corporation 262 Duffy Avenue Hicksville, NY 11801 United States			
Prüfgegenstand: Test item:	Wireless Microphone Transmitter	FCC ID: CCRAH2K		
Bezeichnung / Typ-Nr.: Identification / Type No.:	AH2			
Auftrags-Inhalt: Order content:	TUV Rheinland - EMC service			
Prüfgrundlage: Test specification:	TIA/EIA-603-D-2010 FCC 47 CFR Part 74.861, Subpart H: 2016			
Wareneingangsdatum: Date of receipt:	04 Jan 2015			
Prüfmuster-Nr.: Test sample No.:	174064455-001			
Prüfzeitraum: Testing period:	Refer to test report			
Ort der Prüfung: Place of testing:	TÜV Rheinland (Guangdong) Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Guangdong) Ltd. EMC Laboratory			
Prüfergebnis*: Test result*:	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
				
04 Jul 2017 Storm Shu / Assistant Project Manager		04 Jul 2017 Max Y. C. Yao / Vice General Manager		
Datum Date	Name/Stellung Name/Position	Unterschrift Signature	Datum Date	Name/Stellung Name/Position
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet				
Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specifications(s) F(ail) = failed a.m. test specifications(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

TEST SUMMARY

5.1 CONDUCTED OUTPUT POWER

RESULT: Pass

5.2 SPURIOUS RADIATION MEASUREMENT (TX)

RESULT: Pass

5.3 MODULATION CHARACTERISTICS MEASUREMENT

RESULT: Pass

5.4 OCCUPIED BANDWIDTH

RESULT: Pass

5.5 FREQUENCY TOLERANCE

RESULT: Pass

5.6 EMISSION MASK

RESULT: Pass

5.7 ELECTROMAGNETIC FIELDS

RESULT: Pass

Contents

1.	GENERAL REMARKS.....	5
1.1.	COMPLEMENTARY MATERIALS	5
	TEST SITES.....	5
1.2.	TEST FACILITIES.....	5
1.3.	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	6
1.4.	TRACE ABILITY.....	7
1.5.	CALIBRATION.....	7
1.6.	ABBREVIATIONS	7
1.7.	MEASUREMENT UNCERTAINTY	7
2.	GENERAL PRODUCT INFORMATION.....	8
2.1.	PRODUCT FUNCTION AND INTENDED USE	8
2.2.	RATING AND PHYSICAL CHARACTERISTICS.....	8
2.3.	NOISE GENERATING OR SOURCES OF INTERFERENCE	8
2.4.	NOISE SUPPRESSING PARTS	8
2.5.	SUBMITTED DOCUMENTS.....	8
3.	TEST SET-UP AND OPERATION MODES.....	9
3.1.	TEST METHODOLOGY.....	9
3.2.	INDEPENDENT AND TEST OPERATION MODES	9
3.3.	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	9
3.4.	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....	9
3.5.	TEST SETUP	10
4.	TEST RESULTS EMISSION	12
4.1.	CONDUCTED OUTPUT POWER	12
4.2.	SPURIOUS RADIATION MEASUREMENT.....	14
4.3.	MODULATION CHARACTERISTICS MEASUREMENT.....	20
		22
4.4.	OCCUPIED BANDWIDTH.....	23
4.5.	FREQUENCY TOLERANCE	25
4.6.	EMISSION MASK	26
4.7.	ELECTROMAGNETIC FIELDS.....	31

Prüfbericht - Nr.: 16082749 001
Test Report No.

Seite 4 von 33
Page 4 of 33

5.	PHOTOGRAPHS OF TEST SETUP	32
6.	LIST OF TABLES	33
7.	LIST OF FIGURES	33
	LIST OF PICTURES	33

1. General Remarks

1.1. Complementary Materials

All attachments are integral parts of this test report.

Test Sites

1.2. Test Facilities

BZT Testing Technology Co., Ltd

Buliding 17,Xinghua Road Xingwei industrial Park Fuyong,Baoan District,
Shenzhen,Guangdong,China

Register no.: 701733

The tests at these test sites have been conducted under the supervision of a TÜV Rheinland engineer.

1.3. List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Spectrum Analyzer	Agilent	E4407B	MY50140340	2016.10.23	2017.10.22
Bilog Antenna	TESEQ	CBL6111D	34678	2014.11.24	2017.11.23
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D-1343	2015.03.05	2018.03.04
Bilog Antenna	Schwarzbeck	VULB9160	9160-3206	2016.06.28	2019.06.27
Horn Antenna	Schwarzbeck	BBHA9120D	452	2016.06.28	2019.06.27
PreAmplifier	Agilent	8449B	60538	2016.10.23	2017.10.22
Temperature& Humidity test chamber	GZGONGWEN	GDS-250	080821	2016.10.23	2017.10.22
Signal Generator	Agilent	N5182A	MY46240556	2016.10.23	2017.10.22
Signal Analyzer	Agilent	N9020A	MY49100060	2016.10.23	2017.10.22
Attenuator	HP	8494B	DC-18G	2016.10.23	2017.10.22
Audio analyzer	R&S	UPL	100689	2017.05.02	2018.05.01
Audio generator	Tronson	TAG-101	20030212	2016.10.23	2017.10.22

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.

1.4. Trace ability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

1.5. Calibration

All equipment requiring calibration is calibrated periodically by the manufacturer or accredited calibration services according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

1.6. Abbreviations

PASS means 'complied with requirement'	N/A means 'not applicable'
FAIL means 'not complied'	N.C.R. means 'no calibration required'

1.7. Measurement Uncertainty

Table 2: Measurement Uncertainty

Testing Item	Frequency Range	Uncertainty
Conducted Emission (Mains port)	0.09MHz - 30MHz	2.67 dB
Radiated Emission (966 Chamber: 3m)	0.09MHz - 30MHz	2.83 dB
Radiated Emission (966 Chamber: 3m)	30MHz – 1000MHz	2.94 dB
Radiated Emission (966 Chamber: 3m)	Above 1000MHz	3.03 dB

Note:

The uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. General Product Information

2.1. Product Function and Intended Use

The submitted sample is "**wireless microphone transmitter**" which is certified in test report 16023053 001 apply for a new frequency band 489.050MHz to 492.425MHz.

2.2. Rating and Physical Characteristics

Product name:	wireless microphone transmitter
Model name:	AH2
Rating:	3.7Vdc
Frequency range:	CH1: 489.050MHz
	CH2: 490.975MHz
	CH3: 492.425MHz
Bandwidth:	200kHz
Modulation:	FM
Antenna:	Integral, -1.63dBi Max
Temperature	-10 ~ +60 °C

2.3. Noise Generating or Sources of Interference

- 1) IC circuits

2.4. Noise Suppressing Parts

Please refer to Attachment Photo Documentation for details.

2.5. Submitted Documents

- 1) Circuit diagram
- 2) Block diagram
- 3) User manual
- 4) PCB Layout
- 5) BOM List

3. Test Set-up and Operation Modes

3.1. Test Methodology

The test methods, which have been used, are based on ANSI/TIA-603-D-2010.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the instructions for use.

3.2. Independent and Test Operation Modes

The basic operation mode is:

- A. Transmitter mode
 - 1. Low CH
 - 2. Middle CH
 - 3. High CH

3.3. Special Accessories and Auxiliary Equipment

The EUT was tested as an independent unit with the following equipment:

Description	Manufacturer	Model No.	S/N	Certification
N/A	N/A	N/A	N/A	N/A

3.4. Countermeasures to achieve EMC compliance

The test sample, which has been tested, contained the noise suppression parts as described in the technical document. No additional measures were employed to achieve compliance.

3.5. Test Setup

The test setup was realized on a table of 80cm height during all the tests.
The test arrangement is configured and set according to manufacturer's installations.

Diagram 1 of Configuration for testing other test items

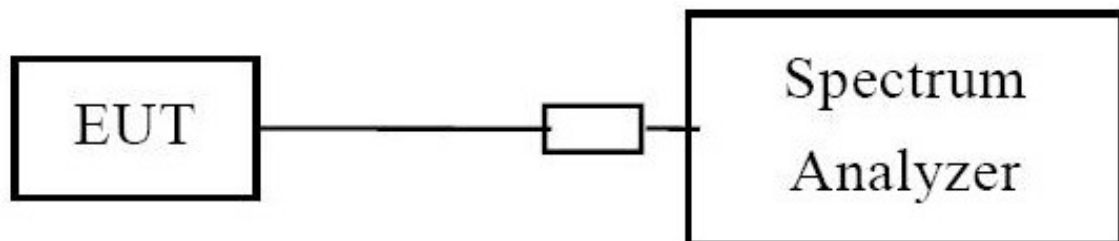


Diagram 2 of Configuration for testing modulation characteristics

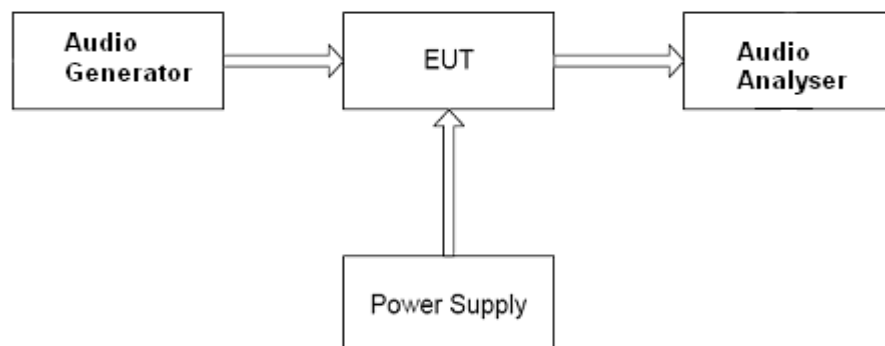


Diagram 3 of Measurement Equipment Configuration for Testing Radiated Emission

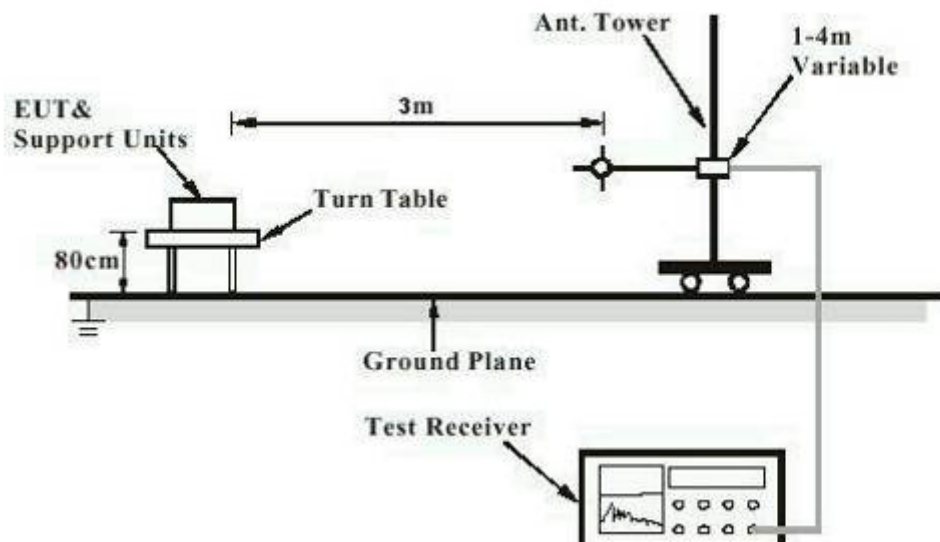
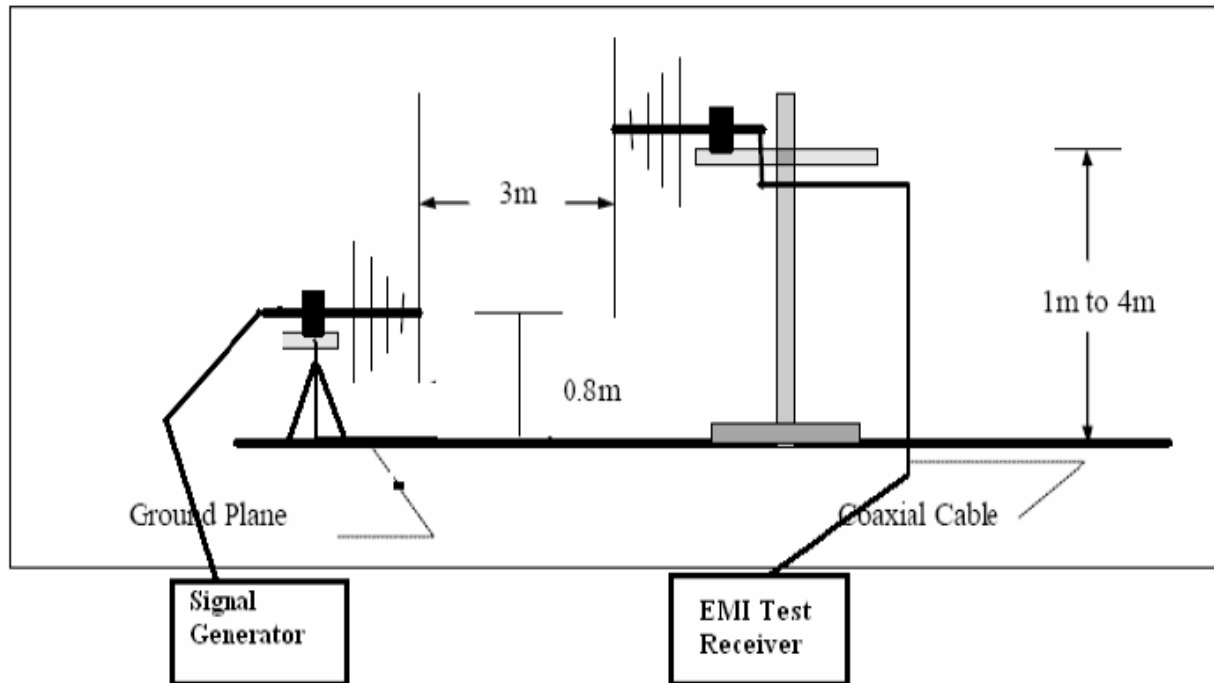


Diagram 4 of Measurement Equipment Configuration for Substitution Method



4. Test Results EMISSION

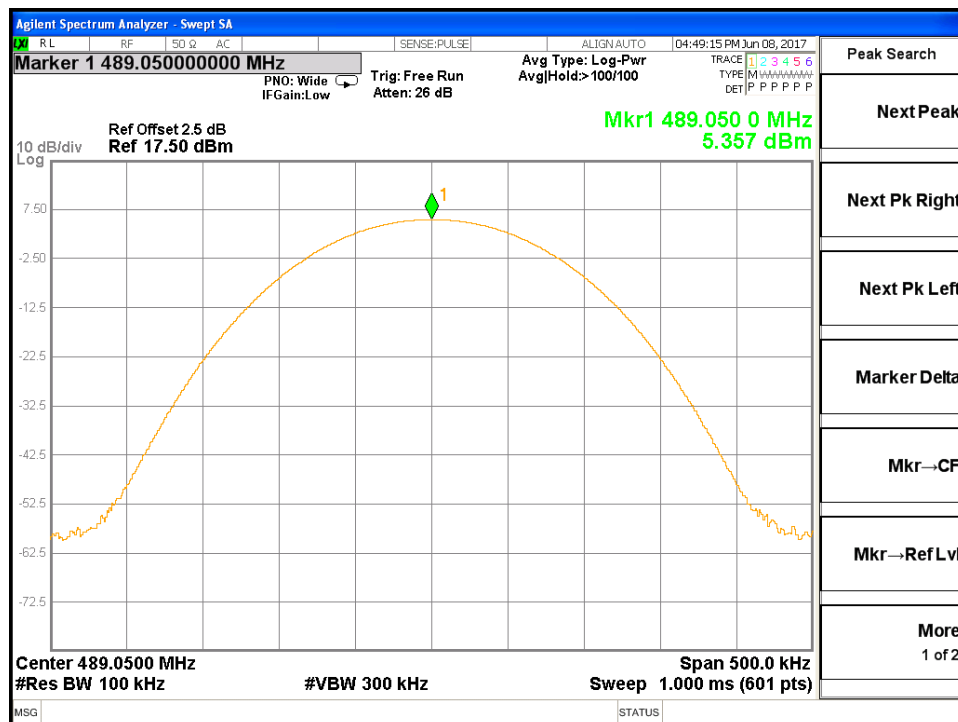
4.1. Conducted Output Power

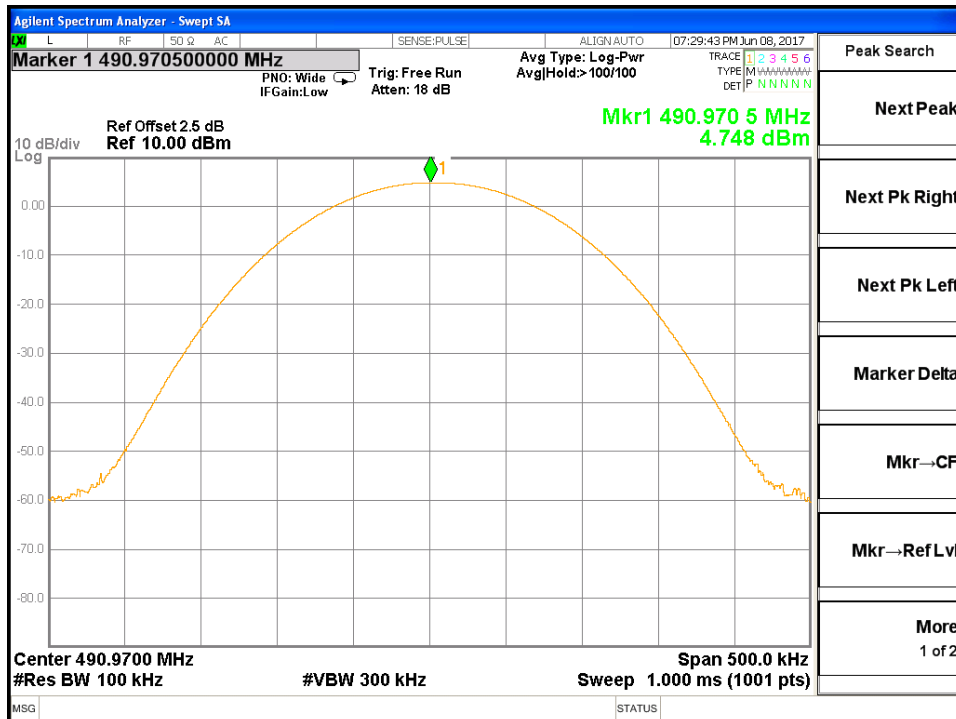
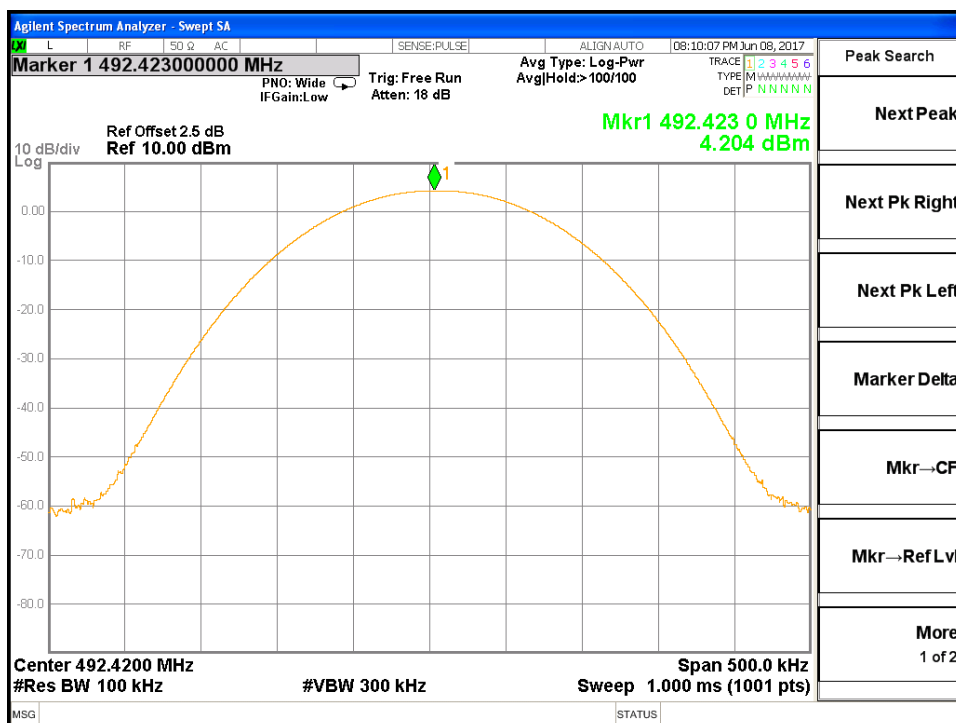
RESULT:	PASS
----------------	-------------

Date of testing	:	08 Jun 2017
Test specification	:	FCC Part 2 Per Section 2.1046(a)
Guide	:	ANSI/TIA-603-D-2010, clause 2.2.1
Limits	:	FCC Part 74 Per Section 74.861(e)(1)
Kind of test site	:	3m Anechoic Chamber
Operation mode	:	Transmitting (unmodulated)
Temperature	:	23°C
Humidity	:	50%
Limit	:	470-608MHz: 250mW (17dBm)

Figure 1: Conducted Output Power

Low CH (489.050MHz):



Middle CH (490.975MHz):

High CH (492.425MHz):


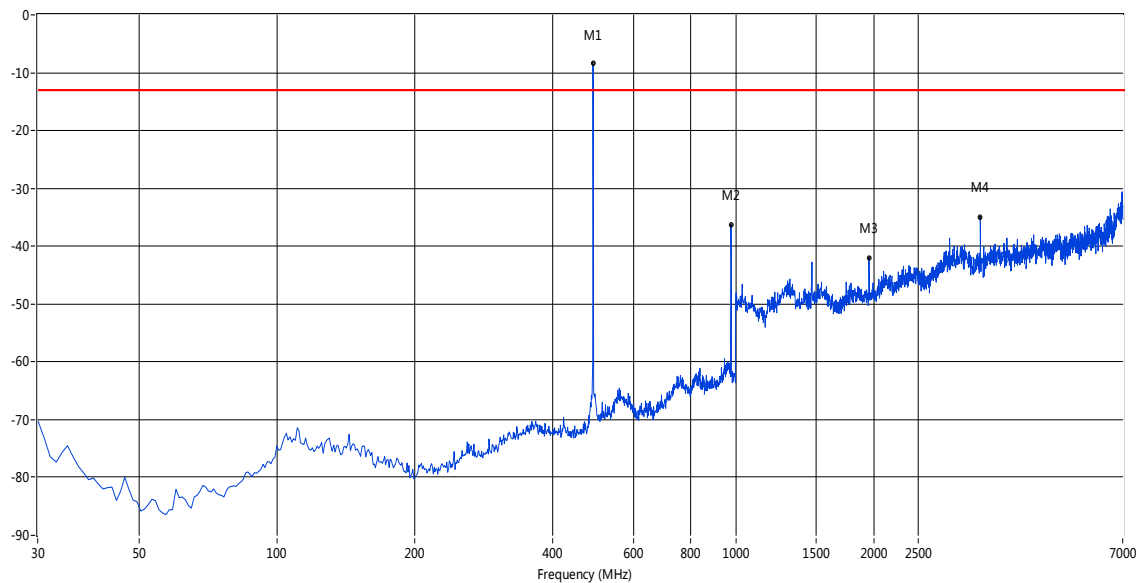
4.2. Spurious Radiation Measurement

RESULT:
PASS

Date of testing : 08 Jun 2017
 Test specification : FCC Part 2 Per Section 2.1053(a) and 2.1057
 Guide : ANSI/TIA-603-D-2010, clause 2.2.12
 Limits : FCC Part 74 Per Section 74.861(e)(6)(iii)
 Kind of test site : 3m Full-Anechoic Chamber
 Operation mode : Transmitting (unmodulated)
 Temperature : 23°C
 Humidity : 50%

Figure 2: TX Spurious Radiation, 30 – 7000 MHz, Vertical (Low CH)

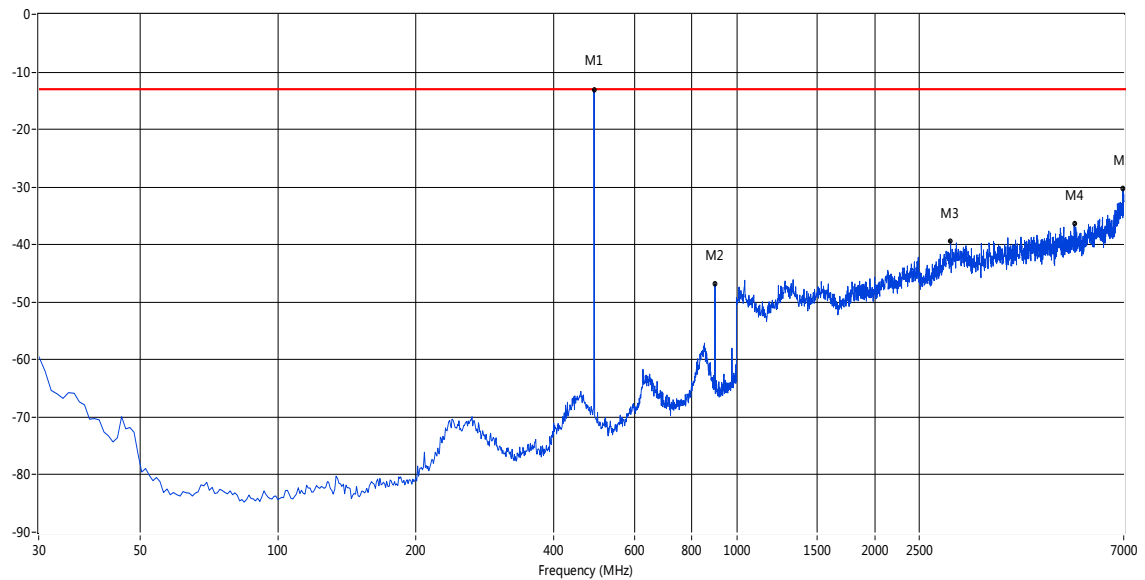
RSE_FCC Test Case_RSE_PART74 V 30M-7G



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
488.352	-8.46	-4.29	-13.0	-4.54	228.70	Vertical	Vertical	Fail
976.743	-36.28	6.38	-13.0	23.28	13.30	Vertical	Vertical	Pass
1955.045	-41.99	10.53	-13.0	28.99	154.30	Vertical	Vertical	Pass
3423.576	-34.96	14.21	-13.0	21.96	22.60	Vertical	Vertical	Pass

Figure 3: TX Spurious Radiation, 30 – 7000 MHz, Horizontal (Low CH)

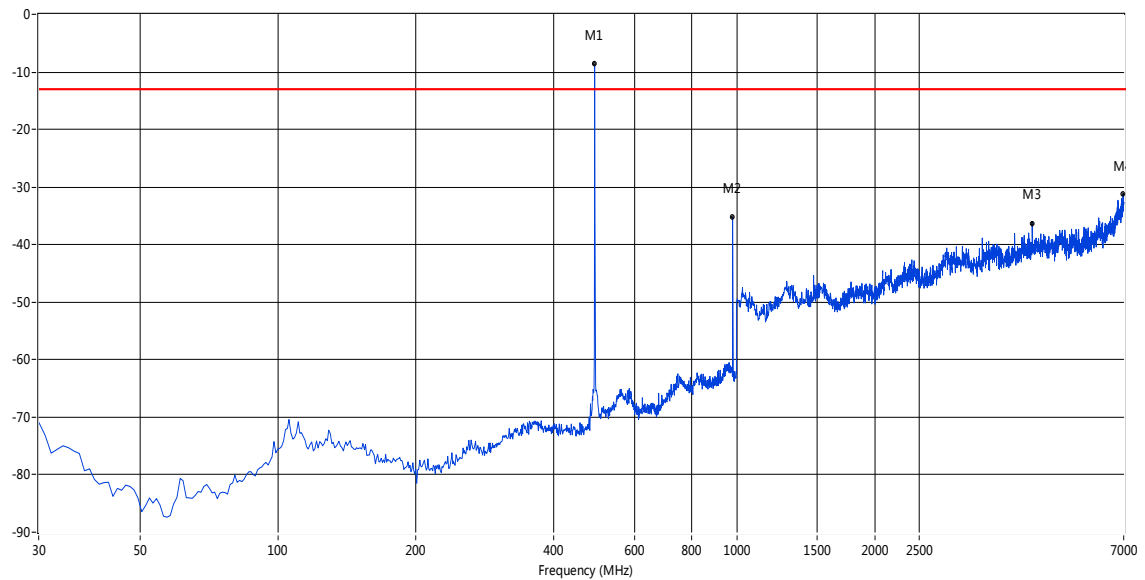
RSE_FCC Test Case_RSE_PART74 H 30M-7G



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
488.352	-13.04	-2.63	-13.0	0.04	51.10	Horizontal	Vertical	Pass
897.283	-46.84	3.81	-13.0	33.84	19.50	Horizontal	Vertical	Pass
2932.068	-39.47	14.68	-13.0	26.47	356.80	Horizontal	Vertical	Pass
5457.542	-36.39	20.49	-13.0	23.39	223.30	Horizontal	Vertical	Pass
6980.020	-30.29	24.91	-13.0	17.29	341.40	Horizontal	Vertical	Pass

Figure 4: TX Spurious Radiation, 30 – 7000 MHz, Vertical (Middle CH)

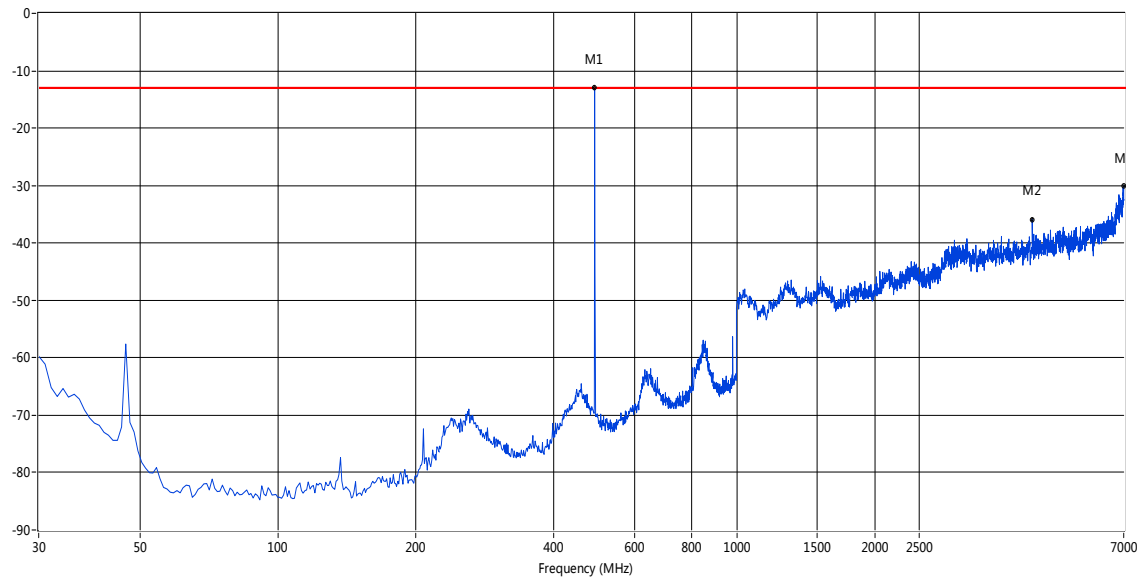
RSE_FCC Test Case_RSE_PART74 V 30M-7G



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
490.290	-8.58	-4.35	-13.0	-4.42	143.00	Vertical	Vertical	Fail
980.619	-35.26	6.20	-13.0	22.26	0.00	Vertical	Vertical	Pass
4418.581	-36.26	18.49	-13.0	23.26	58.70	Vertical	Vertical	Pass
6968.032	-31.19	24.81	-13.0	18.19	100.90	Vertical	Vertical	Pass

Figure 5: TX Spurious Radiation, 30 – 7000 MHz, Horizontal (Middle CH)

RSE_FCC Test Case_RSE_PART74 H 30M-7G



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
490.290	-13.01	-3.09	-13.0	0.01	41.60	Horizontal	Vertical	Pass
4418.581	-35.91	18.49	-13.0	22.91	163.00	Horizontal	Vertical	Pass
6992.008	-30.06	24.38	-13.0	17.06	223.90	Horizontal	Vertical	Pass

Figure 6: TX Spurious Radiation, 30 – 7000 MHz, Vertical (High CH)

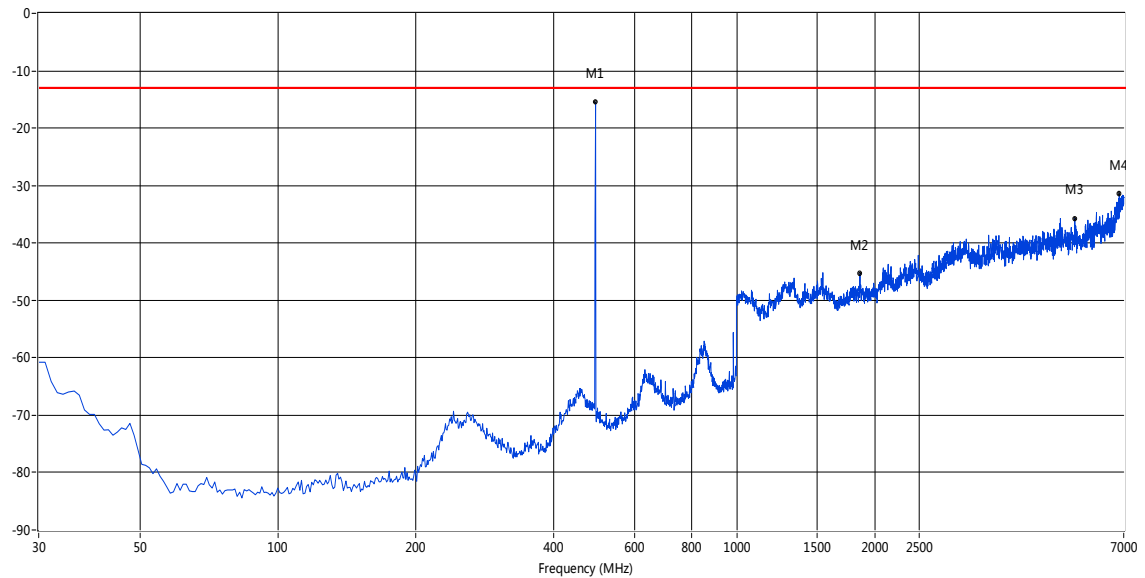
RSE_FCC Test Case_RSE_PART74 V 30M-7G



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
492.228	-8.67	-4.29	-13.0	-4.33	102.20	Vertical	Vertical	Fail
983.526	-37.80	6.13	-13.0	24.80	78.00	Vertical	Vertical	Pass
5485.514	-35.33	20.26	-13.0	22.33	91.70	Vertical	Vertical	Pass
6832.168	-30.90	24.05	-13.0	17.90	174.20	Vertical	Vertical	Pass

Figure 7: TX Spurious Radiation, 30 – 7000 MHz, Horizontal (High CH)

RSE_FCC Test Case_RSE_PART74 H 30M-7G



Frequency (MHz)	Result (dBm)	Factor (dB)	PK Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
492.228	-15.45	-3.43	-13.0	2.45	295.30	Horizontal	Vertical	Pass
1859.141	-45.36	10.49	-13.0	32.36	59.80	Horizontal	Vertical	Pass
5473.526	-35.69	20.26	-13.0	22.69	357.90	Horizontal	Vertical	Pass
6840.160	-31.38	24.04	-13.0	18.38	214.20	Horizontal	Vertical	Pass

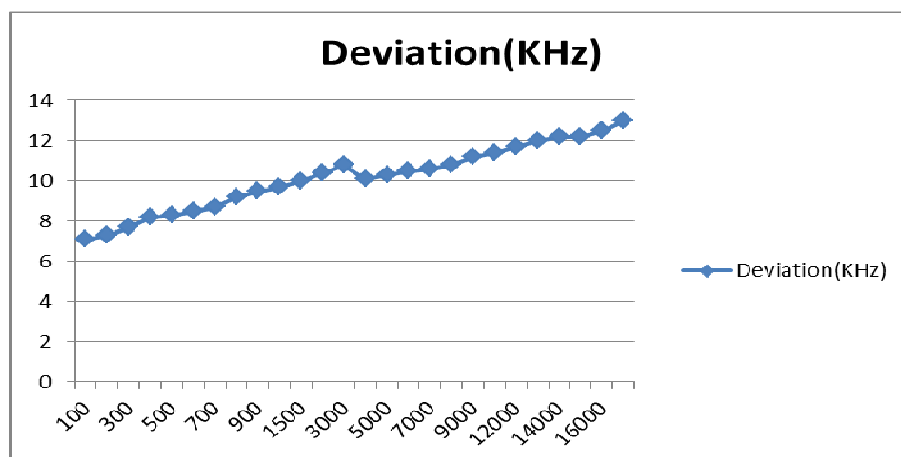
4.3. Modulation Characteristics measurement

RESULT:
PASS

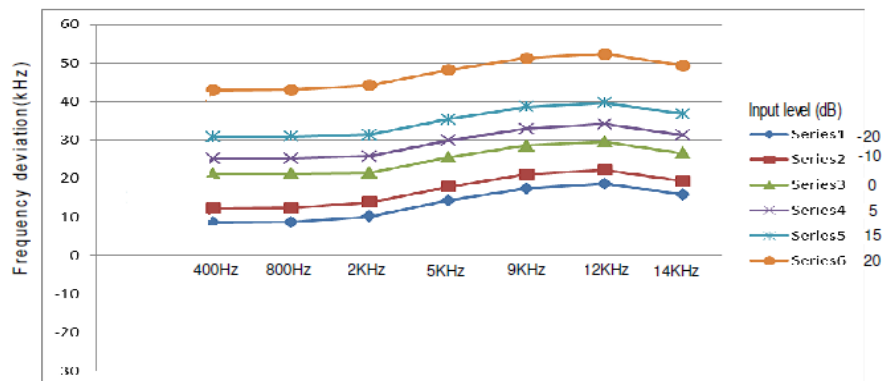
Date of testing : 08 Jun 2017
 Test specification : FCC Part 2 Per Section 2.1047(a) and (b)
 Guide : ANSI/TIA-603-D-2010, clause 2.2.3
 Limits : FCC Part 74 Per Section 74.861(e)(3)
 FCC Part 2 Per Section 2.1047(a) and (b)
 Operation mode : Transmitting
 Temperature : 20°C
 Humidity : 51%

Figure 9: Modulation Characteristics measurement

Frequency(Hz)	Deviation(KHz)	Frequency(Hz)	Deviation(KHz)
100	7.1	4000	10.1
200	7.3	5000	10.3
300	7.7	6000	10.5
400	8.2	7000	10.6
500	8.3	8000	10.8
600	8.5	9000	11.2
700	8.7	10000	11.4
800	9.2	12000	11.7
900	9.5	13000	12.0
1000	9.7	14000	12.2
1500	10.0	15000	12.2
2000	10.4	16000	12.5
3000	10.8	17000	13.0



Modulation (dB)		-20	-10	0	5	15	20
400Hz	KHz	8.51	12.22	21.25	25.21	30.84	42.98
800Hz	KHz	8.60	12.32	21.29	25.27	30.90	43.04
2KHz	KHz	10.13	13.80	21.44	25.78	31.33	44.14
5KHz	KHz	14.22	17.83	25.45	29.88	35.38	48.22
9KHz	KHz	17.41	21.01	28.52	32.93	38.56	51.28
12KHz	KHz	18.60	22.17	29.54	34.11	39.60	52.29
14KHz	KHz	15.77	19.30	26.54	31.29	36.76	49.37

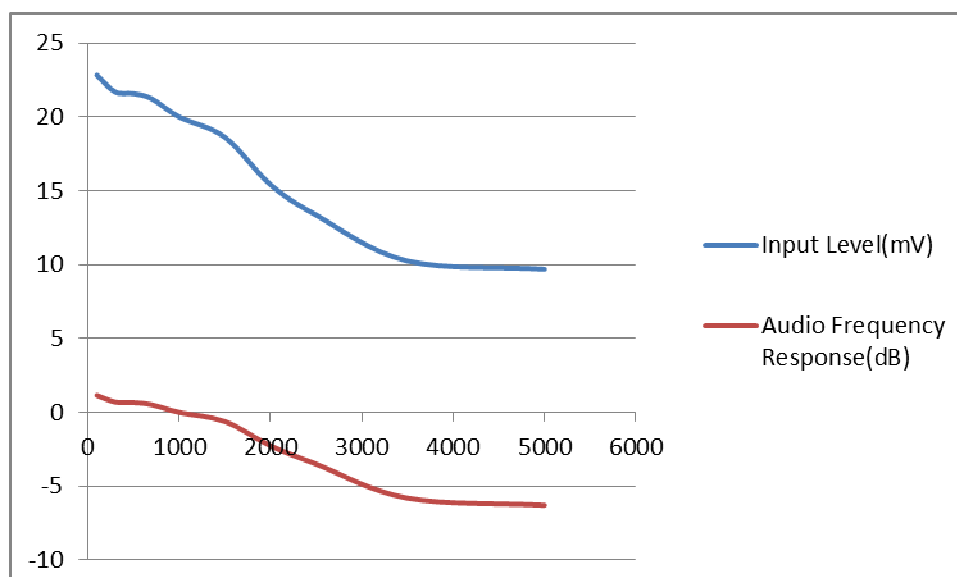


Maximum Deviation

modulation Frequency(Hz)	Input Level(mV)	Maximum deviation	Limit
1000	98.37	71kHz	75kHz

Audio Frequency Response

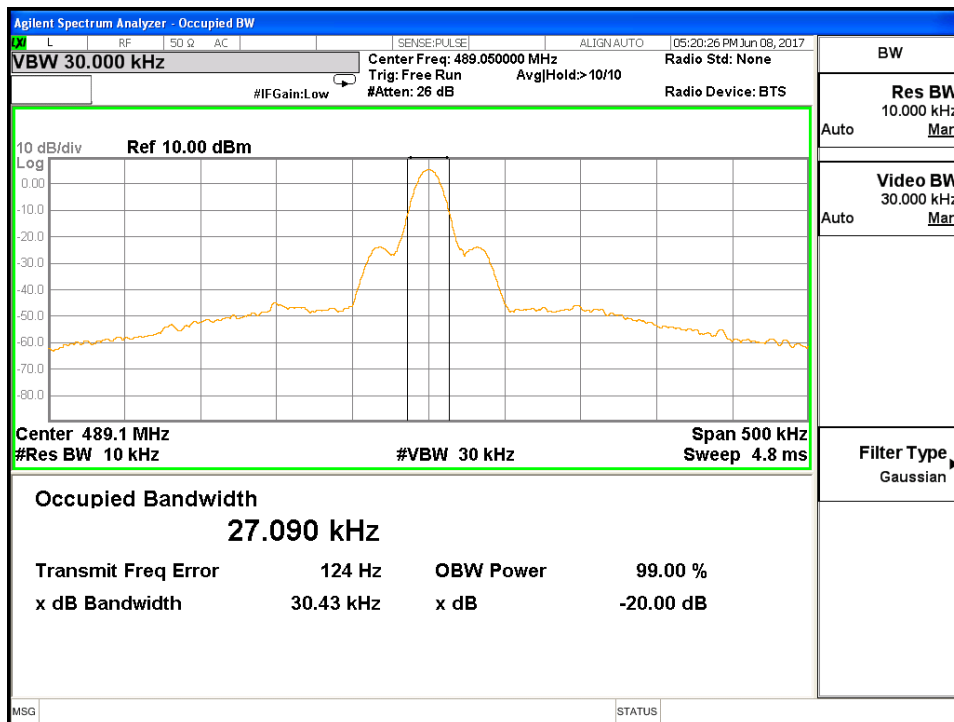
modulation Frequency(Hz)	Input Level(mV)	Audio Frequency Response(dB)
100	22.83	1.15
300	21.69	0.70
500	21.58	0.66
700	21.23	0.52
1000	20.00	0
1500	18.63	-0.62
2000	15.42	-2.26
2500	13.36	-3.50
3500	10.25	-5.81
5000	9.69	-6.29

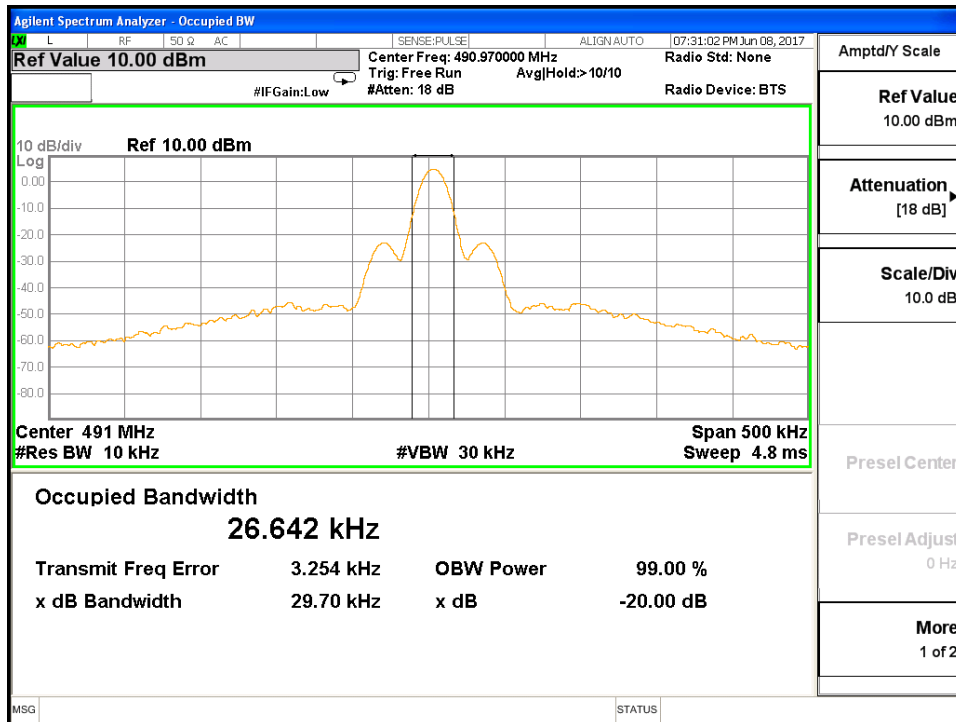
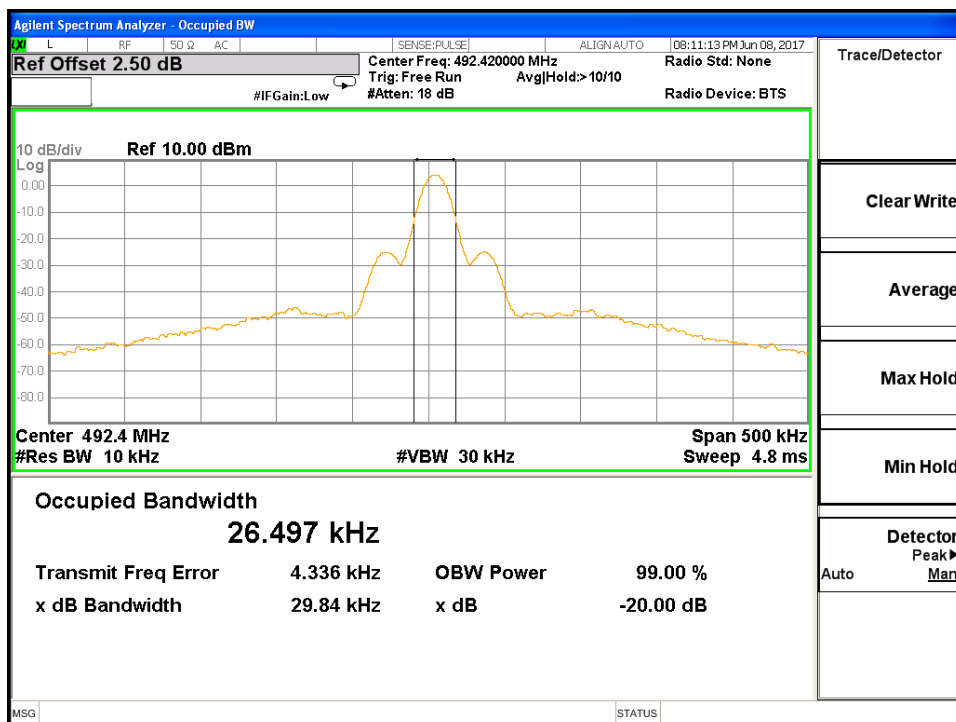


4.4. Occupied Bandwidth

RESULT:
PASS

Date of testing	:	08 Jun 2017
Test specification	:	FCC Part 2 Per Section 2.1049(c)1
Guide	:	ANSI/TIA-603-D-2010, clause 2.2.11
Limits	:	FCC Part 74 Per Section 74.861(e)(3), 74.861(e)(5) and 74.861(e)(6)
Operation mode	:	Transmitting (modulated)
Temperature	:	22°C
Humidity	:	54%

Figure 10: Occupied Bandwidth
Low CH (489.050MHz):


Middle CH (490.975MHz):

High CH (492.425MHz):


4.5. Frequency tolerance

RESULT:	PASS
----------------	-------------

Date of testing	:	08 Jun 2017
Test specification	:	FCC Part 2 Per Section 2.1055
Guide	:	ANSI/TIA-603-C-2004, clause 2.2.2
Limits	:	FCC Part 74 Per Section 74.861(e)(4)
Operation mode	:	Transmitting (unmodulated)
Temperature	:	-30°C to 60°C
Humidity	:	51%

Figure 11: Frequency tolerance

The Frequency Tolerance (temperature)

Test condition	Power Supply	Low Frequency (489.050MHz)	Middle Frequency (490.975MHz)	High Frequency (492.425MHz)
-30°C	DC3.7V	489.045	490.967	492.418
-20°C		489.046	490.969	492.422
-10°C		489.046	490.970	492.421
0°C		489.049	490.974	492.420
10°C		489.050	490.977	492.424
20°C		489.052	490.971	492.425
30°C		489.055	490.982	492.429
40°C		489.055	490.988	492.428
50°C		489.056	490.985	492.431
60°C		489.057	490.984	492.431
Frequency Error:		0.0070	0.0130	0.0070
Frequency tolerance:		0.0014%	0.0026%	0.0014%
Frequency tolerance limit		0.005%		

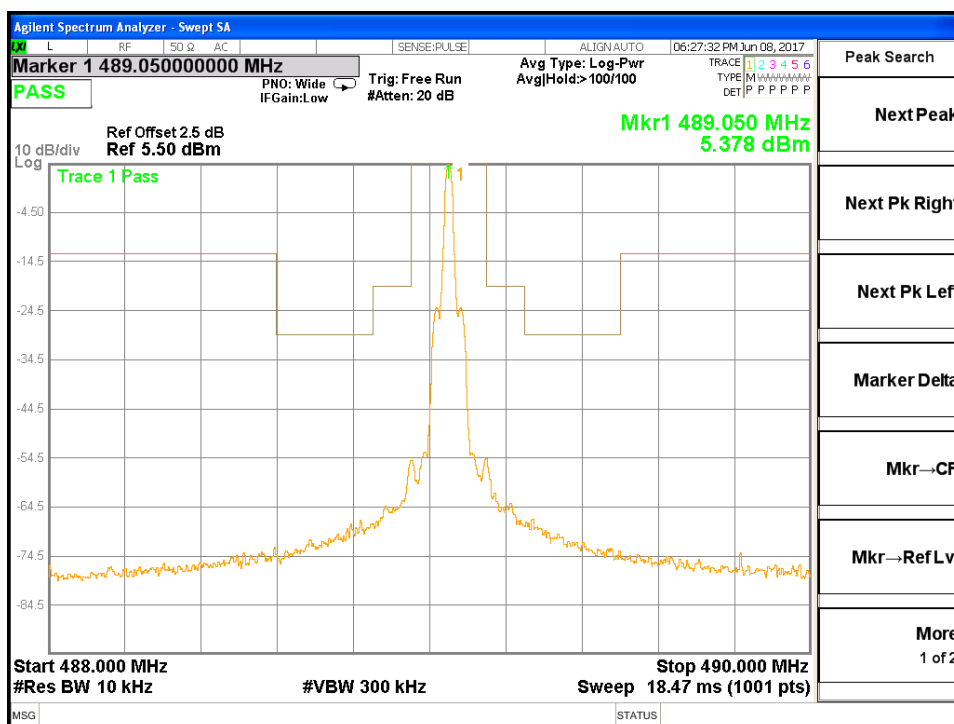
The Frequency Tolerance (supply voltage)

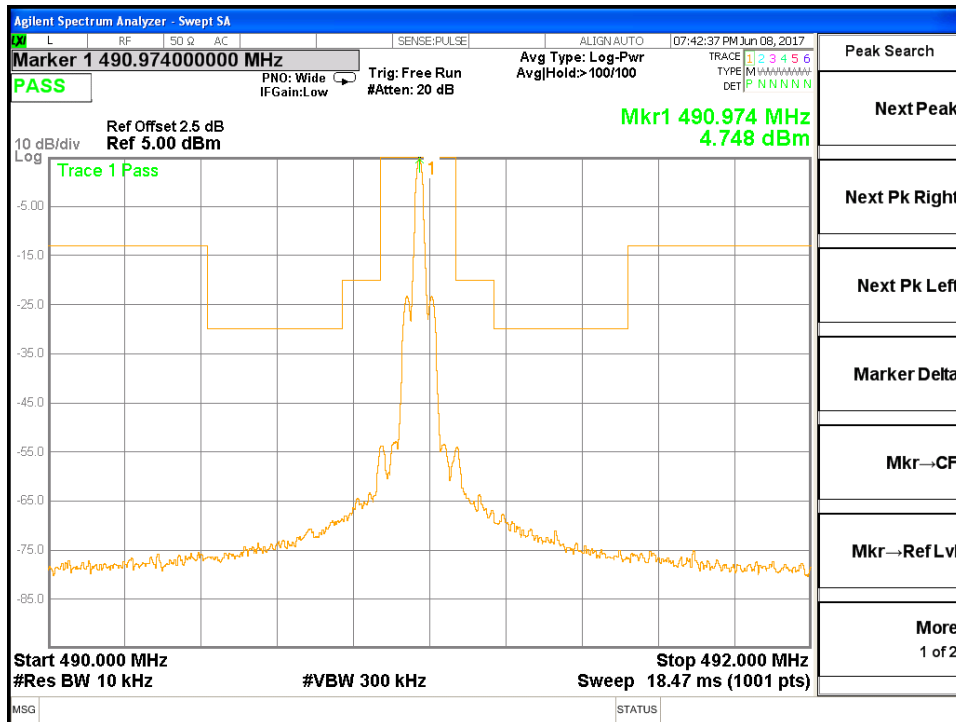
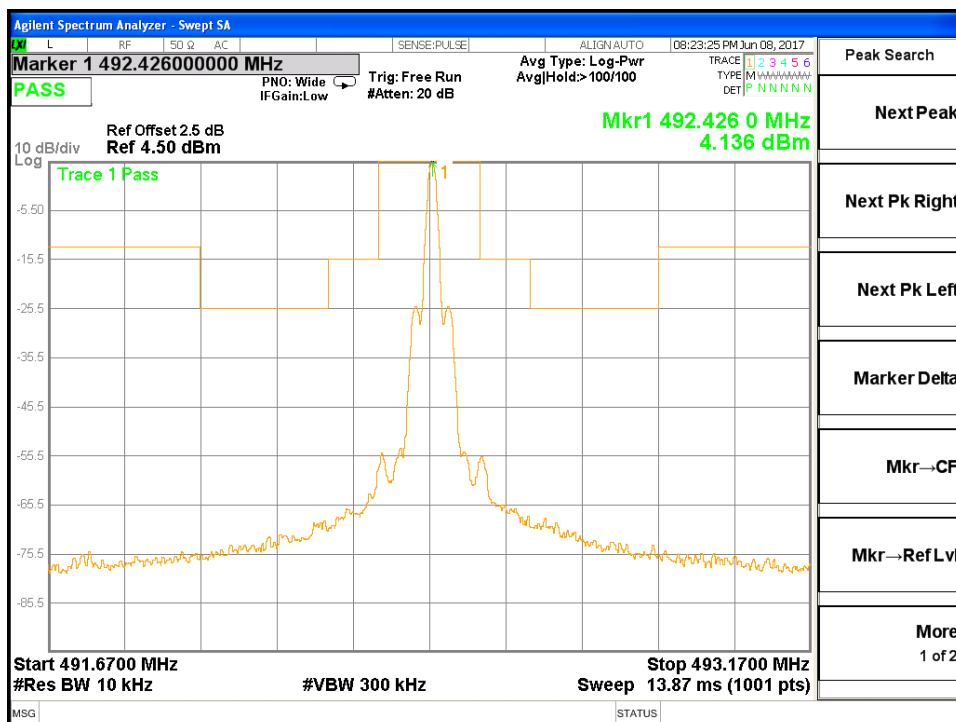
Test condition	Power Supply	Low Frequency (489.050MHz)	Middle Frequency (490.975MHz)	High Frequency (492.425MHz)
20°C	DC4.07V	489.051	490.975	492.425
20°C	DC3.7V	489.051	490.974	492.425
20°C	DC3.33V	489.050	490.973	492.424
Frequency Error:		0.001	0.002	0.001
Frequency tolerance:		0.0002%	0.0004%	0.0002%
Frequency tolerance limit		0.005%		

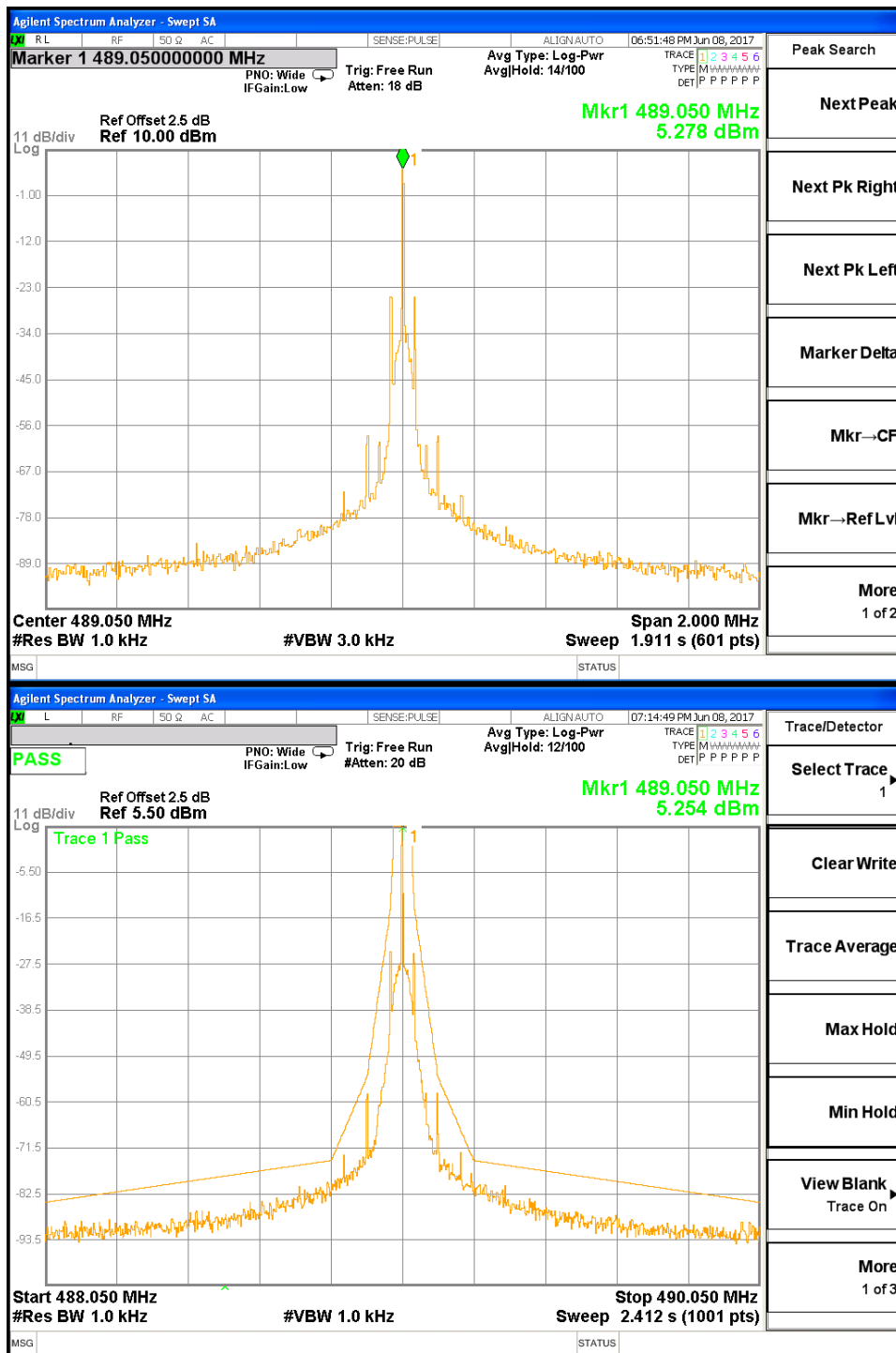
4.6. Emission Mask

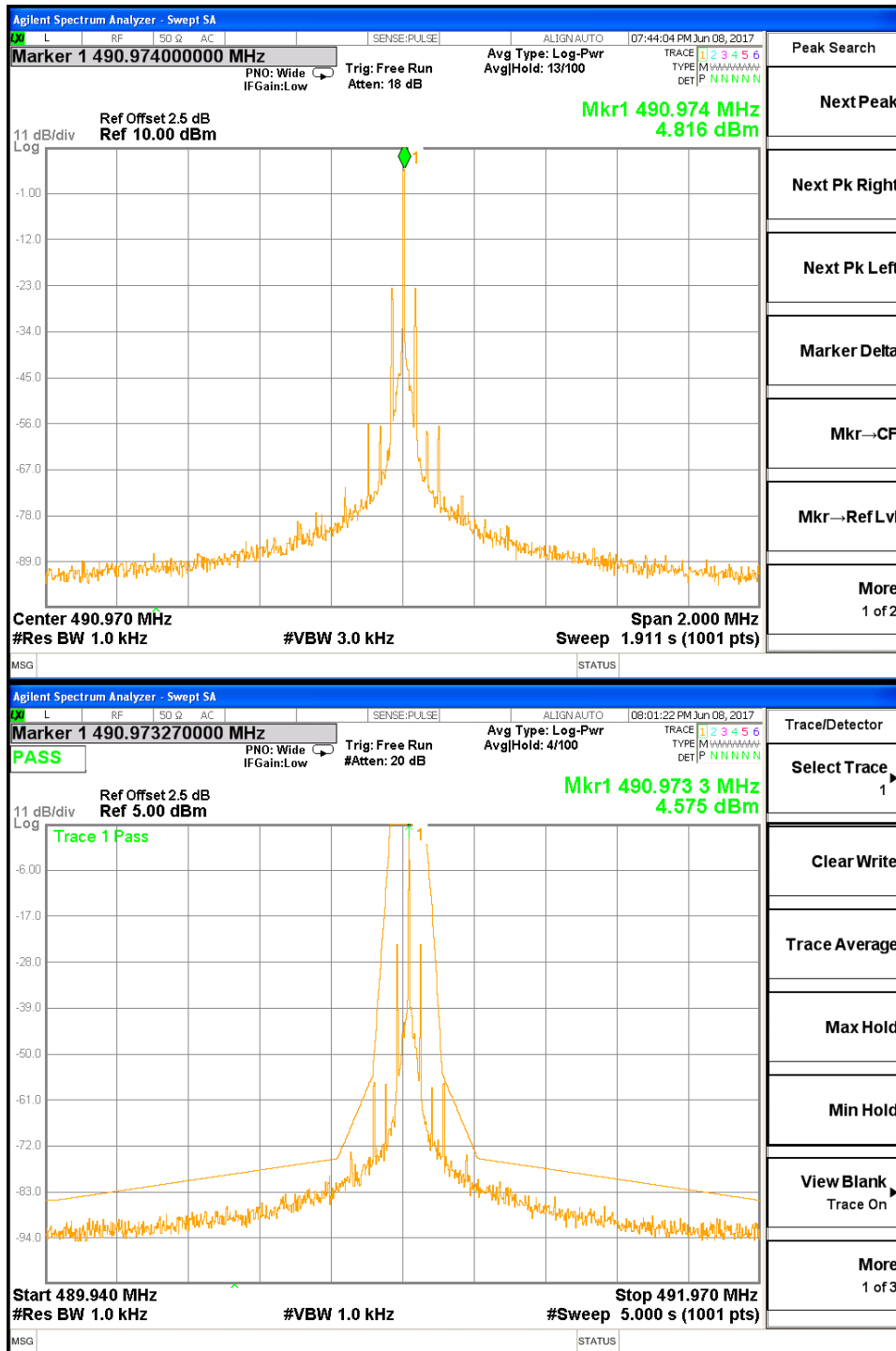
RESULT:
PASS

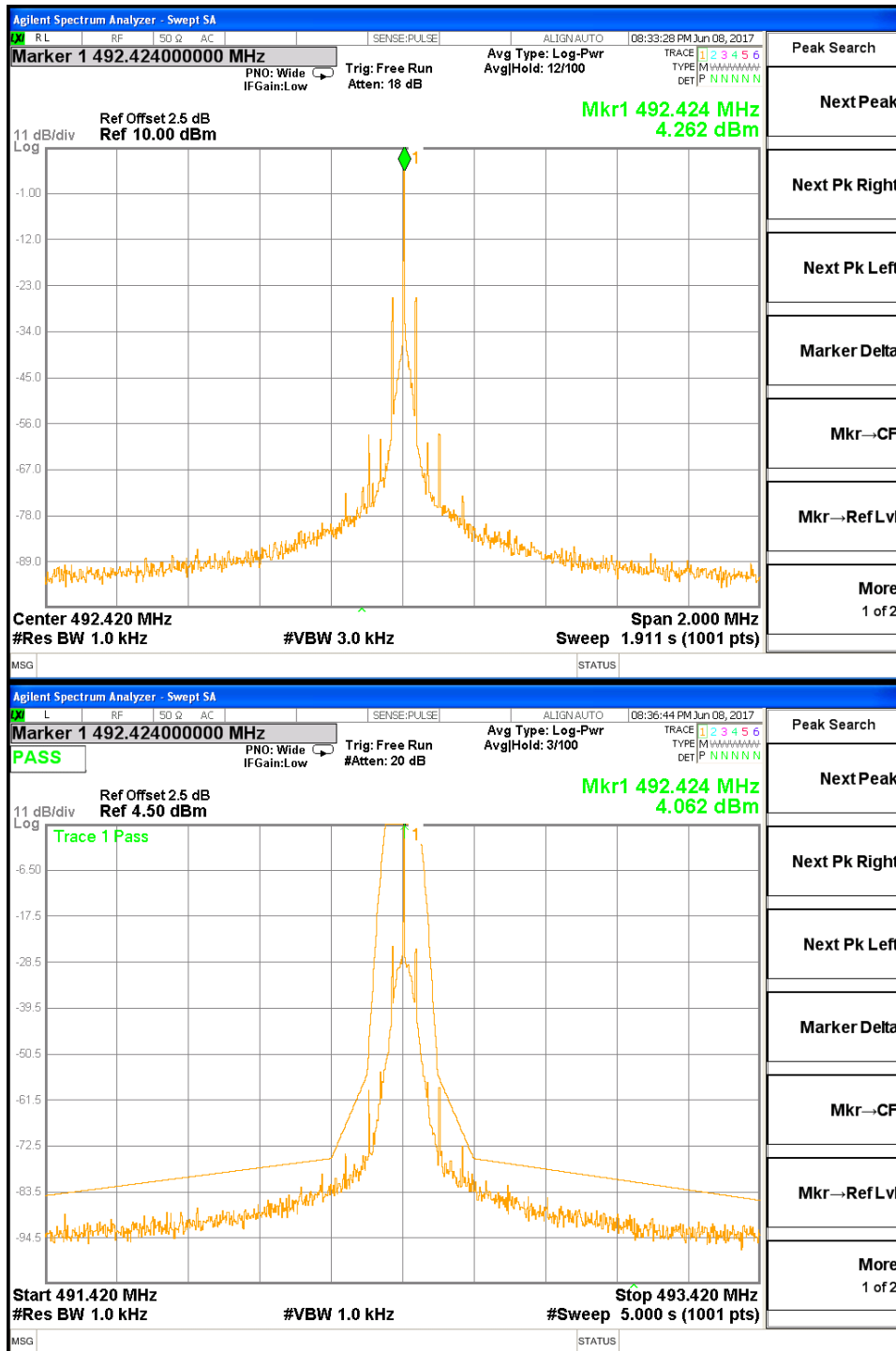
Date of testing : 08 Jun 2017
 Test specification : FCC Part 2 Per Section 2.1053(a) and 2.1057
 Guide : ANSI/TIA-603-C-2004, clause 2.2.12
 Limits : FCC Part 74 Per Section 74.861(e)(6)(7)
 Operation mode : Transmitting (modulated)
 Temperature : 20°C
 Humidity : 51%

Figure 12: Emission Mask
Low CH (489.050MHz):


Middle CH (490.975MHz):

High CH (492.425MHz):


Emission Mask in ETSI EN300 422-1 V1.4.2 (Low CH)


Emission Mask in ETSI EN300 422-1 V1.4.2 (U-299H, Middle CH)


Emission Mask in ETSI EN300 422-1 V1.4.2 (U-299H, High CH)


4.7. Electromagnetic Fields

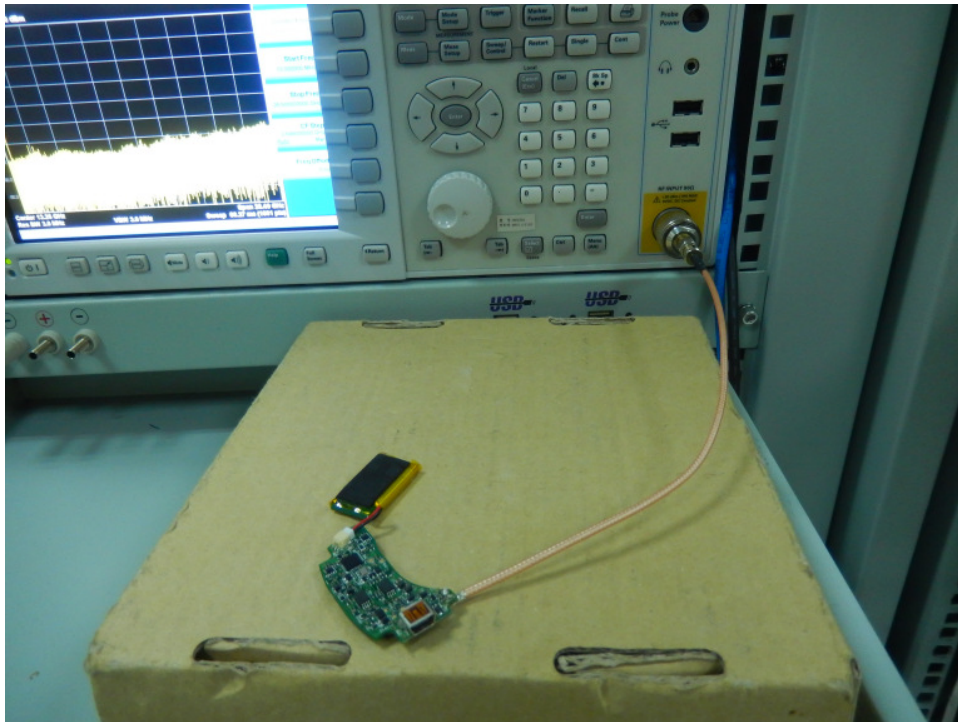
RESULT:	PASS
----------------	-------------

Date of testing	:	08 Jun 2017
Guide	:	FCC KDB Publication 447498

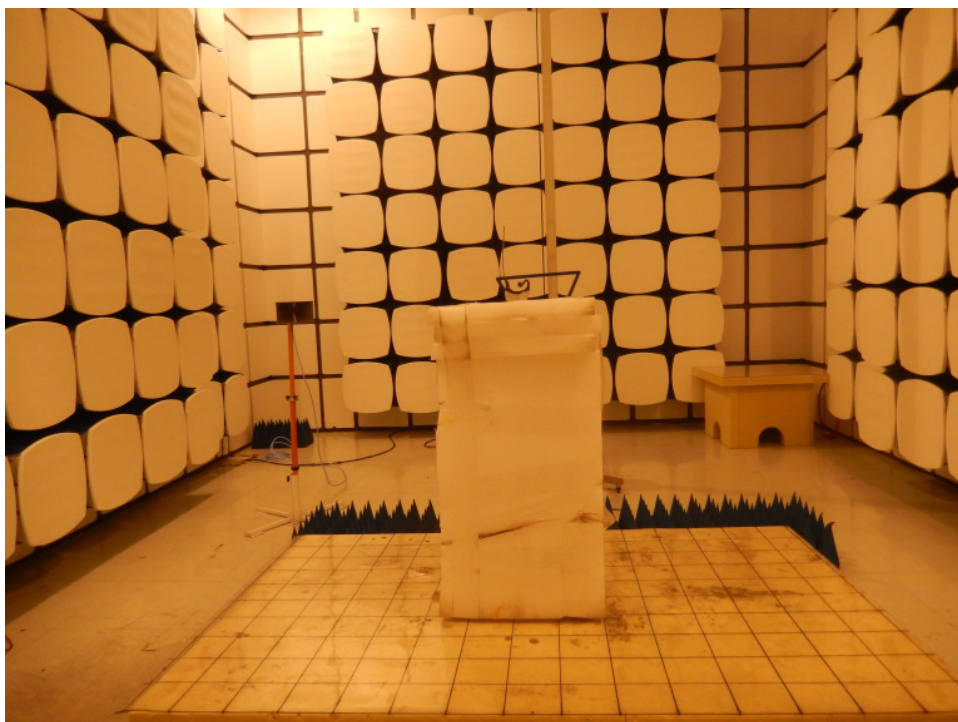
The minimum distance for the EUT is <5mm, since maximum peak output power of the transmitter is **16.71mW** (8.45dBm+1.63dBi+2.15dBi) <22mW, hence the EUTs are excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile and Portable RF Exposure. Guidance v06.

5. Photographs of Test Setup

Photograph 1: Conducted Output Power



Photograph 2: Spurious Radiation Measurement



6. List of Tables

TABLE 1: LIST OF TEST AND MEASUREMENT EQUIPMENT	6
TABLE 2: MEASUREMENT UNCERTAINTY	7

7. List of Figures

FIGURE 1: CONDUCTED OUTPUT POWER	12
FIGURE 2: TX SPURIOUS RADIATION, 30 – 7000 MHz, VERTICAL (LOW CH)	14
FIGURE 3: TX SPURIOUS RADIATION, 30 – 7000 MHz, HORIZONTAL (LOW CH)	15
FIGURE 4: TX SPURIOUS RADIATION, 30 – 7000 MHz, VERTICAL (MIDDLE CH)	16
FIGURE 5: TX SPURIOUS RADIATION, 30 – 7000 MHz, HORIZONTAL (MIDDLE CH)	17
FIGURE 6: TX SPURIOUS RADIATION, 30 – 7000 MHz, VERTICAL (HIGH CH)	18
FIGURE 7: TX SPURIOUS RADIATION, 30 – 7000 MHz, HORIZONTAL (HIGH CH)	19
FIGURE 8: MODULATION CHARACTERISTICS MEASUREMENT	20
FIGURE 9: OCCUPIED BANDWIDTH	23
FIGURE 10: FREQUENCY TOLERANCE	24
FIGURE 11: EMISSION MASK	25

List of Pictures

PHOTOGRAPH 1: CONDUCTED OUTPUT POWER	32
PHOTOGRAPH 2: SPURIOUS RADIATION MEASUREMENT	32