

TEST REPORT

FCC Standards : FCC 47 CFR part 15 subpart C
Industry Canada Standards :RSS-210 Issue 9 & RSS-GEN Issue 4

Test Report No. : CTK-2016-01523
Date of Issue : 2016-12-13
FCC ID : AK8TMRRF995R
Certification Number IC : 409B-TMRRF995R
Model/Type No. : TMR-RF995R
Kind of Product : RF Stereo Transmitter
Applicant : Sony Corporation
Applicant Address : 1-7-1 Konan, Minato-ku, Tokyo 108-0075, Japan
Manufacturer : Sony Corporation
Manufacturer Address : 1-7-1 Konan, Minato-ku, Tokyo 108-0075, Japan
Contact Person : Takeshi Kobayashi / Compliance Manager
Telephone : +81-50-3750-6543
Received Date : 2016-11-20
Test period : Start : 2016-12-05 End : 2016-12-12
Test Results : ☒ In Compliance ☐ Not in Compliance

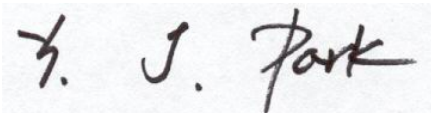
The test results presented in this report relate only to the object tested.

Tested by



Won-Jae, Hwang
Test Engineer
Date: 2016-12-13

Reviewed by



Young-Joon, Park
Technical Manager
Date: 2016-12-13



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CTK Co., Ltd.

(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
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REPORT REVISION HISTORY

Date	Revision	Page No
2016-12-13	Issued (CTK-2016-01523)	All

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TABLE OF CONTENTS

REPORT REVISION HISTORY	2
1.0 General Product Description	4
1.1 EUT Operation Test Setup	4
1.2 Tested Frequency	4
1.3 Device Modifications	4
1.4 Peripheral Devices	5
1.5 Configuration of System under Test	5
1.6 Calibration Details of Equipment Used for Measurement	6
1.7 Test Facility.....	6
1.8 Laboratory Accreditations and Listings	6
2 Summary of tests.....	7
2.1 Transmitter Requirements	8
2.1.1 20 dB bandwidth	8
2.1.2 Electric field strength of fundamental emission.....	11
2.1.3 AC Conducted Emissions.....	20
APPENDIX A – Test Equipment Used For Tests	23

1.0 General Product Description

Basic Model/Type No.	TMR-RF995R
Serial number	Prototype
EUT condition	Pre-production, not damaged
Antenna type	Integral
Frequency Range	915.5 MHz – 916.5 MHz
Number of channels	3
Channel Spacing	0.5 MHz
Type of Modulation	FM
Power Source	AC 120V / 60 Hz (DC 12 V from the AC adaptor)
Hardware Rev	Ver 1.0
Software Rev	-
Firmware Rev	Ver 1.0

1.1 EUT Operation Test Setup

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

1.2 Tested Frequency

	LOW	MID	HIGH
Frequency (MHz)	915.5	916.0	916.5

1.3 Device Modifications

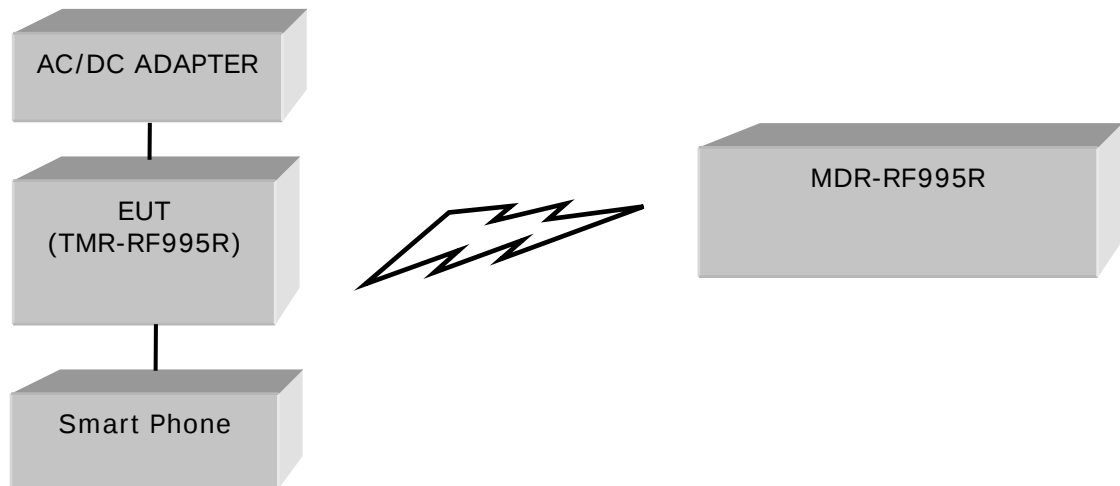
The following modifications was applied by the applicant:

Not applicable

1.4 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Wireless stereo headphones	SONY	MDR-RF995R	-
AC adaptor	SONY	AC-MS1202C	-
Smart Phone	SAMSUNG	SHV-E210S	-
Audio Cable	-	-	-

1.5 Configuration of System under Test



1.6 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.7 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.8 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	FCC	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	
JAPAN	VCCI	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-986 T-1843 R-3627 G-387	
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	KR0025	

2 Summary of tests

FCC Part Section(s)	IC Part Section(s)	Parameter	Test Condition	Status (note 1)
15.215	RSS-210 Issue 9 A.1.3 RSS-GEN Issue 4 6.6	20 dB Bandwidth Occupied Bandwidth	Radiated	C
15.249 (a)(e), 15.209	RSS-210 Issue 9 F.2	Electric field strength of fundamental emission		C
15.205 (a)(b), 15.209, 15.249 (a)(d)(e)	RSS-210 Issue 9 F.1 RSS-GEN Issue 4 8.9	Electric field strength of spurious emission		C
15.249 (b)	RSS-210 Issue 9 F.2.2	Frequency tolerance	NA	NA
15.207	RSS-GEN Issue 4 8.8	AC Conducted Emissions	Line Conducted	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:

- FCC Part 15.249, IC RSS-210 Issue 9

The tests were performed according to the method of measurements prescribed in
ANSI C63.4 -2014.

2.1 Transmitter Requirements

2.1.1 20 dB bandwidth

Test Location

RF Test Room

Test Procedures

The bandwidth at 20 dB below the highest in-band spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 200 kHz (approximately 2 or 3 times of the 20 dB bandwidth)

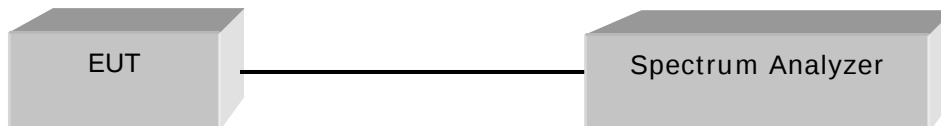
RBW = 10 kHz ($\geq 1\%$ of the span)

Sweep = auto

VBW = 30 kHz ($\geq$ RBW)

Detector function = peak

Trace = max hold



Limit

Limit : N/A



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Test Results (20 dB bandwidth)

Frequency (MHz)	Channel Number.	Measured Bandwidth (kHz)	Result
915.5	1	101.50	Complies
916.0	2	101.70	Complies
916.5	3	101.90	Complies

Test Results (Occupied Bandwidth)

Frequency (MHz)	Channel Number.	Measured Bandwidth (kHz)	Result
915.5	1	79.21	Complies
916.0	2	79.42	Complies
916.5	3	79.56	Complies

See next pages for actual measured spectrum plots.



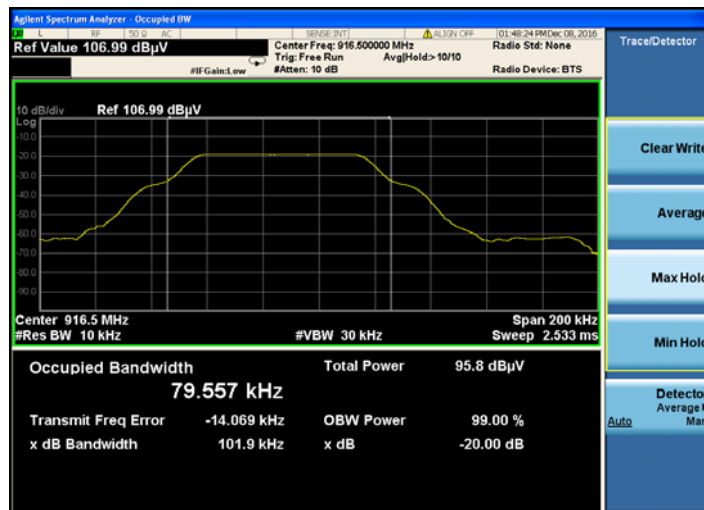
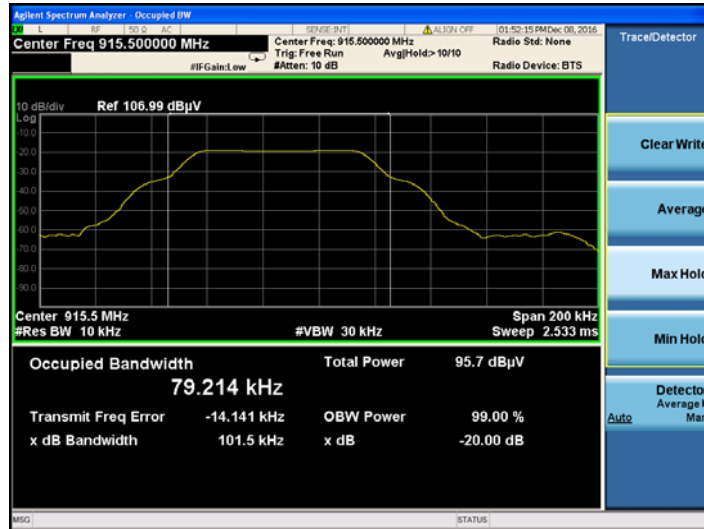
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2.1.2 Electric field strength of fundamental emission Electric field strength of spurious emission

Test Location

- ☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☒ 3 m SAC (test distance : 3 m)

Test Procedures

- 1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

The spectrum analyzer is set to:

Frequency Range = 9 kHz ~ 10 GHz (Fundamental 10th harmonic)
RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, 9 kHz for $f < 30$ MHz
VBW $\geq$ RBW
Sweep = auto

Limit

- 15.209(a)

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note :

- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)



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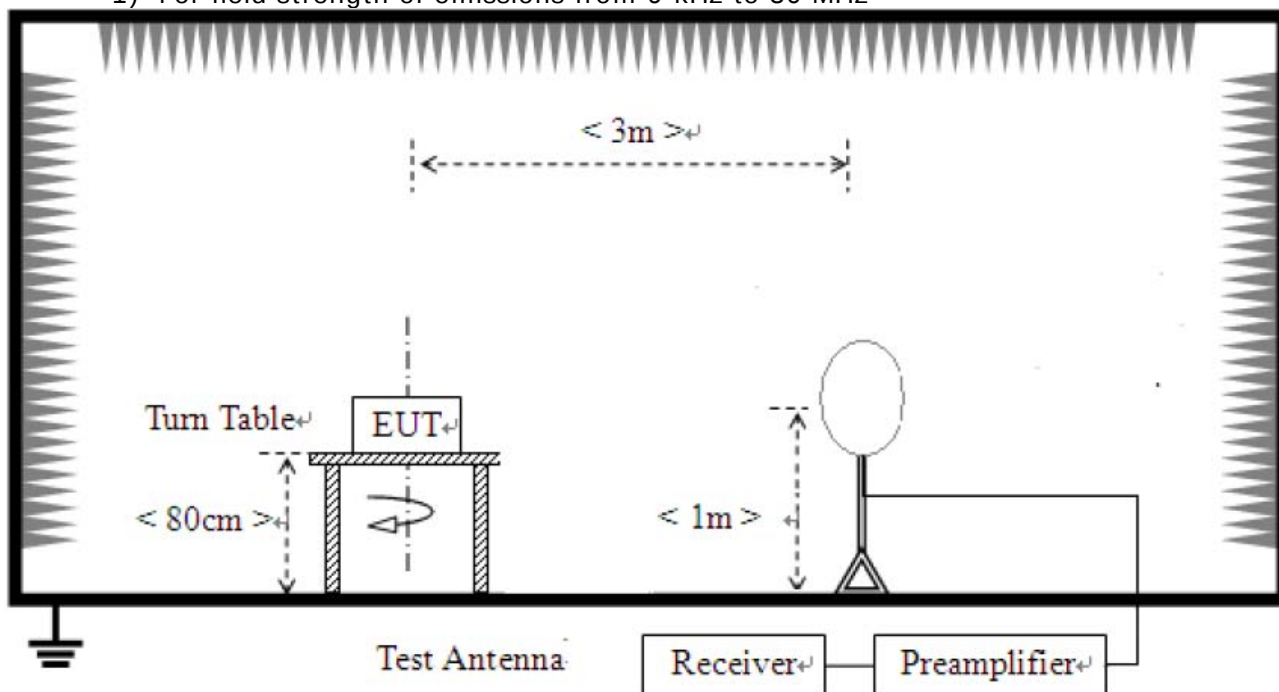
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- 15.249(a)

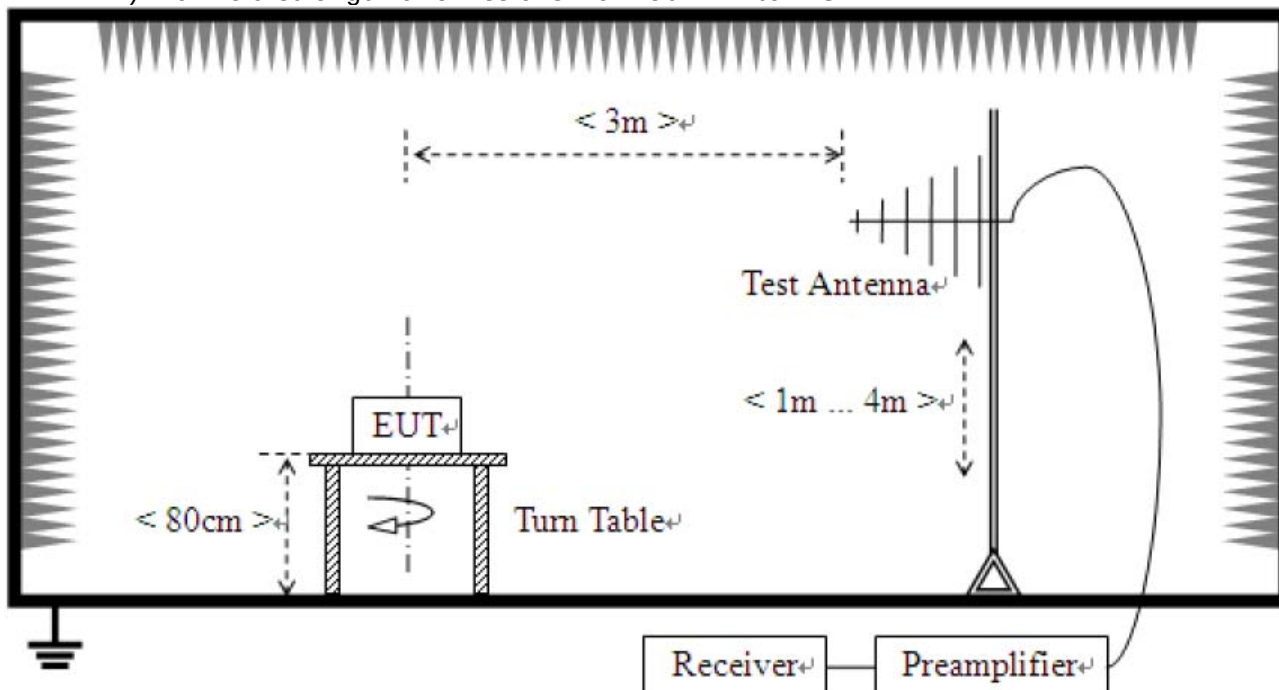
Fundamental Frequency(MHz)	Field Strength of Fundamental (uV/m)	Field Strength of harmonics (uV/m)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Test Setup:

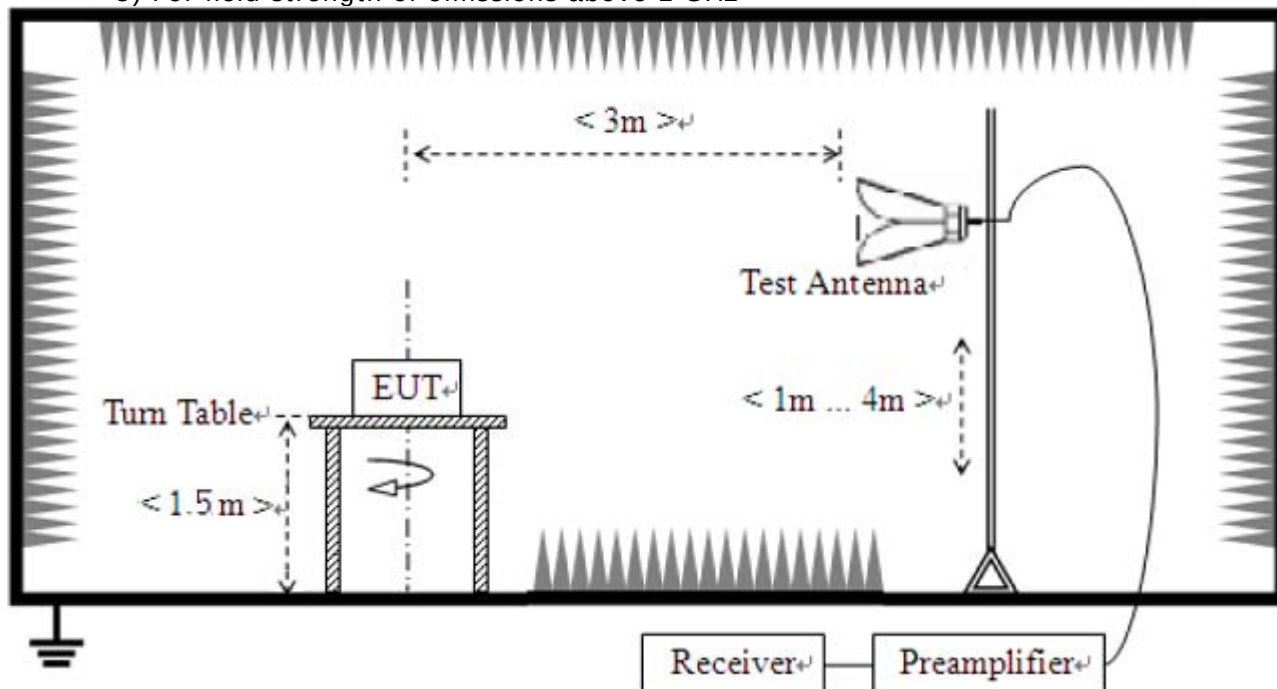
- 1) For field strength of emissions from 9 kHz to 30 MHz



- 2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



Test Results

1) 9 kHz to 30 MHz

EUT	RF Stereo Transmitter	Measurement Detail	
Model	TMR-RF995R	Frequency Range	9 kHz – 30 MHz
Test mode	Operating	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	See note

Note :

The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)



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2) 30 MHz to 1 GHz

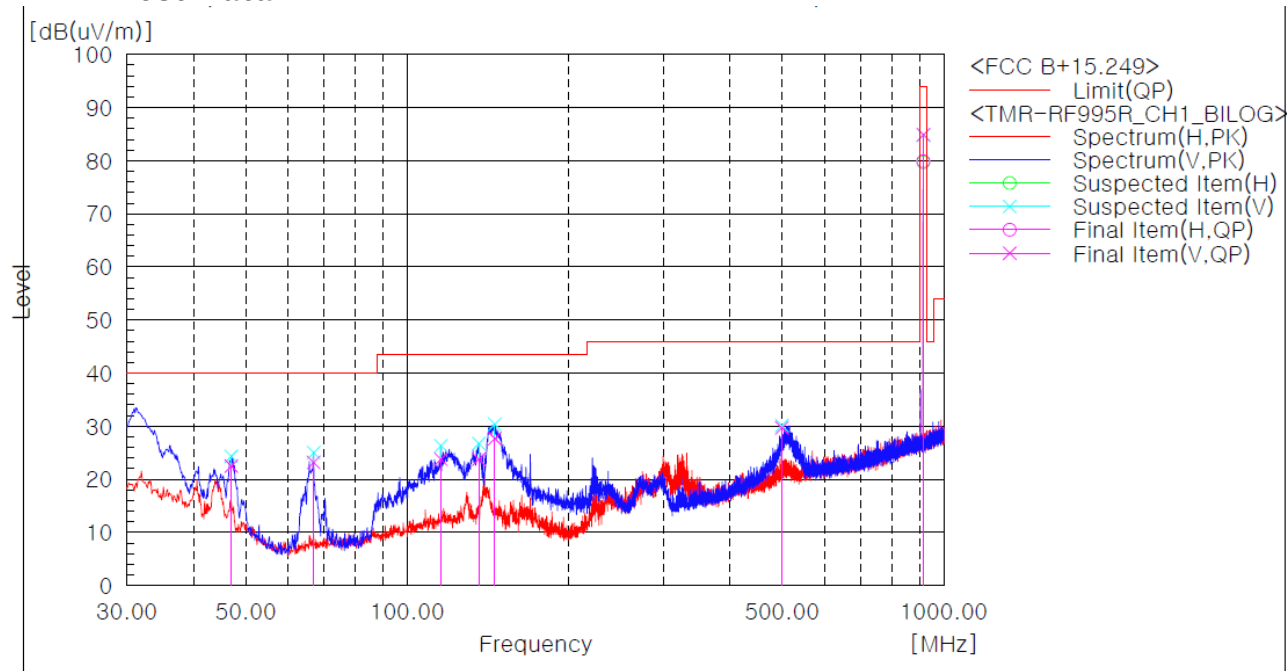
EUT	RF Stereo Transmitter	Measurement Detail	
Model	TMR-RF995R	Frequency Range	Below 1000MHz
Test mode	Operating CH 1	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
66.860	23.2	16.8	Spurious
915.500	84.9	9.1	Fundamental

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Angle [deg]
1	46.975	V	36.5	-14.0	22.5	40.0	17.5	93.0
2	66.860	V	41.1	-17.9	23.2	40.0	16.8	260.0
3	115.481	V	36.0	-12.2	23.8	43.5	19.7	75.0
4	135.851	V	35.8	-12.0	23.8	43.5	19.7	260.0
5	145.551	V	39.8	-12.1	27.7	43.5	15.8	334.0
6	498.752	V	32.7	-3.0	29.7	46.0	16.3	315.0
7	915.500	V	80.0	4.9	84.9	94.0	9.1	2.0
8	915.500	H	75.0	4.9	79.9	94.0	14.1	120.0

Remark :

1. The field strength of spurious 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 lie-down position(X axis) and the worst case was recorded.



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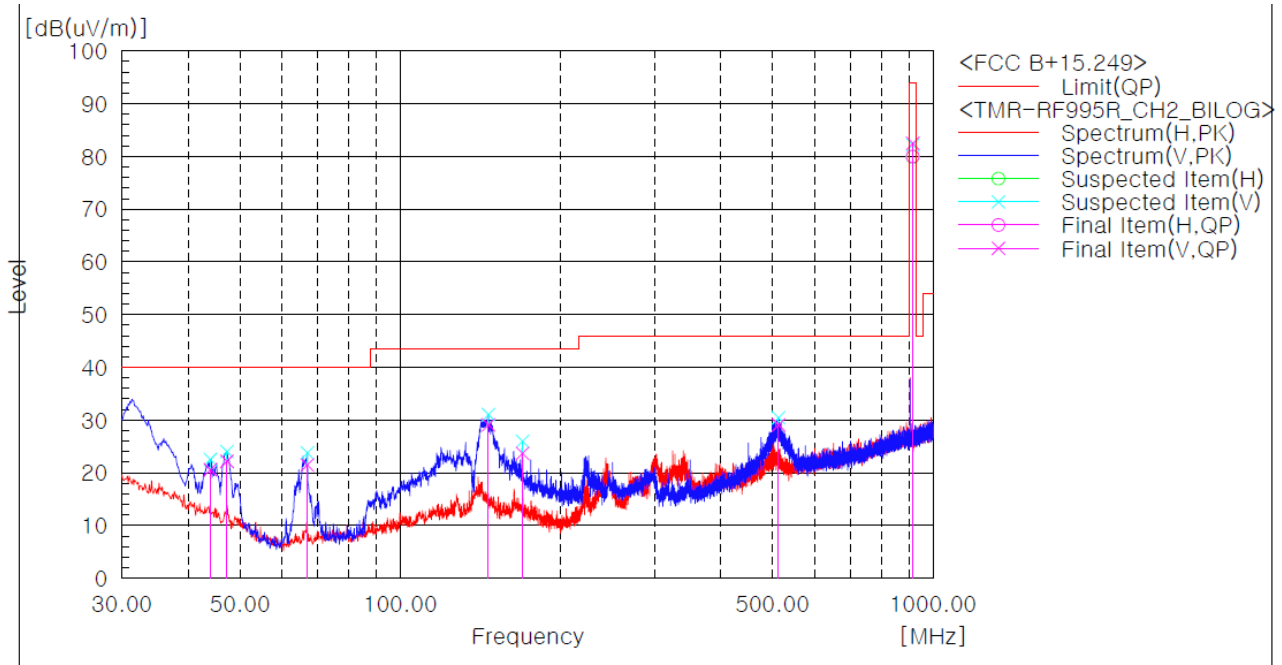
EUT	RF Stereo Transmitter	Measurement Detail	
Model	TMR-RF995R	Frequency Range	Below 1000MHz
Test mode	Operating CH 2	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
146.279	29.1	14.4	Spurious
916.000	82.5	11.5	Fundamental

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Angle [deg]
1	43.944	V	33.4	-12.8	20.6	40.0	19.4	100.0
2	47.218	V	36.3	-14.1	22.2	40.0	17.8	82.0
3	66.860	V	39.4	-17.9	21.5	40.0	18.5	303.0
4	146.279	V	41.2	-12.1	29.1	43.5	14.4	341.0
5	169.559	V	37.4	-13.7	23.7	43.5	19.8	322.0
6	512.575	V	31.7	-2.6	29.1	46.0	16.9	63.0
7	916.000	V	77.5	5.0	82.5	94.0	11.5	45.0
8	916.000	H	75.0	5.0	80.0	94.0	14.0	315.0

Remark :

1. The field strength of spurious 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 lie-down position(X axis) and the worst case was recorded.



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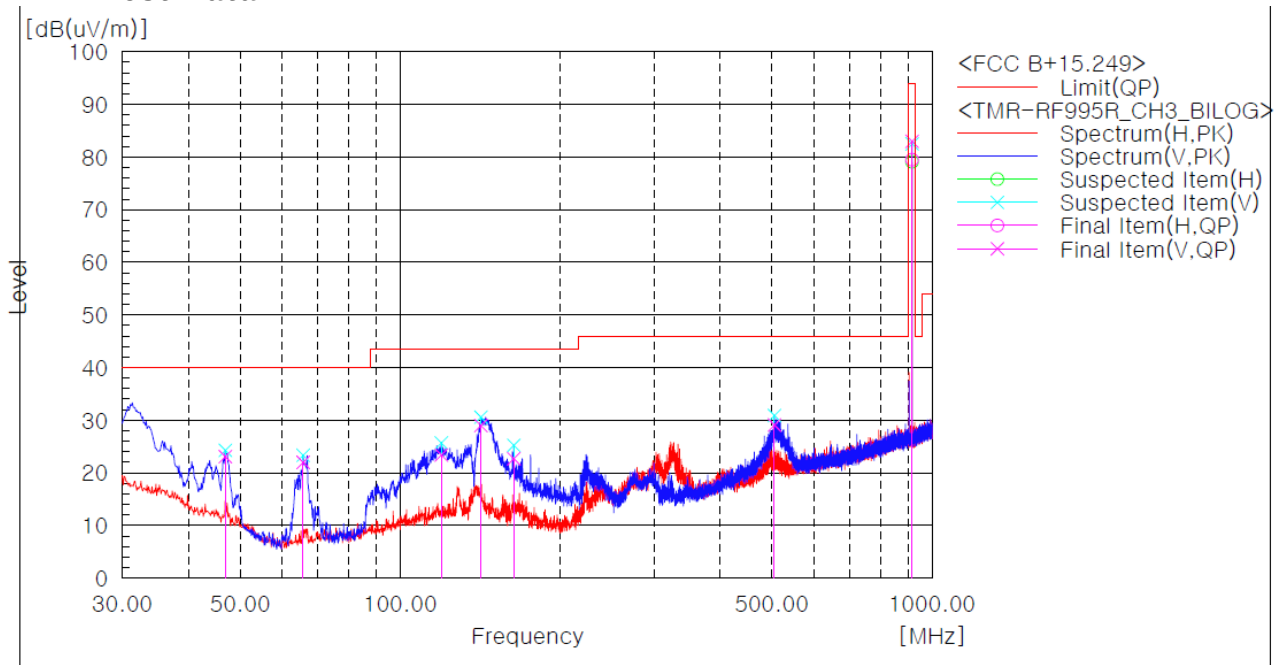
EUT	RF Stereo Transmitter	Measurement Detail	
Model	TMR-RF995R	Frequency Range	Below 1000MHz
Test mode	Operating CH 3	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
141.671	29.0	14.5	Spurious
916.500	83.0	11.0	Fundamental

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Angle [deg]
1	46.854	V	37.1	-14.0	23.1	40.0	16.9	112.0
2	65.648	V	40.0	-18.0	22.0	40.0	18.0	223.0
3	119.483	V	35.4	-12.0	23.4	43.5	20.1	56.0
4	141.671	V	41.0	-12.0	29.0	43.5	14.5	0.0
5	163.375	V	35.9	-13.2	22.7	43.5	20.8	223.0
6	505.057	V	31.9	-2.8	29.1	46.0	16.9	297.0
7	916.500	V	78.0	5.0	83.0	94.0	11.0	334.0
8	916.500	H	74.5	5.0	79.5	94.0	14.5	285.0

Remark :

1. The field strength of spurious 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 lie-down position(X axis) and the worst case was recorded.



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3) above 1 GHz

EUT	RF Stereo Transmitter	Measurement Detail	
Model	TMR-RF995R	Frequency Range	1-10GHz
		Detector function	Average / Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBUV/m)	Margin (dB)	Remark
1832.00	46.80	7.20	Average

Test Data

Ch.1(Low Channel)

Frequency [MHz]	(P)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1831.00	H	46.80	49.50	-3.8	54.00	74.00	43.00	45.70	11.00	28.30
1831.00	V	50.50	52.10	-3.8	54.00	74.00	46.70	48.30	7.30	25.70
2746.50	H	46.90	49.70	-1.5	54.00	74.00	45.36	48.16	8.64	25.84
2746.50	V	47.30	49.80	-1.5	54.00	74.00	45.76	48.26	8.24	25.74
3662.00	H	42.10	45.40	1.5	54.00	74.00	43.56	46.86	10.44	27.14
3662.00	V	41.60	46.30	1.5	54.00	74.00	43.06	47.76	10.94	26.24

Ch.2(Mid Channel)

Frequency [MHz]	(P)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1832.00	H	46.50	49.90	-3.8	54.00	74.00	42.70	46.10	11.30	27.90
1832.00	V	50.60	53.00	-3.8	54.00	74.00	46.80	49.20	7.20	24.80
2748.00	H	44.90	48.10	-1.5	54.00	74.00	43.36	46.56	10.64	27.44
2748.00	V	43.30	46.50	-1.5	54.00	74.00	41.76	44.96	12.24	29.04
3664.00	H	39.60	44.50	1.5	54.00	74.00	41.06	45.96	12.94	28.04
3664.00	V	41.50	44.60	1.5	54.00	74.00	42.96	46.06	11.04	27.94



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Ch.3(High Channel)

Frequency [MHz]	(P)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
1833.00	H	47.10	50.00	-3.8	54.00	74.00	43.30	46.20	10.70	27.80
1833.00	V	50.60	53.00	-3.8	54.00	74.00	46.80	49.20	7.20	24.80
2749.50	H	44.50	47.50	-1.5	54.00	74.00	42.96	45.96	11.04	28.04
2749.50	V	42.50	46.40	-1.5	54.00	74.00	40.96	44.86	13.04	29.14
3666.00	H	38.70	44.30	1.5	54.00	74.00	40.16	45.76	13.84	28.24
3666.00	V	40.50	44.80	1.5	54.00	74.00	41.96	46.26	12.04	27.74



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2.1.3 AC Conducted Emissions

Test Location

Shielded Room

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.

Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

- 15.207(a)

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency.

Test Results

The requirements are:

☒ Complies

Test mode : Operating CH 1

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
0.321	31.1	18.6	Average



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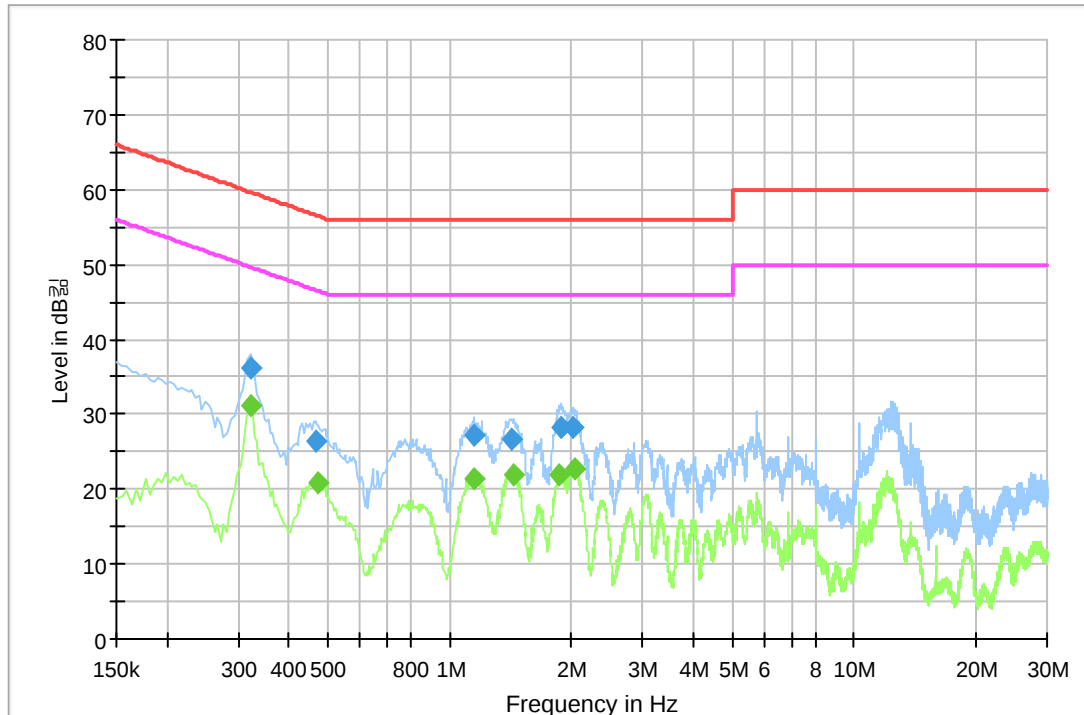
CTK Co., Ltd.

(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970 Fax: +82-31-624-9501
www.e-ctk.com

Test Data

[L1]

3CE_Class B_L1



Final Result 1

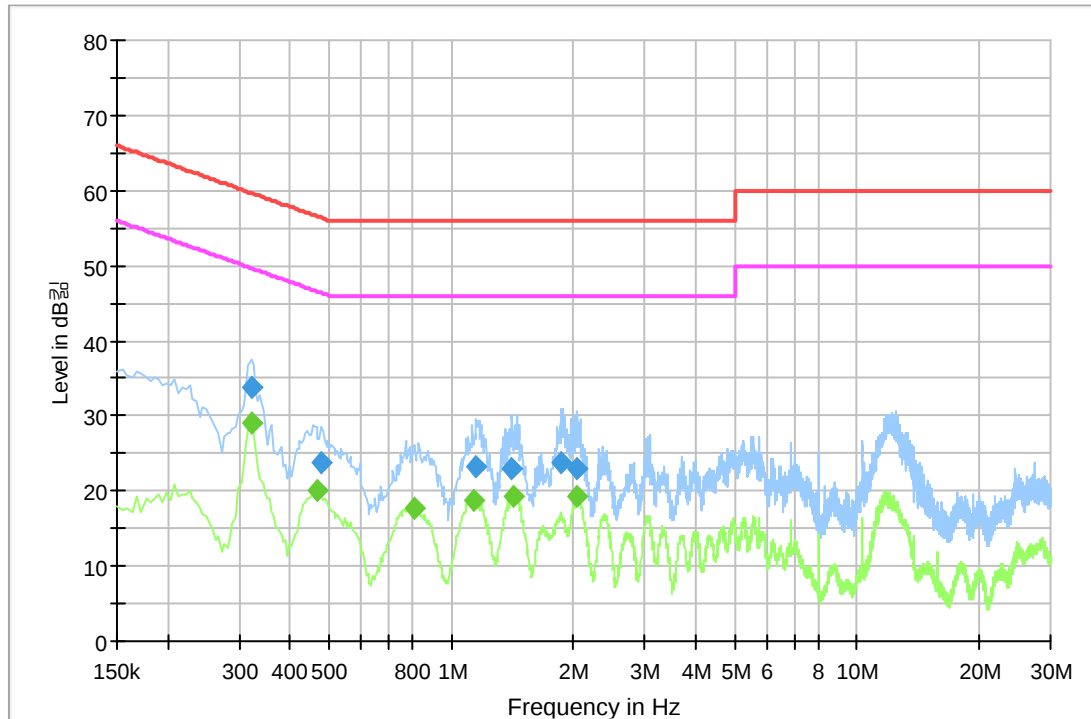
Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.321000	36.1	1000.0	9.000	On	L1	10.0	23.6	59.7
0.465000	26.3	1000.0	9.000	On	L1	10.0	30.3	56.6
1.149000	27.2	1000.0	9.000	On	L1	9.9	28.8	56.0
1.428000	26.8	1000.0	9.000	On	L1	9.8	29.2	56.0
1.882500	28.3	1000.0	9.000	On	L1	9.8	27.7	56.0
2.026500	28.1	1000.0	9.000	On	L1	9.7	27.9	56.0

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.321000	31.1	1000.0	9.000	On	L1	10.0	18.6	49.7
0.474000	20.8	1000.0	9.000	On	L1	10.0	25.6	46.4
1.153500	21.5	1000.0	9.000	On	L1	9.9	24.5	46.0
1.441500	22.0	1000.0	9.000	On	L1	9.8	24.0	46.0
1.855500	22.0	1000.0	9.000	On	L1	9.8	24.0	46.0
2.040000	22.8	1000.0	9.000	On	L1	9.7	23.2	46.0

[NEUTRAL]

3CE_Class B_N



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.321000	33.9	1000.0	9.000	On	N	10.0	25.8	59.7
0.478500	23.8	1000.0	9.000	On	N	10.0	32.5	56.4
1.153500	23.3	1000.0	9.000	On	N	9.8	32.7	56.0
1.414500	22.9	1000.0	9.000	On	N	9.8	33.1	56.0
1.860000	23.8	1000.0	9.000	On	N	9.8	32.2	56.0
2.049000	22.9	1000.0	9.000	On	N	9.8	33.1	56.0

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.321000	29.1	1000.0	9.000	On	N	10.0	20.6	49.7
0.465000	20.0	1000.0	9.000	On	N	10.0	26.6	46.6
0.811500	17.6	1000.0	9.000	On	N	9.9	28.4	46.0
1.135500	18.6	1000.0	9.000	On	N	9.8	27.4	46.0
1.419000	19.3	1000.0	9.000	On	N	9.8	26.7	46.0
2.049000	19.2	1000.0	9.000	On	N	9.8	26.8	46.0



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APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Signal Analyzer	Agilent	N9020A	MY48011598	2016-11-01	2017-11-01
2	Spectrum Analyzer	Rohde & Schwarz	FSP-30	100994	2016-11-01	2017-11-01
3	Signal Generator	Rohde & Schwarz	SMB100A	175528	2016-11-01	2017-11-01
4	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2016-10-31	2017-10-31
5	LISN	Rohde & Schwarz	ENV216	101760	2016-02-05	2017-02-05
6	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2016-11-01	2017-11-01
7	Trilog Broadband Antenna	SCHWARZBECK	VULB 9161 SE	9161-4133	2015-06-18	2017-06-18
8	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2016-05-16	2018-05-16
9	6dB Attenuator	R&S	DNF	272.4110.50-1	2016-02-04	2017-02-04
10	6dB Attenuator	R&S	DNF	272.4110.50-2	2016-11-01	2017-11-01
11	AMPLIFIER	SONOMA	310	291721	2016-02-02	2017-02-02
12	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2015-05-14	2017-05-14
13	PREAMPLIFIER	Agilent	8449B	3008A02011	2016-12-01	2017-12-01
14	Horn Antenna	ETS-Lindgren	3115	00078894	2015-09-02	2017-09-02
15	Horn Antenna	ETS-Lindgren	3116	00062504	2015-09-04	2017-09-04
16	Horn Antenna	ETS-Lindgren	3116	00062916	2015-04-30	2017-04-30
17	Horn Antenna	ETS-Lindgren	3117	00154525	2015-09-02	2017-09-02