SHURE

ELECTROMAGNETIC COMPATIBILITY LABORATORY
TEST REPORT

TEST REPORT TITLE: Electromagnetic Compatibility Tests of the Shure P9T Wireless Personal Monitor Transmitter in the H21 Band (542MHz to 578MHz)

TEST ITEM DESCRIPTION:

The Shure P9T is a wireless personal monitor transmitter.

For: Shure Incorporated
5800 West Touhy Avenue
Niles, IL 60714

Project ID Number: RFTM-180 & 183/P9T H21 FCC15C

Date Tested: January 13 thru March 5, 2021

Test Personnel: Sharjeel Sohail, Frank Salmeron

Test Specification:

IC RSS-GEN – General Requirements and Information for the Certification of Radio Apparatus
IC RSS-210 - License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
FCC Title 47, Part 2.1051
FCC Part 15C, Section 15.236(g)
FCC Part 15C, Section 15.236(d)(1)
FCC Part 15C, Section 15.236(f)(2)
FCC Part 15C, Section 15.236(f)(3)

TEST REPORT BY: Jaime Terrazas	Global Compliance Engineer	March 12, 2021
APPROVED BY: _____	Manager, Compliance Lab	March 12, 2021
Signature	Position	Date

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LIST OF APPENDICIES

APPENDIX	TEST DESCRIPTION
A	Necessary Bandwidth, Maximum Bandwidth, 99% bandwidth
B	Radiated Spurious Emissions
C	Maximum Rated Power
D	Frequency Tolerance

REPORT REVISION HISTORY

Revision	Date	Description
0	March 12, 2021	Initial release

1. INTRODUCTION

1.1. Scope of Tests

This report presents the results of testing per FCC Part 15C, Section 15.236(g), Section 15.236(d)(1), Section 15.236(f)(1), Section 15.236(f)(2), Section 15.236(f)(3), RSS-Gen, and RSS-210. The following data was taken following the measurement method as described in the document section(s) listed on page 1 of this document. Provided is the data for the test sample. Also included is a summary of the measurements made and a description of the measurement setup. The test samples meet the requirements of the above standards. The equipment under test (EUT) contained a transmitter that was designed to transmit in the UHF TV frequency bands shown in Table 1.

Model	Band	Frequency (MHz)	Output Power (mW)
P9T	H21	542 to 578	10

Table 1. EUT Frequencies and Power Levels

1.2. Purpose

This series of testing was performed to determine if the test item would meet the requirements of FCC Part 15C, Section 236(g), Section 15.236(d)(1), Section 15.236(f)(1), Section 15.236(f)(2), Section 15.236(f)(3), RSS-Gen, and RSS-210.

1.3 Deviations, Additions and Exclusions

None

1.4 EMC Laboratory Identification

The electromagnetic compatibility tests were performed at the Shure Electromagnetic Laboratory, Shure Incorporated, 5800 West Touhy Ave, Niles, Illinois 60714-4608. This laboratory is registered with Industry Canada as Site # 616A-1. The Shure Electromagnetic Laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP).
The NVLAP Lab Code is: 200946-0.

1.5 Summary of Tests Performed

The following electromagnetic compatibility tests (Table 2) were performed on the test item in accordance with ETSI specifications.

Table 2. Summary of tests performed

FCC Part 15C Test Spec	Description	EUT Firmware	Tested Frequency in MHz	Appendix	Test Results
15.236(g), RSS-Gen 6.7	Necessary Bandwidth, 99% Emissions Bandwidth	1.2.2	542.000, 560.000, 578.000	A	Pass
15.236(f)(2)	Maximum Bandwidth	1.2.2	542.000, 560.000, 578.000	A	Pass
15.236(g)	Radiated Spurious Emissions	1.2.2	542.000, 560.000, 578.000	B	Pass
15.236(d)(1)	Maximum Rated Power	1.2.2	542.000, 560.000, 578.000	C	Pass
15.236(f)(3)	Frequency Tolerance	1.2.2	542.000, 560.000, 578.000	D	Pass

2 APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

FCC Part 15C, Section 15.236(g)

FCC Part 15C, Section 15.236(d)(1)

FCC Part 15C, Section 15.236(f)(2)

FCC Part 15C, Section 15.236(f)(3)

FCC Title 47, Chapter I, Subchapter A, Part 2 – Frequency Allocations and Radio Treaty Matters, General Rules and Regulations, Subpart J – Equipment Authorization Procedures

EN 300 422-1 V1.4.2 (2011-08), “Electromagnetic compatibility and Radio spectrum Matters (ERMM); Wireless Microphones in the 25 MHz to 3 GHz frequency range; Part 1: technical characteristics and methods of measurement”

ANSI C63.10 (2013), " American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"

RSS-Gen Issue 5, “General Requirements for Compliance of Radio Apparatus”

RSS-210 Issue 9, “Licence-Exempt Radio Apparatus: Category I Equipment”

3 EUT SET-UP AND OPERATION

3.1. General Description

The test sample used was Shure P9T wireless personal monitor transmitter. The EUT was arranged and tested per individual Appendices.

3.2 Test Sample

The following product sample was tested:

Table 3: Shure P9T Transmitter Sample

Band	Serial Numbers
H21	Test Unit # 1

3.3 Operational Mode

The transmit frequency and output power modes shown in the individual appendixes.

4. Test Instrumentation

A list of the test equipment used can be found in Table 10-1. All equipment used was within calibration during and throughout the duration of the tests. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

5. Procedure

The specific test procedures are presented in the individual appendices.

6. Other Test Conditions:

6.1. Test Personnel

All EMC tests were performed by qualified personnel from the Shure EMC Laboratory.

6.2. Disposition of the EUT

The EUTs and all associated equipment were returned to Shure Incorporated upon completion of the tests.

7. Results of Tests:

The results are presented in Appendices. It was found that the EUT meets the requirements of FCC Part 15C, Section 236(g), Section 15.236(d)(1), Section 15.236(f)(2), Section 15.236(f)(3), RSS-Gen, and.RSS-210

8. Conclusions:

It was determined that the Shure P9T Wireless Monitor Transmitter did fully comply with the requirements of FCC Part 15C, Section 236(g), Section 15.236(d)(1), Section 15.236(f)(2), Section 15.236(f)(3), RSS-Gen, RSS-210.

9. **Certification**:

Shure EMC Laboratory certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the EUTs at the test date. Any electrical or mechanical modification made to the EUTs subsequent to the specified test date will serve to invalidate the data and void this certification.

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

10. Equipment List

Table 10-1 Test Equipment

L# or ID	Description	Manufacturer	Model #	Serial #	Frequency Range	Cal Date	Due Date
L23-011-01	3 meter RF Chamber	ETS Lindgren	FACT-3	AJ640	25MHz - 18GHz	12/31/2020	12/31/2021
L23-011-02	Electric Powered Turntable	ETS Lindgren	2088	N/A	N/A	N/A	N/A
L23-011-08	Controller	EMCO	2090	29799	N/A	N/A	N/A
L23-011-09	Antenna Positioner	ETS Lindgren	2071-2	35500	N/A	N/A	N/A
L23-011-15	BiConiLog Antenna	ETS Lindgren	3142C	34790	25MHz-1GHz	7/16/2019	7/16/2021
L23-011-54	EMI Test Receiver	Rohde & Schwarz	ESR26	100220	9kHz-26GHz	11/18/2019	11/18/2021
L23-011-31	EMI/EMS Test Software	Rohde & Schwarz	EMC32	V 9.21.00	N/A	N/A	N/A
L23-011-53	Horn antenna with pre-amplifier	ETS Lindgren	3117-PA	200363	1GHz to 18 GHz	9/17/2019	9/17/2021
L23-011-41	Horn Antenna	ETS Lindgren	3117	123511	1GHz to 18 GHz	1/23/2019	1/23/2021
L23-011-56	High Pass Filter	K&L	11SH10-940/X10000-0/0	2	940MHz – 10GHz	3/3/2020	3/3/2022
L23-022-02	Spectrum Analyzer	Rohde & Schwarz	FSW26	103788	9kHz-26GHz	3/4/2020	3/4/2022
L23-022-01	Spectrum Analyzer	Rohde & Schwarz	FSU26	201043	9kHz-26GHz	8/14/2019	8/14/2021
L23-034-02	Temperature Hygrometer	Extech	445703	48254-65	N/A	4/3/2020	4/3/2022
L23-034-12	Temperature Hygrometer	Extech	445703	48254-13	N/A	10/13/2020	10/13/2022
L23-040-03	20dB Attenuator	MCL	BW-N20W5+	N/A	20MHz to 18GHz	3/2/2020	3/2/2022
L23-045-36	RF Power Sensor	ETS-Lindgren	7002-006	151071	10MHz to 6GHz	1/10/2020	1/10/2022
L23-024-01	Frequency Counter	Agilent	53220A	MY50006485	DC to 6GHz	7/28/2020	7/28/2022
L23-034-08	Thermometer	Extech	TM100	13018733	N/A	3/3/2020	3/3/2022
L19-00010	Temperature Chamber	ESPEC	BTZ-133	0641489	N/A	7-20-2020	7-20-2021
L23-023-01	RF Signal Generator	Rohde & Schwarz	SMF100A	101553	20Hz to 26.5GHz	8/14/2019	8/14/2021

Appendix A

NECESSARY BANDWIDTH
OPERATING BANDWIDTH
99% EMISSIONS BANDWIDTH

PURPOSE

This test was performed to determine if the EUT meets the necessary bandwidth requirements of EN 300 422-1, section 8.3.2., and Occupied Bandwidth of RSS-210 Annex G, Section G 3.2, with the EUT operating at 542.000MHz, 560.000MHz, and 578.000MHz.

The testing results show the EUT meets FCC 15C 15.236(f)(2) and RSS-210 Section G.3.2, operating bandwidth and occupied bandwidth does not exceed 200kHz. This test was performed to determine if the EUT meets the Emissions Bandwidth of RSS-Gen 6.7.

REQUIREMENTS

As stated in EN 300 422-1, section 8.3.2, the emission mask given in section 8.3.2.2 shall not be exceeded. As stated in RSS-Gen 6.7 measurement of 995 Emissions bandwidth.

TEST SETUP AND INSTRUMENTATION

A photograph of the test setup is shown in Figure A-1. The test instrumentation can be determined from Table 10-1.

MEASUREMENT UNCERTAINTY

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system. Values of Expanded Measurement Uncertainty (95% Confidence):

Measurement Type	U_{LAB}
Necessary Bandwidth	**±0.130 %**

U_{lab} = Determined for Shure EMC Laboratory

Since U_{LAB} is less than or equal to U_{ETSI}:

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

EUT OPERATION

The EUT was powered up and the transmit frequency and power output of the EUT were selected. The EUT was checked for proper operation after it was setup for the test. Testing was conducted with the EUT set to transmit at 542.000MHz, 560.000MHz, and 578.000MHz, at an output power level of 10mW. The transmitter was modulated per EN300422-1 V1.4.2 (2011-08), clause 7.1.2.

Appendix A

TEST PROCEDURE

The test procedure followed is shown in EN300422-1 V1.4.2 (2011-08), section 8.3.2.

RESULTS

The necessary bandwidth data is presented on pages 12 and 16. The figure shows the maximum relative level within the emission mask with modulation. As shown by the test data, the necessary bandwidth of the EUT meets the requirements of EN 300 422-1, section 8.3.1. The RSS-Gen maximum 99% bandwidth measurement was less than 200kHz.

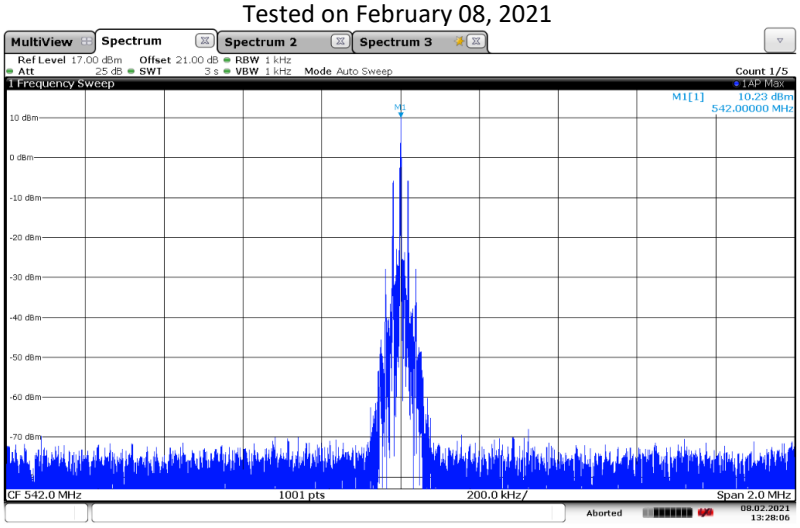
The temperature during the testing was 74 degrees F, with relative humidity of 17%.

Figure A-1 - Test Setup for Necessary Bandwidth

Appendix A

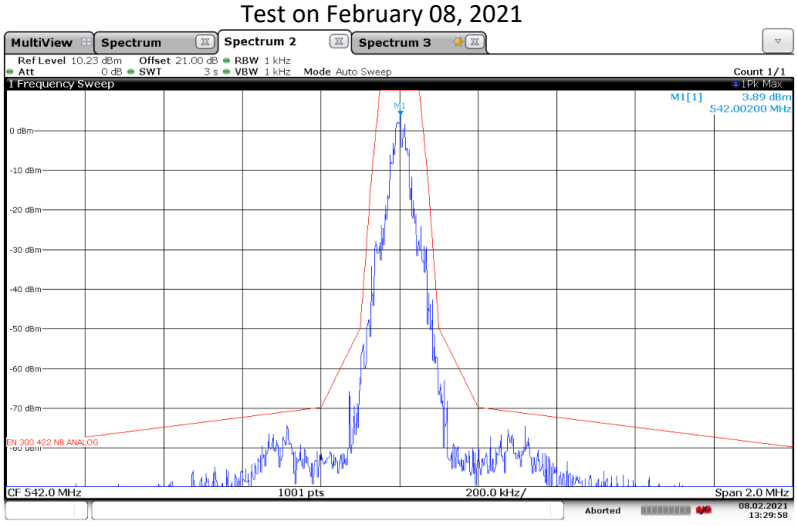
Test Information

EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	EN 300 422 Analog Necessary Bandwidth
Operating Conditions:	Low Frequency, 542.00 MHz, 10mW
Operator Name:	Frank Salmeron
Comment:	Carrier Power
Date Tested:	Tested on February 08, 2021



Test Information

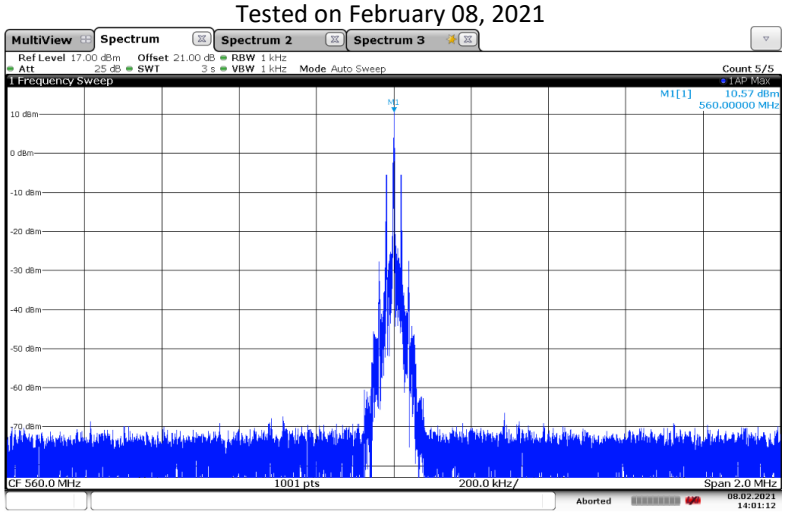
EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	EN 300 422 Analog Necessary Bandwidth
Operating Conditions:	Low Frequency, 542.00 MHz, 10mW
Operator Name:	Frank Salmeron
Comment:	Maximum Relative Level
Date Tested:	Test on February 08, 2021



Appendix A

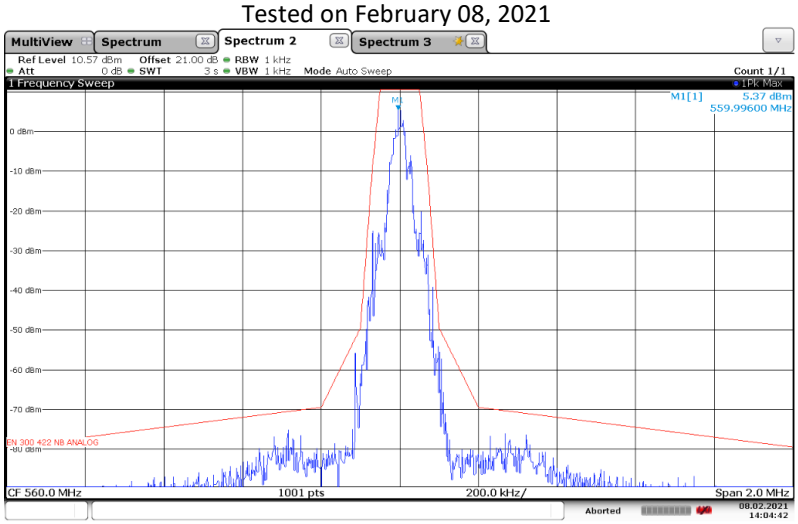
Test Information

EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	EN 300 422 Analog Necessary Bandwidth
Operating Conditions:	Low Frequency, 560.00 MHz, 10mW
Operator Name:	Frank Salmeron
Comment:	Carrier Power
Date Tested:	Tested on February 08, 2021



Test Information

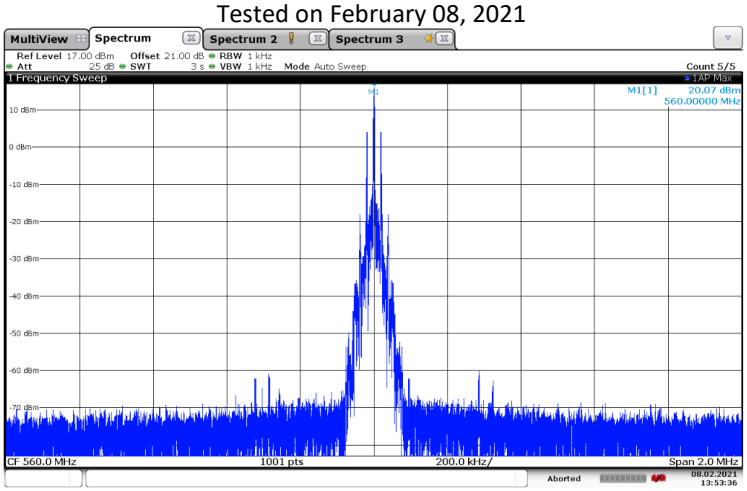
EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	EN 300 422 Analog Necessary Bandwidth
Operating Conditions:	Low Frequency, 560.00 MHz, 10mW
Operator Name:	Frank Salmeron
Comment:	Maximum Relative Level
Date Tested:	Tested on February 08, 2021



Appendix A

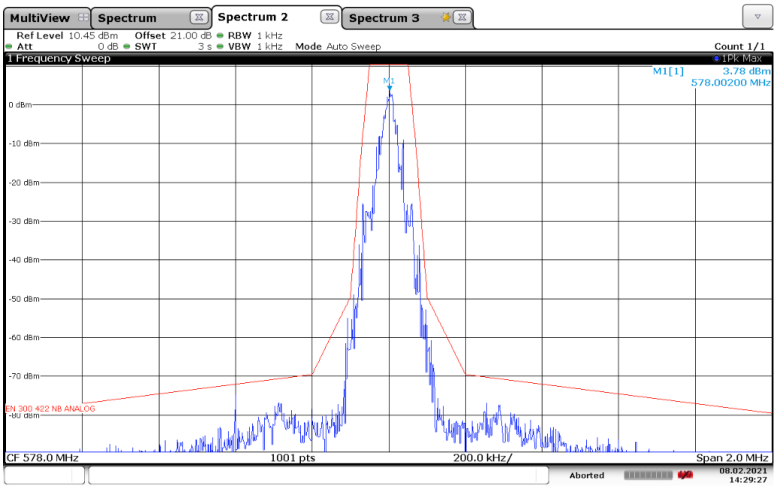
Test Information

EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	EN 300 422 Analog Necessary Bandwidth
Operating Conditions:	Low Frequency, 578.00 MHz, 10mW
Operator Name:	Frank Salmeron
Comment:	Carrier Power
Date Tested:	Tested on February 08, 2021



Test Information

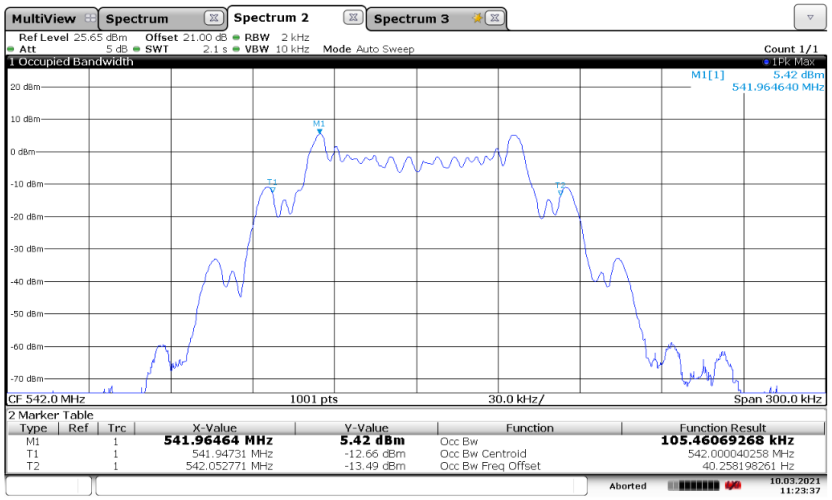
EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	EN 300 422 Analog Necessary Bandwidth
Operating Conditions:	Low Frequency, 578.00 MHz, 10mW
Operator Name:	Frank Salmeron
Comment:	8.3.3.1: Maximum Relative Level
Date Tested:	Tested on February 08, 2021



Appendix A

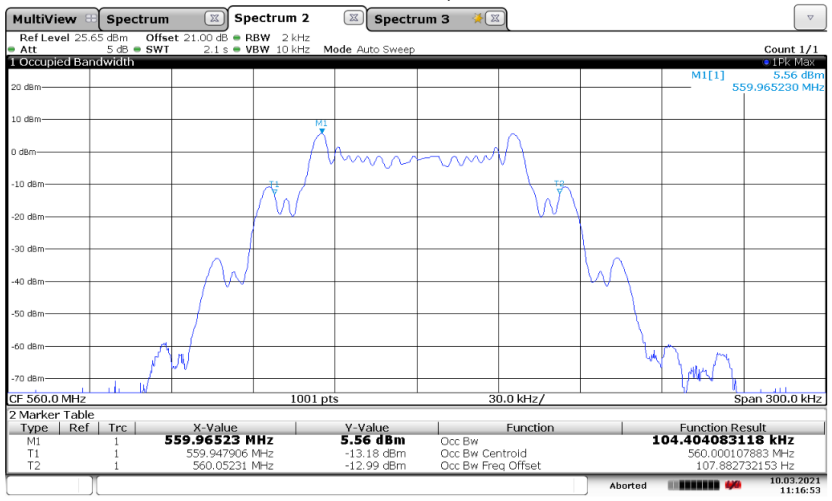
Test Information

EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	RSS-Gen 99% Emissions Bandwidth
Operating Conditions:	Low Frequency, 542.000MHz, 10mW
Operator Name:	Frank Salmeron
Comment:	
Date Tested:	Test on March 10, 2021



Test Information

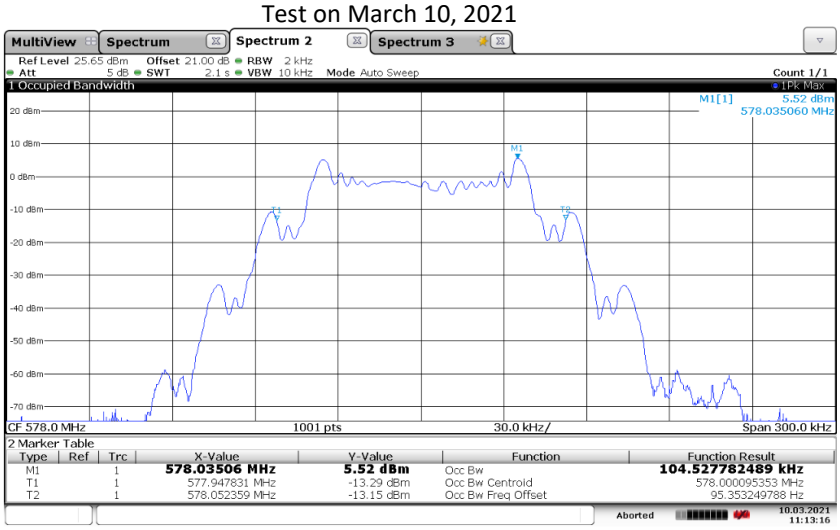
EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	RSS-Gen 99% Emissions Bandwidth
Operating Conditions:	Middle Frequency, 560.000MHz, 10mW
Operator Name:	Frank Salmeron
Comment:	
Date Tested:	Test on March 10, 2021



Appendix A

Test Information

EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	RSS-Gen 99% Emissions Bandwidth
Operating Conditions:	High Frequency, 578.000MHz, 10mW
Operator Name:	Frank Salmeron
Comment:	
Date Tested:	Test on March 10, 2021



99% Emissions Bandwidth at 10mW

540.000MHz	105.461kHz
560.000MHz	104.404kHz
578.000MHz	104.528kHz

Appendix B

Radiated Spurious Emissions

Purpose:

This test performed to determine if the EUT meets the radiated RF emission requirements of the FCC Part 15C section 236(g). A Quasi-Peak and Average detectors were used for the measurements. Both FCC Part 15C and IC RSS-Gen require measurements to the 10th harmonic of the carrier.

Requirements:

As stated in FCC 15C section 236(g), and RSS-210 Annex G, Compliance for spurious emission requirements shall be demonstrated using the applicable measurement procedures of ETSI EN 300 422-1. Compliance with the emission limits shall be demonstrated using a QP detector below 1GHz and a RMS Average detector above 1GHz. Emissions shall be investigated up to the 10th harmonic of the fundamental.

Measurement Uncertainty:

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

Values of Expanded Measurement Uncertainty (95% Confidence)

Measurement Type	U_{lab}	U_{ETSI}
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.24 dB	6.00 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 13 GHz)	4.56 dB	6.00 dB

U_{lab} = Determined for Shure EMC Laboratory

U_{ETSI} = From ETSI EN 300 422-1 Table 10

Since U_{lab} is less than or equal to U_{ETSI}:

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit; Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

Test Setup and Instrumentation:

Photographs of the test setup are shown in Figure B 1 and Figure B 2. The test instrumentation can be determined from Table 10-1.

EUT Operation:

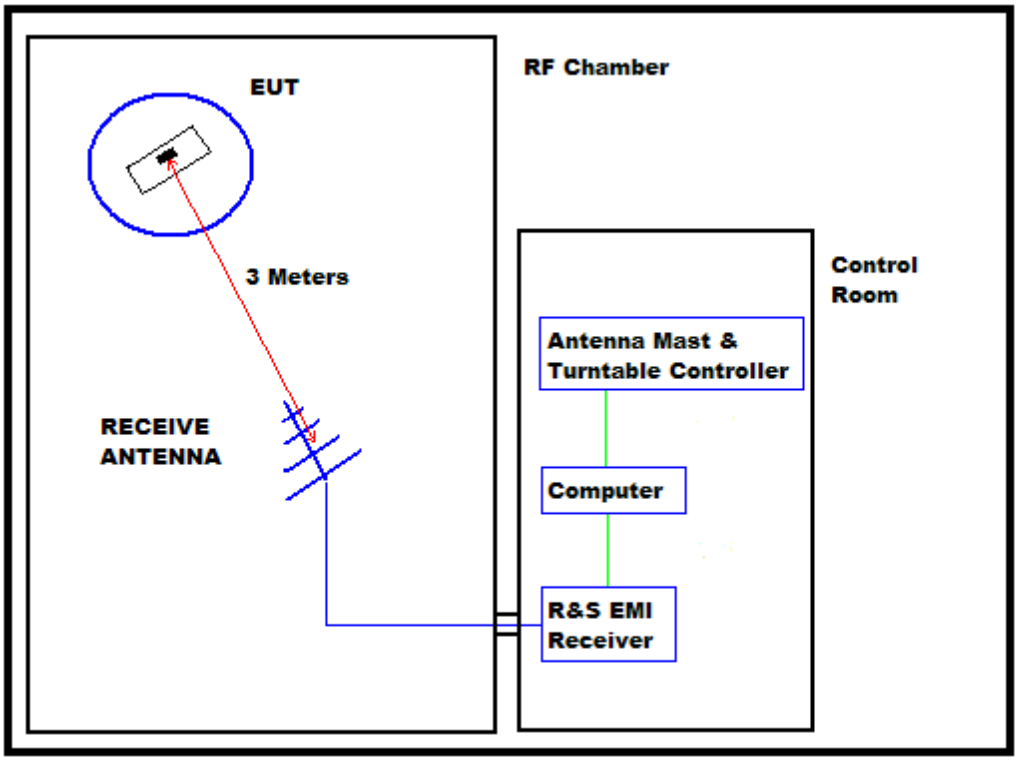
The EUT was powered up and the frequency of the transmitter was selected using the front panel controls. The EUT was checked for proper operation after it was setup on the test table. For radiated spurious emissions the testing was performed with the EUT set to the low, middle, and high frequencies with RF power output of 10mW.

Appendix B

Specific Test Procedures:

All tests were performed in a 28ft. x 20ft. x 18.5ft. 3m semi-anechoic test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4A-2017 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All power lines and signal lines entering the enclosure pass through filters on the enclosure wall. The power line filters prevent extraneous signals from entering the enclosure on these leads.



BLOCK DIAGRAM OF SHIELDED ENCLOSURE

Preliminary radiated measurements were performed to determine the frequencies where the significant emissions might be found. With the EUT at one set position and the measurement antenna at a set height (i.e. without maximizing), the radiated emissions were measured using a peak detector and automatically plotted. The BiConiLog measuring antenna was positioned at a 3 meter distance from the EUT for below 1GHz testing, and a double ridged waveguide antenna above 1GHz testing.

Appendix B

All significant broadband and narrowband signals found in the preliminary sweeps were then measured using a peak detector at a test distance of 3 meters. The measurements were made with a BiConiLog antenna over the frequency range of 30 MHz to 1 GHz, and a double ridged waveguide antenna over the frequency range of 1 GHz to 6 GHz.

To ensure that maximum emission levels were measured, the following steps were taken:

i. The EUT was rotated so that all of its sides were exposed to the receiving antenna.
ii. Since the measuring antennas are linearly polarized, both horizontal and vertical field components were measured.
iii. The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, another antenna was set in place of the EUT and connected to a calibrated signal generator. (A tuned dipole was used for all measurements below 1GHz and a double ridged waveguide antenna was used for all measurements above 1GHz.) The output of the signal generator was adjusted to match the received level at the EMI receiver. The signal level was recorded. The reading was corrected to compensate for cable loss and antenna gain.

Results:

The plots of the peak preliminary radiated voltage levels in the graphs on page 20 thru page 25. All emissions measured from the EUT were within the ETSI EN 300 422-1 specification limits.

The temperature during the testing in the RF Chamber was 76 degrees F, with relative humidity of 26%.

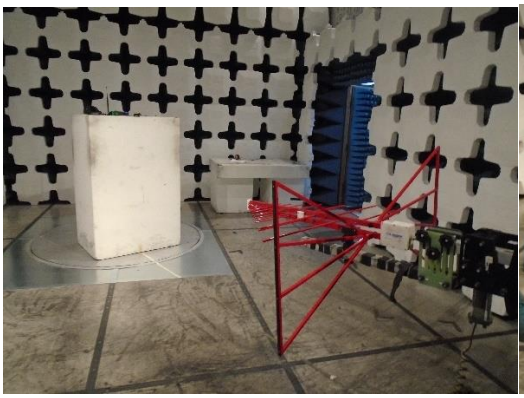


Figure B 1: P9T Transmitter Test Setup

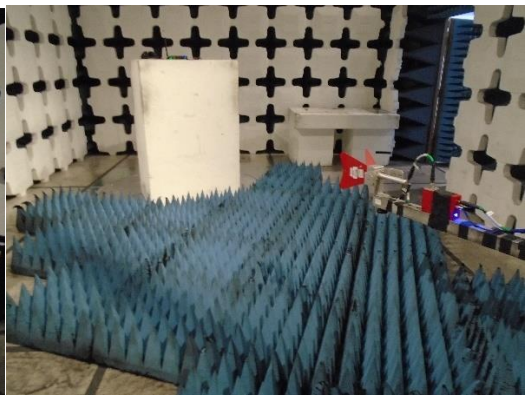


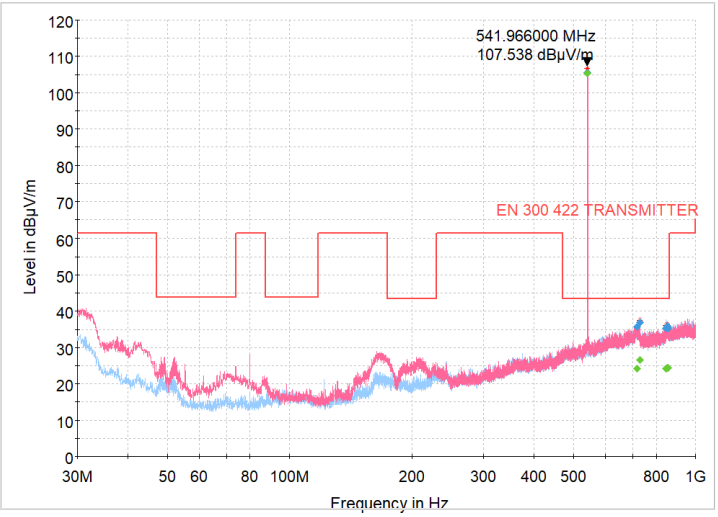
Figure B 2: P9T Transmitter Test Setup

Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 30MHz - 1GHz
EUT:	P9T H21
Serial Number:	Test Unit # 1
Operating Frequency:	Low Frequency 542.000 MHz
RF Power Level	10mW
Tester Name:	Sharjeel Sohail
Date Tested	Tested on January 21, 2021



Critical Frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
541.998333	106.67	43.38	-63.29	---	---	177.0	V	264.0	20.3	4:12:10 PM - 1/13/2021
717.762333	35.84	43.38	7.54	---	---	177.0	V	68.0	22.9	9:14:39 AM - 1/21/2021
728.432333	37.57	43.38	5.81	---	---	225.0	V	68.0	23.0	9:15:49 AM - 1/21/2021
846.934000	36.19	43.38	7.19	---	---	272.0	H	265.0	24.2	4:06:59 PM - 1/20/2021
851.945667	35.56	43.38	7.82	---	---	103.0	V	236.0	24.2	9:10:37 AM - 1/21/2021
854.694000	36.09	43.38	7.29	---	---	100.0	V	131.0	24.2	4:08:36 PM - 1/20/2021

Final Results

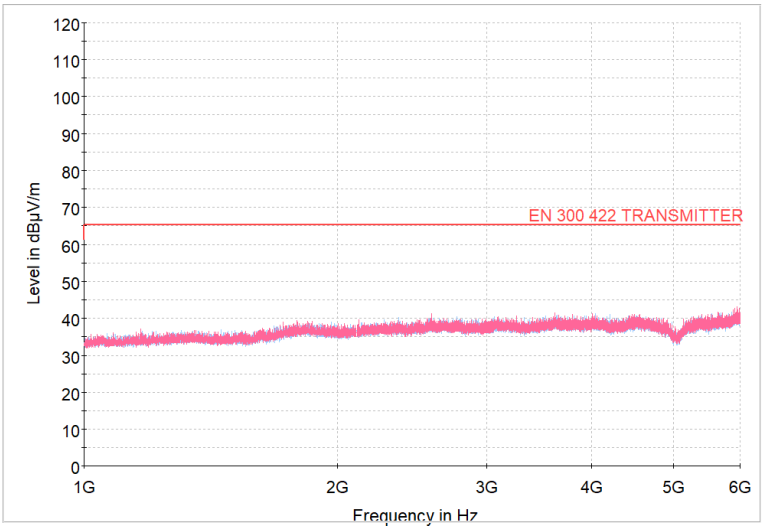
Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m	Comment
541.998333	105.44	---	43.38	-62.06	1000.0	120.000	177.0	V	219.0	20.3	4:13:40 PM - 1/13/2021
541.998333	---	105.38	43.38	-62.00	1000.0	120.000	177.0	V	219.0	20.3	4:13:40 PM - 1/13/2021
717.762333	35.77	---	43.38	7.61	1000.0	120.000	177.0	V	68.0	22.9	9:14:53 AM - 1/21/2021
717.762333	---	24.10	43.38	19.28	1000.0	120.000	177.0	V	68.0	22.9	9:14:53 AM - 1/21/2021
728.432333	36.94	---	43.38	6.44	1000.0	120.000	225.0	V	68.0	23.0	9:15:54 AM - 1/21/2021
728.432333	---	26.54	43.38	16.84	1000.0	120.000	225.0	V	68.0	23.0	9:15:54 AM - 1/21/2021
846.934000	35.25	---	43.38	8.13	1000.0	120.000	275.0	H	265.0	24.2	4:07:04 PM - 1/20/2021
846.934000	---	24.23	43.38	19.15	1000.0	120.000	275.0	H	265.0	24.2	4:07:05 PM - 1/20/2021
851.945667	35.95	---	43.38	7.43	1000.0	120.000	103.0	V	236.0	24.2	9:10:49 AM - 1/21/2021
851.945667	---	24.41	43.38	18.97	1000.0	120.000	103.0	V	236.0	24.2	9:10:49 AM - 1/21/2021
854.694000	35.29	---	43.38	8.09	1000.0	120.000	100.0	V	86.0	24.2	9:09:45 AM - 1/21/2021
854.694000	---	24.37	43.38	19.01	1000.0	120.000	100.0	V	86.0	24.2	9:09:45 AM - 1/21/2021

Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 1GHz - 6GHz
EUT:	P9T H21
Serial Number:	Test Unit # 1
Operating Frequency:	High Frequency 542.000 MHz
RF Power Level	10mW
Tester Name:	Sharjeel Sohail
Date Tested	Tested on January 21, 2021



Critical Frequencies

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
---	---	---	---	---	---	---		---	---	

Final Results

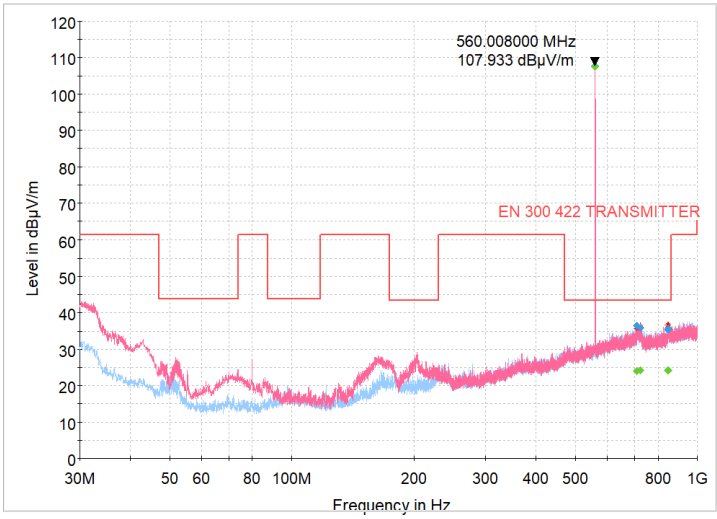
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
---	---	---	---	---	---	---	---		---	---	

Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 30MHz - 1GHz
EUT:	P9T H21
Serial Number:	Test Unit # 1
Operating Frequency:	Low Frequency 560.000 MHz
RF Power Level	10mW
Tester Name:	Sharjeel Sohail
Date Tested	Tested on January 21, 2021



Critical Frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
560.008000	107.96	43.38	-64.58	---	---	188.0	V	253.0	20.2	11:59:52 AM - 1/13/2021
709.323333	35.61	43.38	7.77	---	---	121.0	V	45.0	23.0	3:49:20 PM - 1/20/2021
722.935667	36.46	43.38	6.92	---	---	373.0	V	65.0	23.0	3:54:53 PM - 1/20/2021
845.673000	36.60	43.38	6.78	---	---	125.0	V	253.0	24.1	3:53:02 PM - 1/20/2021
847.742333	36.20	43.38	7.18	---	---	162.0	H	97.0	24.2	3:48:16 PM - 1/20/2021
849.811667	36.62	43.38	6.76	---	---	353.0	V	346.0	24.2	3:57:27 PM - 1/20/2021

Final Results

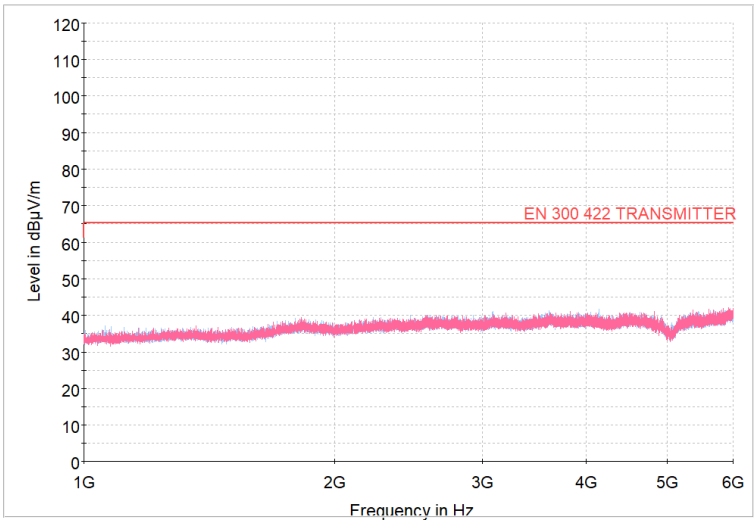
Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m	Comment
560.008000	---	107.60	43.38	-64.22	1000.0	120.000	188.0	V	253.0	20.2	12:00:05 PM - 1/13/2021
560.008000	107.66	---	43.38	-64.28	1000.0	120.000	188.0	V	253.0	20.2	12:00:05 PM - 1/13/2021
709.323333	36.58	---	43.38	6.80	1000.0	120.000	121.0	V	45.0	23.0	3:49:28 PM - 1/20/2021
709.323333	---	24.10	43.38	19.28	1000.0	120.000	121.0	V	45.0	23.0	3:49:29 PM - 1/20/2021
722.935667	35.99	---	43.38	7.39	1000.0	120.000	375.0	V	65.0	23.0	3:54:58 PM - 1/20/2021
722.935667	---	24.27	43.38	19.11	1000.0	120.000	375.0	V	65.0	23.0	3:54:58 PM - 1/20/2021
845.673000	---	24.20	43.38	19.18	1000.0	120.000	125.0	V	253.0	24.1	3:53:08 PM - 1/20/2021
845.673000	35.48	---	43.38	7.90	1000.0	120.000	125.0	V	253.0	24.1	3:53:08 PM - 1/20/2021
847.742333	---	24.29	43.38	19.09	1000.0	120.000	162.0	H	97.0	24.2	3:48:27 PM - 1/20/2021
847.742333	35.51	---	43.38	7.87	1000.0	120.000	162.0	H	97.0	24.2	3:48:26 PM - 1/20/2021
849.811667	---	24.24	43.38	19.14	1000.0	120.000	353.0	V	346.0	24.2	3:57:39 PM - 1/20/2021
849.811667	35.64	---	43.38	7.74	1000.0	120.000	353.0	V	346.0	24.2	3:57:38 PM - 1/20/2021

Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 1GHz - 6GHz
EUT:	P9T H21
Serial Number:	Test Unit # 1
Operating Frequency:	High Frequency 560.000 MHz
RF Power Level	10mW
Tester Name:	Sharjeel Sohail
Date Tested	Tested on January 21, 2021



Critical Frequencies

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
---	---	---	---	---	---	---		---	---	

Final Results

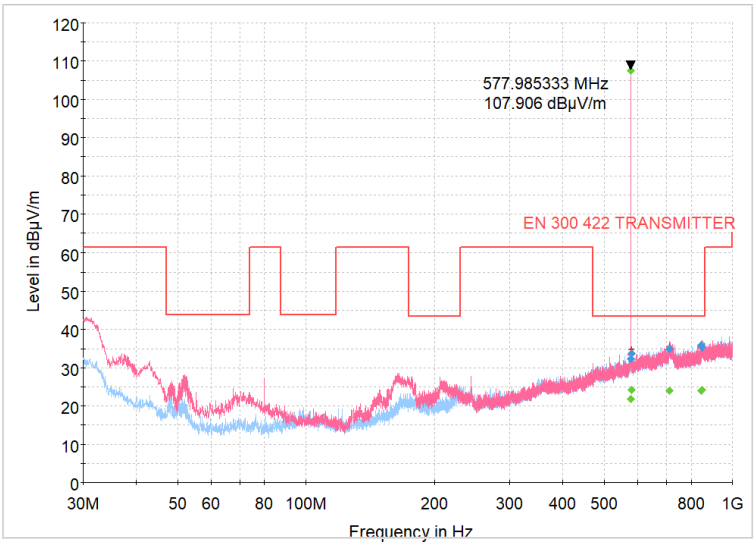
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
---	---	---	---	---	---	---	---		---	---	

Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 30MHz - 1GHz
EUT:	P9T H21
Serial Number:	Test Unit # 1
Operating Frequency:	Low Frequency 578.000 MHz
RF Power Level	10mW
Tester Name:	Sharjeel Sohail
Date Tested	Tested on January 21, 2021



Critical Frequencies

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
576.983000	33.36	43.38	10.02	---	---	375.0	V	46.0	20.5	9:42:30 AM - 1/14/2021
577.985333	107.74	43.38	-64.36	---	---	102.0	V	320.0	20.5	9:44:15 AM - 1/14/2021
579.020000	34.67	43.38	8.71	---	---	200.0	V	281.0	20.5	9:45:13 AM - 1/14/2021
712.977000	35.54	43.38	7.84	---	---	225.0	V	160.0	22.8	1:38:41 PM - 1/20/2021
845.026333	36.19	43.38	7.19	---	---	100.0	V	190.0	24.1	1:35:56 PM - 1/20/2021
847.516000	36.33	43.38	7.05	---	---	225.0	H	256.0	24.2	1:28:17 PM - 1/20/2021

Final Results

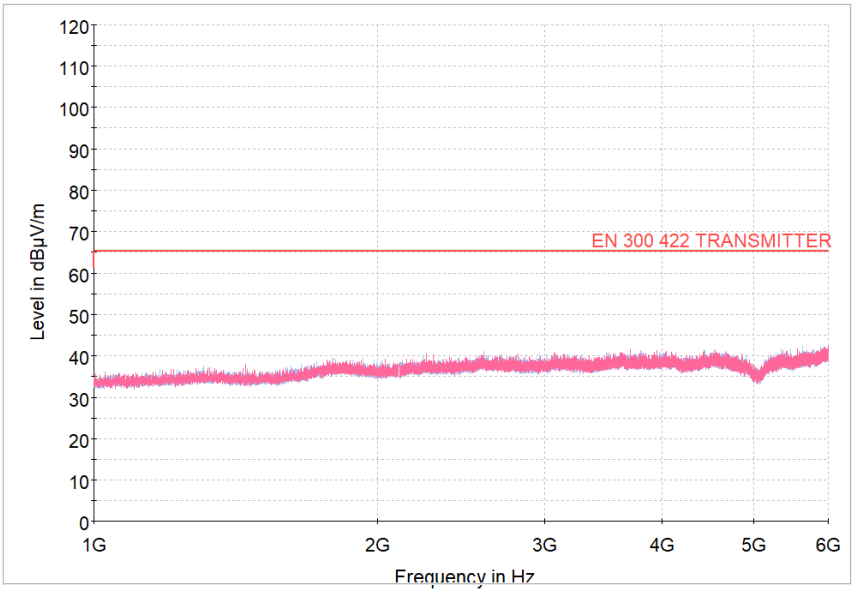
Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m	Comment
576.983000	---	21.87	43.38	21.51	1000.0	120.000	375.0	V	46.0	20.5	9:42:36 AM - 1/14/2021
576.983000	32.42	---	43.38	10.96	1000.0	120.000	375.0	V	46.0	20.5	9:42:36 AM - 1/14/2021
577.985333	---	107.43	43.38	-64.05	1000.0	120.000	102.0	V	320.0	20.5	9:44:27 AM - 1/14/2021
577.985333	107.54	---	43.38	-64.16	1000.0	120.000	102.0	V	320.0	20.5	9:44:27 AM - 1/14/2021
579.020000	---	24.10	43.38	19.28	1000.0	120.000	200.0	V	236.0	20.5	9:47:03 AM - 1/14/2021
579.020000	33.63	---	43.38	9.75	1000.0	120.000	200.0	V	236.0	20.5	9:47:03 AM - 1/14/2021
712.977000	---	23.95	43.38	19.43	1000.0	120.000	225.0	V	160.0	22.8	1:38:47 PM - 1/20/2021
712.977000	34.81	---	43.38	8.57	1000.0	120.000	225.0	V	160.0	22.8	1:38:47 PM - 1/20/2021
845.026333	35.82	---	43.38	7.56	1000.0	120.000	100.0	V	190.0	24.1	1:36:08 PM - 1/20/2021
845.026333	---	24.09	43.38	19.29	1000.0	120.000	100.0	V	190.0	24.1	1:36:09 PM - 1/20/2021
847.516000	---	24.10	43.38	19.28	1000.0	120.000	225.0	H	256.0	24.2	1:28:22 PM - 1/20/2021
847.516000	35.39	---	43.38	7.99	1000.0	120.000	225.0	H	256.0	24.2	1:28:22 PM - 1/20/2021

Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 15C Radiated Emissions 1GHz - 6GHz
EUT:	P9T H21
Serial Number:	Test Unit # 1
Operating Frequency:	High Frequency 578.000 MHz
RF Power Level	10mW
Tester Name:	Sharjeel Sohail
Date Tested	Tested on January 21, 2021



Critical Frequencies

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
---	---	---	---	---	---	---		---	---	

Final Results

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
---	---	---	---	---	---	---	---		---	---	

Appendix C

Maximum Radiated Power

Purpose:

This test performed to determine if the EUT meets the Maximum Radiated Power requirements of the FCC Part15C, Section 15.236, and RSS-210 Annex G.

Requirements:

As stated in FCC 15C Section 15.236 (6)(2). and RSS-210 Annex G.

Measurement Uncertainty:

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

Values of Expanded Measurement Uncertainty (95% Confidence)

Measurement Type	U_{lab}
Radiated measurements (30 MHz – 1000 MHz)	4.24 dB

U_{lab} = Determined for Shure EMC Laboratory

Since U_{lab} is less than or equal to U_{ETSI}:

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit; Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

Test Setup and Instrumentation:

Photographs of the test setup are shown in Figure C 1. The test instrumentation can be determined from Table 10-1.

EUT Operation:

The EUT was powered up and the frequency of the transmitter was selected using the front panel controls. For rated output power, the testing was performed with the EUT set to the low, middle, and high frequency within the operating frequency range, and at 10mW RF output.

Appendix C

Specific Test Procedures:

The EUT was set to transmit on the low, middle, and high frequencies, and power levels of 10mW.

Results:

The EIRP for all frequencies measured meets the FCC15C 15.236 requirements, and RSS-210 Annex G.

The results are shown on page 26 thru page 36.

The temperature during the test was 75 degrees F, with relative humidity of 18%.

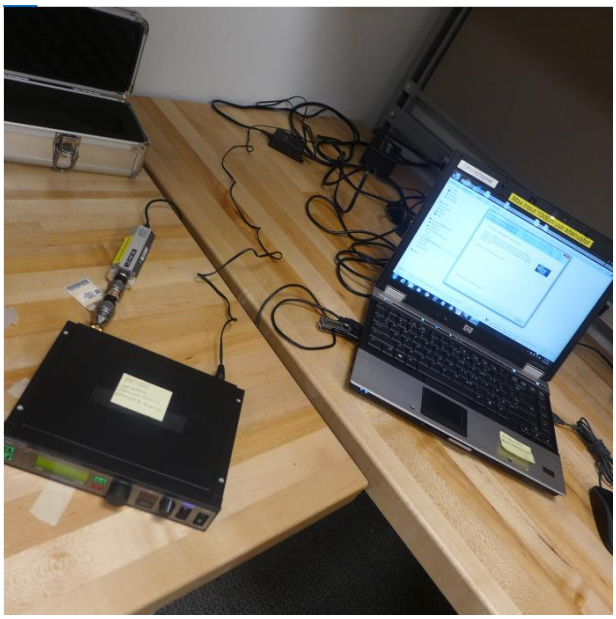


Figure C-1 - Test Setup for Maximum Radiated Power

Appendix C

Test Information

EUT Name: P9T H21
Serial Number: Test Unit # 1
Test Description: Maximum Power Output
Operating Conditions: Low Frequency, 542.000 MHz, 10mW
Operator Name: Frank Salmeron
Comment: FCC Part15C, Section 15.236, RSS-210
Date Tested: Tested on January 21, 2021

Power Meter Measurement in dBm	Power Meter Measured in mW	Measured Antenna Gain in dBi	Equivalent Antenna Gain in dB	EIRP in dBm	EIRP in mW	RSS-210: EIRP LIMIT in mW	FCC 15C EIRP Limit in mW
10.28	10.67	1.2	2.15	13.63	23.07	250	50

Test Information

EUT Name: P9T H21
Serial Number: Test Unit # 1
Test Description: Maximum Power Output
Operating Conditions: Low Frequency, 560.000 MHz, 10mW
Operator Name: Frank Salmeron
Comment: FCC Part15C, Section 15.236, RSS-210
Date Tested: Tested on January 21, 2021

Power Meter Measurement in dBm	Power Meter Measured in mW	Measured Antenna Gain in dBi	Equivalent Antenna Gain in dB	EIRP in dBm	EIRP in mW	RSS-210: EIRP LIMIT in mW	FCC 15C EIRP Limit in mW
10.29	10.69	1.2	2.15	13.64	23.12	250	50

Test Information

EUT Name: P9T H21
Serial Number: Test Unit # 1
Test Description: Maximum Power Output
Operating Conditions: Low Frequency, 578.000 MHz, 10mW
Operator Name: Frank Salmeron
Comment: FCC Part15C, Section 15.236, RSS-210
Date Tested: Tested on January 21, 2021

Power Meter Measurement in dBm	Power Meter Measured in mW	Measured Antenna Gain in dBi	Equivalent Antenna Gain in dB	EIRP in dBm	EIRP in mW	RSS-210: EIRP LIMIT in mW	FCC 15C EIRP Limit in mW
9.96	9.91	1.2	2.15	13.31	21.43	250	50

Appendix D

FREQUENCY TOLERANCE

PURPOSE:

This test was performed to determine if the EUT meets the frequency stability requirements of the FCC Part 15C, Section 15.236(f)(3) and the RSS-210 Annex G Table G1, specifications over the EUT operating frequency range of 542MHz to 578MHz.

REQUIREMENTS:

As stated in paragraph 15.236(f)(3) and, for low power auxiliary stations operating in the bands allocated for TV broadcasting, the frequency tolerance of the transmitter shall be 0.005 percent. RSS-210 Annex G Table G1 require ±50ppm.

MEASUREMENT UNCERTAINTY:

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

Values of Expanded Measurement Uncertainty (95% Confidence):

Measurement Type	U_{lab}
Frequency Error (Stability)	.0000000583 ppm

U_{lab} = Determined for Shure EMC Laboratory

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

TEST SETUP AND INSTRUMENTATION:

The EUT was heated and cooled in an ESPEC temperature chamber over a temperature range of -30C to +50C. The temperature around the EUT was measured and monitored by a J-Type thermocouple connected to an Extech thermometer. The EUTs frequency was measured with a frequency counter set to measure signal count at 0.1Hz resolution. The EUT was measured at low, middle, and high frequencies. Photographs of the test setup are shown as Figure D-1. The test instrumentation can be determined from Table 10-1.

EUT OPERATION:

The antenna port of the EUT was connected to the 50 Ohm input of a frequency counter. The EUT was operated at 10mW. The EUT was set to transmit at a low, mid or high frequency within its operating band of H21 Band (542MHz to 578.000MHz).

Appendix D

TEST PROCEDURES:

a. The temperature chamber was set to 23C, ambient temperature, with the EUT inside and powered on.

b. The EUT was allowed to soak for at least 15 minutes after the temperature chamber reached the set temperature.

c. The measured frequency of the transmitter was measured on the frequency counter.

d. Steps a. through c. were repeated at -30C through +50C in ten degree increments for representative low, mid and high frequencies within the EUTs operational band.

RESULTS:

The frequency stability measurements are presented on page 39. As shown by the test data, the test frequency deviation was within the 0.005 percent limit set out in the FCC Part 15C Section 15.236(f)(3) and the RSS-210 specifications.

The temperature in the test room during the test was 75 degrees F, with relative humidity of 18%.

Figures D-1 - Test Setup for Frequency Stability

Appendix D

Test Information

EUT Name:	P9T H21
Serial Number:	Test Unit # 1
Test Description:	FCC Part 15C Section 15.236(f)(3) Frequency Tolerance
Operating Conditions:	Low, Middle, and High frequency at 10mW, -30C to +50C
Operator Name:	Frank Salmeron
Comment:	R & S FSU Spectrum Analyzer and ESPEC Temp Chamber
Test Date	March 02, 2021

Temp °C	Nominal Frequency (MHz)	Measured Frequency (MHz)	Deviation (%)	Frequency Stability (%)	Deviation (Hz)	PPM	Pass Or Fail
-30	542.000	542.0001680	0.0000310	0.005	168	0.30996309	PASS
-20	542.000	542.0000181	0.0000033	0.005	18	0.33394833	PASS
-10	542.000	542.0001830	0.0000338	0.005	183	0.33763837	PASS
0	542.000	542.0002010	0.0000371	0.005	201	0.3708487	PASS
10	542.000	542.0000144	0.0000027	0.005	14	0.26568265	PASS
20	542.000	542.0000850	0.0000157	0.005	85	0.20848708	PASS
23	542.000	542.0001400	0.0000258	0.005	140	0.25830258	PASS
30	542.000	542.0000940	0.0000173	0.005	94	0.17343173	PASS
40	542.000	542.0000820	0.0000151	0.005	82	0.15129151	PASS
50	542.000	542.0000840	0.0000155	0.005	84	0.15498154	PASS
-30	560.000	560.0002280	0.0000407	0.005	228	0.40714285	PASS
-20	560.000	560.0002050	0.0000366	0.005	205	0.36607142	PASS
-10	560.000	560.0002490	0.0000445	0.005	249	0.44464285	PASS
0	560.000	560.0002210	0.0000395	0.005	221	0.39464285	PASS
10	560.000	560.0001470	0.0000262	0.005	147	0.26249999	PASS
20	560.000	560.0001150	0.0000205	0.005	115	0.20535714	PASS
23	560.000	560.0001400	0.0000250	0.005	140	0.24999999	PASS
30	560.000	560.0000980	0.0000175	0.005	98	0.17499999	PASS
40	560.000	560.0000840	0.0000150	0.005	84	0.15	PASS
50	560.000	560.0000880	0.0000157	0.005	88	0.15714285	PASS
-30	578.000	578.0001990	0.0000344	0.005	199	0.34429065	PASS
-20	578.000	578.0001900	0.0000329	0.005	190	0.32871972	PASS
-10	578.000	578.0002100	0.0000363	0.005	210	0.36332179	PASS
0	578.000	578.0002320	0.0000401	0.005	232	0.40138408	PASS
10	578.000	578.0001500	0.0000260	0.005	150	0.25951557	PASS
20	578.000	578.0001170	0.0000202	0.005	117	0.20242214	PASS
23	578.000	578.0001180	0.0000204	0.005	118	0.20415224	PASS
30	578.000	578.0001010	0.0000175	0.005	101	0.17474048	PASS
40	578.000	578.0000880	0.0000152	0.005	88	0.15224913	PASS
50	578.000	578.0000850	0.0000147	0.005	85	0.14705882	PASS