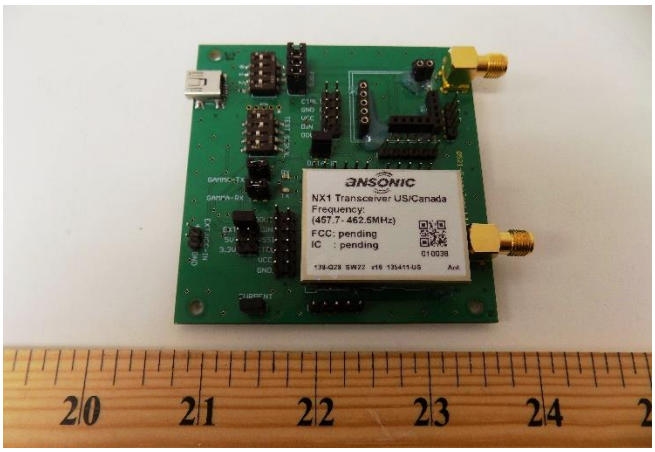
Test Report - Products

Prüfbericht - Produkte

TÜVRheinland®

Test Report No.: *Prüfbericht-Nr.:*	US22BGK1.002	**Order No.:** *Auftrags-Nr.:*	P00466470 0234180206	Page 1 of 60 *Seite 1 von 60*
Client Reference No.: *Kunden-Referenz-Nr.:*	2381215	**Order date:** *Auftragsdatum:*	10/18/2021	
Client: *Auftraggeber:*	Ansonic GmbH Deilbachtal 23 Essen, Germany, 45257			
Test item: *Prüfgegenstand:*	NX1 - Transceiver			
Identification/ Type No.: *Bezeichnung / Typ-Nr.*	NX1			
Order content: *Auftrags-Inhalt:*	0234180206			
Test specification: *Prüfgrundlage:*	FCC: 90.217, ISED: RSS-119, RSS-GEN TIA-603-D			
Date of sample receipt: *Wareneingangsdatum:*	December 3rd, 2021			
Test sample No: *Prüfmuster-Nr.:*	010038			
Testing period: *Prüfzeitraum:*	January 4th, 2022 – January 12th, 2022			
Place of testing: *Ort der Prüfung:*	Fremont, CA			
Testing laboratory: *Prüflaboratorium:*	TUV Rheinland North America			
Test result*: *Prüfergebnis*:*	Pass			



tested by: Osvaldo Casorla

geprüft von:

Date: February 10, 2022

Datum:

Position / Stellung: Expert

authorized by: Richard Dekcer

genehmigt von:

Issue Date: February 10, 2022

Ausstellungsdatum:

Position / Stellung: Expert

Others /

Sonstiges:

Condition of the test item at delivery:
Zustand des Prüfgegenstandes bei Anlieferung: Test item complete and undamaged

* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
** Legende:*	*P(ass) = entspricht o.g. Prüfgrundlage(n)*	*F(ail) = entspricht nicht o.g. Prüfgrundlage(n)*	*N/A = nicht anwendbar*	*N/T = nicht getestet*

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V05

Remarks
Anmerkungen

1	The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request. *Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.* *Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.*
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Remarks
Anmerkungen

1	**Product details:** *Produktdetails:*	Sub-GHz 0.5, 2 kHz narrow band FSK RF module
2	**Dimensions / Weight:** *Maße / Gewicht:*	35mm x 25mm x 9mm
3	**Operating elements:** *Bedienelemente:*	0.5 kHz, 2.0 kHz GFSK
4	**Equipment / Accessories:** *Ausstattung / Zubehör:*	None
5	**Used materials:** *Verwendete Materialien:*	None
6	**Other:** *Sonstiges:*	Test sample(s), as well sample information, description, product details and intended usage was provided by customer.
7	**Test sample obtaining:** *Prüfmusterbereitstellung:*	☒ Sending by customer ☐ Sampling by TÜV Rheinland Group ☐ others:

Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	2/8/2022	Original Document	OC
0	2/10/2022	TCB Update	OC

Note: Latest revision report will replace all previous reports.

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1 Executive Summary

1.1 Scope

This report US22BGK1.002 is intended to document the status of conformance with the requirements of the FCC: 90.217, ISED: RSS-119, RSS-GEN based on the results of testing performed on January 3rd, 2022 - January 13th, 2022 on the NX1 - Transceiver Model NX1. Manufactured by Ansonic GmbH. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report. The 457.7 – 462.5 MHz frequency band for GFSK.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method TIA-603-D	Worse Case (Measured)	Result
Maximum Output Power	2.1046 (RSS-GEN 6.12 and RSS-119 Sect. 5.4)	25.53 mW @ 457.7 MHz Channel, 0.5 kHz	**Complied**
Occupied Bandwidth	2.1049 (RSS-GEN 6.7 and RSS-119 Sect. 5.5)	8.17 kHz	**Complied**
Spurious Emissions at Antenna terminals	2.1051 (RSS-GEN 6.13 and RSS-119 Sect. 5.8)	See Section 4.2	**Complied**
Transmitter Spurious Emissions	2.1051 (RSS-GEN 6.13 and RSS-119 Sect. 5.8)	See Section 4.3	**Complied**
Displacement Frequency	RSS-119 Sect.5.10.	- 40.6 dBm	**Complied**
Carrier Frequency Stability	2.1055 (RSS-GEN 6.11 and RSS-119)	See Section 4.6	**Note 2**

Note 1: This test report covers 457.7 MHz to 462.5 MHz band.

Note 2: Conditions in RSS-119 Section 5.10 positions transmitters operating with output power with less than 120 mW subject for exempt from Carrier Frequency Stability limits of RSS-119 Section 5.3. Any emission appearing on a frequency 25 kHz or more removed from the assigned frequency is attenuated at least 30 dB below the unmodulated carrier.

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission, US1131

TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct, Fremont, CA 94538, are recognized by the Commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No. US1131). The laboratory Scopes of Accreditation include Title 47 CFR Parts 15, 18 and 90. The accreditations are updated every three years.

2.1.2 NIST / A2LA, Testing Cert #3331.02

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:2017. The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada, 2932M

Industry Canada Industrie Canada

The Pleasanton 5-meter Semi-Anechoic Chamber, Registration No. 2932M-1, has been accepted by Industry Canada to perform testing to 3 and 5 meters based on the test procedures described in ANSI C63.4-2014. The Fremont 10-meter Semi-Anechoic Chamber, Registration No. 2932D-1, has been accepted by Industry Canada to perform testing to 3 and 10 meters based on the test procedures described in ANSI C63.4-2014.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct, Fremont, CA 94538, have been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0326

VCCI Registration No. for Fremont: A-0327

2.1.5 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

Test facilities are located at 5015 Brandin Ct, Fremont, California, 94538, USA and 1279 Quarry Lane, Pleasanton, California 94566, USA (Fremont is the Pleasanton Annex).

2.2.1 Emission Test Facility

The Semi-Anechoic Chambers and AC Line Conducted measurement facilities used to collect radiated and conducted emissions data have been constructed in accordance with ANSI C63.7:1992. The Fremont 10 meter semi-anechoic chamber has been measured in accordance with and verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2014 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04), at test distances of 3 and 10 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02). The Pleasanton 5 meter semi-anechoic chamber has been verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2009 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04) at a test distance of 3 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02).

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurement and the fraction may be viewed as the coverage probability or level of confidence of the interval.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2017. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Model NX1 is a NX1 - Transceiver utilizing GFSK. The EUT will be in compliance with regulatory standards of regions it will be operating in.

3.2 Equipment Configuration

A description of the equipment configuration is given in the Test Plan Section. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.3 Operating Mode

A description of the operation mode is given in the Test Plan Section. In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing.

4 Emissions

Testing was performed in accordance with CFR47 FCC Part 90.217, RSS-119, RSS-Gen. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 8 of the standard were used.

4.1 Output Power Requirements

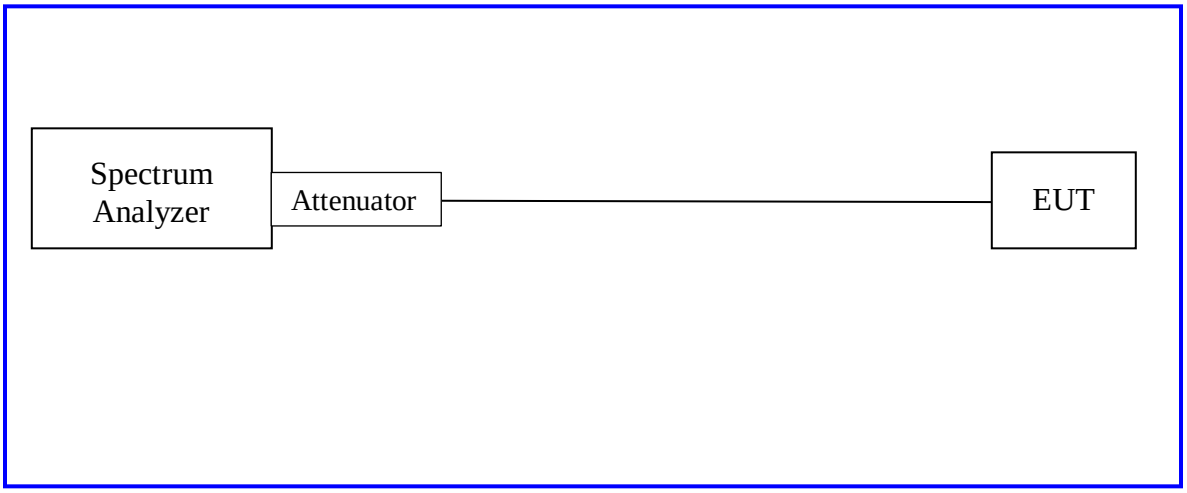
The maximum output power requirement is the maximum equivalent isotropic radiated power delivering at the transmitting antenna under specified conditions of measurements in the presence of modulation.

RSS-119 Sect. 5.4 Table 2: 450 - 470 MHz. Base/Fixed Equipment will be authorized a maximum of 110 watts.

4.1.1 Test Method

Conducted method was used to measure the channel power output. The worst findings were conducted on 3 channels in each operating range per CFR47 *90.217* and RSS Gen Sect. 6.12; 450 - 470 MHz. Conditions applied based on TIA-603-D section 2.2.1. The worst mode results indicated below.

Test Setup:



4.1.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s). Worse case data for each mode reported below. Plots of highest power included for low, medium, and high channels.

Table 2: RF Output Power at the Antenna Port – Test Results

Test Conditions: Conducted Measurement, Normal Temperature				
Antenna Type: Conducted, Pins				
Max. Antenna Gain: na				
Operating Channel (MHz)	**Limit [dBm]**	**Total Power [dBm]**	**Total Power [mW]**	**Margin [dB]**
457.7	20.8	14.07	25.53	6.73
462.2	20.8	14.01	25.18	6.79
462.5	20.8	14.04	25.35	6.76

4.2 Occupied Bandwidth

The occupied bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency.

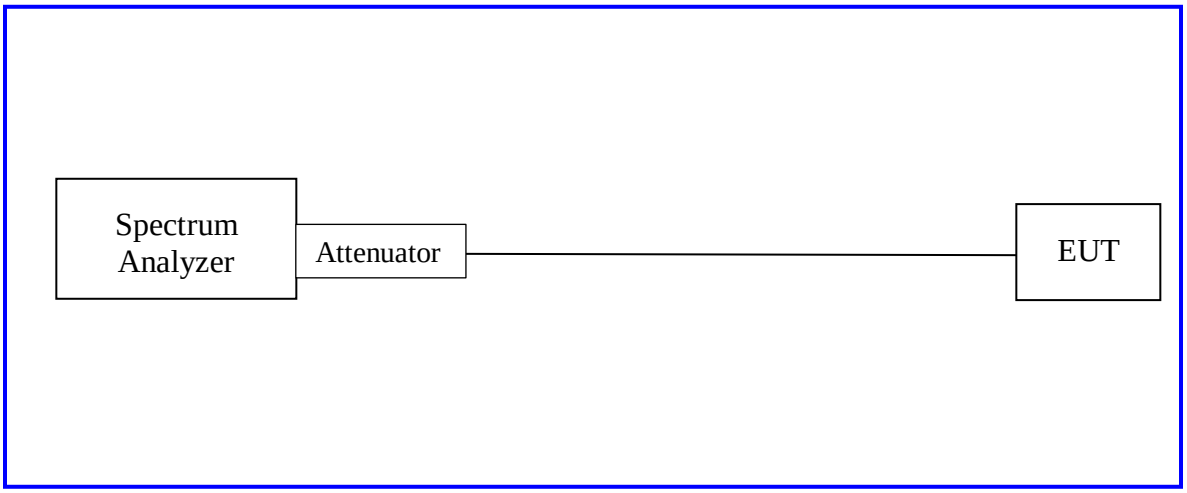
The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.

The maximum bandwidth shall be less than 11.25 kHz for the frequency range 450-470 MHz

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth according to RSS Gen Sect. 6.7. The measurement was performed with modulation per CFR47 90.217 and RSS Gen Sect. 6.7. Measurements were performed on the low, middle and high channels of the operating frequency range; 450 - 470 MHz.

Test Setup:

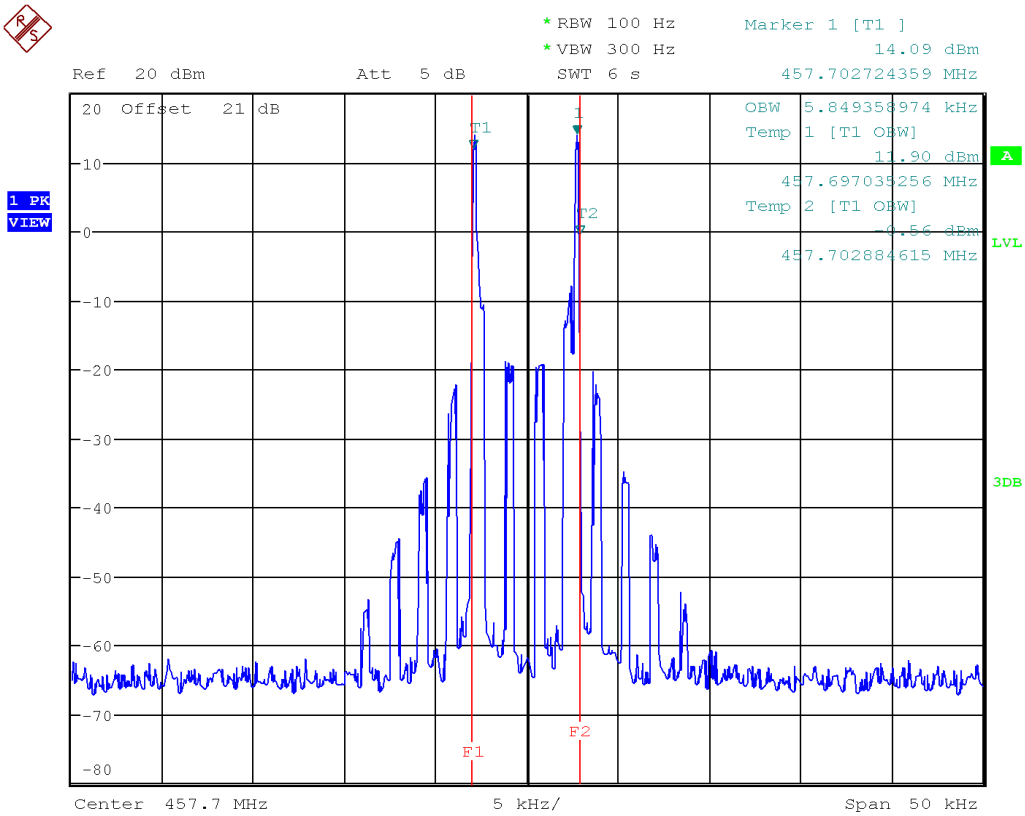


Results
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

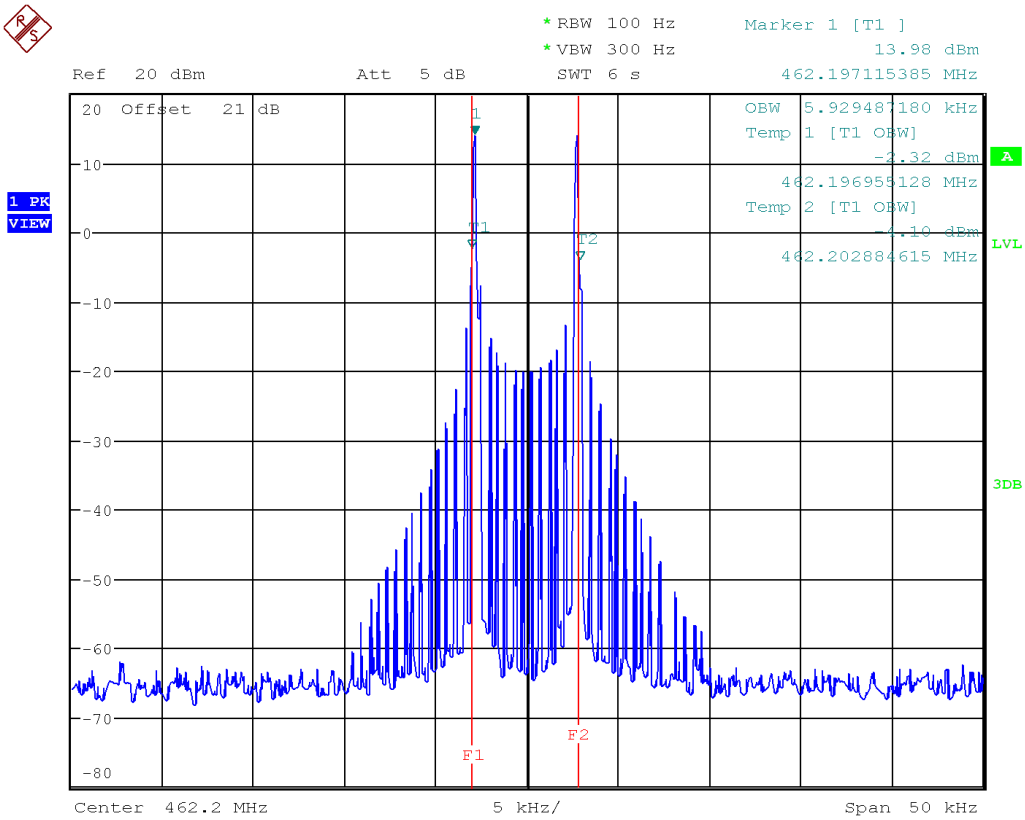
4.2.2 Results

Table 3: Occupied Bandwidth – Test Results

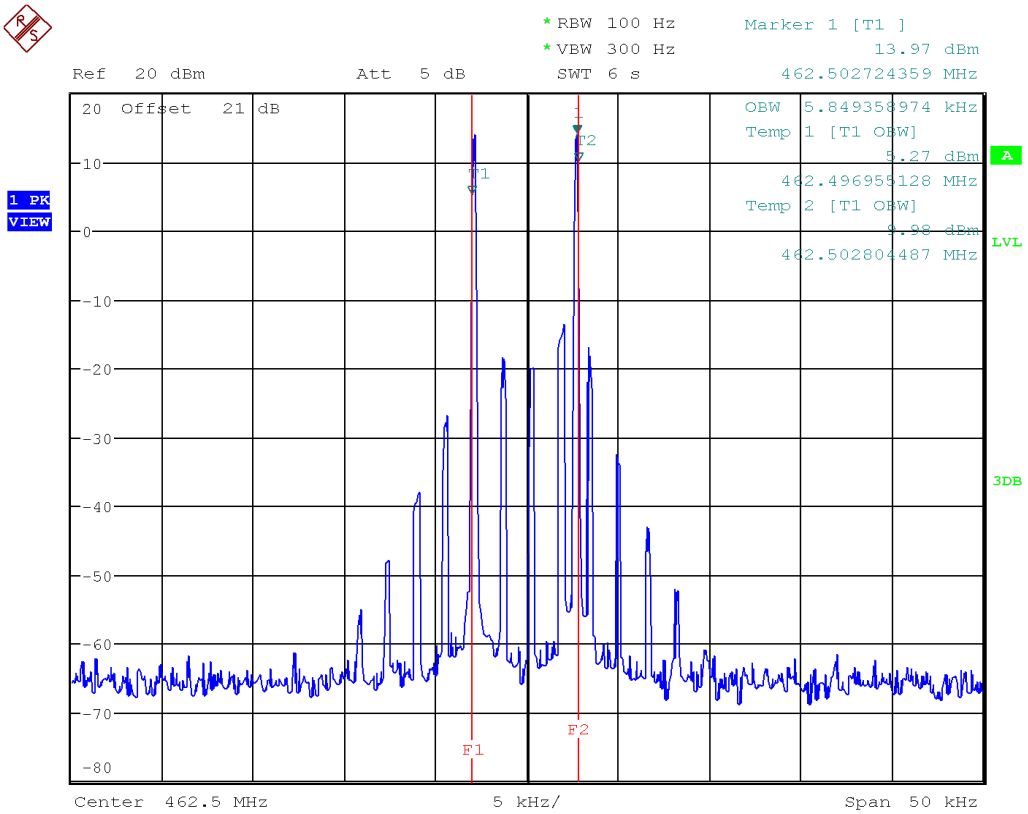
Test Conditions: Conducted Measurement, Normal Temperature		
99% Bandwidth		
Freq. (MHz)	**0.5 kHz Modulation**	**2 kHz Modulation**
	kHz	**kHz**
457.7	5.85	8.17
462.2	5.93	8.17
462.5	5.85	8.17
Note: None		



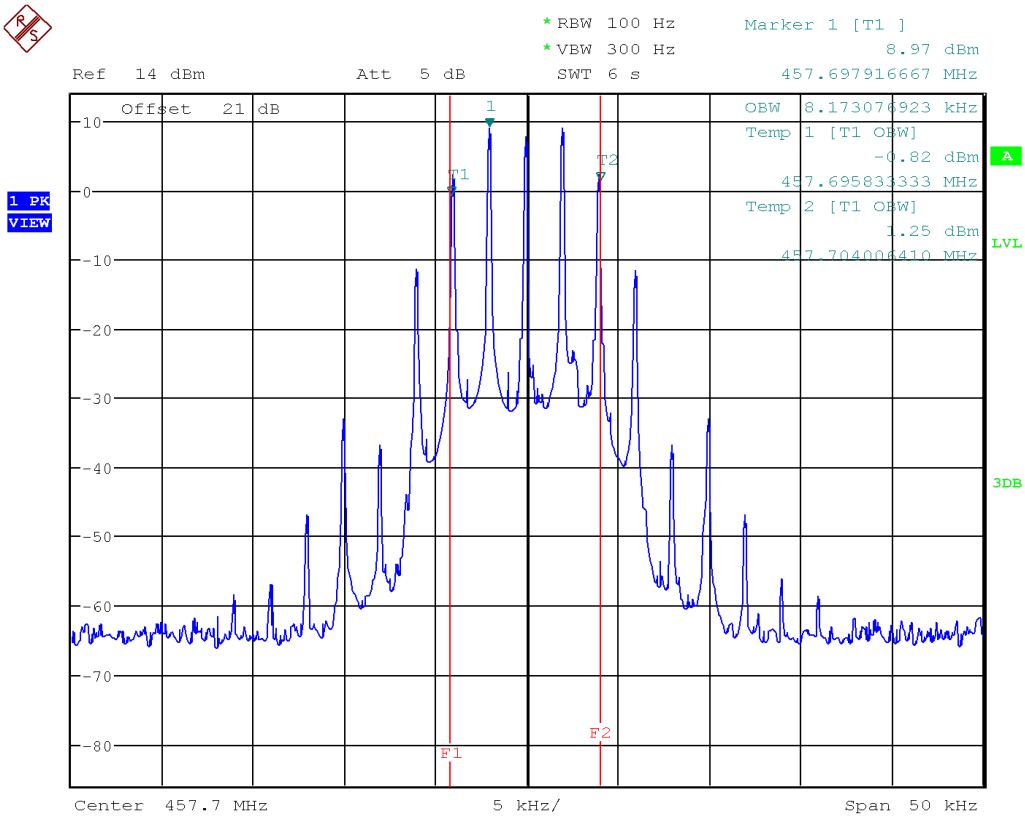
Plot 1. 457.7 MHz, 99% Bandwidth at 0.5 kHz



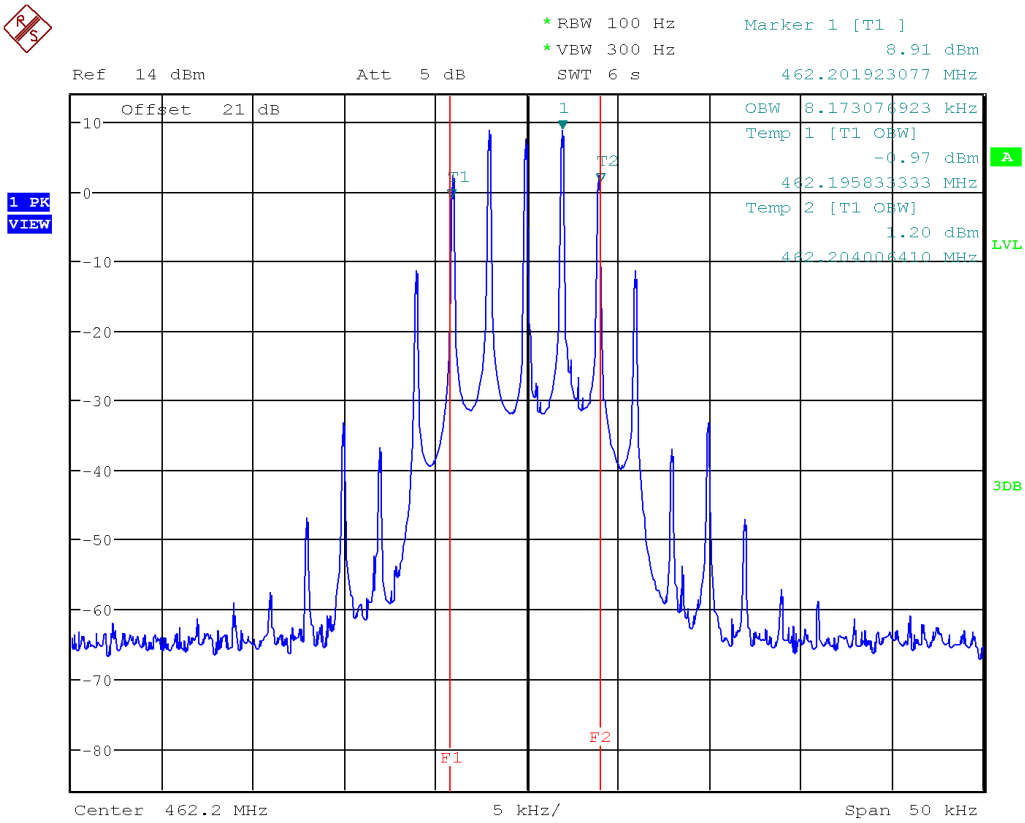
Plot 2. 462.2 MHz, 99% Bandwidth at 0.5 kHz



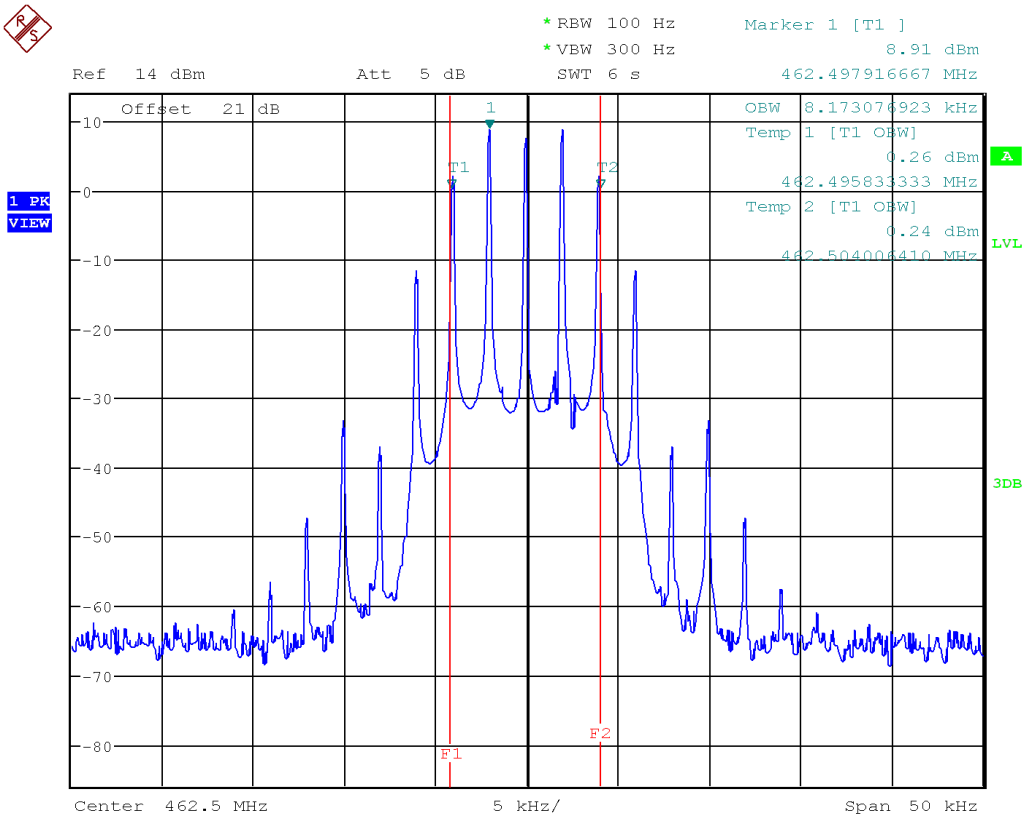
Plot 3. 462.5 MHz, 99% Bandwidth at 0.5 kHz



Plot 4. 457.7 MHz, 99% Bandwidth at 2 kHz



Plot 5. 462.2 MHz, 99% Bandwidth at 2 kHz



Plot 6. 462.5 MHz, 99% Bandwidth at 2 kHz

4.3 Modulation Characteristics

The occupied bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The designation of a set of characteristics of the intentional radiated emission of a radio transmitter by standard symbols (e.g. type of modulation of the main carrier, modulating signal, type of information to be transmitted and also, if appropriate, any additional signal characteristics). For example, designator 20K0FID means a necessary bandwidth (or occupied bandwidth) of 20.0 kHz, uses frequency modulation, is single channel and is in the data/digital format.
Conditions applied based on RSS-119 Sect. 5.5.

Type of Emissions: 8K17F2D, 5K93F2D

Table 4: Occupied Bandwidth – Test Results

Test Conditions: Conducted Measurement, Normal Temperature		
99% Bandwidth		
Freq. (MHz)	**0.5 kHz Modulation**	**2 kHz Modulation**
	kHz	**kHz**
457.7	5.85	8.17
462.2	5.93	8.17
462.5	5.85	8.17
Note: None		

4.4 Transmitter Spurious Emissions

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 90.217, RSS 119 Sect.5.8.9.2, RSS Gen 6.13.

4.4.1 Test Methodology

4.4.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. Conditions applied based on TIA-603-D section 2.2.12. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 100 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

Pre-scans were performed to determine the worst data rate / chains.

4.4.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.
RBW is set to 200 Hz and VBW is set to 1 kHz for 9 kHz-150 kHz.
RBW is set to 9 kHz and VBW is set to 30 kHz for 150 kHz-30 MHz
RBW is set to 100 kHz, VBW is set to 300 kHz for 30 MHz-1 GHz.
RBW is set to 1 MHz, VBW is set to 3 MHz for above 1 GHz.

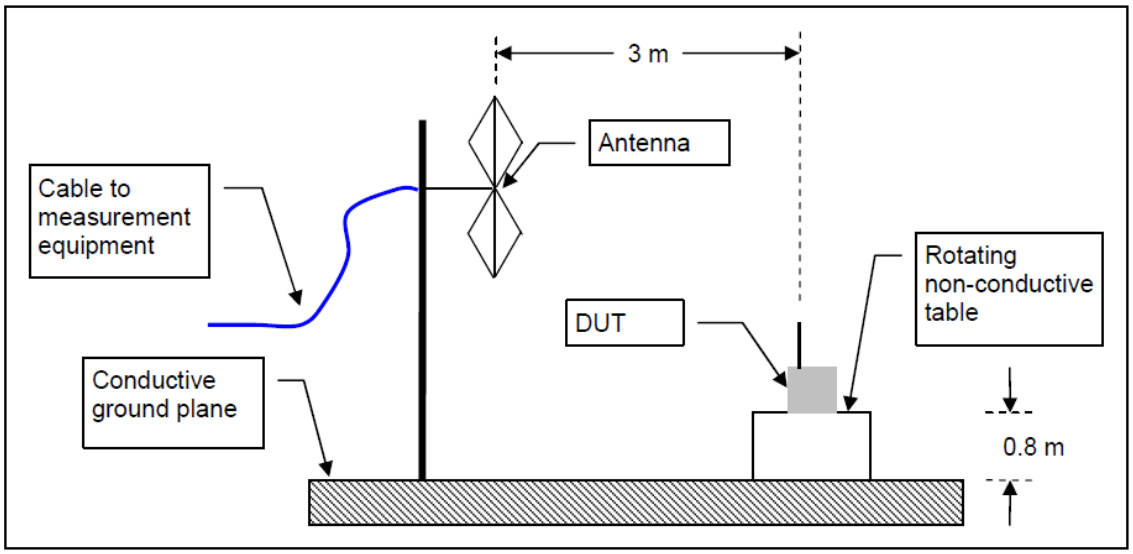
4.4.1.3 Deviations

None.

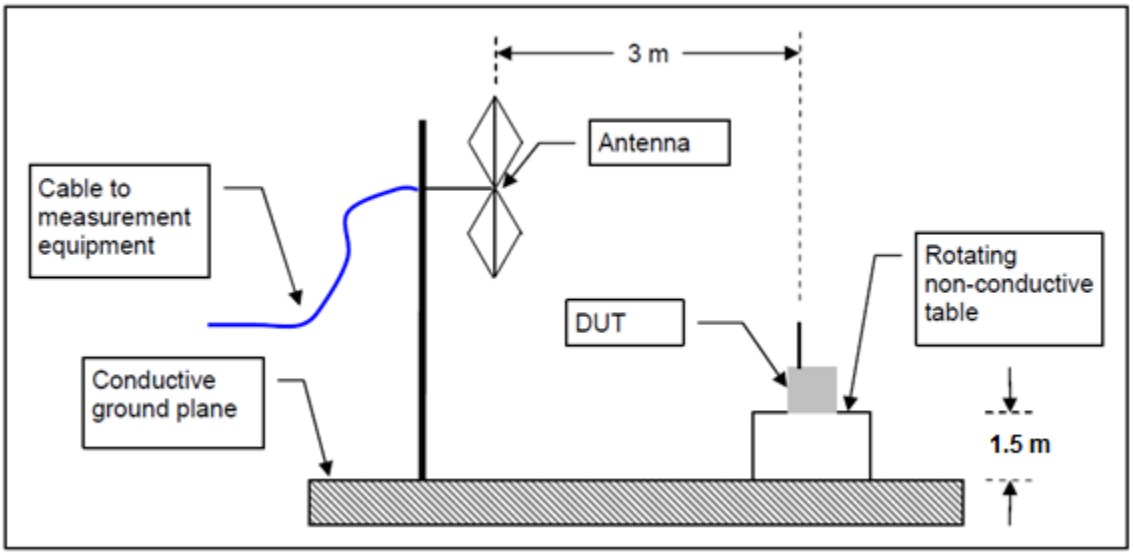
4.4.2 Test Setup:

All tests were conducted at full power on low, middle, and high channels. The DUT was stimulated by manufacturer provided test software that is not available to the end user.

30MHz-1GHz



1-26GHz



4.4.3 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 90.217, RSS-119 Sect.5.8.9.2.

The power of any emission outside the equipment operating sub-band edge shall be attenuated below the maximum permitted output power Pmax by at least 43 + 10 log (P) dB = (-) 13 dBm or 82.23 dBuV/m at 3 meter distance, where (P) is the highest emission (watts) of the transmitter inside the licensee's sub-band.

Resolution bandwidth (RBW) = 120 kHz for spurious emission below 1 GHz, and 1 MHz for spurious emissions above 1 GHz.
Video bandwidth (VBW) = 300 kHz for spurious emission below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.

4.4.4 Test Results

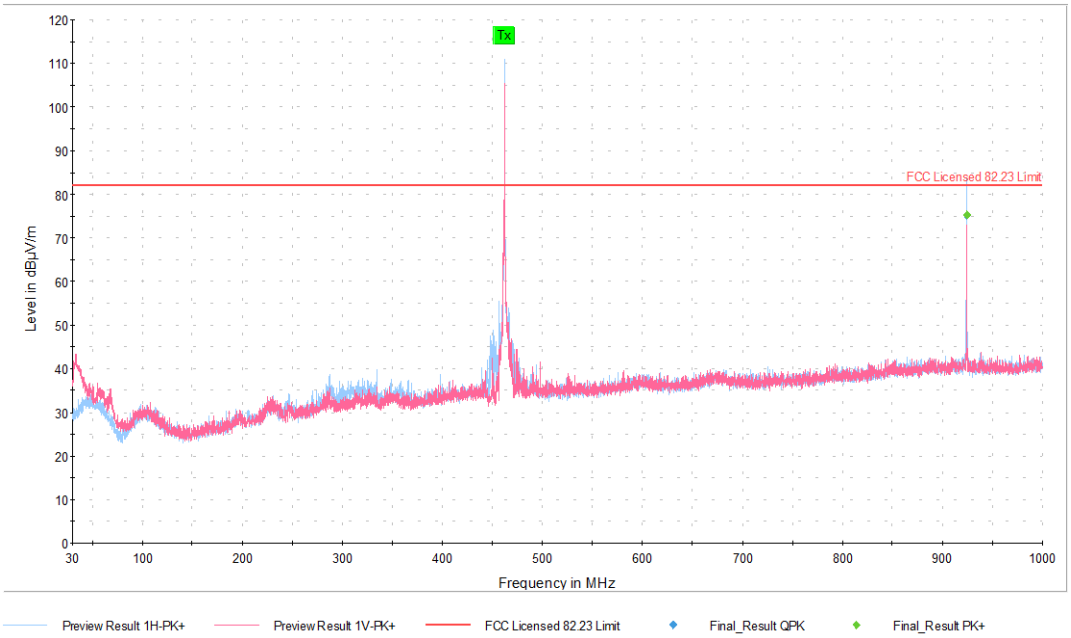
The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and test plan.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Note: Below 30 MHz was investigated and no emissions was found above noise floor.

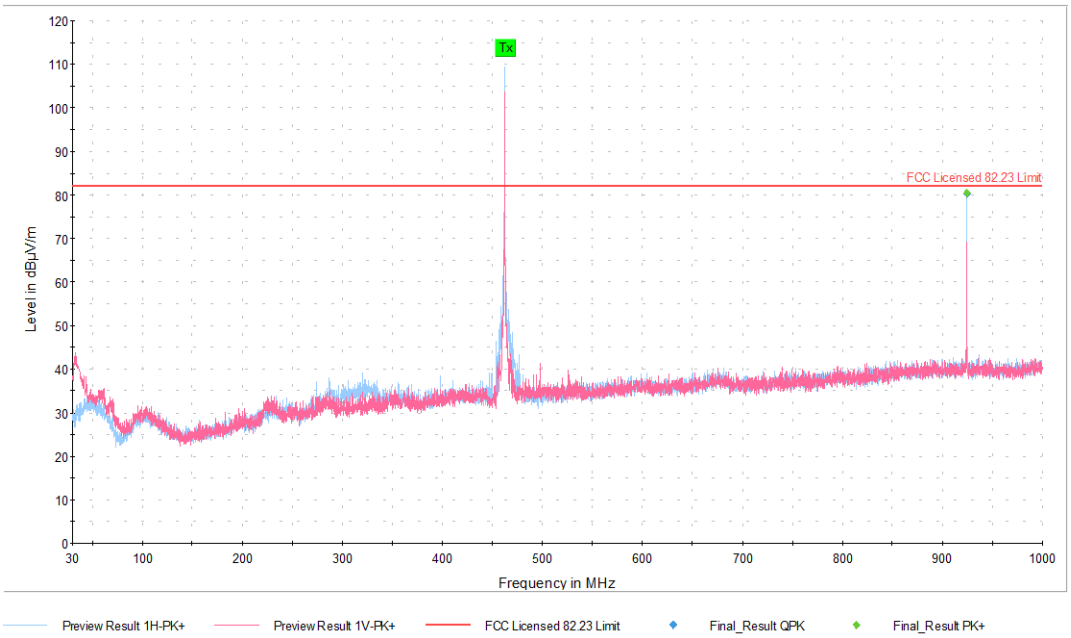
4.4.4.1 Results

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
924.39	75.07	---	82.23	7.16	10000.00	120.00	154.00	H	40.00	10.30
924.39	---	75.31	---	---	10000.00	120.00	154.00	H	40.00	10.30



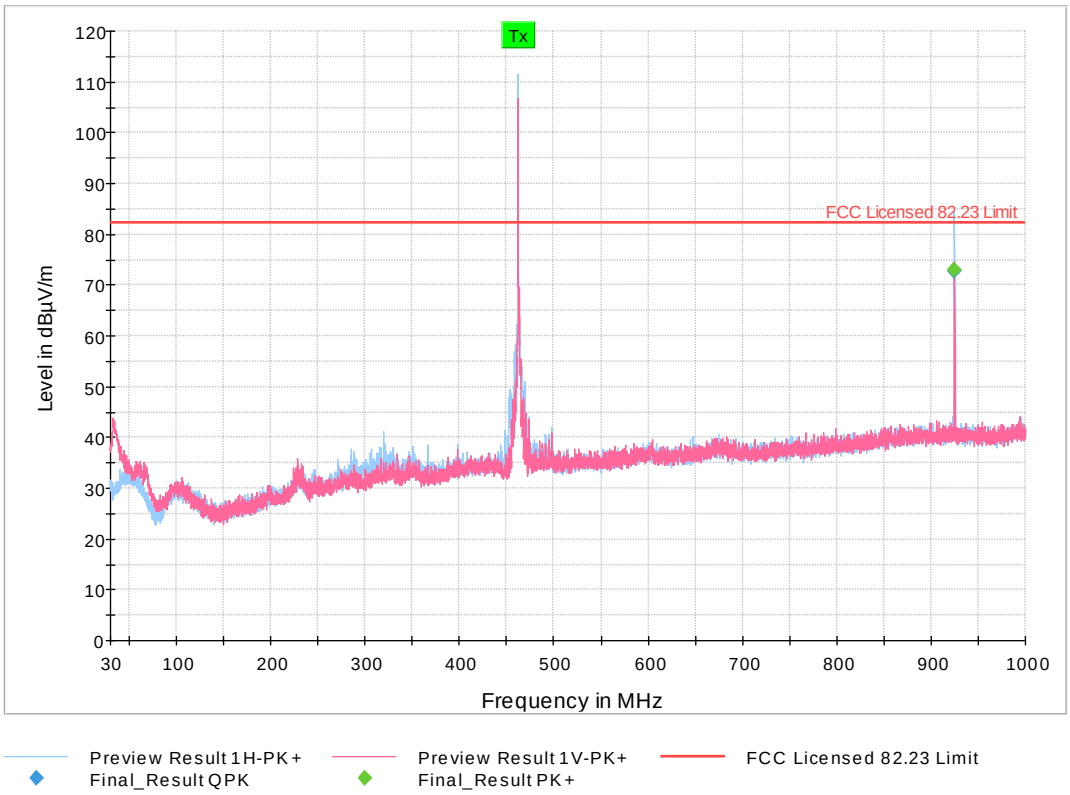
Plot 7. 30 MHz-1 GHz, 457.7 MHz at 0.5 kHz

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
924.40	---	80.42	---	---	10000.00	120.00	100.00	H	68.00	10.30
924.40	80.28	---	82.23	1.95	10000.00	120.00	100.00	H	68.00	10.30



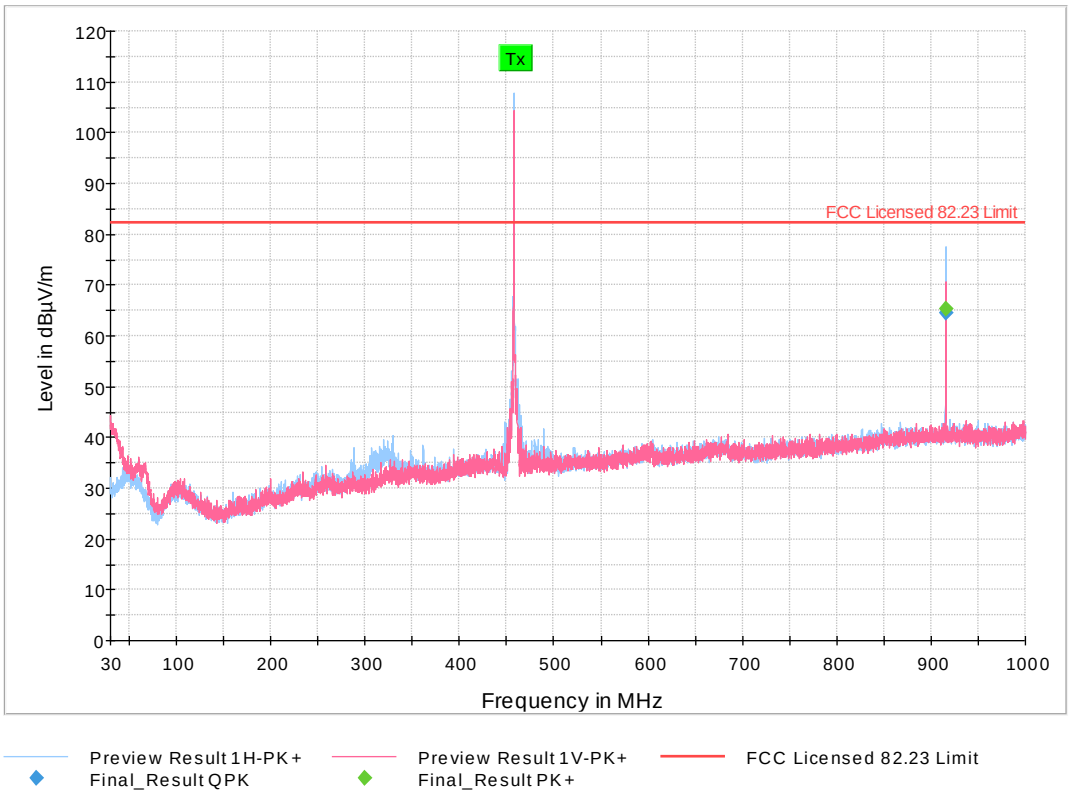
Plot 8. 30 MHz-1 GHz, 462.2 MHz at 0.5 kHz

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
925.00	---	73.02	---	---	10000.00	120.00	153.00	H	40.00	10.30
925.00	72.73	---	82.23	9.50	10000.00	120.00	153.00	H	40.00	10.30



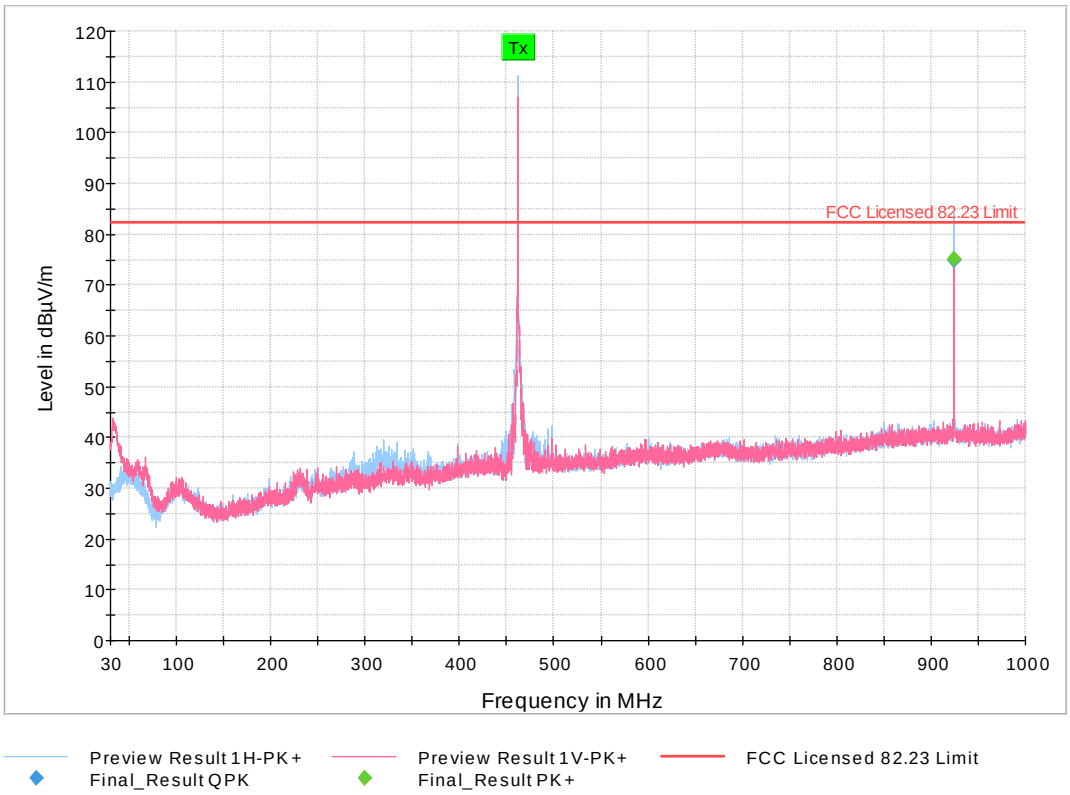
Plot 9. 30 MHz-1 GHz, 462.5 MHz at 0.5 kHz

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
915.40	---	65.20	---	---	10000.00	120.00	156.00	H	241.00	10.10
915.40	64.46	---	82.23	17.77	10000.00	120.00	156.00	H	241.00	10.10



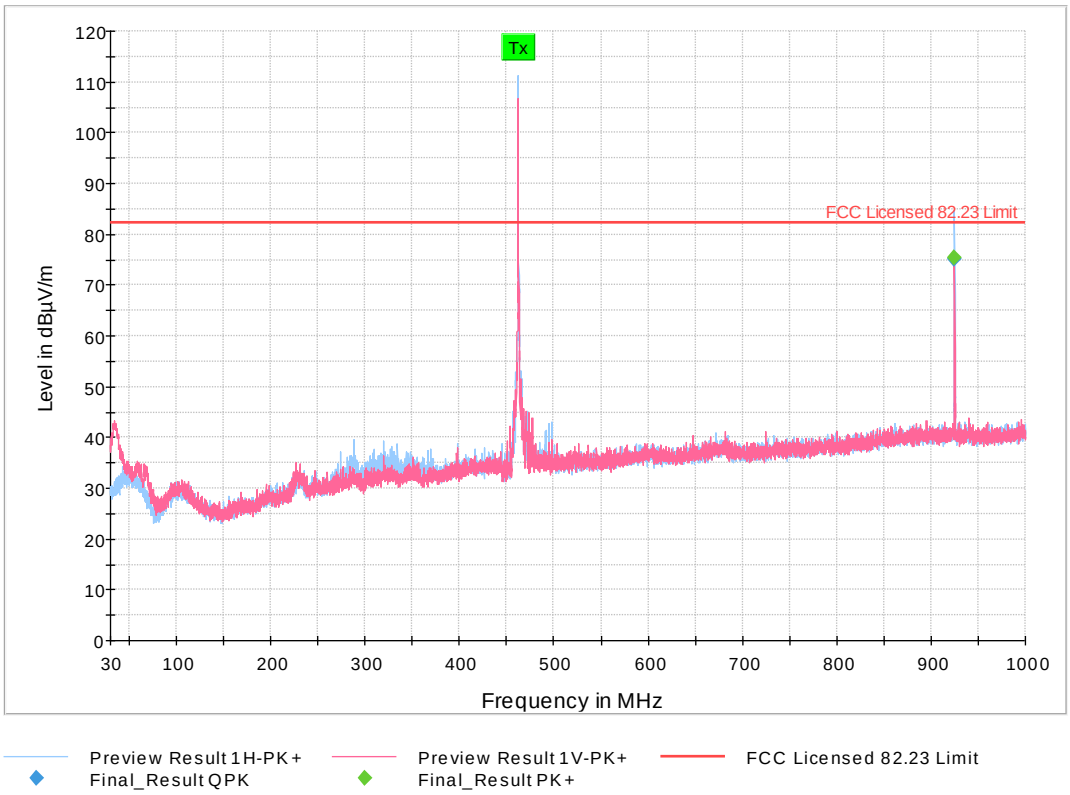
Plot 10. 30 MHz-1 GHz, 457.7 MHz at 2 kHz

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
924.40	---	75.11	---	---	10000.00	120.00	153.00	H	64.00	10.30
924.40	74.86	---	82.23	7.37	10000.00	120.00	153.00	H	64.00	10.30



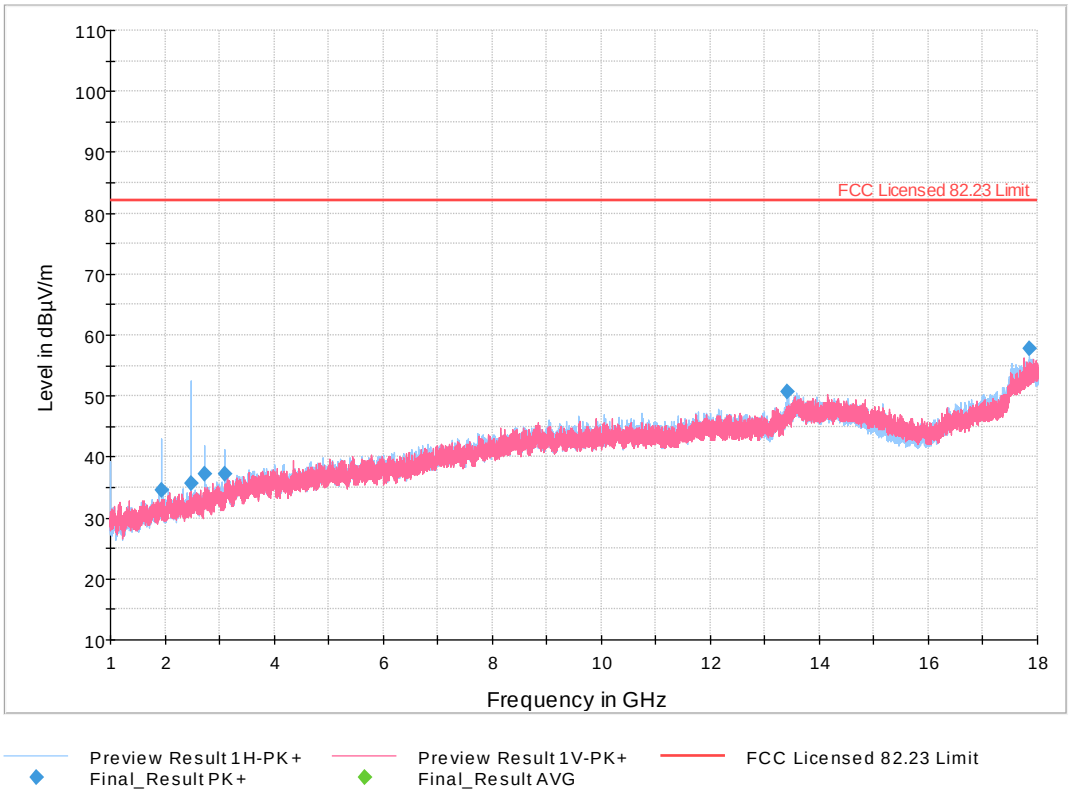
Plot 11. 30 MHz-1 GHz, 462.2 MHz at 2 kHz

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
924.99	---	75.36	---	---	10000.00	120.00	153.00	H	65.00	10.30
924.99	75.10	---	82.23	7.13	10000.00	120.00	153.00	H	65.00	10.30



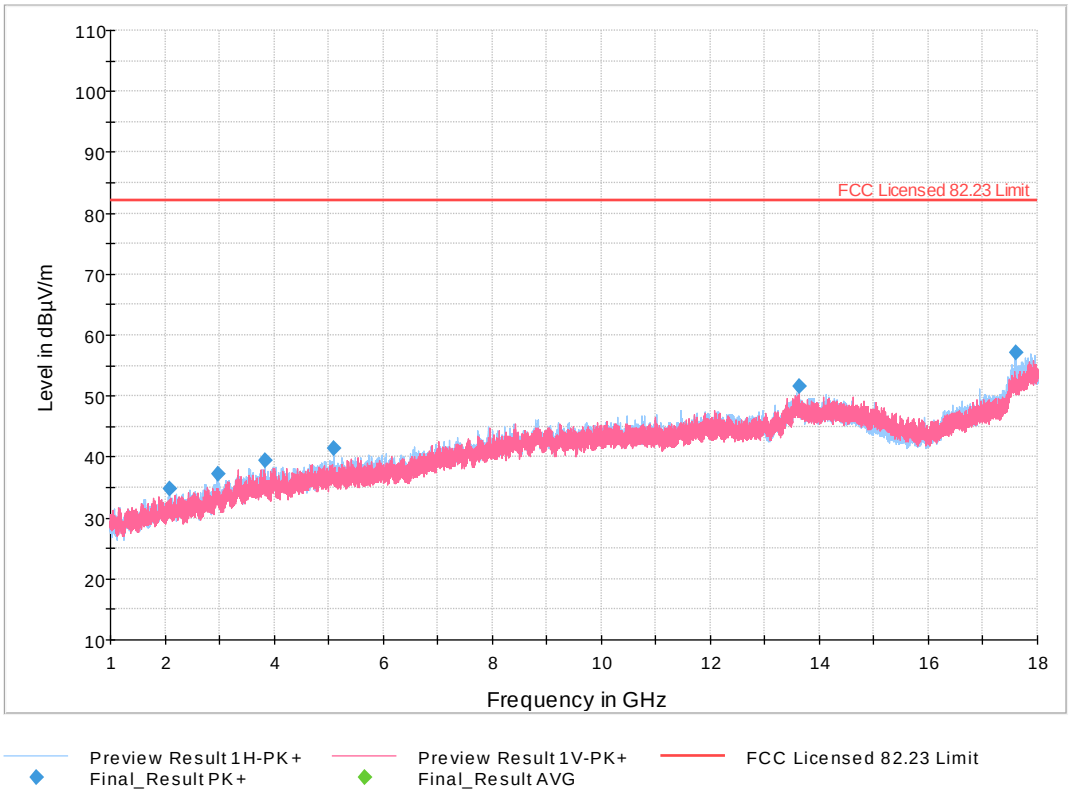
Plot 12. 30 MHz-1 GHz, 462.5 MHz at 2 kHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1938.00	34.62	82.23	47.61	1000.00	156.00	H	18.00	-3.60
2471.00	35.62	82.23	46.61	1000.00	350.00	H	253.00	-2.30
2725.58	37.31	82.23	44.92	1000.00	236.00	H	255.00	-1.40
3102.05	37.30	82.23	44.93	1000.00	153.00	H	241.00	0.70
13418.50	50.76	82.23	31.47	1000.00	254.00	H	213.00	15.00
17853.00	57.77	82.23	24.46	1000.00	350.00	H	272.00	22.60



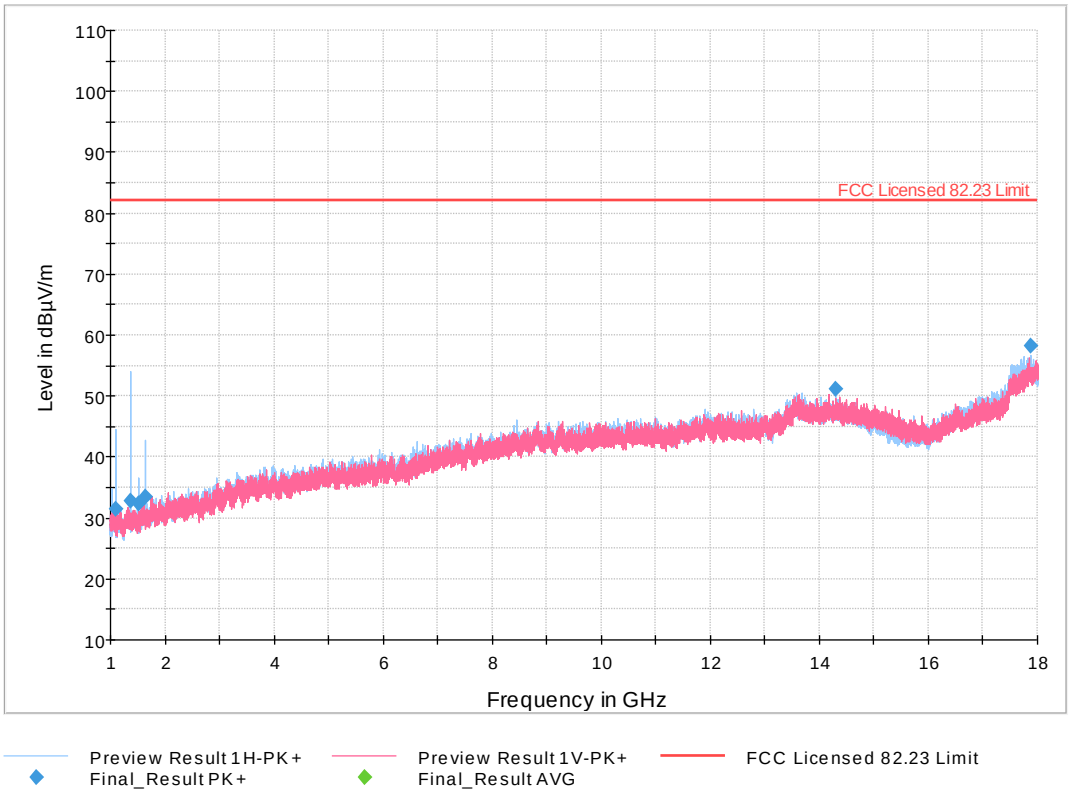
Plot 13. 1-18 GHz, 457.7 MHz at 0.5 kHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2092.58	34.86	82.23	47.37	1000.00	100.00	H	207.00	-3.40
2965.82	37.19	82.23	45.04	1000.00	100.00	H	192.00	0.00
3828.89	39.45	82.23	42.78	1000.00	100.00	H	64.00	2.80
5087.83	41.32	82.23	40.91	1000.00	100.00	H	82.00	4.90
13626.96	51.67	82.23	30.56	1000.00	350.00	V	113.00	15.10
17597.60	57.05	82.23	25.18	1000.00	354.00	H	302.00	21.00



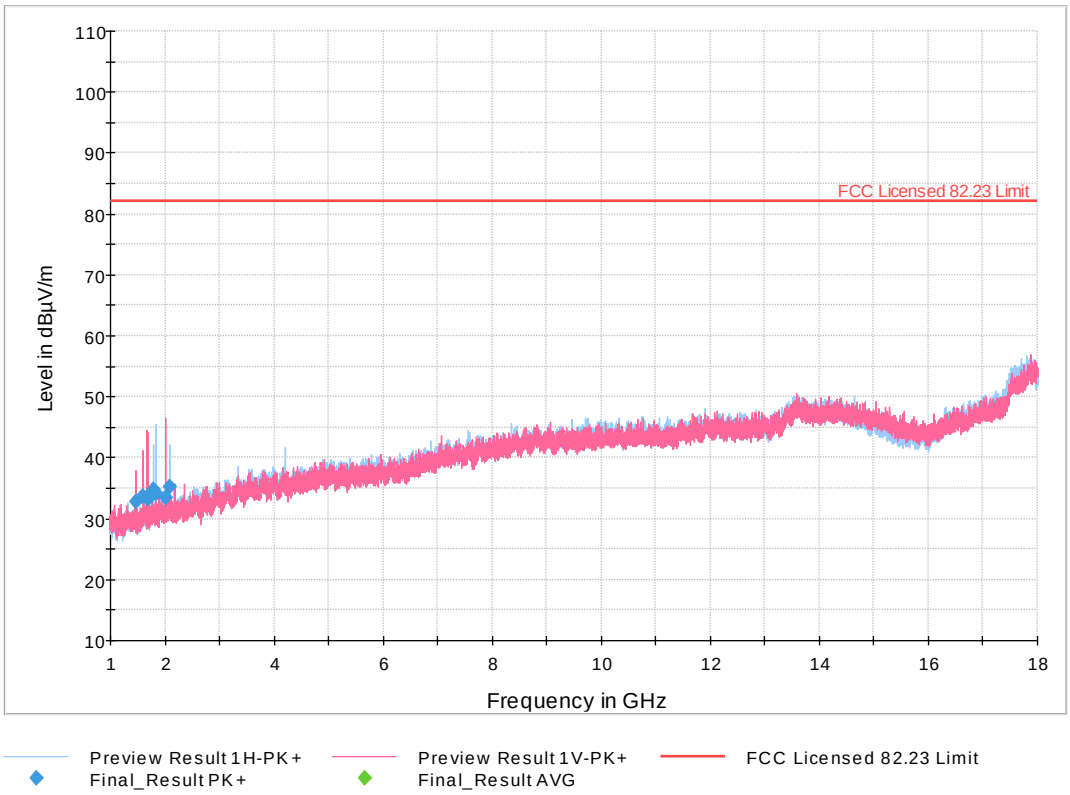
Plot 14. 1-18 GHz, 462.2 MHz at 0.5 kHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1099.54	31.57	82.23	50.66	1000.00	350.00	H	267.00	-7.00
1371.79	32.82	82.23	49.41	1000.00	350.00	H	15.00	-5.80
1524.55	32.26	82.23	49.97	1000.00	350.00	H	14.00	-5.70
1641.19	33.40	82.23	48.83	1000.00	353.00	H	232.00	-4.90
14299.75	51.14	82.23	31.09	1000.00	250.00	H	113.00	16.10
17876.15	58.22	82.23	24.01	1000.00	350.00	H	69.00	22.60



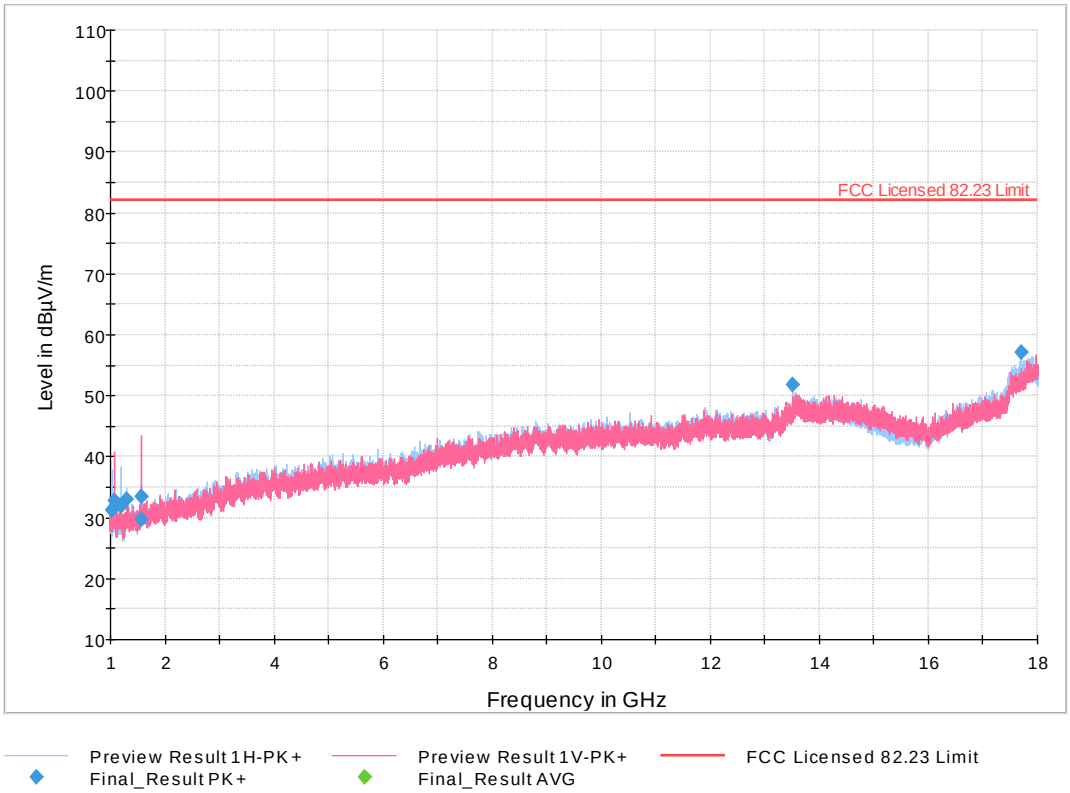
Plot 15. 1-18 GHz, 462.5 MHz at 0.5 kHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1479.42	32.82	82.23	49.41	1000.00	255.00	V	4.00	-6.10
1603.91	33.56	82.23	48.67	1000.00	350.00	V	280.00	-5.00
1673.00	33.40	82.23	48.83	1000.00	350.00	V	262.00	-4.90
1684.16	33.16	82.23	49.07	1000.00	336.00	V	261.00	-4.90
1794.00	34.82	82.23	47.41	1000.00	250.00	H	80.00	-4.20
1831.60	34.16	82.23	48.07	1000.00	353.00	H	235.00	-4.00
2022.51	33.40	82.23	48.83	1000.00	104.00	V	48.00	-3.50
2088.36	35.16	82.23	47.07	1000.00	350.00	H	235.00	-3.40



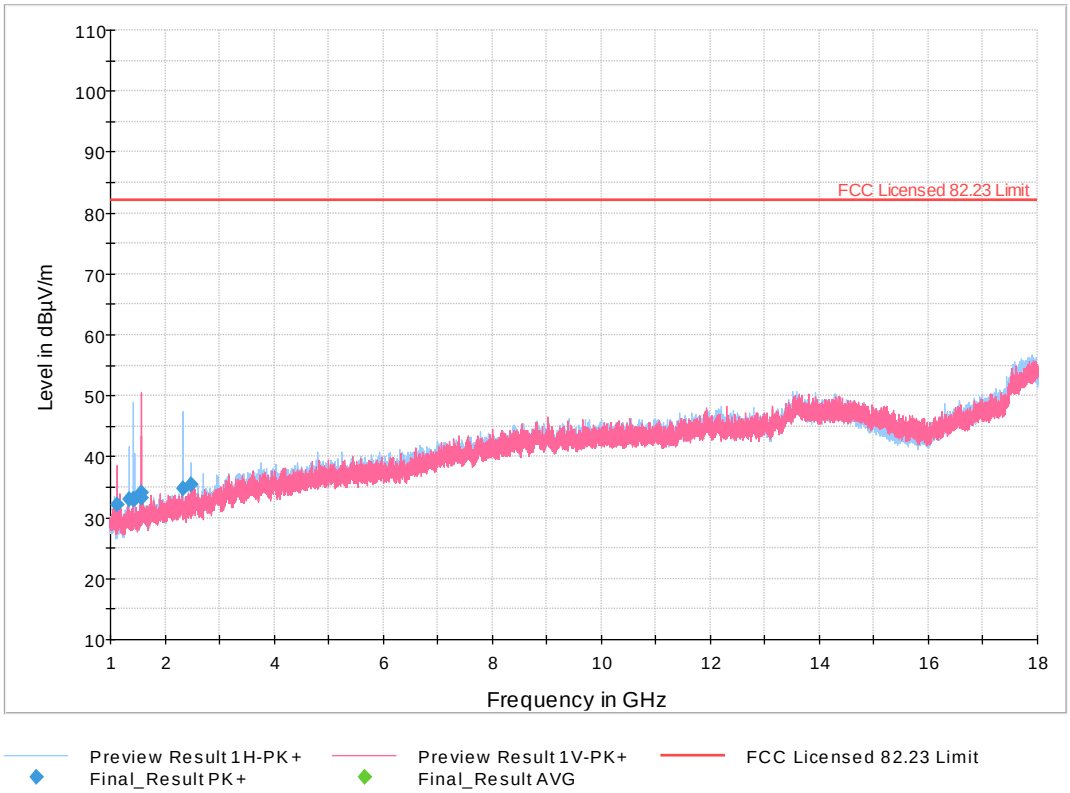
Plot 16. 1-18 GHz, 457.7 MHz at 2 kHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1018.52	31.24	82.23	50.99	1000.00	105.00	H	94.00	-6.90
1068.50	32.80	82.23	49.43	1000.00	350.00	V	270.00	-6.60
1203.50	31.91	82.23	50.32	1000.00	335.00	H	30.00	-6.70
1293.79	33.05	82.23	49.18	1000.00	350.00	H	250.00	-6.50
1558.00	33.39	82.23	48.84	1000.00	350.00	V	59.00	-5.20
1579.72	29.61	82.23	52.62	1000.00	105.00	H	98.00	-5.10
13504.50	51.88	82.23	30.35	1000.00	236.00	H	1.00	15.10
17702.80	57.18	82.23	25.05	1000.00	150.00	H	25.00	21.70



Plot 17. 1-18 GHz, 462.2 MHz at 2 kHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1132.80	32.06	82.23	50.17	1000.00	250.00	V	258.00	-6.40
1344.43	33.11	82.23	49.12	1000.00	250.00	H	262.00	-5.80
1412.00	33.04	82.23	49.19	1000.00	335.00	H	232.00	-5.90
1441.39	32.95	82.23	49.28	1000.00	100.00	H	180.00	-6.00
1565.00	33.13	82.23	49.10	1000.00	336.00	V	309.00	-5.10
1575.00	34.04	82.23	48.19	1000.00	350.00	V	314.00	-5.10
2335.00	34.69	82.23	47.54	1000.00	103.00	H	180.00	-2.70
2470.00	35.48	82.23	46.75	1000.00	100.00	H	25.00	-2.30



Plot 18. 1-18 GHz, 462.5 MHz at 2 kHz

4.5 Spurious Emissions at Antenna Terminals

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 90.217, RSS 119 Sect.5.8.9.2, RSS Gen 6.13.

4.5.1 Test Methodology

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. Conditions applied based on TIA-603-D section 2.2.13. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz and 1 MHz for above 1GHz. Band emissions are measured up to 10th harmonic

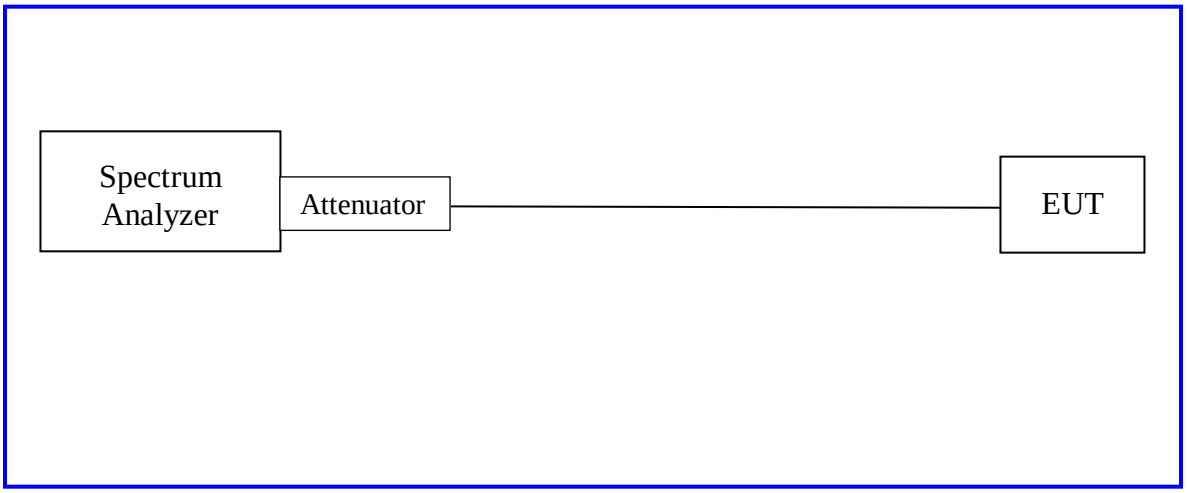
4.5.1.1 Deviations

None.

4.5.2 Test Setup:

All tests were conducted at full power on low, middle, and high channels. The DUT was stimulated by manufacturer provided test software that is not available to the end user.

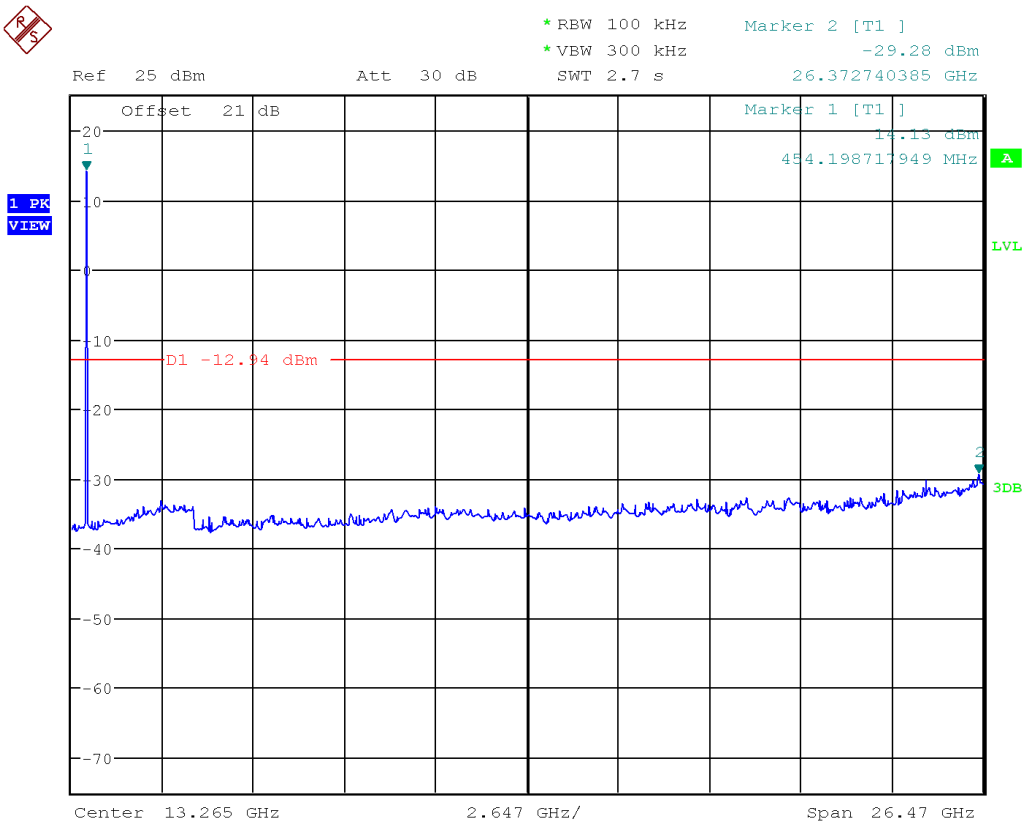
Test Setup:



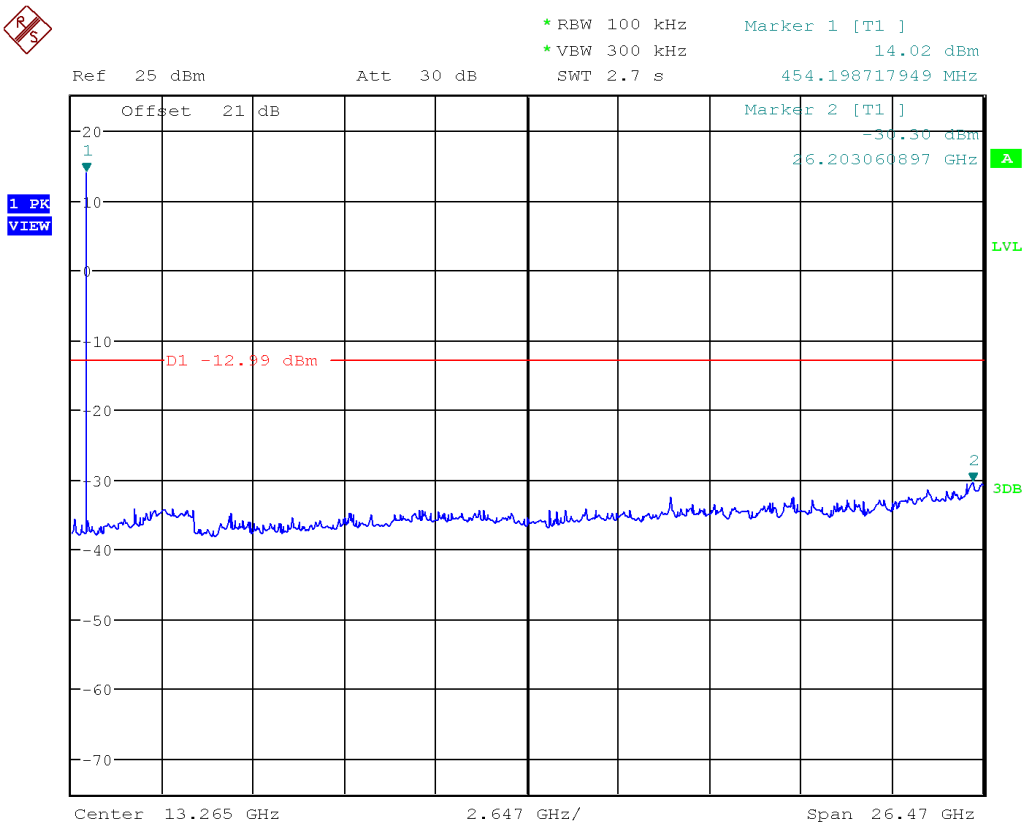
4.5.3 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in *RSS 119 Sect.5.8.9.2*. The power of any emission outside the equipment operating sub-band edge shall be attenuated below the maximum permitted output power Pmax by at least 43 + 10 log (P) dB = (-) 13 dBm, where (P) is the highest emission (watts) of the transmitter inside the licensee's sub-band.

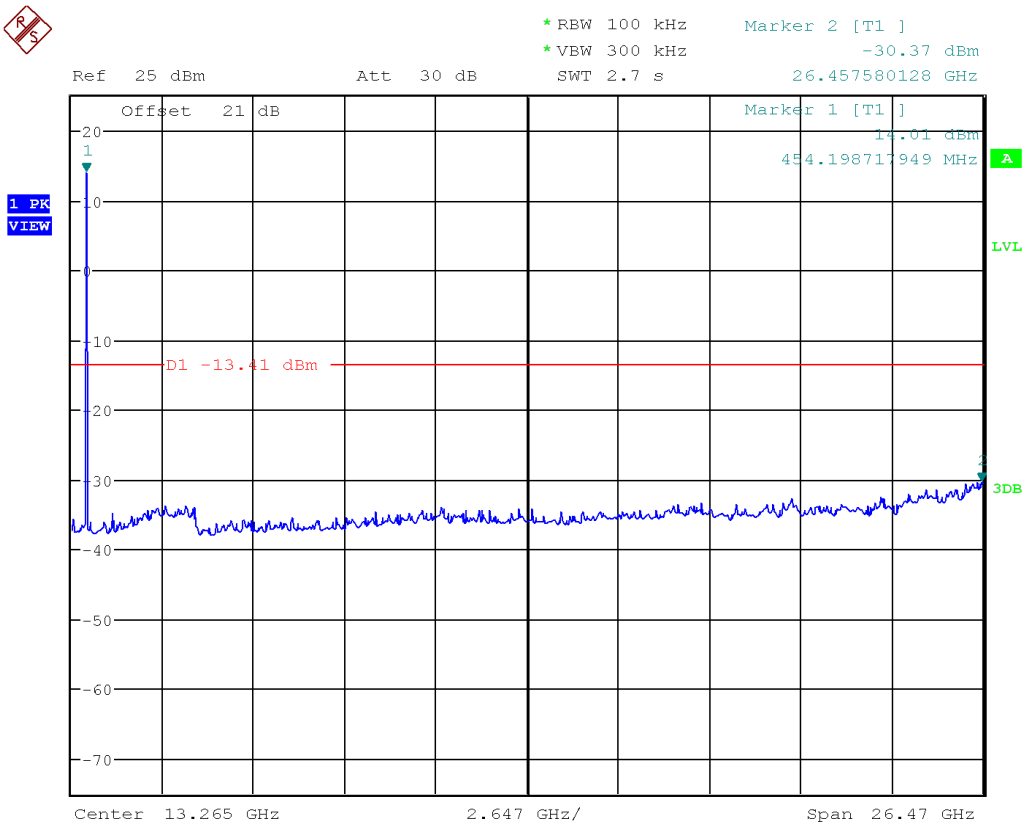
4.5.4 Test Results



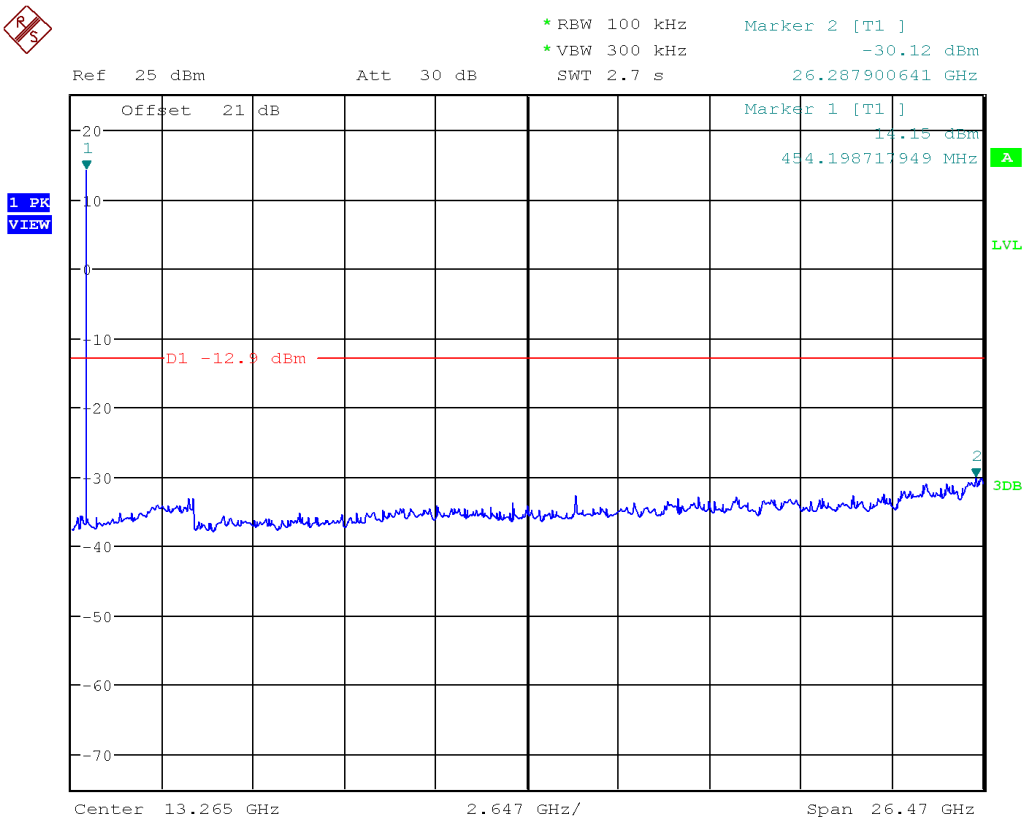
Plot 11. 30 MHz – 26.5 GHz, 457.7 MHz, 0.5 kHz



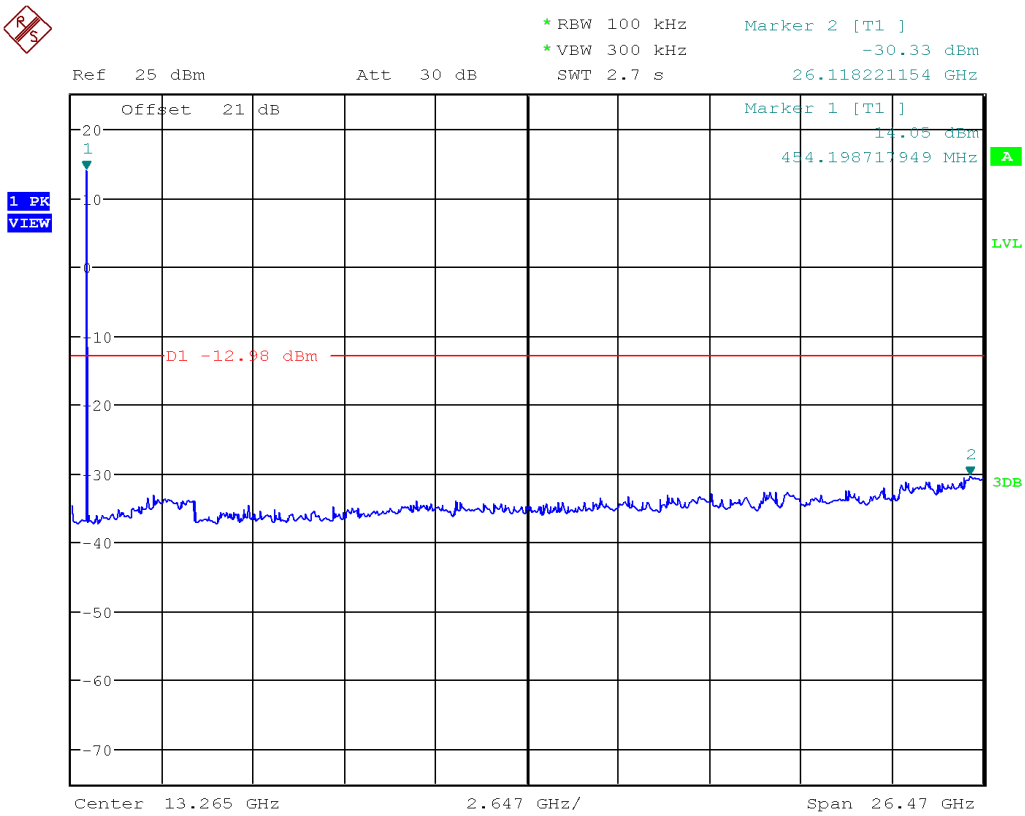
Plot 11. 30 MHz – 26.5 GHz, 462.2 MHz, 0.5 kHz



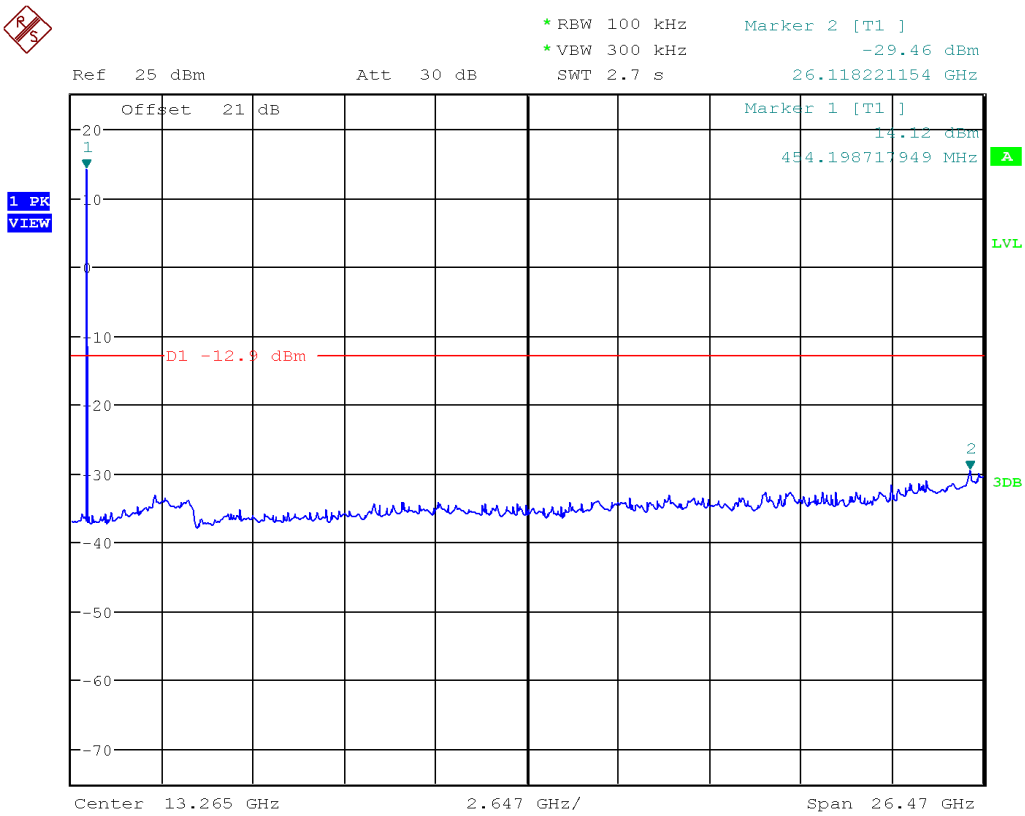
Plot 11. 30 MHz – 26.5 GHz, 462.5 MHz, 0.5 kHz



Plot 11. 30 MHz – 26.5 GHz, 457.7 MHz, 2 kHz



Plot 11. 30 MHz – 26.5 GHz, 462.2 MHz, 2 kHz



Plot 11. 30 MHz – 26.5 GHz, 462.5 MHz, 2 kHz

4.6 Displacement Frequency

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 90.217, RSS-119 Sect.5.10.

4.6.1 Test Methodology

Any emission appearing on a displacement frequency, fd = 25 kHz, from the assigned frequency as shown in Table 19 in RSS-119 Sect. 5.10, is attenuated below the unmodulated carrier power by at least 30 dB, when measured with a resolution bandwidth of 300 Hz.

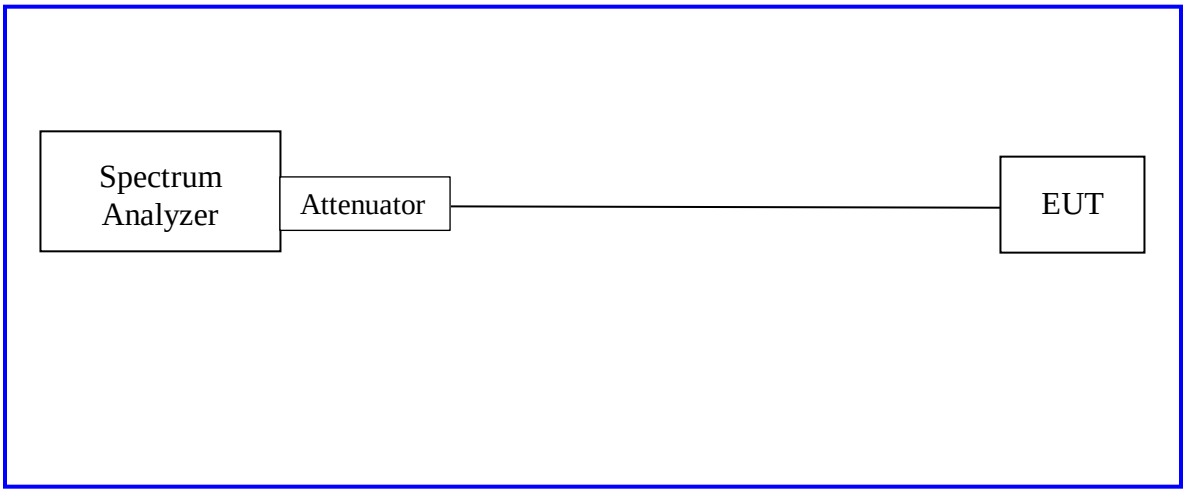
4.6.1.1 Deviations

None.

4.6.2 Test Setup:

All tests were conducted at full power on low, middle, and high channels. The DUT was stimulated by manufacturer provided test software that is not available to the end user.

Test Setup:



4.6.3 Transmitter Spurious Emission Limit

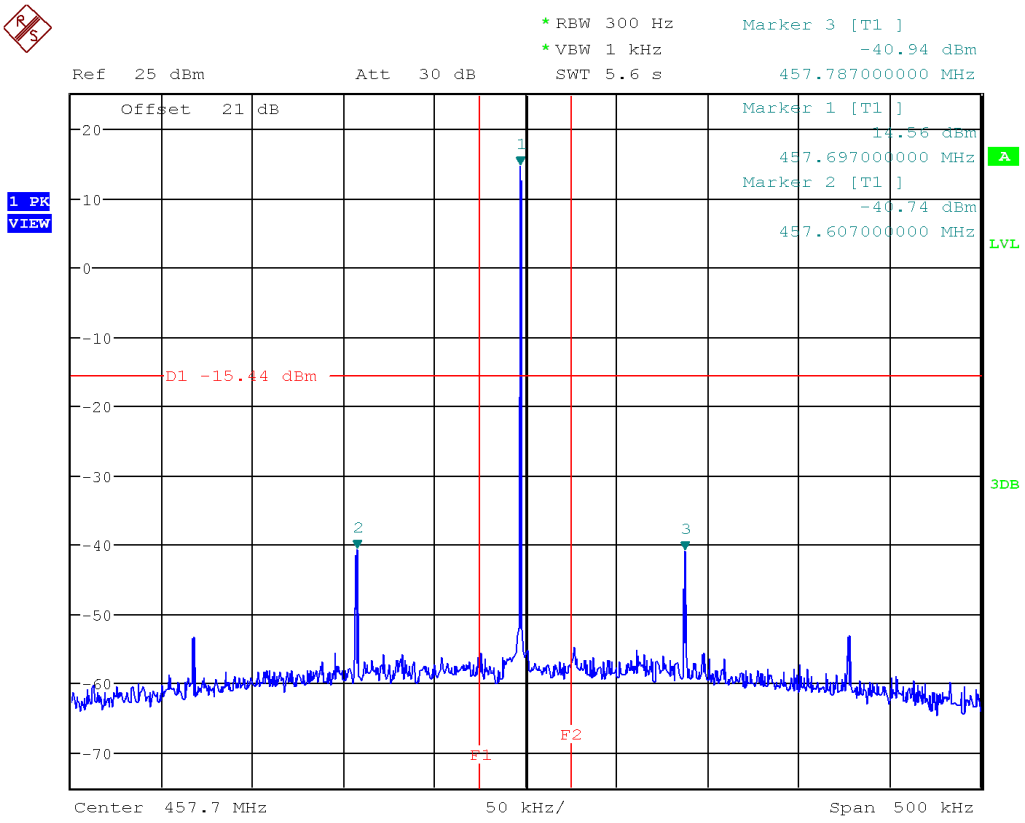
Any emission appearing on a displacement frequency, fd ≥ 25, from the assigned frequency as shown in Table 19 in RSS-119 Sect. 5.10, is attenuated below the unmodulated carrier power by at least 30 dB, when measured with a resolution bandwidth of 300 Hz.

Equipment Channel Bandwidth (kHz)	Displacement Frequency, fd (kHz)
25	fd ≥ 40
30	
12.5	fd ≥ 25
15	
6.25	fd ≥ 12.5
7.5	

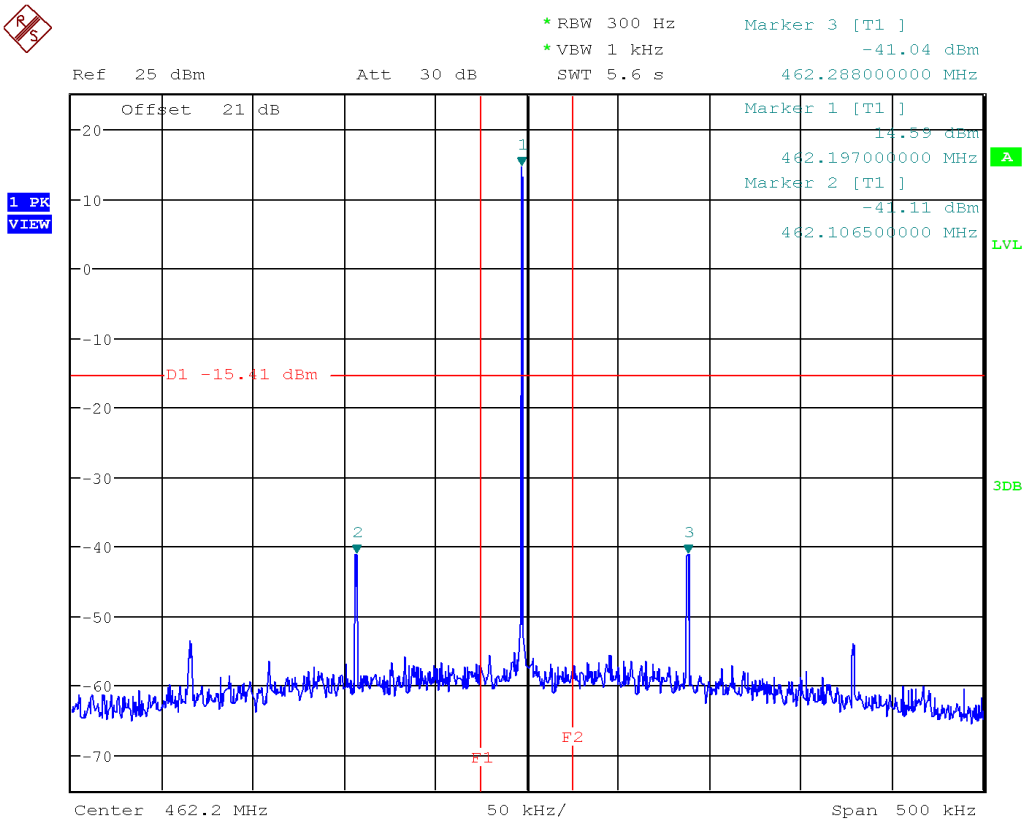
4.6.4 Test Results

Table 5: Displacement Frequency – Test Results

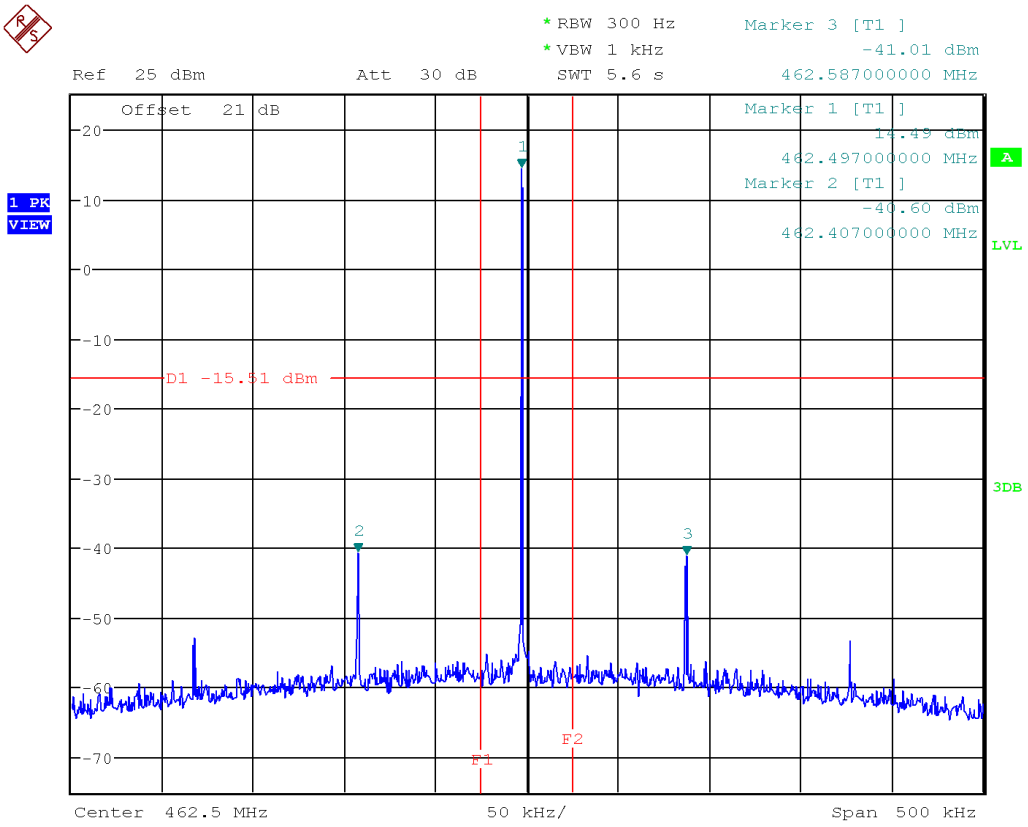
Test Conditions: Conducted Measurement, Normal Temperature				
Freq. (MHz)	**Unmodulated Carrier**			
	Measured (dBm)	**Limit (dBm)**	**Margin (dB)**	**Results**
457.7	-40.74	-15.44	25.30	Pass
462.2	-41.04	-15.41	25.63	Pass
462.5	-40.60	-15.51	25.09	Pass
Note: None				



Plot 19. 457.7 MHz, Displacement Frequency



Plot 20. 462.2 MHz, Displacement Frequency



Plot 21. 462.5 MHz, Displacement Frequency

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yy	Next Cal mm/dd/yy
EMI Receiver	Rohde & Schwarz	ESW, 2 Hz-44GHz	5000-2455-0027	2/28/2021	2/28/2022
Preamplifier, 30 MHz – 8 GHz	Rohde & Schwarz	TS-PR8	102353	2/26/2021	2/26/2022
Trilog Antenna	Rohde & Schwarz	VULB 9162	A102606	2/27/2021	2/27/2022
Preamplifier, 1-18GHz	Rohde & Schwarz	SFUNIT-RX	102143	3/23/2021	3/23/2022
Preamplifier, 1-18GHz	Rohde & Schwarz	TS-PR18	101649	3/23/2021	3/23/2022
Horn, 1-18GHz	EMCO	3115	9402-4226	7/29/2021	7/29/2023
Preamplifier, 18 – 40GHz	Rohde & Schwarz	TS-PR1840	100067	2/27/2020	2/27/2022
Horn, 18-40GHz	Rohde & Schwarz	180-442-KF	132596-01	4/17/2020	4/17/2022
Spectrum Analyzer	Rohde & Schwarz	FSU26.5	200050	2/24/2021	2/24/2022
1.6 GHz Low Pass Filter	K&L Microwave	8L120-X1600-0/09135-0249	UA691-35	N/A (See Note)	
3.5 GHz High Pass Filter	Hewlett Packard	84300-80038	820004	N/A (See Note)	
2.4 GHz Notch Filter	Micro-Tronics	BRM50702	009	N/A (See Note)	

Note: Equipment is characterized before use.

* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

VBU = Verify Before Use.

6 EMC Test Plan

6.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer (information supplied by the customer and can affect the validity of results) so that the test laboratory may perform the requested testing.

6.2 Customer

Table 6: Customer Information

Company Name	Ansonic GmbH
Address	Deilbachtal 23
City, State, Zip	Essen, Germany, 45257
Country	Germany

Table 7: Technical Contact Information

Name	Gerhard Ganser
E-mail	gerhard.ganser@ansonic.de

6.3 Equipment Under Test (EUT)

The information provided in the following table should be listed as it should appear in the final report. For those products that have only a model name, list the model number as *non-applicable* and vice-versa.

Table 8: EUT Designation

Product Name	NX1 - Transceiver
Model Number	NX1
System Name	NX1 - Transceiver

6.4 Product Specifications

Table 9: EUT Specifications *

EUT Specifications	
AC/DC Input	3.6 V_{DC}, 36 mAmps
Environment (Indoor / Outdoor)	Indoor
Operating Temperature Range:	–30 τo +60°C
Multiple Feeds:	☐ Yes and how many 1 ☒ No
Product Marketing Name (PMN)	NX1 - Transceiver
Model No.	NX1
Hardware Version Identification Number (HVIN)	2016
Firmware Version Identification Number (FVIN)	V22
Operating Modes	0.5 – 2 kHz
Transmitter Frequency Band	457.7 – 462.5 MHz
Antenna Type	Conducted, Pins
Antenna Gain (dBi)	n/a
Modulation Type	☐ BLE ☐ DSSS ☐ OFDM ☐ Other describe: GFSK
Type of Equipment	☐ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☒ Other: Fixed/ Base equipment
*All EUT specifications are provided by the manufacturer or the TUV direct customer. Note: Information supplied by the customer and can affect the validity of results.	

Table 10: EUT Channel Power Specifications

Freq. (MHz)	GFSK								
FCC/IC Power Setting									
457.7	15								
462.2	15								
462.5	15								

Table 11: Interface Specifications

Interface Information					
Interface design / Port name	**Number**	**Cable type**	**Shielded Cable**	**Maximum potential length of the cable**	**Comments**
Power supply pins	2	Power supply pins	☐Yes ☒No	<3m	
Digital Pins	Up to 12	Digital Pins	☐Yes ☒No	<3m	50 Ohms connector

Table 12: Accessory Equipment

Equipment	Manufacturer	Model	Serial	Comment
N/A	N/A	N/A	N/A	N/A

Table 13: Ancillary Equipment (used for test purposes only)

Equipment	Manufacturer	Model	Serial	Used for
N/A	N/A	N/A	N/A	N/A
Note: None.				

Table 14: Description of Sample used for Testing

Sample Number	Device	Serial Number	Configuration	Used For
1	NX1	010038	Radiate Sample	TX Spurious Emissions
2	NX1	010035	Conducted Sample	All other conducted Measurements
Note: None.				

6.5 Test Specifications

Table 15: Test Specifications

Emissions and Immunity	
Standard	**Requirement**
47 CFR FCC Part 90	All
RSS-119	All

END OF REPORT