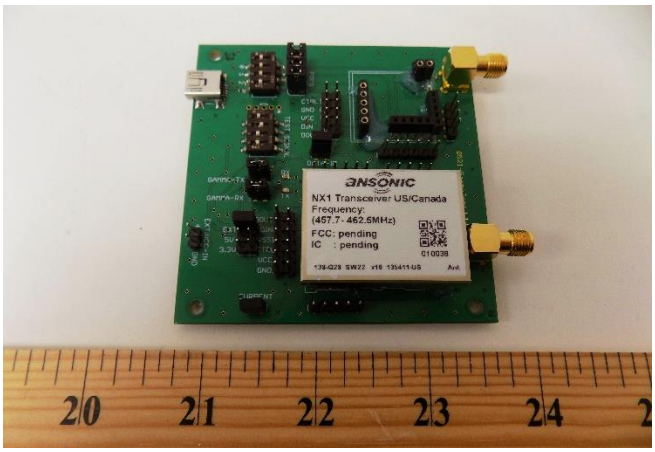
| | | | | |
|---|---|---|---|---|
| **Test Report No.:** *Prüfbericht-Nr.:* | US22BGK1.002 | **Order No.:** *Auftrags-Nr.:* | P00466470<br>0234180206 |  |
| **Client Reference No.:** *Kunden-Referenz-Nr.:* | 2381215 | **Order date:** *Auftragsdatum:* | 10/18/2021 | |
| **Client:** *Auftraggeber:* | Ansonic GmbH<br>Deilbachtal 23<br>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<br>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* |

**Test report no.: US22BGK1.002**
*Prüfbericht-Nr.:*



## 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.<br>Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.<br><br>*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.*<br>*Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.* |
| **2** | As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.<br><br>*Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.* |
| **3** | Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.<br>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.<br><br>*Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.*<br>*Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.* |

## Remarks
*Anmerkungen*

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

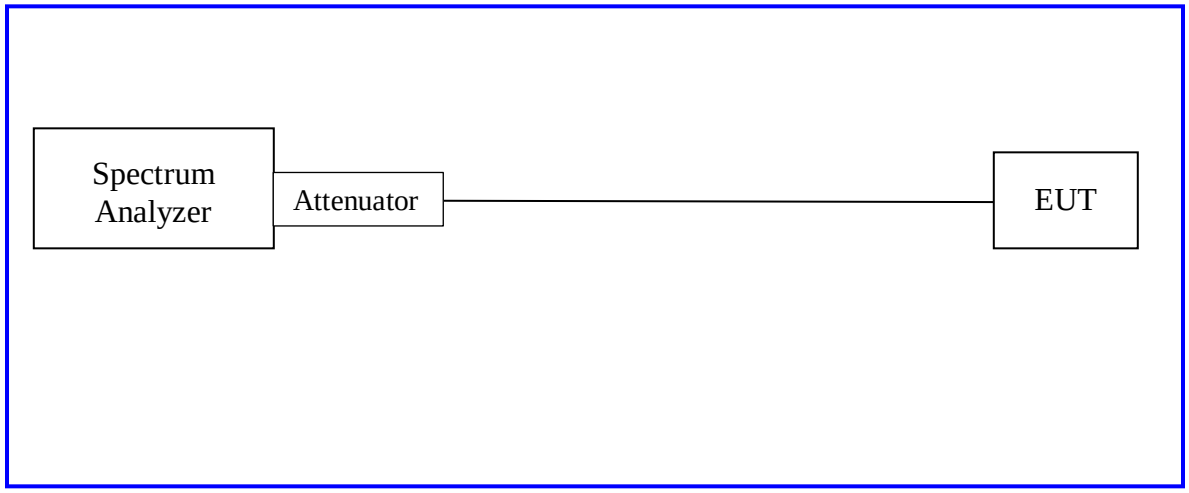
*The maximum output power requirement is the maximum equivalent isotropic radiated power delivering at the transmitting antenna under specified conditions of measurements in the presence of modulation.*

*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.*

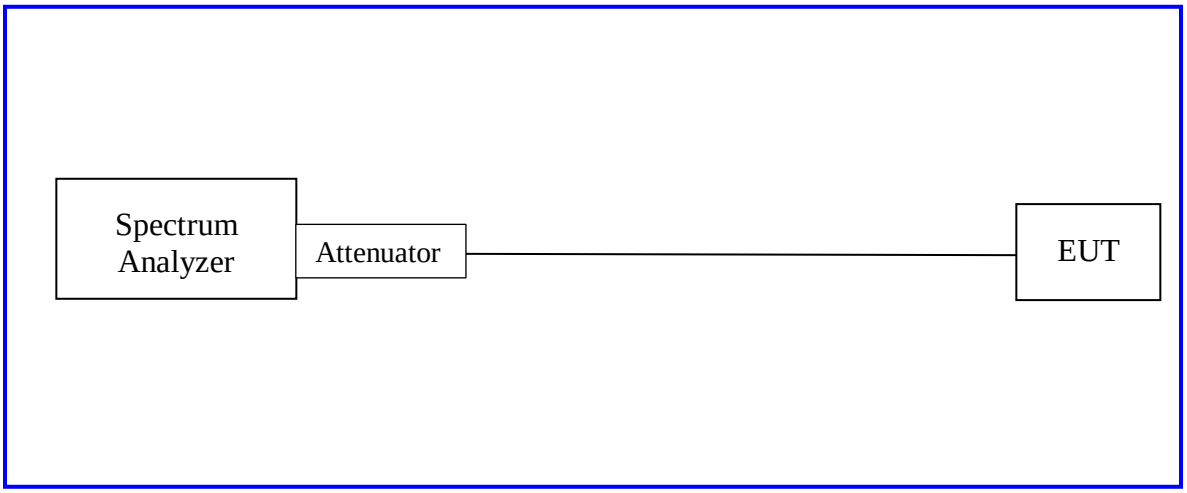
*The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.*

*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:

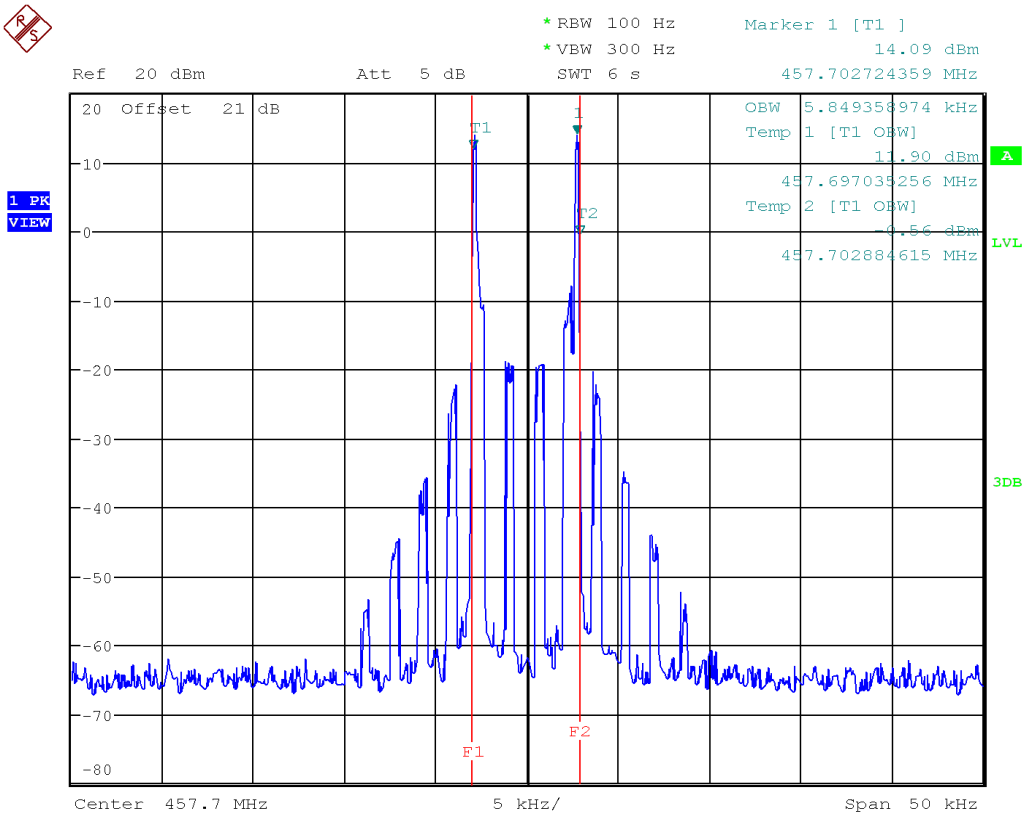



Results
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

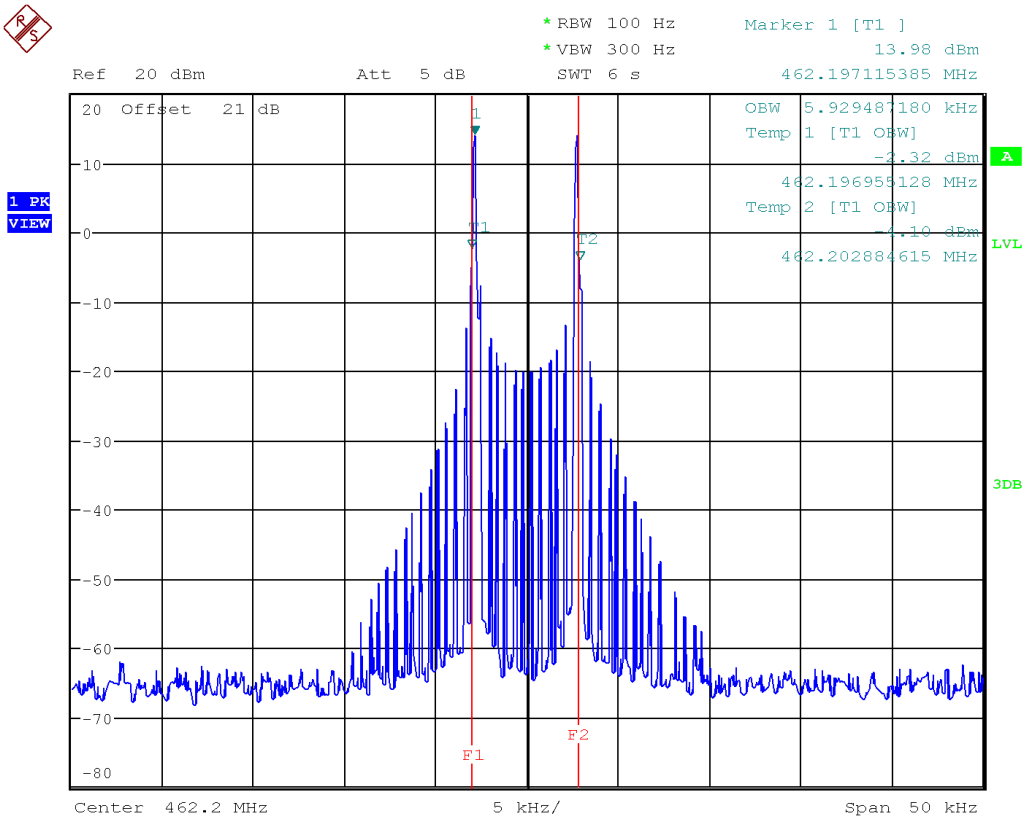
### 4.2.2 Results

**Table 3:** Occupied Bandwidth – Test Results

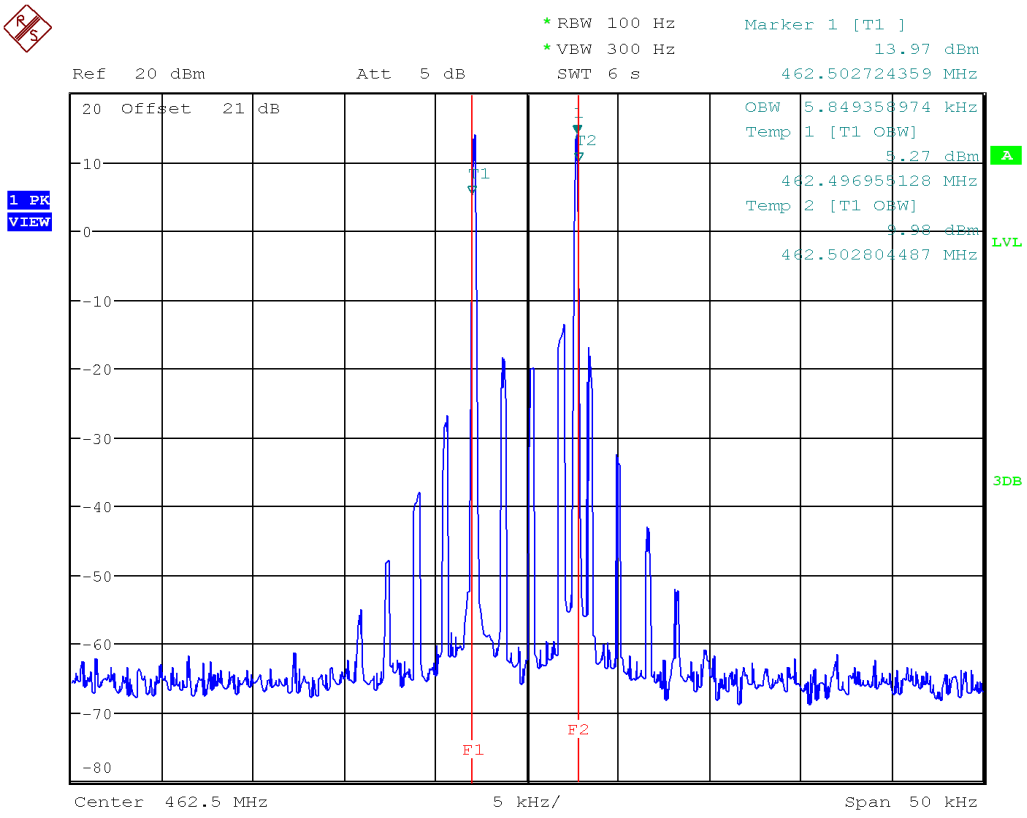
| **Test Conditions:** Conducted Measurement, Normal Temperature | | |
|---|---|---|
| **99% Bandwidth** | | |
| **Freq. (MHz)** | **0.5 kHz Modulation** | **2 kHz Modulation** |
| | **kHz** | **kHz** |
| 457.7 | 5.85 | 8.17 |
| 462.2 | 5.93 | 8.17 |
| 462.5 | 5.85 | 8.17 |
| **Note:** None | | |



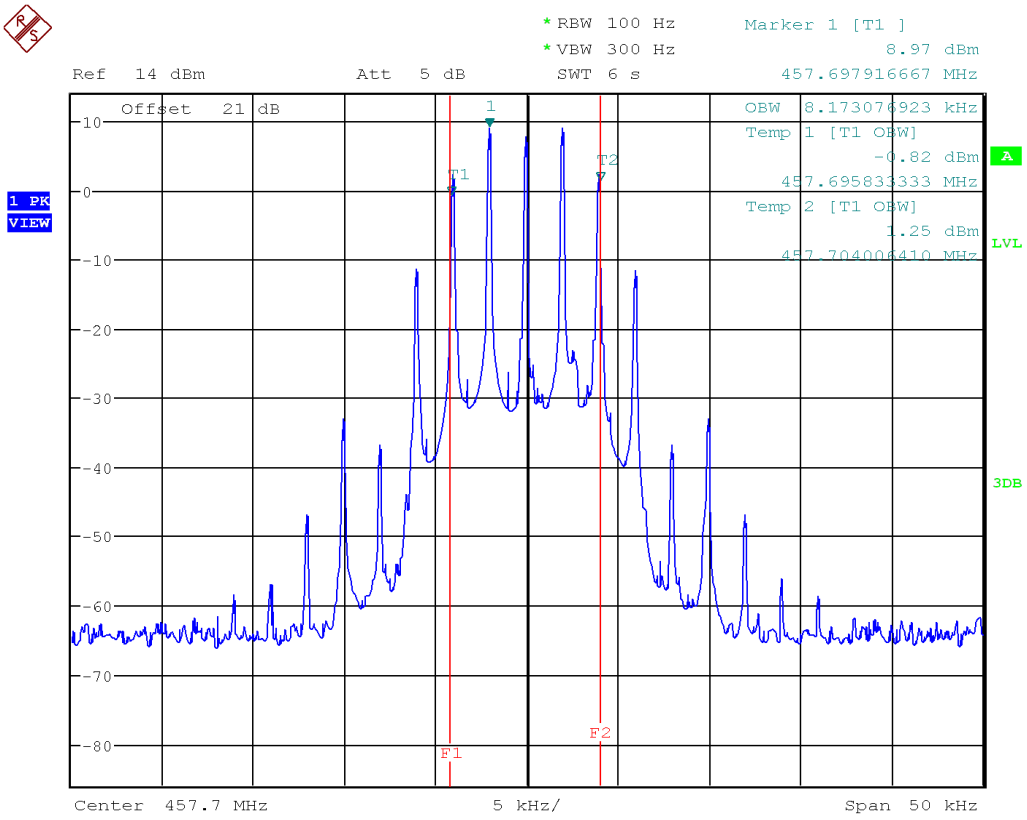

**Plot 1.** 457.7 MHz, 99% Bandwidth at 0.5 kHz



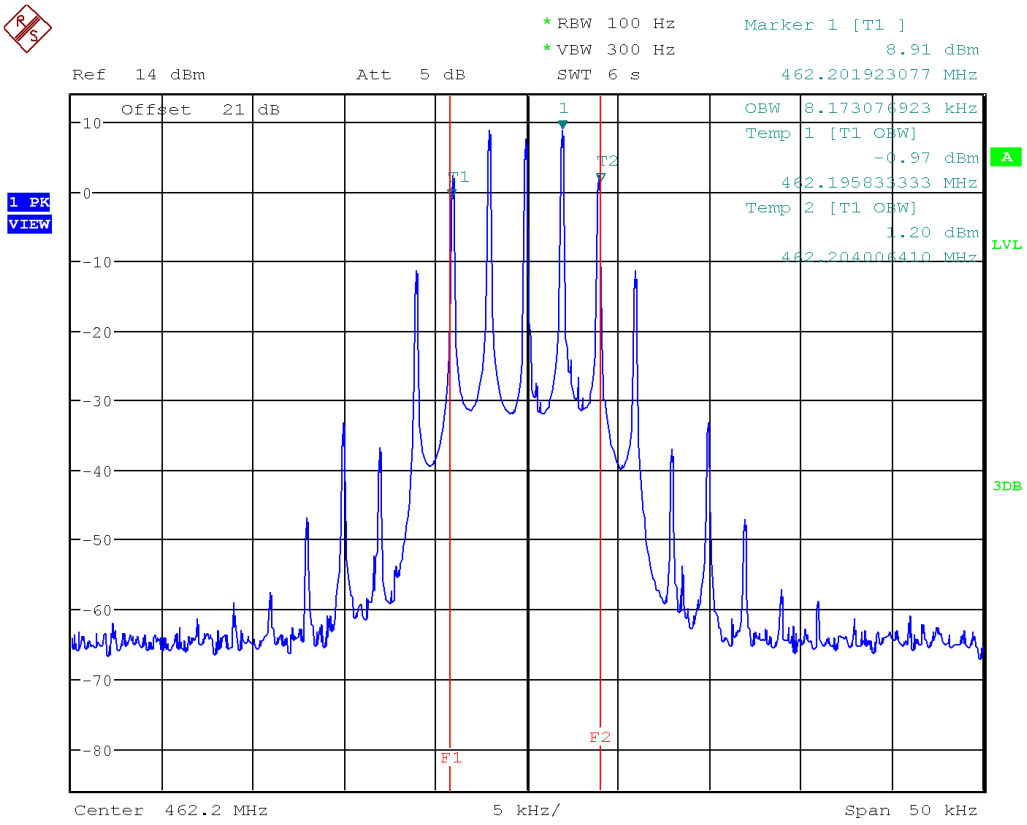

**Plot 2.** 462.2 MHz, 99% Bandwidth at 0.5 kHz



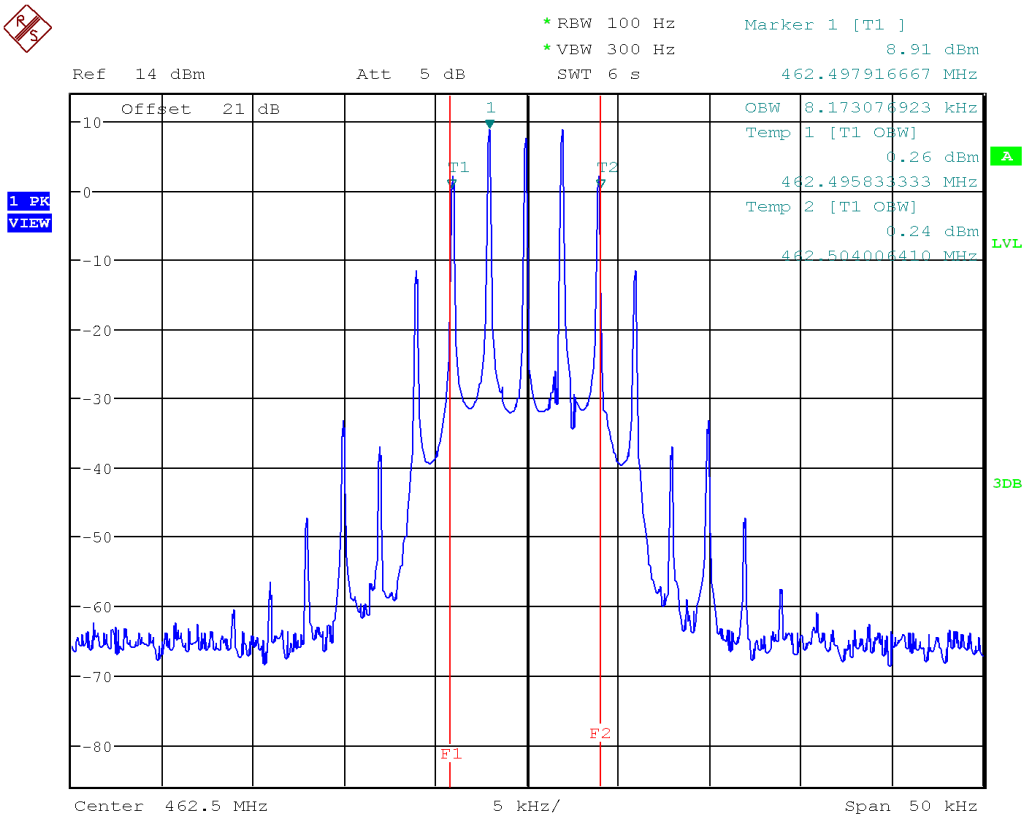

**Plot 3.** 462.5 MHz, 99% Bandwidth at 0.5 kHz




**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.

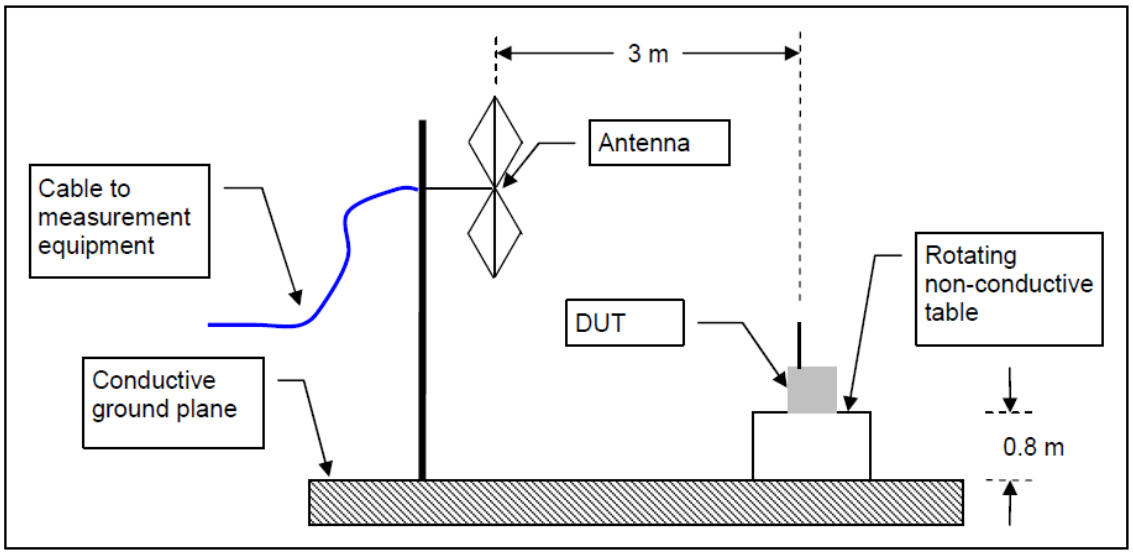
#### *4.4.1.3 Deviations*

None.

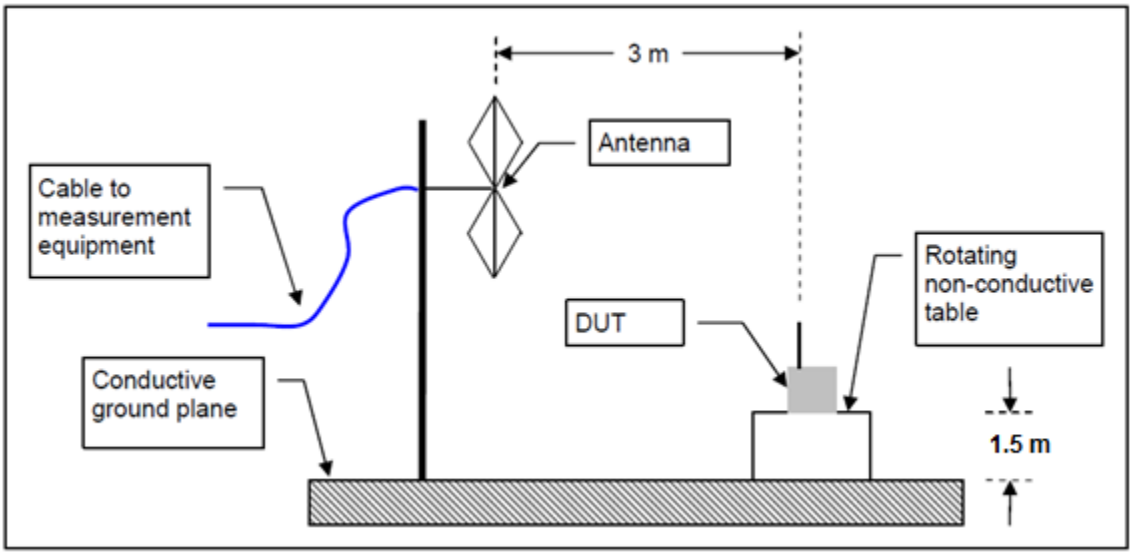
### 4.4.2 Test Setup:

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

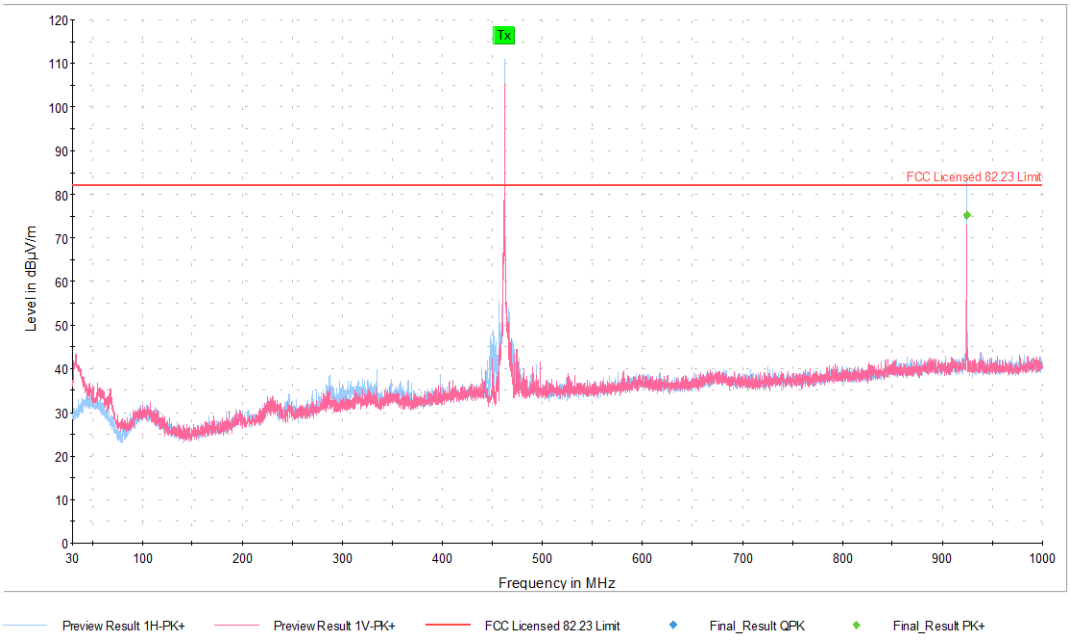
The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and test plan.

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.

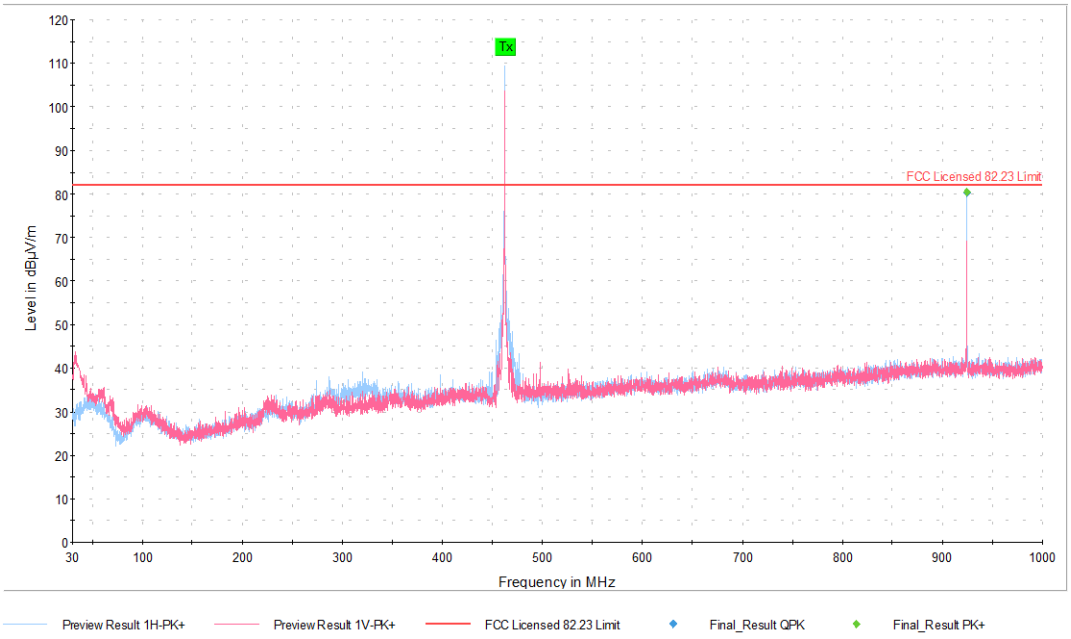
### *4.4.4.1 Results*

| 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 |



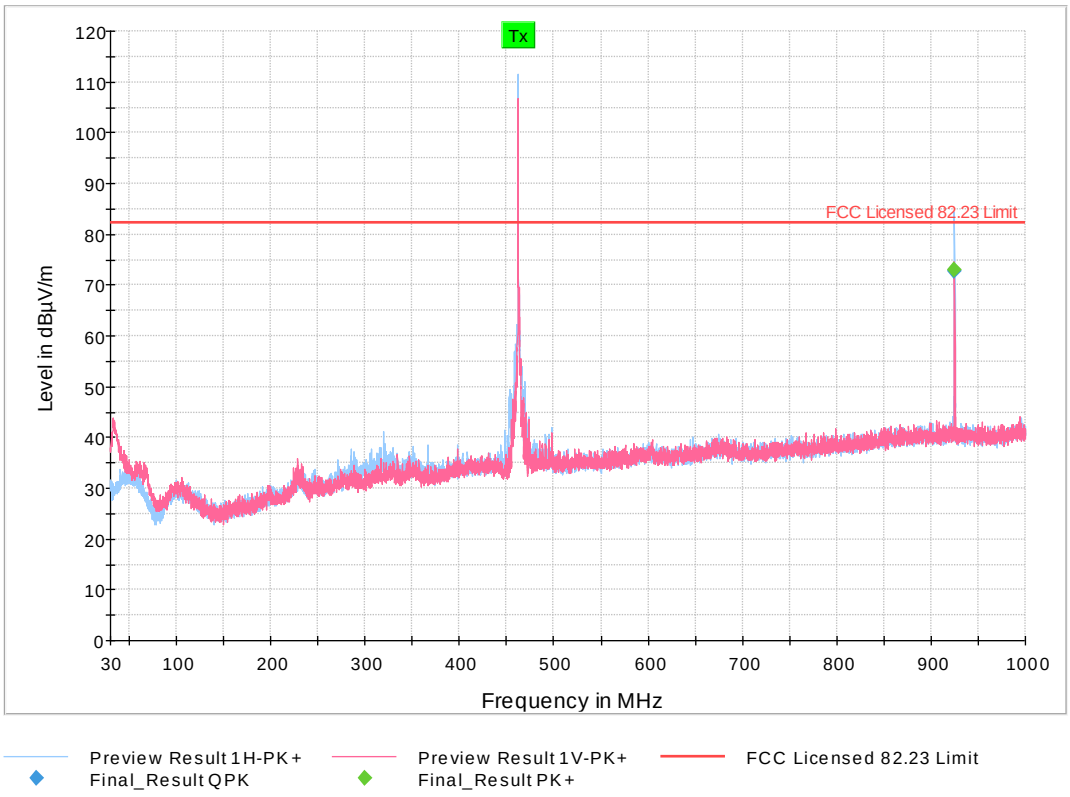

**Plot 7.** 30 MHz-1 GHz, 457.7 MHz at 0.5 kHz

| 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 |



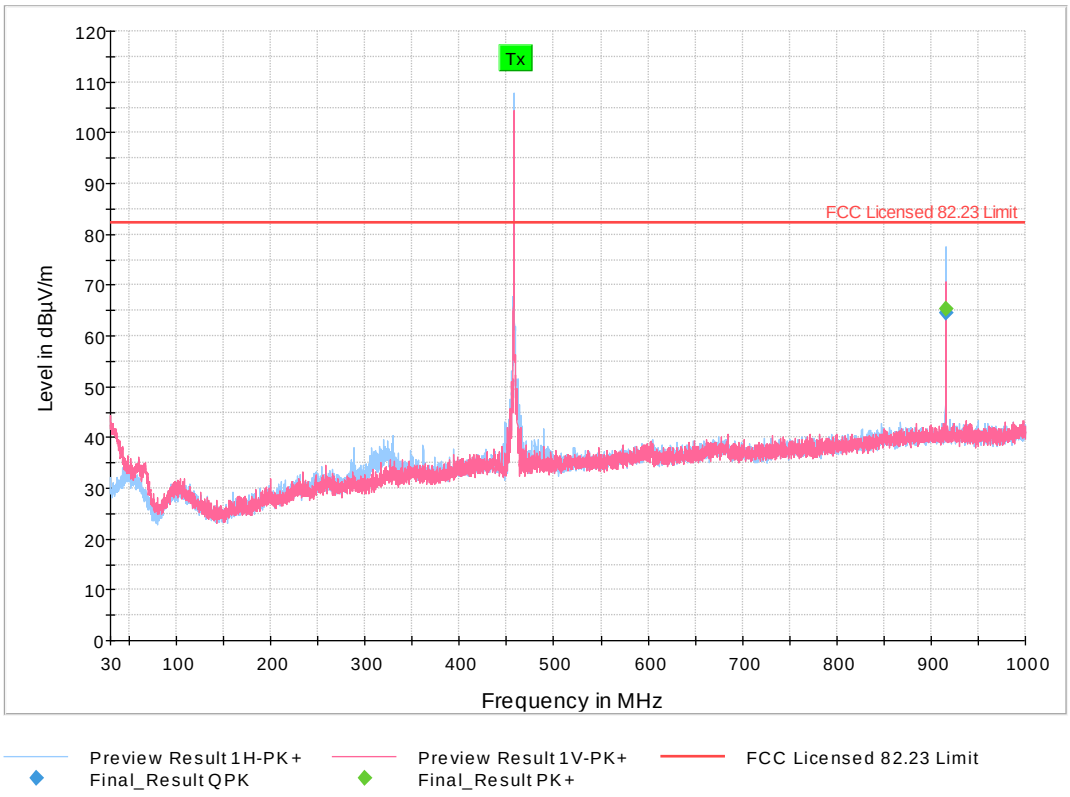

**Plot 8.** 30 MHz-1 GHz, 462.2 MHz at 0.5 kHz

| 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 |



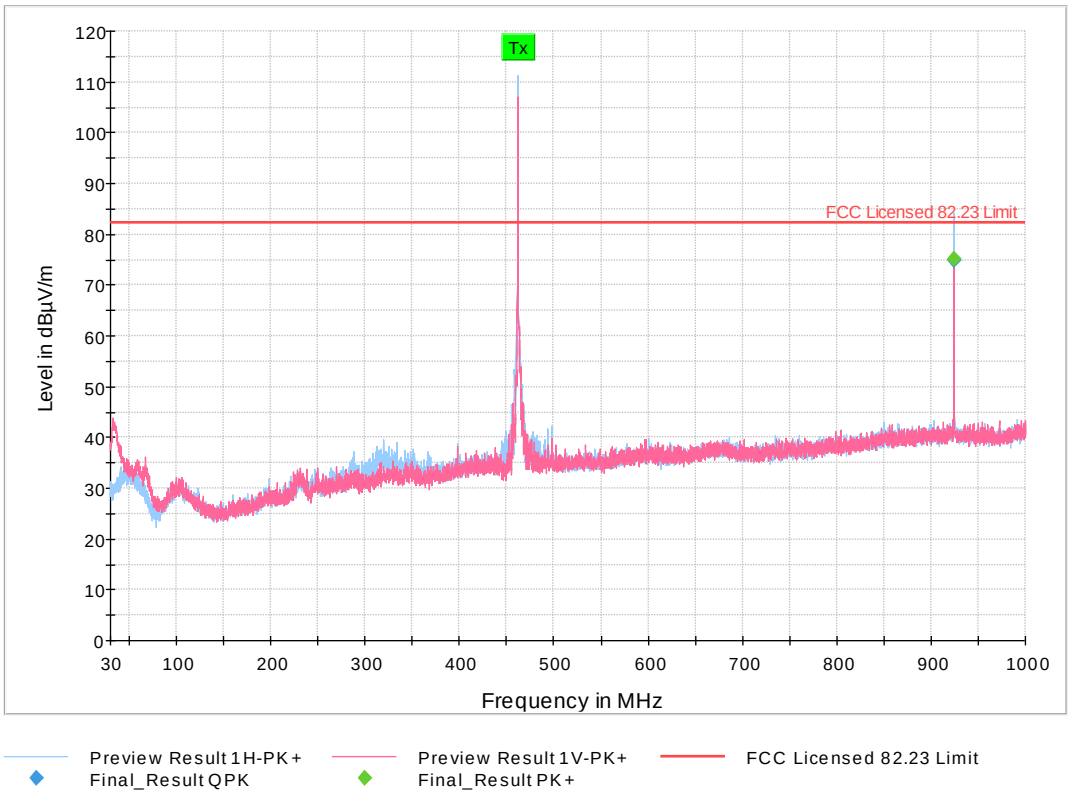

**Plot 9.** 30 MHz-1 GHz, 462.5 MHz at 0.5 kHz

| 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 |



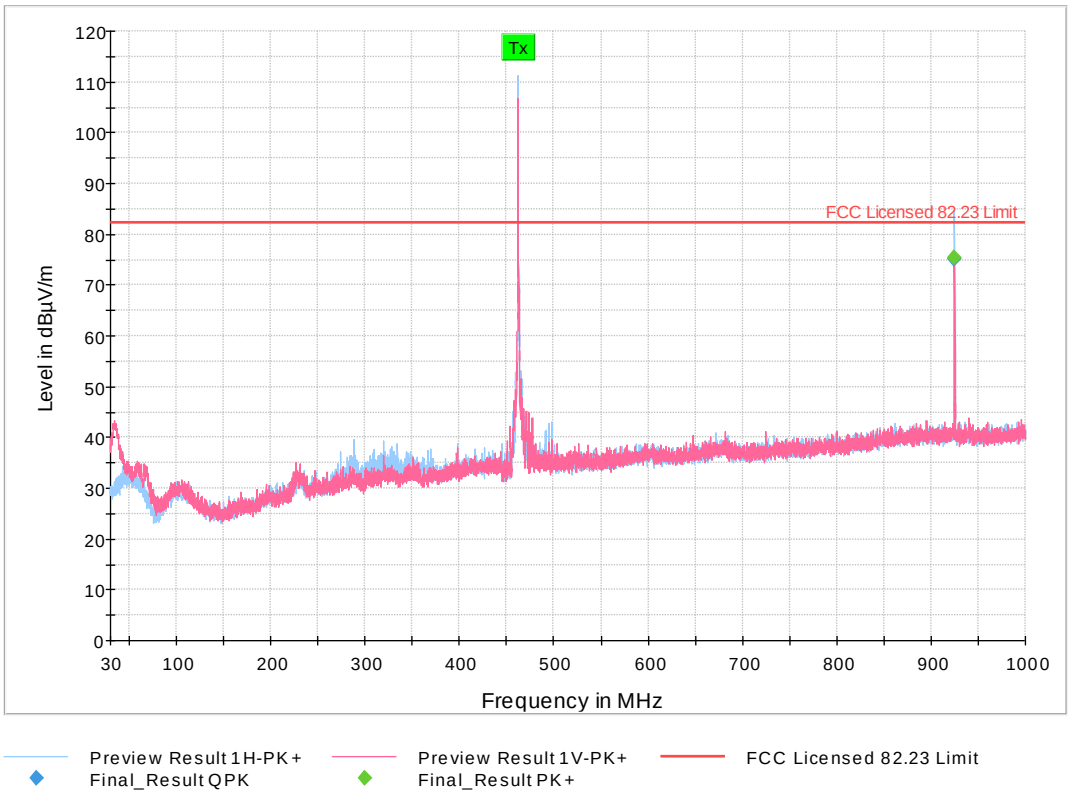

**Plot 10.** 30 MHz-1 GHz, 457.7 MHz at 2 kHz

| 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 |



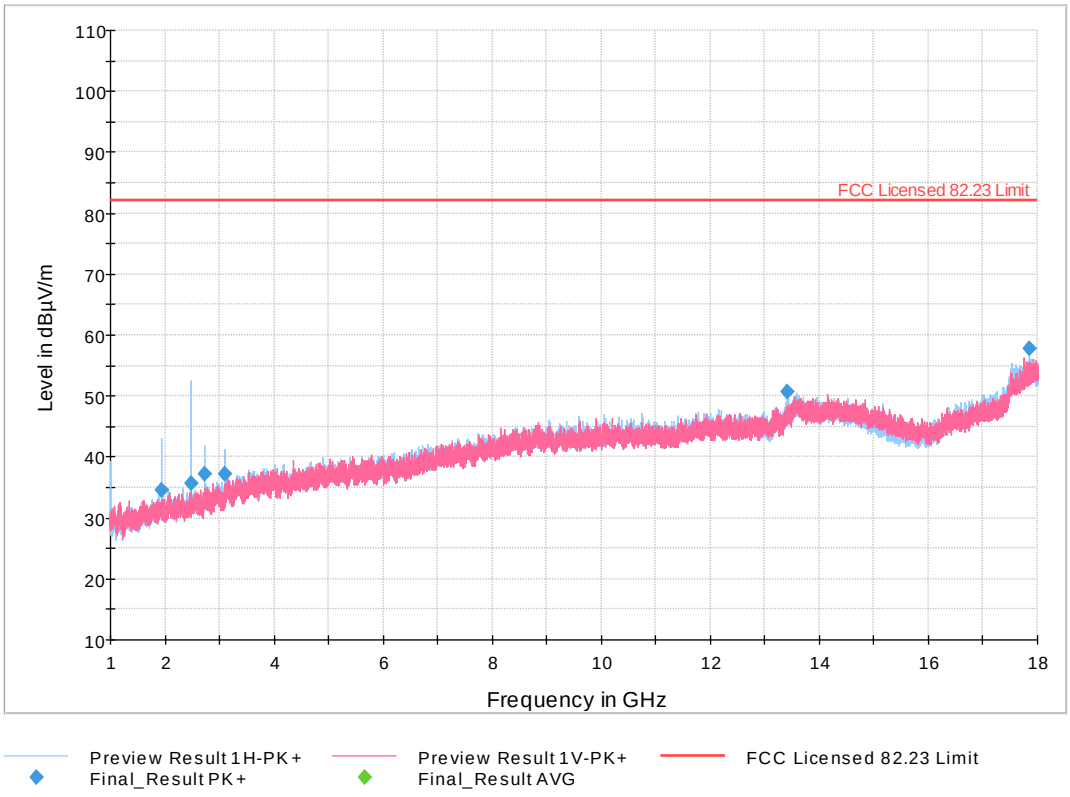

**Plot 11.** 30 MHz-1 GHz, 462.2 MHz at 2 kHz

| 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 |



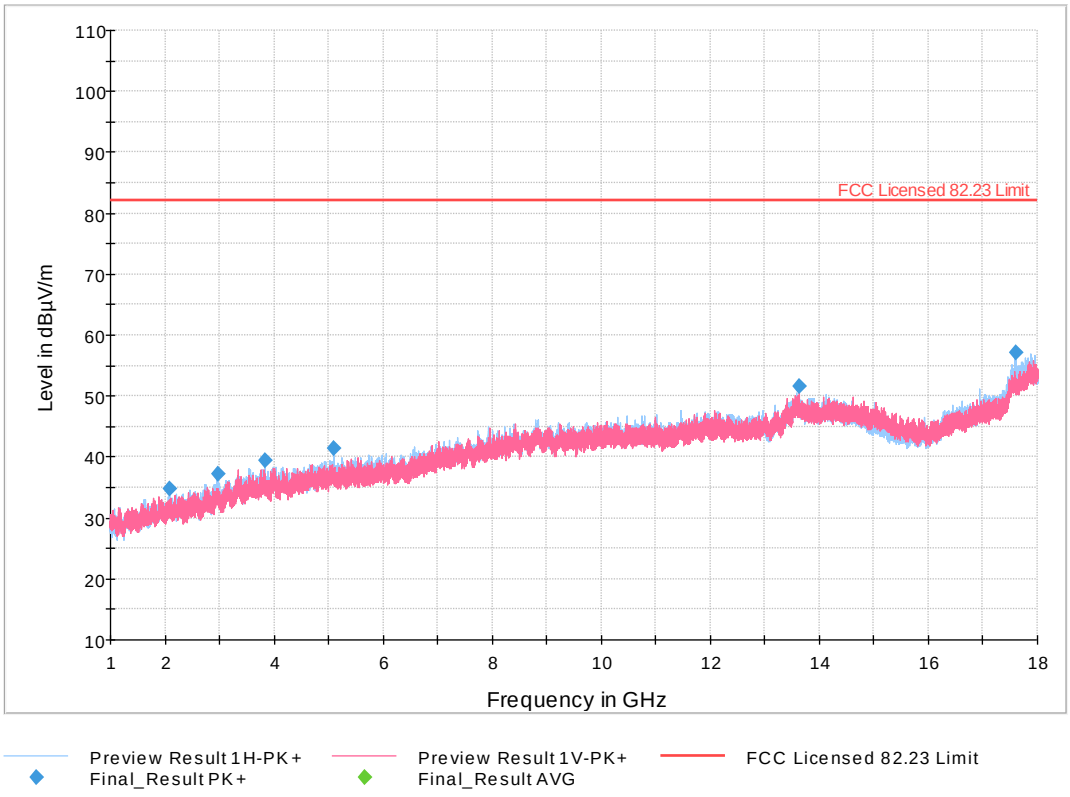

**Plot 12.** 30 MHz-1 GHz, 462.5 MHz at 2 kHz

| 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 |



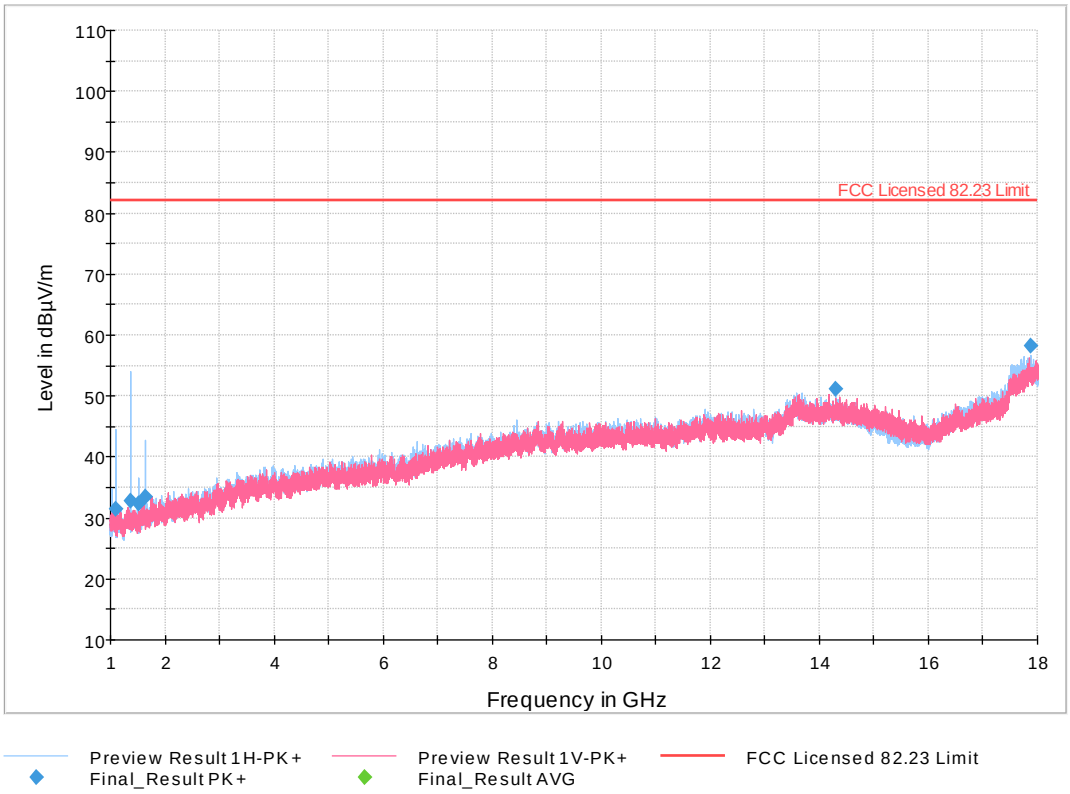

**Plot 13**. 1-18 GHz, 457.7 MHz at 0.5 kHz

| 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 |



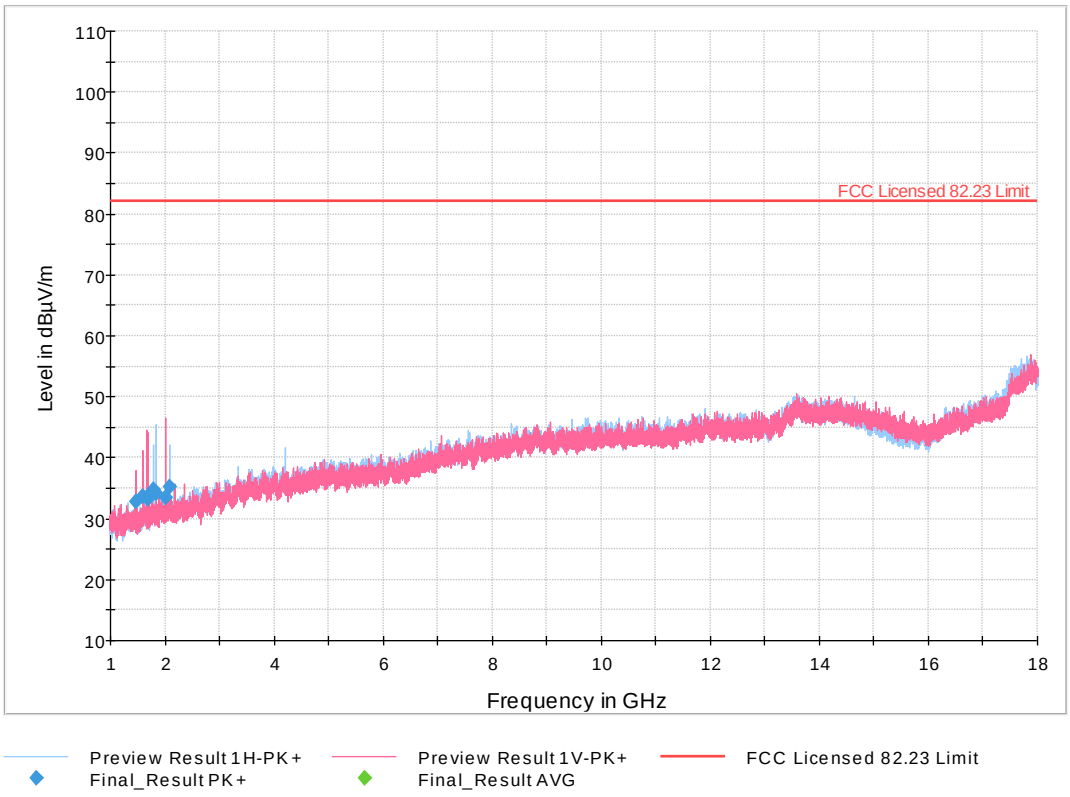

**Plot 14**. 1-18 GHz, 462.2 MHz at 0.5 kHz

| 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 |



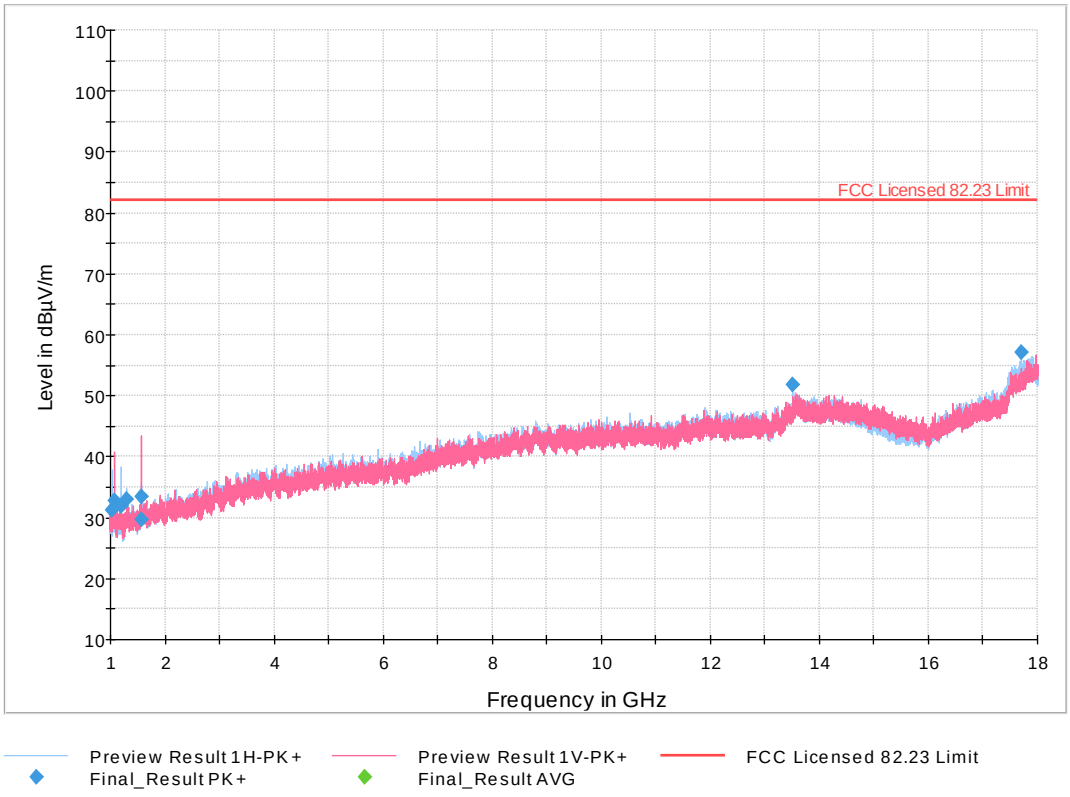

**Plot 15**. 1-18 GHz, 462.5 MHz at 0.5 kHz

| 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 |



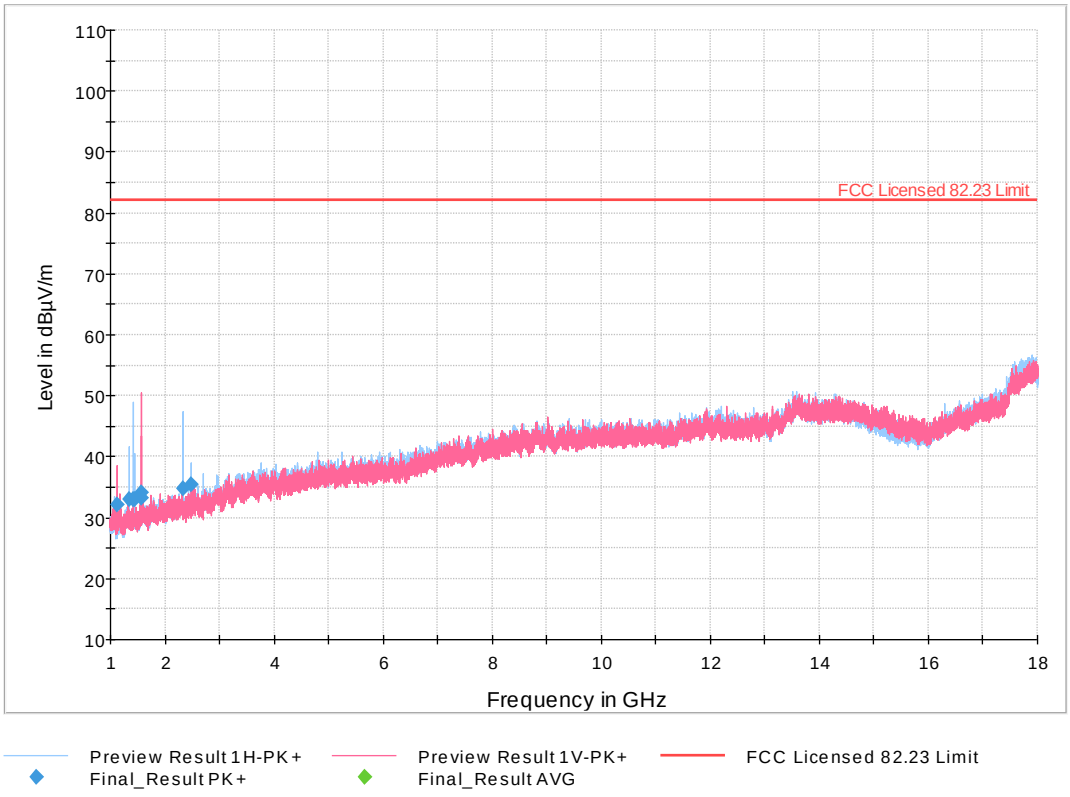

**Plot 16**. 1-18 GHz, 457.7 MHz at 2 kHz

| 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 $10^{th}$ harmonic

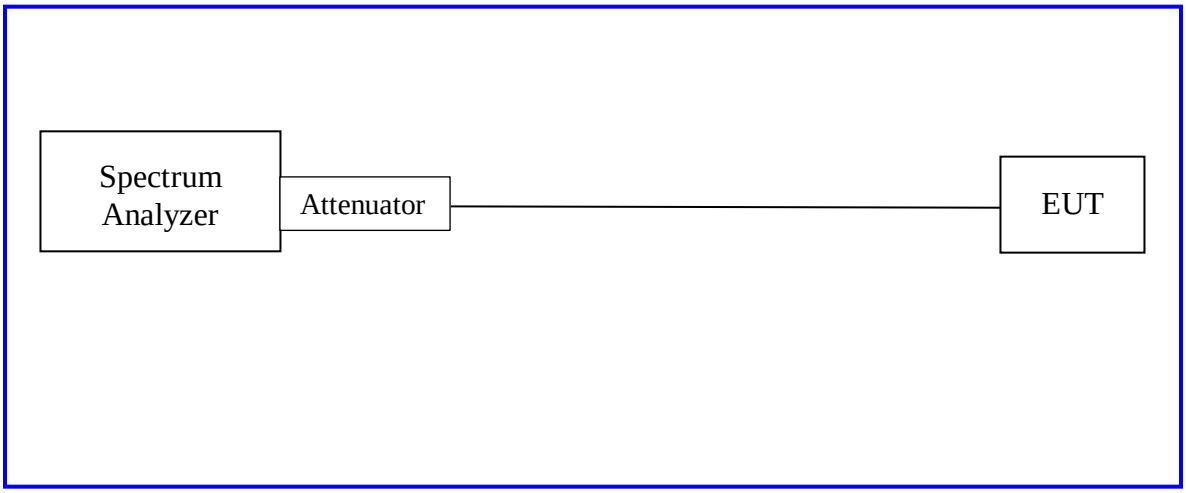
#### *4.5.1.1 Deviations*

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.

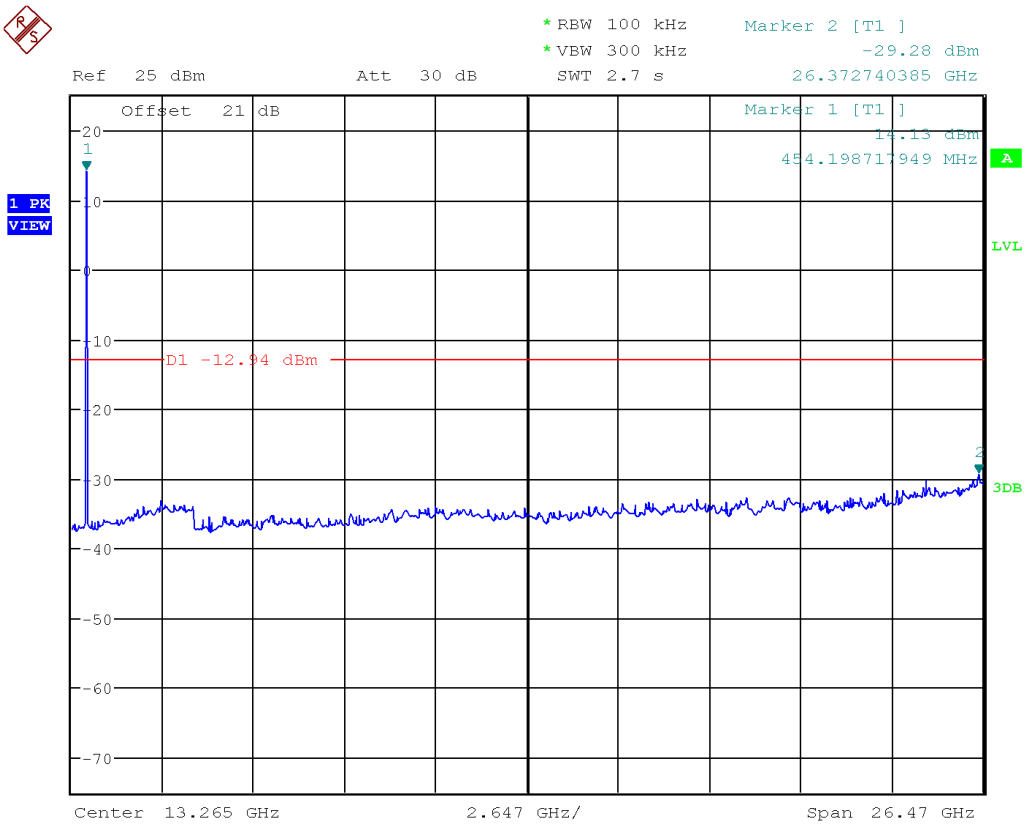
Test Setup:



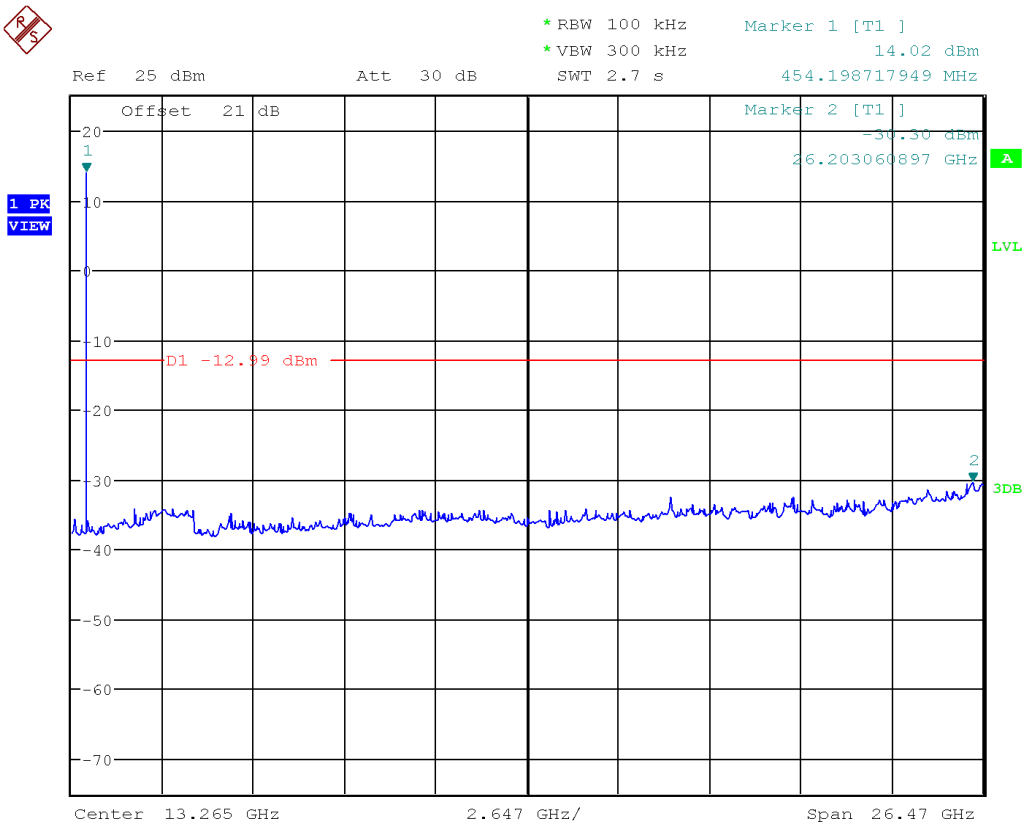

### 4.5.3 Transmitter Spurious Emission Limit

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.

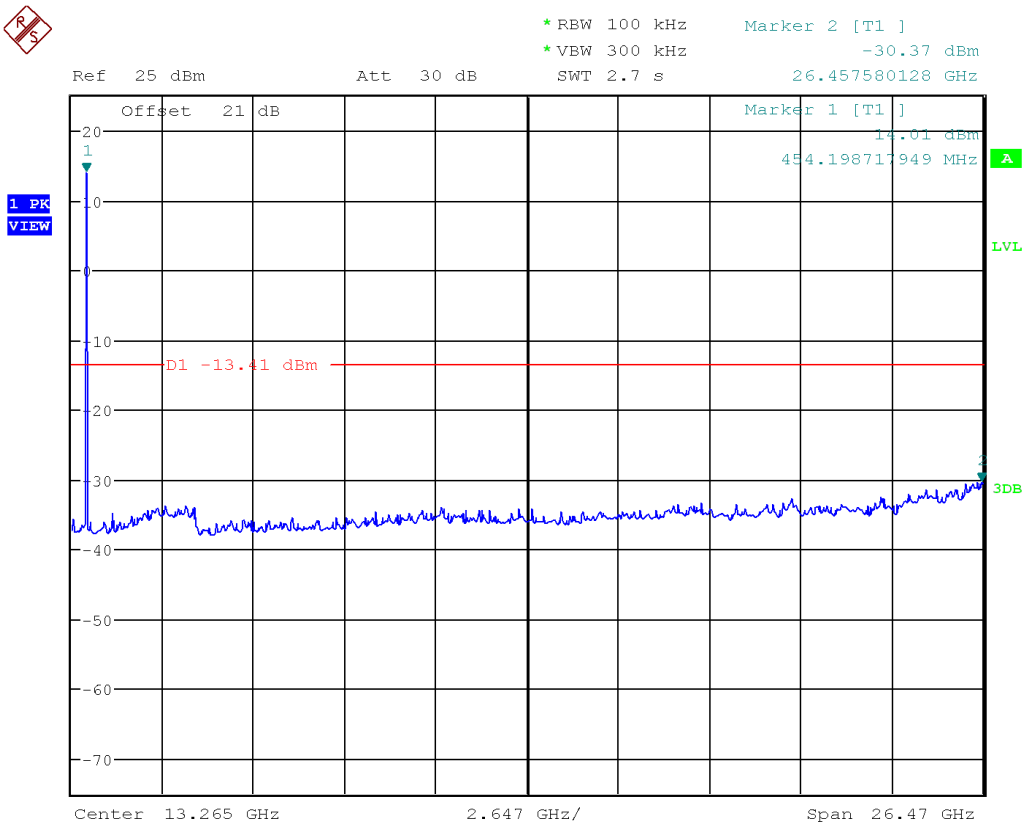
### 4.5.4 Test Results



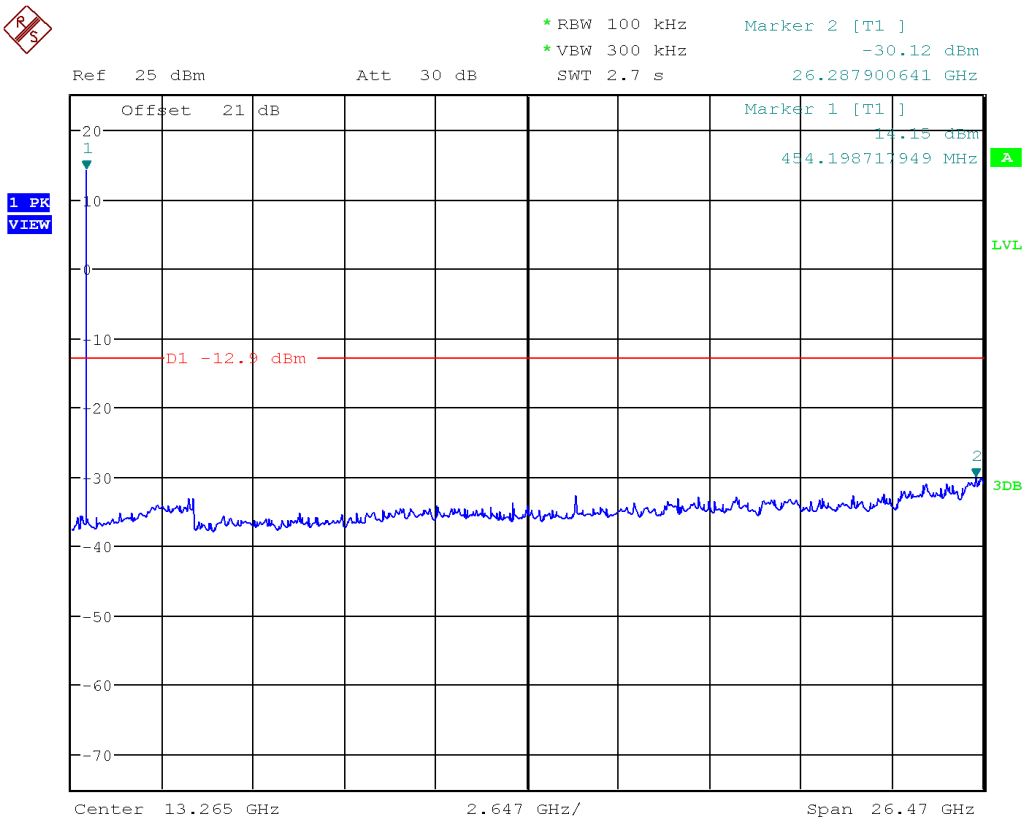

**Plot 11**. 30 MHz – 26.5 GHz, 457.7 MHz, 0.5 kHz



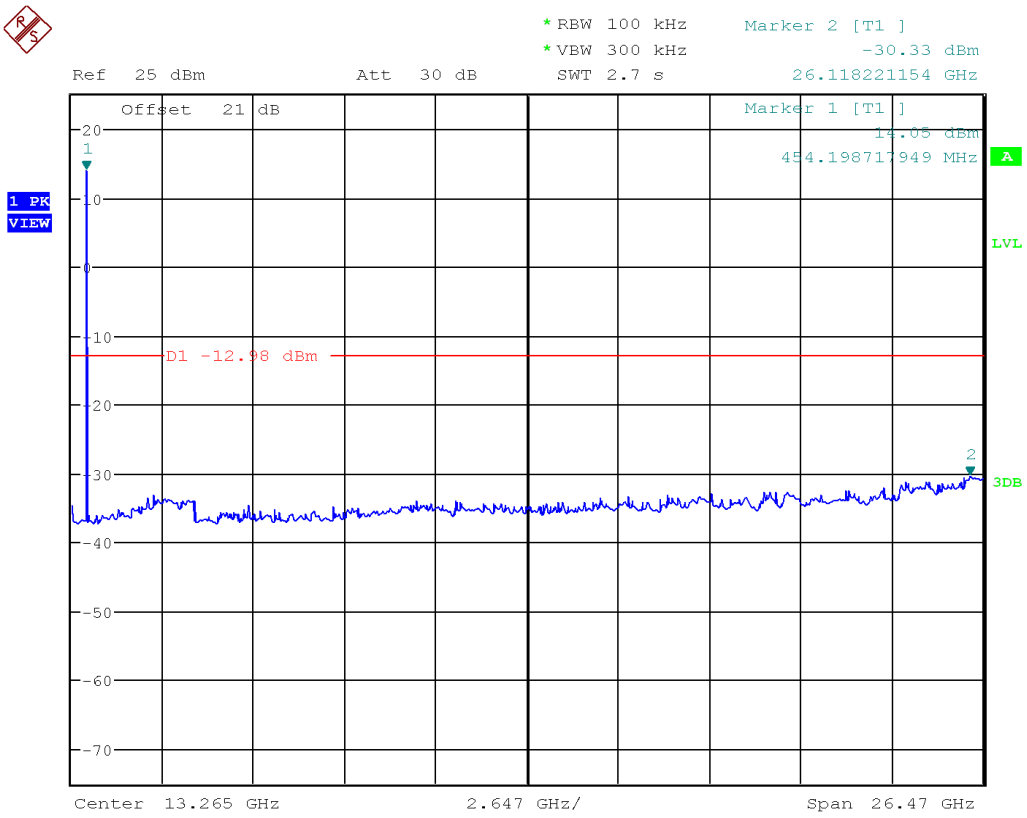

**Plot 11**. 30 MHz – 26.5 GHz, 462.2 MHz, 0.5 kHz



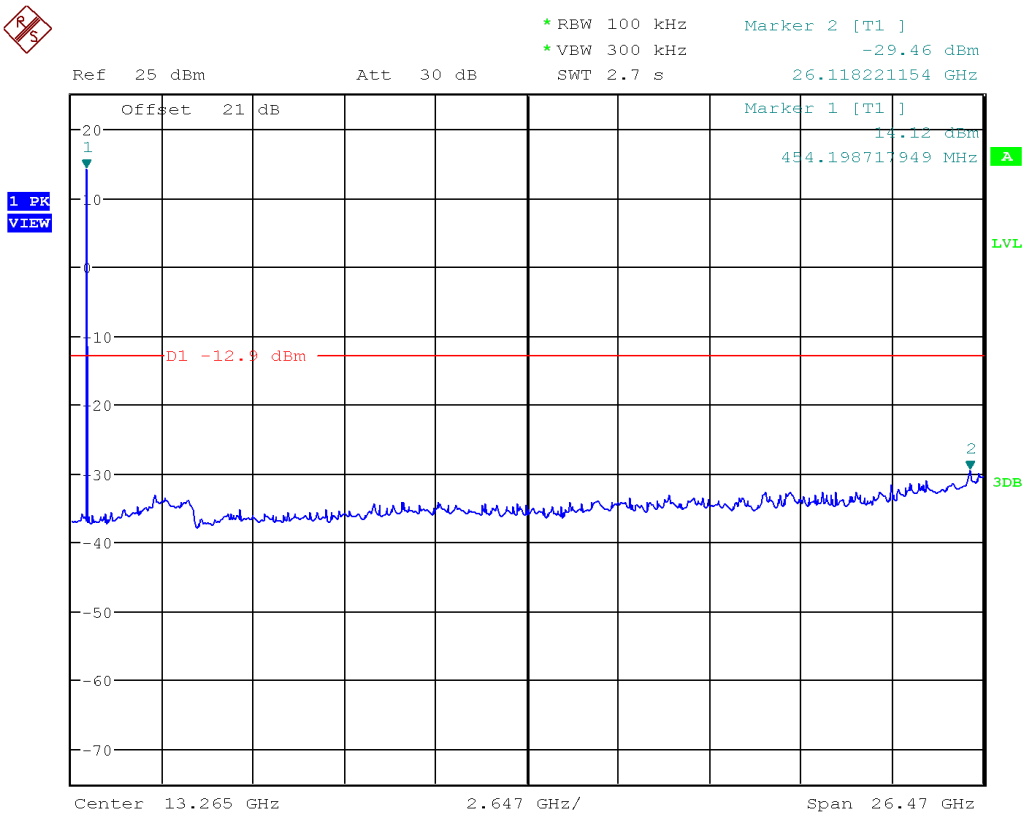

**Plot 11**. 30 MHz – 26.5 GHz, 462.5 MHz, 0.5 kHz




**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.*

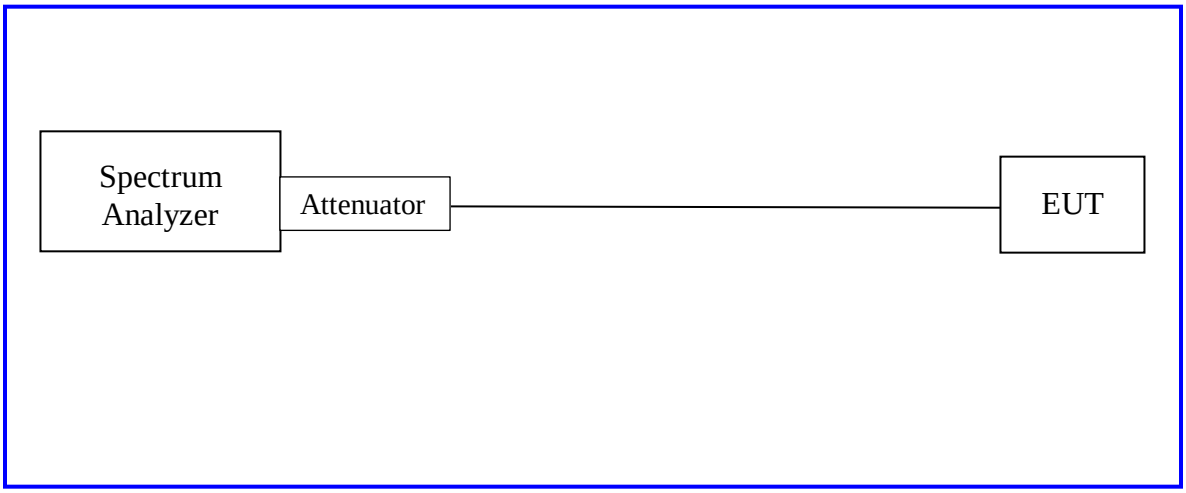
#### *4.6.1.1 Deviations*

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

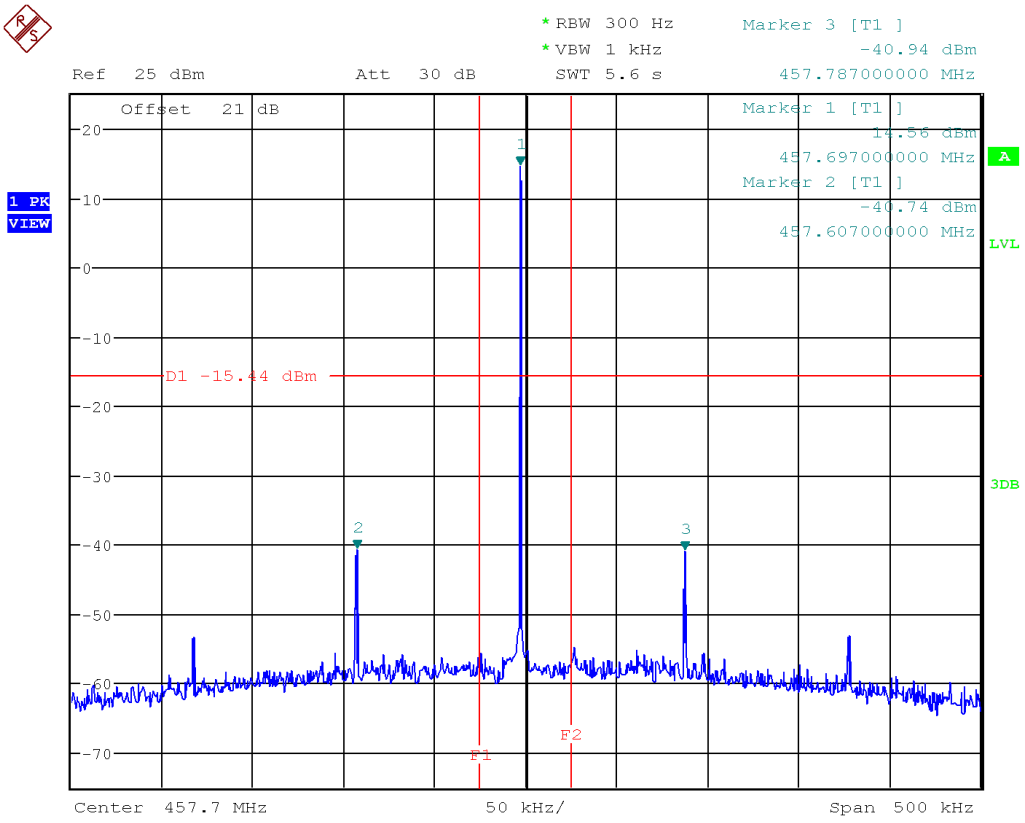
Any emission appearing on a displacement frequency, fd ≥ 25, from the assigned frequency as shown in Table 19 in RSS-119 Sect. 5.10, is attenuated below the unmodulated carrier power by at least 30 dB, when measured with a resolution bandwidth of 300 Hz.

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

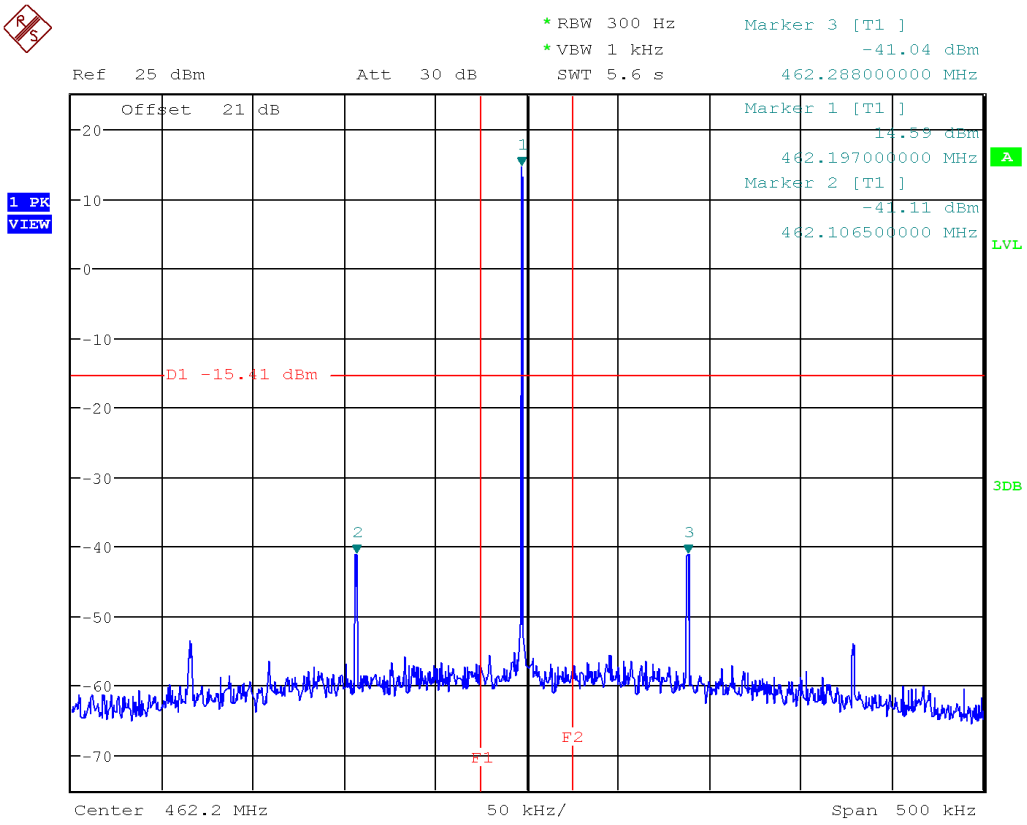
### 4.6.4 Test Results

**Table 5:** Displacement Frequency – Test Results

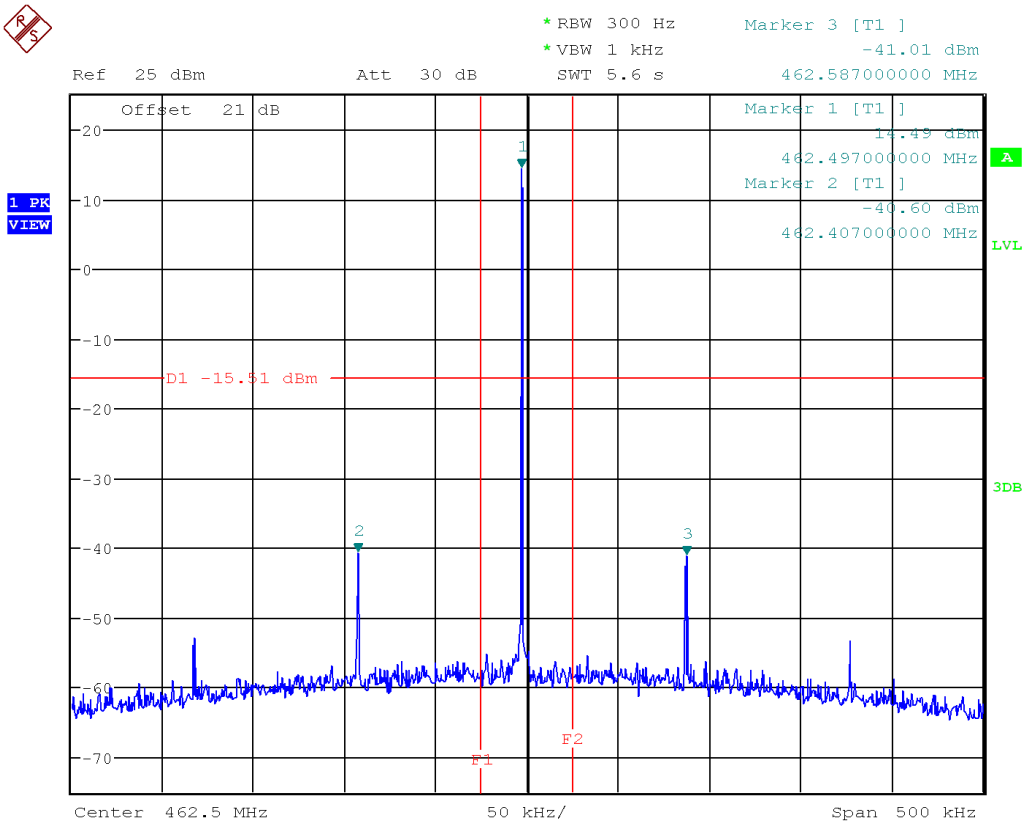
| **Test Conditions:** Conducted Measurement, Normal Temperature | | | | |
|---|---|---|---|---|
| **Freq. (MHz)** | **Unmodulated Carrier** | | | |
| | **Measured (dBm)** | **Limit (dBm)** | **Margin (dB)** | **Results** |
| 457.7 | -40.74 | -15.44 | 25.30 | Pass |
| 462.2 | -41.04 | -15.41 | 25.63 | 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 το +60°C |
| Multiple Feeds: | ☐ Yes and how many 1<br>☒ 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<br>☐ Other describe: GFSK |
| Type of Equipment | ☐ Table Top ☐ Wall-mount ☐ Floor standing cabinet<br>☒ Other: Fixed/ Base equipment |
| *All EUT specifications are provided by the manufacturer or the TUV direct customer.<br>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