

File Number **21/36403394\_M1**



## TEST REPORT

### FCC/ISED Test Report

#### Petitioner's Reference: Sensata/Schrader Electronics

Customer Address: Schrader Electronics 11 Technology Park, Belfast Road  
Antrim (Northern Ireland)  
BT41 1QS  
United Kingdom

#### Equipment: TPMS Tire-Pressure Monitoring System

Brand:	Schrader Electronics	Model:	AFFPK4
	DUT 1: 52FD7705		DUT 1: 11475/1
S/N:	DUT 2: 52FD76F1	Applus Id:	DUT 2: 11475/2
	DUT 3: 52FD7684		DUT 3: 11475/3
	DUT 4: 52FD7669		DUT 4: 11475/4
FCC Id:	MRXAFFPK4	IC:	2546A -AFFPK4

#### Result: compliant

It has been tested and complies the standard specifications Applicable / s.  
See specifications applied on page 9.

#### Applicable Standards

##### FCC 47 CFR Part 15 Subpart C (October 2020)<sup>1</sup>

<sup>1</sup>The latest modifications of the standard, published at the date of the tests reported in this document, have been considered

Applicable Standard/s: **RSS-210 Issue 10**  
**RSS-Gen Issue 5 Amendment 2**  
**ANSI C63.10:2013**

**Date of issue:** Bellaterra, 10 December 2021

**M1:** This report replaces and annuls the report with certificate number 21/36403394 dated 06-10-2021.

**Modifications performed:** FCC Id and IC fields have been added since they were skipped in the previous report. Software version updated. OCBW uncertainty added. Pages 1, 4, 7 and 9 are affected. It is responsibility of the petitioner to replace the previous version with this one.

Fernando Rivas Fernández  
Technical Manager  
Electrical and Electronics  
LGAI Technological Center S.A.

The results refer only and exclusively to the sample, product or material delivered for testing in "Received Material" section below. The equipment has been tested under conditions stipulated by standard(s) quoted in this document.  
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This is the first page of the document, which consists of 27 pages. Device ID photographs are included in Annex 1. Test Setup photographs are included in Annex 2.

## **INDEX**

<b>1. EQUIPMENT RECEIVED AND TESTED .....</b>	<b>4</b>
1.1. TEST CONFIGURATION .....	5
1.2. AUXILIARY AND CONTROL EQUIPMENT .....	5
1.3. INPUT/OUTPUT WIRES.....	5
<b>2. APPLICABLE STANDARDS .....</b>	<b>6</b>
2.1. TEST APPLICABLE STANDARDS .....	6
2.1.1. Acceptance criteria for the test .....	6
2.2 TEST FACILITIES ID .....	6
2.3 MEASURING UNCERTAINTIES .....	7
2.4 FIELD STRENGTH CALCULATION.....	7
2.5 MODIFICATIONS.....	7
2.6 USED EQUIPMENT.....	8
2.7 ENVIRONMENTAL CONDITIONS .....	8
<b>3. RESULT .....</b>	<b>9</b>
<b>4. ANNEXES .....</b>	<b>10</b>
4.1. TEST RESULTS.....	10
4.1.1. Antenna requirements.....	10
4.1.2. Radiated emissions .....	11
4.1.3. Occupied bandwidth .....	21
4.1.4. Transmission time .....	23
4.1.5. Duty cycle.....	25

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## 1. EQUIPMENT RECEIVED AND TESTED

EQUIPMENT: TPMS Tire-Pressure Monitoring System			
<b>Brand:</b>	SCHRADER ELECTRONICS	<b>Model:</b>	AFFPK4
<b>S/N:</b>	DUT 1: 52FD7705	<b>Power Supply Range:</b>	3 V battery
	DUT 2: 52FD76F1		
	DUT 3: 52FD7684		
	DUT 4: 52FD7669		
<b>SW Version:</b>	V 1.0	<b>HW Version:</b>	N.A.
<b>FCC Id:</b>	MRXAFFPK4	<b>IC:</b>	2546A -AFFPK4
<b>Maximum internal frequency:</b>	433.92 MHz		

### Product description:

*(Information declared by the manufacturer, Applus + is not responsible)*

The product is a Tyre Pressure Monitoring System (TPMS) Transmitter installed to the valve stem in each tyre of a vehicle. The device measures tyre pressure periodically and transmits this information by 433.92 MHz RF communication to a receiver inside the vehicle. In addition, the TPMS Transmitter performs the following functions:

- Determines a temperature compensated pressure value.
- Determines any abnormal pressure variations in the wheel.
- Monitors the state of the Transmitters' internal battery and informs the receiver of a low battery condition.

### DESCRIPTION OF AVAILABLE ANTENNAS

- **INTEGRATED ANTENNAS:**  
Internal PCB antenna

### WORST-CASE CONFIGURATION AND MODE

A pre-exploratory is performed for each sample in order to determinate the sample with the worst emissions. Moreover, the radiation measurements are performed in X, Y, Z axis positioning in order to determine the worst case.

Moreover, the operation mode is set with the radio module ON. The radio module has two modes of operations:

- CW mode: the DUT is continuously transmitting.
- Normal mode: the DUT is transmitting bursts periodically.

<b>Test product reception:</b>	06/09/2021
<b>Test initial date:</b>	29/09/2021
<b>Test final date:</b>	30/09/2021

### 1.1. Test configuration

<b>Power Supply:</b>	3 V DC battery
<b>Set-up:</b>	Table-top The DUT is operated in continuous transmitting mode in order to measure its largest emissions level.
<b>Test exercise:</b>	For the transmission time test and the duty cycle test, the DUT is set to normal mode for periodic operation.
<b>Equipment size:</b>	H80 x W10 x D30 mm (height x width x depth)

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### 1.2. Auxiliary and control equipment

AFFPK4 LF tool to switch the transmitter mode, provided by the manufacturer.

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### 1.3. Input/output wires

The equipment under test does not any have input-output wires.

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### 1.4. Modification performed

No modifications were performed.

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## 2. APPLICABLE STANDARDS

### 2.1. TEST APPLICABLE STANDARDS

<b>Test Summary:</b>
<b>Basic standard:</b> ANSI C63.10:2013
<input checked="" type="checkbox"/> Radiated emissions: <ul style="list-style-type: none"><li><input checked="" type="checkbox"/> Intentional radiated emissions (Radiated) (9kHz - 6 GHz): 15.231 (e), 15.205 RSS-GEN 7.1, 8.9, 8.10 / RSS-210, A1.4</li><li><input checked="" type="checkbox"/> Unwanted emissions into Restricted Frequency Bands (Radiated) (9kHz -6 GHz): 15.231 (e), 15.209 (a) / 15.205 (a) RSS-GEN 7.1, 8.9, 8.10 / RSS-210</li></ul>
<b>Note 1:</b> Conducted Emission referred in FCC rule part 15.207 Not Applicable, since the EUT has an internal battery.
<b>Note 2:</b> The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
<b>Basic standard:</b> ANSI C63.10:2013
<input checked="" type="checkbox"/> Occupied Bandwidth (20dB and 99%): FCC 15.231 (c) and RSS-210, A1.3 / RSS-GEN 6.7
<input checked="" type="checkbox"/> Transmission Time: FCC 15.231 (e) and RSS-210, A1.4
<input checked="" type="checkbox"/> Duty Cycle: FCC 15.231 (e) and RSS-GEN 6.10.
<b>Note 1:</b> The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
<b>Basic standard:</b> ANSI C63.10:2013
<input checked="" type="checkbox"/> Antenna Requirements: FCC 15.203 and RSS-GEN 6.8.
<b>Note:</b> The DUT uses an integrated antenna.

#### 2.1.1. Acceptance criteria for the test

According to standard	<b>FCC 47 CFR Part 15 Subpart C (October 2020)<sup>1</sup></b> <b>RSS-210 Issue 10</b> <b>RSS-Gen Issue 5 Amendment 2</b> <b>ANSI C63.10:2013</b>
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### 2.2 Test facilities ID

FCC Test Firm Registration Number:	507478
ISED Assigned Code:	5766A

### 2.3 Measuring uncertainties

Radiated emission tests (9 kHz to 1 GHz)	±4.3 dB
Radiated emission tests above 1 GHz to 40 GHz	±4.3 dB
Duty-cycle	±1%
OCBW	±2.31 kHz

Expanded uncertainty measurement is obtained multiplying the typical uncertainty measurement with a coverage factor  $k=2$ , which corresponds to a confidence level of 95% for a normal distribution.

### 2.4 Field Strength Calculation

The field strength (level) is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading.

The basic equation is as follow:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength (Level)

- RA = Receiver Amplitude (Meter Reading)
- AF = Antenna Factor
- CF = Cable Factor
- AG = Amplifier Gain

Margin value = Emission level – Limit value

Example:

RA: 14.0dB $\mu$ V / AF: 16.5 dBm-1 / CF: 3.5dB / AG: 15dB

- Total factor: 5dBm-1
- Field level: 19.0dB $\mu$ V/m (-21.0dB for margin if limit is 40dB $\mu$ V/m)

### 2.5 Modifications

No modifications were performed

## 2.6 USED EQUIPMENT

RF RADIATED EMISSION					
INSTRUMENT	BRAND	MODEL	NUMBER	LAST CALIBRATION	NEXT CALIBRATION
EMI RECEIVER	R&S	ESW 26	1041791	09/07/2020	09/01/2022
LOOP ANTENNA	EMCO	6502	05-ER-019	05/07/2021	05/07/2022
BILOG ANTENNA	SCHAWARZBECK	VULB 9162	142229	14/12/2020	14/12/2021
HORN ANTENNA	EMCO	3115	05-ER-182	25/11/2020	25/11/2021
ATENUADOR 3 DB	HUBER/SUHNER	6803.17.B	1042020	10/08/2021	10/08/2022
CABLE	HUBER/SUHNER	SF103/11N/16N/4000MM	1041909	28/01/2021	28/01/2022
CABLE	HUBER/SUHNER	SF104 WITH FERRITE	1042526	29/06/2021	29/06/2022
RF CABLE (WALL PANEL),	--	--	104572	23/08/2021	23/08/2022
SEMIANECHOIC CHAMBER SAC2	EUROSHIELD	TC2	104563	17/09/2021	17/09/2022
TEST SOFTWARE	ROHDE & SCHWARZ	EMC32 v.10.50.00	104624	--	--
MAST-TABLE CONTROLLER	COMTEST	4630 - 100	104369	--	--

AUXILIARY EQUIPMENT					
EQUIPMENT	BRAND	MODEL	NUMBER	LAST CALIBRATION	NEXT CALIBRATION
THERMOHIGROMETER	TESTO	608-H1	1042506	28/01/2021	28/01/2022

## 2.7 Environmental conditions

See results sheets



### 3. RESULT

<b>PRODUCT: TPMS Tire-Pressure Monitoring System</b>			
<b>Brand:</b>	SCHRADER ELECTRONICS	<b>Model:</b>	AFFPK4
<b>S/N:</b>	DUT 1: 52FD7705	<b>Internal Id:</b>	DUT 1: 11475/1
	DUT 2: 52FD76F1		DUT 2: 11475/2
	DUT 3: 52FD7684		DUT 3: 11475/3
	DUT 4: 52FD7669		DUT 4: 11475/4
<b>FCC Id:</b>	MRXAFFPK4	<b>IC:</b>	2546A -AFFPK4
<b>TESTING</b>		<b>RESULTS</b>	<b>NOTES</b>
Antenna Requirements		Pass	Note: 4
Intentional radiated emissions		Pass	Note: 4
Unwanted emissions into Restricted Frequency Bands.		Pass	Note: 4
Occupied Bandwidth (20dB and 99%)		Pass	Note: 4
Transmission Time		Pass	Note: 4
Duty Cycle		Pass	Note: 4
<p>The criteria to give conformity in those cases where it is not implicit in the standard or specification will be, for EMC emissions tests, a non-simple binary decision rule will be followed with a safety zone equal to the value of the uncertainty (<math>w = U</math>).</p> <p>In this case, the upper limit of the value of the probability of false acceptance, according to ILAC G8, is 2.5% and the criteria notes are:</p> <p><b>1:</b> The measured results are above the upper limit, even considering the uncertainty interval.</p> <p><b>2:</b> The measured results are above the specified limits, but within the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the results indicate that non-compliance is more probable than compliance</p> <p><b>3:</b> The measured results are below the specified limits, but within the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the results indicate that compliance is more probable than non-compliance</p> <p><b>4:</b> The measured results are within the limits, including the uncertainty interval.</p>			

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[satisfaccion.cliente@applus.com](mailto:satisfaccion.cliente@applus.com)

## **4. ANNEXES**

### **4.1. Test Results**

#### **4.1.1. Antenna requirements**

**Standard applicable:**

According to the subpart 15.203 of the FCC Rules/Regulations, an intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

**Test result:** Pass

- The antenna of the Tire Pressure Monitoring System Sensor is permanently attached.
- The Tire Pressure Monitoring System Sensor unit complies with the requirement of §15.203

### 4.1.2. Radiated emissions

**Standard applicable:**

According to 15.231 (e), the field strength of emissions from intentional radiators shall not exceed the following limits:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66		
40.66-40.70	1.000	100
70-130	500	50
130-174	500 to 1.500 <sup>1</sup>	50 to 150 <sup>1</sup>
174-260	1.500	150
260-470	1.500 to 5.000 <sup>1</sup>	150 to 500 <sup>1</sup>
Above 470	5.000	500

<sup>1</sup>Linear interpolations.

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in 15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in part 15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements start below or at the lowest crystal frequency.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013.

**For 15.205 requirement:**

In case the emission fall within the restricted band specified on 15.205(a), shown in the following table, then the 15.209(a) limit has to be followed.

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
<sup>1</sup> 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

<sup>1</sup>Until February 1, 1999, this restricted band shall be 0.49 – 0.51 MHz.

Emission limits from an intentional radiator, specified in section 15.209 (a), follow:

Restricted Frequency(MHz)	Field Strength ( $\mu\text{V/m}$ )	Field Strength ( $\text{dB}\mu\text{V/m}$ )	Measurement Distance
0.009~0.490	2400/F(KHz)	20 log ( $\mu\text{V/m}$ )	300
0.490~1.705	2400/F(KHz)	20 log ( $\mu\text{V/m}$ )	30
1.705~30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

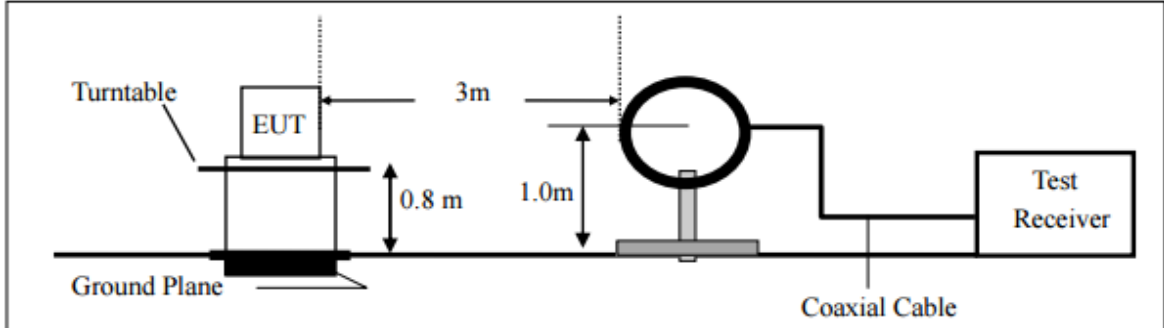
**For RSS-Gen Section 8.10 Requirement:**

Radiated emissions which fall in the restricted bands, as defined in Section 8.10 of RSS-Gen, must also comply with the radiated emission limits specified in Section 8.9.

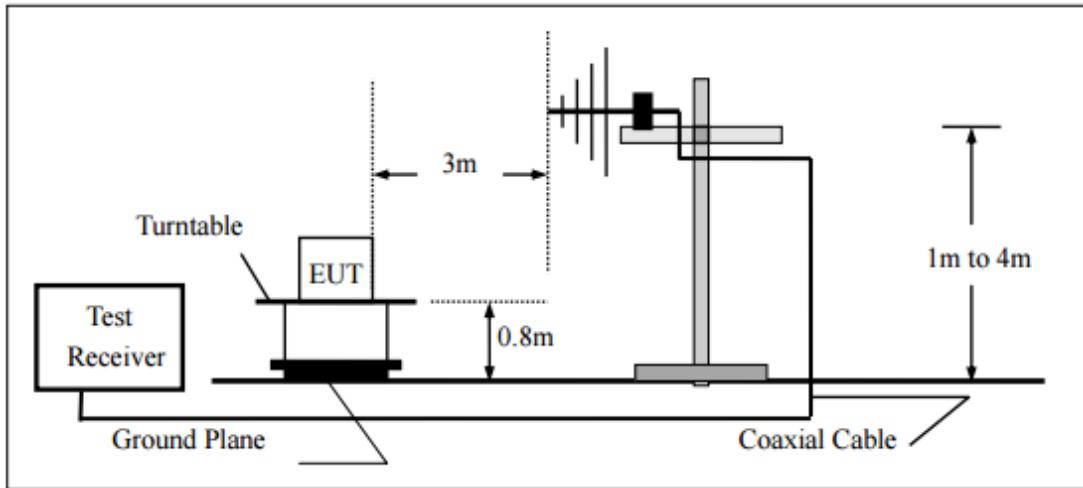
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (Hz)
0.090 - 0.110	16.42 - 16.423	1645.5 - 1646.5	9.0 - 9.2
0.495 - 0.505	16.69475 - 16.69525	1660 - 1710	9.3 - 9.5
2.1735 - 2.1905	16.80425 - 16.80475	1718.8-1722.2	10.6 - 12.7
3.020 - 3.026	25.5 - 25.67	2200 - 2300	13.25 - 13.4
4.125 - 4.128	37.5 - 38.25	2310 - 2390	14.47 - 14.5
4.17725 - 4.17775	73 - 74.6	2483.5 - 2500	15.35 - 16.2
4.17725 - 4.17775	73 - 74.6	2655 - 2900	17.7 - 21.4
5.677 - 5.683	108 - 138	3260 - 3267	22.01 - 23.12
6.215 - 6.218	149.9 - 150.05	3332 - 3339	23.6 - 24.0
6.26775 - 6.26825	156.52475 - 156.52525	3345.5 - 3358	31.2 - 31.8
6.31175 - 6.31225	156.7 - 156.9	3500 - 4400	36.43 - 36.5
8.291 - 8.294	162.0125 - 167.17	4500 - 5150	Above 38.6
8.362 - 8.366	167.72 - 173.2	5350 - 5460	
8.37625 - 8.38675	240 - 285	7250 - 7750	
8.41425 - 8.41475	322 - 335.4	8025 - 8500	
12.29 - 12.293	399.9 - 410		
12.51975 - 12.52025	608 - 614		
12.57675 - 12.57725	960 - 1427		
12.57675 - 12.57725	608 - 614		

**Test Configuration**

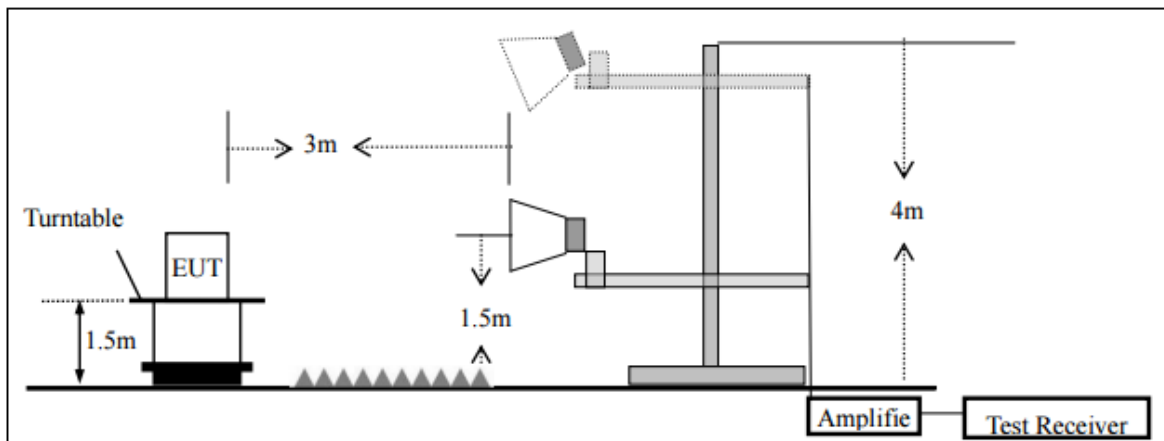
- **For radiated emissions below 30 MHz:**



- **For radiated emissions from 30 MHz to 1000 MHz:**



- **For radiated emissions above 1000 MHz:**



**Test Procedures**

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.231(e) and FCC Part 15.209 Limit.

The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.

The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter. The EUT was set to continuous mode of operation for convenience.

**For the radiated emission test above 1GHz:**

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note: Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

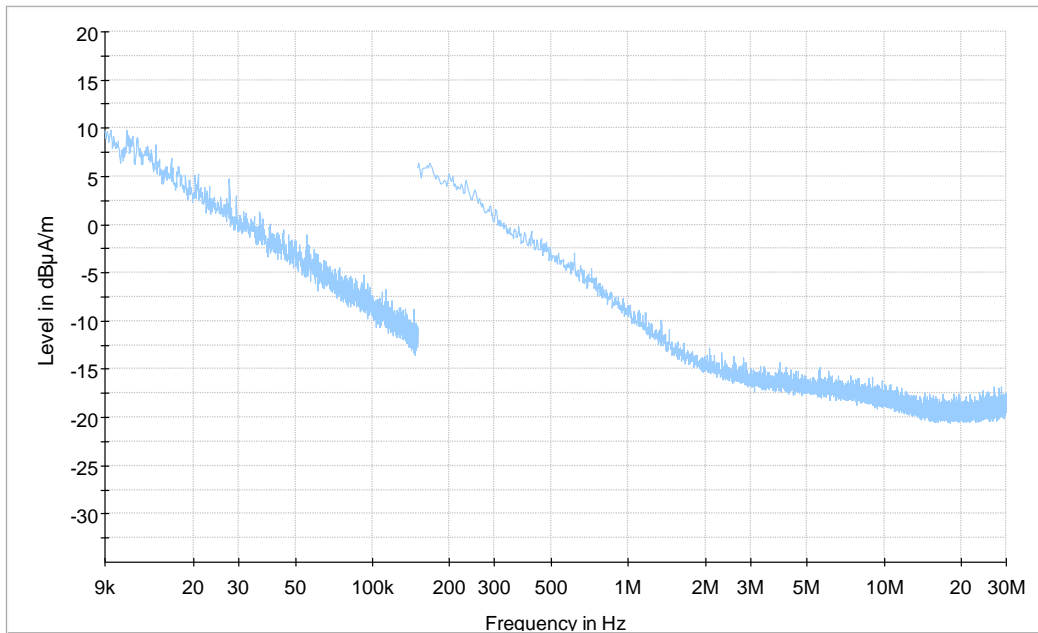
Note: for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where  $RBWCF [dB] = 10 * \lg(100 [kHz] / \text{narrower RBW [kHz]})$ . the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

**Test results:**

RADIATED EMISSIONS (RADIATED)													
<b>Technician:</b> Jose M. Llauradó		<b>Test Area:</b> Semi-anechoic chamber, SAC-2											
<b>Test date:</b> 29/09/2021													
<b>Basic standard: ANSI C63.10:2013</b>													
<table border="1" style="width: 100%;"> <tr> <td><b>Temperature:</b></td> <td>22.1</td> <td>°C</td> </tr> <tr> <td><b>Humidity:</b></td> <td>55.4</td> <td>%</td> </tr> <tr> <td><b>Atm. Pressure:</b></td> <td>997.8</td> <td>hPa</td> </tr> </table>					<b>Temperature:</b>	22.1	°C	<b>Humidity:</b>	55.4	%	<b>Atm. Pressure:</b>	997.8	hPa
<b>Temperature:</b>	22.1	°C											
<b>Humidity:</b>	55.4	%											
<b>Atm. Pressure:</b>	997.8	hPa											
EUT:	Test Area	Distance	Maximization	Evaluation									
Table-top	SAC2	3 m	Worst-case orientation	Individual									
<b>RESULTS:</b> Pass													
Identification	Emissions	Main emission source and type											
DUT: Device under test AUX: Auxiliary Devices SYS: DUT + AUX BB : Broad-band NB : Narrow-band QP: Quasi-peak	P < Limit - I AV < Limit - I  I=Uncertainty	DUT, NB											
<b>Comments:</b>													

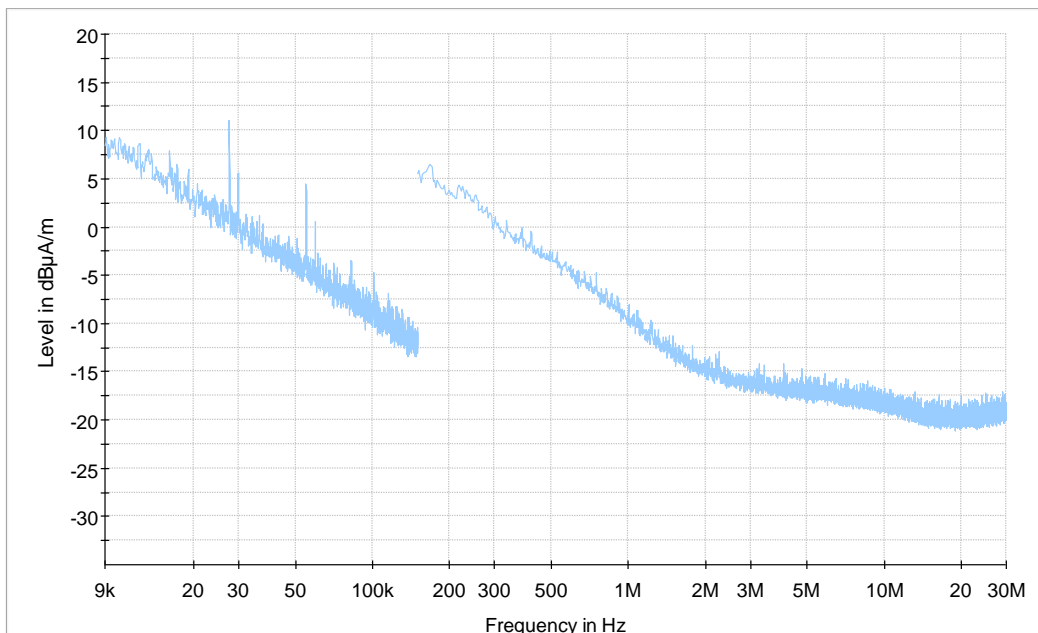
**RADIATED EMISSIONS (RADIATED) II**

**PRESCAN 9 kHz – 30 MHz (HORIZONTAL POLARITY)**



Preview Result 1-PK+

**PRESCAN 9 kHz – 30 MHz (VERTICAL POLARITY)**



Preview Result 1-PK+

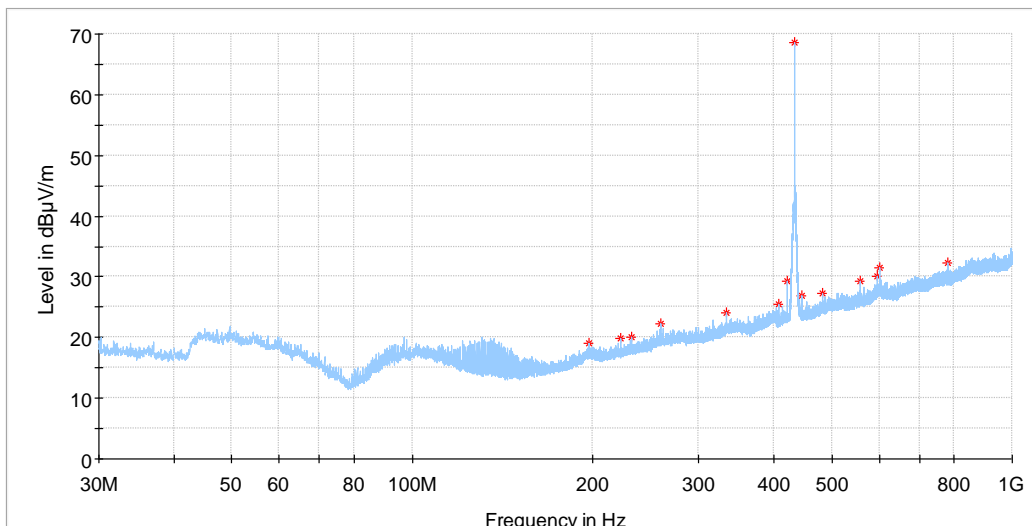
**Comments:**

Note: There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.



**RADIATED EMISSIONS (RADIATED) III**

**PRESCAN 30 MHz - 1 GHz (HORIZONTAL POLARITY)**



\* PK+ Marker      — Preview Result 1-PK+

Comment

**FINAL MEASUREMENTS**

Frequency (MHz)	MaxPeak level (dBµV/m)	Duty Cycle Factor (dB)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Corr. (dB/m)	Type
433.890	68.56	N.A.	92.866	-24.306	145.0	H	21.8	PK
433.890	42.64	25.92	72.866	-30.226	145.0	H	21.8	AV
600.000	31.44	N.A.	72.866	-41.426	145.0	H	25.4	PK
600.000	5.52	25.92	52.866	-47.346	145.0	H	25.4	AV
781.020	32.28	N.A.	72.866	-40.586	145.0	H	27.6	PK
781.020	6.36	25.92	52.866	-46.506	145.0	H	27.6	AV

**Comments:**

N.A.: Not Applied

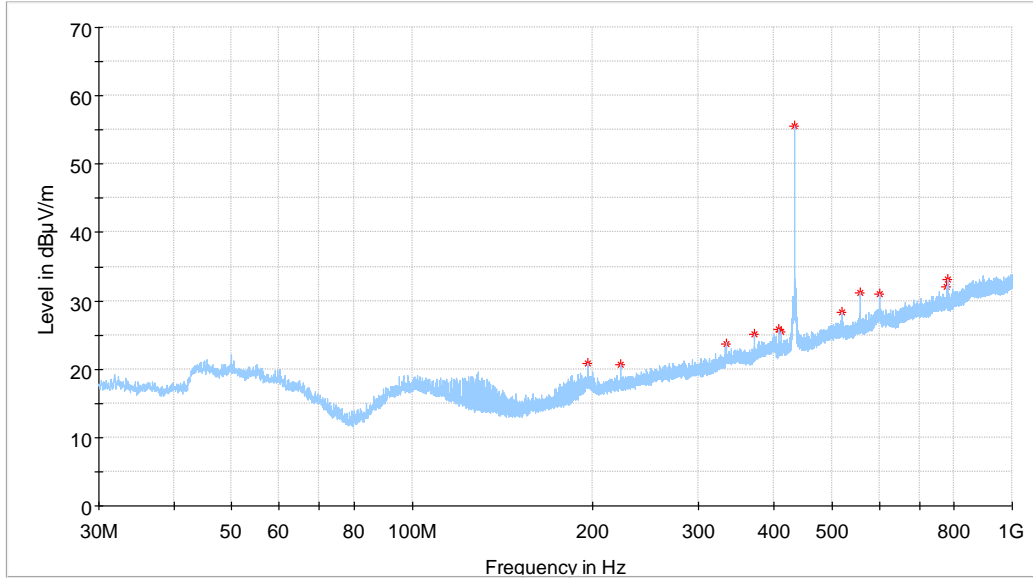
Note 1: All spurious emission limit applied according to the requirement 15.231 (e), corresponding to intentional radiators with the fundamental frequency at 433.92 MHz.

Note 2: The rest of spurious are not analysed in the table above because their peak level is lower and therefore, they fulfil the limit required in the standard 15.231 (e).

Emission Level = Measured Level + Correction Factor

**RADIATED EMISSIONS (RADIATED) IV**

**PRESCAN 30 MHz - 1 GHz (VERTICAL POLARITY)**



\* PK+ Marker      — Preview Result 1-PK+

**FINAL MEASUREMENTS**

Frequency (MHz)	MaxPeak level (dBµV/m)	Duty Cycle Factor (dB)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Corr. (dB/m)	Type
433.890	55.57	N.A.	92.866	-37.296	145.0	V	21.8	PK
433.890	29.65	25.92	72.866	-43.216	145.0	V	21.8	AV
556.830	31.1	N.A.	72.866	-41.766	145.0	V	24.1	PK
556.830	5.18	25.92	52.866	-47.686	145.0	V	24.1	AV
600.000	31.07	N.A.	72.866	-41.796	145.0	V	25.4	PK
600.000	5.15	25.92	52.866	-47.716	145.0	V	25.4	AV
781.110	33.11	N.A.	72.866	-39.756	145.0	V	27.6	PK
781.110	7.19	25.92	52.866	-45.676	145.0	V	27.6	AV

**Comments:**

N.A.: Not Applied

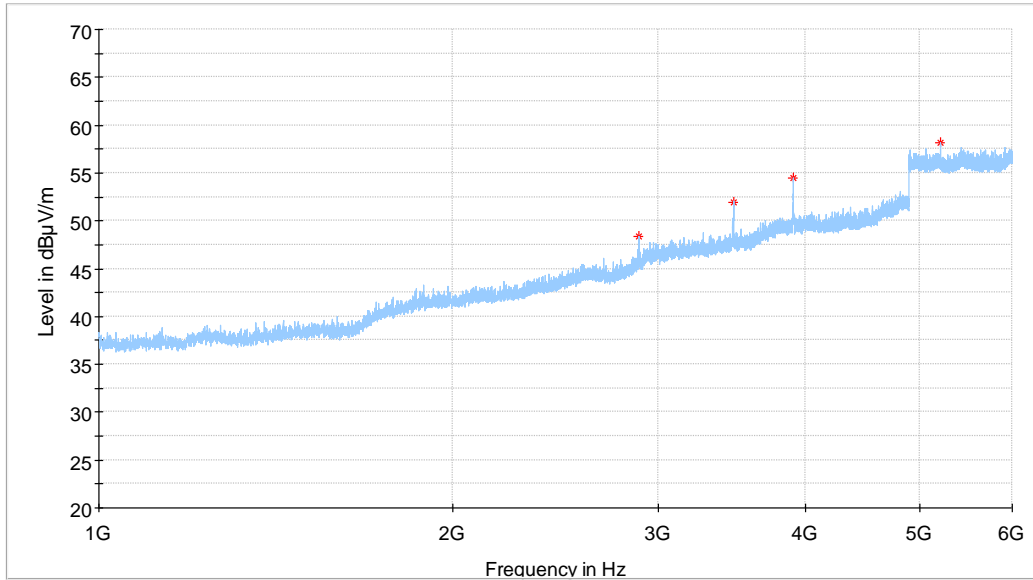
Note 1: All spurious emission limit applied according to the requirement 15.231 (e), corresponding to intentional radiators with the fundamental frequency at 433.92 MHz.

Note 2: The rest of spurious are not analysed in the table above because their peak level is lower and therefore, they fulfil the limit required in the standard 15.231 (e).

Emission Level = Measured Level + Correction Factor

**RADIATED EMISSIONS (RADIATED) V**

**PRESCAN 1 - 6 GHz (HORIZONTAL POLARITY)**



\* PK+ Marker      — Preview Result 1-PK+

**FINAL MEASUREMENTS**

Frequency (MHz)	MaxPeak level (dBµV/m)	Duty Cycle Factor (dB)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Corr. (dB/m)	Type
2885.250	48.38	N.A.	72.866	-24.486	150.0	H	32.2	PK
2885.250	22.46	25.92	52.866	-30.406	150.0	H	32.2	AV
3471.000	51.93	N.A.	72.866	-20.936	150.0	H	34.3	PK
3471.000	26.01	25.92	52.866	-26.856	150.0	H	34.3	AV
3905.250	54.49	N.A.	72.866	-18.376	150.0	H	35.9	PK
3905.250	28.57	25.92	52.866	-24.296	150.0	H	35.9	AV
5211.750	58.22	N.A.	72.866	-14.646	150.0	H	37.5	PK
5211.750	32.3	25.92	52.866	-20.566	150.0	H	37.5	AV

**Comments:**

N.A.: Not Applied

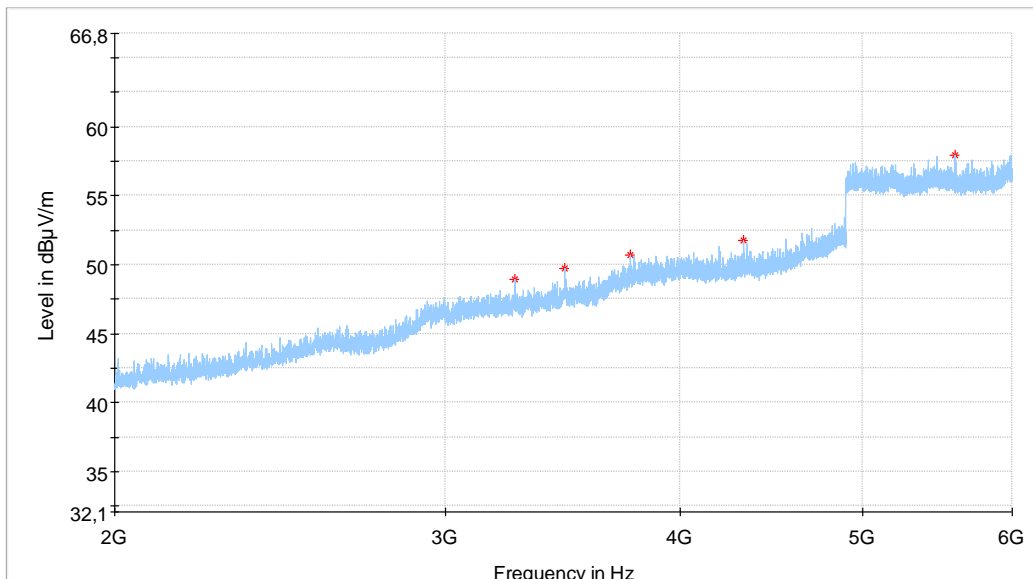
Note 1: All spurious emission limit applied according to the requirement 15.231 (e), corresponding to intentional radiators with the fundamental frequency at 433.92 MHz.

Note 2: The rest of spurious are not analysed in the table above because their peak level is lower and therefore, they fulfil the limit required in the standard 15.231 (e).

Emission Level = Measured Level + Correction Factor

**RADIATED EMISSIONS (RADIATED) VI**

**PRESCAN 1 - 6 GHz (VERTICAL POLARITY)**



\* PK+ Marker      Preview Result 1-PK+

**FINAL MEASUREMENTS**

Frequency (MHz)	MaxPeak level (dBµV/m)	Duty Cycle Factor (dB)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Corr. (dB/m)	Type
3265.750	48.90	N.A.	72.866	-23.966	150.0	V	34.0	PK
3265.750	22.98	25.92	52.866	-29.886	150.0	V	34.0	AV
3471.000	49.76	N.A.	72.866	-23.106	150.0	V	34.3	PK
3471.000	23.84	25.92	52.866	-29.026	150.0	V	34.3	AV
4322.000	51.78	N.A.	72.866	-21.086	150.0	V	35.6	PK
4322.000	25.86	25.92	52.866	-27.006	150.0	V	35.6	AV
5595.500	57.92	N.A.	72.866	-14.946	150.0	V	38.1	PK
5595.500	32.00	25.92	52.866	-20.866	150.0	V	38.1	AV

**Comments:**

N.A.: Not Applied

Note 1: All spurious emission limit applied according to the requirement 15.231 (e), corresponding to intentional radiators with the fundamental frequency at 433.92 MHz.

Note 2: The rest of spurious are not analysed in the table above because their peak level is lower and therefore, they fulfil the limit required in the standard 15.231 (e).

Emission Level = Measured Level + Correction Factor

### 4.1.3.Occupied bandwidth

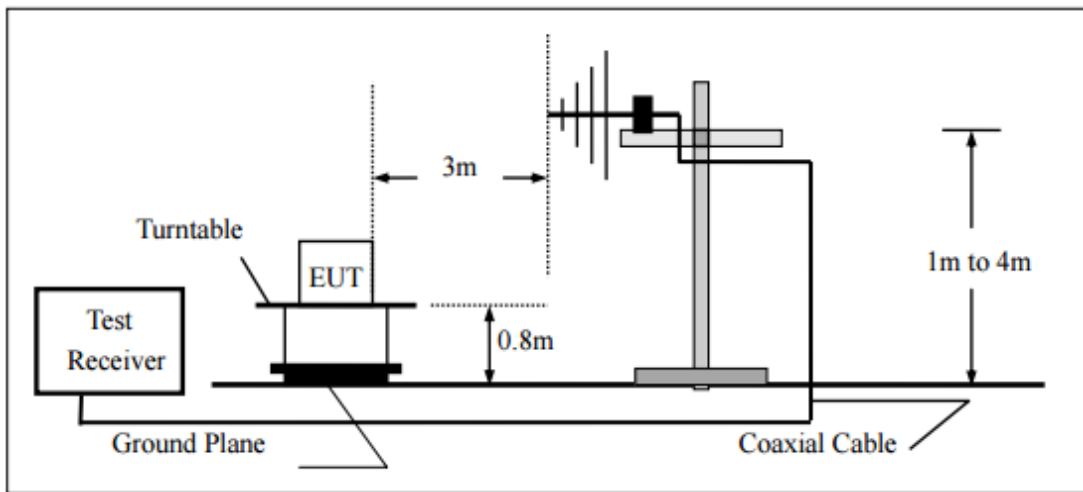
**Standard applicable:**

According to FCC Part 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier

**Test procedure**

With the DUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band. The EUT was set to continuous mode of operation for convenience.

**Test setup**



Note: relative measurements were performed at a different distance.

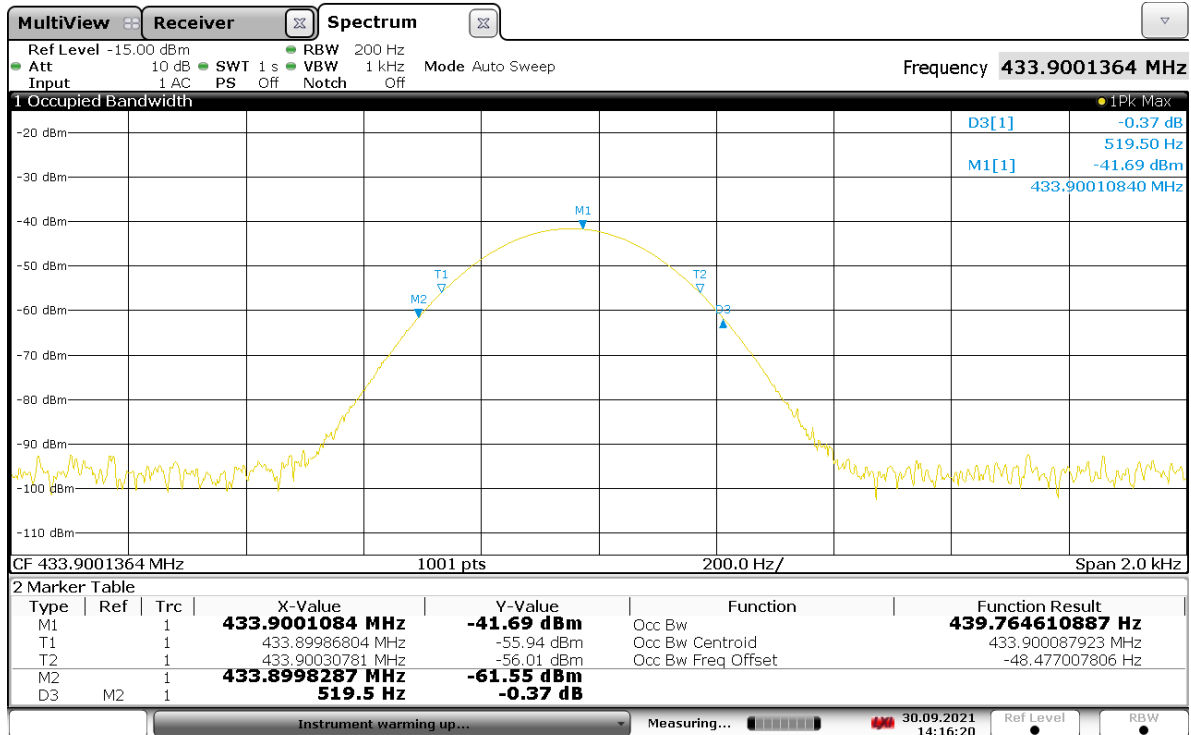
**Test result:**

**OCCUPIED BANDWIDTH**

Test Frequency (MHz)	20 dB BW (kHz)	99% BW (kHz)	Limit (kHz)	Result
433.90	0.520	0.440	≤ 1084.75	Pass

Limit = Fundamental Frequency \* 0.25% = 433.90 MHz \* 0.25% = 1084.75 kHz

**433.92 MHz 99% and 20 dB - Bandwidth**



**Comments:**

#### 4.1.4. Transmission time

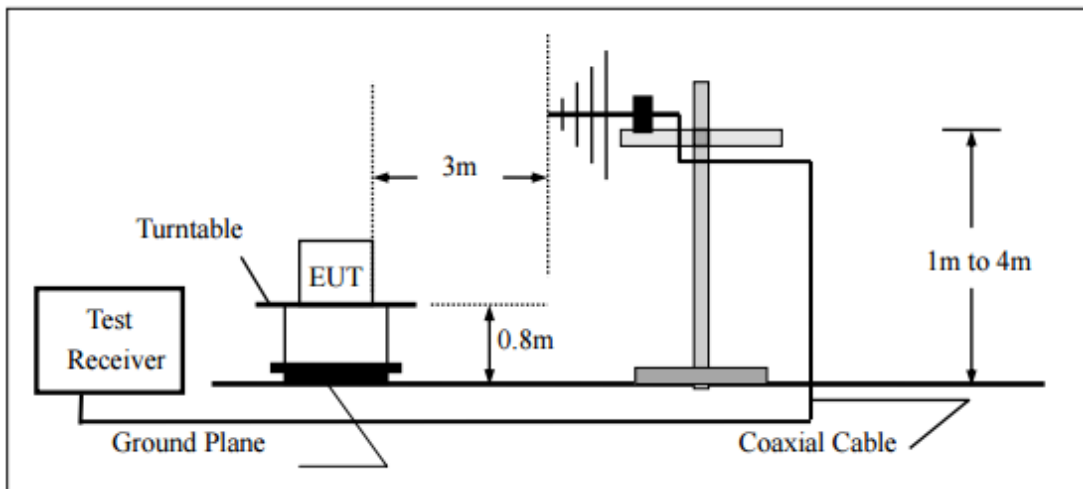
**Standard applicable:**

According to FCC 15.231(e), devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

**Test procedure**

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, then set the spectrum analyzer to Zero Span for the release time reading.

**Test setup**

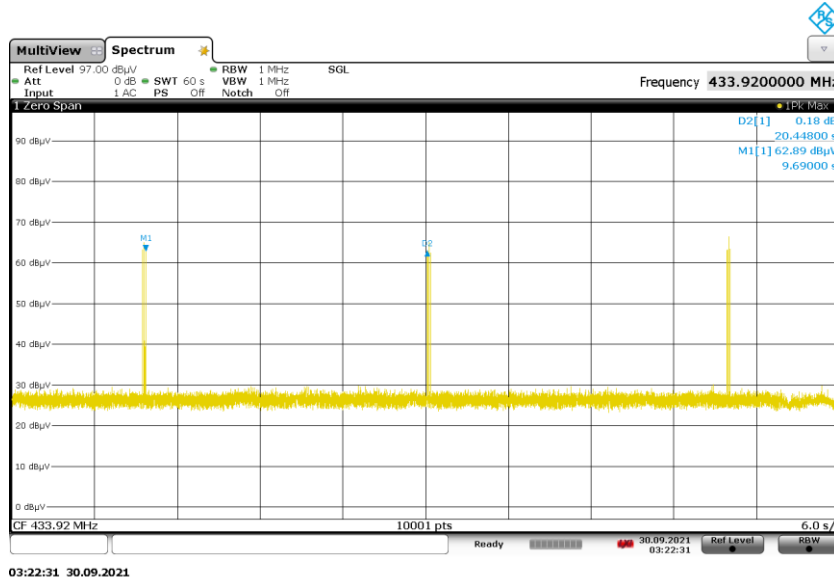


**Test result:**

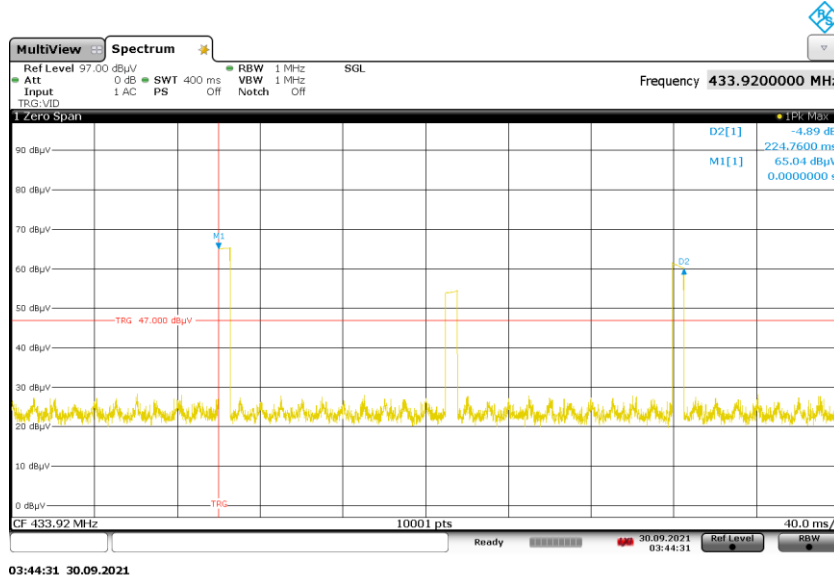
TRANSMISSION TIME				
Test Frequency (MHz)	Item	Measured Value	Limit	Result
433.92	Transmission time	224.76 ms	≤ 1 s	Pass
	Silent Time	20.44 s	≥ 10 s	Pass
	Silent Time/Transmission time	90.94 s	≥ 30 times	Pass

Limit for Silent Time = 30 times \* Duration of the transmission = 6.74 s

**Silent Time for 433.92MHz**



**Transmission time for 433.92MHz**



**Comments:**

Note 1: Radio module is ON.



#### 4.1.5. Duty cycle

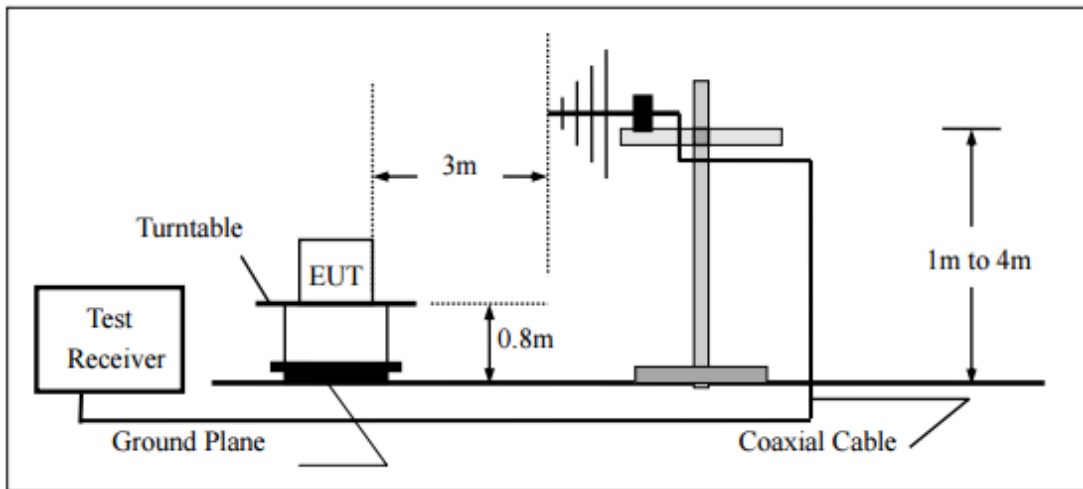
**Standard applicable:**

According to FCC Part 15.231(e) and 15.35(c), for pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

**Test procedure**

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to fundamental frequency, then set the spectrum analyzer to Zero Span for the release time reading.

**Test setup**





**END OF TEST REPORT**