TEST REPORT

Application No.:	SZCR2304001032AT
Applicant:	Treel Mobility Solutions Private Limited
Address of Applicant:	S.No.6/1B,6/4,7/4, Plot No.02, Shivane Laxmi Vishnupuram Amenities Business, NDA Road, Pune-411023(MH), India
Manufacturer:	Treel Mobility Solutions Private Limited
Address of Manufacturer:	Laxmi Vishnupuram Amenities Business, S.No.6/1B,6/4,7/4, Plot No.02, NDA Road, Shivane, Pune-411023(MH), India
Factory:	Treel Mobility Solutions Private Limited
Address of Factory:	Laxmi Vishnupuram Amenities Business, S.No.6/1B,6/4,7/4, Plot No.02, NDA Road, Shivane, Pune-411023(MH), India
Equipment Under Test (EUT):	
EUT Name:	TPMS 433 Sensor
Model No.:	TR0001TV020201000, TR0001TV350201000 ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	TREEL A JK TYRE PRODUCT
FCC ID:	2BA4YT01TV020201
Standard(s) :	47 CFR Part 15, Subpart C 15.231
Date of Receipt:	2023-04-12
Date of Test:	2023-04-21 to 2023-04-26
Date of Issue:	2023-04-27
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2023-04-27		Original

Authorized for issue by:				
		Edison Li **Edison Li/Project Engineer**		
		Eric Fu **Eric Fu/Reviewer**		

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.231	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
20dB Bandwidth	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.231(c)	Pass
Dwell Time (15.231(a)(2))		ANSI C63.10 (2013) Section 7.5	47 CFR Part 15, Subpart C 15.231(a)(2)	Pass
Field Strength of the Fundamental Signal (15.231(b))		ANSI C63.10 (2013) Section 6.5	47 CFR Part 15, Subpart C 15.231(b)	Pass
Radiated Emissions below 1GHz		ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15C Section 15.231(b) and 15.209	Pass
Radiated Emissions above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15C Section 15.231(b) and 15.209	Pass

Remark:

Model No.: TR0001TV020201000, TR0001TV350201000

Only the model TR0001TV020201000 was tested, since according to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only difference on model no., application and type of vehicle on which it is fitted.

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4 General Information

4.1 Details of E.U.T.

Power supply:	3V CR2050HR Battery
Nominal Frequency:	433.92MHz
Modulation Technique:	FSK
Number of Channels:	1
Antenna Type:	Metal Antenna
Antenna Gain:	0dBi

Remark:The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--
The EUT has been tested as an independent unit.			

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
20dB Bandwidth	3%
Dwell Time	3%
Field Strength of the Fundamental Signal	4.5dB
Radiated Emissions below 1GHz	4.5dB (below 1GHz)/4.8dB (above 1GHz)

Remark:
The U_{lab} (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so the test results
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

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4.4 Test Location

All tests were performed at:

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Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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5 Equipment List

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2022-10-20	2023-10-19
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2023-03-21	2024-03-20
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2022-07-08	2023-07-07
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2023-03-31	2024-03-30
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2023-03-21	2024-03-20

Dwell Time					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2022-10-20	2023-10-19
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2023-03-21	2024-03-20
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2022-07-08	2023-07-07
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2023-03-31	2024-03-30
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2023-03-21	2024-03-20

Field Strength of the Fundamental Signal					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2022-10-20	2023-10-19
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2021-09-17	2023-09-16
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2023-03-20	2024-03-19
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2022-07-08	2023-07-07

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Radiated Emissions below 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2021-11-30	2023-11-29
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2022-10-20	2023-10-19
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2021-09-17	2023-09-16
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2023-03-20	2024-03-19
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2022-07-08	2023-07-07

Radiated Emissions above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2022-04-02	2025-04-01
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2023-03-20	2024-03-19
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2022-07-24	2024-07-23
Microwave system amplifier	Agilent	83017A	SEM005-25	2022-09-21	2023-09-20
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2022-07-08	2023-07-07

General used equipment					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2022-09-04	2023-09-03
Humidity/ Temperature Indicator	Anymetre	TH101B	SEM002-09	2022-09-04	2023-09-03
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2023-03-23	2024-03-22

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

6.1.2 Conclusion

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

Antenna location: Refer to Internal photos

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7 Radio Spectrum Matter Test Results

7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.231(c)

Test Method: ANSI C63.10 (2013) Section 6.9

Limit:

Frequency range(MHz)	Limit
70-900	No wider than 0.25% of the center frequency
Above 900	No wider than 0.5% of the center frequency

7.1.1 E.U.T. Operation

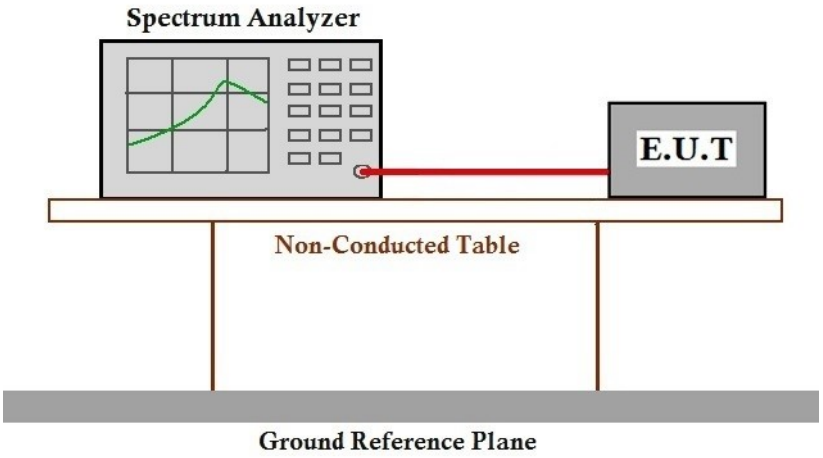
Operating Environment:

Temperature: 25.3 °C Humidity: 61.2 % RH Atmospheric Pressure: 1015 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Tx mode, Keep the EUT in transmitting mode.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

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7.1.5 Measurement Procedure and Data

Test Channel	Bandwidth	Limit	Verdict
433.92MHz	48.39kHz	1.0848MHz	PASS

Note:Limit=433.92*0.25%=1.0848MHz

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7.2 Dwell Time (15.231(a))

Test Requirement 47 CFR Part 15, Subpart C 15.231(a)(2)

Test Method: ANSI C63.10 (2013) Section 7.5

Limit:

Device type	Limit
Manually operated transmitter	The switch automatically deactivate the transmitter within not more than 5 seconds of being released
Automatically actived transmitter	Cease transmission within 5 seconds after activation
Periodic transmissions to determine system integrity of transmitters used in security or safety applications	The total transmission time does not exceed 2 seconds per hour

7.2.1 E.U.T. Operation

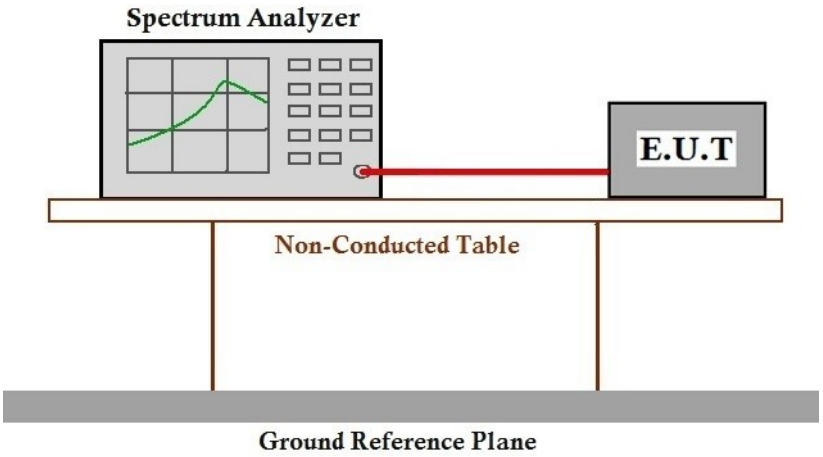
Operating Environment:

Temperature: 25.3 °C Humidity: 61.2 % RH Atmospheric Pressure: 1015 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Tx mode, Keep the EUT in transmitting mode.

7.2.3 Test Setup Diagram



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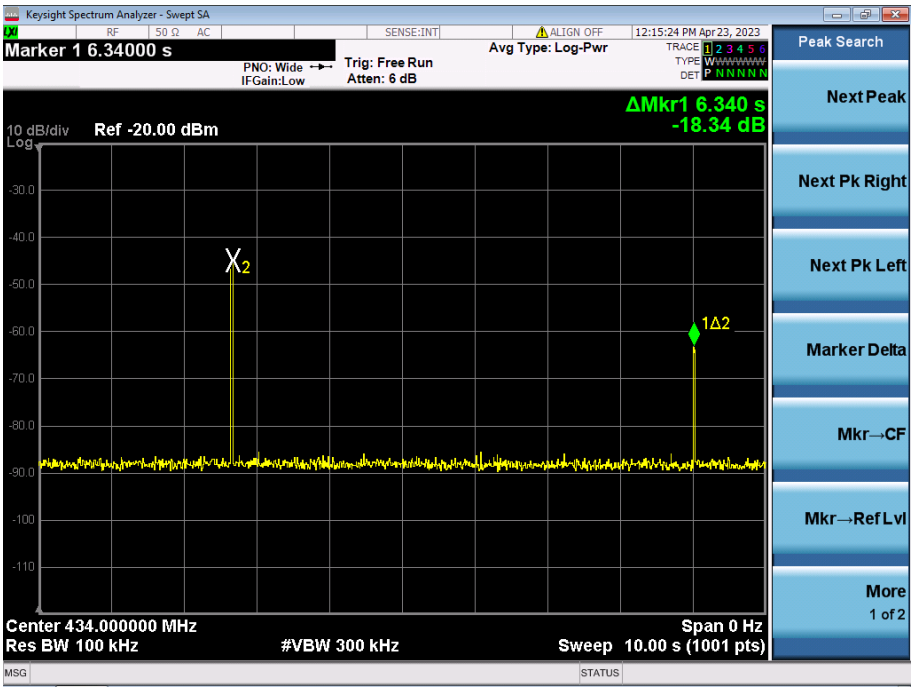
7.2.4 Measurement Procedure and Data



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7.3 Field Strength of the Fundamental Signal (15.231(b))

Test Requirement 47 CFR Part 15, Subpart C 15.231(b)

Test Method: ANSI C63.10 (2013) Section 6.5

Measurement Distance: 3m

Limit:

Fundamental frequency(MHz)	Field strength of fundamental(microvolts/meter)	Field strength of spurious emissions(microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750	125 to 375
174-260	3750	375
260-470	3750 to 12500	375 to 1250
Above 470	12500	1250

Remark: the emission limit is based on measurement instrumentation employing an average detector at a distance of 3 meters. The frequencies above 1000MHz are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

** linear interpolations

The fundamental frequency of the EUT is 433.92 MHz

The limit for average or QP field strength dBuv/m for the fundamental emission= 80.83 dBµV/m

No fundamental is allowed in the restricted bands.

The limit for average field strength dBuv/m for the spurious emission=60.83 dBuV/m. Spurious in the restricted bands must be less than 60.83 dBuV/m or 15.209, whichever limit permits a higher field strength.

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C Humidity: 52.5 % RH Atmospheric Pressure: 1015 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Tx mode, Keep the EUT in transmitting mode.

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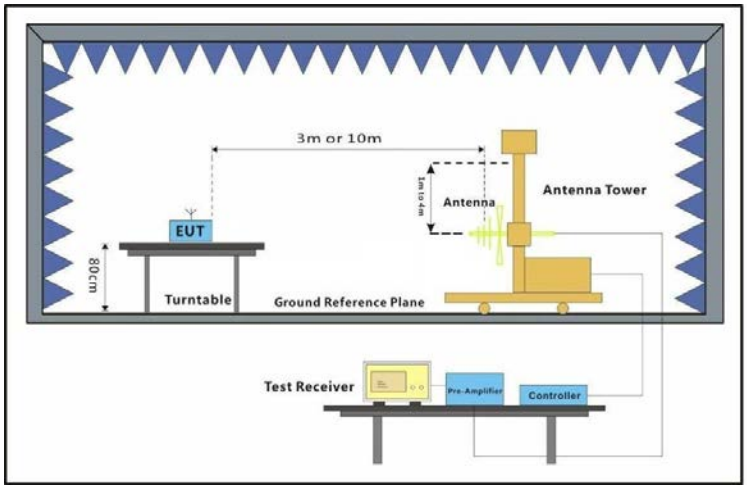
7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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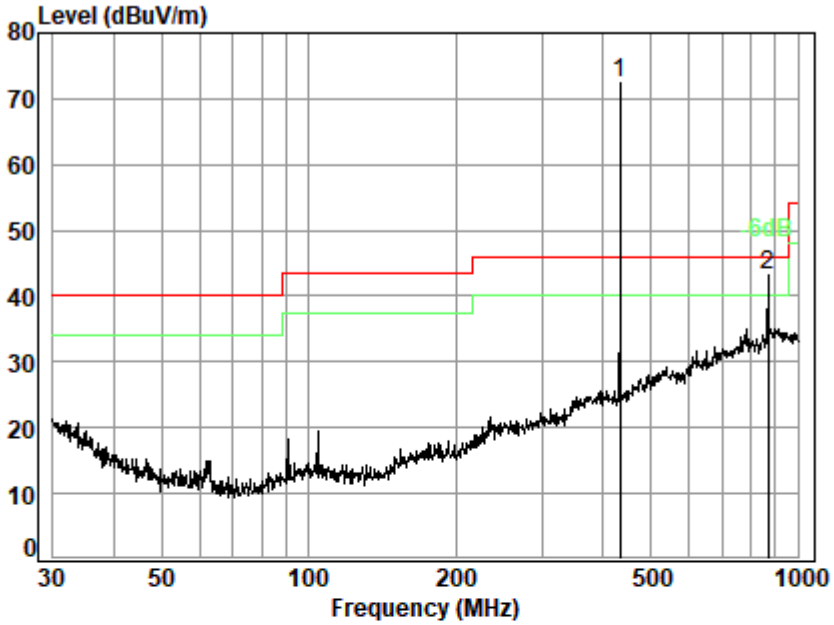
Test Mode: 00; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : 01032AT
Test Mode: 00

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1 p	433.92	21.29	2.59	26.60	75.02	72.30	46.00	26.30	Peak
2	867.84	27.92	3.91	26.03	37.31	43.11	46.00	-2.89	Peak

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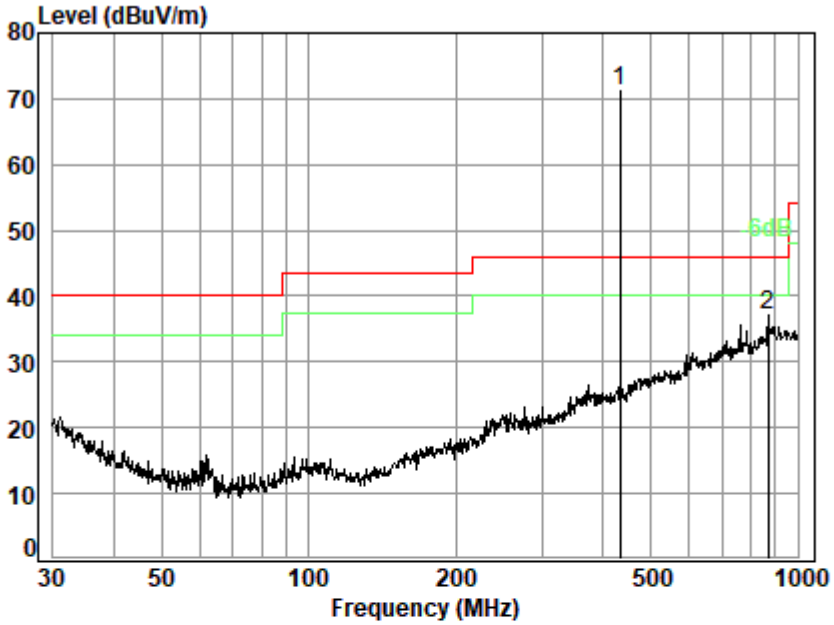
Test Mode: 00; Polarity: Vertical



Site : chamber
Condition: 3m Vertical
Job No. : 01032AT
Test Mode: 00

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1 p	433.92	21.29	2.59	26.60	73.75	71.03	46.00	25.03	Peak
2	867.84	27.92	3.91	26.03	31.19	36.99	46.00	-9.01	Peak

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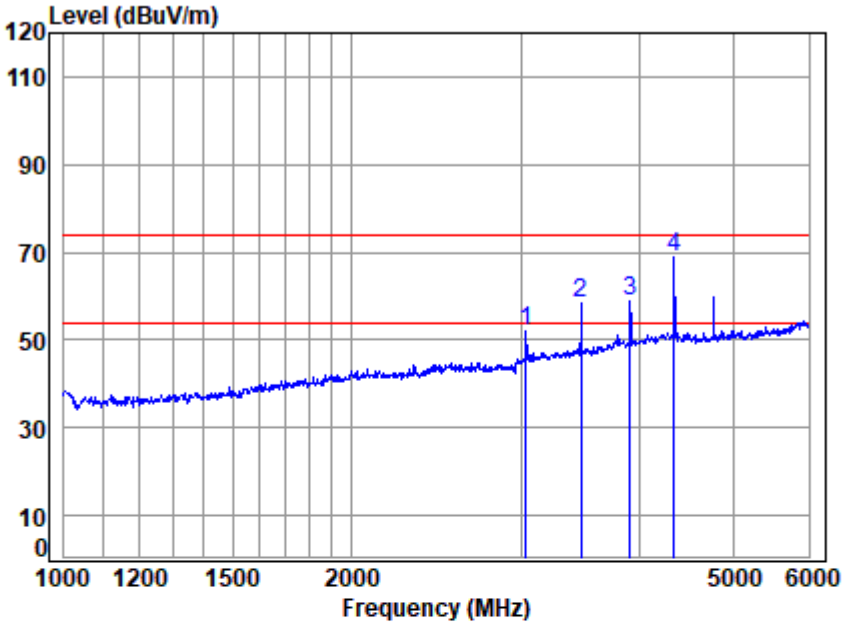
Test Mode: 00; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 01032AT\01033AT
Mode : 433M TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	3037.440	4.87	31.17	35.40	51.22	51.86	74.00	-22.14	Peak
2	3471.360	5.56	31.75	34.88	55.85	58.28	74.00	-15.72	Peak
3	3905.280	6.15	32.60	34.43	54.71	59.03	74.00	-14.97	Peak
4 q	4339.200	6.62	33.60	34.57	63.23	68.88	74.00	-5.12	Peak

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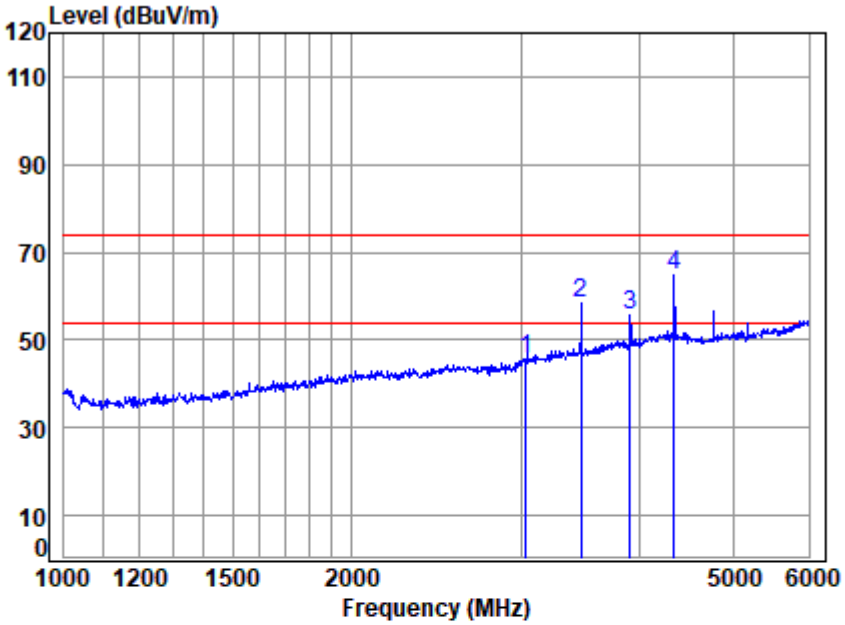
Test Mode: 00; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 01032AT\01033AT
Mode : 433M TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	3037.440	4.87	31.17	35.40	45.13	45.77	74.00	-28.23	Peak
2	3471.360	5.56	31.75	34.88	55.88	58.31	74.00	-15.69	Peak
3	3905.280	6.15	32.60	34.43	51.50	55.82	74.00	-18.18	Peak
4 q	4339.200	6.62	33.60	34.57	59.19	64.84	74.00	-9.16	Peak

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Peak value:

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
433.92	2.59	21.29	26.60	75.02	72.30	100.83	-28.53	Horizontal
867.84	3.91	27.92	26.03	37.31	43.11	80.83	-37.72	Horizontal
3037.44	4.87	31.17	35.4	51.22	51.86	80.83	-28.97	Horizontal
3471.36	5.56	31.75	34.88	55.85	58.28	80.83	-22.55	Horizontal
3905.28	6.15	32.6	34.43	54.71	59.03	80.83	-21.8	Horizontal
4339.20	6.62	33.6	34.57	63.23	68.88	80.83	-11.95	Horizontal
433.92	2.59	21.29	26.60	73.75	71.03	100.83	-29.8	Vertical
867.84	3.91	27.92	26.03	31.19	36.99	80.83	-43.84	Vertical
3037.44	4.87	31.17	35.4	45.13	45.77	80.83	-35.06	Vertical
3471.36	5.56	31.75	34.88	55.88	58.31	80.83	-22.52	Vertical
3905.28	6.15	32.6	34.43	51.5	55.82	80.83	-25.01	Vertical
4339.20	6.62	33.6	34.57	59.19	64.84	80.83	-15.99	Vertical

Average value:

Frequency (MHz)	Average correction factor	Peak Level (dBuV/m)	Average Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	-13.89	72.3	58.41	80.83	-22.42	Horizontal
867.84	-13.89	43.11	29.22	60.83	-31.61	Horizontal
3037.44	-13.89	51.86	37.97	60.83	-22.86	Horizontal
3471.36	-13.89	58.28	44.39	60.83	-16.44	Horizontal
3905.28	-13.89	59.03	45.14	60.83	-15.69	Horizontal
4339.20	-13.89	68.88	54.99	60.83	-5.84	Horizontal
433.92	-13.89	71.03	57.14	80.83	-23.69	Vertical
867.84	-13.89	36.99	23.1	60.83	-37.73	Vertical
3037.44	-13.89	45.77	31.88	60.83	-28.95	Vertical
3471.36	-13.89	58.31	44.42	60.83	-16.41	Vertical
3905.28	-13.89	55.82	41.93	60.83	-18.9	Vertical
4339.20	-13.89	64.84	50.95	60.83	-9.88	Vertical

Note: The Average correction factor calculation please refer to Clause 7.4.4

Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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7.4 Radiated Emissions below 1GHz

Test Requirement 47 CFR Part 15C Section 15.231(b) and 15.209
Test Method: ANSI C63.10 (2013) Section 6.4&6.5
Measurement Distance: 3m
Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

For Other bands

Fundamental Frequency MHz	Field Strength of Fundamental (dBµV/m @ 3 m)	Field Strength of Hasrmonics and Spurious Emissions (dBµV/m @ 3 m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
130 to 174	**61.94 to 71.48	41.94 to 51.48
174 to 260	71.48	51.48
260 to 470	**71.48 to 81.94	51.48 to 61.94
Above 470	81.94	61.94
Detector:	Peak for pre-scan	
	QP for 30MHz to1000 MHz:120 kHz resolution bandwidth Peak for Above 1 GHz: 1 MHz resolution bandwidth	

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636;

for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333.

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

The fundamental frequency of the EUT is 433.92 MHz

The limit for average or QP field strength dBuv/m for the fundamental emission= 80.83 dBµV/m

No fundamental is allowed in the restricted bands.

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7.4.1 E.U.T. Operation

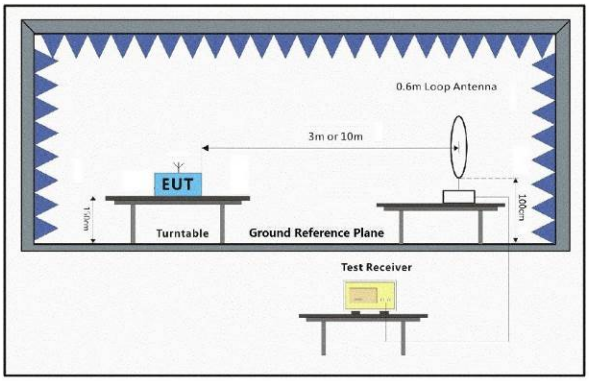
Operating Environment:

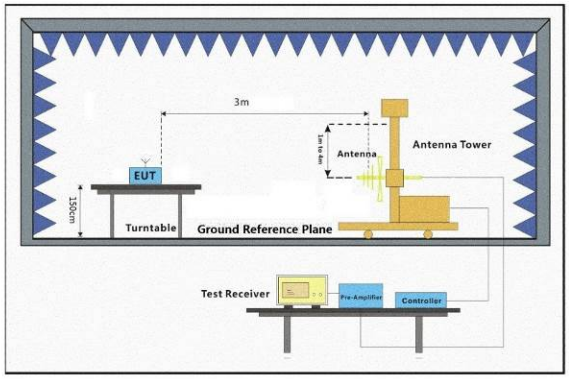
Temperature: 23.6 °C Humidity: 52.5 % RH Atmospheric Pressure: 1015 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Tx mode, Keep the EUT in transmitting mode.

7.4.3 Test Setup Diagram





7.4.4 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of Horizontal was shown in the report.

Measured Level l=Read Level + Antenna Factor + Cable Loss - Preamp Factor

The average correction factor is computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: Average = Peak value + 20log (Duty cycle), where the duty factor is calculated from following formula:

20log (Duty cycle) =20log(20.19%)= -13.89 dB

Here:

Duty cycle = Ton_cum / Ton+off

Ton_cum = 20.19ms

Ton+off = 100ms

Duty cycle = 20.19/ 100 = 0.2019

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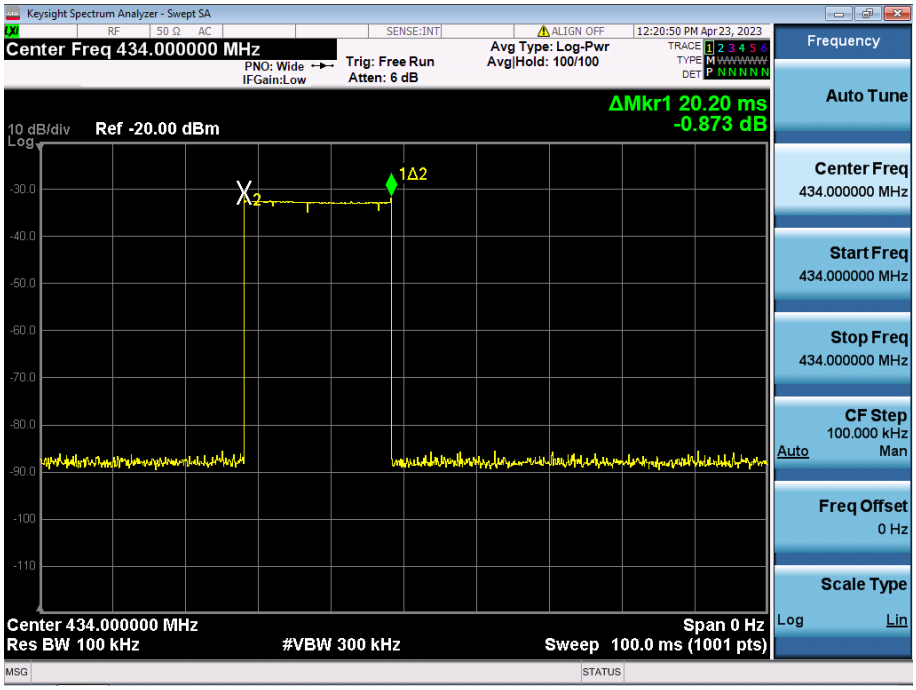
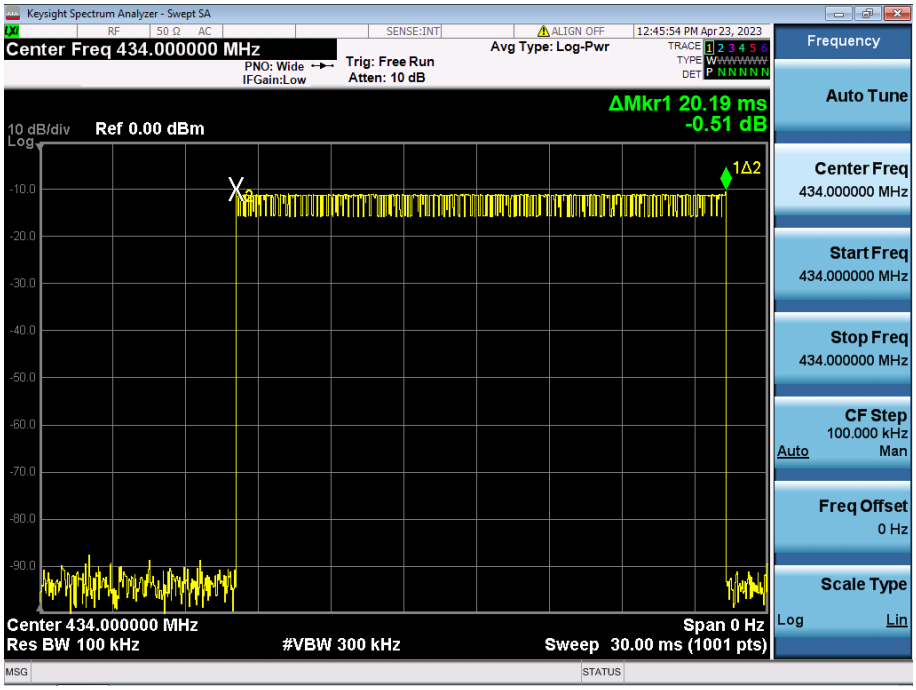
Please refer to below plot for more details.





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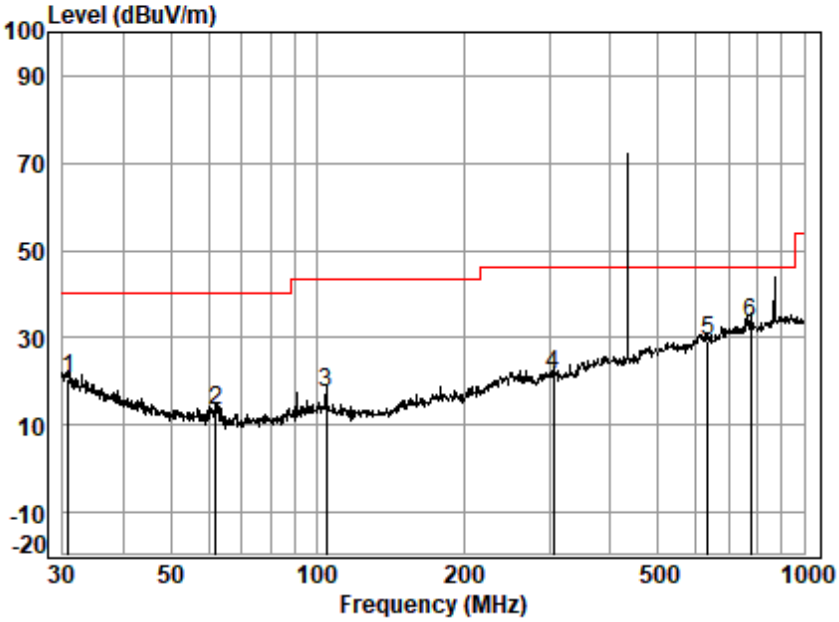
Test Mode: 00; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : 01032AT
Test Mode: 00

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	30.85	20.93	0.63	27.23	26.21	20.54	40.00	-19.46	QP
2	62.00	10.98	0.87	27.13	28.57	13.29	40.00	-26.71	QP
3	104.17	12.96	1.16	26.98	30.26	17.40	43.50	-26.10	QP
4	305.68	18.97	2.14	26.22	26.47	21.36	46.00	-24.64	QP
5	633.91	25.16	3.23	26.96	27.80	29.23	46.00	-16.77	QP
6 q	776.88	26.71	3.61	26.39	29.59	33.52	46.00	-12.48	QP

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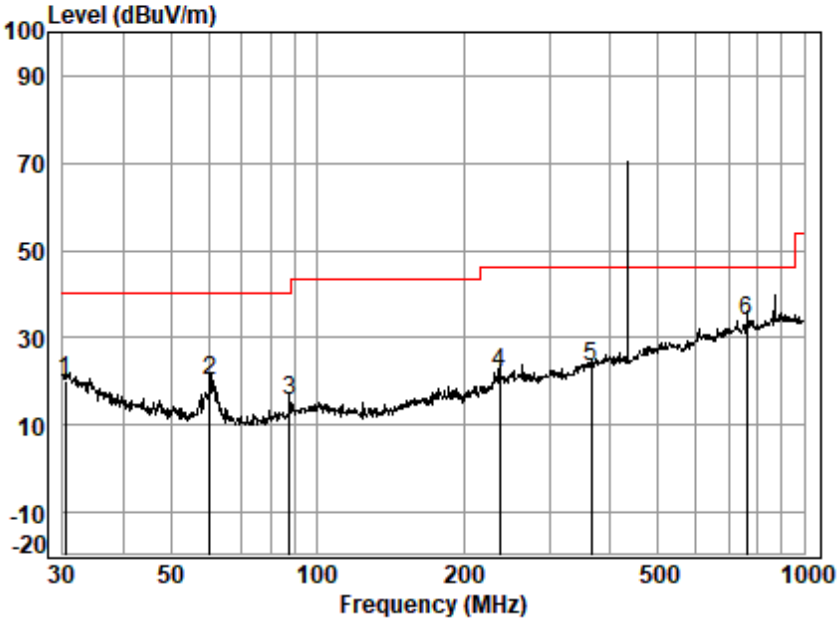
Test Mode: 00; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : 01032AT
Test Mode: 00

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	30.32	21.27	0.63	27.23	25.51	20.18	40.00	-19.82	QP
2	60.28	11.20	0.85	27.13	35.07	19.99	40.00	-20.01	QP
3	87.72	11.62	1.07	27.04	29.87	15.52	40.00	-24.48	QP
4	236.64	17.67	1.85	26.45	28.83	21.90	46.00	-24.10	QP
5	365.54	21.03	2.36	26.40	26.30	23.29	46.00	-22.71	QP
6 q	763.38	26.64	3.58	26.45	30.15	33.92	46.00	-12.08	QP

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7.5 Radiated Emissions above 1GHz

Test Requirement 47 CFR Part 15C Section 15.231(b) and 15.209

Test Method: ANSI C63.10 (2013) Section 6.6

Measurement Distance: 3m

Limit:

For Restricted bands

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

For Other bands

Fundamental Frequency MHz	Field Strength of Fundamental (dBµV/m @ 3 m)	Field Strength of Hasrmonics and Spurious Emissions (dBµV/m @ 3 m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
130 to 174	**61.94 to 71.48	41.94 to 51.48
174 to 260	71.48	51.48
260 to 470	**71.48 to 81.94	51.48 to 61.94
Above 470	81.94	61.94
Detector:	Peak for pre-scan	
	QP for 30MHz to1000 MHz:120 kHz resolution bandwidth Peak for Above 1 GHz: 1 MHz resolution bandwidth	

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636;

for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333.

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

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The fundamental frequency of the EUT is 433.92 MHz

The limit for average or QP field strength dBuv/m for the fundamental emission= 80.83 dBµV/m

7.5.1 E.U.T. Operation

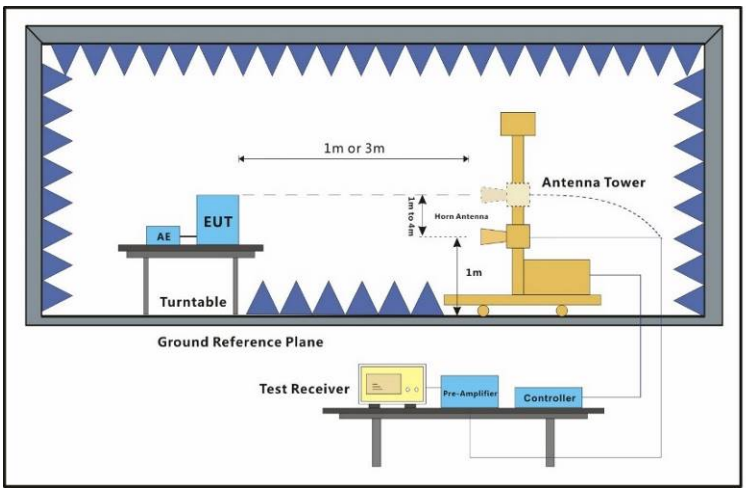
Operating Environment:

Temperature: 21.8 °C Humidity: 60.2 % RH Atmospheric Pressure: 1015 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Tx mode, Keep the EUT in transmitting mode.

7.5.3 Test Setup Diagram



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7.5.4 Measurement Procedure and Data

a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

2) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

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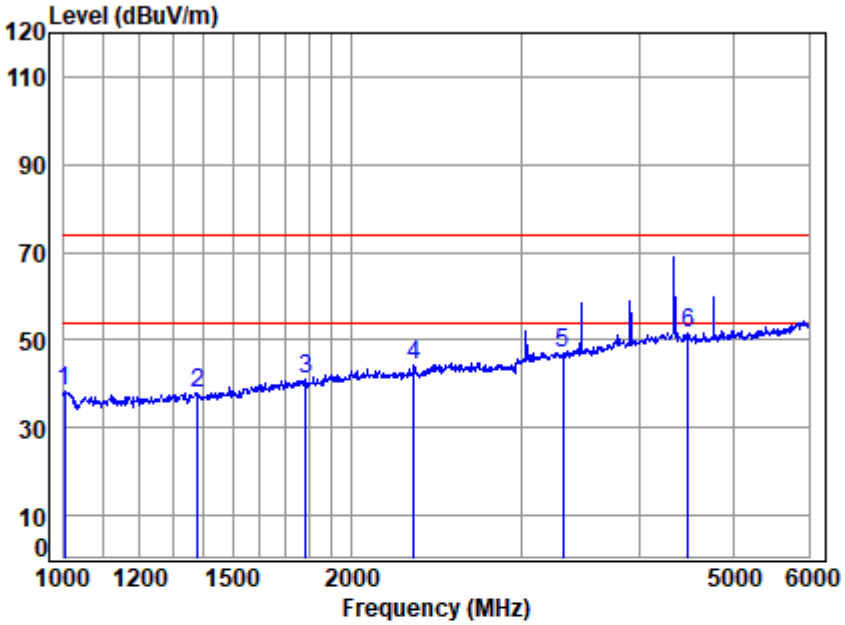
Test Mode: 00; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 01032AT\01033AT
Mode : 433M TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1001.793	2.44	24.98	38.39	49.38	38.41	74.00	-35.59	Peak
2	1380.598	3.08	24.96	37.19	47.08	37.93	74.00	-36.07	Peak
3	1786.985	3.59	26.95	36.21	46.89	41.22	74.00	-32.78	Peak
4	2321.299	4.18	28.49	35.67	47.06	44.06	74.00	-29.94	Peak
5	3321.707	5.33	31.60	35.05	45.13	47.01	74.00	-26.99	Peak
6 q	4488.392	6.76	33.50	34.67	45.84	51.43	74.00	-22.57	Peak

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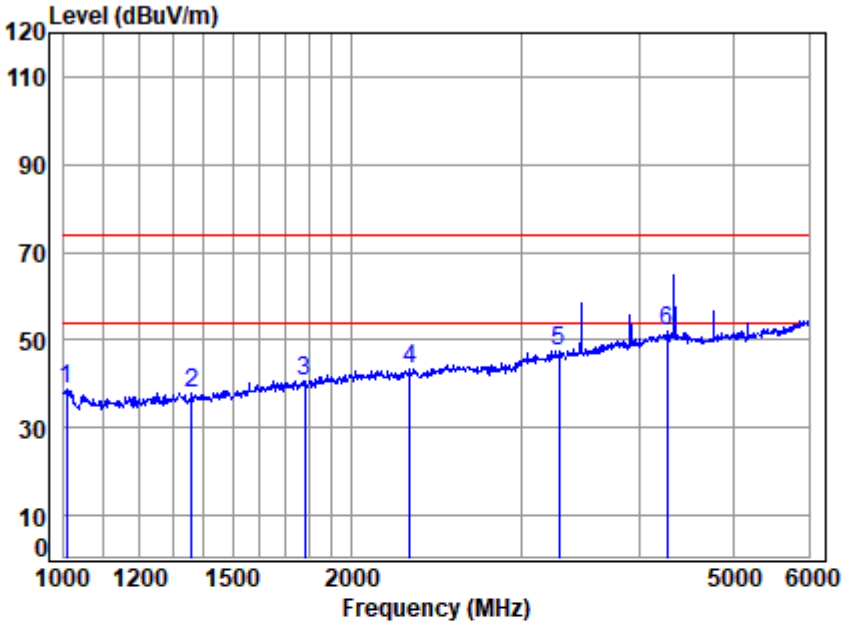
Test Mode: 00; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 01032AT\01033AT
Mode : 433M TX RSE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1005.390	2.45	24.93	38.38	49.96	38.96	74.00	-35.04	Peak
2	1360.949	3.05	24.92	37.24	47.08	37.81	74.00	-36.19	Peak
3	1783.786	3.58	26.94	36.22	46.47	40.77	74.00	-33.23	Peak
4	2300.596	4.16	28.40	35.67	46.36	43.25	74.00	-30.75	Peak
5	3292.082	5.28	31.58	35.09	45.79	47.56	74.00	-26.44	Peak
6 q	4268.768	6.55	33.60	34.52	46.24	51.87	74.00	-22.13	Peak

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8 Test Setup Photo

Refer to Appendix – Test Setup Photos for SZCR2304001032AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for SZCR2304001032AT

- End of the Report -

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