TEST REPORT

of

FCC Part 15 Subpart C

 \boxtimes New Application; \square Class I PC; \square Class II PC

Product:	TPMS
Brand:	More Sensor
Main Model:	TX-V003
Series Model:	TX-V004, TX-V003-1
Model Difference:	Model differences in valve type
FCC Rule Part:	§15.231 (e)
Applicant:	Mobiletron Electronics Co., Ltd.
Address:	85, Sec.4, Chung-Ching Rd., Ta-Ya District,
	Taichung 428, Taiwan

Test Performed by:

Differentiational Standards Laboratory Corp. LT Lab. TEL: +886-3-263-8888 FAX: +886-3-263-8899 No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan

Report No.: ISL-22LR0103FC315 Issue Date : May 25, 2022



Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein. The uncertainty of the measurement does not include in consideration of the test result unless the customer required the determination of uncertainty via the agreement, regulation or standard document specification. This test report shall not be reproduced except in full, without the written approval of International Standards Laboratory Corp.



VERIFICATION OF COMPLIANCE

Applicant:	Mobiletron Electronics CO.,LTD.
Equipment Under Test:	TPMS
Brand Name:	More Sensor
Model:	TX-V003
Serial Models:	TX-V004, TX-V003-1
Model Difference:	Model differences in valve type
FCC ID:	ULZ-TXV003
FCC Rule Part:	§15.231 (e)
Date of Test:	2022/5/13 ~2022/5/23
Date of EUT Received:	2022/5/13

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	Bill Huang	Date:	2022/05/25
	Bill Huang / Engineer		
Prepared By:	Elise Chen	Date:	2022/05/25
	Elisa Chen / Sr. Engineer		
Approved By:	Suy In	Date:	2022/05/25

Jerry Liu / Assistant Manager



Version

Version No.	Date	Description
00	2022/05/25	Initial creation of document

Uncertainty of Measurement

Parameter	Uncertainty (k=2)
Conducted Emission (AC power line)	±0.852 dB
Spurious emissions, radiated	±3.46 dB
RF power, conducted	±1.386 dB
Power Density	±1.432 dB
RF Frequency	$\pm 0.00298\%$
Time	±0.01%
DC Voltage	$\pm 0.808\%$



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1. General Information

1.1 Product Description

General Information			
Product Name:	TPMS		
Brand Name:	More Sensor		
Model Name:	TX-V003		
Model Difference:	TX-V004, TX-V003-1		
Temperature Range	-40°C to +105°C		
Power Supply:	3V dc battery cell		
315MHz Information			
Frequency Range:	TX: 315MHz		
May Output Davyon	ASK: 64.05 dBuV/m at 3 m		
Max Output Power:	FSK: 63.96 dBuV/m at 3 m		
Channel Number:	1		
Modulation type:	ASK and FSK		
Test SW Version:	N/A		
RF power setting:	default		
Antenna Designation:	Loop antenna, -10dBi		





1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: <u>ULZ-TXV003</u> filing to comply with Section 15.231 (e) of the FCC Part 15, Subpart C, Subpart C Rules filing to comply.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in C63.10: 2013. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of International Standards Laboratory Corp. <LT Lab.> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.10: 2013. FCC Registration Number is: 487532; Designation Number is: TW0997.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.



2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was tested with a test program to fix the Tx frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

2.3 Test Procedure

2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10: 2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR 16-1-1 Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m/1.5m(Frequency above 1GHz) above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 6 and 11 of ANSI C63.10: 2013.



2.4 Limitation

(1) Conducted Emission

	Limits
(dB (uV)
Quasi-peak	Average
66 to 56	56 to 46
56	46
60	50
	Quasi-peak 66 to 56 56 60

Note

The lower limit shall apply at the transition frequencies
 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.



(2) Radiated Emission

According to (e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 ¹	50 to 150 ¹
174-260	1,500	150
260-470	1,500 to 5,000 ¹	150 to 500 ¹
Above 470	5,000	500

¹Linear interpolations.

- Remark: 1. Emission level in dBuV/m=20 log (uV/m)
 - 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
 - 3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205
 - 4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ 15.205, then the general radiated emission limits in ξ 15.209 apply.
 - For the band 130-174MHz, uV/m at 3meters = 22.72727 * F(MHz) 2454.545;
 For the band 260-470MHz uV/m at 3meters = 16.6667 * F(MHz) 2833.333;
 Where F is the frequency in MHz.
 - 6. 315MHz AV limit = 16.6667 * 315(MHz) 2833.333= 2416.6775 uV/m = 67.7dBuV/m
 - 7. 315MHz Peak limit = AV Limit + 20dB = 87.7MHz



2.5 Configuration of Tested System

Fig. 1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	N/A					



3. Summary of Test Results

FCC /IC Rules	Description Of Test	Result
§15.207	Conducted Emission	N/A
§15.231(e)	Radiated Emission	Compliant
§15.231(c)	20dB Bandwidth	Compliant
	Duty Cycle Test (Pulse	N/A
	Modulation)	
§15.231(e)	transmission time, silent period	Compliant
§15.203	Antenna Requirement	Compliant

4. Description of Test Modes

The EUT has been tested under engineering test mode condition and the EUT staying in continuous transmitting mode. The Frequency 315MHz is chosen for testing.



5. AC Conducted Emissions Test

5.1 Measurement Procedure:

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

5.2 Test SET-UP (Block Diagram of Configuration)



5.3 Measurement Result:

N/A



6. Duty Cycle (Average Correction factor) Measurement

6.1 Measurement Procedure

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. Set ETU normal operating mode.
- 3. Set SPA Center Frequency = fundamental frequency, RBW= 100kHz, VBW= 300kHz, Span =0 Hz. Adjacent sweep.
- 4. Set SPA View. Mark delta.

6.2 Test SET-UP (Block Diagram of Configuration)

Same as 7.2 Radiated Emission Measurement.

6.3 Measurement Equipment Used:

Same as 7.3 Radiated Emission Measurement.

6.4 Measurement Results:

Averaging factor in dB =20*Log (duty cycle) Duty cycle =7.6ms/100ms=0.07 Average Factor=20log(0.07)= -23.0980



ASK

Ton gilent Spectrum Analyzer - Swept SA Aglinov, RL RF 50Ω AL Center Freq 315.0000000 MHz PNO:Wide → IFGain:Low 11:58:47 AM May 19, 202 TRACE 1 2 3 4 5 INT REF ALIGN OFF Frequency Trig: Free Run DET P N N N N Atten: 10 dB Auto Tune ΔMkr1 7.600 ms -0.03 dB 10 dB/div Log Ref 0.00 dBm **Center Freq** 1Δ2 315 000000 MHz X2 Start Freq 315.000000 MHz Stop Freq Planton y right about mark my any different familie adaa dig the her new compart with the set weather the processing and all provides the set of the set 315.000000 MHz Center 315.000000 MHz Res BW 100 kHz Span 0 Hz Sweep 100.0 ms (1001 pts) CF Step 100.000 kHz #VBW 300 kHz Auto Man FUNCTION <u>Δ2 1 t (Δ)</u> F 1 t 7.600 ms (∆) 37.00 ms -0.03 dB -28.60 dBm 2 345678910112 **Freq Offset** 0 Hz STATUS SG

Тр





FSK

Ton Agilent Spectrum Analyzer - Swept SA 11:42:36 AM May 19, 2022 TRACE 1 2 3 4 5 5 R INT REF ALIGN OFF Frequency Center Freq 315.000000 MHz Trig: Free Run Atten: 10 dB TYPE V DET P PNO: Wide ↔ IFGain:Low Auto Tune ∆Mkr1 7.600 ms -0.09 dB Ref 0.00 dBm 10 dB/div Log **Center Freq** ▲1∆2 315.000000 MHz X2 Start Freq 315.000000 MHz Stop Freq www.lipstack.openhander.com.news.alrater.com.langer.alpine.com.news whentwhen her war and the war Aprillippe 315.000000 MHz Center 315.000000 MHz Res BW 100 kHz Span 0 Hz CF Step 100.000 kHz #VBW 300 kHz Sweep 100.0 ms (1001 pts) Man FUNCTION FUNCTION WIDTH FUNCTION VALUE Auto 7.600 ms (∆) 74.30 ms Δ2 1 t (Δ) F 1 t -0.09 dB -27.40 dBm 234 **Freq Offset** 0 Hz 56789 1011 G

Тр





7. Radiated Emission Test

15.231 (e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

7.1 Measurement Procedure

- 1. The EUT was placed on a turn table which is 0.8/1.5 m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4. Repeat above procedures until all frequency measured were complete.



7.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz





Location Conducted	Equipment Name	Brand	Model	S/N	Last Cal.	Next Cal.
Conducted Chamber 10	Speetrum analyzar	D & S	ESV40	101010	Date = 0.8/1.8/2021	Date = 08/18/2022
Chamber 19	Spectrum analyzer	Ras	F5V40	101919	08/18/2021	06/16/2022
Chamber 19	EMI Receiver	R&S	ESR3	102461	05/10/2022	05/10/2023
Chamber 19	Loop Antenna	EM	EM-6879	271	09/29/2021	09/29/2022
Chamber 19	Bilog Antenna (30MHz-1GHz)	Schwarzbeck	VULB9168 w 6dB Att.	9168-736	03/09/2022	03/09/2023
Chamber 19	Horn antenna (1GHz-18GHz)	ETS	3117	00218718	10/12/2021	10/12/2022
Chamber 19	Horn antenna (18GHz-26GHz)	Com-power	AH-826	081001	11/30/2021	11/30/2022
Chamber 19	Horn antenna (26GHz-40GHz)	Com-power	AH-640	100A	03/18/2022	03/18/2023
Chamber 19	Preamplifier (9kHz-1GHz)	HP	8447F	3113A04621	06/22/2021	06/22/2022
Chamber 19	Preamplifier (1GHz-26GHz)	EM	EM01M26G	060681	05/12/2022	05/12/2022
Chamber 19	Preamplifier (26GHz-40GHz)	MITEQ	JS4-26004000- 27-5A	818471	05/12/2022	05/12/2023
Chamber 19	RF Cable (100kHz-26.5GHz)	HUBER SUHNER	Sucoflex 104A	MY1394/4A & 50886/4A	08/30/2021	08/30/2022
Chamber 19	RF Cable (18GHz-40GHz)	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	11/17/2021	11/17/2022
Chamber 19	Signal Generator	Anritsu	MG3692A	20311	12/28/2021	12/28/2022
Chamber 19	Test Software	Audix	E3 Ver:6 12023	N/A	N/A	N/A

7.3 Measurement Equipment Used:

7.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Average Value = Peak Value + 20 Log (Ton/Tp)Pulse Modulation Duty Cycle Correction Factor

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	



7.5 Measurement Result

Fundamental Measurement Result

Operation Mode:	Transmitting Mode	Test Date:	2022/05/18
Fundamental Frequency:	315MHz	Test By:	Bill
Temp:	25 °C	Hum.:	60%

ASK

Freq	Reading	Factor	Level	Limit	Margin	Remark	Pol
MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
315.03	67.80	-3.75 64.05		87.70 -23.65		Peak	VERTICAL
315.03	65.94	-3.75	62.19	87.70	-25.51	Peak	HORIZONTAL

FSK

Freq	Reading	Factor	Level	Limit	Margin	Remark	Pol
MHz	dBuV	dB	dBuV/m	dBuV/m	dB		V/H
315.03	67.71	-3.75	63.96	87.70	87.70 -23.74		VERTICAL
315.03	66.65	-3.75	62.90	87.70	-24.80	Peak	HORIZONTAL

- 1 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 2 The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz, VBW=300kHz.
- 3 Average Value = Peak Value + 20 Log (Ton/Tp)Pulse Modulation Duty Cycle Correction Factor



Opera Funda Temp	tion Mode mental Free erature :	: Tacquency: 3 2:	ransmitting 15MHz 5 °C	g Mode (AS	SK)	Te: Te: Hu	st Date: st By: midity :	2022/05/18 Bill 60 %
No	Freq	Reading	Factor	Level	Limit	Margin	Remark	Pol
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		V/H
1	159.01	27.17	-5.07	22.10	43.50	-21.40	Peak	VERTICA
2	331.67	26.30	-3.50	22.80	46.00	-23.20	Peak	VERTICA
3	449.04	28.08	-1.10	26.98	46.00	-19.02	Peak	VERTICA
4	581.93	27.65	1.02	28.67	46.00	-17.33	Peak	VERTIC

Radiated Spurious Emission Measurement Result (below 1GHz)

No	Freq	Reading	Factor	Level	Limit	Margin	Remark	Pol
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		V/H
1	159.01	27.17	-5.07	22.10	43.50	-21.40	Peak	VERTICAL
2	331.67	26.30	-3.50	22.80	46.00	-23.20	Peak	VERTICAL
3	449.04	28.08	-1.10	26.98	46.00	-19.02	Peak	VERTICAL
4	581.93	27.65	1.02	28.67	46.00	-17.33	Peak	VERTICAL
5	707.06	29.55	3.26	32.81	46.00	-13.19	Peak	VERTICAL
6	847.71	28.03	5.41	33.44	46.00	-12.56	Peak	VERTICAL
1	152.22	26.91	-5.15	21.76	43.50	-21.74	Peak	HORIZONTAL
2	335.55	27.42	-3.46	23.96	46.00	-22.04	Peak	HORIZONTAL
3	453.89	27.25	-1.01	26.24	46.00	-19.76	Peak	HORIZONTAL
4	586.78	29.10	1.19	30.29	46.00	-15.71	Peak	HORIZONTAL
5	723.55	27.99	3.31	31.30	46.00	-14.70	Peak	HORIZONTAL
6	807.94	27.99	4.91	32.90	46.00	-13.10	Peak	HORIZONTAL

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result within this frequency range shown " " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz, VBW=300kHz.



Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode:Transmitting Mode (ASK)Fundamental Frequency:315MHzTemperature :25 °C

Test Date: 2022/05/18 Test By: Bill Humidity: 60 %

	1	1			1		1	
No	Freq	Reading	Factor	Level	Limit	Margin	Remark	Pol
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		V/H
1	1900.00	50.40	-12.26	38.14	67.70	-29.56	Peak	VERTICAL
2	3151.00	52.70	-9.09	43.61	67.70	-24.09	Peak	VERTICAL
1	1771.00	53.32	-13.01	40.31	67.70	-27.39	Peak	HORIZONTAL
2	3151.00	54.77	-9.09	45.68	67.70	-22.02	Peak	HORIZONTAL

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- ⁴ Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3 MHz.
- 5 Average Value = Peak Value + 20 Log (Ton/Tp).....Pulse Modulation Duty Cycle Corrction Factor.



Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode:	Transmitting Mode (FSK)	Test Date:	2022/05/18
Fundamental Frequency:	315MHz	Test By:	Bill
Temperature :	25 °C	Humidity :	60 %

No	Freq	Reading	Factor	Level	Limit	Margin	Remark	Pol
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		V/H
1	147.37	27.04	-5.32	21.72	43.50	-21.78	Peak	VERTICAL
2	300.63	27.39	-4.16	23.23	46.00	-22.77	Peak	VERTICAL
3	450.01	28.07	-1.08	26.99	46.00	-19.01	Peak	VERTICAL
4	578.05	29.18	0.89	30.07	46.00	-15.93	Peak	VERTICAL
5	758.47	27.82	4.46	32.28	46.00	-13.72	Peak	VERTICAL
6	884.57	28.27	5.78	34.05	46.00	-11.95	Peak	VERTICAL
1	159.01	27.08	-5.07	22.01	43.50	-21.49	Peak	HORIZONTAL
2	310.33	27.88	-3.91	23.97	46.00	-22.03	Peak	HORIZONTAL
3	454.86	27.84	-1.00	26.84	46.00	-19.16	Peak	HORIZONTAL
4	578.05	28.03	0.89	28.92	46.00	-17.08	Peak	HORIZONTAL
5	734.22	28.13	3.66	31.79	46.00	-14.21	Peak	HORIZONTAL
6	913.67	27.57	6.57	34.14	46.00	-11.86	Peak	HORIZONTAL

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz, VBW=300kHz.



Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode:Transmitting Mode (FSK)Fundamental Frequency:315MHzTemperature :25 °C

Test Date: 2022/05/18 Test By: Bill Humidity : 60 %

No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	2092.00	50.45	-12.01	38.44	67.70	-29.26	Peak	VERTICAL
2	3151.00	52.61	-9.09	43.52	67.70	-24.18	Peak	VERTICAL
1	3151.00	54.37	-9.09	45.28	67.70	-22.42	Peak	HORIZONTAL
2	3466.00	54.04	-8.78	45.26	67.70	-22.44	Peak	HORIZONTAL

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- ² Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3 MHz.
- 5 Average Value = Peak Value + 20 Log (Ton/Tp).....Pulse Modulation Duty Cycle Corrction Factor.





8. 20dB Occupied Bandwidth

8.1 Measurement Procedure

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. Set EUT as normal operation
- 3. Set SPA Center Frequency = fundamental frequency, RBW= 10kHz, VBW= 30kHz, Span =3MHz.
- 4. Set SPA Max hold. Mark peak, -20dB.

8.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 Radiated Emission Measurement.

8.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement. 8.4 Measurement Results

Refer to attached data chart.

The center frequency f_c is 315MHz, according to the Rules, section 15.231(C), the Bandwidth of Center Frequency at-20dB should be calculated as following:

315 X 0.0025 = 0.7875(MHz)

8.5 Measurement Result: ASK:
65.0 kHz < limit 0.7875MHz
FSK:
130.8 kHz < limit 0.7875MHz



20dB Band Width Test Data



Agilent	Spectru	m Anal	yzer - Swe	ept SA				214 214					
LXI RL		RF	50 Ω	AC			INT REF	Aug Ture (ALIGN OFF	11:52:50	AM May 19, 2022	Ν	leas Setup
N aB	5 -20.0	JU ai	3		PNO: Wide IFGain:Low	Trig: Atter	Free Run n: 10 dB	Avg Hold	:> 100/100	TY E		A	verage/Hold
10 dB	/div	Ref	0.00 dE	3m					Mkr1	315.03 -27.2	1 8 MHz 81 dBm		Number 100
-10.0 -												A Log <u>Auto</u>	verage Type g-Pwr (Video) ▶ Man
-20.0 - -30.0 -					-		1						Limits►
-40.0 -									20.00 dB 15.0 kHz			<u>On</u>	N dB Points -20.00 dB Off
-60.0 -	\sim	~~~								hand	~~~~~	<u>Auto</u>	PhNoise Opt Wide-offset▶ Man
-80.0 -												Auto	ADC Dither Medium► Man
Cente #Res	er 315 BW 1	0.031 0 kH	8 MHz z		#V	BW 30 kł	Iz		Sweep	Span 1.93 ms	200.0 kHz (1001 pts)		More 1 of 2
MSG									STATU	s			

FSK

Agilent Spectrum	Analyzer - Swept SA					
Center Fred	RF 50 Ω AC	MHz	INT REF	ALIGN OFF Avg Type: Log-Pwr	11:39:17 AM May 19, 2022 TRACE 1 2 3 4 5 6	Frequency
		PNO: Wide 🖵	Trig: Free Run Atten: 10 dB	Avg Hold:>100/100	TYPE MWWWWW DET PINNNN	
		I OUTLON		Mkr	1 315.032 6 MHz	Auto Tune
10 dB/div	Ref 0.00 dBm				-26.120 dBm	
						Center Frea
-10.0	<u>- 4</u>				<u>s</u>	315.000000 MHz
20.0						
-20.0				¹		Start Freq
-30.0		$ \land $			<u>.</u>	314.900000 MHz
-40.0					-20.00 dB	Stop Freq
-50.0					130.8 kHz	315.100000 MHz
						OF Oton
-60.0						20.000 kHz
-70.0						<u>Auto</u> Man
-80.0	-					Freq Offset
-90.0						
Center 315.0	0000 MHz				Span 200.0 kHz	
#Res BW 10	kHz	#VBW	30 kHz	Sweep	1.93 ms (1001 pts)	
MSG				STAT	US	



9. Silent Period Time Measurement:

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.

9.1 Measurement Procedure

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 1MHz, Span =0Hz
- 3. Set EUT Power on as normal operation
- 4. Set SPA Max hold. Delta Mark.

9.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 Radiated Emission Measurement.

9.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.



9.4 Measurement Results

Total transmission time of transmissions calculation:

ASK: Ton: 7.6 ms < 1s Tp: 60.6 s silent period limit: 10s or 0.007s *30 = 0.21s T silent period = 60.6s - 0.007s = 60.593s > 10s The result: PASS

FSK: Ton: 7.6 ms < 1s Tp: 60.6 s silent period limit: 10s or 0.007s *30 = 0.21s T silent period = 60.6s - 0.007s = 60.593s > 10s The result: PASS.



ASK:

											lon								
Agiler	nt Spect	rum A	nalyzer	- Swe	pt SA														
Cen	ter F	_ہ req	315.	50 Ω 000	AC 000 N	ИНz		. .		INT REF		Avg		ALIGN OF	ff M r	11:58:47 TRA	AM May 19, 202 CE 1 2 3 4 5	2	Frequency
	PNO: Wide Trig: Free Run TYPE WANNAW IFGain:Low Atten: 10 dB DET PINNIN N								N										
10 d	10 dB/div Ref 0.00 dBm -0.03 dB												Autorune						
-10.0 -20.0 -30.0							X	2	1∆2										Center Freq 315.000000 MHz
-40.0 -50.0 -60.0																			Start Freq 315.000000 MHz
-70.0 -80.0 -90.0	dir de la la	ካተኑስ	ih waa ka	hot Mile	enfotoppend	North New York	nluylin		HIMIN	niphar and	(b-liney)d	Mangala .	(v i kitev	en la france	rhah	nununu	งปัน ¹¹ ามุระสารแหน่งไป		Stop Freq 315.000000 MHz
Cen Res	Center 315.000000 MHz Span 0 Hz Res BW 100 kHz #VBW 300 kHz Sweep 100.0 ms (1001 pts)									z)	CF Step 100.000 kHz								
MKR	MODE T	RC SC	ι (Δ)		×	7.600	ms (Δ))	Y -0.03	dB	FUNC	TION	FUN	ICTION WI	DTH	FUNCT	ION VALUE	Aut	<u>:o</u> Man
2 3 4 5 6						37.00		-2	0.0U U	5									Freq Offset 0 Hz
7 8 9 10 11																			
12 MSG				_							_			STA	ATUS				

Тр





FSK:

Ton nt Spectrum Analyzer - Swept SA Aug Type: Log-Pwr 11:42:36 AM May 19, 2022 C RL INT REF Frequency TRACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N N Center Freq 315.000000 MHz Trig: Free Run Atten: 10 dB PNO: Wide +++ IFGain:Low Auto Tune ∆Mkr1 7.600 ms -0.09 dB 10 dB/div Log Ref 0.00 dBm **Center Freq** ▲1∆2 315.000000 MHz X2 Start Freq 315.000000 MHz **Stop Freq** auto mopor an firstering and attending and the west strated press to a substance while they How was a second with a second Uniperity 315.000000 MHz Center 315.000000 MHz Res BW 100 kHz Span 0 Hz Sweep 100.0 ms (1001 pts) CF Step 100.000 kHz #VBW 300 kHz FUNCTION Man MKB MOD FUNCTION WIDTH FUNCTION VALUE Auto 7.600 ms (Δ) 74.30 ms 1 t (Δ) 1 t -0.09 dB -27.40 dBm Δ2 F 23456789 **Freq Offset** 0 Hz 10 11 12 STATUS

Тp

Agilent Spectrum Analyzer - Swept SA		- I		
0/ RL RF 50Ω AC Center Freq 315.000000 M		ALIGN OFF Avg Type: Log-Pwr	11:48:59 AM May 19, 2022 TRACE 1 2 3 4 5 5	Frequency
	PNO: Wide +++ Trig: Free Run IFGain:Low Atten: 10 dB			Auto Tune
10 dB/div Ref 0.00 dBm			0.01 dB	
-10.0 -20.0 -30.0		1 ∆2		Center Freq 315.000000 MHz
-40.0 -50.0 -60.0				Start Freq 315.000000 MHz
-70.0 -80.0 -90.0			-wet-utbackware	Stop Freq 315.000000 MHz
Center 315.000000 MHz Res BW 100 kHz	#VBW 300 kHz	Sweep	Span 0 Hz 120.0 s (1001 pts)	CF Step 100.000 kHz
MKR MODE TRC SCL X	60.60 s (Δ) 0.01 dB	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
2 F I C 3 4 4 5 6 7 8 9	19.44 \$ -21.30 dBm			Freq Offset 0 Hz
10 11 12 MSG		STATUS		