SGS-CSTC Standards Technical Services Co., Ltd.
Guangzhou Branch

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TEST REPORT

Application No.:	GZEM1810001374CR
Applicant:	Hinex MRO Indusries Limited
Address of Applicant:	SUITE 2202, TOWER 1, CHINA-HK CITY, 33 CANTOD ROAD, KOWLOON, HONGKONG
Manufacturer:	Hinex MRO Indusries Limited
Address of Manufacturer:	SUITE 2202, TOWER 1,CHINA-HK CITY, 33 CANTOD ROAD, KOWLOON, HONGKONG
Factory:	Guangzhou Lizheng Electron Technology Co. Ltd.
Address of Factory:	Floor 3, A1 Building, Baijiang, Xintang, Zengcheng District, Guangzhou, Guangdong, China
Equipment Under Test (EUT):	
FCC ID:	2ARYEHS-2018 (for HOST) 2ARYEPT-2018 (for P-TAG)
EUT Name:	Forklift Alarming System V9.1
Model No.:	HOST: HS-2018, P-TAG: PT-2018
Standard(s) :	47 CFR Part 15, Subpart C 15.250
Date of Receipt:	2018-10-16
Date of Test:	2018-10-18 to 2018-10-23
Date of Issue:	2018-12-26
Test Result:	**Pass***

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

Kobe Jian
Lab Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2018-12-26		Original

Authorized for issue by:				
Tested By		Jackson Yuan **Jackson_Yuan /Project Engineer**		2018-10-18 to 2018-10-23 **Date**
Checked By		Ricky Liu **Ricky_Liu /Reviewer**		2018-12-26 **Date**

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.250	ANSI C63.10 (2013)	47 CFR Part 15, Subpart C 15.203 & 15.250	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.250	ANSI C63.10 (2013)	47 CFR Part 15, Subpart C 15.207	Pass
10dB Bandwidth	47 CFR Part 15, Subpart C 15.250	ANSI C63.10 (2013)	47 CFR Part 15, Subpart C 15.250(a) & (b)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.250	ANSI C63.10 (2013)	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.250	ANSI C63.10 (2013)	47 CFR Part 15, Subpart C 15.205 & 15.209 & 15.250(d)	Pass
Peak Power	47 CFR Part 15, Subpart C 15.250	ANSI C63.10 (2013)	47 CFR Part 15, Subpart C 15.250(d) (3)	Pass

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4 General Information

4.1 Details of E.U.T.

Power Supply:	HOST:	DC 12V-48V
	P-TAG:	DC 5 V powered by built-in battery and charged by AC/DC adapter as below
		Battery:
		Model No.: A612C01
		Rated: DC 3.7V, 1.85Wh, 500mAh
		AC/DC adapter:
		Model No.: BSG7W5-U0501000K
		Input: AC 100-240V, 50/60Hz, 0.8A
		Output: DC 5V, 1000mA
Types of the Enclosure:	Two, one for white and the other for black	
Test Voltage:	AC 120 V, 60 Hz with dedicate AC/DC power	
Cable:	For Host:	
	DC input cables (unshielded, <3m)	
	For P-TAG:	
	DC input ports (unshielded, <3m)	
	For AC/DC adapter:	
	AC power plug	
	DC output ports (unshielded, <3m)	
Antenna Gain	5 dBi	
Antenna Type	Chip Antenna	
Number of Channels	1	
Operation Frequency	5980.3 to 6998.9 MHz	

4.2 Description of Support Units

Description	Manufacturer	Model No.
DC power for Host	ZHAOXIN	REF. No.SEA2700
Micro USB Cable	PHILIPS	SWR2101
Alarming equipment	Offered by client	None

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4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	±5.5 x 10^{-8}
2	Duty cycle	±0.57%
3	Occupied Bandwidth	±3%
4	RF Conducted power	±0.68dB
5	RF Power Density	±1.50dB
6	Conducted Spurious Emissions	±1.04dB
7	RF Radiated Power	±4.5dB (below 1GHz)
		±4.8dB (above 1GHz)
8	Radiated Spurious Emission Test	±4.5dB (30MHz-1GHz)
		±4.8dB (1GHz-18GHz)
9	Temperature	±0.4℃
10	Humidity	±1.3%
11	Supply Voltages	±1.5%
12	Time	±3%
13	Conducted Disturbance Voltage at Mains Terminals	±3.63dB (9kHz to 150kHz)
		±3.22dB (150kHz to 30MHz)

4.4 Test Location

All tests were performed at:

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No tests were sub-contracted.

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4.5 Test Facility

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

● NVLAP (Lab Code: 200611-0)

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

● ACMA

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

● SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

● CNAS (Lab Code: L0167)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to

ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

● FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

● FCC Recognized Accredited Test Firm(Registration No.: 486818)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

● Industry Canada (Registration No.: 4620B-1)

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

● VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584，G-449 and T-1179 respectively.

● CBTL (Lab Code: TL129)

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

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4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	Zhong Yu	8m x 3m x 3.8m	EMC0306	N/A	N/A
Two-Line V-Netwok	R&S	ENV216	EMC0118	2018-01-19	2019-01-18
LISN	R&S	ENV216	EMC2135	2018-09-21	2019-09-20
EMI Test Receiver	Rohde & Schwarz	ESCS30	EMC0506	2018-11-19	2019-11-18
Coaxial Cable	HangTianXing	2m	EMC0107	2017-07-23	2019-07-22
Voltage Probe	SGS	N/A	EMC0106	2018-04-04	2020-04-03
Conical Metal Housing	SGS-EMC	N/A	EMC0167	2018-04-19	2020-04-18
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A

10dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2018-11-19	2019-11-18
6dB Attenuator	HP	8491A	EMC2062	2018-04-04	2020-04-03
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A

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Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2018-01-19	2019-01-18
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2018-01-19	2019-01-18
Chamber cable	HangTianXing	N/A	EMC0542	2017-06-30	2019-06-30
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9160	EMC2025	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6112B	EMC0524	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6143	EMC0519	2017-05-04	2020-05-03
Horn Antenna 1GHz-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2016-09-09	2019-09-08
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2018-01-08	2019-01-07
Amplifier	HP	8447F	EMC2065	2018-06-01	2019-05-31
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2018-11-19	2019-11-18
Active Loop Antenna	EMCO	6502	EMC0523	2018-02-24	2019-02-23
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2018-01-19	2019-01-18
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2018-01-08	2019-01-07
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2017-06-18	2019-06-18
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2019-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2018-11-19	2019-11-18
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2018-11-19	2019-11-18
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2016-06-29	2019-06-28
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

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Radiated Spurious Emissions & Peak Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2018-01-19	2019-01-18
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2018-01-19	2019-01-18
Chamber cable	HangTianXing	N/A	EMC0542	2017-06-30	2019-06-30
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9160	EMC2025	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6112B	EMC0524	2016-09-08	2019-09-07
Bi-log Type Antenna	Schaffner -Chase	CBL6143	EMC0519	2017-05-04	2020-05-03
Horn Antenna 1GHz-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2016-09-09	2019-09-08
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2018-01-08	2019-01-07
Amplifier	HP	8447F	EMC2065	2018-06-01	2019-05-31
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2018-11-19	2019-11-18
Active Loop Antenna	EMCO	6502	EMC0523	2018-02-24	2019-02-23
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2018-01-19	2019-01-18
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2018-01-08	2019-01-07
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2017-06-18	2019-06-18
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2019-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2018-11-19	2019-11-18
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2018-11-19	2019-11-18
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2016-06-29	2019-06-28
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DMM	Fluke	73	EMC0006	2018-07-20	2019-07-19
DMM	Fluke	73	EMC0007	2018-07-19	2019-07-18

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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

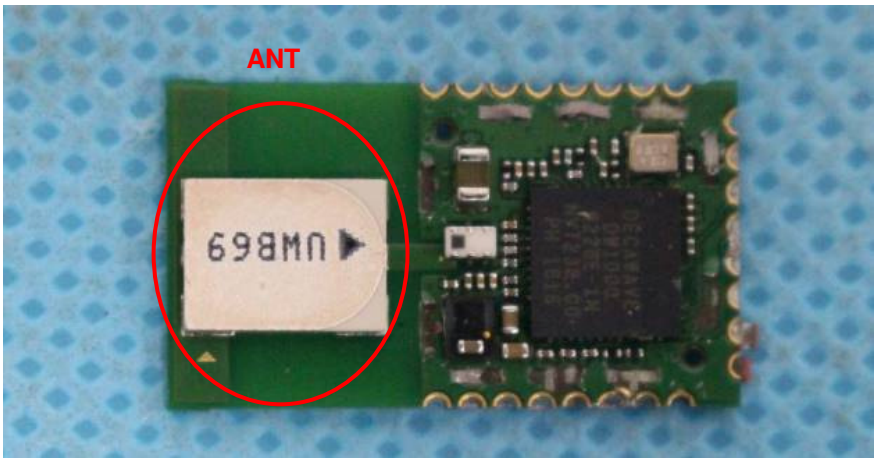
6.1.2 Conclusion

Standard 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 5 dBi.



Test result: The unit does meet the FCC requirements.

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7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207
Test Method: ANSI C63.10 (2013) Section 6.2
Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		

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7.1.1 E.U.T. Operation

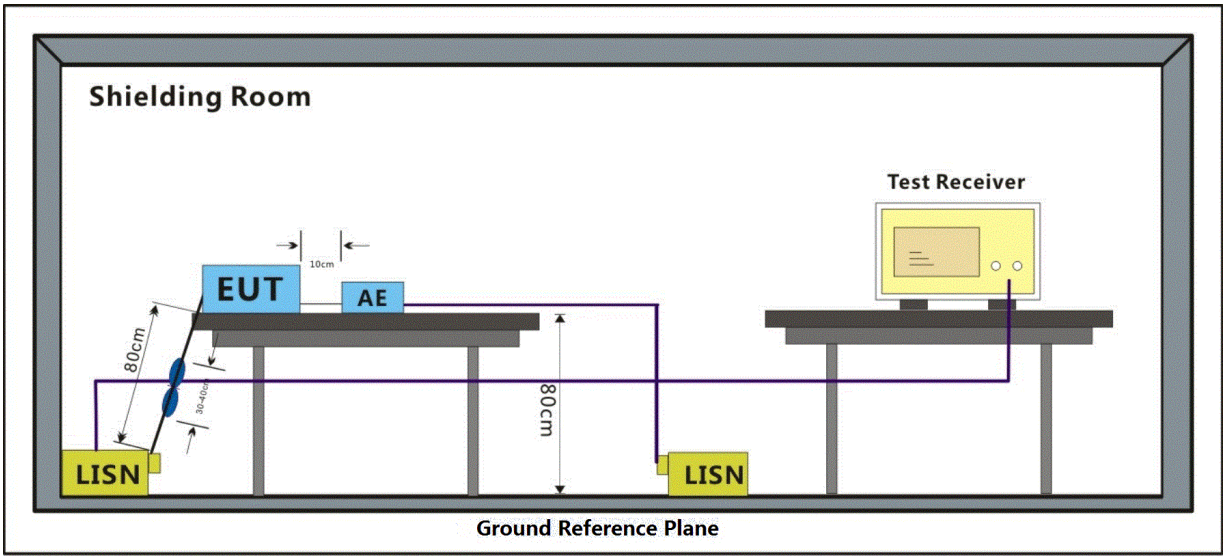
Operating Environment:

Temperature: 24.4 °C Humidity: 52 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode for HOST.

b:Charge + TX mode_Keep the EUT in charging and continuously transmitting mode for P-TAG.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

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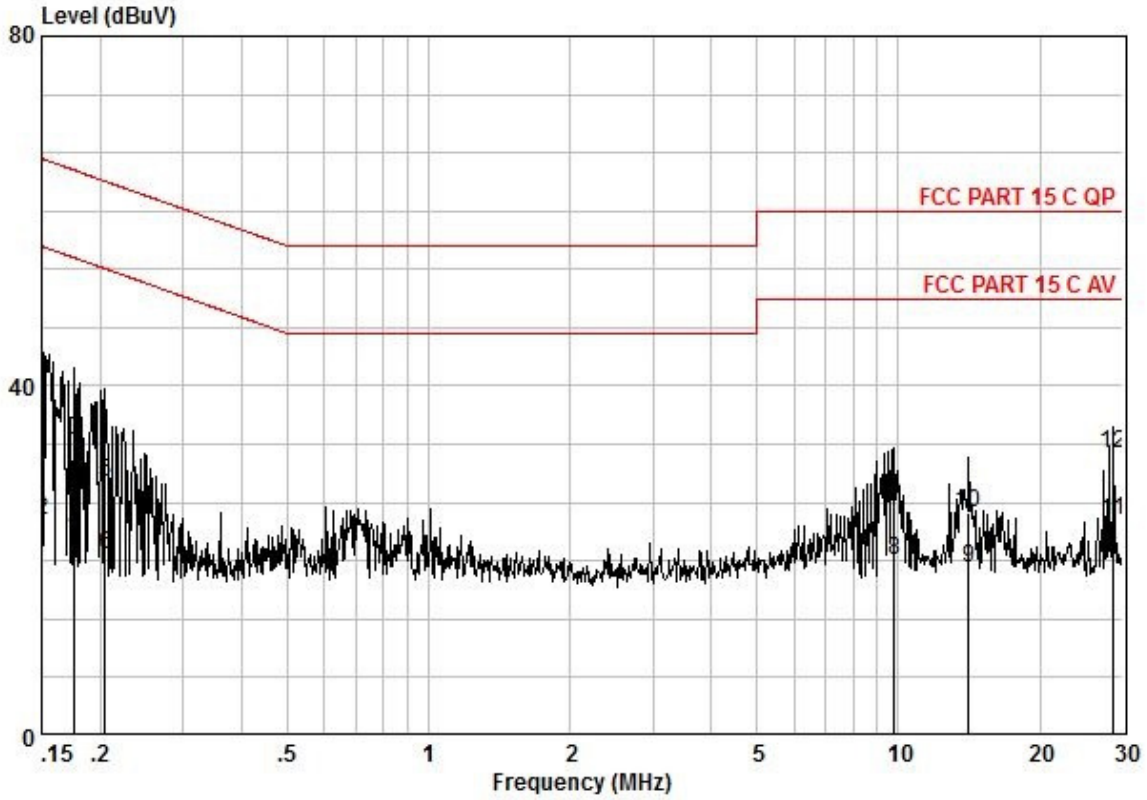
Mode:a; Line:Live Line for HOST



Pol :LIVE
No :HOST
Model :

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0.15	26.65	0.10	9.46	36.21	66.00	-29.79	QP
0.15	15.05	0.10	9.46	24.61	56.00	-31.39	AVERAGE
0.18	24.19	0.10	9.55	33.84	64.68	-30.84	QP
0.18	13.71	0.10	9.55	23.36	54.68	-31.32	AVERAGE
0.21	19.24	0.10	9.62	28.96	63.40	-34.44	QP
0.21	10.92	0.10	9.62	20.64	53.40	-32.76	AVERAGE
9.81	15.99	0.60	9.64	26.23	60.00	-33.77	QP
9.81	9.76	0.60	9.64	20.00	50.00	-30.00	AVERAGE
14.14	8.73	0.70	9.67	19.10	50.00	-30.90	AVERAGE
14.14	15.17	0.70	9.67	25.54	60.00	-34.46	QP
28.75	14.47	0.56	9.61	24.64	50.00	-25.36	AVERAGE
28.75	22.03	0.56	9.61	32.20	60.00	-27.80	QP

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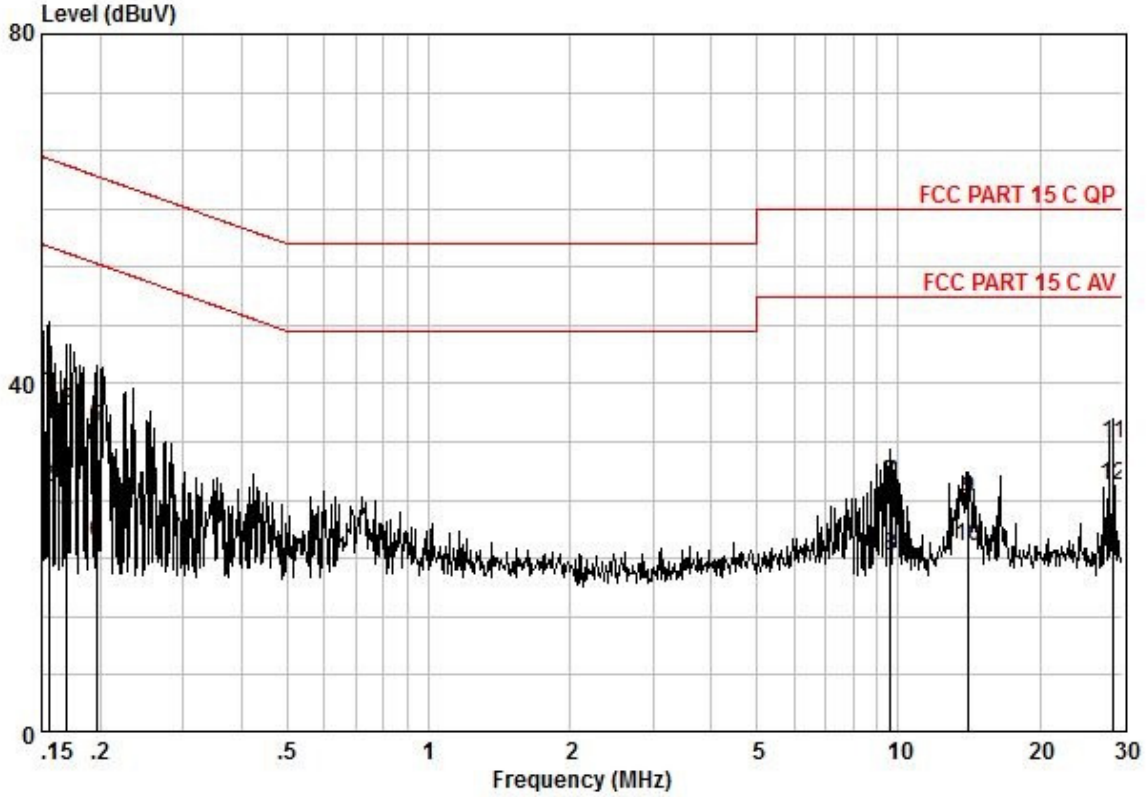
Mode:a; Line:Neutral Line for HOST



Pol :NEUTRAL
No :HOST
Model :

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0.16	29.58	0.10	9.40	39.08	65.69	-26.61	QP
0.16	18.63	0.10	9.40	28.13	55.69	-27.56	AVERAGE
0.17	27.26	0.10	9.47	36.83	64.99	-28.16	QP
0.17	15.47	0.10	9.47	25.04	54.99	-29.95	AVERAGE
0.20	25.24	0.10	9.58	34.92	63.76	-28.84	QP
0.20	12.02	0.10	9.58	21.70	53.76	-32.06	AVERAGE
9.60	18.24	0.61	9.63	28.48	60.00	-31.52	QP
9.60	9.98	0.61	9.63	20.22	50.00	-29.78	AVERAGE
14.14	16.43	0.70	9.66	26.79	60.00	-33.21	QP
14.14	10.94	0.70	9.66	21.30	50.00	-28.70	AVERAGE
28.75	22.98	0.56	9.68	33.22	60.00	-26.78	QP
28.75	18.15	0.56	9.68	28.39	50.00	-21.61	AVERAGE

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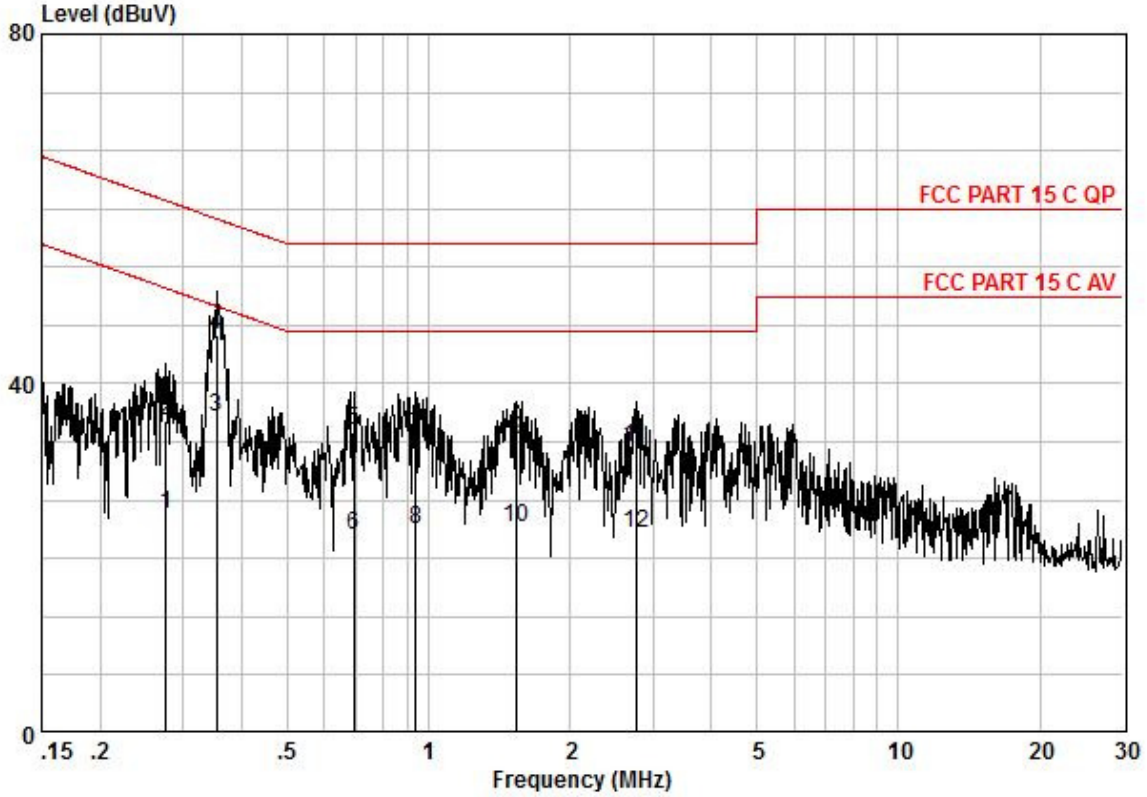
Mode:b; Line:Live Line for P-TAG



Pol :LIVE
No :P-TAG
Model :RT

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0.28	15.35	0.14	9.63	25.12	50.94	-25.82	AVERAGE
0.28	25.92	0.14	9.63	35.69	60.94	-25.25	QP
0.35	26.36	0.16	9.64	36.16	48.87	-12.71	AVERAGE
0.35	35.75	0.16	9.64	45.55	58.87	-13.32	QP
0.69	24.81	0.25	9.61	34.67	56.00	-21.33	QP
0.69	12.91	0.25	9.61	22.77	46.00	-23.23	AVERAGE
0.94	24.19	0.29	9.63	34.11	56.00	-21.89	QP
0.94	13.38	0.29	9.63	23.30	46.00	-22.70	AVERAGE
1.54	23.66	0.31	9.62	33.59	56.00	-22.41	QP
1.54	13.66	0.31	9.62	23.59	46.00	-22.41	AVERAGE
2.76	22.52	0.51	9.62	32.64	56.00	-23.36	QP
2.76	12.87	0.51	9.62	22.99	46.00	-23.01	AVERAGE

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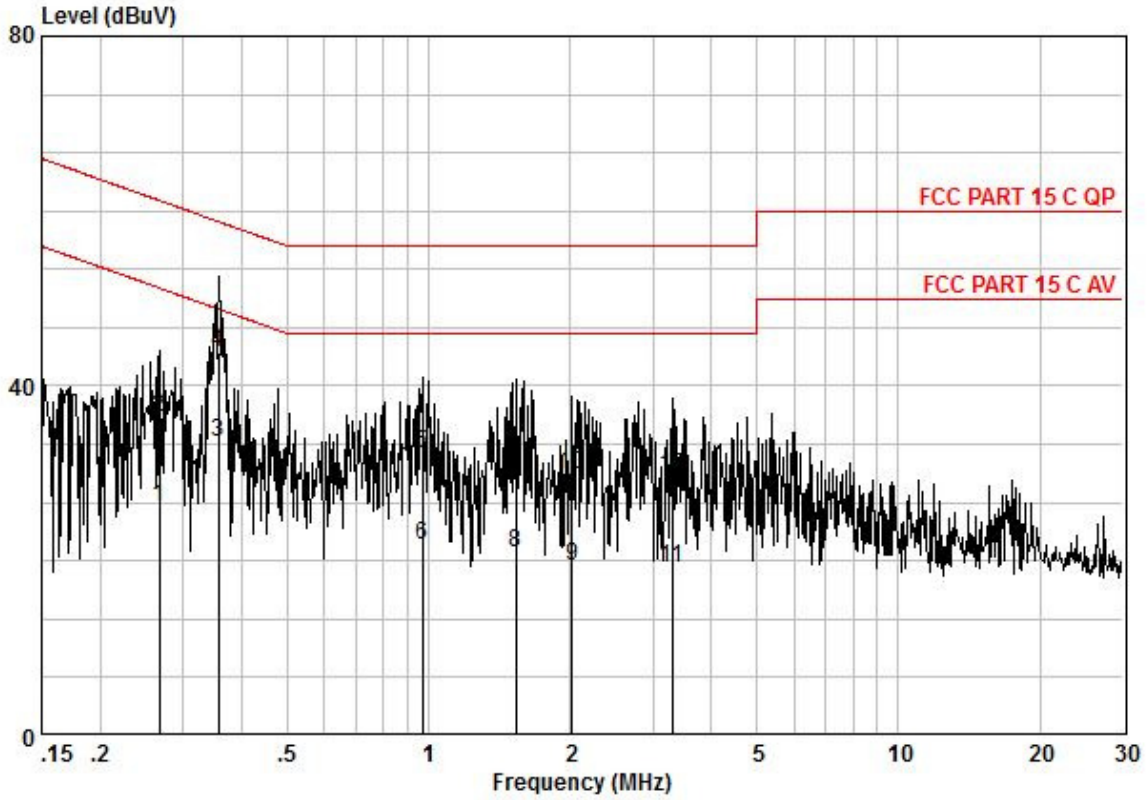
Mode:b; Line:Neutral Line for P-TAG



Pol :NEUTRAL
No :P-TAG
Model :RT

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0.27	16.52	0.13	9.58	26.23	51.20	-24.97	AVERAGE
0.27	26.75	0.13	9.58	36.46	61.20	-24.74	QP
0.36	23.94	0.16	9.56	33.67	48.78	-15.11	AVERAGE
0.36	34.16	0.16	9.56	43.89	58.78	-14.89	QP
0.97	22.40	0.30	9.59	32.29	56.00	-23.71	QP
0.97	11.94	0.30	9.59	21.83	46.00	-24.17	AVERAGE
1.54	21.86	0.31	9.55	31.71	56.00	-24.29	QP
1.54	11.09	0.31	9.55	20.94	46.00	-25.06	AVERAGE
2.02	9.52	0.41	9.52	19.45	46.00	-26.55	AVERAGE
2.02	19.93	0.41	9.52	29.86	56.00	-26.14	QP
3.29	8.97	0.56	9.57	19.10	46.00	-26.90	AVERAGE
3.29	19.44	0.56	9.57	29.57	56.00	-26.43	QP

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7.2 10dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.250 (a) & (b)

Test Method: ANSI C63.10 (2013)

7.2.1 E.U.T. Operation

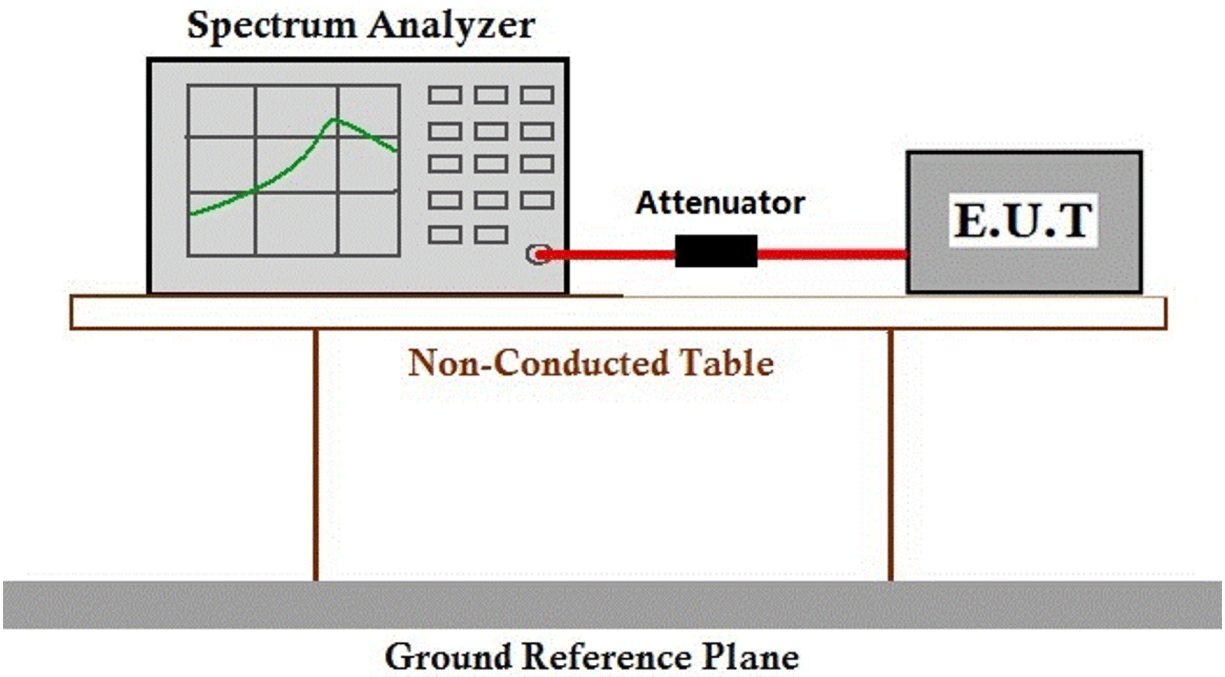
Operating Environment:

Temperature: 23.5 °C Humidity: 51.1 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode for HOST.

b:Charge + TX mode_Keep the EUT in charging and continuously transmitting mode for P-TAG.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

Test Frequency (MHz)	F_L (MHz)	F_H (MHz)	Limit (MHz)	10dB bandwidth (MHz)	Limit (MHz)	Results
For HOST						
6489.6	5974.0	7000.0	Within 5925-7250	1026.0	≥50MHz	Pass
For P-TAG						
6489.6	5977.0	6994.0	Within 5925-7250	1017.0	≥50MHz	Pass

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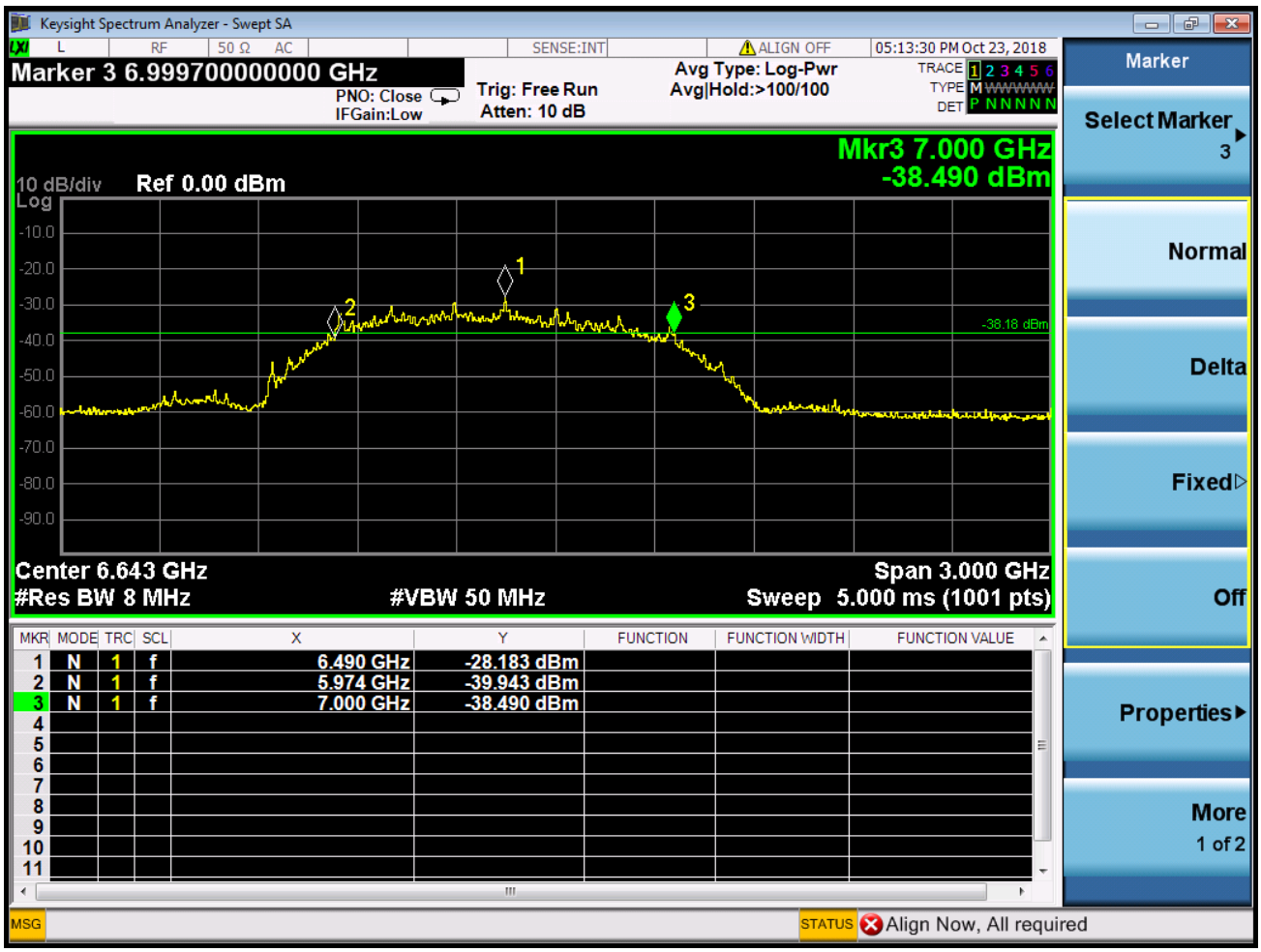
Test plot as follows:

For HOST



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For P-TAG

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7.3 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013)
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.		

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 24.9 °C Humidity: 65.4 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode for HOST.

b:Charge + TX mode_Keep the EUT in charging and continuously transmitting mode for P-TAG.

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7.3.2 Test Setup Diagram

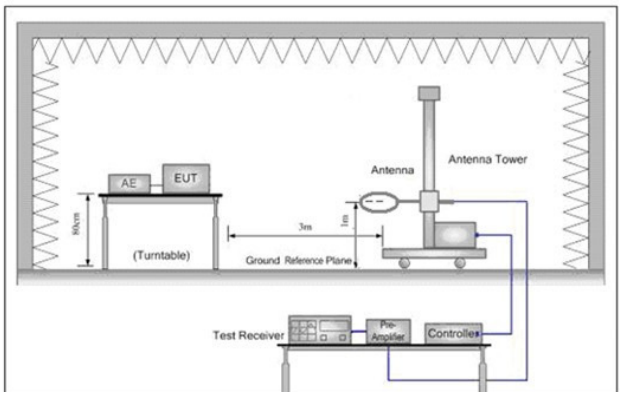

Figure 1. Below 30MHz

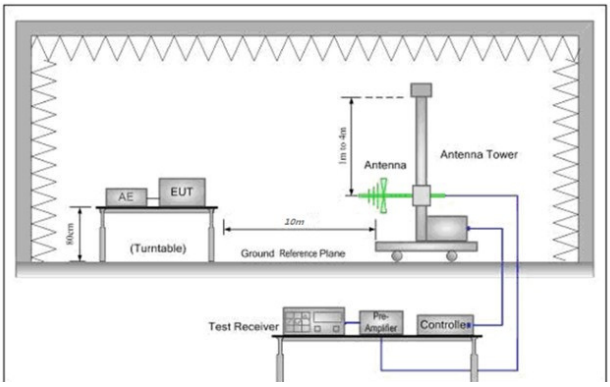

Figure 2. 30MHz to 1GHz

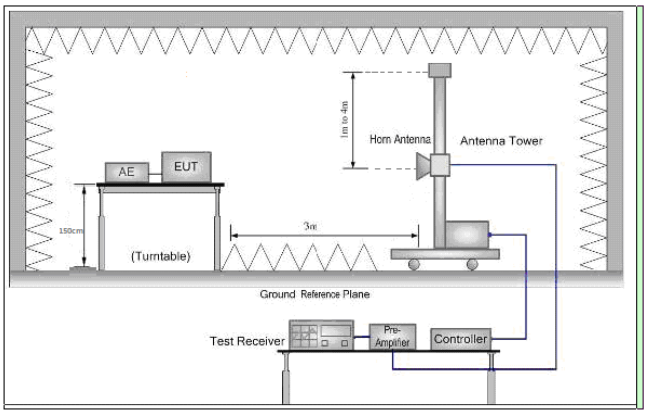

Figure 3. Above 1 GHz

7.3.3 Measurement Procedure and Data

The detailed test data see: Section 7.4

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7.4 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.250 (d)
Test Method: ANSI C63.10 (2013)
Measurement Distance: 3m above 30MHz, 10m below 30MHz
Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1610MHz	-75.3 dBm (EIRP, RBW=1MHz)		RMS	3
1610MHz-1990MHz	-63.3 dBm (EIRP, RBW=1MHz)		RMS	3
1990MHz-3100MHz	-61.3 dBm (EIRP, RBW=1MHz)		RMS	3
3100MHz-5925MHz	-51.3 dBm (EIRP, RBW=1MHz)		RMS	3
5925MHz-7250MHz	-41.3 dBm (EIRP, RBW=1MHz)		RMS	3
7250MHz-10600MHz	-51.3 dBm (EIRP, RBW=1MHz)		RMS	3
Above 10600MHz	-61.3 dBm (EIRP, RBW=1MHz)		RMS	3
1164MHz-1240MHz	-85.3 dBm (EIRP, RBW=1kHz)		RMS	3
1559MHz-1610MHz	-85.3 dBm (EIRP, RBW=1kHz)		RMS	3

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7.4.1 E.U.T. Operation

Operating Environment:

Temperature:	24.1	°C	Humidity:	74.1	% RH	Atmospheric Pressure:	1020	mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode for HOST.
b:Charge + TX mode_Keep the EUT in charging and continuously transmitting mode for P-TAG.

7.4.2 Test Setup Diagram

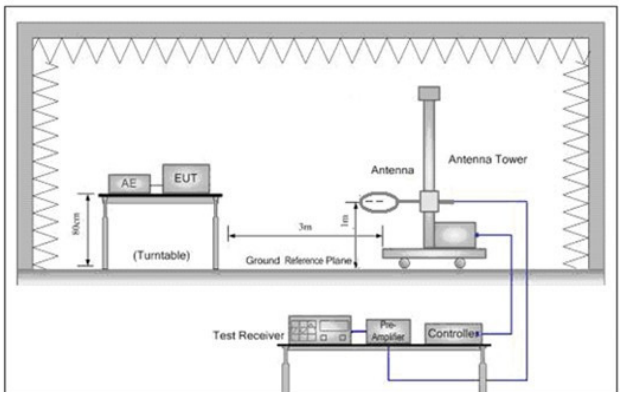

Figure 1. Below 30MHz

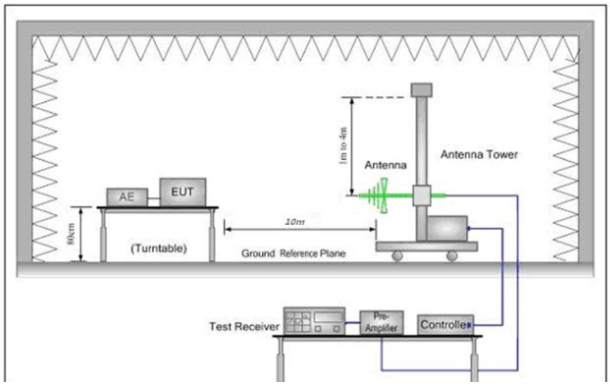

Figure 2. 30MHz to 1GHz

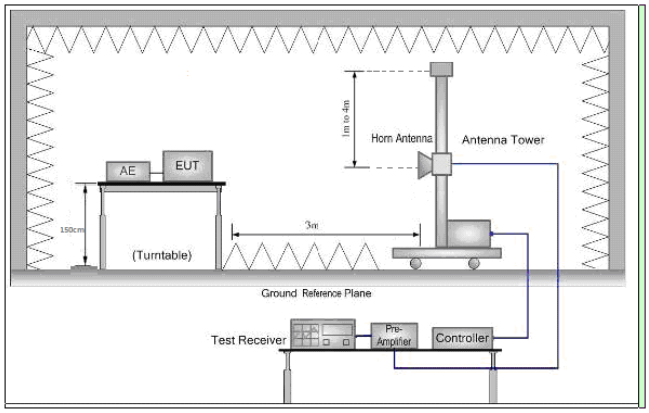

Figure 3. Above 1 GHz

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7.4.3 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. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) 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

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4) 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

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According to ANSI 63.10 Clause 10.3.9, the EIRP to field strength at a specified measurement distance of 3 m is below:

E (dBuV/m) = EIRP(dBm) + 95.3

Thus, the field strength limit for the test above 1GHz is below:

Frequency	Limit		Detector	Measurement Distance
	EIRP (dBm)	Field Strength (dBuV/m)		
960MHz-1610MHz	-75.3 (RBW=1MHz)	20.00	RMS	3
1610MHz-1990MHz	-63.3 (RBW=1MHz)	32.00	RMS	3
1990MHz-3100MHz	-61.3 (RBW=1MHz)	34.00	RMS	3
3100MHz-5925MHz	-51.3 (RBW=1MHz)	44.00	RMS	3
5925MHz-7250MHz	-41.3 (RBW=1MHz)	54.00	RMS	3
7250MHz-10600MHz	-51.3 (RBW=1MHz)	44.00	RMS	3
Above 10600MHz	-61.3 (RBW=1MHz)	34.00	RMS	3
1164MHz-1240MHz	-85.3 (RBW=1kHz)	10.00	RMS	3
1559MHz-1610MHz	-85.3 (RBW=1kHz)	10.00	RMS	3

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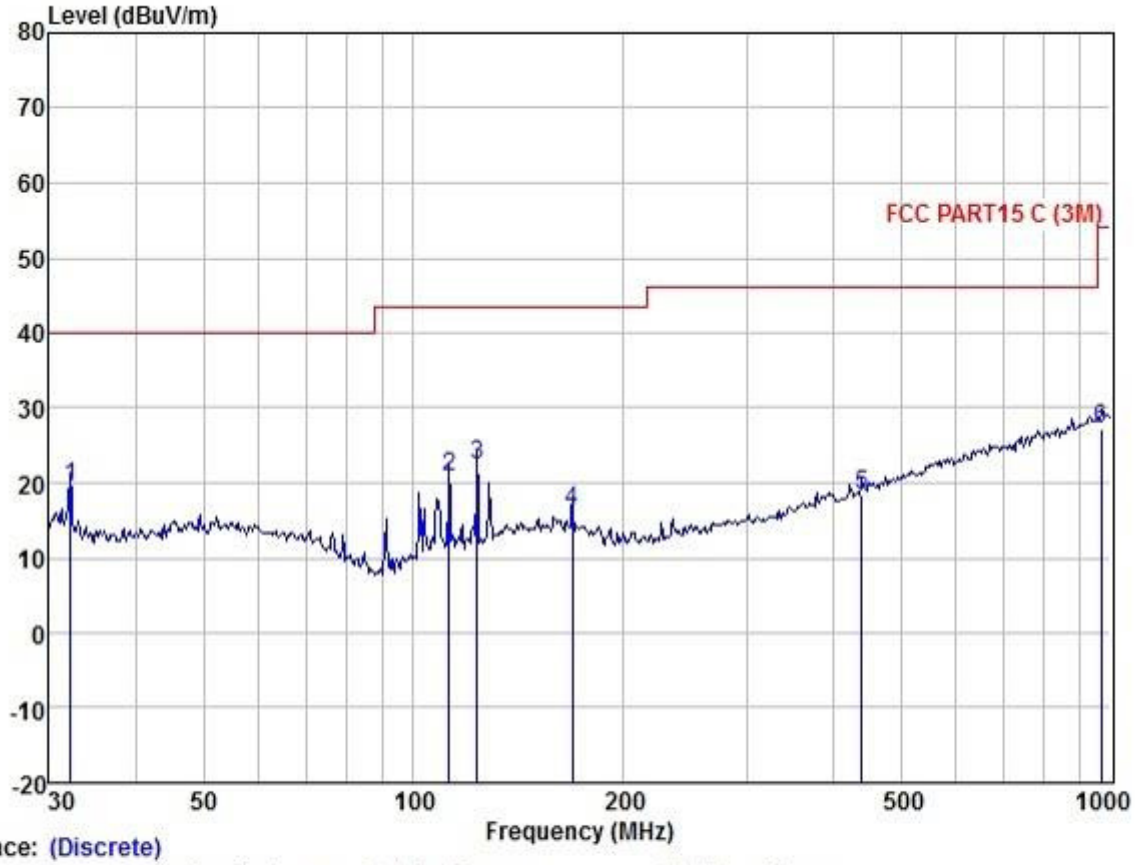
Measurement Data

30MHz~1GHz	
Test mode:	Transmitting

For HOST:



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	32.179	31.26	14.04	0.60	26.55	19.35	40.00	-20.65	HORIZONTAL	QP
2	112.524	35.41	10.51	1.17	26.40	20.69	43.50	-22.81	HORIZONTAL	QP
3	123.266	36.31	11.25	1.21	26.41	22.36	43.50	-21.14	HORIZONTAL	QP
4	169.005	28.08	13.25	1.38	26.44	16.27	43.50	-27.23	HORIZONTAL	QP
5	440.196	26.58	16.99	2.30	27.41	18.46	46.00	-27.54	HORIZONTAL	QP
6	968.934	26.55	24.31	3.25	26.87	27.24	54.00	-26.76	HORIZONTAL	QP

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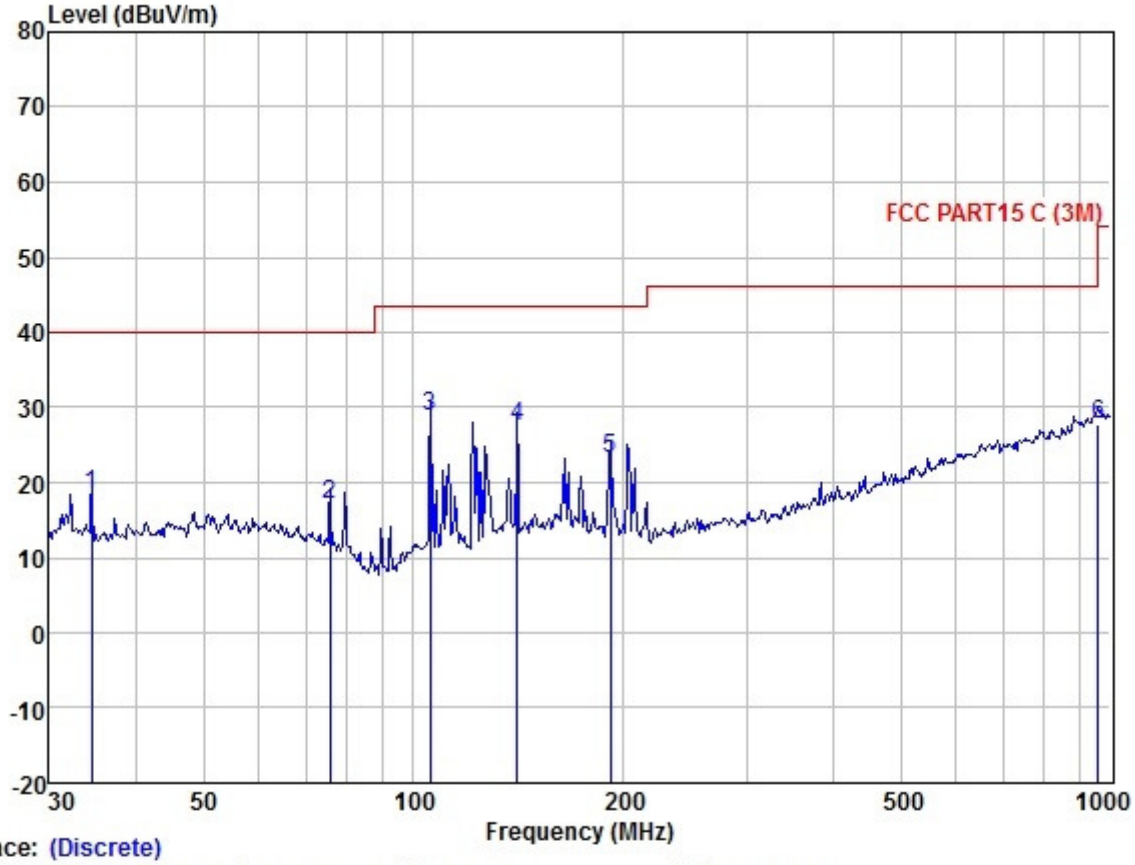

Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	34.517	30.32	13.91	0.60	26.53	18.30	40.00	-21.70	VERTICAL	QP
2	75.977	31.99	10.66	0.92	26.43	17.14	40.00	-22.86	VERTICAL	QP
3	105.642	44.57	9.61	1.13	26.40	28.91	43.50	-14.59	VERTICAL	QP
4	140.835	39.49	13.02	1.27	26.42	27.36	43.50	-16.14	VERTICAL	QP
5	191.745	36.52	11.74	1.48	26.45	23.29	43.50	-20.21	VERTICAL	QP
6	958.794	27.31	24.17	3.20	26.89	27.79	46.00	-18.21	VERTICAL	QP

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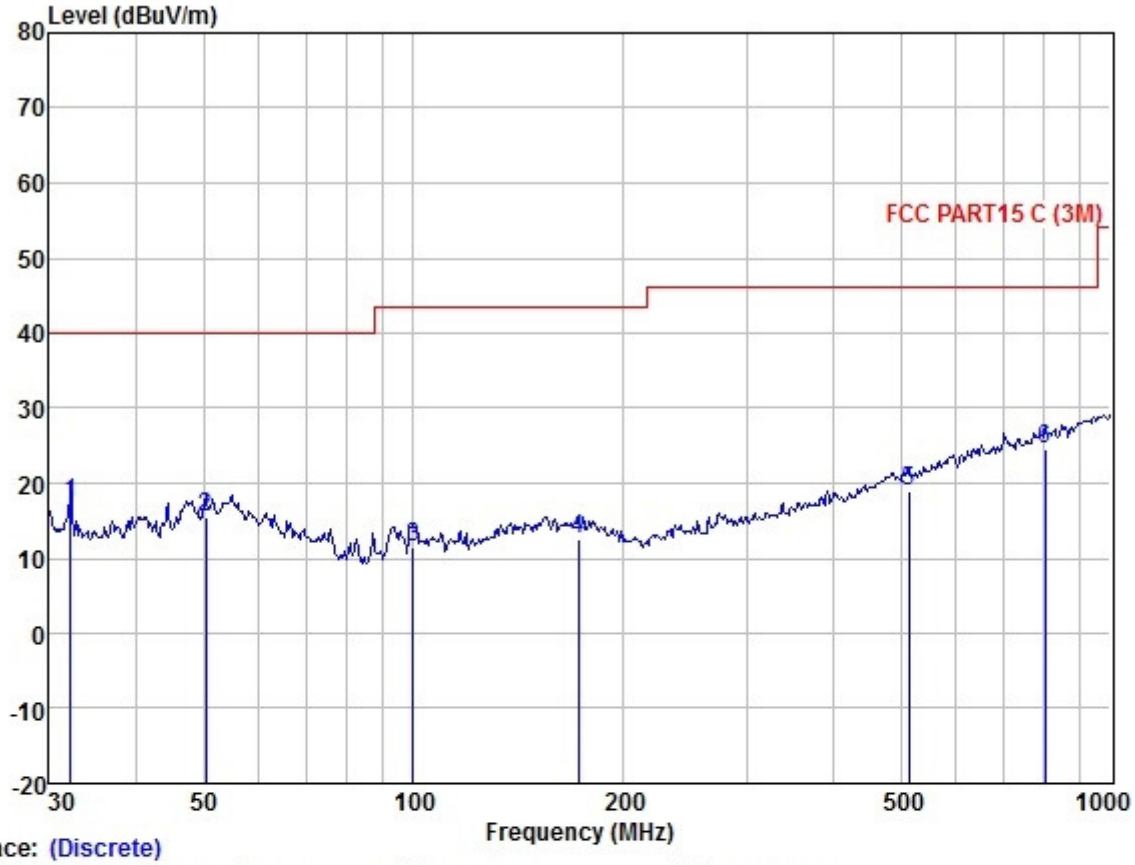
For P-TAG:



Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	32.179	29.13	14.04	0.60	26.55	17.22	40.00	-22.78	HORIZONTAL	QP
2	50.409	26.82	14.49	0.71	26.50	15.52	40.00	-24.48	HORIZONTAL	QP
3	99.878	27.55	9.20	1.10	26.40	11.45	43.50	-32.05	HORIZONTAL	QP
4	172.599	24.69	13.00	1.40	26.44	12.65	43.50	-30.85	HORIZONTAL	QP
5	513.633	25.75	18.32	2.41	27.47	19.01	46.00	-26.99	HORIZONTAL	QP
6	804.603	26.35	22.44	3.00	27.29	24.50	46.00	-21.50	HORIZONTAL	QP

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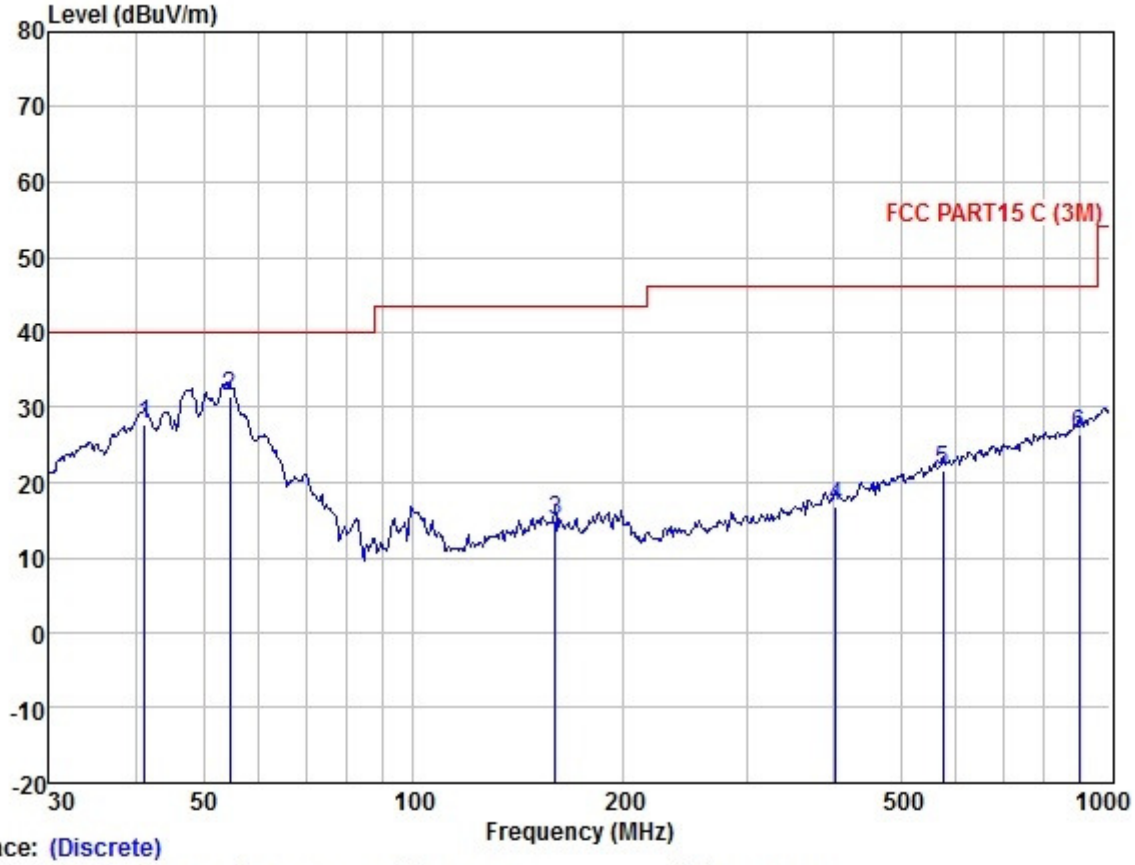

Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	41.132	39.89	13.76	0.62	26.51	27.76	40.00	-12.24	VERTICAL	QP
2	54.452	42.82	14.33	0.79	26.49	31.45	40.00	-8.55	VERTICAL	QP
3	159.784	26.34	13.70	1.33	26.44	14.93	43.50	-28.57	VERTICAL	QP
4	403.250	25.67	16.33	2.22	27.36	16.86	46.00	-29.14	VERTICAL	QP
5	574.626	26.54	19.95	2.55	27.44	21.60	46.00	-24.40	VERTICAL	QP
6	900.147	27.01	23.40	3.10	27.04	26.47	46.00	-19.53	VERTICAL	QP

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Above 960 MHz	
Test mode:	Transmitting

Transmitting with modulation Mode for HOST								
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1164MHz ≤ f ≤ 1240MHz & 1559MHz ≤ f ≤ 1610MHz								
1176.062	12.31	24.36	2.79	38.21	1.25	10	-8.75	Vertical
1193.975	10.45	24.41	2.91	38.2	-0.43	10	-10.43	Vertical
1209.94	13.1	24.48	3.09	38.19	2.48	10	-7.52	Vertical
1571.698	10.53	25.02	3.22	37.66	1.11	10	-8.89	Vertical
1585.009	11.41	25.02	3.26	37.66	2.03	10	-7.97	Vertical
1601.523	9.71	25.03	3.3	37.64	0.4	10	-9.6	Vertical
f > 960MHz (except for above frequency range)								
1271.123	11.78	24.73	2.96	38.13	1.34	20	-18.66	Vertical
1767.212	17.27	25.13	4.95	37.56	9.79	32	-22.21	Vertical
2442.751	12.92	26.52	5.13	37.41	7.16	34	-26.84	Vertical
4242.641	9.92	29.8	6.53	36.91	9.34	44	-34.66	Vertical
9641.257	7.11	37.54	8.18	37.08	15.75	44	-28.25	Vertical
14745.47	6	41.15	13.26	35.55	24.86	34	-9.14	Vertical
1164MHz ≤ f ≤ 1240MHz & 1559MHz ≤ f ≤ 1610MHz								
1175.245	12.7	24.36	2.79	38.21	1.64	10	-8.36	Horizontal
1190.582	11.83	24.4	2.89	38.2	0.92	10	-9.08	Horizontal
1211.165	13.7	24.48	3.09	38.18	3.09	10	-6.91	Horizontal
1568.918	8.86	25.02	3.22	37.67	-0.57	10	-10.57	Horizontal
1583.887	9.2	25.02	3.26	37.66	-0.18	10	-10.18	Horizontal
1604.619	9.97	25.03	3.32	37.64	0.68	10	-9.32	Horizontal
f > 960MHz (except for above frequency range)								
1304.623	12.56	24.8	2.91	38.1	2.17	20	-17.83	Horizontal
1949.701	10	25.19	8.87	37.51	6.55	32	-25.45	Horizontal
2442.751	12.33	26.52	5.13	37.41	6.57	34	-27.43	Horizontal
3834.438	9.1	29.12	7.8	36.91	9.11	44	-34.89	Horizontal
10156.14	6.37	38.24	8.97	37.1	16.48	44	-27.52	Horizontal
14450.13	6.36	42.04	11.8	35.38	24.82	34	-9.18	Horizontal

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Transmitting with modulation Mode for P-TAG								
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1164MHz ≤ f ≤ 1240MHz & 1559MHz ≤ f ≤ 1610MHz								
1174.13	13.24	24.36	2.79	38.21	2.18	10	-7.82	Vertical
1188.551	14.45	24.4	2.89	38.2	3.54	10	-6.46	Vertical
1214.848	13.34	24.49	3.15	38.18	2.8	10	-7.2	Vertical
1562.567	11.73	25.01	3.18	37.67	2.25	10	-7.75	Vertical
1570.08	13.07	25.02	3.22	37.67	3.64	10	-6.36	Vertical
1596.736	11.71	25.03	3.29	37.64	2.39	10	-7.61	Vertical
f > 960MHz (except for above frequency range)								
1084.295	11.53	24.19	2.83	38.26	0.29	20	-19.71	Vertical
1767.212	13.76	25.13	4.95	37.56	6.28	32	-25.72	Vertical
2071.708	10.49	25.33	9.87	37.49	8.2	34	-25.8	Vertical
5016.977	8.54	31.12	8.22	36.96	10.92	44	-33.08	Vertical
6490.26	8.18	34.25	7.06	36.98	12.51	54	-41.49	Vertical
10423.8	7.92	38.84	9.44	37.11	19.09	44	-24.91	Vertical
1164MHz ≤ f ≤ 1240MHz & 1559MHz ≤ f ≤ 1610MHz								
1173.981	11.59	24.35	2.76	38.21	0.49	10	-9.51	Horizontal
1203.681	11.5	24.45	2.99	38.19	0.75	10	-9.25	Horizontal
1223.561	11.17	24.55	3.31	38.18	0.85	10	-9.15	Horizontal
1565.537	12	25.02	3.2	37.67	2.55	10	-7.45	Horizontal
1581.34	12.37	25.02	3.26	37.66	2.99	10	-7.01	Horizontal
1597.404	11.49	25.03	3.29	37.64	2.17	10	-7.83	Horizontal
f > 960MHz (except for above frequency range)								
1271.123	10.97	24.73	2.96	38.13	0.53	20	-19.47	Horizontal
1746.898	18.13	25.11	4.56	37.57	10.23	32	-21.77	Horizontal
2492.677	11.45	26.59	5.09	37.39	5.74	34	-28.26	Horizontal
3958.309	8.32	29.42	7.35	36.9	8.19	44	-35.81	Horizontal
6490.789	7.22	34.25	7.06	36.98	11.55	54	-42.45	Horizontal
9152.479	7.57	36.73	8.37	37.04	15.63	44	-28.37	Horizontal

Remark:

1) Scan from 9kHz to 40GHz, the disturbance above 18GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

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7.5 Peak Power

Test Requirement	47 CFR Part 15, Subpart C 15.250 (d) (3)
Test Method:	ANSI C63.10 (2013)
Measurement Distance:	3m
Limit:	20 log(RBW/50) dBm

7.5.1 E.U.T. Operation

Operating Environment:

Temperature:	24.1	°C	Humidity:	74.1	% RH	Atmospheric Pressure:	1020	mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode for HOST.

b:Charge + TX mode_Keep the EUT in charging and continuously transmitting mode for P-TAG.

7.5.2 Test Setup Diagram

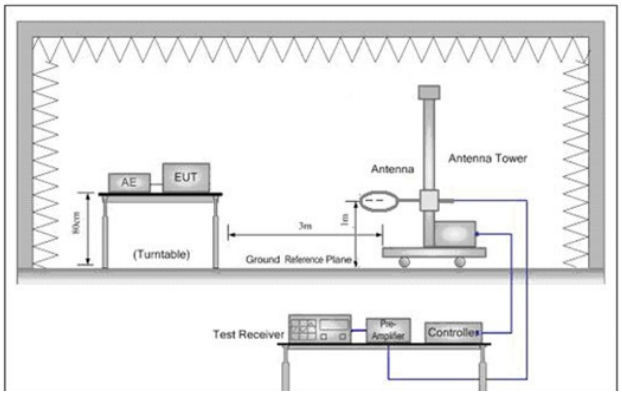

Figure 1. Below 30MHz

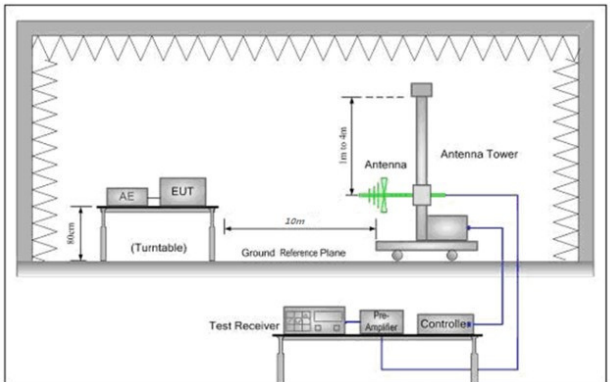

Figure 2. 30MHz to 1GHz

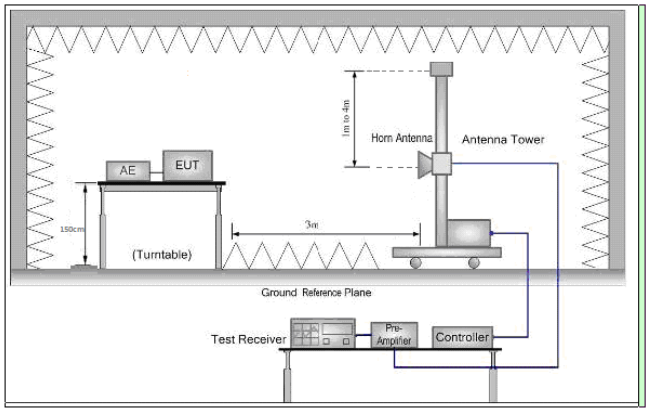

Figure 3. Above 1 GHz

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7.5.3 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. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) 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

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4) 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

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Measurement Data

Field Strength for fundamental @ RBW=10MHz for HOST						
Frequency (MHz)	**Antenna Factor (dB/m)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Read Level (dBuV)**	**Level (dBuV/m)**	**Polarization**
6488.95	34.25	7.06	36.98	74.58	78.91	Horizontal
6489.27	34.25	7.06	36.98	72.05	76.38	Vertical
Field Strength for fundamental @ RBW=10MHz for P-TAG						
Frequency (MHz)	**Antenna Factor (dB/m)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Read Level (dBuV)**	**Level (dBuV/m)**	**Polarization**
6485.55	34.25	7.06	36.98	69.85	73.54	Horizontal
6486.32	34.25	7.06	36.98	67.32	71.65	Vertical

Caculated Field Strength of fundamental @ RBW=50MHz for HOST					
Frequency (MHz)	**Measured Field Strength of fundamental (FS_M) (dBuV/m)**	**Limit (dBm)**	**Limit (dBuV/m)**	**Margin**	**Polarization**
6488.95	78.91	-13.98	81.32*	-2.41	Horizontal
6489.27	76.38	-13.98	81.32*	-4.94	Vertical
Note: EIRP limit = 20log (10MHz/50MHz) = -13.98 (dBm)					
Caculated Field Strength of fundamental @ RBW=50MHz for P-TAG					
Frequency (MHz)	**Measured Field Strength of fundamental (FS_M) (dBuV/m)**	**Limit (dBm)**	**Limit (dBuV/m)**	**Margin**	**Polarization**
6485.55	73.54	-13.98	81.32*	-7.78	Horizontal
6486.32	71.65	-13.98	81.32*	-9.67	Vertical
Note: EIRP limit = 20log (10MHz/50MHz) = -13.98 (dBm)					
*Remark: According to ANSI 63.10 Clause 10.3.9, the EIRP to field strength at a specified measurement distance of 3 m is below: E (dBuV/m) = EIRP(dBm) + 95.3					

--End of Report—

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