

TEST REPORT

OF

FCC Part 15 Subpart C §15.209
FCC ID : UVNTP2-TRUCKER-MA

Equipment Under Test : Monitor-AM
Model Name : TP2-TRUCKER-MA
Applicant : SEETRON INC.
Manufacturer : SEETRON INC.
Date of Test(s) : 2015. 07. 20 ~ 2015. 10. 25
Date of Issue : 2015. 12. 18

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

Tested By:



Jinhyoung Cho

Date:

2015. 12. 18

Approved By:



Hyunchae You

Date:

2015. 12. 18

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

-Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Telephone : + 82 31 688 0901

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1.2. Details of Applicant

Applicant : SEETRON INC.

Address : 201-403, 388 Songnae-daero, Wonmi-gu, Bucheon-si, Gyeonggi-do, 14502

Contact Person : Cho, Byoum-Youn

Phone No. : + 82 32 327 3123

1.3. Description of EUT

Kind of Product	Monitor-AM
Model Name	TP2-TRUCKER-MA
Power Supply	DC 24.0 V (Lead-acid battery)
Frequency Range	Tx : 433.92 MHz, 125 kHz Rx : 433.92 MHz
Modulation Technique	433.92 MHz : FSK 125 kHz : ASK
Number of Channels	2
Antenna Type	Ant 1 (433.92 MHz) : Dipole Antenna
	Ant 2 (125 kHz) : Helical Antenna

1.4. Declarations by the manufacturer

- The antennas of EUT cannot operate at the same time.

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1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due.
Loop Antenna	R&S	HFH2-Z2	100118	Jun. 04, 2015	Biennial	Jun. 04, 2017
Trilog Broadband Antenna	SCHWARZBECK MESS-ELEKTONIK	VULB9163	396	Jun. 18, 2015	Biennial	Jun. 18, 2017
DC power Supply	Agilent	U8002A	MY50060028	Mar. 03, 2015	Annual	Mar. 03, 2016
Test Receiver	R&S	ESU26	100109	Mar. 03, 2015	Annual	Mar. 03, 2016
Preamplifier	H.P.	8447F	2944A03909	Aug. 27, 2015	Annual	Aug. 27, 2016
Antenna Master	INN-CO	MM 4000	N/A	N.C.R.	N.C.R.	N.C.R.
Turn Device	INN-CO	DS 1200S	N/A	N.C.R.	N.C.R.	N.C.R.
Anechoic Chamber	SY Corporation	L x W x H (9.6 m x 6.4 m x 6.6 m)	N/A	N.C.R.	N.C.R.	N.C.R.

1.6. Test Report Revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL009051	2015.10.26	Initial
1	F690501/RF-RTL009051-1	2015.12.18	Revised test procedure

1.7. Summary of Test Results

The EUT has been tested according to the following specifications:

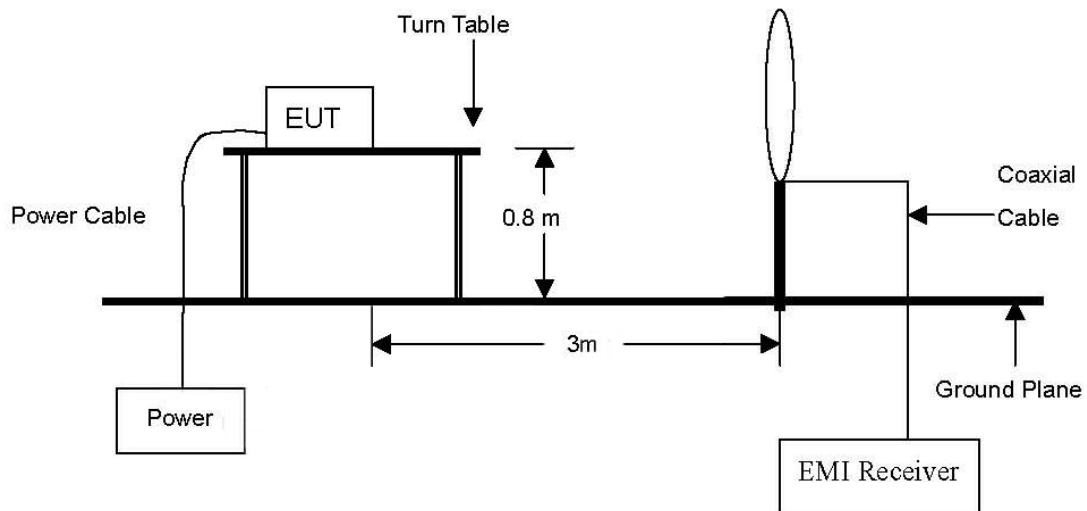
APPLIED STANDARD: FCC Part 15 Subpart C §15.209		
Section in FCC 15 Subpart C	Test Item	Result
15.209 15.209(a)	Radiated emission, Spurious Emission and Field Strength of Fundamental	Complied

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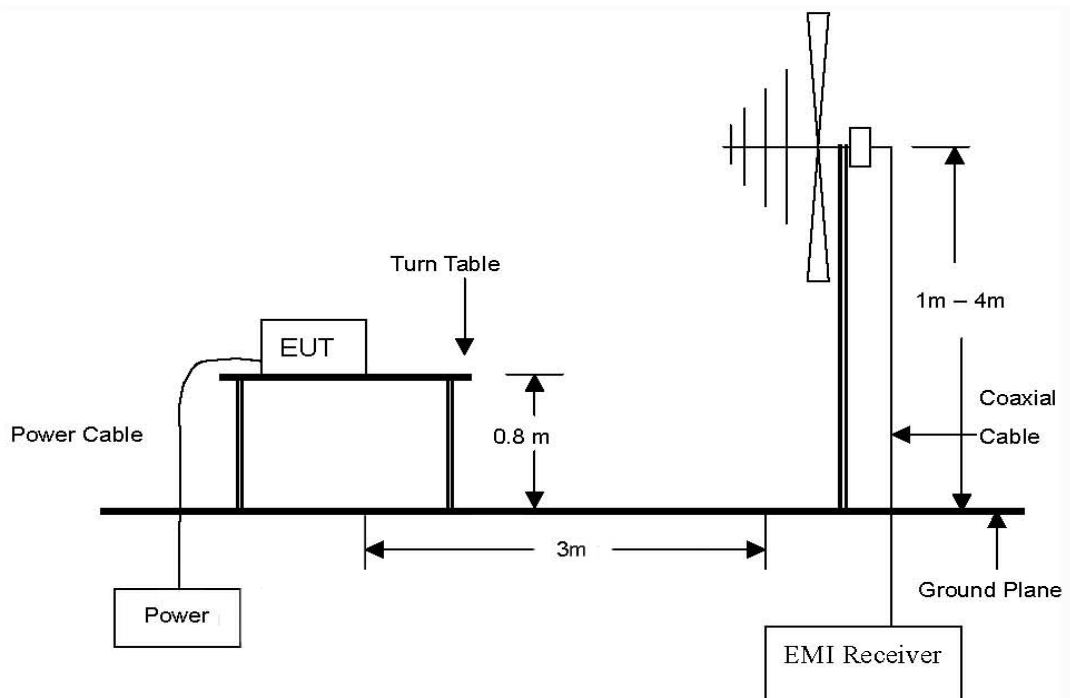
2. Field Strength of Fundamental

2.1. Test Setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



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2.2. Limit

2.2.1. Radiated emission limits, general requirements

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meter)
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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241

2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2009.

2.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to average Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note;

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 meter open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

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2.4. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on a polarization of horizontal.

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (kHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m)	Margin (dB)
125.011	47.80	Average	H	19.59	0.10	67.49	-12.51	25.67	38.18

Remark:

To get a maximum emission level from the EUT, the EUT was moved throughout the X-axis, Y-axis and Z-axis. Worst case is X-axis.

Definition of DUT for three orthogonal planes is described in the test setup photo.

Note:

- According to §15.31 (f)(2) 300 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(300/3) (dB μ V/m)
- According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9 – 90 kHz, 110 – 490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
- The limit above was calculated based on table of §15.209 (a).

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3. Spurious Emission

3.1. Test Setup

Same as section 2.1 of this report.

3.2. Limit

Same as section 2.2 of this report.

3.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2009.

3.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note;

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 meter open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

3.3.2. Test Procedures for emission from 30 MHz to 1 000 MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
- The antenna is a broadband antenna, and its 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.
- 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 table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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3.4. Test Result

Ambient temperature : (24 ± 1) °C
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

3.4.1. Spurious emission from 9 kHz to 490 kHz

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual ¹ (dB μ V/m) at 300 m	Limit (dB μ V/m)	Margin (dB)
0.021	41.70	Average	H	19.93	0.13	61.76	-18.24	41.16	59.40
0.064	33.20	Average	H	19.67	0.11	52.98	-27.02	31.48	58.50
0.086	41.70	Average	H	19.63	0.10	61.43	-18.57	28.91	47.48
0.105	38.50	Qusi-Peak	H	19.60	0.09	58.19	-21.81	27.18	48.99
0.150	32.60	Average	H	19.58	0.10	52.28	-27.72	24.08	51.80

3.4.2. Spurious emission from 490 kHz to 1.705 MHz

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual ¹ (dB μ V/m) or 30 m	Limit (dB μ V/m)	Margin (dB)
0.500	30.10	Qusi-Peak	H	19.40	0.19	49.69	9.69	33.62	23.93
0.843	26.40	Qusi-Peak	H	19.40	0.27	46.07	6.07	29.09	23.02

3.4.3. Spurious emission from 1.705 MHz to 30 MHz

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual ¹ (dB μ V/m) or 30 m	Limit (dB μ V/m)	Margin (dB)
2.543	17.40	Qusi-Peak	H	19.32	0.38	37.10	-2.90	29.54	32.44

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3.4.4. Spurious emission from 30 MHz to 1 000 MHz

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
35.25	46.69	Peak	V	13.30	-26.79	33.20	40.00	6.80
89.98	38.27	Peak	H	12.97	-26.04	25.20	43.50	18.30
90.91	44.94	Peak	V	11.58	-26.02	30.50	43.50	13.00
245.46	48.23	Peak	H	13.24	-24.37	37.10	46.02	8.92
245.46	45.28	Peak	V	13.79	-24.37	34.70	46.02	11.32
509.18	41.24	Peak	H	18.53	-24.37	35.40	46.02	10.62
Above 600.00	Not detected	-	-	-	-	-	-	-

Remark:

- To get a maximum emission level from the EUT, the EUT was moved throughout the X-axis, Y-axis and Z-axis. Worst case is Z-axis.
Definition of DUT for three orthogonal planes is described in the test setup photo.
- Radiated spurious emission measurement as below
(Actual = Reading + AF + Amp + CL)
- According to §15.31 (f)(2) 300 m Result(dBμV/m) = 3 m Result(dBμV/m) – 40log(300/3) (dBμV/m)
30 m Result(dBμV/m) = 3 m Result(dBμV/m) – 40log(30/3) (dBμV/m)
- According to field strength table of general requirement in §15.209 (a), field strength limits below 30 MHz were calculated as below.
- 9 kHz to 490 kHz : 20log(2 400 / F (kHz)) at 300 m (dBμV/m)
- 490 kHz to 1.705 MHz : 20log(24 000 / F (kHz)) at 30 m (dBμV/m)
- 1.705 MHz to 30 MHz : 20log(30) at 30 m (dBμV/m)
- According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9 – 90 kHz, 110 – 490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
- All results above 30 MHz are peak detector.

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