



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 1 of 25

TEST REPORT

Application No.: KSCR2308001517AT
FCC ID: 2AH25K2
IC: 22621-K2
Applicant: Shanghai Sunmi Technology Co.,Ltd.
Address of Applicant: Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai,China
Manufacturer: Shanghai Sunmi Technology Co.,Ltd.
Address of Manufacturer: Room 505, No.388 Song Hu Road, Yang Pu District, Shanghai,China
Equipment Under Test (EUT):
EUT Name: Self-Checkout Kiosk
Model No.: F4E00
HVIN: F4E00-A
Standard(s) : 47 CFR Part 15, Subpart C 15.209
RSS-210 issue 10 Amendment (April 2020)
RSS-Gen Issue 5 Amendment 2 (February 2021)
Date of Receipt: 2023-08-29
Date of Test: 2023-09-08 to 2023-09-15
Date of Issue: 2023-11-17

Test Result:

Pass*

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

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Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 2 of 25

Revision Record			
Version	Description	Date	Remark
00	Original	2023-11-17	/

Authorized for issue by:			
Tested By		Damon Zhou	
		Damon_Zhou/Project Engineer	
Approved By		Terry Hou	
		Terry Hou /Reviewer	



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 3 of 25

2 Test Summary

Radio Spectrum Technical Requirement				
Item	FCC Requirement	IC Requirement	Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.209	N/A	RSS-210 Issue 10 Amendment (April 2020)	Customer Declaration

Radio Spectrum Matter Part				
Item	FCC Requirement	IC Requirement	Method	Result
20dB Bandwidth	47 CFR Part 15, Subpart C 15.209	RSS-210 Issue 10 Amendment (April 2020)	ANSI C63.10 (2013) Section 6.9.2	Pass
Radiated Emissions (9kHz-30MHz)	47 CFR Part 15, Subpart C 15.209	RSS-210 Issue 10 Amendment (April 2020)	ANSI C63.10 (2013) Section 6.4	Pass
Radiated Emissions (30MHz-1GHz)	47 CFR Part 15, Subpart C 15.209	RSS-210 Issue 10 Amendment (April 2020)	ANSI C63.10 (2013) Section 6.5	Pass
Conducted Emissions at AC Mains Power Port (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.209	RSS-210 Issue 10 Amendment (April 2020)	ANSI C63.10 (2013) Section 6.2	Pass
99% Bandwidth	47 CFR Part 15, Subpart C 15.209	RSS-210 Issue 10 Amendment (April 2020)	RSS-Gen Issue 5 Section 6.7	Pass

3 Contents

	Page
1 COVER PAGE.....	1
2 Test Summary	3
3 Contents	4
4 General Information	5
4.1 Details of E.U.T.....	5
4.2 Description of Support Units	5
4.3 Measurement Uncertainty.....	5
4.4 Test Location	6
4.5 Test Facility.....	6
4.6 Deviation from Standards	6
4.7 Abnormalities from Standard Conditions	6
5 Equipment List.....	7
6 Radio Spectrum Technical Requirement	8
6.1 Antenna Requirement	8
7 Radio Spectrum Matter Test Results.....	9
7.1 20dB Bandwidth.....	9
7.2 Radiated Emissions (9kHz-30MHz).....	10
7.3 Radiated Emissions (30MHz-1GHz).....	12
7.4 Conducted Emissions at AC Mains Power Port (150kHz-30MHz)	14
7.5 99% Bandwidth	18
8 Test Setup Photo	19
9 EUT Constructional Details (EUT Photos)	19
10 Appendix	20
10.1 20dB Bandwidth.....	20
10.2 Radiated Emissions(9kHz-30MHz).....	22
10.3 Below 1GHz	24

4 General Information

4.1 Details of E.U.T.

Power supply:	AC 100-120V,1.5A,50/60Hz
Antenna Type:	Loop Antenna
Modulation Type:	ASK
Number of Channels:	1
Operation Frequency:	125KHz
Serial Number:	K217232800030
Firmware Version:	1.5.3

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

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	5.2dB (Below 1GHz) 5.9dB (Above 1GHz)
9	Radiated Spurious Emission Test	4.2dB (Below 30MHz) 4.5dB (30MHz-1GHz) 5.1dB (1GHz-18GHz) 5.4dB (Above 18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.4 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

1. SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).
2. SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).
3. Sample source: sent by customer.

4.5 Test Facility

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

- **A2LA**

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

- **FCC**

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

- **ISED**

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

- **VCCI**

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 7 of 25

5 Equipment List

Item	Equipment	Manufacturer	Model	Inventory No	Cal Date	Cal. Due Date
Conducted Emission at Mains Terminals (150kHz-30MHz)						
1	EMI Test Receive	R&S	ESCI	KS301101	02/03/2023	02/02/2024
2	LISN	R&S	ENV216	KS301197	01/17/2023	01/16/2024
3	LISN	Schwarzbeck	NNLK 8129	KS301091	01/17/2023	01/16/2024
4	Pulse Limiter	R&S	ESH3-Z2	KUS1902E001	01/17/2023	01/16/2024
5	CE test Cable	Thermax	/	CZ301102	01/17/2023	01/16/2024
6	Test Software	Farad	EZ-EMC	/	N.C.R	N.C.R
RF Conducted Test						
1	Spectrum Analyzer	Keysight	N9020A	KUS1911E004-2	08/24/2023	08/23/2024
2	Spectrum Analyzer	Keysight	N9020A	KUS2001M001-2	08/24/2023	08/23/2024
3	Spectrum Analyzer	Keysight	N9030B	KSEM021-1	02/03/2023	02/02/2024
4	Signal Generator	R&S	SMBV100B	KSEM032	03/16/2023	03/15/2024
5	Signal Generator	R&S	SMW200A	KSEM020-1	08/24/2023	08/23/2024
6	Signal Generator	Agilent	N5182A	KUS2001M001-1	08/24/2023	08/23/2024
7	Radio Communication Test Station	Anritsu	MT8000A	KSEM001-1	08/24/2023	08/23/2024
8	Radio Communication Analyzer	Anritsu	MT8821C	KSEM002-1	03/16/2023	03/15/2024
9	Universal Radio Communication Tester	R&S	CMW500	KUS1911E004-1	08/24/2023	08/23/2024
10	Switcher	CCSRF	FY562	KUS2001M001-3	08/24/2023	08/23/2024
11	AC Power Source	EXTECH	6605	KS301178	N.C.R	N.C.R
12	DC Power Supply	Aglient	E3632A	KS301180	N.C.R	N.C.R
13	Conducted Test Cable	Thermax	RF01-RF04	CZ301111-CZ301120	02/03/2023	02/02/2024
14	Temp. / Humidity Chamber	TERCHY	MHK-120AK	KS301190	08/24/2023	08/23/2024
15	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-5	03/22/2023	03/21/2024
16	Software	BST	TST-PASS	/	N/A	N/A
17	Spectrum Analyzer	R&S	FSV40	KUS1806E003	08/24/2023	08/23/2024
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	KUS1806E003	08/24/2023	08/23/2024
2	Universal Radio Communication Tester	R&S	CMW500	KSEM009-1	03/16/2023	03/15/2024
3	Signal Generator	Agilent	E8257C	KS301066	08/24/2023	08/23/2024
4	Loop Antenna	COM-POWER	AL-130R	KUS1806E001	03/18/2023	03/17/2025
5	Bilog Antenna	TESEQ	CBL 6112D	KUS1806E005	06/29/2023	06/28/2025
6	Bilog Antenna	SCHWARZBECK	VULB9160	CZ301016	04/13/2021	04/12/2024
7	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	KS301079	08/24/2023	08/23/2024
8	Horn-antenna(1-18GHz)	ETS-LINDGREN	3117	KS301186	02/21/2023	02/20/2024
9	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	CZ301058	02/26/2023	02/25/2024
10	Amplifier(30MHz~18GHz)	PANSHAN TECHNOLOGY	LNA:1~18G	KSEM010-1	01/17/2023	01/16/2024
11	Amplifier(18~40GHz)	COM-POWER	PAM-840A	KUS1710E001	01/21/2023	01/20/2024
12	RE Test Cable	REBES MICROWAVE	/	CZ301097	08/24/2023	08/23/2024
13	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-4	03/22/2023	03/21/2024
14	Software	ESE	E3	/	N/A	N/A
15	Software	Faratronic	EZ EMC-v 3A1	/	N/A	N/A

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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an 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 Loop Antenna and no consideration of replacement.

Antenna location: Refer to Appendix (Internal Photos)

7 Radio Spectrum Matter Test Results

7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215
 Test Method: ANSI C63.10 (2013) Section 6.9.2
 Measurement Distance: 3m

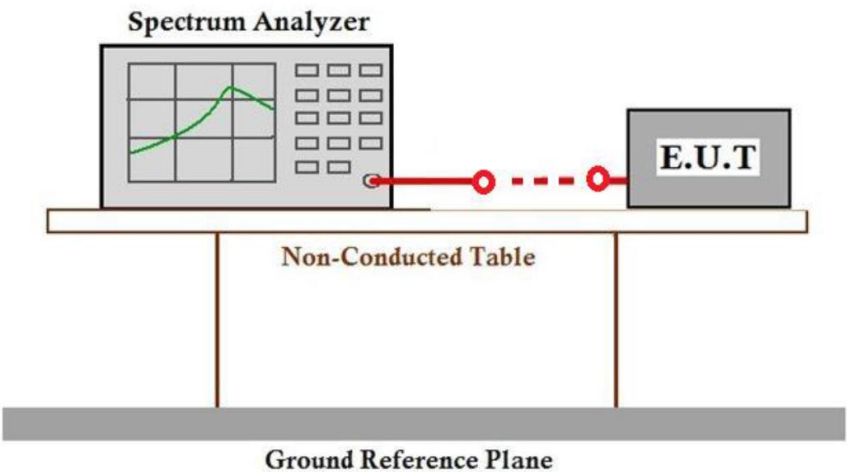
7.1.1 E.U.T. Operation

Operating Environment:
 Temperature: 24 °C Humidity: 48 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	08	TX mode with modulation

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Please Refer to Appendix for Details

Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 10 of 25

7.2 Radiated Emissions (9kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4

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

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. 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.

If field strength is measured at only a single point, then that point shall be at the radial from the EUT that produces the maximum emission at the frequency being measured, as described in 5.4. If that point is closer to the EUT than $\lambda/2\pi$ and the limit distance is greater than $\lambda/2\pi$, the measurement shall be extrapolated to the limit distance by conservatively presuming that the field strength decreases at a 40 dB/decade of distance rate to the $\lambda/2\pi$ distance, and at a 20 dB/decade of distance rate beyond $\lambda/2\pi$. This shall be accomplished using Equation (2):

$$FS_{(10m)} = FS_{(30/300m)} + 40\log\{d_{(near\ field)}/d_{(10m)}\} + 20\log\{d_{(30/300m)}/d_{(near\ field)}\} \quad (2)$$

If the single point measured is at a distance greater than $\lambda/2\pi$, then extrapolation to the limit distance shall be calculated using Equation (3):

$$FS_{(10m)} = FS_{(30/300m)} + 20\log\{d_{(30/300m)}/d_{(10m)}\} \quad (3)$$

If both the single point and the limit distance are equal to or closer to the EUT than $\lambda/2\pi$, then extrapolation to the limit distance shall be calculated using Equation (4):

$$FS_{(10m)} = FS_{(30/300m)} + 40\log\{d_{(30/300m)}/d_{(10m)}\} \quad (4)$$

Remark:

$$d_{near\ field} = 47.77 / f_{MHz}$$

where f_{MHz} is the frequency of the emission being measured in MHz.

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C

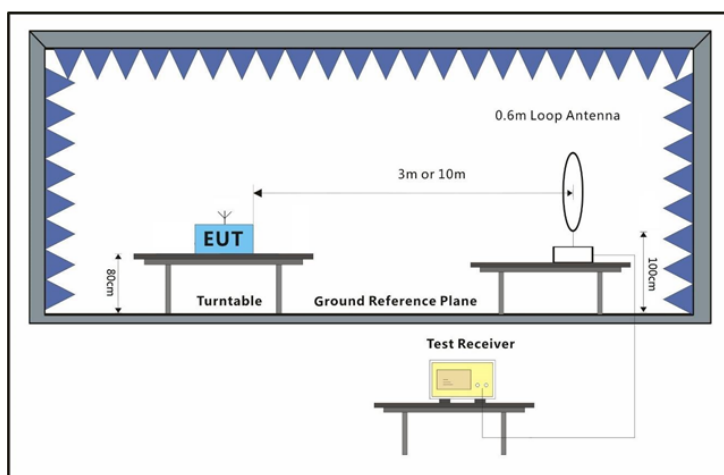
Humidity: 48 % RH

Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	08	TX mode with modulation

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

- All radiated emission measurements in terms of magnetic field strength shall be performed with a shielded loop antenna.
- For all radiated emission measurements in terms of magnetic field strength, the loop antenna were placed such that:
 - its centre shall be at 1.3 m height above the ground plane;
 - the projection of its centre onto the ground plane shall be at the specified measurement distance from the projection on the ground plane of the closest point on the boundary of the equipment under test (EUT); and
 - measurements shall be performed with the loop antenna placed vertically, in turn, in two polarizations (the measurement axis specified below is the line segment connecting the projections on the ground plane of the centre of the loop antenna and the centre of the EUT arrangement):
 - coaxial (loop plane perpendicular to the ground plane and to the measurement axis); and
 - coplanar (loop plane perpendicular to the ground plane and coplanar with the measurement axis).

Please Refer to Appendix for Details

7.3 Radiated Emissions (30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

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

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
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.

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C

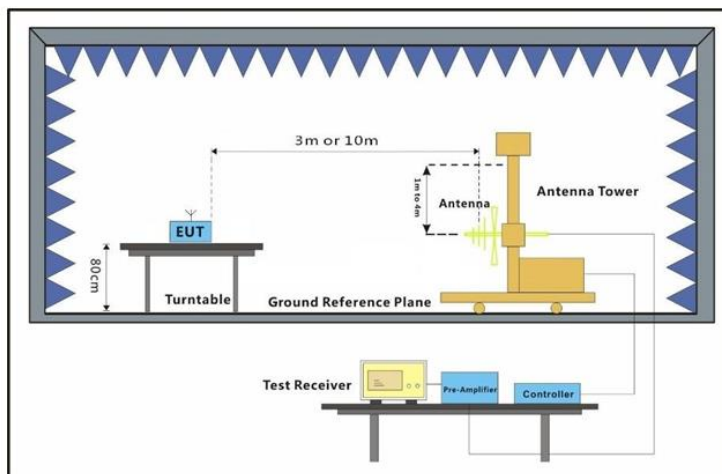
Humidity: 48 % RH

Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	08	TX mode with modulation

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. 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.
- 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 (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.
- 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. Test the EUT in the lowest channel,the middle channel,the Highest channel
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case.
- i. Repeat above procedures until all frequencies measured was complete.

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

Please Refer to Appendix for Details

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

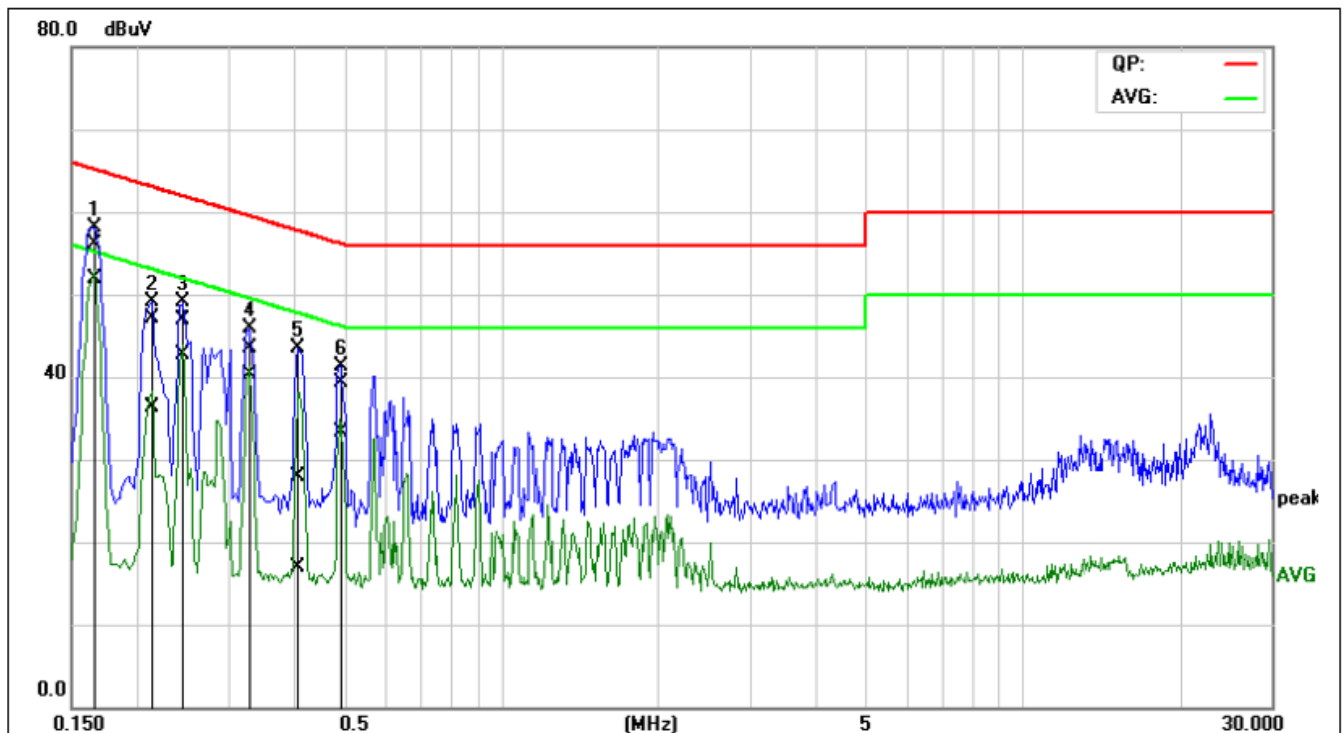
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 16 of 25

Test Mode: 08; Line: Live line



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1660	36.06	31.67	20.14	56.20	51.81	65.15	55.16	-8.95	-3.35	Pass
2	0.2140	27.00	16.27	20.02	47.02	36.29	63.04	53.05	-16.02	-16.76	Pass
3	0.2460	26.97	22.77	20.03	47.00	42.80	61.89	51.89	-14.89	-9.09	Pass
4	0.3300	23.55	20.24	20.03	43.58	40.27	59.45	49.45	-15.87	-9.18	Pass
5	0.4100	7.80	-3.17	20.04	27.84	16.87	57.65	47.65	-29.81	-30.78	Pass
6	0.4940	19.29	13.23	20.06	39.35	33.29	56.10	46.10	-16.75	-12.81	Pass

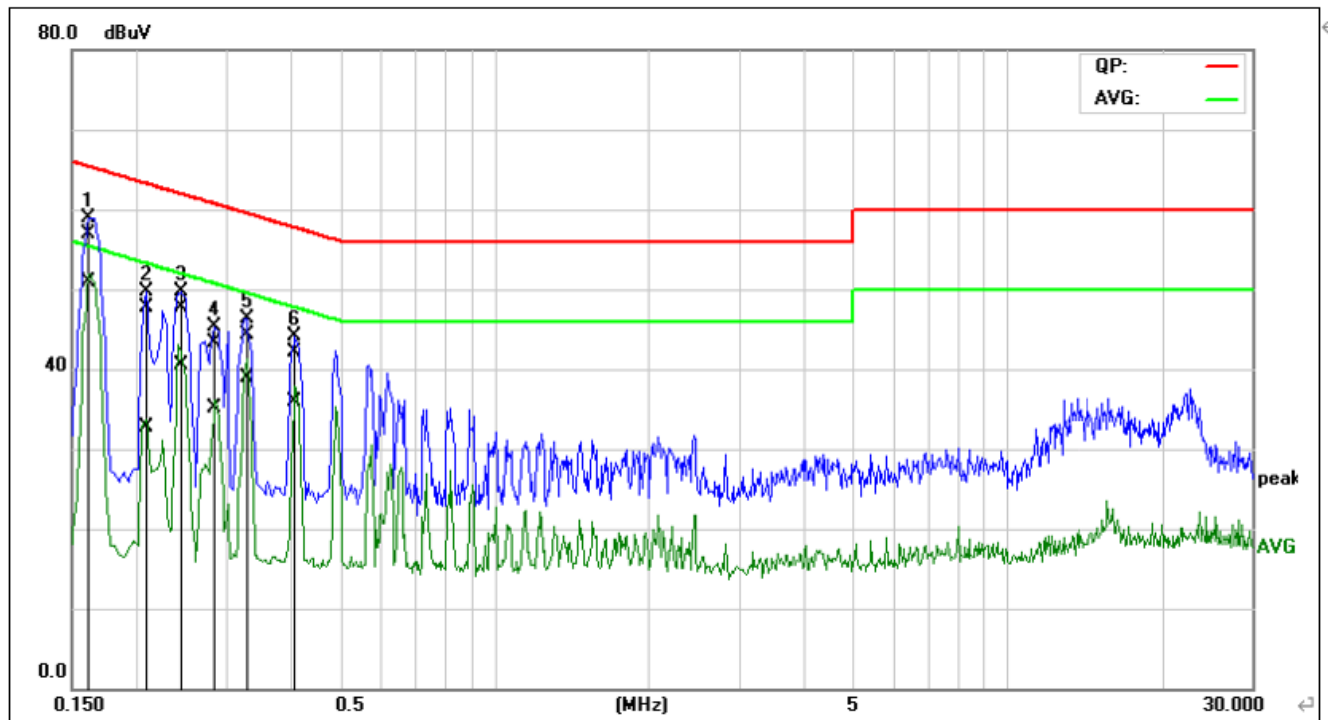
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 17 of 25

Test Mode: 08; Line: Neutral Line



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.1620	36.75	30.74	20.23	56.98	50.97	65.36	55.36	-8.38	-4.39	Pass
2	0.2100	27.65	12.64	20.14	47.79	32.78	63.20	53.21	-15.41	-20.43	Pass
3	0.2460	27.49	20.38	20.15	47.64	40.53	61.89	51.89	-14.25	-11.36	Pass
4	0.2860	23.17	15.02	20.15	43.32	35.17	60.64	50.64	-17.32	-15.47	Pass
5	0.3260	24.09	18.73	20.14	44.23	38.87	59.55	49.55	-15.32	-10.68	Pass
6	0.4100	22.03	15.78	20.10	42.13	35.88	57.65	47.65	-15.52	-11.77	Pass

7.5 99% Bandwidth

Test Requirement RSS-Gen Issue 5 Section 6.7
 Test Method: RSS-Gen Issue 5 Section 6.7
 Measurement Distance: 3m

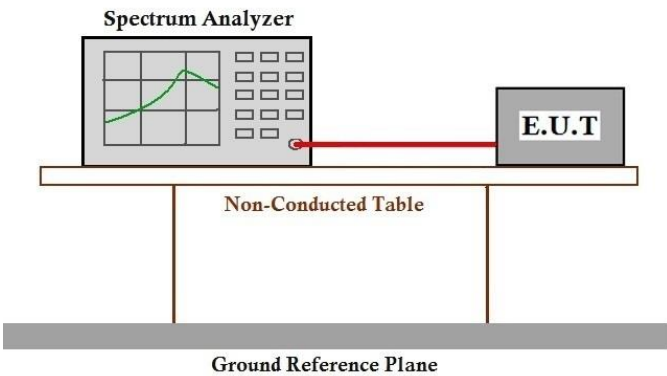
7.5.1 E.U.T. Operation

Operating Environment:
 Temperature: 24 °C Humidity: 48 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	08	TX mode with modulation

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer to Appendix for Details



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 19 of 25

8 Test Setup Photo

Refer to Appendix - Test Setup Photo for KSCR2308001517AT

9 EUT Constructional Details (EUT Photos)

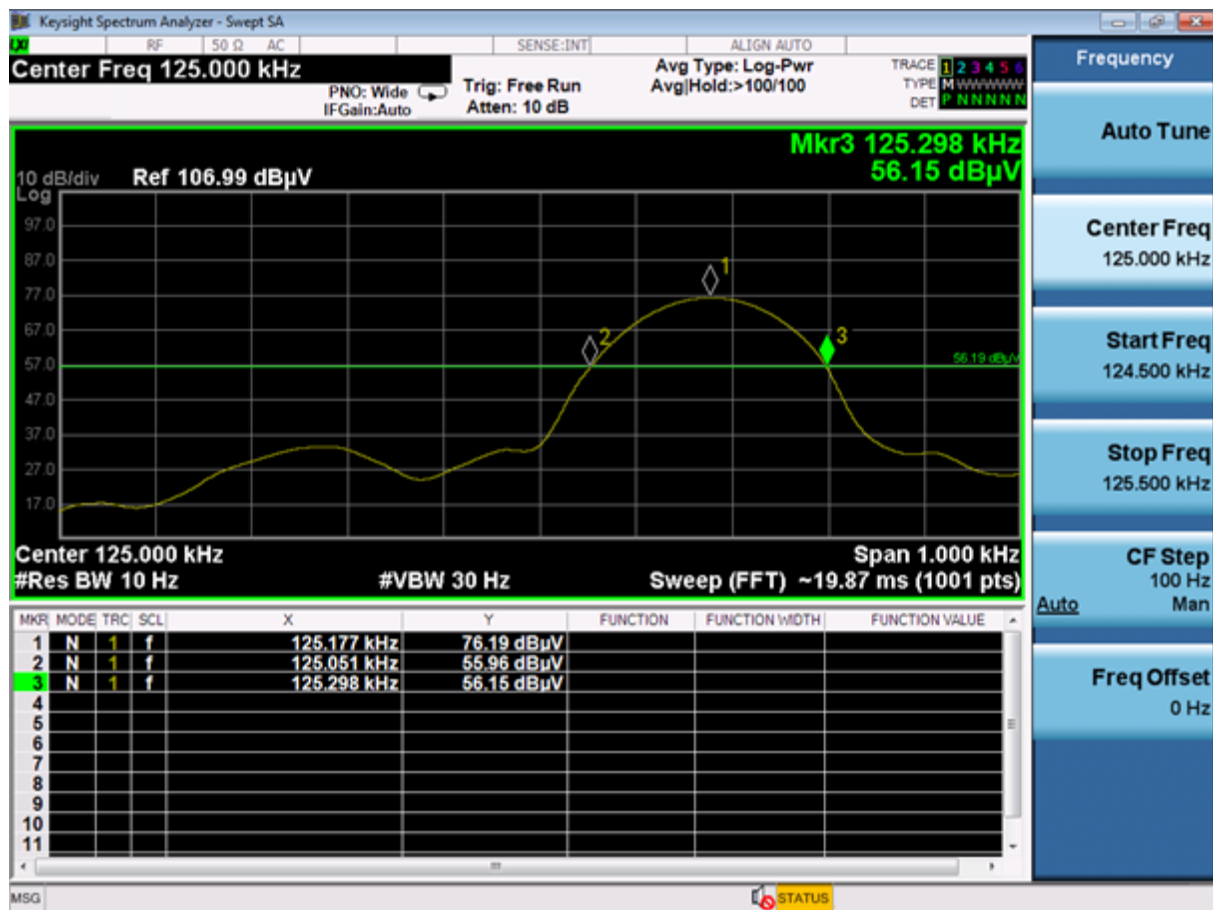
Refer to Appendix - Photographs of EUT Constructional Details for KSCR2308001517AT

10 Appendix

10.1 20dB Bandwidth

20dB bandwidth (Hz)	Result
247.0	Pass

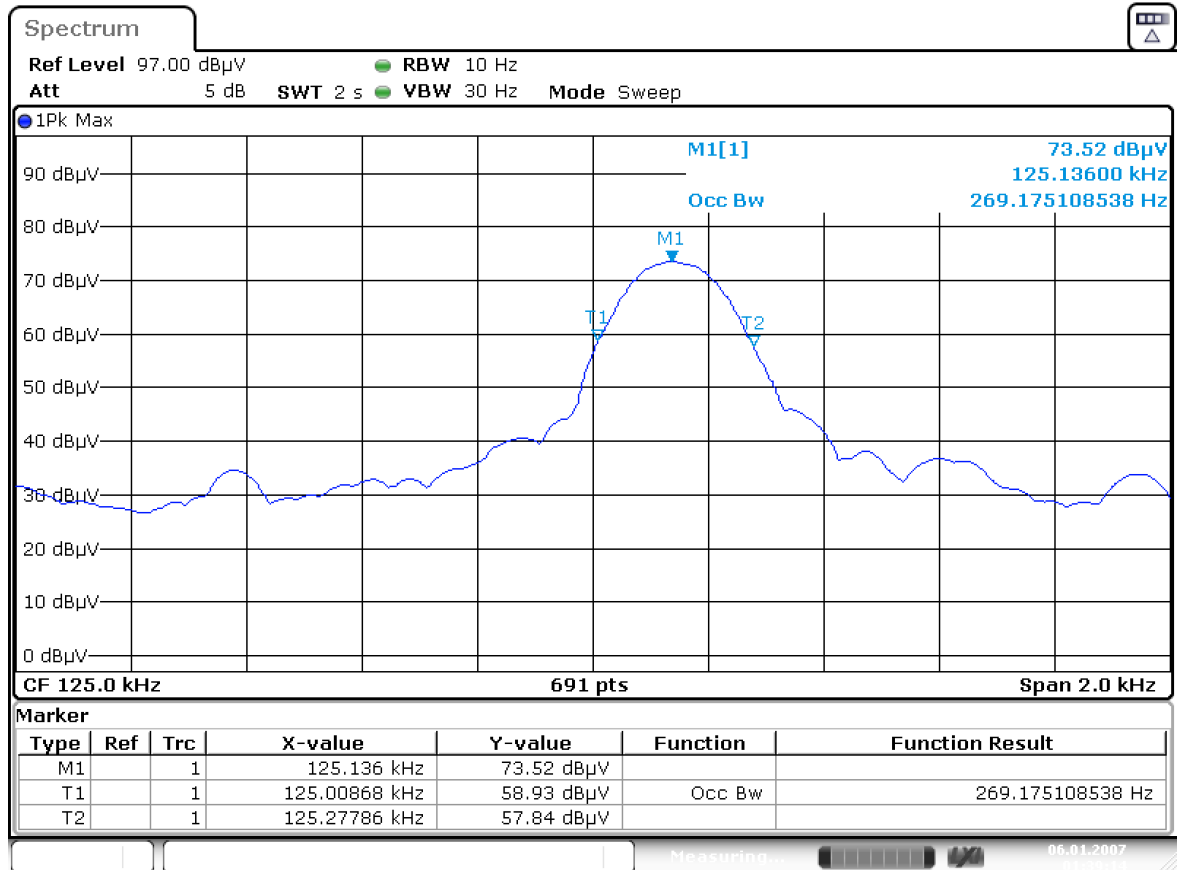
Test plot as follows:



10.2 99% Bandwidth

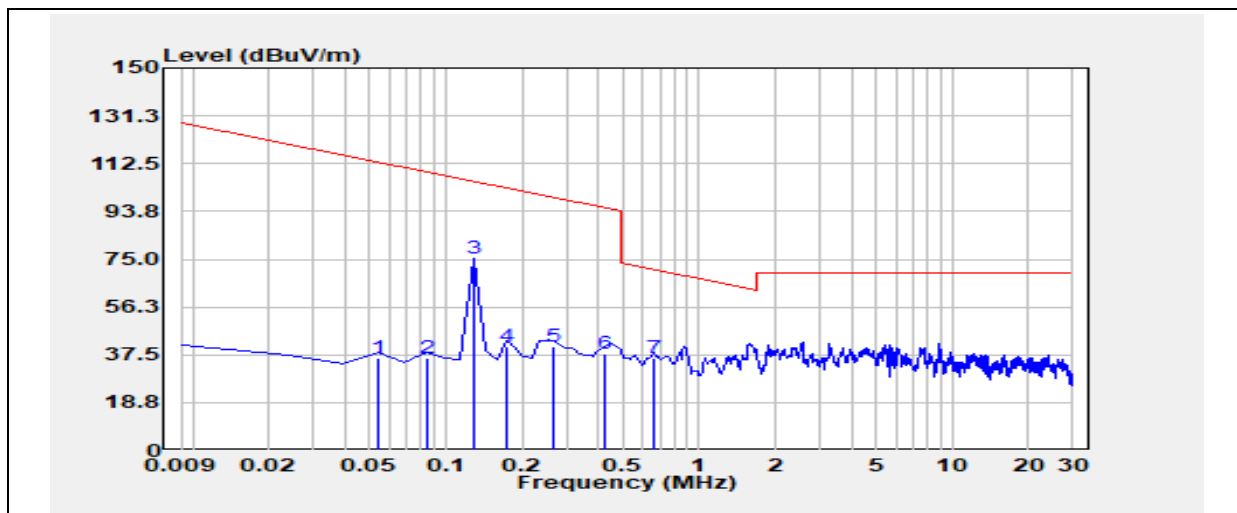
Frequency (kHz)	99% bandwidth (kHz)
125.0	0.2692

Test plot as follows:



10.3 Radiated Emissions(9kHz-30MHz)

Coaxial



Item	Freq.	Read Level	Correct Factor	Result Level@3m	Result Level@SP EC	Limit Line@SPE C	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.054	21.70	14.44	36.14	-43.86	32.95	-76.81	QP
2	0.084	21.61	14.44	36.05	-43.95	29.11	-73.06	QP
3	0.125	60.99	14.45	75.44	-4.56	25.39	-29.95	Peak
4	0.174	26.57	14.44	41.01	-38.99	22.79	-61.78	QP
5	0.264	26.38	14.44	40.82	-39.18	19.17	-58.35	QP
6	0.429	23.42	14.42	37.84	-42.16	14.96	-57.12	QP
7	0.669	21.69	14.48	36.17	-3.83	31.11	-34.94	QP

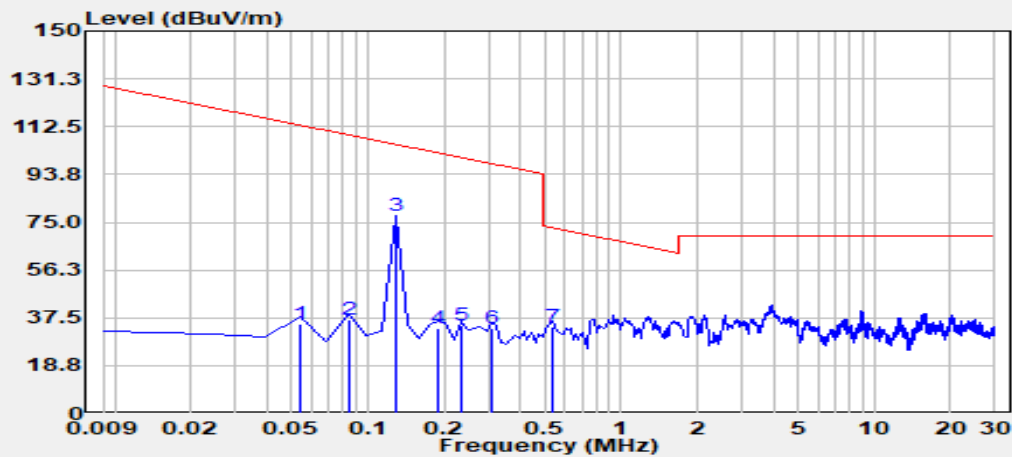
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 23 of 25

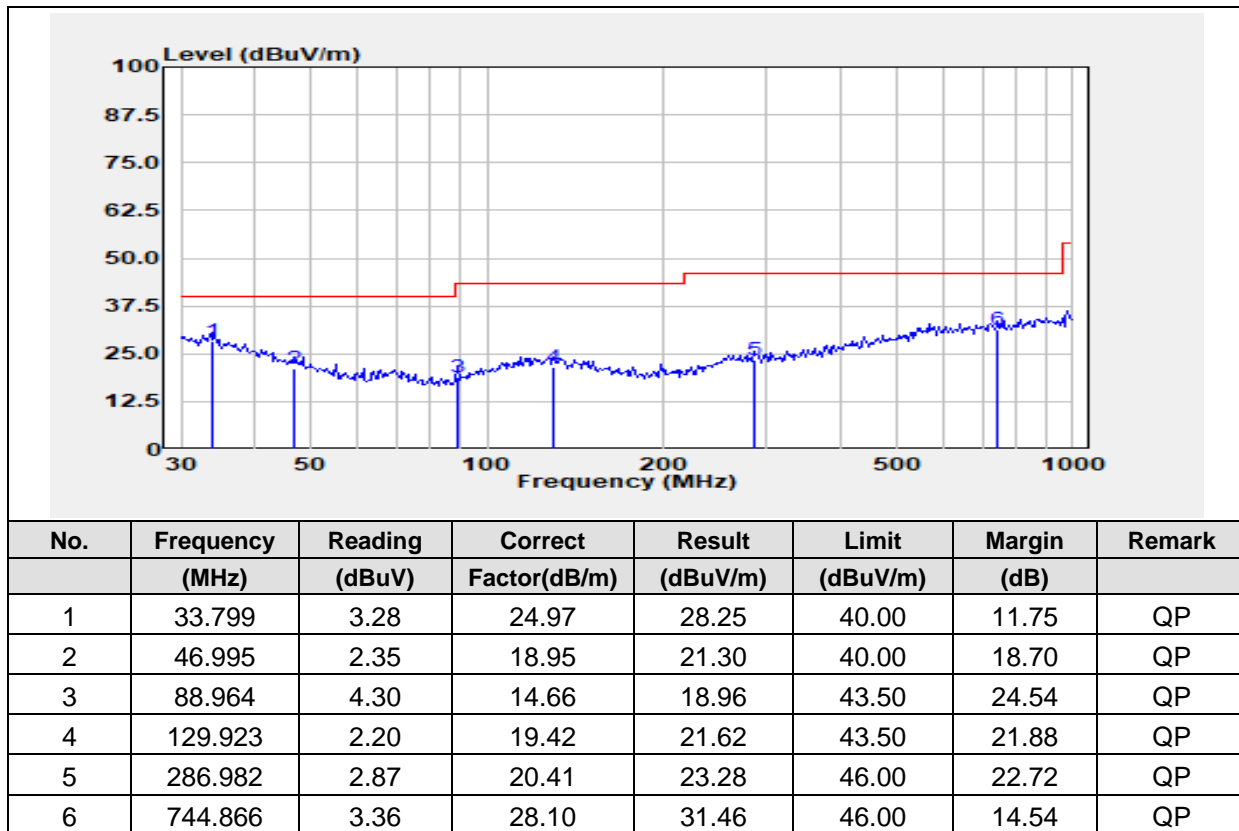
Coplanar



Item	Freq.	Read Level	Correct Factor	Result Level@3m	Result Level@SPEC	Limit Line@SPEC	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.054	20.52	14.44	34.96	-45.04	32.95	-77.99	QP
2	0.084	22.28	14.44	36.72	-43.28	29.11	-72.39	QP
3	0.125	63.11	14.45	77.56	-2.44	25.39	-27.83	Peak
4	0.189	18.77	14.43	33.20	-46.8	22.07	-68.87	QP
5	0.234	19.91	14.43	34.34	-45.66	20.22	-65.88	QP
6	0.309	18.91	14.44	33.35	-46.65	17.81	-64.46	QP
7	0.534	19.28	14.45	33.73	-6.27	33.06	-39.33	QP

10.4 Below 1GHz

Horizontal



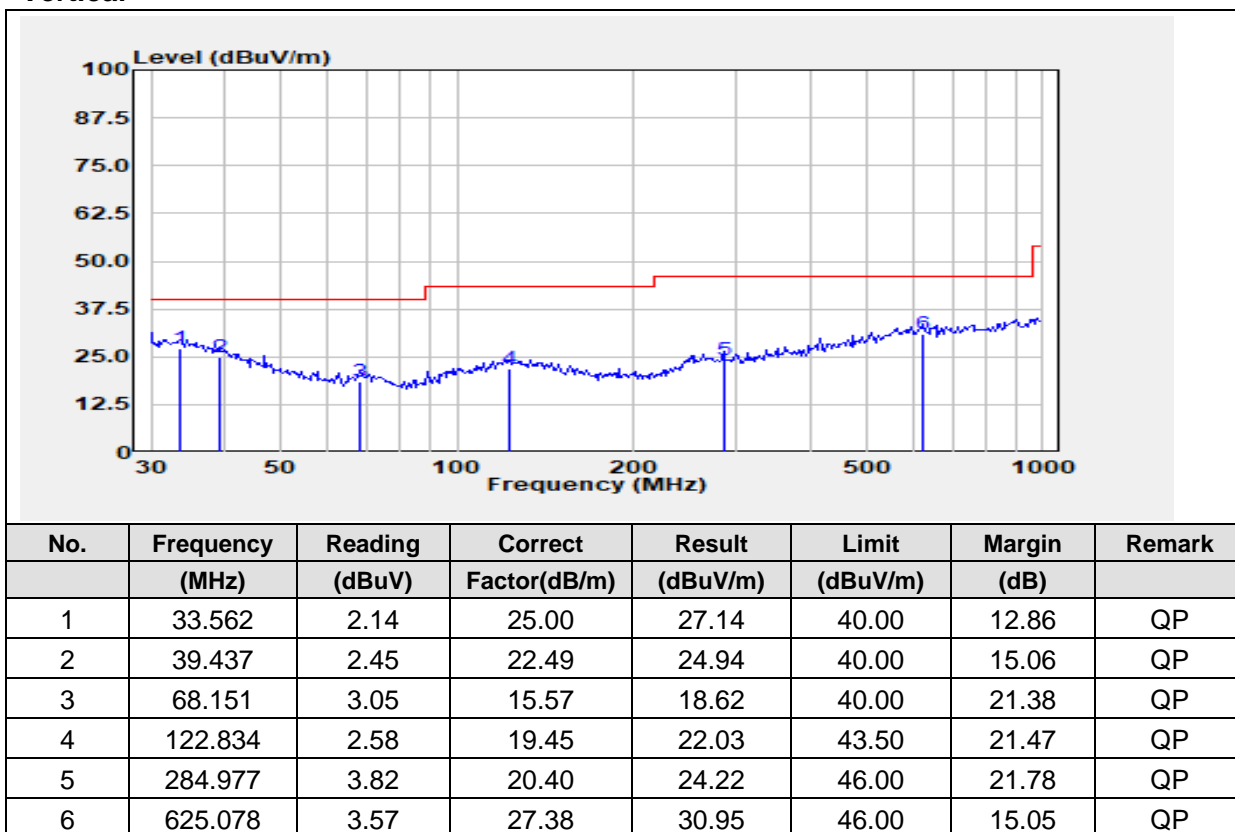
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR230800151706

Page: 25 of 25

Vertical



- End of the Report -