TEST REPORT

KCTL KCTL Inc.
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Suwon-si, Gyeonggi-do, 16677, Korea
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KCTL

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2020-04-24

2. Use of Report : Certification

3. Name of Product / Model : Tablet PC / SM-T976B

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam

5. FCC ID : A3LSMT976B

6. Date of Test : 2020-05-09 to 2020-06-22

7. Location of Test : ■ Permanent Testing Lab □ On Site Testing (Address: Address of testing location)

8. Test method used : FCC Part 15 Subpart C, 15.209

9. Test Results : Refer to the test result in the test report

Affirmation	Tested by Name : Taeyoung Kim (Signature)	Technical Manager Name : Seungyong Kim (Signature)

2020-07-02

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2020-06-24	Originally issued	-
2020-07-02	Updated	4,5

Note. The report No. KR20-SRF0156 is superseded by the report No. KR20-SRF0156-A.

General remarks for test reports

Nothing significant to report.

CONTENTS

1. General information

Client	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory	:	Samsung Electronics Vietnam Thai Nguyen Co., Ltd
Address	:	Yen binh Industrial Zone Pho Ten Dist., Thai Nguyen Province, Vietnam
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056 Industry Canada Registration No. : 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Tablet PC
Model	:	SM-T976B
Modulation technique	:	Bluetooth(BDR/EDR)_ GFSK, π/4DQPSK, 8DPSK Bluetooth(BLE)_GFSK WIFI(802.11a/b/g/n/ac/ax)_DSSS, OFDM, OFDMA WPT_AM LTE_QPSK, 16QAM, 64QAM, 256QAM WCDMA_QPSK GSM_GMSK, 8-PSK
Number of channels	:	Bluetooth(BDR/EDR)_79 ch / Bluetooth(BLE)_40 ch 802.11b/g/n/ac/ax_HT20/VHT20/HE20 : 13 ch UNII-1: 4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒) UNII-2A: 4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒) UNII-2C: 12 ch (20 ㎒), 6 ch (40 ㎒), 3 ch (80 ㎒) UNII-3: 5 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒) WPT_1 ch
Power source	:	DC 3.86 Ⅴ
Antenna specification	:	LTE/WCDMA_Metal Antenna WIFI/Bluetooth(BDR/EDR/BLE)_ Metal Antenna Loop Coil Antenna_Flat type (WPT)
Antenna gain	:	WIFI/Bluetooth(BDR/EDR/BLE)_ ANT 1 : -5.71 ㏈i, ANT 2 : -6.52 ㏈i UNII-1 ANT 1 : -8.45 ㏈i, ANT 2 : -8.84 ㏈i UNII-2A ANT 1 : -6.15 ㏈i, ANT 2 : -8.46 ㏈i

		UNII-2C ANT 1 : -6.05 dBi, ANT 2 : -8.57 dBi
		UNII-3 ANT 1 : -8.65 dBi, ANT 2 : -7.70 dBi
Frequency range	:	Bluetooth(BDR/EDR/BLE)_2 402 ㎒ ~ 2 480 ㎒
		2 412 ㎒ ~ 2 472 ㎒ (802.11b/g/n/ac/ax_HT20/VHT20/HE20)
		UNII-1: 5 180 ㎒ ~ 5 240 ㎒ (802.11a/n/ac/ax_HT20/VHT20/HE20)
		UNII-1: 5 190 ㎒ ~ 5 230 ㎒ (802.11n/ac/ax_HT40/VHT40/HE40)
		UNII-1: 5 210 ㎒ (802.11ac/ax_VHT80/HE80)
		UNII-2A: 5 260 ㎒ ~ 5 320 ㎒ (802.11a/n/ac/ax_HT20/VHT20/HE20)
		UNII-2A: 5 270 ㎒ ~ 5 310 ㎒ (802.11n/ac/ax_HT40/VHT40/HE40)
		UNII-2A: 5 290 ㎒ (802.11ac/ax_VHT80/HE80)
		UNII-2C: 5 500 ㎒ ~ 5 720 ㎒ (802.11a/n/ac/ax_HT20/VHT20/HE20)
		UNII-2C: 5 510 ㎒ ~ 5 710 ㎒ (802.11n/ac/ax_HT40/VHT40/HE40)
		UNII-2C: 5 530 ㎒ ~ 5 690 ㎒ (802.11ac/ax_VHT80/HE80)
		UNII-3: 5 745 ㎒ ~ 5 825 ㎒ (802.11a/n/ac/ax_HT20/VHT20/HE20)
		UNII-3: 5 755 ㎒ ~ 5 795 ㎒ (802.11n/ac/ax_HT40/VHT40/HE40)
		UNII-3: 5 775 ㎒ (802.11ac/ax_VHT80/HE80)
		LTE Band 2_1 850.7 ㎒ ~ 1909.3 ㎒
		LTE Band 4_1 710.7 ㎒ ~ 1754.3 ㎒
		LTE Band 5_824.7 ㎒ ~ 848.3 ㎒
		LTE Band 12_699.7 ㎒ ~ 715.3 ㎒
		LTE Band 13_779.5 ㎒ ~ 784.5 ㎒
		LTE Band 25_1850.7 ㎒ ~ 1914.3 ㎒
		LTE Band 26_824.7 ㎒ ~ 848.3 ㎒, 814.7 ㎒ ~ 824.0 ㎒
		LTE Band 41_2 498.5 ㎒ ~ 2 687.5 ㎒
		LTE Band 66_1 710.7 ㎒ ~ 1779.3 ㎒
		GSM 850_824.2 ㎒ ~ 848.8 ㎒
		GSM 1900_1 850.2 ㎒ ~ 1 909.8 ㎒
		WCDMA 850_826.4 ㎒ ~ 846.6 ㎒
		WCDMA 1700_1 712.4 ㎒ ~ 1752.6 ㎒
		WCDMA 1900_1 852.4 ㎒ ~ 1907.6 ㎒
		WPT_530 ㎑ ~ 600 ㎑
Software version	:	T976B.001
Hardware version	:	REV0.4
Test device serial No.	:	R32N4005MLN
Operation temperature	:	-30 ℃ ~ 50 ℃

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source	FCC ID
Travel Adapter	Samsung Electronics Co., Ltd	EP-TA800	-	Input : 100-240V, 50-60㎐ Output : (PDO) 5.0V, 3A or 9.0V, 2.77A (PPS) 3.3-5.9V, 3A or 3.3-11.0V, 2.25A	-
Data Cable	Samsung Electronics Co., Ltd	EP-DT725BBE	-	-	-
Stylus Pen	Samsung Electronics Co., Ltd	EJ-PT870	-	DC 2.75 Ⅴ	A3LEJPT870
Earphone	Samsung Electronics Co., Ltd	EHS64	-	-	-
External Keyboard	Samsung Electronics Co., Ltd	EF-DT970	-	DC 3.30 Ⅴ	-

2.2. Frequency/channel operations

This device contains the following capabilities:
WIFI(802.11a/b/g/n/ac/ax), Bluetooth(BDR/EDR/BLE), WPT,
LTE Band 2, LTE Band 4, LTE Band 5, LTE Band 12, LTE Band 13, LTE Band 25, LTE Band 26, LTE Band 41, LTE Band 66, GSM 850, GSM 1900, WCDMA 850, WCDMA 1700, WCDMA 1900

Frequency (㎑)
530 ~ 600

Table 2.2.1 WPT

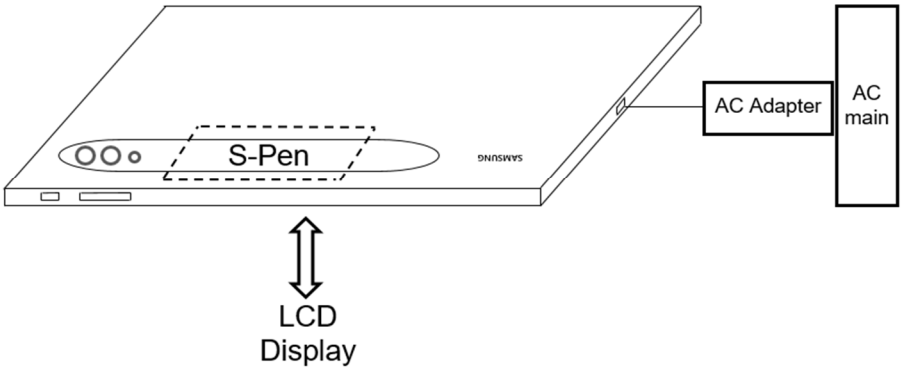
2.3. Worst-case configuration and mode

Mode	Test case	Description
S-Pen	1	Charging from AC Adaptor to EUT EUT to S-Pen (Charging)
	2	Charging from AC Adaptor to EUT EUT to S-Pen (LCD touch)
	3	Charging from AC Adaptor to EUT EUT to S-Pen (Push button and drag after touch of LCD)

Note:

1. The EUT has a charged state and an uncharged state, and the charged state is a worst case.
2. There are three test cases in total, and test case 3 has the same frequency as test case 1. Test case 1 is a worst case, so it's only reported.
3. For the S-Pen test, both fully charged and non-fully charged condition were investigated, test case 1/2/3 were performed fully charged condition as worst case.
4. The EUT operates with the S-Pen in two different inductive coupling modes of S-Pen motion detection (Test case 2 and 3) and charging (Device to S-Pen wireless charging) operating in the range of 530 ~ 600 ㎑. The EUT was set to continuously transmit to the S-Pen in each of the three modes. S-Pen charging mode is also applicable during the device wireless charging condition. Data is additionally included for this condition.

2.4. Test setup diagram



2.4.1 Test case 1 Charging S-Pen condition

3. Antenna requirement

Requirement of FCC part section 15.203:

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 shall be considered sufficient to comply with the provisions of this section.

- The transmitter has permanently attached FPCB coil antenna (Internal antenna) on board.

4. Summary of tests

FCC Part section(s)	Parameter	Test results
15.209(a)	Field Strength of Fundamental and Spurious Emission	Pass
2.1049	20dB Bandwidth	Pass
15.203	Antenna requirement	Pass
15.207(a)	Conducted Emission	Pass (Note1)

Notes:

1. For the AC line conducted test, all test case was performed with the AC adaptor connected.
2. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that X orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in X orientation.
3. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
4. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.
All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

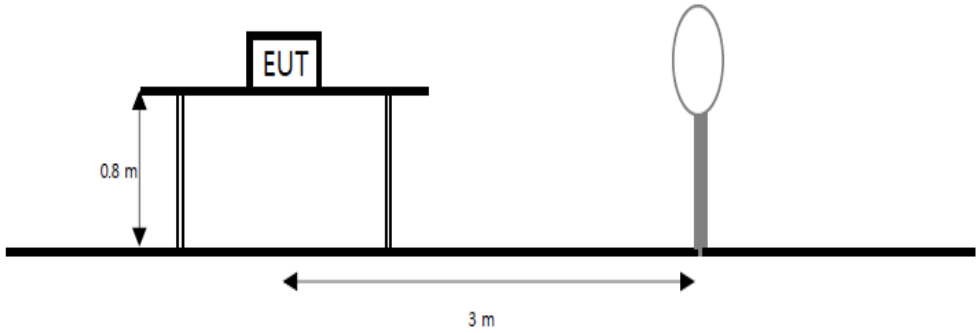
Parameter	Expanded uncertainty (±)	
Radiated spurious emissions	9 ㎑ ~ 30 ㎒	2.3 dB
Conducted emissions	9 ㎑ ~ 150 ㎑	3.7 dB
	150 ㎑ ~ 30 ㎒	3.3 dB

6. Test results

6.1. Field Strength of Fundamental and Spurious Emission

Test setup

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



Limit

According to section 15.209(a), 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 (㎒)	Field strength (㎶/m)	Measurement distance (m)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	30
1.705 - 30	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 ㎒, 76–88 ㎒, 174–216 ㎒ or 470–806 ㎒. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section15.231 and 15.241.

Test procedure

ANSI C63.10-2013

Test settings

Test Procedures for emission from 9 ㎑ to 30 ㎒

a. 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.

b. 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.

c. 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.

d. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode.

e. Below 30 ㎒ frequency range, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported and the worse orientations of Face-on and Face-off were set for final test.

- Face-on = Parallel, Face-off = Perpendicular

Notes:

1. *f* <30 ㎒, extrapolation factor of 40 ㏈/decade of distance. $F_d = 40\log(D_m/Ds)$
   Where:
   F_d = Distance factor in ㏈
   D_m = Measurement distance in meters
   D_s = Specification distance in meters
2. The test measurement distance is 3 meter
3. Limit (㏈(㎶/m)) = For 0.009 ㎒ - 0.490 ㎒, 20*log(2 400/F(㎑)) ㏈(㎶/m)
   For 0.490 ㎒ - 1.705 ㎒, 20*log(24 000/F(㎑)) ㏈(㎶/m)
   For 1.705 ㎒ - 30 ㎒, 20*log(30) = 29.54 ㏈(㎶/m)

Test results

Radiated Emissions Fundamental & 9 ㎑ to 30 ㎒ (S-Pen charging mode Test case 1)

[Face-on]

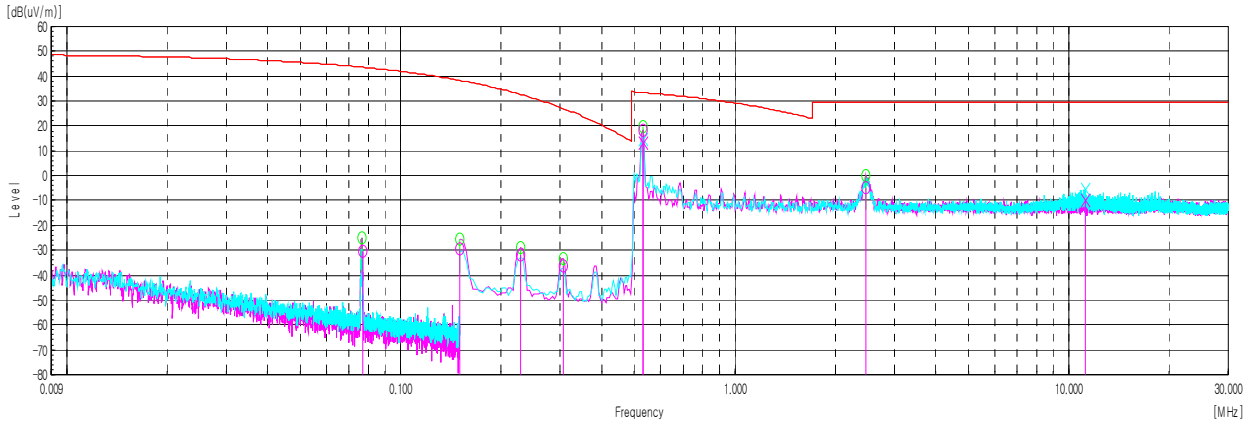
Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.077	62.00	AV	20.05	-32.42	80.00	-92.40	-30.37	43.60	73.97
0.150	62.80	AV	19.98	-32.40	80.00	-92.40	-29.62	38.30	67.92
0.228	60.70	AV	19.94	-32.29	80.00	-92.40	-31.65	32.70	64.35
0.307	55.90	AV	19.90	-32.28	80.00	-92.40	-36.48	27.00	63.48
0.530	70.50	QP	20.00	-32.21	40.00	-52.20	18.29	33.40	15.11
2.471	47.30	QP	20.07	-31.96	40.00	-51.90	-4.59	29.50	34.09

[Face-off]

Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.530	65.40	QP	20.00	-32.21	40.00	-52.20	13.19	33.40	20.21
11.209	41.20	QP	20.22	-31.22	40.00	-51.00	-9.80	29.50	39.30

Note:

1. Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss + distance factor(dB)
2. -80 dB is distance factor = 40*log(3/300), -40 dB is distance factor = 40*log(3/30)



Radiated Emissions Fundamental & 9 ㎑ to 30 ㎒ (S-Pen LCD touch mode Test case 2)

[Face-on]

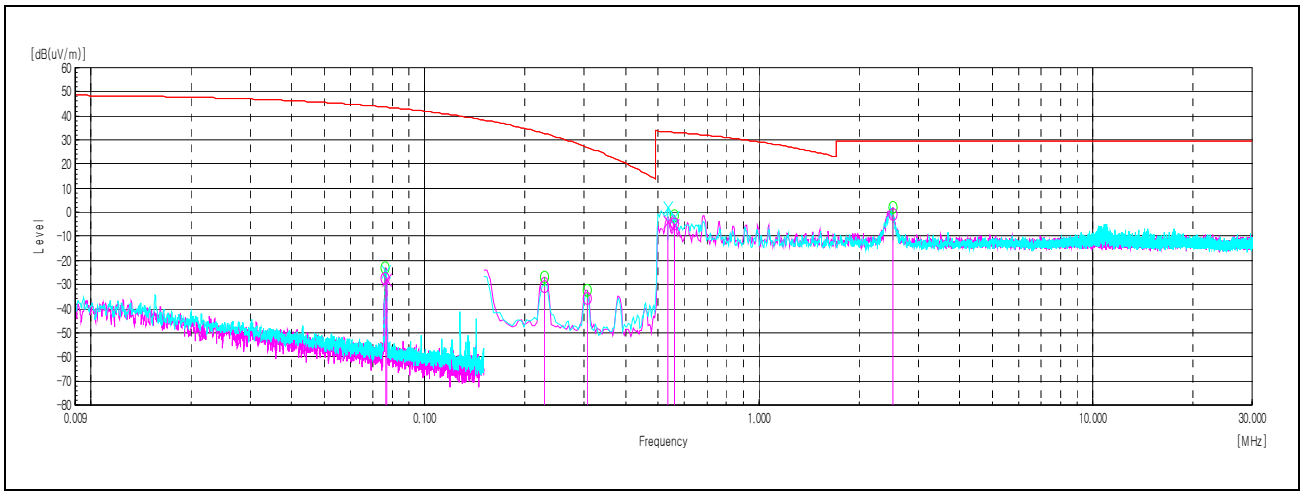
Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.076	65.00	AV	20.05	-32.42	80.00	-92.40	-27.37	43.70	71.07
0.228	61.50	AV	19.94	-32.29	80.00	-92.40	-30.85	32.70	63.55
0.307	56.40	AV	19.90	-32.28	80.00	-92.40	-35.98	27.00	62.98
0.562	47.20	QP	20.00	-32.21	40.00	-52.20	-5.01	33.20	38.21
2.523	51.10	QP	20.08	-31.96	40.00	-51.90	-0.78	29.50	30.28

[Face-off]

Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.077	64.70	AV	20.05	-32.42	80.00	-92.40	-27.67	43.60	71.27
0.534	48.30	QP	20.00	-32.21	40.00	-52.20	-3.91	33.40	37.31
0.562	46.90	QP	20.00	-32.21	40.00	-52.20	-5.31	33.20	38.51

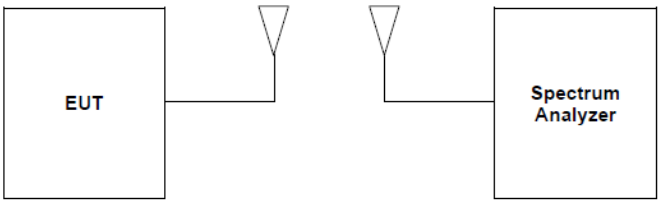
Note:

1. Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss + distance factor(dB)
2. -80 dB is distance factor = 40*log(3/300), -40 dB is distance factor = 40*log(3/30)



6.2. 20dB Bandwidth

Test setup



Limit

For reporting purpose only

Test settings

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.

The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.

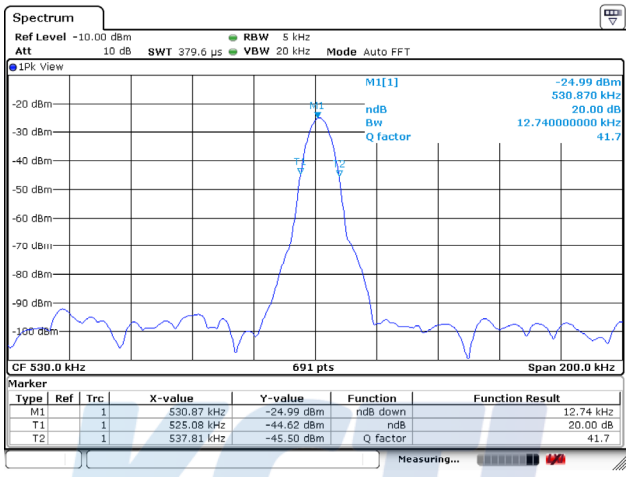
Test results

20dB Bandwidth

Frequency (㎑)	20dB Bandwidth (㎑)	Limit
530	12.74	Reporting purpose only

Test Plots

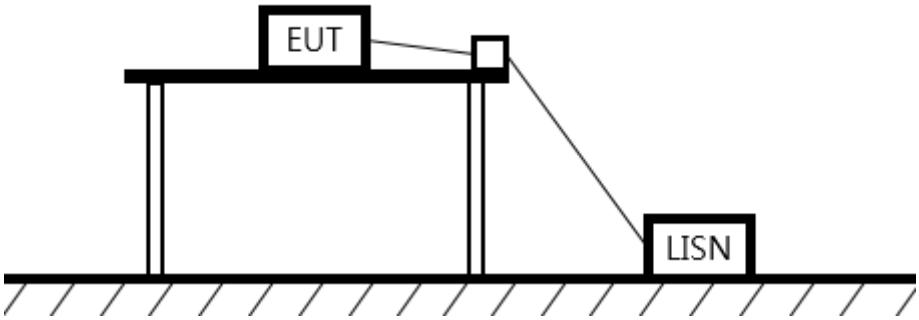
S-Pen



Note:
Because the measured signal is CW/CW-like, adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

6.3. AC Conducted emission

Test setup



Limit

According to 15.207(a), For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

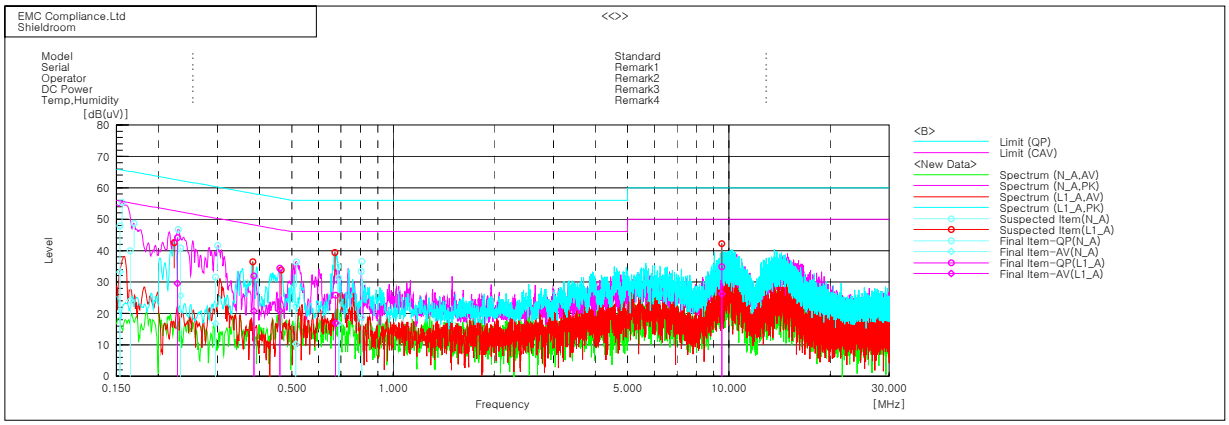
Frequency of Emission (㎒)	Conducted limit (dB㎶/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Measurement procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 ㎝ in which is located 40 ㎝ away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 ㎒ to 30 ㎒.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 ㎑ or to quasi-peak and average within a bandwidth of 9 ㎑. The EUT was in transmitting mode during the measurements.

Test results

Worst Case : S-Pen charging mode Test case 1



Final Result

--- L2 Phase ---

No.	Frequency	Reading QP	Reading CAV	c.f	Result QP	Result CAV	Limit QP	Limit AV	Margin QP	Margin CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.15365	37.8	23.1	10.0	47.8	33.1	65.8	55.8	18.0	22.7
2	0.16494	29.7	14.0	10.2	39.9	24.2	65.2	55.2	25.3	31.0
3	0.23302	30.9	15.7	10.0	40.9	25.7	62.3	52.3	21.4	26.6
4	0.29582	21.6	6.7	10.0	31.6	16.7	60.4	50.4	28.8	33.7
5	0.51281	12.0	0.1	10.2	22.2	10.3	56.0	46.0	33.8	35.7
6	0.68878	21.3	6.6	10.1	31.4	16.7	56.0	46.0	24.6	29.3
7	0.80665	26.5	8.5	10.1	36.6	18.6	56.0	46.0	19.4	27.4

--- L3 Phase ---

No.	Frequency	Reading QP	Reading CAV	c.f	Result QP	Result CAV	Limit QP	Limit AV	Margin QP	Margin CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.22779	34.3	19.7	9.8	44.1	29.5	62.5	52.5	18.4	23.0
2	0.38526	22.0	10.8	9.9	31.9	20.7	58.2	48.2	26.3	27.5
3	0.45983	24.4	10.8	10.0	34.4	20.8	56.7	46.7	22.3	25.9
4	0.67391	15.9	7.1	9.9	25.8	17.0	56.0	46.0	30.2	29.0
5	9.51642	24.8	16.1	10.1	34.9	26.2	60.0	50.0	25.1	23.8

7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
SIGNAL GENERATOR	R&S	SMB100A	176206	21.01.21
VECTOR SIGNAL GENERATOR	R&S	SMBV100A	257566	20.07.16
Spectrum Analyzer	R&S	FSV30	100806	20.07.30
EMI TEST RECEIVER	R&S	ESCI7	100732	20.08.22
EMI TEST RECEIVER	R&S	ESCI3	100001	20.08.22
TWO-LINE V-NETWORK	R&S	ENV216	101358	20.10.02
LOOP Antenna	R&S	HFH2-Z2	100355	20.08.24
AMPLIFIER	SONOMA INSTRUMENT	310N	284608	20.08.22
Antenna Mast	MATURO	EAS 1.5	042/8941211	-
Antenna Mast	MATURO	EAS 1.5	043/8941211	-
Turn Table	MATURO	TT 0.8 PF	041/8941211	-

End of test report