

TEST REPORT

Eurofins KCTL Co.,Ltd.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 Report No.: KR23-SRF0046 Page (1) of (21)



KCTL

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1. Client

Name : Samsung Electronics Co., Ltd.

· Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677,

Rep. of Korea

Date of Receipt : 2022-12-05

2. Use of Report : Certification

3. Name of Product / Model : Mobile phone / SM-A245M/DSN

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

5. FCC ID : A3LSMA245M

6. Date of Test : 2022-12-14 to 2023-01-13

7. Location of Test : ■ Permanent Testing Lab □ On Site Testing

(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

8. Test method used: FCC Part 15 Subpart C, 15.225

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

Affirmation Name : Kwonse Kim (Signature) Name : Seungyong Kim (Signature)

2023-01-19

Eurofins KCTL Co.,Ltd.

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REPORT REVISION HISTORY

Date	Revision	Page No
2023-01-19	Originally issued	-

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G

eneral remarks for test reports
Statement concerning the uncertainty of the measurement systems used for the tests
(may be required by the product standard or client)
Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:
Procedure number, issue date and title: Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.
☑ Statement not required by the standard or client used for type testing

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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 Park, Dong Tien Ward, Pho Yen Town, Thai Nguyen Province,

Vietnam

Factory : SAMSUNG ELECTRONICS VIETNAM CO.,LTD.

Address : Yenphong 1 - I.P Yentrung Commune, Yenphong Dist., Bac Ninh Province, Vietnam

Laboratory : Eurofins KCTL Co.,Ltd.

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

CAB Identifier: KR0040 ISED Number: 8035A KOLAS No.: KT231

2. Device information

Equipment under test : Mobile phone

Model : SM-A245M/DSN

Derivative model : SM-A245M/N

Modulation technique : ASK (NFC)

Number of channels : 1 ch

Power source : DC 3.88 V

Antenna specification : NFC_FPCB Antenna

Software version : A245M.001 Hardware version : REV1.0

Test device serial No. : Conducted : R38TB005MCL

Radiated : R38TB005MFD

Operation temperature : -20 $^{\circ}$ C ~ 60 $^{\circ}$ C

Note. The Product equality letter includes detailed information about the differences between basic and derivative model.

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2.1. Frequency/channel operations

This device contains the following capabilities: WLAN (11a/b/g/n/ac), Bluetooth (BDR/EDR/BLE), LTE B2/4/5/12/13/17/26/41/66, GSM 850/1900, WCDMA 850/1700/1900, NFC

Ch.	Frequency (Mb)	
01	13.56	

Table 2.1-1. NFC

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 Antenna (Internal antenna) on board.

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4. Summary of tests

FCC Part section(s)	Parameter	Test Condition	Test results		
15.225(a)	In-band Fundamental Emission		Pass		
15.225(b)	In-band Spurious Emission		Pass		
15.225(c)	In-band Spurious Emission	Radiated	Pass		
15.225(d) 15.209	Out-of–band Spurious Emission Pas		Pass		
15.225(e)	Frequency Stability Tolerance		Pass		
15.215(c)	15.215(c) 20 dB Bandwidth Conducted		Pass		
15.207(a)	7(a) AC Conducted emissions P		Pass		

Notes:

- 1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2. These tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field 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 414788.
- 3. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **Y** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Y** orientation
- 4. The test procedure(s) in this report were performed in accordance as following.
 - + ANSI C63.10-2013
- 5. All the radiated tests have been performed several case.

(Stand-alone, with accessories (DLC Cable etc.))

Worst case: Stand-alone

- 6. Radiated(fundamental level and spurious emissions) tests were performed both without reading a passive tag condition[test mode] and with reading a passive tag condition
 - Worst case: Without passive tag

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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 kHz ~ 30 MHz:	2.4 dB	
Radiated spurious emissions	30 MHz ~ 1 000 MHz	2.3 dB	
Conducted emissions	9 kHz ~ 150 kHz	1.6 dB	
	150 kHz ~ 30 MHz	1.7 dB	



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Test results

20 dB Bandwidth & 99% Bandwidth

Test setup

EUT	Spectrum analyzer

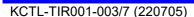
Report No.:

Limit

According to §15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Test procedure

ANSI C63.10 - Section 6.9.2



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Test settings

The occupied bandwidth is measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced from a reference value by a specified ratio (or in decibels, a specified number of dB down from the reference value). Typical ratios, expressed in dB, are -6 dB, -20 dB, and -26 dB, corresponding to 6 dB BW, 20 dB BW, and 26 dB BW, respectively. In this subclause, the ratio is designated by "-xx dB." The reference value is either the level of the unmodulated carrier or the highest level of the spectral envelope of the modulated signal, as stated by the applicable requirement. Some requirements might specify a specific maximum or minimum value for the "-xx dB" bandwidth; other requirements might specify that the "-xx dB" bandwidth be entirely contained within the authorized or designated frequency band.

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.
- b) Span: Two times and five times the OBW.
- c) RBW = 1 % to 5 % of the OBW and VBW ≥ 3 x RBW
- d) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation.
- e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "-xx dB down" requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
- f) Detector: peak
- g) Trace mode: max hold.
- h) Allow the trace to stabilize.
- i) Determine the "-xx dB down amplitude" using ((reference value) xx). Alternatively, this calculation may be made by using the marker-delta function of the instrument.
- j) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).
- k) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "-xx dB down amplitude" determined in step h). If a marker is below this "-xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "-xx dB down amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

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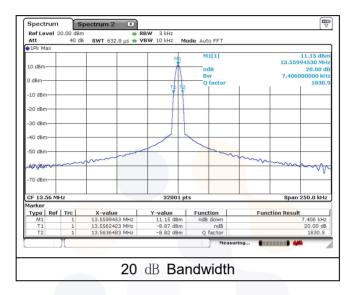
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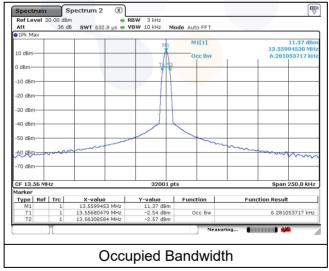
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Test results

Frequency [雕]	20 dB Bandwidth [吨]		Limit [Mt]	20 dB Bandwidth [Mt/z]	Occupied Bandwidth (99 % BW) [飐]
12.56	Lowest Frequency	13.556	13.110	0.007	0.006
13.56	Highest Frequency	13.564	14.010	0.007	0.006





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

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6.2. Frequency tolerance

Test setup

FUT	Spectrum analyzer
LOT	opectium analyzei

Limit

15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency over a temperature variation of -20 degrees to ± 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test procedure

ANSI C63.10-2013 - Section 6.8.1

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Test results

Voltage	Voltage	TEMP	Maintaining	Measure frequency	Frequency deviation	Deviation
[%]	[V]	[°C]	time	[Hz]	[Hz]	[%]
			Startup	13 559 951	49.0	-0.000 36
		20/Def)	2 minutes	13 559 951	49.0	-0.000 36
		20(Ref.)	5 minutes	13 559 950	50.0	-0.000 37
			10 minutes	13 559 950	50.0	-0.000 37
			Startup	13 560 029	-29.0	0.000 21
		-20	2 minutes	13 560 029	-29.0	0.000 21
		-20	5 minutes	13 560 032	-32.0	0.000 24
			10 minutes	13 560 037	-37.0	0.000 27
			Startup	13 560 041	-41.0	0.000 30
		10	2 minutes	13 560 041	-41.0	0.000 30
		-10	5 minutes	13 560 041	-41.0	0.000 30
			10 minutes	13 560 041	-41.0	0.000 30
			Startup	13 560 041	-41.0	0.000 30
		0	2 minutes	13 560 041	-41.0	0.000 30
		0	5 minutes	13 560 041	-41.0	0.000 30
100	2.00		10 minutes	13 560 041	-41.0	0.000 30
100	3.88	10	Startup	13 560 <mark>039</mark>	-39.0	0.000 29
			2 minutes	13 560 <mark>039</mark>	-39.0	0.000 29
	10	5 minutes	13 560 037	-37.0	0.000 27	
			10 minutes	13 560 037	-37.0	0.000 27
			Startup	13 560 008	-8.0	0.000 06
		30	2 minutes	13 560 008	-8.0	0.000 06
		30	5 minutes	13 559 999	1.0	-0.000 01
			10 minutes	13 559 994	6.0	-0.000 04
			Startup	13 <mark>5</mark> 59 967	33.0	-0.000 24
		40	2 minutes	13 559 966	34.0	-0.000 25
		40	5 minutes	13 559 966	34.0	-0.000 25
			10 minutes	13 559 966	34.0	-0.000 25
			Startup	13 559 940	60.0	-0.000 44
		50	2 minutes	13 559 939	61.0	-0.000 45
		30	5 minutes	13 559 931	69.0	-0.000 51
			10 minutes	13 559 925	75.0	-0.000 55
			Startup	13 559 941	59.0	-0.000 44
End Point	End Point 3.40 20	2 minutes	13 559 941	59.0	-0.000 44	
LIMEOUN		5 minutes	13 559 941	59.0	-0.000 44	
			10 minutes	13 559 942	58.0	-0.000 43
			Startup	13 559 960	40.0	-0.000 30
115	4.46	20	2 minutes	13 559 961	39.0	-0.000 29
110	4.40	20	5 minutes	13 559 961	39.0	-0.000 29
			10 minutes	13 559 962	38.0	-0.000 28

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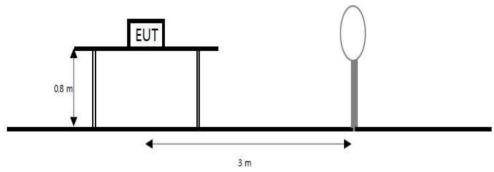
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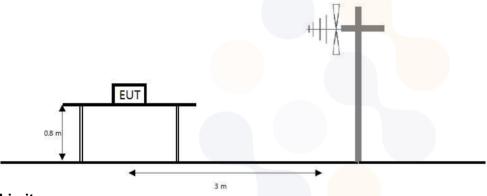
6.3. Radiated spurious emissions

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 Mb to 1 Gb emissions.



Limit

15.225 (a) The field strength of any emission within the band 13.553-13.567 ^{Mtz} shall not exceed 15, 848 microvolts/meter at 30 meters.

15.225 (b) With in the bands 13.410-13.553 № and 13.567-13.710 №, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

15.225 (c) With in the bands 13.110-13.410 № and 13.710-14.010 №, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

15.225 (d) The Field Strength of any emissions appearing outside of the 13.110-14.010 Number band shall not exceed the general radiated emission limits in 15.209.

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Frequency (雕)	Field Strength $(\mu \! \! N/m)$	Measurement distance (meters)
0.009-0.490	2400/F(kllz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30(29.54 dBμV/m)	30
30.0-88.0	100(40 dBμV/ m)	3
88-216	150(43.5 dBμV/ m)	3
216-960	200 (46 dBμV/ m)	3
Above 960	500 (53.98 dBμV/ m)	3

Test procedure

ANSI C63.10-2013 - Section 6.4, 6.5

Test settings

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = as specified in table
- 3. VBW \geq 3 x RBW
- 4. Detector = peak
- 5. Sweep time = auto couple
- 6. Trace mode = max hold
- 7. Trace was allowed to stabilize

Table. RBW as a function of frequency

Frequency	RBW			
9 kHz to 150 kHz	200 Hz to 300 Hz			
0.15 Mb to 30 Mb	9 kHz to 10 kHz			
30 MHz to 1 000 MHz	100 kHz to 120 kHz			
> 1 000 MHz	1 MHz			

Notes:

- f <30 Mb, extrapolation factor of 40 dB/decade of distance. F_d = 40log(D_m/Ds)
 f ≥30 Mb, extrapolation factor of 20 dB/decade of distance. F_d = 20log(D_m/Ds)
 Where:
 - F_d= Distance factor in dB
 - D_m= Measurement distance in meters
 - D_s= Specification distance in meters
- 2. Measurements were performed at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in § 15.31(f)(2). Extrapolation Factor = 40 log10(30/3) = 40 dB.
- 3. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or $F_d(dB)$
- 4. Result = Reading + Cable loss + Amp gain + Ant. factor Distance factor
- 5. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
- 6. All measurements were recorded using a spectrum analyzer employing a quasi-peak detector.
- 7. Below 30 Mb 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.
- 8. Face-on = Parallel, Face-off = Perpendicular
- 9. 1) means restricted band

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Test results for fundamental

15.225 (a) 13.553-13.567 Mtz

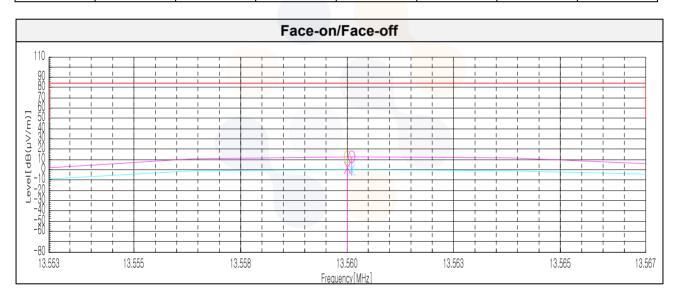
[Face-on]

ш	[1 400 01]									
	Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin		
	(MHz)	$(dB(\mu V))$	(dB)	(dB)	(dB)	(dB(μV/ m))	(dB(μV/ m))	(dB)		
	Quasi peak data									
Ī	13.56	62.90	20.31	-31.13	40.00	12.08	84.00	71.92		

Report No.:

[Face-off]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin		
(MHz)	$(dB(\mu V))$	(dB)	(dB)	(dB)	(dB(μV/ m))	(dB(μV/ m))	(dB)		
	Quasi peak data								
13.56	52.10	20.31	-31.13	40.00	1.28	84.00	82.72		



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Test results for in-band & out-band (9 klb to 30 Mb)

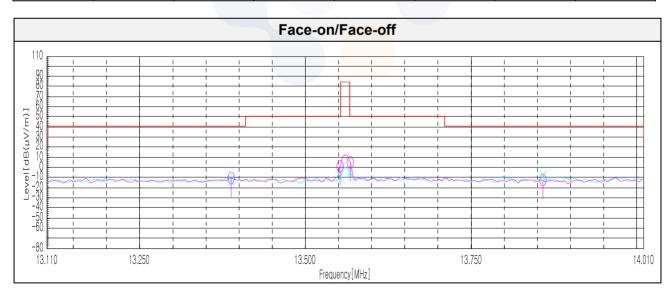
15.225 (b,c) 13.110-14.010 Mb

[Face-on]

į ace-onj								
Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin	
(MEz)	$(dB(\mu V))$	(dB)	(dB)	(dB)	(dB(μV/ m))	(dB(μV/m))	(dB)	
Quasi peak data								
13.39	34.80	20.30	-31.14	40.00	-16.04	29.50	45.54	
13.55	49.00	20.31	-31.13	40.00	-1.82	29.50	31.32	
13.57	41.80	20.31	-31.13	40.00	-9.02	50.50	59.52	
13.86	35.40	20.33	-31.14	40.00	-15.41	40.50	55.91	

[Face-off]

race-oiij								
Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin	
(MHz)	$(dB(\mu V))$	(dB)	(dB)	(dB)	(dB(μV/ m))	(dB(μV/m))	(dB)	
Quasi peak data								
13.39	35.00	20.30	-31.14	40.00	-15.84	29.50	45.34	
13.55	38.80	20.31	-31.13	40.00	-12.02	29.50	41.52	
13.57	36.60	20.31	-31.13	40.00	-14.22	50.50	64.72	
13.86	35.40	20.33	-31.14	40.00	-15.41	40.50	55.91	



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Test results (9 kHz to 30 MHz)

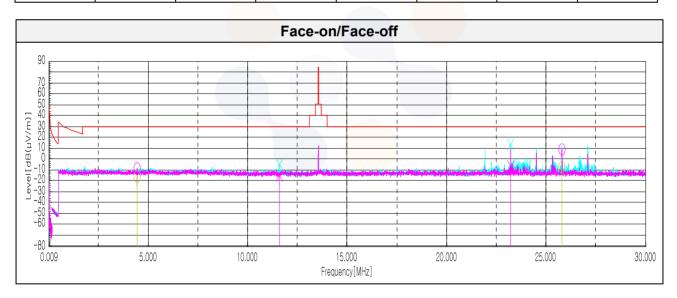
15.225 (d) 0.009-30 MHz

[Face-on]

Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin		
(MHz)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/ m))	(dB(μV/ m))	(dB)		
	Quasi peak data								
4.45	35.30	20.17	-31.66	40.00	-16.19	29.50	45.69		
25.81	41.70	20.87	-30.54	40.00	-7.97	29.50	37.47		

[Face-off]

1 400-011									
Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin		
(MEz)	$(dB(\mu V))$	(dB)	(dB)	(dB)	(dB(μV/ m))	(dB(μV/ m))	(dB)		
	Quasi peak data								
11.61	35.60	20.20	-31.23	40.00	-15.43	29.50	44.93		
23.23	42.60	20.89	-30.67	40.00	-7.18	29.50	36.68		



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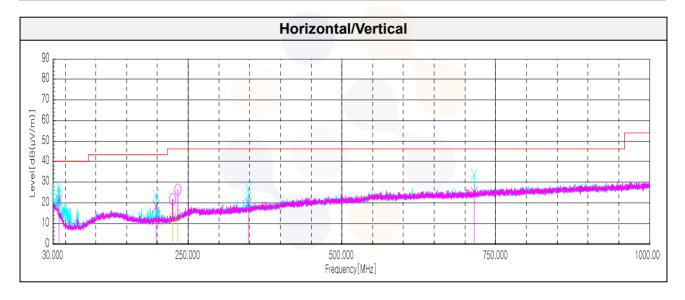
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Test results (Below 1 000 MHz)

15.225 (d) 30-1000 MHz

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin	
(MHz)	(V/H)	$(dB(\mu V))$	(dB)	(dB)	(dB)	(dB(μV/ m))	(dB(μV/ m))	(dB)	
	Quasi peak data								
39.94	V	31.50	19.24	-29.81	-	20.93	40.00	19.07	
197.57	V	29.00	15.31	-27.30	-	17.01	43.50	26.49	
224.61	Н	23.30	15.47	-26.93	-	11.84	46.00	34.16	
233.34	Н	23.70	16.23	-26.84	-	13.09	46.00	32.91	
348.04	V	24.10	20.02	-25.60	-	18.52	46.00	27.48	
715.18	V	20.80	25.00	-22.23	-	23.57	46.00	22.43	



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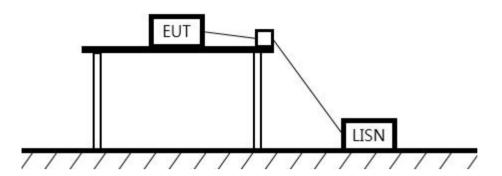
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6.4. AC Conducted emission

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 klb to 30 Mb, 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.

Fragues of Emission (Mb)	Conducted limit (dBμN/m)					
Frequency of Emission (艦)	Quasi-peak	Average				
0.15 – 0.50	66 - 5 <mark>6*</mark>	56 - 46*				
0.50 - 5.00	<u>56</u>	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 cm in which is located 40 cm 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 $50\Omega/50\mu H$ 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 Mb to 30 Mb.
- 5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 kHz or to quasi-peak and average within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

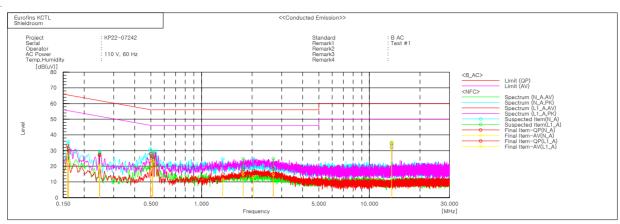
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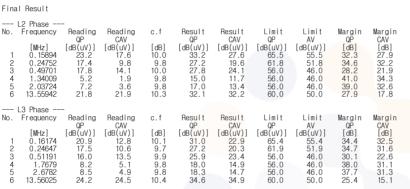
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Test results





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7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV40	101578	23.11.28
DC Power Supply	AGILENT	E3632A	MY40007371	23.05.02
Vector Signal Generator	R&S	SMBV100A	257566	23.07.04
Signal Generator	R&S	SMB100A	176206	23.01.19
EMI Test Receiver	R&S	ESCI7	100732	23.01.19
Bi-Log Antenna	TESEQ	CBL 6112D	62438	24.08.24
Amplifier	SONOMA INSTRUMENT	310N	284608	23.08.18
ISOLATION TRANSFORMER	ONETECH CO., LTD	OT-IT500VA	OTR1-16026	23.03.28
Attenuator	KEYSIGHT	8491B-6dB	MY39271060	24.04.27
Loop Antenna	R&S	HFH2-Z2	100355	24.08.10
Antenna Mast	Innco Systems	MA46 <mark>40-XP-</mark> ET	-	-
Turn Table	Innco Systems	C <mark>O3000</mark>	1175/45850319/P	-
TWO-LINE V - NETWORK	R&S	ENV216	101358	23.09.29
EMI Test Receiver	R&S	ESCI3	100001	23.08.18

End of test report