



TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 www.kctl.co.kr		Report No.: KR23-SRF0114-A Page (1) of (19)	
1. Client ◦ Name : WINNERCOM CO., LTD ◦ Address : 158-7, Golden root-ro, Juchon-myeon, Gimhae-si, Gyeongsangnam-do, KOREA ◦ Date of Receipt : 2023-04-04			
2. Use of Report : Certification			
3. Name of Product / Model : Touch door / MX5			
4. Manufacturer / Country of Origin : WINNERCOM CO., LTD / Korea			
5. FCC ID : 2AU37MX5			
6. Date of Test : 2023-04-07 to 2022-04-14			
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	Tested by Name : Minki Kim (Signature)		Technical Manager Name : Heesu Ahn (Signature)
2023-05-16			
Eurofins KCTL Co.,Ltd.			
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REPORT REVISION HISTORY

Date	Revision	Page No
2023-05-10	Originally issued	-
2023-05-16	Updated	4

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Note. The report No. KR23-SRF0114 is superseded by the report No. KR23-SRF0114-A.

General 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:

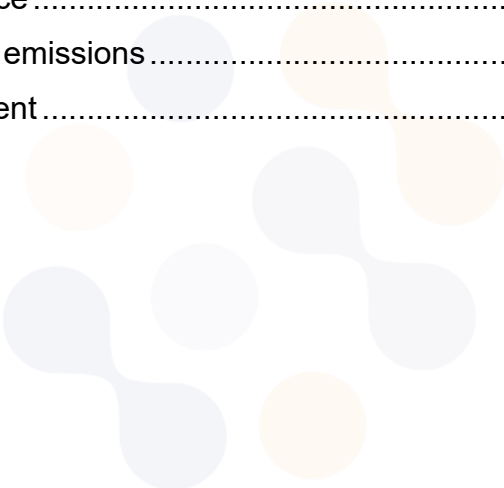
Procedure number, issue date and title:

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 : WINNERCOM CO., LTD
 Address : 158-7, Golden root-ro, Juchon-myeon, Gimhae-si, Gyeongsangnam-do, KOREA
 Manufacturer : WINNERCOM CO., LTD
 Address : 158-7, Golden root-ro, Juchon-myeon, Gimhae-si, Gyeongsangnam-do, KOREA
 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 : Touch door
 Model : MX5
 Frequency range : 13.56 MHz (NFC)
 Modulation technique : ASK
 Number of channels : 1ch
 Power source : DC 12 V
 Antenna specification : PCB Loop antenna
 Antenna gain : N/A
 Software version : Ver 1.0
 Hardware version : Ver 1.0
 Test device serial No. : 2211079000A0008
 Operation temperature : -30 °C ~ 75 °C

2.1. Frequency/channel operations

This device contains the following capabilities: NFC

Frequency (MHz)
13.56

Table 2.1.1. NFC mode

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 PCB Loop antenna (internal antenna) on board.



4. Summary of tests

FCC Part section(s)	Parameter	Test Condition	Test results
15.225(a)	In-band Fundamental Emission	Radiated	Pass
15.225(b), (c)	In-band Spurious Emission		Pass
15.225(d) 15.209	Out-of-band Spurious Emission		Pass
15.225(e)	Frequency Stability Tolerance	Conducted	Pass
15.215(c)	20 dB Bandwidth		Pass
15.207(a)	AC Conducted emissions		N/A ^(Note4)

Notes: (N/T: Not Tested, N/A: Not Applicable)

- All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 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.
- The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z It was determined that **X** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **X** orientation
- This test is not applicable because the EUT falls into the automotive device and it's not to be connected to the public utility (AC) power line
- The test procedure(s) in this report were performed in accordance as following.
 - ANSI C63.10-2013
- The radiated test was performed with and without passive tag. The test results shown in the following sections represent the worst case emissions.
 - Worst Case : Without passive tag

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 or 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.

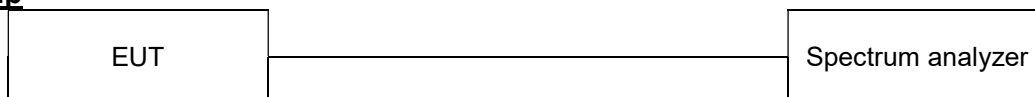
Parameter	Expanded uncertainty ($\pm$)	
Radiated spurious emissions	Below 30 MHz	2.3 dB
	30 MHz ~ 1 000 MHz	2.5 dB
	1 000 MHz ~ 18 000 MHz	4.7 dB
	Above 18 000 MHz	4.8 dB
Conducted emissions	150 kHz ~ 30 MHz	2.7 dB



6. Test results

6.1. 20 dB Bandwidth

Test setup



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

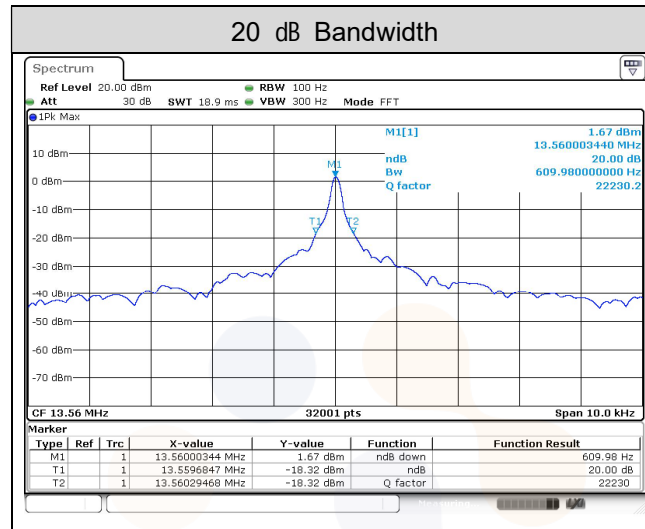
ANSI C63.10-2013 - Section 6.9.2

Test settings

The spectrum analyzer connected receive antenna and the EUT placed on near the receive antenna. The RBW is set to 10 kHz. The VBW is set to 3 times the RBW. The sweep time is coupled.

Test results

Frequency [MHz]	20 dB Bandwidth [MHz]		Limit [MHz]	20 dB Bandwidth [kHz]
13.56	Lowest Frequency	13.559 7	13.110 0	0.61
	Highest Frequency	13.560 3	14.010 0	



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

6.2. Frequency tolerance

Test setup



Limit

According to §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



Test results

Voltage		TEMP	Maintaining time	Measure frequency	Frequency deviation	Deviation
[%]	[V]	[℃]		[Hz]	[Hz]	[%]
100	12.00	20(Ref.)	Startup	13 559 616	384.3	-0.002 83
			2 minutes	13 559 599	401.3	-0.002 96
			5 minutes	13 559 603	397.1	-0.002 93
			10 minutes	13 559 627	373.1	-0.002 75
		-30	Startup	13 559 616	383.9	-0.002 83
			2 minutes	13 559 599	401.0	-0.002 96
			5 minutes	13 559 603	396.7	-0.002 93
			10 minutes	13 559 627	373.0	-0.002 75
		-20	Startup	13 559 794	206.1	-0.001 52
			2 minutes	13 559 803	197.1	-0.001 45
			5 minutes	13 559 822	178.0	-0.001 31
			10 minutes	13 559 806	194.3	-0.001 43
		-10	Startup	13 559 796	203.6	-0.001 50
			2 minutes	13 559 806	193.7	-0.001 43
			5 minutes	13 559 809	191.3	-0.001 41
			10 minutes	13 559 813	187.0	-0.001 38
		0	Startup	13 559 823	177.0	-0.001 31
			2 minutes	13 559 807	192.7	-0.001 42
			5 minutes	13 559 807	192.8	-0.001 42
			10 minutes	13 559 810	189.6	-0.001 40
		10	Startup	13 559 727	273.3	-0.002 02
			2 minutes	13 559 722	278.5	-0.002 05
			5 minutes	13 559 724	275.7	-0.002 03
			10 minutes	13 559 727	273.0	-0.002 01
		20	Startup	13 559 733	267.4	-0.001 97
			2 minutes	13 559 732	268.3	-0.001 98
			5 minutes	13 559 723	277.2	-0.002 04
			10 minutes	13 559 740	260.2	-0.001 92
		30	Startup	13 559 731	269.2	-0.001 99
			2 minutes	13 559 727	273.0	-0.002 01
			5 minutes	13 559 750	250.1	-0.001 84
			10 minutes	13 559 730	270.0	-0.001 99
		40	Startup	13 559 724	276.3	-0.002 04
			2 minutes	13 559 729	270.6	-0.002 00
			5 minutes	13 559 730	270.4	-0.001 99
			10 minutes	13 559 706	294.1	-0.002 17
		50	Startup	13 559 394	605.9	-0.004 47
			2 minutes	13 559 427	573.0	-0.004 23
			5 minutes	13 559 408	592.0	-0.004 37
			10 minutes	13 559 470	530.0	-0.003 91
		60	Startup	13 559 394	606.2	-0.004 47
			2 minutes	13 559 427	573.2	-0.004 23
			5 minutes	13 559 408	591.8	-0.004 36
			10 minutes	13 559 470	529.7	-0.003 91
		70	Startup	13 559 395	605.5	-0.004 47
			2 minutes	13 559 427	573.0	-0.004 23
			5 minutes	13 559 408	592.2	-0.004 37
			10 minutes	13 559 470	529.6	-0.003 91

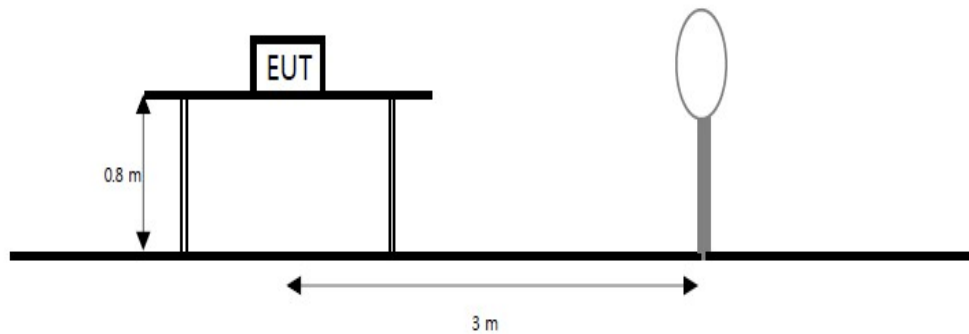
Voltage		TEMP	Maintaining time	Measure frequency	Frequency deviation	Deviation
[%]	[V]	[°C]		[Hz]	[Hz]	[%]
100	12.00	75	Startup	13 559 394	605.9	-0.004 47
			2 minutes	13 559 427	572.9	-0.004 23
			5 minutes	13 559 408	592.5	-0.004 37
			10 minutes	13 559 470	529.9	-0.003 91
85	10.20	20	Startup	13 559 626	374.0	-0.002 76
			2 minutes	13 559 606	393.9	-0.002 91
			5 minutes	13 559 599	401.5	-0.002 96
			10 minutes	13 559 623	377.1	-0.002 78
115	13.80	20	Startup	13 559 606	394.5	-0.002 91
			2 minutes	13 559 606	394.0	-0.002 91
			5 minutes	13 559 594	406.0	-0.002 99
			10 minutes	13 559 597	403.0	-0.002 97



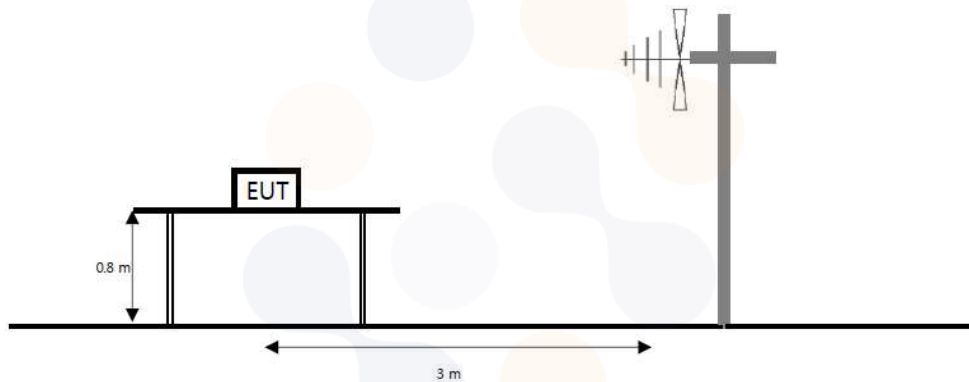
6.3. Radiated spurious emissions

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 MHz to 1 GHz emissions.



Limit

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

15.225 (b), Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

15.225 (c), Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz, 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 MHz band shall not exceed the general radiated emission limits in 15.209.

Frequency (MHz)	Field Strength ($\mu V/m$)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30(29.54 dB $\mu V/m$)	30
30.0-88.0	100(40 dB $\mu V/m$)	3
88-216	150(43.5 dB $\mu V/m$)	3
216-960	200 (46 dB $\mu V/m$)	3
Above 960	500 (53.98 dB $\mu V/m$)	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 $\geq 3 \times$ 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 MHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1 000 MHz	100 kHz to 120 kHz
> 1 000 MHz	1 MHz

Notes:

1. $f < 30$ MHz, extrapolation factor of 40 dB/decade of distance. $F_d = 40 \log(D_m/D_s)$
 $f \geq 30$ MHz, extrapolation factor of 20 dB/decade of distance. $F_d = 20 \log(D_m/D_s)$
 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 = $40 \log_{10}(30/3) = 40$ dB.
3. (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 MHz 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

Test results for fundamental

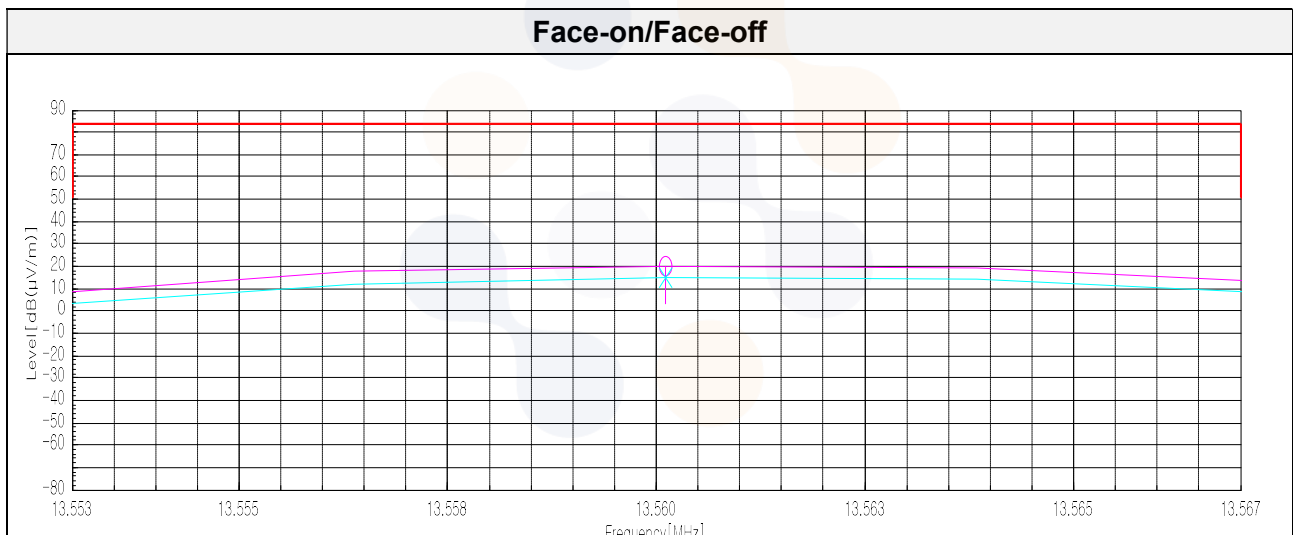
15.225 (a) 13.553-13.567 MHz

[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							
13.56	69.90	20.31	-31.13	40.00	19.08	84.00	64.92

[Face-off]

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							
13.56	65.10	20.31	-31.13	40.00	14.28	84.00	69.72



Test results for in-band & out-band (9 kHz to 30 MHz)

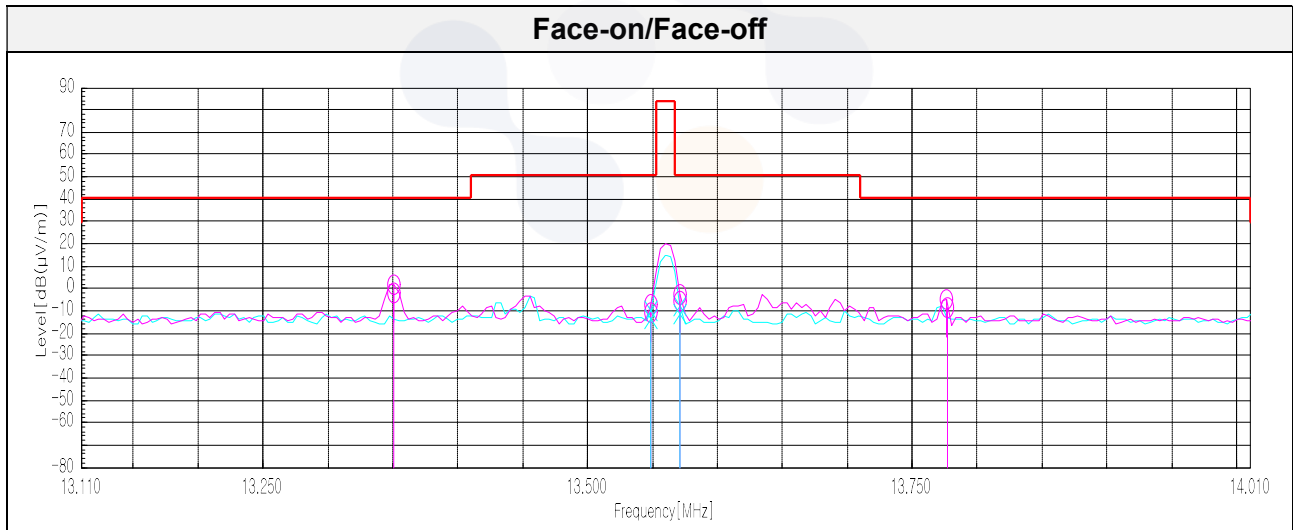
15.225 (b,c) 13.110-14.010 MHz

[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							
13.35	48.50	20.30	-31.14	40.00	-2.34	40.50	42.84
13.55	40.10	20.31	-31.13	40.00	-10.72	50.50	61.22
13.57	45.20	20.31	-31.13	40.00	-5.62	50.50	56.12
13.78	41.80	20.33	-31.14	40.00	-9.01	40.50	49.51

[Face-off]

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							
13.55	36.80	20.31	-31.13	40.00	-14.02	50.50	64.52
13.57	39.40	20.31	-31.13	40.00	-11.42	50.50	61.92



Test results (9 kHz to 30 MHz)

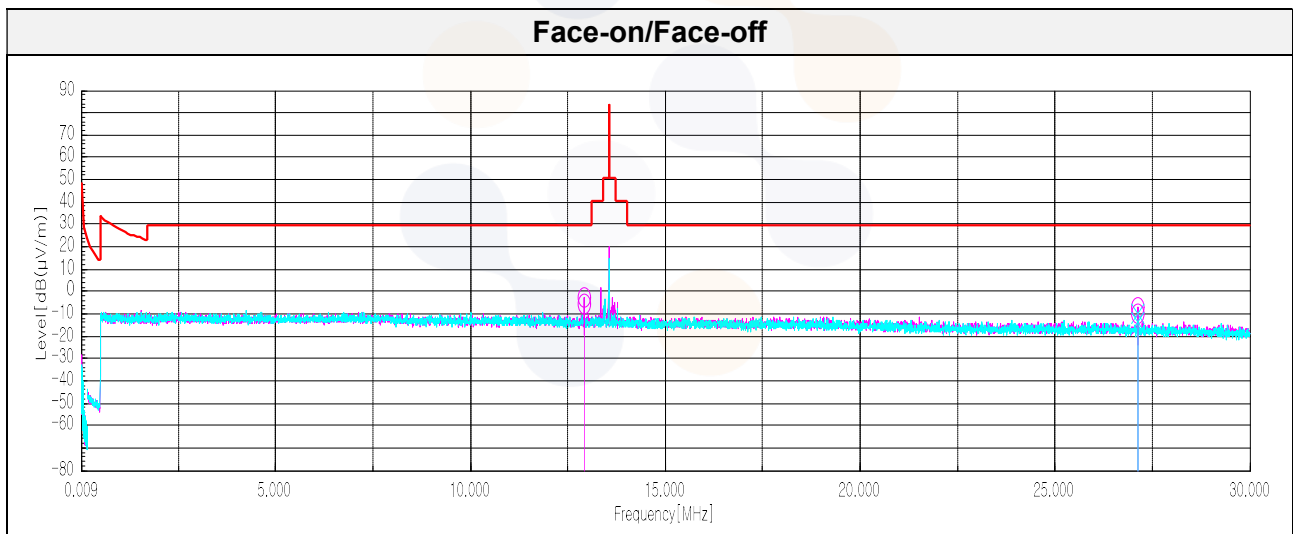
15.225 (d) 0.009-30 MHz

[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							
12.93	44.80	20.28	-31.17	40.00	-6.09	29.50	35.59
27.12	39.50	20.66	-30.58	40.00	-10.42	29.50	39.92

[Face-off]

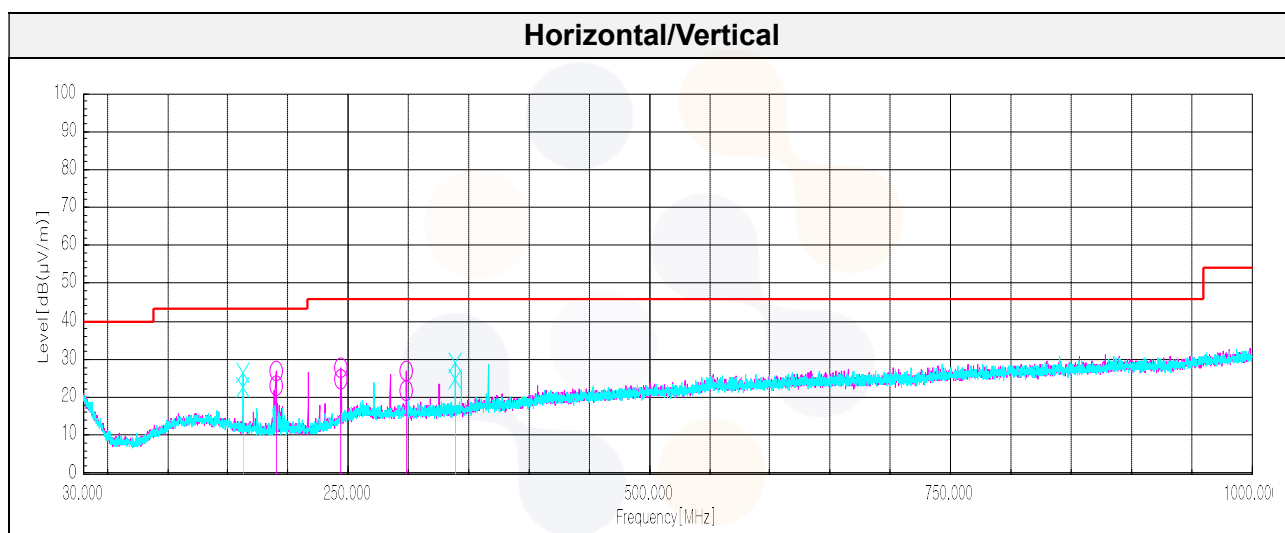
Frequency	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(MHz)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Quasi peak data							
27.12	36.10	20.66	-30.58	40.00	-13.82	29.50	43.32



Test results (Below 1 000 MHz)

15.225 (d) 30-1 000 MHz

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	Distance Factor	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Quasi peak data								
162.65 ¹⁾	V	34.50	15.80	-27.85	-	22.45	43.50	21.05
189.81	H	35.80	14.90	-27.46	-	23.24	43.50	20.26
244.13 ¹⁾	H	33.80	17.68	-26.64	-	24.84	46.00	21.16
298.21	H	28.90	19.06	-26.04	-	21.92	46.00	24.08
339.07	V	30.80	19.78	-25.66	-	24.92	46.00	21.08



7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100808	23.07.11
DC Power Supply	AGILENT	E3632A	MY40004791	23.09.14
Temp & Humid Chamber	ESPEC CORP.	SH-642	93016978	24.01.19
EMI TEST RECEIVER	R&S	ESCI7	100732	24.03.03
Bilog Antenna	TESEQ	CBL6112D	62438	24.08.24
AMPLIFIER	SONOMA	310N	284608	23.08.18
ATTENUATOR	KEYSIGHT	8491B-6 dB	MY39271082	24.08.24
ISOLATION TRANSFORMER	ONETECH CO., LTD	OT-IT500VA	OTR1-16026	24.03.23
Loop Antenna	R&S	HFH2-Z2	100355	24.08.10
Vector Signal Generator	R&S	SMBV100A	257566	23.07.04
Signal Generator	R&S	SMB100A	176206	24.01.19
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-

End of test report