

Test report No:
75900REM.001A2

Test report

**FCC Rules and Regulations CFR 47, Part 15, Subpart B
(2-6-23 Edition) & ICES-003 Issue 7 (October 2020)**

(*) Identification of item tested	Bittium Tough Comnode™
(*) Trademark	Bittium Tough Comnode™
(*) Model and /or type reference	Bittium Tough Comnode™, Product code 9404092, Type Designate TV0201
(*) Derived Model Not Tested	Bittium Tough Field Phone™ 2, Product code 9404768, Type Designate TV0201
Other identification of the product	HW version: 9304516A19 SW version: C2GB_2023w34_d2308 FCC ID: V27-TV0201 IC: 3282B-TV0201
(*) Features	BT for headset (Hands-Free Profile), WLAN 802.11 bgn (2.4GHz)
Manufacturer	Bittium Wireless Oy Ritaharjuntie 1 90590 Oulu
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B (2-6-23 Edition) & ICES-003 Issue 7 (October 2020)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Antonio José Jurado Industrial & Automotive EMC Lab. Manager 80157242B Firmado digitalmente por 80157242B ANTONIO JOSE JURADO JURADO (CA:29507456) Fecha: 2026.02.18 15:32:59 +01'00'
Date of issue	2026-02-18
Report template No	FDT08_24 (*) "Data provided by the client"



Index

ACRONYMS 3

COMPETENCES AND GUARANTEES 3

GENERAL CONDITIONS 4

UNCERTAINTY 4

DATA PROVIDED BY THE CLIENT 4

USAGE OF SAMPLES 6

TEST SAMPLE DESCRIPTION 7

IDENTIFICATION OF THE CLIENT 9

TESTING PERIOD AND PLACE 9

DOCUMENT HISTORY 9

ENVIRONMENTAL CONDITIONS 10

REMARKS AND COMMENTS 11

TESTING VERDICTS 11

LIST OF EQUIPMENT USED DURING THE TEST 12

SUMMARY 13

APPENDIX A: TEST RESULTS 14

Acronyms

Acronym ID	Acronym Description
Code	EMC Test Code
Freq Rng	Frequency Range
Line	Conducted Emissions - Tested Line
MP	Measurement Point
OM	Operation Mode
S/	Sample
V	Verdict

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

The total uncertainty of the measurement system for the measured conducted disturbance characteristics of EUT from 150 kHz to 30 MHz is $I = \pm 3,9$ dB for quasi-peak measurements, $I = \pm 3,2$ dB for peak measurements ($k = 2$).

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 30 MHz to 1000 MHz is $I = \pm 4,9$ dB for quasi-peak measurements, $I = \pm 4,6$ dB for peak measurements ($k = 2$).

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 1000 MHz to 12.75 GHz is $I = \pm 2,6$ dB for peak and average measurements ($k = 2$).

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of a Bittium Tough Comnode™.
3. Declaration of equivalence between models:



Confidential

STATEMENT OF MODEL DIFFERENCES

Model and /or type reference: Bittium Tough Comnode™
Product code 9404092
Type Designate TV0201
HW version: 9304516A19

Derived Model: Bittium Tough VoIP Field Phone™ 2
Product code 9404768
Type Designate TV0201
HW version: 9304516A19

The type designate identifies different product codes (variants) which can be seen as the same product from type approval point of view. The same type designate is used for two or several products when there are no significant functional or performance differences between these variants.

From hardware point of view the models Bittium Tough VoIP Field Phone™ 2 and Bittium Tough Comnode™ are the same. Difference between models are software features.

Bittium Tough Comnode™ is a versatile and rugged terminal and IP communication device for tactical networks. The device fulfils the data transfer needs for mobile troops by functioning for example as a VoIP phone (Voice over IP), an IP router (Internet Protocol), and an SHDSL repeater (Symmetrical Highspeed Digital Subscriber Line).

Bittium Tough VoIP Field Phone™ 2 is a robust VoIP phone that has been designed for tactical networks with PTT functionality. It provides IP telecommunication either with Bittium Tough VoIP Service™ or 3rd party SIP servers.

Tampere 10.11.2023


Jussi-Pekka Pudas
Product Manager

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	75900B_2.1	Bittium Tough Comnode	TV0201	9304516A19-23340024	2023-10-23	Element Under Test
S/01	75900B_1.1	Telephone handset			2023-10-23	Element Under Test
S/01	75900B_4.1	Ethernet Cable			2023-10-23	Element Under Test
S/01	75900B_5.1	Multi Pin /Loose ends Cable			2023-10-23	Element Under Test
S/01	75900B_6.1	Multi Pin / 2 Ethernet Adapter			2023-10-23	Element Under Test
S/01	75900B_7.1	Shell			2023-10-23	Auxiliary Element

Notes referenced to samples during the project: N/A.

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	Two ITU-T G991.2 (G.SHDSL) interfaces, push-and-release connector	NA	[X]	[]	[]		
	Two 10BASE-T/100BASE-TX interfaces with PoE 802.3af input	NA	[X]	[]	[]		
	Power supply port 12-32VDC (tested with 28V)	5m	[X]	[]	[]		
	Audio/serial interface for connecting handset/headset/CNR , incl. two serial ports and push-to-talk signals	0.8m	[X]	[X]	[]		
	USBv2.0 host port / USB power input	5m	[]	[]	[]		
Supplementary information to the ports..... :	Not provided data						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[]	AC:	[]	[]	[]	[]	[]
	[X]	DC: 12 - 32 VDC					
Rated Power	Power consumption 7W						
Clock frequencies.....	20.48 MHz, 25 MHz, 100MHz , 32.768kHz, 26 MHz						
Other parameters	Not provided data						
Software version	C2GB_2023w34_d2308						
Hardware version	9304516A19						
Dimensions in cm (W x H x D)	180 x 90 x 30 mm (without handset and handset holder)						
Mounting position	[]	Table top equipment					
	[]	Wall/Ceiling mounted equipment					
	[]	Floor standing equipment					
	[X]	Hand-held equipment					
	[X]	Other: Mount kit					

Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	Bittium Tough Comnode™	9404092/TV 0201	Bittium
	Bittium Tough VoIP Field Phone™ 2	9404768/TV 0201	Bittium
Accessories (not part of the test item)	Description	Type	Manufacturer
	Handset 9304639A01	H-350/U	CJ Component Products
	Cable DC Powering 5.0m, 5500959A02	Cable	Bittium
	Cable Ethernet 0.4m Dual, 5500961A05	Cable	Bittium
	Cable DC Powering 2.0m, 5500959A02	Cable	Bittium
Documents as provided by the applicant	Description	File name	Issue date
	Not provided data		

⁽³⁾ Only for Medical Equipment

Identification of the client

Bittium Wireless Oy
Ritaharjuntie 1 90590 Oulu. Finland.

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2023-10-31
Date (finish)	2023-11-02

Document history

Report number	Date	Description
75900REM.001	2025-12-11	First release
75900REM.001A1	2026-02-18	Second release. Modification due to typos. This modification test report cancels and replaces the test report 75900REM.001.
75900REM.001A2	2026-02-18	Third release. Modification due to minor changes. This modification test report cancels and replaces the test report 75900REM.001A1.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860mbar Max. = 1060mbar

Remarks and comments

The tests have been performed by the technical personnel: José Antonio Santiago Galván.

Testing verdicts

Fail	F
Inconclusive	I
Not applicable	N/A
Not measured	N/M
Pass	P
Partial Passed	P*

List of equipment used during the test

Control No.	Equipment	Model	Manufacturer	Next Calibration
07816	EMI TEST RECEIVER 1Hz-26.5GHz	ESW26	ROHDE AND SCHWARZ	2023-11-04
08825	EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2025-08-21
06135	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2024-05-09
07743	HORN ANTENNA 0,75-18GHz	3115	ETS LINDGREN	2026-08-22
07746	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2026-09-01
06145	PRE-AMPLIFIER G>38dB 30MHz-6GHz	BLNA 0360-01N	BONN ELEKTRONIK	2024-05-30
09361	PRE-AMPLIFIER G>40dB 1-18 GHz	BLMA 0118-1M	BONN ELEKTRONIK	2024-06-12
08150	SEMIANECHOIC ABSORBER LINED CHAMBER I	FACT 10	ETS LINDGREN	--
04848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	--
07553	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-04-18
07546	TEMPERATURE AND HUMIDITY PROBE	HWg-STE	HW GROUP	2024-04-18
06204	THREE-PHASE ARTIFICIAL NETWORK 32A	PMM L3-32	NARDA	2023-11-17
07771	TRANSIENT LIMITER 10DB N CONNECTOR	VTSD 9561-F	SCHWARZBECK	2024-04-14

Summary

Test Specification	Requirement – Test case	Verdict	Remark
FCC CFR 47, Part 15, Subpart B (2-6-23 Edition) & ICES-003 Issue 7 (October 2020)	RE Radiated emission. Electromagnetic field measure	P	(1)
	CE Continuous conducted emission	P	--
<u>Supplementary information and remarks:</u> (1) Range: $f > 12.75$ GHz. Test required only to the 5th harmonics of the maximum internal work frequency in the EUT.			

Appendix A: Test results

Appendix A content

DESCRIPTION OF THE OPERATION MODES 16

TEST STANDARDS VERSION APPLIED 17

TEST CASES DETAILS 18

CE Continuous conducted emission 18

RE Radiated emission. Electromagnetic field measure 21

Description of the operation modes

The operation modes described in this paragraph constitute a functionality of the sample under test for itself.
The operation modes used by the samples to which the present report refers, are shown in the following table:

Id	Description
OM/01	EUT ON. The EUT was connected to auxiliary PC via LAN cable. Bluetooth on Rx mode, WLAN on Rx mode. Power supply 28Vdc.

Test standards version applied

The product standards and test standards applied for each test cases are shown in the following table:

Product Test Standard	Test standard	Requirement – Test case
FCC CFR 47, Part 15, Subpart B (2-6-23 Edition) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 (2014)	RE Radiated emission.
	ANSI C63.4 (2014)	CE Continuous conducted emission

Test Cases Details

FCC 47 CFR Part 15B CE Continuous conducted emission

Limits of interference

Class B

The applied limit for continuous conducted emissions in power leads, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (2-6-23 Edition), Secs. 15.107 & ICES-003 Issue 7 (October 2020), in the frequency range 0,15 to 30 MHz, for Class B equipment was:

Frequency range (MHz)	Limit (dBμV)	
	Quasi-Peak	Average
0,15 to 0,5	66 – 56*	56 – 46*
0,5 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

Results

S/	OM	Code	Freq Rng (MHz)	Line	V
01	OM/01	CE0101NE	[0.15, 30]	DC-	P
01	OM/01	CE0101PO	[0.15, 30]	DC+	P

Verdict

Pass

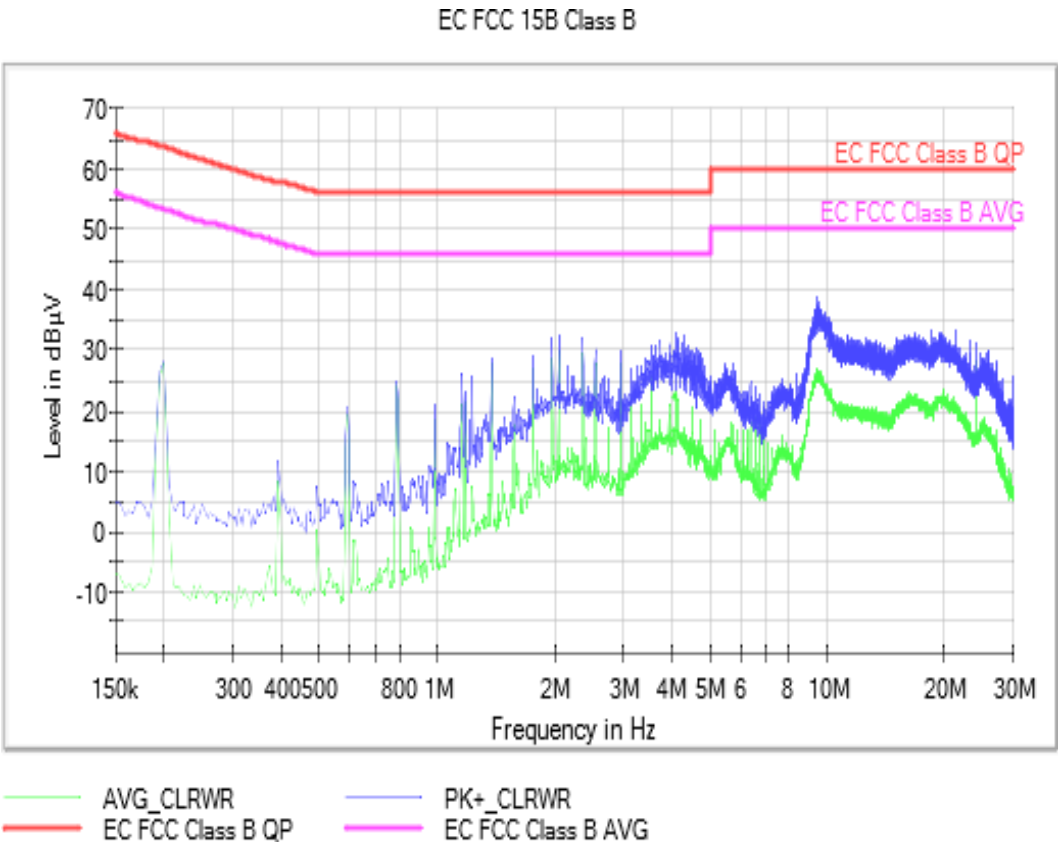
Attachments

EMC Test Code = CE0101NE Frequency Range MHz = [0.15, 30]
Conducted Emissions - Tested Line = DC-

Sample ID: S/01

Operation Mode: OM/01. EUT ON. The EUT was connected to auxiliary PC via LAN cable. Bluetooth on Rx mode, WLAN on Rx mode. Power supply 28Vdc.

Images:



Tables:

Frequency(MHz)	PK+_CLRWR(dBµV)	AVG_CLRWR(dBµV)
0.198000	28.2	27.8
0.394000	11.8	8.3
0.590000	20.5	19.4
1.154000	26.3	20.9
2.046000	32.7	30.3
2.362000	32.1	29.3
4.090000	32.9	23.4
9.498000	39.0	26.9
16.754000	32.8	22.1
21.310000	33.4	20.9

EMC Test Code = CE0101PO

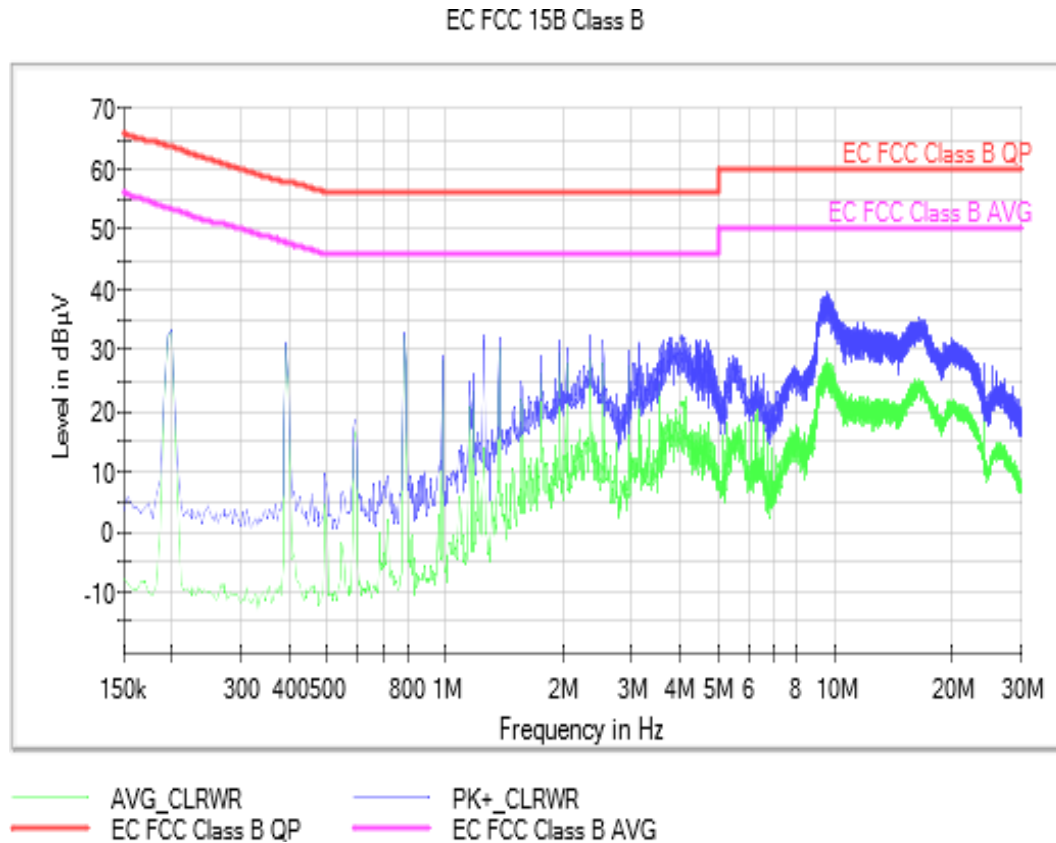
Frequency Range MHz = [0.15, 30]

Conducted Emissions - Tested Line = DC+

Sample ID: S/01

Operation Mode: OM/01. EUT ON. The EUT was connected to auxiliary PC via LAN cable. Bluetooth on Rx mode, WLAN on Rx mode. Power supply 28Vdc.

Images:



Tables:

Frequency(MHz)	PK+ CLRWR(dBµV)	AVG CLRWR(dBµV)
0.198000	33.5	33.3
0.394000	31.2	30.9
0.590000	18.6	16.8
0.786000	33.0	32.7
1.266000	32.6	13.8
2.358000	32.7	28.9
3.818000	32.3	15.0
9.558000	39.6	27.4
16.954000	35.5	21.3
17.698000	32.5	21.3

RE Radiated emission. Electromagnetic field measure

Limits of interference

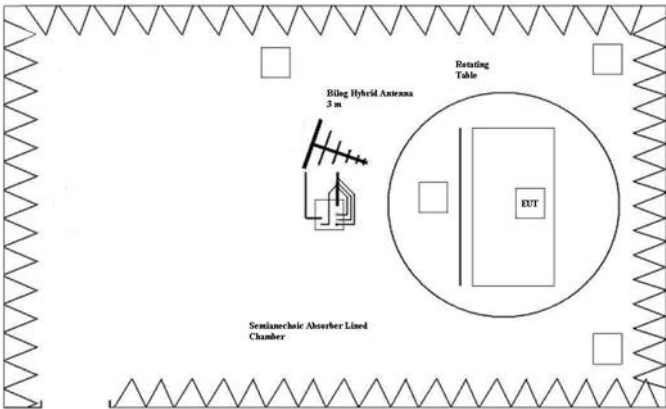
Class B

The applied limit for radiated emissions, 3 m distance, according to the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (2-6-23 Edition), Secs. 15.109 & ICES-003 Issue 7 (October 2020) in the frequency range 30 MHz to 12.75 GHz for class B equipment.

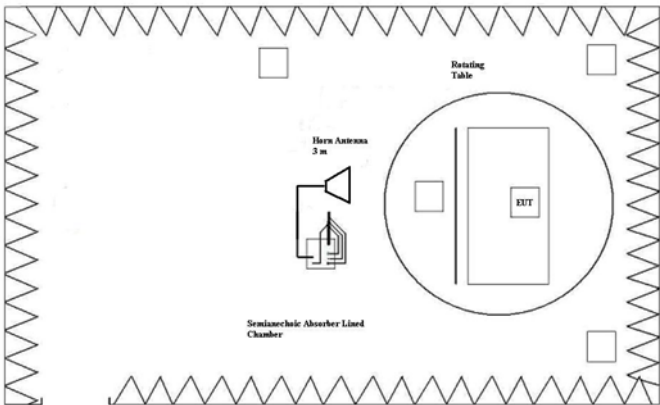
Frequency range (MHz)	FCC Part 15B		ICES-003 Issue 7		FCC Part 15B & ICES-003 Issue 7	
	QP Limit for 3 m		QP Limit for 3 m		PK Limit for 3 m	AVG Limit for 3 m
	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)
30 to 88	100	40	100	40	---	---
88 to 216	150	43.5	150	43.5	---	---
216 to 230	200	46	200	46	---	---
230 to 960	200	46	224	47	---	---
960 to 1000	500	54	500	54	---	---
Above 1000	---	---	---	---	74	54

Limits according to FCC Part 15B, are equal or more stringent than those of ICES-003 Issue 7.

Setup for measurements



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

Results

S/	OM	Code	Freq Rng (MHz)	V
01	OM/01	RE0101LR	[30, 1000]	P
01	OM/01	RE0101HR	[1000, 12750]	P

Verdict

Pass

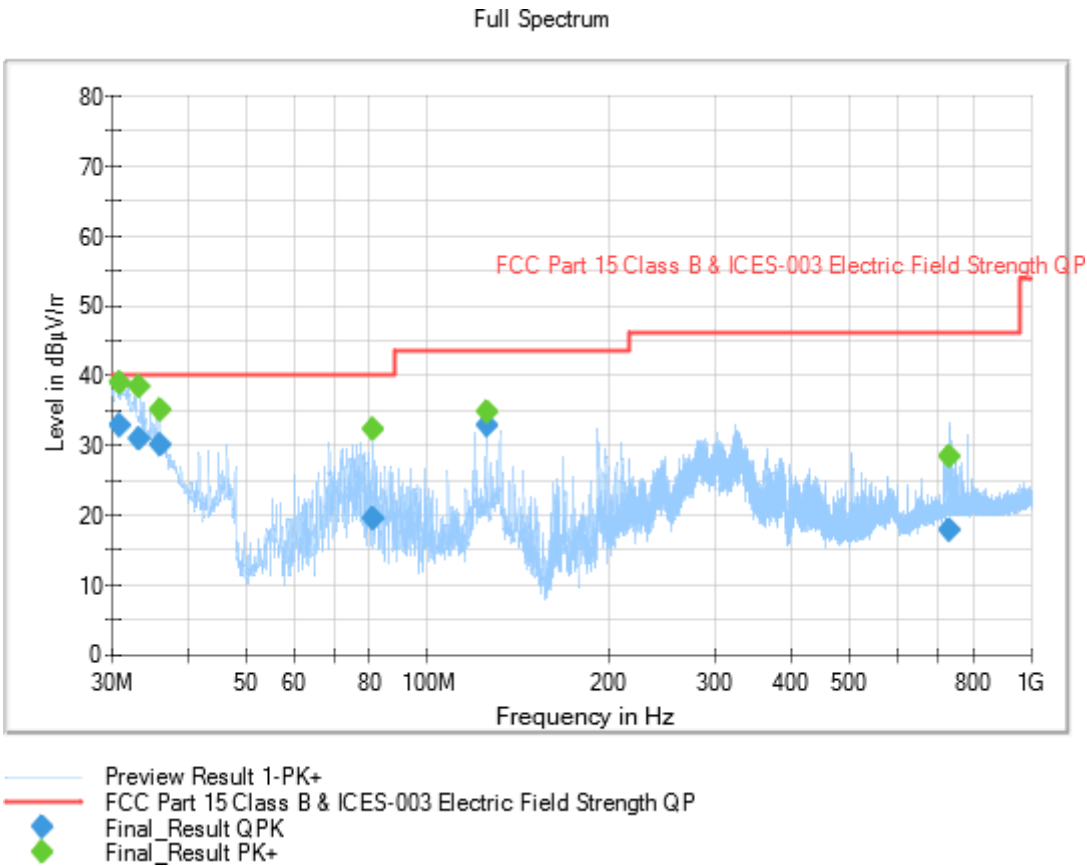
Attachments

EMC Test Code = RE0101LR Frequency Range MHz = [30, 1000]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. The EUT was connected to auxiliary PC via LAN cable. Bluetooth on Rx mode, WLAN on Rx mode. Power supply 28Vdc.

Images:



Tables:

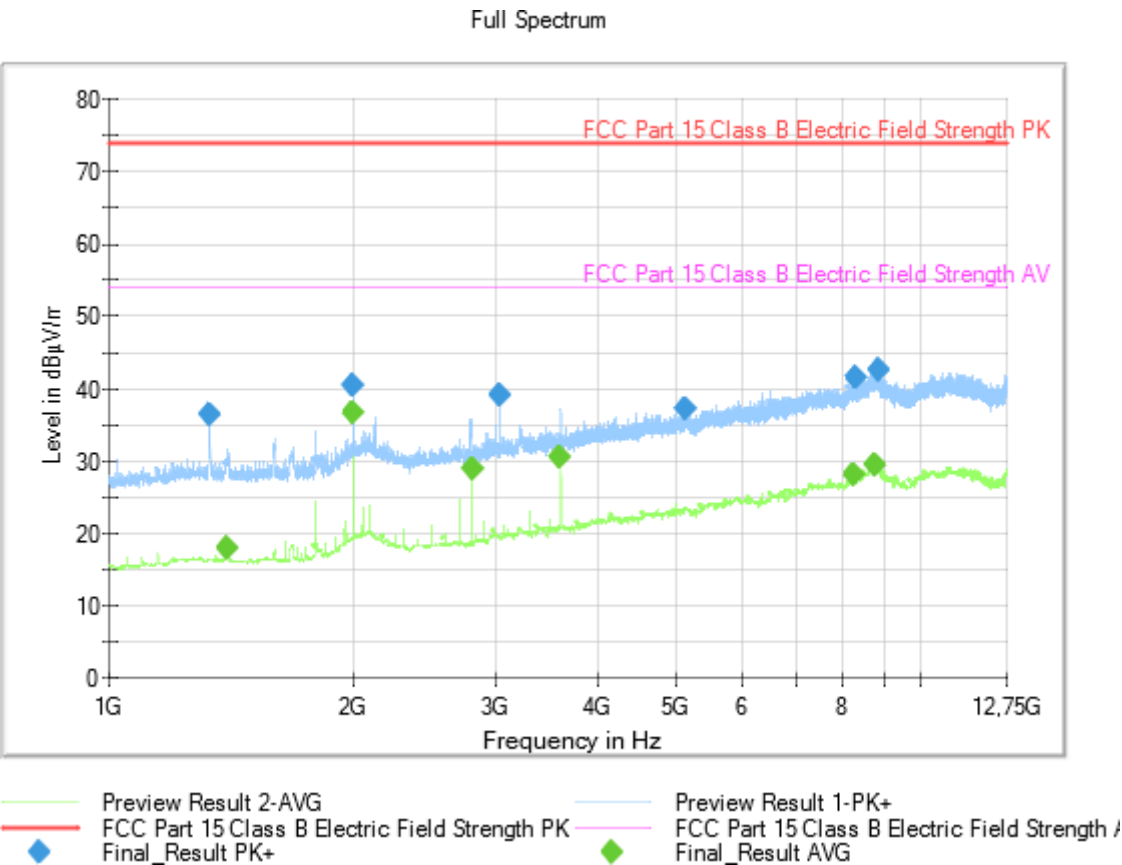
Frequency(MHz)	QuasiPeak(dBµV/m)	MaxPeak(dBµV/m)	Limit(dBµV/m)	Margin(dB)	Height(cm)	Po l	Azimuth(deg)
30.964000	---	38.87	---	---	150.0	V	0.0
30.964000	32.65	---	40.00	7.35	150.0	V	0.0
33.173000	---	38.29	---	---	150.0	V	90.0
33.173000	30.85	---	40.00	9.15	150.0	V	90.0
35.959000	29.96	---	40.00	10.04	150.0	V	0.0
35.959000	---	34.86	---	---	150.0	V	0.0
81.255000	---	32.24	---	---	150.0	V	0.0
81.255000	19.44	---	40.00	20.56	150.0	V	0.0
125.853000	32.71	---	43.52	10.81	150.0	V	90.0
125.853000	---	34.78	---	---	150.0	V	90.0
735.159000	---	28.29	---	---	150.0	H	90.0
735.159000	17.64	---	46.00	28.36	150.0	H	90.0

EMC Test Code = RE0101HR Frequency Range MHz = [1000, 12750]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. The EUT was connected to auxiliary PC via LAN cable. Bluetooth on Rx mode, WLAN on Rx mode. Power supply 28Vdc.

Images:



Tables:

Frequency(MHz)	MaxPeak(dBµV/m)	Average(dBµV/m)	Limit(dBµV/m)	Margin(dB)	Corr.(dB/m)
1328.800000	36.45	---	73.97	37.52	-13.7
1398.400000	---	17.94	53.97	36.03	-13.6
2000.000000	---	36.65	53.97	17.32	-9.7
2000.000000	40.28	---	73.97	33.69	-9.7
2800.000000	---	29.00	53.97	24.97	-9.5
3022.400000	39.16	---	73.97	34.81	-8.9
3600.000000	---	30.60	53.97	23.37	-7.4
5140.000000	37.16	---	73.97	36.81	-4.4
8269.600000	---	28.06	53.97	25.91	2.4
8316.400000	41.44	---	73.97	32.53	2.5
8798.400000	---	29.42	53.97	24.55	3.7
8868.800000	42.54	---	73.97	31.43	3.8