AT4 wireless, S.A.
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ENAC ENSAYOS Nº 51/LE147

Informe de ensayo nº:
Test report No:

NIE: 46883REM.004A1

Test Report (Modification 1)

FCC Rules and Regulations 47 CFR Chapter I Part 15 Subpart B (10-01-13 Edition); ICES-003 ISSUE 5 (2012)
&
ANSI C63.4-2009: American National standard for methods of measurements of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9kHz to 40GHz.

Identificación del objeto ensayado.....: Identification of item tested	WIRELESS COMMUNICATION MODULE
Marca .....: Trade	NTT DOCOMO
Modelo y/o referencia tipo .....: Model and /or type reference	UM04-KO
Otra identificación del producto.....: Other identification of the product	FCC ID: TTIUM04KO
Versión final del HW .....: Final HW version	Version 0.80
Versión final del SW .....: Final SW version	Version 0.56
Características .....: Features	Packet communication, SMS
Fabricante .....: Manufacturer	HITACHI KOKUSAI ELECTRIC INC. 32, Miyuki-cho 187-8511 Kodaira-shi Tokyo Japan
Método de ensayo solicitado, norma.....: Test method requested, standard	FCC Rules and Regulations 47 CFR Chapter I Part 15 Subpart B (10-01-13 Edition); ICES-003 ISSUE 5 (2012) & ANSI C63.4-2009
Resultado.....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) .....: Approved by (name / position & signature)	Rafael López Martín LAB EMC Manager Firmado digitalmente por Rafael López Martín Fecha: 2015.09.18 11:44:37 +02'00'
Fecha de realización .....: Date of issue	2015-09-18
Formato de informe No. .....: Report template No	FDT11_17

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Competences and guarantees

AT4 wireless 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, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless 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 AT4 wireless at the time of performance of the test.

AT4 wireless 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.

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 AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples under test have been selected by: the Client.

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial number	Reception date
46883/002	Module LX301	LX301	LX301-SW-11	2015-07-20

Sample S/01 is composed of the following auxiliary elements:

Control Nº	Description	Model	Serial number	Reception date
46883/001	Module WM3-JIG	WM3-JIG	WM3-JIG-023	2015-07-20
46883/013	Antenna	DP-BRO-AD	---	2015-07-20
46883/014	Antenna	DP-BRO-AD	---	2015-07-20
46883/035	AC/DC adapter	US300520	F05-0316753	2015-07-20
46883/041	Plug adapter	---	---	2015-07-20

Test sample description

The sample is an UM04-KO wireless communication module which unified in combination with the radio part of the cellular telephone and the modem part.

Identification of the client

HITACHI KOKUSAI ELECTRIC INC.
32, Miyuki-cho
187-8511. Kodaira-shi. Tokyo. Japan

Testing period

The performed test started on 2015-08-07 and finished on 2015-08-13.
The tests have been performed at AT4 wireless.

Environmental conditions

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 80 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

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

Temperature	Min. = 15 ºC Max. = 30 ºC
Relative humidity	Min. = 45 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Site VSWR	< ±6 dB at 3m distance between item under test and receiver antenna, (1 GHz to 18 GHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 18 GHz).

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

Temperature	Min. = 15 ºC Max. = 30 ºC
Relative humidity	Min. = 45 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 46883REM.004 related with the same samples, in the next clauses and sub-clauses:

By client requirement it was modified the table of the page 4:

Control Nº	Description	Model	Serial number	Reception date
46883/002	Module WM3-JIG	WM3-JIG	WM3-JIG-023	2015-07-20

By the next one:

Control Nº	Description	Model	Serial number	Reception date
46883/002	Module LX301	LX301	LX301-SW-11	2015-07-20

This modification test report cancels and replaces the test report 46883REM.004.

Remarks and comments

The test has been performed by the technical personnel: José Manuel Márquez, Alberto Parada & Antonio Jurado.

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 30 MHz to 1 GHz is I = ± 4,57 dB for quasi-peak measurements, I = ± 4,48 dB for peak measurements (k = 2) and from 1 to 12,75 GHz is I = ± 3,43 dB for average and peak measurements.

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 12,75 GHz to 26 GHz is I = ± 4,09 dB for average and peak measurements.

Testing verdicts (Legend)

Not applicable ..... :	N/A
Pass ..... :	P
Fail ..... :	F
Not measured ..... :	N/M

List of equipment used during the test					
CONTROL NUMBER	**DESCRIPTION**	**MANUFACTURER**	**MODEL**	**LAST CALIBRATION**	**NEXT CALIBRATION**
4523	EMI Receptor	ROHDE & SCHWARZ	ESU 26	2013-08-27	2015-08-27
1935	EMI Receptor	ROHDE & SCHWARZ	ESPI 3	2013-12-11	2015-12-11
2932	Bilog Hybrid Antenna	SUNOL	JB6	2014-05-11	2017-05-11
4656	Horn Antenna	SCHWARZBECK	BBHA 9170	2014-03-28	2017-03-28
1658	RF Amplifier	SCHAFFNER	CPA9231A	2013-06-11	2015-06-11
1975	RF Amplifier	MITEQ	JS4	2014-05-22	2016-05-22
3783	RF Amplifier	BONN ELEKTRONIK	BLMA 0118-3A	2015-05-15	2016-05-15
0258	Transient Limiter	HP	119471A	2014-10-02	2016-10-02

1650	Artificial Network	SCHWARZBECK	NNLK - 8121	2013-06-25	2015-06-25

Appendix A – Test result

CONTENT

DESCRIPTION OF THE OPERATION MODES

The operation modes used by the samples to which the present report refers, are shown in the following table:

OPERATION MODE	DESCRIPTION
OM#01	EUT ON. Idle GSM 850MHz. Power supply Vnom: 3.7Vdc.
OM#02	EUT ON. Idle UMTS Band V. Power supply Vnom: 3.7Vdc.
OM#03	EUT ON. Idle LTE Band 1. Power supply Vnom: 3.7Vdc.

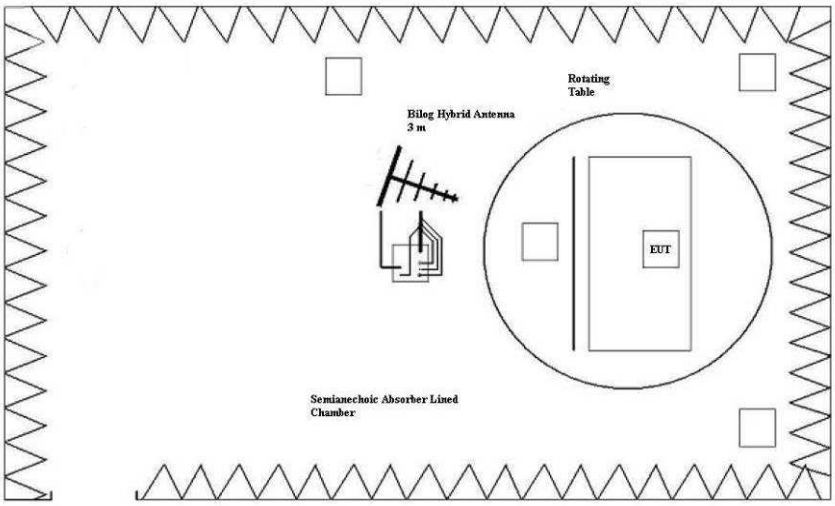
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE.

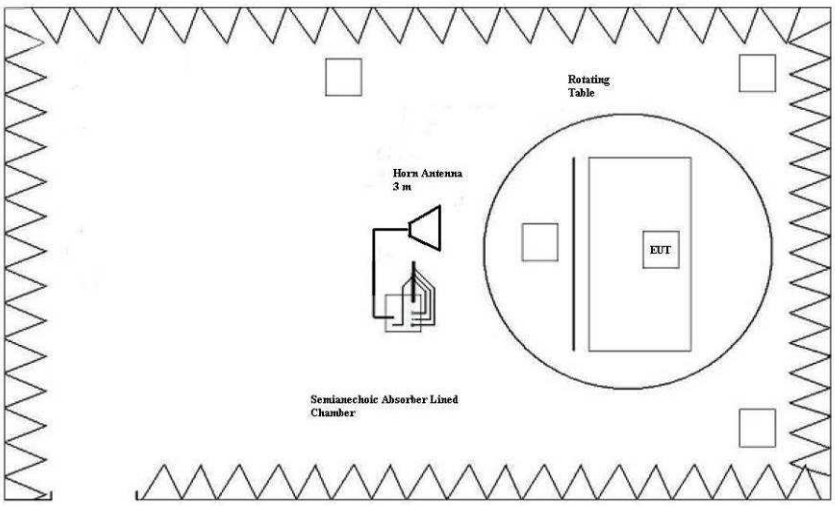
LIMITS:	Product standard:	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-13 Edition); ICES-003 ISSUE 5 (2012) & ANSI C63.4-2009
	Test standard:	FCC RULES AND REGULATIONS 47 CFR PART 15, SUBPART B (10-01-13 Edition); ICES-003 ISSUE 5 (2012) & ANSI C63.4-2009

LIMITS OF INTERFERENCE CLASS B:

The applied limit for radiated emissions, 3 m distance, according with the requirements of FCC Rules and Regulations 47 CFR Part 15.109, Subpart B (10-01-13 Edition); ICES-003 ISSUE 5 (2012) & ANSI C63.4-2009 in the frequency range 30 MHz to 26 GHz, for Class B equipment, which is a transmitter in a band over 500 MHz, was:

Frequency range (MHz)	QP Limit for 3 m (µV/m)	QP Limit for 3 m (dBµV/m)
30 to 88	100	40
88 to 216	150	43,52
216 to 960	200	46,02
Above 960	500	53,98
Above 1000	Limit for 3m AVG	Limit for 3m PK
	53.98 dBµV/m	73.98 dBµV/m





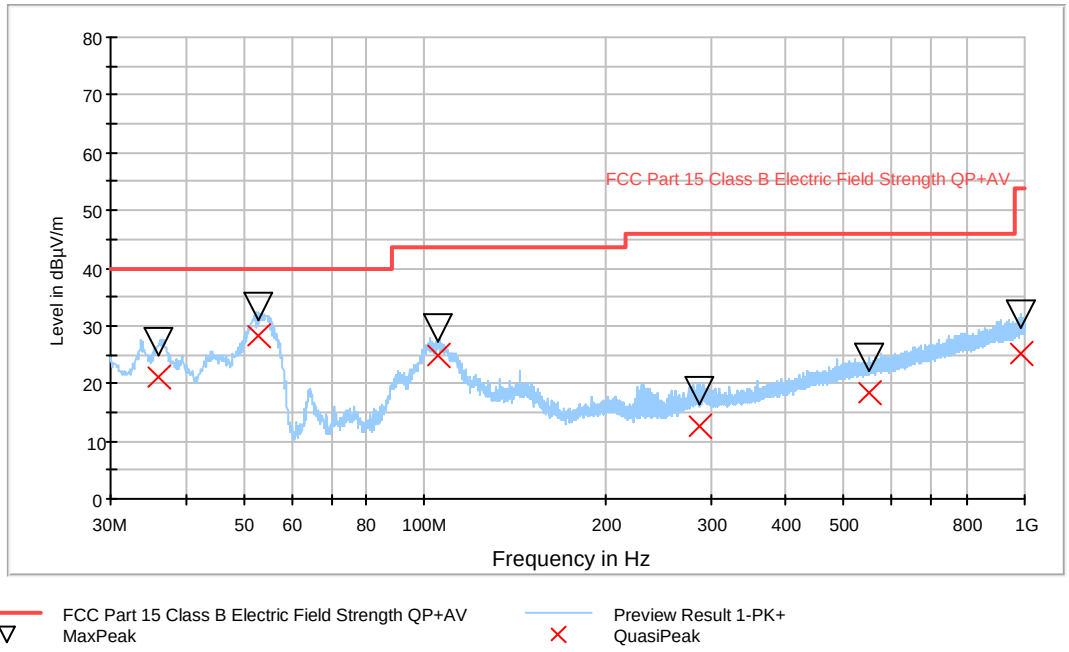
TESTED SAMPLES:	S/01
TESTED OPERATION MODES:	OM#01; 02 & 03
TEST RESULTS :	CRmmnn: CR, Condición de Radiación; mm: Sample number; nn: Operation mode.

CRmmnn	Description	Result
CR0101	Range: 30MHz o 1GHz. Worst case.	P
CR0101_RA1_PH	Range: 1GHz o 18GHz. Horizontal polarization. Worst case.	P
CR0101_RA1_PV	Range: 1GHz o 18GHz. Vertical polarization. Worst case.	P
CR0101_RA2_PH	Range: 18GHz o 26GHz. Horizontal polarization. Worst case.	P
CR0101_RA2_PV	Range: 18GHz o 26GHz. Vertical polarization. Worst case.	P
CR0102	Range: 30MHz o 1GHz.	P
CR0102_RA1_PH	Range: 1GHz o 18GHz. Horizontal polarization.	P
CR0102_RA1_PV	Range: 1GHz o 18GHz. Vertical polarization.	P
CR0102_RA2_PH	Range: 18GHz o 26GHz. Horizontal polarization.	P
CR0102_RA2_PV	Range: 18GHz o 26GHz. Vertical polarization.	P
CR0103	Range: 30MHz o 1GHz. Worst case.	P
CR0103_RA1_PH	Range: 1GHz o 18GHz. Horizontal polarization. Worst case.	P
CR0103_RA1_PV	Range: 1GHz o 18GHz. Vertical polarization. Worst case.	P
CR0103_RA2_PH	Range: 18GHz o 26GHz. Horizontal polarization. Worst case.	P
CR0103_RA2_PV	Range: 18GHz o 26GHz. Vertical polarization. Worst case.	P

Radiated Emission: CR0101

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. Idle GSM 850MHz. Power supply: Vnom=3,7Vdc.

FCC class B Bilog Hybrid AMP2193



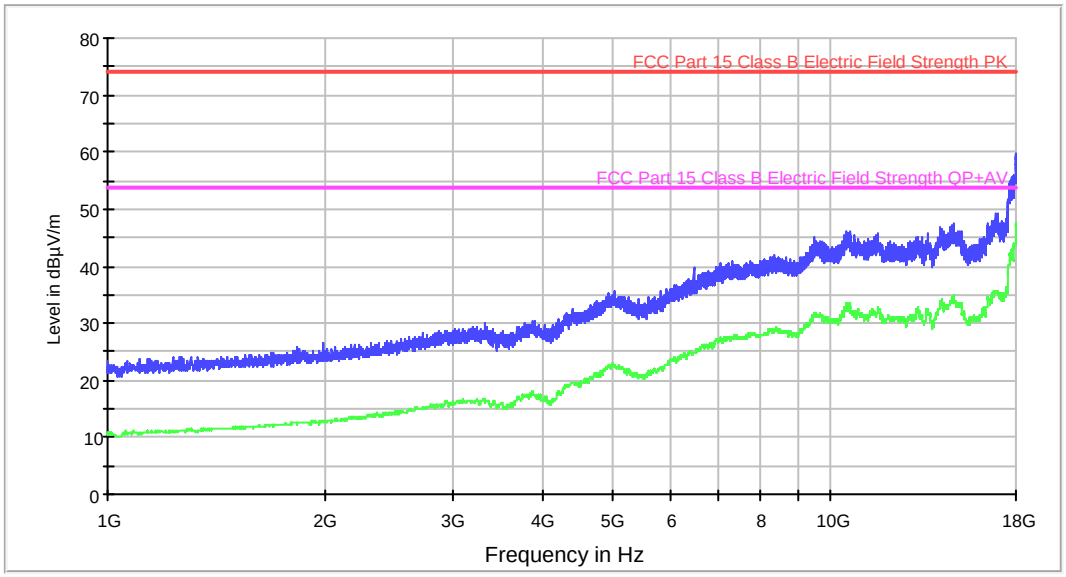
Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)
35.981142	27.2	21.1	106.0	V	303.0
52.939880	33.3	28.3	98.0	V	305.0
105.562525	29.5	24.8	104.0	V	126.0
286.893186	18.6	12.7	145.0	V	173.0
549.559118	24.4	18.2	182.0	V	76.0
987.796994	32.1	25.3	164.0	V	355.0

Radiated Emission: CR0101RA1_PH

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. IDLE 2G 850 MHz. Power supply 3.7Vdc. Horizontal polarization.

ER EMI FCC 15 Class B AMP_4659 (1-18GHz)



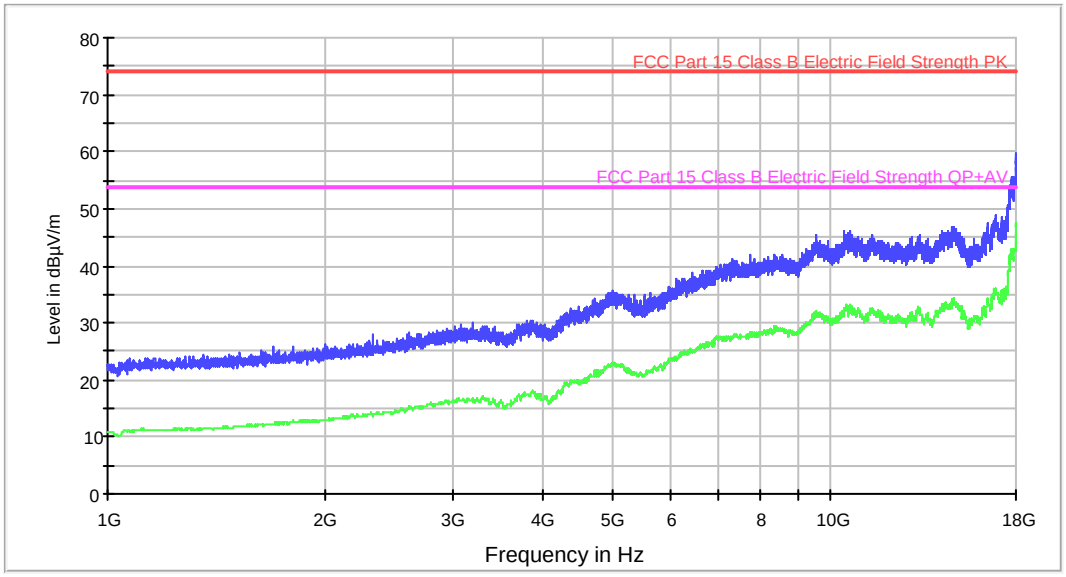
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1572.000000	24.4	11.9
2615.000000	27.4	14.9
4197.000000	30.6	18.0
6453.000000	39.7	24.9
10597.000000	46.1	33.4
17995.000000	59.7	47.4

Radiated Emission: CR0101RA1_PV

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. IDLE 2G 850 MHz. Power supply 3.7Vdc. Vertical polarization.

ER EMI FCC 15 Class B AMP_4659 (1-18GHz)



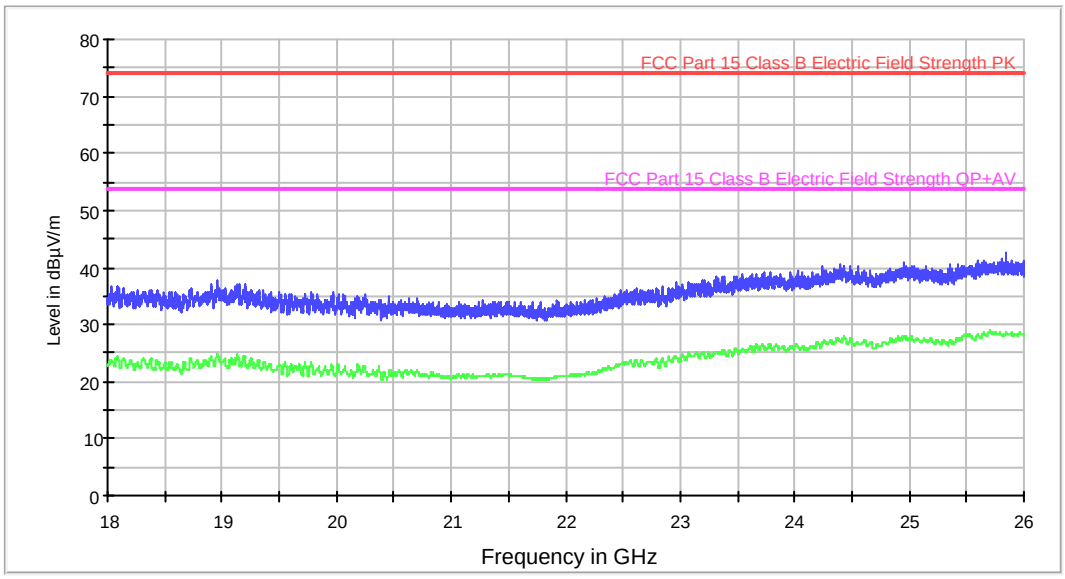
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1525.000000	24.7	11.9
2616.000000	28.3	15.2
4217.000000	30.9	18.0
6656.000000	39.0	26.2
10430.000000	46.1	32.1
17991.000000	59.8	47.1

Radiated Emission: CR0101RA2_PH

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. IDLE 2G 850 MHz. Power supply 3.7Vdc. Horizontal polarization.

ER EMI FCC 15 Class B AMP_4729 (18-26GHz)



Peak Scan
FCC Part 15 Class B Electric Field Strength PK
Average Scan
FCC Part 15 Class B Electric Field Strength QP+AV

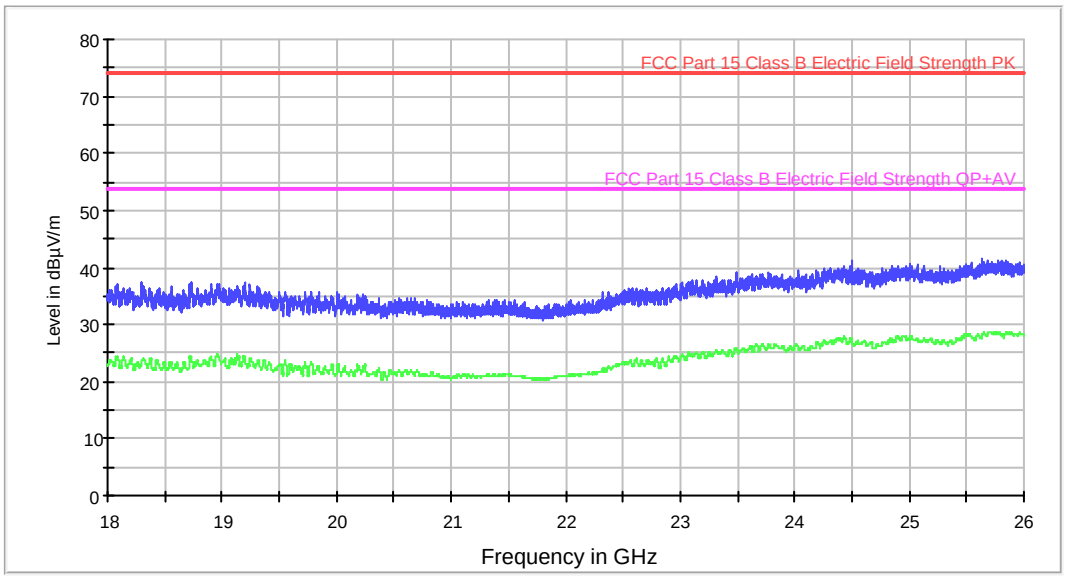
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18965.000000	37.7	24.7
19205.000000	37.1	23.8
20459.000000	34.9	21.7
22971.000000	37.3	24.3
24396.000000	40.5	27.4
25836.000000	42.5	28.2

Radiated Emission: CR0101RA2_PV

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#01
Description:	EUT ON. IDLE 2G 850 MHz. Power supply 3.7Vdc. Horizontal polarization.

ER EMI FCC 15 Class B AMP_4729 (18-26GHz)



Peak Scan
FCC Part 15 Class B Electric Field Strength PK
Average Scan
FCC Part 15 Class B Electric Field Strength QP+AV

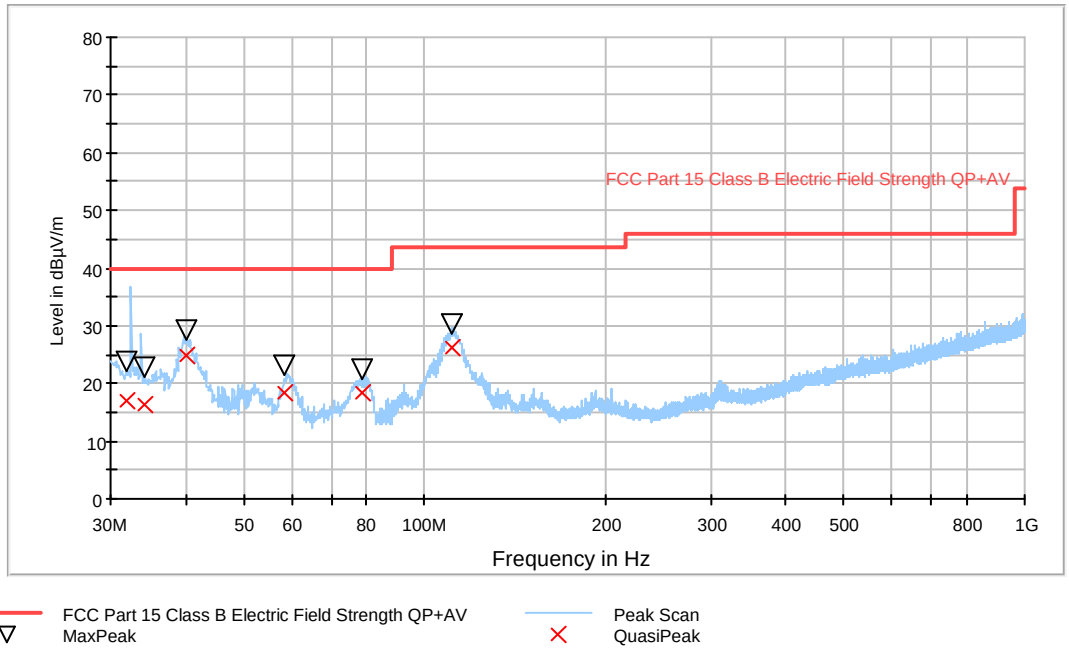
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18297.000000	37.4	23.1
19194.000000	37.2	24.6
20537.000000	34.6	21.9
22960.000000	36.9	24.3
24430.000000	40.1	27.9
25636.000000	41.5	28.1

Radiated Emission: CR0102

Project:	46082REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#02
Description:	EUT ON. Idle UMTS Band V. Power supply: Vnom=3.7Vdc.

FCC class B Bilog Hybrid AMP2193



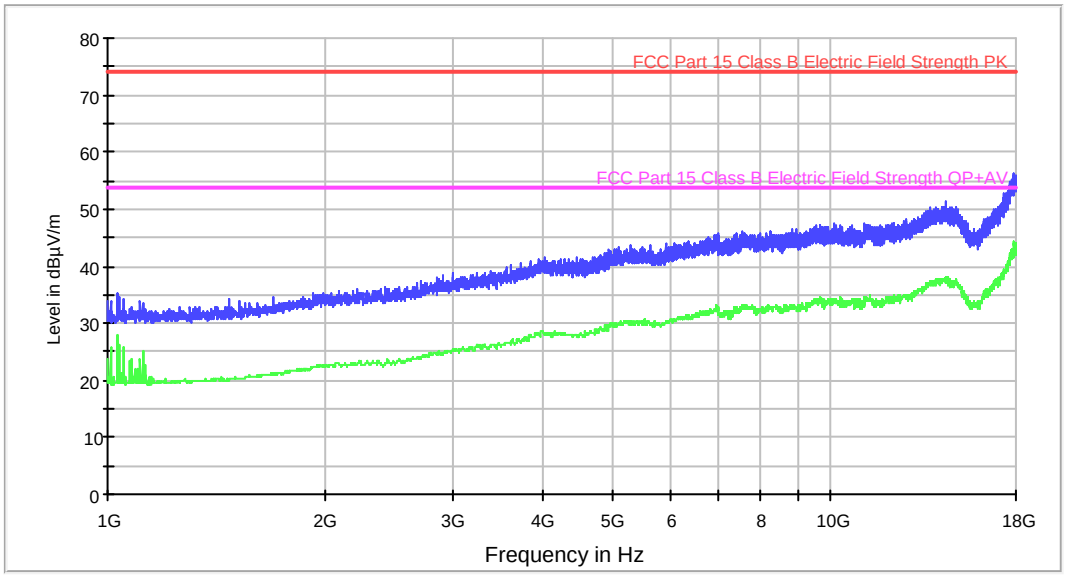
Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)
32.002004	24.0	17.1	189.0	H	126.0
34.085772	22.9	16.5	258.0	H	236.0
40.063727	29.1	24.7	98.0	V	91.0
58.590180	23.2	18.4	99.0	V	201.0
79.020040	22.6	18.4	109.0	V	167.0
111.467936	30.1	26.3	283.0	H	190.0

Radiated Emission: CR0102RA1_PH

Project:	46883rem004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#02
Description:	EUT ON. Idle UMTS Band V. Power supply: Vnom=3.7Vdc. Horizontal polarization.

FCC 1-18GHz class B



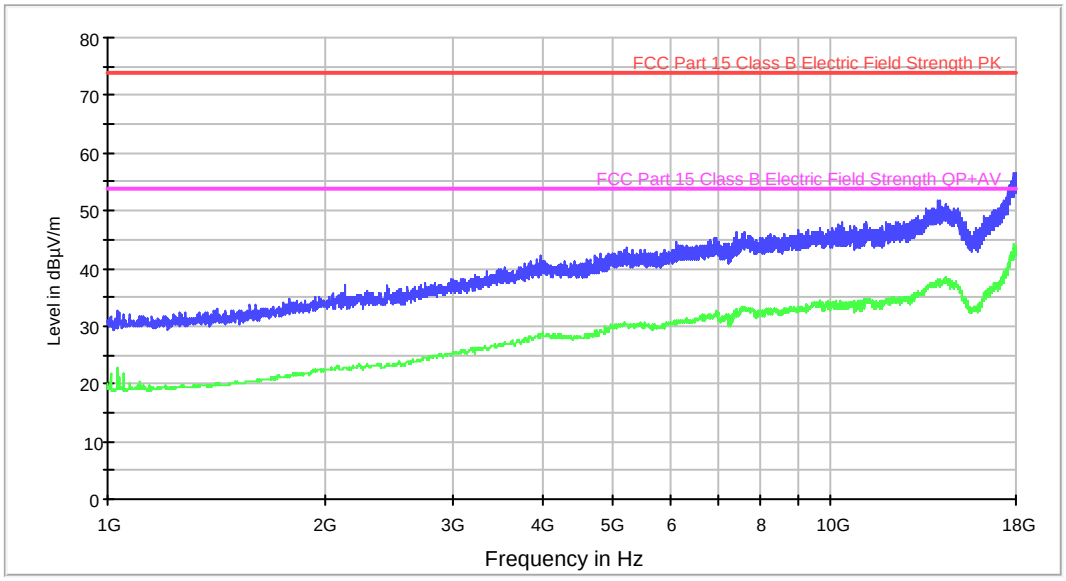
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)	Polarization
1030.000000	35.2	27.8	H
1693.000000	34.5	21.1	H
2218.000000	36.0	23.2	H
3004.000000	38.8	25.2	H
4016.000000	41.4	28.2	H
5284.000000	43.8	30.3	H
7537.000000	46.0	33.1	H
10081.000000	47.6	33.9	H
13398.000000	49.2	35.9	H
17918.000000	56.4	44.2	H

Radiated Emission: CR0102RA1_PV

Project:	46883rem004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#02
Description:	EUT ON. Idle UMTS Band V. Power supply: Vnom=3.7Vdc.

FCC 1-18GHz class B



MaxPeak-ClearWrite-PK+
FCC Part 15 Class B Electric Field Strength PK
Average-ClearWrite-AVG
FCC Part 15 Class B Electric Field Strength QP+AV

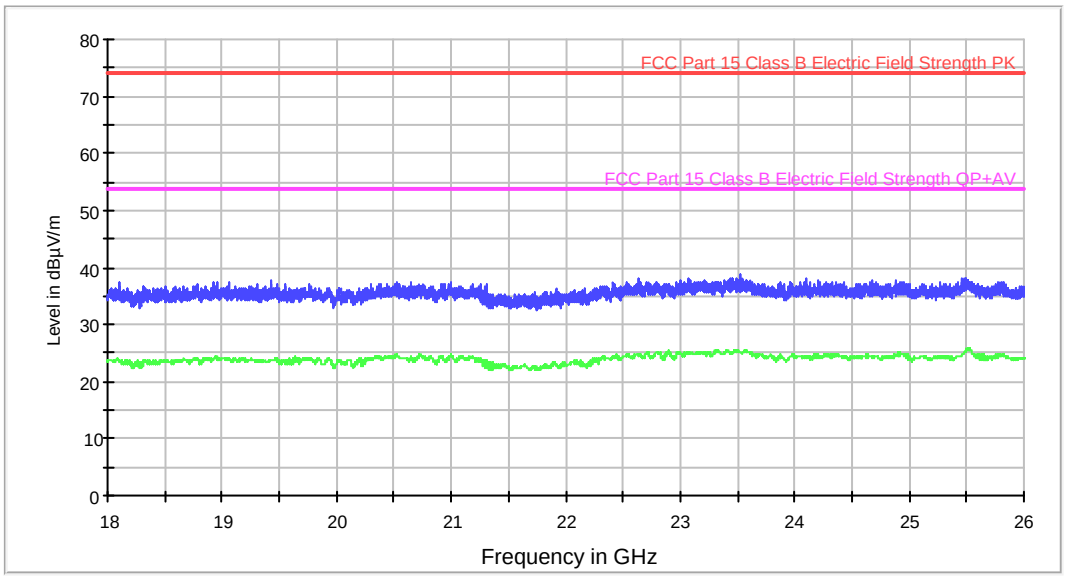
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)	Polarization
1030.000000	32.8	22.7	V
1748.000000	34.1	21.1	V
2128.000000	37.0	22.8	V
2987.000000	38.3	25.2	V
3978.000000	42.2	28.5	V
5218.000000	43.6	30.3	V
7386.000000	46.3	32.7	V
9666.000000	46.9	34.2	V
13209.000000	49.1	35.8	V
17909.000000	56.4	43.8	V

Radiated Emission: CR0102RA2_PH

Project:	46883rem004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#02
Description:	EUT ON. Idle UMTS Band V. Power supply: Vnom=3.7Vdc. Horzontal polarization.

FCC 18-26GHz class B



MaxPeak-ClearWrite-PK+
FCC Part 15 Class B Electric Field Strength PK
Average-ClearWrite-AVG
FCC Part 15 Class B Electric Field Strength QP+AV

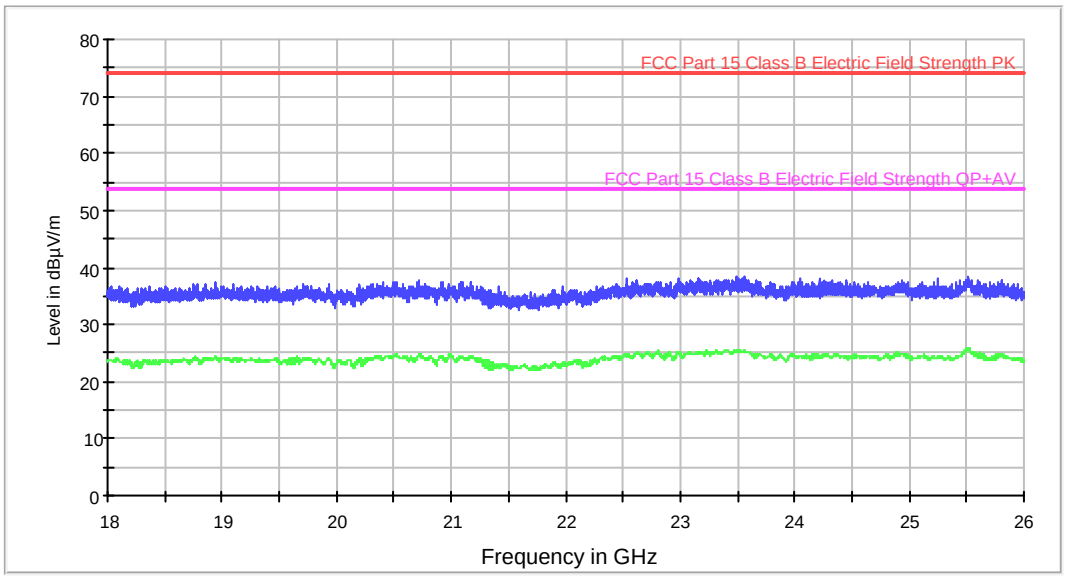
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)	Polarization
18107.000000	37.4	23.8	H
18961.000000	37.3	24.0	H
19428.000000	37.9	23.8	H
20521.000000	37.4	24.7	H
21005.000000	37.4	24.6	H
22418.000000	37.3	24.5	H
23065.000000	38.2	25.0	H
23524.000000	38.8	25.3	H
24681.000000	37.8	24.6	H
25485.000000	38.2	25.3	H

Radiated Emission: CR0102RA2_PV

Project:	46883rem004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#02
Description:	EUT ON. Idle UMTS Band V. Power supply: Vnom=3.7Vdc. Vertical polarization.

FCC 18-26GHz class B



MaxPeak-ClearWrite-PK+
FCC Part 15 Class B Electric Field Strength PK
Average-ClearWrite-AVG
FCC Part 15 Class B Electric Field Strength QP+AV

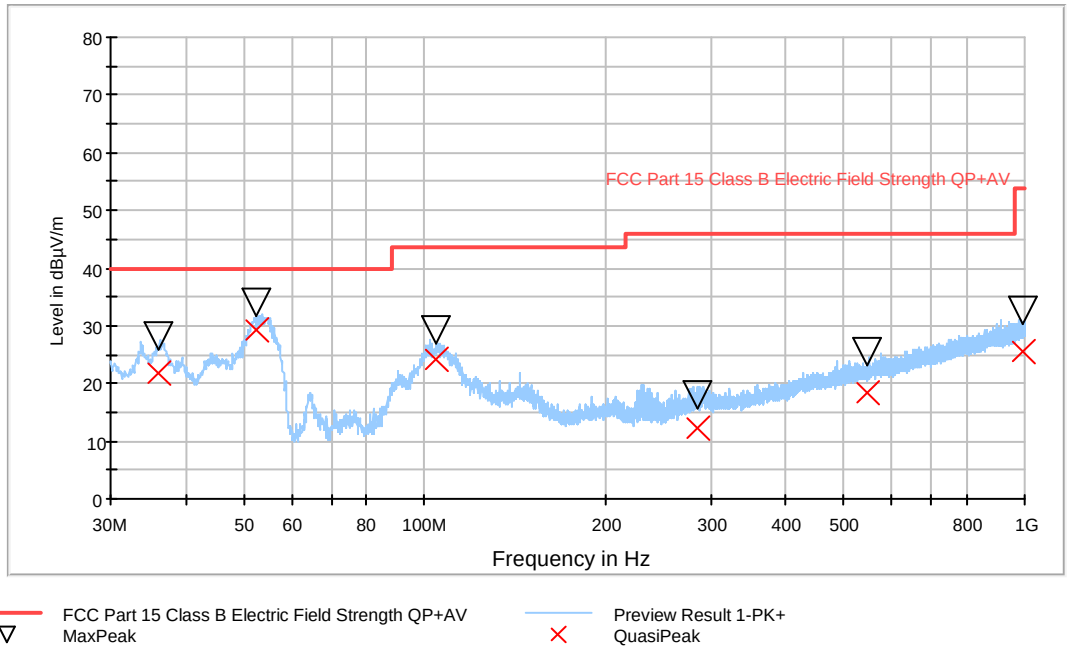
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)	Polarization
18511.000000	36.7	23.6	V
18936.000000	37.5	24.2	V
19709.000000	37.1	24.0	V
20720.000000	37.6	24.4	V
21178.000000	37.5	24.5	V
22442.000000	37.2	24.4	V
23165.000000	38.2	25.1	V
23563.000000	38.3	25.3	V
24214.000000	38.2	24.6	V
25519.000000	38.5	25.8	V

Radiated Emission: CR0103

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#03
Description:	EUT ON. Idle LTE Band 1. Power supply: Vnom=3.7Vdc.

FCC class B Bilog Hybrid AMP2193



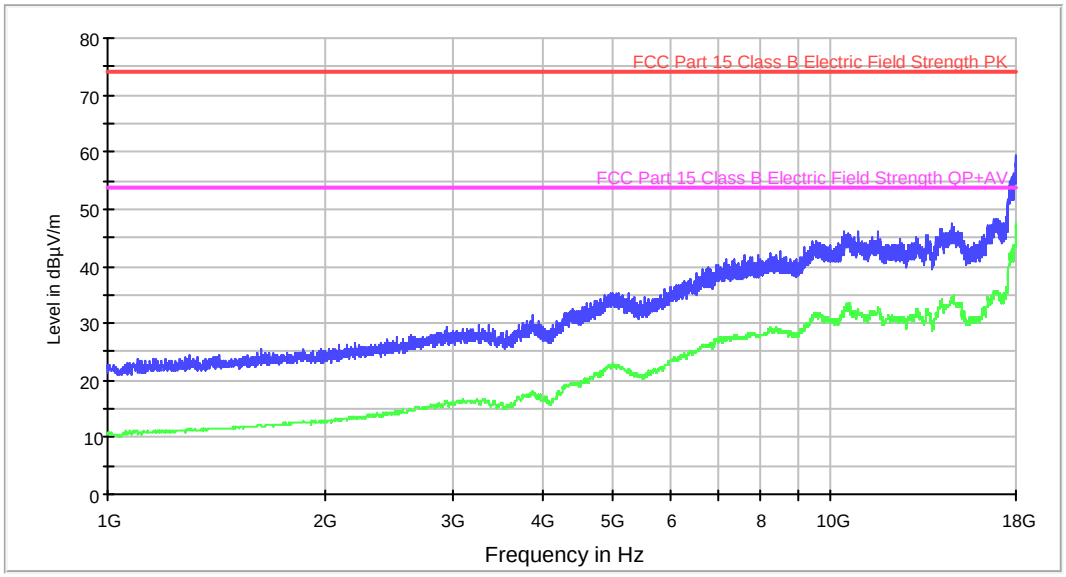
Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)
35.940000	28.3	21.8	106.0	V	303.0
52.354800	34.1	29.1	98.0	V	305.0
104.515698	29.4	24.2	104.0	V	126.0
285.691450	18.2	12.4	145.0	V	173.0
546.683900	25.5	18.3	182.0	V	76.0
988.722590	32.6	25.7	164.0	V	355.0

Radiated Emission: CR0103RA1_PH

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#03
Description:	EUT ON. IDLE LTE Band 1. Power supply 3.7Vdc. Horizontal polarization.

ER EMI FCC 15 Class B AMP_4659 (1-18GHz)



Peak Scan
FCC Part 15 Class B Electric Field Strength PK
Average Scan
FCC Part 15 Class B Electric Field Strength QP+AV

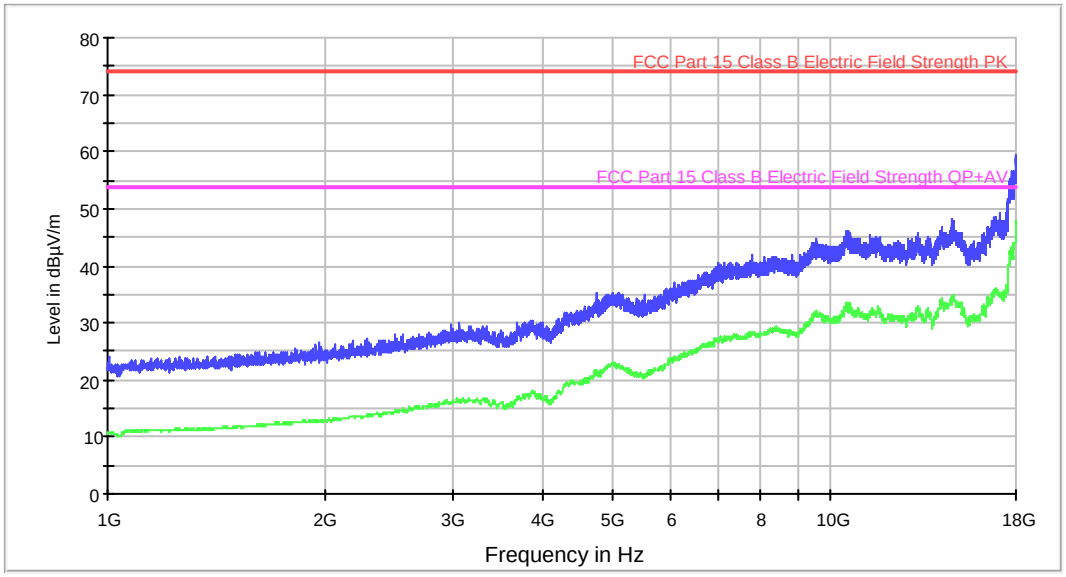
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1613.000000	24.9	12.0
2509.000000	27.7	14.5
3862.000000	31.5	18.1
6776.000000	39.8	26.2
10443.000000	46.2	32.9
17997.000000	59.5	47.3

Radiated Emission: CR0103RA1_PV

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#03
Description:	EUT ON. IDLE LTE Band 1. Power supply 3.7Vdc. Vertical polarization.

ER EMI FCC 15 Class B AMP_4659 (1-18GHz)



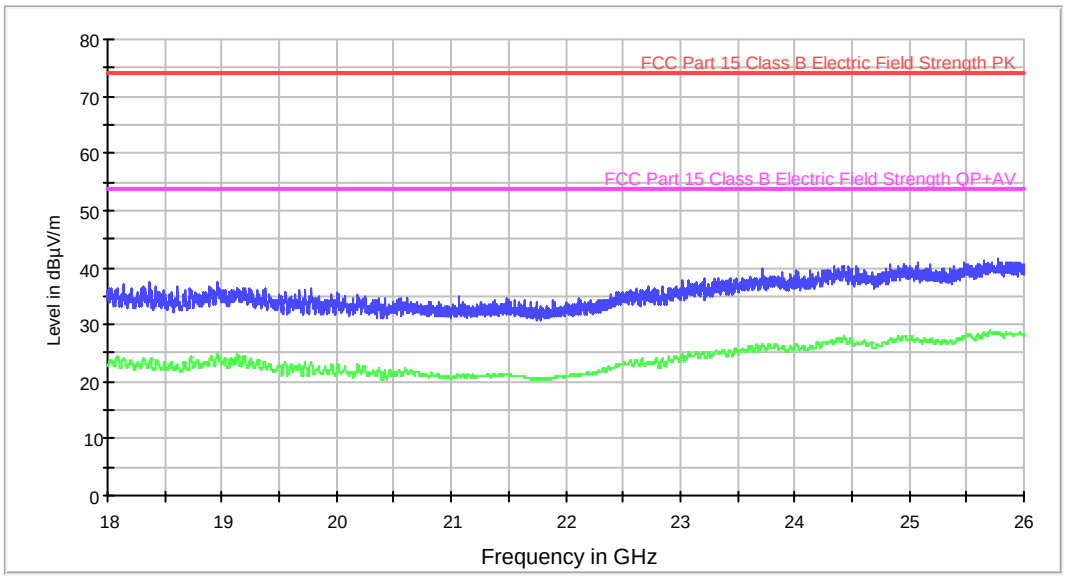
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
1615.000000	24.9	12.1
2561.000000	28.1	14.9
4201.000000	30.9	18.0
6842.000000	39.2	26.3
10460.000000	46.1	32.3
17993.000000	59.4	47.7

Radiated Emission: CR0103RA2_PH

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#03
Description:	EUT ON. IDLE LTE Band 1. Power supply 3.7Vdc. Horizontal polarization.

ER EMI FCC 15 Class B AMP_4729 (18-26GHz)



Peak Scan
FCC Part 15 Class B Electric Field Strength PK
Average Scan
FCC Part 15 Class B Electric Field Strength QP+AV

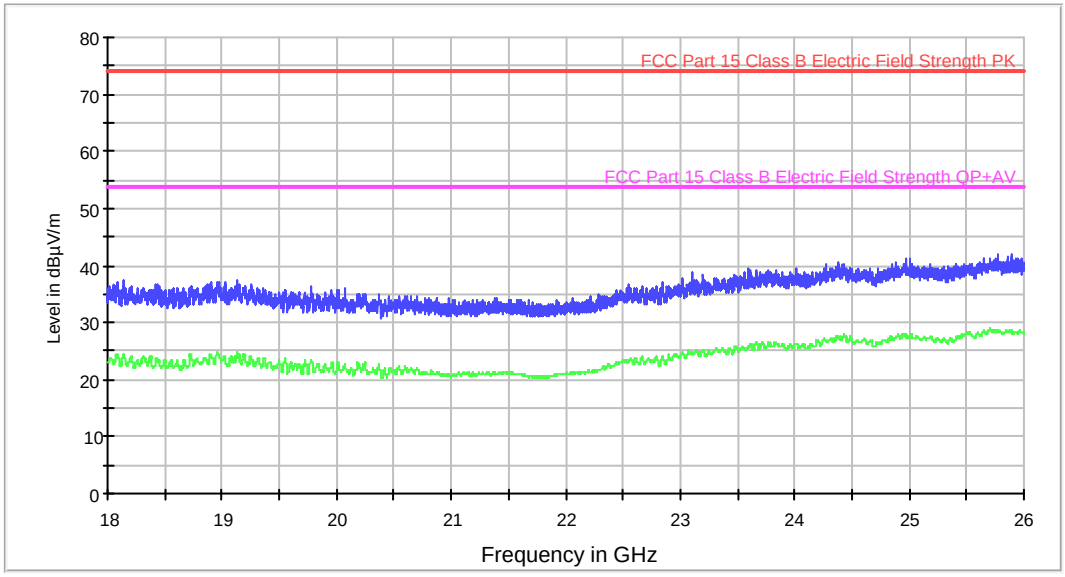
Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
18955.000000	37.4	24.6
19183.000000	36.4	24.2
21066.000000	34.8	21.3
22964.000000	36.8	24.2
24346.000000	40.2	26.8
25779.000000	41.7	28.4

Radiated Emission: CR0103RA2_PV

Project:	46883REM.004
Company:	HITACHI
Sample:	S/01
Operation mode:	OM#03
Description:	EUT ON. IDLE LTE Band 1. Power supply 3.7Vdc. Vertical polarization.

ER EMI FCC 15 Class B AMP_4729 (18-26GHz)



Peak Scan
FCC Part 15 Class B Electric Field Strength PK
Average Scan
FCC Part 15 Class B Electric Field Strength QP+AV

Subrange Maxima

Frequency (MHz)	MaxPeak-ClearWrite (dBµV/m)	Average-ClearWrite (dBµV/m)
19134.000000	37.5	24.5
19152.000000	36.8	23.5
20371.000000	35.0	22.4
22849.000000	37.0	24.0
24385.000000	40.5	27.4
25901.000000	42.0	28.2

Appendix B - Photographs