HCT CO., LTD.

CERTIFICATE OF COMPLIANCE

FCC Certification

Applicant Name:
HYUNDAI MOBIS CO., LTD.

Address:
80-9, Mabook-Dong, Giheung-Gu Yongin-shi
Gyunggi-Do, 446-912 South Korea

Date of Issue:
May 11, 2011

Test Site/Location:
HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, Korea

Test Report No.: HCTR1105FR01-1

HCT FRN: 0005866421

IC Recognition No.: 5944A-3

FCC ID	**: TQ8RKE-3F01**
IC	**: 5074A-RKE3F01**
APPLICANT	**: HYUNDAI MOBIS CO., LTD.**

FCC Model(s):	RKE-3F01
IC Model(s):	RKE-3F01
EUT Type:	Remote Keyless Entry
Tx Frequency:	315.00 MHz (Tx)
Type of Modulation:	FSK
Equipment Class:	DSC - Part 15 Security / Remote Control Transmitter
IC Equipment Category:	RSS-210 Issue 7: Category I Equipment, annex 1
FCC Rule Part(s)	Part 15 subpart C 15.231
IC Rule:	RSS-GEN(Issue3, December 2010), RSS-210(Issue 8, December 2010)
IC Registration No. :	5944A-3

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Jong Seok Lee

Report prepared by
: Jong Seok Lee
Test Engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1105FR01	May 03, 2011	First Approval Report
HCTR1105FR01-1	May 11, 2011	▪ Change the application address and test site ▪ Revise antenna height unit(cm → m) ▪ Revise measured frequency at 19 page

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1. GENERAL INFORMATION

Applicant:	HYUNDAI MOBIS CO., LTD.
Address:	80-9, Mabook-Dong, Giheung-Gu Yongin-shi Gyunggi-Do, 446-912 South Korea
FCC ID:	TQ8RKE-3F01
IC :	5074A-RKE3F01
EUT:	Remote Keyless Entry
FCC Model(s):	RKE-3F01
IC Model(s):	RKE-3F01
Date of Test:	April 14, 2011 ~ April 29, 2011
Contact Person:	Name: Seung Keun, Jeon Phone #: +82-31-288-5232 Fax #: +82-31-280-2764
Place of Tests:	HCT Co., Ltd. 105-1, Jangam-ri , Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, KOREA. (IC Recognition No. : 5944A-3)

2. EUT DESCRIPTION

Type	Remote Keyless Entry
Model Name	RKE-3F01
Power Source	DC 3 V (Lithium Battery)
Tx Frequency	315.00 MHz (Tx)
Type of Modulation	FSK
Antenna	Antenna type : PCB Pattern Antenna

3. TEST METHODOLOGY

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2003) and FCC Public Notice DA 00-705 dated March 30, 2000 entitled “Filing and Measurement Guidelines for Transmitter for Remote Keyless Entry System” were used in the measurement of the **HYUNDAI MOBIS CO., LTD. Remote Keyless Entry FCC ID: TQ8RKE-3F01**

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.205, 15.207, 15.209 and 15.231 under the FCC Rules Part 15 Subpart C.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version :2003) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version: 2003)

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated March 02, 2011 (Registration Number: 90661)

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antennas of this E.U.T are permanently attached.

*The E.U.T Complies with the requirement of §15.203

7. LIMITS AND TEST RESULT

Report Section	FCC Part Section(s)	RSS-210 Section	Test Description	Test Result
TRANSMITTER MODE (TX)				
7.2, 7.3	15.231(a)	A1.1.1(a)	MAXIMUM MODULATION PERCENTAGE (M%) LESS THAN 5 SECOND PLOT	PASS
7.4	15.231(b)	A.1.1.2(1)	RADIATED EMISSIONS	PASS
7.1	15.231(c)	A1.1.3	20dB BANDWIDTH	PASS

7.1 20 dB BANDWIDTH

LIMIT

§15.231 (c) & IC RSS-210 Issue 6 A1.1.3

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz. the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer.

20dB Bandwidth The RBW is set to 100KHz. The VBW is set to 100KHz. The sweep time is coupled. Bandwidth is determined at the points 20 dB down from the modulated carrier.

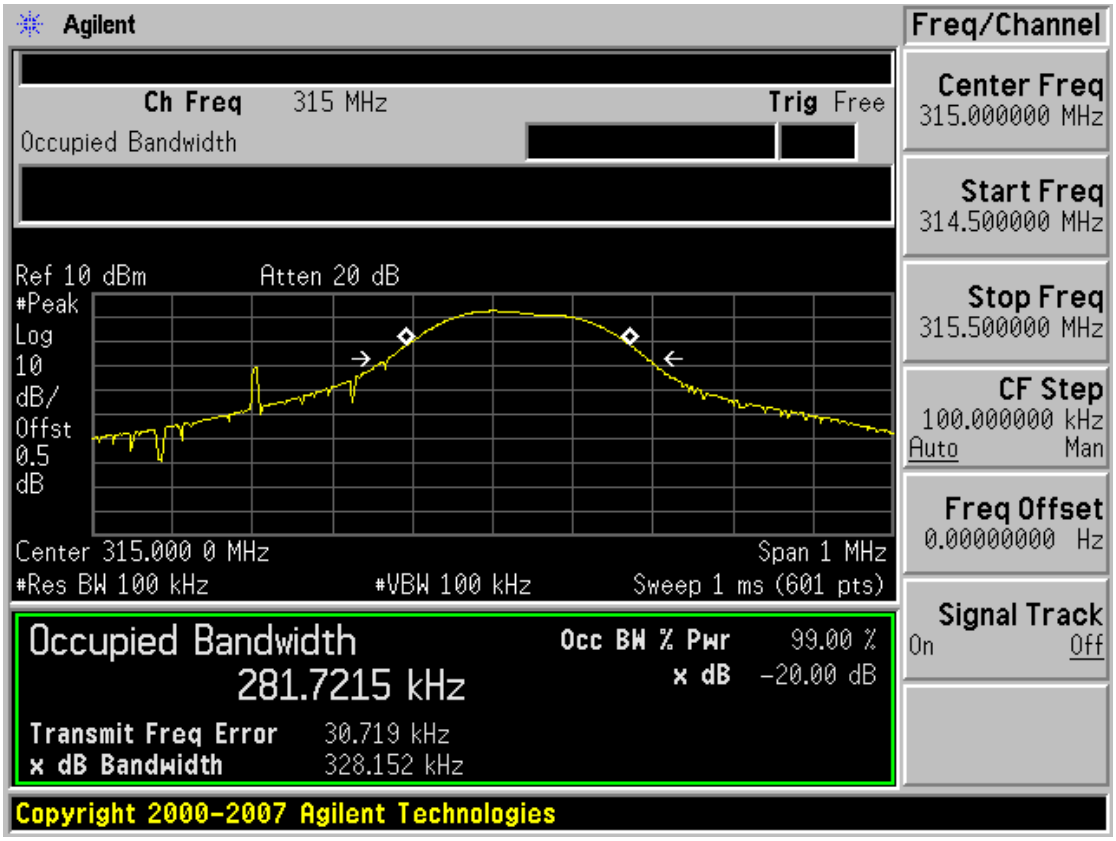
RESULTS

NO non-compliance noted.

Operating Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Margin (KHz)
315.00	328.152	787.5	459.348

20dB BANDWIDTH

▣ RESULT PLOTS



7.2 MAXIMUM MODULATION PERCENTAGE (M%)

LIMIT

§15.35 (c) & IC RSS-Gen Issue 1 §4.3

The measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative(provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 seconds interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 100 KHz and the VBW is set to 100 KHz. The sweep time is coupled and the span is set to 0 Hz. The number of pulses is measured and calculated in a 100 ms scan.

CALCULATION

Average Reading = Peak Reading(dBuV/m)+20log (Duty Cycle), Where Duty Cycle is (# of pulses *pulse width)/100 or T

RESULTS

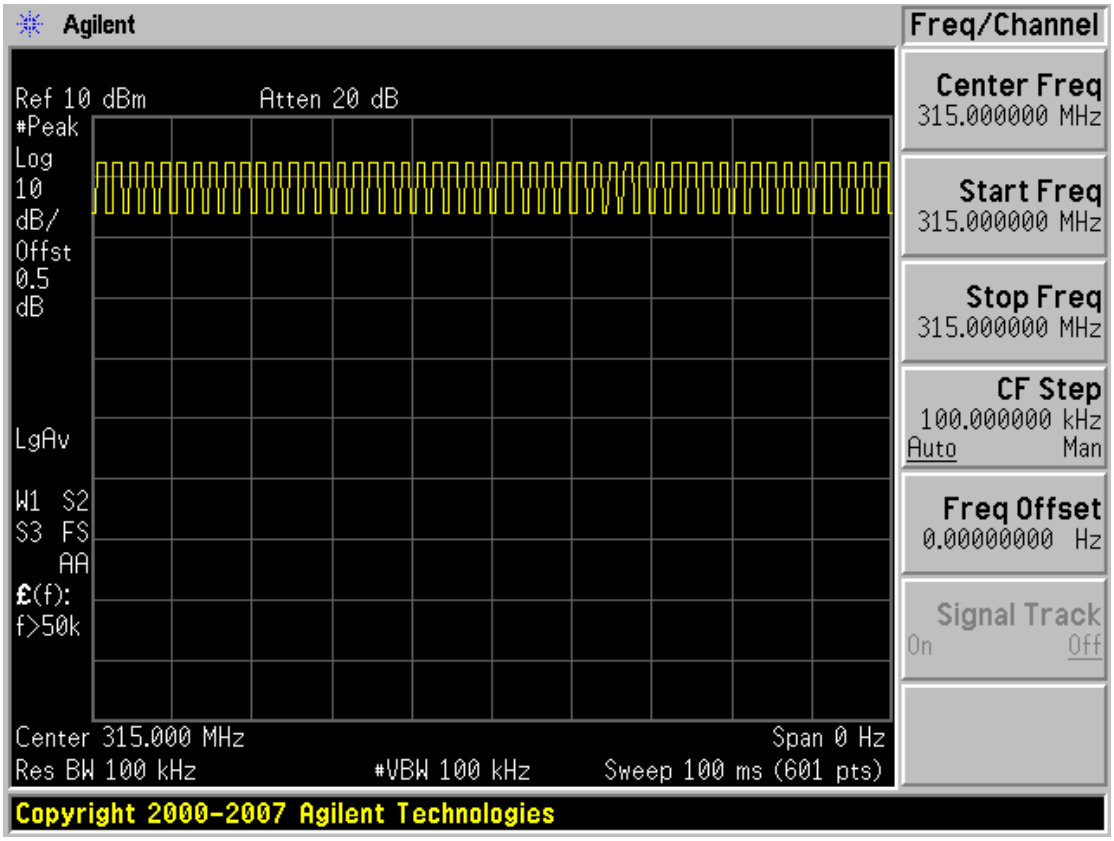
No non-compliance noted:

MAXIMUM MODULATION PERCENTAGE

One Period (ms)	Pulse Width (ms)	# of Pulses	Duty Cycle	% Duty Cycle
100	1.00	50	0.50	50

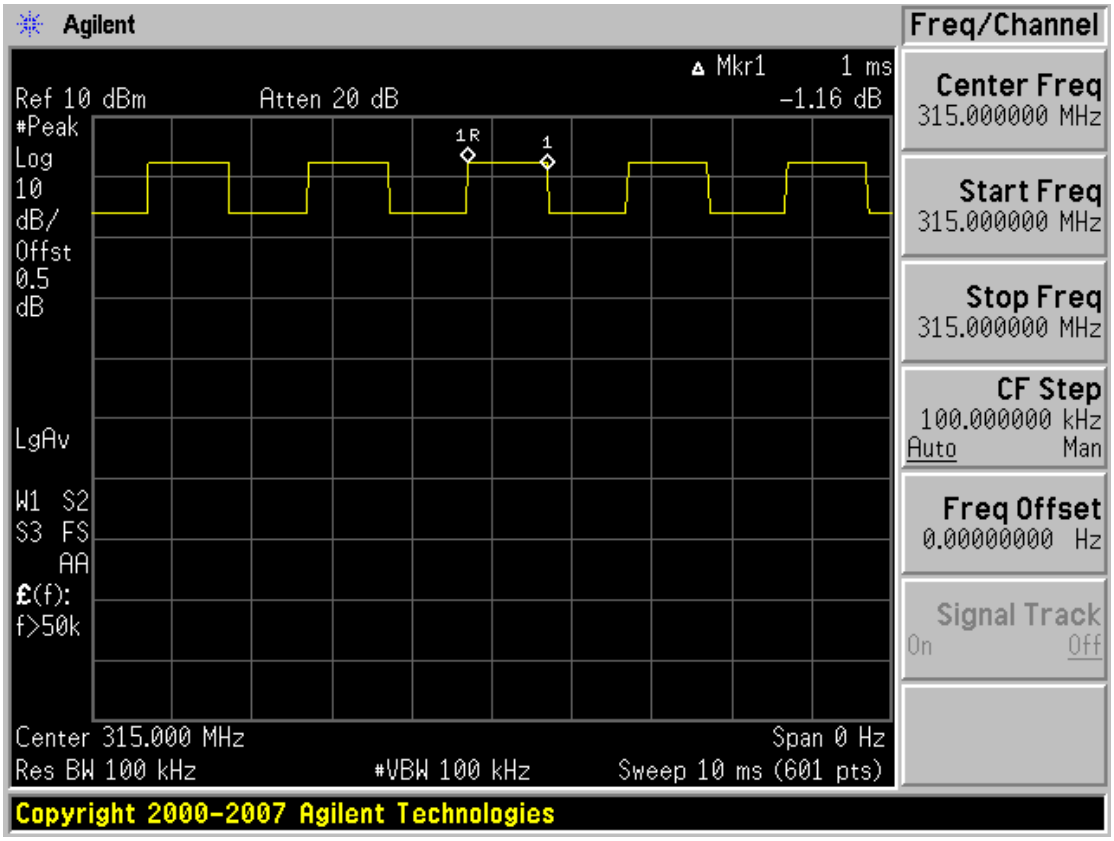
100 ms

▣ RESULT PLOTS



PULSE WIDTH

▣ RESULT PLOTS



7.3 LESS THAN 5 SECOND PLOT

LIMIT

§15.231 (a) (1) & RSS210 A1.1.1 (1)

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 100 KHz and the VBW is set to 100 KHz . The sweep time is set to 1 seconds and the span is set to 0 Hz.

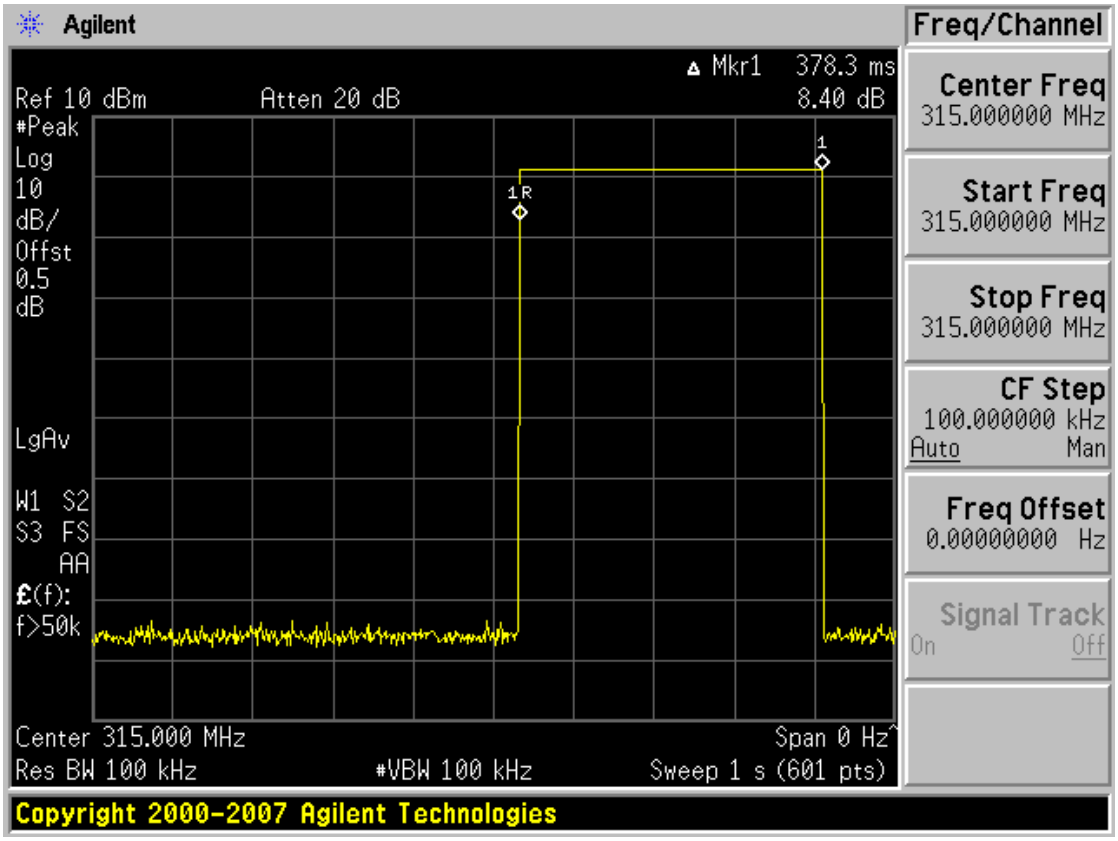
RESULTS

NO non-complianc noted.

Frequency (MHz)	Transmission time (ms)	Limit (Second)	Remark
315	378.3	5	PASS

LESS THAN 5 SECONDS

▣ RESULT PLOTS



7.4 RADIATED EMISSIONS

7.4.1 TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.231 (b) In addition to the provisions of §15.205, the field strength of emissions from Intentional radiators operated under this section shall not exceed the following.

Fundametal Frequency (MHz)	Field Strength of fundamental (uV/m)	Field Strength of Spurious Emissions (uV/m)
40.66 ~ 40.70	22.50	225
70 ~ 130	1250	125
130 ~ 174	1250 to 3750 **	125 to 375 **
174 ~ 260	3750	375
260 ~ 470	3750 to 12500 **	375 to 1250 **
Above 470	12500	1250

**** Linear interpolations**

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

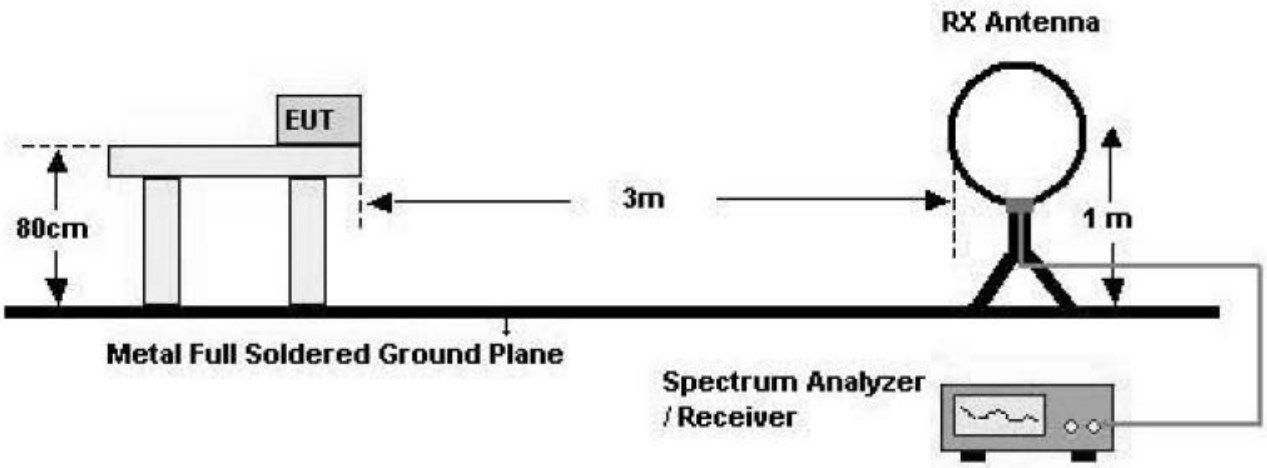
§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table ;

Frequency (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

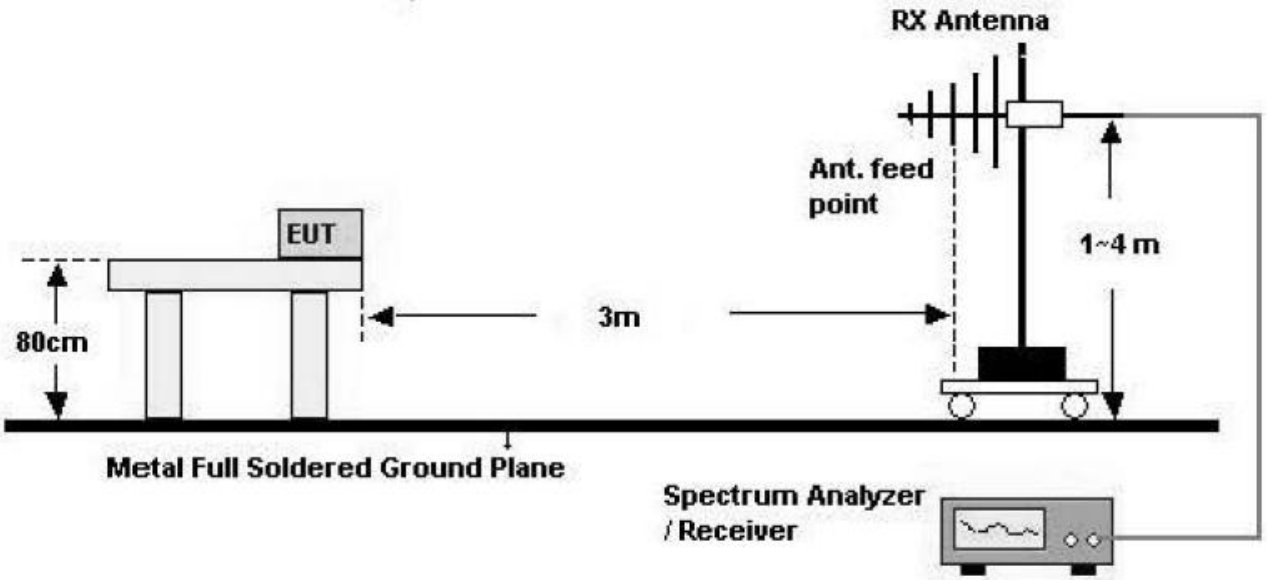
**** Except as provided in paragraph (g), fundamental emissions rom intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz However, operation within these frequency bands is permitted under other sections of this part, e.g., Sections 15.231 and 15.241**

Test Configuration

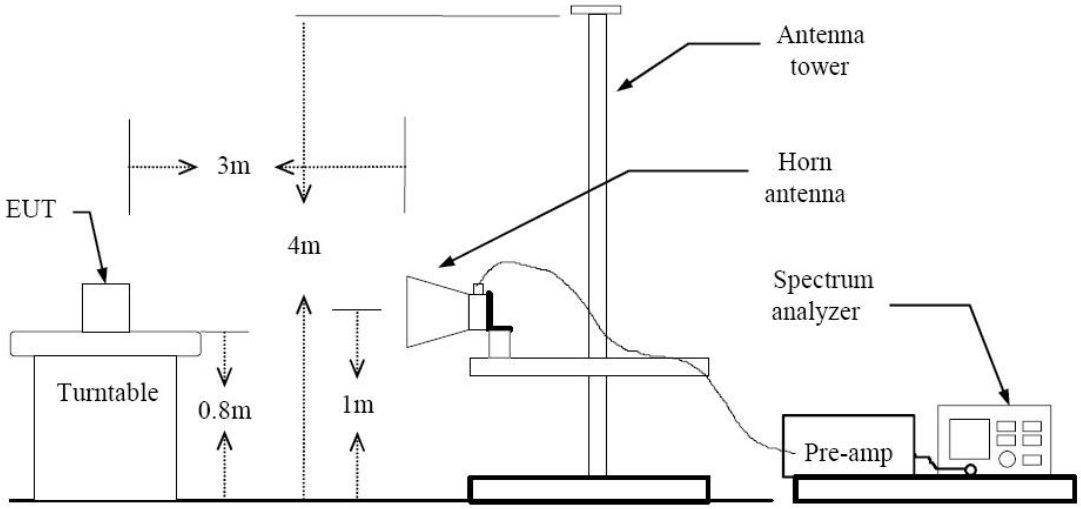
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4 The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 KHz for peak detection measurements or 120 KHz or quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and -6.02 duty cycle for a average measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

7.4.2 TEST RESULTS

Below 1 GHz

Table 1: Measured values of the Field strength

*Av Reading = Pk Reading + 20*log(M%)*

*20*log(M%) = -6.02*

Frequency [MHz]	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	Pol [H/V]	Height [m]	Azimuth [degrees]	Field Strength [dBuV/m]	Limit dBuV/m	Margin [dB]
AVERAGE data									
315	36.22	11.95	0.48	V	1.172	150.0	48.65	75.6	26.95
315	59.00	11.95	0.48	H	1.000	274.6	71.43	75.6	4.17
630	13.67	12.39	2.83	V	1.000	170.0	28.89	55.6	26.71
630	18.69	12.39	2.83	H	1.319	218.0	33.91	55.6	21.69
945	3.05	23.70	3.60	V	1.050	192.0	30.35	55.6	25.25
945	5.36	23.70	3.60	H	1.000	231.8	32.66	55.6	22.94
PEAK data									
315	42.24	11.95	0.48	V	1.172	150.0	54.67	95.6	40.93
315	65.02	11.95	0.48	H	1.000	274.6	77.45	95.6	18.15
630	19.69	12.39	2.83	V	1.000	170.0	34.91	75.6	40.69
630	24.71	12.39	2.83	H	1.319	218.0	39.93	75.6	35.67
945	9.07	23.70	3.60	V	1.050	192.0	36.37	75.6	39.23
945	11.38	23.70	3.60	H	1.000	231.8	38.68	75.6	36.92

Note

1. The antenna is manipulated through typical positions, polarity and length during the testing

2. The frequency range was scanned from 30 MHz to 1 GHz and the worst-case emissions are reported.

3. There is detected level above reference noise floor spectrum analyzer. Except above frequency

7.4.3 TEST RESULTS

Above 1 GHz

Table 1: Measured values of the Field strength

*Av Reading = Pk Reading + 20*log(M%)*

*20*log(M%) = -6.02*

Frequency [MHz]	Reading dBuV	※A.F.+CL-AMP G dB	Pol [H/V]	Height [m]	Azimuth [degrees]	Field Strength [dBuV/m]	Limit dBuV/m	Margin [dB]
AVERAGE data								
1260	48.35	-14.76	V	1.138	199.6	33.59	55.6	22.01
1260	52.87	-14.76	H	1.000	58.0	38.11	55.6	17.49
1575	48.43	-14.26	V	1.000	337.0	34.17	54.0	19.83
1575	50.15	-14.26	H	1.133	16.7	35.89	54.0	18.11
1890	51.33	-13.57	V	1.055	20.8	37.76	55.6	17.84
1890	48.55	-13.57	H	1.000	330.8	34.98	55.6	20.62
2205	53.32	-11.79	V	1.222	20.0	41.53	54.0	12.47
2205	55.37	-11.79	H	1.056	259.4	43.58	54.0	10.42
2520	52.52	-10.37	V	1.201	20.0	42.15	55.6	13.45
2520	54.33	-10.37	H	1.051	107.0	43.96	55.6	11.64
2835	45.72	-9.23	V	1.170	27.0	36.49	54.0	17.51
2835	46.79	-9.23	H	1.100	109.0	37.56	54.0	16.44
3150	45.87	-8.64	V	1.000	0.0	37.23	55.6	18.37
3150	45.84	-8.64	H	1.000	0.0	37.20	55.6	18.40
PEAK data								
1260	54.37	-14.76	V	1.138	199.6	39.61	75.6	35.99
1260	58.89	-14.76	H	1.000	58.0	44.13	75.6	31.47
1575	54.45	-14.26	V	1.000	337.0	40.19	74.0	33.81
1575	56.17	-14.26	H	1.133	16.7	41.91	74.0	32.09
1890	57.35	-13.57	V	1.055	20.8	43.78	75.6	31.82
1890	54.57	-13.57	H	1.000	330.8	41.00	75.6	34.60
2205	59.34	-11.79	V	1.222	20.0	47.55	74.0	26.45
2205	61.39	-11.79	H	1.056	259.4	49.60	74.0	24.40
2520	58.54	-10.37	V	1.201	20.0	48.17	75.6	27.43
2520	60.35	-10.37	H	1.051	107.0	49.98	75.6	25.62
2835	51.74	-9.23	V	1.170	27.0	42.51	74.0	31.49
2835	52.81	-9.23	H	1.100	109.0	43.58	74.0	30.42
3150	51.89	-8.64	V	1.000	0.0	43.25	75.6	32.35
3150	51.86	-8.64	H	1.000	0.0	43.22	75.6	32.38

Note

1. The antenna is manipulated through typical positions, polarity and length during the testing

2. The frequency range was scanned from 1 GHz to 4 GHz and the worst-case emissions are reported.

3. There is detected level above reference noise floor spectrum analyzer. Except above frequency

7.4.4 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor.

The basic equation with a sample calculation is as follows:

FS = RA + AF + CF

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

Assume a receiver reading of 21.5 dBuV is obtained. The Antenna Factor of 7.4 dB/m and a Cable Factor of 1.1 dB is added. The 30 dBuV/m value is mathematically converted to its corresponding level in uV/m.

FS = 21.5 + 7.4 + 1.1 = 30 dBuV/m

8. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Interval	Calibration Due	Serial No.
Rohde & Schwarz	ESH2-Z5/ LISN	Annual	02/01/2012	861741/013
Schwarzbeck	VULB 9168/ TRILOG Antenna	Biennial	02/09/2013	9168-200
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
Rohde & Schwarz	ESH3-Z2/ PULSE LIMITER	Annual	10/25/2011	375.8810.352
Rohde & Schwarz	SCU-18/ Signal Conditioning Unit	Annual	09/29/2011	10094
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	09/23/2011	296
Rohde & Schwarz	FSP30 / Spectrum Analyzer	Annual	03/23/2012	839117/011
Agilent	E4440A / Spectrum Analyzer	Annual	05/02/2012	US45303008
Agilent	E4416A /Power Meter	Annual	01/04/2012	GB41291412
Agilent	E9327A /POWER SENSOR	Annual	05/02/2012	MY4442009
Wainwright Instrument	WHF3.3/18G-10EF / High Pass Filter	Annual	05/02/2012	1
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	Annual	05/02/2012	1
Hewlett Packard	11636B/Power Divider	Annual	12/29/2011	11377
Hewlett Packard	11667B / Power Spliter	Annual	11/08/2011	10126
DIGITAL	EP-3010 /DC POWER SUPPLY	Annual	01/04/2012	3110117
ITECH	IT6720 / DC POWER SUPPLY	Annual	12/01/2011	010002156287001199
TESCOM	TC-3000A / BLUETOOTH TESTER	Annual	01/10/2012	3000A490112
Rohde & Schwarz	CBT / BLUETOOTH TESTER	Annual	05/02/2012	100422
EMCO	6502.LOOP ANTENNA	Biennial	01/13/2012	9009-2536