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TEST REPORT For FCC

Test Report No.	:	CTK-2014-01105
Date of Issue	:	2014-09-15
FCC ID	:	P4YSHN-WDD510
Model/Type No.	:	SHN-WDD510K/EN
Kind of Product	:	Digital door lock
Applicant	:	Samsung SDS Co., Ltd.
Applicant Address	:	125, Olympic-ro 35-gil, Songpa-gu, Seoul, Korea
Manufacturer	:	Meta Networks Co. Ltd.
Manufacturer Address	:	55, Galmachi-ro 281beon-gil, Jungwon-gu, Seongnam-si, Gyeonggi-do
Contact Person	:	Yu Seungkwan / Advisory Engineer
Telephone	:	+82-6155-5105
Received Date	:	2014-09-04
Test period	:	Start : 2014-09-04 End : 2014-09-15
Test Results	:	☒ **In Compliance** ☐ **Not in Compliance**

The test results presented in this report relate only to the object tested.

Tested by

Y. T. Lee

Young-taek Lee
Test Engineer
Date: 2014-09-15

Reviewed by

Y. J. Park

Young-Joon, Park
Technical Manager
Date: 2014-09-15

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REPORT REVISION HISTORY

Date	Revision	Revision
2014-09-15	Issued (CTK-2014-01105)	

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TABLE OF CONTENTS

REPORT REVISION HISTORY 2
1.0 General Product Description 4
1.1 Model Differences 4
1.2 Device Modifications 4
1.3 EUT Configuration(s) 5
1.4 Test Software 5
1.5 EUT Operating Mode(s) 5
1.6 Configuration 6
1.7 Calibration Details of Equipment Used for Measurement 7
1.8 Test Facility 7
1.9 Measurement Procedure 7
1.10 Laboratory Accreditations and Listings 8
2.0 Emissions Test Regulations 9
2.1 Radiated Electric Field Emissions - 15.225(a) 10
2.2 Radiated Electric Field Emissions - 15.225(b)(c) 12
2.3 Radiated Electric Field Emissions - 15.225(d) 13
2.4 Frequency Stability – 15.225(e) 15
2.5 Conducted Voltage Emissions – 15.207 17
APPENDIX A – TEST DATA 18
Radiated Electric Field Emissions (Quasi-Peak reading) 18
Bandwidth of the Operating Frequency 20

1.0 General Product Description

1.0.1 Tested Equipment

☒ Unless otherwise indicated, all tests were conducted on Model SHN-WDD510K/EN.
☐ Tests performed on Model _____ were considered to be representative of Model(s) _____.

1.0.2 Equipment Size, Mobility and Identification

Dimensions:	68(W) by 180(L) by 36.5(H)	☒ mm (Outdoor Unit)
	68(W) by 180(L) by 38.3(H)	☒ mm (Indoor Unit)
Mobility:	☐ Portable ☐ Table-top	☒ Built-in
	☐ Floor-standing	
Serial No.:	Prototype	

1.0.3 Electrical Ratings

Input : 6 Vdc (4 AA Alkaline 1.5 V Batteries (LR6))
Output : -

1.0.4 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

Voltage: 6 Vdc (Battery)
Frequency: -

1.0.5 Clock & Other Frequencies Utilized

16 MHz (CPU), 13.56 MHz (RFID), 2.4 GHz (Zigbee)

1.1 Model Differences

Not applicable

1.2 Device Modifications

Not applicable

1.3 EUT Configuration(s)

See Appendix A for individual test set-up configuration(s). The following peripheral devices and/or interface cables were connected during the measurement:

☐ Peripheral Devices

Device	Manufacturer	Model No.	Serial No.	FCC ID or DoC

☐ Cable Description

#	Description	Ferrite Core	Length (m)	Other Details

1.4 Test Software

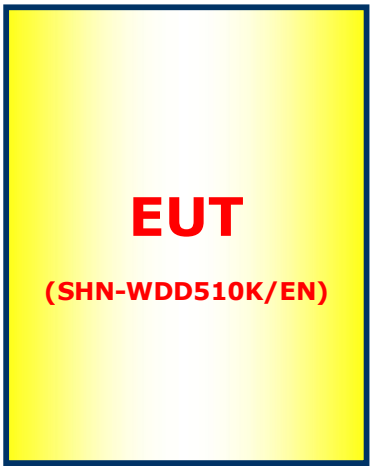
☐ EMC Test V 1.0
☐ Display Test Patterns – V1.5
☐ Ping.exe
☒ Not applicable

1.5 EUT Operating Mode(s)

Equipment under test was operated during the measurement under the following conditions:

☐ Standby
☐ Display circles pattern
☒ Practice operation – EUT transmitting at 13.56 MHz continuously
☐ Scrolling 'H'
☐ Read / Write

1.6 Configuration



1.7 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.8 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yong-in-si, Gyeonggi-do, Korea. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.9 Measurement Procedure

Preliminary AC power line conducted emissions tests were performed shielded room. To find worst mode, several typical mode and typical cable position were tested.
Final AC power line conducted emissions test was performed shielded room. (location is same as Preliminary test)
Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.

Preliminary radiated emissions test were performed anechoic chamber (Distance of antenna and EUT was 3 m). To find worst mode, several typical mode and typical cable position were tested and peak level and frequency were recorded.

Final radiated emissions test was performed Open Area Test Site. Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.

* Measurement procedures was In accordance with ANSI C63.4-2009 7.3.3, 7.3.4, 8.3.1.1, 8.3.1.2, 8.3.2.1, 8.3.2.2

1.10 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	FCC	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	
JAPAN	VCCI	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-986 T-1843 R-3627 G-387	
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	KR0025	

2.0 Emissions Test Regulations

The emissions tests were performed according to following regulations:

☐ EN 61000-6-3:2007		
☐ EN 61000-6-4:2007		
☐ EN 55011:2007 +A2:2007	☐ Group 1 ☐ Class A	☐ Group 2 ☐ Class B
☐ EN 55013:2001 +A1:2003 +A2:2006		
☐ EN 55014-1:2006		
☐ EN 55015:2006		
☐ EN 61204-3:2000	☐ Class A	☐ Class B
☐ EN 61131-2:2003		
☐ EN 61326-1:2006	☐ Class A	☐ Class B
☐ EN 55022:2006	☐ Class A	☐ Class B
☐ EN 61000-3-2:2006		
☐ EN 61000-3-3:1995 +A1:2001 +A2:2005		
☐ VCCI V-3/2008.04	☐ Class A	☐ Class B
☐ AS/NZS CISPR22:2006	☐ Class A	☐ Class B
☒ FCC Part 15 Subpart C		
☐ CISPR 22:2006	☐ Class A	☐ Class B

2.1 Radiated Electric Field Emissions - 15.225(a)

Reference Standard
FCC Part 15.225(a)

Test Date
2014-09-10

Test Location
☒ EMI-Anechoic chamber with a conductive ground plane:
Testing was performed at a test distance of 3 m

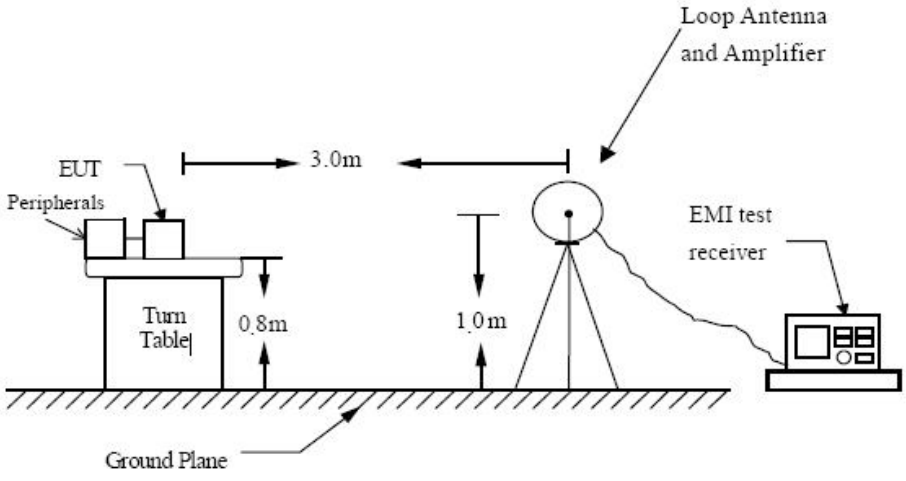
Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
☒	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2013-12-06	2014-12-06
☒	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2013-06-13	2015-06-13

Frequency Range of Measurement
13.553 MHz to 13.567 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Setup



Measurement Procedure(below 30 MHz)

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. Three orientation for the EUT were tried to find out which orientation produces the worst emissions.
3. The loop antenna was also moved around to find out worst position for the emissions.
4. Set the spectrum analyzer in the following setting as:
   For Below 30 MHz :
   RBW = 9 kHz / VBW = 300 kHz / Sweep = AUTO
5. Repeat above procedures until the measurements for all frequencies are complete.

Radiated emission limits

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 uV/m at 30 meters.

Test Results

Frequency (MHz)	Field Strength of Fundamental uV/m @ 30 m	Field Strength of Fundamental dBuV/m @ 30 m	Field Strength of Fundamental dBuV/m @ 3 m
13.553-13.567	3.51	10.90	50.90

The requirements are:

☒ MET
☐ NOT MET
☐ NOT APPLICABLE

Remarks

See Appendix A for test data

2.2 Radiated Electric Field Emissions - 15.225(b)(c)

Reference Standard
FCC Part 15.225(b)(c)

Test Date
2014-09-10

Test Location
☒ EMI-Anechoic chamber with a conductive ground plane:
Testing was performed at a test distance of 3 m

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
☒	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2013-12-06	2014-12-06
☒	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2013-06-13	2015-06-13

Frequency Range of Measurement
13.410 MHz to 13.553 MHz, 13.567 MHz to 13.710 MHz
13.110 MHz to 13.410 MHz, 13.710 MHz to 14.010 MHz

Instrument Settings
IF Band Width: 9 kHz

Radiated emission limits

Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 uV/m at 30 meters.

Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz, the field strength of any emissions shall not exceed 106 uV/m at 30 meters.

Test Results

Frequency (MHz)	Field Strength of Fundamental uV/m @ 30 m	Field Strength of Fundamental dBuV/m @ 30 m	Field Strength of Fundamental dBuV/m @ 3 m
13.110-13.410	0.33	-9.55	30.45
13.410-13.553	0.68	-3.41	36.59
13.567-13.710	0.77	-2.26	37.74
13.710-14.010	0.32	-9.94	30.06

The requirements are:

☒ MET
☐ NOT MET
☐ NOT APPLICABLE

2.3 Radiated Electric Field Emissions - 15.225(d)

Reference Standard
FCC Part 15.225(d), 15.209

Test Date
2014-09-10

Test Location
☒ EMI-Anechoic chamber with a conductive ground plane:
Testing was performed at a test distance of 3 m

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
☒	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2013-12-06	2014-12-06
☒	Bilog Antenna	CBL6111C	Schaffner	2551	2013-05-08	2015-05-08
☒	6dB Attenuator	DNF	Rohde & Schwarz	272.4110.50-2	2013-11-12	2014-11-12
☒	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2013-06-13	2015-06-13

Frequency Range of Measurement
9 kHz to 1000 MHz

Instrument Settings
IF Band Width: 9 kHz (9 kHz to 30 MHz)
IF Band Width: 120 kHz (30 MHz to 1000 MHz)

Measurement Procedure(above 30 MHz)
1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
   For 30 MHz ~ 1000 MHz :
   RBW = 120 kHz / VBW = 300 kHz / Sweep = AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

Radiated emission limits

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Test Results

The requirements are:

☒ MET
☐ NOT MET
☐ NOT APPLICABLE

Remarks

See Appendix A for test data

2.4 Frequency Stability – 15.225(e)

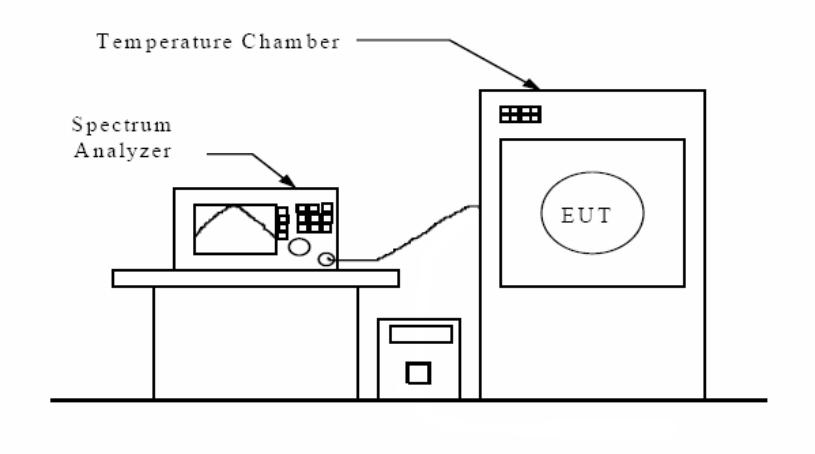
Reference Standard
FCC Part 15.225(e)

Test Date
2014-09-12

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
☒	Signal Analyzer	Agilent	N9020A	MY48011598	2013-11-08	2014-11-08
☒	Temp & Humi Chamber	Kunpoong Engineering	JT-TH-556-2	9QE5-003	2014-01-16	2015-01-16

Test Setup



Test Procedure

A. Frequency stability vs. temperature measurement
- The EUT was placed into the constant temperature chamber.
- The spectrum analyzer was used to read the EUT operating frequency.
- Set the constant temperature chamber temperature within the range of -20 °C to +50 °C

B. Frequency stability vs. input voltage measurement
- The EUT was placed into the constant temperature chamber and set the temperature to 20 °C.
- The spectrum analyzer was used to read the EUT operating frequency.
- The EUT is powered with the DC Power Supplied it with 85 % and 115 % voltage, and measured the EUT operating frequency.

Frequency tolerance Limit

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01 % of the operating frequency over a temperature variation of -20 °C to +50 °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 °C.
- Operating frequency : 13.56 MHz
- Limit : 13.56 MHz * (±) 0.0001 = (±) 1356 Hz
- Within the band : 13.558644 MHz to 13.561356 MHz

Test Data

Timing	-20 °C	-10 °C	0 °C	10 °C	20 °C	30 °C	40 °C	50 °C
Start-up	13.560336	13.560356	13.560357	13.560340	13.560312	13.560267	13.560218	13.560185
10 min	13.560331	13.560358	13.560358	13.560342	13.560311	13.560269	13.560219	13.560186
30 min	13.560329	13.560359	13.560360	13.560343	13.560313	13.560270	13.560221	13.560186

Timing	Power 85 %	Power 115 %
Start-up	Not Applicable (Battery Power)	Not Applicable (Battery Power)
10 min	Not Applicable (Battery Power)	Not Applicable (Battery Power)
30 min	Not Applicable (Battery Power)	Not Applicable (Battery Power)

Test Results

The requirements are:

☒ MET
☐ NOT MET
☐ NOT APPLICABLE

2.5 Conducted Voltage Emissions – 15.207

Reference Standard
FCC Part 15.207

Test Date
Not Applicable (Battery Power)

Test Location
Shielded Room

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☐	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2014-12-06
☐	LISN	Rohde & Schwarz	ENV216	101235	2015-07-30
☐	LISN	Rohde & Schwarz	ENV216	101236	2015-07-30

Frequency Range of Measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Conducted Emission limits

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Test Results
The requirements are:

☐ MET

Frequency (MHz)	Measured Data (dBuV)	Margin (dB)	Remark

☐ NOT MET
☒ NOT APPLICABLE

Remarks

APPENDIX A – TEST DATA

Radiated Electric Field Emissions (Quasi-Peak reading)

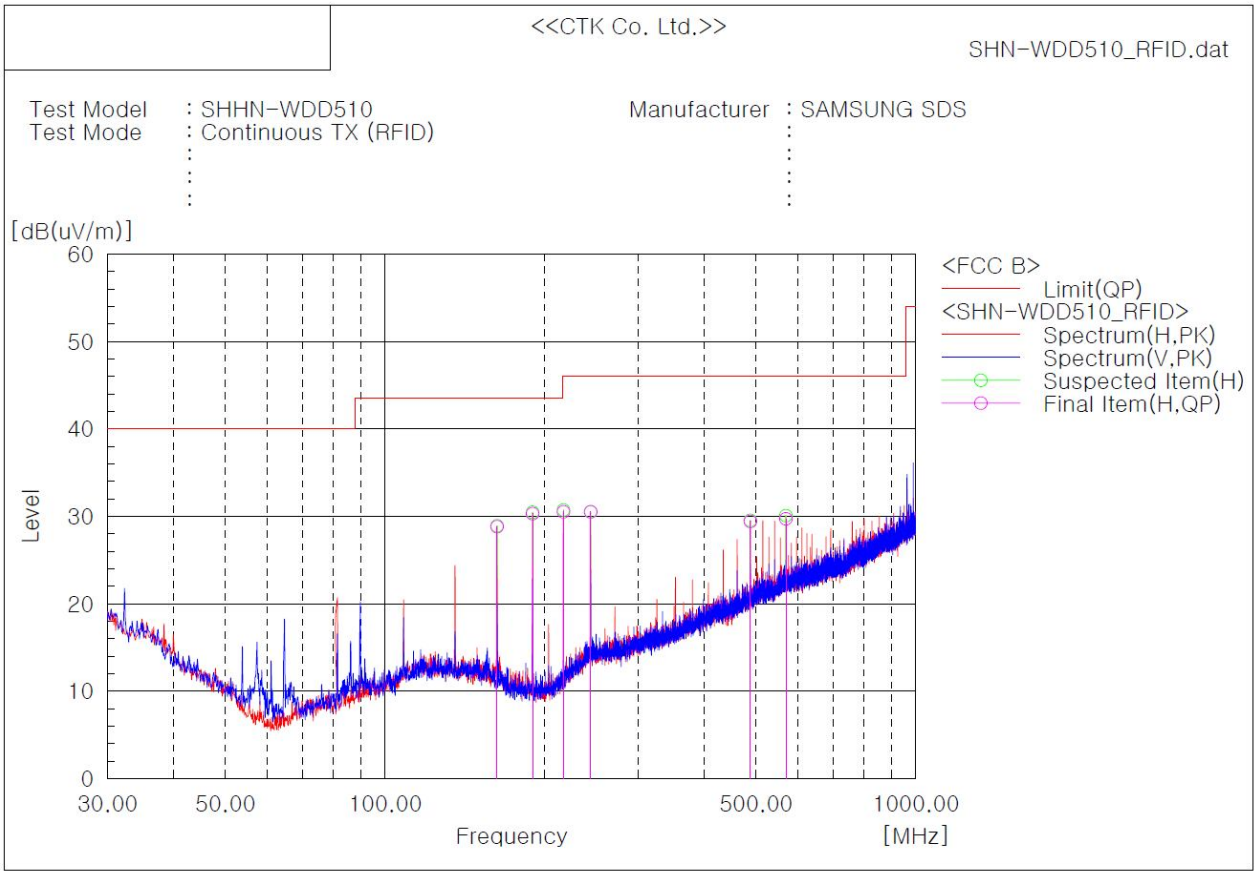
1) Fundamental Frequency Test Data

Frequency [MHz]	Reading [dBuV/m] @ 3 m	Pol.	Height [m]	Correction Factor		Limits [dBuV/m] @ 3 m	Result [dBuV/m] @ 3 m	Margin [dB]
				Antenna	Cable			
13.56	23.96	H	1.0	20.49	6.45	124.0	50.9	73.1
13.56	17.60	V	1.0	20.49	6.45	124.0	44.5	79.5

2) Frequency Range from 9 kHz to 30 MHz Test Data

Frequency [MHz]	Reading [dBuV/m] @ 3 m	Pol.	Height [m]	Correction Factor		Limits [dBuV/m] @ 3 m	Result [dBuV/m] @ 3 m	Margin [dB]
				Antenna	Cable			
0.035	25.4	H	1.0	20.3	5.9	116.7	51.6	65.1
0.070	22.9	H	1.0	20.3	5.9	110.7	49.1	61.6
0.669	10.5	H	1.0	20.2	6.0	71.1	36.6	34.5

3) Frequency Range from 30 MHz to 1000 MHz Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	162.648	H	42.0	-13.2	28.8	43.5	14.7	207.0	84.0
2	189.808	H	44.6	-14.3	30.3	43.5	13.2	100.0	164.0
3	216.968	H	43.4	-12.9	30.5	46.0	15.5	100.0	126.0
4	244.127	H	40.5	-10.0	30.5	46.0	15.5	100.0	126.0
5	488.204	H	32.5	-3.1	29.4	46.0	16.6	207.0	84.0
6	569.563	H	30.9	-1.2	29.7	46.0	16.3	400.0	87.0

Bandwidth of the Operating Frequency