LTA
Laboratory for Test & Approval Co.,Ltd.

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http://www.ltalab.com

Dates of Tests: June 04 ~ June 24, 2019
Test Report S/N: LR500111906I
Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID. **VA5REJ100-1WAM**
IC ID **7087A-1WREJ100AM**
APPLICANT **SEGI LIMITED**

Equipment Class	:	**Security/Remote Control Transmitter (DSC)**
Manufacturing Description	:	**Keyless Entry System**
Manufacturer	:	**SEGI ELECTRONICS CO.,LTD**
Model name	:	**900R**
Test Device Serial No.:	:	**Identical prototype**
Rule Part(s)	:	**FCC Part 15 Subpart C ; ANSI C-63.10-2013**
		IC : RSS-210
Frequency Range	:	**433.92 MHz**
Max. Output Power	:	**Max 78.38 dBuV/m – Radiated**
Date of issue	:	**June 24, 2019**

his test report is issued under the authority of:

JaBeom.Koo

Ja-Beom Koo, Manager

The test was supervised by:

Eun-Hwan Jung, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

NVLAP LAB Code.: 200723-0

Revision History

Rev	Issue Date	Revisions	Notes
-	-	Initial issue	-
V1	06/24/2019	Updated to TCB question	-
V2	06/24/2019	Updated to TCB question about the duty cycle	-

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1. General information

1-1 Test Performed

Company name : LTA Co., Ltd.

Address : 243, Jubug-ri,Yangji-Myeon,Youngin-Si, Kyunggi-Do, Korea. 17159

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E-mail : chahn@ltalab.com

Telephone : +82-31-323-6008

Facsimile +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	2019-09-30	ECT accredited Lab.
RRA	KOREA	KR0049	-	EMC accredited Lab.
FCC	U.S.A	649054	2021-04-11	FCC CAB
VCCI	JAPAN	C-4948,	2020-09-10	VCCI registration
VCCI	JAPAN	T-2416,	2020-09-10	VCCI registration
VCCI	JAPAN	R-4483(10 m),	2020-10-15	VCCI registration
VCCI	JAPAN	G-847	2021-12-13	VCCI registration
IC	CANADA	5799A-1	2019-11-07	IC filing
KOLAS	KOREA	NO.551	2021-08-20	KOLAS accredited Lab.
NVLAP	U.S.A	200723-0	2021-08-20	ECT accredited Lab.

2. Information about test item

2-1 Client & Manufacturer

Company name	:	SEGI LIMITED
Address	:	Unit J2, 4/F, Block 1, Kinho Industrial Building, 14-24 Au Pui Wan Street, Shatin, New Territories, Hongkong
Tel / Fax	:	TEL No : +82-10-8883-4604 / FAX No : +82-10-8883-4604

2-2 Equipment Under Test (EUT)

Trade name	:	SEGI LIMITED
Model name	:	900R
Serial number	:	Identical prototype
Date of receipt	:	June 04, 2019
EUT condition	:	Pre-production, not damaged
Antenna type	:	Internal Helical Antenna (Max Gain : -7.6 dBi)
Frequency Range	:	433.92 MHz
RF output power	:	Max 78.38 dBuV/m – Radiated
Number of channels	:	1
Type of Modulation	:	FSK
Power Source	:	3.0 Vdc

2-3 Tested frequency

	LOW	MID	HIGH
Frequency (MHz)		433.92	

2-4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
-	-	-	-

2-5 Operating Mode

Mode	Remakrs[1)]
Transmitting mode(TX)	* The system was configured in typical fashion (as a user would normally use it) for testing. *1) End users cannot change the settings of the output power of the product.
No Modification by the test lab	

3. Test Report

3.1 Summary of tests

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	FCC : ANSI C63.10:2013 6 Standard test methods	FCC : Section 15.207	N/A*1)	N/A	-
	IC : RSS-Gen 8.8	IC : RSS-Gen 8.8			
Automatically Deactivate	FCC : ANSI C63.10:2013 6 Standard test methods	FCC :Section 15.231(a)(1)	N/A	Complied a)	Radiated
	IC : -	IC : RSS-210 A 1.1			
Electric Field Strength of Fundamental Emission	FCC : ANSI C63.10:2013 6 Standard test methods	FCC : Section 15.231(b)	2.42 dB 433.92MHz Horizomtal PK with Duty factor	Complied b)	Radiated
	IC : RSS-Gen 6.13	IC : RSS-210 A1.2			
Electric Field Strength of Fundamental Emission	FCC : ANSI C63.10:2013 6 Standard test methods	FCC : Section 15.205 Section 15.209 Section 15.231(b)	6.22dB 2603.13 MHz Vertical PK with Duty factor	Complied c)	Radiated
	IC : RSS-Gen 6.13	IC : RSS-210 A1.2, 4.4 RSS-Gen 8.9			
-20dB Bandwidth	FCC : ANSI C63.10:2013 6 Standard test methods	FCC : Section 15.231(c)	N/A	Complied d)	Radiated
	IC : -	IC : Reference data			

Note:

*1) The test is not applicable since the EUT does not have AC Mains.

a) Refer to APPENDIX 1 (data of Automatically Deactivate)

b)Refer to APPENDIX 1 (data of Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission))

c)Refer to APPENDIX 1 (data of Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission))

d) Refer to APPENDIX 1 (data of -20dB and 99% Occupied Bandwidth)

Symbols:

Complied The data of this test item has enough margin, more than the measurement uncertainty.

Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

FCC 15.31 (e)

This test was performed with the New Battery (DC 3.0 V) during the tests. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted by soldering inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

Frequency range to be scanned:

0.15 MHz - 30 MHz as conducted measurement

30 MHz to 5th harmonic of the highest frequency or 40 GHz, whichever is lower as radiated measurement.

Bandwidth:

Measured by the CISPR quasi-peak function Bandwidth is 9 kHz in the frequency 0.15 MHz to 30 MHz and 120 kHz in the frequency 30 MHz to 1,000 MHz.

Measured by the Peak function Bandwidth is 1 MHz in the frequency 1 GHz to 40 GHz.

A sample calculation:

COR. F (correction factor)= Antenna factor + Cable loss- Amp.gain- Distance correction

Emission Level= meter reading + COR.F

3.2 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Bandwidth	IC: RSS-Gen 6.7	IC: RSS-210 A1.3	N/A	Complied	Radiated

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.2 Technical Characteristics Test

3.2.1 Radiated emission(Electric Field Strength of Fundamental and Spurious emission)

Procedure:

[For below 30 MHz]

The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

[For 30 MHz to 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The measuring antenna height was varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the

maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function of the test receiver / spectrum analyzer.

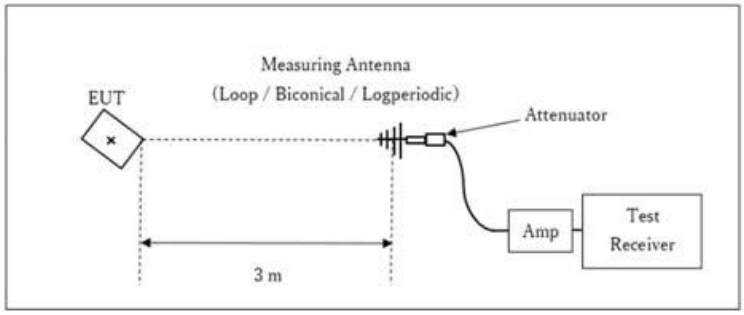
Test Antennas are used as below;

Frequency	Below 30 MHz	30 MHz to 1 GHz	Above 1 GHz
Antenna Type	Loop	TRILOG Antenna	Horn

	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz	Above 1 GHz
Dectector Type	Peak	Peak	Peak	Peak	Quasi Peak	Peak and Peak with Duty factor
IF Bandwidth	200 Hz	200 Hz	9.0 kHz	9.0 kHz	120 kHz	PK: S/A: RBW 1 MHz, VBW: 3 MHz

Test Setup

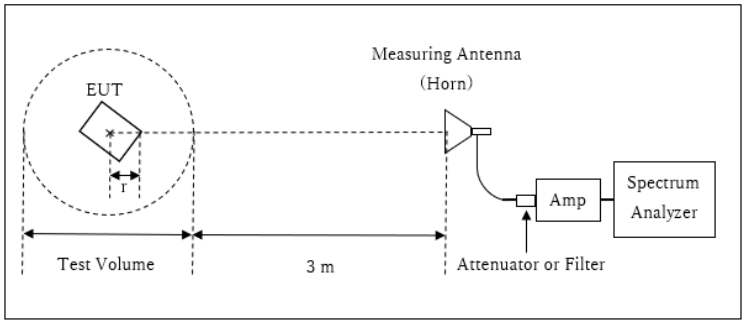
Below 1 GHz



× : Center of turn table

Test Distance : 3m

1 GHz ~ 10 GHz



r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (4.0 m / 3.0 m) = 2.5 dB

* Test Distance: (3 + Test Volume /2) - r = 4.0 m Test Volume : 2.0 m

(Test Volume has been calibrated based on CISPR 16-1-4.) r = 0.0 m

* The test was performed with r = 0.0 m since EUT is small and it was the rather conservative condition.

-30 MHz or less Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 10m open field test site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlated with the one of tests made in an open field site based on KDB 414788.

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

Noise levels of all the frequencies were measured at the position.

*The result is rounded off to the second decimal place, so some differences might be observed.

*This is the measured data from the worst axis, Y Axis.

Measurement range :	9 KHz ~ 4.4 GHz
Test data :	Test Data section 3.2.3.2
Test result :	Pass

3.2.2 -20 dB and 99% Occupied Bandwidth

Limit:
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

Procedure:
The test was measured with a spectrum analyzer using a test fixture.

Test	20 dB Bandwidth	99% Occupied Bandwidth
RBW	1 to 5% of 20 dB Bandwidth	1 to 5% of OBW
VBW	Tree Times of RBW	Tree Times of RBW
Span	Between two times and five times the 20 dB Bandwidth	Enough width to display emission skirts
Sweep	Auto	Auto
Detector	Peak	Peak
Trace	Max hold	Max hold
Instrument used	Spectrum Analyzer	Spectrum Analyzer

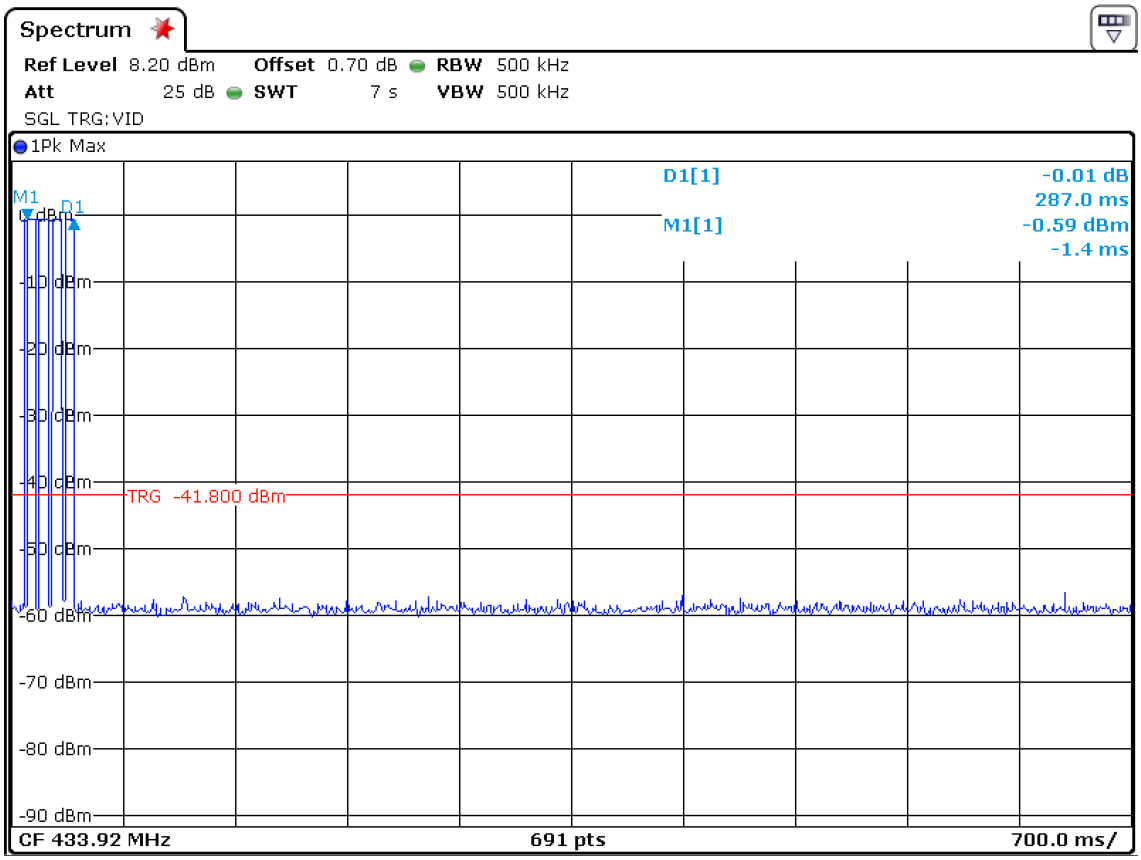
Test data	Test Data section 3.2.3.3
Test Result	Pass

3.2.3 Test Data

3.2.3.1 Automatically deactivate

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

Time of Transmitting [sec]	Limit [sec]	Result
0.287	5.000	Pass



3.2.3.2 Radiated Emission(Electric Field strength of Fundamental and Spurious Emission)

Limit:

FCC §15.205 and §15.209

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	**Limits (μV/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 paragraph (g), fundamental emissions from 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. §§ 15.231 and 15.241.

FCC §15.231(b)

Limits for radiated disturbance of an intentional radiator		
Fundamental frequency (MHz)	**Field strength of fundamental (microvolts/meter)**	**Field strength of spurious emissions (microvolts/meter)**
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

- Fundamental Frequency: 433.92 MHz
- Fundamental Limit: Peak 100.8 dBuV/m / Average 80.8 dBuV/m
- Spurious Emissions Limit: Peak 80.8 dBuV/m / Average 60.8 dBuV/m

Sample calculation:

Result of PK = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1GHz) +Distance factor (above 1 GHz)} - Gain (Amplifier)

Result of PK with Duty factor = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1 GHz) +Distance factor (above 1 GHz)} - Gain (Amplifier) + Duty factor (Refer to Duty factor data sheet)

For above 1GHz : Distance Factor: 20 x log (4.0 m/3.0 m) = 2.50 dB

***Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).**

Average measurement : Average result = Peak result (dBuV/m) – Duty Correction Factor (dB)

Duty Correction Factor (dB) = 20 x log (On time (in 0.1s)/0.1) = 20 x log (0.03185/0.1) = -9.94 dB

Measurement Data : (9 kHz – 30 MHz)

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Correction Factor		Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
				Antenna	Amp.Gain+Cable						
-	-	-	-	-	-	-	-	-	-	-	-
No emissions were detected at a level greater than 20 dB below limit.											
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Measurement Data : (Below 1 GHz)

Frequency [MHz]	Reading [dBuV/m]	Pol.	C.F [dB]	D.C.F [dB]	Detector	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
68.56	27.19	H	-15.15	N/A	QP	43.50	12.04	31.46
369.74	22.41	H	-9.55	N/A	QP	43.50	12.86	30.64
433.88*	96.39	H	-8.07	N/A	PK	100.8	88.32	12.48
433.88*	96.39	H	-8.07	-9.94	AV	80.8	78.38	2.42
867.84	32.23	H	-0.70	N/A	QP	60.8	31.53	29.27
68.44	33.14	V	-15.13	N/A	QP	43.50	18.01	25.49
433.88*	90.31	V	-8.07	N/A	PK	100.8	82.24	18.56
433.88*	90.31	V	-8.07	-9.94	AV	80.8	72.30	8.50
772.78	27.66	V	-1.74	N/A	QP	43.50	25.92	17.58
970.29	26.75	V	1.15	N/A	QP	43.50	27.90	15.60

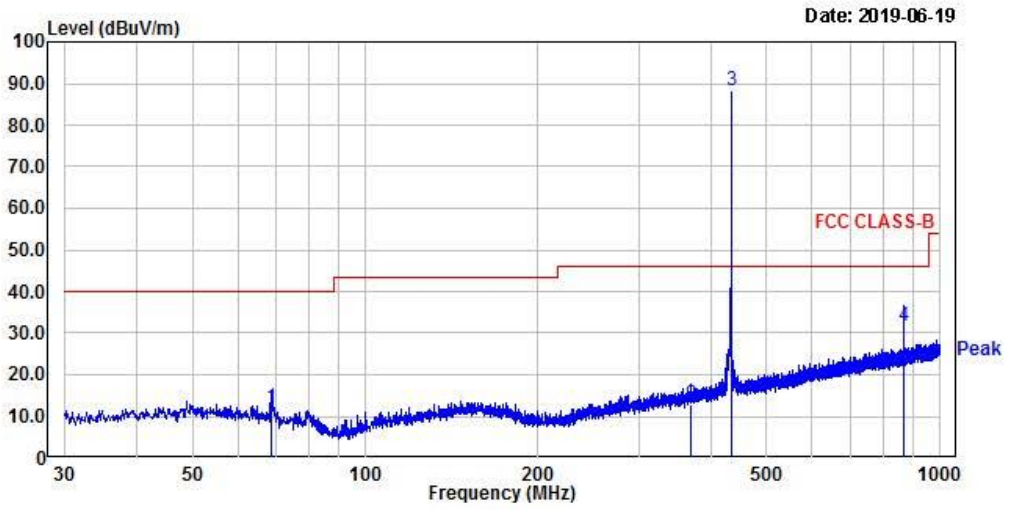
* Fundamental

Note 1: C.F (Correction Factor) = Antenna - Amp.Gain + Cable
Note 2: D.C.F (Duty correction factor) = 20 x log(Duty Cycle). Please refer to section 3.2.3.4.

- Below 1 GHz (Horizontal)

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

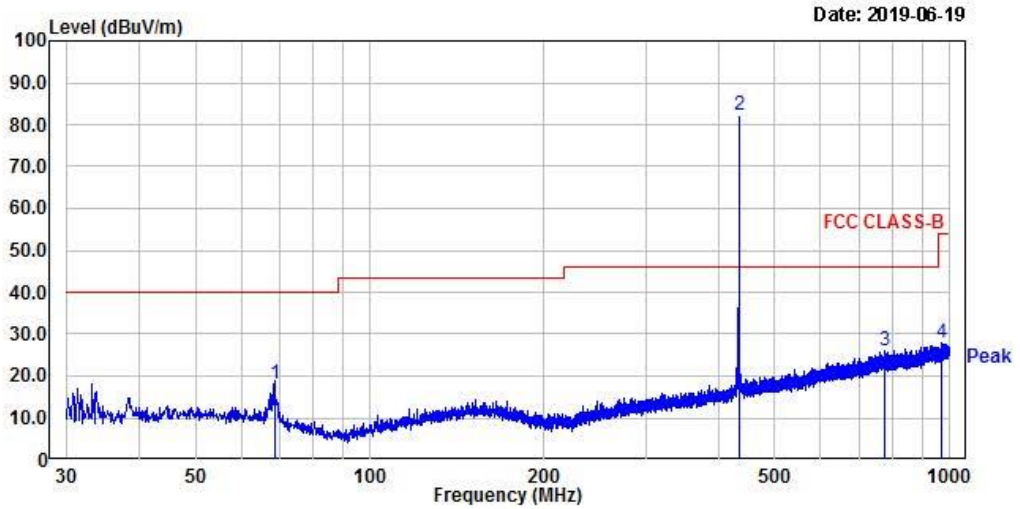
EUT/Model No.: 900R Temp/Humi: 24 / 39
Test Mode : Operating mode Tested by: Jung E H



- Below 1 GHz (Vertical)

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: 900R Temp/Humi: 24 / 39
Test Mode : Operating mode Tested by: Jung E H



Measurement Data : (Above 1 GHz)

Frequency [MHz]	Reading [dBuV/m]	Pol.	C.F [dB]	D.C.F [dB]	Detector	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
1735.00	50.17	H	-1.90	-9.94	AV	60.80	38.32	22.48
1735.00	50.17	H	-1.90	N/A	PK	80.80	48.28	32.52
2169.38	56.39	H	1.00	-9.94	AV	60.80	47.45	13.35
2169.38	56.39	H	1.00	N/A	PK	80.80	57.39	23.41
2603.13	61.85	H	2.68	-9.94	AV	60.80	54.58	6.22
2603.13	61.85	H	2.68	N/A	PK	80.80	64.54	16.26
3037.50	55.67	H	4.92	-9.94	AV	60.80	50.65	10.15
3037.50	55.67	H	4.92	N/A	PK	80.80	60.59	20.21
3471.25	43.96	H	7.36	-9.94	AV	60.80	41.38	19.42
3471.25	43.96	H	7.36	N/A	PK	80.80	51.32	29.48
4339.38*	42.10	H	10.96	-9.94	AV	54.00	43.12	10.88
4339.38*	42.10	H	10.96	N/A	PK	74.00	53.06	20.94
2169.38	49.94	V	1.00	-9.94	AV	60.80	41.00	19.80
2169.38	49.94	V	1.00	N/A	PK	80.80	50.94	29.86
3037.50	47.13	V	4.92	-9.94	AV	60.80	42.11	18.69
3037.50	47.13	V	4.92	N/A	PK	80.80	52.05	28.75
3471.25	41.09	V	7.36	-9.94	AV	60.80	38.51	22.29
3471.25	41.09	V	7.36	N/A	PK	80.80	48.45	32.35

* Include in the restricted band (15.205)

Note 1: C.F (Correction Factor) = Antenna - Amp.Gain + Cable
Note 2: D.C.F (Duty correction factor) = 20 x log(Duty Cycle). Please refer to section 3.2.3.4.

- Above 1GHz (Horizontal)

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
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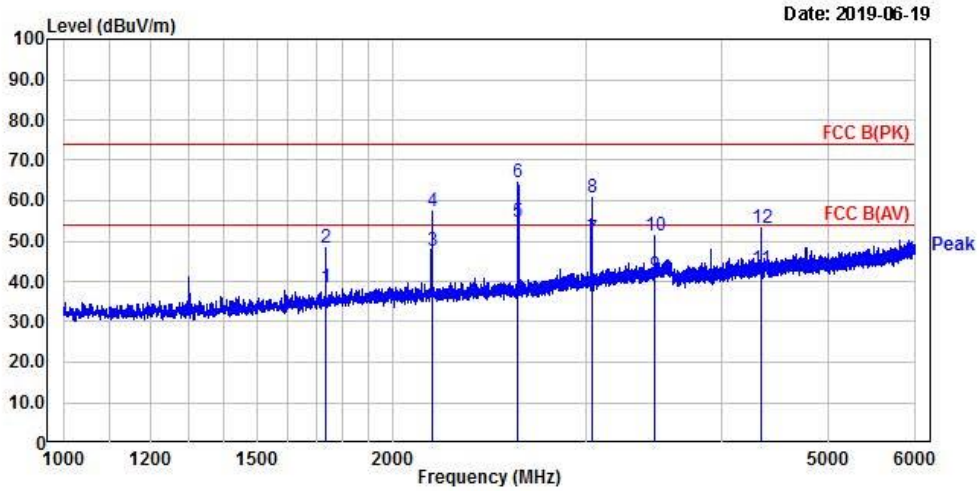
www.ltalab.com

EUT/Model No.: 900R Temp/Humi: 24 / 42
Test Mode : Operating mode Tested by: JUNG E H



- Above 1GHz (Vertical)

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
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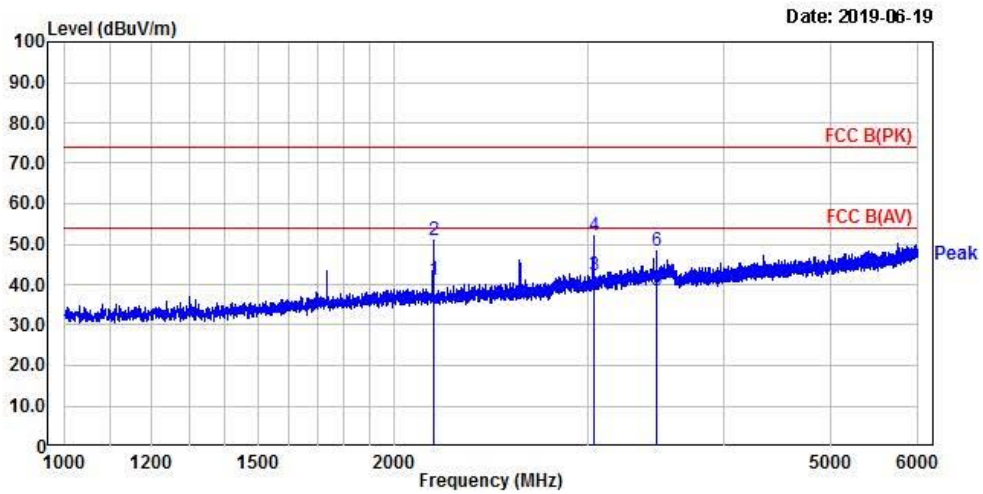
www.ltalab.com

EUT/Model No.: 900R Temp/Humi: 24 / 42
Test Mode : Operating mode Tested by: JUNG E H



3.2.3.3 -20 dB and 99% Occupied Bandwidth

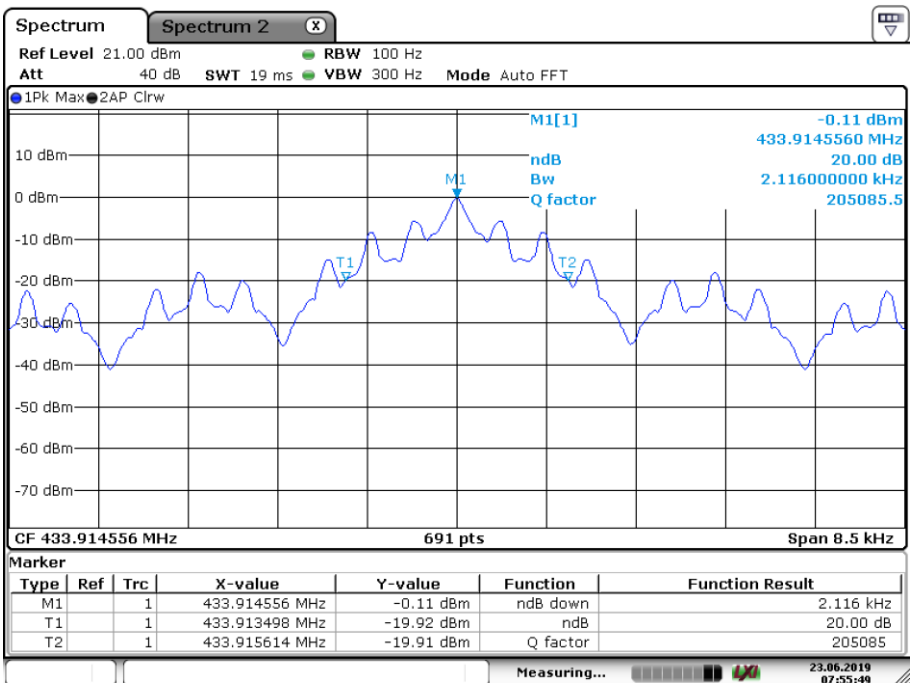
Bandwidth Limit : Fundamental Frequency 433.92 MHz X 0.25 % = 1084.80 KHz

*The above limit was calculated from more stringent nominal frequency.

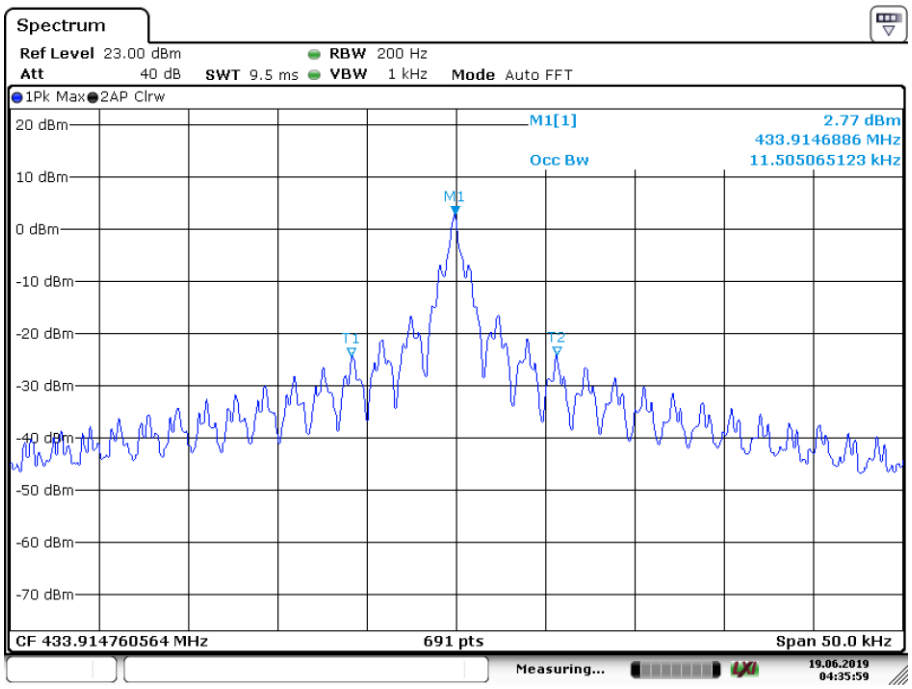
Test result:

Frequency [MHz]	20 dB Bandwidth [kHz]	99 % Bandwidth [kHz]	Limit [kHz]	Result
433.92	2.116	11.505	1084.80	Pass

- 20dB Bandwidth



- OBW (99%)



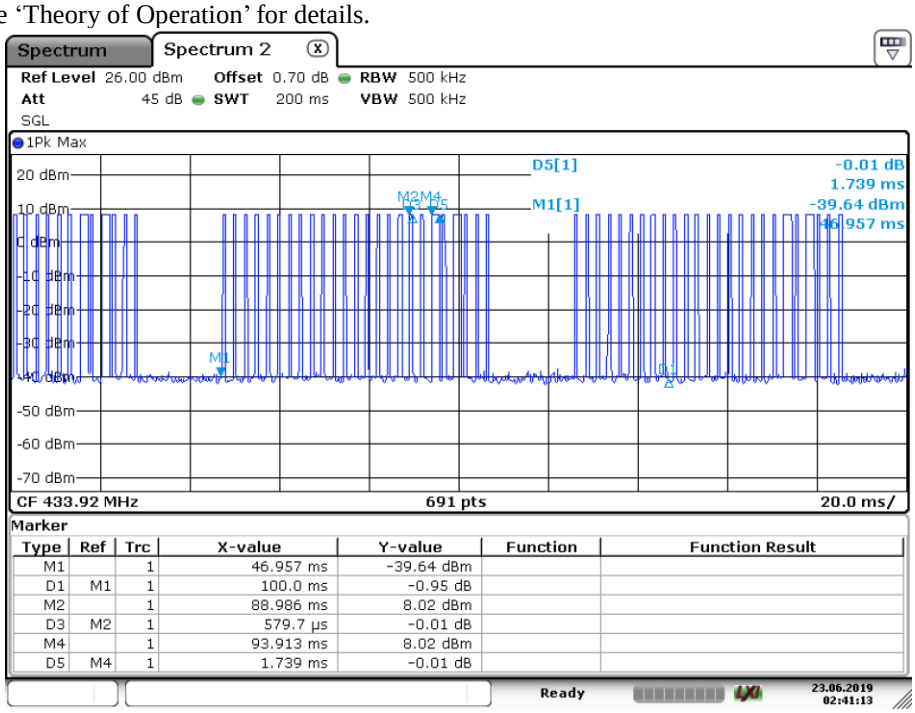
3.2.3.4 Duty Cyle

1) Measured Duty Cycle

Type	Times	ON time(One Pulse)	Sum of ON time [ms]	Total ON time [ms]	Duty cycle(in 100ms) [%]
A	23	0.580	13.340	16.82	16.82
B	2	1.739	3.478		

*1) ON time(in 100ms) = Times * ON time(One Pulse)
*2) Total ON time = Type A's ON time + Type B's ON time

*The test was performed by a button-pressed operation as the worst case.
Please refer to the 'Theory of Operation' for details.



2) Calculation of Duty correction factor

- Declared maximum ON time per 100ms = **31.85 ms** > 16.82 ms
  Note: The worst duty cycle has been provide by the manufacturer's operational description.

- Worst Duty Correction Factor

Worst ON time [ms]	Period [ms]	Duty [On time / Period]	Duty correction factor [dB]
31.85	100	0.3185	-9.94

*4) Duty correction factor = $20\log_{10}$(ON time/ Period)

APPENDIX

TEST EQUIPMENT USED FOR TESTS

	Use	Description	Model No.	Serial No.	Manufacturer	Interval	Nest Cal. Date
1		Signal Analyzer (9 kHz ~ 30 GHz)	FSV30	100757	R&S	1 year	2019-09-07
2		Signal Generator (~3.2 GHz)	8648C	3623A02597	HP	1 year	2020-03-20
3		SYNTHESIZED CW GENERATOR	83711B	US34490456	HP	1 year	2020-03-20
4		Attenuator (3 dB)	8491A	37822	HP	1 year	2019-09-07
5		Attenuator (10 dB)	8491A	63196	HP	1 year	2019-09-07
6	■	EMI Test Receiver (~7 GHz)	ESCI7	100722	R&S	1 year	2019-09-07
7	■	RF Amplifier (~1.3 GHz)	8447D OPT 010	2944A07684	HP	1 year	2019-09-07
8	■	RF Amplifier (1~26.5 GHz)	8449B	3008A02126	HP	1 year	2019-03-21
9	■	Horn Antenna (1~18 GHz)	3115	00114105	ETS	2 year	2020-08-04
10		DRG Horn (Small)	3116B	81109	ETS-Lindgren	2 year	2020-03-18
11		DRG Horn (Small)	3116B	133350	ETS-Lindgren	2 year	2020-03-18
12	■	TRILOG Antenna	VULB 9160	9160-3237	SCHWARZBECK	2 year	2021-03-20
13		Temp.Humidity Data Logger	SK-L200TH II A	00801	SATO	1 year	2020-03-20
14		Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
15	■	DC Power Supply	6674A	3637A01657	Agilent	-	-
17	■	Power Meter	EPM-441A	GB32481702	HP	1 year	2020-03-20
18	■	Power Sensor	8481A	3318A94972	HP	1 year	2019-09-07
19		Audio Analyzer	8903B	3729A18901	HP	1 year	2019-09-07
20		Modulation Analyzer	8901B	3749A05878	HP	1 year	2019-09-07
21		TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2019-09-07
22		Stop Watch	HS-3	812Q08R	CASIO	2 year	2020-03-18
23		LISN	KNW-407	8-1430-1	Kyoritsu	1 year	2019-09-07
24		Two-Lime V-Network	ESH3-Z5	893045/017	R&S	1 year	2020-03-18
25		UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	1 year	2020-03-18
26		Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	1 year	2020-03-18
27		Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	1 year	2020-03-18
28		OSP120 BASE UNIT	OSP120	101230	R&S	1 year	2020-03-18
29	■	Signal Generator(100 kHz ~ 40 GHz)	SMB100A03	177621	R&S	1 year	2020-03-18
30	■	Signal Analyzer (10 Hz ~ 40 GHz)	FSV40	101367	R&S	1 year	2020-03-18
31	■	Active Loop Antenna	FMZB 1519	1519-031	SCHWARZBECK	2 year	2021-02-26