


TEST REPORT No.: (5223)055-0336

TEST REPORT

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Folder No.:	--	Date of Receipt:	2023-02-22
		Test date :	2023-02-22 to 2023-03-10

MANUFACTURER OR SUPPLIER NAME :	--	
MANUFACTURER OR SUPPLIER ADDRESS :	--	
PRODUCT :	THUNDER-CLAP	
MODEL REFERENCE :	20645	
ADDITIONAL MODEL & MODEL DIFFERENCE :	SK17056	
RATED VOLTAGE :	Remote: 3Vd.c. ("AA" size battery x 2) Car: 3.7Vd.c. ("Rechargeable battery x 1)	
REMARKS :	--	
SAMPLE NO. :	(5223)055-0336	

The submitted sample of the above equipment has been tested according to the requirements of the following standards:

ETSI EN 300 440 V2.2.1 (2018-07)

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Assistant Manager,
EMC Department



Name: Kinko Wong
Date: March 21, 2023



TEST REPORT No.: (5223)055-0336

TABLE OF CONTENTS

RELEASE CONTROL RECORD	4
1 SUMMARY OF TEST RESULTS	5
1.1 TEST INSTRUMENTS	7
1.2 MEASUREMENT UNCERTAINTY	9
1.3 MAXIMUM MEASUREMENT UNCERTAINTY	10
2 GENERAL INFORMATION.....	11
2.1 GENERAL DESCRIPTION OF EUT	11
2.2 DESCRIPTION OF TEST MODES	12
2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS	13
2.4 DESCRIPTION OF SUPPORT UNITS	13
3 TEST TYPES AND RESULTS	14
TRANSMITTER PARAMETERS.....	14
3.1 EQUIVALENT ISOTROPIC RADIATED POWER	14
3.1.1 LIMITS OF EQUIVALENT ISOTROPIC RADIATED POWER	14
3.1.2 TEST PROCEDURES	14
3.1.3 DEVIATION FROM TEST STANDARD	14
3.1.4 TEST SETUP	15
3.1.5 TEST RESULTS	16
3.2 PERMITTED RANGE OF OPERATING FREQUENCIES	17
3.2.1 LIMITS OF PERMITTED RANGE OF OPERATING FREQUENCIES	17
3.2.2 TEST PROCEDURES	17
3.2.3 DEVIATION FROM TEST STANDARD	17
3.2.4 TEST SETUP	17
3.2.5 TEST RESULTS	18
3.3 MEASUREMENT RADIATED SPURIOUS EMISSION.....	19
3.3.1 LIMITS OF MEASUREMENT RADIATED SPURIOUS EMISSION.....	19
3.3.2 TEST PROCEDURES	19
3.3.3 DEVIATION FROM TEST STANDARD	19
3.3.4 TEST SETUP	19
3.3.5 TEST RESULTS	20
3.4 DUTY CYCLE (NOT APPLY)	25
3.4.1 LIMITS OF DUTY CYCLE.....	25
3.4.2 TEST PROCEDURES	25
3.4.3 DEVIATION FROM TEST STANDARD	25
3.4.4 TEST SETUP	25
3.4.5 TEST RESULTS	26
RECEIVER PARAMETERS	27
3.5 ADJACENT CHANNEL SELECTIVITY	27
3.5.1 LIMITES OF ADJACENT CHANNEL SELECTIVITY.....	27
3.5.2 TEST PROCEDURES	27



TEST REPORT No.: (5223)055-0336

3.5.3	TEST SETUP.....	28
3.5.4	TEST RESULTS	29
3.6	BLOCKING OR DESENSITIZATION	30
3.6.1	LIMITES OF RECEIVER BLOCKING.....	30
3.6.2	TEST PROCEDURES	30
3.6.3	TEST SETUP.....	31
3.6.4	TEST RESULTS	32
3.7	RECEIVER SPURIOUS EMISSIONS.....	36
3.7.1	LIMITS OF RECEIVER SPURIOUS EMISSIONS.....	36
3.7.2	TEST PROCEDURES	36
3.7.3	DEVIATION FROM TEST STANDARD	36
3.7.4	TEST SETUP.....	36
3.7.5	TEST RESULTS	37
4	PHOTOGRAPHS OF THE TEST CONFIGURATION	40
5	APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	42



TEST REPORT No.: (5223)055-0336

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RE2302WDG0202	Original release	Mar. 16, 2023



TEST REPORT No.: (5223)055-0336

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: EN 300 440 V2.2.1 (2018-07)			
Standard Subclause	Test Type and Limit	Result	Remark
	TRANSMITTER PARAMETERS		
4.2.2	Equivalent Isotropic Radiated Power	PASS	Applicable
4.2.3	Permitted range of operating frequency	PASS	Applicable
4.2.4	Unwanted emissions in the spurious domain	PASS	Applicable
4.2.5	Duty Cycle	N/A	Not Applicable
	RECEIVER PARAMETERS		
4.3.3	Adjacent channel selectivity	N/A	Not Applicable
4.3.4	Blocking or desensitization	PASS	Applicable
4.3.5	Radiated spurious emission	PASS	Applicable



TEST REPORT No.: (5223)055-0336

Receiver categories

Receiver category	Relevant receiver clauses	Risk assessment of receiver performance	The EUT Category
1	4.3.3, 4.3.4 and 4.3.5	Highly reliable SRD communication media; e.g. serving human life inherent systems (may result in a physical risk to a person).	-
2	4.3.4 and 4.3.5	Medium reliable SRD communication media e.g. causing inconvenience to persons, which cannot simply be overcome by other means.	-
3	4.3.4 and 4.3.5	Standard reliable SRD communication media e.g. Inconvenience to persons, which can simply be overcome by other means (e.g. manual).	√

If receiver category 1 or 2 is selected, this shall be stated in both the test report and in the user's manual for the equipment.



TEST REPORT No.: (5223)055-0336

1.1 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
Spectrum Analyzer	Rohde&Schwarz	FSV3044	101326	July 20, 23
Bilog Antenna	SCHWARZBECK	VULB 9168	01281	Jun. 19, 23
Pre-Amplifier	Agilent	8447D	2944A10488	Aug. 03, 23
3m Semi-anechoic Chamber	ETS-Lindgren	9m*6m*6m	D3040003DG-1	July 30, 24
Coaxial RF Cable	Joinfront	JFAA6-NMNM-8000	2100033742	July. 11, 23
Coaxial RF Cable	Joinfront	JFAR-NMBNCM-2000	2100033742	July. 11, 23
Coaxial RF Cable	Joinfront	JFAR-BNCMSMM-500	2100033742	July. 11, 23
Test software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A
Horn Antenna	ETS-Lindgren	3117	00240041	Jun. 19, 23
Horn Antenna	SCHWARZBECK	BBHA 9170	01024	Oct. 16, 23
Pre-Amplifier (1GHz-18GHz)	SCHWARZBECK	BBV 9718C	00142	Jun. 14, 23
Pre-Amplifier (18GHz-40GHz)	Rohde&Schwarz	SCU40	100437	Oct. 27, 23
Coaxial RF Cable	Joinfront	JFAA6-NMSMM-2000	2100033742	July. 11, 23
Coaxial RF Cable	Joinfront	JFAA6-NMSMM-800	2100033742	July. 11, 23
Spectrum Analyzer	Rohde&Schwarz	FSV40	101094	Jan. 11, 24
Progammable Temperature&Humidity Chamber	Hongjin	HYC-TH-225DH	DG-180746	Jan. 11, 24
Attenuator	MINI	BW-S10W2+	S130129FGE2	N/A
DC Source	Agilent	E3640A	MY40004013	Feb. 08, 24
Test software	ADT	ADT_RF Test Software V6.6.5.3	N/A	N/A
Test software	ADT	ADT_RF Test Software V6.6.5.4	N/A	N/A

NOTES:

1. The test was performed in 966 Chamber and RF Oven room.
2. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
4. Test site: No. 122, Houjie Avenue West Houjie Town, Dongguan City Guangdong Province, 523960, People's Republic of China.



TEST REPORT No.: (5223)055-0336

For Receiver Blocking test and Adjacent channel selectivity test:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
Wireless Connectivity Tester	Rohde&Schwarz	CMW270	102426	Jun. 01, 23
Signal Analyzer	Rohde&Schwarz	FSV7	102331	May 09, 23
Spectrum Analyzer	Keysight	N9020A	MY55400499	Jan. 10, 24
Signal Generator	Agilent	N5183A	MY50140980	Jul. 20, 23
MXG-B RF Vector Signal Generator	Keysight	N5182B	MY56200288	Jul. 20, 23
Power Sensor	Keysight	U2021XA	MY55060016	Jan. 11, 24
Vector Signal Generator	Rohde&Schwarz	SMBV100A	257579	Nov. 01, 23
Agile Signal Generator	Agilent	8645A	Agilent	N/A
Shield Box	TOJOIN	MS4345-C	SZA18A 3038	N/A
Attenuator	TOJOIN	CHB-8-90-1-B 50SMA	0803002	N/A
COM Power Splitter	TOJOIN	PS-TX-2B	020801	N/A
COM Power Splitter	TOJOIN	PS-TX-2B	020802	N/A
Test software	TonScend	JS1120-3-1	V2.6.88.0330	N/A

NOTES:

1. The test was performed in RF Oven room.
2. The calibration interval of the above test instruments is 12 & 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



TEST REPORT No.: (5223)055-0336

1.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

Parameter	Uncertainty
Radio frequency	$\pm 1.06 \times 10^{-8}$
RF power (conducted)	± 0.56 dB
Radiated emission of transmitter, valid up to 26.5GHz	± 4.84 dB
Radiated emission of transmitter, valid between 26.5GHz and 66GHz	± 4.96 dB
Radiated emission of receiver, valid up to 26.5GHz	± 4.84 dB
Radiated emission of receiver, valid between 26.5GHz and 66GHz	± 4.96 dB
Temperature	± 0.23 °C
Humidity	± 0.3 %
Voltages(DC)	± 0.1 %
Voltages(AC, <10kHz)	± 0.22 %

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



TEST REPORT No.: (5223)055-0336

1.3 MAXIMUM MEASUREMENT UNCERTAINTY

For the test methods, according to ETSI EN 300 440 standard, the measurement uncertainty figures shall be calculated in accordance with TR 100 028 [7] and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Parameter	Uncertainty
Radio frequency	$\pm 1 \times 10^{-7}$
RF power (conducted)	± 1.5 dB
Radiated emission of transmitter, valid up to 26.5GHz	± 6.0 dB
Radiated emission of transmitter, valid between 26.5GHz and 66GHz	± 8.0 dB
Radiated emission of receiver, valid up to 26.5GHz	± 6.0 dB
Radiated emission of receiver, valid between 26.5GHz and 66GHz	± 8.0 dB
Temperature	$\pm 1^{\circ}\text{C}$
Humidity	± 5.0 %
Voltages(DC)	± 1.0 %
Voltages(AC, <10kHz)	± 2.0 %



TEST REPORT No.: (5223)055-0336

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	THUNDER-CLAP			
MODEL NO.	20645			
ADDITIONAL MODEL	SK17056			
NOMINAL VOLTAGE	Car: DC 3.7V from Li-ion battery; Remote control: DC 3V(1.5V*AA*2) from battery Charging: DC 5V From USB Host Unit			
OPERATING VOLTAGE RANGE	Car	Vnom= 3.7V	Vmin= 3.145V	Vmax= 3.7V
	Remote Control	Vnom= 3V	Vmin=2.55V	Vmax=3 V
OPERATING TEMPERATURE RANGE	-20 ~ +85°C			
MODULATION TYPE	GFSK			
OPERATING FREQUENCY	2410MHz ~ 2473MHz			
EIRP (MAX.)	-26.72dBm			
ANTENNA TYPE	Whip Antenna, with 2.1dBi gain			
CABLE SUPPLIED	USB Line: Unshielded, Detachable, 0.6m			
RECEIVER CATEGORY	<input type="checkbox"/> Category 1	<input type="checkbox"/> Category 2	<input checked="" type="checkbox"/> Category 3	

NOTES:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 2302WDG0202) for detailed product photo.
4. Additional model SK17056 is identical with the test model 20645 except the shell of the appearance and model number for trading purpose.



TEST REPORT No.: (5223)055-0336

2.2 DESCRIPTION OF TEST MODES

SAMPLE	MODE	FREQUENCY
Remote Control	Transmitting/ Receiving	2418MHz-2462MHz
Car	Transmitting/ Receiving	2418MHz-2462MHz

Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2410	12		23	
2	2145	13			
3	2427	14			
4	2437	15			
5	2445	16			
6	2450	17			
7	2455	18			
8	2467	19			
9	2473	20			
10		21			
11		22			

Channel	Freq. (MHz)
Low	2410
Middle	2445
High	2473

Note: The more detailed channel, please refer to the product specifications



TEST REPORT No.: (5223)055-0336

2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product, according to the specifications of the manufacturers; it must comply with the requirements of the following standards:

EN 300 440 V2.2.1 (2018-07)

All test items have been performed and recorded as per the above standards.

2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	DC source	LONG WEI	PS-6403D	010934269	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line: Unshielded, Detachable 1.5m, DC Line: Unshielded, Detachable 1.0m



TEST REPORT No.: (5223)055-0336

3 TEST TYPES AND RESULTS

TRANSMITTER PARAMETERS

3.1 EQUIVALENT ISOTROPIC RADIATED POWER

3.1.1 LIMITS OF EQUIVALENT ISOTROPIC RADIATED POWER

Condition	Limit (e.i.r.p)
Generic use	10 mW e.i.r.p.

For Extreme temperature ranges:

Category	Temperature range	The EUT Category
I (General)	-20°C to +55°C	-
II (Portable)	-10°C to +55°C	-
III (Equipment for normal indoor use)	5°C to +35°C	-
Other(Declared by the manufacturer)	-20°C to +85°C	√

3.1.2 TEST PROCEDURES

Refer to chapter 4.2.2.3 of EN 300 440 V2.2.1 (2018-07).

3.1.3 DEVIATION FROM TEST STANDARD

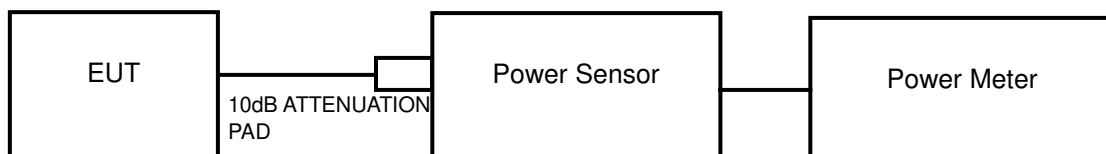
No deviation.



TEST REPORT No.: (5223)055-0336

3.1.4 TEST SETUP

1. Ran a test program to control EUT transmit at specific channel
2. A power meter was used to read the response of the power sensor.
3. Record the power level.
4. EIRP = antenna gain + power level of step 3.



The -6dB bandwidth is less than 20 MHz, so determine the appropriate method of measurement: see clauses 4.2.2.3.1



TEST REPORT No.: (5223)055-0336

3.1.5 TEST RESULTS

Car

TEST CONDITION			EQUIVALENT ISOTROPIC RADIATED POWER (dBm)		
			(Low) 2410MHz	(Middle) 2445MHz	(High) 2473MHz
T _{nom} (°C)	+25	V _{nom} (V)	-27.68	-27.52	-27.61
T _{min} (°C)	-20	V _{min} (V)	-27.28	-27.32	-27.21
		V _{max} (V)	-27.26	-27.31	-27.23
T _{max} (°C)	+85	V _{min} (V)	-27.89	-27.67	-28.12
		V _{max} (V)	-27.89	-27.69	-28.09

Remote Control

TEST CONDITION			EQUIVALENT ISOTROPIC RADIATED POWER (dBm)		
			(Low) 2410MHz	(Middle) 2445MHz	(High) 2473MHz
T _{nom} (°C)	+25	V _{nom} (V)	-27.23	-27.21	-27.12
T _{min} (°C)	-20	V _{min} (V)	-26.83	-27.01	-26.72
		V _{max} (V)	-26.81	-27.00	-26.74
T _{max} (°C)	+85	V _{min} (V)	-27.44	-27.36	-27.63
		V _{max} (V)	-27.44	-27.38	-27.60



TEST REPORT No.: (5223)055-0336

3.2 PERMITTED RANGE OF OPERATING FREQUENCIES

3.2.1 LIMITS OF PERMITTED RANGE OF OPERATING FREQUENCIES

The width of the power envelope is $f_H - f_L$ for a give operating frequency. In equipment that allow adjustment or selection of different frequencies, the power envelope take up different positions in the allowed band. The frequency range is determined by the lowest value of f_L and the highest value of f_H resulting from the adjustment of the equipment to the lowest and highest operating frequency.

CONDITION	LIMIT
Under all test conditions	$F_L > 2400.0\text{MHz}$ $F_H < 2483.5\text{MHz}$

3.2.2 TEST PROCEDURES

Refer to chapter 4.2.3.3 of EN 300 440 V2.2.1 (2018-07).

3.2.3 DEVIATION FROM TEST STANDARD

No deviation.

3.2.4 TEST SETUP

The EUT and probe antenna were placed into the temperature oven. The probe has to be connected with spectrum analyzer. The power source of the EUT has to be connected with the power supply for voltage change. The frequency has to be recorded for the right and left end above threshold of highest and lowest channel respectively.



TEST REPORT No.: (5223)055-0336

3.2.5 TEST RESULTS

Car

TEST CONDITION			FREQUENCY (MHz)	
			LOWEST	HIGHEST
$T_{nom}(^{\circ}C)$	+25	$V_{nom}(V)$	CC	2473.58
$T_{min}(^{\circ}C)$	-20	$V_{min}(V)$	2409.45	2473.69
		$V_{max}(V)$	2409.48	2473.71
$T_{max}(^{\circ}C)$	+85	$V_{min}(V)$	2409.58	2473.52
		$V_{max}(V)$	2409.53	2473.51
Measured frequency (lowest and highest)			FL = 2409.45	FH = 2473.71

Remote Control

TEST CONDITION			FREQUENCY (MHz)	
			LOWEST	HIGHEST
$T_{nom}(^{\circ}C)$	+25	$V_{nom}(V)$	2409.49	2473.58
$T_{min}(^{\circ}C)$	-20	$V_{min}(V)$	2409.45	2473.69
		$V_{max}(V)$	2409.48	2473.71
$T_{max}(^{\circ}C)$	+85	$V_{min}(V)$	2409.58	2473.52
		$V_{max}(V)$	2409.53	2473.51
Measured frequency (lowest and highest)			FL = 2409.45	FH = 2473.71



TEST REPORT No.: (5223)055-0336

3.3 MEASUREMENT RADIATED SPURIOUS EMISSION

3.3.1 LIMITS OF MEASUREMENT RADIATED SPURIOUS EMISSION

Frequency Range	47MHz to 74MHz 87.5MHz to 108MHz 174MHz to 230MHz 470MHz to 862MHz	Other Frequencies Below 1GHz	>1GHz
Limit (Operating)	4nW (-54dBm)	250nW (-36dBm)	1µW (-30dBm)
Limit (Standby)	2nW (-57dBm)	2nW (-57dBm)	20nW (-47dBm)

3.3.2 TEST PROCEDURES

Refer to chapter 4.2.4.3 of EN 300 440 V2.2.1 (2018-07).

3.3.3 DEVIATION FROM TEST STANDARD

No deviation.

3.3.4 TEST SETUP

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. The test setup has been constructed as the normal use condition. Controlling software (provided by manufacturer) has been activated to set the EUT on specific status.



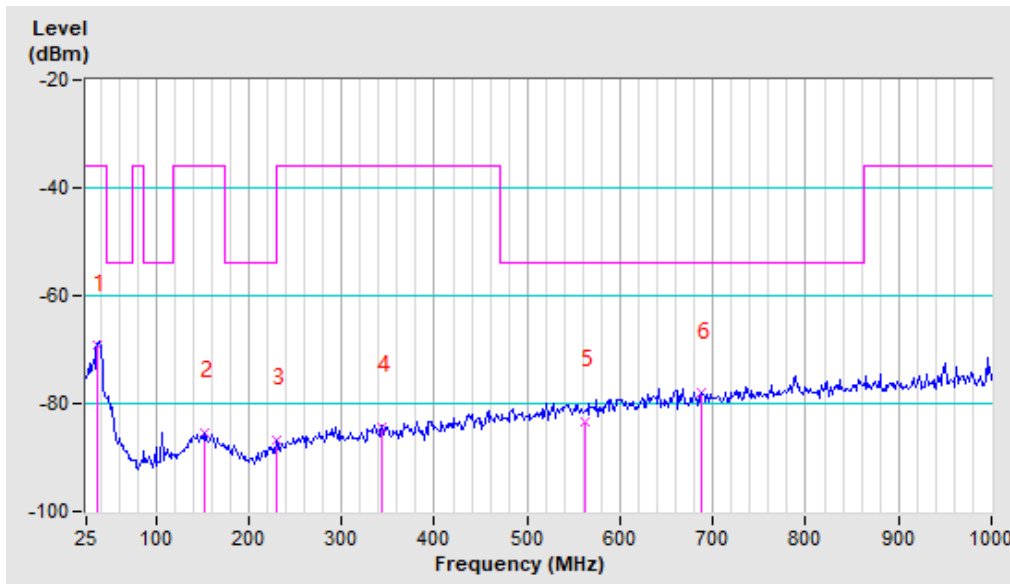
TEST REPORT No.: (5223)055-0336

3.3.5 TEST RESULTS

Car TX BELOW 1GHz DATA

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	Low
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SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
37.50	H	-69.30	-36.00	-33.30
153.12	H	-85.39	-36.00	-49.39
229.69	H	-86.86	-54.00	-32.86
343.75	H	-84.43	-36.00	-48.43
562.50	H	-83.23	-54.00	-29.23
687.50	H	-78.08	-54.00	-24.08

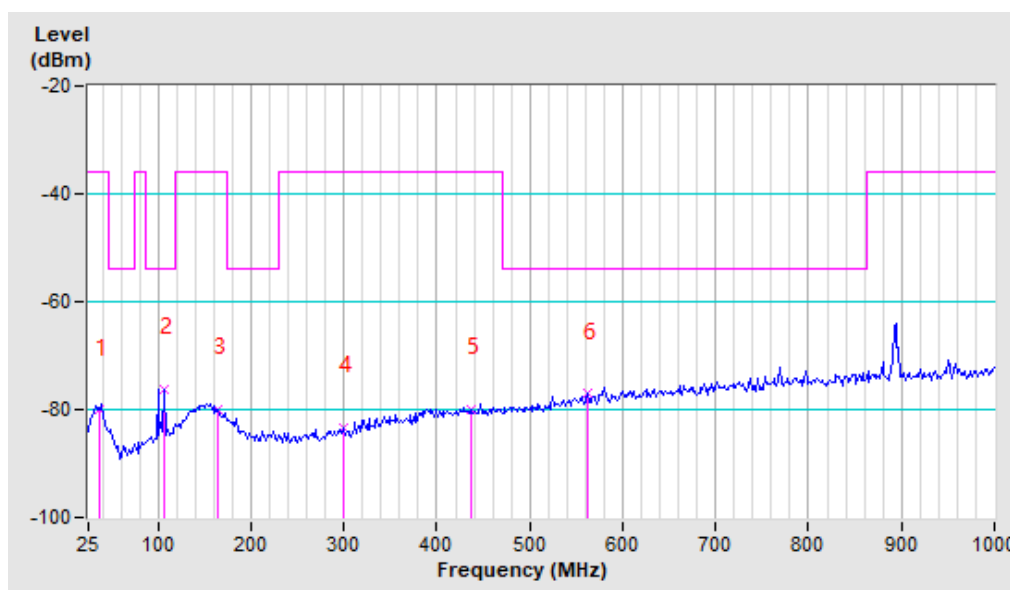




TEST REPORT No.: (5223)055-0336

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	Low
--	--------------	--------------------------	-----

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
37.50	V	-80.12	-36.00	-44.12
106.25	V	-76.18	-54.00	-22.18
164.06	V	-79.85	-36.00	-43.85
300.00	V	-83.29	-36.00	-47.29
435.94	V	-80.08	-36.00	-44.08
562.50	V	-77.07	-54.00	-23.07



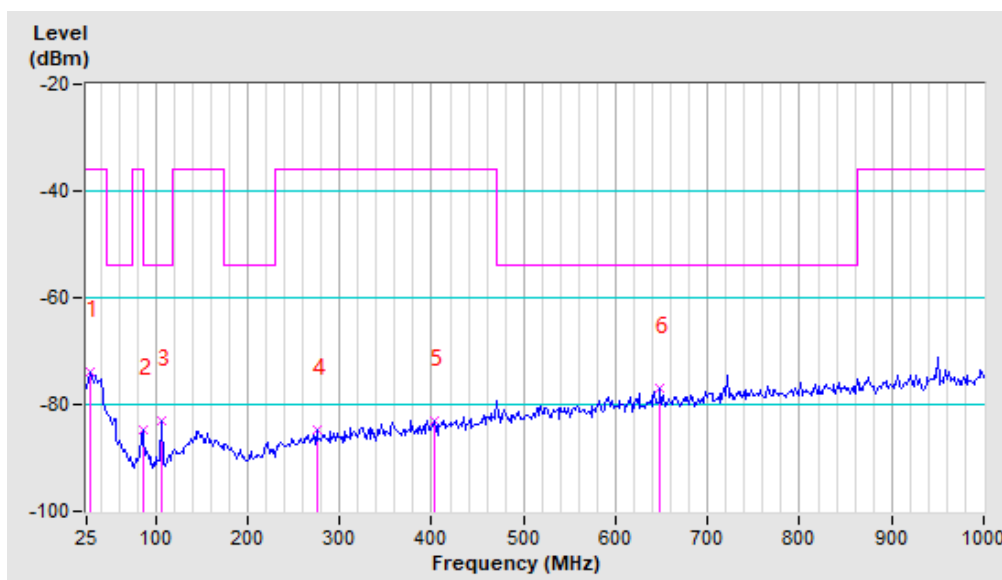


TEST REPORT No.: (5223)055-0336

Remote Control TX BELOW 1GHz DATA

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	Low
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SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
29.69	H	-73.98	-36.00	-37.98
85.94	H	-84.75	-36.00	-48.75
106.25	H	-82.92	-54.00	-28.92
275.00	H	-84.64	-36.00	-48.64
403.12	H	-82.95	-36.00	-46.95
648.44	H	-76.86	-54.00	-22.86



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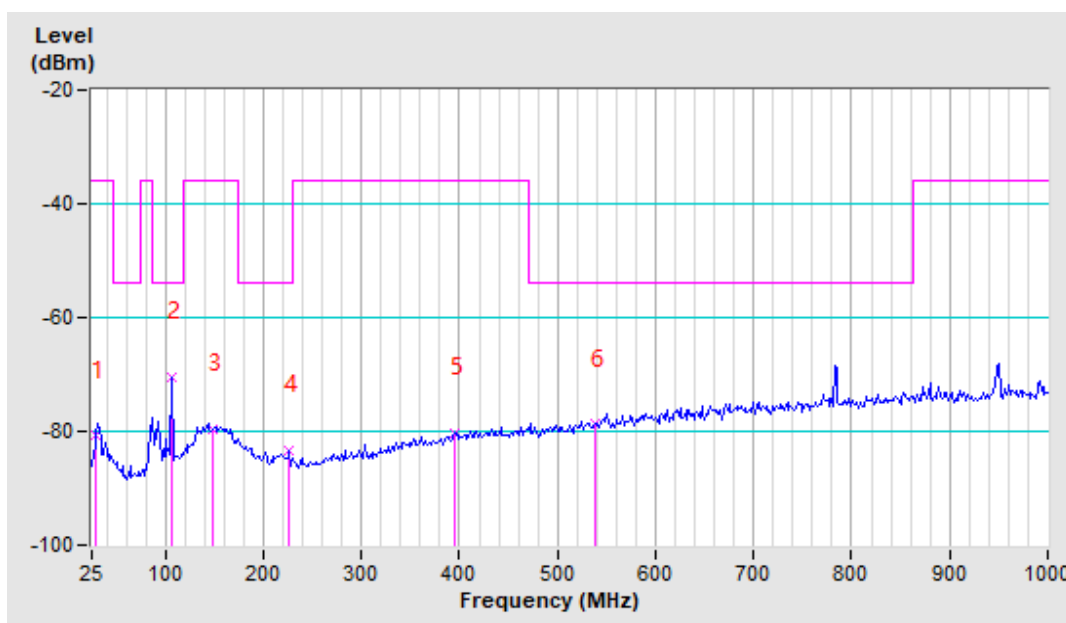
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TEST REPORT No.: (5223)055-0336

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	Low
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SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
29.69	V	-80.84	-36.00	-44.84
106.25	V	-70.59	-54.00	-16.59
148.44	V	-79.55	-36.00	-43.55
226.56	V	-83.23	-54.00	-29.23
395.31	V	-80.35	-36.00	-44.35
537.50	V	-78.77	-54.00	-24.77





TEST REPORT No.: (5223)055-0336

Car TX ABOVE 1GHz DATA

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 25GHz	OPERATING CHANNEL	Low , High
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SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
Low	4820.00	H	-46.75	-30.00	-16.75
	4820.00	V	-46.81	-30.00	-16.81
	7230.00	H	-46.53	-30.00	-16.53
	7230.00	V	-46.35	-30.00	-16.35
High	4946.00	H	-50.12	-30.00	-20.12
	4946.00	V	-44.32	-30.00	-14.32
	7419.00	H	-45.93	-30.00	-15.93
	7419.00	V	-45.74	-30.00	-15.74

Remote Control TX ABOVE 1GHz DATA

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 25GHz	OPERATING CHANNEL	Low , High
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SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
Low	4810.00	V	-47.94	-30.00	-17.94
	4820.00	H	-48.84	-30.00	-18.84
	7230.00	H	-46.68	-30.00	-16.68
	7230.00	V	-45.16	-30.00	-15.16
High	4946.00	H	-47.43	-30.00	-17.43
	4946.00	V	-48.16	-30.00	-18.16
	7419.00	H	-47.17	-30.00	-17.17
	7419.00	V	-47.28	-30.00	-17.28



TEST REPORT No.: (5223)055-0336

3.4 DUTY CYCLE (NOT APPLY)

3.4.1 LIMITS OF DUTY CYCLE

Frequency Band	Duty Cycle	Application
2400MHz to 2483.5MHz	No Restriction	Generic use
2400MHz to 2483.5MHz	No Restriction	Detection, movement and alert applications
(a) 2446MHz to 2454MHz	No Restriction	RFID
(b) 2446MHz to 2454MHz	15%	RFID
5725MHz to 5875MHz	No Restriction	Generic use
9200MHz to 9500MHz	No Restriction	Detection, movement and alert applications
9500MHz to 9975MHz	No Restriction	Detection, movement and alert applications
10.5GHz to 10.6GHz	No Restriction	Detection, movement and alert applications
13.4GHz to 14.0GHz	No Restriction	Detection, movement and alert applications
17.1GHz to 17.3GHz	DDA or equivalent techniques	GBSAR detecting and movement and alert applications
24.00GHz to 24.25GHz	No Restriction	Detection, movement and alert applications

3.4.2 TEST PROCEDURES

Refer to chapter 4.2.5.3 of EN 300 440 V2.2.1 (2018-07).

3.4.3 DEVIATION FROM TEST STANDARD

No deviation.

3.4.4 TEST SETUP

The test setup has been constructed as the normal use condition. Controlling software (provided by manufacturer) has been activated to set the EUT on specific status.



TEST REPORT No.: (5223)055-0336

3.4.5 TEST RESULTS

This product does not apply.



TEST REPORT No.: (5223)055-0336

RECEIVER PARAMETERS

3.5 ADJACENT CHANNEL SELECTIVITY

3.5.1 LIMITES OF ADJACENT CHANNEL SELECTIVITY

The adjacent channel selectivity of the equipment under specified conditions shall not be less than $-30 \text{ dBm} + k$

Receiver category	Limit
1	$-30 \text{ dBm} + K$

The correction factor, k , is as follows:

$$k = -20 \log f - 10 \log BW$$

Where:

f is the frequency in GHz;

BW is the channel bandwidth in MHz.

The factor k is limited within the following:

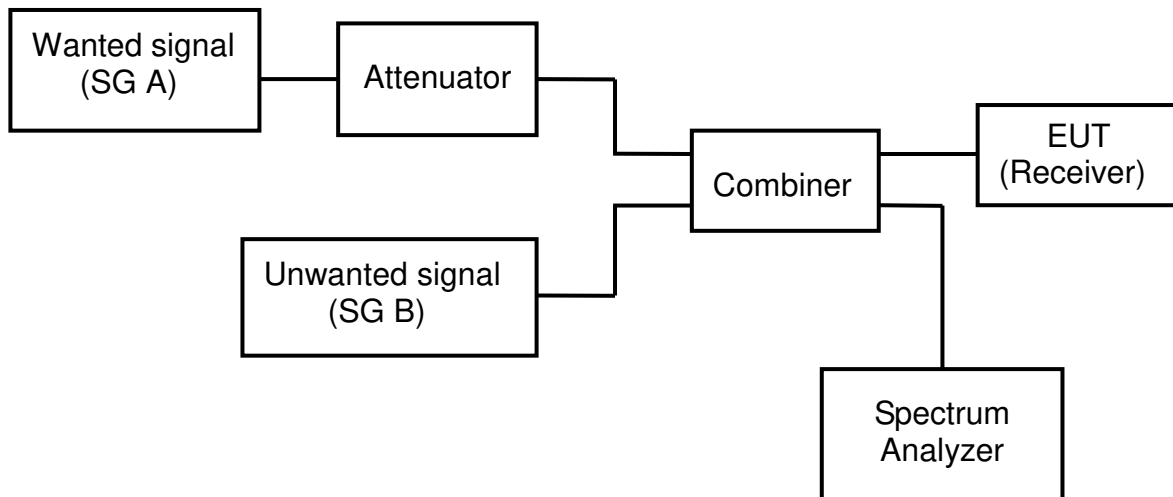
$$-40 \text{ dB} < k < 0 \text{ dB}$$

3.5.2 TEST PROCEDURES

Refer to chapter 4.3.3.3 of EN 300 440 V2.2.1 (2018-07).

TEST REPORT No.: (5223)055-0336

3.5.3 TEST SETUP





TEST REPORT No.: (5223)055-0336

3.5.4 TEST RESULTS

This product does not apply.



TEST REPORT No.: (5223)055-0336

3.6 BLOCKING OR DESENSITIZATION

3.6.1 LIMITES OF RECEIVER BLOCKING

The blocking level, shall not be less than the values given in table

Receiver category	Limit
1	-30dBm + K
2	-45dBm + K
3	-60dBm + K

The correction factor, k, is as follows:

$$k = -20\log f - 10\log BW$$

Where:

f is the frequency in GHz;

BW is the channel bandwidth in MHz.

The factor k is limited within the following:

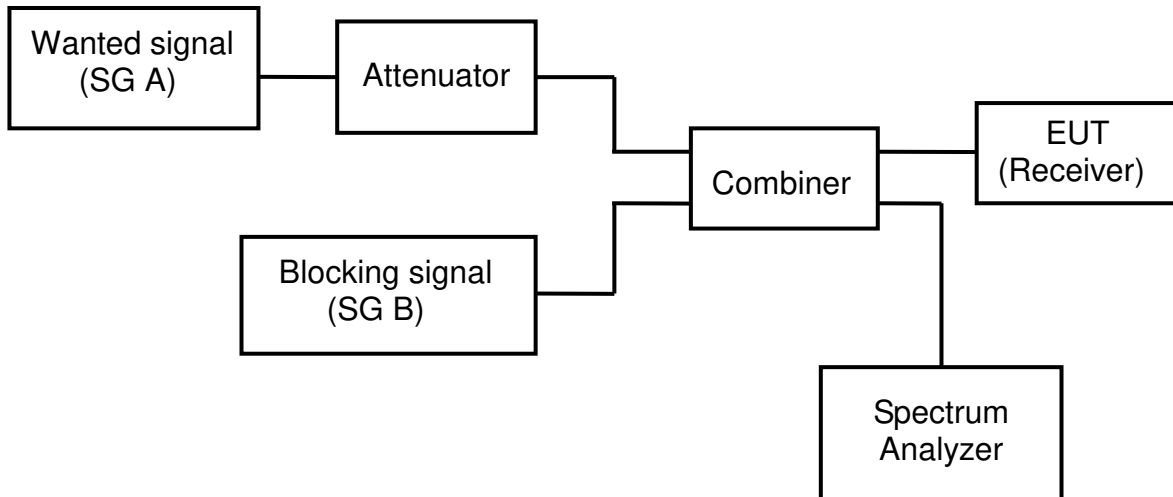
$$-40 \text{ dB} < k < 0 \text{ dB}$$

3.6.2 TEST PROCEDURES

Refer to chapter 4.3.4.3 of EN 300 440 V2.2.1 (2018-07).

TEST REPORT No.: (5223)055-0336

3.6.3 TEST SETUP





TEST REPORT No.: (5223)055-0336

3.6.4 TEST RESULTS

Car Receiver Category 3 Equipment

Blocking measure of the capability						
P _{min} : -76.33dBm						
The actual blocking signal power(Note)					<input checked="" type="checkbox"/> at the antenna connector	
					<input type="checkbox"/> in front of the antenna	
Note: For the conducted measurements, the same level should be used at the antenna connector irrespective of antenna gain.						
Operation mode	Operation frequency (MHz)	Wanted signal power (dBm)	Offset of the bandwidth (times)	Blocking signal frequency (MHz)	Blocking signal Power (dBm)	Minimum Limit (dBm)
Normal working	2410	-73.33	-10	2398.24318	-51.33	-68.13
			-20	2387.04208	-44.52	
			-50	2353.43878	-45.85	
	2473		10	2485.07814 3	-55.62	-68.47
			20	2496.56873 6	-46.37	
			50	2531.04051 5	-44.62	

Notes:

Lower Channel: $K=-20\log f - 10\log BW = -8.1329$

Upper Channel: $K=-20\log f - 10\log BW = -8.4679$



TEST REPORT No.: (5223)055-0336

Remote Control Receiver Category 3 Equipment

Blocking measure of the capability						
P _{min} : -76.34dBm						
The actual blocking signal power(Note)					<input checked="" type="checkbox"/> at the antenna connector <input type="checkbox"/> in front of the antenna	
Note: For the conducted measurements, the same level should be used at the antenna connector irrespective of antenna gain.						
Operation mode	Operation frequency (MHz)	Wanted signal power (dBm)	Offset of the bandwidth (times)	Blocking signal frequency (MHz)	Blocking signal Power (dBm)	Minimum Limit (dBm)
Normal working	2410	-73.34	-10	2398.379157	-51.52	-68.09
			-20	2387.293773	-44.82	
			-50	2354.037623	-45.51	
	2473		10	2484.872648	-55.93	-68.39
			20	2496.160637	-46.82	
			50	2530.024602	-44.41	

Note:

Lower Channel: $K=-20\log f - 10\log BW=-8.0878$

Upper Channel: $K=-20\log f - 10\log BW=-8.3906$



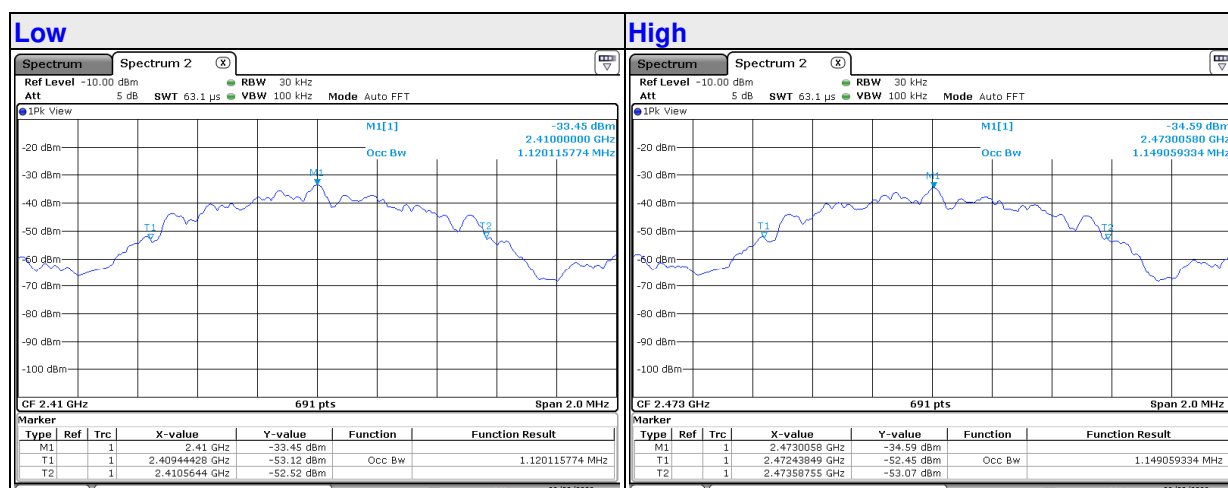
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OCCUPIED BANDWIDTH (FOR REFERENCE)

Car

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)
Low	2410	1.1201
High	2473	1.1491



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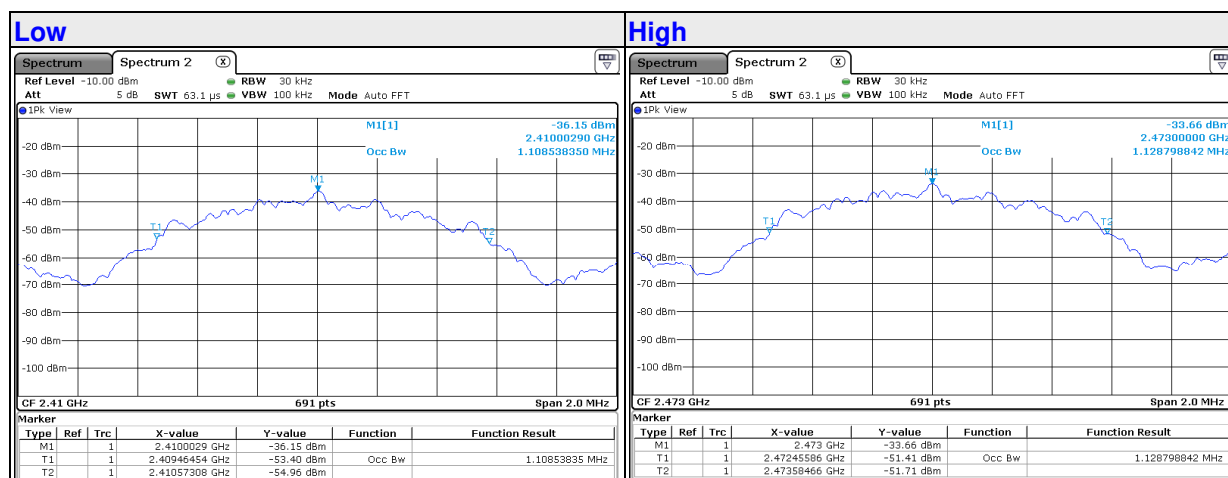
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TEST REPORT No.: (5223)055-0336

Remote Control

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)
Low	2410	1.1085
High	2473	1.1288



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TEST REPORT No.: (5223)055-0336

3.7 RECEIVER SPURIOUS EMISSIONS

3.7.1 LIMITS OF RECEIVER SPURIOUS EMISSIONS

Frequency range	Frequencies below 1GHz	Frequencies above 1GHz
Limit	2nW or -57dBm	20nW or -47dBm

3.7.2 TEST PROCEDURES

Refer to chapter 4.3.5.3 of EN 300 440 V2.2.1 (2018-07).

3.7.3 DEVIATION FROM TEST STANDARD

No deviation.

3.7.4 TEST SETUP

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. The test setup has been constructed as the normal use condition. Controlling software (provided by manufacturer) has been activated to set the EUT on specific status.



TEST REPORT No.: (5223)055-0336

3.7.5 TEST RESULTS

Car RX BELOW 1GHz DATA

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	Low
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SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
25.00	H	-75.10	-57.00	-18.10
32.81	V	-79.16	-57.00	-22.16
40.62	H	-69.37	-57.00	-12.37
100.00	V	-75.43	-57.00	-18.43
106.25	V	-76.23	-57.00	-19.23
143.75	H	-85.64	-57.00	-28.64
165.62	V	-81.07	-57.00	-24.07
315.62	H	-85.01	-57.00	-28.01
465.62	V	-80.89	-57.00	-23.89
504.69	H	-81.04	-57.00	-24.04
576.56	V	-78.96	-57.00	-21.96
687.50	H	-79.53	-57.00	-22.53



TEST REPORT No.: (5223)055-0336

Remote Control RX BELOW 1GHz DATA

SPURIOUS EMISSION FREQUENCY RANGE	25MHz ~ 1GHz	OPERATING CHANNEL	Low
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SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
37.50	H	-69.85	-57.00	-12.85
87.50	V	-76.89	-57.00	-19.89
106.25	H	-74.25	-57.00	-17.25
148.44	H	-80.57	-57.00	-23.57
153.12	V	-77.93	-57.00	-20.93
193.75	V	-83.52	-57.00	-26.52
315.62	V	-83.36	-57.00	-26.36
384.37	H	-82.52	-57.00	-25.52
415.62	V	-80.93	-57.00	-23.93
446.87	H	-82.13	-57.00	-25.13
642.19	H	-78.07	-57.00	-21.07
642.19	V	-75.33	-57.00	-18.33



TEST REPORT No.: (5223)055-0336

Car RX ABOVE 1GHz DATA

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 25GHz	OPERATING CHANNEL	Low , High
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SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
Low	4820.00	H	-56.97	-47.00	-9.97
	4820.00	V	-57.03	-47.00	-10.03
	7230.00	H	-53.09	-47.00	-6.09
	7230.00	V	-53.09	-47.00	-6.09
High	4946.00	H	-56.73	-47.00	-9.73
	4946.00	V	-56.73	-47.00	-9.73
	7419.00	H	-53.54	-47.00	-6.54
	7419.00	V	-53.68	-47.00	-6.68

Remote Control RX ABOVE 1GHz DATA

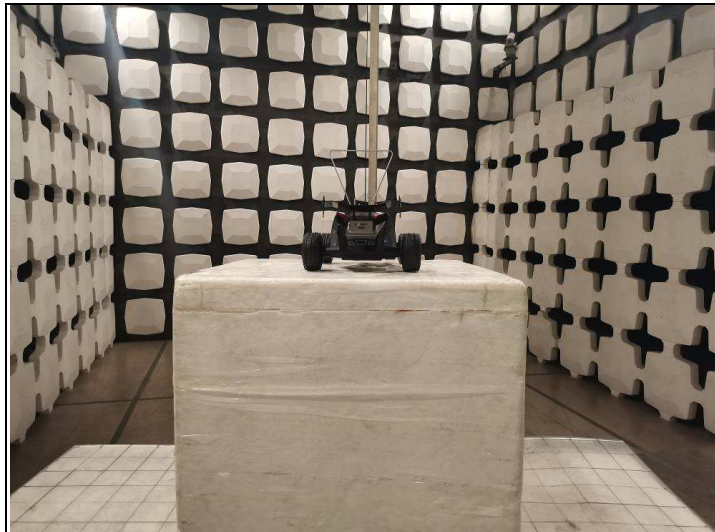
SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 25GHz	OPERATING CHANNEL	Low , High
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SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
Low	4820.00	H	-56.22	-47.00	-9.22
	4820.00	V	-57.01	-47.00	-10.01
	7230.00	H	-53.73	-47.00	-6.73
	7230.00	V	-53.19	-47.00	-6.19
High	4946.00	H	-57.07	-47.00	-10.07
	4946.00	V	-56.07	-47.00	-9.07
	7419.00	H	-53.81	-47.00	-6.81
	7419.00	V	-52.81	-47.00	-5.81

TEST REPORT No.: (5223)055-0336

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

CAR SPURIOUS EMISSION TEST BELOW 1GHz



CAR SPURIOUS EMISSION TEST ABOVE 1GHz



TEST REPORT No.: (5223)055-0336

REMOTE CONTROL SPURIOUS EMISSION TEST BELOW 1GHz



REMOTE CONTROL SPURIOUS EMISSION TEST ABOVE 1GHz





TEST REPORT No.: (5223)055-0336

5 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---