



TEST REPORT

Report Reference No. : **TRE1806016603** R/C.....: 34212
FCC ID : **RAYVHFRS90S**
Applicant's name : **Navico Inc.**
Address : 4500 S. 129th East Avenue, Ste. 200
Manufacturer..... : Navic Inc.
Address..... : 4500 S. 129th East Avenue, Ste. 200
Test item description..... : **Base Station VHF Marine Radio**
Trade Mark..... : SIMRAD/B&G
Model/Type reference : RS90S
Listed Model(s)..... : V90S
Standard..... : **IEC 61097-8**
Date of receipt of test sample..... : Jun.25, 2018
Date of testing..... : Jun.25, 2018- Jul.03, 2018
Date of issue..... : Jul.04, 2018
Result : **PASS**

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Hans Hu

Testing Laboratory Name..... : **Shenzhen Huatongwei International Inspection Co., Ltd**

Address : 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road,
Tianliao, Gongming, Shenzhen, China

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The test report merely correspond to the test sample.

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1. TEST STANDARDS AND TEST DESCRIPTION

1.1. Test Standards

The tests were performed according to following standards:

[IEC 61097-8:2003](#)-Global maritime distress and safety system (GMDSS) – Part 8: Shipborne watchkeeping receivers for the reception of digital selective calling (DSC) in the maritime MF, MF/HF and VHF bands – Operational and performance requirements, methods of testing and required test results

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2018-07-04	Original

2. Test Description

VHF watchkeeping receiver			
Test item	Standards requirement (IEC61097-8)	Result	Test Engineer
Calling sensitivity	Sub-clause 9.1	Pass	Jinquan Wu
Adjacent channel selectivity	Sub-clause 9.2	Pass	Jinquan Wu
Co-channel rejection	Sub-clause 9.3	Pass	Jinquan Wu
Intermodulation response	Sub-clause 9.4	Pass	Jinquan Wu
Spurious response and blocking immunity	Sub-clause 9.5	Pass	Jinquan Wu
Dynamic range	Sub-clause 9.6	Pass	Jinquan Wu
Conducted spurious emissions into the antenna	Sub-clause 9.7	Pass	Jinquan Wu

Note:

N/A means not applicable

3. SUMMARY

3.1. Client Information

Applicant:	Navico Inc.
Address:	4500 S. 129th East Avenue, Ste. 200
Manufacturer:	Navic Inc.
Address:	4500 S. 129th East Avenue, Ste. 200

3.2. Product Description

Name of EUT:	Base Station VHF Marine Radio	
Trade mark:	SIMRAD/B&G	
Model/Type reference:	RS90S	
Listed Model(s):	V90S	
Power supply:	DC 12V	
Wired hand:	Model: HS90	
External speaker:	Model: THX92N-0003	
Marine Radio		
Operation Frequency Range:	RX:156.525MHz(CH70)	
Rated Output Power:	25W (43.98dBm)	
Modulation Type:	Digital Data:	AFSK
Emission Designator:	16K0G2B	
Antenna Type:	External	

3.3. Test frequency list

Modulation Type	Test Channel	Test Frequency (MHz)
		RX
Digital Data(DSC)	CH _M (CH70)	156.525

3.4. EUT operation mode

Test mode	Receiving	Digital Data(DSC)
RX-DSC	√	√

√ : is operation mode.

3.5. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	Unshielded
		Detachable :	Undetachable
○	Multimeter	Manufacturer :	/
		Model No. :	/

4. TEST ENVIRONMENT

4.1. Address of the test laboratory

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Phone: 86-755-26748019 Fax: 86-755-26748089

4.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 762235

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 762235.

IC-Registration No.: 5377B-1

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B-1.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

4.3. Environmental conditions

Normal Conditon	Temperature	15 °C to 35 °C	
	Relative humidity	20 % to 75 %.	
	Voltage	<input checked="" type="checkbox"/> Mains voltage	Nominal mains voltage
		<input type="checkbox"/> Lead-acid battery	1.1 * the nominal voltage of the battery
<input type="checkbox"/> Other		the normal test voltage shall be that declared by the equipment provider	
Extreme Conditon	Temperature	<input type="checkbox"/> -15 °C and +55 °C for equipment intended for mounting below deck	
		<input checked="" type="checkbox"/> -25 °C and +55 °C for equipment intended for mounting above deck.	
		<input type="checkbox"/> -10 °C to +55 °C for Base stations for indoor/controlled climate conditions	
	Voltage	<input type="checkbox"/> Mains voltage	± 10 %* the nominal mains voltage
		<input type="checkbox"/> Secondary battery power sources	1,3 and 0,9 multiplied by the nominal voltage of the battery
		<input checked="" type="checkbox"/> Other	For equipment using other power sources, the extreme test voltages shall be as stated by the manufacturer.

Normal Conditon	V _N =nominal Voltage	DC 12V
	T _N =normal Temperature	25 °C
Extreme Conditon	V _L =lower Voltage	DC 10.8V
	T _L =lower Temperature	-20 °C
	V _H =higher Voltage	DC 15.6V
	T _H =higher Temperature	55 °C

4.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
RF frequency	25 Hz	(1)
RF power	0.55 dB	(1)
Maximum frequency deviation: within 300 Hz to 6 kHz of modulation frequency	2.6 %	(1)
Maximum frequency deviation: within 6 kHz to 25 kHz of modulation frequency	2.20 dB	(1)
Deviation limitation	3.5 %	(1)
Adjacent channel power	1.20 dB	(1)
Conducted spurious emission of transmitter	0.57 dB	(1)
Audio output power	0.25 dB	(1)
Amplitude characteristics of receiver limiter	1.20 dB	(1)
Sensitivity at 20 dB SINAD	2.60 dB	(1)
Conducted emission of receiver	1.60 dB	(1)
Two-signal measurement	2.80 dB	(1)
Three-signal measurement	2.20 dB	(1)
Radiated emission of transmitter	2.20 dB	(1)
Radiated emission of receiver	2.20 dB	(1)
Transmitter transient time	6.8 %	(1)
Transmitter transient frequency	75 Hz	(1)
Receiver desensitization (duplex operation)	0.25 dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

4.5. Equipments Used during the Test

RF Conducted Test						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal. (mm-dd-yy)	Next Cal. (mm-dd-yy)
1	Analog communication tester	HP	8920A	3813A10206	11/11/2017	11/10/2018
2	Digital communication tester	Aeroflex	3920B	1001682041	11/11/2017	11/10/2018
3	Spectrum Analyzer	R&S	FSW26	103440	11/11/2017	11/10/2018
4	Signal Generator	R&S	SML02	100507	11/11/2017	11/10/2018
5	Signal Generator	IFR	2032	203002\100	11/11/2017	11/10/2018
6	RF Cable	Chengdu E-Microwave	----	----	11/11/2017	11/10/2018
7	Attenuator	Chengdu E-Microwave	EMCAXX-10RNZ-3	----	11/11/2017	11/10/2018
8	High-Pass Filter	OCEN	OSP-HPF26300P20-LC	----	11/11/2017	11/10/2018
9	High-Pass Filter	OCEN	OSP-HPF60300P20-LC	----	11/11/2017	11/10/2018
10	RF Control Unit	Tonscend	JS0806-2	N/A	11/11/2017	11/10/2018
11	Climate Chamber	ESPEC	GPL-2	----	11/10/2017	11/09/2018
12	Variable Power Supply	GW INSTRON	GPS-3030D	012578	11/11/2017	11/10/2018

5. TEST CONDITIONS AND RESULTS

5.1. Calling sensitivity

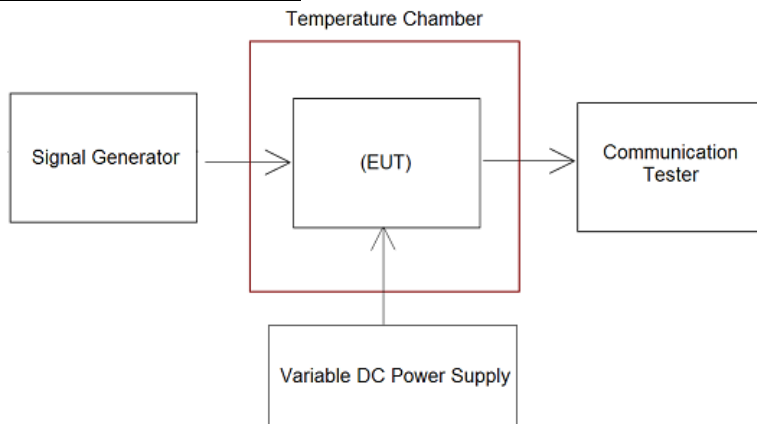
To determine the maximum usable sensitivity which is the minimum level of the signal (e.m.f.) at the nominal frequency of the receiver which, when applied to the receiver input with a standard test signal, will produce a specified BER.

Limit

IEC 61097 Sub-clause 9.1.3

The BER shall be equal to or less than 10^{-2} .

TEST CONFIGURATION



TEST PROCEDURE

Please refer to IEC 61097 Sub-clause 9.1.2 for the measurement method.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Operation Mode	Temperature (°C)	Voltage (V)	Test Channel	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	T _N	V _N	CH _M	0.0062	≤10 ⁻²	Pass
	T _L	V _H	CH _M	0.0076	≤10 ⁻²	
		V _L	CH _M	0.0078		
	T _H	V _H	CH _M	0.0075		
		V _L	CH _M	0.0078		

5.2. Adjacent channel selectivity

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal which differs in frequency from the wanted signal by 25 kHz.

LIMIT

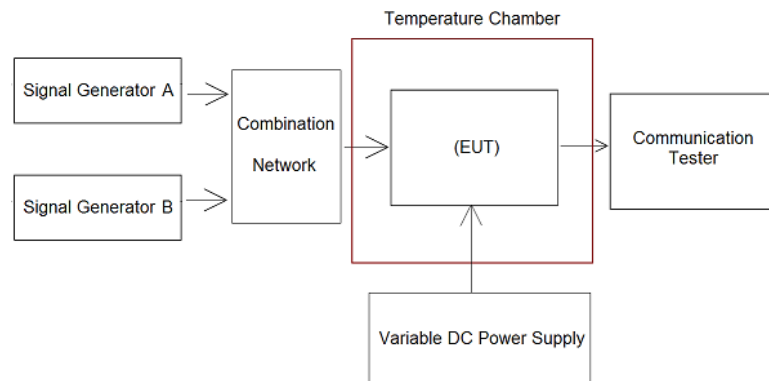
IEC 61097 Sub-clause 9.2.3

The bit error ratio shall be equal to or less than 10^{-2}

TEST PROCEDURE

Please refer to IEC61097 Sub-clause 9.2.2 for the measurement method.

TEST CONFIGURATION



TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Operation Mode	Test Condition		Test Channel	Measurement Position	Measured (error ratio)	Limit (error ratio)	Result
	Temperature (°C)	Voltage (V)					
RX-DSC	T_N	V_N	CH_M	Lower adjacent	0.0075	$\leq 10^{-2}$	Pass
				Upper adjacent	0.0077		
	T_L	V_H	CH_M	Lower adjacent	0.0081	$\leq 10^{-2}$	Pass
				Upper adjacent	0.0080		
		V_L	CH_M	Lower adjacent	0.0079	$\leq 10^{-2}$	Pass
				Upper adjacent	0.0081		
	T_L	V_H	CH_M	Lower adjacent	0.0078	$\leq 10^{-2}$	Pass
				Upper adjacent	0.0079		
		V_L	CH_M	Lower adjacent	0.0082	$\leq 10^{-2}$	Pass
				Upper adjacent	0.0084		

5.3. Co-channel rejection

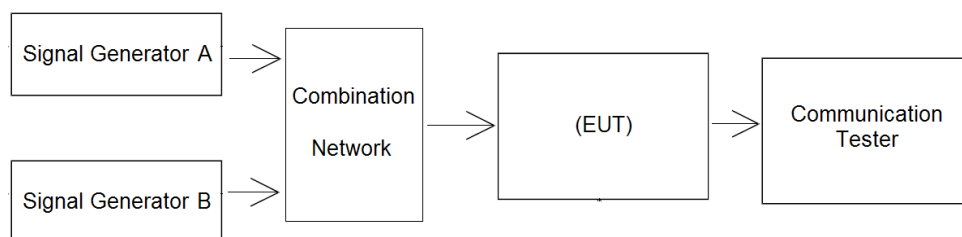
The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

LIMIT

IEC 61097 Sub-clause 9.3.3

The bit error ratio shall be equal to or less than 10^{-2}

TEST CONFIGURATION



TEST PROCEDURE

Please refer to IEC 61097 Sub-clause 9.3.2 for the measurement method.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ Passed ☐ Not Applicable

Please refer to the below test data:

Operation Mode	Test Channel	Measurement Offset (kHz)	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	CH _M	-3	0.0078	$\leq 10^{-2}$	Pass
		0	0.0076		
		3	0.0079		

5.4. Intermodulation response

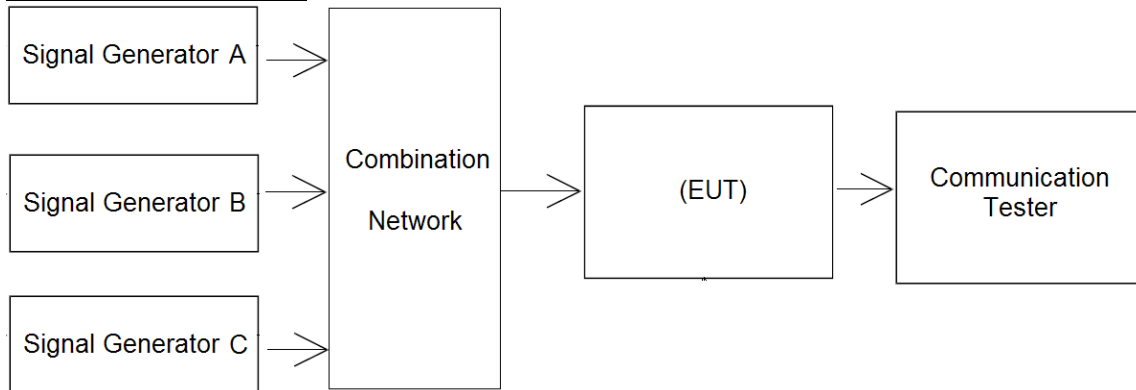
The intermodulation response is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

LIMIT

IEC 61097 Sub-clause 9.4.3

The bit error ratio shall be equal to or less than 10^{-2}

TEST CONFIGURATION



TEST PROCEDURE

Please refer to IEC 61097 Sub-clause 9.4.2 for the measurement method.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Operation Mode	Test Channel	Measurement Offset (kHz)		Measured (error ratio)	Limit (error ratio)	Result
		SG B	SG C			
RX-DSC	CH _M	-50	-100	0.0079	$\leq 10^{-2}$	Pass
		50	100	0.0078		

5.5. Spurious response and blocking immunity

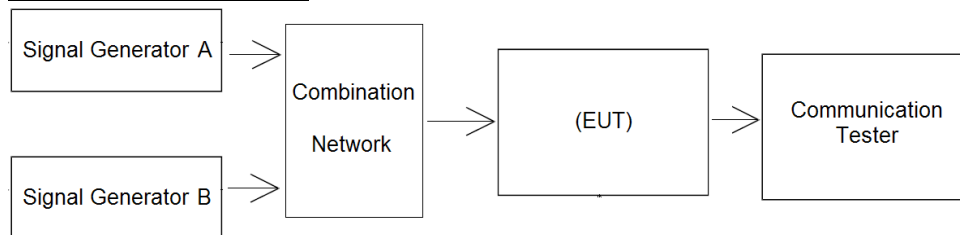
The spurious response and blocking immunity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal with frequencies outside the pass band of the receiver.

LIMIT

IEC 61097 Sub-clause 9.5.3

The bit error ratio shall be equal to or less than 10^{-2}

TEST CONFIGURATION



TEST PROCEDURE

Please refer to IEC 61097 Sub-clause 9.5.2 for the measurement method

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Spurious response:

Operation Mode	Test Channel	Spurious Frequency (MHz)	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	CH _M	156.3	0.0077	$\leq 10^{-2}$	Pass
		156.75	0.0075		
		135.125	0.0072		
		177.925	0.0071		

Blocking immunity:

Operation Mode	Test Channel	Measurement Offset (MHz)	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	CH _M	-10	0.0070	$\leq 10^{-2}$	Pass
		-5	0.0072		
		-2	0.0079		
		-1	0.0084		
		1	0.0083		
		2	0.0078		
		5	0.0073		
		10	0.0071		

5.6. Dynamic range

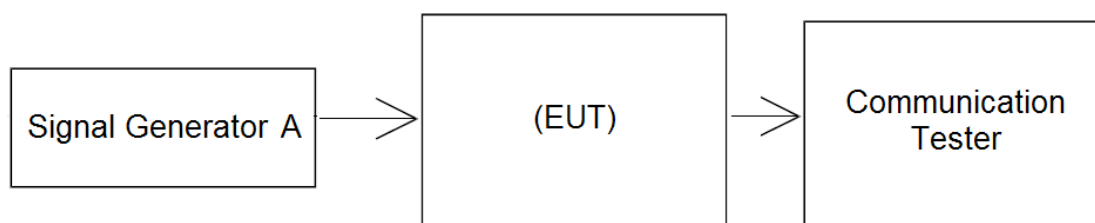
The dynamic range of the equipment is the range from the minimum to the maximum level of a radio frequency input signal at which the bit error ratio in the output of the decoder does not exceed a specified value.

Limit

IEC 61097 Sub-clause 9.6.3

The bit error ratio shall be equal to or less than 10^{-2}

TEST CONFIGURATION



TEST PROCEDURE

Please refer to IEC 61097 Sub-clause 9.6.2 for the measurement method

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Please refer to the below test data:

Operation Mode	Test Channel	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	CH _M	0.0080	$\leq 10^{-2}$	Pass

5.7. Conducted spurious emissions into the antenna

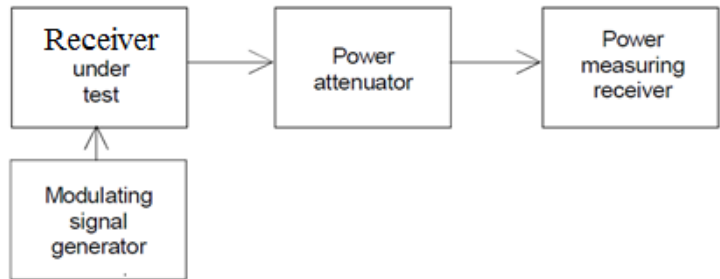
To determine internally generated signals conducted to the antenna terminal and which may be radiated.

Limit

IEC 61097 Sub-clause 9.7.3

The power of any spurious emission shall not exceed 2 nW at any frequency in the range between 9 kHz and 2 GHz.

TEST CONFIGURATION



TEST PROCEDURE

Please refer to IEC 61097 Sub-clause 9.7.2 for the measurement method.

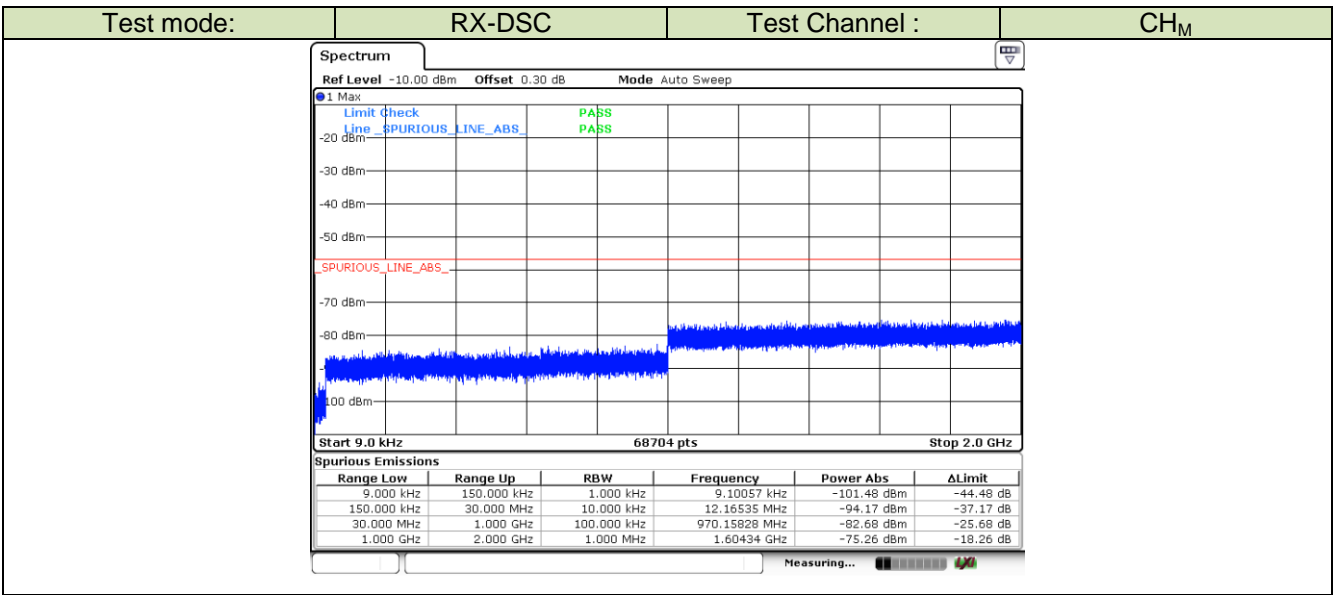
TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ Passed ☐ Not Applicable

Please refer to the below test data:



6. External and Internal Photos of the EUT

Reference to the test report No.: TRE1806016601

-----End of Report-----