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TEST REPORT

CE GNSS Test for SRM200A

APPLICANT
SEONG JI INDUSTRIAL CO., LTD

REPORT NO.
HCT-RF-1909-CE007

DATE OF ISSUE
Sep. 26, 2019

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Applicant	**SEONG JI INDUSTRIAL CO., LTD** 54-33, DongtanHana 1-gil, Hwaseong-si, Gyeonggi-do, 18423, Korea
Product Name	Monarch Quad-mode module
Model Name	SRM200A
Date of Receipt	Sep. 10, 2019
Date of Test	Sep. 24, 2019
Test Standard Used	ETSI EN 303 413 V1.1.1 (2017-06)
Test Results	Approval for CE Temperature : (23.1 ± 3.0)°C, Relative Humidity : (53.7 ± 3.0) % Results, Measurement uncertainty : Refer to the attachment
Manufacturer	SEONG JI INDUSTRIAL CO., LTD
Frequency range and etc.	1 559 MHz ~ 1 610 MHz

Tested by
Beom Jin Cho

Technical Manager
Young Kwan Kim

HCT CO., LTD.
Soo Chan Lee
SooChan Lee / CEO
Accredited by KOLAS, Republic of KOREA

REVISION HISTORY

. The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	Sep. 26, 2019	Initial Release

Test Report Statement:
The above Test Report is not related to the accredited test result by KOLAS(Korea Laboratory Accreditation Scheme) / A2LA(American Association for Laboratory Accreditation), which signed the ILAC-MRA.

CONTENTS

1. CLIENT INFORMATION

The EUT has been tested by request of

Company	SEONG JI INDUSTRIAL CO., LTD 54-33, DongtanHana 1-gil, Hwaseong-si, Gyeonggi-do, 18423, Korea

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment	Monarch Quad-mode module
Model	SRM200A
Hardware version	v1.4
Software version	v1.0.1
Additional Model	-
Serial number	-
Manufacturer	SEONG JI INDUSTRIAL CO., LTD
Rating	DC 3.30 V

3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

3.1 Manufacturers declarations

No. of units:	One
Application:	Monarch Quad-mode module
Model:	SRM200A
Specification(s):	ETSI EN 303 413 V1.1.1 (2017-06)
Antenna type:	External Antenna
Operating frequency range:	1 559 MHz ~ 1 610 MHz

Note:

1. All the testing were performed according to the procedures in ETSI EN 303 413 V1.1.1 (2017-06)
2. All possible frequencies have been observed.
3. In the case of GLONASS, at a minimum Channel 6 (1 605.375 MHz) was included.

3.2 Supported GNSS and GNSS signals

GNSS	GNSS Signals Designations
GLONASS	G1
GPS	L1

4. TEST SUMMARY

The list of test item called for in ETSI EN 303 413 V1.1.1 (2017-06) is given below:

Clause	Test item	Result
4.2.1	Adjacent frequency band selectivity performance	Passed
4.2.2	Spurious emission	Passed

5. TEST EQUIPMENT

No.	Instrument	Model	Due to Calibration	Manufacture	Serial No.
☒	Multi-GNSS Simulator	GSG 64	2020-07-18	SPECTRACOM	201599
☒	BI-LOG Antenna (30 MHz ~ 1 GHz)	VULB9160	2020-08-09	Schwarzbeck	3368
☒	Broadband Low Noise Amplifier (0.1 GHz ~ 18 GHz)	CBLU1183540B-01	2019-12-21	CERNEX	25540
☒	AMPLIFIER (9 KHz ~ 1 GHz)	310N	2020-05-03	SONOMA INSTRUMENT	186169
☒	Horn Antenna (1 GHz ~ 18 GHz)	BBHA9120D	2019-11-21	Schwarzbeck	9120D-1191
☒	Vector Signal Generator	SMU200A	2020-09-24	Rohde&Schwarz	104781
☒	Semi anechoic chamber	10m×5m×5m	-	EMERSON&CUMING	-
☒	Turn Table	DE 3260	-	INNCO GmbH	-
☒	EMI TEST RECEIVER (20 Hz ~ 26.5 GHz)	ESU 26	2020-08-05	Rohde&Schwarz	100241
☒	Spectrum Analyzer (3 Hz ~ 26.5 GHz)	N9020A	2020-09-11	Agilent	MY46471928
☒	Power Divider	11636B	2020-05-16	Agilent	07048
☒	Step Attenuator	8495B	2020-08-19	Agilent	MY41110293
☒	Step Attenuator	8494B	2020-08-19	HP	2812A19007
☒	20dB Attenuation	8493C	2020-06-04	HP	17280

All equipment is calibrated with traceable calibrations.

Each calibration is traceable to the national or international standards.

6. GENERAL REQUIREMENTS

6.1 GUE adjacent frequency band selectivity performance

The C/N_0 metric reported by the GUE for all GNSS and GNSS signals and supported by the GUE shall not degrade by more than the value given in the equation 5-1 when an adjacent frequency signal is applied.

$$\Delta C/N_0 \leq 1dB \qquad \text{Equation 5-1}$$

Note:

References: ETSI EN 303 413 V1.1.1 (2017-06) Clause 4.2.1

6.2 Spurious emission

Receiver spurious emissions are emissions at any frequency when the GUE is in receive-only operating mode. In case of a GUE with an external antenna connector, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or for emissions radiated by a GUE with an integral antenna (without an antenna connector), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Frequency range	Maximum power	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 8.3 GHz	-47 dBm	1 MHz

Note:

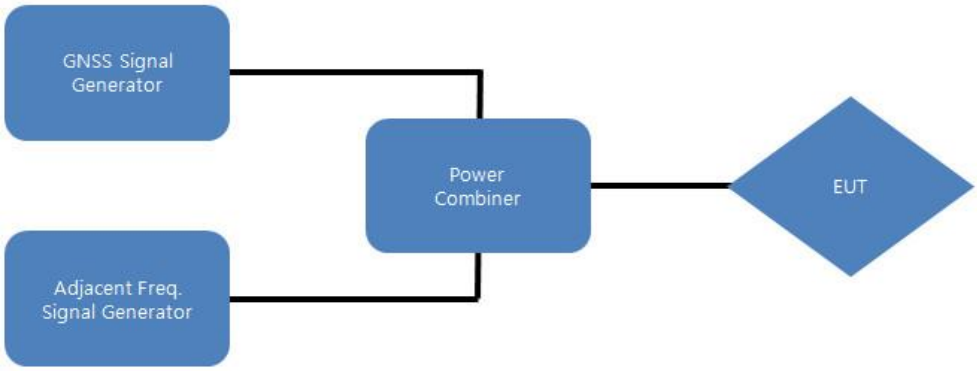
References: ETSI EN 303 413 V1.1.1 (2017-06) Clause 4.2.2

7. GUE adjacent frequency band selectivity performance-Test Results

7.1 Conducted or Radiated testing

■ Conducted □ Radiated

7.2 Test set-up



7.3 Test Procedure

Refer to the ETSI EN 303 413 V1.1.1 (2017-06) Clause 5.4.3

7.4 Test Method

- Record the baseline C/N0 value(s) reported by the EUT with the adjacent frequency signal switched off.
- Record the baseline C/N0 value(s) reported by the EUT with the adjacent frequency signal generator configured to generate the signal defined in the test procedure.
- If the C/N0 degradation from two values does not exceed the 1dB, then this test point is set to "pass". If the C/N0 degradation exceeds the 1dB, then this test point is set to "fail".

7.5 Test Results for 1 599 MHz to 1 610 MHz RNSS band

Frequency band (MHz)	Test point centre frequency (MHz)	Adjacent frequency signal power level (dBm)	Measured C/N0 (dB-Hz)			
			No interfering signal	With interfering signal	Decrease of C/N0	Decrease ≤ 1 dB?
1 518 to 1 525	1 524	-65	-	-	-	BDS N/A
			-	-	-	Galileo N/A
			37.13	37.13	0.00	GLONASS Pass
			41.00	41.00	0.00	GPS Pass
1 525 to 1 549	1 548	-95	-	-	-	BDS N/A
			-	-	-	Galileo N/A
			37.13	37.13	0.00	GLONASS Pass
			41.00	41.00	0.00	GPS Pass
1 549 to 1 559	1 554	-105	-	-	-	BDS N/A
			-	-	-	Galileo N/A
			37.13	37.13	0.00	GLONASS Pass
			41.00	41.00	0.00	GPS Pass
1 610 to 1 626	1 615	-105	-	-	-	BDS N/A
			-	-	-	Galileo N/A
			37.13	37.13	0.00	GLONASS Pass
			41.00	41.00	0.00	GPS Pass
1 626 to 1 640	1 627	-85	-	-	-	BDS N/A
			-	-	-	Galileo N/A
			37.13	37.13	0.00	GLONASS Pass
			41.00	41.00	0.00	GPS Pass

7.6 Final Test result for 1 599 MHz to 1 610 MHz RNSS band:

■ Pass ☐ Fail

8. Spurious Emission-Test Results

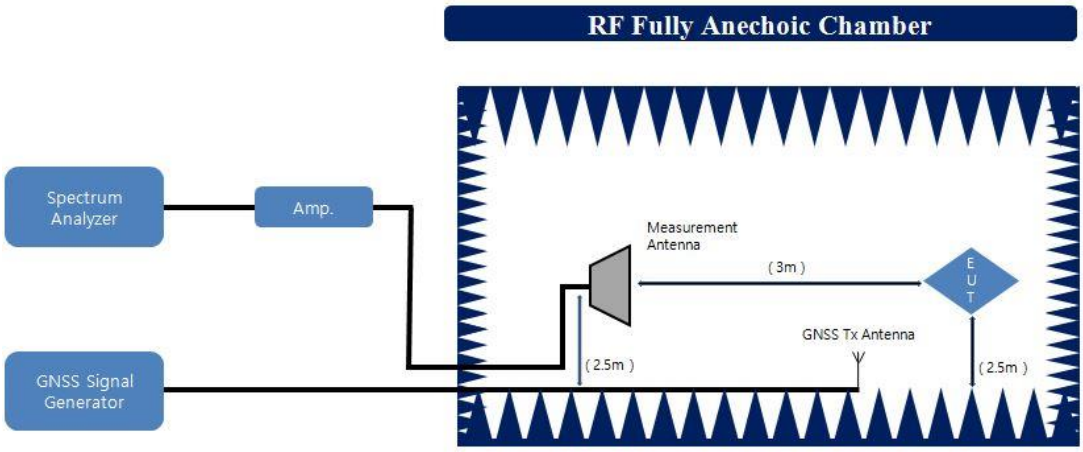
8.1 Test site

Fully Anechoic Chamber : ☐ 30 MHz ~ 1 GHz ☐ 1 GHz ~ 8.3 GHz

Semi Anechoic Chamber : ■ 30 MHz ~ 1 GHz ■ 1 GHz ~ 8.3 GHz

8.2 Test set-up

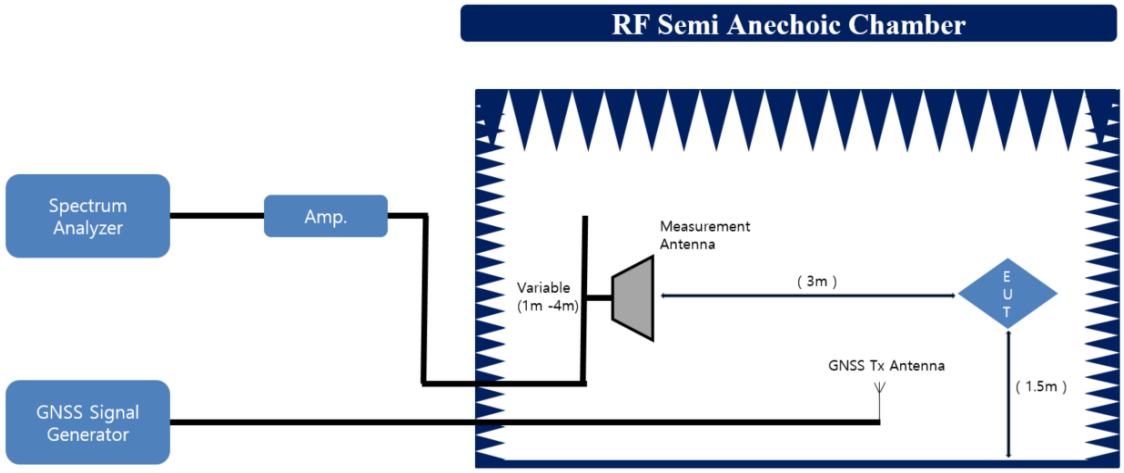
8.2.1 Fully Anechoic Chamber



8.2.1.1 Test Method

- Correction values from a verified site calibration was used.
- During the tests, the measurement antenna polarization and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.
- The test was performed by placing the EUT on 3 orthogonal axis (X, Y, Z) at antenna Polarization (Horizontal, Vertical) and shown the worst case on this report.

8.2.2 Semi Anechoic Chamber



8.2.2.1 Test Method

- The Measurement antenna mast provides a variable height facility (from 1 m to 4 m) so that the position of the measurement antenna can be optimized for maximum coupled signal between antennas or between a EUT and the measurement antenna.
- During the tests the measurement antenna polarization and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.
- The test was performed by placing the EUT on 3orthogonal axis (X, Y, Z) at antenna polarization (Horizontal, Vertical) and shown the worst case in this report.

8.3 Measurement Uncertainty

Semi Anechoic Chamber: 30 MHz ~ 1 GHz: 4.80 dB (about 95 %, k = 2)
1 GHz ~ 8.3 GHz: 5.70 dB (about 95 %, k = 2)

8.4 Test Procedure

Refer to the ETSI EN 303 413 V1.1.1 (2017-06) Clause 5.5.2

8.5 GNSS signal(s) present or absent:

■ Present ☐ Absent

8.6 Receiver Spurious Emissions test result:

■ Pass ☐ Fail ☐ N/A

30 MHz – 1 GHz

GNSS	Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
GLONASS / GPS	No peak found					RMS

1 GHz – 8.3 GHz

GNSS	Measurement Frequency(MHz)	Polarization	Level (dBm)	Limit (dBm)	Margin (dB)	Detector
GLONASS / GPS	No peak found					RMS

Note

1. Performed at normal test condition.
2. All possible frequencies have been observed.
3. Spurious emissions were measured from 30 MHz to 8.3 GHz in the presence of all GNSS signals.

9. PHOTOGRAPHS OF THE EUT

■ Photographs is described in Appendix A. Please refer to Appendix A.

10. TEST SETUP PHOTOGRAPHS

■ Photographs is described in Appendix C. Please refer to Appendix C.