MEASUREMENT REPORT
FCC PART 15C

Report No.: S20230912283204
Issue Date: 23-10-2023

Applicant:	Queclink Wireless Solutions Co., Ltd.
Address:	No.30, Lane 500, Xinlong Road, Minhang District, Shanghai, China 201101
FCC ID:	YQD-SC350MG
Product:	GPS Tracker
Model No.:	SC350MG
FCC Rule Part(s):	Part 15 Subpart C
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01v05r02
Result:	Pass
Item Receipt Date:	Sep 12 2023
Test Date:	Sep 25 ~ Oct 13, 2023

Compiled By: Amos Xia
(Amos Xia)
Senior Test Engineer

Approved By: Line Chen
(Line Chen)
Engineer Manager

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of Fangguang Inspection & Testing Co., Ltd. Wuxi Branch
The test report must not be used by the client to claim product certifications, approval, or endorsement by NVLAP, NIST or any agency of U.S. Government.

Revision History

Report No.	Version	Description	Issue Date
S20230912283204	Rev. 01	/	23-10-2023

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Description Page

§2.1033 General Information

Applicant:	Queclink Wireless Solutions Co., Ltd.
Applicant Address:	No.30, Lane 500, Xinlong Road, Minhang District, Shanghai, China 201101
Manufacturer:	Queclink Wireless Solutions Co., Ltd.
Manufacturer Address:	No.30, Lane 500, Xinlong Road, Minhang District, Shanghai, China 201101
Test Site:	Fangguang Inspection & Testing Co., Ltd.
LAB ID:	CN5037
Test Site Address:	G9 Building, China Sensor Network International Innovation Park No.200, Linghu Avenue Wuxi, Jiangsu 214000 China
FCC Rule Part(s):	Part 15 Subpart C
FCC ID:	YQD-SC350MG
Test Device Serial No.:	S/N.: MP03617D7003277 ☐ Production ☒ Pre-Production ☐ Engineering

1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2. Fangguang Test Location

These measurement tests were performed at the Fangguang Inspection and testing Co.,LTD located at 200 Linghu Avenue, Xinwu District, Wuxi City. The detailed description of the measurement facility was found to be in compliance with the requirements of ANSI C63.4-2014.

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	GPS Tracker
Model Name:	SC350MG
Trade Mark:	Queclink
Input Voltage Range:	DC 8V ~ 60V

Note1: The **GPS Tracker** have BLE and 2G&4G function, the 2G&4G modular is certified, the 2G&4G modular FCC ID is XMR202005BG95M5. The EUT reference 2G&4G modular report, so the EUT was tested radiated spurious emissions.

2.2. Test Configuration

The EUT was tested per the guidance FCC CFR Title 47 Part 15 Subpart C and ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.3. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.4. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

2.5. Calculation with all conversion and correction factors used

For AC Line Conducted Emissions Test:

Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

For Radiated Emissions Below 1GHz Test:

Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

For Radiated Emissions Above 1GHz Test:

Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB).

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement of the EUT.

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. The turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-25GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- Use a unique coupling to the intentional radiator.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	FWXGJC-2016-181	1 year	2024/03/14
Two-Line V-Network	R&S	ENV 216	FWXGJC-2016-182	1 year	2024/05/14
Thermohygrometer	Yuhuaze	HTC-1	FWXDA-2016-385	1 year	2024/03/21

Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Loop Antenna	Schwarzbeck	FMZB 1519B	FWXGJC-2018-015	3 year	2024/08/13
Bi-Log Antenna	R&S	HL562E	FWXGJC-2016-267-06	3 year	2024/03/10
Broadband Horn Antenna	R&S	HF907	FWXGJC-2016-267-07	1 year	2024/03/02
Broadband Horn Antenna	Schwarzbeck	BBHA9170	FWXGJC-2018-016	3 year	2024/06/04
EMI Receiver	R&S	ESR26	FWXGJC-2016-267-01	1 year	2023/11/08
Pre-Amplifier	R&S	SCU-18D	FWXGJC-2016-267-05	1 year	2023/11/17
Pre-Amplifier	R&S	EMC184055 SE	FWXGJC-2018-018	3 year	2025/04/13
Thermohygrometer	Yuhuaze	HTC-1	FWXDA-2016-386	1 year	2023/11/21
Anechoic Chamber	Aimuke	EMCCT-3	FWXGJC-2016-270	1 year	2025/06/07

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.05dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 30MHz-1GHz: 3.06dB 1GHz-12.75GHz: 4.13dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 30MHz-1GHz: 1.00 dB 1GHz-26.5GHz: 1.30 dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.60dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.80dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.20MHz

7. TEST RESULT

7.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS GEN [8.9])	Radiated	Pass	Section 7.2
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits (RSS GEN [8.8])	Line Conducted	Not Applicable	Section 7.3

Notes:

1) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

7.2. Radiated Spurious Emission Measurement

7.2.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.2.2. Test Procedure Used

ANSI C63.10-2013 – Section 6.6.4.3

7.2.3. Test Setting

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold

7. Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

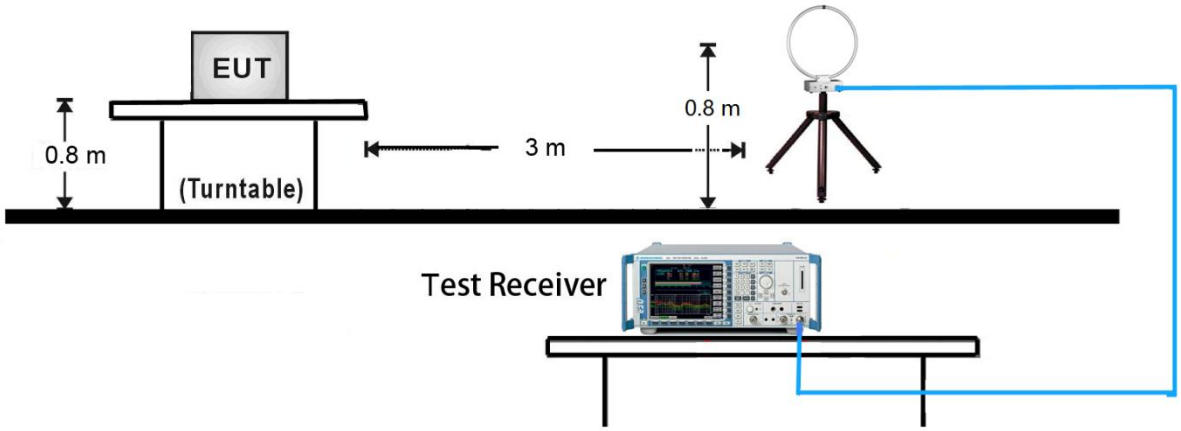
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

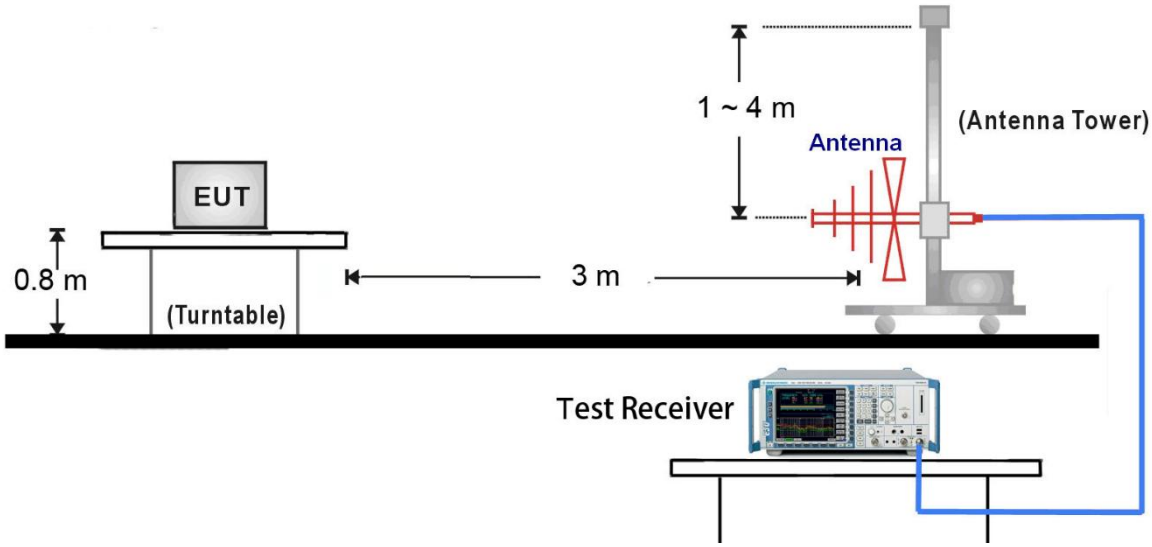
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Power Average (RMS)
5. Number of sweep point = 2001 (Number of sweep points must be ≥ 2 x span / RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

7.2.4. Test Setup

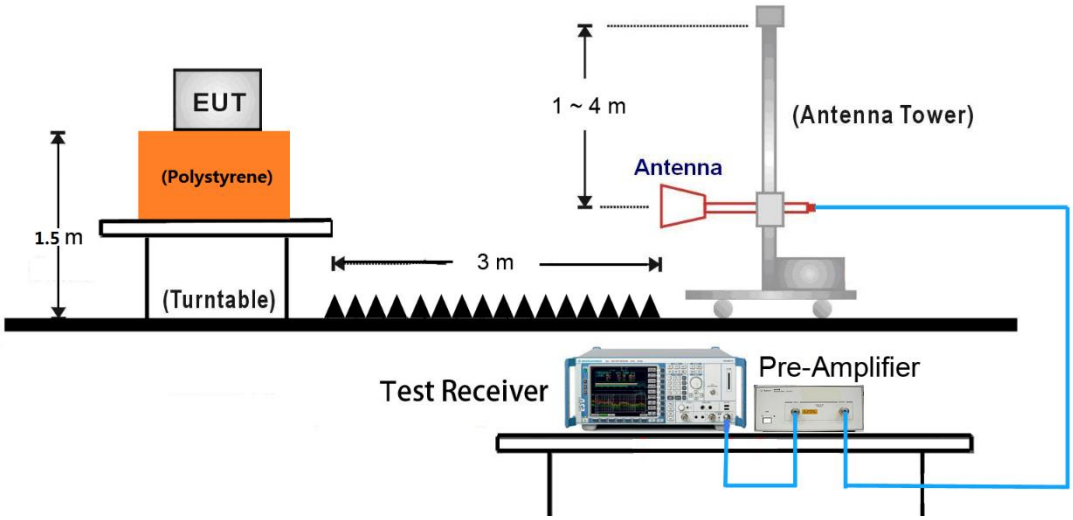
9kHz ~ 30MHz Test Setup:



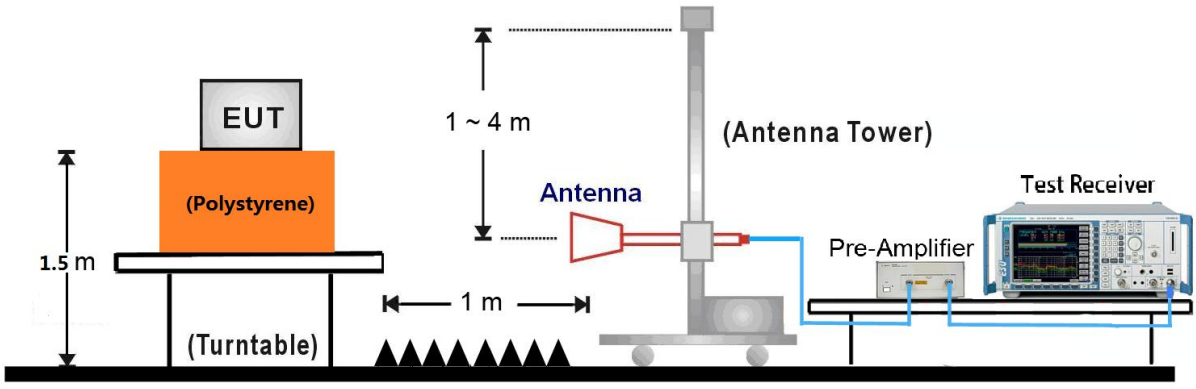
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



18GHz ~40GHz Test Setup:



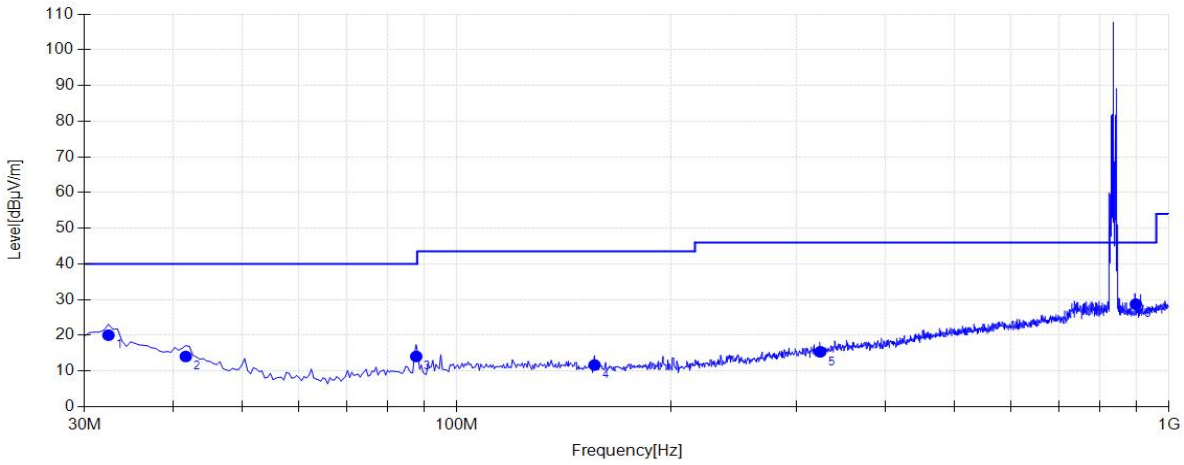
7.2.5. Test Result

The worst case of Radiated Emission:

1) 30MHz – 1GHz Test Data

EUT:	GPS Tracker	Polarity:	Horizontal
Model:	SC350MG	SN:	MP03617D7003277
Mode:	Transmit at BLE_1M Channel 00 and 2G GSM850(worst case)	Voltage:	DC 12V
Environment:	Temp: 23℃; Humi:53%	Engineer:	Amos Xia

Test Graph

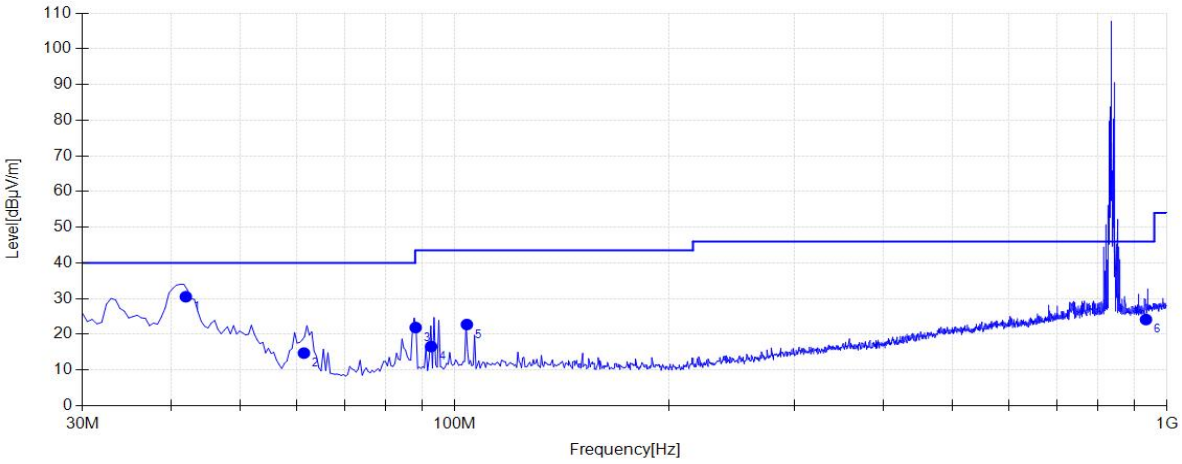


Final Data List								
NO.	Frequency [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	32.4250	18.58	20.04	40.00	19.96	200	221	Horizonta
2	41.6400	13.89	14.06	40.00	25.94	200	0	Horizonta
3	87.7150	10.14	14.06	40.00	25.94	200	173	Horizonta
4	156.1000	10.82	11.67	43.50	31.83	100	84	Horizonta
5	323.9100	14.74	15.38	46.00	30.62	100	263	Horizonta
6	898.6350	24.77	28.73	46.00	17.27	100	133	Horizonta

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz), therefore no data appear in the report.

Note 2: The above limit frequency is the 2G GSM 850 fundamental emission.

Test Graph



Final Data List								
NO.	Frequency [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	41.9124	13.89	30.53	40.00	9.47	100	214.6	Vertical
2	61.4052	7.31	14.73	40.00	25.27	200	325.9	Vertical
3	88.1111	10.13	21.88	43.50	21.62	100	191.2	Vertical
4	92.6200	10.64	16.56	43.50	26.94	100	344.6	Vertical
5	104.0022	11.57	22.74	43.50	20.76	100	128	Vertical
6	934.3679	25.42	24.13	46.00	21.87	100	307.1	Vertical

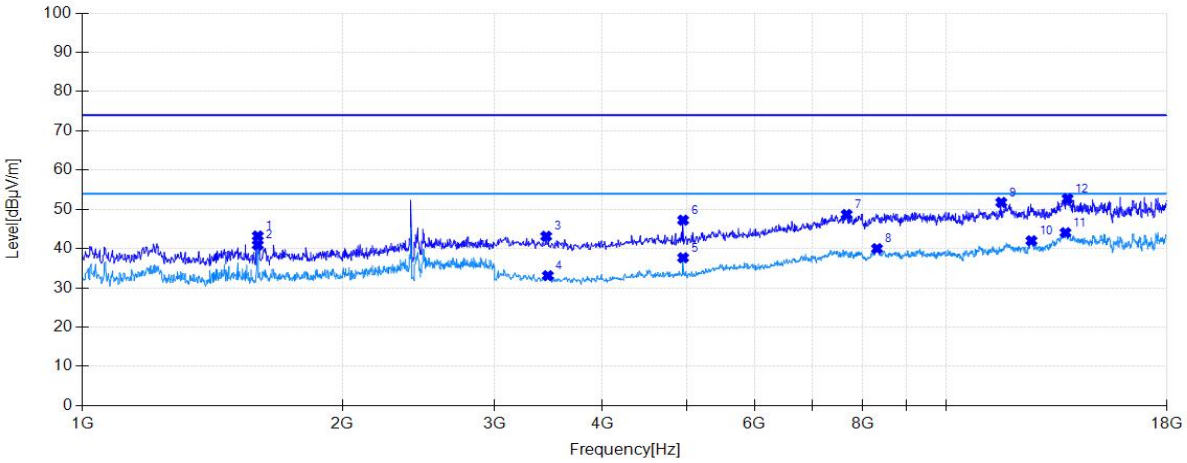
Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz), therefore no data appear in the report.

Note 2: The above limit frequency is the 2G GSM 850 fundamental emission.

2) 1GHz – 18GHz Test Data

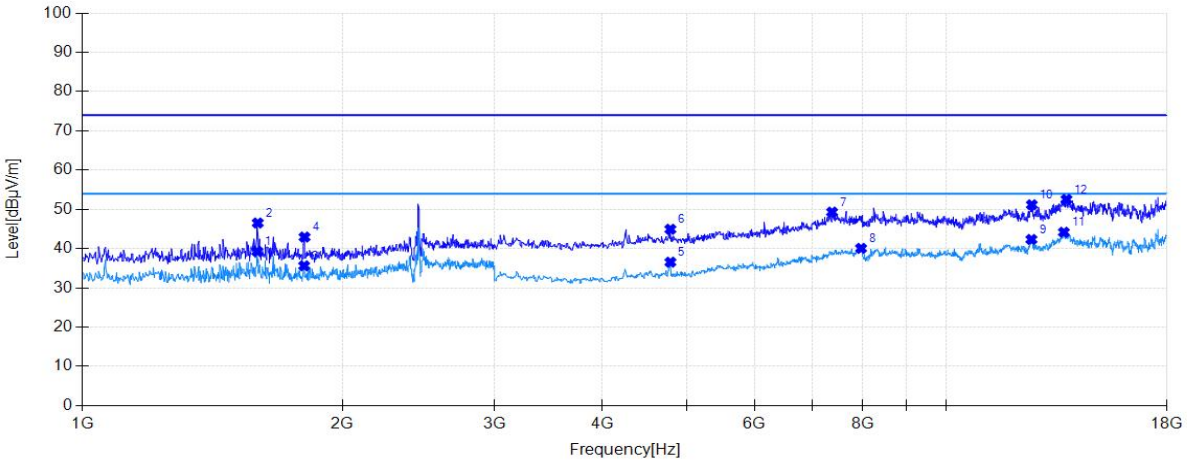
EUT:	GPS Tracker	Polarity:	Horizontal
Model:	SC350MG	SN:	MP03617D7003277
Mode:	Transmit at BLE_1M Channel 00 and 2G GSM850(worst case)	Voltage:	DC 12V
Environment:	Temp: 23℃; Humi:53%	Engineer:	Amos Xia

Test Graph



NO	Frequency [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	1596.0000	43.22	-13.50	74.00	30.78	150	224	PK	Horizont
2	1596.0000	40.92	-13.50	54.00	13.08	150	231	AV	Horizont
3	3442.7214	43.14	-6.20	74.00	30.86	150	248	PK	Horizont
4	3457.7289	33.10	-6.19	54.00	20.90	150	90	AV	Horizont
5	4958.4792	37.67	-2.31	54.00	16.33	150	40	AV	Horizont
6	4958.4792	47.25	-2.31	74.00	26.75	150	40	PK	Horizont
7	7667.3337	48.70	4.07	74.00	25.30	150	352	PK	Horizont
8	8312.6563	40.01	4.91	54.00	13.99	150	76	AV	Horizont
9	11576.7884	51.76	9.08	74.00	22.24	150	358	PK	Horizont
10	12544.7724	42.00	9.43	54.00	12.00	150	327	AV	Horizont
11	13737.8689	44.06	11.42	54.00	9.94	150	97	AV	Horizont
12	13812.9065	52.71	11.73	74.00	21.29	150	227	PK	Horizont

Test Graph

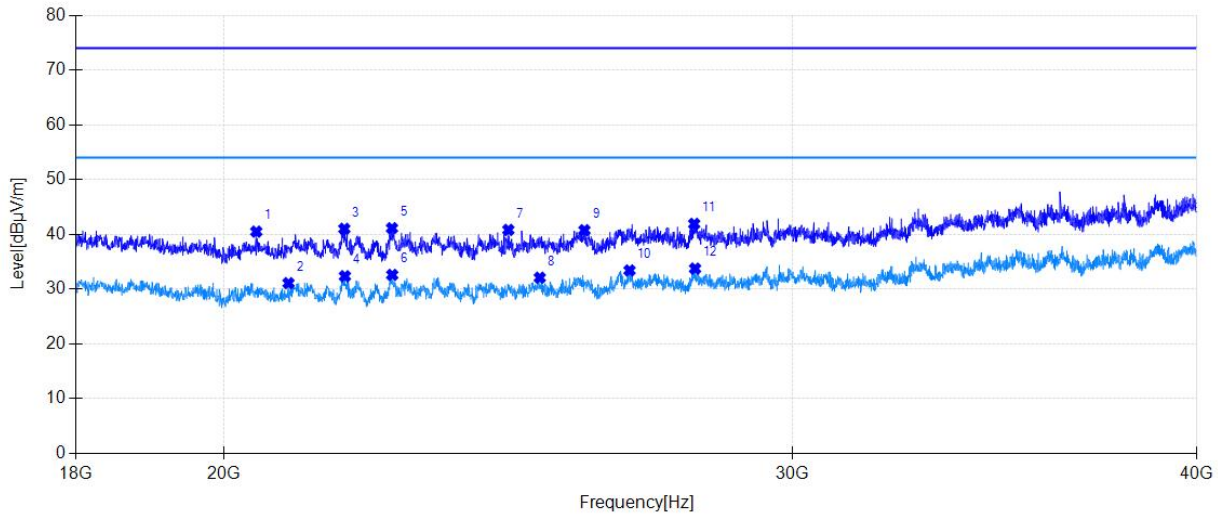


NO	Frequency [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	1594.0000	39.28	-13.51	54.00	14.72	150	329	AV	Vertical
2	1596.0000	46.52	-13.50	74.00	27.48	150	310	PK	Vertical
3	1806.0000	35.61	-12.51	54.00	18.39	150	245	AV	Vertical
4	1808.0000	42.94	-12.51	74.00	31.06	150	245	PK	Vertical
5	4793.3967	36.55	-2.63	54.00	17.45	150	326	AV	Vertical
6	4793.3967	44.93	-2.63	74.00	29.07	150	326	PK	Vertical
7	7374.6873	49.30	3.82	74.00	24.70	150	334	PK	Vertical
8	7967.4837	40.06	4.39	54.00	13.94	150	9	AV	Vertical
9	12544.7724	42.33	9.43	54.00	11.67	150	182	AV	Vertical
10	12559.7799	51.17	9.49	74.00	22.83	150	96	PK	Vertical
11	13677.8389	44.17	11.59	54.00	9.83	150	231	AV	Vertical
12	13775.3877	52.52	11.58	74.00	21.48	150	58	PK	Vertical

3) 18GHz – 40GHz Test Data

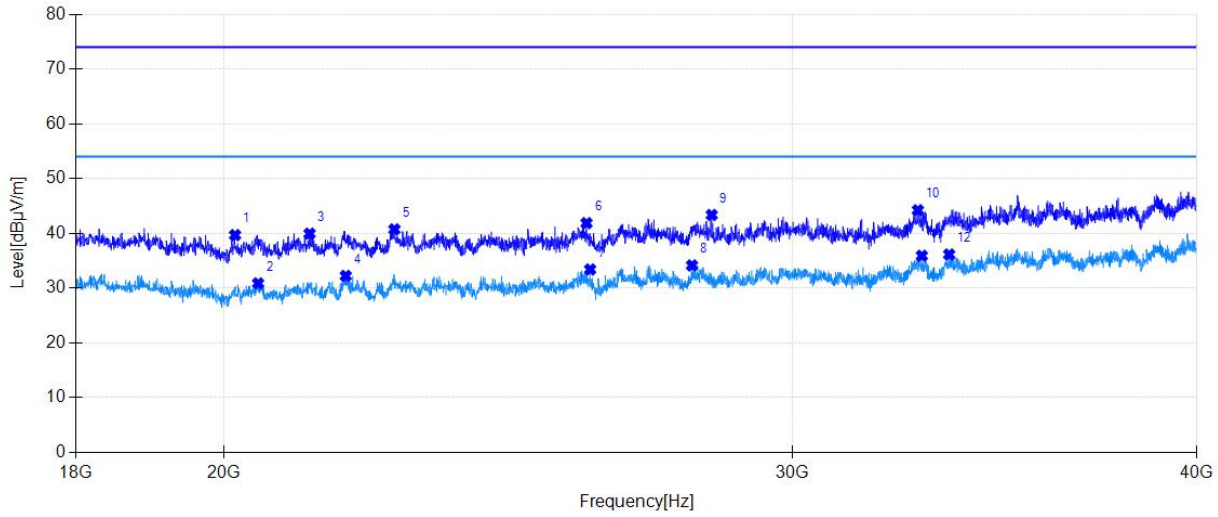
EUT:	GPS Tracker	Polarity:	Horizontal
Model:	SC350MG	SN:	MP03617D7003277
Mode:	Transmit at BLE_1M Channel 00 and 2G GSM850(worst case)	Voltage:	DC 12V
Environment:	Temp: 23℃; Humi:53%	Engineer:	Amos Xia

Test Graph



NO	Frequency [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	20468.4000	40.49	-23.06	74.00	33.51	100	190	PK	Horizont
2	20943.6000	31.08	-22.55	54.00	22.92	100	290	AV	Horizont
3	21792.8000	41.00	-21.88	74.00	33.00	100	270	PK	Horizont
4	21801.6000	32.35	-21.85	54.00	21.65	100	120	AV	Horizont
5	22545.2000	41.12	-20.83	74.00	32.88	100	330	PK	Horizont
6	22549.6000	32.59	-20.82	54.00	21.41	100	220	AV	Horizont
7	24494.4000	40.81	-17.43	74.00	33.19	100	330	PK	Horizont
8	25048.8000	32.08	-16.35	54.00	21.92	100	100	AV	Horizont
9	25858.4000	40.74	-16.02	74.00	33.26	100	90	PK	Horizont
10	26703.2000	33.40	-15.46	54.00	20.60	100	90	AV	Horizont
11	27961.6000	41.91	-15.41	74.00	32.09	100	180	PK	Horizont
12	27979.2000	33.74	-15.42	54.00	20.26	100	250	AV	Horizont

Test Graph



NO	Frequency [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	20160.4000	39.67	-23.29	74.00	34.33	100	40	PK	Vertical
2	20494.8000	30.86	-23.04	54.00	23.14	100	300	AV	Vertical
3	21260.4000	39.94	-22.30	74.00	34.06	100	20	PK	Vertical
4	21814.8000	32.22	-21.85	54.00	21.78	100	220	AV	Vertical
5	22584.8000	40.72	-20.74	74.00	33.28	100	190	PK	Vertical
6	25898.0000	41.86	-16.00	74.00	32.14	100	20	PK	Vertical
7	25964.0000	33.40	-15.96	54.00	20.60	100	160	AV	Vertical
8	27917.6000	34.14	-15.41	54.00	19.86	100	260	AV	Vertical
9	28313.6000	43.36	-15.52	74.00	30.64	100	240	PK	Vertical
10	32792.8000	44.22	-13.96	74.00	29.78	100	200	PK	Vertical
11	32885.2000	35.90	-13.88	54.00	18.10	100	310	AV	Vertical
12	33532.0000	36.14	-13.92	54.00	17.86	100	110	AV	Vertical

7.3. AC Conducted Emissions Measurement

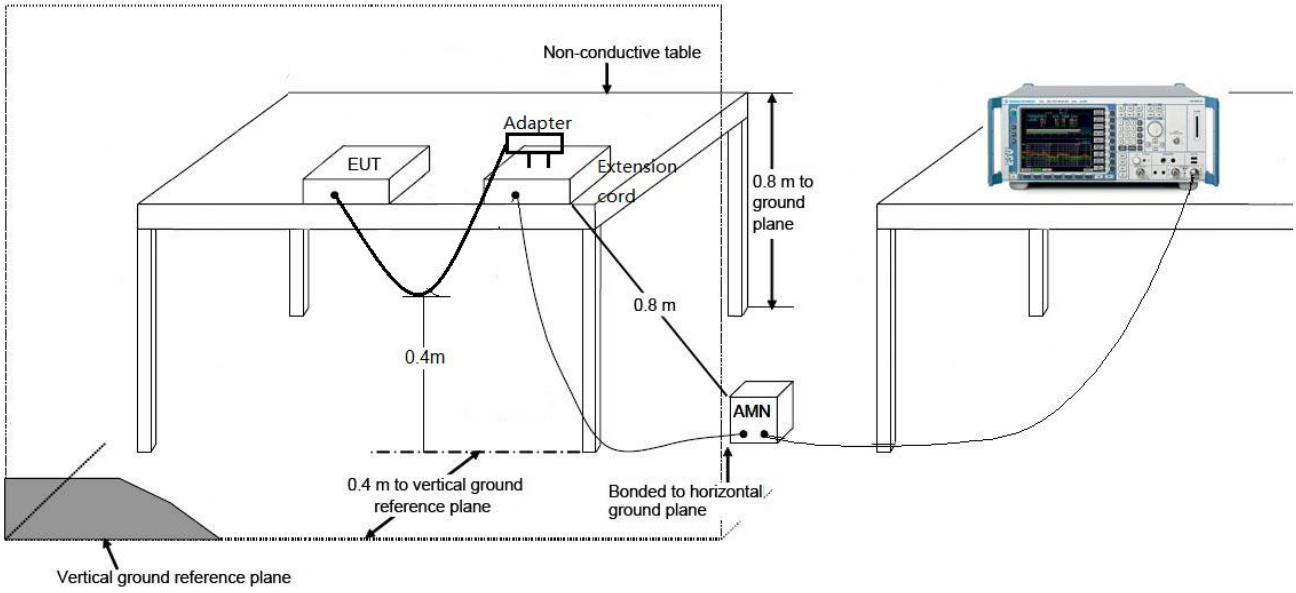
7.3.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 – 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

7.3.2. Test Setup



7.3.3. Test Result

The product is DC powered. Not applicable.

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **GPS Tracker** is in compliance with Part 15C of the FCC Rules.

The End