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TEST REPORT

SCOPE OF WORK
FCC Testing – REF-0003

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FCC
RF Test Report

For

Glooko, Inc.

Product Name: Diabetes patient data transmitter

Model Number: REF-0003

FCC ID: 2ACSCGTM400

Report No: 220511078SZN-002

Tested and Prepared by:	Approved by:
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1. Summary of Test Result

Applicant:	Glooko, Inc.
Address:	579 University Avenue, Palo Alto, CA 94301, United States
Product name:	Diabetes patient data transmitter
Model Number:	REF-0003
FCC ID:	2ACSCGTM400
Report number:	220511078SZN-002
Date of Test	11 May 2022 to 09 June 2022

The above equipment was tested by Intertek Testing Services Shenzhen Ltd. Longhua Branch. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI 63.26-2015 and KDB 971168 D01. This device is in compliance with FCC rules as following:

47 CFR FCC Part 02:2020
47 CFR FCC Part 22:2020
47 CFR FCC Part 24:2020
47 CFR FCC Part 27:2020

The test results of this report relate only to the tested sample identified in this report.

1.1 Cellular Band (824-849MHz paired with 869-894MHz)

Test Item	FCC Rule No.	Requirements	Test Result	Verdict (Note1)
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913	FCC: ERP ≤ 7 W.	Appendix A	Pass
Peak-Average Ratio	--	--	Appendix B	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Appendix C	Pass
Band Edges Compliance	§2.1051, §22.917	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix D	Pass
Spurious Emission at Antenna Terminals	§2.1051, §22.917	FCC: ≤ -13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Appendix E	Pass
Frequency Stability	§2.1055, §22.355	≤ ±2.5ppm.	Appendix F	Pass
Modulation Characteristics	§2.1047	Digital modulation	Appendix G	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	FCC: ≤ -13 dBm/100 kHz.	Section 6	Pass
Note1: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".				

1.2 PCS Band (1850-1910MHz paired with 1930-1990MHz)

Test Item	FCC Rule No.	Requirements	Test Result	Verdict (Note1)
Effective (Isotropic) Radiated Power Output Data	§2.1046, §24.232	EIRP ≤ 2 W	Appendix A	Pass
Peak-Average Ratio	§2.1046, §24.232	Limit≤13 dB	Appendix B	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Appendix C	Pass
Band Edges Compliance	§2.1051, §24.238	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix D	Pass
Spurious Emission at Antenna Terminals	§2.1051, §24.238	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Appendix E	Pass
Frequency Stability	§2.1055, §24.235	within the authorized frequency block	Appendix F	Pass
Modulation Characteristics	§2.1047	Digital modulation	Appendix G	Pass
Field Strength of Spurious Radiation	§2.1053, §24.238	≤ -13 dBm/1 MHz.	Section 6	Pass
Note1: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".				

1.3 AWS Band (1710-1755MHz paired with 2110-2155MHz)

Test Item	FCC Rule No.	Requirements	Test Result	Verdict (Note1)
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)	EIRP ≤ 1 W	Appendix A	Pass
Peak-Average Ratio	§2.1046, §27.50(d)	Limit≤13 dB	Appendix B	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Appendix C	Pass
Band Edges Compliance	§2.1051, §27.53(h)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix D	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Appendix E	Pass
Frequency Stability	§2.1055, §27.54	within the authorized frequency block	Appendix F	Pass
Modulation Characteristics	§2.1047	Digital modulation	Appendix G	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	Section 6	Pass
Note1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” denotes “not tested”.				

1.4 Band12 (699-716MHz paired with 729-746 MHz)

Test Item	FCC Rule No	Requirements	Test Result	Verdict (Note1)
Effective (Isotropic) Radiated Power Output Data	§27.50(c)	FCC: ERP ≤ 3 W.	Appendix A	Pass
Peak-Average Ratio	--	--	Appendix B	Pass
Bandwidth	§2.1047	OBW: No limit. EBW: No limit.	Appendix C	Pass
Band Edges Compliance	§2.1049,	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix D	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(g)	FCC: ≤ -13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Appendix E	Pass
Frequency Stability	§2.1053, §27.53(g)	within the authorized frequency block	Appendix F	Pass
Modulation Characteristics	§2.1047	Digital modulation	Appendix G	Pass
Field Strength of Spurious Radiation	§2.1051, §27.53(g)	FCC: ≤ -13 dBm/100 kHz.	Section 6	Pass
Note1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” denotes “not tested”.				

2. General Description

2.1 Product Description

REF-0003 is subscriber equipment in the GSM/UMTS/LTE system. The GSM frequency band includes GSM850 and PCS1900. The UMTS frequency band is band II and band V. The LTE frequency band is Band II and band IV and band V and Band XII. The device implements such functions as RF signal receiving/transmitting, LTE/UMTS and GSM/GPRS/EDGE protocol processing. Externally it provides USB, ethernet, and USIM card interface. The EUT is powered by DC 12V/2A. For more detailed features description, please refer to the user's manual.

2.2 Test Facility

Company Name:	Intertek Testing Service Shenzhen Ltd. Longhua Branch
Address:	101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, ShenZhen, P.R. China.
FCC Registration Number:	CN1188

2.3 Test Environment Condition

Ambient Temperature:	19.5 to 25 °C
Ambient Relative Humidity:	40 to 55 %
Atmospheric Pressure:	Not applicable

2.4 Sub-Assembly

Description	Manufacturer	Description
Power Adapter	XP Power Limited	Model: VER24US120-JA Input: 100-240V~ 0.6A 50/60Hz Output: DC 12V, 2A

2.5 Technical Specification

Characteristics	Description		
Radio System Type	GSM UMTS LTE		
Supported Frequency Range	GSM850/ WCDMA850	Transmission (TX):	824 to 849 MHz
		Receiving (RX):	869 to 894 MHz
	GSM1900/ WCDMA1900	Transmission (TX):	1850 to 1910 MHz
		Receiving (RX):	1930 to 1990 MHz
	LTE BAND2	Transmission (TX):	1850 to 1910 MHz
		Receiving (RX):	1930 to 1990 MHz
	LTE BAND4	Transmission (TX):	1710 to 1755 MHz
		Receiving (RX):	2110 to 2155 MHz
	LTE BAND5	Transmission (TX):	824 to 849 MHz
		Receiving (RX):	869 to 894 MHz
	LTE BAND12	Transmission (TX):	699 to 716 MHz
		Receiving (RX):	729 to 746 MHz
TX and RX Antenna Ports	TX & RX port:	1	
	TX-only port:	0	
	RX-only port:	0	
Target TX Output Power	GSM850: 32dBm GSM1900: 30dBm UMTS850: 24dBm UMTS1900: 24dBm LTE BAND2: 23dBm LTE BAND4: 23dBm LTE BAND5: 23dBm LTE BAND12: 23dBm		
Antenna Gain:	2.15 dBi		
Supported Channel Bandwidth	GSM system:	200 kHz	
	UMTS system:	5 MHz	
	LTE band 2	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz	
	LTE band 4	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz	
	LTE band 5	1.4 MHz, 3 MHz, 5 MHz, 10 MHz	
	LTE band 12	1.4 MHz, 3 MHz, 5 MHz, 10 MHz	
Designation of Emissions (Note: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)	GSM850:	248KGXW, 250KG7W	
	GSM1900:	248KGXW, 247KG7W	
	UMTS1900:	4M22F9W	
	UMTS850:	4M21F9W	
	LTE BAND2:	1M09G7D (1.4 MHz QPSK modulation), 1M09W7D (1.4 MHz 16QAM modulation) 2M70G7D (3 MHz QPSK modulation), 2M70W7D (3 MHz 16QAM modulation) 4M51G7D (5 MHz QPSK modulation), 4M51W7D (5 MHz 16QAM modulation) 9M02G7D (10 MHz QPSK modulation), 8M99W7D (10 MHz 16QAM modulation) 13M48G7D (15 MHz QPSK modulation), 13M48W7D (15 MHz 16QAM modulation) 18M04G7D (20 MHz QPSK modulation), 18M10W7D (20 MHz 16QAM modulation)	
	LTE BAND4:	1M10G7D (1.4 MHz QPSK modulation), 1M09W7D (1.4 MHz 16QAM modulation) 2M70G7D (3 MHz QPSK modulation), 2M70W7D (3 MHz 16QAM modulation) 4M50G7D (5 MHz QPSK modulation), 4M51W7D (5 MHz 16QAM modulation) 8M99G7D (10 MHz QPSK modulation), 8M99W7D (10 MHz 16QAM modulation) 13M48G7D (15 MHz QPSK modulation), 13M48W7D (15 MHz 16QAM modulation)	

Characteristics	Description	
		18M04G7D (20 MHz QPSK modulation), 18M04W7D (20 MHz 16QAM modulation)
	LTE BAND5:	1M09G7D (1.4 MHz QPSK modulation), 1M09W7D (1.4 MHz 16QAM modulation) 2M70G7D (3 MHz QPSK modulation), 2M70W7D (3 MHz 16QAM modulation) 4M50G7D (5 MHz QPSK modulation), 4M51W7D (5 MHz 16QAM modulation) 8M99G7D (10 MHz QPSK modulation), 8M95W7D (10 MHz 16QAM modulation)
	LTE BAND12:	1M09G7D (1.4 MHz QPSK modulation), 1M09W7D (1.4 MHz 16QAM modulation) 2M70G7D (3 MHz QPSK modulation), 2M70W7D (3 MHz 16QAM modulation) 4M50G7D (5 MHz QPSK modulation), 4M51W7D (5 MHz 16QAM modulation) 9M02G7D (10 MHz QPSK modulation), 9M02W7D (10 MHz 16QAM modulation)

3. General Test Conditions/Configuration

3.1 Test Modes

Test Mode	Test Modes Description
GSM/TM1	GSM system, GPRS, GMSK modulation
GSM/TM2	GSM system, EDGE, 8PSK modulation
UMTS/TM1	WCDMA system, QPSK modulation
UMTS/TM2	HSDPA system, QPSK modulation
UMTS/TM3	HSUPA system, QPSK modulation
LTE/TM1	LTE system, QPSK modulation
LTE/TM2	LTE system, 16QAM modulation

3.2 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	10.2V
	VN	12.0V
	VH	13.8V

NOTE: VL= lower extreme test voltage, VN= nominal voltage, VH= upper extreme test voltage
TN= normal temperature

3.3 Test Frequency

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM850	TX	Channel 128	Channel 190	Channel 251
		824.2MHz	836.6MHz	848.8MHz
	RX	Channel 128	Channel 190	Channel 251
		869.2MHz	881.6MHz	893.8MHz
WCDMA850	TX	Channel 4132	Channel 4182	Channel 4233
		826.4MHz	836.4MHz	846.6MHz
	RX	Channel 4357	Channel 4407	Channel 4458
		871.4MHz	881.4MHz	891.6MHz
Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM1900	TX	Channel 512	Channel 661	Channel 810
		1850.2MHz	1880.0MHz	1909.8MHz
	RX	Channel 512	Channel 661	Channel 810
		1930.2 MHz	1960.0 MHz	1989.8 MHz
WCDMA1900	TX	Channel 9262	Channel9400	Channel9538
		1852.4MHz	1880.0MHz	1907.6MHz
	RX	Channel 9662	Channel 9800	Channel 9938
		1932.4 MHz	1960.0 MHz	1987.6 MHz

Test Mode	TX / RX	RF Channel		
		Low (B)	Middle (M)	High (T)
LTE Band 2	TX(1.4M)	Channel 18607	Channel 18900	Channel 19193
		1850.7 MHz	1880 MHz	1909.3 MHz
	TX(3M)	Channel 18615	Channel 18900	Channel 19185
		1851.5 MHz	1880 MHz	1908.5 MHz
	TX(5M)	Channel 18625	Channel 18900	Channel 19175
		1852.5 MHz	1880 MHz	1907.5 MHz
	TX(10M)	Channel 18650	Channel 18900	Channel 19150
		1855 MHz	1880 MHz	1905 MHz
	TX(15M)	Channel 18675	Channel 18900	Channel 19125
		1857.5 MHz	1880 MHz	1902.5 MHz
	TX(20M)	Channel 18700	Channel 18900	Channel 19100
		1860 MHz	1880 MHz	1900 MHz
	RX(1.4M)	Channel 607	Channel 900	Channel 1193
		1930.7 MHz	1960 MHz	1989.3 MHz
	RX(3M)	Channel 615	Channel 900	Channel 1185
		1931.5 MHz	1960 MHz	1988.5 MHz
	RX(5M)	Channel 625	Channel 900	Channel 1175
		1932.5 MHz	1960 MHz	1987.5 MHz
	RX(10M)	Channel 650	Channel 900	Channel 1150
		1935 MHz	1960 MHz	1985 MHz
	RX(15M)	Channel 675	Channel 900	Channel 1125
		1937.5 MHz	1960 MHz	1982.5 MHz
	RX(20M)	Channel 700	Channel 900	Channel 1100
		1940 MHz	1960 MHz	1980 MHz
Test Mode	TX / RX	RF Channel		
		Low (B)	Middle (M)	High (T)
LTE Band 4	TX(1.4M)	Channel 19957	Channel 20175	Channel 20393
		1710.7 MHz	1732.5 MHz	1754.3 MHz
	TX(3M)	Channel 19965	Channel 20175	Channel 20385
		1711.5 MHz	1732.5 MHz	1753.5 MHz
	TX(5M)	Channel 19975	Channel 20175	Channel 20375
		1712.5 MHz	1732.5 MHz	1752.5 MHz
	TX(10M)	Channel 20000	Channel 20175	Channel 20350
		1715 MHz	1732.5 MHz	1750 MHz
	TX(15M)	Channel 20025	Channel 20175	Channel 20325
		1717.5 MHz	1732.5 MHz	1747.5 MHz
	TX(20M)	Channel 20050	Channel 20175	Channel 20300
		1720 MHz	1732.5 MHz	1745 MHz
	RX(1.4M)	Channel 1975	Channel 2175	Channel 2375
		2112.5 MHz	2132.5MHz	2152.5 MHz
	RX(3M)	Channel 2000	Channel 2175	Channel 2350
		2115 MHz	2132.5MHz	2150 MHz
	RX(5M)	Channel 1975	Channel 2175	Channel 2375
		2112.5 MHz	2132.5MHz	2152.5 MHz
	RX(10M)	Channel 2000	Channel 2175	Channel 2350

		2115 MHz	2132.5MHz	2150 MHz
	RX(15M)	Channel 2025	Channel 2175	Channel 2325
		2117.5 MHz	2132.5MHz	2147.5 MHz
	RX(20M)	Channel 2050	Channel 2175	Channel 2300
		2120 MHz	2132.5MHz	2145 MHz
Test Mode	TX / RX	RF Channel		
		Low (B)	Middle (M)	High (T)
LTE Band 5	TX(1.4M)	Channel 20407	Channel 20525	Channel 20643
		824.7 MHz	836.5 MHz	848.3 MHz
	TX(3M)	Channel 20415	Channel 20525	Channel 20635
		825.5 MHz	836.5 MHz	847.5 MHz
	TX(5M)	Channel 20425	Channel 20525	Channel 20625
		826.5 MHz	836.5 MHz	846.5 MHz
	TX(10M)	Channel 20450	Channel 20525	Channel 20600
		829 MHz	836.5 MHz	844 MHz
	RX(1.4M)	Channel 2407	Channel 2525	Channel 2643
		869.7 MHz	881.5 MHz	893.3 MHz
	RX (3M)	Channel 2415	Channel 2525	Channel 2635
		870.5 MHz	881.5 MHz	892.5 MHz
	RX(5M)	Channel 2425	Channel 2525	Channel 2625
		871.5 MHz	881.5 MHz	891.5 MHz
	RX (10M)	Channel 2450	Channel 2525	Channel 2600
		874 MHz	881.5 MHz	889 MHz
Test Mode	TX / RX	RF Channel		
		Low (B)	Middle (M)	High (T)
LTE Band 12	TX(1.4M)	Channel 23017	Channel 23095	Channel 23173
		699.7 MHz	707.5 MHz	715.3 MHz
	TX(3M)	Channel 23025	Channel 23095	Channel 23165
		700.5 MHz	707.5 MHz	714.5 MHz
	TX(5M)	Channel 23035	Channel 23095	Channel 23155
		701.5 MHz	707.5 MHz	713.5 MHz
	TX(10M)	Channel 23060	Channel 23095	Channel 23130
		704 MHz	707.5 MHz	711 MHz
	RX(1.4M)	Channel 5017	Channel 5095	Channel 5173
		729.7 MHz	737.5 MHz	745.3 MHz
	RX (3M)	Channel 5025	Channel 5095	Channel 5165
		730.5 MHz	737.5 MHz	744.5 MHz
	RX(5M)	Channel 5035	Channel 5095	Channel 5155
		731.5 MHz	737.5 MHz	743.5 MHz
	RX (10M)	Channel 5060	Channel 5095	Channel 5130
		734 MHz	737.5 MHz	741 MHz

4. DESCRIPTION OF TESTS

4.1 Radiated Power and Radiated Spurious Emissions

Radiated spurious emissions are investigated indoors in a semi-anechoic chamber to determine the frequencies producing the worst case emissions. Final measurements for radiated power and radiated spurious emissions are performed on the 3 meter OATS per the guidelines of ANSI/TIA-603-C-2004. The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Emissions are also investigated with the receive antenna horizontally and vertically polarized.
A portable or small unlicensed wireless device shall be placed on a non-metallic test fixture or other non-metallic support during testing. The supporting fixture shall permit orientation of the EUT in each of three orthogonal (x, y, z) axis positions such that emissions from the EUT are maximized. Measure the EUT maximum RF power and record the result.
A half-wave dipole is then substituted in place of the EUT. For emissions above 3GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT.

The power of the emission is calculated using the following formula:

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]}$$

Where, Pd is the dipole equivalent power, Pg is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to Pg [dBm] – cable loss [dB].
The calculated Pd levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10\log_{10}(\text{Power}_{\ [Watts]})$.

Test Procedures Used

KDB 971168 v02r02-Section 5.2.1 / KDB 971168 v02R02-Section 5.8

ANSI C63.26 §5.2 / ANSI C63.26 §5.5/ ANSI C63.26 §6.4

Note: Reference test setup 3

4.2 Peak-Average Ratio

A peak to average ratio measurement is performed at the conducted port of the EUT. For WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth. The traces are generated with the spectrum analyzer set to zero span mode.

Test Procedures Used

971168 D01 v03r01 -Section 5.7
ANSI C63.26 §5.2

Test Settings

1. The signal analyzer's CCDF measurement profile enabled
2. Frequency= carrier center frequency
3. Measurement BW > EBW of signal
4. for continuous transmissions, set to 1ms
5. Record the maximum PAPR level associated with a probability of 0.1%. Note: Reference test setup 1

4.3 Occupied Bandwidth

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

Test Procedures Used
971168 D01 v03r01 -Section 4.3
ANSI C63.26 §5.4
Test Settings
1. SET RBW=1-5% of OBW
2. SET VBW ≥ 3*RBW
3. Detector: Peak
4. Trace mode= max hold.
5. Sweep= auto couple
6. Steps 1-5 were repeated after it is stable

Note: Reference test setup 1.

4.4 Band Edge Compliance

the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission power must be attenuated below the transmitting power (P) by a factor of at least $43+10\log_{10}P$ dB.

Test Procedures Used
971168 D01 v03r01 -Section 6
ANSI C63.26 §5.7/ ANSI C63.26 §6.4
Test Settings
1. SET RBW ≥ 1% of Emission BW.
2. SET VBW about three times of RBW
3. Detector: RMS
4. Trace mode= max hold.
5. Span= 2MHz

Note: Reference test setup 1.

4.5 Spurious and Harmonic Emissions at Antenna Terminal

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10^{th} harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least

43 + 10 log(P) dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Test Procedures Used

KDB 971168 v03r01-Section 6.0

Test Settings

1. 9kHz~150kHz, RBW = 1KHz, VBW ≥ 3×RBW,
   150kHz~30MHz, RBW = 10KHz, VBW ≥ 3×RBW,
   30MHz~1GHz, RBW = 100 kHz, VBW = 300 kHz.
   Above 1GHz, RBW = 1 MHz, VBW = 3 MHz.
2. Detector: Peak
3. Trace mode= max hold.

Note: Reference test setup 1.

4.6 Frequency Stability / Temperature Variation

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. The frequency stability of the transmitter is measured by:

a.) **Temperature**: The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage**: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

Time Period and Procedure:

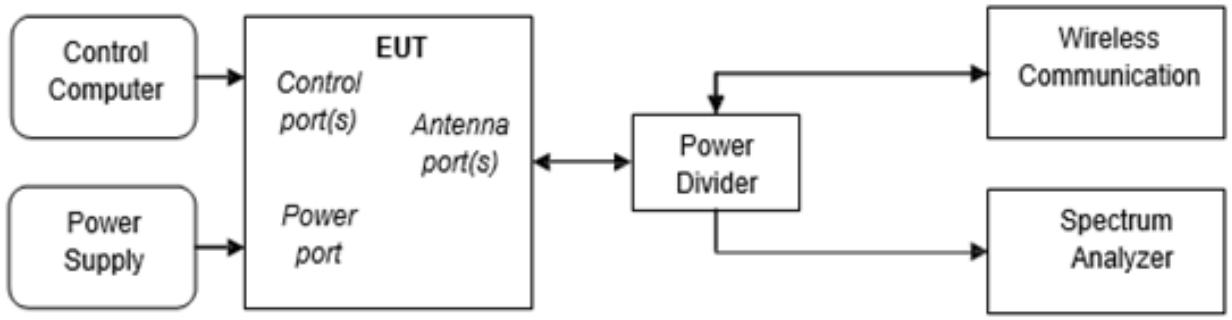
1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +60°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Procedures Used

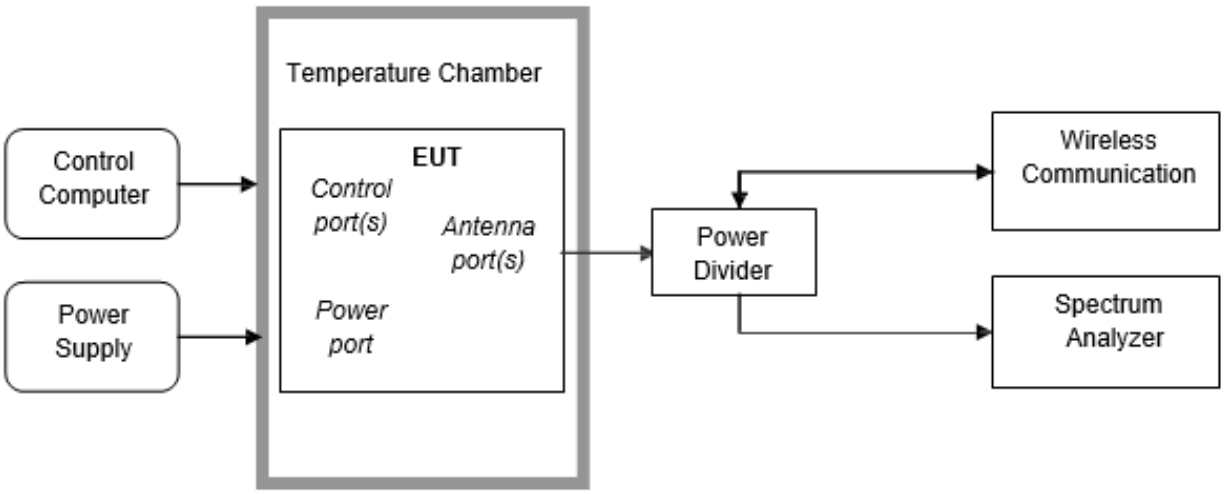
971168 D01 v03r01 -Section 9
ANSI C63.26 §5.6
Note: Reference test setup 2.

5. Test Setups

5.1 Test Setup 1



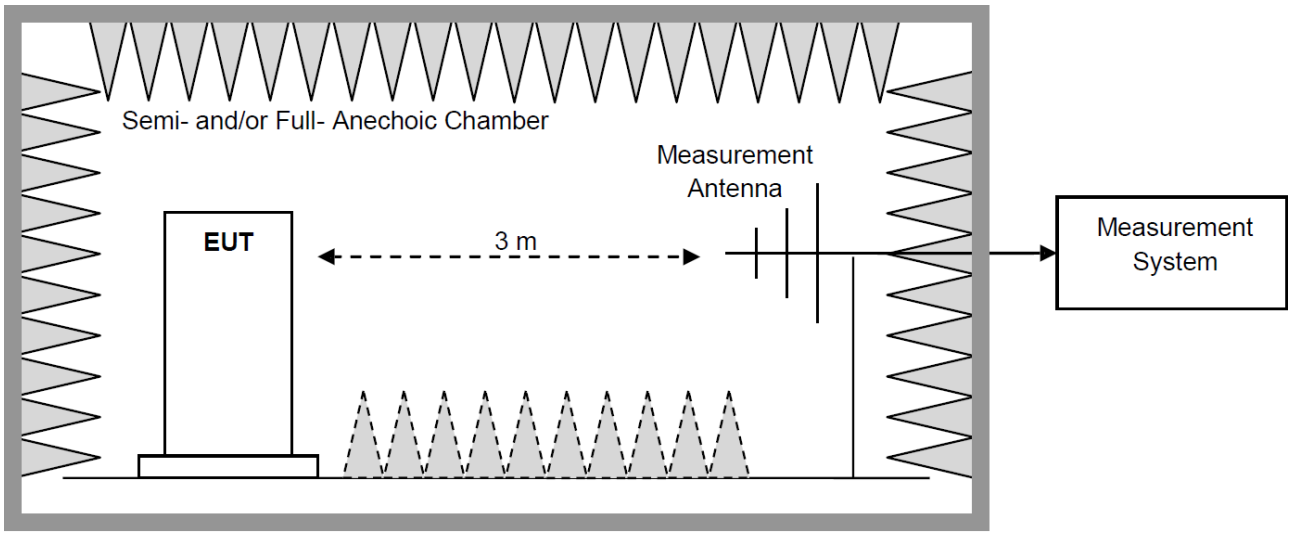
5.2 Test Setup 2



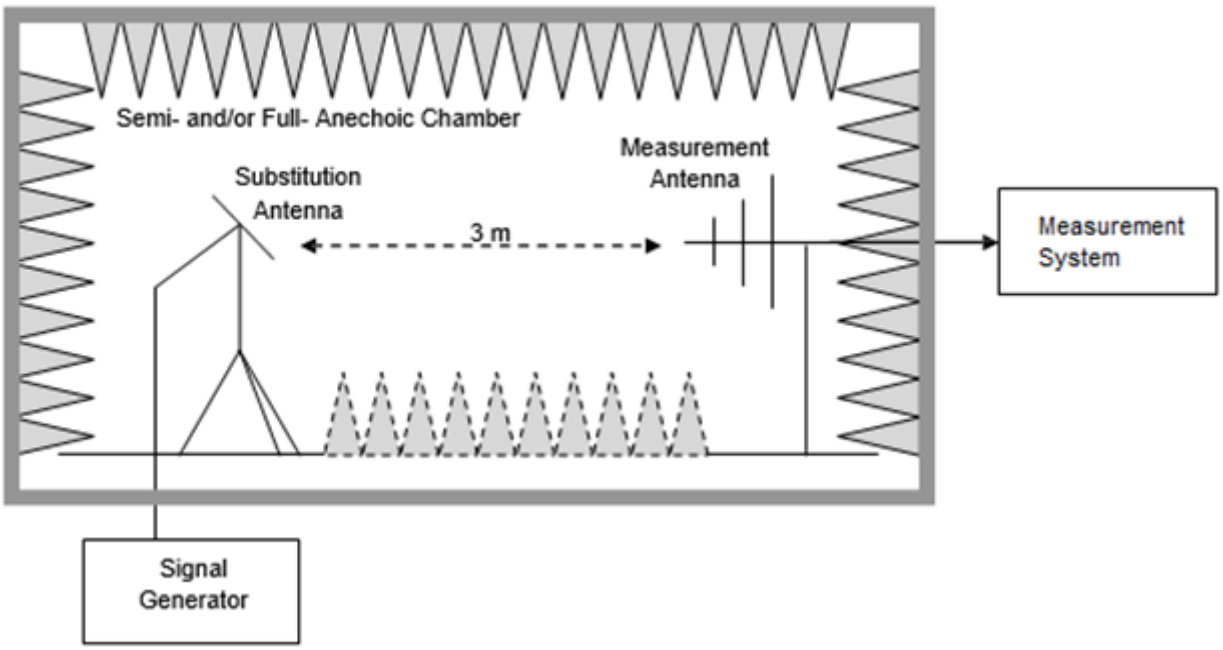
5.3 Test Setup 3

NOTE: Effective radiated power (ERP) and Equivalent Isotropic Radiated Power (EIRP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

5.3.1 Step 1: Pre-test



5.3.2 Step 2: Substitution method to verify the maximum ERP/EIRP



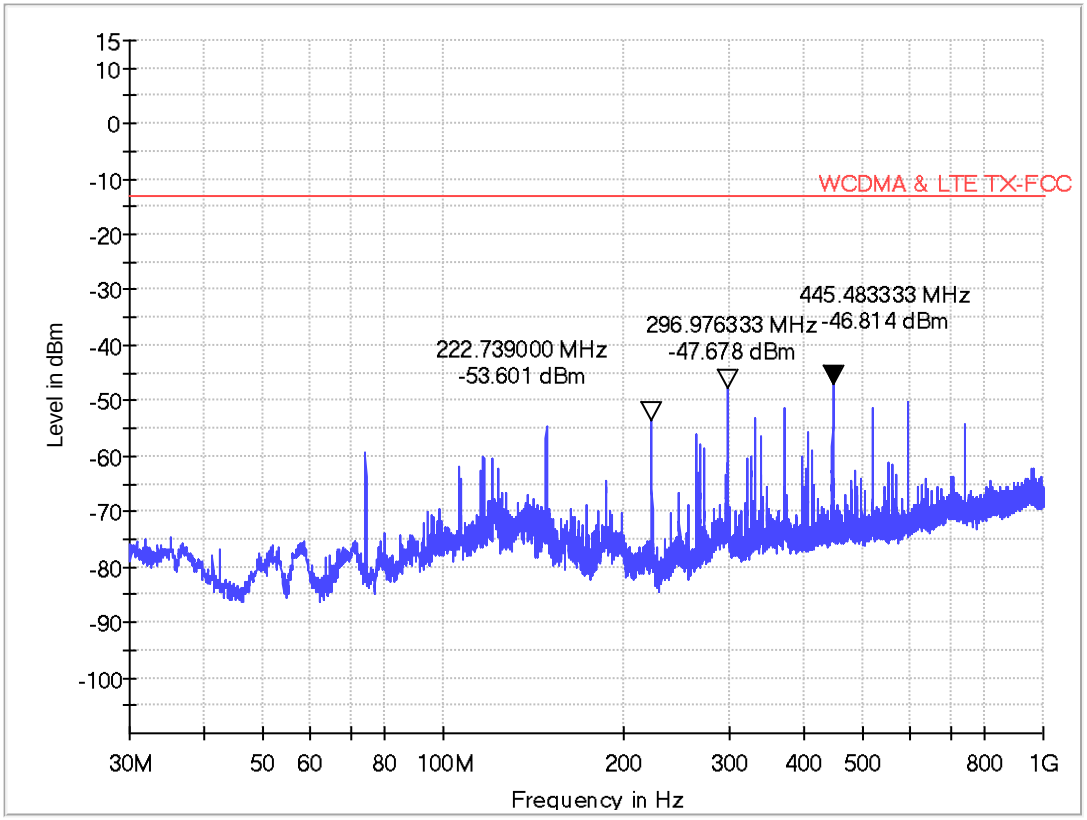
5.4 Test Conditions

Test Case		Test Conditions	
Transmit Output Power Data	Average Power, Total	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1, GSM/TM2, UMTS/TM1, LTE/TM1, LTE/TM2
	Average Power, Spectral Density (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1, GSM/TM2, UMTS/TM1, LTE/TM1,LTE/TM2
Peak-to-Average Ratio (if required)		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1, GSM/TM2, UMTS/TM1, LTE/TM1,LTE/TM2
Modulation Characteristics		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	M (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1, GSM/TM2, UMTS/TM1, LTE/TM1,LTE/TM2
Bandwidth	Occupied Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1, GSM/TM2, UMTS/TM1, LTE/TM1,LTE/TM2
	Emission Bandwidth (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1,GSM/TM2,UMTS/TM1,LTE/TM1,LTE/TM2
Band Edges Compliance		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	L, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1,GSM/TM2,UMTS/TM1,LTE/TM1,LTE/TM2
Spurious Emission at Antenna Terminals		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1,GSM/TM2,UMTS/TM1,LTE/TM1,LTE/TM2

Test Case	Test Conditions	
Field Strength of Spurious Radiation	Test Env.	Ambient Climate & Rated Voltage
	Test Setup	Test Setup 3
	Test Mode	GSM/TM1, GSM/TM2, UMTS/TM1/TM2/TM3, LTE/TM1, LTE/TM2 NOTE: If applicable, the EUT conf. that has maximum power density (based on the equivalent power level) is selected.
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
Frequency Stability	Test Env.	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) VL, VN and VH of Rated Voltage at Ambient Climate.
	Test Setup	Test Setup 2
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
	Test Mode	GSM/TM1, GSM/TM2, UMTS/TM1, LTE/TM1, LTE/TM2

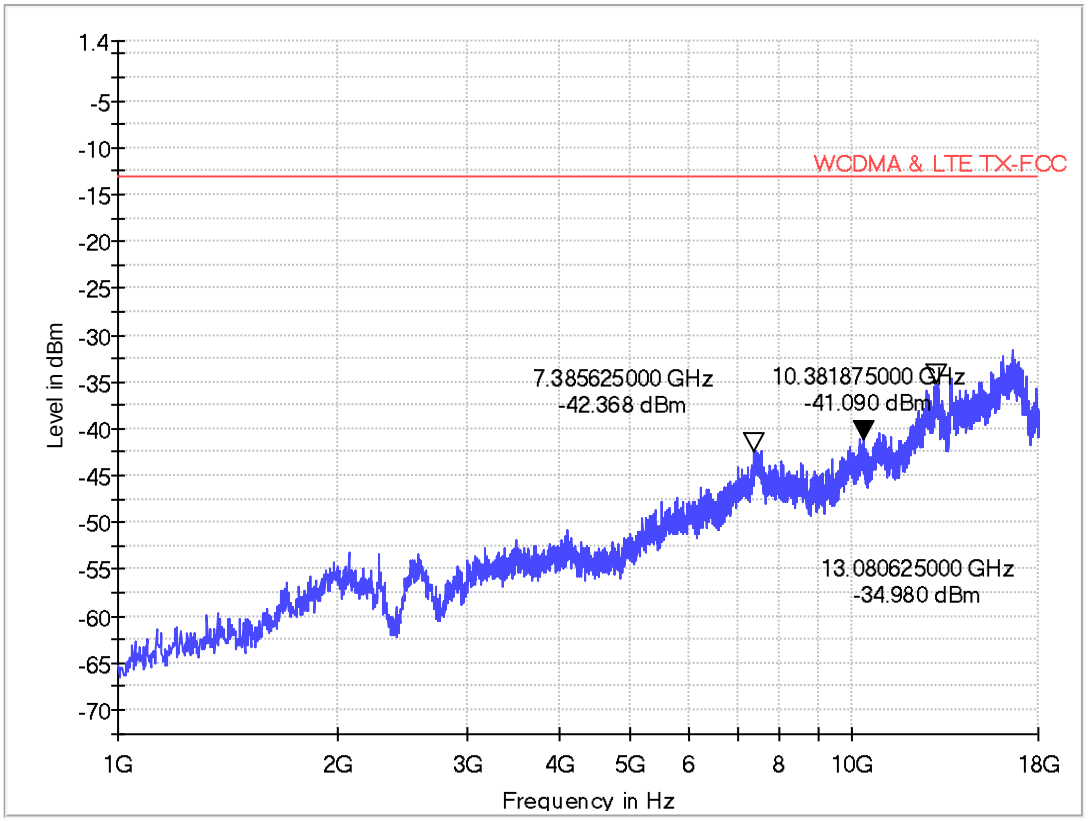
6. Field Strength of Spurious Radiation

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (GSM/TM1 GSM850)
Worst Case ANT Polarity: Vertical



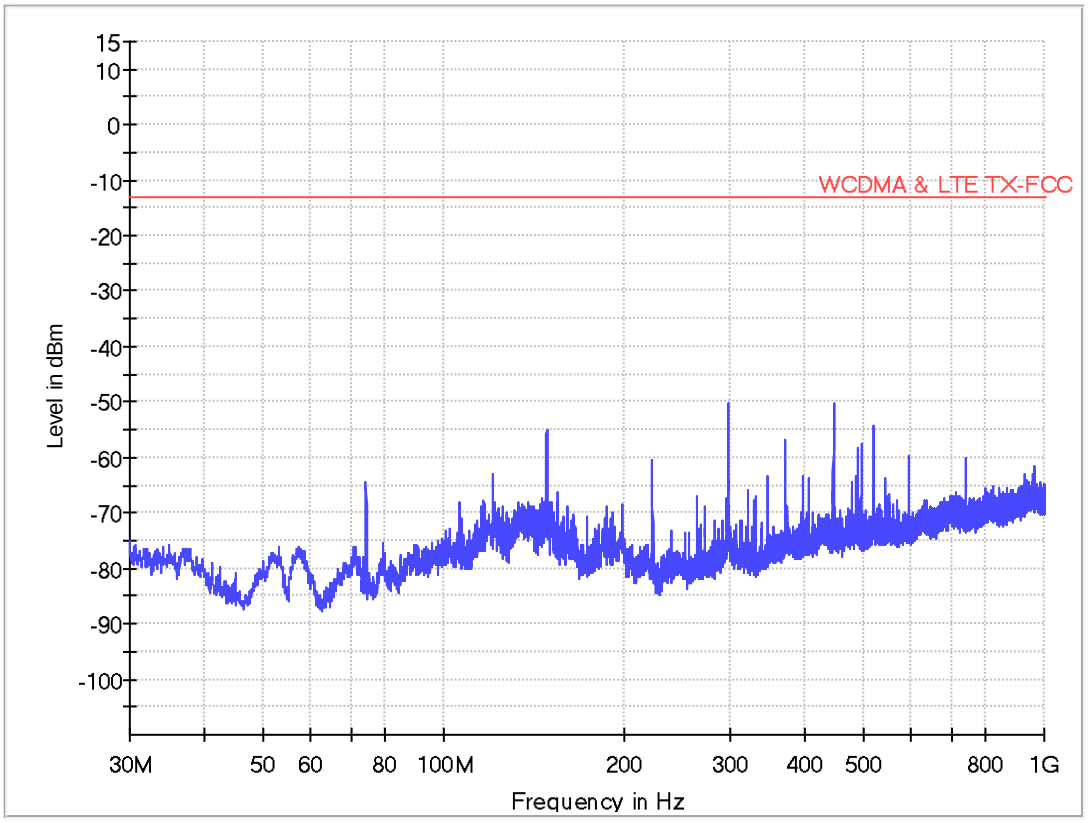
Remark: The emissions were very low against the limit in the frequency range 30 MHz ~ 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (GSM/TM1 GSM850)
Worst Case ANT Polarity: Vertical



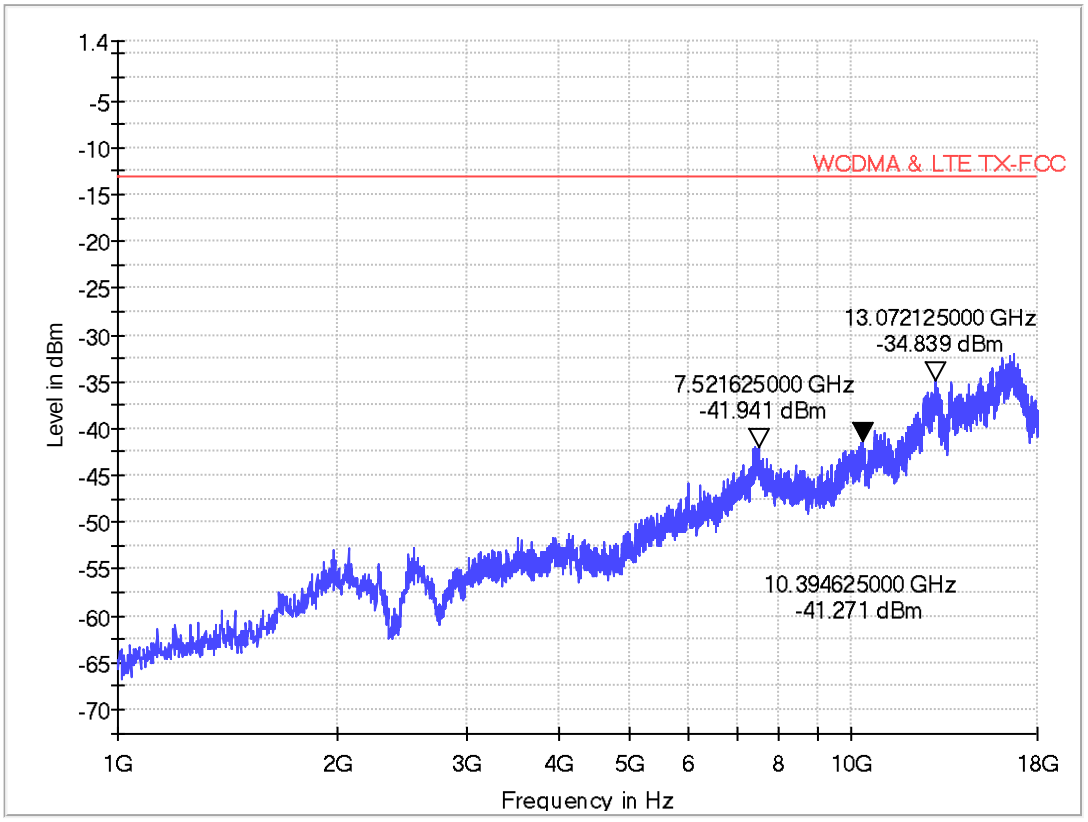
Remark: The emissions were very low against the limit in the frequency above 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (GSM/TM1 GSM1900)
Worst Case ANT Polarity: Vertical



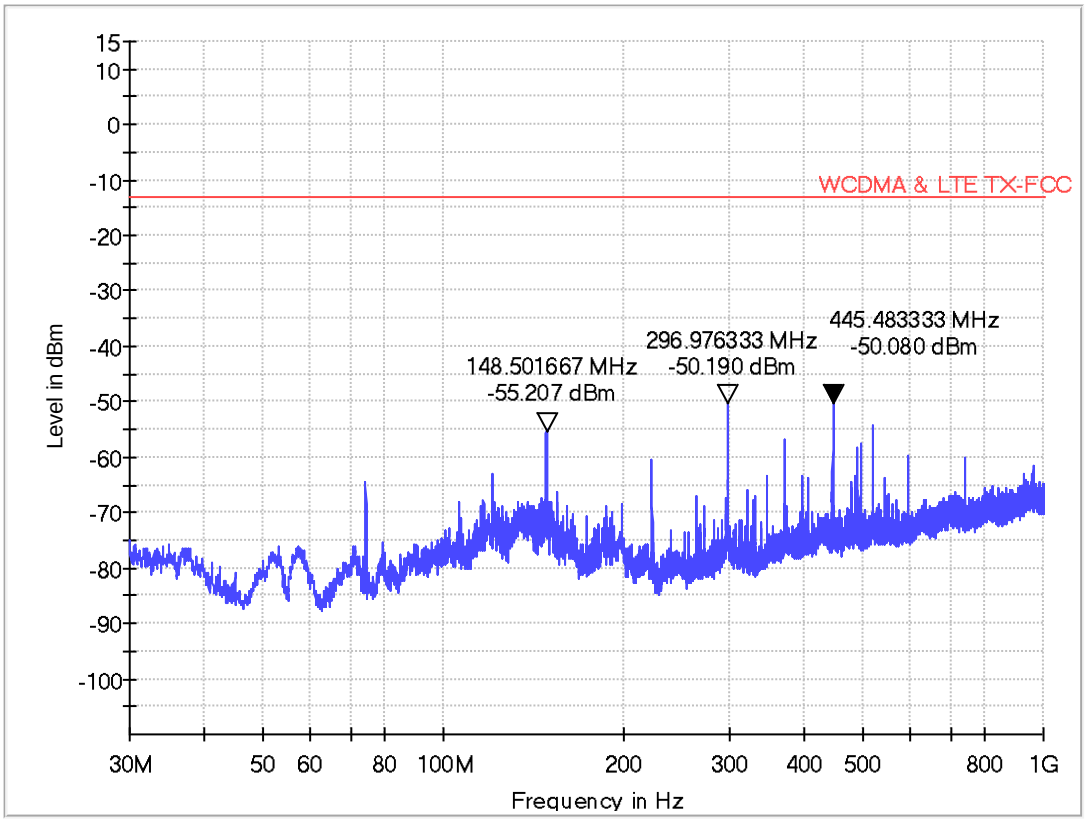
Remark: The emissions were very low against the limit in the frequency range 30 MHz ~ 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (GSM/TM1 GSM1900)
Worst Case ANT Polarity: Vertical



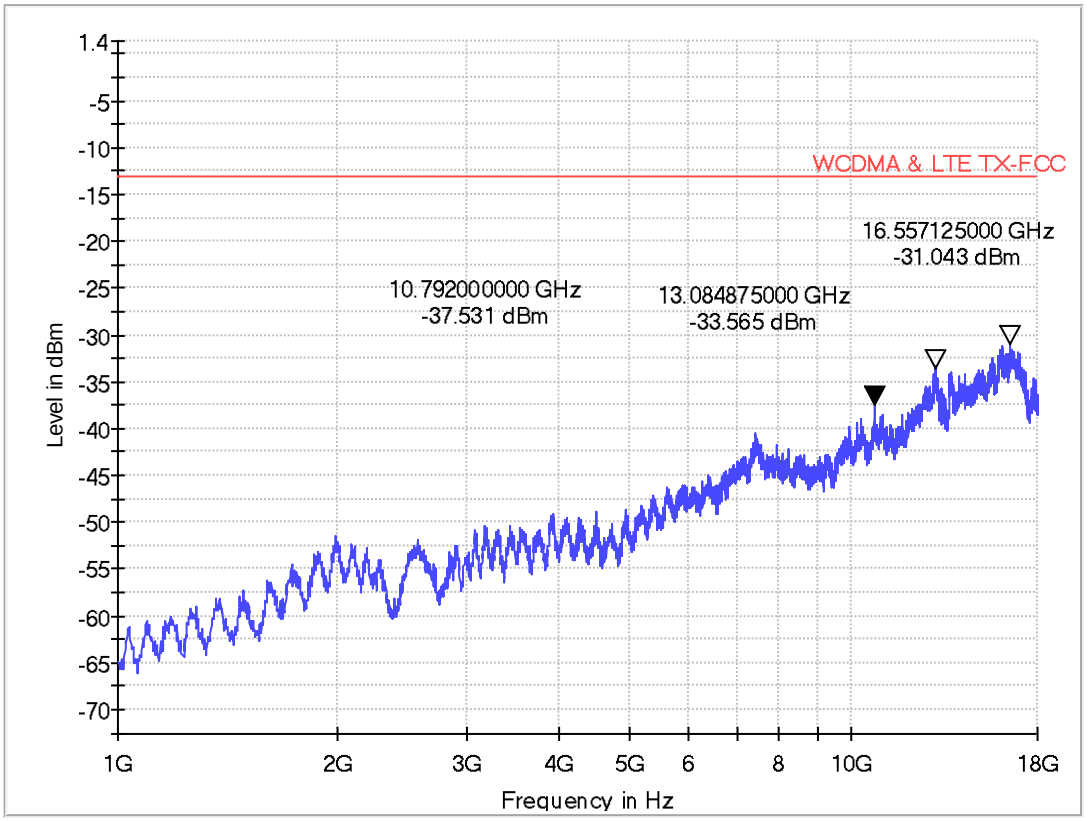
Remark: The emissions were very low against the limit in the frequency above 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (UMTS/TM1 WCDMA1900)
Worst Case ANT Polarity: Vertical



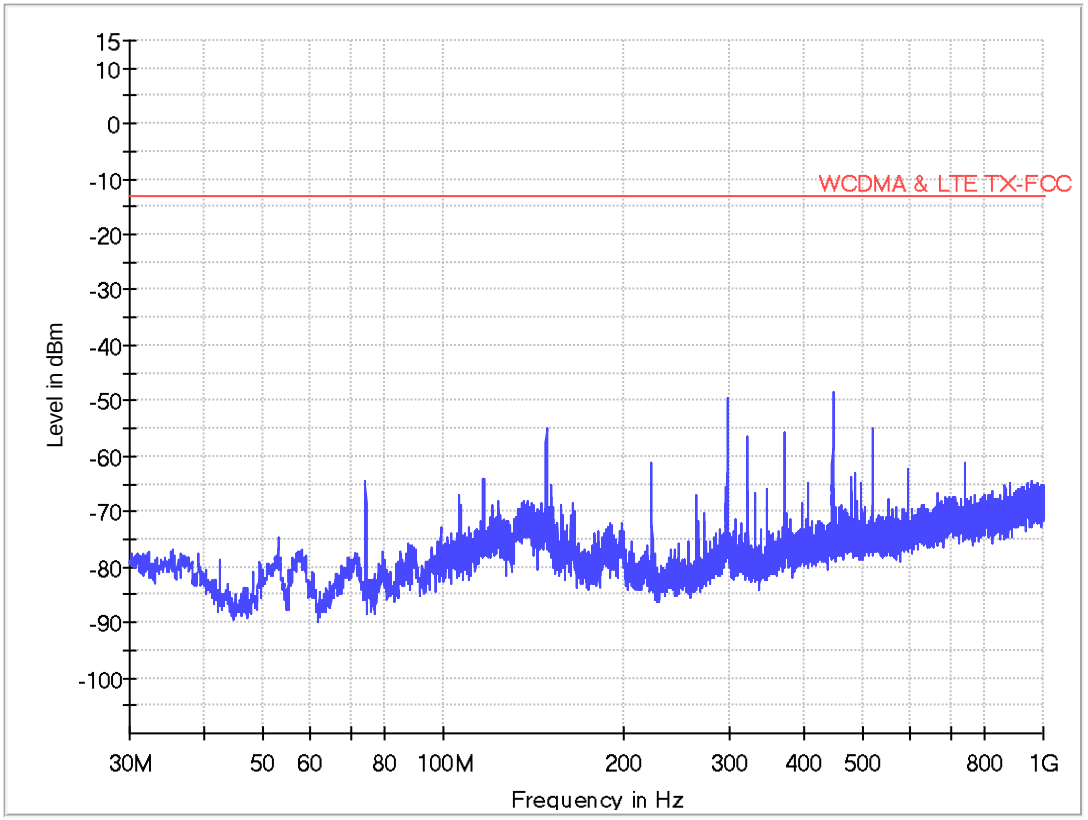
Remark: The emissions were very low against the limit in the frequency range 30 MHz ~ 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (UMTS/TM1 WCDMA1900)
Worst Case ANT Polarity: Vertical



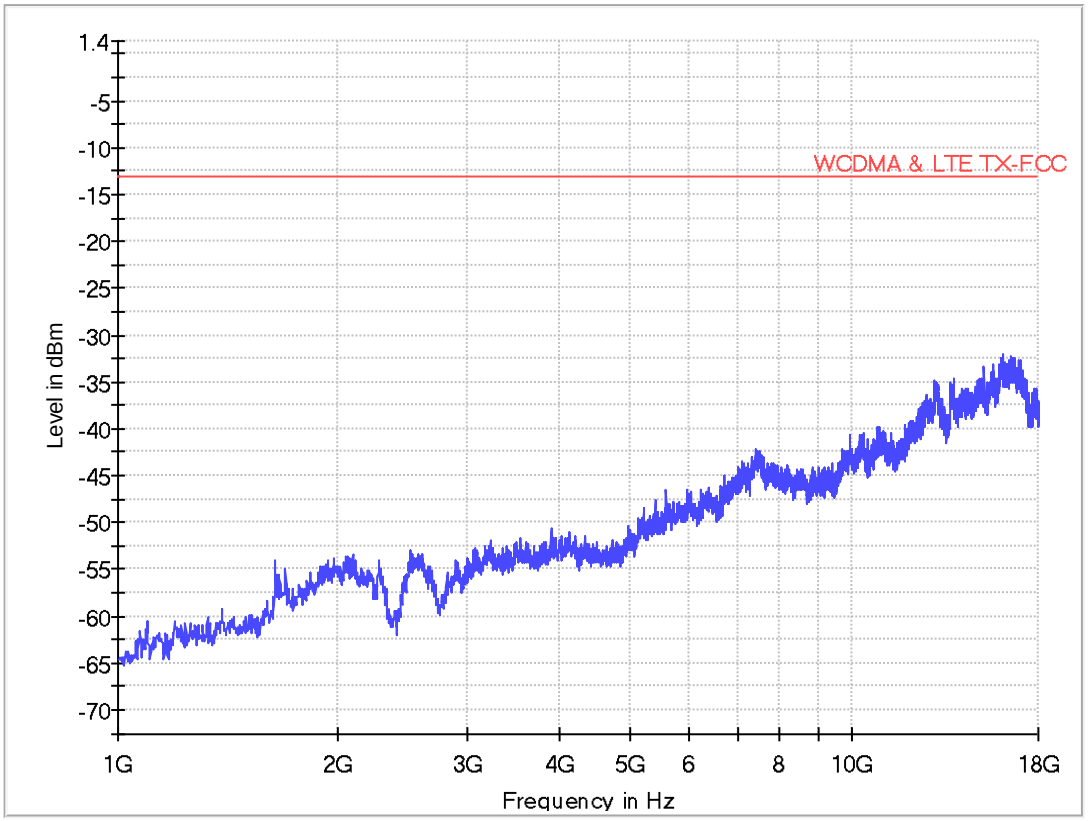
Remark: The emissions were very low against the limit in the frequency above 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (UMTS/TM1 WCDMA850)
Worst Case ANT Polarity: Vertical



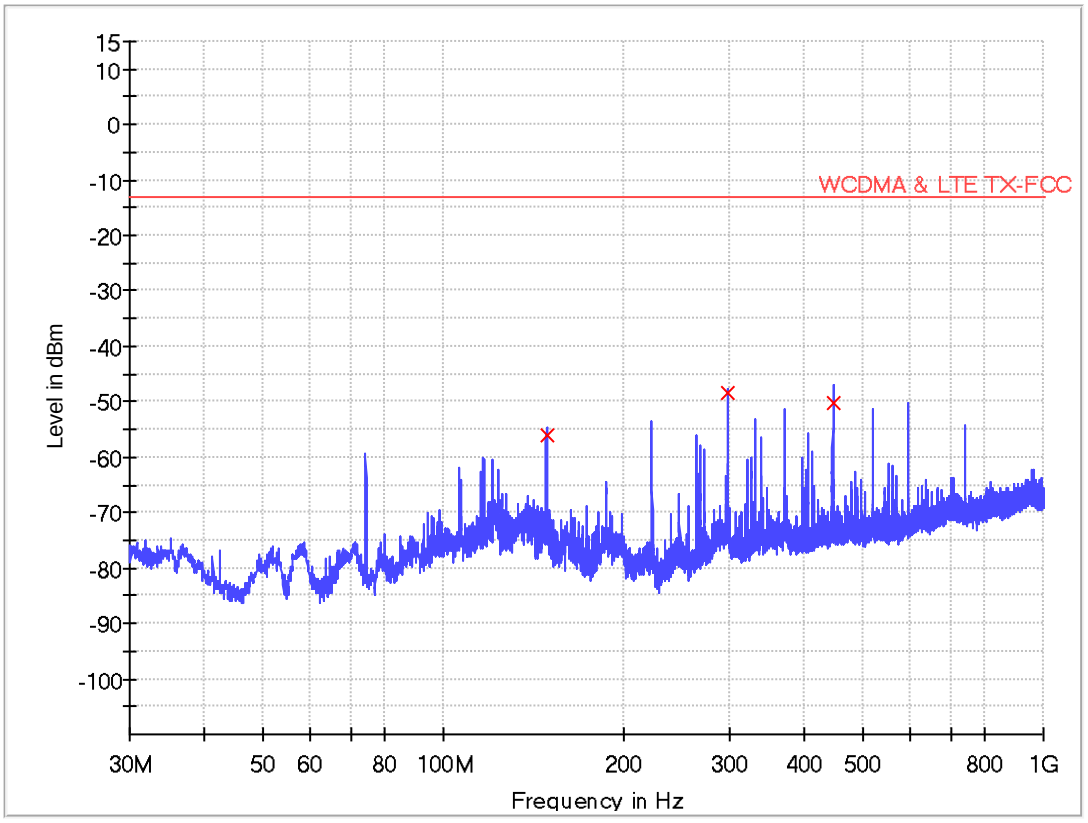
Remark: The emissions were very low against the limit in the frequency range 30 MHz ~ 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (UMTS/TM1 WCDMA850)
Worst Case ANT Polarity: Vertical



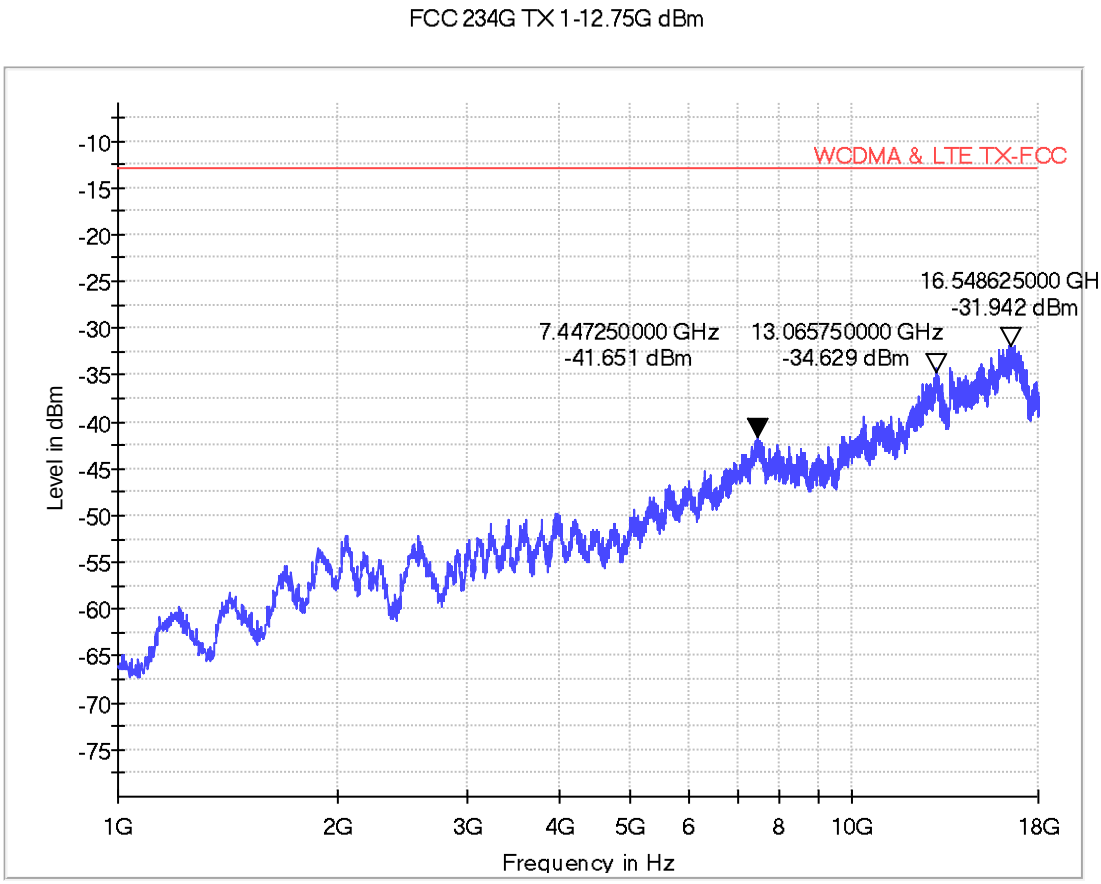
Remark: The emissions were very low against the limit in the frequency above 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (Band 2, 15MHz)
Worst Case ANT Polarity: Vertical



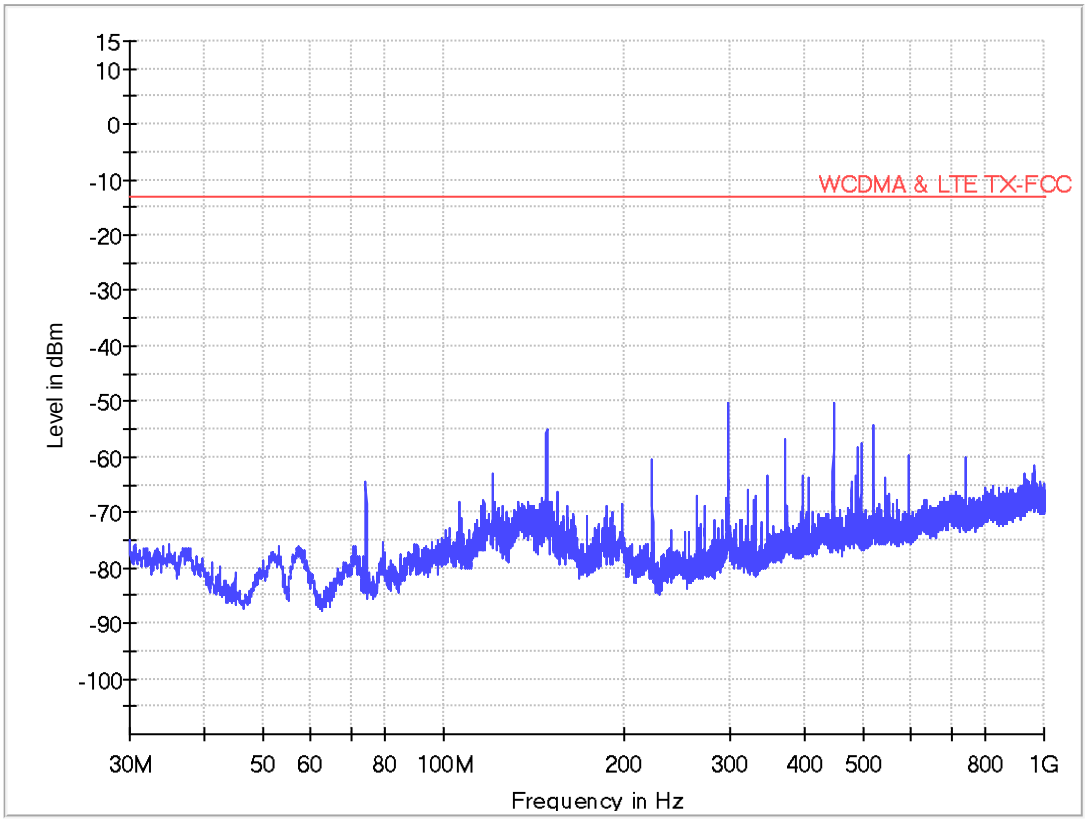
Remark: The emissions were very low against the limit in the frequency range 30 MHz ~ 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (Band 2, 15MHz)
Worst Case ANT Polarity: Vertical



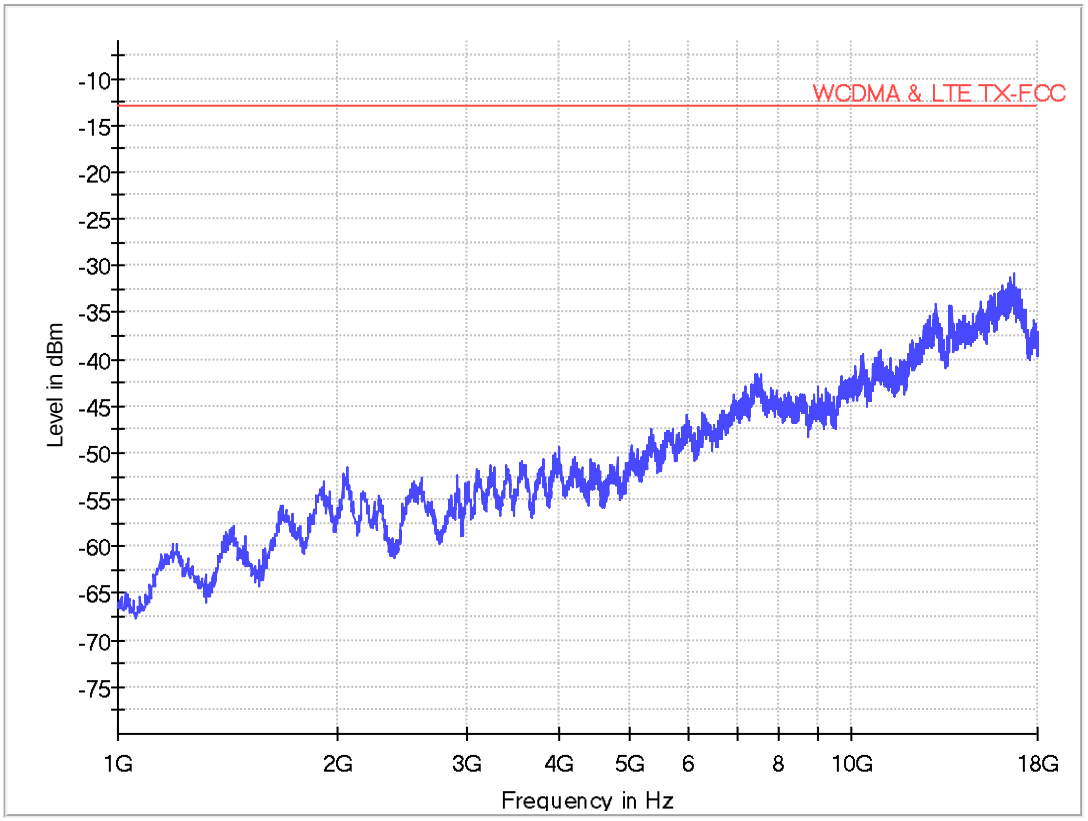
Remark: The emissions were very low against the limit in the frequency above 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (Band 4, 15MHz)
Worst Case ANT Polarity: Vertical



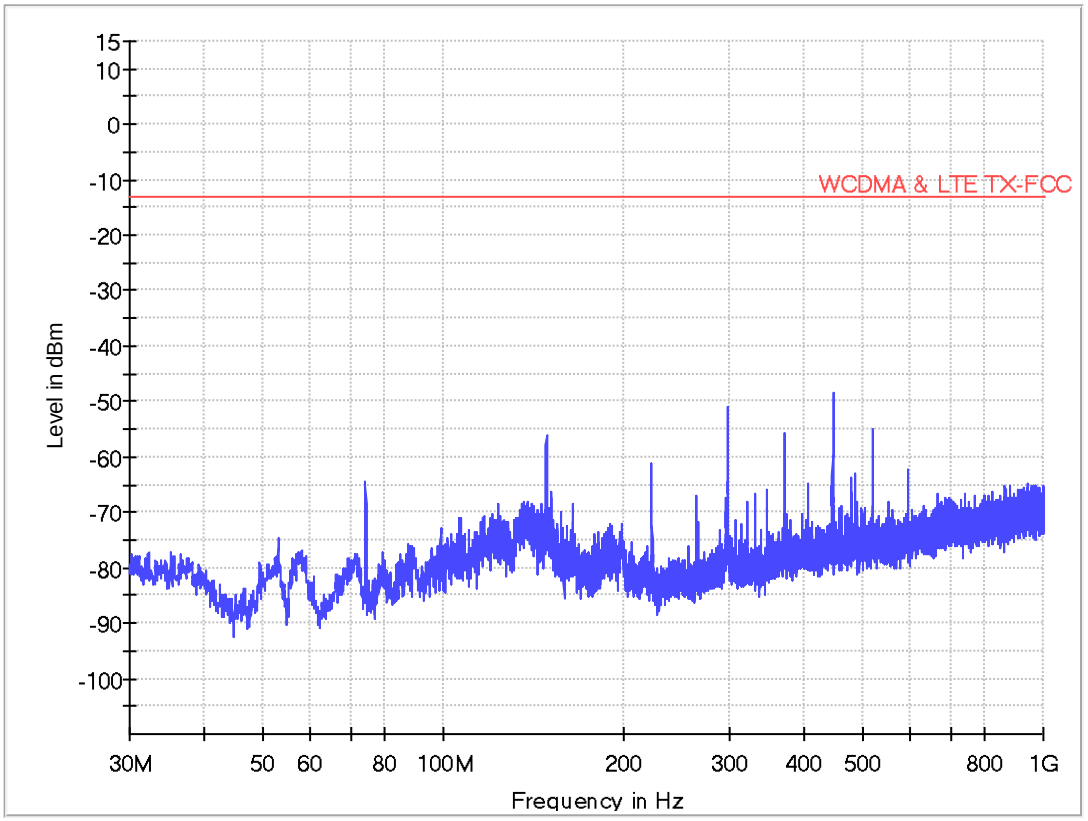
Remark: The emissions were very low against the limit in the frequency range 30 MHz ~ 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (Band 4, 15MHz)
Worst Case ANT Polarity: Vertical



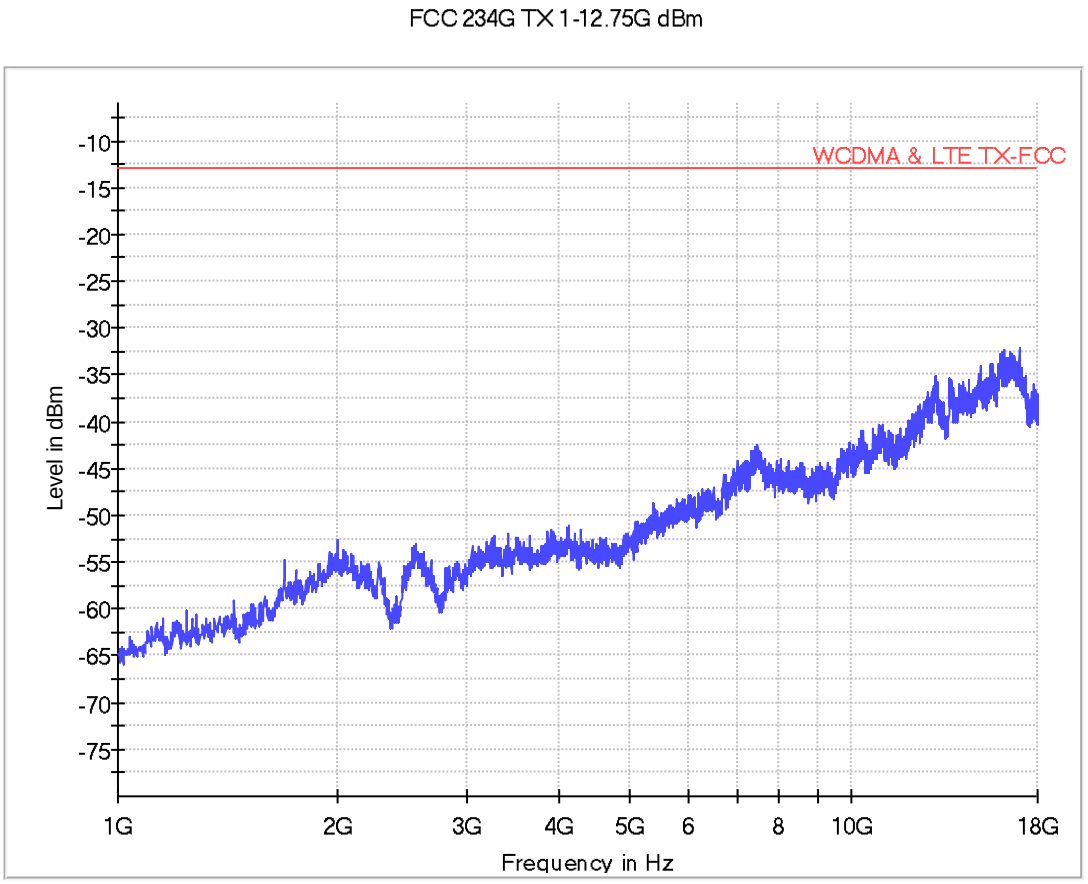
Remark: The emissions were very low against the limit in the frequency above 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (Band 5, 10MHz)
Worst Case ANT Polarity: Vertical



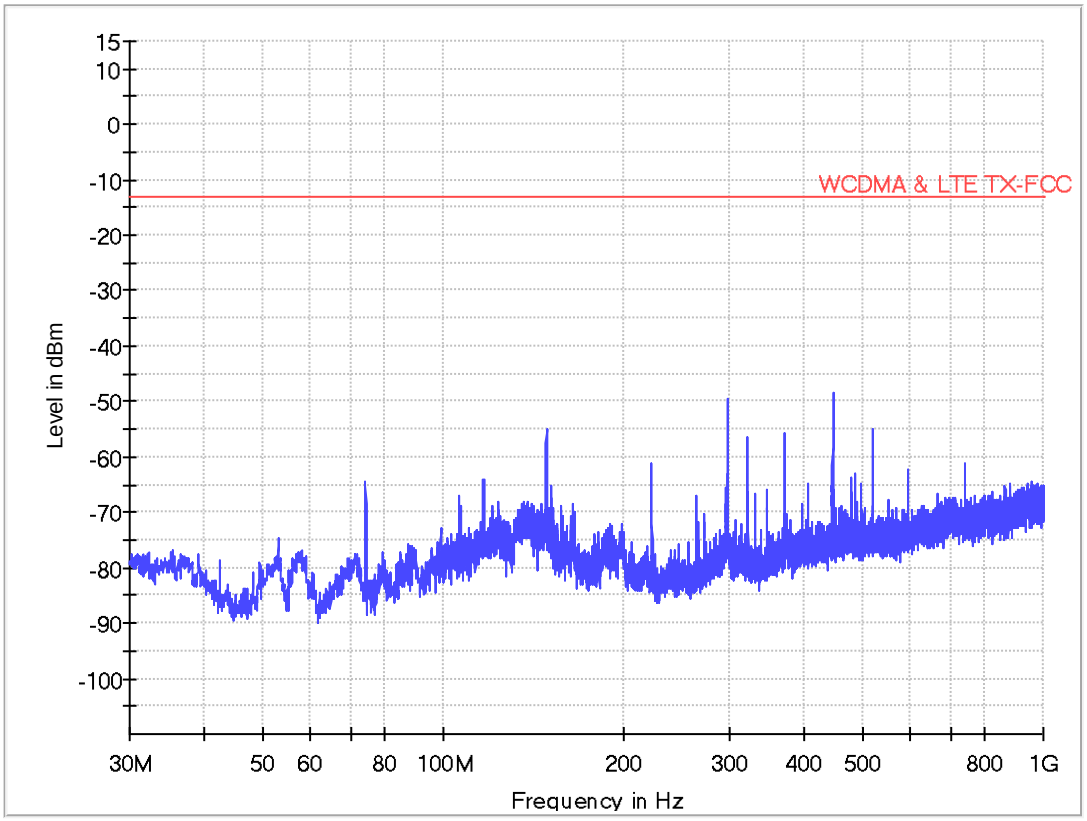
Remark: The emissions were very low against the limit in the frequency range 30 MHz ~ 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (Band 5, 10MHz)
Worst-case ANT Polarity: Vertical



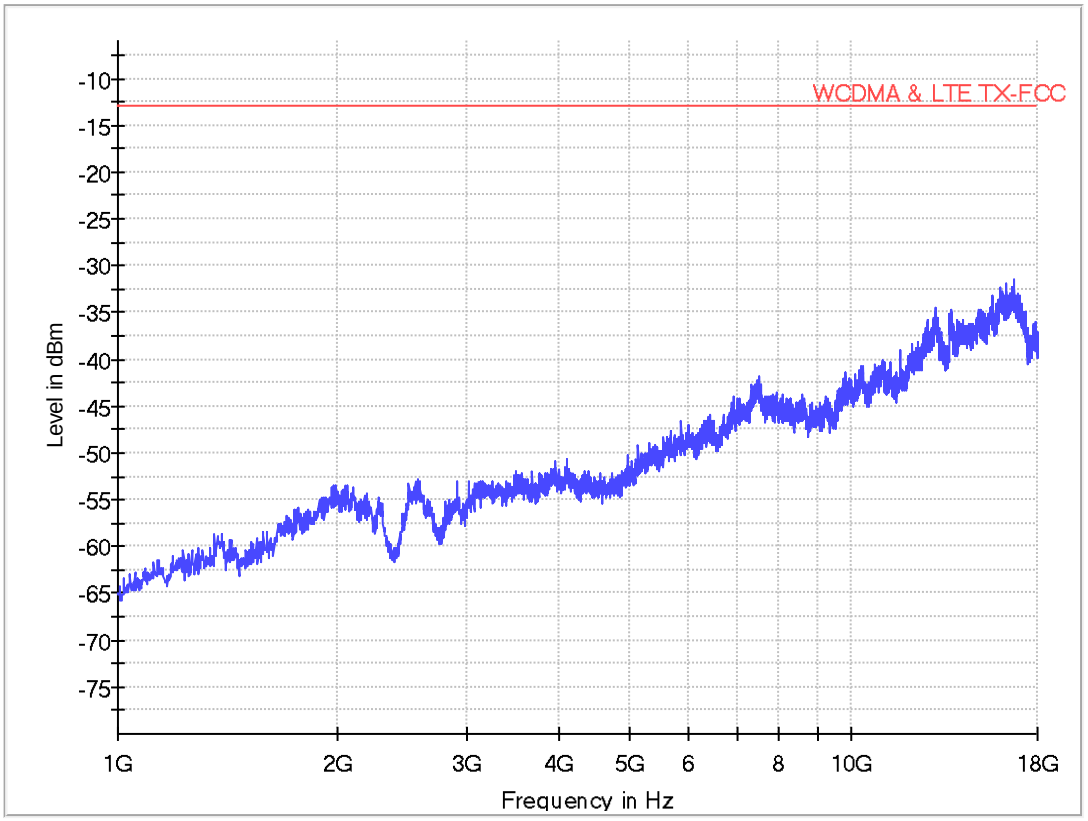
Remark: The emissions were very low against the limit in the frequency above 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (Band 12, 10MHz)
Worst Case ANT Polarity: Vertical



Remark: The emissions were very low against the limit in the frequency range 30 MHz ~ 1 GHz.

Applicant: Glooko, Inc.
Model: REF-0003
Date of Test: 26 May 2022
Worst Case Operating Mode: Transmitting (Band 12, 10MHz)
Worst-case ANT Polarity: Vertical



Remark: The emissions were very low against the limit in the frequency above 1 GHz.

7. Main Test Instruments

Main Test Equipment					
Equip No.	Equipment Name	Manufacturer	Model	Cal Date	Cal- Due
SZ006-27	DC Power Supply	Keysight	E3648A	2021-12-21	2022-12-21
SZ065-08	Wideband Radio Communication Tester	R & S	CMW 500	2022-05-10	2023-05-10
SZ056-07	Signal Analyzer	R&S	FSV40	2021-10-25	2022-10-25
SZ016-12	Programmable Temperature & Humidity Chamber	TaiLi	MHK-120NK	2022-01-05	2023-01-05
SZ047-35	Digital Temperature-Humidity Recorder	YiJie	RS210	2021-07-29	2022-07-29
SZ061-12	Biconilog Antenna	ETS	3142E	2021-08-04	2022-08-04
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	2021-05-18	2023-05-18
SZ061-08	Horn Antenna	ETS	3115	2021-09-05	2024-09-05
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	2019-08-13	2022-08-13
SZ056-03	Spectrum Analyzer	R&S	FSP30	2022-05-10	2023-05-10
SZ185-04	EMI Test Receiver	R & S	ESR7	2021-11-16	2022-11-16
SZ181-04	Preamplifier	Agilent	8449B	2022-05-16	2023-05-16
SZ188-05	Anechoic Chamber	ETS	FACT 3-2.0	2021-05-25	2024-05-25
SZ062-02	RF Cable	RADIALL	RG 213U	2022-05-01	2022-11-01
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	2022-05-01	2022-11-01
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	2022-05-01	2022-11-01
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	2022-05-17	2023-05-17

Software Information			
Test Item	Software Name	Manufacturer	Version
RSE	EMC32	R&S	V8.40.0
Conducted RF	JS1120 RF Test System	Shenzhen JS tonscend co., Ltd	2.6.9.0518

8. Measurement Uncertainty

For a 95% confidence level (k = 2), the measurement expanded uncertainties for defined systems, in accordance with

the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmit Output Power Data	Power [dBm]	U = 0.42 dB
Bandwidth	Magnitude [%]	U = 0.2%
Band Edge Compliance	Disturbance Power [dBm]	U = 1.24 dB
Spurious Emissions, Conducted	Disturbance Power [dBm]	U = 1.62 dB
Field Strength of Spurious Radiation	ERP [dBm]	For 3 m Chamber: U = 4.9 dB (30 MHz to 26.5GHz)
Frequency Stability	Frequency Accuracy [ppm]	U = 0.017 ppm

9. Appendixes

Appendix No.	Description
220511078SZN-002-Appendix A	Appendix for GSM
220511078SZN-002-Appendix B	Appendix for WCDMA
220511078SZN-002-Appendix C	Appendix for LTE

**********End of Report**********