FCC ID PER PART 15.229 & 15.235
EMI MEASUREMENT AND TEST REPORT

For

Columbia Telecommunications Group Inc.

174 Milbar Blvd., Farmingdale,
N.Y. 11735 U.S.A.

FCC ID: GAFWT-SG

2003-04-20

This Report Concerns:	**Equipment Type:**
☒ Original Report	Walkie Talkie

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Applicant:	Columbia Telecommunications Group Inc.
Product Description:	Walkie Talkie
Trade Name:	Columbia
Model:	WT-SG
FCC ID:	GAFWT-SG
Dimension:	4.5” L x 3.2” W x 11.5” H
Frequency:	Unit A: TX at 40.68MHz; RX at 49.86MHz
	Unit B: TX at 49.86MHz; RX at 40.68MHz
Applicable standard(s):	15.229 (Unit A) & 15.235 (Unit B)

* The test data was only good for test sample. It may have deviation for other product samples.

1.2 Objective

This Type approval report is prepared on behalf of *Columbia Telecommunications Group Inc.* in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules, Part 15, sec 229 and 235 for band edge, conducted, radiated margin and frequency stability.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22: 1997, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	Panel 2408A00105 Display 2403A06544	2003-05-01
HP	Spectrum Analyzer	8593A	29190A00242	2003-05-01
HP	Amplifier	8447E	1937A01054	2003-05-01
HP	Quasi-Peak Adapter	85650A	2521A00718	2003-05-01
Com-Power	Biconical Antenna	AB-100	14012	2003-05-01
Com-Power	LISN	LI-200	12005	2004-03-28
Com-Power	LISN	LI-200	12008	2004-03-28
Com-Power	Log Periodic Antenna	AL-100	16091	2003-05-01
Com-Power	Log Periodic Antenna	AB-900	15049	2003-05-01
Rohde & Schwarz	EMI Test Receiver	ESPI	1147 8007 07	2003-12-03

***Statement of Traceability**: Bay Area Compliance Laboratory Corp. certifies that all calibration has been performed using suitable standards traceable to the NATIONAL INSTITUTE OF STANDARDS and TECHNOLOGY (NIST).

1.7 Local Support Equipment

Manufacturer	Description	Model	Serial Number	Cal. Due Date
NANYAN	Audio Generator	NY2201	000420	Not Required

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was configured for testing in a typical fashion (as normally used in a typical application).

The final qualification test was performed with the EUT operating at normal mode for the purpose of measurement.

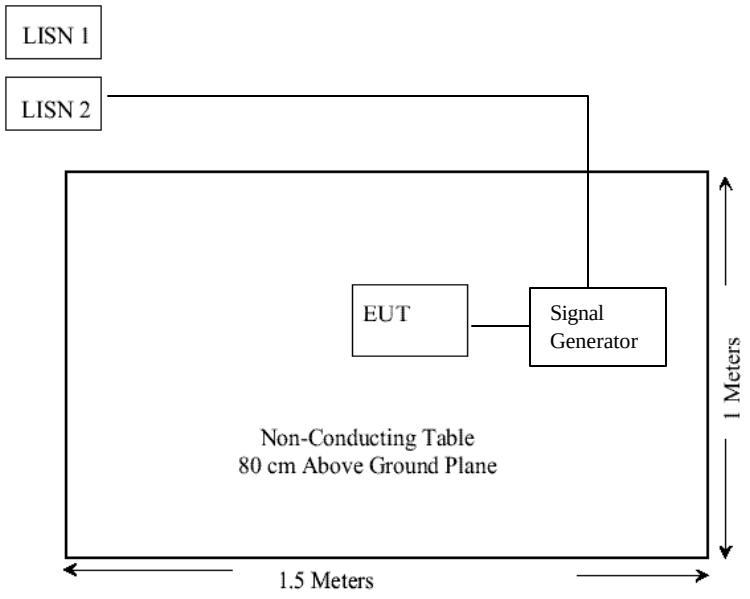
2.2 Block Diagram

Please refer to Exhibit D.

2.3 Equipment Modifications

No modification(s) was (were) made by BACL in final test to make sure the EUT compliant with the applicable limits and requirements.

2.4 Test Setup Block Diagram



3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT	REFERENCE
§15.207	Conducted Emission Test	N/A	Section 4
§15.235(a) §15.235(b) §15.229(a) §15.229(c)	Field Strength Radiated Emission	Compliant	Section 5
§15.235(b)	Band Edge	Compliant	Section 6
§ 15.229 (d)	Frequency Stability	Compliant	Section 7

4 - CONDUCTED EMISSIONS TEST

Per FCC 15.207 (c), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtainig their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

5 - FIELD STRENGTH RADIATED EMISSION

5.1 Applicable Requirements

Per FCC 15.229 (a), unless operating pursuant to the provisions in § 15.231, the field strength of any emissions within this band shall not exceed 1,000 microvolts/meter at 3 meters.

Per FCC 15.229 (c), the field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits in § 15.209.

Per FCC 15.235 (a), the field strength of any emission within this band shall not exceed 10, 000 microvolts/meter at 3 meters.

Per FCC 15.235 (b), the field strength of any emissions appearing between the band edges and up to 10kHz above and below the band edges shall be attenuated at least 26dB below the level of the unmodulated carrier or to the general limits in §15.209, whichever permits the higher emission levels. The field strength of any emissions removed by more than 10kHz from the band edges shall not exceed the general radiated emission limits in §15.209. All signal exceeding 20 micorvolts/meter at 3 meters shall be reported in the application for certification.

5.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

5.3 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4-1992. The specification used was the FCC Class B limits.

The DC power supply was connected to 120Vac/60Hz power source.

The spacing between the peripherals was 10 cm.

External I/O cables are draped over edge of test table or bundled when necessary.

5.4 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33, the EUT was tested to 500 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency	30 MHz
Stop Frequency	500 MHz
Sweep Speed	Auto
IF Bandwidth	100 KHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

5.5 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -4 dBµV of specified limitation), and are distinguished with a "**QP**" in the data table.

The EUT was modulated with a 2500 Hz tone at an input level 20 dB greater than the necessary to produce 50% of rated system deviation to represent worst-case results during final qualification test. Therefore, this configuration was used for final test data recorded in the table(s) listed under section 4.7 of this report.

5.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBµV means the emission is 7dBµV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - FCC Limit

5.7 Summary of Test Results

According to the final data in section 4.6, the EUT complied with the FCC 15.229 and 15.235 standards, and had the worst margin of:

Unit A: - 4.3 dB at 81.36 MHz in the Horizontal polarization, FCC 15.229

Unit B: -5.3 dB at 99.72 MHz in the Vertical polarization, FCC 15.235

5.8 Radiated Emissions Test Result Data

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15.229	
Frequency MHz	Ampl. dBµV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dBµV/m	Cable dB	Amp. dB	Corr. Ampl. dBµV/m	Limit dBµV/m	Margin dB
81.36	53.2	220	2.0	h	9.6	1.4	25.0	39.2	43.5	-4.3
81.36	53.0	180	1.0	v	9.6	1.4	25.0	39.0	43.5	-4.5
40.68*	65.7	330	1.8	v	12.1	0.7	25.0	53.5	60	-6.5
122.04	47.2	90	1.2	v	12.1	2.2	25.0	36.5	43.5	-7.0
122.04	46.8	30	1.0	h	12.1	2.2	25.0	36.1	43.5	-7.4
40.68*	64.0	270	1.5	h	12.1	0.7	25.0	51.8	60	-8.2
110.83	41.83	240	1.5	v	11.7	1.3	25.0	29.8	43.5	-13.7
274.95	36.3	90	1.2	h	13.9	5.2	25.0	30.4	46	-15.6
246.81	35.5	30	2.0	v	12.6	2.3	25.0	25.4	46	-20.6

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15.235	
Frequency MHz	Ampl. dBµV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dBµV/m	Cable dB	Amp. dB	Corr. Ampl. dBµV/m	Limit dBµV/m	Margin dB
99.72	51.5	180	1.5	v	10.4	1.3	25.0	38.2	43.5	-5.3
99.72	49.7	120	1.8	h	10.4	1.3	25.0	36.4	43.5	-7.1
39.29	43.5	30	1.0	h	13.3	0.5	25.0	32.3	40	-7.7
166.73	45.17	240	1.5	v	13.3	2.1	25.0	35.6	43.5	-7.9
112.83	46.0	90	1.2	v	11.7	1.3	25.0	34.0	43.5	-9.5
149.58	42.7	270	1.5	v	13.4	1.6	25.0	32.7	43.5	-10.8
149.58	40.8	120	1.5	h	13.4	1.6	25.0	30.8	43.5	-12.7
279.91	35.2	160	1.5	v	13.9	5.2	25.0	29.3	46	-16.7
49.86*	74.0	180	1.2	v	11.3	0.5	25.0	60.8	80	-19.2
258.03	33.5	160	1.0	v	13.1	3.0	25.0	24.6	46	-21.4
49.86*	67.5	330	2.0	h	11.3	0.5	25.0	54.3	80	-25.7

* Fundamental Frequency

6 - BAND EDGE

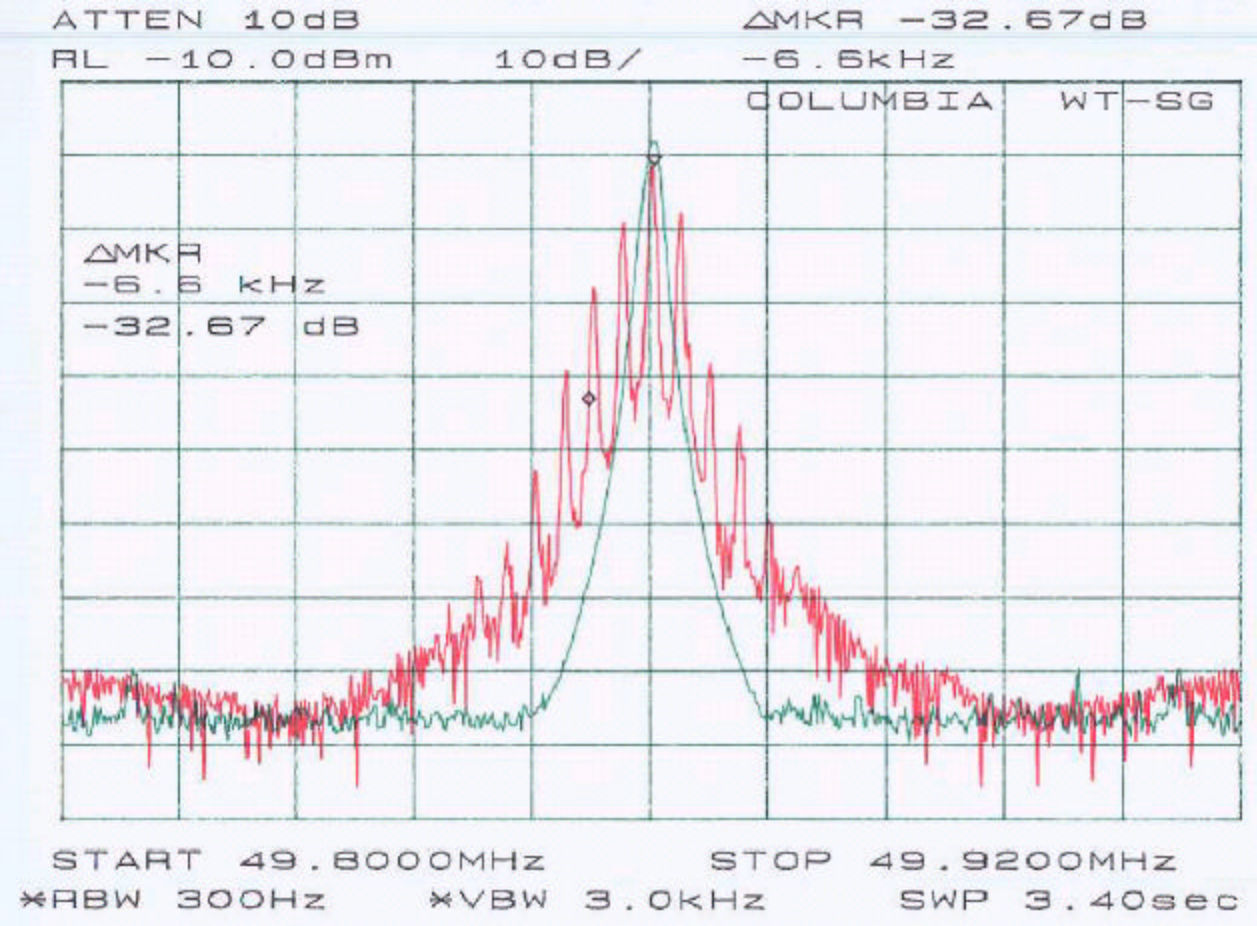
6.1 Applicable Requirements

Per FCC 15.235 (b), the field strength of any emissions appearing between the band edges and up to 10kHz above and below the band edges shall be attenuated at least 26dB below the level of the unmodulated carrier or to the general limits of §15.209.

6.2 Test Results

Result: Pass.

Please refer the attached plots for more details.



7 - FREQUENCY STABILITY MEASUREMENT

7.1 Provision Applicable

According to FCC §2.1055(a)(1), the frequency stability shall be measure with variation of ambient temperature from –30ºC to +50ºC, and according to FCC 2.1055(d)(2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to FCC §15.229(c), the frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of 20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

7.2 Test Procedure

7.2.1 Frequency stability versus environmental temperature

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

7.2.2 Frequency Stability versus Input Voltage

At room temperature (25±5°C), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

7.3 Test Equipment

Temperature Chamber, -20°C to +50°C
Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter
Hewlett Packard HP 5383A Frequency Counter
Goldstar DC Power Supply, GR303

7.4 Test Results

Reference Frequency: 40.68 MHz, Limit: 0.01%			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MCF (MHz)	%
50	New Batt.	40.6797	-0.00074
40	New Batt.	40.6798	-0.00049
30	New Batt.	40.68	0
20	New Batt.	40.68	0
10	New Batt.	40.6801	0.00025
0	New Batt.	40.6802	0.00049
-10	New Batt.	40.6804	0.00098
-20	New Batt.	40.6805	0.0012

Frequency Stability Versus Input Voltage

Reference Frequency: 40.68 MHz, Limit: 0.01%						
Power Supplied (Vdc)	Frequency Measure with Time Elapsed					
	2 Minutes		5 Minutes		10 Minutes	
	MHz	%	MHz	%	MHz	%
6.5Vdc	40.68	0.0	40.6798	-0.00049	40.6798	-0.00049
6.5Vdc	40.68	0.0	40.6797	-0.00074	40.6798	-0.00049
6Vdc	40.6798	-0.00049	40.6797	-0.00074	40.68	0
6Vdc	40.6797	-0.00074	40.68	0.0	40.6801	0.00025
4.5Vdc	40.68	0.0	40.6801	0.00025	40.6802	0.00049
4.5Vdc	40.6798	-0.00049	40.6802	0.00049	40.6804	0.00098

End Point = 4.5 V

Conclusion: The EUT complied with the applicable Frequency Stability Limits.