FCC PART 15 Subpart C

EMI MEASUREMENT AND TEST REPORT

For

TECOM CO., LTD.

No. 23, R & D Rd. 2, Science-Based Industrial Park,
Hsin-Chu, Taiwan, R. O. C.

FCC ID: D6X-T7406

May 15, 2001

This Report Concerns:	**Equipment Type:**
☒ Original Report	Multiple -Handset Cordless Phone – Household Appliances

Test Engineer: Victor Liu / Hien Pham

Test Date: March 30, 2001

Reviewed By:

John Y. Chan – Engineering Manager

Prepared By:

Bay Area Compliance Laboratory Corporation
230 Commercial Street, Suite 2
Sunnyvale, CA 94085
Tel: (408) 732-9162
Fax: (408) 732 9164

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

TECOM CO., LTD.'s product, FCC ID: *D6X-T7406* or the "EUT" as referred to in this report is a 900MHz Cordless Telephone. The EUT was composed of two parts, one is the base which measures approximately 15.5cm L x 15cm W x 2.5cm H, and the other is the handset which measures 22cm L x 5.5 cm W x 3.5cm H.

The EUT was tested with Cheng Uei Precision Industry Co., Ltd. AC/DC power adapter, M/N: DBT120950D, Serial #: M/N-105.

1.2 Objective

This type approval report is prepared on behalf of *TECOM CO., LTD.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for Output Power, Antenna Requirement, Hopping Channel Separation, Number of Hopping Frequency Used, 20 dB Bandwidth, Dwell Time on Each Channel, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Spurious Radiated Emission.

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, Suite 2, 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, IEC/CISPR 22: 1998, 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	8564E	08303	12/6/01
HP	Spectrum Analyzer	8593B	2919A00242	12/20/01
HP	Amplifier	8349B	2644A02662	12/20/01
HP	Quasi-Peak Adapter	85650A	917059	12/6/01
HP	Amplifier	8447E	1937A01046	12/6/01
A.H. System	Horn Antenna	SAS0200/571	261	12/27/01
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/02
Com-Power	Biconical Antenna	AB-100	14012	11/2/02
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/01
Com-Power	LISN	LI-200	12208	12/20/01
Com-Power	LISN	LI-200	12005	12/20/01
BACL	Data Entry Software	DES1	0001	12/20/01
Rohde & Schwarz	Signal Generator	SMIQ03B	1125.5555.03	7/10/02
Rohde & Schwarz	I/Q Modulation Generator	AMIQ	1110.2003.02	8/10/02

1.7 Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Nortel Norstar	Power Adapter	NT7B56	P0882883-01	AB6CAN-23740-PF-E

1.8 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Unshielded RJ11 Cable x 1	30	RJ11 Input Port/Base	Phone Line

2 - SYSTEM TEST CONFIGURATION

2.1 Description of Test Configuration

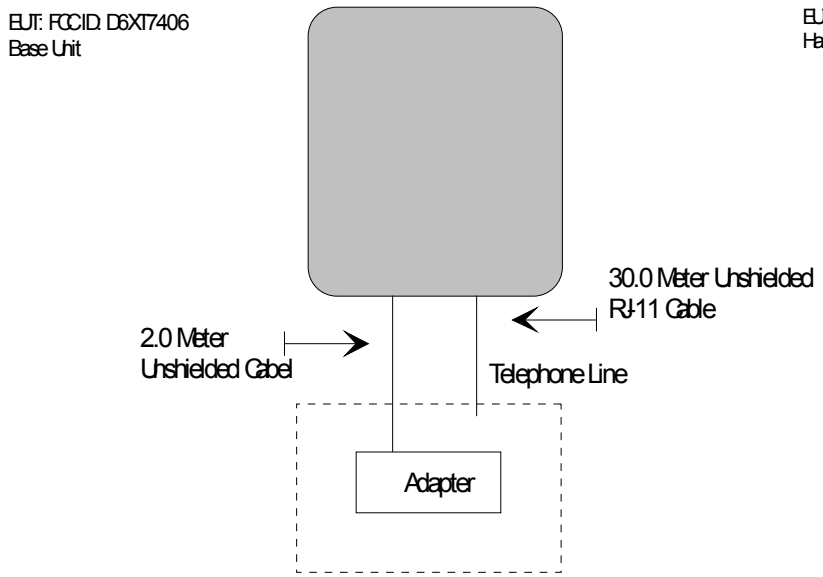
The EUT was configured for testing in a typical fashion (as normally used by a typical user).

Handset being tested: The Cordless Phone – Handset, Model T7406 (EUT) was placed on the wooden table and tested in three orthogonal axis. The handset was connected to the headset via its headset port. The Low, middle, and high channels were tested. The handset was transmitting to and receiving from the Base unit. The EUT was investigated for emissions while off hook. The radiated data was taken in this mode of operation. All initial and final investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the 2.5.

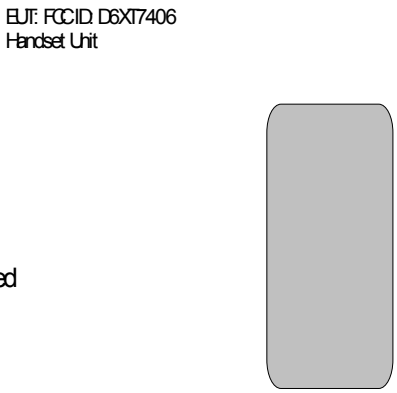
Base being tested: The Cordless Phone – Base, Model T7406 (EUT) was placed on the wooden table. The Low, middle, and high channels were tested. The base was connected to the line simulator and an AC adapter via its Tel Line and power ports, respectively. The base was transmitting and receiving from the 900 MHz Handset unit. The conducted as well as radiated data was taken in this mode of operation. All initial and final investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the 2.3.

2.2 Configuration of Test System

For Base Unit

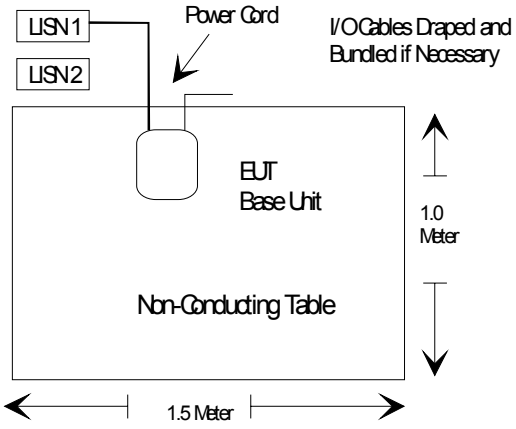


For Handset Unit

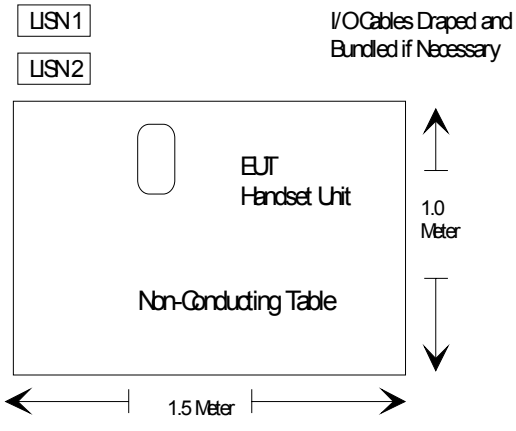


2.3 Test Setup Block Diagram

For Base Unit



For Handset Unit



2.4 Equipment Modifications

No modification(s) was made by BACL Corp. to ensure the EUT complies with the applicable limits and standards.

3 - SUMMARY OF TEST RESULTS

FCC Rules	REQUIREMENTS	RESULT
CFR 15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by responsible party shall 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. The manufacturer may designed the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213. §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	Complied
CFR15.207 (a)	For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequency within the band 450 kHz to 30 MHz shall not exceed 250 microvolts.	Complied
CFR 15.247 (a)	Frequency hopping systems operating in the 902 –928 MHz: if the 20dB bandwidth of the hopping channel is 250kHz or greater, the system shall use at least 25 hopping frequencies. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.	
Carrier Frequency Separation	604kHz	Complied
Number of Hopping Frequencies	25 Channels	Complied
Time of Occupancy	10.6mS	Complied
20 dB Bandwidth	474kHz	Complied
Pseudo-random Frequency Hopping Sequence	See Technical Manual	Provided

FCC Rules	REQUIREMENTS	RESULT
Equal Hopping Frequency Use	See Technical Manual	Provided
System Receiver Input Bandwidth	See Technical Manual	Provided
System Receiver Hopping Capacity	See Technical Manual	Provided
CFR 15.247 (b) (2)	For frequency hopping system operating in the 902 – 928 MHz, band: 0.25 Watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a) (1) of this section.	
Peak Output Power	21.03dBm for Base Unit; 12.39dBm for Handset Unit	Complied
CFR 15.247 (b) (4)	Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. Session 1.1307(b) (1) of this chapter	
RF Exposure Compliance Requirements	See User Manual	Complied
CFR 15.247 (c)	In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100kHz bandwidth within the band contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209 (a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205 (a), must also comply with the radiated emission limits specified in § 15.209 (a) (see § 15.205 (c)).	Complied
Conducted RF Band Edge	See Test Report Page 28, 29	Complied
Spurious Radiated Emissions	This test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT	Complied
Section 15.247 (g)	Describe how the EUT complies with the requirement that it be designed to capable of operating as a true frequency hopping system	Complied
Section 15.247 (h)	Describe how the EUT complies with the requirement that it not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.	Complied

4 - CONDUCTED OUTPUT POWER MEASUREMENT

4.1 Standard Applicable

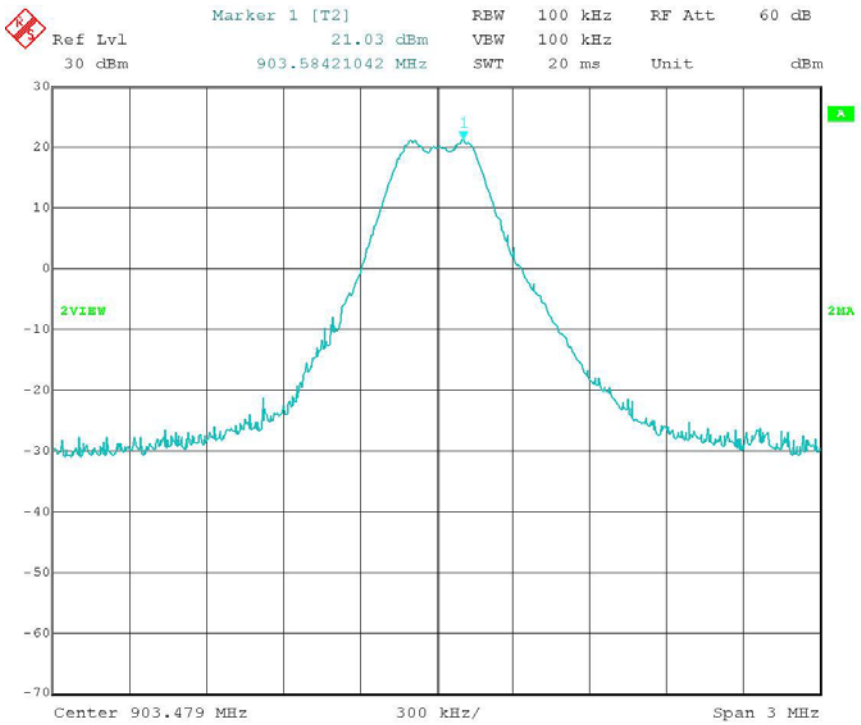
For frequency hopping, according to §15.247(b) (2), the maximum peak output power of the transmitter shall not exceed 1 Watt.

4.2 Measurement Procedure

1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

4.3 Measurement Result

Refer to the attached plots.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RBW 100 kHz
RF Att 60 dB
Ref Lvl
21.03 dBm
VBW 100 kHz
30 dBm
903.58421042 MHz
SWT 20 ms
Unit dBm
2VIEW
2MA
Center 903.479 MHz
300 kHz/
Span 3 MHz
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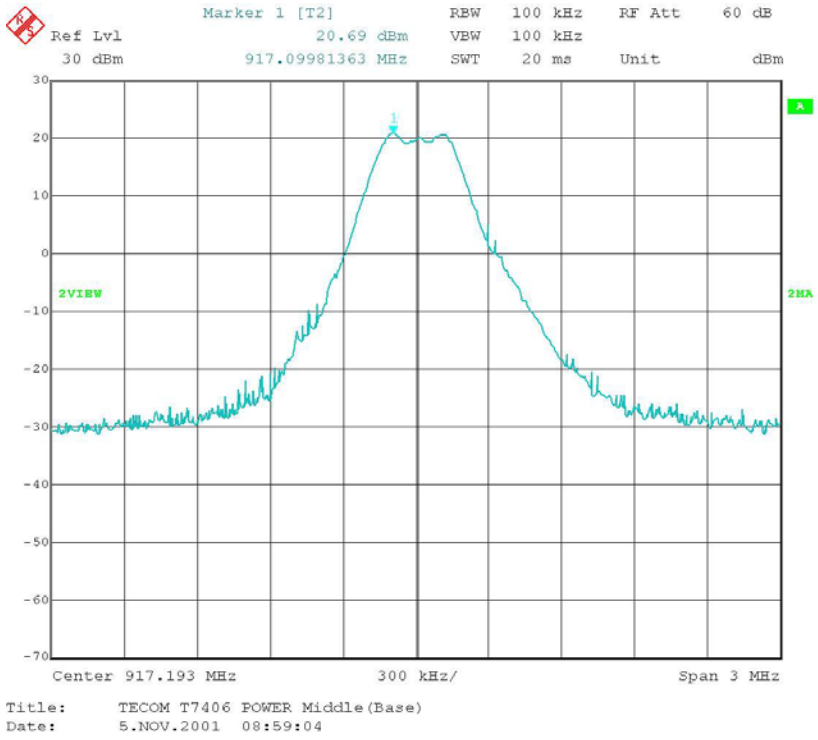
Date: 5.NOV.2001 08:56:54


Marker 1 [T2]
RBW 100 kHz
RF Att 60 dB
Ref Lvl
20.69 dBm
VBW 100 kHz
30 dBm
917.09981363 MHz
SWT 20 ms
Unit dBm
2VIEW
2MA
Center 917.193 MHz
300 kHz/
Span 3 MHz
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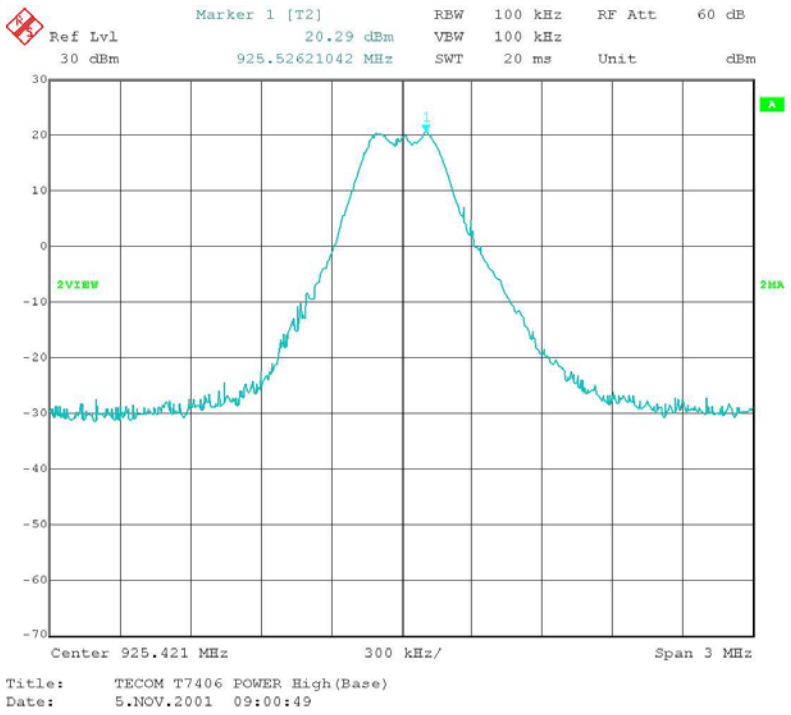
Date: 5.NOV.2001 08:59:04


Marker 1 [T2]
Ref Lvl
30 dBm
20.29 dBm
925.52621042 MHz
RBW 100 kHz
VBW 100 kHz
SWT 20 ms
RF Att 60 dB
Unit dBm
2VIEW
2MA
Center 925.421 MHz
300 kHz/
Span 3 MHz
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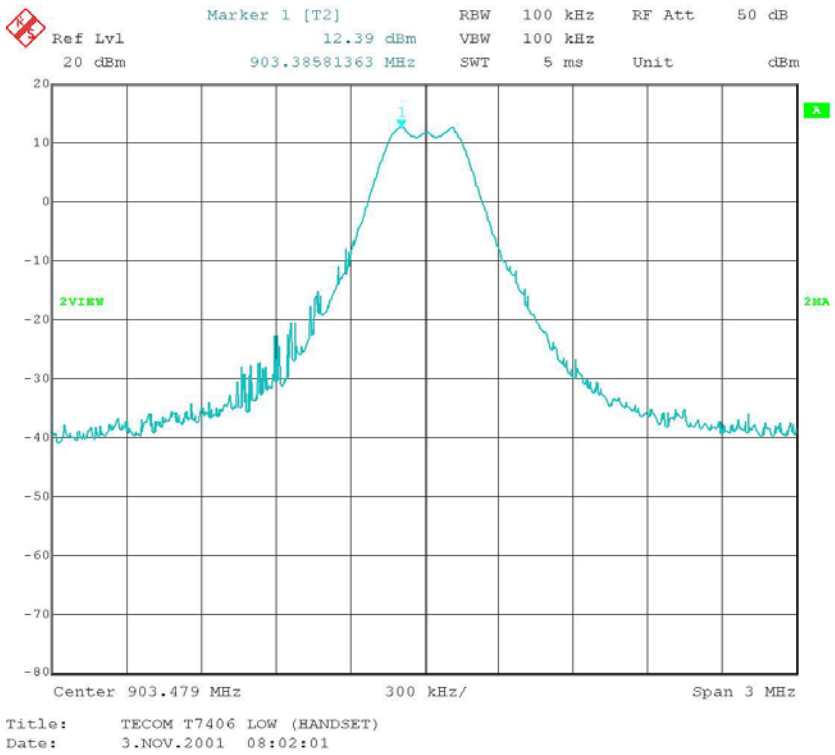
Date: 5.NOV.2001 09:00:49


Marker 1 [T2]
Ref Lvl
20 dBm
12.39 dBm
903.38581363 MHz
RBW 100 kHz
VBW 100 kHz
SWT 5 ms
RF Att 50 dB
Unit dBm
2VIEW
2MA
Center 903.479 MHz
300 kHz/
Span 3 MHz
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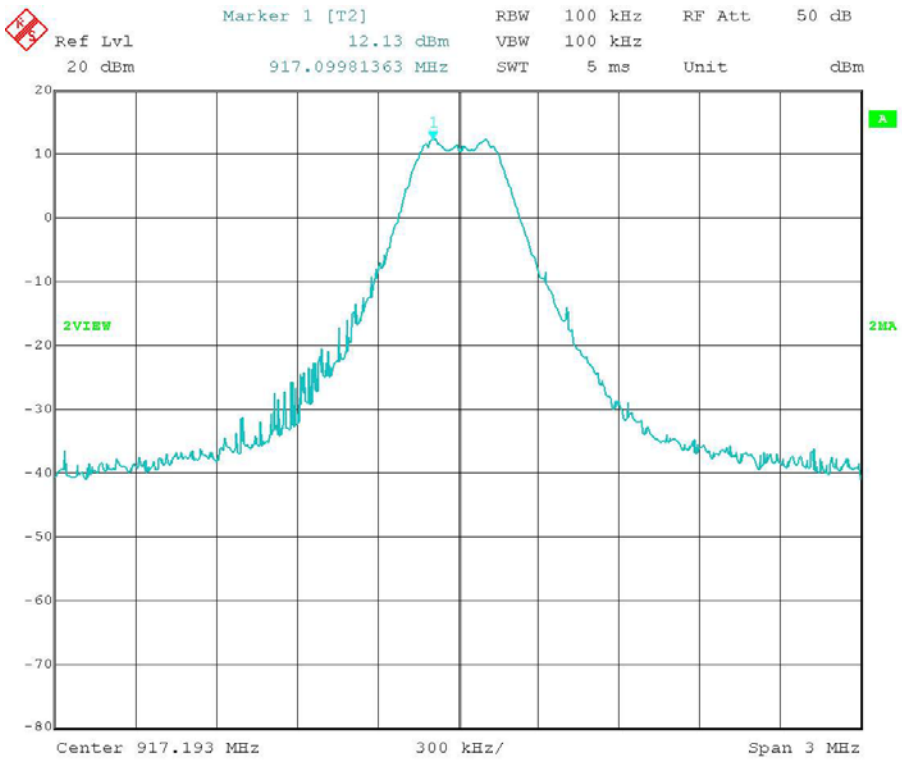
Date: 3.NOV.2001 08:02:01



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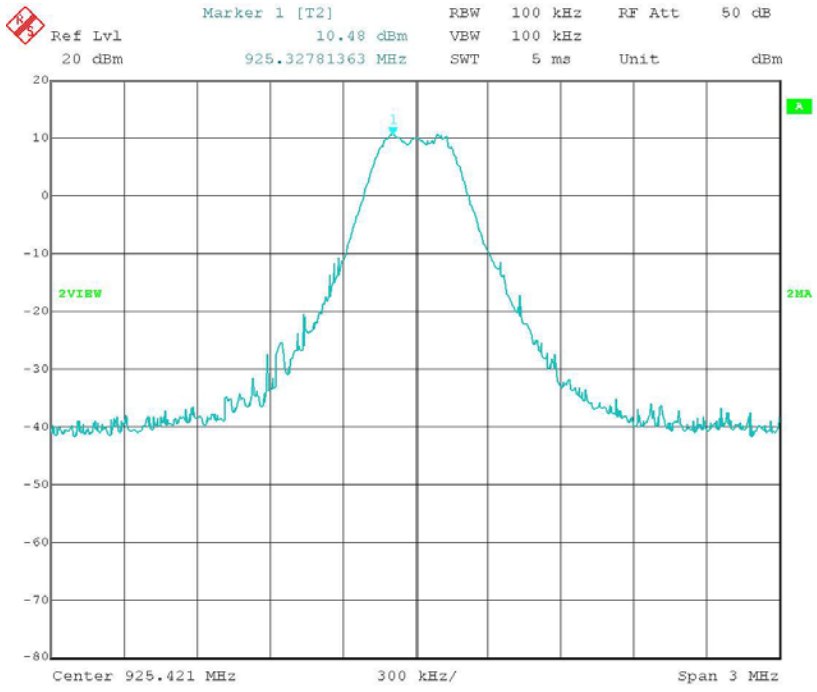
Date: 3.NOV.2001 07:57:39



Title: TECOM T7406 HIGH (HANDSET)
Date: 3.NOV.2001 07:53:11

5 - CHANNEL BANDWIDTH

5.1 Standard Applicable

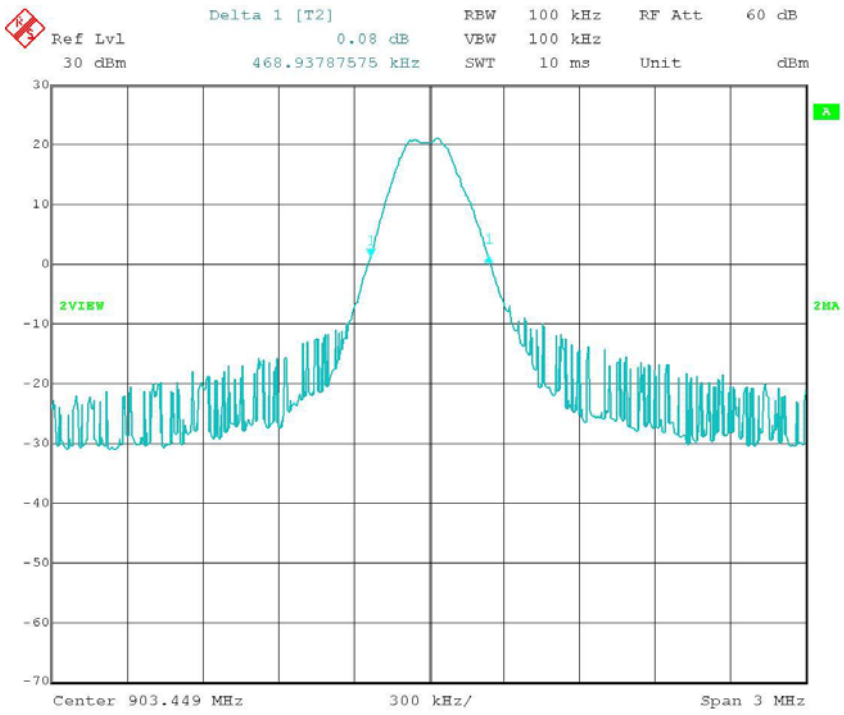
According to §15.247(a)(l)(ii), for frequency hopping system operating in the 902-928 MHz, the maximum 20dB bandwidth of the hopping channel is 500 kHz.

5.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

5.3 Measurement Result

Please refer to the hereinafter plots for more details.



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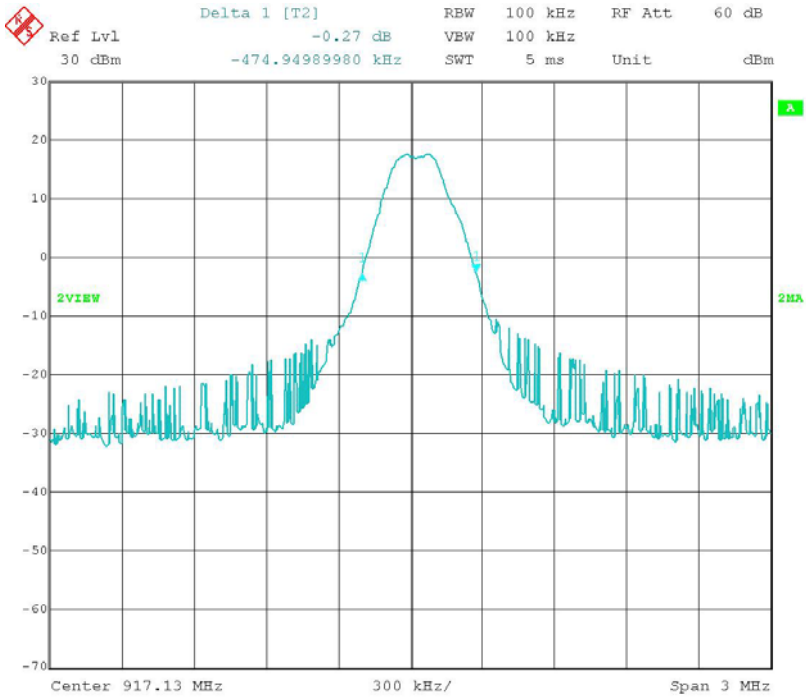
Date: 8.NOV.2001 03:36:47



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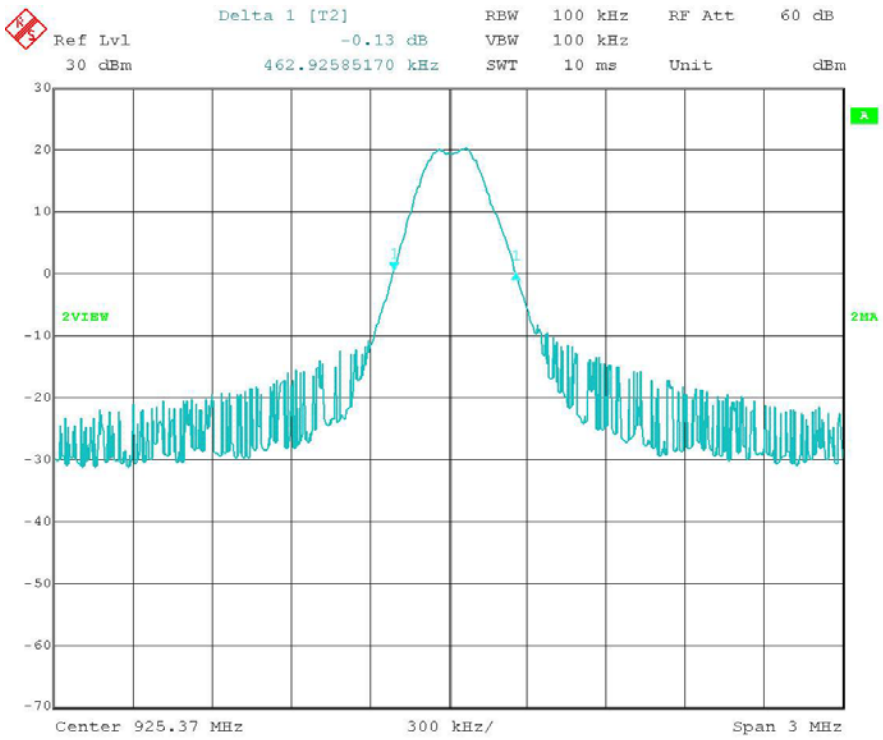

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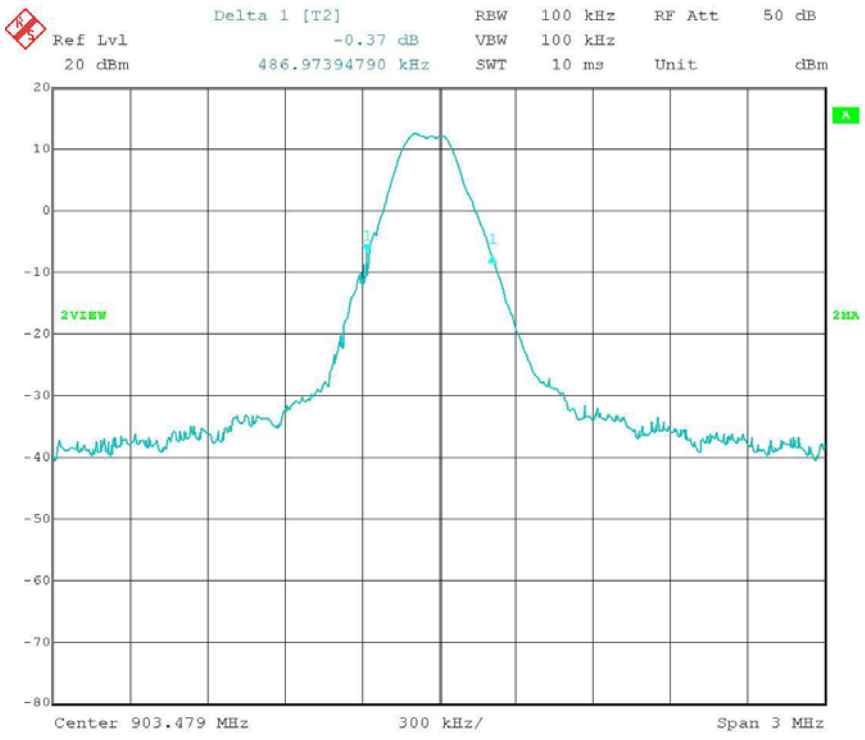

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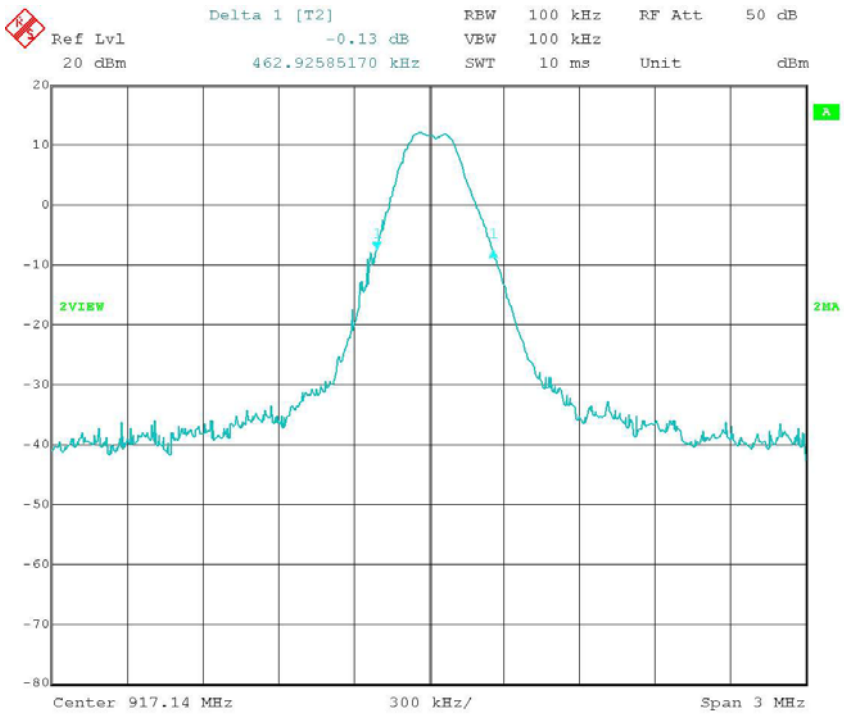
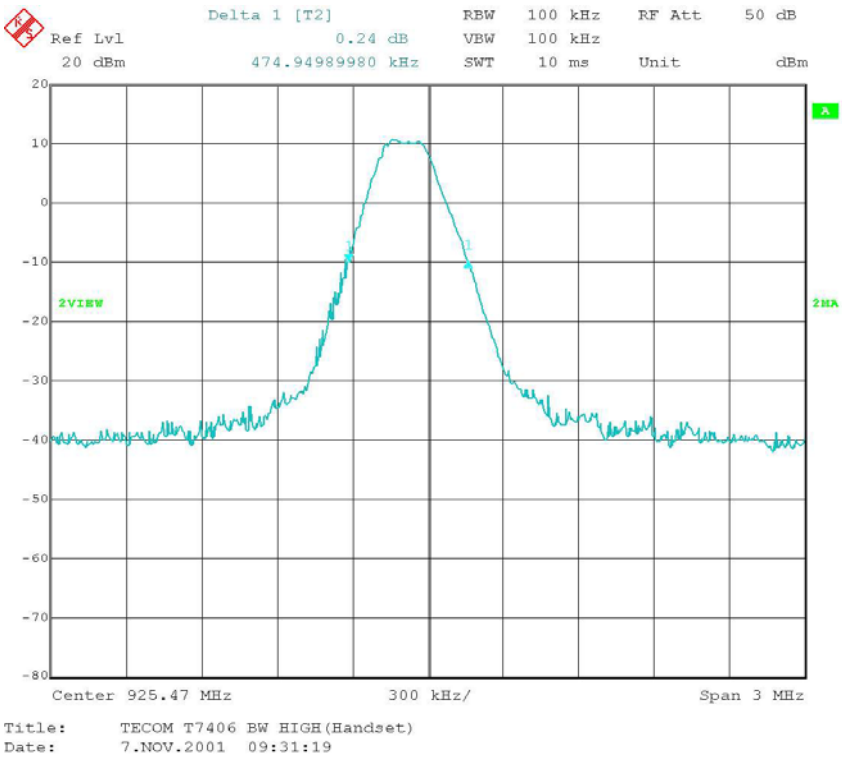
Date: 7.NOV.2001 09:52:33


Delta 1 [T2]
RBW 100 kHz
RF Att 50 dB
Ref Lvl
-0.13 dB
VBW 100 kHz
20 dBm
462.92585170 kHz
SWT 10 ms
Unit dBm
2VIEW
2MA
Center 917.14 MHz
300 kHz/
Span 3 MHz
Title: TECOM T7406 BW MIDDLE(Handset)
Date: 7.NOV.2001 09:46:17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RF Att 50 dB
Ref Lvl
0.24 dB
VBW 100 kHz
20 dBm
474.94989980 kHz
SWT 10 ms
Unit dBm
2VIEW
2MA
Center 925.47 MHz
300 kHz/
Span 3 MHz
Title: TECOM T7406 BW HIGH(Handset)
Date: 7.NOV.2001 09:31:19

6 - NUMBER OF HOPPING FREQUENCY USED

6.1 Standard Applicable

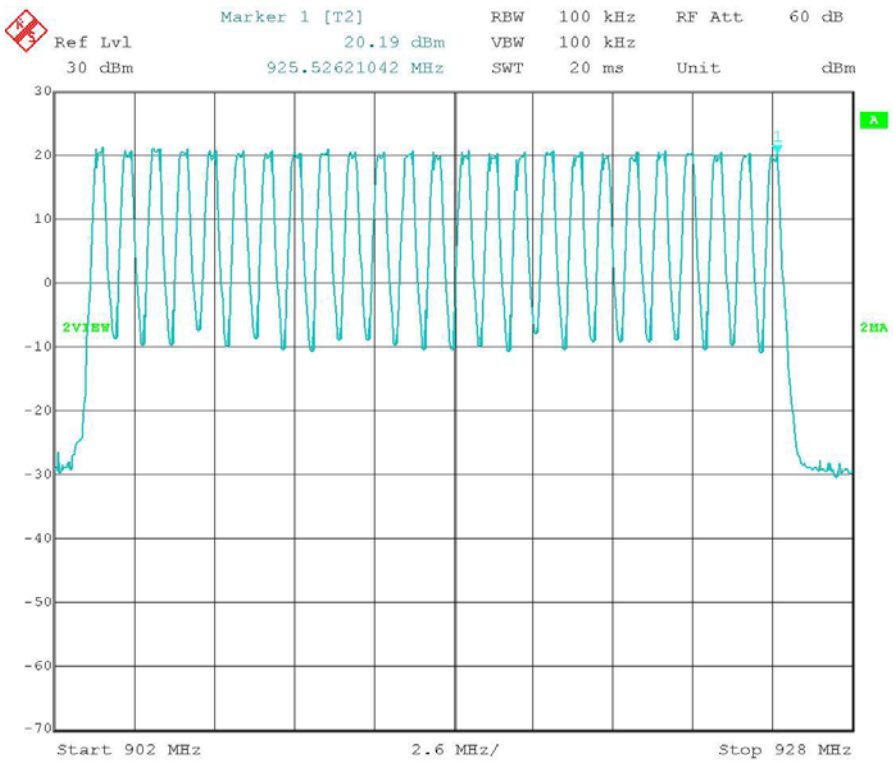
According to §15.247(a)(1)(i), for frequency hopping system operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

6.2 Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

6.3 Measurement Result

Please see the hereinafter pots for more detail.



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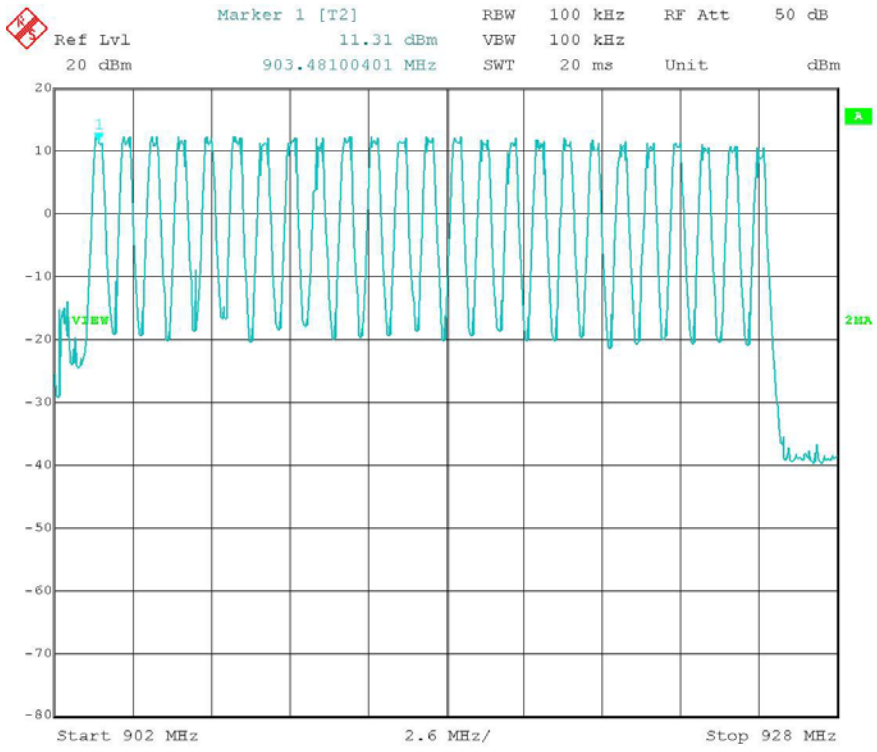
Date: 5.NOV.2001 09:04:06



Title: TECOM T7406 HOPPING CHANNEL(HANDSET)
Date: 5.NOV.2001 06:20:10

7 - HOPPING CHANNEL SEPARATION

7.1 Standard Applicable

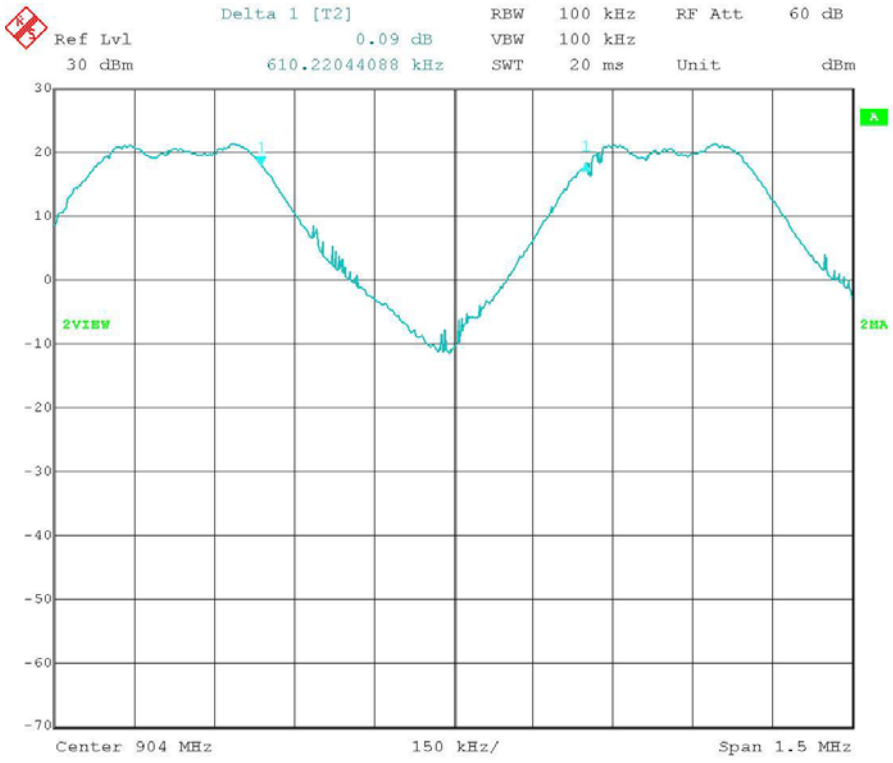
According to §15.247(a)(1), frequency hopping system shall have, hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the Max-Hold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function, and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

7.3 Test Results

Refer to the attached Plots.



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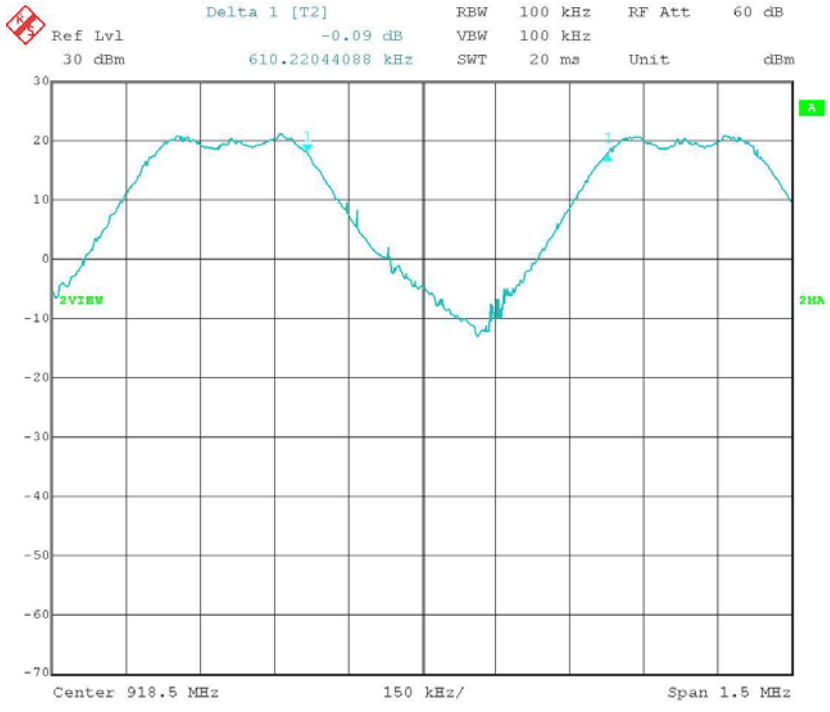

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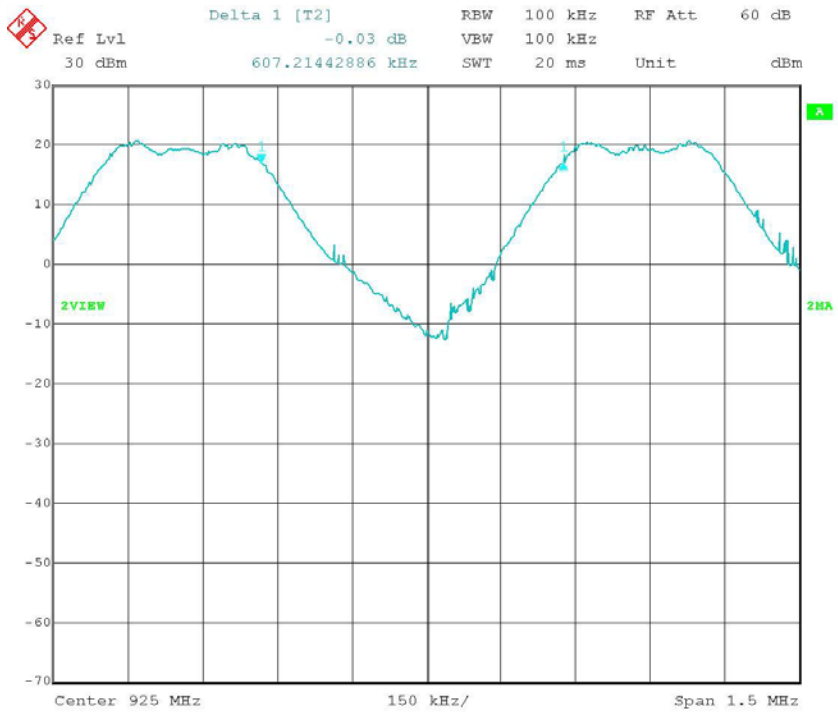

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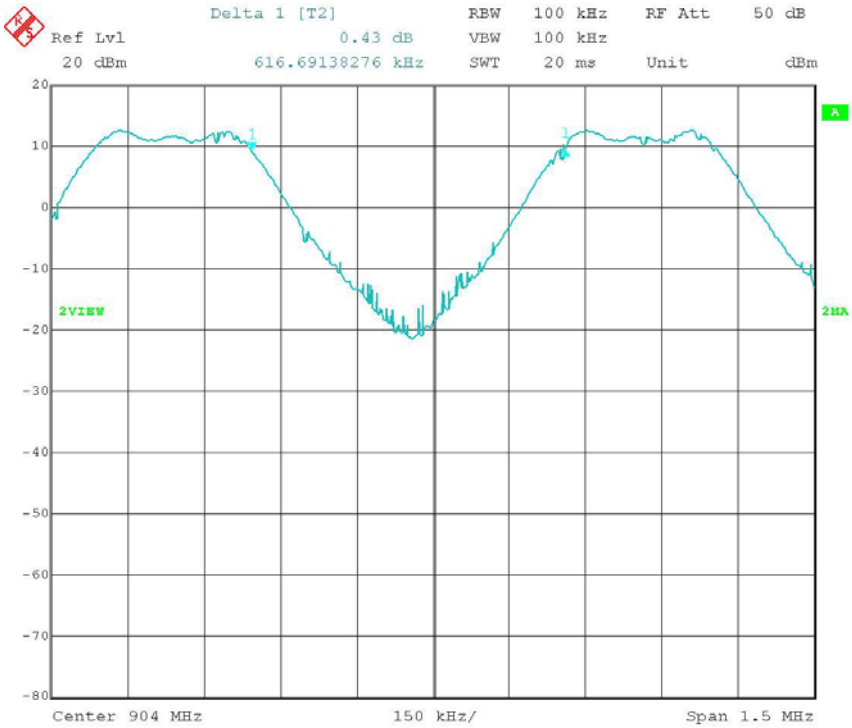

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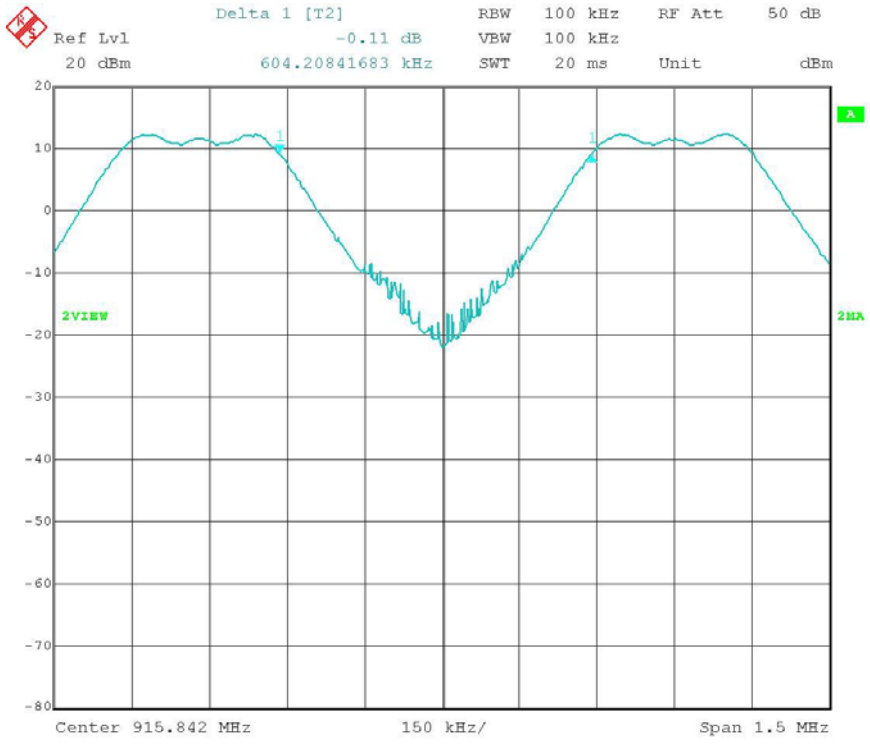

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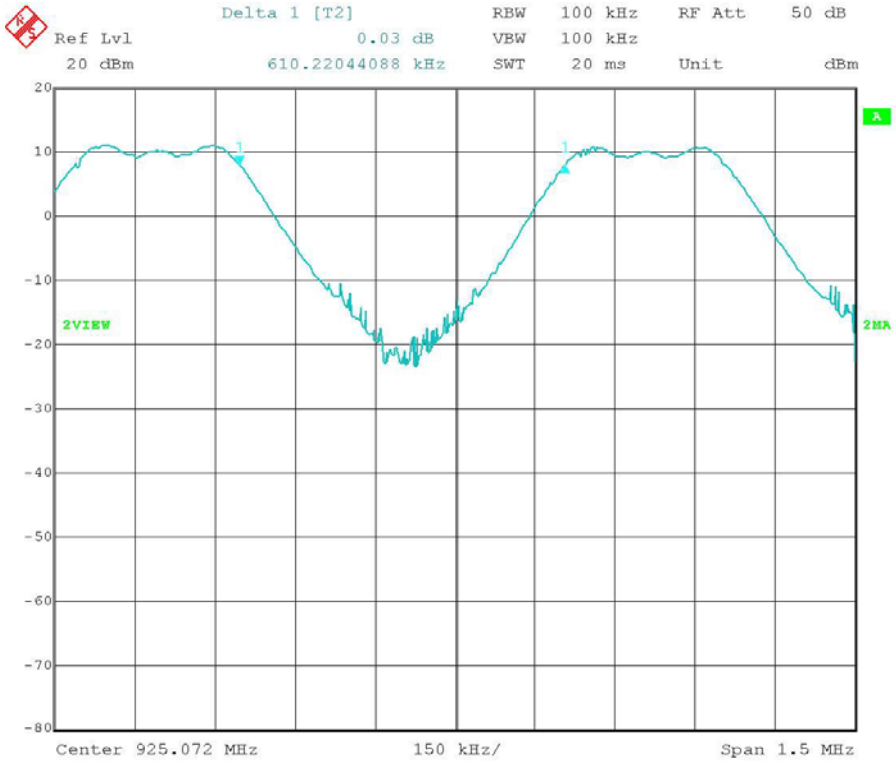


Title: TECOM T7406 ADJ HIGH (Handset)
Date: 5.NOV.2001 07:11:19

8 - 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

8.1 Standard Applicable

According to §15.247(c), if *any* 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a), whichever results in the lesser attenuation.

8.2 Measurement Procedure

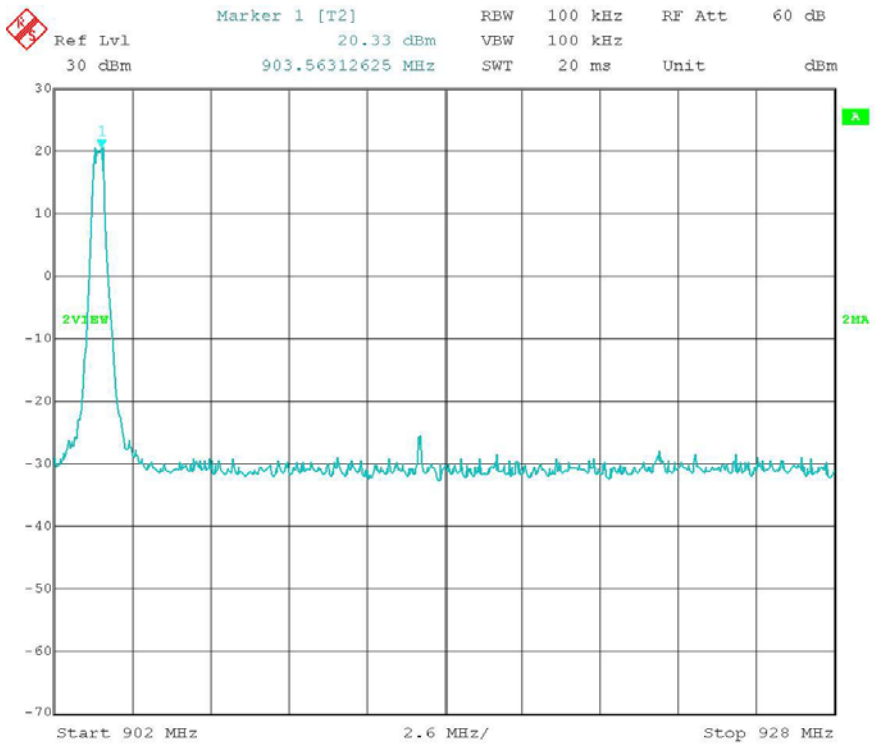
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

8.3 Measurement Results

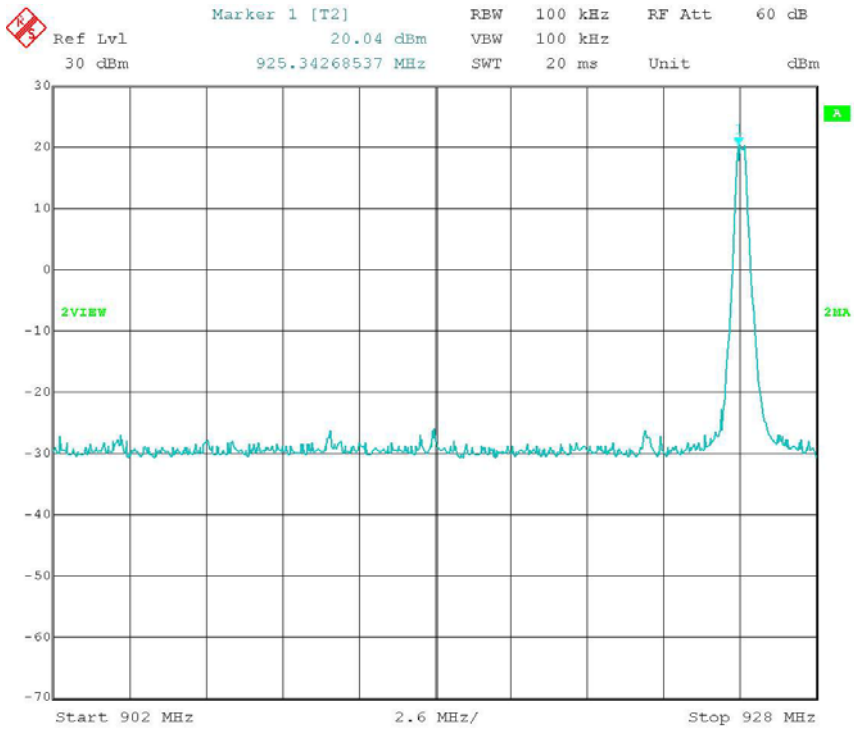
a) Lower Band Edge: All emissions in this 100kHz bandwidth are attenuated more than 20 dB from the carrier.

b) Upper Band Edge: All emissions in this 100kHz bandwidth are attenuated more than 20 dB from the carrier.

Please refer to the hereinafter plots.



Title: TECOM T7406 EDGE LOW (Base)
Date: 5.NOV.2001 08:53:34



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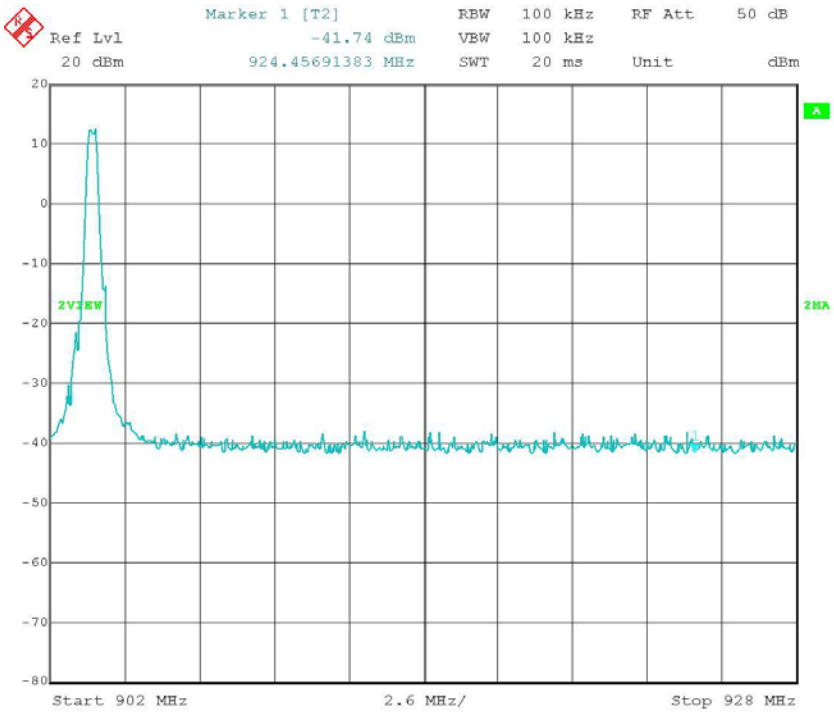
Date: 5.NOV.2001 08:48:12



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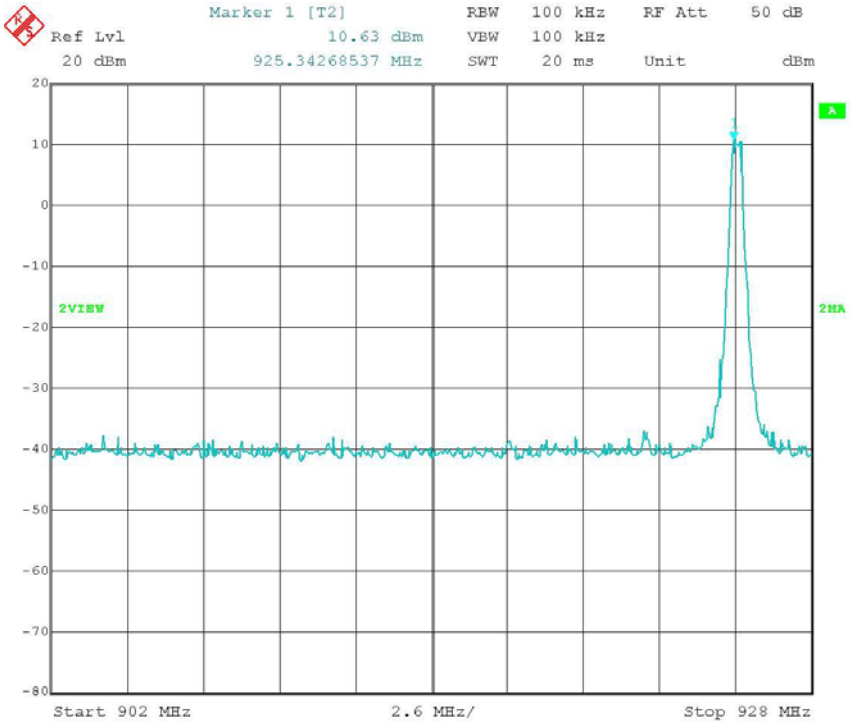
Date: 5.NOV.2001 08:29:11



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Date: 5.NOV.2001 08:32:49