FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8
CERTIFICATION TEST REPORT

FOR

RF TRANSCEIVER

MODEL NUMBER: T-FH256MC-AR

FCC ID: UY6-TFH256MCAR

IC: 6561B-TFH256MCAR

REPORT NUMBER: 11J13611-1

ISSUE DATE: JANUARY 27, 2011

Prepared for
TOHNICHI MFG CO., LTD
2-12, OMORI-KITA 2-CHOME, OTA-KU
TOKYO 143-0016, JAPAN

Prepared by
COMPLIANCE CERTIFICATION SERVICES (UL CCS)
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	01/27/11	Initial Issue	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: TOHNICHI MFG. CO., LTD
2-12, OMORI-KITA 2-CHOME
OTA-KU, TOKYO, 143-0016, JAPAN

EUT DESCRIPTION: RF TRANSCEIVER

MODEL: T-FH256MC-AR

SERIAL NUMBER: T1002301-5

DATE TESTED: JANUARY 21-27, 2011

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	PASS
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	PASS
INDUSTRY CANADA RSS-GEN Issue 3	PASS

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

FRANK IBRAHIM
EMC SUPERVISOR
UL CCS

Tested By:

DAVID GARCIA
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The T-FH256MC AR Transceiver operates in the 2402-2479MHz frequency range with 78 channels of GFSK modulation type in 1MHz spacing channels. It is installed onto TOHNICHI torque wrenches, and sends the tightening completion signal to the TOHNICHI R-FH256 RF Terminal far from the wrench using GFSK wave.

5.2. MAXIMUM OUTPUT FUNDAMENTAL FIELD STRENGTH

Frequency Range (MHz)	Mode	E-field Strength (dBuV/m)
2402 - 2479	GFSK	101.30

The transmitter has maximum output fundamental field strength as follows:

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Chip Antenna with a maximum peak gain of 1 dBi.

5.4. SOFTWARE AND FIRMWARE

EUT transmits continuously if the switches are set to low, mid or high channel.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest E-field strength. The highest E-field strength was at 2440MHz. Radiated Emissions below 1 GHz was performed with the EUT set to transmit at mid channel.

The EUT has been evaluated at X, Y and Z axes. The worst-case orientation was found out to be the X-axis.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

N/A; EUT is a stand-alone device.

I/O CABLES

N/A; EUT is a stand-alone device.

TEST SETUP

The EUT is a stand-alone device and is powered by internal batteries.

6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01176	08/10/10	08/10/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	07/12/10	07/12/11
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06/29/10	06/29/11
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	07/14/10	07/14/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	01/06/10	02/06/11
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	06/25/10	06/25/11

7. LIMITS AND RESULTS

7.1. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

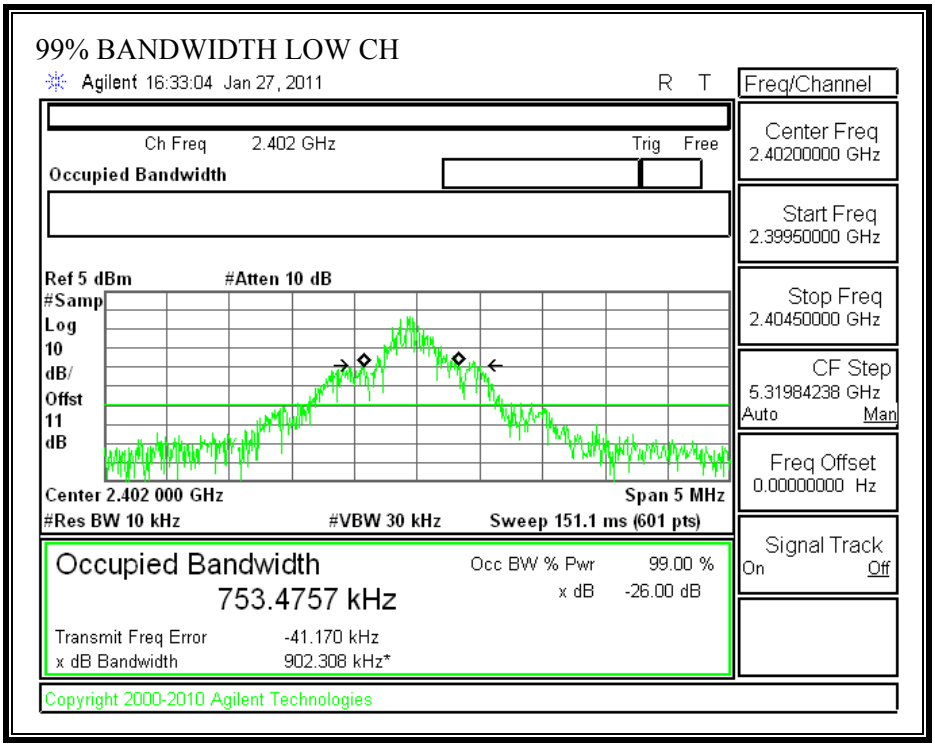
TEST PROCEDURE

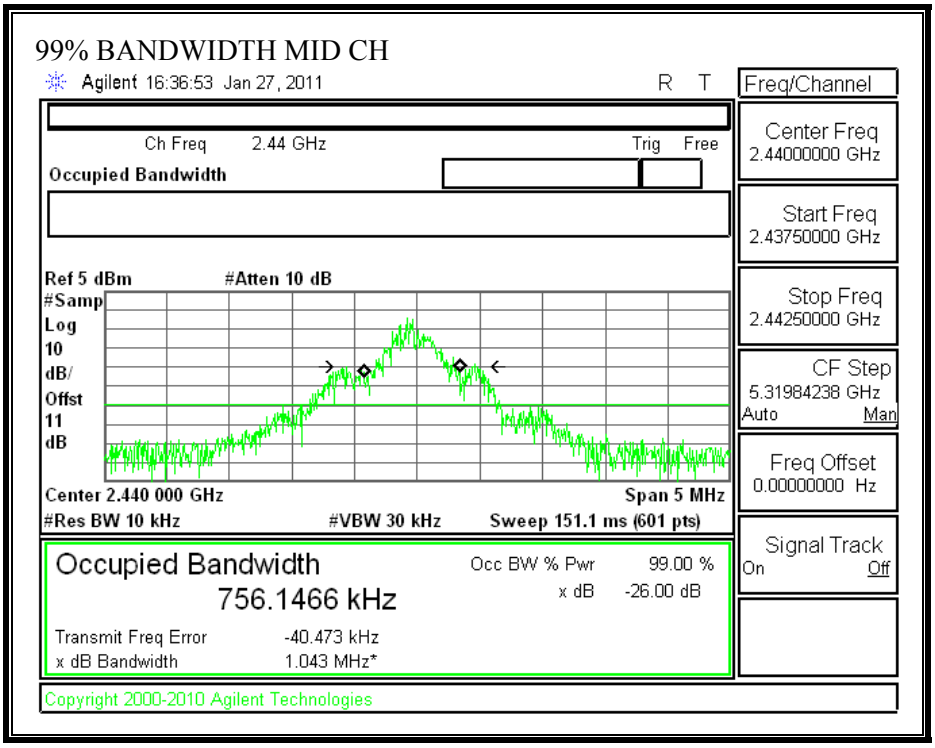
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

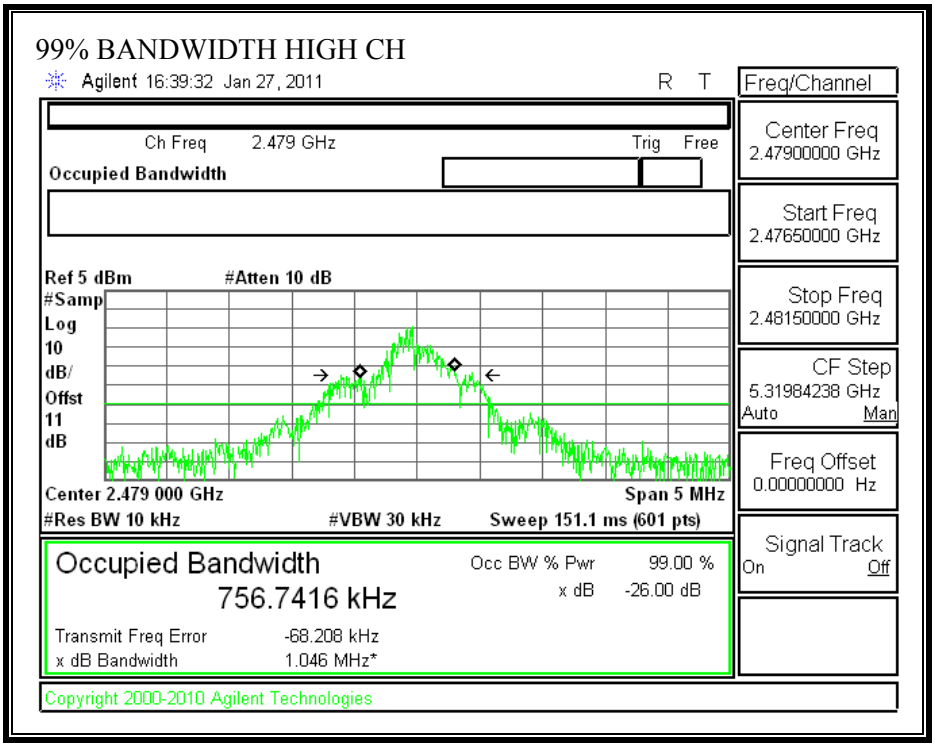
Channel	Frequency (MHz)	99% Bandwidth (KHz)
Low	2402	753.4757
Middle	2440	756.1466
High	2479	756.7416

99% BANDWIDTH





99% BANDWIDTH HIGH CH



7.2. TRANSMITTER RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

IC RSS-210, A2.9
FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.
(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

RESULTS

7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION

COMPLIANCE Certification Services
FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP
561F MONTEREY ROAD, SAN JOSE, CA 95037-9001
PHONE: (408) 463-0885 FAX: (408) 463-0888

Project #:	11J13611
Report #:	11J13611
Date& Time:	01/20/11
Test Engr:	David Garcia
Company:	Tohnichi
EUT Description:	RF Transceiver
Test Configuration :	Stand-alone EUT
Type of Test:	FCC 15.249
Mode of Operation:	Transmitting

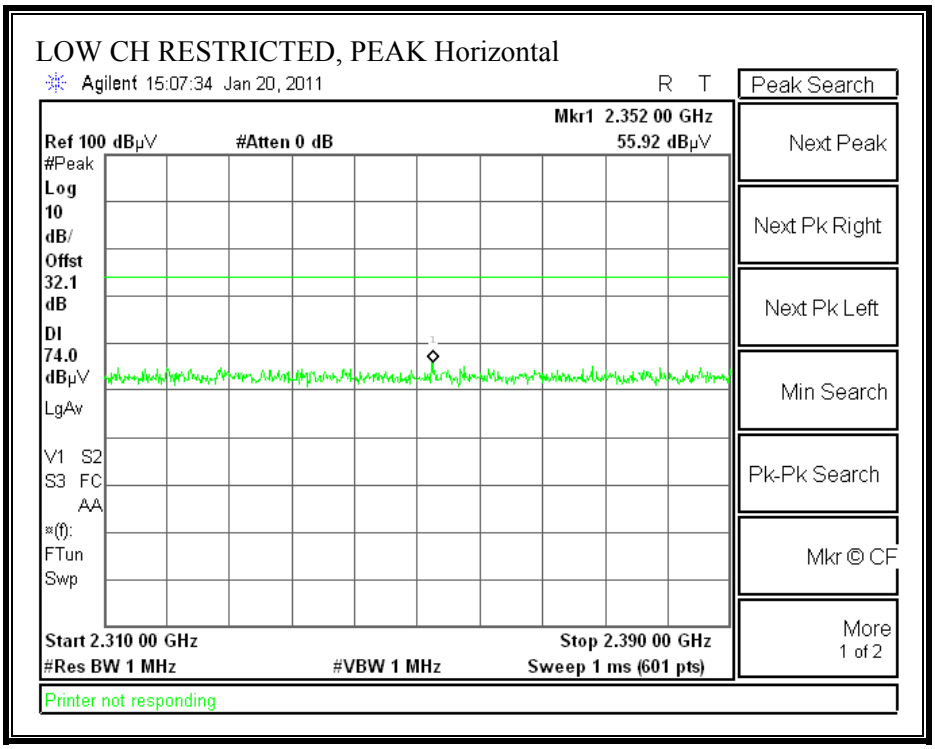
M% = ((t1+t2+t3+…)/T) * 66.83% = 10.86%

Av Reading = Pk Reading + 20*log(M%)
20 * log (M%) = -19.28

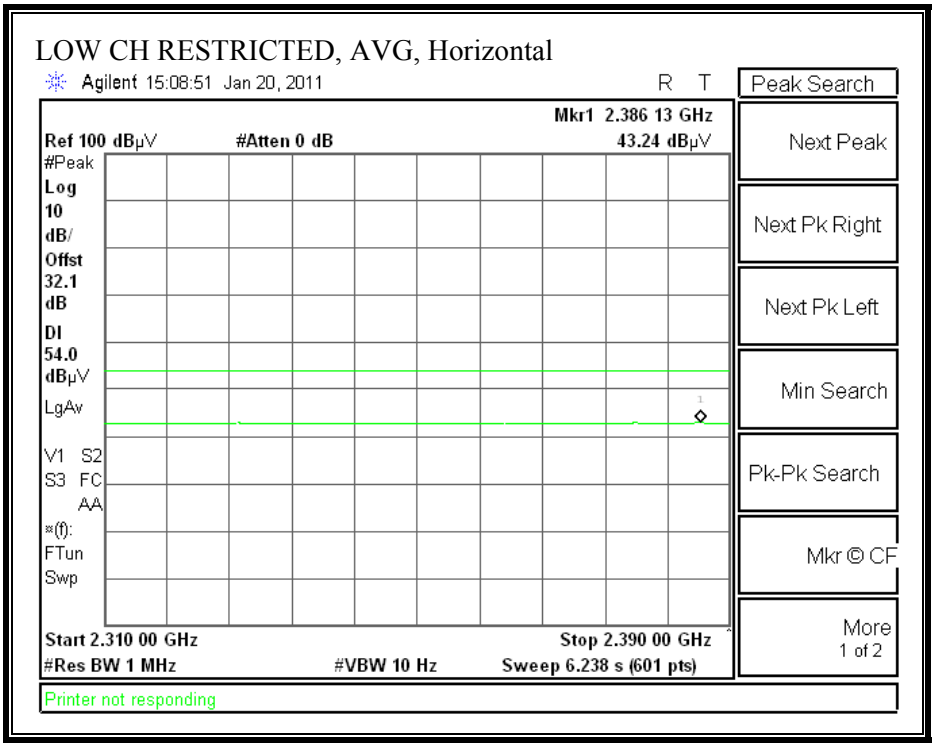
Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Pk Level (dBuV/m)	Av Level (dBuV/m)	Pk Limit FCC_B	Av Limit FCC_B	Pk Margin (dB)	Avg Margin (dB)	Pol (H/V)
X-Position (worst orientation)												
Low Channel												
2402.00	68.60	49.32	28.05	3.84	0.00	100.50	81.21	114.00	94.00	-13.50	-12.79	3mV
2402.00	65.27	45.99	28.05	3.84	0.00	97.17	77.88	114.00	94.00	-16.83	-16.12	3mH
Mid Channel												
2440.00	69.10	49.82	28.16	3.87	0.00	101.13	81.85	114.00	94.00	-12.87	-12.15	3mV
2440.00	66.96	47.68	28.16	3.87	0.00	98.99	79.71	114.00	94.00	-15.01	-14.29	3mH
High Channel												
2479.00	61.38	42.10	28.26	3.91	0.00	93.55	74.26	114.00	94.00	-20.45	-19.74	3mV
2479.00	58.50	39.22	28.26	3.91	0.00	90.67	71.38	114.00	94.00	-23.33	-22.62	3mH

7.2.2. TRANSMITTER RESTRICTED BAND EDGES

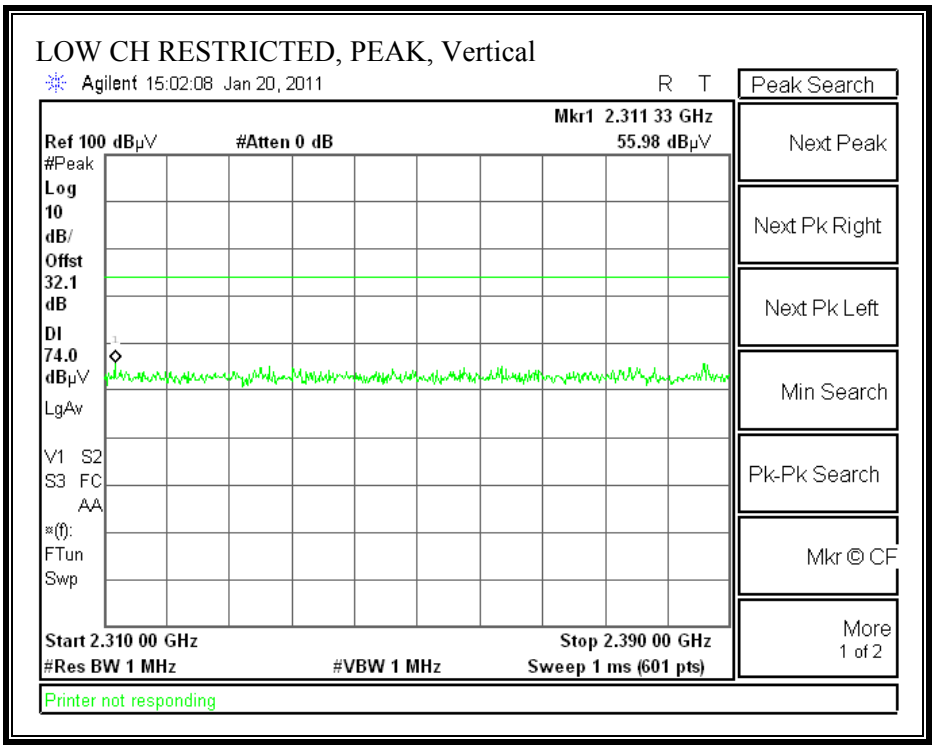
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



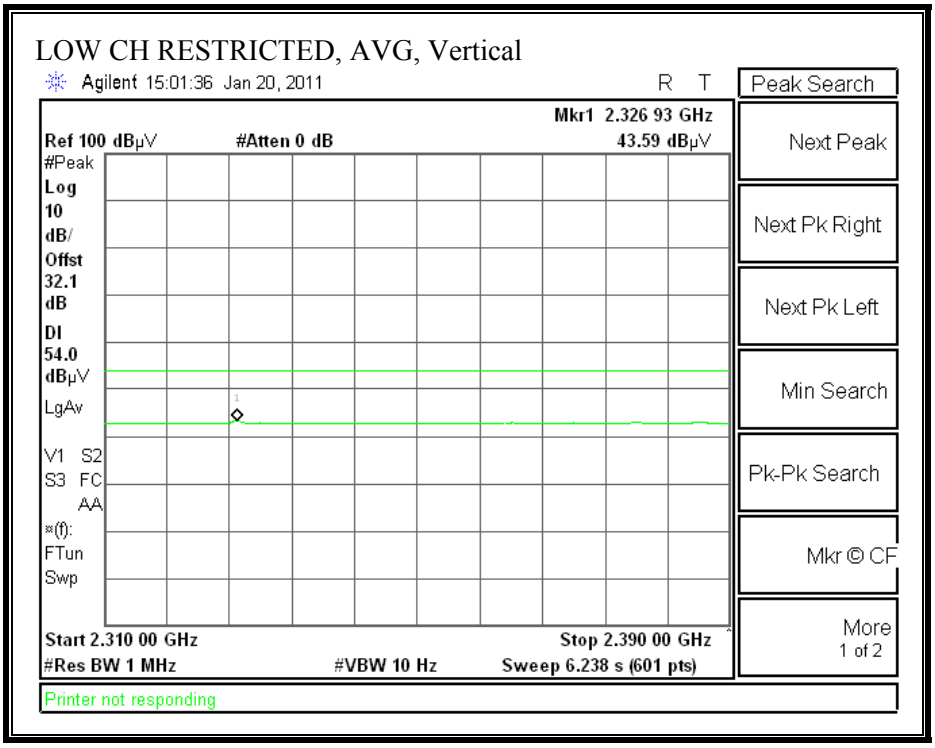
LOW CH RESTRICTED, AVG, Horizontal



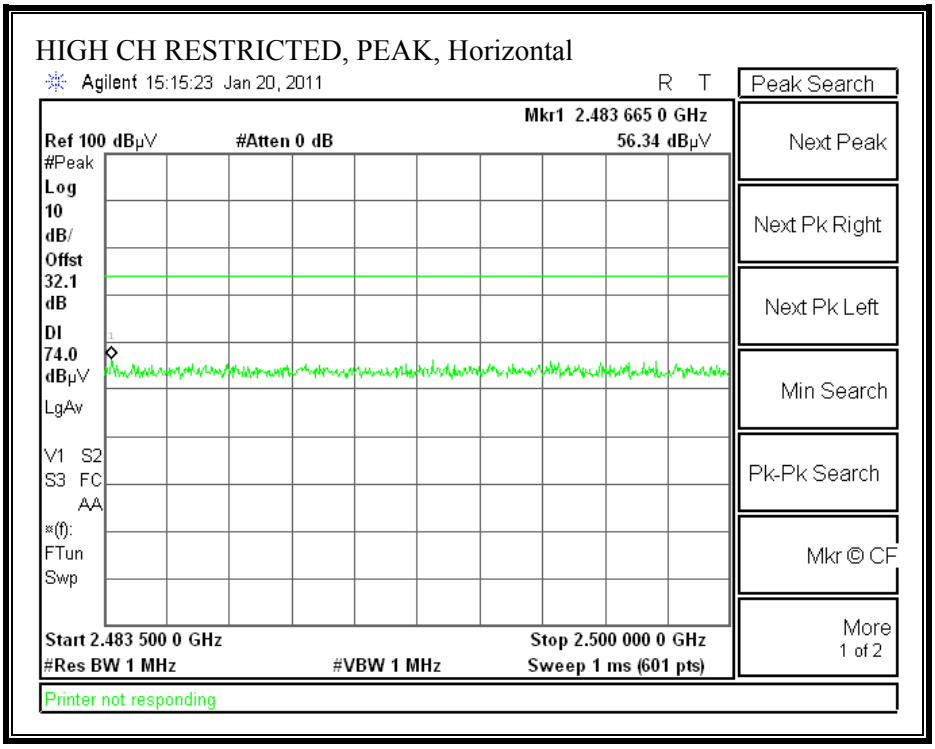
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



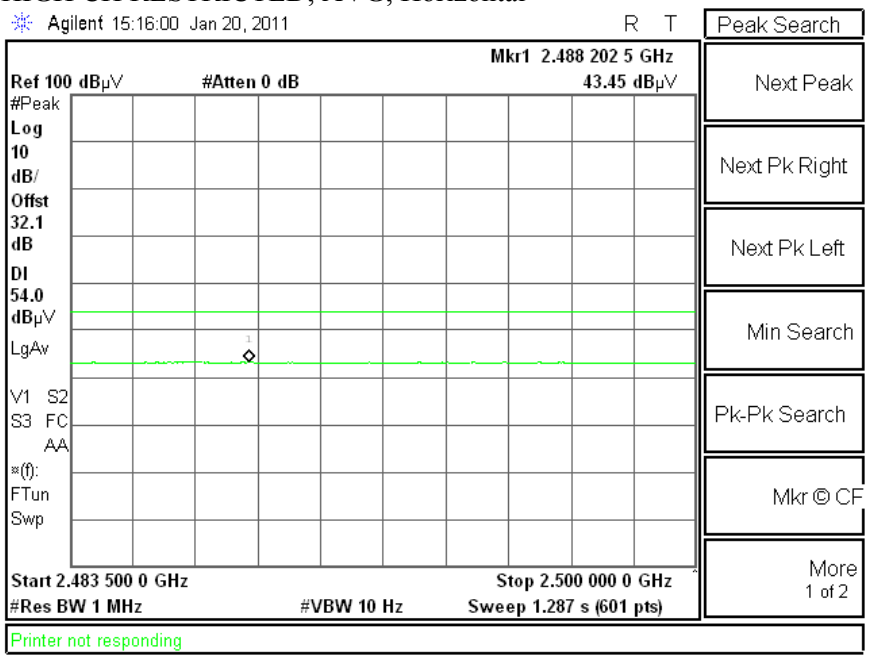
LOW CH RESTRICTED, AVG, Vertical



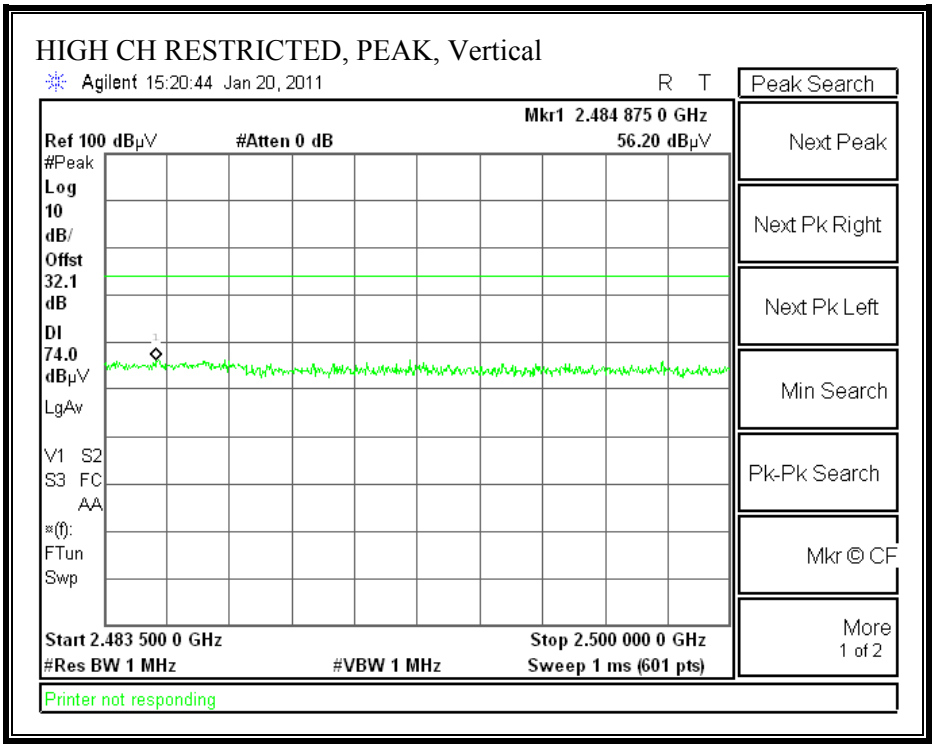
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



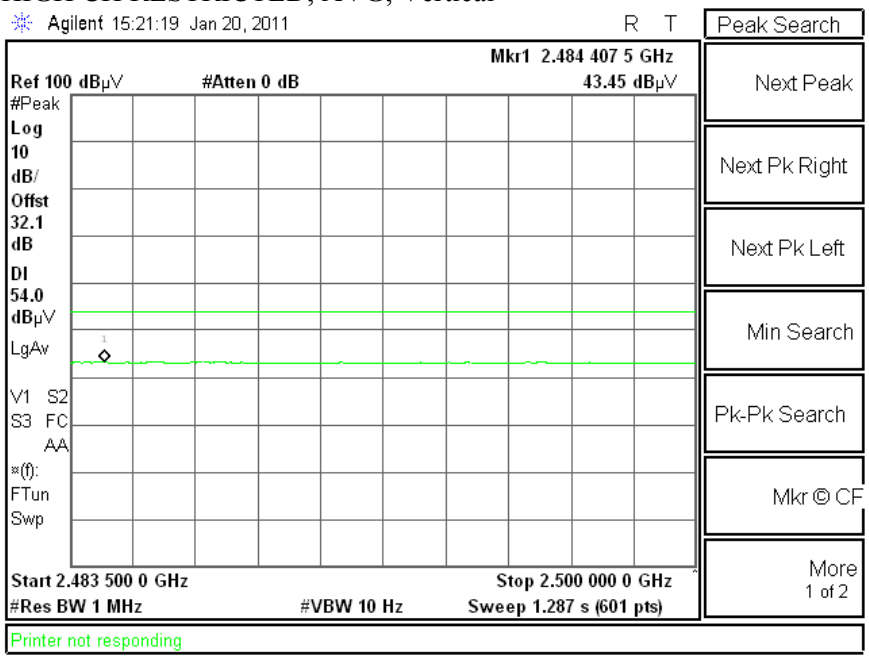
HIGH CH RESTRICTED, AVG, Horizontal



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CH RESTRICTED, AVG, Vertical



7.2.3. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Tohnichi
Project #: 11J13611
Date: 1/20/2011
Test Engineer: David Garcia
Configuration: Eut standalone, runs on battery
Mode: Tx
EUT s/n: T1002301-5

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_2.7GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
LOW CHANNEL, 2402 MHz															
4.804	3.0	42.8	37.7	32.7	5.8	-34.8	0.0	0.5	46.9	41.8	74	54	-27.1	-12.2	H
7.206	3.0	42.8	36.0	35.4	7.2	-34.2	0.0	0.5	51.7	44.9	74	54	-22.3	-9.1	H
4.804	3.0	45.5	40.8	32.7	5.8	-34.8	0.0	0.5	49.6	44.9	74	54	-24.4	-9.1	V
7.206	3.0	42.0	36.3	35.4	7.2	-34.2	0.0	0.5	50.9	45.2	74	54	-23.1	-8.8	V
MID CHANNEL, 2440 MHz															
4.880	3.0	43.6	39.4	32.7	5.8	-34.8	0.0	0.5	47.9	43.7	74	54	-26.1	-10.3	H
7.320	3.0	40.5	31.9	35.5	7.3	-34.1	0.0	0.5	49.7	41.1	74	54	-24.3	-12.9	H
4.880	3.0	43.8	39.7	32.7	5.8	-34.8	0.0	0.5	48.1	44.0	74	54	-25.9	-10.0	V
7.320	3.0	42.5	37.1	35.5	7.3	-34.1	0.0	0.5	51.7	46.3	74	54	-22.3	-7.7	V
HIGH CHANNEL, 2479 MHz															
4.958	3.0	44.5	40.6	32.8	5.9	-34.8	0.0	0.5	48.9	45.0	74	54	-25.1	-9.0	H
7.437	3.0	39.6	31.1	35.6	7.3	-34.1	0.0	0.5	49.0	40.5	74	54	-25.0	-13.5	H
4.958	3.0	49.1	46.7	32.8	5.9	-34.8	0.0	0.5	53.5	51.1	74	54	-20.5	-2.9	V
7.437	3.0	41.5	35.3	35.6	7.3	-34.1	0.0	0.5	50.9	44.7	74	54	-23.1	-9.3	H

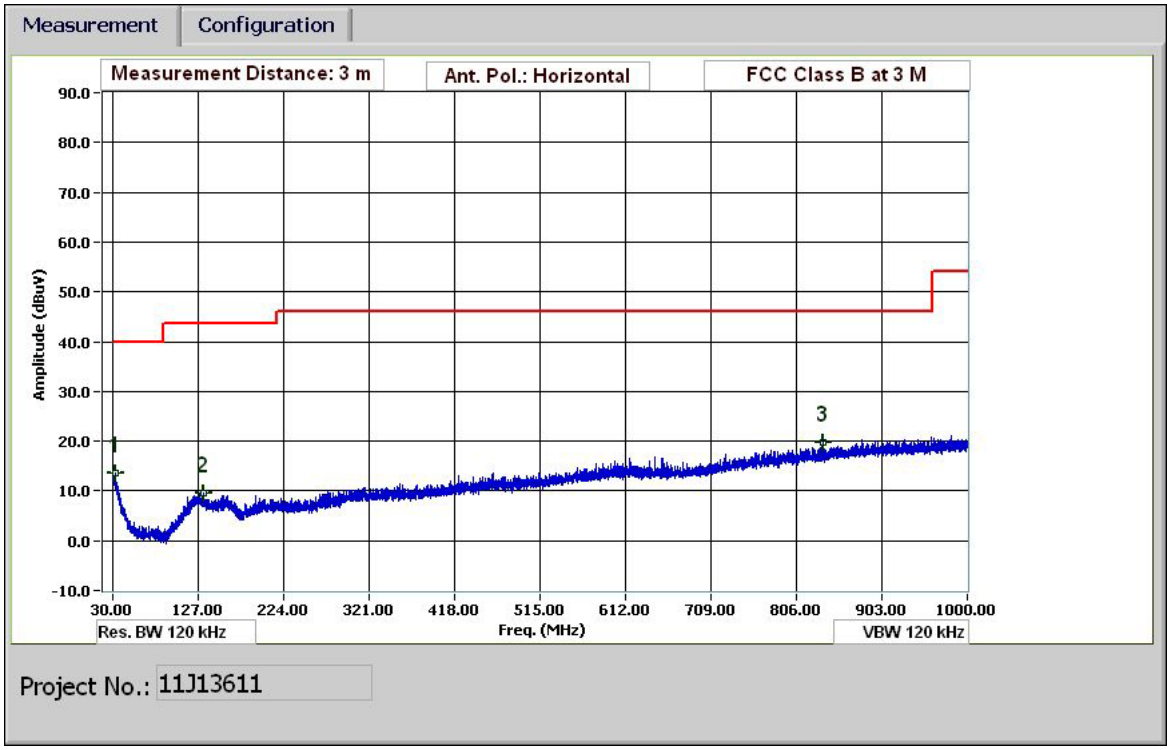
Note: No other emissions were detected above the system noise floor.
Rev. 07.22.09

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.2.4. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (HORIZONTAL)

HORIZONTAL PLOT



HORIZONTAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: David Garcia
Date: 01/20/11
Project #: 11J13611
Company: Tohnichi
Test Target: FCC 15.249
Mode Oper: Tx Mid Channel, X position (worst case)
EUT s/n: TI002301-5

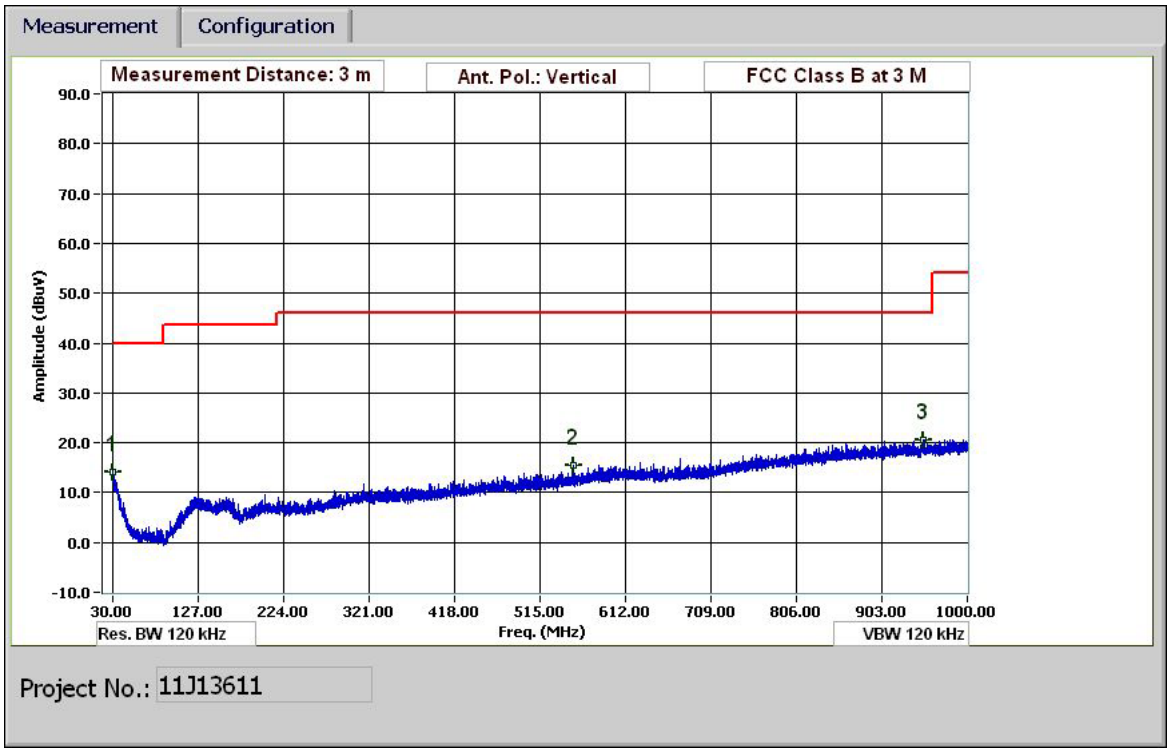
f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
32.64	3.0	22.8	18.7	0.5	28.4	0.0	0.0	13.6	40.0	-26.4	H	P	100.0	0 - 360	Prescan
133.084	3.0	23.0	13.6	1.0	27.9	0.0	0.0	9.6	43.5	-33.9	H	P	100.0	0 - 360	Prescan
836.913	3.0	24.0	21.3	2.6	28.1	0.0	0.0	19.8	46.0	-26.2	H	P	100.0	0 - 360	Prescan

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

SPURIOUS EMISSIONS 30 TO 1000 MHz (VERTICAL)

VERTICAL PLOT



VERTICAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: David Garcia
Date: 01/20/11
Project #: 11J13611
Company: Tohnichi
Test Target: FCC 15.249
Mode Oper: Tx Mid Channel, X position (worst case)
EUT s/n: T1002301-5

f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Filter	Filter Insert Loss
AF	Antenna Factor	Corr.	Calculated Field Strength
CL	Cable Loss	Limit	Field Strength Limit

Margin Margin vs. Limit

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
30.48	3.0	22.4	19.7	0.5	28.4	0.0	0.0	14.2	40.0	-25.8	V	P	100.0	0 - 360	Prescan
553.342	3.0	24.2	17.7	2.1	28.6	0.0	0.0	15.4	46.0	-30.6	V	P	100.0	0 - 360	Prescan
950.678	3.0	23.0	22.4	2.8	27.7	0.0	0.0	20.5	46.0	-25.5	V	P	100.0	0 - 360	Prescan

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

7.3. RECEIVER RADIATED EMISSION

TEST PROCEDURE

ANSI C63.4

LIMIT

IC RSS-210
FCC 15.249

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

RESULTS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Tohnichi
Project #: 11J13611
Date: 1/20/2011
Test Engineer: David Garcia
Configuration: Eut standalone, runs on battery
Mode: Rx, Mid Channel: 2440 MHz
EUT s/n: T1002301-5

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.030	3.0	45.4	32.4	24.6	2.4	-38.2	0.0	0.0	34.2	21.2	74	54	-39.8	-32.8	V
1.260	3.0	44.5	31.3	25.3	2.7	-37.9	0.0	0.0	34.6	21.4	74	54	-39.4	-32.6	V
1.023	3.0	46.0	32.5	24.5	2.4	-38.2	0.0	0.0	34.7	21.2	74	54	-39.3	-32.8	H
1.186	3.0	45.6	31.6	25.1	2.6	-38.0	0.0	0.0	35.3	21.3	74	54	-38.7	-32.7	H

Note: No other emissions were detected above the system noise floor.
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f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		