

5.5. Maximum Peak Output Power - Conducted -

5.5.1 Test Procedure [FCC 15.247(b)(1), 15.31(e), IC RSS-210 A8.4(2)]

The peak power is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- RBW=3MHz, VBW=3MHz, Span=10MHz, Sweep=auto

The EUT was set to operate with following conditions.

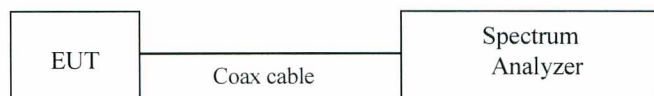
- No hopping [ch 1 (low), ch 40 (mid) and ch 79 (high)]

The test mode of EUT is as follows.

- Test mode in Battery operation. (new)

5.5.2 Test Instruments and Measurement Setup

Equipment	Company	Model Number	Serial Number
Spectrum Analyzer	Agilent Technologies	E 4405 B	US40240628
Coax cable: - Spectrum Analyzer <=> EUT	N/A	Length: 5cm Loss: 0.1dB	N/A



5.5.3 Limit of Maximum Peak Output Power

0.125 watt or less.

5.5.4 Measurement Result

[Test mode (new Battery)]

channel	Center Frequency [MHz]	Factor [dB]	Reading [dBm]	Antenna Gain of EUT [dBi]	Level [dBm]	Peak Output Power [mW]	Limit [mW]	PASS /FAIL
1	2402.0	0.1	-0.324	1.2	0.976	1.252	≤ 125	PASS
40	2441.0	0.1	-0.841	1.2	0.459	1.111	≤ 125	PASS
79	2480.0	0.1	-0.964	1.2	0.336	1.080	≤ 125	PASS

Calculation :

Reading (dBm) + Factor (dB) + Antenna Gain of EUT (dBi) = Level (dBm)

$10\log P = \text{Level (dBm)}$

$P = 10^{(\text{Maximum Peak Output Power (dBm)} / 10)} (\text{mW})$

5.5.5 Trace Data

As for the chart of the observed RF profiles, refer to **Appendix E**.

Test Personnel:

Tester Signature:

Tester Name:


Hiroaki Suzuki

Date : Jun. 29, 2006
Temperature : 24.0 [°C]
Humidity : 51.0 [%]
Test place : Shielded room

5.6 Band Edge Compliance of RF Conducted Emissions

5.6.1 Test Procedure [FCC 15.247 (c), IC RSS-210 A8.5]

The Band Edge is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to :

- RBW=100KHz, VBW=100KHz, Span=Arbitrary setting, Sweep=Auto

The EUT was set to operate with following conditions.

- No hopping [ch 1 (low) and ch 79 (high)]

The test mode of EUT is as follows.

- Test mode

5.6.2 Test Instruments and Measurement Setup

Equipment	Company	Model Number	Serial Number
Spectrum Analyzer	Agilent Technologies	E7405A	US41160344
Coax cable: - Spectrum Analyzer <=> EUT	N/A	Length: 5cm Loss: 0.1dB	N/A



5.6.3 Limit of Band-edge Compliance of RF Conducted Emissions

In any 100KHz bandwidth outside the frequency band the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power.

5.6.4 Measurement Results of Band-edge

[No hopping]

Channel	Frequency [MHz]	RF power Level [dBm]	Band-edge Frequency [MHz]	Band-edge Level [dBm]	Difference Level [dBm]	Limit [dBm]	PASS / FAIL
1	2402.0	-3.81	2400.50	-47.70	43.89	At least 20dB below from peak of RF.	PASS
79	2480.0	-3.78	2481.55	-48.49	44.71	At least 20dB below from peak of RF.	PASS

5.6.5 Trace Data

As for the chart of the observed RF profiles, refer to **Appendix F**.

Test Personnel:

Tester Signature:

Tester Name:

Hiroaki Suzuki

Date : Jun. 29, 2006
Temperature : 24.0 [°C]
Humidity : 51.0 [%]
Test place : Shielded room

5.7. Spurious Emissions - Conducted -

5.7.1 Test Procedure [FCC 15.247(c), IC RSS-210 A8.5, RSS-Gen 4.7&4.8]

The spurious emissions (Conducted) is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- RBW=100kHz, VBW=300kHz, Span=Arbitrary setting, Sweep=Auto

The EUT was set to operate with following conditions.

- No hopping [ch 1 (low), ch 40 (mid) and ch 79 (high)]

The test mode of EUT is as follows.

- Test mode

5.7.2 Test Instruments and Measurement Setup

Equipment	Company	Model Number	Serial Number
Spectrum Analyzer	Agilent Technologies	E 4405 B	US40240628
Coax cable: - Spectrum Analyzer <=> EUT	N/A	Length: 5cm Loss: 0.1dB	N/A



5.7.3 Limit of Spurious Emissions - Conducted -

In any 100KHz bandwidth outside the frequency band the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power.

5.7.4 Measurement Results of Spurious Emissions - Conducted -

[No hopping]

Channel	Frequency [MHz]	Limit [dBm]	Results Chart	PASS / FAIL
1	2402.0	At least 20dB below from peak of RF.	Appendix H	PASS
40	2441.0	At least 20dB below from peak of RF.	Appendix H	PASS
79	2480.0	At least 20dB below from peak of RF.	Appendix H	PASS

5.7.5 Trace Data

As for the chart of the observed RF profiles, refer to **Appendix G**.

Test Personnel:

Tester Signature:

Tester Name:

Hiroaki Suzuki
Hiroaki Suzuki

Date : Jun. 29, 2006

Temperature : 24.0 [°C]

Humidity : 51.0 [%]

Test place : Shielded room

5.8. Spurious Emissions - Radiated - (9kHz – 25GHz)

5.8.1 Test Procedure [FCC 15.205/209/247(c), IC RSS-210 A8.5, RSS-Gen 4.7&4.8]

Radiated emission measurements are performed at 3m distance with the broadband antenna (Loop antenna, Biconical antenna, log-periodic antenna and double-ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1 to 4 meters and stopped at height producing the maximum emission. As for the Loop antenna, it is positioned with its plane vertical, and the center of the Loop is 1.0meter above the ground plane. Frequency Range: 9kHz –1GHz is scanned and investigated with the test receiver, and above 1GHz, with the spectrum analyzer. The detector function of the test receiver is set to CISPR Quasi-peak mode and the bandwidth is set to 120kHz. Peak and average detectors are used for measurements above 1GHz. The bandwidth of the spectrum analyzer is set to 1MHz. The EUT and support equipment are placed on a 1 meter x 1.5meter surface, 0.8meter height styrene form table. The turntable is rotated by 360 degrees and stopped at azimuth of producing the maximum emission. Interconnecting cables, which hanging closer than 40cm to the horizontal metal ground plane are bundled its excess in center. The highest fundamental frequency generated in the EUT is 2402-2480MHz, therefore the frequency was investigated up to 25GHz, as specified in CFR section 15.33, and at least six highest emissions are reported. The test results represent the worst-case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation. Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

5.8.2 Test Instruments and Measurement Setup

Spurious Emissions Test Instrumentation

[Testing below 30MHz]

Equipment	Company	Model Number	Serial Number
Spectrum Analyzer (100Hz-1.5GHz)	Agilent Technologies	8568B	2732A03847
Test Receiver (9kHz-30MHz)	ROHDE&SCHWARZ	ESHS10	835499/012
Loop Antenna	ROHDE&SCHWARZ	HFH2-Z2	892246/010
Coaxial cable	N/A	RG213	N/A
	Fujikura	5D-2W/1m	YTCRFC#3R,3C-001
Coaxial Switch	Anritsu	MP59B	6200331883

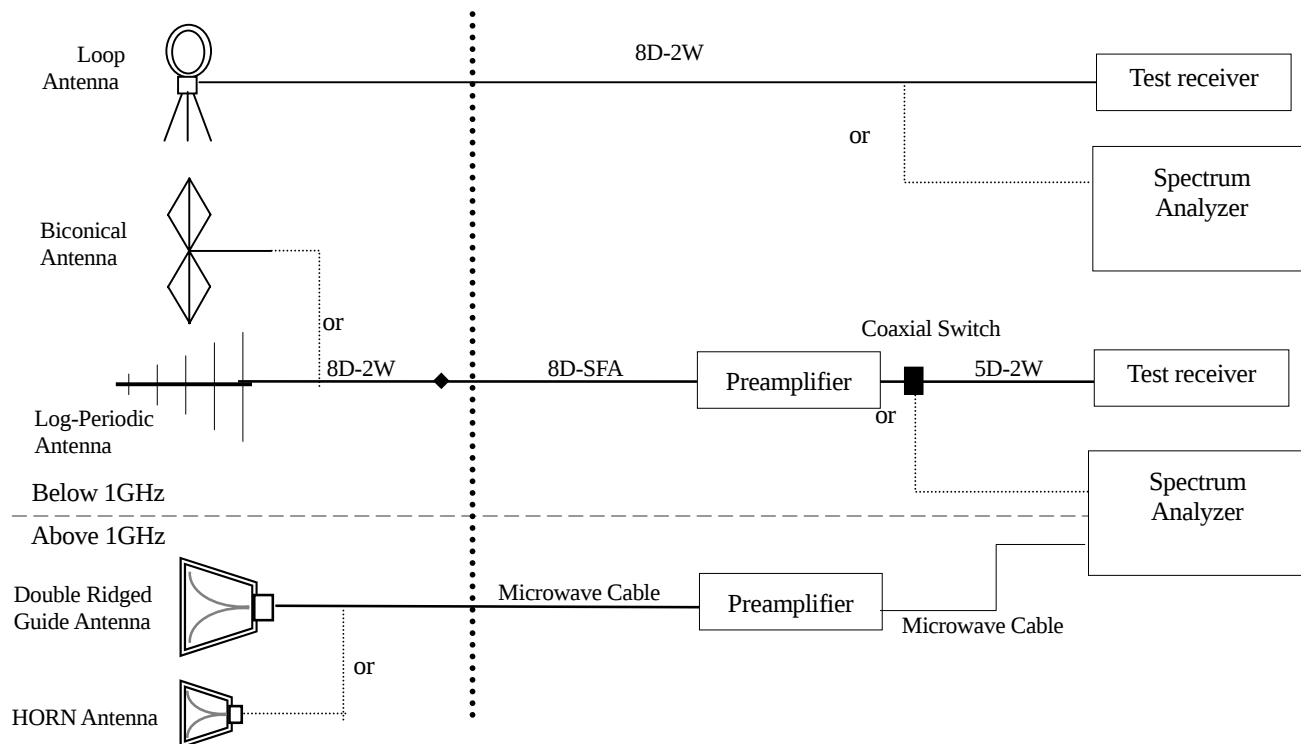
[Testing 30MHz-1GHz]

Equipment	Company	Model Number	Serial Number
Spectrum Analyzer (100Hz-1.5GHz)	Agilent Technologies	8568B	2732A03847
Preamplifier (100kHz-1.2GHz)	NOGAWA	5331	060110
Test Receiver (25MHz-1.5GHz)	Kyoritsu Electrical Works, Ltd.	KNM-5002	4N-200-5
	Kyoritsu Electrical Works, Ltd.	KCV-6002	4-288-2
Biconical Antenna	Schwarzbeck	VHA9103/BBA9106	1488
Log Periodic Antenna	Schwarzbeck	UHALP9108A	0398
Coaxial cable	Fujikura	8D-SFA/15m	YTCRFC#3R-001
		8D-SFA/15m	YTCRFC#3R-002
		8D-2W/8m	YTCRFC#3R-003
		5D-2W/1m	YTCRFC#3R,3C-001
Coaxial Switch	Anritsu	MP59B	6200331883

[Testing above 1GHz]

Equipment	Company	Model Number	Serial Number
Spectrum Analyzer	ADVANTEST	R3271A	65050042
Preamplifier	Agilent Technologies	8449B	3008A01008
Double Ridged Guide Antenna	EMCO	3115	9408-4327
HORN Antenna	Schwarzbeck	BBHA9170	BBHA9170189
Microwave cable	Suhner	SUCOFLEX 104/15m	108014/4
		SUCOFLEX 104/1m	108015/4

Test configuration for Spurious emissions



5.8.3 Limit of Spurious Emission Measurement

Frequency [MHz]	Field Strength	
	[uV/m]	[dBuV/m]
0.009 – 0.490	2400 / F [kHz]	20logE [uV/m]
0.490 – 1.705	24000 / F [kHz]	20logE [uV/m]
1.705-30	30	29.5
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level [dBuV/m] = 20 log Emission [uV/m]
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

5.8.4 Sample of field strength calculation

Spurious Emission $\text{dB}\mu\text{V/m} = 20\log_{10}(\mu\text{V/m})$

Limit @147.6MHz = 150 $\mu\text{V/m}$ = 43.5dB $\mu\text{V/m}$
Reading = 42.8dB μV Ant. Factor + Cable Loss - Amp. Gain = 14.2 + 3.0 - 30.0 = -12.8dB Total = 42.8 - 12.8 = 30.0dB $\mu\text{V/m}$ Margin = 43.5 - 30.0 = <u>13.5dB</u>

5.8.5 Measurement Results

The minimum margins to the limits are as follows:

Channel	Frequency [MHz]	Pol. [H/V]	Antenna Height [m]	Table Degree [deg.]	Margin [dB]	Detector
1	4803.99	H	1.2	150	4.2	Average
40	4881.99	H	1.0	150	4.4	Average
79	4960.03	H	1.0	115	4.0	Average

Note:

- 1.Emission Level (Margin) = Limit – [Reading + Factor (Antenna + Cable - Amp)]
- 2.The 6 highest emissions relative to the limits are reported.
- 3.The EUT was found to comply to the limits of FCC Part15 Subpart C and RSS-210 with a margin of 4.0dB.
4. No emissions were detected in frequency range 9KHz to 30MHz at the 3 meters distance.

5.8.6 Data

As for the data of the observed RF profiles, refer to **Appendix H**.

5.9. Restricted Band of Operation

5.9.1 Test Procedure [FCC 15.205, 15.209, 15.247(c), IC RSS-210 A8.5]

The peak power is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- RBW=1MHz, VBW=1MHz, Span=Arbitrary setting, Sweep=auto

The EUT was set to operate with following conditions.

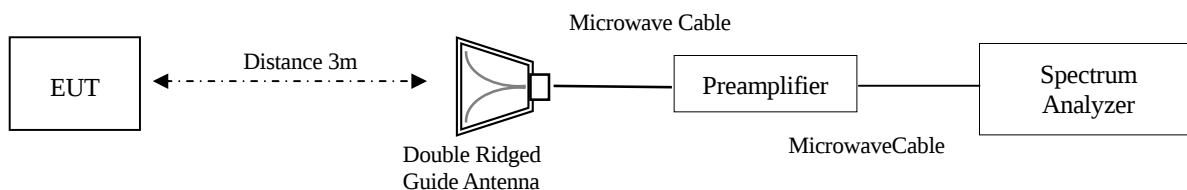
- Hopping

The test mode of EUT is as follows.

- Test mode

5.9.2 Test Instruments and Measurement Setup

Equipment	Company	Model Number	Serial Number
Spectrum Analyzer	ADVANTEST	R3271A	65050042
Preamplifier	Agilent Technologies	8449B	3008A01008
Double Ridged Guide Antenna	EMCO	3115	9408-4327
Microwave cable	Suhner	SUCOFLEX 104/15m SUCOFLEX 104/1m	108014/4 108015/4



5.9.3 Limit of Restricted Band of Operation

Emission at the boundary of the restricted band provided by 15.205 shall be lower than 15.209 limit.

5.9.4 Measurement Result

Frequency [MHz]	Pol. [H/V]	Reading [dBuV/m]		Factor [dB]	Emission Level [dBuV/m]		Limit [dBuV/m]		Margin [dB]		PASS / FAIL
		Peak	Ave.		Peak	Ave.	Peak	Ave.	Peak	Ave.	
2390.0	H	44.9	34.5	-2.0	42.9	32.5	74.0	54.0	31.1	21.5	PASS
2390.0	V	45.1	34.4	-2.0	43.1	32.4	74.0	54.0	30.9	21.6	PASS
2483.5	H	56.1	52.0	-1.3	54.8	50.7	74.0	54.0	19.2	3.3	PASS
2483.5	V	52.3	47.8	-1.3	51.0	46.5	74.0	54.0	23.0	7.5	PASS

5.9.5 Trace Data

As for the chart of the observed RF profiles, refer to **Appendix I**.

Test Personnel:

Tester Signature:

Tester Name:


Hiroaki Suzuki

Date : Jun. 28, 2006
Temperature : 25.6 [°C]
Humidity : 64.6 [%]
Test place : Site 3

5.10. Transmitter Power Spectral Density

5.10.1. Test Procedure [FCC 15.247(d)/247(f), IC RSS-210 A8.2(2)]

The peak power density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

RBW= 3KHz, VBW=10KHz, Span=300kHz, Sweep = 100 sec.

5.10.2 Test Instruments and Measurement Setup

Equipment	Company	Model Number	Serial Number
Spectrum Analyzer	Agilent Technologies	E7405A	US41160344
Coax cable: - Spectrum Analyzer <=> EUT	N/A	Length: 5cm Loss: 0.1dB	N/A



5.10.3 Limit of Transmitter Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band.

5.10.4 Measurement Results

Ch No.	Frequency [MHz]	Reading [dBm]	Factor (Cable loss) [dB]	Level [dBm]	Limit [dBm]	Margin [dB]
1	2402.0	-14.69	0.1	-14.59	8.0	22.59
40	2441.0	-14.99	0.1	-14.89	8.0	22.89
79	2480.0	-17.34	0.1	-17.24	8.0	25.24

Note:

1. Transmitter Power Spectral Density Level (Margin) = Limit – [Reading + Factor (Cable)]

5.10.5 Trace Data

As for the chart of the observed RF profiles, refer to **Appendix J**.

Test Personnel:

Tester Signature:

Tester Name:

Hiroaki Suzuki
Hiroaki Suzuki

Date : Jun. 29, 2006

Temperature : 24.0 [°C]

Humidity : 51.0 [%]

Test place : Shielded room

5.11. Antenna requirement

According to FCC section 15.203., an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The antenna is pattern antenna mounted inside of the EUT. Therefore, the EUT complies with the antenna requirement of FCC section 15.203.

6. Uncertainty of measurement

Expanded uncertainties stated were calculated with a coverage Factor k=2.

Please note that these results are not taken into account when determining compliance or non-compliance with test result.

Test item	Measurement uncertainty
Conducted emission at mains port (150kHz - 30MHz)	±2.6dB
Radiated emission (9kHz - 30MHz)	±4.1dB
Radiated emission (30MHz - 1000MHz)	±4.1dB
Radiated emission (1000MHz – 26.5GHz)	±3.6dB

7. Laboratory description

1. Location: ZACTA Technology Corporation Yonezawa Testing Center

4149-7 Hachimanpara 5-chome Yonezawa-shi Yamagata 992-1128 Japan

Phone: +81-238-28-2880 Fax: +81-238-28-2888

2. Facility type:

Site name: Site 1, Site 2 and Site 3 - Total 3 sites.

Site type: Whether protected site

*3m/10m Radiated emission & Conducted emission testing can be performed on each site

3m anechoic chamber

Shielded room

3. Facility filing information:

1) NVLAP accreditation: NVLAP Lab. code: 200306-0

2) Industry Canada Oats site filing: Pursuant to RSS 212, Issue 1(Provisional)

Site name	Sites on file: Oats 3m/10m	Filing date (Terms of validity: 3 years)
Site 1	4224-1	January 11, 2005
Site 2	4224-2	January 11, 2005
Site 3	4224-3	January 11, 2005

3) VCCI site filing: Pursuant to V-5/2003.04 VCCI regulations for registration of measurement facilities

Site name	Radiated emission registration No.	Conducted emission registration No.	Duration of registration
Site 1	R-136	C-132	September 30, 2006
Site 2	R-137	C-133	September 30, 2006
Site 3	R-138	C-134	September 30, 2006

4) ETL SEMKO authorization:

Authorized as an EMC test laboratory.

5) TUV Rheinland authorization:

ZACTA Technology Corp.
FCC 15C Rev.2.0

FCC ID:POO-WC45

Authorized as an EMC test laboratory.

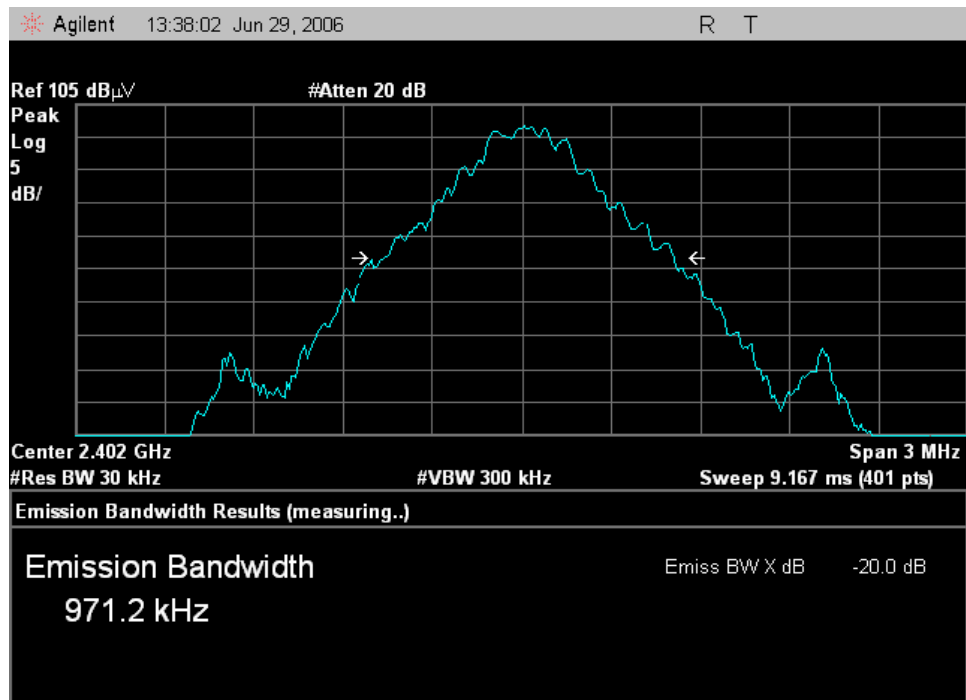
Appendix A

Appendix A

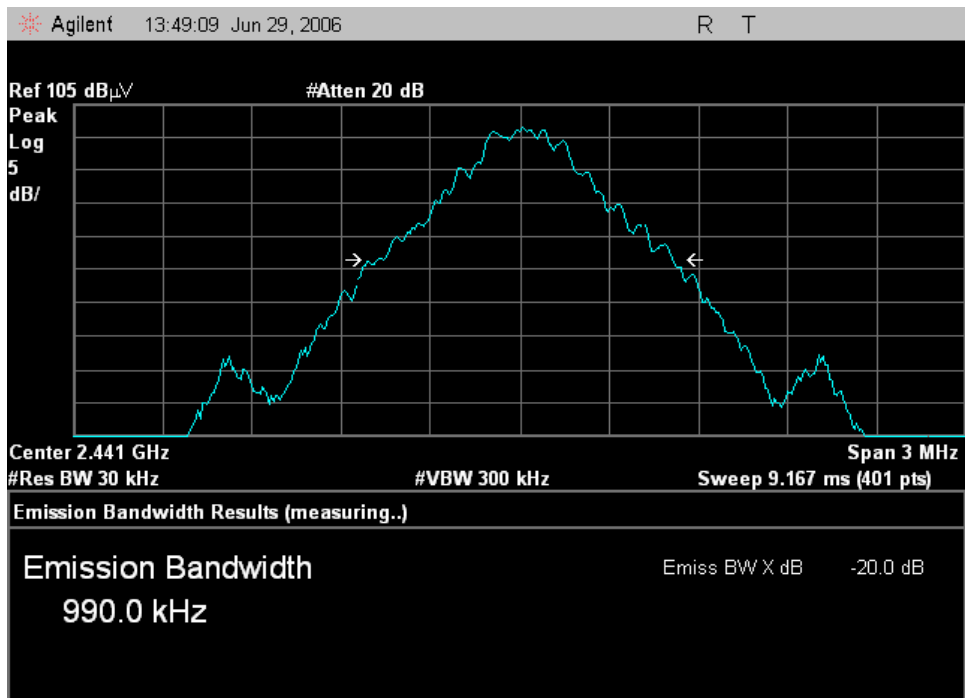
20dB Bandwidth / Occupied Bandwidth Trace Data

Trace Data of 20dB Bandwidth

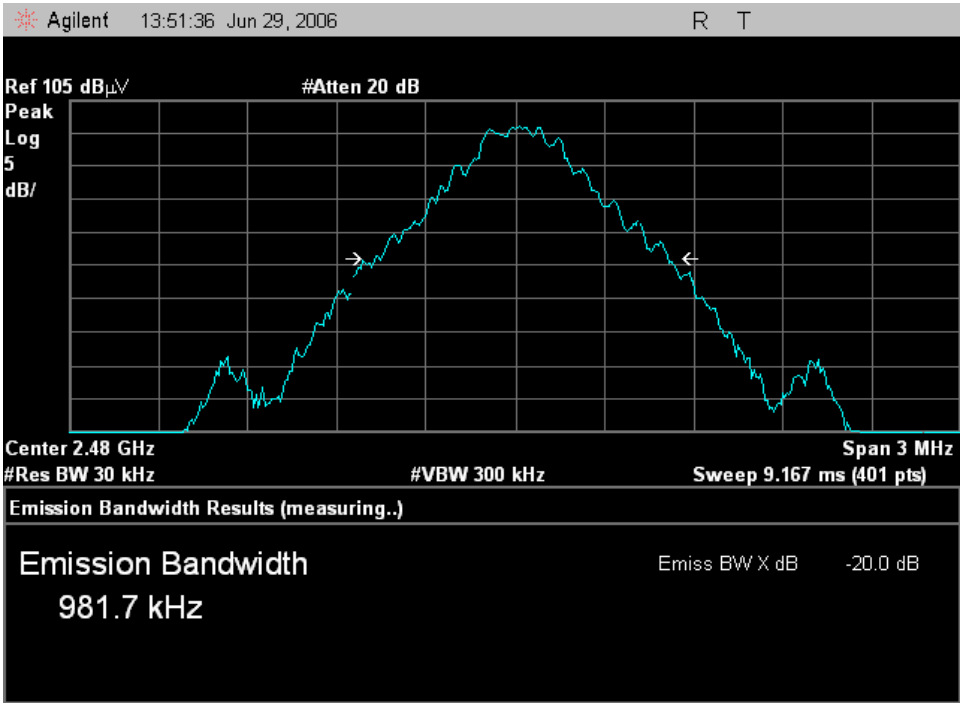
Channel Low : 2402.0MHz [Channel 1]



Channel Middle : 2441.0MHz [Channel 40]

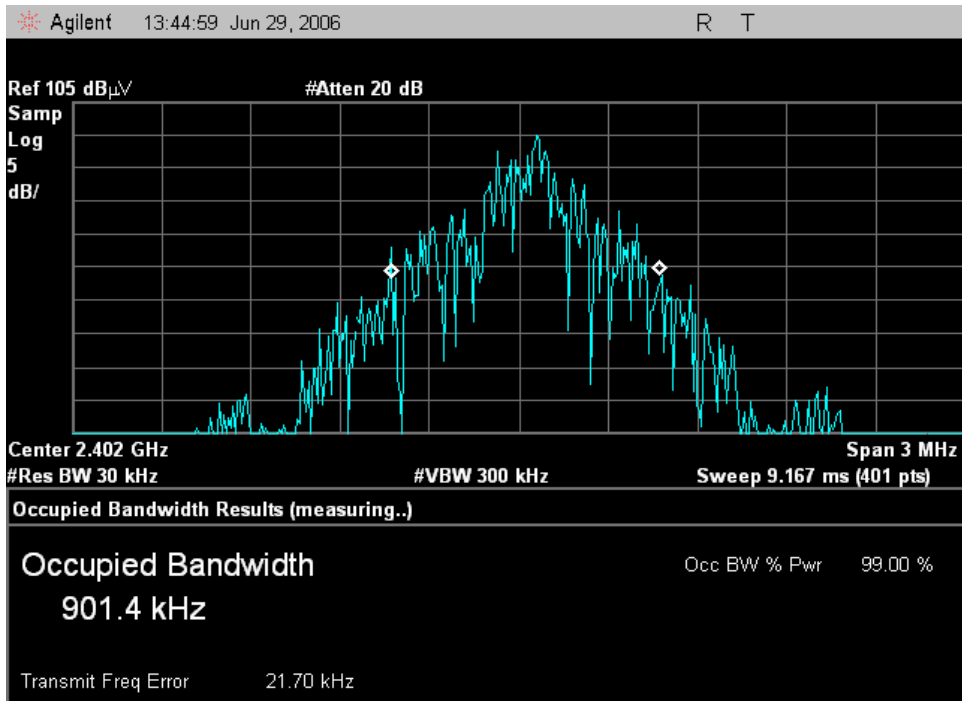


Channel High : 2480.0MHz [Channel 79]

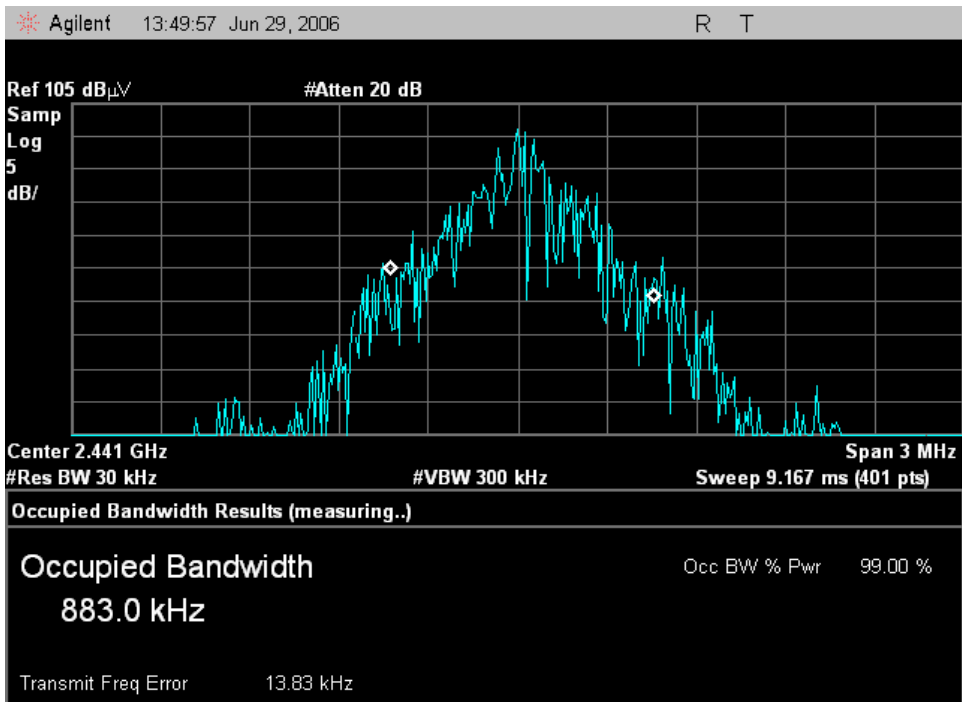


Trace Data of Occupied Bandwidth

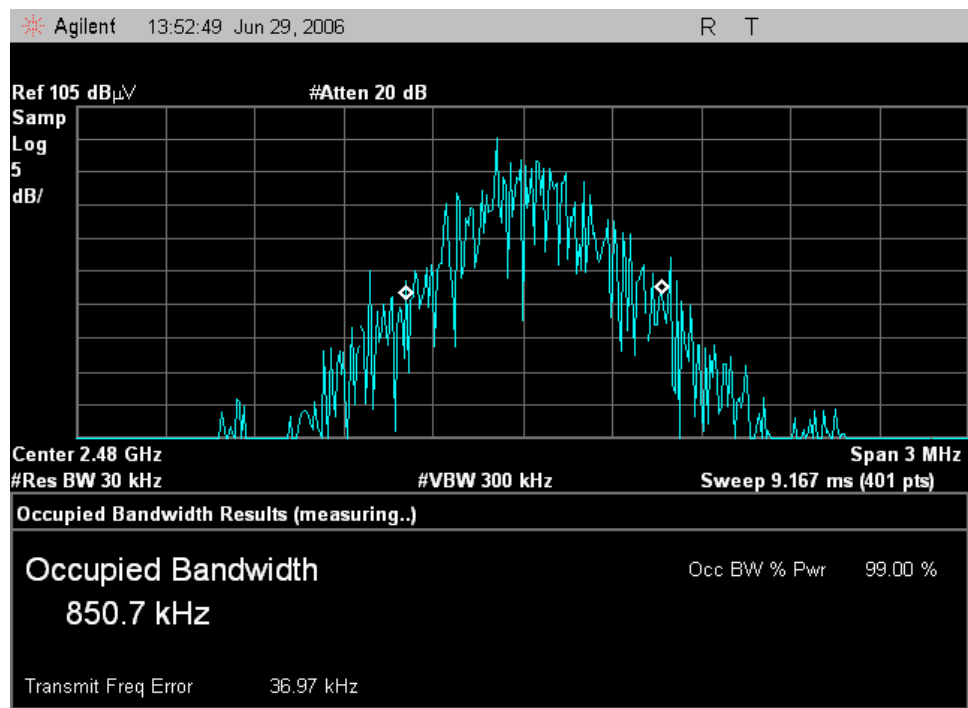
Channel Low : 2402.0MHz [Channel 1]



Channel Middle : 2441.0MHz [Channel 40]



Channel High : 2480.0MHz [Channel 79]



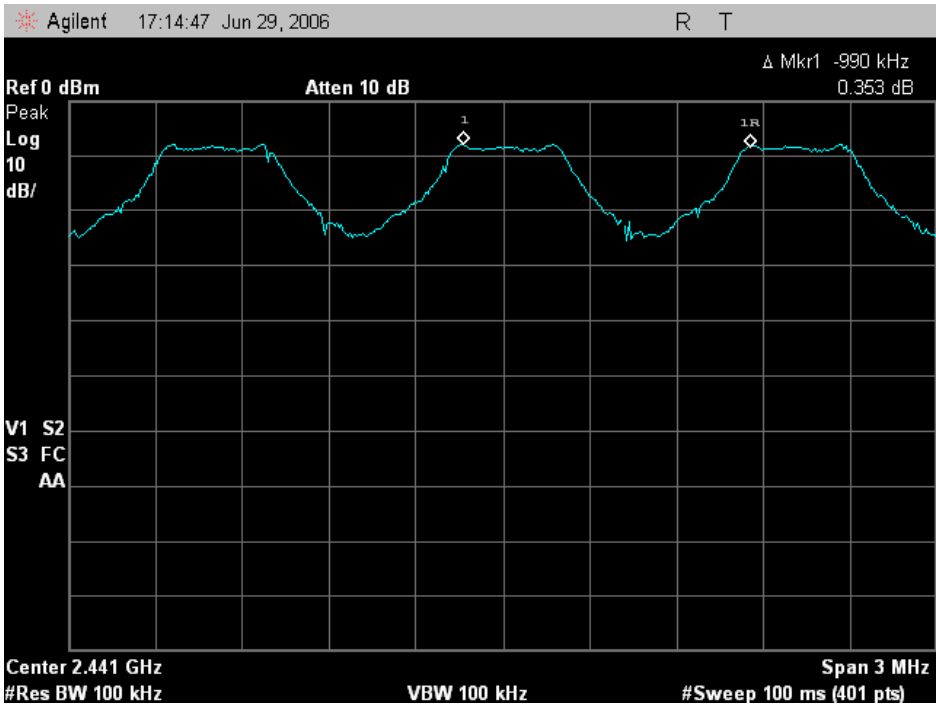
Appendix B

Appendix B

Carrier Frequency Separation Trace Data

Carrier Frequency Separation

CH: Middle (2441MHz) Hopping

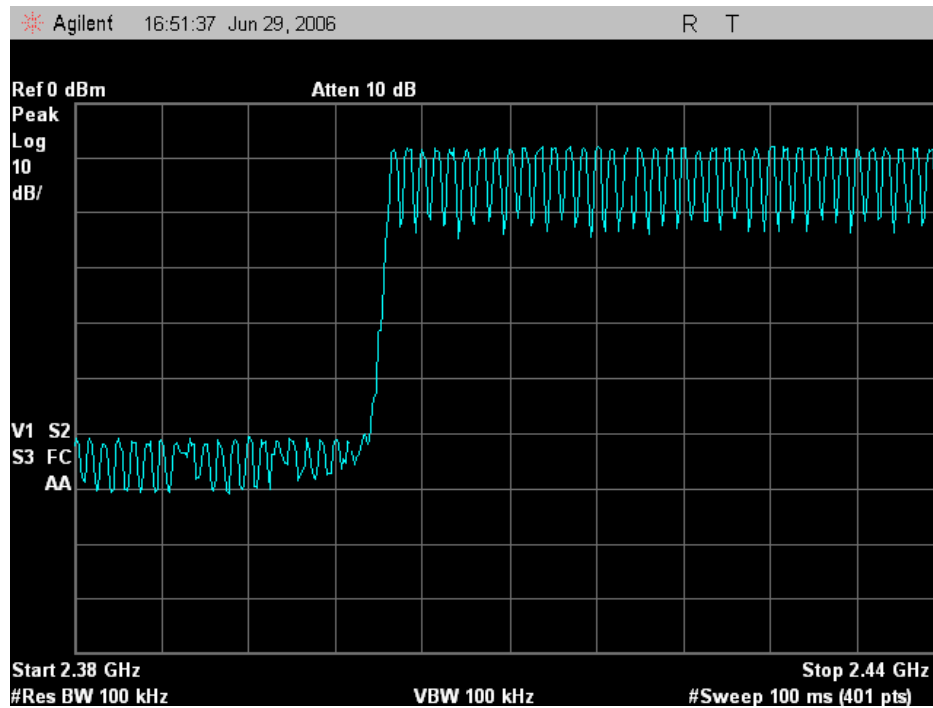


Appendix C

Appendix C

Number of Hopping Frequencies Trace Data

CH: Low (2402MHz) Hopping



CH: High (2480MHz) Hopping

