4.6 FREQUENCY STABILITY

4.6.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within +/- 0.02% of the operating frequency over a temperature variation of –30 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.

4.6.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2005

NOTE:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

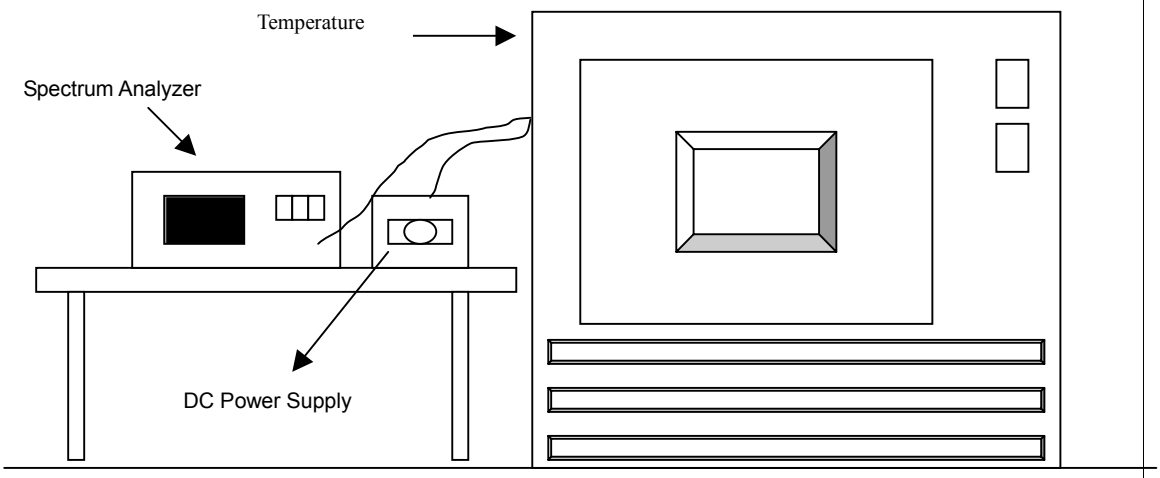
4.6.3 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



4.6.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

4.6.7 TEST RESULTS (MODE 1)

Operating frequency: 5320MHz						Limit : ± 0.02%	
Temp. (℃)	Power supply (VAC)	2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	126.5	5320.0416	0.000782	5320.0418	0.000786	5320.0418	0.000786
	110	5320.0414	0.000778	5320.0416	0.000782	5320.0418	0.000786
	93.5	5320.0416	0.000782	5320.0414	0.000778	5320.0418	0.000786
40	126.5	5320.0281	0.000528	5320.0276	0.000519	5320.0273	0.000513
	110	5320.0282	0.000530	5320.0276	0.000519	5320.0275	0.000517
	93.5	5320.0281	0.000528	5320.0279	0.000524	5320.0272	0.000511
30	126.5	5320.0222	0.000417	5320.0219	0.000412	5320.0217	0.000408
	110	5320.0222	0.000417	5320.0221	0.000415	5320.0218	0.000410
	93.5	5320.0222	0.000417	5320.0219	0.000412	5320.0216	0.000406
20	126.5	5320.0071	0.000133	5320.0068	0.000128	5320.0065	0.000122
	110	5320.0072	0.000135	5320.0072	0.000135	5320.0069	0.000130
	93.5	5320.0071	0.000133	5320.0068	0.000128	5320.0065	0.000122
10	126.5	5320.0124	0.000233	5320.0122	0.000229	5320.0119	0.000224
	110	5320.0124	0.000233	5320.0122	0.000229	5320.0121	0.000227
	93.5	5320.0124	0.000233	5320.0121	0.000227	5320.0118	0.000222
0	126.5	5320.0232	0.000436	5320.0180	0.000338	5320.0180	0.000338
	110	5320.0232	0.000436	5320.0210	0.000395	5320.0190	0.000357
	93.5	5320.0216	0.000406	5320.0180	0.000338	5320.0180	0.000338
-10	126.5	5319.9806	0.000365	5320.0290	0.000545	5320.0270	0.000508
	110	5319.9804	0.000368	5319.9810	0.000357	5320.0290	0.000545
	93.5	5319.9804	0.000368	5320.0280	0.000526	5320.0270	0.000508
-20	126.5	5319.9800	0.000376	5320.0250	0.000470	5320.0210	0.000395
	110	5319.9800	0.000376	5320.0280	0.000526	5320.0240	0.000451
	93.5	5319.9800	0.000376	5320.0240	0.000451	5320.0220	0.000414
-30	126.5	5320.0116	0.000218	5320.0111	0.000209	5320.0108	0.000203
	110	5320.0116	0.000218	5320.0113	0.000212	5320.0111	0.000209
	93.5	5320.0116	0.000218	5320.0111	0.000209	5320.0108	0.000203

4.6.8 TEST RESULTS (MODE 2)

Operating frequency: 5320MHz						Limit : ± 0.02%	
Temp. (℃)	Power supply (VAC)	2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	126.5	5320.0416	0.000782	5320.0418	0.000786	5320.0418	0.000786
	110	5320.0414	0.000778	5320.0416	0.000782	5320.0418	0.000786
	93.5	5320.0416	0.000782	5320.0414	0.000778	5320.0418	0.000786
40	126.5	5320.0281	0.000528	5320.0276	0.000519	5320.0273	0.000513
	110	5320.0282	0.000530	5320.0276	0.000519	5320.0275	0.000517
	93.5	5320.0281	0.000528	5320.0279	0.000524	5320.0272	0.000511
30	126.5	5320.0222	0.000417	5320.0219	0.000412	5320.0217	0.000408
	110	5320.0222	0.000417	5320.0221	0.000415	5320.0218	0.000410
	93.5	5320.0222	0.000417	5320.0219	0.000412	5320.0216	0.000406
20	126.5	5320.0071	0.000133	5320.0068	0.000128	5320.0065	0.000122
	110	5320.0072	0.000135	5320.0072	0.000135	5320.0069	0.000130
	93.5	5320.0071	0.000133	5320.0068	0.000128	5320.0065	0.000122
10	126.5	5320.0124	0.000233	5320.0122	0.000229	5320.0119	0.000224
	110	5320.0124	0.000233	5320.0122	0.000229	5320.0121	0.000227
	93.5	5320.0124	0.000233	5320.0121	0.000227	5320.0118	0.000222
0	126.5	5320.0232	0.000436	5320.0180	0.000338	5320.0180	0.000338
	110	5320.0232	0.000436	5320.0210	0.000395	5320.0190	0.000357
	93.5	5320.0216	0.000406	5320.0180	0.000338	5320.0180	0.000338
-10	126.5	5319.9806	0.000365	5320.0290	0.000545	5320.0270	0.000508
	110	5319.9804	0.000368	5319.9810	0.000357	5320.0290	0.000545
	93.5	5319.9804	0.000368	5320.0280	0.000526	5320.0270	0.000508
-20	126.5	5319.9800	0.000376	5320.0250	0.000470	5320.0210	0.000395
	110	5319.9800	0.000376	5320.0280	0.000526	5320.0240	0.000451
	93.5	5319.9800	0.000376	5320.0240	0.000451	5320.0220	0.000414
-30	126.5	5320.0116	0.000218	5320.0111	0.000209	5320.0108	0.000203
	110	5320.0116	0.000218	5320.0113	0.000212	5320.0111	0.000209
	93.5	5320.0116	0.000218	5320.0111	0.000209	5320.0108	0.000203

4.7 BAND EDGES MEASUREMENT

4.7.1 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2005

NOTE:

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.7.2 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 1MHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.7.3 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

4.7.4 TEST RESULTS (Mode 1)

For signals in the restricted bands above and below the 5.15 to 5.35GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was applied to the average and peak filed strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

The spectrum plots (Peak RBW=VBW=100KHz; Average RBW=1MHz, VBW=10Hz) are attached on the following pages.

802.11a OFDM modulation

NOTE (Peak):

The band edge emission plot on the following first page shows 47.72dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 108.5dBuV/m (Peak), so the maximum field strength in restrict band is 108.5-47.72=60.78dBuV/m which is under 74dBuV/m limit.

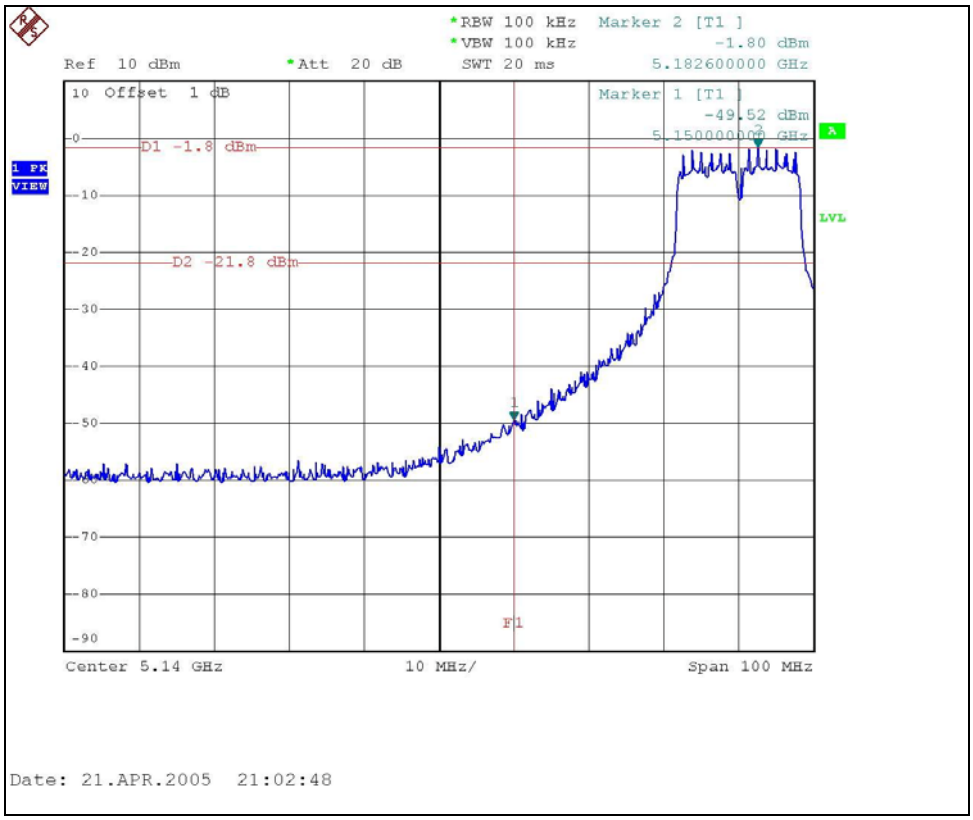
The band edge emission plot on the following first page shows 49.68dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 112.1dBuV/m (Peak), so the maximum field strength in restrict band is 112.1-49.68=62.42dBuV/m which is under 74dBuV/m limit.

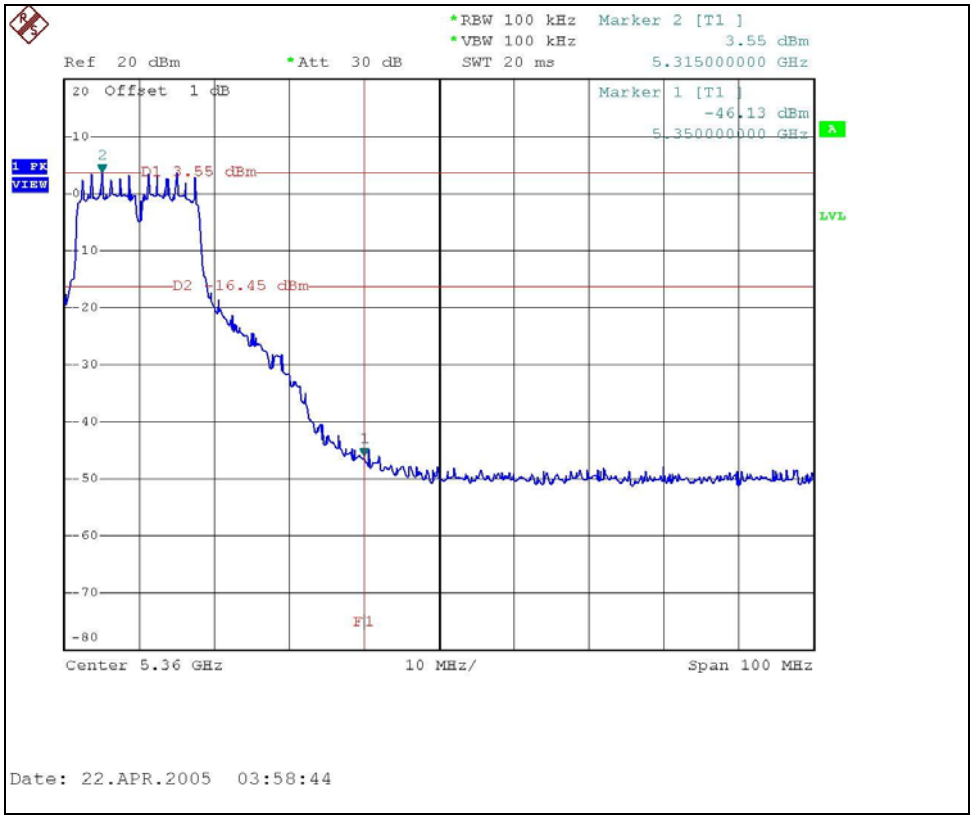
NOTE (Average):

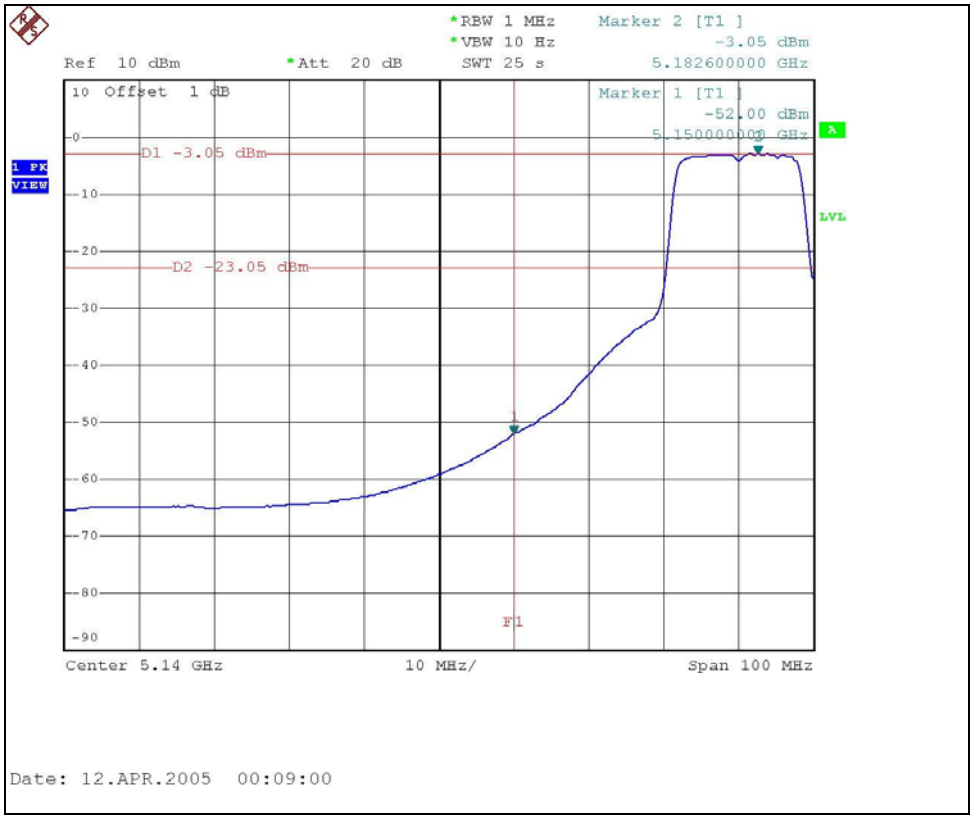
The band edge emission plot on the following second page shows 48.95dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 99.1dBuV/m (Average), so the maximum field strength in restrict band is 99.1-48.95=50.15dBuV/m which is under 54dBuV/m limit.

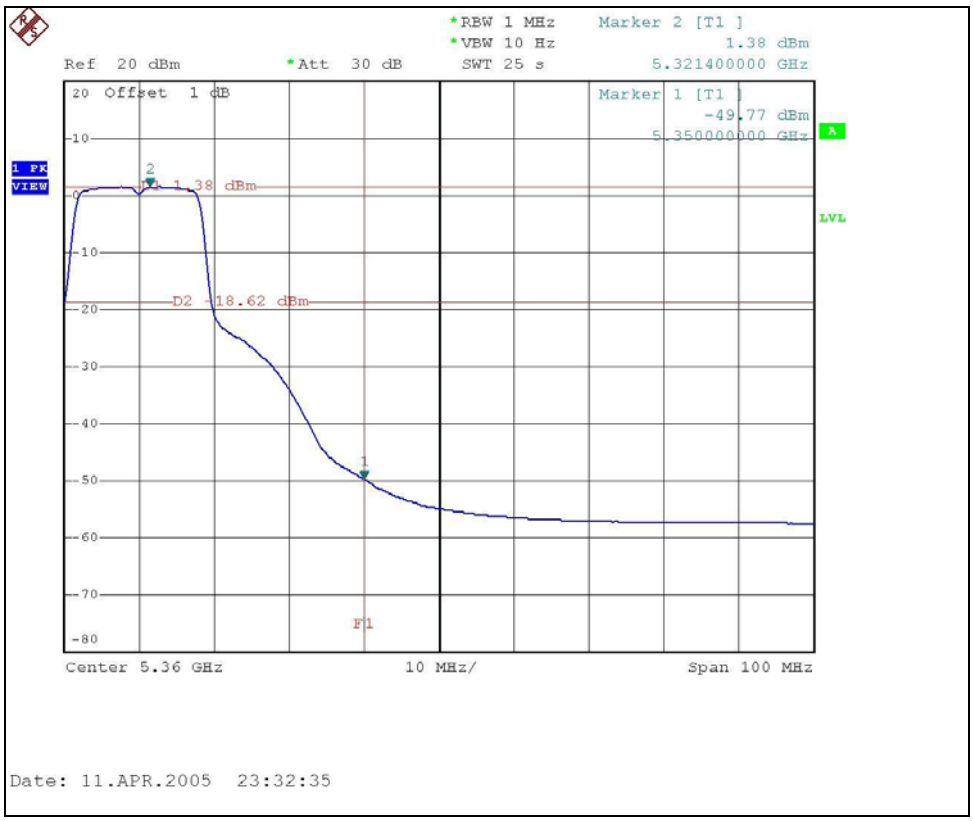
The band edge emission plot on the following second page shows 51.15dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 103.3dBuV/m (Average), so the maximum field strength in restrict band is 103.3-51.15=52.15dBuV/m which is under 54dBuV/m limit.

802.11a OFDM modulation






*RBW 1 MHz
*VBW 10 Hz
SWT 25 s
Marker 2 [T1]
-3.05 dBm
5.182600000 GHz
Ref 10 dBm
*Att 20 dB
10 Offset 1 dB
Marker 1 [T1]
-52.00 dBm
5.150000000 GHz
D1 -3.05 dBm
D2 -23.05 dBm
F1
Center 5.14 GHz
10 MHz/
Span 100 MHz
Date: 12.APR.2005 00:09:00


*RBW 1 MHz
*VBW 10 Hz
SWT 25 s
Marker 2 [T1]
1.38 dBm
5.321400000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 1 dB
Marker 1 [T1]
-49.77 dBm
5.350000000 GHz
D2 -18.62 dBm
F1
Center 5.36 GHz
10 MHz/
Span 100 MHz
Date: 11.APR.2005 23:32:35

802.11a Turbo OFDM modulation

NOTE (Peak):

The band edge emission plot on the following first page shows 52.04dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 101.8dBuV/m (Peak), so the maximum field strength in restrict band is 101.8-52.04=49.76dBuV/m which is under 74dBuV/m limit.

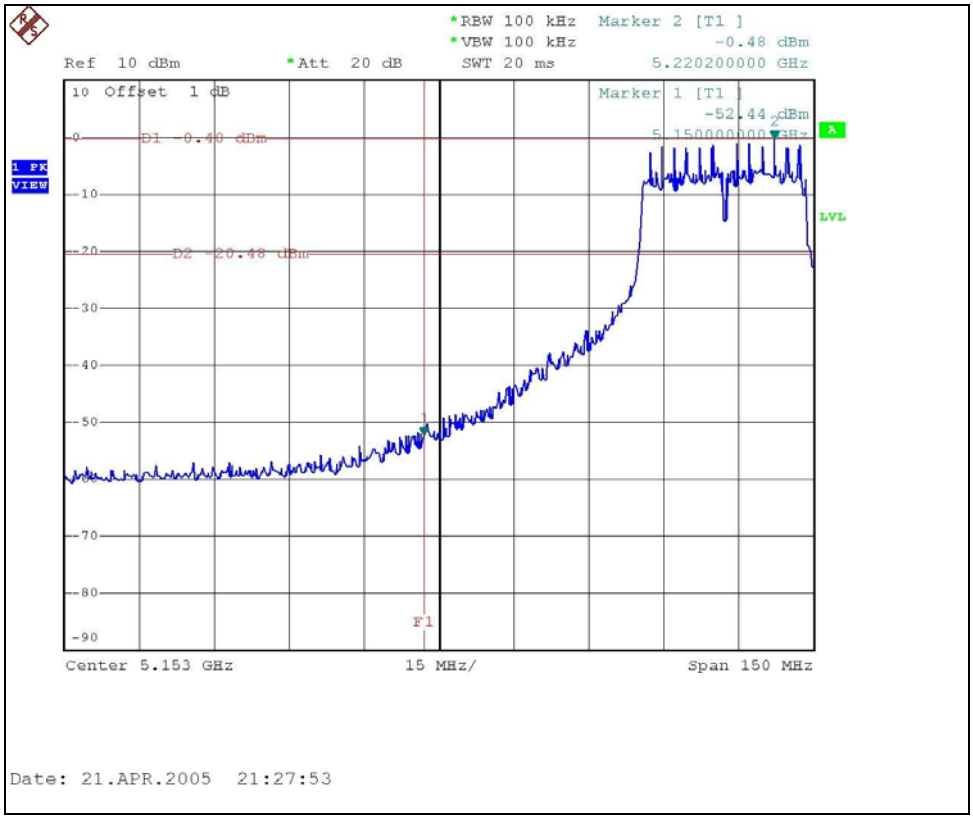
The band edge emission plot on the following first page shows 47.67dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 3 is 108.3dBuV/m (Peak), so the maximum field strength in restrict band is 108.3-47.67=60.63dBuV/m which is under 74dBuV/m limit.

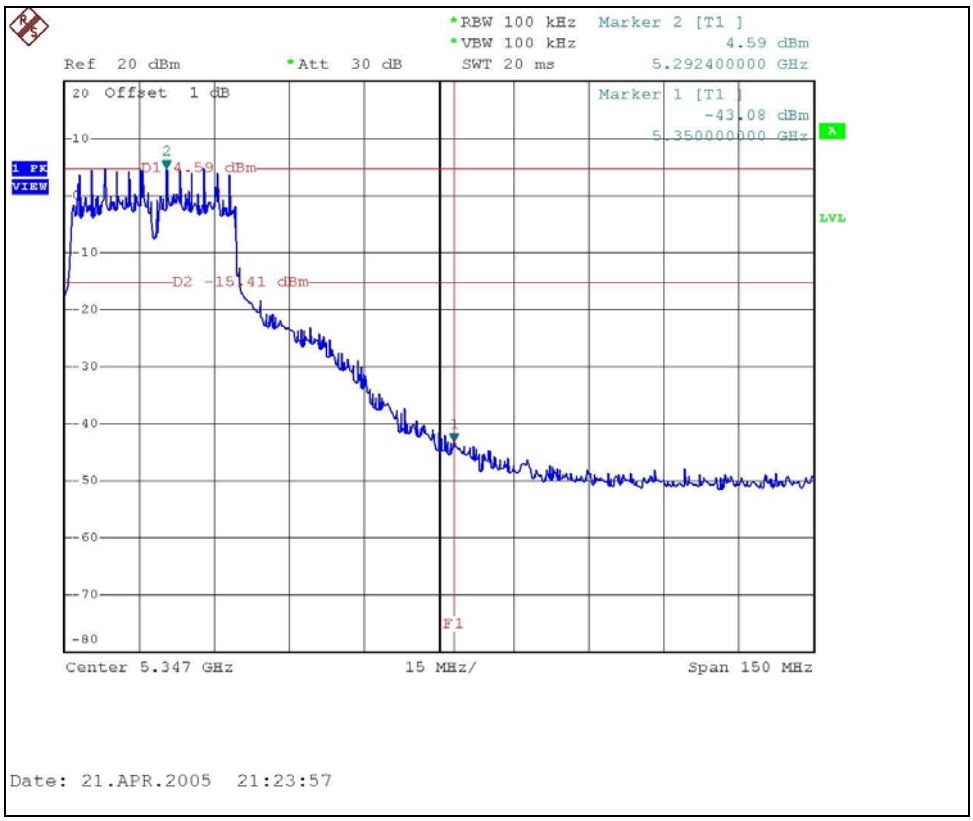
NOTE (Average):

The band edge emission plot on the following second page shows 48.05dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 92.9dBuV/m (Average), so the maximum field strength in restrict band is 92.9-48.05=44.85dBuV/m which is under 54dBuV/m limit.

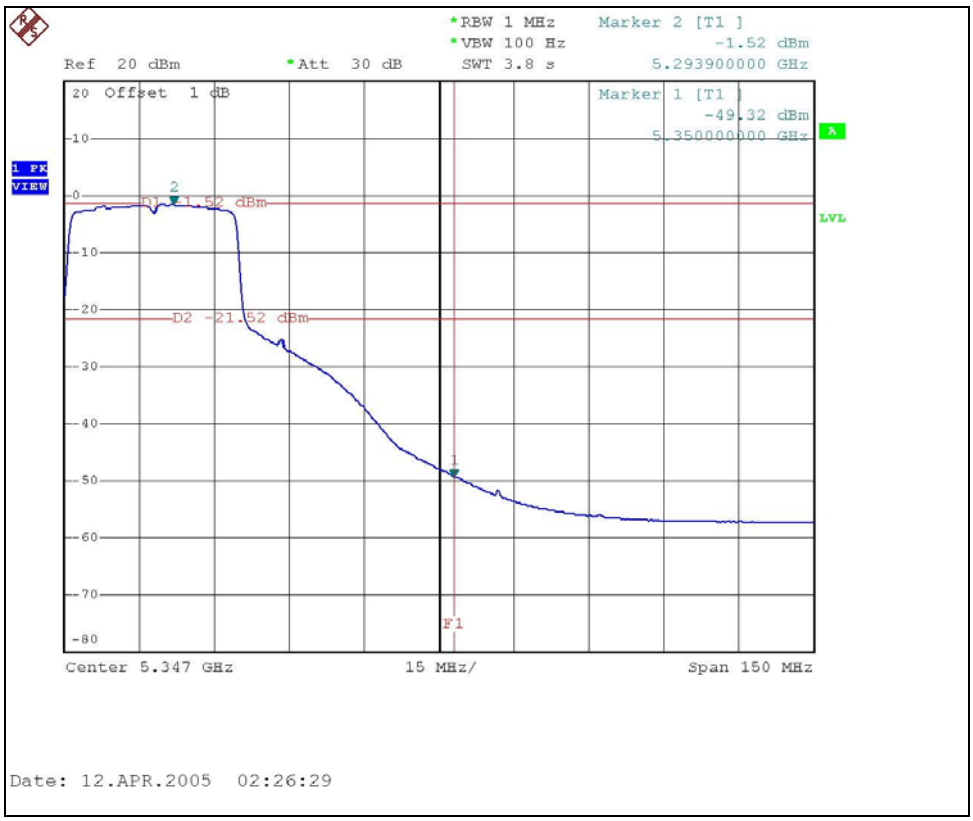
The band edge emission plot on the following second page shows 47.8dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 3 is 99.6dBuV/m (Average), so the maximum field strength in restrict band is 99.6-47.8=51.80dBuV/m which is under 54dBuV/m limit.

802.11a Turbo OFDM modulation





*RBW 1 MHz
*VBW 10 Hz
SWT 38 s
Marker 2 [T1]
-5.45 dBm
5.212400000 GHz
Ref 10 dBm
*Att 20 dB
10 Offset 1 dB
Marker 1 [T1]
-53.50 dBm
5.150000000 GHz
D1 -5.45 dBm
D2 -25.45 dBm
F1
Center 5.153 GHz
15 MHz/
Span 150 MHz
Date: 12.APR.2005 01:47:46


*RBW 1 MHz
*VBW 100 Hz
SWT 3.8 s
Marker 2 [T1]
-1.52 dBm
5.293900000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 1 dB
Marker 1 [T1]
-49.32 dBm
5.350000000 GHz
D1 -1.52 dBm
D2 -21.52 dBm
F1
Center 5.347 GHz
15 MHz/
Span 150 MHz
Date: 12.APR.2005 02:26:29

4.7.5 TEST RESULTS (Mode 2)

For signals in the restricted bands above and below the 5.15 to 5.35GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was applied to the average and peak filed strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

The spectrum plots (Peak RBW=VBW=100KHz; Average RBW=1MHz, VBW=10Hz) are attached on the following pages.

802.11a OFDM modulation

NOTE (Peak):

The band edge emission plot on the following first page shows 49.41dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 106.7dBuV/m (Peak), so the maximum field strength in restrict band is 106.7-49.41=57.29dBuV/m which is under 74dBuV/m limit.

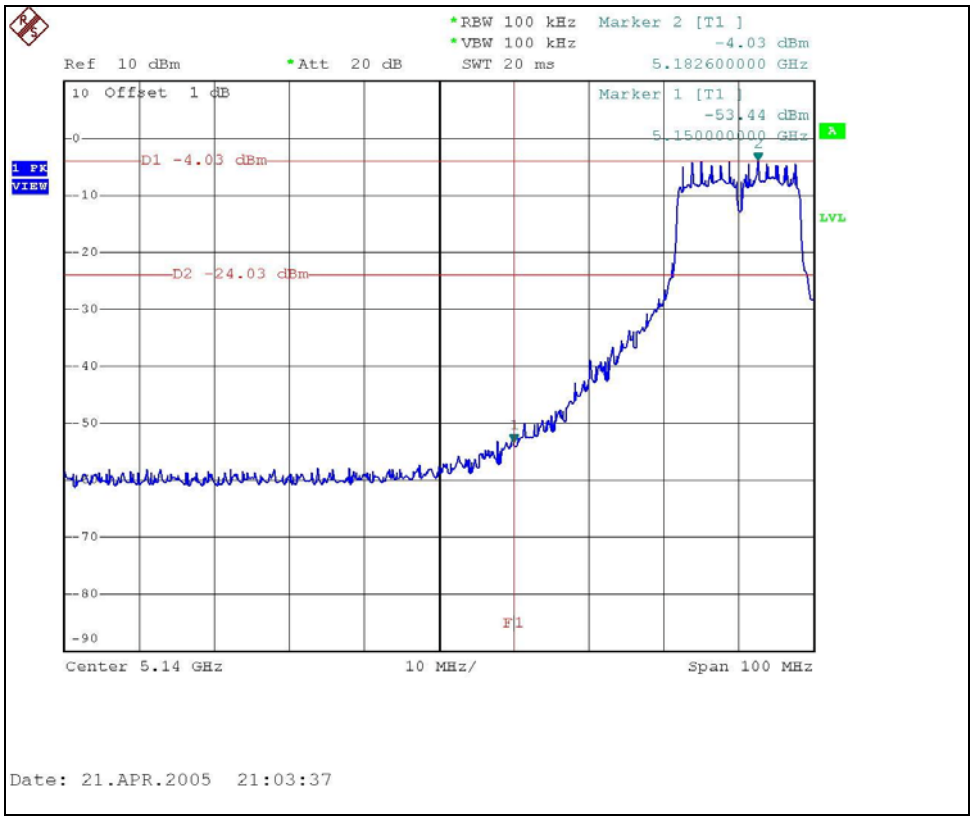
The band edge emission plot on the following first page shows 49.86dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 113.1dBuV/m (Peak), so the maximum field strength in restrict band is 113.1-49.86=63.24dBuV/m which is under 74dBuV/m limit.

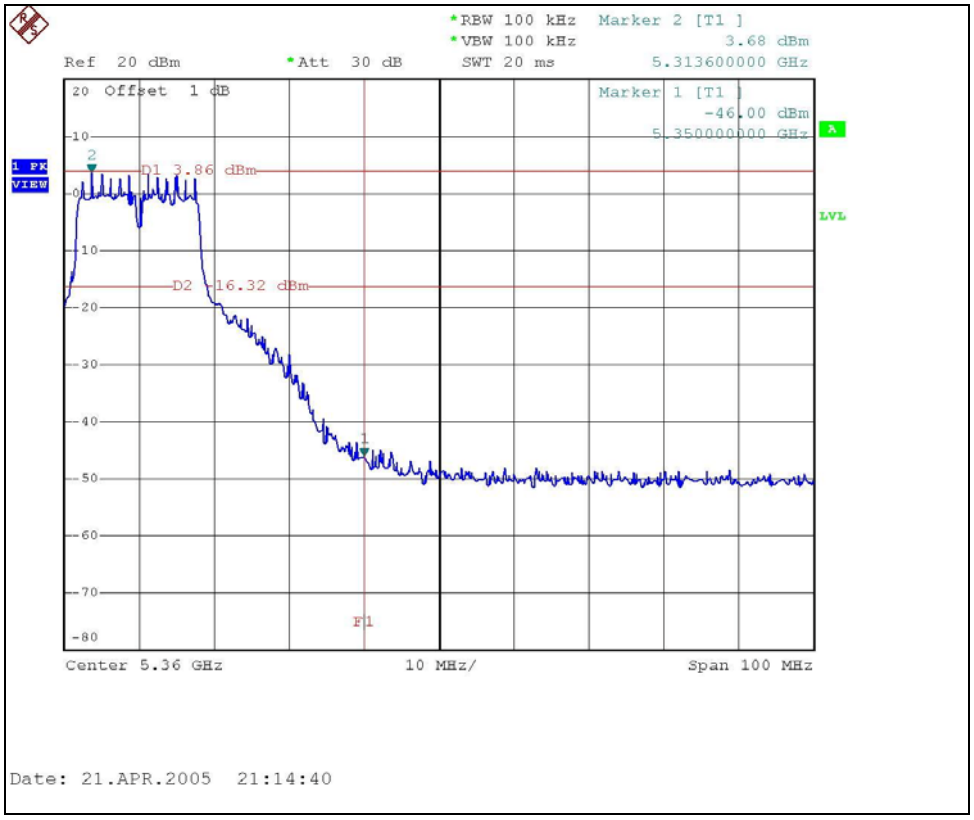
NOTE (Average):

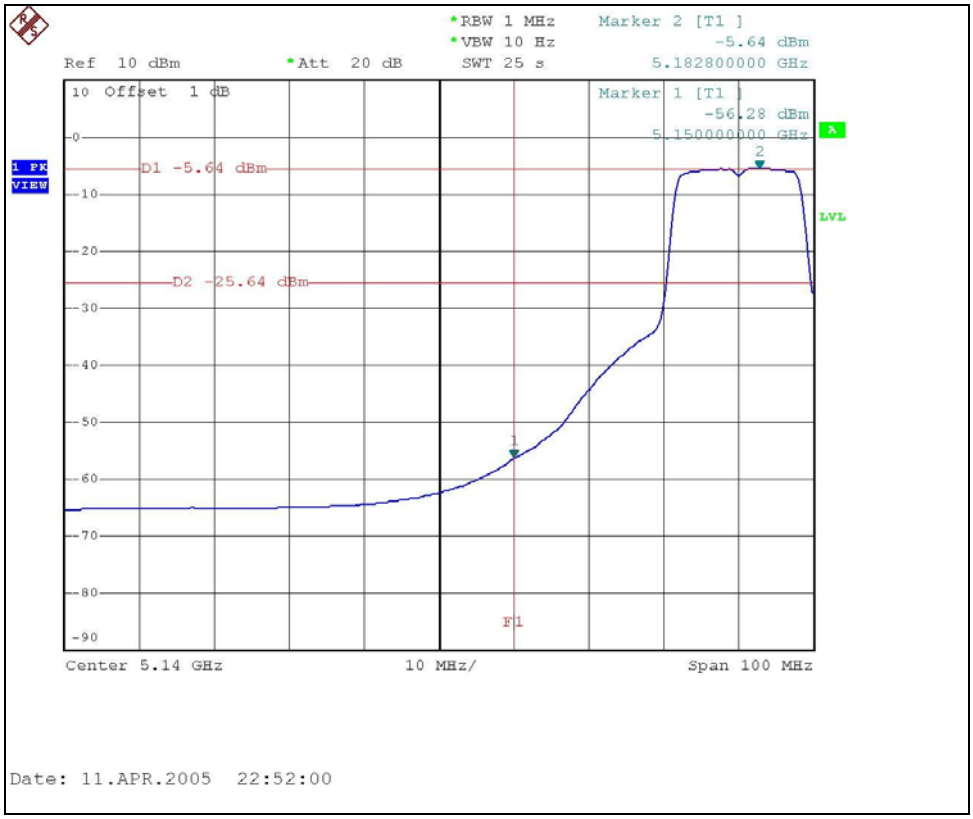
The band edge emission plot on the following second page shows 50.64dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 97.10dBuV/m (Average), so the maximum field strength in restrict band is 97.10-50.64=46.46dBuV/m which is under 54dBuV/m limit.

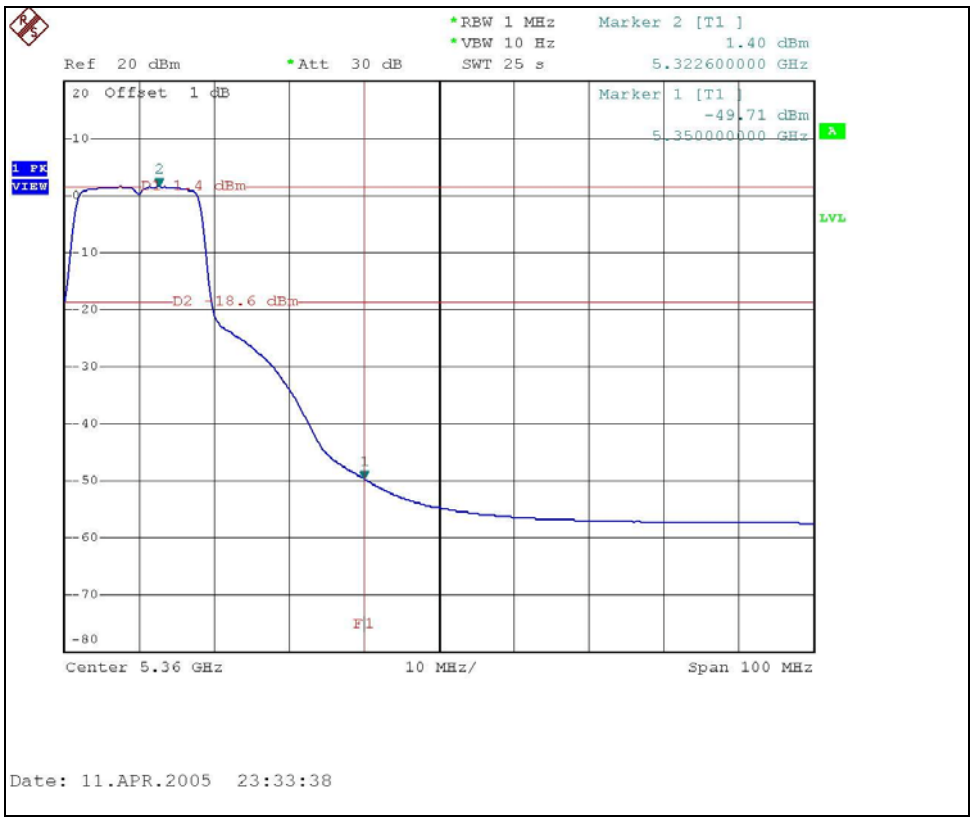
The band edge emission plot on the following second page shows 51.11dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 103.4dBuV/m (Average), so the maximum field strength in restrict band is 103.4-51.11=52.29dBuV/m which is under 54dBuV/m limit.

802.11a OFDM modulation






RBW 1 MHz
VBW 10 Hz
SWT 25 s
Marker 2 [T1]
-5.64 dBm
5.182800000 GHz
Ref 10 dBm
Att 20 dB
10 Offset 1 dB
Marker 1 [T1]
-56.28 dBm
5.150000000 GHz
D1 -5.64 dBm
D2 -25.64 dBm
F1
Center 5.14 GHz
10 MHz/
Span 100 MHz
Date: 11.APR.2005 22:52:00


RBW 1 MHz
VBW 10 Hz
SWT 25 s
Marker 2 [T1]
1.40 dBm
5.322600000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 1 dB
Marker 1 [T1]
-49.71 dBm
5.350000000 GHz
D1 1.4 dBm
D2 -18.6 dBm
F1
Center 5.36 GHz
10 MHz/
Span 100 MHz
Date: 11.APR.2005 23:33:38

802.11a Turbo OFDM modulation

NOTE (Peak):

The band edge emission plot on the following first page shows 51.07dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 102.8dBuV/m (Peak), so the maximum field strength in restrict band is 102.8-51.07=51.73dBuV/m which is under 74dBuV/m limit.

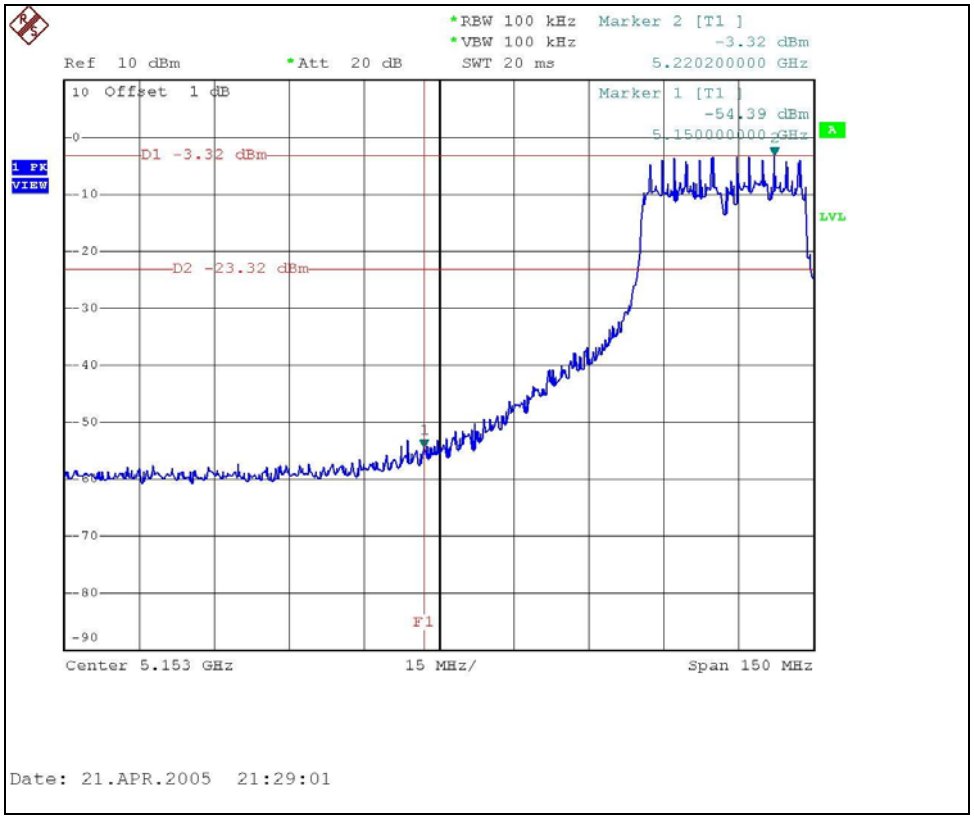
The band edge emission plot on the following first page shows 48.98dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 3 is 100.9dBuV/m (Peak), so the maximum field strength in restrict band is 100.9-48.98=51.92dBuV/m which is under 74dBuV/m limit.

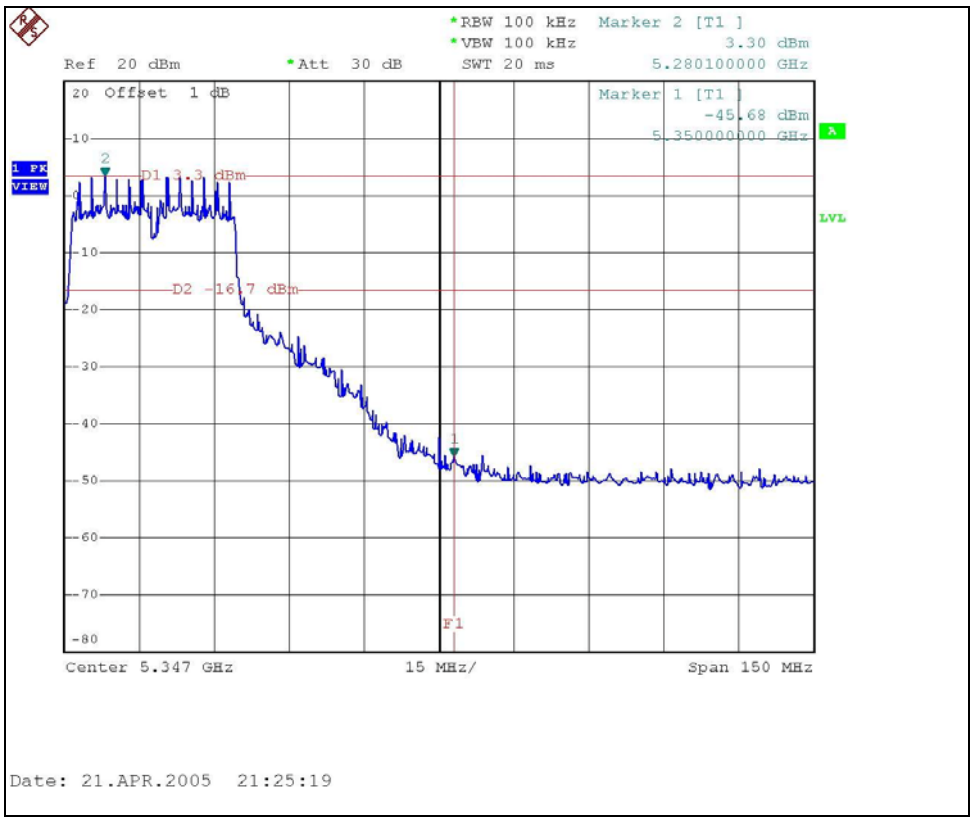
NOTE (Average):

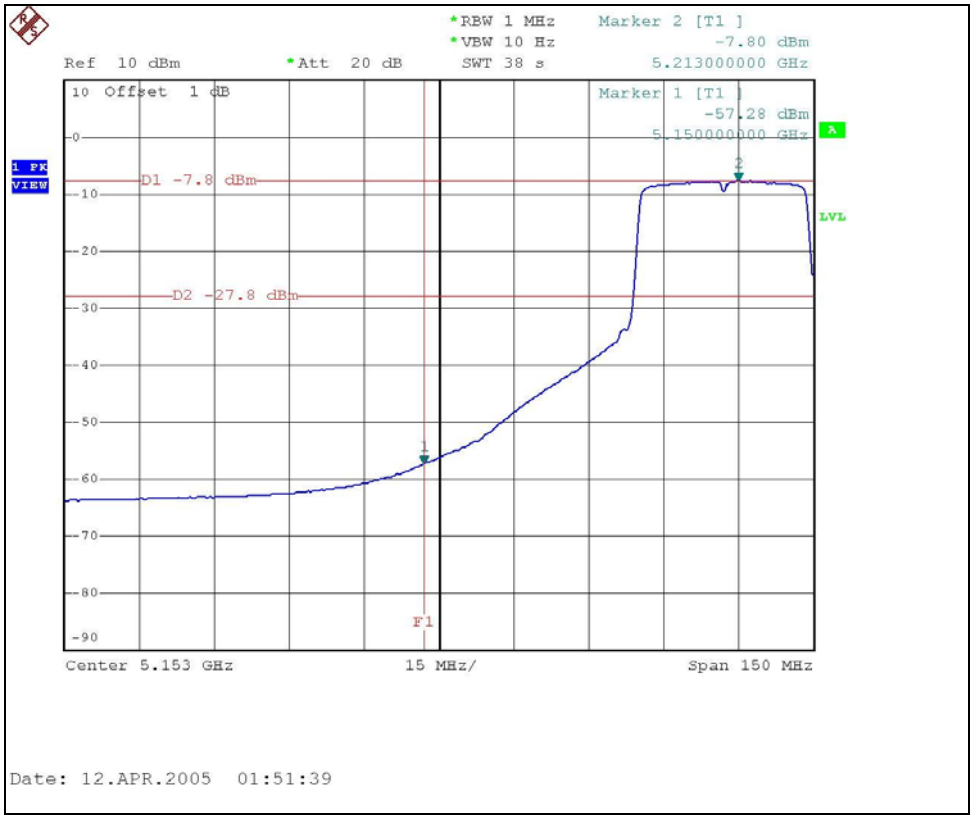
The band edge emission plot on the following second page shows 49.48dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 94.3dBuV/m (Average), so the maximum field strength in restrict band is 94.3-49.48=44.82dBuV/m which is under 54dBuV/m limit.

The band edge emission plot on the following second page shows 48.14dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 3 is 68.3dBuV/m (Average), so the maximum field strength in restrict band is 68.3-48.14=20.16dBuV/m which is under 54dBuV/m limit.

802.11a Turbo OFDM modulation






*RBW 1 MHz
*VBW 10 Hz
SWT 38 s
Marker 2 [T1]
-7.80 dBm
5.213000000 GHz
Ref 10 dBm
*Att 20 dB
10 Offset 1 dB
Marker 1 [T1]
-57.28 dBm
5.150000000 GHz
1 PK
VIEW
D1 -7.8 dBm
D2 -27.8 dBm
LVL
F1
Center 5.153 GHz
15 MHz/
Span 150 MHz
Date: 12.APR.2005 01:51:39

*RBW 1 MHz
*VBW 100 Hz
SWT 3.8 s
Marker 2 [T1]
-2.86 dBm
5.292100000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 1 dB
Marker 1 [T1]
-52.00 dBm
5.350000000 GHz
1 PK
VIEW
D1 -2.86 dBm
D2 -22.86 dBm
LVL
F1
Center 5.347 GHz
15 MHz/
Span 150 MHz
Date: 12.APR.2005 02:26:59

4.8 ANTENNA REQUIREMENT

4.8.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR 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.

And according to FCC 47 CFR Section 15.407(a), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.8.2 ANTENNA CONNECTED CONSTRUCTION

The antennas used in this product are as below:

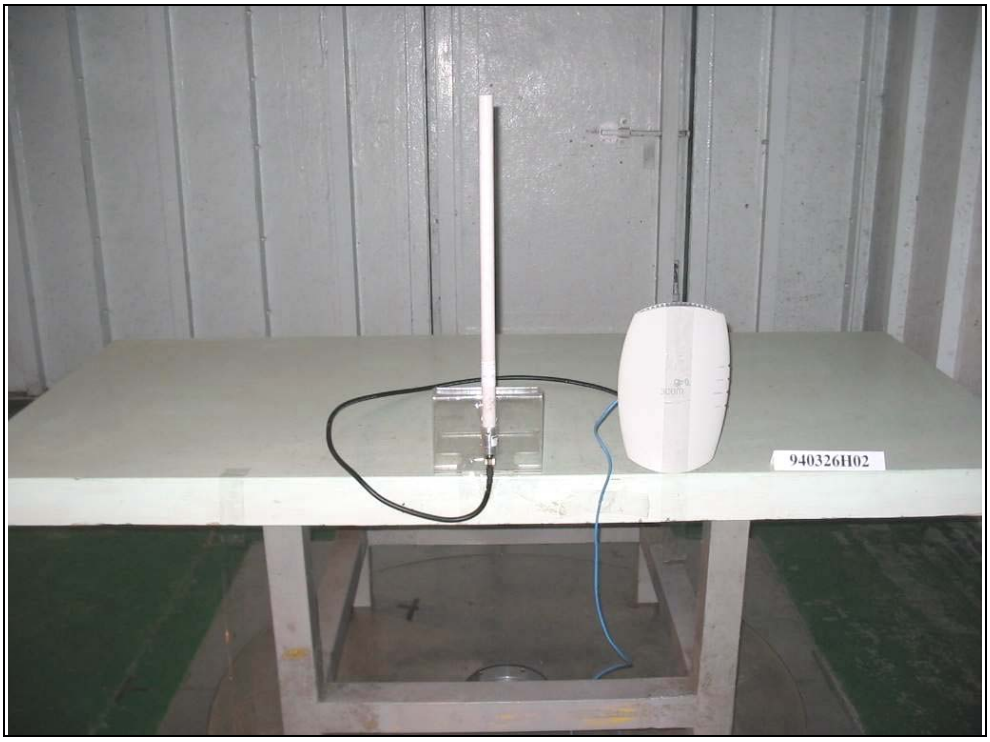
No.	Model	Antnnna Type	2.4/ 5GHz Antenna Gain	Connector Type
1	3CWE591 (Z1996)	High gain omni antenna	6/ 8 dBi	N Female
2	3CWE598 (Z1997)	Medium gain panel antenna	8/ 10 dBi	N Female

5. PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST (ANTENNA 1)

CONDUCTED EMISSION TEST (ANTENNA 2)

RADIATED EMISSION TEST (ANTENNA 1)



RADIATED EMISSION TEST (ANTENNA 2)

6. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025:

USA	FCC, NVLAP, UL, A2LA
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	CNLA, BSMI, DGT
Netherlands	Telefication
Singapore	PSB , GOST-ASIA(MOU)
Russia	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
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Hwa Ya EMC/RF/Safety Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also