TEST REPORT For FCC

Test Report No.	: TK-FR11014
Date of Issue	: 04/07/2011
Description of Product	: 5G-WiFi
FCC ID	: ZD7DNMM-K1
Model No.	: DNMM-K1
Applicant	: Nimbus, Inc. Suite 619 Hanshin S-meca,1359, Gwanpyeong-dong, Yuseong-g, Daejeon, Korea
Manufacturer	: **Wistron NeWeb Corp.** NO. 10-1, Lin-hsin I Road, Science-Based Industry Park, Hsinchu 300, Taiwan, R.O.C
Standards	: FCC Part 15 Subpart E §15.407
Test Date	: 03/30/2011 ~ 04/07/2011
Test Results	: ☒ PASS ☐ FAIL

The test results relate only to the items tested.

Tested by:
Kyu-Chul Shin
Test Engineer
Date:04/07/2011

Reviewed by: KT Kang
KT Kang
Technical Manager
Date: 04/07/2011

THRU-KES CO.,LTD.
477-6, Hager-Ri, Yoju-Up, Yoju-Gun Kyunggi-Do,469-803, Korea
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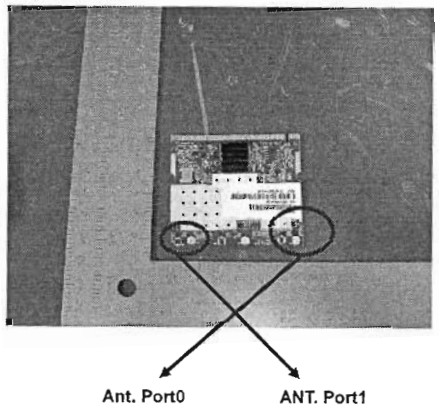
1.0 General Product Description

Equipment model name	: DNMM-K1
Serial number	: Prototype
EUT condition	: Pre-production, not damaged
Antenna type	: External Antenna (Supporting MIMO) : Dipole antenna Gain 3.94dBi
Frequency Range	: 802.11a/n – Band1 _ 5190MHz ~ 5230MHz Band2 _ 5270MHz ~ 5310MHz Band3 _ 5755MHz ~ 5795MHz
RF output power(HT40)	Band 1 : 13.72 dBm Conducted Peak Power Band 2 : 13.10 dBm Conducted Peak Power Band 4 : 9.03 dBm Conducted Peak Power
Number of channels	Band 1 : 2CH Band 2 : 2CH Band 4 : 2CH
Channel Spacing	: 40 MHz
Transfer Rate	: 270Mbps
Type of Modulation	: 64-QAM for OFDM _ Only HT40
Power Source	: DC 3.3V



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1.1 Tested Frequency

Band		CH	Test Frequency
Band 1	5150 ~ 5250	38	5190
		46	5230
Band 2	5250 ~ 5350	54	5270
		62	5310
Band 4	5725 ~ 5825	151	5755
		159	5795

1.2 Model Differences

1.3 Device Modifications

The following modifications were necessary for compliance:
Not applicable

1.4 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.	FCC ID or DoC
EUT	Wistron NeWeb Corp.	DNMM-K1	-	-
Notebook	Lenovo(Singapore)Pte.Ltd.	2957	-	DoC
DC Power Supply	L e n o v o	PA-1400-12	-	-

1.5 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.6 Test Facility

THRU-KES Co.,Ltd. (Test Site # : 343818)
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1.7 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	343818
KOREA	KCC	EMI (10 meter Open Area Test Site and one conducted site) Radio(3 & 10 meter Open Area Test Sites and one conducted site)	KR100
Canada	IC	3 & 10 meter Open Area Test Sites and one conducted site	4769B-1

2.0 Summary of tests

FCC Part Section(s)	Parameter	Limit	Status (note 1)
15.407(a)	26dB Spectrum Bandwidth	-	C
15.407(a)	Maximum Conducted Output Power	< 50mW	C
15.407(a)	Power Spectral Density	> 4 dBm	C
15.407(a)	Peak Excursion	> 13 dB	C
15.407(b)	Radiated Emissions	< -27dBm @ EIRP	C
15.407(g)	Frequency Stability	20ppm	C
15.207	AC Power Line Conducted Emissions	EN 55022	C

The sample was tested according to the following specification:
-ANSI C63.4 and 47 CFR FCC Part 15 Subpart E

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2.1 Technical Characteristic Test

2.1.1 26dB Bandwidth - 15.407(a)

Procedure:
1. The transmitted output (antenna port) was connected to the spectrum analyzer in peak hold mode
2. The resolution bandwidth of 300kHz and the video bandwidth of 1000kHz were used
3. Measured the spectrum width with power higher than 26dB below carrier
4. Measuring multiple antenna, the connector is required to link with spectrum analyzer through a combiner

The spectrum analyzer is set to:

Center frequency = 38ch , 46ch

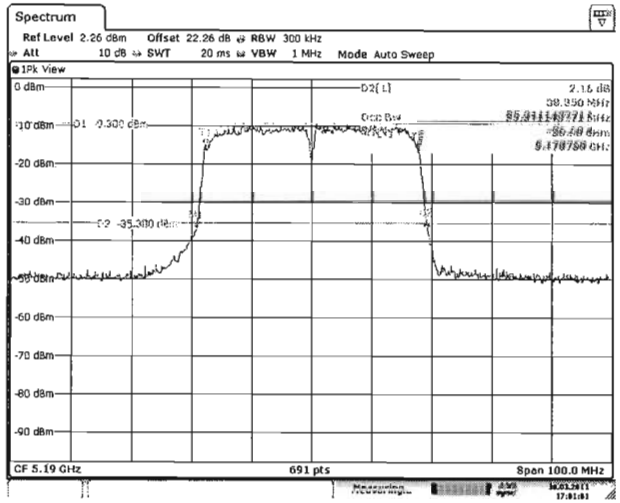
RBW = 300 kHz
VBW = 1000 kHz
Trace = max hold
Span = >26dB Bandwidth
Sweep = auto
Detector function = peak

Configuration Draft n Ant. Port0

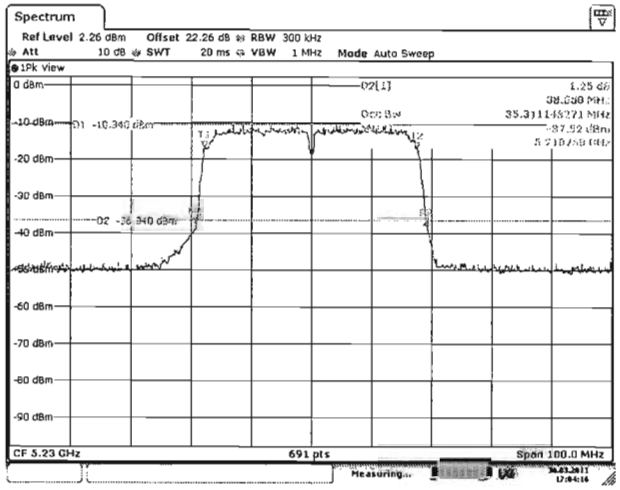
Band	Frequency (MHz)	Channel No.	Test Results	
			26dB Bandwidth (MHz)	99% Occupied Bandwidth(MHz)
Band1	**5190**	**38**	**38.35**	35.31
	5230	**46**	**38.35**	35.31

- See next pages for actual measured spectrum plots.

26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port0/5190



26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port0/5230MHz



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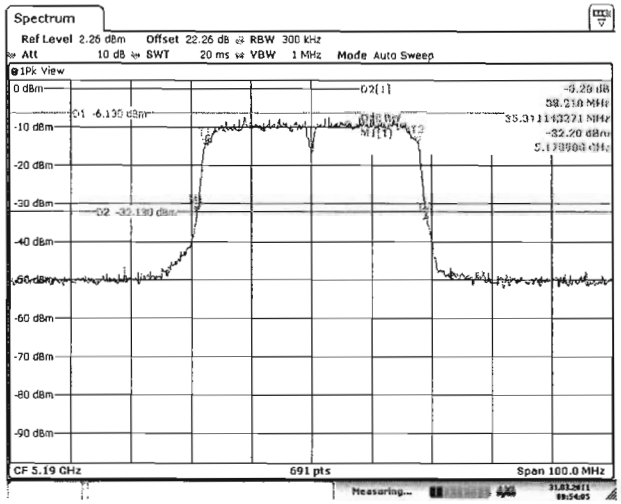
Configuration Draft n Ant. Port1

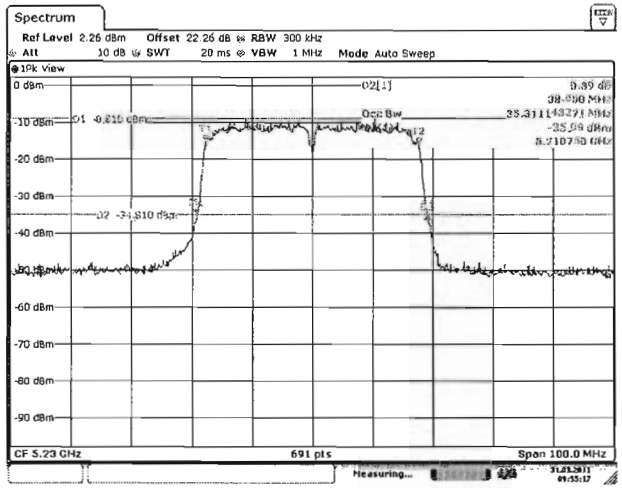
Band	Frequency (MHz)	Channel No.	Test Results	
			26dB Bandwidth (MHz)	99% Occupied Bandwidth(MHz)
Band1	5190	38	38.21	35.31
	5230	46	38.35	35.31

- See next pages for actual measured spectrum plots.

26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port1/5190



26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port1/5230MHz



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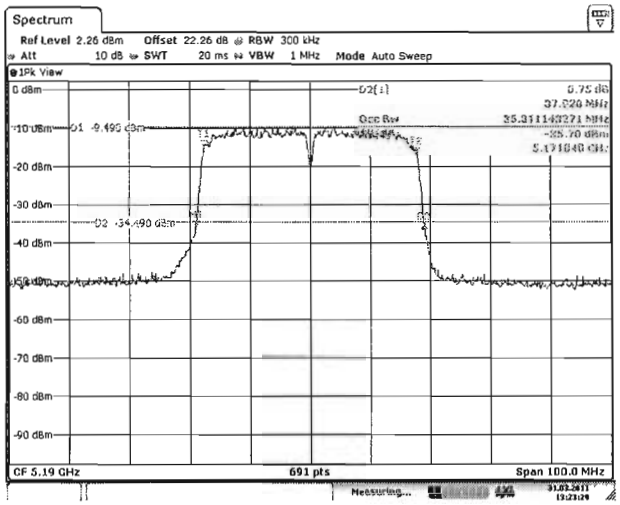
Configuration Draft n Ant. Port0 + Port1

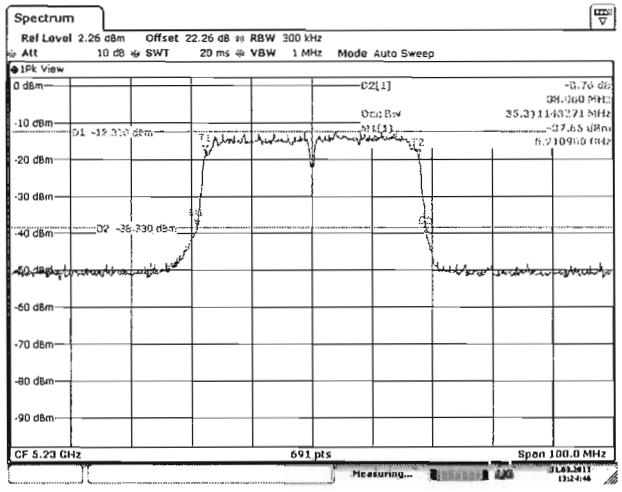
Band	Frequency (MHz)	Channel No.	Test Results	
			26dB Bandwidth (MHz)	99% Occupied Bandwidth(MHz)
Band1	5190	38	37.92	35.31
	5230	46	38.06	35.31

- See next pages for actual measured spectrum plots.

26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5190



26dB Bandwidth Plot on Configuration Draft n 40MHz Port0+Port1/5230MHz



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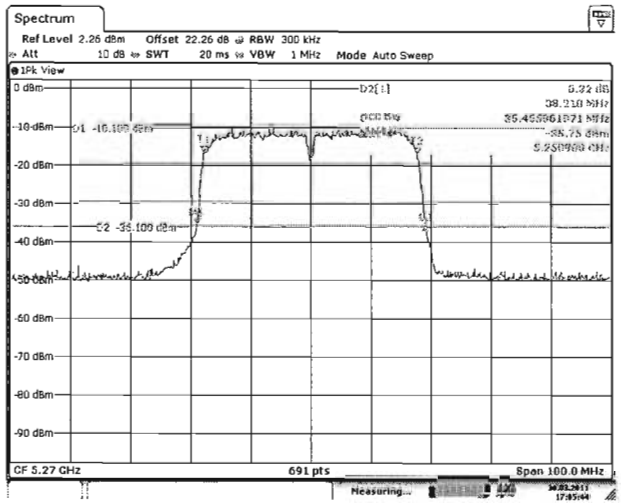
Configuration Draft n Ant. Port0

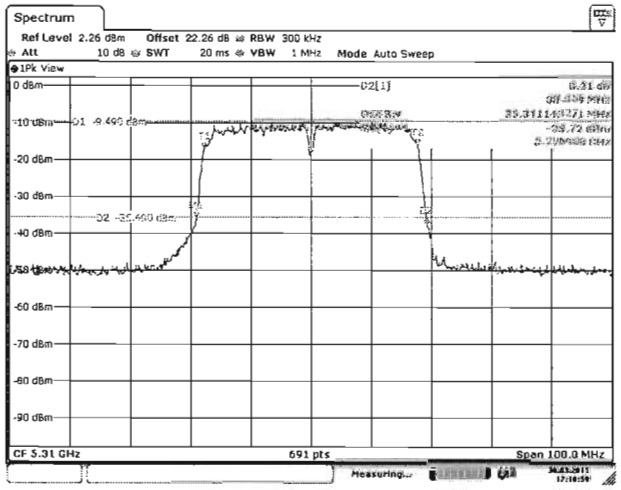
Band	Frequency (MHz)	Channel No.	Test Results	
			26dB Bandwidth (MHz)	99% Occupied Bandwidth(MHz)
Band2	5270	54	38.21	35.45
	5310	62	38.35	35.31

- See next pages for actual measured spectrum plots.

26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port0/5270



26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port0/5310MHz



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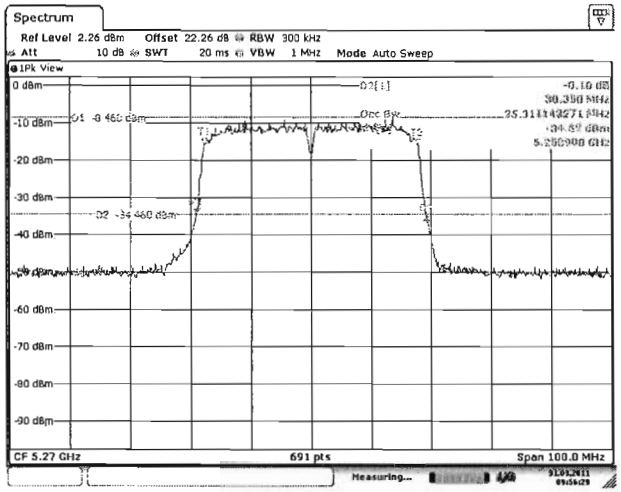
Configuration Draft n Ant. Port1

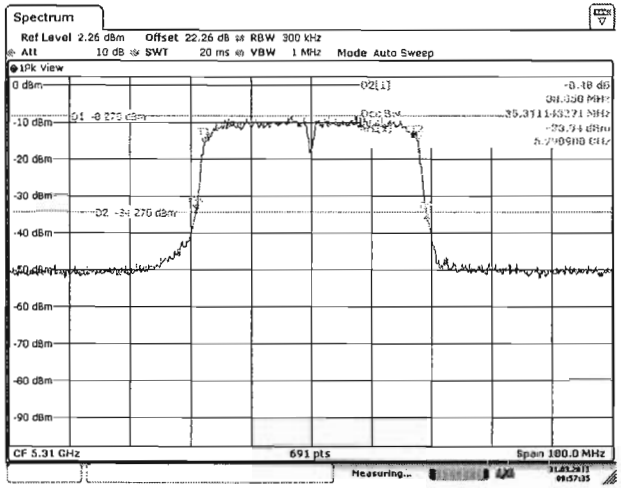
Band	Frequency (MHz)	Channel No.	Test Results	
			26dB Bandwidth (MHz)	99% Occupied Bandwidth(MHz)
Band2	5270	54	38.35	35.31
	5310	62	38.35	35.31

- See next pages for actual measured spectrum plots.

26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port1/5270



26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port1/5310MHz



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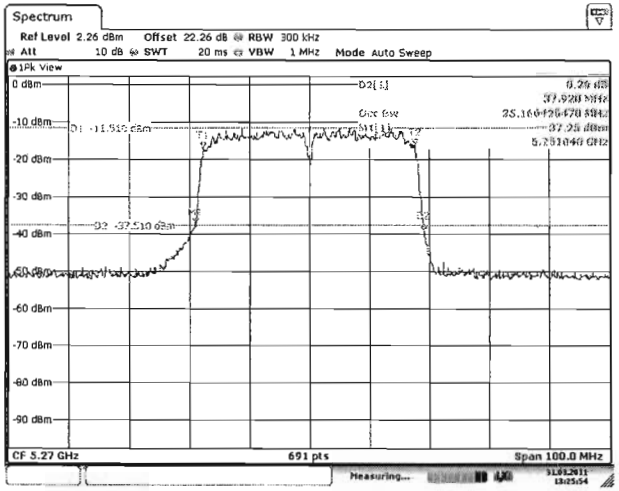
Configuration Draft n Ant. Port0 + Port1

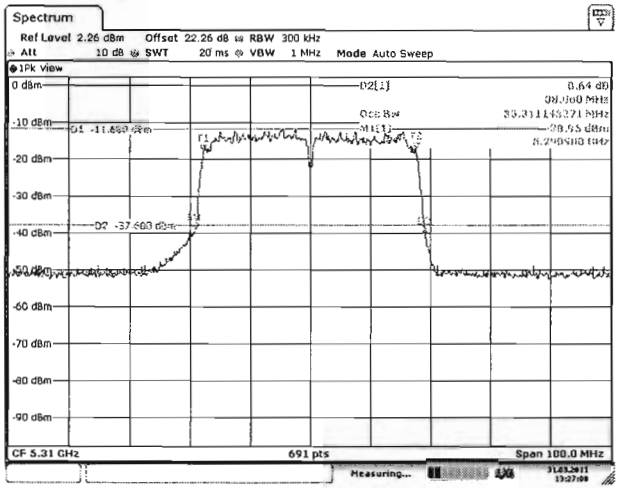
Band	Frequency (MHz)	Channel No.	Test Results	
			26dB Bandwidth (MHz)	99% Occupied Bandwidth(MHz)
Band2	5270	54	37.92	35.16
	5310	62	38.06	35.31

- See next pages for actual measured spectrum plots.

26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5270



26dB Bandwidth Plot on Configuration Draft n 40MHz Port0+Port1/5310MHz



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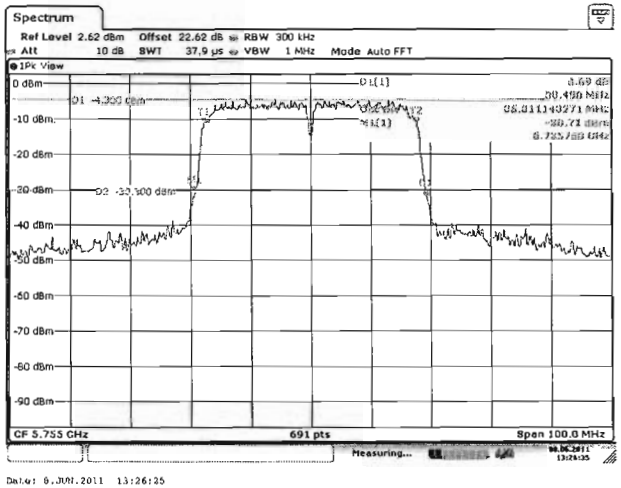
Configuration Draft n Ant. Port0

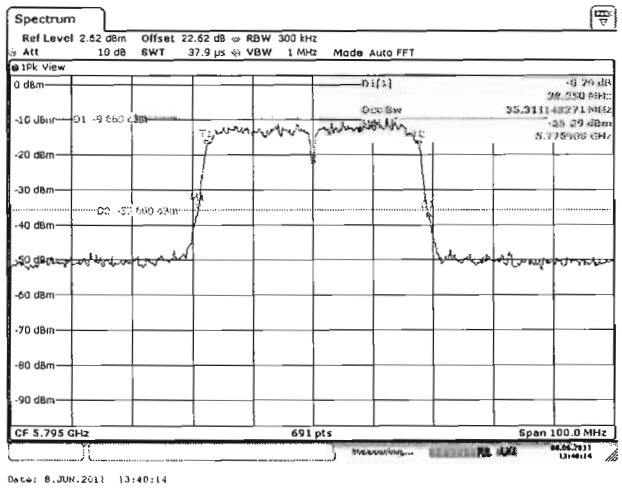
Band	Frequency (MHz)	Channel No.	Test Results	
			26dB Bandwidth (MHz)	99% Occupied Bandwidth(MHz)
Band4	5755	151	38.490	35.31
	55795	159	38.350	35.311

- See next pages for actual measured spectrum plots.

26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port0/5755



26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port0/5795



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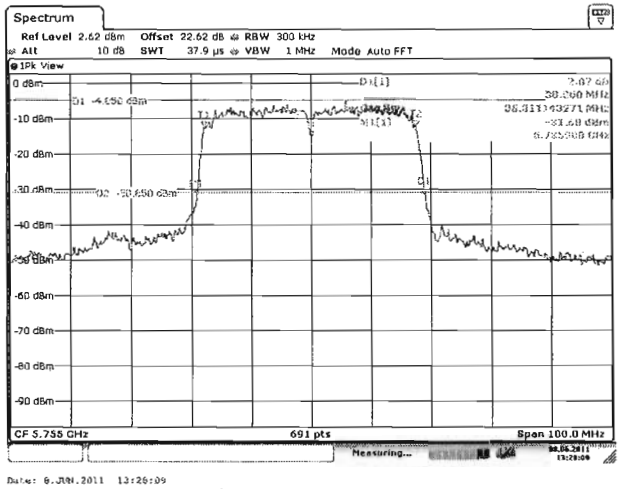
Configuration Draft n Ant. Port1

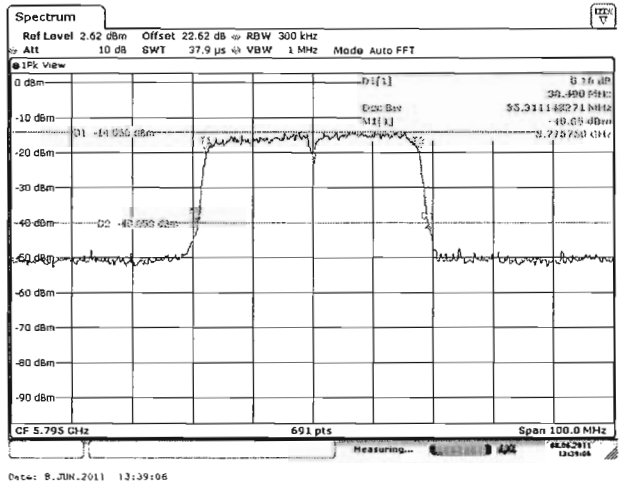
Band	Frequency (MHz)	Channel No.	Test Results	
			26dB Bandwidth (MHz)	99% Occupied Bandwidth(MHz)
Band4	5755	151	38.060	35.311
	5795	159	38.490	35.311

- See next pages for actual measured spectrum plots.

26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port1/5755



26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port1/5795



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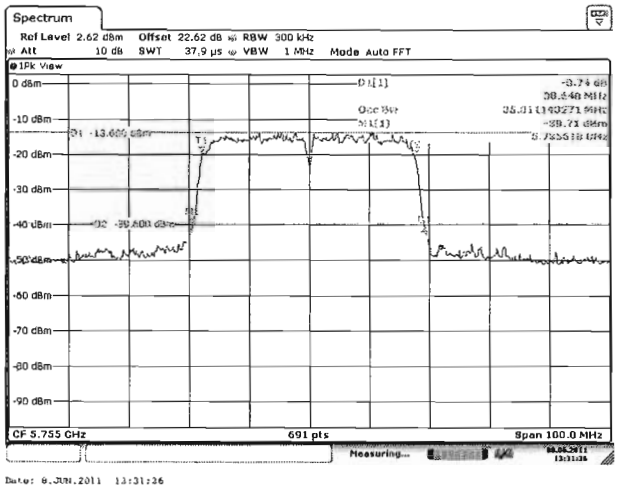
Configuration Draft n Ant. Port0 + Port1

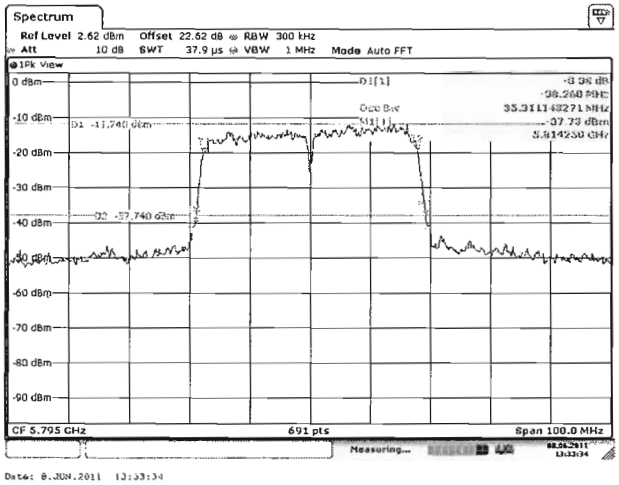
Band	Frequency (MHz)	Channel No.	Test Results	
			26dB Bandwidth (MHz)	99% Occupied Bandwidth(MHz)
Band4	5755	151	38.640	35.311
	5795	159	38.260	35.311

- See next pages for actual measured spectrum plots.

26dB Bandwidth Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5755



26dB Bandwidth Plot on Configuration Draft n 40MHz Port0+Port1/5795



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2.1.2 Maximum peak Conducted Output Power-15.407(a)

Test Location

RF Test Room

Procedures

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

Test Results

Configuration Draft n 40MHz ANT. Port0

Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5190	38	12.60	17dBm(50mW)	Complies
5230	46	11.27	17dBm(50mW)	Complies

Configuration Draft n 40MHz ANT. Port1

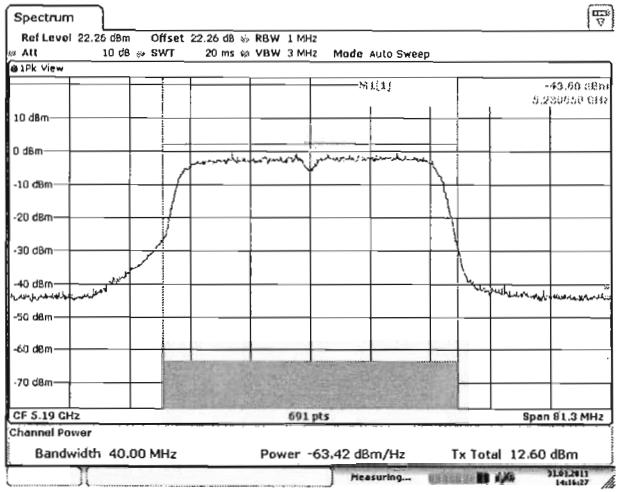
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5190	38	13.72	17dBm(50mW)	Complies
5230	46	12.38	17dBm(50mW)	Complies

Configuration Draft n 40MHz ANT. Port0+Port1

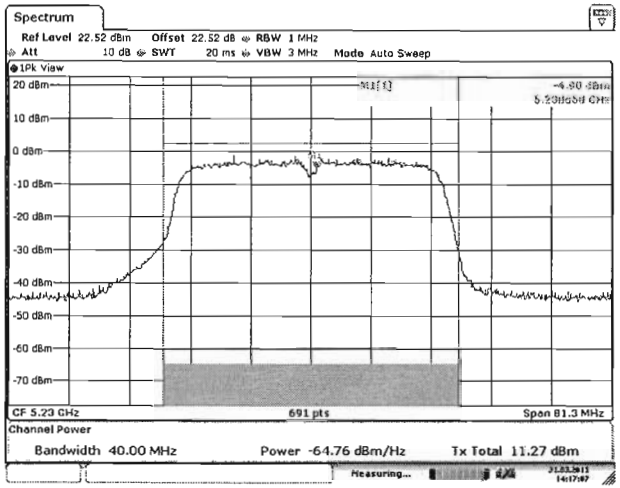
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5190	38	13.54	17dBm(50mW)	Complies
5230	46	11.42	17dBm(50mW)	Complies

See next pages for actual measured spectrum plots.

Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0/5190



Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0/5230



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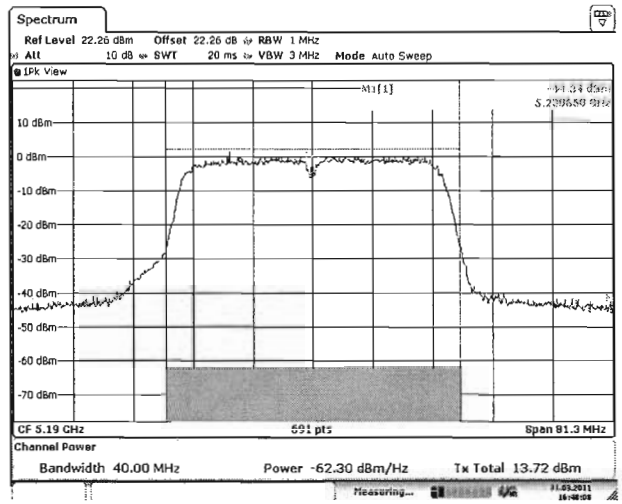
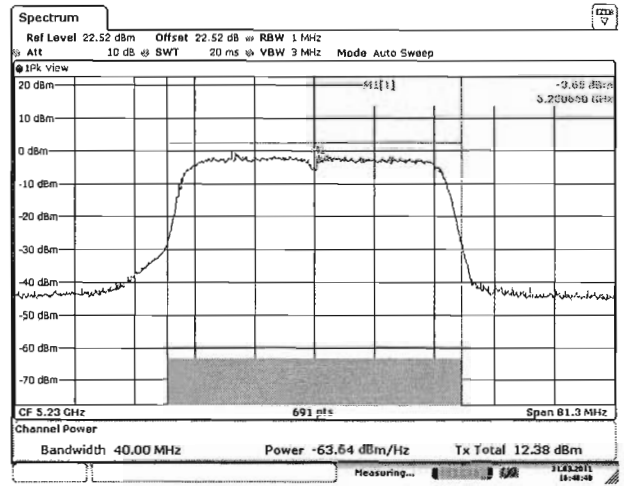
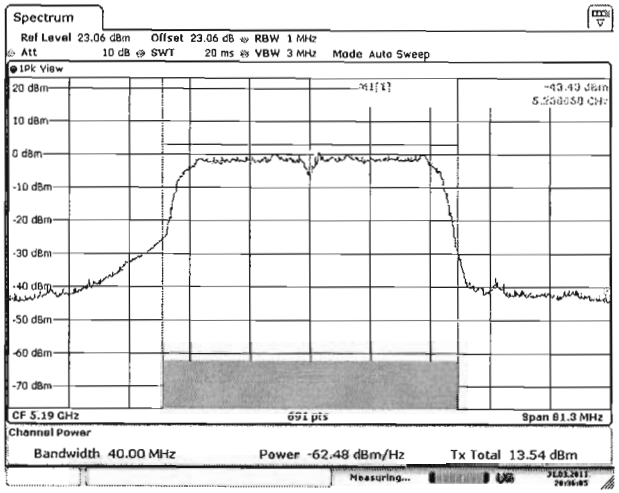
Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port1/5190



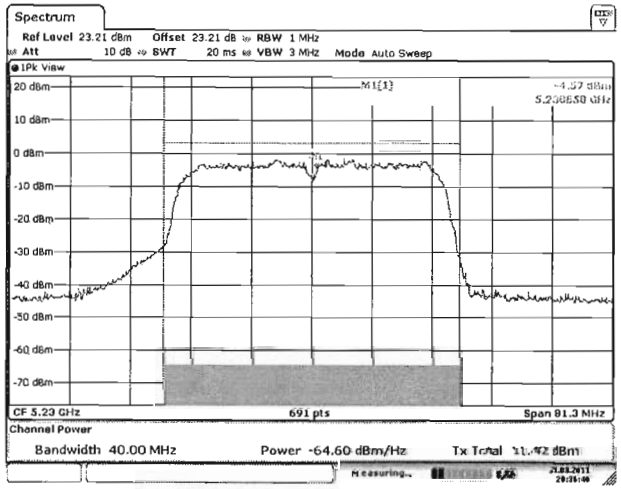
Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port1/5230



Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5190



Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5230



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Test Results

Configuration Draft n 40MHz ANT. Port0

Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5270	54	11.06	24dBm(250mW)	Complies
5310	62	13.10	24dBm(250mW)	Complies

Configuration Draft n 40MHz ANT. Port1

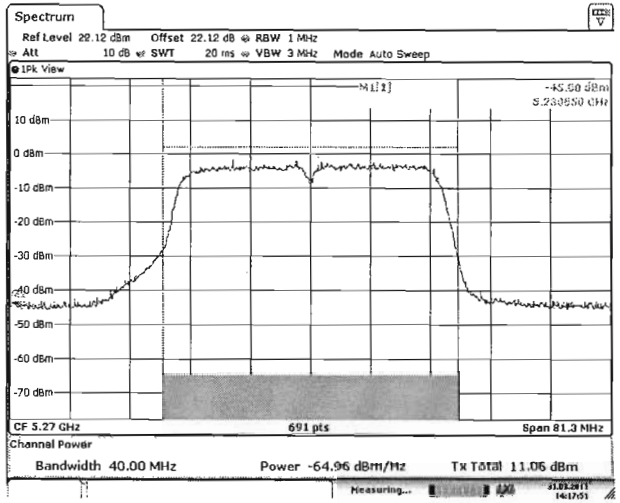
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5270	54	11.42	24dBm(250mW)	Complies
5310	62	13.10	24dBm(250mW)	Complies

Configuration Draft n 40MHz ANT. Port0+Port1

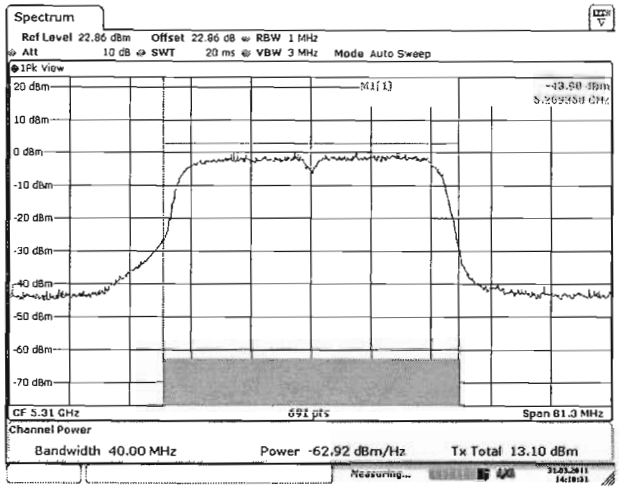
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5270	54	10.97	24dBm(250mW)	Complies
5310	62	10.51	24dBm(250mW)	Complies

See next pages for actual measured spectrum plots.

Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0/5270



Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0/5310



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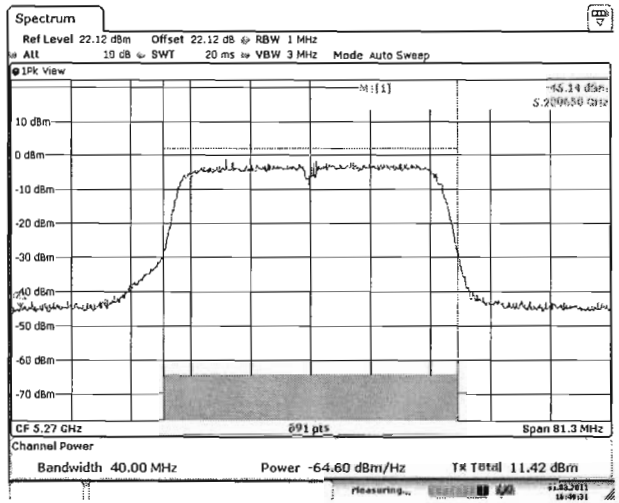
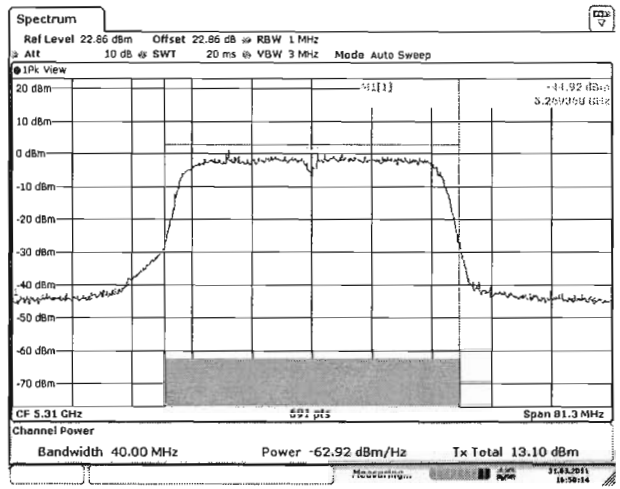
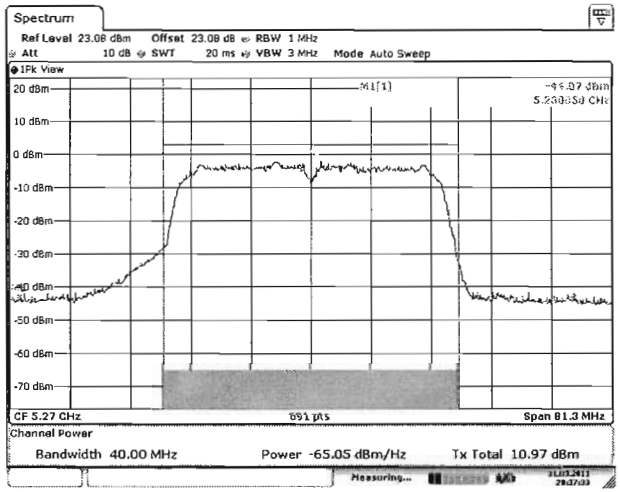
Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port1/5270



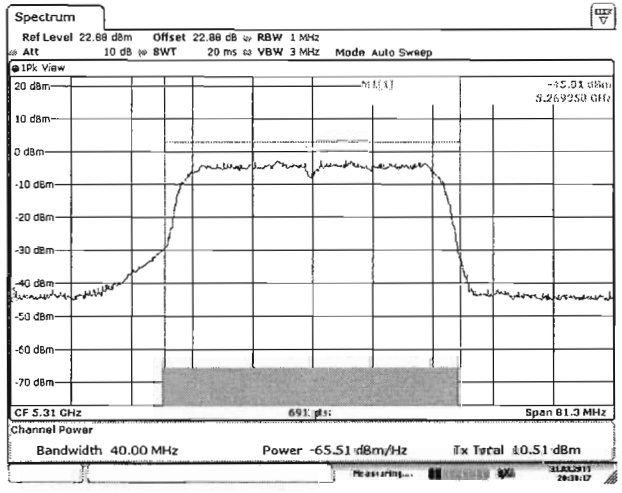
Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port1/5310



Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5270



Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5310



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Test Results

Configuration Draft n 40MHz ANT. Port0

Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5755	151	7.58	30dBm(1W)	Complies
5795	159	8.08	30dBm(1W)	Complies

Configuration Draft n 40MHz ANT. Port1

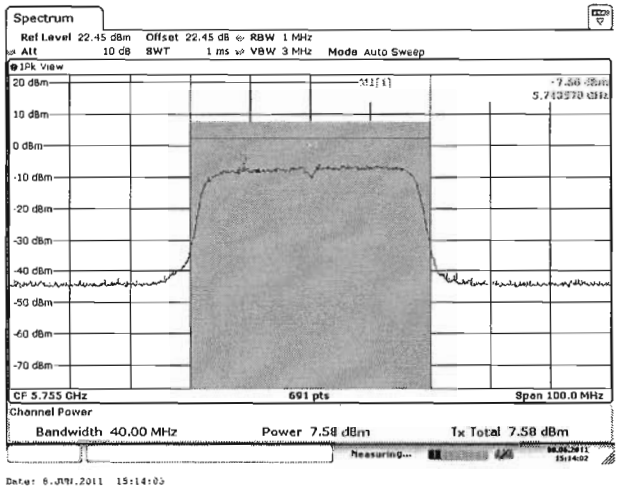
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5755	151	6.37	30dBm(1W)	Complies
5795	159	6.07	30dBm(1W)	Complies

Configuration Draft n 40MHz ANT. Port0+Port1

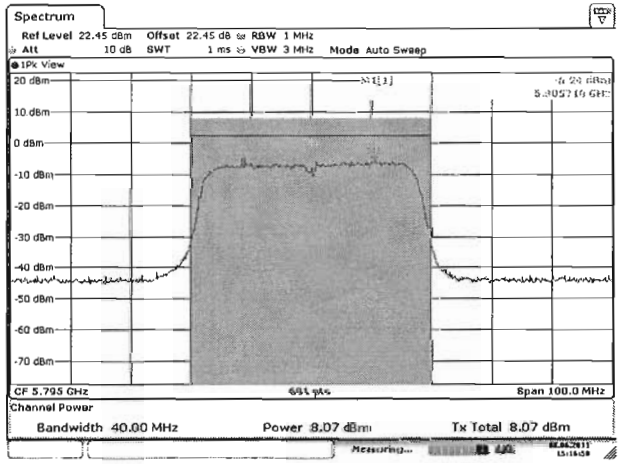
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5755	151	9.03	30dBm(1W)	Complies
5795	159	4.55	30dBm(1W)	Complies

See next pages for actual measured spectrum plots.

Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0/5755



Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0/5795



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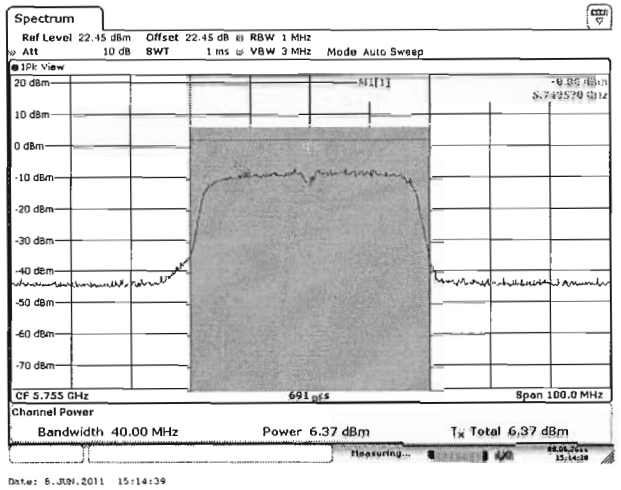
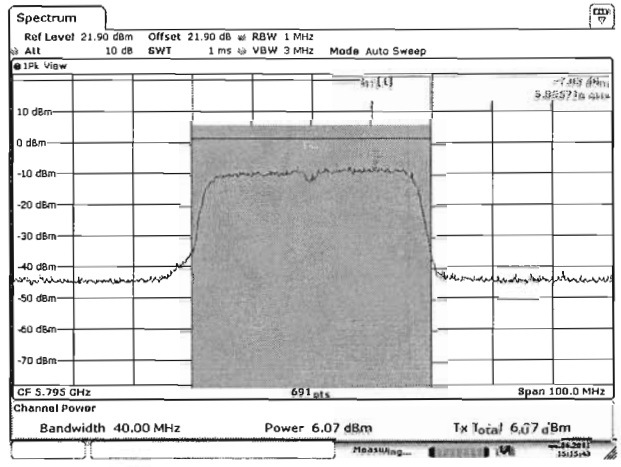
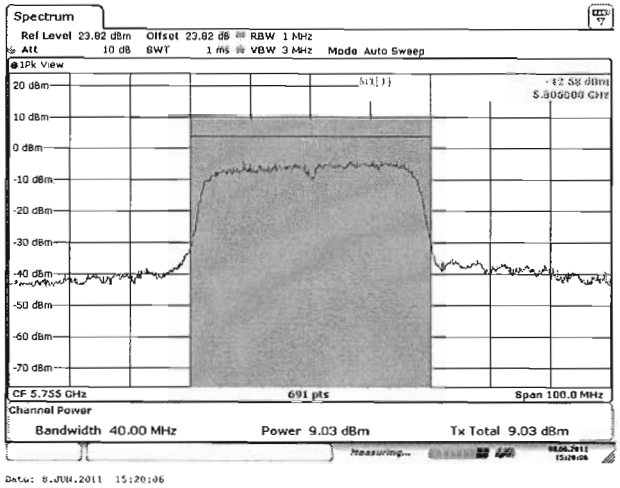
Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port1/5755



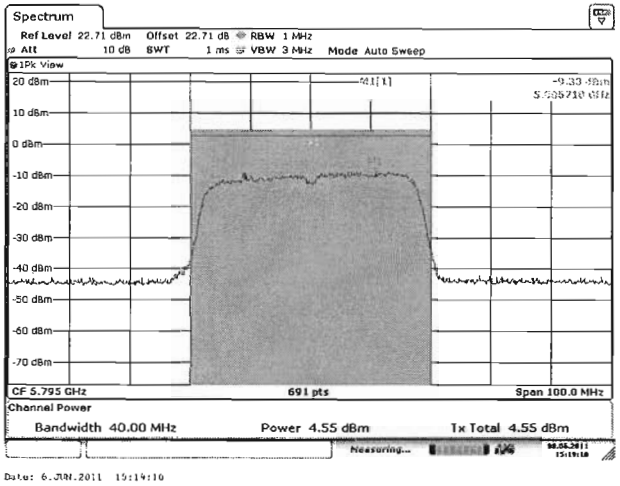
Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port1/5795



Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5755



Peak Conducted Output Power Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5795



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2.1.3 Power Spectral Density-15.407(a)

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

The spectrum analyzer is set to:

RBW = 1000 kHz	VBW = 3000kHz
Sweep = Auto	Span = 60 MHz
Detector function = Sample	Trace = Average

Measurement Data:

Test Results

Configuration Draft n 40MHz ANT. Port0

Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5190	38	0.81	4dBm	Complies
5230	46	-0.69	4dBm	Complies

Configuration Draft n 40MHz ANT. Port1

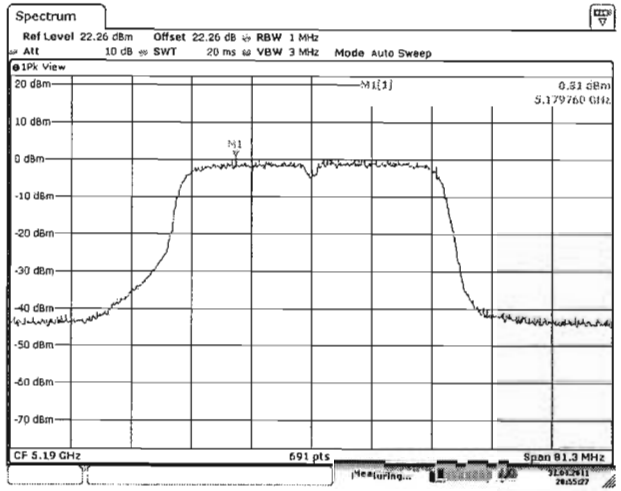
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5190	38	1.16	4dBm	Complies
5230	46	0.26	4dBm	Complies

Configuration Draft n 40MHz ANT. Port0+Port1

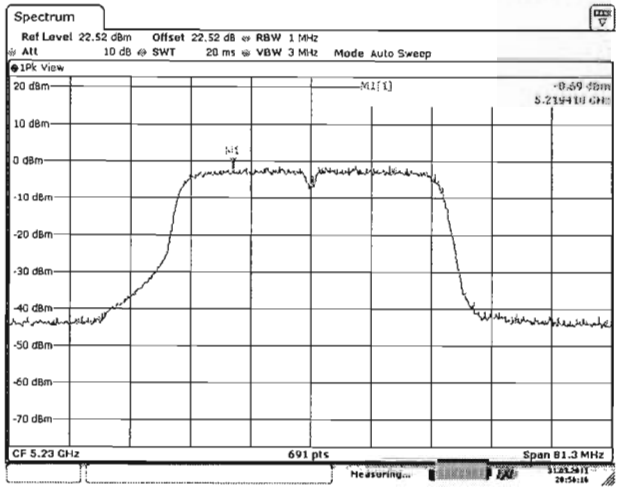
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5190	38	-1.38	4dBm	Complies
5230	46	-2.33	4dBm	Complies

See next pages for actual measured spectrum plots.

Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0/5190



Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0/5230



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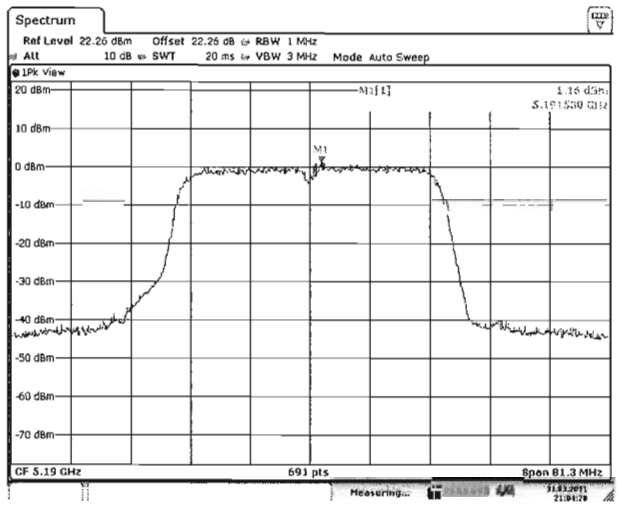
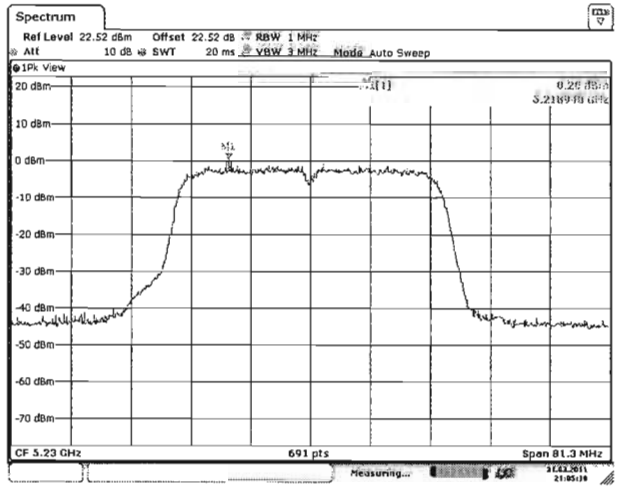
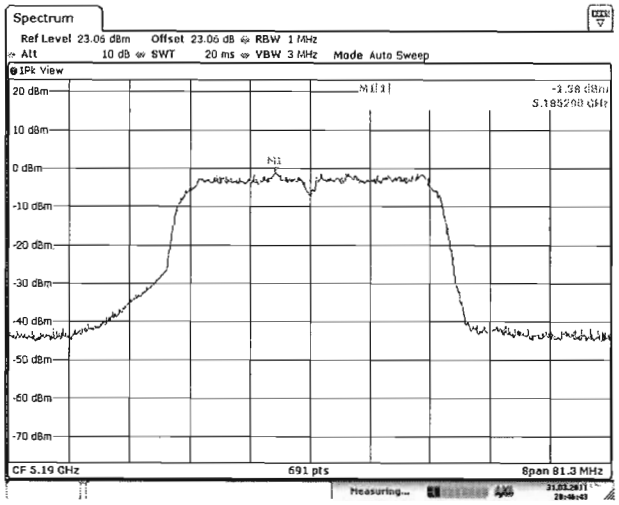
Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port1/5190



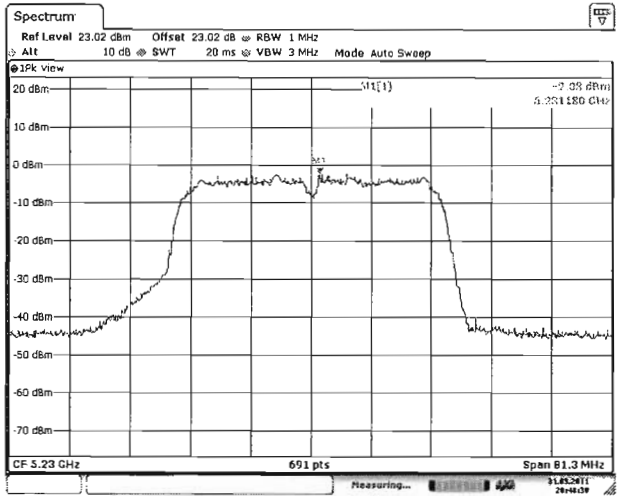
Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port1/5230



Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5190



Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5230



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Test Results

Configuration Draft n 40MHz ANT. Port0

Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5270	54	-0.89	11dBm	Complies
5310	62	1.17	11dBm	Complies

Configuration Draft n 40MHz ANT. Port1

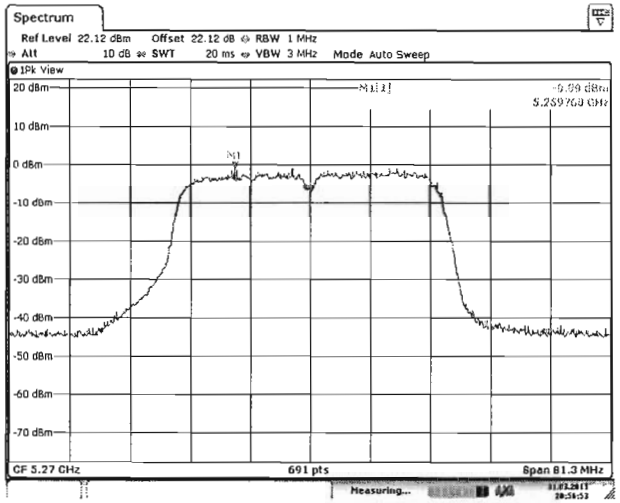
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5270	54	-0.34	11dBm	Complies
5310	62	1.77	11dBm	Complies

Configuration Draft n 40MHz ANT. Port0+Port1

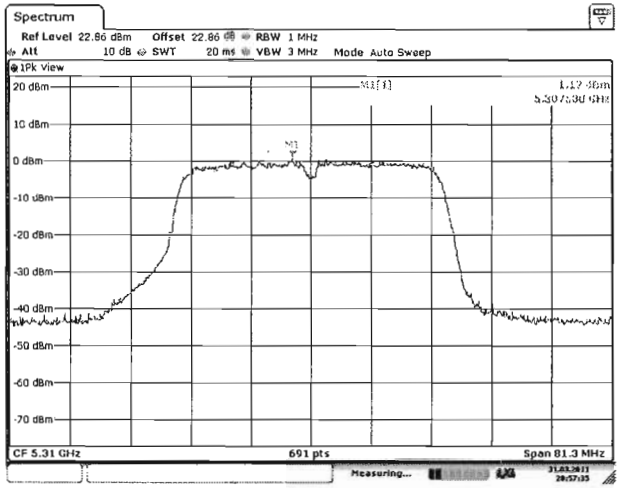
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5270	54	-3.09	11dBm	Complies
5310	62	-3.23	11dBm	Complies

See next pages for actual measured spectrum plots.

Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0/5270



Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0/5310



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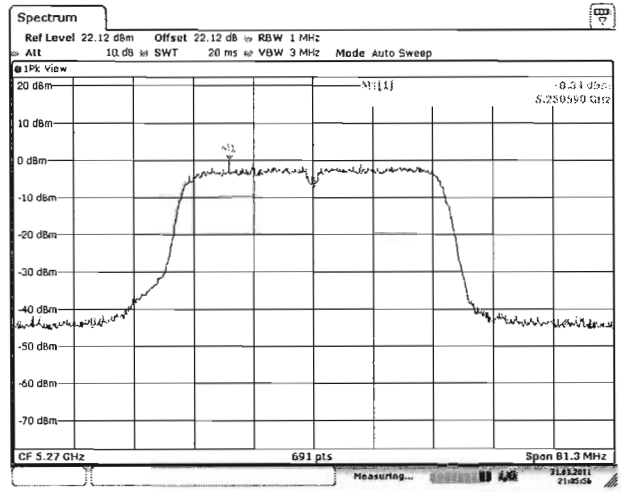
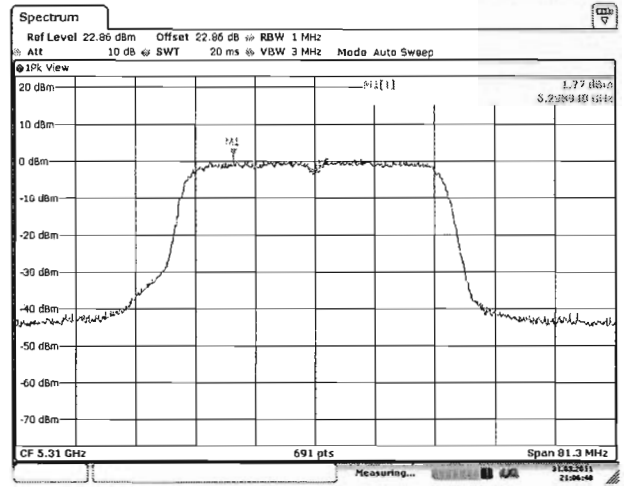
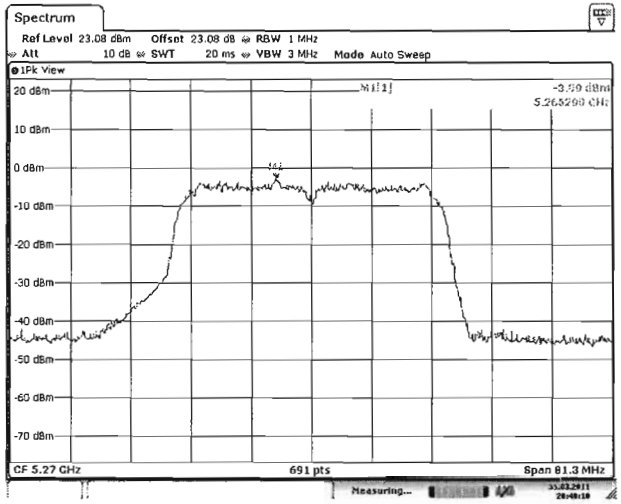
Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port1/5270



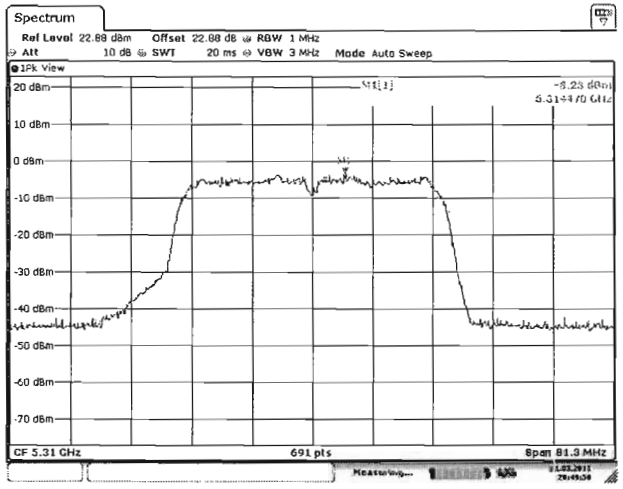
Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port1/5310



Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5270



Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5310



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Test Results

Configuration Draft n 40MHz ANT. Port0

Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5755	151	3.48	17dBm	Complies
5795	159	2.78	17dBm	Complies

Configuration Draft n 40MHz ANT. Port1

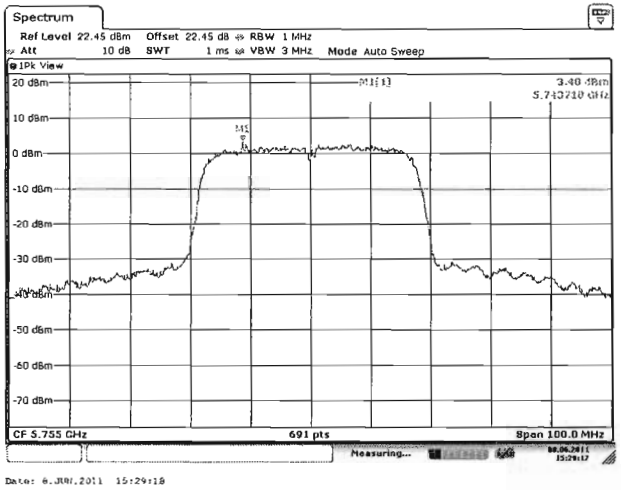
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5755	151	1.46	17dBm	Complies
5795	159	2.78	17dBm	Complies

Configuration Draft n 40MHz ANT. Port0+Port1

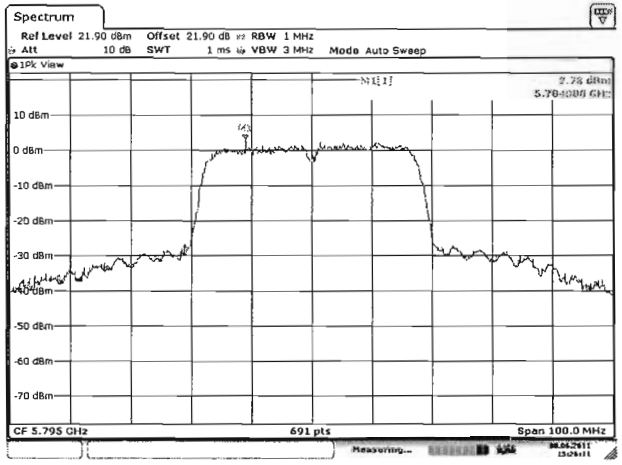
Frequency (MHz)	Channel No.	Peak output power(dBm)	Limit	Result
5755	151	-5.52	17dBm	Complies
5795	159	-3.33	17dBm	Complies

See next pages for actual measured spectrum plots.

Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0/5755



Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0/5795



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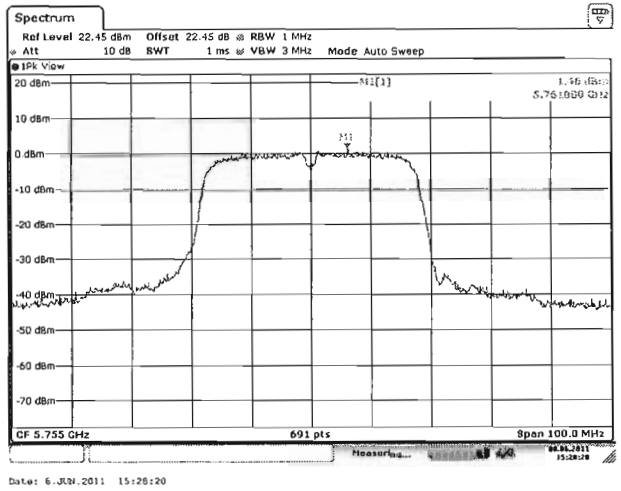
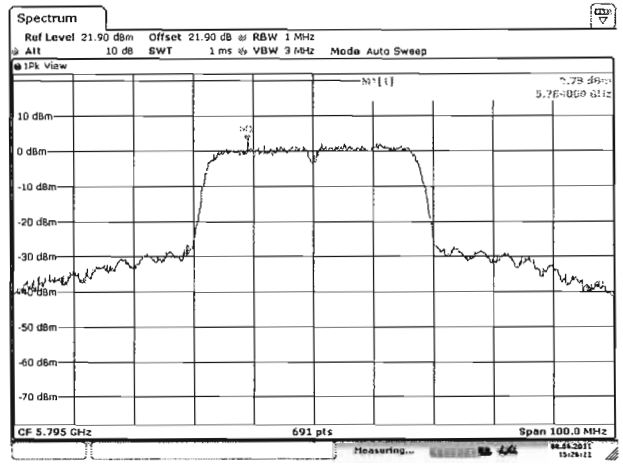
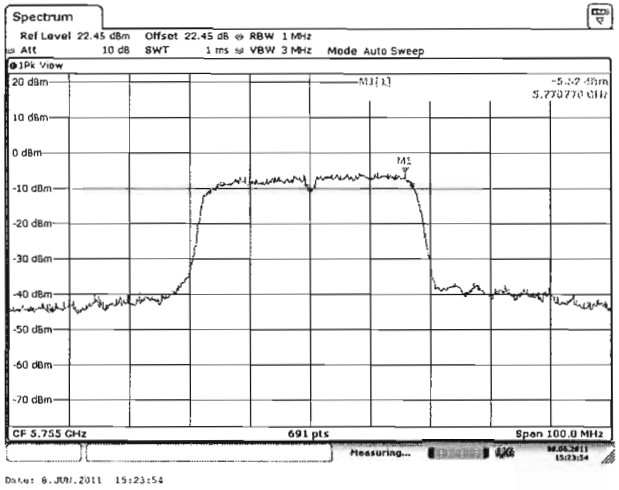
Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port1/5755



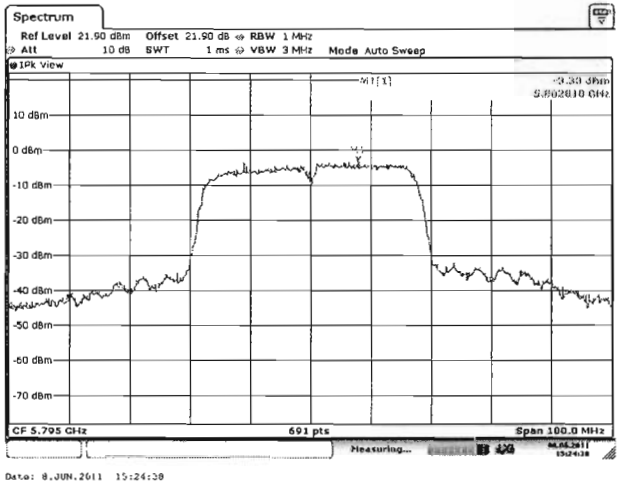
Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port1/5795



Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5755



Power Spectral Density Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5795



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2.1.4 Peak Excursion Measurement -15.407(a)

Procedure:

1. The transmitter Output(antenna port) was connected to the spectrum analyzer
2. Set the spectrum analyzer span to view the entire emissions bandwidth. The largest difference between the following two traces (Peak Trace and Average Trace) must be ≤13 dB for all frequencies across the emissions bandwidth. Submit a plot.
3. Peak Trace : Set RBW=1MHz, VBW≥3MHz with peak detector and max-hold settings
4. Average Trace: Method #3-vido averaging with max hold and sum power across the band. Set span to encompass the entire emissions bandwidth[EBW] of the signal. Set sweep trigger to 'free run'. Set RBW=1MHz. Set VBW ≥ 1/T(Draft n VBW=300kHz ≥1/4㎲). Use sample detector mode if bin width(i.e.,span/number of points in spectrum) <0.5RBW. Otherwise use peak detector mode. Set max hold. Allow max hold to run for 60 seconds.
5. Measuring multiple antennas, the connector is required to link with spectrum analyzer through a combiner

The spectrum analyzer is set to:

RBW = 1000 kHz(Peak Trace) / 1000kHz(Average Trace)

VBW = 3000 kHz(Peak Trace) / 300kHz(Average Trace)

Detector function = Peak (Peak Trace) / Sample (Average Trace)

Trace = Max hold

Sweep = 60s

Span Frequency = Encompass the entire emissions bandwidth (EBW) of the signal

Measurement Data:

Configuration Draft n 40MHz ANT. Port0

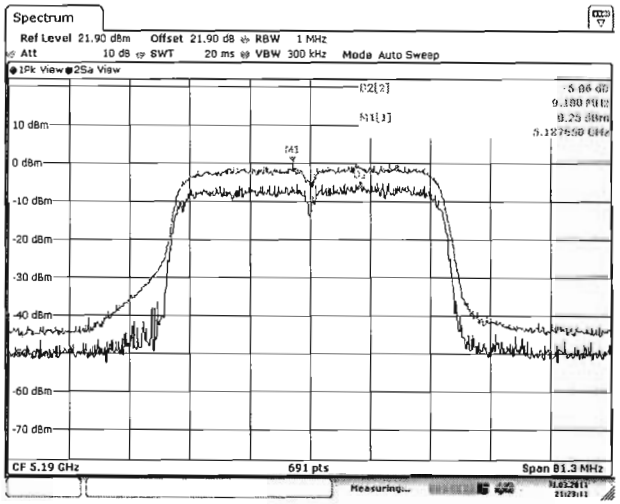
Band	Frequency (MHz)	Ch.	Test Results	
			dB	Result
Band1	5190	38	5.06	Complies
	5230	46	4.61	Complies

Limit

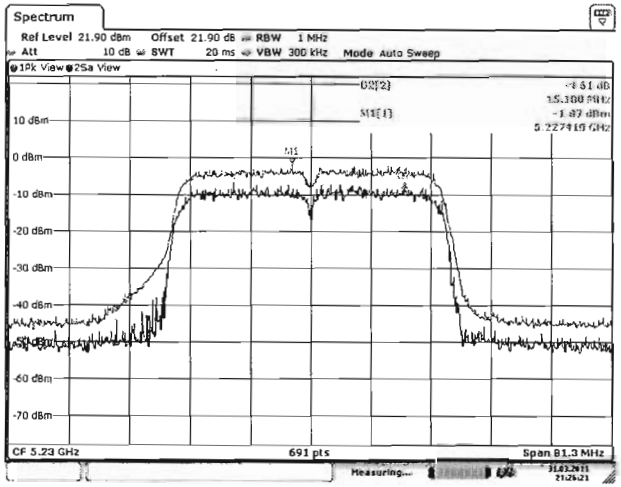
Peak Excursion:	13dB

See next pages for actual measured spectrum plots.

Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0/5190



Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0/5230



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Configuration Draft n 40MHz ANT. Port1

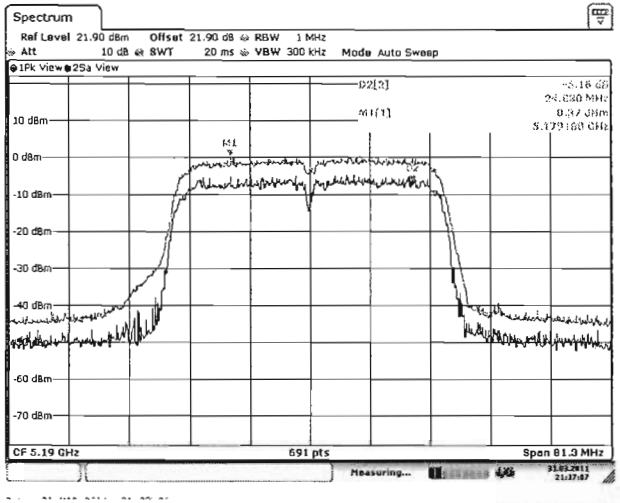
Band	Frequency (MHz)	Ch.	Test Results	
			dB	Result
Band1	5190	38	5.16	Complies
	5230	46	4.01	Complies

Limit

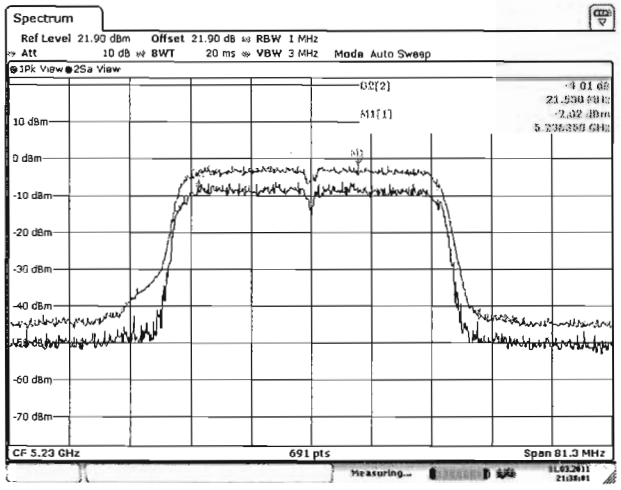
Peak Excursion:	13dB

See next pages for actual measured spectrum plots.

Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port1/5190



Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port1/5230



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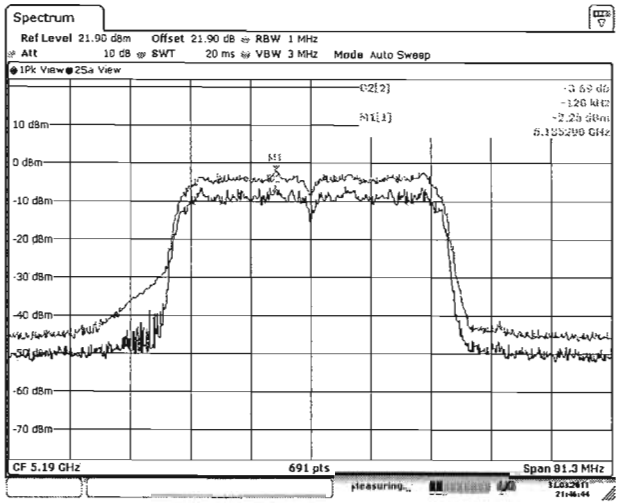
Configuration Draft n 40MHz ANT. Port0+Port1

Band	Frequency (MHz)	Ch.	Test Results	
			dB	Result
Band1	5190	38	3.69	Complies
	5230	46	3.81	Complies

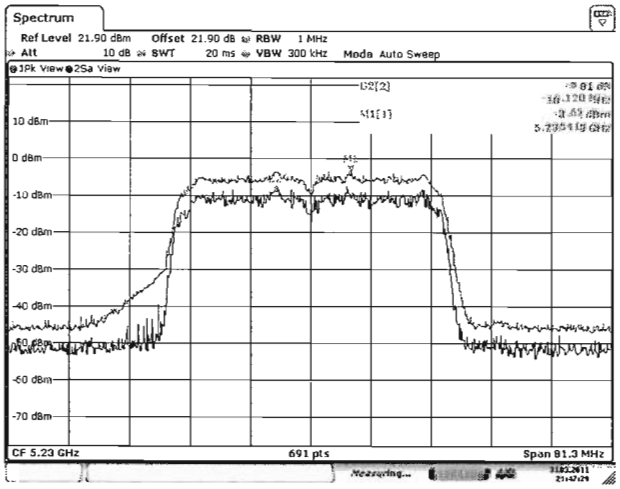
Limit	
Peak Excursion:	13dB

See next pages for actual measured spectrum plots.

Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5190



Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5230



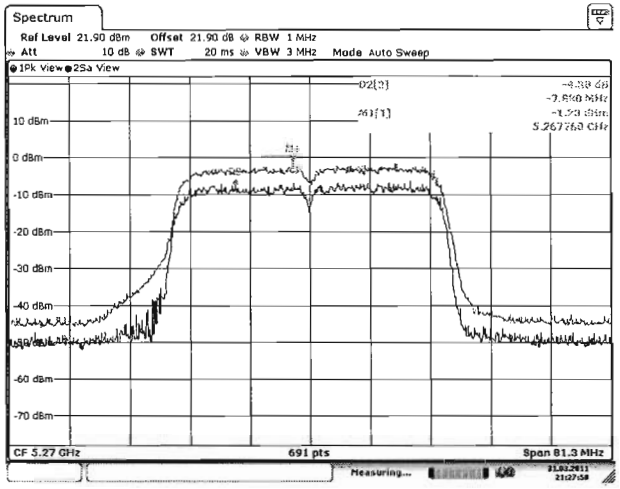
Configuration Draft n 40MHz ANT. Port0

Band	Frequency (MHz)	Ch.	Test Results	
			dB	Result
Band2	5270	54	4.38	Complies
	5310	62	4.30	Complies

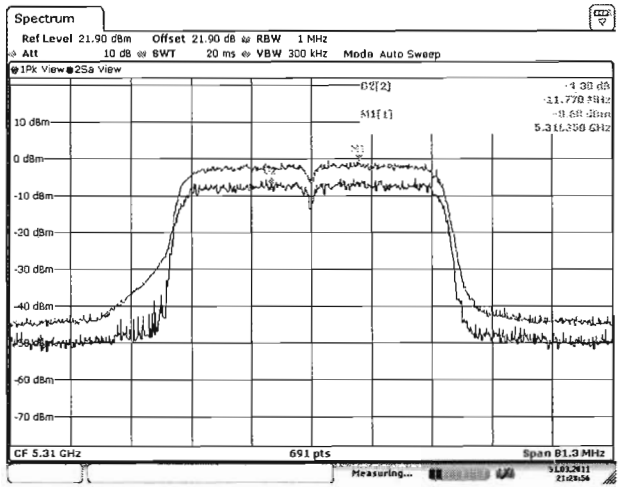
Limit	
Peak Excursion:	13dB

See next pages for actual measured spectrum plots.

Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0/5270



Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0/5310



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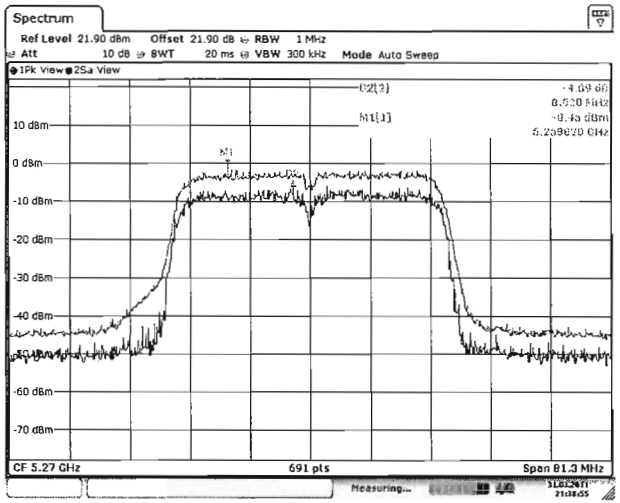
Configuration Draft n 40MHz ANT. Port1

Band	Frequency (MHz)	Ch.	Test Results	
			dB	Result
Band2	5270	54	4.09	Complies
	5310	62	4.42	Complies

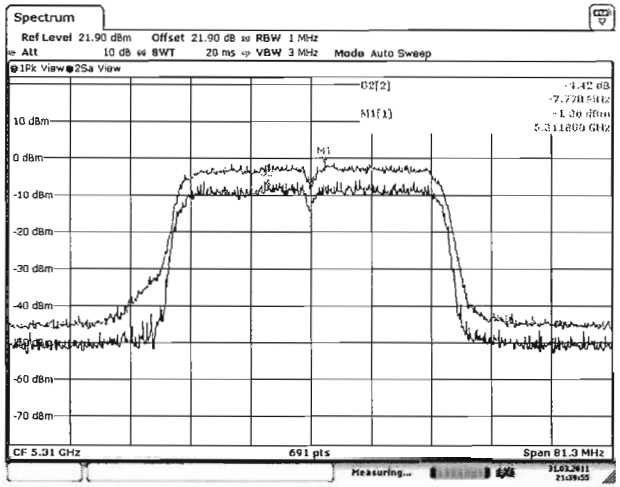
Limit	
Peak Excursion:	13dB

See next pages for actual measured spectrum plots.

Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port1/5270



Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port1/5310



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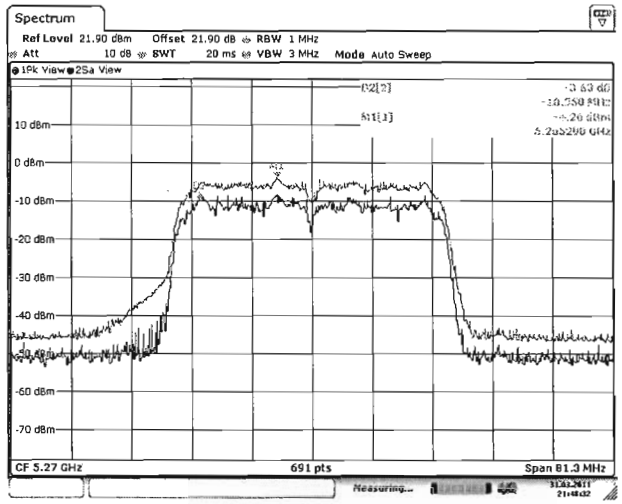
Configuration Draft n 40MHz ANT. Port0+Port1

Band	Frequency (MHz)	Ch.	Test Results	
			dB	Result
Band2	5270	54	3.63	Complies
	5310	62	3.53	Complies

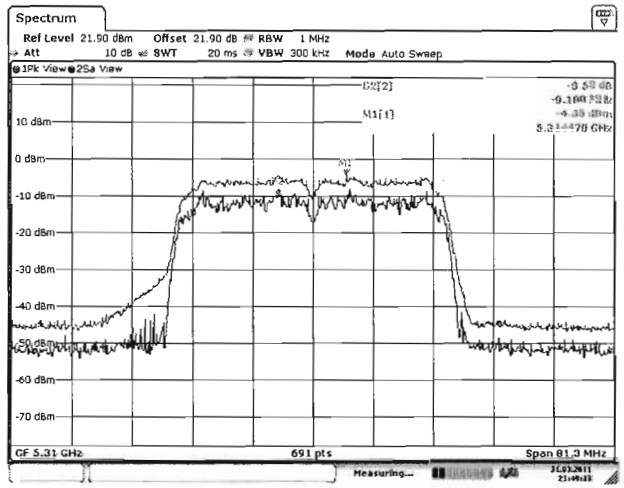
Limit	
Peak Excursion:	13dB

See next pages for actual measured spectrum plots.

Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5270



Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5310



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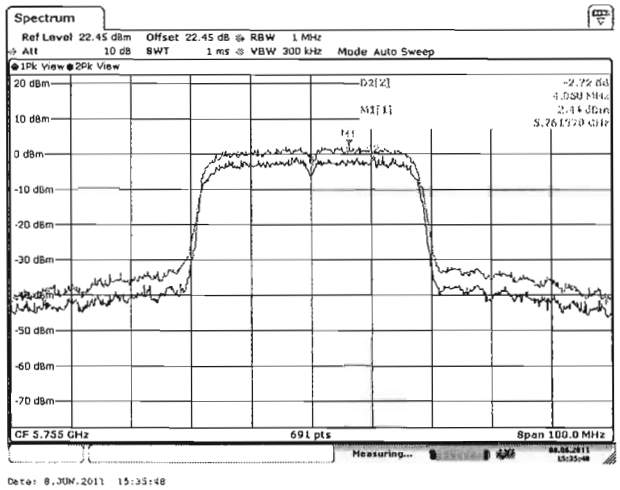
Configuration Draft n 40MHz ANT. Port0

Band	Frequency (MHz)	Ch.	Test Results	
			dB	Result
Band4	5755	151	2.75	Complies
	5795	159	2.31	Complies

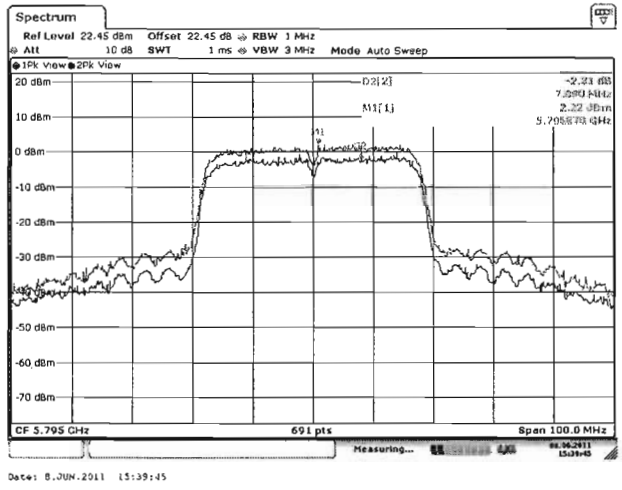
Limit	
Peak Excursion:	13dB

See next pages for actual measured spectrum plots.

Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0/5755



Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0/5795



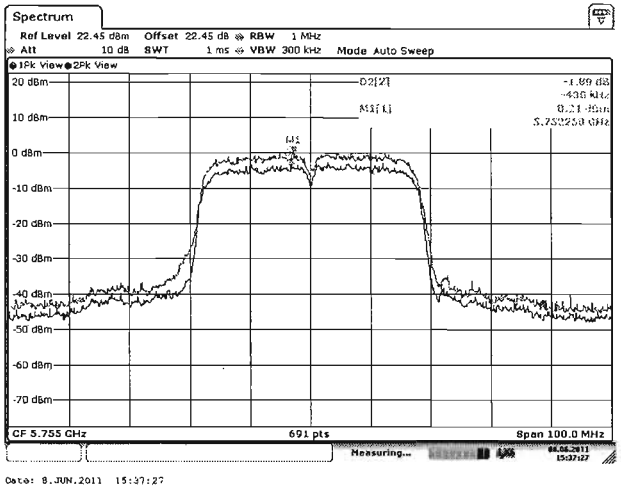
Configuration Draft n 40MHz ANT. Port1

Band	Frequency (MHz)	Ch.	Test Results	
			dB	Result
Band4	5755	151	1.89	Complies
	5795	159	3.66	Complies

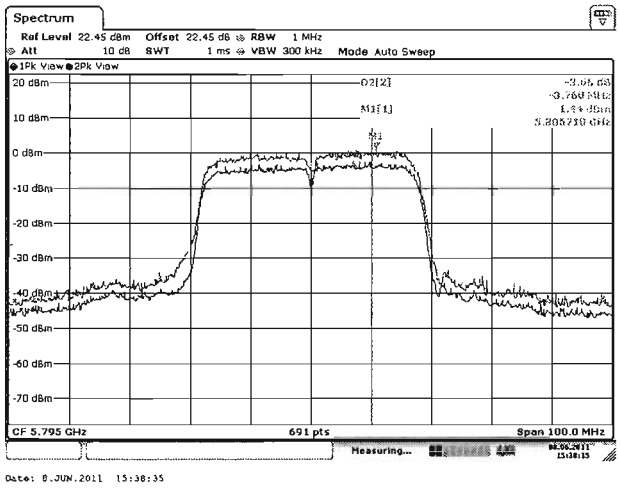
Limit	
Peak Excursion:	13dB

See next pages for actual measured spectrum plots.

Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port1/5755



Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port1/5795



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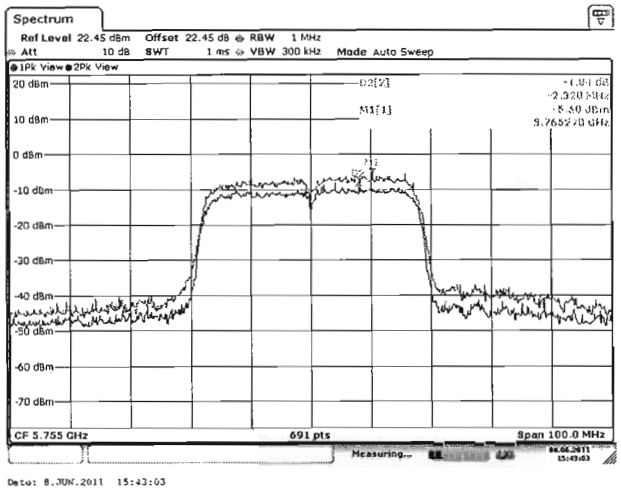
Configuration Draft n 40MHz ANT. Port0+Port1

Band	Frequency (MHz)	Ch.	Test Results	
			dB	Result
Band4	5755	151	1.84	Complies
	5795	159	2.48	Complies

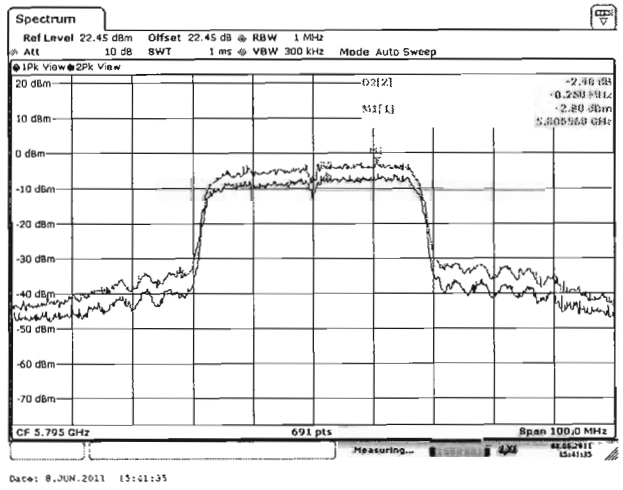
Limit	
Peak Excursion:	13dB

See next pages for actual measured spectrum plots.

Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5755



Peak Excursion Plot on Configuration Draft n 40MHz ANT. Port0+Port1/5795



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2.1.5 Condcuted Band Edge Emissions Test Results

Description:
For transmitters operating in the 5.25-5.35GHz Band: all emissions outside of the 5.15~5.35GHZ band shall not exceed an EIRP of -27dBm/MHz. Devices operating in the 5.25~5.35GHz band that generate emissions in the 5.51~5.25GHz band must meet all applicable technical requirements for operation in 5.15~5.25GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27dBm/MHz in the 5.15~5.25GHz band.

Unwanted Spurious Emissions Limits	
Frequency(MHz)	Field Strength(dBm/Hz) (Emissions outside the restricted bands)
5250~5350	EIRP<-27dBm/Hz(68.3dBuV/m)

See next pages for actual measured spectrum plots.

Configuration Draft n 40MHz ANT. Port0

Frequency (MHz)	Power Spec Den. Reading(dBm/MHz)	Antenna Gain(dBi)	Corrected Reading (dBm/MHz
5755	-37.13	3.94	-33.19
5795	-43.60	3.94	-39.66

Configuration Draft n 40MHz ANT. Port1

Frequency (MHz)	Power Spec Den. Reading(dBm/MHz)	Antenna Gain(dBi)	Corrected Reading (dBm/MHz
5755	-46.64	3.94	-42.70
5795	-43.22	3.94	-39.28

Configuration Draft n 40MHz ANT. Port0+Port1

Frequency (MHz)	Power Spec Den. Reading(dBm/MHz)	Antenna Gain(dBi)	Corrected Reading (dBm/MHz
5755	-36.43	3.94	-32.49
5795	-46.00	3.94	-42.06

Limit	
EIRP	-27dBm/MHz

See next pages for actual measured spectrum plots

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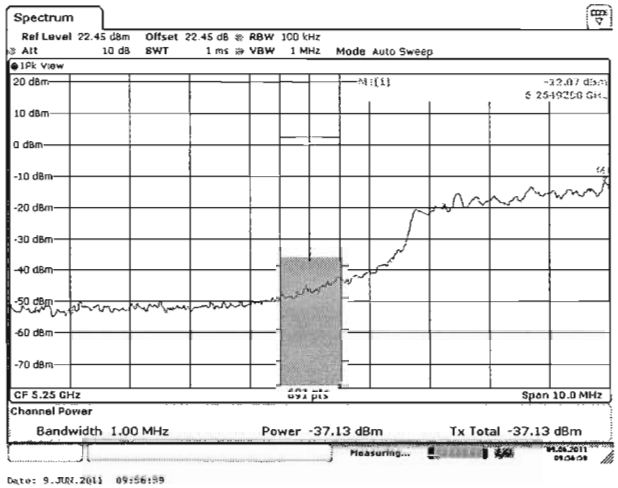
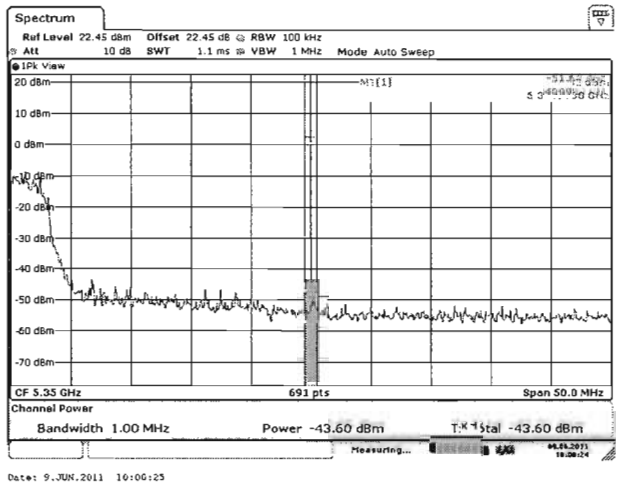
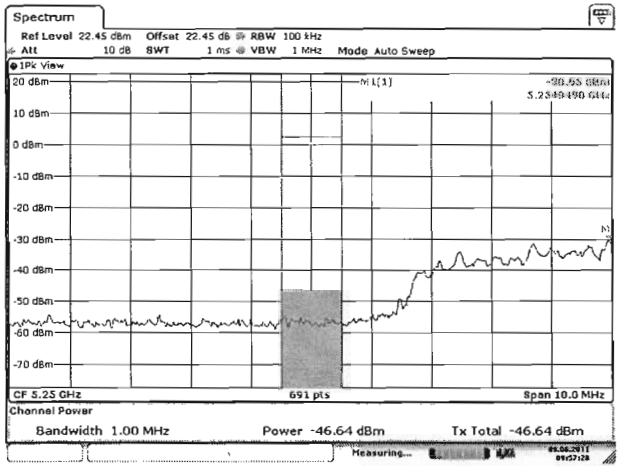
Conducted Band Edge Emissions Plot on ANT. Port0/5270



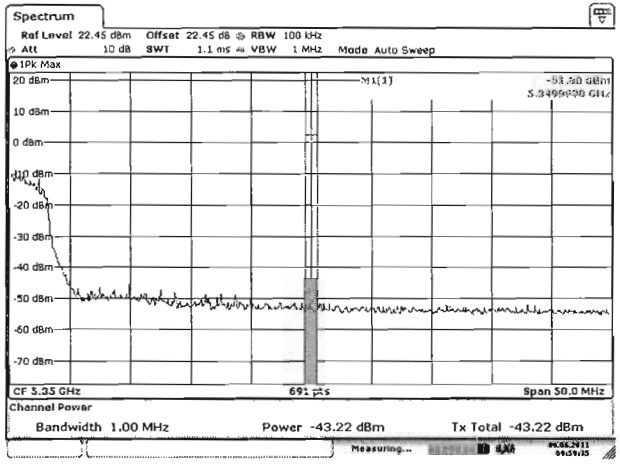
Conducted Band Edge Emissions Plot on ANT. Port0/5310



Conducted Band Edge Emissions Plot on ANT. Port1/5270



Conducted Band Edge Emissions Plot on ANT. Port1/5310



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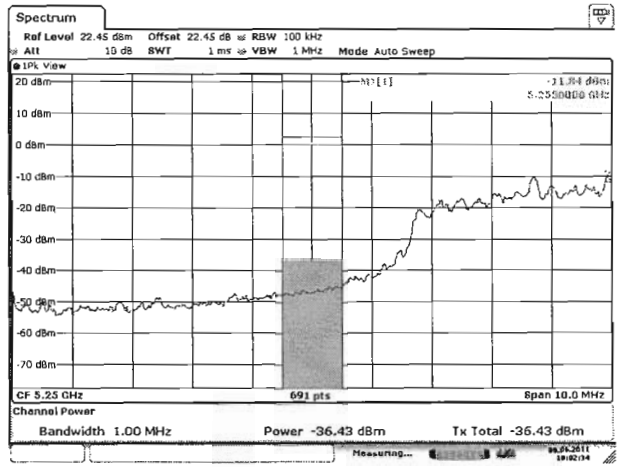
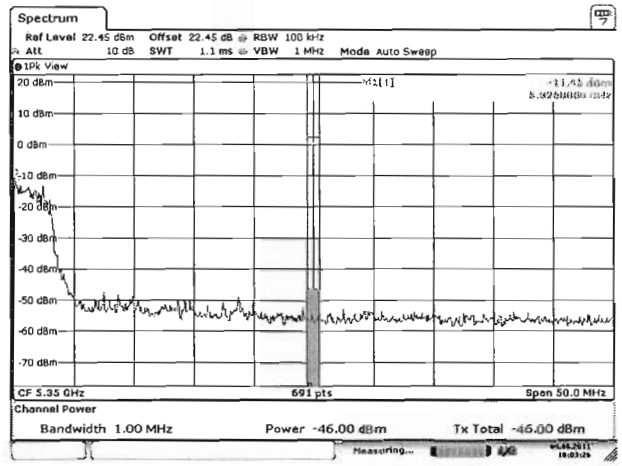
Conducted Band Edge Emissions Plot on ANT. Port0+Port1/5270



Conducted Band Edge Emissions Plot on ANT. Port0+Port1/5310



2.1.6 Condcuted Band Edge Emissions Test Results

Description:

For transmitters operating in the 5.25-5.35GHz Band: all emissions outside of the 5.15~5.35GHZ band shall not exceed an EIRP of -27dBm/MHz.

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm/MHz.
Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27dBm/MHz.

See next pages for actual measured spectrum plots.

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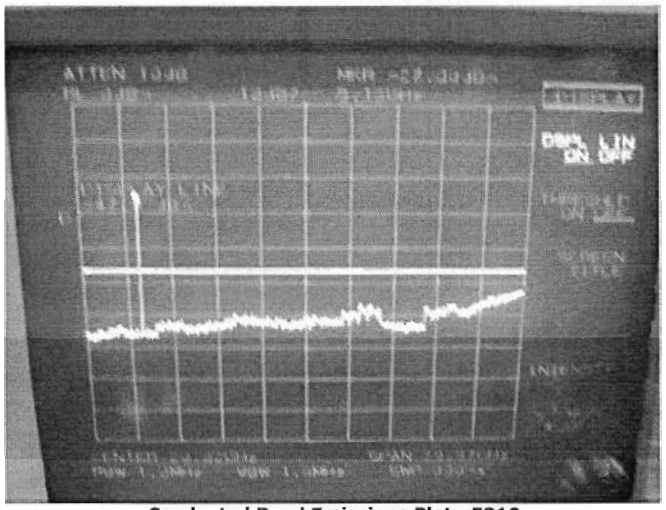
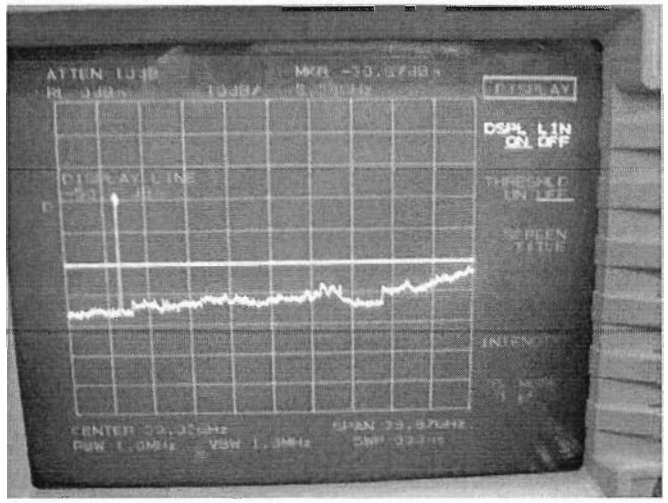
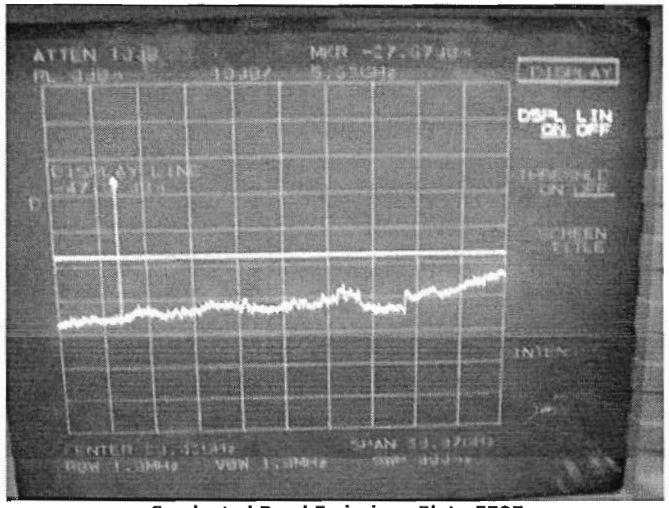
Conducted Band Emissions Plot _5190



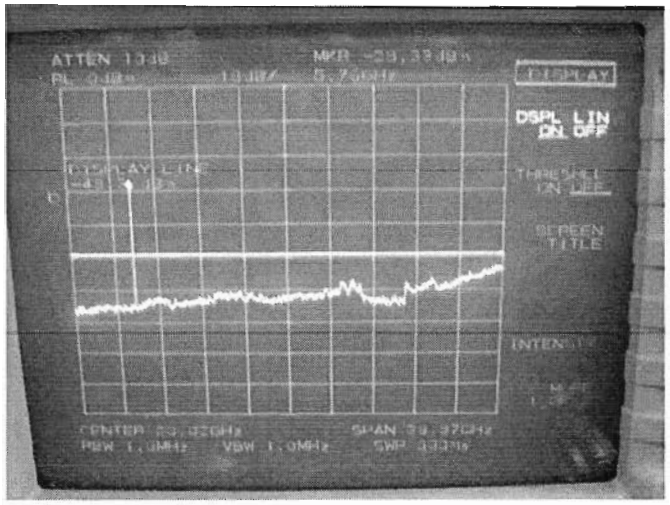
Conducted Band Emissions Plot _5310



Conducted Band Emissions Plot _5755



Conducted Band Emissions Plot _5795



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2.1.7 Radiated Emissions Measurement

Test Location

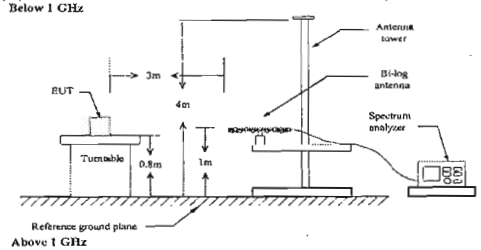
☒ Testing was performed at a test distance of 3 meter Open Area Test Site

Test Procedures

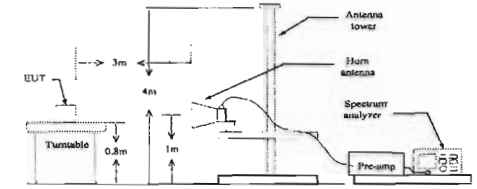
Configure the EUT according to ANSI C63.4.
The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity. The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

The spectrum analyzer is set to:
Below 1GHz :
RBW=100KHz/VBW=300KHz/Sweep=AUTO
Above 1GHz:
(a) PEAK:RBW=VBW=1MHz/Sweep=AUTO
(b) AVERAGE:RBW=1MHz/VBW=10Hz/Sweep=AUTO

Below 1 GHz



Above 1 GHz



Note : The amplitudes of spurious emissions that are attenuated more than 20dB below the limit have not been reported

Limit

-15.407(b) (1)
For transmitters operating in the 5.15~5.35 GHz band: all emissions outside of the 5.15 ~ 5.35GHz band shall not exceed an EIRP of -27dBm/MHz [80 dBuV/m@3m]

- 15.209(a),15.205

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m
30-88	100**	40
88-216	150**	43.5
216-960	200**	46
Above 960	500	54

** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted 0 of this Part, e.g.15.231 and 15.241.

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Test Results

EUT	5G-WiFi	Measurement Detail	
Model	DNMM-K1	Frequency Range	Below 1000MHz
Channel	CH38	Detector function	Quasi-Peak

Test Data

Emission Frequency (MHz)	Meter Reading dBuV/m	Ant. Polaritry	Correction Factor dB	Cable Loss Db	Field Strength (dBuv/m)	Limit (dBuv/m)	Margin (dB)
66.70	31.8	H	11.46	0.43	33.19	40	6.81
85.60	32.3	H	9.37	0.91	32.11	40	7.89
125.20	32.3	H	12.57	0.90	35.29	43.5	8.21
134.60	32.6	H	13.17	0.84	36.07	43.5	7.43
200.00	31.8	V	9.90	1.70	32.87	43.5	10.63
202.40	32.4	V	9.98	1.68	33.51	43.5	9.99
269.40	35.7	V	12.05	1.61	38.81	46	7.19
275.90	34.9	V	12.21	1.71	38.36	46	7.64
350.40	33.0	V	13.84	1.51	37.89	46	8.11
466.80	32.6	V	16.15	2.70	40.91	46	5.09
500.10	31.3	V	16.51	2.80	40.13	46	5.87

Radiated Emissions Test Results

RADIATED EMISSIONS – Horizontal Antenna Polarization			
Freq. (MHz)	Corrected Reding (dBμV)	Limits	Remark
5150	65.27	74.00	PK
5150	52.52	54.00	AV
5350	64.84	74.00	PK
5350	51.39	54.00	AV

RADIATED EMISSIONS – Vertical Antenna Polarization			
Freq. (MHz)	Corrected Reding (dBμV)	Limits	Remark
5150	65.34	74.00	PK
5150	52.51	54.00	AV
5350	69.26	74.00	PK
5350	51.38	54.00	AV

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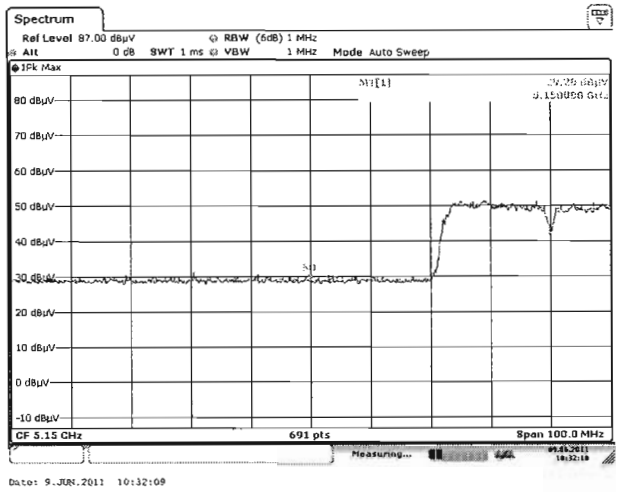
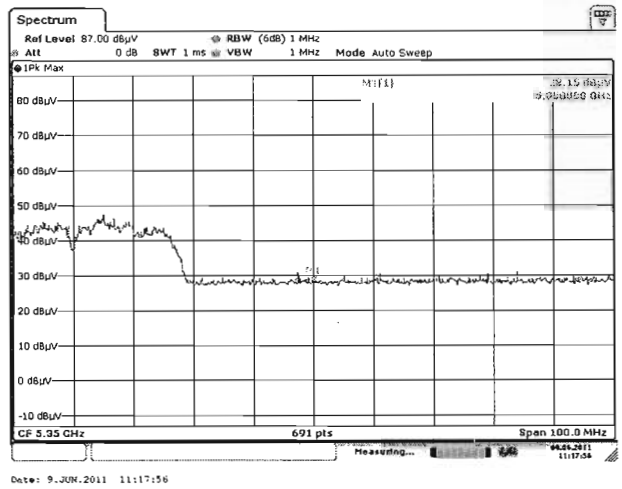
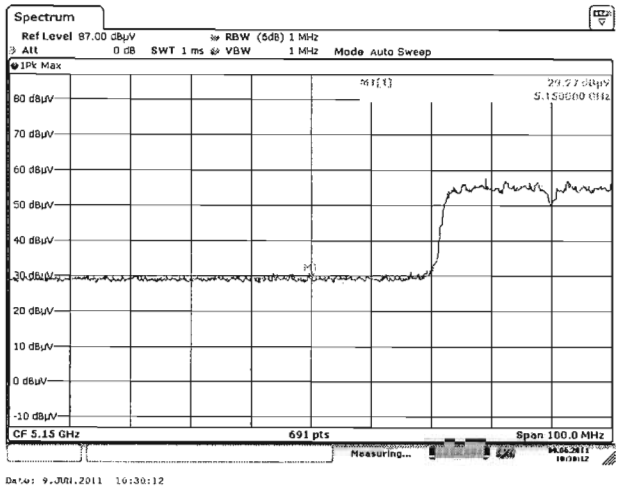
Band Edge Emissions Plot , 5150MHz , PK(1MHz/1MHz) _Horizontal ant Polarization



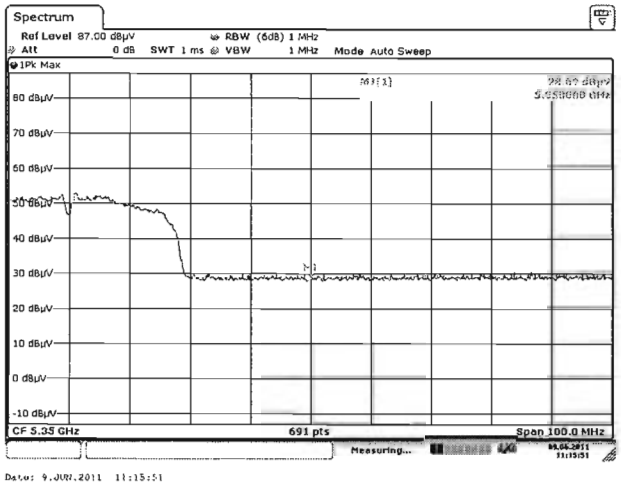
Band Edge Emissions Plot , 5350MHz , PK(1MHz/1MHz) _ Horizontal ant Polarization



Band Edge Emissions Plot , 5150MHz , PK(1MHz/1MHz) _Vertical ant Polarization



Band Edge Emissions Plot , 5350MHz , PK(1MHz/1MHz) _ Vertica ant Polarization



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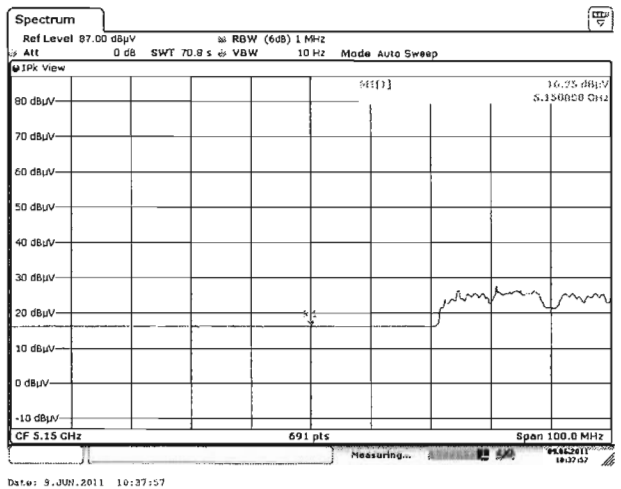
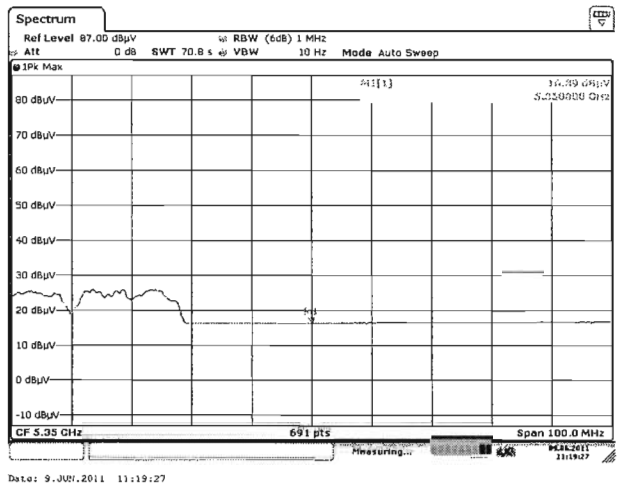
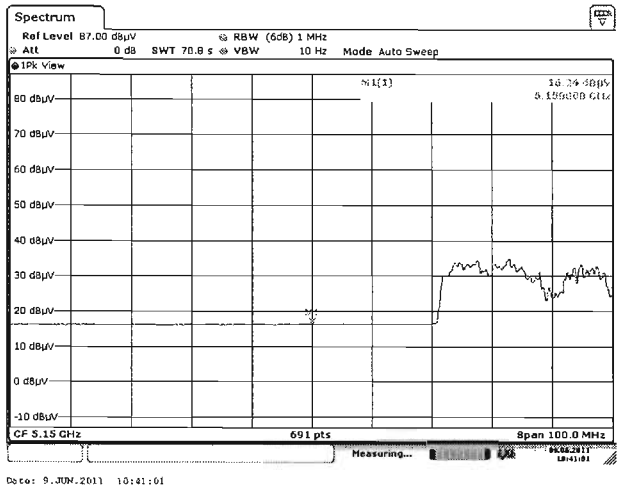
Band Edge Emissions Plot , 5150MHz , AV(1MHz/10Hz) _Horizontal ant Polarization



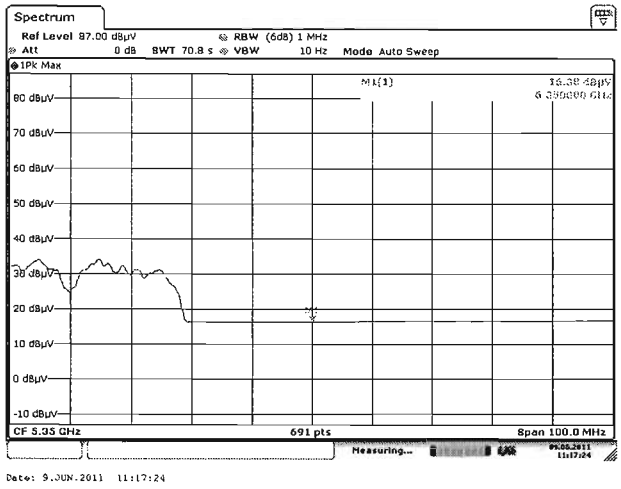
Band Edge Emissions Plot , 5350MHz , AV(1MHz/10Hz) _ Horizontal ant Polarization



Band Edge Emissions Plot , 5150MHz , AV(1MHz/10Hz) _Vertical ant Polarization



Band Edge Emissions Plot , 5350MHz , AV(1MHz/10Hz) _ Vertica ant Polarization



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Test Results

EUT	5G-WiFi	Measurement Detail	
Model	DNMM-K1	Frequency Range	1-40GHz
Channel	38	Detector function	Average/Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	Average/Peak

Test Data – Configuration Draft n 40MHz ANT. Port0/Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Test Data – Configuration Draft n 40MHz ANT. Port0+Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Restricted band edge test data

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits [dBuV/m]	Result [dBuV/m]
				Antenna	Amp. Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Test Results

EUT	5G-WiFi	Measurement Detail	
Model	DNMM-K1	Frequency Range	1-40GHz
Channel	46	Detector function	Average/Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	Average/Peak

Test Data – Configuration Draft n 40MHz ANT. Port0/Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Test Data – Configuration Draft n 40MHz ANT. Port0+Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Restricted band edge test data

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits [dBuV/m]	Result [dBuV/m]
				Antenna	Amp. Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

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Test Results

EUT	5G-WiFi	Measurement Detail	
Model	DNMM-K1	Frequency Range	1-40GHz
Channel	54	Detector function	Average/Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	Average/Peak

Test Data – Configuration Draft n 40MHz ANT. Port0/Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Test Data – Configuration Draft n 40MHz ANT. Port0+Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Restricted band edge test data

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits [dBuV/m]	Result [dBuV/m]
				Antenna	Amp. Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Test Results

EUT	5G-WiFi	Measurement Detail	
Model	DNMM-K1	Frequency Range	1-40GHz
Channel	62	Detector function	Average/Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	Average/Peak

Test Data – Configuration Draft n 40MHz ANT. Port0/Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Test Data – Configuration Draft n 40MHz ANT. Port0+Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Restricted band edge test data

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits [dBuV/m]	Result [dBuV/m]
				Antenna	Amp. Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

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Test Results

EUT	5G-WiFi	Measurement Detail	
Model	DNMM-K1	Frequency Range	1-40GHz
Channel	151	Detector function	Average/Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	Average/Peak

Test Data – Configuration Draft n 40MHz ANT. Port0/Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Test Data – Configuration Draft n 40MHz ANT. Port0+Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Restricted band edge test data

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits [dBuV/m]	Result [dBuV/m]
				Antenna	Amp. Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Test Results

EUT	5G-WiFi	Measurement Detail	
Model	DNMM-K1	Frequency Range	1-40GHz
Channel	159	Detector function	Average/Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	Average/Peak

Test Data – Configuration Draft n 40MHz ANT. Port0/Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Test Data – Configuration Draft n 40MHz ANT. Port0+Port1

Frequency [MHz]	Reading A/P [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits/ Detector A/P [dBuV/m]	Result A/P [dBuV/m]
				Antenna	Amp.Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

Restricted band edge test data

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits [dBuV/m]	Result [dBuV/m]
				Antenna	Amp. Gain	Cable		
No emissions were detected at a level greater than 20dB below limit.								

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2.1.6 Frequency Stability Measurement 15.407(g)

Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and max hold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 106 ppm and the limit is less than ±20ppm (Draft n specification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature rule is -30°C~50°C. 8. Measuring multiple antennas, the connector is required to link with spectrum analyser through a combiner

The spectrum analyzer is set to:

RBW /VBW= 10kHz

Span = Entire absence of modulation emissions bandwidth

Sweep = auto

Test Setup Layout

Measurement Data:

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(℃)	5190
-10	5189.997205
0	5189.989194
10	5189.981445
20	5189.963505
30	5189.945000
40	5189.933096
50	5189.929886
+15% voltage	5189.932870
-15% voltage	5189.932423
Max. Deviation (MHz)	0.070114
Max. Deviation (ppm)	13.51

Limit : 20ppm

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2.1.8 AC Conducted Emissions 15.207

Test Location
Shielded Room

Frequency Range of Measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Procedures

Configure the EUT according to ANSI C63.4.
The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m. Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

- 15.207(a)

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency.

Test Results
The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
0.153	56.87	8.966	Quasi-peak

Test Data

Frequency	Correction Factor		극성	Quasi-peak			Average		
[MHz]	LISN	Cable		Limit	Reading	Result	Limit	Reading	Result
0.153	9.798	0.176	H	66	56.870	56.870	56	34.040	34.040
0.258	9.764	0.100	H	61	51.790	51.790	51	32.700	32.700
0.309	9.760	0.100	H	60	49.730	49.730	50	33.920	33.920
0.504	9.760	0.100	H	56	39.830	39.830	46	15.550	15.550
0.540	9.760	0.100	H	56	35.030	35.030	46	24.810	24.810
0.975	9.760	0.100	H	56	28.530	28.530	46	19.810	19.810
8.715	9.820	0.185	H	60	32.270	32.270	50	25.180	25.180
16.230	9.850	0.148	H	60	29.340	29.340	50	24.860	24.860
20.379	9.990	0.200	H	60	31.000	31.000	50	26.410	26.410
0.156	9.788	0.165	N	66	56.040	56.040	56	31.090	31.090
0.288	9.761	0.100	N	61	48.330	48.330	51	26.470	26.470
0.291	9.761	0.100	N	60	48.260	48.260	50	26.010	26.010
0.510	9.750	0.100	N	56	38.350	38.350	46	12.700	12.700
0.678	9.758	0.100	N	56	33.630	33.630	46	12.550	12.550
0.936	9.760	0.100	N	56	27.350	27.350	46	12.930	12.930
8.715	9.810	0.185	N	60	30.410	30.410	50	23.990	23.990
14.151	9.840	0.161	N	60	23.700	23.700	50	17.840	17.840
16.230	9.840	0.148	N	60	22.240	22.240	50	16.680	16.680

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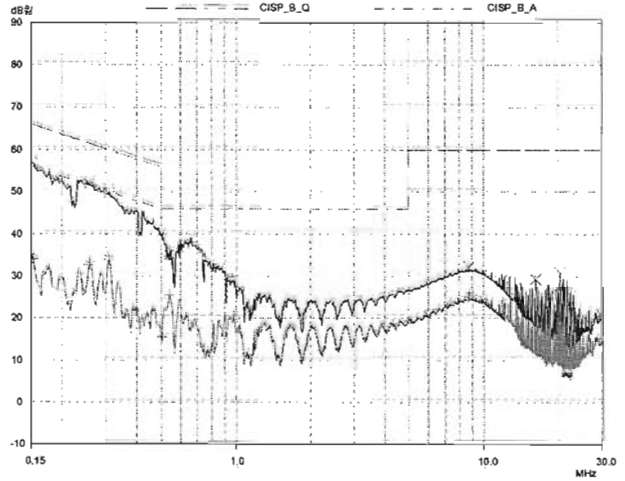
[HOT]



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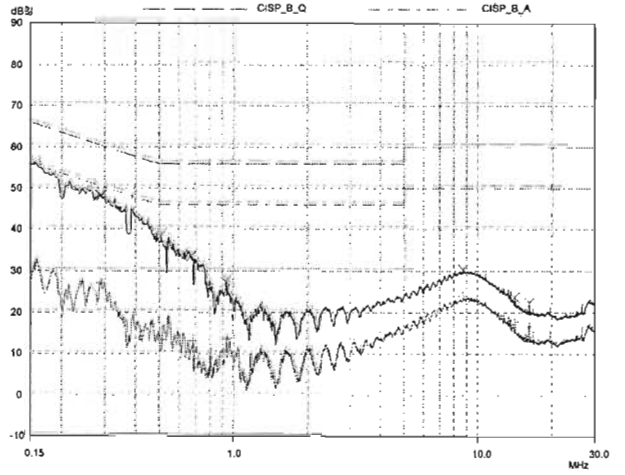

APPENDIX A – Test Equipment Used For Tests

Equipment	Manufacturer	Model	Calibration due.
Spectrum Analyzer	R&S	FSV30	2012-01-07
Vector Signal Generator	R&S	SMBV2100A	2012-01-07
Attenuator	HP	8495B	2011-05-06
Attenuator	HP	8494B	2011-05-06
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168-385	2012-03-05
Horn Antenna	Schwarzbeck	BBHA9120D	2012-10-13
High Pass Filter	Wainwright Instrument	WHJS3000-10TT	2012-01-07
Preamplifier	HP	8449B	2011-07-27
EMI Test Receiver	R&S	ESHS10	2011-06-01
Spectrum Analyzer	HP	8565E	2012-02-01

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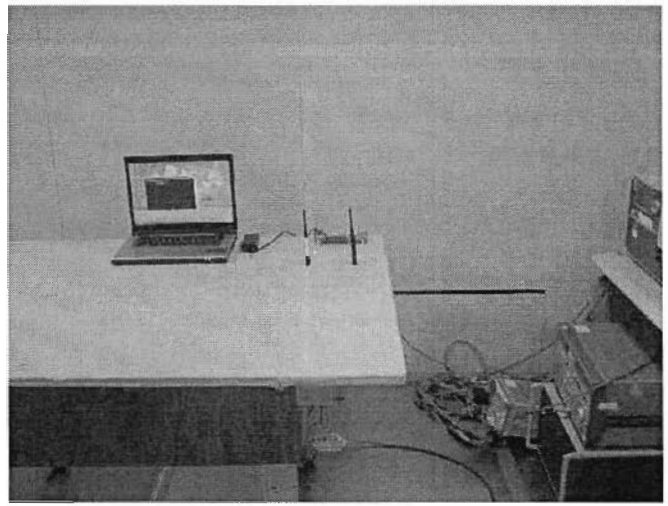
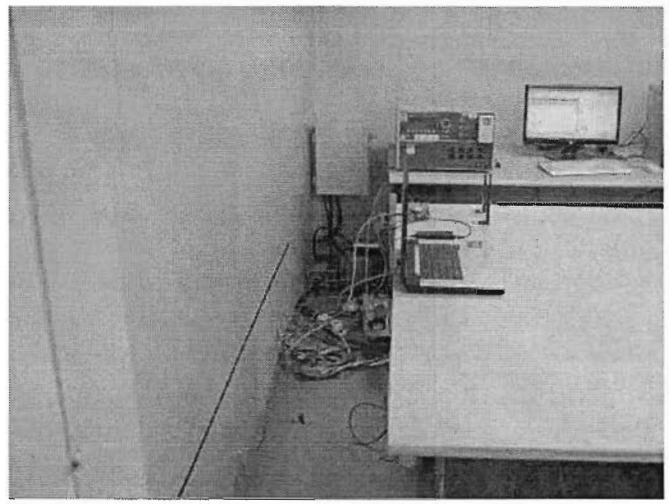
Test Setup Photos and Configuration

Conducted Voltage Emissions





Radiated Electric Field Emissions