

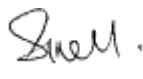

# FCC PART 25 TYPE APPROVAL EMI MEASUREMENT AND TEST REPORT

For

## DACOM Corporation

DACOM B/D, 65-228, Hangangro-3ga, Yongsan-gu, Seoul, Korea, 140-716

**FCC ID: TVYGIR2005ODU**

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Equipment Type:</b> 1.6/2.4 GHz SIGNAL BOOSTER (Outdoor unit)
<b>Test Engineer:</b> Snell Leong 	
<b>Report No.:</b> R0511224	
<b>Report Date:</b> 2005-12-21	
<b>Reviewed By:</b> Richard Lee 	
<b>Prepared By:</b> Bay Area Compliance Laboratory Corporation (BACL) 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164	

**Note:** The test report is specially limited to the use of the above client company and this particular sample only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. Government.

**TABLE OF CONTENTS**

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY .....	3
TEST FACILITY .....	3
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
JUSTIFICATION .....	5
EUT EXERCISE SOFTWARE .....	5
SPECIAL ACCESSORIES .....	5
SCHEMATICS / BLOCK DIAGRAM.....	5
EQUIPMENT MODIFICATIONS .....	5
LOCAL SUPPORT EQUIPMENT LIST AND DETAILS .....	5
EXTERNAL I/O CABLING LIST AND DETAILS.....	5
CONFIGURATION OF TEST SYSTEM .....	6
TEST SETUP BLOCK DIAGRAM .....	6
<b>SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>§2.1047 – MODULATION CHARACTERISTICS .....</b>	<b>8</b>
<b>§2.1051 – SPURIOUS EMISSIONS AT ANTENNA TERMINALS .....</b>	<b>9</b>
STANDARD APPLICABLE .....	9
MEASUREMENT PROCEDURE.....	9
EQUIPMENT LISTS .....	9
MEASUREMENT RESULT .....	9
<b>§15.107 - CONDUCTED EMISSIONS .....</b>	<b>21</b>
<b>§ 2.1053 &amp; §25.202 (F) – FIELD STRENGTH OF SPURIOUS RADIATION .....</b>	<b>22</b>
STANDARD APPLICABLE .....	22
MEASUREMENT PROCEDURE.....	22
EQUIPMENT LISTS .....	22
MEASUREMENT RESULT .....	22
<b>§25.202 – EMISSION MASK .....</b>	<b>24</b>
STANDARD APPLICABLE .....	24
MEASUREMENT PROCEDURE.....	24
EQUIPMENT LISTS .....	24
MEASUREMENT RESULT .....	24
<b>§2.1046 &amp; §25.204 – POWER OUTPUT .....</b>	<b>28</b>
STANDARD APPLICABLE .....	28
MEASUREMENT PROCEDURE.....	28
EQUIPMENT LISTS .....	28
MEASUREMENT RESULT .....	28
<b>§25.216(C) 25.216(G)– EMISSIONS FROM MOBILE EARTH STATIONS FOR PROTECTION OF AERONAUTICAL RADIONAVIGATION-SATELLITE SERVICE .....</b>	<b>31</b>
STANDARD APPLICABLE .....	31
MEASUREMENT PROCEDURE.....	31
EQUIPMENT LISTS .....	31
MEASUREMENT RESULT .....	31
<b>§2.1055 &amp; §25.202(D) – FREQUENCY STABILITY.....</b>	<b>34</b>

---

## GENERAL INFORMATION

---

### Product Description for Equipment Under Test (EUT)

The *DACOM Corporation* product , FCC ID: *TVYGIR 2005ODU*, model number: GIR 2005 or the “EUT” as referred to in this report is a 1.6/2.4 GHz SIGNAL BOOSTER (Outdoor Unit). The EUT operates at 1611.5 – 1624.5 MHz with maximum output power 21.52 dBm (EIRP).

*\* The test data gathered are from production sample, serial number: 008, provided by the manufacturer.*

### Objective

This type approval report is prepared on behalf of *DACOM Corporation* in accordance with Part 2, Subpart J, and Part 25, Subparts C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for Radiated Emission, Frequency Tolerance, Emission Limitation (out of band), Power Density, Emission Limitation (in band), and Power Limit.

### Related Submittal(s)/Grant(s)

No Related Submittals.

### Test Methodology

All measurements contained in this report were conducted with TIA 603-C.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp.

### Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA with registration number: 90464.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC), Industry Canada (IC), and Voluntary Control Council for Interference (VCCI).

The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2, IC registration number: 3062A, and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

## SYSTEM TEST CONFIGURATION

### Justification

The host system was configured for testing according to TIA 603-C.

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

### EUT Exercise Software

A Typical IS95 test signal is feeding into unit with sufficient level to saturate the output so maximum output power is obtained.

### Special Accessories

As shown in following test setup block diagram, all interface cables used for compliance testing are shielded.

### Schematics / Block Diagram

Please refer to Appendix A.

### Equipment Modifications

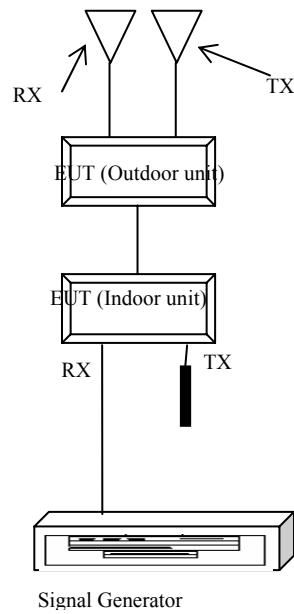
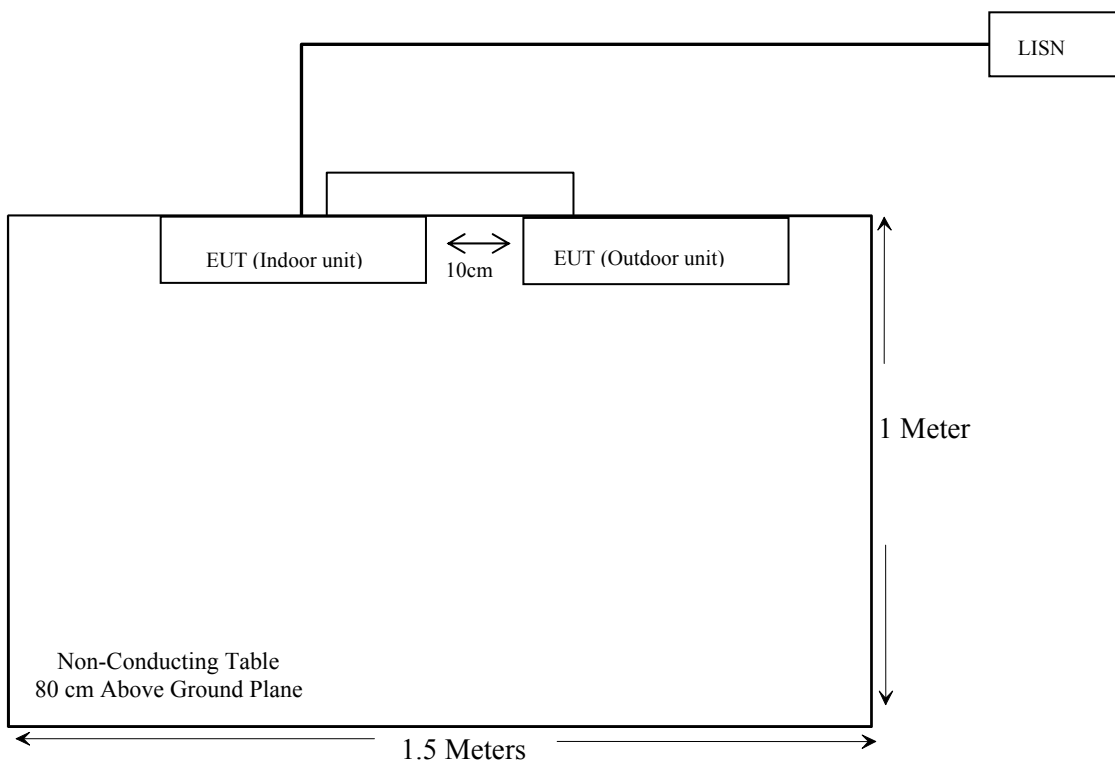
No modifications were made to the EUT.

### Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
R&S	Signal generator	SMIO03	849192/0085	DoC

### External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Sma cable	2	Signal generator	EUT

**Configuration of Test System****Test Setup Block Diagram**

---

## SUMMARY OF TEST RESULTS

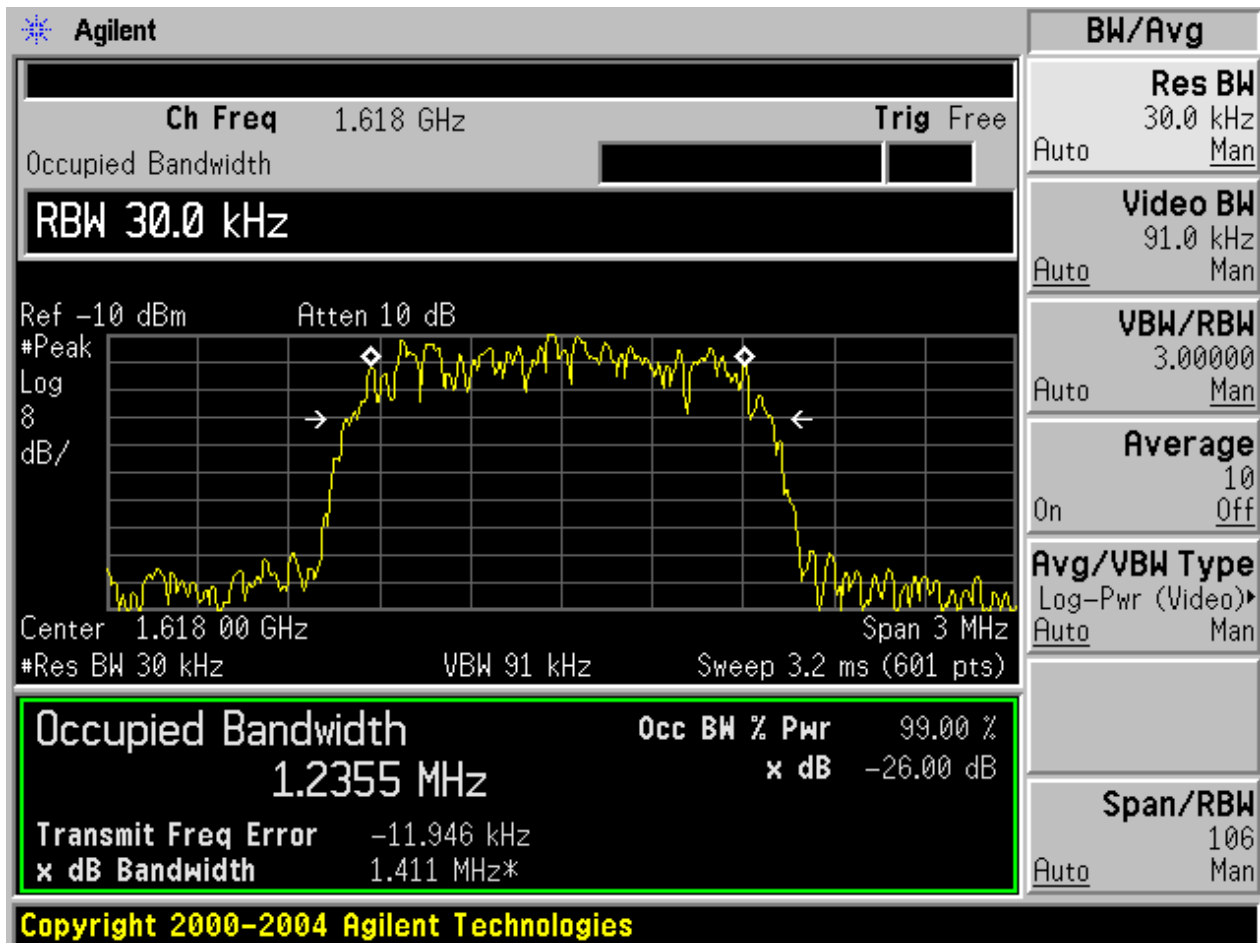
---

Results reported relate only to the product tested.

FCC RULES	DESCRIPTION OF TEST	RESULT
§1.1307(b)(1) & §2.1091	RF Exposure	Compliant
§2.1047	Modulation Characteristic	Compliant
§2.1051	Spurious Emission at Antenna Terminals	Compliant
§15.107	AC Line Conducted Emission	N/A
§2.1055 & §25.202(d)	Frequency Stability	Compliant
§2.1053 & §25.202(f)	Field Strength of Spurious Radiation	Compliant
§25.202	Emission Mask	Compliant
§25.216 (c) & (g)	Emission from Mobile Earth Station for Protection of Aeronautical Radionavigation- Satellite Service	Compliant
§2.1046 & §25.204	Power Output	Compliant

## §2.1047 – MODULATION CHARACTERISTICS

The EUT uses digital modulation techniques which were employed during the tests for occupied bandwidth. Per 2.1047(d) & part 25, there is no modulation requirement, therefore modulation characteristic is not presented. Please see below for occupied bandwidth shown.





## §2.1051 – SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### Standard Applicable

For out-of-band emissions for frequencies removed from the midpoint of the assigned frequency segment by more than 250% of the authorized bandwidth (1.23MHz), at least

$43 + 10 \log (P_{\text{watts}})$  attenuation below the mean power of the transmitter.

### Measurement Procedure

Spurious emissions appearing at the antenna terminals were measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable and 20dB attenuator to the antenna output terminals of EUT.

### Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

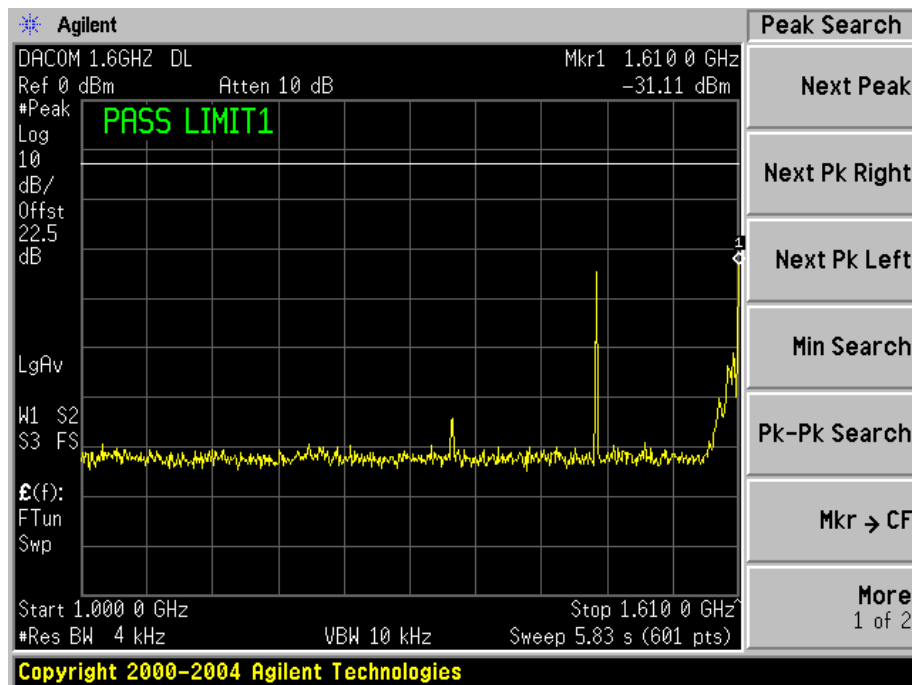
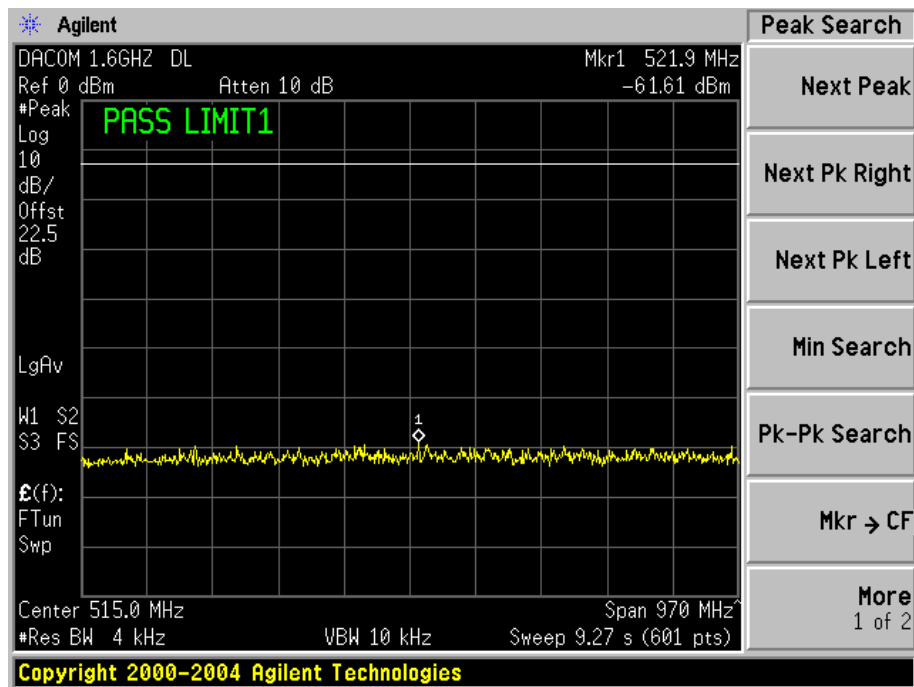
### Measurement Result

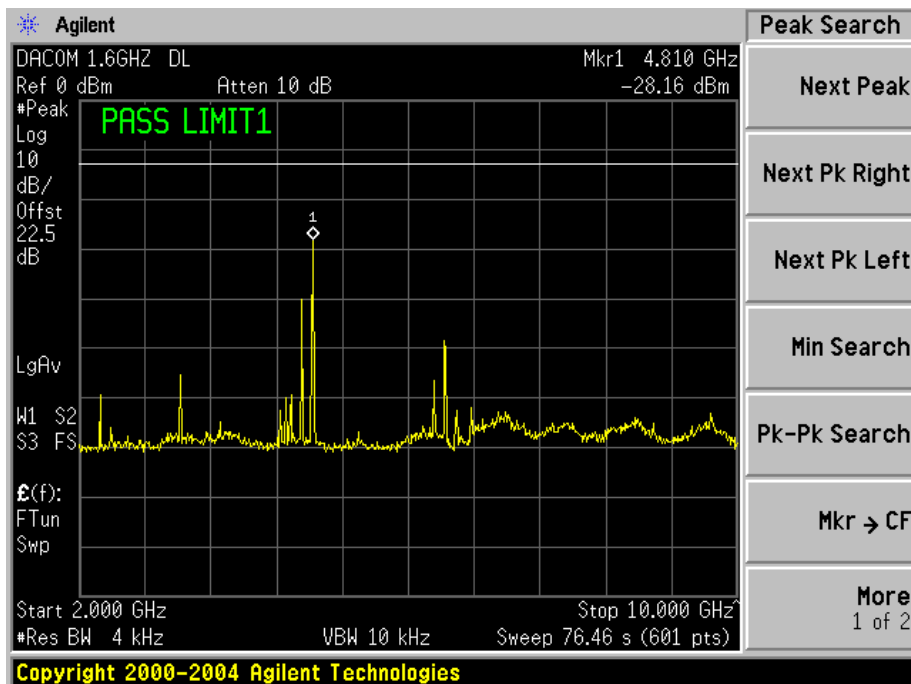
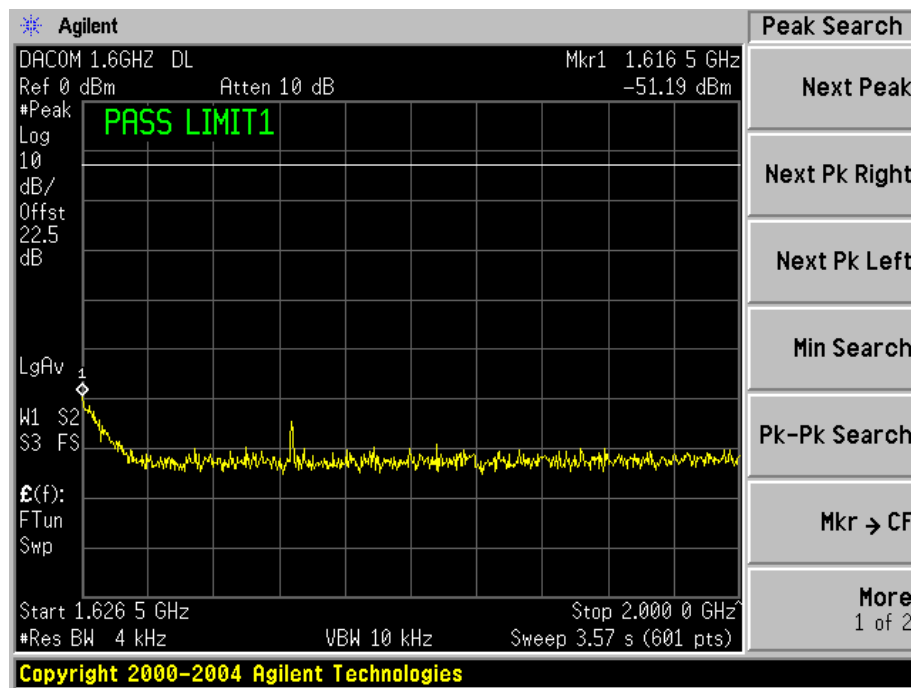
#### Environmental Conditions

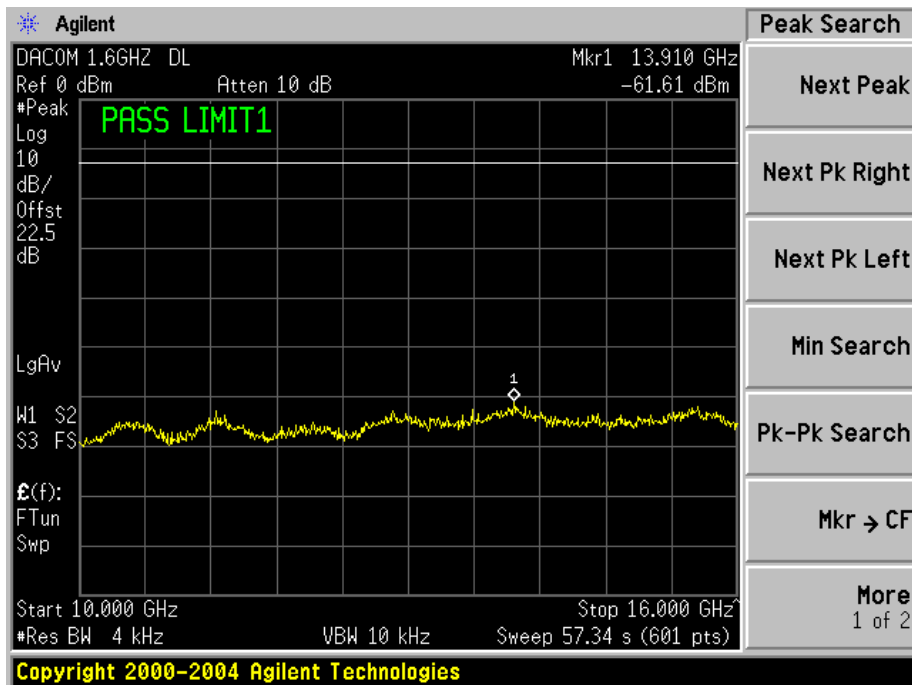
Temperature:	15° C
Relative Humidity:	82%
ATM Pressure:	1025mbar

*The testing was performed by Snell Leong on 2005-12-17.*

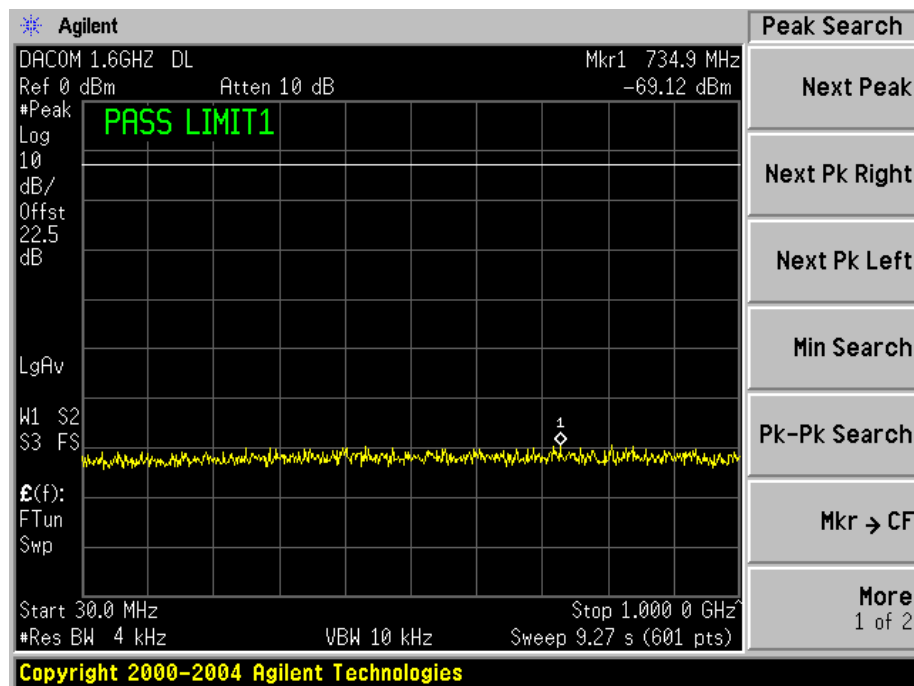
The following plots show that all emissions are fall below limit line -13 dBm.

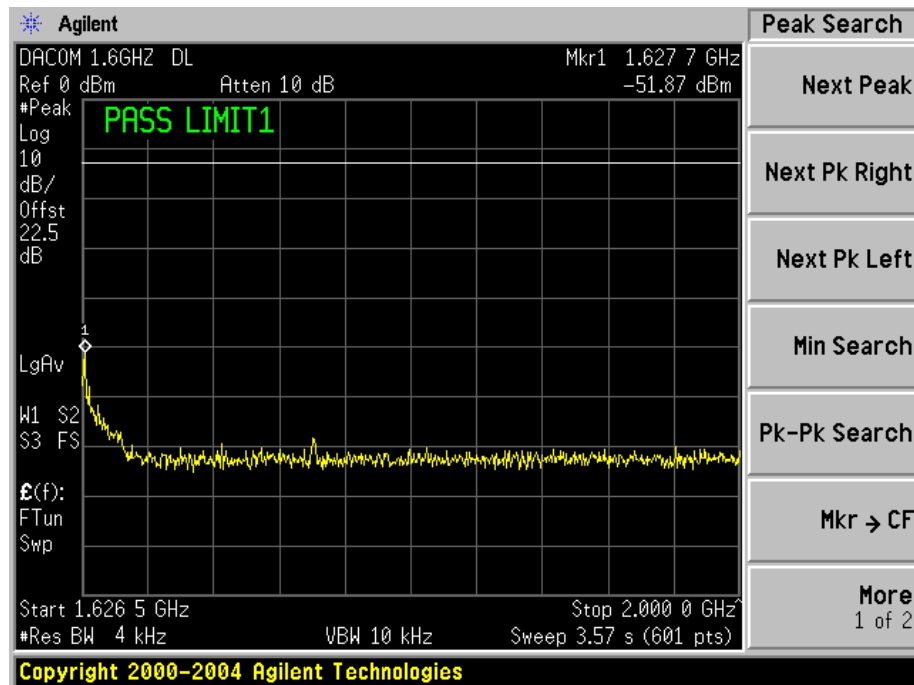
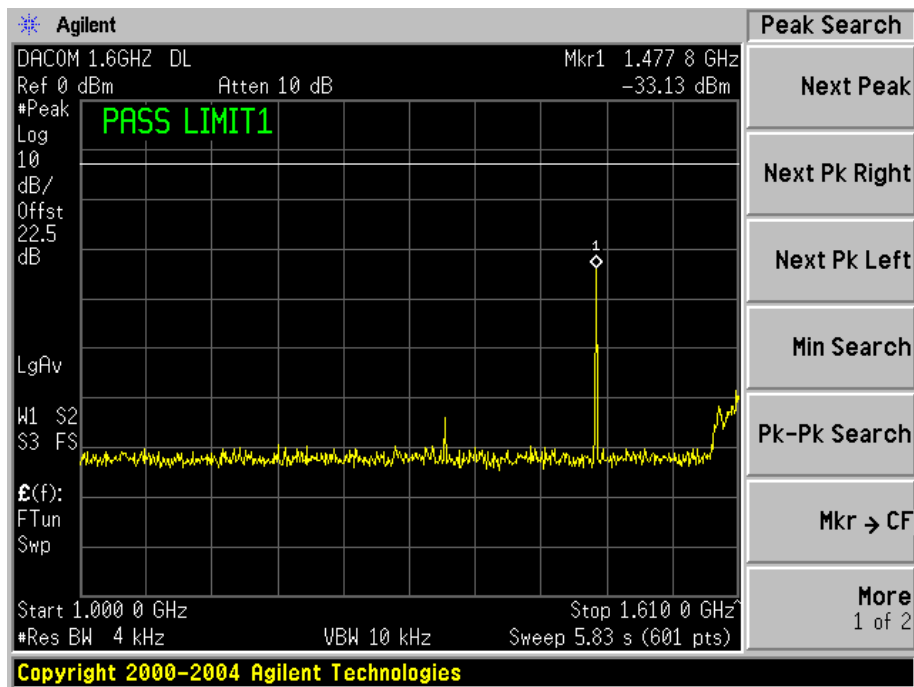
*Low Channel (single tone input)*

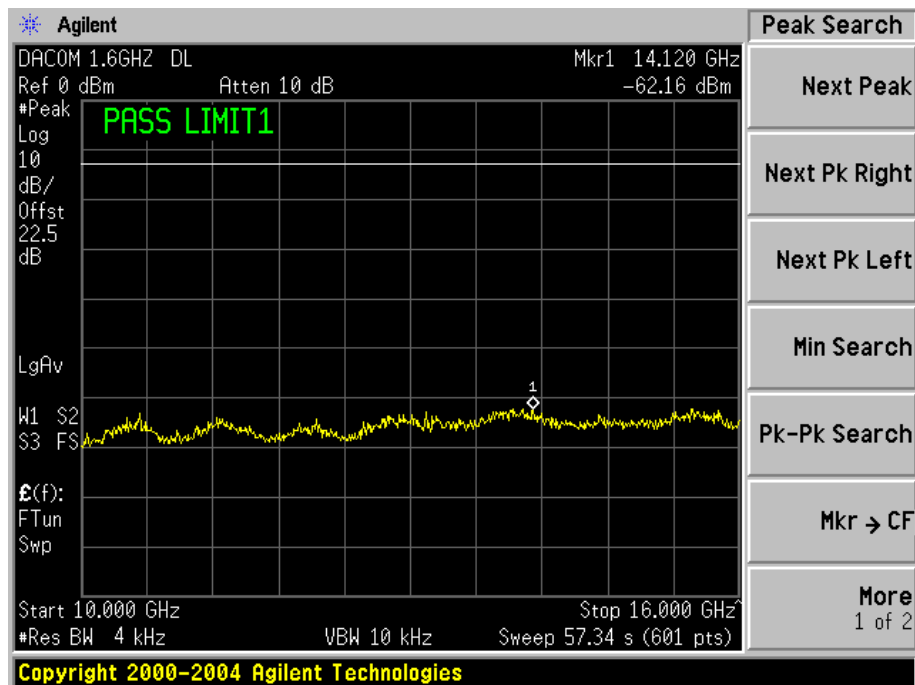
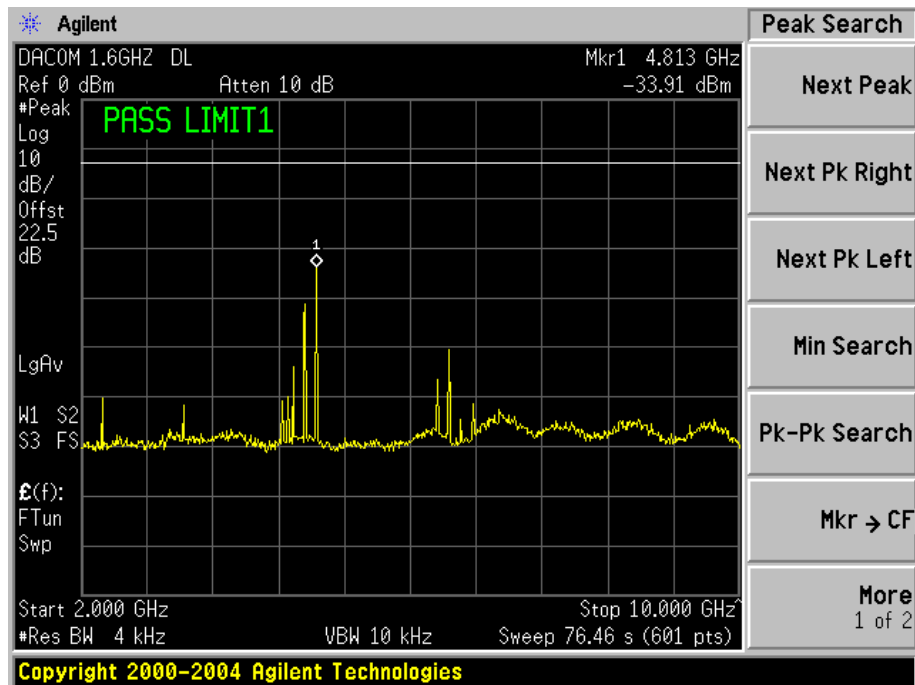




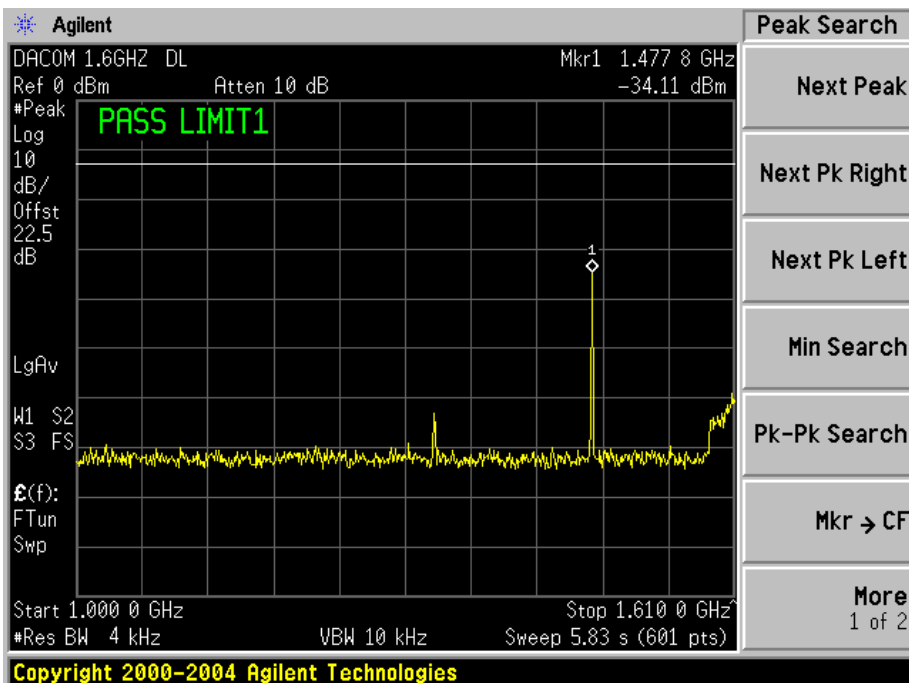
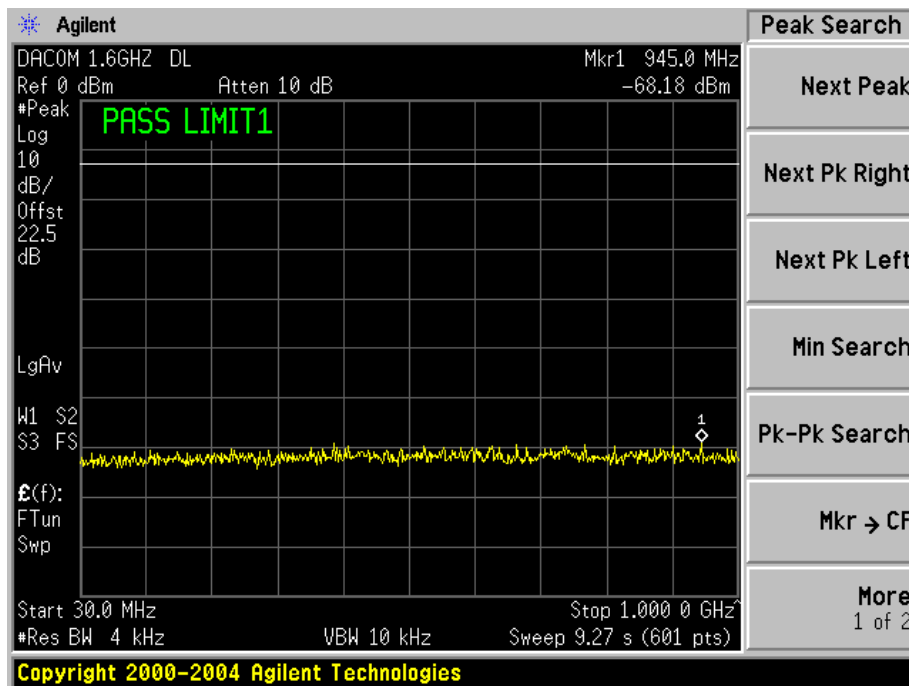
*Middle Channel*(single tone input)

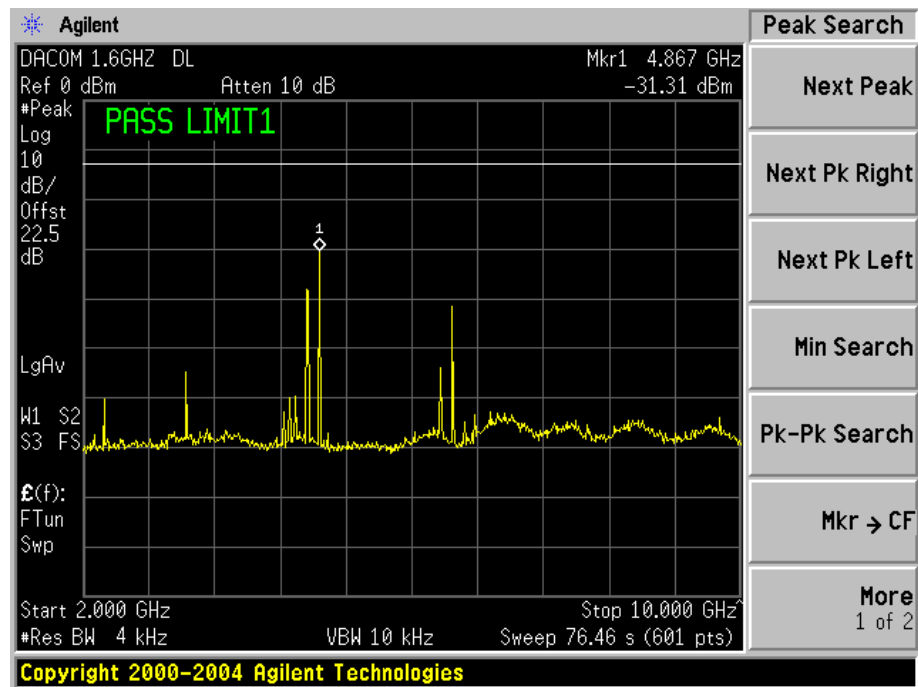
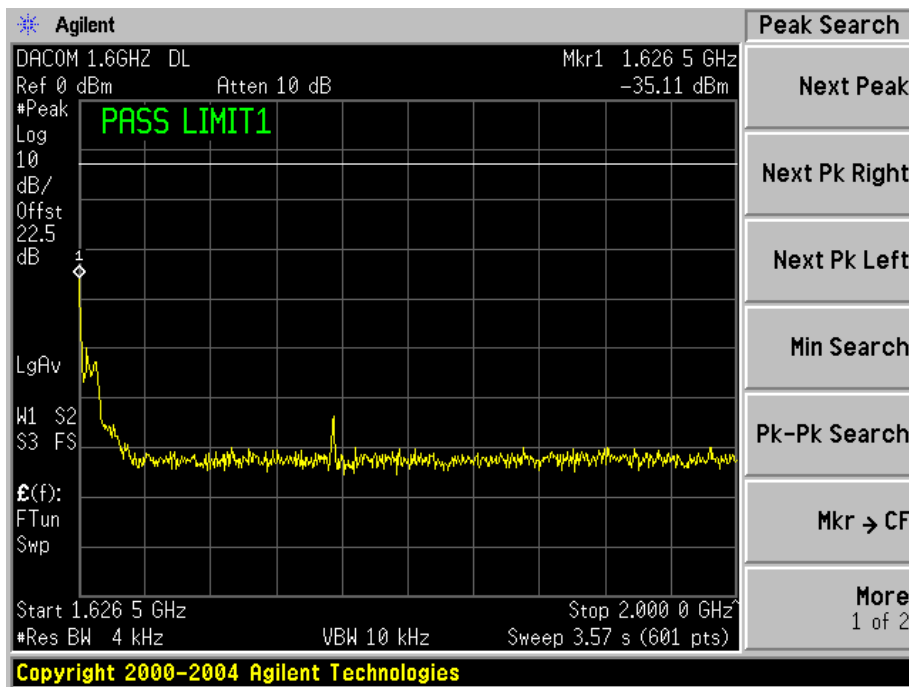




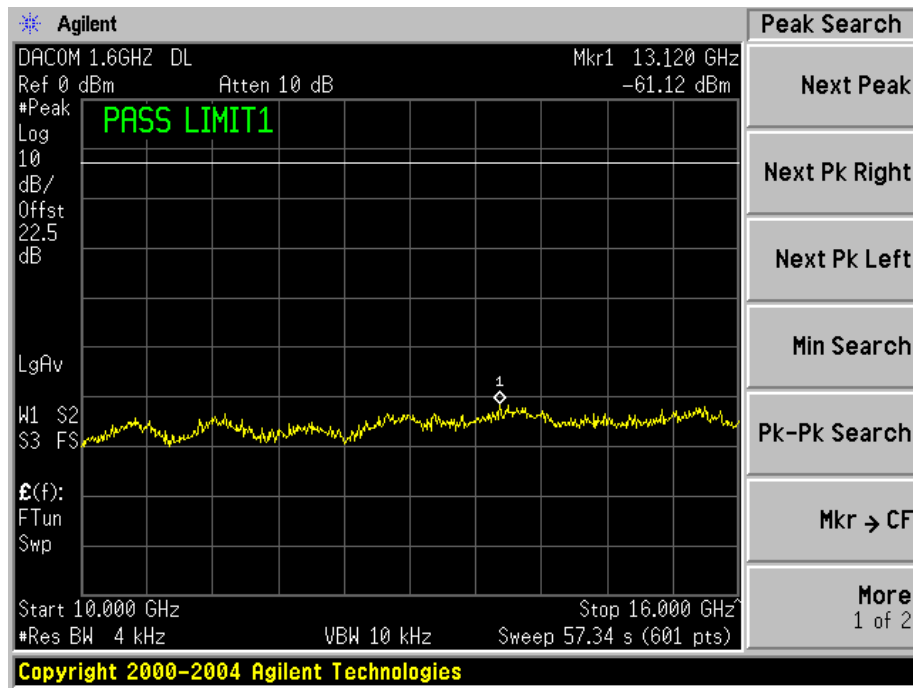


## High Channel(single tone input)

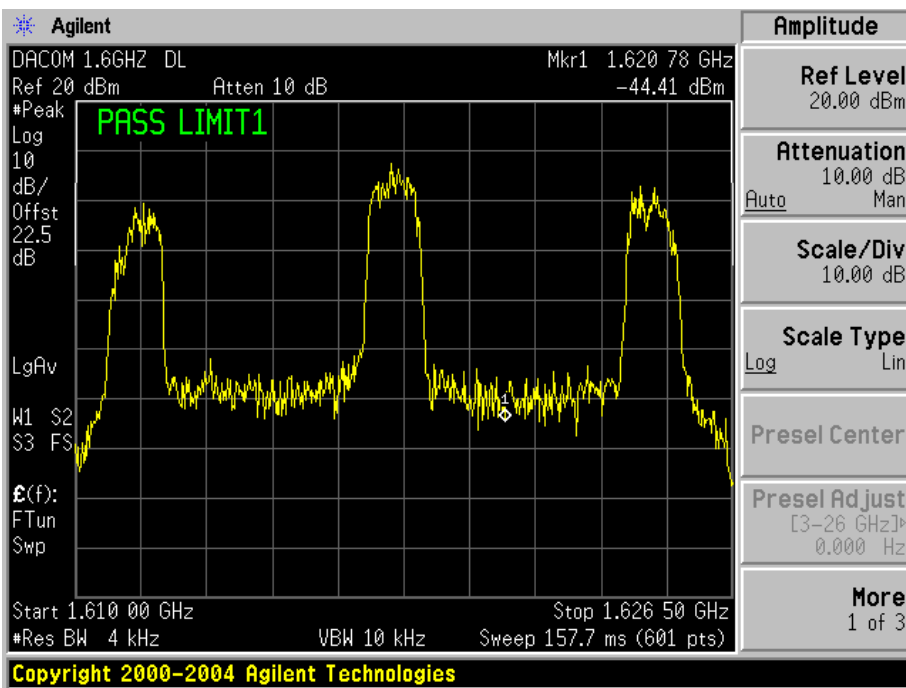




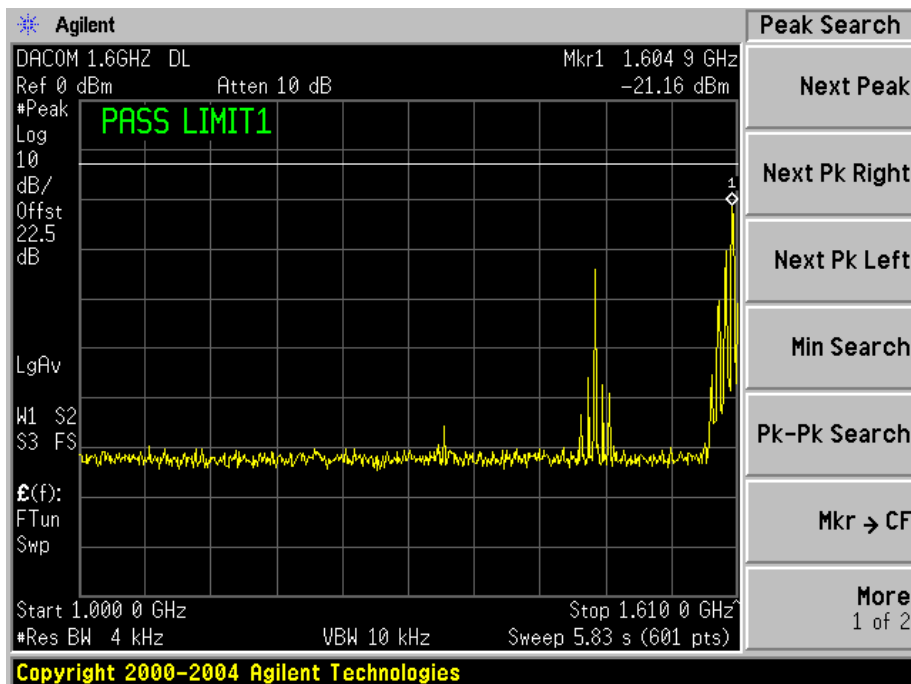
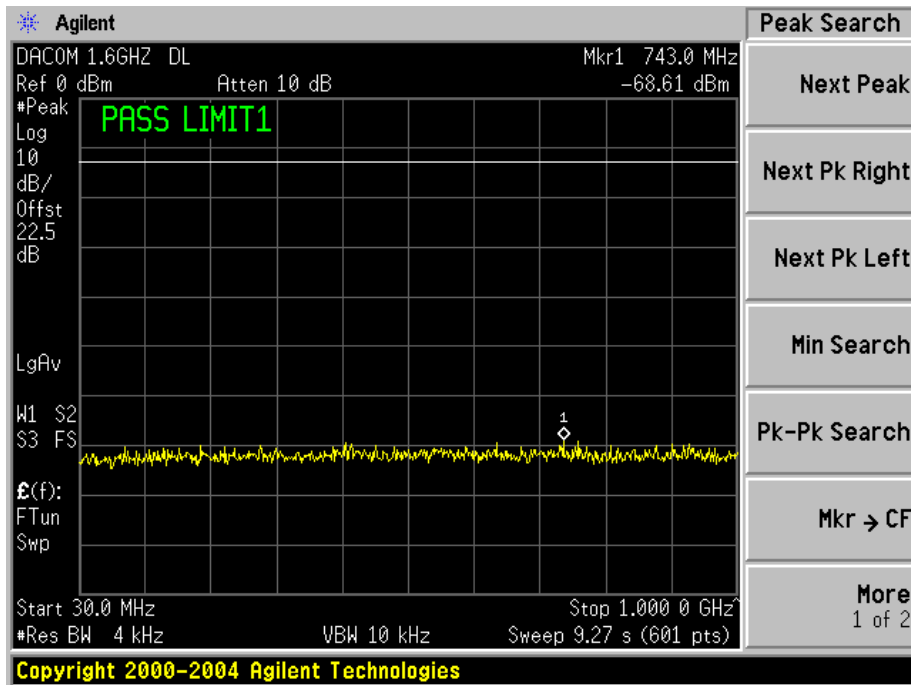


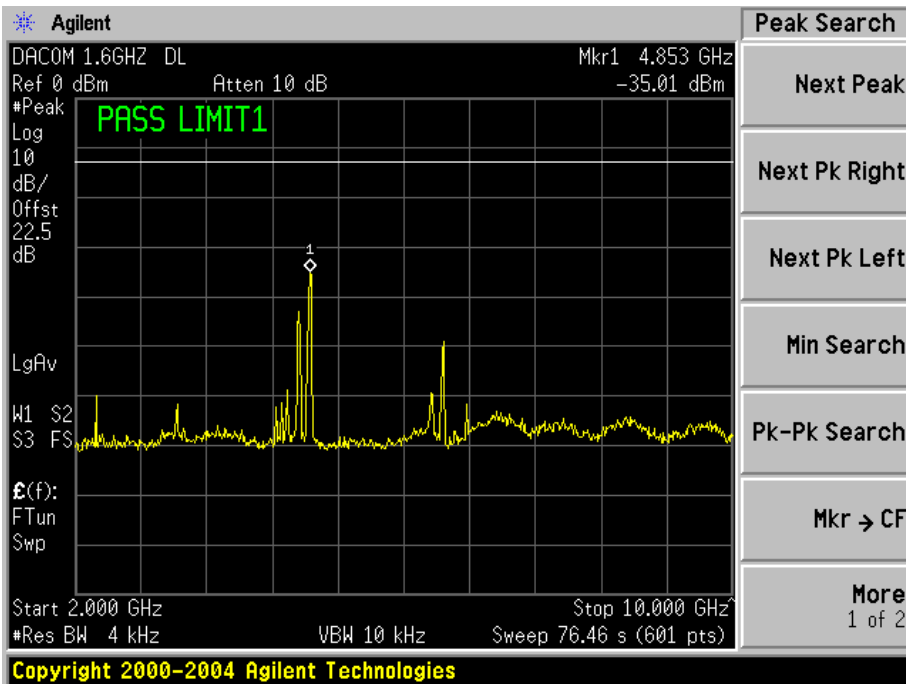
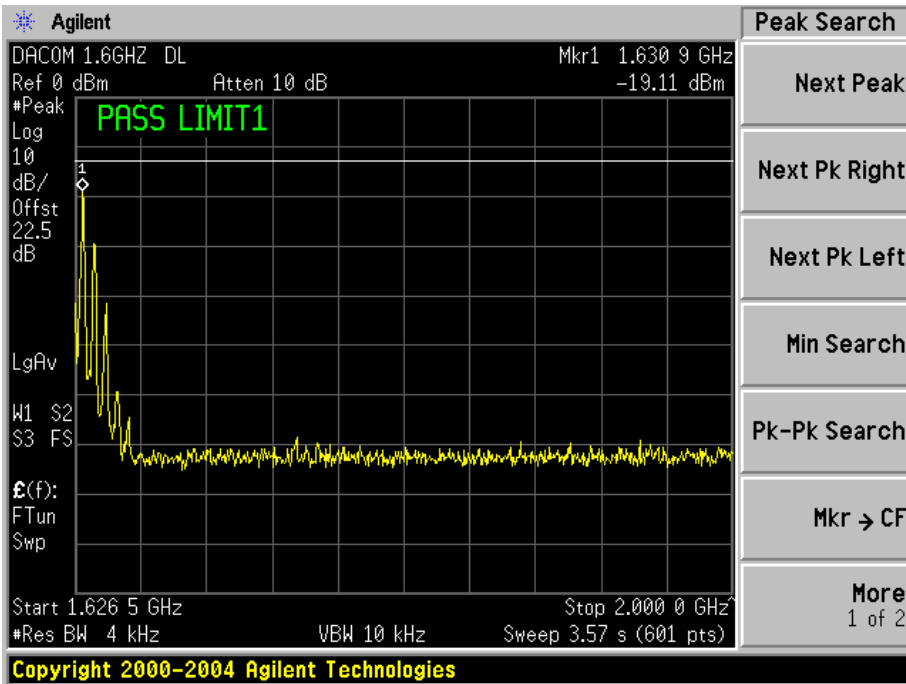


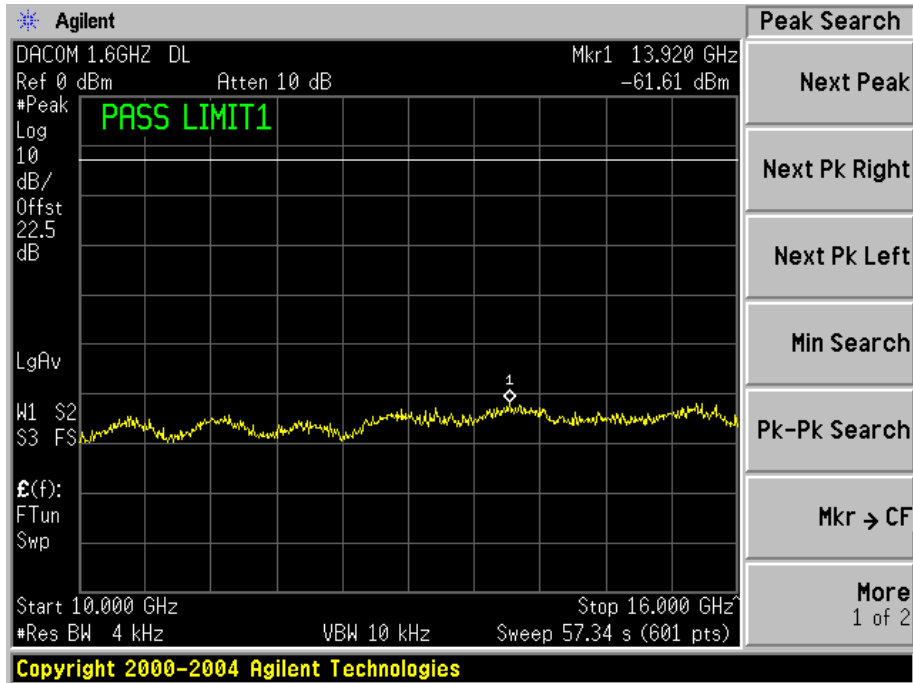
### 3 Tones input Plot For inter modulation emission



## 3 Tones Inter modulations Port Emission







---

## **§15.107 - CONDUCTED EMISSIONS**

---

Not Applicable.

## § 2.1053 & §25.202 (f) – FIELD STRENGTH OF SPURIOUS RADIATION

### Standard Applicable

Requirements: CFR 47, § 25.202(f). The mean power of emission shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

### Measurement Procedure

The testing procedure was set according to TIA 603-C.

### Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Measurement Result

#### Environmental Conditions

Temperature:	15° C
Relative Humidity:	82%
ATM Pressure:	1025 mbar

*The testing was performed by Snell Leong on 2005-12-17.*

**Out of Band (Carrier On)**

*Final Scan 30MHz – 16.5GHz (Lowest Channel: 1611.5 MHz), Antenna gain= 2.4 dB, Cable Loss=3.5dB*

Indicated		Table	Test Antenna		Substituted		Antenna	Cable	Absolute	Limit	Margin
Frequency	Ampl.	Angle	Height	Polar	Frequency	Level	Gain	Loss	Level		
MHz	dBuV/m	Degree	Meter	H/V	MHz	dBm	Correction	dB	dBm	dBm	dB
4834.5	58.4	90	1.2	v	4834.5	-40.1	11.8	5.07	-33.4	-13	-20.4
4834.5	58	0	1.4	h	4834.5	-41.5	11.8	5.07	-34.8	-13	-21.8
6446	42.2	180	1.4	v	6446	-55.5	11.5	5.26	-49.3	-13	-36.3
6446	39.5	0	1.4	h	6446	-55.8	11.5	5.26	-49.6	-13	-36.6
3223	38.7	180	1.4	v	3223	-59.7	9.6	2.4	-52.5	-13	-39.5
3223	38.5	330	1.2	h	3223	-60.1	9.6	2.4	-52.9	-13	-39.9

*Final Scan 30MHz – 16.5GHz (Middle Channel: 1618 MHz), Antenna gain= 2.4 dB, Cable Loss=3.5dB*

Indicated		Table	Test Antenna		Substituted		Antenna	Cable	Absolute	Limit	Margin
Frequency	Ampl.	Angle	Height	Polar	Frequency	Level	Gain	Loss	Level		
MHz	dBuV/m	Degree	Meter	H/V	MHz	dBm	Correction	dB	dBm	dBm	dB
4854	54.6	90	1.2	v	4854	-44.3	11.8	5.07	-37.6	-13	-24.6
4854	53.8	0	1.4	h	4854	-45.1	11.8	5.07	-38.4	-13	-25.4
6472	41.1	180	1.4	v	6472	-56.8	11.5	5.26	-50.6	-13	-37.6
3236	40.1	180	1.4	v	3236	-58.3	9.6	2.4	-51.1	-13	-38.1
6472	40.7	0	1.4	h	6472	-57.3	11.5	5.26	-51.1	-13	-38.1
3236	39.8	330	1.2	h	3236	-58.8	9.6	2.4	-51.6	-13	-38.6

*Final Scan 30MHz – 16.5GHz (Highest Channel: 1624.5 MHz), Antenna gain= 2.4 dB, Cable Loss=3.5dB*

Indicated		Table	Test Antenna		Substituted		Antenna	Cable	Absolute	Limit	Margin
Frequency	Ampl.	Angle	Height	Polar	Frequency	Level	Gain	Loss	Level		
MHz	dBuV/m	Degree	Meter	H/V	MHz	dBm	Correction	dB	dBm	dBm	dB
4873.5	56.7	90	1.2	v	4873.5	-42.3	11.8	5.07	-35.6	-13	-22.6
4873.5	55.7	0	1.4	h	4873.5	-43.1	11.8	5.07	-36.4	-13	-23.4
3249	40	180	1.4	v	3249	-58.5	9.6	2.4	-51.3	-13	-38.3
3249	39.6	330	1.2	h	3249	-58.9	9.6	2.4	-51.7	-13	-38.7
6498	38.7	180	1.4	v	6498	-59.7	11.5	5.26	-53.5	-13	-40.5
6498	38.2	0	1.4	h	6498	-60.2	11.5	5.26	-54.0	-13	-41.0

## §25.202 – EMISSION MASK

### Standard Applicable

According to CFR 47, § 25.202. The mean power of emission shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;

In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and include 250 percent of the authorized bandwidth: 35 dB;

### Measurement Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 4 kHz.

### Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Measurement Result

#### Environmental Conditions

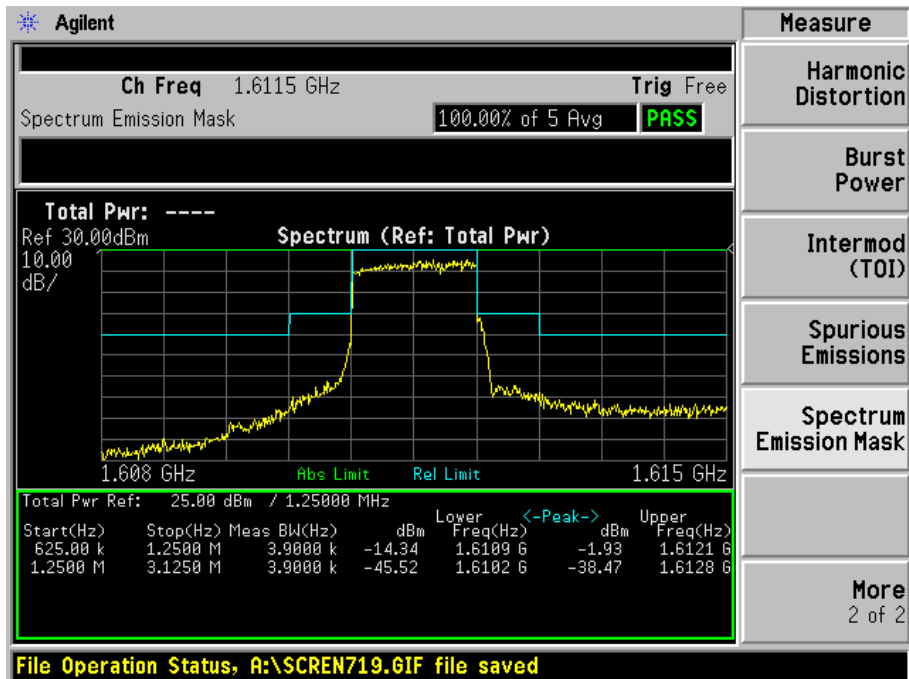
Temperature:	15° C
Relative Humidity:	82%
ATM Pressure:	1025mbar

*The testing was performed by Snell Leong on 2005-12-17.*

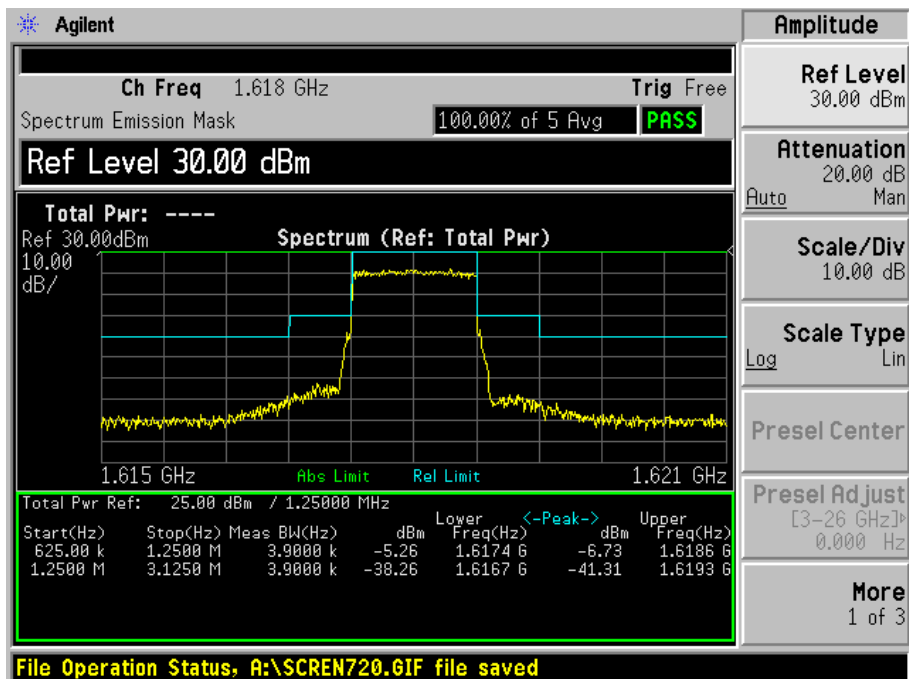
Pleas note that Input Signal plots is included to show that spectral shape of the output look similar to input.



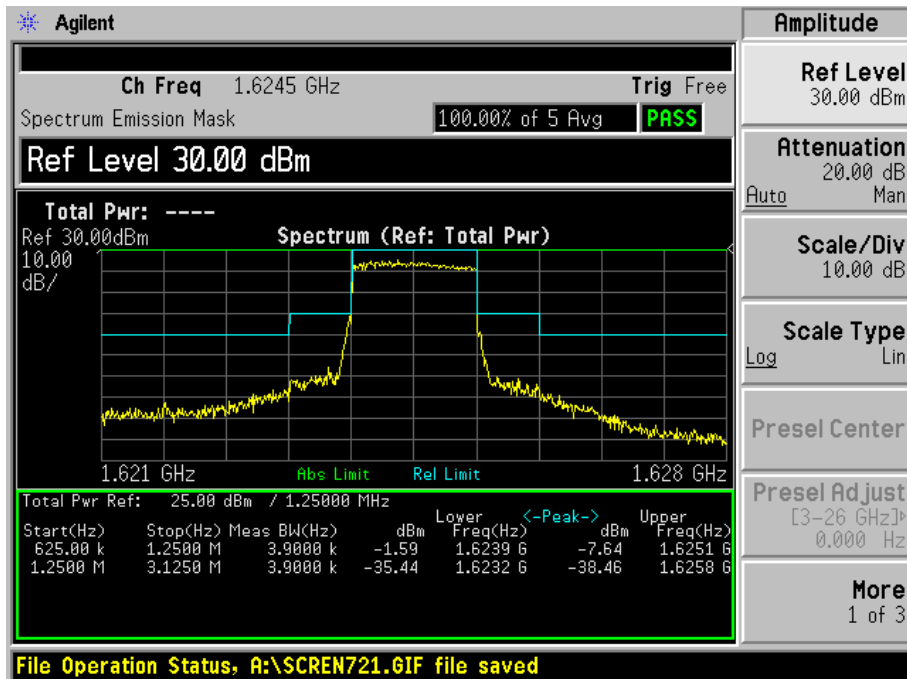
## Low Channel



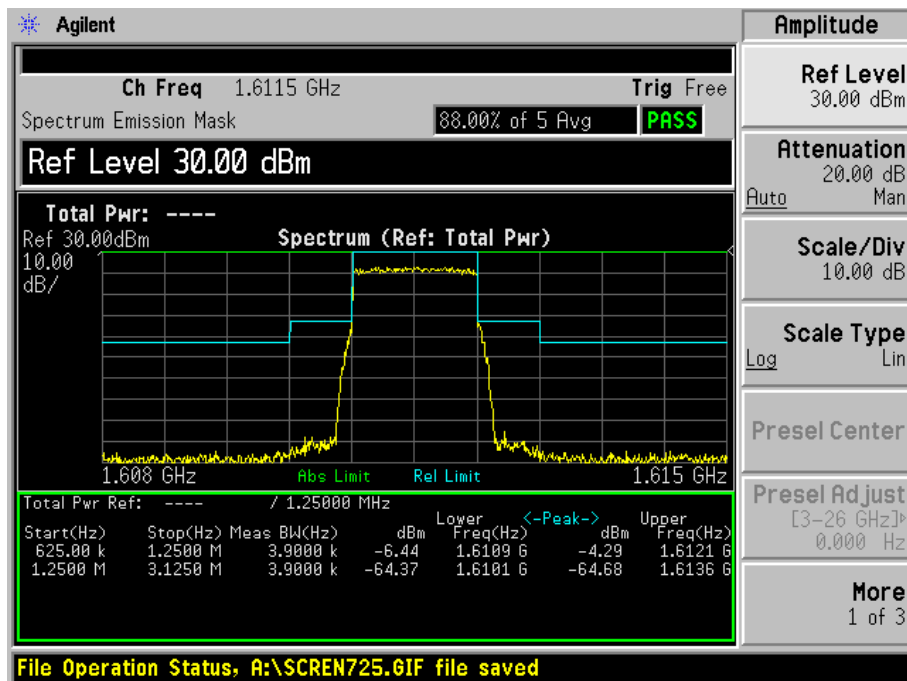
## Middle Channel



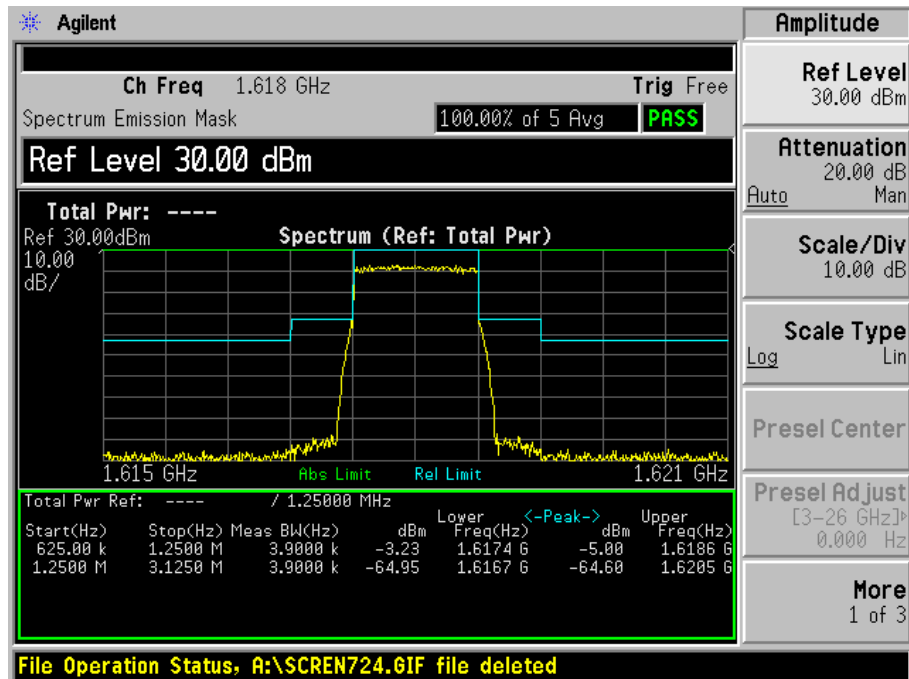
## High Channel



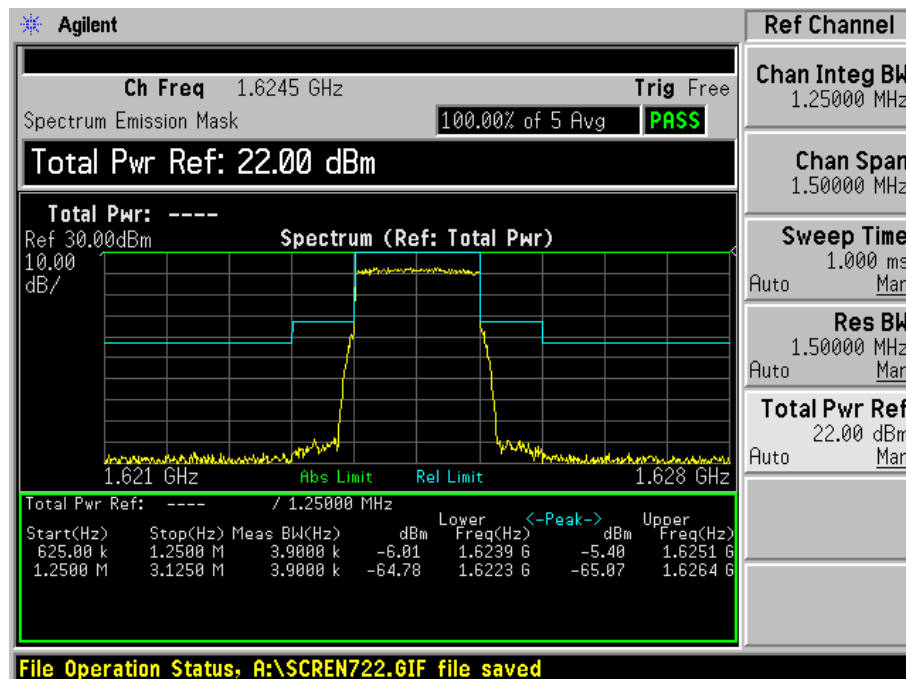
## Low Channel of Signal Input



## Middle Channel of Signal Input



## High Channel of Signal Input



## §2.1046 & §25.204 – POWER OUTPUT

### Standard Applicable

According to §25.204 (a) In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

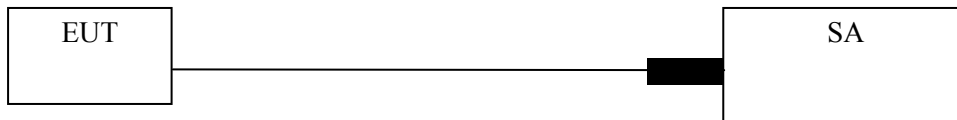
+40 dBW in any 4 kHz band for  $\Theta \leq 0^\circ$

+40 + 3 $\Theta$  dBW in any 4 kHz band for  $0^\circ < \Theta \leq 5^\circ$

where  $\Theta$  is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

### Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable & 20 dB attenuator from the antenna port to a Spectrum Analyzer.



### Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Measurement Result

#### Environmental Conditions

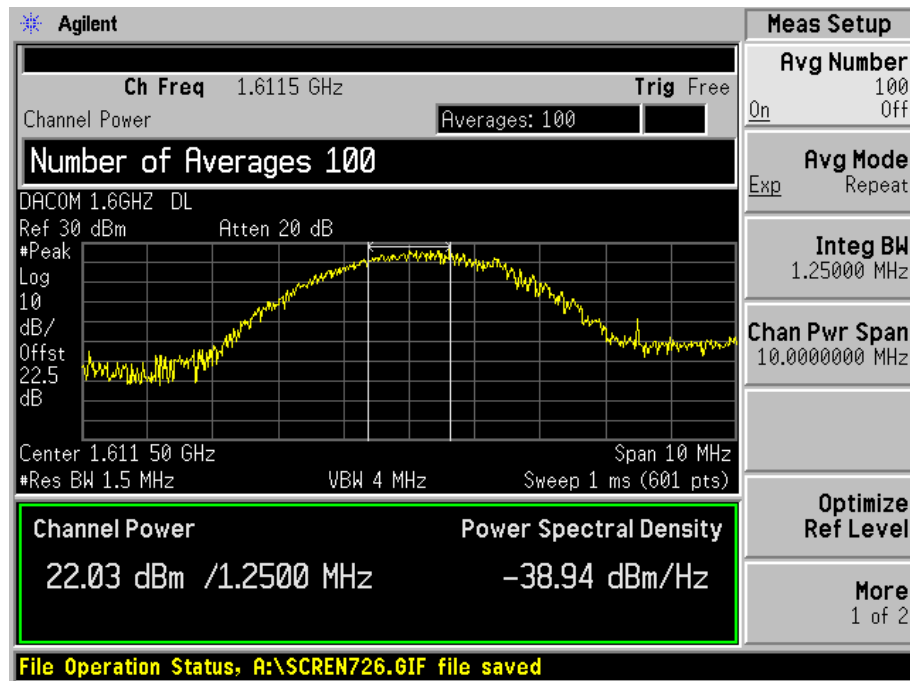
Temperature:	15° C
Relative Humidity:	82%
ATM Pressure:	1025 mbar

*The testing was performed by Snell Leong on 2005-12-17.*

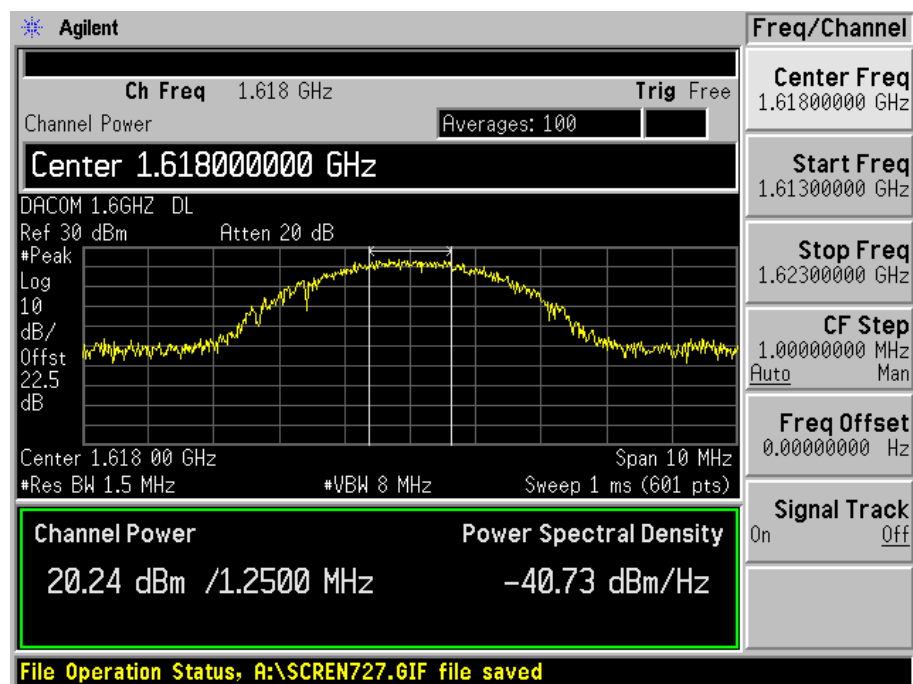
Antenna gain =2.4dB / Cable loss =3.5dB

Channel	Frequency MHz	Max conducted power (dBm)	Antenna gain & Cable loss	Corrected EIRP dBW	Limit (dBW)	Result
Low	1611.5	22.03	-1.10	-9.07	40	Pass
Middle	1618.0	20.24	-1.10	-10.86	40	Pass
High	1624.5	22.62	-1.10	-8.48	40	Pass

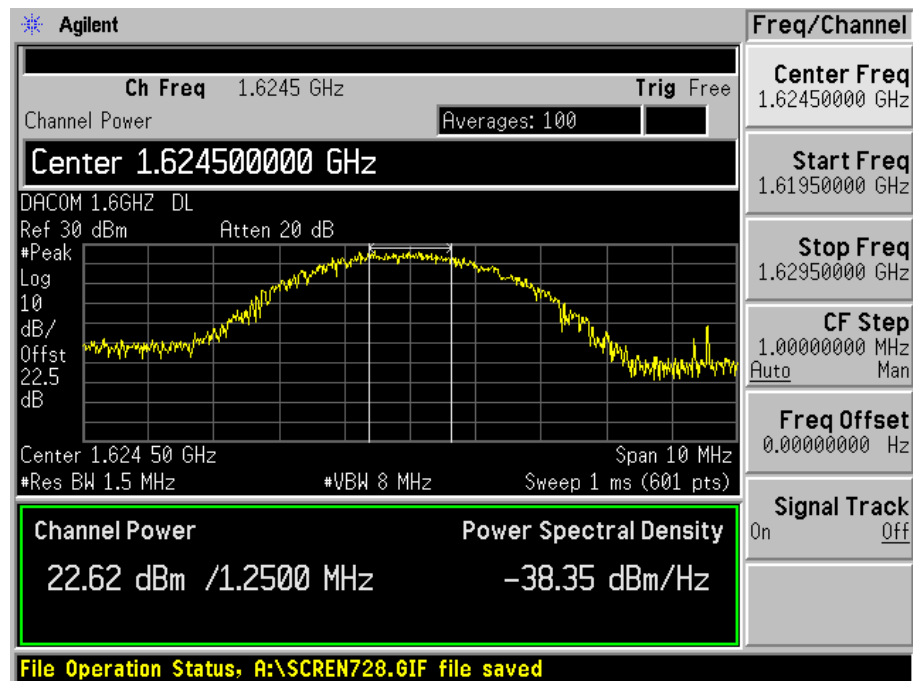
### Low Channel



## Middle Channel



## High Channel



## §25.216(c) 25.216(g)– EMISSIONS FROM MOBILE EARTH STATIONS FOR PROTECTION OF AERONAUTICAL RADIONAVIGATION-SATELLITE SERVICE

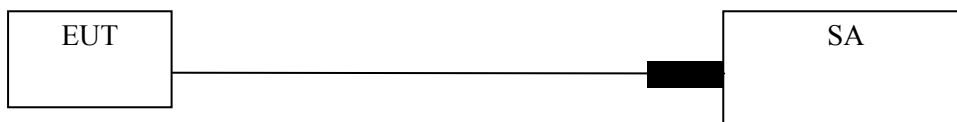
### Standard Applicable

According to §215.216(c), The e.i.r.p. density of emissions from mobile earth stations placed in service after July 21, 2002 with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed  $-70$  dBW/MHz, averaged over any 2 millisecond active transmission interval, in the band 1559–1605 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed  $-80$  dBW, averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band.

According to §215.216(g), mobile earth stations manufactured more than six months after Federal Register publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies in the 1610–1626.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band-segment to an extent determined by linear interpolation from  $-70$  dBW/MHz at 1605 MHz to  $-10$  dBW/MHz at 1610 MHz averaged over any 2 millisecond active transmission interval. The e.i.r.p of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level determined by linear interpolation from  $-80$  dBW at 1605 MHz to  $-20$  dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

### Measurement Procedure

- Place the EUT on a bench and set it in transmitting mode.
- Remove the antenna from the EUT and then connect a low loss RF cable & 20 dB attenuator from the antenna port to a Spectrum Analyzer.



### Equipment Lists

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2005-11-10

\* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

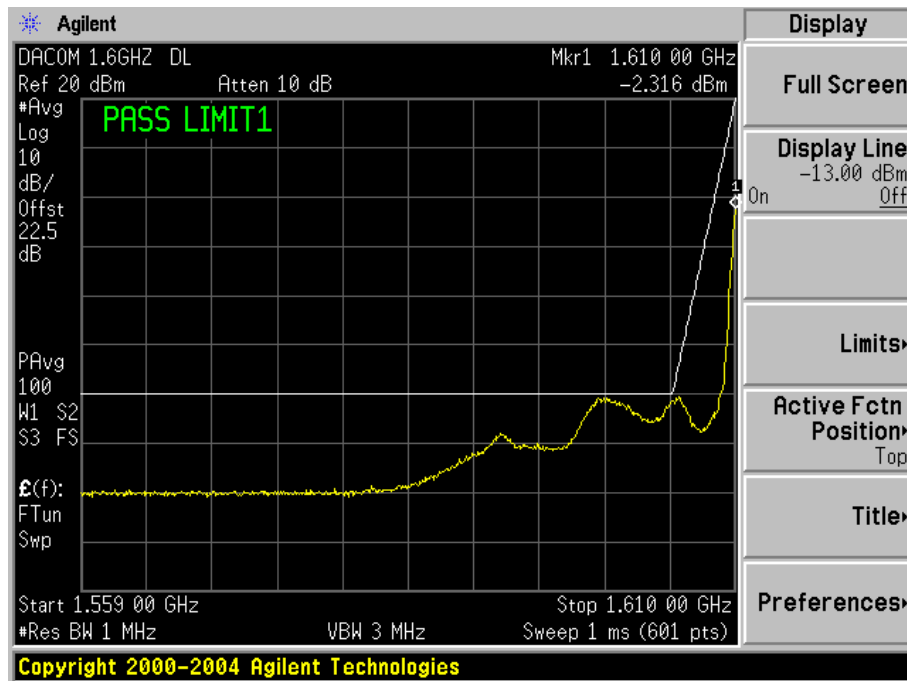
### Measurement Result

#### Environmental Conditions

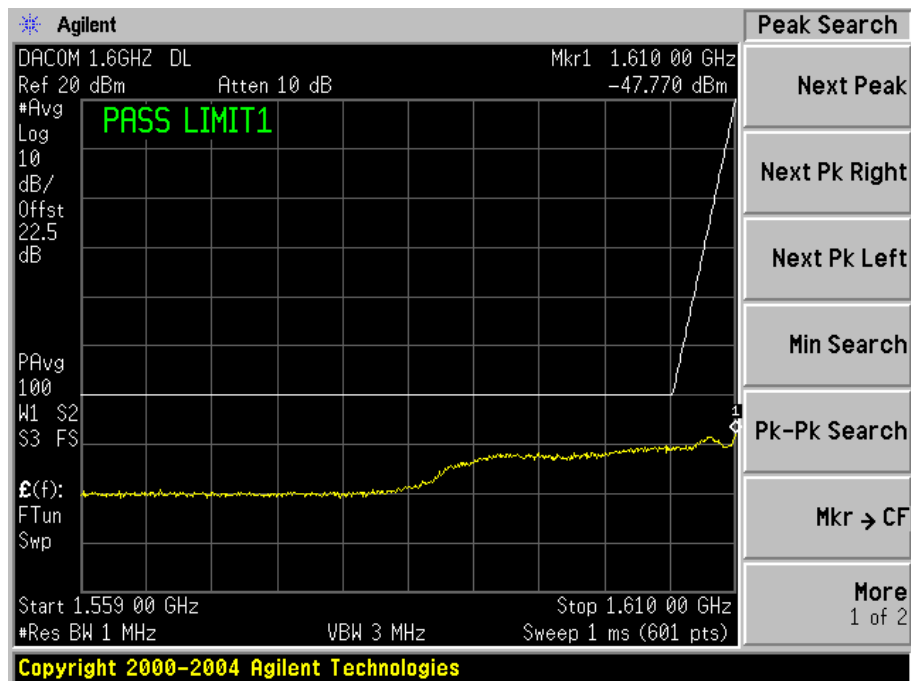
Temperature:	15° C
Relative Humidity:	82%
ATM Pressure:	1025 mbar

The testing was performed by Snell Leong on 2005-12-17.

## Low Channel

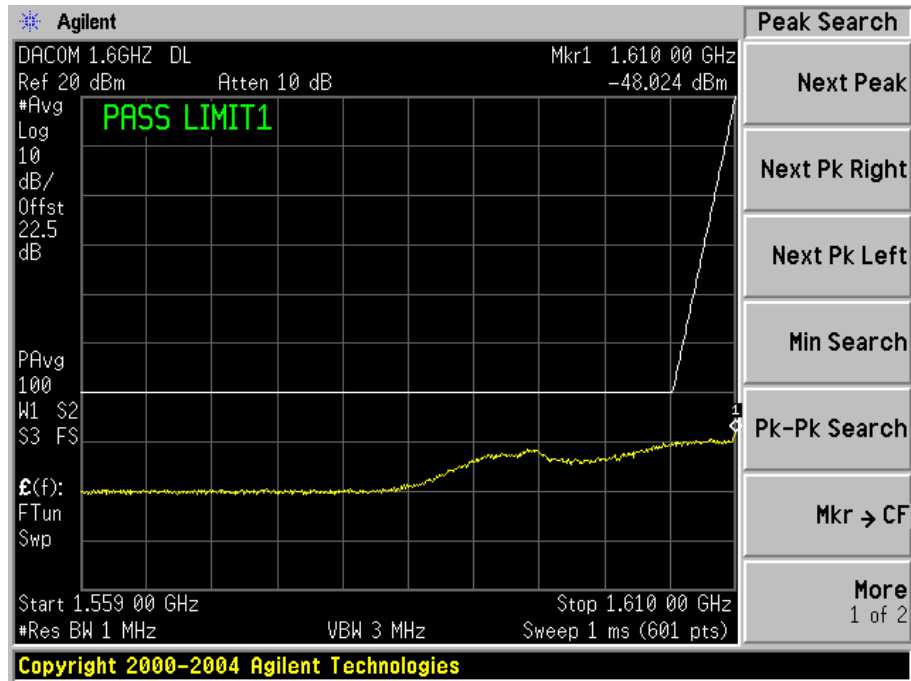


## Middle Channel





## High Channel



---

## **§2.1055 & §25.202(d) – FREQUENCY STABILITY**

---

No Required for Signal Booster