



# Test Report

Product Name : TES25 ExpressCard Modem

Model No. : TES25

FCC ID : Q78-ZTE-TES25

Applicant : ZTE Corporation

Address : ZTE Plaza, Keji Road South, Hi-tech Industrial Park,  
Nanshan District, Shenzhen, P.R. China

Date of Receipt : 2008/03/26

Issued Date : 2008/07/14

Report No. : 084S014-RF-US-P10V01

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by CNLA, NVLAP or any agency of the Government.  
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# Test Report Certification

Issued Date : 2008/07/14

Report No. : 084S014-RF-US-P10V01



Product Name : TES25 ExpressCard Modem  
 Applicant : ZTE Corporation  
 Address : ZTE Plaza, Keji Road South, Hi-tech Industrial Park,  
 Nanshan District, Shenzhen, P.R. China  
 Manufacturer : ZTE Corporation  
 Address : ZTE Plaza, Keji Road South, Hi-tech Industrial Park,  
 Nanshan District, Shenzhen, P.R. China  
 Model No. : TES25  
 FCC ID : Q78-ZTE-tes25  
 Rated Voltage : AC 120 V / 60 Hz  
 EUT Voltage : DC 3.0V~3.6V  
 Trade Name : TES25  
 Applicable Standard : FCC Part 27 Subpart C & M: 2007  
 Test Result : Complied  
 Performed Location : SuZhou EMC laboratory  
 No.99 Hongye Rd., Suzhou Industrial Park Loufeng  
 Hi-Tech Development Zone., SuZhou, China  
 TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098  
 FCC Registration Number: 800392

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## Laboratory Information

We , **Quietek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited by the following accreditation Bodies in compliance with ISO 17025, EN 45001 and Guide 25:

Taiwan R.O.C.	: BSMI, DGT, CNLA
Germany	: TUV Rheinland
Norway	: Nemko, DNV
USA	: FCC, NVLAP
Japan	: VCCI

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site : <http://tw.quietek.com/modules/myalbum/>  
 The address and introduction of Quietek Corporation's laboratories can be founded in our Web site : <http://www.quietek.com/>  
 If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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**1. General Information****1.1. EUT Description**

Product Name	TES25 ExpressCard Modem
Trade Name	ZTE
Model No.	TES25
FCC ID	Q78-ZTE-TES25
Working Voltage	DC 3.6V
Frequency Range	2496 - 2690 MHz
Channel Number	5MHz, 10MHz
Type of Modulation	QPSK, 16QAM, 64QAM (DL)
Data Rate	DL: 20Mbps, UL: 7Mbps
Channel Control	Auto
Antenna Type	Monopole
Antenna Gain	3.0dBi

**RF Profile:**

Frequency Range (GHz)	Channel Frequency Step (kHz)	Channel Bandwidth(s)(MHz)	FFT size	Duplexing Mode
2.496 – 2.69	250	5	512	TDD
		10	1024	TDD

**Physical Parameter:**

Parameter	Uplink	Uplink
System Bandwidth	5MHz	10MHz
FFT Size	512	1024
Null Sub-Carriers	104	184
Pilot Sub-Carriers	136	280
Data Sub-Carriers	272	560
Sub-Channels	17	35
Symbol Period, Ts	102.9 microseconds	
Frame Duration	5 millisecond	
OFDM Symbols/Frame	48	
Data OFDM Symbols	44	
Modulations	QPSK 1/2 CTC , QPSK 3/4 CTC 16QAM 1/2 CTC , 16QAM 3/4 CTC	

**1.2. Mode of Operation**

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

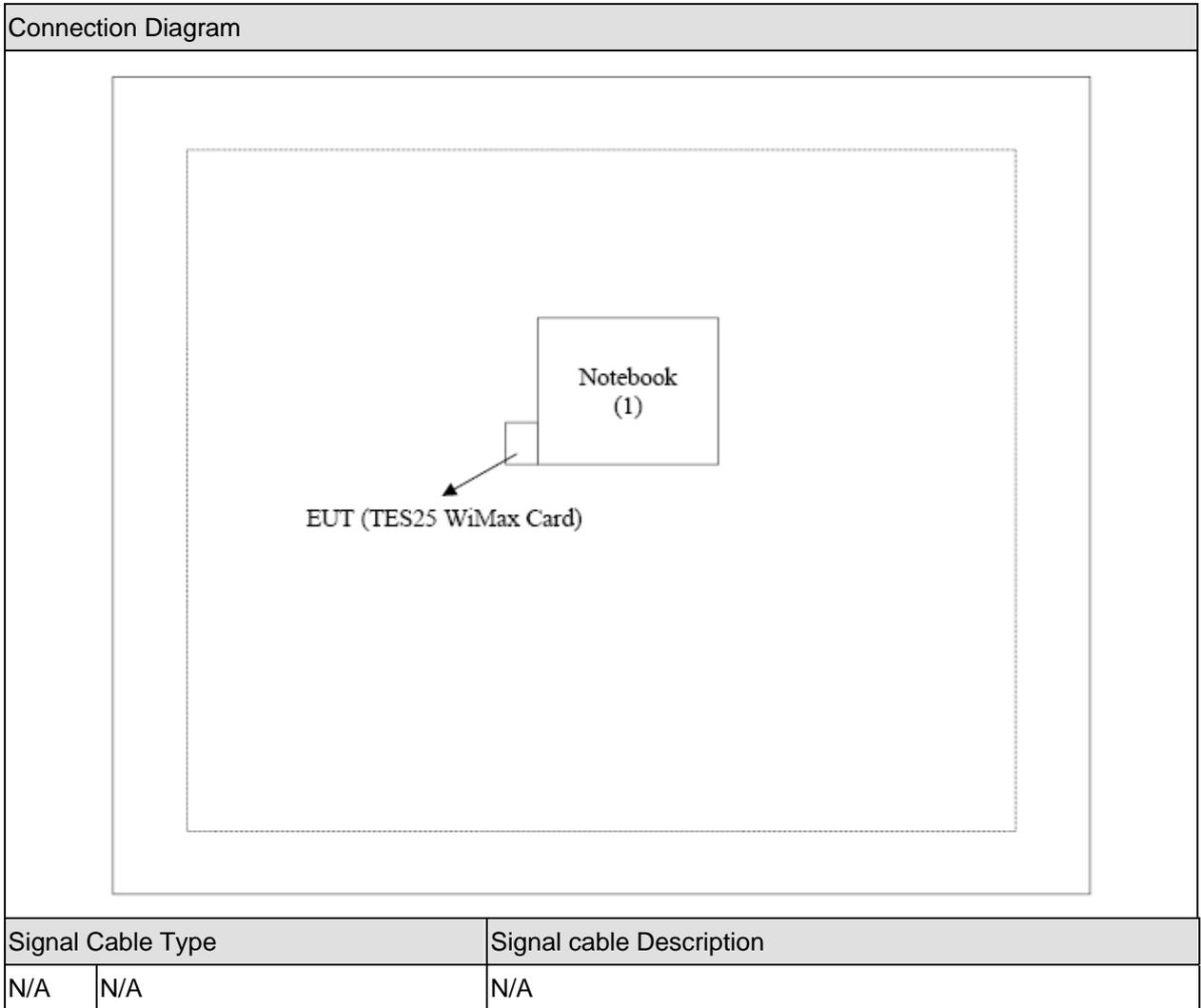
Test Mode
Mode 1: Transmit (5MHz Bandwidth)
Mode 2: Transmit (10MHz Bandwidth)

**1.3. Tested System Details**

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	DELL	PP19L	JH097 A01	Power by adaptor

1.4. Configuration of Tested System



**1.5. EUT Exercise Software**

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Execute beceem control software, and set the EUT working at continuous transmission mode.
4	Change the modulation (QPSK, 16QAM) and channel (low, middle, high), test them respectively.

**2. Technical Test**

**2.1. Summary of Test Result**

- No deviations from the test standards
- Deviations from the test standards as below description:

Performed Test Item	Normative References	Test Performed	Deviation
RF Power Output	FCC Part 27.50(h)(2) and Part 2.1046	Yes	No
Occupied Bandwidth	FCC Part 27.53(l)(6) and Part 2.1049	Yes	No
Band Edge	FCC Part 27.53(l)(4)(6) and Part 2.1051	Yes	No
Spurious Emission at Antenna Terminals	FCC Part 27.53(l)(4)(6) and Part 2.1051	Yes	No
Field Strength of Spurious Radiation	FCC Part 27.53(l)(4)(6) and Part 2.1053	Yes	No
Frequency Stability	FCC Part 27.54 and Part 2.1055	Yes	No

**2.2. Test Environment**

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

### 3. RF Power Output

#### 3.1. Test Equipment

RF Power Output (Conducted Measurement) / AC-4

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2007/06/11
Coaxial Cable	Huber+Suhner	AC4-RF	09	2007/11/25
Temperature/Humidity Meter	zhicheng	ZC1-2	QT-TH007	2008/03/09

RF Power Output (Radiated Measurement) / AC-2

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4408B	MY45102679	2007/11/12
PSG Analog S.G.	Agilent	E8257D	MY44321116	2008/06/11
Preamplifier	Quietek	AP-180C	CHM-0602012	2007/11/25
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	496	2007/11/25
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2007/11/25
Coaxial Cable	Huber+Suhner	AC2-C	04	2007/11/25
Coaxial Cable	Huber+Suhner	AC4-T	08	2007/11/25
Temperature/Humidity Meter	zhicheng	ZC1-2	QT-TH002	2008/03/31

RF Power Output (Radiated Measurement) / AC-3

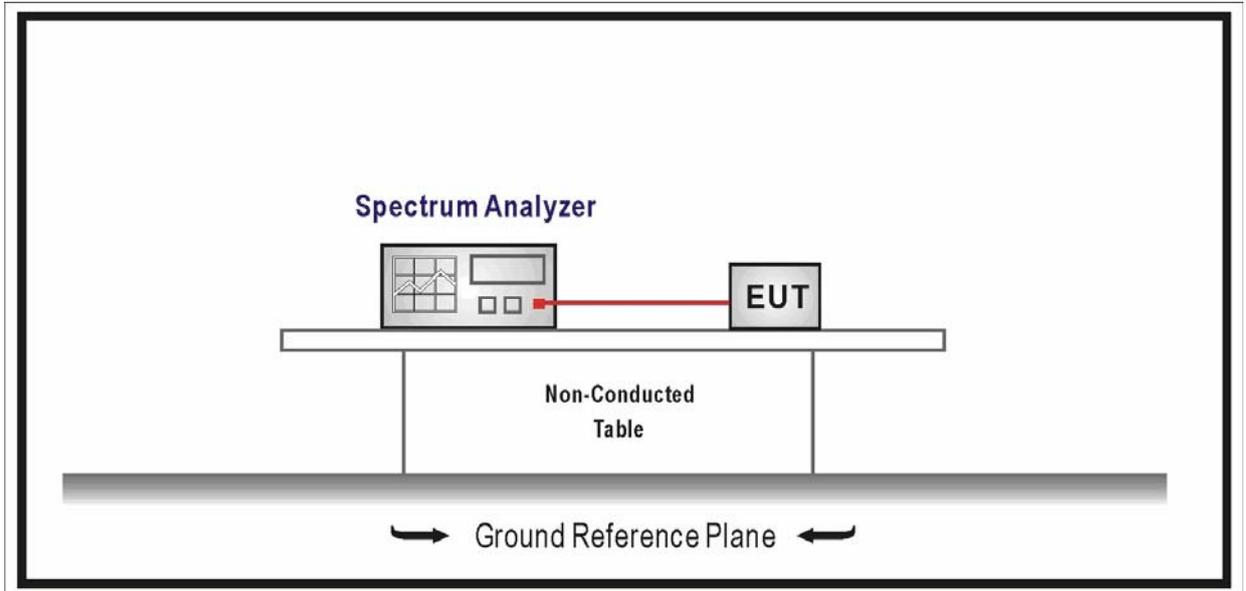
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2008/04/24
PSG Analog S.G.	Agilent	E8257D	MY44321116	2008/06/11
Preamplifier	Quietek	AP-180C	CHM-0602012	2007/11/25
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	496	2007/11/25
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2007/11/25
Coaxial Cable	Huber+Suhner	AC3-C	05	2007/11/25
Coaxial Cable	Huber+Suhner	AC4-T	08	2007/11/25
Temperature/Humidity Meter	zhicheng	ZC1-2	QT-TH003	2008/03/31

Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

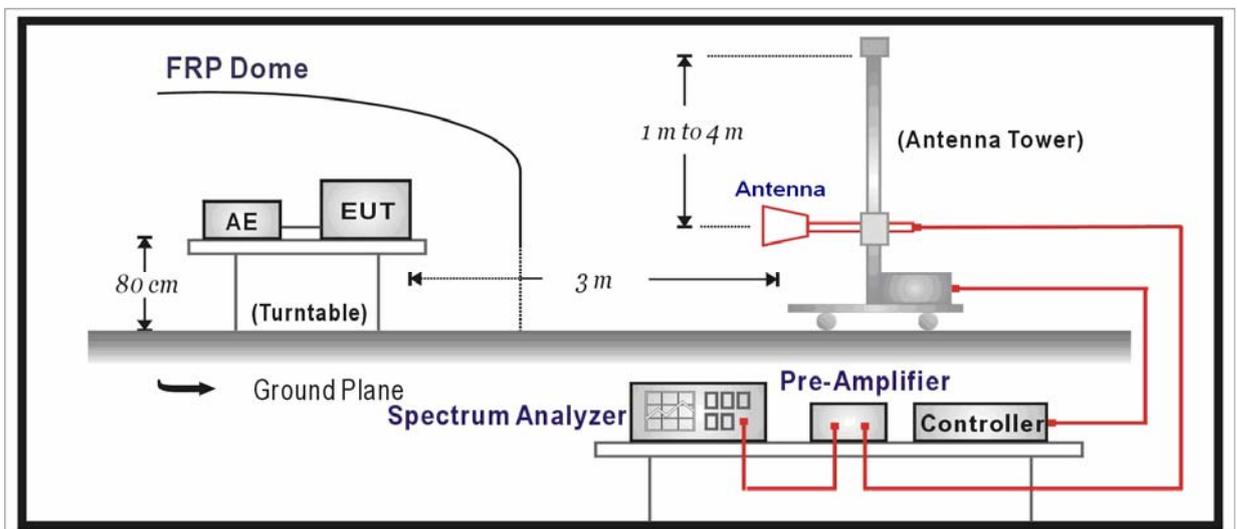
Note 2: The test instruments marked with "X" are used to measure the final test results.

### 3.2. Test Setup

#### For Conducted Measurement



#### For Radiated Measurement



### 3.3. Limit

Mobile stations are limited to 2.0 watts EIRP

All user stations are limited to 2.0 watts transmitter output power

### **3.4. Test Procedure**

RF output power would be determined by the channel power measurement function of the spectrum analyzer.

Spectrum analyzer settings as following:

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 100 kHz, VBW = 1 MHz, Detector mode = Peak.
- Computer power by integrating the spectrum across the 26dB EBW of the signal.

### **3.5. Uncertainty**

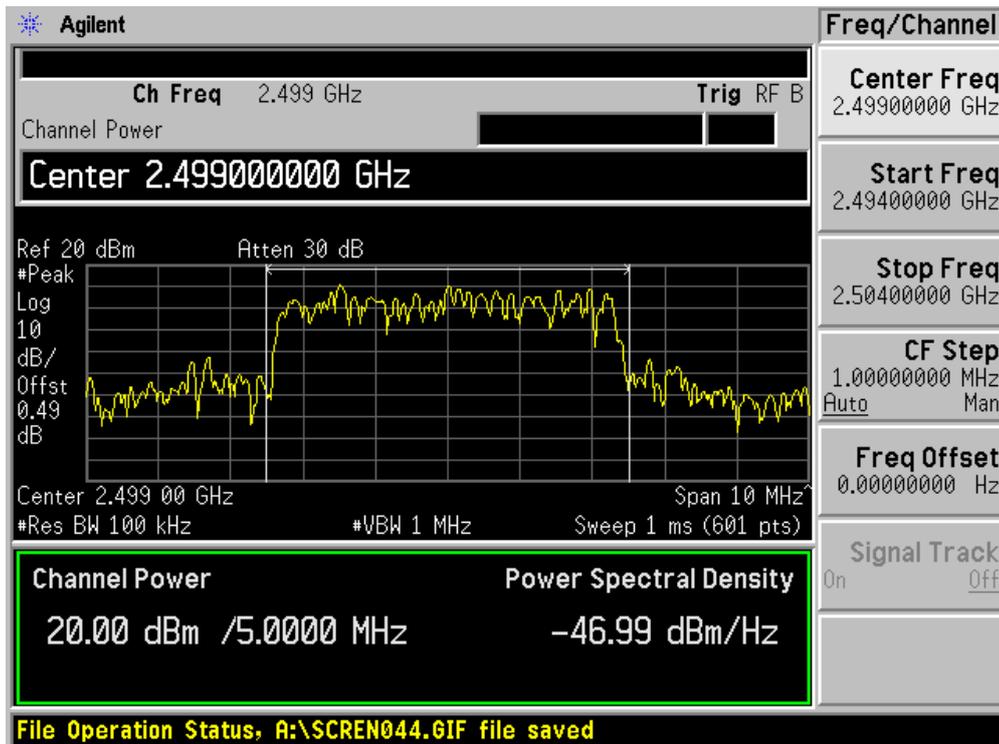
The measurement uncertainty is defined as  $\pm 1.27$  dB

3.6. Test Result

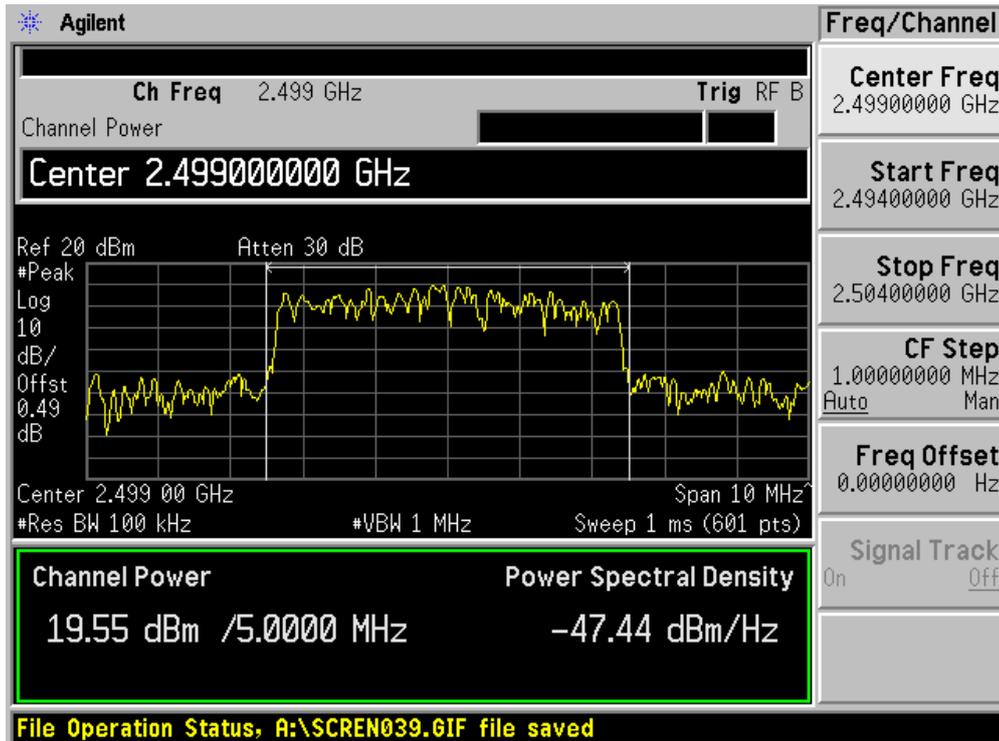
Product	:	TES25 ExpressCard Modem
Test Item	:	RF Power Output (Conducted Measurement)
Test Site	:	AC-4
Test Mode	:	Mode 1: Transmit (5MHz Bandwidth)

Channel	Frequency (MHz)	Power Output of Different Type Modulation (dBm)			Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)
		QPSK	16QAM	64QAM			
Low	2499	20.00	19.55	N/A	3.0	23.00	33
Middle	2600	19.89	19.41	N/A	3.0	22.89	33
High	2687	21.23	21.15	N/A	3.0	24.23	33

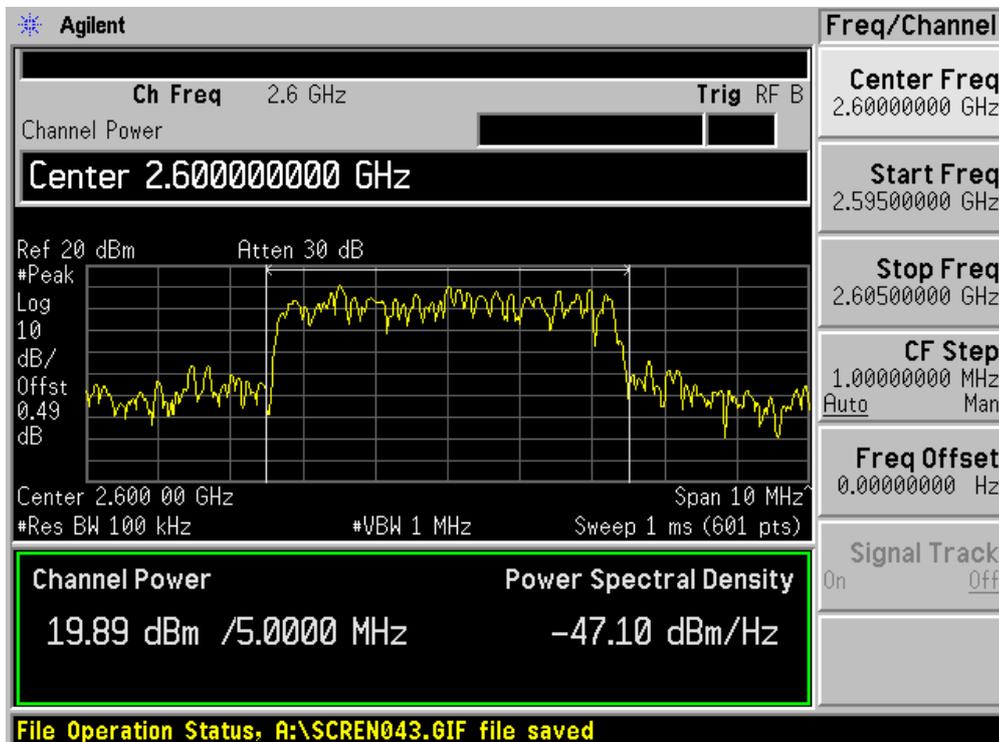
Channel - Low (2499MHz-QPSK)



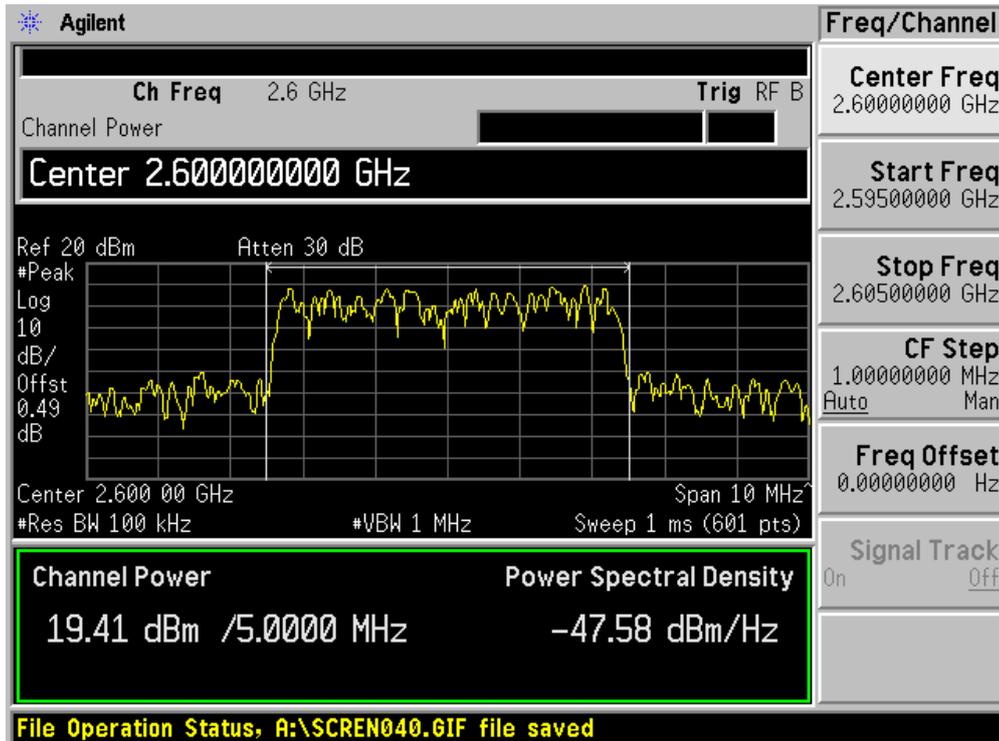
Channel - Low (2499MHz-16QAM)



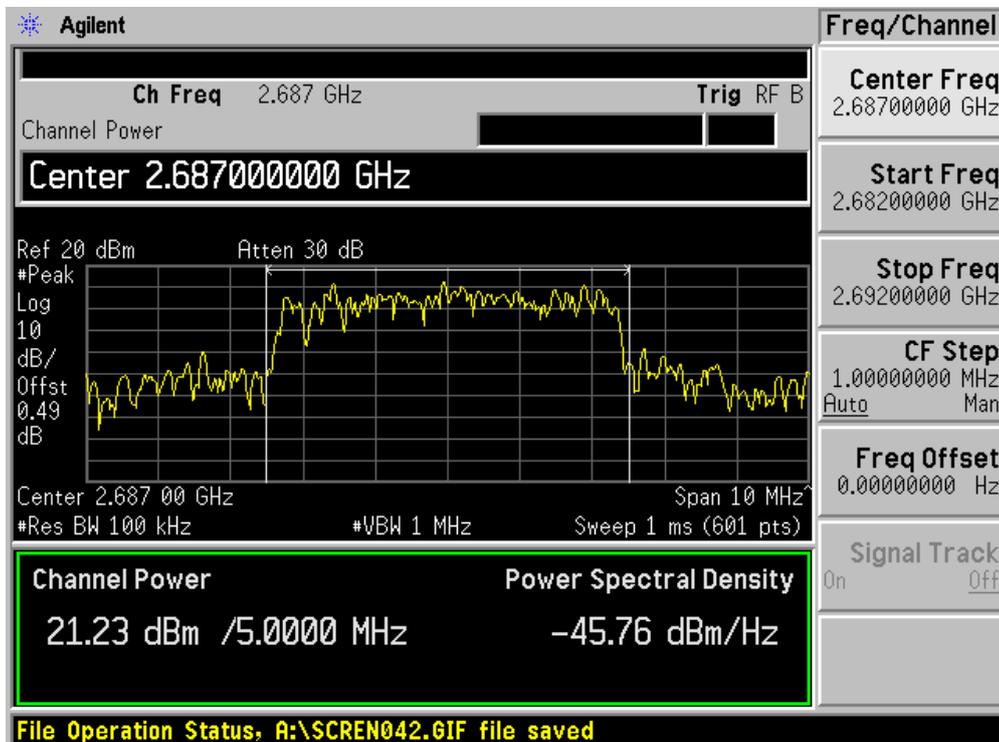
Channel - Middle (2600MHz-QPSK)



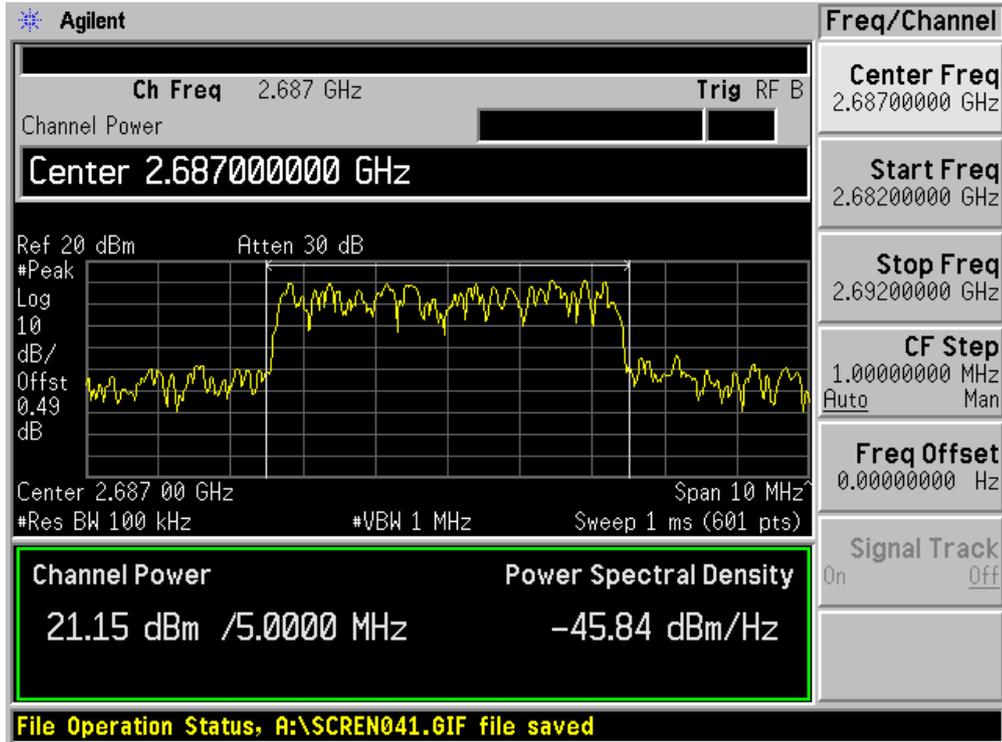
Channel - Middle (2600MHz-16QAM)



Channel - High (2687MHz-QPSK)



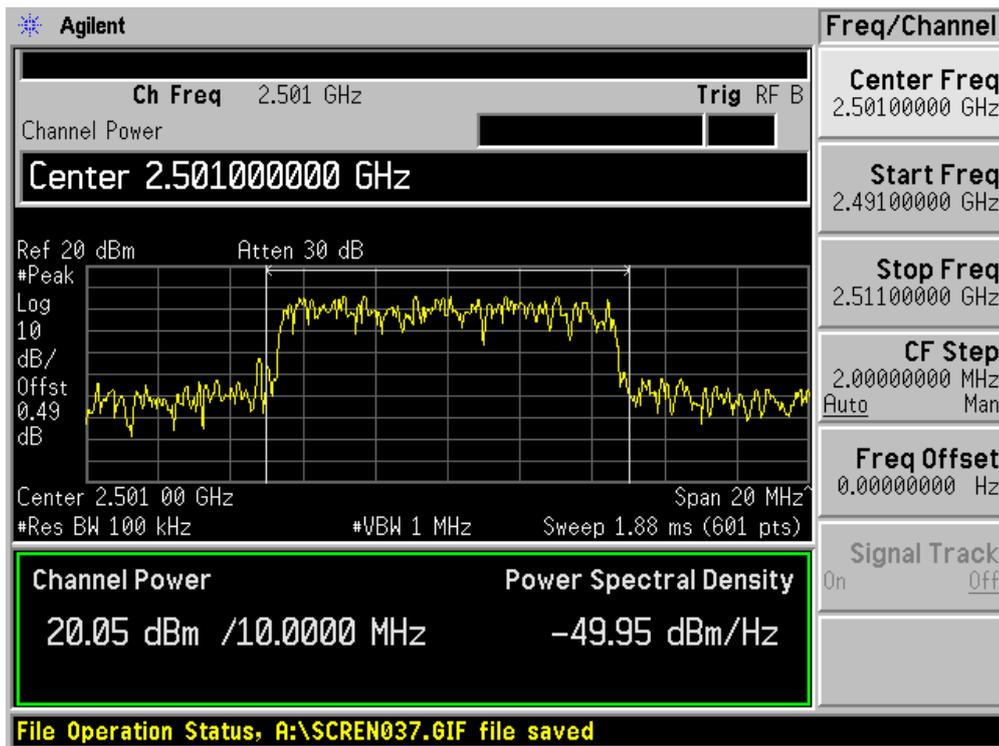
Channel - High (2687MHz--16QAM)



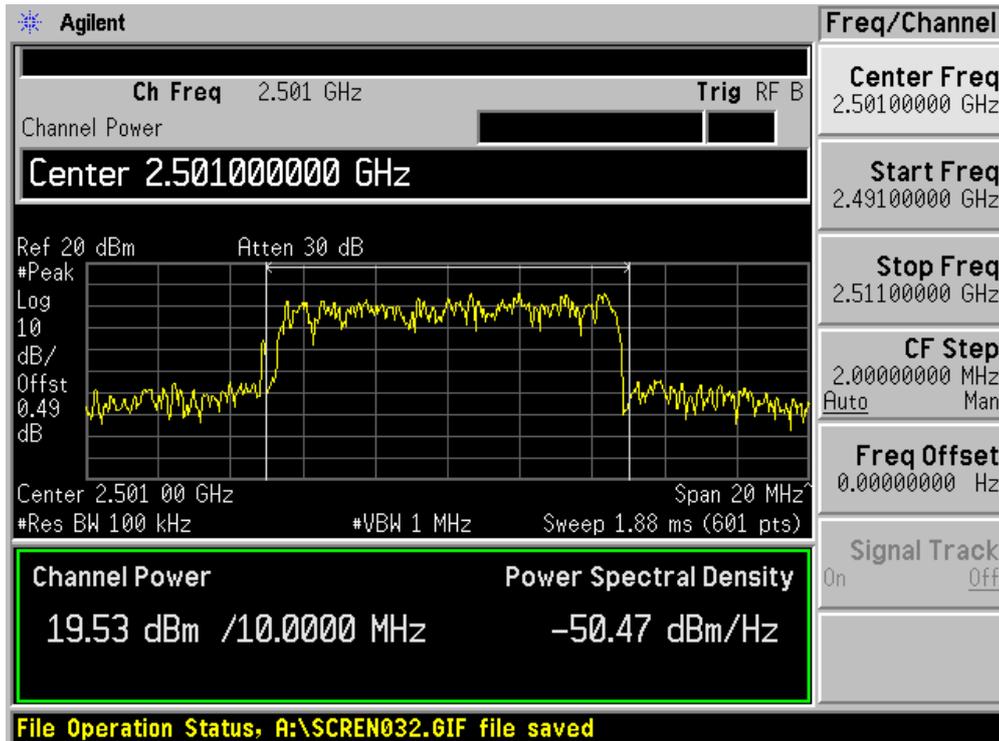
Product	:	TES25 ExpressCard Modem
Test Item	:	RF Power Output (Conducted Measurement)
Test Site	:	AC-4
Test Mode	:	Mode 2: Transmit (10MHz Bandwidth)

Channel	Frequency (MHz)	Power Output of Different Type Modulation (dBm)			Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)
		QPSK	16QAM	64QAM			
Low	2501	20.05	19.53	N/A	3.0	23.05	33
Middle	2600	19.76	19.73	N/A	3.0	22.76	33
High	2685	21.56	21.19	N/A	3.0	24.56	33

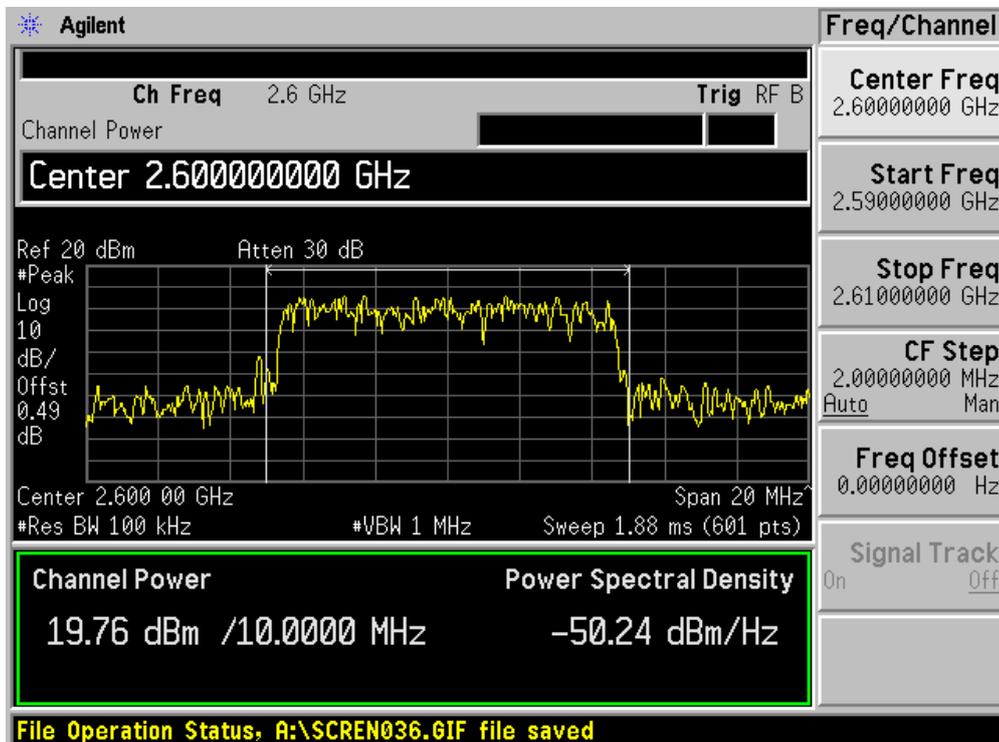
### Channel - Low (2501MHz-QPSK)



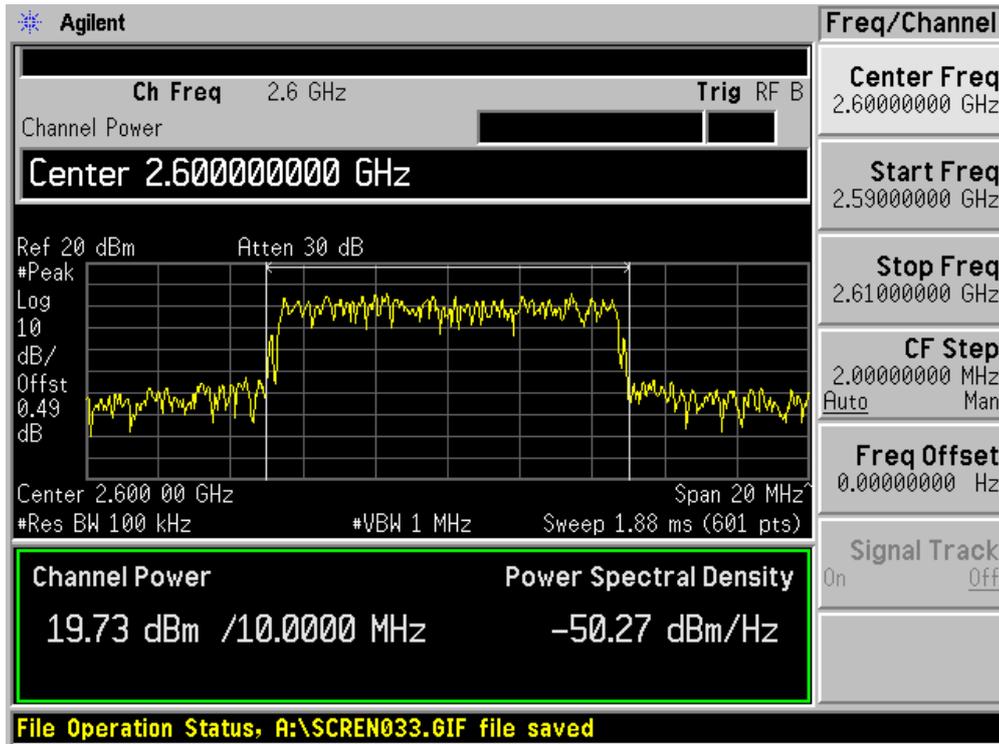
Channel - Low (2501MHz-16QAM)



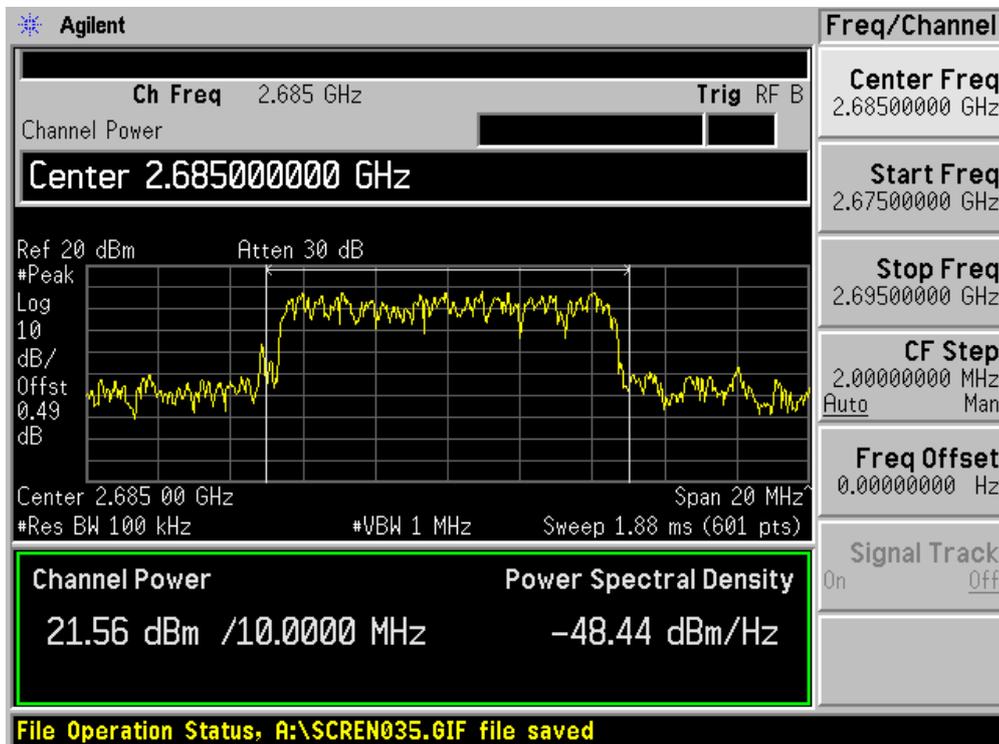
Channel - Middle (2600MHz-QPSK)



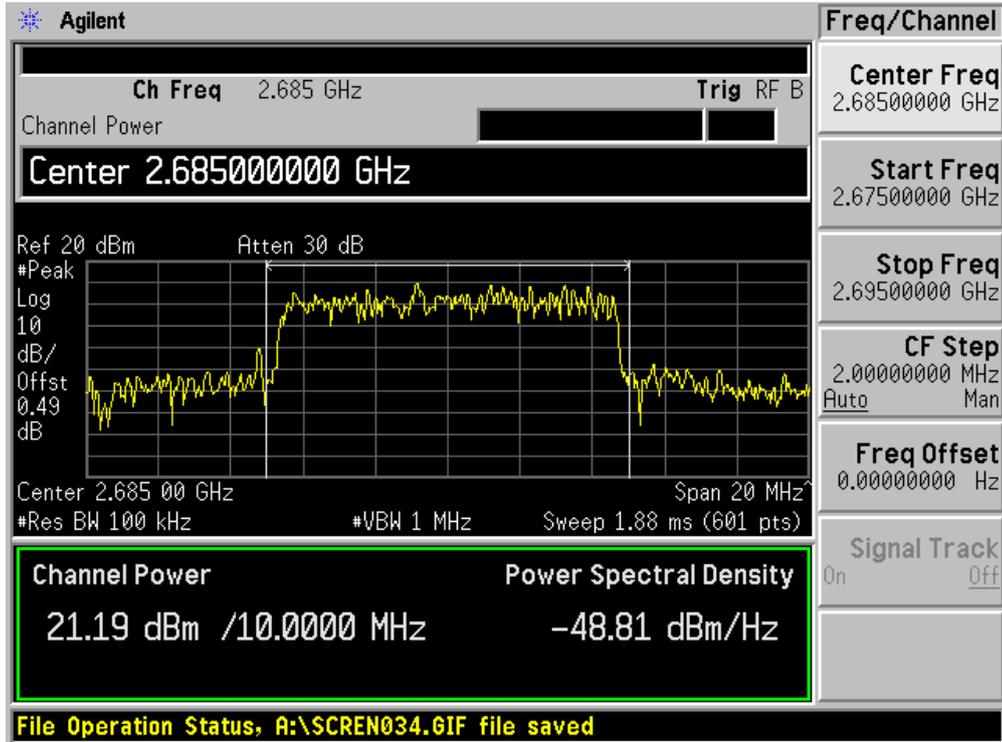
Channel - Middle (2600MHz-16QAM)



Channel - High (2685MHz-QPSK)



Channel - High (2685MHz--16QAM)



Product	:	TES25 ExpressCard Modem
Test Item	:	RF Power Output (Radiated Measurement)
Test Site	:	AC-4
Test Mode	:	Mode 1: Transmit (5MHz Bandwidth)

Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel (2499MHz) - QPSK								
2499	10.51	H	26.13	4.12	10.59	19.66	33	-13.34
2499	12.15	V	29.12	4.12	10.59	22.65	33	-10.35
Middle Channel (2600MHz) - QPSK								
2600	10.85	H	28.12	4.26	10.77	21.61	33	-11.39
2600	14.58	V	31.80	4.26	10.77	25.29	33	-7.71
High Channel (2687MHz) - QPSK								
2687	10.38	H	28.13	4.16	10.95	21.34	33	-11.66
2687	14.48	V	32.06	4.16	10.95	25.27	33	-7.73

Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel (2499MHz) - 16QAM								
2499	10.01	H	25.63	4.12	10.59	19.16	33	-13.84
2499	11.60	V	28.57	4.12	10.59	22.10	33	-10.90
Middle Channel (2600MHz) - 16QAM								
2600	10.25	H	27.51	4.26	10.77	21.00	33	-12.00
2600	12.00	V	29.32	4.26	10.77	22.81	33	-10.19
High Channel (2687MHz) - 16QAM								
2687	9.80	H	27.55	4.16	10.95	20.76	33	-12.24
2687	14.20	V	31.78	4.16	10.95	24.99	33	-8.01

Product	:	TES25 ExpressCard Modem
Test Item	:	RF Power Output (Radiated Measurement)
Test Site	:	AC-4
Test Mode	:	Mode 2: Transmit (10MHz Bandwidth)

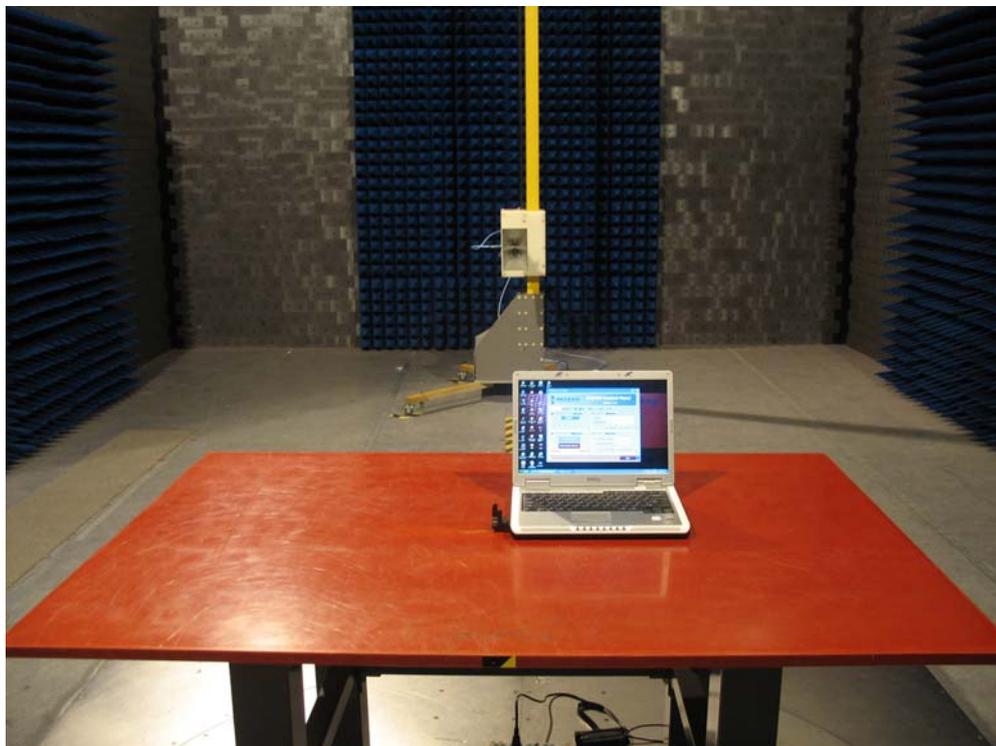
Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel (2501MHz) - QPSK								
2501	6.45	H	23.42	4.13	10.59	16.96	33	-16.04
2501	9.09	V	26.05	4.13	10.59	19.59	33	-13.41
Middle Channel (2600MHz) - QPSK								
2600	7.74	H	25.01	4.26	10.77	18.50	33	-14.5
2600	11.74	V	28.95	4.26	10.77	22.44	33	-10.56
High Channel (2685MHz) - QPSK								
2685	7.24	H	24.97	4.16	10.94	18.19	33	-14.81
2685	11.66	V	29.23	4.16	10.94	22.45	33	-10.55

Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel (2501MHz) - 16QAM								
2501	5.95	H	22.92	4.13	10.59	16.46	33	-16.54
2501	8.30	V	25.26	4.13	10.59	18.80	33	-14.20
Middle Channel (2600MHz) - 16QAM								
2600	7.70	H	25.96	4.26	10.77	18.45	33	-14.55
2600	11.70	V	28.90	4.26	10.77	22.38	33	-10.62
High Channel (2685MHz) - 16QAM								
2685	6.79	H	24.50	4.16	10.94	17.72	33	-15.28
2685	11.10	V	28.65	4.16	10.94	21.85	33	-11.15

### 3.7. Test Photograph

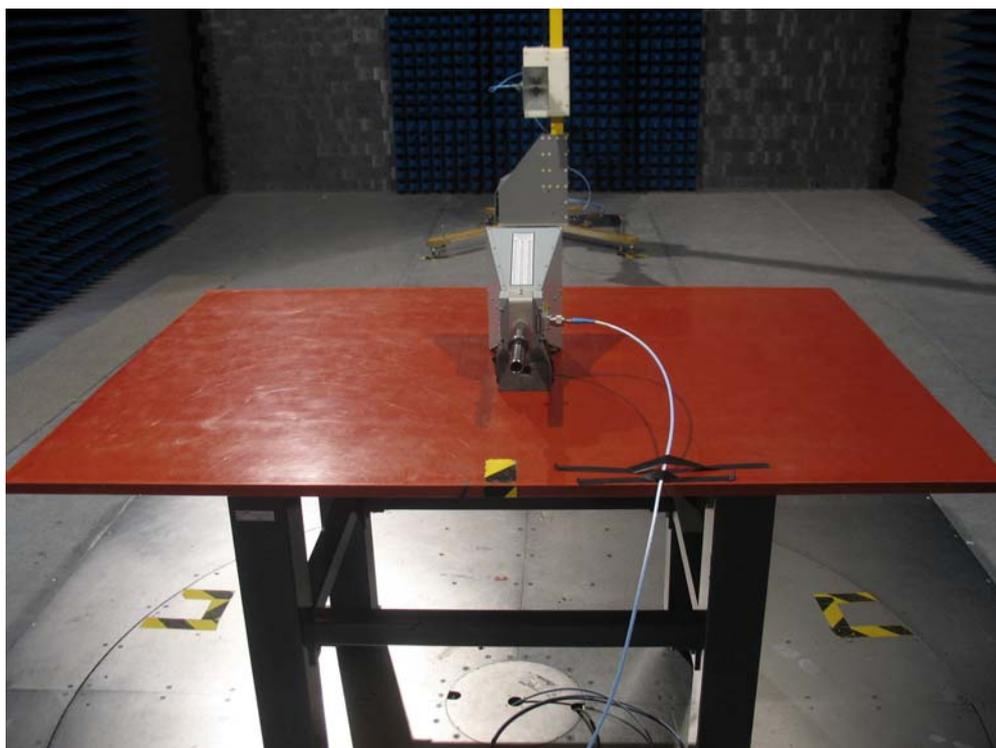
Test Mode: Mode 1: Transmit (5MHz Bandwidth)

Description: Peak Output Power (Radiated Measurement) Test Setup for EUT



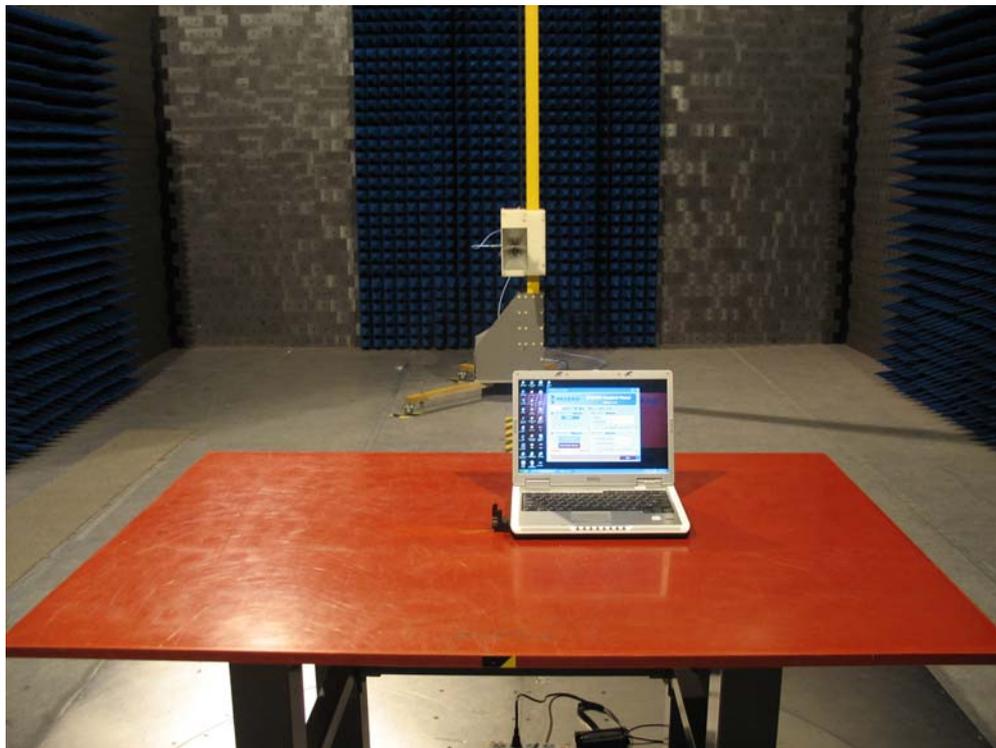
Test Mode: Mode 2: Transmit (5MHz Bandwidth)

Description: Peak Output Power (Radiated Measurement) Test Setup for Substitution Antenna



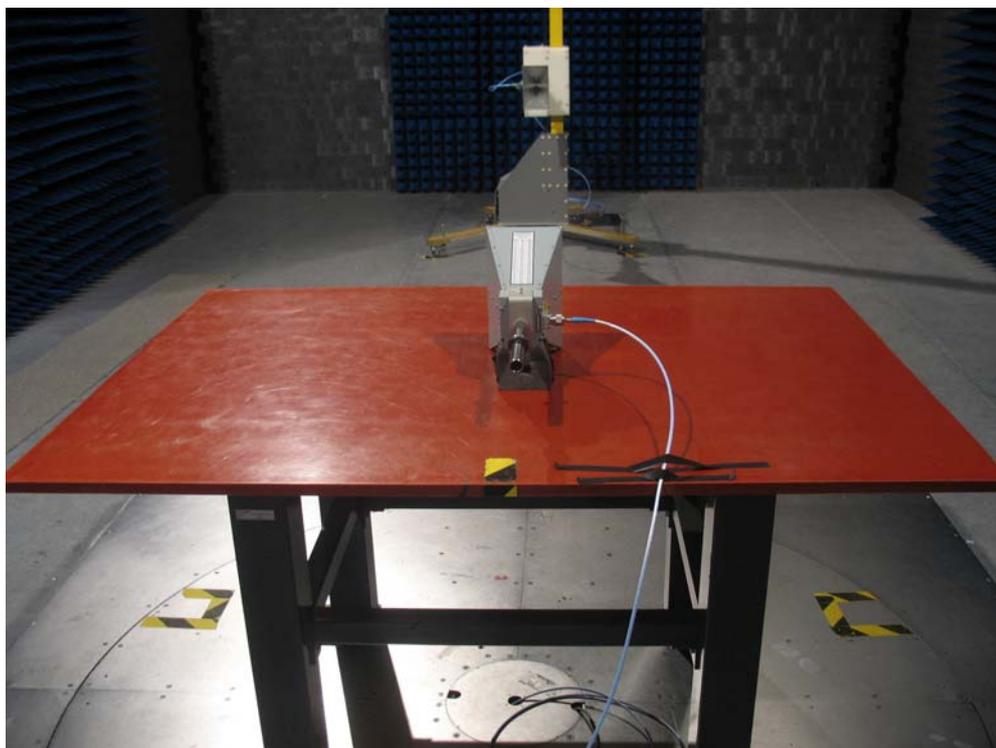
Test Mode: Mode 1: Transmit (10MHz Bandwidth)

Description: Peak Output Power (Radiated Measurement) Test Setup for EUT



Test Mode: Mode 2: Transmit (10MHz Bandwidth)

Description: Peak Output Power (Radiated Measurement) Test Setup for Substitution Antenna



## 4. Occupied Bandwidth

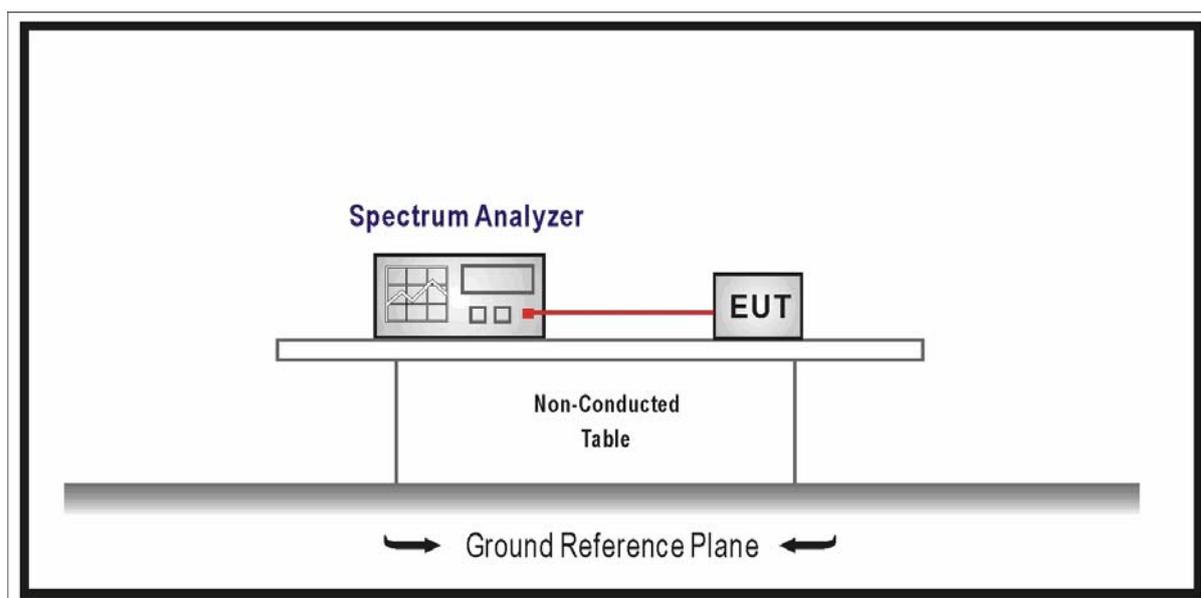
### 4.1. Test Equipment

Occupied Bandwidth / AC-4

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2008/06/11
Coaxial Cable	Huber+Suhner	AC4-RF	09	2007/11/25
Temperature/Humidity Meter	zhicheng	ZC1-2	QT-TH007	2008/03/09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

### 4.2. Test Setup



### 4.3. Limit

N/A

### 4.4. Test Procedure

Occupied Bandwidth would be determined by the occupied bandwidth measurement function of the spectrum analyzer.

Spectrum analyzer settings as following:

- Set span to encompass the entire emission bandwidth (EBW) of the signal.

- Set RBW = 1% of rated occupied bandwidth, VBW  $\geq$  RBW, Detector mode = Peak.

#### **4.5. Uncertainty**

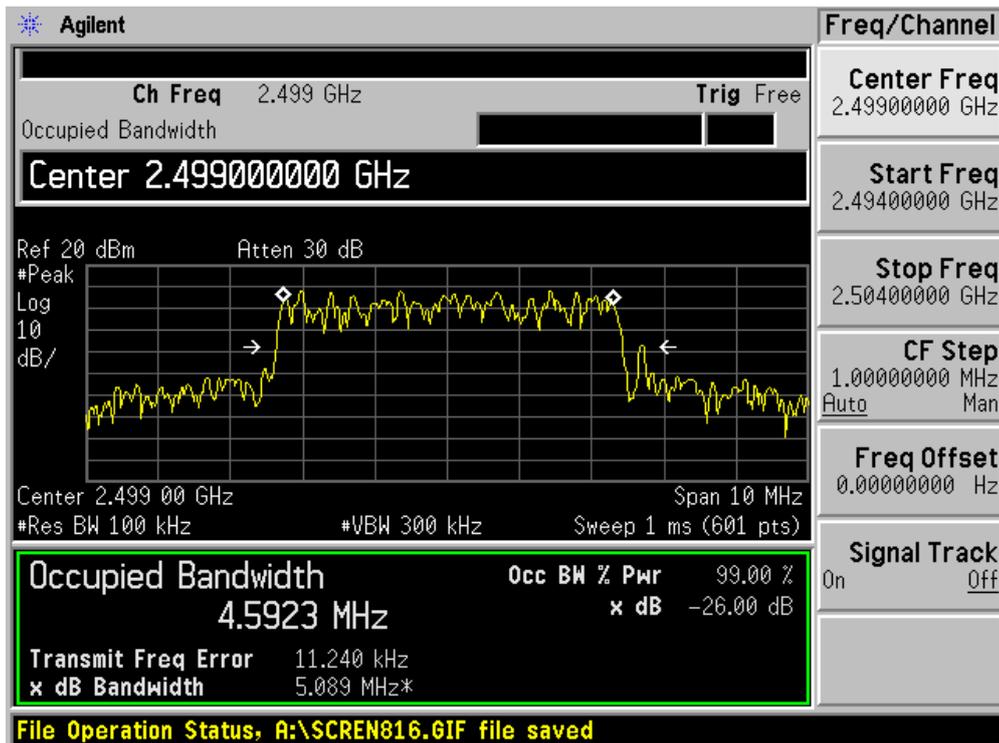
The measurement uncertainty is defined as  $\pm 1$  kHz

4.6. Test Result

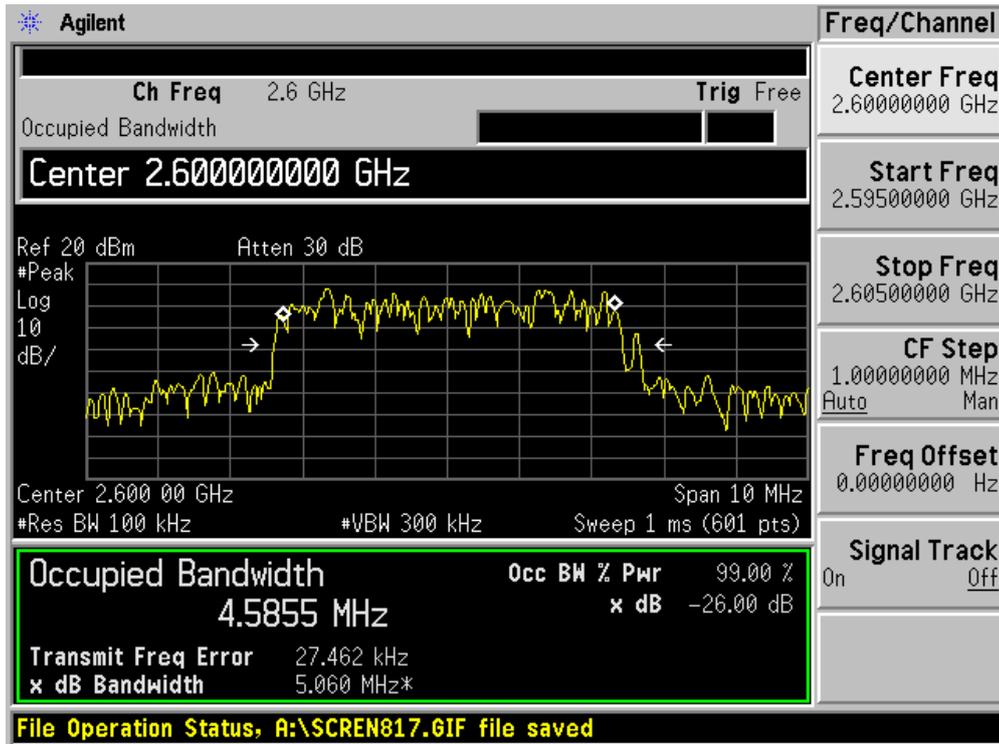
Product	:	TES25 ExpressCard Modem
Test Item	:	Occupied Bandwidth
Test Site	:	AC-4
Test Mode	:	Mode 1: Transmit (5MHz Bandwidth)

Channel	Frequency (MHz)	26dB Occupied Bandwidth (kHz)	Limit (kHz)
Low	2499	5089	N/A
Middle	2600	5060	N/A
High	2687	5079	N/A

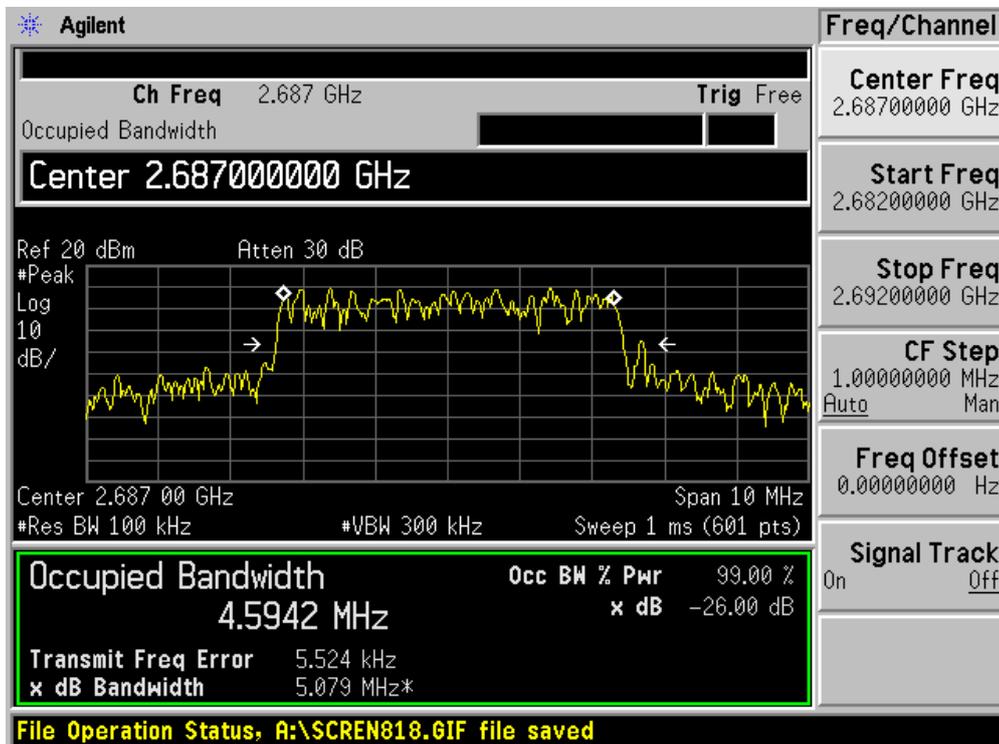
Channel - Low (2499MHz)



Channel - Middle (2600MHz)



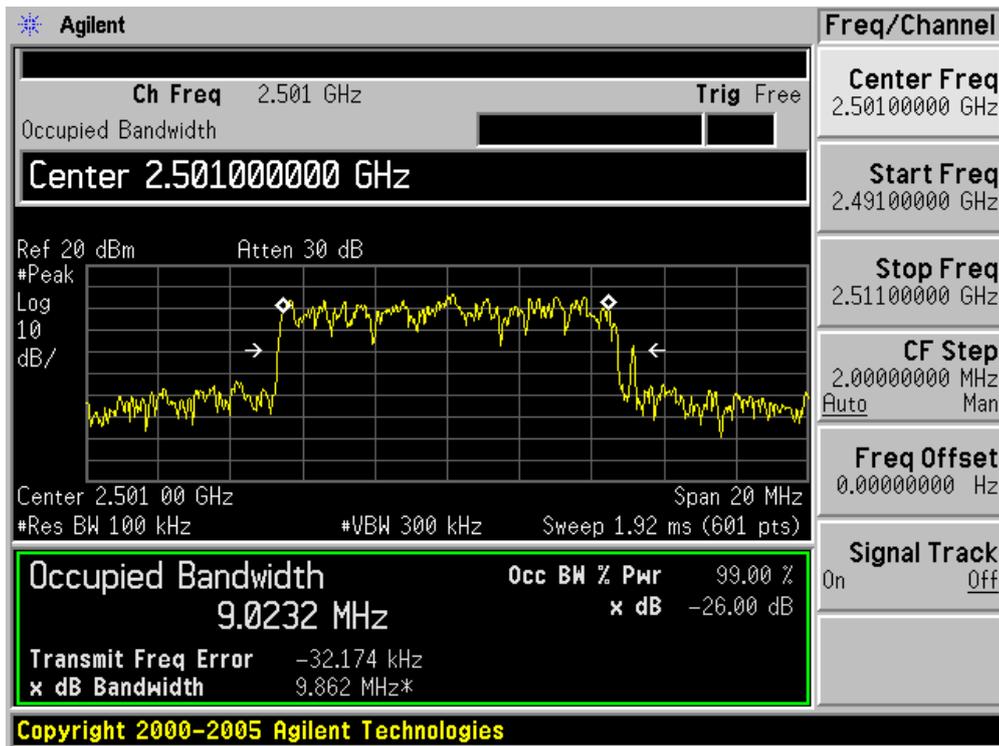
Channel - High (2687MHz)



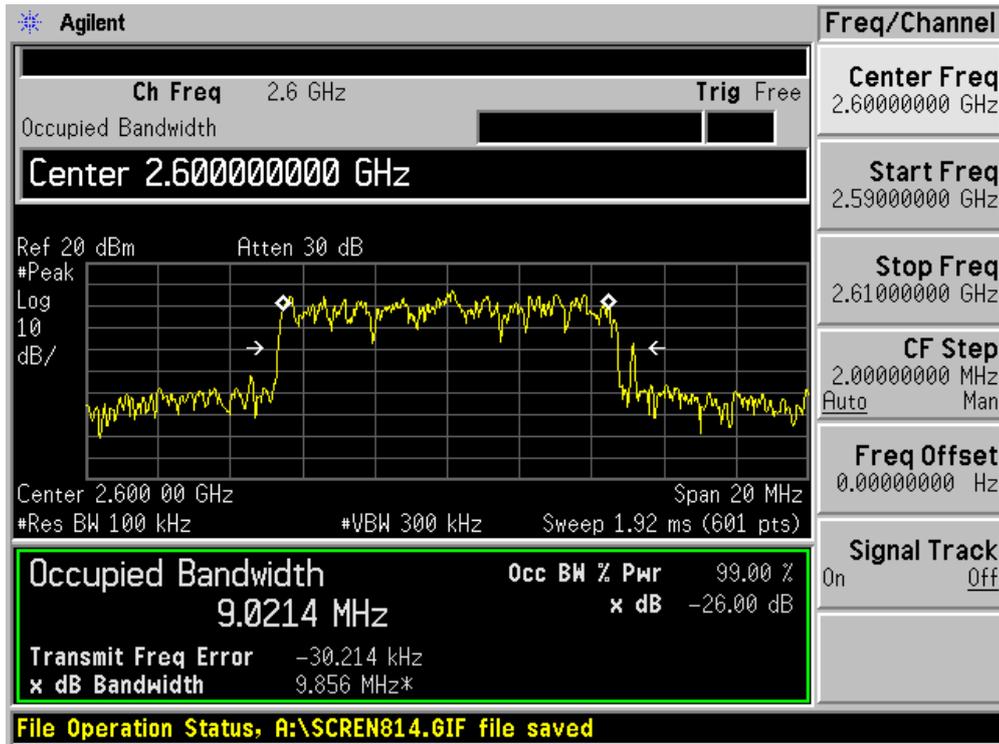
Product	:	TES25 ExpressCard Modem
Test Item	:	Occupied Bandwidth
Test Site	:	AC-4
Test Mode	:	Mode 2: Transmit (10MHz Bandwidth)

Channel	Frequency (MHz)	26dB Occupied Bandwidth (kHz)	Limit (kHz)
Low	2501	9862	N/A
Middle	2600	9856	N/A
High	2685	9825	N/A

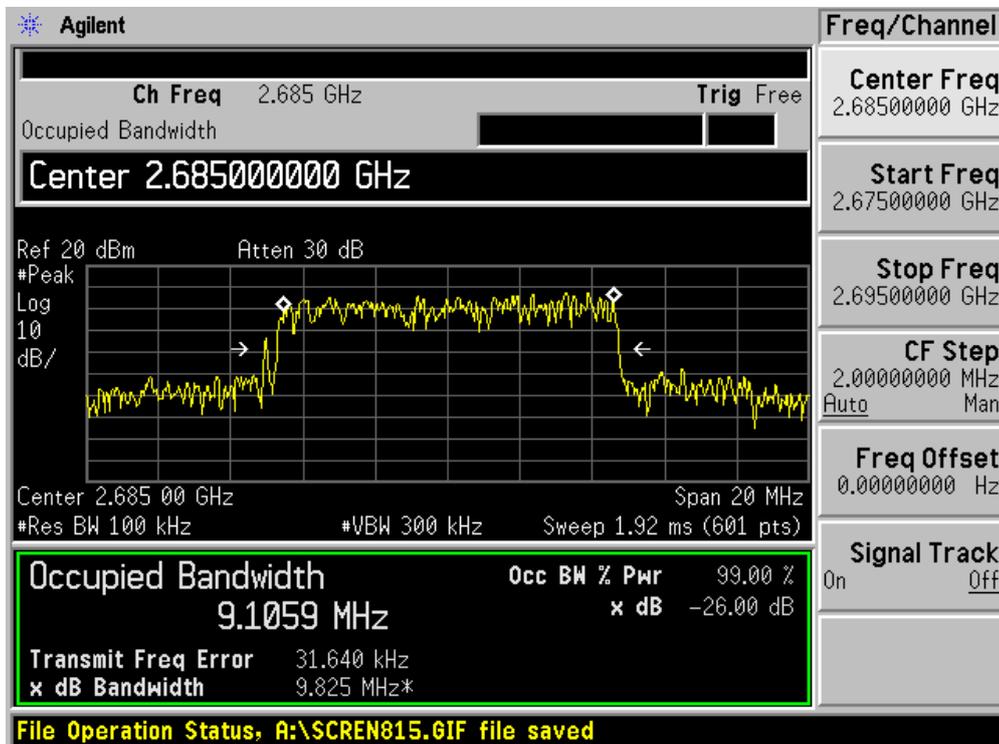
### Channel - Low (2501MHz)



Channel - Middle (2600MHz)



Channel - High (2685MHz)



5. Band Edge

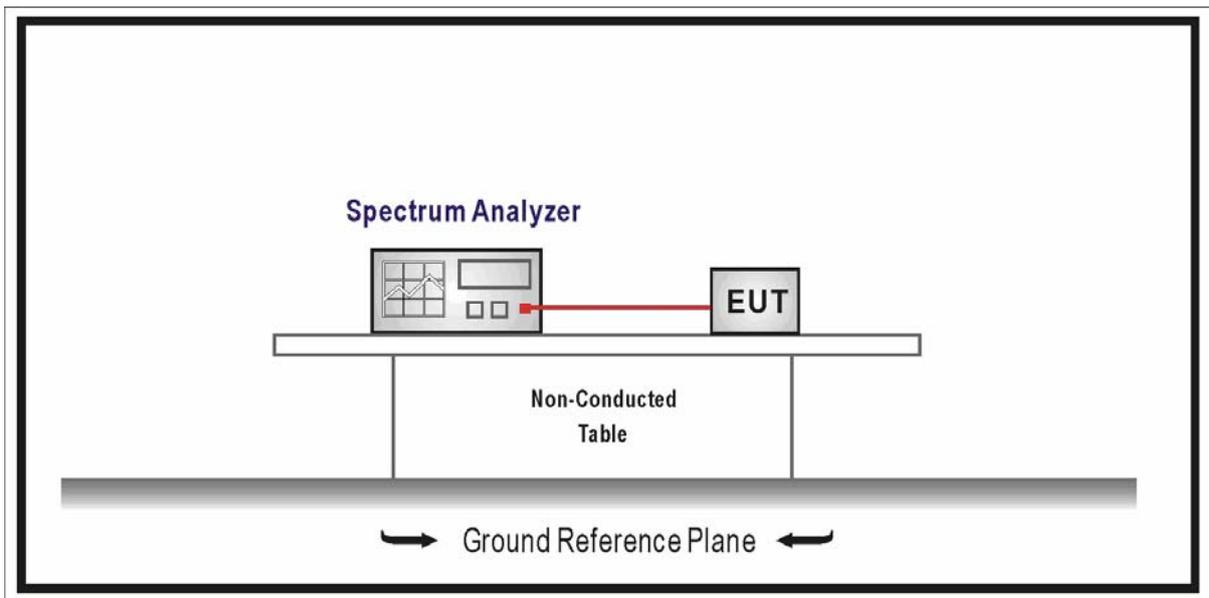
5.1. Test Equipment

Band Edge / AC-4

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2008/06/11
Coaxial Cable	Huber+Suhner	AC4-RF	09	2007/11/25
Temperature/Humidity Meter	zhicheng	ZC1-2	QT-TH007	2008/03/09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2. Test Setup



5.3. Limit

For mobile digital stations, the attenuation factor shall be not less than  $43 + 10\log(P)$  dB at the channel edge and  $55 + 10\log(P)$  dB at 5.5 MHz from the channel edges

5.4. Test Procedure

- Band edge would be conducted with the EUT operated the nearest channel to the band edge.
- To measure the emission level at the 1 MHz bands immediately outside the frequency

band, Set RBW = 1% of rated occupied bandwidth, VBW  $\geq$  RBW, Detector mode = Peak.

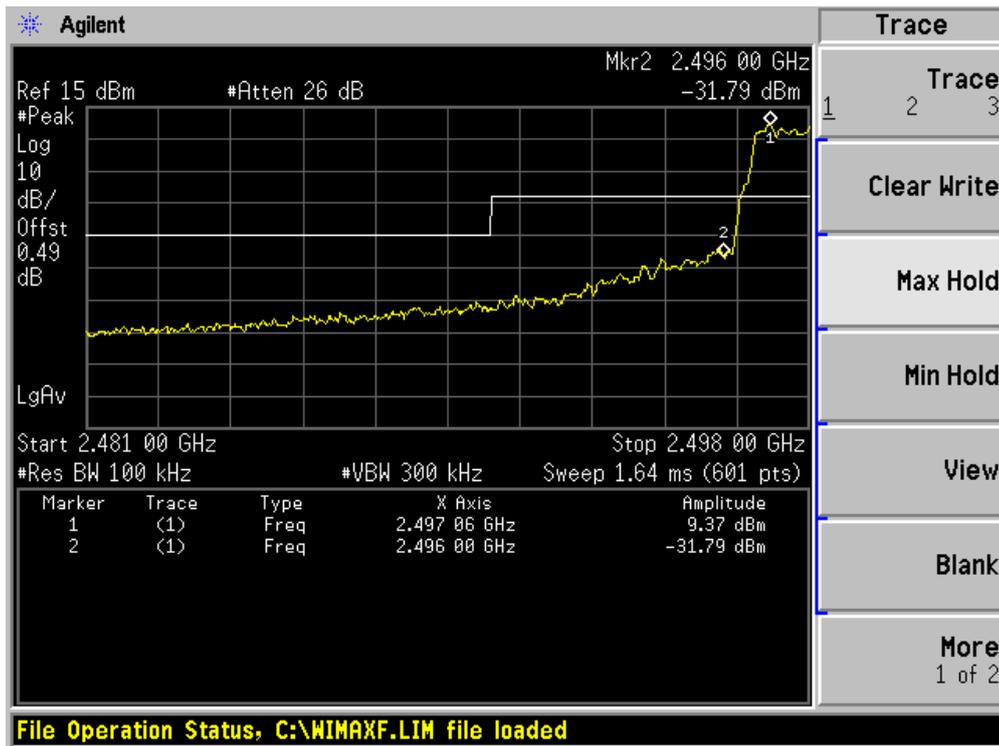
### **5.5. Uncertainty**

The measurement uncertainty is defined as  $\pm 1.27$  dB

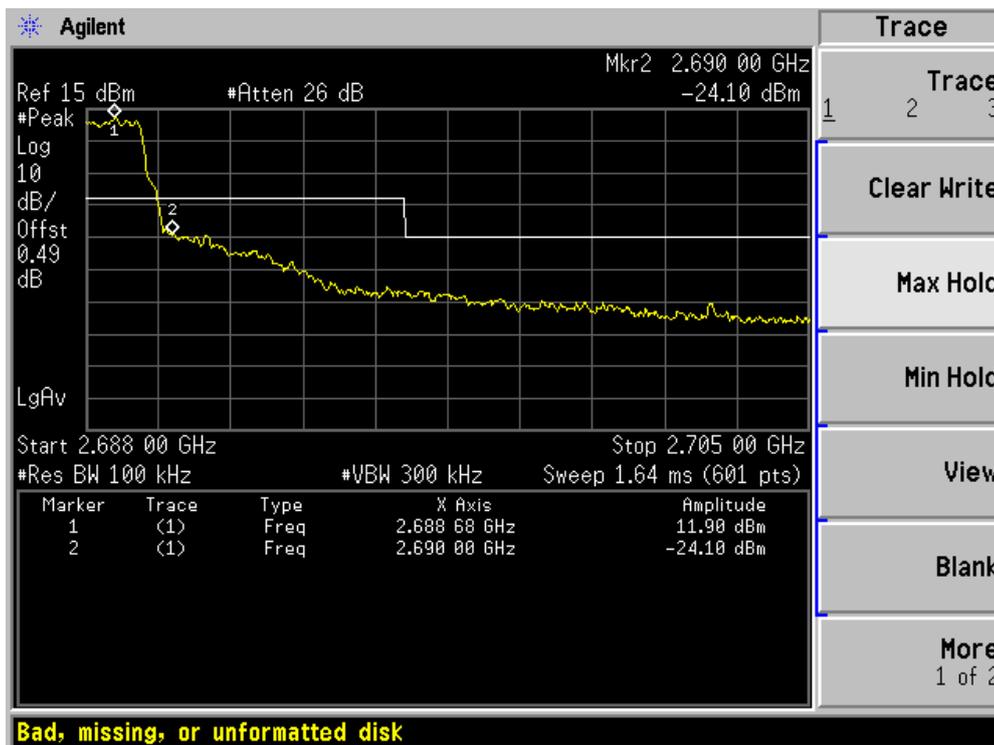
5.6. Test Result

Product	:	TES25 ExpressCard Modem
Test Item	:	Band Edge
Test Site	:	AC-4
Test Mode	:	Mode 1: Transmit (5MHz Bandwidth)

Channel - Low (2499MHz)

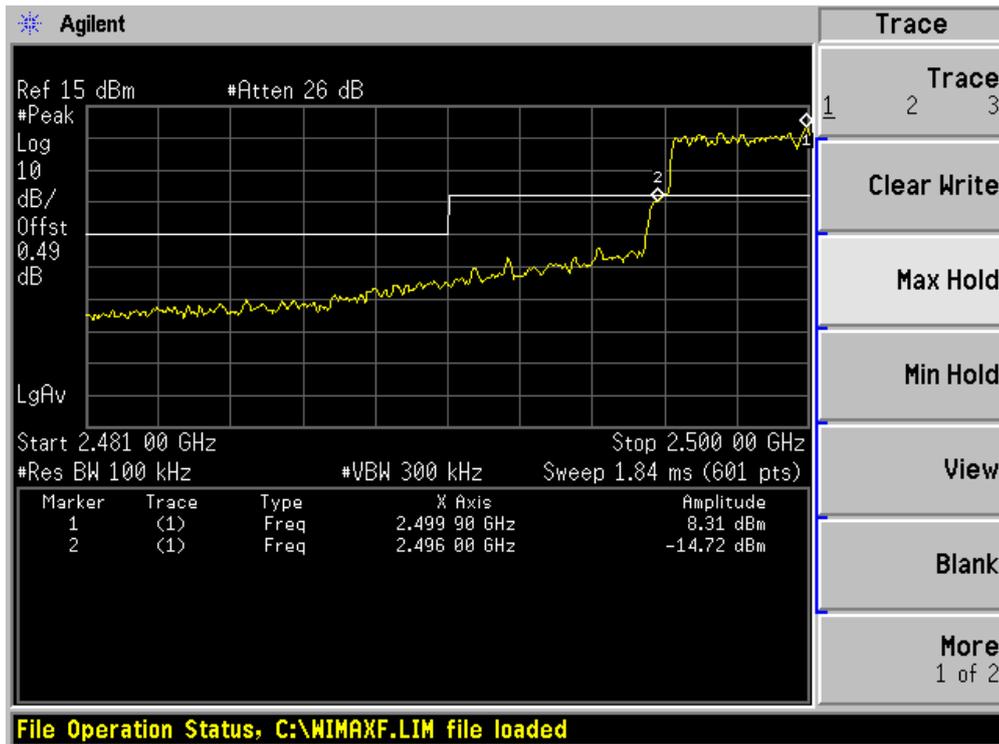


Channel - High (2687MHz)

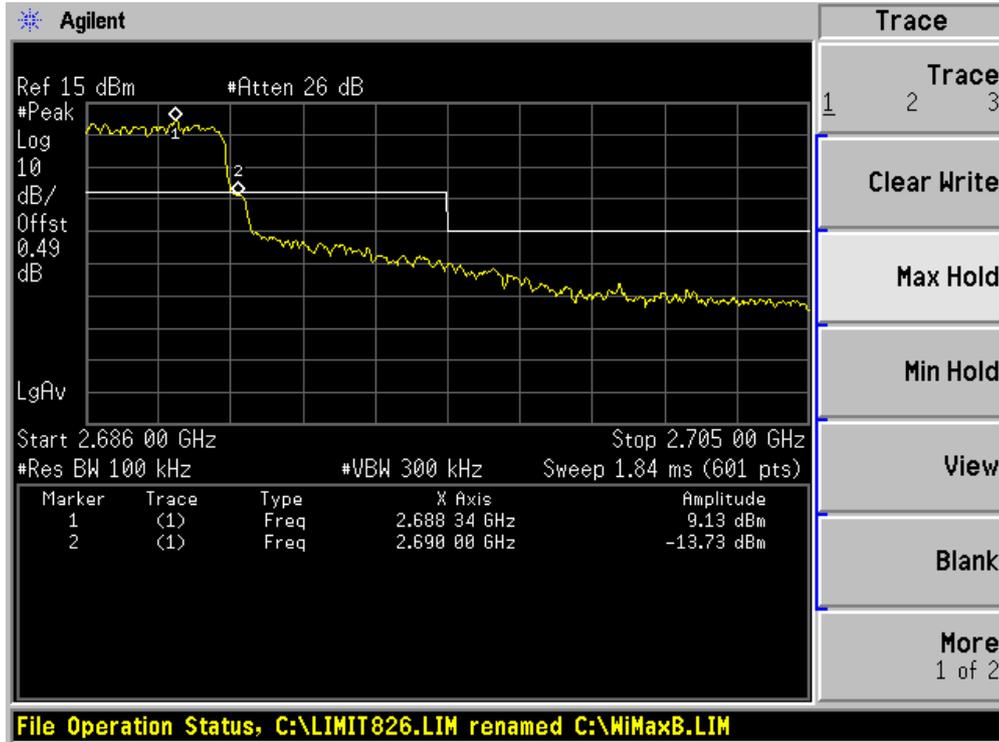


Product	: TES25 ExpressCard Modem
Test Item	: Band Edge
Test Site	: AC-4
Test Mode	: Mode 2: Transmit (10MHz Bandwidth)

### Channel - Low (2501MHz)



Channel - High (2685MHz)



## 6. Spurious Emission at Antenna Terminals

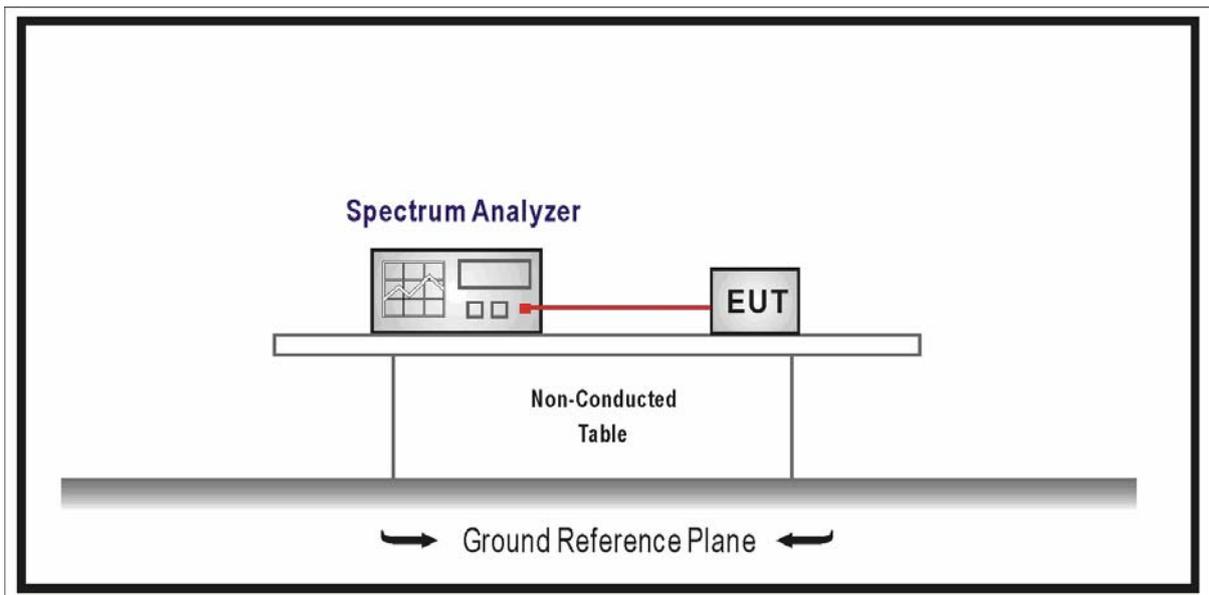
### 6.1. Test Equipment

Spurious Emission at Antenna Terminals / AC-4

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2008/06/11
Coaxial Cable	Huber+Suhner	AC4-RF	09	2007/11/25
Temperature/Humidity Meter	zhicheng	ZC1-2	QT-TH007	2008/03/09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

### 6.2. Test Setup



### 6.3. Limit

For mobile digital stations, the attenuation factor shall be not less than  $43 + 10\log(P)$  dB

### 6.4. Test Procedure

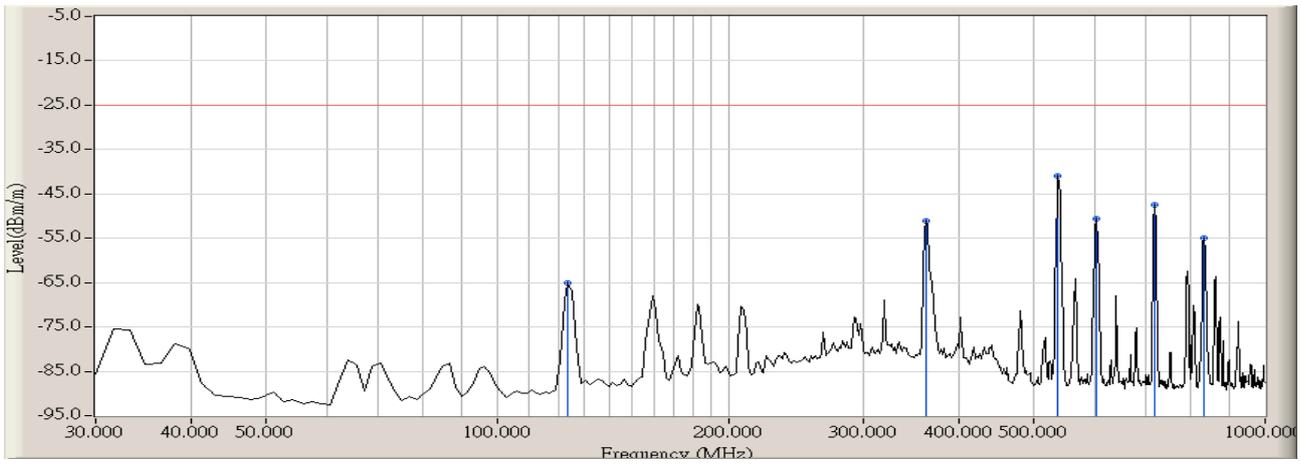
- Spurious emission at antenna terminals would be conducted with the EUT operated the 3 channels: low, middle and high operational frequency range.
- Set RBW = 100 kHz for below 1GHz and RBW = 1MHz for above 1GHz, VBW  $\geq$  RBW, Detector mode = Peak, the frequency range is scanned from 30MHz to 10<sup>th</sup> harmonics.

**6.5. Uncertainty**

The measurement uncertainty is defined as  $\pm 1.27$  dB

6.6. Test Result

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:49
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 1: Transmit (5MHz Bandwidth - Channel 2499MHz)

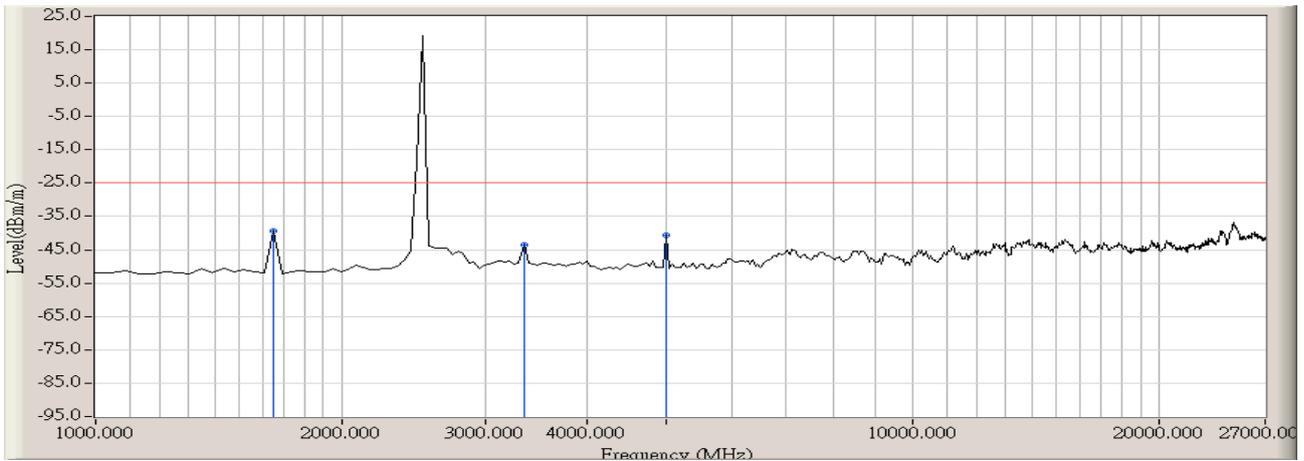


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1	123.767	0.065	-65.258	-65.193	-40.193	-25.000	PEAK
2	361.417	0.103	-51.302	-51.199	-26.199	-25.000	PEAK
3	* 537.633	0.130	-41.154	-41.024	-16.024	-25.000	PEAK
4	602.300	0.142	-50.721	-50.579	-25.579	-25.000	PEAK
5	717.083	0.165	-47.519	-47.354	-22.354	-25.000	PEAK
6	833.483	0.180	-55.144	-54.964	-29.964	-25.000	PEAK

Note:

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:49
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 1: Transmit (5MHz Bandwidth - Channel 2499MHz)

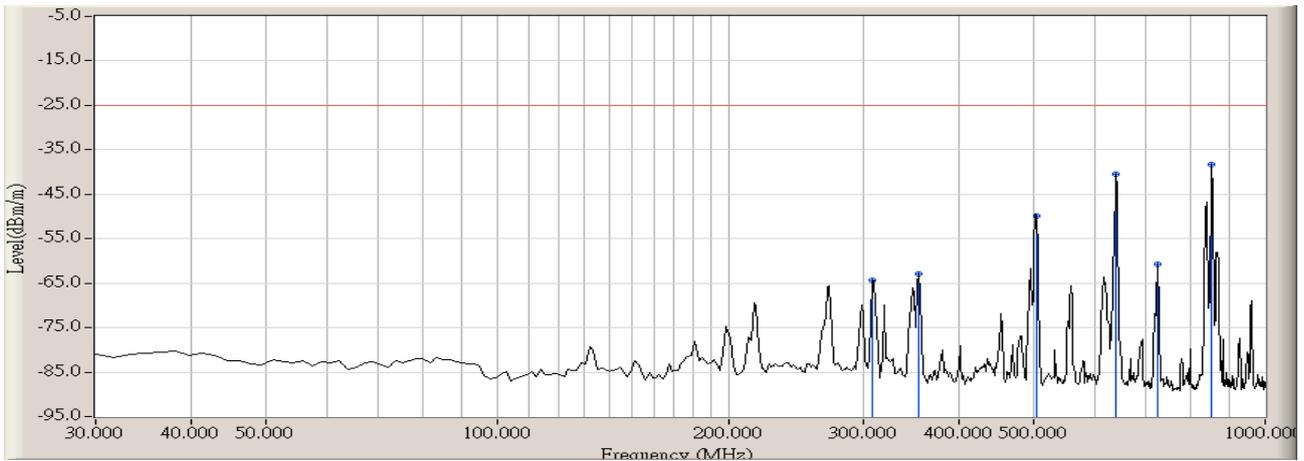


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1	*	1650.000	0.310	-39.790	-39.480	-14.480	-25.000	PEAK
2		3340.000	0.567	-44.016	-43.449	-18.449	-25.000	PEAK
3		4986.667	0.818	-41.596	-40.778	-15.778	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:49
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 1: Transmit (5MHz Bandwidth - Channel 2600MHz)

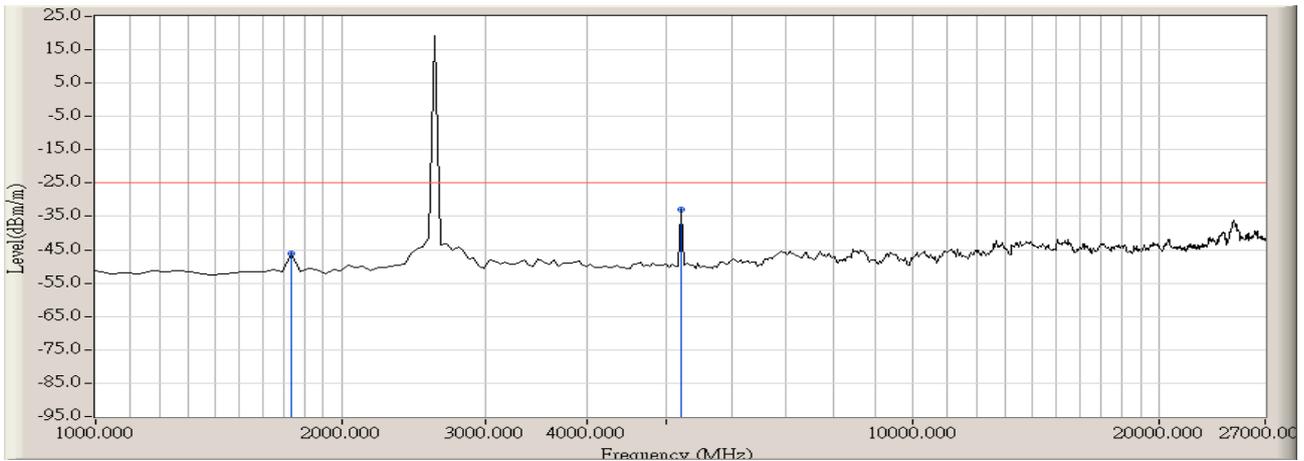


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1	308.067	0.093	-64.415	-64.322	-39.322	-25.000	PEAK
2	353.333	0.100	-63.120	-63.020	-38.020	-25.000	PEAK
3	503.683	0.130	-49.914	-49.784	-24.784	-25.000	PEAK
4	639.483	0.150	-40.527	-40.377	-15.377	-25.000	PEAK
5	725.167	0.168	-61.019	-60.851	-35.851	-25.000	PEAK
6	* 851.267	0.185	-38.466	-38.281	-13.281	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:49
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 1: Transmit (5MHz Bandwidth - Channel 2600MHz)

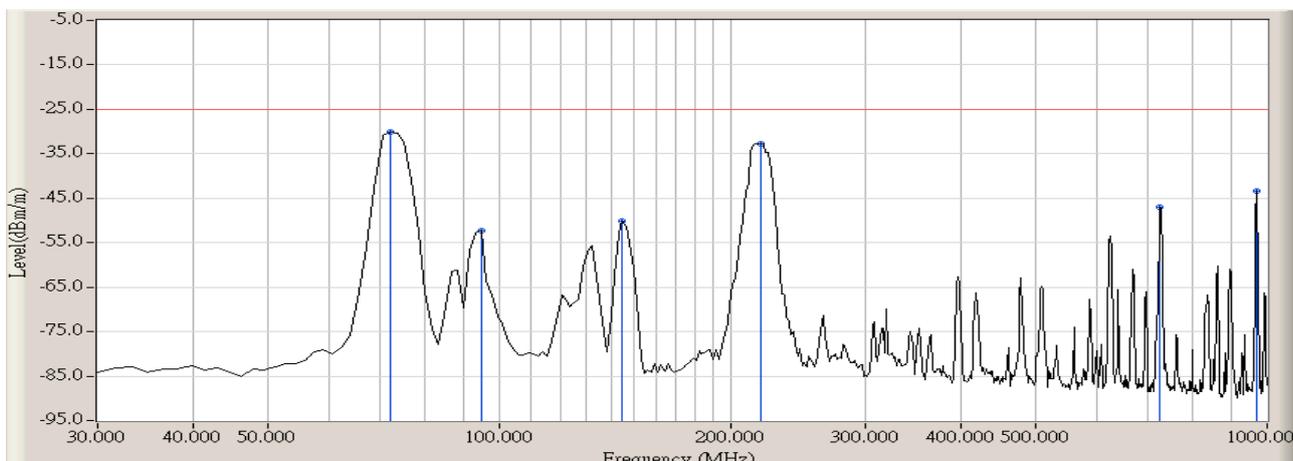


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1		1736.667	0.323	-46.501	-46.178	-21.178	-25.000	PEAK
2	*	5203.333	0.850	-33.640	-32.790	-7.790	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:50
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 1: Transmit (5MHz Bandwidth - Channel 2687MHz)

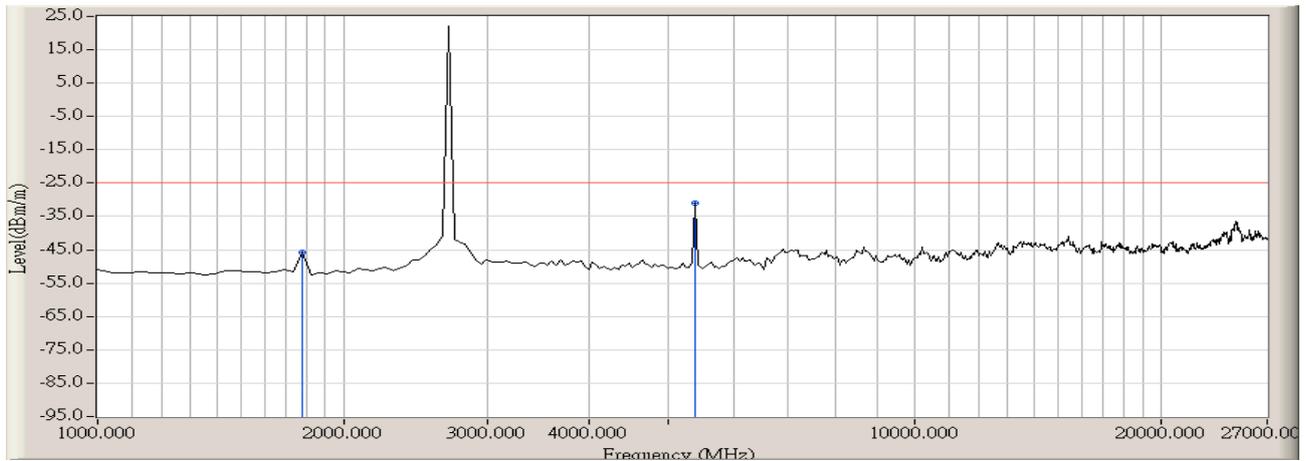


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1	*	72.033	0.056	-30.125	-30.069	-5.069	-25.000	PEAK
2		94.667	0.060	-52.252	-52.192	-27.192	-25.000	PEAK
3		144.783	0.070	-50.169	-50.099	-25.099	-25.000	PEAK
4		219.150	0.080	-32.777	-32.697	-7.697	-25.000	PEAK
5		725.167	0.168	-47.197	-47.029	-22.029	-25.000	PEAK
6		969.283	0.208	-43.609	-43.401	-18.401	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:50
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 1: Transmit (5MHz Bandwidth - Channel 2687MHz)

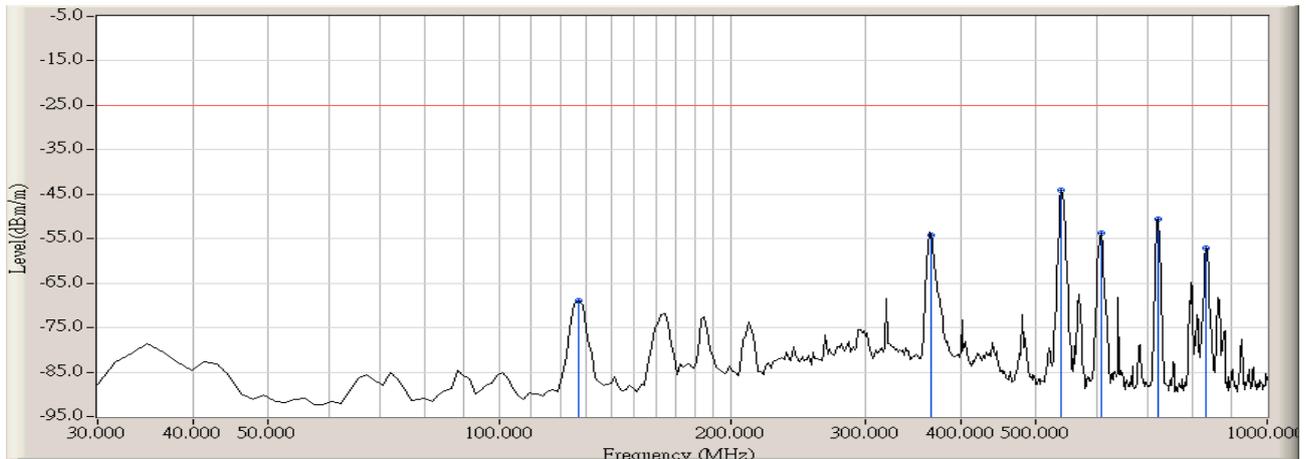


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1		1780.000	0.330	-45.992	-45.662	-20.662	-25.000	PEAK
2	*	5376.667	0.880	-31.893	-31.013	-6.013	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:50
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 2: Transmit (10MHz Bandwidth - Channel 2501MHz)

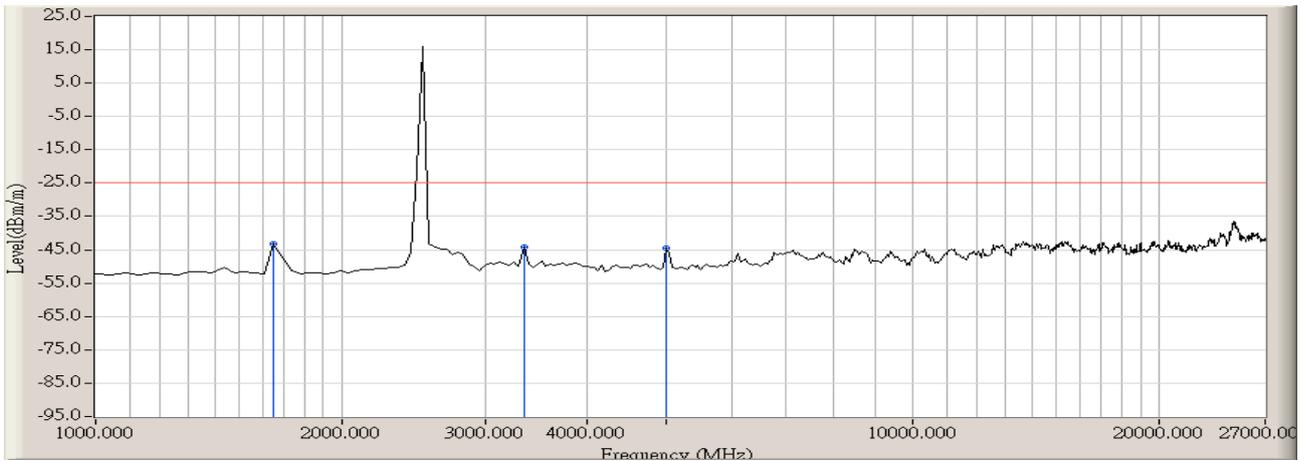


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1	127.000	0.066	-68.941	-68.875	-43.875	-25.000	PEAK
2	364.650	0.104	-54.384	-54.280	-29.280	-25.000	PEAK
3	* 539.250	0.130	-44.286	-44.156	-19.156	-25.000	PEAK
4	607.150	0.144	-53.781	-53.637	-28.637	-25.000	PEAK
5	720.317	0.166	-50.700	-50.534	-25.534	-25.000	PEAK
6	833.483	0.180	-57.262	-57.082	-32.082	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:50
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 2: Transmit (10MHz Bandwidth - Channel 2501MHz)

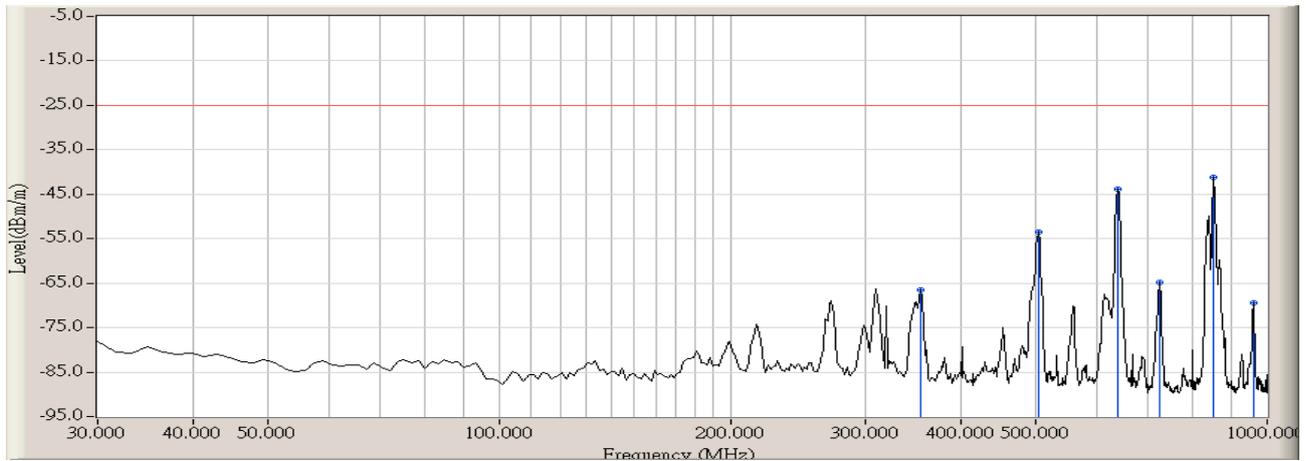


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1	*	1650.000	0.310	-43.667	-43.357	-18.357	-25.000	PEAK
2		3340.000	0.567	-44.738	-44.171	-19.171	-25.000	PEAK
3		4986.667	0.818	-45.216	-44.398	-19.398	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:50
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 2: Transmit (10MHz Bandwidth - Channel 2600MHz)

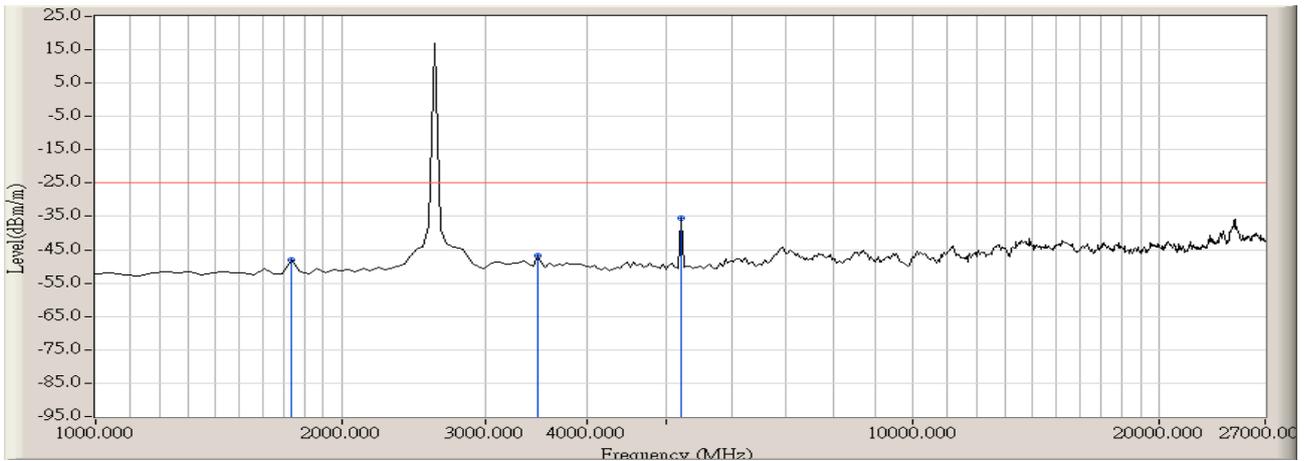


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1	353.333	0.100	-66.734	-66.634	-41.634	-25.000	PEAK
2	503.683	0.130	-53.568	-53.438	-28.438	-25.000	PEAK
3	637.867	0.150	-44.045	-43.895	-18.895	-25.000	PEAK
4	723.550	0.167	-65.051	-64.884	-39.884	-25.000	PEAK
5	* 851.267	0.185	-41.300	-41.115	-16.115	-25.000	PEAK
6	959.583	0.205	-69.543	-69.338	-44.338	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:50
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 2: Transmit (10MHz Bandwidth - Channel 2600MHz)

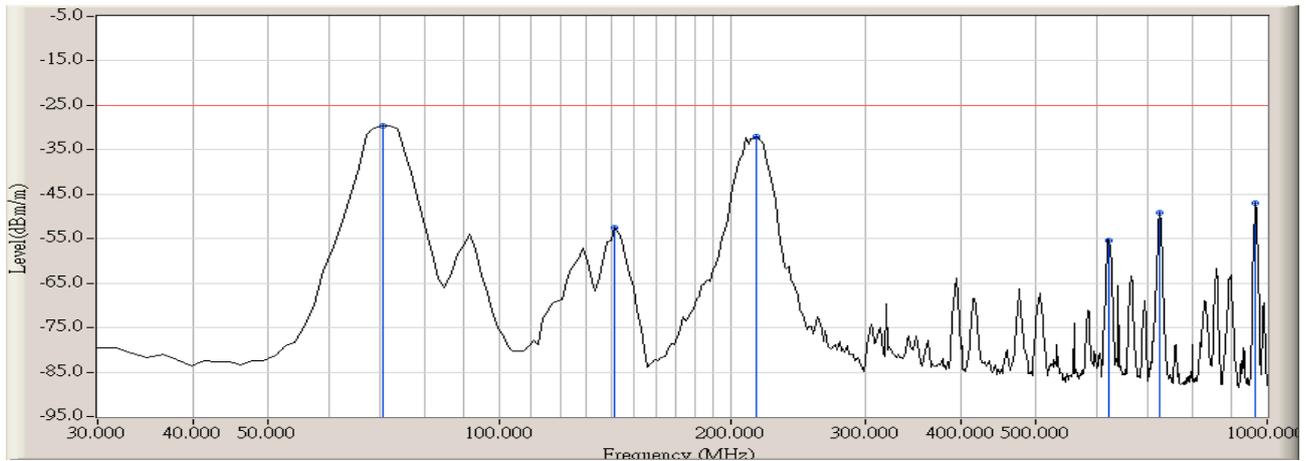


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1	1736.667	0.323	-48.478	-48.155	-23.155	-25.000	PEAK
2	3470.000	0.585	-47.463	-46.878	-21.878	-25.000	PEAK
3	* 5203.333	0.850	-36.179	-35.329	-10.329	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:50
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 2: Transmit (10MHz Bandwidth - Channel 2685MHz)

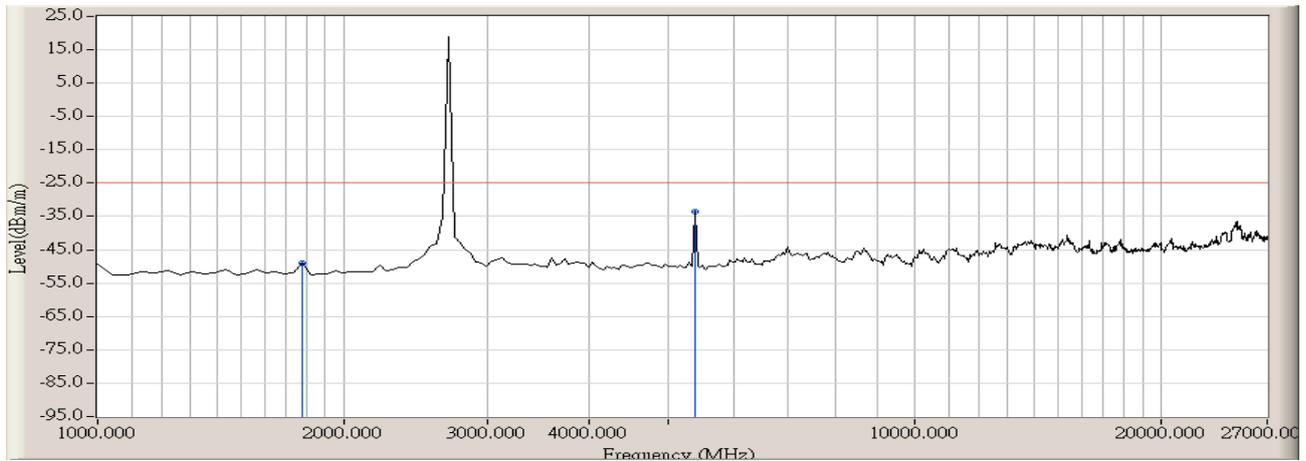


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1	*	70.417	0.055	-29.560	-29.505	-4.505	-25.000	PEAK
2		141.550	0.070	-52.705	-52.635	-27.635	-25.000	PEAK
3		215.917	0.080	-32.123	-32.043	-7.043	-25.000	PEAK
4		621.700	0.149	-55.472	-55.323	-30.323	-25.000	PEAK
5		723.550	0.167	-49.351	-49.184	-24.184	-25.000	PEAK
6		966.050	0.207	-47.076	-46.869	-21.869	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Engineer : Marlin	
Site : AC4 Chamber	Time : 2008/03/31 - 10:50
Limit : FCC_Part27_WiMax_03M_PK	Margin : 0
EUT : TES25 ExpressCard Modem	Probe : - Line1
Power : DC 3.6V	Note : Mode 2: Transmit (10MHz Bandwidth - Channel 2685MHz)



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBm)	Measure Level (dBm)	Margin (dB)	Limit (dBm)	Detector Type
1		1780.000	0.330	-49.276	-48.946	-23.946	-25.000	PEAK
2	*	5376.667	0.880	-34.374	-33.494	-8.494	-25.000	PEAK

**Note:**

1. All Readings is peak measurements.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

**7. Field Strength of Spurious Radiation**

**7.1. Test Equipment**

Field Strength of Spurious Radiation / AC-2

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4408B	MY45102679	2007/11/12
PSG Analog S.G.	Agilent	E8257D	MY44321116	2008/06/11
Preamplifier	Quietek	AP-025C	QT-AP003	2007/11/25
Preamplifier	Quietek	AP-180C	CHM-0602012	2007/11/25
Half Wave Tuned Dipole Antenna	COM-POWER	AD-100	40137	2007/11/25
Bilog Type Antenna	Schaffner	CBL6112B	2932	2007/11/22
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	496	2007/11/25
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2007/11/25
Coaxial Cable	Huber+Suhner	AC2-C	04	2007/11/25
Coaxial Cable	Huber+Suhner	AC4-T	08	2007/11/25
Temperature/Humidity Meter	zhicheng	ZC1-2	QT-TH002	2008/03/31

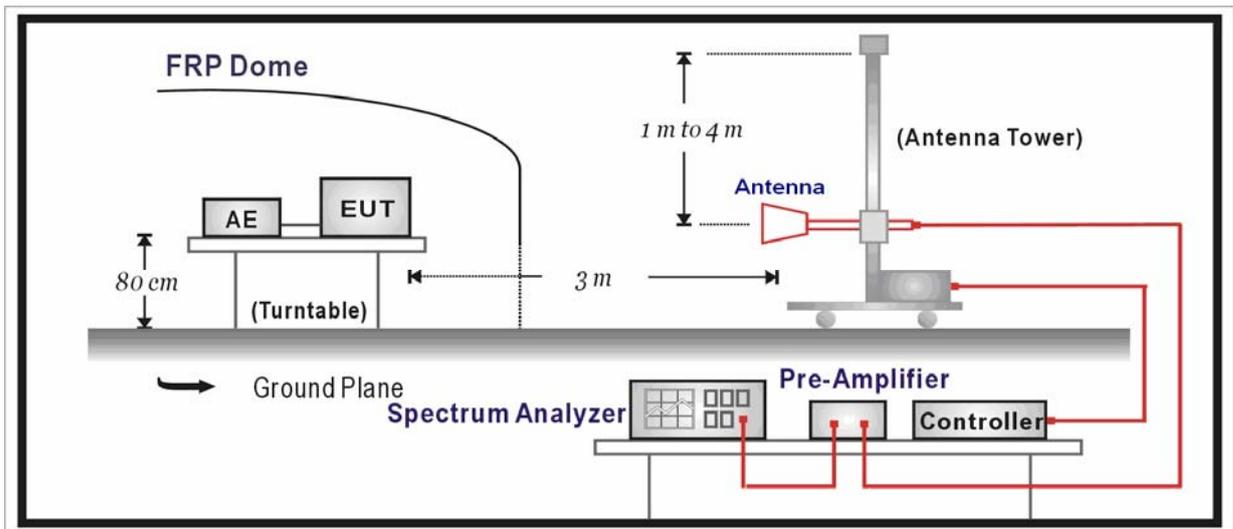
Field Strength of Spurious Radiation / AC-3

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2008/04/24
PSG Analog S.G.	Agilent	E8257D	MY44321116	2008/06/11
Preamplifier	Quietek	AP-025C	QT-AP004	2007/11/25
Preamplifier	Quietek	AP-180C	CHM-0602012	2007/11/25
Half Wave Tuned Dipole Antenna	COM-POWER	AD-100	40137	2007/11/25
Bilog Type Antenna	Schaffner	CBL6112D	22254	2007/11/22
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	496	2007/11/25
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2007/11/25
Coaxial Cable	Huber+Suhner	AC3-C	05	2007/11/25
Coaxial Cable	Huber+Suhner	AC4-T	08	2007/11/25
Temperature/Humidity Meter	zhicheng	ZC1-2	QT-TH003	2008/03/31

Note 1: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Note 2: The test instruments marked with "X" are used to measure the final test results.

**7.2. Test Setup**



## 7.3. Limit

For mobile digital stations, the attenuation factor shall be not less than  $43 + 10\log(P)$  dB

## 7.4. Test Procedure

- (a) Adjust the spectrum analyzer for the following setting:
  - RBW = 100 kHz for spurious emissions below 1GHz, and 1MHz for spurious emissions above 1GHz.
  - VBW = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.
  - Sweep speed slow enough to maintain measurement calibration.
  - Detector mode = Positive Peak.
- (b) Place the transmitter to be tested on the turntable in the standard semi-Anechoic chamber.
- (c) Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to  $\pm$  the test bandwidth.
- (d) Key the transmitter.
- (e) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated  $360^\circ$  to highest possible reading. Record this maximum reading.
- (f) Repeat step (e) for each spurious frequency with the test antenna polarized vertically.
- (g) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.
- (h) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
- (i) Repeat step (h) with both antennas vertically polarized for each spurious frequency.
- (j) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in (h) and (i) by the power loss in the cable between the generator and

the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

Where:

$P_d$  is the dipole equivalent power and

$P_g$  is the generator output power into the substitution antenna.

## 7.5. Uncertainty

The measurement uncertainty above 1GHz is defined as  $\pm 3.9$  dB

below 1GHz is defined as  $\pm 3.8$  dB

**7.6. Test Result**

Product	:	TES25 ExpressCard Modem
Test Item	:	Field Strength of Spurious Radiation
Test Site	:	AC-4
Test Mode	:	Mode 1: Transmit (5MHz Bandwidth)

Below 1GHz								
Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel (2499MHz)								
500.45	-68.76	V	-61.81	1.94	2.01	-61.74	-25	-36.74
666.97	-71.39	V	-59.98	2.26	1.68	-60.56	-25	-35.56
797.92	-64.53	V	-51.27	2.47	1.87	-51.87	-25	-26.87
366.26	-71.83	H	-65.63	1.69	2.26	-65.06	-25	-40.06
797.92	-67.29	H	-55.08	2.47	1.87	-55.68	-25	-30.68
831.86	-71.74	H	-58.70	2.51	2.21	-59.00	-25	-34.00
Middle Channel (2600MHz)								
666.97	-71.08	V	-59.68	2.26	1.68	-60.26	-25	-35.26
797.92	-64.85	V	-51.59	2.47	1.87	-52.19	-25	-27.19
867.43	-75.15	V	-61.38	2.60	2.56	-61.42	-25	-36.42
720.32	-73.81	H	-60.72	2.39	1.51	-61.60	-25	-36.60
799.53	-68.27	H	-56.09	2.45	1.88	-56.66	-25	-31.66
867.43	-70.24	H	-56.20	2.60	2.56	-56.24	-25	-31.24
High Channel (2687MHz)								
498.83	-66.96	V	-59.97	1.95	2.00	-59.92	-25	-34.92
666.97	-71.66	V	-60.25	2.26	1.67	-60.84	-25	-35.84
797.92	-65.10	V	-51.84	2.47	1.87	-52.44	-25	-27.44
720.32	-72.35	H	-59.26	2.39	1.51	-60.14	-25	-35.14
799.53	-68.40	H	-56.21	2.45	1.88	-56.78	-25	-31.78
894.92	-70.78	H	-56.03	2.62	2.85	-55.80	-25	-30.80

Above 1GHz								
Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel (2499MHz)								
2785	-55.99	V	-51.49	4.25	11.22	-44.52	-25	-19.52
3323	-55.63	V	-51.32	4.80	12.82	-43.30	-25	-18.30
4998	-64.91	V	-55.01	5.95	12.65	-48.31	-25	-23.31
2756	-61.26	H	-56.67	4.24	11.13	-49.78	-25	-24.78
3323	-53.70	H	-49.49	4.80	12.82	-41.47	-25	-16.47
4998	-62.02	H	-52.07	5.95	12.65	-45.37	-25	-20.37
Middle Channel (2600MHz)								
2786	-55.35	V	-50.85	4.25	11.22	-43.88	-25	-18.88
3466	-61.83	V	-57.44	4.73	12.73	-49.44	-25	-24.44
5200	-61.54	V	-50.98	5.85	12.86	-43.97	-25	-18.97
2769	-60.45	H	-55.84	4.24	11.17	-48.91	-25	-23.91
3466	-58.04	H	-53.64	4.73	12.73	-45.64	-25	-20.64
5200	-59.21	H	-48.33	5.85	12.86	-41.32	-25	-16.32
High Channel (2687MHz)								
2786	-52.97	V	-48.47	4.25	11.22	-41.50	-25	-16.50
3007	-61.59	V	-56.97	4.65	11.53	-50.09	-25	-25.09
5374	-58.32	V	-47.53	6.09	13.10	-40.52	-25	-15.52
2803	-57.69	H	-52.95	4.26	11.26	-45.95	-25	-20.95
3585	-63.28	H	-57.94	4.91	12.57	-50.28	-25	-25.28
5374	-59.82	H	-49.14	6.09	13.10	-42.13	-25	-17.13

Product	:	TES25 ExpressCard Modem
Test Item	:	Field Strength of Spurious Radiation
Test Site	:	AC-4
Test Mode	:	Mode 2: Transmit (10MHz Bandwidth)

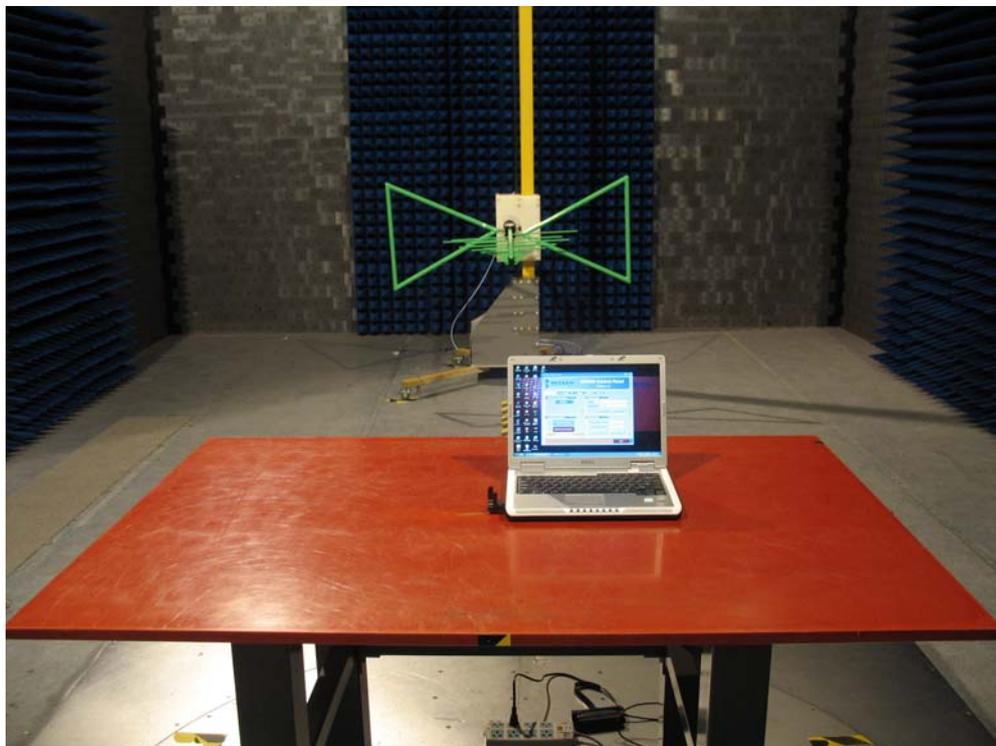
Below 1GHz								
Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel (2501MHz)								
498.83	-68.14	V	-61.15	1.95	2.00	-61.10	-25	-36.10
666.97	-71.10	V	-59.69	2.26	1.67	-60.28	-25	-35.28
797.92	-65.33	V	-52.07	2.47	1.87	-52.67	-25	-27.67
720.32	-74.37	H	-61.28	2.39	1.51	-62.16	-25	-37.16
797.92	-68.37	H	-56.16	2.47	1.87	-56.76	-25	-31.76
833.48	-71.84	H	-58.73	2.51	2.20	-59.04	-25	-34.04
Middle Channel (2600MHz)								
498.83	-67.21	V	-60.22	1.95	2.00	-60.17	-25	-35.17
666.97	-71.05	V	-59.64	2.26	1.67	-60.23	-25	-35.23
797.92	-65.13	V	-51.87	2.47	1.87	-52.47	-25	-27.47
720.32	-73.49	H	-60.40	2.39	1.51	-61.28	-25	-36.28
797.92	-68.98	H	-56.77	2.47	1.87	-57.37	-25	-32.37
867.43	-70.91	H	-56.87	2.60	2.56	-56.91	-25	-31.91
High Channel (2685MHz)								
498.83	-66.40	V	-59.41	1.95	2.00	-59.36	-25	-34.36
765.58	-70.68	V	-57.63	2.45	1.72	-58.36	-25	-33.36
797.92	-65.37	V	-52.12	2.47	1.87	-52.72	-25	-27.72
366.27	-71.30	H	-65.09	1.69	2.26	-64.52	-25	-39.52
797.92	-68.51	H	-56.30	2.47	1.87	-56.90	-25	-31.90
896.53	-71.37	H	-56.57	2.63	2.87	-56.33	-25	-31.33

Above 1GHz								
Frequency (MHz)	SA Reading (dBm)	Ant.Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel (2501MHz)								
2777	-55.22	V	-50.57	4.25	11.20	-43.62	-25	-18.62
3338	-54.13	V	-50.04	4.79	12.85	-41.98	-25	-16.98
5002	-65.59	V	-55.60	5.96	12.65	-48.91	-25	-23.91
2803	-60.84	H	-56.31	4.26	11.26	-49.31	-25	-24.31
3338	-51.92	H	-47.74	4.79	12.85	-39.68	-25	-14.68
5002	-63.97	H	-53.98	5.96	12.65	-47.29	-25	-22.29
Middle Channel (2600MHz)								
2769	-54.39	V	-49.78	4.24	11.17	-42.85	-25	-17.85
3466	-60.23	V	-55.82	4.73	12.73	-47.82	-25	-22.82
5200	-65.79	V	-54.91	5.85	12.86	-47.90	-25	-22.90
2828	-59.40	H	-54.61	4.34	11.32	-47.63	-25	-22.63
3466	-56.91	H	-52.51	4.73	12.73	-44.51	-25	-19.51
5200	-63.67	H	-53.11	5.85	12.86	-46.10	-25	-21.10
High Channel (2685MHz)								
2777	-52.51	V	-47.86	4.25	11.20	-40.91	-25	-15.91
4988	-65.68	V	-55.66	5.98	12.65	-48.99	-25	-23.99
5370	-62.59	V	-51.90	6.09	13.09	-44.90	-25	-19.90
2820	-58.00	H	-53.29	4.31	11.30	-46.30	-25	-21.30
3576	-64.00	H	-58.63	4.91	12.57	-50.97	-25	-25.97
5370	-62.84	H	-52.22	6.09	13.09	-45.22	-25	-20.22

**7.7. Test Photograph**

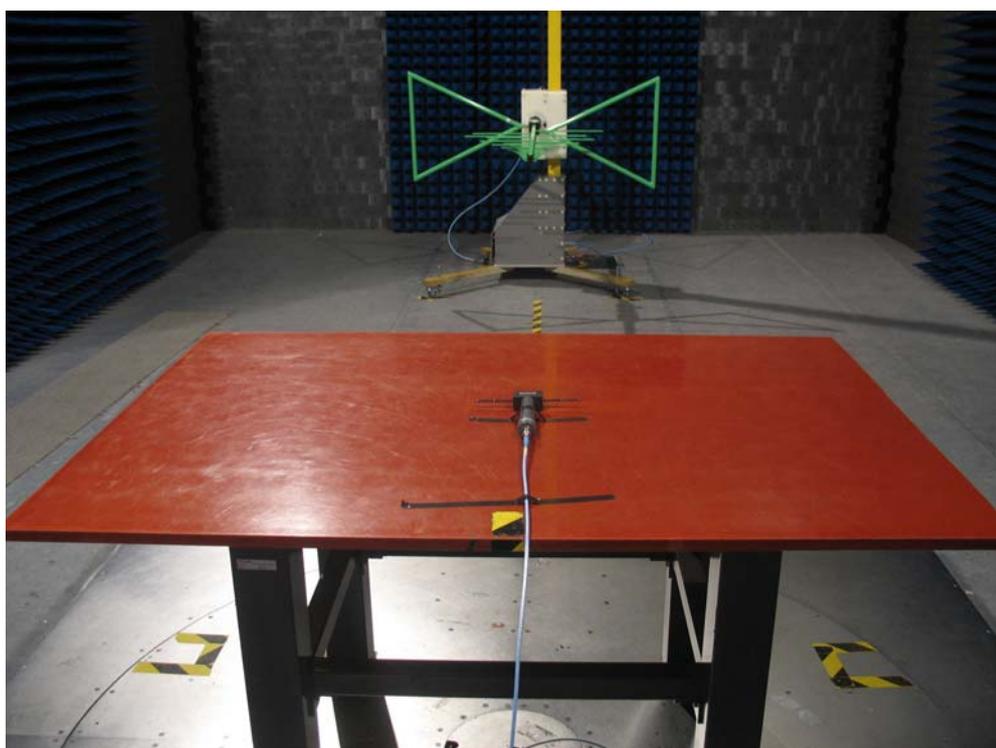
Test Mode: Mode 1: Transmit (5MHz Bandwidth)

Description: Field Strength of Spurious Radiation Test Setup for EUT (Below 1GHz)



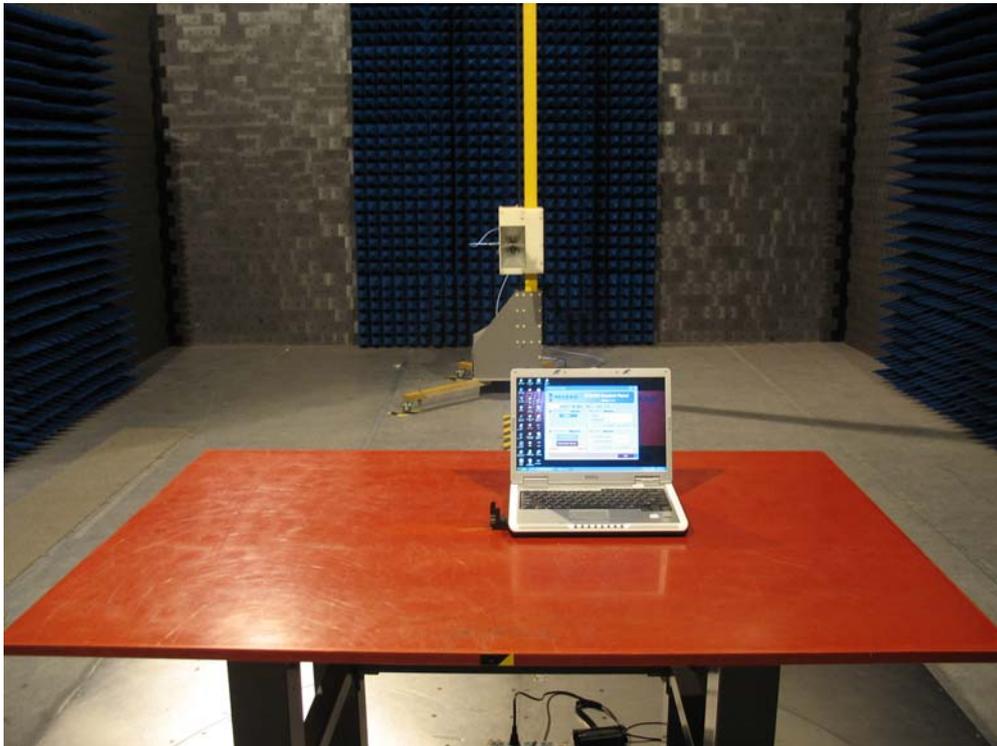
Test Mode: Mode 1: Transmit (5MHz Bandwidth)

Description: Field Strength of Spurious Radiation Test Setup for Substitution Antenna (Below 1GHz)



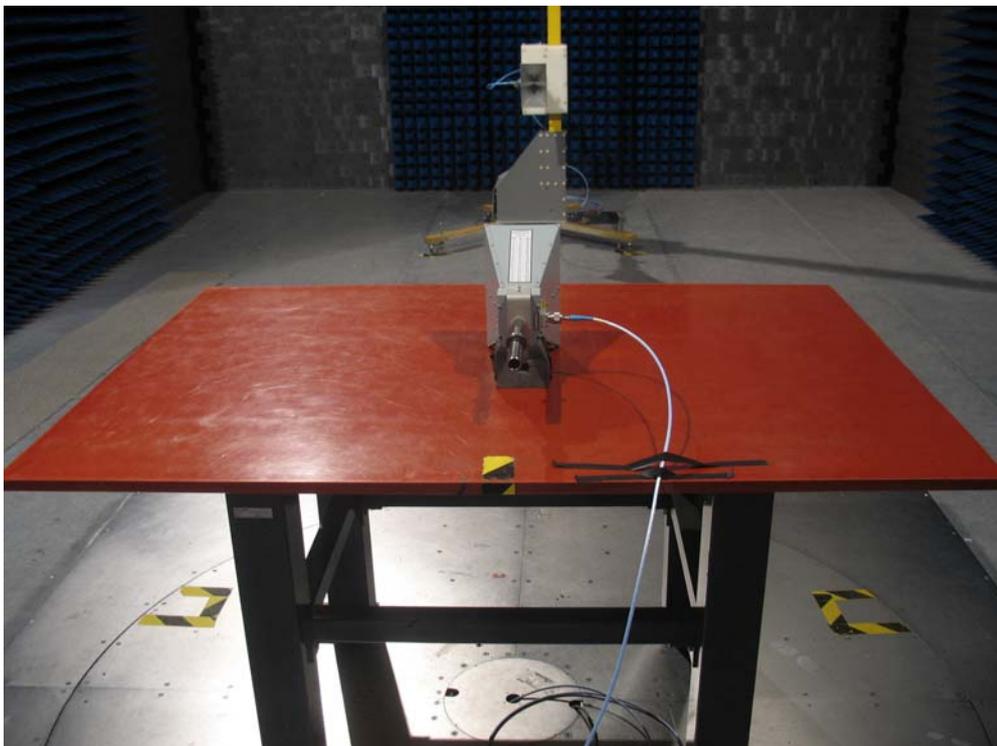
Test Mode: Mode 1: Transmit (5MHz Bandwidth)

Description: Field Strength of Spurious Radiation Test Setup for EUT (Above 1GHz)



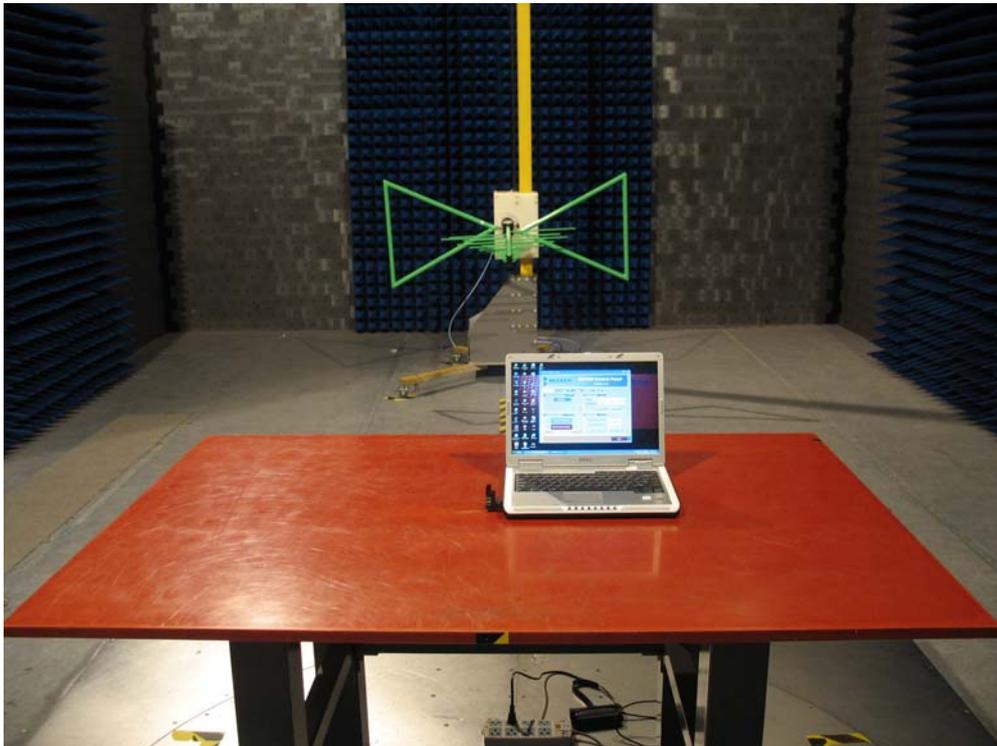
Test Mode: Mode 1: Transmit (5MHz Bandwidth)

Description: Field Strength of Spurious Radiation Test Setup for Substitution Antenna (Above 1GHz)



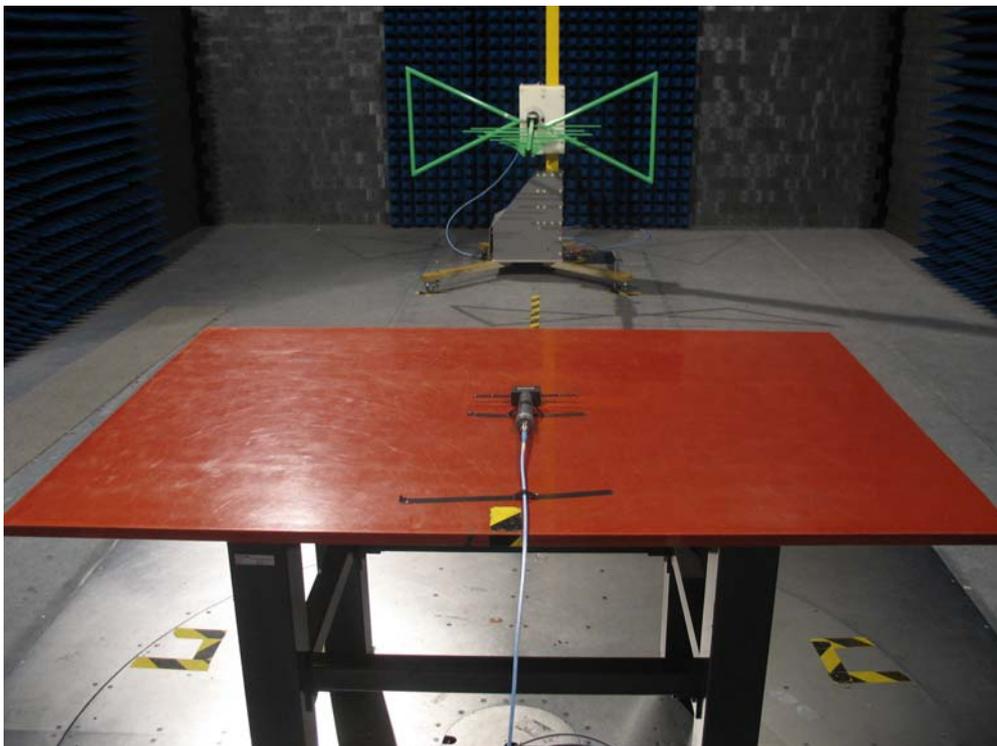
Test Mode: Mode 2: Transmit (10MHz Bandwidth)

Description: Field Strength of Spurious Radiation Test Setup for EUT (Below 1GHz)



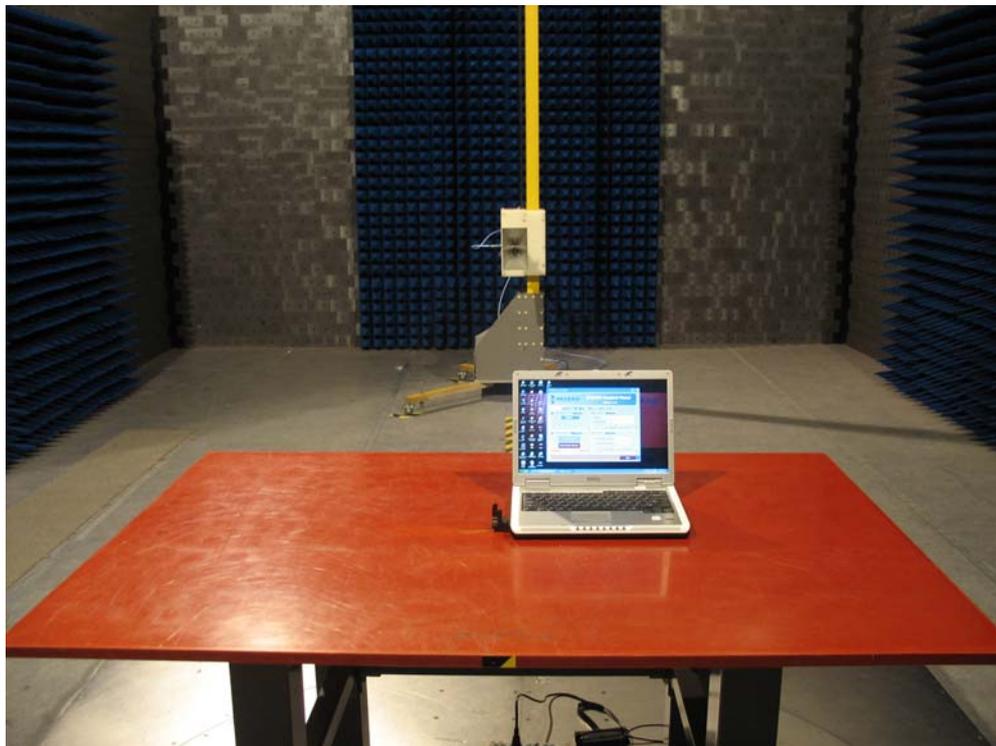
Test Mode: Mode 2: Transmit (10MHz Bandwidth)

Description: Field Strength of Spurious Radiation Test Setup for Substitution Antenna (Below 1GHz)



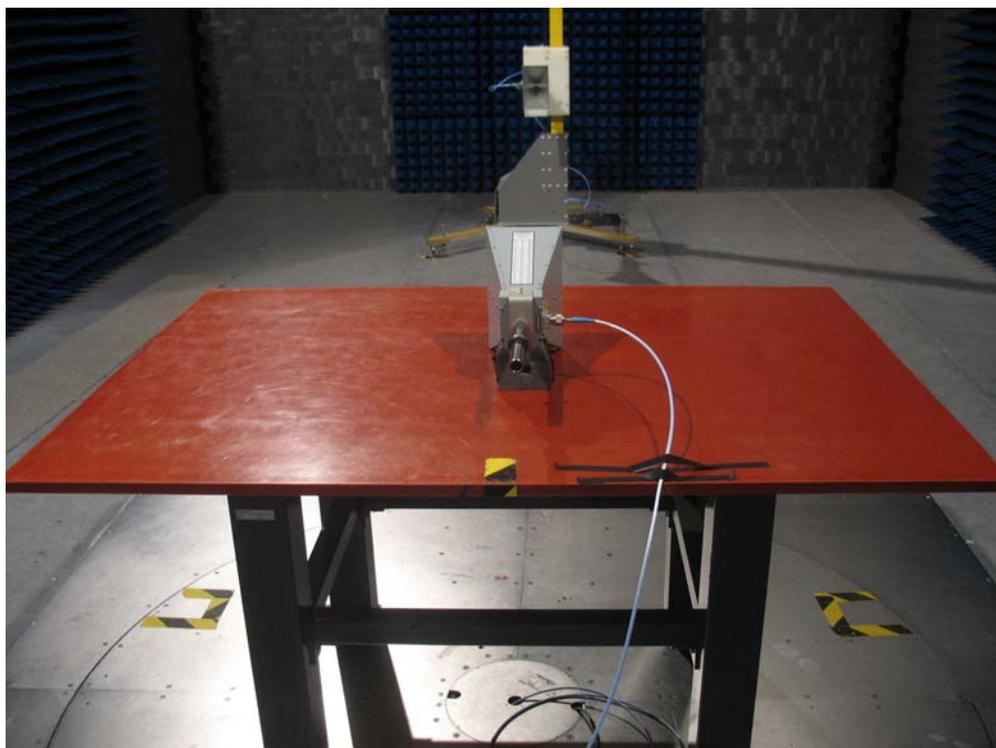
Test Mode: Mode 2: Transmit (10MHz Bandwidth)

Description: Field Strength of Spurious Radiation Test Setup for EUT (Above 1GHz)



Test Mode: Mode 2: Transmit (10MHz Bandwidth)

Description: Field Strength of Spurious Radiation Test Setup for Substitution Antenna (Above 1GHz)



**8. Frequency stability**

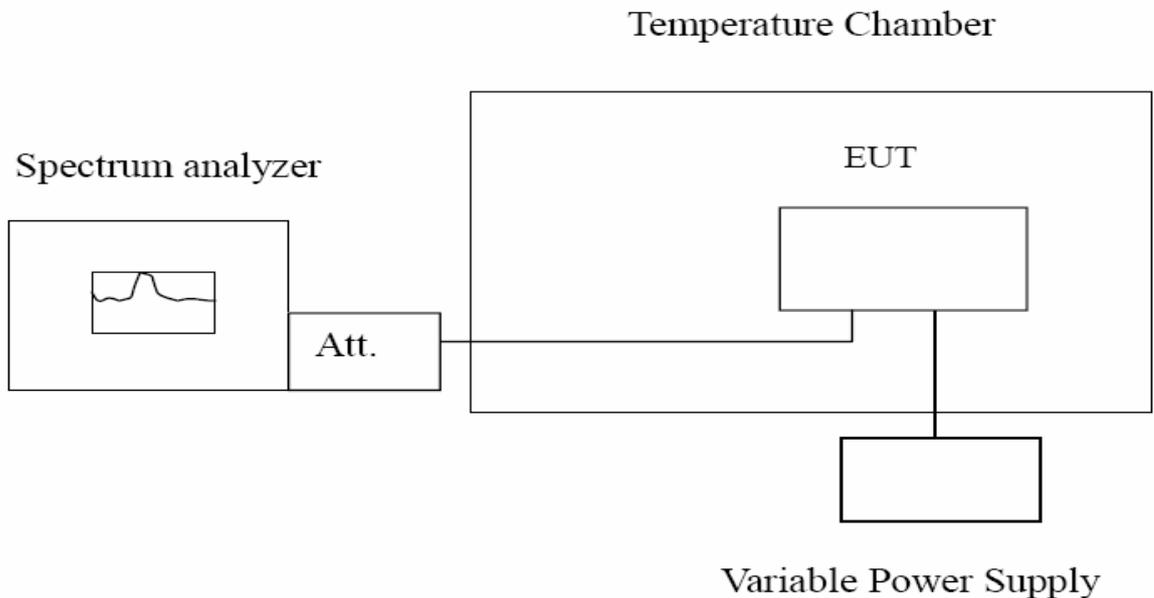
**8.1. Test Equipment**

Frequency stability / AC-4

Instrument	Manufacturer	Type No.	Serial No.	Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2008/06/11
AC Power Supply	IDRC	CF-500TP	979422	2007/10/30
DC Power Supply	IDRC	CD-035-020PR	977272	2007/10/30
Programmable Temperature & Humidity Chamber	Gaoyu	TH-1P-B	WIT-05121302	2008/01/19
Coaxial Cable	Huber+Suhner	AC4-RF	09	2007/11/25
Temperature/Humidity Meter	zhicheng	ZC1-2	QT-TH007	2008/03/09

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

**8.2. Test Setup**



**8.3. Limit**

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation

## 8.4. Test Procedure

### **Frequency Stability Under Temperature Variations:**

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

### **Frequency Stability Under Voltage Variations:**

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the maximum frequency change.

## 8.5. Uncertainty

The measurement uncertainty is defined as  $\pm 10$  Hz

**8.6. Test Result**

Product	:	TES25 ExpressCard Modem
Test Item	:	Frequency stability
Test Site	:	AC-4
Test Mode	:	Mode 1: Transmit (5MHz Bandwidth)

Frequency Stability Under Temperature - Channel Low (2600MHz)				
Temperature (°C)	Frequency (Hz)	Limit (MHz)	Tolerance (ppm)	Result
-30	2,599,987,000	2496 ~ 2690	-5.0	Pass
-20	2,599,994,000	2496 ~ 2690	-2.3	Pass
-10	2,599,998,200	2496 ~ 2690	-0.7	Pass
0	2,600,000,000	2496 ~ 2690	0.0	Pass
10	2,600,000,400	2496 ~ 2690	0.2	Pass
20	2,600,001,230	2496 ~ 2690	0.5	Pass
30	2,600,002,420	2496 ~ 2690	0.9	Pass
40	2,600,008,560	2496 ~ 2690	3.3	Pass
50	2,600,012,000	2496 ~ 2690	4.6	Pass

Frequency Stability Under Voltage - Channel Low (2600MHz)				
AC Voltage (V)	Frequency (Hz)	Limit (MHz)	Tolerance (ppm)	Result
138	2,600,009,030	2496 ~ 2690	3.5	Pass
120	2,600,000,000	2496 ~ 2690	0.0	Pass
102	2,600,013,300	2496 ~ 2690	5.1	Pass

Product	:	TES25 ExpressCard Modem
Test Item	:	Frequency stability
Test Site	:	AC-4
Test Mode	:	Mode 2: Transmit (10MHz Bandwidth)

Frequency Stability Under Temperature - Channel Low (2600MHz)				
Temperature (°C)	Frequency (Hz)	Limit (MHz)	Tolerance (ppm)	Result
-30	2,599,986,200	2496 ~ 2690	-5.3	Pass
-20	2,599,995,420	2496 ~ 2690	-1.8	Pass
-10	2,599,998,600	2496 ~ 2690	-0.5	Pass
0	2,600,000,000	2496 ~ 2690	0.0	Pass
10	2,600,000,600	2496 ~ 2690	0.2	Pass
20	2,600,001,200	2496 ~ 2690	0.5	Pass
30	2,600,002,460	2496 ~ 2690	0.9	Pass
40	2,600,008,580	2496 ~ 2690	3.3	Pass
50	2,600,012,400	2496 ~ 2690	4.8	Pass

Frequency Stability Under Voltage - Channel Low (2600MHz)				
AC Voltage (V)	Frequency (Hz)	Limit (MHz)	Tolerance (ppm)	Result
138	2,600,009,022	2496 ~ 2690	3.5	Pass
120	2,600,000,000	2496 ~ 2690	0.0	Pass
102	2,600,012,400	2496 ~ 2690	4.8	Pass