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<i>Test Report No.:</i>		<i>Page 1 of 76</i>	
<b>Auftraggeber:</b> <i>Client:</i>	<b>Japan Radio Co., Ltd.</b> 1-1, Shimorenjaku 5-chome, Mitaka-shi, Tokyo 181-8510, Japan		
<b>Gegenstand der Prüfung:</b> <i>Test Item:</i>	<b>Wireless Access System</b>		
<b>Bezeichnung:</b> <i>Identification:</i>	<b>NTG-525EUL</b>	<b>Serien-Nr.:</b> <i>Serial No.:</i>	<b>PD03821</b>
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>	<b>PT0214016235-1</b>	<b>Eingangsdatum:</b> <i>Date of Receipt:</i>	<b>2011-10-07</b>
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of Test Item at Delivery:</i>	<b>Good</b>		
<b>Prüfört:</b> <i>Testing Location:</i>	<b>TÜV Rheinland Japan Ltd. – Global Technology Assessment Center</b> 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan		
<b>Prüfgrundlage:</b> <i>Test Specification:</i>	<b>FCC 47 CFR Part 101, Subparts C and G (October 1, 2011)</b> FCC 47 CFR Part 2 (October 1, 2010) KDB Publication No. 971168: D01 Power Meas License Digital Systems v01 (November 30, 2010)		
<b>Prüfergebnis:</b> <i>Test Result:</i>	<b>Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).</b> <i>The test item passed the test specification(s).</i>		
<b>Prüflaboratorium:</b> <i>Testing Laboratory:</i>	<b>TÜV Rheinland Japan Ltd. – Global Technology Assessment Center</b> 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan		
<b>geprüft/ tested by:</b>	<b>kontrolliert/ reviewed by:</b>		
2012-04-23	T. Sauter / Inspector	2012-04-23	T. Cheung / Reviewer
<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>
			<b>Name/Stellung</b> <i>Name/Position</i>
			<b>Unterschrift</b> <i>Signature</i>
<b>Sonstiges / Other Aspects:</b>			
<b>Abkürzungen:</b>	<b>P(ass) = entspricht Prüfgrundlage</b>	<b>Abbreviations:</b>	<b>P(ass) = passed</b>
	<b>F(ail) = entspricht nicht Prüfgrundlage</b>		<b>F(ail) = failed</b>
	<b>N/A = nicht anwendbar</b>		<b>N/A = not applicable</b>
	<b>N/T = nicht getestet</b>		<b>N/T = not tested</b>
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.  <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i></p>			

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## TEST SUMMARY

### **5.1.1 MICROWAVE MODULATION**

*RESULT: PASS*

### **5.1.2 ANTENNA REQUIREMENTS**

*RESULT: PASS*

### **5.2.1 TRANSMITTER POWER LIMITATIONS**

*RESULT: PASS*

### **5.2.2 OCCUPIED BANDWIDTH**

*RESULT: PASS*

### **5.2.3 FREQUENCY STABILITY**

*RESULT: PASS*

### **5.2.4 EMISSION MASK**

*RESULT: PASS*

### **5.2.5 CONDUCTED SPURIOUS EMISSIONS OF TRANSMITTER**

*RESULT: PASS*

### **5.3.1 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER**

*RESULT: PASS*

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## 1. General Remarks

### 1.1 Complementary Materials

There is no attachment to this test report.

## 2. Test Sites

### 2.1 Test Facilities

TÜV Rheinland Japan Ltd. – Global Technology Assessment Center  
4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The Federal Communications Commission has reviewed the technical characteristics of the radiated and conducted emission facilities and has found these test sites to be in compliance with the requirements of section 2.948 of the FCC rules. The description of the test facility is listed under FCC registration number 299054.

TÜV Rheinland Japan Ltd. is accredited by the Federal Communications Commission as a Conformity Assessment Body under Designation Number JP0017 and Test Firm Registration Number 386498.

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## 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
<b>For Antenna Port Conducted Emission</b>					
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2013-01
Spectrum Analyzer	Agilent	E4447A	MY482500 05	BT-8267	2012-05
Harmonic Mixer 40-50GHz	Agilent	11970U	MY300302 22	BT-8348	2012-05
Harmonic Mixer 50-75GHz	Agilent	11970V	MY300330 72	BT-8367	2012-08
Harmonic Mixer 75-110GHz	Agilent	11970W	MY252104 62	BT-8350	2012-05
Temperature Chamber	Voetsch	VT 4018	585660250 90010	BT-8012	2012-09
DC Power Supply	Kikusui	PWR400L	QL002003	Y3-1221	N/A
True RMS Multimeter	Fluke	87V	93760364	TL-9108	2012-09
<b>For Radiated Emission below 40GHz</b>					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2012-02
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2013-01
RF Selector (10m)	Toyo Corporation	NS4900	0703-182	RF-0029	2012-05
Loop Antenna with power supply, 9kHz-30MHz	Rohde & Schwarz	HFH2-Z2	100139	RF-0048	2012-02
Trilog Antenna, 30-1000MHz	Schwarzbeck	VULB9168	0245	RF-0019	2012-03
Biconical Antenna, 30-300MHz	EMCO	3110B	9603-2379	RF-0207	2012-02
3dB Attenuator 50Ohm	Tamagawa Electronics Co., Ltd.	CFA-01	-	RF-0265	2012-05
Low Noise Pre-Amplifier, 9kHz-1GHz	TSJ	MLA-10K01-B01-35	1370750	RF-0253	2012-05
Horn Antenna, 1-8GHz	Schwarzbeck	BBHA9120B	419	RF-0050	2012-05
Microwave Pre-Amplifier, 1-8GHz	Toyo Corporation	TPA0108-40	0634	RF-0052	2012-05
Band Reject Filter, 1-8GHz	Nitsuki	NF-49BT	027	RF-0131	2012-05
Horn Antenna with Pre-Amplifier, 8-18GHz	Toyo Corporation	HAP06-18W	00000025	RF-0065	2012-05
High Pass Filter, 8-18GHz	Micro-Tronics	HPM50107	006	RF-0334	2012-05
Horn Antenna with Pre-Amplifier, 18-26.5GHz	Toyo Corporation	HAP18-26N	00000010	RF-0070	2012-05

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Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
Horn Antenna with Preamplifier, 26.5-40GHz	Toyo Corporation	HAP26-40N	00000007	RF-0069	2012-08
SMA Amplifier, 26.5-40GHz	Toyo Corporation	HAP2640-S	-	RF-0258	2012-05
<b>For Radiated Emission above 40GHz</b>					
Spectrum Analyzer	Agilent	E4447A	MY48250005	BT-8267	2012-05
Harmonic Mixer 40-50GHz	Agilent	U11970U	MY30030222	BT-8348	2012-05
Horn Antenna 40-50GHz (RX)	VEGA Technology Inc.	HO19R	-	BT-8334	N/A
Harmonic Mixer 50-75GHz	Agilent	11970V	MY30033072	BT-8367	2012-08
Horn Antenna 50-75GHz (RX)	VEGA Technology Inc.	HO15R	-	BT-8336	N/A
Harmonic Mixer 75-110GHz	Agilent	11970W	MY25210462	BT-8350	2012-05
Horn Antenna 75-110GHz (RX)	VEGA Technology Inc.	HO10R	-	BT-8338	N/A
<b>Constant Voltage Constant Frequency Stabilizers</b>					
CVCF (10m chamber)	NF Corporation	ESU2000S	9067307	RF-0212	N/A
CVCF Booster (10m chamber)	NF Corporation	ESU2000B	9074408	RF-0213	N/A
CVCF (Pulse Test lab)	NF Corporation	ESU2000U	9067195	RF-0122	N/A
CVCF Booster (Pulse Test lab)	NF Corporation	ESU2000B	9072108	RF-0121	N/A

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.

## 2.3 Measurement Uncertainty

**Table 2: Emission Measurement Uncertainty**

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±1.5dB
	1 - 40GHz	±1.5dB
	40 - 50GHz	±1.9dB
	50 - 75GHz	±2.1dB
	75 - 110GHz	±3.0dB
Radiated Emission	150kHz - 30MHz	±4.7dB
	30MHz - 1GHz	±4.7dB
	> 1GHz	±4.7dB

### 3. General Product Information

#### 3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is a wireless 25GHz data transfer terminal used in Point-to-Point or Point-to-Multipoint systems.

#### 3.2 System Details

Rated voltage:	DC 42.5 - 57V, via Power over Ethernet (PoE) Adapter
Rated power:	Max. 20W
Protection class:	III
Test voltage:	DC 48V via PoE adapter, unless otherwise specified.

The EUT incorporates a fixed microwave radio. Refer to the table below for details.

**Table 3: Radio Properties**

Radio type:	Fixed Microwave	
Modulation Type:	QPSK, 16QAM, 64QAM (single carrier TDD)	
Symbol Rates:	20MHz or 40MHz	
Freq. Band in ITU Region 1:	24.549 – 25.445GHz Channel center frequencies: QPSK 20, 16QAM 20, 64QAM 20: 24.563 to 25.431GHz QPSK 40, 16QAM 40, 64QAM 40: 24.577 to 25.417GHz	
Frequency Band in USA	25.050 – 25.250GHz Channel center frequencies: QPSK 20, 16QAM 20, 64QAM 20: 25.064 to 25.236GHz QPSK 40, 16QAM 40, 64QAM 40: 25.078 to 25.222GHz	
Max. Rated Output Power:	QPSK: +14.0dBm 16QAM: +11.4dBm 64QAM: +10.3dBm	
Max. Measured Output Power:	QPSK 20: +14.6dBm    QPSK 40: +14.4dBm 16QAM 20: +12.1dBm    16QAM 40: +12.2dBm 64QAM 20: +10.8dBm    64QAM 40: +11.1dBm	
Specified Carrier Bandwidth:	QPSK 20, 16QAM 20, 64QAM 20: 26MHz QPSK 40, 16QAM 40, 64QAM 40: 52MHz	
Transmit Speed (Bit Rate):	QPSK 20: 40Mbps    QPSK 40: 80Mbps 16QAM 20: 80Mbps    16QAM 40: 160Mbps 64QAM 20: 120Mbps    64QAM 40: 240Mbps	
Number of Channels:	Un-specified	
FCC Classification:	TNB- Licensed Non-Broadcast Station Transmitter	
Emission Designator:	QPSK 20: 25M6G7W    QPSK 40: 51M0G7W 16QAM 20: 25M6D7W    16QAM 40: 50M8D7W 64QAM 20: 25M6D7W    64QAM 40: 50M8D7W	



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Antenna Type and Gain:	Flat antenna (Japan Radio Co., Ltd.: NAY-241R):	max. 32dBi
	Flat antenna (Japan Radio Co., Ltd.: NAY-2500):	max. 32dBi
	Parabolic antenna 0.6m (Radio Waves Inc.: HP2-26):	41.5dBi
	Parabolic antenna 0.3m (Radio Waves Inc.: HPCPE-26):	35.9dBi

**Table 4: Interfaces present on the EUT**

No.	Interface	Cable Length for Testing, Shielding	Interface Classification
1.	Ethernet (with POE)	20m for radiated tests, 2m for other tests, shielded	Telecom and DC Power Line
2.	Serial (for Maintenance purpose only)	1.7m, Un-shielded	Signal Line
3.	Antenna Port (WR-42 Waveguide)	N/A (direct connection to measurement equipment via RF cable)	Antenna Port
4.	Functional Ground	2.5m	Ground Line

### 3.3 Clock Frequencies

The highest clock frequency generated by the digital interface of the EUT is 250MHz.

### 3.4 Noise Suppressing Parts

Refer to schematics.

## **4. Test Set-up and Operation Modes**

### **4.1 Test Methodology**

The test methodology used is based on the requirements of 47 CFR Part 101 and KDB Publication No. 971168: D01 Power Meas License Digital Systems v01.

For details, see under each test item.

### **4.2 Operation Modes**

Testing was performed at the lowest operating frequency, at the operating frequency in the middle of the specified frequency band and at the highest operating frequency.

The basic operation modes used for testing are:

- A. EUT transmits continuously at lowest channel (25.064GHz @ 26MHz BW or 25.078GHz @ 52MHz BW)
- B. EUT transmits continuously at middle channel (25.150GHz @ 26MHz or 52MHz BW)
- C. EUT transmits continuously at highest channel (25.236GHz @ 26MHz BW or 25.222GHz @ 52MHz BW)

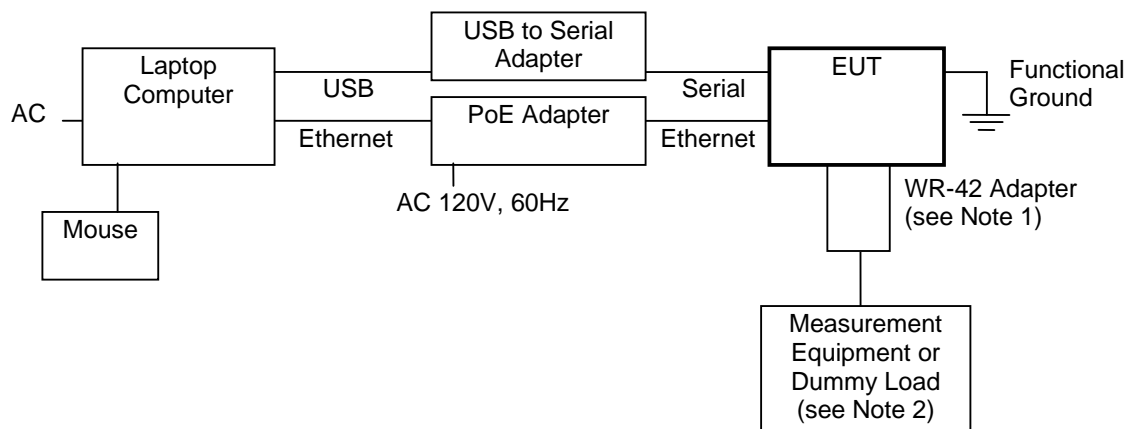
Unless otherwise specified, the transmitted signal was modulated for testing purpose.

### 4.3 Physical Configuration for Testing

The test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out.

**Figure 1: Block Diagram**



Notes:

1. For frequencies below 40GHz, a WR-42 to K-type adapter was attached at the EUT waveguide connector. For frequencies above 40GHz, a WR-42 to WR-19 adapter was used.
2. For antenna conducted measurements, a spectrum analyzer was connected to the antenna port of the EUT via an RF cable. For radiated measurements, a dummy load was connected at the EUT antenna port.
3. Accessories were placed in a pit below the turntable for radiated emission measurements.

For more details, refer to section: Photographs of the Test Set-Up.

### 4.4 Test Software

Software used for testing: Tera Term version 4.71 (SVN# 4604).

This software was running on the laptop computer connected to the EUT. It was used to enable the test operation modes listed in section 4.2 as appropriate.

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## 4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. Product: Power over Ethernet (PoE) Adapter  
Manufacturer: PowerDsine  
Model: PD-9001G  
Rated Voltage: AC100-240V  
Input Current: 0.8A  
Frequency: 50/60Hz  
Protection Class: I  
Serial Number: D101065000003D1A00
2. Product: Power over Ethernet (PoE) Adapter  
Manufacturer: JRC  
Model: CQD-2188 WT Adapter 7PCCM5225  
Rated Voltage: DC 40.8-55.2V  
Input Current: Unspecified  
Protection Class: III
3. Product: Notebook computer  
Manufacturer: Toshiba  
Model: Dynabook Satellite K33 253E/W  
Rated Voltage: DC 15V  
Input Current: 5A  
Protection Class: II  
Serial Number: 4A035724H
4. Product: AC/DC Adapter  
Manufacturer: Toshiba  
Model: PA3755U-1ACA  
Rated Voltage: AC 100-240V  
Input Current: 1.3A  
Frequency: 50-60Hz  
Protection Class: II  
Serial Number: G71C000A5210
5. Product: Optical Mouse  
Manufacturer: Microsoft  
Model: 1113  
Rated Voltage: DC 5V  
Input Current: 100mA  
Protection Class: III  
Serial Number: P/N: X817159-002 PID: 91705-492-9091135-81001

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6. Product: USB to Serial Adapter  
Manufacturer: Elecom  
Model: UC-SGT  
Rated Voltage: DC 5V  
Protection Class: III  
Serial Number: C0276E

Note:

PoE Adapter No. 1 was used for all tests except Frequency Stability. PoE Adapter No. 2 was used for Frequency Stability test only.

#### **4.6 Countermeasures to achieve EMC Compliance**

No additional measures were employed to achieve compliance.

## 5. Test Results RADIO

### 5.1 Technical Requirements

#### 5.1.1 Microwave Modulation

**RESULT:**
**PASS**

Requirement:

FCC 101.141(a)(1)

Microwave transmitters employing digital modulation techniques and operating below 25.25 GHz (except for MVDDS stations in the 12,200–12,700 MHz band) must, with appropriate multiplex equipment, comply with the following requirement: The bit rate, in bits per second, must be equal to or greater than the bandwidth specified by the emission designator in Hertz, except the bandwidth used to calculate the minimum rate may not include any authorized guard band.

Verdict:

The bit rate in Mbps is greater than the maximum measured occupied bandwidth in MHz. Therefore the EUT complies with the requirement. Refer to the table here below and to the test item "Occupied Bandwidth" for details.

**Table 5: Modulation Characteristics**

Modulation	Bit Rate [Mbps]	Max. Occupied Bandwidth [MHz]
QPSK 20	40	25.64
QPSK 40	80	50.96
16QAM 20	80	25.64
16QAM 40	160	50.80
64QAM 20	120	25.64
64QAM 40	240	50.80

Note:

For modulation characteristic spectra required by FCC 2.1047, refer to the test item "Occupied Bandwidth".

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## 5.1.2 Antenna Requirements

**RESULT:****PASS**

Requirement:

FCC 101.517

- (a) Transmitting antennas may be omnidirectional or directional, consistent with coverage and interference requirements.
- (b) The use of horizontal or vertical plane wave polarization, or right hand or left hand rotating elliptical polarization must be used to minimize harmful interference between stations.
- (c) Directive antennas must be used at all DEMS User Stations.

Verdict:

The EUT is specified for use with different kinds of plane wave polarized directional antennas, listed in section 3.2, which have a gain of 32dBi or higher. Thus the EUT complies with the above requirements.

Note:

Stations to be authorized to operate in the 24.25-25.25GHz band do not have to meet the additional requirements of FCC 101.115. Therefore compliance with FCC 101.517 is sufficient to demonstrate compliance with antenna requirements for certification purpose according to FCC Part 101.

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## 5.2 Conducted Measurements at Antenna Port

### 5.2.1 Transmitter Power Limitations

**RESULT:****PASS**

Date of testing: 2011-12-20

Ambient temperature: 21°C

Relative humidity: 22%

Atmospheric pressure: 1019hPa

## Requirements:

FCC 101.113(a)

In no event shall the average equivalent isotropically radiated power (EIRP), as referenced to an isotropic radiator, exceed +55dBW (+85dBm) for equipment operating in the 24.25-25.25GHz band.

## Test procedure:

FCC 2.1046 and KDB Publication No. 971168: D01 Power Meas License Digital Systems v01.

The average output power was measured at the antenna port with a spectrum analyzer using an RMS detector with a resolution bandwidth of 1MHz and a video bandwidth of 8MHz. The measured power levels were integrated over the occupied bandwidth of the carrier. The integration results were corrected with the cable loss value and were added the highest available antenna gain in order to obtain the corresponding average EIRP levels of the EUT.



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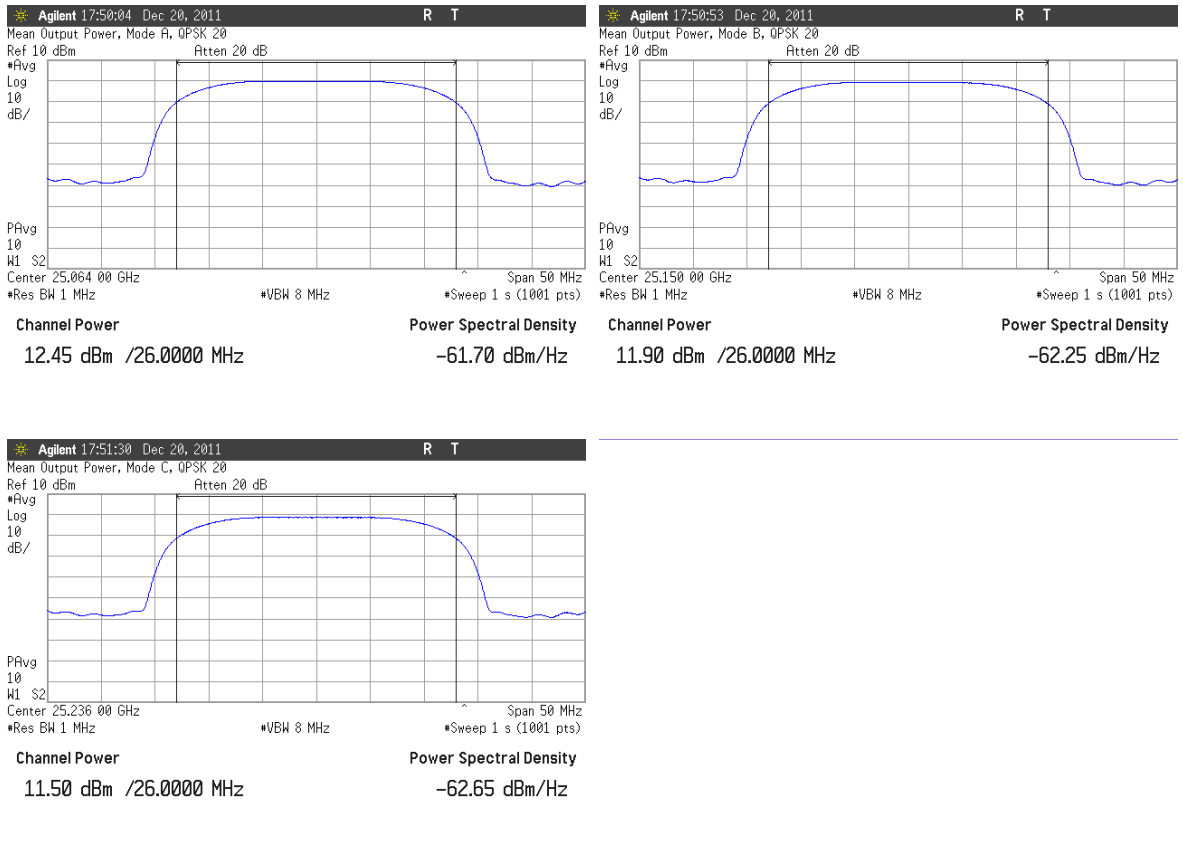
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**Table 6: Transmitter Average Equivalent Isotropically Radiated Power, QPSK 20**

Operation Mode	Operation Freq. [GHz]	Reading [dBm]	Cable Loss [dB]	Antenna Gain [dBi]	Average EIRP [dBm]	Limit [dBm]	Margin [dB]
A	25.064	12.5	2.1	41.5	56.1	85.0	28.9
B	25.150	11.9	2.3	41.5	55.7	85.0	29.3
C	25.236	11.5	2.3	41.5	55.3	85.0	29.7

Notes: Reading = Average conducted power integrated over the occupied bandwidth (channel power, without correction)  
 Antenna gain = Gain of highest gain antenna declared for use with the EUT  
 Average EIRP = Reading + Cable Loss + Antenna gain  
 Margin = Limit – Average EIRP

**Figure 2: Transmitter Conducted Average Output Power, QPSK 20**



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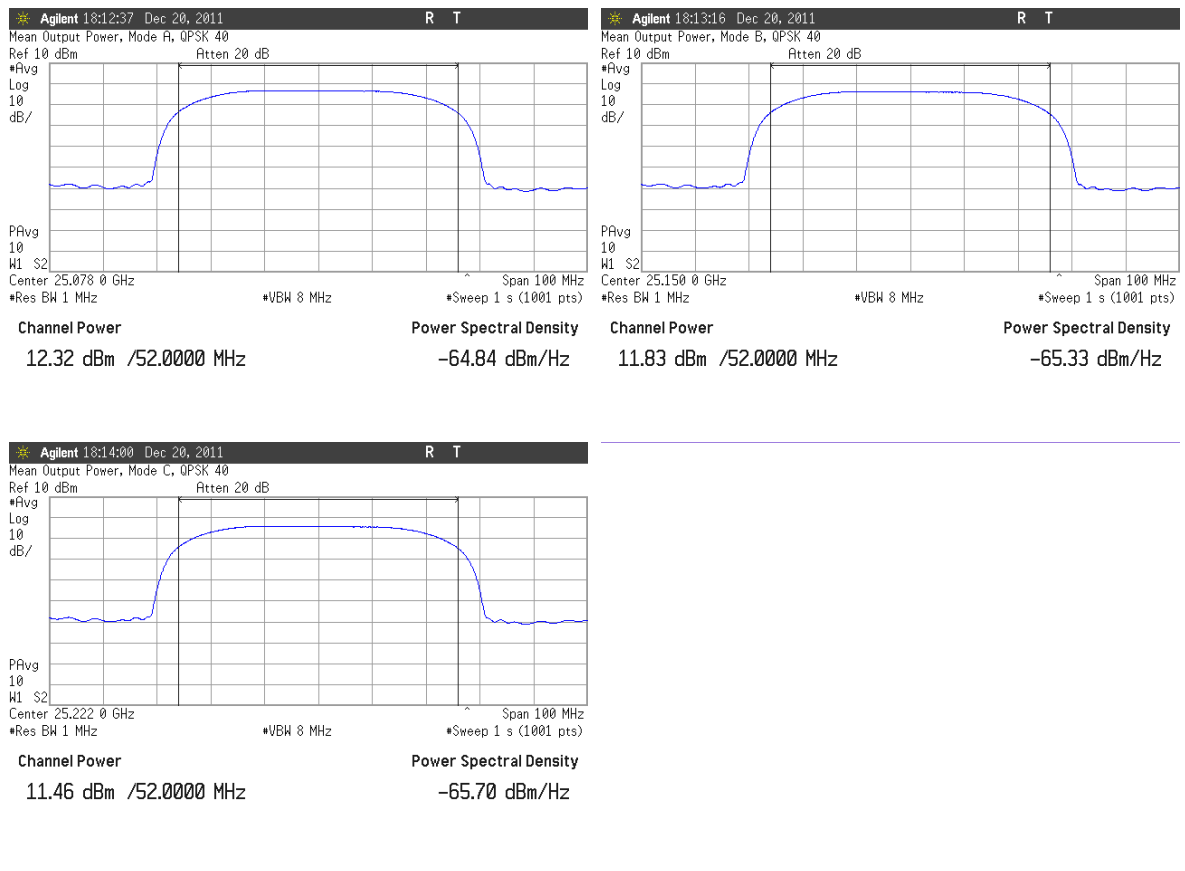
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**Table 7: Transmitter Average Equivalent Isotropically Radiated Power, QPSK 40**

Operation Mode	Operation Freq. [GHz]	Reading [dBm]	Cable Loss [dB]	Antenna Gain [dBi]	Average EIRP [dBm]	Limit [dBm]	Margin [dB]
A	25.078	12.3	2.1	41.5	55.9	85.0	29.1
B	25.150	11.8	2.3	41.5	55.6	85.0	29.4
C	25.222	11.5	2.1	41.5	55.1	85.0	29.9

Notes: Reading = Average conducted power integrated over the occupied bandwidth (channel power, without correction)  
 Antenna gain = Gain of highest gain antenna declared for use with the EUT  
 Average EIRP = Reading + Cable Loss + Antenna gain  
 Margin = Limit – Average EIRP

**Figure 3: Transmitter Conducted Average Output Power, QPSK 40**

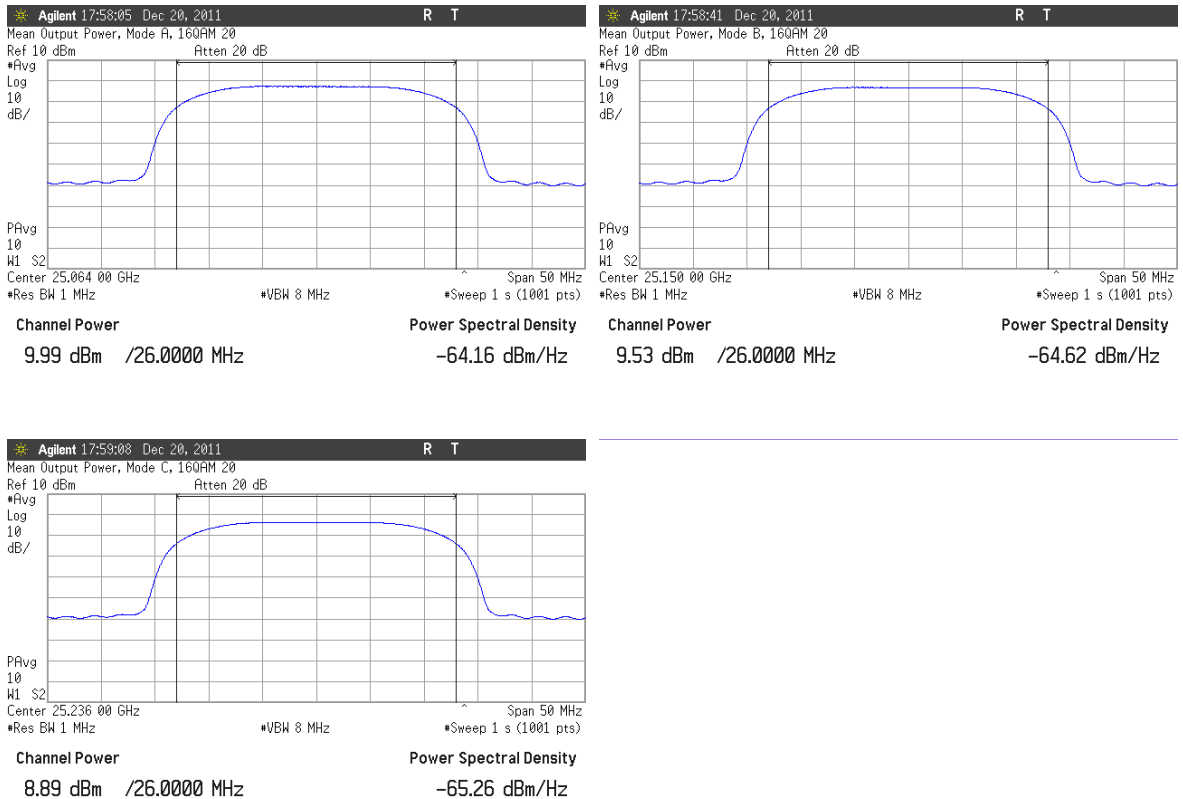


**Table 8: Transmitter Average Equivalent Isotropically Radiated Power, 16QAM 20**

Operation Mode	Operation Freq. [GHz]	Reading [dBm]	Cable Loss [dB]	Antenna Gain [dBi]	Average EIRP [dBm]	Limit [dBm]	Margin [dB]
A	25.064	10.0	2.1	41.5	53.6	85.0	31.4
B	25.150	9.5	2.3	41.5	53.3	85.0	31.7
C	25.236	8.9	2.3	41.5	52.7	85.0	32.3

Notes: Reading = Average conducted power integrated over the occupied bandwidth (channel power, without correction)  
 Antenna gain = Gain of highest gain antenna declared for use with the EUT  
 Average EIRP = Reading + Cable Loss + Antenna gain  
 Margin = Limit – Average EIRP

**Figure 4: Transmitter Conducted Average Output Power, 16QAM 20**



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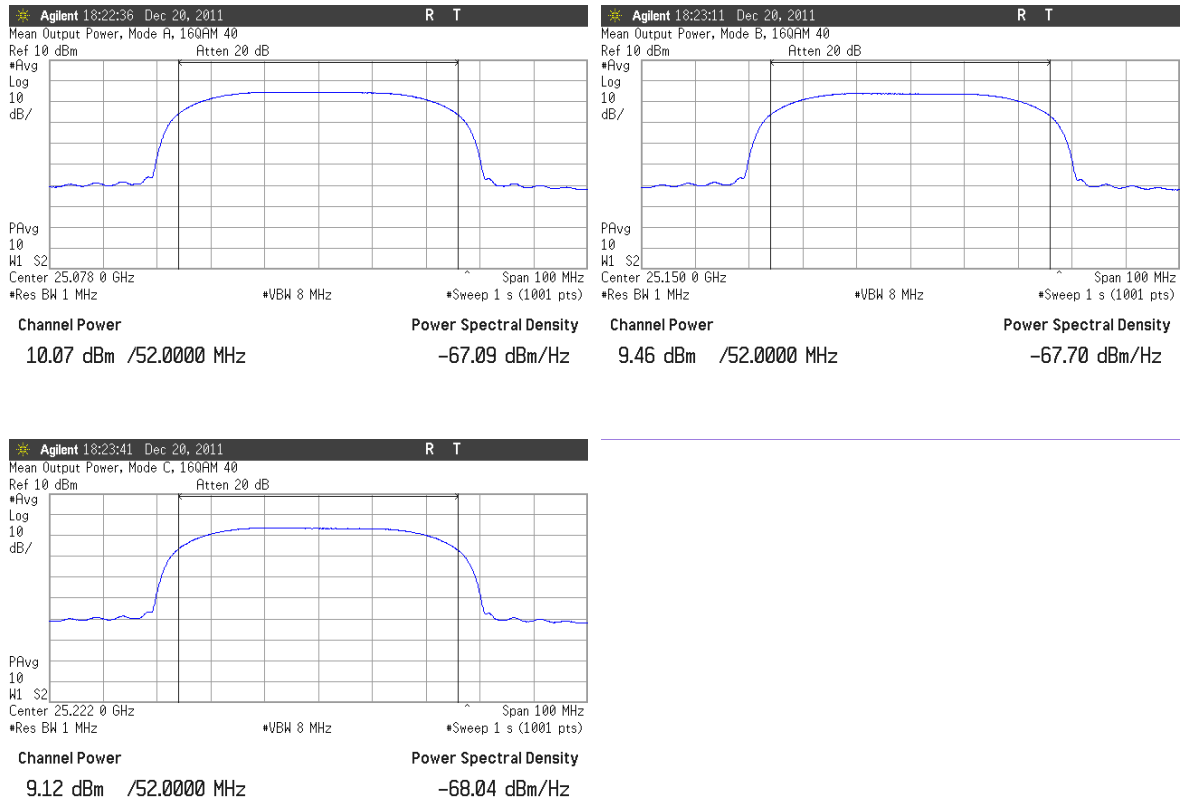
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**Table 9: Transmitter Average Equivalent Isotropically Radiated Power, 16QAM 40**

Operation Mode	Operation Freq. [GHz]	Reading [dBm]	Cable Loss [dB]	Antenna Gain [dBi]	Average EIRP [dBm]	Limit [dBm]	Margin [dB]
A	25.078	10.1	2.1	41.5	53.7	85.0	31.3
B	25.150	9.5	2.3	41.5	53.2	85.0	31.8
C	25.222	9.1	2.1	41.5	52.8	85.0	32.2

Notes: Reading = Average conducted power integrated over the occupied bandwidth (channel power, without correction)  
 Antenna gain = Gain of highest gain antenna declared for use with the EUT  
 Average EIRP = Reading + Cable Loss + Antenna gain  
 Margin = Limit – Average EIRP

**Figure 5: Transmitter Conducted Average Output Power, 16QAM 40**



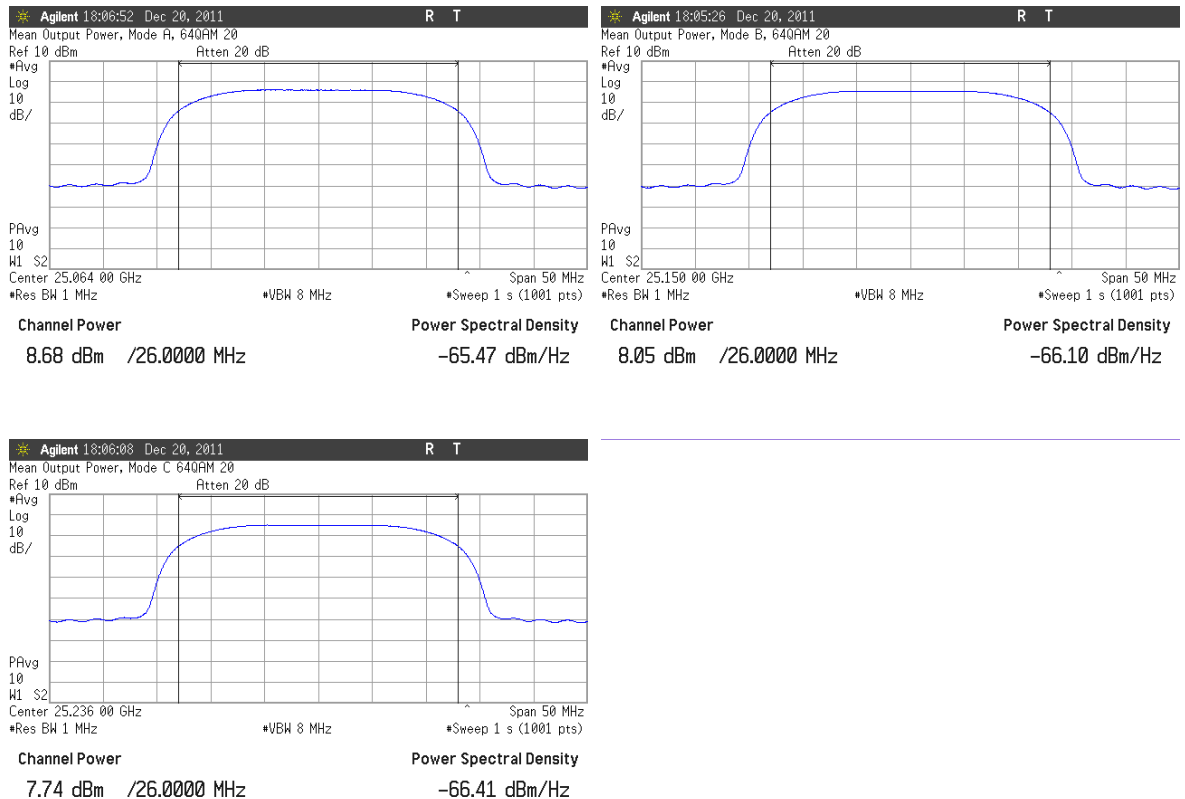
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**Table 10: Transmitter Average Equivalent Isotropically Radiated Power, 64QAM 20**

Operation Mode	Operation Freq. [GHz]	Reading [dBm]	Cable Loss [dB]	Antenna Gain [dBi]	Average EIRP [dBm]	Limit [dBm]	Margin [dB]
A	25.064	8.7	2.1	41.5	52.3	85.0	32.7
B	25.150	8.1	2.3	41.5	51.8	85.0	33.2
C	25.236	7.7	2.3	41.5	51.5	85.0	33.5

Notes: Reading = Average conducted power integrated over the occupied bandwidth (channel power, without correction)  
 Antenna gain = Gain of highest gain antenna declared for use with the EUT  
 Average EIRP = Reading + Cable Loss + Antenna gain  
 Margin = Limit – Average EIRP

**Figure 6: Transmitter Conducted Average Output Power, 64QAM 20**



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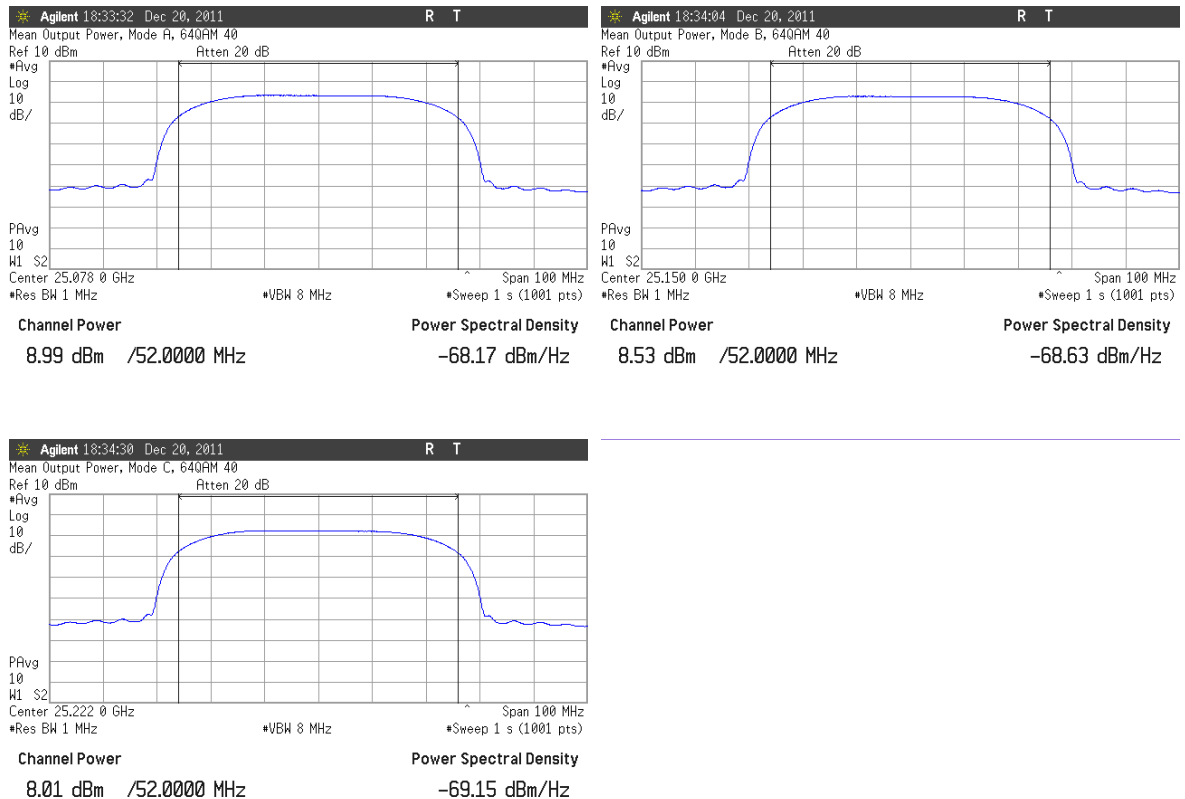
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**Table 11: Transmitter Average Equivalent Isotropically Radiated Power, 64QAM 40**

Operation Mode	Operation Freq. [GHz]	Reading [dBm]	Cable Loss [dB]	Antenna Gain [dBi]	Average EIRP [dBm]	Limit [dBm]	Margin [dB]
A	25.078	9.0	2.1	41.5	52.6	85.0	32.4
B	25.150	8.5	2.3	41.5	52.3	85.0	32.7
C	25.222	8.0	2.1	41.5	51.6	85.0	33.4

Notes: Reading = Average conducted power integrated over the occupied bandwidth (channel power, without correction)  
 Antenna gain = Gain of highest gain antenna declared for use with the EUT  
 Average EIRP = Reading + Cable Loss + Antenna gain  
 Margin = Limit – Average EIRP

**Figure 7: Transmitter Conducted Average Output Power, 64QAM 40**



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## 5.2.2 Occupied Bandwidth

**RESULT:****PASS**

Date of testing: 2011-11-17

Ambient temperature: 19°C

Relative humidity: 34%

Atmospheric pressure: 1023hPa

## Requirements:

FCC 101.109(c)

The maximum bandwidth which will be authorized per frequency assigned shall not exceed 40MHz for devices operating in the frequency band 24.25 to 25.25GHz.

When adjacent channels are aggregated, equipment is permitted to operate over the full channel block aggregation without restriction.

## Test procedure:

FCC 2.1049(h) and KDB Publication No. 971168: D01 Power Meas License Digital Systems v01.

The occupied bandwidth was measured at the antenna port with a spectrum analyzer using an RMS detector with a resolution bandwidth of 1MHz and a video bandwidth of 3MHz. The measurement was made using the OBW function of the analyzer with a 99% coverage setting.

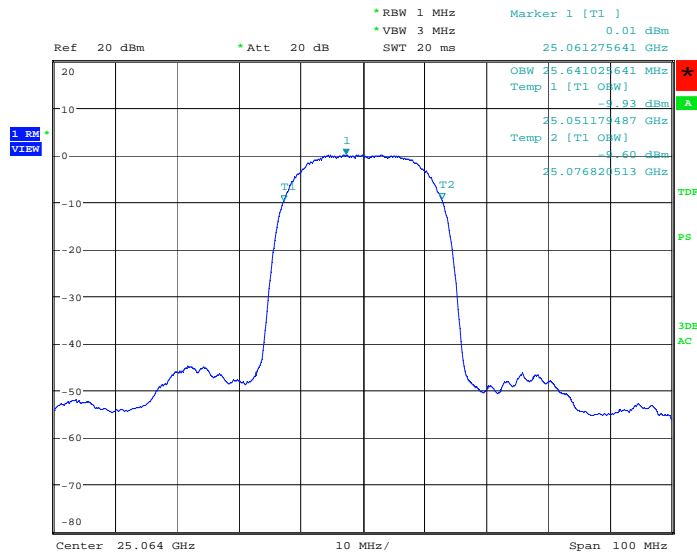
The modulations QPSK 20, 16QAM 20 and 64QAM 20 are subject to 40MHz limit. The modulations QPSK 40, 16QAM 40 and 64QAM 40 require the use of two aggregated channels and are therefore subject to  $2 \times 40\text{MHz} = 80\text{MHz}$  limit.

**Table 12: Occupied Bandwidth, QPSK 20**

Operation Mode	Operating Frequency [GHz]	Occupied Bandwidth [MHz]	Limit [MHz]	Margin [MHz]
A	25.064	25.64	40.00	14.36
B	25.150	25.64	40.00	14.36
C	25.236	25.48	40.00	14.52

Note: Margin = Limit – Occupied bandwidth

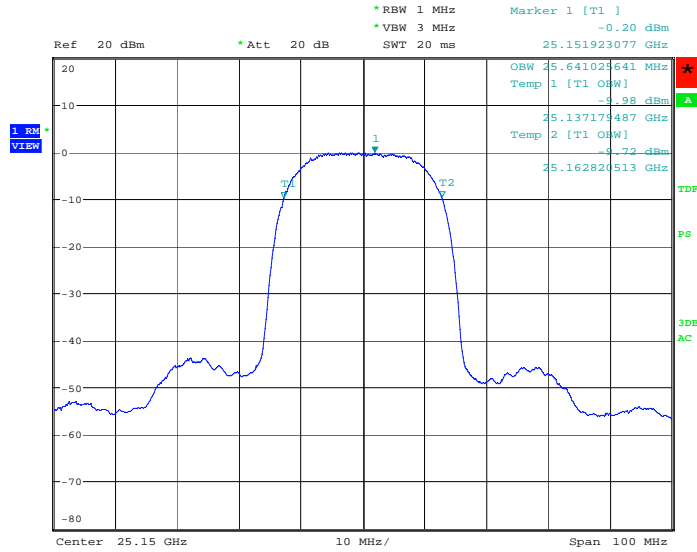
**Figure 8: Occupied Bandwidth, Mode A, QPSK 20**



99% Bandwidth, Mode A, QPSK 20  
Date: 17.NOV.2011 15:33:46

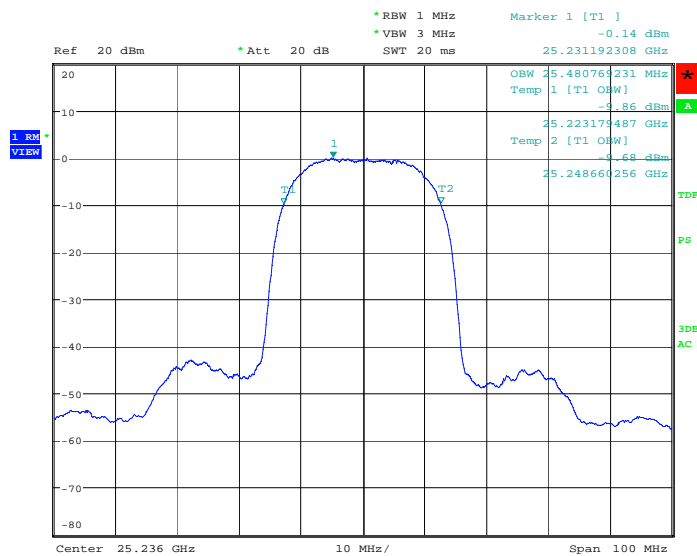


**Figure 9: Occupied Bandwidth, Mode B, QPSK 20**



99% Bandwidth, Mode B, QPSK 20  
Date: 17.NOV.2011 15:41:53

**Figure 10: Occupied Bandwidth, Mode C, QPSK 20**



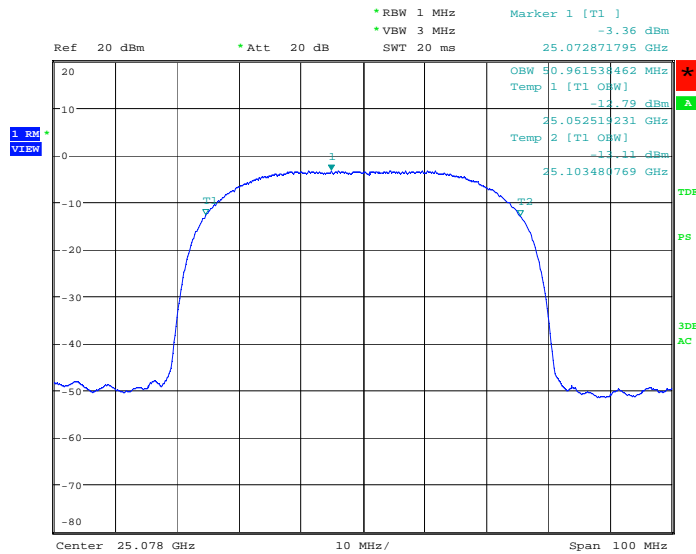
99% Bandwidth, Mode C, QPSK 20  
Date: 17.NOV.2011 15:54:31

**Table 13: Occupied Bandwidth, QPSK 40**

Operation Mode	Operating Frequency [GHz]	Occupied Bandwidth [MHz]	Limit [MHz]	Margin [MHz]
A	25.078	50.96	80.00	29.04
B	25.150	50.80	80.00	29.20
C	25.222	50.64	80.00	29.36

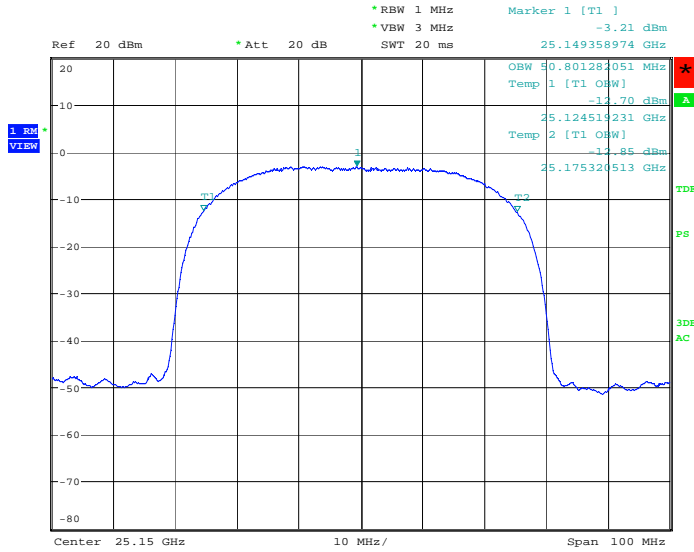
Note: Margin = Limit – Occupied bandwidth

**Figure 11: Occupied Bandwidth, Mode A, QPSK 40**



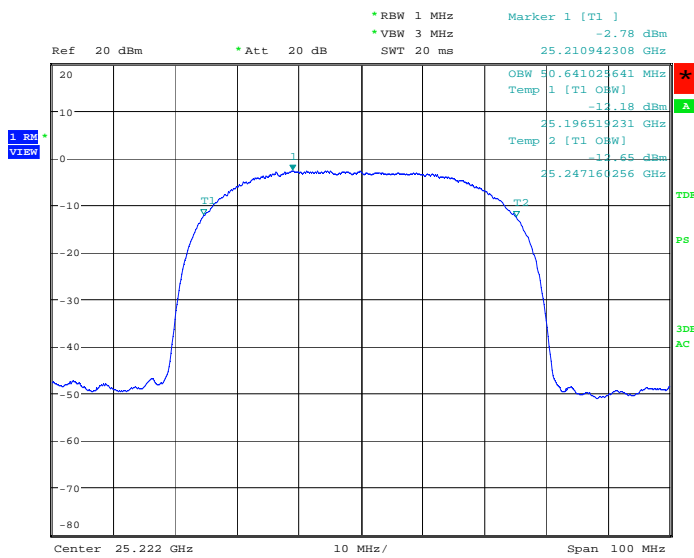
99% Bandwidth, Mode A, QPSK 40  
Date: 17.NOV.2011 16:05:13

Figure 12: Occupied Bandwidth, Mode B, QPSK 40



99% Bandwidth, Mode B, QPSK 40  
Date: 17.NOV.2011 16:14:22

Figure 13: Occupied Bandwidth, Mode C, QPSK 40



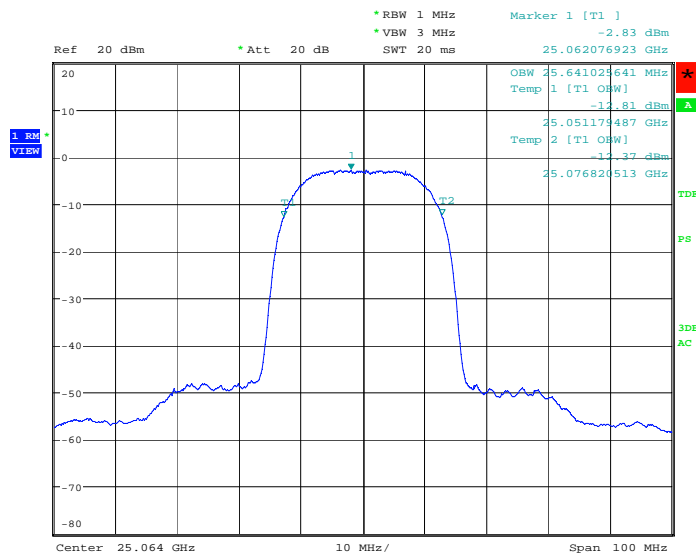
99% Bandwidth, Mode C, QPSK 40  
Date: 17.NOV.2011 16:32:11

**Table 14: Occupied Bandwidth, 16QAM 20**

Operation Mode	Operating Frequency [GHz]	Occupied Bandwidth [MHz]	Limit [MHz]	Margin [MHz]
A	25.064	25.64	40.00	14.36
B	25.150	25.64	40.00	14.36
C	25.236	25.48	40.00	14.52

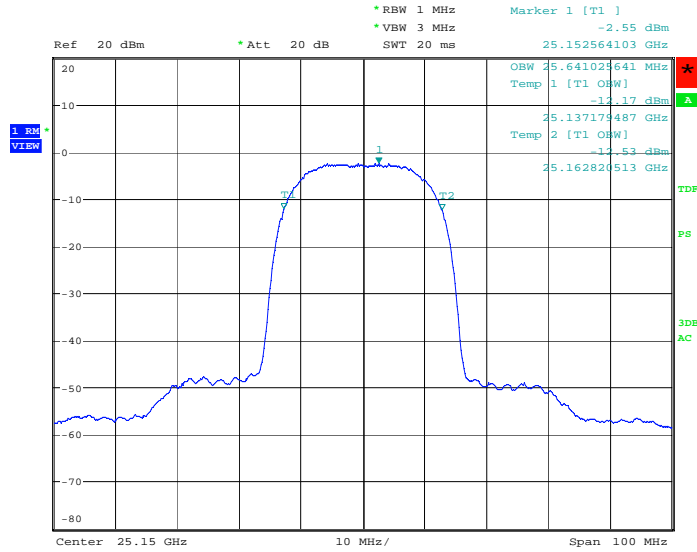
Note: Margin = Limit – Occupied bandwidth

**Figure 14: Occupied Bandwidth, Mode A, 16QAM 20**



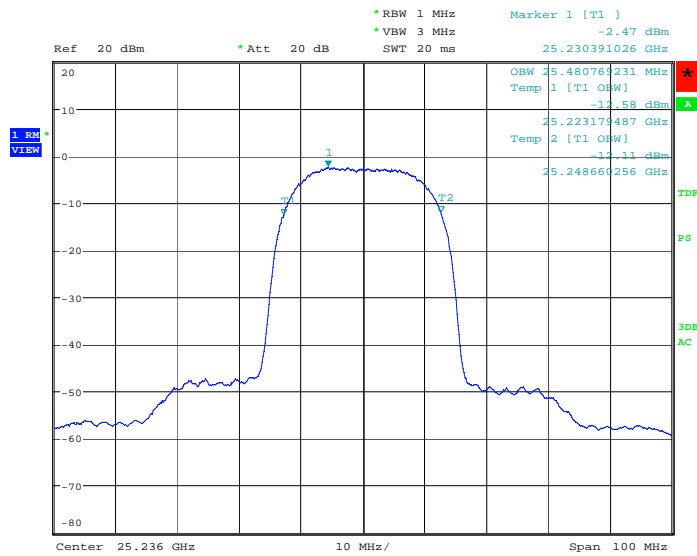
99% Bandwidth, Mode A, 16QAM 20  
Date: 17.NOV.2011 16:41:24

**Figure 15: Occupied Bandwidth, Mode B, 16QAM 20**



99% Bandwidth, Mode B, 16QAM 20  
Date: 17.NOV.2011 16:54:56

**Figure 16: Occupied Bandwidth, Mode C, 16QAM 20**



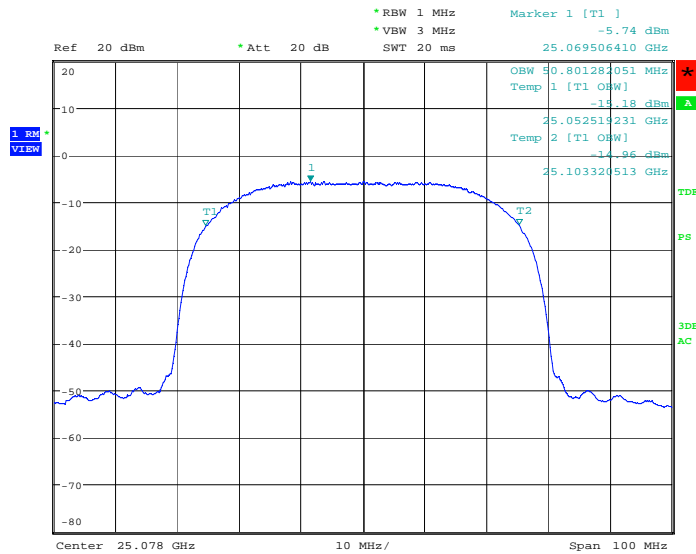
99% Bandwidth, Mode C, 16QAM 20  
Date: 17.NOV.2011 17:03:55

**Table 15: Occupied Bandwidth, 16QAM 40**

Operation Mode	Operating Frequency [GHz]	Occupied Bandwidth [MHz]	Limit [MHz]	Margin [MHz]
A	25.078	50.80	80.00	29.20
B	25.150	50.64	80.00	29.36
C	25.222	50.48	80.00	29.52

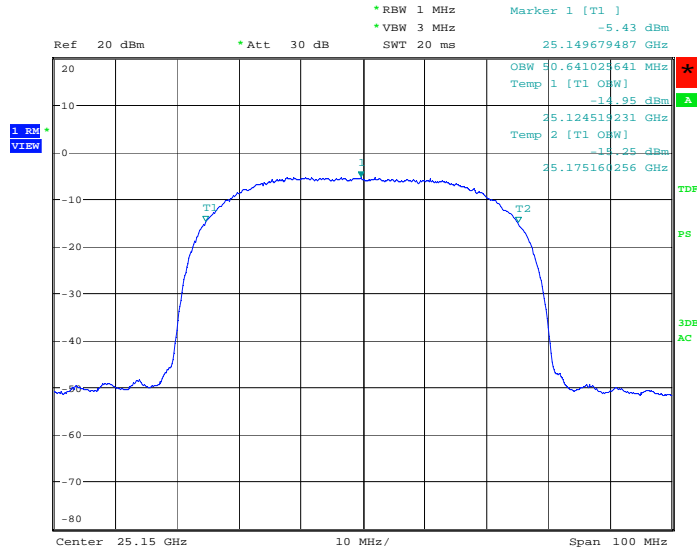
Note: Margin = Limit – Occupied bandwidth

**Figure 17: Occupied Bandwidth, Mode A, 16QAM 40**



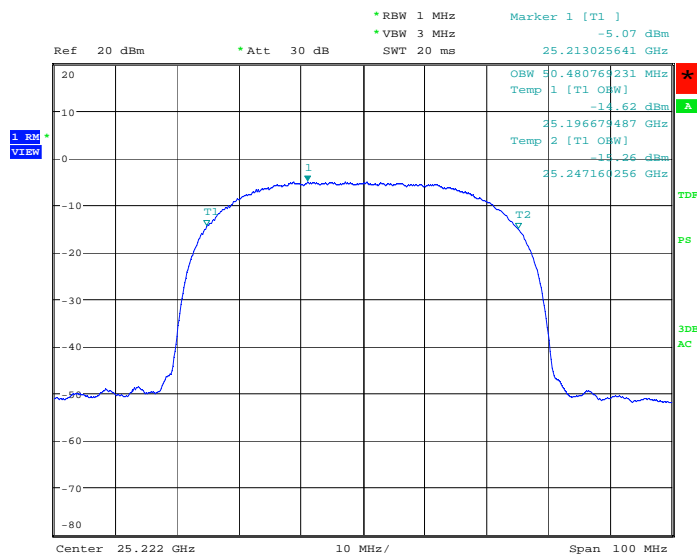
99% Bandwidth, Mode A, 16QAM 40  
Date: 17.NOV.2011 17:11:41

Figure 18: Occupied Bandwidth, Mode B, 16QAM 40



99% Bandwidth, Mode B, 16QAM 40  
Date: 17.NOV.2011 17:38:46

Figure 19: Occupied Bandwidth, Mode C, 16QAM 40



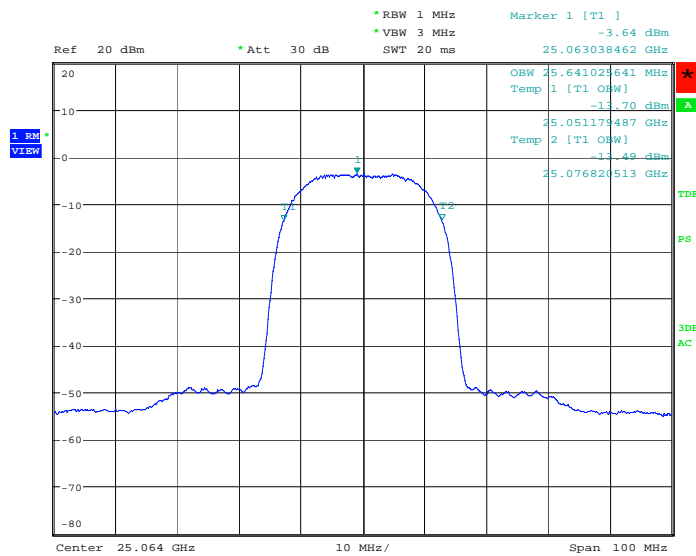
99% Bandwidth, Mode C, 16QAM 40  
Date: 17.NOV.2011 17:47:58

**Table 16: Occupied Bandwidth, 64QAM 20**

Operation Mode	Operating Frequency [GHz]	Occupied Bandwidth [MHz]	Limit [MHz]	Margin [MHz]
A	25.064	25.64	40.00	14.36
B	25.150	25.64	40.00	14.36
C	25.236	25.48	40.00	14.52

Note: Margin = Limit – Occupied bandwidth

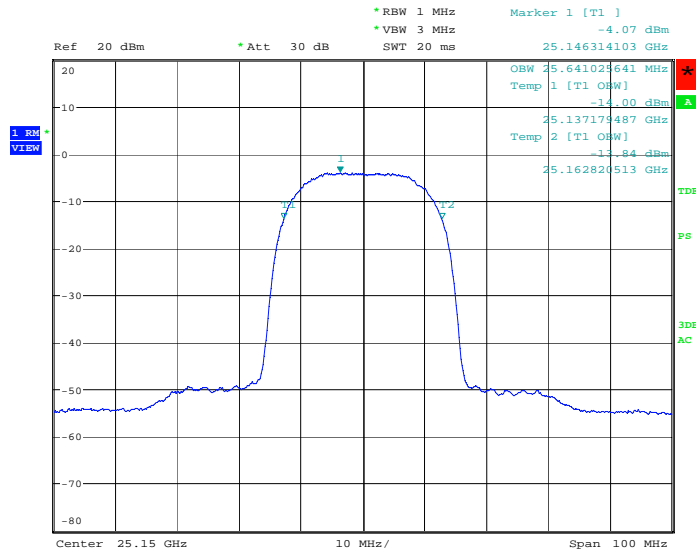
**Figure 20: Occupied Bandwidth, Mode A, 64QAM 20**



99% Bandwidth, Mode A, 64QAM 20  
Date: 17.NOV.2011 17:54:57

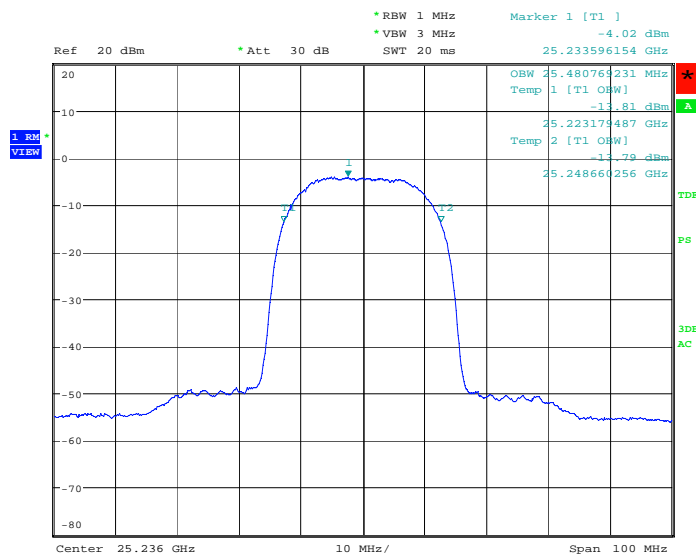


**Figure 21: Occupied Bandwidth, Mode B, 64QAM 20**



99% Bandwidth, Mode B, 64QAM 20  
Date: 17.NOV.2011 18:02:41

**Figure 22: Occupied Bandwidth, Mode C, 64QAM 20**



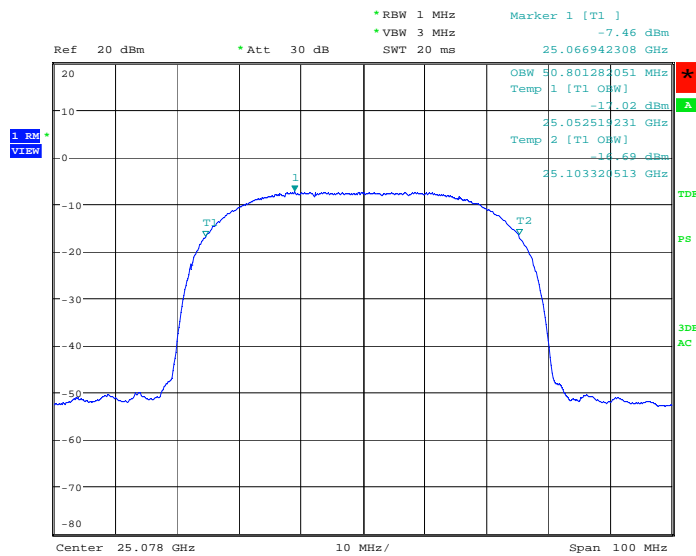
99% Bandwidth, Mode C, 64QAM 20  
Date: 17.NOV.2011 18:10:44

**Table 17: Occupied Bandwidth, 64QAM 40**

Operation Mode	Operating Frequency [GHz]	Occupied Bandwidth [MHz]	Limit [MHz]	Margin [MHz]
A	25.078	50.80	80.00	29.20
B	25.150	50.64	80.00	29.36
C	25.222	50.48	80.00	29.52

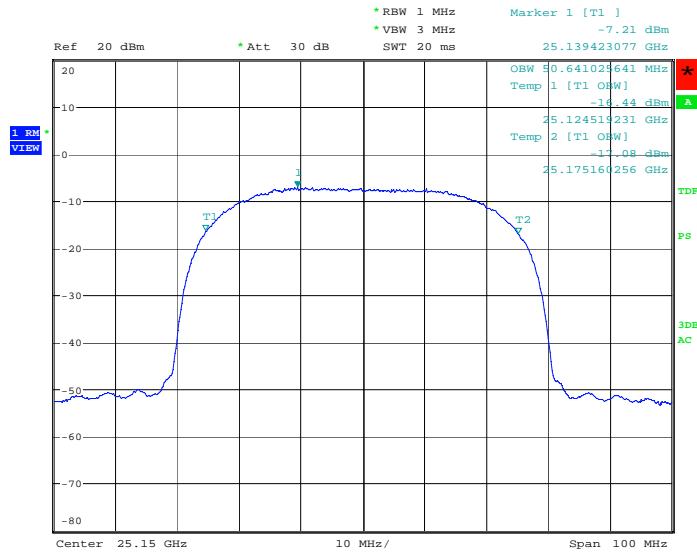
Note: Margin = Limit – Occupied bandwidth

**Figure 23: Occupied Bandwidth, Mode A, 64QAM 40**



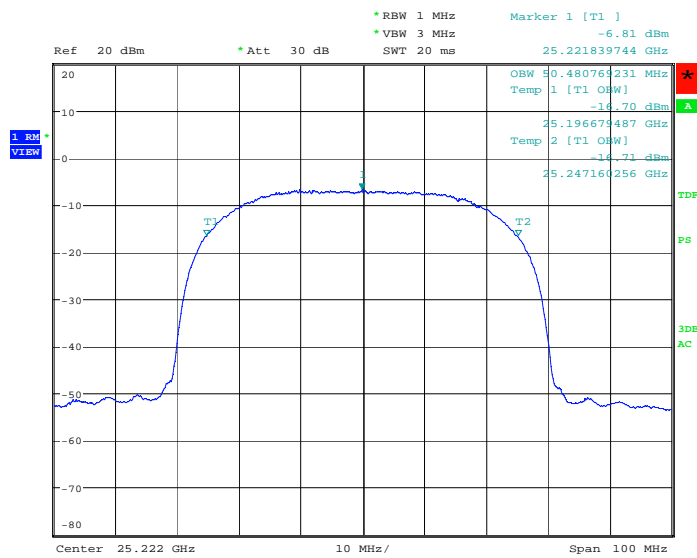
99% Bandwidth, Mode A, 64QAM 40  
Date: 17.NOV.2011 18:16:55

Figure 24: Occupied Bandwidth, Mode B, 64QAM 40



99% Bandwidth, Mode B, 64QAM 40  
Date: 17.NOV.2011 18:27:36

Figure 25: Occupied Bandwidth, Mode C, 64QAM 40



99% Bandwidth, Mode C, 64QAM 40  
Date: 17.NOV.2011 18:35:55

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### 5.2.3 Frequency Stability

**RESULT:**
**PASS**

Date of testing: 2011-11-16, 2011-11-17

Ambient temperature: 24, 25°C

Relative humidity: 28, 27%

Atmospheric pressure: 1021, 1023hPa

## Requirements:

FCC 101.107(a) and FCC 101.507

The carrier frequency of each authorized transmitter must be maintained within the following percentage of the reference frequency:  $\pm 0.001\%$  (10ppm) for operation frequency between 19.7 and 27.5GHz.

The frequency stability in the 24.25–25.25GHz bands must be  $\pm 0.001\%$  (10ppm) for each Nodal Station transmitter and  $\pm 0.003\%$  (30ppm) for each User Station transmitter.

## Test procedure:

FCC 2.1055

The EUT was placed inside a temperature chamber and its Ethernet port was connected to a PoE adapter attached to a tunable DC power supply to allow voltage variation. The frequency stability was measured at the antenna port with a spectrum analyzer using a peak detector with a resolution bandwidth and a video bandwidth of 1kHz.

Measurements were performed at nominal power supply voltage (DC 48V) with variation of ambient temperature from -30 to +50°C with 10°C steps and at nominal temperature (20°C) with variation of power supply voltage from 85% to 115% of the nominal value. For each test condition, after stable temperature was reached, the EUT was turned on and the operating frequency was measured at startup and at 2, 5 and 10 minutes after the EUT was energized.

The EUT was transmitting an unmodulated carrier for this test.

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**Table 18: Frequency Stability, Mode B**

Test Conditions		Assigned Center Freq. [GHz]	Frequency Deviation [kHz]				Worst Freq. Deviation [ppm]	Limit [ppm]
Temp. [°C]	DC Input Voltage [V]		Startup	2min	5min	10min		
-30	48	25.15	14.42	14.42	14.58	14.42	0.580	10
-20	48	25.15	13.78	12.98	12.66	12.34	0.548	10
-10	48	25.15	9.61	8.65	8.01	7.21	0.382	10
0	48	25.15	3.69	2.08	1.76	1.44	0.147	10
10	48	25.15	0.64	0.64	0.32	0.96	0.038	10
20	48	25.15	1.28	1.44	1.44	1.60	0.064	10
30	48	25.15	2.40	1.76	1.92	1.92	0.096	10
40	48	25.15	1.44	0.64	0.32	-0.16	0.057	10
50	48	25.15	0.16	-0.80	-0.80	-0.80	0.032	10
20	40.8	25.15	1.76	1.76	1.76	1.60	0.070	10
20	55.2	25.15	1.60	1.60	1.76	1.76	0.070	10

Note: Worst frequency deviation [ppm] = Worst frequency deviation [kHz] / Assigned center frequency [GHz]

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## 5.2.4 Emission Mask

**RESULT:**
**PASS**

Date of testing: 2011-11-17

Ambient temperature: 19°C

Relative humidity: 34%

Atmospheric pressure: 1023hPa

## Requirements:

FCC 101.111(a)(2)(ii)

The mean power of emissions must be attenuated below the mean output power of the transmitter in accordance with the following schedule:

For operating frequencies above 15 GHz, in any 1 MHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 11 decibels:

$A = 11 + 0.4(P-50) + 10 \text{ Log}_{10} B$ . (Attenuation greater than 56 decibels or to an absolute power of less than -13 dBm/1MHz is not required.)

P = Percent removed from the center frequency of the transmitter bandwidth.

B = Authorized bandwidth in MHz.

## Test procedure:

FCC 2.1051

The emission mask was measured at the antenna port with a spectrum analyzer using an RMS detector with a resolution bandwidth of 1MHz and a video bandwidth of 3MHz. The readings of the measurements take into account the loss generated by all the involved cables.

The modulations QPSK 20, 16QAM 20 and 64QAM 20 have an authorized bandwidth B of 40MHz. The modulations QPSK 40, 16QAM 40 and 64QAM 40 require the use of two aggregated channels and have an authorized bandwidth B of  $2 \times 40\text{MHz} = 80\text{MHz}$ .

The most severe limit (-13dBm) was applied for the measurements.

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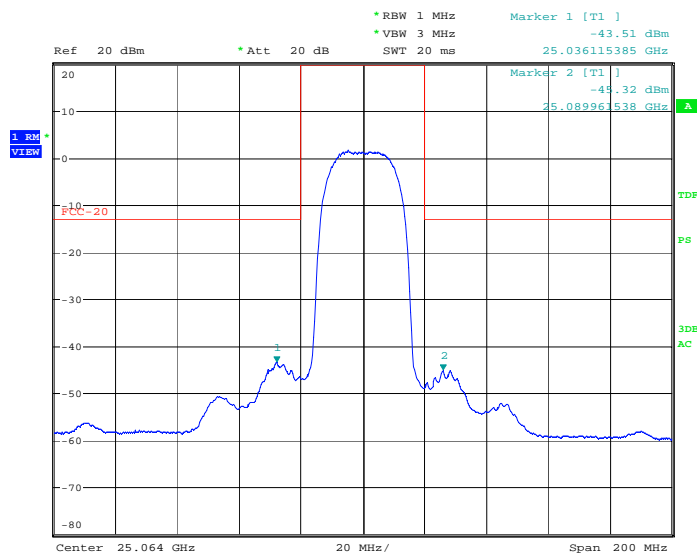
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**Table 19: Emission Mask, QPSK 20**

Operation Mode	Operation Frequency [GHz]	Spurious Frequency [GHz]	Spurious Level [dBm]	Limit [dBm]	Margin [dB]
A	25.064	25.036	-43.51	-13.00	30.51
		25.090	-45.32	-13.00	32.32
B	25.150	25.122	-42.89	-13.00	29.89
		25.176	-44.54	-13.00	31.54
C	25.236	25.208	-42.44	-13.00	29.44
		25.262	-44.39	-13.00	31.39

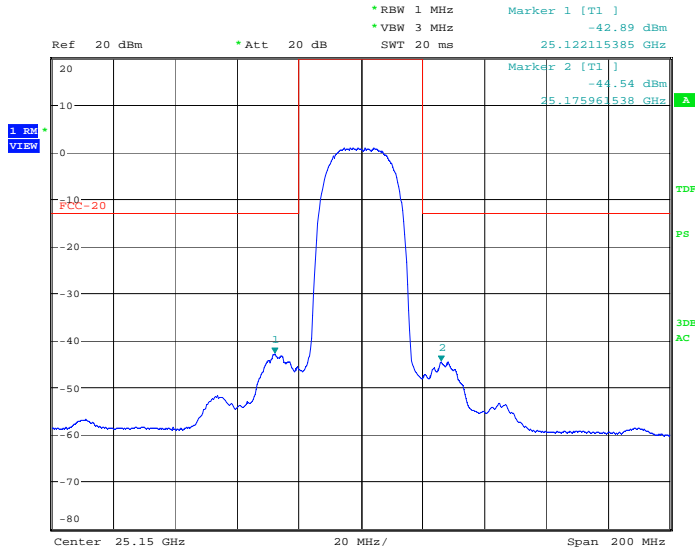
Note: Margin = Limit – Spurious level

**Figure 26: Emission Mask, Mode A, QPSK 20**



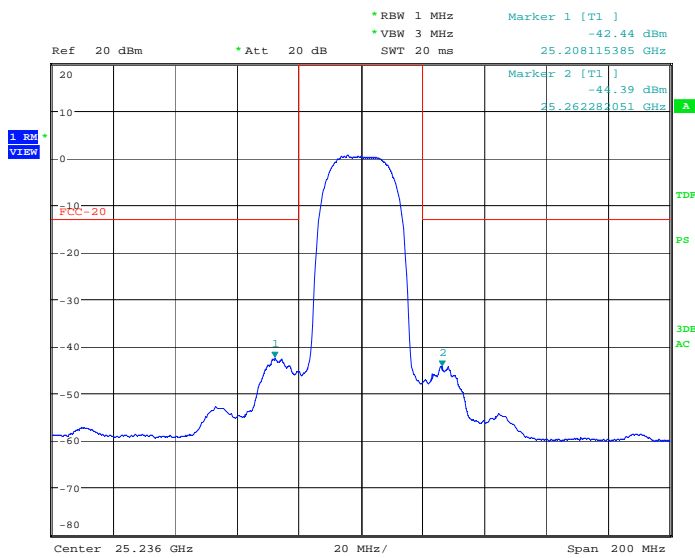
Emission Mask, Mode A, QPSK 20  
Date: 17.NOV.2011 15:34:03

Figure 27: Emission Mask, Mode B, QPSK 20



Emission Mask, Mode B, QPSK 20  
Date: 17.NOV.2011 15:42:21

Figure 28: Emission Mask, Mode C, QPSK 20



Emission Mask, Mode C, QPSK 20  
Date: 17.NOV.2011 15:54:46

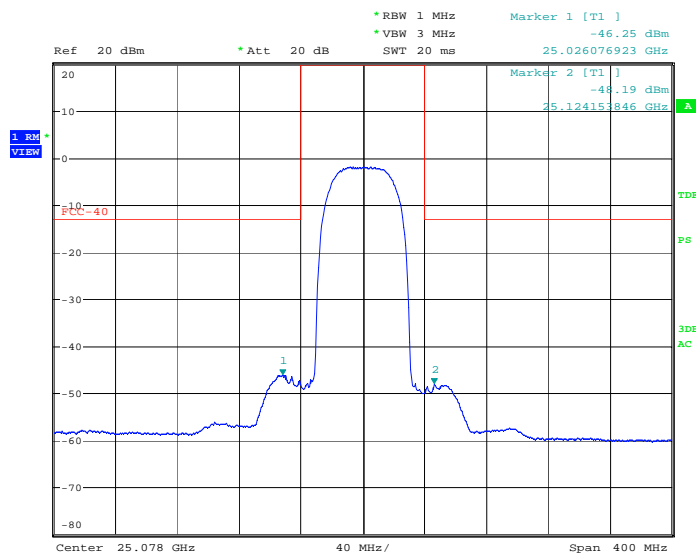


**Table 20: Emission Mask, QPSK 40**

Operation Mode	Operation Frequency [GHz]	Spurious Frequency [GHz]	Spurious Level [dBm]	Limit [dBm]	Margin [dB]
A	25.078	25.026	-46.25	-13.00	33.25
		25.124	-48.19	-13.00	35.19
B	25.150	25.099	-45.97	-13.00	32.97
		25.205	-47.63	-13.00	34.63
C	25.222	25.171	-46.23	-13.00	33.23
		25.276	-47.36	-13.00	34.36

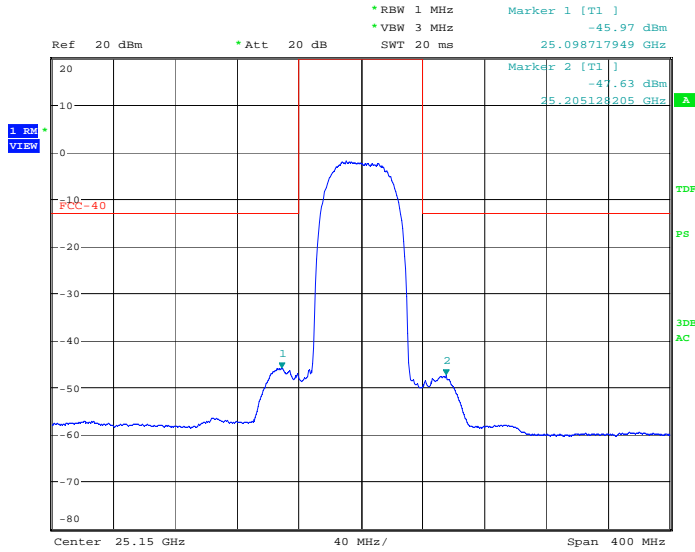
Note: Margin = Limit – Spurious level

**Figure 29: Emission Mask, Mode A, QPSK 40**



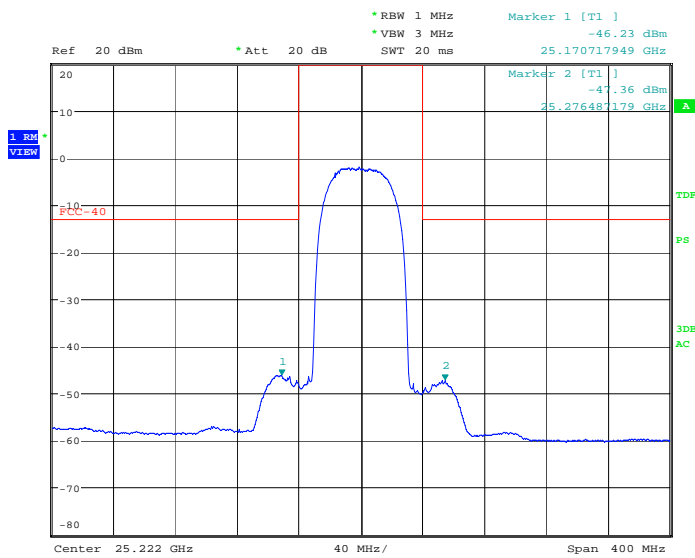
Emission Mask, Mode A, QPSK 40  
Date: 17.NOV.2011 16:05:26

**Figure 30: Emission Mask, Mode B, QPSK 40**



Emission Mask, Mode B, QPSK 40  
Date: 17.NOV.2011 16:14:45

**Figure 31: Emission Mask, Mode C, QPSK 40**



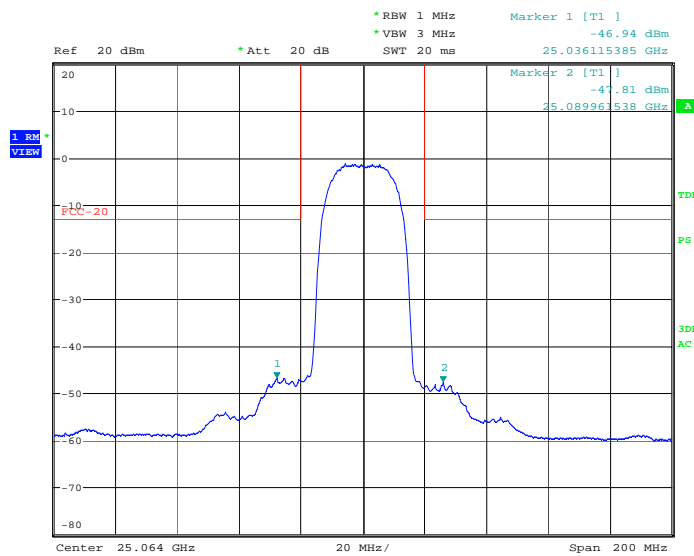
Emission Mask, Mode C, QPSK 40  
Date: 17.NOV.2011 16:32:26

**Table 21: Emission Mask, 16QAM 20**

Operation Mode	Operation Frequency [GHz]	Spurious Frequency [GHz]	Spurious Level [dBm]	Limit [dBm]	Margin [dB]
A	25.064	25.036	-46.94	-13.00	33.94
		25.090	-47.81	-13.00	34.81
B	25.150	25.129	-46.99	-13.00	33.99
		25.171	-47.95	-13.00	34.95
C	25.236	25.216	-47.03	-13.00	34.03
		25.257	-48.53	-13.00	35.53

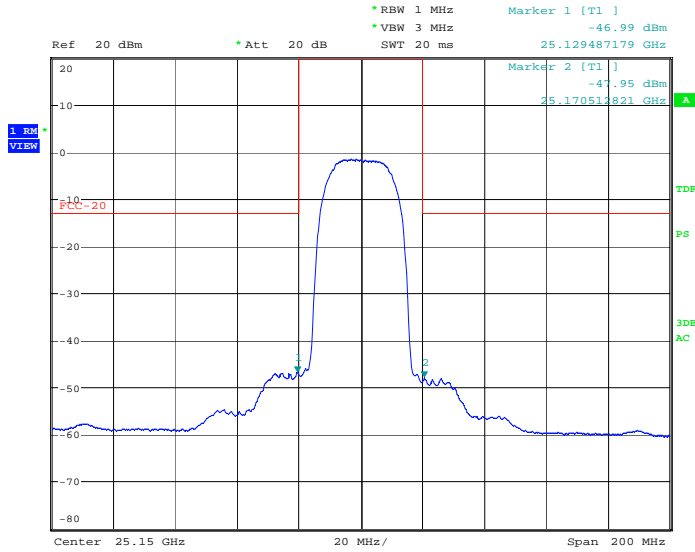
Note: Margin = Limit – Spurious level

**Figure 32: Emission Mask, Mode A, 16QAM 20**



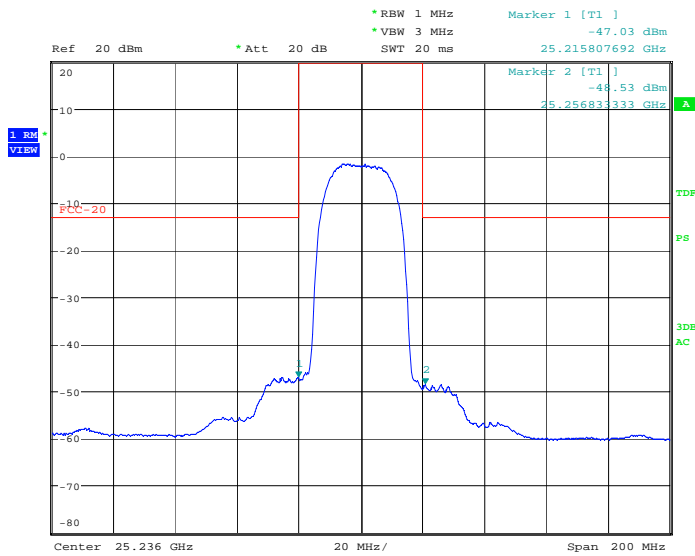
Emission Mask, Mode A, 16QAM 20  
Date: 17.NOV.2011 16:41:37

**Figure 33: Emission Mask, Mode B, 16QAM 20**



Emission Mask, Mode B, 16QAM 20  
Date: 17.NOV.2011 16:55:30

**Figure 34: Emission Mask, Mode C, 16QAM 20**



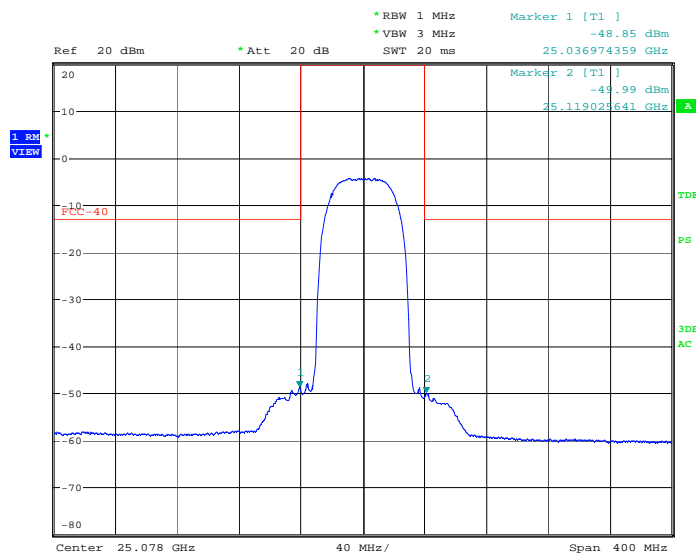
Emission Mask, Mode C, 16QAM 20  
Date: 17.NOV.2011 17:04:09

**Table 22: Emission Mask, 16QAM 40**

Operation Mode	Operation Frequency [GHz]	Spurious Frequency [GHz]	Spurious Level [dBm]	Limit [dBm]	Margin [dB]
A	25.078	25.037	-48.85	-13.00	35.85
		25.119	-49.99	-13.00	36.99
B	25.150	25.109	-48.01	-13.00	35.01
		25.192	-49.37	-13.00	36.37
C	25.222	25.181	-48.51	-13.00	35.51
		25.264	-49.82	-13.00	36.82

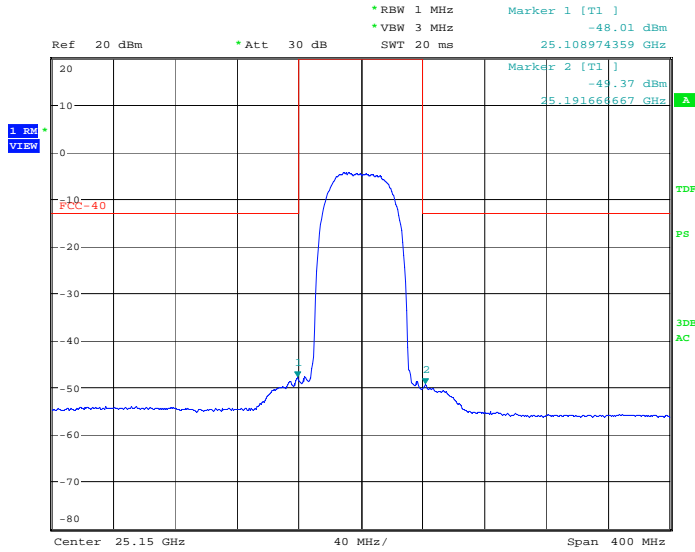
Note: Margin = Limit – Spurious level

**Figure 35: Emission Mask, Mode A, 16QAM 40**



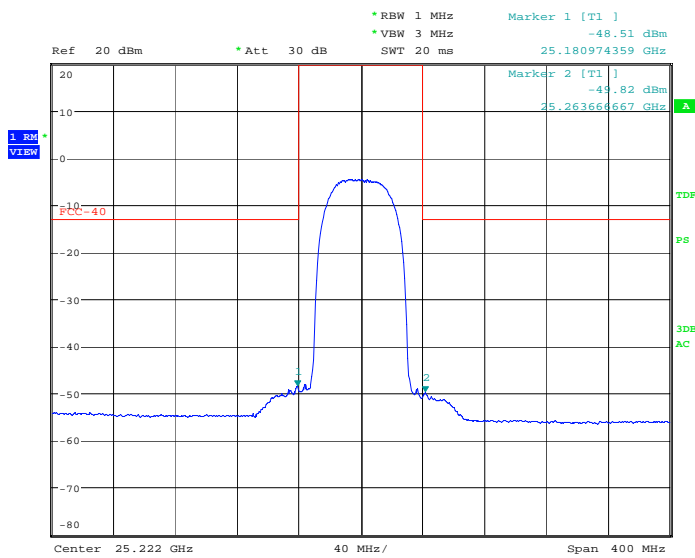
Emission Mask, Mode A, 16QAM 40  
Date: 17.NOV.2011 17:11:54

**Figure 36: Emission Mask, Mode B, 16QAM 40**



Emission Mask, Mode B, 16QAM 40  
Date: 17.NOV.2011 17:39:12

**Figure 37: Emission Mask, Mode C, 16QAM 40**



Emission Mask, Mode C, 16QAM 40  
Date: 17.NOV.2011 17:48:15

Produkte  
Products

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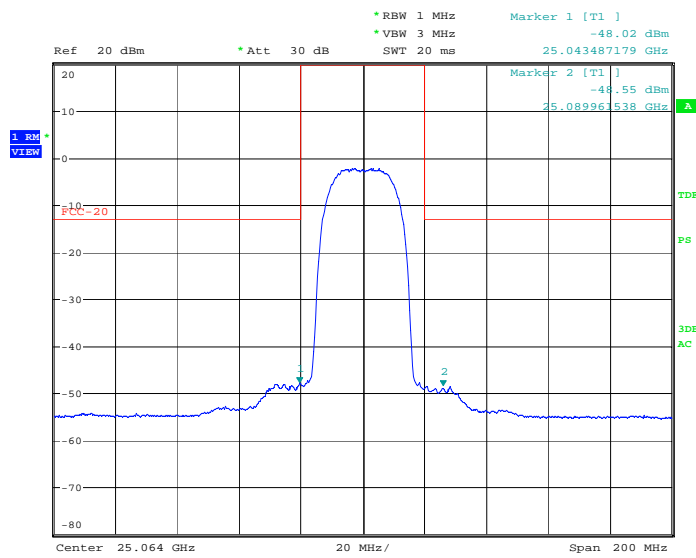
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**Table 23: Emission Mask, 64QAM 20**

Operation Mode	Operation Frequency [GHz]	Spurious Frequency [GHz]	Spurious Level [dBm]	Limit [dBm]	Margin [dB]
A	25.064	25.043	-48.02	-13.00	35.02
		25.090	-48.55	-13.00	35.55
B	25.150	25.130	-48.11	-13.00	35.11
		25.171	-49.14	-13.00	36.14
C	25.236	25.216	-48.79	-13.00	35.79
		25.257	-49.73	-13.00	36.73

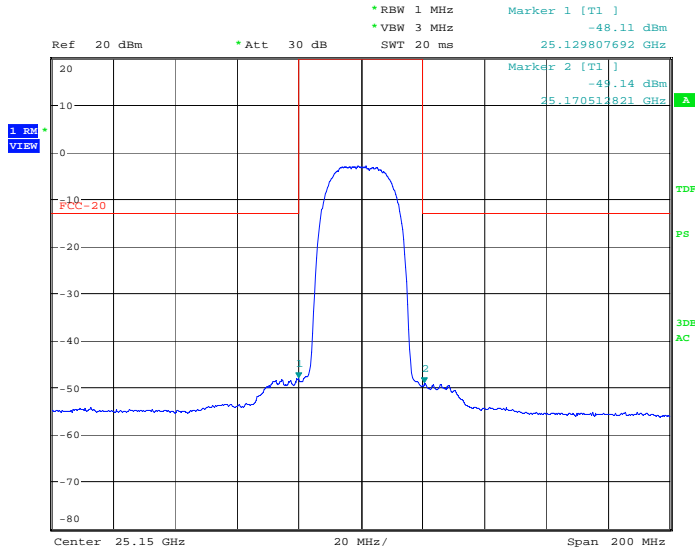
Note: Margin = Limit – Spurious level

**Figure 38: Emission Mask, Mode A, 64QAM 20**



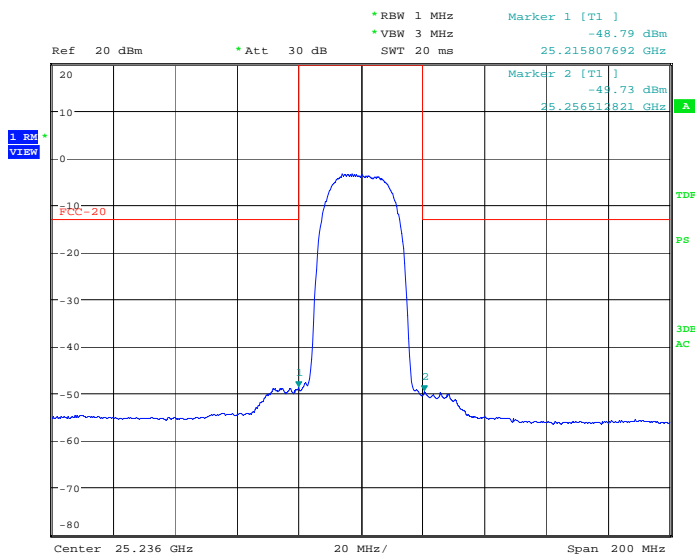
Emission Mask, Mode A, 64QAM 20  
Date: 17.NOV.2011 17:55:09

**Figure 39: Emission Mask, Mode B, 64QAM 20**



Emission Mask, Mode B, 64QAM 20  
Date: 17.NOV.2011 18:03:07

**Figure 40: Emission Mask, Mode C, 64QAM 20**



Emission Mask, Mode C, 64QAM 20  
Date: 17.NOV.2011 18:10:57



Produkte  
Products

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Test Report No.:

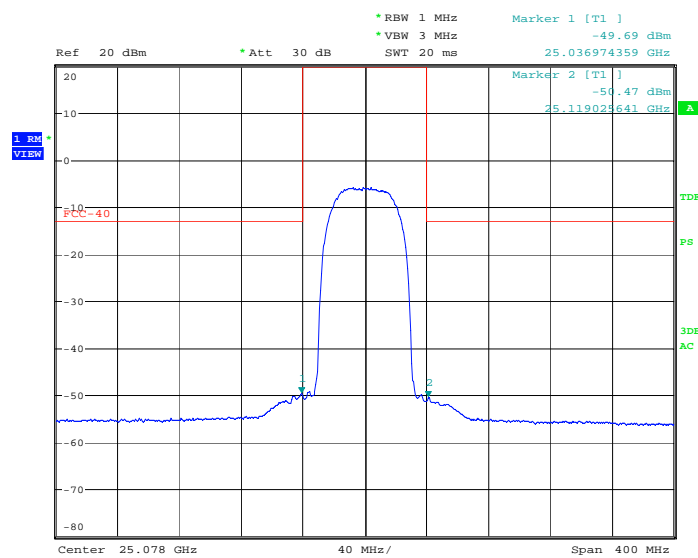
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**Table 24: Emission Mask, 64QAM 40**

Operation Mode	Operation Frequency [GHz]	Spurious Frequency [GHz]	Spurious Level [dBm]	Limit [dBm]	Margin [dB]
A	25.078	25.037	-49.69	-13.00	36.69
		25.119	-50.47	-13.00	37.47
B	25.150	25.109	-49.74	-13.00	36.74
		25.192	-50.69	-13.00	37.69
C	25.222	25.181	-50.33	-13.00	37.33
		25.264	-51.55	-13.00	38.55

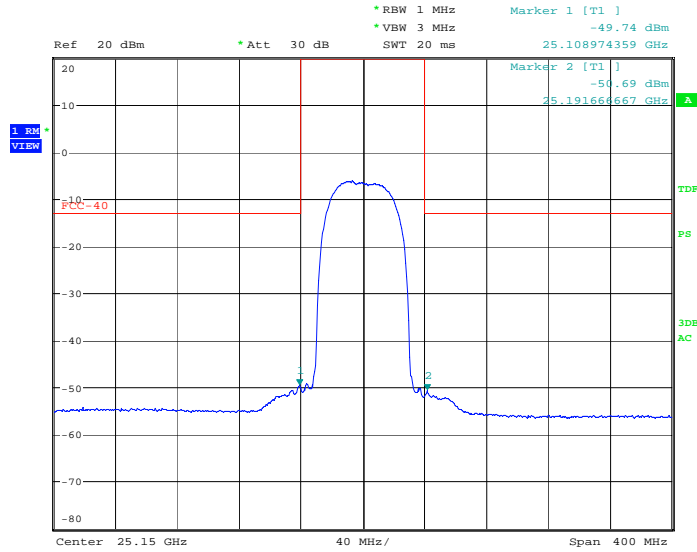
Note: Margin = Limit – Spurious level

**Figure 41: Emission Mask, Mode A, 64QAM 40**



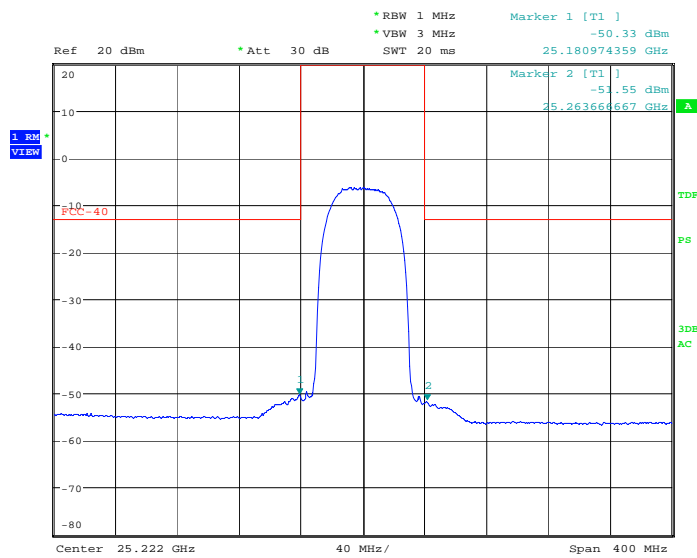
Emission Mask, Mode A, 64QAM 40  
Date: 17.NOV.2011 18:17:08

**Figure 42: Emission Mask, Mode B, 64QAM 40**



Emission Mask, Mode B, 64QAM 40  
Date: 17.NOV.2011 18:28:02

**Figure 43: Emission Mask, Mode C, 64QAM 40**



Emission Mask, Mode C, 64QAM 40  
Date: 17.NOV.2011 18:36:07

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## 5.2.5 Conducted Spurious Emissions of Transmitter

**RESULT:****PASS**

Date of testing: 2011-11-10, 2011-11-17

Ambient temperature: 23, 19°C

Relative humidity: 37, 34%

Atmospheric pressure: 1018, 2023hPa

Requirements:

FCC 101.111(a)(2)(iii)

The mean power of emissions must be attenuated below the mean output power of the transmitter in accordance with the following schedule:

In any 1 MHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \text{Log}_{10}$  (the mean output power in watts) decibels, or 80 decibels, whichever is the lesser attenuation.

Test procedure:

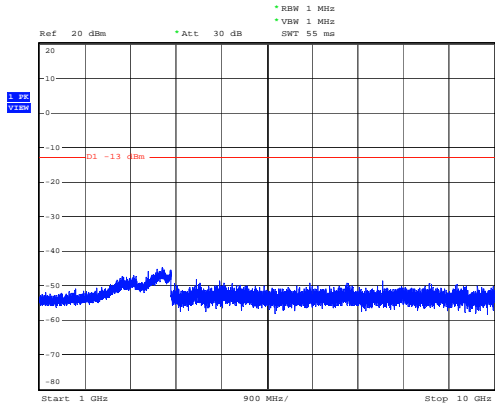
FCC 2.1051 and 2.1057

The conducted spurious emissions were measured at the antenna port with a spectrum analyzer using a peak detector with a resolution bandwidth of 1MHz and a video bandwidth of 1MHz.

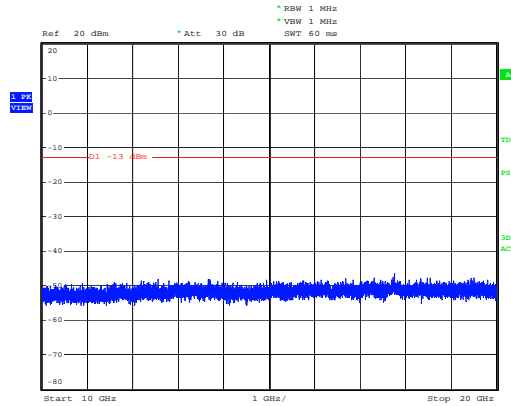
The limit is -13dBm for all modulations and operation frequencies.

Prechecks were performed in the range 9kHz-100GHz in modes A, B, C and with the modulations QPSK 20, QPSK 40, 16QAM 20, 16QAM 40, 64QAM 20, 64QAM 40. No spurious emission was observed. Measurement data corresponding to the modulation 64QAM 40 for the modes A, B, C in the range 1-100GHz is given here below for reference. The readings of the measurements take into account the loss generated by all the involved cables.

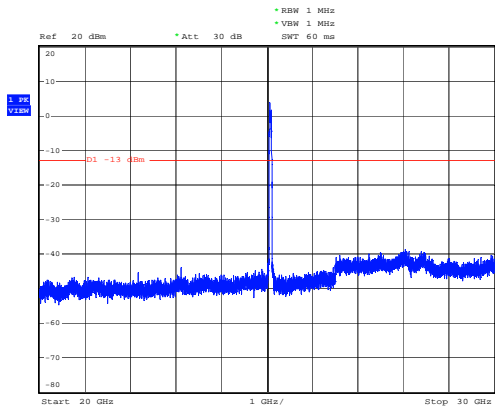
Figure 44: Conducted Spurious Emissions of Transmitter, Spectral Diagrams, 1-40GHz, Mode A, 64QAM 40



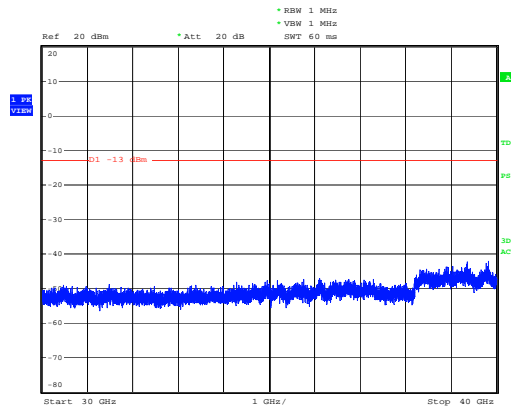
Conducted Spurious Emission, Mode A, 64QAM 40  
Date: 17.NOV.2011 18:21:40



Conducted Spurious Emission, Mode A, 64QAM 40  
Date: 17.NOV.2011 18:21:51



Conducted Spurious Emission, Mode A, 64QAM 40  
Date: 17.NOV.2011 18:22:07



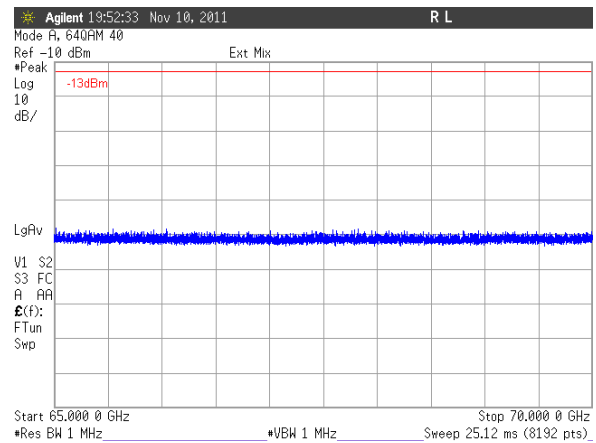
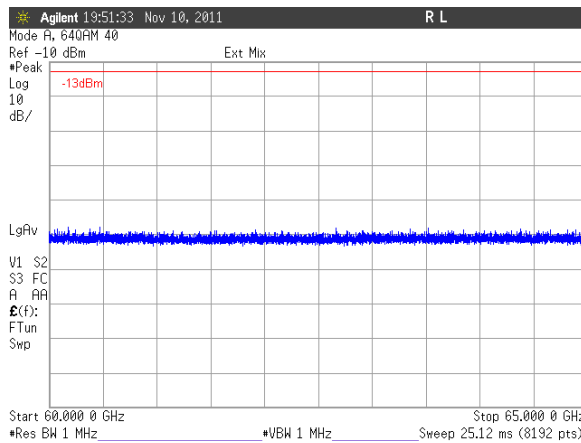
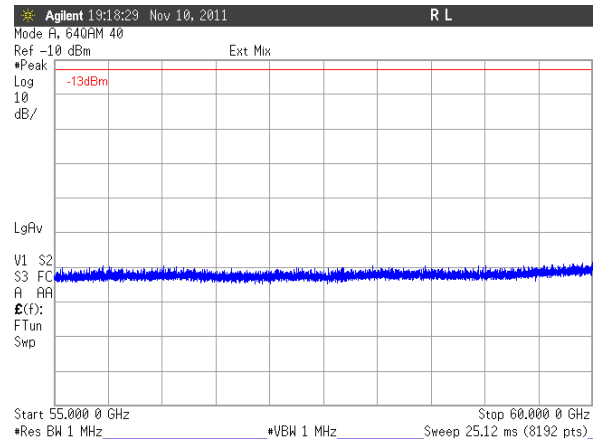
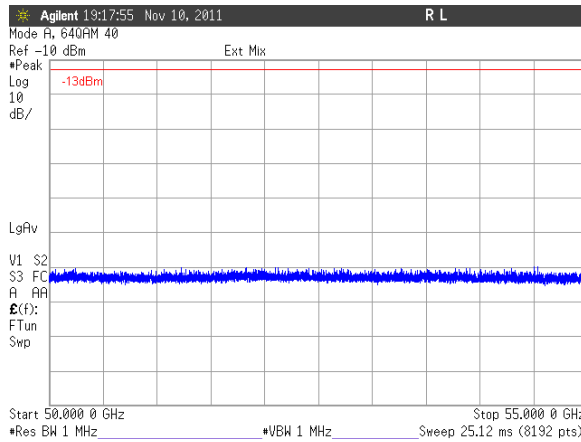
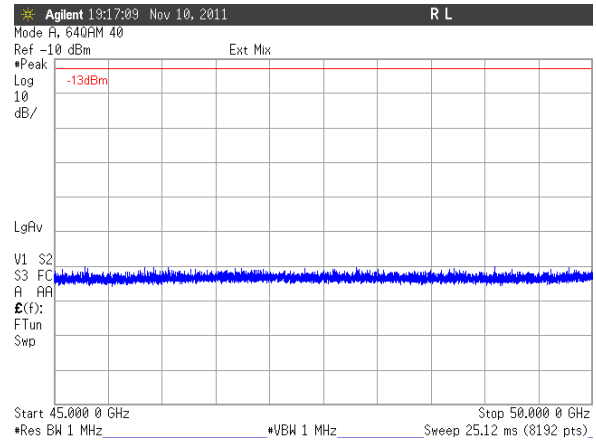
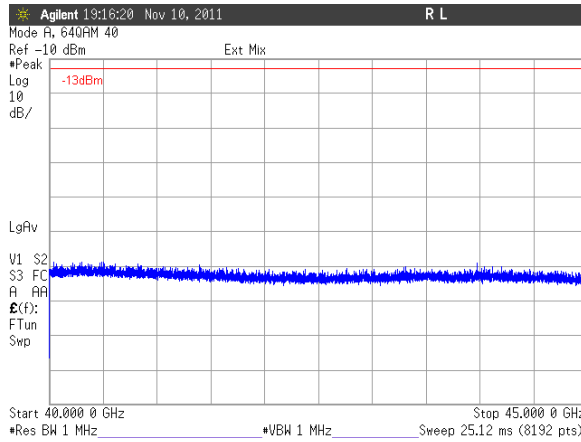
Conducted Spurious Emission, Mode A, QPSK 40  
Date: 17.NOV.2011 16:08:32

Produkte  
Products

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**Figure 45: Conducted Spurious Emissions of Transmitter, Spectral Diagrams, 40-70GHz, Mode A, 64QAM 40**

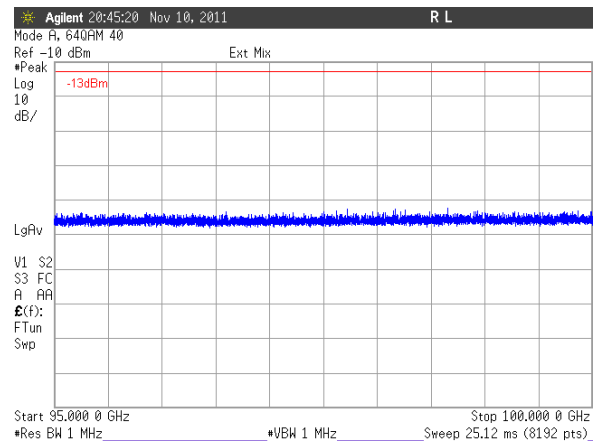
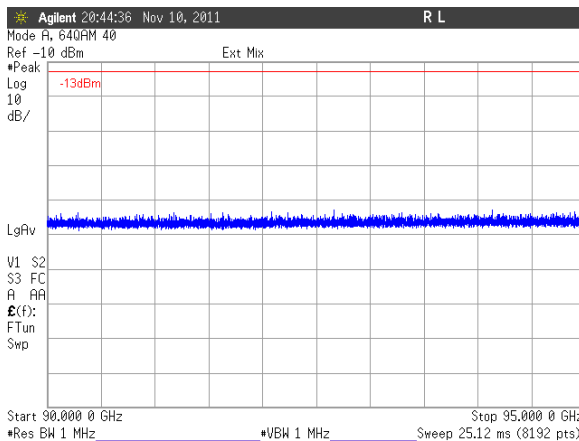
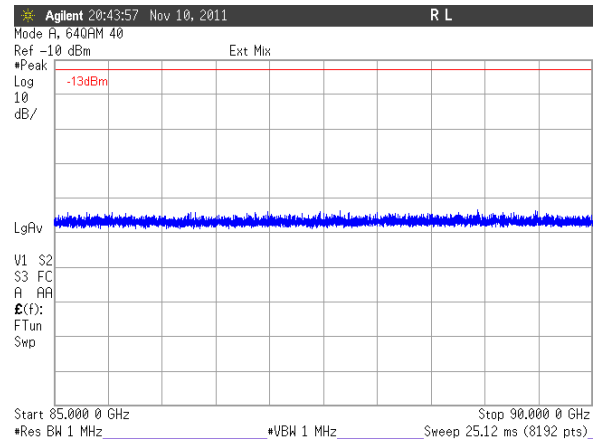
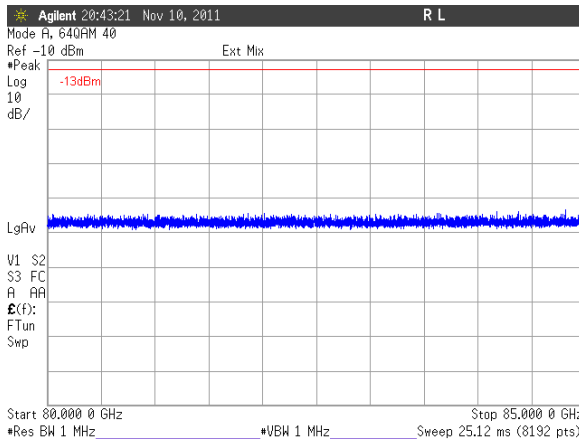
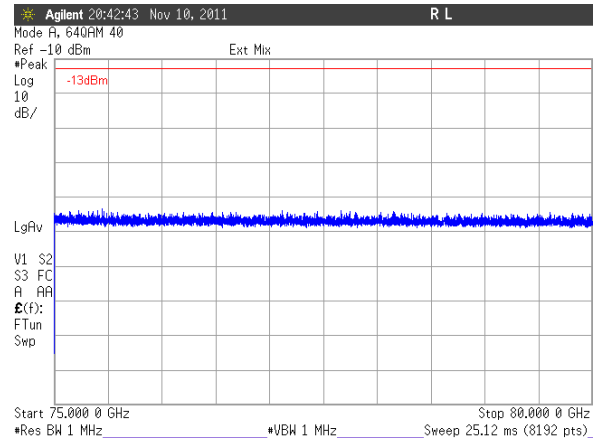
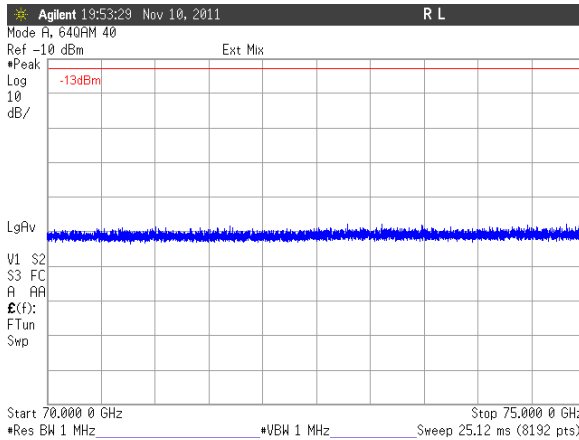


Produkte  
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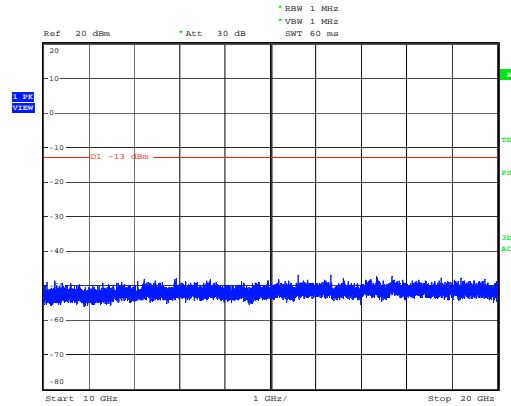
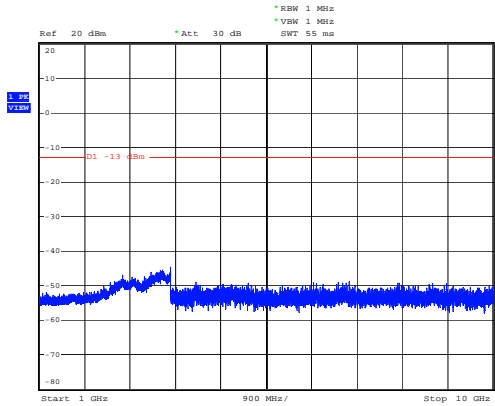
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**Figure 46: Conducted Spurious Emissions of Transmitter, Spectral Diagrams, 70-100GHz, Mode A, 64QAM 40**

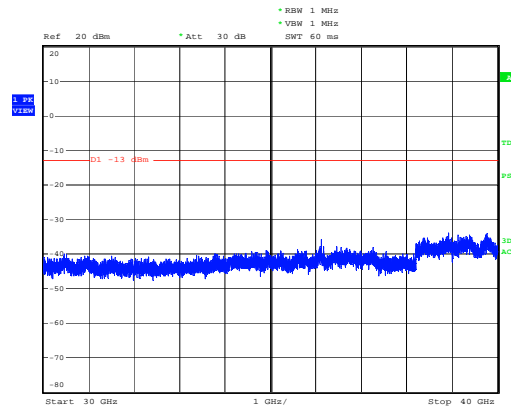
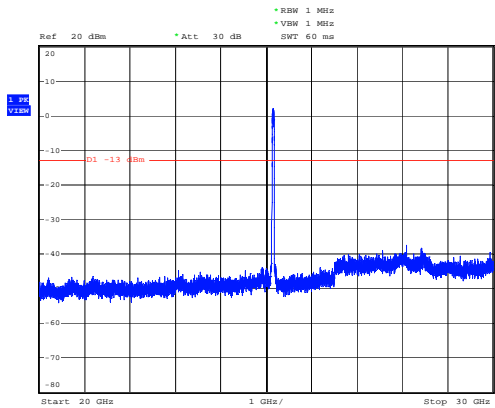


**Figure 47: Conducted Spurious Emissions of Transmitter, Spectral Diagrams, 1-40GHz, Mode B, 64QAM 40**



Conducted Spurious Emission, Mode B, 64QAM 40  
Date: 17.NOV.2011 18:30:19

Conducted Spurious Emission, Mode B, 64QAM 40  
Date: 17.NOV.2011 18:30:29



Conducted Spurious Emission, Mode B, 64QAM 40  
Date: 17.NOV.2011 18:30:39

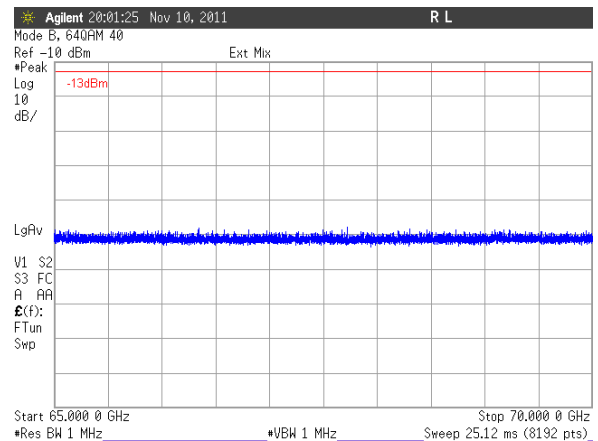
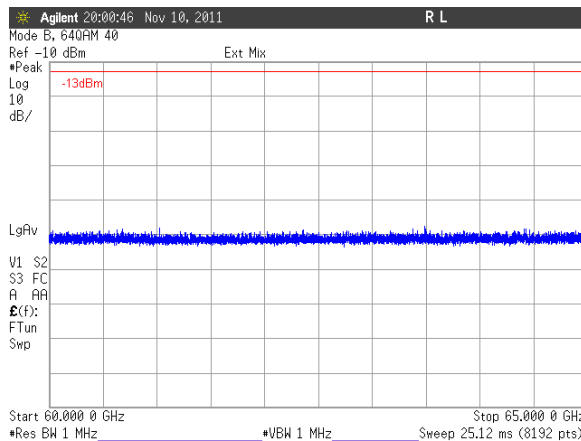
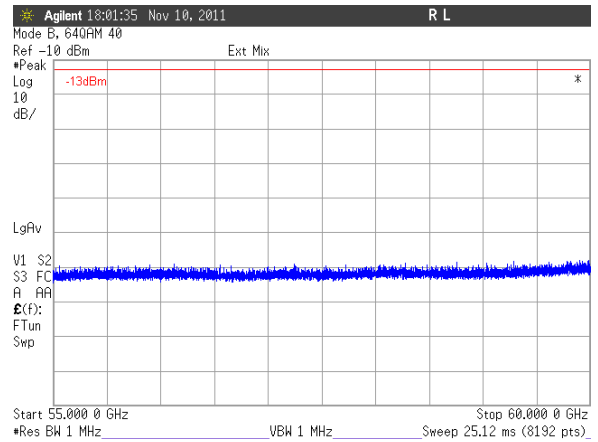
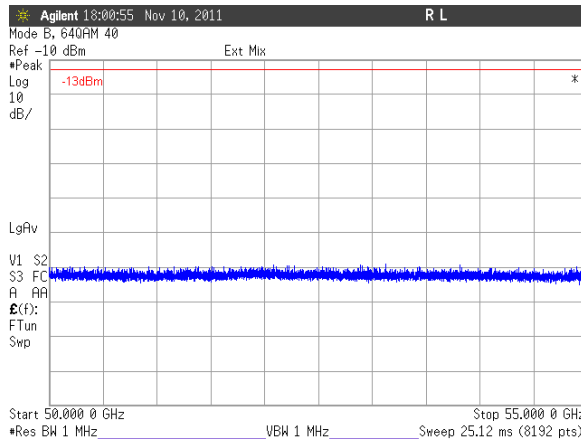
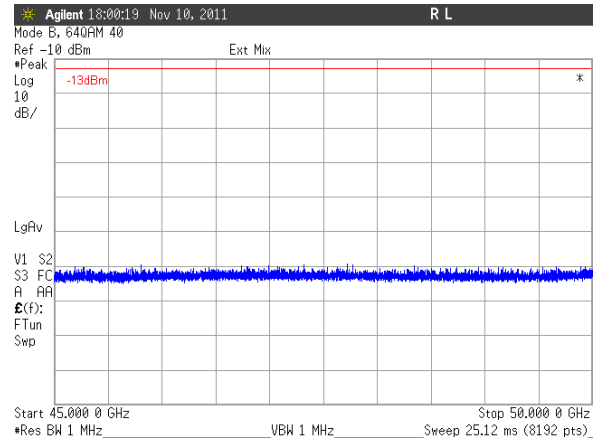
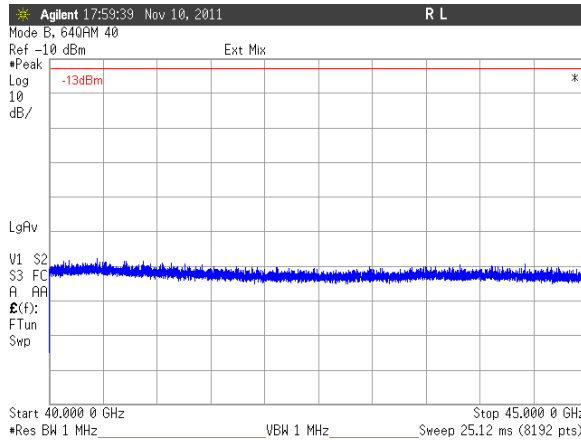
Conducted Spurious Emission, Mode B, 64QAM 40  
Date: 17.NOV.2011 18:30:50

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**Figure 48: Conducted Spurious Emissions of Transmitter, Spectral Diagrams, 40-70GHz, Mode B, 64QAM 40**





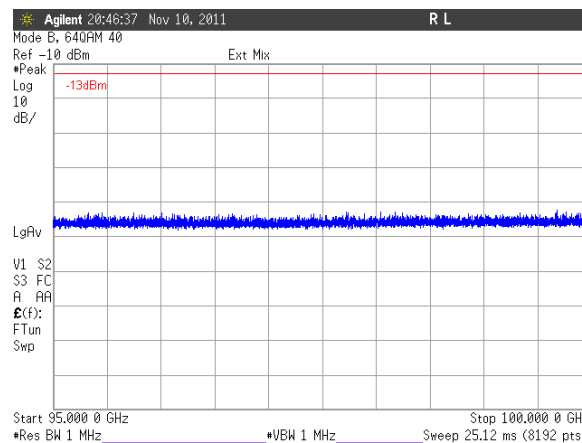
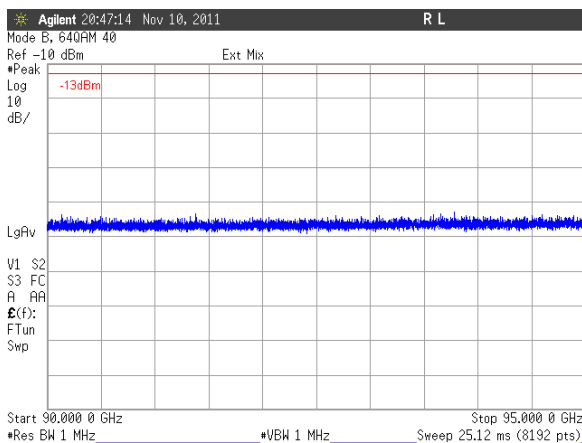
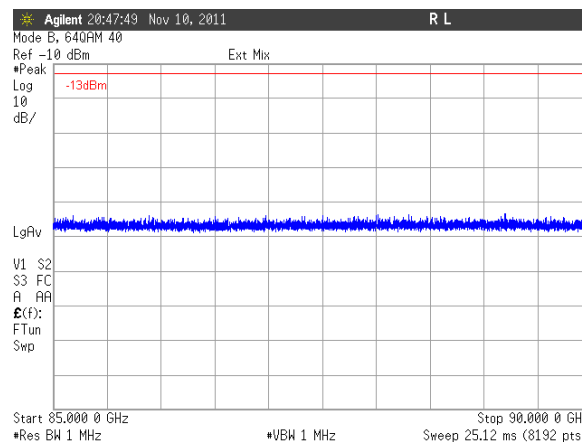
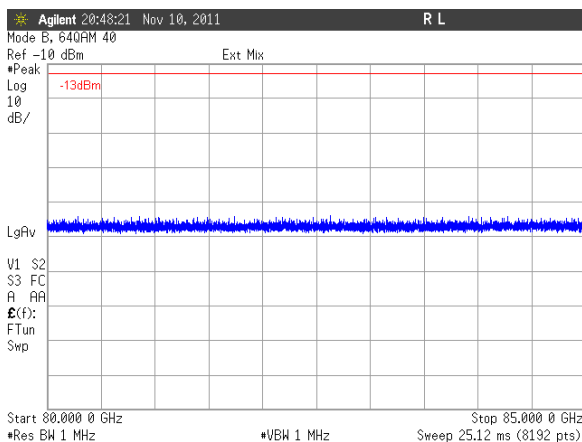
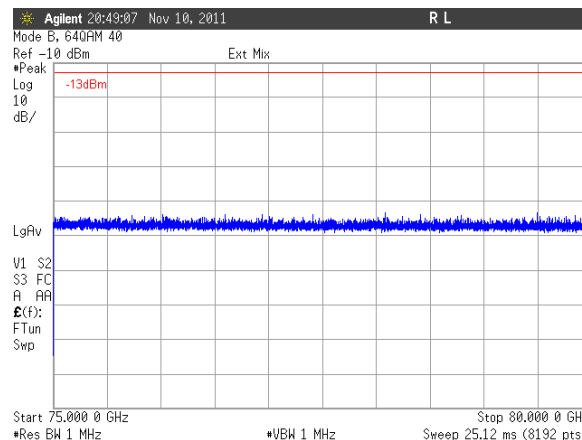
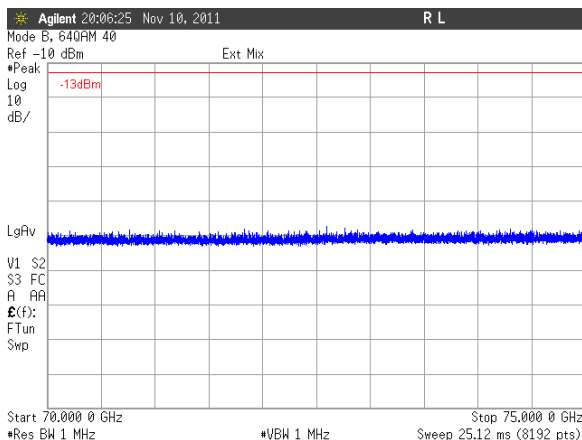
Produkte  
Products

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**Figure 49: Conducted Spurious Emissions of Transmitter, Spectral Diagrams, 70-100GHz, Mode B, 64QAM 40**

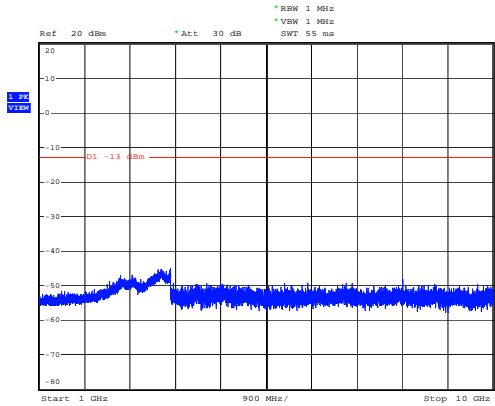


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Products

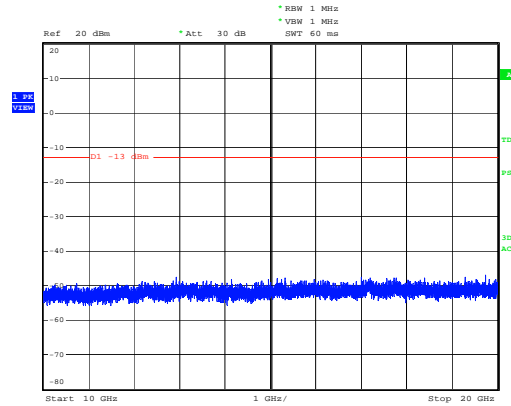
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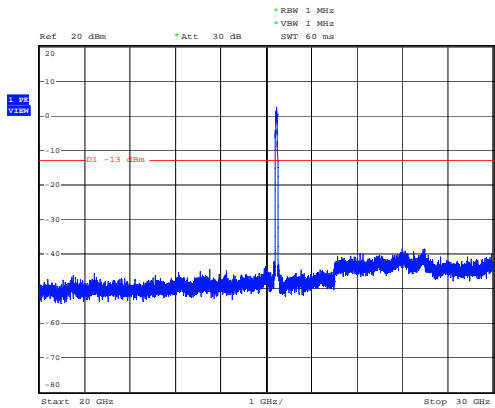
Figure 50: Conducted Spurious Emissions of Transmitter, Spectral Diagrams, 1-40GHz, Mode C, 64QAM 40



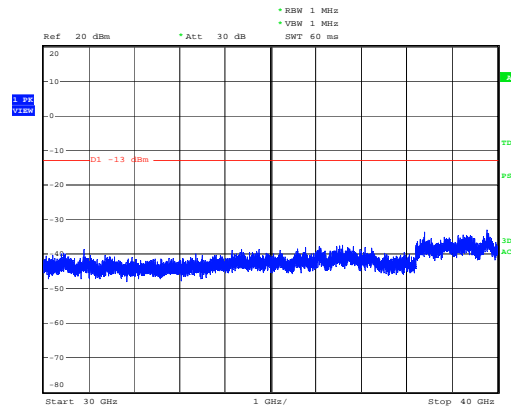
Conducted Spurious Emission, Mode C, 64QAM 40  
Date: 17.NOV.2011 18:38:11



Conducted Spurious Emission, Mode C, 64QAM 40  
Date: 17.NOV.2011 18:38:21



Conducted Spurious Emission, Mode C, 64QAM 40  
Date: 17.NOV.2011 18:38:31



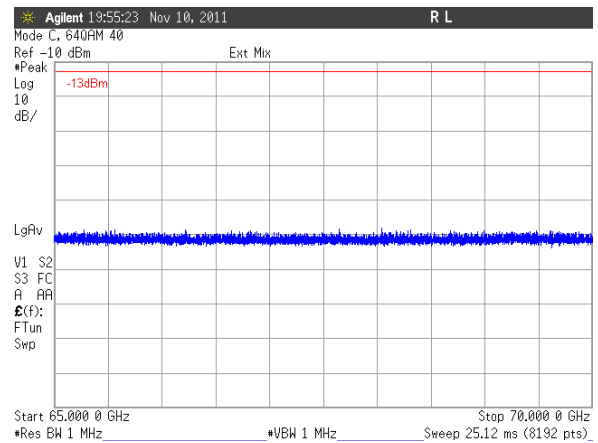
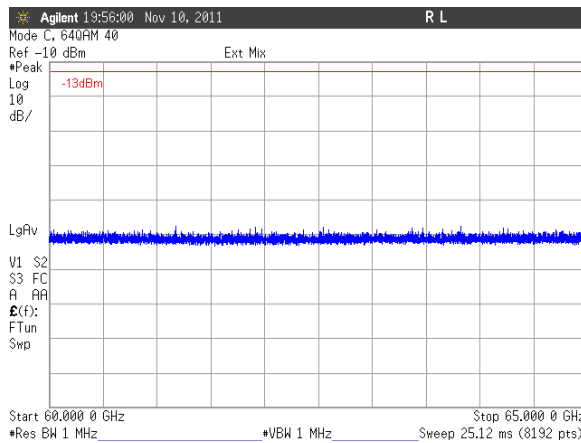
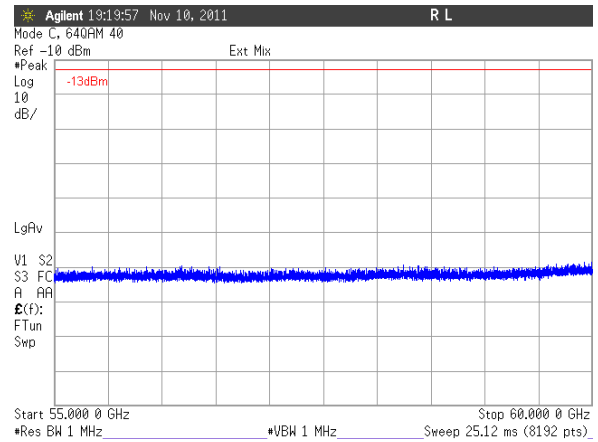
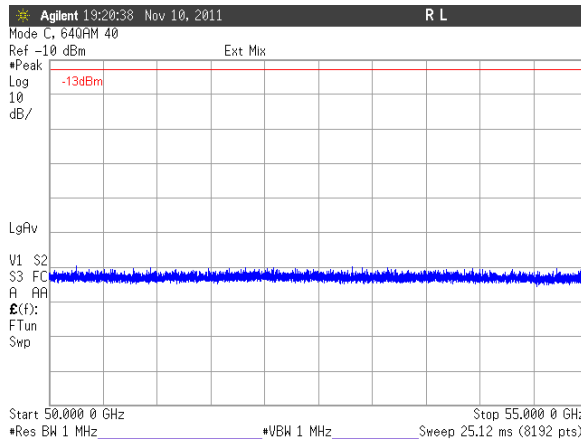
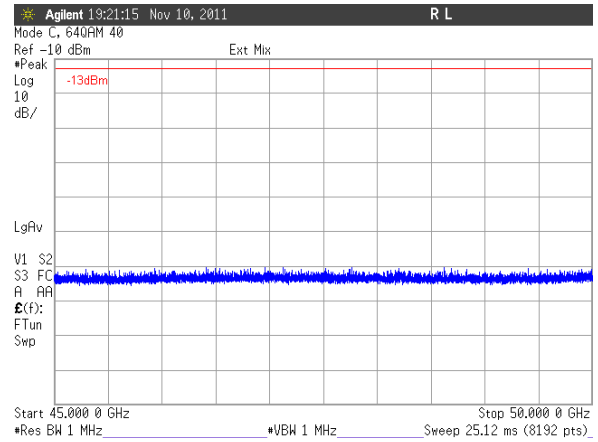
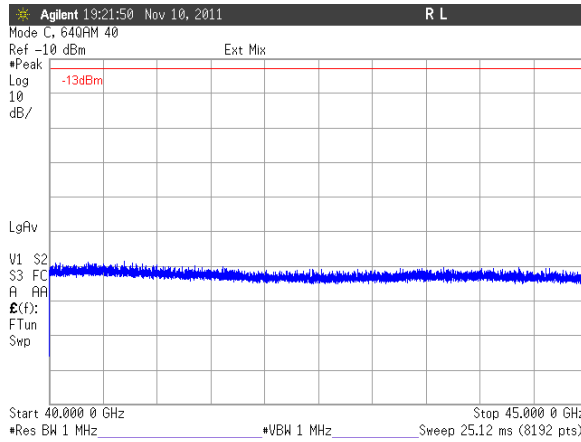
Conducted Spurious Emission, Mode C, 64QAM 40  
Date: 17.NOV.2011 18:38:41

Produkte  
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**Figure 51: Conducted Spurious Emissions of Transmitter, Spectral Diagrams, 40-70GHz, Mode C, 64QAM 40**

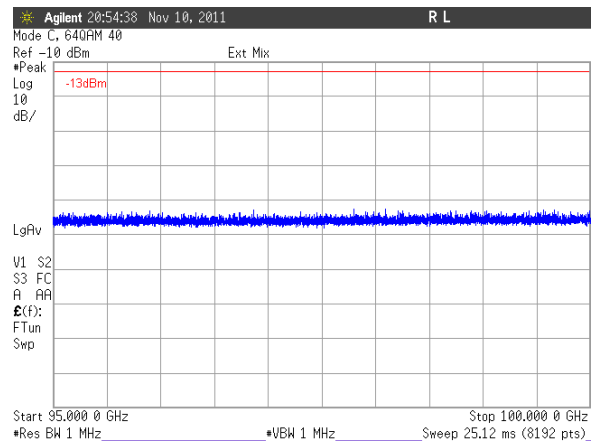
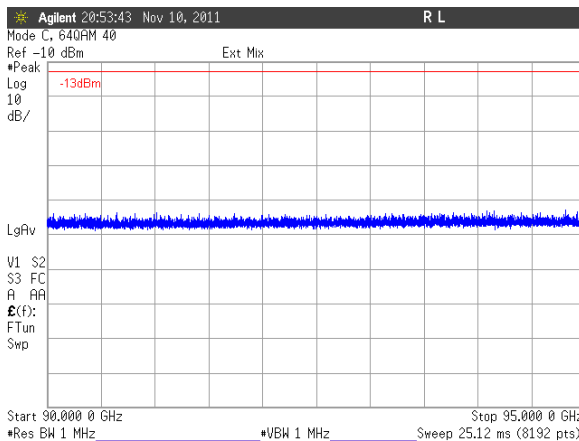
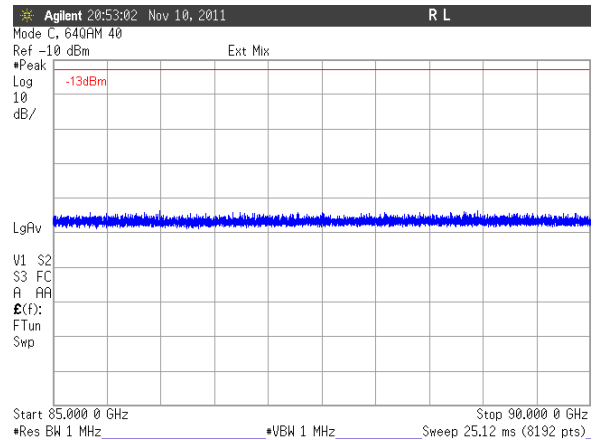
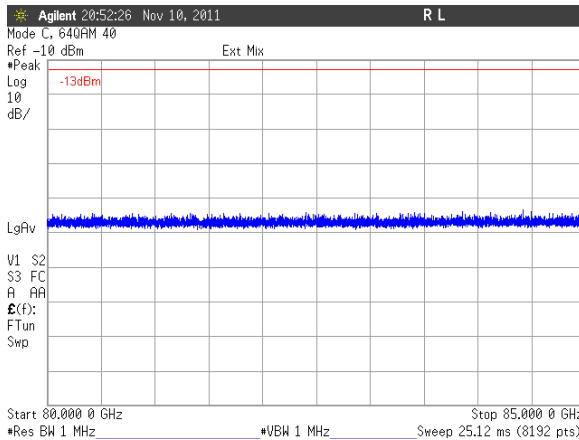
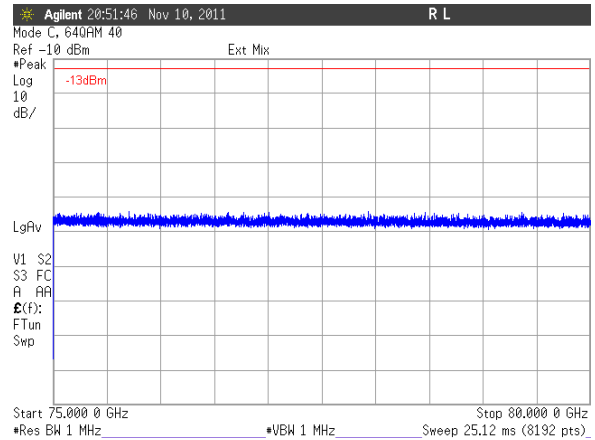
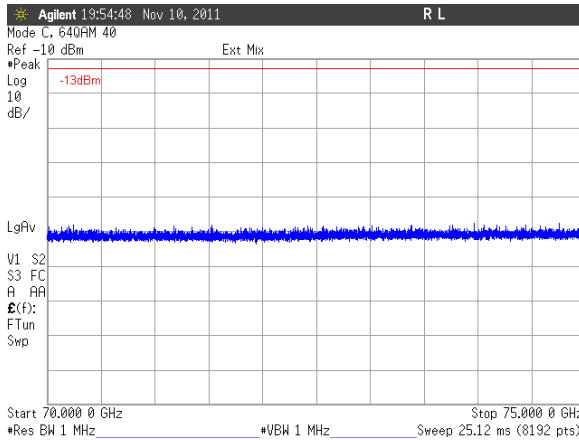


Produkte  
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**Figure 52: Conducted Spurious Emissions of Transmitter, Spectral Diagrams, 70-100GHz, Mode C, 64QAM 40**



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## 5.3 Radiated Measurements

### 5.3.1 Radiated Spurious Emissions of Transmitter

**RESULT:**
**PASS**

Date of testing:	2011-10-31 till 2011-11-04
Ambient temperature:	24°C
Relative humidity:	41 to 47%
Atmospheric pressure:	1014 to 1025hPa
Frequency range:	9kHz - 100GHz
Measurement distance:	3m in the range 9kHz-40GHz 45cm in the range 40-100GHz
Kind of test site:	Semi Anechoic Chamber

Requirements:

FCC 101.111(a)(2)(iii)

The mean power of emissions must be attenuated below the mean output power of the transmitter in accordance with the following schedule:

In any 1 MHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \text{Log}_{10}$  (the mean output power in watts) decibels, or 80 decibels, whichever is the lesser attenuation.

Test procedure:

FCC 2.1053 and 2.1057

The EUT was placed on a nonconductive turntable 0.8m above the ground plane in a semi anechoic chamber. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (H, V) were varied in order to ensure that maximum emission amplitudes were attained.

Prechecks were performed in the range 9kHz-100GHz in modes A, B, C and with the modulations QPSK 20, QPSK 40, 16QAM 20, 16QAM 40, 64QAM 20, 64QAM 40. The measuring antenna was placed at a 3m distance for frequencies below 40GHz and at 45cm distance for frequencies above 40GHz.

The limit is -13dBm for all modulations and operation frequencies. A limit of -13dBm EIRP corresponds to a field strength of 82.2dBuV/m at 3m distance. This limit is calculated using the formula  $[\text{limit power EIRP in W}] = ([\text{limit field strength in V/m}] \times [\text{distance in m}])^2 / 30$ .

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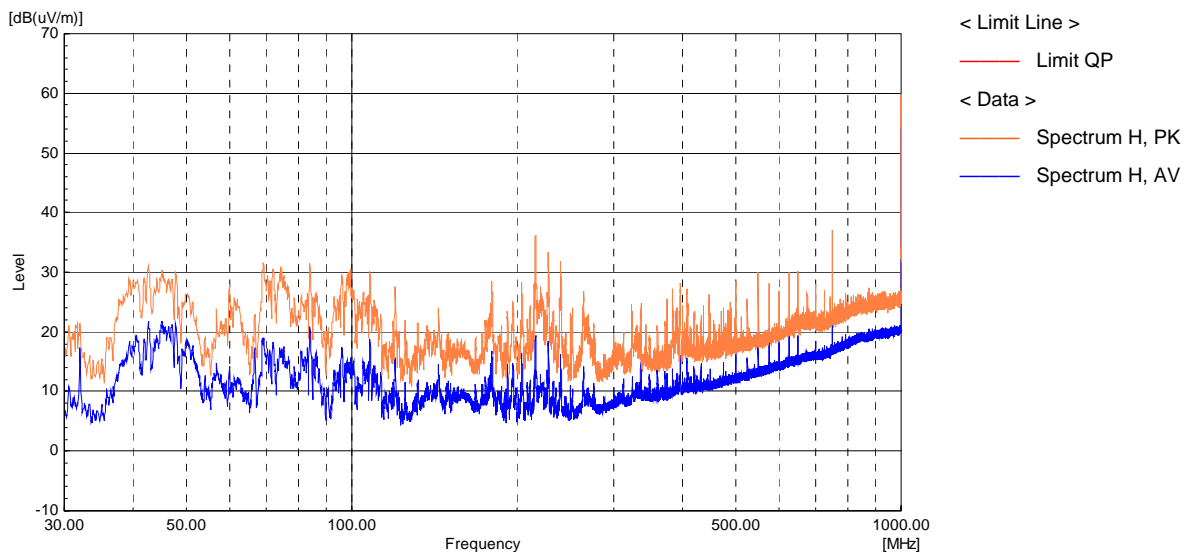
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No spurious emission less than 20dB below the limit was observed. Precheck spectra taken for mode B, 64QAM 40 (worst case operation mode) are given here below for the range 30MHz-100GHz, for reference purpose. Precheck spectra were taken with a resolution bandwidth of 100kHz in the range 30-1000MHz and with a resolution bandwidth of 1MHz for frequencies above 1GHz.

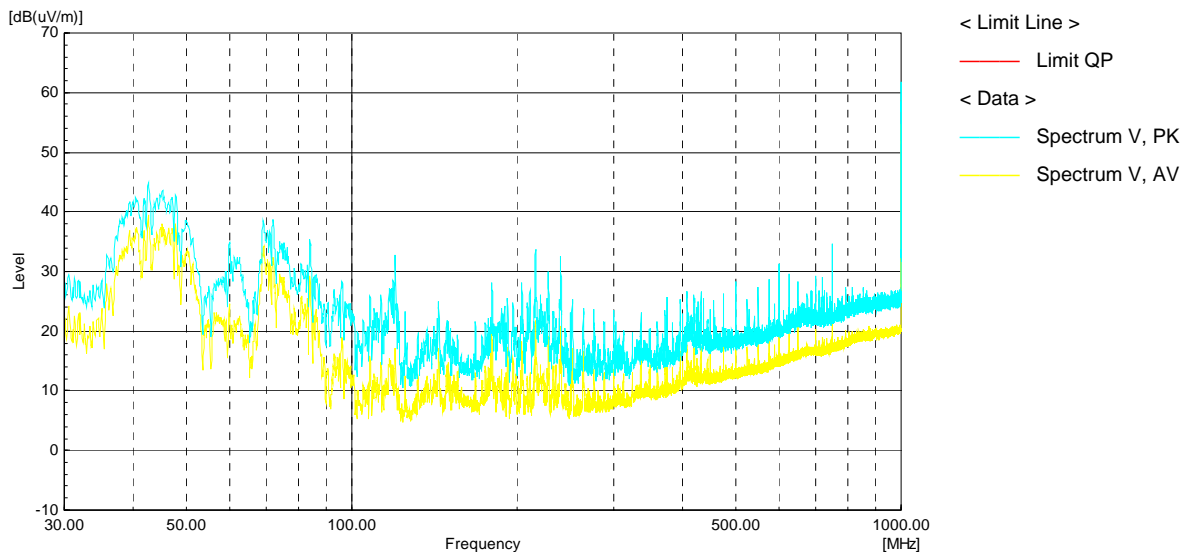
The spectra given here below for the range 40-100GHz (taken at a distance of 45cm) do not show any spurious or harmonic. Further investigations have however been made with a distance less than 10cm in the range 40-100GHz to confirm that no spurious or harmonic can be detected in this frequency range.

**Figure 53: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 30MHz - 1GHz, Horizontal Antenna Orientation, Mode B, 64QAM 40**



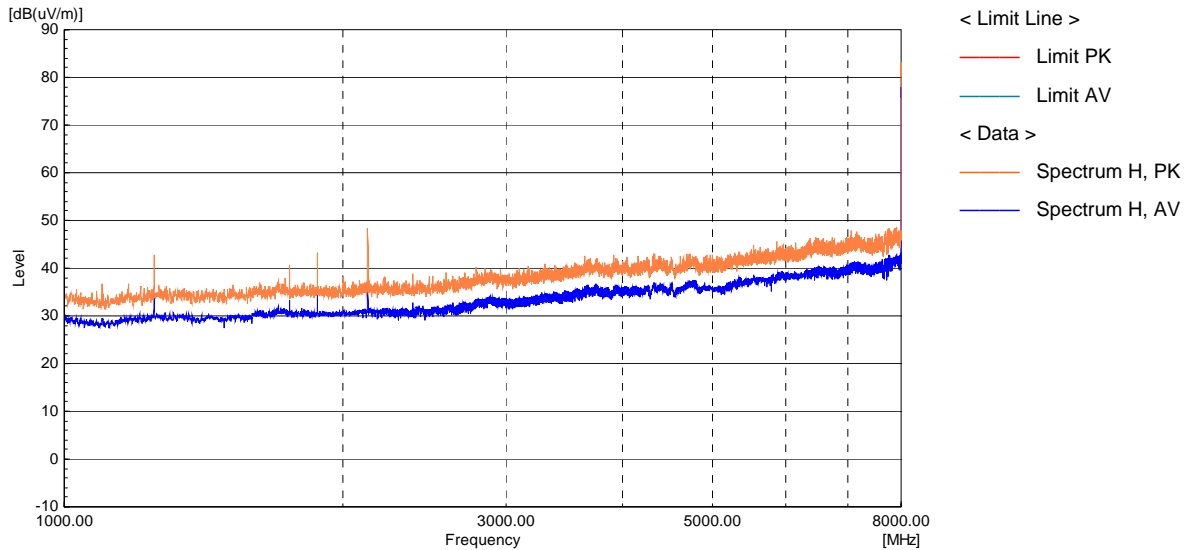
Note: This spectrum was taken for the EUT orientation V.

**Figure 54: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 30MHz - 1GHz, Vertical Antenna Orientation, Mode B, 64QAM 40**



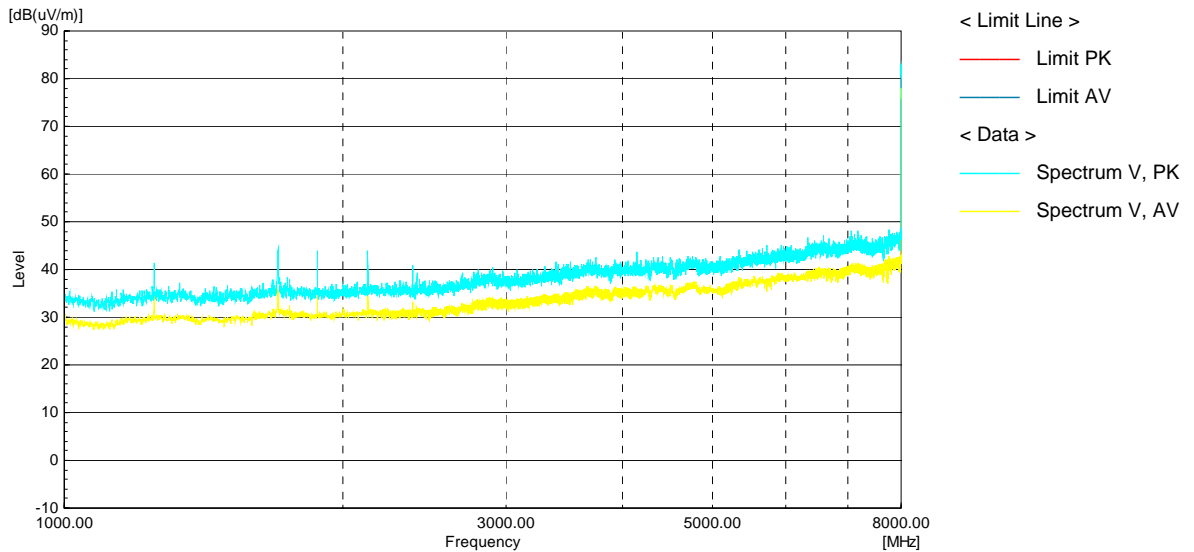
Note: This spectrum was taken for the EUT orientation V.

**Figure 55: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 1 – 8GHz, Horizontal Antenna Orientation, Mode B, 64QAM 40**



Note: This spectrum was taken for the EUT orientation V.

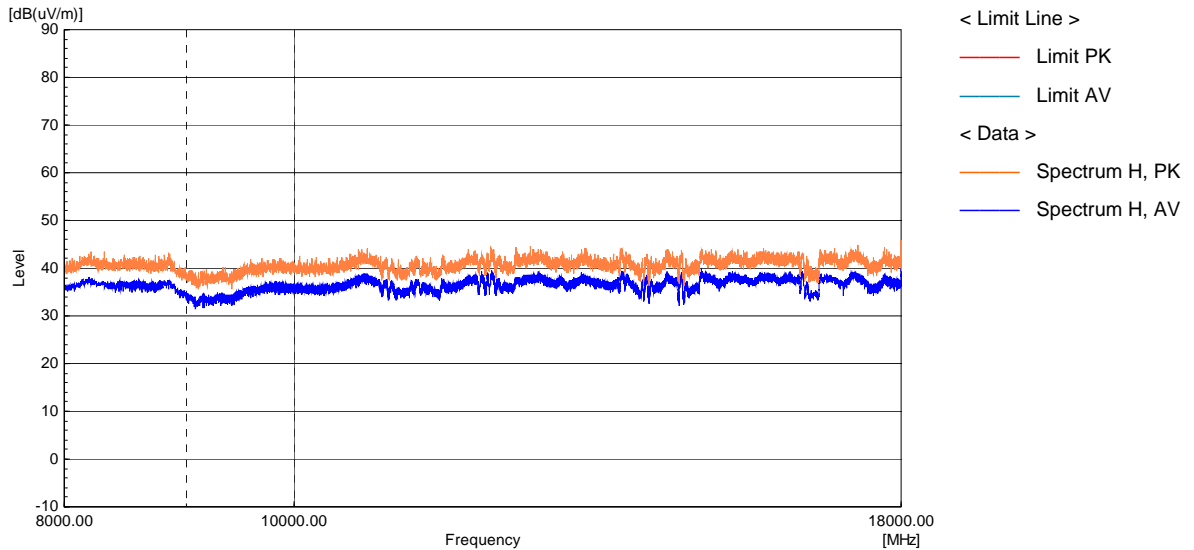
**Figure 56: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 1 – 8GHz, Vertical Antenna Orientation, Mode B, 64QAM 40**



Note: This spectrum was taken for the EUT orientation V.

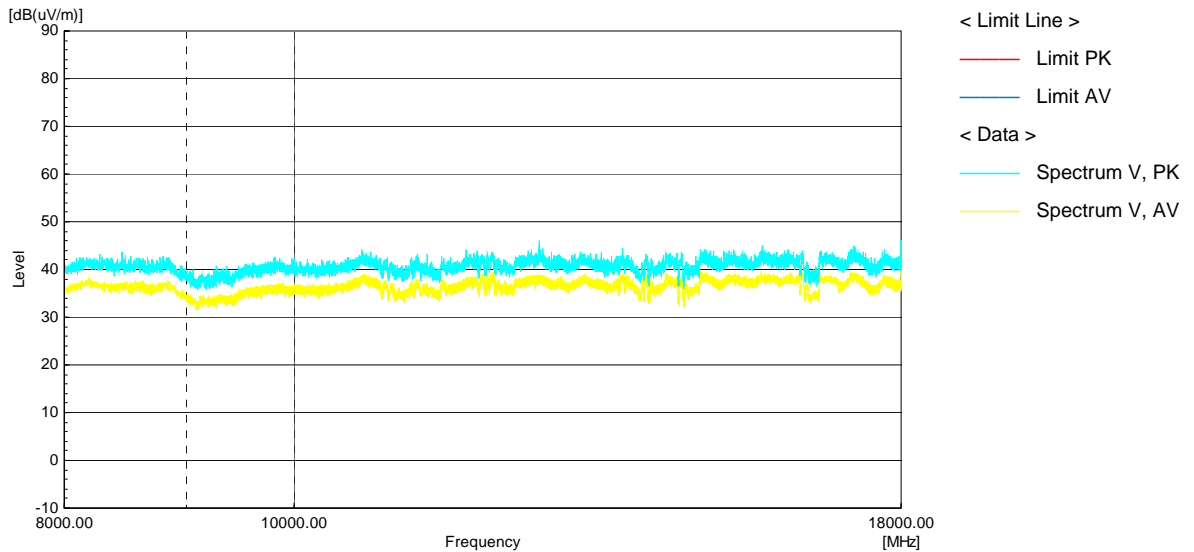


**Figure 57: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 8 – 18GHz, Horizontal Antenna Orientation, Mode B, 64QAM 40**



Note: This spectrum was taken for the EUT orientation V.

**Figure 58: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 8 – 18GHz, Vertical Antenna Orientation, Mode B, 64QAM 40**



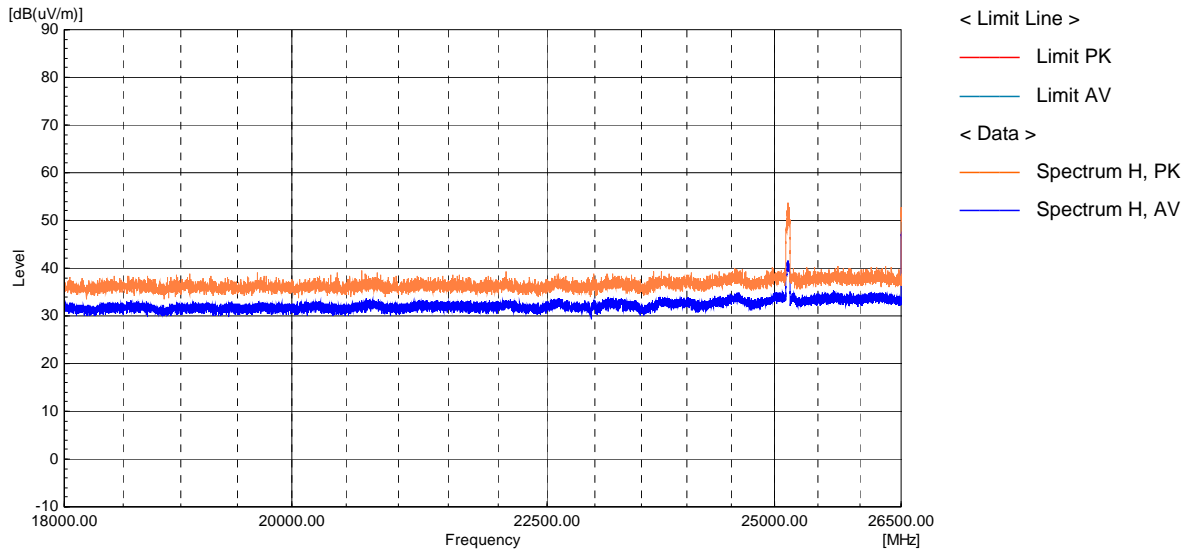
Note: This spectrum was taken for the EUT orientation V.

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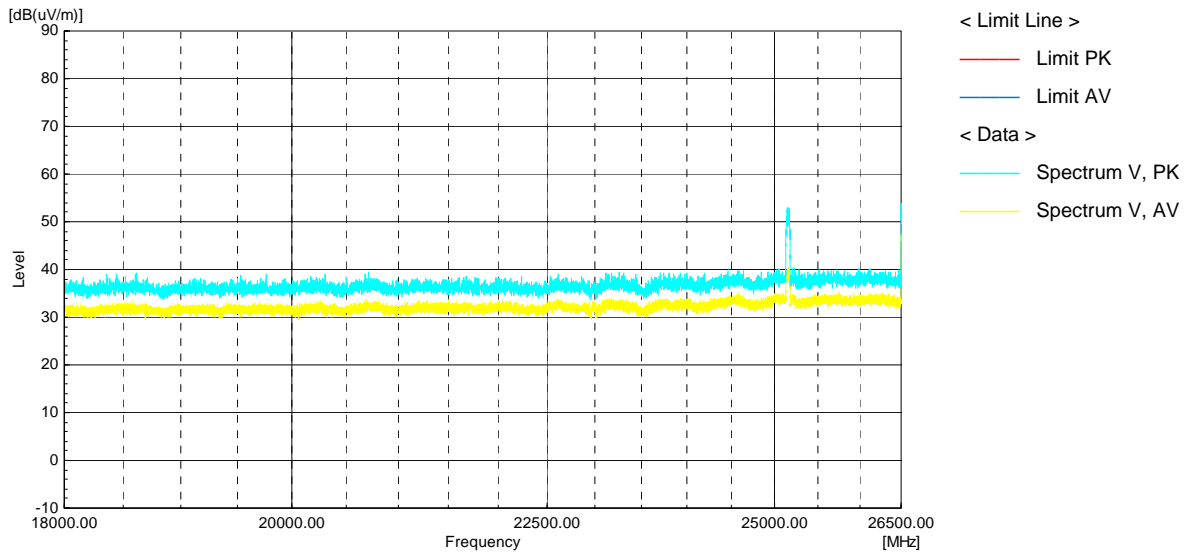
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**Figure 59: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 18 – 26.5GHz, Horizontal Antenna Orientation, Mode B, 64QAM 40**



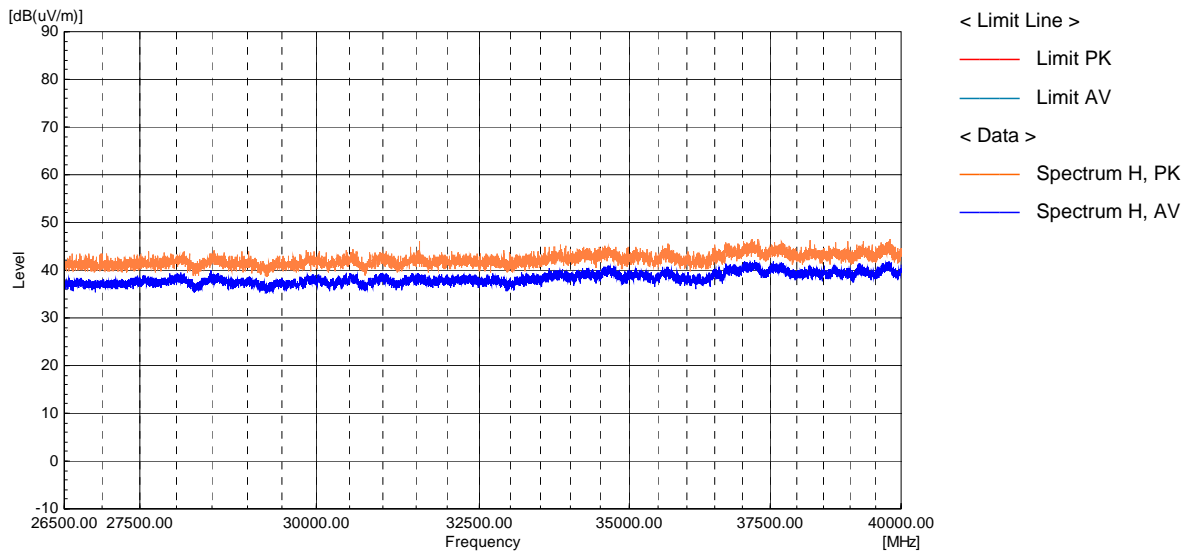
Note: This spectrum was taken for the EUT orientation V.

**Figure 60: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 18 – 26.5GHz, Vertical Antenna Orientation, Mode B, 64QAM 40**



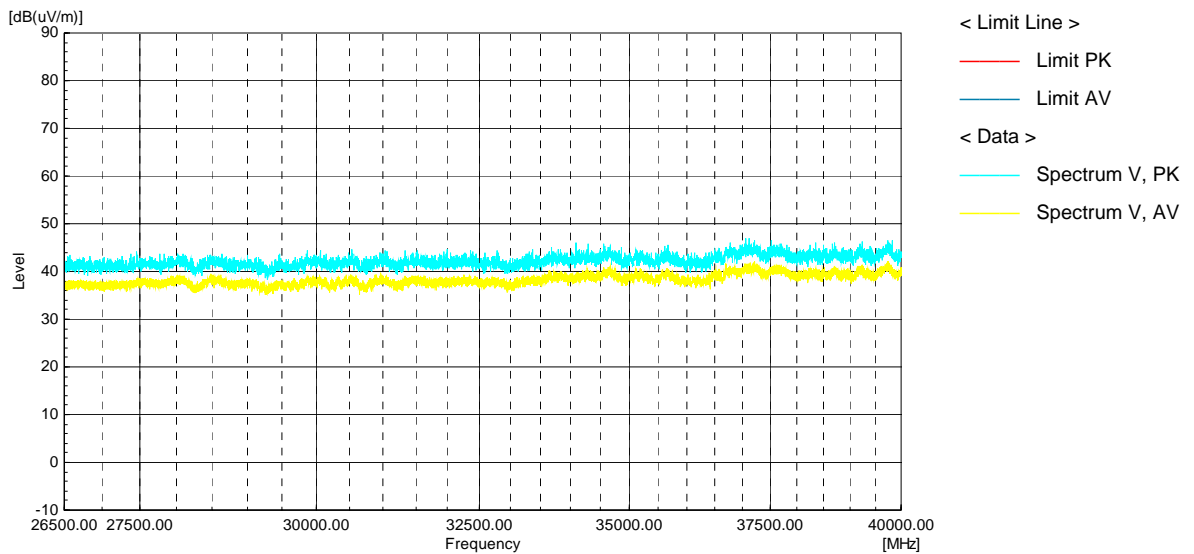
Note: This spectrum was taken for the EUT orientation V.

**Figure 61: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 26.5 – 40GHz, Horizontal Antenna Orientation, Mode B, 64QAM 40**



Note: This spectrum was taken for the EUT orientation V.

**Figure 62: Radiated Spurious Emissions of Transmitter, Spectral Diagram, 26.5 – 40GHz, Vertical Antenna Orientation, Mode B, 64QAM 40**



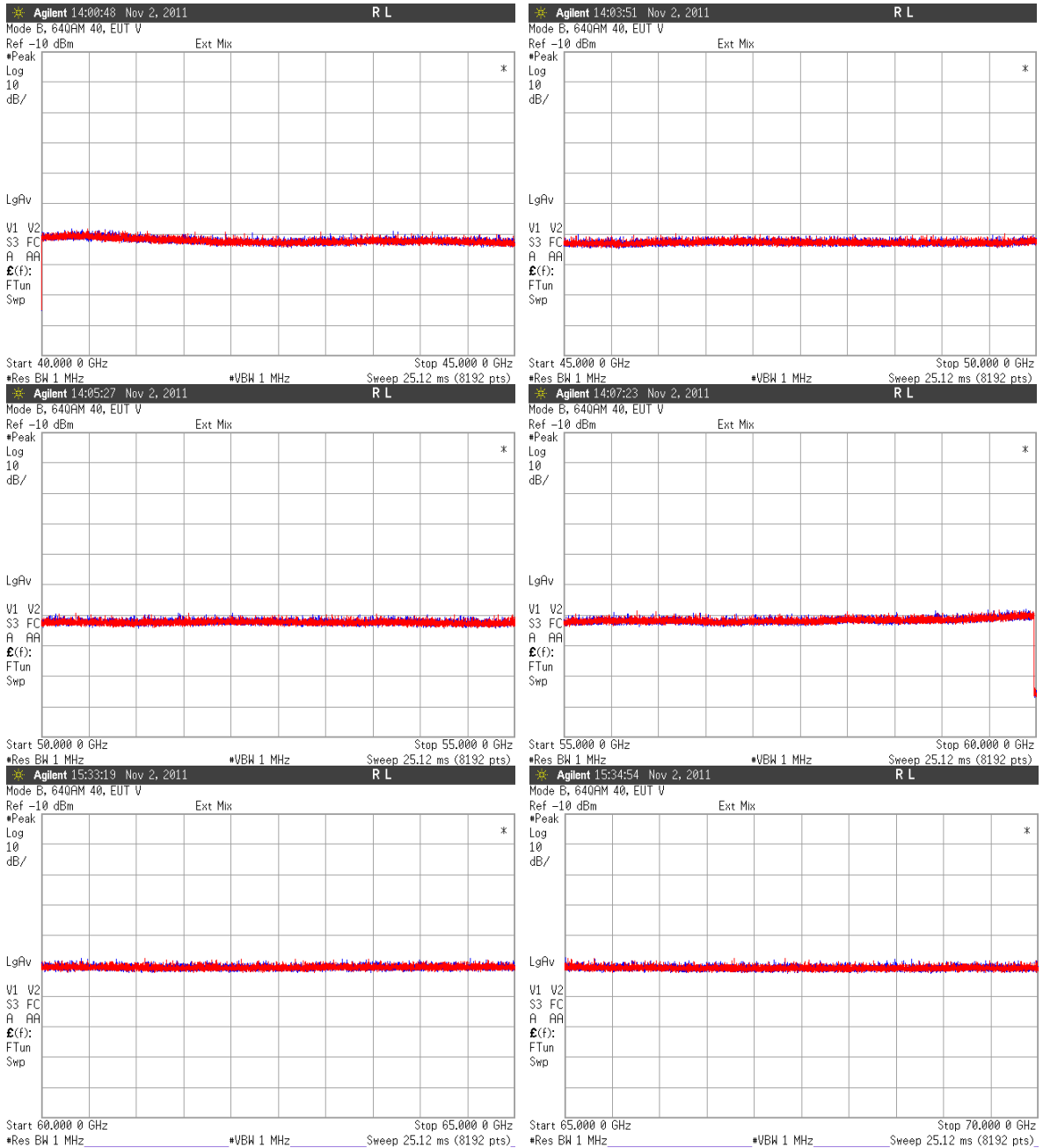
Note: This spectrum was taken for the EUT orientation V.

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**Figure 63: Radiated Spurious Emissions of Transmitter, Spectral Diagrams, 40-70GHz, Mode B, 64QAM 40**



< Data >      — Spectrum H, PK      — Spectrum V, PK

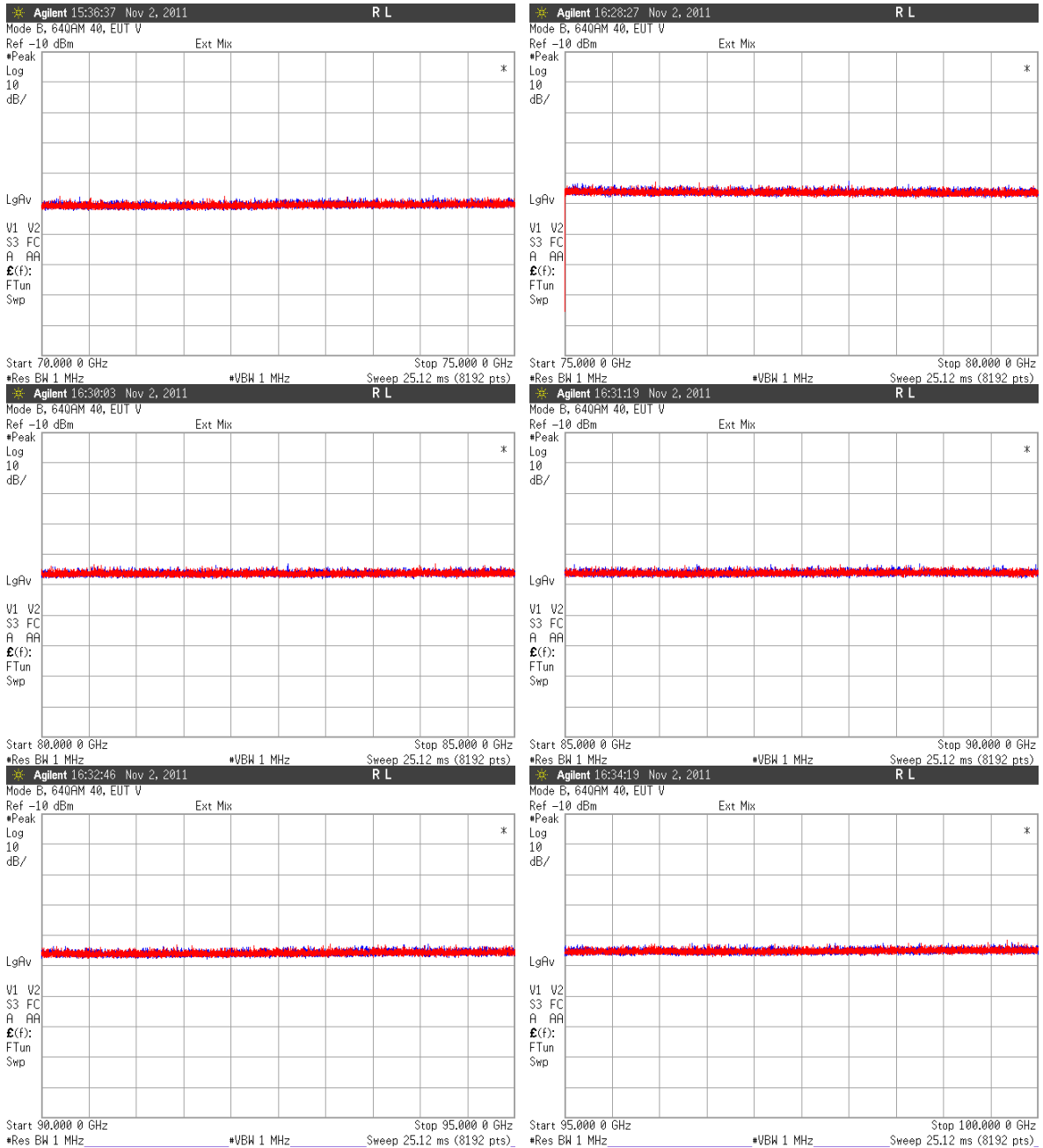
Note: These spectra were taken for the EUT orientation V. No correction factor is included.

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**Figure 64: Radiated Spurious Emissions of Transmitter, Spectral Diagrams, 70-100GHz, Mode B, 64QAM 40**



< Data >      — Spectrum H, PK      — Spectrum V, PK

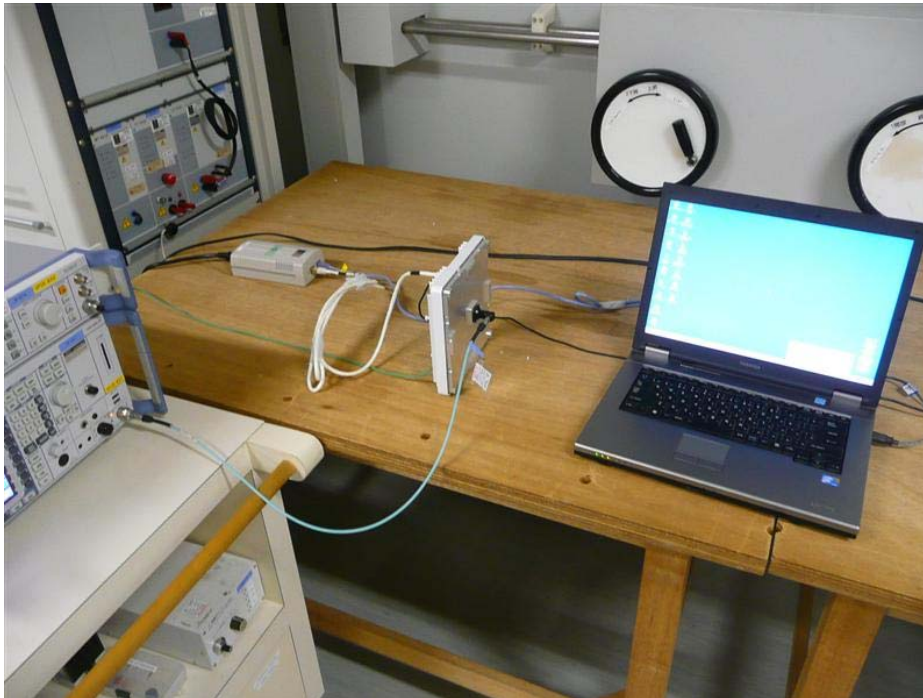
Note: These spectra were taken for the EUT orientation V. No correction factor is included.

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## 6. Photographs of the Test Setup

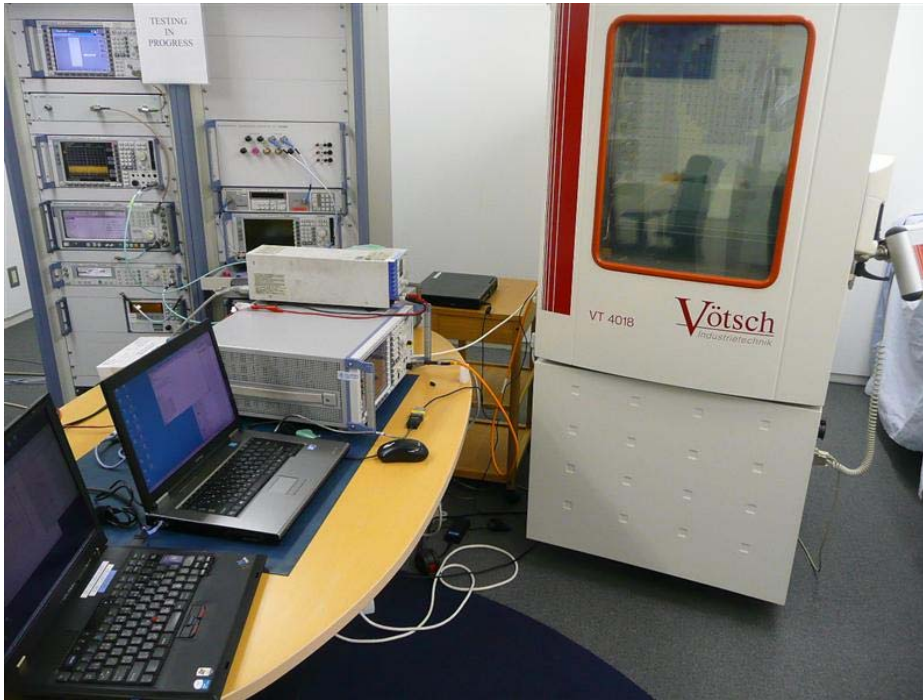
**Photograph 1: Set-up for Conducted Emissions at Antenna Port**



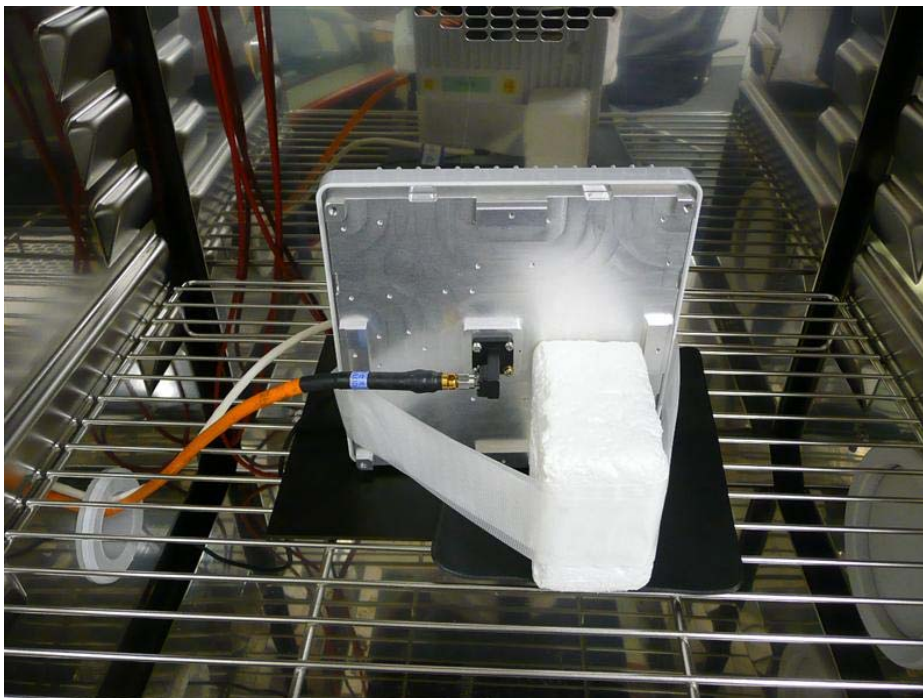
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**Photograph 2: Set-up for Frequency Stability, General View**



**Photograph 3: Set-up for Frequency Stability, inside Temperature Chamber**





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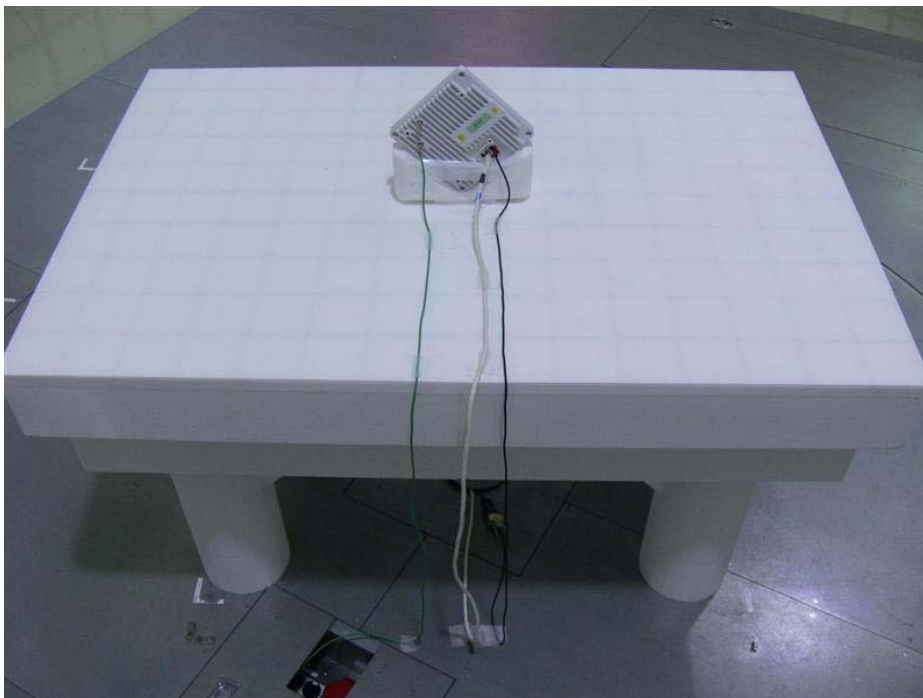
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**Photograph 4: Set-up for Radiated Emissions, Front View**



**Photograph 5: Set-up for Radiated Emissions, Rear View**



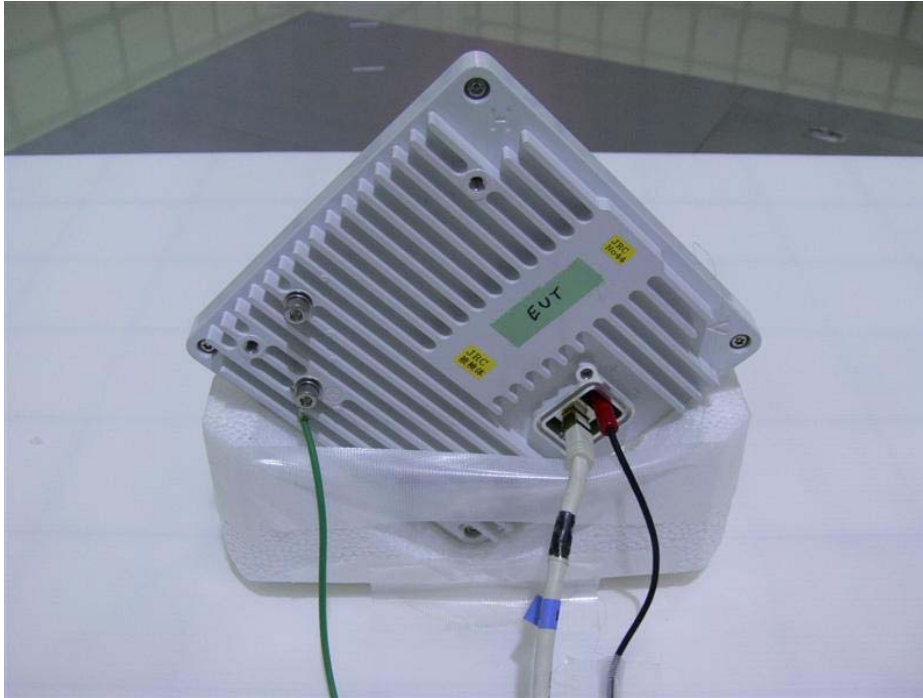


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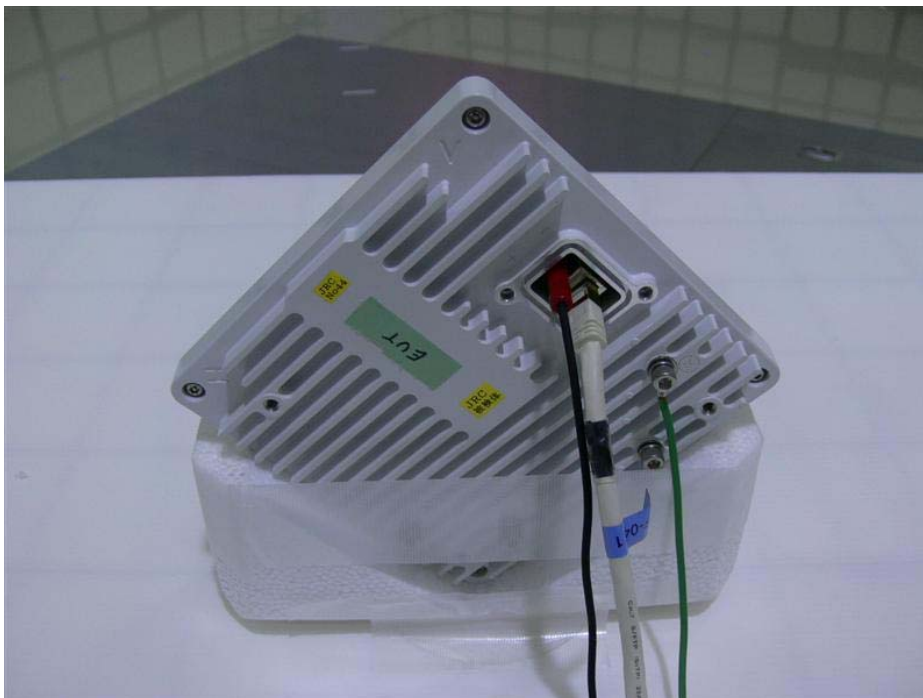
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**Photograph 6: Set-up for Radiated Emissions, EUT Orientation H**



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