Radio Transmitter FCC Part 90z Test Report

Product Name:	ExcelMAX ODU CPE
Product Model Number:	EHD-CPE3310-C7
Test Report Number:	20090302
Test Report Revision:	0

Manufacturer:	Axxcelera Broadband Wireless 1600 East Parham Road Richmond, VA 23228
POC:	Tony Masters
Equipment Identification:	ExcelMAX ODU CPE EHD-CPE3310-C7
Test Engineer:	Al Servais
Director:	Chris Moritz
Report Number:	20090302
Type of Equipment:	Information Technology Equipment (ITE)
Classification Achieved:	Class B
Application of Regulations:	FCC 47 CFR Part 90
Operating Voltage:	+48 VDC
Frequency:	DC
Power:	680mW
Test Dates:	17 March 2009 to 19 March 2009

Core Standard	Guidance Standard	Guidance Standard	Guidance Standard
FCC 47 CFR Part 90	FCC 47 CFR Part 2	CISPR 16-4-2:2003	CISPR 16-1
None	None	None	None

The Electromagnetic Compatibility test and documented data described in this report has been performed and recorded by Axxcelera Broadband Wireless Product Compliance Engineering, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC team, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the Radio Transmitter requirements of the stated regulations and standards based on these results.

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1 Executive Summary

1.1 Scope

Testing was performed to *FCC 47 CFR Part 90* on the *ExcelMAX ODU CPE* and the results are documented in this report. The equipment was tested in accordance with the procedures specified in Sections 2.1046 to 2.1057 of the *FCC 47 CFR Part 90*. TIA-603 was also used as a test procedure guideline to perform some of the required tests.

The intentional radiator above was tested in a simulated typical installation to demonstrate compliance with the relevant FCC & RSS performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

1.2 Objective

The primary objective of the manufacturer is compliance with the *FCC 47 CFR Part 90*. Certification of these devices is required as a prerequisite to marketing as defined in Section 2.1033.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to FCC. The FCC issues a grant of equipment authorization and a certification number upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product that may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

1.3 Summary of Test Results

Table 1 – FCC Part 90 Test Results

Measurement Requirement	Test Method(s)	Test Parameters	Result
99% Occupied Bandwidth	2.1049	99% Bandwidth Measurement	Complies
Radiated RF power output (ERP/EIRP)	2.1046 / 90.1321	Modulated Output Power Test	Complies
Peak Power	2.1046 / 90.1321	Conducted Peak Power Spectral Density	Complies
Spurious emissions at antenna Port	2.1051/ 90.1323	Emission Limits and/or Unwanted Emission 30MHz – 40GHz (**Antenna Conducted**)	Complies
Field strength of spurious radiation	2.1053 / 90.1323	Radiated Spurious Emissions 30MHz – 40GHz	Complies
Frequency stability	2.1055 / 90	Frequency Vs. Temperature	Complies
Frequency stability	2.1055 / 90	Frequency Vs. Voltage	Complies
Exposure to Mobile devices	1.1307, 1.1310, 2.1091 & 2.1093	Exposure of Humans to RF Fields	Complies

1.3.1 Abstract of Deviation (non-compliant)

There were no deviations to the standard and test procedure.

1.3.2 Modifications to *ExcelMAX ODU CPE*

The were no modification made to the *ExcelMAX ODU CPE* during the course of RF emissions testing conducted on *17 March* 2009 in an effort to mitigate any non-compliant result.

1.4 Measurement Uncertainties

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of k=2, which gives a level of confidence of approximately 95%. The levels were found to be below levels of *U*cispr and therefore no adjustment of the data for measurement uncertainty is required.

Table 2 – Table of Measurement Uncertainty

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	±3.6

2 Test Facility Information

2.1 Transmitter Test Facility

The *ExcelMAX ODU CPE* was evaluated for verification between *17 March 2009* and *19 March 2009* at Axxcelera Broadband Laboratories located in Richmond, VA.

Conducted RF testing at the antenna port is performed in conformance with Section 2 of FCC Rules. Measurements are made with the EUT connected to a spectrum analyzer through an attenuator to prevent overloading the analyzer.

Radiated and Conducted Emissions testing was performed by a third party lab and the test results can be found in another report.

Radiated measurements are performed in an open field environment or Anechoic Chamber. The test site is maintained free of conductive objects within the CISPR 16-1 defined elliptical area. Radiated Emissions testing was performed by a third party lab and the test results can be found in another report.

2.2 Measurement System

2.2.1 RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers are capable of measuring over the frequency range of 9 kHz up to 2000MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the particular detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. If average measurements above 1000MHz are performed, the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz is used.

2.2.2 INSTRUMENT CONTROL COMPUTER

A personal computer is utilized to record the receiver measurements of the field strength at the antenna, which is then compared directly with the appropriate specification limit. The receiver is programmed with appropriate factors to convert the received voltage into filed strength at the antenna. Results are printed in a graphic and/or tabular format, as appropriate.

The test receiver also provides a visual display of the signal being measured.

2.2.3 PEAK POWER METER

A peak power meter and thermister mount may be used for output power measurements from transmitters as they provide a broadband indication of the power output.

2.2.4 FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or EUT and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transmitters and transient events.

2.2.5 INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An appendix of this report contains the list of test equipment used and calibration information.

2.3 Test Personnel

During the testing performed on *17 March* 2009 on the *ExcelMAX ODU CPE* the following personnel were present for the evolution.

Table 3 – Table of Test Personnel

Name	Company	Purpose
Al Servais	Axxcelera Broadband Wireless	Test Operator

3 Product Information

Figure 1 – Photo of *ExcelMAX ODU CPE*

The Axxcelera Broadband Wireless *ExcelMAX ODU CPE* ODU (Outdoor Unit) is a licensed transmitter that is designed to provide high speed data for point to multipoint applications. The EUT would normally be placed on a tower or pole in a fixed location as customer premise equipment. Since this is not possible in the laboratory environment, the EUT was treated as table-top equipment during testing. The electrical rating of the EUT is rated *+48 VDC* at *680mW MAX*.

The radio can be configured to operate using multiple modulation schemes at various bandwidths. The radio is a TDD platform designed to operate in the 3.65GHz band for WiMAX systems. An overview of the technical specifications follows.

Table 4 – Table of Radio Specifications

TRANSMITTER	
Equipment Type:	Subscriber Station - Fixed
Intended Operating Environment:	Residential, Commercial, Light Industry & Heavy Industry
Power Supply Requirement:	120 Vac, 60 Hz using external power supply (Manufacturer: Phihong, Model POE30U-560(G), Input: 120/240Vac, Output: 48 Vdc)
RF Output Power Rating:	-22.7 to 30.5 dBm (total Peak EIRP power in 3.5 MHz BW) -23.4 to 31.8 dBm (total Peak EIRP power in 7 MHz BW)
Operating Frequency Range:	3652-3675 MHz (3.5 MHz BW) 3653-3675 MHz (5.0 MHz BW) 3654-3675 MHz (7.0 MHz BW)
RF Output Impedance:	50 Ohms
Channel Spacing:	3.5, 5 and 7MHz
Occupied Bandwidth (99%):	3.19 MHz (3.5 MHz Ch) 4.67 MHz (5.0 MHz Ch)

TRANSMITTER	
Equipment Type:	Subscriber Station - Fixed
	6.43 MHz (7.0 MHz Ch)
Modulation:	Auto-select BPSK, QPSK, 16QAM, 64QAM
Emission Designation*:	3M19DXW (for 3.5 MHz BW) 4M7W7D (for 5.0 MHz BW) 6M43DXW (for 7.0 MHz BW)
Antenna Connector Type:	Integral
Antenna Description:	Manufacturer: Axxcelera Type: Patch Array Model: 15deg Frequency Range: 3.3-3.8 GHz Gain: 16.0 dBi
Operating Temperature:	-33 °C to +55 °C

The sample was received on 17 March 2009 and was tested between 17 March 2009 and 19 March 2009. The EUT consisted of the following component(s):

Table 5 – Table of EUT Assembly and Subassemblies

Manufacturer	Model	Description	Serial Number	FCC ID
Axxcelera Broadband Wireless	EHD-CPE3310-C7	ExcelMAX ODU CPE	FCC1	OJB-SSC7-365
Phihong	POE30U-560(G)	POE	Sample	N/A

3.1.1 EUT ANTENNA DETAILS

The EUT is designed to be used with fixed-mounted, high-gain parabolic dish antennas. The Outdoor Unit (ODU) containing the transmitter is intended to be mounted alongside the antenna.

3.1.2 ENCLOSURE Details

The EUT enclosure is primarily constructed of metal and plastic. It measures approximately 37 cm wide by 7 cm deep by 40 cm high.

3.1.3 SUPPORT EQUIPMENT

The following equipment was used as local support equipment for emissions testing:
Table 6 – Table of Support Equipment

Manufacturer	Model	Description	Serial Number
Dell	E5500	PC	29589

3.1.4 EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

Table 7 – EUT Interfaces

Port	Connected to	Description	Shielding	Length (m)
RJ-45	POE	Ethernet and Power port	YES	1m
RF	T&M	RF Port connected to Test Equipment	YES	.5m

3.2 Equipment Configuration

Provide a technical description of the product here.

Table 8 – EUT Test Configurations

Modulation	Lower Frequency	Middle Frequency	Upper Frequency	Bandwidth (MHz)	Maximum Power
BPSK	3653.5MHz	3662.5MHz	3675MHz	5	24dBm
QPSK	3653.5MHz	3662.5MHz	3675MHz	5	24dBm
16QAM	3653.5MHz	3662.5MHz	3675MHz	5	24dBm
64QAM	3653.5MHz	3662.5MHz	3675MHz	5	24dBm

3.3 Operating Mode

During testing the *ExcelMAX ODU CPE* was set to continuously transmit at the specified data rate and on the specified channel at maximum output power with 100% duty cycle in burst mode.

4 RF Testing

4.1 Radiated Emissions

Testing was performed in accordance with FCC 47 CFR Part 90. This test measures the levels emanating from the *ExcelMAX ODU CPE*, thus evaluating the potential for the *ExcelMAX ODU CPE* to cause radio frequency interference to the infrastructure and other consist.

4.1.1 Test Methodology

For Transmitters with detachable antenna, direct measurements for output power, modulation characterization, occupied bandwidth, and frequency stability are performed with the antenna port of the EUT connected to either of the power meter, modulation analyzer, or spectrum analyzer via a suitable attenuator and/or filter. The attenuators and/or filters are used to ensure that the transmitter fundamental will not overload the front end of the measurement instrument.

4.1.1.1 Power Measurement (Conducted Method)

The following procedure was used for transmitters that do use external antennas.

1) Set the EUT to maximum power and to the lowest channel.
2) Either a power meter or a spectrum analyzer was used to measure the power output.
3) If a spectrum analyzer was used a resolution and video bandwidth 10 kHz was used to measure the power output. Corrected for any external attenuation used for the protection of the input of analyzer. In addition, For CDMA or TDMA modulations set spectrum analyzer resolution to 1MHz and video to 30 kHz. Use video averaging with a 100-sample rate.
4) If a power meter was used, corrected for any external attenuation used for the protection of the input of the sensor head. Also set the power sensor correction by setting up the frequency range that will be measured.
5) Repeat this for the high channel and all modulations that will be used and all output ports used for transmission

4.1.1.2 Occupied Bandwidth (Conducted Method)

Either for analog, digital, or data modulations, occupied bandwidth was performed. The EUT was set to transmit the appropriate modulation at maximum power. The bandwidth was measured using following methods:

1) The built-in 99% function of the spectrum analyzer was used.
2) If the built-in 99% is not available then the following method is used: 26-dB or 20-dB was subtracted to the maximum peak of the emission. Then the display line function was used, in conjunction with the marker delta function, to measure the emissions bandwidth.
3) For the above two methods a resolution and video bandwidth of 100 or 300 Hz was used to measure the emission's bandwidth.

4.1.1.3 Occupied Bandwidth (Conducted Emission Mask)

Either for analog, digital, or data modulations, emission mask was performed. The EUT was set to transmit the appropriate modulation at maximum power. The following method was used:

1) The EUT was connected directly to the spectrum analyzer and used an attenuator to protect the input of the analyzer. The EUT antenna was removable, so conducted measurements was performed. The EUT was set to transmit continuous packets of data and the Fundamental Frequency set to the appropriate channel of the EUT frequency range.
2) A mask was created to show that the fundamental signal energy is within.

NOTE: Video bandwidth was used to show compliance for the above requirement: 10k Hz

4.1.1.4 Other Types of Equipment

Either digital or data modulated signals were simulated, by software or external sources, to performed the required tests. The EUT was set to transmit the appropriate digital modulation.

4.1.1.5 Antenna Conducted Emissions

For spurious emission measurements at the antenna terminal the following procedure was performed:

1) Set the transmitting signal at the middle of the operating range of the transmitter, as specified in the standard. Power is set to maximum and then to minimum.
2) Set the spectrum analyzer display line function to –13-dBm.
3) Set the spectrum analyzer bandwidth to 10 kHz <1GHz and 1 MHz >1GHz.
4) For the spectrum analyzer, the start frequency was set to 30 MHz and the stop frequency set to the 10^{th} harmonic of the fundamental. All spurious or intermodulation emission must not exceed the –13dBm limit.
5) Steps 1 to 4 were repeated for all modulations and output ports that will be used for transmission.

4.1.1.6 Frequency Stability over Temperature

The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The spectrum analyzer is configured to give a 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. The Temperature chamber was varied from –30° C to +50° C (or +60° C for some IC RSS standards, if applicable) in 10 degrees increment. The EUT was allowed enough time to stabilize for each temperature variation.

4.1.1.7 Frequency Stability over Voltage

For AC or DC operated devices the nominal voltage is varied to 85% and to 115% at either room temperature or at a controlled +20°C temperature.

4.1.1.8 Frequency Stability

For battery-powered devices the voltage battery endpoint is determined by reducing the dc voltage until the unit ceases to function. This is performed at either room temperature or at a controlled +20°C temperature.

4.1.1.9 Field Strength Measurement

The EUT was set on the turntable and the search antenna position 3 meters away. The output antenna terminal was terminated with a 50ohm terminator. The EUT was set at the middle of the frequency band and set at maximum output power.

4.1.1.10 Preliminary Test

For the first scan, a preliminary measurement is performed. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. One or more of these is with the antenna polarized vertically while the one or more of these are with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

4.1.1.11 Final Test

For the final measurement, Substitution method is performed on spurious emissions not being 20-dB below the calculated radiated limit. Substitution method is performed by replacing the EUT with a horn antenna and signal generator. The horn antenna factors can be reference to a half-wave dipole in dBi. The signal generator power level was adjusted until a similar level, which was measured on the first scan, is achieved on the spectrum analyzer. The level on the signal generator is than added to the antenna factor, in dBi, which will give the corrected value.

4.2 SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

4.2.1 FCC Part 90 Specifications

§ 90.1305 Permissible operations:-Use of the 3652–3700 MHz band must be consistent with the allocations for this band as set forth in Part 2 of the Commission's Rules. All stations operating in this band must employ a contention- based protocol (as defined in § 90.7).

§ 90.1307 Licensing:- The 3652–3700 MHz band is licensed on the basis of non-exclusive nationwide licenses. Nonexclusive nationwide licenses will serve as a prerequisite for registering individual fixed and base stations. A licensee cannot operate a fixed or base station before registering it under its license and licensees must delete registrations for unused fixed and base stations.

§ 90.1309 Regulatory status:- Licensees are permitted to provide services on a non-common carrier and/or on a common carrier basis. A licensee may render any kind of communications service consistent with the regulatory status in its license and with the Commission's rules applicable to that service.

§ 90.1311 License term:-The license term is ten years, beginning on the date of the initial authorization (non-exclusive nationwide license) grant. Registering fixed and base stations will not change the overall renewal period of the license.

§ 90.1312 Assignment and transfer:- Licensees may assign or transfer their non-exclusive nationwide licenses, and any fixed or base stations registered under those licenses will remain associated with those licenses.

§ 90.1319 Policies governing the use of the 3652–3700 MHz band:

a) Channels in this band are available on a shared basis only and will not be assigned for the exclusive use of any licensee

b) Any base, fixed, or mobile station operating in the band must employ a contention-based protocol.

c) All applicants and licensees shall cooperate in the selection and use of frequencies in the 3650–3700 MHz band in order to minimize the potential for interference and make the most effective use of the authorized facilities. A database identifying the locations of registered stations will be available at *http://wireless.fcc.gov/uls.* Licensees should examine this database before seeking

station authorization, and make every effort to ensure that their fixed and base stations operate at a location, and with technical parameters, that will minimize the potential to cause and receive interference. Licensees of stations suffering or causing harmful interference are expected to cooperate and resolve this problem by mutually satisfactory arrangements.

4.2.2 Peak Output Power FCC 90.1321

§ 90.1321 Power and antenna limits:

a) Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one megahertz slice of spectrum.

b) In addition to the provisions in paragraph (a) of this section, transmitters operating in the 3650–3700 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

1. Different information must be transmitted to each receiver.
2. If the transmitter employs an antenna system that emits multiple directional beams but does not emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, *i.e.*, the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (a) of this section, as applicable. The directional antenna gain shall be computed as follows:
   i. The directional gain, in dBi, shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain, in dBi, of the individual element or stave having the highest gain.
   ii. A lower value for the directional gain than that calculated in paragraph (b)(2)(i) of this section will be accepted if sufficient evidence is presented, *e.g.*, due to shading of the array or coherence loss in the beam-forming.
3. If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels and if transmitted beams overlap, the power shall be reduced to ensure that the aggregate power from the overlapping beams does not exceed the limit specified in paragraph (b)(2) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (b)(2) of this section by more than 8 dB.
4. Transmitters that emit a single directional beam shall operate under the provisions of paragraph (b)(2) of this section.

c) Mobile and portable stations are limited to 1 watt/25 MHz EIRP. In any event, the peak EIRP density shall not exceed 40 milliwatts in any one-megahertz slice of spectrum.

4.2.3 Method of Measurements

- The total conducted power was measured using the Peak Power meter
- The peak conducted power density in 1 MHz was measured using an EMI receiver (spectrum analyzer) with RBW = 1 MHz, VBW >= RBW.

CALCULATIONS – EFFECTIVE RADIATED POWER

$$E(V/m) = \frac{\sqrt{30*P*G}}{d}$$

E= Field Strength in V/m
P= Power in Watts (for this example we use 3 watts)
G= Gain of antenna in numeric gain (Assume 1.64 for ERP)
d= distance in meters

$$E(V/m) = \frac{\sqrt{30} * 3 \text{ watts} * 1.64 \text{ dB}}{3 \text{ meters}}$$

20 * log (4.049 V/m * 1,000,000) = 132.14 dBuV/m @ 3 meters

FCC Rules request an attenuation of 43 + 10 log (3) or 47.8 dB for all emissions outside the assigned block, the limit for spurious and harmonic emissions is:

132.1 dBuV/m – 47.8 dB = 84.3 dBuV/m @ 3 meter.

Note: Substitution Method is performed for spurious emission not being 20-dB below the calculated field strength.

4.3 Final Test Data

Table 9 – RF Test Data Table of Compliance

RF Test Data

Client	Axxcelera Broadband Wireless		Project Number		20090302
Model	EHD-CPE3310-C7		Project Revision		0
POC	Tony Masters		Test Engineer		Al Servais
Test Standard	FCC 47 CFR Part 90		Systems Director		Chris Moritz
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

EUT

Manufacturer	Model	Description	Serial Number	FCC ID
Axxcelera Broadband Wireless	EHD-CPE3310-C7	Wireless Broadband	FCC1	OJB-SSC7-365

Test Specifications

The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator.
All measurements have been corrected to allow for the external attenuators used.

Summary of Test Results

Test Performed	Standard	Result	Report
99% Bandwidth	2.1049	Complies	AXXC08-A4 Rev A Axxcelera EID-CPE3410-C9 MHz FCC Part 90z.pdf
EIRP	2.1046/90.1321	Complies	20090302.pdf
PPSD	2.1046 / 90.1321	Complies	20090302.pdf
Emission Mask	2.1051/ 90.1323	Complies	AXXC08-A4 Rev A Axxcelera EID-CPE3410-C9 MHz FCC Part 90z.pdf
Spurious Emissions	2.1053 / 90	Complies	AXXC08-A4 Rev A Axxcelera EID-CPE3410-C9 MHz FCC Part 90z.pdf
Frequency Stability	2.1055	Complies	AXXC08-A4 Rev A Axxcelera EID-CPE3410-C9 MHz FCC Part 90z.pdf
MPE	90.1217	Complies	AXXC08-A4 Rev A Axxcelera EID-CPE3410-C9 MHz FCC Part 90z.pdf

Summary of Modifications

No modifications were made to the EUT during the execution of the test procedure

Summary of Deviations

No deviations were made to the test standard during the execution of the test procedure

Table 10 – RF Test Data EIRP

Axxcelera

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

Peak Output Power

Freq (MHz)	MAX dBi	Power (dBm)	BW (MHz)	Limit (dBm)	PSD (dBm)	PSD Limit	MOD	Margin	Result
3653.5	16	28.63	5	37			BPSK		Complies
3662.5	16	28.38	5	37			BPSK		Complies
3675	16	26.86	5	37			BPSK		Complies
3653.5	16	28.65	5	37			QPSK		Complies
3662.5	16	28.71	5	37			QPSK		Complies
3675	16	28.43	5	37			QPSK		Complies
3653.5	16	28.57	5	37			16QAM		Complies
3662.5	16	28.62	5	37			16QAM		Complies
3675	16	27.18	5	37			16QAM		Complies
3653.5	16	28.81	5	37			64QAM		Complies
3662.5	16	28.55	5	37			64QAM		Complies
3675	16	28.11	5	37			64QAM		Complies
Note 1									
Note 2									

Table 11 – 3653.5MHz PPSD with BPSK

Axxcelera

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3653.5MHz with BPSK

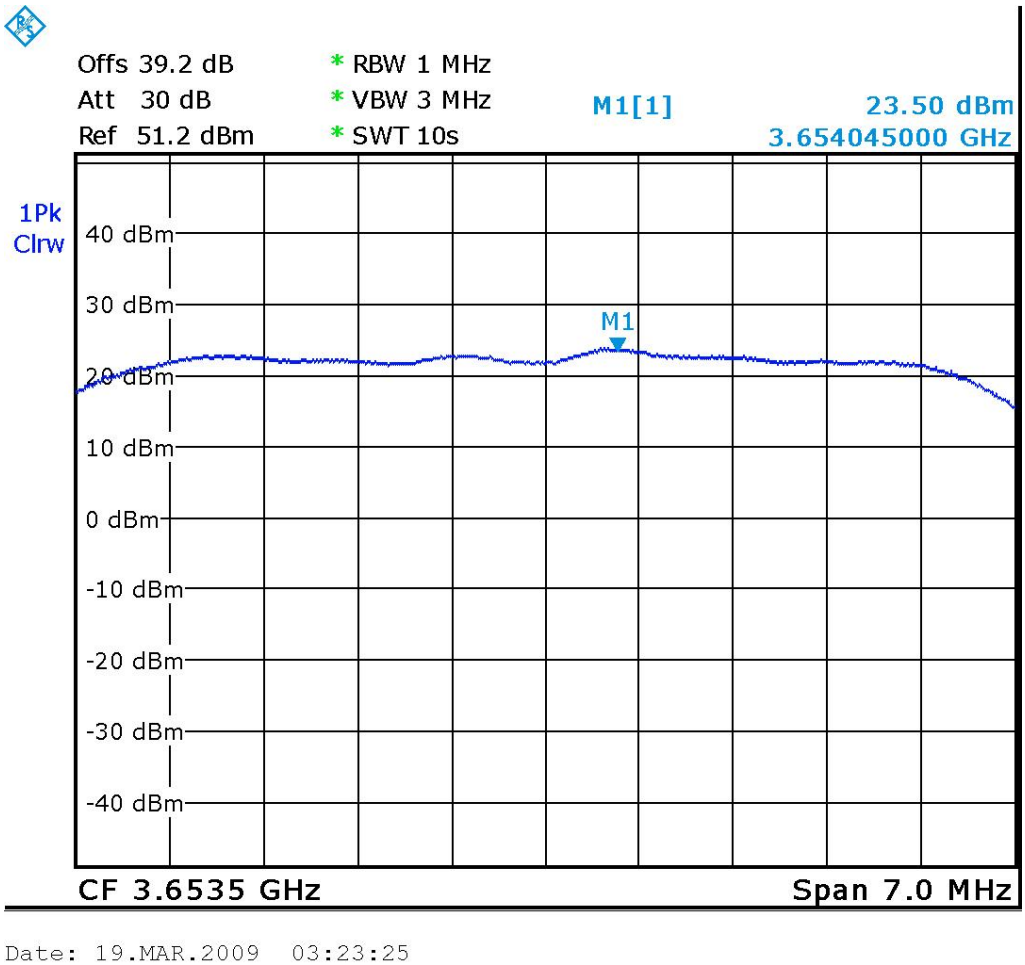


Table 12 – 3662.5MHz PPSD with BPSK

Axxcelera **RF Test Data**

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3662.5MHz with BPSK

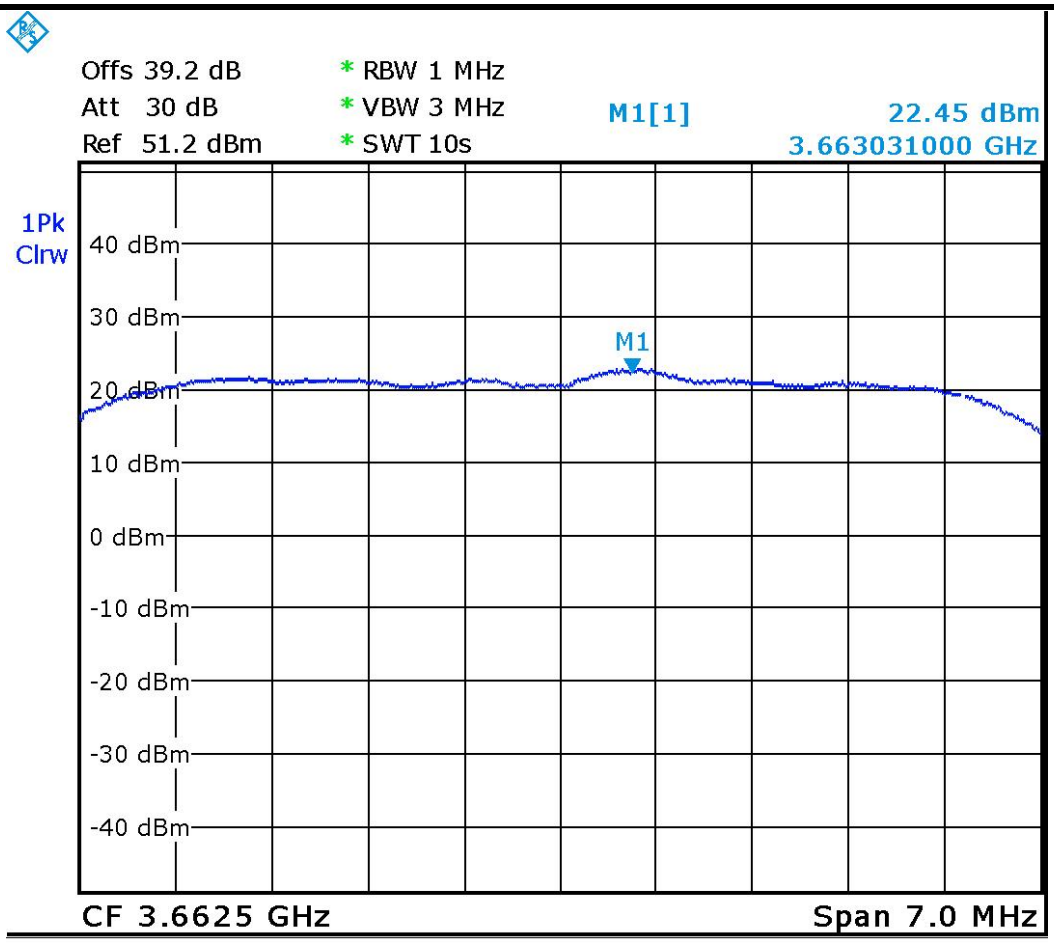


Table 13 – 3675MHz PPSD with BPSK

Axxcelera **RF Test Data**

Client	Axxcelera Broadband Wireless		Project Number	20090302	
Model	EHD-CPE3310-C7		Project Revision	0	
POC	Tony Masters		Test Engineer	Al Servais	
Test Standard	FCC 47 CFR Part 90		Systems Director	Chris Moritz	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3675MHz with BPSK

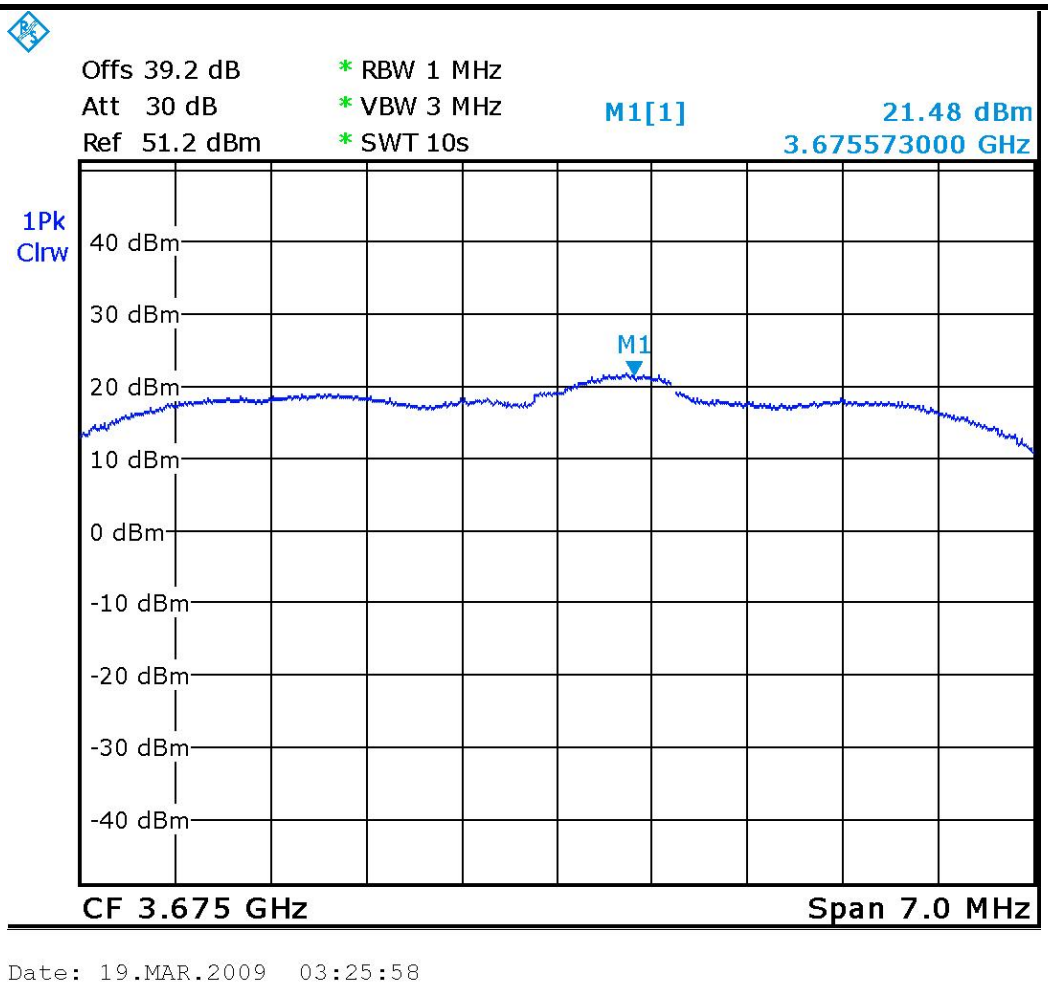


Table 14 – 3653.5MHz PPSD with QPSK

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3653.5MHz with QPSK

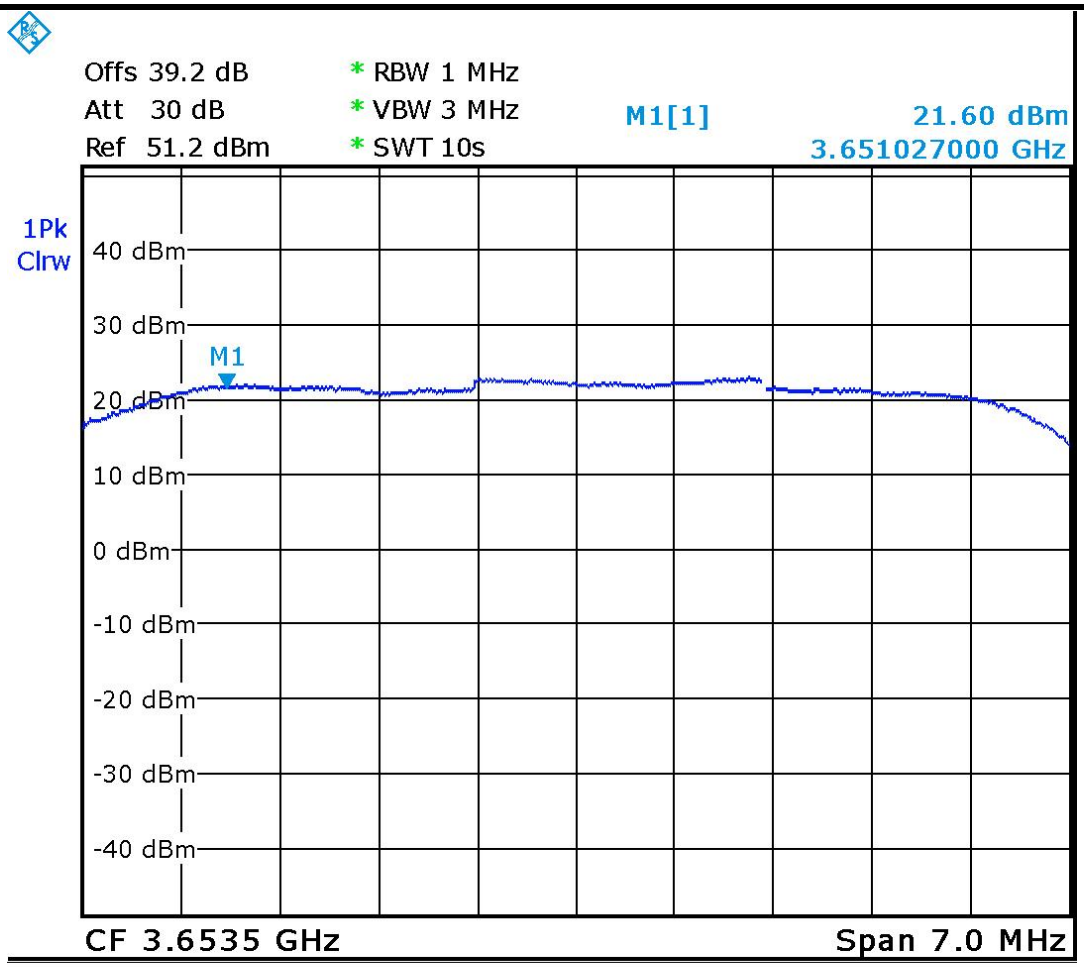


Table 15 – 3662.5MHz PPSD with QPSK

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3662.5MHz with QPSK

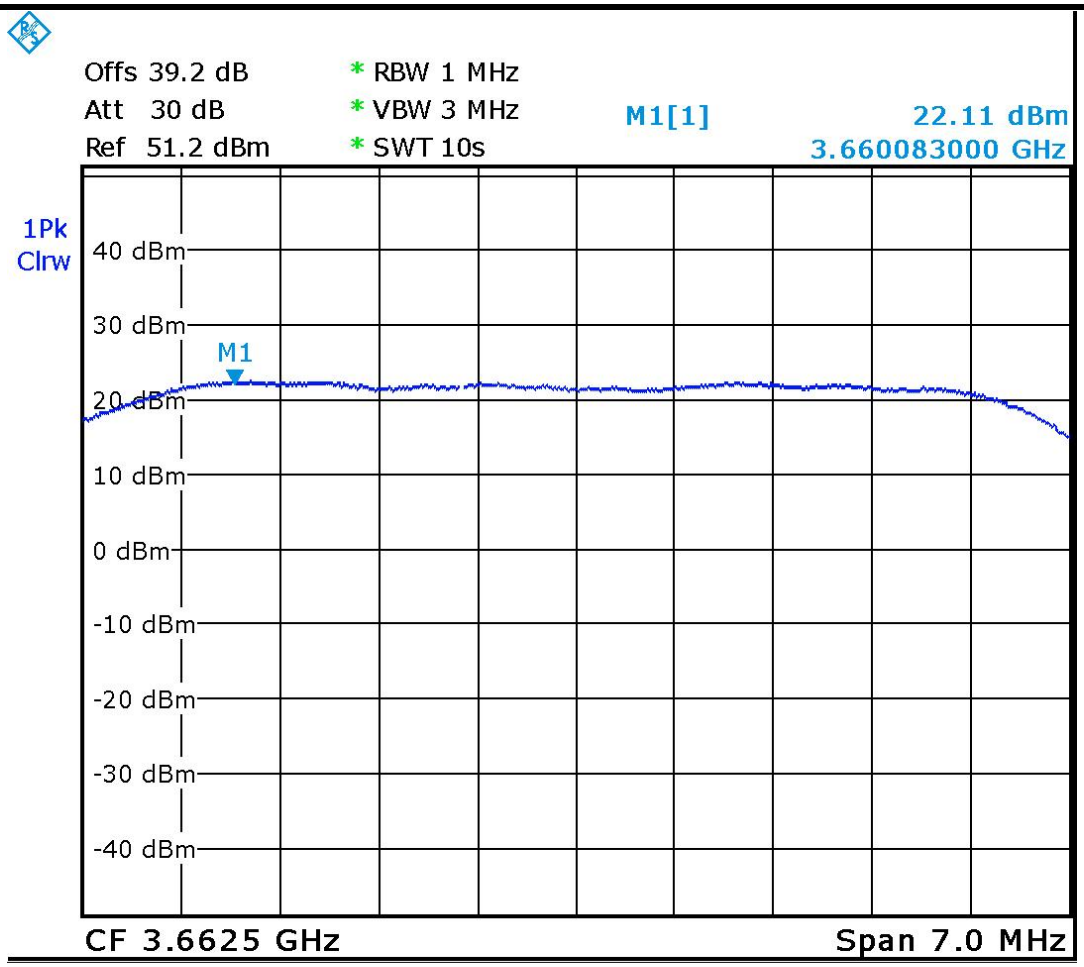


Table 16 – 3675MHz PPSD with QPSK

Axxcelera **RF Test Data**

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3675MHz with QPSK

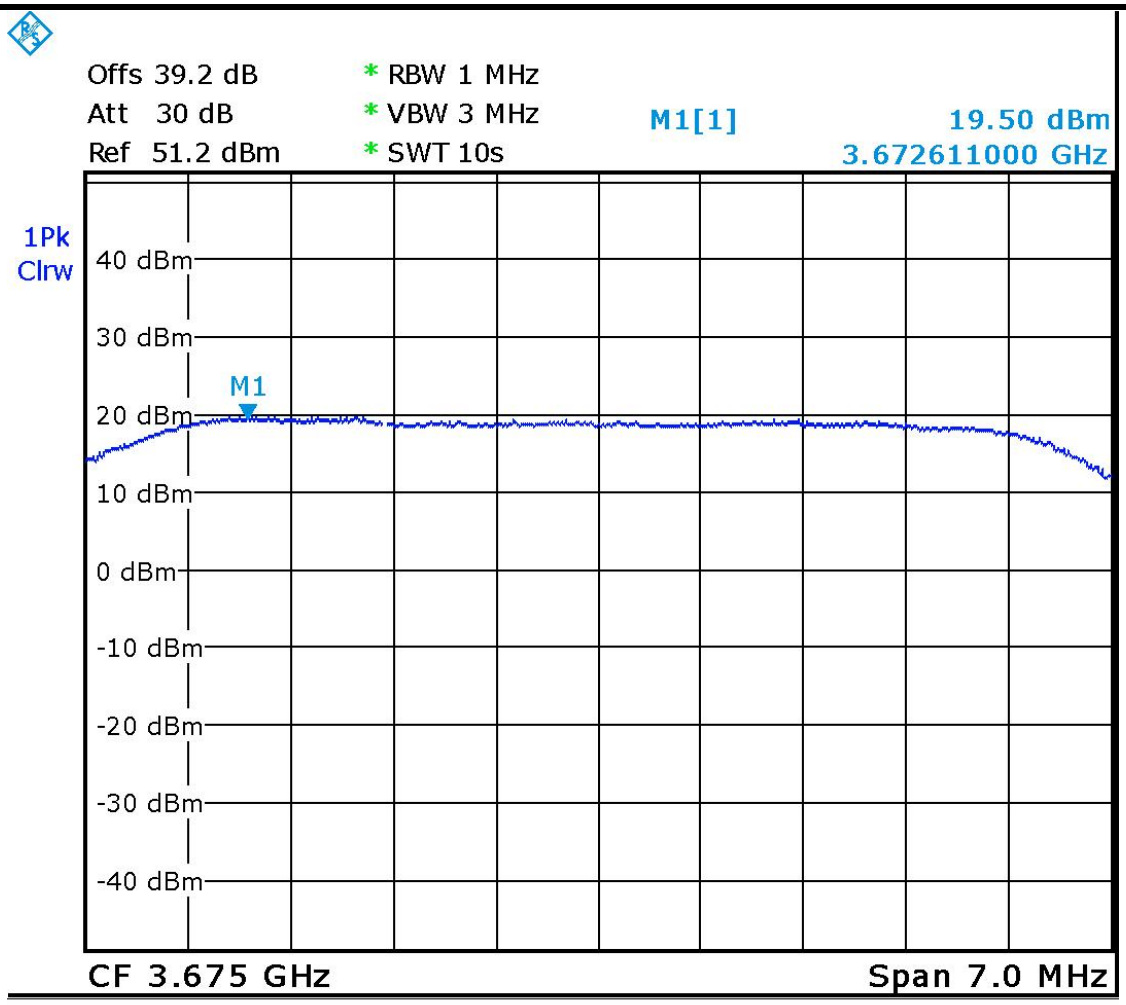


Table 17 – 3653.5MHz PPSD with 16QAM

Axxcelera **RF Test Data**

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3653.5MHz with 16QAM

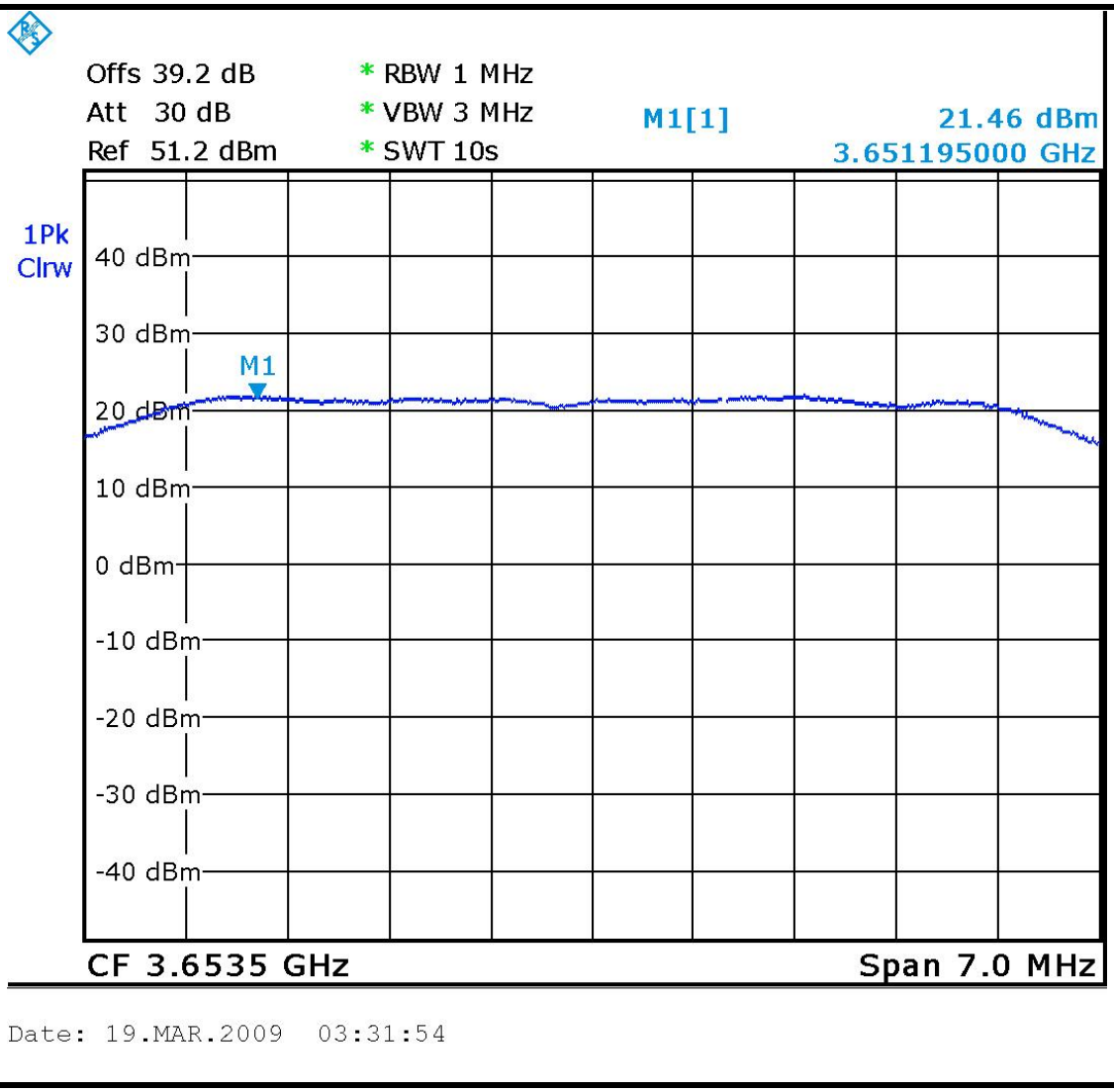


Table 18 – 3662.5MHz PPSD with 16QAM

Axxcelera **RF Test Data**

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3662.5MHz with 16QAM

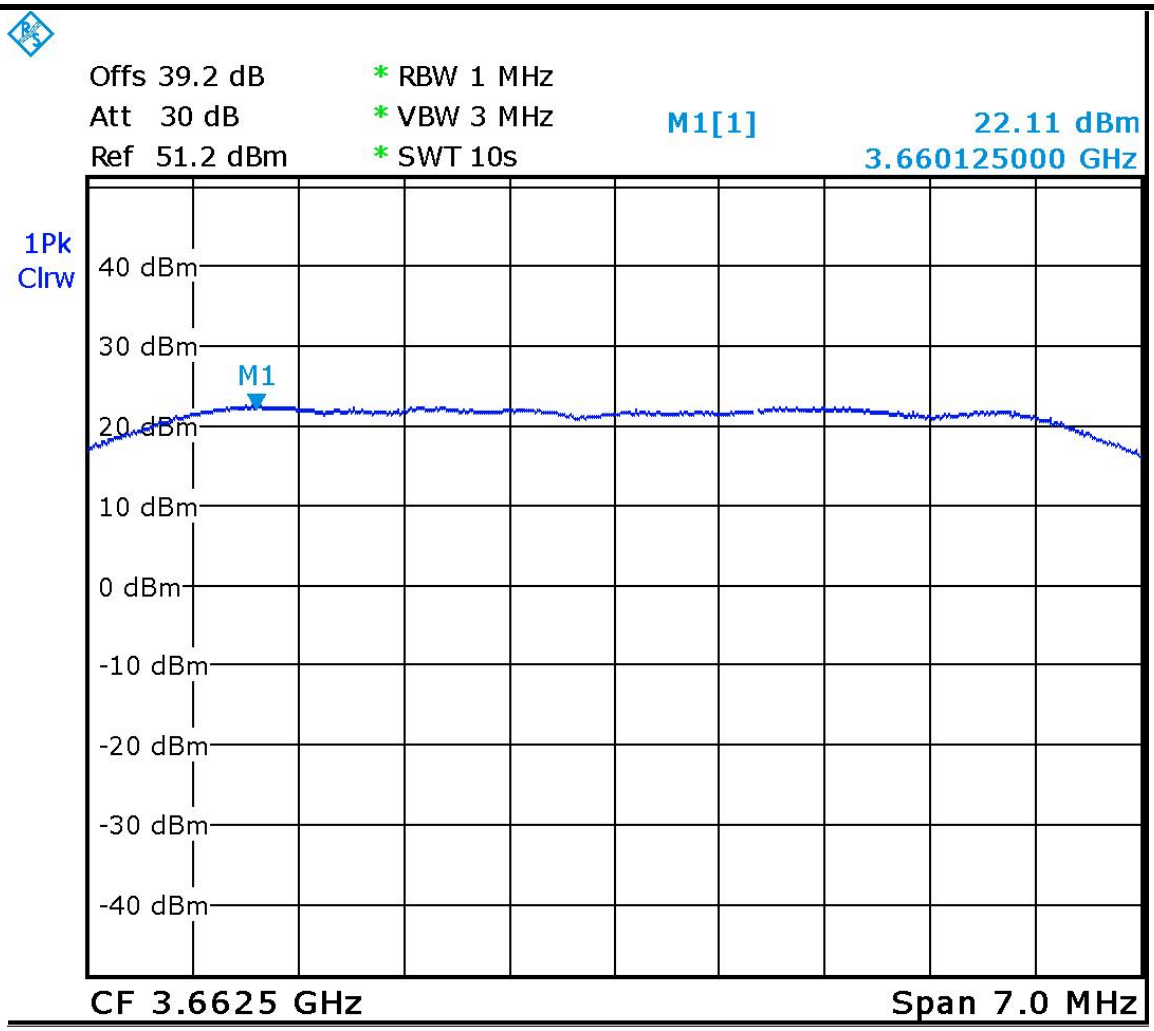


Table 19 – 3675MHz PPSD with 16QAM

Axxcelera **RF Test Data**

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3675MHz with 16QAM

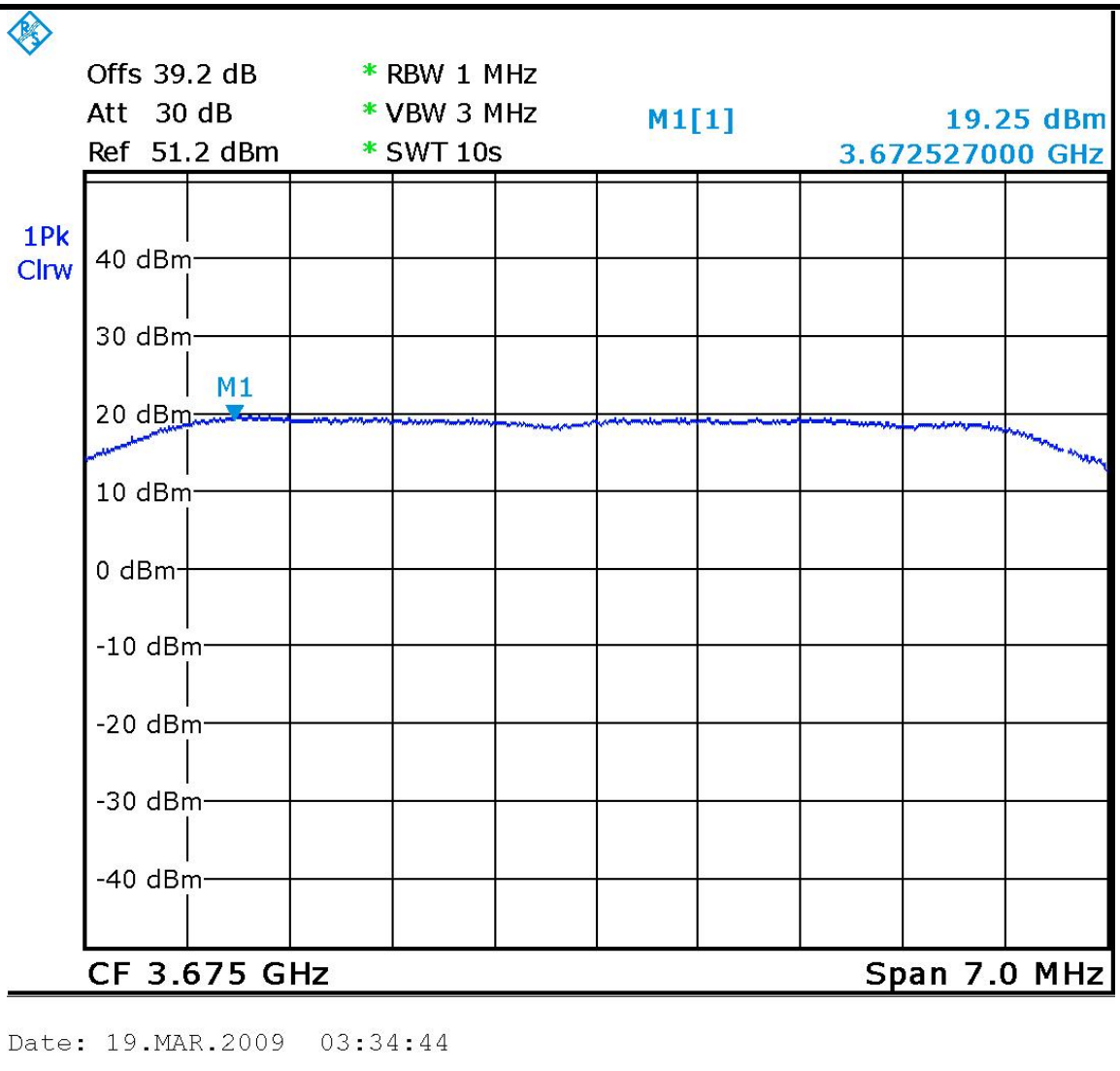


Table 20 – 3653.5MHz PPSD with 64QAM

Axxcelera

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3653.5MHz with 64QAM

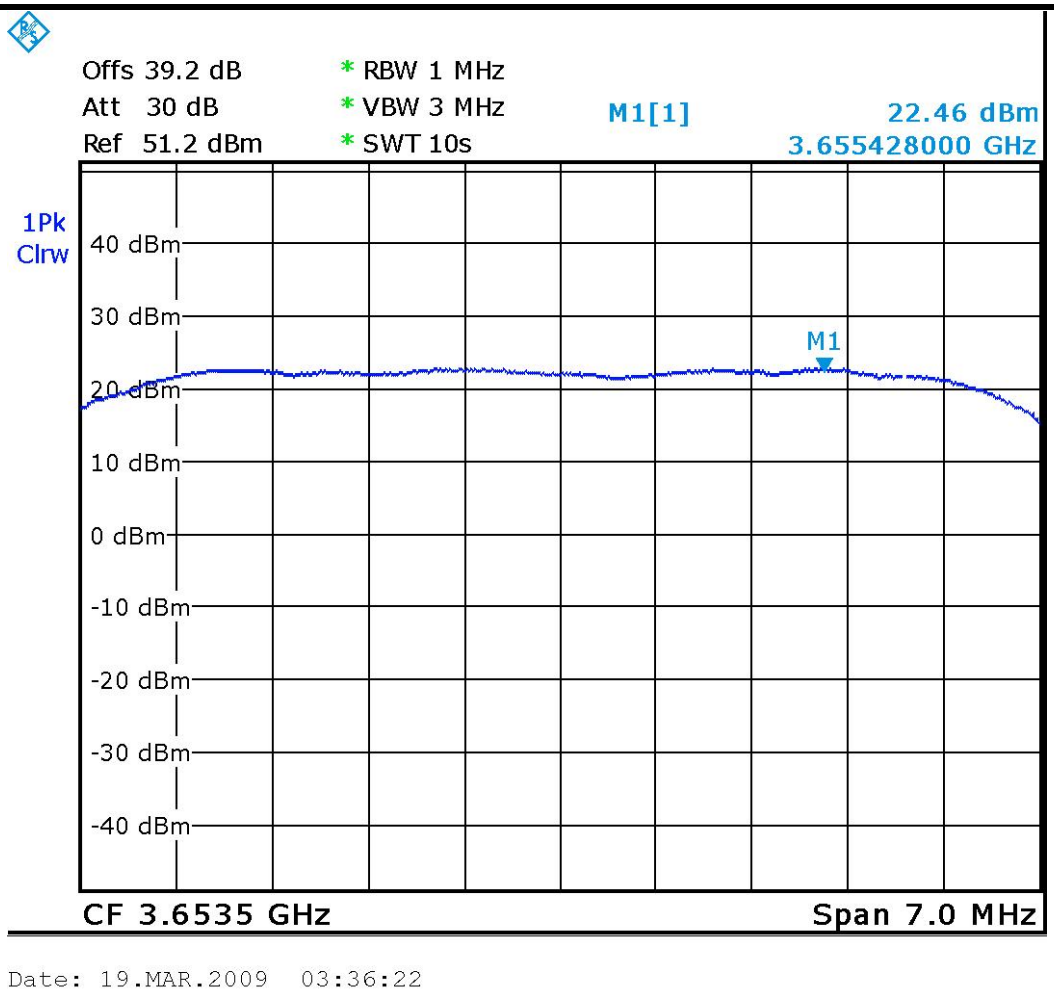


Table 21 – 3662.5MHz PPSD with 64QAM

Axxcelera

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3662.5MHz with 64QAM

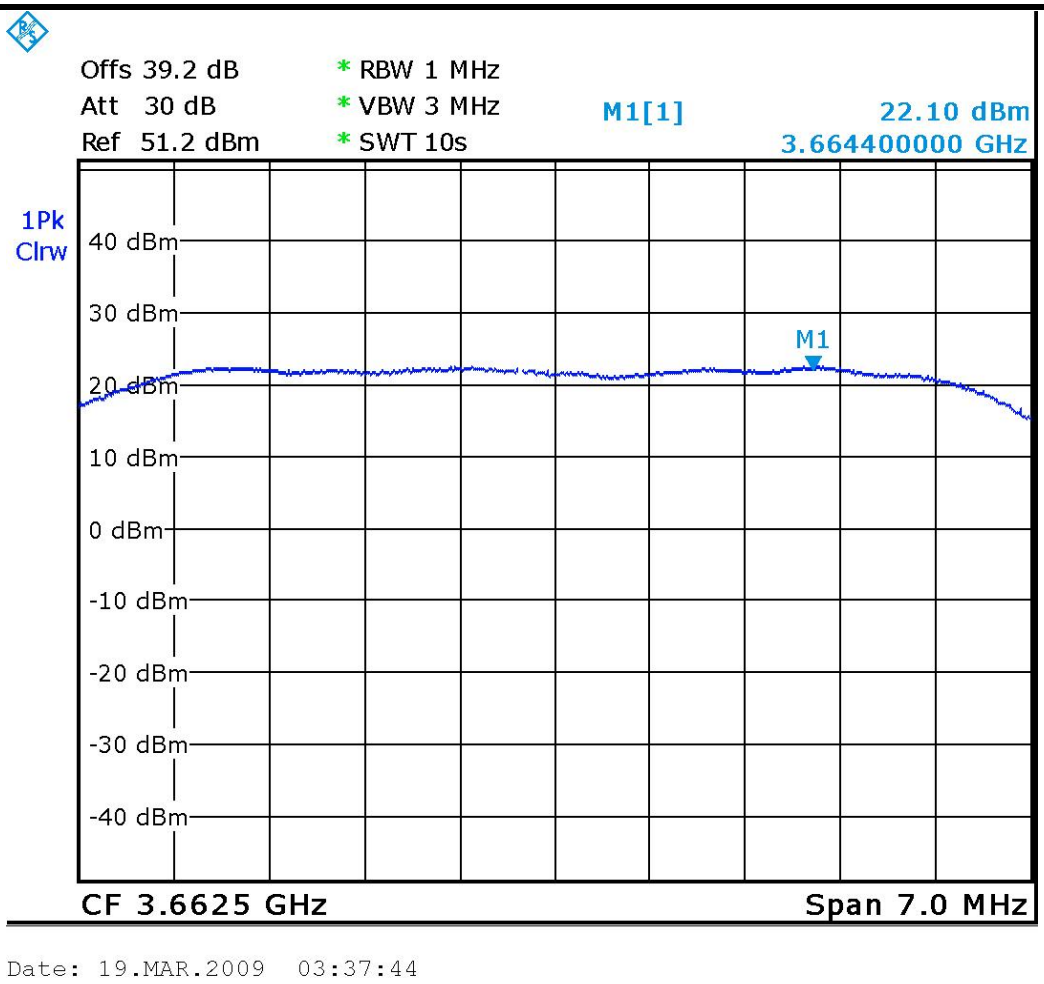


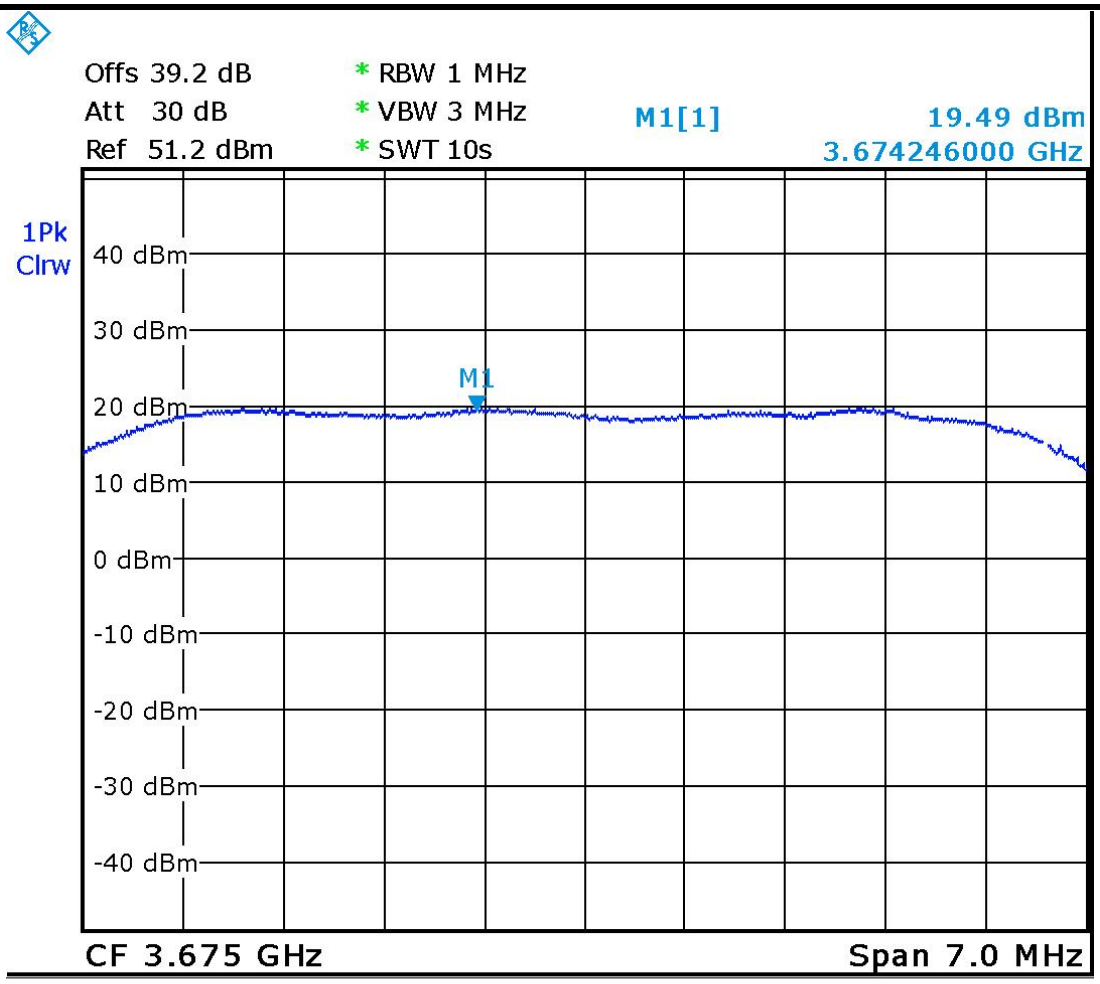
Table 22 – 3675MHz PPSD with 64QAM

Axxcelera

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3675MHz with 64QAM



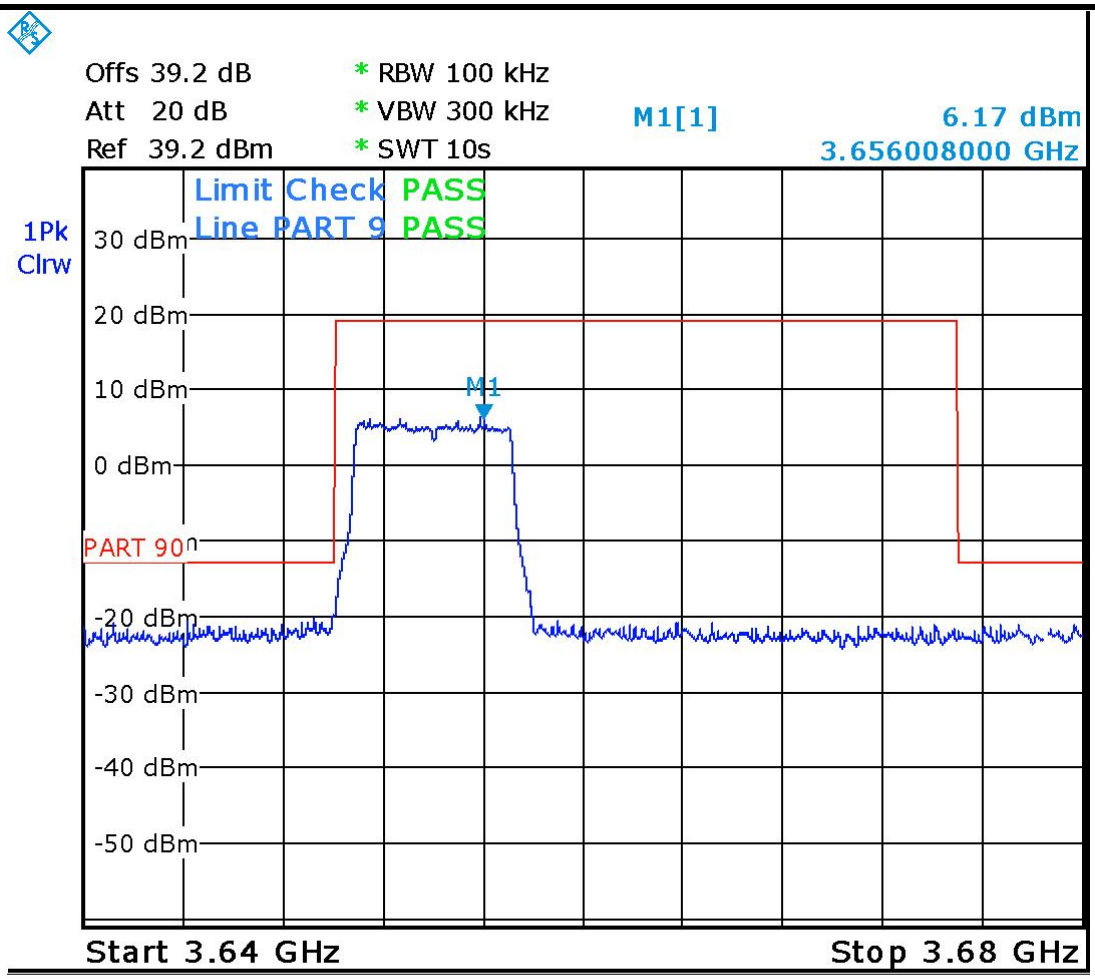
Date: 19.MAR.2009 03:39:11

Table 23 – 3653.5MHz Band Edge Spurious BPSK

Axxcelera **RF Test Data**

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3653.5 Band Edge Spurious BPSK



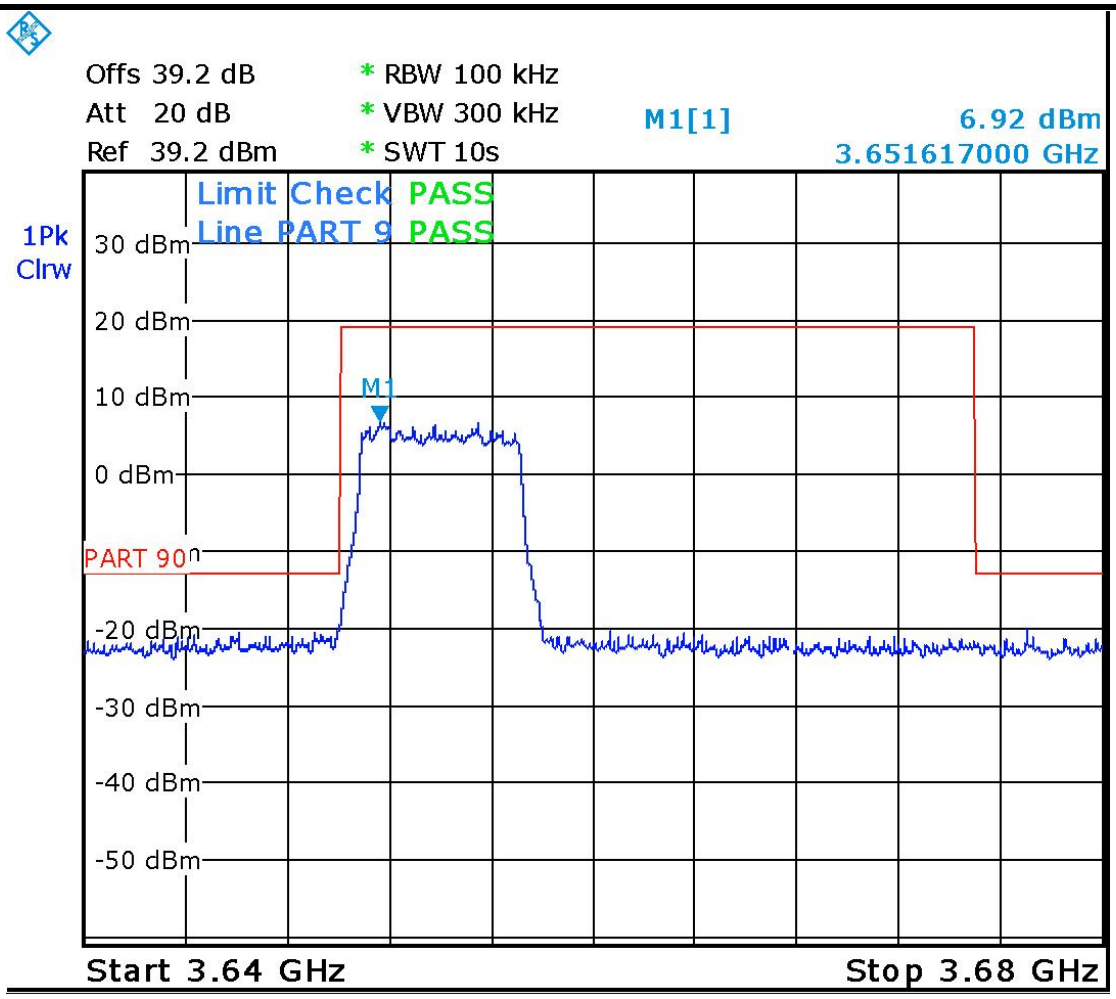
Date: 19.MAR.2009 04:44:13

Table 24 – 3653.5MHz Band Edge Spurious QPSK

Axxcelera **RF Test Data**

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3653.5 Band Edge Spurious QPSK



Date: 19.MAR.2009 04:43:07

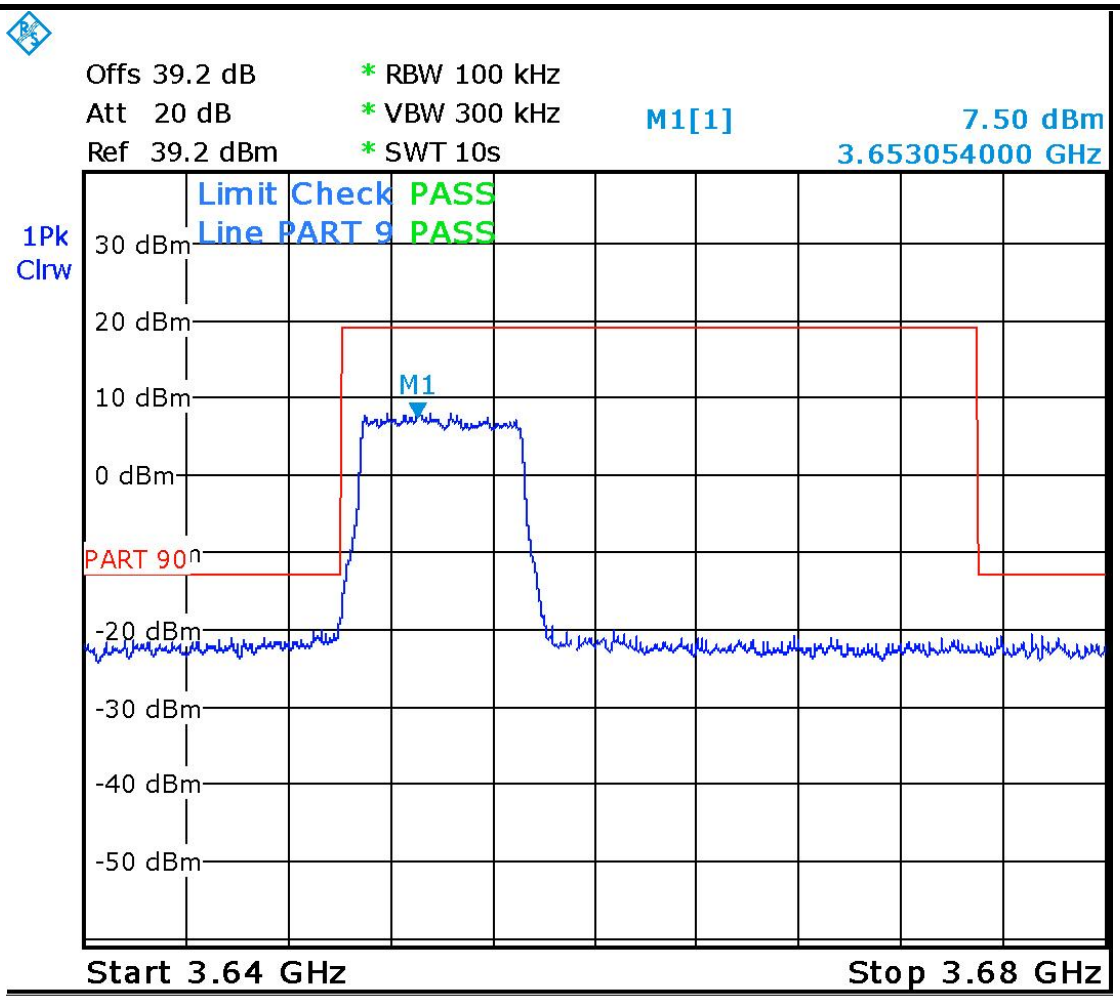
Table 25 – 3653.5MHz Band Edge Spurious 16QAM

Axxcelera

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3653.5 Band Edge Spurious 16QAM



Date: 19.MAR.2009 04:42:02

Table 26 – 3653.5MHz Band Edge Spurious 64QAM

Axxcelera

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

3653.5 Band Edge Spurious 64QAM

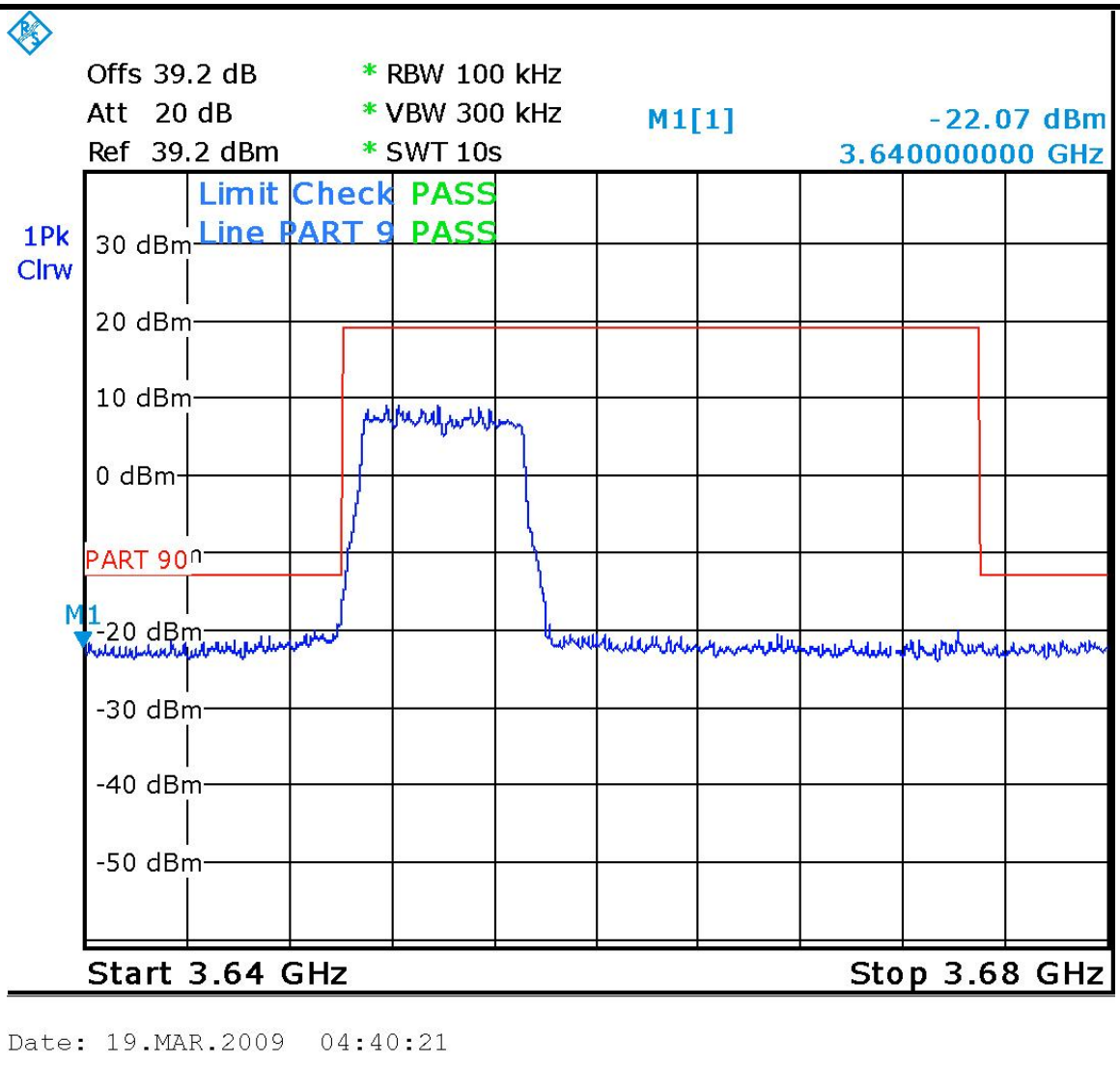


Table 27 – Conducted Spurious 9KHz to 150KHz BPSK

Axxcelera **RF Test Data**

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

Conducted Spurious Emissions 9KHz to 150KHz

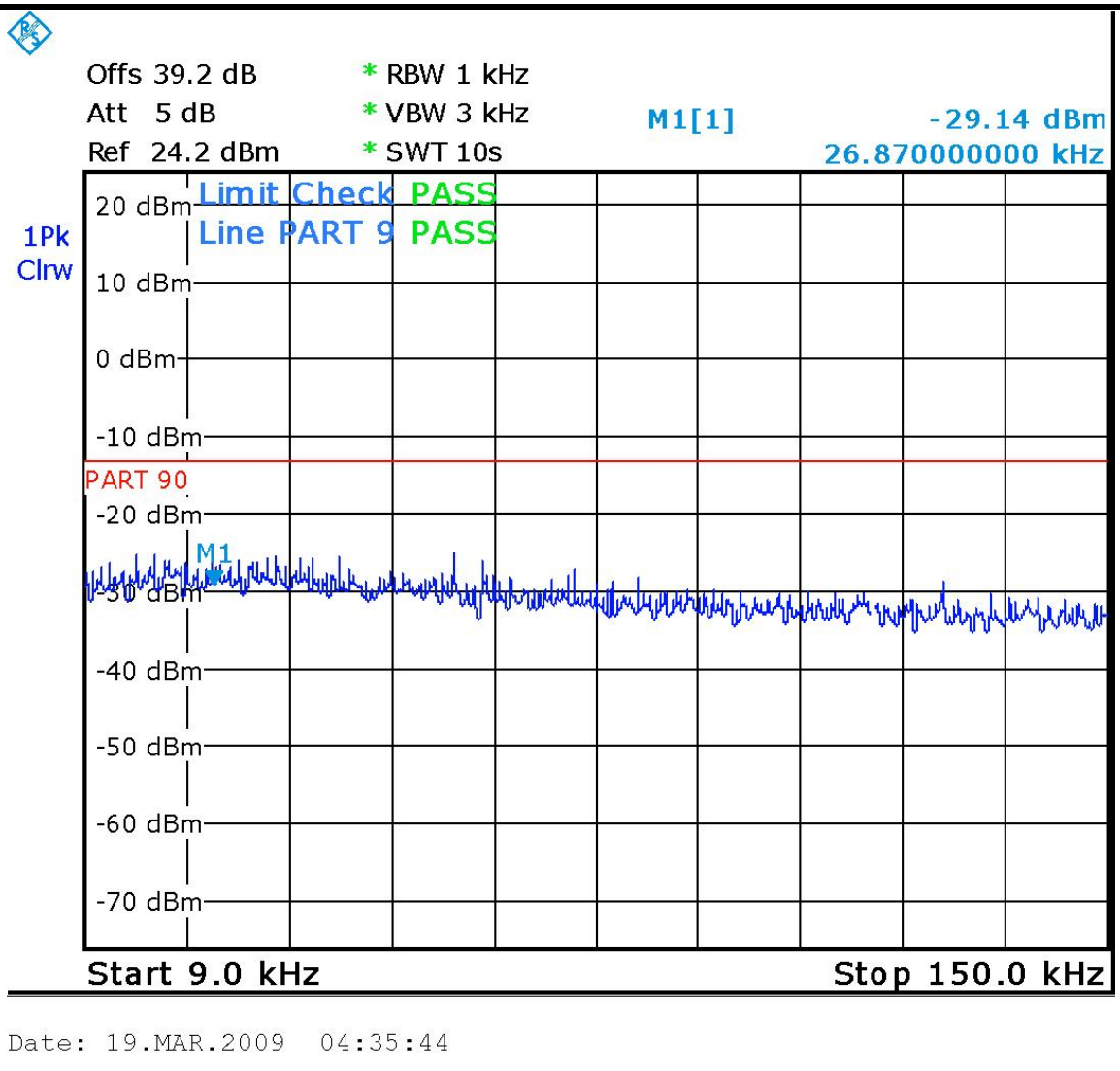


Table 28 – Conducted Spurious 150KHz to 30MHz BPSK

Axxcelera

RF Test Data

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

Conducted Spurious Emissions 150KHz to 30MHz

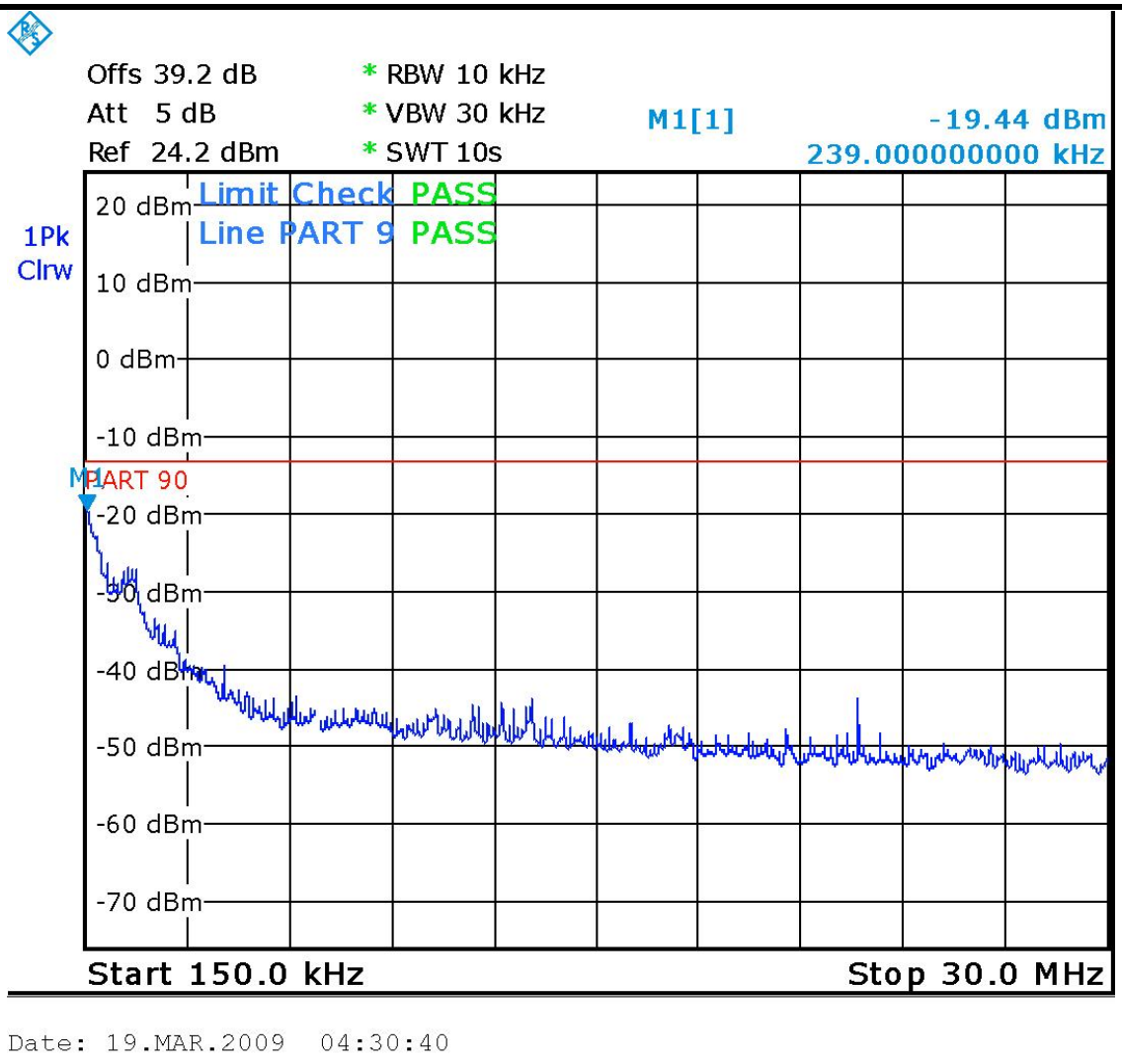


Table 29 – Conducted Spurious 30MHz to 1GHz BPSK

Axxcelera **RF Test Data**

Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

Conducted Spurious Emissions 30MHz to 1GHz

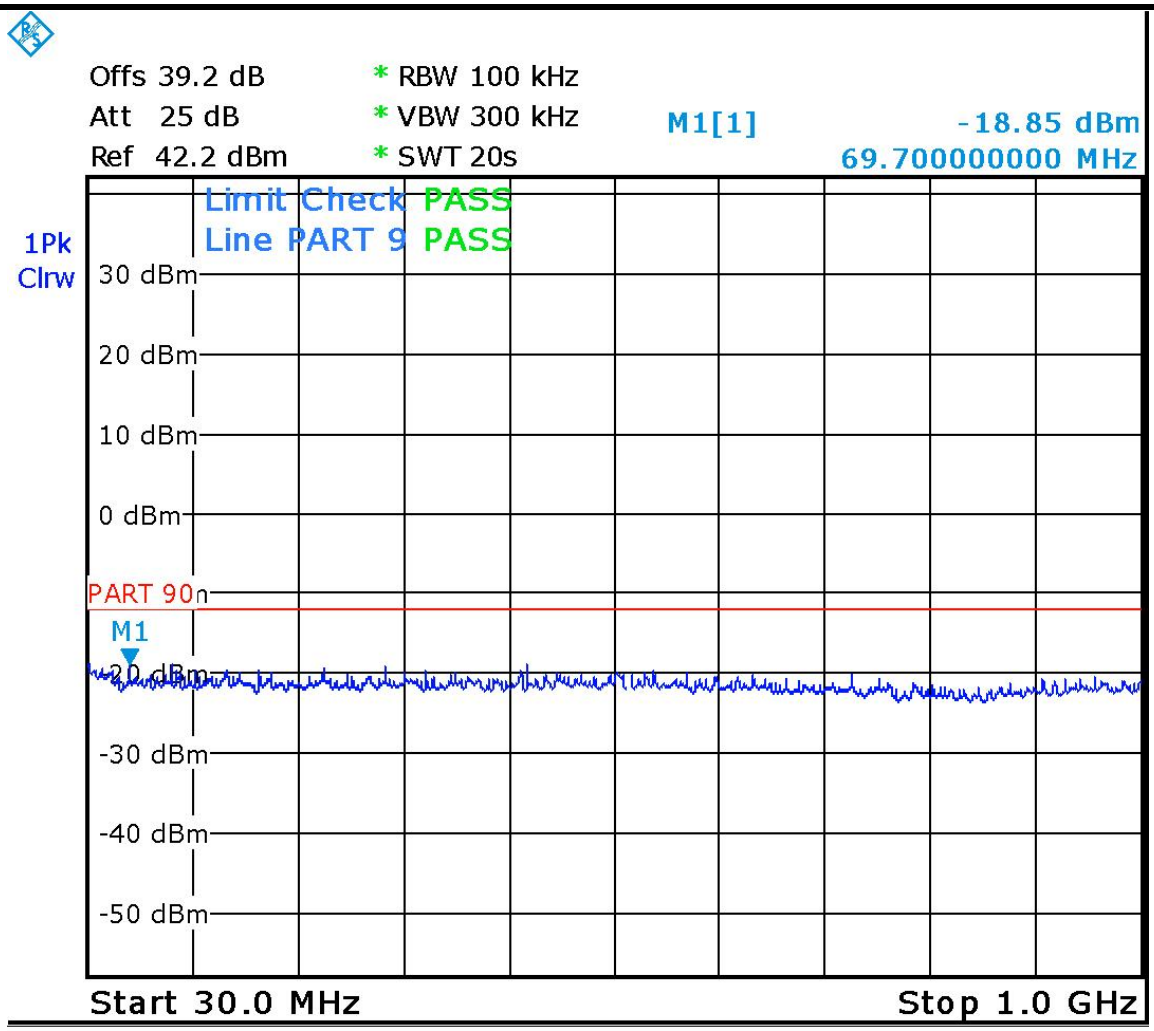


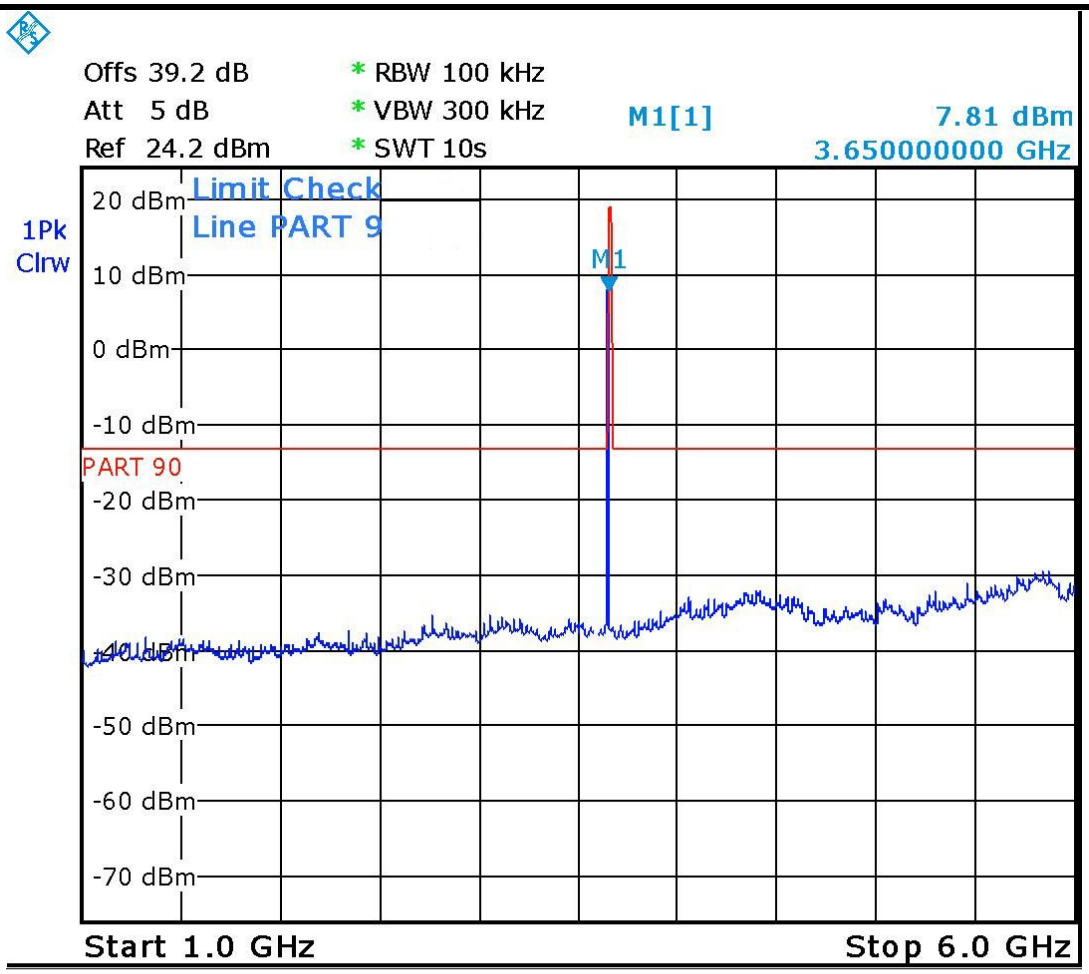
Table 30 – Conducted Spurious 1GHz to6GHz BPSK

Axxcelera

RF Test Data

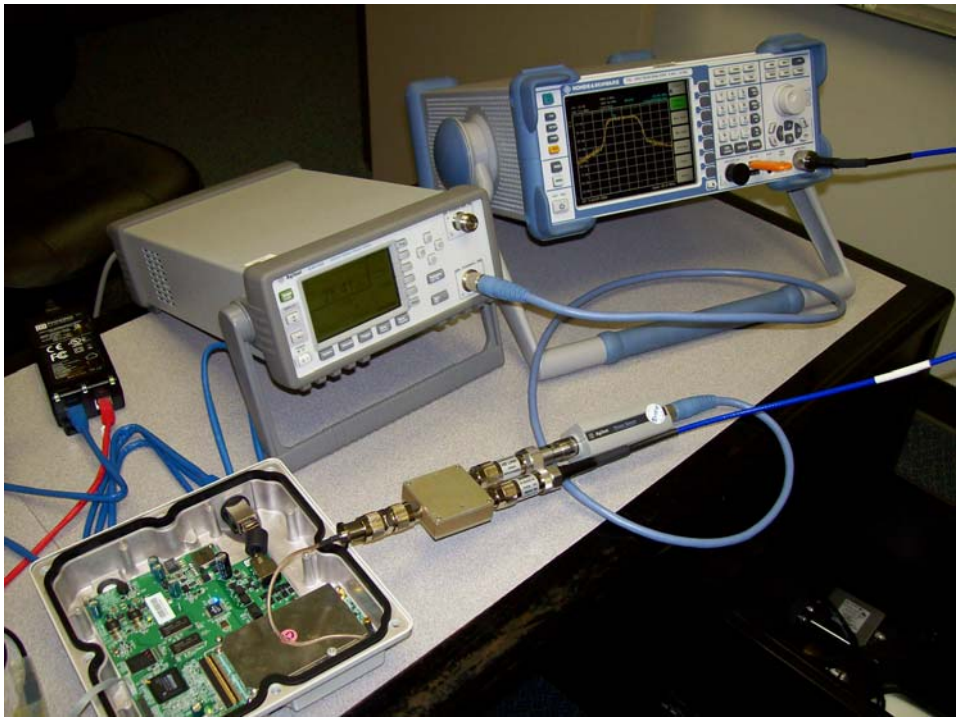
Client	*Axxcelera Broadband Wireless*		Project Number	20090302	
Model	*EHD-CPE3310-C7*		Project Revision	0	
POC	*Tony Masters*		Test Engineer	*Al Servais*	
Test Standard	*FCC 47 CFR Part 90*		Systems Director	*Chris Moritz*	
Operating Voltage	+48 VDC	AC/DC	Frequency	DC	Hz
Temperature	22	°C	Relative Humidity	54	%

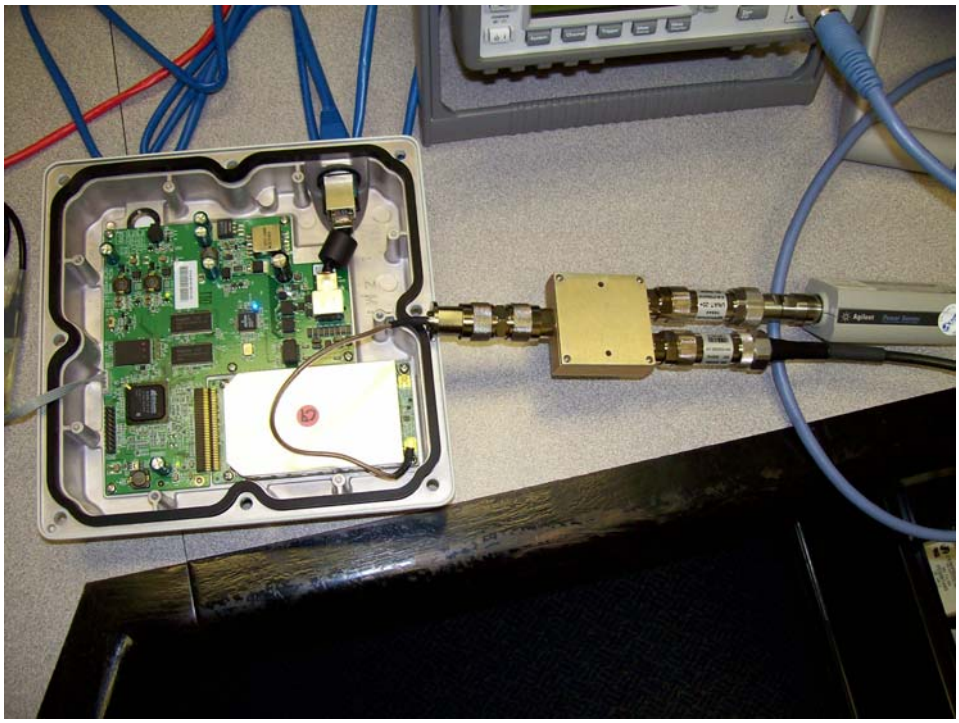
Conducted Spurious Emissions 30MHz to 1GHz



Date: 19.MAR.2009 04:29:45

4.4 EUT Test Configuration Photos





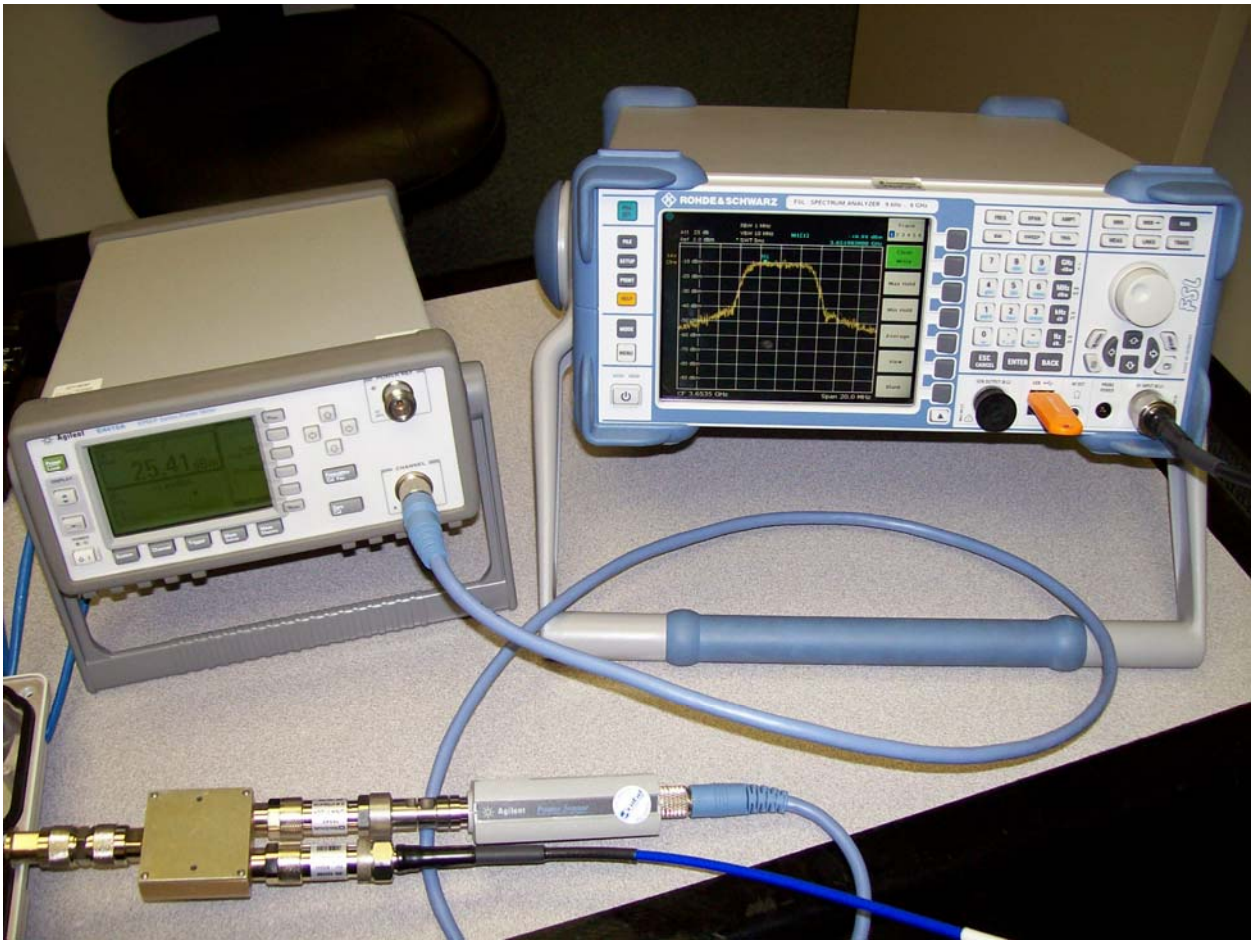


Figure 2 – Test Set-up Photos

4.5 EUT External Photos

Figure 3 – EUT External Photos

4.6 EUT Internal Photos

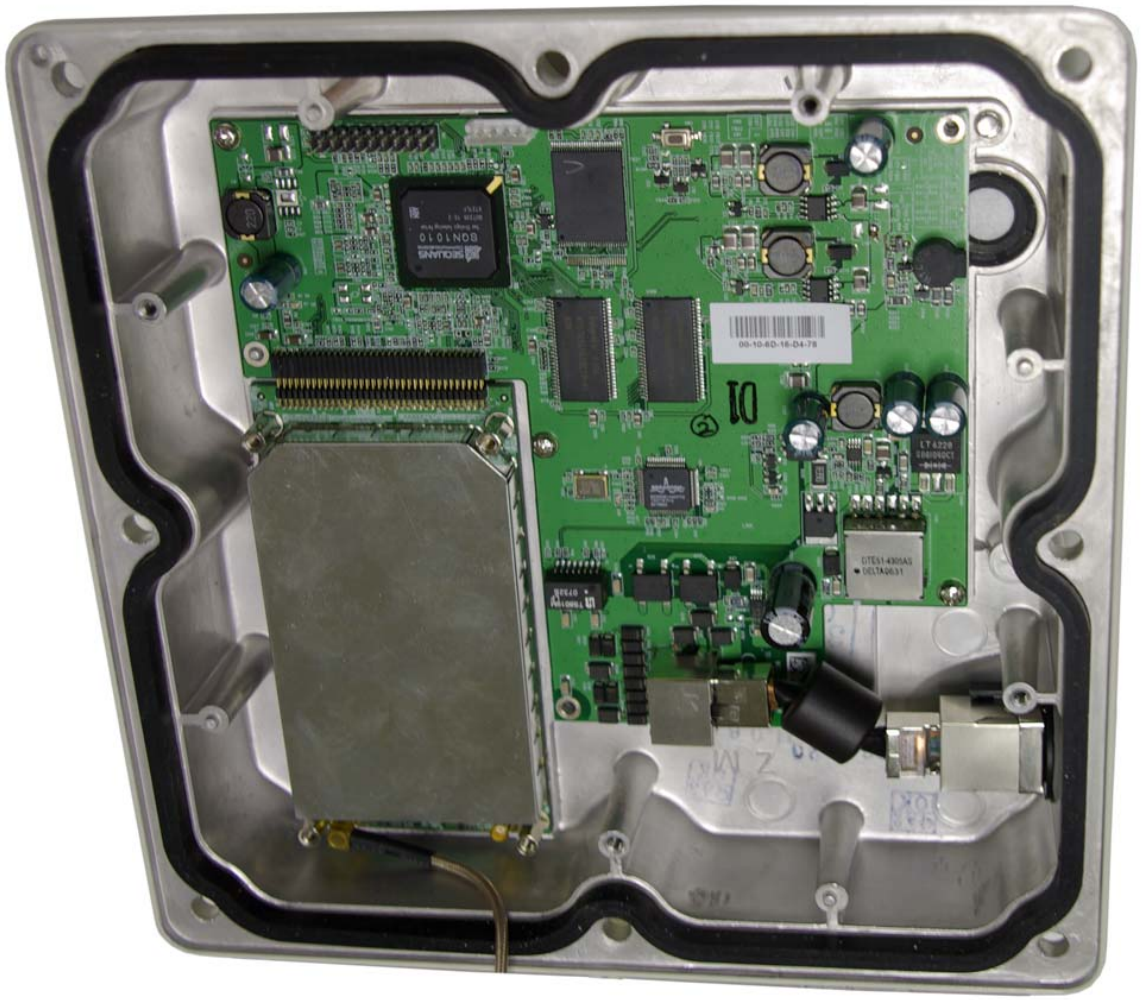


Figure 4 – EUT Internal Photos

4.7 EUT Label

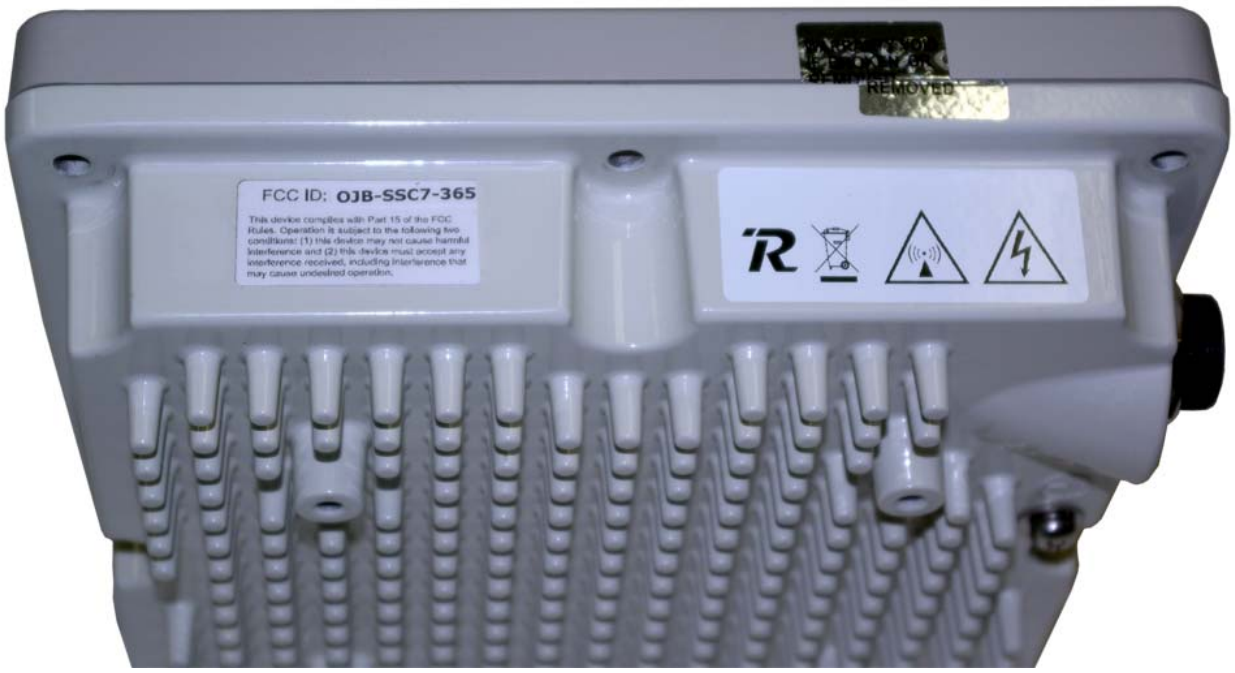


Figure 5 – FCC Label and Location

5 Test Equipment Use List

5.1 Test Equipment List

Table 31 – Axxcelera T&M List

Axxcelera T&M List				
Cal Due	Manufacturer	Model Number	Nomenclature	Serial Number
24-Nov-09	Agilent	E4416A	EPM-P Series Power Meter	GB41292813
24-Nov-09	Agilent	E9323A	Peak and Ave Power Sensor	US40411900
10-Jun-09	Rhode & Schwarz	FSL6	Spectrum Analyzer	100310

Declaration of Conformity

Declaration of Conformity

Axxcelera Broadband Wireless, Inc.
111 Castilian Drive
Santa Barbara CA, 93117

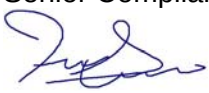
declares that under our sole responsibility, the product

ExcelMAX WiMAX wireless Broadband, xxxx

is in conformity with the provisions of the following radio standards specification, including all amendments and with national legislation:

47 CFR § 90

NAME AND TITLE	PLACE	DATE
Al Servais Senior Compliance Engineer	Richmond VA	12/8/2007



SIGNATURE OF APPLICANT