Excellence in Compliance Testing

# Certification Test Report

## FCC ID: Y75WINTLAW

## FCC Rule Part: 15.247

## ACS Report Number: 10-0313.W03.11.A

Manufacturer: BAE Systems
Model: R3T-S-700

Test Begin Date: September 28, 2010
Test End Date: November 4, 2010

Report Issue Date: February 9, 2011

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

**Reviewed by:**

**Kirby Munroe**
**Director, Wireless Certifications**
**ACS, Inc.**



**This report contains 25 pages**

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# 1 GENERAL

## 1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations.

## 1.2 Product description

The R3T-S-700 is based upon the commercial IEEE 802.16D5-2004 standard specifically targeted at ground and airborne mobile networking. The system is implemented as a WLAN gateway configuration converting a wired gigabit ethernet connection to a wireless interface with a range of up to 75 miles and a maximum data rate of 65.5 megabits per second. The R3T-S-700 radio system is comprised of an Indoor radio in an air cooled 1U 19 inch rack mountable chassis and the Outdoor RF Unit (PA/LNA). The system provides ethernet interfaces, and modulates/demodulates OFDM-256 as specified in the IEEE 802.16-2004 specification.

| | |
|---|---|
| Modulation Type(s): | OFDM (BPSK, QPSK, 16QAM, 64QAM) |
| Available Bandwidth(s): | 10 MHz / 20 MHz |
| EUT Frequency Range: | 5740-5830 MHz (10 MHz BW) |
| | 5745-5825 MHz (20 MHz BW) |
| Operating Voltage: | 120 VAC, 60 Hz |
| RF Output Power: | 25.2 dBm |
| Antenna: | Omni-directional 6dBi (Cobham Ant. Systems, Model:OA6-4.7L/1755) |

Manufacturer Information:
BAE Systems
164 Totowa Road
Wayne, NJ 07474

Test Sample Serial Number(s): 9229-2 -- J 27719 (IDU), AFP68 (ODU)

Test Sample Condition: The test samples were provided in good working order with no visible defects.

## 1.3 Test Methodology and Considerations

The R3T-S-700 was configured as a system to include both the Indoor Unit (IDU) and Outdoor PN/LNA Unit (ODU). The minimal length of cable specified for installation was used from the IDU to the ODU.

All modulation types and bandwidths were evaluated and the worst case presented in this report. It was determined that the BPSK modulation was worst case. Both bandwidths were evaluated in full and data presented in this report.

# 2 TEST FACILITIES

## 2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

## 2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 894540
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

## 2.3 Radiated Emissions Test Site Description

### 2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

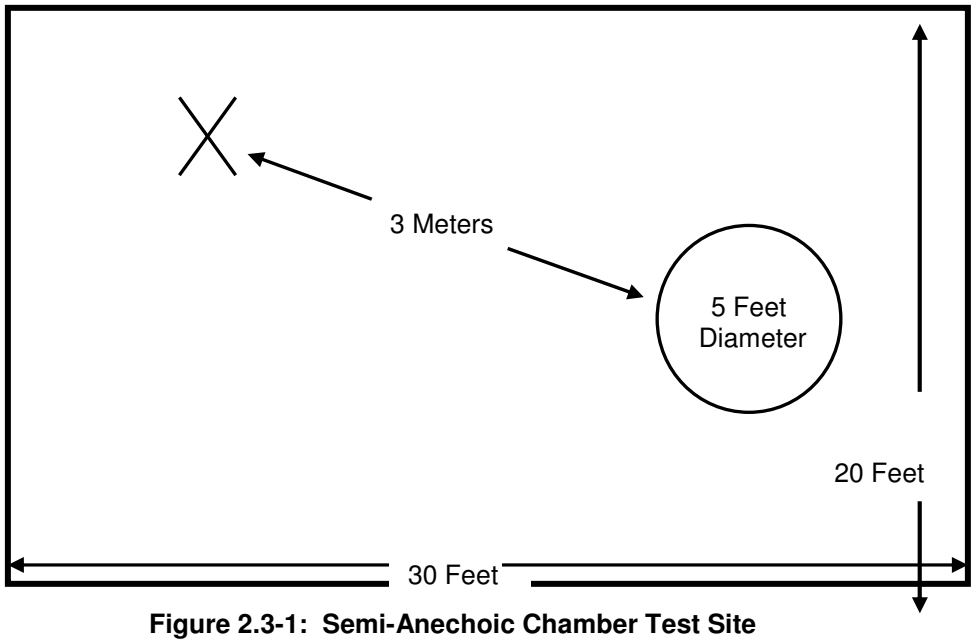


**Figure 2.3-1: Semi-Anechoic Chamber Test Site**

### 2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

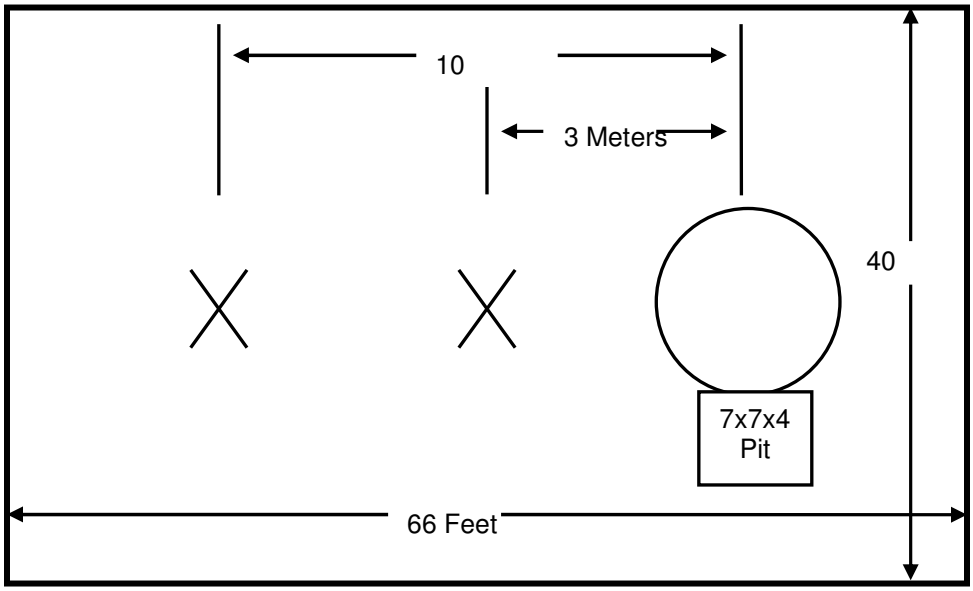


**Figure 2.3-2: Open Area Test Site**

### 2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

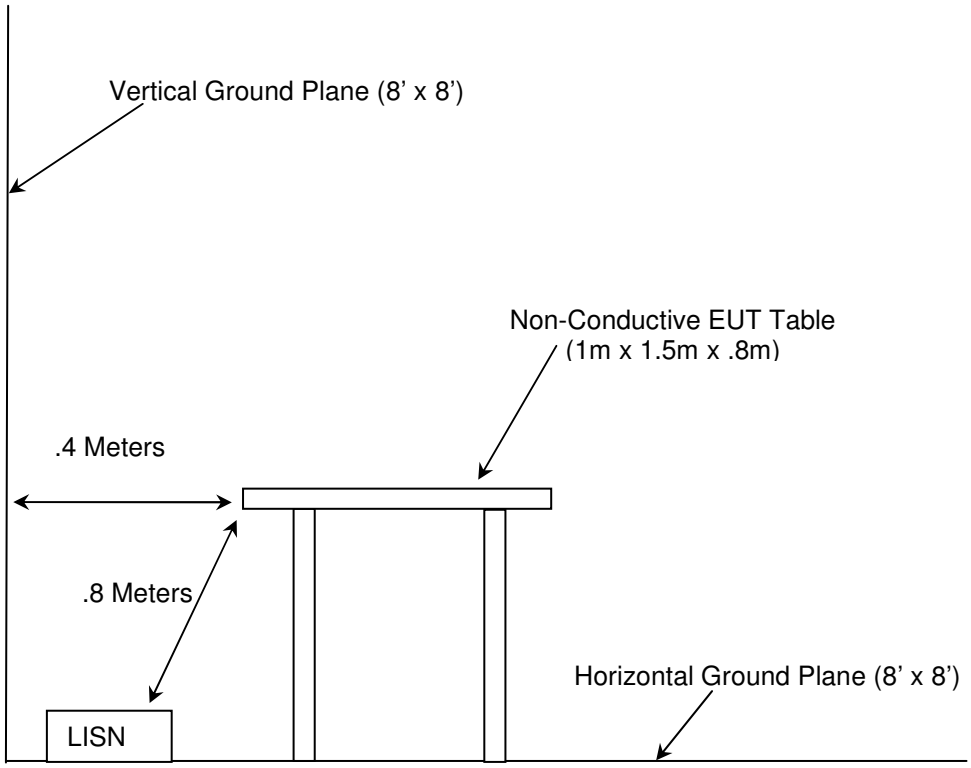


**Figure 2.4-1: AC Mains Conducted EMI Site**

## 3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2010
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2010
- FCC KDB Publication No. 558074 - Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247), March 2005

## 4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

**Table 4-1: Test Equipment**

| Asset ID | Manufacturer | Model # | Equipment Type | Serial # | Last Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|---|
| 1 | Rohde & Schwarz | ESMI - Display | Spectrum Analyzers | 833771/007 | 9/23/2010 | 9/23/2012 |
| 2 | Rohde & Schwarz | ESMI-Receiver | Spectrum Analyzers | 839587/003 | 9/23/2010 | 9/23/2012 |
| 3 | Rohde & Schwarz | ESMI - Display | Spectrum Analyzers | 839379/011 | 2/2/2009 | 2/2/2011 |
| 4 | Rohde & Schwarz | ESMI - Receiver | Spectrum Analyzers | 833827/003 | 2/2/2009 | 2/2/2011 |
| 25 | Chase | CBL6111 | Antennas | 1043 | 9/13/2010 | 9/13/2012 |
| 30 | Spectrum Technologies | DRH-0118 | Antennas | 970102 | 5/8/2009 | 5/8/2011 |
| 73 | Agilent | 8447D | Amplifiers | 2727A05624 | 5/26/2010 | 5/26/2011 |
| 152 | EMCO | 3825/2 | LISN | 9111-1905 | 11/2/2010 | 11/2/2012 |
| 167 | ACS | Chamber EMI Cable Set | Cable Set | 167 | 1/25/2010 | 1/25/2011 |
| 168 | Hewlett Packard | 11947A | Attenuators | 44829 | 2/4/2010 | 2/4/2011 |
| 283 | Rohde & Schwarz | FSP40 | Spectrum Analyzers | 1000033 | 8/31/2010 | 8/31/2011 |
| 291 | Florida RF Cables | SMRE-200W-12.0-SMRE | Cables | None | 12/7/2010 | 12/7/2011 |
| 292 | Florida RF Cables | SMR-290AW-480.0-SMR | Cables | None | 12/7/2010 | 12/7/2011 |
| 324 | ACS | Belden | Cables | 8214 | 7/9/2010 | 7/9/2011 |
| 332 | Rohde & Schwarz | TS-PR40 | Amplifiers | 100021 | 10/29/2010 | 10/29/2011 |
| 333 | Rohde&Schwarz | 3160-09 | Antennas | 49404 | 11/4/2010 | NCR |
| 334 | Rohde&Schwarz | 3160-10 | Antennas | 45576 | 11/4/2010 | NCR |
| 335 | Suhner | SF-102A | Cables | 882/2A | 10/29/2010 | 10/29/2011 |
| 338 | Hewlett Packard | 8449B | Amplifiers | 3008A01111 | 10/29/2010 | 10/29/2011 |
| 341 | Aeroflex/Weinschel | 54A-20 | Attenuators | 4686 | 9/3/2010 | 9/3/2011 |
| 345 | Suhner Sucoflex | 102A | Cables | 1077/2A | 10/29/2010 | 10/29/2011 |
| 347 | Microwave Circuits | H07G18G3 | Filters | 171921 | 10/27/2010 | 10/27/2011 |
| 422 | Florida RF | SMS-200AW-72.0-SMR | Cables | 805 | 12/29/2010 | 12/29/2011 |

## 5 SUPPORT EQUIPMENT

**Table 5-1: Support Equipment**

| Item | Equipment Type | Manufacturer | Model Number | Serial Number |
|---|---|---|---|---|
| 1 | Antenna | Cobham Antenna Systems | OA6-4.7L/1755 | NA |
| 2 | 20' LMR-400UF Cables | Times Microwave Systems | LMR-400UF | NA |

## 6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

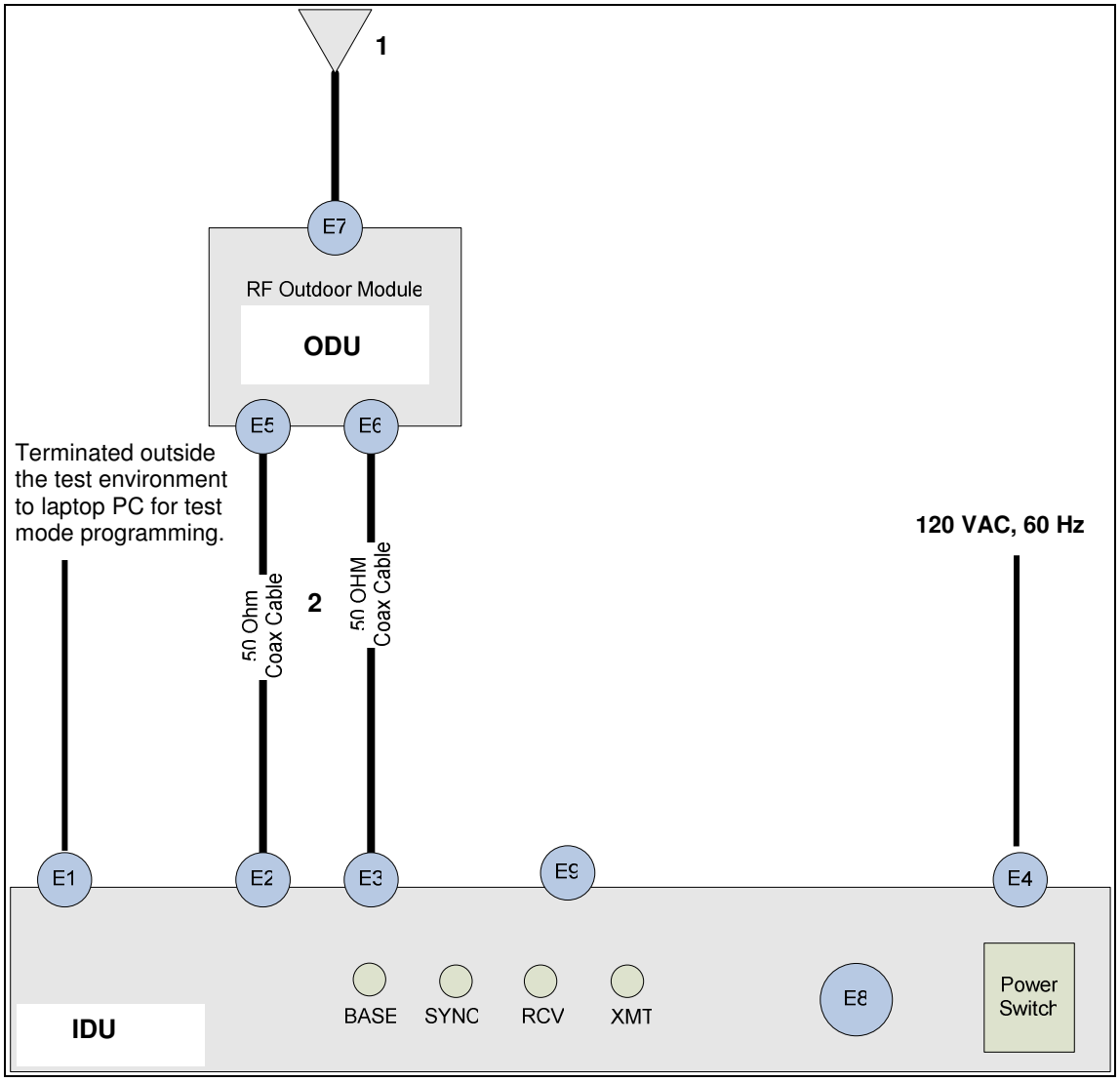


**Figure 6-1: EUT Test Setup**

**Table 6-1: EUT Interfaces**

| No. | Interface | Connector | Direction | Description |
|---|---|---|---|---|
| E1 | Ethernet Control/Data | RJ-45 | Input/Output | 10/100BaseT Ethernet Network Connector |
| E2 | RF -Radio | RX TNC Female | Input/Output | Input: RF Rx IF Input 5.8<br>Output: 15VDC prime power for RF Unit |
| E3 | RF -Radio | Tx TNC Female | Output | RF Tx IF Output 5.8. TTL Signal For RF Unit T/R Control: HIGH, 2.4V MIN TO 5V MAX; LOW, 0.7 VOLTS MAX TO 0 V MIN. |
| E4 | Power | AC Plug | Input | 110 VAC Power Source –Less than 1 Amp |
| E5 | RF - RF Unit | J2 Type N Female | Input/Output | Output: RF Unit Rx out Port<br>Input: Primary 15VDC |
| E6 | RF –RF Unit | J1 Type TNC Female | Input | RF Module Tx in Port. TTL Signal : HIGH, 2.4V MIN TO 5V MAX; LOW, 0.7 VOLTS MAX TO 0 V MIN. |
| E7 | RF –RF Unit | J3 Type N Female | Input/Output | Antenna Port (Tx/Rx) |
| E8 | Serial Control Interface | DB9 | Input/Output | RS-232 Serial Connection – User Port SW Maintenance |
| E9 | Serial Control Interface | DB25 | Input/Output | RS-422/232 Serial Connection supporting GPS 1PPS, T/R Switch |

# 7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

## 7.1 Antenna Requirement – FCC: Section 15.203

The antenna is an omni-directional Cobham Antenna Systems, Model:OA6-4.7L/1755. Maximum gain is 6dBi. The connector is a standard N-type however professional installation applies.

## 7.2 Power Line Conducted Emissions – FCC: Section 15.207

### 7.2.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

**Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss**
**Margin = Applicable Limit - Corrected Reading**

### 7.2.2 Measurement Results

Results of the test are shown below in and Tables 7.2.2-1 to 7.2.2-2.

**Table 7.2.2-1: Line 1 Conducted EMI Results**

| Frequency (MHz) | Level (dBuV) | Transducer (dB) | Limit (dBuV) | Margin (dB) | Line | PE | Detector |
|---|---|---|---|---|---|---|---|
| 0.258 | 46.9 | 10 | 62 | 14.6 | L1 | GND | QP |
| 0.522 | 30.5 | 10 | 56 | 25.5 | L1 | GND | QP |
| 11.706 | 23.3 | 9.8 | 60 | 36.7 | L1 | GND | QP |
| 11.808 | 27.6 | 9.8 | 60 | 32.4 | L1 | GND | QP |
| 11.898 | 28.6 | 9.8 | 60 | 31.4 | L1 | GND | QP |
| 11.958 | 24.5 | 9.8 | 60 | 35.5 | L1 | GND | QP |
| 12.096 | 24.1 | 9.8 | 60 | 35.9 | L1 | GND | QP |
| 12.258 | 24.8 | 9.9 | 60 | 35.2 | L1 | GND | QP |
| 27.042 | 20.8 | 9.4 | 60 | 39.2 | L1 | GND | QP |
| 0.258 | 41.9 | 10 | 52 | 9.6 | L1 | GND | AVG |
| 0.51 | 16.2 | 10 | 46 | 29.8 | L1 | GND | AVG |
| 11.718 | 22 | 9.8 | 50 | 28 | L1 | GND | AVG |
| 11.88 | 18.4 | 9.8 | 50 | 31.6 | L1 | GND | AVG |
| 11.952 | 20.2 | 9.8 | 50 | 29.8 | L1 | GND | AVG |
| 11.994 | 25.2 | 9.8 | 50 | 24.8 | L1 | GND | AVG |
| 12.072 | 20.3 | 9.8 | 50 | 29.7 | L1 | GND | AVG |
| 12.336 | 14.4 | 9.9 | 50 | 35.6 | L1 | GND | AVG |
| 27.162 | 15.9 | 9.4 | 50 | 34.1 | L1 | GND | AVG |

**Table 7.2.2-2: Line 2 Conducted EMI Results**

| Frequency (MHz) | Level (dBuV) | Transducer (dB) | Limit (dBuV) | Margin (dB) | Line | PE | Detector |
|---|---|---|---|---|---|---|---|
| 0.174 | 50.2 | 9.9 | 65 | 14.6 | L2 | GND | QP |
| 0.258 | 46.3 | 10 | 62 | 15.2 | L2 | GND | QP |
| 0.51 | 25.3 | 10 | 56 | 30.7 | L2 | GND | QP |
| 11.766 | 22.4 | 9.8 | 60 | 37.6 | L2 | GND | QP |
| 11.796 | 23.7 | 9.8 | 60 | 36.3 | L2 | GND | QP |
| 11.904 | 29.4 | 9.8 | 60 | 30.6 | L2 | GND | QP |
| 11.994 | 28.8 | 9.8 | 60 | 31.2 | L2 | GND | QP |
| 12.234 | 20.3 | 9.9 | 60 | 39.7 | L2 | GND | QP |
| 12.276 | 21.8 | 9.9 | 60 | 38.2 | L2 | GND | QP |
| 0.174 | 42.2 | 9.9 | 55 | 12.5 | L2 | GND | AVG |
| 0.258 | 41.2 | 10 | 52 | 10.3 | L2 | GND | AVG |
| 0.498 | 11.7 | 10 | 46 | 34.3 | L2 | GND | AVG |
| 11.808 | 21 | 9.8 | 50 | 29 | L2 | GND | AVG |
| 11.856 | 15.9 | 9.8 | 50 | 34.1 | L2 | GND | AVG |
| 11.976 | 17.3 | 9.8 | 50 | 32.7 | L2 | GND | AVG |
| 12.138 | 18.4 | 9.8 | 50 | 31.6 | L2 | GND | AVG |
| 12.222 | 13.9 | 9.9 | 50 | 36.1 | L2 | GND | AVG |
| 12.234 | 13.8 | 9.9 | 50 | 36.2 | L2 | GND | AVG |

## 7.3 6dB / 99% Bandwidth – FCC: Section 15.247(a)(2)

### 7.3.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)". The RBW of the spectrum analyzer was set to 100 kHz and VBW 300 kHz. Span was set large enough to capture the entire emissions and >> RBW.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission and approximately 20 dB below the peak level. The RBW was to 1% - 3% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth.

### 7.3.2 Measurement Results

Results are shown below in Tables 7.3.2-1 to 7.3.2-2 and figure 7.3.2-1 to 7.3.2-12:

**Table 7.3.2-1: 10 MHz - 6dB / 99% Bandwidth**

| Frequency [MHz] | 6dB Bandwidth [MHz] | 99% Bandwidth [MHz] |
|---|---|---|
| 5740 | 9.07 | 9.12 |
| 5780 | 9.16 | 9.17 |
| 5830 | 9.12 | 9.17 |

**Table 7.3.2-2: 20 MHz - 6dB / 99% Bandwidth**

| Frequency [MHz] | 6dB Bandwidth [MHz] | 99% Bandwidth [MHz] |
|---|---|---|
| 5745 | 15.80 | 15.72 |
| 5785 | 15.76 | 15.76 |
| 5825 | 15.76 | 15.72 |

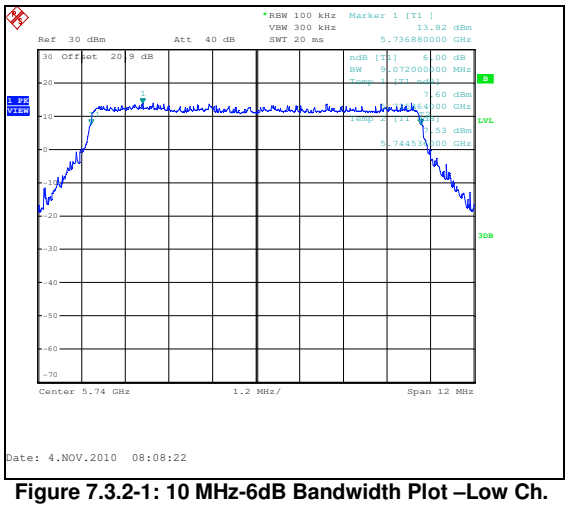


**Figure 7.3.2-1: 10 MHz-6dB Bandwidth Plot –Low Ch.**

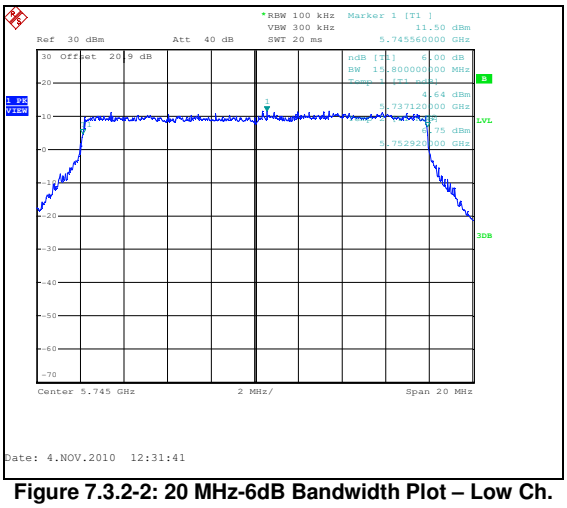


**Figure 7.3.2-2: 20 MHz-6dB Bandwidth Plot – Low Ch.**

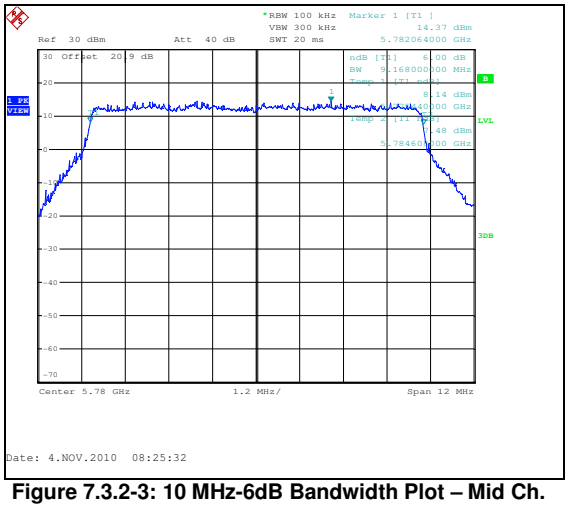


**Figure 7.3.2-3: 10 MHz-6dB Bandwidth Plot – Mid Ch.**

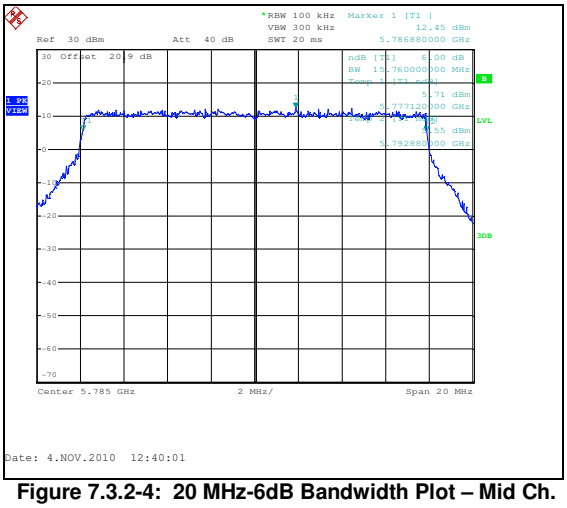


**Figure 7.3.2-4: 20 MHz-6dB Bandwidth Plot – Mid Ch.**

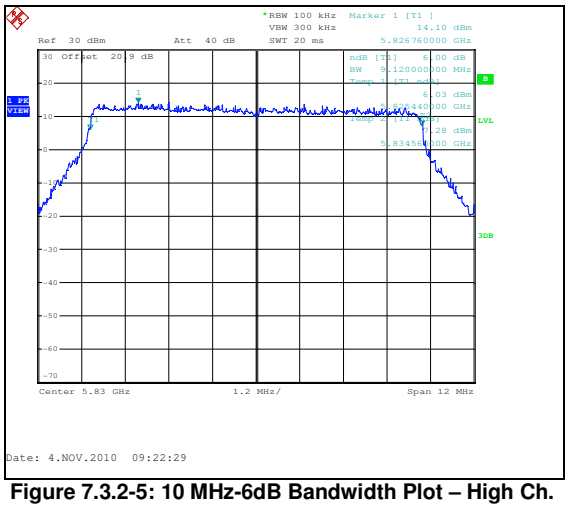


**Figure 7.3.2-5: 10 MHz-6dB Bandwidth Plot – High Ch.**

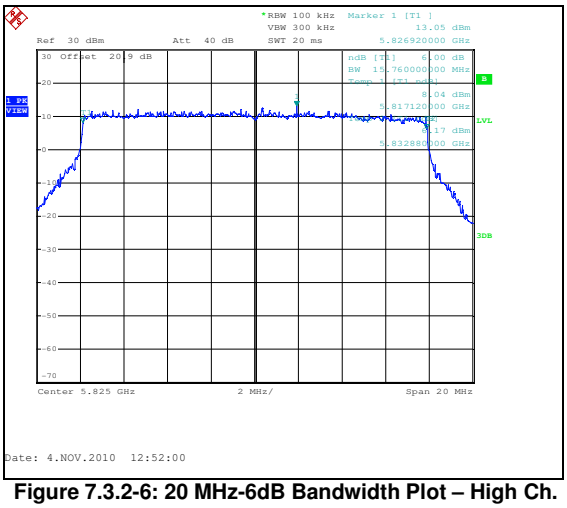


**Figure 7.3.2-6: 20 MHz-6dB Bandwidth Plot – High Ch.**

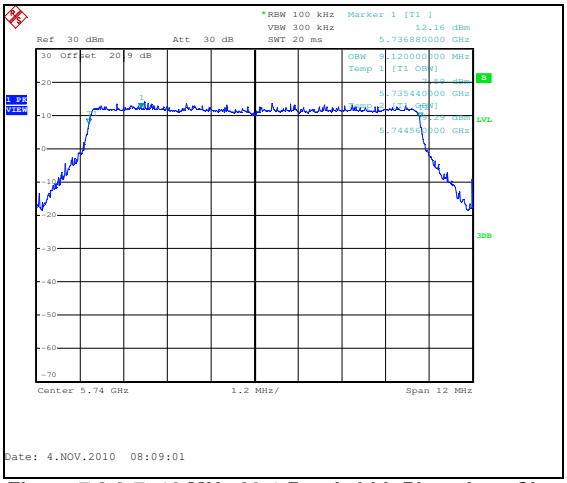


**Figure 7.3.2-7: 10 MHz-99% Bandwidth Plot – Low Ch.**

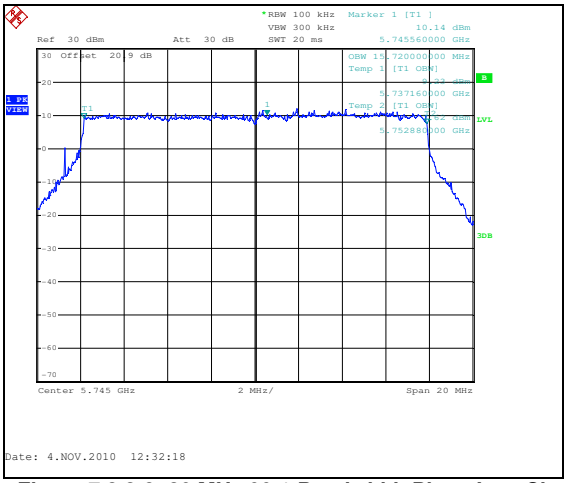


**Figure 7.3.2-8: 20 MHz-99% Bandwidth Plot – Low Ch.**

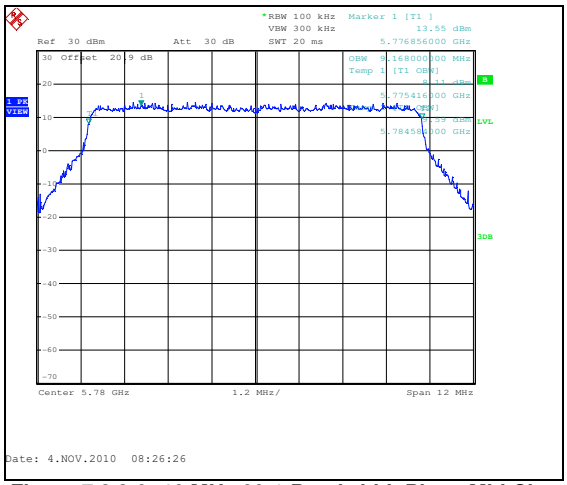


**Figure 7.3.2-9: 10 MHz-99% Bandwidth Plot – Mid Ch.**

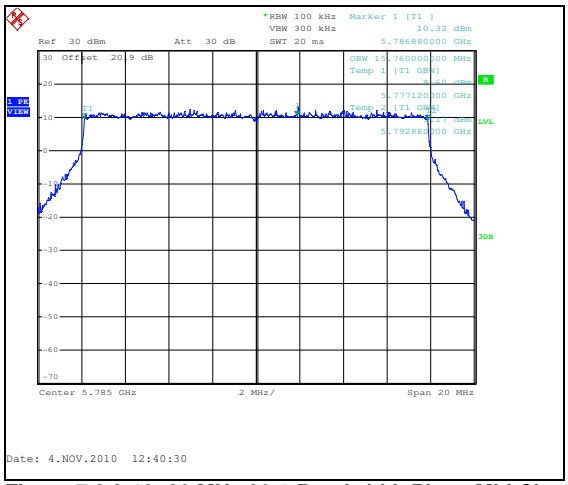


**Figure 7.3.2-10: 20 MHz-99% Bandwidth Plot – Mid Ch.**

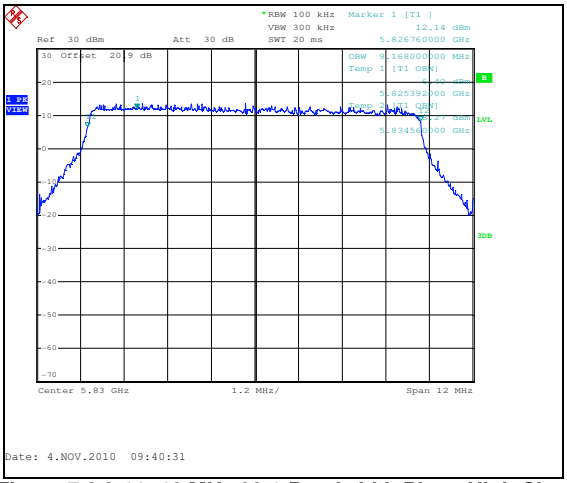


**Figure 7.3.2-11: 10 MHz-99% Bandwidth Plot – High Ch.**

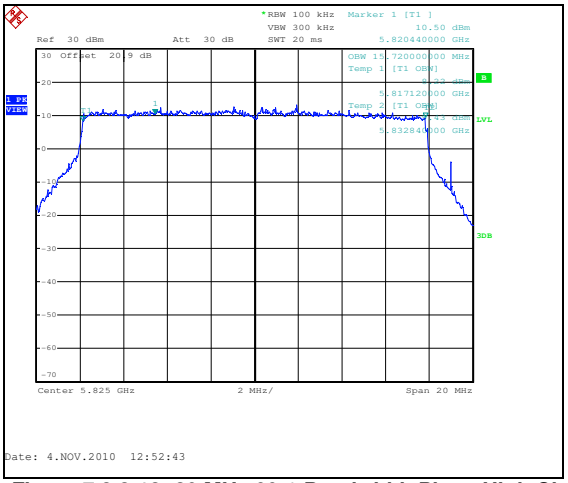


**Figure 7.3.2-12: 20 MHz-99% Bandwidth Plot – High Ch.**

## 7.4 Peak Output Power Requirement - FCC Section 15.247(b)(3)

### 7.4.1 Measurement Procedure

The Peak Output Power was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)" Power Option 2, Method 1. The insertion loss for all cables and attenuators was included as an offset value. The EUT was operating at maximum power.

### 7.4.2 Measurement Results

Results are shown below in Tables 7.4.2-1 to 7.4.2-2 and Figures 7.4.2-1 to 7.4.2-6 below.

**Table 7.4.2-1: 10 MHz - Peak Output Power**

| Frequency (MHz) | Output Power (dBm) |
|---|---|
| 5740 | 23.30 |
| 5780 | 25.10 |
| 5830 | 24.37 |

**Table 7.4.2-2: 20 MHz - Peak Output Power**

| Frequency (MHz) | Output Power (dBm) |
|---|---|
| 5745 | 23.79 |
| 5785 | 25.21 |
| 5825 | 24.66 |

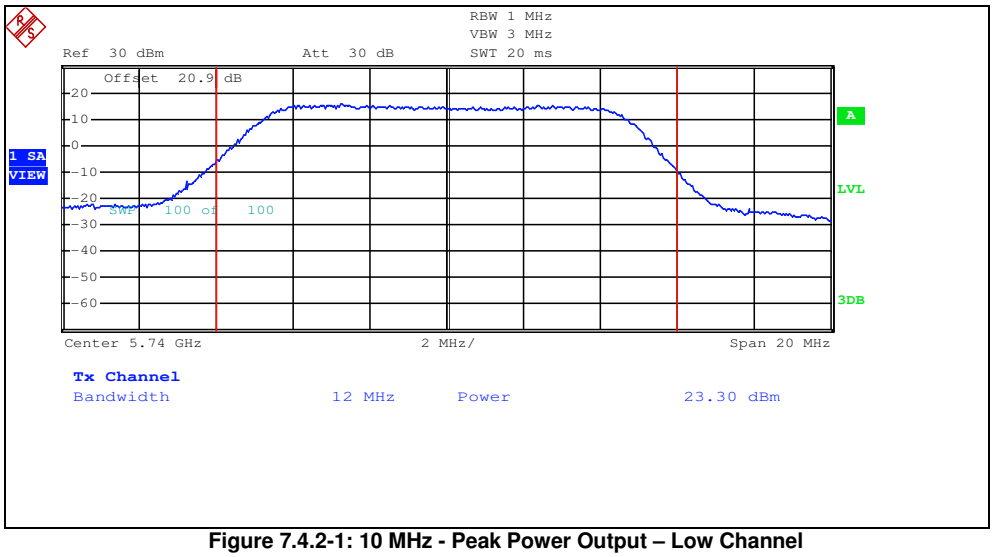


**Figure 7.4.2-1: 10 MHz - Peak Power Output – Low Channel**

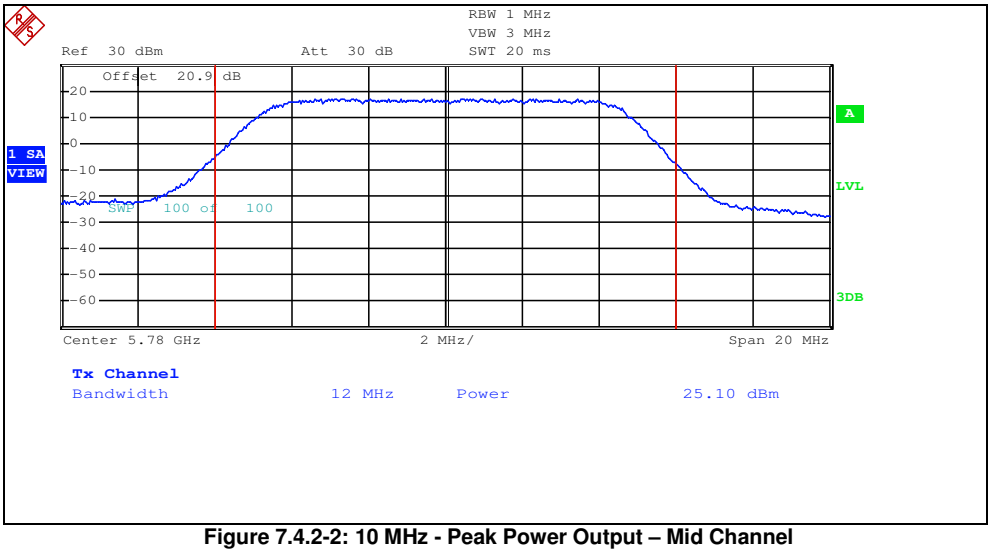


**Figure 7.4.2-2: 10 MHz - Peak Power Output – Mid Channel**

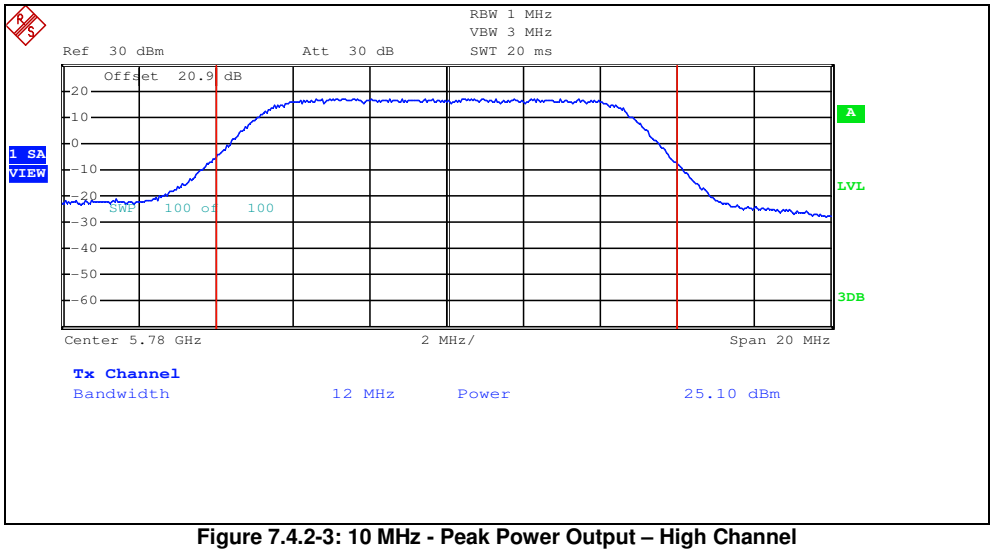


**Figure 7.4.2-3: 10 MHz - Peak Power Output – High Channel**

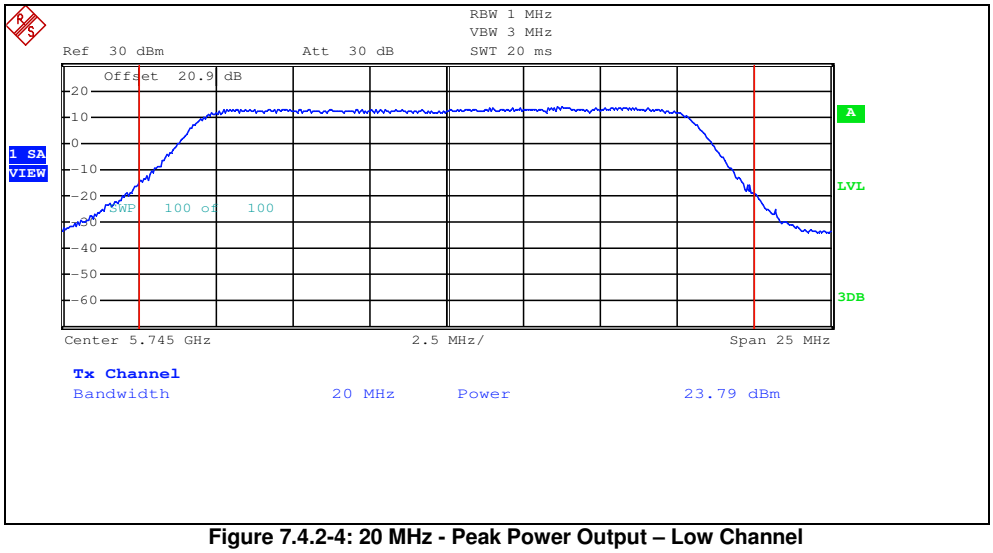


**Figure 7.4.2-4: 20 MHz - Peak Power Output – Low Channel**

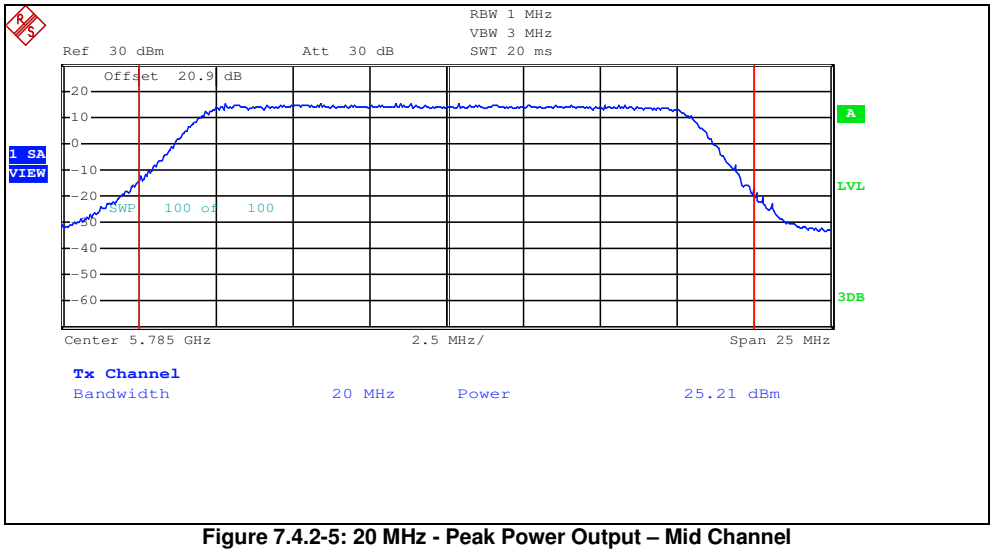


**Figure 7.4.2-5: 20 MHz - Peak Power Output – Mid Channel**

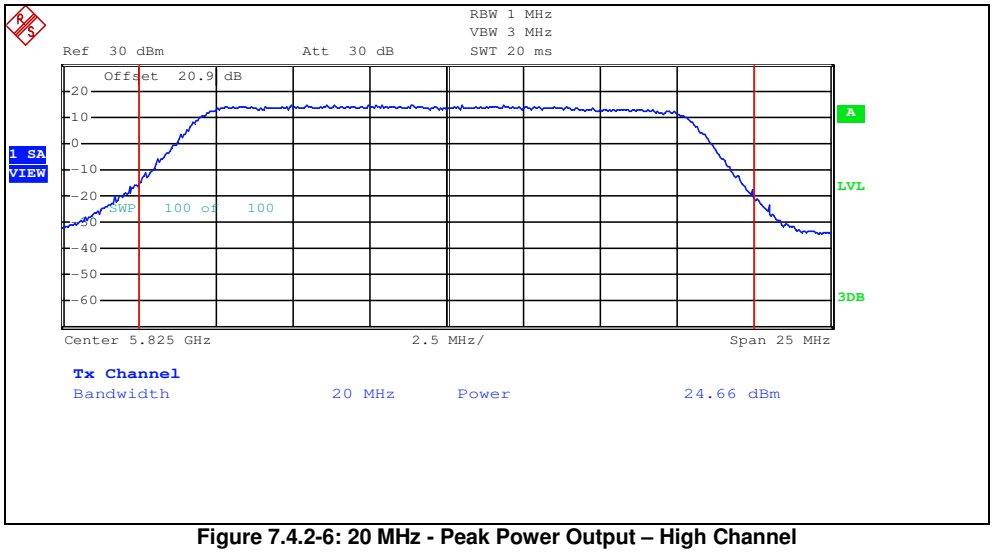


**Figure 7.4.2-6: 20 MHz - Peak Power Output – High Channel**

## 7.5 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d)

### 7.5.1 Band-Edge Compliance of RF Conducted Emissions

#### *7.5.1.1* Measurement Procedure

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. The lower and upper band-edge compliance was determined using the conducted marker-delta method in which the radio frequency power that is produced by the EUT is at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power. The 30dBc limit is required based on the use of power option 2 per FCC KDB Publication No. 558074 “Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)”.

#### *7.5.1.2* Measurement Results

Band-edge data is displayed in Figures 7.5.1.2-1 to 7.5.1.2-4 below.

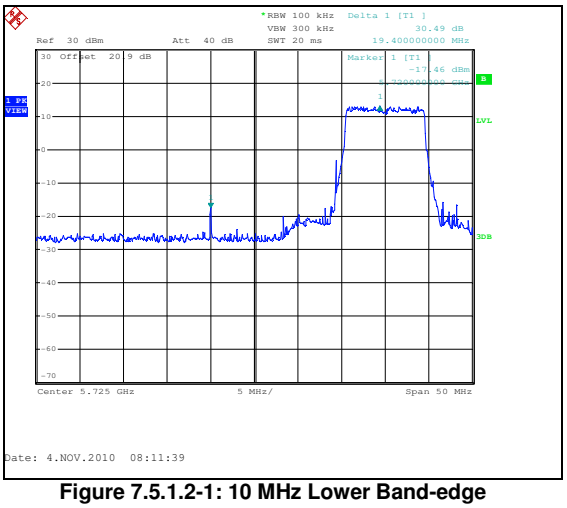


**Figure 7.5.1.2-1: 10 MHz Lower Band-edge**

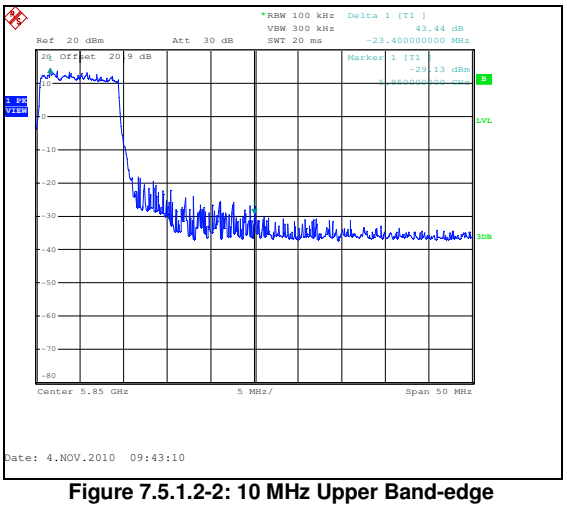


**Figure 7.5.1.2-2: 10 MHz Upper Band-edge**

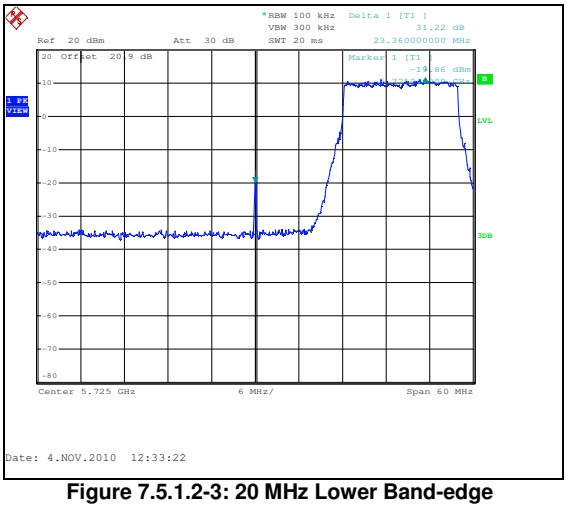


**Figure 7.5.1.2-3: 20 MHz Lower Band-edge**

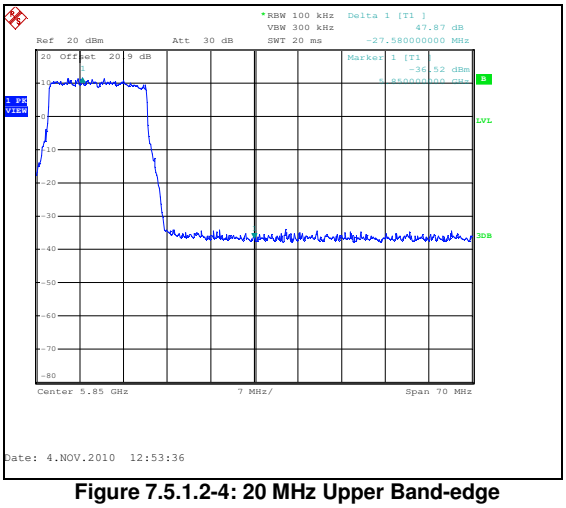


**Figure 7.5.1.2-4: 20 MHz Upper Band-edge**

## 7.5.2 RF Conducted Spurious Emissions

### *7.5.2.1* Measurement Procedure

The RF Conducted Spurious Emissions were measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)". The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 40GHz, For each measurement, the spectrum analyzer's RBW was set to 100 kHz and the VBW was set to 300 kHz. The peak detector and Max Hold function of the analyzer were utilized.

In a 100 kHz bandwidth, the radio frequency power that is produced by the EUT emissions must be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power. The 30dBc limit is required based on the use of power option 2 per FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)".

### *7.5.2.2* Measurement Results

RF Conducted Emissions are displayed in Figures 7.5.2.2-1 through 7.5.2.2-18.

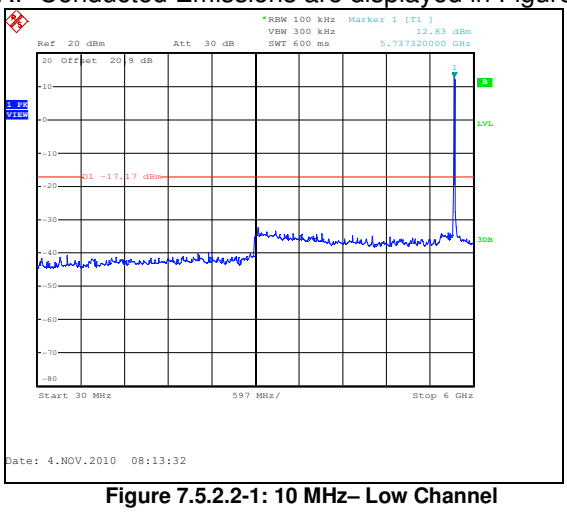


**Figure 7.5.2.2-1: 10 MHz– Low Channel**

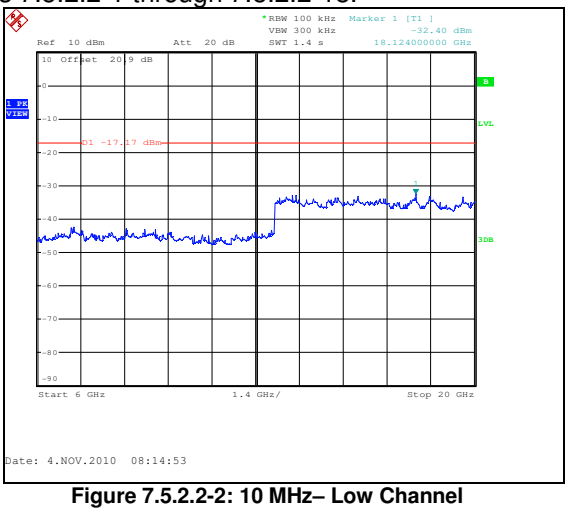


**Figure 7.5.2.2-2: 10 MHz– Low Channel**

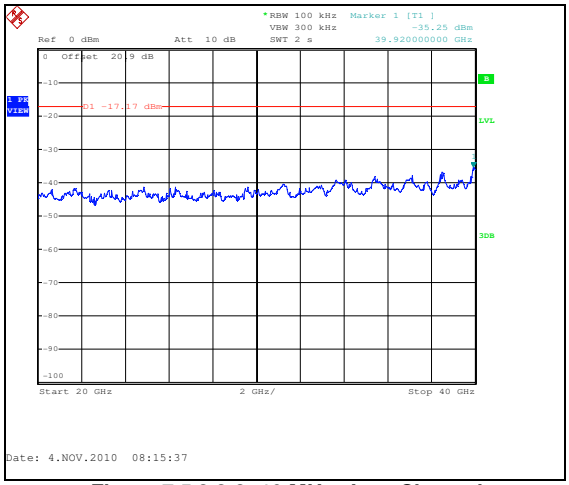


**Figure 7.5.2.2-3: 10 MHz– Low Channel**

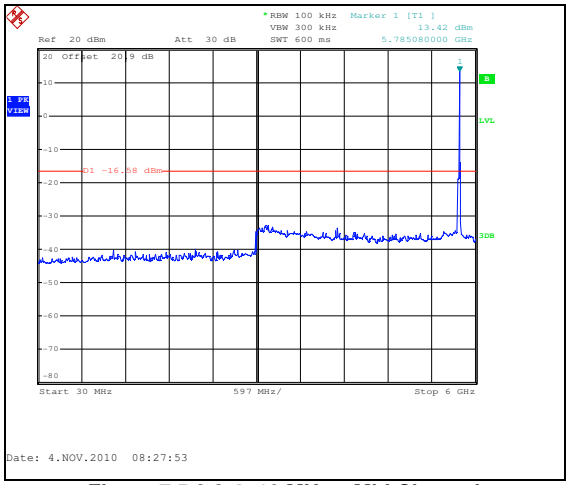


**Figure 7.5.2.2-4: 10 MHz – Mid Channel**

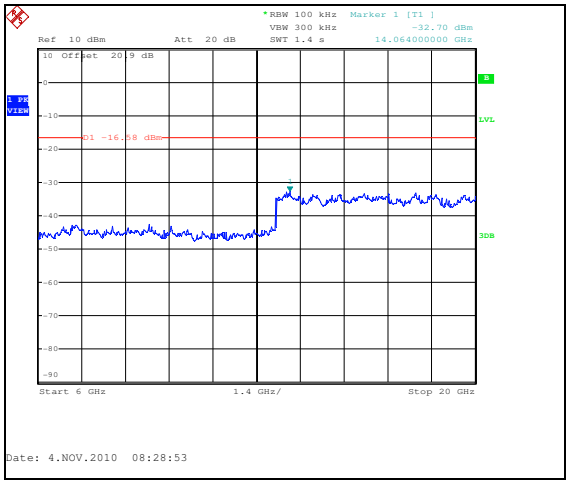


**Figure 7.5.2.2-5: 10 MHz – Mid Channel**

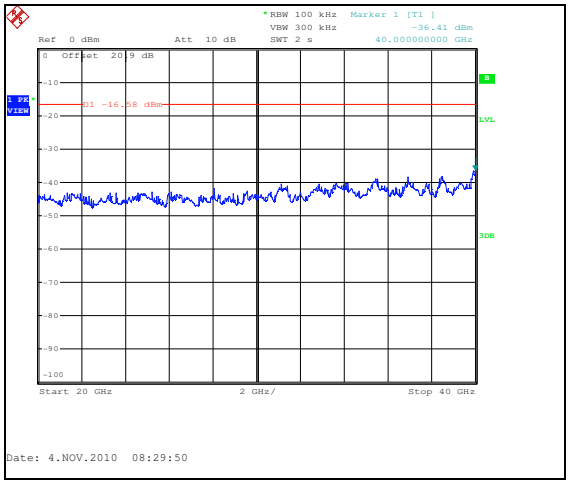


**Figure 7.5.2.2-6: 10 MHz – Mid Channel**

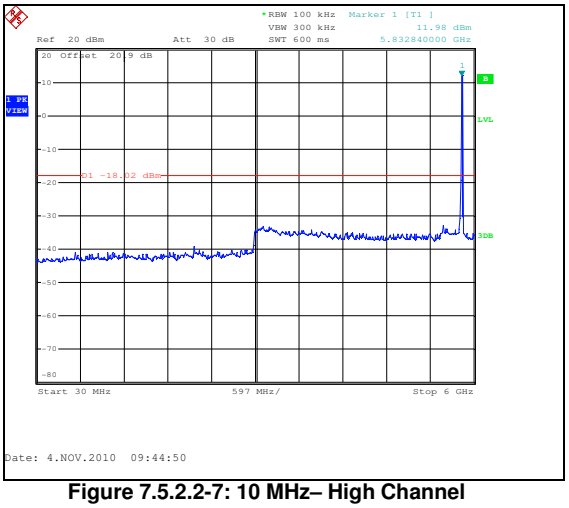


**Figure 7.5.2.2-7: 10 MHz– High Channel**

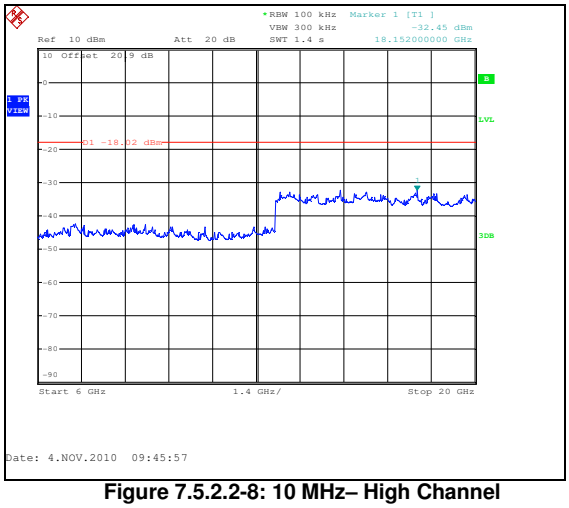


**Figure 7.5.2.2-8: 10 MHz– High Channel**

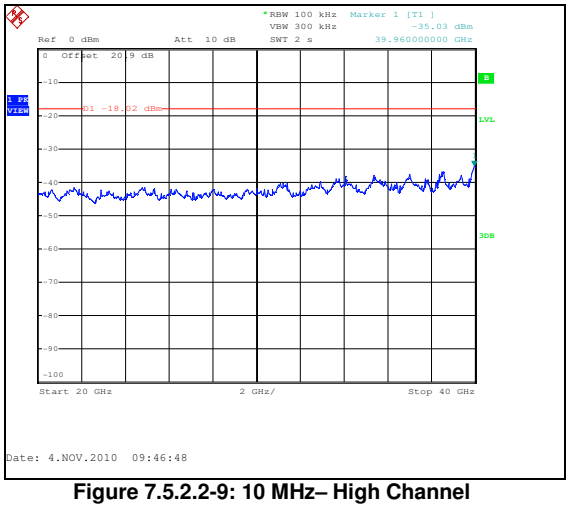


**Figure 7.5.2.2-9: 10 MHz– High Channel**

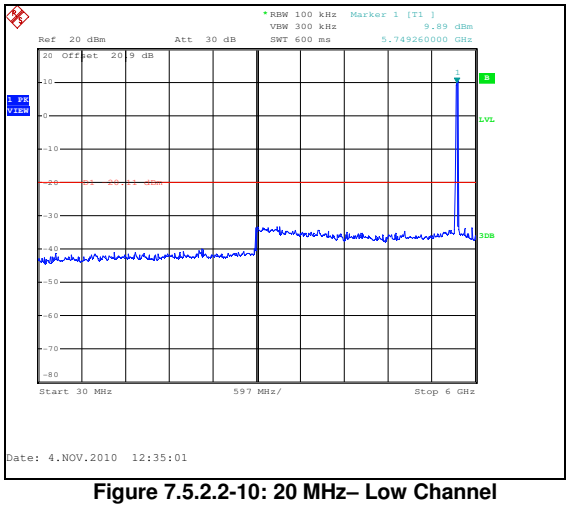


**Figure 7.5.2.2-10: 20 MHz– Low Channel**

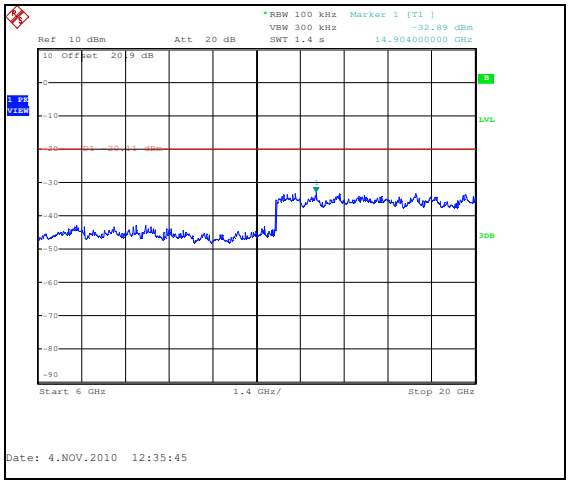


**Figure 7.5.2.2-11: 20 MHz– Low Channel**

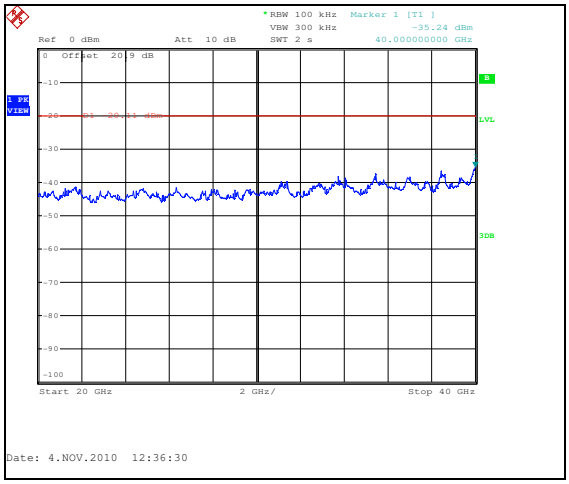


**Figure 7.5.2.2-12: 20 MHz– Low Channel**

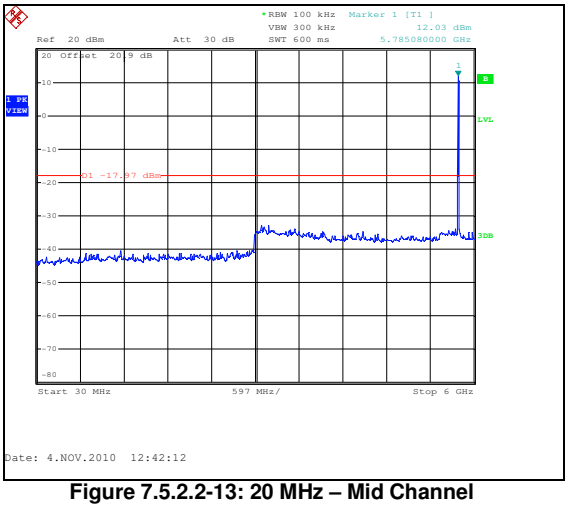


**Figure 7.5.2.2-13: 20 MHz – Mid Channel**

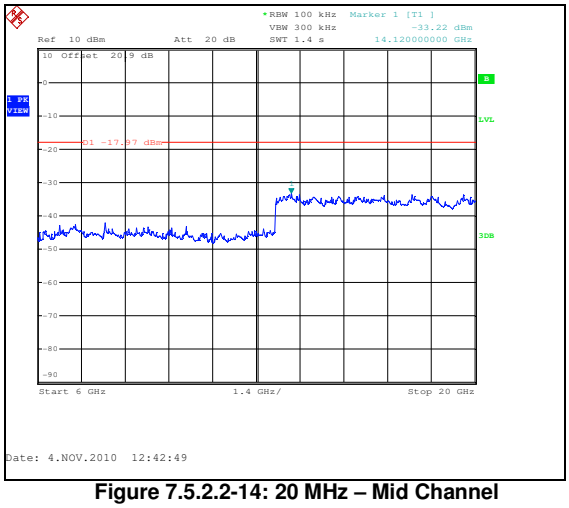


**Figure 7.5.2.2-14: 20 MHz – Mid Channel**

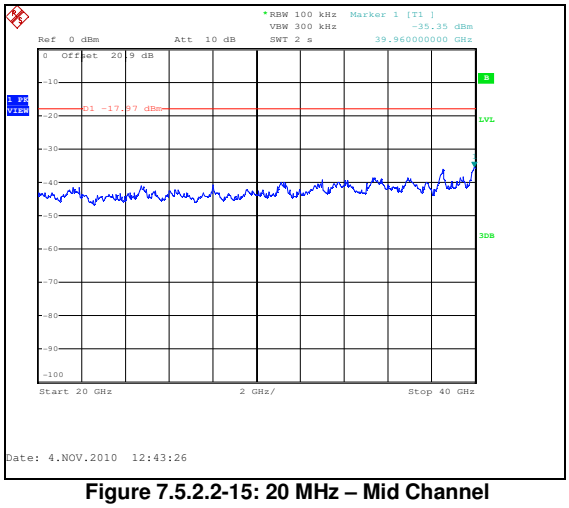


**Figure 7.5.2.2-15: 20 MHz – Mid Channel**

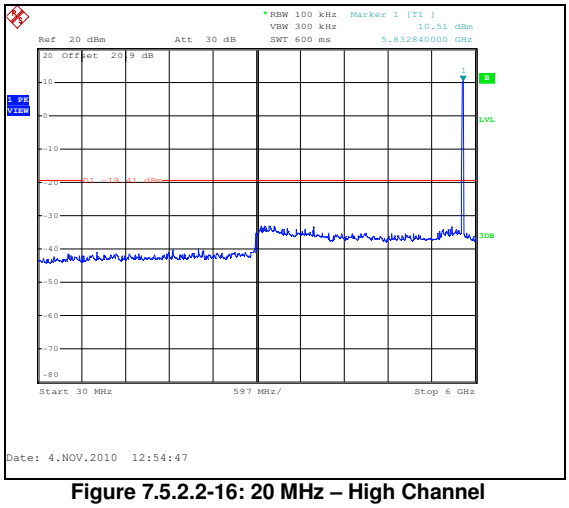


**Figure 7.5.2.2-16: 20 MHz – High Channel**

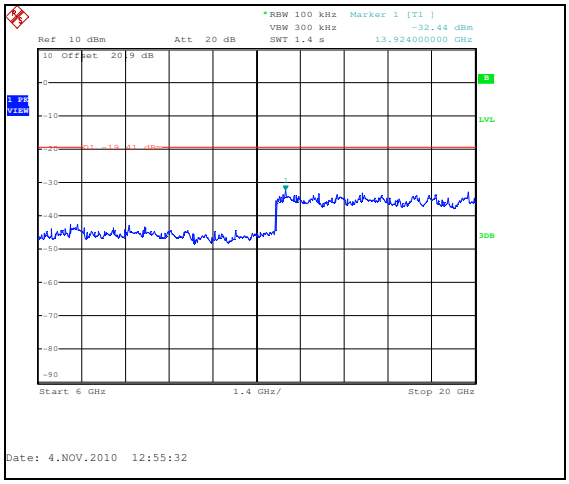


**Figure 7.5.2.2-17: 20 MHz– High Channel**

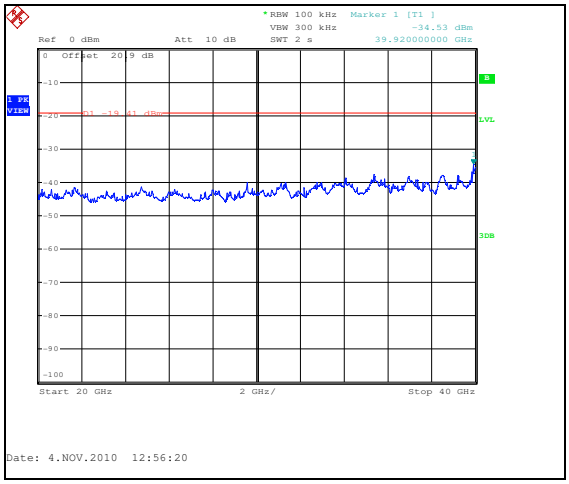


**Figure 7.5.2.2-18: 20 MHz– High Channel**

## 7.5.3 Radiated Spurious Emissions (Restricted Bands) - FCC Sec. 15.205

### *7.5.3.1* Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 40 GHz.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively.

Each emission found to be in a restricted band as defined by section 15.205 was compared to the radiated emission limits as defined in section 15.209.

### *7.5.3.2* Measurement Results

Radiated spurious emissions are reported in the table 7.5.3.3-1 to 7.5.3.3-6 below.

**Table 7.5.3.3-1: Radiated Spurious Emissions–Low Channel (10 MHz—5740 MHz)**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **11480** | 42.28 | 29.98 | H | 12.46 | 54.74 | 42.44 | 83.5 | 63.5 | 28.8 | 21.1 |
| **11480** | 51.62 | 37.24 | V | 12.46 | 64.08 | 49.70 | 83.5 | 63.5 | 19.4 | 13.8 |

**Table 7.5.3.3-2: Radiated Spurious Emissions–Mid Channel (10 MHz—5780 MHz)**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **11560** | 44.15 | 30.41 | H | 12.74 | 56.89 | 43.15 | 83.5 | 63.5 | 26.6 | 20.3 |
| **11560** | 50.02 | 35.99 | V | 12.74 | 62.76 | 48.73 | 83.5 | 63.5 | 20.7 | 14.8 |

**Table 7.5.3.3-3: Radiated Spurious Emissions – High Channel (10 MHz—5830 MHz)**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **11660** | 46.21 | 32.21 | H | 13.15 | 59.36 | 45.36 | 83.5 | 63.5 | 24.1 | 18.1 |
| **11660** | 51.10 | 36.43 | V | 13.15 | 64.25 | 49.58 | 83.5 | 63.5 | 19.3 | 13.9 |

**Table 7.5.3.3-4: Radiated Spurious Emissions–Low Channel (20 MHz—5745 MHz)**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **11490** | 49.89 | 35.46 | V | 12.48 | 62.37 | 47.94 | 83.5 | 63.5 | 21.1 | 15.6 |

**Table 7.5.3.3-5: Radiated Spurious Emissions–Mid Channel (20 MHz—5785 MHz)**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **11570** | 47.38 | 35.05 | V | 12.78 | 60.16 | 47.83 | 83.5 | 63.5 | 23.3 | 15.7 |

**Table 7.5.3.3-6: Radiated Spurious Emissions – High Channel (20 MHz—5825 MHz)**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **11650** | 48.70 | 34.65 | V | 13.11 | 61.81 | 47.76 | 83.5 | 63.5 | 21.7 | 15.7 |

### *7.5.3.3* Sample Calculation:

$R_C = R_U + CF_T$

Where:

$CF_T$ = Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
$R_U$ = Uncorrected Reading
$R_C$ = Corrected Level
AF = Antenna Factor
CA = Cable Attenuation
AG = Amplifier Gain
DC = Duty Cycle Correction Factor

**Example Calculation: Peak**

Corrected Level: 42.28 + 12.46 = 54.74dBuV/m
Margin: 83.5dBuV/m – 54.74dBuV/m = 28.8dB

**Example Calculation: Average**

Corrected Level: 29.98 + 12.46 + 0 = 42.44dBuV
Margin: 63.5dBuV – 42.44dBuV = 21.1dB

## 7.6 Peak Power Spectral Density- FCC Section 15.247(e)

### 7.6.1 Measurement Procedure

The power spectral density was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)" per PSD option 2.

### 7.6.2 Measurement Results

Results are shown below in Table 7.6.2-1 to 7.6.2-2 and Figures 7.6.2-1 to 7.6.2-6.

**Table 7.6.2-1: 10 MHz Peak Power Spectral Density**

| Frequency (MHz) | PSD Level (dBm) |
|---|---|
| 5740 | -9.13 |
| 5780 | -7.33 |
| 5830 | -9.04 |

**Table 7.6.2-2: 20 MHz Peak Power Spectral Density**

| Frequency (MHz) | PSD Level (dBm) |
|---|---|
| 5745 | -10.92 |
| 5785 | -9.12 |
| 5825 | -9.68 |

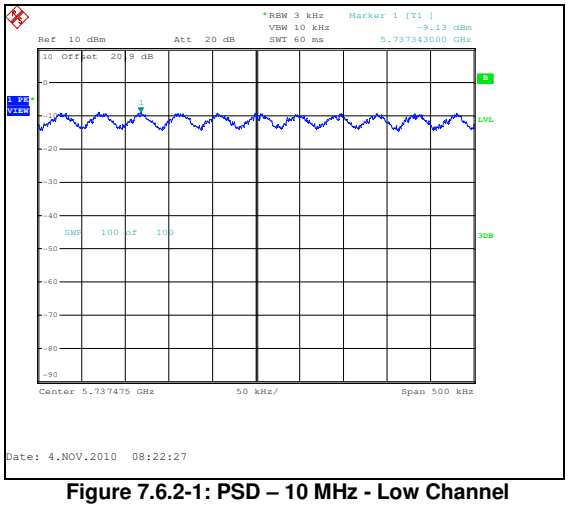


**Figure 7.6.2-1: PSD – 10 MHz - Low Channel**

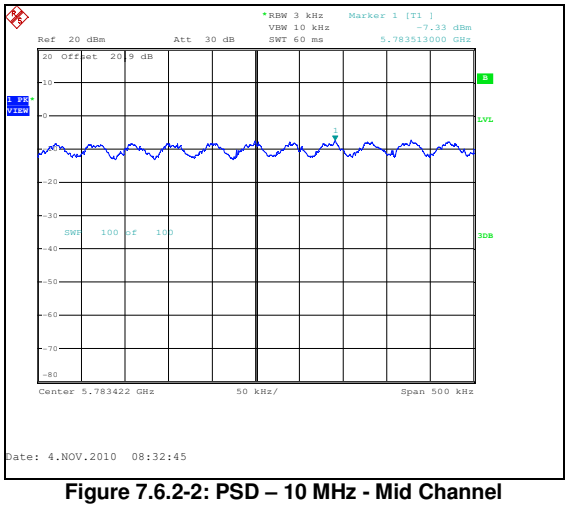


**Figure 7.6.2-2: PSD – 10 MHz - Mid Channel**

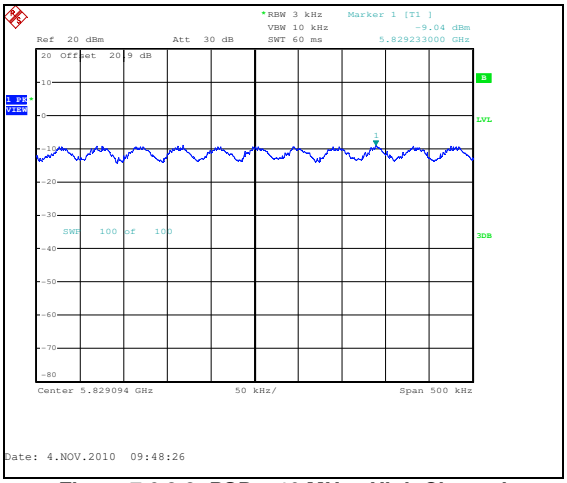


**Figure 7.6.2-3: PSD – 10 MHz - High Channel**

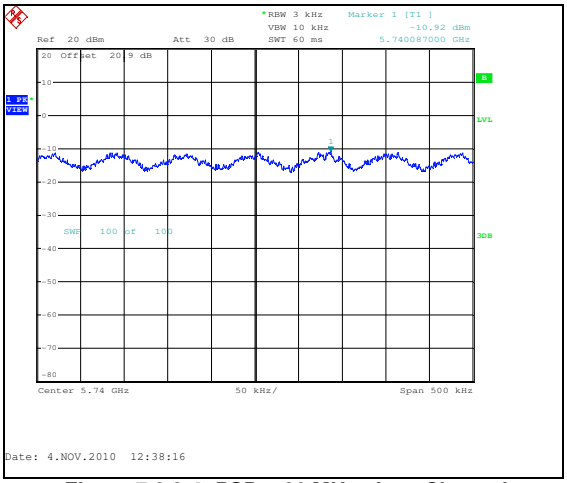


**Figure 7.6.2-4: PSD – 20 MHz - Low Channel**

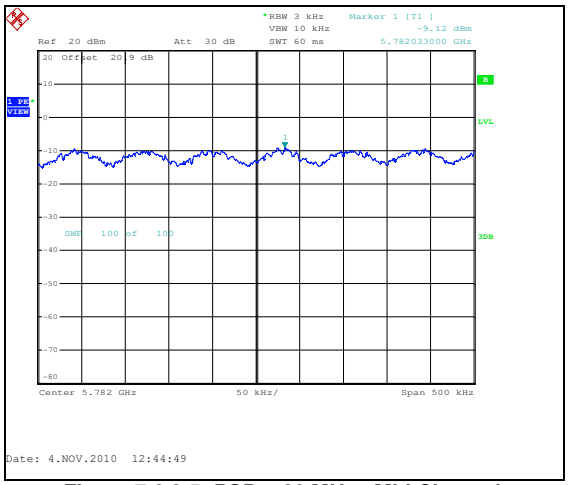


**Figure 7.6.2-5: PSD – 20 MHz - Mid Channel**

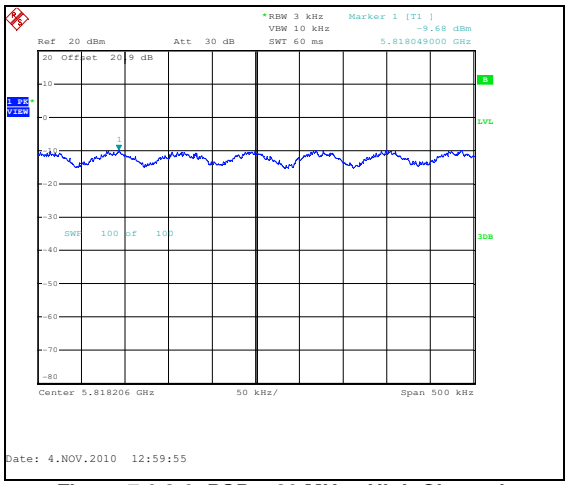


**Figure 7.6.2-6: PSD – 20 MHz - High Channel**

## 8 CONCLUSION

In the opinion of ACS, Inc. the R3T-S-700, manufactured by BAE Systems meets the requirements of FCC Part 15 subpart C.

# END REPORT