Compliance report of Wireless UWB Port Replicator with metal shield

Customer:
Toshiba Corporation

Date:
February 17, 2007

TDK Report:
TTS-TR-T111-104a

Test performed by:
TDK R&D Corporation
1101 Cypress Creek Rd
Cedar Park, TX 78613

	Technician	**Checked by**
Radiated 3 GHz to 5 GHz	**A. Medina**	**K. Yata**
Report	**A. Medina**	**P. Carson**

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1. Executive Summary

An EMC evaluation to determine compliance of the Wireless UWB Port Replicator with requirements of FCC 47 CFR Part 15, Subpart F Section 15.517 was conducted. All references are to the most current version of the Code of Federal Regulations 47 that is currently in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the. The client should retain a copy of this document on file for at least 5 years after the manufacturing of the product has been discontinued.

Test Description	FCC 47 CFR Section	Compliance
Operational Limitations	15.517(a)	The client has been notified of these limitations. In normal operating mode the transmitter will only send data when associated with a receiver. See section 5 for detail
UWB Bandwidth	15.517(b)	Yes
Radiated Emissions	15.517(c), 15.209	Yes
Radiated Emissions in GPS Bands	15.517(d)	Yes
Peak Emissions within a 50 MHz Bandwidth	15.517(e)	Yes
Labelling Requirements	15.517(f)	Yes

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2. Task Description

2.1. Scope

Reference	**FCC ET Docket No. 98-153, FCC 02-48 First R&O;** **FCC 47 CFR, Part 15, Subpart A;** **FCC 47 CFR, Part 15, Subpart B;** **FCC 47 CFR, Part 15, Subpart C;** **FCC 47 CFR, Part 15, Subpart F** **FCC ET Docket No. 04-352, Petition for Waiver of the Part 15 UWB Regulations Filed by MBOA-SIG (Adopted: March 10, 2005)**
Title	**Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmissions Systems;** **Code of Federal Regulations, Part 15 Subpart A: General** **Code of Federal Regulations, Part 15 Subpart B: Unintentional Radiators** **Code of Federal Regulations, Part 15 Subpart C: Intentional Radiators** **Code of Federal Regulations, Part 15 Subpart F: Ultra-Wideband Operation**
Purpose of Test	**To gain FCC Certification Authorization for technical requirements for Indoor UWB Systems operating between 3.1 GHz and 10.6 GHz.**
Test Procedures	**The tests were conducted in accordance with the following documents:** **FCC ET Docket 98-153, FCC 02-48 First R&O** **ANSI C63.4: 2003: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz** **FCC Code of Federal Regulations 47, Part 15 Subpart A: General** **FCC ET Docket No. 04-352, Petition for Waiver of the Part 15 UWB Regulations Filed by MBOA-SIG (Adopted: March 10, 2005)**
General Procedures	**FCC Code of Federal Regulations 47, Part 2 Frequency Allocations and Radio Treaty Matter: General Rules and Regulations**
Classification of EUT	**Indoor Ultra-Wideband System**

2.2. Related Submittal(s)/Grant(s)

None

2.3. Test Plan Reference

Publication	Year	Title
FCC 47 CFR, Part 15, Subpart A	10/2004	Code of Federal Regulations, Part 15 Subpart A: General
FCC 47 CFR, Part 15, Subpart B	10/2004	Code of Federal Regulations, Part 15 Subpart B: Unintentional Radiators
FCC 47 CFR, Part 15, Subpart C	10/2004	Code of Federal Regulations, Part 15 Subpart C: Intentional Radiators
FCC 47 CFR, Part 15, Subpart F	10/2004	Code of Federal Regulations, Part 15 Subpart F: Ultra-Wideband Operation
FCC ET Docket 98-153, FCC 02-48 First R&O	04/2002	Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmissions Systems: First Report & Order
ANSI C63.4	01/2004	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
FCC ET Docket No. 04-352	3/2005	Petition for Waiver of the Part 15 UWB Regulations Filed by MBOA-SIG

2.4. Client Information

APPLICANT	
Name:	Toshiba Corporation
Address:	Digital Media Network, Company Ome Complex, 2-9 Suehiro-cho Tokyo, Japan 198-8710
Contact Person:	Kusuke Takenaka

MANUFACTURER	
Name:	Askey Technology (JingSu) LTD
Address:	Number 1388, Jiao Tong Road, WuJiang Economic – Technological Development Area, JiangSu Province, P.R.C.
Contact Person:	Stanly Cheng

2.5. Equipment Under Test (EUT)

The following information (with the exception of the date information) has been supplied by the applicant.

The test results in this report pertain only to the item tested.

General	
Brand Name	Toshiba
Product Name	Wireless UWB Port Replicator
Model Name or Number	PA3529U-2PRP
Serial Number	116AU000069 B0752 S1
Type of Equipment	UWB radio Transmitter
Input Power Supply Type	External power adaptor
Classification	Indoor Ultra-Wideband System

Technical	
Power Supply Requirements	AC mains, 100 – 240 Vac, 50 – 60 Hz
RF Output Rating	-42 dBm EIRP @ 3 meters
Operating Frequency Range	3100 MHz to 4800 MHz
RF Output Impedance	50 Ω
Channel Spacing	N/A
Pulse Width	N/A
Pulse Repetition Frequency	N/A
10 dB Bandwidth	>500 MHz
Modulation / Constellation	Multiband OFDM
Oscillators' Frequencies	48 MHz,
EUT Ports	15V DC, USB(4), DVI-D, Ethernet, audio
Antenna Connector Type	Internal
Antenna Description	Diversity omni directional linear polarized internal and external antennas

Logistics	
EUT Receive Date	February 14, 2007
EUT Receive Condition	Good
Test Start Date	February 14, 2007
Test Completion Date	February 16, 2007

2.5.1.Support Equipment

Description	Manufacturer	Model No.	Serial No.	FCC ID
Laptop PC	Toshiba	TROMEU-AAA11	76019785J	No ID
AC Power Adapter (PC)	Toshiba	PA324U-2ACA	G71C00062210	No ID

2.5.2.I/O Cables

Description	Length	Shielding	Ferrites	Connection	
				From	To
DC Power Cable	1.7m	No	No	Power supply	EUT
USB Cable	1.8m	No	No	Host PC	EUT

2.5.3. Justification

The EUT was connected to the host PC using USB cable to activate UWB emission and tested as a customer would normally use it. The packet length and modulation data rates were changed in order to find the worst case emissions. It was found that the 100% Tx, TFC1, 4095 packet length, 53.3 Mbps data rate, and payload set to random, provided the worst case emissions. This EUT has diversity antenna function and one of the two antennas is selected and used automatically. Emission from each antenna was measured and the emission from ANT 1 (external) was determined as the worst case. All testing was done in this configuration.

The EUT was configured to run preliminary scans in a mode where the symbols can be sent in a random sequence. The random sequence smoothes out the spectrum and makes the signal more white noise like. This mode represents the worst-case real world usage scenario based on the FCC waiver (Adopted March 10, 2005) that allows radios under test to be operated as they are intended to be used in the field. The data presented in section 6 is the worst-case data.

To insure maximum emissions were detected, the system was rotated 360°, the antenna height was varied from 1 to 4 meters in 1 meter steps above the ground plane in both horizontal and vertical polarizations. These maximum emissions are represented in the collected data enclosed.

Above 960 MHz, the measurements were made at equal or less than 3 meters due to the extremely low emission limits outside the UWB

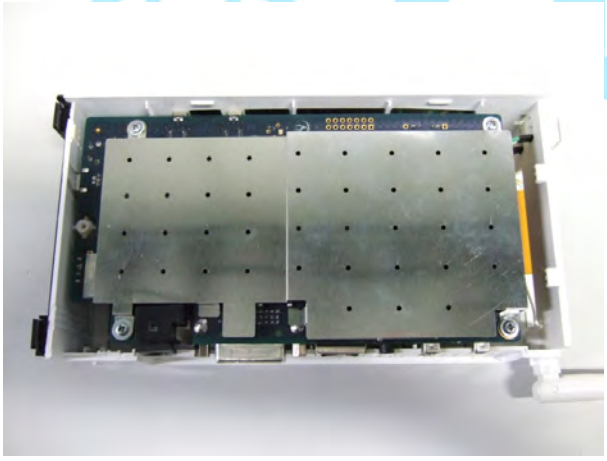
bandwidth margins. At 3 meters, the instrument noise floor is at or above the limits specified in 15.517 (c). The intentional emissions were measured at 3 meters or less.

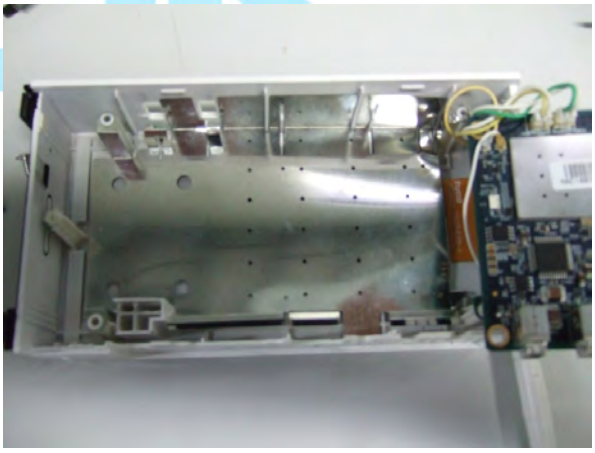
The highest frequency employed in 47 CFR Section 15.33 to determine the frequency range over which radiated emissions are made were based on the center frequency, f_c, unless a higher frequency was generated within the UWB device. For measuring emission levels, the spectrum was investigated from the lowest frequency generated in the UWB, without going below 9 kHz, up to the frequency range shown in Section 15.33(a) of 47 CFR or up to f_c + 3/(pulse width in seconds), whichever was higher. There is no requirement to measure emissions beyond 40 GHz provided f_c was less than 10 GHz; beyond 100 GHz if f_c was at or above 10 GHz and below 30 GHz; or beyond 200 GHz if f_c was at or above 30 GHz.

The center frequency (of the highest sub band) f_c was found to be 4487.5 MHz. Therefore; the highest frequency to be measured was 40 GHz.

2.6. Modifications Required for Compliance

Metal shield was added in order to improve margin for manufacturing





3. Facilities and Accreditation

3.1. Facilities and Equipment

The entire EMC test facility (comprising of the open area test site, semi-anechoic chamber, fully anechoic antenna/high frequency chamber, and support test instrumentation) is located at 1101 Cypress Creek Rd, Cedar Park, TX USA 78613.

All measurement facilities are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

The test receiver instrumentation (e.g. receiver, analyzer, QP adapter, pre-selector) and LISN's conform to the CISPR Publication 16-2 (Specifications for Radio Interference Measuring Apparatus and Measurement Methods) Publication 16-1 where required.

3.2. Laboratory Accreditations and Listings

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200430-0 to perform Electromagnetic Compatibility tests according to FCC 47 CFR, Part 15 and CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

3.3. Table of Accreditations and Listings

Country	Agency	Accreditation	Logo
USA	NVLAP	200430-0	NVLAP LAB Code 200430-0
USA	FCC	94066	FC

4. Test Equipments and Procedure

4.1. Test and Measurement Equipment

Test Equipment Matrix				
Description	**Make**	**Model No.**	**Serial No.**	**Cal Due**
EMI Receiver RF Section	HP	8546A	3520A00237	01/20/08
EMI Receiver RF Filter Section	HP	85460A	3448A00238	01/20/08
PSA	Agilent	E4448	US42070173	12/29/07
Preamplifier	Quinstar	QLN-2230J0	7164001	03/01/07
Preamplifier	Quinstar	QLN-3330J0	7164002	03/02/07
Preamplifier	TDK	PA-02	0900002	05/11/07
Hybrid Log Antenna	TDK	HLP-3003C	061101	04/19/07
Horn Antenna	TDK	HRN0118	130091	06/01/07
Horn Antenna	Antenna Research Association	SWH-28	1008	06/14/07
Horn Antenna	Antenna Research Association	SWH-29	1003	06/14/07
RF Cable	MicroCoax	UFB205A-0-0591-300504	211411-001	08/29/07
RF Cable	MicroCoax	UFB205A-0-2362-000000	206217-001	02/13/08
RF Cable	MicroCoax	UFB142A-0-2364-200200	211368-001	08/18/07
RF Cable	MicroCoax	UFB142A-0-0788-200200	207950-001	11/21/07
RF Cable	Huber+Suhner	Sucoflex 106P	181543-003	01/08/08
LISN	EMCO	3810/2NM	9702-1823	06/14/07

4.2. Measuring Instrument Calibration

The measuring equipment utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer's recommendations, and are traceable to recognized national standards.

4.3. Measurement Uncertainty

Compliance of the product is based on the reported measured values. However, the measurement uncertainty is included for informational purposes in the table below.

Radiated Emissions			
Frequency Range	**1 m**	**3 m**	**10 m**
30 MHz to 200 MHz	**N/A**	**± 3.8 dB**	**± 3.5 dB**
200 MHz to 1 GHz	**N/A**	**± 3.8 dB**	**± 3.5 dB**
1 GHz to 18 GHz	**± 4.5 dB**	**± 4.6 dB**	**N/A**
18 GHz to 40 GHz	**± 4.2 dB**	**N/A**	**N/A**

Conducted Emissions	
Frequency Range	
150 kHz to 30 MHz	**± 2.6 dB**

Note: The combined level of uncertainty in each case above was expanded to provide a confidence level of approximately 95% (k=2).

4.4. Test Setup for UWB Device Tests

4.4.1.EUT Setup

The EUT was connected to a host PC and AC power adapter connected with 120VAC-60Hz power source. To activate UWB circuit, a batch file was run on host PC. A continuous transmission of random data was sent at 53.3 Mbps.

SETUP diagram

4.4.2.Radiated Emission Test Setup

In order to test compliance of EUT, facilities described section 3, and test and measurement equipment listed in section 4.1, were used. For all measurements the EUT was located on a table whose top was 80 cm above the ground plane. The table was constructed of non-conductive materials and the dimensions were 0.8 meter by 1.2 meter. The table was located in the center of the turntable.

For the test four types of receive antennas were used depending on frequency range. The antenna was held on an antenna mast which has the ability to switch the polarization of the receive antenna by 90 degree by means of mechanical rotation. The distance between the EUT and the receive antenna was equal or less than 3 meters, depending on the test. Shorter measurement distances may be used to improve the measurement system's noise floor. As Subpart F description is based on the measurement in distance of 3 meters, the data obtained at 1 meter distance was compared to the calculated limit for 1m distance:

Limit at 1meter distance (dBm)

= limit at 3 meter distance (dBm) -20log(1/3)(dB)

= limit at 3 m distance (dBm)-9.54(dB).

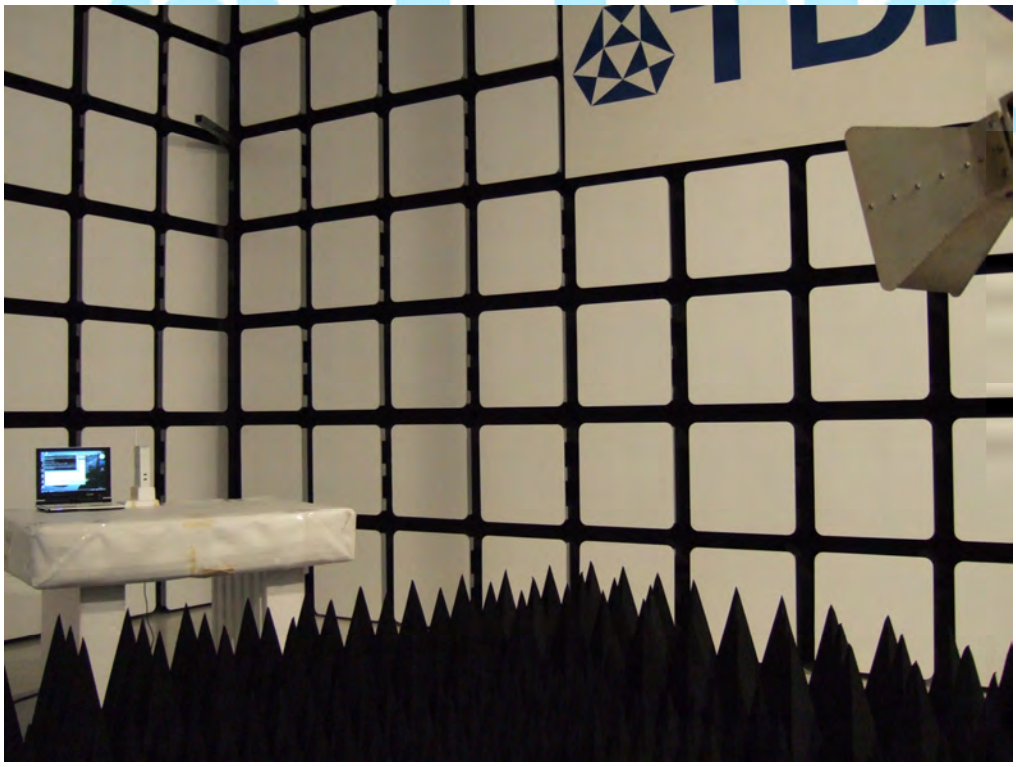
The maximization of the radiated signal was achieved by rotating the EUT over 360 degrees in the azimuth, because the EUT is designed for table top usage so that orienting the EUT in three orthogonal axes was difficult. Additionally, the receive antenna was scanned in height from 1 meter to 4 meters (while maintaining boresight alignment) with both horizontal and vertical polarizations being recorded. The maximization was performed by use of automated software with CPU controlled maximum-hold function for both single and multiple sweeps.

The spectrum analyzer and EMI receiver was set up as described in each test procedure in section 6. The data used to determine compliance of EUT was calculated from the data following the method described in section 4.6. The equipment set up for the radiated emissions tests followed the guidelines in ANSI C63.4: latest edition.

For measurement of UWB intentional emissions radio wave absorber measuring 3.0 by 3.0 meters was located on the ground plane between EUT and receive antenna.

4.4.3.Test Configuration Photographs

Test Configuration 1: 3 GHz to 5 GHz



4.4.4.EUT Setup for Digital Circuitry Radiated Emission Tests

In order to test compliance of EUT, facilities described section 3, and test and measurement equipment listed section 4.1, were used. For all measurement, the EUT was located on a table whose top was 80 cm above the ground plane. The table was constructed of non-conductive materials and the dimensions were 0.8 meter by 1.2 meter. The table was located in the center of the turntable. To test for digital circuit radiation from the EUT, the antenna of EUT was disconnected and a 50-ohm terminator was connected. To test for the digital emissions from the EUT a micro coax cable was connected to the miniature coax connector located on the PCB near the antenna feed point. A 50-ohm terminator was connected to the other end of the micro coax.

4.5. Measurement Calculations

4.5.1.Field Strength Calculations

The field strength is calculated by taking the received spectrum analyzer (or receiver) signal and adjusting it by the system parameters. These system parameters are the antenna factor (AF); any cable, coupler, filter or switching losses (CL); and the preamplifier gain (PG). The basic formula is displayed below.

E (dBμV/m) = SA (dBμV) + AF (dB/m) + CL (dB) – PG (dB)

Where:

E is the electric field represented in dBμV/m
SA is the spectrum analyser (or receiver) reading in dBμV
AF is the receive antenna's factor in dB/m
CL is the cable, etc. system losses in dB
PG is the external pre-amplifier gain in dB

Assume a spectrum analyzer reading of 50 dBμV at 80 MHz on a 3 m site. With an antenna factor of 10 dB/m, system losses of about 1.5 dB, and a pre-amplifier gain of 25 dB, the resulting electric field strength would be calculated as follows.

E (dBμV/m) = 50 (dBμV) + 10 (dB/m) + 1.5 (dB) –25 (dB) = 36.5 dBμV/m

4.5.2.EIRP Calculations

As defined in FCC 47 CFR Part 15, Subpart F (15.503 k), EIRP is the equivalent isotropic radiated power, i.e. the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna. The EIRP, in terms of dBm, can be converted to field strength, in dBμV/m at 3 meters, by adding 95.2 dB. Conversely, the field strength in dBμV/m at 3 meters can be converted to the EIRP in dBm by subtracting 95.2 dB. As used in Subpart F, EIRP refers to the highest signal strength measured in any direction and at any frequency from the UWB device, as tested in accordance with the procedures specified in 15.31(a) and 15.523 of FCC 47 CFR.

As in the example above, assume a spectrum analyzer reading of 50 dBμV at 80 MHz on a 3 m site. With an antenna factor of 10 dB/m, system losses of about 1.5 dB, and a pre-amplifier gain of 25 dB, the resulting electric field strength would be calculated as follows.

E (dBμV/m) = 50 (dBμV) + 10 (dB/m) + 1.5 (dB) –25 (dB) = 36.5 dBμV/m

Now to convert to an EIRP reading at 3 meters use EIRP (dBm) = E (dBμV/m) – 95.2 (dB)

EIRP (dBm) = 36.5 (dBμV/m) – 95.2 (dB) = -58.7 dBm

5. Test Limits, Procedures, Results and Setups

5.1. UWB Bandwidth

5.1.1.Test Limits

Ultra-wideband (UWB) transmitter. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth

The UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated f_H and the lower boundary is designated f_L. The frequency at which the highest radiated emission occurs is designated f_M.

Center frequency. The center frequency, f_C, equals $(f_H + f_L)/2$.

Fractional bandwidth. The fractional bandwidth equals $2(f_H - f_L)/ (f_H + f_L)$.

As per section 15.517(b), the UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3100 MHz and 10600 MHz

5.1.2.Test Procedure

Facilities and equipment was set up as described in section 4; resolution bandwidth (RBW) of 8 MHz, video bandwidth (VBW) of 8 MHz, peak detector, and the sweep time was set to auto. The EUT was located less than 3 meter distance from the receive antenna. The receive antenna was elevated from 1 to 4 meters in 1 meter steps while maintaining boresight alignment

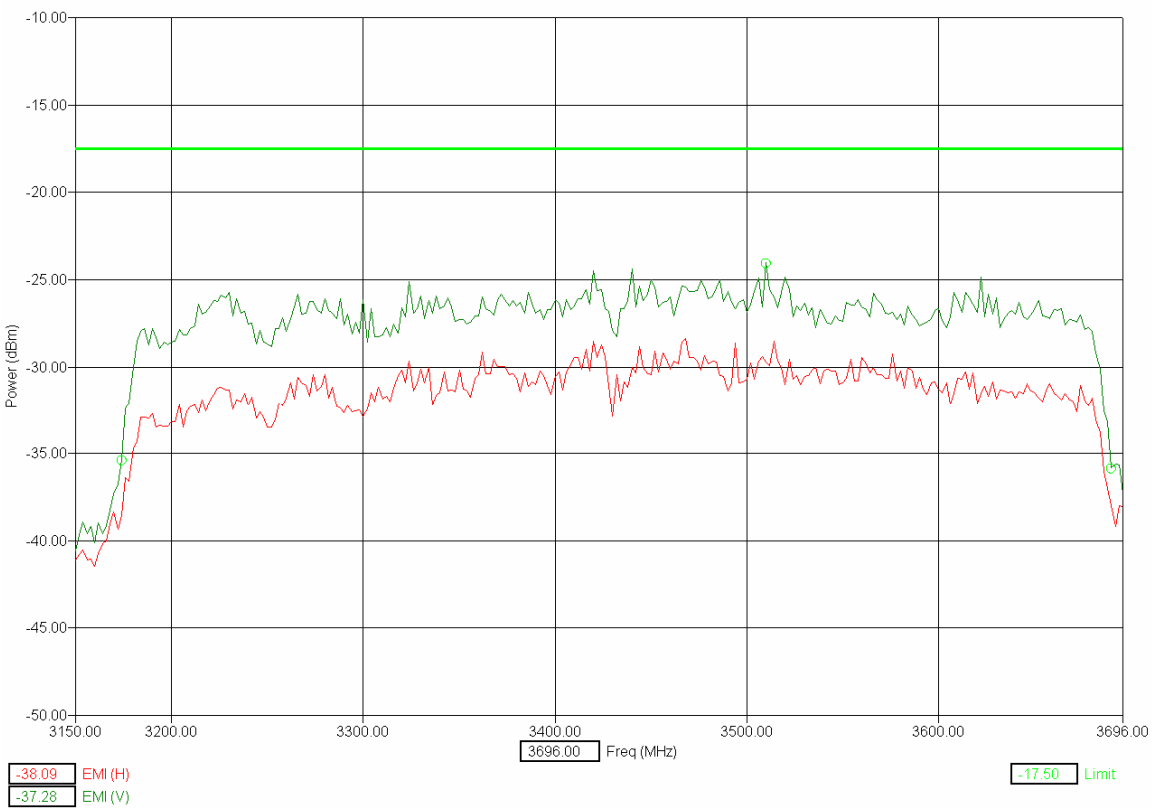
Maximum emission amplitude was determined from the measured data for both horizontal and vertical polarization and the higher amplitude of emission of these two polarizations was used to determine the frequency at which the highest radiated emission occurs, f_M. Next, the points that are 10dB or more below the highest radiated emission were observed in a search from f_M in both the lower and higher frequency direction in the measured frequency EIRP graph, they are denoted as f_L and f_H, respectively. The UWB bandwidth is the difference between f_L and f_H.

At the request of the FCC the individual UWB bandwidths were measured for each sub-band of the UWB spectrum. Both horizontal and vertical polarizations were taken into account to determine the full UWB BW on the maximized (in azimuth and elevation) signals.

5.1.3.Test Results

UWB Bandwidth Requirements: Sub band 1

47 CFR, Part 15, Subpart F, §15.517(b)



Frequency: 3150 MHz to 3700 MHz

Both horizontal and vertical polarizations taken into account to determine UWB BW

UWB BW = 516 MHz

F_L = 3174.0 MHz; F_H = 3690.0 MHz; F_M = 3510.0 MHz

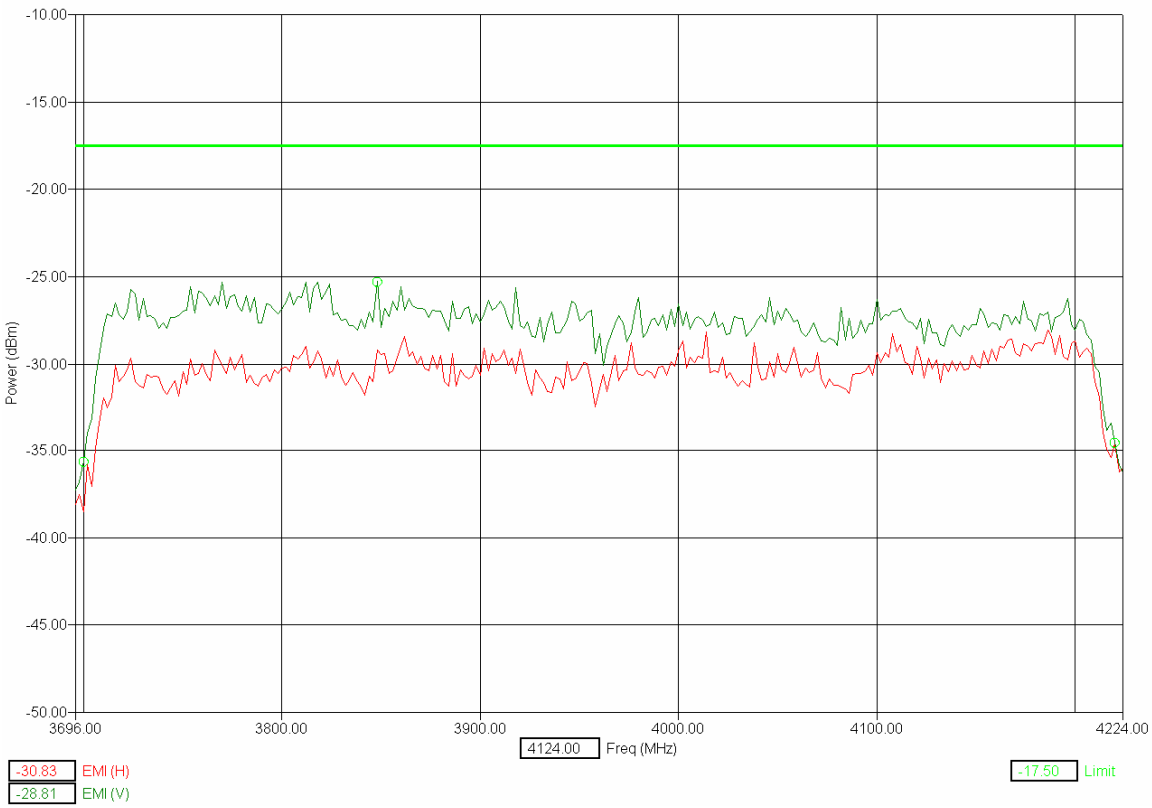
Measurements made with 8 MHz RBW / 8 MHz VBW, peak detector.

Measurement Time auto for sweep

Measurement Distance: 3 meter, antenna boresighted to EUT.

UWB Bandwidth Requirements: Sub band 2

47 CFR, Part 15, Subpart F, §15.517(b)



Frequency: 3700 MHz to 4225 MHz

Both horizontal and vertical polarizations taken into account to determine UWB BW

UWB BW = 520.0 MHz

F_L = 3700.0 MHz; F_H = 4220.0 MHz; F_M = 3848.0 MHz

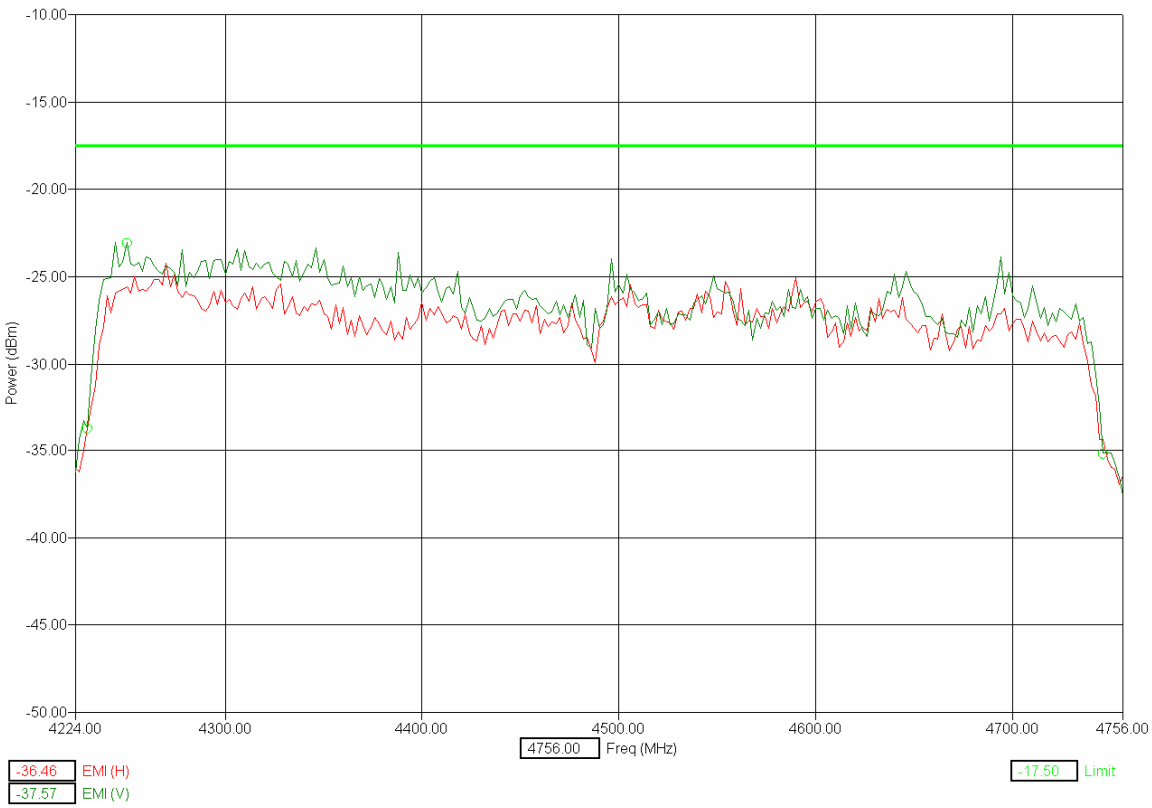
Measurements made with 8 MHz RBW / 8 MHz VBW, peak detector

Measurement Time auto for sweep

Measurement Distance: 3 meter, antenna boresighted to EUT.

UWB Bandwidth Requirements: Sub band 3

47 CFR, Part 15, Subpart F, §15.517(b)



Frequency: 4225 MHz to 4750 MHz

Both horizontal and vertical polarizations taken into account to determine UWB BW

UWB BW = 512.0 MHz

F_L = 4230.0 MHz; F_H = 4746.0 MHz; F_M = 4250.0 MHz;

Measurements made with 8 MHz RBW / 8 MHz VBW, peak detector

Measurement Time auto for sweep

Measurement Distance: 3 meter, antenna boresighted to EUT.

Freq (Max) (MHz)	Pol	(PEAK) EMI (dBm)	(PEAK) Margin (dB)	Limit (dBm)	Ttbl Agl (deg)	Twr Ht (cm)
3515.55	V	-23.22	-5.72	-17.5	173	100
3861.97	V	-24.77	-7.27	-17.5	185	200
4260.24	V	-20.23	-2.73	-17.5	192	100

Radiated Emissions, UWB Specific Requirements

5.1.4.Test Limits

The radiated emissions at or below 960 MHz shall not exceed the emission levels in Section 15.209 Table below.

Frequency (MHz)	E-Field (μV/m)	E- Field (dBμV/m)	Distance (m)
0.009 to 0.490	2400/F(kHz)	67.6 – 20Log[F(kHz)]	300
0.490 to 1.705	24000/F(kHz)	87.6 – 20Log[F(kHz)]	30
1.705 to 30.0	30	29.5	30
30 to 88	100	40.0	3
88 to 216	150	43.5	3
216 to 960	200	46.0	3

The radiated emissions above 960 MHz shall not exceed the RMS detected limits in Section 15.517c table below when measured using a resolution bandwidth of 1 MHz.

Frequency (MHz)	EIRP (dBm)	E- Field (dBμV/m)	Distance (m)
960 to 1610	-75.3	19.9	3
1610 to 1990	-53.3	41.9	3
1990 to 3100	-51.3	43.9	3
3100 to 10600	-41.3	53.9	3
Above 10600	-51.3	43.9	3

From 47 CFR Section 15.521(c): As noted in Section 15.3(k), digital circuitry that is used only to enable the operation of a transmitter and that does not control additional functions or capabilities is not classified as a digital device. Instead, the emissions from that digital circuitry are subject to the same limits as those applicable to the transmitter. If it can be clearly demonstrated that an emission from a UWB transmitter is due solely to emissions from digital circuitry contained within the transmitter and that the emission is not intended to be radiated from the transmitter's

antenna, the limits shown in Section 15.209 shall apply to that emission rather than the limits specified in this section.

5.1.5.Test Procedure

The measurements made over the frequency range from 30 MHz to 960 MHz were maximized using an EMI receiver with peak detector capabilities. Measurements of the radiated field from 30 MHz to 960 MHz were made with the measurement antenna located a distance of 3 meters from the EUT and the final measurements utilizing a quasi-peak detector at the frequencies with the largest amplitudes. The relative CISPR resolutions bandwidth of 120 kHz was used for these measurements. In the case where there was sufficient margin between the peak detected maximized spectrum and the quasi-peak limit lines, no additional measurements were undertaken.

Measurements above 960 MHz were maximized using a spectrum analyzer with RMS detector capabilities. A spectrum analyzer was used for the final measurements utilizing an RMS detector at the frequencies with the largest amplitudes. The prescribed RBW of 1 MHz and VBW of 3 MHz, and a 1 msec averaging time were used for these measurements. Measurements of the radiated field at frequencies above 960 MHz were made with the measurement antenna located a distance of 3 meter or less from the EUT.

The equipment set up for the radiated emissions tests followed the guidelines in ANSI C63.4.

5.1.6.Test Results

The spectrum between 30 MHz and 960 MHz contained no intentional radiation and lies below the limits. The spectrum from 960 MHz to 18 GHz contained intentional UWB signals between 3100 MHz and 10600 MHz and lie below the limits. No other emissions above 10600 MHz were detected. The maximum frequency tested was 40 GHz.

Per 47 CFR, Part 15, Subpart F, §15.521(c) (§15.209) all digital emissions from the transmitter whether radiating from the antenna port or not intended to be radiated from the antenna port meet the 15.209 subpart C limits.

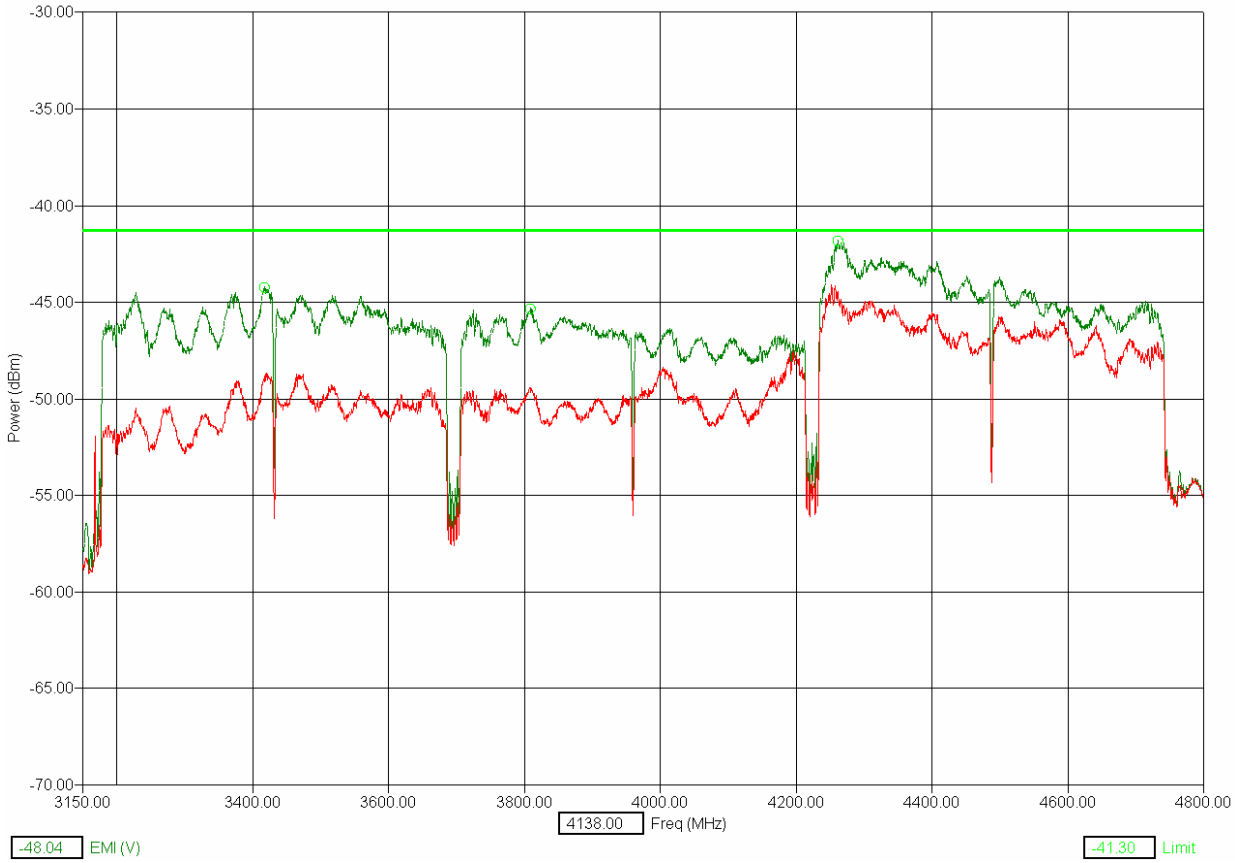
Additional measurements in the 960 MHz to 40 GHz range were performed to determine the nature of all unintentional emissions in this span. Conducted antenna port measurement and terminated antenna port measurement were done in the 960 MHz to 18 GHz range show that all noise peaks have the same frequency and polarization and are determined to be emission from the digital circuit and are not radiated from the antenna.

Per 47 CFR, Part 15, Subpart F, §15.505(a) (§15.109) all emissions from the digital devices not directly associated with the operation of the transmitter meets the Class B limits of §15.109

Refer to the UWB Radiated Emissions 960 MHz to 40 GHz section for specific data presentation.

UWB Radiated Emissions 3.15 GHz – 4.80 GHz

47 CFR, Part 15, Subpart F, §15.517(c) (§15.209)



Frequency: 3150 MHz to 4800 MHz

Measurements made with 1 MHz RBW / 3 MHz VBW at 3 meter distance

Measurement time 1 msec per frequency

Antenna height 1 meter to 4 meters, 1 meter steps, antenna boresighted to EUT.

Freq (Max) (MHz)	Pol	(RMS) EMI (dBm)	(RMS) Margin (dB)	Limit (dBm)	Ttbl Agl (deg)	Twr Ht (cm)
3417.86	V	-44.73	3.43	-41.3	181	100
3808.96	V	-45.17	3.87	-41.3	224	100
4263.31	V	-41.43	0.13	-41.3	196	100

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