

FCC Part 15 Subpart B and C Compliance Test Report
Industry Canada RSS-210 Issue 5

Applicant Name: Tranzeo Wireless Technologies Inc.

Product Name: Wireless

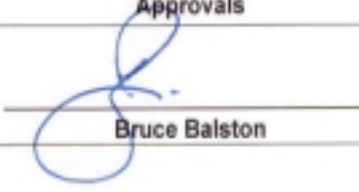
Model No.: TR-3315

FCC ID: QRF-TR-3315

Date of Test Report: April 23, 2003

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Report Version: 1.0

Approvals		
Approved By	 Bruce Balston	<u>Apr 23/2003</u> Date

Report Revision		
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1.0 General Information

1.1 EUT Description

Product Name : Access Point, Bridge, Repeater
Trade Name : Tranzeo Wireless Technologies Inc
FCC ID : QRF-TR-3315
Model No. : TR-3315
Frequency Range : 2412 MHz to 2462 MHz
Number of Channels : 11
Transmit Rate : Max is 11Mbps
Type of modulation : Direct Sequence Spread Spectrum
Antenna Type : Permanent
Antenna Gain : 15 dB Gain
Product Software : Firmware, version
Test Software : LAN EVAL
Operator Channel Selection : By Software
Method :
Power Adapter : SINCHO ELECTRIC CO LTD
Input: AC 120 V 60 Hz, 10 W
Output: DC 12 V, 500 mA, non shielded cable

Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 1	2412 MHz	Channel 5	2432 MHz	Channel 9	2452 MHz
Channel 2	2417 MHz	Channel 6	2437 MHz	Channel 10	2457 MHz
Channel 3	2422 MHz	Channel 7	2442 MHz	Channel 11	2462 MHz
Channel 4	2437 MHz	Channel 8	2447 MHz		

Note:

- 1.0 This device is a 2.4 GHz wireless router includes a 2.4 GHz receiving function and a 2.4 GHz transmitting function.
- 2.0 Channels 1, 6 and 11 were selected to cover the full transmitting range of the transmitter.
- 3.0 The tests were conducted on a production model sample to demonstrate compliance with FCC Part 15 Subpart C section 15.247 for spread spectrum devices.
- 4.0 The transmit rate of 11Mbps was used for all the measurements after an investigation was performed show that this was the worst case transmit rate.

1.2 Operational Description

The EUT is a wireless router with 11 channels, with a max transmit rate of 11Mbps..

1.3 Test Facilities

Protocol EMC
28945 McTavish Rd.
Abbotsford B.C., Canada, V4X 2E7

Phone: 604-607-0012
Fax: 604-607-0019

FCC Registration Number 96437
Industry Canada Registration Number IC3384

1.4 Test System Details

The following equipment listed below is all equipment and cables used on the EUT side of the testing.

Description	Manufacturer	Model No.	Serial No.	FCC ID.
A USB Wireless LAN Adapter	Z-COM Inc	XI-725	X7252BNU00024	M4Y-07250
B Computer	Daewoo	CT5840	908C3D02117	N/A

Signal Cable Type	Signal Cable Description
A CAT5 LAN Cable	EUT to DC injection Block (This Block also connects the EUT with whatever host PC you are using)
B CAT5 LAN Cable	DC Block to 1 m unterminated LAN cable

1.5 EUT Modifications

There were no modifications required for this unit to comply with FCC Part 15 Subpart B and C section 15.247 and Industry Canada RSS-210 Issue 5.

1.6 EUT Testing Configuration

The EUT was setup on the emissions test site. The host computer was connected to the USB wireless LAN adapter to give us a way to change the transmitting channels on the EUT. The provided test software gave us the ability to put the EUT in TXM mode which turns off the DSS mode and produces a solid state for easier measuring of harmonics and other tests. This option is only available on the test software for Protocol EMC.

1.7 Test Results

The TR-3315 complies with FCC Part 15 Subpart C and Industry Canada RSS-210 Issue 5.



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2.0 Conducted Emissions

2.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
LISN	Solar 8012-50-R-24-BNC	863092	09/18/02	09/18/03
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Turntable	Protocol	Custom	N/A	N/A

2.2 Test Standard

FCC Part 15 Subpart C Section 15.207 Conducted emission limits.

2.3 Test Setup

The EUT was setup in its normal operating mode for the duration of the test. All lines were tested to find the maximum conducted emissions that the EUT emitted. All Conducted Emissions measurements were performed according to ANSI C63.4: 1992 on conducted measurement. Conducted Emissions were tested over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9kHz.

2.4 Test Limits

Class B Limits:

Frequency (MHz)	Maximum Level (dB μ V)	Maximum Level (dB μ V)
	Quasi-Peak	Average
0.15 - 0.50	66-56 (Log Delta)	56-46 (Log Delta)
0.50 - 5.00	56	46
5.00 - 30.0	60	50

2.5 Test Results

Product : TR-3315
Test Item : Conducted Emissions
Test Site : Protocol EMC
Test Mode : Receiving mode

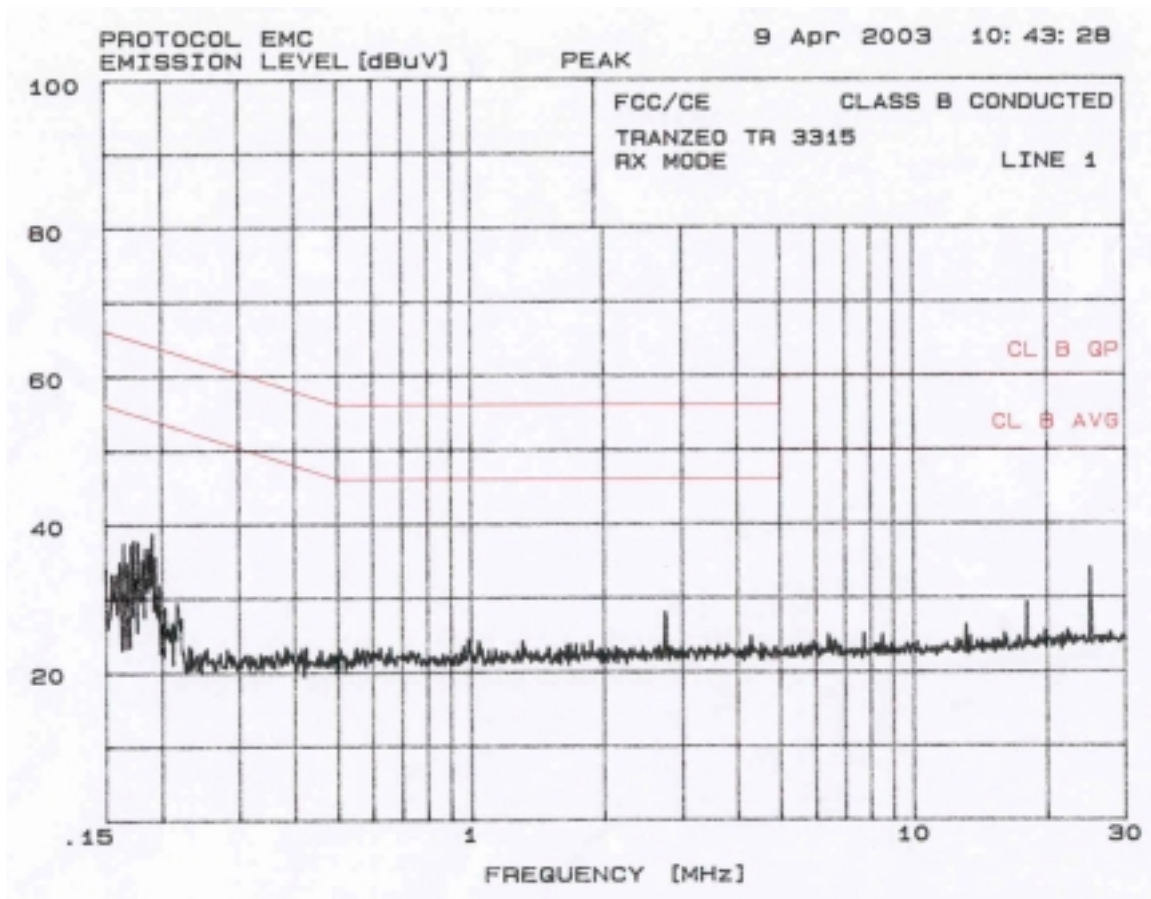
Line 1

Frequency MHz	Test Reading	Delta Limit
0.1883	40.3	-13.8
0.1914	39.3	-14.6
0.1749	39.6	-15.1
0.1786	38.7	-15.8
24.93	33.4	-16.6

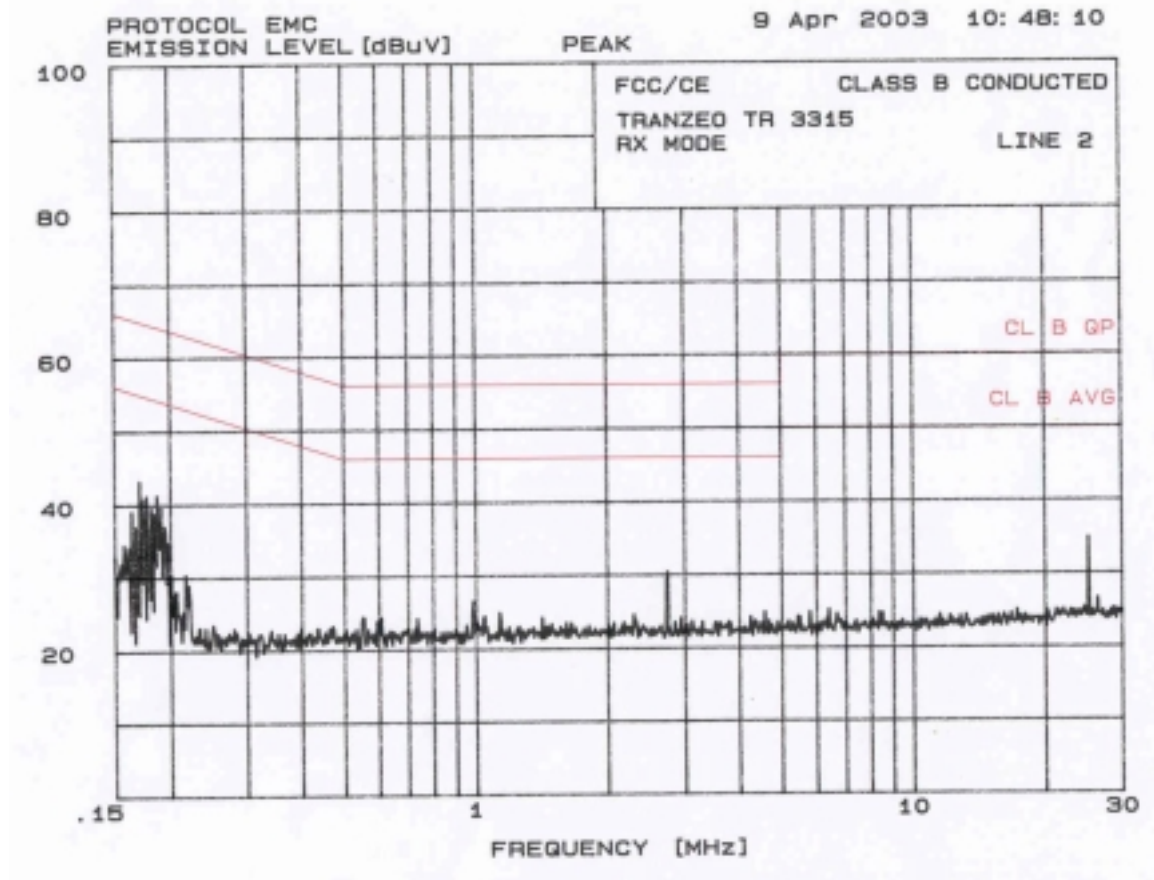
Line 2

Frequency MHz	Test Reading	Delta Limit
0.1712	43.3	-11.6
0.1873	41.3	-12.8
0.1777	41.2	-13.8
0.1740	40.9	-13.8
0.1815	39.6	-14.8

2.5.1 Emissions Plots



Line 1 Conducted Emissions



Line 2 Conducted Emissions

2.6 Test Results

Product : TR-3315
Test Item : Conducted Emissions
Test Site : Protocol EMC
Test Mode : Transmitting Mode Channel 6

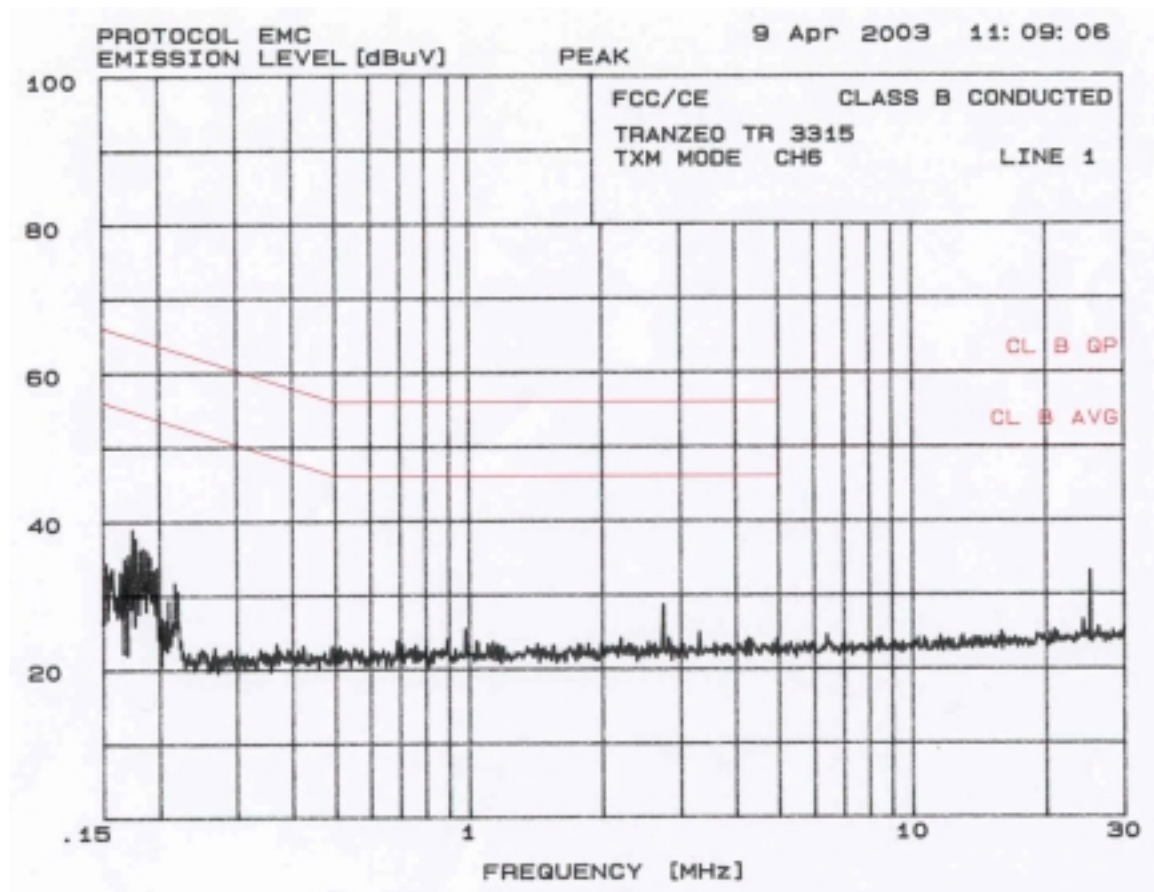
Line 1

Frequency MHz	Test Reading	Delta Limit
.1749	38.9	-15.8
.1777	37.7	-16.8
25.006	33.2	-16.8
2.742	28.7	-17.3
.1844	36.4	-17.8

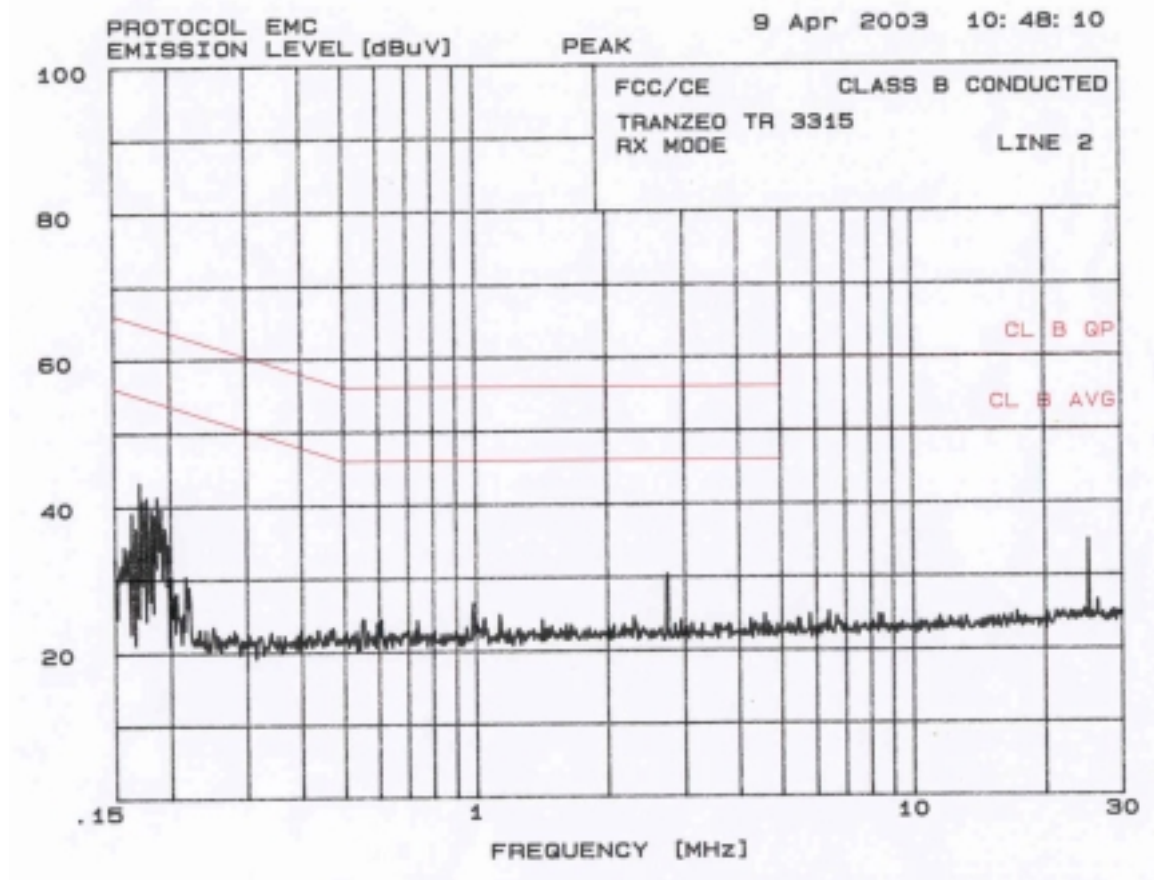
Line 2

Frequency MHz	Test Reading	Delta Limit
.1767	41.1	-13.5
.174	40.9	-13.8
.1914	39.3	-14.6
.1873	39.4	-14.7
.1805	39.1	-15.3

2.6.1 Emissions Plots



Line 1 Conducted Emissions



Line 2 Conducted Emissions

3.0 Peak Power Output

3.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
RF Peak Power Meter	Pacific Measurement Model 1045	512	07/01/02	07/01/03

3.2 Test Setup

The EUT's was connected to a power meter at the RF output for the duration of the test. Test EUT was placed in full transmit mode. This test is a Conducted power measurement.

3.3 Limits

The maximum peak power shall be less than 1 Watt = 30 dBm.

3.4 Test Standard

FCC CFR47, Part 15, Subpart B 15.247b

3.5 Test Results

Product : TR-3315
Test Item : Peak Output Power
Test Site : Tranzeo Wireless Technologies
Test Mode : TXM Mode

Channel #	Frequency (MHz)	Measurement	Required Limit	Result
1	2412	22.5 dBm	30 dBm	Pass
6	2437	21.5 dBm	30 dBm	Pass
11	2462	21.9 dBm	30 dBm	Pass

4.0 Radiated Emissions

4.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3105 Horn	2024	10/30/02	10/30/03
Antenna	Microlab FXR K638A Horn		03/04/03	03/04/04
Antenna	EMCO 3141 Bilog	1127	09/26/02	09/26/03
Harmonic Mixer	HP11971K Mixer	2332A01250	03/04/03	03/04/04
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Microwave Amplifier	HP8349A	2512A00824	09/13/02	09/13/03
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

4.2 Test Setup

The EUT was placed in receive mode for the duration of the test. The EUT was rotated 360 degrees to determine the worst case angle for the maximum emissions level. The antenna was raised and lowered from 1 m to 4 m to find the maximum emissions level. Both horizontal and vertical antenna polarization were tested to find the worst case polarization. This test was performed at a distance of 3 m from the EUT to the measurement antenna.

4.3 Test Standard

FCC Part 15 Subpart C Section 15.209 Radiated emission limits.

4.4 Limits

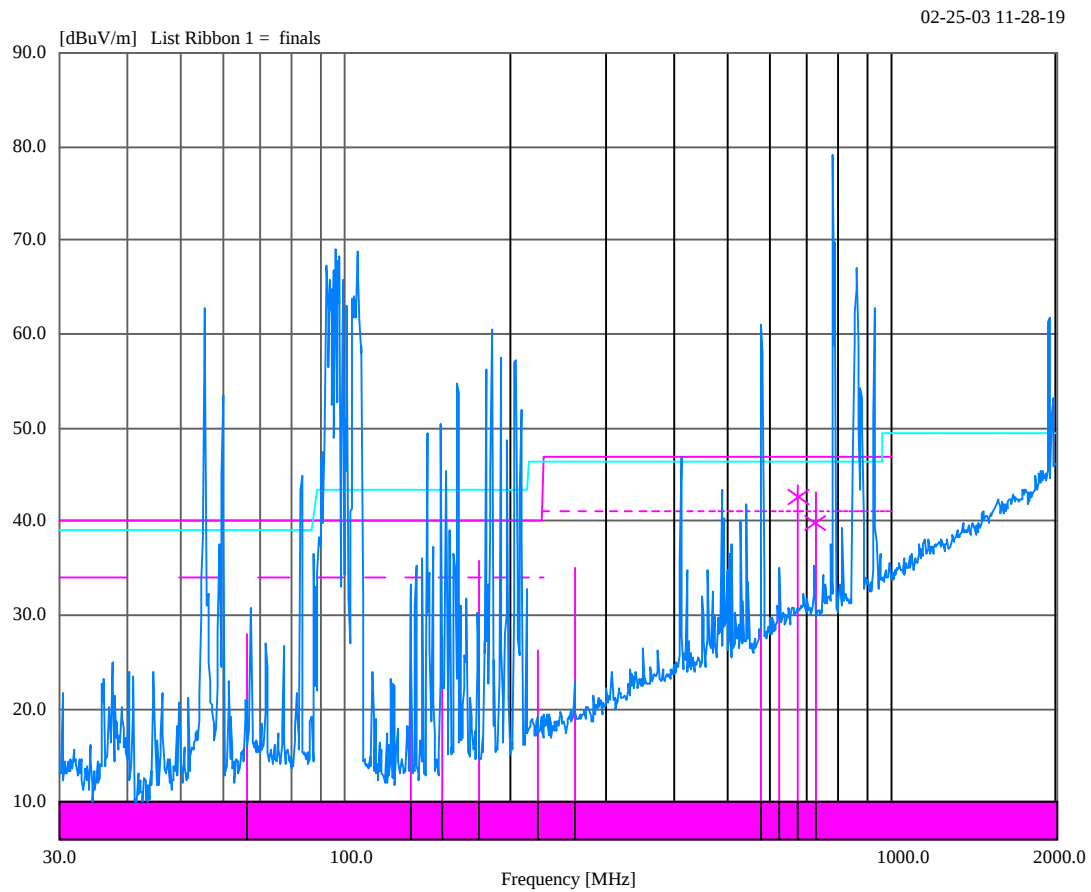
Frequency (MHz)	Maximum Field Strength $\mu\text{V/m}$ at 3m	Maximum Field Strength $\text{dB}\mu\text{V/m}$ at 3m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - 1000	500	54.0

4.5 Test Result

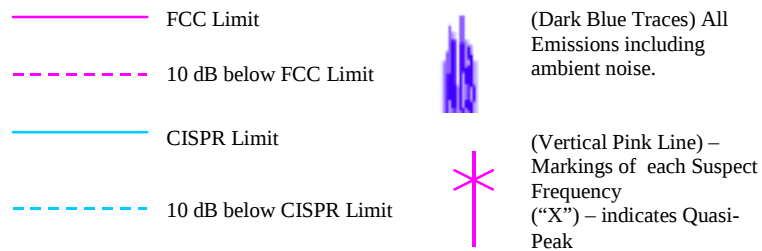
Product : TR-3315
 Test Item : Radiated Emissions
 Test Site : Protocol EMC
 Test Mode : Receive mode

Frequency (MHz)	Pol	Height (m)	Angle (deg)	Un Corr Pk (dB)	Tot Corr (dB)	Peak (dBuV/m)	DelLim -Pk FCC (dB)	QP (dBu V/m)	DelLim -QP (dB)
66.018738	Vert	1.5	335	19.00	8.89	27.89	-12.11	-	-
131.997861	Vert	1.5	185	21.90	9.84	31.74	-11.76	-	-
150.026495	Vert	1.0	85	16.90	10.76	27.66	-15.84	-	-
176.014528	Vert	1.2	85	24.40	11.44	35.84	-7.66	-	-
225.001543	Vert	1.4	45	12.80	13.51	26.31	-19.69	-	-
263.997596	Vert	1.2	45	20.50	14.48	34.98	-11.02	-	-
575.006746	Vert	1.0	135	13.70	22.53	36.23	-9.77	-	-
624.982946	Horz	2.0	90	10.20	24.17	34.38	-11.62	-	-
675.037440	Vert	1.0	95	18.80	25.13	43.93	-2.07	42.70	-3.30
725.025584	Vert	1.0	85	17.60	25.48	43.08	-2.92	39.90	-6.10

4.6 Emissions Plots



Radiated Emissions



5.0 Radiated Harmonic and Spurious Emissions

5.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3105 Horn	2024	10/30/02	10/30/03
Antenna	Microlab FXR K638A Horn		03/04/03	03/04/04
Antenna	EMCO 3141 Bilog	1127	09/26/02	09/26/03
Harmonic Mixer	HP11971K Mixer	2332A01250	03/04/03	03/04/04
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Microwave Amplifier	HP8349A	2512A00824	09/13/02	09/13/03
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

5.2 Test Setup

The EUT was placed in full transmit mode for the duration of the test not DSS mode (Tranzeo has created a function in there software that turns DSS mode off so that we have a full transmit signal). The EUT was rotated 360 degrees to determine the worst case angle for the maximum emissions level. The antenna was raised and lowered from 1 m to 4 m to find the maximum emissions level. Both horizontal and vertical antenna polarization were tested to find the worst case polarization. Channels 1, 6, 11 were tested. This test was performed at a distance of 3 m from the EUT to the measurement antenna.

5.3 Test Standard

FCC CFR47, Part 15, Subpart B 15.247c

5.4 Limits

Fundamental Limit = 137 dB μ V/m

Harmonics and Spurious Emissions = 20 dBc

Restricted Band Emissions = AVG 54 dB μ V/m

5.5 Test Result Channel 1

Product : TR-3315
 Test Item : Harmonic Emissions
 Test Site : Protocol EMC
 Test Mode : Full Transmit Mode

Harmonic	Frequency (MHz)	Polarity	Uncor Pk (dBμV)	Tot Corr (dB)	Peak (dBμV/m)	Peak Limit (dBμV/m)	Delta Limit (dB)	dBc
1 st	2412	Vert	105.0	11.4	116.4	137.00	-20.6	-
2 nd	4824	Vert	60.9	-5.4	55.5	74.00*	-18.5	-60.9
3 rd	7236	Vert	59.7	-7.6	52.1	96.40	-44.3	-64.3
4 th	9648	Vert	54.4	1.2	55.6	96.40	-40.8	-60.8
5 th	12060	Vert	50.4	3.9	54.3	74.00*	-19.7	-62.1
6 th	14472	Vert	52.6	9.7	62.3	74.00*	-11.7	-54.1
7 th	16884	Vert	52.2	16.5	68.7	96.40	-27.7	-47.7
8 th	19296	Vert	37.9	-10.4	27.5	74.00*	-46.5	-88.9
9 th	21708	Vert	38.2	-10.4	27.8	96.40	-68.6	-88.6
10 th	24120	Vert	38.6	-10.4	28.2	96.40	-68.2	-88.2

*These Harmonics are in restricted band and are subject to Average limit of 54 (dBμV/m)

Harmonic	Frequency (MHz)	Polarity	Uncor Average (dBμV)	Tot Corr (dB)	Average (dBμV/m)	Average Limit (dBμV/m)	Delta Limit (dB)
2 nd	4824	Vert	50.8	-5.4	45.4	54.00*	-8.6
5 th	12060	Vert	37.2	-3.9	41.1	54.00*	-12.9
6 th	14472	Vert	39.6	-9.7	49.3	54.00*	-4.7
8 th	19296	Vert	26.0	-10.4	15.6	54.00*	-38.4

Note:

- 1 Receiver Settings (Peak Detector) RBW: 1 MHz VBW: 1 MHz
- 2 Receiver Settings (Average Detector) RBW: 1 MHz VBW: 30 Hz
- 3 Harmonics 8, 9 and 10 are not listed because there is no measurable signal at those frequencies.

5.6 Test Result Channel 6

Product : TR-3315
 Test Item : Harmonic Emissions
 Test Site : Protocol EMC
 Test Mode : Full Transmit Mode

Harmonic	Frequency (MHz)	Polarity	Uncor Pk (dBμV)	Tot Corr (dB)	Peak (dBμV/m)	Peak Limit (dBμV/m)	Delta Limit (dB)	dBc
1 st	2437	Vert	105.2	11.4	116.4	137.00	-20.6	-
2 nd	4874	Vert	62.0	-5.4	57.0	74.00*	-17.0	-59.4
3 rd	7311	Vert	58.5	-7.6	50.7	74.00*	-23.3	-65.7
4 th	9748	Vert	52.8	1.2	54.5	96.40	-41.9	-61.9
5 th	12185	Vert	49.9	3.9	53.8	74.00*	-20.2	-62.6
6 th	14622	Vert	53.7	9.7	61.9	96.40	-34.5	-54.5
7 th	17059	Vert	52.3	16.5	73.1	96.40	-23.3	-43.3
8 th	19496	Vert	38.8	-10.4	28.4	74.00*	-45.6	-88.0
9 th	21933	Vert	37.6	-10.4	27.2	96.40	-69.2	-89.2
10 th	24370	Vert	38.9	-10.4	28.5	96.40	-67.9	-87.9

*These Harmonics are in restricted band and are subject to Average limit of 54 (dBμV/m)

Harmonic	Frequency (MHz)	Polarity	Uncor Average (dBμV)	Tot Corr (dB)	Average (dBμV/m)	Average Limit (dBμV/m)	Delta Limit (dB)
2 nd	4874	Vert	50.7	-5.4	45.7	54.00	-8.3
3 rd	7311	Vert	46.4	-7.6	38.6	54.00	-15.4
5 th	12185	Vert	36.9	3.9	40.8	54.00	-13.3
8 th	19496	Vert	25.8	-10.4	15.4	54.00	-38.6

Note:

1 Receiver Settings (Peak Detector) RBW: 1 MHz VBW: 1 MHz
 2 Receiver Settings (Average Detector) RBW: 1 MHz VBW: 30 Hz
 3 Harmonics 8, 9 and 10 are not listed because there is no measurable signal at those frequencies.

5.7 Test Result Channel 11

Product : TR-3315
 Test Item : Harmonic Emissions
 Test Site : Protocol EMC
 Test Mode : Full Transmit Mode

Harmonic	Frequency (MHz)	Polarity	Uncor Pk (dBμV)	Tot Corr (dB)	Peak (dBμV/m)	Peak Limit (dBμV/m)	Delta Limit (dB)	dBc
1 st	2462	Vert	105.0	11.4	116.4	137.00	-20.6	-
2 nd	4924	Vert	61.5	-5.4	56.6	74.00*	-17.4	-58.6
3 rd	7386	Vert	60.0	-7.6	53.2	74.00*	-20.8	-63.2
4 th	9848	Vert	51.9	1.2	55.5	96.40	-40.9	-60.9
5 th	12310	Vert	50.6	3.9	52.2	74.00*	-21.8	-64.2
6 th	14772	Vert	52.9	9.7	60.9	96.40	-35.5	-55.5
7 th	17234	Vert	52.8	16.5	73.2	96.40	-23.2	-43.2
8 th	19696	Vert	38.6	-10.4	28.2	74.00*	-45.8	88.2
9 th	22158	Vert	37.8	-10.4	27.4	74.00*	-46.6	89.0
10 th	24620	Vert	38.4	-10.4	28.0	96.40	-68.4	-88.4

*These Harmonics are in restricted band and are subject to Average limit of 54 (dBμV/m)

Harmonic	Frequency (MHz)	Polarity	Uncor Average (dBμV)	Tot Corr (dB)	Average (dBμV/m)	Average Limit (dBμV/m)	Delta Limit (dB)
2 nd	4924	Vert	51.0	-5.4	46.1	54.00	-7.9
3 rd	7386	Vert	49.6	-7.6	42.8	54.00	-11.2
5 th	12310	Vert	36.9	3.9	38.5	54.00	-15.5
8 th	19696	Vert	26.0	-10.4	15.6	54.00	-38.4
9 th	22158	Vert	26.0	-10.4	15.6	54.00	-38.4

Note:

- 1 Receiver Settings (Peak Detector) RBW: 1 MHz VBW: 1 MHz
- 2 Receiver Settings (Average Detector) RBW: 1 MHz VBW: 30 Hz
- 3 Harmonics 8, 9 and 10 are not listed because there is no measurable signal at those frequencies.

6.0 Band Edge

6.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3105 Horn	2024	10/30/02	10/30/03
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Microwave Amplifier	HP8349A	2512A00824	09/13/02	09/13/03
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

6.2 Test Setup

The EUT was placed in full transmit mode for the duration of the test not DSS mode (Tranzeo has created a function in there software that turns DSS mode off so that we have a full transmit signal). The EUT was rotated 360 degrees to determine the worst case angle for the maximum emissions level. The antenna was raised and lowered from 1 m to 4 m to find the maximum emissions level. Both horizontal and vertical antenna polarization were tested to find the worst case polarization. Channels 1, 6, 11 were tested. This test was performed at a distance of 3 m from the EUT to the measurement antenna.

6.3 Test Standard

FCC CFR47, Part 15, Subpart B 15.247c

6.4 Limits

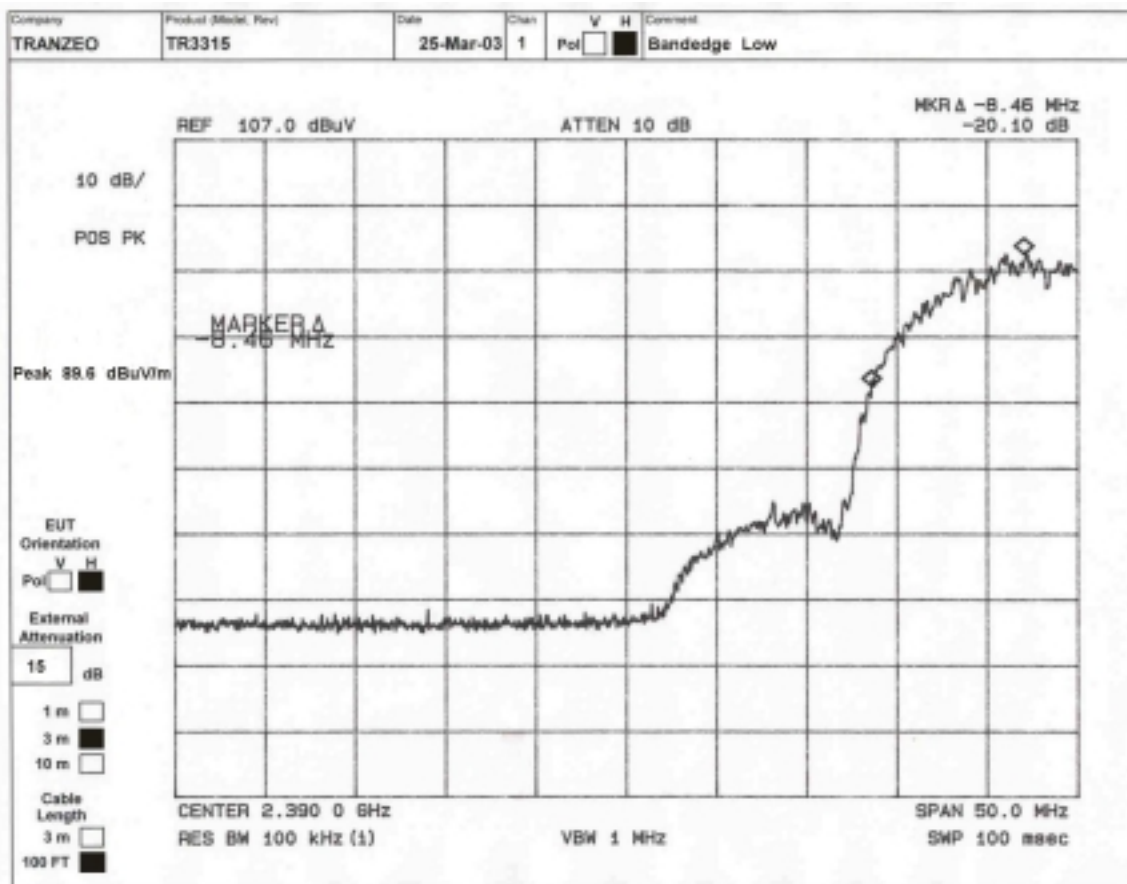
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on an RF radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.5 Test Result Channel 1

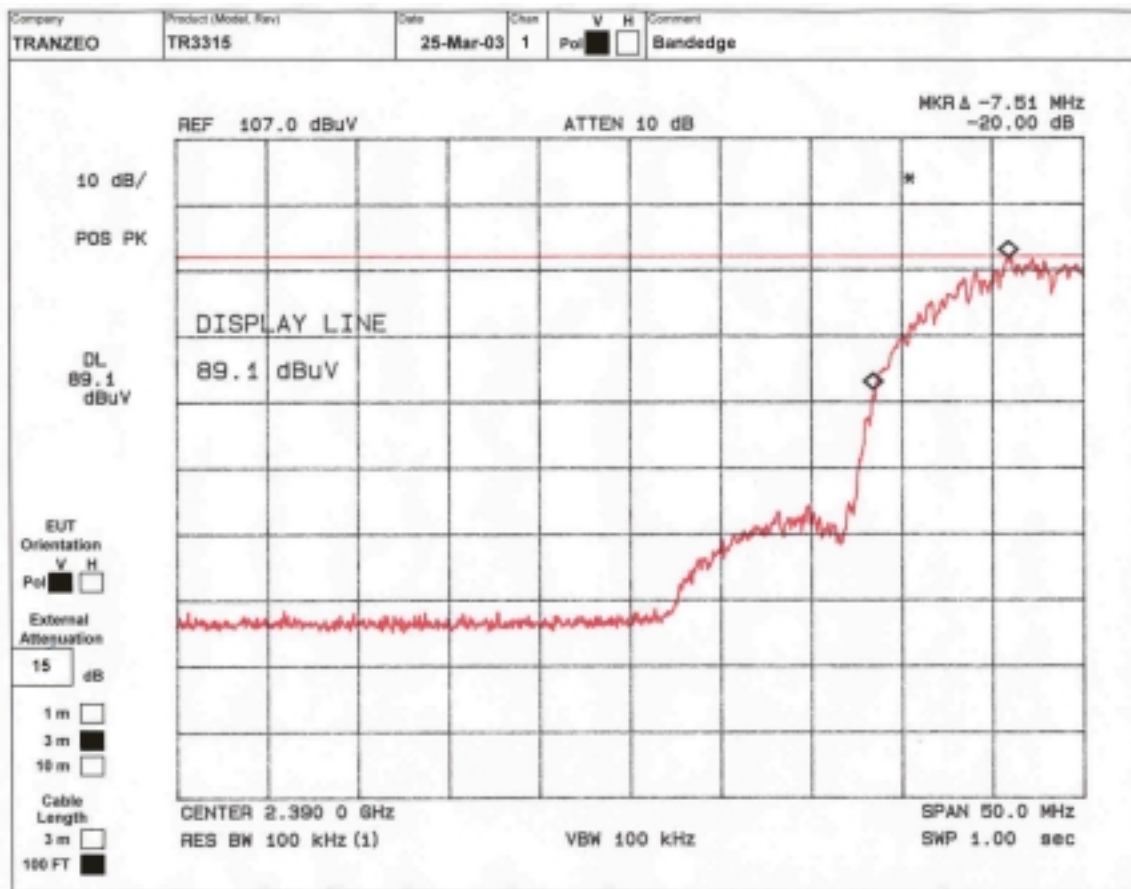
Product : TR-3315
 Test Item : Band Edge Measurement
 Test Site : Protocol EMC
 Test Mode : Full Transmit Mode

Orientation	Frequency MHz	Limit dBc	Result
Horizontal	<2400	>20	Pass
Vertical	<2400	>20	Pass

6.5.1 Channel 1 Band Edge Plot Horizontal



6.5.2 Channel 1 Band Edge Plot Vertical

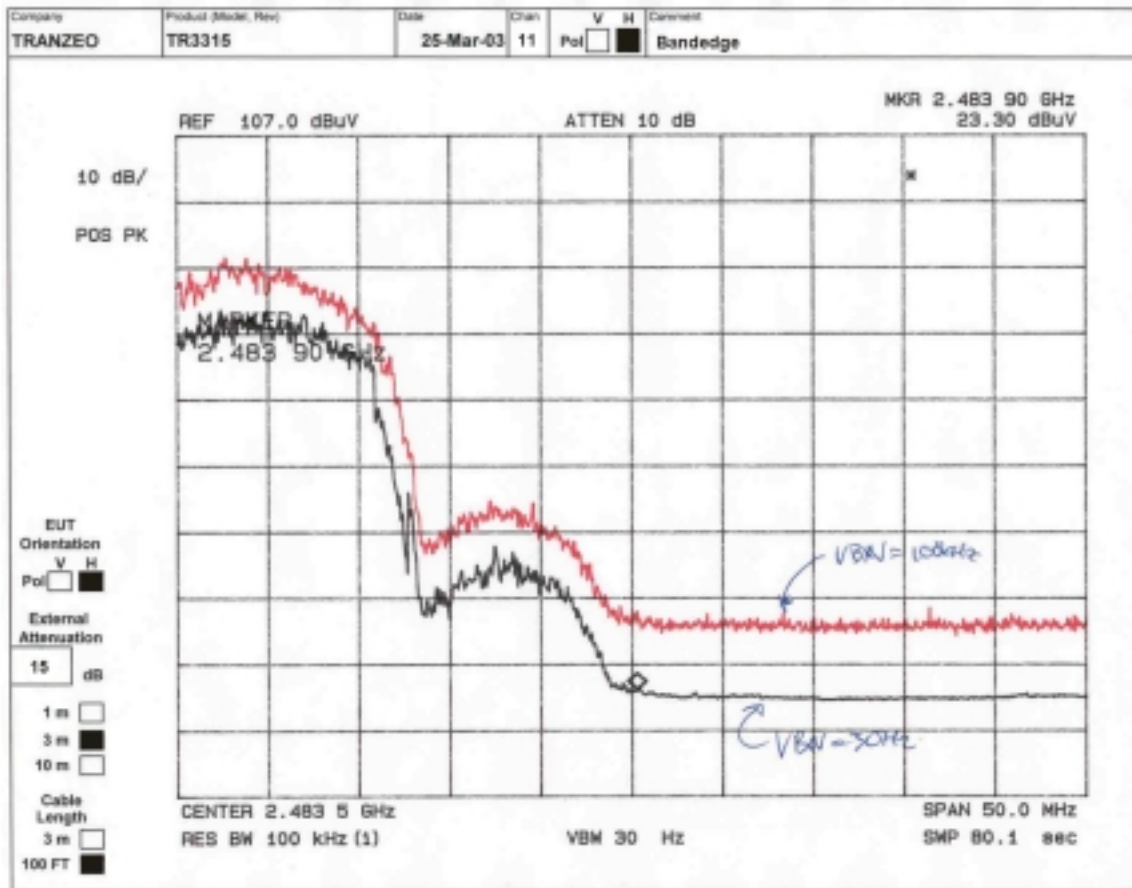


6.6 Test Result Channel 11

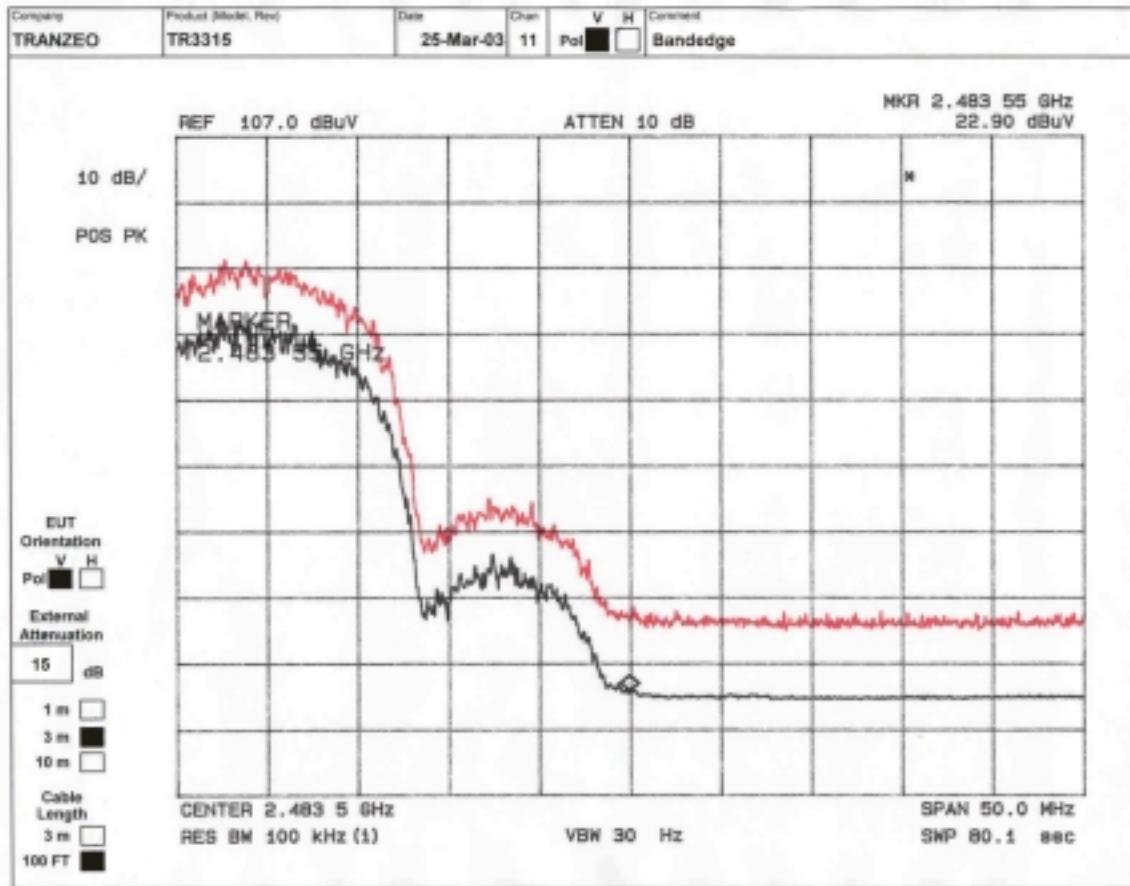
Product : TR-3315
Test Item : Band Edge Measurement
Test Site : Protocol EMC
Test Mode : Full Transmit Mode

Orientation	Frequency MHz	Limit dBc	Result
Horizontal	<2400	>20	Pass
Vertical	<2400	>20	Pass

Frequency (MHz)	Polarity	Uncor Average (dB μ V)	Tot Corr (dB)	Average (dB μ V/m)	Average Limit (dB μ V/m)	Delta Limit (dB)
2483.7	Horz	23.3	5.7	29	54.00*	25
2483.6	Vert	22.9	5.7	28.6	54.00*	25.4

6.6.1 Channel 11 Band Edge Plot Horizontal Average

6.4.2 Channel 11 Band Edge Plot Vertical Average



7.0 Occupied Bandwidth

7.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3105 Horn	2024	10/30/02	10/30/03
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Microwave Amplifier	HP8349A	2512A00824	09/13/02	09/13/03
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

7.2 Test Setup

The EUT was placed in full transmit mode for the duration of the test not DSS mode (Tranzeo has created a function in there software that turns DSS mode off so that we have a full transmit signal). The EUT was rotated 360 degrees to determine the worst case angle for the maximum emissions level. The antenna was raised and lowered from 1 m to 4 m to find the maximum emissions level. Both horizontal and vertical antenna polarization were tested to find the worst case polarization. Channels 1, 6, 11 were tested. This test was performed at a distance of 3 m from the EUT to the measurement antenna.

7.3 Test Standard

FCC CFR47, Part 15, Subpart B 15.247a

7.4 Limits

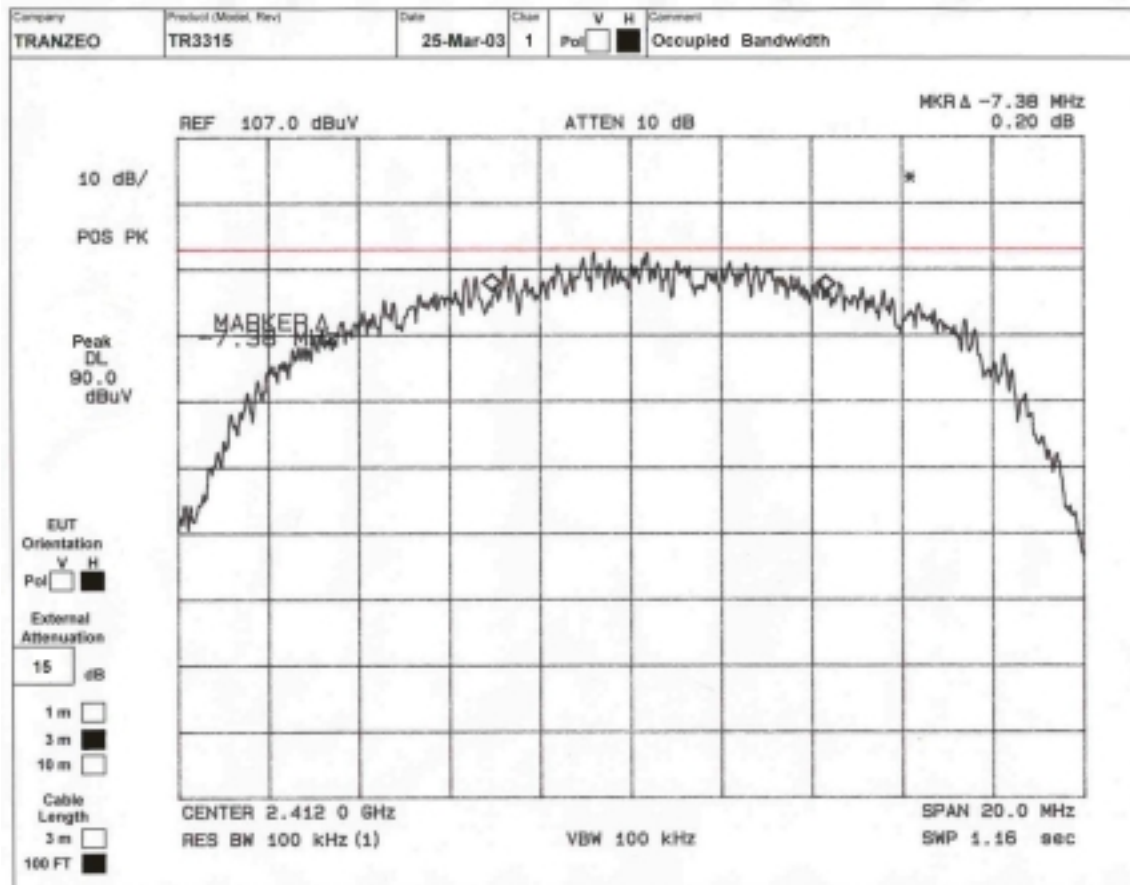
The minimum bandwidth shall be at least 500 kHz.

7.5 Test Result Channel 1

Product : TR-3315
Test Item : Occupied Bandwidth
Test Site : Protocol EMC
Test Mode : Full Transmit Mode

Orientation	Frequency MHz	Measurement Level	Limit kHz	Result
Vertical	2412	7.38 MHz	>500	Pass

7.5.1 Channel 1 Occupied Bandwidth Plot

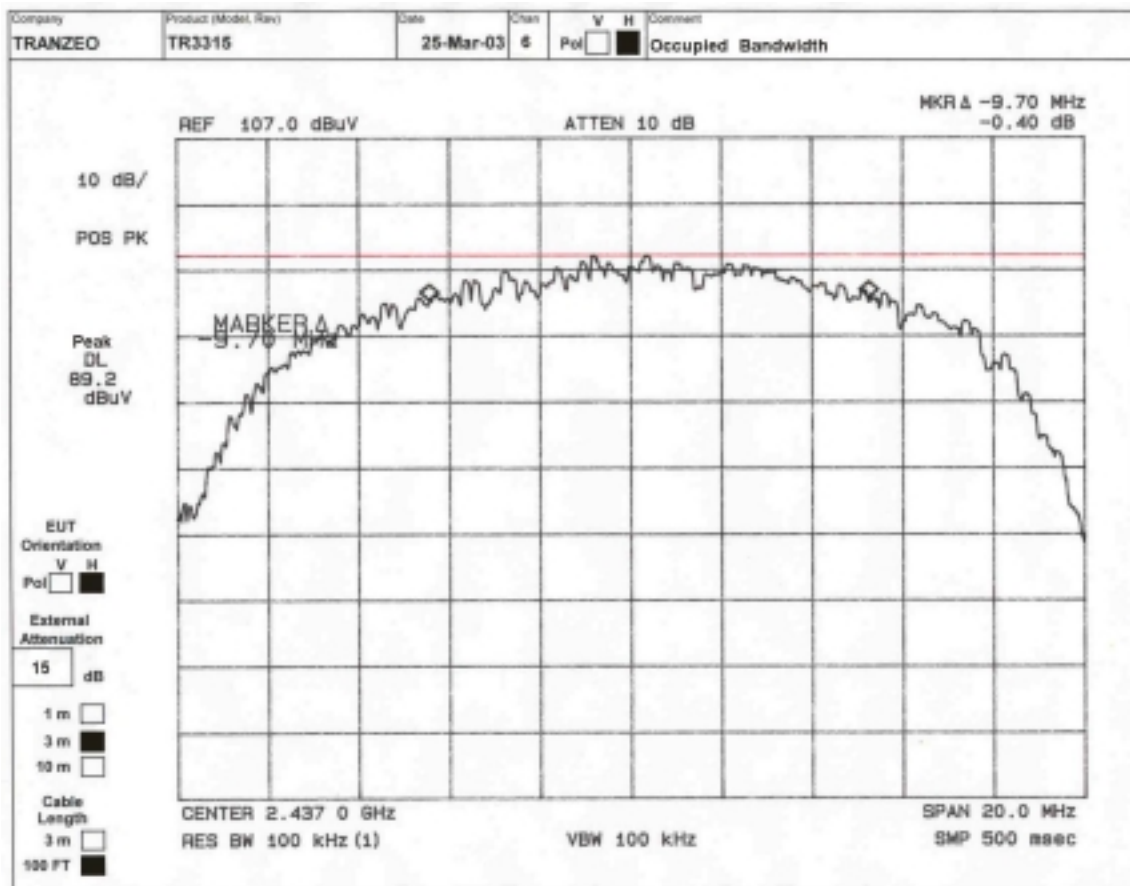


7.6 Test Result Channel 6

Product : TR-3315
 Test Item : Occupied Bandwidth
 Test Site : Protocol EMC
 Test Mode : Full Transmit Mode

Orientation	Frequency MHz	Measurement Level	Limit kHz	Result
Vertical	2437	9.7 MHz	>500	Pass

7.6.1 Channel 6 Occupied Bandwidth Plot

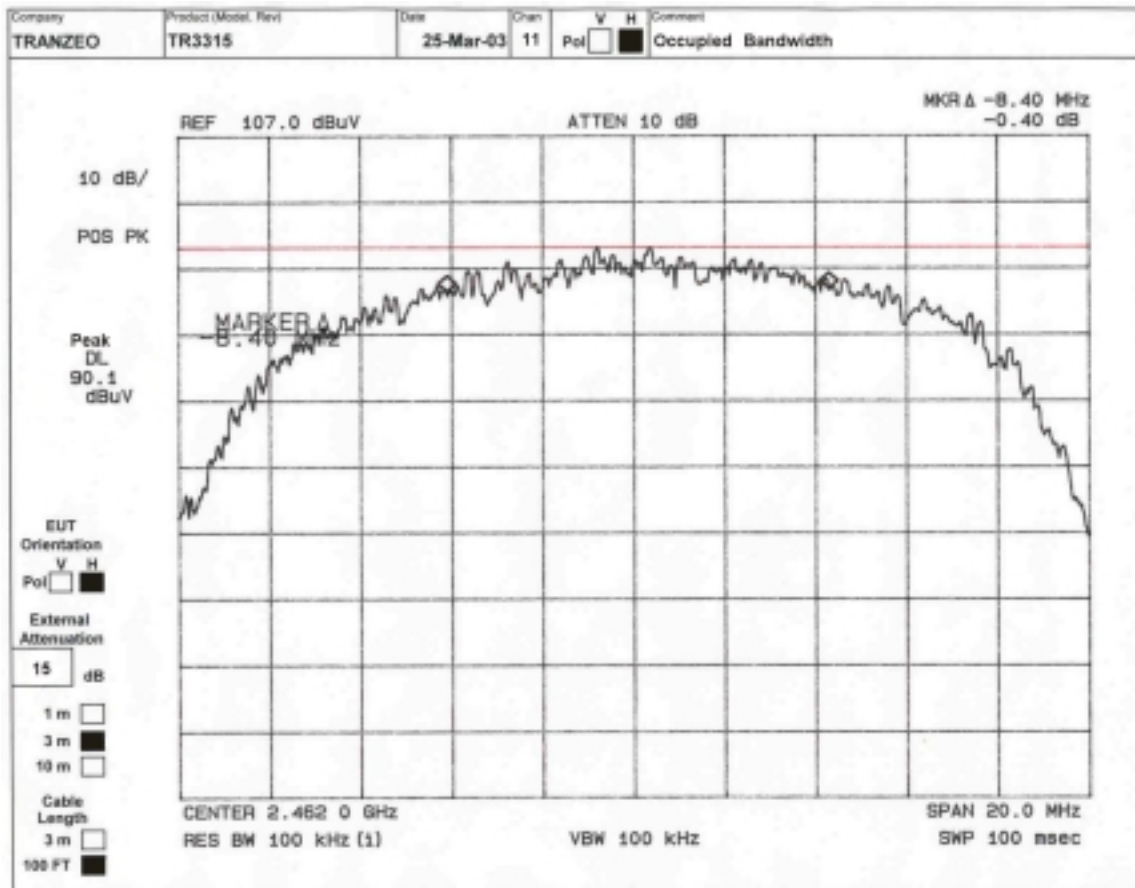


7.7 Test Result Channel 11

Product : TR-3315
 Test Item : Occupied Bandwidth
 Test Site : Protocol EMC
 Test Mode : Full Transmit Mode

Orientation	Frequency MHz	Measurement Level	Limit kHz	Result
Vertical	2462	8.4 MHz	>500	Pass

7.7.1 Channel 11 Occupied Bandwidth Plot



8.0 Power Spectral Density

8.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3105 Horn	2024	10/30/02	10/30/03
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Microwave Amplifier	HP8349A	2512A00824	09/13/02	09/13/03
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

8.2 Test Setup

The EUT was placed in full transmit mode for the duration of the test not DSS mode (Tranzeo has created a function in there software that turns DSS mode off so that we have a full transmit signal). The EUT was rotated 360 degrees to determine the worst case angle for the maximum emissions level. The antenna was raised and lowered from 1 m to 4 m to find the maximum emissions level. Both horizontal and vertical antenna polarization were tested to find the worst case polarization. Channels 1, 6, 11 were tested. This test was performed at a distance of 3 m from the EUT to the measurement antenna.

8.3 Test Standard

FCC CFR47, Part 15, Subpart B 15.247d

8.4 Limit

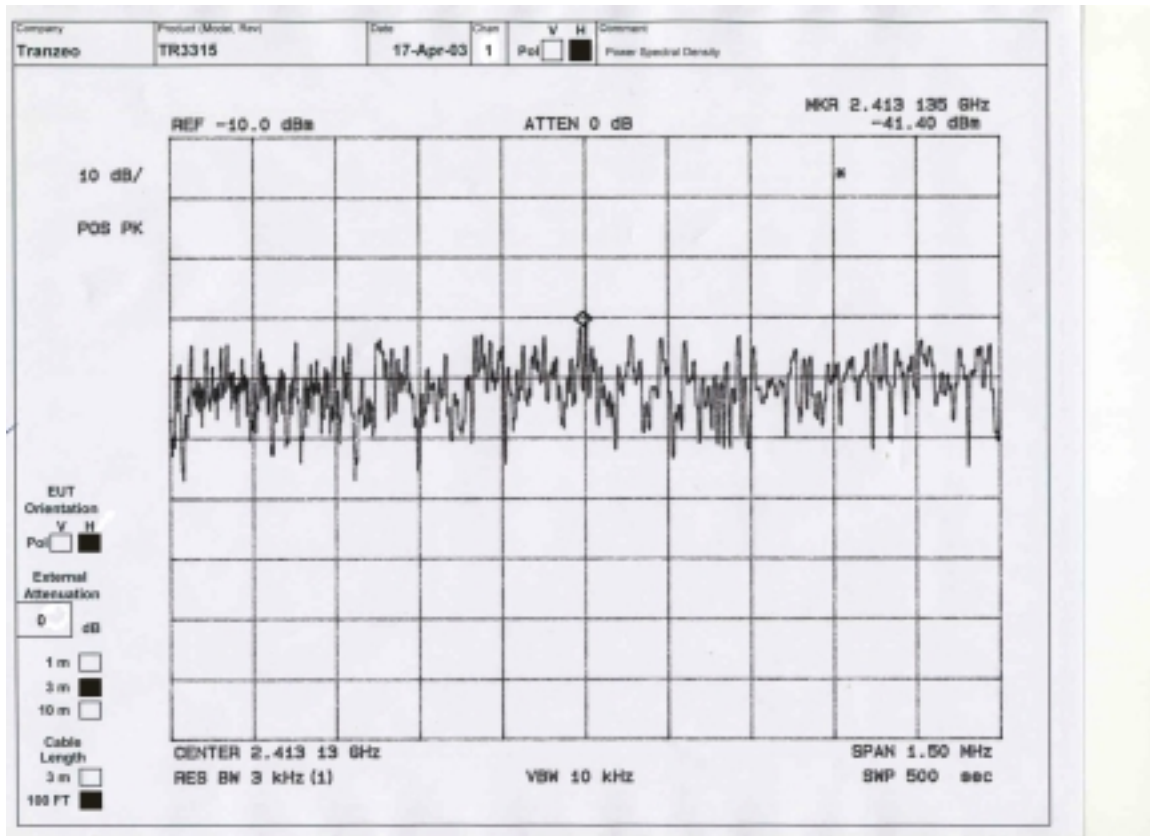
The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

8.5 Test Result Channel 1

Product : TR-3315
Test Item : Power Spectral Density
Test Site : Protocol EMC
Test Mode : Full Transmit Mode

Orientation	Frequency MHz	Measurement dBm	Limit dBm	Result
Horz	2413.13	-12.4	+8	Pass

8.5.1 Channel 1 Power Spectral Density Plot

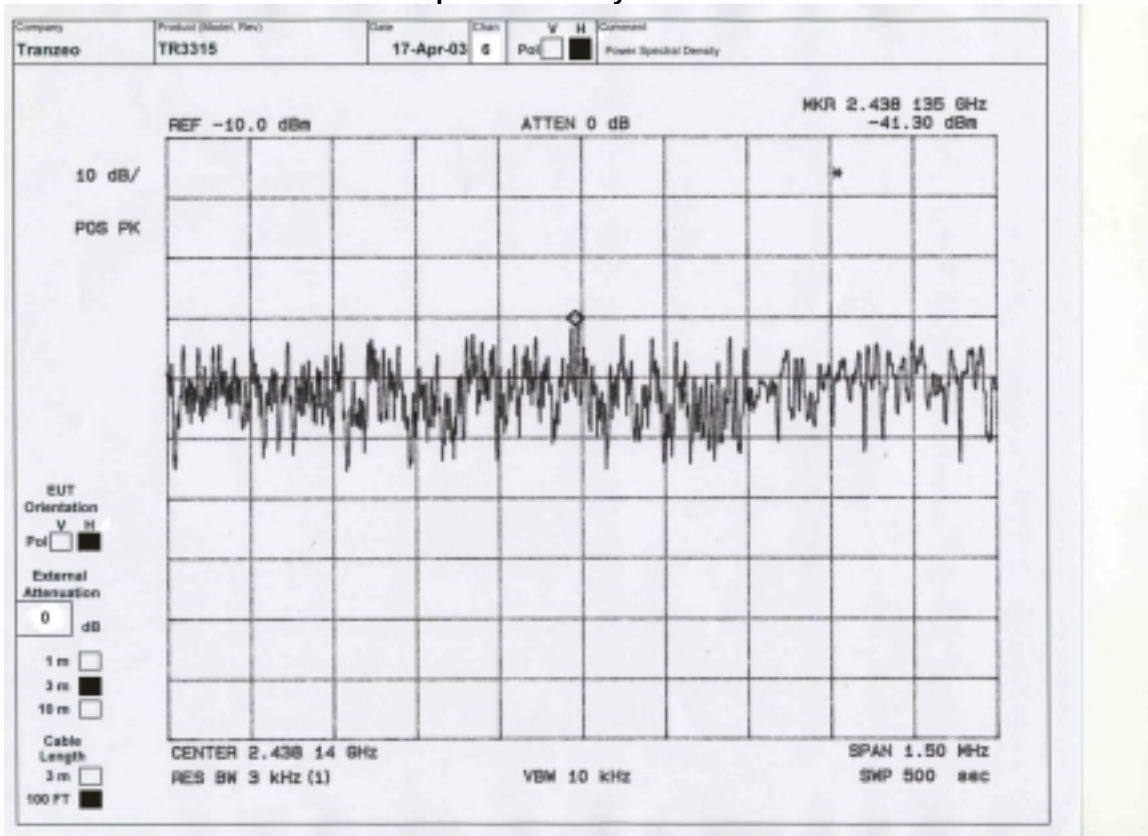


8.6 Test Result Channel 6

Product : TR-3115
Test Item : Power Spectral Density
Test Site : Protocol EMC
Test Mode : Full Transmit Mode

Orientation	Frequency MHz	Measurement dBm	Limit dBm	Result
Horz	2438.13	-12.9	+8	Pass

8.6.1 Channel 1 Power Spectral Density Plot

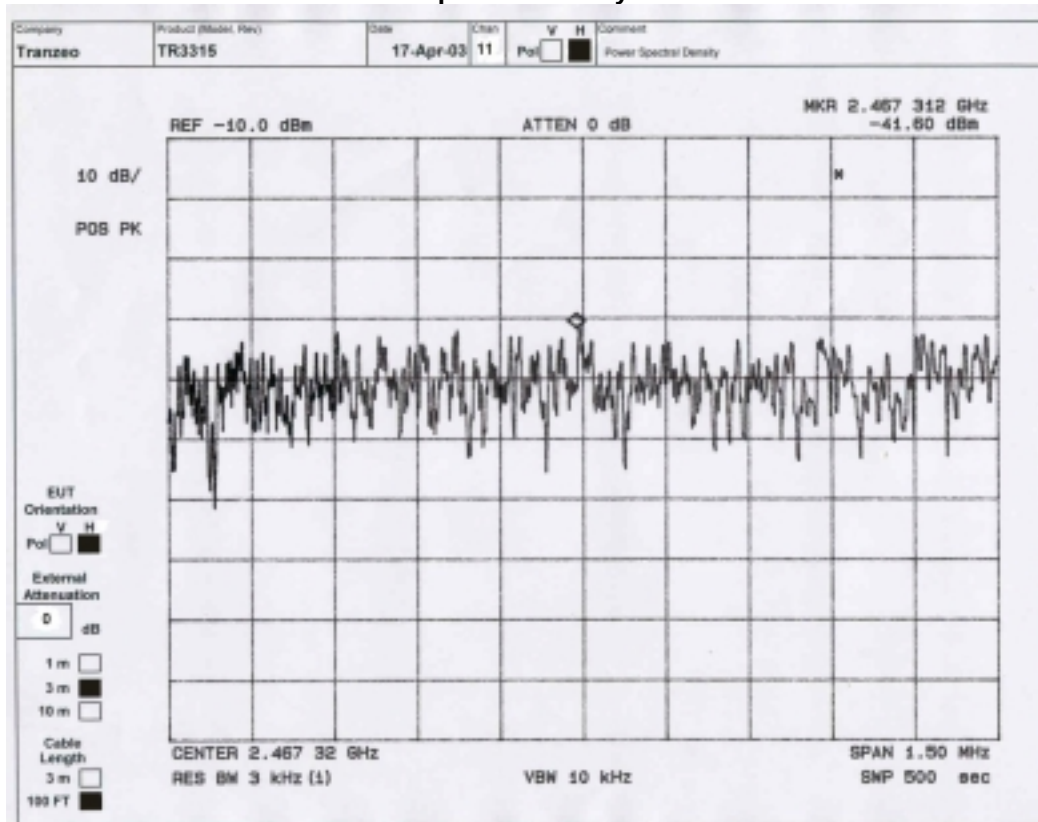


8.7 Test Result Channel 11

Product : TR-3115
Test Item : Power Spectral Density
Test Site : Protocol EMC
Test Mode : Full Transmit Mode

Orientation	Frequency MHz	Measurement dBm	Limit dBm	Result
Horz	2467.31	12.6	+8	Pass

8.7.1 Channel 1 Power Spectral Density Plot



9.0 RF Exposure Evaluation

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to RF radiation as specified in 1.1307(b)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

9.1 Fries Formula

Fries transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$ Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

9.2 EUT Operation condition

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

9.3 Test Result of RF Exposure Evaluation

Product : TR-3315
Test Item : RF Exposure Evaluation Data
Test Site : Protocol EMC
Test Mode : Full Transmit Mode

9.3.1 Antenna Gain

Antenna Gain: The maximum antenna gain for this product is 15dBi as stated by the manufacture.

9.3.2 Output Power into Antenna and RF Exposure Evaluation Distance

Channel	Channel Frequency (MHz)	Output Power to Antenna	Minimum Allowable Distance from Skin(cm)
1	2412	22.5	15.0
6	2437	21.5	15.0
11	2462	21.9	15.0

After performing the calculation it was found that the required distance from the skin is 7.0cm in order to comply with the 1 mW/cm^2 . As this distance is less than 20 cm separation requirement no RF exposure limit warning or SAR test are not required.

10.0 Test Photos

The Test photos are in an attached document.