CLASS II PERMISSIVE CHANGE TEST REPORT

Report Number: 101555940MPK-001
Project Number: G101555940
Report Date: March 20, 2014

Testing performed on the
Compact Wireless Remote
Model: Remote Control Transmitter SCP680135
FCC ID: VGESCP135T
IC: 7228A-SCP135T

to

FCC Part 15 Subpart C (15.247)
FCC Part 15, Subpart B
Industry Canada RSS-210 Issue 8
Industry Canada ICES-003

for

Abbott Medical Optics, Inc.

Test Performed by:	**Test Authorized by:**
Intertek	Abbott Medical Optics, Inc.
1365 Adams Court	1700 East Saint Andrew Place
Menlo Park, CA 94025, USA	Santa Ana, CA 92705 USA

Prepared by: _____ **Date:** March 20, 2014
Anderson Soungpanya

Reviewed by: _____ **Date:** March 20, 2014
Krishna K Vemuri

Report No. 101555940MPK-001

Equipment Under Test:	Compact Wireless Remote
Trade Name:	Abbott Medical Optics, Inc.
Model No.:	Remote Control Transmitter SCP680135
Serial No.:	P007 (RF Power) & 014 (Radiated Measurements)
FCC ID:	VGESCP135T
IC:	7228A-SCP135T
Applicant:	Abbott Medical Optics, Inc.
Contact:	Fred Lee
Address:	1700 East Saint Andrew Place Santa Ana, CA 92705
Country	USA
Tel. Number:	(714) 247-8578
Email:	Fred.Lee@amo.abbott.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) FCC Part 15, Subpart B Industry Canada RSS-210 Issue 8 Industry Canada ICES-003
Test Site Location:	ITS – Site 1 1365 Adams Drive Menlo Park, CA 94025
Date of Test:	February 25 to March 04, 2014

We attest to the accuracy of this report:

Anderson Soungpanya	Krishna K Vemuri
Project Engineer	EMC Senior Staff Engineer

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1.0 Introduction

The Equipment under Test (EUT) is the Compact Wireless Remote, model number Remote Control Transmitter SCP680135 consisting of one Bluetooth radio. As declared by the Applicant, the Bluetooth radio is identical to the radio which is used in the Remote Control Transmitter SCP680135 model previously tested per Intertek report # 101289472LAX-001 (FCC ID: VGESCP135T, IC: 7228A-SCP135T). The applicant of the Remote Control Transmitter SCP680135 is changing the keypad plate of the remote control from metal to delrin (Plastic). Therefore, a Class II Permissive Change was performed to show compliance for Remote Control Transmitter SCP680135 model: RF Output Power, Radiated Spurious Emission and Digital parts emissions.

The Compact wireless remote is a Bluetooth Low Energy wireless remote control used in conjunction with the Compact Intuitive Ophthalmic Surgery System.

This report is designed to show compliance of the 2.4 GHz transceiver with the requirements of FCC 15.247 & RSS-210.

1.1 Summary of Tests

TEST	FCC REFERENCE	REFERENCE RSS-210	RESULTS
RF Output Power	§ 15.247(b)(3)(4)	A8.4	Complies
Transmitter Radiated Emissions	§ 15.247(d), § 15.209, and § 15.205	A8.5	Complies
Radiated Emission from Digital Parts	§ 15.109	ICES-003	Complies
AC Power line Conducted Emissions	§ 15.107, § 15.207	RSS-Gen (7.2.4)	Not Applicable Note 1
Antenna Requirement	§ 15.203	RSS-Gen (7.1.2)	Complies. The EUT does not have an external antenna connector

Note 1: EUT is battery powered; AC Power line Conducted Emissions test is not applicable.

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is the Compact Wireless Remote, model number Remote Control Transmitter SCP680135, consisting of one Bluetooth radio.

The Compact wireless remote is a Bluetooth Low Energy wireless remote control used in conjunction with the Compact Intuitive Ophthalmic Surgery System.

Overview of the EUT

Applicant	Abbott Medical Optics, Inc. 1700 East Saint Andrew Place Santa Ana, CA 92705 USA
Manufacturer name & address	Abbott Medical Optics, Inc. 1700 East Saint Andrew Place Santa Ana, CA 92705 USA
Model	Remote Control Transmitter SCP680135
Serial Number	P007 (RF Power) & 014 (Radiated Measurements)
FCC Identifier	VGESCP135T
IC Identifier	7228A-SCP135T
Frequency Band	2402MHz – 2480MHz
Mode(s) of Operation	BT4.0
Modulation Type	GFSK
Transmission Control	Test Commands
Test Channels	0, 19, 39 (2402, 2440, 2480 MHz)
Antenna Type (15.203)	Internal, Chip Antenna, Maximum Antenna Gain= 2.5 dBi
Power Supply	Battery Powered, 2 x AA Batteries

EUT receive date: February 25, 2014
EUT receive condition: The EUT was received in good condition with no apparent damage. As declared by the Applicant it is identical to the production units.
Test start date: February 25, 2014
Test completion date: March 04, 2014

2.2 Related Submittal(s) Grants

None.

2.3 Test Methodology

Radiated and AC Line conducted emissions measurements were performed according to the procedures in ANSI C63.4. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures described in DA 00-705.

2.4 Test Facility

Radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC.

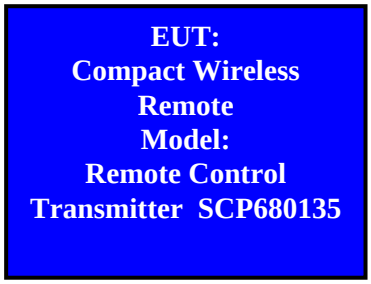
3.0 System Test Configuration

3.1 Support Equipment

None. The EUT is a stand-alone system.

3.2 Block Diagram of Test Setup

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.



EUT is Battery Powered by 2 x AA Batteries

S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT is attached to peripherals and they are connected and operational (as typical as possible). The EUT is wired to transmit full power. During testing, all cables are manipulated to produce worst-case emissions.

The Remote Control Transmitter SCP680135 was previously evaluated and complied for FCC 15.247, FCC 15B, RSS-210 & ICES-003 reference report# 101289472LAX-001 issued on October 29, 2013 for the operating frequency range: 2402 to 2480 MHz. The Remote Control Transmitter SCP680135 keypad black plate is now being constructed of plastic rather than metal when it was initially tested in report# 101289472LAX-001.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by the Applicant.

3.5 Mode of Operation during Test

During transmitter testing, the transmitter was setup to transmit at maximum RF power on low, middle and high frequencies/channels. During the digital parts testing, the EUT was setup in Receive only mode.

3.6 Modifications Required for Compliance

No modifications were installed by Intertek Testing Services during compliance testing in order to bring the product into compliance.

4.0 Measurement Results

4.1 Conducted Output Power at Antenna Terminals
§ 15.247(b)(3)(4), RSS-210, A8.4

Requirements

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt or 30 dBm.
For antennas with gains greater than 6 dBi, transmitter output level must be decreased appropriately, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer. Power was read directly and cable loss correction was added to the reading to obtain the power at the EUT antenna terminal.

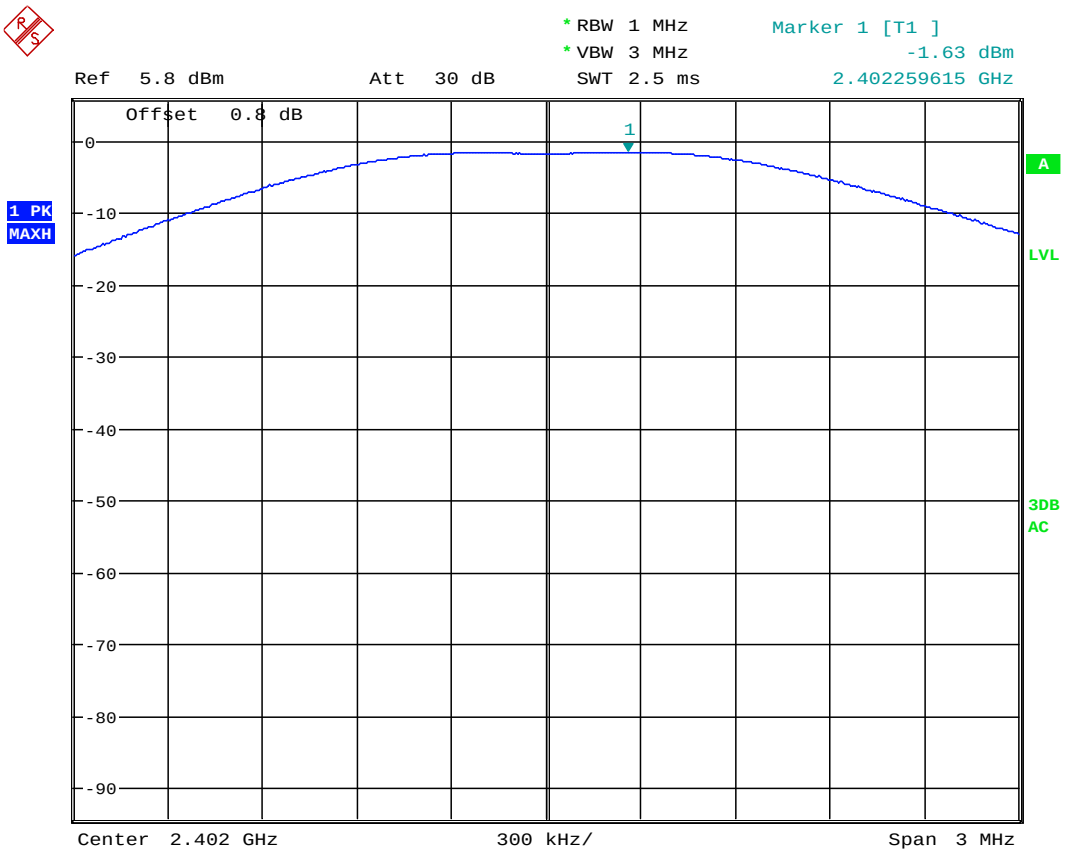
Test Results

Frequency (MHz)	Output in dBm	Output in mW	Plot Number
2402	-1.63	0.688	1.1
2441	-1.65	0.685	1.2
2480	-1.64	0.687	1.3

Notes: 1. Hopping function was disabled during the test.
2. The EUT's antenna has less than 6 dBi gain.

Plot 1.1

2402MHz, Low Channel

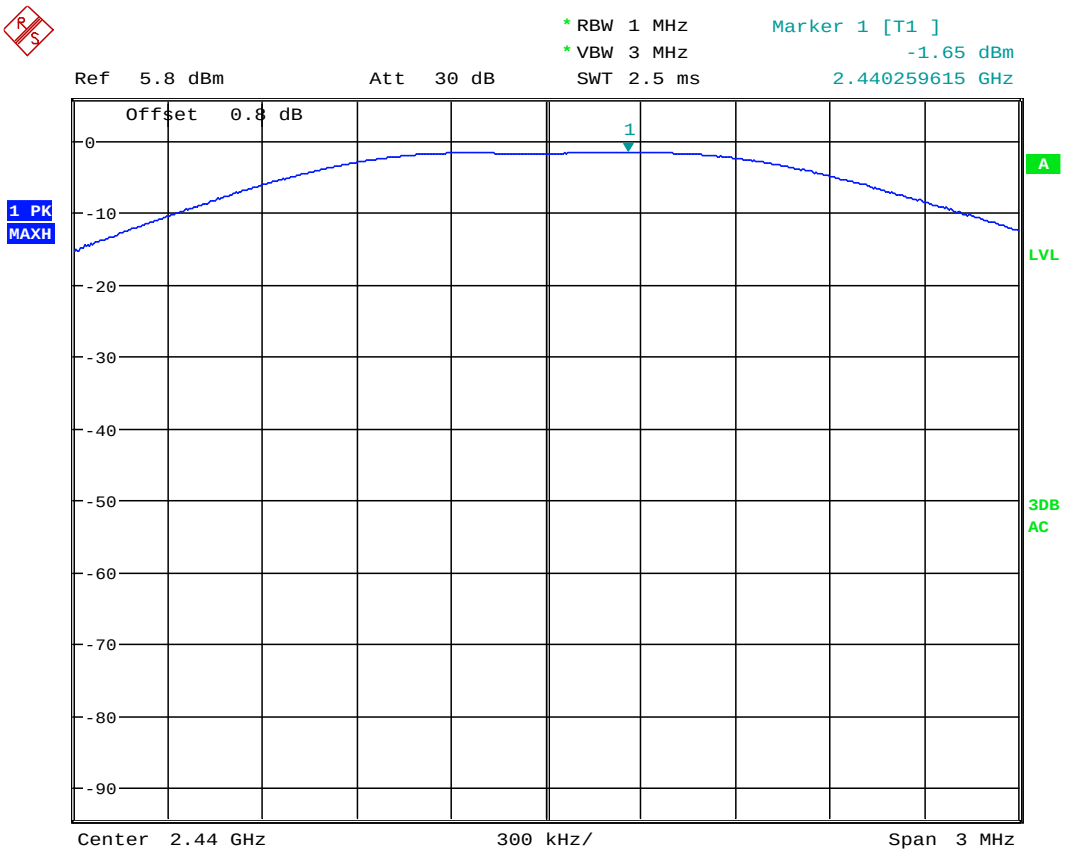


Output Power

Date: 25.FEB.2014 18:31:29

Plot 1.2

2440MHz, Mid Channel

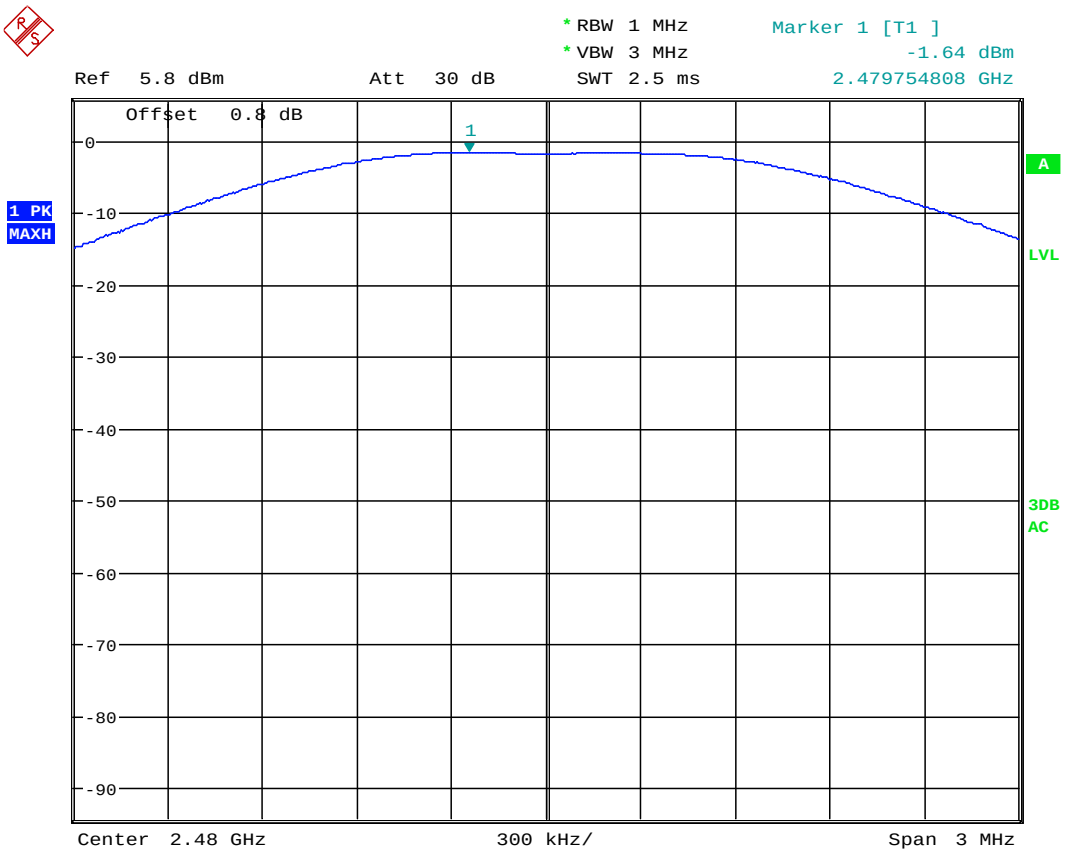


Output Power

Date: 25.FEB.2014 18:32:12

Plot 1.3

2480MHz, High Channel



Output Power

Date: 25.FEB.2014 18:32:47

4.2 Transmitter Radiated Emissions
§ 15.247(d), § 15.209, § 15.205, RSS-210, A7.2, A8.5

Requirement

For out of band radiated emissions (except for frequencies in restricted bands), in any 100 kHz bandwidths outside the EUT pass-band, the RF power shall be at least 20dB (peak) or 30 dB (average) below that of the maximum in-band 100 kHz emissions. Harmonic emissions which fall in the restricted bands, as defined in FCC 15.205, shall meet the general field strength limits of FCC 15.209.

Procedure

Radiated emission measurements were performed from 30 MHz to 26,000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz for frequencies above 1000 MHz.

The EUT is placed on a non-conductive table. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst case emissions. The signal is maximized through rotation of the turntable. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

Radiated emissions are taken at 3 meters for frequencies above 1 GHz and at 10 meters for frequencies below 1 GHz. Measurements made from 1 GHz to 18GHz had a 2.4-2.5GHz notch filter in place. A preamp was used from 30MHz to 26GHz. All measurements were made with a Peak Detector and compared to QP limits for 30MHz – 1GHz and Average limits for 1GHz – 26GHz.

Data is included for the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation

For measurements made at 10 meters distance
The field strength is calculated by adding the Antenna Factor and Cable Factor to from the measured reading, followed by subtracting the Amplifier Gain (if any) and Distance Correction Factor (if any). The basic equation with a sample calculation is as follows:

The field strength is calculated by adding the Antenna Factor and Cable Factor and the Distance Correction Factor; and subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG + DCF

Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB
AG = Amplifier Gain in dB
DCF = Distance Correction Factor in dB for measurements made at 10 meters distance

Assume a receiver reading of 52.5 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB and Distance Correction Factor (for measurements made at 10 meters distance) of 10.5 dB is subtracted, giving field strength of 22 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.5 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
DCF = 10.5 dB
FS = 52.5+7.4+1.6-29.0+10.5 = 43 dB(μV/m).
Level in μV/m = Common Antilogarithm [(43 dBμV/m)/20] = 141.3 μV/m.

For measurements made at 3 meters distance
The field strength is calculated by following the example above *for measurements made at 10 meters distance* except the Distance Correction Factor in dB is not applied.

Test Results

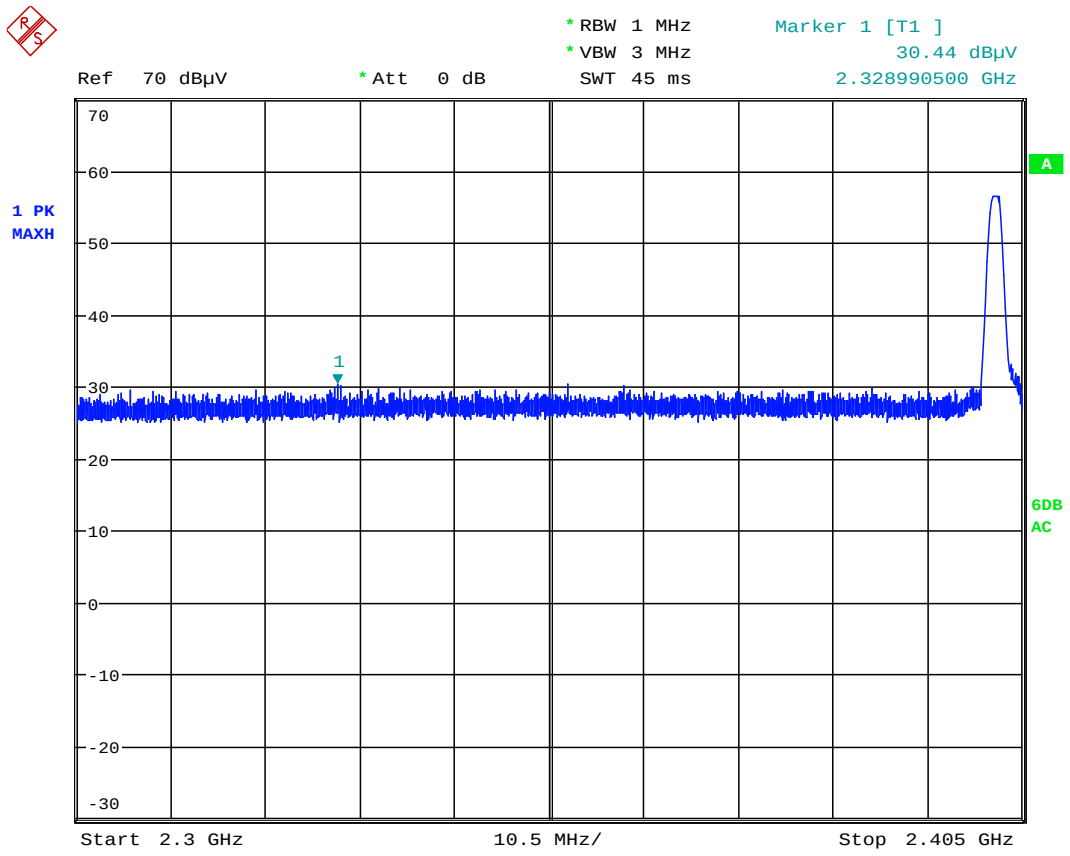
The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

The radiated emissions in the restricted bands near the operating band are presented on the following Plots 7.1-7.4. On these plots, the antenna factor and cable loss are not included in the OFFSET of the spectrum analyzer reading; therefore, the measurements for the final corrected field strength was calculated in the tables below the plots.

The EUT passed the test by 3.3dB.

Plot 7.1

Restricted Band 2300-2390 MHz (Peak Measurement)



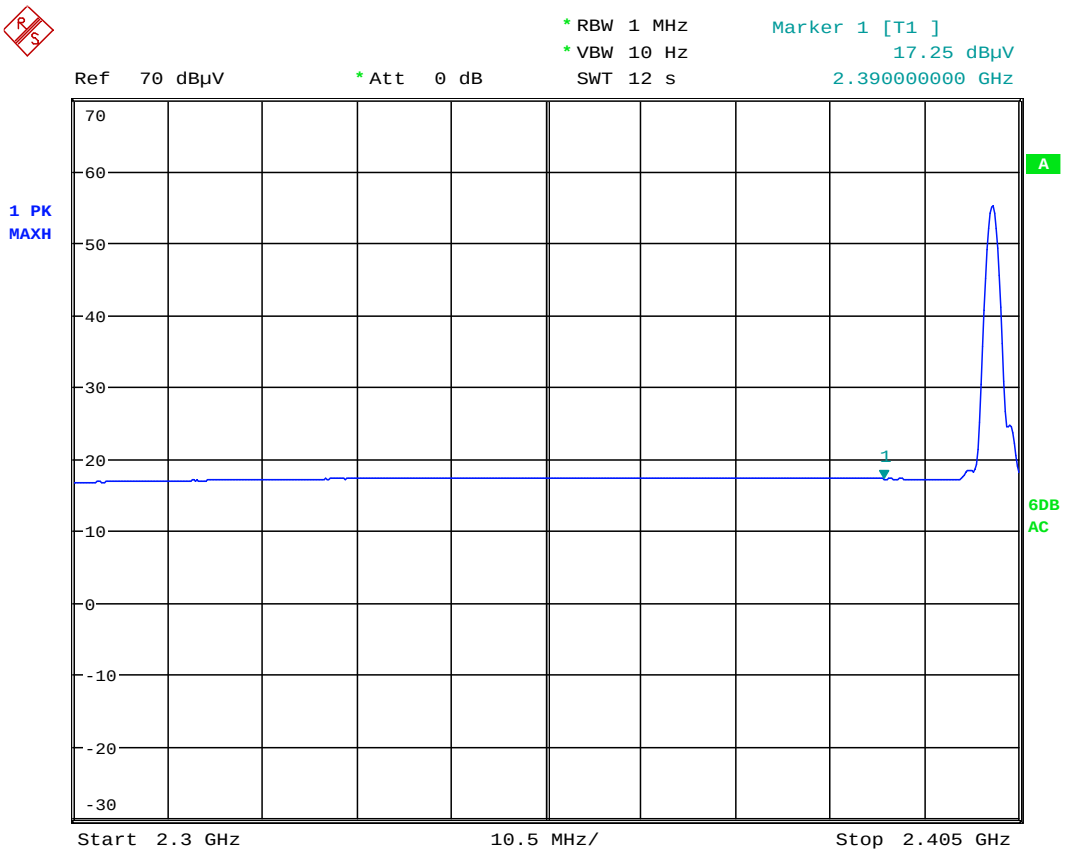
Band Edge

Date: 25.FEB.2014 16:07:28

Frequency	Corrected Field Strength	Limit @ 3m	Margin	Raw Field Strength	Cable Loss	Antenna Factor	Result
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	
2328.9	59.6	74	-14.4	30.4	1.7	27.5	Complies

Plot 7.2

Restricted Band 2300-2390 MHz (Average Measurement)



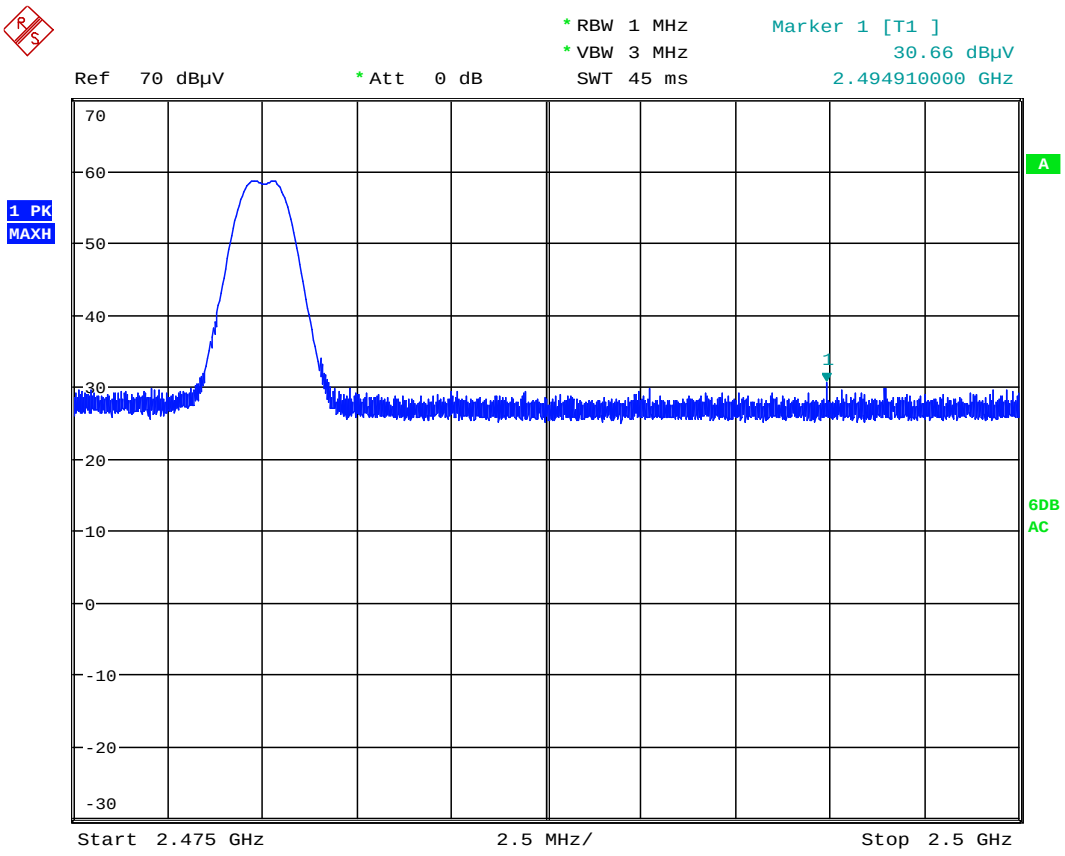
Band Edge

Date: 25.FEB.2014 16:06:42

Frequency	Corrected Field Strength	Limit @ 3m	Margin	Raw Field Strength	Cable Loss	Antenna Factor	Result
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	
2390.0	46.8	54	-7.2	17.3	1.8	27.7	Complies

Plot 7.3

Restricted Band 2483.5-2500 MHz (Peak Measurement)



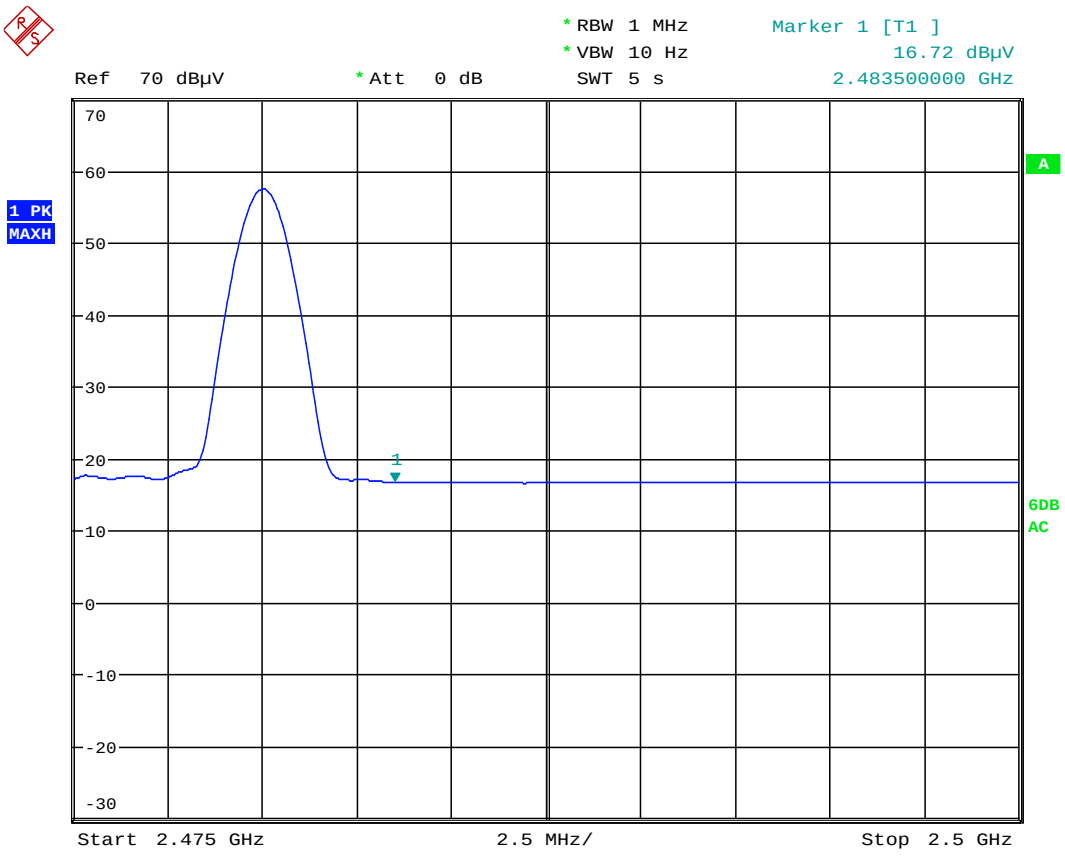
Band Edge

Date: 25.FEB.2014 16:12:54

Frequency	Corrected Field Strength	Limit @ 3m	Margin	Raw Field Strength	Cable Loss	Antenna Factor	Result
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	
2494.9	61.1	74	-12.9	30.7	2.0	28.4	Complies

Plot 7.4

Restricted Band 2483.5-2500 MHz (Average Measurement)



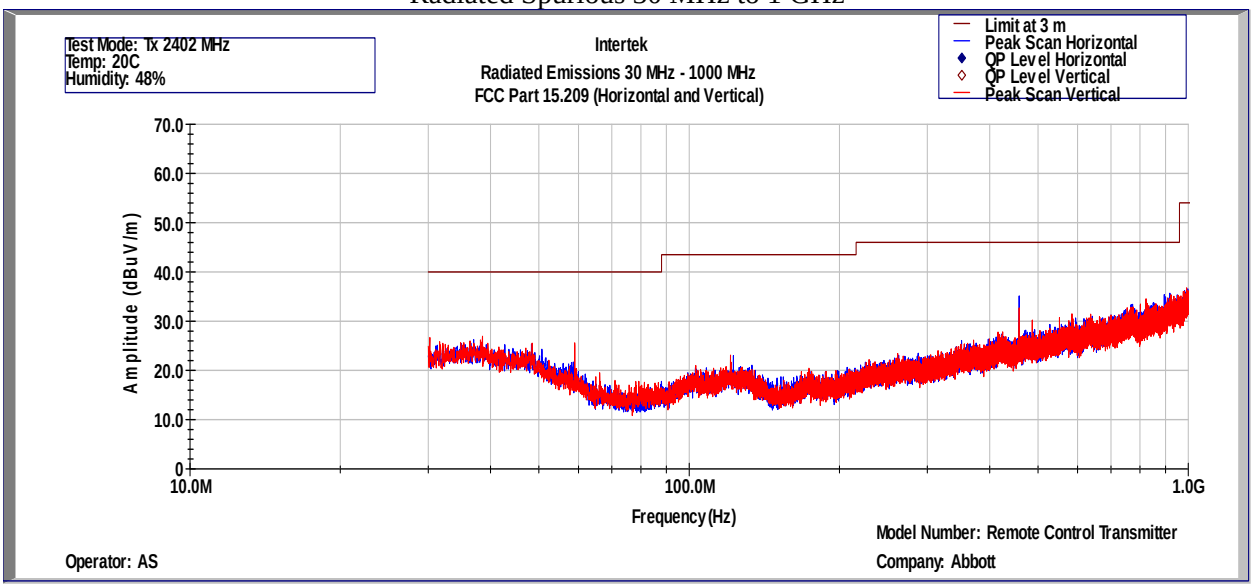
Band Edge

Date: 25.FEB.2014 16:13:39

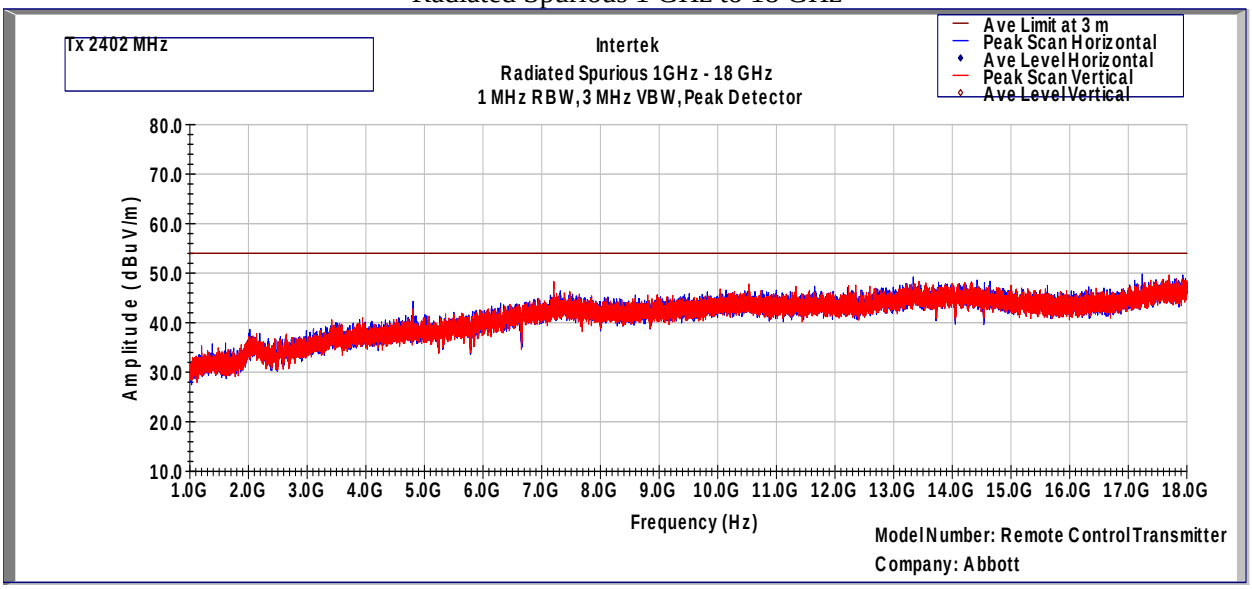
Frequency	Corrected Field Strength	Limit @ 3m	Margin	Raw Field Strength	Cable Loss	Antenna Factor	Result
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	
2483.5	46.7	54	-7.3	16.7	1.9	28.1	Complies

Radiated Spurious Emissions Tx @ 2402MHz

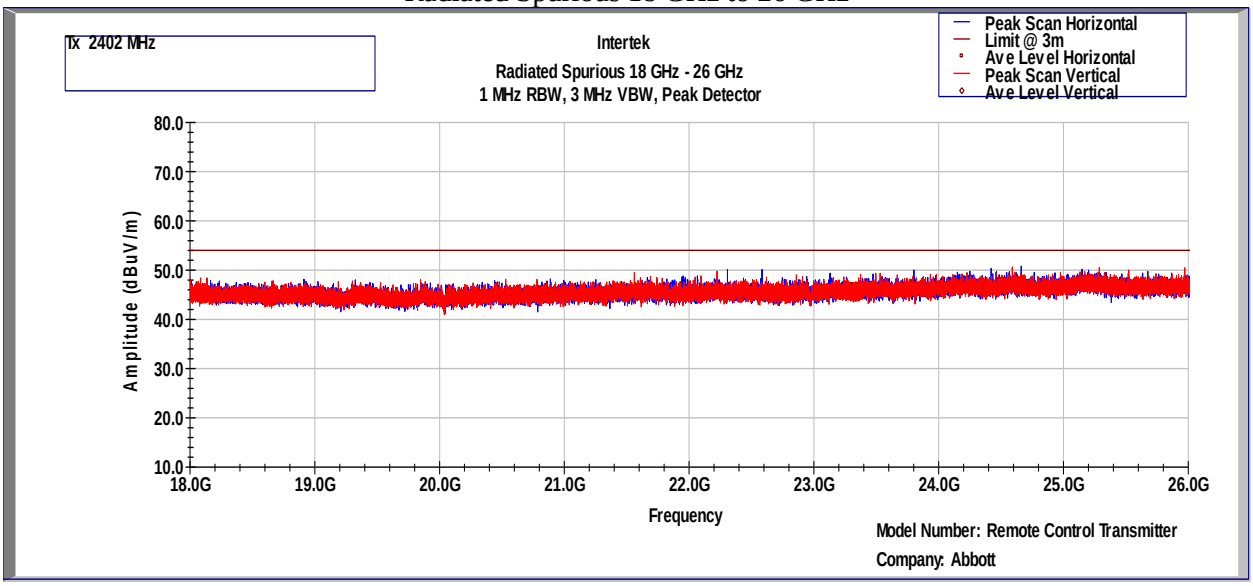
Radiated Spurious 30 MHz to 1 GHz



Radiated Spurious 1 GHz to 18 GHz



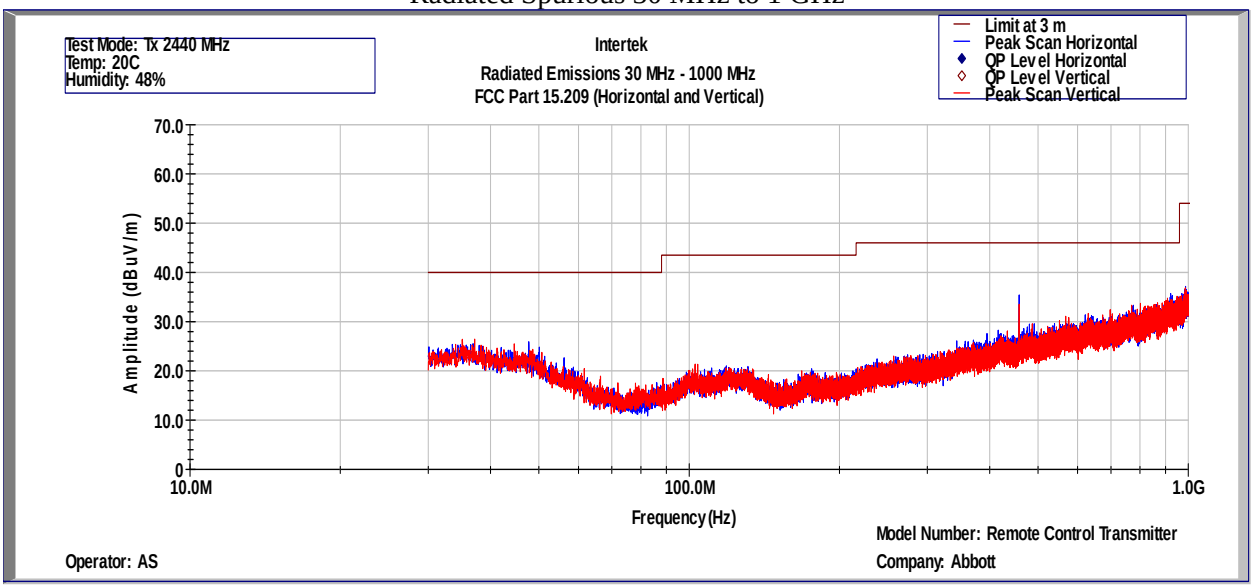
Radiated Spurious 18 GHz to 26 GHz



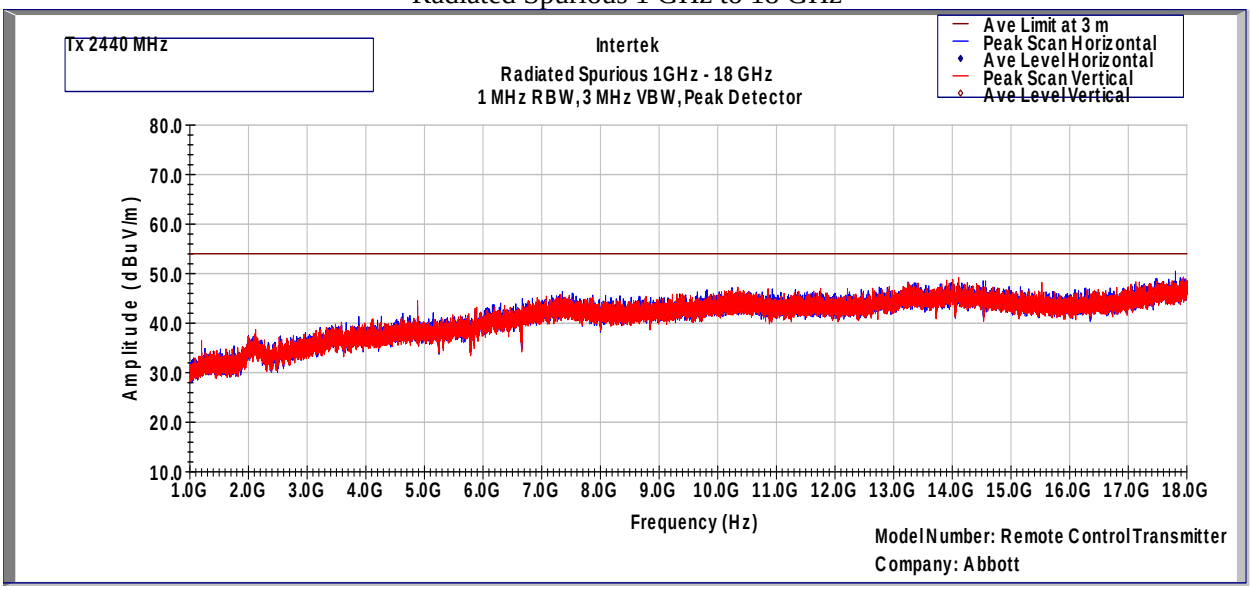
Result	**Complies** by 3.7 dB

Radiated Spurious Emissions Tx @ 2440MHz

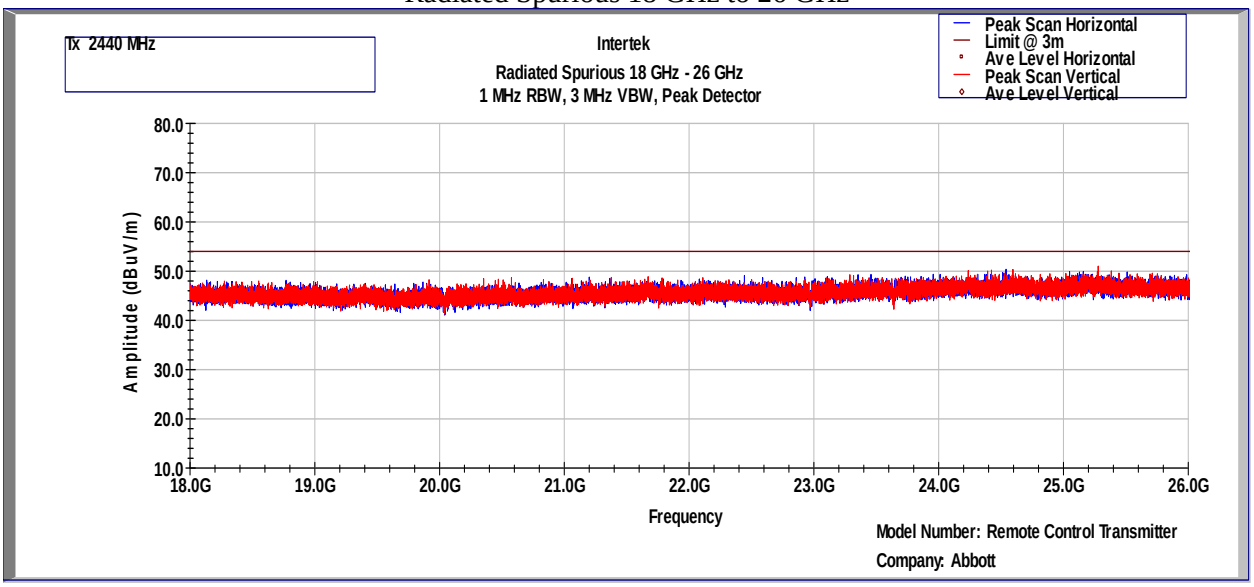
Radiated Spurious 30 MHz to 1 GHz



Radiated Spurious 1 GHz to 18 GHz



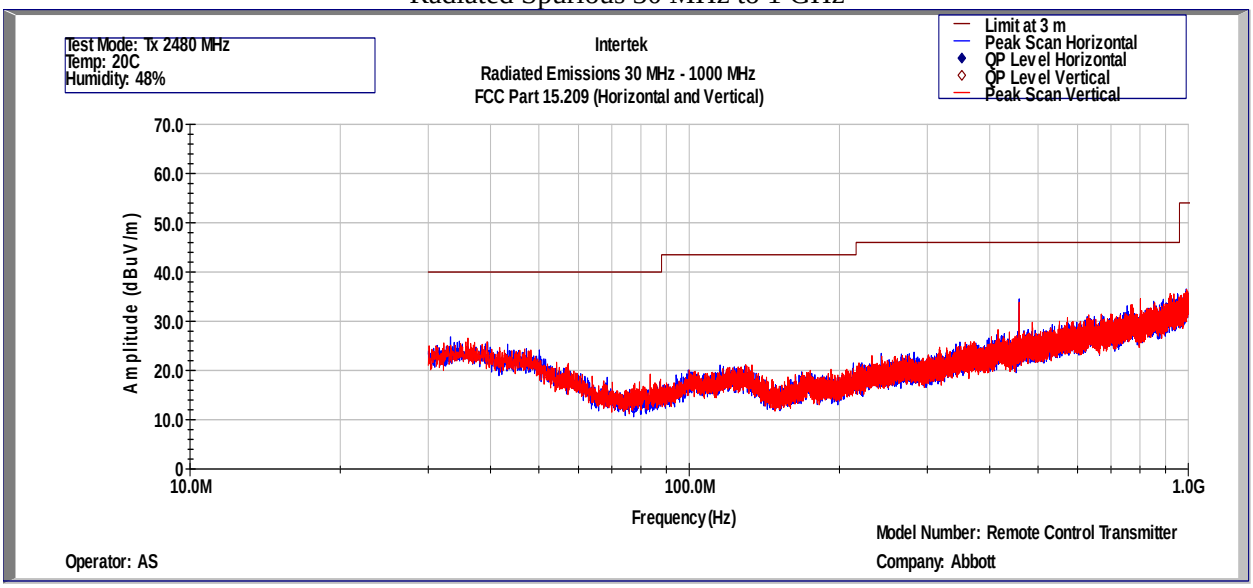
Radiated Spurious 18 GHz to 26 GHz



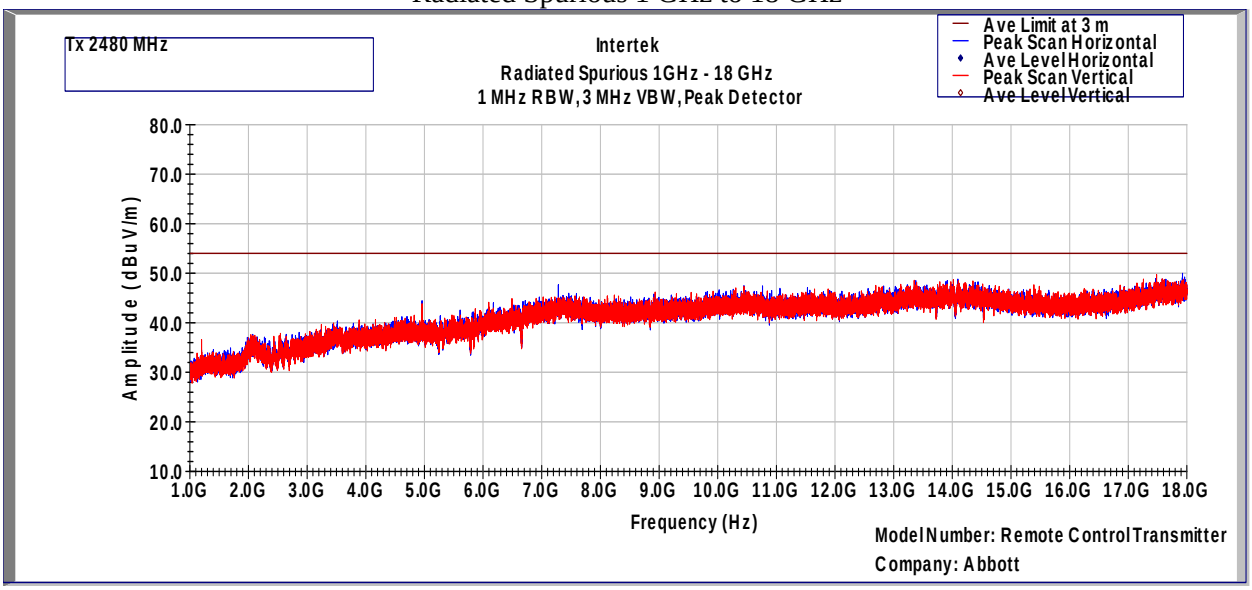
Result	**Complies** by 3.5 dB

Radiated Spurious Emissions Tx @ 2480MHz

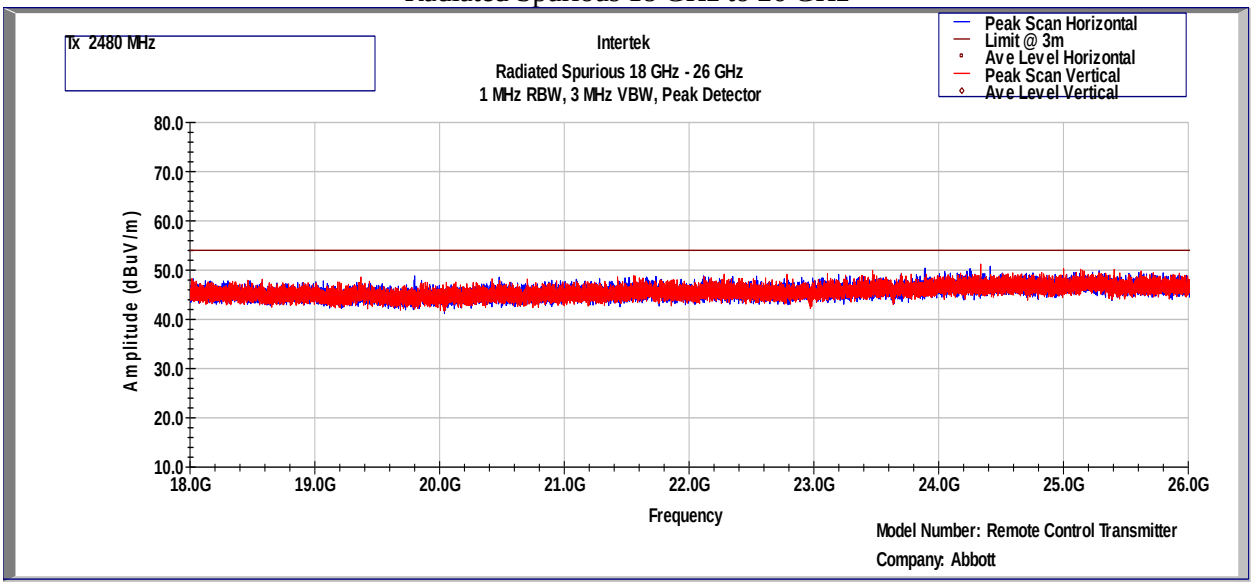
Radiated Spurious 30 MHz to 1 GHz



Radiated Spurious 1 GHz to 18 GHz



Radiated Spurious 18 GHz to 26 GHz



Result	**Complies** by 3.3 dB

4.3 Emissions from Digital Parts
§ 15.109, ICES 003

Requirement

Limits for Electromagnetic Radiated Emissions, FCC Section 15.109(b) and ICES 003*

Frequency (MHz)	Class A at 10m dB(μV/m)	Class B at 3m dB(μV/m)
30-88	39	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

Procedure

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to 1000 MHz and with the average detector instrument in the frequency range above 1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a larger EUT.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.

Example Field Strength Calculation

For measurements made at 10 meters distance

The field strength is calculated by adding the Antenna Factor and Cable Factor to from the measured reading, followed by subtracting the Amplifier Gain (if any) and Distance Correction Factor (if any). The basic equation with a sample calculation is as follows:

The field strength is calculated by adding the Antenna Factor and Cable Factor and the Distance Correction Factor; and subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG + DCF

Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB
AG = Amplifier Gain in dB
DCF = Distance Correction Factor in dB for measurements made at 10 meters distance

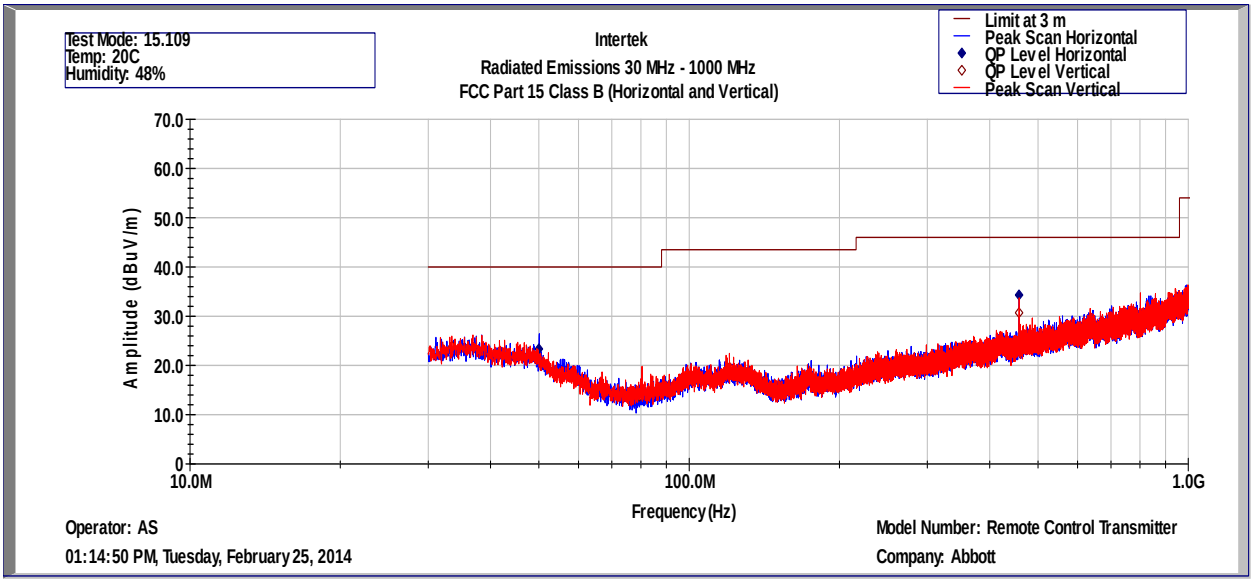
Assume a receiver reading of 52.5 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB and Distance Correction Factor (for measurements made at 10 meters distance) of 10.5 dB is subtracted, giving field strength of 22 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.5 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
DCF = 10.5 dB
FS = 52.5+7.4+1.6-29.0+10.5 = 43 dB(μV/m).
Level in μV/m = Common Antilogarithm [(43 dBμV/m)/20] = 141.3 μV/m.

For measurements made at 3 meters distance

The field strength is calculated by following the example above except the Distance Correction Factor in dB is not applied.

Test Results

Radiated Emissions



Intertek Testing Services

Radiated Emissions 30 MHz - 1000 MHz

FCC Part 15 Class B (Quasi-Peak)

Company: Abbott				Model Number: Compact Wireless Remote						
Frequency	**Quasi Peak FS**	**Limit @3m**	**Margin**	**RA**	**CF**	**AG**	**DCF**	**AF**	**Azimuth**	**Height**
MHz	**dB(µV/m)**	**dB(µV/m)**	**dB**	**dB(µV)**	**dB**	**dB**	**dB**	**dB(1/m)**	**Degrees**	**cm**
Vertical Polarization										
50	23.3	40	-16.7	29.4	0.8	32.1	10.5	14.7	220	188
458.1	34.3	46	-11.7	37.3	2.4	32	10.5	16.2	310	177
Horizontal Polarization										
33.5	23.8	40	-16.2	27.4	0.6	32.1	10.5	17.4	50	100
79.5	13.7	40	-26.3	27.5	1.1	32.1	10.5	6.7	161	350
120.5	19.6	43.5	-23.9	28.2	1.2	32	10.5	11.7	42	120
458.1	30.7	46	-15.3	33.7	2.4	32	10.5	16.2	189	100

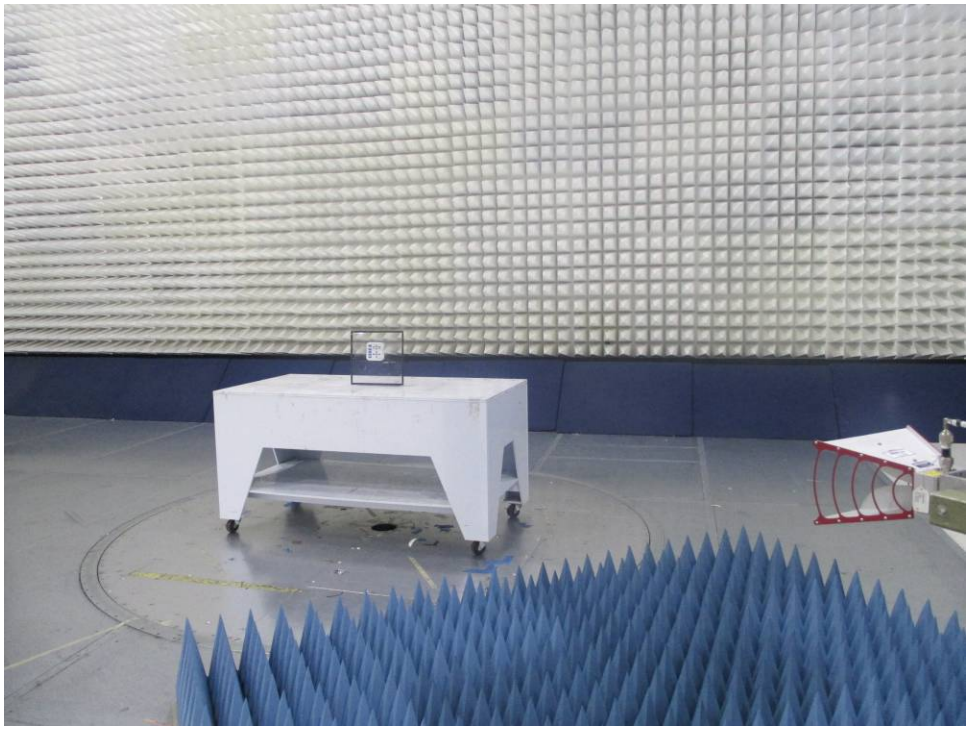
Notes: Measurements made at 10 meters distance.

Temp: 20C
Humidity: 48%

Result	Complies by 11.7dB

5.0 Test Setup Photographs

Test Setup Photographs



6.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
Spectrum Analyzer	Rohde & Schwarz	ESU	100172	12	11/04/14
BI-Log Antenna	ARA	LPB-2513/A	1154	12	08/01/14
Horn Antenna	EMCO	3115	00126795	12	11/14/14
Pyramidal Horn Antenna	EMCO	3160-09	9307-1017	#	#
Preamp	Sonoma	310N	293620	12	11/19/14
Pre-Amplifier (1-18GHz)	Miteq	AMF-4D-001180-24-10P	799159	12	09/27/14

Calibration not required

7.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G101555940	AS	KK	March 20, 2014	Original document