

TobyRich GmbH

Application
For
Certification

Smartphone controlled plane

Model: SPBL01-013

Brand Name: SmartPlane

Bluetooth 4.0 Transceiver

Report No.: 131210017SZN-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-12]

Prepared and Checked by:

Approved by:

Sign on file

Leo Lai
Project Engineer

Andy Yan
Project Engineer
Date: January 7, 2014

- The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
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TRF no.: FCC 15C_Tx_b

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MEASUREMENT/TECHNICAL REPORT

TobyRich GmbH - MODEL: SPBL01-013

This report concerns (check one) Original Grant ☒ Class II Change ☐

Equipment Type: DTS - Part 15 Digital Transmission Systems (Bluetooth 4.0 transmitter portion)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes ☐ No ☒

If yes, defer until :
date

Company Name agrees to notify the Commission by:
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes ☐ No ☒

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-01-12 Edition] provision.

Report prepared by:

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List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf

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EXHIBIT 1

SUMMARY OF TEST RESULTS

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1.0 Summary of Test

TobyRich GmbH - MODEL: SPBL01-013

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)(3)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(e)	Pass
Out of Band Antenna Conducted Emission	15.247(d)	Pass
Radiated Emission in Restricted Bands	15.247(d)	Pass
AC Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass (See Notes)

Notes: The EUT uses Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

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EXHIBIT 2

GENERAL DESCRIPTION

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2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a Smartphone controlled plane, Model: SPBL01-013 with internal Bluetooth 4.0 function operating at 2402-2480MHz, 40 channels with 2MHz channel spacing. The EUT was powered by 3.7Vdc (rechargeable battery). For more detailed features description, please refer to the user's manual.

Type of Modulation: GFSK.

Antenna Type: Integral Antenna.

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

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2.2 Related Submittal(s) Grants

This is an application for certification of:

DTS- Part 15 Digital Transmission Systems (Bluetooth 4.0 transmitter portion)

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009) and KDB 558074. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the “Justification Section” of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The Semi-Anechoic chamber and shield room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, Block D, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

EXHIBIT 3

SYSTEM TEST CONFIGURATION

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3.0 System Test Configuration

3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. The EUT was powered by fully charged battery during test. Only the worst case data was reported.

The signal is maximized through rotation and placement in the three orthogonal axes. 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. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

3.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:

During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

Power Parameters of Bluetooth 4.0

Channel No.	Output Power (dBm)	Data rate	Modulation type
0	-2	1Mbps	GFSK
19	-2	1Mbps	GFSK
39	-2	1Mbps	GFSK

Note: only one antenna is used for transmission.

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3.3 Special Accessories

N/A

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance – Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

3.5 Equipment Modification

Any modifications installed previous to testing by TobyRich GmbH will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch.

3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
iPod	Apple	A1509
Adaptor	TP Link	T050100-2AS
USB cable	TobyRich	Unshielded, 80cm

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EXHIBIT 4

MEASUREMENT RESULTS

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Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.0 **Measurement Results**

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(3):

- ☒ The antenna power 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 power at the EUT antenna terminals.
- ☐ The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set according to the FCC KDB 558074 spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges and power was read directly in dBm. External attenuation and cable loss were compensated from the measured value.

For antennas with gains of 6 dBi or less, maximum allowed Transmitter output is 1 watt (+30 dBm).

Bluetooth 4.0 (Antenna Gain = 2.5dBi) (GFSK, 1Mbps)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2402	-2.45	0.57
Middle Channel: 2440	-2.96	0.51
High Channel: 2480	-3.57	0.44

Cable loss: 0.3 dB External Attenuation: 0 dB

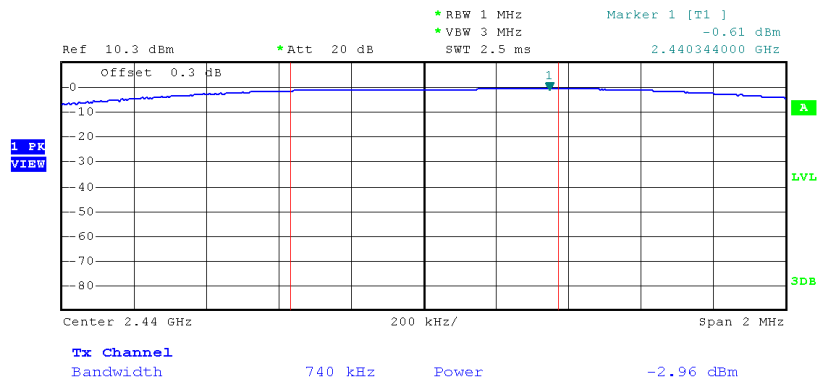
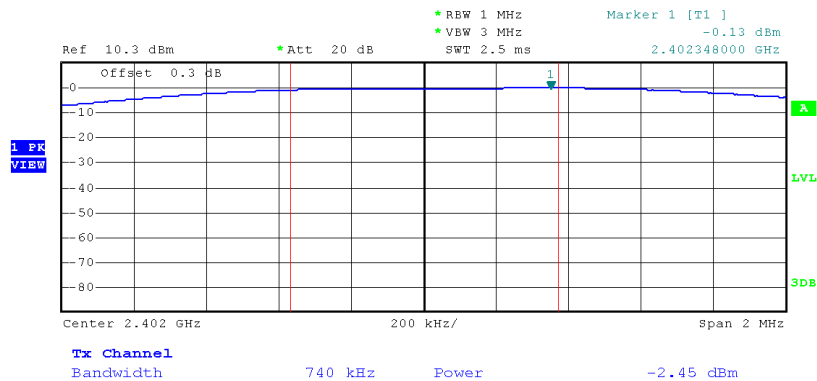
Cable loss, external attenuation has been included in OFFSET function

EUT max. output level = -2.45 dBm

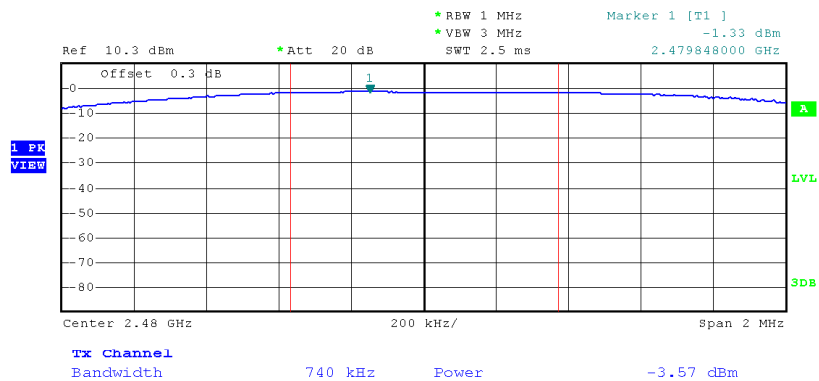
For RF Exposure, the information is saved with filename: RF exposure.pdf.

The test plots are attached as below.

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Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2):

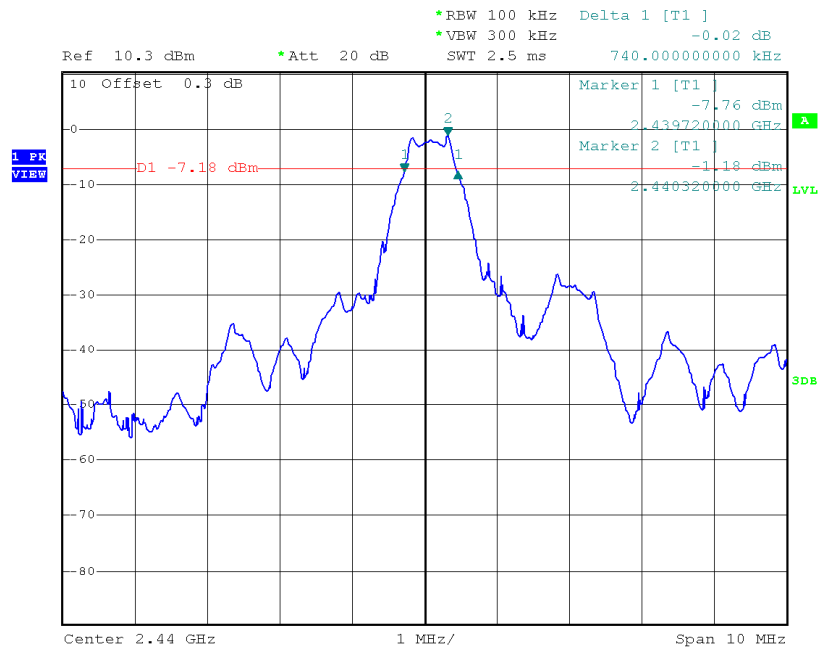
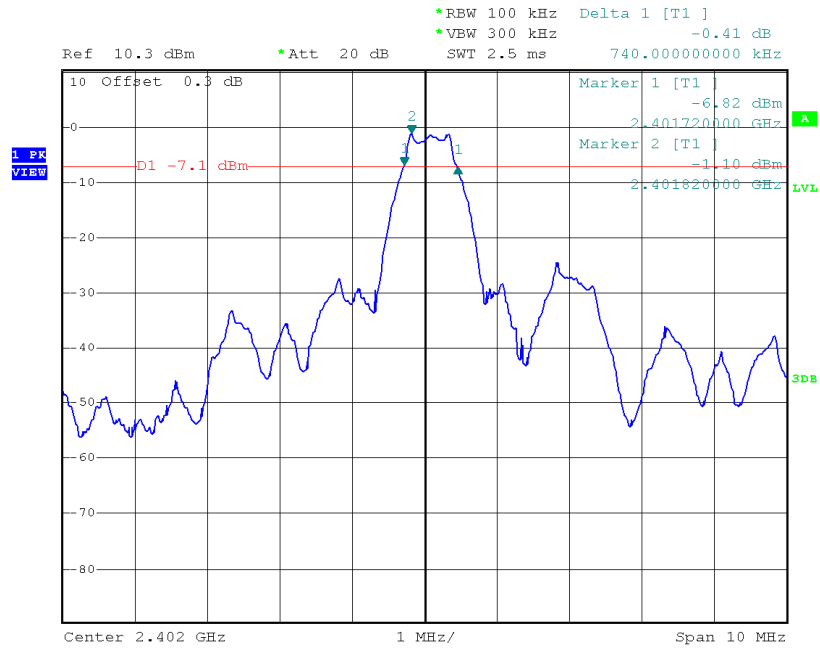
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 KHz according to FCC KDB 558074. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Limit: The 6 dB Bandwidth is at least 500 kHz.

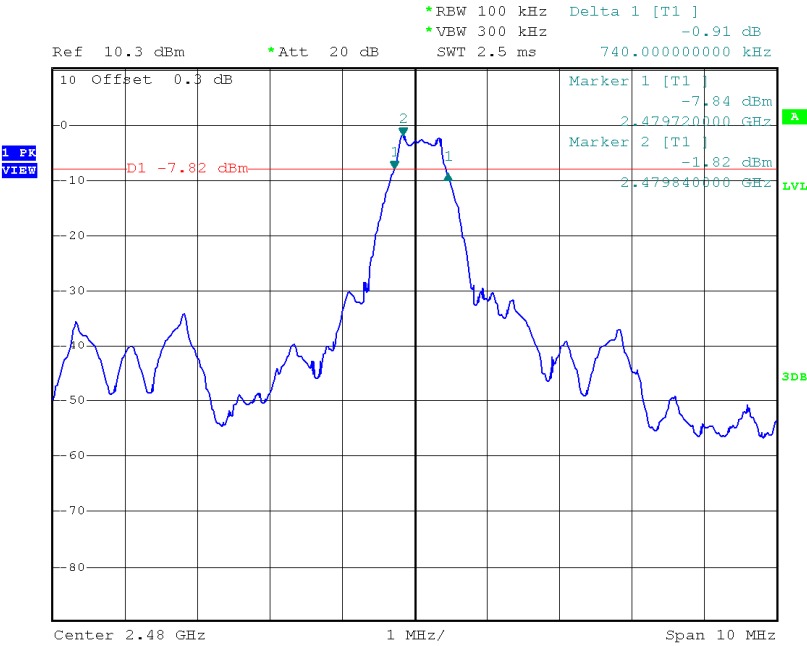
Bluetooth 4.0 (GFSK, 1Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
Low Channel: 2402	0.740
Middle Channel: 2440	0.740
High Channel: 2480	0.740

The test plots are attached as below.

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Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.3 Maximum Power Density Reading, FCC Rule 15.247(e):

The Measurement Procedure PKPSD was set according to the FCC KDB 558074.

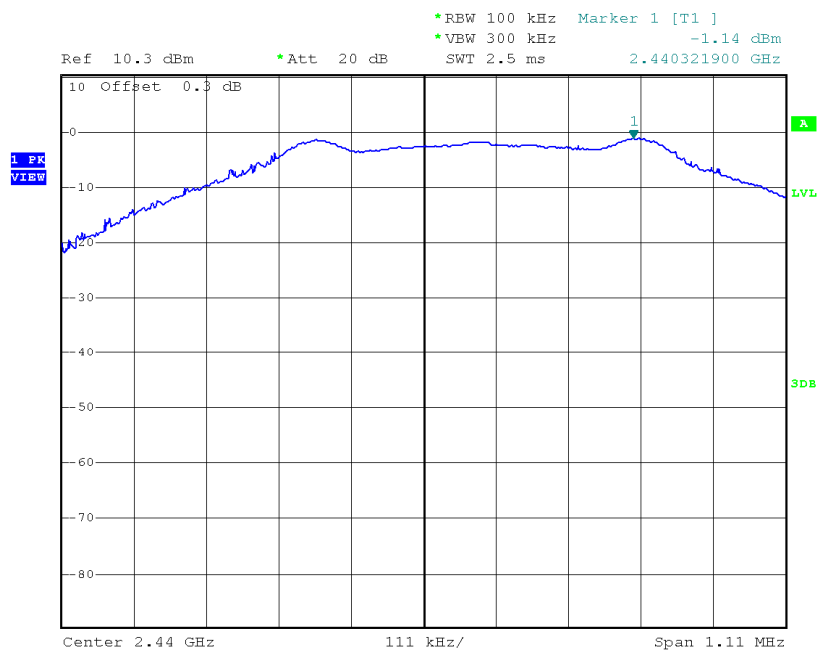
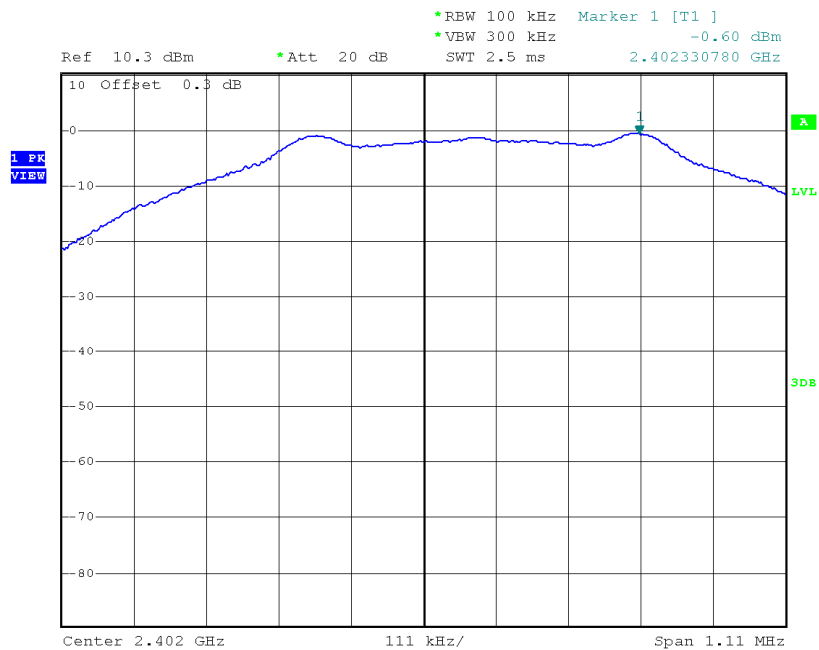
Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Limit: The Power Density does not exceed 8dBm/ 3 kHz.

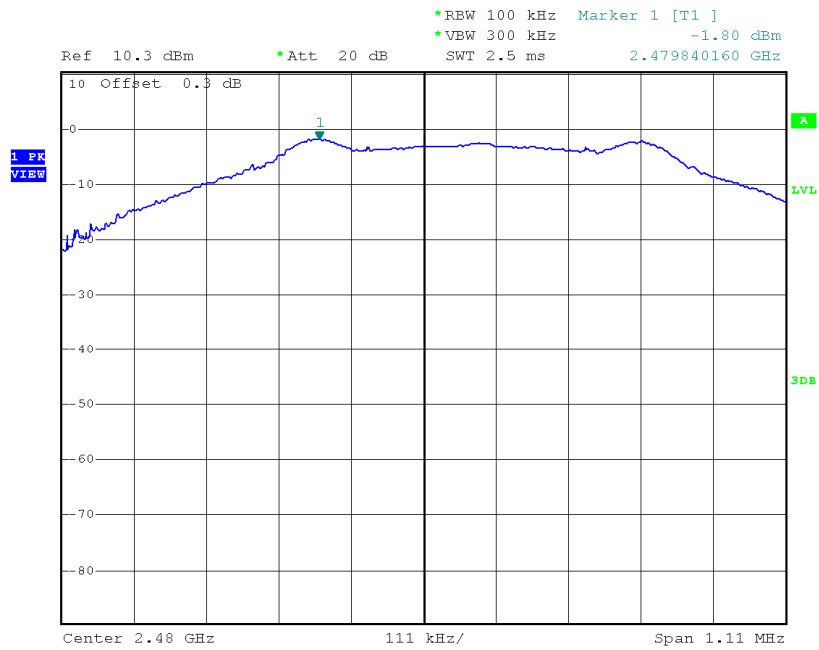
Bluetooth 4.0 (GFSK, 1Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz (dBm)
Low Channel: 2402	-0.60
Middle Channel: 2440	-1.14
High Channel: 2480	-1.80

The test plots are attached as below.

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Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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 either an RF conducted or a radiated measurement. The Measurement Procedure was set according to the FCC KDB 558074.

Refer to the attached test plots for out of band conducted emissions data with rate of 1Mbps for Bluetooth 4.0.

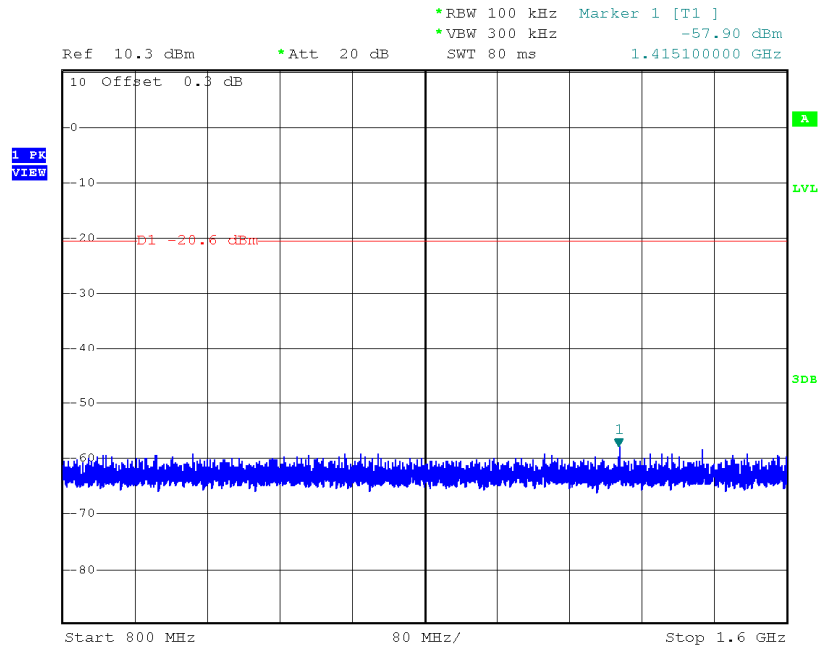
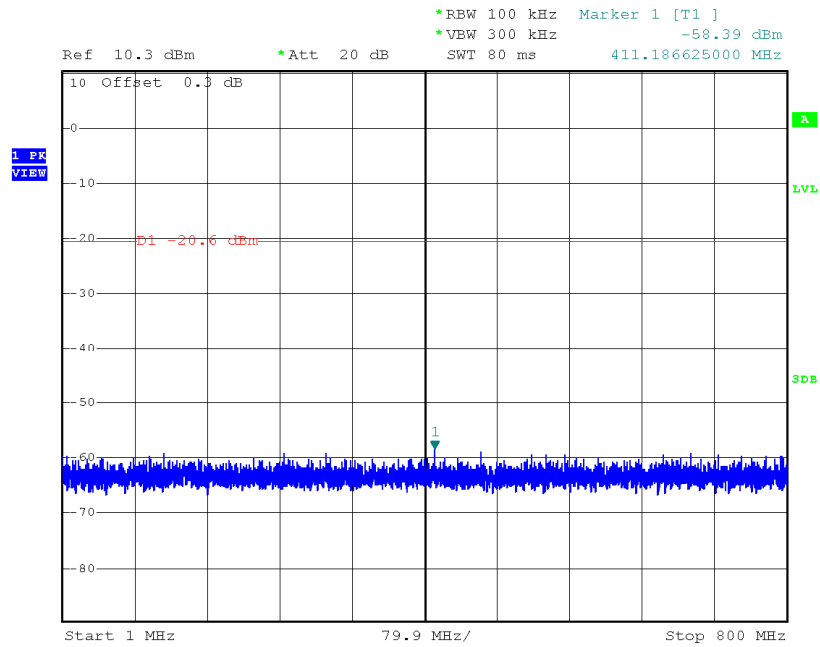
The test plots showed all spurious emission up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

Note: the RBW was set to 1MHz rather than 100KHz in order to increase the measurement speed, if found out fail point at 1MHz RBW, we will use reduce the RBW to 100KHz determine the final result.

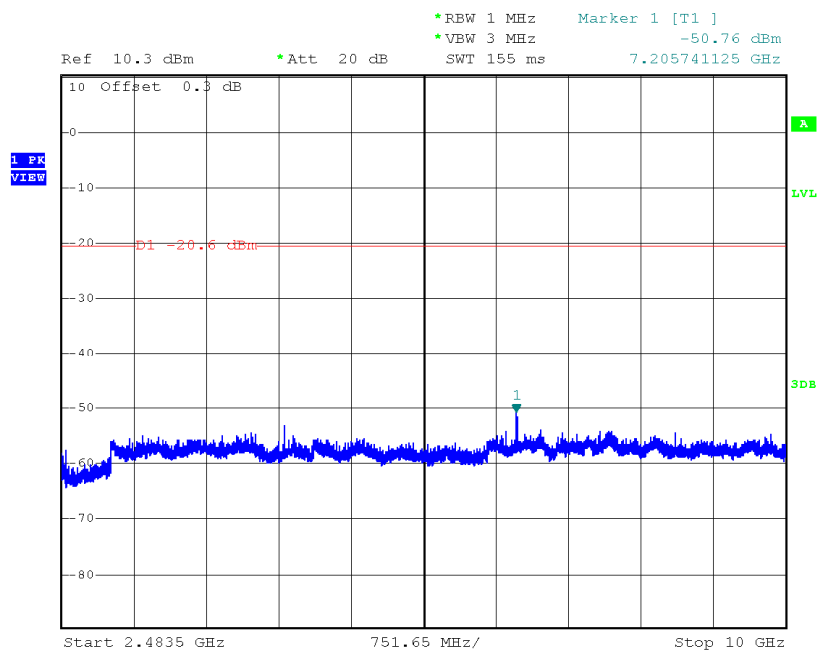
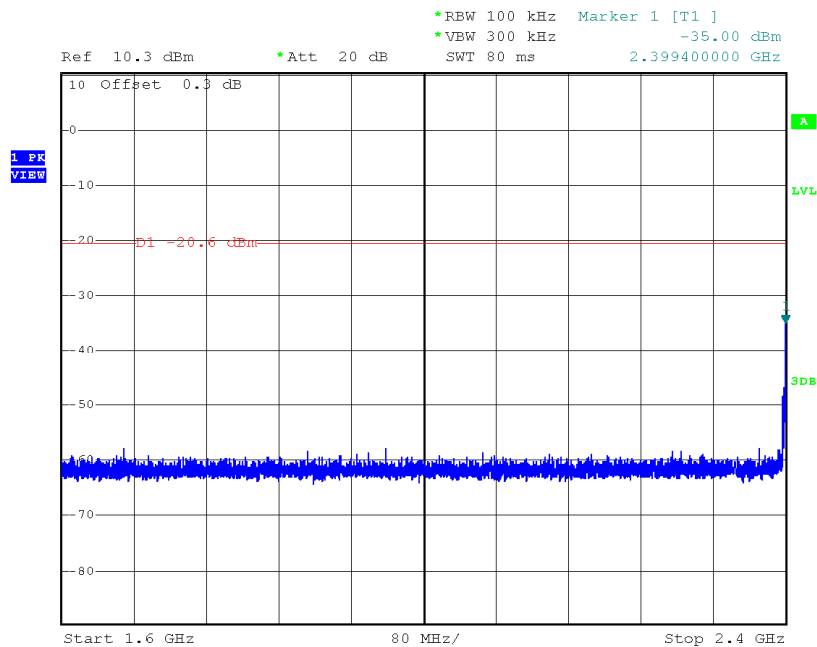
The test plots are attached as below.

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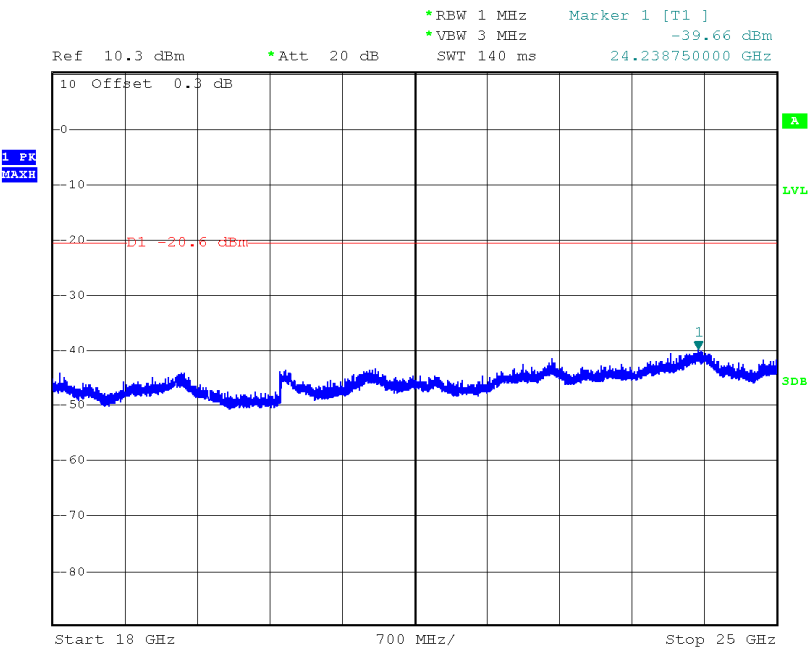
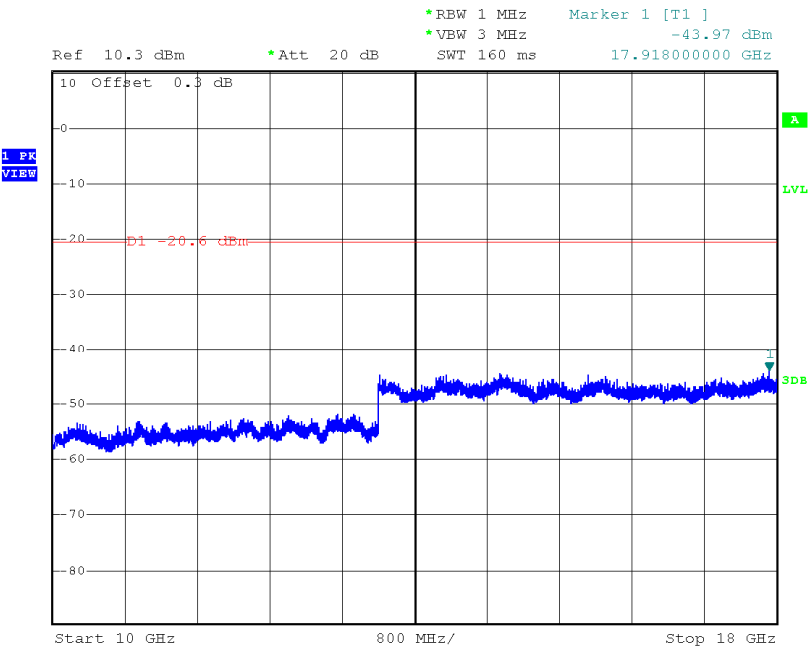
Channel 0 (2402MHz) Reference Level: -0.60 dBm



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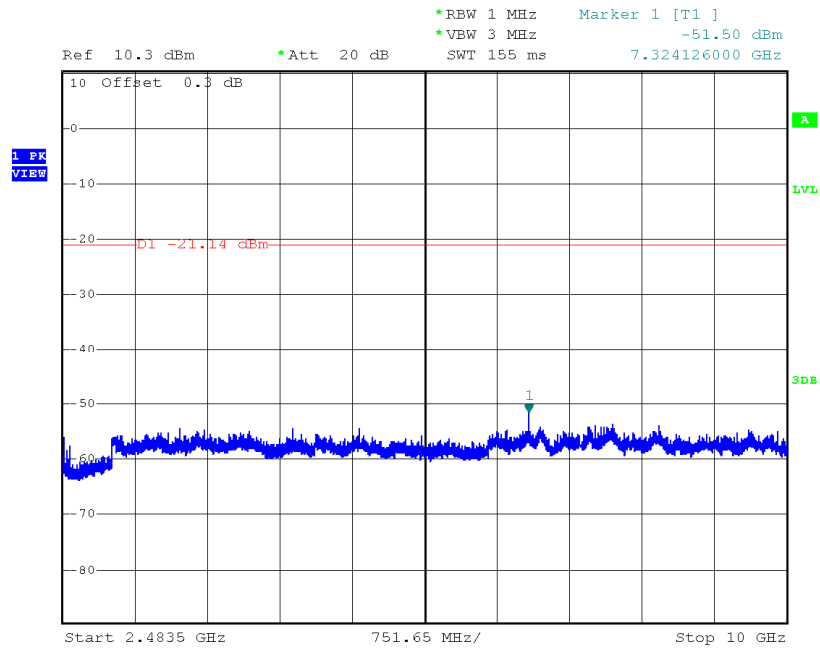
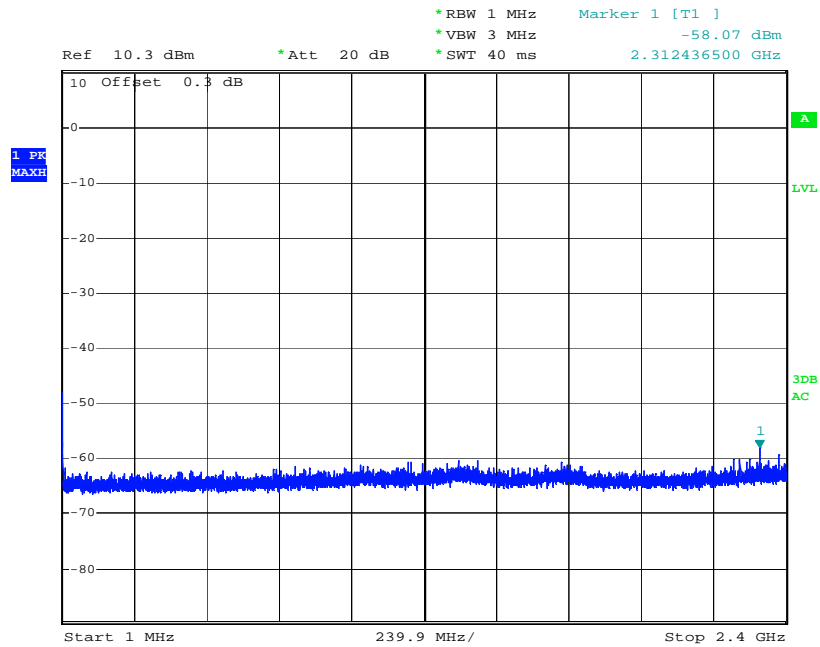


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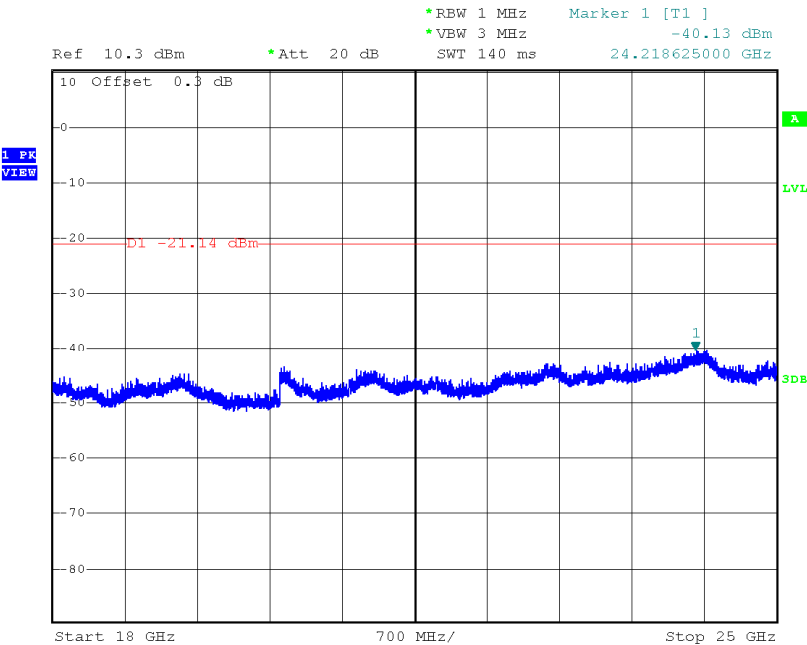
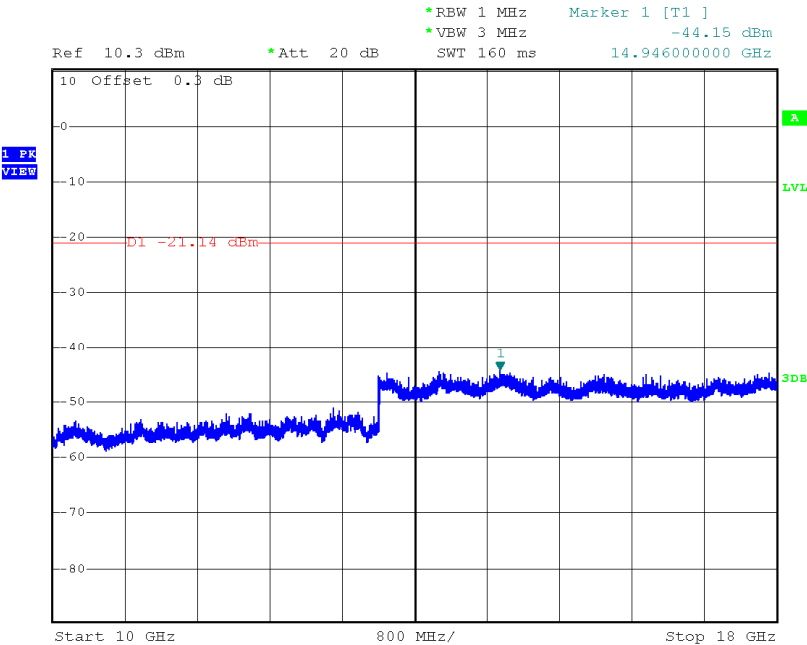


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Channel 19 (2440MHz) Reference Level: -1.14 dBm

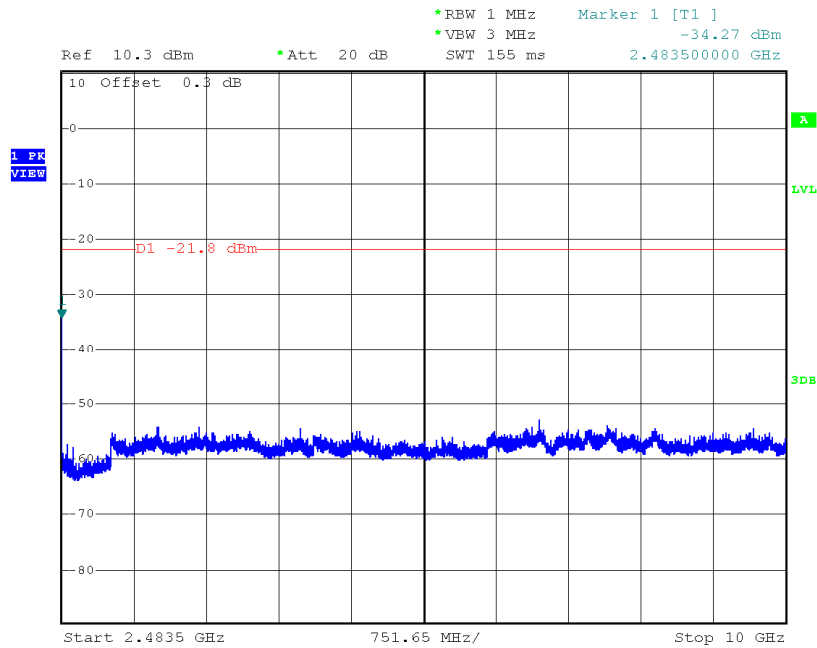
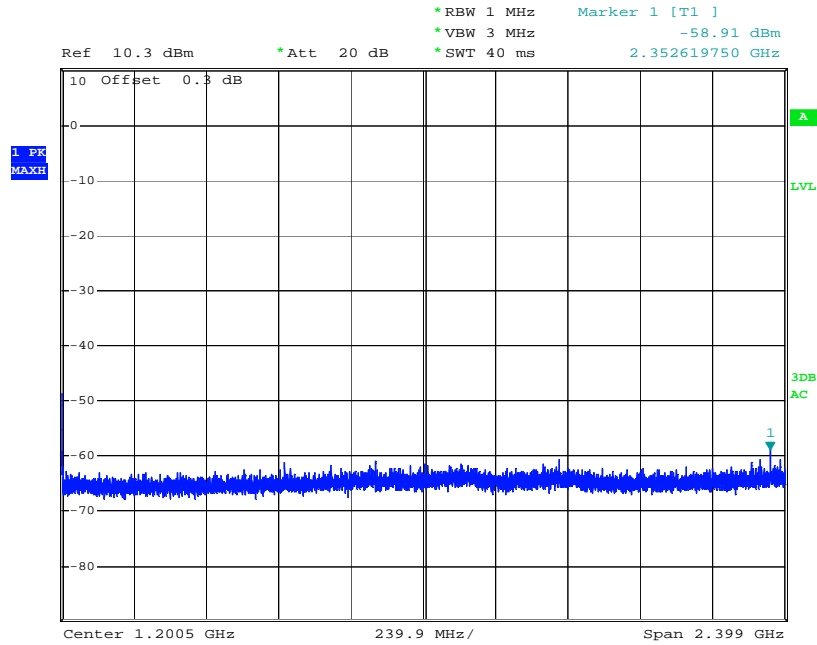


INTERTEK TESTING SERVICES

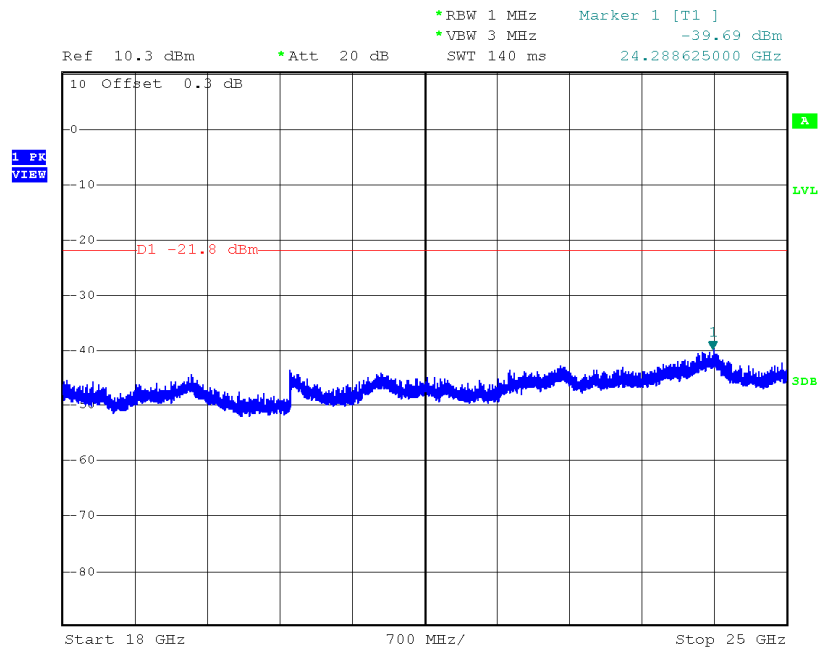
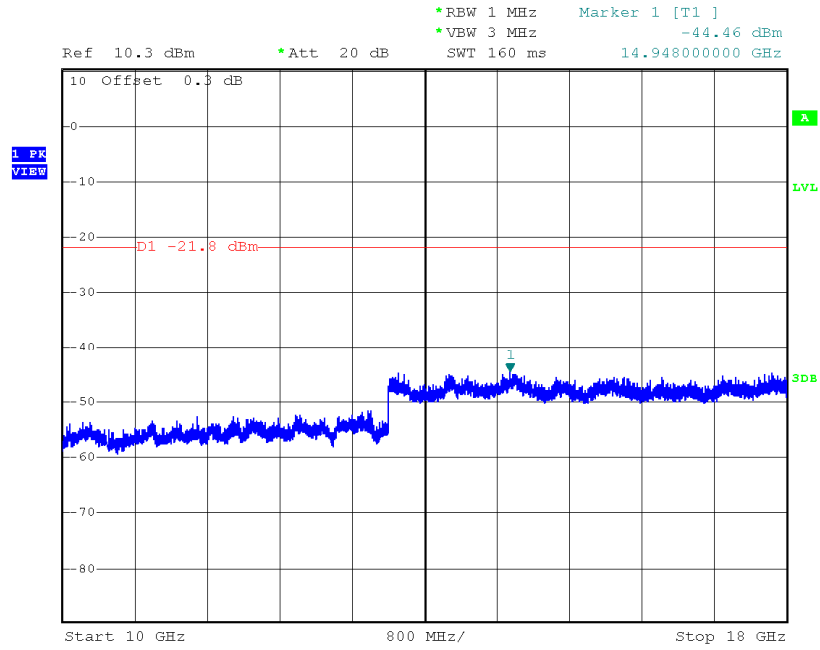


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Channel 39 (2480MHz) Reference Level: -1.80 dBm



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Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

- ☒ Not required, since all emissions are more than 20dB below fundamental
- ☐ See attached data sheet

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c):

Data is included of 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. All measurements were performed with peak detection unless otherwise specified.

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

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD$$

Where FS = Field Strength in dB μ V/m
 RA = Receiver Amplitude (including preamplifier) in dB μ V
 CF = Cable Attenuation Factor in dB
 AF = Antenna Factor in dB
 AG = Amplifier Gain in dB
 PD = Pulse Desensitization in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD$$

Example

Assume a receiver reading of 62.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 62.0 dB μ V
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
 $FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 \text{ dB}\mu\text{V/m}$

Level in mV/m = Common Antilogarithm $[(42 \text{ dB}\mu\text{V/m})/20] = 125.9 \mu\text{V/m}$

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.8 Radiated Spurious Emission

Worst Case Radiated Spurious Emission at 4804.000MHz is passed by 14.4 dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH

Date of Test: December 05, 2013

Model: SPBL01-013

Worst Case Operating Mode: Transmit

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	168.012	33.0	20.0	9.8	22.8	43.5	-20.7
Horizontal	207.998	37.6	20.0	9.8	27.4	43.5	-16.1
Horizontal	900.086	25.1	20.0	21.1	26.2	46.0	-19.8
Vertical	41.155	29.0	20.0	9.8	18.8	40.0	-21.2
Vertical	135.245	33.4	20.0	7.8	21.2	43.5	-22.3
Vertical	918.520	25.0	20.0	24.3	29.3	46.0	-16.7

- NOTES:
1. Quasi-Peak detector is used except for others stated.
 2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
 3. Negative value in the margin column shows emission below limit.
 4. All emissions are below the QP limit.

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH
 Model: SPBL01-013
 Mode: Tx (Channel 0)

Date of Test: December 05, 2013

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	*4804.000	60.8	36.7	35.5	59.6	74.0	-14.4
Horizontal	7206.000	53.4	36.1	37.0	54.3	74.0	-19.7
Horizontal	*2388.934	67.9	36.7	28.1	59.3	74.0	-14.7

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	*4804.000	60.8	36.7	35.5	34.5	25.1	54.0	-28.9
Horizontal	7206.000	53.4	36.1	37.0	34.5	19.8	54.0	-34.2
Horizontal	*2388.934	67.9	36.7	28.1	34.5	24.8	54.0	-29.2

- NOTES:
1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz).
 2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
 3. Negative value in the margin column shows emission below limit.
 4. Horn antenna used for the emission over 1000MHz.
- * Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH
 Model: SPBL01-013
 Mode: Tx (Channel 19)

Date of Test: December 05, 2013

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	*4880.000	59.5	36.7	35.5	58.3	74.0	-15.7
Horizontal	*7320.000	52.6	36.1	37.0	53.5	74.0	-20.5

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	*4880.000	59.5	36.7	35.5	34.5	23.8	54.0	-30.2
Horizontal	*7320.000	52.6	36.1	37.0	34.5	19.0	54.0	-35.0

- NOTES:
1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz).
 2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
 3. Negative value in the margin column shows emission below limit.
 4. Horn antenna used for the emission over 1000MHz.
- * Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH

Date of Test: December 05, 2013

Model: SPBL01-013

Mode: Tx (Channel 39)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	*4960.000	58.7	36.1	35.5	58.1	74.0	-15.9
Horizontal	*7440.000	52.2	36.1	37.0	53.1	74.0	-20.9
Horizontal	*2483.694	67.3	36.7	28.1	58.7	74.0	-15.3

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	*4960.000	58.7	36.1	35.5	34.5	23.6	54.0	-30.4
Horizontal	*7440.000	52.2	36.1	37.0	34.5	18.6	54.0	-35.4
Horizontal	*2483.694	67.3	36.7	28.1	34.5	24.2	54.0	-29.8

- NOTES:
1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz).
 2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
 3. Negative value in the margin column shows emission below limit.
 4. Horn antenna used for the emission over 1000MHz.
- * Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

INTERTEK TESTING SERVICES

4.9 Conducted Emission

Worst Case Neutral-Conducted emission at 0.450MHz is Passed by 18.3 dB margin

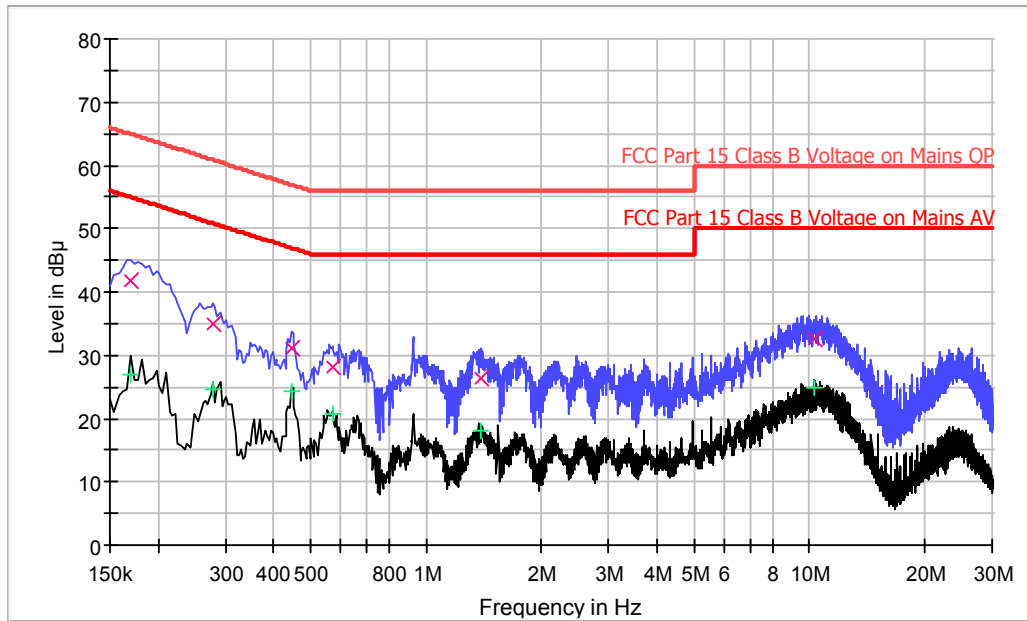
For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH
 Model: SPBL01-013
 Worst Case Operating Mode: Transmit

Date of Test: December 05, 2013

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.170000	41.9	L1	9.7	23.1	65.0
0.278000	34.9	L1	9.7	26.0	60.9
0.446000	31.2	L1	9.7	25.7	56.9
0.570000	28.1	L1	9.7	27.9	56.0
1.398000	26.5	L1	9.8	29.5	56.0
10.310000	32.5	L1	10.0	27.5	60.0

Result Table AV

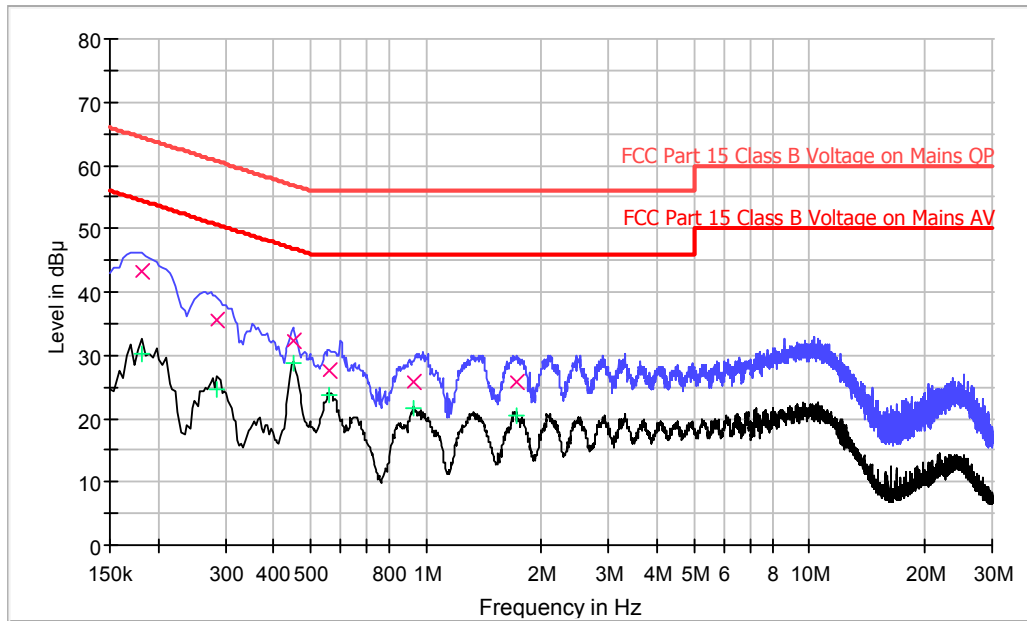
Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.170000	27.0	L1	9.7	28.0	55.0
0.278000	24.5	L1	9.7	26.4	50.9
0.446000	24.2	L1	9.7	22.7	46.9
0.570000	20.7	L1	9.7	25.3	46.0
1.398000	18.0	L1	9.8	28.0	46.0
10.310000	24.7	L1	10.0	25.3	50.0

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH
 Model: SPBL01-013
 Worst Case Operating Mode: Transmit

Date of Test: December 05, 2013

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.182000	43.3	N	10.2	21.1	64.4
0.286000	35.6	N	10.2	25.0	60.6
0.450000	32.3	N	10.2	24.6	56.9
0.558000	27.7	N	10.2	28.3	56.0
0.926000	25.7	N	10.3	30.3	56.0
1.718000	25.7	N	10.3	30.3	56.0

Result Table AV

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.182000	30.3	N	10.2	24.1	54.4
0.286000	24.7	N	10.2	25.9	50.6
0.450000	28.6	N	10.2	18.3	46.9
0.558000	23.8	N	10.2	22.2	46.0
0.926000	21.7	N	10.3	24.3	46.0
1.718000	20.4	N	10.3	25.6	46.0

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.10 Radiated Emissions from Digital Section of Transceiver, FCC Ref: 15.109

☒ [x] Not required - No digital part

☐ [] Test results are attached

☐ [] Included in the separated report.

INTERTEK TESTING SERVICES

Applicant: TobyRich GmbH
Model: SPBL01-013

Date of Test: December 05, 2013

4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

Worst case duty cycle:

Based on the Bluetooth Specification Version 4.0, the maximum duty cycle occurs when the advertising interval is 20 ms (lowest possible), this results in 5 advertising event during 100ms. On every advertising event, the advertising packet is sent out on each of three channels. The largest advertise packet is 376 bits sent, and since we have a 1Mbit link, each packet takes 376 us to transmit. 5 packets per 100ms gives thus a maximum 1.88ms TX on time per 100ms.

Therefore, the averaging factor is found by $20 \log_{10} 0.0188 = -34.5 \text{ dB}$

	See attached spectrum analyzer chart (s) for Transmitter timing
	See Transmitter timing diagram provided by manufacturer
x	Duty cycle was used.

EXHIBIT 5
EQUIPMENT PHOTOGRAPHS

INTERTEK TESTING SERVICES

5.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.doc & internal photos.pdf.

INTERTEK TESTING SERVICES

EXHIBIT 6

MISCELLANEOUS INFORMATION

INTERTEK TESTING SERVICES

6.0 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

INTERTEK TESTING SERVICES

EXHIBIT 7

TEST EQUIPMENT LIST

INTERTEK TESTING SERVICES

7.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	00066460	20-Jul-13	20-Jan-14
SZ185-01	EMI Receiver	R&S	ESCI	100547	20-Jul-13	20-Jan-14
SZ061-09	Horn Antenna	ETS	3115	00092346	17-Oct-13	17-Apr-14
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	20-Jul-13	20-Jan-14
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	17-Oct-13	17-Apr-14
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	20-Jul-13	20-Jan-14
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	18-Oct-13	18-Apr-14
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	18-Oct-13	18-Apr-14
SZ062-02	RF Cable	RADIAL	RG 213U	--	20-Jul-13	20-Jan-14
SZ062-06	RF Cable	RADIAL	0.04-26.5GHz	--	20-Jul-13	20-Jan-14
SZ062-12	RF Cable	RADIAL	0.04-26.5GHz	--	17-Oct-13	17-Apr-14
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	20-Jul-13	20-Jan-14
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	9-Nov-13	9-Nov-14
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	9-Nov-13	9-Nov-14
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	9-Nov-13	9-Nov-14
SZ188-03	Shielding Room	ETS	RFD-100	4100	23-Aug-13	23-Aug-14