



MEASUREMENT AND TEST REPORT

VERSION 1.00

Class II Permissive Change

Report Prepared for: Exegin Technologies Limited
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Canada

Equipment Under Test (EUT): Model: Q51, Q52, Q53R6, Q70, Q71

FCC ID: VD4Q53R6

IC Certification number: 7162A-Q53R6

FCC Rule Part(s): Part 15B, 15C

Industry Canada Rule Part(s) RSS-210

Tested by: Island Compliance Services Inc.
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Note: This test report has been prepared for the Applicant and device described herein. It may not be duplicated or used in part without prior written consent from Island Compliance Services Inc.

FCC OATS registration number: 386117

Industry Canada OATS registration number: 9578B-1

Revision History

Version	Date	Author	Comment
1.00	15/11/2013	A. Horel	Original Release

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2 SUMMARY

This test report details a Class II permissive change request to add a substitute antenna (Phoenix Contact, part number: RAD-ISM-2400-ANT-VAN- 3-0-SMA) with 3dBi gain to the existing certification (FCC ID: VD4Q53R6). The EUT has two transmitters and this antenna is only intended for connection to the 2.4 GHz antenna port.



FIGURE 1 - PHOENIX CONTACT ANTENNA

3 SUMMARY OF TEST RESULTS

The equipment under test was found to comply with the test standards and criteria outlined herein.

Test Description	Reference Specification FCC	Reference Specification Industry Canada	Result	Comment
Radiated Spurious Emissions Band Edge	FCC Subpart C 15.209(a) 15.205(a)	RSS 210 Issue 8 2.5, A8.5	Complies	
Radiated Spurious Emissions (TX and RX)	FCC Subpart C 15.247, 15.205 FCC Subpart B 15.109	RSS 210 Issue 8 2.5, A8.5 RSS Gen Issue 3 Section 4.10 and section 6 for RX ICES-003 Issue 4	Complies	

3.1 ENVIRONMENTAL CONDITIONS

Description	Reading
Test Dates: 8 th November 2013	
Indoor Temperature	20°C - 26°C
Indoor Humidity	40% - 55%
Outdoor Temperature	8°C -11°C
Outdoor Humidity	60% - 80%

3.2 STANDARD TEST CONDITIONS AND ENGINEERING PRACTICES

Except as noted herein, the following conditions and procedures were observed during the testing:

CFR 47, FCC rules Part 15 subpart C, ANSI C63.4 (2003), DTS procedures KDB 558074, IC standards RSS-GEN and RSS0210. ANSI C63.4-2003 or later, was used for all test procedures as required by RSS-Gen I3 2010, Section 4.1. Deviations, modification or clarifications (if any) to above mentioned documents are described herein.

Measurement results, unless otherwise noted, are worst-case measurements.

4 GENERAL EQUIPMENT SPECIFICATIONS

Item	Description
Manufacturer	Exegin Technologies Limited
Applicant	Exegin Technologies Limited
Model Number(s)	Q51, Q52, Q53R6, Q70, Q71
Function	Zigbee gateway bridge
Power Supply Input	External DC supply 5V; PoE (Power over Ethernet)
Power Output	2.4dBm (2.4GHz band); 9.6 dBm (915 MHz band)
Antenna Gain/Type	2.4GHz: Omni-directional, 3 dBi (Phenix Contact RAD-ISM-2400-ANT-VAN- 3-0-SMA) or 2dBi, ¼ wave dipole; 915MHz: ½ wave dipole, 2 dBi
Channel Spacing	5 MHz (2.4 GHz band); 2 MHz (915 MHz band)
Frequency Range	2405 MHz-2480 MHz; 906 MHz-924 MHz
Modulation	OQPSK (2.4 GHz band); BPSK (915 MHz band)

4.1 AUXILIARY EQUIPMENT

Equipment	Description
Laptop	HP EliteBook 2170p
Power Supply (PS1)	HP PPP009L-E WBGST0A1R3E066 (18.5V, 3.5A)
Power Supply (PS2)	Cisco Systems Inc, CP-PWR-INJ (SN: RCH13149J59) (48V, 0.4A)
Power Supply (PS3)	USB Adaptor V-Infinity EMSA050100-138-SZ (5V, 1A)

4.2 ENGINEERING CHANGES TO PRODUCTION UNIT

N/A

5 RADIATED SPURIOUS EMISSIONS BAND EDGE

5.1 TEST PROCEDURE

The EUT is placed on a non-conducive turntable on the 3m OATS. An in-band field strength measurement of the fundamental emissions using RBW and detector function for the frequency being measured. Repeated with average detector. Spectrum analyzer span is chosen that encompasses both the peak and the fundamental emissions and the band edge emissions under investigation. Analyzer is set, RBW to 1% of total span (never less than 30kHz) with a video bandwidth equal to or greater than the RBW. Peak levels of the fundamental emissions and the relevant band edge emissions are recorded. Stored trace is observed and amplitude delta between the peak of fundamental and band edge emissions are measured. Delta is subtracted from field strengths, these measurements are used to determine compliance.

5.2 SUMMARY OF TEST RESULTS

Test Description	Reference Specification	Result	Notes
Radiated Spurious Emissions Band Edge	FCC Subpart C 15.209(a) 15.205(a) RSS 210 Issue 8 2.5, A8.5	Complies	

5.2.1 SUMMARY OF 15.205 LIMITS

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
10.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(2)
13.36–13.41			

FIGURE 2 - RESTRICTED BANDS

5.3 MEASUREMENT DATA

5.3.1 DATA (UPPER BAND EDGE)

Spurious Emission Frequency (MHz)	Reading (dBuV)	Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det	Result
2479.512M (Fund)	97.1	103.4	-	-	Pk	Complies
2483.985M	58.0	64.3	74.0	-9.7	Pk	Complies
2484.935M	54.4	60.7	74.0	-13.3	Pk	Complies
2486.135M	51.8	58.1	74.0	-15.9	Pk	Complies
2486.910M	49.3	55.6	74.0	-18.4	Pk	Complies
2487.985M	47.0	53.3	74.0	-20.7	Pk	Complies
2489.960M	40.7	47.0	54.0	-7.0	Avg	Complies

5.3.2 DATA (LOWER BAND EDGE)

Spurious Emission Frequency (MHz)	Reading (dBuV)	Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det	Result
2404.507M (Fund)	98.2	104.2	-	-		Complies
2323.012M	43.7	49.4	74.0	-24.6	Pk	Complies
2328.426M	41.1	46.8	74.0	-27.2	Pk	Complies
2342.055M	41.7	47.5	74.0	-26.5	Pk	Complies
2376.113M	41.1	47.0	74.0	-27.0	Pk	Complies
2389.612M	43.7	49.7	74.0	-24.3	Pk	Complies
2323.012M	34.6	40.3	54.0	-13.7	Avg	Complies
2384.026M	34.3	40.2	54.0	-13.8	Avg	Complies
2342.513M	33.5	39.4	54.0	-14.6	Avg	Complies

5.4 BAND EDGE PLOTS

5.4.1 UPPER BAND EDGE

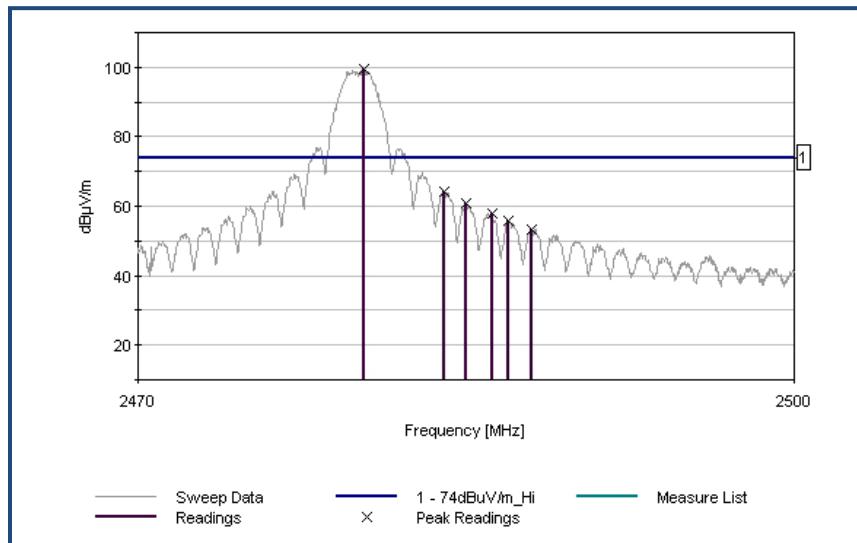


FIGURE 3 – UPPER BAND EDGE (PK)

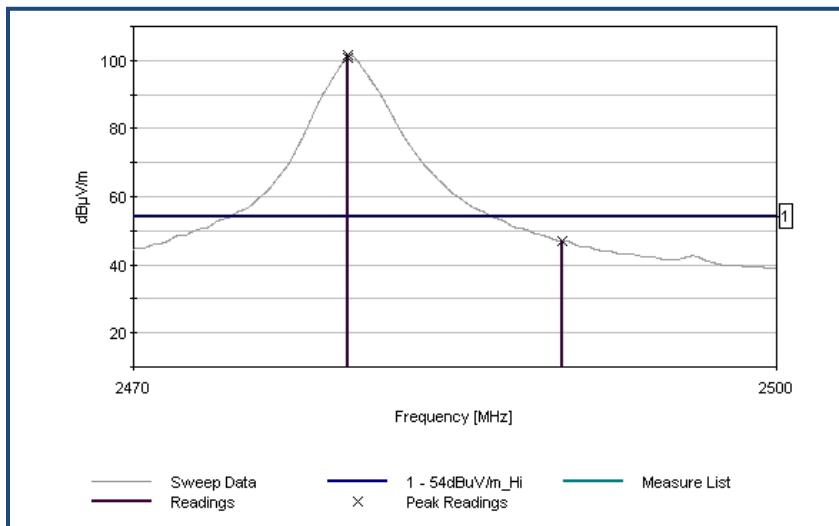


FIGURE 4 - UPPER BAND EDGE (AVG)

5.4.2 LOWER BAND EDGE

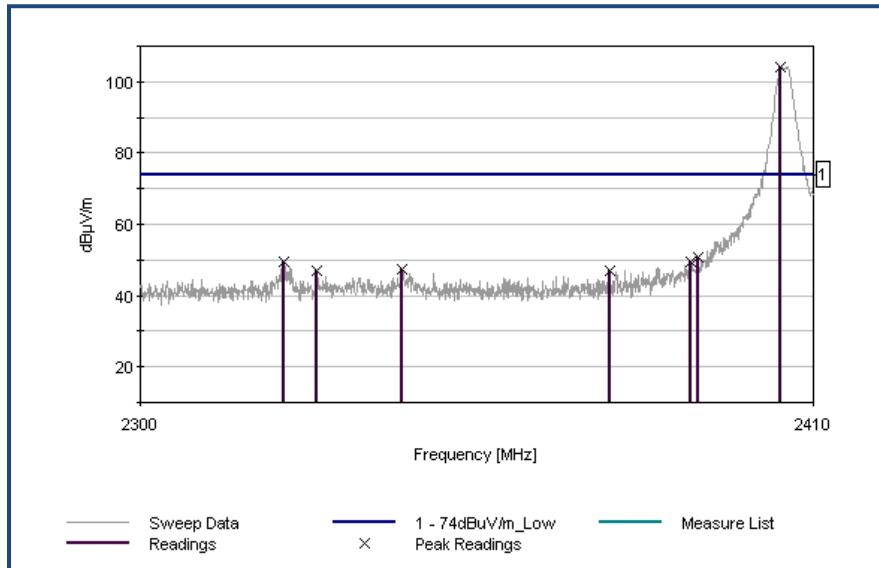


FIGURE 5 - LOWER BBAND EDGE (PK)

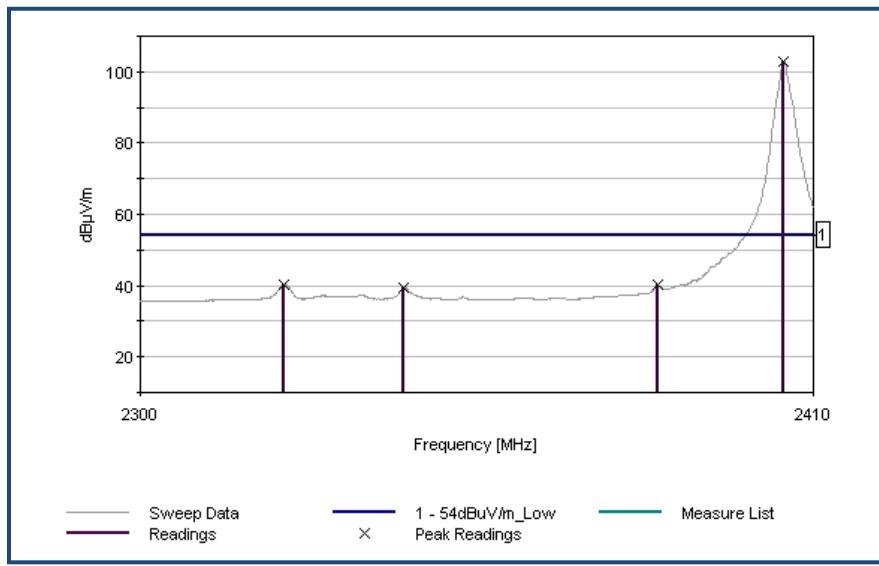


FIGURE 6 – LOWER BAND EDGE (AVG)

6 RADIATED SPURIOUS EMISSIONS

6.1 TEST PROCEDURE

The EUT is placed on a non-conductive turntable on the 3m OATS. Exploratory measurements are made using a suitable antenna positioned within 1m of the EUT. Maximizing procedure was performed on the six (6) highest emissions readings between the lowest RF frequency generated on the device (without going below 9 kHz) and the 10th harmonic of the highest fundamental frequency. Where applicable, a hybrid antenna, horn antenna and loop antenna were used to cover the relevant frequency bands. Notable emissions are maximized and final measurements are taken if the initial results are within 20 dB of the permissible limit. The EUT is placed at nonconductive plate at the turntable center. For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations. The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E [\mu\text{V}/\text{m}] = URX + ATOT$$

Where URX is receiver reading and ATOT is total correction factor including cable loss, antenna factor and preamplifier gain (ATOT = LCABLES + AF - GPREAMP).

6.2 SUMMARY OF TEST RESULTS

Test Description	Reference Specification	Result	Notes
Radiated Spurious Emissions	15.209(a) 15.205(a) A8.5	Complies	

Emissions were investigated from the lowest present clock frequency, to the 10th harmonic of the highest present clock frequency (up to 25 GHz). No other emissions were observed within 20 dB of the limits.

6.2.1 SUMMARY OF 15.205 LIMITS

See [5.2.1] above.

6.3 MEASUREMENT DATA

6.3.1 DATA (LOW CHANNEL)

Spurious Emission Frequency (MHz)	Reading (dBuV)	Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det	Result
4810M	39.9	52.7	74.0	-21.3	Pk	Complies
7215M	34.4	52.2	74.0	-21.8	Pk	Complies
9620M	33.2	53.5	74.0	-20.5	Pk	Complies
12025M	35.2	58.3	74.0	-15.7	Pk	Complies
14430M	37.4	62.5	74.0	-11.5	Pk	Complies
4810M	32.3	45.1	54.0	-8.9	Avg	Complies
7215M	27.7	45.5	54.0	-8.5	Avg	Complies
9620M	27.2	47.5	54.0	-6.5	Avg	Complies
12025M	27.1	50.2	54.0	-6.5*	Avg	Complies
14430M	27.8	52.9	54.0	-1.1*	Avg	Complies

*Noise floor

6.3.2 DATA (HIGH CHANNEL)

Spurious Emission Frequency (MHz)	Reading (dBuV)	Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det	Result
4960M	49.3	62.7	74.0	-11.3	Pk	Complies
7440M	48.7	66.8	74.0	-7.2	Pk	Complies
9920M	36.3	56.7	74.0	-17.3	Pk	Complies
12400M	34.8	58.2	74.0	-15.8	Pk	Complies
14880M	37.2	62.0	74.0	-12.0	Pk	Complies
4960M	34.2	47.6	54.0	-6.4	Avg	Complies
7440M	26.9	45.0	54.0	-9.0	Avg	Complies
9920M	27.2	47.6	54.0	-6.4	Avg	Complies

6.4 EMISSIONS PLOT

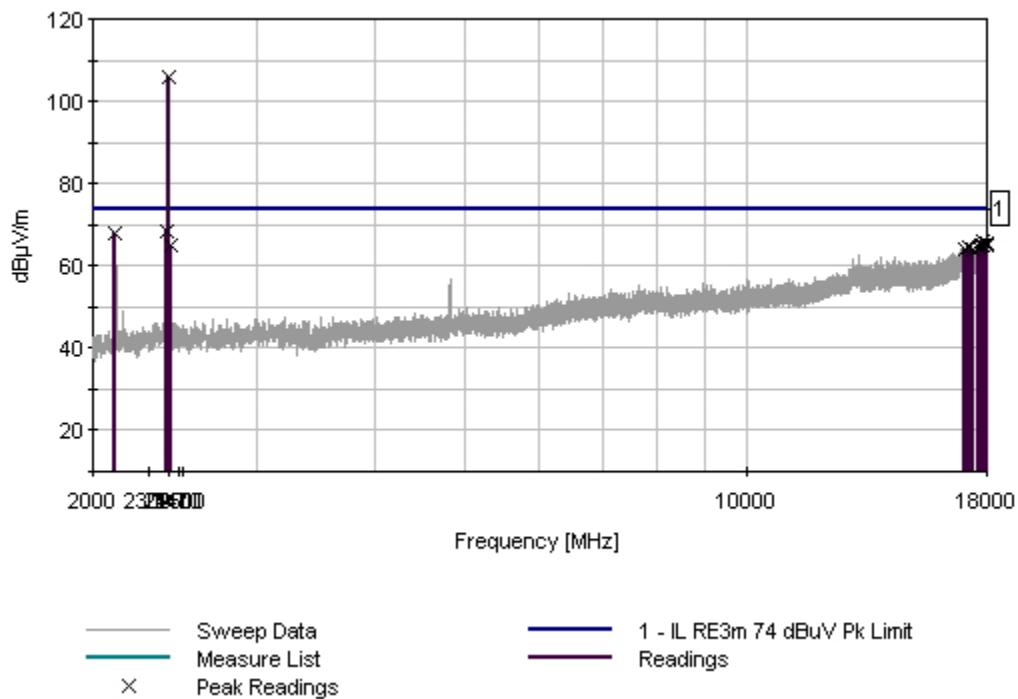


FIGURE 7 - SPURIOUS EMISSIONS PLOT (PK)

7 TEST EQUIPMENT

All applicable test equipment will be calibrated in accordance with ANSI Standard NCSL Z540-1 or other NIST traceable calibration standard. Equipment is calibrated on a 2 year cycle or according to the manufacturer's recommendations.

Manufacturer	Description	Model	Serial Number	Cal/Char Due Date D/M/Y
Agilent	Spectrum Analyzer	E4407B	US4142960	10/10/2014
Com-Power	Loop Antenna	AL-130	ICS100	15/1/2014
Electro Metrics	Hybrid Antenna	EM-3141	9902-1141	07/12/2014
HP	RF Amplifier	11975A	2738A01196	01/03/2014
AH Systems	Horn Antenna	SAS-571	1242	18/11/2013
Amawima	Horn Antenna	ANT-K	002009	7/2/2014

8 TEST DIAGRAMS

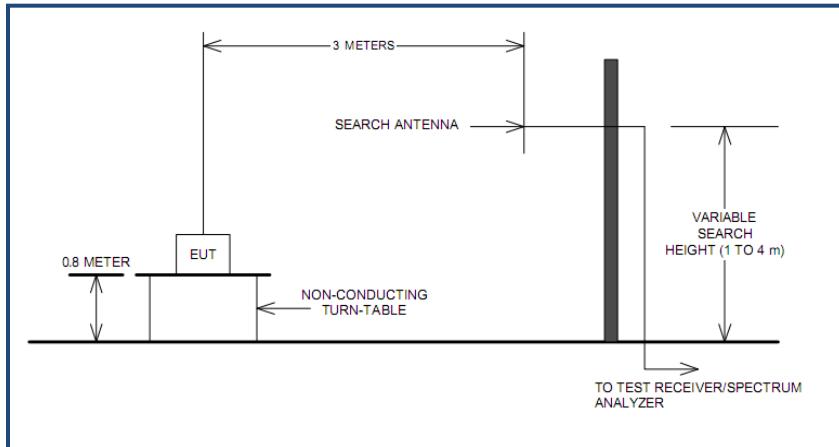
8.1 CONDUCTED RF TEST SETUP



8.2 POWER LINE CONDUCTED EMISSIONS TEST SETUP



8.3 RADIATED EMISSIONS TEST SETUP



8.4 PHOTOGRAHPS OF TEST SETUP



FIGURE 8 - TEST SETUP