RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_IC_RF_SL18102402-ZBR-062_BLE_Rev3.0
Supersede Report No.: FCC_IC_RF_SL18102402-ZBR-062_BLE_Rev2.0

Applicant	:	Zebra Technologies Corporation
Host Product Name	:	Thermal Printer
Module Model No.		ZQ3BT
Host Model No.	:	ZT610, ZT620
Test Standard	:	47 CFR 15.247 RSS247 Issue 2, 2017
Test Method	:	ANSI C63.10: 2013 RSS-Gen Issue 5, 2018 558074 D01 DTS Meas Guidance v05
FCC ID	:	I28-ZBRZQ3BT
IC	:	3798B-ZBRZQ3BT
Dates of test	:	12/10/2018 – 12/19/2018
Issue Date	:	01/04/2019
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification [X] Equipment did not comply with the specification [ ]		

This Test Report is Issued Under the Authority of:	
	
Shuo Zhang	**Chen Ge**
Test Engineer	Engineer Reviewer

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA

ilac-MRA
ACCREDITED
TESTING CERT # 2742-01

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC, NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC, RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & Radio Equipment Directive (RED)
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_IC_RF_SL18102402-ZBR-062_BLE	None	Original	12/19/2018
FCC_IC_RF_SL18102402-ZBR-062_BLE_Rev1.0	1.0	Update EUT info	12/27/2018
FCC_IC_RF_SL18102402-ZBR-062_BLE_Rev2.0	2.0	Change Radio Description	01/03/2019
FCC_IC_RF_SL18102402-ZBR-062_BLE_Rev3.0	3.0	Update Antenna Info	01/04/2019

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company:	Zebra Technologies Corporation
Host Product Name:	Thermal Printer
Host Model No.:	ZT610, ZT620
Module Model No.	ZQ3BT

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	Zebra Technologies Corporation
Applicant Address	3 Overlook Point, Lincolnshire, IL 60069
Manufacturer Name	Zebra Technologies Corporation
Manufacturer Address	3 Overlook Point, Lincolnshire, IL 60069

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Host Product Name	Thermal Printer
Host Model No.	ZT610, ZT620
Module Model No.	ZQ3BT
Trade Name	Zebra Technologies Corporation
Serial No.	76J184300386, 76J184400121
Input Power	100-240V, 50-60Hz
Power Adapter Manu/Model	N/A, internal PSU
Power Adapter SN	N/A, internal PSU
Product Hardware version	N/A
Date of EUT received	12/01/2018
Equipment Class/ Category	DTS, DSS
Port/Connectors	USB, USB host x2, Gig-Ethernet, RS232, Parallel
Remark	Only model ZT620 is tested as worst case. ZT610 and ZT620 have the same internal power supply and control PCB

6.2 Radio Description

Bluetooth LE:

Radio Type	Bluetooth LE
Radio Module	ZQ3BT
Operating Frequency	2402MHz-2480MHz
Modulation	DSSS (LE)
Channel Spacing	2MHz (LE)
Antenna Type	Chip
Antenna Gain	1.69 dBi
Antenna Connector Type	N/A
Maximum conducted power	4.72 dBm See FCC IC_SL17060501-ZBR-021_BLE_Rev2.0 pg24
Maximum EIRP	6.41 dBm

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	ThinkPad T420s	N/A	Lenovo	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
USB	EUT	I/O Port	Laptop	USB	2	Unshielded	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Zebra Toolbox	Set the EUT to transmit continuously in diferent test mode

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Antenna Requirement	FCC	15.203	FCC	ANSI C63.10 – 2013 558074 D01 DTS Meas Guidance v05	☒ Pass ☐ N/A
	IC	-	IC		
Restricted Band of Operation	FCC	15.205	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v05	☒ Pass ☐ N/A
	IC	RSS Gen 8.10	IC		
AC Conducted Emissions	FCC	15.207(a)	FCC	ANSI C63.10:2013	☒ Pass* ☐ N/A
	IC	RSS Gen 8.8	IC	RSS Gen Issue 5: 2018	

DTS Band Requirement

Test Item	Test standard		Test Method/Procedure		Pass / Fail
99% Occupied Bandwidth	-	-	-	-	☒ Pass* ☐ N/A
	IC	RSS Gen 6.6	IC	RSS Gen Issue 5: 2018	
6dB Bandwidth	FCC	15.247(a)(2)	FCC	558074 D01 DTS Meas Guidance v05	☒ Pass* ☐ N/A
	IC	RSS247 (5.2.1)	IC		
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v05	☒ Pass ☐ N/A
	IC	RSS247 (5.5)	IC		
Output Power	FCC	15.247(b)	FCC	558074 D01 DTS Meas Guidance v05	☒ Pass* ☐ N/A
	IC	RSS247 (5.4.4)	IC		
Receiver Spurious Emissions	IC	RSS Gen (4.8)	IC	RSS Gen Issue 5: 2018	☐ Pass ☒ N/A
Antenna Gain > 6 dBi	FCC	15.247(e)	FCC	-	☐ Pass ☒ N/A
	IC	-	IC	-	
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v05	☒ Pass* ☐ N/A
	IC	RSS247 (5.2.2)	IC		
RF Exposure requirement	FCC	15.247(i)	FCC	-	☐ Pass ☒ N/A
	IC	RSS Gen(5.5)	IC	RSS Gen Issue 5: 2018	
Remark	1. All measurement uncertainties do not take into consideration for all presented test results. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual. 3. Pass* : Please refer to FCC IC_SL17060501-ZBR-021-BLE_Rev2.0 test report.				

9 Measurement Uncertainty

Emissions			
Test Item	**Frequency Range**	**Description**	**Uncertainty**
AC Conducted Emissions	150KHz – 30MHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2	±3.5dB
RF conducted measurement	150KHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2	±0.95dB
Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	±6dB
Radiated Spurious Emissions	1GHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	±6dB

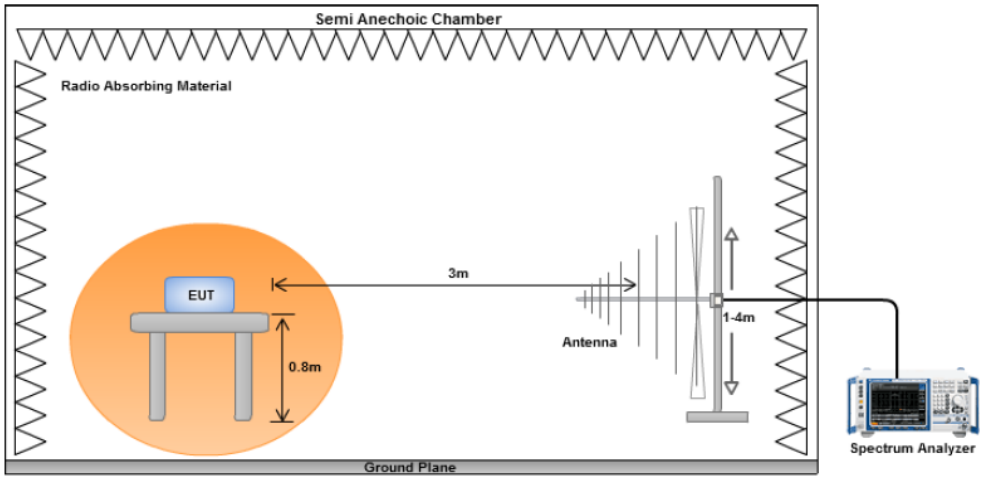
10 Measurements, Examination and Derived Results

10.1 Antenna Requirement

Spec	Requirement	Applicable
§15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. Antenna requirement must meet at least one of the following: a) Antenna must be permanently attached to the device. b) The antenna must use a unique type of connector to attach to the device. c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.	☒
Remark	The EUT uses a Chip antenna that is permanently attached to the board which meets the requirement.	
Result	☒ PASS ☐ FAIL	

10.2 Radiated Spurious Emissions below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d) RSS247 (5.5)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges **Frequency range (MHz) / Field Strength (uV/m)** 30 – 88 / 100 88 – 216 / 150 216 960 / 200 Above 960 / 500	☒
Test Setup			
Procedure		1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. A Quasi-peak measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.	
Remark		The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.	
Result		☒ Pass ☐ Fail	

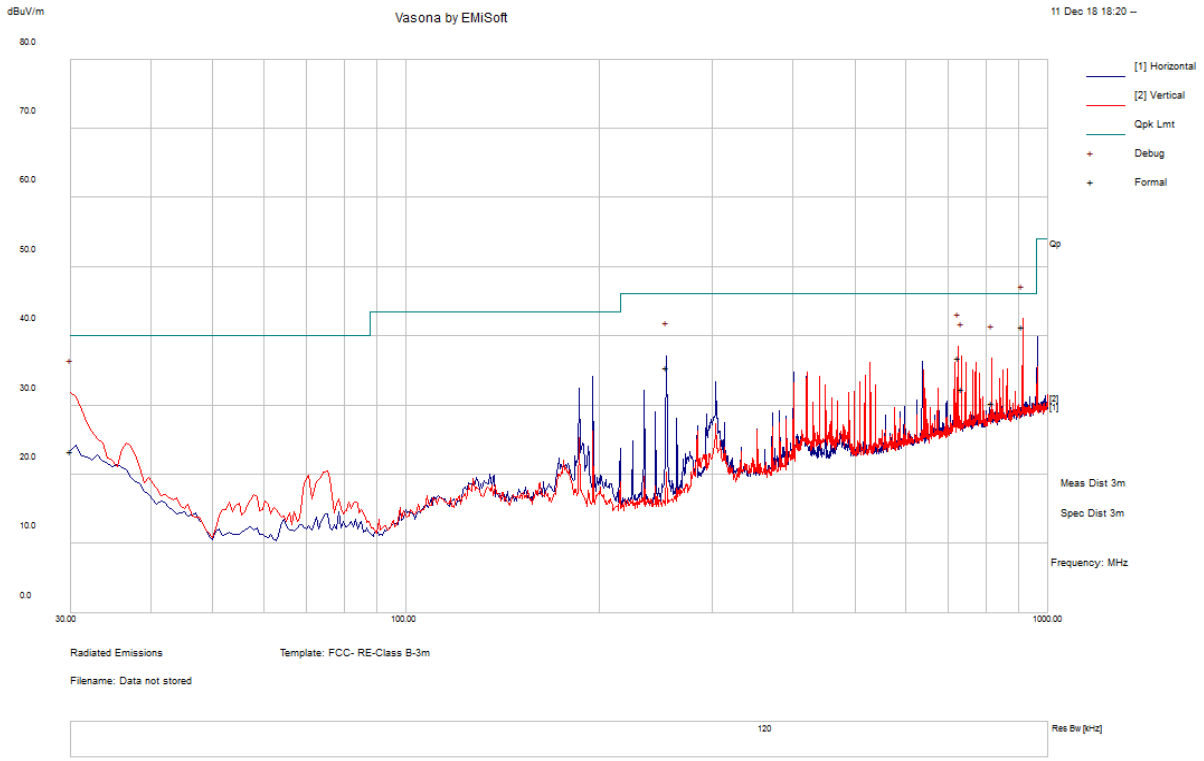
Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Shuo Zhang at 10m chamber.

Radiated Emission Test Results (Below 1GHz)

Test specification	Below 1GHz			
Environmental Conditions:	Temp (°C):	23	Result	Pass
	Humidity (%)	46		
	Atmospheric (mbar):	1018		
Mains Power:	120VAC, 60Hz			
Tested by:	Shuo Zhang			
Test Date:	12/12/2018			
Remarks:	BLE, Middle Channel			



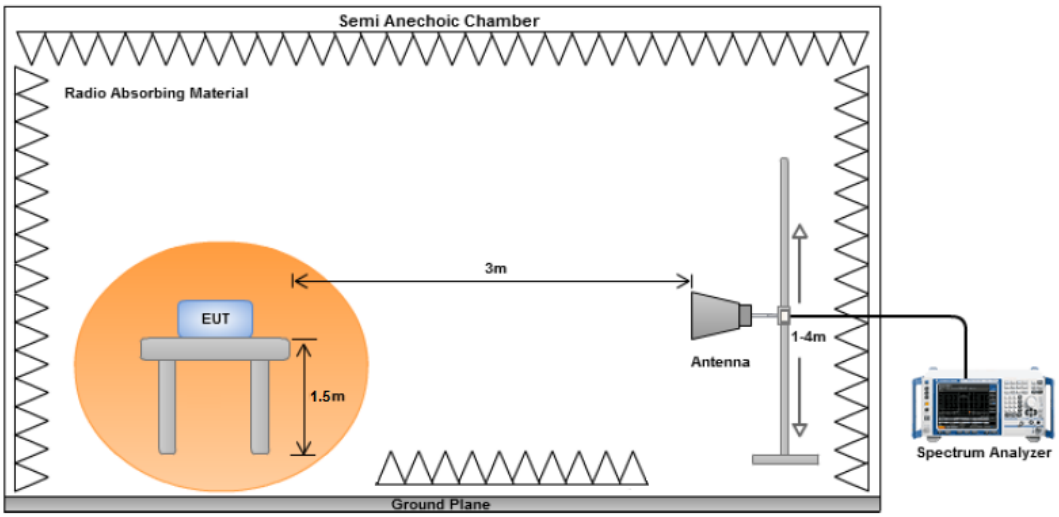
Quasi Max Measurements

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol (V/H)	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
913.06	38	15.9	-12.54	41.35	Quasi Max	V	137	102	46	-4.65	Pass
724.11	36.77	15.19	-15.1	36.86	Quasi Max	V	100	13	46	-9.14	Pass
30.00	24.37	11.12	-12.08	23.4	Quasi Max	V	105	281	40	-16.6	Pass
254.42	46.78	12.96	-24.21	35.53	Quasi Max	H	104	12	46	-10.47	Pass
733.91	32.28	15.17	-15.09	32.36	Quasi Max	V	165	28	46	-13.64	Pass
816.97	29.03	15.52	-14.22	30.33	Quasi Max	V	137	100	46	-15.67	Pass

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

10.3 Radiated Spurious Emissions between 1GHz – 25GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS247(A8.5)	a)	For non-restricted band, 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 or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required ☐ 20 dB down ☒ 30 dB down	☒
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	☒
Test Setup			
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. An average measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.		
Remark	The EUT was scanned up to 40GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Shuo Zhang at 10m chamber.

Radiated Emission Test Results (Above 1GHz)

Above 1GHz-25GHz – BLE-2402MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol (V/H)	Height cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1285.725	52.4	2.14	-5.98	48.56	Peak Max	V	136	285	74	-25.44	Pass
4804.46	47.99	4.1	-0.93	51.17	Peak Max	H	102	48	74	-22.84	Pass
3307.089	41.19	3.49	-1.6	43.09	Peak Max	V	231	286	74	-30.92	Pass
1285.725	30.09	2.14	-5.98	26.25	Average Max	V	136	285	54	-27.75	Pass
4804.46	39.09	4.1	-0.93	42.27	Average Max	H	102	48	54	-11.73	Pass
3307.089	29.14	3.49	-1.6	31.03	Average Max	V	231	286	54	-22.97	Pass

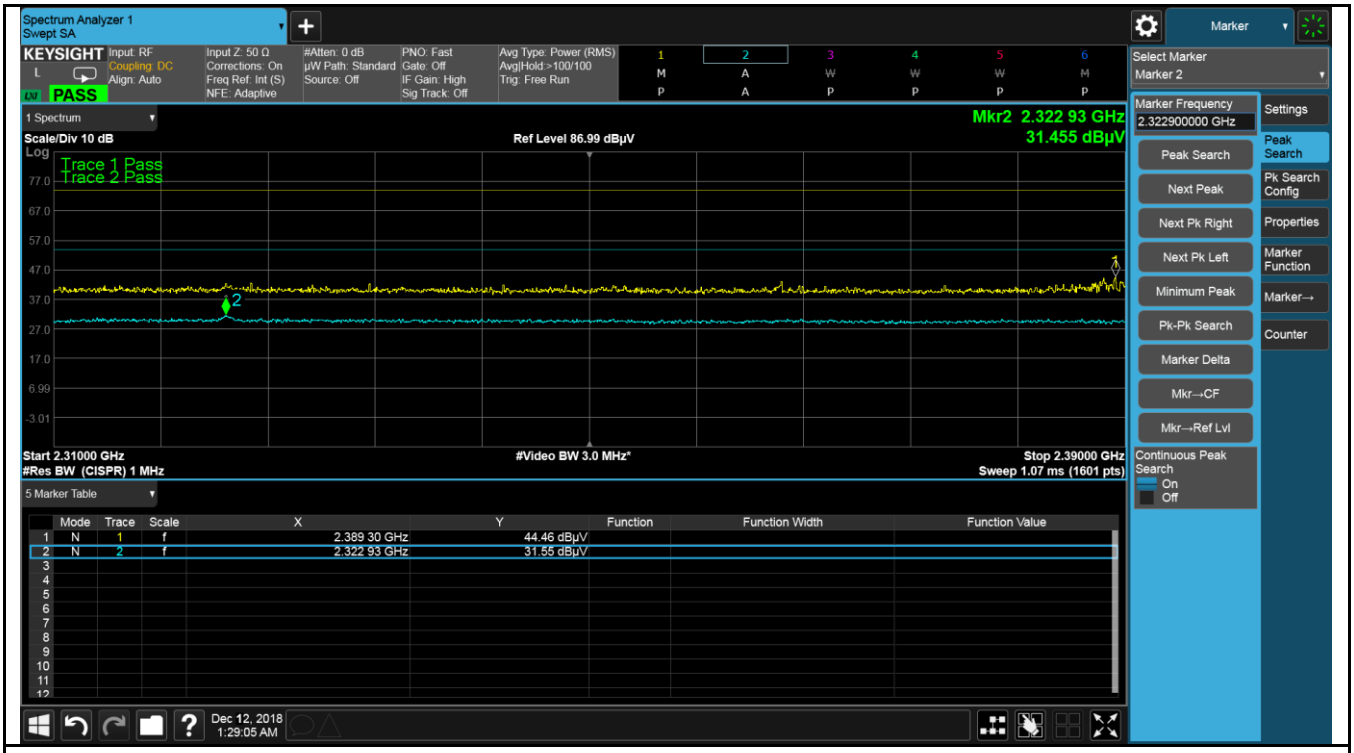
Above 1GHz-25GHz – BLE-2440MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol (V/H)	Height cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4879.772	41.33	4.18	-1	44.51	Peak Max	V	142	193	74	-29.49	Pass
6177.435	40.1	4.71	-0.33	44.48	Peak Max	V	218	270	74	-29.52	Pass
1773.355	41.75	2.59	-3.91	40.44	Peak Max	V	170	135	74	-33.56	Pass
4879.772	28.11	4.18	-1	31.29	Average Max	V	142	193	54	-22.71	Pass
6177.435	27.08	4.71	-0.33	31.45	Average Max	V	218	270	54	-22.55	Pass
1773.355	29.31	2.59	-3.91	28	Average Max	V	170	135	54	-26	Pass

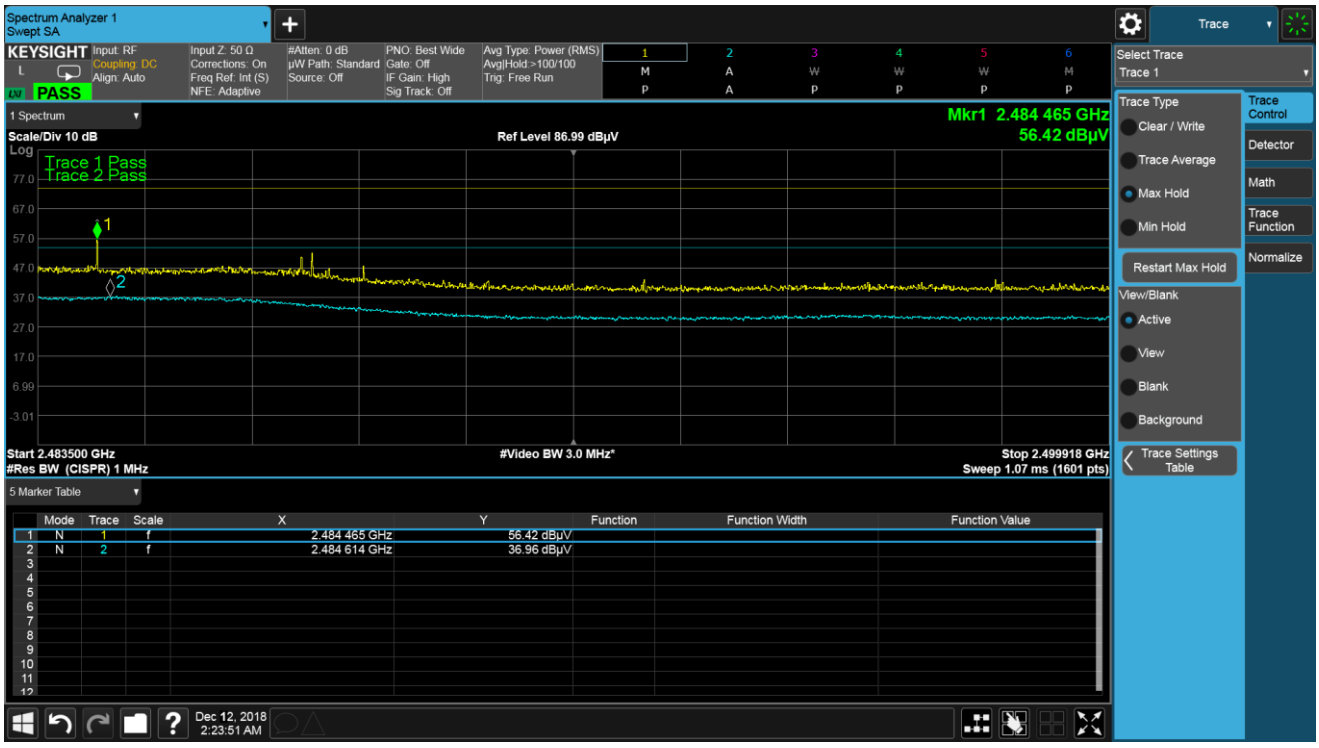
Above 1GHz-25GHz – BLE –2480MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol (V/H)	Height cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4959.385	40.34	4.25	-1.06	43.53	Peak Max	V	257	151	74	-30.47	Pass
9558.358	40.14	5.64	0.47	46.24	Peak Max	V	200	74	74	-27.76	Pass
4171.481	40.76	3.91	-0.78	43.9	Peak Max	V	187	196	74	-30.1	Pass
4959.385	27	4.25	-1.06	30.19	Average Max	V	257	151	54	-23.81	Pass
9558.358	27.36	5.64	0.47	33.47	Average Max	V	200	74	54	-20.53	Pass
4171.481	27.83	3.91	-0.78	30.96	Average Max	V	187	196	54	-23.04	Pass

Restricted Band Test plot (BLE)



Restricted Band BLE 2402MHz



Restricted Band BLE 2480MHz

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Radiated Emissions						
Keysight EXA 44GHz Spectrum Analyzer	N9030B(PXA)	MY57140374	09/06/2018	1 Year	09/06/2019	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	03/09/2018	1 Year	03/09/2019	☑
Horn Antenna (1GHz~26GHz)	3115	100059	11/09/2018	1 Year	11/09/2019	☑
Horn Antenna (18GHz~40GHz)	PA-840	181251	06/23/2018	1 Year	06/23/2019	☑
Preamplifier (100KHz-7GHz)	LPA-6-30	11170602	05/09/2018	1 Year	05/09/2019	☑
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	08/16/2018	1 Year	08/16/2019	☑

Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		**Radio Equipment: EN45011:** EN ISO/IEC 17065
		Electromagnetic Compatibility: EN45011 – EN ISO/IEC 17065
Singapore iDA CB(Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
Hong Kong OFCA		**(Phase II)** OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		**Radio:** Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		**Radio**: A1. Terminal equipment for purpose of calling **Telecom**: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		**EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI **EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measuremet
Australia CAB Recognition		**EMC:** AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radiocommunications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016,AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2