


Test Report TR3664B BL5340

Equipment Under Test:	BL5340
Requirement(s):	FCC 15.247 RSS-247
Test Date(s):	3/9/2023 – 3/21/2023
Prepared for:	Laird Connectivity Attn: Jonathan Kaye W66 N220 Commerce Ct. Cedarburg, WI 53012

Report Issued by: Anthony Smith, EMC Engineering Specialist

Signature: 

Date: 7/12/2023

Report Reviewed by: Adam Alger, Laboratory Manager

Signature: 

Date: 06/16/2023

Report Constructed by: Anthony Smith, EMC Engineering Specialist

Signature: 

Date: 7/12/2023

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Company: Laird Connectivity	Page 1 of 20	Name: BL5340
Report: TR3664B BL5340		Model: BL5340
Quote: NBO-12-2022-005678		Serial: 00037

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Laird Connectivity Test Services in Review

The Laird Connectivity LLC laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein unless otherwise noted



Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers



Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

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1 TEST REPORT SUMMARY

During **March 9th, 2023 to March 21st, 2023** the Equipment Under Test (EUT), **BL5340**, as provided by **Laird Connectivity** was tested to the following requirements for the purpose of a Class 2 Permissive Change to add an antenna:

FCC 15.247/RSS-247

Requirements	Description	Specification	Method	Compliant
FCC: 15.247 (b)(3) ISED: RSS-247 5.4 (d)	Maximum Output Power	<30 dBm	ANSI C63.10	Yes
FCC: 15.247 (d) ISED: RSS-GEN 8.10	Spurious Emissions in Restricted Frequency Bands	FCC 15.209 RSS-GEN 8.9	ANSI C63.10	Yes

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

The decision rule for Pass / Fail assessment to the specification or standard listed in this test report has been agreed upon by the client and laboratory to be as follows:

Measurement Type	Rule
Emissions – Amplitude	1 dB below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

Company Name	Laird Connectivity
Contact Person	Jonathan Kaye
Address	W66N220 Commerce Court Cedarburg, WI, 53012

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	BL5340
Model Number	BL5340
Serial Number	00037
FCC ID	SQGBL5340
IC ID	3147A-BL5340

2.2 Product Description

Bluetooth and 802.15.4 Module operating in the 2.4 GHz range.

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Additional Information

USB to Serial connection to program radio utilizing Tera Term v4.105 terminal simulation software. Zigbee 802.15.4 250kbit signal utilizing channels 11 (2405 MHz), 18 (2440 MHz), 25 (2475 MHz), and 26 (2480 MHz).

2.6 Additional Information

This testing is for a permissive change to add the iFlex-Pifa Antenna, with an antenna gain of 3.1 dBi, to the list of antennas usable by the BL5340. EUT tested via Cabinet Radiation method.

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3 REFERENCES

Publication	Edition	Date	AMD 1
eCFR	-	2023	-
RSS-247	2	2017	-
RSS-GEN	5	2018	2019
ANSI C63.10	-	2013	-
KDB 178919 D01	6	2015	-

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of $k = 2$.

References
CISPR 16-4-1
CISPR 16-4-2
CISPR 32
ANSI C63.23
A2LA P103
A2LA P103c
ETSI TR 100-028

Measurement Type	Configuration	Uncertainty \pm
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

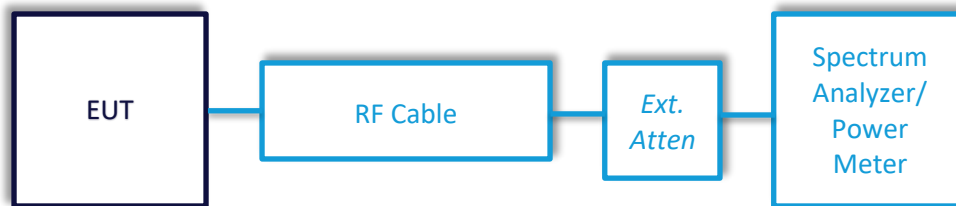
Parameter	ETSI U.C. \pm	U.C. \pm
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	<p>The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p>
Example Calculations	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

Block Diagram



5.1.1 Antenna Port Conducted Emissions – RF Output Power

Operator	Anthony Smith	QA	Adam Alger
Temperature	20.6°C	R.H. %	29.6%
Test Date	3/9/2023	Location	RF Conducted Bench
Requirement	FCC 15.247 RSS-247	Method	ANSI C63.10

Limits: <30 dBm

Test Parameters

Frequency	2.4-2.4835 GHz	Setup	Conducted
RBW	3 MHz	VBW	50 MHz
Detector(s)	Peak	Settings	Trace Max Hold

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960172	Cable	A.H. Systems, Inc.	SAC-26G-1	387	3/22/2022	3/22/2023	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/12/2022	4/12/2023	Active Calibration

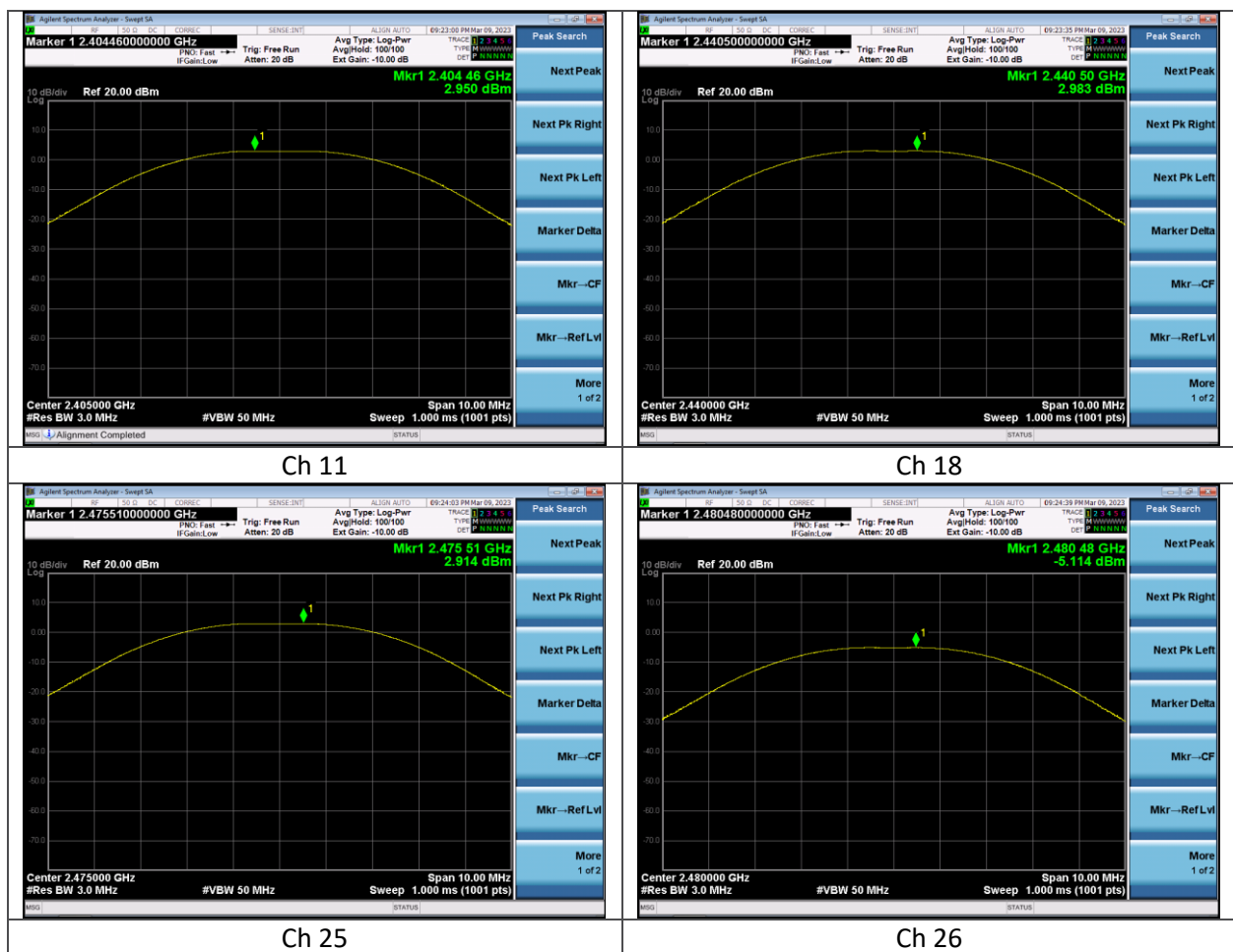
EUT Parameters

Input Power	USB	Mode	802.15.4 250kbit
Frequency	2405, 2440, 2475, 2480 MHz	Channel	11, 18, 25, 26
Notes	Power Index: 0 for Channels 11, 18, and 25; -8 for Channel 26		

Data Table

Channel	Mode	Peak Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Transmit Power Setting
11	802.15.4	3.0	30.0	27.0	0
18	802.15.4	3.0	30.0	27.0	0
25	802.15.4	2.9	30.0	27.1	0
26	802.15.4	-5.1	30.0	35.1	-8

Plots



5.1.2 Antenna Port Conducted Emissions – Emissions in Restricted Frequency Bands

Operator	Anthony Smith	QA	Adam Alger
Temperature	22.0°C	R.H. %	25.7%
Test Date	3/21/2023	Location	Bench
Requirement	FCC 15.247	Method	ANSI C63.10

Limits:

Frequency (MHz)	Quasi Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Peak Limit (dBµV/m)
30-88	40.0	-	-
88-216	43.5	-	-
216-960	46.0	-	-
960-1000	54.0	-	-
1000-25000	-	54.0	74.0

Test Parameters

Frequency	1-25 GHz	Setup	Conducted
RBW	1 MHz	VBW	3 MHz Peak 1 kHz Average
Detector(s)	Peak	Settings	Max Hold - Peak
Notes	Method 11.12.2.5.3 Reduced VBW used for Average Measurements		

Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960173	Cable	A.H. Systems, Inc.	SAC-26G-1	388	3/22/2022	3/22/2023	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/12/2022	4/12/2023	Active Calibration

EUT Parameters

Input Power	USB	Mode	802.15.4 250kbit
Frequency	2405, 2440, 2475, 2480 MHz	Channel	11, 18, 25, 26
Notes	Power Index: 0 for Ch 11, 18, 25; -8 for 26. Duty Cycle 100%.		

Data Tables

Peak Measurements

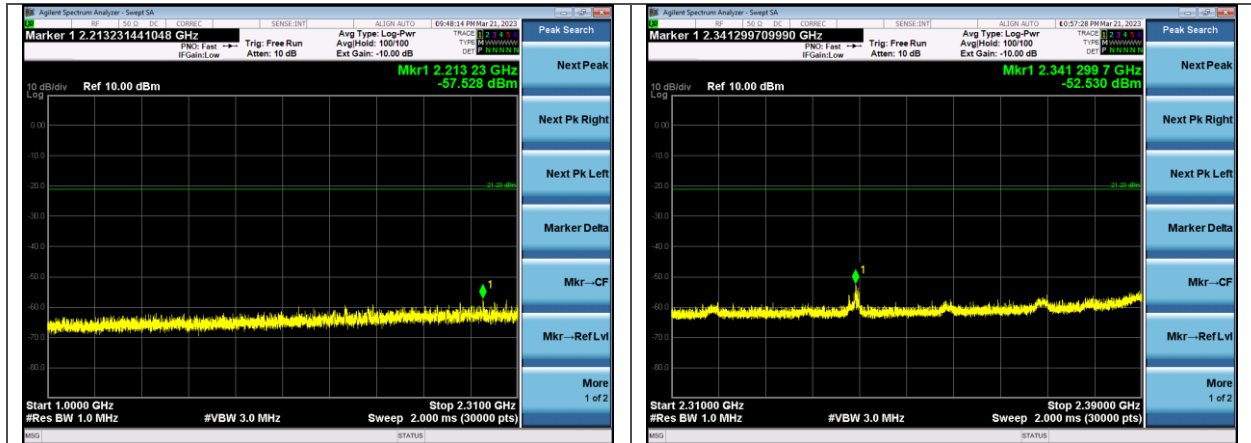
Mode/Channel	Freq (MHz)	Meas. (dBm)	Ant. Gain (dBi)	Corrected Meas. (dBm)	Limit (dBm)	Margin (dB)
11	2341.3	-52.5	3.1	-49.4	-21.2	28.2
25	2483.6	-48.3	3.1	-45.2	-21.2	24.0
26	2486.6	-36.8	3.1	-33.7	-21.2	12.5
25	4948.8	-44.7	3.1	-41.6	-21.2	20.4
18	4879.1	-43.8	3.1	-40.7	-21.2	19.5
11	4809.3	-43.9	3.1	-40.8	-21.2	19.6

Average Measurements

Mode/Channel	Freq (MHz)	Meas. (dBm)	Ant. Gain (dBi)	Corrected Meas. (dBm)	Limit (dBm)	Margin (dB)
11	2389.0	-66.1	3.1	-63.0	-41.2	21.8
25	2483.5	-58.1	3.1	-55.0	-41.2	13.8
26	2483.5	-47.5	3.1	-44.4	-41.2	3.2
11	4810.9	-53.1	3.1	-50.0	-41.2	8.8
18	4880.8	-52.5	3.1	-49.4	-41.2	8.2
25	4950.9	-53.3	3.1	-50.2	-41.2	9.0
26	4960.6	-64.3	3.1	-61.2	-41.2	20.0

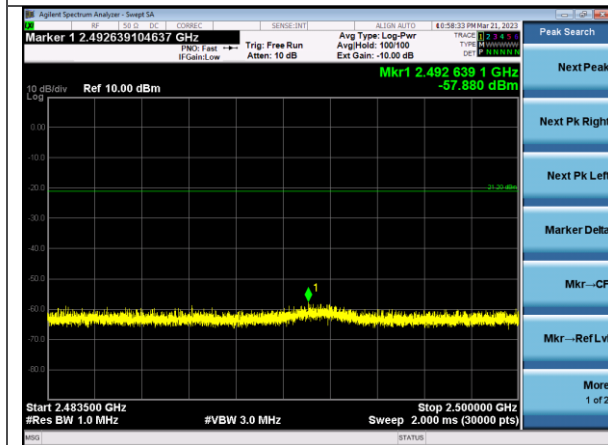
Plots

Peak

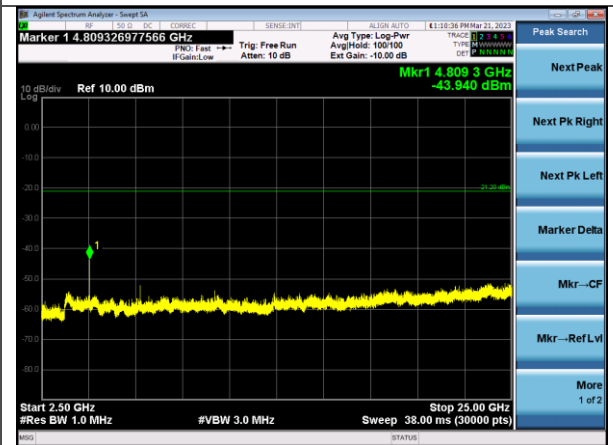


1-2.31 GHz
Ch 11

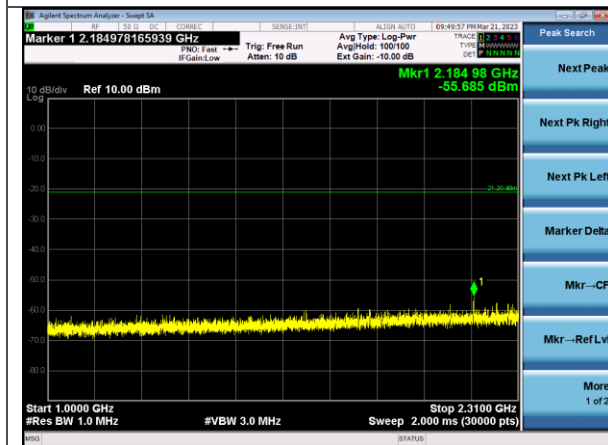
2.31-2.39 GHz
Ch 11



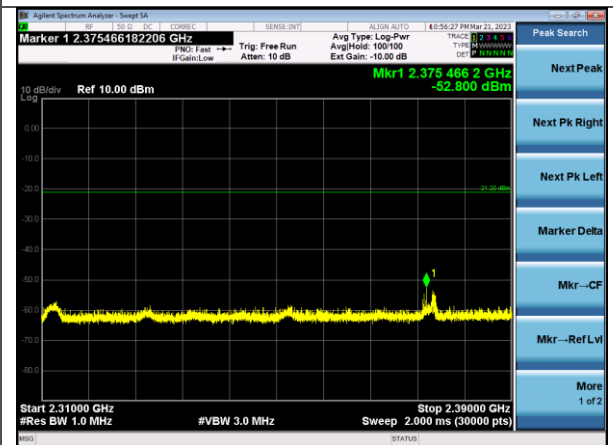
2.4835-2.5 GHz
Ch 11



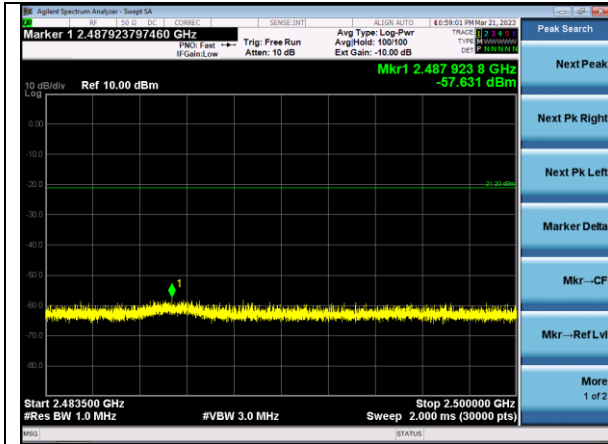
2.5-25 GHz
Ch 11



1-2.31 GHz
Ch 18



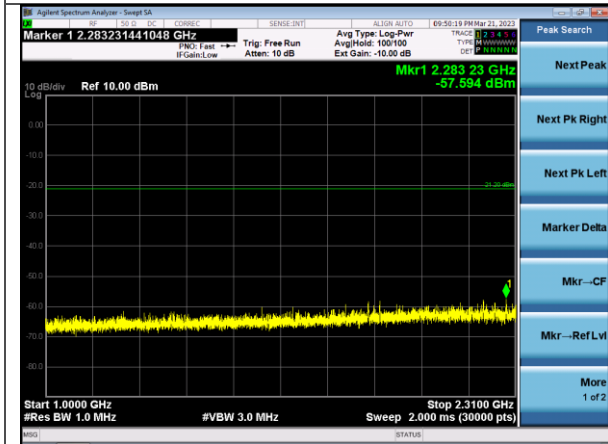
2.31-2.39 GHz
Ch 18



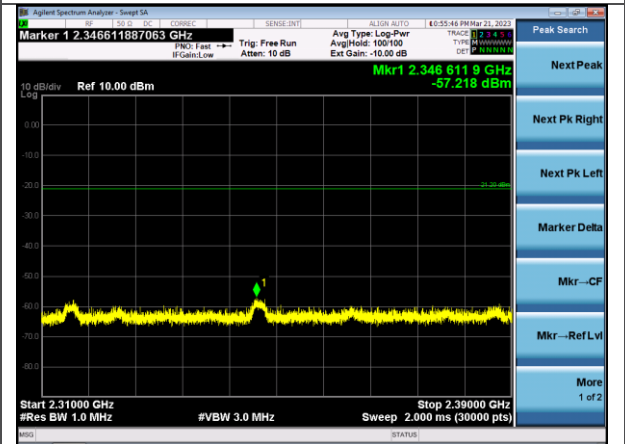
2.4835-2.5 GHz
Ch 18



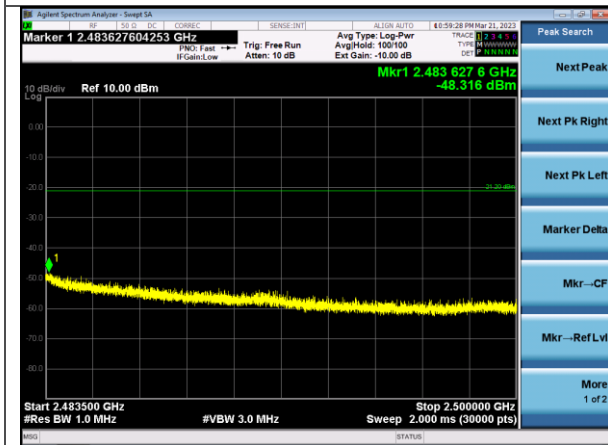
2.5-25 GHz
Ch 18



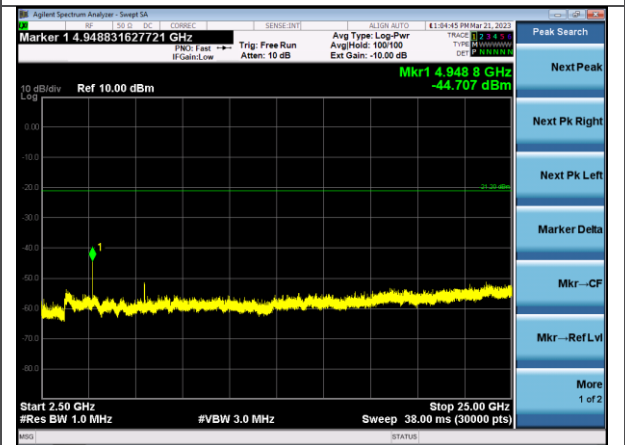
1-2.31 GHz
Ch 25



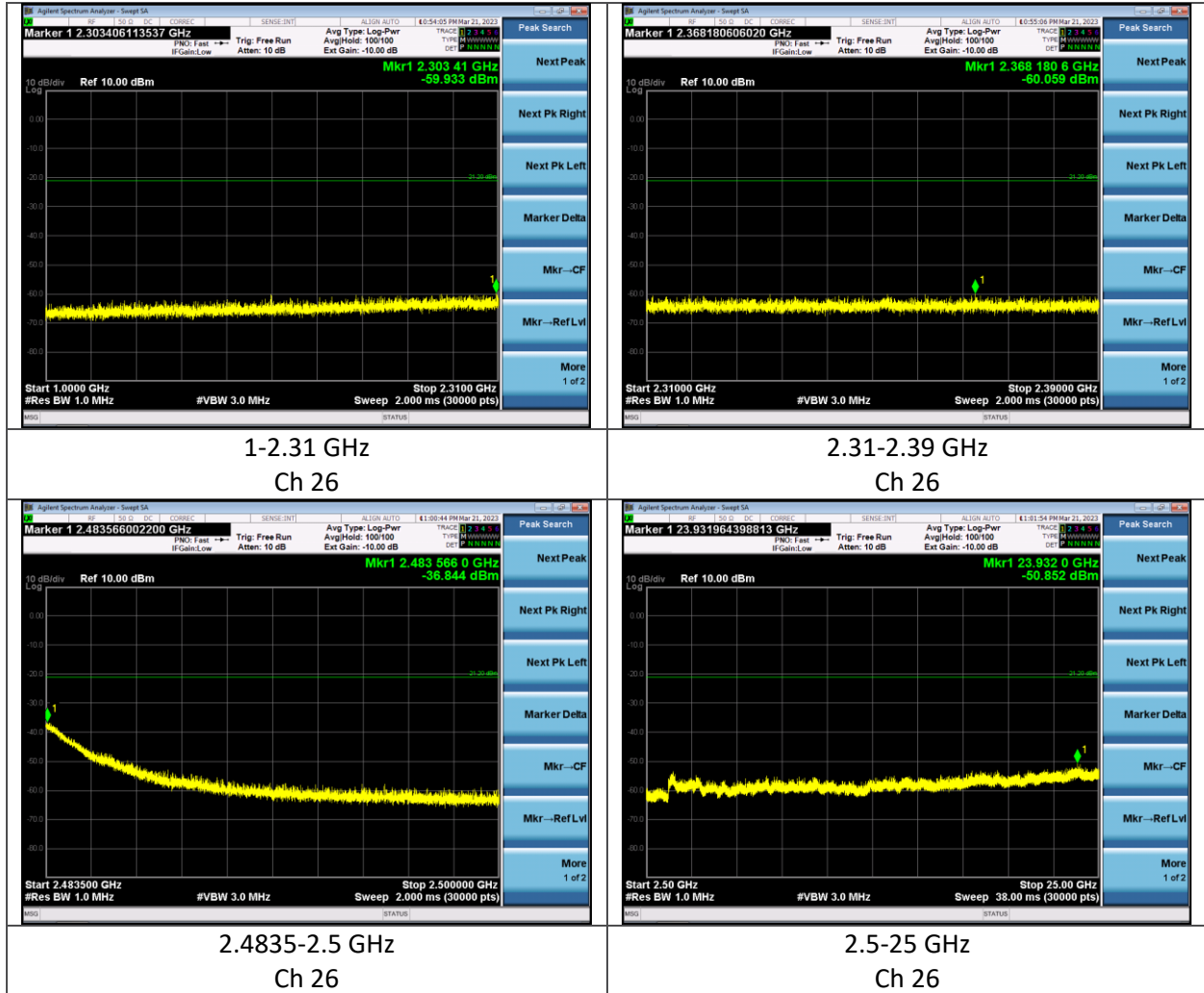
2.31-2.39 GHz
Ch 25



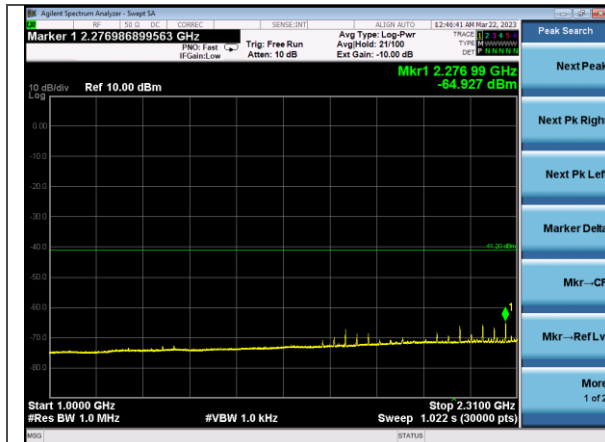
2.4835-2.5 GHz
Ch 25



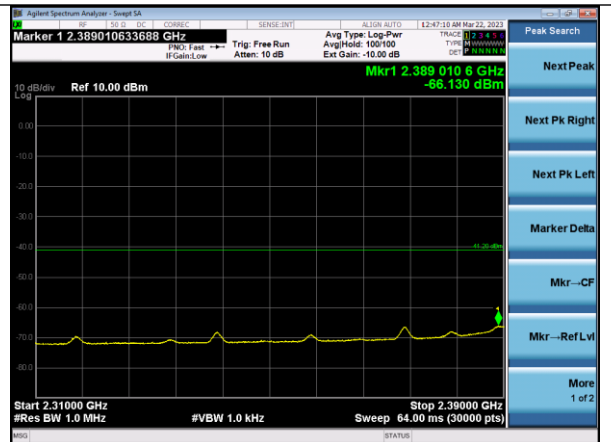
2.5-25 GHz
Ch 25



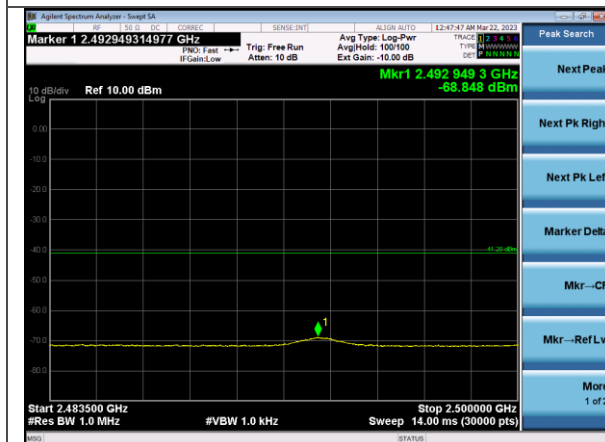
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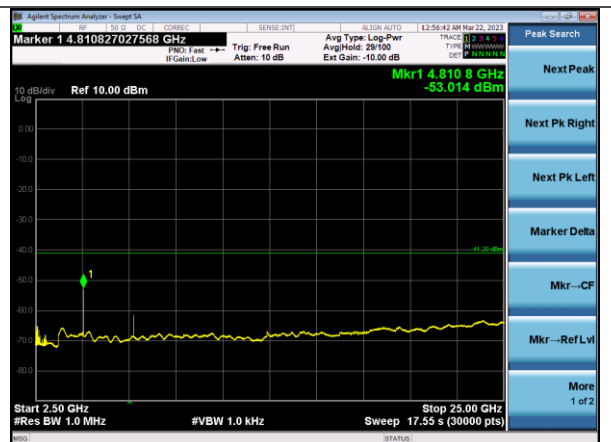
1-2.31 GHz
Ch 11



2.31-2.39 GHz
Ch 11



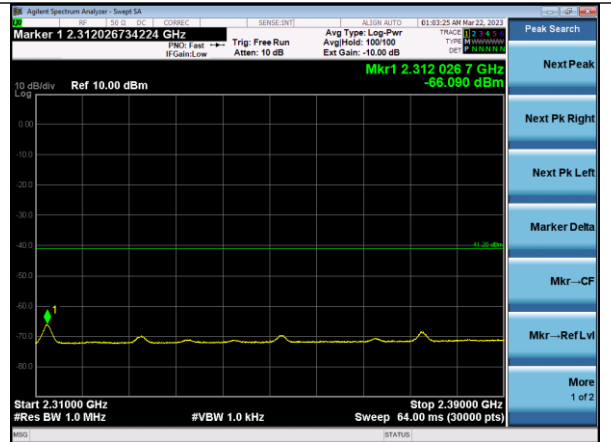
2.4835-2.5 GHz
Ch 11



2.5-25 GHz
Ch 11



1-2.31 GHz
Ch 18



2.31-2.39 GHz
Ch 18

Company: Laird Connectivity

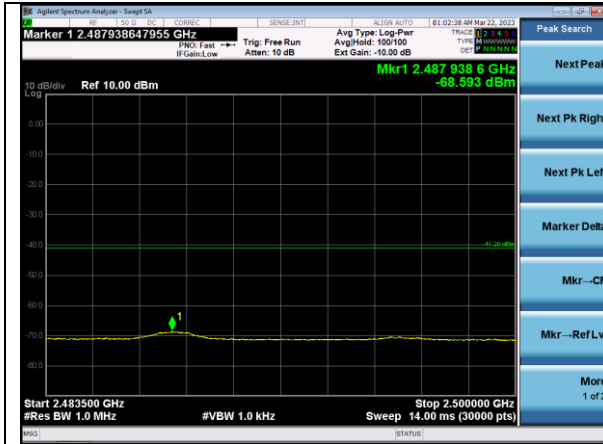
Report: TR3664B BL5340

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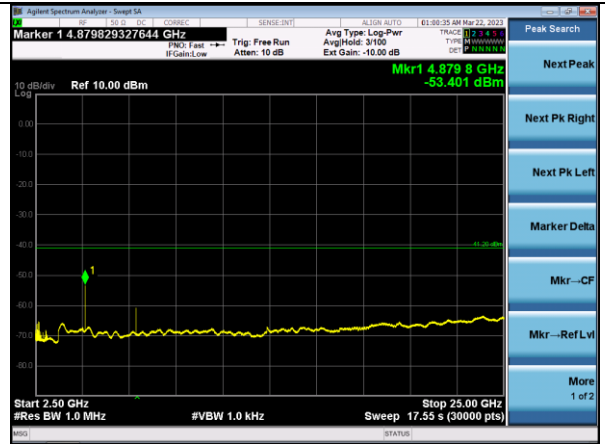
Name: BL5340

Model: BL5340

Serial: 00037



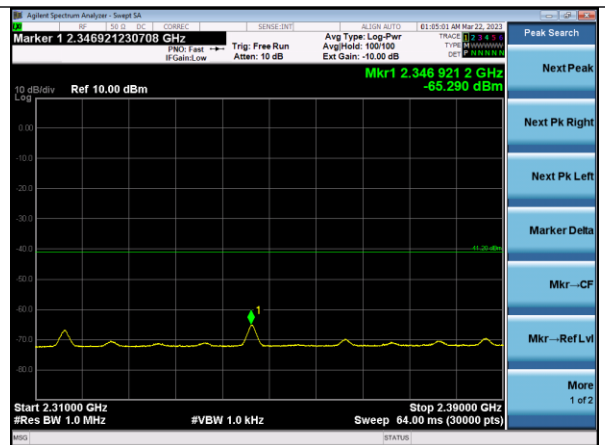
2.4835-2.5 GHz
Ch 18



2.5-25 GHz
Ch 18



1-2.31 GHz
Ch 25



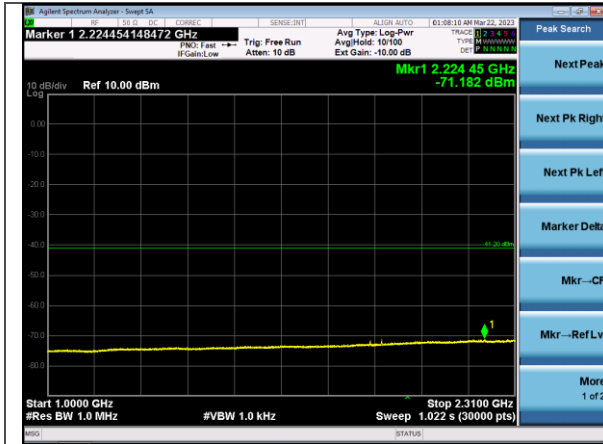
2.31-2.39 GHz
Ch 25



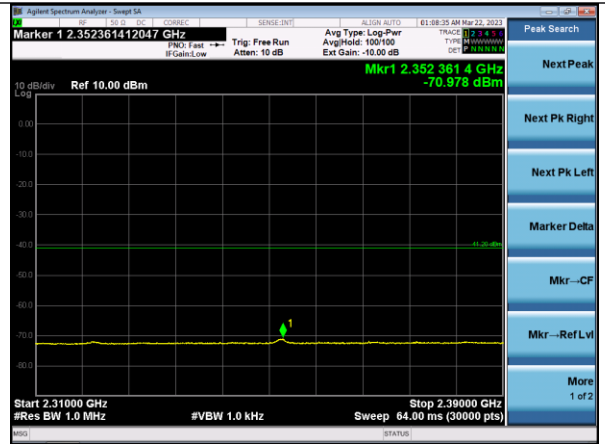
2.4835-2.5 GHz
Ch 25



2.5-25 GHz
Ch 25



1-2.31 GHz
Ch 26



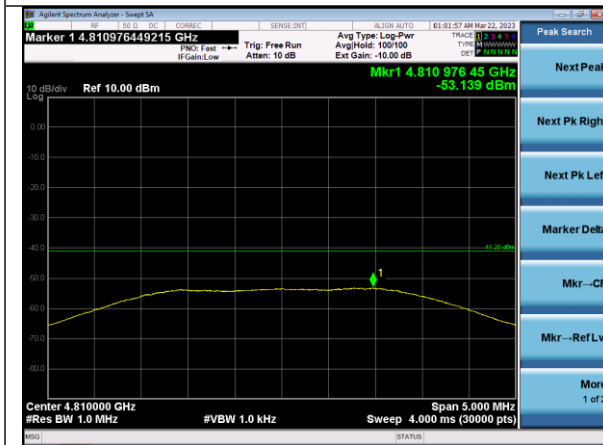
2.31-2.39 GHz
Ch 26



2.4835-2.5 GHz
Ch 26



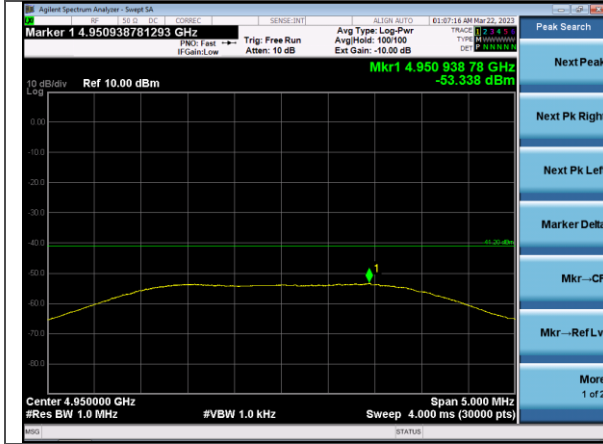
2.5-25 GHz
Ch 26



Ch 11 Spurious Emission – 4810.9 MHz



Ch 18 Spurious Emission – 4880.8 MHz

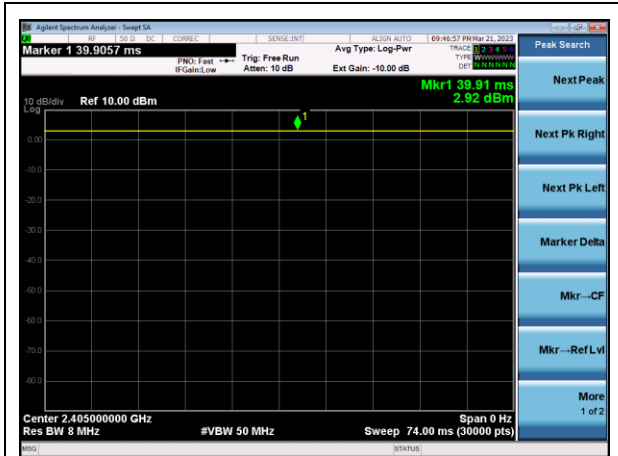


Ch 25 Spurious Emission – 4950.9 MHz



Ch 26 Spurious Emission – 4960.6 MHz

Duty Cycle



Duty Cycle – 100%

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6 REVISION HISTORY

Version	Date	Notes	Person
0	3/24/2023	Initial Draft	Anthony Smith
1	7/12/2023	Revised Draft	Anthony Smith

END OF REPORT