FCC and ISED Test Report

Apple Inc
Model: A2439

In accordance with FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN (2.4 GHz Bluetooth DTS)

Prepared for: Apple Inc
One Apple Park Way, Cupertino, California, 95014, USA

FCC ID: BCGA2439 IC: 579C-A2439

COMMERCIAL-IN-CONFIDENCE

Document 75949506-10 Issue 01

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SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Neil Rousell	Senior Engineer	Authorised Signatory	15 February 2021

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Connor Lee	15 February 2021	
Testing	Aasim Butt	15 February 2021	
Testing	Colin Brain	15 February 2021	
Testing	Liang Tian	15 February 2021	
Testing	Jaiyanth Balendrarajah	15 February 2021	
Testing	Mohammad Malik	15 February 2021	
Testing	Daniel Cameron	15 February 2021	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN: 2019, Issue 2 (02-2017) and Issue 5 (04-2018) + A1 (03-2019) for the tests detailed in section 1.3.

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	15 February 2021

Table 1

1.2 Introduction

Applicant	Apple Inc
Manufacturer	Apple Inc
Model Number(s)	A2439
Serial Number(s)	C02DM00P0FTP and C02DM00M0FTN
Hardware Version(s)	REV 1.0
Software Version(s)	20W430340t
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2019 ISED RSS-247: Issue 2 (02-2017) ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019)
Order Number Date	0540205414 13-July-2020
Date of Receipt of EUT	09-October-2020
Start of Test	09-November-2020
Finish of Test	11-January-2021
Name of Engineer(s)	Connor Lee, Aasim Butt, Colin Brain, Liang Tian, Jaiyanth Balendrarajah, Mohammad Malik and Daniel Cameron
Related Document(s)	ANSI C63.10 (2013) ANSI C63.4 (2014) KDB 662911 D01 v02r01

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C, ISED RSS-247 and ISED RSS-GEN is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	Part 15C	RSS-247	RSS-GEN			
Configuration and Mode: 2.4 GHz Bluetooth - DTS						
-	15.203	-	-	Antenna Requirement	N/T	The devices complies with the provisions of this section, as it uses a permanently attached integral antenna
2.1	15.247 (b)	5.4	6.12	Maximum Conducted Output Power	Pass	
2.2	15.247 (e)	5.2	6.12	Power Spectral Density	Pass	
2.3	15.247 (a)(2)	5.2	6.7	Emission Bandwidth	Pass	
2.4	15.247 (d)	5.5	-	Authorised Band Edges	Pass	
2.5	15.205	-	8.10	Restricted Band Edges	Pass	
2.6	15.247 (d) and 15.205	5.5	6.13	Spurious Radiated Emissions	Pass	

Table 2

1.4 Product Information

1.4.1 Technical Description

The Equipment Under Test (EUT) was a desktop computer with Bluetooth, Bluetooth Low Energy and 802.11 a/b/g/n/ac/ax capabilities in the 2.4 GHz and 5 GHz bands.

1.4.2 Test Set-up

For conducted tests, a conducted test point was provided by the manufacturer via a UFL connector and cable. The loss of these test cables were known and compensated for in any conducted measurements.

For tests in SISO operation, conducted tests were performed on the Core with the highest antenna gain as Core 0 and Core 1 are identical but with unequal antenna gains. Radiated tests were performed on all Cores. The EUT supports TxBF on Core 0 + Core 1.

Bluetooth LE/HDR was assessed as a DTS system. The EUT supports Bluetooth on the following mode of operations across it's antenna ports:

- BT Core 0 – SISO (iPA and ePA)
- BT Core 1 – SISO (iPA and ePA)
- BT Dedicated Core – SISO (iPA)
- BT Core 0 + BT Core 1 - TxBF (iPA and ePA)

For all tests, the EUT was put into a continuous transmit test mode with the manufacturer's test commands via a script running in the EUTs terminal application. The EUT then transmitted the required type of modulation/packet type on a static channel selected within the test script.

All testing was performed with the EUT powered via a 120 V AC, 60 Hz source.

1.4.3 Antenna Gain Table (2.4GHz Bluetooth)

Antenna Port	Frequency Range (MHz)	Peak Gain (dBi)	Conducted Cable Loss (dB)
Core 0	2400 to 2480	3.33	1.90
Core 1	2400 to 2480	-0.10	1.90
BT Dedicated Core	2400 to 2480	1.00	1.80

Table 3

1.5 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.6 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Model: A2439, Serial Number: C02DM00P0FTP			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: A2439, Serial Number: C02DM00M0FTN			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 4

1.7 Test Location

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 2.4 GHz Bluetooth - DTS		
Maximum Conducted Output Power	Daniel Cameron	UKAS
Power Spectral Density	Daniel Cameron	UKAS
Emission Bandwidth	Daniel Cameron	UKAS
Authorised Band Edges	Connor Lee, Aasim Butt, Colin Brain, Liang Tian, Jaiyanth Balendrarajah and Mohammad Malik	UKAS
Restricted Band Edges	Connor Lee, Aasim Butt, Colin Brain, Liang Tian, Jaiyanth Balendrarajah and Mohammad Malik	UKAS
Spurious Radiated Emissions	Mohammad Malik, Jaiyanth Balendrarajah, Liang Tian, Colin Brain, Aasim Butt and Connor Lee	UKAS

Table 5

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Maximum Conducted Output Power

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (b)
ISED RSS-247, Clause 5.4
ISED RSS-GEN, Clause 6.12

2.1.2 Equipment Under Test and Modification State

A2439, S/N: C02DM00P0FTP - Modification State 0

2.1.3 Date of Test

04-January-2021

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10 clause 11.9.1.3 Method PKPM1

2.1.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	29.8 %

2.1.6 Test Results

2.4 GHz Bluetooth - DTS

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	3.33

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	-	-	17.25	-	-	30.00	-12.75
2441	-	-	17.29	-	-	30.00	-12.71
2478	-	-	17.26	-	-	30.00	-12.74

Table 6 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	-	-	17.25	-	-	30.00	-12.75	20.58	36.00	-15.42
2441	-	-	17.29	-	-	30.00	-12.71	20.62	36.00	-15.38
2478	-	-	17.26	-	-	30.00	-12.74	20.59	36.00	-15.41

Table 7 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	3.33

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	-	-	17.91	-	-	30.00	-12.09
2441	-	-	17.99	-	-	30.00	-12.01
2478	-	-	18.10	-	-	30.00	-11.90

Table 8 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	-	-	17.91	-	-	30.00	-12.09	21.24	36.00	-14.76
2441	-	-	17.99	-	-	30.00	-12.01	21.32	36.00	-14.68
2478	-	-	18.10	-	-	30.00	-11.90	21.43	36.00	-14.57

Table 9 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	4.79

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	-	17.16	17.36	-	20.26	30.00	-9.74
2441	-	17.07	17.04	-	20.04	30.00	-9.96
2478	-	17.21	17.08	-	20.12	30.00	-9.88

Table 10 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	-	17.16	17.36	-	20.26	30.00	-9.74	25.05	36.00	-10.95
2441	-	17.07	17.04	-	20.04	30.00	-9.96	24.83	36.00	-11.17
2478	-	17.21	17.08	-	20.12	30.00	-9.88	24.91	36.00	-11.09

Table 11 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911D01 v02r01 E)1)		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.4
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	4.79

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	-	17.55	17.64	-	20.56	30.00	-9.44
2441	-	17.66	17.67	-	20.63	30.00	-9.37
2478	-	17.90	17.73	-	20.78	30.00	-9.22

Table 12 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	-	17.55	17.64	-	20.56	30.00	-9.44	25.35	36.00	-10.65
2441	-	17.66	17.67	-	20.63	30.00	-9.37	25.42	36.00	-10.58
2478	-	17.90	17.73	-	20.78	30.00	-9.22	25.57	36.00	-10.43

Table 13 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	3.33

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	-	-	13.78	-	-	30.00	-16.22
2440	-	-	13.61	-	-	30.00	-16.39
2480	-	-	13.60	-	-	30.00	-16.40

Table 14 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	-	-	13.78	-	-	30.00	-16.22	17.11	36.00	-18.89
2440	-	-	13.61	-	-	30.00	-16.39	16.94	36.00	-19.06
2480	-	-	13.60	-	-	30.00	-16.40	16.93	36.00	-19.07

Table 15 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	3.33

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	-	-	13.88	-	-	30.00	-16.12
2440	-	-	13.70	-	-	30.00	-16.30
2480	-	-	13.70	-	-	30.00	-16.30

Table 16 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	-	-	13.88	-	-	30.00	-16.12	17.21	36.00	-18.79
2440	-	-	13.70	-	-	30.00	-16.30	17.03	36.00	-18.97
2480	-	-	13.70	-	-	30.00	-16.30	17.03	36.00	-18.97

Table 17 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	ePa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	4.79

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	-	13.37	13.26	-	16.31	30.00	-13.69
2440	-	13.35	13.71	-	16.52	30.00	-13.48
2480	-	13.09	13.67	-	16.36	30.00	-13.64

Table 18 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	-	13.37	13.26	-	16.31	30.00	-13.69	21.10	36.00	-14.90
2440	-	13.35	13.71	-	16.52	30.00	-13.48	21.32	36.00	-14.68
2480	-	13.09	13.67	-	16.36	30.00	-13.64	21.15	36.00	-14.85

Table 19 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	ePa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	4.79

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	-	13.56	13.39	-	16.44	30.00	-13.56
2440	-	13.23	13.62	-	16.40	30.00	-13.60
2480	-	12.85	13.58	-	16.21	30.00	-13.79

Table 20 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	-	13.56	13.39	-	16.44	30.00	-13.56	21.24	36.00	-14.76
2440	-	13.23	13.62	-	16.40	30.00	-13.60	21.20	36.00	-14.80
2480	-	12.85	13.58	-	16.21	30.00	-13.79	21.00	36.00	-15.00

Table 21 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	1.00

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	8.35	-	-	-	-	30.00	-21.65
2441	8.53	-	-	-	-	30.00	-21.47
2478	8.75	-	-	-	-	30.00	-21.25

Table 22 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	8.35	-	-	-	-	30.00	-21.65	9.35	36.00	-26.65
2441	8.53	-	-	-	-	30.00	-21.47	9.53	36.00	-26.47
2478	8.75	-	-	-	-	30.00	-21.25	9.75	36.00	-26.25

Table 23 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.5
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	1.00

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	9.32	-	-	-	-	30.00	-20.68
2441	9.16	-	-	-	-	30.00	-20.84
2478	9.40	-	-	-	-	30.00	-20.60

Table 24 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	9.32	-	-	-	-	30.00	-20.68	10.32	36.00	-25.68
2441	9.16	-	-	-	-	30.00	-20.84	10.16	36.00	-25.84
2478	9.40	-	-	-	-	30.00	-20.60	10.40	36.00	-25.60

Table 25 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	3.33

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	-	-	8.49	-	-	30.00	-21.51
2441	-	-	8.71	-	-	30.00	-21.29
2478	-	-	8.52	-	-	30.00	-21.48

Table 26 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	-	-	8.49	-	-	30.00	-21.51	11.82	36.00	-24.18
2441	-	-	8.71	-	-	30.00	-21.29	12.04	36.00	-23.96
2478	-	-	8.52	-	-	30.00	-21.48	11.85	36.00	-24.15

Table 27 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	3.33

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	-	-	9.15	-	-	30.00	-20.85
2441	-	-	9.39	-	-	30.00	-20.61
2478	-	-	9.12	-	-	30.00	-20.88

Table 28 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	-	-	9.15	-	-	30.00	-20.85	12.48	36.00	-23.52
2441	-	-	9.39	-	-	30.00	-20.61	12.72	36.00	-23.28
2478	-	-	9.12	-	-	30.00	-20.88	12.45	36.00	-23.55

Table 29 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	4.79

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	-	8.47	7.92	-	11.19	30.00	-18.81
2441	-	8.10	8.35	-	11.20	30.00	-18.80
2478	-	7.72	8.55	-	11.14	30.00	-18.86

Table 30 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	-	8.47	7.92	-	11.19	30.00	-18.81	15.99	36.00	-20.01
2441	-	8.10	8.35	-	11.20	30.00	-18.80	15.99	36.00	-20.01
2478	-	7.72	8.55	-	11.14	30.00	-18.86	15.93	36.00	-20.07

Table 31 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911D01 v02r01 E)1)		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.4
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	4.79

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2404	-	9.27	8.74	-	11.98	30.00	-18.02
2441	-	8.73	9.00	-	11.83	30.00	-18.17
2478	-	8.36	9.18	-	11.76	30.00	-18.24

Table 32 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2404	-	9.27	8.74	-	11.98	30.00	-18.02	16.78	36.00	-19.22
2441	-	8.73	9.00	-	11.83	30.00	-18.17	16.63	36.00	-19.37
2478	-	8.36	9.18	-	11.76	30.00	-18.24	16.55	36.00	-19.45

Table 33 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	1.00

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	13.35	-	-	-	-	30.00	-16.65
2440	13.33	-	-	-	-	30.00	-16.67
2480	13.50	-	-	-	-	30.00	-16.50

Table 34 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	13.35	-	-	-	-	30.00	-16.65	14.35	36.00	-21.65
2440	13.33	-	-	-	-	30.00	-16.67	14.33	36.00	-21.67
2480	13.50	-	-	-	-	30.00	-16.50	14.50	36.00	-21.50

Table 35 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	1.00

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	13.50	-	-	-	-	30.00	-16.50
2440	13.46	-	-	-	-	30.00	-16.54
2480	13.62	-	-	-	-	30.00	-16.38

Table 36 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	13.50	-	-	-	-	30.00	-16.50	14.50	36.00	-21.50
2440	13.46	-	-	-	-	30.00	-16.54	14.46	36.00	-21.54
2480	13.62	-	-	-	-	30.00	-16.38	14.62	36.00	-21.38

Table 37 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	3.33

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	-	-	13.76	-	-	30.00	-16.24
2440	-	-	13.61	-	-	30.00	-16.39
2480	-	-	13.57	-	-	30.00	-16.43

Table 38 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	-	-	13.76	-	-	30.00	-16.24	17.09	36.00	-18.91
2440	-	-	13.61	-	-	30.00	-16.39	16.94	36.00	-19.06
2480	-	-	13.57	-	-	30.00	-16.43	16.90	36.00	-19.10

Table 39 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	3.33

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	-	-	13.56	-	-	30.00	-16.44
2440	-	-	13.75	-	-	30.00	-16.25
2480	-	-	13.75	-	-	30.00	-16.25

Table 40 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	-	-	13.56	-	-	30.00	-16.44	16.89	36.00	-19.11
2440	-	-	13.75	-	-	30.00	-16.25	17.08	36.00	-18.92
2480	-	-	13.75	-	-	30.00	-16.25	17.08	36.00	-18.92

Table 41 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	iPa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	4.79

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	-	13.40	13.27	-	16.31	30.00	-13.69
2440	-	13.36	13.74	-	16.52	30.00	-13.48
2480	-	13.11	13.64	-	16.36	30.00	-13.64

Table 42 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	-	13.40	13.27	-	16.31	30.00	-13.69	21.10	36.00	-14.90
2440	-	13.36	13.74	-	16.52	30.00	-13.48	21.31	36.00	-14.69
2480	-	13.11	13.64	-	16.36	30.00	-13.64	21.15	36.00	-14.85

Table 43 - ISED Maximum Conducted (peak) Output Power Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (b)(3) RSS-247 5.4 d)	Test Method(s):	C63.10 11.9.1.3
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911D01 v02r01 E)1)		

DUT Configuration			
Mode:	iPa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	4.79

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	∑		
2402	-	13.56	13.41	-	16.47	30.00	-13.53
2440	-	13.24	13.61	-	16.41	30.00	-13.59
2480	-	13.31	13.81	-	16.54	30.00	-13.46

Table 44 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	∑					
2402	-	13.56	13.41	-	16.47	30.00	-13.53	21.26	36.00	-14.74
2440	-	13.24	13.61	-	16.41	30.00	-13.59	21.21	36.00	-14.79
2480	-	13.31	13.81	-	16.54	30.00	-13.46	21.34	36.00	-14.66

Table 45 - ISED Maximum Conducted (peak) Output Power Results

FCC 47 CFR Part 15, Limit Clause 15.247 (b)(3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

ISED RSS-247, Limit Clause 5.4 (d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e) of the specification.

2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Multimeter	Iso-tech	IDM101	2424	12	14-Dec-2021
Hygrometer	Rotronic	I-1000	3220	12	16-Oct-2021
Climatic Chamber	Aralab	FitoTerm 300E45	4823	12	19-Mar-2021
USB Power Sensor	Boonton	RTP5006	5184	12	09-Jan-2021
USB Power Sensor	Boonton	RTP5006	5187	12	09-Jan-2021
AC Programmable Power Supply	iTech	IT7324	5225	-	O/P Mon
USB Power Sensor	Boonton	RTP5006	5279	12	27-Apr-2021
Signal Commissioning Unit	TUV SUD	SCU001	5546	12	15-Apr-2021

Table 46

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

2.2 Power Spectral Density

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (e)
ISED RSS-247, Clause 5.2
ISED RSS-GEN, Clause 6.12

2.2.2 Equipment Under Test and Modification State

A2439, S/N: C02DM00P0FTP - Modification State 0

2.2.3 Date of Test

04-January-2021

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.10.2 (PKPSD).

2.2.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	29.8 %

2.2.6 Test Results

2.4 GHz Bluetooth - DTS

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-	-	-2.19	-	-	8.00	-10.19
2441	3.0	-	-	-2.34	-	-	8.00	-10.34
2478	3.0	-	-	-2.14	-	-	8.00	-10.14

Table 47 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-	-	-1.95	-	-	8.00	-9.95
2441	3.0	-	-	-1.78	-	-	8.00	-9.78
2478	3.0	-	-	-1.46	-	-	8.00	-9.46

Table 48 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	662911 D01 v02r01 E)2)b)		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-	-10.99	-10.96	-	-7.97	8.00	-15.97
2441	3.0	-	-10.76	-9.85	-	-7.27	8.00	-15.27
2478	3.0	-	-10.65	-9.42	-	-6.98	8.00	-14.98

Table 49 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	662911 D01 v02r01 E)2)b)		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.4
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-	-10.58	-11.71	-	-8.10	8.00	-16.10
2441	3.0	-	-10.43	-10.37	-	-7.39	8.00	-15.39
2478	3.0	-	-10.28	-9.05	-	-6.61	8.00	-14.61

Table 50 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-	-	-2.22	-	-	8.00	-10.22
2440	3.0	-	-	-2.45	-	-	8.00	-10.45
2480	3.0	-	-	-2.19	-	-	8.00	-10.19

Table 51 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-	-	-4.38	-	-	8.00	-12.38
2440	3.0	-	-	-4.61	-	-	8.00	-12.61
2480	3.0	-	-	-4.40	-	-	8.00	-12.40

Table 52 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	662911 D01 v02r01 E)2)b)		

DUT Configuration			
Mode:	ePa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-	-2.63	-2.80	-	0.30	8.00	-7.70
2440	3.0	-	-2.67	-2.20	-	0.58	8.00	-7.42
2480	3.0	-	-2.77	-2.11	-	0.59	8.00	-7.41

Table 53 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	662911 D01 v02r01 E)2)b)		

DUT Configuration			
Mode:	ePa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-	-4.84	-4.91	-	-1.86	8.00	-9.86
2440	3.0	-	-5.20	-4.63	-	-1.89	8.00	-9.89
2480	3.0	-	-5.45	-4.56	-	-1.97	8.00	-9.97

Table 54 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-11.43	-	-	-	-	8.00	-19.43
2441	3.0	-11.23	-	-	-	-	8.00	-19.23
2478	3.0	-10.77	-	-	-	-	8.00	-18.77

Table 55 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.5
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-11.02	-	-	-	-	8.00	-19.02
2441	3.0	-10.80	-	-	-	-	8.00	-18.80
2478	3.0	-10.45	-	-	-	-	8.00	-18.45

Table 56 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-	-	-11.16	-	-	8.00	-19.16
2441	3.0	-	-	-10.89	-	-	8.00	-18.89
2478	3.0	-	-	-10.93	-	-	8.00	-18.93

Table 57 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-	-	-10.66	-	-	8.00	-18.66
2441	3.0	-	-	-10.51	-	-	8.00	-18.51
2478	3.0	-	-	-10.56	-	-	8.00	-18.56

Table 58 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	662911 D01 v02r01 E)2)b)		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR4)	Duty Cycle (%):	78.3
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-	-11.06	-13.82	-	-9.21	8.00	-17.21
2441	3.0	-	-10.84	-10.12	-	-7.45	8.00	-15.45
2478	3.0	-	-10.73	-12.14	-	-8.37	8.00	-16.37

Table 59 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	662911 D01 v02r01 E)2)b)		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR8)	Duty Cycle (%):	78.4
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2404	3.0	-	-10.96	-14.36	-	-9.32	8.00	-17.32
2441	3.0	-	-10.95	-23.51	-	-10.71	8.00	-18.71
2478	3.0	-	-10.27	-13.69	-	-8.64	8.00	-16.64

Table 60 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-2.54	-	-	-	-	8.00	-10.54
2440	3.0	-2.62	-	-	-	-	8.00	-10.62
2480	3.0	-2.30	-	-	-	-	8.00	-10.30

Table 61 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-4.67	-	-	-	-	8.00	-12.67
2440	3.0	-4.74	-	-	-	-	8.00	-12.74
2480	3.0	-4.39	-	-	-	-	8.00	-12.39

Table 62 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-	-	-2.18	-	-	8.00	-10.18
2440	3.0	-	-	-2.37	-	-	8.00	-10.37
2480	3.0	-	-	-2.21	-	-	8.00	-10.21

Table 63 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-	-	-4.78	-	-	8.00	-12.78
2440	3.0	-	-	-4.54	-	-	8.00	-12.54
2480	3.0	-	-	-4.34	-	-	8.00	-12.34

Table 64 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	662911 D01 v02r01 E)2)b)		

DUT Configuration			
Mode:	iPa GFSK (LE 1M)	Duty Cycle (%):	60.6
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-	-2.63	-2.77	-	0.31	8.00	-7.69
2440	3.0	-	-2.60	-2.24	-	0.59	8.00	-7.41
2480	3.0	-	-2.75	-2.11	-	0.60	8.00	-7.40

Table 65 - Maximum Power Spectral Density Results

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (e) RSS-247 5.2 b)	Test Method(s):	C63.10 11.10.2
Additional Reference(s):	662911 D01 v02r01 E)2)b)		

DUT Configuration			
Mode:	iPa GFSK (LE 2M)	Duty Cycle (%):	31.4
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	RBW (kHz)	PSD (dBm/RBW)					Limit (dBm/3 kHz)	Margin (dB)
		A	B	C	D	Σ		
2402	3.0	-	-4.78	-4.90	-	-1.83	8.00	-9.83
2440	3.0	-	-5.18	-4.66	-	-1.90	8.00	-9.90
2480	3.0	-	-4.88	-4.21	-	-1.52	8.00	-9.52

Table 66 - Maximum Power Spectral Density Results

FCC 47 CFR Part 15, Limit Clause 15.247 (e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

ISED RSS-247, Limit Clause 5.2(b)

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	17-May-2021
Multimeter	Iso-tech	IDM101	2424	12	14-Dec-2021
Hygrometer	Rotronic	I-1000	3220	12	16-Oct-2021
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	17-May-2021
Climatic Chamber	Aralab	FitoTerm 300E45	4823	12	19-Mar-2021
AC Programmable Power Supply	iTech	IT7324	5225	-	O/P Mon
MXA Signal Analyser	Keysight Technologies	N9020B	5528	24	04-Mar-2022
Signal Commissioning Unit	TUV SUD	SCU001	5546	12	15-Apr-2021

Table 67

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

2.3 Emission Bandwidth

2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (a)(2)
ISED RSS-247, Clause 5.2
ISED RSS-GEN, Clause 6.7

2.3.2 Equipment Under Test and Modification State

A2439, S/N: C02DM00P0FTP - Modification State 0

2.3.3 Date of Test

04-January-2021

2.3.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.8.1.

2.3.5 Environmental Conditions

Ambient Temperature	21.0 °C
Relative Humidity	29.8 %

2.3.6 Test Results

2.4 GHz Bluetooth - DTS

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR4)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	-	1.576	-	1.576	≥500.0
2441	-	-	1.576	-	1.576	≥500.0
2478	-	-	1.592	-	1.592	≥500.0

Table 68 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	-	2.344	-	2.344	-
2441	-	-	2.352	-	2.352	-
2478	-	-	2.352	-	2.352	-

Table 69 - 99% Bandwidth Results

Figure 1 - Core0 (C) 2404 MHz (CH2) 99% Bandwidth

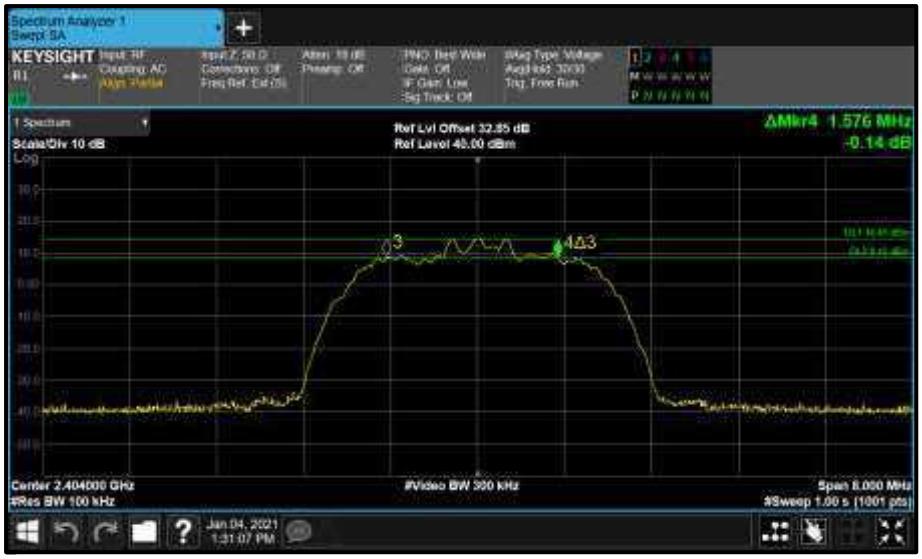

Figure 2 - Core0 (C) 2404 MHz (CH2) 6 dB Bandwidth

Figure 3 - Core0 (C) 2441 MHz (CH39) 99% Bandwidth

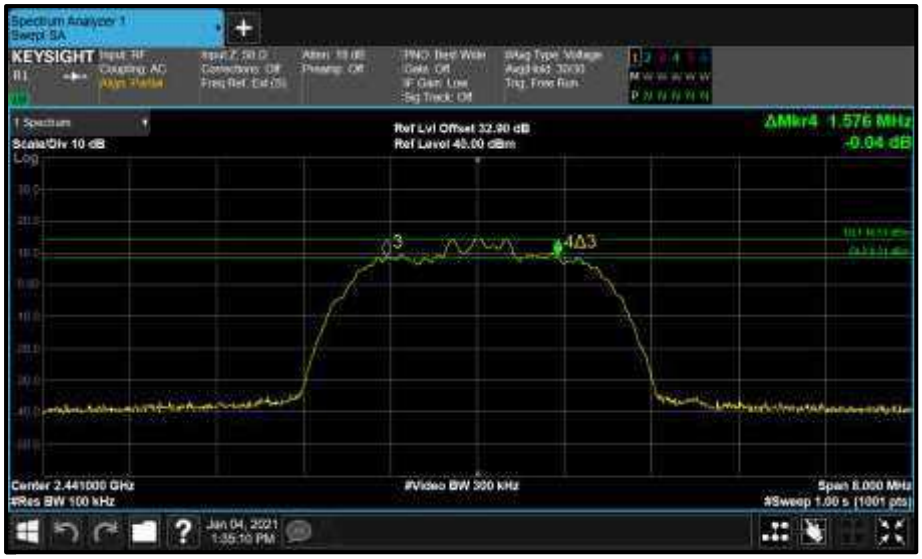

Figure 4 - Core0 (C) 2441 MHz (CH39) 6 dB Bandwidth

Figure 5 - Core0 (C) 2478 MHz (CH76) 99% Bandwidth

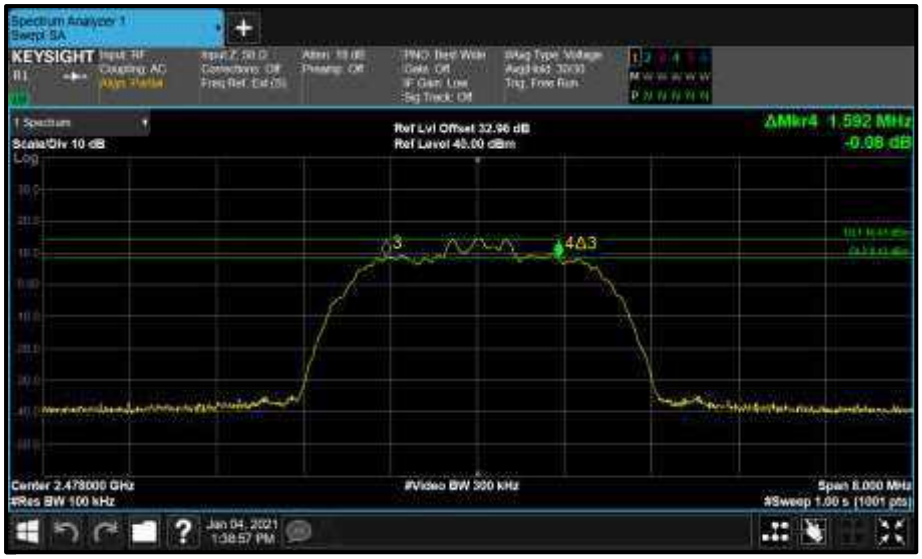

Figure 6 - Core0 (C) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR8)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	-	0.660	-	0.660	≥500.0
2441	-	-	0.660	-	0.660	≥500.0
2478	-	-	0.675	-	0.675	≥500.0

Table 70 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	-	4.500	-	4.500	-
2441	-	-	4.500	-	4.500	-
2478	-	-	4.515	-	4.515	-

Table 71 - 99% Bandwidth Results

Figure 7 - Core0 (C) 2404 MHz (CH2) 99% Bandwidth

Figure 8 - Core0 (C) 2404 MHz (CH2) 6 dB Bandwidth

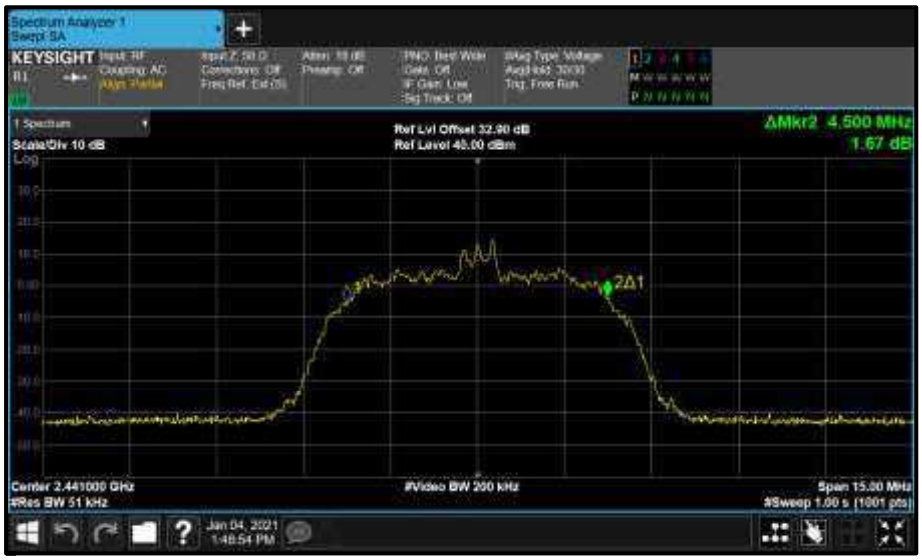

Figure 9 - Core0 (C) 2441 MHz (CH39) 99% Bandwidth

Figure 10 - Core0 (C) 2441 MHz (CH39) 6 dB Bandwidth

Figure 11 - Core0 (C) 2478 MHz (CH76) 99% Bandwidth

Figure 12 - Core0 (C) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR4)	Duty Cycle (%):	-
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	1.584	1.576	-	1.576	≥500.0
2441	-	1.592	1.584	-	1.584	≥500.0
2478	-	1.584	1.584	-	1.584	≥500.0

Table 72 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	2.344	2.344	-	2.344	-
2441	-	2.344	2.344	-	2.344	-
2478	-	2.344	2.344	-	2.344	-

Table 73 - 99% Bandwidth Results

Figure 13 - Core1 (B) 2404 MHz (CH2) 99% Bandwidth

Figure 14 - Core1 (B) 2404 MHz (CH2) 6 dB Bandwidth

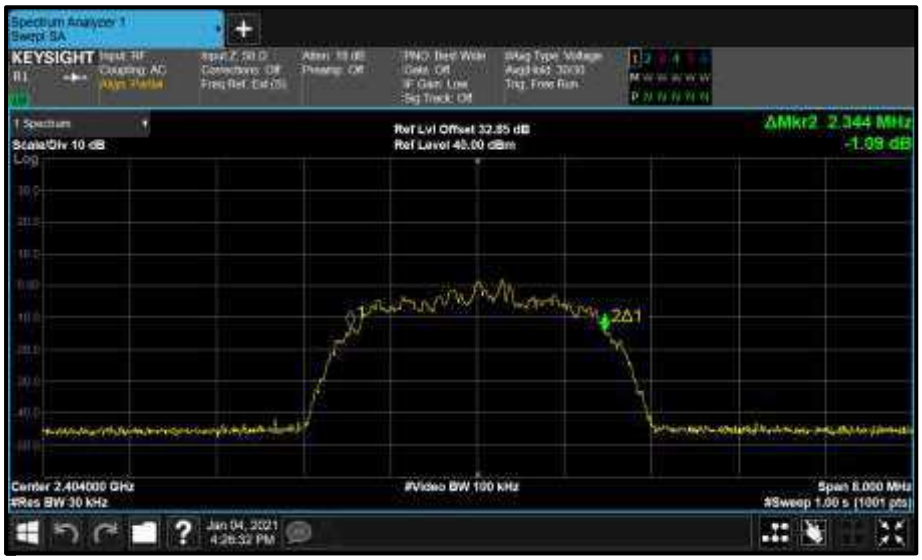

Figure 15 - Core0 (C) 2404 MHz (CH2) 99% Bandwidth

Figure 16 - Core0 (C) 2404 MHz (CH2) 6 dB Bandwidth

Figure 17 - Core1 (B) 2441 MHz (CH39) 99% Bandwidth

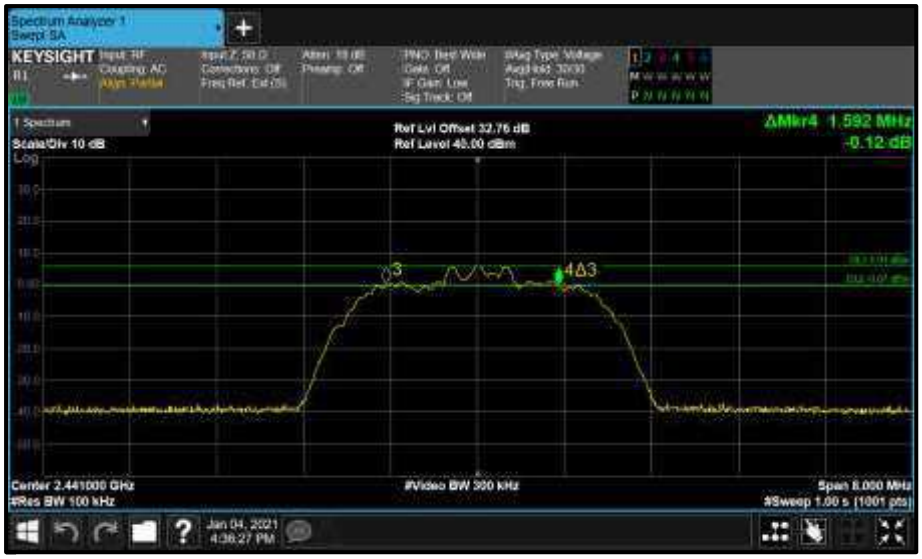

Figure 18 - Core1 (B) 2441 MHz (CH39) 6 dB Bandwidth

Figure 19 - Core0 (C) 2441 MHz (CH39) 99% Bandwidth

Figure 20 - Core0 (C) 2441 MHz (CH39) 6 dB Bandwidth

Figure 21 - Core1 (B) 2478 MHz (CH76) 99% Bandwidth

Figure 22 - Core1 (B) 2478 MHz (CH76) 6 dB Bandwidth

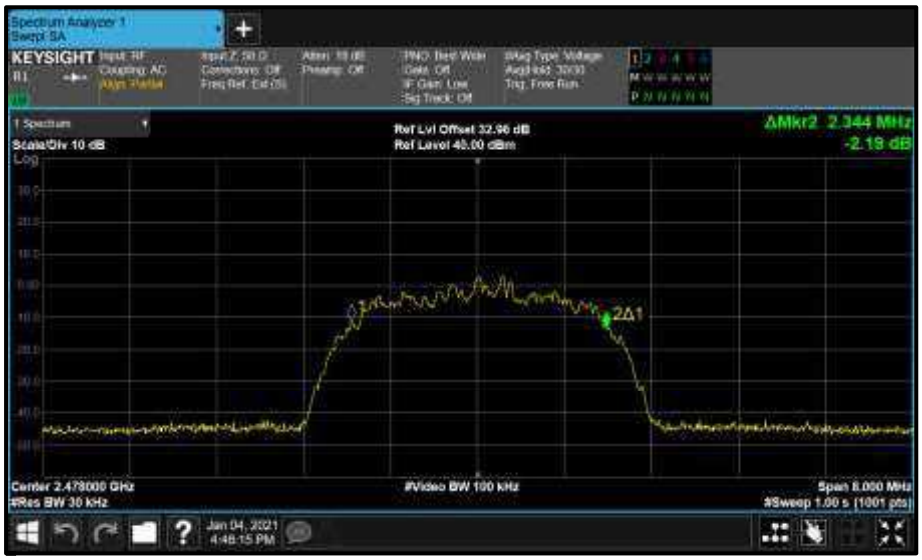

Figure 23 - Core0 (C) 2478 MHz (CH76) 99% Bandwidth

Figure 24 - Core0 (C) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa π/4 DQPSK (HDR8)	Duty Cycle (%):	-
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	0.945	0.915	-	0.915	≥500.0
2441	-	0.945	0.960	-	0.945	≥500.0
2478	-	0.930	0.945	-	0.930	≥500.0

Table 74 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	4.590	4.530	-	4.530	-
2441	-	4.530	4.530	-	4.530	-
2478	-	4.560	4.530	-	4.530	-

Table 75 - 99% Bandwidth Results

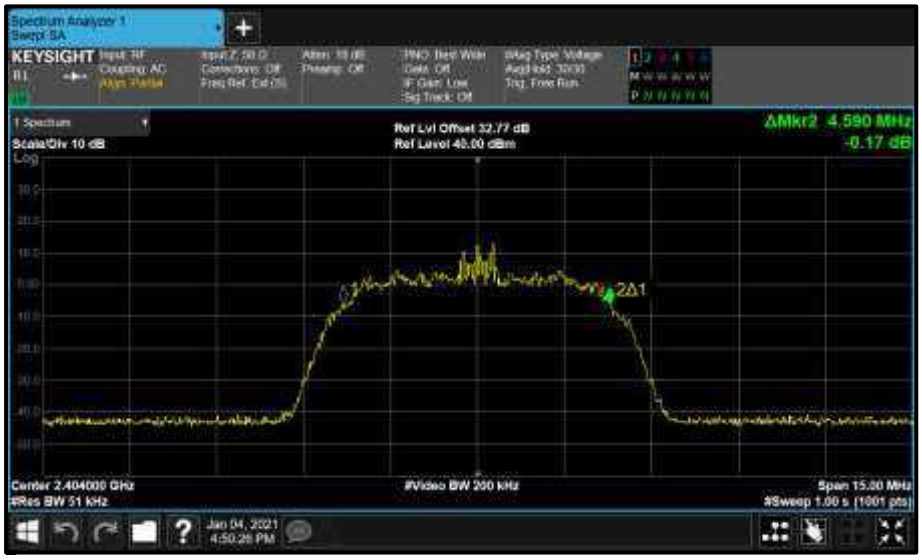

Figure 25 - Core1 (B) 2404 MHz (CH2) 99% Bandwidth

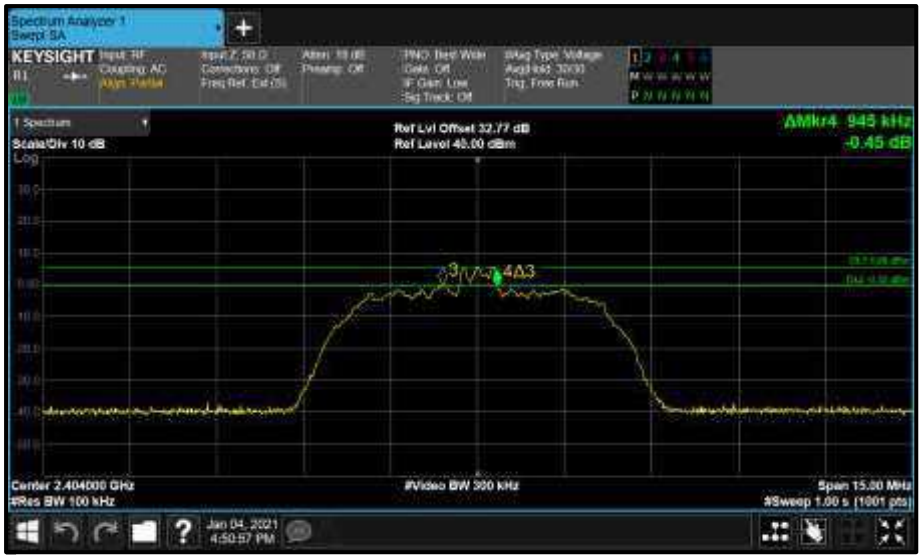

Figure 26 - Core1 (B) 2404 MHz (CH2) 6 dB Bandwidth

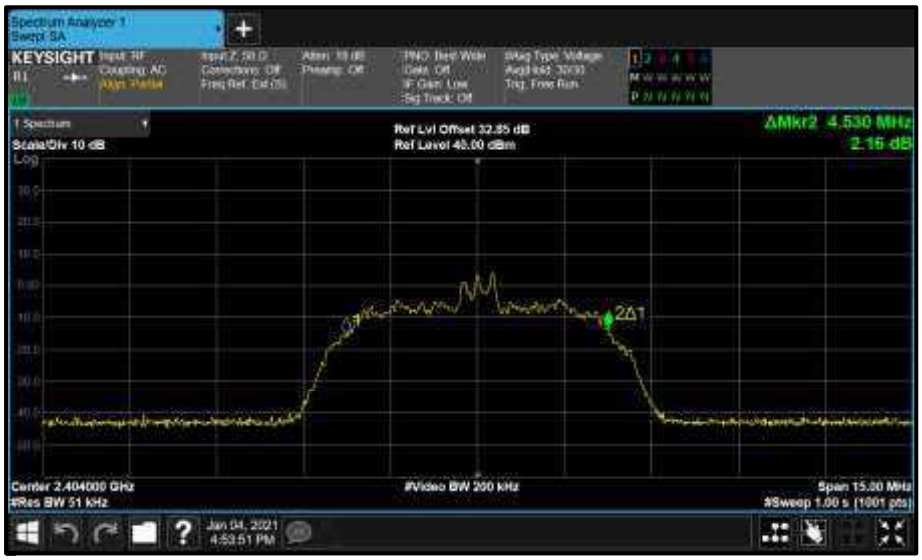

Figure 27 - Core0 (C) 2404 MHz (CH2) 99% Bandwidth

Figure 28 - Core0 (C) 2404 MHz (CH2) 6 dB Bandwidth

Figure 29 - Core1 (B) 2441 MHz (CH39) 99% Bandwidth

Figure 30 - Core1 (B) 2441 MHz (CH39) 6 dB Bandwidth

Figure 31 - Core0 (C) 2441 MHz (CH39) 99% Bandwidth

Figure 32 - Core0 (C) 2441 MHz (CH39) 6 dB Bandwidth

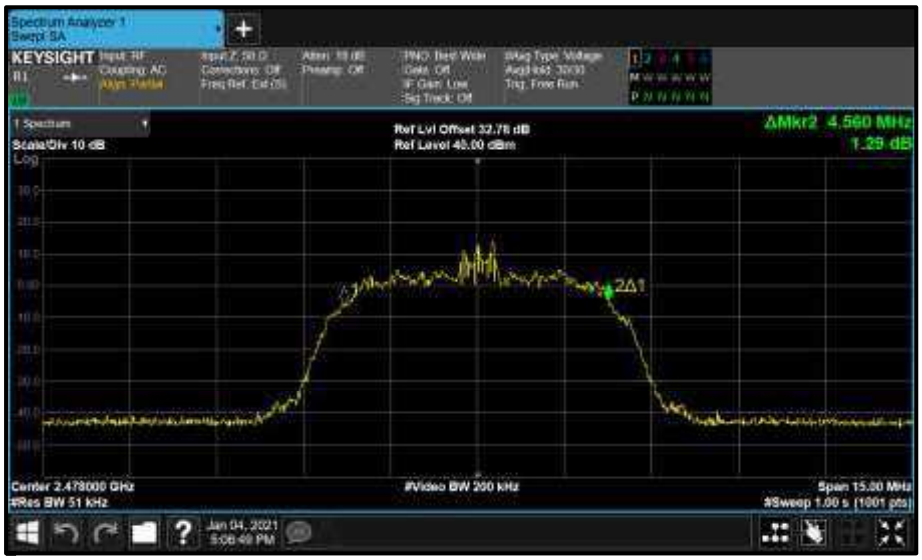

Figure 33 - Core1 (B) 2478 MHz (CH76) 99% Bandwidth

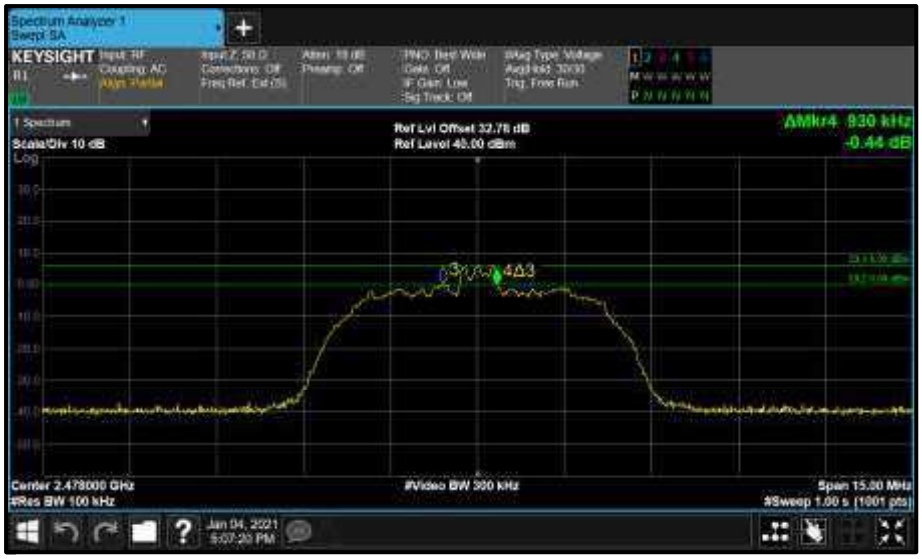

Figure 34 - Core1 (B) 2478 MHz (CH76) 6 dB Bandwidth

Figure 35 - Core0 (C) 2478 MHz (CH76) 99% Bandwidth

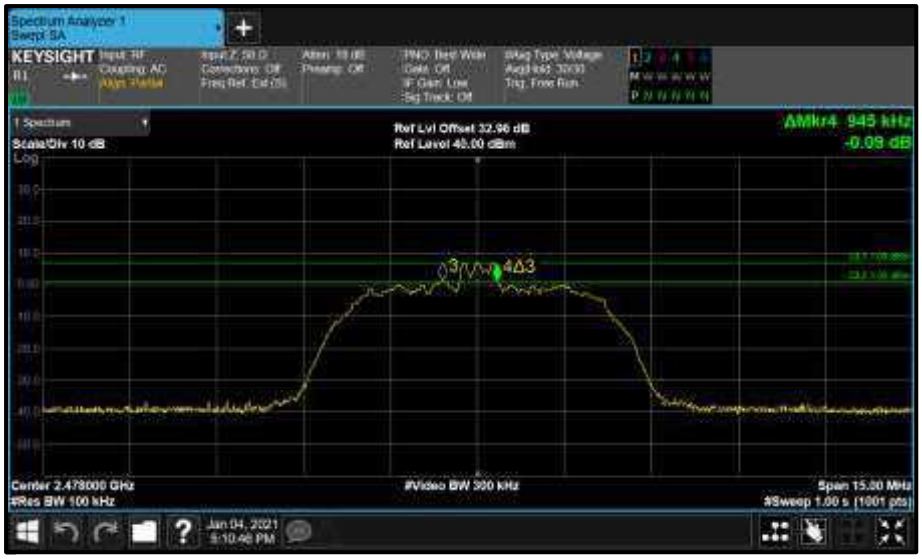

Figure 36 - Core0 (C) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa GFSK (LE 1M)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	-	0.676	-	0.676	≥500.0
2440	-	-	0.680	-	0.680	≥500.0
2480	-	-	0.688	-	0.688	≥500.0

Table 76 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	-	1.032	-	1.032	-
2440	-	-	1.032	-	1.032	-
2480	-	-	1.032	-	1.032	-

Table 77 - 99% Bandwidth Results

Figure 37 - Core0 (C) 2402 MHz (CH0) 99% Bandwidth

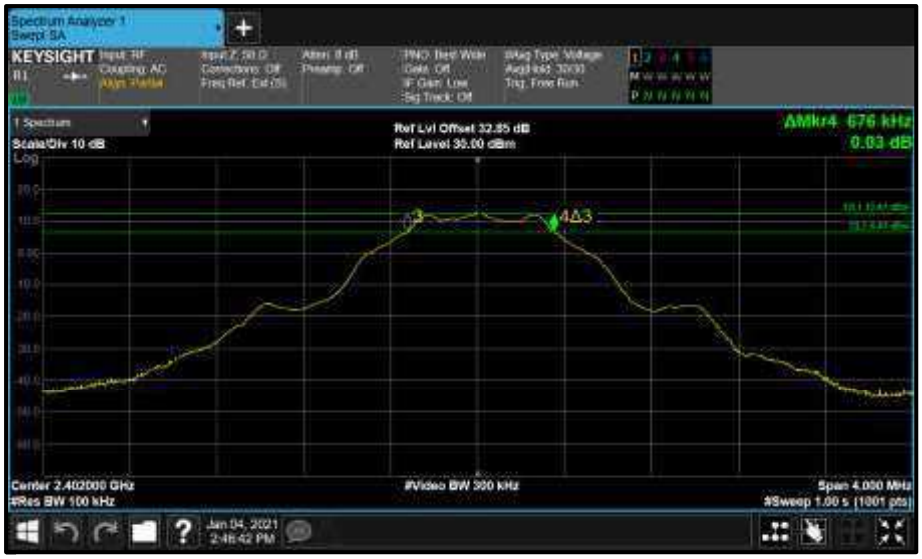

Figure 38 - Core0 (C) 2402 MHz (CH0) 6 dB Bandwidth

Figure 39 - Core0 (C) 2440 MHz (CH19) 99% Bandwidth

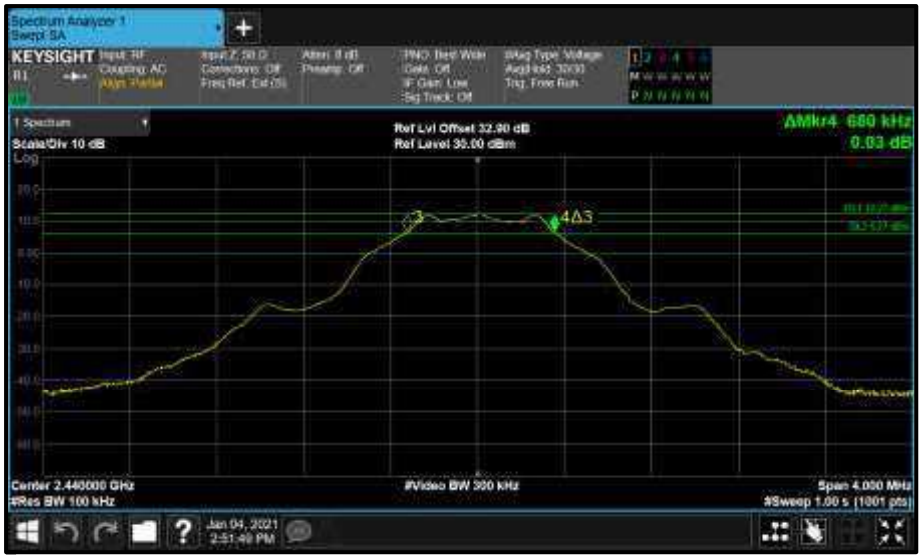

Figure 40 - Core0 (C) 2440 MHz (CH19) 6 dB Bandwidth

Figure 41 - Core0 (C) 2480 MHz (CH39) 99% Bandwidth

Figure 42 - Core0 (C) 2480 MHz (CH39) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa GFSK (LE 2M)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	-	1.176	-	1.176	≥500.0
2440	-	-	1.176	-	1.176	≥500.0
2480	-	-	1.176	-	1.176	≥500.0

Table 78 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	-	2.040	-	2.040	-
2440	-	-	2.048	-	2.048	-
2480	-	-	2.040	-	2.040	-

Table 79 - 99% Bandwidth Results

Figure 43 - Core0 (C) 2402 MHz (CH0) 99% Bandwidth

Figure 44 - Core0 (C) 2402 MHz (CH0) 6 dB Bandwidth

Figure 45 - Core0 (C) 2440 MHz (CH19) 99% Bandwidth

Figure 46 - Core0 (C) 2440 MHz (CH19) 6 dB Bandwidth

Figure 47 - Core0 (C) 2480 MHz (CH39) 99% Bandwidth

Figure 48 - Core0 (C) 2480 MHz (CH39) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa GFSK (LE 1M)	Duty Cycle (%):	-
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	0.692	0.672	-	0.672	≥500.0
2440	-	0.688	0.684	-	0.684	≥500.0
2480	-	0.688	0.692	-	0.688	≥500.0

Table 80 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	1.036	1.032	-	1.032	-
2440	-	1.040	1.032	-	1.032	-
2480	-	1.036	1.036	-	1.036	-

Table 81 - 99% Bandwidth Results

Figure 49 - Core1 (B) 2402 MHz (CH0) 99% Bandwidth

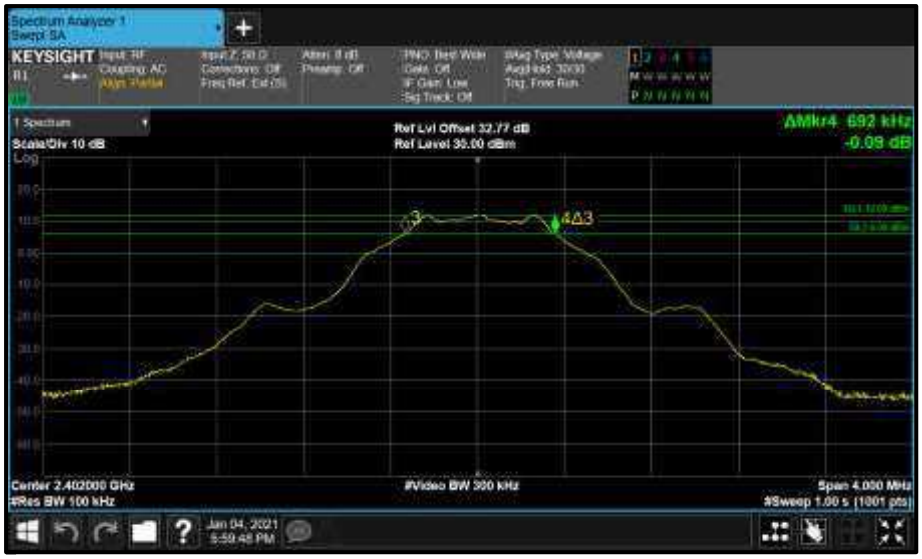

Figure 50 - Core1 (B) 2402 MHz (CH0) 6 dB Bandwidth

Figure 51 - Core0 (C) 2402 MHz (CH0) 99% Bandwidth

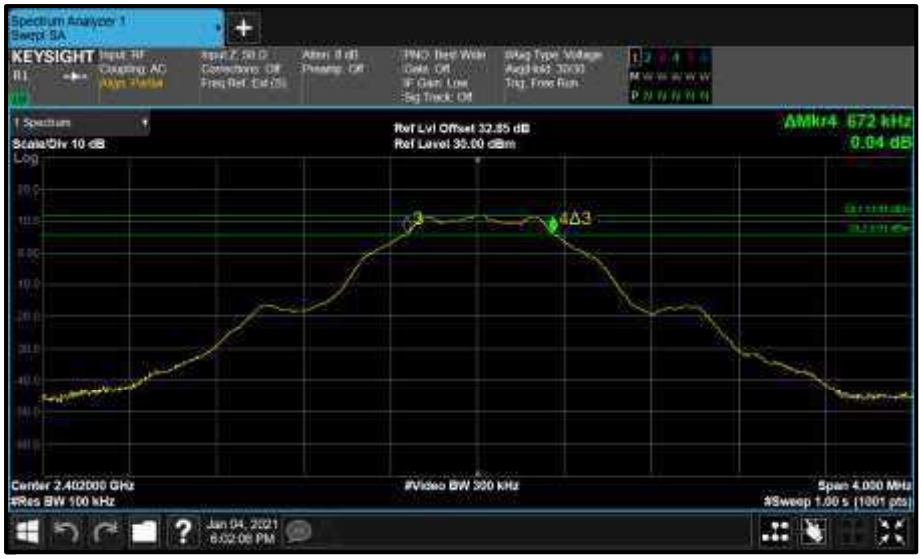

Figure 52 - Core0 (C) 2402 MHz (CH0) 6 dB Bandwidth

Figure 53 - Core1 (B) 2440 MHz (CH19) 99% Bandwidth

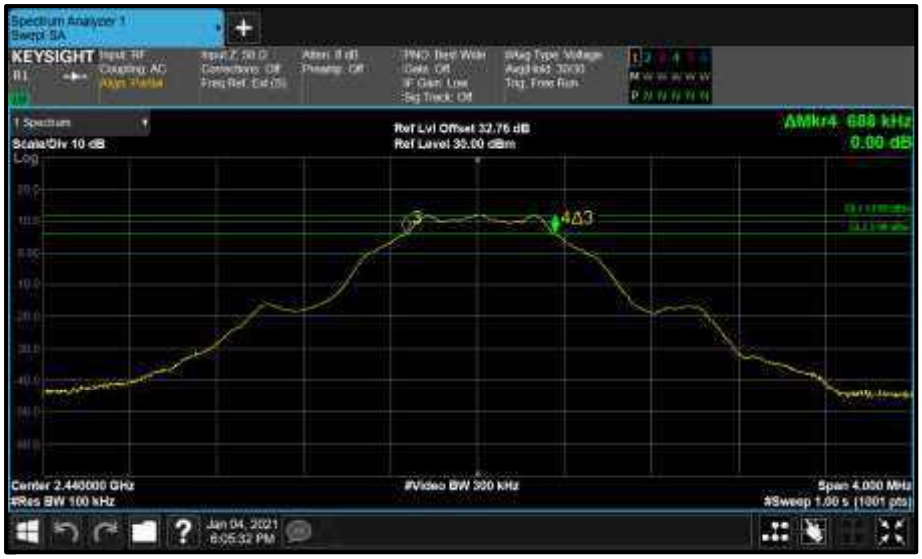

Figure 54 - Core1 (B) 2440 MHz (CH19) 6 dB Bandwidth

Figure 55 - Core0 (C) 2440 MHz (CH19) 99% Bandwidth

Figure 56 - Core0 (C) 2440 MHz (CH19) 6 dB Bandwidth

Figure 57 - Core1 (B) 2480 MHz (CH39) 99% Bandwidth

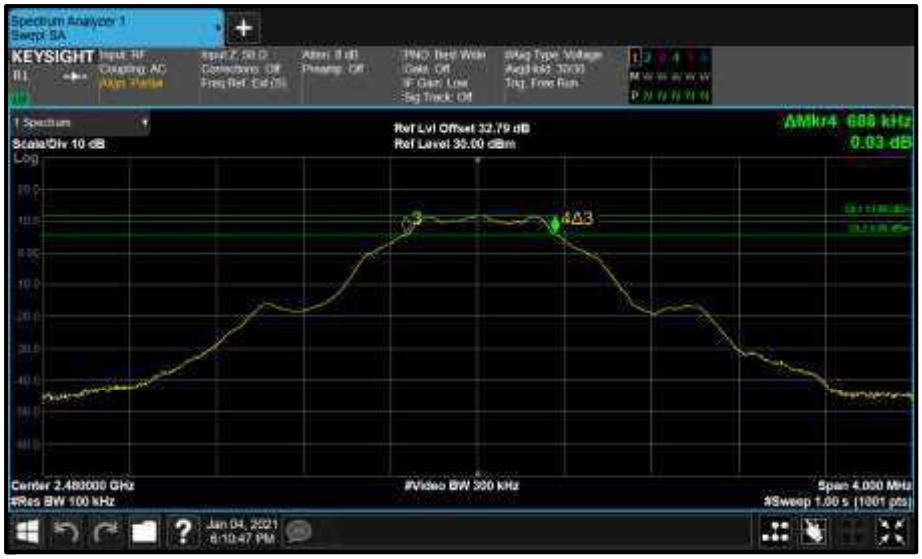

Figure 58 - Core1 (B) 2480 MHz (CH39) 6 dB Bandwidth

Figure 59 - Core0 (C) 2480 MHz (CH39) 99% Bandwidth

Figure 60 - Core0 (C) 2480 MHz (CH39) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePa GFSK (LE 2M)	Duty Cycle (%):	-
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	1.184	1.168	-	1.168	≥500.0
2440	-	1.184	1.176	-	1.176	≥500.0
2480	-	1.184	1.176	-	1.176	≥500.0

Table 82 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	2.048	2.040	-	2.040	-
2440	-	2.048	2.040	-	2.040	-
2480	-	2.048	2.048	-	2.048	-

Table 83 - 99% Bandwidth Results

Figure 61 - Core1 (B) 2402 MHz (CH0) 99% Bandwidth

Figure 62 - Core1 (B) 2402 MHz (CH0) 6 dB Bandwidth

Figure 63 - Core0 (C) 2402 MHz (CH0) 99% Bandwidth

Figure 64 - Core0 (C) 2402 MHz (CH0) 6 dB Bandwidth

Figure 65 - Core1 (B) 2440 MHz (CH19) 99% Bandwidth

Figure 66 - Core1 (B) 2440 MHz (CH19) 6 dB Bandwidth

Figure 67 - Core0 (C) 2440 MHz (CH19) 99% Bandwidth

Figure 68 - Core0 (C) 2440 MHz (CH19) 6 dB Bandwidth

Figure 69 - Core1 (B) 2480 MHz (CH39) 99% Bandwidth

Figure 70 - Core1 (B) 2480 MHz (CH39) 6 dB Bandwidth

Figure 71 - Core0 (C) 2480 MHz (CH39) 99% Bandwidth

Figure 72 - Core0 (C) 2480 MHz (CH39) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR4)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	1.584	-	-	-	1.584	≥500.0
2441	1.584	-	-	-	1.584	≥500.0
2478	1.584	-	-	-	1.584	≥500.0

Table 84 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	2.336	-	-	-	2.336	-
2441	2.336	-	-	-	2.336	-
2478	2.336	-	-	-	2.336	-

Table 85 - 99% Bandwidth Results

Figure 73 - Core2 (A) 2404 MHz (CH2) 99% Bandwidth

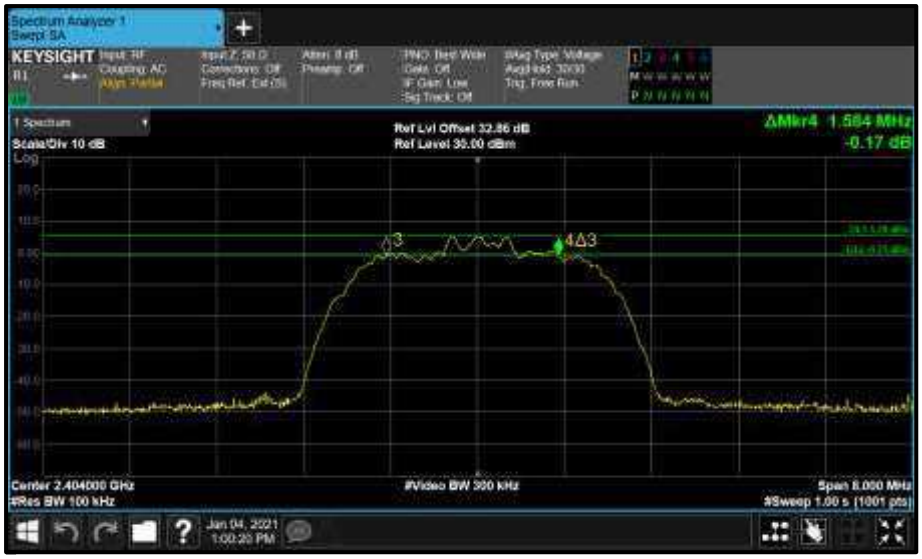

Figure 74 - Core2 (A) 2404 MHz (CH2) 6 dB Bandwidth

Figure 75 - Core2 (A) 2441 MHz (CH39) 99% Bandwidth

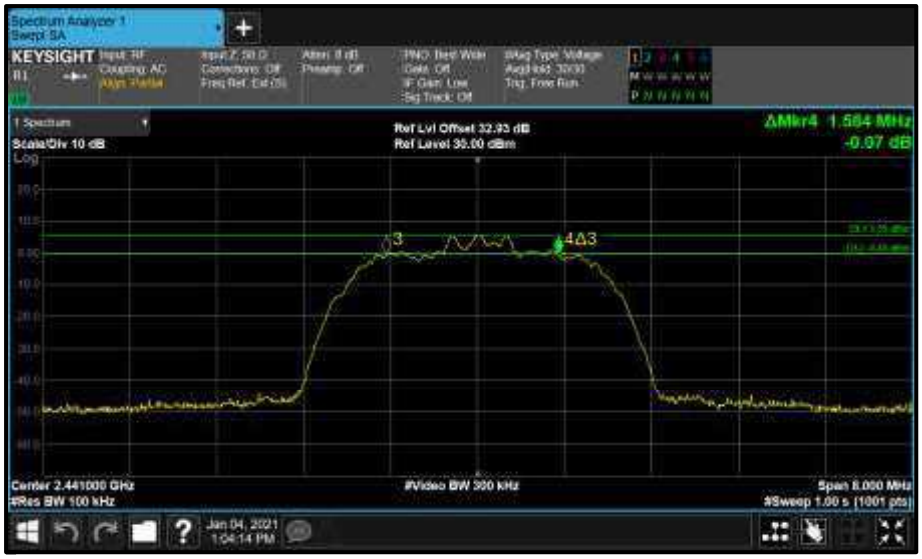

Figure 76 - Core2 (A) 2441 MHz (CH39) 6 dB Bandwidth

Figure 77 - Core2 (A) 2478 MHz (CH76) 99% Bandwidth

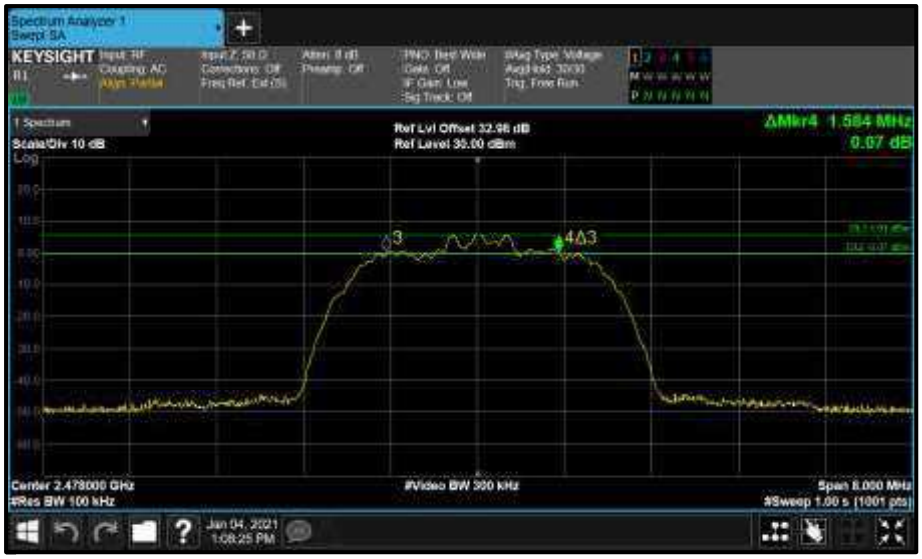

Figure 78 - Core2 (A) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR8)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	0.960	-	-	-	0.960	≥500.0
2441	0.945	-	-	-	0.945	≥500.0
2478	0.960	-	-	-	0.960	≥500.0

Table 86 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	4.500	-	-	-	4.500	-
2441	4.500	-	-	-	4.500	-
2478	4.515	-	-	-	4.515	-

Table 87 - 99% Bandwidth Results

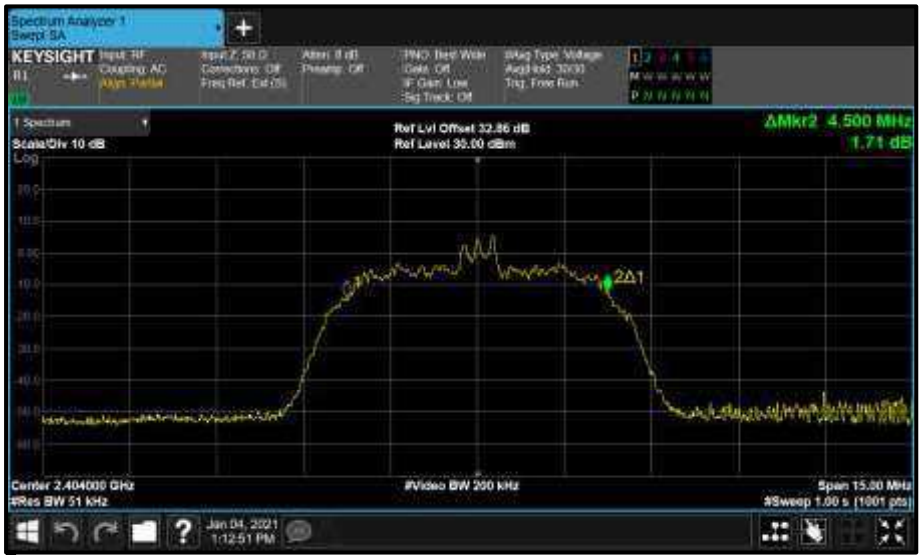

Figure 79 - Core2 (A) 2404 MHz (CH2) 99% Bandwidth

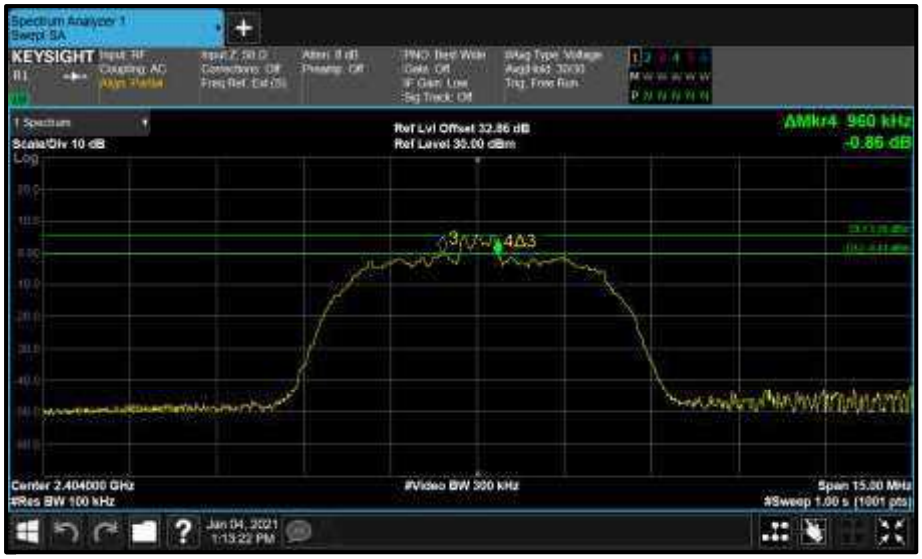

Figure 80 - Core2 (A) 2404 MHz (CH2) 6 dB Bandwidth

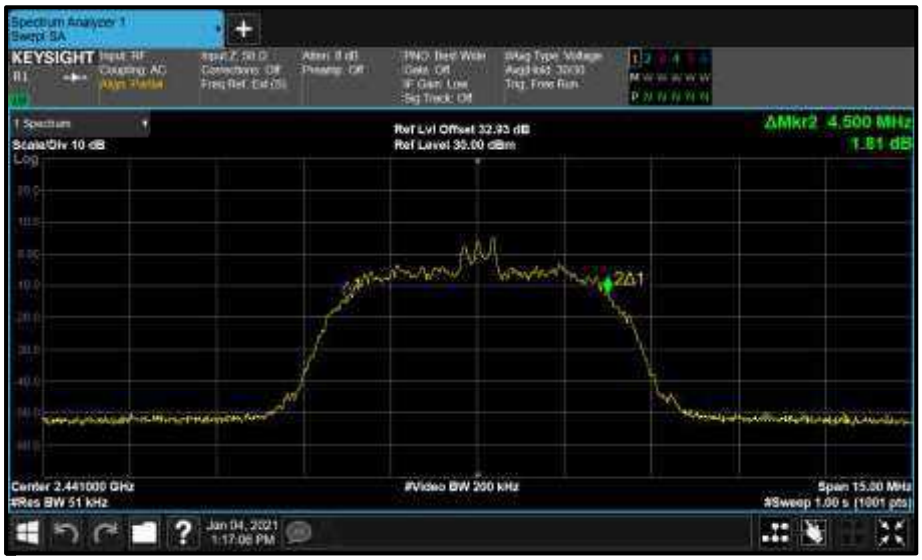

Figure 81 - Core2 (A) 2441 MHz (CH39) 99% Bandwidth

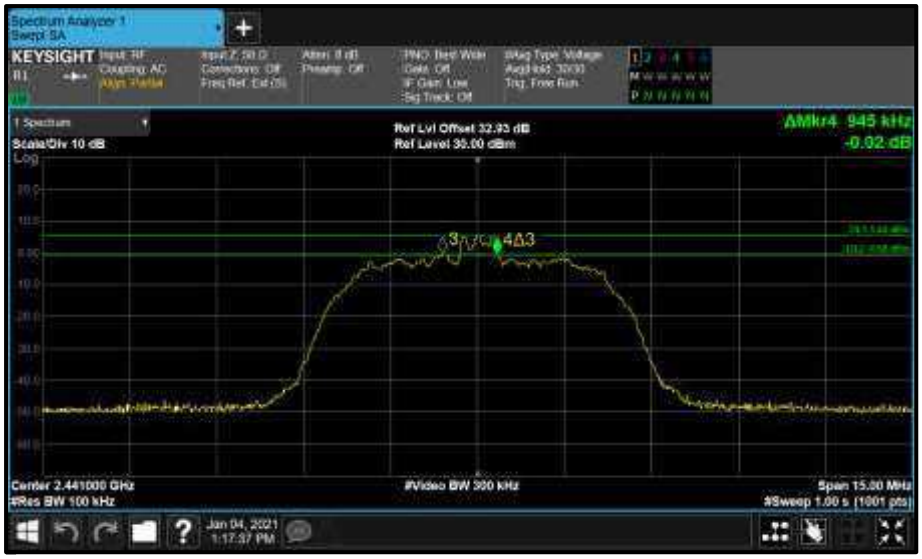

Figure 82 - Core2 (A) 2441 MHz (CH39) 6 dB Bandwidth

Figure 83 - Core2 (A) 2478 MHz (CH76) 99% Bandwidth

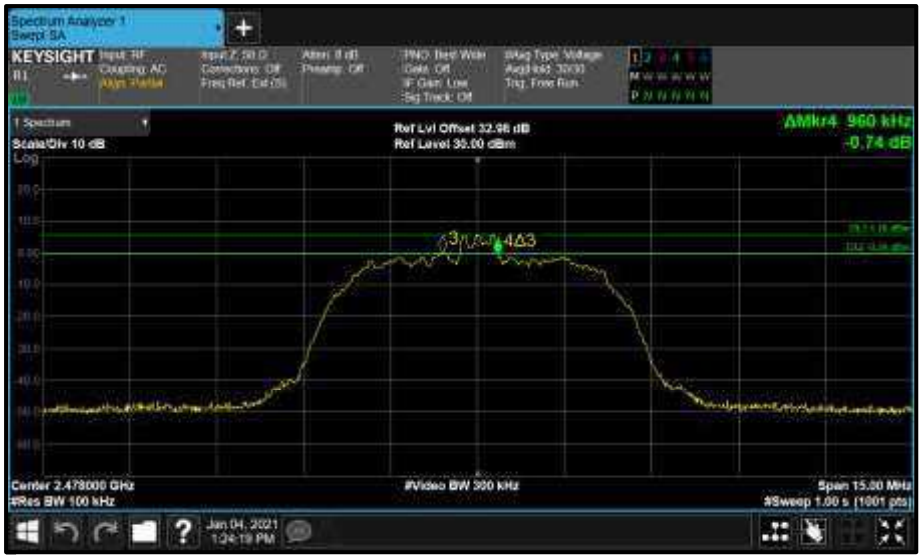

Figure 84 - Core2 (A) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR4)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	-	1.584	-	1.584	≥500.0
2441	-	-	1.584	-	1.584	≥500.0
2478	-	-	1.584	-	1.584	≥500.0

Table 88 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	-	2.336	-	2.336	-
2441	-	-	2.336	-	2.336	-
2478	-	-	2.344	-	2.344	-

Table 89 - 99% Bandwidth Results

Figure 85 - Core0 (C) 2404 MHz (CH2) 99% Bandwidth

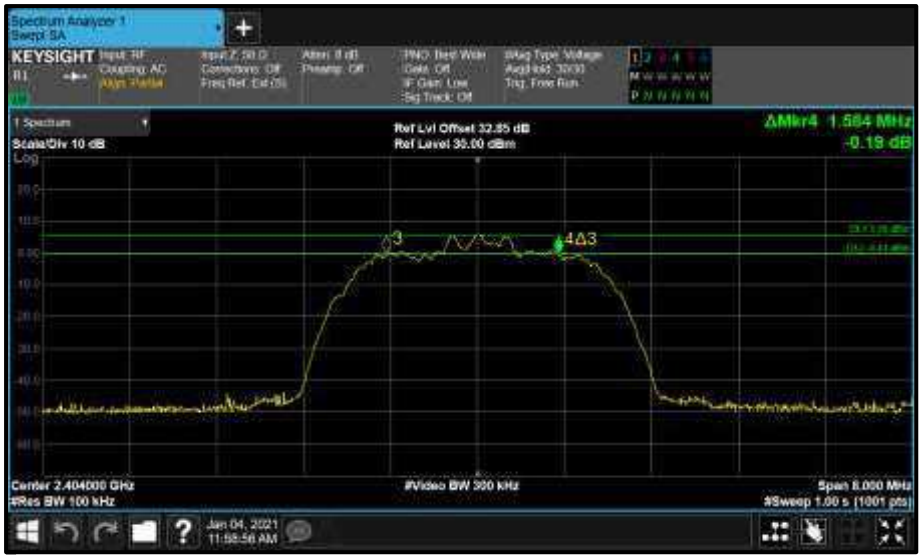

Figure 86 - Core0 (C) 2404 MHz (CH2) 6 dB Bandwidth

Figure 87 - Core0 (C) 2441 MHz (CH39) 99% Bandwidth

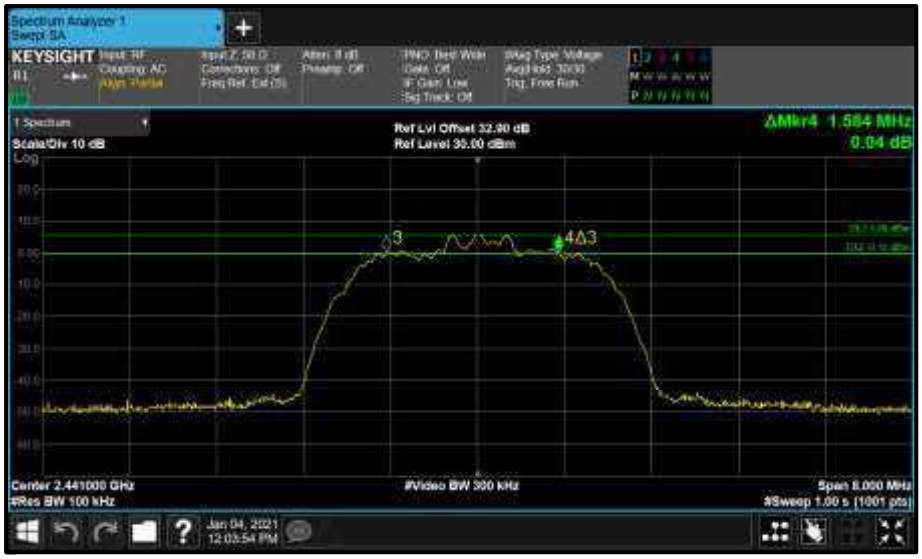

Figure 88 - Core0 (C) 2441 MHz (CH39) 6 dB Bandwidth

Figure 89 - Core0 (C) 2478 MHz (CH76) 99% Bandwidth

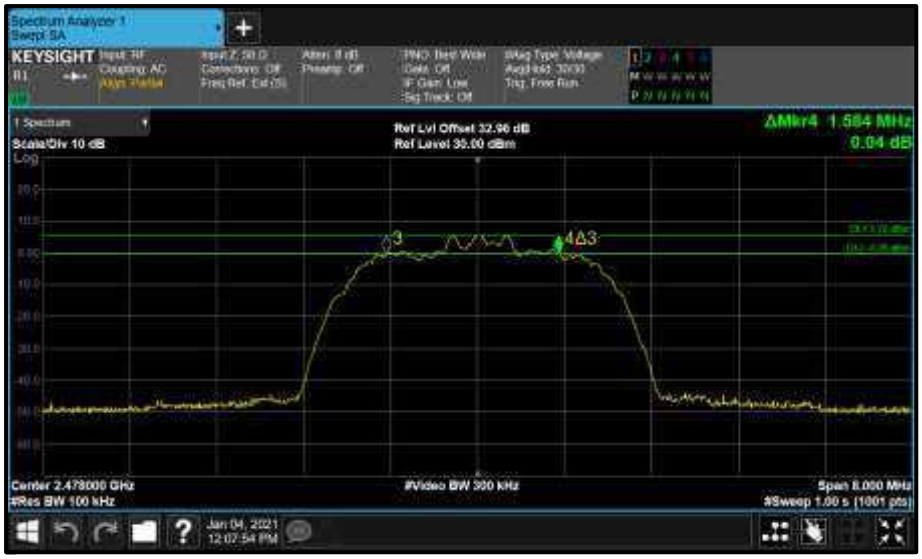

Figure 90 - Core0 (C) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR8)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	-	0.945	-	0.945	≥500.0
2441	-	-	0.945	-	0.945	≥500.0
2478	-	-	0.960	-	0.960	≥500.0

Table 90 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	-	4.500	-	4.500	-
2441	-	-	4.515	-	4.515	-
2478	-	-	4.515	-	4.515	-

Table 91 - 99% Bandwidth Results

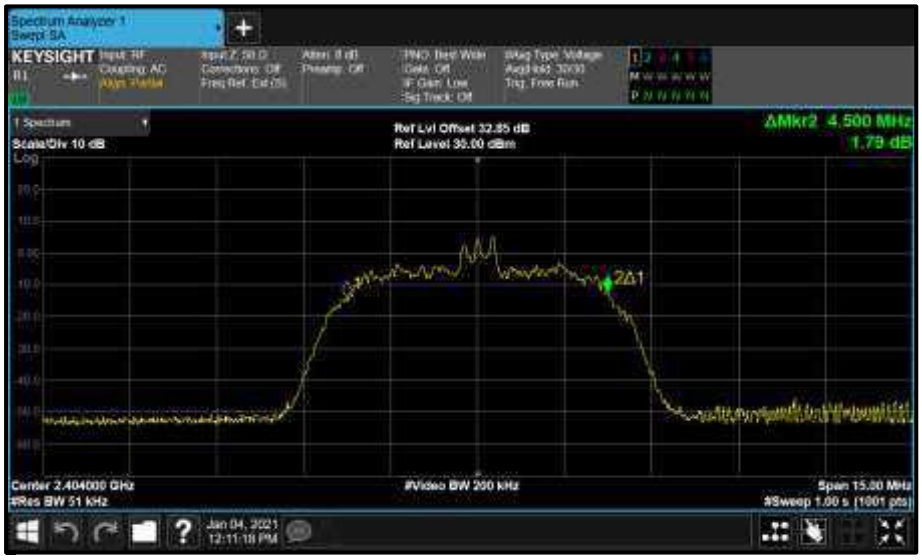

Figure 91 - Core0 (C) 2404 MHz (CH2) 99% Bandwidth

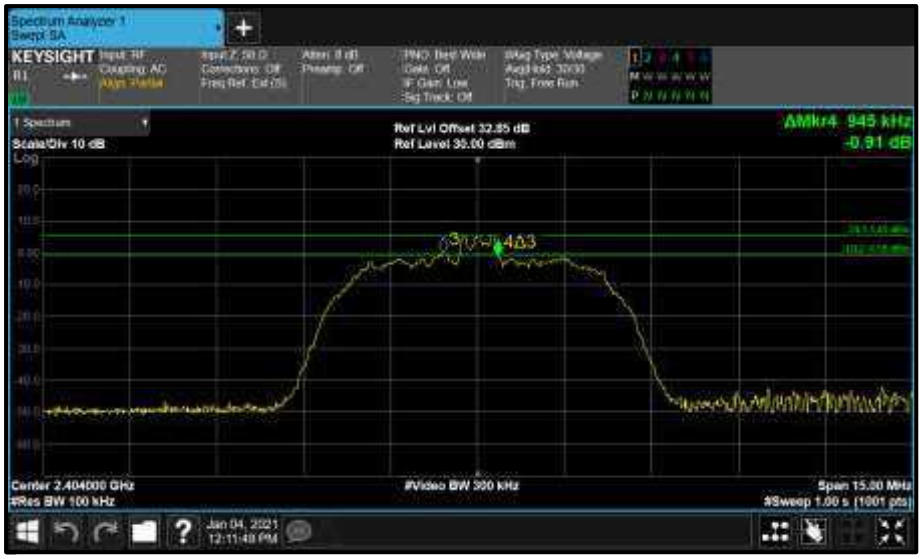

Figure 92 - Core0 (C) 2404 MHz (CH2) 6 dB Bandwidth

Figure 93 - Core0 (C) 2441 MHz (CH39) 99% Bandwidth

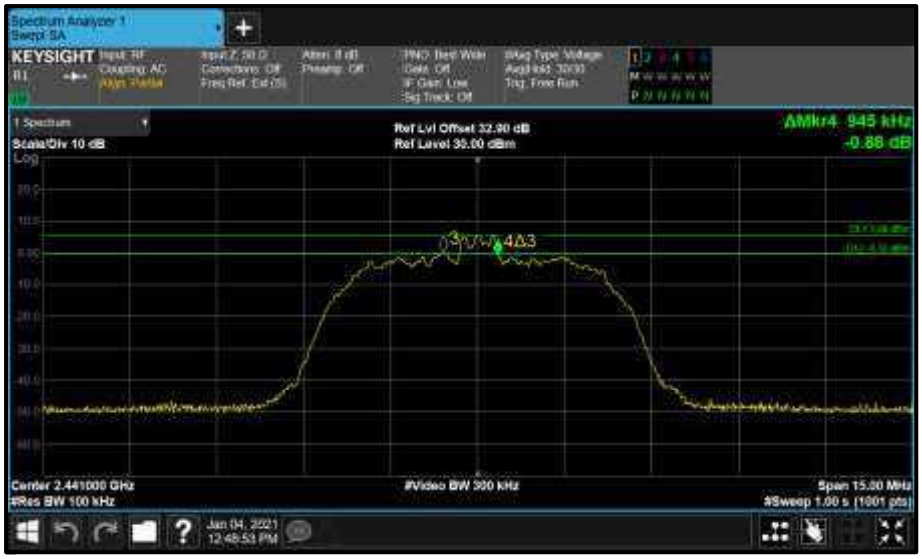

Figure 94 - Core0 (C) 2441 MHz (CH39) 6 dB Bandwidth

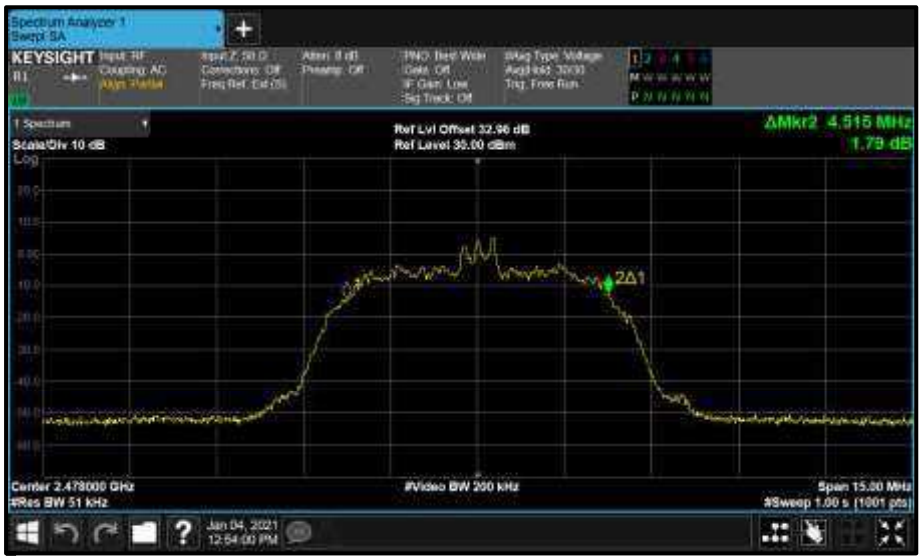

Figure 95 - Core0 (C) 2478 MHz (CH76) 99% Bandwidth

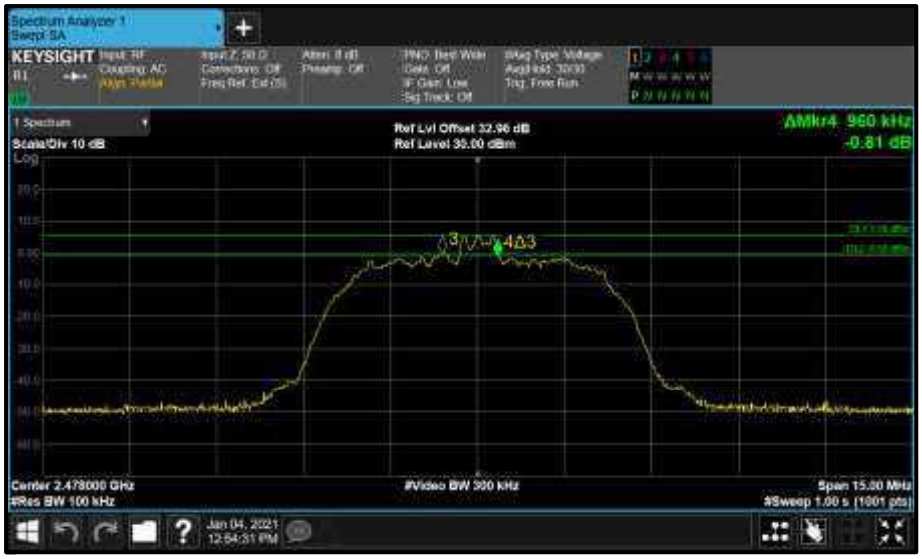

Figure 96 - Core0 (C) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR4)	Duty Cycle (%):	-
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	1.584	1.576	-	1.576	≥500.0
2441	-	1.584	1.584	-	1.584	≥500.0
2478	-	1.584	1.584	-	1.584	≥500.0

Table 92 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	2.336	2.336	-	2.336	-
2441	-	2.336	2.336	-	2.336	-
2478	-	2.336	2.336	-	2.336	-

Table 93 - 99% Bandwidth Results

Figure 97 - Core1 (B) 2404 MHz (CH2) 99% Bandwidth

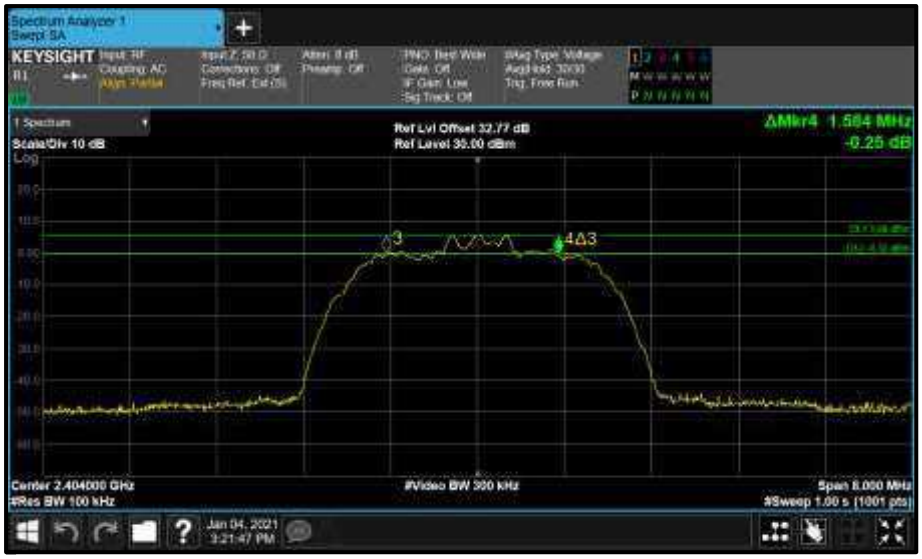

Figure 98 - Core1 (B) 2404 MHz (CH2) 6 dB Bandwidth

Figure 99 - Core0 (C) 2404 MHz (CH2) 99% Bandwidth

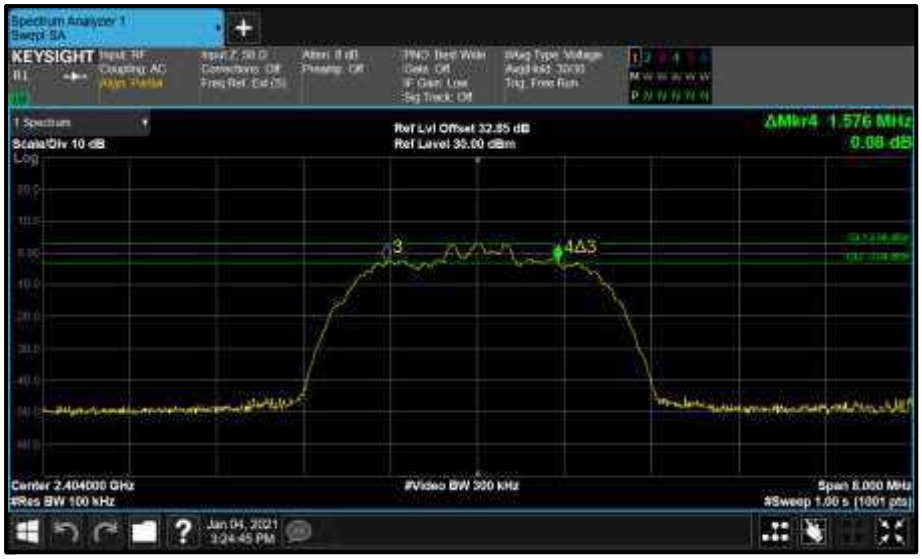

Figure 100 - Core0 (C) 2404 MHz (CH2) 6 dB Bandwidth

Figure 101 - Core1 (B) 2441 MHz (CH39) 99% Bandwidth

Figure 102 - Core1 (B) 2441 MHz (CH39) 6 dB Bandwidth

Figure 103 - Core0 (C) 2441 MHz (CH39) 99% Bandwidth

Figure 104 - Core0 (C) 2441 MHz (CH39) 6 dB Bandwidth

Figure 105 - Core1 (B) 2478 MHz (CH76) 99% Bandwidth

Figure 106 - Core1 (B) 2478 MHz (CH76) 6 dB Bandwidth

Figure 107 - Core0 (C) 2478 MHz (CH76) 99% Bandwidth

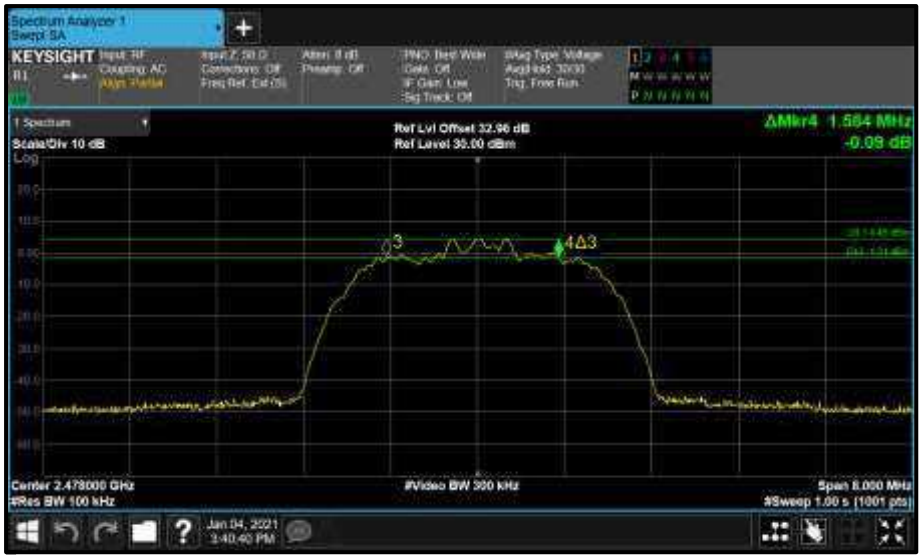

Figure 108 - Core0 (C) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa π/4 DQPSK (HDR8)	Duty Cycle (%):	-
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Ports(s):	B+C (Core1 + Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	0.930	0.675	-	0.675	≥500.0
2441	-	0.930	0.930	-	0.930	≥500.0
2478	-	0.960	0.960	-	0.960	≥500.0

Table 94 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2404	-	4.500	4.500	-	4.500	-
2441	-	4.500	4.530	-	4.500	-
2478	-	4.500	4.500	-	4.500	-

Table 95 - 99% Bandwidth Results

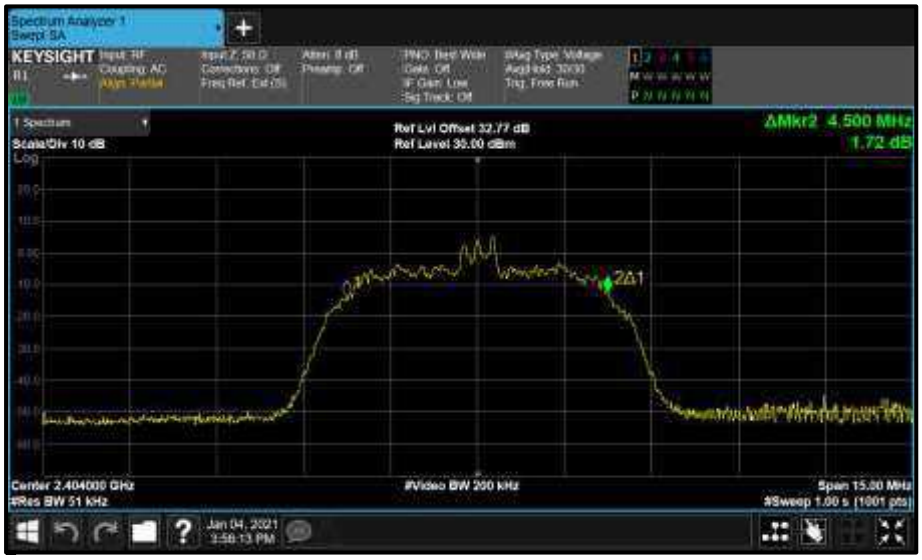

Figure 109 - Core1 (B) 2404 MHz (CH2) 99% Bandwidth

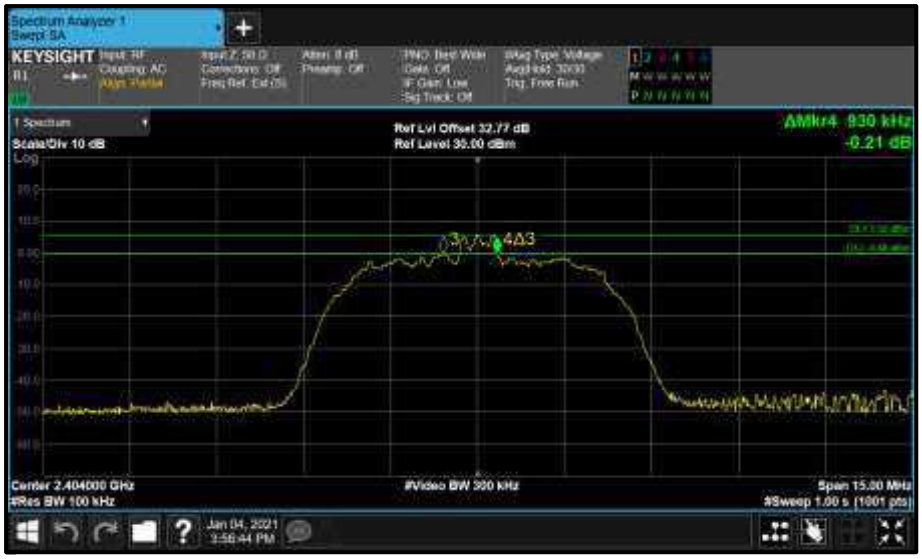

Figure 110 - Core1 (B) 2404 MHz (CH2) 6 dB Bandwidth

Figure 111 - Core0 (C) 2404 MHz (CH2) 99% Bandwidth

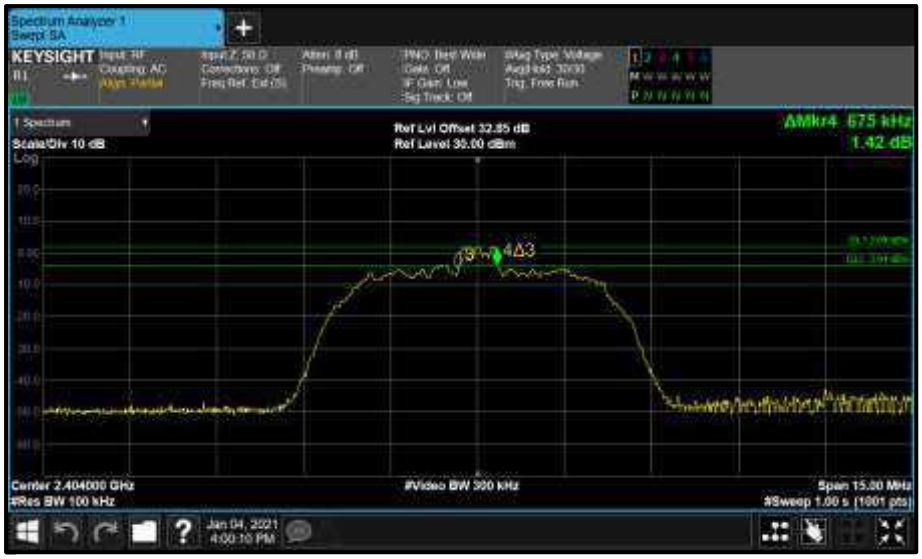

Figure 112 - Core0 (C) 2404 MHz (CH2) 6 dB Bandwidth

Figure 113 - Core1 (B) 2441 MHz (CH39) 99% Bandwidth

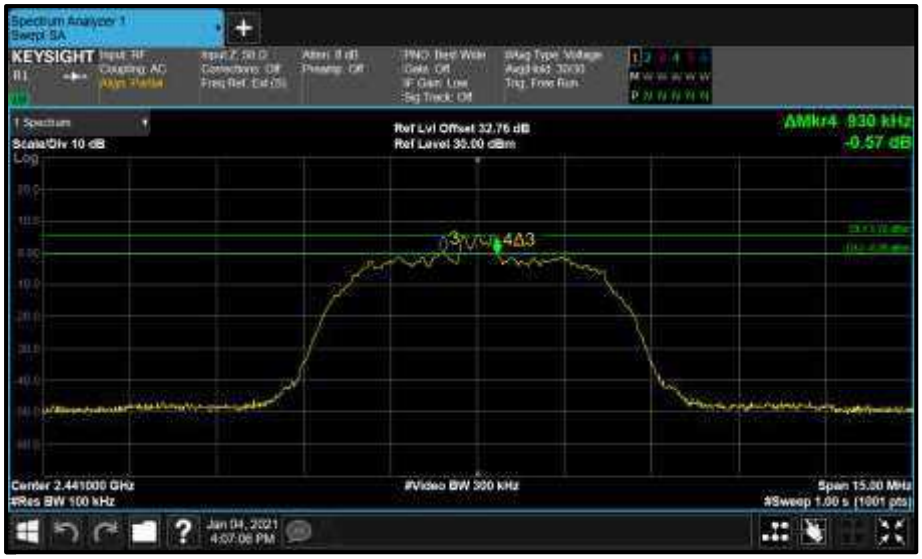

Figure 114 - Core1 (B) 2441 MHz (CH39) 6 dB Bandwidth

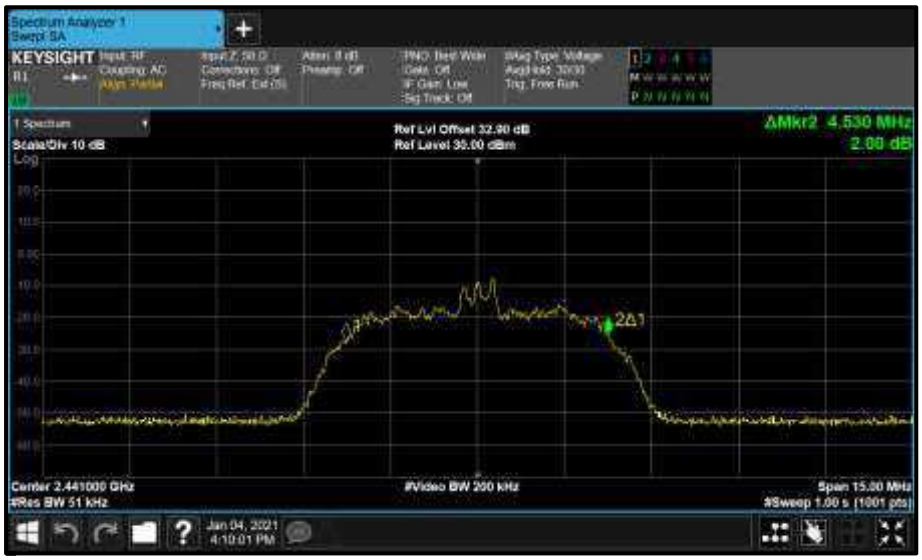

Figure 115 - Core0 (C) 2441 MHz (CH39) 99% Bandwidth

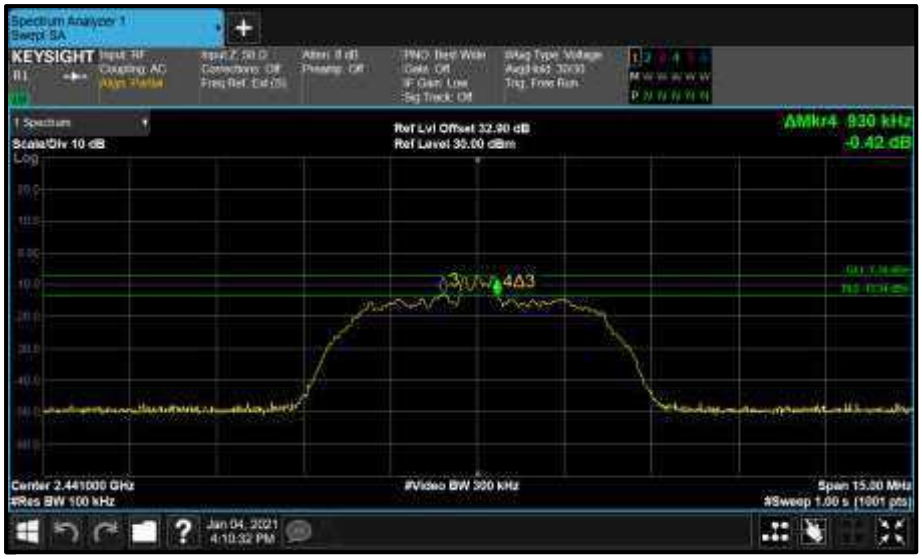

Figure 116 - Core0 (C) 2441 MHz (CH39) 6 dB Bandwidth

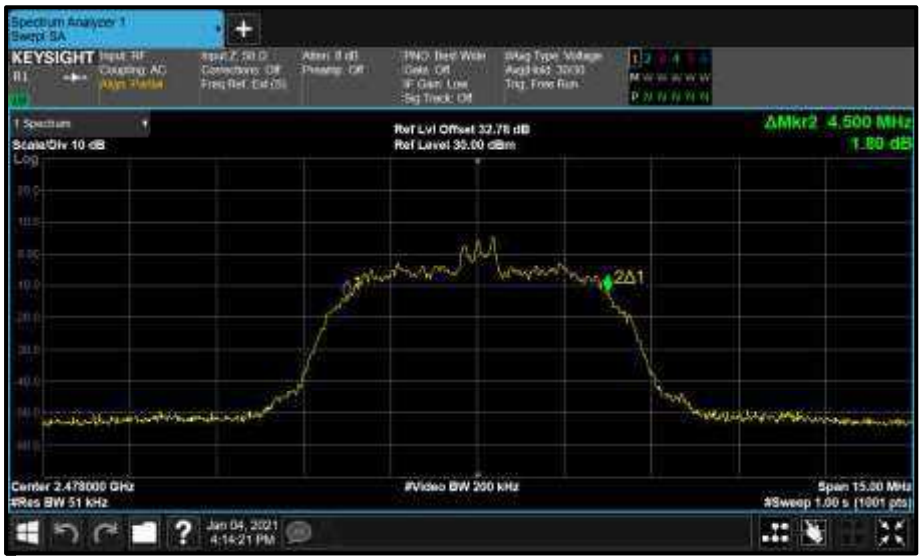

Figure 117 - Core1 (B) 2478 MHz (CH76) 99% Bandwidth

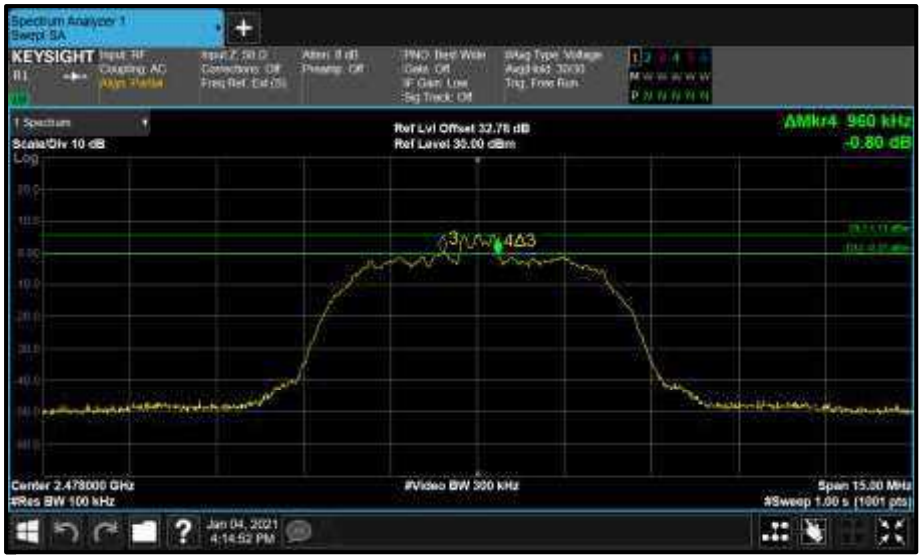

Figure 118 - Core1 (B) 2478 MHz (CH76) 6 dB Bandwidth

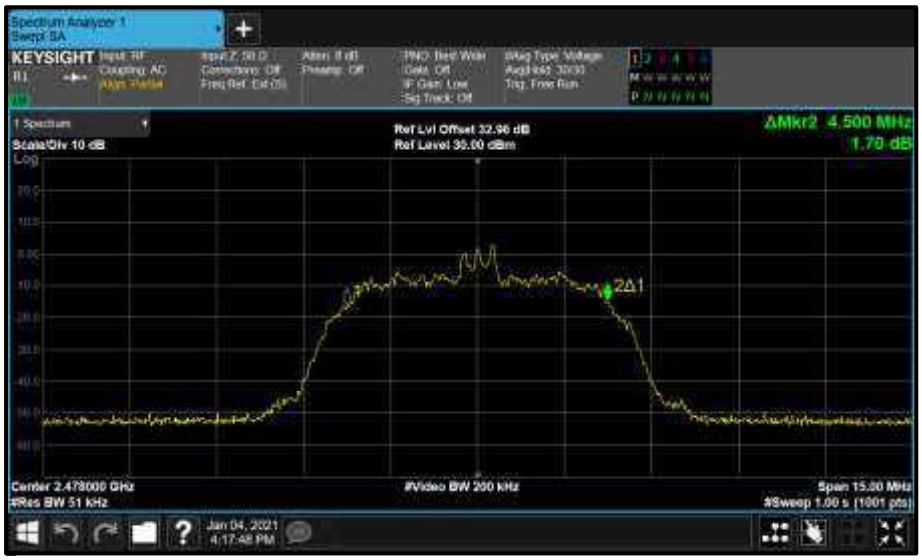

Figure 119 - Core0 (C) 2478 MHz (CH76) 99% Bandwidth

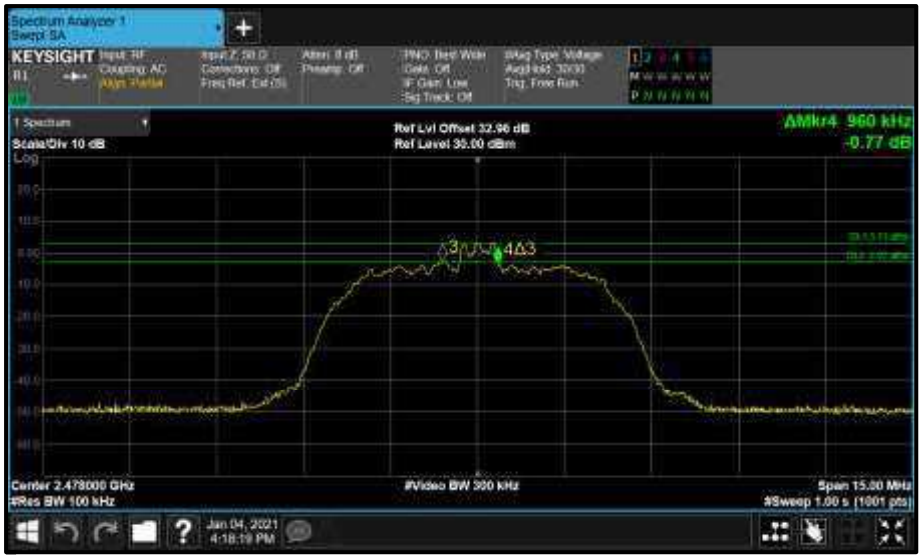

Figure 120 - Core0 (C) 2478 MHz (CH76) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 1M)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	0.688	-	-	-	0.688	≥500.0
2440	0.692	-	-	-	0.692	≥500.0
2480	0.688	-	-	-	0.688	≥500.0

Table 96 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	1.032	-	-	-	1.032	-
2440	1.032	-	-	-	1.032	-
2480	1.032	-	-	-	1.032	-

Table 97 - 99% Bandwidth Results

Figure 121 - Core2 (A) 2402 MHz (CH0) 99% Bandwidth

Figure 122 - Core2 (A) 2402 MHz (CH0) 6 dB Bandwidth

Figure 123 - Core2 (A) 2440 MHz (CH19) 99% Bandwidth

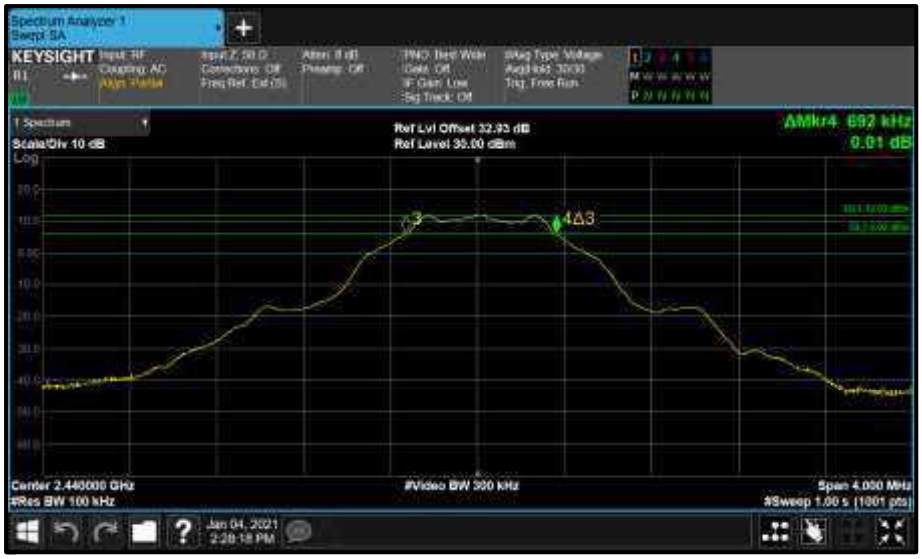

Figure 124 - Core2 (A) 2440 MHz (CH19) 6 dB Bandwidth

Figure 125 - Core2 (A) 2480 MHz (CH39) 99% Bandwidth

Figure 126 - Core2 (A) 2480 MHz (CH39) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 2M)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	A (Core2)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	1.184	-	-	-	1.184	≥500.0
2440	1.176	-	-	-	1.176	≥500.0
2480	1.176	-	-	-	1.176	≥500.0

Table 98 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	2.040	-	-	-	2.040	-
2440	2.040	-	-	-	2.040	-
2480	2.040	-	-	-	2.040	-

Table 99 - 99% Bandwidth Results

Figure 127 - Core2 (A) 2402 MHz (CH0) 99% Bandwidth

Figure 128 - Core2 (A) 2402 MHz (CH0) 6 dB Bandwidth

Figure 129 - Core2 (A) 2440 MHz (CH19) 99% Bandwidth

Figure 130 - Core2 (A) 2440 MHz (CH19) 6 dB Bandwidth

Figure 131 - Core2 (A) 2480 MHz (CH39) 99% Bandwidth

Figure 132 - Core2 (A) 2480 MHz (CH39) 6 dB Bandwidth

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Specification Clause(s):	15.247 (a)(2) RSS-247 5.2 a)	Test Method(s):	C63.10 6.9.3 C63.10 11.8.1
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPa GFSK (LE 1M)	Duty Cycle (%):	-
Antenna Configuration:	SISO	DCCF (dB):	-
Active Ports(s):	C (Core0)	Antenna Gain (dBi):	-

Test Frequency (MHz)	6 dB Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	-	0.680	-	0.680	≥500.0
2440	-	-	0.680	-	0.680	≥500.0
2480	-	-	0.688	-	0.688	≥500.0

Table 100 - 6 dB Bandwidth Results

Test Frequency (MHz)	99% Bandwidth (MHz)					Limit (kHz)
	A	B	C	D	Minimum	
2402	-	-	1.032	-	1.032	-
2440	-	-	1.032	-	1.032	-
2480	-	-	1.036	-	1.036	-

Table 101 - 99% Bandwidth Results

Figure 133 - Core0 (C) 2402 MHz (CH0) 99% Bandwidth

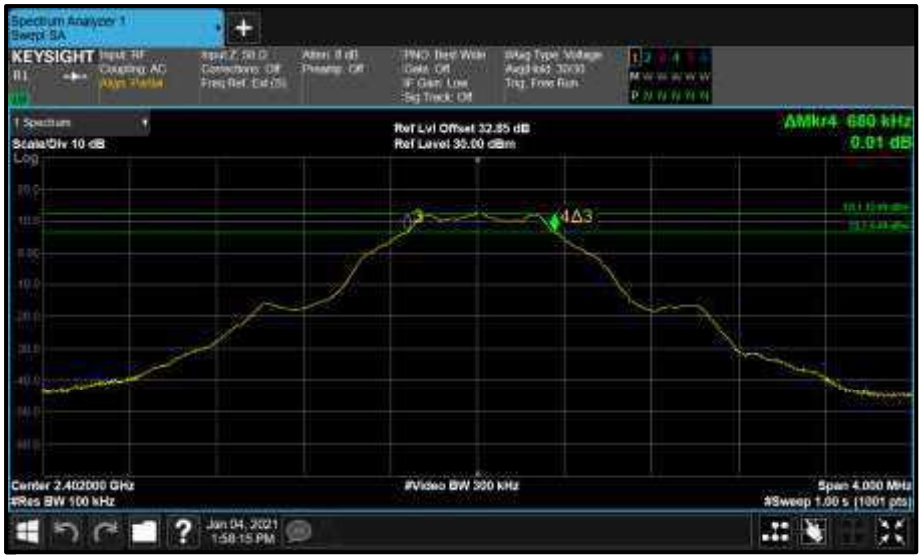

Figure 134 - Core0 (C) 2402 MHz (CH0) 6 dB Bandwidth

Figure 135 - Core0 (C) 2440 MHz (CH19) 99% Bandwidth