

5.1.4 Power Density

RESULT:
Passed

Test standard : FCC Part 15.247(e) , RSS-247 5.2(b)
 Basic standard : ANSI C63.10:2013, KDB558074
 Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
 Operation Mode : A
 Ambient temperature : 20-24°C
 Relative humidity : 50-65%
 Atmospheric pressure : 100-103 kPa

Table 21: Test result of Power Density, LE 1M

Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2402	-7.41	8
Middle Channel	2440	-7.62	8
High Channel	2480	-7.40	8

Table 22: Test result of Power Density, LE 2M

Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2402	-10.29	8
Middle Channel	2440	-10.20	8
High Channel	2480	-9.73	8

Table 23: Test result of Power Density, ANT (1Mbps)

Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2402	-3.60	8
Middle Channel	2441	-3.47	8
High Channel	2480	-3.34	8

Table 24: Test result of Power Density, Nordic Original (2Mbps)

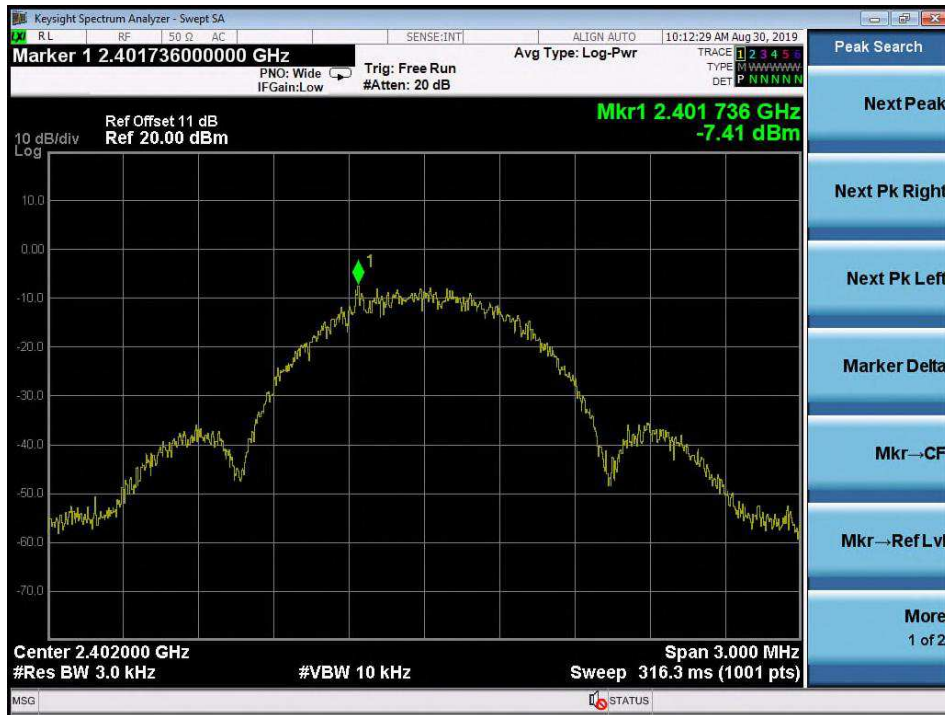
Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2402	-6.15	8
Middle Channel	2441	-6.36	8
High Channel	2480	-6.13	8

Table 25: Test result of Power Density, IEEE 802.15.4

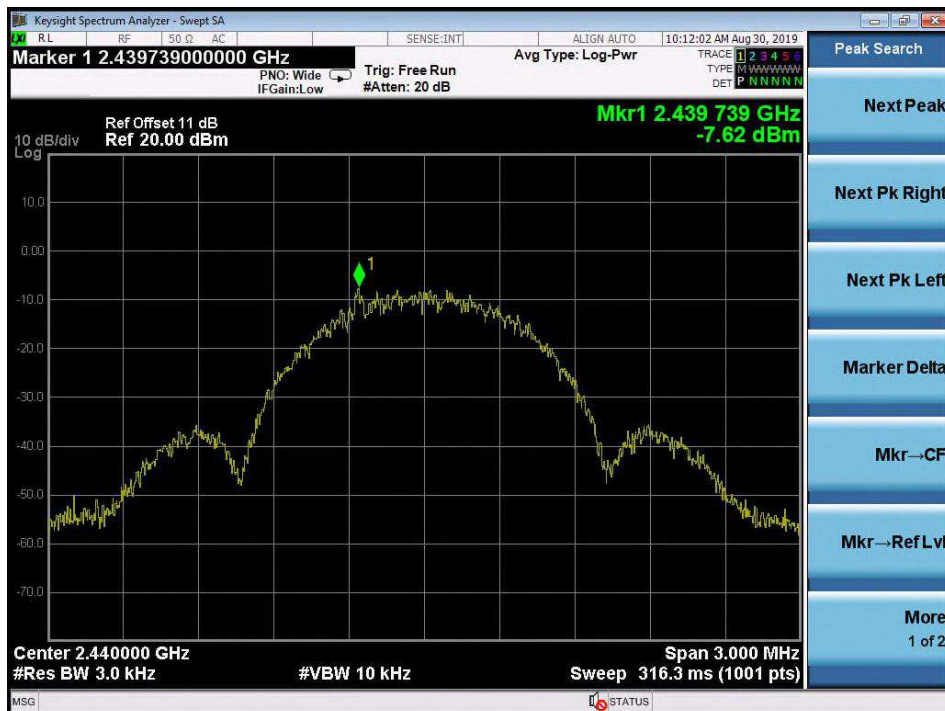
Channel	Channel Frequency (MHz)	Power Density	Limit
		(dBm)	(dBm)
Low Channel	2405	-5.55	8
Middle Channel	2440	-6.13	8
High Channel	2475	-6.05	8

Test Plot of Power Density, LE 1M

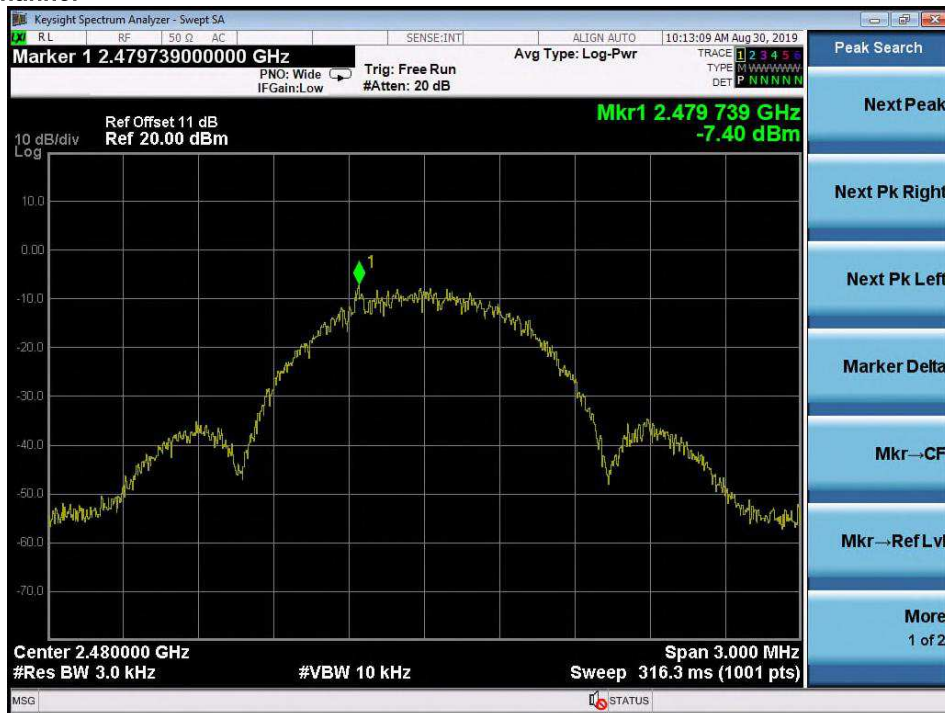
Low Channel



Middle Channel



High Channel

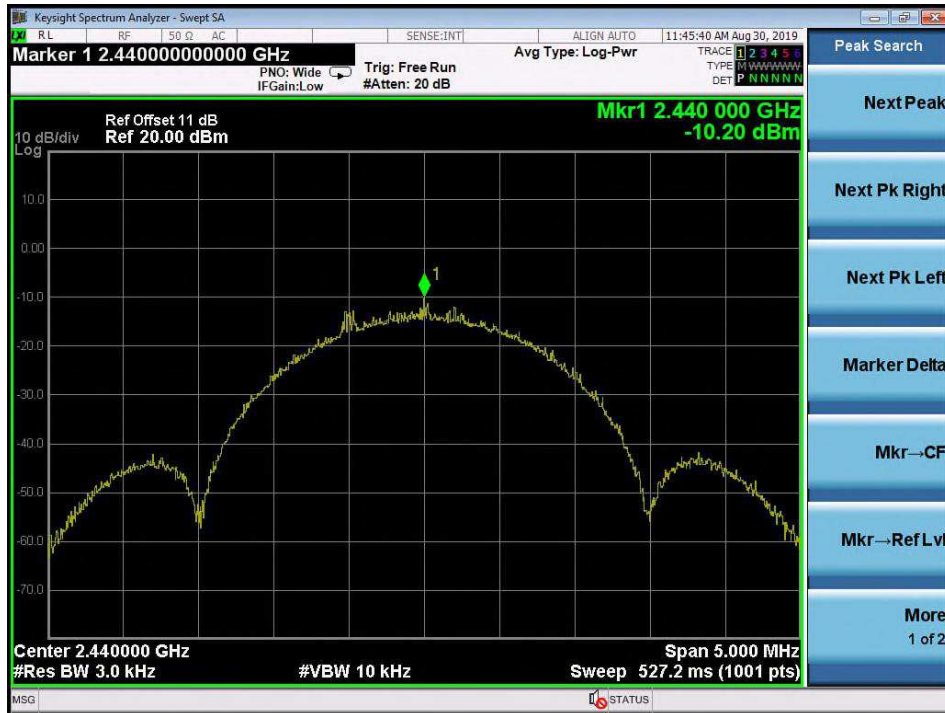


Test Plot of Power Density, LE 2M

Low Channel



Middle Channel



High Channel

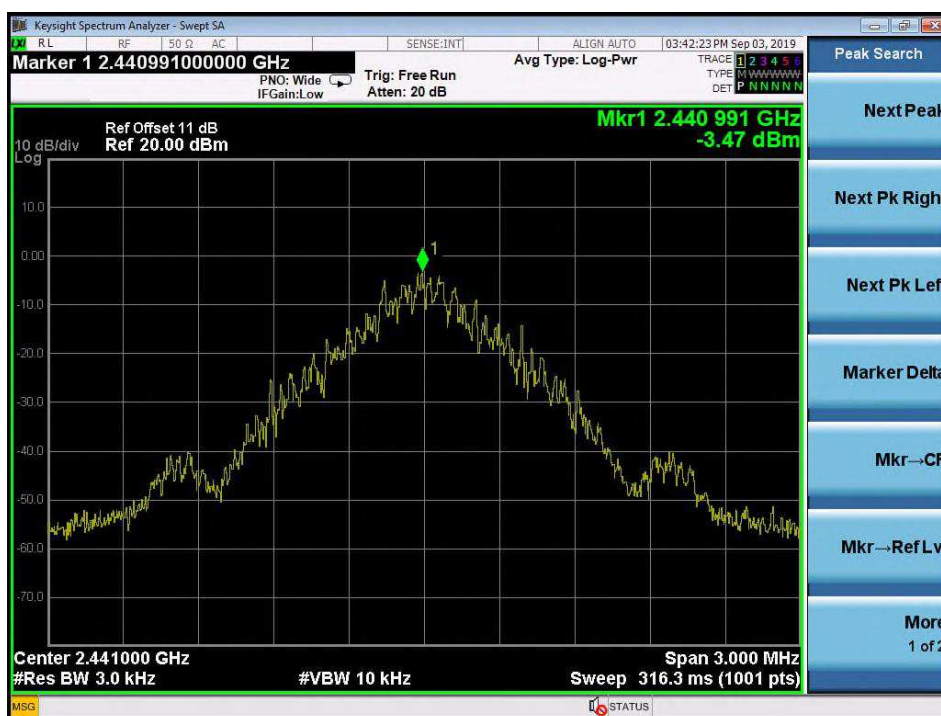


Test Plot of Power Density, ANT (1Mbps)

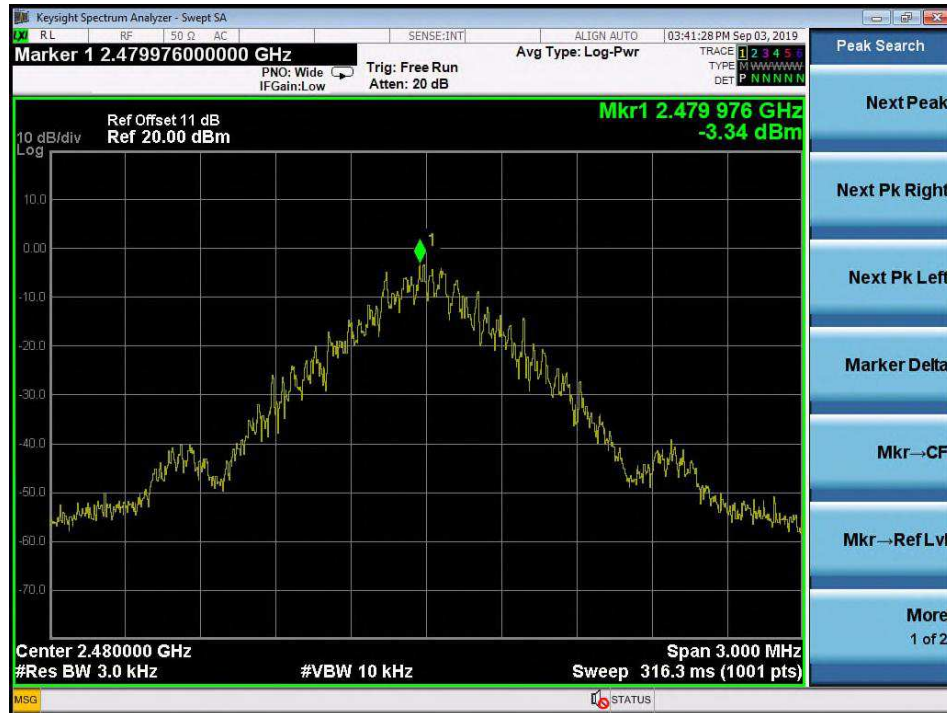
Low Channel



Middle Channel

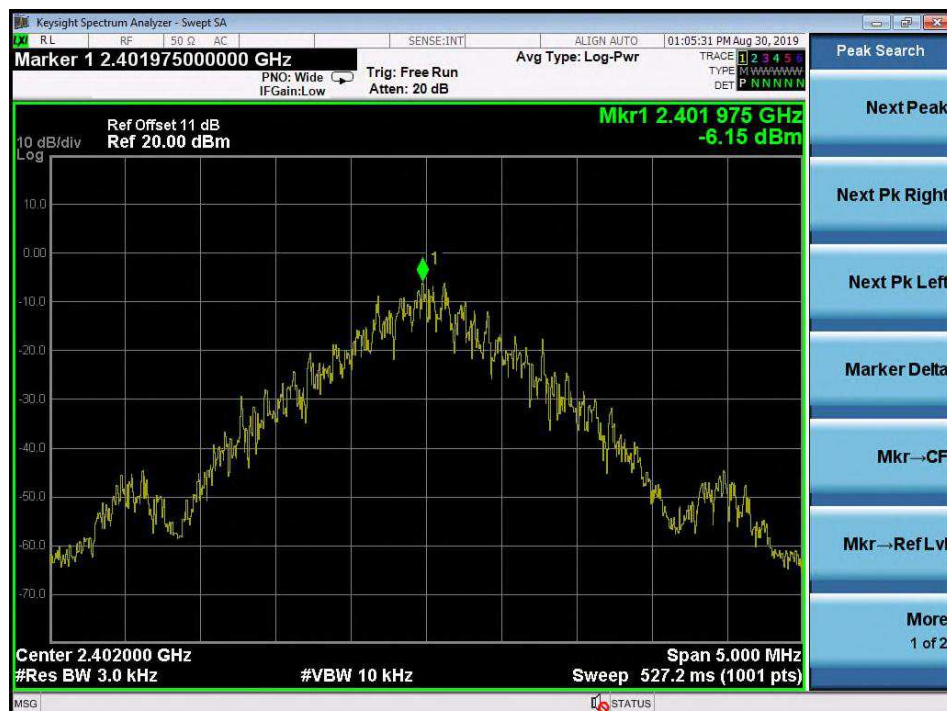


High Channel

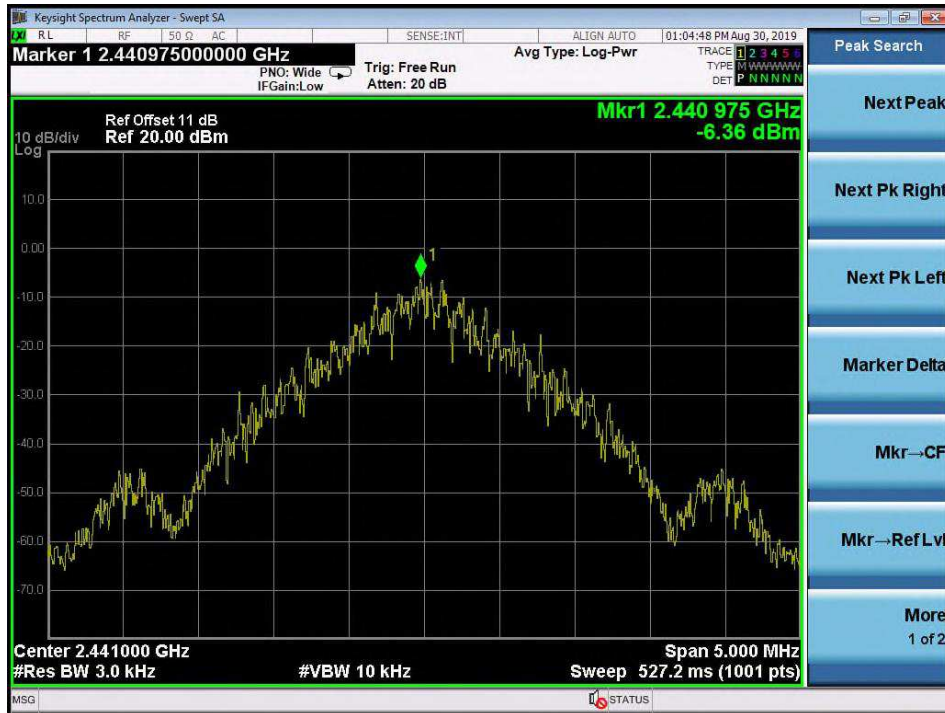


Test Plot of Power Density, Nordic Original (2Mbps)

Low Channel



Middle Channel



High Channel



Test Plot of Power Density, IEEE 802.15.4

Low Channel



Middle Channel



High Channel



**5.1.5 Conducted spurious emissions and Frequency Band Edge
measured in 100kHz Bandwidth****RESULT:****Passed**

Test standard	:	FCC part 15.247(d), RSS-247 5.5
Basic standard	:	ANSI C63.10:2013, KDB558074
Limit	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power)
Kind of test site	:	Shielded room

Test setup

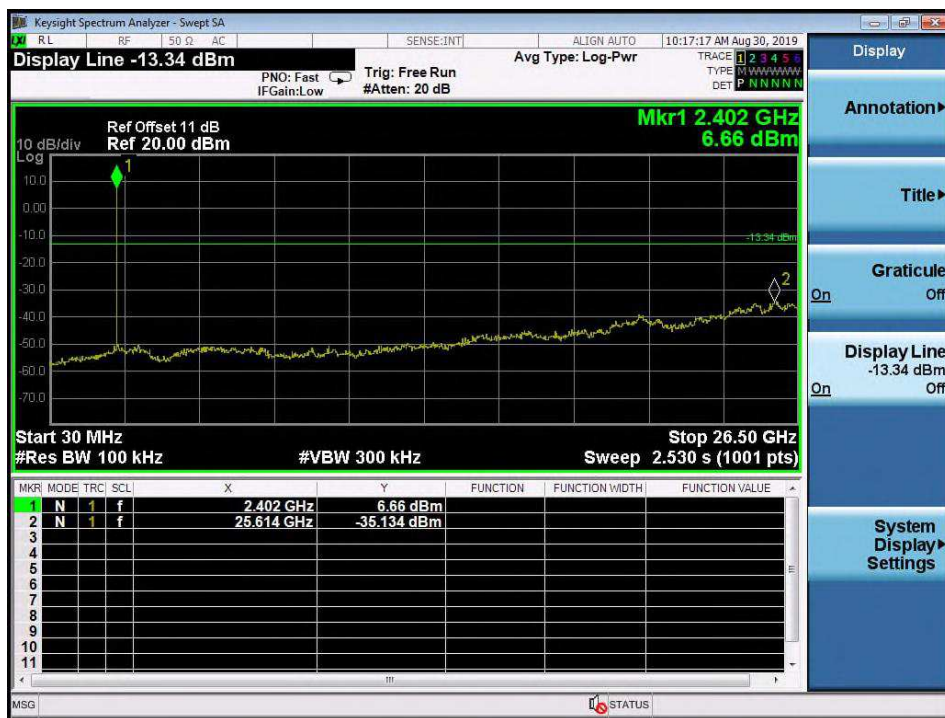
Test Channel	:	Low/ Mid/ High for spurious, Low/ High for Band Edge
Operation mode	:	A
Ambient temperature	:	20-24°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achieved as well.

Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

Test Plot 100kHz Conducted Emissions, LE 1M

Low Channel

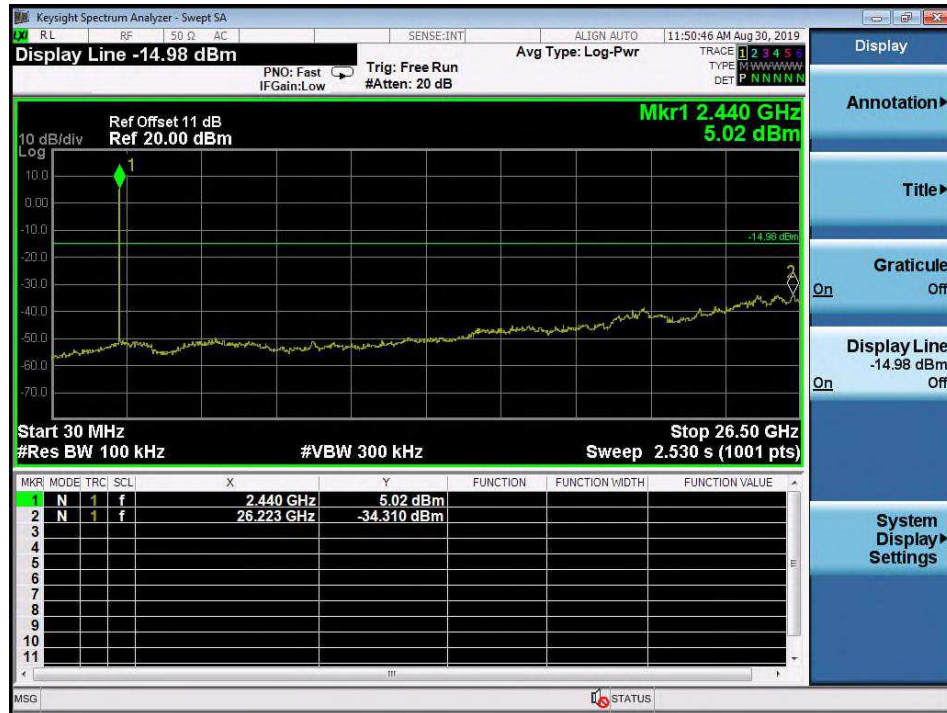


Middle Channel

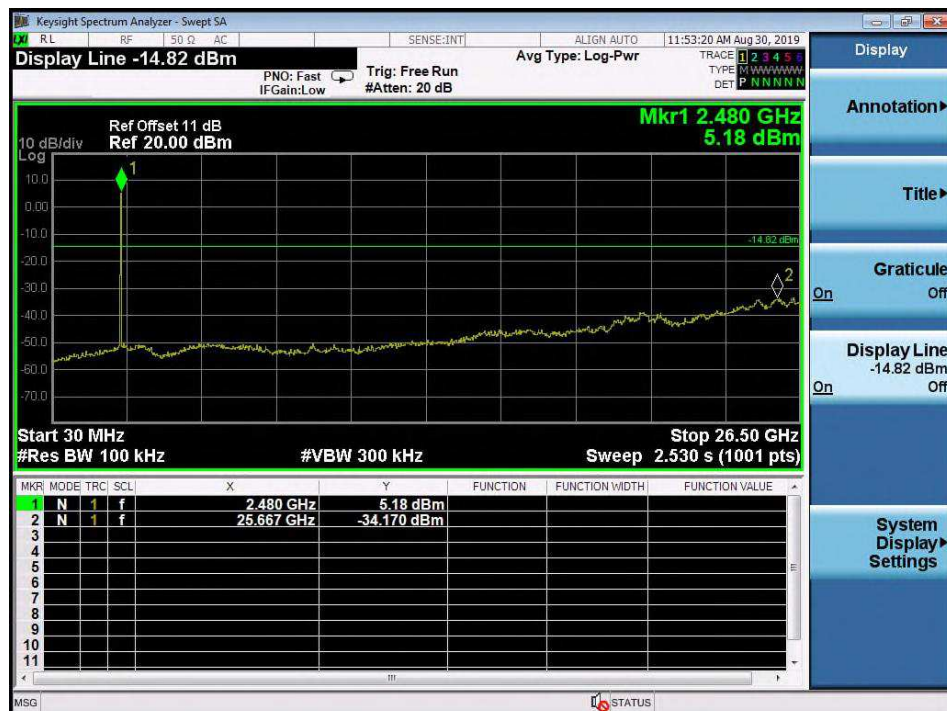




Middle Channel

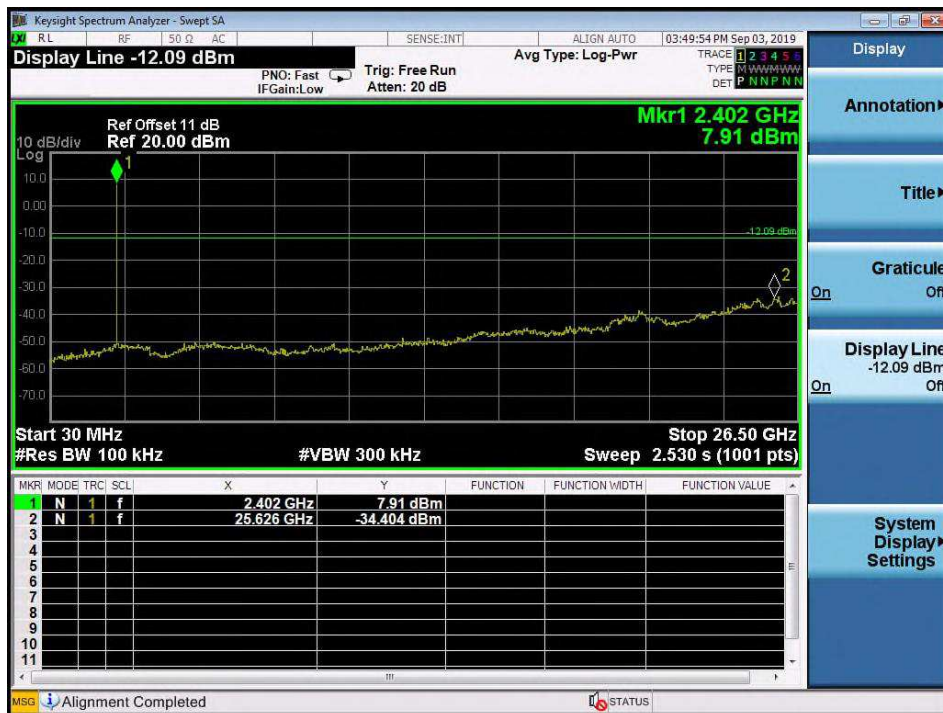


High Channel



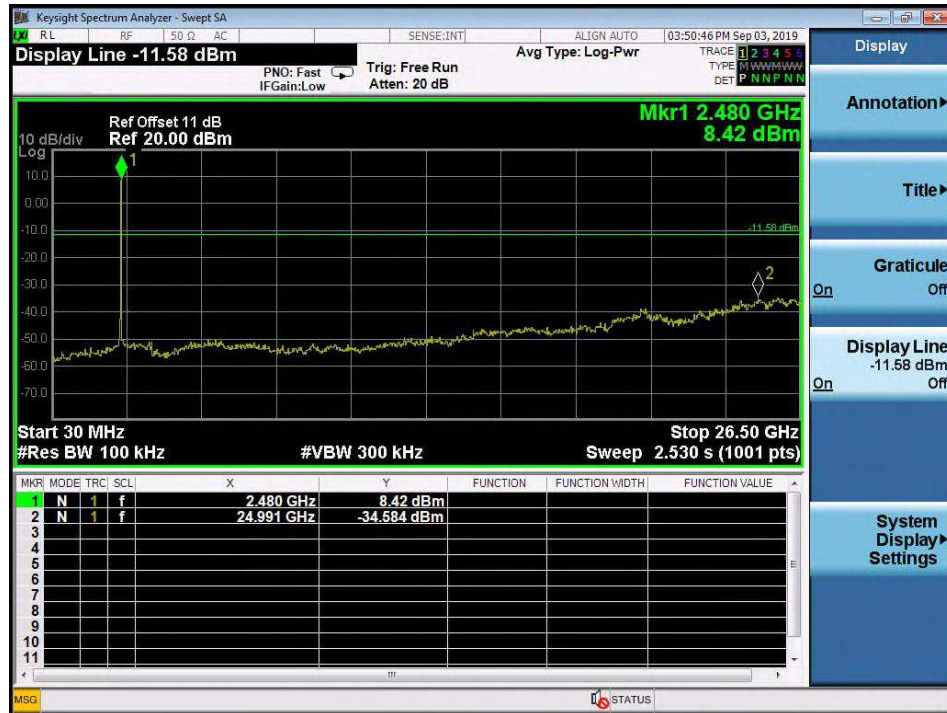
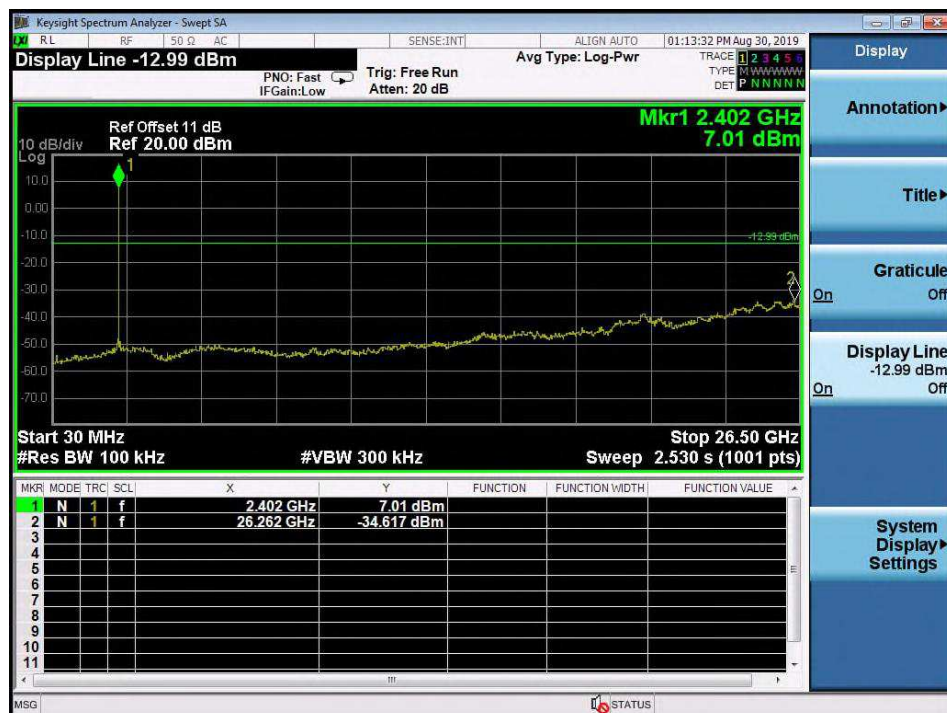
Test Plot 100kHz Conducted Emissions, ANT (1Mbps)

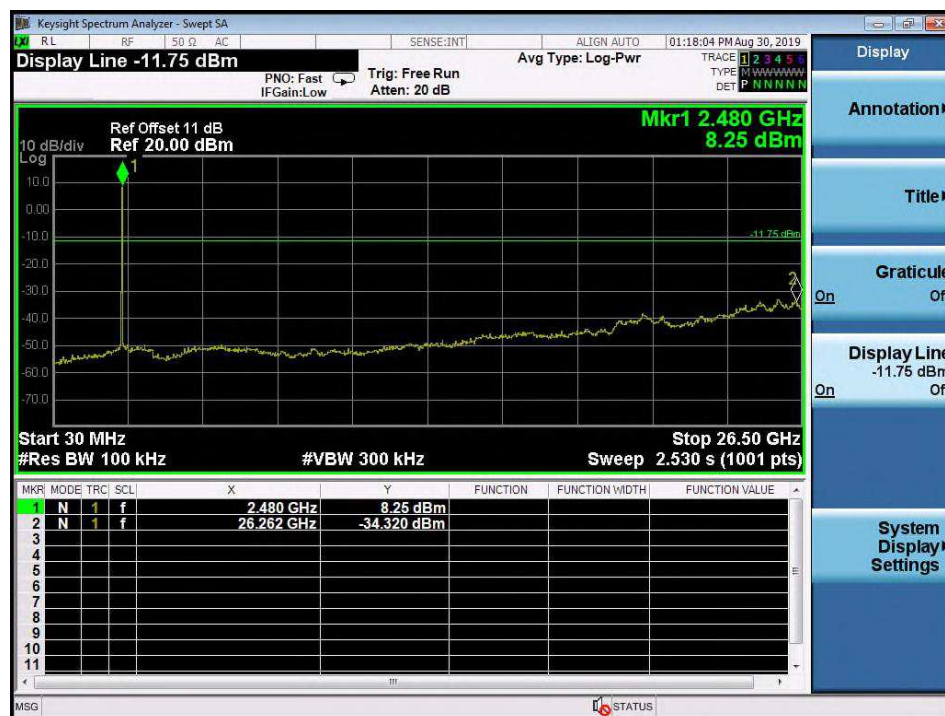
Low Channel



Middle Channel



High Channel

Test Plot 100kHz Conducted Emissions, Nordic Orginal (2Mbps)
Low Channel




Test Plot 100kHz Conducted Emissions, IEEE 802.15.4

Low Channel

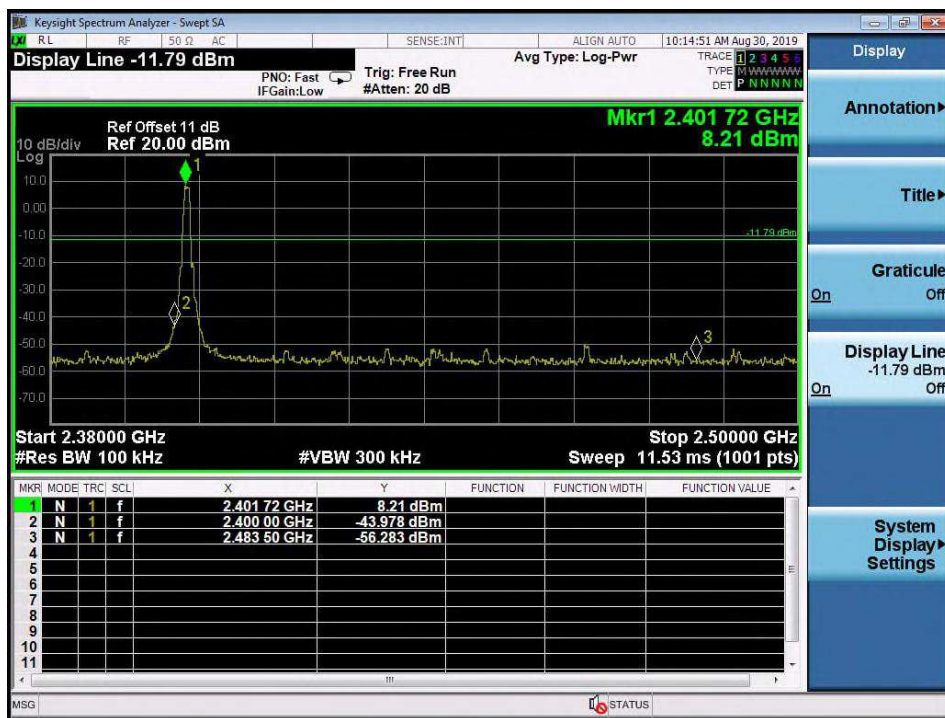


Middle Channel

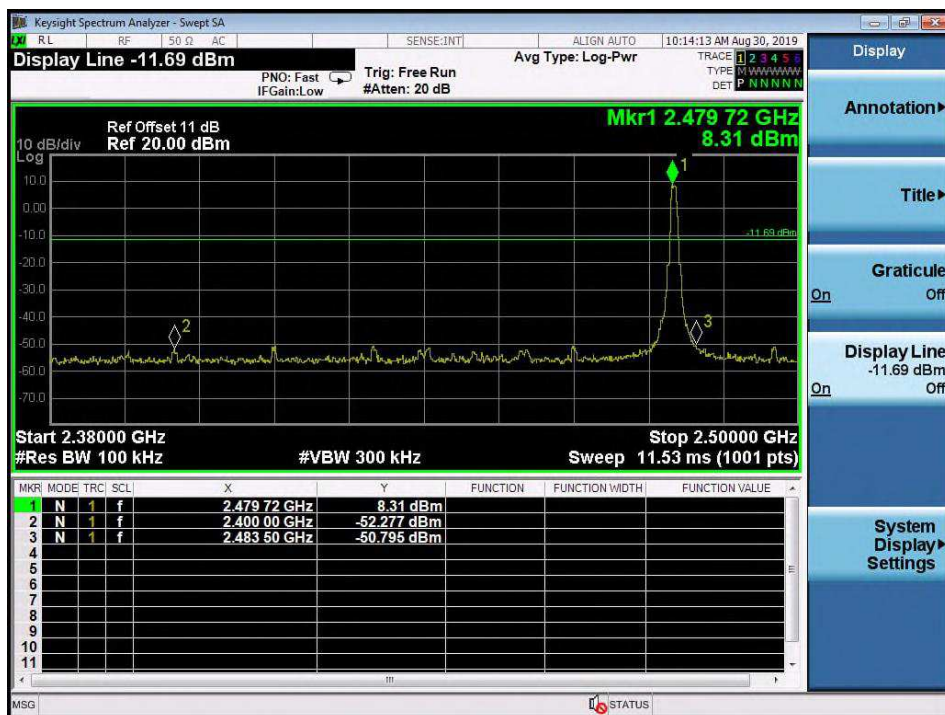


Test Plot 100kHz RBW Band Edge, LE 1M

Low Channel

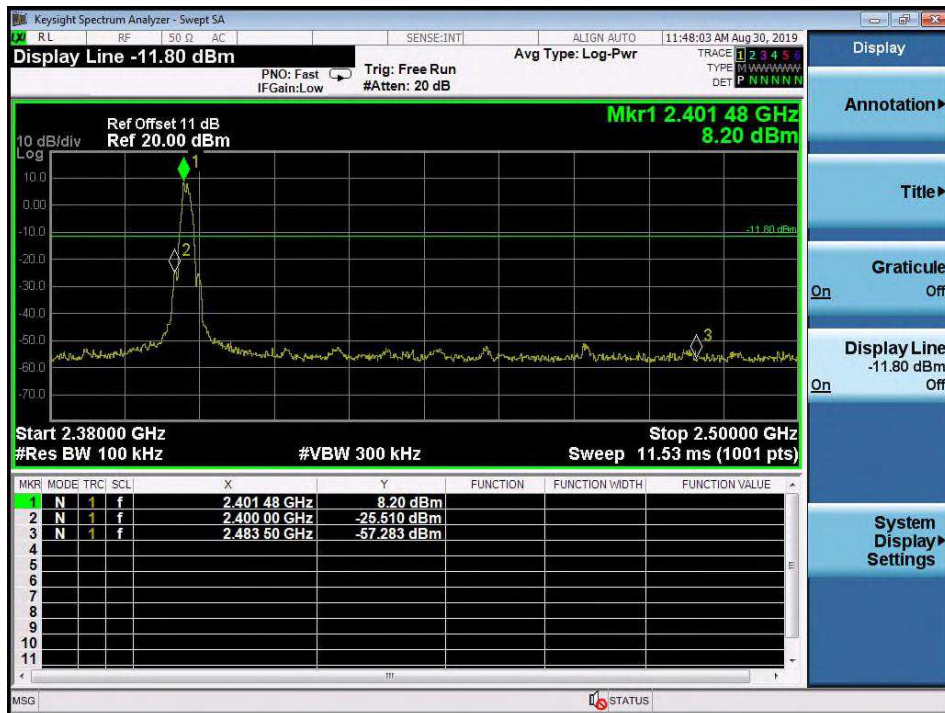


High Channel

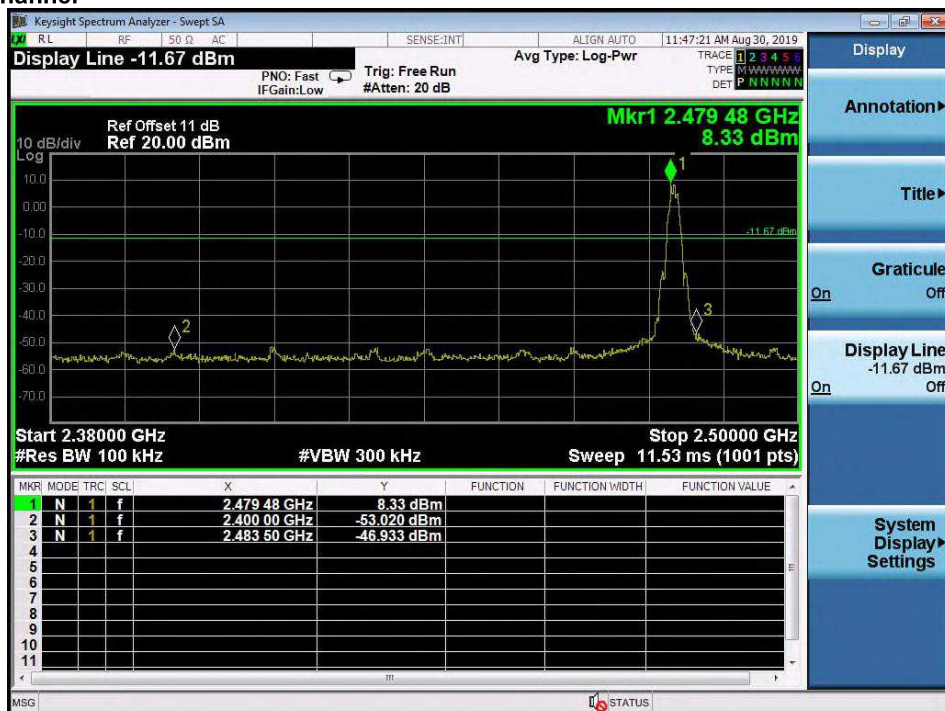


Test Plot 100kHz RBW of Band Edge, LE 2M

Low Channel

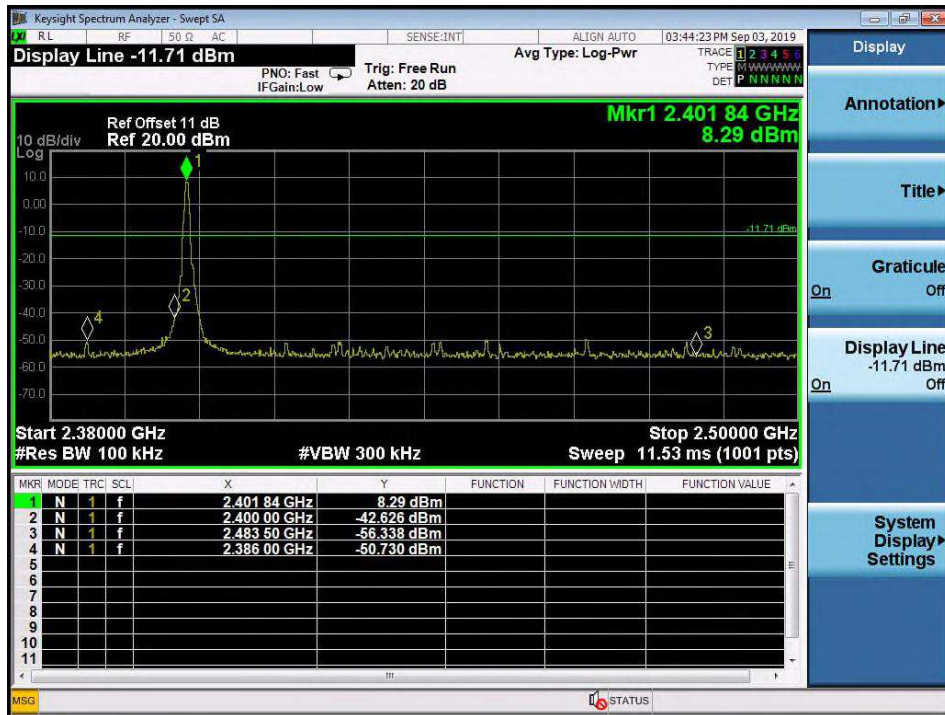


High Channel

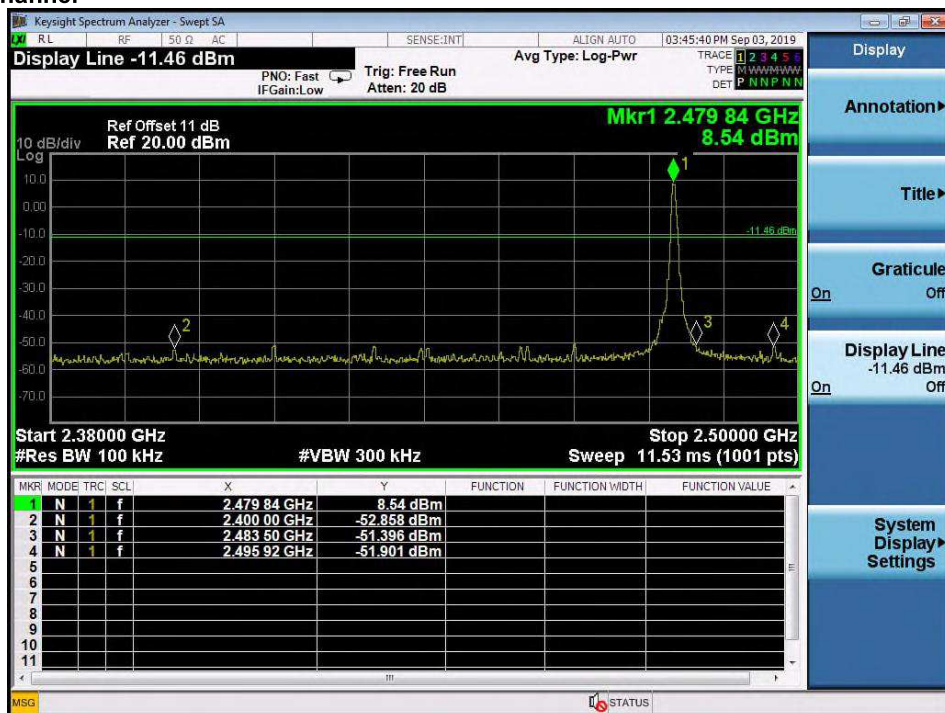


Test Plot 100kHz RBW of Band Edge, ANT (1Mbps)

Low Channel

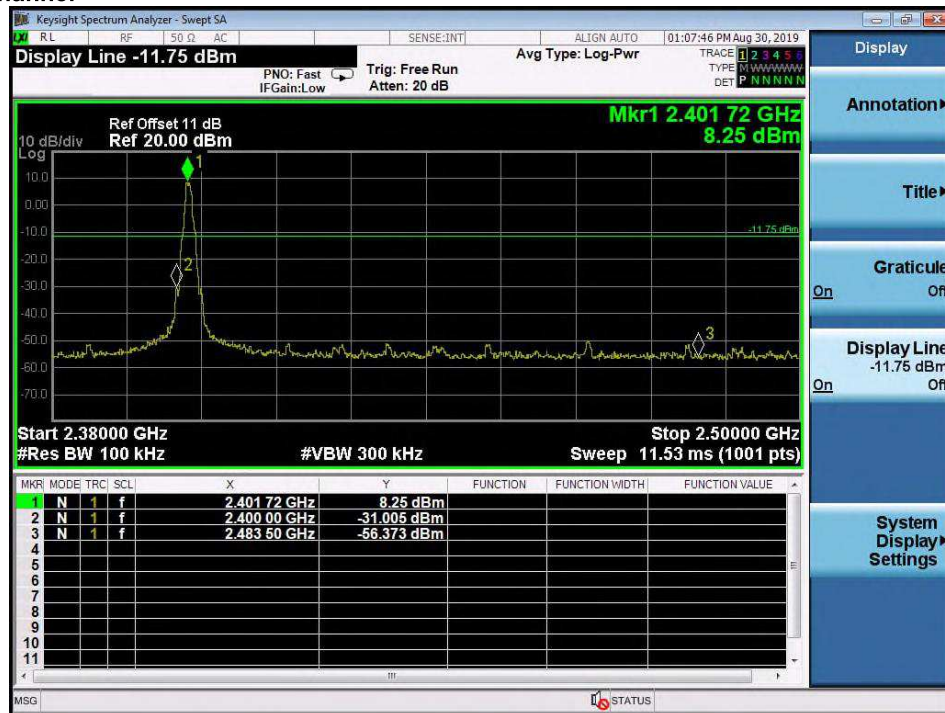


High Channel

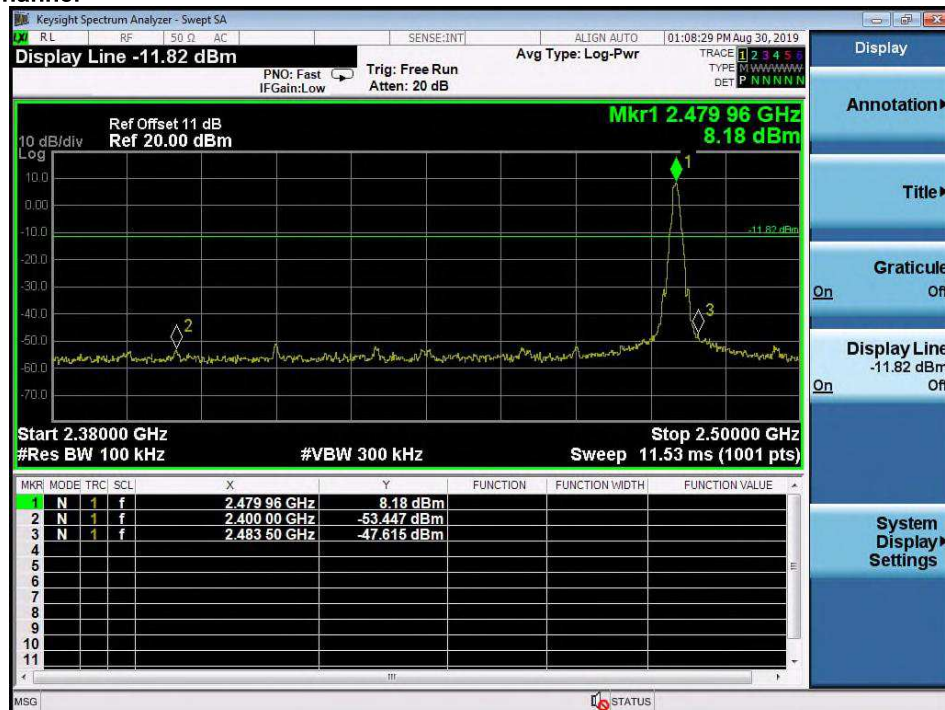


Test Plot 100kHz RBW of Band Edge, Nordic Original (2Mbps)

Low Channel

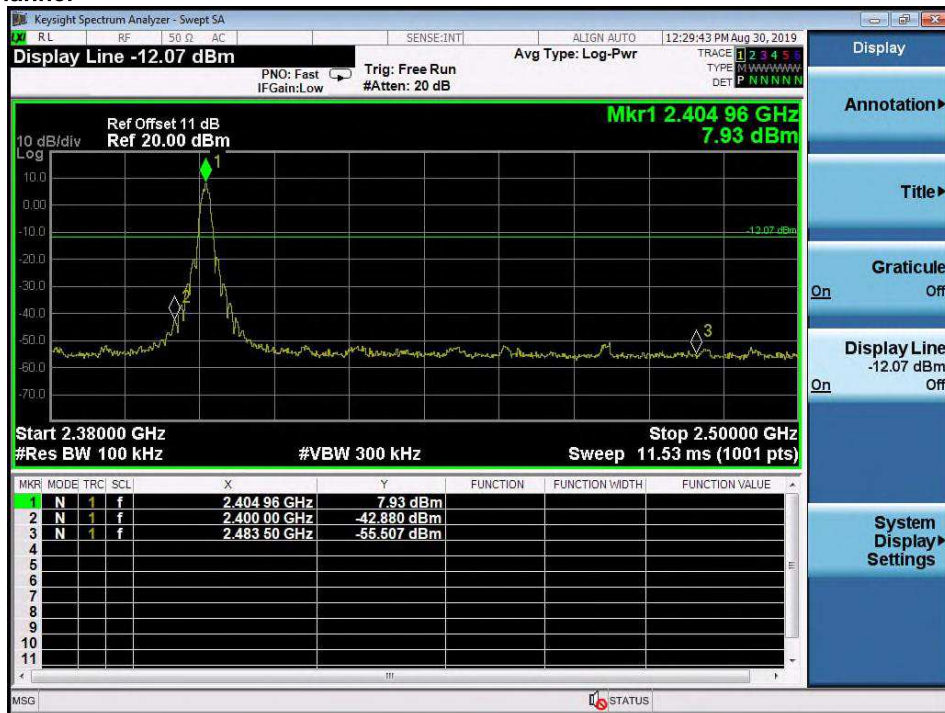


High Channel

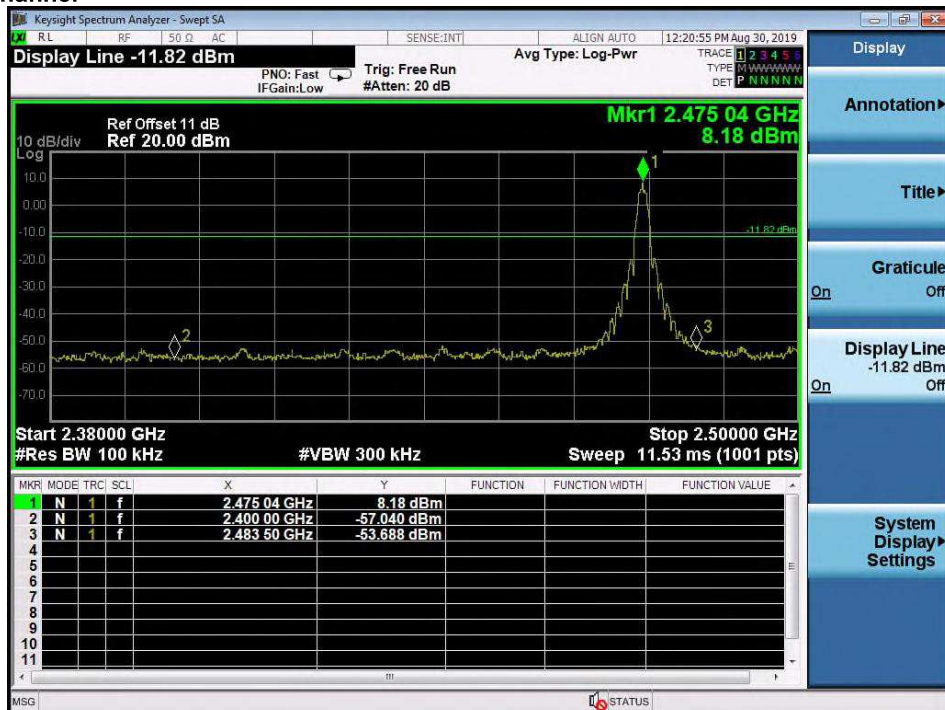


Test Plot 100kHz RBW of Band Edge, IEEE 802.15.4

Low Channel



High Channel



5.1.6 Spurious Emission

RESULT:**Passed**

Test standard	:	FCC part 15.247(d), FCC 15.205, FCC 15.209, RSS-247 5.5 and RSS-Gen issue 5 LP0002(2018): 3.10.1, (5)
Basic standard	:	ANSI C63.10: 2013
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-Gen i5, 8.10 (Table 7), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen i5, 8.9 (Table 5 and 6). Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen i5, 8.9 (Table 5 and 6).
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A, B

For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

Factor (dB/m)=Antenna Factor(dB/m)+Cable loss (dB)
Level(dBuV/m)=Reading(dBuV)+ Factor(dB/m)

5.2 Mains Emissions

5.2.1 Mains Conducted Emissions

RESULT:**Passed**

Test standard : FCC Part 15.207
FCC Part 15.107
RSS-Gen i5 8.8

Limits : Mains Conducted emissions as defined in
above test standards must comply with the
mains conducted emission limits specified

Kind of test site : Shielded Room

Test setup

Test Channel : Middle
Operation mode : A

Remark: For details refer to Appendix D.

6. Safety Human exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:**Passed**

Test standard : FCC KDB Publication 447498 D01 v06
47CFR 1.1310
47CFR 2.1091
RSS-102 issue 5

FCC:

Therefore the maximum output power of the transmitter is $7.52\text{mW} < 10\text{mW}$ (Distance: 5 mm), hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

Canada:

Maximum conducted peak power: 7.52mW
Antenna Gain: 2.5dbi
Maximum EIRP available 13.4mW

Since maximum output power of the transmitter is $13.4\text{mW} < 15\text{mW}$ (distance $\leq 15\text{mm}$), hence the EUT is excluded from SAR evaluation according to Table 1 in RSS-102, For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 of RSS-102 are multiplied by a factor of 2.5.

---End---

8. List of Tables

Table 1: Applied Standard and Test Levels	5
Table 2: List of Test and Measurement Equipment	7
Table 3: Emission Measurement Uncertainty.....	8
Table 4: Basic Information of EUT	9
Table 5: Technical Specification of EUT	10
Table 6: Test result of Maximum conducted Peak output power, LE 1M.....	16
Table 7: Test result of Maximum conducted Peak output power, LE 2M.....	16
Table 8: Test result of Maximum conducted Peak output power, ANT (1Mbps).....	17
Table 9: Test result of Maximum conducted Peak output power, Nordic Original (2Mbps).....	17
Table 10: Test result of Maximum conducted Peak output power, IEEE 802.15.4.....	17
Table 11: Test result of 6dB Bandwidth, LE 1M	18
Table 12: Test result of 6dB Bandwidth, LE 2M	18
Table 13: Test result of 6dB Bandwidth, ANT (1Mbps).....	18
Table 14: Test result of 6dB Bandwidth, Nordic Original (2Mbps)	19
Table 15: Test result of 6dB Bandwidth, IEEE 802.15.4	19
Table 16: Test result of 99% Bandwidth, LE 1M	19
Table 17: Test result of 99% Bandwidth, LE 2M	19
Table 18: Test result of 99% Bandwidth, ANT (1Mbps)	19
Table 19: Test result of 99% Bandwidth, Nordic Original (2Mbps)	19
Table 20: Test result of 99% Bandwidth, IEEE 802.15.4	19
Table 21: Test result of Power Density, LE 1M	30
Table 22: Test result of Power Density, LE 2M	30
Table 23: Test result of Power Density, ANT (1Mbps).....	30
Table 24: Test result of Power Density, Nordic Original (2Mbps)	31
Table 25: Test result of Power Density, IEEE 802.15.4	31

9. List of Photographs

Photograph 1: Set-up for Spurious Emissions (Front View 1).....	57
Photograph 2: Set-up for Spurious Emissions (Front View 2).....	57
Photograph 3: Set-up for Spurious Emissions (Back View 1).....	58
Photograph 4: Set-up for Spurious Emissions (Back View 2).....	58
Photograph 5: Set-up for Spurious Emissions (Back View 3).....	59
Photograph 6: Set-up for Spurious Emissions (Back View 4).....	59
Photograph 7: Set-up for Conducted testing	60
Photograph 8: Set-up for Conducted testing	60
Photograph 9: Set-up for Mains Conducted testing (Front View).....	61
Photograph 10: Set-up for Mains Conducted testing (Back View).....	61