



Test Report for RSAE Labs, Inc.
Report No. EY0476-2 Issue 2



TEST REPORT

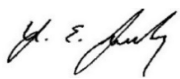
Applicant	RSAE Labs, Inc.
Address	1002 Arthur Drive Suite 200 Lynn Haven, FL 32444
FCC ID	2ASIM-TGU1
ISED IC	33142-TGU1
Product Marketing Name (PMN)	TGU-1 and MGU-1
Hardware Version Identification Number (HVIN)	03-2004-01
Additional HVINs	See Section 3.1 of this report for details
Firmware Version Identification Number (FVIN)	3.12
Date of tests	Oct 16 – Oct 18, 2024
FCC Test Firm DN Canada CABID	US1028 US0106
The tests have been carried out according to the requirements of the following standard:	
☒ FCC Part 15, Subpart C, Section 15.247	
☒ ISED Canada RSS-247 Issue 3	
CONCLUSION: The submitted sample was found to <u>COMPLY</u> with the test requirement	
Prepared by Nisha Patel Wireless Engineer I	Approved by Yunus Faziloglu Wireless Manager
	
Report Issue Date: Jan 15, 2025	Issue Number: 2
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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED	PREPARED BY	APPROVED BY
1	Original release	Nov 27, 2024	NP	YF
2	Updated applicant address	Jan 15, 2025	NP	YF



1 SUMMARY OF TEST RESULTS

The EUT has been tested against the following requirements:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247), RSS-247				
STANDARD SECTION		TEST TYPE AND LIMIT	APPLICABLE	RESULT
47CFR15	RSS			
15.207	Gen 8.8	AC Power Line Conducted Emissions	N/A (Note 1)	N/A
15.205 15.209	247 3.3 247 5.5 Gen 8.9 Gen 8.10	Radiated Spurious Emissions	Y	Pass
15.247(d)	247 5.5	Conducted Spurious Emissions	Y	Pass
15.247(a)(2)	247 5.2(a)	6dB Bandwidth	Y	Pass
--	Gen 6.7	99% Occupied Bandwidth	Y	Pass
15.247(b)(3)	247 5.4(d)	Conducted Output Power	Y	Pass
15.247(e)	247 5.2(b)	Power Spectral Density	Y	Pass
15.203	Gen 6.8	Antenna Requirement	Y	Pass

Note 1: EUT is battery powered.



2 MEASUREMENT UNCERTAINTY

The listed uncertainties are the worst-case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results. Values for measurement uncertainty are calculated per ETSI TR 100 028 (2001).

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radio frequency (@ 2.4GHz)	3.23×10^{-8}	1×10^{-7}
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation: Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	3.4% 0.3dB	5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

NOMINAL VOLTAGE	7.2 VDC (Battery)
MODULATION TECHNOLOGY	DTS
MODULATION TYPES	OQPSK
DATA RATES	250kbps
OPERATING FREQUENCY	2405 – 2480MHz
EUT Power Setting	4.5dBm
OUTPUT POWER	2.61mW (Average Conducted Power)
ANTENNA TYPE (Customer Supplied Information)	Planar Inverted F Antenna (PIFA) with 2.62dBi Peak Gain

Additional Versions and Differences:

Product Marketing Name	Hardware Version Identification Number	Tested
TGU-1	03-2001-05	No (See Note 1)
TGU-1	03-2001-06	No (See Note 1)
TGU-1	03-2001-07	No (See Note 1)
TGU-1	03-2001-08	No (See Note 1)
TGU-1	03-2001-09	No (See Note 1)
MGU-1	03-2004-01	Yes
MGU-1	03-2004-02	No (See Note 1)
MGU-1	03-2004-03	No (See Note 1)
MGU-1	03-2004-04	No (See Note 1)
MGU-1	03-2004-05	No (See Note 1)
MGU-1	03-2004-06	No (See Note 1)

Note 1: Version variant for marketing purposes only. Electrically identical to the tested version.

TGU device includes previously certified radio module.

Transmitter Module	FCC ID	ISED IC
Cellular	XPYUBX19KM01	8595A-UBX19KM01

EUT has no ports for power or I/O.

Lowest clock frequency in the device (used/generated): 0.032 MHz

Highest clock frequency in the device (used/generated): 2480 MHz

For a more detailed description of the EUT, please refer to the manufacturer's specifications or the user's manual.

For photos of the EUT, please refer to External and Internal Photos exhibits.

3.2 DESCRIPTION OF TEST MODES

EUT has 16 operating channels as shown below:

Channel	FREQ. (MHz)	Channel	FREQ. (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	26	2480

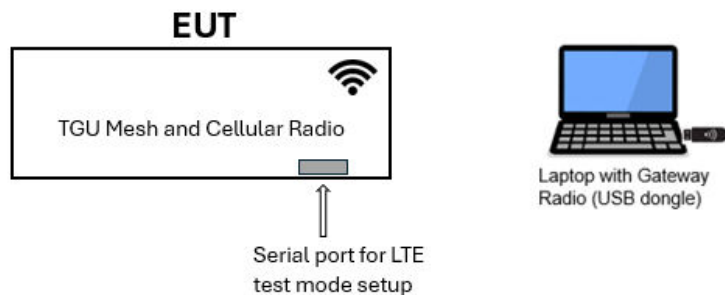
Two samples were provided for testing, one for radiated measurements and another with an u.FL connector for conducted antenna port measurements. EUT is a battery powered device. Customer supplied the laptop with software tool and PRU4 (USB dongle) for necessary test mode setup. EUT battery voltages were monitored to ensure fresh battery levels during testing.

EUT configuration modes:

TEST MODE	DESCRIPTION
A	Transmit at 250kbps (Duty-cycle: 99.89%)

EUT SETUP BLOCK DIAGRAMS

Radiated Emissions EUT Setup



Laptop was removed from the chamber after necessary test mode was set up for the 2.4GHz radio via Gateway Radio (USB Dongle). Serial port connection (internal on EUT PCB) was used for LTE test mode setup during simultaneous transmission radiated emissions testing.

For the antenna port test setup block diagrams, please see section 4.2.2 of this report.



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Following channels/modes were selected for the applicable tests below.

TEST	TEST MODE	AVAILABLE CHANNELS	TESTED CHANNEL	MODULATION TYPE	DATA RATE (kbps)	Notes
COP	A	11 to 26	11,18,26	OQPSK	250	-
PSD	A	11 to 26	11,18,26	OQPSK	250	-
CBE	A	11 to 26	11,26	OQPSK	250	-
6DB	A	11 to 26	11,18,26	OQPSK	250	-
OBW	A	11 to 26	11,18,26	OQPSK	250	-
CSE	A	11 to 26	11,18,26	OQPSK	250	-
RSE<1G	A	11 to 26	11,18,26	OQPSK	250	1, 2
RSE≥1G	A	11 to 26	11,18,26	OQPSK	250	1
RBE	A	11 to 26	11,26	OQPSK	250	1
PLCE	-	-	-	-	-	3

Notes:

- 1) For radiated emissions, worst-case orientation was found when the EUT was positioned on Y-Axis as shown in the Test Setup Photos exhibit. Worst-case orientation was determined based on pre-scans.
- 2) Only middle channel was tested in 9kHz-30MHz range since no emissions were detected.
- 3) Not applicable since EUT is battery powered only.

COP: Conducted Output Power

PSD: Power Spectral Density

CBE: Conducted Band-edge

6DB: 6dB Bandwidth

OBW: 99% Occupied Bandwidth

CSE: Conducted Spurious Emissions

RSE<1G: Radiated Spurious Emissions Below 1GHz

RSE≥1G: Radiated Spurious Emissions Above 1GHz

RBE: Radiated Band-edge

PLCE: Power Line Conducted Emissions

TEST CONDITIONS:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY	DATE OF TEST
RE<1G	20.9°C, 47.3%, 1020mbar	7.2V DC	NP	10/18/2024
RE≥1G	21.1°C, 58.1%, 1009mbar 20.9°C, 47.3%, 1020mbar	7.2V DC	NP	10/17/2024 10/18/2024
RBE	21.7°C, 47.8%, 1015mbar	7.2V DC	NP	10/17/2024
Antenna Port Measurements	27.6°C, 48.0%, 1009mbar	7.2V DC	NP	10/16/2024



3.3 MEASUREMENT PROCEDURES USED

All tests were performed in accordance with the following measurement procedures:

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2013

3.4 DESCRIPTION OF SUPPORT EQUIPMENT

Support Equipment	Model #	Serial #	Comments
Laptop	Dell Latitude 5450	-	Supplied by the customer for necessary test mode setup
PRU-4 80-1024-01 (USB dongle)	BL654	1462400199	

4 TEST TYPES AND RESULTS

4.1 RADIATED EMISSIONS MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSIONS MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emissions limits specified in Section 15.209(a).

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

- Lower limit applies at the transition frequencies.
- As specified in 15.35(b), for frequencies above 1000MHz, field strength limits are based on the use of measurement instrumentation employing an average detector function. However, there is also a limit on the peak level of the emissions that is 20 dB above the maximum permitted average emission limit.
- Measurements above 6GHz or 18GHz can be performed at distances less than 3m from the EUT due to increased noise floor of the measurement system. Since such measurements produce higher amplitudes than what they would be if they were measured at 3 meters, this would be considered worst-case and no compensation back to 3 meters is needed. Limit conversion above 30MHz is done by using inverse linear distance extrapolation factor (20dB/decade) as allowed in FCC 15.31(f)(1).

$$\text{Limit}(1\text{m}) = \text{Limit}(3\text{m}) + 20 \cdot \log(3/1) = \text{Limit}(3\text{m}) + 9.5$$

$$\text{Limit}(0.1\text{m}) = \text{Limit}(3\text{m}) + 20 \cdot \log(3/0.1) = \text{Limit}(3\text{m}) + 29.5$$
- Limit conversion below 30MHz is done by using the square of an inverse linear distance extrapolation factor (40 dB/decade) as allowed in FCC 15.31(f)(2).

$$\text{Limit}(3\text{m}) = \text{Limit}(30\text{m}) + 40 \cdot \log(30/3) = \text{Limit}(30\text{m}) + 40$$

$$\text{Limit}(3\text{m}) = \text{Limit}(300\text{m}) + 40 \cdot \log(300/3) = \text{Limit}(300\text{m}) + 80$$
- Adjusted Reading (dBuV/m) = Raw Reading (dBuV) + Transducer(Correction) Factor (dB/m)
 Transducer Factor (dB/m) = Antenna Factor (dB/m) – PreAmp Gain (dB) + Cable Loss (dB) + Filter Loss (dB)
 Note: Filter loss only applies if a notch filter is used during testing.
- RSS-GEN Table 6 H-field limits are 51.5dB lower than FCC 15.209(a) E-field limits.
 Measurements are performed in terms of magnetic field and converted to electric field using the free space impedance of 377Ω (E-field = H-field + 51.5). Therefore resulting pass/fail margin would be the same if an E-field reading is compared to an E-field limit or an H-field reading is compared to an H-field limit.



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4.1.2 TEST INSTRUMENTS

Rev. 10/29/2024								
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz	1685	I	9/19/2025	9/19/2024
EMI Chamber 1	719150	2762A-6	A-0015	1-18GHz	1685	I	9/19/2025	9/19/2024
Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Gauss TDEMI Ultra 40	9kHz-40Ghz	TDEMI Ultra 40	Gauss	2305001	2712	1	7/23/2025	7/23/2024
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Red-Black Bilog	30-2000MHz	JB1	Sunol	A091604-2	1106	I	10/2/2025	10/2/2023
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	3/27/2025	3/27/2023
3116C Horn / PA	18-40GHz	3116C	ETS	258845	2852	I	3/21/2026	3/21/2024
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	1/18/2025	1/18/2023
Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
8447F Rental PA	9KHz-1.3GHz	84477F	HP	3113A05395		II	10/14/2025	10/14/2024
2116 BRF	0.009-18000MHz	BRM50702	Micro-Tronics	G226	2116	II	12/5/2024	12/5/2023
Cables	Range		Mfr			Cat	Calibration Due	Calibrated on
Asset #2466	9KHz-18GHz		MegaPhase			II	11/2/2024	11/2/2023
Asset #2608	9KHz-18GHz		Pasternack			II	10/29/2025	10/29/2024
Asset #2595	9KHz-40GHz		Carlisle			II	2/17/2025	2/17/2024
Asset #2596	9KHz-40GHz		Carlisle			II	4/22/2025	4/22/2024
Asset #2681	9KHz-18GHz		Pasternack			II	12/7/2024	12/7/2023
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Asset 2848		SD700	EXTECH	A.115171	2848	I	1/13/2025	1/13/2023
Asset #2847		1235C97	Control Company	200435382	2847	I	8/18/2025	8/18/2022
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.								



4.1.3 TEST PROCEDURES

- The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber.
- For below 30MHz, a loop antenna with its lowest point 1m above the ground was placed 3m away from the EUT and it was rotated 0 and 90 degrees around its vertical axis.
- In 30MHz-1GHz range, a biconilog antenna was mounted on a variable-height antenna tower and placed 3m away from the EUT. Antenna height was varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were investigated. The table was rotated 360 degrees to determine the position of the highest radiation.
- In 1GHz-18GHz range, a horn antenna was mounted on a variable-height antenna tower and placed 3m away from the EUT. Antenna height was varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were investigated. The table was rotated 360 degrees to determine the position of the highest radiation.
- In 18-25GHz a smaller horn antenna was used to make measurements 1m away from the EUT.
- Tests were performed using fresh batteries.
- Following bandwidths were used during emissions testing:

Freq. (MHz)	RBW	VBW	Pre- scan	Final
0.009-0.15	200Hz	1kHz	Peak	Not required based on pre-scan data
0.15-30	9kHz	30kHz	Peak	Not required based on pre-scan data
30-1000	120kHz	300kHz	Peak	Quasi Peak
>1000	1MHz	3MHz	Peak	Peak Max Hold and RMS Power Avg (Max Hold)

Per FCC §15.209(d), limits §15.209(a) are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. If peak measurements in these frequency bands were below the applicable limits, QPk and RMS measurements were not performed.

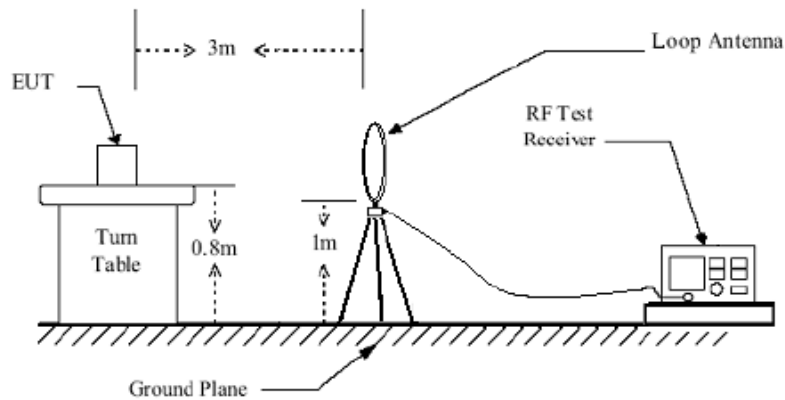
RMS power averaging default mode in measurement software is trace max hold.

4.1.4 DEVIATION FROM TEST STANDARD

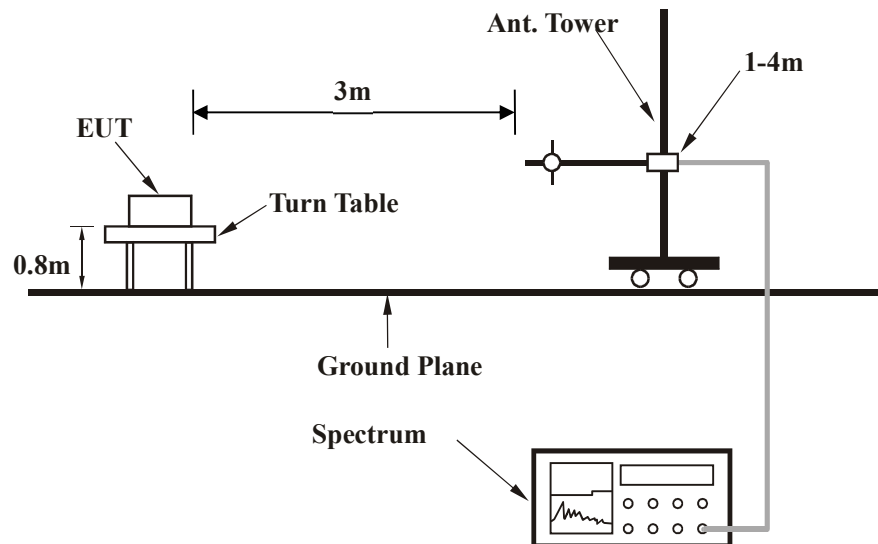
No deviation.

4.1.5 TEST SETUP

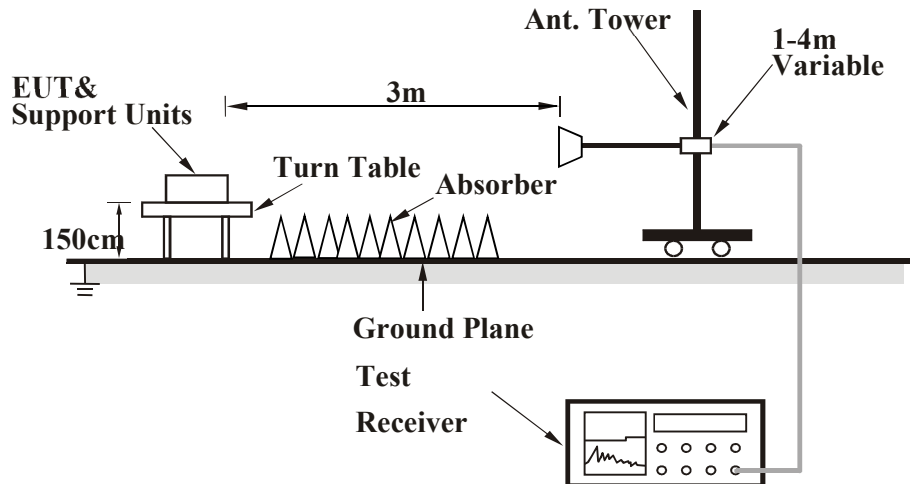
Below 30MHz test setup



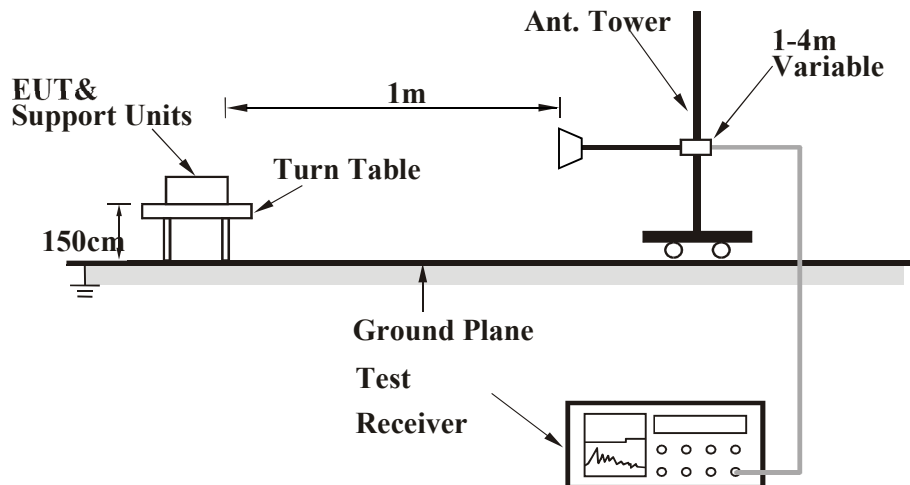
Below 1GHz test setup



1GHz – 18GHz Test Setup



18GHz – 25GHz Test Setup



Note: For the actual test configuration, please refer to the Test Setup Photos exhibit.

4.1.6 EUT OPERATING CONDITIONS

EUT was operated according to the manufacturer's specifications.



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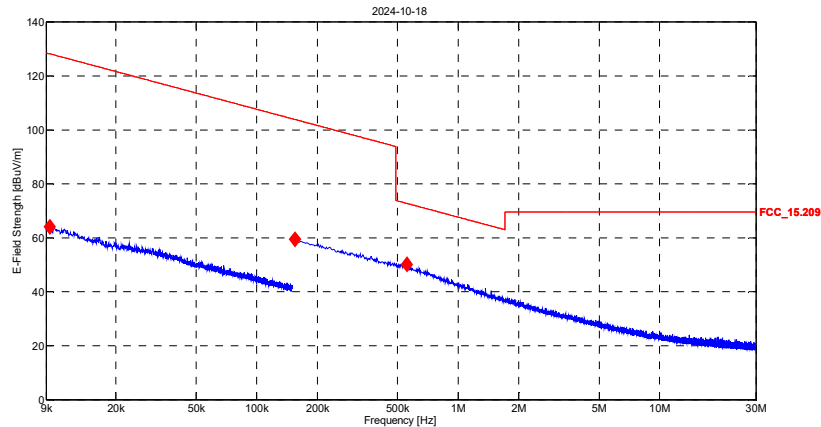


4.1.7 TEST RESULTS

Emissions below 30MHz

No emissions within 20dB of the limit were identified in 9kHz-30MHz range.

250kbps 802.15.4 Channel 18



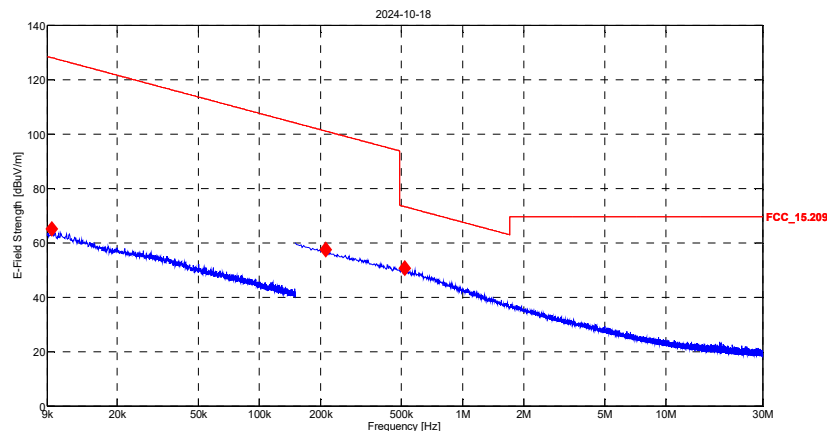
Scan1: 9.0 kHz, 100.0 Hz, 150.0 kHz; IF:200Hz, 100.0 ms MaxPeak, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Height [cm]	Angle [°]	Trans	Name
9.4 kHz	64.01	128.13	64.13	Parallel	100	67.511	18.97	FCC_15.209

Scan2: 150.0 kHz, 5.0 kHz, 30.0 MHz; IF:9kHz, 100.0 ms MaxPeak, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Height [cm]	Angle [°]	Trans	ame
155 kHz	59.35	103.79	44.45	Parallel	100	190.895	10.01	FCC_15.209
557.5 kHz	50.00	72.68	22.67	Parallel	100	295.21	10.21	FCC_15.209

9k-30MHz Parallel, Plot and Data Table



Scan1: 9.0 kHz, 100.0 Hz, 150.0 kHz; IF:200Hz, 100.0 ms MaxPeak, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Height [cm]	Angle [°]	Trans	Name
9.5 kHz	65.01	128.04	63.03	Perpendicular	100	78.066	18.92	FCC_15.209

Scan2: 150.0 kHz, 5.0 kHz, 30.0 MHz; IF:9kHz, 100.0 ms MaxPeak, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Height [cm]	Angle [°]	Trans	Name
212.5 kHz	57.55	101.05	43.50	Perpendicular	100	58.862	9.97	FCC_15.209
520 kHz	50.73	73.28	22.55	Perpendicular	100	221.987	10.13	FCC_15.209

9k-30MHz Perpendicular, Plot and Data Table

Bureau Veritas Consumer Product
Services Inc.

One Distribution Center Circle, #1
Littleton, MA

Tel.: (978) 486-8880
Fax: (978) 486-8828

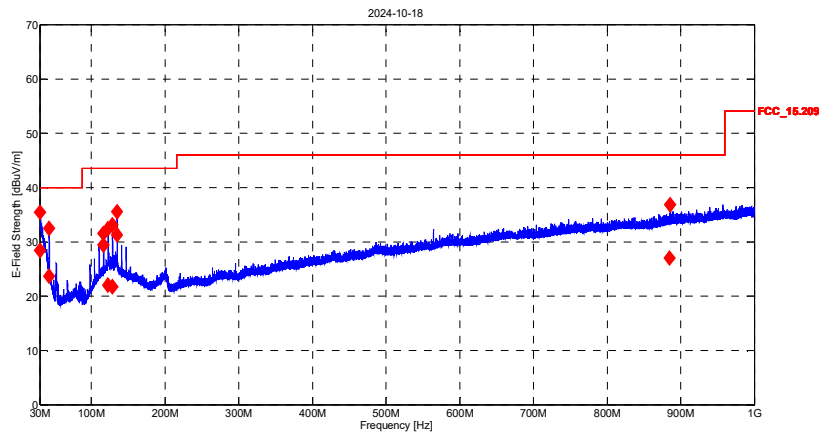


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30MHz-1000MHz

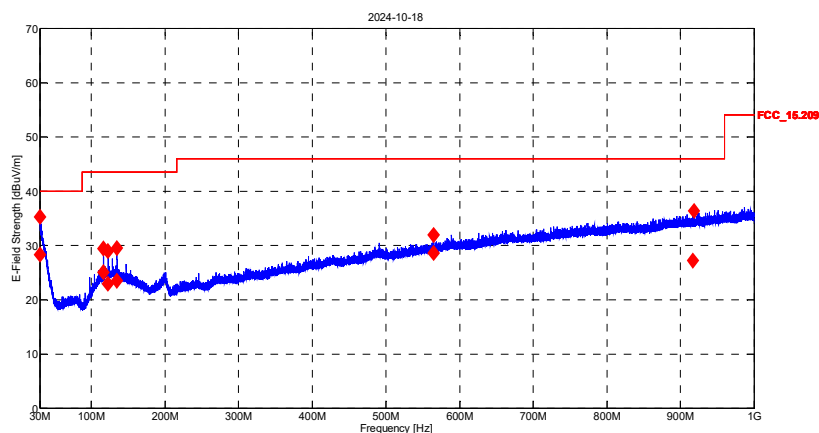
250kbps 802.15.4 Channel 11



Final 1: 30.0 MHz, 50.0 kHz, 888.0 MHz; IF:120kHz, 200.0 ms QP, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
30.175 MHz	28.35	40.00	11.65	V	157.464	179.6	1.90	FCC 15.209
42.8 MHz	23.70	40.00	16.30	V	154	100	-5.91	FCC 15.209
116.375 MHz	29.44	43.50	14.06	V	295.47	132.5	-5.70	FCC 15.209
122.45 MHz	21.96	43.50	21.54	V	347.156	100	-5.16	FCC 15.209
128.575 MHz	21.74	43.50	21.76	V	11.58	200	-4.97	FCC 15.209
134.725 MHz	31.24	43.50	12.26	V	33.188	100	-4.95	FCC 15.209
884.75 MHz	26.99	46.00	19.01	V	126.952	253.121	5.89	FCC 15.209

30-1000MHz Vertical, Plot and Data Table



Final 1: 30.0 MHz, 50.0 kHz, 920.5 MHz; IF:120kHz, 200.0 ms QP, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
30.1 MHz	28.31	40.00	11.69	H	149.1	168.925	1.90	FCC 15.209
116.375 MHz	25.07	43.50	18.43	H	258.82	300	-5.71	FCC 15.209
122.525 MHz	22.89	43.50	20.61	H	262.831	233.212	-5.13	FCC 15.209
134.725 MHz	23.48	43.50	20.02	H	44.045	314.75	-4.95	FCC 15.209
564.525 MHz	28.58	46.00	17.42	H	12.26	265.237	0.32	FCC 15.209
916.95 MHz	27.19	46.00	18.81	H	165.851	175.444	6.22	FCC 15.209

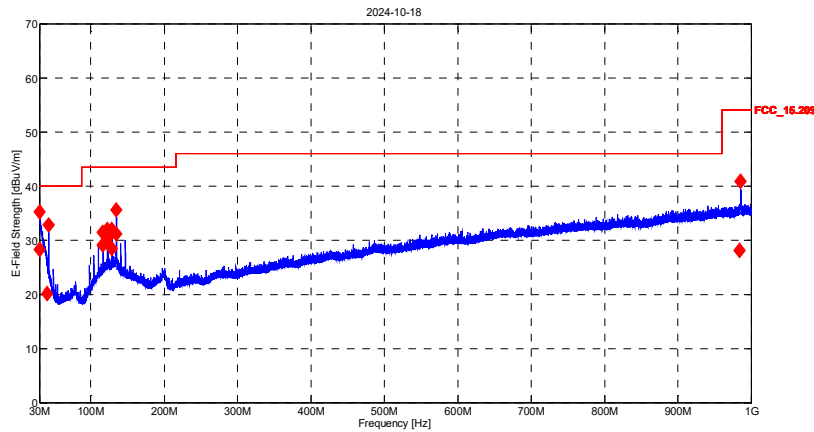
30-1000MHz Horizontal, Plot and Data Table

Bureau Veritas Consumer Product
Services Inc.

One Distribution Center Circle, #1
Littleton, MA

Tel.: (978) 486-8880
Fax: (978) 486-8828

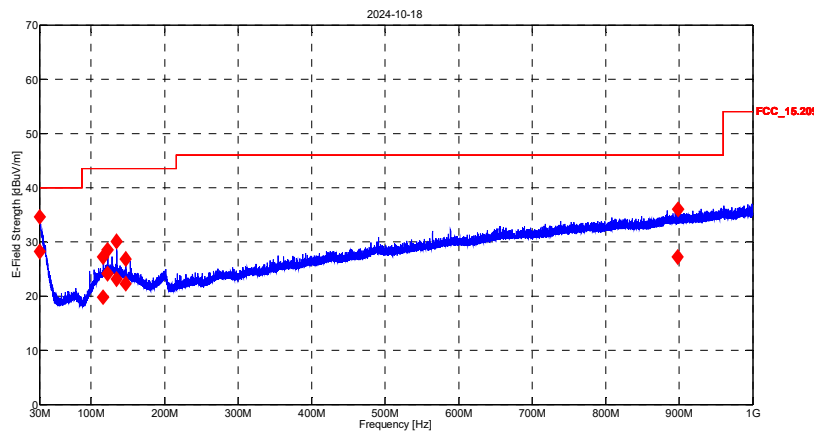
250kbps 802.15.4 Channel 18



Final 1: 30.0 MHz, 50.0 kHz, 987.2 MHz; IF:120kHz, 200.0 ms QP, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
30.25 MHz	28.27	40.00	11.73	V	341.98	267.2	1.90	FCC 15.209
40.85 MHz	20.12	40.00	19.88	V	216.72	100	-5.91	FCC 15.209
116.375 MHz	29.09	43.50	14.41	V	294.77	100	-5.70	FCC 15.209
122.475 MHz	30.35	43.50	13.15	V	345.458	100	-5.15	FCC 15.209
128.625 MHz	28.47	43.50	15.03	V	55.192	114.25	-4.97	FCC 15.209
134.725 MHz	31.12	43.50	12.38	V	25.868	100	-4.94	FCC 15.209
983.95 MHz	28.15	54.00	25.85	V	80.433	200.1	7.45	FCC 15.209

30-1000MHz Vertical, Plot and Data Table

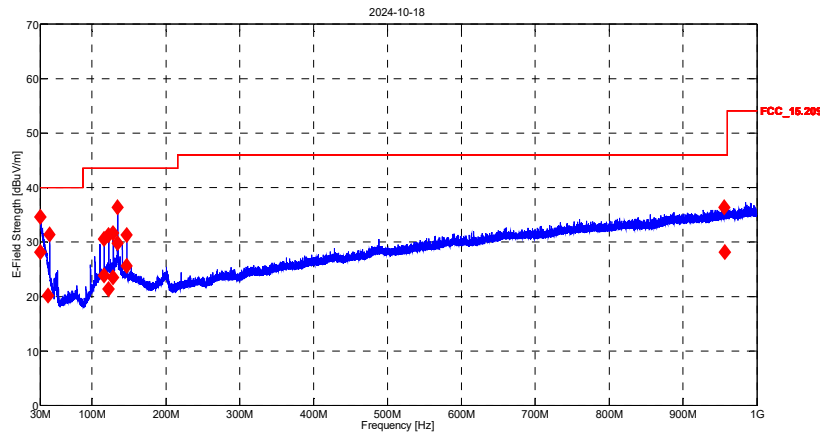


Final 1: 30.0 MHz, 50.0 kHz, 900.8 MHz; IF:120kHz, 200.0 ms QP, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
30.175 MHz	28.22	40.00	11.78	H	131.52	378.265	1.90	FCC 15.209
116.375 MHz	19.75	43.50	23.75	H	266.6	243.741	-5.69	FCC 15.209
122.475 MHz	24.16	43.50	19.34	H	263.061	297.981	-5.14	FCC 15.209
134.725 MHz	23.12	43.50	20.38	H	43.626	331.3	-4.94	FCC 15.209
147 MHz	22.31	43.50	21.19	H	214.6	200	-5.73	FCC 15.209
897.75 MHz	27.21	46.00	18.79	H	46.56	195.045	6.13	FCC 15.209

30-1000MHz Horizontal, Plot and Data Table

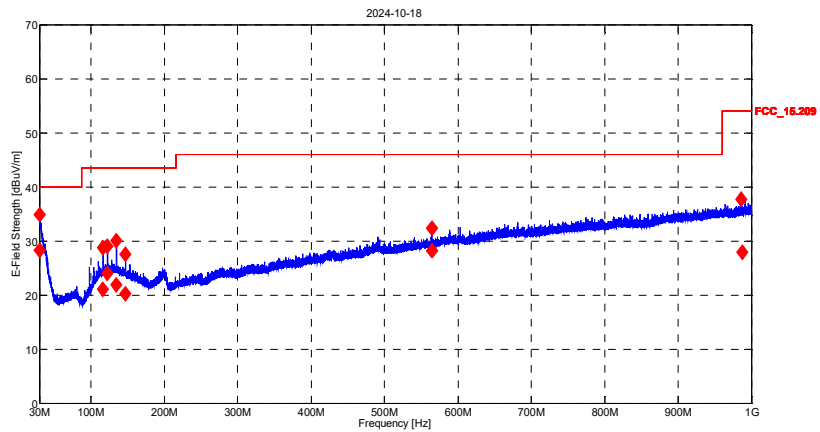
250kbps 802.15.4 Channel 26



Final 1: 30.0 MHz, 50.0 kHz, 957.8 MHz; IF:120kHz, 200.0 ms QP, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
30.175 MHz	28.10	40.00	11.90	V	163.512	145.5	1.90	FCC_15.209
40.85 MHz	20.12	40.00	19.88	V	221.2	186.3	-5.91	FCC_15.209
116.375 MHz	23.84	43.50	19.66	V	57.649	200	-5.70	FCC_15.209
122.525 MHz	21.35	43.50	22.15	V	293.009	119.667	-5.13	FCC_15.209
128.65 MHz	23.47	43.50	20.03	V	57.649	165.411	-4.97	FCC_15.209
134.725 MHz	29.81	43.50	13.69	V	32.524	100	-4.94	FCC_15.209
147 MHz	25.63	43.50	17.87	V	315.319	100	-5.71	FCC_15.209
956.575 MHz	28.12	46.00	17.88	V	64.462	156.2	6.87	FCC_15.209

30-1000MHz Vertical, Plot and Data Table



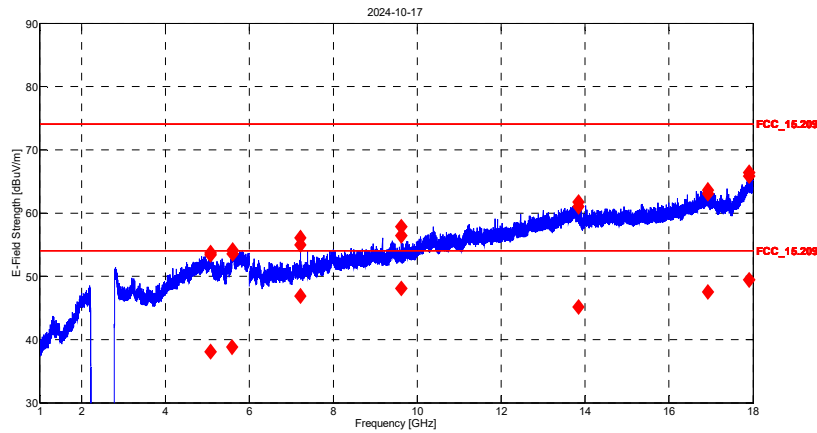
Final 1: 30.0 MHz, 50.0 kHz, 988.2 MHz; IF:120kHz, 200.0 ms QP, Att 10dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
30.175 MHz	28.29	40.00	11.71	H	0	132.8	1.90	FCC_15.209
116.375 MHz	21.05	43.50	22.45	H	259.58	300	-5.71	FCC_15.209
122.475 MHz	24.02	43.50	19.48	H	259.58	243.106	-5.14	FCC_15.209
134.725 MHz	21.87	43.50	21.63	H	43.4	356.044	-4.95	FCC_15.209
147 MHz	20.21	43.50	23.29	H	225.22	200	-5.72	FCC_15.209
564.525 MHz	28.21	46.00	17.79	H	93.752	299.975	0.32	FCC_15.209
987.7 MHz	27.94	54.00	26.06	H	0	150.056	7.45	FCC_15.209

30-1000MHz Horizontal, Plot and Data Table

1-18GHz

250kbps 802.15.4 Channel 11



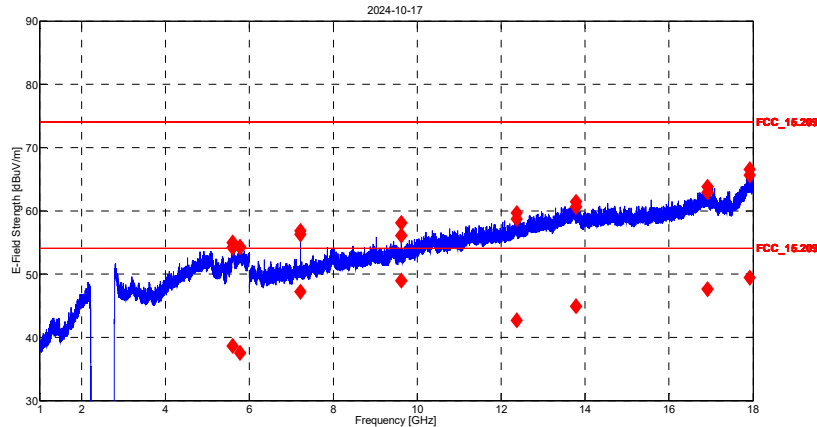
Final 1: 5.1 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.07575 GHz	53.35	74.00	20.65	V	93.831	171.392	39.58	FCC_15.209
5.5945 GHz	53.56	74.00	20.44	V	315.892	100.078	41.42	FCC_15.209
7.21625 GHz	56.04	74.00	17.96	V	335.961	170.32	42.40	FCC_15.209
9.62175 GHz	57.83	74.00	16.17	V	140.185	182.78	43.96	FCC_15.209
13.83775 GHz	60.99	74.00	13.01	V	206.633	400.079	49.38	FCC_15.209
16.93375 GHz	63.02	74.00	10.98	V	329.256	300.005	52.10	FCC_15.209
17.91425 GHz	65.87	74.00	8.13	V	360	260.269	54.55	FCC_15.209

Final 2: 5.1 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.07575 GHz	38.08	54.00	15.92	V	93.831	100	39.58	FCC_15.209
5.59375 GHz	38.73	54.00	15.27	V	315.892	100.705	41.42	FCC_15.209
7.21625 GHz	46.87	54.00	7.13	V	335.961	179.137	42.40	FCC_15.209
9.62175 GHz	48.06	54.00	5.94	V	140.185	182.78	43.96	FCC_15.209
13.84 GHz	45.08	54.00	8.92	V	206.633	200	49.38	FCC_15.209
16.93175 GHz	47.54	54.00	6.46	V	329.256	382.603	52.10	FCC_15.209
17.91425 GHz	49.40	54.00	4.60	V	360	209.051	54.55	FCC_15.209

1-18GHz Vertical, Plot and Data Table



Final 1: 5.6 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

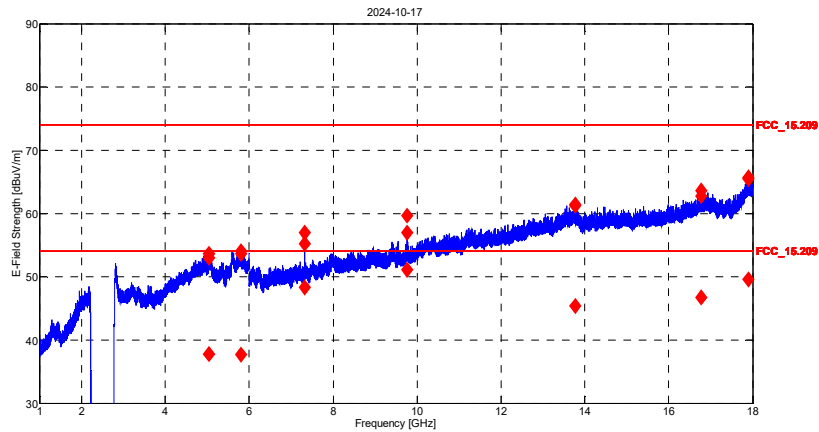
f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.5945 GHz	54.20	74.00	19.80	H	344.489	197.869	41.42	FCC_15.209
5.7845 GHz	54.24	74.00	19.76	H	184.662	214.387	40.96	FCC_15.209
7.2135 GHz	56.82	74.00	17.18	H	57.478	168.47	42.40	FCC_15.209
9.62175 GHz	58.06	74.00	15.94	H	142.611	210.624	43.96	FCC_15.209
12.37 GHz	58.69	74.00	15.31	H	10.5	360.521	47.31	FCC_15.209
13.7845 GHz	60.62	74.00	13.38	H	182.878	200	49.41	FCC_15.209
16.91975 GHz	62.87	74.00	11.13	H	176.6	199.71	52.19	FCC_15.209
17.917 GHz	66.53	74.00	7.47	H	50.4	100	54.56	FCC_15.209

Final 2: 5.6 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.5945 GHz	38.63	54.00	15.37	H	344.489	100	41.42	FCC_15.209
5.7845 GHz	37.49	54.00	16.51	H	184.662	214.387	40.96	FCC_15.209
7.2135 GHz	47.16	54.00	6.84	H	57.478	181.373	42.40	FCC_15.209
9.62175 GHz	48.92	54.00	5.08	H	142.611	225.952	43.96	FCC_15.209
12.37125 GHz	42.65	54.00	11.35	H	10.5	200	47.31	FCC_15.209
13.7865 GHz	44.89	54.00	9.11	H	182.878	185.727	49.41	FCC_15.209
16.91975 GHz	47.59	54.00	6.41	H	176.6	107.808	52.19	FCC_15.209
17.917 GHz	49.37	54.00	4.63	H	50.4	160.127	54.56	FCC_15.209

1-18GHz Horizontal, Plot and Data Table

250kbps 802.15.4 Channel 18



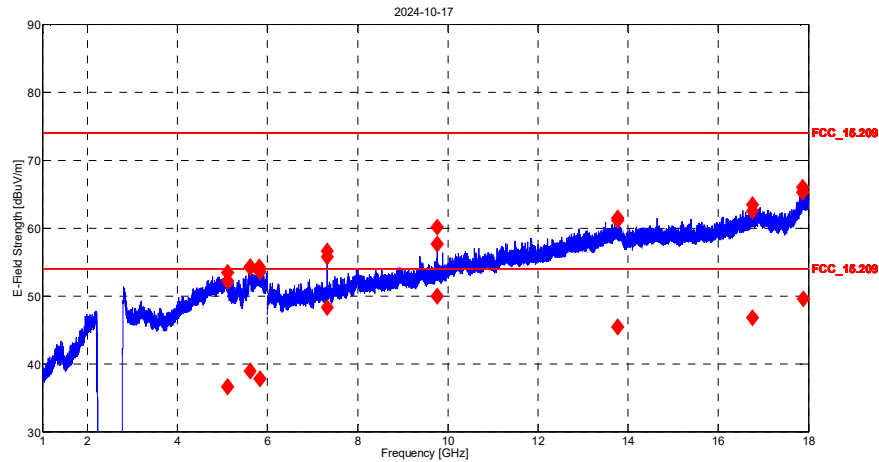
Final 1: 5.0 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.0385 GHz	52.99	74.00	21.01	V	155.77	118.981	39.43	FCC_15.209
5.7995 GHz	53.58	74.00	20.42	V	307.332	147.807	41.03	FCC_15.209
7.321 GHz	56.94	74.00	17.06	V	337.956	176.024	42.61	FCC_15.209
9.762 GHz	59.66	74.00	14.34	V	147	185.211	44.22	FCC_15.209
13.7705 GHz	61.20	74.00	12.80	V	127.7	182.511	49.33	FCC_15.209
16.77475 GHz	62.77	74.00	11.23	V	295.845	400	52.10	FCC_15.209
17.89575 GHz	65.67	74.00	8.33	V	186.5	135.524	54.51	FCC_15.209

Final 2: 5.0 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.03975 GHz	37.77	54.00	16.23	V	155.77	137.316	39.43	FCC_15.209
5.79875 GHz	37.70	54.00	16.30	V	307.332	167.244	41.03	FCC_15.209
7.321 GHz	48.28	54.00	5.72	V	337.956	166.078	42.61	FCC_15.209
9.762 GHz	51.07	54.00	2.93	V	147	193.596	44.22	FCC_15.209
13.77025 GHz	45.38	54.00	8.62	V	127.7	200	49.33	FCC_15.209
16.7775 GHz	46.74	54.00	7.26	V	295.845	300	52.10	FCC_15.209
17.895 GHz	49.58	54.00	4.42	V	186.5	144.459	54.51	FCC_15.209

1-18GHz Vertical, Plot and Data Table



Final 1: 5.1 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

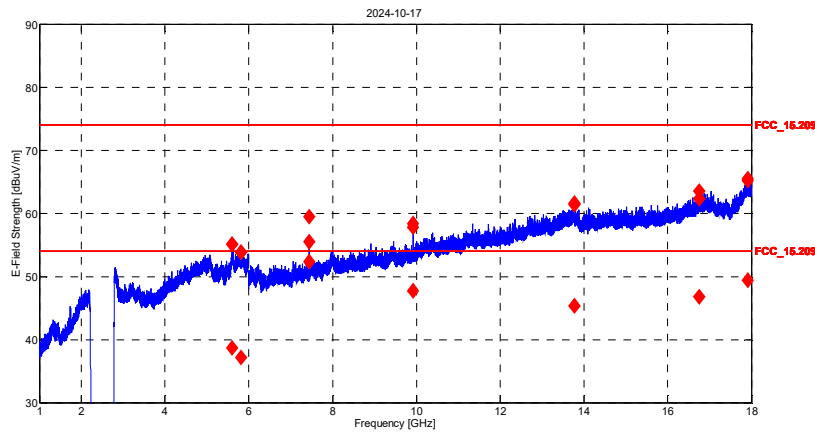
f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.11175 GHz	52.17	74.00	21.83	H	99.001	373.07	39.69	FCC_15.209
5.61375 GHz	54.33	74.00	19.67	H	309.412	183.035	41.40	FCC_15.209
5.82075 GHz	54.25	74.00	19.75	H	0	360.577	41.03	FCC_15.209
7.321 GHz	56.66	74.00	17.34	H	143.761	201.122	42.61	FCC_15.209
9.758 GHz	60.10	74.00	13.90	H	143.761	226.654	44.20	FCC_15.209
13.77575 GHz	61.49	74.00	12.51	H	110.996	157.016	49.35	FCC_15.209
16.76225 GHz	62.52	74.00	11.48	H	272.893	172.454	52.13	FCC_15.209
17.879 GHz	65.25	74.00	8.75	H	322.671	162.746	54.46	FCC_15.209

Final 2: 5.1 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.1105 GHz	36.60	54.00	17.40	H	99.001	300	39.69	FCC_15.209
5.615 GHz	38.92	54.00	15.08	H	309.412	119.454	41.40	FCC_15.209
5.82475 GHz	37.84	54.00	16.16	H	0	353.523	41.03	FCC_15.209
7.321 GHz	48.28	54.00	5.72	H	143.761	201.122	42.61	FCC_15.209
9.758 GHz	49.97	54.00	4.03	H	143.761	223.711	44.20	FCC_15.209
13.77575 GHz	45.46	54.00	8.54	H	110.996	182.314	49.35	FCC_15.209
16.763 GHz	46.79	54.00	7.21	H	272.893	100	52.13	FCC_15.209
17.88225 GHz	49.59	54.00	4.41	H	322.671	166.53	54.46	FCC_15.209

1-18GHz Horizontal, Plot and Data Table

250kbps 802.15.4 Channel 26



Final 1: 5.6 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.603 GHz	55.12	74.00	18.88	V	116.708	119.054	41.43	FCC_15.209
5.814 GHz	53.84	74.00	20.16	V	188.568	272.656	41.04	FCC_15.209
7.44125 GHz	59.47	74.00	14.53	V	222.463	168.052	42.46	FCC_15.209
9.91775 GHz	58.35	74.00	15.65	V	50.244	187.841	44.35	FCC_15.209
13.7745 GHz	61.38	74.00	12.62	V	79.256	110.844	49.35	FCC_15.209
16.75225 GHz	62.33	74.00	11.67	V	318.478	200	52.15	FCC_15.209
17.91425 GHz	65.23	74.00	8.77	V	195.478	166.916	54.56	FCC_15.209

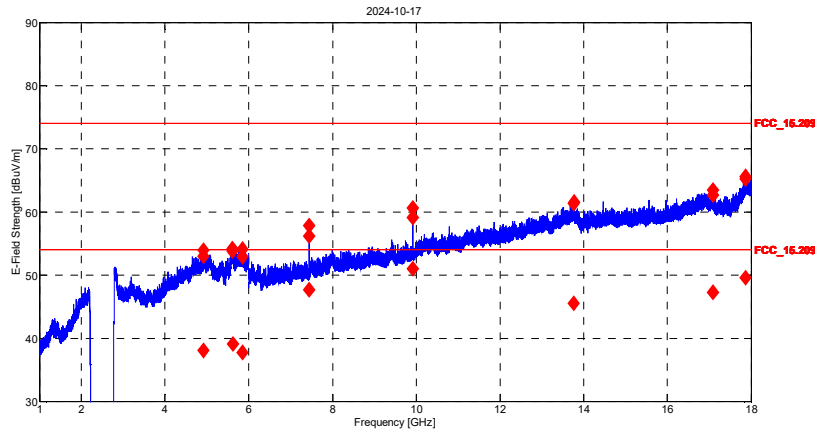
Final 2: 5.6 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
5.60375 GHz	38.69	54.00	15.31	V	116.708	100	41.43	FCC_15.209
5.81675 GHz	37.16	54.00	16.84	V	188.568	108.958	41.04	FCC_15.209
7.44125 GHz	52.37	54.00	1.63	V	222.463	168.052	42.46	FCC_15.209
9.91775 GHz	47.74	54.00	6.26	V	50.244	207.282	44.35	FCC_15.209
13.7725 GHz	45.38	54.00	8.62	V	79.256	170	49.35	FCC_15.209
16.75275 GHz	46.82	54.00	7.18	V	318.478	100	52.15	FCC_15.209
17.91225 GHz	49.40	54.00	4.60	V	195.478	200	54.56	FCC_15.209

1-18GHz Vertical, Plot and Data Table



Test Report for RSAE Labs, Inc.
Report No. EY0476-2 Issue 2



Final 1: 4.9 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
4.91625 GHz	52.94	74.00	21.06	H	159.47	137.849	39.83	FCC_15.209
5.617 GHz	53.76	74.00	20.24	H	49.749	191.708	41.38	FCC_15.209
5.85275 GHz	52.89	74.00	21.11	H	42.942	192.13	40.96	FCC_15.209
7.4385 GHz	57.85	74.00	16.15	H	139.678	205.679	42.45	FCC_15.209
9.91775 GHz	60.61	74.00	13.39	H	146.317	178.782	44.35	FCC_15.209
13.76375 GHz	61.30	74.00	12.70	H	30.319	133.785	49.30	FCC_15.209
17.08925 GHz	62.65	74.00	11.35	H	206.511	169.416	51.85	FCC_15.209
17.8615 GHz	65.56	74.00	8.44	H	118.754	343.117	54.37	FCC_15.209

Final 2: 4.9 GHz, 50.0 kHz, 17.9 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
4.91825 GHz	38.08	54.00	15.92	H	159.47	106.459	39.83	FCC_15.209
5.6185 GHz	39.10	54.00	14.90	H	49.749	179.728	41.38	FCC_15.209
5.8515 GHz	37.73	54.00	16.27	H	42.942	183.554	40.96	FCC_15.209
7.4385 GHz	47.64	54.00	6.36	H	139.678	196.572	42.45	FCC_15.209
9.91775 GHz	50.98	54.00	3.02	H	146.317	178.782	44.35	FCC_15.209
13.76375 GHz	45.48	54.00	8.52	H	30.319	107.269	49.30	FCC_15.209
17.08525 GHz	47.25	54.00	6.75	H	206.511	200	51.85	FCC_15.209
17.8595 GHz	49.59	54.00	4.41	H	118.754	208.35	54.37	FCC_15.209

1-18GHz Horizontal, Plot and Data Table

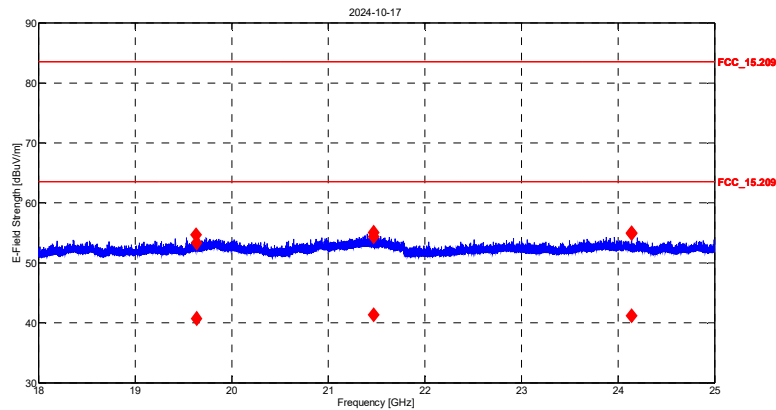


Test Report for RSAE Labs, Inc.
Report No. EY0476-2 Issue 2



18-25GHz

250kbps 802.15.4 Channel 11



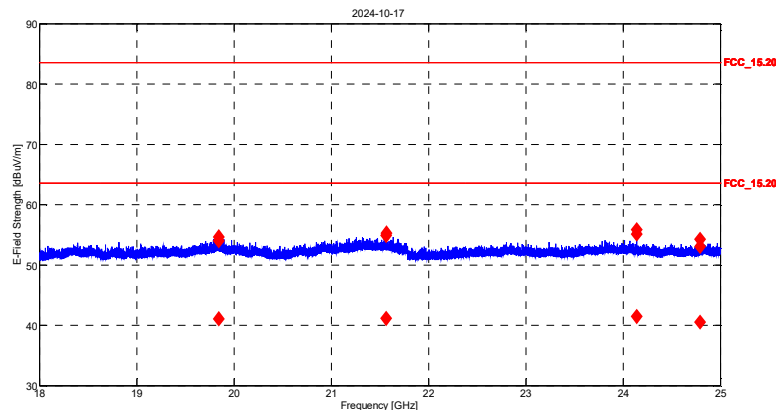
Final 1: 19.6 GHz, 50.0 kHz, 24.1 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.6355 GHz	53.26	83.50	30.24	V	294.383	173.229	12.62	FCC_15.209
21.47225 GHz	54.29	83.50	29.21	V	156.315	100.2	12.76	FCC_15.209
24.139 GHz	54.85	83.50	28.65	V	322.553	160.365	12.68	FCC_15.209

Final 2: 19.6 GHz, 50.0 kHz, 24.1 GHz; IF:1MHz, 100.0 ms RMS, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.63675 GHz	40.70	63.50	22.80	V	294.383	200	12.62	FCC_15.209
21.4695 GHz	41.28	63.50	22.22	V	156.315	125	12.76	FCC_15.209
24.1385 GHz	41.14	63.50	22.36	V	322.553	160.365	12.68	FCC_15.209

18-25GHz Vertical, Plot and Data Table



Final 1: 19.8 GHz, 50.0 kHz, 24.8 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.847 GHz	54.04	83.50	29.46	H	241.869	199.044	12.87	FCC_15.209
21.5685 GHz	55.30	83.50	28.20	H	63.931	172.048	12.62	FCC_15.209
24.139 GHz	55.81	83.50	27.69	H	136.923	136.613	12.68	FCC_15.209
24.78925 GHz	53.09	83.50	30.41	H	340.269	116.8	12.34	FCC_15.209

Final 2: 19.8 GHz, 50.0 kHz, 24.8 GHz; IF:1MHz, 100.0 ms RMS, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.845 GHz	41.05	63.50	22.45	H	241.869	225	12.87	FCC_15.209
21.5665 GHz	41.17	63.50	22.33	H	63.931	150	12.62	FCC_15.209
24.1385 GHz	41.50	63.50	22.00	H	136.923	125.187	12.68	FCC_15.209
24.7925 GHz	40.55	63.50	22.95	H	340.269	125	12.34	FCC_15.209

18-25GHz Horizontal, Plot and Data Table

Bureau Veritas Consumer Product
Services Inc.

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Littleton, MA

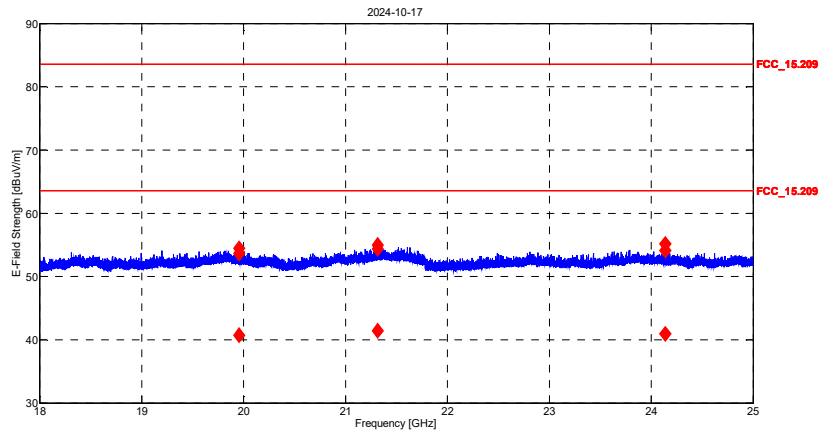
Tel.: (978) 486-8880
Fax: (978) 486-8828



Test Report for RSAE Labs, Inc.
Report No. EY0476-2 Issue 2



250kbps 802.15.4 Channel 18



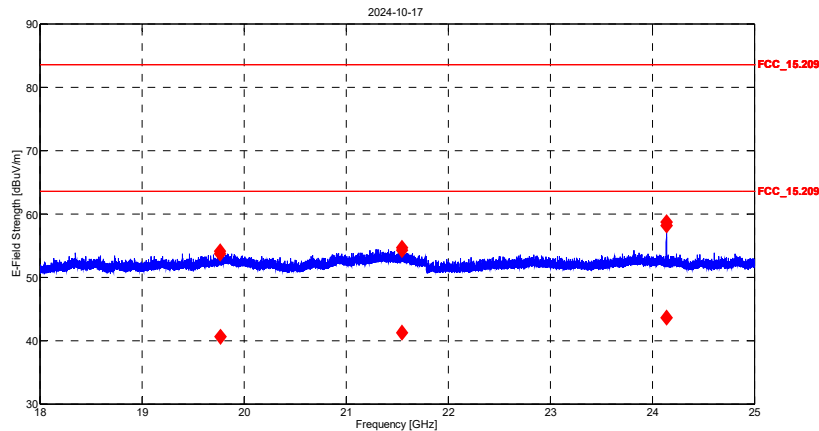
Final 1: 20.0 GHz, 50.0 kHz, 24.1 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.9575 GHz	53.65	83.50	29.85	V	325.074	150	12.87	FCC_15.209
21.3175 GHz	54.30	83.50	29.20	V	87.311	111.633	12.81	FCC_15.209
24.139 GHz	54.08	83.50	29.42	V	267.704	167.887	12.68	FCC_15.209

Final 2: 20.0 GHz, 50.0 kHz, 24.1 GHz; IF:1MHz, 100.0 ms RMS, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.95625 GHz	40.68	63.50	22.82	V	325.074	200	12.87	FCC_15.209
21.3175 GHz	41.37	63.50	22.13	V	87.311	125	12.81	FCC_15.209
24.139 GHz	40.92	63.50	22.58	V	267.704	164.722	12.68	FCC_15.209

18-25GHz Vertical, Plot and Data Table



Final 1: 19.8 GHz, 50.0 kHz, 24.1 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.76625 GHz	53.70	83.50	29.80	H	350.91	103.633	12.98	FCC_15.209
21.54925 GHz	54.25	83.50	29.25	H	0	149.809	12.65	FCC_15.209
24.139 GHz	58.70	83.50	24.80	H	173.6	125	12.68	FCC_15.209

Final 2: 19.8 GHz, 50.0 kHz, 24.1 GHz; IF:1MHz, 100.0 ms RMS, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.769 GHz	40.60	63.50	22.90	H	350.91	125	12.98	FCC_15.209
21.5485 GHz	41.21	63.50	22.29	H	0	100	12.65	FCC_15.209
24.139 GHz	43.63	63.50	19.87	H	173.6	125	12.68	FCC_15.209

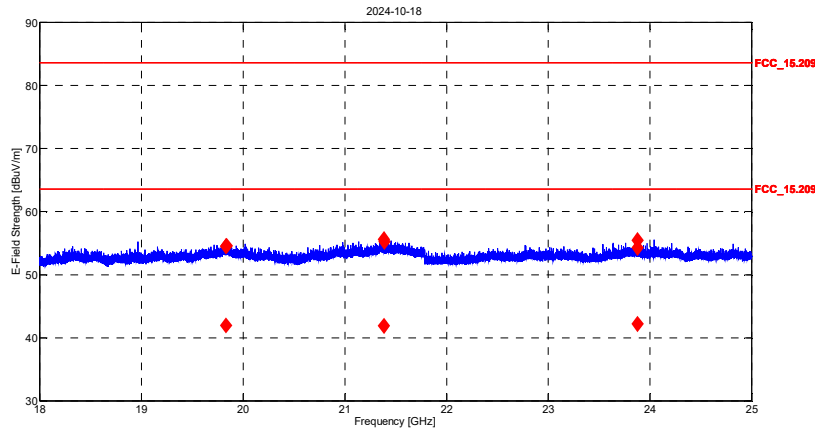
18-25GHz Horizontal, Plot and Data Table

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250kbps 802.15.4 Channel 26



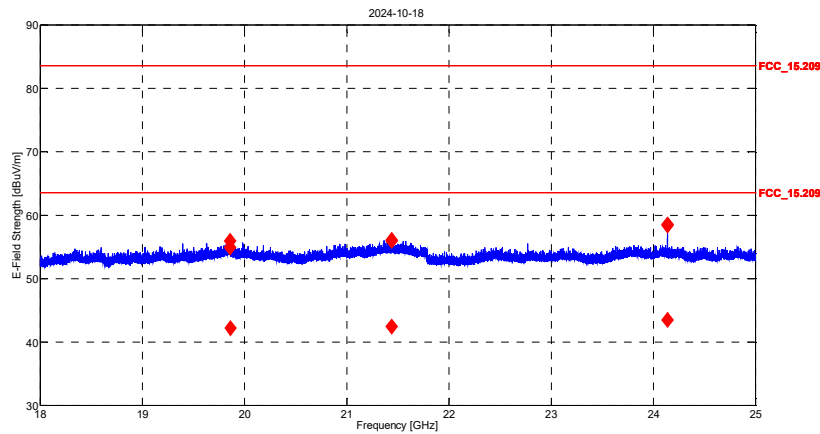
Final 1: 19.8 GHz, 50.0 kHz, 23.9 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.83825 GHz	54.54	83.50	28.96	V	41.277	193.065	12.87	FCC_15.209
21.39025 GHz	55.23	83.50	28.27	V	81.708	140.908	12.83	FCC_15.209
23.8815 GHz	54.21	83.50	29.29	V	77.454	125	12.64	FCC_15.209

Final 2: 19.8 GHz, 50.0 kHz, 23.9 GHz; IF:1MHz, 100.0 ms RMS, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.83625 GHz	41.96	63.50	21.54	V	41.277	175	12.87	FCC_15.209
21.38675 GHz	41.86	63.50	21.64	V	81.708	150	12.83	FCC_15.209
23.8815 GHz	42.21	63.50	21.29	V	77.454	100	12.64	FCC_15.209

18-25GHz Vertical, Plot and Data Table



Final 1: 19.9 GHz, 50.0 kHz, 24.1 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.859 GHz	54.92	83.50	28.58	H	23.356	121.354	12.88	FCC_15.209
21.44025 GHz	55.88	83.50	27.62	H	9.314	199.356	12.80	FCC_15.209
24.13825 GHz	58.56	83.50	24.94	H	164.365	109.64	12.68	FCC_15.209

Final 2: 19.9 GHz, 50.0 kHz, 24.1 GHz; IF:1MHz, 100.0 ms RMS, Att 20dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
19.863 GHz	42.20	63.50	21.30	H	23.356	200	12.88	FCC_15.209
21.44225 GHz	42.39	63.50	21.11	H	9.314	100	12.80	FCC_15.209
24.1385 GHz	43.45	63.50	20.05	H	164.365	143.88	12.68	FCC_15.209

18-25GHz Horizontal, Plot and Data Table

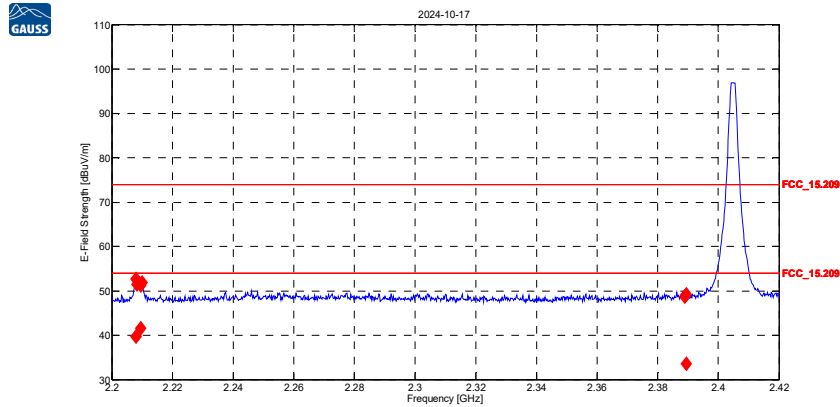
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Services Inc.

One Distribution Center Circle, #1
Littleton, MA

Tel.: (978) 486-8880
Fax: (978) 486-8828

Radiated Band-edge:

250kbps 802.15.4 Channel 11



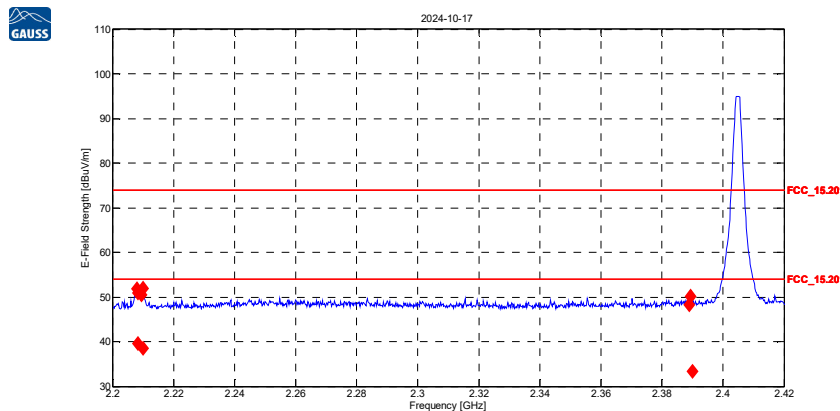
Final 1: 2.2 GHz, 50.0 kHz, 2.4 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
2.20825 GHz	51.44	74.00	22.56	V	163.78	253.235	34.40	FCC_15.209
2.2095 GHz	51.26	74.00	22.74	V	291.554	260.011	34.40	FCC_15.209
2.389 GHz	48.63	74.00	25.37	V	176.217	196.539	34.42	FCC_15.209

Final 2: 2.2 GHz, 50.0 kHz, 2.4 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
2.208 GHz	39.66	54.00	14.34	V	163.78	239.4	34.40	FCC_15.209
2.2095 GHz	41.61	54.00	12.39	V	291.554	263.42	34.40	FCC_15.209
2.3895 GHz	33.56	54.00	20.44	V	176.217	144.733	34.42	FCC_15.209

Low-Ch Vertical, Plot and Data Table



Final 1: 2.2 GHz, 50.0 kHz, 2.4 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
2.20825 GHz	50.94	74.00	23.06	H	164.117	177.907	34.40	FCC_15.209
2.2095 GHz	50.43	74.00	23.57	H	155.509	129.349	34.40	FCC_15.209
2.389 GHz	48.27	74.00	25.73	H	154.09	162.189	34.42	FCC_15.209

Final 2: 2.2 GHz, 50.0 kHz, 2.4 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
2.20825 GHz	39.52	54.00	14.48	H	164.117	249.892	34.40	FCC_15.209
2.21 GHz	38.54	54.00	15.46	H	155.509	191.077	34.40	FCC_15.209
2.39 GHz	33.29	54.00	20.71	H	154.09	168.333	34.42	FCC_15.209

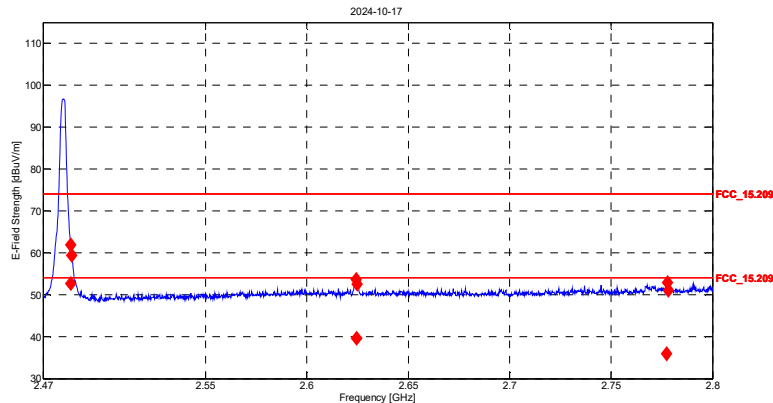
Low-Ch Horizontal, Plot and Data Table

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Services Inc.

One Distribution Center Circle, #1
Littleton, MA

Tel.: (978) 486-8880
Fax: (978) 486-8828

250kbps 802.15.4 Channel 26



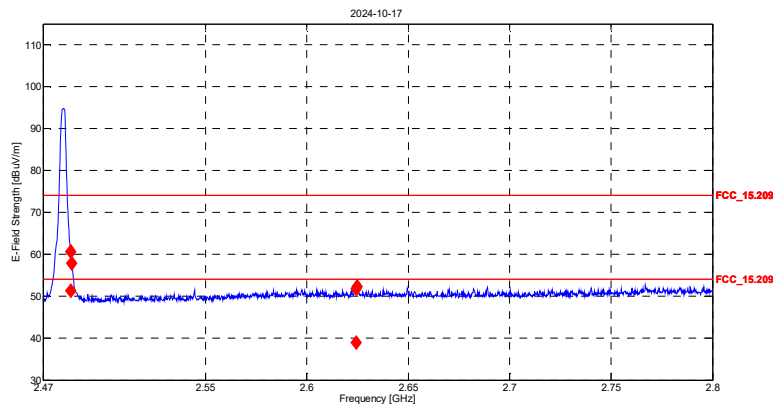
Final 1: 2.5 GHz, 50.0 kHz, 2.8 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
2.4835 GHz	61.85	74.00	12.15	V	237.514	197.622	35.00	FCC_15.209
2.62475 GHz	52.49	74.00	21.51	V	153.643	196.862	35.98	FCC_15.209
2.77825 GHz	51.08	74.00	22.92	V	93.843	126.367	36.04	FCC_15.209

Final 2: 2.5 GHz, 50.0 kHz, 2.8 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
2.4835 GHz	52.61	54.00	1.39	V	237.514	201.181	35.00	FCC_15.209
2.6245 GHz	39.66	54.00	14.34	V	153.643	145.385	35.98	FCC_15.209
2.77725 GHz	35.95	54.00	18.05	V	93.843	117.344	36.04	FCC_15.209

High-Ch Vertical, Plot and Data Table



Final 1: 2.5 GHz, 50.0 kHz, 2.6 GHz; IF:1MHz, 100.0 ms MaxPeak, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
2.4835 GHz	60.68	74.00	13.32	H	194.886	147.158	35.00	FCC_15.209
2.62425 GHz	51.71	74.00	22.29	H	205.586	200	35.98	FCC_15.209

Final 2: 2.5 GHz, 50.0 kHz, 2.6 GHz; IF:1MHz, 100.0 ms RMS, Att 0dB

f	Mag [dBuV/m]	Limit	Diff	Polarization	Angle [°]	Height [cm]	Trans	Name
2.4835 GHz	51.32	54.00	2.68	H	194.886	147.158	35.00	FCC_15.209
2.62425 GHz	38.91	54.00	15.09	H	205.586	199.8	35.98	FCC_15.209

High-Ch Horizontal, Plot and Data Table

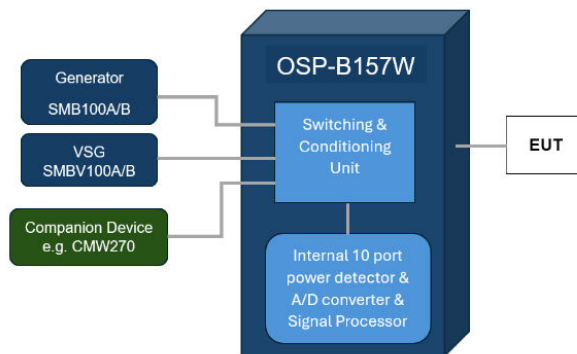
4.2 6dB CHANNEL BANDWIDTH & 99% OBW

4.2.1 LIMIT OF 6dB CHANNEL BANDWIDTH

The minimum 6 dB bandwidth shall be 500 kHz.

4.2.2 TEST SETUP

SCHEMATIC RF CABLING



4.2.3 TEST INSTRUMENTS

Rev. 10/14/2024								
Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
FSV40 Spectrum Analyzer	10Hz-40GHz	FSV40	ROHDE & SCHWARZ	101551	2200	I	10/9/2025	10/9/2024
Signal Generators/Comparison Noise Emitter	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
OSP-B157W8		OSP-B157W8	ROHDE & SCHWARZ	100955	2558	I	2/14/2026	2/14/2024
Cables	Range		Mfr			Cat	Calibration Due	Calibrated on
Asset#2905	9Kh-26.5GHz		Mini-Circuits			II	4/22/2025	4/22/2024
Attenuators	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
10dB Attenuator-01 Brown	9KHz-18GHz		Mini Circuits			II	2/17/2025	2/17/2024
Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
API - 30dB 20W Attenuator	9KHz-40GHz	89-30-11	API Weinschel	703	2121	II	4/22/2025	4/22/2024
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	12/15/2025	12/15/2022
Asset #2657		1235C97	Control Company	2E+08	2657	I	8/18/2025	8/18/2022
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.								



4.2.4 TEST PROCEDURE

6dB CHANNEL BANDWIDTH (In accordance with ANSI C63.10-2013 Section 11.8.1)

- a. Set RBW = 100 kHz.
- b. Set the video bandwidth (VBW) ≥ 3 RBW.
- c. Detector = Peak.
- d. Trace mode = max hold.
- e. Sweep = auto couple.
- f. Allow the trace to stabilize.
- g. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

99% OBW (In accordance with ANSI C63.10-2013 Section 6.9.3)

- a. The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- c. Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (OBW/RBW)]$ below the reference level. Specific guidance is given in 4.1.5.2.
- d. Step a) through step c) might require iteration to adjust within the specified range.
- e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f. Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

4.2.5 DEVIATION FROM TEST STANDARD

No deviation.

4.2.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications.

4.2.7 TEST RESULTS

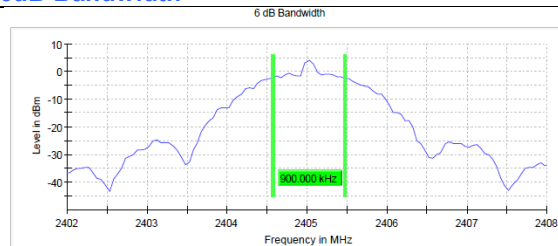
250kbps 802.15.4:

Test date: 10/16/2024

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	99% OBW (MHz)	PASS / FAIL
11	2405	0.900000	2.205000	Pass
18	2440	0.900000	2.220000	Pass
26	2480	0.900000	2.205000	Pass

CH11

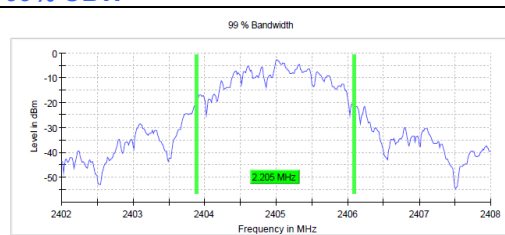
6dB Bandwidth



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40200 GHz	2.40200 GHz
Stop Frequency	2.40800 GHz	2.40800 GHz
Span	6.000 MHz	6.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	120	~ 120
SweepTime	18.984 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.20 dB	0.20 dB
Run	74 / max. 150	max. 150
Stable	20 / 20	20
Max Stable Difference	0.00 dB	0.20 dB

99% OBW

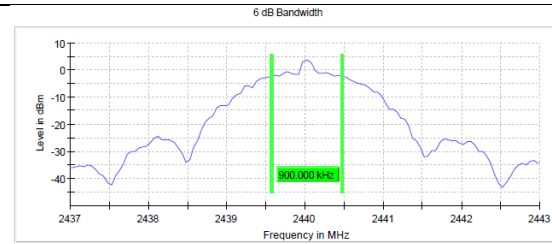


Measurement

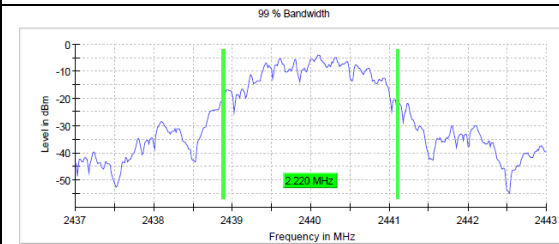
Setting	Instrument Value	Target Value
Start Frequency	2.40200 GHz	2.40200 GHz
Stop Frequency	2.40800 GHz	2.40800 GHz
Span	6.000 MHz	6.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 90.000 kHz
SweepPoints	400	~ 400
SweepTime	63.216 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	28 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.19 dB	0.30 dB

CH18

6dB Bandwidth



99% OBW



Measurement

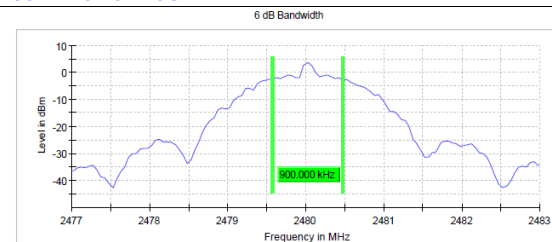
Setting	Instrument Value	Target Value
Start Frequency	2.43700 GHz	2.43700 GHz
Stop Frequency	2.44300 GHz	2.44300 GHz
Span	6.000 MHz	6.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	120	~ 120
SweepTime	18.984 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.20 dB	0.20 dB
Run	42 / max. 150	max. 150
Stable	20 / 20	20
Max Stable Difference	0.00 dB	0.20 dB

Measurement

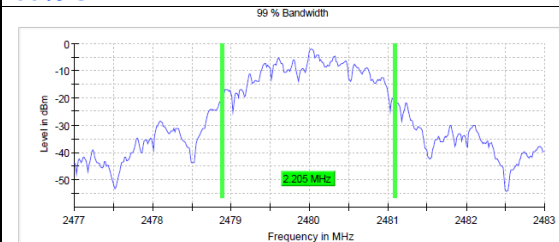
Setting	Instrument Value	Target Value
Start Frequency	2.43700 GHz	2.43700 GHz
Stop Frequency	2.44300 GHz	2.44300 GHz
Span	6.000 MHz	6.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 90.000 kHz
SweepPoints	400	~ 400
SweepTime	63.216 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	35 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.03 dB	0.30 dB

CH26

6dB Bandwidth



99% OBW



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47700 GHz	2.47700 GHz
Stop Frequency	2.48300 GHz	2.48300 GHz
Span	6.000 MHz	6.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	120	~ 120
SweepTime	18.984 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.20 dB	0.20 dB
Run	66 / max. 150	max. 150
Stable	20 / 20	20
Max Stable Difference	0.00 dB	0.20 dB

Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47700 GHz	2.47700 GHz
Stop Frequency	2.48300 GHz	2.48300 GHz
Span	6.000 MHz	6.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 90.000 kHz
SweepPoints	400	~ 400
SweepTime	63.216 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	37 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.06 dB	0.30 dB



4.3 CONDUCTED OUTPUT POWER

4.3.1 LIMITS

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm)

4.3.2 TEST SETUP

Refer to section 4.2.2.

4.3.3 TEST INSTRUMENTS

Refer to section 4.2.3.

4.3.4 TEST PROCEDURES

Average conducted output power was measured in accordance with ANSI C63.10 - 2013 Section 11.9.2.3.2 (Method AVGPM-G).

4.3.5 DEVIATION FROM TEST STANDARD

No deviations from the standard.

4.3.6 EUT OPERATING CONDITIONS

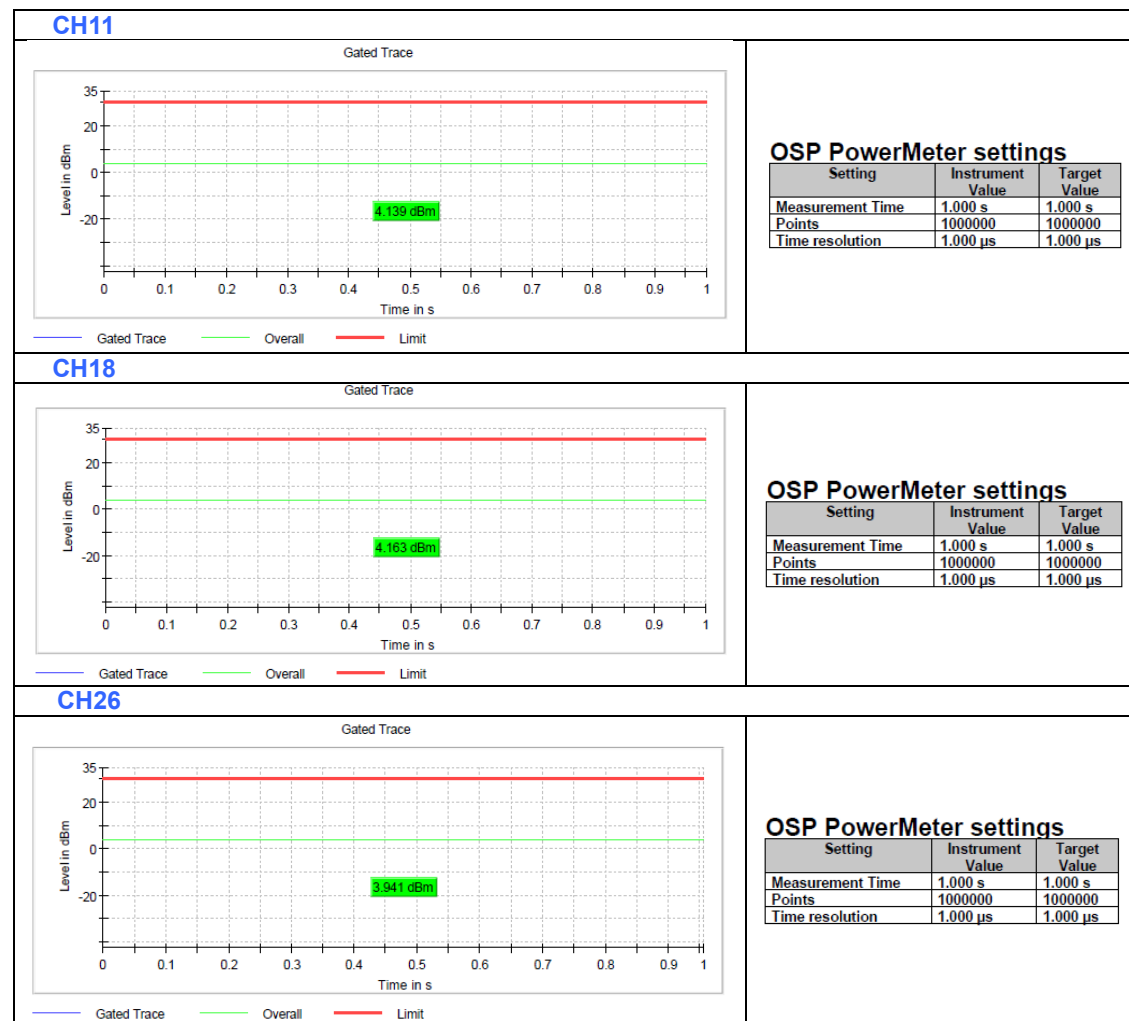
EUT was operated according to manufacturer's specifications.

4.3.7 TEST RESULTS

250kbps 802.15.4:

Test date: 10/16/2024

CHANNEL	CHANNEL FREQUENCY (MHz)	RMS POWER (dBm)	RMS POWER (mW)	RMS POWER LIMIT (W)	PASS/FAIL
11	2405	4.139	2.59	1	PASS
18	2440	4.163	2.61	1	PASS
26	2480	3.941	2.48	1	PASS





4.4 POWER SPECTRAL DENSITY MEASUREMENT

4.4.1 LIMITS

The limit for Power Spectral Density is 8dBm/3kHz.

4.4.2 TEST SETUP

Refer to section 4.2.2.

4.4.3 TEST INSTRUMENTS

Refer to section 4.2.3.

4.4.4 TEST PROCEDURE

In accordance with ANSI C63.10-2013 Section 11.10.2 (Method PKPSD (Peak PSD)).

1. Set the span to 1.5 times the DTS bandwidth
2. Set the RBW = 3 kHz, VBW $\geq 3 \times$ RBW, Detector = peak.
3. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

4.4.5 DEVIATION FROM TEST STANDARD

No deviations from the standard.

4.4.6 EUT OPERATING CONDITION

EUT was operated according to manufacturer's specifications.



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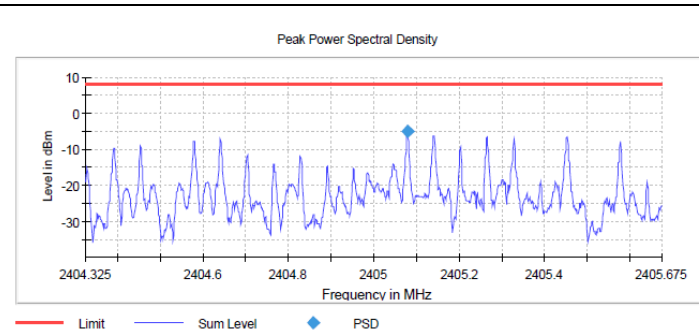
4.4.7 TEST RESULTS

250kbps 802.15.4:

Test date: 10/16/2024

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
11	2405	-5.008	8	PASS
18	2440	-5.164	8	PASS
26	2480	-5.349	8	PASS

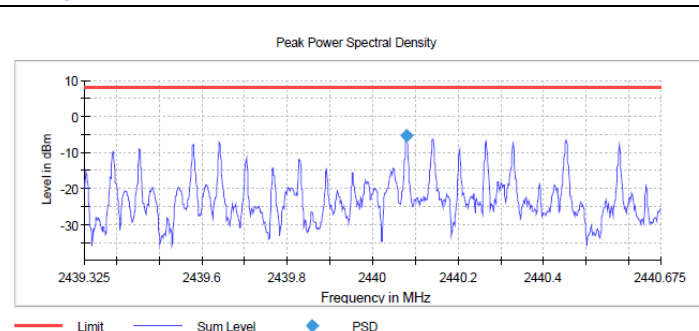
CH11



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40433 GHz	2.40433 GHz
Stop Frequency	2.40568 GHz	2.40568 GHz
Span	1.350 MHz	1.350 MHz
RBW	3.000 kHz	<= 3.000 kHz
VBW	10.000 kHz	>= 9.000 kHz
SweepPoints	900	~ 900
SweepTime	15.000 ms	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	3 / max. 150	max. 150
Stable	2 / 2	2
Max Stable Difference	0.16 dB	0.50 dB

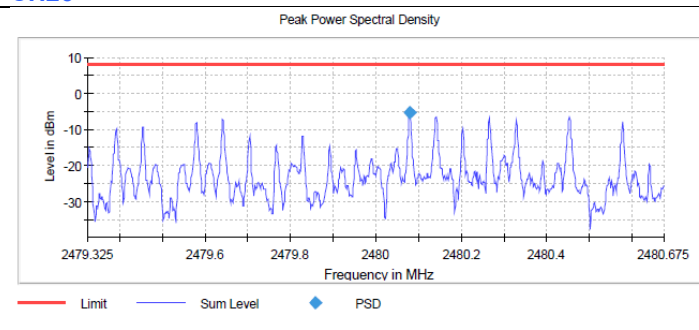
CH18



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.43933 GHz	2.43933 GHz
Stop Frequency	2.44068 GHz	2.44068 GHz
Span	1.350 MHz	1.350 MHz
RBW	3.000 kHz	<= 3.000 kHz
VBW	10.000 kHz	>= 9.000 kHz
SweepPoints	900	~ 900
SweepTime	15.000 ms	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	3 / max. 150	max. 150
Stable	2 / 2	2
Max Stable Difference	0.12 dB	0.50 dB

CH26



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47933 GHz	2.47933 GHz
Stop Frequency	2.48068 GHz	2.48068 GHz
Span	1.350 MHz	1.350 MHz
RBW	3.000 kHz	<= 3.000 kHz
VBW	10.000 kHz	>= 9.000 kHz
SweepPoints	900	~ 900
SweepTime	15.000 ms	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	3 / max. 150	max. 150
Stable	2 / 2	2
Max Stable Difference	0.09 dB	0.50 dB



4.5 Conducted Spurious Emissions and Band Edges

4.5.1 LIMITS

30dB below the highest emission level in the operating band (in 100kHz RBW).

4.5.2 TEST SETUP

Refer to section 4.2.2.

4.5.3 TEST INSTRUMENTS

Refer to section 4.2.3.

4.5.4 TEST PROCEDURE

In accordance with ANSI C63.10-2013 Section 11.11.

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.



MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

EUT was operated according to manufacturer's specifications.



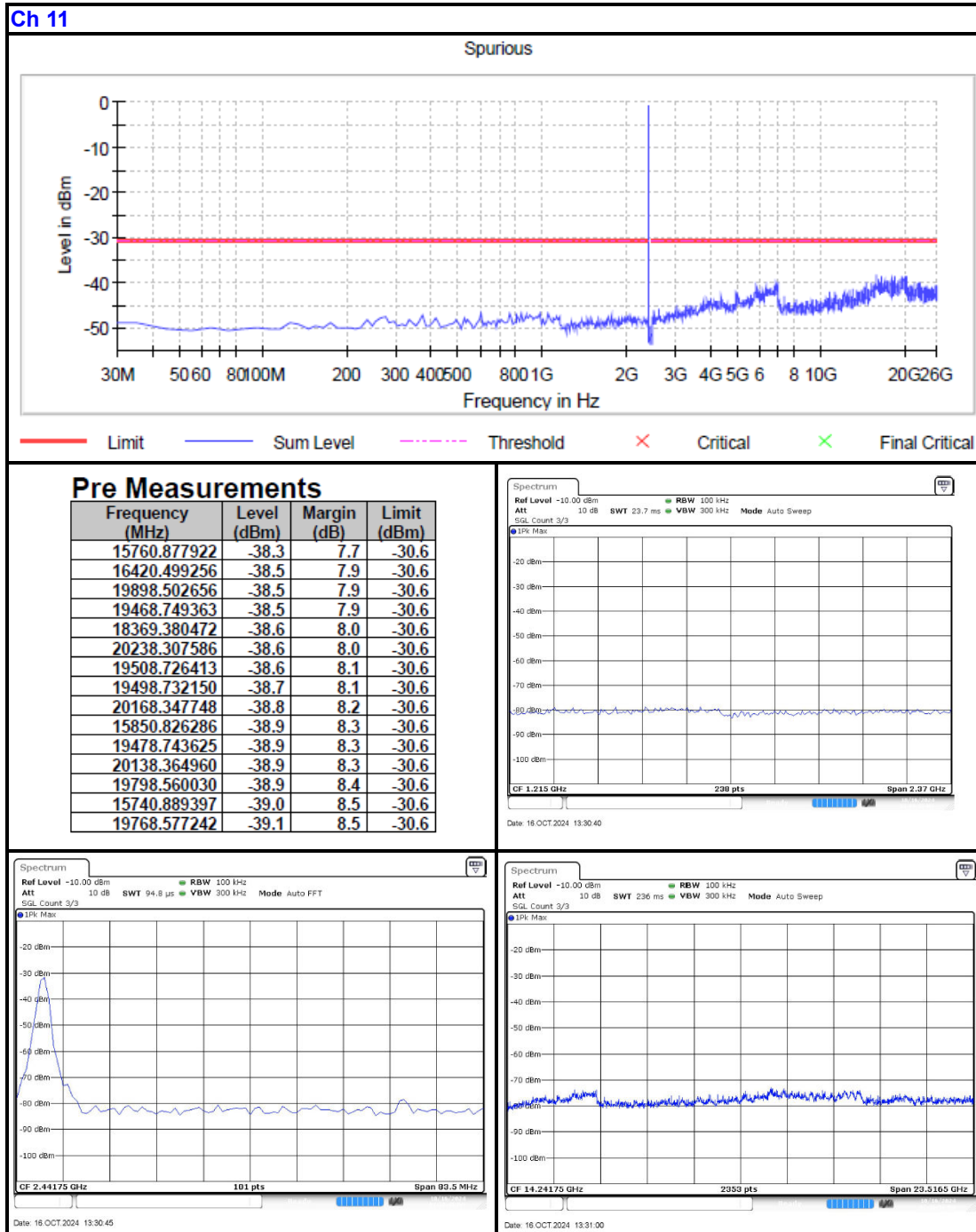
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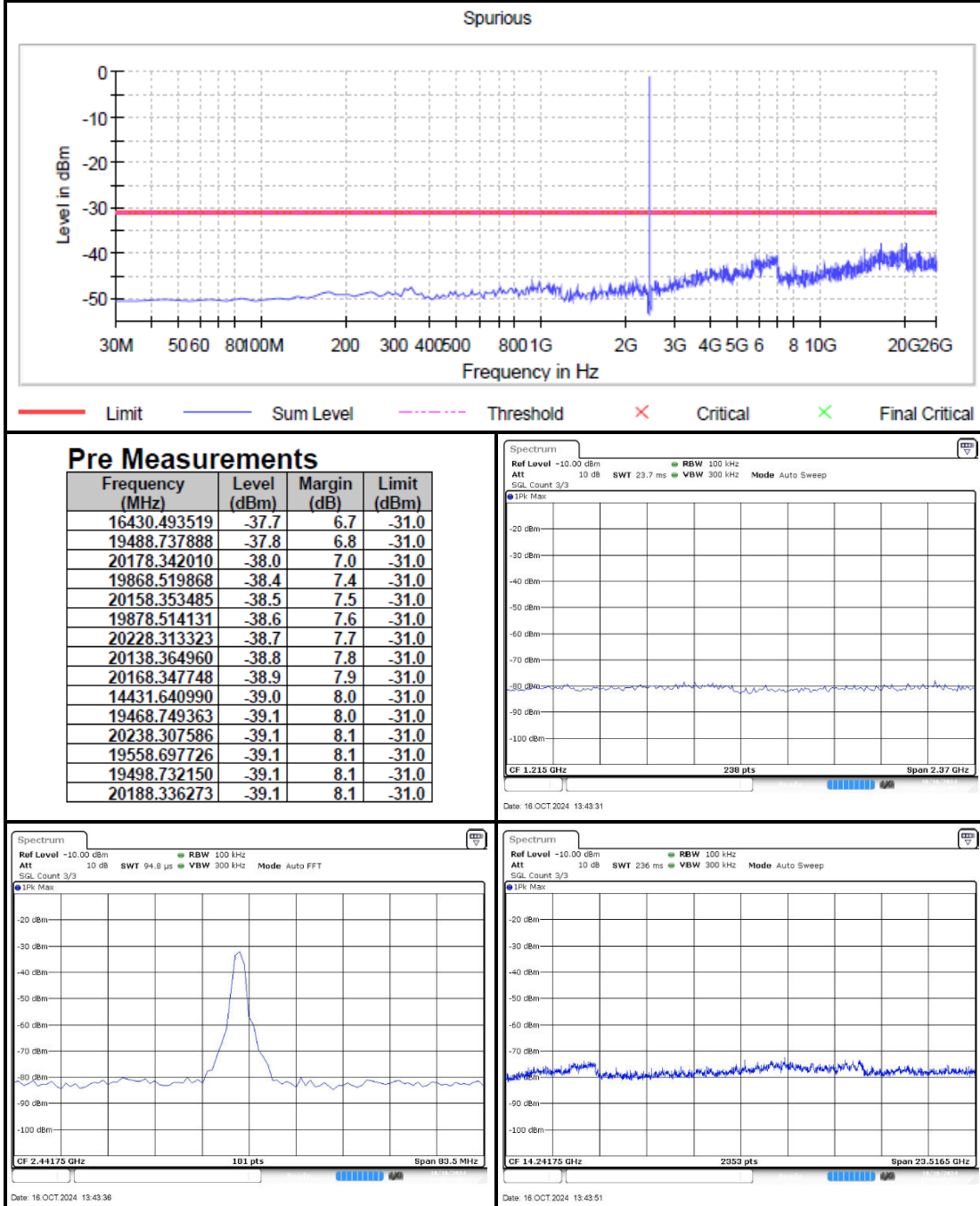
4.5.7 TEST RESULTS

250kbps 802.15.4:

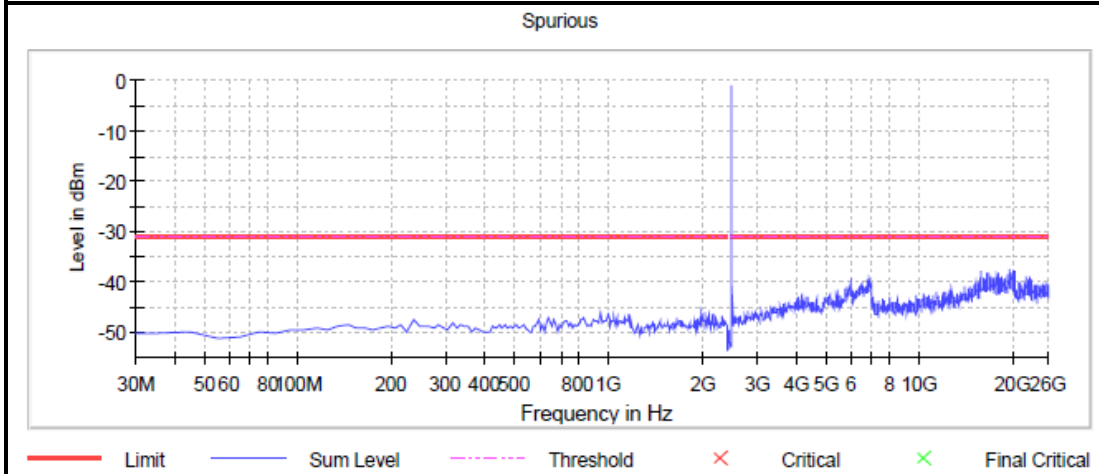
Test date: 10/16/2024



Ch 18

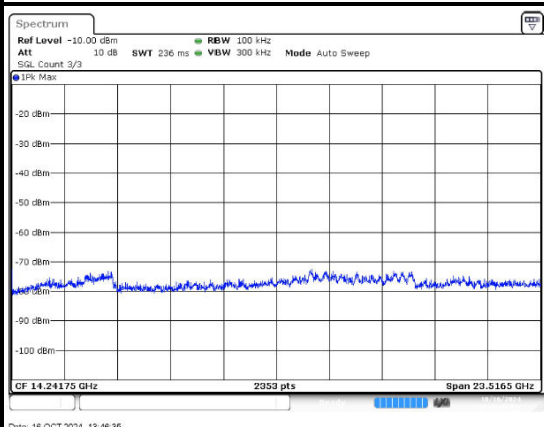
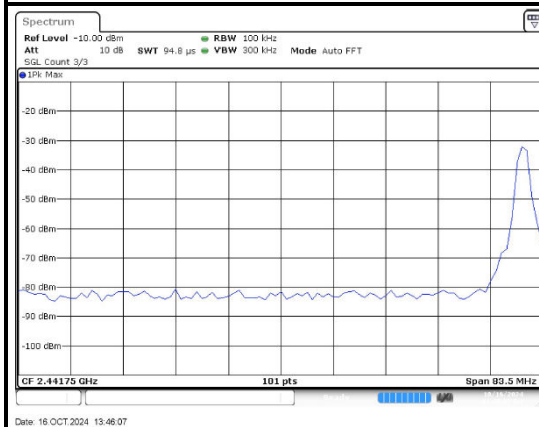
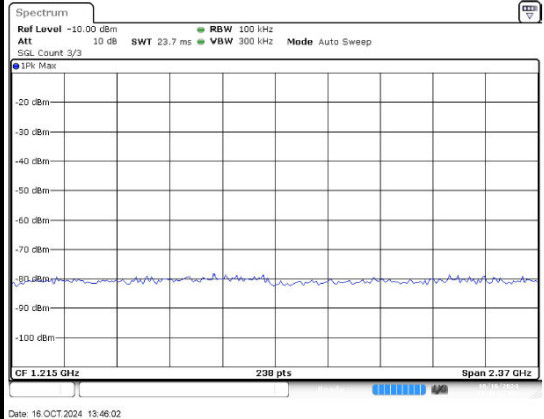


Ch 26



Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
19458.755100	-37.5	6.6	-30.9
19868.519868	-37.8	6.9	-30.9
15810.849235	-37.9	7.0	-30.9
20258.296111	-38.0	7.1	-30.9
19778.571504	-38.2	7.3	-30.9
16750.309924	-38.2	7.3	-30.9
20168.347748	-38.2	7.4	-30.9
19548.703464	-38.3	7.4	-30.9
17809.701764	-38.3	7.4	-30.9
16430.493519	-38.3	7.4	-30.9
20118.376434	-38.4	7.5	-30.9
19828.542818	-38.4	7.5	-30.9
15740.889397	-38.4	7.6	-30.9
20248.301849	-38.5	7.6	-30.9
19578.686252	-38.5	7.6	-30.9





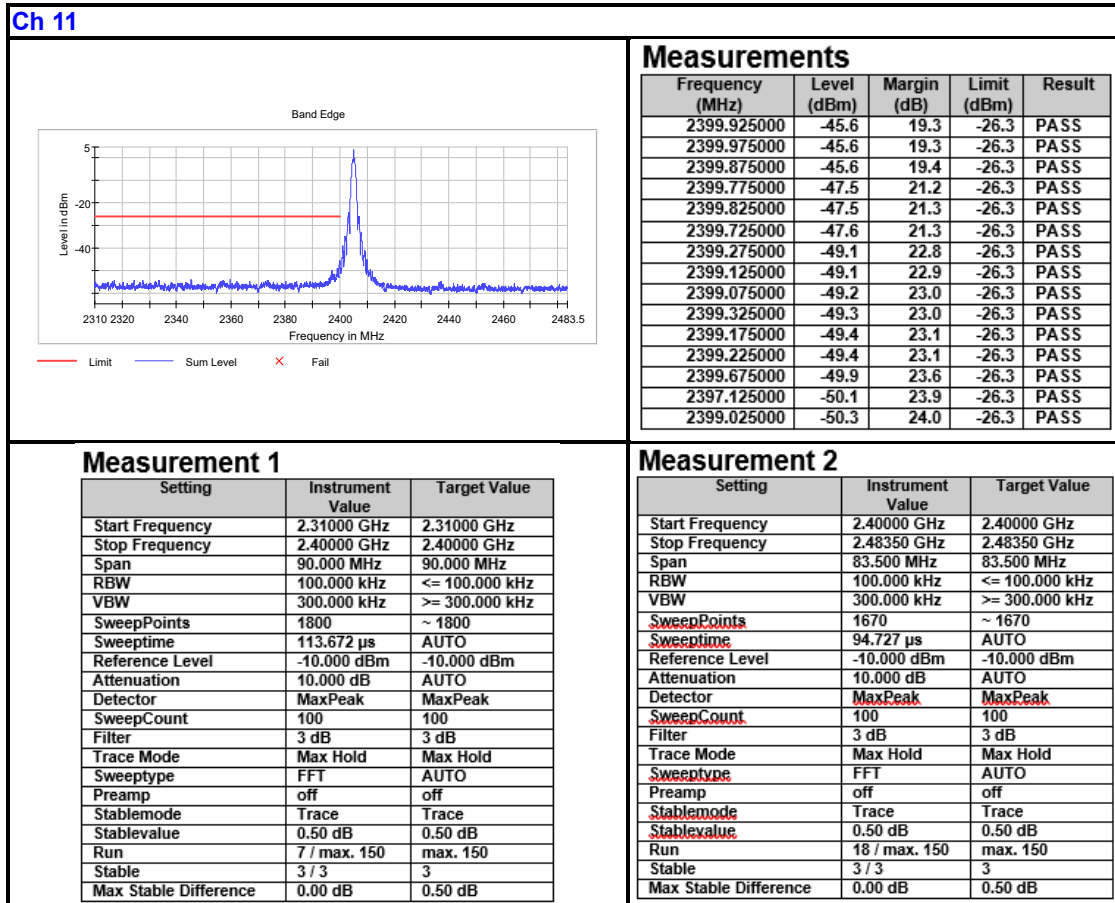
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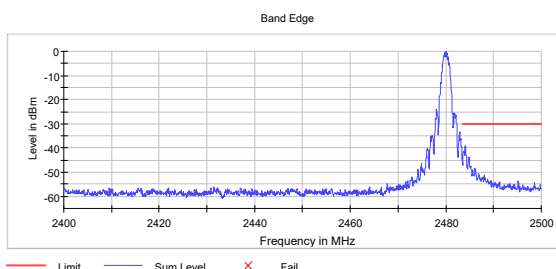
Conducted Band Edges

250kbps 802.15.4:

Test date: 10/16/2024



Ch 26



Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2484.125000	-39.0	8.8	-30.2	PASS
2484.075000	-39.3	9.1	-30.2	PASS
2484.175000	-40.0	9.8	-30.2	PASS
2483.775000	-41.4	11.2	-30.2	PASS
2483.875000	-41.4	11.2	-30.2	PASS
2483.725000	-41.5	11.3	-30.2	PASS
2483.925000	-41.7	11.5	-30.2	PASS
2483.825000	-41.7	11.5	-30.2	PASS
2484.025000	-42.3	12.1	-30.2	PASS
2484.225000	-42.4	12.2	-30.2	PASS
2484.275000	-42.5	12.3	-30.2	PASS
2483.675000	-42.8	12.6	-30.2	PASS
2483.975000	-42.9	12.7	-30.2	PASS
2483.625000	-43.2	13.0	-30.2	PASS
2484.325000	-43.5	13.3	-30.2	PASS

Measurement 1

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	94.727 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.01 dB	0.50 dB

Measurement 2

Setting	Instrument Value	Target Value
Start Frequency	2.48350 GHz	2.48350 GHz
Stop Frequency	2.50000 GHz	2.50000 GHz
Span	16.500 MHz	16.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	330	~ 330
SweepTime	18.945 μ s	AUTO
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.25 dB	0.50 dB



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5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the Test Setup Photos exhibit.



6 APPENDIX A – MODIFICATIONS

802.15.4 PCB antenna required “tuning” via modification to its trace during pre-compliance testing to meet the radiated band-edge requirements. This modification was present on the PCB during all final compliance tests. Please refer to Test Setup Photos exhibit for details of this modification.

---END OF REPORT---