Mode: BLE

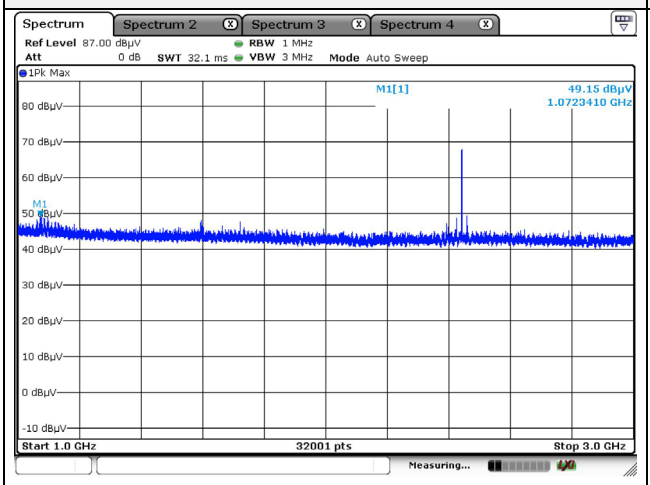
Transfer rate: 1 Mbps

Distance of measurement: 3 meter

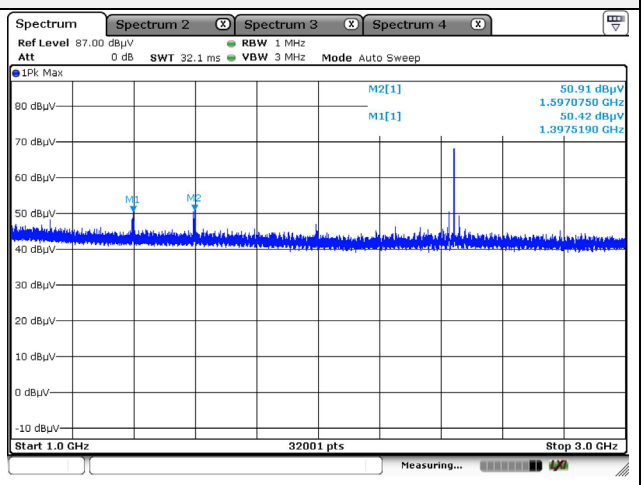
Channel: 20

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 072.34	49.15	Peak	H	-9.10	-	40.05	74.00	33.95
1 397.52	50.42	Peak	V	-6.87	-	43.55	74.00	30.45
1 597.08	50.91	Peak	V	-5.26	-	45.65	74.00	28.35
4 884.08	45.24	Peak	H	7.10	-	52.34	74.00	21.66
4 884.08	46.61	Peak	V	7.10	-	53.71	74.00	20.29
4 884.08	36.22	Average	H	7.10	2.08	45.40	54.00	8.60
4 884.08	35.72	Average	V	7.10	2.08	44.90	54.00	9.10
7 325.26	44.80	Peak	V	13.13	-	57.93	74.00	16.07
7 325.41	35.32	Average	V	13.13	2.08	50.53	54.00	3.47
7 326.66	33.24	Average	H	13.13	2.08	48.45	54.00	5.55
7 325.72	45.56	Peak	H	13.13	-	58.69	74.00	15.31

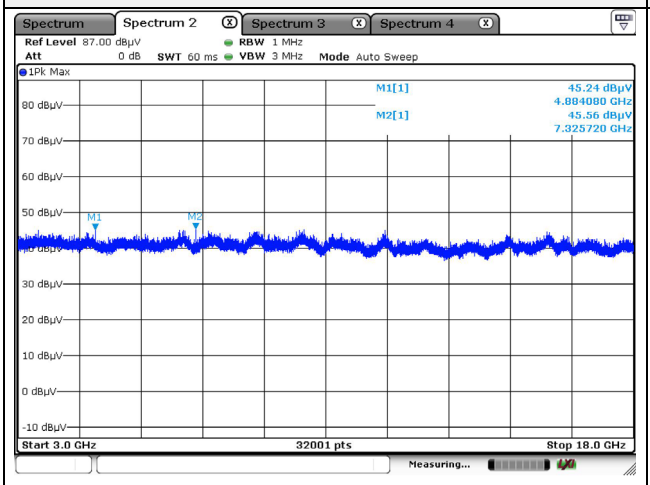
Horizontal // Peak for 1 GHz to 3 GHz



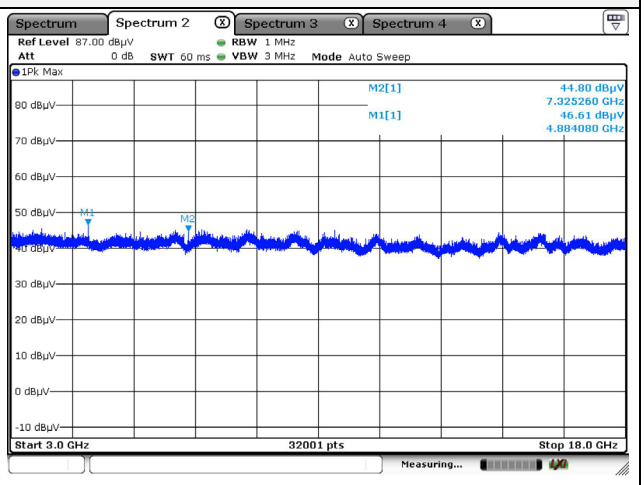
Vertical // Peak for 1 GHz to 3 GHz



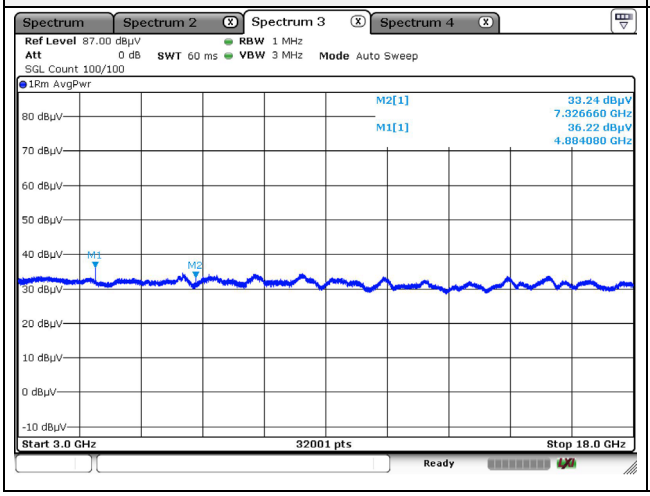
Horizontal // Peak for 3 GHz to 18 GHz



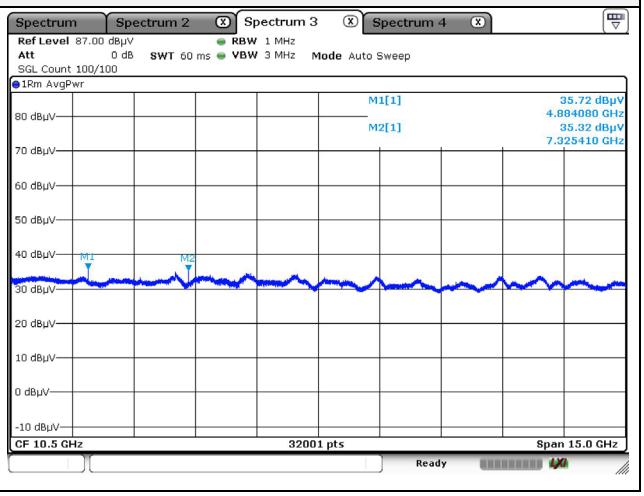
Vertical // Peak for 3 GHz to 18 GHz



Horizontal // Average for 3 GHz to 18 GHz



Vertical // Average for 3 GHz to 18 GHz



Note.
1. Average test would be performed if the peak result were greater than the average limit.

Mode:	BLE
Transfer rate:	1 Mbps
Distance of measurement:	3 meter
Channel:	39

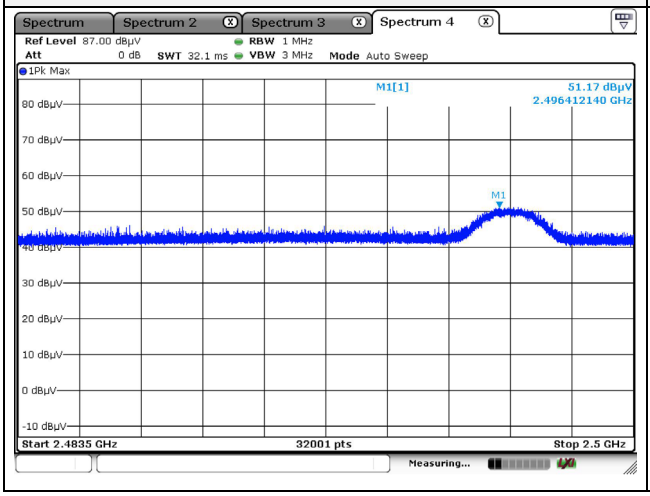
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 057.03	46.16	Peak	H	-9.20	-	36.96	74.00	37.04
1 395.02	50.35	Peak	V	-6.88	-	43.47	74.00	30.53
1 595.58	51.27	Peak	V	-5.28	-	45.99	74.00	28.01
6 905.27	45.21	Peak	H	11.20	-	56.41	74.00	17.59
7 014.95	34.40	Average	H	11.69	2.08	48.17	54.00	5.83
7 439.63	45.09	Peak	V	13.70	-	58.79	74.00	15.21
7 439.63	34.90	Average	V	13.70	2.08	50.68	54.00	3.32

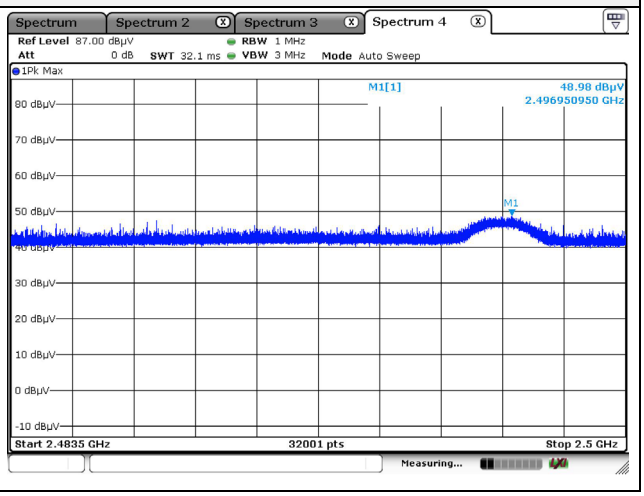
- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2 496.41	51.17	Peak	H	-0.55	-	50.62	74.00	23.38
2 496.95	48.98	Peak	V	-0.55	-	48.43	74.00	25.57

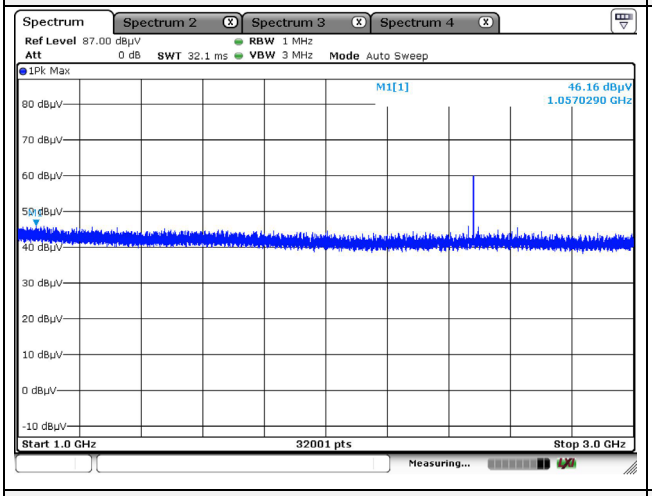
Restricted band // Horizontal // Peak



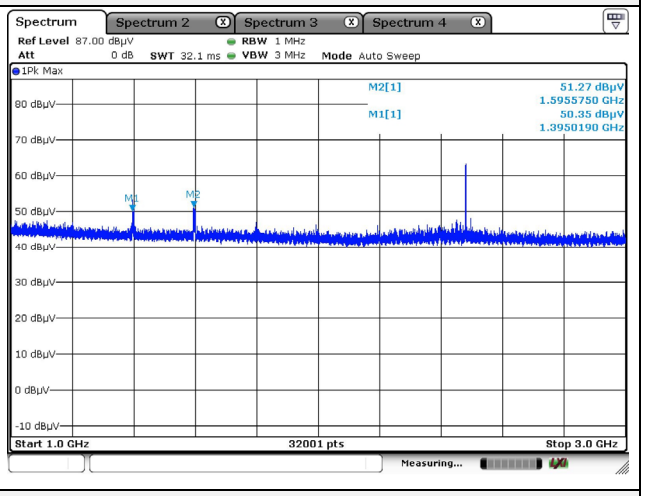
Restricted band // Vertical // Peak



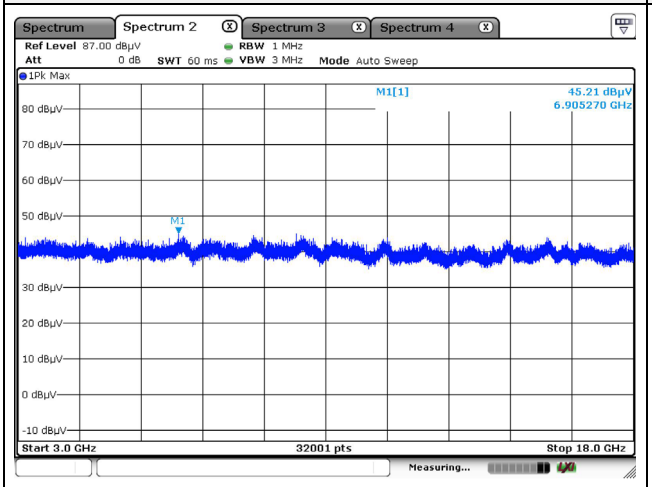
Horizontal // Peak for 1 GHz to 3 GHz



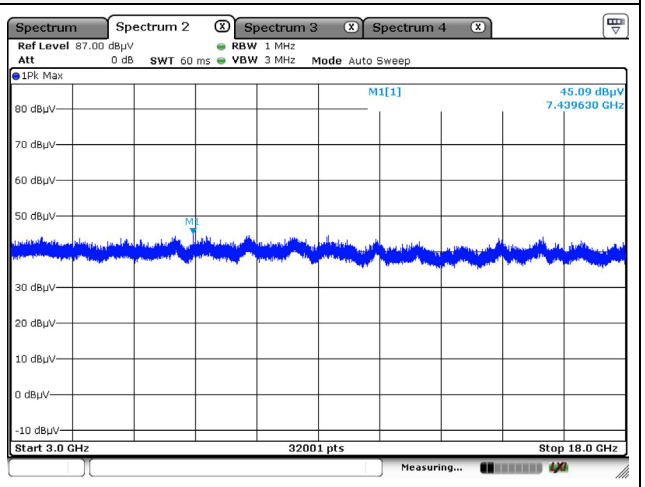
Vertical // Peak for 1 GHz to 3 GHz



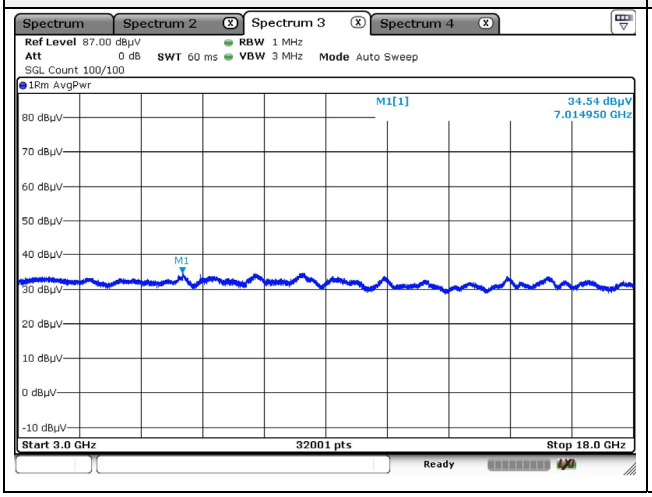
Horizontal // Peak for 3 GHz to 18 GHz



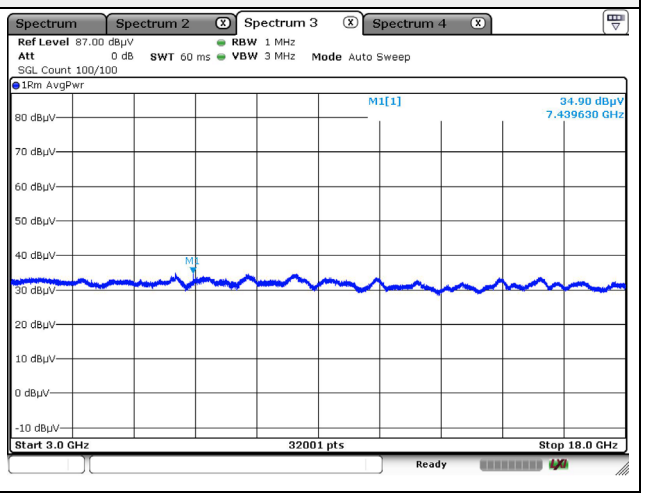
Vrtical // Peak for 3 GHz to 18 GHz



Horizontal // Average for 3 GHz to 18 GHz



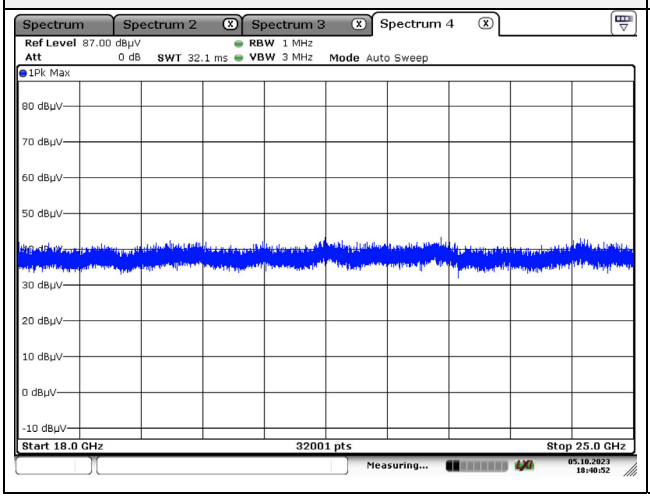
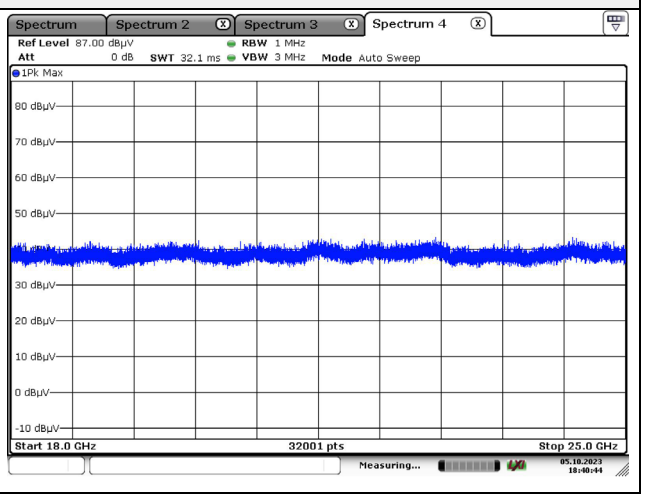
Vertical // Average for 3 GHz to 18 GHz



Note.
1. Average test would be performed if the peak result were greater than the average limit.

Test results (18 ㎓ to 25 ㎓) – Worst case

Mode:	BLE
Transfer rate:	1 Mbps
Distance of measurement:	3 meter
Channel:	0 (Worst case)

Horizontal	Vertical
	

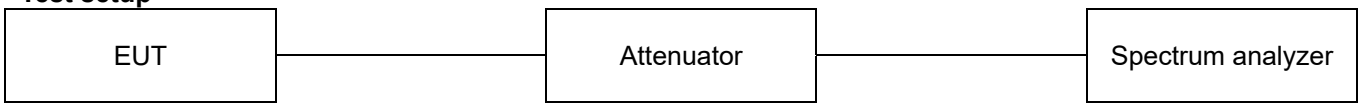
Note.
1. No spurious emission were detected above 18 ㎓.

3.5. Conducted spurious emissions & band edge

Test procedure

KDB 558074 v05r02 & ANSI 63.10-2013

Test setup



Test procedure

<u>Band edge</u>

ANSI C63.10 – Section 11.11

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100 ㎑
4. VBW = 300 ㎑
5. Detector = Peak
6. Trace mode = max hold
7. Sweep time = auto
8. The trace was allowed to stabilize

<u>Out of band emissions</u>

ANSI C63.10 – Section 11.11

1. Start frequency was set to 30 ㎒ and stop frequency was set to 25 ㎓ for 2.4 ㎓ frequencies and 40 ㎓ for 5 ㎓ frequencies
2. RBW = 100 ㎑
3. VBW = 300 ㎑
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Limit

According to 15.247(d), in any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section 15.205(a), must also comply the radiated emission limits specified in section 15.209(a) (see section 15.205(c))

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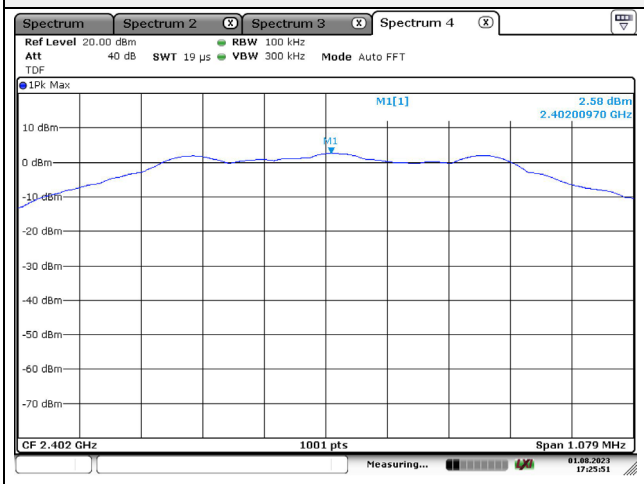
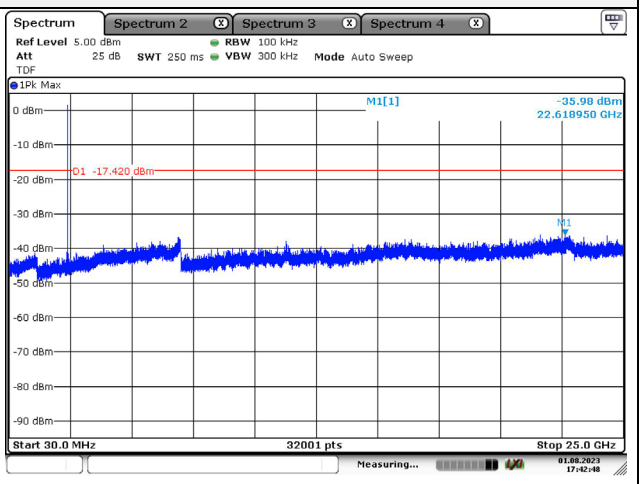
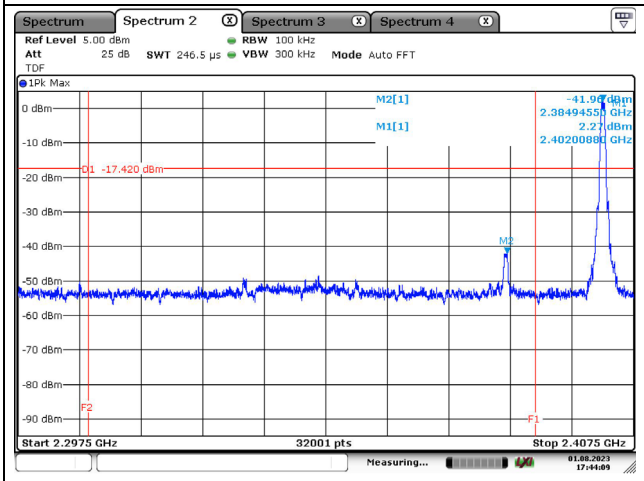
Test plots

BLE_1 Mbps_2 402 MHz







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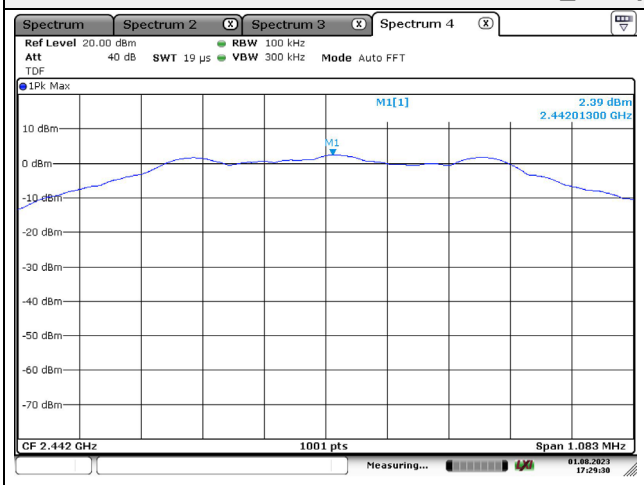
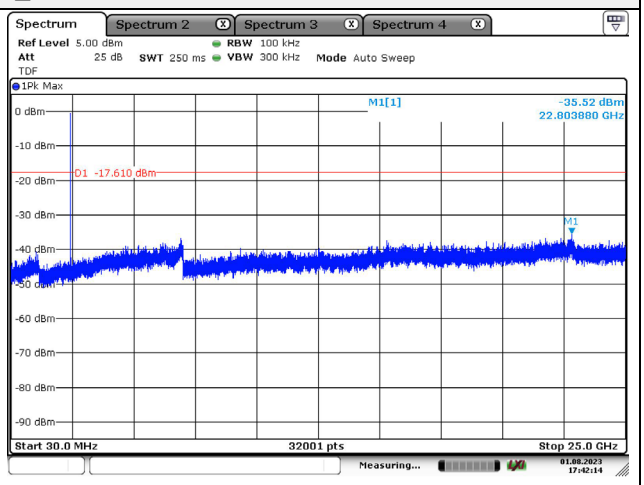
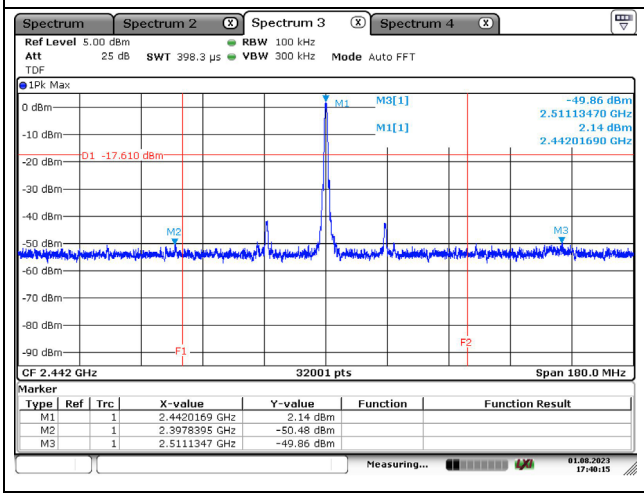
BLE_1 Mbps_2 442 MHz







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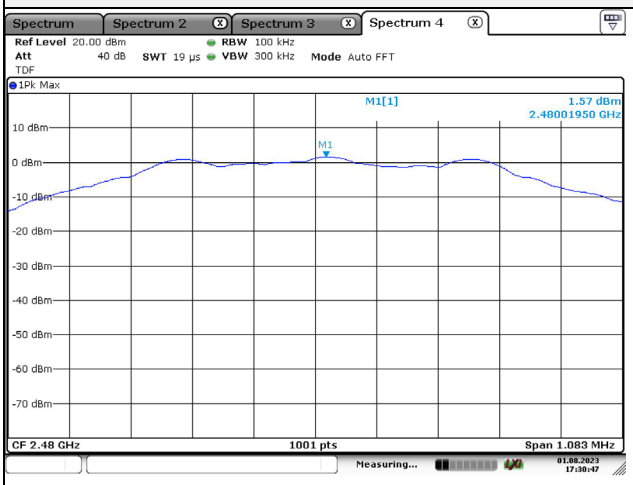
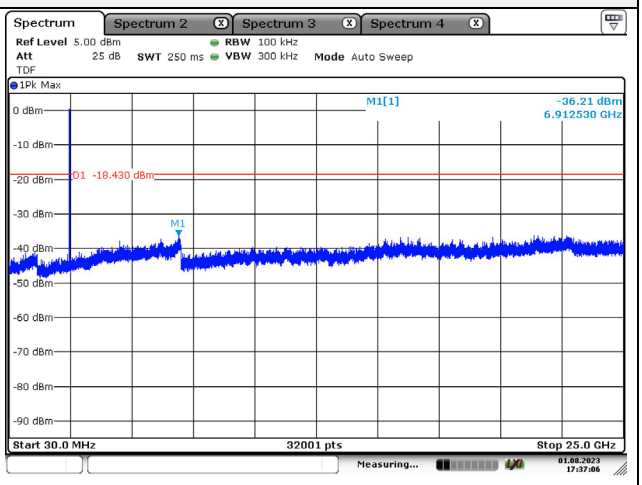
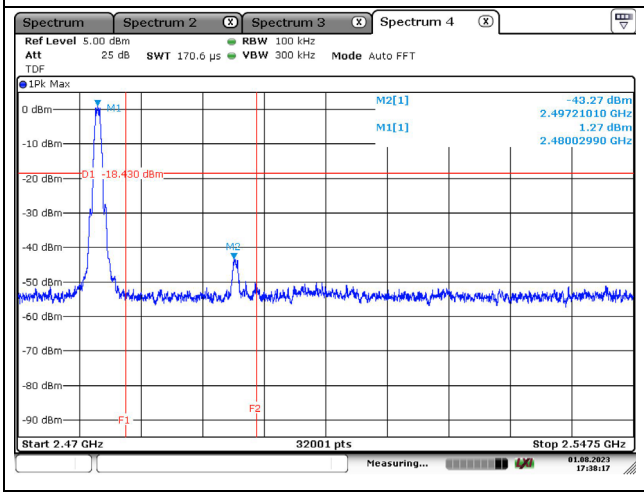
BLE_1 Mbps_2 480 MHz







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3.6. AC conducted emissions

FCC Limit

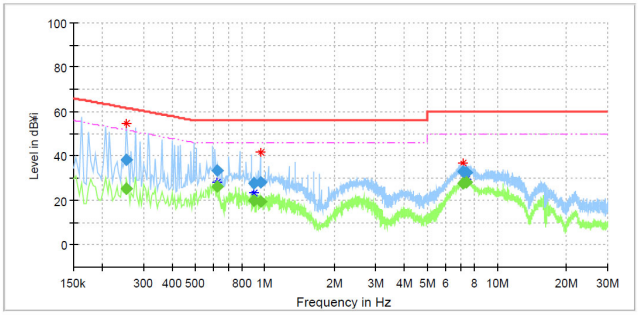
According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (㎒)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Test results

Mode:	BLE
Transfer rate:	1 Mbps
Channel:	0 (Worst case)

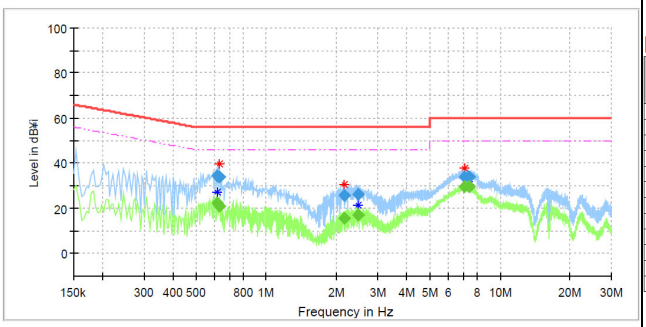
Hot Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµi V)	CAverage (dBµi V)	Limit (dBµi V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.254000	---	25.05	51.63	26.58	1000.0	9.000	L1	19.5
0.254000	38.08	---	61.63	23.55	1000.0	9.000	L1	19.5
0.622000	---	26.03	46.00	19.97	1000.0	9.000	L1	19.5
0.622000	33.46	---	56.00	22.54	1000.0	9.000	L1	19.5
0.902000	---	20.09	46.00	25.91	1000.0	9.000	L1	19.6
0.902000	27.50	---	56.00	28.50	1000.0	9.000	L1	19.6
0.958000	---	19.56	46.00	26.44	1000.0	9.000	L1	19.6
0.958000	28.07	---	56.00	27.93	1000.0	9.000	L1	19.6
7.146000	---	27.76	50.00	22.24	1000.0	9.000	L1	20.2
7.146000	32.76	---	60.00	27.24	1000.0	9.000	L1	20.2
7.350000	---	27.91	50.00	22.09	1000.0	9.000	L1	20.2
7.350000	32.48	---	60.00	27.52	1000.0	9.000	L1	20.2

Neutral Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµi V)	CAverage (dBµi V)	Limit (dBµi V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.618000	---	22.36	46.00	23.64	1000.0	9.000	N	19.5
0.618000	34.50	---	56.00	21.50	1000.0	9.000	N	19.5
0.630000	---	20.73	46.00	25.27	1000.0	9.000	N	19.5
0.630000	33.98	---	56.00	22.02	1000.0	9.000	N	19.5
2.166000	---	15.79	46.00	30.21	1000.0	9.000	N	19.7
2.166000	25.64	---	56.00	30.36	1000.0	9.000	N	19.7
2.470000	---	17.13	46.00	28.87	1000.0	9.000	N	19.7
2.470000	26.00	---	56.00	30.00	1000.0	9.000	N	19.7
7.058000	---	29.33	50.00	20.67	1000.0	9.000	N	20.1
7.058000	33.99	---	60.00	26.01	1000.0	9.000	N	20.1
7.366000	---	29.35	50.00	20.65	1000.0	9.000	N	20.2
7.366000	33.85	---	60.00	26.15	1000.0	9.000	N	20.2

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3.7. Antenna Requirement

According to 15.207(a), An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

The EUT has an internal Chip antenna and meets the requirements of this section.

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Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
EMI Test Receiver	R&S	ESU26	100552	1 year	2024.03.21
Spectrum Analyzer	R&S	FSV40	101002	1 year	2024.06.14
EMI Test Receiver	R&S	ESR3	101783	1 year	2023.11.11
ATTENUATOR	KEYSIGHT	8493C	82506	1 year	2024.01.17
Power Meter	Anritsu	ML2495A	1438001	1 year	2024.01.13
Pulse Power Sensor	Anritsu	MA2411B	1339205	1 year	2024.01.13
SIGNAL GENERATOR	KEYSIGHT	N5182B	MY59100115	1 year	2024.05.26
SIGNAL GENERATOR	Anritsu	68369B	002118	1 year	2024.05.12
BAND REJECT FILTER	MICRO-TRONICS	BRM50702	G272	1 year	2024.01.12
Attenuator	KEYSIGHT	-	-	1 year	2024.03.21
Loop Antenna	Schwarzbeck	FMZB1513	1513-257	2 years	2025.03.22
Horn Antenna	A.H	SAS-571	414	1 year	2024.01.16
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA 9170550	1 year	2024.01.16
TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	714	2 years	2024.04.19
Amplifier	SONOMA INSTRUMENT	310N	186549	1 year	2024.03.21
PREAMPLIFIER	HP	8449B	3008A00538	1 year	2024.05.31
BROADBAND AMPLIFIER	SCHWARZBECK	BBV9721	PS9721-003	1 year	2024.01.16
DC POWER SUPPLY	AGILENT	6632B	US36351824	1 year	2024.01.13
LISN	R&S	ENV216	101787	1 year	2023.11.10
PULSE LIMITER	R&S	ESH3-Z2	101915	1 year	2023.11.10
DIGITAL MULTI METER	TEKTRONIX	DMM916	138401	1 year	2024.01.13

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook computer	LG Electronics Inc.,	LG15N54	504NZJV027828
Jig board	-	-	-

The end of test report.