



KES Co., Ltd.

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Report No.:

KES-RF1-22T0045

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Test results (Above 1 000 MHz)

Mode: LE 1 Mbps

Distance of measurement: 3 meter

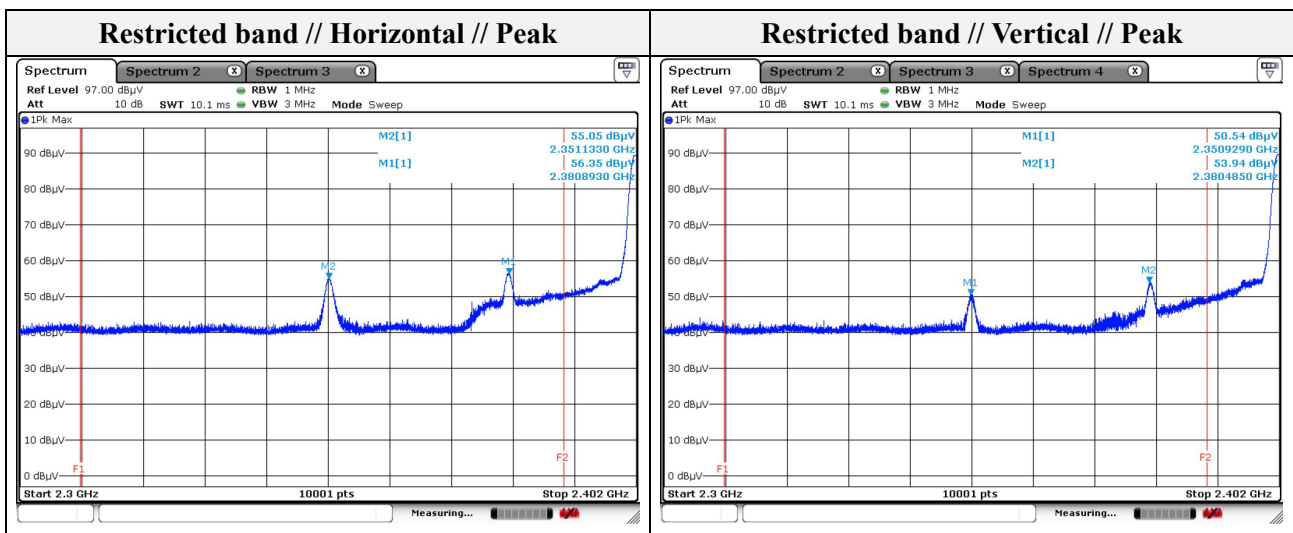
Channel: 00

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 063.29	46.32	Peak	V	-10.82	-	35.50	74.00	38.50
1 065.09	46.56	Peak	H	-10.81	-	35.75	74.00	38.25
1 937.61	46.79	Peak	H	-4.95	-	41.84	74.00	32.16
2 519.55	44.87	Peak	V	-2.28	-	42.59	74.00	31.41

- 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)
2 350.93	50.54	Peak	V	-2.93	-	47.61	74.00	26.39
2 351.13	55.05	Peak	H	-2.93	-	52.12	74.00	21.88
2 380.09	56.35	Peak	H	-2.81	-	53.54	74.00	20.46
2 380.49	53.94	Peak	V	-2.81	-	51.13	74.00	22.87



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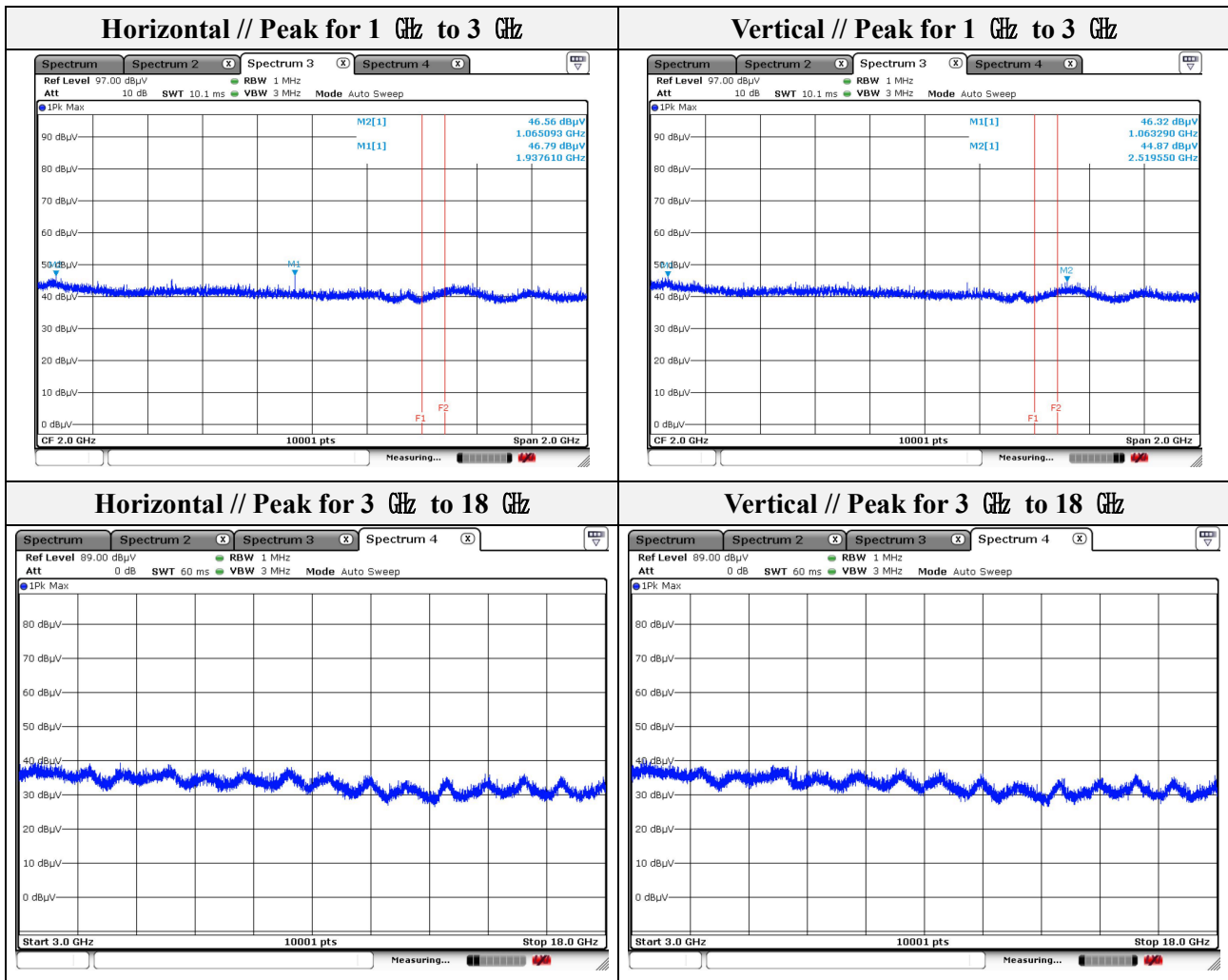
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Note.

1. No spurious emission were detected above 3 GHz.
2. Average test would be performed if the peak result were greater than the average limit.

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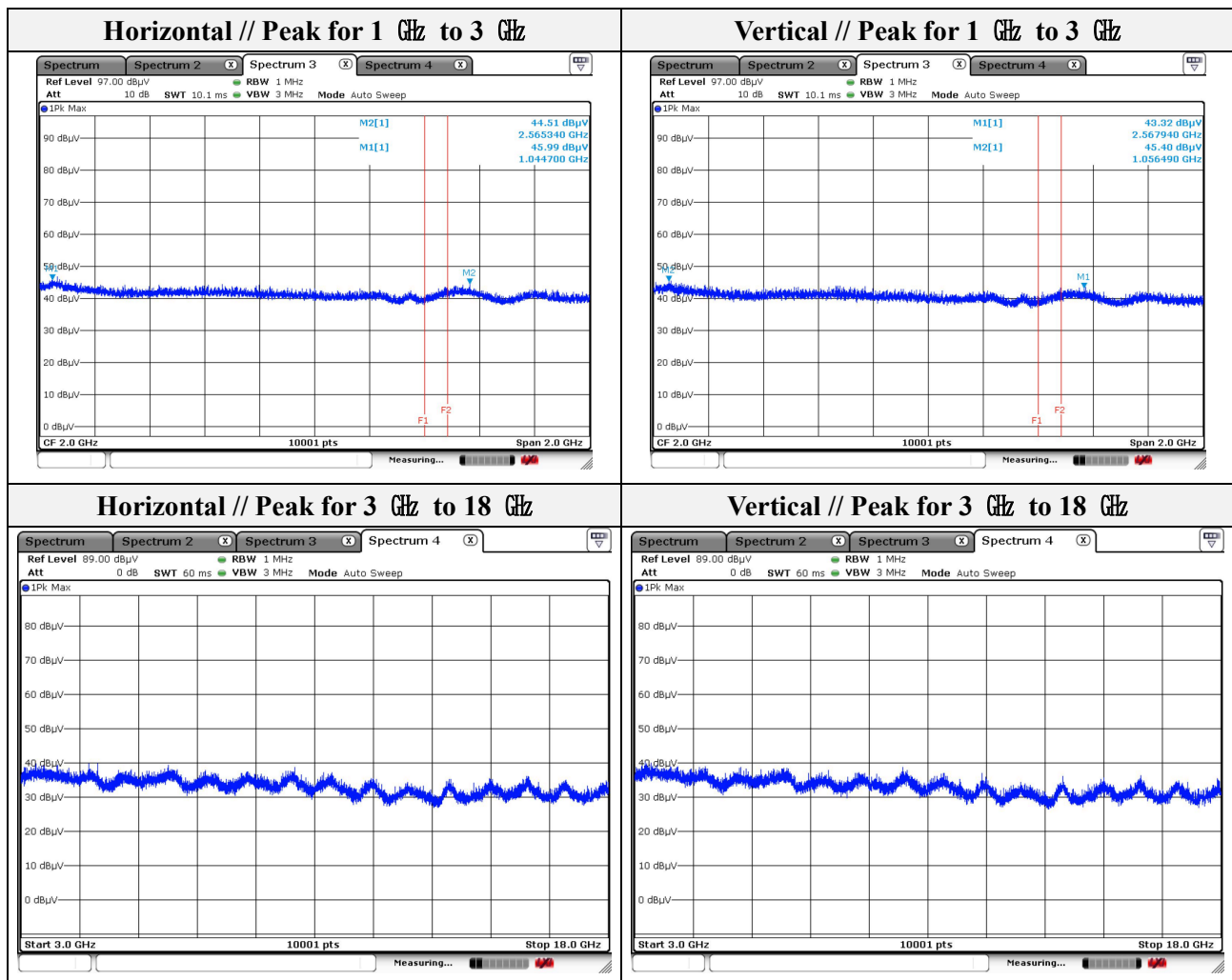
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Mode: LE 1 Mbps
Distance of measurement: 3 meter
Channel: 20

- Spurious

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 044.70	45.99	Peak	H	-10.92	-	35.07	74.00	38.93
1 056.49	45.40	Peak	V	-10.86	-	34.54	74.00	39.46
2 565.34	44.51	Peak	H	-2.16	-	42.35	74.00	31.65
2 567.94	43.32	Peak	V	-2.15	-	41.17	74.00	32.83



Note.

1. No spurious emission were detected above 3 GHz.
2. Average test would be performed if the peak result were greater than the average limit.

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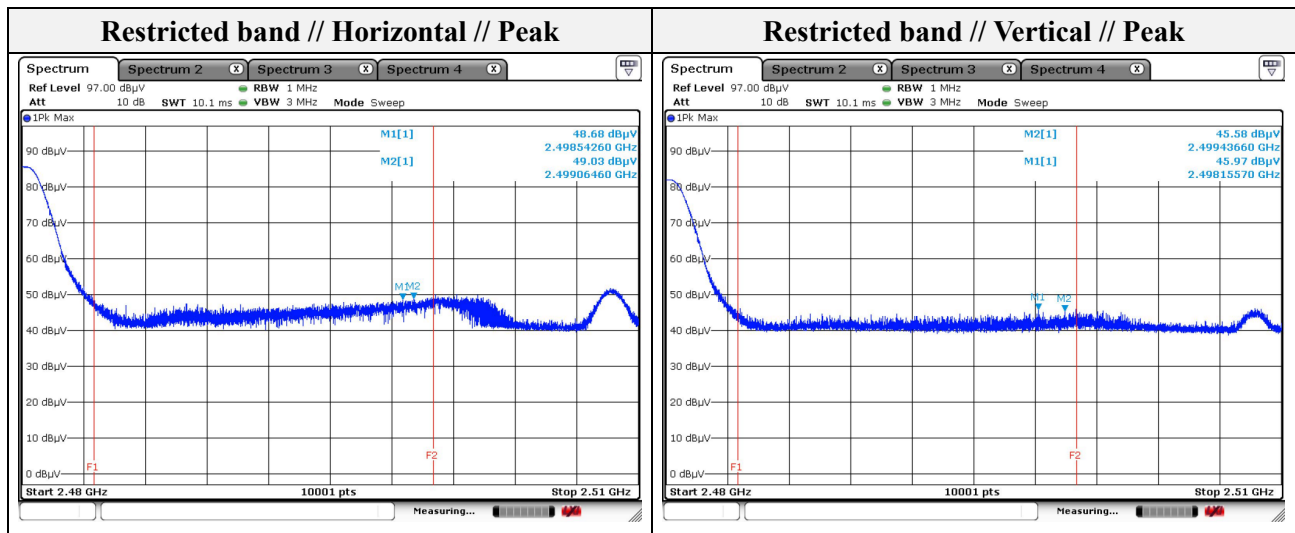
Mode: LE 1 Mbps
Distance of measurement: 3 meter
Channel: 39

- Spurious

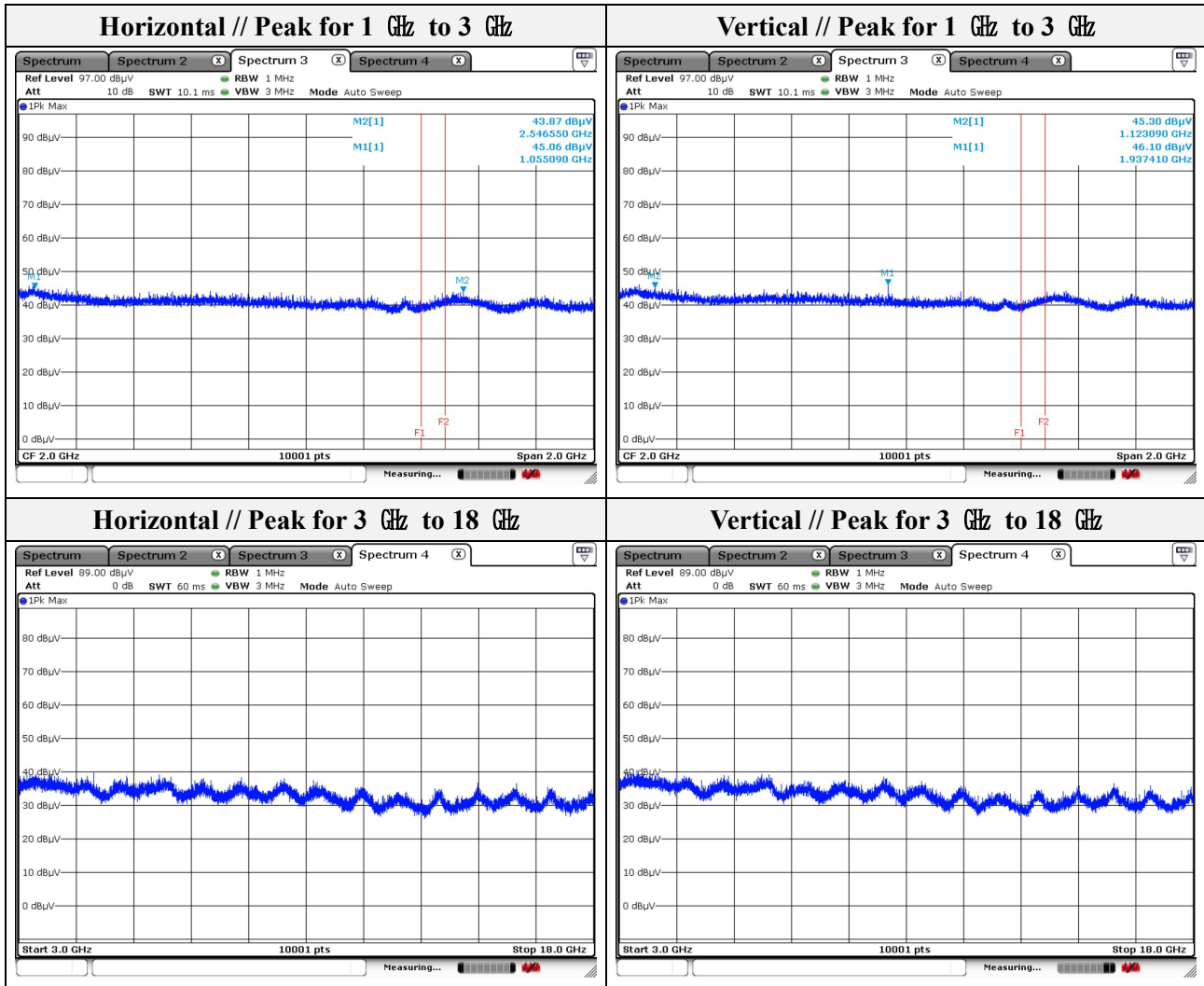
Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 055.09	45.06	Peak	H	-10.87	-	34.19	74.00	39.81
1 123.09	45.30	Peak	V	-10.51	-	34.79	74.00	39.21
1 937.41	46.10	Peak	V	-4.95	-	41.15	74.00	32.85
2 546.55	43.87	Peak	H	-2.21	-	41.66	74.00	32.34

- 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)
2 498.16	45.97	Peak	V	-2.34	-	43.63	74.00	30.37
2 498.54	48.68	Peak	H	-2.34	-	46.34	74.00	27.66
2 499.06	49.03	Peak	H	-2.34	-	47.36	74.00	26.64
2 499.44	45.58	Peak	V	-2.34	-	43.24	74.00	30.76



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Note.

1. No spurious emission were detected above 3 GHz.
2. Average test would be performed if the peak result were greater than the average limit.



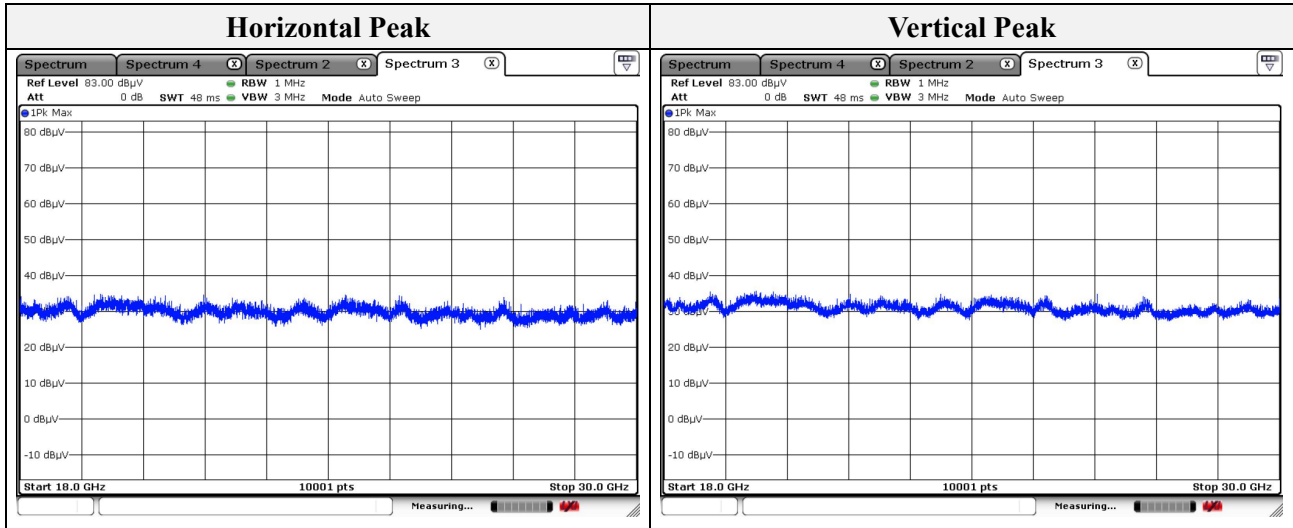
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Test results (18 GHz to 30 GHz) – Worst case

Mode: LE 1 Mbps
Distance of measurement: 3 meter
Channel: 00 (Worst case)



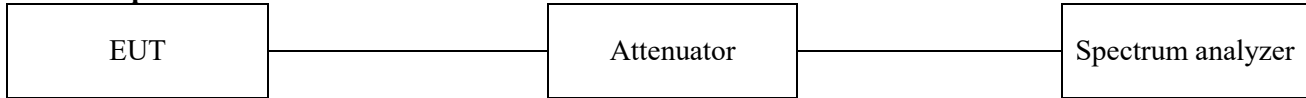
Note.

No spurious emission were detected above 18 GHz.

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3.5. Conducted spurious emissions & band edge

Test setup



Test procedure

Band edge

ANSI C63.10-2013 - 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. Set the RBW = 100 kHz
4. Set the VBW = $[3 \times \text{RBW}]$.
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow trace to fully stabilize.

Out of band emissions

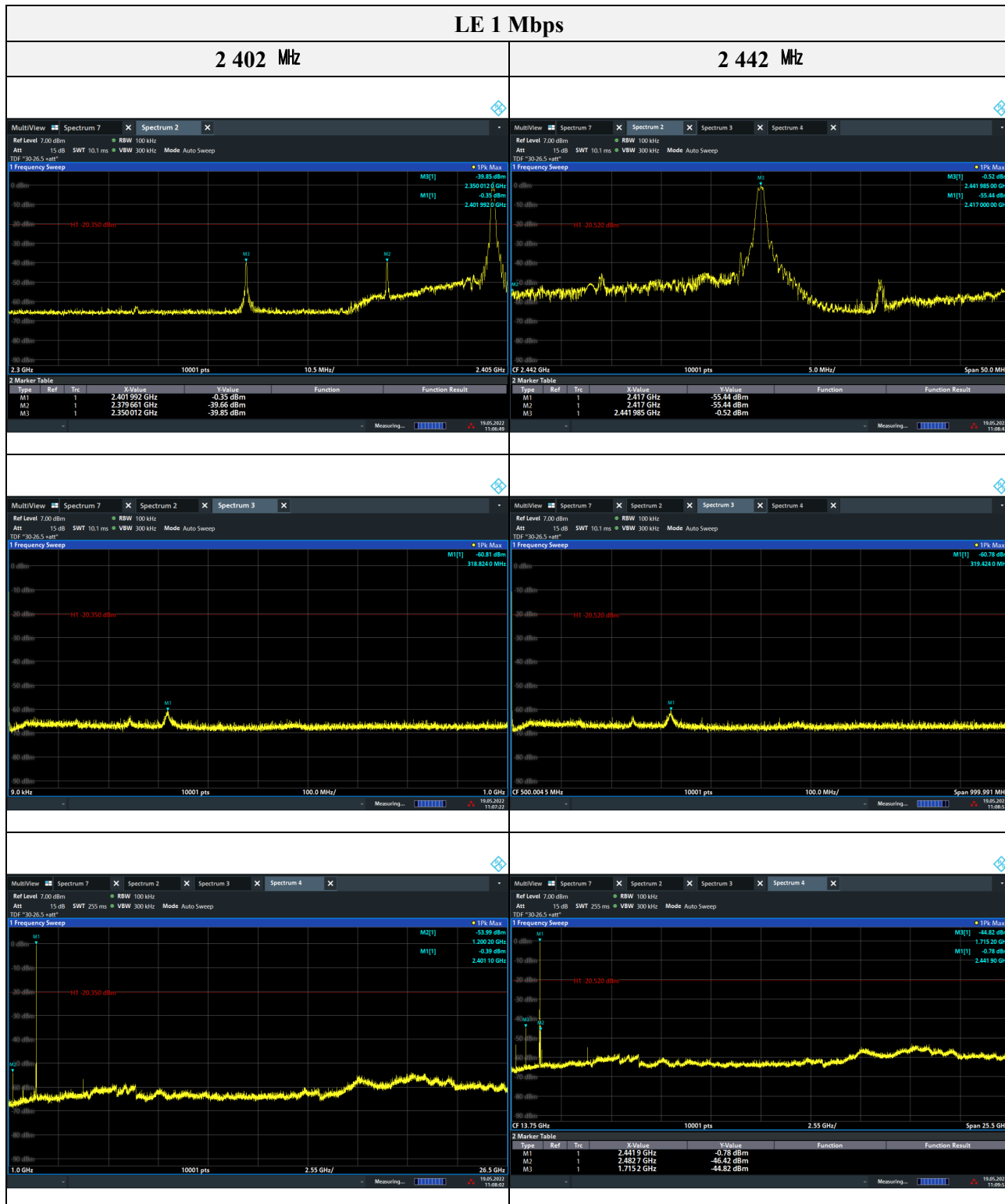
ANSI C63.10-2013 - Section 11.11

1. Start frequency was set to 30 MHz and stop frequency was set to 25 GHz for 2.4 GHz frequencies and 40 GHz for 5 GHz frequencies
2. Set the RBW = 100 kHz
3. Set the VBW = $[3 \times \text{RBW}]$.
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Allow trace to fully stabilize.

Limit

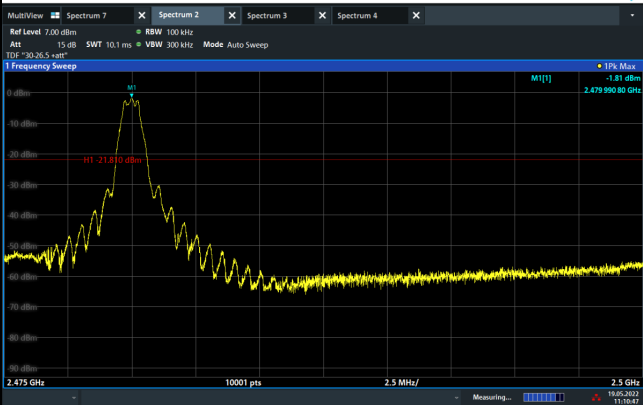
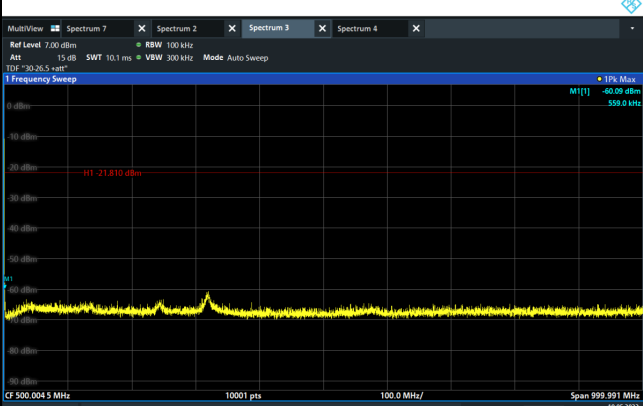
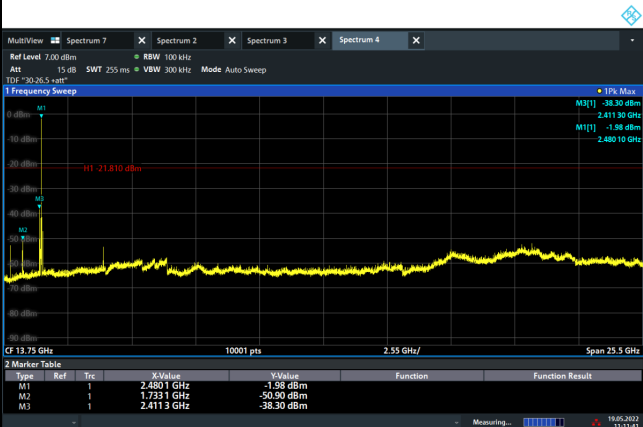
According to 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within 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 dB instead of 20 dB. 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))

Test results



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LE 1Mbps																									
2 480 MHz	-																								
	BLANK																								
	BLANK																								
 <table><tr><th>Type</th><th>Ref</th><th>Freq</th><th>Value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td>2.4801 GHz</td><td>-21.81 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td>1.7331 GHz</td><td>-50.90 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td>2.4113 GHz</td><td>-38.30 dBm</td><td></td><td></td></tr></table>	Type	Ref	Freq	Value	Function	Function Result	M1	1	2.4801 GHz	-21.81 dBm			M2	1	1.7331 GHz	-50.90 dBm			M3	1	2.4113 GHz	-38.30 dBm			BLANK
Type	Ref	Freq	Value	Function	Function Result																				
M1	1	2.4801 GHz	-21.81 dBm																						
M2	1	1.7331 GHz	-50.90 dBm																						
M3	1	2.4113 GHz	-38.30 dBm																						

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3.6. AC conducted emissions

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 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall be 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 (MHz)	Conducted limit (dB μ V/m)	
	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



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Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Spectrum analyzer	R&S	FSV3044	101272	1 year	2023.03.14
SIGNAL GENERATOR	KEYSIGHT	N5182B	MY59100115	1 year	2023.04.27
SIGNAL GENERATOR	Anritsu	68369B	002118	1 year	2023.05.13
Power Meter	Anritsu	ML2495A	2010001	1 year	2023.04.27
Pulse Power Sensor	Anritsu	MA2411B	1911111	1 year	2023.04.27
Attenuator	Mini-Circuits	BW-S10-2W263+	3	1 year	2023.01.17
Loop Antenna	Schwarzbeck	FMZB1513	225	2 years	2023.01.18
BILOG ANTENNA	Schwarzbeck	VULB 9168	9168-461	2 years	2022.12.22
Horn Antenna	A.H	SAS-571	414	1 year	2023.01.18
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA 9170550	1 year	2023.01.18
Amplifier	SONOMA INSTRUMENT	310N	401123	1 year	2022.06.07
PREAMPLIFIER	HP	8449B	3008A00538	1 year	2022.06.21
BROADBAND AMPLIFIER	SCHWARZBECK	BBV9721	PS9721-003	1 year	2023.01.17
Attenuator	HUBER+SHHNER	6806.17.A	NONE	1 year	2023.04.01
AC POWER SOURCE/ ANALYZER	HP	6813A	3729A00754	1 year	2023.01.14
DC Power supply	Agilent	6632B	MY43004090	1 year	2022.06.21
EMI Test Receiver	R&S	ESU26	100552	1 year	2023.03.31
LISN	ENV216	R & S	101787	1 year	2022.12.27
EMI TEST RECEIVER	ESR3	R & S	101783	1 year	2022.12.28
PULSE LIMITER	ESH3-Z2	R & S	101915	1 year	2022.12.27

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook computer	LG Electronics Inc.,	LGS53	306QCZP560949
Test Jig Board	N/A	N/A	N/A

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